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# U.S. STANDARD ATMOSPHERE SUPPLEMENTS, 1966

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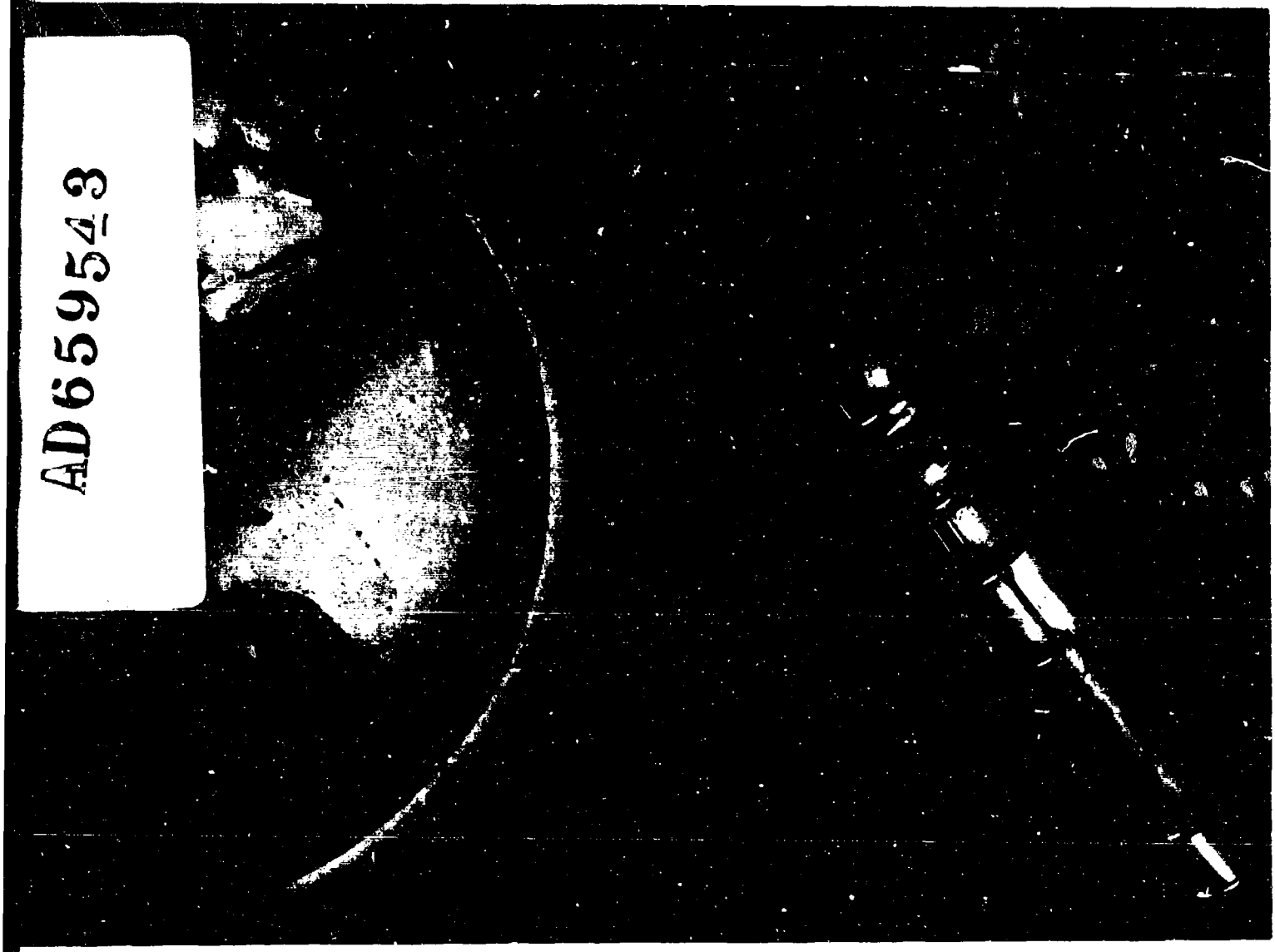

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# Abstract

The *U.S. Standard Atmosphere Supplements, 1966* was prepared in response to a need for atmospheric tables depicting conditions other than the mid-latitude mean represented by the tables of the *U.S. Standard Atmosphere, 1962*. Tables of typical winter and summer conditions for various latitudes are provided for the troposphere, stratosphere, and mesosphere. The models merge into three sets of boundary conditions at 120 kilometers in the lower thermosphere. Models starting from these boundary conditions then branch upward into atmospheric profiles which are related to the wide range of conditions in the heterosphere associated with varying solar activity, geomagnetic activity, and zenith angle of the sun.

The substance of this publication is two major sets of tables: those for the region below 120 kilometers, keyed to seasonal and latitudinal variations; and those for 120 to 1,000 kilometers, keyed to solar and geomagnetic activity and solar angle. These two sets of tables, though separated, have mutual boundary conditions so that users will be able to select for any location, season, and solar activity the appropriate continuous profiles from the surface up to 1,000 kilometers. Profiles of atmospheric properties for any orbital or re-entry trajectory can thus be estimated. In addition, this publication contains information on diurnal variations in density up to 90 kilometers, refined analytic expressions which can be used to represent pressure and density profiles of the 1962 Standard and these Supplementary Atmospheres to 80 kilometers, and a mid-latitude ozone model up to 50 kilometers. Tables providing the altitude variation of equal geopotential surfaces as a function of latitude are also included to facilitate application of the atmospheric tables to all locations. For those interested in aircraft pressure altimetry, a set of detailed pressure-altitude tables for levels from the surface up to 10 millibars is included.

The general background leading to development of these tables is contained in the foreword. Technical background is presented in Part 1—Basis of the Tables. Parts 2 and 3 provide detailed insight on the development of the two major sets of tables and include presentations of pertinent supporting data. Part 4 contains the additional material on analytic approximations, ozone, and latitude-altitude relations and Parts 5 and 6 are the major tables of the atmosphere. Throughout the document, figures and tables have been introduced to permit visual comparisons of the varying conditions presented. Major tables are presented in both English and metric systems below 120 kilometers. Above 120 kilometers only metric tables are provided.

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# Symbols and Abbreviations

| | |
|---|---|
| $A$ | area, also empirical parameter |
| $A'$ | coefficient |
| Å | Angstrom |
| $a$ | coefficient in Chebyshev expansion |
| $a_p$ | geomagnetic planetary index |
| $B$ | empirical parameter |
| BTU | British thermal unit |
| $b$ | subscript indicating base or reference level |
| °C | degrees, in thermodynamic Celsius scale |
| $C_D$ | aerodynamic drag coefficient |
| $C_k$ | Chebyshev polynomial |
| $C_s$ | speed of sound |
| $c$ | cycles |
| cal | calorie |
| cm | centimeter |
| CST | Central Standard Time |
| $D$ | empirical parameter |
| $d$ | days since January 1 |
| $e$ | vapor pressure |
| EST | Eastern Standard Time |
| $F$ | function |
| °F | degrees, in thermodynamic Fahrenheit scale |
| $F_{10.7}$ | 10.7 cm solar flux |
| $\overline{F}_{10.7}$ | 10.7 cm solar flux averaged over three solar rotations |
| $f$ | function |
| $f(d)$ | empirical parameter |
| ft | foot |
| $G$ | Newton's universal gravitational constant |
| GMT | Greenwich Mean Time |
| $g$ | acceleration due to gravity |
| g | gram (mass) |
| $H$ | geopotential altitude |
| $H_b$ | geopotential altitude of base of layer |
| $H^*$ | hour angle of sun |
| $H_i$ | scale height of individual atmospheric constituent |
| $H_p$ | pressure scale height |
| $h$ | $H-H_b$ |
| in | inch |
| $j$ | index |
| °K | degrees, in thermodynamic Kelvin scale |
| $K_p$ | geomagnetic planetary index |
| $k$ | thermal conductivity; also Boltzmann constant |
| kg | kilogram (mass) |
| kg-cal | kilogram-calorie |
| km | kilometer |
| $L'_M$ | gradient of molecular-scale temperature with geopotential altitude |
| lb | pound (mass) |
| LST | Local Standard Time |
| $M$ | mean molecular weight of air |
| $M_0$ | sea-level value of mean molecular weight |
| matm-cm | milli-atmosphere-centimeter |

| | |
|---|---|
| m | meter; also exponent |
| m′ | geopotential meter |
| mm | millimeter |
| $m_i$ | molecular (or atomic) mass of individual atmospheric constituent |
| mb | millibar |
| MST | Mountain Standard Time |
| $n$ | number density; exponent and index |
| o | subscript indicating sea-level value |
| $P$ | pressure |
| $p$ | a constant |
| $q$ | an exponent |
| °R | degrees, in thermodynamic Rankine scale |
| $R$ | a constant in the diurnal bulge equation |
| $R^*$ | universal gas constant |
| $r$ | effective earth radius; also a density or pressure ratio |
| $s$ | an exponent associated with temperature profiles in thermosphere |
| $S$ | Sutherland's constant |
| SD | standard deviation |
| STP | standard temperature and pressure |
| sec | second |
| $T$ | temperature in absolute thermodynamic scale |
| $T_D$ | daytime maximum exospheric temperature at particular latitude |
| $T_k$ | Chebyshev polynomial |
| $T_M$ | molecular-scale temperature in absolute thermodynamic scale |
| $T_{Mv}$ | molecular-scale virtual temperature in absolute thermodynamic scale |
| $T_N$ | nighttime minimum exospheric temperature at particular latitude |
| $\bar{T}_0$ | nighttime global minimum temperature averaged over three solar rotations |
| $T_0$ | nighttime global minimum exospheric temperature |
| $T_0'$ | $\bar{T}_0$ corrected for day-to-day variation in solar flux |
| $T_v$ | virtual temperature in absolute thermodynamic scale |
| $T_x$ | daytime global maximum exospheric temperature |
| $T_\pi$ | temperature at satellite perigee |
| $T_\infty$ | exospheric temperature |
| $u$ | east-west wind component |
| UV | ultraviolet |
| w | watt |
| $x$ | independent variable |
| $Y$ | horizontal north-south distance |
| $Z$ | geometric altitude |
| $Z_m$ | matching geometric altitude |
| $Z_x$ | empirical function |
| $\alpha$ | thermal-diffusion factor |
| $\alpha_\pi$ | right ascension of satellite perigee |
| $\alpha_\odot$ | right ascension of sun |
| $\beta$ | a constant |
| $\gamma$ | ratio of specific heats; also a constant |
| $\delta_\pi$ | declination of satellite perigee |
| $\delta_\odot$ | declination of sun |
| $\eta$ | empirical parameter |
| $\theta$ | empirical parameter |
| $\mu$ | coefficient of viscosity |
| $\xi$ | argument of Chebyshev polynomial |
| $\rho$ | mass density |
| $\rho_j$ | mass density for spring/fall atmospheric models |
| $\rho_s$ | mass density for summer atmospheric models |
| $\rho_w$ | mass density for winter atmospheric models |
| $\rho_\pi$ | mass density at satellite perigee |
| $\rho_r$ | mass density at reference altitude |
| $\tau$ | empirical parameter |

| | |
|---|---|
| $\Phi$ | geopotential |
| $\phi$ | geographic latitude |
| $\phi_N$ | geographic latitude of center of diurnal bulge |
| $\psi$ | empirical parameter |
| $\omega$ | angular velocity of earth |

# Foreword

The *U.S. Standard Atmosphere, 1962* was developed to serve the aerospace community as a mean basis for design and operation of vehicles and for general scientific considerations. However, there are also requirements for realistic tables of the atmosphere for use in investigations of effects due to nonstandard atmospheric conditions, especially for systematic departures due to geography, season, time of day, and solar activity. The ***U.S. Standard Atmosphere Supplements, 1966*** provide tabulations of atmospheric parameters from the surface to 1,000 km, based upon latitude and season for lower altitudes and as a function of solar activity and angle for higher altitudes. Such tables, designated as supplementary atmospheres, must be judged, found acceptable, and published by a knowledgeable, responsible group such as the U.S. Committee on Extension to the Standard Atmosphere (COESA) in order to receive widest circulation and be utilized with confidence.

COESA is a group of organizations that banded together in 1953 to take actions required to provide the then newborn missile industry with a realistic description of the atmosphere extending beyond altitudes of conventional aircraft operations. Sponsors of this effort are the Environmental Science Services Administration (ESSA), the National Aeronautics and Space Administration (NASA), and the United States Air Force (USAF).* Today, 30 participating organizations, representing government, industry, research institutions, and universities, support this effort. These organizations and the scientists and engineers that have participated at the COESA Working Group level are listed here:

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For several years COESA has been attempting to assemble information permitting the tabulation of vertical profiles of atmospheric properties as functions of latitude, season, and other systematic influences. Such tables are required chiefly for scientific calculations and investigations of the effect on aerospace vehicle design, of atmospheric departures from the accepted baseline, the *U.S. Standard Atmosphere, 1962*. They will also prove useful in long term planning of specific scientific experiments and aerospace vehicle flights in instances of great sensitivity to atmospheric conditions. For locations and seasons characterized by a minimum in variability of the type caused in the lower atmosphere by weather, supplementary tables may be quite satisfactory as predictions of atmospheric conditions to be encountered for a specific operation or experiment. In other instances a supplementary atmosphere may be the best prediction available even though it is suspected that effects due to nonsystematic variability around it are unacceptably large.

However, readers who intend to use these models operationally, as representations of variations in the real atmosphere, are advised to study carefully the material on limitations (Sections 2.4 and 3.6). This may be particularly important for precise applications during and immediately subsequent to geomagnetic storms (both planetary and polar) in the 120- to 200-km region and at all altitudes within the auroral oval. An example of such an application is precise ephemeris prediction for low-altitude satellites in nearly circular polar orbits.

Development of the new Supplementary Atmospheres has been well coordinated with that of CIRA 1965 (COSPAR International Reference Atmosphere, 1965). This has been achieved through participation of some of the major contributors in both preparatory Working Groups and by presentation of COESA models and studies at COSPAR meetings. Both sets of models give latitudinal and seasonal variations up to 80 km. Though these are somewhat similar there are

some important differences, particularly in the high latitude models, where the COESA profiles appear to be in better agreement with recent data. The new Supplementary Atmospheres give latitudinal variations in properties at all altitudes (up to 1,000 km) and seasonal variations up to about 250 km, so that *continuous* atmospheric profiles from the surface can be obtained for any location and time. No seasonal or latitudinal information is provided in CIRA above 80 km.

This document is the result of the efforts of all Working Group members listed previously. The cochairmen would like to take this opportunity to thank each of them for his unselfish contribution. However, for an effort of this type a small, hard core group of dedicated individuals is also required to bring to fruition the ideas of many people. Special recognition which must be given to them is provided in the following paragraphs.

In addition to guiding the Working Group through several major meetings, Dr. Luigi Jacchia, Working Group Chairman, is responsible for extension into the exosphere of what had originally started out to be a report on systematic variations below 90 km. He illustrated the manner in which satellite-determined density data can be classified by profiles which are logically related to solar activity and the time of day. He followed this contribution by developing a methodology for obtaining a family of exponential temperature curves which fitted these density data after application of the barometric equations. It was adopted with some modifications for this report. Finally, Dr. Jacchia is responsible for much of the text and tables describing the atmosphere above 120 km. These tables also include his findings on the geometry of upper-atmosphere parameters as related to the earth's coordinates and the relationship of solar (and geomagnetic) activity and exospheric temperature. Along with Dr. Jacchia, a great deal of credit must be given to his associate, Jack Slowey. His competence in the programming and computing of tables of atmospheric profiles was invaluable in the tedious process of joining together the families of lower altitude and higher altitude atmospheres.

During the several years of development of these tables, Dr. K. S. W. Champion was a source of strength and knowledge. As a responsible Task Group Convener, he refused to compromise toward a less exact but more convenient solution in joining the lower-altitude seasonally and latitudinally dependent atmospheres to the high-altitude atmospheres. With the aid of his associate, Frank Marcos, he performed extensive studies of the available data in order to present an interface family of curves above 90 km which gradually merge the seasonal and latitudinal variations below this altitude to the upper-altitude atmospheres. Thus the variability shown in the 100- to 250-km altitude interval is most likely to be fairly representative (excluding conditions during geomagnetic storms) of the true but insufficiently explored conditions in this region. Dr. Champion contributed extensively to the development of text and tables for altitudes above 90 km, especially those between 90 and 250 km. He was responsible for convening several Task Group meetings when the situation seemed rather dark during attempts to join the lower- and higher-altitude atmospheres. Through these discussions and presentations of data, Dr. Champion was able to provide the guidance required to overcome the grave difficulty encountered.

Allen E. Cole and Arthur J. Kantor deserve much gratitude for their major responsibility in development of the supplementary atmospheres up to 90 km and for their patience and continuing efforts during the several years required to modify and attach the upper portion of their already well used *Air Force Interim Supplementary Atmospheres* to the high-altitude atmospheres. Mr. Cole led a Task Group of several Working Group members for a number of years in these efforts and showed great skill in assimilating many of their modifications in the original presentations, including those of Dr. Arnold Court, Frederick G. Finger (ESSA), Stanley Batten, Dr. William Nordberg, and Roderick S. Quiroz. Mr. Quiroz also deserves recognition for preparing a section of this report describing diurnal variability of density up to 90 km. Special appreciation must be extended at this time to Paul F. Nee and Eugene A. Bertoni of AFCRL, who assisted in the programming and computation of the tables of surface to 120-km atmospheric properties.

Raymond A. Minzner has been an invaluable contributor in all phases of the development of this volume. He was extremely helpful in resolution of the problem involving the interface altitudes of the 0 to 90 km and the above 200-km atmospheres. He prepared many task level working papers on methodologies of joining the various families of atmospheres. He also prepared a subsidiary table applicable to the family of high-altitude atmospheres, which relates the geometric altitude of geopotential surfaces at all latitudes to that at the standard latitude, 45° N.

COESA's *U.S. Standard Atmosphere, 1962* includes presentations of temperature as approximate analytic functions of altitude, up to 200 km. Although very close fit of the temperature curve was obtained, density and pressure computed from this curve departed considerably from the Standard at certain altitudes. Therefore, it was decided that additional supplementary material

should be developed and included in this volume. Richard A. Hord (with the aid of his associate, Miss Jean P. Mason) and Hermann B. Wobus comprised a Task Group assigned this responsibility. They were able to prepare independent analytic approximations for density and pressure for the 1962 Standard up to 200 km and for the new Supplementary Atmospheres up to 80 km. These should prove invaluable to those concerned with machine programming of interactions of the sensible atmosphere with aerospace vehicles in the mesosphere, stratosphere, and troposphere.

Finally, the COESA Working Group decided there existed a requirement for presenting information on a minor but extremely important atmospheric constituent, ozone. Wayne Hering of the Air Force Cambridge Research Laboratories, though not previously associated with COESA efforts, was called upon and responded with a valuable section on ozone for this volume.

The technical contributions to this volume of course cannot end with the preparation of the draft material. There must be final overseers so that all material may tie together logically and accurately. Responsibility for this fell to the three co-sponsoring organizations. Assigned as technical editors were Dr. K. S. W. Champion, AFCRL; William O'Sullivan, Jr. with the aid of Gerald Keating, NASA; and Harold M. Woolf, ESSA. Major Donald A. Krider also provided informal aid in this phase of preparation. Their extensive efforts are indeed appreciated. They in turn had to be followed by an editorial group completely responsible for format and final preparation. To John Marple, AFCRL's Publication Chief, and his staff, including Eugene Pepin, cover-picture artist, we owe our thanks for completion and publication of this work.

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*Cochairmen, U.S. Committee on Extension to the Standard Atmosphere*

# PART 1

## Basis of the Tables

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# PART 1

# Basis of the Tables

## 1.0 INTRODUCTION

Part 1 contains the basis of the main tables of atmospheric properties that appear in Parts 5 and 6. The specifications of the model atmospheres that are included are listed (Section 1.2). Also included in Part 1 are background information, definitions, equations, physical constants, and conversion factors used in the computations.

## 1.1 BACKGROUND

Systematic variation in the troposphere due to season and latitude has been fairly well known for years. In fact, when COESA first started to update the Standard Atmosphere in 1953, rough data were presented which depicted this variability up to 30 km, the middle stratosphere. These data were obtained from a limited number of radiosonde flights. However, the requirement for presenting variability in a format similar to the tables in the Standard Atmosphere had not been established.

The current COESA effort to provide supplementary atmospheres received its impetus a little more than five years ago when expansion of the nation's space program generated requirements for information on the variability of atmospheric structure in the design of second-generation scientific and military aerospace vehicles. At that time, a decision was made to utilize a comparatively large mass of data coming into the inventory from a new sensor, the meteorological rocketsonde. It was thought that such data, in conjunction with the very much improved 30-km radiosonde data, would permit construction of typical January and July atmospheric profiles for 30°, 45°, 60°, and 75° N. latitudes and an annual average for 15° N. The extension of these nine atmospheric profiles to an altitude of 90 km was established as the goal. To attain this goal, data from a handful of specialized rocket experiments for altitudes above those of meteorological rockets were subjected to extrapolation techniques through which the wind field is related to gradients of pressure, temperature, and density.

In July 1963, the COESA Working Group, meeting at Fort Collins, Colorado was able to define a generally acceptable set of seasonally and latitudinally determined atmospheres. Seven of these extended to 90 km. The two 75° latitude atmospheres had to be limited to 30 km altitude because of a lack of data. However, due to the different thermal regimes found at high latitudes in winter, four additional atmospheres were defined to represent the warm and cold stratospheric-mesospheric conditions at 60° (to 90 km) and 75° (to 30 km) in January.

At this point, very little additional effort would have been required to provide a follow-on COESA publication to the *U.S. Standard Atmosphere, 1962* with detailed tabulations of these 13 Supplementary Atmospheres. In fact, the Air Force, in response to urgent requirements, published preliminary tables as *Air Force Interim Supplemental Atmospheres*. However, at the Fort Collins meeting, Working Group Chairman Jacchia presented a summary of recent research indicating that it had become feasible to prepare models for altitudes above 200 km which would portray systematic variability resulting from changes in solar flux and zenith angle. New pressures from the aerospace community, this time from atmosphere-space interface interests, made it desirable to extend our supplementary atmospheres to orbital altitudes.

Unfortunately, there was little information on systematic variability for altitudes from 90 km up to 200 km, above the maximum altitude of most rocket sensors and below the minimum altitude of most satellites. Despite this difficulty the Working Group decided to try to provide a reasonable interpolation across this region for the seven basic surface-to-90 km (15° annual and 30°, 45°, and 60° January and July) atmospheres.

The contemplated interpolation required physical expressions for describing the atmospheric profiles obtained from satellite drag. Although the physical relationship was partially understood, it can still be only roughly specified. The final goal of spanning the 90- to 200-km "ignorosphere" was found difficult to attain in spite of intensive research by COESA students of the upper atmosphere.

To review the situation, the COESA Working Group met again in January 1965 at the University of Miami. It was agreed that an inadequate theory is worse than none when it must fit a great many accurate observations. Density profiles acceptably close to those deduced from satellite data can be computed from a family of empirically derived exponential temperature curves and the barometric equations. Thus temperature is continued as the defining parameter

of the atmosphere, as in the case of the lower altitude seasonally and latitudinally specified supplementary atmospheres. All profiles of atmospheric properties converged below altitudes of satellite data to a single boundary condition of density, temperature, pressure, and molecular weight at 120 km which differed only slightly from corresponding values in the 1962 Standard.

The arrangement of these atmospheric tables in terms of exospheric temperature, rather than solar activity, ensures that the family of tables will not become obsolete as relationships between exospheric temperature and solar activity are refined. In utilizing the tables, one notes that the basic high-altitude atmosphere selected will be that with exospheric temperature on the shaded side of the earth appropriate to prevailing solar activity. Exospheric temperatures for other locations can then be obtained from a functional expression requiring only the angle of the sun. These exospheric temperatures serve as the key in selecting the table of atmospheric properties for the location applicable to a specific solar angle.

The meeting at Miami was adjourned with our goal and procedure supposedly well established. The low-altitude supplementary atmospheres (15° N. annual and 30°, 45°, and 60° N. January and July) terminated at 90 km with seven sets of temperature, pressure, and density data. Though the 90-km temperatures and pressures differed substantially, density profiles of these atmospheres appear to be converging to a single value slightly above 90 km. Since an acceptable family of high-altitude atmospheres had been defined which now extended downward to a single set of boundary conditions at about 120 km, connection with the seven low-altitude atmospheres which reached 90 km appeared to be a simple chore. Some manipulation of the lapse rates between 90 and 120 km would be required since consistency through the barometric equation must be achieved. Also, consideration had to be given to several newly available soundings, some of which had been presented at Miami during Task Group sessions. Therefore, it was decided to permit modification of the seven low-altitude models to levels as low as 80 km, if necessary, to provide greater flexibility.

The implication of this decision to join all models at 120 km is that latitudinal/seasonal variability, so well defined in the lower layers, becomes essentially damped out and negligible above 90 km. This simplifying assumption was not borne out by examination of most recent data. More realistic conditions for winter, at least for middle latitudes, are represented if the 30°, 45°, and 60° N. January densities at 120 km are approximately 50 percent above the Standard. Mid-latitude summer and low-latitude data grouped around a density some 20 percent below standard at 120 km. The 15° annual and 30°, 45°, and 60° N. July atmospheres could be conveniently extended to that point. In so doing, the density-altitude profiles for all atmospheres had to pass through a density ranging from 10 percent to 15 percent above standard just above 90 km, a level recently noted to be isopycnic (near-constant density). The concept of such a singular point has proved to be most useful.

Two new families of temperature curves for the interface region above 120 km were developed to connect with the Jacchia high-altitude atmospheres. One family starts with 120-km winter conditions, each member joining smoothly at an altitude in the 200- to 250-km region with the corresponding curve in the family of high-altitude atmospheres, whereas the other family starts at 120-km summer conditions and in similar fashion joins high-altitude atmospheres. These continue upward to 1000 km.

Another important point arose. The available spring and fall soundings, although sparse, indicated that density at 120 km is probably very close to standard. In these soundings, densities near 90 km are also shown to approach isopycnic conditions. It is apparent that if we were developing a new Standard today, density should be 10 to 15 percent greater than the present Standard just above 90 km. Since density variability approaches a factor of 3 around 70 km and is known to amount to orders of magnitude at several hundred kilometers, such a small discrepancy is not sufficient justification for a revision of the 1962 Standard at this time. However, it does appear reasonable to provide additional realism in a report on supplementary atmospheres by including "spring/fall" atmospheres. The Standard appears to be a good representation of spring/fall conditions up to about 70 km, above which a departure is convenient through the 91-km isopycnic to 120 km, meeting exactly the basic family of high-altitude atmospheres suggested by Working Group Chairman Jacchia. With these considerations, a density profile can now be constructed which depicts mid-latitude spring/fall conditions at low altitudes and conditions for the heterosphere for any solar position and degree of solar and geomagnetic activity.

In summary, the goal of these efforts is a description of the complete range of atmospheric properties commensurate with known systematic variations for lower altitudes due to latitude and season, and for the heterosphere due to solar activity and angle. Continuity and internal consistency are maintained between all latitudes and altitudes. Two sets of tables, one for the family of atmospheres below 120 km and the other for 120 to 1000 km, are provided. These families are matched at 120 km.

Further refinements are likely in the future, especially between 100 and 200 km, but it is believed that

the greatest possible correspondence with data and theory currently available is presented by the tables of atmospheric profiles in this new COESA publication.

## 1.2 ATMOSPHERIC MODELS

1.2.1 MODELS UP TO 120 KILOMETERS.—Systematic (latitudinal and seasonal) variability of properties of the atmosphere is shown for altitudes up to 120 km by a family of internally consistent Supplementary Atmospheres. The following atmospheres are included:

| *Title* | *Latitude* | *Time of Year* |
|---|---|---|
| Tropic | 15° N. | Annual average up to 120 km. |
| Subtropic | 30° N. | January and July to 80 km; winter and summer 80 to 120 km. |
| Mid-latitude | 45° N. | January and July to 80 km; winter and summer 80 to 120 km. *U.S. Standard Atmosphere, 1962* to 69 km; spring/fall 69 to 120 km. |
| Subarctic | 60° N. | January and July to 80 km; winter and summer 80 to 120 km. Cold and warm stratospheric-mesospheric regimes to 80 km for January. |
| Arctic | 75° N. | January and July to 30 km. Cold and warm stratospheric regimes to 30 km for January. |

Some special considerations employed in the development of this lower altitude family of atmospheres are:

a. The distribution of thermodynamic properties in the January and July atmospheres is consistent with the observed wind fields for altitudes up to 80 km.

b. Atmospheric profiles between 80 and 120 km are based on empirical density profiles for the winter, summer, and transitional months. They provide a hydrostatically consistent link between the season- and latitude-dependent atmospheres below 80 km and the families of atmospheres related to diurnal and solar flux variability above 120 km.

c. Atmospheric models are considered applicable to the northern hemisphere only. However, it is believed that they closely approximate conditions as far south as mid-latitudes in the southern hemisphere.

d. A north pole (90° N.) atmosphere is not provided in the low-altitude family of supplementary atmospheres. The 75° N. atmospheres are believed to be the best approximation to the 90° N. atmosphere that can be developed at this time. They are limited to an altitude of [illegible] due to the sparsity of rocket observations at this [illegible].

e. Models presenting the vertical distribution of thermodynamic properties are defined by temperature-altitude profiles in which the vertical gradients of molecular-scale temperature are linear with geopotential altitude.

f. Molecular weight is assumed to be constant, 28.96 to 80 km, decreasing above 80 km to 26.90 in the spring/fall, 27.12 in the winter, and 26.76 in the summer and 15° N. annual atmospheres at 120 km.

g. Special characteristics of these atmospheres, such as the trade inversion of the tropics and distribution of water vapor in the lower layers, are included.

h. Special attention is given to physical features of a global nature, such as isopycnic levels, which help to tie the family of supplementary atmospheres together.

i. A brief discussion on diurnal variability of atmospheric density for altitudes below 90 km is included in Part 2.

1.2.2 MODELS ABOVE 120 KILOMETERS.—A family of atmospheres between 120 and 1000 km is presented with the following 11 exospheric temperatures: 600°, 700°, 800°, 900°, 1000°, 1100°, 1300°, 1500°, 1700°, 1900°, and 2100° K. Each atmosphere corresponding to a single exospheric temperature divides into separate atmospheres denoting variation with season below the matching altitude, $Z_m$. These three atmospheres denote typical summer, winter, and spring/fall conditions. The altitude $Z_m$ varies systematically with exospheric temperature within the range 195 to 255 km. For the lower exospheric temperatures the value of $Z_m$ is higher for the winter models than for the summer models, but for exospheric temperatures above 1300° K, $Z_m$ is independent of season.

All the summer atmospheres converge to approximately the same set of conditions at 120 km (density about 20 percent below the Standard), all the winter atmospheres approach another set of conditions (density about 46 percent above the Standard), and all the spring/fall atmospheres converge to a third set of conditions (density 1 percent above the Standard).

## 1.3 BASIC ASSUMPTIONS AND FORMULAS

1.3.1 PRIMARY CONSTANTS.—The numerical values for the various thermodynamic and physical constants used in the computations of atmospheric properties are the same as those given in Table 1.2.1 of the *U.S. Standard Atmosphere, 1962*, with two exceptions. Surface conditions for each of the atmospheres below 120 km are based on hemispheric mean sea-level values of temperature, pressure, density, and relative humidity for the appropriate latitude and month rather than on standard conditions; and accelerations due to gravity at sea level for latitudes other than 45° N. were obtained from the following expression by Lambert (List, 1963)

$$g_\phi = 9.780356\,(1 + 0.0052885 \sin^2 \phi - 0.0000059 \sin^2 2\phi) \text{ m sec}^{-2}. \quad (1.1)$$

For 45° N. the value of the acceleration due to gravity at sea level ($g_0$) was taken as 9.80665 m sec$^{-2}$. This value had been used in most of the earlier standard atmospheres and was adopted for the *U.S. Standard Atmosphere, 1962*. It more precisely applies to a latitude of 45°32′33″. The value at 45° N. from Lambert's formula is 9.80616 m sec$^{-2}$. The following table shows values of $g_0$ used in the computations:

TABLE 1.1 ACCELERATION VALUES

| Latitude | Values of $g_0$ (m sec$^{-2}$) |
|---|---|
| 0° | 9.78036 |
| 15° N. | 9.78381 |
| 30° N. | 9.79324 |
| 45° N. | 9.80665 |
| 60° N. | 9.81911 |
| 75° N. | 9.82860 |
| 90° N. | 9.83208 |

1.3.2 PERFECT GAS LAW.—It is assumed that dry air and water vapor-air mixture behave in accordance with the perfect gas law:

$$\rho = \frac{MP}{R^* T_v} \tag{1.2}$$

where $M$ is the mean molecular weight, $R^*$ is the universal gas constant, and $T_v$ is the virtual temperature, obtained from the empirical formula

$$T_v = \frac{T}{1 - 0.379(e/P)}. \tag{1.3}$$

This is the fictitious temperature which dry air must have at the given pressure $P$, in order to have the same density $\rho$, as a water vapor-air mixture at the same pressure $P$, temperature $T$, and vapor pressure $e$. The assumption that the mixture behaves as a perfect gas eliminates the necessity for considering minor deviations from the perfect gas law such as the compressibility factor of air which is a function of pressure, temperature, and relative humidity. The error in computed densities resulting from the assumption that air is a perfect gas may approach 0.05 percent below 10 km but becomes less than 0.01 percent above 20 km (List, 1963).

1.3.3 MOLECULAR-SCALE TEMPERATURE.—The molecular-scale temperature $T_M$ is defined by

$$T_M = \frac{M_0}{M} T \tag{1.4}$$

and

$$T_{Mv} = \frac{M_0}{M} T_v \tag{1.5}$$

is the corresponding relation between $T_{Mv}$ and the virtual temperature $T_v$; $M_0$ is the mean molecular weight of air at sea level. Due to molecular dissociation and diffusive separation, the mean molecular weight decreases with altitude above 80 km. Hence the value of $T_M$ is larger than the value of $T$ at these altitudes.

1.3.4 HYDROSTATIC EQUATION.—The air is assumed to be in hydrostatic equilibrium and to satisfy the differential equation

$$dP = -\rho g dZ \tag{1.6}$$

where $Z$ denotes geometric altitude.

1.3.5 GEOPOTENTIAL.—The relationship between geopotential altitude and geometric altitude developed in the *U.S. Standard Atmosphere, 1962* is used at 45° N. For latitudes other than 45° N., the following expressions were used to obtain the relationship between geopotential altitude and geometric altitude. The geopotential at a point whose geometric altitude is $Z$ is given by

$$\Phi = \int_0^Z g dZ \tag{1.7}$$

where the integration is performed along the line of force which passes through the point.

The geopotential altitude is given by

$$H = \frac{1}{G} \int_0^Z g dZ \tag{1.8}$$

and is in geopotential meters (m′) when the unit geopotential $G$ is set equal to 9.80665 m$^2$ sec$^{-2}$(m′)$^{-1}$.

The inverse-square law of gravitation provides an expression of $g$ as a function of altitude with sufficient accuracy for most model atmosphere computations:

$$g = \frac{g_0 r^2}{(r+Z)^2} \tag{1.9}$$

where $r$ is an effective earth's radius at a specific latitude as given by Lambert's equations (List, 1963). Integration of Eq. (1.8) after substitution of Eq. (1.9) for $g$, yields

$$H = \frac{g_0}{G}\left(\frac{rZ}{r+Z}\right) \tag{1.10}$$

or

$$Z = \frac{rH}{\left(\frac{g_0 r}{G}\right) - H}. \tag{1.11}$$

Differences between geopotential altitudes obtained from Eq. (1.10) and those computed from the more complex relationship used in developing the *U.S.*

*Standard Atmosphere, 1962* are small. For example, values from Eq. (1.10) for 45° N. are approximately 0.2, 0.4, and 33.3 meters greater at 90, 120, and 700 km, respectively, than those obtained from the relationship used in the Standard.

1.3.6 PRESSURE.—Initial pressures (sea-level values for each atmosphere) were obtained from monthly normal sea-level charts for the northern hemisphere (United States Weather Bureau, 1952) based upon a 40-year period of record and from 5-day normal sea-level charts (Lahey et al., 1958) based upon a 20-year period of record. Vertical pressure distributions for altitudes up to 120 km were calculated using the following equations with the appropriate temperature-altitude profiles in which $T_M$ is a linear function of geopotential altitude

$$\frac{P}{P_b}=\left(\frac{T_{Mb}}{T_{Mb}+L'_M h}\right)^{\frac{g_0 M_0}{R^* L'_M}} \qquad (L'_M \neq 0) \quad (1.12)$$

and

$$\frac{P}{P_b}=\exp\left(-\frac{g_0 M_0 h}{R^* T_{Mb}}\right) \qquad (L'_M = 0) \quad (1.13)$$

where $h=H-H_b$.

The quantity $H_b$ is the geopotential altitude at the base of a particular layer characterized by a specific value of $L'_M$, the gradient of the molecular-scale temperature with geopotential altitude. $T_{Mb}$ and $P_b$ are the respective values of $T_M$ and $P$ at the altitude $H_b$. It should be noted that $T_{Mc}$ was substituted for $T_M$ at levels below 10 km.

1.3.7 MODELS ABOVE 120 KILOMETERS.—The additional equations and specific techniques used to calculate the models above 120 km are described in Part 3, Section 3.1.

1.3.8 THERMAL WIND EQUATION.—The thermal wind equation is

$$\Delta u=\frac{gh}{2\omega \bar{T} \sin\phi}\frac{\partial T}{\partial Y} \qquad (1.14)$$

where $\Delta u$ is the change in east-west wind component through the vertical layer $h=H-H_b$, $\bar{T}$ is the mean temperature of the layer, $\omega$ is angular velocity of earth, $\phi$ is latitude, and $\partial T/\partial Y$ the north-south temperature gradient.

## 1.4 DERIVED QUANTITIES

1.4.1 SPEED OF SOUND.—The expression adopted for the computation of the speed of sound is the same as that used in the *U.S. Standard Atmosphere, 1962*.

$$C_s=\left(\gamma\frac{R^*}{M_0}T_M\right)^{1/2} \qquad (1.15)$$

where $\gamma$ is the ratio of specific heat of air at constant pressure to that at constant volume and is taken to be 1.40 (dimensionless). Owing to the limitations of Eq. (1.15) at low pressures and high altitudes, tabulations of values for the speed of sound are terminated at 90 km.

1.4.2 COEFFICIENT OF VISCOSITY.—The coefficient of viscosity is defined as a coefficient of internal friction developed where gas regions move adjacent to each other at different velocities. The expression used to compute coefficients of viscosity in the *U.S. Standard Atmosphere, 1962* was used for computation of the tables:

$$\mu=\frac{\beta T^{3/2}}{T+S} \qquad (1.16)$$

where $\beta$ is a constant equal to $1.458\times10^{-6}$ kg sec$^{-1}$ m$^{-1}$(°K)$^{-1/2}$ and $S$ is Sutherland's constant, equal to 110.4° K. Equation (1.16) fails for conditions of very high and very low temperatures and under conditions occurring at great altitudes. Consequently, tabular entries for the coefficient of viscosity have been terminated at 90 km.

1.4.3 COEFFICIENT OF THERMAL CONDUCTIVITY.—The same empirical expression as that adopted for the 1962 Standard was used to obtain the tabular values of the coefficient of thermal conductivity:

$$k=\frac{6.325\times10^{-7}T^{3/2}}{T+245.4\times10^{-(12/T)}} \qquad (1.17)$$

Tabular values of thermal conductivity are terminated at 90 km owing to the limitations of Eq. (1.17) at higher levels.

It should be noted that in computing the derived quantities at altitudes below 10 km, $T_c$ was substituted for $T$ and $T_{Mc}$ for $T_M$.

# PART 2

# Atmospheric Models Up to 120 Kilometers

# PART 2

# Atmospheric Models Up to 120 Kilometers

## 2.0 INTRODUCTION

The defining parameter of the Supplementary Atmospheres below 120 km is molecular-scale temperature presented by linear gradients in geopotential altitude. Relative humidity has been specified at levels up to and including 10 km in the mean annual 15° N. and all January and July atmospheres. The mid-latitude spring/fall atmosphere is the same as the 1962 Standard up to 69 km and consequently is a dry atmosphere.

Vertical pressure and density distributions were calculated from virtual temperature-altitude profiles using the barometric equations from Part 1 and appropriate sea-level pressures. Tables of the virtual temperatures and other properties of the 14 Supplementary Atmospheres, discussed in this section, are given in Part 5.

## 2.1 CONSTRUCTION OF ATMOSPHERIC MODELS FOR ALTITUDES BELOW 120 KILOMETERS

2.1.1 BELOW 80 KILOMETERS.—Temperature-altitude profiles of the mean January and July atmospheres at 30°, 45°, 60°, and 75° N., and the mean annual atmosphere at 15°N. are based on the temperature-altitude cross section in Figure 2.1. The temperature distribution shown for levels below 30 km was obtained from radiosonde observations. Mean northern hemispheric values were computed at various latitudes from available summaries by giving equal weight to observed and interpolated temperature data at each 10 degrees of longitude. Mean monthly values of relative humidity, Table 2.1, were obtained in a similar manner for levels below 10 km. The initial pressures (sea-level values for each atmosphere) were obtained from monthly

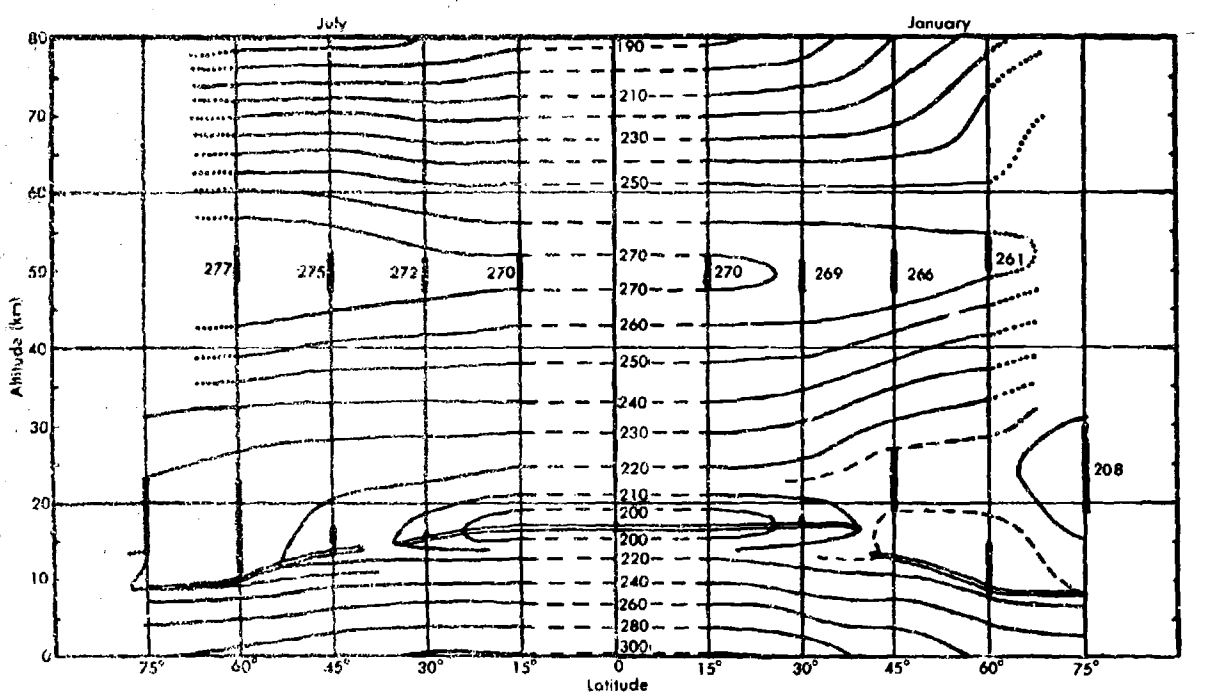


FIGURE 2.1.—Temperature-altitude cross section for January and July.

TABLE 2.1.—VIRTUAL TEMPERATURE STRUCTURE TO 10 KM

| 15° N. Annual | | | | | | |
|---|---|---|---|---|---|---|
| Altitude $H$, m' | Temp $T$, °K | Virtual Temp $T_v$, °K | Humidity % | | | |
| 0000 | 299.65 | 302.59 | 75 | | | |
| 1000 | 293.65 | 295.89 | 75 | | | |
| 2000 | 287.65 | 289.34 | 75 | | | |
| 2250 | 286.15 | 287.72 | 75 | | | |
| 2500 | 286.95 | 287.74 | 35 | | | |
| 4000 | 276.90 | 277.36 | 35 | | | |
| 6000 | 263.50 | 263.71 | 35 | | | |
| 8000 | 250.10 | 250.17 | 30 | | | |
| 10000 | 236.70 | 236.72 | 20 | | | |
| | January 30° N. | | | July | | |
| Altitude $H$, m' | Temp $T$, °K | Virtual Temp $T_v$, °K | Humidity % | Temp $T$, °K | Virtual Temp $T_v$, °K | Humidity % |
| 0000 | 287.15 | 288.52 | 80 | 301.15 | 304.58 | 80 |
| 1000 | 284.15 | 285.24 | 70 | 293.65 | 295.58 | 65 |
| 2000 | 281.15 | 281.86 | 50 | 288.15 | 289.54 | 60 |
| 3000 | 274.65 | 275.10 | 45 | 282.65 | 283.72 | 60 |
| 4000 | 268.15 | 268.39 | 35 | 277.15 | 277.82 | 50 |
| 6000 | 255.15 | 255.24 | 30 | 266.15 | 266.44 | 40 |
| 8000 | 242.15 | 242.18 | 30 | 252.15 | 252.27 | 40 |
| 10000 | 229.15 | 229.16 | 30 | 238.15 | 238.18 | 30 |
| | January 45° N. | | | July | | |
| 0000 | 272.15 | 272.59 | 77 | 294.15 | 296.22 | 75 |
| 1000 | 268.65 | 269.00 | 70 | 289.65 | 291.14 | 65 |
| 2000 | 265.15 | 265.43 | 65 | 285.15 | 286.19 | 55 |
| 3000 | 261.65 | 261.85 | 55 | 279.15 | 279.78 | 45 |
| 4000 | 255.65 | 255.77 | 50 | 273.15 | 273.55 | 40 |
| 6000 | 243.65 | 243.70 | 45 | 261.15 | 261.30 | 30 |
| 8000 | 231.65 | 231.66 | 35 | 248.15 | 248.21 | 30 |
| 10000 | 219.65 | 219.65 | 30 | 235.15 | 235.17 | 30 |
| | January 60° N. | | | July | | |
| 0000 | 257.15 | 257.28 | 80 | 287.15 | 288.45 | 75 |
| 1000 | 259.15 | 259.31 | 70 | 281.75 | 282.68 | 70 |
| 2000 | 255.95 | 256.09 | 70 | 276.35 | 277.06 | 70 |
| 3000 | 252.75 | 252.86 | 65 | 270.95 | 271.45 | 65 |
| 3500 | 251.15 | 251.24 | 60 | 268.25 | ..... | ..... |
| 4000 | 247.75 | 247.82 | 60 | 265.55 | 265.89 | 60 |
| 5000 | 240.95 | ..... | ..... | 260.15 | 260.38 | 55 |
| 6000 | 234.15 | 234.17 | 50 | 253.15 | 253 28 | 50 |
| 8000 | 220.55 | 220.55 | 40 | 239.15 | 239.18 | 40 |
| 10000 | ..... | ..... | ..... | 225.15 | 225.15 | 30 |

TABLE 2.1 (Continued)

| Altitude $H$, m' | Temp $T$, °K | Virtual Temp $T_v$, °K | Humidity % | Temp $T$, °K | Virtual Temp $T_v$, °K | Humidity % |
|---|---|---|---|---|---|---|
| | January 75° N. | | | July | | |
| 0000 | 249.15 | 249.22 | 80 | 278.15 | 278.92 | 85 |
| 1000 | 252.15 | 252.23 | 65 | 275.55 | 276.19 | 75 |
| 1500 | 253.65 | 253.74 | 60 | 274.25 | ..... | ..... |
| 2000 | 250.90 | 250.98 | 60 | 272.95 | 273.46 | 65 |
| 2500 | 248.15 | ..... | ..... | 271.65 | 272.14 | 65 |
| 3000 | 245.40 | 245.45 | 55 | 268.40 | ..... | ..... |
| 4000 | 239.90 | 239.93 | 50 | 261.90 | 262.13 | 55 |
| 6000 | 228.90 | 228.91 | 45 | 248.90 | 248.98 | 45 |
| 8000 | 217.90 | 217.90 | 40 | 235.90 | 235.92 | 35 |
| 9500 | ..... | ..... | ..... | 226.15 | 226.16 | 30 |
| 10000 | ..... | ..... | ..... | 226.65 | 226.66 | 20 |

normal sea-level charts of the northern hemisphere (USWB 1952) based upon a 40-year period of record and from 5-day normal sea-level charts (Lahey et al., 1958) based on a 20-year period of record. In the development of the temperature field between 30 and 80 km, temperature, density, and pressure observations, taken from December through February and June through August, were considered in arriving at mean monthly values for January and July. The thermal wind equation was employed to obtain estimates of the latitudinal pressure and temperature distributions from available zonal wind observations at various heights above 30 km.

Observed characteristics of the atmosphere such as the level of minimum latitudinal and seasonal temperature variability near 65 km (Nordberg and Smith, 1962), the level of minimum density variability near 90 km (Cole, 1961), and the inverse relationship between mean monthly temperatures at 50 km and those near 70 km (Figures 2.2 and 2.3) were used in arriving at an internally consistent thermal structure for the Supplementary Atmospheres.

A mean annual atmosphere rather than monthly atmospheres was adopted for 15° N. since the monthly variability of the temperature-altitude structure in the tropics appears to be relatively small at levels for which data are available. In addition, the sparsity of observations above 30 km in tropical areas makes it impractical at this time to develop monthly atmospheres between 30 and 80 km. Recent meteorological rocket network observations at Ascension, 8° S., Antigua, 17° N., Grand Turk, 21° N., and San Salvador, 24° N., and falling sphere measurements at Kwajalein, 9° N. (Peterson et al., 1964) leave little doubt that at equatorial latitudes the seasonal variations are minimal.

Typical features of the thermal structure of the tropical atmosphere not evident in Figure 2.1 have been incorporated into the mean annual temperature-altitude profile for 15° N. (Figure 2.3). For example, routine averaging of monthly temperature-altitude data indicates an isothermal layer about 2 km thick from 16 to 18 km. An examination of daily observations, however, reveals a sharp inversion at the tropopause. This sharp inversion, a feature typical of the tropical atmosphere, has been retained and appears at 16.5 km, the mean annual tropopause altitude at 15° N. The average altitude and magnitude of the trade wind inversion, characteristic of the temperature structure between 2 and 3 km over tropical ocean areas, also have been included in the 15° N. temperature-altitude profile. In addition, surface temperature inversions, normally observed during the winter in arctic and subarctic regions, are incorporated into the January temperature-altitude profiles for 60° and 75° N. (Figure 2.2).

Profiles representative of the cold and warm stratospheric regimes observed at 60° and 75° N. in January are shown in Figures 2.4 and 2.5. The frequency of occurrence of warm and cold stratospheric regimes varies with longitude at both 60° and 75° N. Temperature-altitude structures below 30 km for the cold and warm stratospheric regimes at 60° and 75° N. are based on radiosonde observations taken over northeastern Canada during January and the first week of February. Due to insufficient rocket observations at 75° N., temperature-altitude profiles for January and July and the cold and warm winter stratospheric regimes could not be provided for altitudes above 30 km. The two regimes above 30 km at 60° N. are based primarily on rocket observations taken at Fort Churchill (59° N.) during observed cold and warm stratospheric conditions. Most of the available winter grenade observations were taken during days with a cold stratosphere, whereas warm conditions were recorded by a number of thermistor and falling-sphere observations. The num-

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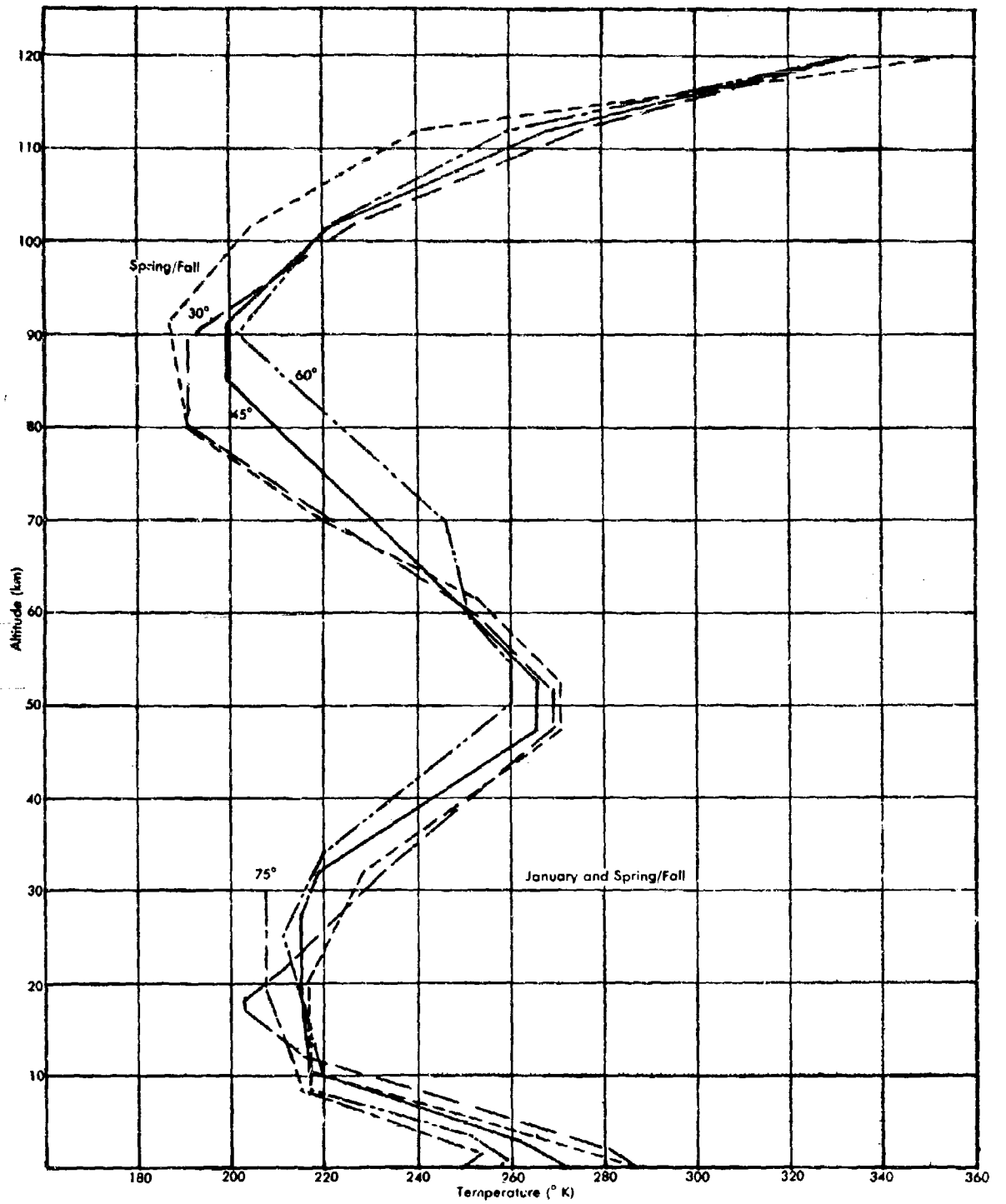


FIGURE 2.2.—Temperature-altitude profiles of the 30°, 45°, 60°, and 75° N. January and mid-latitude spring/fall Supplementary Atmospheres.

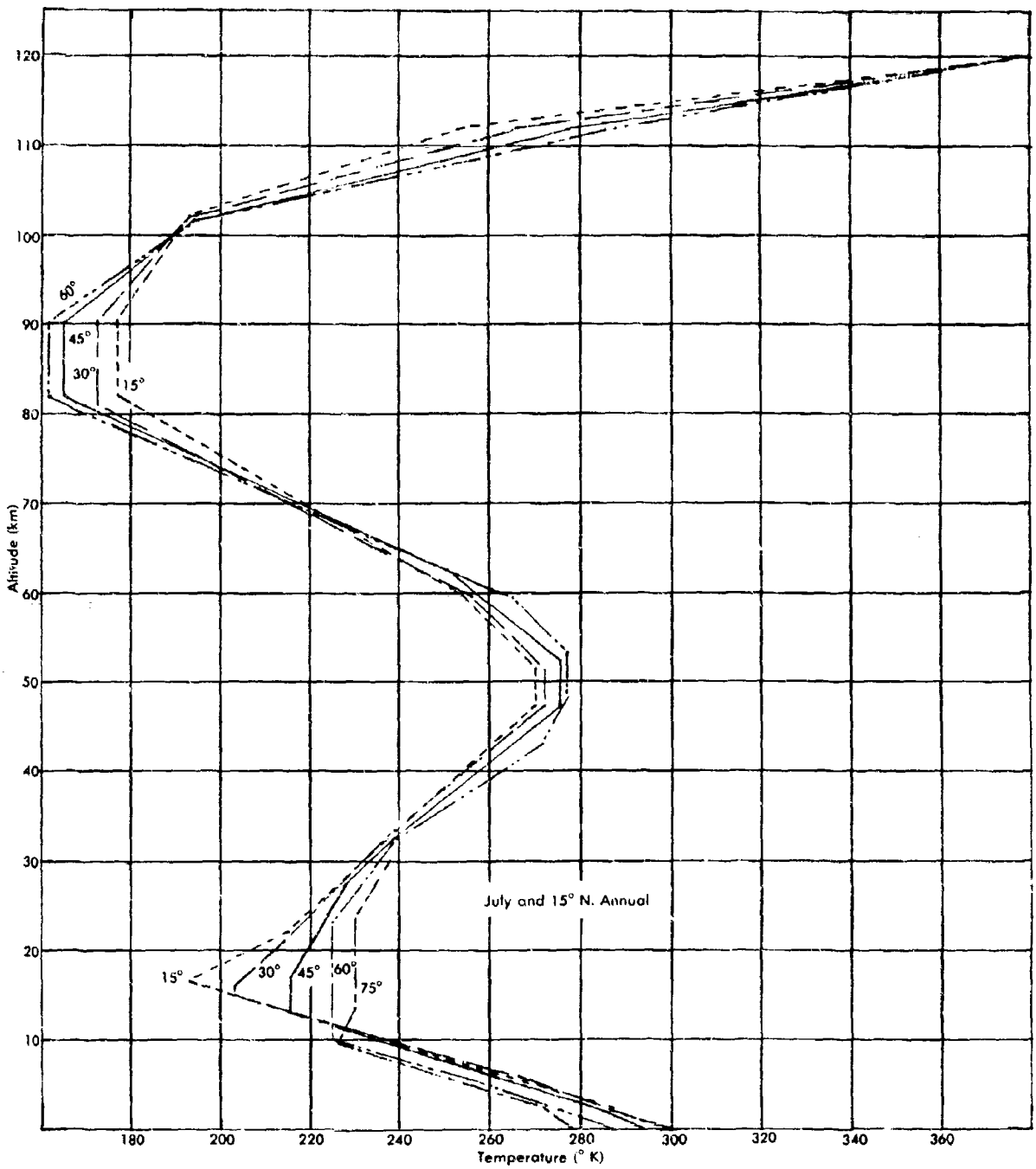


FIGURE 2.3.—Temperature-altitude profiles of the 30°, 45°, 60°, and 75° N. July and 15° N. mean annual Supplementary Atmospheres.

ber of observations above 50 km, however, is inadequate for determining mean temperature-altitude profiles for these cold and warm January regimes. Consequently, the profiles above 50 km are intended only to depict temperatures typical of those obtained from the few rocket observations made during these regimes at Fort Churchill.

The first 69 km of the temperature-altitude profile of the mid-latitude spring/fall atmosphere (Figure 2.2) is the same as that for the *U.S. Standard Atmosphere, 1962*; the portion between 69 and 80 km is based on recent density observations and is intended to approximate mean conditions during the periods of March/April and September/October.

TABLE 2.2.—TEMPERATURE ($T_M$, °K) STRUCTURE BELOW 120 KM

| 15° N. | |
|---|---|
| Altitude $H$, m′ | Annual |
| 0000 | 299.65 |
| 2250 | 286.15 |
| 2500 | 286.95 |
| 16500 | 193.15 |
| 22000 | 215.15 |
| 47000 | 270.15 |
| 51000 | 270.15 |
| 59000 | 254.15 |
| 81000 | 177.15 |
| 89000 | 177.15 |
| 100000 | 199.15 |
| 110000 | 270.65 |
| 117496 | 410.90 |

| 30° N. | | |
|---|---|---|
| $H$, m′ | January | July |
| 0000 | 287.15 | 301.15 |
| 1000 | ..... | 293.65 |
| 2000 | 281.15 | ..... |
| 6000 | ..... | 266.15 |
| 12000 | 216.15 | ..... |
| 15000 | ..... | 203.15 |
| 16000 | ..... | 203.15 |
| 17000 | 203.15 | ..... |
| 18000 | 203.15 | ..... |
| 21000 | ..... | 214.15 |
| 22000 | 213.15 | ..... |
| 32000 | 233.15 | 236.15 |
| 47000 | 269.15 | 272.15 |
| 51000 | 269.15 | 272.15 |
| 59000 | 253.15 | 256.15 |
| 79000 | 191.15 | ..... |
| 81000 | ..... | 172.55 |
| 88000 | 191.15 | ..... |
| 89000 | ..... | 172.55 |
| 100000 | 233.15 | 198.95 |
| 110000 | 290.85 | 283.25 |
| 117612 | 355.90 | 410.90 |

| 45° N. | | |
|---|---|---|
| Altitude $H$, m′ | January | July |
| 0000 | 272.15 | 294.15 |
| 2000 | ..... | 285.15 |
| 3000 | 261.65 | ..... |
| 6000 | ..... | 261.15 |
| 10000 | 219.65 | ..... |
| 13000 | ..... | 215.65 |
| 17000 | ..... | 215.65 |
| 19000 | 215.15 | ..... |
| 27000 | 215.15 | 227.65 |
| 32000 | 219.15 | 238.15 |
| 47000 | 265.65 | 275.65 |
| 52000 | 265.65 | 275.65 |
| 62000 | ..... | 250.65 |
| 64000 | 241.65 | ..... |
| 81000 | ..... | 165.15 |
| 84000 | 199.65 | ..... |
| 89000 | ..... | 165.15 |
| 90000 | 199.65 | ..... |
| 100000 | 227.65 | 200.35 |
| 110000 | 282.25 | 295.25 |
| 117776 | 355.90 | 410.90 |

| 45° N. | |
|---|---|
| $H$, m′ | Spring/Fall |
| 0000 | 288.15 |
| 11000 | 216.65 |
| 20000 | 216.65 |
| 32000 | 228.65 |
| 47000 | 270.65 |
| 52000 | 270.65 |
| 61000 | 252.65 |
| 69000 | 220.65 |
| 79000 | 190.65 |
| 90000 | 190.65 |
| 100000 | 210.65 |
| 110000 | 254.25 |
| 117776 | 382.24 |

TABLE 2.2 (Continued)

| 60° N. | | |
|---|---|---|
| Altitude $H$, m′ | January | July |
| 0000 | 257.15 | 287.15 |
| 1000 | 259.15 | ..... |
| 3500 | 251.15 | ..... |
| 5000 | ..... | 260.15 |
| 8500 | 217.15 | ..... |
| 10000 | ..... | 225.15 |
| 15000 | 217.15 | ..... |
| 23000 | ..... | 225.15 |
| 25000 | 211.15 | ..... |
| 32000 | ..... | 238.65 |
| 34000 | 220.15 | ..... |
| 43000 | ..... | 271.65 |
| 48000 | ..... | 277.15 |
| 50000 | 260.15 | ..... |
| 53000 | ..... | 277.15 |
| 54000 | 260.15 | ..... |
| 59000 | 251.15 | 265.15 |
| 69000 | 246.15 | ..... |
| 81000 | ..... | 161.75 |
| 89000 | 202.15 | 161.75 |
| 100000 | 226.35 | 200.25 |
| 110000 | 273.15 | 303.45 |
| 117930 | 355.90 | 410.90 |

| 60° N. | | |
|---|---|---|
| $H$, m′ | January Cold | January Warm |
| 0000 | 257.15 | |
| 1000 | 259.15 | |
| 3500 | 251.15 | |
| 8500 | 217.15 | |
| 12000 | 217.15 | 224.15 |
| 25500 | ..... | 224.15 |
| 30000 | 199.15 | ..... |
| 35000 | 206.15 | ..... |
| 37000 | ..... | 235.65 |
| 40000 | 228.15 | ..... |

| 60° N. | | |
|---|---|---|
| $H$, m′ | January Cold | January Warm |
| 50000 | 256.15 | 268.15 |
| 54000 | 256.15 | 268.15 |
| 59000 | 243.15 | ..... |
| 71000 | 255.15 | 225.65 |
| 79108 | 238.93 | 221.60 |

| 75° N. | | |
|---|---|---|
| $H$, m′ | January | July |
| 0000 | 249.15 | 278.15 |
| 1500 | 253.65 | ..... |
| 2500 | ..... | 271.65 |
| 8500 | 215.15 | ..... |
| 9500 | ..... | 226.15 |
| 11500 | 213.65 | ..... |
| 13500 | ..... | 230.15 |
| 19000 | 207.65 | ..... |
| 23500 | ..... | 230.15 |
| 30000 | 207.65 | 237.95 |

| 75° N. | | |
|---|---|---|
| $H$, m′ | January Cold | January Warm |
| 0000 | 249.15 | |
| 1500 | 253.65 | |
| 8500 | 215.15 | |
| 11000 | ..... | 222.15 |
| 17000 | ..... | 222.15 |
| 17500 | 201.65 | ..... |
| 25000 | 197.15 | 226.15 |
| 30000 | 197.15 | 233.65 |

2.1.2 BETWEEN 80 AND 120 KILOMETERS.—The Supplementary Atmospheres outlined in this section have been based on an analysis of experimental data, described in Section 2.4.2, as well as on theory.

Estimates of the mean density deviations from Standard, between 80 and 120 km, are shown as a function of latitude and season in Figure 2.6. These curves, which are based primarily on experimental data, connect at 80 km with the density profiles of the January and July atmospheres for 30°, 45°, and 60° N., the mean annual atmosphere for 15° N., and the mid-latitude spring/fall atmosphere for 45° N. which were discussed in the previous section. The approximate isopycnic level near 90 km should be noted, as well as the large density variation in the altitude region 110 to 120 km.

TABLE 2.3—MOLECULAR WEIGHTS FOR SUPPLEMENTARY ATMOSPHERES

| $Z$, km | Summer | Winter | Spring/Fall |
|---|---|---|---|
| 80 | 28.96 | 28.96 | 28.96 |
| 85 | 28.95 | 28.95 | 28.95 |
| 90 | 28.94 | 28.94 | 28.94 |
| 95 | 28.75 | 28.79 | 28.77 |
| 100 | 28.23 | 28.34 | 28.28 |
| 105 | 27.78 | 27.96 | 27.86 |
| 110 | 27.39 | 27.63 | 27.49 |
| 115 | 27.05 | 27.35 | 27.17 |
| 120 | 26.76 | 27.12 | 26.90 |

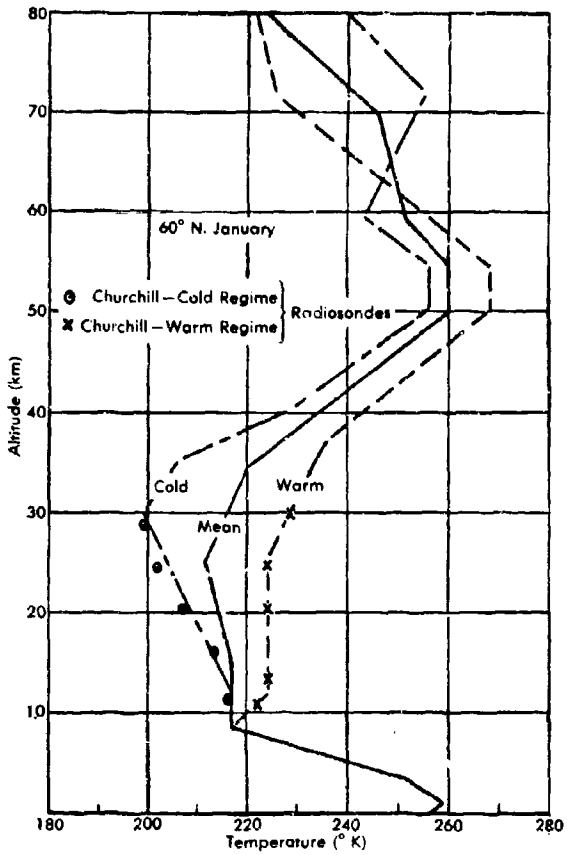


FIGURE 2.4.—Temperature-altitude profiles for 60° N. January mean and cold and warm regime atmospheres.

The density curves in Figure 2.7 are essentially an idealization of those plotted in Figure 2.6. The isopycnic is more pronounced. To reduce the number of boundary conditions at 120 km the curves have been drawn into three points. The first is for spring/fall conditions which match the boundary conditions used by Jacchia (1964) in the development of atmospheric models for levels above 120 km. Density is 1.01 percent higher than the *U.S. Standard Atmosphere, 1962*. The second point is for typical winter conditions with a density about 46 percent greater than Standard and the final point is for summer and tropical conditions with a density 20 percent lower than Standard.

Models for the region 80 to 120 km were developed by choosing suitable temperature-altitude profiles, consisting of straight-line segments of molecular temperature ($T_M$) in terms of geopotential altitude, which yield density profiles approximately the same as those shown in Figure 2.7.

To obtain values of kinetic temperature ($T$) from the molecular temperatures it is necessary to have values of mean molecular weight as a function of altitude for levels between 80 and 120 km. Suitable values were derived (Champion, 1966a) and are given in Table 2.3.

2.1.3 DEFINING PROPERTIES.—Adopted molecular scale temperature-altitude structures for each of the 14 atmospheres are shown in Table 2.2. Mean monthly values of relative humidity, ambient temperature, and the resulting virtual temperatures for the lowest 10 km are shown in Table 2.1. Above 10 km the difference between virtual and ambient temperatures is insignificant, since humidity produces a negligible virtual temperature increment at the colder temperatures. It should be noted that the mid-latitude spring/fall atmosphere is the same as the 1962 Standard up to 69 km and is a dry atmosphere.

## 2.2 LATITUDINAL AND SEASONAL VARIATIONS

Maximum and minimum mean monthly temperature, pressure, and density do not occur at all latitudes between the surface and 120 km in the same month or season. Consequently, the tabulated properties of the January and July Supplementary Atmospheres presented in Part 5 do not represent extreme mean monthly conditions at all altitudes. They do, however, provide an indication of the magnitude of the latitudinal and seasonal variability which can be expected at these levels in the atmosphere.

2.2.1 TEMPERATURE.—Temperature extremes at altitudes below 20 km occur in January and July at most locations between 30° and 75° N. In the stratosphere, however, semiannual and biennial temperature oscillations complicate the annual temperature distribution. The magnitude of the annual cycle is largest at high latitudes, decreasing toward the equator. The amplitudes of the biennial and semiannual cycles are largest near the equator, decreasing toward the poles. The phases, as well as the amplitudes of these temperature oscillations, change with latitude and altitude. A sufficient sample of observations is not available above 30 km from which to establish the vertical extent and magnitude of the biennial oscillation in equatorial regions. North of 15° latitude, however, the annual and semiannual cycles appear to be stronger and tend to obscure the biennial oscillation. Observations show that the semiannual oscillation produces two pronounced maxima and minima within the annual stratospheric temperature cycle in tropical and subtropical regions (Cole et al., 1965). At mid-latitudes the combined semiannual and annual components shift the time of maximum temperature in the stratosphere toward early June or May (Batten, 1963).

Radiosonde data which extend to 30 km indicate that two thermal regimes exist in the winter stratosphere in arctic and subarctic regions (Figures 2.4 and 2.5). In January the cold regime predominates by roughly four-to-one over northeastern Canada (McClain, 1961; Belmont, 1962), whereas the warm regime prevails by nearly eight-to-one in the Aleutian area. Explosive

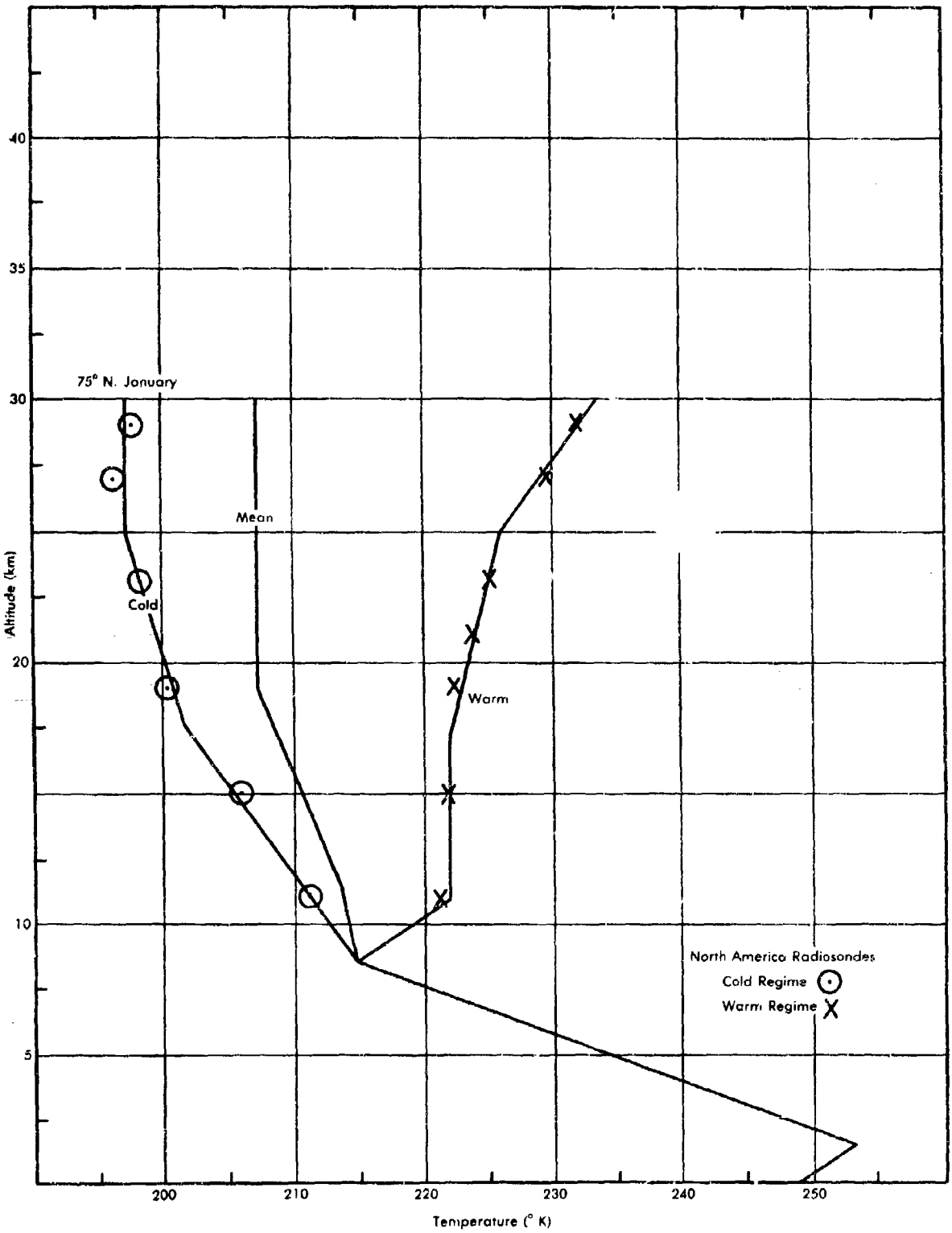


FIGURE 2.5.—Temperature-altitude profiles for 75° N. January mean and cold and warm regime atmospheres.

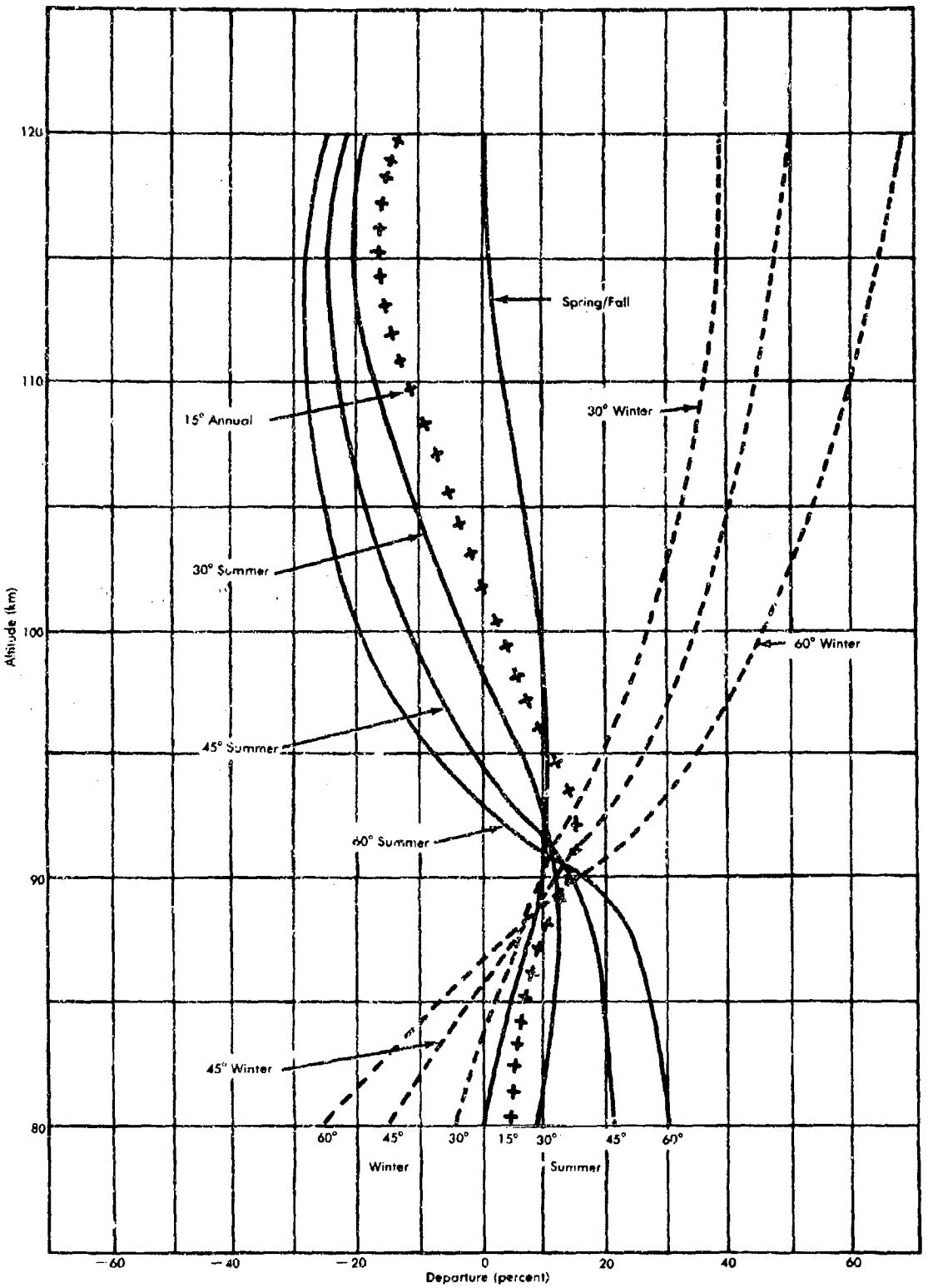


FIGURE 2.6.—Mean density variations with latitude and season, 80 to 120 km.

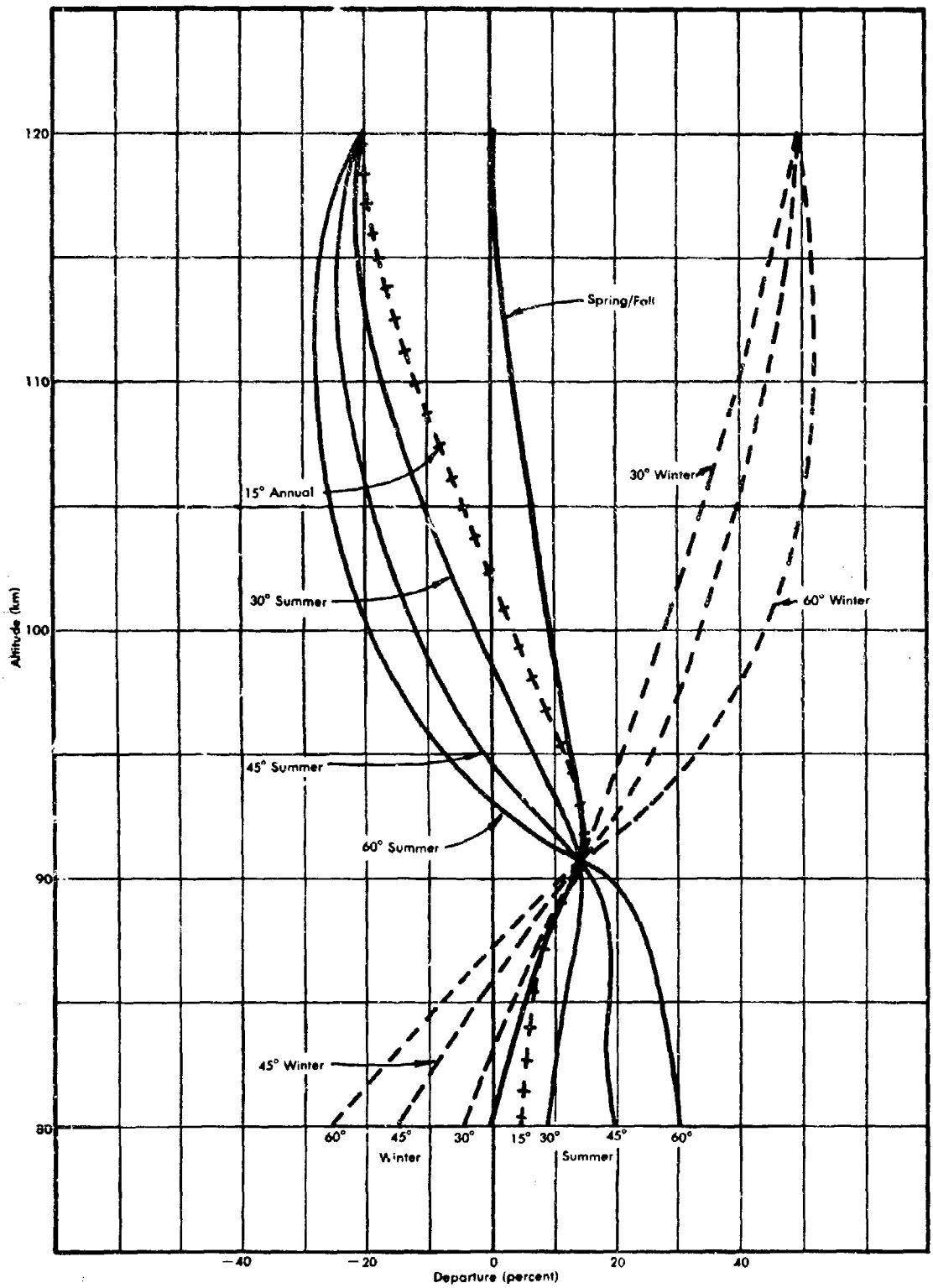


FIGURE 2.7.—Idealized mean seasonal and latitudinal density variations, 80 to 120 km.

warmings, the abrupt change from a cold to an extremely warm regime, occur during the winter in the arctic and subarctic stratosphere and mesosphere and can produce large departures in a given season or month from annual temperature cycles based on long-term averages. The frequency of such occurrences depends on longitude as well as on latitude. Recent meteorological rocket observations between 30 and 50 km indicate that these explosive warmings occasionally affect the stratospheric circulation as far south as Wallops Island, 38° N.

The meridional temperature gradient (Figure 2.1) varies with altitude and season. In the troposphere, from the surface to roughly 10 km, temperatures decrease toward the pole in both seasons. The north-south gradient, however, is much larger during January than July. In July there is a reversal of the meridional temperature gradients between 10 and 15 km; temperatures above these levels increase toward the pole rather than the equator. The thermal structure in this region is not as well defined in January because of the relatively large variations with latitude in the thickness of isothermal and near-isothermal regions immediately above the tropopause.

In the upper stratosphere and lower mesosphere, 25 to 60 km, temperatures increase toward the pole in July and toward the equator in January. This is in accord with expected seasonal variations in the solar heating at these altitudes. At the stratopause, the region of maximum temperature near 50 km, the mean monthly temperature at 60° N. is approximately 17° K warmer in July than in January. The corresponding change at 30° N. is 3° K.

The meridional temperature gradients reverse again above 65 km and temperatures increase toward the pole in January and decrease in July in the upper mesosphere and lower thermosphere, 70 to 110 km. Temperatures in this region are inversely related to those in the stratosphere. A warm stratopause, for example, is normally associated with a cold mesopause. Grenade soundings taken in northern Sweden during 1963 and 1964 (Witt et al., 1965) confirm the existence of this inverse relationship between stratopause and mesopause temperatures during the summer months at northern latitudes. Near 80 km temperatures average 50° K warmer in January than July at 60° N. Seasonal differences at this level, however, decrease with latitude to approximately 10° K at 30° N.

The step function in the north-south temperature gradient at 120 km (Figures 2.2 and 2.3) is the result of an arbitrary decision to establish three sets of boundary conditions at this altitude, the interface between seasonally- and latitudinally-defined atmospheres below 120 km and the family of atmospheres related to solar activity above 120 km. The altitude interval between 100 and 180 km is the least explored region of the atmosphere. Operational meteorological rockets do not reach above 70 km, and satellites seldom orbit below 150 km. Consequently, data presented for this region are considered only an approximation of actual conditions.

2.2.2 DENSITY AND PRESSURE.—Density profiles for each of the Supplementary Atmospheres are shown in Figures 2.8 and 2.9 as percentage departure from Standard. The region of minimum seasonal and latitudinal variability in density near 8 km represents the first isopycnic level where density remains relatively constant throughout the year regardless of location. A second isopycnic level appears to exist just above 90 km where density profiles of all latitudes and seasons tend to converge or cross at a density roughly 10 percent greater than Standard (Cole, 1961; Champion, 1965). This concept of a second isopycnic level near 90 km is supported by density observations and observed wind and temperature distributions between 60 and 100 km. The levels of maximum seasonal and latitudinal variability in atmospheric density occur between 65 and 75 km and 100 to 120 km. Seasonal variability is greatest at high latitudes. To reduce the number of boundary conditions at 120 km the density profiles (Figures 2.6 and 2.7) have been arbitrarily drawn into three points. The limitations discussed in the previous section on temperature also apply to density between 100 and 120 km.

Density profiles associated with typical warm and cold stratospheric and mesospheric thermal regimes observed at 60° and 75° N. in January are shown in Figures 2.8 and 2.9, also in terms of percentage departures from Standard. The profiles for 60° N. in Figure 2.8 indicate that during January at 70 km, the warm regime density is approximately 80 percent greater than the cold regime density. Although these atmospheres are intended to depict typical January conditions, similar conditions can occur in the arctic and subarctic during other winter months.

The pressure profiles in Figures 2.10 and 2.11 are similar to those for density. A level of minimum seasonal pressure variability exists near 85 km which reflects the negative correlations between temperatures at altitudes above 70 km and below 60 km. The limitations that apply to the density between 100 and 120 km owing to the assumption of only three sets of boundary conditions at 120 km also apply to the pressure at these altitudes.

## 2.3 DIURNAL VARIATIONS OF DENSITY TO 90 KILOMETERS

One of the more important aspects of the variability of density is the diurnal variation, that is, the variation within a 24-hour period which remains after synoptic-scale effects are eliminated. Since sufficient observational evidence is not yet available to describe definitively the diurnal variation between 30 and 90 km, some speculation is necessary.

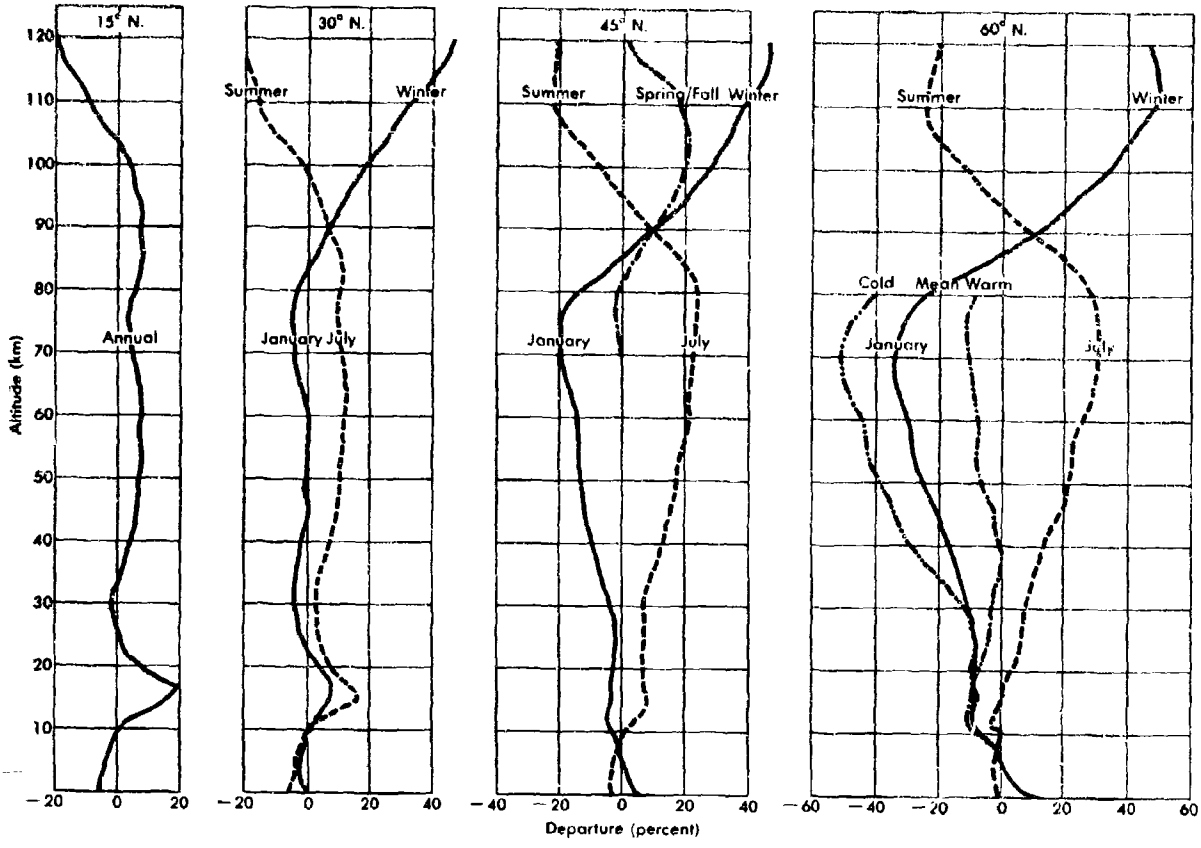


FIGURE 2.8.—Departures of Supplementary Atmosphere densities from Standard.

The diurnal variation of density is attributed, in part, to the rise and fall of the constant density surfaces in association with thermally- and gravitationally-produced oscillations of the atmosphere. From a consideration of the relative radiational and gravitational forces acting on the lower and upper atmosphere, and taking into account the high density of the lower atmosphere, one expects that oscillations of the lower atmosphere should be of relatively small amplitude. Thus, the diurnal variation of density due to atmospheric oscillations at the heights of interest should be correspondingly small.

Near sea level the diurnal range is generally 1 percent to 6 percent of the minimum density, depending on climatological regime. Maximum density tends to occur near the time of minimum temperature, as a rule, shortly before sunrise.

In the free air to a height of about 30 km, the expected diurnal range varies from less than 1 percent to as much as 2 percent of the minimum density. Maximum density is expected during nighttime below about 10 km, and in daytime above that altitude.

At about 30 to 40 km, the diurnal range is expected to be about 2 to 5 percent. However, suitable observational data are lacking for a final determination. Minimum density is expected during the day in phase with diurnal heating due to the absorption of solar radiation by ozone.

From 45 to 90 km, the structure of diurnal density variability may be complicated by the variable influence of lunar gravitational oscillations of the atmosphere. When the lunar effect is combined with the effect of diurnal atmospheric expansion related to the absorption of heat in the ozonosphere, a complicated diurnal density wave with variable amplitude can be expected. Tentative observational evidence from three series of ROBIN falling-sphere soundings on 10 and 18 May 1961 and 12 October 1962 at Eglin Air Force Base, Florida, suggests a diurnal range of about 10 percent, possibly as high as 25 percent, in the vicinity of 60 km. Maximum density occurred during the afternoon. At about 95 km, results from meteor observations (Hall, 1960) suggest a diurnal density range of 30 percent or more with maximum density during late afternoon. However, the accuracy of density values deduced from meteor observations is rather uncertain.

From the foregoing, it may be estimated that the factor by which the daytime density exceeds the minimum at heights of from 50 to 90 km varies from

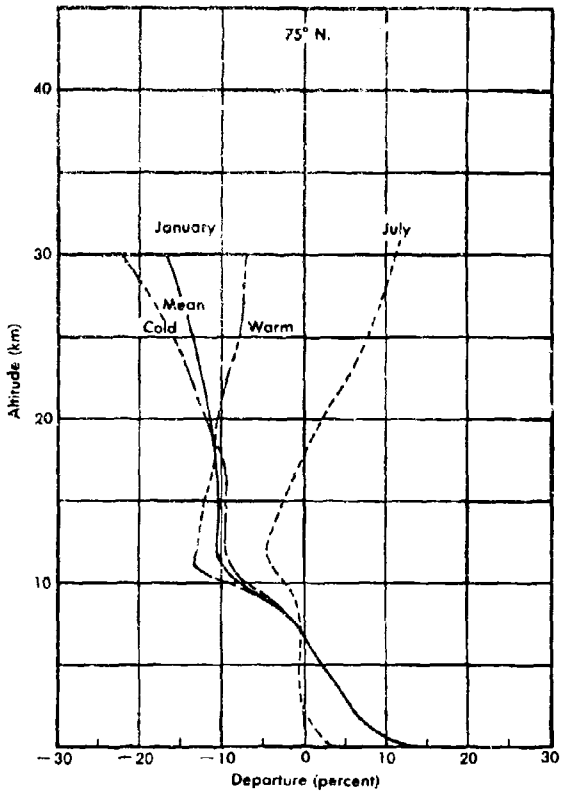


FIGURE 2.9.—Departures of 75° N. Atmosphere densities from Standard.

1.10 to 1.25. However, at times when the lunar tidal oscillation and the thermally induced oscillation are of the same or opposite phase, this factor might take on values greater than 1.25 or less than 1.10, respectively. Estimated ratios of the diurnal maximum and minimum densities for altitudes up to 90 km are presented in Figure 2.12.

The apparent existence of a quasi-isopycnic level near 90 km would seem to suggest that the diurnal variation has a minimum in this region. A minimum at 90 km, however, would be difficult to reconcile with the amplitude deduced at 95 km from meteor results. In view of the uncertainty, an alternate curve has been entered between 70 and 90 km in Figure 2.12. It is emphasized that sustained observational series which might permit a definitive evaluation of the diurnal variations between 30 and 90 km are not yet available. Although Figure 2.12 clearly does not provide final information, it is at least indicative of the various unsolved problems surrounding the diurnal variation.

## 2.4 SUPPORTING DATA

2.4.1 BELOW 80 KILOMETERS.—Data available for constructing the various atmospheres to 80 km comprise radiosonde observations at stations within a few degrees of latitudes 15°, 30°, 45°, 60°, and 75° N. and observations made from rockets and instruments released from rockets. The rockets were fired at the following locations:

| *Locations* | *Latitude* |
|---|---|
| Kwajalein | 9° N. |
| Eniwetok | 11° N. |
| Guam | 13° N. |
| Kauai | 22° N. |
| Cape Kennedy | 28° N. |
| Eglin AFB | 30° N. |
| Kindley AFB | 32° N. |
| White Sands Missile Range | 32° N. |
| Point Mugu | 34° N. |
| Wallops Island | 38° N. |
| Tonopah Range | 38° N. |
| Michikawa Japan | 40° N. |
| Fort Churchill, Canada | 59° N. |
| Fort Greely, Alaska | 64° N. |
| Point Barrow, Alaska | 71° N. |
| Ascension Island | 8° S. |
| Woomera, Australia | 31° S. |
| Aboard Ship | North Atlantic |

Although there has been a recent increase in the number of locations taking meteorological rocket observations, the preponderance of available data is for North America. This is particularly true for levels above 50 km.

Recently compiled distributions of observed data are compared to adopted mean monthly values for January and July in Figures 2.13, 2.14, 2.15, and 2.16. Temperatures obtained from thermistor and grenade observations taken at locations near 30° latitude are plotted with temperature-altitude profiles for the 30° N. atmospheres in Figure 2.13. The mean monthly thermistor temperatures that are shown for Point Mugu, 34° N., White Sands, 32° N., and Cape Kennedy, 28° N., are based on Meteorological Rocket Network (MRN) observations taken during the period 1961 through 1965. Mean seasonal grenade values are based on experimental observations taken at Wallops Island, 38° N. (Nordberg et al., 1965, Smith et al., 1964) and Woomera, 31° S. (Groves, 1965) during the period 1959 through 1964. Thermistor and grenade observations for each location and level, in approximate number, are given in Tables 2.4 and 2.5. Many of the observations were made after the atmospheric models were constructed. Seasonal rather than monthly means are presented for the grenade data because of the sparsity of January and July observations above 55 km.

A similar comparison is made in Figure 2.14 between the temperature-altitude profiles for the mean January

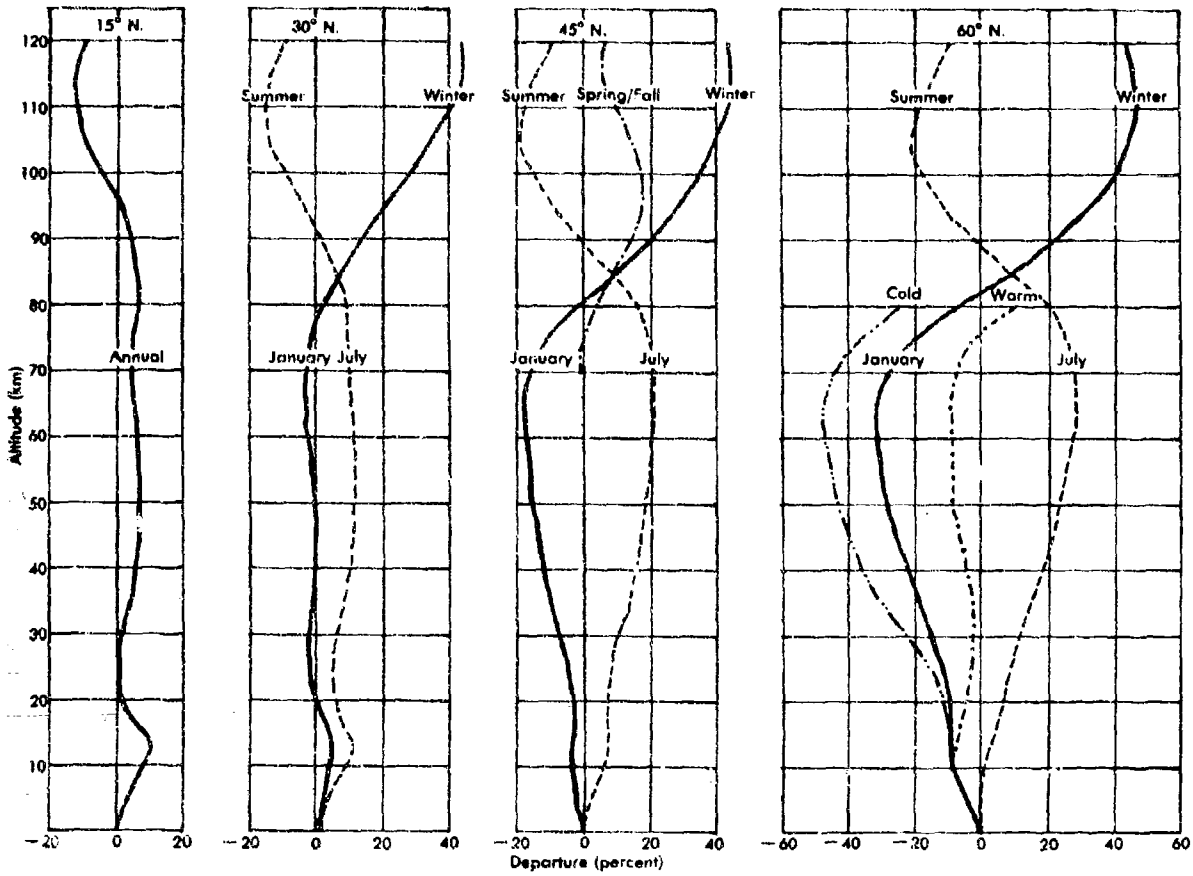


FIGURE 2.10.—Departures of Supplementary Atmosphere pressures from Standard.

TABLE 2.4—NUMBER OF JANUARY AND JULY MRN THERMISTOR OBSERVATIONS

| Altitude km | Point Mugu | | White Sands | | Cape Kennedy | | Fort Churchill | | Fort Greely | | West Geirinish | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | July | Jan | July | Jan | July | Jan | July | Jan | July | Jan | July |
| 30 | 17 | 17 | 21 | 30 | 25 | 22 | 8 | 11 | 10 | 2 | 10 | |
| 35 | 16 | 17 | 21 | 29 | 24 | 22 | 7 | 11 | 10 | 2 | 10 | |
| 40 | 13 | 15 | 22 | 27 | 25 | 22 | 6 | 11 | 10 | 2 | 9 | |
| 45 | 12 | 15 | 18 | 26 | 22 | 22 | 6 | 11 | 9 | 2 | 9 | |
| 50 | 5 | 14 | 9 | 23 | 19 | 21 | 5 | 10 | 8 | 2 | 8 | |
| 55 | | 9 | 7 | 21 | 10 | 19 | | | | | 8 | |
| 60 | | | | | | | | | | | 8 | |

TABLE 2.5.—NUMBER OF CHEMADE OBSERVATIONS FOR ALTITUDES ABOVE 50 KM

| Season | Wallops | Woomera | Fort Churchill |
|---|---|---|---|
| Winter | 17 | 3 | 13 |
| Summer | 10 | 3 | 8 |

and July atmospheres for 60° N. and temperature observations made at Fort Churchill, 59° N., Fort Greely, 64° N., and West Geirinish, 57° N. It should be noted that the Fort Greely January temperatures between 30 and 40 km are considerably warmer than those for Churchill and West Geirinish. Radiosonde data indicate that similar differences exist at 20 to 25 km. Consequently, it appears that these differences

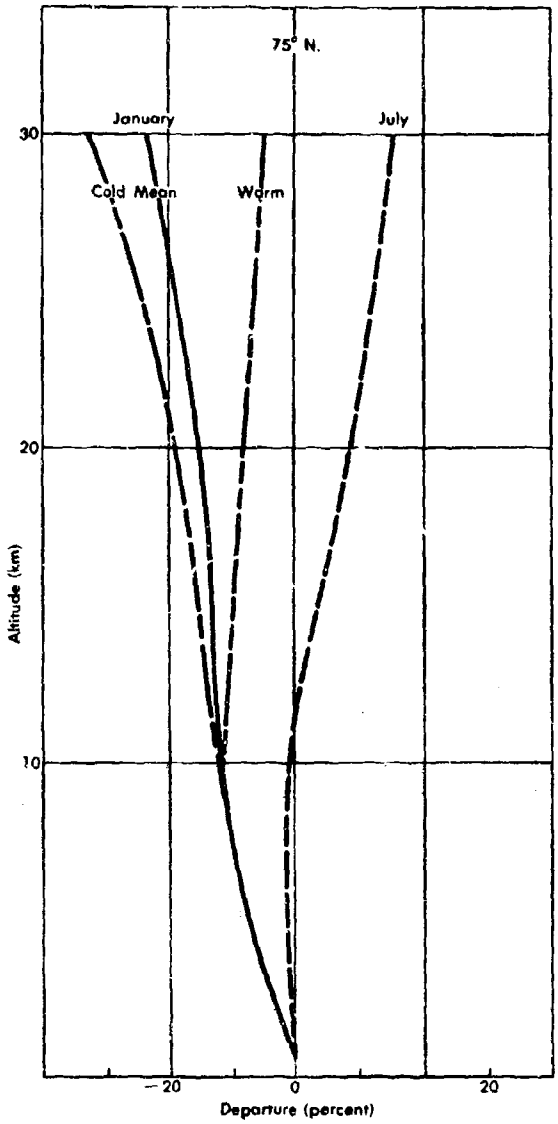


FIGURE 2.11. – Departures of 75° N. Atmosphere preasures from Standard.

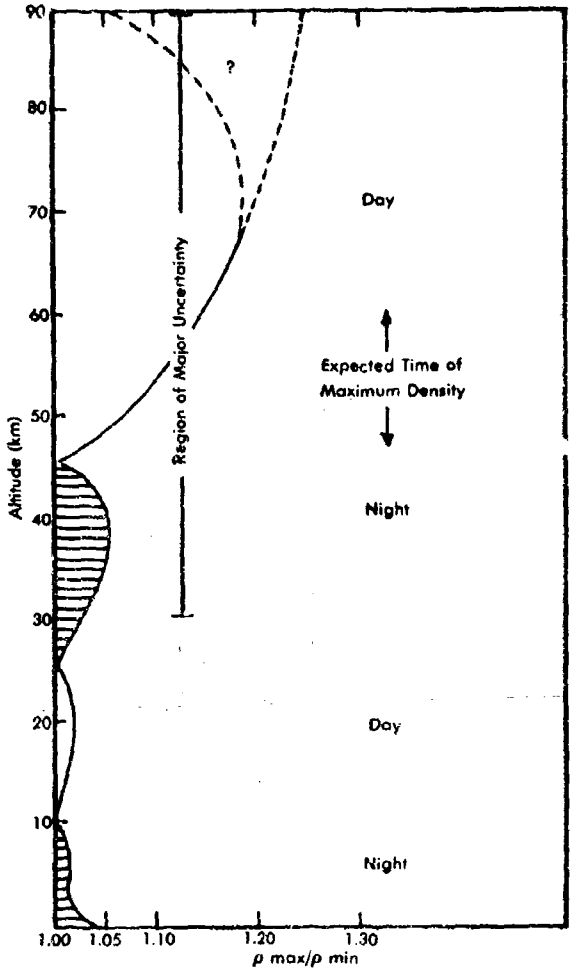


FIGURE 2.12. – Approximate values of diurnal density variability up to 90 km.

are due to longitudinal variations in stratospheric temperatures. The Fort Greely temperatures, however, are in close agreement with those for the 60° N. warm January atmosphere in Figure 2.4.

A summary of MRN and other density data for January and July from locations near 30° N. and 60° N. latitude is provided in Figures 2.15 and 2.16. Density is presented as percentage departure from the *U.S. Standard Atmosphere, 1962*. The horizontal arrows indicate a range in density at various levels which contains approximately 95 percent of the observed values. The data below 50 km are from MRN observations taken in January and July and the estimated 95 percent ranges are based on two standard deviations. The density ranges at altitudes above 50 km are estimates based on departures of grenade, falling sphere, and pressure gage measurements from individual monthly means during the summer and winter seasons. Note that at the higher latitudes the distribution of observed densities around the monthly means is not symmetrical. The January density distributions for 60° N. are based primarily on Fort Churchill data and are undoubtedly influenced by the two thermal regimes which tend to produce bimodal temperature distributions in the arctic and subarctic winter stratosphere and mesosphere. The skewed July distribution is probably a result of the inadequate data sample.

The indicated density variability includes some diurnal and semi-diurnal variations due to solar and lunar effects since the observations on which the estimates are based were not all taken at the same hour of the day. They also include observational errors which comprise part of the observed variability. Re-

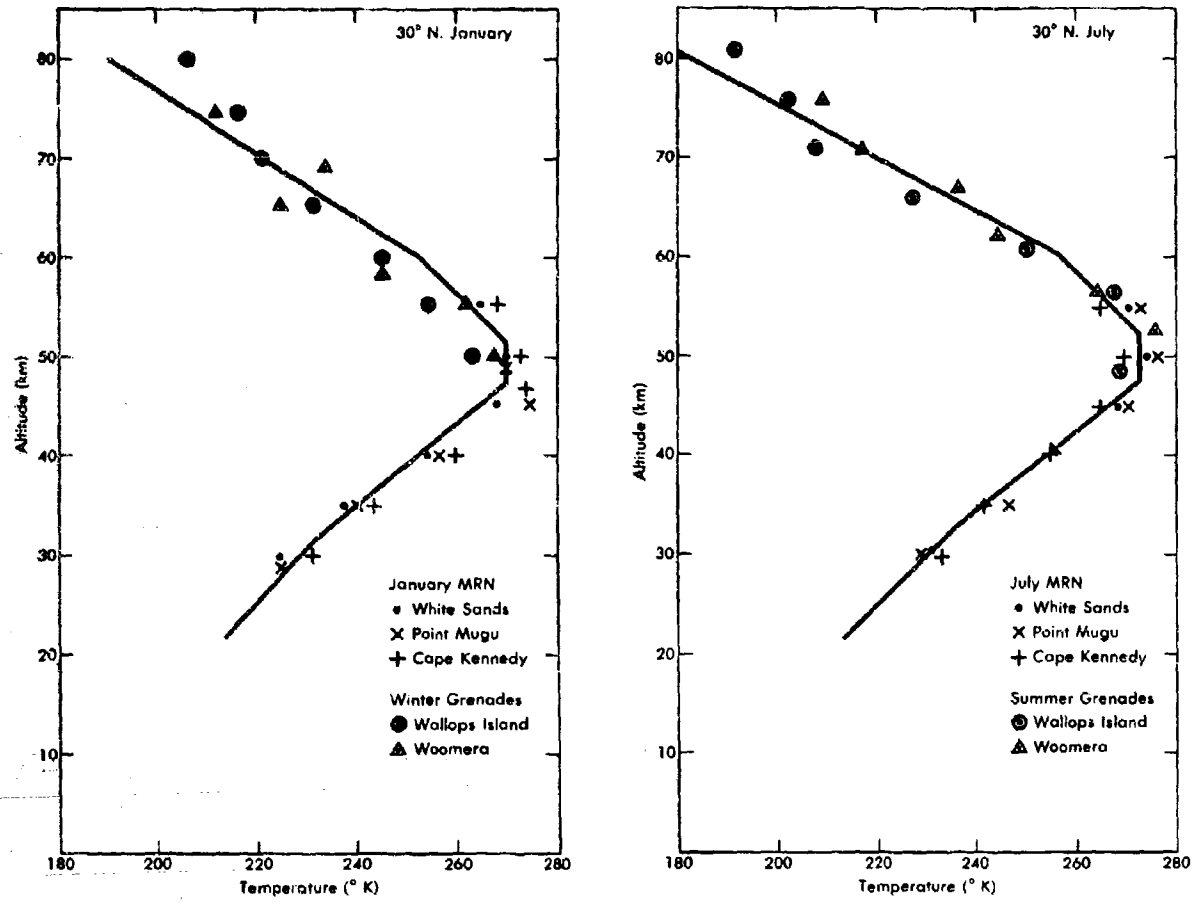


FIGURE 2.13.—Comparison of some observed temperatures with 30° N. temperature-altitude profiles.

cent experimental observations between 80 and 120 km are presented in Section 2.4.2.

Summer and winter pressure profiles based on approximately 61 rocket grenade soundings (Nordberg et al., 1965) are shown as percentage departure from Standard in Figure 2.17. These profiles, which are similar to those shown for the various models in Figure 2.10, indicate that in this altitude range winter pressures are lower and summer pressures generally higher than Standard. The seasonal variation is largest at high latitudes. It should also be noted that the range of seasonal and latitudinal variations is small at 80 km.

The thermal wind relationship was employed to obtain estimates of the temperature distribution with latitude from available zonal wind observations at various altitudes between 30 and 80 km. Geostrophic zonal wind components computed from the latitudinal pressure gradients of the Supplementary Atmospheres are compared with recent zonal wind summaries based on appropriate MRN and grenade observations (Figures 2.18 and 2.19).

Observed zonal winds at Wallops Island, 38° N., and Green River, 39° N. (Figure 2.18), locations approximately halfway between 30° and 45° N., compare favorably with the geostrophic values computed from the 30° and 45° N. atmospheres.

Observations are not available for a point midway between 45° and 60° N. Instead, January and July zonal wind observations at Fort Churchill, Fort Greely, and West Geirinish, locations near 60° N., have been compared in Figure 2.19 with the computed geostrophic winds between 45° and 60° N. The values observed in July at Fort Churchill and Fort Greely are in relatively good agreement with the computed winds. Observed winds for January, however, vary considerably with longitude. Fort Greely at 146° W. has the lightest and West Geirinish at 7° W. the strongest zonal winds, with Churchill values intermediate. An analysis of available data at Fort Churchill indicates that strong westerly winds above 30 km normally are associated with a cold stratosphere. The Churchill winds which were used to determine the temperature gradient in this region were weighted on a four-to-one basis, the ratio of cold to warm stratospheric regimes in January. This provides a January wind distribution which compares favorably with the geostrophic zonal

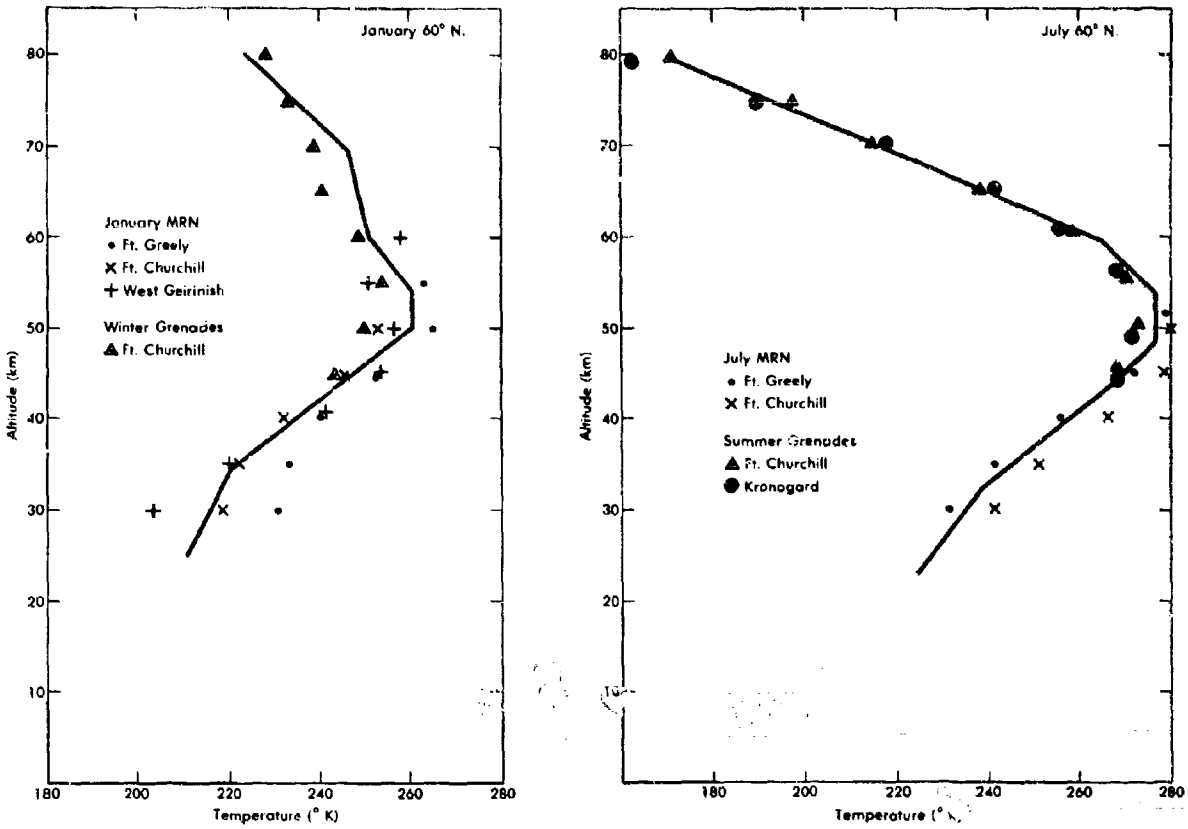


FIGURE 2.14.—Comparison of some observed temperatures with 60° N. temperature-altitude profiles.

winds computed from the pressure distribution between the January 45° and 60° N. atmospheres.

2.4.2 BETWEEN 80 AND 120 KILOMETERS.—Data available for extending the latitudinal and seasonal atmospheres from 80 to 120 km comprise primarily density measurements. Summaries of recent measurements and results of previous analyses of data in this region are presented and discussed in this section.

An analysis of data from 13 falling sphere firings at Kwajalein (Peterson et al., 1965) is contained in Figure 2.20. The plotted curve represents the mean density values given as percentage departure from Standard. On either side of the mean curve are plotted curves indicating the standard deviation (Crowley and Sandlin, 1964) of the individual observations about the observed means. The mean curve is considered the best available estimate of the annual average density for 10° latitude.

Results obtained by Peterson (1964) from two flights of radar tracked one-meter inflatable spheres at Wallops Island in June 1961 and 1962 are shown in Figure 2.21. Figure 2.21 also contains a mean curve and envelope curves which indicate the range of observed densities at 38° N. in June.

Estimates (Kantor and Cole, 1963) of the mean summer and winter density profiles for 45° and 60° N. are plotted as percentage departures from Standard in Figure 2.22. The 45° N. profiles, based on observed wind and thermodynamic properties, are probably accurate up to 110 km but uncertain above that altitude. This applies particularly to the crossing of the curves and reversal above 123 km. The curves for 60° latitude are based on new measurements at Churchill (59° N.). The observed values appear to verify the trend toward greater seasonal fluctuation with increasing latitude. The level of maximum seasonal variability appears to lie between 110 and 120 km at latitudes higher than 30°. Above this level the seasonal variability probably decreases.

Figure 2.23 contains the results of 12 falling sphere density measurements. Six were made at White Sands (Faire and Champion, 1965) and six at Eglin AFB (Faire and Champion, 1966). At levels between 60 and 80 km the measured densities range from 10 percent greater to approximately 16 percent less than Standard. Between 80 and 90 km there is a marked change in the data. The difference between the observed minimum densities and the 1962 Standard decreases until at 90 km the observed minimum values correspond to those of the Standard and the maximum densities are 30 percent greater than Standard. Thus, these data suggest a mean density approxi-

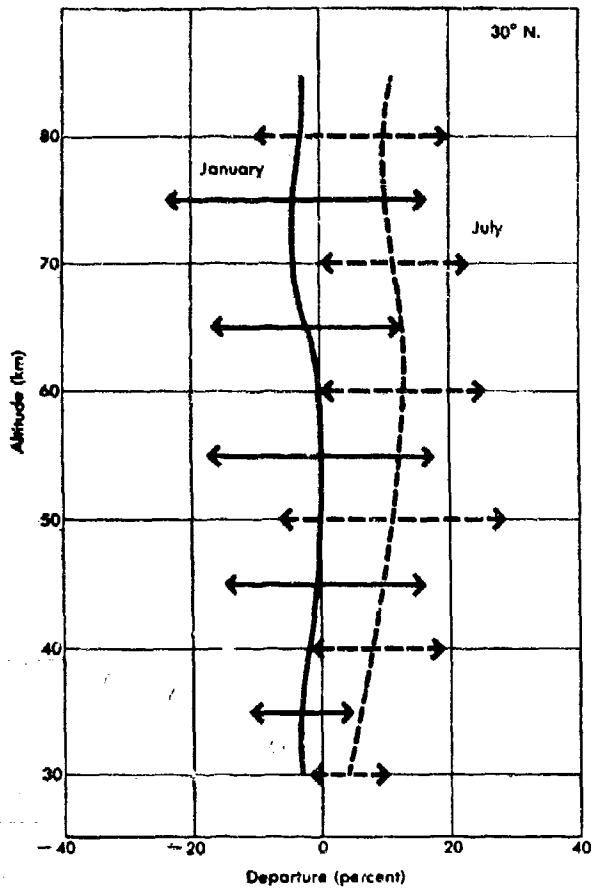


FIGURE 2.15.—Approximate 95 percent range of observed values (indicated by arrows) around the density-altitude profiles for the January and July 30° N. Supplementary Atmospheres.

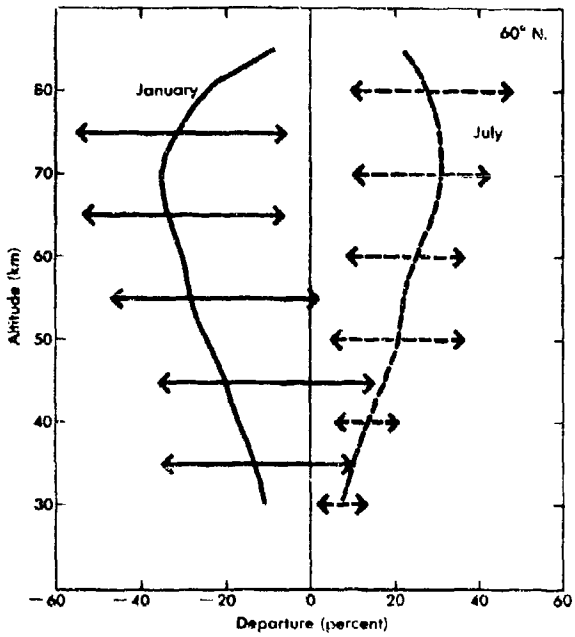


FIGURE 2.16.—Approximate 95 percent range of observed values (indicated by arrows) around the density-altitude profiles for the January and July 60° N. Supplementary Atmospheres.

mately 15 percent higher than Standard at 90 km. At higher altitudes the spread of data continues. The measurements range from several percent less to 65 percent more than Standard at 100 km and at 110 km from 20 percent less to 62 percent more than Standard. At 110 km the July measurements deviate from Standard by −15 and +5 percent. The density deviations of three November and three February measurements lie between +13 and +62 percent, with a mean of about +36 percent. Two February measurements have negative deviations at 110 km. It is believed that these do not represent typical winter conditions, but tropical conditions. Since 30° latitude is relatively close to 15° latitude, where there is no winter, there must be a large gradient in temperature and density between these two latitudes, and thus large variations in the properties at 30° latitude during the winter would be expected.

Mean seasonal curves have been deduced from the data in Figure 2.23 and plotted in Figure 2.24. Data from the two July measurements were used to produce

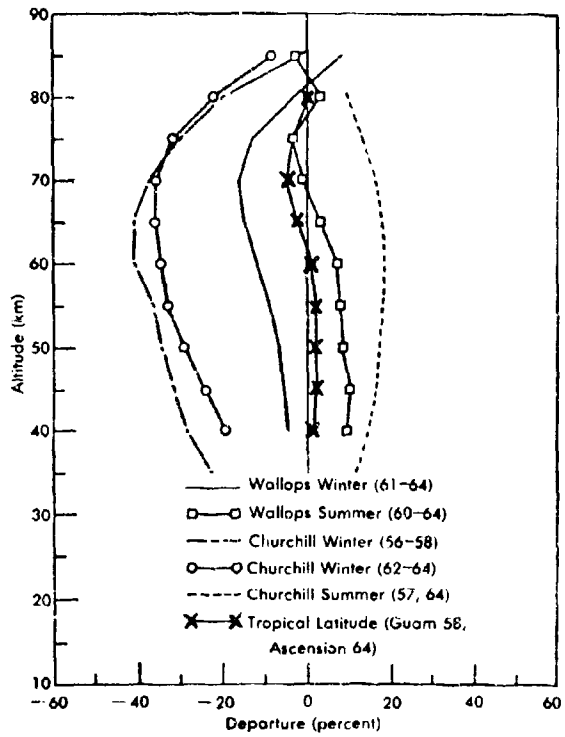


FIGURE 2.17.—Departures of mean rocket grenade pressures from Standard for summer and winter at four locations.

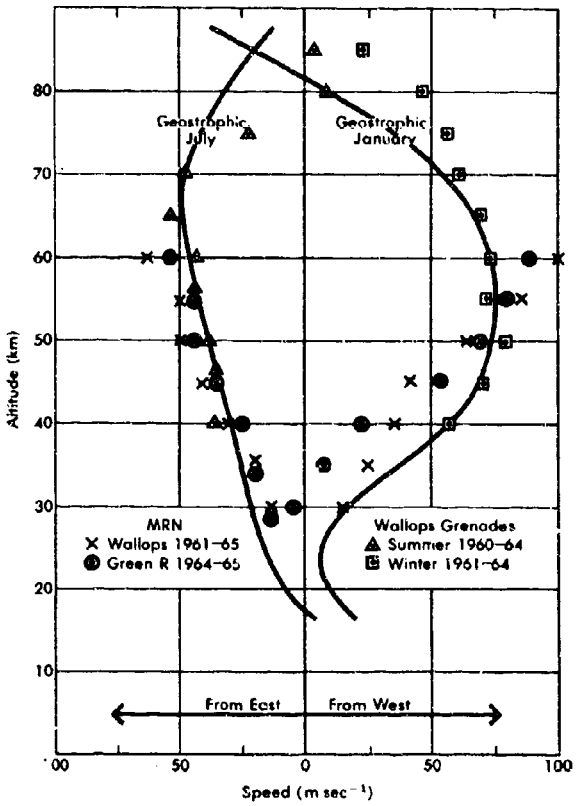


FIGURE 2.18.—Zonal wind components between 30° and 45° N.

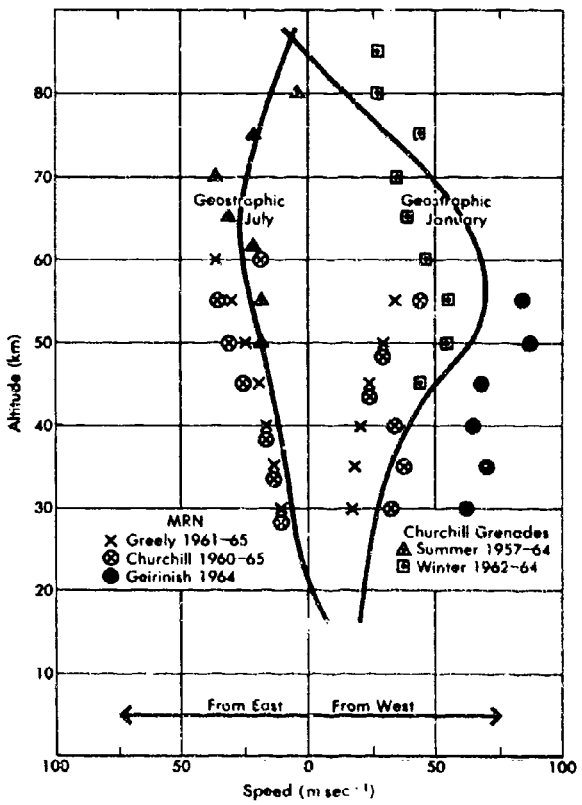


FIGURE 2.19.—Zonal wind components between 45° and 60° N.

the summer curve and the other ten measurements were grouped together to yield the winter curve. The 30° N. suggested summer and winter density curves are also plotted for comparison (Figure 2.24). The mean winter density curve is in very good agreement with the suggested curve up to 150 km, above that altitude the agreement is fair. The difficulty arises from the great variability of the atmosphere in this region (see Figure 2.23). This is also demonstrated by the sharp change in the mean density curve at 110 km. Up to 110 km the curve is the mean of results from ten rocket flights. Above this level it is the mean of two flights. It is obvious that the results of the latter measurements are significantly different from the mean of the other eight measurements. For the same reason the significance of the summer curve (based on only two rocket flights) is not high.

Figure 2.25 contains the results of three recent winter experimental observations at Churchill, Canada (Faire and Champion, 1966) obtained during the IQSY. The flights were made after completion of the models contained in this book. Thus, the relatively good agreement between the results and the other curves in Figure 2.25 constitutes confirmation of the models. The comparison curves are the 60° N. winter mean model and the 60° N. winter cold and warm models.

Other data that have been analyzed include the results of two pitot-static rocket probes at Wallops Island. The flights were made on 6 June and 1 December 1962 by Taeusch and Nagy (1965). The data, shown in Figure 2.26, agree with the general trends of other data as represented by the suggested 45° N summer and winter density curves. The very high winter density values above 100 km may be partly attributed to outgassing effects.

The results of eight density measurements at Woomera, Australia, using radar tracked inflatable spheres (Pearson 1965), are plotted in Figure 2.27. It can be seen by comparison with Figure 2.23 that, in general, the data are very similar to those obtained at the corresponding latitude in the northern hemisphere. The suggested summer and winter models for 30° N. are also shown in Figure 2.27. However, there are some differences in the data. For example, near 70 km the Woomera data show a region where the densities are higher than Standard and this does not occur in the Eglin and White Sands data in Figure 2.23. An isopycnic level still appears to exist near 90 km, but the average density is 32 percent above Standard, as compared to 15 percent for northern hemisphere data. However, it is not clear whether these differences are the result of different measuring techniques, of relatively small samples, of differences

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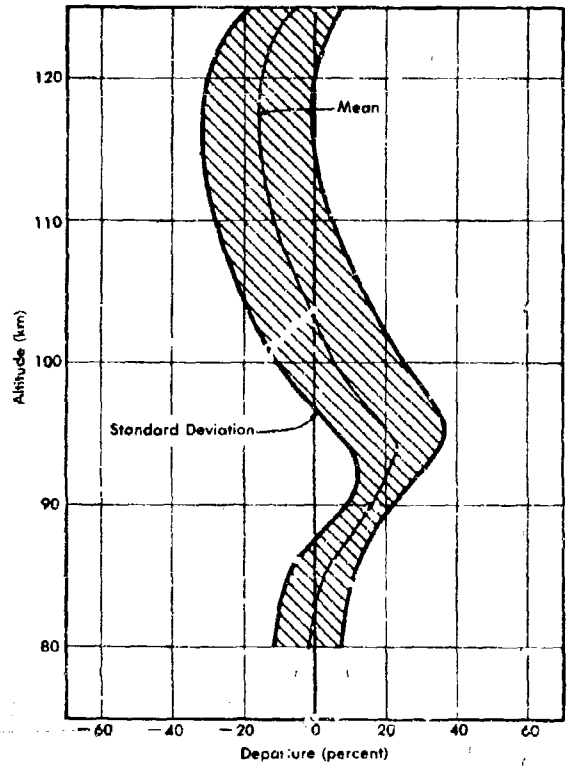


FIGURE 2.20.—Departures from Standard of the mean and standard deviations of 13 density measurements at Kwajalein Island.

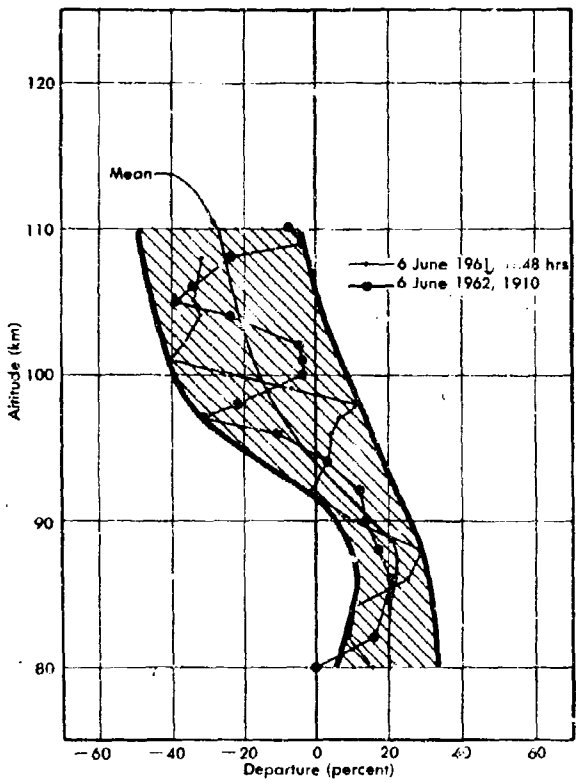


FIGURE 2.21.—Departures from Standard of two falling sphere density measurements at Wallops Island.

between the northern and southern hemispheres, or of longitudinal effects.

Values of oxygen ($O_2$) density as a function of altitude (Jursa et al., 1965) obtained by various experimenters are shown in Figure 2.28. The $O_2$ density is determined primarily by the total atmospheric density but also, above about 100 km, by any large variations in the degree of dissociation (that is, the magnitude of the O density). Thus, at high altitudes the percentage variation in $O_2$ density will be larger than in the total density. Like the total density, the observed $O_2$ density has small variability at 90 km. The variation increases with altitude and is large at 120 km and higher altitudes. It is interesting to note that in Figure 2.28 the highest $O_2$ densities at 120 km and adjacent altitudes are those of the theoretical models of Harris and Priester (1962). These authors developed a revised set of models, published as part of CIRA 1965, in which the $O_2$ density at 120 km has been reduced from $1.2 \times 10^{11}$ cm$^{-3}$ to $7.5 \times 10^{10}$ cm$^{-3}$. The new value is almost identical with that at the 120 km end of the line drawn by Jursa et al. in Figure 2.28. Up to 150 km the theoretical values agree almost exactly with Hinteregger's (1961) experimental values indicated by crosses in the figure.

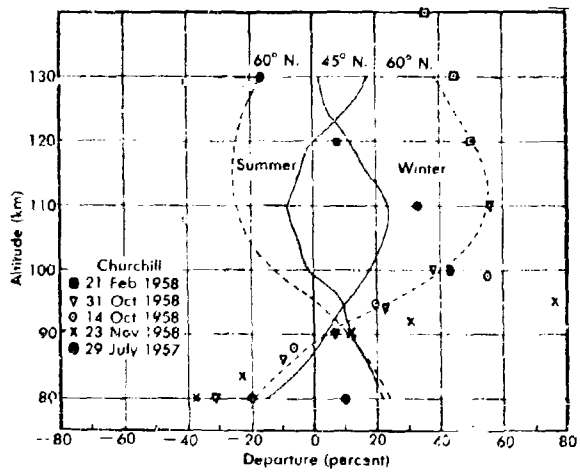


FIGURE 2.22.—Departures from Standard of IGY Churchill density data and of early curves for winter and summer 45° and 60° N.

Most values of temperature obtained for the upper atmosphere are derived, in principle, from the slope of density curves. These yield scale height or molecular temperature. At altitudes where oxygen dissociation is not significant, molecular temperature is the

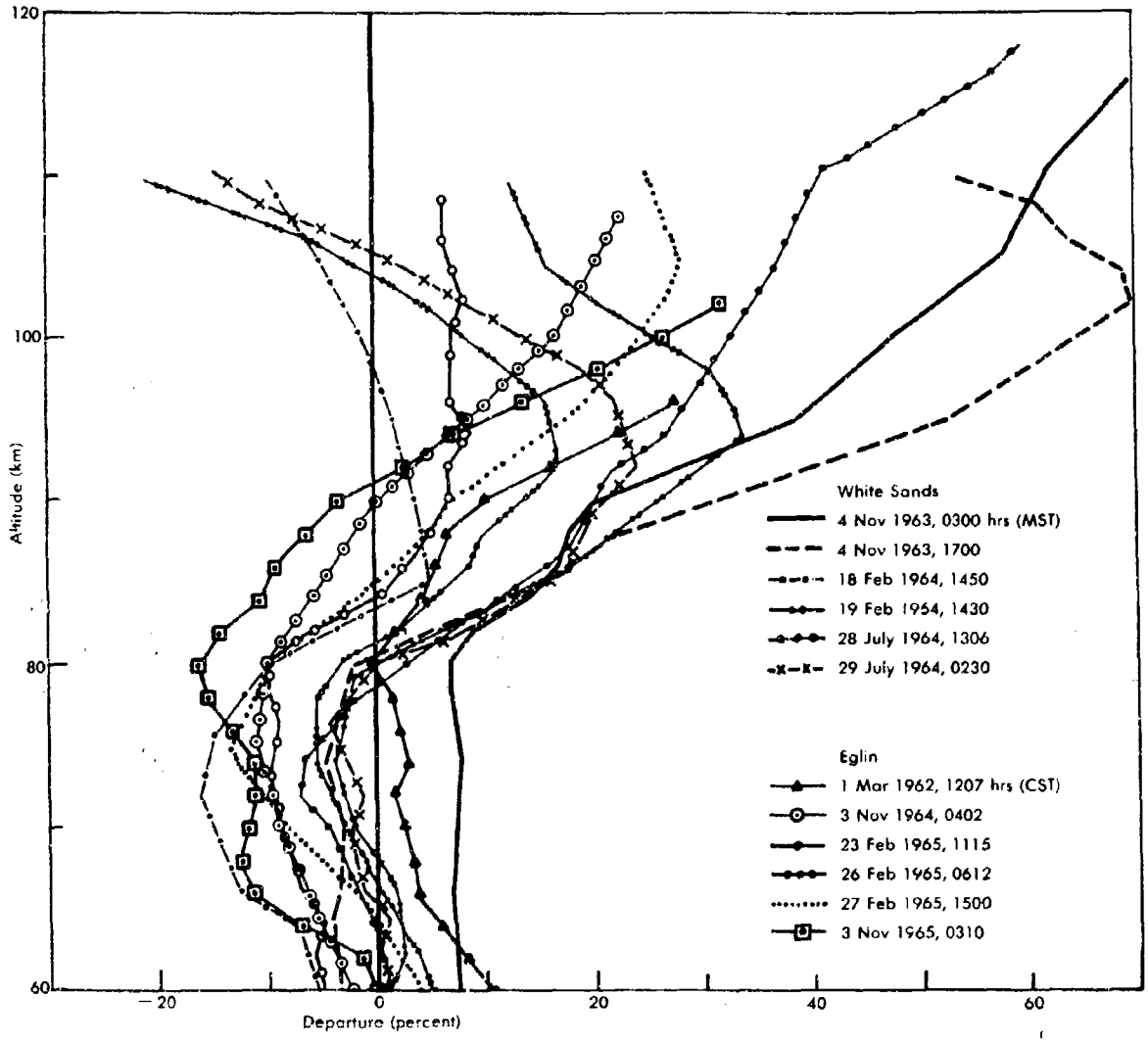


FIGURE 2.23.—Departures from Standard of 12 recent density measurements at White Sands and Eglin.

same as kinetic temperature. At higher altitudes, values of the mean molecular weight must be known to deduce the kinetic temperature. Values of kinetic temperature can be deduced directly in the region of diffusive separation if the altitude profile of a single constituent, such as $N_2$ or $O_2$, is measured. Independent methods of measuring kinetic temperature directly are mainly optical in nature. They include measurements of the Doppler broadening of resonance radiation from sodium or potassium and the deduction of temperature from the band emission of aluminum oxide by Armstrong (1963) and Blamont (1964).

Temperatures can also be measured on a synoptic basis by measuring the Doppler width of the atomic oxygen airglow lines. This is particularly convenient to do with the 5577 Å line. This line is primarily emitted in the vicinity of 95 km, at or near the mesopause, a region of minimum temperature. Armstrong (1959) has obtained a considerable amount of temperature data from observations on the 5577 Å line. The results of 15 early measurements gave temperatures in the range 180° to 220° K, with a median value of 190° K. More recent results have sometimes yielded temperatures as low as 150° K and, on the other hand, sometimes as high as several hundred degrees. In the latter case, Armstrong believes that the observed radiation must be coming largely from higher altitudes, near where the red line (6300 Å) is emitted.

Recent data include those of Hernandez and Turtle (1965). The temperatures measured at Bedford, Massachusetts (November, 1964 to February, 1965) lie between 150 and 260° K, with a mean of 210° K. This compares favorably with a kinetic temperature of 208.5° K at 95 km in the 45° N. winter model. The

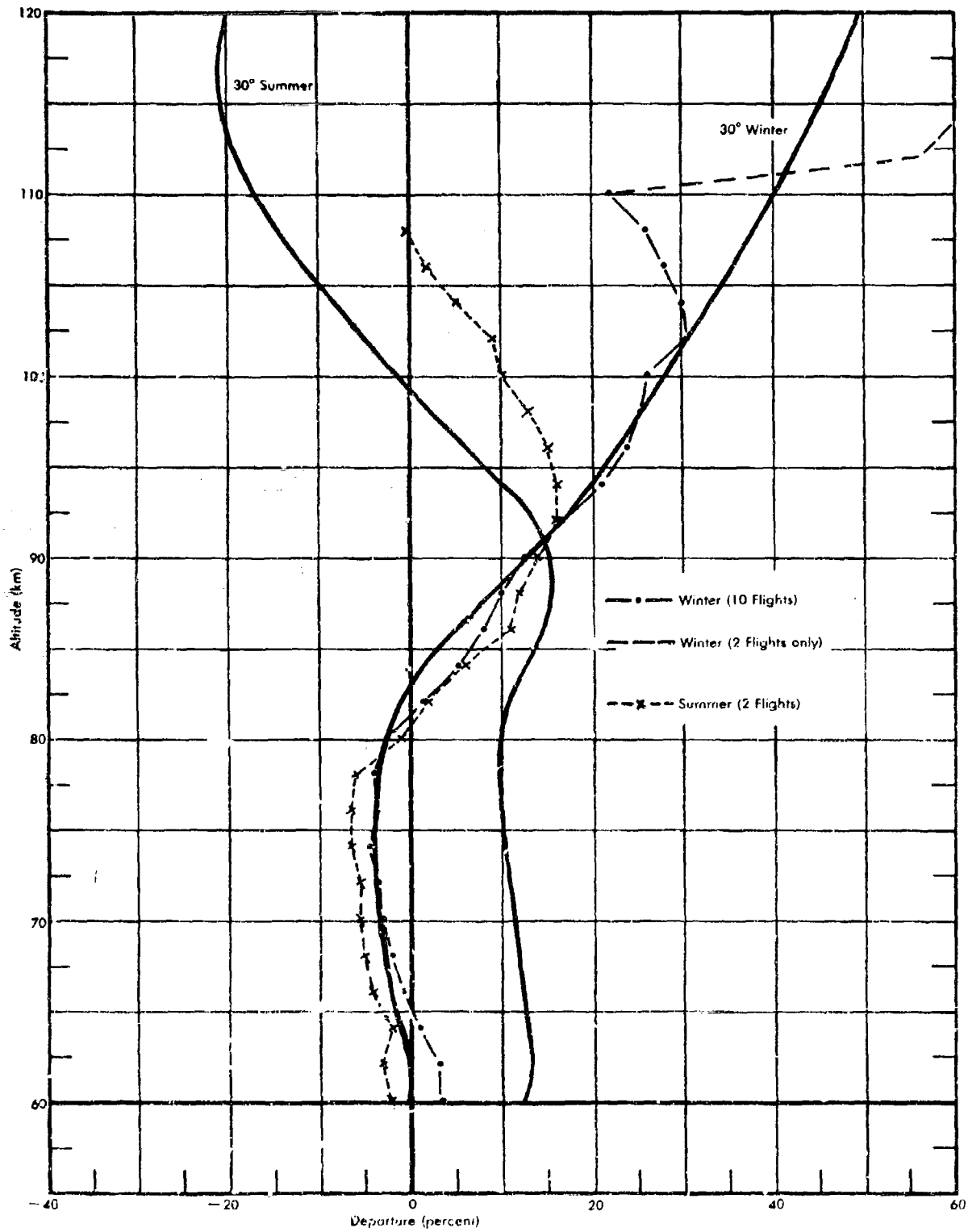


FIGURE 2.24.—Mean summer and winter density data for White Sands and Eglin compared with idealized (Figure 2.7) 30° N. summer and winter density curves.

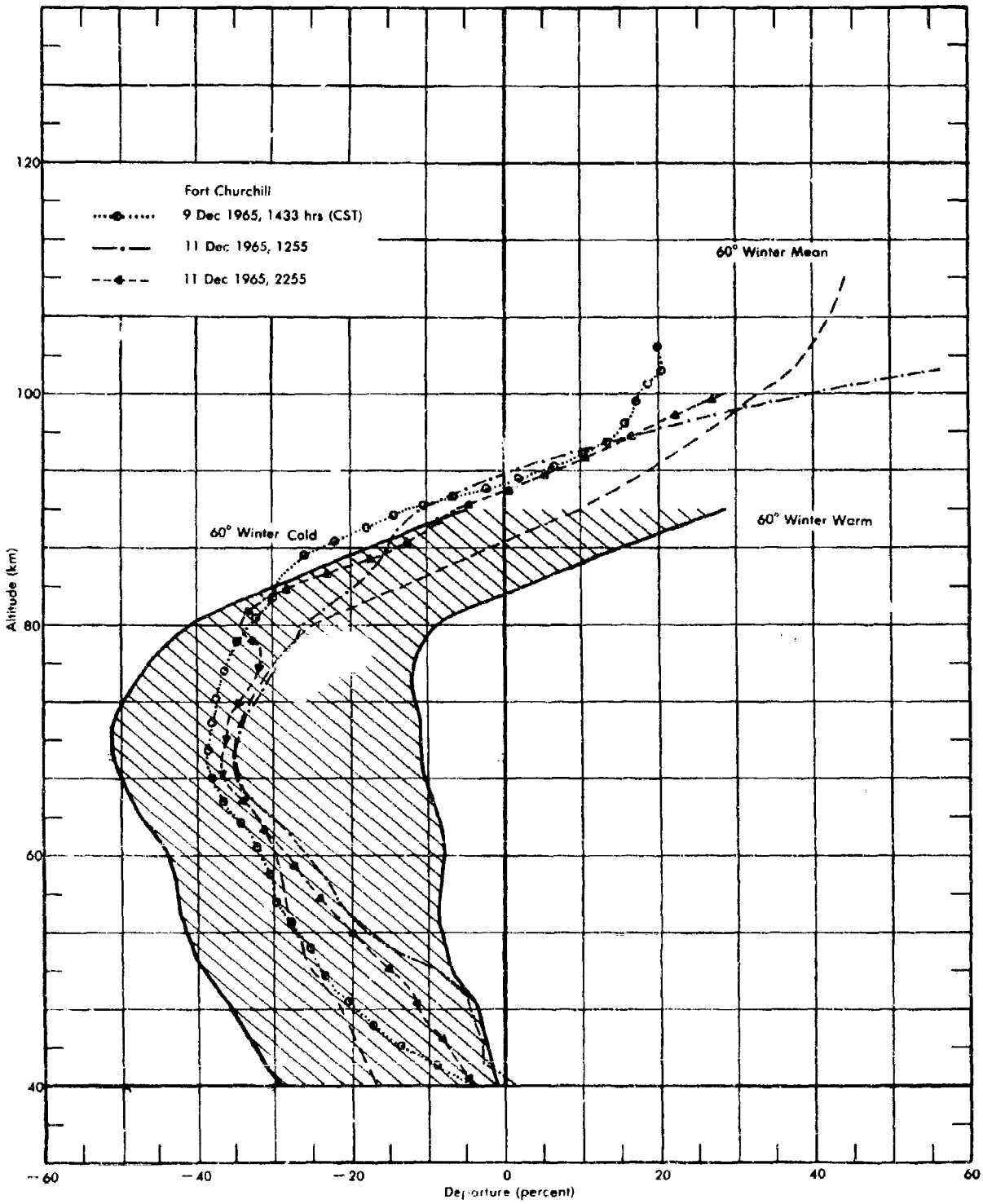


FIGURE 2.25.—Departures from Standard of the densities from three recent measurements at Churchill and of the 60° N. winter mean, cold and warm models.

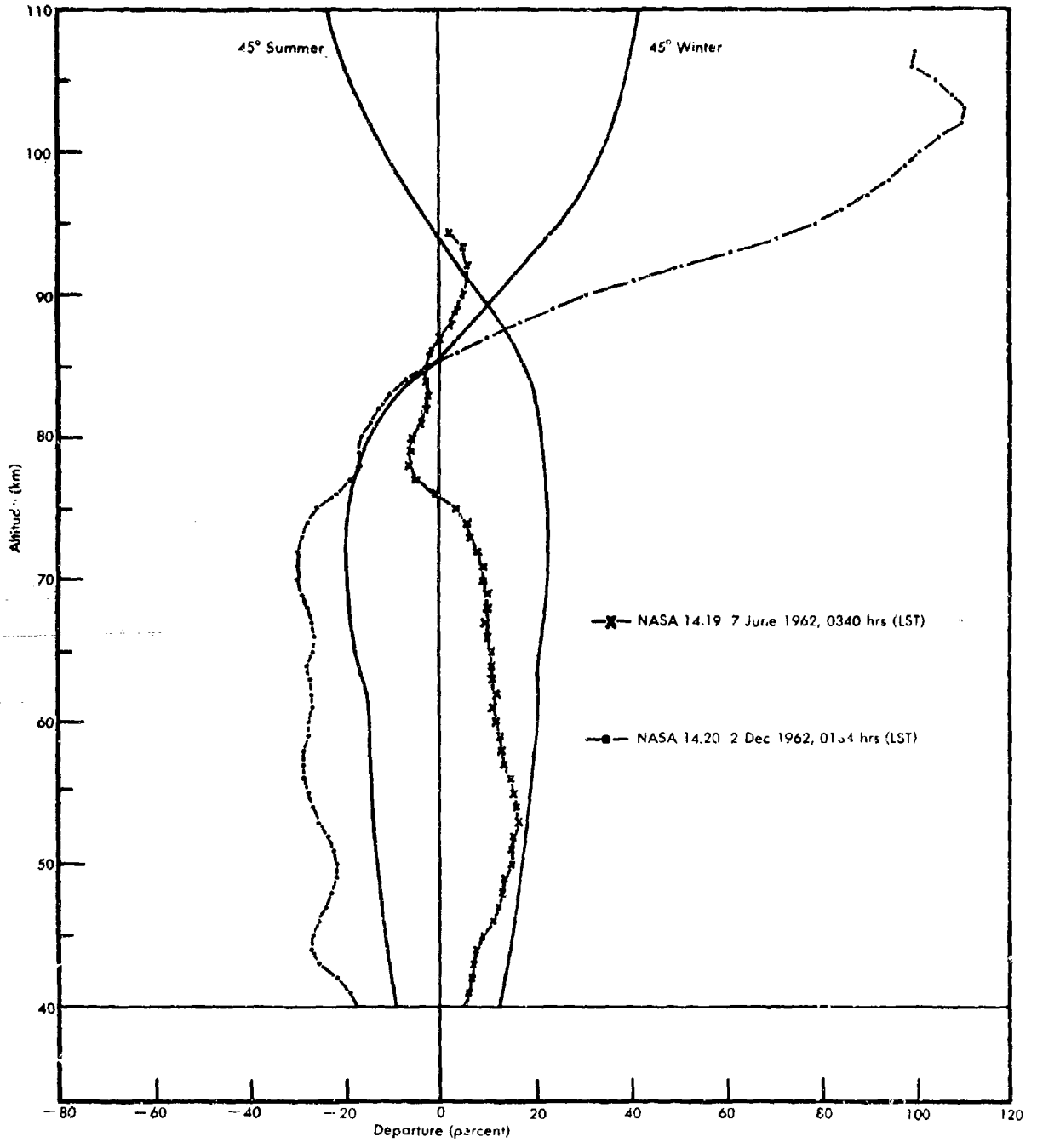


FIGURE 2.26. – Departures from Standard of two pitot-static density measurements at Wallops Island and of the idealized (Figure 2.7) 45° summer and winter density curves.

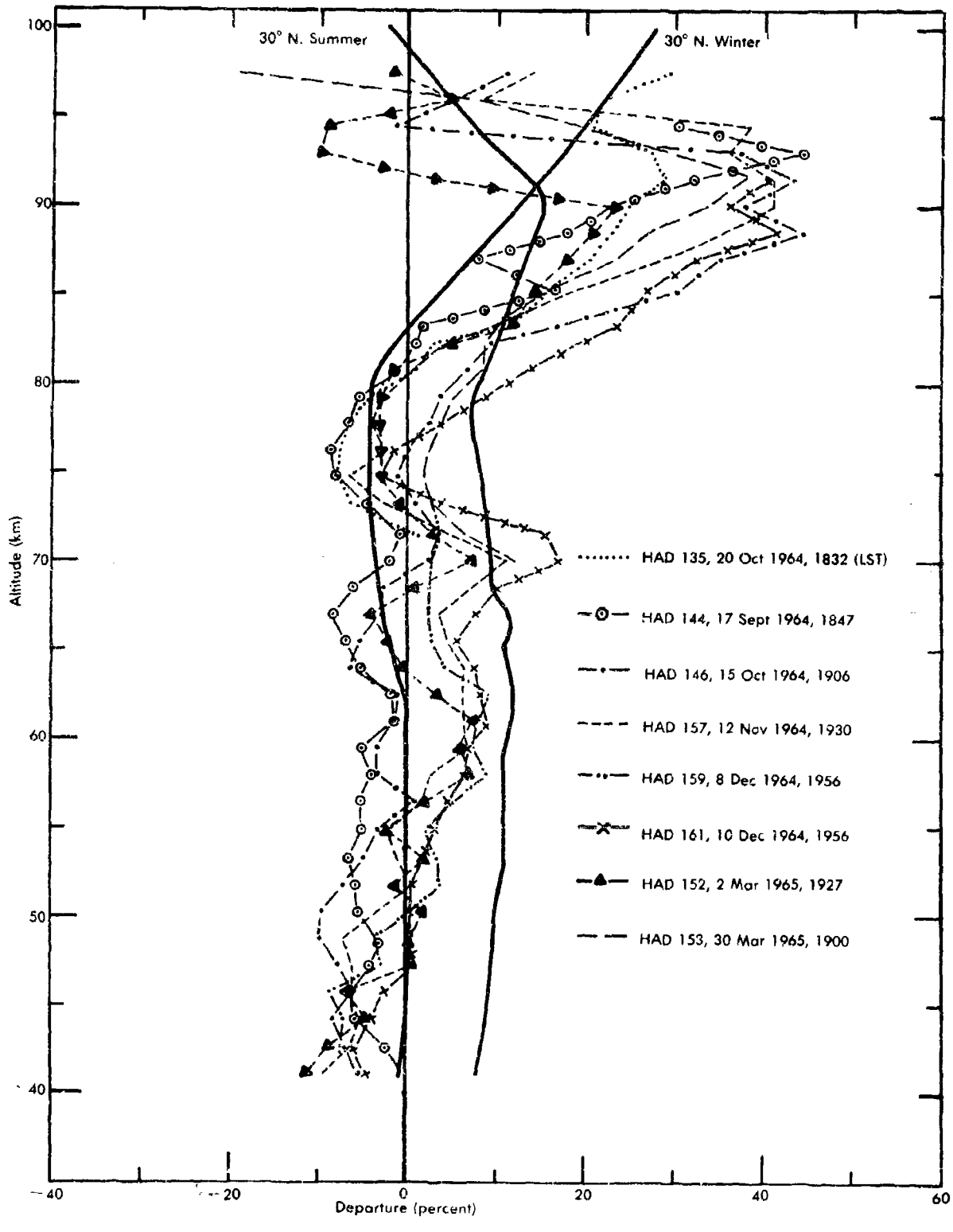


FIGURE 2.27.—Departures from Standard of eight density measurements at Woomera and of the summer and winter models for 30° N.

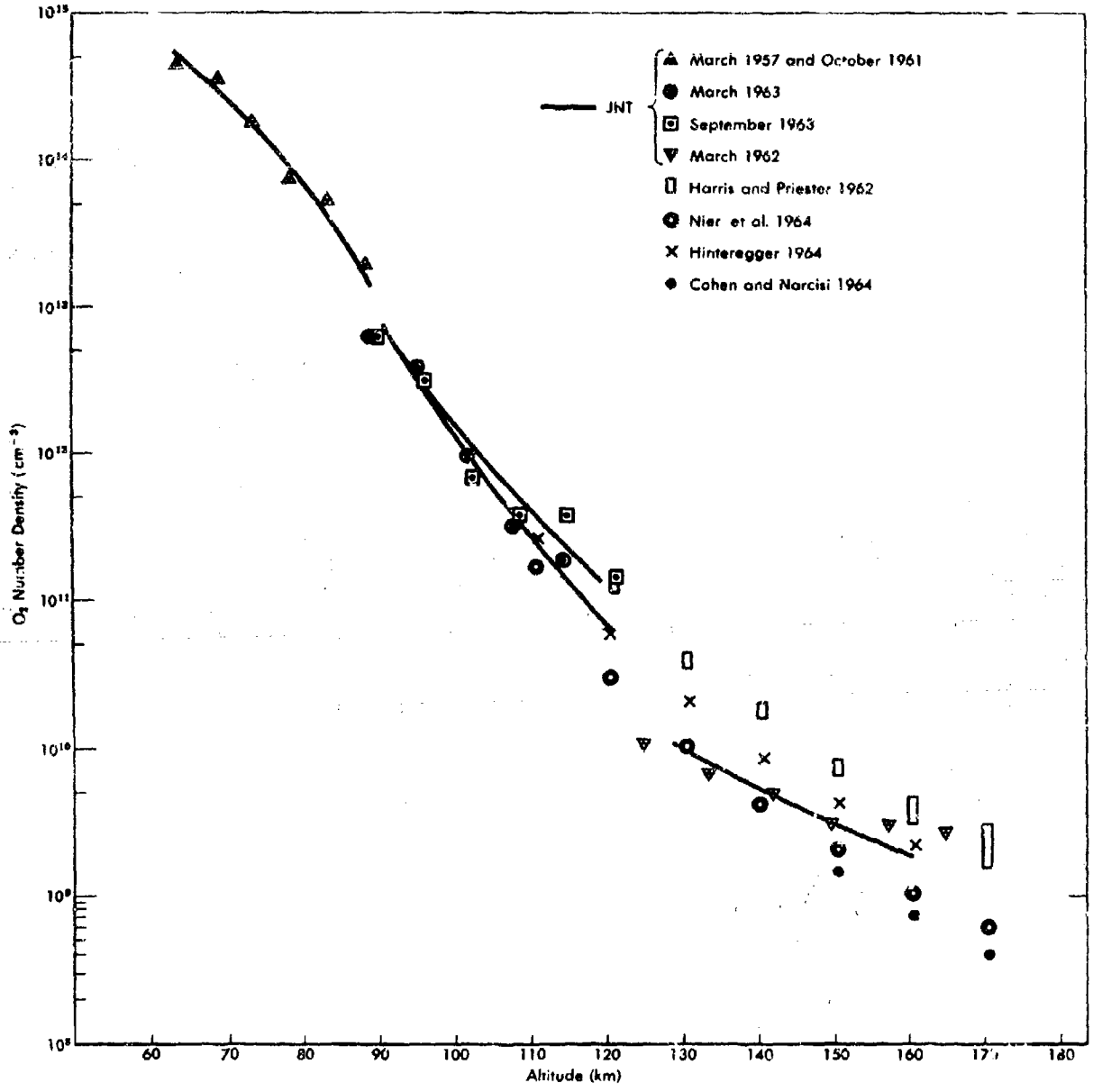


FIGURE 2.28. -Molecular oxygen number density data between 60 and 170 km.

observed temperatures showed fluctuations up to 65° in time intervals of the order of 10 to 20 minutes. For example:

| *7 January 1965* | |
|---|---|
| EST | °K |
| 0410 | 211 |
| 0427 | 150 |
| 0445 | 210 |

Certainly, from energy considerations, the average temperature of the atmosphere cannot fluctuate in this way. Assuming that the fluctuations are not instrumental or due to processes peculiar to the excited oxygen atom, one notes that they suggest a fine structure in the atmosphere near 95 km. The instrument views a cross-sectional area with a diameter of 300 m. Zimmerman (1966) believes that large eddies exist at this altitude with diameters in the range 300 m to 2 km. It is possible that a part of the observed variability is due to the temperature fluctuations associated with these eddies.

# PART 3

# Atmospheric Models Above 120 Kilometers

## 3.0 INTRODUCTION

The basic defining parameter of the Supplementary Atmospheres above 120 km is a family of exponential temperature curves. These were empirically derived so as to provide density-altitude profiles which are in agreement with satellite-drag derived densities for various degrees of solar and geomagnetic activity and varying solar angles. Such a family of atmospheres was defined for one boundary condition of temperature, pressure, density, and molecular weight at its base, 120 km, by Jacchia (1965) and can be considered to represent the annual mean or spring and fall conditions in lower layers. However, the eight supplementary atmospheres below 120 km converge at three separate and distinct boundary conditions at 120 km and new mathematical treatment was required to join these families realistically.

Tables of atmospheric properties for 120 to 1000 km, the development of which is covered in this Part, are provided in Part 6

## 3.1 CONSTRUCTION OF ATMOSPHERIC MODELS FOR ALTITUDES ABOVE 120 KILOMETERS

3.1.1 SPRING/FALL MODELS.—For altitudes above 120 km the spring/fall atmospheric models presented here are identical with Jacchia's (1965) static diffusion models. Winter and summer models, which start from different boundary conditions at 120 km, join the spring/fall models at altitudes near 225 km. A description of the method followed in joining the homosphere and heterospheric models is given in Section 3.1.2. Here we shall give a brief description of how the spring/fall models were constructed.

These models assumed the following set of fixed boundary conditions at 120 km:

$T = 355.0°$ K

$\rho = 2.461 \times 10^{-11}$ gm cm$^{-3}$

$M = 26.90$

$n(N_2) = 4.0 \times 10^{11}$ cm$^{-3}$

$n(O_2) = 7.5 \times 10^{10}$ cm$^{-3}$

$n(O) = 7.6 \times 10^{10}$ cm$^{-3}$

$n(He) = 3.4 \times 10^{7}$ cm$^{-3}$

This is the same set of boundary conditions that had been selected for the construction of the COSPAR International Reference Atmosphere 1965 (CIRA, 1965) except for argon, which was neglected in view of its small contribution to the total density, and helium which has a density of $2.4 \times 10^{7}$ cm$^{-3}$ in CIRA. As a result of these changes $\rho$ and $M$ are also slightly different.

Above 120 km, diffusive equilibrium was assumed, and the number density $n_i$ of each constituent $i$ was computed as a function of the geometric altitude $Z$ by integrating the diffusion equation:

$$\frac{dn_i}{n_i} = -\frac{dZ}{H_i} - \frac{dT}{T}(1+\alpha). \tag{3.1}$$

Here, $T$ is the temperature, $\alpha$ the thermal-diffusion factor, and $H_i$ the scale height of the individual constituent, defined by

$$H_i = \frac{kT}{m_i g} \tag{3.2}$$

where $k$ is the Boltzmann constant, $m_i$ the molecular (or atomic) mass of the constituent, and $g$ the acceleration of gravity. For helium, following Kockarts and Nicolet (1962), a value $\alpha = -0.38$ was adopted; for $N_2$, $O_2$, and O it was assumed that $\alpha = 0$.

Hydrogen was assumed to be in diffusive equilibrium above 500 km, although this assumption is not entirely justified for temperatures above 1500° K. The values of $n$(H) at 500 km were taken from Kockarts and Nicolet (1962, 1963), or rather the empirical equation

$$\log_{10} n(H) = 73.13 - 39.40 \log_{10} T + 5.5 (\log_{10} T)^2 \tag{3.3}$$

was taken to represent their numerical data.

Below 500 km it is known that hydrogen is not in diffusive equilibrium, but at the moment, theory is not adequate to calculate the density profile due to lack of knowledge of the flow rate.

A family of temperature profiles, which approach different asymptotic exospheric temperatures, was constructed by assuming exponential curves of the form

$$T = T_\infty - (T_\infty - T_{120}) \exp[-s(Z-120)] \tag{3.4}$$

where $T_\infty$ is dependent on solar activity and other parameters and $T_{120}$ is the boundary temperature at 120 km. All temperatures are in °K, $Z$ is in kilometers, and $s$ is a constant, different for each profile

and therefore a function of $T_\infty$. Appropriate values of $s$ such that realistic density variations are generated from the temperature profiles are determined by the empirical equation

$$s = 0.0291 \exp\left(-\frac{q^2}{2}\right) \tag{3.5}$$

where

$$q = \frac{T_\infty - 800}{750 + 1.722 \times 10^{-4}(T_\infty - 800)^2}$$

Once a set of models for a wide range of $T_\infty$ was constructed, the problem remained of relating $T_\infty$ to the various parameters that characterize the different factors of atmospheric variation: solar and geomagnetic activity, location of the observer with respect to the sun, and so forth. Equations and tables for these conditions, based on Jacchia (1965), are given in Section 3.2.

3.1.2 SUMMER AND WINTER MODELS.—As shown in Figure 2.7 (Champion, 1966) the eight supplementary atmospheres below 120 km converge at three different density values at 120 km. Starting with these boundary conditions, one observes that three sets of high-altitude models were developed: a single set applicable to transition season (spring and fall) conditions, a set for summer, and a set for winter. In order to represent atmospheric behavior observed at various times of day during an entire solar cycle, models with a range of exospheric temperatures from 600° to 2100° K were prepared.

The summer and winter atmospheres merge with the spring/fall atmospheres at altitudes near 225 km. The matching altitude depends on exospheric temperature and season. Thus, corresponding to each exospheric temperature, there are three models below the matching altitudes and a single model above.

In Figure 3.1 density departures are plotted for three typical cases corresponding to exospheric temperatures of 600°, 1500°, and 2100° K. For each exospheric temperature the reference line corresponds to a different density profile and furthermore the matching altitude $Z_m$ is different. In fact, the matching altitude lies within the range 195 to 255 km, depending upon the exospheric temperature and season. One condition that can be satisfied by varying the matching altitude is the requirement that all the summer models have the same temperature at 120 km, so that they can be matched to the low-altitude models. Similarly, all the winter models must have the same temperature at 120 km. The matching altitudes for the summer and winter atmospheres are given in Table 3.1 and in Figure 3.2. For temperatures above 1300° K it can be seen that the summer and winter values of $Z_m$ are the same.

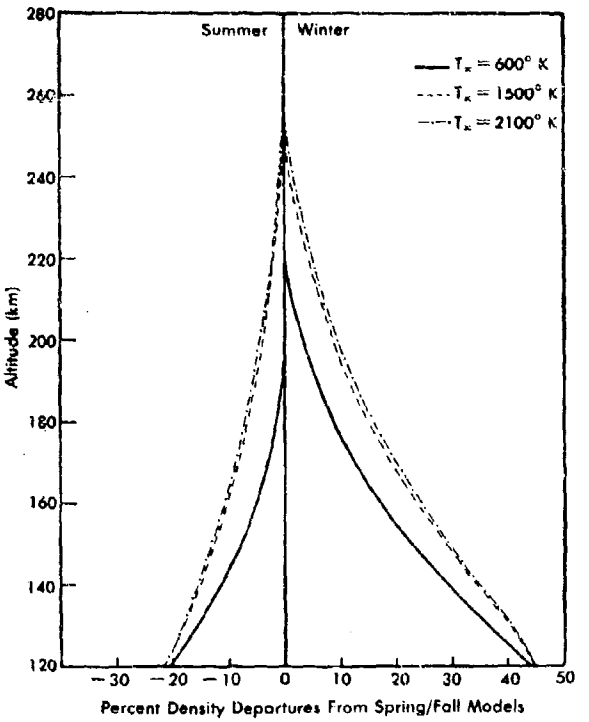


FIGURE 3.1.—Density departures from the spring/fall models for summer and winter with three exospheric temperatures.

TABLE 3.1.—MATCHING ALTITUDES ($Z_m$) FOR SUMMER AND WINTER ATMOSPHERES AS A FUNCTION OF EXOSPHERIC TEMPERATURE

| $T_\infty$ °K | $Z_m$ (Summer) km | $Z_m$ (Winter) km |
|---|---|---|
| 600 | 195 | 220 |
| 700 | 200 | 225 |
| 800 | 210 | 230 |
| 900 | 220 | 235 |
| 1000 | 230 | 240 |
| 1100 | 235 | 240 |
| 1300 | 245 | 245 |
| 1500 | 250 | 250 |
| 1700 | 255 | 255 |
| 1900 | 255 | 255 |
| 2100 | 255 | 255 |

The mathematical functions chosen to represent winter and summer density curves are

$$\rho_w = \rho_j(1.4848 - 0.4848\ \psi) \tag{3.6}$$

and

$$\rho_s = \rho_j(0.7919 + 0.2081\ \psi) \tag{3.7}$$

where

$$\psi = \tanh 1.75\ D + 0.059\ D^2 \tag{3.8}$$

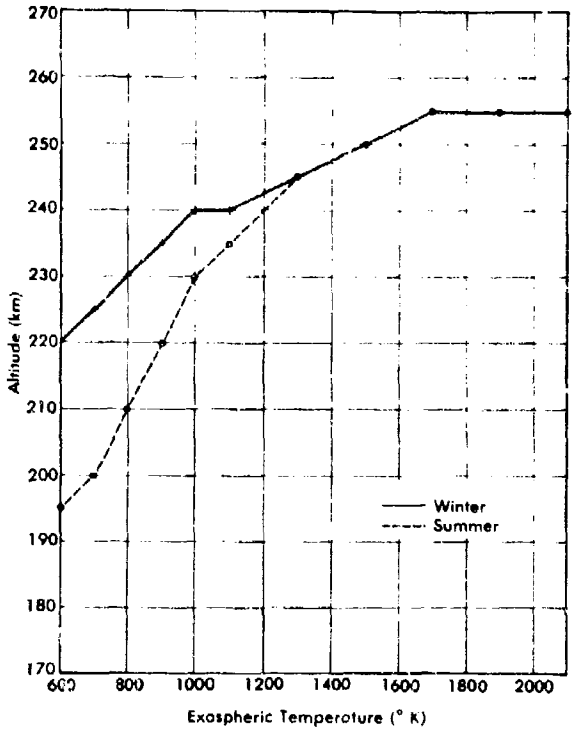


FIGURE 3.2.– Matching altitudes ($Z_m$) for summer and winter atmospheres as a function of exospheric temperature.

and

$$D=\frac{Z-120}{Z_m-120} \tag{3.9}$$

where $\rho_j$ designates the appropriate density value from Jacchia's (1965) models, $\rho_w$ the winter density, $\rho_s$ the summer density, $\psi$ a parameter defined by Eq. (3.8), and $D$ a parameter defined by Eq. (3.9).

In Part 6 tables are given for models with exospheric temperatures of 600°, 700°, 800°, 900°, 1000°, 1100°, 1300°, 1500°, 1700°, 1900°, and 2100° K. The following procedure was used to obtain the values in the tables. Molecular-scale temperatures were calculated from the density curves described by Eqs. (3.6) and (3.7) using integration downward from the matching altitude. To convert to kinetic temperature, the molecular weight values of the spring/fall models were used as a first estimate. With this temperature profile, and boundary conditions for $n(O_2)$, $n(O)$, $n(N_2)$, and $n(He)$ that were the spring/fall values multiplied by 1.4848 and 0.7919 for winter and summer models, respectively, a new set of tables was computed. Molecular weights obtained by this process were used with the $T_M$ profile to obtain a revised set of kinetic temperatures. By an iterative process in which the temperature profile and boundary conditions were adjusted slightly, the summer and winter models were matched to the corresponding spring/fall models at $Z_m$ and above.

The density departures shown in Figure 3.1 are replotted in Figure 3.3, but in this case the reference is the *1962 Standard*. Densities are shown for an exospheric temperature of 600° K, separating below 200 km into curves for summer, winter, and spring/fall. Densities corresponding to exospheric temperatures of 1500° K and 2100° K are similarly represented. The density departures at 300 km for models with exospheric temperatures of 900°, 1100°, 1300°, 1700°, and 1900° K are also marked.

Figure 3.4 illustrates percentage density departure from the *1962 Standard* at all latitudes corresponding to 1400 hours local time at the northern hemisphere summer solstice when the maximum daytime exospheric temperature is 1200° K. This figure is based on the type of temperature distribution in Figure 3.5.

Figure 3.6 contains typical summer, winter, and spring/fall temperature profiles for 45° latitude from sea level to an altitude of 300 km. The three temperature curves which start at 120 km and extend towards 300 km are plotted from values for the 1500° K exospheric temperature models in Part 5. The mean temperature curve from sea level to 120 km is the *1962 Standard*, whereas the summer and winter temperature profiles up to 120 km are obtained from the appropriate tables in Part 5.

The values shown in Figure 3.6 are typical. Actual values at any particular time will depend on the latitude and, at the higher altitudes, also on solar flux and time of day. The present models are the first in which variations in temperature and density as functions of latitude, season, and other parameters are given continuously and at all altitudes from sea level to 1000 km. Figure 3.7 is the density plot appropriate to a maximum daytime exospheric temperature of 1500° K. It should be noted that, at the higher altitudes, the densities are larger in comparison with the Standard than those plotted in Figure 3.4.

The boundary conditions at 120 km of the high altitude Supplementary Atmospheres are given in Table 3.2. It can be seen that each of the tabulated quantities varies with season.

## 3.2 SYSTEMATIC VARIATIONS IN THE ATMOSPHERE ABOVE 200 KILOMETERS

Four types of atmospheric variation have been recognized at heights greater than 200 km, namely:

1. a variation with solar activity,
2. a semiannual variation,
3. a diurnal variation, and
4. a variation with geomagnetic activity.

Each of these variations has been found to be related to one or more observable parameters, and empirical formulas have been constructed to compute

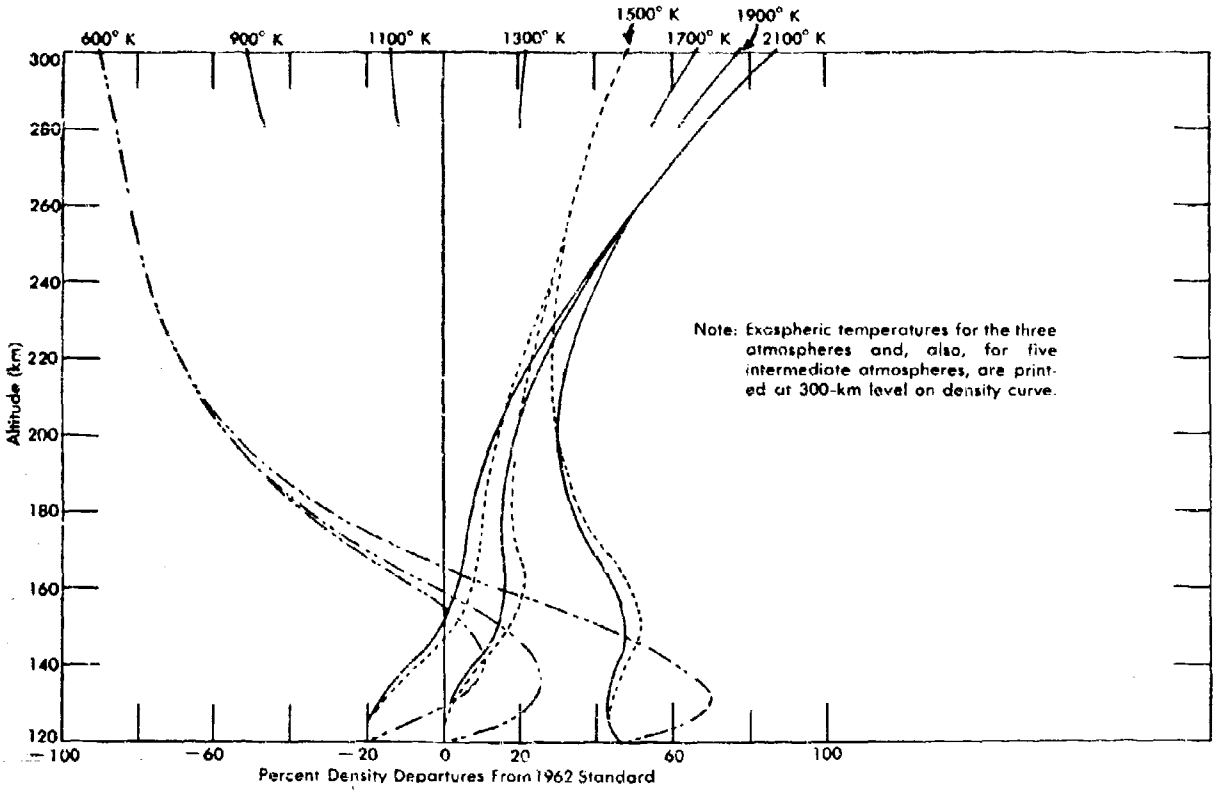


FIGURE 3.3.—Departures from Standard of densities for summer, winter and spring/fall models with three exospheric temperatures.

the exospheric temperature when these parameters are known. Once the exospheric temperature $T_\infty$ has been computed, atmospheric densities and related quantities can be found for any given height by interpolation between the individual profiles given in the Tables in Part 5. Following is a brief summary of the formulas to be used for computing $T_\infty$. The order in which the types of variation are listed does not reflect their relative importance; it is dictated by the sequence in which the computations to obtain $T_\infty$ are to be performed.

3.2.1 VARIATIONS WITH SOLAR ACTIVITY.—The parameter that can be used to best advantage to characterize solar activity is the 10.7-centimeter flux which is monitored by the National Research Council in Ottawa, Ontario. The relation between this flux and $T_\infty$ is different, however, according to whether we consider the slow 11-year cycle variation or the day-to-day variation within one 27-day solar rotation.

*Variation with the solar cycle.*—Let $\overline{F}_{10.7}$ be the 10.7-cm solar flux in units of $10^{-22}$ watts/m$^2$/cycle/sec averaged over three solar rotations, and $\overline{T}_0$ the nighttime global minimum value of exospheric temperature averaged over the same time interval. The formula

$$\overline{T}_0 = 362 + 3.60\,\overline{F}_{10.7} \qquad (3.10)$$

gives the relation between these two quantities for absolutely quiet geomagnetic conditions, that is when the 3-hour geomagnetic planetary index is zero. If a relation for average quiet geomagnetic conditions ($K_p = 2$) is desired, the absolute term should be changed from 362 to 418.

TABLE 3.2 BOUNDARY CONDITIONS OF SUPPLEMENTARY ATMOSPHERES, $Z = 120$ KILOMETERS

| | $T$ °K | *log n($O_2$) | *log n(O) | *log n($N_2$) | *log n(He) | $M$ | $H$ km | $P$ mb | $\rho$ kg m$^{-3}$ |
|---|---|---|---|---|---|---|---|---|---|
| Summer | 379.7 | 16.759 | 16.808 | 17.497 | 13.502 | 26.76 | 12.49 | $2.283 \times 10^{-5}$ | $1.935 \times 10^{-8}$ |
| Winter | 353.5 | 17.056 | 16.958 | 17.764 | 13.568 | 27.12 | 10.83 | $3.641 \times 10^{-5}$ | $3.561 \times 10^{-8}$ |
| Spring/Fall | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | 26.90 | 11.62 | $2.700 \times 10^{-5}$ | $2.461 \times 10^{-8}$ |

*n($O_2$), n(O), n($N_2$), and n(He) are in m$^{-3}$.

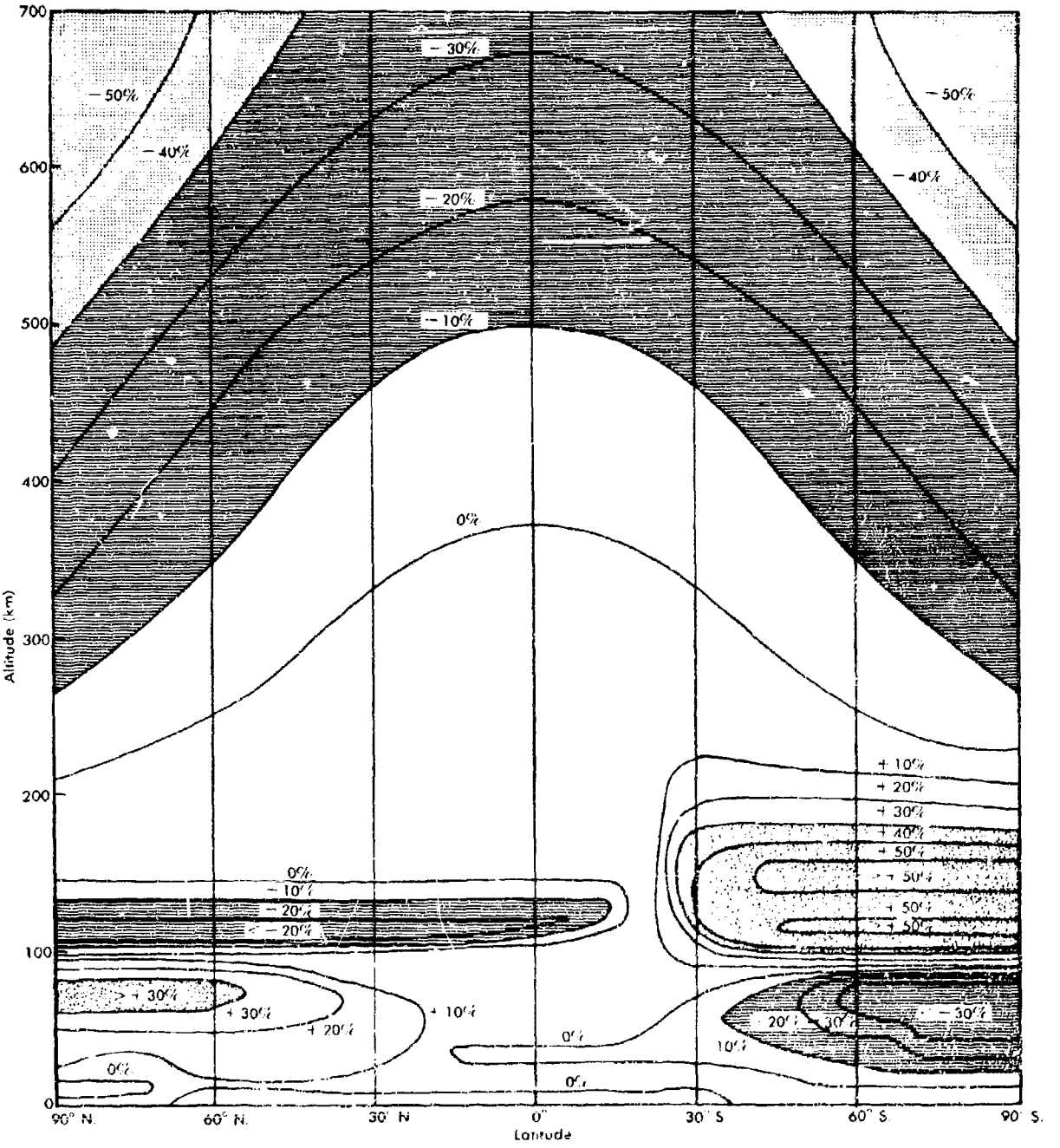


FIGURE 3.4.—Contours of percentage departures of density from Standard at all latitudes corresponding to 1400 hours local time at northern hemisphere summer solstice with an equatorial bulge and a maximum exospheric temperature of 1200° K.

*Variation within one solar rotation.*—Let $F_{10.7}$ be the daily mean of the 10.7-cm solar flux in the source units as above. We can account approximately for the day-to-day temperature variation superimposed on the 11-year cycle variations by using the formula

$$T_0 = \bar{T}_0 + 1.8\,(F_{10.7} - \bar{F}_{10.7}) \qquad (3.11)$$

Here $T_0$ is the nighttime global minimum of the exospheric temperature corrected for the day-to-day variation in solar flux. There is some indication that the numerical coefficient in this formula might be somewhat smaller (1.5) near sunspot minimum and larger (possibly 2.4) near sunspot maximum.

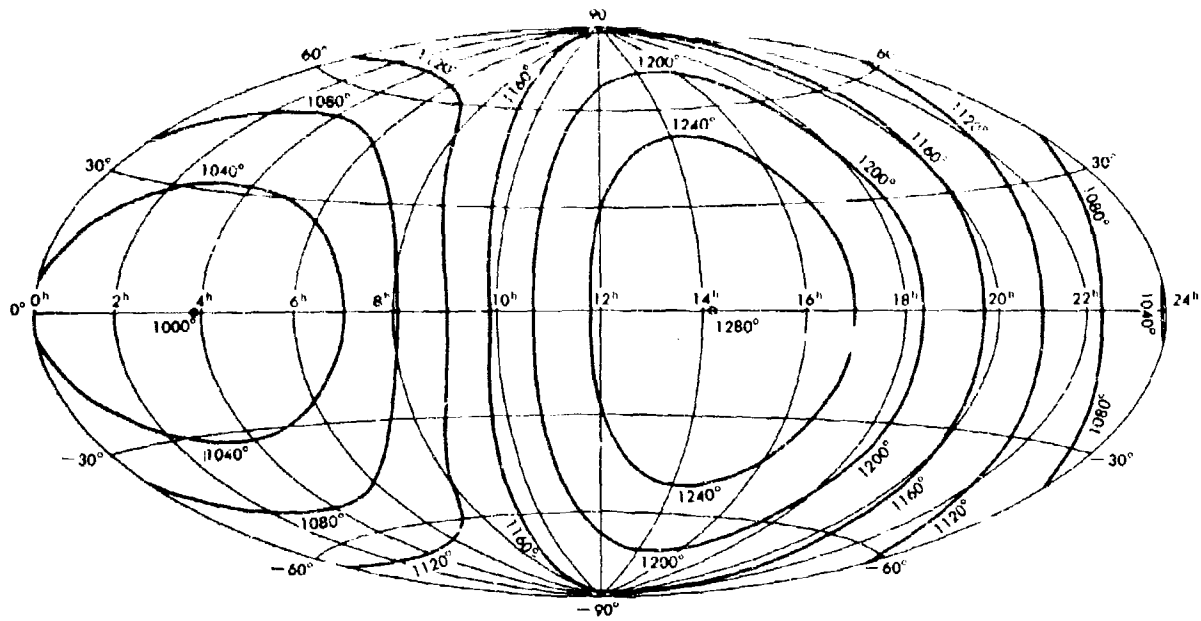


FIGURE 3.5.—Temperature distribution above the thermopause according to Eqs. (3.13) and (3.14), for the case when $T_0 = 1000°$ K. Hours of local time, counted from midnight, are marked on the equator. (Aitoff's equal-area projection.)

3.2.2 SEMIANNUAL VARIATION.—The amplitude of this variation is a function of the solar cycle and can be related to $\overline{F}_{10.7}$ by

$$T_0 = T_0' + f(d)\overline{F}_{10.7} \tag{3.12}$$

where

$$f(d) = \left(0.37 + 0.14 \sin 2\pi \frac{d-151}{365}\right) \sin 4\pi \frac{d-59}{365}$$

and $d$ is the number of days elapsed since January 1 of each year. $T_0$ is the nighttime global minimum exospheric temperature. The combination of these two sine terms produces two unequal maxima and two unequal minima in the course of the year: a secondary minimum on 8 January, a secondary maximum on 20 April, a primary minimum on 18 July, and a primary maximum on 14 October. Table 3.3 gives values of $f(d)$ for the 1st, the 11th and the 21st day of each month.

3.2.3 DIURNAL VARIATION.—The distribution of exospheric temperature on the globe is such that the maximum is observed around 1400 hours local solar time, and the minimum around 0400 hours; both the maximum and the minimum are located at low latitudes. Since atmospheric densities at heights above 200 km are greater when the temperature is higher, the atmosphere bulges out slightly in the bright hemisphere, producing what is often referred to as the "diurnal bulge." Let $\phi_B$ be the latitude of the center of the bulge, that is, of the point where the highest exospheric temperature, $T_X$, is observed. Satellite drag data from 1958 to 1965 have shown that the ratio $T_X/T_0$ is nearly constant; we shall write

TABLE 3.3 VALUES OF THE FACTOR $f(d)$ FOR COMPUTING THE SEMIANNUAL EFFECT

| $f(d)$ | $f(d)$ | $f(d)$ | $f(d)$ |
|---|---|---|---|
| Jan 1 −0.267 | Apr 1 +0.218 | Jul 1 −0.383 | Oct 1 +0.434 |
| 11 −0.276 | 11 +0.259 | 11 −0.453 | 11 +0.472 |
| 21 −0.255 | 21 +0.275 | 21 −0.469 | 21 +0.451 |
| Feb 1 −0.203 | May 1 +0.258 | Aug 1 −0.418 | Nov 1 +0.366 |
| 11 −0.138 | 11 +0.200 | 11 −0.312 | 11 +0.250 |
| 21 −0.063 | 21 +0.119 | 21 −0.163 | 21 +0.117 |
| Mar 1 0.000 | Jun 1 −0.010 | Sep 1 +0.026 | Dec 1 −0.016 |
| 11 +0.078 | 11 −0.143 | 11 +0.196 | 11 −0.130 |
| 21 +0.151 | 21 −0.273 | 21 +0.338 | 21 −0.215 |

$$\frac{T_X}{T_0} = 1 + R$$

The daytime-maximum temperature $T_D$ and the nighttime minimum temperature $T_N$ at any given latitude $\phi$ can be related to the nighttime minimum global temperature by

$$\begin{aligned} T_D &= T_0(1 + R\cos^m \eta) \\ T_N &= T_0(1 + R\sin^m \theta) \end{aligned} \tag{3.13}$$

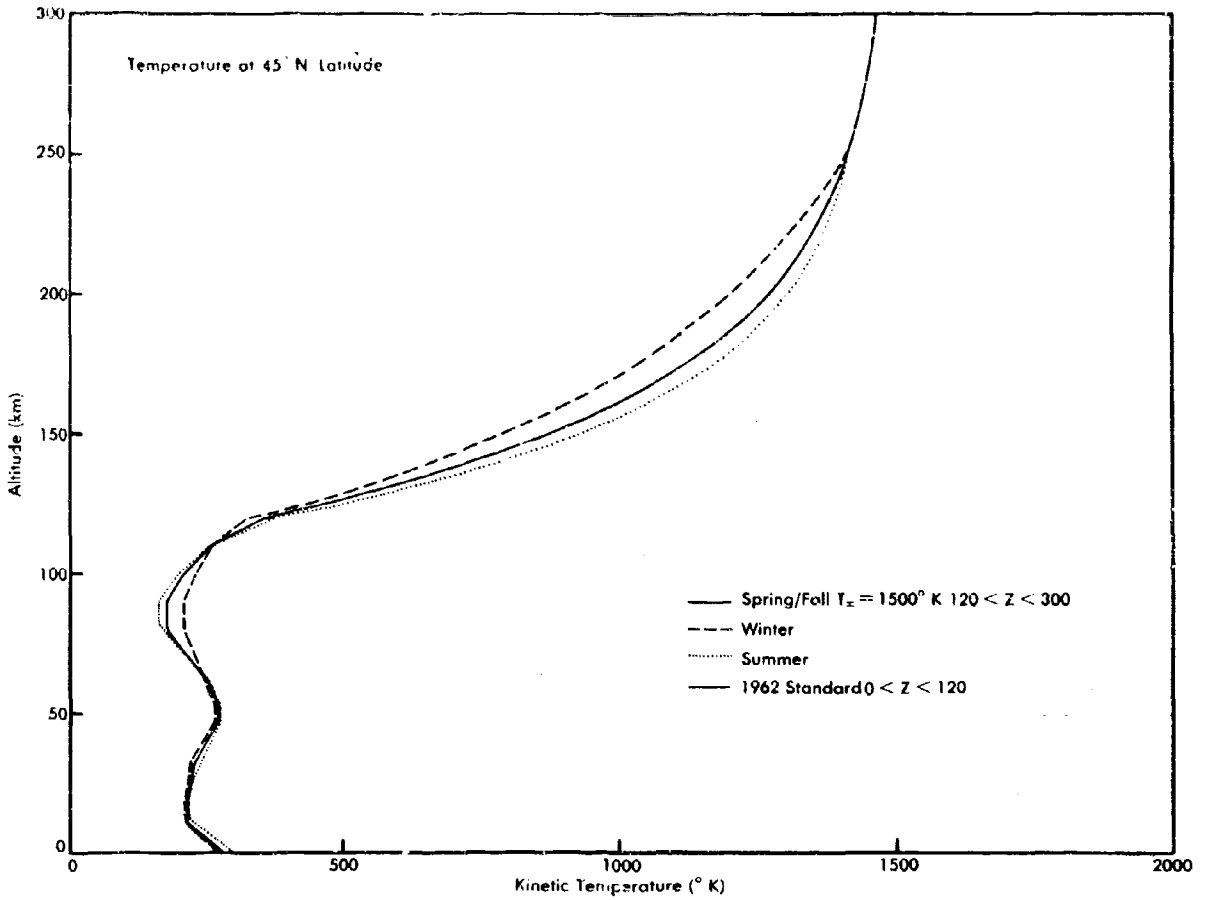


FIGURE 3.6. — Typical summer, winter and spring/fall temperatures, 0 to 300 km, for 45° latitude with an equatorial bulge.

where

$$\eta = \frac{1}{2}|\phi - \phi_B| \text{ and } \theta = \frac{1}{2}|\phi + \phi_B|$$

As can be seen, the exponent $m$ controls the temperature decay from the center of the bulge in the north-south direction.

We shall represent the diurnal variation at a given latitude $\phi$ by

$$T = T_N\left(1 + A\cos^n\frac{\tau}{2}\right) \tag{3.14}$$

where

$$A = \frac{T_D - T_N}{T_N} = R\frac{\cos^n\eta - \sin^m\theta}{1 + R\sin^m\theta}$$

Here $\tau$ is a function of $H^*$, the hour angle of the sun, that is, of the local solar time counted from culmination. This function must account for the asymmetry between the morning rise and evening decline of temperature, and for the difference in sharpness between the maximum and the minimum in the temperature curve. A suitable expression for $\tau$ is

$$\tau = H^* + \beta + p\sin(H^* + \gamma) \qquad (-\pi < \tau < \pi) \tag{3.15}$$

In an earlier version of this model (Jacchia, 1964), the latitude of the bulge, $\phi_B$, had been assumed to be the same as that of the subsolar point (that is, $\phi_B = \delta_\odot$, where $\delta_\odot$ is the declination of the sun), and the same value had been assigned to the exponents $m$ and $n$. Information from the high-inclination satellites Explorer XIX and Explorer XXIV has led to a revised version of the model (Jacchia and Slowey, 1966), in which the bulge never moves much from the equator ($\phi_B \approx 0$) and is elongated in the north-south direction ($m < n$). This seems, at least, to be the picture of the bulge above the $F2$ layer. There is good indication that at lower altitudes the earlier version of the bulge might be correct, in which case $m$ and $\phi_B$ would become functions of altitude or, better, functions of density.

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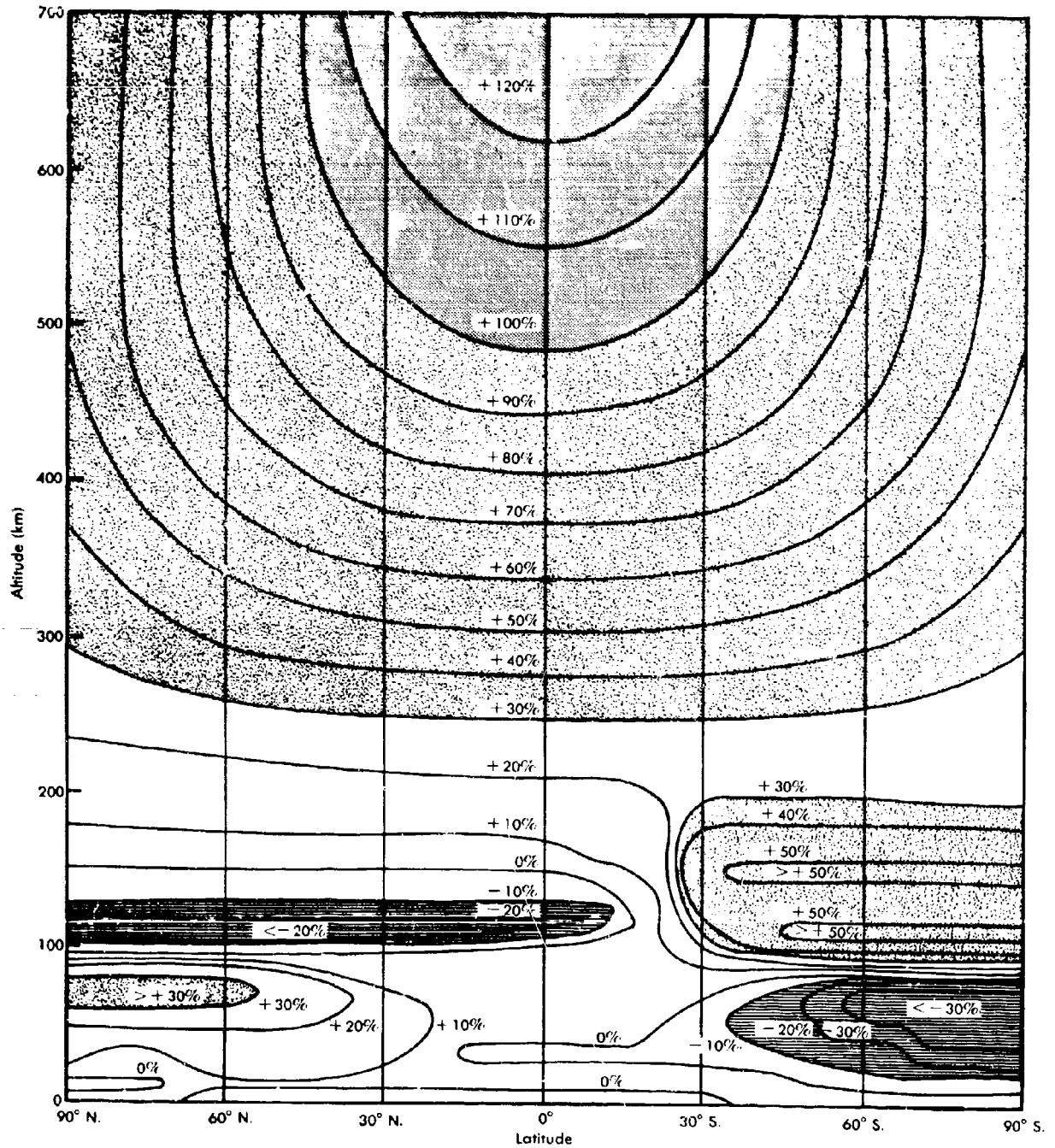



FIGURE 3.7.—Contours of percentage departures of density from Standard at all latitudes corresponding to 1400 hours local time at northern hemisphere summer solstice with an equatorial bulge and a maximum exospheric temperature of 1500° K.

The recommended constants for use in the diurnal-variation formulas are:

| | |
|---|---|
| $R = 0.28$ | $\beta = -45°$ |
| $m = 1.5$ | $\rho = 12°$ |
| $n = 2.5$ | $\gamma = +45°$ |
| $\phi_n = 0$ | |

With these constants we always have $T_X/T_0 = 1.28$; the local solar time of the temperature minimum is 0347 hours and that of the maximum is 1413 hours. The distribution of exospheric temperature according to this model is given in Table 3.4 and shown in Figure 3.5.

TABLE 3.4 RATIO $T_c$ OF EXOSPHERIC TEMPERATURE TO MINIMUM NIGHTTIME TEMPERATURE ON EQUATOR AS A FUNCTION OF LATITUDE AND LOCAL SOLAR TIME (HOURS FROM MIDNIGHT)

| LST / Lat | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 |
| 75 | 1.142 | 1.138 | 1.135 | 1.133 | 1.133 | 1.134 | 1.137 | 1.142 | 1.150 | 1.160 | 1.171 | 1.182 | 1.190 | 1.196 | 1.198 | 1.197 | 1.194 | 1.188 | 1.182 | 1.175 | 1.167 | 1.160 | 1.153 | 1.147 |
| 60 | 1.116 | 1.108 | 1.102 | 1.099 | 1.099 | 1.101 | 1.106 | 1.117 | 1.132 | 1.152 | 1.174 | 1.194 | 1.210 | 1.221 | 1.226 | 1.224 | 1.217 | 1.207 | 1.194 | 1.181 | 1.166 | 1.152 | 1.139 | 1.127 |
| 45 | 1.091 | 1.079 | 1.071 | 1.067 | 1.066 | 1.068 | 1.076 | 1.092 | 1.114 | 1.143 | 1.174 | 1.203 | 1.227 | 1.242 | 1.248 | 1.246 | 1.237 | 1.222 | 1.204 | 1.184 | 1.163 | 1.143 | 1.124 | 1.106 |
| 30 | 1.068 | 1.053 | 1.043 | 1.038 | 1.037 | 1.040 | 1.049 | 1.069 | 1.097 | 1.133 | 1.172 | 1.208 | 1.238 | 1.258 | 1.266 | 1.263 | 1.251 | 1.232 | 1.209 | 1.184 | 1.159 | 1.134 | 1.109 | 1.087 |
| 15 | 1.049 | 1.032 | 1.026 | 1.014 | 1.013 | 1.016 | 1.028 | 1.050 | 1.083 | 1.124 | 1.168 | 1.210 | 1.245 | 1.267 | 1.276 | 1.273 | 1.259 | 1.238 | 1.212 | 1.183 | 1.153 | 1.124 | 1.096 | 1.071 |
| 0 | 1.038 | 1.020 | 1.007 | 1.001 | 1.000 | 1.003 | 1.015 | 1.039 | 1.074 | 1.118 | 1.165 | 1.210 | 1.246 | 1.270 | 1.280 | 1.276 | 1.262 | 1.239 | 1.211 | 1.180 | 1.149 | 1.118 | 1.088 | 1.061 |
| −15 | 1.049 | 1.032 | 1.020 | 1.014 | 1.013 | 1.016 | 1.028 | 1.050 | 1.083 | 1.124 | 1.168 | 1.210 | 1.245 | 1.267 | 1.276 | 1.273 | 1.259 | 1.238 | 1.212 | 1.183 | 1.153 | 1.124 | 1.096 | 1.071 |
| −30 | 1.068 | 1.053 | 1.043 | 1.038 | 1.037 | 1.040 | 1.049 | 1.069 | 1.097 | 1.133 | 1.172 | 1.208 | 1.238 | 1.258 | 1.266 | 1.263 | 1.251 | 1.232 | 1.209 | 1.184 | 1.159 | 1.133 | 1.109 | 1.087 |
| −45 | 1.091 | 1.079 | 1.071 | 1.067 | 1.066 | 1.068 | 1.076 | 1.092 | 1.114 | 1.143 | 1.174 | 1.203 | 1.227 | 1.242 | 1.248 | 1.246 | 1.237 | 1.222 | 1.204 | 1.184 | 1.163 | 1.143 | 1.124 | 1.106 |
| −60 | 1.116 | 1.108 | 1.102 | 1.099 | 1.099 | 1.101 | 1.106 | 1.117 | 1.132 | 1.152 | 1.174 | 1.194 | 1.210 | 1.221 | 1.226 | 1.224 | 1.217 | 1.207 | 1.194 | 1.181 | 1.166 | 1.152 | 1.139 | 1.127 |
| −75 | 1.142 | 1.138 | 1.135 | 1.133 | 1.133 | 1.134 | 1.137 | 1.142 | 1.150 | 1.160 | 1.171 | 1.182 | 1.190 | 1.196 | 1.198 | 1.197 | 1.194 | 1.188 | 1.182 | 1.175 | 1.167 | 1.160 | 1.153 | 1.147 |
| −90 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 | 1.166 |

3.2.4 VARIATIONS WITH GEOMAGNETIC ACTIVITY.— The temperature variations with geomagnetic activity closely follow those of the 3-hourly geomagnetic planetary index, $K_p$ or $a_p$, with a lag of 6 to 7 hours. The relation between exospheric temperature and planetary index, whether one chooses $a_p$ or its nearly logarithmic counterpart $K_p$, seems to be nonlinear; it can be approximated by the two nearly equivalent formulas:

$$\Delta T = 28\,K_p + 0.03 \exp K_p \qquad (3.16)$$

or

$$\Delta T = a_p + 100\,[1 - \exp(-0.08\,a_p)]. \qquad (3.17)$$

Here $\Delta T$ is the increase of temperature above the level that applies for the condition $K_p = a_p = 0$. The time lag should not be forgotten in computing the temperature. Table 3.5 gives $\Delta T$ as a function of $K_p$, computed with the first of the two formulas, and at the same time shows the correspondence between $K_p$ and $a_p$.

TABLE 3.5 TEMPERATURE INCREMENT AS A FUNCTION OF GEOMAGNETIC INDICES

| $K_p$ | $a_p$ | $\Delta T$ | $K_p$ | $a_p$ | $\Delta T$ |
|---|---|---|---|---|---|
| $0_0$ | 0 | 0° | $5-$ | 39 | 134 |
| $0+$ | 2 | 9 | $5_0$ | 48 | 145 |
| $1-$ | 3 | 19 | $5+$ | 56 | 156 |
| $1_0$ | 4 | 28 | $6-$ | 67 | 167 |
| $1+$ | 5 | 37 | $6_0$ | 80 | 180 |
| $2-$ | 6 | 47 | $6+$ | 94 | 194 |
| $2_0$ | 7 | 56 | $7-$ | 111 | 210 |
| $2+$ | 9 | 66 | $7_0$ | 132 | 229 |
| $3-$ | 12 | 75 | $7+$ | 154 | 251 |
| $3_0$ | 15 | 85 | $8-$ | 179 | 279 |
| $3+$ | 18 | 94 | $8_0$ | 207 | 313 |
| $4-$ | 22 | 104 | $8+$ | 236 | 350 |
| $4_0$ | 27 | 114 | $9$ | 300 | 417 |
| $4+$ | 32 | 124 | $9_0$ | 400 | 495 |

There is no indication that $\Delta T/\Delta K_p$ varies with the hour of the day. There seems to be, however, a substantial increase in $\Delta T/\Delta K_p$ at latitudes above 50° or 60°, that is, in the auroral zones. Occasional increases by a factor of 2 to 4 have been observed, but it is not known whether such enhancements are regular or just occasional features at high latitudes. There is some indication that the time lag decreases a little at high latitudes. Jacchia et al. (1966) find a mean time lag of $7.2 \pm 0.2$ hours for latitudes lower than 55° and $5.8 \pm 0.5$ hours for latitudes higher than 55°. An even greater variation of the time lag with latitude was found by DeVries et al. (1966) from low-altitude Agena satellites in high-inclination orbits.

## 3.3 COMPUTATION OF EXOSPHERIC TEMPERATURE

Suppose, in accordance with the preceding formulas and present tables, atmospheric density is desired on September 15, 1963, at 1600 GMT, at an altitude of 420 km above sea level, for a point on the globe located at longitude 75° east of Greenwich and latitude 44° north.

The procedure is as follows: First, look up the daily mean of the 10.7-cm solar flux $F_{10.7}$ for the day in question, which in this case is $99 \times 10^{-22}$ watts/m$^2$/cycle/sec. Second, determine the value of the flux averaged over three solar rotations, that is, over roughly 3 months. The monthly means of $F_{10.7}$ for August, September, and October, 1963, were 81, 85, and 85, respectively, in the same units as the foregoing. Therefore, to a close approximation, $\overline{F}_{10.7} = 84$. The needed value of the $K_p$ index 7 hours earlier, that is at 0900 GMT, is found to be $4_0$. The local solar time is 1105 hours, which corresponds to a solar angle $H^* = -14°$.

Summarizing, we have:

$F_{10.7} = 99$ Local Solar Time = 1105 hours

$\overline{F}_{10.7} = 84$

$K_p = 4_0$ $\phi = 44°$.

*Variation with solar cycle.* Equation (3.10) gives $T_0 = 362 + 3.60 \times 84 = 644.4$.

*Variation with day-to-day solar activity.* From Eq. (3.11) $T_0 = 644.4 + 1.8\,(99 - 84) = 691.4$

*Semiannual variation.* In Table 3.3 by interpolation, $f(d) = 0.257$; therefore

$$T_0 = 691.4 + 0.257 \times 84 = 713.0$$

*Diurnal variation.* By interpolation in Table 3.4, $T/T_0 = 1.205$; therefore,

$$T = 1.205 \times 713.0 = 859.2$$

*Variation with geomagnetic activity.* From Table 3.5, $\Delta T = 114°$; therefore

$$T_\infty = 859 + 114 = 973$$

*Computations of density.* $T_\infty$ is the final exospheric temperature which is used to enter the appropriate seasonal density table for an altitude of 420 km. Look up the logarithm of the density, which is easier to interpolate, for the models corresponding to $T_\infty = 800°$, 900°, 1000°, and 1100° K, respectively, and form Table 3.6 complete with first and second differences.

By interpolation, for $T_\infty = 973°$ K, it is found that $\log \rho = -11.695$, from which $\rho = 2.02 \times 10^{-12}$ kg m$^{-3}$

TABLE 3.6.—DIFFERENCE TABLE FOR SAMPLE DENSITY COMPUTATION

| | $T_\infty$ (°K) | log $\rho$ | $\Delta$ | $\Delta$ |
|---|---|---|---|---|
| For $Z$ = 420 km | 800 | −12.118 | | |
| | | | +0.264 | |
| | 900 | −11.854 | | −0.053 |
| | | | +0.211 | |
| | 1000 | −11.643 | | −0.040 |
| | | | +0.171 | |
| | 1100 | −11.472 | | |

## 3.4 EXPERIMENTAL DATA

From the time of the earliest satellite drag studies the density values have been analyzed to determine if they vary systematically with latitude or season. From analysis of density values from 1957$\alpha$, 1957$\beta$, 1958$\delta$ (Sputniks I, II, III) and 1958$\gamma$ (Explorer III) Champion and Minzner (1959) found that in the 170 to 230 km altitude region, densities in the northern hemisphere winter were higher than those at low latitudes or at high latitudes in the summer.

Groves (1961) computed density data from orbital observations on ten Discoverer satellites during the period April, 1959 to October, 1960. He found, in general, that the change of density with latitude was less than 20 percent. However, in the altitude range 190 to 240 km, he found that the density was higher at latitudes above 30° in the winter than in the summer or at lower latitudes. The increase was as much as 60 percent near the pole in some cases. Some of these data are shown in Figure 3.8.

Lidov (1958) reported that latitude variations of density at 230 km may be as large as 50 percent. Priester et al. (1960) and Paetzold and Zschörner (1961) pointed out similar variations. Schilling and Whit-

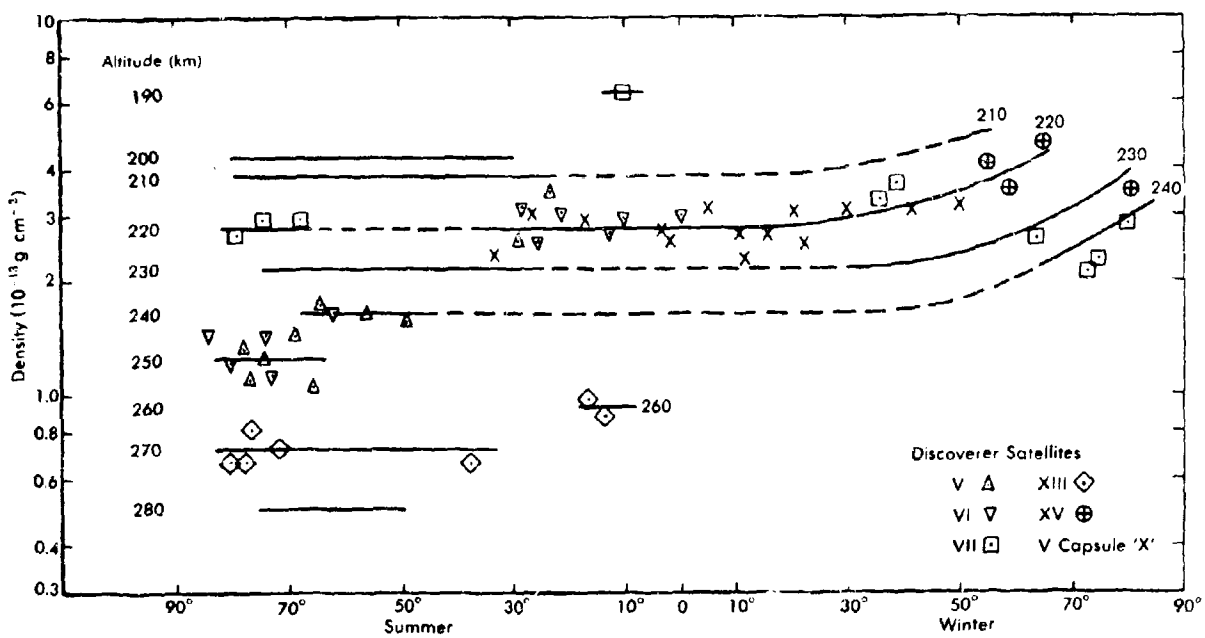



FIGURE 3.8.—Density versus latitude for polar regions (lat. > 65°) and night side of earth (L.T., 18–06 hrs) from Discoverer satellites, standardized to 20 cm solar flux of $160 \times 10^{-22}$ watts/m$^2$/cycle/sec.

ney (1959) did not find any important latitude effect in densities derived from Explorer IV (1958ε) data. The perigee altitude was approximately 255 km and thus the result is consistent with the present models, which give no significant latitude variation at that altitude. Newton et al. (1965) found on analysis of Explorer XVII data for the latitude range 35° to 55° N. that any latitude variation of density at the satellite altitude (about 270 km) was less than a factor of 2.

Figure 3.9 shows some interesting satellite density data derived by Small (1964). The data for altitudes below 200 km are valuable because of the paucity of data in this altitude region. The data for 1962$\beta\sigma$ with perigee between 126 and 134 km are unique for a satellite. In the plot (Jacchia, 1965) the satellite data are divided into four groups: (1) exospheric temperature greater than 1200° K; (2) between 1000° and 1200° K; (3) less than 1000° K; and (4) from 1958δ2 (Sputnik III). The data from (4) were plotted separately because they may contain a systematic error. The figure represents departures in log density from that of the spring/fall model with an exospheric temperature of 1100° K. Curves are also shown for the winter and summer models with the same exospheric temperature. The data for 1962$\beta\sigma$ were obtained between 4 and 8 December 1962 with a perigee latitude of approximately 34° S. This corresponds to summer in the southern hemisphere and the agreement with the summer curve provides excellent confirmation of the models. At higher altitudes, the effect of varying exospheric temperature (with time of day, solar flux, and so forth) dominates over seasonal effects. For example, at 180 km the values of $\Delta \log \rho$ are marked on the plot corresponding to exospheric temperature extremes of 600° and 2100° K.

During the period of low solar flux, and consequently low exospheric temperature, it would be expected that appreciable diurnal density variations would be observed at relatively low altitudes. Figure 3.10 shows some interesting results obtained from observations of Cosmos satellites (Marov, 1966) which confirm this expectation. Perigee altitudes lay in the range 190 to 240 km. Note that the quantity $\rho\sqrt{H}$, where $H$ is density scale height, is plotted, but the variation with time is primarily due to that in $\rho$. Maximum values occur near 1400 hours and minimum values near 0400 hours local time.

Roemer (1966) derived precise density data from Baker-Nunn observations of Explorer IX. Analysis of the data revealed a seasonal density variation of ±25 percent at a latitude of 39° and an average altitude of 690 km. The atmospheric density at a given altitude was higher in winter than in summer when compared with the model of the atmospheric bulge discussed in Section 3.2. He also found that the average time lag between the maximum of a geomagnetic storm and the peak in atmospheric density was 5.2 hours. In order to decide whether the variations of the residuals in log $\rho$ represent a seasonal variation or whether they are caused by a smaller amplitude of the diurnal effect, the correlation coefficient between the residuals and the curves was computed. A correlation coefficient of 0.47 was obtained, compared with a coefficient of 0.22 when the correlation was made with angular distance from the bulge.

More recently, from a study of Explorer XIX and Explorer XXIV data, Jacchia and Slowey (1966) found that lower residuals can be obtained with a model in which there is no seasonal variation at high altitudes, and the bulge is always centered near the equator and elongated in the north-south direction ($m = 1.5$, $n = 2.5$). Keating and Prior (1966) have analyzed data from the same satellites (and also Explorer IX). Some of the results of their study are shown in Figure

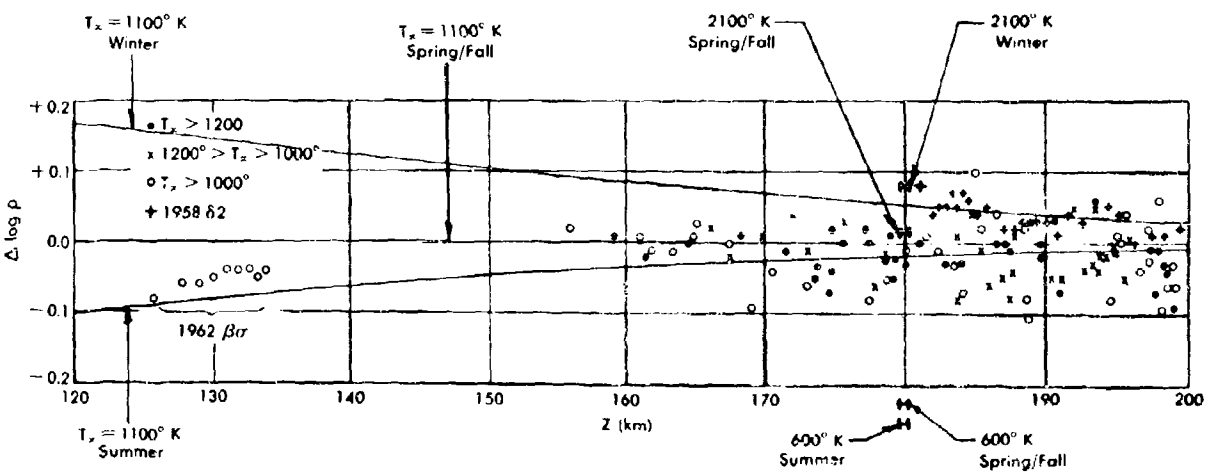



FIGURE 3.9.—Comparison of densities from drag of low-orbiting satellites with the present tables. Note that $\Delta \log \rho$ is the difference between $\log \rho$ for the experimental data and $\log \rho$ for the 1100° K exospheric temperature spring/fall model.

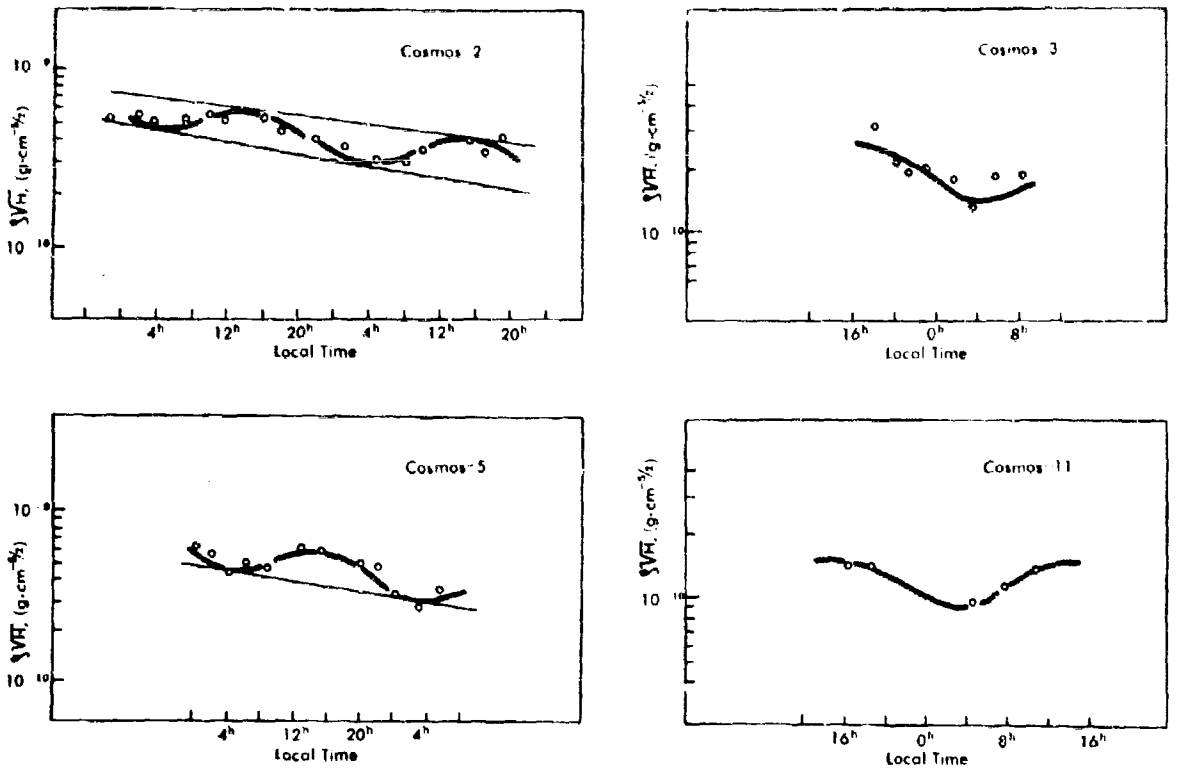



FIGURE 3.10.—Diurnal variations of $\rho\sqrt{H}$ at altitudes between 190 and 240 km from Cosmos satellites. The abscissa is local time.

3.11 where exospheric temperature residuals between predicted and observed values are plotted as a function of $m$ and $B$; $B$ is a constant defined by $\phi_B = B\delta_\odot$ so that negative $B$ corresponds to a winter bulge. These results confirm that the new model of Jacchia and Slowey ($m = 1.5$, $B = 0$) gives smaller residuals than the earlier models ($m = 2.5$, $B = 1$), but indicate that the residuals are still lower with a model that has a density maximum in the winter hemisphere ($m = 1$, $B = -1$). However, the residuals are almost as low for a bulge centered at the equator ($m = 1$, $B = 0$). The density measurements which indicate a winter bulge were made with balloon-type satellites, within the altitude interval 550 to 850 km and between 1961 and 1966. Data from other satellites, altitudes and levels of solar activity must be analyzed before the position and shape of the bulge can be more accurately defined.

Some recent precision-reduced density data from ground-based observations of the San Marco satellite (Bramson, 1966) are given in Table 3.7.

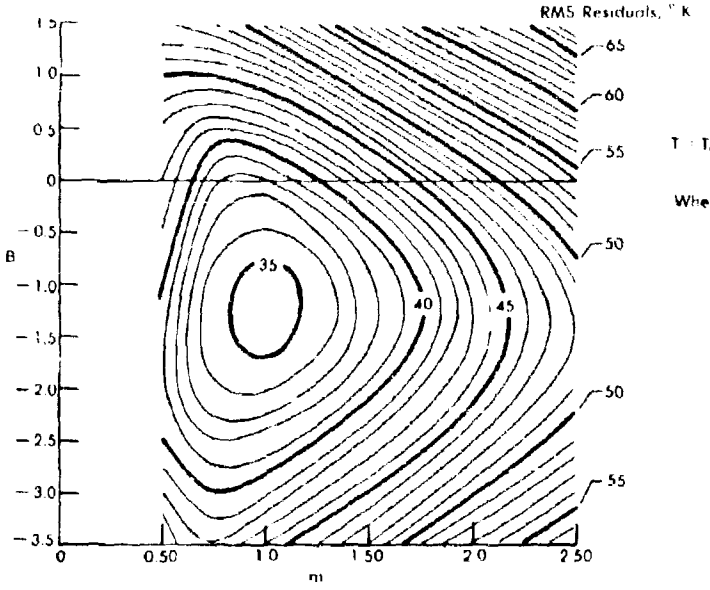
The data in the first line were obtained for a 1.5-day interval around 7 January 1965, and in the second line for a period of 12 hours on 9 September 1965. For 7 January 1965 the value of $T_0$ (minimum nighttime exospheric temperature) calculated from the present models is 652.5° K. From the satellite data $T_\pi = 772°$ K for a latitude $-34.3°$ and hour angle 103°. The

TABLE 3.7.—SAN MARCO SATELLITE DENSITY DATA

| $T_\pi$ | $\alpha_\pi - \alpha_\odot$ | $\delta_\pi$ | $Z$ | $\log \rho_\pi$ | $\log \rho_s$ |
|---|---|---|---|---|---|
| 772° K | 103.0 | −34.3 | 210.2 km | −12.815 | −12.654 ($s$ = 200 km) |
| 614 | 25.2 | −31.5 | 172.3 | −12.243 | −12.190 ($s$ = 170 km) |

$T_\pi$ = exospheric temperature at perigee
$\alpha_\pi$, $\alpha_\odot$ = right ascension of perigee and sun, respectively
$\delta_\pi$ = declination of perigee
$Z$ = perigee altitude
$\rho_\pi$, $\rho_s$ = density at perigee and reference altitude, respectively, in g. cm$^{-3}$.

corresponding $T_\infty$ (minimum nighttime exospheric temperature at the given latitude) was found to be 682.0° K and (with $m = 1.5$, $B = 0$) $T_0 = 652.6°$ K, which is in excellent agreement with the theoretical value. The value of $T_\pi$ on 9 September was computed to be 614° K from a density of $6.46 \times 10^{-19}$ kg m$^{-3}$ at the perigee reference altitude. From these data $T_\infty$ was calculated to be 505.8° K and $T_0 = 486.8°$ K. For this day the model predicts $T_0 = 671.6°$ K and $T = 812.2°$ K for a latitude of $-31.5°$ and an hour angle of 25.2°. This constitutes an apparently large discrepancy. However, the model density at 170 km corresponding




$$T = T_\infty(1 + 0.28\sin^m\theta)\left[1 + 0.28\left(\frac{\cos^m\eta}{1 + 0.28\sin^m\theta}\right)\cos^{2.5}\left(\frac{\tau}{2}\right)\right]$$

Where $\eta = \frac{1}{2}|(\delta_1 - 8\delta_2)|$

$\theta = \frac{1}{2}|(\delta_1 + 8\delta_2)|$

FIGURE 3.11.—Root mean square (rms) exospheric temperature residuals for Explorer XIX (1963-66) and Explorer XXIV (1964-66) as a function of B and m.

to $T = 812.2°$ K is $8.08 \times 10^{-10}$ kg m$^{-3}$. The observed density is only 20 percent below this density, which is not a large discrepancy, particularly when considering the differences between some gauge and drag density data. The result primarily points out that exospheric temperature is not a good parameter with which to characterize atmospheric density below 200 km.

DeVries et al. (1966) have used multiple regression techniques to determine the functional dependence of atmospheric density. One interesting finding is that the delay time for the density increase following a geomagnetic storm varies with latitude, from near-instantaneous at 70° latitude to almost 22 hours for a satellite with perigee point near 20° latitude. Roemer (1966), on the other hand, found no variation of the delay time with latitudes up to 40°. Jacchia has raised the question whether in DeVries' study the density changes can be genuinely referred to the perigee location since the eccentricity of the orbits of the satellites studied was very small (0.013 to 0.027).

Several experimenters have made mass spectrometric measurements of neutral composition above 120 km. One of these is Schaefer (1966) who has analyzed the results of four composition measurements made with massenfilters. Two of the flights were at Churchill (1400 CST, 18 February 1965 and 0300 CST, 19 February 1965) and two were at Wallops Island (0300 EST, 28 March 1963 and 1300 EST, 26 November 1963). It should be noted that only the Churchill measurements constitute a genuine diurnal variation measurement. The data presented consist of ratios of the ion currents for the different species and not the density ratios. However, the variation of the two ratios with latitude, season, and time of day should be the same. The data clearly show that the $O/O_2$ ratio is larger during the daytime than at night and also larger at Wallops Island than at Churchill, as can be seen in Figure 3.12. Both observations are consistent with larger values of $O/O_2$ occurring when the solar EUV flux which causes the dissociation is larger. Observations are also consistent with the present models which show that the $O/O_2$ ratio is greater in the summer than in the winter.

Hedin et al. (1964) and Hedin and Nier (1965) have made a rather thorough analysis of the results obtained from a flight of a magnetic mass spectrometer at White Sands at 0730 MST on 6 June 1963. They give number densities of $N_2$, $O_2$, O, and Ar. The temperature profile, as determined by the slopes of the curves, is in satisfactory agreement with the CIRA 1965 models. However, the number densities of the various species are lower than the model values. When compared with the corresponding CIRA model the measured $O_2$ and O number densities are lower by a factor of 2.0, whereas the $N_2$ densities are lower by a factor of 1.7. When compared with the models in Part 6, the densities are found to be much closer at 120 km, but the discrepancy is greater at 200 km, as can be seen in Figure 3.13. At 120 km the ratios are 1.5 for $O_2$ and O and 1.1 for $N_2$; at 200 km the ratios are 3.4 for $O_2$, 2.5 for O, and 2.1 for $N_2$. Some of the discrepancy is probably due to calibration inaccuracies. There are three sources of this: (1) statistical errors ranging

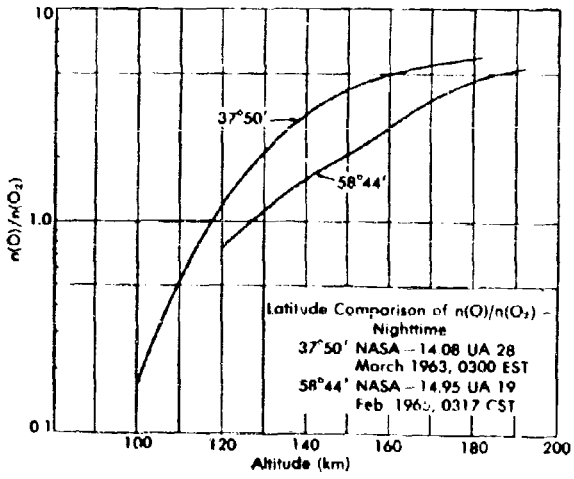



FIGURE 3.12.—Latitude variation of $n(O)/n(O_2)$ for nighttime measurements.

from 5 percent at the highest altitude to 30 percent at the lowest altitude for the $N_2$ profile and possibly higher for the other density curves; (2) an error of up to 50 percent in the laboratory calibration; (3) an error due to limitations of the theory used to relate the measurements made under dynamic conditions to the ambient density.

Some interesting density and temperature measurements have been made by Spencer et al. (1965). Results are available from six thermosphere probe flights in which the $N_2$ density was measured as a function of altitude with an omegatron gauge. Temperatures are deduced from the slopes of the $N_2$ profiles. The measurements were made at Wallops Island at various times of day and year between November 1962 and March 1965. In general, the densities are lower than the corresponding models by about a factor of 2. The temperature profiles from the four earlier flights are shown in Figure 3.14. They are in moderate agreement with the CIRA 1965 (Harris and Priester, 1964) model temperatures. For the two most recent flights the agreement of the temperature profile for the night measurement with both the CIRA and U.S. Supplementary models is satisfactory, but for the day measurement the agreement is much better with the U.S. Supplementary model. Spencer et al. (1965) conclude that "the assumption, for model atmosphere purposes, of constant boundary conditions at 120 km should be expanded to reflect, probably, a significant diurnal variation." The authors are in general agreement with this statement and had previously suggested the same conclusion with regard to latitude and seasonal variations (Champion, 1966). It is believed that there probably is also a diurnal variation of properties at 120 km, but the present data do not provide conclusive evidence as to its nature.

It should be noted that whereas the temperatures deduced by Spencer et al. (1965) tend to be low, those derived by Hedin et al. (1964) are higher than the supplementary models between 170 and 200 km and about the same as the models between 130 and 170 km.

Brandy (1964, 1965) has deduced rotational temperatures from the $N_2^+$ 3914 Å band emission during auroras at Churchill. Although there is a possibility that the rotational temperature may differ from the kinetic temperature, at least the altitude to be assigned to the measurement can be determined by means of the technique of triangulation. During the study over 800 measurements were made, which included 75 simultaneous altitude and temperature measurements. Data were obtained from auroras of intensity ranging from I to slightly over III. The observed rotational temperatures are plotted in Figure 3.15. Taking into account seasonal variations and the effects of solar flux and magnetic index, one notes the approximate expected temperature ranges from the tables in Parts 5 and 6, given as a function of altitude in Table 3.8.

TABLE 3.8.—TEMPERATURE RANGE AS A FUNCTION OF ALTITUDE

| Altitude km | Temperature Range °K |
|---|---|
| 80 | 171–224 |
| 100 | 190–218 |
| 120 | 334–380 |
| 140 | 467–574 |
| 160 | 550–671 |

Between 80 and 120 km, agreement between the experimental data and the models is reasonable, although the scatter of the experimental data is large. Probably the scatter is to be attributed primarily to disturbed atmospheric conditions that exist during aurora, but may also be partly attributed to differences between the rotational and kinetic temperatures. Above 140 km the observed temperatures are definitely lower than those of the models.

Bourdeau et al. (1964) have compared exospheric temperatures deduced from satellite drag observations with the intensity of extreme ultraviolet radiation measured by OSO–1. The EUV flux observed during the interval March to May 1962 is shown in Figure 3.16a. The plotted values represent the sum of the intensities of the twenty-two most prominent lines in the wavelength range 170 to 370 Å. Of course, these lines represent only a fraction of the *UV* up to 1750 Å which deposits energy in the atmosphere by either photo-dissociation or photo-ionization. In Figure 3.16b is plotted the exospheric temperature; in Figure 3.16c the 2800 Mc/sec solar flux; and in Figure 3.16d the geomagnetic index ($\Sigma K_p$). Superficially there appears to be good correlation between the EUV flux and the observed exospheric temperatures. How-

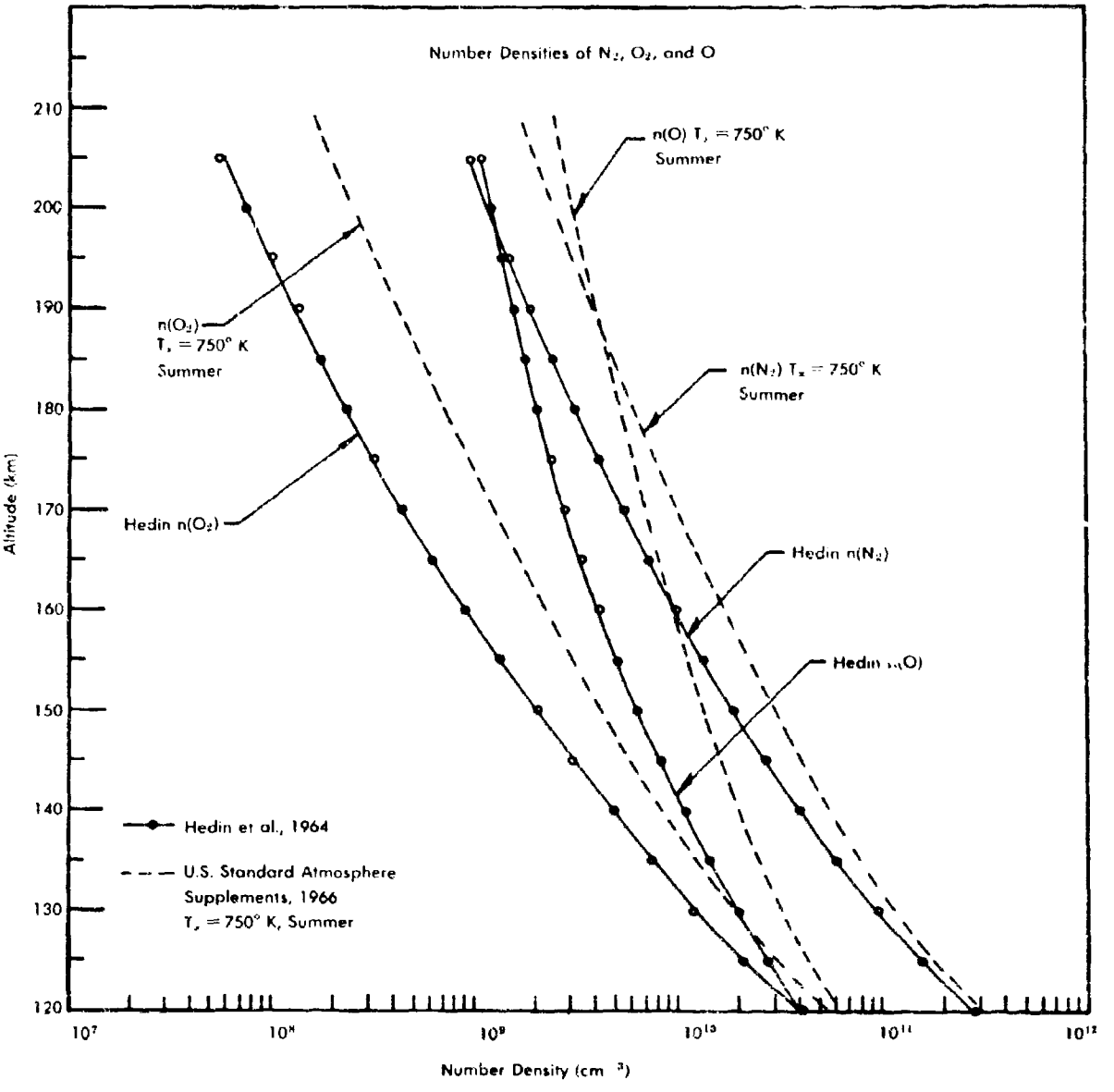



FIGURE 3.13. – Measured $N_2$, $O_2$, and O profiles at White Sands compared with values from the appropriate Supplementary model.

ever, the comparison is made for only a short period of time and much more observational evidence is required before conclusions can be made.

## 3.5 DENSITY DATA FOR ALTITUDES ABOVE 250 KILOMETERS

For altitudes greater than 250 km the observational material on which the present atmospheric models are based consists entirely of densities determined from the atmospheric drag on artificial satellites. Table 3.9 gives a list of the satellites that were used for drag analysis. The original density data up to the end of September 1963 have been published by Jacchia and Slowey (1965). No suitable satellites with perigee altitudes lower than 250 km were available for drag analysis in the construction of the original density models (Jacchia, 1964) on which the present models are based.

Checks on the models were provided by the yearly average daytime and nighttime density profiles determined from many artificial satellites by King-Hele and collaborators at the Royal Aircraft Establishment, Farnborough, England. See, for example, King-Hele and Quinn (1965).

3.5.1 COMPARISON OF MODELS WITH DENSITIES FROM SATELLITE DRAG. – In the homosphere and lower

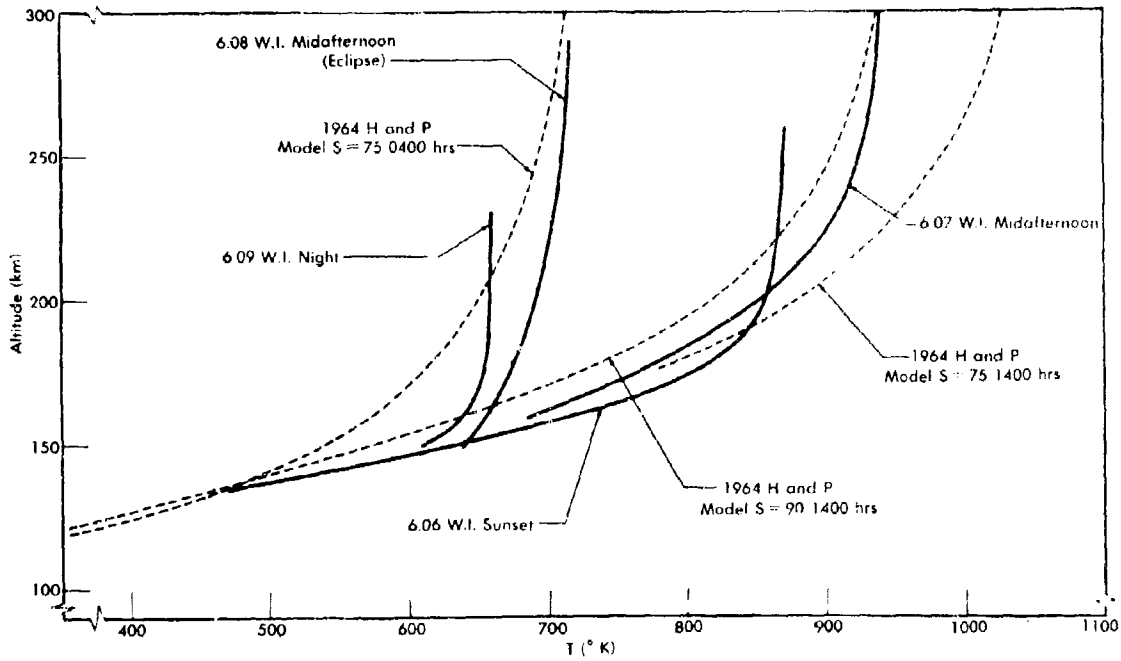



FIGURE 3.14.—$N_2$ temperature profiles measured with an omegatron compared with model atmosphere profiles.

TABLE 3.9.—SATELLITES USED FOR DETERMINING ATMOSPHERIC DENSITIES

| Satellites | Perigee Altitude km | Apogee Altitude km | Inclination deg | $A/m$ $cm^2/g$ | Time Interval | Time resolution (days) of density determinations | |
|---|---|---|---|---|---|---|---|
| | | | | | | Quiet Conditions | Magnetic Storms |
| *San Marco (1964-84A) | 200 | 890 | 37.6 | 0.032 | Dec 1964–Feb 1965 | 0.5 | 0.2 |
| Injun III (1962βr2) | 250 | 2500 | 70.3 | 0.070 | Dec 1962–Aug 1965 | 1.0 | 0.2 |
| Explorer XVII (1963d1) | 270 | 800 | 57.6 | 0.036 | Apr 1963–Oct 1963 | 1.0 | 0.2 |
| Explorer I (1958α) | 350 | 2000 | 33.2 | 0.17 | Feb 1958–Aug 1965 | 1.0 | 0.2–0.5 |
| Explorer VIII (1960ζ1) | 425 | 2250 | 50.0 | 0.11 | Nov 1960–Aug 1965 | 2.0 | 0.5 |
| Vanguard III (1959η) | 515 | 3720 | 33.3 | 0.17 | Sept 1959–Sept 1962 | 2.0 | 0.5 |
| *Explorer XXIV (1964-76A) | 545 | 2400 | 81.4 | 12.2 | Nov 1964–Aug 1965 | 1.0 | 0.5 |
| Vanguard II (1959α1) | 565 | 3300 | 32.9 | 0.24 | Feb 1959 Aug 1965 | 2.5–5.0 | 1.0 |
| *Explorer XIX (1963-53A) | 615 | 2400 | 78.6 | 13.0 | Dec 1963–Aug 1965 | 1.0–2.0 | 0.5 |
| Vanguard I (1958β2) | 660 | 3950 | 34.2 | 0.25 | May 1958 Oct 1961 | 2.5–5.0 | 1.0 |
| Explorer IX (1961δ1) | 450–760 | 2500 | 38.9 | 15.8 | Feb 1961 Sept 1963 | 0.5 | 0.2 |

*The satellites marked with an asterisk were launched too late to be used in the construction of the density models. They did, however, provide a further check on them and help to improve the model of the diurnal variation.

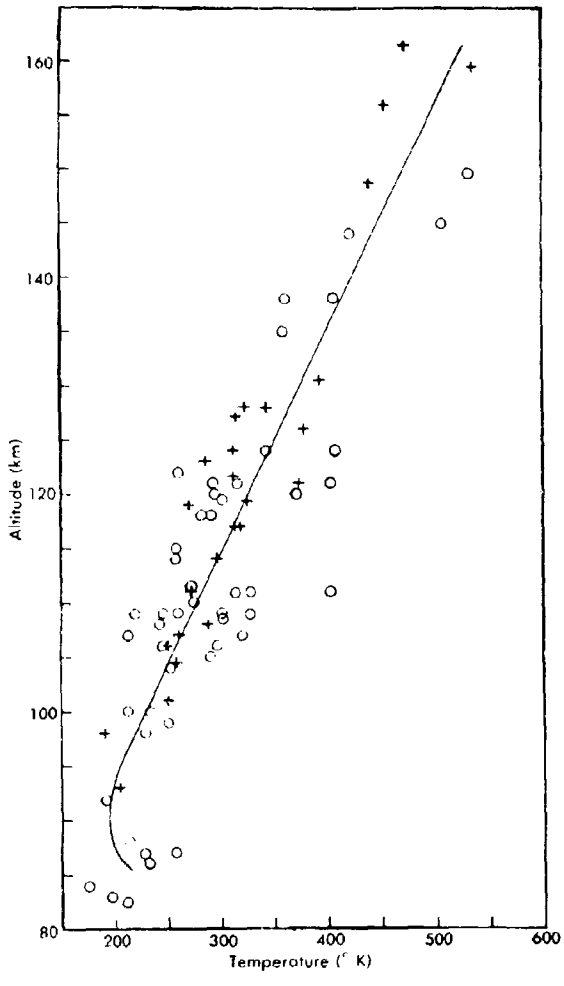



FIGURE 3.15. – Rotational temperature versus altitude at Churchill. Data for 1964 and 1965.

thermosphere, at altitudes below 150 km, density variations are relatively small, hardly ever exceeding a factor of 3. At greater altitudes, however, density variations rapidly increase, reaching a factor of 12 at 300 km, of 50 at 400 km, of 150 at 500 km, and a maximum of 200 or more near 600 km. In consideration of the magnitude of these variations, the systematic and even the random residuals obtained when comparing density observations with the present models are surprisingly small.

A typical example of the density errors that can be expected when the models are used with computed values of $T_x$ is given in Table 3.10. This table lists mean deviations from the tables of Part 6, standard deviations for individual density determinations made at 2-day intervals and the standard deviations of the 10-day mean densities, all for 4 separate years of observations of the Explorer VIII satellite (1960$\xi$1). The deviations include the systematic and accidental errors in the determinations of the densities.

TABLE 3.10. – DEPARTURES FROM THE MODELS OF EXPLORER VIII DRAG DENSITIES

| Time Interval | Mean Deviation % | SD of One Density Value % | SD of 10-Day Means % |
|---|---|---|---|
| Nov 1960–Oct 1961 | +6 | 28 | 23 |
| Nov 1961–Oct 1962 | −3 | 22 | 17 |
| Nov 1962–Oct 1963 | −14 | 32 | 26 |
| Nov 1963–Oct 1964 | −15 | 30 | 26 |

The systematic trend in the mean deviation is attributable in part to imperfections in the relation between $T_x$ and $F_{10.7}$, and in part to the failure of the tables to represent exactly the variation of density with $T_x$ at the perigee altitude of the satellite (425 km).

Error statistics are not available for all satellites that have contributed data for the construction of these models. We can, however, give a few additional statistics. Ten-day density means from the drag of the Explorer I satellite (average perigee altitude 350 km), covering the 7½ years from February 1958 to October 1965, when converted to temperatures with the present models, are represented with a mean residual of −18° and an arithmetic mean of the residuals, irrespective of sign, of 44°. If we assume that the mean exospheric temperature during this interval was about 1000° K, the corresponding mean residual in log $\rho$ would be −0.027, or about −6.5 percent in $\rho$; the mean of the absolute values of the individual residuals would turn out to be 0.066 in log $\rho$, or about 15 percent in $\rho$. A similar analysis for Explorer XXIV, with an average perigee altitude of 545 km gives for 10-day means, from November 1964 to August 1965, a mean residual of 3.6° (corresponding to −3 percent in density), and a mean absolute value of the residuals of 19.7° (17 percent in density).

Densities and temperatures derived from the drag of the Explorer I satellite (1958$\alpha$) are compared in Figure 3.17 with solar and geomagnetic parameters. The decrease in density and temperature parallels the decrease in the 10.7-cm solar flux during the five-year period covered by the diagram. The regular oscillations with a period of about 250 days are caused by the motion of the satellite perigee in and out of the diurnal bulge. Visible also are the 27-day oscillations, in phase with those of the 10.7-cm solar flux, and a few perturbations caused by major magnetic storms. Schematic curves of the diurnal and semiannual variations are added to aid in their recognition in the plots of satellite data. The short period oscillations in the theoretical diurnal-variation curve are caused by the rapid variations in latitude of the satellite perigee.

Densities and temperatures derived from the drag of the Explorer IX satellite (1961$\delta$1) are compared with the geomagnetic index $a_p$ and the 10.7-cm solar flux (Figure 3.18). The drag was determined from

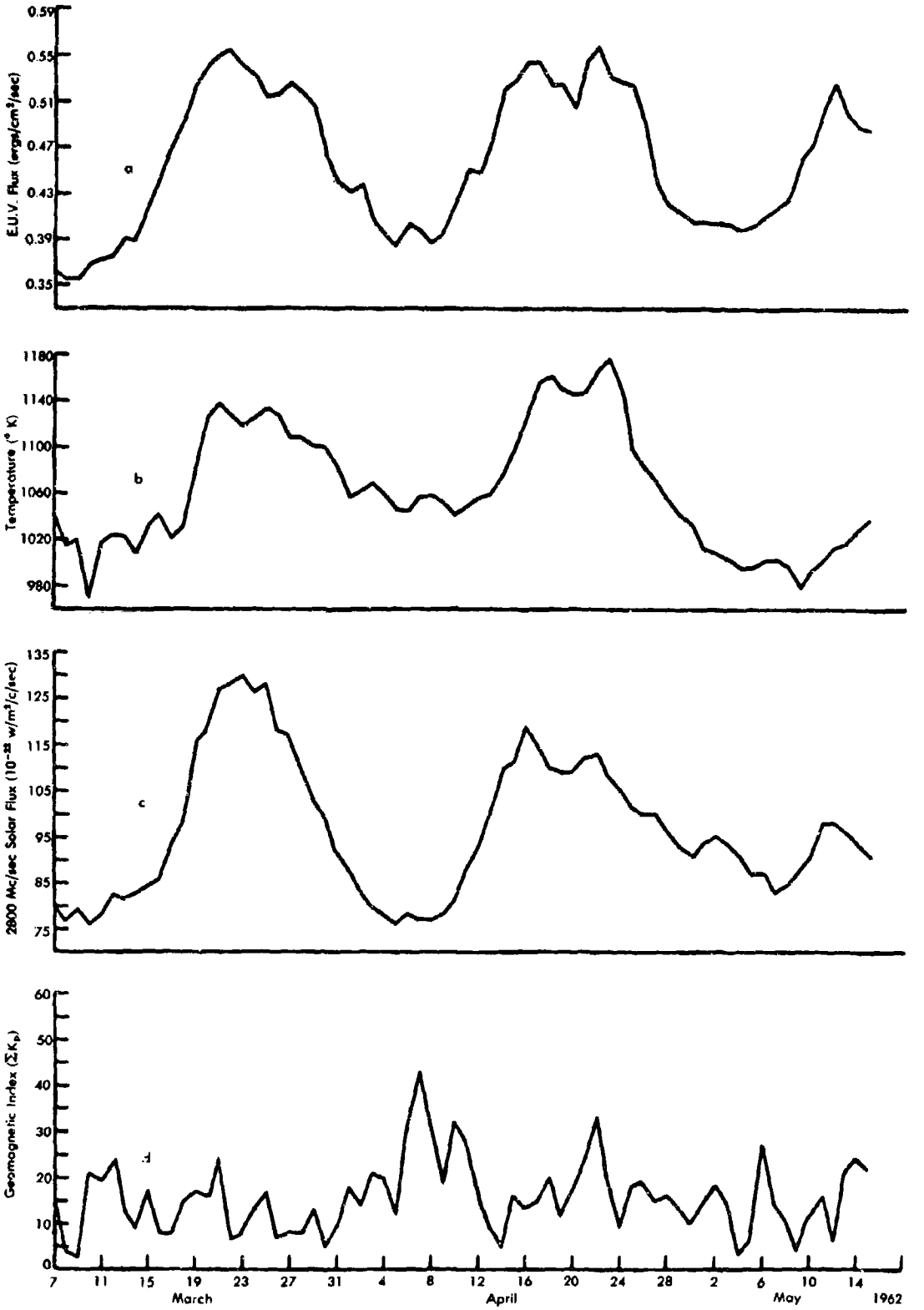



FIGURE 3.16.—Comparison of the EUV flux with the exospheric temperature, the 2800 Mc/sec solar flux, and the geomagnetic index $\Sigma K_p$.

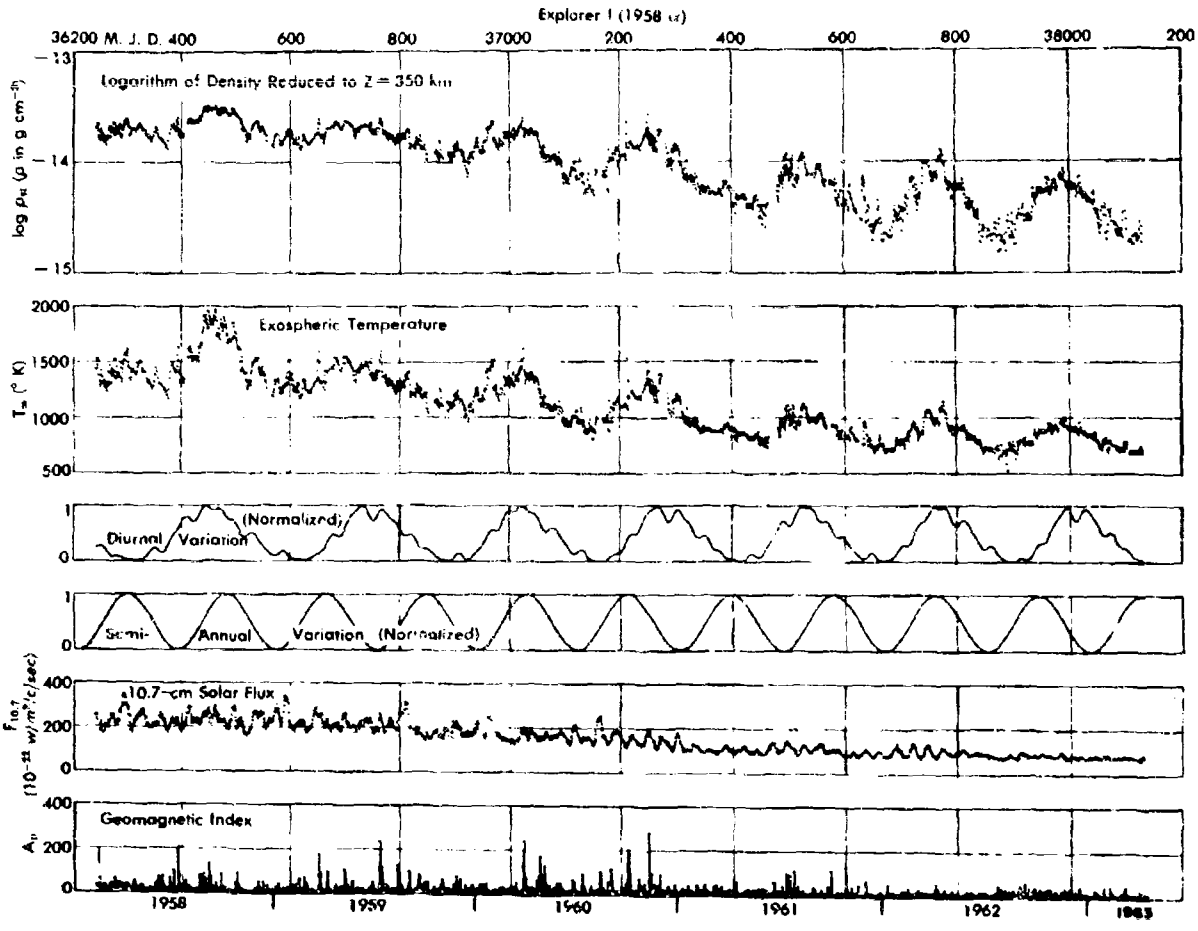



FIGURE 3.17. — Densities and temperatures derived from the drag of the Explorer I satellite (1958α), compared with solar and geomagnetic parameters. MJD is the abscissa in the Modified Julian Day (JD minus 2400000.5).

precise position measurements on photographs taken with the Baker-Nunn cameras. Notice the 27-day oscillations in phase with the 10.7-cm flux and the perturbations in phase with geomagnetic disturbances. Day and night density profiles in the upper atmosphere corresponding to extreme conditions at sunspot minimum and at a time of exceptionally high solar activity are shown in Figure 3.19.

Daytime maximum and nighttime minimum temperatures above the thermopause deduced from density data are shown in Figure 3.20 as a function of the 10.7-cm solar flux. Data are averaged over two or three solar rotations. Open circles denote individual maxima deduced from satellite drag curves. Dots indicate temperatures reduced to the nighttime minimum at times when the curve of the semiannual temperature variation was close to the annual average. The temperatures in this diagram must be considered as referred to average quiet geomagnetic conditions ($K_p = 2$ or $a_p = 7$).

3.5.2 DIRECT MEASUREMENTS OF DENSITY. — A number of satellites have been instrumented with pressure gauges, mass spectrometers or accelerometers. Each of these instruments can provide an instantaneous measurement of density, independent of that deduced from orbital observations of a satellite. The instrumented satellites include San Marco (accelerometer), Snapshot (ionization gauge) and Explorer XVII (gauges and mass spectrometers). Figure 3.21 contains data obtained from Explorer XVII (Newton et al., 1965) between April and June 1963 during passes over the northern hemisphere mid-latitude minitrack stations, and plotted without regard for local time, geomagnetic or solar activity. Due to orbit characteristics, the local times of the data for altitudes above 400 km are usually between 0 and 0600 hours. The data below 400 km are more generally distributed throughout the day. The comparison models in Figure 3.21 are from Harris and Priester (1962). The Supplementary Atmosphere model with exospheric temperature 650°K (corresponding to $\bar{F} = 82$, $K_p = 0$) is almost identical with Harris and Priester ($S = 90$, 0400 hours). If $K_p = 2$ (a more typical value) the exospheric temperature is 700°K and the

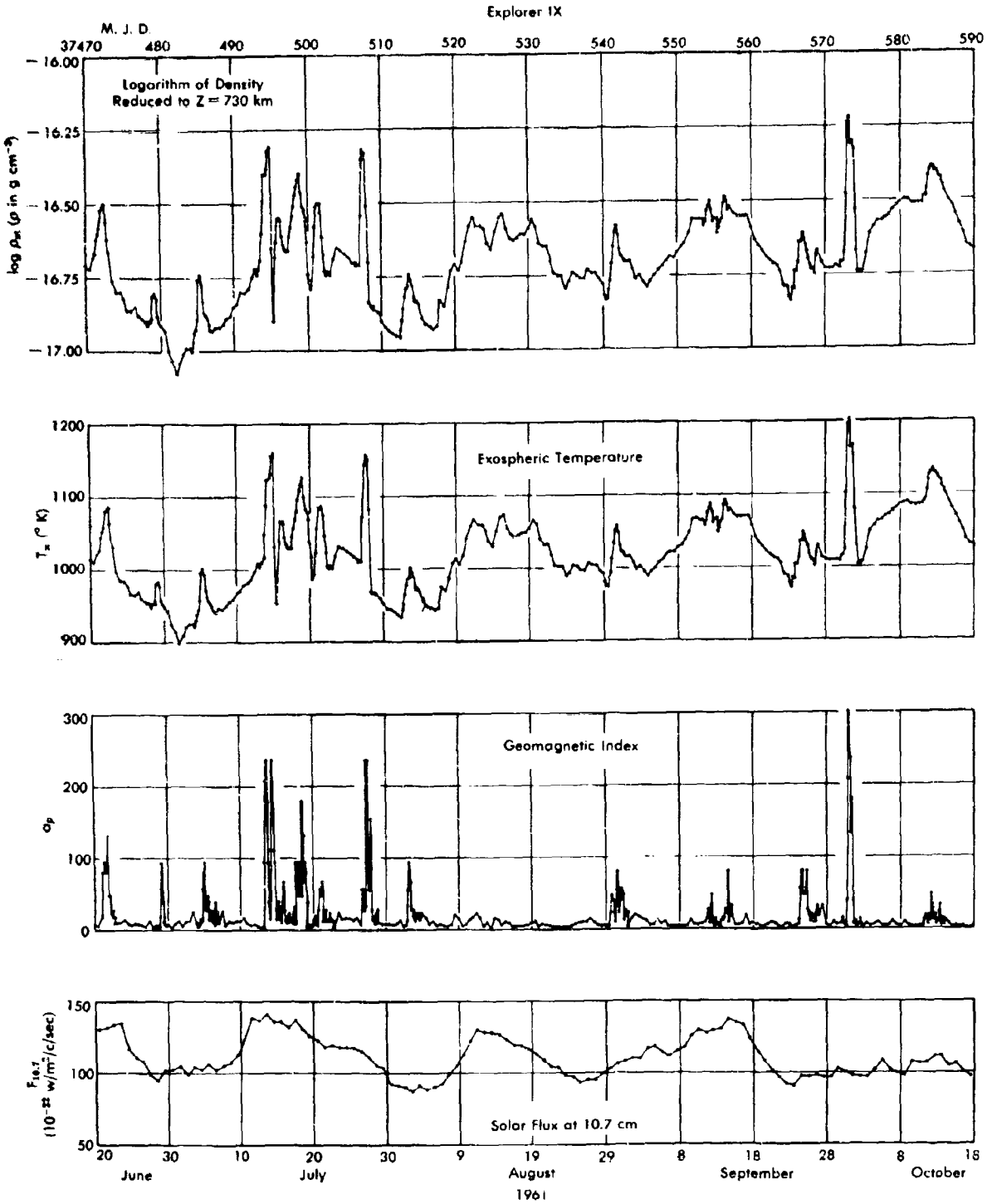



FIGURE 3.18. – Densities and temperatures derived from the drag of the Explorer IX satellite (1961δ1), compared with the geomagnetic index $a_p$ and the 10.7-cm solar flux.

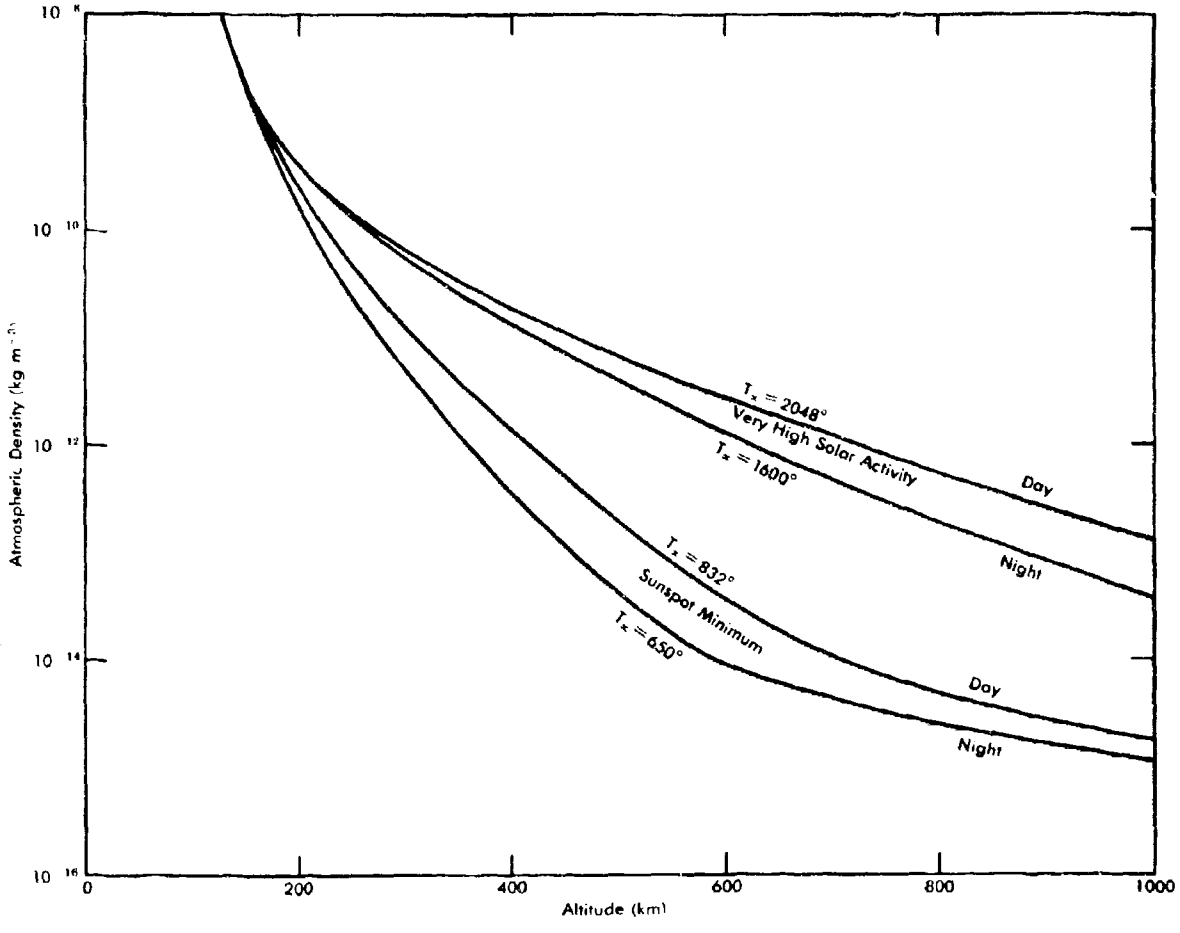



FIGURE 3.19.—Day and night density profiles in the upper atmosphere at sunspot minimum and at a time of exceptionally high solar activity.

density curve is a little higher than the Harris and Priester 0400 hours curve.

There is evidence in the data of density fluctuations which do not correlate with any known index. For example, a density variation occurring on 1 June 1963 correlates with an increased zenith intensity of the 6300 Å oxygen line. It might be that these fluctuations reflect local perturbations with horizontal dimensions of the order of a few thousand kilometers. The implication of these variations is that caution should be exercised in interpreting results obtained by combining directly measured parameters with model atmospheric values.

Explorer XVII contained magnetic mass spectrometers to obtain data on the concentrations of the major neutral atmospheric components (Reber and Nicolet, 1965). Densities of $N_2$, O, and He were obtained. Figure 3.22 is representative of the results and shows helium number densities plotted versus altitude for local times between 0400 and 2100 hours. These measurements were made in both northern and southern hemispheres during the last two weeks in May 1963. A diffusive model profile for $T = 800°$ K (reduced in absolute value by 3) is shown for reference. (The exospheric temperature from the models for the time of the measurements was approximately 700° K and the theoretical curve for this temperature is in much better agreement with the data.)

An unexpected result of the observations was the large variability of the absolute concentrations and ratios of concentrations of the components measured at the same altitudes and local times (and with the same measuring equipment) on successive days. There is a strong sensitivity to changes in magnetic activity. Some of the variations cannot be explained entirely on the basis of temperature changes in the upper atmosphere, but must be attributed to changes in the boundary conditions at the base of the diffusive atmosphere. Further investigations are clearly required in order to define the source of these variations and their relation to the various energy inputs to the atmosphere.

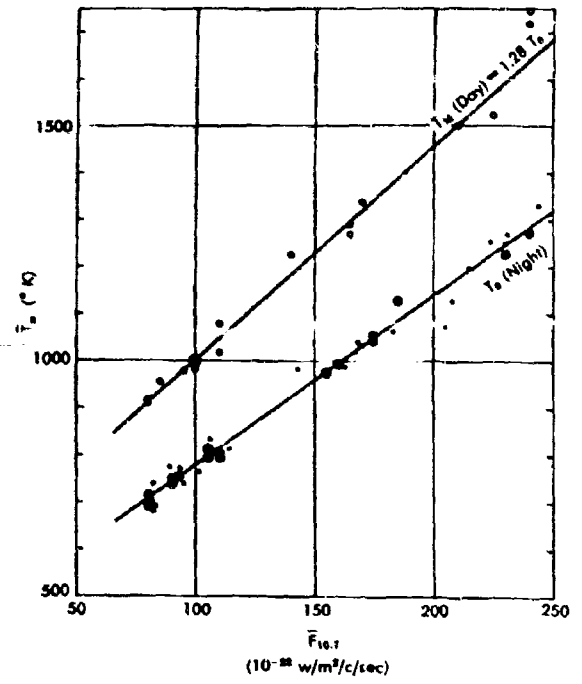



FIGURE 3.20.—Daytime maximum and nighttime minimum temperatures above the thermopause as a function of the 10.7-cm solar flux. Open circles: individual maxima deduced from satellite drag curves. Circled dots: individual minima deduced from satellite drag curves. Dots: temperatures reduced to the nighttime minimum at times when the curve of the semiannual temperature variation was close to the annual average.

## 3.6 LIMITATIONS OF HIGH-ALTITUDE MODELS

Simple static models cannot represent to complete satisfaction the properties of the upper atmosphere through all its manifold variations. Even if they were perfect, static models would represent only idealized equilibrium conditions that are never realized owing to the perpetual presence of rapid temperature fluctuations, such as the diurnal variation and variation associated with geomagnetic activity. If the temperature variation necessary to produce a given density change at a given altitude is correct when the variation is caused by changes in solar activity in the 11-year cycle, then it cannot be correct when the same change in density is caused by the diurnal variation. This does not mean that we cannot reproduce, and even with good approximation, the diurnal variation in density; we can, but to obtain the observed density change we shall have to use a fictitious temperature variation that may be at some variance with reality. The equations in Section 3.2 that relate $T_\infty$ to local solar time and to $K_p$ or $a_p$ must be considered in this light; the aim was to reproduce the observed density variations, and we cannot guarantee that the corresponding temperature variations are correct.

In addition, we must consider the fact that, owing to the many oversimplifications one is obliged to introduce for construction of any atmospheric model, our models cannot be expected to reproduce to complete satisfaction even idealized static conditions. One of the most serious oversimplifications is certainly that of the invariance (except for seasonal variation) of the boundary conditions at 120 km through all the variations at greater altitudes, an assumption forced on us by lack of information. By systematically changing these boundary conditions with $T_\infty$, we could find different sets of temperature profiles that would reproduce the observed densities with comparable accuracy. Stein and Walker (1964) estimate that the present state of our knowledge concerning the lower thermosphere allows such a leeway that all exospheric temperatures could be in error by as much as 25 percent.

One of the consequences of the arbitrary isopycnic layer at 120 km is the emergence in the models of a quasi-isopycnic layer, which at times of low solar activity lies at 150 km, but rises to 200 km at times of high solar activity. In the region between 120 km and the second quasi-isopycnic layer, the variations in density with temperature are inverted with respect to those above it, that is, an increase in temperature engenders a decrease in density. We know that this is not so, at least for two types of variation. In 1957 and 1958, near sunspot maximum, the drag of Sputnik II (perigee height 200 to 210 km) showed lively fluctuations in phase with the decimetric solar flux, although according to the models there should not have been any; and in 1963 and 1964 (sunspot minimum) marked variations with geomagnetic activity were observed, in phase with those in the exosphere, at heights as low as 160 km.

The difficulties due to the arbitrary isopycnic level at 120 km are partially relieved by having three sets of boundary conditions at that altitude. This makes it possible to represent typical seasonal variations in properties at 120 km and higher altitudes. The same technique can be used to represent changes with time of day, solar flux, and magnetic index when these variations are known.

It should also be kept in mind that the mechanisms that cause the different types of atmospheric variation may involve energy dissipation at different altitude levels, and that this can be another source of distortion of the temperature profiles.

It must also be remembered that the relation between exospheric temperature and solar activity was derived from only the descending half of one solar cycle, which happened to be the most spectacular of all cycles observed since 1749. If the relation holds without change throughout a cycle and from one cycle to another, the exceptional nature of the last cycle may prove to have been a boon, inasmuch as it allowed the models to cover the largest possible range of density variation. Nevertheless, we cannot discount

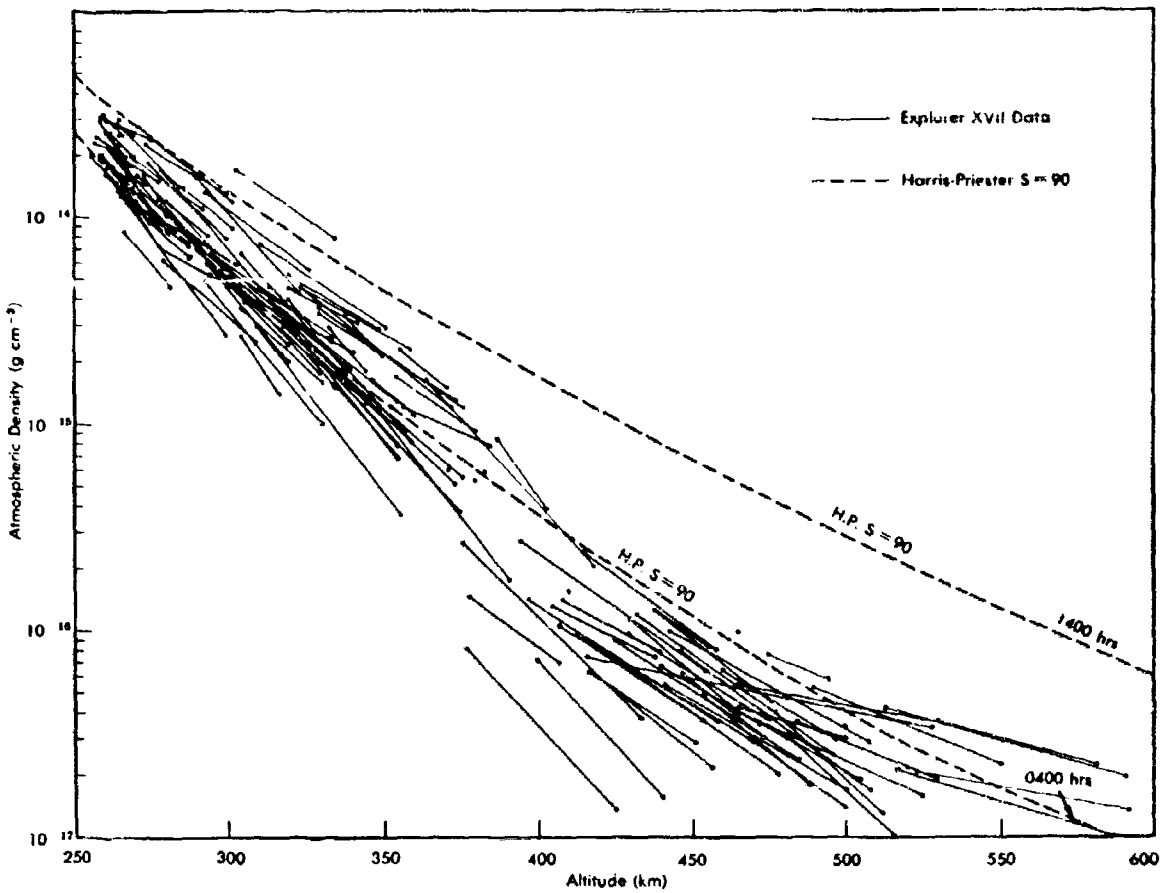



FIGURE 3.21.—Measured atmospheric density versus altitude obtained for passes over the northern hemisphere mid-latitude minitrack stations. Data plotted without regard for local time, geomagnetic or solar activity.

the possibility, however unlikely, that the relation between atmospheric temperature and solar activity may not be maintained during a period of increasing sunspot activity.

We must not forget the possibility of a systematic error in the density tables caused by our imperfect knowledge of the drag coefficient of satellites. Atmospheric densities are generally determined assuming a constant value, $C_D = 2.2$. In a recent paper on satellite drag coefficients, Cook (1966) concluded: "Between heights of 140 and 400 km at times of low solar activity, or heights of 140 to 600 km at times of high solar activity, the drag coefficient is almost independent of height, and at present for most satellites, because of the lack of decisive evidence, there is perhaps not sufficient reason to abandon the value of 2.2, which has been widely used in recent years for the drag coefficient. It must be recognized, however, that this value is subject to some uncertainties and may be too low, perhaps by as much as 10 percent. At heights above 400 km (low solar activity) or 600 km (high solar activity) the drag coefficient increases with height."

According to Cook, the drag coefficient $C_D$ should increase to an asymptotic value of 2.6 to 2.7, which is nearly reached at 800 km at times of low solar activity. The relative uncertainty in $C_D$, however, should not increase with altitude; the likely error is estimated at 15 percent, while the maximum possible error is about 30 percent.

Since a density value computed from satellite drag is inversely proportional to the assumed value of $C_D$, we must count on similar uncertainties from this cause in the model densities below 600 km at times of high solar activity, and below 400 km at times of low solar activity. Above these levels there is the likelihood of a systematic error, increasing with altitude, that will make the computed densities a little too high, on account of the assumed constancy of $C_D$.

There has been much discussion about the discrepancy between the densities derived from satellite drag and those computed from the output of density

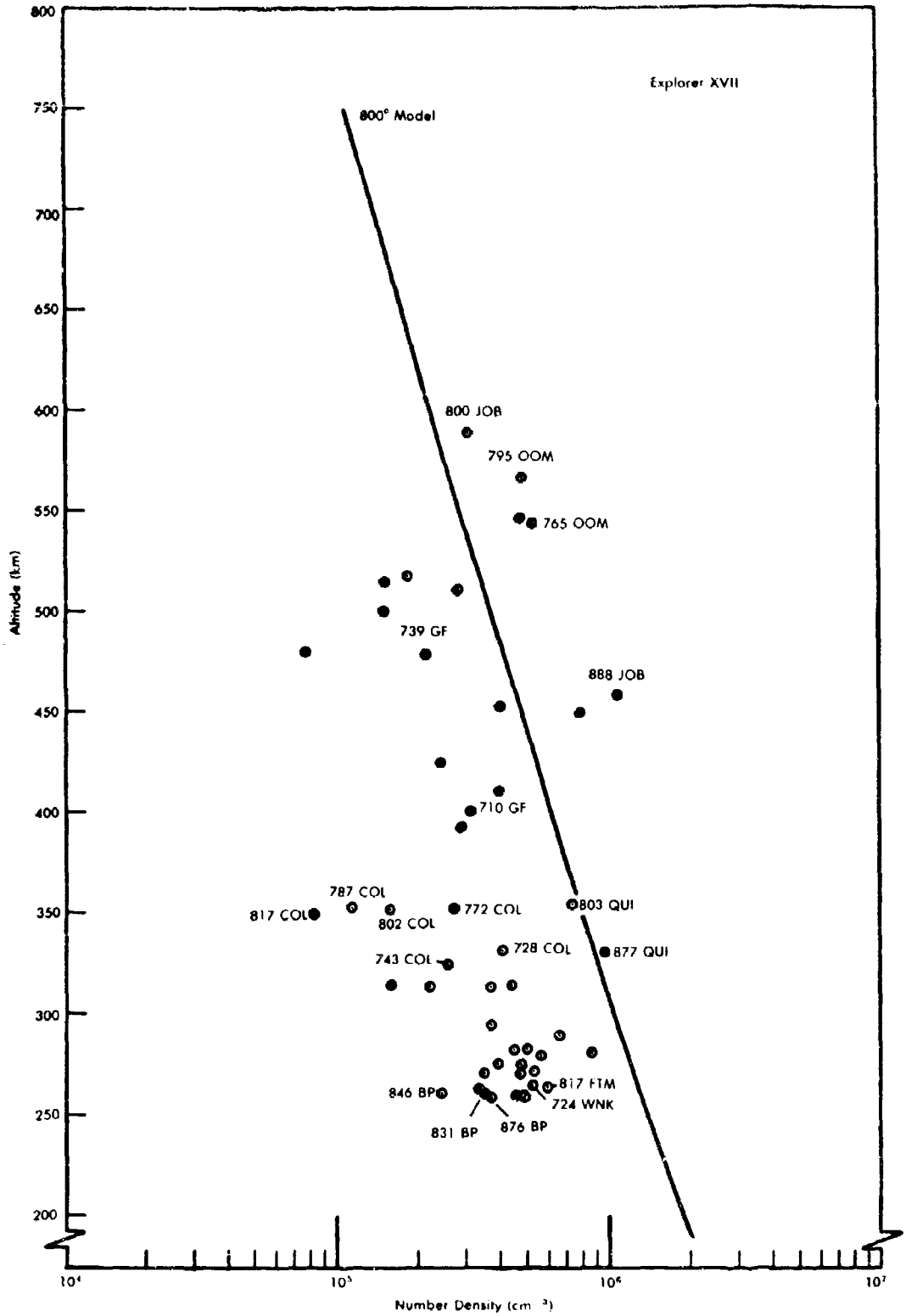



FIGURE 3.22.—Helium number densities versus altitude for local times between 0400 and 2100 hours during May, 1963. A diffusive model profile for $T = 800°$ K (reduced in absolute value by three) is shown for reference.

gauges on the Explorer XVII satellite (Newton et al., 1964), which appear to be about half the former. It is the opinion of Cook (1965) that the uncertainty in the drag coefficient, the primary physical parameter for which some assumptions have to be made in the drag method, is too small to explain the discrepancy.

A word of caution about hydrogen is necessary. At times of high and even moderate solar activity the contribution of hydrogen to the total density is negligible for altitudes up to 1000 km. The situation is quite different at times of low solar activity. In the model corresponding to an exospheric temperature of 700° K, the number density of hydrogen overtakes that of helium at 900 km, whereas in the model for 600° K the crossover point is down to 510 km. Hydrogen is the only constituent for which the densities given in the model rely entirely on theory, and moreover it is the only constituent for which the total mass in the atmosphere should vary greatly with exospheric temperature, because of the effect of the latter on the escape rate.

In addition to the uncertainties that obviously exist in the theory, we must warn the reader that Eq. (3.3), which fixes the boundary conditions for hydrogen at 500 km, was fitted to Kockarts and Nicolet's (1962, 1963) theoretical hydrogen concentrations, which had been computed for temperatures between 2000 and 750° K. Thus, below 750° K the results from Eq. (3.3) represent an extrapolation. According to the models, in the region above 840 km there is an actual *increase* of density when the exospheric temperature drops from 700° to 600° K. Recent results from the Explorer XIX satellite (Jacchia and Slowey, 1966) indicate that the hydrogen concentrations given by the models for temperatures below 700° K are too high, so that it appears doubtful that the inversion of the covariance of density with temperature in the exosphere occurs in the real atmosphere within the tabular range of temperatures and altitudes. A useful rule is to distrust model densities when hydrogen is the major constituent. Only the models for 600° K and 700° K are affected; the first above 500 km and the second above 800 km.

The uncertainty concerning hydrogen is one of many that are encountered in the exosphere. There are disquieting signs that our models of atmospheric variations, derived from satellites with perigee altitudes mostly below 500 km, cannot be trusted at much greater altitudes. For example, Cook (1966) finds from the drag of Echo II during 1964 and 1965 that at an altitude of 1100 km there is little evidence for a seasonal variation. On the other hand, the semiannual variation, with a range of a factor of 3 in the densities, emerges as the only significant fluctuation at that altitude. The ion density in the $F2$ layer, as evidenced by observations of the critical frequency $f_0F2$, shows a large semiannual oscillation in phase with the density variations of the neutral atmosphere (Radicella and Cosio de Ragone, 1966). This lends support to the view expressed by King and Kohl (1965) and by Jacchia and Slowey (1966) that there might be a causal relation between ion density and neutral-gas temperature in the diurnal variation.

Ions propelled by electric forces in the geomagnetic field (Martyn, 1966) may be responsible for the 100 m sec$^{-1}$ mass transport of the neutral atmosphere in an easterly direction, at altitudes between 200 and 300 km, deduced by King-Hele and Scott (1966) from the secular variations in the orbital inclinations of satellites. Winds of this magnitude are bound to affect the global distribution of temperatures at thermospheric levels. At greater altitudes, where ions are free to move with little chance of collisions, we can expect the penetration of ions, driven along magnetic lines of force through the neutral atmosphere, to distort the density distribution computed according to the laws of diffusion. Under these conditions, the departure from hydrostatic equilibrium can also be expected to become a serious factor. The altitude at which the mean free path of a neutral particle is equal to the atmospheric scale height is about 900 km when the exospheric temperature is 2000° K, but it drops to 500 km for 1000° K and to 350 km for 600° K. At sunspot minimum, therefore, exospheric conditions prevail at altitudes as low as 350 to 400 km.

# PART 4

# Additional Information Relating to the Atmosphere

# PART 4

# Additional Information Relating to the Atmosphere

## 4.0 INTRODUCTION

During the period covering COESA's development of the major contributions of this publication, the supplementary tables of the atmosphere of Parts 5 and 6, the need for some related material has been recognized. This need includes mathematical expressions that can be used to approximate the detailed profiles of pressure and density of the 1962 Standard to 200 km and these 1966 Supplements to 80 km; ozone distribution to 50 km, and altitude-latitude relationships for locating at the correct geometric altitude the atmospheric data in the tables of Part 6 which are presented only for standard latitude.

## 4.1 ANALYTIC APPROXIMATIONS OF ATMOSPHERIC PRESSURE AND DENSITY

4.1.1 U.S. STANDARD ATMOSPHERE, 1962.—The basis for the *U.S. Standard Atmosphere, 1962* was the selected variation of molecular-scale temperature with altitude.* The selected profile had a number of corners, that is, discontinuities in the lapse rate or first derivative. For those applications in which such discontinuities induce computational or other difficulties, approximate smoothed versions of the standard atmosphere were developed and presented in Part II.3 of the 1962 Standard. The standard molecular-scale temperature profile was approximated, in various degrees, by polynomial functions of geometric altitude from 0 to 200 km. The polynomials of degrees eight and ten were used to obtain approximations for the pressure and density which were mutually consistent with respect to the hydrostatic equation and perfect gas law.

For some applications it is preferable to have direct, simple approximations for the 1962 Standard pressure and density, as functions of geometric altitude, even though these may not be exactly compatible with respect to the hydrostatic equation. This will be especially true, for example, of an application in which the density profile is the basic requirement of all the atmospheric properties.

In what follows, the aforementioned direct approximations for pressure and density are developed. Although this problem is not so restricted as to have a unique solution, the outstanding feature to be observed is that both pressure and density roughly are exponentially decreasing functions of altitude. Equivalently, the logarithms of both pressure and density roughly are linearly decreasing functions of altitude. This feature primarily influenced the two approaches taken to the solution of the approximation problem.

The first solution presented here is a generalization of a method used in digital computers for generating the exponential function. The variable $f(Z)$ to be represented is expressed approximately:

$$f(Z) = 1/(A_0 + A_1 Z + A_2 Z^2 + \ldots + A_n Z^n)^4 \quad (4.1)$$

on a certain interval $Z_0 \leq Z \leq Z_1$. In the present case, the independent variable $Z$ is the geometric altitude, $Z_0 = 0$ is the lower or sea-level extreme, and $Z_1 = 200$ km is the higher extreme altitude for which the approximation is attempted. The variable $f(Z)$ represents the pressure, or the density, in ratio to its sea-level value. The constant coefficients $A_0, \ldots, A_n$ are selected to give a uniformly good approximation, on the given interval,† in the sense that the greatest fractional or percentage error in the variable $f(Z)$ is to be as small as possible. Thus, the absolute error is small at high altitudes, where the pressure, or density, is also small. In Table 4.1 the two sets of coefficients presented are the results of successively refining the approximation 4.1 above, with $n = 11$, for the cases $f(Z) = P/P_0$ and $f(Z) = \rho/\rho_0$, the 1962 Standard pressure ratio and density ratio, respectively. Discrepancies between this approximation and the actual model are presented in Figure 4.1. In computations with these approximations, it is recommended that at least nine and preferably ten decimal digits be carried. The percentage error in each case is less than five percent for the geometric altitude interval 0 to 200 km. The detailed variation of the percentage error as a function of altitude is shown in the curves in Figure 4.1. The pressure was found to be more easily approximated within given limits. The approximation for the pressure has been developed so that its ratio to the approximate density

*The technical basis of the selected profile is given by Champion and Minzner (1963).

†A different interval would generally require a different set of coefficients for best results.

TABLE 4.1.—APPROXIMATION OF 1962 STANDARD UP TO 200 KM BY DIGITAL COMPUTER TECHNIQUE

Altitude range: 0–200 km
Surface values: $P_0 = 1.013250 \times 10^5$ newtons meter$^{-2}$
$\rho_0 = 1.2250$ kilograms meter$^{-3}$
Coefficient $A_j | j = 0, 1, \ldots, 11$; $A_j$ has dimensions km$^{-j}$; see Equation (4.1)]:

| $j$ | $f(Z) = \frac{P}{P_0}$ | $f(Z) = \frac{\rho}{\rho_0}$ |
|---|---|---|
| 0 | +0.1000000000E+01 | +0.1000000000E+01 |
| 1 | +0.3533367370E−01 | +0.3393495800E−01 |
| 2 | −0.7474788290E−03 | −0.3433553057E−02 |
| 3 | +0.2121572232E−03 | +0.5497466428E−03 |
| 4 | −0.1325255219E−04 | −0.3228358326E−04 |
| 5 | +0.5344159692E−06 | +0.1106617734E−05 |
| 6 | −0.1322745646E−07 | −0.2291755793E−07 |
| 7 | +0.1965359762E−09 | +0.2902146443E−09 |
| 8 | −0.1723714966E−11 | −0.2230070938E−11 |
| 9 | +0.8707590786E−14 | +0.1010575266E−13 |
| 10 | −0.2341816445E−16 | −0.2482089627E−16 |
| 11 | +0.2597772972E−19 | +0.2548769715E−19 |

yields, through the perfect gas law, an approximation for the molecular-scale temperature which has a fractional error of less than five percent over the altitude interval 0 to 200 km. The approximations are much less accurate outside this altitude interval and should not be used there; this is also true of the second solution of the approximation problem which is discussed in the next paragraph. With reference to Eq. (4.1), it is noted that changing $A_0$ or both $A_0$ and $A_1$ will produce changes which are appreciable at low altitudes but tend asymptotically toward zero change at high altitude.

The second solution presented here utilizes the truncated Chebyshev expansion† (Goodwin, 1961; National Bureau of Standards, 1952) for the variable $f(x)$ on the interval $-1 \leq x \leq 1$. In the present case, the independent variable $x$ is related linearly to the geometric altitude $Z$ by

$$x = \frac{2Z}{Z_1} - 1 \text{ or } Z = \frac{Z_1}{2}(x+1). \tag{4.2}$$

As $x$ varies from −1 to 1, $Z$ increases from 0 to $Z_1$. The variable $f(x)$ in the present case is ln $(P/P_0)$ or ln $(\rho/\rho_0)$, the natural logarithm (base $e$) of the 1962

†The Chebyshev expansion of a given function $f(x)$ on the interval $-1 \leq x \leq 1$ is the Fourier half-range cosine-series expansion of the corresponding function $F(\theta) \equiv f(\cos\theta)$ on the interval $0 \leq \theta \leq \pi$. The function $\cos(k\theta) = \cos(k \cos^{-1} x) \equiv T_k(x)$ is expressible as a polynomial in $x$. The Chebyshev polynomials $T_k(\xi)$ and $C_k(\eta)$ are related by definition, according to: $1/2C_k(2\xi) = T_k(\xi)$, $k = 0, 1, 2, \ldots$.

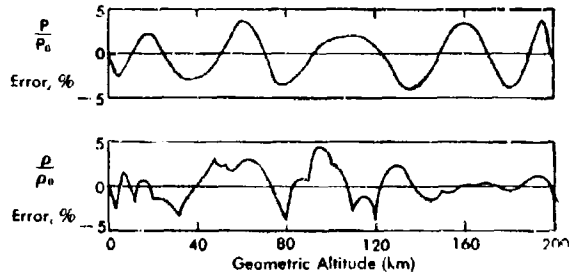



FIGURE 4.1.—Errors in representing the 1962 Standard to 200 km by digital computer technique approximation.

Standard pressure ratio or density ratio, respectively. For small errors, the (absolute) error in approximating the logarithm ln $r$ is approximately equal to the corresponding fractional error in the (pressure or density) ratio $r$ itself, that is,

$$\ln r_a - \ln r = \ln\left(1 + \frac{r_a - r}{r}\right) \doteq \frac{r_a - r}{r} \tag{4.3}$$

where $|(r_a - r)/r|$ is much less than unity and the subscript $a$ refers to the approximate value of $r$. Therefore, a uniformly good polynomial fit to ln $r$, in the sense of minimizing the maximum absolute value of the error (ln $r_a$ − ln $r$) on the interval $0 \leq Z \leq Z_1$, is of interest here. The best polynomial in this sense can be approximated with a truncated Chebyshev expansion. This standard approximation, for ln $r$, is of the form

$$\ln r \doteq \frac{a_0}{2} + \sum_{k=1}^{n} a_k T_k(x) = \frac{1}{2}\left[a_0 + \sum_{k=1}^{n} a_k C_k(2x)\right] \tag{4.4}$$

where

$$a_k = \frac{2}{\pi}\int_0^{\pi} \ln|r(x)| \cos k\theta d\theta,\ x \equiv \cos\theta \tag{4.5}$$

and (with $\eta \equiv 2x$) the $C_k(\eta)$ can be obtained recursively from

$$C_1(\eta) = \eta, \qquad C_2(\eta) = \eta^2 - 2,$$
$$C_k(\eta) = \eta C_{k-1}(\eta) - C_{k-2}(\eta), \tag{4.6}$$
$$k = 3, 4, \ldots$$

Alternatively, the $C_k(\eta)$ have been tabulated by the National Bureau of Standards (1952). As before, the approximations are not intended for application outside the interval $0 \leq Z \leq Z_1$. The first fifteen Chebyshev series expansion coefficients $a_k$ are presented in Tables 4.2 and 4.3 for the 1962 Standard for the maximum altitudes $Z_1 = 200$ km and $Z_1 = 80$ km, respec-

TABLE 4.2.—APPROXIMATION OF 1962 STANDARD UP TO 200 KM BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–200 km
Surface values: $P_{Z=0}=P_0$, $\rho_{Z=0}=\rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k=$ 0 | $-0.24470569E+02$ | $-0.25415229E+02$ |
| 1 | $-0.10685861E+02$ | $-0.11684380E+02$ |
| 2 | $+0.22622605E+01$ | $+0.18721406E+01$ |
| 3 | $+0.63433398E+00$ | $+0.81660876E+00$ |
| 4 | [illegible]$948959E-00$ | $-0.93811118E-01$ |
| 5 | [illegible]$1548574E-00$ | $-0.30155735E-00$ |
| 6 | $+0.90751361E-01$ | $-0.77593291E-01$ |
| 7 | $+0.18530467E-00$ | $+0.21640168E-00$ |
| 8 | $-0.95325843E-01$ | $-0.34918422E-01$ |
| 9 | $-0.50214309E-01$ | $-0.70126799E-01$ |
| 10 | $+0.45101378E-01$ | $+0.36014616E-01$ |
| 11 | $+0.88997472E-02$ | $+0.14951351E-01$ |
| 12 | $-0.18935899E-01$ | $-0.21450283E-01$ |
| 13 | $+0.35690621E-02$ | $-0.12497995E-02$ |
| 14 | $+0.63989880E-02$ | $+0.18421866E-01$ |
| Maximum error, percent for | | |
| $n=10$ | $+0.48716851E+01$ | $+0.90159774E+01$ |
| 11 | $+0.44642039E+01$ | $+0.78204393E+01$ |
| 12 | $+0.27651749E+01$ | $+0.62153101E+01$ |
| 13 | $+0.26185820E+01$ | $+0.61527729E+01$ |
| 14 | $+0.21790823E+01$ | $+0.45074701E+01$ |

TABLE 4.3.—APPROXIMATION OF 1962 STANDARD UP TO 80 KM BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0}=P_0$, $\rho_{Z=0}=\rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k=$ 0 | $-0.11385925E+02$ | $-0.10960632E+02$ |
| 1 | $-0.56837011E+01$ | $-0.55717132E+01$ |
| 2 | $+0.57666476E-01$ | $+0.99116555E-01$ |
| 3 | $-0.77884294E-01$ | $+0.61044847E-01$ |
| 4 | $-0.11004083E-00$ | $-0.14304157E-00$ |
| 5 | $+0.17572339E-01$ | $+0.29492088E-02$ |
| 6 | $+0.48546337E-02$ | $+0.58789604E-02$ |
| 7 | $+0.17694805E-02$ | $+0.20421324E-02$ |
| 8 | $-0.18165298E-02$ | $+0.71033206E-02$ |
| 9 | $-0.26635086E-02$ | $-0.10314086E-01$ |
| 10 | $+0.35685433E-02$ | $+0.34107737E-02$ |
| 11 | $-0.82257517E-03$ | $+0.41764325E-02$ |
| 12 | $-0.10363683E-02$ | $-0.39151559E-02$ |
| 13 | $+0.57053477E-03$ | $+0.11227828E-02$ |
| 14 | $-0.19023078E-03$ | $-0.15751053E-02$ |
| Maximum error, percent for | | |
| $n=10$ | $+0.32537075E+00$ | $+0.25532037E+01$ |
| 11 | $+0.33326241E+00$ | $+0.23517296E+01$ |
| 12 | $+0.26060434E+00$ | $+0.19785941E+01$ |
| 13 | $+0.25006738E+00$ | $+0.18775970E+01$ |
| 14 | $+0.23898240E+00$ | $+0.18222705E+01$ |

tively. Discrepancies between these approximations and the actual model are presented in Figures 4.2 and 4.3. The two-digit number following the letter E in each numerical expression for $a_k$ is the power of ten by which to multiply the number preceding the letter E. Maximum errors for the altitude interval $0 \leq Z \leq Z_1$ for different truncations ($n=10$ to 14) and errors as a function of altitude are also presented for $n=10$ and $n=14$ in the figures. In Table 4.2 to Table 4.15, $P_0$ and $\rho_0$ denote sea-level values from the Standard. Eight decimal digits are recommended in computations.

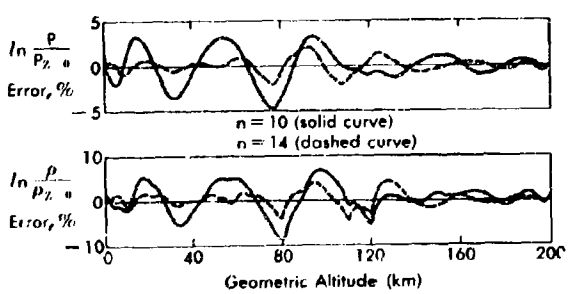



FIGURE 4.2.—Errors in representing the 1962 Standard to 200 km by truncated Chebyshev expansion.

In summary, direct, simple approximations for the 1962 Standard pressure and density (first solution) and their logarithms (second solution) have been presented. The first solution is oriented to the needs for efficient digital-computer operation and requires little in the way of program and storage. The computation of the expansion coefficients in the second solution is very straightforward and can be performed in this or similar problems with little effort or skill in numerical analysis.

4.1.2 U.S. STANDARD ATMOSPHERE SUPPLEMENTS, 1966.—The approximation described in the preceding section and consisting of a truncated Chebyshev series expansion has been applied to the lower 80 km of 13 of the 14 Supplementary Atmospheres described in Parts 2 and 5 to obtain analytic representations of the logarithms of the pressure ratio and density ratio. Since the spring/fall atmosphere is identical to the 1962 Standard up to 69 km, analytic approximation of the spring/fall atmosphere is not described. The expansion coefficients and maximum errors are presented in Tables 4.4 to 4.16. Discrepancies from the Supplementary Atmospheres are illustrated in Figures 4.4 to 4.16. As before, the approximations should not be applied outside the indicated altitude range.

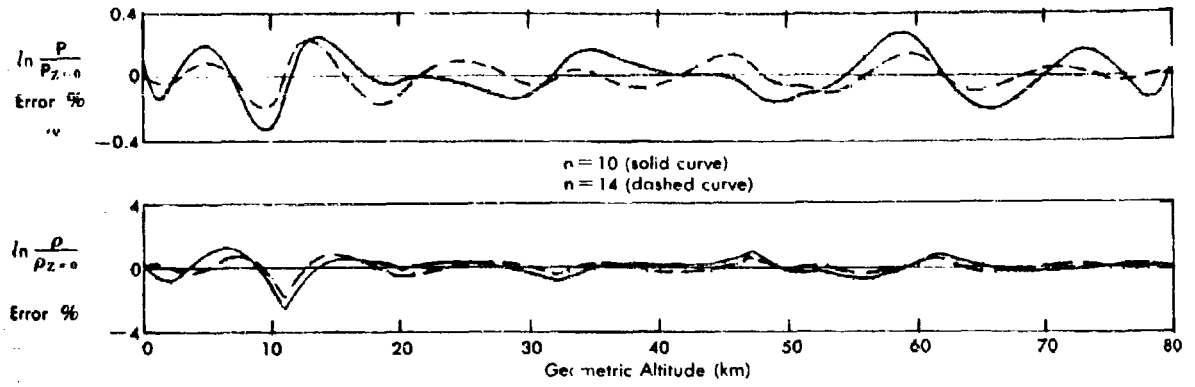



FIGURE 4.3.—Errors in representing the 1962 Standard to 80 km by truncated Chebyshev expansion.

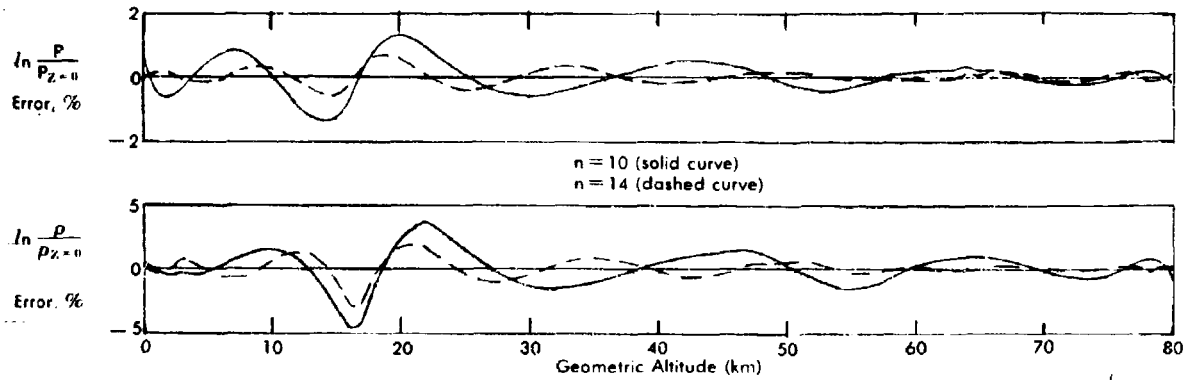



FIGURE 4.4.—Errors in representing the 15° N. Supplementary Atmosphere by truncated Chebyshev expansion.

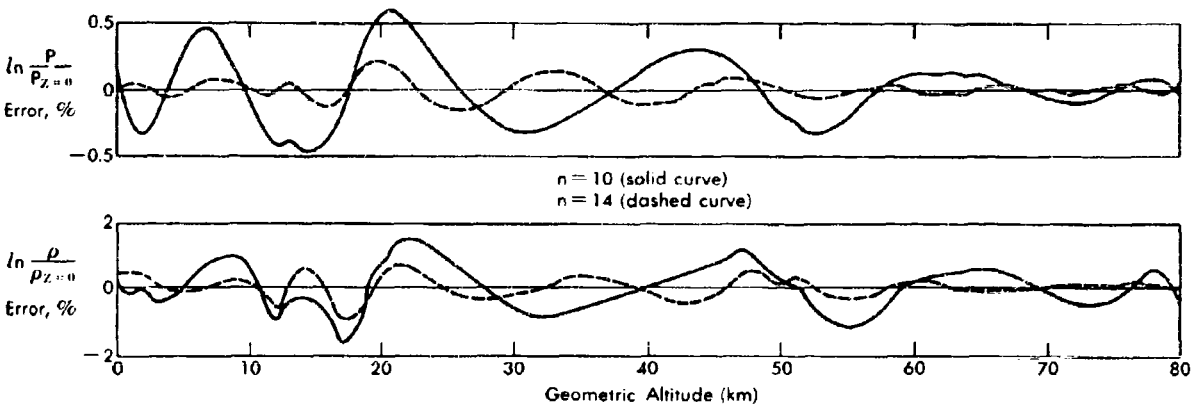



FIGURE 4.5.—Errors in representing the 30° N. Winter Supplementary Atmosphere.

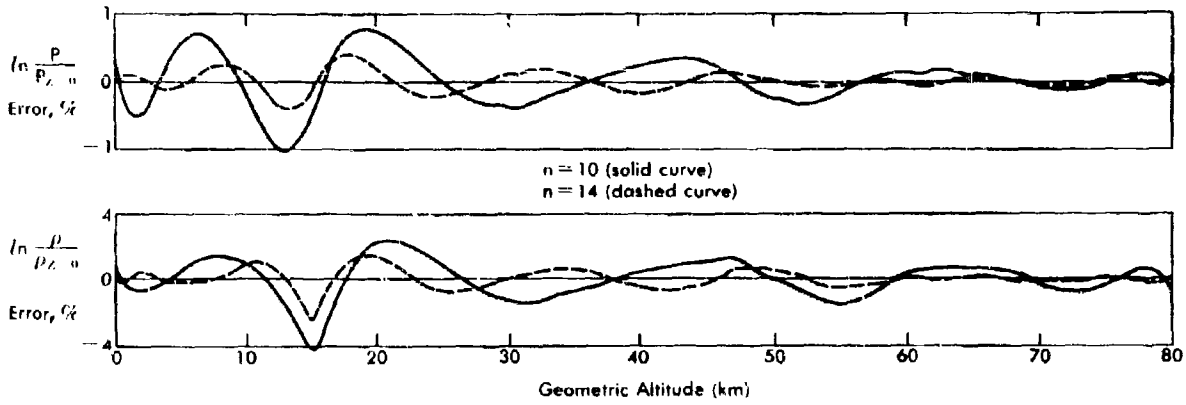



FIGURE 4.6.—Errors in representing the 30° N. Summer Supplementary Atmosphere.

TABLE 4.4.—APPROXIMATION OF 15° N. SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 1.00000000\ P_0$
$\rho_{z=0} = 0.95265306\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k=$ 0 | $-0.11292681E+02$ | $-0.10795064E+02$ |
| 1 | $-0.56676704E+01$ | $-0.55402267E+01$ |
| 2 | $+0.45597384E-01$ | $+0.70185477E-01$ |
| 3 | $-0.72563273E-01$ | $+0.73327006E-01$ |
| 4 | $-0.11895318E-00$ | $-0.16736365E-00$ |
| 5 | $+0.38715330E-01$ | $+0.18269096E-01$ |
| 6 | $+0.10858011E-02$ | $+0.22595998E-01$ |
| 7 | $-0.72492028E-02$ | $-0.21316435E-01$ |
| 8 | $+0.89635745E-02$ | $+0.17031241E-01$ |
| 9 | $-0.68378613E-02$ | $-0.13859797E-02$ |
| 10 | $-0.33748665E-04$ | $-0.12925811E-01$ |
| 11 | $+0.47251073E-02$ | $+0.11510155E-01$ |
| 12 | $-0.36550791E-02$ | $-0.52981801E-03$ |
| 13 | $+0.31158274E-03$ | $-0.66618895E-02$ |
| 14 | $+0.18717224E-02$ | $+0.57506745E-02$ |
| Maximum error, percent for | | |
| $n=10$ | $+0.13981993E+01$ | $+0.46770841E+01$ |
| 11 | $+0.10743026E+01$ | $+0.38551524E+01$ |
| 12 | $+0.78751098E+00$ | $+0.38621232E+01$ |
| 13 | $+0.80631923E+00$ | $+0.32812089E+01$ |
| 14 | $+0.68477737E+00$ | $+0.27716085E+01$ |

TABLE 4.5.—APPROXIMATION OF 30° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 1.00764866\ P_0$
$\rho_{z=0} = 1.00653061\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k=$ 0 | $-0.11398712E+02$ | $-0.10988053E+02$ |
| 1 | $-0.56949156E+01$ | $-0.55952542E+01$ |
| 2 | $+0.66612249E-01$ | $+0.89859452E-01$ |
| 3 | $-0.66339880E-01$ | $+0.66752831E-01$ |
| 4 | $-0.10950316E-00$ | $-0.15432204E-00$ |
| 5 | $+0.34772284E-01$ | $+0.14787448E-01$ |
| 6 | $+0.36534654E-02$ | $+0.20988461E-01$ |
| 7 | $-0.50058098E-02$ | $-0.13602723E-01$ |
| 8 | $+0.42671657E-02$ | $+0.13072287E-01$ |
| 9 | $-0.49216313E-02$ | $-0.61097701E-02$ |
| 10 | $+0.12164620E-02$ | $-0.54250862E-02$ |
| 11 | $+0.24253896E-02$ | $+0.67921825E-02$ |
| 12 | $-0.19684564E-02$ | $-0.20118331E-03$ |
| 13 | $+0.95887702E-05$ | $-0.30992298E-02$ |
| 14 | $+0.79097901E-03$ | $+0.17320223E-02$ |
| Maximum error, percent for | | |
| $n=10$ | $+0.58665549E+00$ | $+0.16619980E+01$ |
| 11 | $+0.44876909E+00$ | $+0.13632268E+01$ |
| 12 | $+0.25192475E+00$ | $+0.13729185E+01$ |
| 13 | $+0.25144791E+00$ | $+0.10648638E+01$ |
| 14 | $+0.21190023E+00$ | $+0.95033348E+00$ |

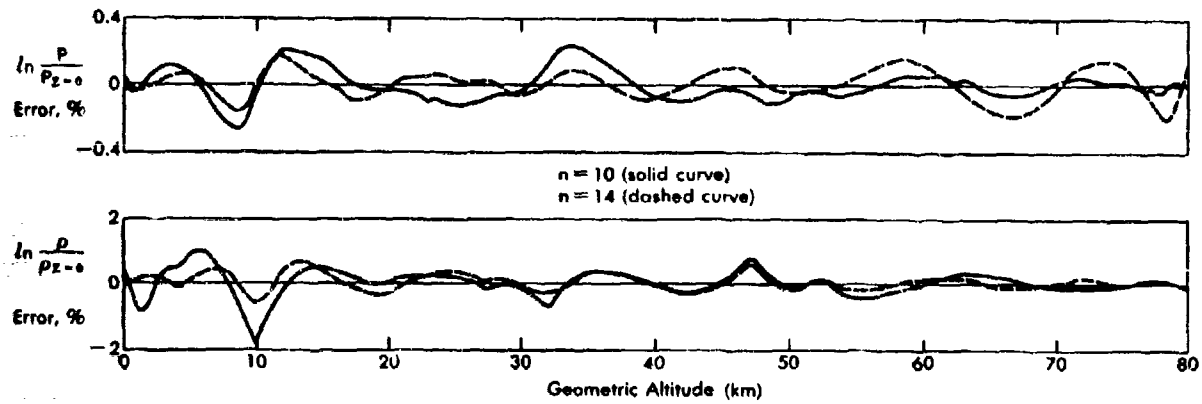



FIGURE 4.7.—Errors in representing the 45° N. Winter Supplementary Atmosphere.

TABLE 4.6.—APPROXIMATION OF 30° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0−80 km
Surface values: $P_{z=0} = 1.00024673\ P_0$
$\rho_{z=0} = 0.94612245\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k=$ 0 | −0.11236010E+02 | −0.10724518E+02 |
| 1 | −0.56476343E+01 | −0.55094862E+01 |
| 2 | +0.30694294E−01 | +0.63777917E−01 |
| 3 | −0.76259755E−01 | +0.71771775E−01 |
| 4 | −0.12104687E−00 | −0.16437107E−00 |
| 5 | +0.32464208E−01 | +0.10906935E−01 |
| 6 | +0.32257811E−02 | +0.20640562E−01 |
| 7 | −0.55074987E−02 | −0.15827267E−01 |
| 8 | +0.64346058E−02 | +0.14407379E−01 |
| 9 | −0.60729037E−02 | −0.27857211E−02 |
| 10 | +0.10370307E−02 | −0.10184736E−01 |
| 11 | +0.31451757E−02 | +0.11202805E−01 |
| 12 | −0.31532521E−02 | −0.34389555E−02 |
| 13 | +0.10123259E−02 | −0.32617962E−02 |
| 14 | +0.79967239E−03 | +0.42496365E−02 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.10690240E+01 | +0.42787224E+01 |
| 11 | +0.76824112E+00 | +0.32592773E+01 |
| 12 | +0.49861088E+00 | +0.31749964E+01 |
| 13 | +0.49004091E+00 | +0.29780984E+01 |
| 14 | +0.42920543E+00 | +0.25532901E+01 |

TABLE 4.7.—APPROXIMATION OF 45° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0−80 km
Surface values: $P_{z=0} = 1.00468789\ P_0$
$\rho_{z=0} = 1.06204082\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k=$ 0 | −0.11554944E+02 | −0.11262047E+02 |
| 1 | −0.57394208E+01 | −0.56938867E+01 |
| 2 | +0.10541182E−00 | +0.10894386E−00 |
| 3 | −0.31041097E−01 | +0.74802921E−01 |
| 4 | −0.90912415E−01 | −0.12099027E−00 |
| 5 | +0.19779769E−01 | −0.18128609E−02 |
| 6 | +0.13230478E−01 | +0.17643137E−01 |
| 7 | +0.15098489E−03 | +0.79451649E−02 |
| 8 | −0.65576137E−02 | +0.75301915E−03 |
| 9 | −0.13792823E−02 | −0.13910341E−01 |
| 10 | +0.45829969E−02 | +0.61671438E−02 |
| 11 | −0.11948063E−02 | +0.26568258E−02 |
| 12 | −0.40015894E−03 | −0.22915218E−02 |
| 13 | +0.27888930E−03 | +0.21201550E−02 |
| 14 | −0.33229920E−03 | −0.24436811E−02 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.26980507E+00 | +0.19066200E+01 |
| 11 | +0.23119020E+00 | +0.18811271E+01 |
| 12 | +0.21727996E+00 | +0.17137662E+01 |
| 13 | +0.19324141E+00 | +0.15018404E+01 |
| 14 | +0.17728639E+00 | +0.13139173E+01 |

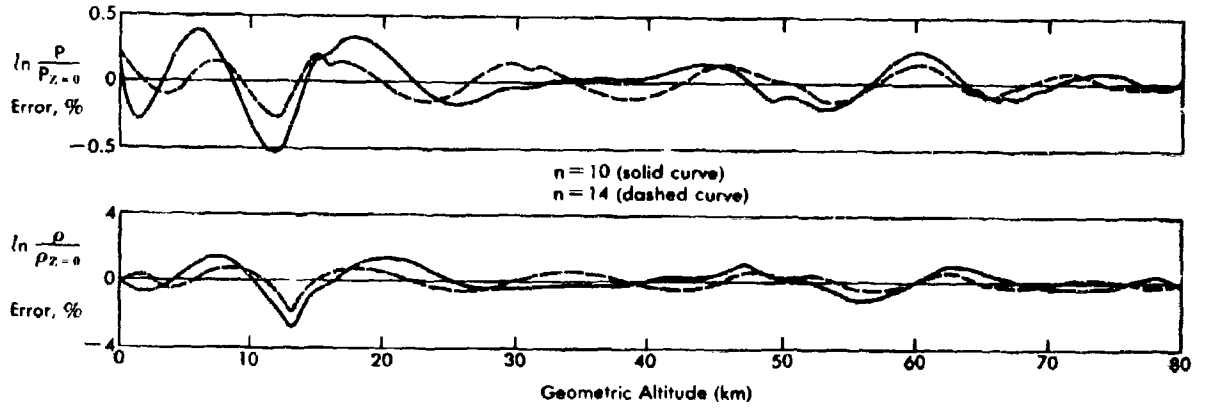



FIGURE 4.8.—Errors in representing the 45° N. Summer Supplementary Atmosphere.

TABLE 4.8.—APPROXIMATION OF 45° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0 − 80 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 0.97306122\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k=$ 0 | −0.11150426E+02 | −0.10692979E+02 |
| 1 | −0.55932330E+01 | −0.54516427E+01 |
| 2 | +0.21511737E−01 | +0.78517903E−01 |
| 3 | −0.89873604E−01 | +0.58080391E−01 |
| 4 | −0.11834978E−00 | −0.15258813E−00 |
| 5 | +0.22024347E−01 | +0.39089340E−02 |
| 6 | +0.26686517E−02 | +0.12920403E−01 |
| 7 | −0.23176521E−02 | −0.90474822E−02 |
| 8 | +0.24556559E−02 | +0.10975508E−01 |
| 9 | −0.38195797E−02 | −0.70757392E−02 |
| 10 | +0.25047988E−02 | −0.17159607E−02 |
| 11 | +0.66807698E−03 | +0.70322484E−02 |
| 12 | −0.18029543E−02 | −0.36113699E−02 |
| 13 | +0.82929434E−03 | −0.14795569E−03 |
| 14 | −0.37180569E−03 | +0.54964149E−03 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.54767413E+00 | +0.30291855E+01 |
| 11 | +0.49553199E+00 | +0.23566723E+01 |
| 12 | +0.31653329E+00 | +0.20456657E+01 |
| 13 | +0.26599004E+00 | +0.20487174E+01 |
| 14 | +0.27117863E+00 | +0.20166874E+01 |

TABLE 4.9.—APPROXIMATION OF 60° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{Z=0} = 1.00024673 P_0$
$\rho_{Z=0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k=$ 0 | −0.11734579E+02 | −0.11559304E+02 |
| 1 | −0.57909640E+01 | −0.57942704E+01 |
| 2 | +0.15565977E+00 | +0.14085435E+00 |
| 3 | +0.43958965E−03 | +0.91568527E−01 |
| 4 | −0.73909307E−01 | −0.89026834E−01 |
| 5 | +0.10612036E−01 | −0.91508620E−03 |
| 6 | +0.81347044E−02 | +0.96263019E−02 |
| 7 | +0.17454704E−02 | +0.74983495E−02 |
| 8 | −0.70900109E−02 | +0.66805500E−03 |
| 9 | −0.10257863E−02 | −0.15687198E−01 |
| 10 | +0.36946803E−02 | +0.69099183E−02 |
| 11 | −0.53343711E−03 | −0.25275559E−02 |
| 12 | +0.16436473E−02 | +0.40577084E−02 |
| 13 | −0.12242473E−02 | +0.35777159E−02 |
| 14 | −0.84107635E−03 | −0.46009748E−02 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.42302819E+00 | +0.17953478E+01 |
| 11 | +0.38139584E+00 | +0.16184054E+01 |
| 12 | +0.26048484E+00 | +0.15816823E+01 |
| 13 | +0.24649215E+00 | +0.13898768E+01 |
| 14 | +0.20221931E+00 | +0.96897483E+00 |

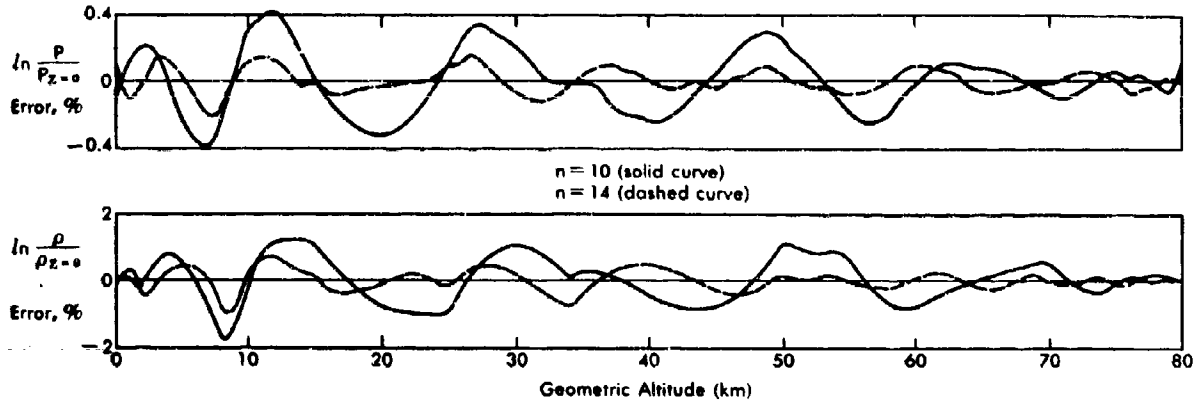



FIGURE 4.9.—Errors in representing the 60° N. Winter Supplementary Atmosphere.

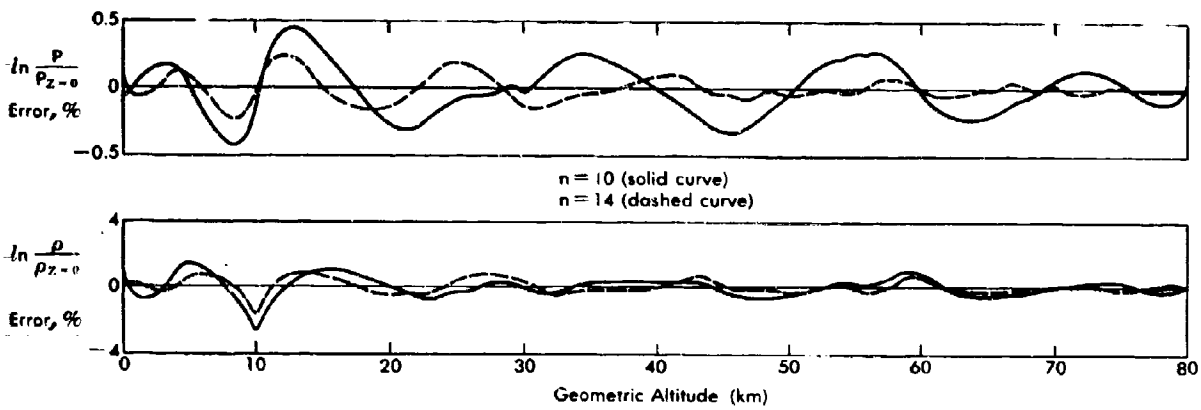



FIGURE 4.10.—Errors in representing the 60° N. Summer Supplementary Atmosphere.

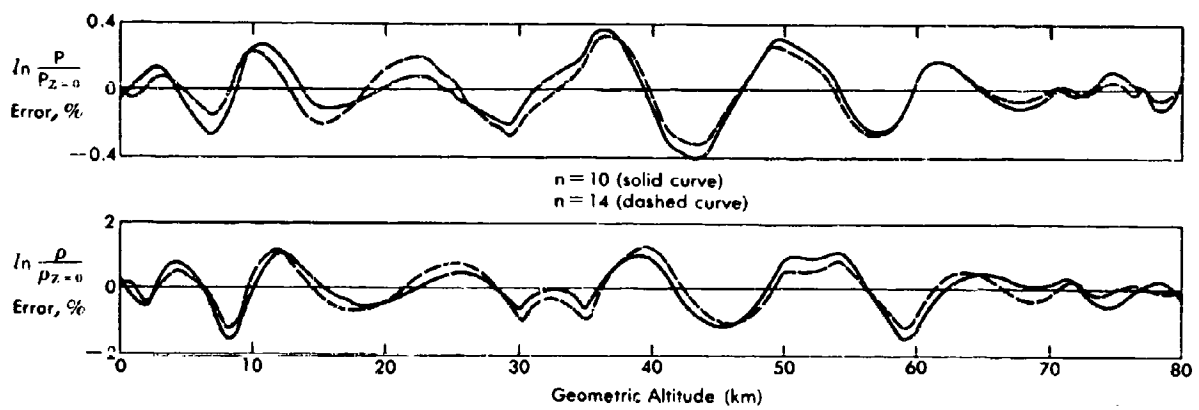



FIGURE 4.11.—Errors in representing the 60° N. Winter (Cold) Supplementary Atmosphere.

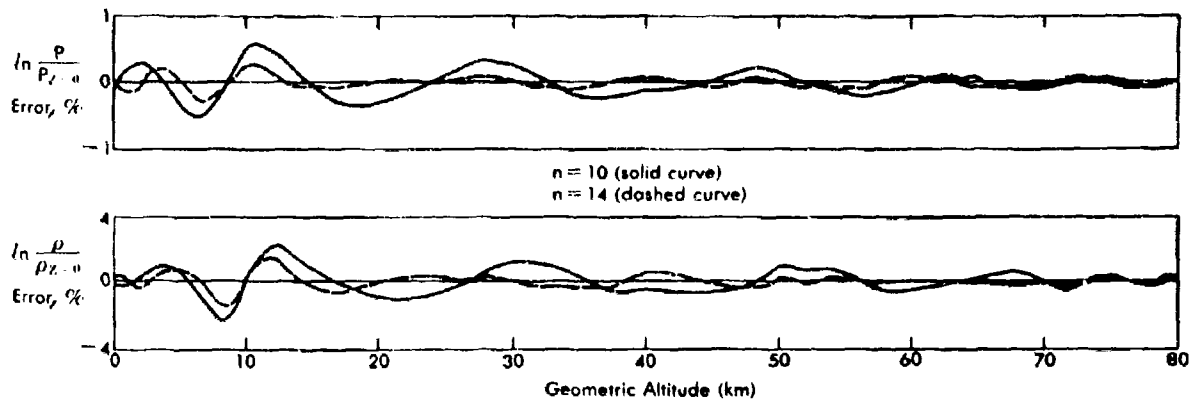



FIGURE 4.12.—Errors in representing the 60° N. Winter (Warm) Supplementary Atmosphere.

TABLE 4.10.—APPROXIMATION OF 60° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 0.99679250\ P_0$
$\rho_{z=0} = 0.99591837\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k = 0$ | $-0.11113715E+02$ | $-0.10702847E+02$ |
| 1 | $-0.55552451E+01$ | $-0.54172088E+01$ |
| 2 | $+0.14711463E-01$ | $+0.94875743E-01$ |
| 3 | $-0.10813282E-00$ | $+0.33971231E-01$ |
| 4 | $-0.11288266E-00$ | $-0.14385514E-00$ |
| 5 | $+0.13886823E-01$ | $-0.22402754E-02$ |
| 6 | $+0.45754226E-02$ | $+0.47746203E-02$ |
| 7 | $+0.15378256E-02$ | $+0.19455712E-02$ |
| 8 | $-0.14691148E-02$ | $+0.62006716E-02$ |
| 9 | $-0.11931194E-02$ | $-0.74573795E-02$ |
| 10 | $+0.20596717E-02$ | $+0.49698568E-02$ |
| 11 | $-0.20676183E-02$ | $-0.10657856E-02$ |
| 12 | $+0.45563554E-03$ | $-0.45141339E-02$ |
| 13 | $+0.83081386E-03$ | $+0.36185520E-02$ |
| 14 | $-0.35421627E-03$ | $+0.17352670E-02$ |
| Maximum error, percent for | | |
| $n = 10$ | $+0.47194607E+00$ | $+0.26714161E+01$ |
| 11 | $+0.31524203E+00$ | $+0.26816413E+01$ |
| 12 | $+0.33107898E+00$ | $+0.23519516E+01$ |
| 13 | $+0.25946698E+00$ | $+0.19902498E+01$ |
| 14 | $+0.24612195E+00$ | $+0.18568054E+01$ |

TABLE 4.11.—APPROXIMATION OF 60° N. WINTER (COLD) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z=0} = 1.00024673\ P_0$
$\rho_{z=0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z=0}}$ | $\ln \frac{\rho}{\rho_{z=0}}$ |
|---|---|---|
| $k = 0$ | $-0.11986395E+02$ | $-0.11811448E+02$ |
| 1 | $-0.59219413E+01$ | $-0.59543981E+01$ |
| 2 | $+0.19521780E-00$ | $+0.13822599E-00$ |
| 3 | $+0.49710290E-01$ | $+0.13723169E-00$ |
| 4 | $-0.78022972E-01$ | $-0.85309979E-01$ |
| 5 | $+0.84323914E-02$ | $-0.80034570E-02$ |
| 6 | $+0.17658515E-01$ | $+0.24007255E-01$ |
| 7 | $-0.84813241E-03$ | $+0.16226391E-01$ |
| 8 | $-0.14690644E-01$ | $-0.85207421E-02$ |
| 9 | $-0.62825929E-03$ | $-0.23385217E-01$ |
| 10 | $+0.72435819E-02$ | $+0.92265872E-02$ |
| 11 | $-0.75193853E-03$ | $+0.48266426E-03$ |
| 12 | $+0.31587886E-03$ | $+0.17416397E-02$ |
| 13 | $-0.15014646E-03$ | $+0.30251177E-02$ |
| 14 | $-0.35626103E-03$ | $-0.13604895E-02$ |
| Maximum error, percent for | | |
| $n = 10$ | $+0.40051306E+00$ | $+0.15021086E+01$ |
| 11 | $+0.34523572E+00$ | $+0.14942810E+01$ |
| 12 | $+0.32561983E+00$ | $+0.14713630E+01$ |
| 13 | $+0.33805336E+00$ | $+0.13232782E+01$ |
| 14 | $+0.34828052E+00$ | $+0.12660265E+01$ |

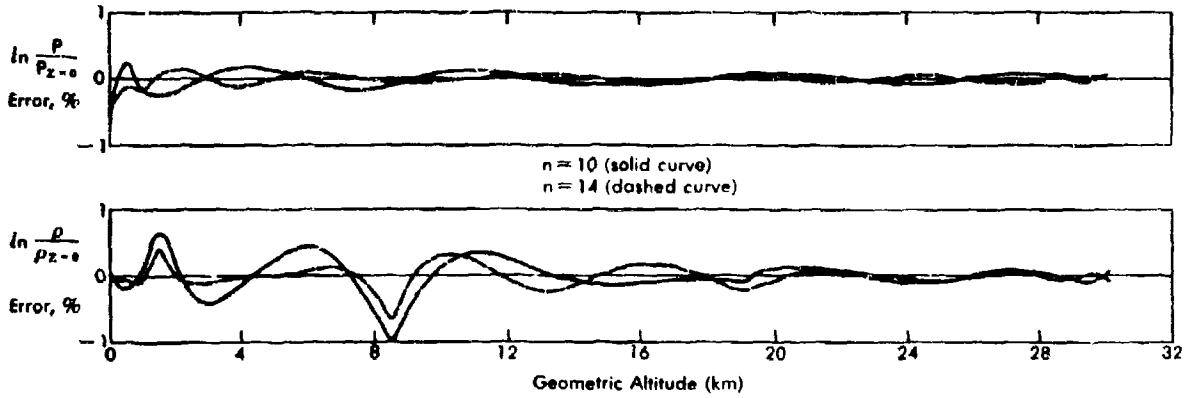



FIGURE 4.13.—Errors in representing the 75° N. Winter Supplementary Atmosphere.

TABLE 4.12.—APPROXIMATION OF 60° N. WINTER (WARM) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–80 km
Surface values: $P_{z-0} = 1.00024673\ P_0$
$\rho_{z-0} = 1.12000000\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z-0}}$ | $\ln \frac{\rho}{\rho_{z-0}}$ |
|---|---|---|
| $k=$ 0 | −0.11454033E + 02 | −0.11290984E + 02 |
| 1 | −0.56620422E + 01 | −0.56411071E + 01 |
| 2 | +0.96319649E − 01 | +0.11306966E − 00 |
| 3 | −0.44269729E − 01 | +0.32309052E − 01 |
| 4 | −0.66507997E − 01 | −0.97161151E − 01 |
| 5 | +0.11909655E − 01 | −0.69107811E − 02 |
| 6 | +0.10722589E − 01 | +0.34919044E − 03 |
| 7 | +0.96289317E − 02 | +0.15701751E − 01 |
| 8 | −0.52646790E − 02 | +0.93187094E − 02 |
| 9 | −0.27010841E − 02 | −0.12750375E − 01 |
| 10 | +0.19167302E − 02 | +0.63867828E − 02 |
| 11 | −0.75229670E − 03 | −0.45595561E − 02 |
| 12 | +0.17112380E − 02 | +0.43776657E − 02 |
| 13 | −0.16415112E − 02 | +0.16522544E − 02 |
| 14 | −0.26017816E − 03 | −0.57111861E − 02 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.57345495E + 00 | +0.24867050E + 01 |
| 11 | +0.53716466E + 00 | +0.21675125E + 01 |
| 12 | +0.37407592E + 00 | +0.21099091E + 01 |
| 13 | +0.30930995E + 00 | +0.20290285E + 01 |
| 14 | +0.29561429E + 00 | +0.15065640E + 01 |

TABLE 4.13.—APPROXIMATION OF 75° N. WINTER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{z-0} = 1.00024673\ P_0$
$\rho_{z-0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{z-0}}$ | $\ln \frac{\rho}{\rho_{z-0}}$ |
|---|---|---|
| $k=$ 0 | −0.46585828E + 01 | −0.43716063E + 01 |
| 1 | −0.23793183E + 01 | −0.22828183E + 01 |
| 2 | −0.45720632E − 01 | −0.93555254E − 01 |
| 3 | +0.18766651E − 01 | +0.28645270E − 01 |
| 4 | −0.37170666E − 02 | +0.23819977E − 02 |
| 5 | −0.11334217E − 02 | −0.10561099E − 01 |
| 6 | +0.26667524E − 02 | +0.10428505E − 01 |
| 7 | −0.28777064E − 02 | −0.50128486E − 02 |
| 8 | +0.18202721E − 02 | −0.79128043E − 03 |
| 9 | −0.74578723E − 03 | +0.18741237E − 02 |
| 10 | +0.75868630E − 03 | +0.54691744E − 03 |
| 11 | −0.11159275E − 02 | −0.13866626E − 02 |
| 12 | +0.12249412E − 02 | +0.14015084E − 03 |
| 13 | −0.10232393E − 02 | +0.11944472E − 02 |
| 14 | +0.80900566E − 03 | −0.16713684E − 02 |
| Maximum error, percent for | | |
| $n=$ 10 | +0.81750139E + 00 | +0.10199890E + 01 |
| 11 | +0.70591864E + 00 | +0.88459402E + 00 |
| 12 | +0.58342451E + 00 | +0.87593496E + 00 |
| 13 | +0.48110057E + 00 | +0.82325637E + 00 |
| 14 | +0.40020000E + 00 | +0.65612495E + 00 |

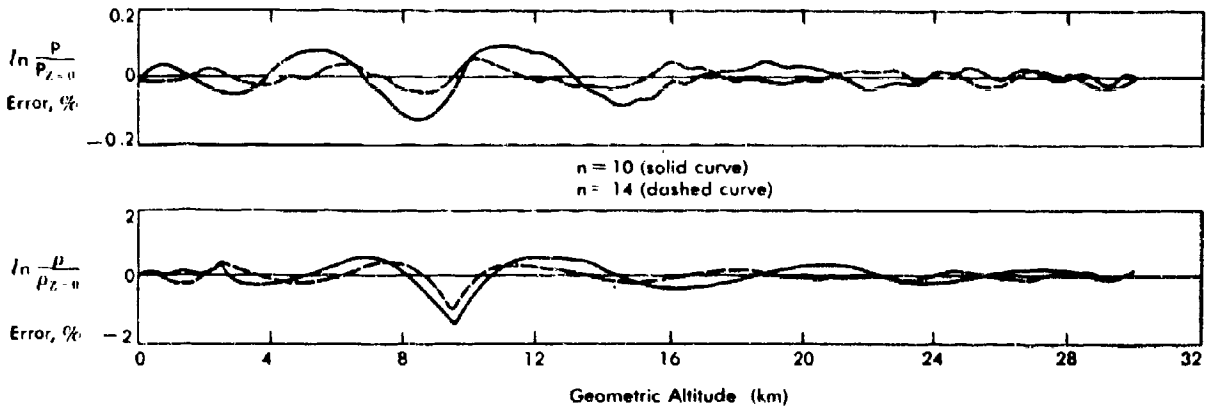



FIGURE 4.14.—Errors in representing the 75° N. Summer Supplementary Atmosphere.

TABLE 4.14.—APPROXIMATION OF 75° N. SUMMER SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 0.99925981\ P_0$
$\rho_{Z=0} = 1.03265306\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k = 0$ | $-0.42278519E+01$ | $-0.39573638E+01$ |
| 1 | $-0.21708018E+01$ | $-0.20952640E+01$ |
| 2 | $-0.29043083E-01$ | $-0.94215480E-01$ |
| 3 | $+0.24327983E-01$ | $+0.38691153E-01$ |
| 4 | $-0.70768897E-02$ | $-0.19255719E-02$ |
| 5 | $+0.39061656E-03$ | $-0.13326340E-01$ |
| 6 | $+0.30080657E-02$ | $+0.11360621E-01$ |
| 7 | $-0.20413522E-02$ | $+0.10086802E-02$ |
| 8 | $-0.31845975E-03$ | $-0.54632690E-02$ |
| 9 | $+0.86191803E-03$ | $+0.20982994E-02$ |
| 10 | $-0.30671941E-03$ | $+0.13258500E-02$ |
| 11 | $-0.23462532E-03$ | $-0.20557834E-02$ |
| 12 | $+0.40526052E-03$ | $-0.39581369E-03$ |
| 13 | $+0.65274826E-04$ | $+0.23348878E-02$ |
| 14 | $-0.24463654E-03$ | $-0.62716101E-03$ |
| Maximum error, percent for | | |
| $n = 10$ | $+0.12279234E+00$ | $+0.14662445E+01$ |
| 11 | $+0.99883296E-01$ | $+0.12945935E+01$ |
| 12 | $+0.74847855E-01$ | $+0.12864456E+01$ |
| 13 | $+0.71968951E-01$ | $+0.10562479E+01$ |
| 14 | $+0.52774628E-01$ | $+0.10238126E+01$ |

TABLE 4.15.—APPROXIMATION OF 75° N. WINTER (COLD) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k = 0$ | $-0.46979427E+01$ | $-0.44018058E+01$ |
| 1 | $-0.24385498E+01$ | $-0.23125096E+01$ |
| 2 | $-0.70155064E-01$ | $-0.11547751E-00$ |
| 3 | $+0.19577885E-01$ | $+0.22280943E-01$ |
| 4 | $-0.30149859E-02$ | $+0.46783411E-02$ |
| 5 | $-0.21707308E-03$ | $-0.10539889E-01$ |
| 6 | $+0.14251117E-02$ | $+0.89370371E-02$ |
| 7 | $-0.12219627E-02$ | $-0.40615459E-02$ |
| 8 | $+0.50480209E-03$ | $+0.32793775E-03$ |
| 9 | $+0.12261519E-03$ | $+0.13813689E-02$ |
| 10 | $-0.30169548E-03$ | $+0.14296263E-03$ |
| 11 | $-0.43468288E-04$ | $-0.14171108E-02$ |
| 12 | $+0.31536786E-03$ | $-0.67675316E-04$ |
| 13 | $-0.45298677E-04$ | $+0.14122584E-02$ |
| 14 | $-0.19354323E-04$ | $-0.13300160E-02$ |
| Maximum error, percent for | | |
| $n = 10$ | $+0.73231601E-01$ | $+0.82924217E+00$ |
| 11 | $+0.69713437E-01$ | $+0.69087446E+00$ |
| 12 | $+0.50133939E-01$ | $+0.69505423E+00$ |
| 13 | $+0.46390140E-01$ | $+0.63276887E+00$ |
| 14 | $+0.47741675E-01$ | $+0.49977154E+00$ |

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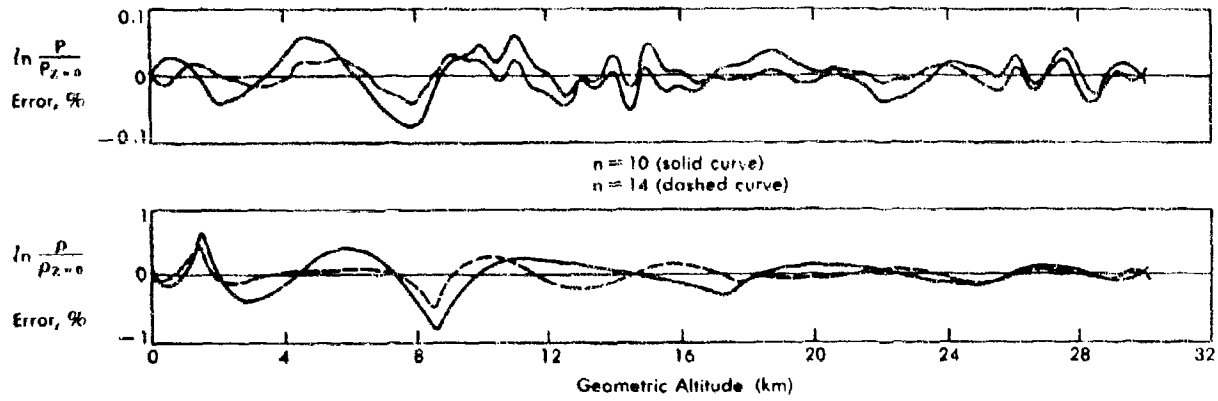


FIGURE 4.15.—Errors in representing the 75° N. Winter (Cold) Supplementary Atmosphere.

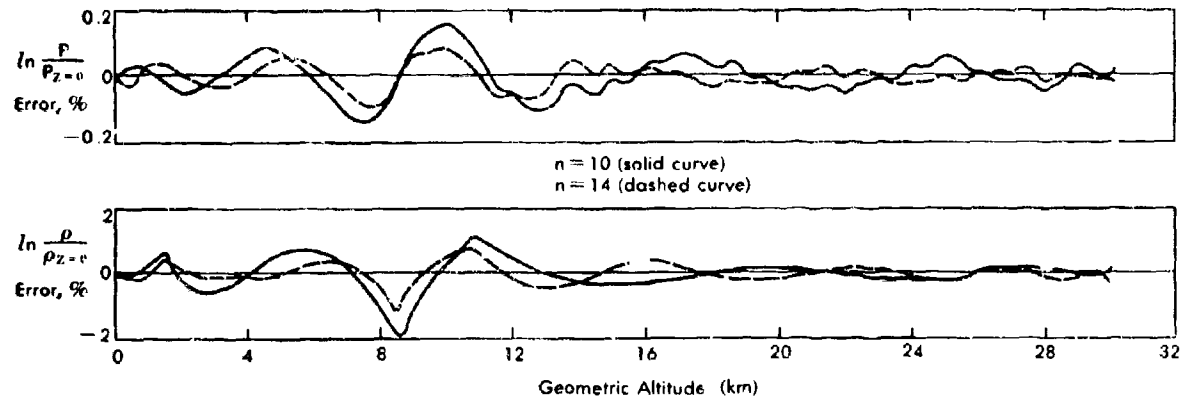


FIGURE 4.16.—Errors in representing the 75° N. Winter (Warm) Supplementary Atmosphere.

## 4.2 MID-LATITUDE OZONE MODEL TO 50 KILOMETERS

Observations from the ozonesonde network in North America, established in January 1963 (Hering and Borden, 1964), have been combined with rocket measurements and photochemical equilibrium calculations to provide a Mid-latitude Ozone Model which is a tentative annual mean of mid-latitude ozone data to 50 km.

4.2.1. DATA.—The lower 34-km portion of the ozone model is based on the data obtained from the systematic program of weekly ozonesonde ascents made throughout the year 1963 at Seattle, Washington; Fort Collins, Colorado; Madison, Wisconsin; and Bedford, Massachusetts. The mean profile represents the average of mean annual profiles computed for these stations after first averaging individual sounding data over 2-km vertical intervals. Approximately 150 ozonesonde ascents were used in the determination of the mean ozone profile.

The mean annual ozone distribution for heights above 34 km has been determined by analysis of photochemical equilibrium distributions as calculated by Dütsch (1956), Craig (1950), Leovy (1964), and London and Prabhakara (1962) in combination with rocket measurements over New Mexico by Johnson et al. (1951) in June 1949 and over Wallops Island by Reed and Scolnick (1964) in May 1960. Most weight was assigned to the rocket measurements in defining the ozone model, although there is rather good agreement with the theoretical distributions.

Table 4.17 gives the vertical distribution of ozone pressure, density, number density, and mixing ratio in the Mid-latitude Ozone Model to 50 km. Total ozone content, also provided, represents the depth of ozone contained in a square centimeter column of the atmosphere at standard pressure and temperature, STP (1013.25 mb and 273.15° K). Figures 4.17, 4.18, 4.19, and 4.20 show the partial pressure, density, number density, and mixing ratio profiles, respectively.

4.2.2 LIMITATIONS OF MODEL.—Although the ozonesonde observations to 34 km were taken at locations extending from Seattle, Washington, to Bedford, Massachusetts, a region covering 51° of longitude, results are considered, tentatively, as typical

TABLE 4.16.—APPROXIMATION OF 75° N. WINTER (WARM) SUPPLEMENTARY ATMOSPHERE BY TRUNCATED CHEBYSHEV EXPANSION

Altitude range: 0–30 km
Surface values: $P_{Z=0} = 1.00024673\ P_0$
$\rho_{Z=0} = 1.15673469\ \rho_0$
Chebyshev series expansion coefficients, $a_k$:

| | $\ln \frac{P}{P_{Z=0}}$ | $\ln \frac{\rho}{\rho_{Z=0}}$ |
|---|---|---|
| $k=0$ | $-0.44657178E+01$ | $-0.43199761E+01$ |
| 1 | $-0.22651483E+01$ | $-0.22321204E+01$ |
| 2 | $-0.77951595E-02$ | $-0.59124081E-01$ |
| 3 | $+0.19291746E-01$ | $+0.32498859E-01$ |
| 4 | $-0.70020744E-02$ | $-0.61137000E-02$ |
| 5 | $+0.23696890E-02$ | $-0.10065819E-01$ |
| 6 | $+0.15803441E-02$ | $+0.13643993E-01$ |
| 7 | $-0.21835677E-02$ | $-0.65008923E-02$ |
| 8 | $+0.11009927E-02$ | $-0.49258938E-03$ |
| 9 | $+0.22904447E-03$ | $+0.37893999E-02$ |
| 10 | $-0.76817563E-03$ | $-0.10783633E-02$ |
| 11 | $+0.16950855E-03$ | $-0.26967059E-02$ |
| 12 | $+0.44253781E-03$ | $+0.16621970E-02$ |
| 13 | $-0.35313824E-03$ | $+0.12531816E-02$ |
| 14 | $-0.10111955E-04$ | $-0.27423631E-02$ |
| Maximum error, percent for | | |
| $n=10$ | $+0.15889272E+00$ | $+0.18673599E+01$ |
| 11 | $+0.14936939E+00$ | $+0.16040519E+01$ |
| 12 | $+0.12314335E+00$ | $+0.15013710E+01$ |
| 13 | $+0.89350497E-01$ | $+0.14461011E+01$ |
| 14 | $+0.89396691E-01$ | $+0.11718735E+01$ |

of mid-latitude conditions around the northern hemisphere. Also, the representativeness of the ozone model based on the 1963 data was checked by comparison with available 1964 observations. Since fully-processed 1964 data were incomplete, 8-month averages were compared. The difference in average density was only $1 \times 10^{-9}$ kg m$^{-3}$ or 0.3 percent at 20 km and $2.1 \times 10^{-8}$ kg m$^{-3}$ or 11 percent at 14 km. The relatively large difference at 14 km probably results from the inter-annual change in the mean position of the tropospheric wind maximum and the associated change in tropopause height.

4.2.3 VARIABILITY.—Standard deviations of ozone density about the model are presented in Table 4.18 for 2-km intervals between the surface and 30 km. They are based on 244 ozonesonde network observations taken during 1963 and 1964. Consequently, the computed rms values include seasonal as well as synoptic-scale variations.

It is apparent from these data that the level of maximum variability lies near 12 km, with minimum variations near 4 km and 30 km or higher. All values, however, must be considered as first estimates due to the limited number of observations currently available. Also, the distribution of ozone seems to be skewed rather than normal, particularly in the lower stratosphere.

The existence of longer-period fluctuations also has been investigated. Angell and Korshover (1964),

TABLE 4.17.—MID-LATITUDE OZONE MODEL

| Altitude | | Pressure | | Density | Number Density | Mixing Ratio |
|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $P$, mb | $P$, mm | $\rho$, kg m$^{-3}$ | $n$, m$^{-3}$ | $w$, kgkg$^{-1}$ |
| 2000 | 2001 | 2.4 −5 | 1.8 −5 | 5.4 −8 | 6.7 +17 | 5.0 −8 |
| 4000 | 4003 | 2.2 | 1.6 | 4.6 | 5.8 | 6.0 |
| 6000 | 6006 | 2.0 | 1.5 | 4.5 | 5.7 | 7.0 |
| 8000 | 8010 | 2.0 | 1.5 | 5.2 | 6.5 | 1.0 −7 |
| 10000 | 10016 | 3.5 | 2.6 | 9.0 | 1.13+18 | 2.2 |
| 12000 | 12023 | 6.1 | 4.6 | 1.61−7 | 2.02 | 5.2 |
| 14000 | 14031 | 7.0 | 5.2 | 1.87 | 2.34 | 8.2 |
| 16000 | 16040 | 8.8 | 6.6 | 2.35 | 2.94 | 1.42 −6 |
| 18000 | 18051 | 1.21−4 | 9.1 | 3.22 | 4.05 | 2.67 |
| 20000 | 20063 | 1.42 | 1.06−4 | 3.80 | 4.77 | 4.31 |
| 22000 | 22076 | 1.46 | 1.10 | 3.87 | 4.85 | 6.07 |
| 24000 | 24091 | 1.38 | 1.04 | 3.62 | 4.54 | 7.82 |
| 26000 | 26107 | 1.24 | 9.3 −5 | 3.21 | 4.03 | 9.53 |
| 28000 | 28124 | 1.00 | 7.5 | 2.58 | 3.23 | 1.048−5 |
| 30000 | 30142 | 8.0 −5 | 6.0 | 2.03 | 2.55 | 1.129 |
| 32000 | 32162 | 6.4 | 4.8 | 1.61 | 2.02 | 1.217 |
| 34000 | 34183 | 5.0 | 3.8 | 1.24 | 1.56 | 1.294 |
| 36000 | 36205 | 3.8 | 2.8 | 9.2 −8 | 1.16 | 1.314 |
| 38000 | 38229 | 2.9 | 2.2 | 6.9 | 8.6 +17 | 1.324 |
| 40000 | 40253 | 2.1 | 1.6 | 4.9 | 6.1 | 1.267 |
| 42000 | 42279 | 1.4 | 1.0 | 3.2 | 4.1 | 1.124 |
| 44000 | 44307 | 9.0 −6 | 6.8 −6 | 2.1 | 2.6 | 9.52 −6 |
| 46000 | 46335 | 6.0 | 4.5 | 1.2 | 1.6 | 7.62 |
| 48000 | 48365 | 3.0 | 2.2 | 7.0 −9 | 9.0 +16 | 5.81 |
| 50000 | 50396 | 2.0 | 1.5 | 4.0 | 5.0 | 4.00 |

TOTAL OZONE=347 matm-cm (milli-atmosphere-centimeters), STP
=0.347 cm, STP

NOTE: 1. Values of ozone density in units of matm-cm/km may be obtained by multiplying the above values of ozone density by $0.467 \times 10^6$.
2. Values of ozone mixing ratio in units of parts per million by volume may be obtained by multiplying the above values of ozone mixing ratio by $0.603 \times 10^6$.

TABLE 4.18.—STANDARD DEVIATION OF OBSERVED OZONE DENSITY ABOUT MODEL

| Altitude $H$, m' | SD, $\rho$ (kg m$^{-3}$) | Altitude $H$, m' | SD, $\rho$ (kg m$^{-3}$) |
|---|---|---|---|
| 2000 | 3.0 −8 | | |
| 4000 | 2.3 | 18000 | 9.8−8 |
| 6000 | 2.4 | 20000 | 7.8 |
| 8000 | 4.7 | 22000 | 6.5 |
| 10000 | 9.8 | 24000 | 4.9 |
| 12000 | 1.26−7 | 26000 | 4.4 |
| 14000 | 1.18 | 28000 | 4.4 |
| 16000 | 1.13 | 30000 | 4.0 |

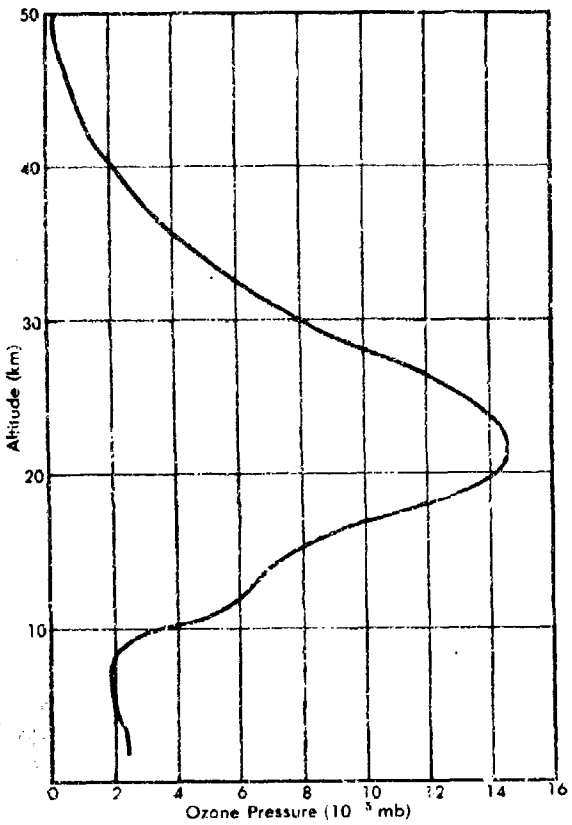


FIGURE 4.17.—Tentative mean annual mid-latitude ozone pressure.

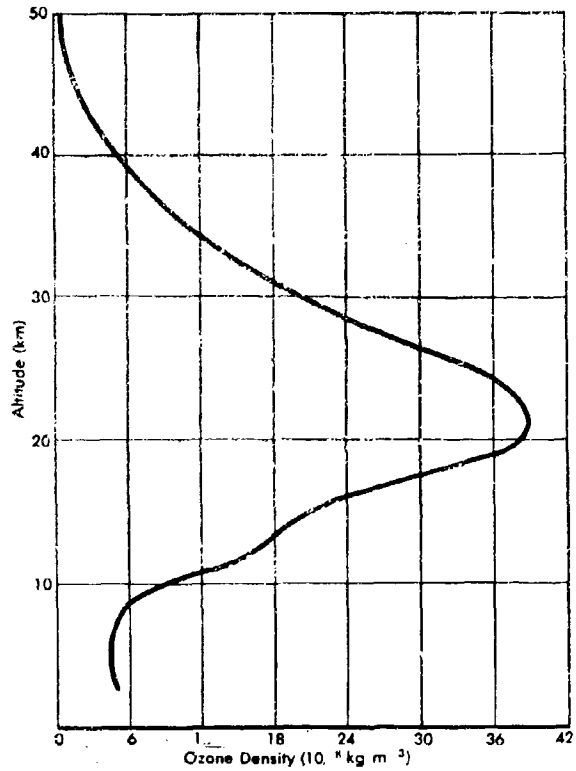


FIGURE 4.18.—Tentative mean annual mid-latitude ozone density.

for example, analyzed quasi-biennial variations in total ozone. Statistically significant biennial oscillations were found at all latitudes. The amplitude in mid-latitudes averages roughly 5 matm-cm. These fluctuations are small compared to total ozone values and synoptic-scale variability in the stratosphere.

## 4.3 GEOPOTENTIAL-GEOMETRIC ALTITUDE RELATIONS

4.3.1 INTRODUCTION.—This section presents a geopotential table which leads to the geometric altitude of equal geopotential surfaces at various latitudes in 15-degree increments from 0 to 90 degrees.

4.3.2 DEFINITION AND METHOD OF CALCULATION.—Geopotential $H_\phi$ of a unit mass, at a given latitude $\phi$, relative to the reference geopotential at the earth's surface $Z_0$ at the same latitude, varies with geometric altitude $Z$ and with the altitude-dependent acceleration of gravity $g_\phi(Z)$ for that latitude in accordance with the following integral equation:

$$H_\phi = \int_{Z_0}^{Z} g_\phi(Z)dZ \qquad (4.7)$$

Approaches of considerable though varying sophistication have been employed in recent years in the determination of a function of $Z$ which permits the perfect integration of Eq. (4.7), and thus leads to numerical values of $H_\phi$ (List, 1963; Minzner and Ripley, 1956; Minzner et al., 1958; *U.S. Standard Atmosphere, 1962*) for specified values of $Z$. The extreme differences in the values of $H_\phi$ for a given value of $Z$ as determined by any of these methods are very small compared with the uncertainties of the atmospheric properties tabulated in this document for the same value of $Z$. Thus, it is reasonable that the simpler of these sophisticated methods (List, 1963; Minzner and Ripley, 1956) be employed in the calculation of geopotential for use with atmospheric properties in these tables. The more complicated and more sophisticated of these referenced methods, that is, the method used in the *U.S. Standard Atmosphere, 1962*, yields a value of $H_\phi$ at 700 km which differs by less than 0.007 percent from that computed for these Supplementary Atmospheres for the same latitude.

Analytical relationships for $H_\phi$ as a function of $Z$, and for $Z_\phi$ as a function of $H$, both stemming from Eq. (4.7), are arrived at by replacing $g_\phi(Z)$ with a specialized form of the inverse-square law prior to the integration of Eq. (4.7). The resulting relationships are:

$$H_\phi(Z) \equiv H_\phi = \frac{r_\phi Z}{r_\phi + Z} \cdot \frac{g_\phi}{G} \qquad (4.8)$$

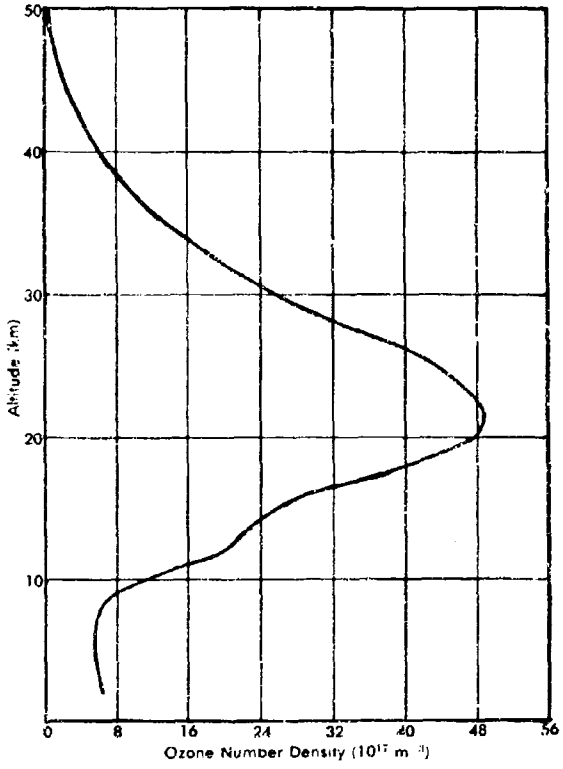


FIGURE 4.19.—Tentative mean annual mid-latitude ozone number density.

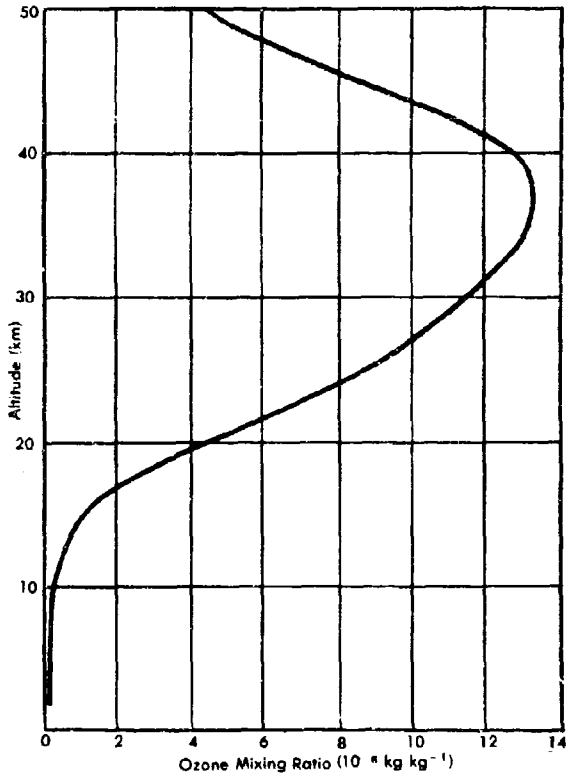


FIGURE 4.20.—Tentative mean annual mid-latitude ozone mixing ratio.

and

$$Z_\phi(H) \equiv Z_\phi = \frac{r_\phi H}{\frac{r_\phi g_\phi}{G} - H} \tag{4.9}$$

where

$H_\phi(Z) \equiv H_\phi$ = geopotential at latitude $\phi$ in geopotential meters (m′) as a function of geometric altitude $Z$

$Z_\phi(H) \equiv Z_\phi$ = geometric altitude at latitude $\phi$ in geometric meters (m) as a function of geopotential $H$,

$G = 9.80665$ m$^2$ sec$^{-2}$ (m′)$^{-1}$, which value implicitly defines one standard geopotential meter

$g_\phi$ = the sea-level value of the acceleration of gravity at latitude $\phi$, (m sec$^{-2}$)

$r_\phi$ = the effective earth's radius for latitude $\phi$, (m)

For any latitude $\phi$, the value of $r_\phi$ is generally not equal to the earth's radius for that latitude, but rather is a quantity calculated to meet certain boundary conditions (List, 1963; Minzner and Ripley, 1956, Appendix M), such that relationships of Eqs. (4.8) and (4.9) retain a high degree of validity over an extended range of altitudes at all latitudes in the geopotential table.

Geopotentials have been calculated for eight latitudes listed in Table 4.19, which also shows the related values of $r_\phi$ and $g_\phi$ employed in the calculations.

TABLE 4.19.—VALUES OF $r_\phi$ AND $g_\phi$ EMPLOYED IN THE CALCULATION OF GEOPOTENTIAL AT VARIOUS LATITUDES

| $\phi$ | $r_\phi$ | $g_\phi$ |
|---|---|---|
| 45°32′33″ | 6,356,766 | 9.80665 |
| 0° | 6,334,984 | 9.78036 |
| 15° | 6,337,838 | 9.78381 |
| 30° | 6,345,653 | 9.79324 |
| 45° | 6,356,360 | 9.80616 |
| 60° | 6,367,103 | 9.81911 |
| 75° | 6,374,972 | 9.82860 |
| 90° | 6,377,862 | 9.83208 |

The values of $g_\phi$ and $r_\phi$ applicable to latitudes 0°, 15°, 30°, 45°, 60°, 75°, and 90° as used in the geopotential calculations of this document were taken from Table 167 and Table 49, respectively, of the Smithsonian Tables (List, 1963). No values of $g_\phi$ and $r_\phi$ are given in the Smithsonian Tables, however, for the reference latitude, $R = 45°32′33″$.

The reference latitude is not an arbitrary value for which the appropriate value of $g_\phi$ must be found but, rather, $R$ is the latitude associated with the so-called standard acceleration of gravity equal to 9.80665 m sec$^{-2}$ as designated in all U.S. Standard Atmospheres published after 1922. If the latitude variation of the sea-level value of the acceleration of gravity is assumed to follow the Lambert equation (List, 1963), that is,

$$g_\phi = 9.806160(1 - 0.0026373 \cos 2\phi + 0.0000059 \cos^2 2\phi) \quad (4.10)$$

the value of $\phi$ which satisfies this equation for $g_\phi = 9.80665$ m sec$^{-2}$ is found to be $\phi = 45°32'33'' = R$. The value of $r_\phi$ for this latitude was computed in the manner described for the computation of values in Smithsonian Table 49 (List, 1963), or as previously discussed by Minzner and Ripley (1956). The use of this particular pair of values of $g_\phi$ and $r_\phi$ in Eq. (4.8) yields values of $H_R$ as a function of $Z$. The corresponding values of $Z$ and $H$ for latitude $R$ are hereafter referred to as $Z_R$ and $H_R$ and serve as the argument pair in the geopotential tables of this section. With the same values of $g_\phi$ and $r_\phi$, Eq. (4.9) yields values of $Z_R$ as a function of $H_R$, or as a function of the second member of the argument pair, $Z_R$ and $H_R$.

Sets of values of $Z_\phi$ as a function of the second member of the argument pair could be calculated for each latitude by means of Eq. (4.9) and the appropriate values of $g_\phi$ and $r_\phi$. A considerable reduction in the number of columns of print is obtained, however, by listing values of the departure of $Z_\phi$ from $Z_R$, in the form of $Z_\phi - Z_R$, as a function of the argument pair for each of the required latitudes.

A comparison of the values of geometric altitude as a function of $H$ in the *U.S. Standard Atmosphere, 1962* with values of $Z_R$ as computed by Eq. (4.9) for the same values of $H = H_R$ at the reference latitude $R$, shows that these two sets of values of $Z$ depart slowly from each other in accordance with some function of increasing values of $H$. The analytical expression for computing the 1962 Standard values of $Z$ as a function of $H$ (or vice versa) has not been published, but Minzner (1966) has shown that the unrounded 1962 Standard values of $Z$ as a function of $H$ are very closely approximated by an empirical function $Z_s$ which is defined by the following pair of equations:

$$Z_s = \frac{r_R[H + f(H)]}{\frac{r_R g_R}{G} - [H + f(H)]} \quad (4.11)$$

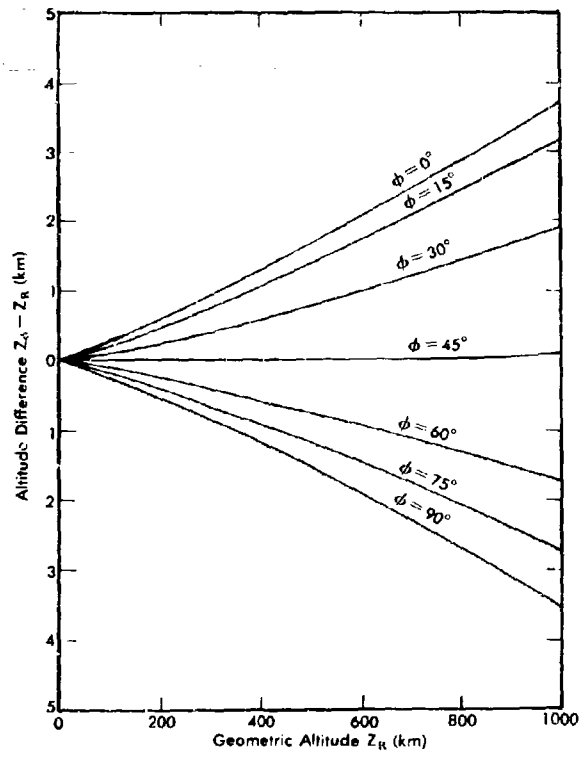


FIGURE 4.21.—Altitude difference ($Z_\phi - Z_R$) as a function of reference altitude $Z_R$ for each of seven latitudes.

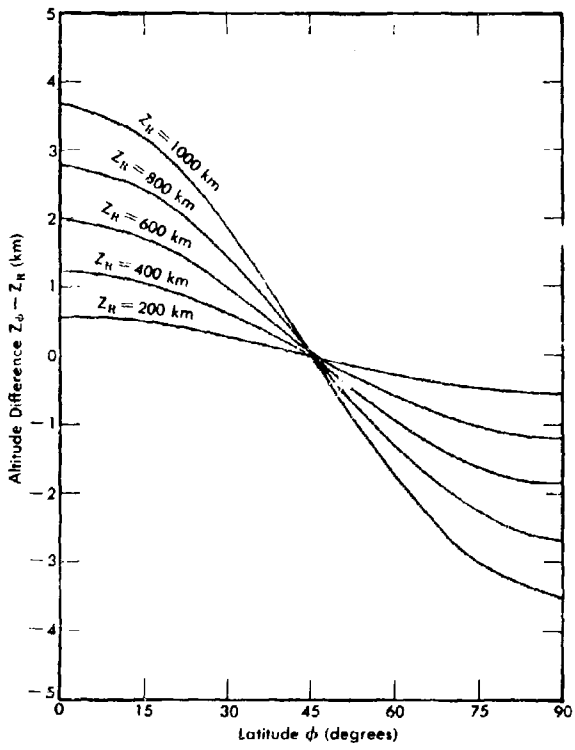


FIGURE 4.22.—Altitude difference ($Z_\phi - Z_P$) as a function of latitude for each of five equal-geopotential surfaces equivalent at the reference latitude to the geometric altitudes 200, 400, 600, 800, and 1000 km.

and

$$f(H) = A' + B'H + C'H^2 + D'H^3 + E'H^4 \quad (4.12)$$

where

$$A' = 0.2579651 \times 10^{-2} \text{ m}'$$
$$B' = 0.2161710 \times 10^{-7} \text{ m}'/\text{m}'$$
$$C' = 0.1807561 \times 10^{-10} \text{ m}'/(\text{m}')^2$$
$$D' = 0.9153012 \times 10^{-16} \text{ m}'/(\text{m}')^3$$
$$E' = 0.2006785 \times 10^{-22} \text{ m}'/(\text{m}')^4$$

Since the 1962 Standard like the earlier Standards used 9.80665 m sec$^{-2}$ as the sea-level value of the acceleration of gravity, this 1962 Standard may be associated with the reference latitude 45°32′33″, at least at sea level. Consequently, a comparison of $Z_s(H)$ with $Z_R(H)$ in the form of $(Z_s - Z_R)$ gives an overall indication of the uncertainties introduced into the $H$ to $Z$ relationship by using the simplified expressions of Eqs. (4.8) and (4.9) rather than the complicated method used in the 1962 Standard.

4.3.3 DESCRIPTION OF THE GEOPOTENTIAL TABLE.—The basic format of Table 4.20 is such as to provide one set of values of $Z_\phi - Z_R$ as a function of the argument pair, $Z_R$ and $H_R$, for each of seven latitudes. The argument pair occupies columns 1 and 2 while the successive sets of values of $Z_\phi - Z_R$, corresponding respectively to each of the seven successive latitudes, occupy the columns 3 through 9. Column 10 contains the set of values of $Z_s - Z_R$.

The particular format of the table is dictated by the large number of entries in the column of $Z_R$ as compared with the small number of values of latitude. Actually, the table will probably find its greatest usefulness in translating atmospheres computed for the reference latitude to other latitudes. From this point of view, latitude is the argument or independent variable and the table is found to provide differences in geometric altitudes for 256 equal geopotential surfaces as a function of latitude. The title of the table reflects this usage.

TABLE 4.20.—*Geometric Altitude Differences $Z_\phi - Z_R$ of Equal-Geopotential Surfaces $H_R$ as a Function of Latitude $\phi$, where Reference Latitude R = 45°32′33″*

| Geometric Altitude $Z_R$(m) | Geopotential $H_R$(m′) | $Z_\phi - Z_R$(m) Latitude $\phi$ (Deg) | | | | | | | $Z_s - Z_R$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 250. | 249.9 | 0.7 | 0.6 | 0.3 | 0.0 | −0.3 | −0.6 | −0.6 | 0.0 |
| 500. | 499.9 | 1.3 | 1.2 | 0.7 | 0.0 | −0.6 | −1.1 | −1.3 | 0.0 |
| 750. | 749.9 | 2.0 | 1.8 | 1.0 | 0.0 | −1.0 | −1.7 | −1.9 | 0.0 |
| 1000. | 999.8 | 2.7 | 2.3 | 1.4 | 0.0 | −1.3 | −2.2 | −2.6 | 0.0 |
| 1250. | 1249.7 | 3.4 | 2.9 | 1.7 | 0.1 | −1.6 | −2.8 | −3.2 | 0.0 |
| 1500. | 1499.6 | 4.0 | 3.5 | 2.1 | 0.1 | −1.9 | −3.4 | −3.9 | 0.0 |
| 1750. | 1749.5 | 4.7 | 4.1 | 2.4 | 0.1 | −2.2 | −3.9 | −4.5 | 0.0 |
| 2000. | 1999.3 | 5.4 | 4.7 | 2.7 | 0.1 | −2.5 | −4.5 | −5.2 | 0.0 |
| 2250. | 2249.2 | 6.1 | 5.3 | 3.1 | 0.1 | −2.9 | −5.0 | −5.8 | 0.0 |
| 2500. | 2499.0 | 6.7 | 5.8 | 3.4 | 0.1 | −3.2 | −5.6 | −6.5 | 0.0 |
| 2750. | 2748.8 | 7.4 | 6.4 | 3.8 | 0.1 | −3.5 | −6.1 | −7.1 | 0.0 |
| 3000. | 2998.5 | 8.1 | 7.0 | 4.1 | 0.2 | −3.8 | −6.7 | −7.8 | 0.0 |
| 3250. | 3248.3 | 8.7 | 7.6 | 4.5 | 0.2 | −4.1 | −7.3 | −8.4 | 0.0 |
| 3500. | 3498.0 | 9.4 | 8.2 | 4.8 | 0.2 | −4.4 | −7.8 | −9.1 | 0.0 |
| 3750. | 3747.7 | 10.1 | 8.8 | 5.1 | 0.2 | −4.8 | −8.4 | −9.7 | 0.0 |
| 4000. | 3997.4 | 10.8 | 9.4 | 5.5 | 0.2 | −5.1 | −8.9 | −10.4 | 0.0 |
| 4250. | 4247.1 | 11.4 | 9.9 | 5.8 | 0.2 | −5.4 | −9.5 | −11.0 | 0.0 |
| 4500. | 4496.8 | 12.1 | 10.5 | 6.2 | 0.2 | −5.7 | −10.1 | −11.7 | 0.0 |
| 4750. | 4746.4 | 12.8 | 11.1 | 6.5 | 0.2 | −6.0 | −10.6 | −12.3 | 0.0 |
| 5000. | 4996.0 | 13.5 | 11.7 | 6.9 | 0.3 | −6.4 | −11.2 | −13.0 | 0.0 |
| 5250. | 5245.6 | 14.1 | 12.3 | 7.2 | 0.3 | −6.7 | −11.7 | −13.6 | 0.0 |
| 5500. | 5495.2 | 14.8 | 12.9 | 7.5 | 0.3 | −7.0 | −12.3 | −14.3 | 0.0 |
| 5750. | 5744.8 | 15.5 | 13.5 | 7.9 | 0.3 | −7.3 | −12.9 | −14.9 | 0.0 |
| 6000. | 5994.3 | 16.2 | 14.0 | 8.2 | 0.3 | −7.6 | −13.4 | −15.6 | 0.0 |
| 6250. | 6243.8 | 16.8 | 14.6 | 8.6 | 0.3 | −7.9 | −14.0 | −16.2 | 0.0 |
| 6500. | 6493.3 | 17.5 | 15.2 | 8.9 | 0.3 | −8.3 | −14.5 | −16.9 | 0.0 |
| 6750. | 6742.8 | 18.2 | 15.8 | 9.3 | 0.3 | −8.6 | −15.1 | −17.5 | 0.0 |
| 7000. | 6992.3 | 18.9 | 16.4 | 9.6 | 0.4 | −8.9 | −15.7 | −18.2 | 0.0 |
| 7250. | 7241.7 | 19.5 | 17.0 | 10.0 | 0.4 | −9.2 | −16.2 | −18.8 | 0.0 |
| 7500. | 7491.1 | 20.2 | 17.6 | 10.3 | 0.4 | −9.5 | −16.8 | −19.4 | 0.0 |
| 7750. | 7740.5 | 20.9 | 18.1 | 10.6 | 0.4 | −9.9 | −17.4 | −20.1 | 0.0 |
| 8000. | 7989.9 | 21.6 | 18.7 | 11.0 | 0.4 | −10.2 | −17.9 | −20.8 | 0.0 |
| 8250. | 8239.3 | 22.2 | 19.3 | 11.3 | 0.4 | −10.5 | −18.5 | −21.4 | 0.0 |
| 8500. | 8488.6 | 22.9 | 19.9 | 11.7 | 0.4 | −10.8 | −19.0 | −22.1 | 0.0 |
| 8750. | 8737.9 | 23.6 | 20.5 | 12.0 | 0.4 | −11.1 | −19.6 | −22.7 | 0.0 |
| 9000. | 8987.2 | 24.3 | 21.1 | 12.4 | 0.5 | −11.5 | −20.2 | −23.4 | 0.0 |
| 9250. | 9236.5 | 24.9 | 21.7 | 12.7 | 0.5 | −11.8 | −20.7 | −24.0 | 0.0 |
| 9500. | 9485.8 | 25.6 | 22.3 | 13.1 | 0.5 | −12.1 | −21.3 | −24.7 | 0.0 |
| 9750. | 9735.0 | 26.3 | 22.8 | 13.4 | 0.5 | −12.4 | −21.8 | −25.3 | 0.0 |

TABLE 4.20. – Continued

| Geometric Altitude $Z_g$(m) | Geopotential $H_g$(m') | $Z_\phi - Z_g$(m) Latitude $\phi$ (Deg) | | | | | | | $Z_s - Z_g$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 10000. | 9984.2 | 27.0 | 23.4 | 13.7 | 0.5 | -12.7 | -22.4 | -26.0 | 0.0 |
| 10250. | 10233.4 | 27.7 | 24.0 | 14.1 | 0.5 | -13.1 | -23.0 | -26.6 | 0.0 |
| 10500. | 10482.6 | 28.3 | 24.6 | 14.4 | 0.5 | -13.4 | -23.5 | -27.3 | 0.0 |
| 10750. | 10731.8 | 29.0 | 25.2 | 14.8 | 0.5 | -13.7 | -24.1 | -27.9 | 0.0 |
| 11000. | 10980.9 | 29.7 | 25.8 | 15.1 | 0.6 | -14.0 | -24.7 | -28.6 | 0.0 |
| 11500. | 11479.2 | 31.0 | 27.0 | 15.8 | 0.6 | -14.7 | -25.8 | -29.9 | 0.0 |
| 12000. | 11977.3 | 32.4 | 28.1 | 16.5 | 0.6 | -15.3 | -26.9 | -31.2 | 0.0 |
| 12500. | 12475.4 | 33.8 | 29.3 | 17.2 | 0.6 | -15.9 | -28.0 | -32.5 | 0.0 |
| 13000. | 12973.4 | 35.1 | 30.5 | 17.9 | 0.7 | -16.6 | -29.2 | -33.8 | 0.0 |
| 13500. | 13471.3 | 36.5 | 31.7 | 18.6 | 0.7 | -17.2 | -30.3 | -35.1 | 0.0 |
| 14000. | 13969.2 | 37.8 | 32.8 | 19.3 | 0.7 | -17.9 | -31.4 | -36.4 | 0.0 |
| 14500. | 14467.0 | 39.2 | 34.0 | 20.0 | 0.7 | -18.5 | -32.5 | -37.7 | 0.0 |
| 15000. | 14964.6 | 40.5 | 35.2 | 20.7 | 0.8 | -19.1 | -33.7 | -39.0 | 0.0 |
| 15500. | 15462.2 | 41.9 | 36.4 | 21.3 | 0.8 | -19.8 | -34.8 | -40.3 | 0.0 |
| 16000. | 15959.8 | 43.3 | 37.6 | 22.0 | 0.8 | -20.4 | -35.9 | -41.6 | 0.0 |
| 16500. | 16457.2 | 44.6 | 38.7 | 22.7 | 0.8 | -21.1 | -37.1 | -42.9 | 0.0 |
| 17000. | 16954.6 | 46.0 | 39.9 | 23.4 | 0.9 | -21.7 | -38.2 | -44.2 | 0.0 |
| 17500. | 17451.9 | 47.3 | 41.1 | 24.1 | 0.9 | -22.3 | -39.3 | -45.5 | 0.0 |
| 18000. | 17949.1 | 48.7 | 42.3 | 24.8 | 0.9 | -23.0 | -40.5 | -46.9 | 0.0 |
| 18500. | 18446.3 | 50.1 | 43.5 | 25.5 | 0.9 | -23.6 | -41.6 | -48.2 | 0.0 |
| 19000. | 18943.3 | 51.4 | 44.7 | 26.2 | 1.0 | -24.3 | -42.7 | -49.5 | 0.0 |
| 19500. | 19440.3 | 52.8 | 45.8 | 26.9 | 1.0 | -24.9 | -43.9 | -50.8 | 0.0 |
| 20000. | 19937.2 | 54.1 | 47.0 | 27.6 | 1.0 | -25.6 | -45.0 | -52.1 | 0.0 |
| 20500. | 20434.1 | 55.5 | 48.2 | 28.3 | 1.0 | -26.2 | -46.1 | -53.4 | 0.0 |
| 21000. | 20930.8 | 56.9 | 49.4 | 29.0 | 1.1 | -26.8 | -47.3 | -54.7 | 0.0 |
| 21500. | 21427.5 | 58.2 | 50.6 | 29.7 | 1.1 | -27.5 | -48.4 | -56.0 | 0.0 |
| 22000. | 21924.1 | 59.6 | 51.8 | 30.4 | 1.1 | -28.1 | -49.5 | -57.3 | 0.0 |
| 22500. | 22420.6 | 61.0 | 53.0 | 31.1 | 1.1 | -28.8 | -50.7 | -58.7 | 0.0 |
| 23000. | 22917.0 | 62.3 | 54.1 | 31.8 | 1.2 | -29.4 | -51.8 | -60.0 | 0.0 |
| 23500. | 23413.4 | 63.7 | 55.3 | 32.5 | 1.2 | -30.1 | -52.9 | -61.3 | 0.0 |
| 24000. | 23909.7 | 65.1 | 56.5 | 33.1 | 1.2 | -30.7 | -54.1 | -62.6 | 0.0 |
| 24500. | 24405.9 | 66.4 | 57.7 | 33.8 | 1.2 | -31.4 | -55.2 | -63.9 | 0.0 |
| 25000. | 24902.0 | 67.8 | 58.9 | 34.5 | 1.3 | -32.0 | -56.3 | -65.2 | 0.0 |
| 25500. | 25398.1 | 69.2 | 60.1 | 35.2 | 1.3 | -32.7 | -57.5 | -66.6 | 0.0 |
| 26000. | 25894.0 | 70.5 | 61.3 | 35.9 | 1.3 | -33.3 | -58.6 | -67.9 | 0.0 |
| 26500. | 26389.9 | 71.9 | 62.5 | 36.6 | 1.3 | -33.9 | -59.7 | -69.2 | 0.0 |
| 27000. | 26885.8 | 73.3 | 63.6 | 37.3 | 1.4 | -34.6 | -60.9 | -70.5 | 0.0 |
| 27500. | 27381.5 | 74.7 | 64.8 | 38.0 | 1.4 | -35.2 | -62.0 | -71.8 | 0.0 |
| 28000. | 27877.2 | 76.0 | 66.0 | 38.7 | 1.4 | -35.9 | -63.2 | -73.1 | 0.0 |
| 28500. | 28372.7 | 77.4 | 67.2 | 39.4 | 1.4 | -36.5 | -64.3 | -74.5 | 0.0 |
| 29000. | 28868.3 | 78.8 | 68.4 | 40.1 | 1.5 | -37.2 | -65.4 | -75.8 | 0.0 |
| 29500. | 29363.7 | 80.1 | 69.6 | 40.8 | 1.5 | -37.8 | -66.6 | -77.1 | 0.0 |

TABLE 4.20. – Continued

| Geometric Altitude $Z_g$(m) | Geopotential $H_g$(m') | $Z_o - Z_g$(m) Latitude $\phi$ (Deg) | | | | | | | $Z_s - Z_g$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 30000. | 29859.0 | 81.5 | 70.8 | 41.5 | 1.5 | -38.5 | -67.7 | -78.4 | 0.0 |
| 30500. | 30354.3 | 82.9 | 72.0 | 42.2 | 1.5 | -39.1 | -68.9 | -79.7 | 0.0 |
| 31000. | 30849.5 | 84.3 | 73.2 | 42.9 | 1.6 | -39.8 | -70.0 | -81.1 | 0.0 |
| 31500. | 31344.6 | 85.6 | 74.4 | 43.6 | 1.6 | -40.4 | -71.1 | -82.4 | 0.0 |
| 32000. | 31839.7 | 87.0 | 75.6 | 44.3 | 1.6 | -41.1 | -72.3 | -83.7 | 0.0 |
| 33000. | 32829.5 | 89.8 | 78.0 | 45.7 | 1.7 | -42.4 | -74.6 | -86.4 | 0.0 |
| 34000. | 33819.1 | 92.5 | 80.3 | 47.1 | 1.7 | -43.7 | -76.9 | -89.0 | 0.0 |
| 35000. | 34808.3 | 95.3 | 82.7 | 48.5 | 1.8 | -45.0 | -79.1 | -91.7 | 0.0 |
| 36000. | 35797.2 | 98.0 | 85.1 | 49.9 | 1.8 | -46.3 | -81.4 | -94.3 | 0.0 |
| 37000. | 36785.8 | 100.8 | 87.5 | 51.3 | 1.9 | -47.6 | -83.7 | -97.0 | 0.0 |
| 38000. | 37774.1 | 103.5 | 89.9 | 52.7 | 1.9 | -48.9 | -86.0 | -99.6 | 0.0 |
| 39000. | 38762.1 | 106.3 | 92.3 | 54.2 | 2.0 | -50.2 | -88.3 | -102.3 | 0.0 |
| 40000. | 39749.8 | 109.1 | 94.7 | 55.6 | 2.0 | -51.5 | -90.6 | -104.9 | 0.0 |
| 41000. | 40737.2 | 111.8 | 97.1 | 57.0 | 2.1 | -52.8 | -92.9 | -107.6 | 0.0 |
| 42000. | 41724.3 | 114.6 | 99.5 | 58.4 | 2.1 | -54.1 | -95.2 | -110.3 | 0.0 |
| 43000. | 42711.0 | 117.4 | 101.9 | 59.8 | 2.2 | -55.4 | -97.5 | -112.9 | 0.0 |
| 44000. | 43697.5 | 120.1 | 104.3 | 61.2 | 2.2 | -56.7 | -99.8 | -115.6 | 0.0 |
| 45000. | 44683.6 | 122.9 | 106.8 | 62.6 | 2.3 | -58.0 | -102.1 | -118.3 | 0.0 |
| 46000. | 45669.5 | 125.7 | 109.2 | 64.0 | 2.3 | -59.3 | -104.4 | -120.9 | 0.0 |
| 47000. | 46655.0 | 128.5 | 111.6 | 65.4 | 2.4 | -60.6 | -106.7 | -123.6 | 0.0 |
| 48000. | 47640.2 | 131.3 | 114.0 | 66.9 | 2.4 | -62.0 | -109.0 | -126.3 | 0.1 |
| 49000. | 48625.1 | 134.0 | 116.4 | 68.3 | 2.5 | -63.3 | -111.3 | -129.0 | 0.1 |
| 50000. | 49609.7 | 136.8 | 118.8 | 69.7 | 2.5 | -64.6 | -113.7 | -131.6 | 0.1 |
| 51000. | 50594.0 | 139.6 | 121.2 | 71.1 | 2.6 | -65.9 | -116.0 | -134.3 | 0.1 |
| 52000. | 51578.0 | 142.4 | 123.7 | 72.5 | 2.6 | -67.2 | -118.3 | -137.0 | 0.1 |
| 53000. | 52561.7 | 145.2 | 126.1 | 74.0 | 2.7 | -68.5 | -120.6 | -139.7 | 0.1 |
| 54000. | 53545.1 | 148.0 | 128.5 | 75.4 | 2.7 | -69.8 | -122.9 | -142.4 | 0.1 |
| 55000. | 54528.2 | 150.8 | 130.9 | 76.8 | 2.8 | -71.2 | -125.2 | -145.0 | 0.1 |
| 56000. | 55510.9 | 153.6 | 133.4 | 78.2 | 2.9 | -72.5 | -127.6 | -147.7 | 0.1 |
| 57000. | 56493.4 | 156.4 | 135.8 | 79.7 | 2.9 | -73.8 | -129.9 | -150.4 | 0.1 |
| 58000. | 57475.5 | 159.2 | 138.2 | 81.1 | 3.0 | -75.1 | -132.2 | -153.1 | 0.1 |
| 59000. | 58457.4 | 162.0 | 140.7 | 82.5 | 3.0 | -76.4 | -134.5 | -155.8 | 0.1 |
| 60000. | 59438.9 | 164.8 | 143.1 | 83.9 | 3.1 | -77.8 | -136.9 | -158.5 | 0.1 |
| 61000. | 60420.2 | 167.6 | 145.5 | 85.4 | 3.1 | -79.1 | -139.2 | -161.2 | 0.1 |
| 62000. | 61401.1 | 170.4 | 148.0 | 86.8 | 3.2 | -80.4 | -141.5 | -163.9 | 0.1 |
| 63000. | 62381.7 | 173.2 | 150.4 | 88.2 | 3.2 | -81.7 | -143.9 | -166.6 | 0.1 |
| 64000. | 63362.0 | 176.0 | 152.8 | 89.7 | 3.3 | -83.1 | -146.2 | -169.3 | 0.1 |
| 65000. | 64342.0 | 178.8 | 155.3 | 91.1 | 3.3 | -84.4 | -148.5 | -172.0 | 0.1 |
| 66000. | 65321.7 | 181.6 | 157.7 | 92.5 | 3.4 | -85.7 | -150.9 | -174.7 | 0.1 |
| 67000. | 66301.1 | 184.4 | 160.2 | 93.9 | 3.4 | -87.1 | -153.2 | -177.4 | 0.1 |
| 68000. | 67280.2 | 187.3 | 162.6 | 95.4 | 3.5 | -88.4 | -155.5 | -180.1 | 0.1 |
| 69000. | 68259.0 | 190.1 | 165.1 | 96.8 | 3.5 | -89.7 | -157.9 | -182.9 | 0.1 |

TABLE 4.20. – Continued

| Geometric Altitude $Z_g$(m) | Geopotential $H_g$(m') | $Z_\phi - Z_g$(m) Latitude $\phi$ (Deg) | | | | | | | $Z_s - Z_g$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 70000. | 69237.5 | 192.9 | 167.5 | 98.3 | 3.6 | -91.0 | -160.2 | -185.6 | 0.1 |
| 71000. | 70215.7 | 195.7 | 170.0 | 99.7 | 3.6 | -92.4 | -162.6 | -188.3 | 0.1 |
| 72000. | 71193.6 | 198.6 | 172.4 | 101.1 | 3.7 | -93.7 | -164.9 | -191.0 | 0.1 |
| 73000. | 72171.2 | 201.4 | 174.9 | 102.6 | 3.7 | -95.0 | -167.3 | -193.7 | 0.1 |
| 74000. | 73148.4 | 204.2 | 177.4 | 104.0 | 3.8 | -96.4 | -169.8 | -196.4 | 0.1 |
| 75000. | 74125.4 | 207.0 | 179.8 | 105.5 | 3.8 | -97.7 | -172.0 | -199.2 | 0.1 |
| 76000. | 75102.0 | 209.9 | 182.3 | 106.9 | 3.9 | -99.1 | -174.3 | -201.9 | 0.1 |
| 77000. | 76078.4 | 212.7 | 184.7 | 108.4 | 4.0 | -100.4 | -176.7 | -204.6 | 0.1 |
| 78000. | 77054.5 | 215.6 | 187.2 | 109.8 | 4.0 | -101.7 | -179.0 | -207.4 | 0.2 |
| 79000. | 78030.2 | 218.4 | 189.7 | 111.2 | 4.1 | -103.1 | -181.4 | -210.1 | 0.2 |
| 80000. | 79005.7 | 221.2 | 192.1 | 112.7 | 4.1 | -104.4 | -183.8 | -212.8 | 0.2 |
| 81000. | 79980.8 | 224.1 | 194.6 | 114.1 | 4.2 | -105.8 | -186.1 | -215.6 | 0.2 |
| 82000. | 80955.7 | 226.9 | 197.1 | 115.6 | 4.2 | -107.1 | -188.5 | -218.3 | 0.2 |
| 83000. | 81930.2 | 229.8 | 199.5 | 117.0 | 4.3 | -108.5 | -190.9 | -221.0 | 0.2 |
| 84000. | 82904.4 | 232.6 | 202.0 | 118.5 | 4.3 | -109.8 | -193.2 | -223.8 | 0.2 |
| 85000. | 83878.4 | 235.5 | 204.5 | 119.9 | 4.4 | -111.1 | -195.6 | -226.5 | 0.2 |
| 86000. | 84852.0 | 238.3 | 207.0 | 121.4 | 4.4 | -112.5 | -198.0 | -229.3 | 0.2 |
| 87000. | 85825.3 | 241.2 | 209.5 | 122.9 | 4.5 | -113.8 | -200.3 | -232.0 | 0.2 |
| 88000. | 86798.4 | 244.0 | 211.9 | 124.3 | 4.5 | -115.2 | -202.7 | -234.8 | 0.2 |
| 89000. | 87771.1 | 246.9 | 214.4 | 125.8 | 4.6 | -116.5 | -205.1 | -237.5 | 0.2 |
| 90000. | 88743.5 | 249.8 | 216.9 | 127.2 | 4.6 | -117.9 | -207.4 | -240.3 | 0.2 |
| 92000. | 90687.4 | 255.5 | 221.9 | 130.1 | 4.7 | -120.6 | -212.2 | -245.8 | 0.2 |
| 94000. | 92630.2 | 261.2 | 226.9 | 133.1 | 4.9 | -123.3 | -217.0 | -251.3 | 0.2 |
| 96000. | 94571.7 | 267.0 | 231.9 | 136.0 | 5.0 | -126.0 | -221.7 | -256.8 | 0.2 |
| 98000. | 96512.1 | 272.7 | 236.9 | 138.9 | 5.1 | -128.7 | -226.5 | -262.3 | 0.3 |
| 100000. | 98451.2 | 278.5 | 241.8 | 141.8 | 5.2 | -131.4 | -231.3 | -267.9 | 0.3 |
| 102000. | 100389.1 | 284.3 | 246.9 | 144.8 | 5.3 | -134.2 | -236.1 | -273.4 | 0.3 |
| 104000. | 102325.9 | 290.0 | 251.9 | 147.7 | 5.4 | -136.9 | -240.9 | -279.0 | 0.3 |
| 106000. | 104261.4 | 295.8 | 256.9 | 150.7 | 5.5 | -139.6 | -245.7 | -284.5 | 0.3 |
| 108000. | 106195.7 | 301.6 | 261.9 | 153.6 | 5.6 | -142.3 | -250.5 | -290.1 | 0.3 |
| 110000. | 108128.8 | 307.4 | 267.0 | 156.6 | 5.7 | -145.1 | -255.3 | -295.7 | 0.3 |
| 112000. | 110060.8 | 313.2 | 272.0 | 159.5 | 5.8 | -147.8 | -260.1 | -301.3 | 0.4 |
| 114000. | 111991.5 | 319.0 | 277.1 | 162.5 | 5.9 | -150.6 | -265.0 | -306.8 | 0.4 |
| 116000. | 113921.1 | 324.8 | 282.1 | 165.5 | 6.0 | -153.3 | -269.8 | -312.5 | 0.4 |
| 118000. | 115849.5 | 330.7 | 287.2 | 168.4 | 6.1 | -156.1 | -274.6 | -318.1 | 0.4 |
| 120000. | 117776.6 | 336.5 | 292.2 | 171.4 | 6.3 | -158.8 | -279.5 | -323.7 | 0.4 |
| 125000. | 122589.3 | 351.1 | 304.9 | 178.9 | 6.5 | -165.7 | -291.6 | -337.7 | 0.5 |
| 130000. | 127394.6 | 365.8 | 317.7 | 186.3 | 6.8 | -172.6 | -303.8 | -351.9 | 0.5 |
| 135000. | 132192.6 | 380.5 | 330.5 | 193.8 | 7.1 | -179.6 | -316.0 | -366.0 | 0.6 |
| 140000. | 136983.1 | 395.3 | 343.3 | 201.3 | 7.3 | -186.6 | -328.3 | -380.2 | 0.6 |
| 145000. | 141766.2 | 410.1 | 356.2 | 208.9 | 7.6 | -193.5 | -340.6 | -394.4 | 0.7 |
| 150000. | 146542.0 | 425.0 | 369.1 | 216.5 | 7.9 | -200.6 | -352.9 | -408.7 | 0.7 |
| 155000. | 151310.5 | 439.9 | 382.0 | 224.1 | 8.2 | -207.6 | -365.3 | -423.1 | 0.8 |
| 160000. | 156071.6 | 454.9 | 395.0 | 231.7 | 8.5 | -214.6 | -377.7 | -437.5 | 0.8 |
| 165000. | 160825.5 | 469.9 | 408.1 | 239.3 | 8.7 | -221.7 | -390.2 | -451.9 | 0.9 |

TABLE 4 20. – Continued

| Geometric Altitude $Z_g$(km) | Geopotential $H_g$(m') | $Z_\phi - Z_g$(m) Latitude $\phi$ (Deg) | | | | | | | $Z_s - Z_g$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 170. | 165572.0 | 484.9 | 421.1 | 247.0 | 9.0 | -228.9 | -402.7 | -466.4 | 1.0 |
| 175. | 170311.3 | 500.1 | 434.3 | 254.7 | 9.3 | -236.0 | -415.2 | -480.9 | 1.0 |
| 180. | 175043.4 | 515.2 | 447.4 | 262.4 | 9.6 | -243.1 | -427.8 | -495.5 | 1.1 |
| 185. | 179768.2 | 530.4 | 460.6 | 270.2 | 9.9 | -250.3 | -440.4 | -510.1 | 1.2 |
| 190. | 184485.8 | 545.7 | 473.9 | 277.9 | 10.2 | -257.5 | -453.1 | -524.7 | 1.3 |
| 195. | 189196.2 | 561.0 | 487.2 | 285.7 | 10.4 | -264.7 | -465.8 | -539.5 | 1.4 |
| 200. | 193899.4 | 576.3 | 500.5 | 293.6 | 10.7 | -271.9 | -478.5 | -554.2 | 1.5 |
| 205. | 198595.4 | 591.7 | 513.9 | 301.4 | 11.0 | -279.2 | -491.3 | -569.0 | 1.6 |
| 210. | 203284.3 | 607.2 | 527.3 | 309.3 | 11.3 | -286.5 | -504.2 | -583.9 | 1.7 |
| 215. | 207966.1 | 622.7 | 540.8 | 317.2 | 11.6 | -293.8 | -517.0 | -598.7 | 1.8 |
| 220. | 212640.7 | 638.2 | 554.3 | 325.1 | 11.9 | -301.1 | -529.9 | -613.7 | 1.9 |
| 225. | 217308.2 | 653.8 | 567.8 | 333.0 | 12.1 | -308.5 | -542.9 | -628.7 | 2.0 |
| 230. | 221968.7 | 669.5 | 581.4 | 341.0 | 12.5 | -315.9 | -555.8 | -643.7 | 2.1 |
| 235. | 226622.1 | 685.1 | 595.0 | 349.0 | 12.7 | -323.3 | -568.9 | -658.8 | 2.2 |
| 240. | 231268.4 | 700.9 | 608.7 | 357.0 | 13.0 | -330.7 | -581.9 | -673.9 | 2.3 |
| 245. | 235907.7 | 716.7 | 622.4 | 365.0 | 13.3 | -338.1 | -595.0 | -689.1 | 2.4 |
| 250. | 240539.9 | 732.5 | 636.1 | 373.1 | 13.6 | -345.6 | -608.2 | -704.3 | 2.6 |
| 255. | 245165.2 | 748.4 | 650.0 | 381.2 | 13.9 | -353.1 | -621.3 | -719.5 | 2.7 |
| 260. | 249783.5 | 764.3 | 663.8 | 389.3 | 14.2 | -360.6 | -634.6 | -734.9 | 2.8 |
| 265. | 254394.8 | 780.3 | 677.6 | 397.4 | 14.5 | -368.2 | -647.8 | -750.2 | 3.0 |
| 270. | 258999.1 | 796.3 | 691.6 | 405.6 | 14.8 | -375.7 | -661.1 | -765.6 | 3.1 |
| 275. | 263596.5 | 812.4 | 705.5 | 413.8 | 15.1 | -383.3 | -674.5 | -781.1 | 3.3 |
| 280. | 268187.0 | 828.5 | 719.5 | 422.0 | 15.4 | -390.9 | -687.9 | -796.6 | 3.5 |
| 285. | 272770.5 | 844.7 | 733.6 | 430.2 | 15.7 | -398.5 | -701.2 | -812.1 | 3.6 |
| 290. | 277347.2 | 860.9 | 747.7 | 438.5 | 16.0 | -406.2 | -714.7 | -827.7 | 3.8 |
| 295. | 281917.0 | 877.2 | 761.8 | 446.8 | 16.3 | -413.8 | -728.2 | -843.3 | 4.0 |
| 300. | 286479.9 | 893.5 | 776.0 | 455.1 | 16.6 | -421.5 | -741.7 | -859.0 | 4.1 |
| 310. | 295585.2 | 926.3 | 804.4 | 471.8 | 17.2 | -437.0 | -768.9 | -890.5 | 4.5 |
| 320. | 304663.2 | 959.3 | 833.1 | 488.6 | 17.8 | -452.6 | -796.3 | -922.2 | 4.9 |
| 330. | 313714.0 | 992.5 | 861.9 | 505.5 | 18.4 | -468.2 | -823.8 | -954.1 | 5.3 |
| 340. | 322737.9 | 1025.9 | 890.9 | 522.5 | 19.1 | -483.9 | -851.5 | -986.1 | 5.7 |
| 350. | 331734.8 | 1059.4 | 920.0 | 539.6 | 19.7 | -499.7 | -879.3 | -1018.3 | 6.2 |
| 360. | 340704.9 | 1093.2 | 949.3 | 556.7 | 20.3 | -515.7 | -907.3 | -1050.8 | 6.7 |
| 370. | 349648.4 | 1127.1 | 978.8 | 574.0 | 20.9 | -531.6 | -935.5 | -1083.4 | 7.2 |
| 380. | 358565.3 | 1161.3 | 1008.5 | 591.4 | 21.6 | -547.7 | -963.8 | -1116.1 | 7.7 |
| 390. | 367455.8 | 1195.6 | 1038.2 | 608.9 | 22.2 | -564.0 | -992.3 | -1149.1 | 8.3 |
| 400. | 376320.0 | 1230.1 | 1068.2 | 626.4 | 22.8 | -580.2 | -1020.9 | -1182.3 | 8.9 |
| 410. | 385158.0 | 1264.9 | 1098.4 | 644.1 | 23.5 | -596.6 | -1049.7 | -1215.6 | 9.5 |
| 420. | 393969.9 | 1299.8 | 1128.7 | 661.9 | 24.2 | -613.0 | -1078.6 | -1249.1 | 10.1 |
| 430. | 402755.7 | 1334.9 | 1159.2 | 679.8 | 24.8 | -629.6 | -1107.8 | -1282.9 | 10.8 |
| 440. | 411515.8 | 1370.2 | 1189.9 | 697.8 | 25.5 | -646.2 | -1137.0 | -1316.7 | 11.4 |
| 450. | 420250.1 | 1405.7 | 1220.7 | 715.8 | 26.1 | -663.0 | -1166.4 | -1350.8 | 12.2 |
| 460. | 428958.9 | 1441.4 | 1251.7 | 734.0 | 26.8 | -679.7 | -1196.0 | -1385.0 | 12.9 |
| 470. | 437642.0 | 1477.2 | 1282.8 | 752.3 | 27.4 | -696.7 | -1225.8 | -1419.5 | 13.7 |
| 480. | 446299.8 | 1513.3 | 1314.2 | 770.6 | 28.1 | -713.7 | -1255.7 | -1454.1 | 14.5 |
| 490. | 454932.3 | 1549.6 | 1345.7 | 789.1 | 28.8 | -730.8 | -1285.7 | -1488.9 | 15.3 |

TABLE 4.20. – Continued

| Geometric Altitude $Z_g$(km) | Geopotential $H_g$(m') | $Z_\phi - Z_g$(m) Latitude $\phi$ (Deg | | | | | | | $Z_s - Z_g$ |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 15 | 30 | 45 | 60 | 75 | 90 | |
| 500. | 463539.6 | 1586.1 | 1377.4 | 807.7 | 29.5 | -747.9 | -1316.0 | -1523.9 | 16.2 |
| 510. | 472121.8 | 1622.7 | 1409.2 | 826.3 | 30.1 | -765.2 | -1346.4 | -1559.2 | 17.1 |
| 520. | 480679.1 | 1659.6 | 1441.2 | 845.1 | 30.8 | -782.6 | -1376.9 | -1594.5 | 18.0 |
| 530. | 489211.6 | 1696.7 | 1473.4 | 864.0 | 31.5 | -800.0 | -1407.6 | -1630.1 | 19.0 |
| 540. | 497719.2 | 1733.9 | 1505.7 | 882.9 | 32.2 | -817.6 | -1438.5 | -1665.8 | 20.0 |
| 550. | 506202.3 | 1771.3 | 1538.2 | 902.0 | 32.9 | -835.2 | -1469.5 | -1701.7 | 21.0 |
| 560. | 514660.8 | 1809.0 | 1570.9 | 921.1 | 33.6 | -853.0 | -1500.7 | -1737.8 | 22.1 |
| 570. | 523095.0 | 1846.8 | 1603.7 | 940.4 | 34.3 | -870.8 | -1532.0 | -1774.1 | 23.2 |
| 580. | 531504.7 | 1884.8 | 1636.7 | 959.7 | 35.0 | -888.7 | -1563.5 | -1810.6 | 24.3 |
| 590. | 539890.3 | 1923.0 | 1669.9 | 979.2 | 35.7 | -906.7 | -1595.2 | -1847.3 | 25.5 |
| 600. | 548251.8 | 1961.4 | 1703.3 | 998.7 | 36.4 | -924.8 | -1627.0 | -1884.1 | 26.7 |
| 610. | 556589.3 | 2000.1 | 1736.8 | 1018.4 | 37.2 | -942.9 | -1658.9 | -1921.1 | 28.0 |
| 620. | 564902.8 | 2038.8 | 1770.5 | 1038.1 | 37.8 | -961.3 | -1691.1 | -1958.4 | 29.3 |
| 630. | 573192.6 | 2077.8 | 1804.3 | 1058.0 | 38.6 | -979.6 | -1723.4 | -1995.7 | 30.6 |
| 640. | 581458.6 | 2117.0 | 1838.4 | 1077.9 | 39.3 | -998.0 | -1755.8 | -2033.3 | 32.0 |
| 650. | 589701.1 | 2156.3 | 1872.5 | 1097.9 | 40.0 | -1016.6 | -1788.5 | -2071.1 | 33.4 |
| 660. | 597920.1 | 2195.9 | 1906.9 | 1118.1 | 40.8 | -1035.2 | -1821.3 | -2109.1 | 34.8 |
| 670. | 606115.7 | 2235.7 | 1941.4 | 1138.3 | 41.5 | -1054.0 | -1854.2 | -2147.2 | 36.3 |
| 680. | 614288.0 | 2275.7 | 1976.1 | 1158.7 | 42.3 | -1072.8 | -1887.3 | -2185.5 | 37.8 |
| 690. | 622437.0 | 2315.8 | 2011.0 | 1179.1 | 43.0 | -1091.7 | -1920.6 | -2224.0 | 39.4 |
| 700. | 630563.0 | 2356.2 | 2046.0 | 1199.7 | 43.7 | -1110.7 | -1954.0 | -2262.7 | 41.0 |
| 710. | 638666.1 | 2396.7 | 2081.2 | 1220.3 | 44.5 | -1129.8 | -1987.5 | -2301.6 | |
| 720. | 646746.2 | 2437.5 | 2116.6 | 1241.1 | 45.3 | -1148.9 | -2021.2 | -2340.6 | |
| 730. | 654803.4 | 2478.4 | 2152.1 | 1261.8 | 46.0 | -1168.2 | -2055.2 | -2379.9 | |
| 740. | 662838.0 | 2519.5 | 2187.8 | 1282.8 | 46.8 | -1187.6 | -2089.2 | -2419.3 | |
| 750. | 670850.0 | 2560.8 | 2223.7 | 1303.8 | 47.6 | -1207.0 | -2123.4 | -2458.9 | |
| 760. | 678839.5 | 2602.4 | 2259.8 | 1325.0 | 48.4 | -1226.5 | -2157.7 | -2498.6 | |
| 770. | 686806.5 | 2644.0 | 2296.0 | 1346.2 | 49.1 | -1246.2 | -2192.3 | -2538.7 | |
| 780. | 694751.3 | 2685.9 | 2332.3 | 1367.5 | 49.9 | -1265.9 | -2227.0 | -2578.8 | |
| 790. | 702673.8 | 2728.0 | 2368.9 | 1388.9 | 50.7 | -1285.7 | -2261.8 | -2619.2 | |
| 800. | 710574.1 | 2770.3 | 2405.6 | 1410.4 | 51.4 | -1305.7 | -2296.9 | -2659.7 | |
| 820. | 726308.7 | 2855.5 | 2479.6 | 1453.8 | 53.0 | -1345.7 | -2367.3 | -2741.3 | |
| 840. | 741955.9 | 2941.3 | 2554.1 | 1497.5 | 54.6 | -1386.2 | -2438.5 | -2823.7 | |
| 860. | 757516.4 | 3028.1 | 2629.4 | 1541.6 | 56.2 | -1427.0 | -2510.2 | -2906.7 | |
| 880. | 772990.8 | 3115.6 | 2705.4 | 1586.1 | 57.8 | -1468.2 | -2582.6 | -2990.6 | |
| 900. | 788380.0 | 3203.9 | 2782.0 | 1631.1 | 59.5 | -1509.7 | -2655.6 | -3075.1 | |
| 920. | 803684.5 | 3292.9 | 2859.3 | 1676.3 | 61.1 | -1551.6 | -2729.3 | -3160.5 | |
| 940. | 818905.2 | 3382.7 | 2937.3 | 1722.1 | 62.8 | -1593.8 | -2803.6 | -3246.4 | |
| 960. | 834042.7 | 3473.3 | 3015.9 | 1768.1 | 64.5 | -1636.5 | -2878.6 | -3333.3 | |
| 980. | 849097.6 | 3564.7 | 3095.3 | 1814.7 | 66.2 | -1679.4 | -2954.1 | -3420.7 | |
| 1000. | 864070.7 | 3656.7 | 3175.2 | 1861.5 | 67.8 | -1722.8 | -3030.4 | -3509.0 | |

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# PART 5

## Tables of Properties of Supplementary Atmospheres to 120 Kilometers

Table 5.1

Sea level to 120 km

TEMPERATURE, PRESSURE, DENSITY, SOUND SPEED, COEFFICIENT OF VISCOSITY AND THERMAL CONDUCTIVITY

Metric Units

TABLE 5.1.
15° N. Annual
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, °K | $t$, °C | $T-T_{ms}$ | $P$, mb | $\frac{P}{P_{ms}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{ms}}$ | $C$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 0 | 0 | 302.59 | 29.44 | 14.44 | 1.01325 + 3 | 1.000 | 1.167 + 0 | 0.952 | 348.7 | 1.858 − 5 | 6.322 − 6 |
| 250 | 251 | 300.91 | 27.76 | 14.39 | 9.850 + 2 | 1.001 | 1.140 | 0.953 | 347.7 | 1.850 | 6.291 |
| 500 | 501 | 299.24 | 26.09 | 14.34 | 9.573 | 1.003 | 1.115 | 0.955 | 346.8 | 1.842 | 6.260 |
| 750 | 752 | 297.57 | 24.42 | 14.29 | 9.303 | 1.004 | 1.089 | 0.956 | 345.8 | 1.834 | 6.229 |
| 1000 | 1002 | 295.89 | 22.74 | 14.24 | 9.039 | 1.006 | 1.064 | 0.957 | 344.8 | 1.827 | 6.198 |
| 1250 | 1253 | 294.25 | 21.10 | 14.23 | 8.781 | 1.007 | 1.040 | 0.958 | 343.9 | 1.819 | 6.167 |
| 1500 | 1504 | 292.61 | 19.46 | 14.21 | 8.529 | 1.009 | 1.015 | 0.960 | 342.9 | 1.811 | 6.137 |
| 1750 | 1755 | 290.98 | 17.83 | 14.20 | 8.283 | 1.010 | 9.917 − 1 | 0.961 | 342.0 | 1.803 | 6.106 |
| 2000 | 2005 | 289.34 | 16.19 | 14.19 | 8.043 | 1.012 | 9.684 | 0.963 | 341.0 | 1.795 | 6.075 |
| 2250 | 2256 | 287.72 | 14.57 | 14.19 | 7.809 | 1.013 | 9.455 | 0.963 | 340.0 | 1.787 | 6.045 |
| 2500 | 2507 | 287.74 | 14.59 | 15.84 | 7.580 + 2 | 1.015 | 9.177 − 1 | 0.959 | 340.1 | 1.787 − 5 | 6.045 − 6 |
| 2750 | 2758 | 286.01 | 12.86 | 15.74 | 7.353 | 1.017 | 8.962 | 0.961 | 339.0 | 1.779 | 6.013 |
| 3000 | 3008 | 284.28 | 11.13 | 15.63 | 7.141 | 1.019 | 8.750 | 0.963 | 338.0 | 1.771 | 5.980 |
| 3250 | 3259 | 282.55 | 9.40 | 15.53 | 6.929 | 1.020 | 8.543 | 0.964 | 337.0 | 1.762 | 5.948 |
| 3500 | 3510 | 280.82 | 7.67 | 15.42 | 6.722 | 1.022 | 8.339 | 0.966 | 335.9 | 1.754 | 5.915 |
| 3750 | 3761 | 279.09 | 5.94 | 15.32 | 6.520 | 1.024 | 8.138 | 0.968 | 334.9 | 1.745 | 5.882 |
| 4000 | 4012 | 277.36 | 4.21 | 15.21 | 6.323 | 1.026 | 7.941 | 0.970 | 333.9 | 1.737 | 5.849 |
| 4250 | 4263 | 275.66 | 2.51 | 15.13 | 6.130 | 1.028 | 7.748 | 0.971 | 332.8 | 1.728 | 5.817 |
| 4500 | 4514 | 273.95 | 0.80 | 15.05 | 5.943 | 1.029 | 7.557 | 0.973 | 331.8 | 1.720 | 5.784 |
| 4750 | 4765 | 272.24 | −0.91 | 14.97 | 5.760 | 1.031 | 7.370 | 0.975 | 330.8 | 1.712 | 5.752 |
| 5000 | 5016 | 270.54 | −2.61 | 14.89 | 5.581 + 2 | 1.033 | 7.187 − 1 | 0.976 | 329.7 | 1.703 − 5 | 5.719 − 6 |
| 5250 | 5267 | 268.83 | −4.32 | 14.80 | 5.407 | 1.035 | 7.007 | 0.978 | 328.7 | 1.695 | 5.687 |
| 5500 | 5518 | 267.12 | −6.03 | 14.72 | 5.238 | 1.037 | 6.831 | 0.980 | 327.6 | 1.686 | 5.654 |
| 5750 | 5769 | 265.42 | −7.73 | 14.64 | 5.072 | 1.039 | 6.658 | 0.982 | 326.6 | 1.678 | 5.621 |
| 6000 | 6020 | 263.71 | −9.44 | 14.56 | 4.911 | 1.041 | 6.488 | 0.983 | 325.5 | 1.669 | 5.588 |
| 6250 | 6271 | 262.02 | −11.13 | 14.49 | 4.754 | 1.043 | 6.321 | 0.985 | 324.5 | 1.660 | 5.556 |
| 6500 | 6522 | 260.32 | −12.83 | 14.42 | 4.601 | 1.045 | 6.158 | 0.987 | 323.4 | 1.652 | 5.523 |
| 6750 | 6773 | 258.63 | −14.52 | 14.36 | 4.452 | 1.047 | 5.997 | 0.989 | 322.4 | 1.643 | 5.490 |
| 7000 | 7024 | 256.94 | −16.21 | 14.29 | 4.307 | 1.049 | 5.840 | 0.991 | 321.3 | 1.635 | 5.458 |
| 7250 | 7275 | 255.25 | −17.90 | 14.22 | 4.166 | 1.051 | 5.686 | 0.992 | 320.3 | 1.626 | 5.425 |
| 7500 | 7526 | 253.56 | −19.59 | 14.16 | 4.028 + 2 | 1.053 | 5.535 − 1 | 0.994 | 319.2 | 1.617 − 5 | 5.392 − 6 |
| 7750 | 7778 | 251.86 | −21.29 | 14.09 | 3.895 | 1.055 | 5.387 | 0.996 | 318.1 | 1.609 | 5.359 |
| 8000 | 8029 | 250.17 | −22.98 | 14.02 | 3.764 | 1.057 | 5.242 | 0.998 | 317.1 | 1.600 | 5.326 |
| 8250 | 8280 | 248.49 | −24.66 | 13.97 | 3.638 | 1.060 | 5.100 | 1.000 | 316.0 | 1.591 | 5.293 |
| 8500 | 8531 | 246.81 | −26.34 | 13.91 | 3.514 | 1.062 | 4.960 | 1.002 | 314.9 | 1.583 | 5.260 |
| 8750 | 8783 | 245.13 | −28.02 | 13.85 | 3.394 | 1.064 | 4.824 | 1.004 | 313.9 | 1.574 | 5.227 |
| 9000 | 9034 | 243.44 | −29.71 | 13.79 | 3.278 | 1.066 | 4.690 | 1.006 | 312.8 | 1.565 | 5.194 |
| 9250 | 9285 | 241.76 | −31.39 | 13.74 | 3.164 | 1.068 | 4.560 | 1.008 | 311.7 | 1.556 | 5.161 |
| 9500 | 9537 | 240.08 | −33.07 | 13.68 | 3.054 | 1.071 | 4.432 | 1.010 | 310.6 | 1.547 | 5.128 |
| 9750 | 9788 | 238.40 | −34.75 | 13.62 | 2.947 | 1.073 | 4.306 | 1.012 | 309.5 | 1.539 | 5.095 |
| 10000 | 10039 | 236.72 | −36.43 | 13.57 | 2.843 + 2 | 1.075 | 4.184 − 1 | 1.014 | 308.4 | 1.530 − 5 | 5.062 − 6 |
| 10250 | 10291 | 235.04 | −38.11 | 13.51 | 2.742 | 1.078 | 4.064 | 1.016 | 307.3 | 1.521 | 5.029 |
| 10500 | 10542 | 233.36 | −39.79 | 13.46 | 2.644 | 1.080 | 3.946 | 1.018 | 306.2 | 1.512 | 4.995 |
| 10750 | 10793 | 231.68 | −41.47 | 13.40 | 2.548 | 1.083 | 3.832 | 1.020 | 305.1 | 1.503 | 4.962 |
| 11000 | 11045 | 230.00 | −43.15 | 13.35 | 2.456 | 1.085 | 3.720 | 1.022 | 304.0 | 1.494 | 4.929 |
| 11500 | 11548 | 226.65 | −46.50 | 10.00 | 2.279 | 1.089 | 3.502 | 1.041 | 301.8 | 1.476 | 4.862 |
| 12000 | 12051 | 223.30 | −49.85 | 6.65 | 2.112 | 1.093 | 3.295 | 1.060 | 299.6 | 1.458 | 4.795 |
| 12500 | 12554 | 219.95 | −53.20 | 3.30 | 1.955 | 1.095 | 3.097 | 1.078 | 297.3 | 1.440 | 4.728 |
| 13000 | 13057 | 216.60 | −56.55 | −0.05 | 1.808 | 1.095 | 2.908 | 1.095 | 295.0 | 1.421 | 4.661 |
| 13500 | 13560 | 213.25 | −59.90 | −3.40 | 1.670 | 1.094 | 2.728 | 1.112 | 292.7 | 1.403 | 4.593 |
| 14000 | 14064 | 209.90 | −63.25 | −6.75 | 1.541 + 2 | 1.093 | 2.557 − 1 | 1.127 | 290.4 | 1.384 − 5 | 4.525 − 6 |
| 14500 | 14567 | 206.55 | −66.60 | −10.10 | 1.419 | 1.089 | 2.394 | 1.142 | 288.1 | 1.366 | 4.457 |
| 15000 | 15071 | 203.20 | −69.95 | −13.45 | 1.306 | 1.084 | 2.238 | 1.156 | 285.8 | 1.347 | 4.389 |
| 15500 | 15574 | 199.85 | −73.30 | −16.80 | 1.200 | 1.078 | 2.091 | 1.168 | 283.4 | 1.328 | 4.321 |
| 16000 | 16078 | 196.50 | −76.65 | −20.15 | 1.100 | 1.069 | 1.951 | 1.180 | 281.0 | 1.309 | 4.252 |
| 16500 | 16582 | 193.15 | −80.00 | −23.50 | 1.008 | 1.060 | 1.818 | 1.189 | 278.6 | 1.289 | 4.184 |
| 17000 | 17086 | 193.15 | −78.00 | −21.50 | 9.232 + 1 | 1.051 | 1.668 | 1.166 | 280.0 | 1.301 | 4.225 |
| 17500 | 17590 | 197.15 | −76.00 | −19.50 | 8.462 | 1.042 | 1.495 | 1.145 | 281.5 | 1.312 | 4.266 |
| 18000 | 18094 | 199.15 | −74.00 | −17.50 | 7.763 | 1.034 | 1.358 | 1.125 | 282.9 | 1.324 | 4.307 |
| 18500 | 18598 | 201.15 | −72.00 | −15.50 | 7.128 | 1.028 | 1.234 | 1.107 | 284.3 | 1.335 | 4.347 |
| 19000 | 19102 | 203.15 | −70.00 | −13.50 | 6.550 + 1 | 1.022 | 1.123 − 1 | 1.090 | 285.7 | 1.346 − 5 | 4.388 − 6 |
| 19500 | 19606 | 205.15 | −68.00 | −11.50 | 6.025 | 1.017 | 1.023 | 1.074 | 287.1 | 1.358 | 4.429 |
| 20000 | 20110 | 207.15 | −66.00 | −9.50 | 5.546 | 1.013 | 9.326 − 2 | 1.059 | 288.5 | 1.369 | 4.470 |
| 20500 | 20615 | 209.15 | −64.00 | −8.00 | 5.109 | 1.010 | 8.509 | 1.048 | 289.9 | 1.380 | 4.510 |
| 21000 | 21119 | 211.15 | −62.00 | −6.50 | 4.710 | 1.007 | 7.771 | 1.038 | 291.3 | 1.391 | 4.551 |
| 21500 | 21624 | 213.15 | −60.00 | −5.00 | 4.345 | 1.005 | 7.102 | 1.028 | 292.7 | 1.402 | 4.591 |
| 22000 | 22128 | 215.15 | −58.00 | −3.50 | 4.012 | 1.003 | 6.497 | 1.019 | 294.0 | 1.413 | 4.631 |
| 22500 | 22633 | 216.25 | −56.90 | −2.90 | 3.707 | 1.002 | 5.972 | 1.015 | 294.8 | 1.419 | 4.654 |
| 23000 | 23138 | 217.35 | −55.80 | −2.30 | 3.426 | 1.001 | 5.491 | 1.012 | 295.5 | 1.425 | 4.676 |
| 23500 | 23643 | 218.45 | −54.70 | −1.70 | 3.168 | 1.000 | 5.052 | 1.008 | 296.3 | 1.431 | 4.698 |
| 24000 | 24148 | 219.55 | −53.60 | −1.10 | 2.930 + 1 | 1.000 | 4.649 − 2 | 1.005 | 297.0 | 1.438 − 5 | 4.720 − 6 |
| 24500 | 24653 | 220.65 | −52.50 | −0.50 | 2.711 | 1.000 | 4.280 | 1.002 | 297.8 | 1.444 | 4.742 |
| 25000 | 25158 | 221.75 | −51.40 | 0.10 | 2.510 | 0.999 | 3.943 | 0.999 | 298.5 | 1.449 | 4.764 |
| 25500 | 25663 | 222.85 | −50.30 | 0.70 | 2.324 | 1.000 | 3.633 | 0.996 | 299.3 | 1.455 | 4.786 |
| 26000 | 26168 | 223.95 | −49.20 | 1.30 | 2.153 | 1.000 | 3.349 | 0.994 | 300.0 | 1.461 | 4.808 |
| 26500 | 26674 | 225.05 | −48.10 | 1.90 | 1.995 | 1.001 | 3.089 | 0.992 | 300.7 | 1.467 | 4.830 |
| 27000 | 27179 | 226.15 | −47.00 | 2.50 | 1.850 | 1.001 | 2.849 | 0.990 | 301.5 | 1.473 | 4.852 |
| 27500 | 27685 | 227.25 | −45.90 | 3.10 | 1.715 | 1.002 | 2.630 | 0.989 | 302.2 | 1.479 | 4.874 |
| 28000 | 28190 | 228.35 | −44.80 | 3.70 | 1.592 | 1.004 | 2.428 | 0.987 | 302.9 | 1.485 | 4.896 |
| 28500 | 28696 | 229.45 | −43.70 | 4.30 | 1.477 | 1.005 | 2.243 | 0.986 | 303.7 | 1.491 | 4.918 |

TABLE 5.1.
15° N. Annual
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ kcal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 302.59 | 29.44 | 14.44 | 1.01325 + 3 | 1.000 | 1.167 + 0 | 0.952 | 348.7 | 1.858 − 5 | 6.322 − 6 |
| 250 | 249 | 300.92 | 27.77 | 14.39 | 9.850 + 2 | 1.001 | 1.140 | 0.953 | 347.8 | 1.850 | 6.291 |
| 500 | 499 | 299.25 | 26.10 | 14.35 | 9.575 | 1.003 | 1.115 | 0.955 | 346.8 | 1.842 | 6.260 |
| 750 | 748 | 297.58 | 24.43 | 14.30 | 9.305 | 1.005 | 1.089 | 0.956 | 345.8 | 1.835 | 6.229 |
| 1000 | 998 | 295.91 | 22.76 | 14.26 | 9.042 | 1.006 | 1.064 | 0.957 | 344.8 | 1.827 | 6.198 |
| 1250 | 1247 | 294.27 | 21.12 | 14.25 | 8.785 | 1.008 | 1.040 | 0.958 | 343.9 | 1.819 | 6.166 |
| 1500 | 1496 | 292.64 | 19.49 | 14.24 | 8.533 | 1.009 | 1.016 | 0.960 | 342.9 | 1.811 | 6.137 |
| 1750 | 1745 | 291.01 | 17.86 | 14.23 | 8.288 | 1.011 | 9.922 − 1 | 0.961 | 342.0 | 1.803 | 6.107 |
| 2000 | 1995 | 289.37 | 16.22 | 14.22 | 8.048 | 1.012 | 9.689 | 0.962 | 341.0 | 1.795 | 6.076 |
| 2250 | 2244 | 287.76 | 14.61 | 14.23 | 7.814 | 1.014 | 9.460 | 0.964 | 340.1 | 1.787 | 6.046 |
| 2500 | 2493 | 287.74 | 14.59 | 15.84 | 7.586 + 2 | 1.016 | 9.185 − 1 | 0.960 | 340.1 | 1.787 − 5 | 6.045 − 6 |
| 2750 | 2742 | 286.07 | 12.92 | 15.78 | 7.364 | 1.017 | 8.968 | 0.961 | 339.1 | 1.779 | 6.014 |
| 3000 | 2992 | 284.34 | 11.19 | 15.68 | 7.148 | 1.019 | 8.757 | 0.963 | 338.0 | 1.771 | 5.981 |
| 3250 | 3241 | 282.62 | 9.47 | 15.58 | 6.936 | 1.021 | 8.550 | 0.965 | 337.0 | 1.763 | 5.949 |
| 3500 | 3490 | 280.89 | 7.74 | 15.48 | 6.730 | 1.023 | 8.347 | 0.967 | 336.0 | 1.754 | 5.916 |
| 3750 | 3739 | 279.17 | 6.02 | 15.38 | 6.529 | 1.025 | 8.147 | 0.968 | 334.9 | 1.746 | 5.884 |
| 4000 | 3988 | 277.44 | 4.29 | 15.28 | 6.332 | 1.027 | 7.951 | 0.970 | 333.9 | 1.737 | 5.851 |
| 4250 | 4237 | 275.74 | 2.59 | 15.20 | 6.140 | 1.029 | 7.757 | 0.972 | 332.9 | 1.729 | 5.819 |
| 4500 | 4486 | 274.04 | 0.89 | 15.12 | 5.953 | 1.031 | 7.567 | 0.974 | 331.9 | 1.720 | 5.786 |
| 4750 | 4735 | 272.34 | −0.81 | 15.04 | 5.770 | 1.033 | 7.381 | 0.976 | 330.8 | 1.712 | 5.754 |
| 5000 | 4984 | 270.64 | −2.51 | 14.97 | 5.592 + 2 | 1.035 | 7.198 − 1 | 0.978 | 329.8 | 1.704 − 5 | 5.721 − 6 |
| 5250 | 5233 | 268.94 | −4.21 | 14.89 | 5.419 | 1.037 | 7.019 | 0.979 | 328.8 | 1.695 | 5.689 |
| 5500 | 5482 | 267.24 | −5.91 | 14.81 | 5.250 | 1.039 | 6.843 | 0.981 | 327.7 | 1.687 | 5.656 |
| 5750 | 5731 | 265.54 | −7.61 | 14.73 | 5.085 | 1.041 | 6.671 | 0.983 | 326.7 | 1.678 | 5.624 |
| 6000 | 5980 | 263.84 | −9.31 | 14.66 | 4.924 | 1.043 | 6.501 | 0.985 | 325.6 | 1.670 | 5.591 |
| 6250 | 6229 | 262.16 | −10.99 | 14.59 | 4.767 | 1.045 | 6.335 | 0.987 | 324.6 | 1.661 | 5.558 |
| 6500 | 6478 | 260.47 | −12.68 | 14.53 | 4.614 | 1.047 | 6.172 | 0.989 | 323.5 | 1.653 | 5.526 |
| 6750 | 6727 | 258.79 | −14.36 | 14.47 | 4.466 | 1.049 | 6.012 | 0.990 | 322.5 | 1.644 | 5.493 |
| 7000 | 6976 | 257.10 | −16.05 | 14.40 | 4.321 | 1.051 | 5.855 | 0.992 | 321.4 | 1.636 | 5.461 |
| 7250 | 7225 | 255.42 | −17.73 | 14.34 | 4.180 | 1.053 | 5.701 | 0.994 | 320.4 | 1.627 | 5.428 |
| 7500 | 7474 | 253.73 | −19.42 | 14.28 | 4.043 + 2 | 1.056 | 5.551 − 1 | 0.996 | 319.3 | 1.618 − 5 | 5.395 − 6 |
| 7750 | 7723 | 252.05 | −21.10 | 14.21 | 3.909 | 1.058 | 5.403 | 0.998 | 318.3 | 1.610 | 5.363 |
| 8000 | 7971 | 250.37 | −22.78 | 14.15 | 3.779 | 1.060 | 5.258 | 1.000 | 317.2 | 1.601 | 5.330 |
| 8250 | 8220 | 248.69 | −24.46 | 14.10 | 3.652 | 1.062 | 5.116 | 1.002 | 316.1 | 1.592 | 5.297 |
| 8500 | 8469 | 247.02 | −26.13 | 14.04 | 3.529 | 1.065 | 4.977 | 1.004 | 315.1 | 1.584 | 5.264 |
| 8750 | 8718 | 245.34 | −27.81 | 13.99 | 3.410 | 1.067 | 4.841 | 1.006 | 314.0 | 1.575 | 5.232 |
| 9000 | 8966 | 243.67 | −29.48 | 13.94 | 3.293 | 1.069 | 4.708 | 1.008 | 312.9 | 1.566 | 5.199 |
| 9250 | 9215 | 242.00 | −31.15 | 13.89 | 3.180 | 1.071 | 4.578 | 1.010 | 311.9 | 1.558 | 5.166 |
| 9500 | 9464 | 240.32 | −32.83 | 13.83 | 3.070 | 1.074 | 4.450 | 1.012 | 310.8 | 1.549 | 5.133 |
| 9750 | 9712 | 238.65 | −34.50 | 13.78 | 2.963 | 1.076 | 4.325 | 1.014 | 309.7 | 1.540 | 5.100 |
| 10000 | 9961 | 236.98 | −36.17 | 13.73 | 2.859 + 2 | 1.079 | 4.203 − 1 | 1.016 | 308.6 | 1.531 − 5 | 5.067 − 6 |
| 10250 | 10210 | 235.31 | −37.84 | 13.68 | 2.758 | 1.082 | 4.083 | 1.018 | 307.5 | 1.522 | 5.034 |
| 10500 | 10458 | 233.64 | −39.51 | 13.63 | 2.660 | 1.084 | 3.966 | 1.021 | 306.4 | 1.513 | 5.001 |
| 10750 | 10707 | 231.97 | −41.18 | 13.58 | 2.565 | 1.087 | 3.851 | 1.023 | 305.3 | 1.505 | 4.968 |
| 11000 | 10955 | 230.30 | −42.85 | 13.53 | 2.472 | 1.089 | 3.739 | 1.025 | 304.2 | 1.496 | 4.935 |
| 11500 | 11452 | 226.97 | −46.18 | 10.32 | 2.295 | 1.094 | 3.523 | 1.044 | 302.0 | 1.478 | 4.868 |
| 12000 | 11949 | 223.64 | −49.51 | 6.99 | 2.128 | 1.097 | 3.316 | 1.063 | 299.8 | 1.460 | 4.802 |
| 12500 | 12446 | 220.31 | −52.84 | 3.66 | 1.972 | 1.100 | 3.118 | 1.081 | 297.6 | 1.442 | 4.735 |
| 13000 | 12943 | 216.98 | −56.17 | 0.33 | 1.824 | 1.100 | 2.929 | 1.099 | 295.3 | 1.423 | 4.668 |
| 13500 | 13440 | 213.65 | −59.50 | −3.00 | 1.686 | 1.100 | 2.749 | 1.115 | 293.0 | 1.405 | 4.601 |
| 14000 | 13937 | 210.32 | −62.83 | −6.33 | 1.556 + 2 | 1.098 | 2.578 − 1 | 1.131 | 290.7 | 1.387 − 5 | 4.534 − 6 |
| 14500 | 14433 | 207.00 | −66.15 | −9.65 | 1.435 | 1.095 | 2.415 | 1.147 | 288.4 | 1.368 | 4.467 |
| 15000 | 14930 | 203.67 | −69.48 | −12.98 | 1.321 | 1.091 | 2.260 | 1.160 | 286.1 | 1.349 | 4.399 |
| 15500 | 15426 | 200.34 | −72.81 | −16.31 | 1.215 | 1.085 | 2.112 | 1.173 | 283.7 | 1.331 | 4.331 |
| 16000 | 15923 | 197.02 | −76.13 | −19.63 | 1.115 | 1.078 | 1.972 | 1.185 | 281.4 | 1.312 | 4.263 |
| 16500 | 16419 | 193.69 | −79.46 | −22.96 | 1.023 | 1.068 | 1.839 | 1.195 | 279.0 | 1.292 | 4.195 |
| 17000 | 16915 | 194.81 | −78.34 | −21.84 | 9.370 + 1 | 1.059 | 1.676 | 1.178 | 279.8 | 1.299 | 4.218 |
| 17500 | 17411 | 196.79 | −76.36 | −19.86 | 8.593 | 1.050 | 1.521 | 1.156 | 281.2 | 1.310 | 4.258 |
| 18000 | 17907 | 198.78 | −74.37 | −17.87 | 7.888 | 1.043 | 1.382 | 1.137 | 282.6 | 1.322 | 4.299 |
| 18500 | 18403 | 200.76 | −72.39 | −15.89 | 7.246 | 1.036 | 1.257 | 1.118 | 284.0 | 1.333 | 4.340 |
| 19000 | 18899 | 202.75 | −70.40 | −13.90 | 6.663 + 1 | 1.030 | 1.145 − 1 | 1.101 | 285.4 | 1.344 − 5 | 4.380 − 6 |
| 19500 | 19395 | 204.73 | −68.42 | −11.92 | 6.131 | 1.025 | 1.043 | 1.085 | 286.8 | 1.355 | 4.420 |
| 20000 | 19891 | 206.71 | −66.44 | −9.94 | 5.647 | 1.021 | 9.516 − 2 | 1.070 | 288.2 | 1.366 | 4.461 |
| 20500 | 20386 | 208.69 | −64.46 | −8.39 | 5.204 | 1.018 | 8.688 | 1.059 | 289.6 | 1.378 | 4.501 |
| 21000 | 20882 | 210.68 | −62.47 | −6.90 | 4.801 | 1.015 | 7.938 | 1.048 | 291.0 | 1.389 | 4.541 |
| 21500 | 21377 | 212.66 | −60.49 | −5.42 | 4.432 | 1.013 | 7.260 | 1.039 | 292.3 | 1.400 | 4.581 |
| 22000 | 21873 | 214.64 | −58.51 | −3.93 | 4.094 | 1.012 | 6.645 | 1.030 | 293.7 | 1.411 | 4.621 |
| 22500 | 22368 | 215.96 | −57.19 | −3.11 | 3.785 | 1.010 | 6.105 | 1.025 | 294.6 | 1.418 | 4.648 |
| 23000 | 22863 | 217.05 | −56.10 | −2.52 | 3.500 | 1.010 | 5.618 | 1.021 | 295.3 | 1.424 | 4.670 |
| 23500 | 23359 | 218.14 | −55.01 | −1.92 | 3.238 | 1.009 | 5.172 | 1.018 | 296.1 | 1.430 | 4.692 |
| 24000 | 23854 | 219.23 | −53.92 | −1.33 | 2.997 + 1 | 1.009 | 4.763 − 2 | 1.015 | 296.8 | 1.436 − 5 | 4.714 − 6 |
| 24500 | 24349 | 220.32 | −52.83 | −0.74 | 2.775 | 1.009 | 4.389 | 1.012 | 297.6 | 1.442 | 4.735 |
| 25000 | 24844 | 221.41 | −51.74 | −0.15 | 2.571 | 1.009 | 4.045 | 1.009 | 298.3 | 1.448 | 4.757 |
| 25500 | 25339 | 222.49 | −50.66 | 0.45 | 2.382 | 1.009 | 3.730 | 1.007 | 299.0 | 1.454 | 4.779 |
| 26000 | 25833 | 223.58 | −49.57 | 1.04 | 2.208 | 1.009 | 3.441 | 1.004 | 299.8 | 1.459 | 4.801 |
| 26500 | 26328 | 224.67 | −48.48 | 1.63 | 2.048 | 1.010 | 3.176 | 1.002 | 300.5 | 1.465 | 4.823 |
| 27000 | 26823 | 225.76 | −47.39 | 2.22 | 1.900 | 1.011 | 2.932 | 1.001 | 301.2 | 1.471 | 4.844 |
| 27500 | 27317 | 226.85 | −46.30 | 2.82 | 1.763 | 1.012 | 2.708 | 0.999 | 301.9 | 1.477 | 4.866 |
| 28000 | 27812 | 227.94 | −45.21 | 3.41 | 1.637 | 1.013 | 2.502 | 0.998 | 302.7 | 1.483 | 4.888 |
| 28500 | 28306 | 229.02 | −44.13 | 4.00 | 1.520 | 1.014 | 2.313 | 0.996 | 303.4 | 1.489 | 4.909 |

TABLE 5.1.—*Continued*
15° N. Annual
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 29000 | 29202 | 230.35 | −42.80 | 4.90 | 1.371 + 1 | 1.006 | 2.072 − 2 | 0.985 | 304.4 | 1.497 − 5 | 4.940 − 6 |
| 29500 | 29707 | 231.65 | −41.50 | 5.50 | 1.274 | 1.008 | 1.915 | 0.984 | 305.1 | 1.503 | 4.962 |
| 30000 | 30213 | 232.75 | −40.40 | 6.10 | 1.183 | 1.010 | 1.771 | 0.983 | 305.8 | 1.509 | 4.983 |
| 30500 | 30719 | 233.85 | −39.30 | 6.70 | 1.100 | 1.012 | 1.636 | 0.983 | 306.6 | 1.515 | 5.005 |
| 31000 | 31225 | 234.95 | −38.20 | 7.30 | 1.023 | 1.014 | 1.514 | 0.983 | 307.3 | 1.520 | 5.027 |
| 31500 | 31732 | 236.05 | −37.10 | 7.90 | 9.510 + 0 | 1.017 | 1.403 | 0.983 | 308.0 | 1.526 | 5.049 |
| 32000 | 32238 | 237.15 | −36.00 | 8.50 | 8.847 | 1.019 | 1.300 | 0.983 | 308.7 | 1.532 | 5.070 |
| 32500 | 32751 | 238.35 | −34.80 | 7.90 | 7.665 | 1.025 | 1.114 | 0.991 | 310.1 | 1.544 | 5.114 |
| 34000 | 34264 | 241.55 | −31.60 | 7.30 | 6.650 | 1.029 | 9.591 − 3 | 0.998 | 311.6 | 1.555 | 5.157 |
| 35000 | 35277 | 243.75 | −29.40 | 6.70 | 5.777 | 1.034 | 8.256 | 1.005 | 313.0 | 1.567 | 5.200 |
| 36000 | 36291 | 245.95 | −27.20 | 6.10 | 5.024 + 0 | 1.037 | 7.117 − 3 | 1.012 | 314.4 | 1.578 − 5 | 5.244 − 6 |
| 37000 | 37305 | 248.15 | −25.00 | 5.50 | 4.376 | 1.041 | 6.143 | 1.018 | 315.8 | 1.590 | 5.287 |
| 38000 | 38319 | 250.35 | −22.80 | 4.90 | 3.815 | 1.044 | 5.309 | 1.023 | 317.2 | 1.601 | 5.329 |
| 39000 | 39334 | 252.55 | −20.60 | 4.30 | 3.330 | 1.047 | 4.594 | 1.029 | 318.6 | 1.612 | 5.372 |
| 40000 | 40349 | 254.75 | −18.40 | 3.70 | 2.911 | 1.049 | 3.980 | 1.034 | 320.0 | 1.624 | 5.415 |
| 41000 | 41364 | 256.95 | −16.20 | 3.10 | 2.547 | 1.051 | 3.453 | 1.038 | 321.3 | 1.635 | 5.458 |
| 42000 | 42380 | 259.15 | −14.00 | 2.50 | 2.231 | 1.052 | 2.999 | 1.042 | 322.7 | 1.646 | 5.500 |
| 43000 | 43395 | 261.35 | −11.80 | 1.90 | 1.957 | 1.054 | 2.608 | 1.046 | 324.1 | 1.657 | 5.543 |
| 44000 | 44412 | 263.55 | −9.60 | 1.30 | 1.718 | 1.055 | 2.271 | 1.049 | 325.4 | 1.668 | 5.585 |
| 45000 | 45428 | 265.75 | −7.40 | 0.70 | 1.510 | 1.055 | 1.979 | 1.052 | 326.8 | 1.679 | 5.627 |
| 46000 | 46445 | 267.95 | −5.20 | 0.10 | 1.328 + 0 | 1.055 | 1.727 − 3 | 1.054 | 328.1 | 1.690 − 5 | 5.670 − 6 |
| 47500 | 47463 | 270.15 | −3.00 | −0.50 | 1.170 | 1.055 | 1.509 | 1.056 | 329.5 | 1.701 | 5.712 |
| 48000 | 48480 | 270.15 | −3.00 | −0.50 | 1.031 | 1.055 | 1.329 | 1.057 | 329.5 | 1.701 | 5.712 |
| 49000 | 49498 | 270.15 | −3.00 | −0.50 | 9.085 − 1 | 1.054 | 1.172 | 1.056 | 329.5 | 1.701 | 5.712 |
| 50000 | 50516 | 270.15 | −3.00 | −0.50 | 8.006 | 1.054 | 1.032 | 1.056 | 329.5 | 1.701 | 5.712 |
| 51000 | 51535 | 270.15 | −3.00 | −0.50 | 7.053 | 1.054 | 9.097 − 4 | 1.056 | 329.5 | 1.701 | 5.712 |
| 52000 | 52554 | 268.15 | −5.00 | −2.50 | 6.214 | 1.053 | 8.073 | 1.063 | 328.3 | 1.691 | 5.674 |
| 53000 | 53573 | 266.15 | −7.00 | −2.50 | 5.468 | 1.052 | 7.157 | 1.062 | 327.0 | 1.681 | 5.635 |
| 54000 | 54592 | 264.15 | −9.00 | −2.50 | 4.807 | 1.051 | 6.339 | 1.061 | 325.8 | 1.671 | 5.597 |
| 55000 | 55612 | 262.15 | −11.00 | −2.50 | 4.222 | 1.049 | 5.610 | 1.059 | 324.6 | 1.661 | 5.558 |
| 56000 | 56632 | 260.15 | −13.00 | −2.50 | 3.704 − 1 | 1.048 | 4.960 − 4 | 1.058 | 323.3 | 1.651 − 5 | 5.520 − 6 |
| 57000 | 57653 | 258.15 | −15.00 | −2.50 | 3.246 | 1.047 | 4.381 | 1.057 | 322.1 | 1.641 | 5.481 |
| 58000 | 58674 | 256.15 | −17.00 | −2.50 | 2.843 | 1.045 | 3.866 | 1.056 | 320.8 | 1.631 | 5.442 |
| 59000 | 59695 | 254.15 | −19.00 | −2.50 | 2.486 | 1.044 | 3.408 | 1.054 | 319.6 | 1.620 | 5.403 |
| 60000 | 60716 | 250.65 | −22.50 | −4.00 | 2.172 | 1.042 | 3.018 | 1.059 | 317.4 | 1.602 | 5.335 |
| 61000 | 61738 | 247.15 | −26.00 | −5.50 | 1.893 | 1.040 | 2.668 | 1.063 | 315.2 | 1.584 | 5.267 |
| 62000 | 62760 | 243.65 | −29.50 | −5.00 | 1.647 | 1.037 | 2.355 | 1.058 | 312.9 | 1.566 | 5.198 |
| 63000 | 63783 | 240.15 | −33.00 | −4.50 | 1.430 | 1.034 | 2.075 | 1.053 | 310.7 | 1.548 | 5.130 |
| 64000 | 64805 | 236.65 | −36.50 | −4.00 | 1.239 | 1.031 | 1.824 | 1.048 | 308.4 | 1.529 | 5.061 |
| 65000 | 65828 | 233.15 | −40.00 | −3.50 | 1.071 | 1.029 | 1.601 | 1.044 | 306.1 | 1.511 | 4.991 |
| 66000 | 66852 | 229.65 | −43.50 | −3.00 | 9.244 − 2 | 1.027 | 1.402 − 4 | 1.040 | 303.8 | 1.492 − 5 | 4.922 − 6 |
| 67000 | 67876 | 226.15 | −47.00 | −2.50 | 7.957 | 1.025 | 1.226 | 1.036 | 301.5 | 1.473 | 4.852 |
| 68000 | 68900 | 222.65 | −50.50 | −2.00 | 6.833 | 1.023 | 1.069 | 1.032 | 299.1 | 1.454 | 4.782 |
| 69000 | 69924 | 219.15 | −54.00 | −1.50 | 5.854 | 1.022 | 9.306 − 5 | 1.029 | 296.8 | 1.435 | 4.712 |
| 70000 | 70949 | 215.65 | −57.50 | −1.00 | 5.003 | 1.021 | 8.082 | 1.026 | 294.4 | 1.416 | 4.642 |
| 71000 | 71974 | 212.15 | −61.00 | −0.50 | 4.264 | 1.021 | 7.002 | 1.023 | 292.0 | 1.397 | 4.571 |
| 72000 | 72999 | 208.65 | −64.50 | −0.00 | 3.625 | 1.020 | 6.053 | 1.020 | 289.6 | 1.377 | 4.500 |
| 73000 | 74025 | 205.15 | −68.00 | 0.50 | 3.073 | 1.021 | 5.219 | 1.018 | 287.1 | 1.358 | 4.429 |
| 74000 | 75051 | 201.65 | −71.50 | 1.00 | 2.598 | 1.021 | 4.489 | 1.016 | 284.7 | 1.338 | 4.358 |
| 75000 | 76077 | 198.15 | −75.00 | 1.50 | 2.190 | 1.022 | 3.850 | 1.015 | 282.2 | 1.318 | 4.286 |
| 76000 | 77104 | 194.65 | −78.50 | 2.00 | 1.840 − 2 | 1.024 | 3.294 − 5 | 1.013 | 279.7 | 1.298 − 5 | 4.214 − 6 |
| 77000 | 78131 | 191.15 | −82.00 | 2.50 | 1.542 | 1.026 | 2.810 | 1.013 | 277.2 | 1.278 | 4.142 |
| 78000 | 79159 | 187.65 | −85.50 | 3.00 | 1.287 | 1.029 | 2.390 | 1.013 | 274.6 | 1.257 | 4.070 |
| 79000 | 80186 | 184.15 | −89.00 | 3.50 | 1.071 | 1.032 | 2.026 | 1.013 | 272.0 | 1.237 | 3.998 |
| 80000 | 81214 | 180.65 | −92.50 | −0.02 | 8.881 − 3 | 1.034 | 1.713 | 1.034 | 269.4 | 1.216 | 3.925 |
| 81000 | 82243 | 177.15 | −96.00 | −3.53 | 7.337 | 1.032 | 1.443 | 1.052 | 266.8 | 1.196 | 3.852 |
| 82000 | 83271 | 177.15 | −96.00 | −3.54 | 6.050 | 1.028 | 1.190 | 1.048 | 266.8 | 1.196 | 3.852 |
| 83000 | 84300 | 177.15 | −96.00 | −3.55 | 4.989 | 1.024 | 9.811 − 6 | 1.045 | 266.8 | 1.196 | 3.852 |
| 84000 | 85330 | 177.15 | −96.00 | −3.57 | 4.114 | 1.021 | 8.091 | 1.041 | 266.8 | 1.196 | 3.852 |
| 85000 | 86359 | 177.15 | −96.00 | −3.58 | 3.393 | 1.017 | 6.672 | 1.037 | 266.8 | 1.196 | 3.852 |
| 86000 | 87389 | 177.15 | −96.00 | −3.59 | 2.798 − 3 | 1.013 | 5.501 − 6 | 1.033 | 266.8 | 1.196 − 5 | 3.852 − 6 |
| 87000 | 88420 | 177.15 | −96.00 | −3.60 | 2.307 | 1.009 | 4.536 | 1.029 | 266.8 | 1.196 | 3.852 |
| 88000 | 89450 | 177.15 | −96.00 | −3.62 | 1.902 | 1.005 | 3.741 | 1.025 | 266.8 | 1.196 | 3.852 |
| 89000 | 90481 | 176.82 | −96.33 | −4.52 | 1.569 | 1.002 | 3.085 | 1.026 | 266.8 | 1.196 | 3.852 |
| 90000 | 91513 | 176.07 | −97.08 | −5.84 | 1.295 | 0.997 | 2.518 | 1.026 | 266.3 | 1.207 | 3.894 |
| 92000 | 93576 | 182.15 | −91.00 | −8.45 | 8.880 − 4 | 0.984 | 1.689 | 1.024 | 271.3 | 1.231 | 3.977 |
| 94000 | 95641 | 189.32 | −83.83 | −11.39 | 6.140 | 0.968 | 1.143 | 1.019 | 274.2 | 1.255 | 4.060 |
| 96000 | 97708 | 187.47 | −85.68 | −14.89 | 4.278 | 0.949 | 7.797 − 7 | 1.008 | 277.2 | 1.278 | 4.142 |
| 98000 | 99775 | 190.82 | −82.33 | −18.29 | 3.003 | 0.928 | 5.361 | 0.995 | 280.0 | 1.301 | 4.225 |
| 100000 | 101844 | 192.98 | −80.17 | −24.72 | 2.124 | 0.904 | 3.715 | 0.992 | 282.9 | 1.324 | 4.307 |
| 102000 | 103914 | 205.43 | −67.72 | −22.13 | 1.525 − 4 | 0.880 | 2.489 − 7 | 0.945 | 292.9 | 1.404 − 5 | 4.597 − 6 |
| 104000 | 105986 | 217.44 | −55.71 | −19.52 | 1.118 | 0.865 | 1.711 | 0.909 | 302.5 | 1.482 | 4.884 |
| 106000 | 108059 | 230.14 | −43.02 | −16.80 | 8.361 − 5 | 0.855 | 1.203 | 0.882 | 311.9 | 1.558 | 5.167 |
| 108000 | 110133 | 242.44 | −30.72 | −14.11 | 6.356 | 0.850 | 8.637 − 8 | 0.862 | 321.0 | 1.632 | 5.446 |
| 110000 | 112209 | 254.47 | −18.68 | −20.77 | 4.904 | 0.845 | 6.312 | 0.874 | 329.8 | 1.704 | 5.721 |
| 112000 | 114286 | 266.17 | −6.98 | −6.38 | 3.871 | 0.844 | 4.377 | 0.824 | 351.9 | 1.884 | 6.424 |
| 114000 | 116364 | 271.67 | −1.48 | 7.91 | 3.140 | 0.853 | 3.166 | 0.794 | 372.6 | 2.054 | 7.101 |
| 116000 | 118444 | 354.95 | 81.80 | 22.23 | 2.602 | 0.868 | 2.368 | 0.776 | 392.3 | 2.215 | 7.754 |

TABLE 5.1.—*Continued*
15° N. Annual
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $\lambda$, kcal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 29000 | 28801 | 230.11 | −43.04 | 4.59 | 1.413 + 1 | 1.016 | 2.138 − 2 | 0.996 | 304.1 | 1.495 − 5 | 4.931 − 6 |
| 29500 | 29295 | 231.20 | −41.95 | 5.18 | 1.313 | 1.018 | 1.978 | 0.995 | 304.8 | 1.500 | 4.953 |
| 30000 | 29789 | 232.29 | −40.86 | 5.78 | 1.221 | 1.020 | 1.831 | 0.994 | 305.5 | 1.506 | 4.974 |
| 30500 | 30283 | 233.37 | −39.78 | 6.37 | 1.135 | 1.022 | 1.695 | 0.994 | 306.2 | 1.512 | 4.996 |
| 31000 | 30777 | 234.46 | −38.69 | 6.96 | 1.056 | 1.024 | 1.569 | 0.994 | 307.0 | 1.518 | 5.017 |
| 31500 | 31271 | 235.55 | −37.60 | 7.55 | 9.830 + 0 | 1.027 | 1.454 | 0.994 | 307.7 | 1.524 | 5.039 |
| 32000 | 31765 | 236.63 | −36.52 | 8.14 | 9.152 | 1.029 | 1.347 | 0.994 | 308.4 | 1.529 | 5.060 |
| 33000 | 32753 | 238.80 | −34.35 | 7.83 | 7.941 | 1.035 | 1.158 | 1.001 | 309.8 | 1.541 | 5.103 |
| 34000 | 33740 | 240.98 | −32.17 | 7.23 | 6.900 | 1.040 | 9.974 − 3 | 1.009 | 311.2 | 1.552 | 5.146 |
| 35000 | 34727 | 243.15 | −30.00 | 6.63 | 6.003 | 1.045 | 8.600 | 1.016 | 312.6 | 1.564 | 5.189 |
| 36000 | 35713 | 245.32 | −27.83 | 6.04 | 5.229 + 0 | 1.049 | 7.425 − 3 | 1.023 | 314.0 | 1.575 − 5 | 5.231 − 6 |
| 37000 | 36700 | 247.49 | −25.66 | 5.44 | 4.561 | 1.053 | 6.419 | 1.029 | 315.4 | 1.586 | 5.274 |
| 38000 | 37686 | 249.66 | −23.49 | 4.84 | 3.983 | 1.056 | 5.557 | 1.035 | 316.8 | 1.597 | 5.316 |
| 39000 | 38671 | 251.83 | −21.32 | 4.24 | 3.482 | 1.059 | 4.817 | 1.041 | 318.1 | 1.609 | 5.358 |
| 40000 | 39657 | 253.99 | −19.16 | 3.64 | 3.048 | 1.062 | 4.181 | 1.046 | 319.5 | 1.620 | 5.400 |
| 41000 | 40642 | 256.16 | −16.99 | 3.05 | 2.671 | 1.064 | 3.633 | 1.051 | 320.8 | 1.631 | 42 |
| 42000 | 41626 | 258.33 | −14.82 | 2.45 | 2.344 | 1.065 | 3.161 | 1.055 | 322.2 | 1.642 | |
| 43000 | 42611 | 260.49 | −12.66 | 1.85 | 2.059 | 1.067 | 2.753 | 1.059 | 323.6 | 1.653 | |
| 44000 | 43595 | 262.66 | −10.49 | 1.25 | 1.811 | 1.068 | 2.401 | 1.063 | 324.9 | 1.664 | |
| 45000 | 44579 | 264.82 | −8.33 | 0.66 | 1.594 | 1.069 | 2.097 | 1.067 | 326.2 | 1.675 | |
| 46000 | 45562 | 266.99 | −6.16 | 0.06 | 1.405 + 0 | 1.070 | 1.833 − 3 | 1.069 | 327.6 | 1.685 − 5 | 5. 21 − 6 |
| 47000 | 46545 | 269.15 | −4.00 | −0.54 | 1.239 | 1.070 | 1.604 | 1.072 | 328.9 | 1.696 | 5.693 |
| 48000 | 47528 | 270.15 | −3.00 | −0.50 | 1.094 | 1.070 | 1.411 | 1.072 | 329.5 | 1.701 | 5.712 |
| 49000 | 48511 | 270.15 | −3.00 | −0.50 | 9.665 − 1 | 1.070 | 1.246 | 1.072 | 329.5 | 1.701 | 5.712 |
| 50000 | 49493 | 270.15 | −3.00 | −0.50 | 8.536 | 1.070 | 1.101 | 1.072 | 329.5 | 1.701 | 5.712 |
| 51000 | 50475 | 270.15 | −3.00 | −0.50 | 7.539 | 1.070 | 9.722 − 4 | 1.072 | 329.5 | 1.701 | 5.712 |
| 52000 | 51457 | 269.24 | −3.91 | −1.41 | 6.658 | 1.070 | 8.615 | 1.076 | 328.9 | 1.697 | 5.694 |
| 53000 | 52438 | 267.27 | −5.88 | −2.25 | 5.876 | 1.069 | 7.659 | 1.078 | 327.7 | 1.687 | 5.657 |
| 54000 | 53419 | 265.31 | −7.84 | −2.25 | 5.181 | 1.068 | 6.803 | 1.077 | 326.5 | 1.677 | 5.619 |
| 55000 | 54400 | 263.35 | −9.80 | −2.24 | 4.564 | 1.068 | 6.038 | 1.077 | 325.3 | 1.667 | 5.581 |
| 56000 | 55380 | 261.39 | −11.76 | −2.24 | 4.017 − 1 | 1.067 | 5.354 − 4 | 1.076 | 324.1 | 1.657 − 5 | 5.544 − 6 |
| 57000 | 56360 | 259.43 | −13.72 | −2.23 | 3.532 | 1.066 | 4.743 | 1.075 | 322.9 | 1.647 | 5.506 |
| 58000 | 57340 | 257.47 | −15.68 | −2.23 | 3.103 | 1.065 | 4.199 | 1.074 | 321.7 | 1.637 | 5.468 |
| 59000 | 58320 | 255.51 | −17.64 | −2.23 | 2.724 | 1.064 | 3.714 | 1.074 | 320.4 | 1.627 | 5.430 |
| 60000 | 59299 | 253.10 | −20.05 | −2.67 | 2.388 | 1.063 | 3.287 | 1.075 | 318.9 | 1.615 | 5.383 |
| 61000 | 60278 | 249.68 | −23.47 | −4.13 | 2.091 | 1.062 | 2.917 | 1.079 | 316.8 | 1.597 | 5.316 |
| 62000 | 61256 | 246.25 | −26.90 | −4.7[illegible] | 1.8[illegible] | 1.060 | 2.585 | 1.080 | 314.6 | 1.580 | 5.249 |
| 63000 | 62235 | 242.83 | −30.32 | −4.30 | 1.594 | 1.057 | 2.266 | 1.076 | 312.4 | 1.562 | 5.182 |
| 64000 | 63213 | 239.40 | −33.75 | −3.80 | 1.387 | 1.055 | 2.019 | 1.072 | 310.2 | 1.544 | 5.115 |
| 65000 | 64190 | 235.98 | −37.17 | −3.30 | 1.206 | 1.053 | 1.780 | 1.068 | 309.0 | 1.526 | 5.047 |
| 66000 | 65168 | 232.56 | −40.59 | −2.80 | 1.045 − 1 | 1.052 | 1.566 − 4 | 1.065 | 305.7 | 1.508 − 5 | 4.980 − 6 |
| 67000 | 66145 | 229.14 | −44.01 | −2.30 | 9.047 − 2 | 1.050 | 1.375 | 1.061 | 303.5 | 1.489 | 4.912 |
| 68000 | 67121 | 225.72 | −47.43 | −1.80 | 7.812 | 1.049 | 1.206 | 1.058 | 301.2 | 1.471 | 4.844 |
| 69000 | 68098 | 222.31 | −50.84 | −1.31 | 6.731 | 1.049 | 1.055 | 1.055 | 298.9 | 1.453 | 4.775 |
| 70000 | 69074 | 218.89 | −54.26 | −0.81 | 5.787 | 1.048 | 9.210 − 5 | 1.052 | 296.6 | 1.434 | 4.707 |
| 71000 | 70050 | 215.47 | −57.68 | −0.31 | 4.963 | 1.048 | 8.024 | 1.050 | 294.3 | 1.415 | 4.638 |
| 72000 | 71025 | 212.06 | −61.09 | 0.18 | 4.247 | 1.049 | 6.977 | 1.048 | 291.9 | 1.396 | 4.569 |
| 73000 | 72001 | 208.65 | −64.50 | 0.68 | 3.625 | 1.049 | 6.052 | 1.046 | 289.6 | 1.377 | 4.500 |
| 74000 | 72976 | 205.23 | −67.92 | 1.18 | 3.086 | 1.050 | 5.238 | 1.044 | 287.2 | 1.358 | 4.431 |
| 75000 | 73950 | 201.82 | −71.33 | 1.67 | 2.620 | 1.052 | 4.523 | 1.043 | 284.8 | 1.339 | 4.361 |
| 76000 | 74925 | 198.41 | −74.74 | 2.17 | 2.219 − 2 | 1.054 | 3.895 − 5 | 1.043 | 282.4 | 1.320 − 5 | 4.292 − 6 |
| 77000 | 75899 | 195.00 | −78.15 | 2.66 | 1.873 | 1.057 | 3.347 | 1.043 | 279.9 | 1.300 | 4.222 |
| 78000 | 76872 | 191.60 | −81.55 | 3.17 | 1.577 | 1.060 | 2.868 | 1.043 | 277.5 | 1.280 | 4.152 |
| 79000 | 77846 | 188.19 | −84.96 | 3.66 | 1.324 | 1.064 | 2.451 | 1.043 | 275.0 | 1.261 | 4.081 |
| 80000 | 78819 | 184.78 | −88.37 | 4.13 | 1.108 | 1.068 | 2.088 | 1.045 | 272.5 | 1.241 | 4.011 |
| 81000 | 79792 | 181.37 | −91.78 | 0.72 | 9.238 − 3 | 1.072 | 1.774 | 1.068 | 270.0 | 1.221 | 3.940 |
| 82000 | 80764 | 177.95 | −95.20 | −2.70 | 7.678 | 1.071 | 1.503 | 1.087 | 267.4 | 1.200 | 3.870 |
| 83000 | 81736 | 177.11 | −96.04 | −3.54 | 6.366 | 1.068 | 1.252 | 1.089 | 266.8 | 1.196 | 3.852 |
| 84000 | 82708 | 177.11 | −96.05 | −3.55 | 5.278 | 1.064 | 1.038 | 1.085 | 266.8 | 1.196 | 3.852 |
| 85000 | 83680 | 177.[illegible] | −96.[illegible] | −3.56 | 4.376 | 1.061 | 8.606 − 6 | 1.082 | 266.8 | 1.196 | 3.852 |
| 86000 | 84651 | 177.[illegible] | −96.[illegible] | −3.57 | 3.629 − 3 | 1.058 | 7.136 − 6 | 1.078 | 266.8 | 1.196 − 5 | 3.852 − 6 |
| 87000 | 85622 | 177.[illegible] | −96.[illegible] | −3.59 | 3.009 | 1.054 | 5.917 | 1.075 | 266.8 | 1.196 | 3.852 |
| 88000 | 86593 | 177.[illegible] | −96.[illegible] | −3.60 | 2.495 | 1.051 | 4.907 | 1.072 | 266.8 | 1.196 | 3.852 |
| 89000 | 87563 | 177.[illegible] | −96.[illegible] | −3.61 | 2.069 | 1.047 | 4.070 | 1.068 | 266.8 | 1.196 | 3.852 |
| 90000 | 88533 | 177.[illegible] | −96.[illegible] | −3.62 | 1.716 | 1.044 | 3.375 | 1.065 | 266.8 | 1.196 | 3.852 |
| 92000 | 90472 | 179.53 | −93.45 | −7.12 | 1.184 | 1.034 | 2.290 | 1.071 | 269.0 | 1.213 | 3.914 |
| 94000 | 92410 | 182.[illegible] | −90.27 | −9.66 | 8.227 − 4 | 1.020 | 1.558 | 1.068 | 271.9 | 1.236 | 3.994 |
| 96000 | 94347 | 185.77 | −87.38 | −12.68 | 5.763 | 1.003 | 1.069 | 1.060 | 274.8 | 1.259 | 4.074 |
| 98000 | 96283 | 186.23 | −86.92 | −16.05 | 4.067 | 0.983 | 7.391 − 7 | 1.049 | 277.6 | 1.281 | 4.154 |
| 100000 | 98217 | 190.73 | −82.45 | −19.32 | 2.891 | 0.961 | 5.150 | 1.035 | 280.4 | 1.303 | 4.234 |
| 102000 | 100151 | 194.92 | −78.23 | −25.74 | 2.070 − 4 | 0.936 | 3.601 − 7 | 1.031 | 283.7 | 1.330 − 5 | 4.329 − 6 |
| 104000 | 102083 | 205.94 | −67.17 | −23.20 | 1.505 | 0.912 | 2.449 | 0.983 | 293.3 | 1.407 | 4.609 |
| 106000 | 104014 | 217.92 | −55.21 | −20.66 | 1.116 | 0.896 | 1.707 | 0.946 | 302.6 | 1.482 | 4.886 |
| 108000 | 105943 | 229.73 | −43.37 | −18.07 | 8.429 − 5 | 0.885 | 1.215 | 0.918 | 311.6 | 1.556 | 5.159 |
| 110000 | 107872 | 241.53 | −31.63 | −15.45 | 6.466 | 0.879 | 8.818 − 8 | 0.897 | 320.4 | 1.627 | 5.428 |
| 112000 | 109799 | 253.25 | −19.93 | −22.60 | 5.030 | 0.873 | 6.509 | 0.910 | 328.9 | 1.697 | 5.694 |
| 114000 | 111725 | 264.57 | −10.42 | −10.95 | 3.992 | 0.869 | 4.591 | 0.863 | 338.9 | 1.860 | 6.329 |
| 116000 | 113650 | 315.82 | 42.67 | 2.81 | 3.252 | 0.876 | 3.342 | 0.828 | 369.1 | 2.025 | 6.984 |
| 118000 | 115573 | 347.87 | 74.72 | 16.54 | 2.704 | 0.889 | 2.513 | 0.807 | 388.2 | 2.181 | 7.616 |

TABLE 5.1.—*Continued*

30° N. January

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $\lambda$, k-cal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 0 | 0 | 288.52 | 15.37 | 0.37 | 1.02100 + 3 | 1.008 | 1.233 + 0 | 1.000 | 340.5 | 1.791 − 5 | 6.060 − 6 |
| 250 | 250 | 287.70 | 14.55 | 1.18 | 9.912 + 2 | 1.008 | 1.200 | 1.004 | 340.0 | 1.787 | 6.045 |
| 500 | 501 | 286.88 | 13.73 | 1.98 | 9.621 | 1.008 | 1.168 | 1.001 | 339.5 | 1.783 | 6.029 |
| 750 | 751 | 286.06 | 12.91 | 2.79 | 9.339 | 1.008 | 1.137 | 0.998 | 339.1 | 1.779 | 6.014 |
| 1000 | 1002 | 285.24 | 12.09 | 3.59 | 9.064 | 1.009 | 1.107 | 0.995 | 338.6 | 1.775 | 5.998 |
| 1250 | 1252 | 284.40 | 11.25 | 4.37 | 8.796 | 1.009 | 1.077 | 0.993 | 338.1 | 1.771 | 5.982 |
| 1500 | 1502 | 283.55 | 10.40 | 5.15 | 8.535 | 1.009 | 1.049 | 0.991 | 337.6 | 1.767 | 5.966 |
| 1750 | 1753 | 282.71 | 9.56 | 5.93 | 8.282 | 1.010 | 1.021 | 0.999 | 337.1 | 1.763 | 5.951 |
| 2000 | 2003 | 281.86 | 8.71 | 6.71 | 8.035 | 1.011 | 9.931 − 1 | 0.987 | 336.6 | 1.759 | 5.935 |
| 2250 | 2254 | 280.17 | 7.02 | 6.65 | 7.794 | 1.011 | 9.692 | 0.988 | 335.5 | 1.751 | 5.903 |
| 2500 | 2504 | 278.48 | 5.33 | 6.58 | 7.560 + 2 | 1.012 | 9.457 − 1 | 0.988 | 334.5 | 1.742 − 5 | 5.870 − 6 |
| 2750 | 2755 | 276.79 | 3.64 | 6.51 | 7.331 | 1.013 | 9.226 | 0.989 | 333.5 | 1.734 | 5.838 |
| 3000 | 3006 | 275.10 | 1.95 | 6.45 | 7.107 | 1.014 | 9.000 | 0.990 | 332.5 | 1.726 | 5.806 |
| 3250 | 3256 | 273.42 | 0.27 | 6.40 | 6.889 | 1.014 | 8.778 | 0.991 | 331.5 | 1.717 | 5.774 |
| 3500 | 3507 | 271.74 | −1.41 | 6.34 | 6.677 | 1.015 | 8.559 | 0.992 | 330.5 | 1.709 | 5.742 |
| 3750 | 3757 | 270.07 | −3.08 | 6.29 | 6.470 | 1.016 | 8.345 | 0.992 | 329.4 | 1.701 | 5.710 |
| 4000 | 4008 | 268.39 | −4.76 | 6.24 | 6.268 | 1.017 | 8.135 | 0.993 | 328.4 | 1.692 | 5.678 |
| 4250 | 4259 | 266.75 | −6.40 | 6.22 | 6.071 | 1.018 | 7.928 | 0.994 | 327.4 | 1.684 | 5.647 |
| 4500 | 4509 | 265.19 | −8.05 | 6.20 | 5.879 | 1.018 | 7.725 | 0.995 | 326.4 | 1.676 | 5.615 |
| 4750 | 4760 | 263.46 | −9.69 | 6.18 | 5.692 | 1.019 | 7.526 | 0.995 | 325.4 | 1.668 | 5.583 |
| 5000 | 5011 | 261.81 | −11.34 | 6.16 | 5.510 + 2 | 1.020 | 7.331 − 1 | 0.996 | 324.4 | 1.659 − 5 | 5.552 − 6 |
| 5250 | 5262 | 260.17 | −12.98 | 6.15 | 5.332 | 1.021 | 7.140 | 0.997 | 323.4 | 1.651 | 5.520 |
| 5500 | 5512 | 258.53 | −14.62 | 6.13 | 5.160 | 1.021 | 6.953 | 0.997 | 322.3 | 1.643 | 5.488 |
| 5750 | 5763 | 256.88 | −16.27 | 6.11 | 4.991 | 1.022 | 6.769 | 0.998 | 321.3 | 1.634 | 5.456 |
| 6000 | 6014 | 255.24 | −17.91 | 6.09 | 4.828 | 1.023 | 6.589 | 0.999 | 320.3 | 1.626 | 5.425 |
| 6250 | 6265 | 253.61 | −19.54 | 6.08 | 4.668 | 1.024 | 6.413 | 0.999 | 319.2 | 1.618 | 5.393 |
| 6500 | 6516 | 251.98 | −21.17 | 6.08 | 4.513 | 1.025 | 6.240 | 1.000 | 318.2 | 1.609 | 5.361 |
| 6750 | 6766 | 250.34 | −22.81 | 6.07 | 4.362 | 1.026 | 6.070 | 1.001 | 317.2 | 1.601 | 5.329 |
| 7000 | 7017 | 248.71 | −24.44 | 6.06 | 4.216 | 1.027 | 5.905 | 1.002 | 316.2 | 1.592 | 5.298 |
| 7250 | 7268 | 247.08 | −26.07 | 6.06 | 4.073 | 1.027 | 5.742 | 1.002 | 315.1 | 1.584 | 5.266 |
| 7500 | 7519 | 245.45 | −27.70 | 6.05 | 3.934 + 2 | 1.028 | 5.583 − 1 | 1.003 | 314.1 | 1.576 − 5 | 5.234 − 6 |
| 7750 | 7770 | 243.82 | −29.33 | 6.04 | 3.799 | 1.029 | 5.428 | 1.004 | 313.0 | 1.567 | 5.202 |
| 8000 | 8021 | 242.18 | −30.97 | 6.03 | 3.668 | 1.030 | 5.276 | 1.005 | 312.0 | 1.559 | 5.170 |
| 8250 | 8272 | 240.56 | −32.59 | 6.03 | 3.540 | 1.031 | 5.127 | 1.005 | 310.9 | 1.550 | 5.138 |
| 8500 | 8523 | 238.93 | −34.22 | 6.03 | 3.416 | 1.032 | 4.981 | 1.006 | 309.9 | 1.541 | 5.106 |
| 8750 | 8774 | 237.30 | −35.85 | 6.03 | 3.296 | 1.033 | 4.839 | 1.007 | 308.8 | 1.533 | 5.073 |
| 9000 | 9025 | 235.67 | −37.48 | 6.02 | 3.179 | 1.034 | 4.699 | 1.008 | 307.8 | 1.524 | 5.041 |
| 9250 | 9276 | 234.05 | −39.10 | 6.02 | 3.066 | 1.035 | 4.563 | 1.008 | 306.7 | 1.516 | 5.009 |
| 9500 | 9527 | 232.42 | −40.73 | 6.02 | 2.955 | 1.036 | 4.430 | 1.009 | 305.6 | 1.5[illegible] | 4.977 |
| 9750 | 9778 | 230.79 | −42.36 | 6.01 | 2.848 | 1.037 | 4.299 | 1.010 | 304.5 | 1.498 | 4.945 |
| 10000 | 10030 | 229.16 | −43.99 | 6.01 | 2.744 + 2 | 1.038 | 4.172 − 1 | 1.011 | 303.5 | 1.490 − 5 | 4.912 − 6 |
| 10250 | 10281 | 227.53 | −45.62 | 6.01 | 2.644 | 1.039 | 4.048 | 1.012 | 302.4 | 1.481 | 4.880 |
| 10500 | 10532 | 225.91 | −47.24 | 6.01 | 2.546 | 1.040 | 3.926 | 1.013 | 301.3 | 1.472 | 4.847 |
| 10750 | 10783 | 224.28 | −48.87 | 6.00 | 2.451 | 1.041 | 3.807 | 1.013 | 300.2 | 1.463 | 4.815 |
| 11000 | 11034 | 222.69 | −50.50 | 6.00 | 2.359 | 1.043 | 3.691 | 1.014 | 299.1 | 1.454 | 4.782 |
| 11500 | 11537 | 219.40 | −53.75 | 2.75 | 2.184 | 1.044 | 3.467 | 1.031 | 296.9 | 1.437 | 4.717 |
| 12000 | 12039 | 216.15 | −57.00 | −0.50 | 2.019 | 1.045 | 3.254 | 1.047 | 294.7 | 1.419 | 4.652 |
| 12500 | 12542 | 214.85 | −58.30 | −1.80 | 1.865 | 1.044 | 3.024 | 1.053 | 293.8 | 1.412 | 4.625 |
| 13000 | 13045 | 213.55 | −59.60 | −3.10 | 1.722 | 1.043 | 2.809 | 1.058 | 293.0 | 1.405 | 4.599 |
| 13500 | 13547 | 212.25 | −60.90 | −4.40 | 1.589 | 1.042 | 2.609 | 1.063 | 292.1 | 1.397 | 4.573 |
| 14000 | 14050 | 210.95 | −62.20 | −5.70 | 1.466 + 2 | 1.040 | 2.421 − 1 | 1.068 | 291.2 | 1.390 − 5 | 4.547 − 6 |
| 14500 | 14553 | 209.65 | −63.50 | −7.00 | 1.352 | 1.037 | 2.246 | 1.072 | 290.3 | 1.383 | 4.520 |
| 15000 | 15056 | 208.35 | −64.80 | −8.30 | 1.246 | 1.035 | 2.083 | 1.075 | 289.4 | 1.376 | 4.494 |
| 15500 | 15559 | 207.05 | −66.10 | −9.60 | 1.147 | 1.031 | 1.930 | 1.078 | 288.5 | 1.368 | 4.468 |
| 16000 | 16062 | 205.75 | −67.40 | −10.90 | 1.056 | 1.026 | 1.788 | 1.081 | 287.6 | 1.361 | 4.441 |
| 16500 | 16566 | 204.45 | −68.70 | −12.20 | 9.718 + 1 | 1.022 | 1.656 | 1.083 | 286.6 | 1.354 | 4.415 |
| 17000 | 17069 | 203.15 | −70.00 | −13.50 | 8.937 | 1.017 | 1.533 | 1.085 | 285.7 | 1.346 | 4.388 |
| 17500 | 17572 | 203.15 | −70.00 | −13.50 | 8.216 | 1.012 | 1.409 | 1.079 | 285.7 | 1.346 | 4.388 |
| 18000 | 18076 | 203.15 | −70.00 | −13.50 | 7.553 | 1.006 | 1.295 | 1.073 | 285.7 | 1.346 | 4.388 |
| 18500 | 18580 | 204.40 | −68.75 | −12.25 | 6.946 | 1.001 | 1.184 | 1.062 | 286.6 | 1.353 | 4.414 |
| 19000 | 19083 | 205.65 | −67.50 | −11.00 | 6.391 + 1 | 0.997 | 1.083 − 1 | 1.050 | 287.5 | 1.360 − 5 | 4.439 − 6 |
| 19500 | 19587 | 206.90 | −66.25 | −9.75 | 5.883 | 0.992 | 9.905 − 2 | 1.040 | 288.4 | 1.368 | 4.465 |
| 20000 | 20091 | 208.15 | −65.00 | −8.50 | 5.418 | 0.990 | 9.068 | 1.030 | 289.2 | 1.376 | 4.490 |
| 20500 | 20595 | 209.40 | −63.75 | −7.75 | 4.992 | 0.987 | 8.306 | 1.023 | 290.1 | 1.381 | 4.515 |
| 21000 | 21099 | 210.65 | −62.50 | −7.00 | 4.602 | 0.984 | 7.611 | 1.017 | 291.0 | 1.388 | 4.541 |
| 21500 | 21603 | 211.90 | −61.25 | −6.25 | 4.245 | 0.982 | 6.979 | 1.010 | 291.8 | 1.395 | 4.566 |
| 22000 | 22107 | 213.15 | −60.00 | −5.50 | 3.917 | 0.979 | 6.402 | 1.005 | 292.7 | 1.402 | 4.591 |
| 22500 | 22611 | 214.15 | −59.00 | −5.00 | 3.616 | 0.977 | 5.883 | 1.000 | 293.4 | 1.408 | 4.611 |
| 23000 | 23115 | 215.15 | −58.00 | −4.50 | 3.340 | 0.976 | 5.407 | 0.996 | 294.0 | 1.413 | 4.631 |
| 23500 | 23620 | 216.15 | −57.00 | −4.00 | 3.085 | 0.974 | 4.972 | 0.992 | 294.7 | 1.419 | 4.652 |
| 24000 | 24124 | 217.15 | −56.00 | −3.50 | 2.851 + 1 | 0.973 | 4.574 − 2 | 0.989 | 295.4 | 1.424 − 5 | 4.672 − 6 |
| 24500 | 24629 | 218.15 | −55.00 | −3.00 | 2.636 | 0.972 | 4.210 | 0.985 | 296.1 | 1.430 | 4.692 |
| 25000 | 25133 | 219.15 | −54.00 | −2.50 | 2.438 | 0.971 | 3.876 | 0.982 | 296.8 | 1.435 | 4.712 |
| 25500 | 25638 | 220.15 | −53.00 | −2.00 | 2.256 | 0.970 | 3.569 | 0.979 | 297.4 | 1.441 | 4.732 |
| 26000 | 26143 | 221.15 | −52.00 | −1.50 | 2.088 | 0.970 | 3.288 | 0.976 | 298.1 | 1.446 | 4.752 |
| 26500 | 26648 | 222.15 | −51.00 | −1.00 | 1.933 | 0.969 | 3.031 | 0.974 | 298.8 | 1.452 | 4.772 |
| 27000 | 27153 | 223.15 | −50.00 | −0.50 | 1.790 | 0.969 | 2.794 | 0.971 | 299.5 | 1.457 | 4.792 |
| 27500 | 27658 | 224.15 | −49.00 | −0.00 | 1.658 | 0.969 | 2.577 | 0.969 | 300.1 | 1.463 | 4.812 |
| 28000 | 28163 | 225.15 | −48.00 | 0.50 | 1.537 | 0.969 | 2.378 | 0.967 | 300.8 | 1.468 | 4.832 |
| 28500 | 28668 | 226.15 | −47.00 | 1.00 | 1.425 | 0.969 | 2.195 | 0.965 | 301.5 | 1.473 | 4.852 |

TABLE 5.1.—*Continued*
30° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ kcal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 288.52 | 15.37 | 0.37 | 1.02100 + 3 | 1.008 | 1.233 + 0 | 1.006 | 340.5 | 1.791 − 5 | 6.060 − 6 |
| 250 | 250 | 287.70 | 14.55 | 1.18 | 9.912 + 2 | 1.008 | 1.200 | 1.004 | 340.0 | 1.787 | 6.045 |
| 500 | 499 | 286.88 | 13.73 | 1.98 | 9.622 | 1.008 | 1.168 | 1.001 | 339.5 | 1.783 | 6.029 |
| 750 | 749 | 286.07 | 12.92 | 2.79 | 9.340 | 1.008 | 1.137 | 0.999 | 339.1 | 1.779 | 6.014 |
| 1000 | 998 | 285.25 | 12.10 | 3.60 | 9.065 | 1.009 | 1.107 | 0.996 | 338.6 | 1.775 | 5.998 |
| 1250 | 1248 | 284.41 | 11.26 | 4.38 | 8.798 | 1.009 | 1.078 | 0.993 | 338.1 | 1.771 | 5.983 |
| 1500 | 1498 | 283.56 | 10.41 | 5.16 | 8.538 | 1.010 | 1.049 | 0.991 | 337.6 | 1.767 | 5.967 |
| 1750 | 1747 | 282.72 | 9.57 | 5.94 | 8.285 | 1.010 | 1.021 | 0.989 | 337.1 | 1.763 | 5.951 |
| 2000 | 1997 | 281.87 | 8.72 | 6.72 | 8.038 | 1.011 | 9.934 − 1 | 0.987 | 336.6 | 1.759 | 5.935 |
| 2250 | 2246 | 280.20 | 7.05 | 6.67 | 7.798 | 1.012 | 9.695 | 0.988 | 335.6 | 1.751 | 5.903 |
| 2500 | 2496 | 278.51 | 5.36 | 6.60 | 7.564 + 2 | 1.013 | 9.461 − 1 | 0.989 | 334.6 | 1.742 − 5 | 5.871 − 6 |
| 2750 | 2745 | 276.82 | 3.67 | 6.54 | 7.335 | 1.013 | 9.231 | 0.989 | 333.5 | 1.734 | 5.839 |
| 3000 | 2994 | 275.14 | 1.99 | 6.48 | 7.112 | 1.014 | 9.005 | 0.990 | 332.5 | 1.726 | 5.807 |
| 3250 | 3244 | 273.46 | 0.31 | 6.43 | 6.895 | 1.015 | 8.783 | 0.991 | 331.5 | 1.718 | 5.775 |
| 3500 | 3493 | 271.79 | −1.36 | 6.38 | 6.682 | 1.016 | 8.565 | 0.992 | 330.5 | 1.709 | 5.743 |
| 3750 | 3743 | 270.12 | −3.03 | 6.33 | 6.476 | 1.017 | 8.352 | 0.993 | 329.5 | 1.701 | 5.711 |
| 4000 | 3992 | 268.44 | −4.71 | 6.28 | 6.274 | 1.018 | 8.142 | 0.994 | 328.5 | 1.693 | 5.679 |
| 4250 | 4241 | 266.80 | −6.35 | 6.26 | 6.077 | 1.018 | 7.935 | 0.994 | 327.4 | 1.684 | 5.648 |
| 4500 | 4491 | 265.16 | −7.99 | 6.24 | 5.886 | 1.019 | 7.733 | 0.995 | 326.4 | 1.676 | 5.616 |
| 4750 | 4740 | 263.52 | −9.63 | 6.23 | 5.699 | 1.020 | 7.534 | 0.996 | 325.4 | 1.668 | 5.585 |
| 5000 | 4989 | 261.88 | −11.27 | 6.21 | 5.517 + 2 | 1.021 | 7.340 − 1 | 0.997 | 324.4 | 1.660 − 5 | 5.553 − 6 |
| 5250 | 5238 | 260.25 | −12.90 | 6.19 | 5.340 | 1.022 | 7.149 | 0.997 | 323.4 | 1.651 | 5.522 |
| 5500 | 5488 | 258.61 | −14.54 | 6.18 | 5.168 | 1.023 | 6.962 | 0.998 | 322.4 | 1.643 | 5.490 |
| 5750 | 5737 | 256.97 | −16.18 | 6.16 | 5.000 | 1.023 | 6.779 | 0.999 | 321.4 | 1.635 | 5.458 |
| 6000 | 5986 | 255.33 | −17.82 | 6.14 | 4.837 | 1.024 | 6.599 | 1.000 | 320.3 | 1.626 | 5.426 |
| 6250 | 6235 | 253.70 | −19.45 | 6.14 | 4.678 | 1.025 | 6.423 | 1.000 | 319.3 | 1.618 | 5.395 |
| 6500 | 6484 | 252.08 | −21.07 | 6.13 | 4.523 | 1.026 | 6.250 | 1.001 | 318.3 | 1.610 | 5.363 |
| 6750 | 6734 | 250.45 | −22.70 | 6.13 | 4.372 | 1.027 | 6.081 | 1.002 | 317.3 | 1.601 | 5.331 |
| 7000 | 6983 | 248.82 | −24.33 | 6.12 | 4.226 | 1.028 | 5.916 | 1.003 | 316.2 | 1.593 | 5.300 |
| 7250 | 7232 | 247.20 | −25.95 | 6.12 | 4.083 | 1.029 | 5.754 | 1.003 | 315.2 | 1.585 | 5.268 |
| 7500 | 7481 | 245.57 | −27.58 | 6.12 | 3.944 + 2 | 1.030 | 5.595 − 1 | 1.004 | 314.1 | 1.576 − 5 | 5.236 − 6 |
| 7750 | 7730 | 243.95 | −29.20 | 6.11 | 3.810 | 1.031 | 5.440 | 1.005 | 313.1 | 1.568 | 5.204 |
| 8000 | 7979 | 242.32 | −30.83 | 6.11 | 3.679 | 1.032 | 5.288 | 1.006 | 312.1 | 1.559 | 5.172 |
| 8250 | 8228 | 240.70 | −32.45 | 6.11 | 3.552 | 1.033 | 5.140 | 1.007 | 311.0 | 1.551 | 5.140 |
| 8500 | 8477 | 239.08 | −34.07 | 6.10 | 3.428 | 1.034 | 4.995 | 1.007 | 310.0 | 1.542 | 5.109 |
| 8750 | 8726 | 237.46 | −35.69 | 6.10 | 3.307 | 1.035 | 4.852 | 1.008 | 308.9 | 1.534 | 5.077 |
| 9000 | 8975 | 235.84 | −37.31 | 6.10 | 3.191 | 1.036 | 4.713 | 1.009 | 307.9 | 1.525 | 5.045 |
| 9250 | 9224 | 234.22 | −38.93 | 6.10 | 3.077 | 1.037 | 4.577 | 1.010 | 306.8 | 1.517 | 5.012 |
| 9500 | 9473 | 232.59 | −40.56 | 6.10 | 2.967 | 1.038 | 4.444 | 1.011 | 305.7 | 1.508 | 4.980 |
| 9750 | 9722 | 230.97 | −42.18 | 6.10 | 2.860 | 1.039 | 4.314 | 1.012 | 304.6 | 1.499 | 4.948 |
| 10000 | 9971 | 229.35 | −43.80 | 6.10 | 2.757 + 2 | 1.040 | 4.187 − 1 | 1.013 | 303.6 | 1.491 − 5 | 4.916 − 6 |
| 10250 | 10219 | 227.73 | −45.42 | 6.10 | 2.656 | 1.042 | 4.063 | 1.013 | 302.5 | 1.482 | 4.884 |
| 10500 | 10468 | 226.11 | −47.04 | 6.10 | 2.558 | 1.042 | 3.941 | 1.014 | 301.4 | 1.473 | 4.851 |
| 10750 | 10717 | 224.49 | −48.66 | 6.10 | 2.463 | 1.044 | 3.823 | 1.015 | 300.4 | 1.464 | 4.819 |
| 11000 | 10966 | 222.87 | −50.28 | 6.10 | 2.372 | 1.045 | 3.707 | 1.016 | 299.3 | 1.456 | 4.787 |
| 11500 | 11464 | 219.64 | −53.51 | 2.99 | 2.196 | 1.047 | 3.483 | 1.032 | 297.1 | 1.438 | 4.722 |
| 12000 | 11961 | 216.40 | −56.75 | −0.25 | 2.032 | 1.047 | 3.270 | 1.049 | 294.9 | 1.420 | 4.6 |
| 12500 | 12458 | 214.96 | −58.19 | −1.69 | 1.878 | 1.047 | 3.043 | 1.055 | 293.9 | 1.412 | 4.6 |
| 13000 | 12956 | 213.66 | −59.49 | −2.99 | 1.734 | 1.046 | .28 | 1.061 | 293.0 | 1.405 | 4.602 |
| 13500 | 13453 | 212.37 | −60.78 | −4.28 | 1.602 | 1.045 | 2.027 | 1.066 | 292. | 1.398 | 4.575 |
| 14000 | 13950 | 211.08 | −62.07 | −5.57 | 1.478 + 2 | 1.043 | 2.439 − 1 | 1.070 | 29 | 1.391 − 5 | 4.549 − 6 |
| 14500 | 14447 | 209.79 | −63.36 | −6.86 | 1.363 | 1.041 | 2.264 | 1.075 | 290.4 | 1.384 | 4.523 |
| 15000 | 14944 | 208.49 | −64.66 | −8.16 | 1.257 | 1.038 | 2.101 | 1.078 | 289.5 | 1.376 | 4.497 |
| 15500 | 15441 | 207.20 | −65.95 | −9.45 | 1.159 | 1.034 | 1.948 | 1.082 | 288 | 1.369 | 4.472 |
| 16000 | 15938 | 205.91 | −67.24 | −10.74 | 1.067 | 1.031 | 1.805 | 1.084 | 287. | 1.362 | 4.444 |
| 16500 | 16435 | 204.62 | −68.53 | −12.03 | 9.825 + 1 | 1.026 | 1.673 | 1.087 | 286.8 | 1.355 | 4.418 |
| 17000 | 16931 | 203.33 | −69.82 | −13.32 | 9.040 | 1.022 | 1.549 | 1.088 | 285.9 | 1.347 | 4.392 |
| 17500 | 17428 | 203.15 | −70.00 | −13.50 | 8.316 | 1.016 | 1.426 | 1.084 | 285.7 | 1.346 | 4.388 |
| 18000 | 17925 | 203.15 | −70.00 | −13.50 | 7.650 | 1.011 | 1.312 | 1.079 | 285.7 | 1.346 | 4.388 |
| 18500 | 18421 | 204.20 | −68.95 | −12.45 | 7.038 | 1.006 | 1.201 | 1.067 | 286.3 | 1.352 | 4.410 |
| 19000 | 18917 | 205.44 | −67.71 | −11.21 | 6.479 + 1 | 1.002 | 1.099 − 1 | 1.056 | 287.3 | 1.359 − 5 | 4.435 − 6 |
| 19500 | 19414 | 206.68 | −66.47 | −9.97 | 5.967 | 0.998 | 1.006 | 1.046 | 288.2 | 1.366 | 4.460 |
| 20000 | 19910 | 207.92 | −65.23 | −8.73 | 5.499 | 0.995 | 9.213 − 2 | 1.039 | 289.1 | 1.373 | 4.485 |
| 20500 | 20406 | 209.16 | −63.99 | −7.92 | 5.070 | 0.992 | 8.444 | 1.029 | 289.9 | 1.380 | 4.511 |
| 21000 | 20902 | 210.40 | −62.75 | −7.18 | 4.676 | 0.989 | 7.742 | 1.022 | 290.8 | 1.387 | 4.536 |
| 21500 | 21398 | 211.64 | −61.51 | −6.43 | 4.315 | 0.987 | 7.103 | 1.016 | 291.6 | 1.394 | 4.561 |
| 22000 | 21894 | 212.88 | −60.27 | −5.69 | 3.984 | 0.985 | 6.520 | 1.011 | 292.5 | 1.401 | 4.586 |
| 22500 | 22390 | 213.93 | −59.22 | −5.14 | 3.680 | 0.982 | 5.993 | 1.006 | 293.2 | 1.407 | 4.607 |
| 23000 | 22886 | 214.92 | −58.23 | −4.65 | 3.401 | 0.981 | 5.512 | 1.002 | 293.9 | 1.412 | 4.627 |
| 23500 | 23381 | 215.91 | −57.24 | −4.15 | 3.144 | 0.980 | 5.072 | 0.998 | 294.6 | 1.418 | 4.647 |
| 24000 | 23877 | 216.90 | −56.25 | −3.66 | 2.907 + 1 | 0.978 | 4.669 − 2 | 0.995 | 295.2 | 1.423 − 5 | 4.667 − 6 |
| 24500 | 24372 | 217.89 | −55.26 | −3.16 | 2.689 | 0.977 | 4.300 | 0.991 | 295.9 | 1.428 | 4.687 |
| 25000 | 24868 | 218.89 | −54.26 | −2.67 | 2.489 | 0.976 | 3.961 | 0.988 | 296.6 | 1.434 | 4.707 |
| 25500 | 25363 | 219.88 | −53.27 | −2.17 | 2.304 | 0.975 | 3.650 | 0.985 | 297.3 | 1.439 | 4.727 |
| 26000 | 25858 | 220.87 | −52.28 | −1.68 | 2.134 | 0.975 | 3.365 | 0.982 | 297.9 | 1.445 | 4.746 |
| 26500 | 26354 | 221.86 | −51.29 | −1.18 | 1.977 | 0.975 | 3.104 | 0.980 | 298.6 | 1.450 | 4.766 |
| 27000 | 26849 | 222.85 | −50.30 | −0.69 | 1.832 | 0.974 | 2.864 | 0.977 | 299.3 | 1.455 | 4.785 |
| 27500 | 27344 | 223.84 | −49.31 | −0.19 | 1.698 | 0.974 | 2.643 | 0.975 | 299.9 | 1.461 | 4.806 |
| 28000 | 27839 | 224.83 | −48.32 | 0.30 | 1.575 | 0.975 | 2.440 | 0.973 | 300.6 | 1.466 | 4.826 |
| 28500 | 28334 | 225.82 | −47.33 | 0.79 | 1.461 | 0.975 | 2.256 | 0.971 | 301.2 | 1.472 | 4.845 |

TABLE 5.1.—*Continued*
30° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ kcal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 29000 | 29173 | 227.15 | -46.00 | 1.50 | 1.321 + 1 | 0.970 | 2.027 - 2 | 0.963 | 302.1 | 1.479 - 5 | 4.872 - 6 |
| 29500 | 29679 | 228.15 | -45.00 | 2.00 | 1.226 | 0.970 | 1.872 | 0.961 | 302.8 | 1.484 | 4.892 |
| 30000 | 30184 | 229.15 | -44.00 | 2.50 | 1.138 | 0.971 | 1.730 | 0.960 | 303.5 | 1.489 | 4.912 |
| 30500 | 30689 | 230.15 | -43.00 | 3.00 | 1.056 | 0.972 | 1.599 | 0.959 | 304.1 | 1.495 | 4.932 |
| 31000 | 31195 | 231.15 | -42.00 | 3.50 | 9.807 + 0 | 0.973 | 1.478 | 0.958 | 304.8 | 1.500 | 4.952 |
| 31500 | 31701 | 232.15 | -41.00 | 4.00 | 9.110 | 0.974 | 1.367 | 0.957 | 305.4 | 1.506 | 4.972 |
| 32000 | 32208 | 233.15 | -40.00 | 4.50 | 8.465 | 0.975 | 1.265 | 0.957 | 306.1 | 1.511 | 4.991 |
| 33000 | 33218 | 235.55 | -37.60 | 4.10 | 7.317 | 0.978 | 1.082 | 0.961 | 307.7 | 1.524 | 5.039 |
| 34000 | 34230 | 237.95 | -35.20 | 3.70 | 6.334 | 0.980 | 9.273 - 3 | 0.965 | 309.2 | 1.536 | 5.086 |
| 35000 | 35243 | 240.35 | -32.80 | 3.30 | 5.491 | 0.982 | 7.958 | 0.969 | 310.8 | 1.549 | 5.134 |
| 36000 | 36255 | 242.75 | -30.40 | 2.90 | 4.766 + 0 | 0.984 | 6.840 - 3 | 0.972 | 312.3 | 1.561 - 5 | 5.181 - 6 |
| 37000 | 37268 | 245.15 | -28.00 | 2.50 | 4.144 | 0.986 | 5.888 | 0.976 | 313.9 | 1.574 | 5.228 |
| 38000 | 38282 | 247.55 | -25.60 | 2.10 | 3.607 | 0.987 | 5.076 | 0.979 | 315.4 | 1.586 | 5.275 |
| 39000 | 39295 | 249.95 | -23.20 | 1.70 | 3.144 | 0.988 | 4.382 | 0.981 | 316.9 | 1.599 | 5.322 |
| 40000 | 40309 | 252.35 | -20.80 | 1.30 | 2.744 | 0.989 | 3.788 | 0.984 | 318.5 | 1.611 | 5.368 |
| 41000 | 41324 | 254.75 | -18.40 | 0.90 | 2.398 | 0.989 | 3.280 | 0.986 | 320.0 | 1.624 | 5.415 |
| 42000 | 42338 | 257.15 | -16.00 | 0.50 | 2.099 | 0.990 | 2.843 | 0.988 | 321.5 | 1.636 | 5.462 |
| 43000 | 43353 | 259.55 | -13.60 | 0.10 | 1.839 | 0.990 | 2.468 | 0.990 | 323.0 | 1.648 | 5.508 |
| 44000 | 44368 | 261.95 | -11.20 | -0.30 | 1 613 | 0.990 | 2.145 | 0.991 | 324.5 | 1.660 | 5.554 |
| 45000 | 45384 | 264.35 | -8.80 | -0.70 | 1.417 | 0.990 | 1.867 | 0.992 | 325.9 | 1.672 | 5.601 |
| 46000 | 46400 | 266.75 | -6.40 | -1.10 | 1.246 + 0 | 0.989 | 1.627 - 3 | 0.993 | 327.4 | 1.684 - 5 | 5.647 - 6 |
| 47000 | 47416 | 269.15 | -4.00 | -1.50 | 1.096 | 0.989 | 1.419 | 0.994 | 328.9 | 1.696 | 5.693 |
| 48000 | 48433 | 269.15 | -4.00 | -1.50 | 9.657 - 1 | 0.988 | 1.250 | 0.994 | 328.9 | 1.696 | 5.693 |
| 49000 | 49449 | 269.15 | -4.00 | -1.50 | 8.506 | 0.987 | 1.101 | 0.993 | 328.9 | 1.696 | 5.693 |
| 50000 | 50467 | 269.15 | -4.00 | -1.50 | 7.492 | 0.987 | 9.697 - 4 | 0.992 | 328.9 | 1.696 | 5.693 |
| 51000 | 51484 | 269.15 | -4.00 | -1.50 | 6.599 | 0.986 | 8.541 | 0.991 | 328.9 | 1.696 | 5.693 |
| 52000 | 52502 | 267.15 | -6.00 | -3.50 | 5.810 | 0.985 | 7.576 | 0.998 | 327.7 | 1.686 | 5.654 |
| 53000 | 53520 | 265.15 | -8.00 | -3.50 | 5.110 | 0.983 | 6.714 | 0.996 | 326.4 | 1.676 | 5.616 |
| 54000 | 54539 | 263.15 | -10.00 | -3.50 | 4.490 | 0.981 | 5.944 | 0.994 | 325.2 | 1.666 | 5.577 |
| 55000 | 55556 | 261.15 | -12.00 | -3.50 | 3.941 | 0.980 | 5.258 | 0.993 | 324.0 | 1.656 | 5.539 |
| 56000 | 56577 | 259.15 | -14.00 | -3.50 | 3.456 - 1 | 0.978 | 4.646 - 4 | 0.991 | 322.7 | 1.646 - 5 | 5.500 - 6 |
| 57000 | 57596 | 257.15 | -16.00 | -3.50 | 3.028 | 0.976 | 4.102 | 0.990 | 321.5 | 1.636 | 5.462 |
| 58000 | 58616 | 255.15 | -18.00 | -3.50 | 2.650 | 0.975 | 3.618 | 0.988 | 320.2 | 1.626 | 5.423 |
| 59000 | 59636 | 253.15 | -20.00 | -3.50 | 2.316 | 0.973 | 3.188 | 0.986 | 319.0 | 1.615 | 5.384 |
| 60000 | 60656 | 250.05 | -23.10 | -4.60 | 2.022 | 0.970 | 2.818 | 0.989 | 317.0 | 1.599 | 5.324 |
| 61000 | 61677 | 246.95 | -26.20 | -5.70 | 1.763 | 0.968 | 2.486 | 0.990 | 315.0 | 1.583 | 5.263 |
| 62000 | 62698 | 243.85 | -29.30 | -4.80 | 1.534 | 0.965 | 2.191 | 0.984 | 313.0 | 1.567 | 5.202 |
| 63000 | 63720 | 240.75 | -32.40 | -3.90 | 1.332 | 0.963 | 1.927 | 0.978 | 311.0 | 1.551 | 5.141 |
| 64000 | 64741 | 237.65 | -35.50 | -3.00 | 1.155 | 0.961 | 1.693 | 0.973 | 309.0 | 1.535 | 5.080 |
| 65000 | 65764 | 234.55 | -38.60 | -2.10 | 9.990 - 2 | 0.960 | 1.484 | 0.968 | 307.0 | 1.518 | 5.019 |
| 66000 | 66786 | 231.45 | -41.70 | -1.20 | 8.628 - 2 | 0.958 | 1.299 - 4 | 0.963 | 305.0 | 1.502 - 5 | 4.958 - 6 |
| 67000 | 67809 | 228.35 | -44.80 | -0.30 | 7.437 | 0.958 | 1.135 | 0.959 | 302.9 | 1.485 | 4.896 |
| 68000 | 68832 | 225.25 | -47.90 | 0.60 | 6.397 | 0.958 | 9.893 - 5 | 0.955 | 300.9 | 1.468 | 4.834 |
| 69000 | 69855 | 222.15 | -51.00 | 1.50 | 5.491 | 0.959 | 8.610 | 0.952 | 298.8 | 1.452 | 4.772 |
| 70000 | 70879 | 219.05 | -54.10 | 2.40 | 4.703 | 0.960 | 7.479 | 0.949 | 296.7 | 1.435 | 4.710 |
| 71000 | 71903 | 215.95 | -57.20 | 3.30 | 4.019 | 0.962 | 6.484 | 0.947 | 294.6 | 1.418 | 4.648 |
| 72000 | 72927 | 212.85 | -60.30 | 4.20 | 3.427 | 0.965 | 5.609 | 0.946 | 292.5 | 1.401 | 4.585 |
| 73000 | 73952 | 209.75 | -63.40 | 5.10 | 2.916 | 0.968 | 4.842 | 0.945 | 290.3 | 1.383 | 4.522 |
| 74000 | 74977 | 206.65 | -66.50 | 6.00 | 2.474 | 0.973 | 4.171 | 0.944 | 288.2 | 1.366 | 4.459 |
| 75000 | 76002 | 203.55 | -69.60 | 6.90 | 2.095 | 0.978 | 3.585 | 0.945 | 286.0 | 1.349 | 4.396 |
| 76000 | 77028 | 200.45 | -72.70 | 7.80 | 1.769 - 2 | 0.984 | 3.074 - 5 | 0.946 | 283.8 | 1.331 - 5 | 4.333 - 6 |
| 77000 | 78055 | 197.35 | -75.80 | 8.70 | 1.490 | 0.992 | 2.630 | 0.948 | 281.6 | 1.313 | 4.270 |
| 78000 | 79080 | 194.25 | -78.90 | 9.60 | 1.251 | 1.000 | 2.244 | 0.951 | 279.4 | 1.296 | 4.206 |
| 79000 | 80107 | 191.15 | -82.00 | 10.50 | 1.048 | 1.009 | 1.910 | 0.954 | 277.2 | 1.278 | 4.142 |
| 80000 | 81134 | 191.15 | -82.00 | 10.48 | 8.764 - 3 | 1.020 | 1.597 | 0.964 | 277.2 | 1.278 | 4.142 |
| 81000 | 82161 | 191.15 | -82.00 | 10.47 | 7.329 | 1.031 | 1.336 | 0.974 | 277.2 | 1.278 | 4.142 |
| 82000 | 83189 | 191.11 | -82.04 | 10.46 | 6.130 | 1.042 | 1.117 | 0.984 | 277.2 | 1.278 | 4.142 |
| 83000 | 84217 | 191.09 | -82.06 | 10.44 | 5.127 | 1.053 | 9.343 - 6 | 0.995 | 277.2 | 1.278 | 4.142 |
| 84000 | 85245 | 191.08 | -82.07 | 10.43 | 4.287 | 1.064 | 7.814 | 1.005 | 277.2 | 1.278 | 4.142 |
| 85000 | 86274 | 191.07 | -82.08 | 10.42 | 3.586 | 1.075 | 6.535 | 1.016 | 277.2 | 1.278 | 4.142 |
| 86000 | 87303 | 191.05 | -82.10 | 10.40 | 2.999 - 3 | 1.086 | 5.465 - 6 | 1.026 | 277.2 | 1.278 - 5 | 4.142 - 6 |
| 87000 | 88332 | 191.04 | -82.11 | 10.39 | 2.508 | 1.097 | 4.571 | 1.037 | 277.2 | 1.278 | 4.142 |
| 88000 | 89361 | 191.03 | -82.12 | 10.38 | 2.098 | 1.109 | 3.823 | 1.048 | 277.2 | 1.278 | 4.142 |
| 89000 | 90391 | 194.44 | -78.71 | 13.80 | 1.757 | 1.122 | 3.145 | 1.046 | 279.7 | 1.298 | 4.214 |
| 90000 | 91422 | 197.72 | -75.43 | 13.21 | 1.477 | 1.137 | 2.596 | 1.051 | 282.2 | 1.318 | 4.286 |
| 92000 | 93483 | 204.27 | -68.88 | 13.66 | 1.052 | 1.166 | 1.787 | 1.084 | 287.1 | 1.358 | 4.429 |
| 94000 | 95546 | 210.80 | -62.35 | 13.79 | 7.583 - 4 | 1.195 | 1.245 | 1.110 | 292.0 | 1.397 | 4.571 |
| 96000 | 97610 | 216.94 | -57.11 | 13.28 | 5.524 | 1.225 | 8.781 - 7 | 1.135 | 296.8 | 1.435 | 4.712 |
| 98000 | 99676 | 221.97 | -51.58 | 12.86 | 4.064 | 1.256 | 6.240 | 1.162 | 301.5 | 1.473 | 4.852 |
| 100000 | 101742 | 227.97 | -46.08 | 9.37 | 3.018 | 1.284 | 4 510 | 1.204 | 306.1 | 1.511 | 4.991 |
| 102000 | 103811 | 236.97 | -36.18 | 9.38 | 2.267 - 4 | 1.309 | 3.228 - 7 | 1.226 | 313.6 | 1.572 - 5 | 5.219 - 6 |
| 104000 | 105880 | 246.83 | -26.32 | 9.47 | 1.726 | 1.335 | 2.347 | 1.247 | 320.9 | 1.631 | 5.444 |
| 106000 | 107951 | 256.64 | -16.51 | 9.71 | 1.330 | 1.360 | 1.730 | 1.268 | 328.0 | 1.689 | 5.666 |
| 108000 | 110023 | 266.44 | -6.71 | 10.00 | 1.036 | 1.385 | 1.292 | 1.289 | 335.0 | 1.746 | 5.886 |
| 110000 | 112096 | 276.22 | 3.07 | 0.98 | 8.150 - 5 | 1.404 | 9.761 - 8 | 1.392 | 341.9 | 1.802 | 6.104 |
| 112000 | 114171 | 291.25 | 18.10 | -3.32 | 6.486 | 1.414 | 7.338 | 1.381 | 351.8 | 1.883 | 6.421 |
| 114000 | 116247 | 306.25 | 33.10 | -7.51 | 5.227 | 1.419 | 5.602 | 1.404 | 361.4 | 1.962 | 6.734 |
| 116000 | 118325 | 321.25 | 48.08 | -11.49 | 4.258 | 1.421 | 4.336 | 1.422 | 370.8 | 2.039 | 7.041 |

TABLE 5.1.—*Continued*
30° N. January

GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 29000 | 28829 | 226.81 | -46.34 | 1.29 | 1.356 + 1 | 0.976 | 2.083 - 2 | 0.970 | 301.9 | 1.477 - 5 | 4.865 - 6 |
| 29500 | 29323 | 227.80 | -45.35 | 1.78 | 1.259 | 0.976 | 1.925 | 0.968 | 302.6 | 1.482 | 4.885 |
| 30000 | 29818 | 228.79 | -44.36 | 2.28 | 1.169 | 0.977 | 1.780 | 0.967 | 303.2 | 1.488 | 4.905 |
| 30500 | 30313 | 229.77 | -43.38 | 2.77 | 1.086 | 0.977 | 1.646 | 0.966 | 303.9 | 1.493 | 4.924 |
| 31000 | 30807 | 230.76 | -42.39 | 3.26 | 1.009 | 0.979 | 1.523 | 0.965 | 304.5 | 1.498 | 4.944 |
| 31500 | 31302 | 231.75 | -41.40 | 3.76 | 9.380 + 0 | 0.980 | 1.410 | 0.964 | 305.2 | 1.503 | 4.964 |
| 32000 | 31796 | 232.74 | -40.41 | 4.25 | 8.723 | 0.981 | 1.306 | 0.963 | 305.8 | 1.509 | 4.983 |
| 33000 | 32784 | 235.03 | -38.12 | 4.06 | 7.550 | 0.984 | 1.119 | 0.967 | 307.3 | 1.521 | 5.029 |
| 34000 | 33773 | 237.40 | -35.75 | 3.66 | 6.544 | 0.986 | 9.608 - 3 | 0.971 | 308.9 | 1.533 | 5.075 |
| 35000 | 34760 | 239.77 | -33.38 | 3.26 | 5.681 | 0.989 | 8.254 | 0.975 | 310.4 | 1.546 | 5.122 |
| 36000 | 35748 | 242.14 | -31.01 | 2.86 | 4.939 + 0 | 0.991 | 7.105 - 3 | 0.979 | 311.9 | 1.558 - 5 | 5.169 - 6 |
| 37000 | 36735 | 244.51 | -28.64 | 2.46 | 4.300 | 0.993 | 6.126 | 0.982 | 313.5 | 1.571 | 5.215 |
| 38000 | 37722 | 246.88 | -26.27 | 2.06 | 3.748 | 0.994 | 5.289 | 0.985 | 315.0 | 1.583 | 5.262 |
| 39000 | 38709 | 249.25 | -23.90 | 1.67 | 3.272 | 0.995 | 4.573 | 0.988 | 316.5 | 1.595 | 5.308 |
| 40000 | 39695 | 251.62 | -21.53 | 1.27 | 2.860 | 0.996 | 3.960 | 0.991 | 318.0 | 1.607 | 5.354 |
| 41000 | 40681 | 253.98 | -19.17 | 0.87 | 2.503 | 0.997 | 3.434 | 0.994 | 319.5 | 1.620 | 5.400 |
| 42000 | 41667 | 256.35 | -16.80 | 0.47 | 2.194 | 0.997 | 2.981 | 0.995 | 321.0 | 1.632 | 5.446 |
| 43000 | 42652 | 258.71 | -14.44 | 0.07 | 1.925 | 0.997 | 2.592 | 0.997 | 322.4 | 1.644 | 5.492 |
| 44000 | 43637 | 261.08 | -12.07 | -0.32 | 1.691 | 0.998 | 2.257 | 0.999 | 323.9 | 1.656 | 5.538 |
| 45000 | 44622 | 263.44 | -9.71 | -0.72 | 1.488 | 0.998 | 1.967 | 1.001 | 325.4 | 1.668 | 5.583 |
| 46000 | 45606 | 265.81 | -7.34 | -1.12 | 1.310 + 0 | 0.998 | 1.717 - 3 | 1.002 | 326.8 | 1.679 - 5 | 5.629 - 6 |
| 47000 | 46591 | 268.17 | -4.98 | -1.52 | 1.155 | 0.997 | 1.500 | 1.003 | 328.3 | 1.691 | 5.674 |
| 48000 | 47575 | 269.15 | -4.00 | -1.50 | 1.019 | 0.996 | 1.319 | 1.002 | 328.9 | 1.696 | 5.693 |
| 49000 | 48558 | 269.15 | -4.00 | -1.50 | 8.996 - 1 | 0.996 | 1.165 | 1.001 | 328.9 | 1.696 | 5.693 |
| 50000 | 49541 | 269.15 | -4.00 | -1.50 | 7.941 | 0.995 | 1.028 | 1.001 | 328.9 | 1.696 | 5.693 |
| 51000 | 50524 | 269.15 | -4.00 | -1.50 | 7.010 | 0.995 | 9.073 - 4 | 1.000 | 328.9 | 1.696 | 5.693 |
| 52000 | 51507 | 268.14 | -5.01 | -2.51 | 6.187 | 0.994 | 8.038 | 1.004 | 328.3 | 1.691 | 5.673 |
| 53000 | 52489 | 266.17 | -6.98 | -3.36 | 5.457 | 0.993 | 7.142 | 1.005 | 327.1 | 1.681 | 5.636 |
| 54000 | 53471 | 264.21 | -8.94 | -3.35 | 4.808 | 0.992 | 6.340 | 1.004 | 325.8 | 1.671 | 5.598 |
| 55000 | 54453 | 262.24 | -10.91 | -3.35 | 4.233 | 0.990 | 5.623 | 1.003 | 324.6 | 1.662 | 5.560 |
| 56000 | 55434 | 260.28 | -12.87 | -3.35 | 3.723 - 1 | 0.989 | 4.983 - 4 | 1.001 | 323.4 | 1.652 - 5 | 5.522 - 6 |
| 57000 | 56415 | 258.32 | -14.83 | -3.34 | 3.272 | 0.987 | 4.412 | 1.000 | 322.2 | 1.642 | 5.484 |
| 58000 | 57396 | 256.36 | -16.79 | -3.34 | 2.872 | 0.986 | 3.903 | 0.999 | 321.0 | 1.632 | 5.446 |
| 59000 | 58377 | 254.40 | -18.75 | -3.34 | 2.519 | 0.984 | 3.450 | 0.997 | 319.7 | 1.622 | 5.408 |
| 60000 | 59357 | 252.04 | -21.11 | -3.73 | 2.207 | 0.983 | 3.051 | 0.997 | 318.3 | 1.610 | 5.362 |
| 61000 | 60337 | 249.01 | -24.14 | -4.80 | 1.931 | 0.981 | 2.702 | 1.000 | 316.3 | 1.594 | 5.303 |
| 62000 | 61316 | 245.97 | -27.18 | -5.08 | 1.687 | 0.979 | 2.389 | 0.998 | 314.4 | 1.578 | 5.244 |
| 63000 | 62295 | 242.93 | -30.22 | -4.19 | 1.471 | 0.976 | 2.110 | 0.993 | 312.5 | 1.562 | 5.184 |
| 64000 | 63274 | 239.90 | -33.25 | -3.30 | 1.281 | 0.974 | 1.860 | 0.987 | 310.5 | 1.547 | 5.125 |
| 65000 | 64253 | 236.87 | -36.28 | -2.42 | 1.113 | 0.972 | 1.637 | 0.983 | 309.5 | 1.531 | 5.065 |
| 66000 | 65231 | 233.83 | -39.32 | -1.53 | 9.659 - 2 | 0.972 | 1.439 - 4 | 0.978 | 306.5 | 1.514 - 5 | 5.005 - 6 |
| 67000 | 66209 | 230.80 | -42.35 | -0.65 | 8.365 | 0.971 | 1.263 | 0.974 | 304.6 | 1.498 | 4.945 |
| 68000 | 67187 | 227.77 | -45.38 | 0.24 | 7.231 | 0.971 | 1.106 | 0.970 | 302.5 | 1.482 | 4.884 |
| 69000 | 68164 | 224.74 | -48.41 | 1.13 | 6.239 | 0.972 | 9.671 - 5 | 0.967 | 300.5 | 1.466 | 4.824 |
| 70000 | 69142 | 221.71 | -51.44 | 2.01 | 5.372 | 0.973 | 8.441 | 0.964 | 298.5 | 1.449 | 4.763 |
| 71000 | 70118 | 218.68 | -54.47 | 2.89 | 4.617 | 0.975 | 7.355 | 0.962 | 296.5 | 1.433 | 4.703 |
| 72000 | 71095 | 215.66 | -57.49 | 3.78 | 3.959 | 0.978 | 6.396 | 0.960 | 294.4 | 1.416 | 4.642 |
| 73000 | 72071 | 212.63 | -60.52 | 4.66 | 3.388 | 0.981 | 5.551 | 0.959 | 292.3 | 1.399 | 4.581 |
| 74000 | 73047 | 209.60 | -63.55 | 5.55 | 2.893 | 0.985 | 4.809 | 0.959 | 290.2 | 1.383 | 4.519 |
| 75000 | 74023 | 206.58 | -66.57 | 6.43 | 2.465 | 0.990 | 4.157 | 0.959 | 288.1 | 1.366 | 4.458 |
| 76000 | 74998 | 203.56 | -69.59 | 7.32 | 2.095 - 2 | 0.996 | 3.586 - 5 | 0.960 | 286.0 | 1.349 - 5 | 4.397 - 6 |
| 77000 | 75973 | 200.53 | -72.62 | 8.19 | 1.777 | 1.003 | 3.087 | 0.962 | 283.9 | 1.332 | 4.335 |
| 78000 | 76948 | 197.51 | -75.64 | 9.08 | 1.503 | 1.010 | 2.651 | 0.964 | 281.7 | 1.314 | 4.273 |
| 79000 | 77922 | 194.49 | -78.66 | 9.96 | 1.268 | 1.020 | 2.272 | 0.967 | 279.6 | 1.297 | 4.211 |
| 80000 | 78896 | 191.47 | -81.68 | 10.82 | 1.068 | 1.029 | 1.942 | 0.972 | 277.4 | 1.280 | 4.149 |
| 81000 | 79870 | 191.14 | -82.01 | 10.49 | 8.970 - 3 | 1.041 | 1.635 | 0.984 | 277.2 | 1.278 | 4.142 |
| 82000 | 80843 | 191.12 | -82.03 | 10.47 | 7.538 | 1.051 | 1.374 | 0.994 | 277.2 | 1.278 | 4.142 |
| 83000 | 81816 | 191.11 | -82.04 | 10.46 | 6.334 | 1.062 | 1.154 | 1.004 | 277.2 | 1.278 | 4.142 |
| 84000 | 82789 | 191.10 | -82.05 | 10.45 | 5.323 | 1.073 | 9.702 - 6 | 1.015 | 277.2 | 1.278 | 4.142 |
| 85000 | 83762 | 191.08 | -82.07 | 10.43 | 4.474 | 1.085 | 8.154 | 1.025 | 277.2 | 1.278 | 4.142 |
| 86000 | 84734 | 191.07 | -82.08 | 10.42 | 3.760 - 3 | 1.096 | 6.853 - 6 | 1.036 | 277.2 | 1.278 - 5 | 4.142 - 6 |
| 87000 | 85706 | 191.06 | -82.09 | 10.41 | 3.161 | 1.107 | 5.760 | 1.047 | 277.2 | 1.278 | 4.142 |
| 88000 | 86678 | 191.04 | -82.11 | 10.39 | 2.657 | 1.119 | 4.842 | 1.057 | 277.2 | 1.278 | 4.142 |
| 89000 | 87649 | 191.03 | -82.12 | 10.38 | 2.233 | 1.130 | 4.070 | 1.068 | 277.2 | 1.278 | 4.142 |
| 90000 | 88620 | 191.10 | -82.05 | 12.54 | 1.879 | 1.143 | 3.386 | 1.088 | 278.7 | 1.290 | 4.187 |
| 92000 | 90561 | 199.50 | -73.65 | 12.94 | 1.341 | 1.171 | 2.335 | 1.092 | 283.6 | 1.329 | 4.326 |
| 94000 | 92501 | 205.42 | -67.73 | 13.34 | 9.683 - 4 | 1.200 | 1.630 | 1.117 | 288.4 | 1.368 | 4.465 |
| 96000 | 94440 | 211.32 | -61.83 | 13.27 | 7.066 | 1.229 | 1.152 | 1.143 | 293.0 | 1.405 | 4.602 |
| 98000 | 96378 | 217.04 | -56.06 | 12.81 | 5.209 | 1.259 | 8.231 - 7 | 1.168 | 297.7 | 1.443 | 4.739 |
| 100000 | 98314 | 222.43 | -50.72 | 12.41 | 3.876 | 1.289 | 5.942 | 1.195 | 302.2 | 1.479 | 4.874 |
| 102000 | 100249 | 228.51 | -44.64 | 8.65 | 2.910 - 4 | 1.316 | 4.322 - 7 | 1.237 | 307.0 | 1.516 - 5 | 5.020 - 6 |
| 104000 | 102183 | 237.88 | -35.27 | 8.70 | 2.210 | 1.340 | 3.135 | 1.257 | 314.3 | 1.577 | 5.240 |
| 106000 | 104116 | 247.40 | -25.75 | 8.82 | 1.699 | 1.364 | 2.305 | 1.277 | 321.3 | 1.634 | 5.457 |
| 108000 | 106047 | 256.88 | -16.27 | 9.03 | 1.322 | 1.388 | 1.718 | 1.298 | 328.2 | 1.691 | 5.672 |
| 110000 | 107978 | 266.33 | -6.82 | 9.33 | 1.039 | 1.412 | 1.296 | 1.318 | 335.0 | 1.746 | 5.884 |
| 112000 | 109907 | 275.74 | 2.61 | -0.09 | 8.239 - 5 | 1.430 | 9.887 - 8 | 1.382 | 341.6 | 1.800 | 6.094 |
| 114000 | 111835 | 290.01 | 16.86 | -4.81 | 6.606 | 1.439 | 7.508 | 1.411 | 351.0 | 1.877 | 6.395 |
| 116000 | 113762 | 304.46 | 31.31 | -8.55 | 5.359 | 1.443 | 5.780 | 1.433 | 360.3 | 1.953 | 6.697 |
| 118000 | 115687 | 318.49 | 45.34 | -12.44 | 4.394 | 1.444 | 4.509 | 1.449 | 369.3 | 2.027 | 6.993 |

TABLE 5.1.—*Continued*

30° N. July

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 304.58 | 31.43 | 16.43 | 1.01350 + 3 | 1.000 | 1.159 + 0 | 0.946 | 349.9 | 1.868 − 5 | 6.359 − 6 |
| 250 | 250 | 302.33 | 29.18 | 15.81 | 9.854 + 2 | 1.002 | 1.135 | 0.949 | 348.6 | 1.857 | 6.318 |
| 500 | 501 | 300.08 | 26.93 | 15.18 | 9.578 | 1.003 | 1.112 | 0.953 | 347.3 | 1.846 | 6.276 |
| 750 | 751 | 297.83 | 24.68 | 14.56 | 9.308 | 1.005 | 1.089 | 0.956 | 346.0 | 1.836 | 6.234 |
| 1000 | 1002 | 295.58 | 22.43 | 13.93 | 9.044 | 1.006 | 1.066 | 0.959 | 344.7 | 1.825 | 6.192 |
| 1250 | 1252 | 294.07 | 20.92 | 14.04 | 8.786 | 1.008 | 1.041 | 0.959 | 343.8 | 1.818 | 6.164 |
| 1500 | 1502 | 292.56 | 19.41 | 14.16 | 8.534 | 1.009 | 1.016 | 0.960 | 342.9 | 1.811 | 6.136 |
| 1750 | 1753 | 291.05 | 17.90 | 14.27 | 8.288 | 1.011 | 9.920 − 1 | 0.961 | 342.0 | 1.803 | 6.107 |
| 2000 | 2003 | 289.54 | 16.39 | 14.39 | 8.048 | 1.012 | 9.683 | 0.962 | 341.1 | 1.796 | 6.079 |
| 2250 | 2254 | 288.08 | 14.93 | 14.56 | 7.813 | 1.014 | 9.448 | 0.963 | 340.3 | 1.789 | 6.051 |
| 2500 | 2504 | 286.63 | 13.48 | 14.73 | 7.584 + 2 | 1.016 | 9.218 − 1 | 0.963 | 339.4 | 1.782 − 5 | 6.024 − 6 |
| 2750 | 2755 | 285.17 | 12.02 | 14.90 | 7.361 | 1.017 | 8.992 | 0.964 | 338.5 | 1.775 | 5.997 |
| 3000 | 3006 | 283.72 | 10.57 | 15.07 | 7.143 | 1.019 | 8.771 | 0.965 | 337.7 | 1.768 | 5.970 |
| 3250 | 3256 | 282.24 | 9.09 | 15.22 | 6.931 | 1.021 | 8.555 | 0.966 | 336.8 | 1.761 | 5.942 |
| 3500 | 3507 | 280.77 | 7.62 | 15.37 | 6.724 | 1.022 | 8.343 | 0.966 | 335.9 | 1.754 | 5.914 |
| 3750 | 3757 | 279.30 | 6.15 | 15.52 | 6.522 | 1.024 | 8.135 | 0.967 | 335.0 | 1.746 | 5.886 |
| 4000 | 4008 | 277.82 | 4.67 | 15.67 | 6.325 | 1.026 | 7.931 | 0.968 | 334.1 | 1.739 | 5.858 |
| 4250 | 4259 | 276.40 | 3.25 | 15.88 | 6.133 | 1.028 | 7.730 | 0.969 | 333.3 | 1.732 | 5.831 |
| 4500 | 4509 | 274.96 | 1.83 | 16.08 | 5.946 | 1.030 | 7.533 | 0.970 | 332.4 | 1.725 | 5.804 |
| 4750 | 4760 | 273.56 | 0.41 | 16.28 | 5.763 | 1.032 | 7.340 | 0.971 | 331.6 | 1.718 | 5.777 |
| 5000 | 5011 | 272.13 | −1.02 | 16.48 | 5.586 + 2 | 1.034 | 7.151 − 1 | 0.971 | 330.7 | 1.711 − 5 | 5.750 − 6 |
| 5250 | 5262 | 270.71 | −2.44 | 16.69 | 5.413 | 1.036 | 6.966 | 0.972 | 329.8 | 1.704 | 5.723 |
| 5500 | 5512 | 269.29 | −3.86 | 16.89 | 5.244 | 1.038 | 6.784 | 0.973 | 329.0 | 1.697 | 5.695 |
| 5750 | 5763 | 267.87 | −5.28 | 17.09 | 5.080 | 1.041 | 6.607 | 0.974 | 328.1 | 1.690 | 5.668 |
| 6000 | 6014 | 266.44 | −6.71 | 17.29 | 4.920 | 1.043 | 6.433 | 0.975 | 327.2 | 1.683 | 5.641 |
| 6250 | 6265 | 264.67 | −8.48 | 17.15 | 4.765 | 1.045 | 6.271 | 0.977 | 326.1 | 1.674 | 5.607 |
| 6500 | 6516 | 262.90 | −10.25 | 17.00 | 4.613 | 1.048 | 6.112 | 0.980 | 325.0 | 1.665 | 5.573 |
| 6750 | 6766 | 261.13 | −12.02 | 16.85 | 4.465 | 1.050 | 5.957 | 0.982 | 323.9 | 1.656 | 5.539 |
| 7000 | 7017 | 259.36 | −13.79 | 16.71 | 4.321 | 1.052 | 5.804 | 0.984 | 322.8 | 1.647 | 5.504 |
| 7250 | 7268 | 257.58 | −15.57 | 16.56 | 4.180 | 1.055 | 5.654 | 0.987 | 321.7 | 1.638 | 5.470 |
| 7500 | 7519 | 255.81 | −17.34 | 16.41 | 4.043 + 2 | 1.057 | 5.506 − 1 | 0.989 | 320.6 | 1.629 − 5 | 5.436 − 6 |
| 7750 | 7770 | 254.04 | −19.11 | 16.26 | 3.910 | 1.059 | 5.362 | 0.992 | 319.5 | 1.620 | 5.401 |
| 8000 | 8021 | 252.27 | −20.88 | 16.12 | 3.781 | 1.062 | 5.221 | 0.994 | 318.4 | 1.611 | 5.367 |
| 8250 | 8272 | 250.51 | −22.64 | 15.98 | 3.654 | 1.064 | 5.082 | 0.996 | 317.3 | 1.602 | 5.333 |
| 8500 | 8523 | 248.74 | −24.41 | 15.84 | 3.531 | 1.067 | 4.946 | 0.999 | 316.2 | 1.593 | 5.298 |
| 8750 | 8774 | 246.98 | −26.17 | 15.71 | 3.412 | 1.070 | 4.812 | 1.001 | 315.0 | 1.584 | 5.264 |
| 9000 | 9025 | 245.22 | −27.93 | 15.57 | 3.295 | 1.072 | 4.681 | 1.004 | 313.9 | 1.574 | 5.229 |
| 9250 | 9276 | 243.46 | −29.69 | 15.44 | 3.182 | 1.074 | 4.553 | 1.006 | 312.8 | 1.565 | 5.195 |
| 9500 | 9527 | 241.70 | −31.45 | 15.30 | 3.072 | 1.077 | 4.428 | 1.009 | 311.7 | 1.556 | 5.160 |
| 9750 | 9778 | 239.94 | −33.21 | 15.16 | 2.965 | 1.080 | 4.305 | 1.011 | 310.5 | 1.547 | 5.125 |
| 10000 | 10030 | 238.18 | −34.97 | 15.03 | 2.861 + 2 | 1.082 | 4.185 − 1 | 1.014 | 309.4 | 1.537 − 5 | 5.091 − 6 |
| 10250 | 10281 | 236.42 | −36.73 | 14.90 | 2.760 | 1.085 | 4.067 | 1.016 | 308.2 | 1.528 | 5.056 |
| 10500 | 10532 | 234.66 | −38.49 | 14.76 | 2.662 | 1.088 | 3.951 | 1.019 | 307.1 | 1.519 | 5.021 |
| 10750 | 10783 | 232.91 | −40.24 | 14.63 | 2.566 | 1.090 | 3.838 | 1.022 | 305.9 | 1.510 | 4.987 |
| 11000 | 11034 | 231.15 | −42.00 | 14.50 | 2.473 | 1.093 | 3.728 | 1.024 | 304.8 | 1.500 | 4.952 |
| 11500 | 11537 | 227.65 | −45.50 | 11.00 | 2.296 | 1.097 | 3.513 | 1.045 | 302.5 | 1.481 | 4.882 |
| 12000 | 12039 | 224.15 | −49.00 | 7.50 | 2.129 | 1.101 | 3.308 | 1.064 | 300.1 | 1.463 | 4.812 |
| 12500 | 12542 | 220.65 | −52.50 | 4.00 | 1.971 | 1.104 | 3.112 | 1.083 | 297.8 | 1.444 | 4.742 |
| 13000 | 13045 | 217.15 | −56.00 | 0.50 | 1.823 | 1.104 | 2.925 | 1.102 | 295.4 | 1.424 | 4.672 |
| 13500 | 13547 | 213.65 | −59.50 | −3.00 | 1.684 | 1.104 | 2.746 | 1.119 | 293.0 | 1.405 | 4.601 |
| 14000 | 14050 | 210.15 | −63.00 | −6.50 | 1.554 + 2 | 1.102 | 2.576 − 1 | 1.131 | 290.6 | 1.386 − 5 | 4.530 − 6 |
| 14500 | 14553 | 206.65 | −66.50 | −10.00 | 1.432 | 1.099 | 2.413 | 1.151 | 288.2 | 1.366 | 4.459 |
| 15000 | 15056 | 203.15 | −70.00 | −13.50 | 1.317 | 1.096 | 2.258 | 1.166 | 285.7 | 1.346 | 4.388 |
| 15500 | 15559 | 203.15 | −70.00 | −13.50 | 1.211 | 1.088 | 2.076 | 1.160 | 285.7 | 1.346 | 4.388 |
| 16000 | 16062 | 203.15 | −70.00 | −13.50 | 1.113 | 1.082 | 1.909 | 1.154 | 285.7 | 1.346 | 4.388 |
| 16500 | 16566 | 204.25 | −68.90 | −12.40 | 1.024 | 1.077 | 1.766 | 1.142 | 286.5 | 1.353 | 4.411 |
| 17000 | 17069 | 205.35 | −67.80 | −11.30 | 9.417 + 1 | 1.072 | 1.598 | 1.131 | 287.3 | 1.359 | 4.433 |
| 17500 | 17572 | 206.45 | −66.70 | −10.20 | 8.667 | 1.067 | 1.463 | 1.120 | 288.0 | 1.365 | 4.455 |
| 18000 | 18076 | 207.55 | −65.60 | −9.10 | 7.981 | 1.063 | 1.340 | 1.110 | 288.8 | 1.371 | 4.478 |
| 18500 | 18580 | 208.65 | −64.50 | −8.00 | 7.352 | 1.060 | 1.228 | 1.101 | 289.6 | 1.377 | 4.500 |
| 19000 | 19083 | 209.75 | −63.40 | −6.90 | 6.776 + 1 | 1.057 | 1.125 − 1 | 1.091 | 290.3 | 1.383 − 5 | 4.522 − 6 |
| 19500 | 19587 | 210.85 | −62.30 | −5.80 | 6.247 | 1.055 | 1.032 | 1.083 | 291.1 | 1.390 | 4.545 |
| 20000 | 20091 | 211.95 | −61.20 | −4.70 | 5.762 | 1.052 | 9.471 − 2 | 1.076 | 291.9 | 1.396 | 4.567 |
| 20500 | 20595 | 213.05 | −60.10 | −4.10 | 5.317 | 1.051 | 8.694 | 1.071 | 292.6 | 1.402 | 4.589 |
| 21000 | 21099 | 214.15 | −59.00 | −3.50 | 4.908 | 1.049 | 7.985 | 1.066 | 293.4 | 1.408 | 4.611 |
| 21500 | 21603 | 215.15 | −58.00 | −3.00 | 4.533 | 1.048 | 7.340 | 1.063 | 294.0 | 1.413 | 4.631 |
| 22000 | 22107 | 216.15 | −57.00 | −2.50 | 4.188 | 1.047 | 6.749 | 1.059 | 294.7 | 1.419 | 4.652 |
| 22500 | 22611 | 217.15 | −56.00 | −2.00 | 3.870 | 1.046 | 6.209 | 1.056 | 295.4 | 1.424 | 4.672 |
| 23000 | 23115 | 218.15 | −55.00 | −1.50 | 3.578 | 1.045 | 5.714 | 1.053 | 296.1 | 1.430 | 4.692 |
| 23500 | 23620 | 219.15 | −54.00 | −1.00 | 3.309 | 1.045 | 5.260 | 1.050 | 296.8 | 1.435 | 4.712 |
| 24000 | 24124 | 220.15 | −53.00 | −0.50 | 3.062 + 1 | 1.045 | 4.845 − 2 | 1.047 | 297.4 | 1.441 − 5 | 4.732 − 6 |
| 24500 | 24629 | 221.15 | −52.00 | −0.00 | 2.833 | 1.045 | 4.463 | 1.045 | 298.1 | 1.446 | 4.752 |
| 25000 | 25133 | 222.15 | −51.00 | 0.50 | 2.623 | 1.045 | 4.114 | 1.042 | 298.8 | 1.452 | 4.772 |
| 25500 | 25638 | 223.15 | −50.00 | 1.00 | 2.430 | 1.045 | 3.793 | 1.040 | 299.5 | 1.457 | 4.792 |
| 26000 | 26143 | 224.15 | −49.00 | 1.50 | 2.251 | 1.045 | 3.498 | 1.038 | 300.1 | 1.463 | 4.812 |
| 26500 | 26648 | 225.15 | −48.00 | 2.00 | 2.086 | 1.046 | 3.228 | 1.037 | 300.8 | 1.468 | 4.832 |
| 27000 | 27153 | 226.15 | −47.00 | 2.50 | 1.934 | 1.047 | 2.979 | 1.035 | 301.5 | 1.473 | 4.852 |
| 27500 | 27658 | 227.15 | −46.00 | 3.00 | 1.794 | 1.048 | 2.751 | 1.034 | 302.1 | 1.479 | 4.872 |
| 28000 | 28163 | 228.15 | −45.00 | 3.50 | 1.664 | 1.049 | 2.541 | 1.033 | 302.8 | 1.484 | 4.892 |
| 28500 | 28668 | 229.15 | −44.00 | 4.00 | 1.544 | 1.050 | 2.348 | 1.032 | 303.5 | 1.489 | 4.912 |

TABLE 5.1.—*Continued*
30° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T - T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 304.58 | 31.43 | 16.43 | 1.01350 + 3 | 1.000 | 1.159 + 0 | 0.946 | 349.9 | 1.868 − 5 | 6.359 − 6 |
| 250 | 250 | 302.34 | 29.19 | 15.81 | 9.854 + 2 | 1.002 | 1.135 | 0.949 | 348.6 | 1.857 | 6.318 |
| 500 | 499 | 300.09 | 26.94 | 15.19 | 9.579 | 1.003 | 1.112 | 0.953 | 347.3 | 1.846 | 6.276 |
| 750 | 749 | 297.84 | 24.69 | 14.56 | 9.310 | 1.005 | 1.089 | 0.956 | 346.0 | 1.836 | 6.234 |
| 1000 | 998 | 295.59 | 22.44 | 13.94 | 9.046 | 1.006 | 1.066 | 0.959 | 344.7 | 1.825 | 6.192 |
| 1250 | 1248 | 294.06 | 20.93 | 14.05 | 8.788 | 1.008 | 1.041 | 0.959 | 343.8 | 1.818 | 6.164 |
| 1500 | 1498 | 292.57 | 19.42 | 14.17 | 8.536 | 1.010 | 1.016 | 0.961 | 342.9 | 1.811 | 6.136 |
| 1750 | 1747 | 291.06 | 17.91 | 14.29 | 8.291 | 1.011 | 9.923 − 1 | 0.962 | 342.0 | 1.803 | 6.108 |
| 2000 | 1997 | 289.56 | 16.41 | 14.40 | 8.051 | 1.013 | 9.686 | 0.962 | 341.1 | 1.796 | 6.079 |
| 2250 | 2246 | 288.10 | 14.95 | 14.57 | 7.817 | 1.014 | 9.452 | 0.963 | 340.3 | 1.789 | 6.052 |
| 2500 | 2496 | 286.65 | 13.50 | 14.75 | 7.588 + 2 | 1.016 | 9.222 − 1 | 0.964 | 339.4 | 1.782 − 5 | 6.025 − 6 |
| 2750 | 2745 | 285.20 | 12.05 | 14.92 | 7.365 | 1.018 | 8.997 | 0.964 | 338.5 | 1.775 | 5.998 |
| 3000 | 2994 | 283.75 | 10.60 | 15.09 | 7.148 | 1.019 | 8.776 | 0.965 | 337.7 | 1.768 | 5.970 |
| 3250 | 3244 | 282.28 | 9.13 | 15.24 | 6.936 | 1.021 | 8.560 | 0.966 | 336.8 | 1.761 | 5.942 |
| 3500 | 3493 | 280.81 | 7.66 | 15.40 | 6.729 | 1.023 | 8.348 | 0.967 | 335.9 | 1.754 | 5.915 |
| 3750 | 3743 | 279.34 | 6.19 | 15.55 | 6.528 | 1.025 | 8.141 | 0.968 | 335.1 | 1.747 | 5.887 |
| 4000 | 3992 | 277.87 | 4.72 | 15.70 | 6.331 | 1.027 | 7.937 | 0.969 | 334.2 | 1.739 | 5.859 |
| 4250 | 4241 | 276.45 | 3.30 | 15.91 | 6.139 | 1.029 | 7.737 | 0.969 | 333.3 | 1.732 | 5.832 |
| 4500 | 4491 | 275.03 | 1.88 | 16.11 | 5.953 | 1.031 | 7.540 | 0.970 | 332.5 | 1.725 | 5.805 |
| 4750 | 4740 | 273.61 | 0.46 | 16.32 | 5.771 | 1.033 | 7.347 | 0.971 | 331.6 | 1.718 | 5.778 |
| 5000 | 4989 | 272.20 | −0.95 | 16.52 | 5.593 + 2 | 1.035 | 7.159 − 1 | 0.972 | 330.7 | 1.711 − 5 | 5.751 − 6 |
| 5250 | 5238 | 270.78 | −2.37 | 16.72 | 5.421 | 1.037 | 6.974 | 0.973 | 329.9 | 1.704 | 5.724 |
| 5500 | 5488 | 269.36 | −3.79 | 16.93 | 5.254 | 1.039 | 6.793 | 0.974 | 329.0 | 1.697 | 5.697 |
| 5750 | 5737 | 267.94 | −5.21 | 17.13 | 5.089 | 1.041 | 6.616 | 0.975 | 328.1 | 1.690 | 5.670 |
| 6000 | 5986 | 266.52 | −6.63 | 17.34 | 4.929 | 1.044 | 6.443 | 0.976 | 327.3 | 1.683 | 5.642 |
| 6250 | 6235 | 264.78 | −8.37 | 17.21 | 4.774 | 1.046 | 6.281 | 0.979 | 326.2 | 1.674 | 5.609 |
| 6500 | 6484 | 263.01 | −10.14 | 17.07 | 4.622 | 1.049 | 6.122 | 0.981 | 325.1 | 1.665 | 5.575 |
| 6750 | 6734 | 261.24 | −11.91 | 16.92 | 4.474 | 1.051 | 5.967 | 0.983 | 324.0 | 1.657 | 5.541 |
| 7000 | 6983 | 259.48 | −13.67 | 16.78 | 4.331 | 1.054 | 5.814 | 0.985 | 322.9 | 1.648 | 5.507 |
| 7250 | 7232 | 257.71 | −15.44 | 16.63 | 4.190 | 1.056 | 5.664 | 0.988 | 321.8 | 1.639 | 5.473 |
| 7500 | 7481 | 255.95 | −17.20 | 16.49 | 4.054 + 2 | 1.058 | 5.518 − 1 | 0.990 | 320.7 | 1.630 − 5 | 5.438 − 6 |
| 7750 | 7730 | 254.18 | −18.97 | 16.34 | 3.921 | 1.061 | 5.376 | 0.993 | 319.6 | 1.621 | 5.404 |
| 8000 | 7979 | 252.41 | −20.74 | 16.20 | 3.791 | 1.063 | 5.232 | 0.995 | 318.5 | 1.612 | 5.370 |
| 8250 | 8228 | 250.66 | −22.49 | 16.06 | 3.665 | 1.066 | 5.094 | 0.998 | 317.4 | 1.603 | 5.336 |
| 8500 | 8477 | 248.91 | −24.24 | 15.93 | 3.542 | 1.069 | 4.958 | 1.000 | 316.3 | 1.593 | 5.301 |
| 8750 | 8726 | 247.15 | −26.00 | 15.80 | 3.423 | 1.071 | 4.825 | 1.003 | 315.2 | 1.584 | 5.267 |
| 9000 | 8975 | 245.40 | −27.75 | 15.67 | 3.307 | 1.074 | 4.694 | 1.005 | 314.0 | 1.575 | 5.233 |
| 9250 | 9224 | 243.65 | −29.50 | 15.53 | 3.194 | 1.076 | 4.567 | 1.008 | 312.9 | 1.566 | 5.198 |
| 9500 | 9473 | 241.89 | −31.26 | 15.40 | 3.084 | 1.079 | 4.441 | 1.010 | 311.8 | 1.557 | 5.164 |
| 9750 | 9722 | 240.14 | −33.01 | 15.27 | 2.977 | 1.081 | 4.319 | 1.013 | 310.7 | 1.548 | 5.129 |
| 10000 | 9971 | 238.39 | −34.76 | 15.13 | 2.873 + 2 | 1.084 | 4.199 − 1 | 1.015 | 309.5 | 1.539 − 5 | 5.095 − 6 |
| 10250 | 10219 | 236.64 | −36.51 | 15.00 | 2.772 | 1.087 | 4.081 | 1.018 | 308.4 | 1.529 | 5.060 |
| 10500 | 10468 | 234.89 | −38.26 | 14.87 | 2.674 | 1.090 | 3.966 | 1.020 | 307.2 | 1.520 | 5.026 |
| 10750 | 10717 | 233.14 | −40.01 | 14.74 | 2.578 | 1.093 | 3.853 | 1.023 | 306.1 | 1.511 | 4.991 |
| 11000 | 10966 | 231.39 | −41.76 | 14.61 | 2.486 | 1.095 | 3.742 | 1.026 | 304.9 | 1.501 | 4.956 |
| 11500 | 11464 | 227.90 | −45.25 | 14.25 | 2.308 | 1.100 | 3.529 | 1.046 | 302.6 | 1.483 | 4.887 |
| 12000 | 11961 | 224.42 | −48.73 | 7.77 | 2.141 | 1.104 | 3.324 | 1.066 | 300.3 | 1.464 | 4.818 |
| 12500 | 12458 | 220.94 | −52.21 | 4.29 | 1.984 | 1.107 | 3.128 | 1.085 | 298.0 | 1.445 | 4.748 |
| 13000 | 12956 | 217.46 | −55.69 | 0.81 | 1.836 | 1.107 | 2.941 | 1.103 | 295.6 | 1.426 | 4.678 |
| 13500 | 13453 | 213.98 | −59.17 | −2.67 | 1.697 | 1.107 | 2.763 | 1.121 | 293.2 | 1.407 | 4.608 |
| 14000 | 13950 | 210.50 | −62.65 | −6.15 | 1.566 + 2 | 1.105 | 2.592 − 1 | 1.138 | 290.9 | 1.388 − 5 | 4.538 − 6 |
| 14500 | 14447 | 207.02 | −66.13 | −9.63 | 1.444 | 1.102 | 2.430 | 1.154 | 288.4 | 1.368 | 4.467 |
| 15000 | 14944 | 203.54 | −69.61 | −13.11 | 1.329 | 1.098 | 2.275 | 1.168 | 286.0 | 1.349 | 4.396 |
| 15500 | 15441 | 203.15 | −70.00 | −13.50 | 1.223 | 1.092 | 2.097 | 1.164 | 285.7 | 1.346 | 4.388 |
| 16000 | 15938 | 203.15 | −70.00 | −13.50 | 1.125 | 1.087 | 1.929 | 1.159 | 285.7 | 1.346 | 4.388 |
| 16500 | 16435 | 204.11 | −69.04 | −12.54 | 1.035 | 1.081 | 1.766 | 1.148 | 286.4 | 1.352 | 4.408 |
| 17000 | 16931 | 205.20 | −67.95 | −11.45 | 9.525 + 1 | 1.076 | 1.617 | 1.136 | 287.2 | 1.358 | 4.430 |
| 17500 | 17428 | 206.29 | −66.86 | −10.36 | 8.771 | 1.072 | 1.481 | 1.126 | 287.9 | 1.364 | 4.452 |
| 18000 | 17925 | 207.38 | −65.77 | −9.27 | 8.081 | 1.068 | 1.357 | 1.116 | 288.7 | 1.370 | 4.474 |
| 18500 | 18421 | 208.48 | −64.67 | −8.17 | 7.448 | 1.065 | 1.245 | 1.106 | 289.4 | 1.376 | 4.497 |
| 19000 | 18917 | 209.57 | −63.58 | −7.08 | 6.867 + 1 | 1.062 | 1.142 − 1 | 1.098 | 290.2 | 1.382 − 5 | 4.519 − 6 |
| 19500 | 19414 | 210.66 | −62.49 | −5.99 | 6.335 | 1.059 | 1.048 | 1.089 | 291.0 | 1.388 | 4.541 |
| 20000 | 19910 | 211.75 | −61.40 | −4.90 | 5.846 | 1.057 | 9.618 − 2 | 1.082 | 291.7 | 1.395 | 4.563 |
| 20500 | 20406 | 212.84 | −60.31 | −4.24 | 5.398 | 1.056 | 8.835 | 1.077 | 292.5 | 1.401 | 4.585 |
| 21000 | 20902 | 213.93 | −59.22 | −3.65 | 4.986 | 1.054 | 8.119 | 1.072 | 293.2 | 1.407 | 4.607 |
| 21500 | 21398 | 214.95 | −58.20 | −3.13 | 4.607 | 1.053 | 7.466 | 1.068 | 293.9 | 1.412 | 4.627 |
| 22000 | 21894 | 215.94 | −57.21 | −2.64 | 4.258 | 1.052 | 6.870 | 1.065 | 294.6 | 1.418 | 4.647 |
| 22500 | 22390 | 216.93 | −56.22 | −2.14 | 3.938 | 1.051 | 6.324 | 1.062 | 295.3 | 1.423 | 4.667 |
| 23000 | 22886 | 217.92 | −55.23 | −1.65 | 3.643 | 1.051 | 5.823 | 1.059 | 295.9 | 1.429 | 4.687 |
| 23500 | 23381 | 218.91 | −54.24 | −1.15 | 3.371 | 1.050 | 5.364 | 1.056 | 296.6 | 1.434 | 4.707 |
| 24000 | 23877 | 219.90 | −53.25 | −0.66 | 3.121 + 1 | 1.050 | 4.944 − 2 | 1.053 | 297.3 | 1.439 − 5 | 4.727 − 6 |
| 24500 | 24372 | 220.89 | −52.26 | −0.16 | 2.890 | 1.050 | 4.558 | 1.051 | 297.9 | 1.445 | 4.747 |
| 25000 | 24868 | 221.88 | −51.27 | 0.33 | 2.677 | 1.050 | 4.203 | 1.049 | 298.6 | 1.450 | 4.767 |
| 25500 | 25363 | 222.88 | −50.27 | 0.83 | 2.481 | 1.050 | 3.878 | 1.047 | 299.2 | 1.456 | 4.787 |
| 26000 | 25858 | 223.87 | −49.28 | 1.32 | 2.300 | 1.051 | 3.579 | 1.045 | 299.7 | 1.461 | 4.807 |
| 26500 | 26354 | 224.86 | −48.29 | 1.82 | 2.133 | 1.052 | 3.305 | 1.043 | 300.6 | 1.466 | 4.826 |
| 27000 | 26849 | 225.85 | −47.30 | 2.31 | 1.979 | 1.053 | 3.052 | 1.042 | 301.3 | 1.472 | 4.846 |
| 27500 | 27344 | 226.84 | −46.31 | 2.80 | 1.836 | 1.054 | 2.820 | 1.041 | 301.9 | 1.477 | 4.866 |
| 28000 | 27839 | 227.83 | −45.32 | 3.30 | 1.705 | 1.055 | 2.607 | 1.039 | 302.6 | 1.482 | 4.886 |
| 28500 | 28334 | 228.82 | −44.33 | 3.79 | 1.583 | 1.056 | 2.410 | 1.038 | 303.2 | 1.488 | 4.905 |

TABLE 5.1.—*Continued*
30° N. July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 29000 | 29173 | 230.15 | -43.00 | 4.50 | 1.434 | + 1 1.052 | 2.170 - 2 | 1.031 | 304.1 | 1.495 - 5 | 4.932 - 6 |
| 29500 | 29679 | 231.15 | -42.00 | 5.00 | 1.331 | 1.053 | 2.006 | 1.030 | 304.8 | 1.500 | 4.952 |
| 30000 | 30184 | 232.15 | -41.00 | 5.50 | 1.237 | 1.055 | 1.856 | 1.030 | 305.4 | 1.506 | 4.971 |
| 30500 | 30689 | 233.15 | -40.00 | 6.00 | 1.149 | 1.057 | 1.717 | 1.030 | 306.1 | 1.511 | 4.991 |
| 31000 | 31195 | 234.15 | -39.00 | 6.50 | 1.068 | 1.060 | 1.589 | 1.030 | 306.8 | 1.516 | 5.011 |
| 31500 | 31701 | 235.15 | -38.00 | 7.00 | 9.930 | + 0 1.062 | 1.471 | 1.030 | 307.4 | 1.521 | 5.031 |
| 32000 | 32206 | 236.15 | -37.00 | 7.50 | 9.236 | 1.064 | 1.362 | 1.031 | 308.1 | 1.527 | 5.051 |
| 33000 | 33218 | 238.55 | -34.60 | 7.10 | 7.998 | 1.069 | 1.168 | 1.037 | 309.6 | 1.539 | 5.098 |
| 34000 | 34230 | 240.95 | -32.20 | 6.70 | 6.936 | 1.073 | 1.003 | 1.044 | 311.2 | 1.552 | 5.145 |
| 35000 | 35243 | 243.35 | -29.80 | 6.30 | 6.023 | 1.078 | 8.622 - 3 | 1.050 | 312.7 | 1.565 | 5.193 |
| 36000 | 36255 | 245.75 | -27.40 | 5.90 | 5.238 | + 0 1.081 | 7.425 - 3 | 1.056 | 314.3 | 1.577 - 5 | 5.240 - 6 |
| 37000 | 37268 | 248.15 | -25.00 | 5.50 | 4.561 | 1.085 | 6.403 | 1.061 | 315.8 | 1.590 | 5.287 |
| 38000 | 38282 | 250.55 | -22.60 | 5.10 | 3.977 | 1.088 | 5.530 | 1.066 | 317.3 | 1.602 | 5.333 |
| 39000 | 39295 | 252.95 | -20.20 | 4.70 | 3.472 | 1.091 | 4.782 | 1.071 | 318.8 | 1.614 | 5.380 |
| 40000 | 40309 | 255.35 | -17.80 | 4.30 | 3.036 | 1.094 | 4.141 | 1.075 | 320.3 | 1.627 | 5.427 |
| 41000 | 41322 | 257.75 | -15.40 | 3.90 | 2.657 | 1.097 | 3.591 | 1.080 | 321.8 | 1.639 | 5.473 |
| 42000 | 42338 | 260.15 | -13.00 | 3.50 | 2.329 | 1.098 | 3.118 | 1.084 | 323.3 | 1.651 | 5.520 |
| 43000 | 43353 | 262.55 | -10.60 | 3.10 | 2.043 | 1.100 | 2.711 | 1.087 | 324.8 | 1.663 | 5.566 |
| 44000 | 44368 | 264.95 | -8.20 | 2.70 | 1.795 | 1.102 | 2.360 | 1.091 | 326.3 | 1.675 | 5.612 |
| 45000 | 45384 | 267.35 | -5.80 | 2.30 | 1.579 | 1.103 | 2.057 | 1.094 | 327.8 | 1.687 | 5.658 |
| 46000 | 46400 | 269.75 | -3.40 | 1.90 | 1.390 | + 0 1.104 | 1.795 - 3 | 1.096 | 329.2 | 1.699 - 5 | 5.704 - 6 |
| 47000 | 47416 | 272.15 | -1.00 | 1.50 | 1.226 | 1.105 | 1.569 | 1.099 | 330.7 | 1.711 | 5.750 |
| 48000 | 48433 | 272.15 | -1.00 | 1.50 | 1.081 | 1.104 | 1.384 | 1.100 | 330.7 | 1.711 | 5.750 |
| 49000 | 49449 | 272.15 | -1.00 | 1.50 | 9.534 | - 1 1.107 | 1.220 | 1.101 | 330.7 | 1.711 | 5.750 |
| 50000 | 50467 | 272.15 | -1.00 | 1.50 | 8.410 | 1.107 | 1.076 | 1.101 | 330.7 | 1.711 | 5.750 |
| 51000 | 51484 | 272.15 | -1.00 | 1.50 | 7.418 | 1.108 | 9.495 - 4 | 1.102 | 330.7 | 1.711 | 5.750 |
| 52000 | 52502 | 270.15 | -3.00 | -0.50 | 6.539 | 1.108 | 8.433 | 1.110 | 329.5 | 1.701 | 5.712 |
| 53000 | 53520 | 268.15 | -5.00 | -0.50 | 5.760 | 1.108 | 7.483 | 1.110 | 328.3 | 1.691 | 5.674 |
| 54000 | 54539 | 266.15 | -7.00 | -0.50 | 5.068 | 1.108 | 6.634 | 1.110 | 327.0 | 1.681 | 5.635 |
| 55000 | 55558 | 264.15 | -9.00 | -0.50 | 4.456 | 1.108 | 5.876 | 1.110 | 325.8 | 1.671 | 5.597 |
| 56000 | 56577 | 262.15 | -11.00 | -0.50 | 3.913 | - 1 1.107 | 5.200 - 4 | 1.110 | 324.6 | 1.661 - 5 | 5.558 - 6 |
| 57000 | 57596 | 260.15 | -13.00 | -0.50 | 3.433 | 1.107 | 4.598 | 1.109 | 323.3 | 1.651 | 5.520 |
| 58000 | 58616 | 258.15 | -15.00 | -0.50 | 3.009 | 1.107 | 4.061 | 1.109 | 322.1 | 1.641 | 5.481 |
| 59000 | 59636 | 256.15 | -17.00 | -0.50 | 2.639 | 1.107 | 3.584 | 1.109 | 320.8 | 1.631 | 5.442 |
| 60000 | 60656 | 252.35 | -20.80 | -2.30 | 2.304 | 1.105 | 3.184 | 1.114 | 318.5 | 1.611 | 5.368 |
| 61000 | 61677 | 248.55 | -24.60 | -6.10 | 2.010 | 1.104 | 2.817 | 1.122 | 316.0 | 1.592 | 5.294 |
| 62000 | 62698 | 244.75 | -28.40 | -3.90 | 1.750 | 1.101 | 2.491 | 1.119 | 313.6 | 1.572 | 5.220 |
| 63000 | 63720 | 240.95 | -32.20 | -3.70 | 1.520 | 1.099 | 2.198 | 1.116 | 311.2 | 1.552 | 5.145 |
| 64000 | 64741 | 237.15 | -36.00 | -3.50 | 1.318 | 1.096 | 1.936 | 1.113 | 308.7 | 1.532 | 5.070 |
| 65000 | 65764 | 233.35 | -39.80 | -3.30 | 1.140 | 1.095 | 1.701 | 1.110 | 306.2 | 1.512 | 4.995 |
| 66000 | 66786 | 229.55 | -43.60 | -3.10 | 9.833 | - 2 1.092 | 1.492 - 4 | 1.107 | 303.7 | 1.492 - 5 | 4.920 - 6 |
| 67000 | 67809 | 225.75 | -47.40 | -2.90 | 8.467 | 1.092 | 1.306 | 1.104 | 301.2 | 1.471 | 4.844 |
| 68000 | 68832 | 221.95 | -51.20 | -2.70 | 7.265 | 1.088 | 1.140 | 1.101 | 298.7 | 1.451 | 4.768 |
| 69000 | 69855 | 218.15 | -55.00 | -2.50 | 6.220 | 1.086 | 9.933 - 5 | 1.098 | 296.1 | 1.430 | 4.692 |
| 70000 | 70879 | 214.35 | -58.80 | -2.30 | 5.311 | 1.084 | 8.632 | 1.096 | 293.5 | 1.409 | 4.615 |
| 71000 | 71903 | 210.55 | -62.60 | -2.10 | 4.522 | 1.082 | 7.482 | 1.093 | 290.9 | 1.388 | 4.539 |
| 72000 | 72927 | 206.75 | -66.40 | -1.90 | 3.839 | 1.081 | 6.469 | 1.090 | 288.2 | 1.367 | 4.461 |
| 73000 | 73952 | 202.95 | -70.20 | -1.70 | 3.249 | 1.079 | 5.578 | 1.088 | 285.6 | 1.345 | 4.384 |
| 74000 | 74977 | 199.15 | -74.00 | -1.50 | 2.742 | 1.078 | 4.796 | 1.086 | 282.9 | 1.324 | 4.307 |
| 75000 | 76002 | 195.35 | -77.80 | -1.30 | 2.306 | 1.076 | 4.112 | 1.083 | 280.2 | 1.302 | 4.229 |
| 76000 | 77028 | 191.55 | -81.60 | -1.10 | 1.932 | - 2 1.075 | 3.514 - 5 | 1.081 | 277.5 | 1.280 - 5 | 4.151 - 6 |
| 77000 | 78054 | 187.75 | -85.40 | -0.90 | 1.614 | 1.074 | 2.994 | 1.079 | 274.7 | 1.258 | 4.072 |
| 78000 | 79080 | 183.95 | -89.20 | -0.70 | 1.343 | 1.073 | 2.543 | 1.078 | 271.9 | 1.236 | 3.993 |
| 79000 | 80107 | 180.15 | -93.00 | -0.50 | 1.113 | 1.072 | 2.152 | 1.076 | 269.1 | 1.213 | 3.915 |
| 80000 | 81134 | 176.39 | -96.81 | -4.31 | 9.189 | - 3 1.070 | 1.815 | 1.096 | 266.2 | 1.191 | 3.836 |
| 81000 | 82161 | 172.62 | -100.63 | -8.13 | 7.555 | 1.063 | 1.525 | 1.113 | 263.3 | 1.168 | 3.756 |
| 82000 | 83189 | 172.61 | -100.64 | -8.14 | 6.198 | 1.053 | 1.251 | 1.102 | 263.3 | 1.168 | 3.756 |
| 83000 | 84217 | 172.65 | -100.65 | -8.15 | 5.084 | 1.044 | 1.027 | 1.093 | 263.3 | 1.168 | 3.756 |
| 84000 | 85245 | 172.69 | -100.66 | -8.16 | 4.171 | 1.035 | 8.421 - 6 | 1.083 | 263.3 | 1.168 | 3.756 |
| 85000 | 86274 | 172.47 | -100.68 | -8.18 | 3.422 | 1.026 | 6.909 | 1.074 | 263.3 | 1.168 | 3.756 |
| 86000 | 87303 | 172.46 | -100.69 | -8.19 | 2.807 | - 3 1.016 | 5.668 - 6 | 1.064 | 263.3 | 1.168 - 5 | 3.756 - 6 |
| 87000 | 88332 | 172.45 | -100.70 | -8.20 | 2.303 | 1.007 | 4.650 | 1.055 | 263.3 | 1.168 | 3.756 |
| 88000 | 89361 | 172.44 | -100.71 | -8.21 | 1.889 | 0.999 | 3.814 | 1.046 | 263.3 | 1.168 | 3.756 |
| 89000 | 90391 | 172.34 | -100.81 | -8.10 | 1.550 | 0.990 | 3.129 | 1.041 | 263.3 | 1.168 | 3.756 |
| 90000 | 91422 | 174.30 | -98.85 | -10.01 | 1.273 | 0.980 | 2.535 | 1.034 | 265.2 | 1.182 | 3.807 |
| 92000 | 93483 | 178.80 | -94.35 | -11.91 | 8.662 | - 4 0.960 | 1.679 | 1.018 | 268.8 | 1.211 | 3.907 |
| 94000 | 95546 | 182.81 | -90.34 | -13.90 | 5.952 | 0.938 | 1.124 | 1.001 | 272.3 | 1.239 | 4.006 |
| 96000 | 97610 | 186.16 | -86.99 | -16.40 | 4.130 | 0.916 | 7.598 - 7 | 0.982 | 275.9 | 1.267 | 4.105 |
| 98000 | 99676 | 189.51 | -83.64 | -19.20 | 2.892 | 0.894 | 5.189 | 0.960 | 279.3 | 1.295 | 4.204 |
| 100000 | 101742 | 192.95 | -80.20 | -24.05 | 2.043 | 0.869 | 3.577 | 0.955 | 282.6 | 1.323 | 4.302 |
| 102000 | 103811 | 197.40 | -75.75 | -19.79 | 1.469 | - 4 0.848 | 2.571 - 7 | 0.900 | 286.5 | 1.417 - 5 | 4.643 - 6 |
| 104000 | 105880 | 202.02 | -71.13 | -14.74 | 1.083 | 0.838 | 1.822 | 0.862 | 305.8 | 1.508 | 4.982 |
| 106000 | 107951 | 207.31 | -65.84 | -9.62 | 8.157 | - 5 0.834 | 1.139 | 0.835 | 316.7 | 1.597 | 5.313 |
| 108000 | 110023 | 211.16 | -61.99 | -4.54 | 6.258 | 0.837 | 8.184 - 6 | 0.817 | 327.2 | 1.682 | 5.640 |
| 110000 | 112096 | 216.40 | -56.75 | -3.84 | 4.880 | 0.841 | 6.002 | 0.831 | 337.4 | 1.766 | 5.961 |
| 112000 | 114171 | 220.24 | -52.91 | 1.86 | 3.885 | 0.847 | 4.273 | 0.804 | 356.8 | 1.924 | 6.586 |
| 114000 | 116247 | 224.26 | -48.89 | 12.50 | 3.145 | 0.860 | 3.147 | 0.789 | 373.2 | 2.075 | 7.186 |
| 116000 | 118325 | 228.92 | -44.23 | 23.20 | 2.627 | 0.877 | 2.384 | 0.782 | 392.8 | 2.219 | 7.770 |

TABLE 5.1.—*Continued*

30° N. July

GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $\frac{k}{\text{k-cal m}^{-1}\text{ sec}^{-1}(°K)^{-1}}$ |
| 29000 | 28829 | 229.81 | -43.34 | 4.29 | 1.476 + 1 | 1.058 | 2.229 - 2 | 1.038 | 303.9 | 1.493 - 5 | 4.925 - 6 |
| 29500 | 29323 | 230.80 | -42.35 | 4.78 | 1.366 | 1.059 | 2.062 | 1.037 | 304.6 | 1.498 | 4.945 |
| 30000 | 29816 | 231.79 | -41.36 | 5.28 | 1.270 | 1.061 | 1.909 | 1.037 | 305.2 | 1.504 | 4.964 |
| 30500 | 30313 | 232.77 | -40.38 | 5.77 | 1.181 | 1.063 | 1.768 | 1.037 | 305.9 | 1.509 | 4.984 |
| 31000 | 30807 | 233.76 | -39.39 | 6.26 | 1.099 | 1.065 | 1.637 | 1.037 | 306.5 | 1.514 | 5.003 |
| 31500 | 31302 | 234.75 | -38.40 | 6.76 | 1.022 | 1.068 | 1.517 | 1.037 | 307.1 | 1.519 | 5.023 |
| 32000 | 31796 | 235.74 | -37.41 | 7.25 | 9.513 + 0 | 1.070 | 1.406 | 1.037 | 307.8 | 1.525 | 5.043 |
| 33000 | 32784 | 238.03 | -35.12 | 7.06 | 8.249 | 1.075 | 1.207 | 1.043 | 309.3 | 1.537 | 5.088 |
| 34000 | 33773 | 240.40 | -32.75 | 7.66 | 7.163 | 1.080 | 1.038 | 1.050 | 310.8 | 1.549 | 5.135 |
| 35000 | 34760 | 242.77 | -30.38 | 8.26 | 6.229 | 1.084 | 8.939 - 3 | 1.056 | 312.4 | 1.562 | 5.181 |
| 36000 | 35748 | 245.14 | -28.01 | 5.86 | 5.425 + 0 | 1.088 | 7.709 - 3 | 1.062 | 313.9 | 1.574 - 5 | 5.228 - 6 |
| 37000 | 36735 | 247.51 | -25.64 | 5.46 | 4.731 | 1.092 | 6.658 | 1.068 | 315.4 | 1.586 | 5.274 |
| 38000 | 37722 | 249.88 | -23.27 | 5.06 | 4.131 | 1.095 | 5.759 | 1.073 | 316.9 | 1.599 | 5.320 |
| 39000 | 38709 | 252.25 | -20.90 | 4.67 | 3.612 | 1.098 | 4.988 | 1.078 | 318.4 | 1.611 | 5.367 |
| 40000 | 39695 | 254.62 | -18.53 | 4.27 | 3.162 | 1.101 | 4.326 | 1.083 | 319.9 | 1.623 | 5.413 |
| 41000 | 40681 | 256.98 | -16.17 | 3.87 | 2.772 | 1.104 | 3.758 | 1.087 | 321.4 | 1.635 | 5.458 |
| 42000 | 41667 | 259.35 | -13.80 | 3.47 | 2.433 | 1.106 | 3.268 | 1.091 | 322.8 | 1.647 | 5.504 |
| 43000 | 42652 | 261.71 | -11.44 | 3.07 | 2.138 | 1.108 | 2.846 | 1.095 | 324.3 | 1.659 | 5.550 |
| 44000 | 43637 | 264.08 | -9.07 | 2.68 | 1.881 | 1.110 | 2.482 | 1.099 | 325.8 | 1.671 | 5.595 |
| 45000 | 44622 | 266.44 | -6.71 | 2.28 | 1.657 | 1.111 | 2.167 | 1.102 | 327.2 | 1.683 | 5.641 |
| 46000 | 45606 | 268.80 | -4.35 | 1.88 | 1.461 + 0 | 1.113 | 1.894 - 3 | 1.105 | 328.7 | 1.694 - 5 | 5.686 - 6 |
| 47000 | 46591 | 271.17 | -1.98 | 1.48 | 1.290 | 1.114 | 1.658 | 1.108 | 330.1 | 1.706 | 5.731 |
| 48000 | 47575 | 272.15 | -1.00 | 1.50 | 1.140 | 1.115 | 1.460 | 1.108 | 330.7 | 1.711 | 5.750 |
| 49000 | 48558 | 272.15 | -1.00 | 1.50 | 1.008 | 1.116 | 1.290 | 1.109 | 330.7 | 1.711 | 5.750 |
| 50000 | 49541 | 272.15 | -1.00 | 1.50 | 8.908 - 1 | 1.117 | 1.140 | 1.110 | 330.7 | 1.711 | 5.750 |
| 51000 | 50524 | 272.15 | -1.00 | 1.50 | 7.874 | 1.118 | 1.008 | 1.111 | 330.7 | 1.711 | 5.750 |
| 52000 | 51507 | 271.14 | -2.01 | 0.49 | 6.959 | 1.118 | 8.942 - 4 | 1.116 | 330.1 | 1.706 | 5.731 |
| 53000 | 52489 | 269.17 | -3.98 | -0.36 | 6.146 | 1.119 | 7.955 | 1.120 | 328.9 | 1.696 | 5.693 |
| 54000 | 53471 | 267.21 | -5.94 | -0.35 | 5.424 | 1.119 | 7.071 | 1.120 | 327.7 | 1.687 | 5.655 |
| 55000 | 54453 | 265.24 | -7.91 | -0.35 | 4.782 | 1.119 | 6.280 | 1.120 | 326.5 | 1.677 | 5.618 |
| 56000 | 55434 | 263.28 | -9.87 | -0.35 | 4.212 - 1 | 1.118 | 5.573 - 4 | 1.120 | 325.3 | 1.667 - 5 | 5.580 - 6 |
| 57000 | 56415 | 261.32 | -11.83 | -0.34 | 3.707 | 1.119 | 4.942 | 1.120 | 324.1 | 1.657 | 5.542 |
| 58000 | 57396 | 259.36 | -13.79 | -0.34 | 3.259 | 1.118 | 4.378 | 1.120 | 322.8 | 1.647 | 5.504 |
| 59000 | 58377 | 257.40 | -15.75 | -0.34 | 2.863 | 1.119 | 3.875 | 1.120 | 321.6 | 1.637 | 5.466 |
| 60000 | 59357 | 254.79 | -18.36 | -0.98 | 2.512 | 1.119 | 3.435 | 1.123 | 320.0 | 1.624 | 5.416 |
| 61000 | 60337 | 251.07 | -22.08 | -2.74 | 2.201 | 1.118 | 3.054 | 1.130 | 317.6 | 1.605 | 5.344 |
| 62000 | 61316 | 247.35 | -25.80 | -3.70 | 1.924 | 1.116 | 2.710 | 1.133 | 315.3 | 1.585 | 5.271 |
| 63000 | 62295 | 243.63 | -29.52 | -3.50 | 1.679 | 1.113 | 2.401 | 1.130 | 312.9 | 1.566 | 5.198 |
| 64000 | 63274 | 239.91 | -33.24 | -3.30 | 1.462 | 1.112 | 2.123 | 1.127 | 310.5 | 1.547 | 5.125 |
| 65000 | 64253 | 236.19 | -36.96 | [illegible] | 1.271 | 1.110 | 1.874 | 1.125 | 308.1 | 1.527 | 5.051 |
| 66000 | 65231 | 232.47 | -40.6 | | 1.102 - 1 | 1.108 | 1.651 - 4 | 1.122 | 305.7 | 1.507 - 5 | 4.978 - 6 |
| 67000 | 66209 | 228.75 | -44.4 | [illegible] | 9.535 - 2 | 1.107 | 1.451 | 1.120 | 303.2 | 1.487 | 4.904 |
| 68000 | 67187 | 225.04 | -48.11 | -2.49 | 8.226 | 1.105 | 1.273 | 1.117 | 300.7 | 1.467 | 4.830 |
| 69000 | 68164 | 221.32 | -51.83 | -2.29 | 7.083 | 1.103 | 1.115 | 1.115 | 298.2 | 1.447 | 4.756 |
| 70000 | 69142 | 217.61 | -55.54 | -2.09 | 6.083 | 1.102 | 9.739 - 5 | 1.113 | 295.7 | 1.427 | 4.681 |
| 71000 | 70118 | 213.90 | -59.25 | -1.89 | 5.212 | 1.101 | 8.488 | 1.110 | 293.2 | 1.406 | 4.606 |
| 72000 | 71095 | 210.19 | -62.96 | -1.69 | 4.453 | 1.099 | 7.380 | 1.108 | 290.6 | 1.386 | 4.531 |
| 73000 | 72071 | 206.48 | -66.67 | -1.49 | 3.794 | 1.099 | 6.402 | 1.106 | 288.1 | 1.365 | 4.456 |
| 74000 | 73047 | 202.77 | -70.38 | -1.29 | 3.224 | 1.097 | 5.539 | 1.104 | 285.5 | 1.344 | 4.381 |
| 75000 | 74023 | 199.06 | -74.09 | -1.09 | 2.731 | 1.097 | 4.779 | 1.102 | 282.8 | 1.323 | 4.305 |
| 76000 | 74998 | 195.36 | -77.79 | -0.88 | 2.306 - 2 | 1.096 | 4.113 - 5 | 1.101 | 280.2 | 1.302 - 5 | 4.229 - 6 |
| 77000 | 75973 | 191.65 | -81.50 | -0.69 | 1.942 | 1.096 | 3.529 | 1.100 | 277.5 | 1.281 | 4.153 |
| 78000 | 76948 | 187.95 | -85.20 | -0.48 | 1.629 | 1.095 | 3.020 | 1.098 | 274.8 | 1.259 | 4.076 |
| 79000 | 77922 | [illegible] | -88.90 | -0.28 | 1.362 | 1.095 | 2.576 | 1.097 | 272.1 | 1.238 | 4.000 |
| 80000 | 78896 | [illegible] | -92.61 | -0.11 | 1.135 | 1.095 | 2.190 | 1.096 | 269.4 | 1.216 | 3.923 |
| 81000 | 79870 | [illegible] | -96.32 | -3.82 | 9.423 - 3 | 1.093 | 1.856 | 1.117 | 266.6 | 1.194 | 3.846 |
| 82000 | 80843 | [illegible] | -100.03 | -7.53 | 7.792 | 1.087 | 1.568 | 1.134 | 263.8 | 1.172 | 3.769 |
| 83000 | 81816 | [illegible] | -103.74 | -8.14 | 6.427 | 1.078 | 1.298 | 1.128 | 263.3 | 1.168 | 3.756 |
| 84000 | 82789 | [illegible] | -103.76 | -8.15 | 5.301 | 1.069 | 1.070 | 1.119 | 263.3 | 1.168 | 3.756 |
| 85000 | 83762 | [illegible] | -103.80 | -8.16 | 4.373 | 1.060 | 8.828 - 6 | 1.110 | 263.3 | 1.168 | 3.756 |
| 86000 | 84734 | [illegible] | -103.87 | -8.17 | 3.607 - 3 | 1.051 | 7.282 - 6 | 1.101 | 263.3 | 1.168 - 5 | 3.756 - 6 |
| 87000 | 85706 | [illegible] | -103.93 | -8.18 | 2.975 | 1.043 | 6.007 | 1.091 | 263.3 | 1.168 | 3.756 |
| 88000 | 86678 | [illegible] | -103.70 | -8.20 | 2.455 | 1.034 | 4.956 | 1.082 | 263.3 | 1.168 | 3.756 |
| 89000 | 87649 | [illegible] | -103.71 | -8.21 | 2.025 | 1.025 | 4.089 | 1.073 | 263.3 | 1.168 | 3.756 |
| 90000 | 88620 | [illegible] | -103.72 | -8.22 | 1.671 | 1.016 | 3.374 | 1.064 | 263.3 | 1.168 | 3.756 |
| 92000 | 90581 | [illegible] | -97.44 | -10.91 | 1.142 | 0.997 | 2.256 | 1.056 | 266.4 | 1.190 | 3.835 |
| 94000 | 92501 | [illegible] | -93.27 | -12.68 | 7.877 - 4 | 0.976 | 1.516 | 1.039 | 269.7 | 1.218 | 3.932 |
| 96000 | 94460 | [illegible] | -89.09 | -14.90 | 5.488 | 0.955 | 1.030 | 1.022 | 273.1 | 1.245 | 4.028 |
| 98000 | 96418 | [illegible] | -84.92 | -17.46 | 3.859 | 0.932 | 7.065 - 7 | 1.003 | 276.5 | 1.273 | 4.124 |
| 100000 | 98376 | [illegible] | -80.12 | -19.99 | 2.737 | 0.910 | 4.892 | 0.983 | 279.9 | 1.299 | 4.220 |
| 102000 | 100249 | [illegible] | -76.43 | -24.94 | 1.958 - 4 | 0.865 | 3.392 - 7 | 0.971 | 284.2 | 1.335 - 5 | 4.345 - 6 |
| 104000 | 102183 | [illegible] | -72.99 | -20.02 | 1.427 | 0.865 | 2.288 | 0.918 | 295.5 | 1.425 | 4.676 |
| 106000 | 104116 | [illegible] | -69.69 | -15.11 | 1.065 | 0.855 | 1.588 | 0.880 | 306.4 | 1.513 | 5.001 |
| 108000 | 106047 | [illegible] | -63.47 | -10.19 | 8.104 - 5 | 0.851 | 1.130 | 0.854 | 316.9 | 1.599 | 5.321 |
| 110000 | 107978 | [illegible] | -61.41 | -5.26 | 6.278 | 0.853 | 8.213 - 8 | 0.836 | 327.1 | 1.681 | 5.636 |
| 112000 | 109907 | [illegible] | -57.43 | -10.13 | 4.935 | 0.857 | 6.087 | 0.851 | 336.9 | 1.762 | 5.946 |
| 114000 | 111835 | [illegible] | -53.31 | -0.50 | 3.955 | 0.861 | 4.388 | 0.825 | 355.2 | 1.912 | 6.533 |
| 116000 | 113762 | [illegible] | -49.27 | 0.71 | 3.240 | 0.872 | 3.259 | 0.808 | 374.1 | 2.057 | 7.116 |
| 118000 | 115687 | [illegible] | -46.1 | 19.97 | 2.702 | 0.868 | 2.486 | 0.799 | 390.1 | 2.197 | 7.680 |

TABLE 5.1.—*Continued*
45° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, kcal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 272.99 | +0.56 | −15.56 | 1.01800 + 3 | 1.005 | 1.301 + 0 | 1.062 | 331.0 | 1.713 − 5 | 5.759 − 6 |
| 250 | 250 | 271.69 | −1.46 | −14.83 | 9.865 + 2 | 1.003 | 1.265 | 1.058 | 330.4 | 1.709 | 5.741 |
| 500 | 500 | 270.80 | −2.35 | −14.10 | 9.560 | 1.001 | 1.230 | 1.054 | 329.9 | 1.704 | 5.724 |
| 750 | 750 | 269.90 | −3.25 | −13.38 | 9.262 | 1.000 | 1.196 | 1.050 | 329.3 | 1.700 | 5.707 |
| 1000 | 1000 | 269.00 | −4.15 | −12.65 | 8.973 | 0.998 | 1.162 | 1.045 | 328.8 | 1.695 | 5.690 |
| 1250 | 1250 | 268.11 | −5.04 | −11.92 | 8.693 | 0.997 | 1.129 | 1.041 | 328.2 | 1.691 | 5.673 |
| 1500 | 1500 | 267.21 | −5.94 | −11.19 | 8.420 | 0.996 | 1.098 | 1.037 | 327.7 | 1.687 | 5.656 |
| 1750 | 1750 | 266.32 | −6.83 | −10.46 | 8.154 | 0.995 | 1.067 | 1.034 | 327.1 | 1.682 | 5.638 |
| 2000 | 2001 | 265.43 | −7.72 | −9.72 | 7.896 | 0.993 | 1.036 | 1.030 | 326.6 | 1.678 | 5.621 |
| 2250 | 2251 | 264.53 | −8.62 | −8.99 | 7.646 | 0.992 | 1.007 | 1.026 | 326.1 | 1.673 | 5.604 |
| 2500 | 2501 | 263.64 | −9.51 | −8.26 | 7.403 + 2 | 0.991 | 9.782 − 1 | 1.022 | 325.5 | 1.669 − 5 | 5.587 − 6 |
| 2750 | 2751 | 262.74 | −10.41 | −7.53 | 7.166 | 0.990 | 9.502 | 1.019 | 324.9 | 1.664 | 5.570 |
| 3000 | 3001 | 261.85 | −11.30 | −6.80 | 6.937 | 0.989 | 9.229 | 1.015 | 324.4 | 1.660 | 5.552 |
| 3250 | 3252 | 260.33 | −12.82 | −6.69 | 6.713 | 0.989 | 8.964 | 1.014 | 323.5 | 1.652 | 5.523 |
| 3500 | 3502 | 258.81 | −14.34 | −6.59 | 6.496 | 0.988 | 8.744 | 1.013 | 322.5 | 1.644 | 5.494 |
| 3750 | 3752 | 257.29 | −15.86 | −6.48 | 6.285 | 0.987 | 8.509 | 1.012 | 321.6 | 1.636 | 5.464 |
| 4000 | 4003 | 255.77 | −17.38 | −6.38 | 6.079 | 0.986 | 8.280 | 1.011 | 320.6 | 1.629 | 5.435 |
| 4250 | 4253 | 254.26 | −18.89 | −6.26 | 5.879 | 0.985 | 8.054 | 1.010 | 319.7 | 1.621 | 5.406 |
| 4500 | 4503 | 252.75 | −20.40 | −6.15 | 5.684 | 0.985 | 7.834 | 1.009 | 318.7 | 1.613 | 5.376 |
| 4750 | 4754 | 251.25 | −21.90 | −6.03 | 5.494 | 0.984 | 7.618 | 1.007 | 317.8 | 1.606 | 5.347 |
| 5000 | 5004 | 249.74 | −23.41 | −5.91 | 5.310 + 2 | 0.983 | 7.408 − 1 | 1.006 | 316.8 | 1.598 − 5 | 5.318 − 6 |
| 5250 | 5254 | 248.23 | −24.92 | −5.80 | 5.131 | 0.982 | 7.201 | 1.005 | 315.8 | 1.590 | 5.288 |
| 5500 | 5505 | 246.72 | −26.43 | −5.68 | 4.957 | 0.981 | 7.000 | 1.004 | 314.9 | 1.582 | 5.259 |
| 5750 | 5755 | 245.21 | −27.94 | −5.57 | 4.788 | 0.981 | 6.802 | 1.003 | 313.9 | 1.574 | 5.229 |
| 6000 | 6006 | 243.70 | −29.45 | −5.45 | 4.624 | 0.980 | 6.609 | 1.002 | 312.9 | 1.566 | 5.199 |
| 6250 | 6256 | 242.19 | −30.96 | −5.33 | 4.464 | 0.979 | 6.421 | 1.001 | 312.0 | 1.559 | 5.170 |
| 6500 | 6507 | 240.69 | −32.46 | −5.21 | 4.309 | 0.979 | 6.236 | 1.000 | 311.0 | 1.551 | 5.140 |
| 6750 | 6757 | 239.19 | −33.96 | −5.09 | 4.158 | 0.978 | 6.056 | 0.999 | 310.0 | 1.543 | 5.111 |
| 7000 | 7008 | 237.68 | −35.47 | −4.97 | 4.012 | 0.977 | 5.880 | 0.997 | 309.1 | 1.535 | 5.081 |
| 7250 | 7258 | 236.18 | −36.97 | −4.85 | 3.870 | 0.976 | 5.708 | 0.996 | 308.1 | 1.527 | 5.051 |
| 7500 | 7509 | 234.67 | −38.48 | −4.73 | 3.732 + 2 | 0.976 | 5.540 − 1 | 0.995 | 307.1 | 1.519 − 5 | 5.021 − 6 |
| 7750 | 7759 | 233.17 | −39.98 | −4.61 | 3.598 | 0.975 | 5.376 | 0.994 | 306.1 | 1.511 | 4.992 |
| 8000 | 8010 | 231.66 | −41.49 | −4.49 | 3.468 | 0.974 | 5.215 | 0.993 | 305.1 | 1.503 | 4.962 |
| 8250 | 8261 | 230.16 | −42.99 | −4.36 | 3.342 | 0.974 | 5.059 | 0.992 | 304.1 | 1.495 | 4.932 |
| 8500 | 8511 | 228.66 | −44.49 | −4.24 | 3.220 | 0.973 | 4.906 | 0.991 | 303.1 | 1.487 | 4.902 |
| 8750 | 8762 | 227.16 | −45.99 | −4.11 | 3.102 | 0.972 | 4.757 | 0.990 | 302.1 | 1.479 | 4.872 |
| 9000 | 9013 | 225.66 | −47.49 | −3.99 | 2.987 | 0.972 | 4.611 | 0.989 | 301.1 | 1.471 | 4.842 |
| 9250 | 9263 | 224.16 | −48.99 | −3.87 | 2.876 | 0.971 | 4.469 | 0.988 | 300.1 | 1.463 | 4.812 |
| 9500 | 9514 | 222.66 | −50.49 | −3.74 | 2.768 | 0.970 | 4.330 | 0.987 | 299.1 | 1.454 | 4.782 |
| 9750 | 9765 | 221.16 | −51.99 | −3.62 | 2.663 | 0.970 | 4.195 | 0.986 | 298.1 | 1.446 | 4.752 |
| 10000 | 10016 | 219.65 | −53.50 | −3.50 | 2.562 + 2 | 0.969 | 4.063 − 1 | 0.985 | 297.1 | 1.438 − 5 | 4.722 − 6 |
| 10250 | 10267 | 219.53 | −53.62 | −2.00 | 2.464 | 0.969 | 3.911 | 0.977 | 297.0 | 1.437 | 4.720 |
| 10500 | 10517 | 219.40 | −53.75 | −0.50 | 2.370 | 0.969 | 3.763 | 0.971 | 296.9 | 1.437 | 4.717 |
| 10750 | 10768 | 219.28 | −53.87 | 1.00 | 2.280 | 0.968 | 3.622 | 0.964 | 296.9 | 1.436 | 4.715 |
| 11000 | 11019 | 219.15 | −54.00 | 2.50 | 2.193 | 0.969 | 3.485 | 0.958 | 296.8 | 1.435 | 4.712 |
| 11500 | 11521 | 218.90 | −54.25 | 2.25 | 2.028 | 0.969 | 3.228 | 0.960 | 296.5 | 1.434 | 4.707 |
| 12000 | 12023 | 218.65 | −54.50 | 2.00 | 1.876 | 0.970 | 2.989 | 0.962 | 296.4 | 1.433 | 4.702 |
| 12500 | 12525 | 218.40 | −54.75 | 1.75 | 1.735 | 0.971 | 2.767 | 0.963 | 296.3 | 1.431 | 4.697 |
| 13000 | 13027 | 218.15 | −55.00 | 1.50 | 1.604 | 0.972 | 2.562 | 0.965 | 296.1 | 1.430 | 4.692 |
| 13500 | 13529 | 217.90 | −55.25 | 1.25 | 1.483 | 0.972 | 2.371 | 0.966 | 295.9 | 1.428 | 4.687 |
| 14000 | 14031 | 217.65 | −55.50 | 1.00 | 1.371 + 2 | 0.973 | 2.195 − 1 | 0.968 | 295.7 | 1.427 − 5 | 4.682 − 6 |
| 14500 | 14533 | 217.40 | −55.75 | 0.75 | 1.268 | 0.973 | 2.032 | 0.969 | 295.6 | 1.426 | 4.677 |
| 15000 | 15035 | 217.15 | −56.00 | 0.50 | 1.172 | 0.973 | 1.880 | 0.971 | 295.4 | 1.424 | 4.672 |
| 15500 | 15538 | 216.90 | −56.25 | 0.25 | 1.083 | 0.973 | 1.740 | 0.972 | 295.2 | 1.423 | 4.667 |
| 16000 | 16040 | 216.65 | −56.50 | −0.00 | 1.001 | 0.973 | 1.610 | 0.973 | 295.1 | 1.422 | 4.662 |
| 16500 | 16543 | 216.40 | −56.75 | −0.25 | 9.252 + 1 | 0.973 | 1.489 | 0.974 | 294.9 | 1.420 | 4.657 |
| 17000 | 17046 | 216.15 | −57.00 | −0.50 | 8.549 | 0.973 | 1.378 | 0.975 | 294.7 | 1.419 | 4.652 |
| 17500 | 17548 | 215.90 | −57.25 | −0.75 | 7.899 | 0.973 | 1.275 | 0.976 | 294.6 | 1.417 | 4.647 |
| 18000 | 18051 | 215.65 | −57.50 | −1.00 | 7.298 | 0.972 | 1.179 | 0.977 | 294.4 | 1.416 | 4.642 |
| 18500 | 18554 | 215.40 | −57.75 | −1.25 | 6.742 | 0.972 | 1.090 | 0.978 | 294.2 | 1.415 | 4.637 |
| 19000 | 19057 | 215.15 | −58.00 | −1.50 | 6.228 + 1 | 0.972 | 1.008 − 1 | 0.978 | 294.0 | 1.413 − 5 | 4.631 − 6 |
| 19500 | 19560 | 215.15 | −58.00 | −1.50 | 5.752 | 0.971 | 9.314 − 2 | 0.978 | 294.0 | 1.413 | 4.631 |
| 20000 | 20063 | 215.15 | −58.00 | −1.50 | 5.313 | 0.970 | 8.603 | 0.977 | 294.0 | 1.413 | 4.631 |
| 20500 | 20566 | 215.15 | −58.00 | −2.00 | 4.908 | 0.970 | 7.947 | 0.979 | 294.0 | 1.413 | 4.631 |
| 21000 | 21070 | 215.15 | −58.00 | −2.50 | 4.533 | 0.969 | 7.340 | 0.980 | 294.0 | 1.413 | 4.631 |
| 21500 | 21573 | 215.15 | −58.00 | −3.00 | 4.187 | 0.968 | 6.780 | 0.982 | 294.0 | 1.413 | 4.631 |
| 22000 | 22076 | 215.15 | −58.00 | −3.50 | 3.868 | 0.967 | 6.263 | 0.983 | 294.0 | 1.413 | 4.631 |
| 22500 | 22580 | 215.15 | −58.00 | −4.00 | 3.573 | 0.966 | 5.785 | 0.984 | 294.0 | 1.413 | 4.631 |
| 23000 | 23084 | 215.15 | −58.00 | −4.50 | 3.300 | 0.964 | 5.343 | 0.984 | 294.0 | 1.413 | 4.631 |
| 23500 | 23587 | 215.15 | −58.00 | −5.00 | 3.048 | 0.962 | 4.935 | 0.985 | 294.0 | 1.413 | 4.631 |
| 24000 | 24091 | 215.15 | −58.00 | −5.50 | 2.815 + 1 | 0.961 | 4.559 − 2 | 0.985 | 294.0 | 1.413 − 5 | 4.631 − 6 |
| 24500 | 24595 | 215.15 | −58.00 | −6.00 | 2.600 | 0.959 | 4.211 | 0.985 | 294.0 | 1.413 | 4.631 |
| 25000 | 25099 | 215.15 | −58.00 | −6.50 | 2.402 | 0.957 | 3.889 | 0.985 | 294.0 | 1.413 | 4.631 |
| 25500 | 25603 | 215.15 | −58.00 | −7.00 | 2.219 | 0.954 | 3.592 | 0.985 | 294.0 | 1.413 | 4.631 |
| 26000 | 26107 | 215.15 | −58.00 | −7.50 | 2.049 | 0.952 | 3.318 | 0.985 | 294.0 | 1.413 | 4.631 |
| 26500 | 26611 | 215.15 | −58.00 | −8.00 | 1.893 | 0.949 | 3.065 | 0.985 | 294.0 | 1.413 | 4.631 |
| 27000 | 27115 | 215.15 | −58.00 | −8.50 | 1.748 | 0.947 | 2.831 | 0.984 | 294.0 | 1.413 | 4.631 |
| 27500 | 27619 | 215.55 | −57.60 | −8.00 | 1.615 | 0.943 | 2.610 | 0.981 | 294.3 | 1.416 | 4.640 |
| 28000 | 28124 | 215.95 | −57.20 | −8.70 | 1.492 | 0.941 | 2.407 | 0.979 | 294.6 | 1.418 | 4.648 |
| 28500 | 28628 | 216.39 | −56.80 | −8.80 | 1.379 | 0.938 | 2.220 | 0.976 | 294.9 | 1.420 | 4.656 |

TABLE 5.1.—*Continued*
45° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, °K | $t$, °C | $T-T_{45}$ | $P$, mb | $\frac{P}{P_{sea}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{sea}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 0 | 0 | 272.59 | -0.56 | -15.56 | 1.01800 + 3 | 1.005 | 1.301 + 0 | 1.062 | 331.0 | 1.713 - 5 | 5.759 - 6 |
| 250 | 250 | 271.70 | -1.45 | -14.83 | 9.665 + 2 | 1.003 | 1.265 | 1.058 | 330.4 | 1.709 | 5.741 |
| 500 | 500 | 270.80 | -2.35 | -14.10 | 9.360 | 1.001 | 1.230 | 1.054 | 329.9 | 1.704 | 5.724 |
| 750 | 750 | 269.90 | -3.25 | -13.38 | 9.262 | 1.000 | 1.196 | 1.050 | 329.3 | 1.700 | 5.707 |
| 1000 | 1000 | 269.00 | -4.15 | -12.65 | 8.974 | 0.998 | 1.162 | 1.045 | 328.8 | 1.695 | 5.690 |
| 1250 | 1250 | 268.11 | -5.04 | -11.92 | 8.693 | 0.997 | 1.130 | 1.041 | 328.2 | 1.691 | 5.673 |
| 1500 | 1500 | 267.21 | -5.94 | -11.19 | 8.420 | 0.996 | 1.098 | 1.038 | 327.7 | 1.687 | 5.656 |
| 1750 | 1750 | 266.32 | -6.83 | -10.46 | 8.155 | 0.994 | 1.067 | 1.034 | 327.2 | 1.682 | 5.638 |
| 2000 | 1999 | 265.43 | -7.72 | -9.72 | 7.897 | 0.993 | 1.036 | 1.029 | 326.6 | 1.678 | 5.621 |
| 2250 | 2249 | 264.54 | -8.61 | -8.99 | 7.647 | 0.992 | 1.007 | 1.024 | 326.1 | 1.673 | 5.604 |
| 2500 | 2499 | 263.64 | -9.51 | -8.26 | 7.404 + 2 | 0.991 | 9.783 - 1 | 1.022 | 325.5 | 1.669 - 5 | 5.587 - 6 |
| 2750 | 2749 | 262.75 | -10.40 | -7.53 | 7.167 | 0.990 | 9.503 | 1.019 | 324.9 | 1.664 | 5.570 |
| 3000 | 2999 | 261.86 | -11.29 | -6.80 | 6.938 | 0.989 | 9.230 | 1.015 | 324.4 | 1.660 | 5.553 |
| 3250 | 3248 | 260.34 | -12.81 | -6.69 | 6.715 | 0.989 | 8.985 | 1.014 | 323.5 | 1.652 | 5.523 |
| 3500 | 3498 | 258.82 | -14.33 | -6.59 | 6.498 | 0.988 | 8.746 | 1.013 | 322.5 | 1.644 | 5.494 |
| 3750 | 3748 | 257.31 | -15.84 | -6.48 | 6.287 | 0.987 | 8.511 | 1.012 | 321.6 | 1.637 | 5.465 |
| 4000 | 3997 | 255.79 | -17.36 | -6.38 | 6.081 | 0.986 | 8.282 | 1.011 | 320.6 | 1.629 | 5.435 |
| 4250 | 4247 | 254.28 | -18.87 | -6.26 | 5.881 | 0.985 | 8.057 | 1.010 | 319.7 | 1.621 | 5.406 |
| 4500 | 4497 | 252.77 | -20.38 | -6.15 | 5.686 | 0.985 | 7.837 | 1.009 | 318.7 | 1.615 | 5.377 |
| 4750 | 4746 | 251.27 | -21.88 | -6.03 | 5.497 | 0.984 | 7.622 | 1.007 | 317.8 | 1.606 | 5.347 |
| 5000 | 4996 | 249.76 | -23.39 | -5.92 | 5.313 + 2 | 0.983 | 7.411 - 1 | 1.006 | 316.8 | 1.598 - 5 | 5.318 - 6 |
| 5250 | 5246 | 248.25 | -24.90 | -5.80 | 5.134 | 0.982 | 7.205 | 1.005 | 315.9 | 1.590 | 5.289 |
| 5500 | 5495 | 246.75 | -26.40 | -5.69 | 4.960 | 0.981 | 7.003 | 1.004 | 314.9 | 1.582 | 5.259 |
| 5750 | 5745 | 245.24 | -27.91 | -5.57 | 4.791 | 0.981 | 6.806 | 1.003 | 313.9 | 1.574 | 5.230 |
| 6000 | 5994 | 243.73 | -29.42 | -5.45 | 4.627 | 0.980 | 6.614 | 1.002 | 313.0 | 1.567 | 5.200 |
| 6250 | 6244 | 242.23 | -30.92 | -5.33 | 4.468 | 0.979 | 6.425 | 1.001 | 312.0 | 1.559 | 5.171 |
| 6500 | 6493 | 240.73 | -32.42 | -5.21 | 4.313 | 0.978 | 6.241 | 1.000 | 311.0 | 1.551 | 5.141 |
| 6750 | 6743 | 239.23 | -33.92 | -5.09 | 4.162 | 0.978 | 6.061 | 0.999 | 310.1 | 1.543 | 5.111 |
| 7000 | 6992 | 237.73 | -35.42 | -4.97 | 4.016 | 0.977 | 5.885 | 0.998 | 309.1 | 1.535 | 5.082 |
| 7250 | 7242 | 236.23 | -36.92 | -4.85 | 3.874 | 0.976 | 5.714 | 0.996 | 308.1 | 1.527 | 5.052 |
| 7500 | 7491 | 234.73 | -38.42 | -4.73 | 3.737 + 2 | 0.976 | 5.546 - 1 | 0.995 | 307.1 | 1.519 - 5 | 5.023 - 6 |
| 7750 | 7741 | 233.22 | -39.93 | -4.61 | 3.603 | 0.975 | 5.382 | 0.994 | 306.1 | 1.511 | 4.993 |
| 8000 | 7990 | 231.72 | -41.43 | -4.49 | 3.473 | 0.974 | 5.222 | 0.993 | 305.2 | 1.503 | 4.963 |
| 8250 | 8239 | 230.23 | -42.92 | -4.37 | 3.348 | 0.974 | 5.065 | 0.992 | 304.2 | 1.495 | 4.933 |
| 8500 | 8489 | 228.73 | -44.42 | -4.24 | 3.226 | 0.973 | 4.913 | 0.991 | 303.2 | 1.487 | 4.904 |
| 8750 | 8738 | 227.23 | -45.92 | -4.12 | 3.107 | 0.972 | 4.764 | 0.990 | 302.2 | 1.479 | 4.874 |
| 9000 | 8987 | 225.74 | -47.41 | -4.00 | 2.993 | 0.972 | 4.618 | 0.989 | 301.2 | 1.471 | 4.844 |
| 9250 | 9237 | 224.24 | -48.91 | -3.87 | 2.881 | 0.971 | 4.477 | 0.988 | 300.2 | 1.463 | 4.814 |
| 9500 | 9486 | 222.74 | -50.41 | -3.75 | 2.774 | 0.971 | 4.338 | 0.987 | 299.2 | 1.455 | 4.784 |
| 9750 | 9735 | 221.24 | -51.91 | -3.63 | 2.669 | 0.970 | 4.203 | 0.986 | 298.2 | 1.447 | 4.754 |
| 10000 | 9984 | 219.75 | -53.40 | -3.50 | 2.568 + 2 | 0.969 | 4.071 - 1 | 0.985 | 297.2 | 1.439 - 5 | 4.724 - 6 |
| 10250 | 10233 | 219.54 | -53.61 | -2.10 | 2.471 | 0.969 | 3.920 | 0.978 | 297.0 | 1.437 | 4.720 |
| 10500 | 10483 | 219.41 | -53.74 | -0.60 | 2.377 | 0.968 | 3.773 | 0.971 | 296.9 | 1.437 | 4.71 |
| 10750 | 10732 | 219.29 | -53.86 | 0.89 | 2.286 | 0.969 | 3.632 | 0.965 | 296.9 | 1.436 | 4.715 |
| 11000 | 10981 | 219.16 | -53.99 | 2.39 | 2.199 | 0.969 | 3.496 | 0.958 | 296.8 | 1.435 | 4.712 |
| 11500 | 11479 | 218.91 | -54.24 | 2.26 | 2.035 | 0.970 | 3.238 | 0.960 | 296.6 | 1.434 | 4.707 |
| 12000 | 11977 | 218.66 | -54.49 | 2.01 | 1.882 | 0.970 | 2.999 | 0.962 | 296.4 | 1.433 | 4.702 |
| 12500 | 12475 | 218.41 | -54.74 | 1.76 | 1.741 | 0.971 | 2.778 | 0.963 | 296.3 | 1.431 | 4.697 |
| 13000 | 12973 | 218.16 | -54.99 | 1.51 | 1.611 | 0.972 | 2.572 | 0.965 | 296.1 | 1.430 | 4.692 |
| 13500 | 13471 | 217.91 | -55.24 | 1.26 | 1.490 | 0.972 | 2.382 | 0.966 | 295.9 | 1.429 | 4.687 |
| 14000 | 13969 | 217.67 | -55.48 | 1.02 | 1.378 + 2 | 0.972 | 2.205 - 1 | 0.968 | 295.8 | 1.427 - 5 | 4.682 - 6 |
| 14500 | 14467 | 217.42 | -55.73 | 0.77 | 1.274 | 0.973 | 2.042 | 0.970 | 295.6 | 1.426 | 4.677 |
| 15000 | 14965 | 217.17 | -55.98 | 0.52 | 1.178 | 0.973 | 1.890 | 0.970 | 295.4 | 1.424 | 4.672 |
| 15500 | 15462 | 216.92 | -56.23 | 0.27 | 1.090 | 0.973 | 1.750 | 0.972 | 295.3 | 1.423 | 4.667 |
| 16000 | 15960 | 216.67 | -56.48 | 0.02 | 1.008 | 0.973 | 1.620 | 0.973 | 295.1 | 1.422 | 4.662 |
| 16500 | 16457 | 216.42 | -56.73 | -0.23 | 9.315 + 1 | 0.973 | 1.499 | 0.974 | 294.9 | 1.420 | 4.657 |
| 17000 | 16955 | 216.17 | -56.96 | -0.48 | 8.611 | 0.973 | 1.388 | 0.975 | 294.7 | 1.419 | 4.652 |
| 17500 | 17452 | 215.92 | -57.23 | -0.73 | 7.960 | 0.973 | 1.284 | 0.976 | 294.6 | 1.418 | 4.647 |
| 18000 | 17949 | 215.68 | -57.47 | -0.97 | 7.357 | 0.973 | 1.188 | 0.977 | 294.4 | 1.416 | 4.642 |
| 18500 | 18446 | 215.43 | -57.72 | -1.22 | 6.800 | 0.972 | 1.100 | 0.977 | 294.2 | 1.415 | 4.637 |
| 19000 | 18943 | 215.18 | -57.97 | -1.47 | 6.284 + 1 | 0.972 | 1.017 - 1 | 0.978 | 294.1 | 1.414 - 5 | 4.632 - 6 |
| 19500 | 19440 | 215.15 | -58.00 | -1.50 | 5.807 | 0.971 | 9.403 - 2 | 0.978 | 294.0 | 1.413 | 4.631 |
| 20000 | 19937 | 215.15 | -58.00 | -1.50 | 5.367 | 0.971 | 8.690 | 0.977 | 294.0 | 1.413 | 4.631 |
| 20500 | 20434 | 215.15 | -58.00 | -1.93 | 4.960 | 0.970 | 8.030 | 0.979 | 294.0 | 1.413 | 4.631 |
| 21000 | 20931 | 215.15 | -58.00 | -2.43 | 4.583 | 0.969 | 7.421 | 0.980 | 294.0 | 1.413 | 4.631 |
| 21500 | 21428 | 215.15 | -58.00 | -2.93 | 4.236 | 0.968 | 6.859 | 0.981 | 294.0 | 1.413 | 4.631 |
| 22000 | 21924 | 215.15 | -58.00 | -3.42 | 3.915 | 0.967 | 6.338 | 0.983 | 294.0 | 1.413 | 4.631 |
| 22500 | 22421 | 215.15 | -58.00 | -3.92 | 3.618 | 0.966 | 5.858 | 0.984 | 294.0 | 1.413 | 4.631 |
| 23000 | 22917 | 215.15 | -58.00 | -4.42 | 3.344 | 0.964 | 5.414 | 0.984 | 294.0 | 1.413 | 4.631 |
| 23500 | 23413 | 215.15 | -58.00 | -4.91 | 3.090 | 0.963 | 5.004 | 0.985 | 294.0 | 1.413 | 4.631 |
| 24000 | 23910 | 215.15 | -58.00 | -5.41 | 2.856 + 1 | 0.961 | 4.624 - 2 | 0.985 | 294.0 | 1.413 - 5 | 4.631 - 6 |
| 24500 | 24406 | 215.15 | -58.00 | -5.91 | 2.640 | 0.959 | 4.274 | 0.985 | 294.0 | 1.413 | 4.631 |
| 25000 | 24902 | 215.15 | -58.00 | -6.40 | 2.440 | 0.957 | 3.950 | 0.986 | 294.0 | 1.413 | 4.631 |
| 25500 | 25398 | 215.15 | -58.00 | -6.90 | 2.255 | 0.955 | 3.651 | 0.985 | 294.0 | 1.413 | 4.631 |
| 26000 | 25894 | 215.15 | -58.00 | -7.39 | 2.084 | 0.953 | 3.375 | 0.985 | 294.0 | 1.413 | 4.631 |
| 26500 | 26390 | 215.15 | -58.00 | -7.89 | 1.926 | 0.950 | 3.119 | 0.985 | 294.0 | 1.413 | 4.631 |
| 27000 | 26886 | 215.15 | -58.00 | -8.39 | 1.780 | 0.947 | 2.883 | 0.984 | 294.0 | 1.413 | 4.631 |
| 27500 | 27382 | 215.46 | -57.69 | -8.58 | 1.646 | 0.944 | 2.661 | 0.982 | 294.3 | 1.415 | 4.638 |
| 28000 | 27877 | 215.85 | -57.30 | -8.68 | 1.521 | 0.941 | 2.455 | 0.979 | 294.5 | 1.417 | 4.646 |
| 28500 | 28373 | 216.25 | -56.90 | -8.77 | 1.407 | 0.938 | 2.266 | 0.976 | 294.8 | 1.419 | 4.654 |

TABLE 5.1.—*Continued*
45° N. January
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{ss}$ | $P$, mb | $\frac{P}{P_{ss}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{ss}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, kcal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 29000 | 29133 | 216.75 | -56.40 | -8.90 | 1.274 + 1 | 0.935 | 2.048 - 2 | 0.973 | 295.1 | 1.422 - 5 | 4.664 - 6 |
| 29500 | 29638 | 217.15 | -56.00 | -9.00 | 1.178 | 0.932 | 1.889 | 0.970 | 295.4 | 1.424 | 4.672 |
| 30000 | 30142 | 217.55 | -55.60 | -9.10 | 1.089 | 0.929 | 1.743 | 0.968 | 295.7 | 1.427 | 4.680 |
| 30500 | 30647 | 217.95 | -55.20 | -9.20 | 1.007 | 0.926 | 1.609 | 0.965 | 296.0 | 1.429 | 4.688 |
| 31000 | 31152 | 218.35 | -54.80 | -9.30 | 9.308 + 0 | 0.923 | 1.485 | 0.962 | 296.2 | 1.431 | 4.696 |
| 31500 | 31657 | 218.75 | -54.40 | -9.40 | 8.606 | 0.920 | 1.371 | 0.960 | 296.5 | 1.433 | 4.704 |
| 32000 | 32162 | 219.15 | -54.00 | -9.50 | 7.962 | 0.917 | 1.266 | 0.957 | 296.8 | 1.435 | 4.712 |
| 33000 | 33172 | 222.25 | -50.90 | -9.20 | 6.820 | 0.912 | 1.069 | 0.949 | 298.9 | 1.452 | 4.774 |
| 34000 | 34183 | 225.35 | -47.80 | -8.90 | 5.854 | 0.906 | 9.050 - 3 | 0.942 | 300.9 | 1.469 | 4.836 |
| 35000 | 35194 | 228.45 | -44.70 | -8.60 | 5.036 | 0.901 | 7.880 | 0.935 | 303.0 | 1.486 | 4.898 |
| 36000 | 36205 | 231.55 | -41.60 | -8.30 | 4.341 + 0 | 0.896 | 6.831 - 3 | 0.928 | 305.0 | 1.502 - 5 | 4.960 - 6 |
| 37000 | 37217 | 234.65 | -38.50 | -8.00 | 3.749 | 0.892 | 5.966 | 0.922 | 307.1 | 1.519 | 5.021 |
| 38000 | 38229 | 237.75 | -35.40 | -7.70 | 3.244 | 0.888 | 4.754 | 0.916 | 309.1 | 1.535 | 5.082 |
| 39000 | 39241 | 240.85 | -32.30 | -7.40 | 2.813 | 0.884 | 4.068 | 0.911 | 311.1 | 1.552 | 5.143 |
| 40000 | 40253 | 243.95 | -29.20 | -7.10 | 2.443 | 0.880 | 3.489 | 0.906 | 313.1 | 1.568 | 5.204 |
| 41000 | 41266 | 247.05 | -26.10 | -6.80 | 2.126 | 0.877 | 2.997 | 0.901 | 315.1 | 1.584 | 5.265 |
| 42000 | 42279 | 250.15 | -23.00 | -6.50 | 1.853 | 0.874 | 2.580 | 0.896 | 317.1 | 1.600 | 5.326 |
| 43000 | 43293 | 253.25 | -19.90 | -6.20 | 1.617 | 0.871 | 2.225 | 0.892 | 319.0 | 1.616 | 5.386 |
| 44000 | 44307 | 256.35 | -16.80 | -5.90 | 1.415 | 0.868 | 1.922 | 0.888 | 321.0 | 1.632 | 5.446 |
| 45000 | 45321 | 259.45 | -13.70 | -5.60 | 1.239 | 0.866 | 1.664 | 0.884 | 322.9 | 1.647 | 5.506 |
| 46000 | 46335 | 262.55 | -10.60 | -5.30 | 1.087 + 0 | 0.863 | 1.442 - 3 | 0.881 | 324.8 | 1.663 - 5 | 5.566 - 6 |
| 47000 | 47350 | 265.65 | -7.50 | -5.00 | 9.551 - 1 | 0.861 | 1.253 | 0.877 | 326.7 | 1.679 | 5.626 |
| 48000 | 48365 | 265.65 | -7.50 | -5.00 | 8.399 | 0.859 | 1.101 | 0.875 | 326.7 | 1.679 | 5.626 |
| 49000 | 49381 | 265.65 | -7.50 | -5.00 | 7.385 | 0.857 | 9.685 - 4 | 0.873 | 326.7 | 1.679 | 5.626 |
| 50000 | 50396 | 265.65 | -7.50 | -5.00 | 6.494 | 0.855 | 8.516 | 0.871 | 326.7 | 1.679 | 5.626 |
| 51000 | 51413 | 265.65 | -7.50 | -5.00 | 5.710 | 0.853 | 7.488 | 0.869 | 326.7 | 1.679 | 5.626 |
| 52000 | 52429 | 265.65 | -7.50 | -5.00 | 5.021 | 0.851 | 6.585 | 0.867 | 326.7 | 1.679 | 5.626 |
| 53000 | 53446 | 263.65 | -9.50 | -5.00 | 4.413 | 0.849 | 5.831 | 0.865 | 325.5 | 1.669 | 5.587 |
| 54000 | 54463 | 261.65 | -11.50 | -5.00 | 3.875 | 0.847 | 5.159 | 0.863 | 324.3 | 1.659 | 5.549 |
| 55000 | 55480 | 259.65 | -13.50 | -5.00 | 3.399 | 0.845 | 4.560 | 0.861 | 323.0 | 1.648 | 5.510 |
| 56000 | 56498 | 257.65 | -15.50 | -5.00 | 2.978 - 1 | 0.843 | 4.027 - 4 | 0.859 | 321.8 | 1.638 - 5 | 5.471 - 6 |
| 57000 | 57516 | 255.65 | -17.50 | -5.00 | 2.607 | 0.841 | 3.553 | 0.857 | 320.5 | 1.628 | 5.433 |
| 58000 | 58534 | 253.65 | -19.50 | -5.00 | 2.280 | 0.838 | 3.131 | 0.855 | 319.3 | 1.618 | 5.394 |
| 59000 | 59553 | 251.65 | -21.50 | -5.00 | 1.991 | 0.836 | 2.757 | 0.853 | 318.0 | 1.608 | 5.355 |
| 60000 | 60572 | 249.65 | -23.50 | -5.00 | 1.738 | 0.834 | 2.425 | 0.851 | 316.7 | 1.597 | 5.316 |
| 61000 | 61591 | 247.65 | -25.50 | -5.00 | 1.515 | 0.832 | 2.131 | 0.848 | 315.5 | 1.587 | 5.277 |
| 62000 | 62611 | 245.65 | -27.50 | -3.00 | 1.319 | 0.830 | 1.870 | 0.840 | 314.2 | 1.577 | 5.238 |
| 63000 | 63631 | 243.65 | -29.50 | -1.00 | 1.147 | 0.829 | 1.640 | 0.832 | 312.9 | 1.566 | 5.198 |
| 64000 | 64651 | 241.65 | -31.50 | 1.00 | 9.962 - 2 | 0.829 | 1.436 | 0.825 | 311.6 | 1.556 | 5.159 |
| 65000 | 65672 | 239.55 | -33.60 | 2.90 | 8.643 | 0.830 | 1.257 | 0.820 | 310.3 | 1.545 | 5.118 |
| 66000 | 66692 | 237.45 | -35.70 | 4.80 | 7.490 - 2 | 0.832 | 1.099 - 4 | 0.815 | 308.9 | 1.534 - 5 | 5.076 - 6 |
| 67000 | 67714 | 235.35 | -37.80 | 6.70 | 6.482 | 0.835 | 9.595 - 5 | 0.811 | 307.5 | 1.523 | 5.035 |
| 68000 | 68735 | 233.25 | -39.90 | 8.60 | 5.603 | 0.839 | 8.368 | 0.808 | 306.2 | 1.511 | 4.993 |
| 69000 | 69757 | 231.15 | -42.00 | 10.50 | 4.836 | 0.844 | 7.288 | 0.806 | 304.8 | 1.500 | 4.952 |
| 70000 | 70779 | 229.05 | -44.10 | 12.40 | 4.159 | 0.851 | 6.340 | 0.805 | 303.4 | 1.489 | 4.910 |
| 71000 | 71802 | 226.95 | -46.20 | 14.30 | 3.589 | 0.859 | 5.509 | 0.805 | 302.0 | 1.478 | 4.868 |
| 72000 | 72825 | 224.85 | -48.30 | 16.20 | 3.085 | 0.868 | 4.780 | 0.806 | 300.6 | 1.466 | 4.826 |
| 73000 | 73848 | 222.75 | -50.40 | 18.10 | 2.648 | 0.880 | 4.142 | 0.808 | 299.2 | 1.455 | 4.784 |
| 74000 | 74872 | 220.65 | -52.50 | 20.00 | 2.270 | 0.892 | 3.584 | 0.811 | 297.8 | 1.444 | 4.742 |
| 75000 | 75896 | 218.55 | -54.60 | 21.90 | 1.943 | 0.907 | 3.097 | 0.816 | 296.4 | 1.432 | 4.700 |
| 76000 | 76920 | 216.45 | -56.70 | 23.80 | 1.661 - 2 | 0.924 | 2.673 - 5 | 0.822 | 294.9 | 1.421 - 5 | 4.658 - 6 |
| 77000 | 77944 | 214.35 | -58.80 | 25.70 | 1.417 | 0.943 | 2.303 | 0.830 | 293.5 | 1.409 | 4.615 |
| 78000 | 78969 | 212.25 | -60.90 | 27.60 | 1.207 | 0.963 | 1.982 | 0.840 | 292.1 | 1.397 | 4.573 |
| 79000 | 79994 | 210.15 | -63.00 | 29.50 | 1.027 | 0.989 | 1.702 | 0.851 | 290.6 | 1.386 | 4.530 |
| 80000 | 81020 | 208.04 | -65.11 | 27.39 | 8.727 - 3 | 1.015 | 1.460 | 0.882 | 289.2 | 1.374 | 4.488 |
| 81000 | 82046 | 205.92 | -67.23 | 25.27 | 7.395 | 1.040 | 1.251 | 0.912 | 287.7 | 1.362 | 4.445 |
| 82000 | 83072 | 203.81 | -69.34 | 23.16 | 6.259 | 1.064 | 1.070 | 0.942 | 286.2 | 1.350 | 4.403 |
| 83000 | 84098 | 201.69 | -71.46 | 21.04 | 5.289 | 1.086 | 9.132 - 6 | 0.972 | 284.7 | 1.338 | 4.360 |
| 84000 | 85125 | 199.58 | -73.57 | 18.93 | 4.461 | 1.107 | 7.784 | 1.001 | 283.3 | 1.327 | 4.317 |
| 85000 | 86152 | 199.57 | -73.58 | 18.92 | 3.759 | 1.127 | 6.560 | 1.020 | 283.3 | 1.327 | 4.317 |
| 86000 | 87180 | 199.55 | -73.60 | 18.90 | 3.168 - 3 | 1.147 | 5.528 - 6 | 1.038 | 283.3 | 1.327 - 5 | 4.317 - 6 |
| 87000 | 88207 | 199.54 | -73.61 | 18.89 | 2.670 | 1.168 | 4.659 | 1.057 | 283.3 | 1.327 | 4.317 |
| 88000 | 89235 | 199.52 | -73.63 | 18.87 | 2.250 | 1.189 | 3.926 | 1.076 | 283.3 | 1.327 | 4.317 |
| 89000 | 90264 | 199.46 | -73.69 | 18.82 | 1.896 | 1.211 | 3.308 | 1.100 | 283.3 | 1.327 | 4.317 |
| 90000 | 91293 | 199.24 | -73.91 | 18.73 | 1.598 | 1.230 | 2.788 | 1.137 | 283.3 | 1.327 | 4.317 |
| 92000 | 93351 | 204.40 | -68.75 | 13.79 | 1.140 | 1.263 | 1.935 | 1.174 | 287.2 | 1.358 | 4.431 |
| 94000 | 95411 | 209.31 | -63.84 | 12.60 | 8.210 - 4 | 1.294 | 1.356 | 1.209 | 291.1 | 1.390 | 4.545 |
| 96000 | 97472 | 213.47 | -59.68 | 10.71 | 5.963 | 1.323 | 9.596 - 7 | 1.241 | 294.9 | 1.421 | 4.658 |
| 98000 | 99535 | 217.64 | -55.51 | 8.93 | 4.366 | 1.349 | 6.850 | 1.271 | 298.7 | 1.451 | 4.770 |
| 100000 | 101598 | 221.81 | -51.34 | 4.11 | 3.222 | 1.371 | 4.930 | 1.317 | 302.5 | 1.481 | 4.882 |
| 102000 | 103663 | 231.14 | -42.01 | 3.55 | 2.403 - 4 | 1.388 | 3.509 - 7 | 1.332 | 309.0 | 1.540 - 5 | 5.098 - 6 |
| 104000 | 105730 | 240.42 | -32.73 | 3.06 | 1.816 | 1.405 | 2.536 | 1.348 | 316.6 | 1.596 | 5.313 |
| 106000 | 107798 | 249.68 | -23.47 | 2.75 | 1.389 | 1.420 | 1.858 | 1.362 | 323.5 | 1.652 | 5.525 |
| 108000 | 109867 | 258.92 | -14.23 | 2.48 | 1.074 | 1.436 | 1.379 | 1.377 | 330.2 | 1.707 | 5.734 |
| 110000 | 111937 | 268.14 | -5.01 | -7.10 | 8.393 - 5 | 1.446 | 1.036 | 1.435 | 336.8 | 1.761 | 5.942 |
| 112000 | 114009 | 284.95 | 11.80 | -9.62 | 6.648 | 1.448 | 7.680 - 8 | 1.445 | 347.9 | 1.852 | 6.297 |
| 114000 | 116082 | 301.72 | 28.57 | -12.04 | 5.329 | 1.447 | 5.798 | 1.453 | 358.7 | 1.940 | 6.645 |
| 116000 | 118156 | 318.46 | 45.31 | -14.26 | 4.331 | 1.445 | 4.449 | 1.459 | 369.1 | 2.025 | 6.986 |

TABLE 5.1.—*Continued*
45° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$ (°K)$^{-1}$ |
| 29000 | 28883 | 216.64 | -56.51 | -8.87 | 1.301 + 1 | 0.936 | 2.092 - 2 | 0.974 | 295.1 | 1.422 - 5 | 4.662 - 6 |
| 29500 | 29384 | 217.04 | -56.11 | -8.97 | 1.203 | 0.933 | 1.931 | 0.971 | 295.3 | 1.424 | 4.670 |
| 30000 | 29859 | 217.44 | -55.71 | -9.07 | 1.113 | 0.930 | 1.783 | 0.969 | 295.6 | 1.426 | 4.678 |
| 30500 | 30334 | 217.83 | -55.32 | -9.17 | 1.030 | 0.927 | 1.647 | 0.966 | 295.9 | 1.428 | 4.686 |
| 31000 | 30850 | 218.23 | -54.92 | -9.27 | 9.529 + 0 | 0.924 | 1.521 | 0.963 | 296.1 | 1.430 | 4.693 |
| 31500 | 31345 | 218.63 | -54.52 | -9.37 | 8.819 | 0.921 | 1.405 | 0.961 | 296.4 | 1.432 | 4.701 |
| 32000 | 31840 | 219.02 | -54.13 | -9.47 | 8.163 | 0.918 | 1.298 | 0.958 | 296.7 | 1.435 | 4.709 |
| 33000 | 32830 | 221.72 | -51.43 | -9.25 | 7.001 | 0.912 | 1.100 | 0.951 | 298.5 | 1.449 | 4.764 |
| 34000 | 33819 | 224.79 | -48.36 | -8.95 | 6.017 | 0.907 | 9.326 - 3 | 0.943 | 300.6 | 1.466 | 4.825 |
| 35000 | 34808 | 227.86 | -45.29 | -8.66 | 5.183 | 0.902 | 7.924 | 0.936 | 302.6 | 1.483 | 4.886 |
| 36000 | 35797 | 230.92 | -42.23 | -8.36 | 4.473 + 0 | 0.897 | 6.748 - 3 | 0.930 | 304.6 | 1.499 - 5 | 4.947 - 6 |
| 37000 | 36786 | 233.99 | -39.16 | -8.06 | 3.868 | 0.893 | 5.759 | 0.924 | 306.6 | 1.515 | 5.008 |
| 38000 | 37774 | 237.05 | -36.10 | -7.77 | 3.351 | 0.889 | 4.925 | 0.918 | 308.6 | 1.532 | 5.068 |
| 39000 | 38762 | 240.11 | -33.04 | -7.47 | 2.909 | 0.885 | 4.221 | 0.912 | 310.6 | 1.548 | 5.129 |
| 40000 | 39750 | 243.17 | -29.98 | -7.18 | 2.530 | 0.881 | 3.625 | 0.907 | 312.6 | 1.564 | 5.189 |
| 41000 | 40737 | 246.24 | -26.91 | -6.88 | 2.204 | 0.878 | 3.119 | 0.902 | 314.6 | 1.580 | 5.249 |
| 42000 | 41724 | 249.30 | -23.85 | -6.58 | 1.924 | 0.874 | 2.688 | 0.898 | 316.5 | 1.595 | 5.309 |
| 43000 | 42711 | 252.35 | -20.80 | -6.29 | 1.682 | 0 871 | 2.322 | 0.893 | 318.5 | 1.611 | 5.369 |
| 44000 | 43698 | 255.41 | -17.74 | -5.99 | 1.473 | 0.869 | 2.009 | 0.889 | 320.4 | 1.627 | 5.428 |
| 45000 | 44684 | 258.47 | -14.68 | -5.69 | 1.292 | 0.866 | 1.741 | 0.886 | 322.3 | 1.642 | 5.487 |
| 46000 | 45669 | 261.53 | -11.62 | -5.40 | 1.135 + 0 | 0.864 | 1.512 - 3 | 0.882 | 324.2 | 1.658 - 5 | 5.546 - 6 |
| 47000 | 46655 | 264.58 | -8.57 | -5.10 | 9.985 - 1 | 0.862 | 1.315 | 0.879 | 326.1 | 1.673 | 5.605 |
| 48000 | 47640 | 265.65 | -7.50 | -5.00 | 8.796 | 0.860 | 1.154 | 0.876 | 326.7 | 1.679 | 5.626 |
| 49000 | 48625 | 265.65 | -7.50 | -5.00 | 7.750 | 0.858 | 1.016 | 0.874 | 326.7 | 1.679 | 5.626 |
| 50000 | 49610 | 265.65 | -7.50 | -5.00 | 6.828 | 0.856 | 8.954 - 4 | 0.872 | 326.7 | 1.679 | 5.626 |
| 51000 | 50594 | 265.65 | -7.50 | -5.00 | 6.016 | 0.854 | 7.890 | 0.870 | 326.7 | 1.679 | 5.626 |
| 52000 | 51578 | 265.65 | -7.50 | -5.00 | 5.301 | 0.852 | 6.952 | 0.868 | 326.7 | 1.679 | 5.626 |
| 53000 | 52562 | 264.53 | -8.62 | -5.00 | 4.670 | 0.850 | 6.151 | 0.866 | 326.0 | 1.673 | 5.604 |
| 54000 | 53545 | 262.56 | -10.59 | -5.00 | 4.111 | 0.848 | 5.455 | 0.864 | 324.8 | 1.663 | 5.566 |
| 55000 | 54528 | 260.59 | -12.56 | -5.00 | 3.616 | 0.846 | 4.834 | 0.862 | 323.6 | 1.653 | 5.528 |
| 56000 | 55511 | 258.63 | -14.52 | -5.00 | 3.177 - 1 | 0.844 | 4.280 - 4 | 0.860 | 322.4 | 1.643 - 5 | 5.490 - 6 |
| 57000 | 56493 | 256.66 | -16.49 | -5.00 | 2.789 | 0.842 | 3.786 | 0.858 | 321.2 | 1.633 | 5.452 |
| 58000 | 57476 | 254.70 | -18.45 | -5.00 | 2.446 | 0.839 | 3.346 | 0.856 | 319.9 | 1.623 | 5.414 |
| 59000 | 58457 | 252.73 | -20.42 | -5.00 | 2.143 | 0.838 | 2.954 | 0.854 | 318.7 | 1.613 | 5.376 |
| 60000 | 59439 | 250.77 | -22.38 | -5.00 | 1.876 | 0.835 | 2.606 | 0.852 | 317.5 | 1.603 | 5.338 |
| 61000 | 60420 | 248.81 | -24.34 | -5.00 | 1.640 | 0.833 | 2.297 | 0.850 | 316.2 | 1.593 | 5.299 |
| 62000 | 61401 | 246.85 | -26.30 | -4.20 | 1.433 | 0.831 | 2.022 | 0.845 | 315.0 | 1.583 | 5.261 |
| 63000 | 62382 | 244.89 | -28.26 | -2.24 | 1.250 | 0.829 | 1.779 | 0.837 | 313.7 | 1.573 | 5.223 |
| 64000 | 63362 | 242.93 | -30.22 | -0.28 | 1.090 | 0.829 | 1.563 | 0.830 | 312.5 | 1.562 | 5.184 |
| 65000 | 64342 | 240.93 | -32.22 | 1.65 | 9.491 - 2 | 0.829 | 1.372 | 0.824 | 311.2 | 1.552 | 5.145 |
| 66000 | 65322 | 238.87 | -34.28 | 3.51 | 8.255 - 2 | 0.830 | 1.204 - 4 | 0.818 | 309.8 | 1.541 - 5 | 5.104 - 6 |
| 67000 | 66301 | 236.82 | -36.33 | 5.37 | 7.172 | 0.833 | 1.055 | 0.814 | 308.5 | 1.530 | 5.064 |
| 68000 | 67280 | 234.76 | -38.39 | 7.23 | 6.223 | 0.836 | 9.235 - 5 | 0.810 | 307.2 | 1.519 | 5.023 |
| 69000 | 68259 | 232.71 | -40.44 | 9.09 | 5.394 | 0.840 | 8.075 | 0.807 | 305.8 | 1.508 | 4.983 |
| 70000 | 69238 | 230.65 | -42.50 | 10.95 | 4.669 | 0.846 | 7.052 | 0.806 | 304.5 | 1.498 | 4.942 |
| 71000 | 70216 | 228.60 | -44.55 | 12.81 | 4.037 | 0.853 | 6.152 | 0.805 | 303.1 | 1.487 | 4.901 |
| 72000 | 71194 | 226.54 | -46.61 | 14.67 | 3.486 | 0.861 | 5.360 | 0.805 | 301.7 | 1.475 | 4.860 |
| 73000 | 72171 | 224.49 | -48.66 | 16.52 | 3.006 | 0.870 | 4.664 | 0.806 | 300.4 | 1.464 | 4.819 |
| 74000 | 73148 | 222.44 | -50.71 | 18.38 | 2.589 | 0.881 | 4.054 | 0.808 | 299.0 | 1.453 | 4.778 |
| 75000 | 74125 | 220.39 | -52.76 | 20.24 | 2.226 | 0.894 | 3.519 | 0.812 | 297.6 | 1.442 | 4.737 |
| 76000 | 75102 | 218.34 | -54.81 | 22.10 | 1.912 - 2 | 0.909 | 3.031 - 5 | 0.817 | 296.2 | 1.431 - 5 | 4.696 - 6 |
| 77000 | 76078 | 216.29 | -56.86 | 23.95 | 1.640 | 0.926 | 2.642 | 0.823 | 294.8 | 1.420 | 4.654 |
| 78000 | 77054 | 214.24 | -58.91 | 25.81 | 1.405 | 0.944 | 2.284 | 0.831 | 293.4 | 1.408 | 4.613 |
| 79000 | 78030 | 212.19 | -60.96 | 27.66 | 1.201 | 0.966 | 1.973 | 0.840 | 292.0 | 1.397 | 4.572 |
| 80000 | 79006 | 210.14 | -63.01 | 29.49 | 1.026 | 0.989 | 1.701 | 0.851 | 290.6 | 1.386 | 4.530 |
| 81000 | 79981 | 208.08 | -65.07 | 27.43 | 8.749 - 3 | 1.015 | 1.465 | 0.881 | 289.2 | 1.374 | 4.489 |
| 82000 | 80956 | 206.01 | -67.14 | 25.36 | 7.450 | 1.039 | 1.260 | 0.911 | 287.8 | 1.363 | 4.447 |
| 83000 | 81930 | 203.95 | -69.20 | 23.30 | 6.333 | 1.062 | 1.081 | 0.940 | 286.3 | 1.351 | 4.406 |
| 84000 | 82904 | 201.89 | -71.26 | 21.24 | 5.375 | 1.084 | 9.272 - 6 | 0.970 | 284.9 | 1.340 | 4.364 |
| 85000 | 83878 | 199.84 | -73.31 | 19.19 | 4.555 | 1.104 | 7.938 | 0.998 | 283.4 | 1.328 | 4.322 |
| 86000 | 84852 | 197.87 | -75.28 | 18.92 | 3.856 - 3 | 1.124 | 6.728 - 6 | 1.017 | 283.3 | 1.327 - 5 | 4.317 - 6 |
| 87000 | 85825 | 197.95 | -75.20 | 18.90 | 3.264 | 1.144 | 5.696 | 1.035 | 283.3 | 1.327 | 4.317 |
| 88000 | 86798 | 197.94 | -75.21 | 18.89 | 2.764 | 1.164 | 4.822 | 1.053 | 283.3 | 1.327 | 4.317 |
| 89000 | 87771 | 197.93 | -75.22 | 18.88 | 2.340 | 1.184 | 4.083 | 1.072 | 283.3 | 1.327 | 4.317 |
| 90000 | 88743 | 197.91 | -75.24 | 18.86 | 1.981 | 1.205 | 3.457 | 1.091 | 283.3 | 1.327 | 4.317 |
| 92000 | 90687 | 201.92 | -71.23 | 14.40 | 1.421 | 1.241 | 2.456 | 1.149 | 284.6 | 1.337 | 4.356 |
| 94000 | 92630 | 206.01 | -67.14 | 13.35 | 1.027 | 1.273 | 1.728 | 1.185 | 288.4 | 1.368 | 4.467 |
| 96000 | 94572 | 210.09 | -63.06 | 12.05 | 7.486 - 4 | 1.302 | 1.228 | 1.218 | 292.2 | 1.398 | 4.577 |
| 98000 | 96512 | 214.34 | -58.81 | 10.25 | 5.501 | 1.329 | 8.796 - 7 | 1.249 | 295.9 | 1.428 | 4.687 |
| 100000 | 98451 | 218.78 | -54.37 | 8.56 | 4.074 | 1.354 | 6.355 | 1.278 | 299.6 | 1.458 | 4.795 |
| 102000 | 100389 | 223.03 | -50.12 | 3.97 | 3.040 - 4 | 1.374 | 4.609 - 7 | 1.319 | 303.9 | 1.493 - 5 | 4.924 - 6 |
| 104000 | 102326 | 227.03 | -46.12 | 3.47 | 2.294 | 1.390 | 3.325 | 1.334 | 310.8 | 1.549 | 5.134 |
| 106000 | 104261 | 231.04 | -42.11 | 3.96 | 1.753 | 1.407 | 2.433 | 1.349 | 317.6 | 1.604 | 5.341 |
| 108000 | 106196 | 235.04 | -38.12 | 2.72 | 1.354 | 1.422 | 1.804 | 1.364 | 324.2 | 1.658 | 5.545 |
| 110000 | 108129 | 239.51 | -33.64 | 2.51 | 1.097 | 1.437 | 1.354 | 1.377 | 330.6 | 1.711 | 5.748 |
| 112000 | 110061 | 244.05 | -29.10 | -7.20 | 8.331 - 5 | 1.446 | 1.026 | 1.435 | 337.1 | 1.764 | 5.953 |
| 114000 | 111991 | 249.68 | -23.47 | -9.64 | 6.646 | 1.447 | 7.689 - 8 | 1.445 | 347.9 | 1.851 | 6.295 |
| 116000 | 113921 | 255.05 | -18.10 | -11.95 | 5.374 | 1.447 | 5.861 | 1.453 | 358.3 | 1.936 | 6.631 |
| 118000 | 115849 | 260.20 | -12.95 | -14.13 | 4.397 | 1.445 | 4.537 | 1.458 | 368.4 | 2.019 | 6.961 |

TABLE 5.1.—*Continued*
45° N. July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m' | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, m sec$^{-1}$ | $\mu$, kg m$^{-1}$ sec$^{-1}$ | $k$, k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 296.22 | 23.07 | 8.07 | 1.01350 + 3 | 1.000 | 1.192 + 0 | 0.973 | 345.0 | 1.878 − 5 | 6.204 − 6 |
| 250 | 250 | 294.95 | 21.80 | 8.42 | 9.896 + 2 | 1.001 | 1.163 | 0.972 | 344.3 | 1.872 | 6.180 |
| 500 | 500 | 293.68 | 20.53 | 8.78 | 9.569 | 1.002 | 1.135 | 0.972 | 343.5 | 1.866 | 6.157 |
| 750 | 750 | 292.41 | 19.26 | 9.14 | 9.290 | 1.003 | 1.107 | 0.972 | 342.8 | 1.860 | 6.133 |
| 1000 | 1000 | 291.14 | 17.99 | 9.49 | 9.022 | 1.004 | 1.080 | 0.971 | 342.1 | 1.854 | 6.109 |
| 1250 | 1250 | 289.90 | 16.75 | 9.88 | 8.761 | 1.005 | 1.053 | 0.970 | 341.3 | 1.798 | 6.086 |
| 1500 | 1500 | 288.67 | 15.52 | 10.27 | 8.506 | 1.006 | 1.026 | 0.970 | 340.6 | 1.792 | 6.063 |
| 1750 | 1750 | 287.43 | 14.28 | 10.65 | 8.257 | 1.007 | 1.001 | 0.970 | 339.9 | 1.786 | 6.039 |
| 2000 | 2001 | 286.19 | 13.04 | 11.04 | 8.015 | 1.008 | 9.756 − 1 | 0.970 | 339.1 | 1.780 | 6.016 |
| 2250 | 2251 | 284.59 | 11.44 | 11.06 | 7.779 | 1.009 | 9.512 | 0.970 | 338.2 | 1.772 | 5.986 |
| 2500 | 2501 | 282.98 | 9.83 | 11.08 | 7.548 + 2 | 1.011 | 9.292 − 1 | 0.971 | 337.2 | 1.764 − 5 | 5.956 − 6 |
| 2750 | 2751 | 281.38 | 8.23 | 11.11 | 7.323 | 1.012 | 9.066 | 0.972 | 336.3 | 1.757 | 5.925 |
| 3000 | 3001 | 279.78 | 6.63 | 11.13 | 7.103 | 1.013 | 8.845 | 0.973 | 335.3 | 1.749 | 5.895 |
| 3250 | 3252 | 278.22 | 5.07 | 11.20 | 6.889 | 1.014 | 8.626 | 0.974 | 334.4 | 1.741 | 5.866 |
| 3500 | 3502 | 276.66 | 3.51 | 11.24 | 6.680 | 1.016 | 8.412 | 0.974 | 333.4 | 1.733 | 5.836 |
| 3750 | 3752 | 275.11 | 1.96 | 11.33 | 6.477 | 1.017 | 8.202 | 0.975 | 332.5 | 1.726 | 5.806 |
| 4000 | 4003 | 273.55 | 0.40 | 11.40 | 6.278 | 1.019 | 7.995 | 0.976 | 331.6 | 1.718 | 5.777 |
| 4250 | 4253 | 272.02 | −1.13 | 11.50 | 6.085 | 1.020 | 7.793 | 0.977 | 330.6 | 1.710 | 5.748 |
| 4500 | 4503 | 270.49 | −2.66 | 11.59 | 5.896 | 1.021 | 7.594 | 0.978 | 329.7 | 1.703 | 5.718 |
| 4750 | 4754 | 268.96 | −4.19 | 11.68 | 5.712 | 1.023 | 7.399 | 0.978 | 328.8 | 1.695 | 5.689 |
| 5000 | 5004 | 267.43 | −5.72 | 11.78 | 5.533 + 2 | 1.024 | 7.208 − 1 | 0.979 | 327.8 | 1.688 − 5 | 5.660 − 6 |
| 5250 | 5254 | 265.89 | −7.26 | 11.87 | 5.359 | 1.026 | 7.021 | 0.980 | 326.9 | 1.680 | 5.630 |
| 5500 | 5505 | 264.36 | −8.79 | 11.96 | 5.189 | 1.027 | 6.838 | 0.981 | 325.9 | 1.672 | 5.601 |
| 5750 | 5755 | 262.83 | −10.32 | 12.06 | 5.024 | 1.029 | 6.658 | 0.982 | 325.0 | 1.665 | 5.571 |
| 6000 | 6006 | 261.30 | −11.85 | 12.15 | 4.863 | 1.031 | 6.483 | 0.983 | 324.1 | 1.657 | 5.542 |
| 6250 | 6256 | 259.66 | −13.49 | 12.14 | 4.706 | 1.032 | 6.313 | 0.984 | 323.0 | 1.649 | 5.510 |
| 6500 | 6507 | 258.03 | −15.12 | 12.13 | 4.553 | 1.034 | 6.147 | 0.985 | 322.0 | 1.640 | 5.479 |
| 6750 | 6758 | 256.39 | −16.76 | 12.12 | 4.404 | 1.036 | 5.984 | 0.987 | 321.0 | 1.632 | 5.447 |
| 7000 | 7008 | 254.75 | −18.40 | 12.10 | 4.259 | 1.037 | 5.825 | 0.988 | 320.0 | 1.624 | 5.415 |
| 7250 | 7258 | 253.12 | −20.03 | 12.09 | 4.119 | 1.039 | 5.668 | 0.989 | 318.9 | 1.615 | 5.383 |
| 7500 | 7509 | 251.48 | −21.67 | 12.08 | 3.982 + 2 | 1.041 | 5.515 − 1 | 0.991 | 317.9 | 1.607 − 5 | 5.352 − 6 |
| 7750 | 7759 | 249.85 | −23.30 | 12.07 | 3.848 | 1.043 | 5.366 | 0.992 | 316.9 | 1.598 | 5.320 |
| 8000 | 8010 | 248.21 | −24.94 | 12.06 | 3.718 | 1.044 | 5.219 | 0.994 | 315.8 | 1.590 | 5.288 |
| 8250 | 8261 | 246.58 | −26.57 | 12.06 | 3.592 | 1.046 | 5.075 | 0.995 | 314.8 | 1.581 | 5.256 |
| 8500 | 8511 | 244.95 | −28.20 | 12.05 | 3.470 | 1.048 | 4.934 | 0.997 | 313.8 | 1.573 | 5.224 |
| 8750 | 8762 | 243.32 | −29.83 | 12.05 | 3.350 | 1.050 | 4.797 | 0.998 | 312.7 | 1.564 | 5.192 |
| 9000 | 9013 | 241.69 | −31.46 | 12.04 | 3.234 | 1.052 | 4.662 | 1.000 | 311.7 | 1.556 | 5.160 |
| 9250 | 9263 | 240.06 | −33.09 | 12.04 | 3.122 | 1.054 | 4.530 | 1.001 | 310.6 | 1.547 | 5.128 |
| 9500 | 9514 | 238.43 | −34.72 | 12.03 | 3.012 | 1.056 | 4.401 | 1.003 | 309.5 | 1.539 | 5.096 |
| 9750 | 9765 | 236.80 | −36.35 | 12.03 | 2.906 | 1.058 | 4.275 | 1.004 | 308.5 | 1.530 | 5.064 |
| 10000 | 10016 | 235.17 | −37.98 | 12.02 | 2.803 + 2 | 1.060 | 4.151 − 1 | 1.006 | 307.4 | 1.522 − 5 | 5.031 − 6 |
| 10250 | 10267 | 233.54 | −39.61 | 12.02 | 2.702 | 1.062 | 4.031 | 1.007 | 306.4 | 1.513 | 4.999 |
| 10500 | 10517 | 231.91 | −41.24 | 12.01 | 2.605 | 1.065 | 3.913 | 1.009 | 305.3 | 1.504 | 4.967 |
| 10750 | 10768 | 230.28 | −42.87 | 12.01 | 2.510 | 1.066 | 3.798 | 1.011 | 304.2 | 1.496 | 4.934 |
| 11000 | 11019 | 228.65 | −44.50 | 12.00 | 2.419 | 1.069 | 3.685 | 1.013 | 303.1 | 1.487 | 4.902 |
| 11500 | 11521 | 225.40 | −47.75 | 8.75 | 2.243 | 1.072 | 3.467 | 1.031 | 301.0 | 1.469 | 4.837 |
| 12000 | 12023 | 222.15 | −51.00 | 5.50 | 2.078 | 1.075 | 3.259 | 1.049 | 298.8 | 1.452 | 4.772 |
| 12500 | 12525 | 218.90 | −54.25 | 2.25 | 1.924 | 1.077 | 3.061 | 1.066 | 296.6 | 1.434 | 4.707 |
| 13000 | 13027 | 215.65 | −57.50 | −1.00 | 1.778 | 1.077 | 2.872 | 1.082 | 294.4 | 1.416 | 4.642 |
| 13500 | 13529 | 215.65 | −57.50 | −1.00 | 1.643 | 1.076 | 2.654 | 1.081 | 294.4 | 1.416 | 4.642 |
| 14000 | 14031 | 215.65 | −57.50 | −1.00 | 1.518 + 2 | 1.076 | 2.452 − 1 | 1.081 | 294.4 | 1.416 − 5 | 4.642 − 6 |
| 14500 | 14533 | 215.65 | −57.50 | −1.00 | 1.402 | 1.076 | 2.265 | 1.081 | 294.4 | 1.416 | 4.642 |
| 15000 | 15035 | 215.65 | −57.50 | −1.00 | 1.295 | 1.076 | 2.092 | 1.080 | 294.4 | 1.416 | 4.642 |
| 15500 | 15536 | 215.65 | −57.50 | −1.00 | 1.197 | 1.075 | 1.933 | 1.080 | 294.4 | 1.416 | 4.642 |
| 16000 | 16040 | 215.65 | −57.50 | −1.00 | 1.105 | 1.074 | 1.786 | 1.080 | 294.4 | 1.416 | 4.642 |
| 16500 | 16543 | 215.65 | −57.50 | −1.00 | 1.021 | 1.074 | 1.650 | 1.079 | 294.4 | 1.416 | 4.642 |
| 17000 | 17046 | 215.65 | −57.50 | −1.00 | 9.435 + 1 | 1.074 | 1.524 | 1.079 | 294.4 | 1.416 | 4.642 |
| 17500 | 17548 | 216.25 | −56.90 | −0.40 | 8.718 | 1.074 | 1.404 | 1.075 | 294.8 | 1.419 | 4.654 |
| 18000 | 18051 | 216.85 | −56.30 | 0.20 | 8.056 | 1.073 | 1.294 | 1.072 | 295.2 | 1.423 | 4.666 |
| 18500 | 18554 | 217.45 | −55.70 | 0.80 | 7.447 | 1.074 | 1.193 | 1.070 | 295.6 | 1.426 | 4.678 |
| 19000 | 19057 | 218.05 | −55.10 | 1.40 | 6.885 + 1 | 1.074 | 1.100 − 1 | 1.067 | 296.0 | 1.429 − 5 | 4.690 − 6 |
| 19500 | 19560 | 218.65 | −54.50 | 2.00 | 6.367 | 1.075 | 1.014 | 1.065 | 296.4 | 1.433 | 4.702 |
| 20000 | 20063 | 219.25 | −53.90 | 2.60 | 5.889 | 1.076 | 9.357 − 2 | 1.064 | 296.8 | 1.436 | 4.714 |
| 20500 | 20566 | 219.85 | −53.30 | 2.70 | 5.448 | 1.077 | 8.633 | 1.063 | 297.2 | 1.439 | 4.726 |
| 21000 | 21070 | 220.45 | −52.70 | 2.80 | 5.042 | 1.078 | 7.967 | 1.064 | 297.6 | 1.442 | 4.738 |
| 21500 | 21573 | 221.05 | −52.10 | 2.90 | 4.666 | 1.079 | 7.354 | 1.065 | 298.1 | 1.446 | 4.750 |
| 22000 | 22076 | 221.65 | −51.50 | 3.00 | 4.320 | 1.080 | 6.789 | 1.065 | 298.5 | 1.449 | 4.762 |
| 22500 | 22580 | 222.25 | −50.90 | 3.10 | 4.000 | 1.081 | 6.269 | 1.066 | 298.9 | 1.452 | 4.774 |
| 23000 | 23084 | 222.85 | −50.30 | 3.20 | 3.704 | 1.082 | 5.790 | 1.067 | 299.3 | 1.455 | 4.786 |
| 23500 | 23587 | 223.45 | −49.70 | 3.30 | 3.431 | 1.083 | 5.349 | 1.068 | 299.7 | 1.459 | 4.798 |
| 24000 | 24091 | 224.05 | −49.10 | 3.40 | 3.179 + 1 | 1.085 | 4.943 − 2 | 1.068 | 300.1 | 1.462 − 5 | 4.810 − 6 |
| 24500 | 24595 | 224.65 | −48.50 | 3.50 | 2.946 | 1.086 | 4.568 | 1.069 | 300.5 | 1.465 | 4.822 |
| 25000 | 25099 | 225.25 | −47.90 | 3.60 | 2.731 | 1.087 | 4.223 | 1.070 | 300.9 | 1.468 | 4.834 |
| 25500 | 25603 | 225.85 | −47.30 | 3.70 | 2.531 | 1.089 | 3.905 | 1.071 | 301.3 | 1.472 | 4.846 |
| 26000 | 26107 | 226.45 | −46.70 | 3.80 | 2.347 | 1.090 | 3.611 | 1.072 | 301.7 | 1.475 | 4.858 |
| 26500 | 26611 | 227.05 | −46.10 | 3.90 | 2.177 | 1.092 | 3.340 | 1.073 | 302.1 | 1.478 | 4.870 |
| 27000 | 27115 | 227.65 | −45.50 | 4.00 | 2.019 | 1.093 | 3.090 | 1.074 | 302.5 | 1.481 | 4.882 |
| 27500 | 27619 | 228.70 | −44.45 | 4.55 | 1.874 | 1.094 | 2.856 | 1.073 | 303.2 | 1.487 | 4.903 |
| 28000 | 28124 | 229.75 | −43.40 | 5.10 | 1.739 | 1.097 | 2.637 | 1.072 | 303.9 | 1.493 | 4.924 |
| 28500 | 28628 | 230.80 | −42.35 | 5.65 | 1.615 | 1.098 | 2.437 | 1.071 | 304.6 | 1.498 | 4.945 |

TABLE 5.1. – *Continued*
45° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T-T_{sea}$ | $P$, mb | $\frac{P}{P_{sea}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{sea}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 0 | 0 | 296.22 | 23.07 | 8.07 | 1.01350 + 3 | 1.000 | 1.192 + 0 | 0.973 | 345.0 | 1.828 − 5 | 6.204 − 6 |
| 250 | 250 | 294.95 | 21.80 | 8.42 | 9.846 + 2 | 1.001 | 1.163 | 0.972 | 344.3 | 1.822 | 6.180 |
| 500 | 500 | 293.68 | 20.53 | 8.78 | 9.565 | 1.002 | 1.135 | 0.971 | 343.5 | 1.816 | 6.157 |
| 750 | 750 | 292.41 | 19.26 | 9.13 | 9.290 | 1.003 | 1.107 | 0.972 | 342.8 | 1.810 | 6.133 |
| 1000 | 1000 | 291.14 | 17.99 | 9.49 | 9.022 | 1.004 | 1.080 | 0.971 | 342.1 | 1.804 | 6.109 |
| 1250 | 1250 | 289.91 | 16.76 | 9.88 | 8.761 | 1.005 | 1.053 | 0.970 | 341.3 | 1.798 | 6.086 |
| 1500 | 1500 | 288.67 | 15.52 | 10.27 | 8.506 | 1.006 | 1.027 | 0.970 | 340.6 | 1.792 | 6.063 |
| 1750 | 1750 | 287.43 | 14.28 | 10.65 | 8.258 | 1.007 | 1.001 | 0.970 | 339.9 | 1.786 | 6.040 |
| 2000 | 1999 | 286.20 | 13.05 | 11.04 | 8.016 | 1.008 | 9.757 − 1 | 0.969 | 339.1 | 1.780 | 6.016 |
| 2250 | 2249 | 284.59 | 11.44 | 11.06 | 7.779 | 1.009 | 9.523 | 0.970 | 338.2 | 1.772 | 5.986 |
| 2500 | 2499 | 282.99 | 9.84 | 11.08 | 7.549 + 2 | 1.011 | 9.293 − 1 | 0.971 | 337.2 | 1.764 − 5 | 5.956 − 6 |
| 2750 | 2749 | 281.39 | 8.24 | 11.11 | 7.324 | 1.012 | 9.067 | 0.972 | 336.3 | 1.757 | 5.926 |
| 3000 | 2999 | 279.79 | 6.64 | 11.13 | 7.105 | 1.013 | 8.846 | 0.973 | 335.3 | 1.749 | 5.895 |
| 3250 | 3248 | 278.23 | 5.08 | 11.20 | 6.891 | 1.015 | 8.628 | 0.974 | 334.4 | 1.741 | 5.866 |
| 3500 | 3498 | 276.68 | 3.53 | 11.26 | 6.682 | 1.016 | 8.413 | 0.974 | 333.5 | 1.733 | 5.836 |
| 3750 | 3748 | 275.12 | 1.97 | 11.33 | 6.479 | 1.017 | 8.203 | 0.975 | 332.5 | 1.726 | 5.807 |
| 4000 | 3997 | 273.57 | 0.42 | 11.40 | 6.280 | 1.019 | 7.997 | 0.976 | 331.6 | 1.718 | 5.777 |
| 4250 | 4247 | 272.04 | −1.11 | 11.49 | 6.087 | 1.020 | 7.795 | 0.977 | 330.6 | 1.711 | 5.748 |
| 4500 | 4497 | 270.51 | −2.64 | 11.59 | 5.899 | 1.021 | 7.596 | 0.978 | 329.7 | 1.703 | 5.719 |
| 4750 | 4746 | 268.98 | −4.17 | 11.68 | 5.715 | 1.023 | 7.402 | 0.978 | 328.8 | 1.695 | 5.689 |
| 5000 | 4996 | 267.45 | −5.70 | 11.77 | 5.536 + 2 | 1.024 | 7.211 − 1 | 0.979 | 327.8 | 1.688 − 5 | 5.660 − 6 |
| 5250 | 5246 | 265.92 | −7.23 | 11.87 | 5.362 | 1.026 | 7.024 | 0.980 | 326.9 | 1.680 | 5.631 |
| 5500 | 5495 | 264.39 | −8.76 | 11.96 | 5.192 | 1.027 | 6.841 | 0.981 | 326.0 | 1.672 | 5.601 |
| 5750 | 5745 | 262.86 | −10.29 | 12.05 | 5.027 | 1.029 | 6.662 | 0.982 | 325.0 | 1.665 | 5.572 |
| 6000 | 5994 | 261.33 | −11.82 | 12.15 | 4.866 | 1.031 | 6.487 | 0.983 | 324.1 | 1.657 | 5.542 |
| 6250 | 6244 | 259.70 | −13.45 | 12.14 | 4.709 | 1.032 | 6.317 | 0.984 | 323.1 | 1.649 | 5.511 |
| 6500 | 6493 | 258.07 | −15.08 | 12.13 | 4.557 | 1.034 | 6.151 | 0.985 | 322.0 | 1.640 | 5.479 |
| 6750 | 6743 | 256.44 | −16.71 | 12.12 | 4.408 | 1.036 | 5.989 | 0.987 | 321.0 | 1.632 | 5.448 |
| 7000 | 6992 | 254.81 | −18.34 | 12.11 | 4.264 | 1.037 | 5.830 | 0.988 | 320.0 | 1.624 | 5.416 |
| 7250 | 7242 | 253.17 | −19.98 | 12.09 | 4.123 | 1.039 | 5.674 | 0.989 | 319.0 | 1.615 | 5.384 |
| 7500 | 7491 | 251.54 | −21.61 | 12.08 | 3.986 + 2 | 1.041 | 5.521 − 1 | 0.991 | 317.9 | 1.607 − 5 | 5.353 − 6 |
| 7750 | 7741 | 249.91 | −23.24 | 12.07 | 3.853 | 1.043 | 5.371 | 0.992 | 316.9 | 1.599 | 5.321 |
| 8000 | 7990 | 248.28 | −24.87 | 12.06 | 3.724 | 1.044 | 5.225 | 0.994 | 315.9 | 1.590 | 5.289 |
| 8250 | 8239 | 246.65 | −26.50 | 12.06 | 3.598 | 1.046 | 5.081 | 0.995 | 314.8 | 1.582 | 5.257 |
| 8500 | 8489 | 245.03 | −28.12 | 12.05 | 3.475 | 1.048 | 4.941 | 0.997 | 313.8 | 1.573 | 5.225 |
| 8750 | 8738 | 243.40 | −29.75 | 12.05 | 3.356 | 1.050 | 4.803 | 0.998 | 312.8 | 1.565 | 5.194 |
| 9000 | 8987 | 241.77 | −31.38 | 12.04 | 3.240 | 1.052 | 4.669 | 0.999 | 311.7 | 1.556 | 5.162 |
| 9250 | 9237 | 240.15 | −33.00 | 12.04 | 3.128 | 1.054 | 4.537 | 1.001 | 310.7 | 1.548 | 5.130 |
| 9500 | 9486 | 238.52 | −34.63 | 12.03 | 3.018 | 1.056 | 4.408 | 1.003 | 309.6 | 1.539 | 5.098 |
| 9750 | 9735 | 236.90 | −36.25 | 12.03 | 2.912 | 1.058 | 4.282 | 1.004 | 308.6 | 1.531 | 5.066 |
| 10000 | 9984 | 235.27 | −37.88 | 12.02 | 2.809 + 2 | 1.060 | 4.159 − 1 | 1.006 | 307.5 | 1.522 − 5 | 5.033 − 6 |
| 10250 | 10233 | 233.65 | −39.50 | 12.02 | 2.709 | 1.062 | 4.039 | 1.007 | 306.4 | 1.514 | 5.001 |
| 10500 | 10483 | 232.02 | −41.13 | 12.01 | 2.612 | 1.064 | 3.921 | 1.009 | 305.4 | 1.505 | 4.969 |
| 10750 | 10732 | 230.40 | −42.75 | 12.01 | 2.517 | 1.067 | 3.806 | 1.011 | 304.3 | 1.496 | 4.937 |
| 11000 | 10981 | 228.77 | −44.38 | 12.00 | 2.426 | 1.069 | 3.693 | 1.012 | 303.2 | 1.487 | 4.904 |
| 11500 | 11479 | 225.53 | −47.62 | 8.88 | 2.250 | 1.073 | 3.476 | 1.030 | 301.1 | 1.470 | 4.840 |
| 12000 | 11977 | 222.30 | −50.85 | 5.65 | 2.086 | 1.075 | 3.269 | 1.048 | 298.9 | 1.452 | 4.775 |
| 12500 | 12475 | 219.06 | −54.09 | 2.41 | 1.931 | 1.077 | 3.071 | 1.065 | 296.7 | 1.435 | 4.710 |
| 13000 | 12973 | 215.82 | −57.33 | −0.83 | 1.786 | 1.077 | 2.882 | 1.081 | 294.5 | 1.417 | 4.645 |
| 13500 | 13471 | 215.65 | −57.50 | −1.00 | 1.650 | 1.076 | 2.666 | 1.081 | 294.4 | 1.416 | 4.642 |
| 14000 | 13969 | 215.65 | −57.50 | −1.00 | 1.525 + 2 | 1.076 | 2.464 − 1 | 1.081 | 294.4 | 1.416 − 5 | 4.642 − 6 |
| 14500 | 14467 | 215.65 | −57.50 | −1.00 | 1.409 | 1.076 | 2.277 | 1.081 | 294.4 | 1.416 | 4.642 |
| 15000 | 14965 | 215.65 | −57.50 | −1.00 | 1.303 | 1.076 | 2.104 | 1.080 | 294.4 | 1.416 | 4.642 |
| 15500 | 15462 | 215.65 | −57.50 | −1.00 | 1.204 | 1.075 | 1.945 | 1.080 | 294.4 | 1.416 | 4.642 |
| 16000 | 15960 | 215.65 | −57.50 | −1.00 | 1.113 | 1.075 | 1.797 | 1.079 | 294.4 | 1.416 | 4.642 |
| 16500 | 16457 | 215.65 | −57.50 | −1.00 | 1.028 | 1.074 | 1.661 | 1.079 | 294.4 | 1.416 | 4.642 |
| 17000 | 16955 | 215.65 | −57.50 | −1.00 | 9.503 + 1 | 1.074 | 1.535 | 1.079 | 294.4 | 1.416 | 4.642 |
| 17500 | 17452 | 216.19 | −56.96 | −0.46 | 8.784 | 1.074 | 1.415 | 1.076 | 294.8 | 1.419 | 4.652 |
| 18000 | 17949 | 216.79 | −56.36 | 0.14 | 8.121 | 1.074 | 1.305 | 1.073 | 295.2 | 1.422 | 4.665 |
| 18500 | 18446 | 217.39 | −55.76 | 0.74 | 7.510 | 1.074 | 1.204 | 1.070 | 295.6 | 1.426 | 4.677 |
| 19000 | 18943 | 217.98 | −55.17 | 1.33 | 6.946 + 1 | 1.074 | 1.110 − 1 | 1.067 | 296.0 | 1.429 − 5 | 4.689 − 6 |
| 19500 | 19440 | 218.58 | −54.57 | 1.93 | 6.427 | 1.075 | 1.024 | 1.065 | 296.4 | 1.432 | 4.700 |
| 20000 | 19937 | 219.17 | −53.98 | 2.52 | 5.947 | 1.076 | 9.453 − 2 | 1.063 | 296.8 | 1.435 | 4.712 |
| 20500 | 20434 | 219.77 | −53.38 | 2.69 | 5.504 | 1.077 | 8.725 | 1.063 | 297.2 | 1.439 | 4.724 |
| 21000 | 20931 | 220.37 | −52.78 | 2.79 | 5.096 | 1.078 | 8.056 | 1.064 | 297.6 | 1.442 | 4.736 |
| 21500 | 21428 | 220.96 | −52.19 | 2.88 | 4.719 | 1.079 | 7.440 | 1.065 | 298.0 | 1.445 | 4.748 |
| 22000 | 21924 | 221.56 | −51.59 | 2.98 | 4.370 | 1.080 | 6.872 | 1.065 | 298.4 | 1.448 | 4.760 |
| 22500 | 22421 | 222.15 | −51.00 | 3.08 | 4.049 | 1.081 | 6.349 | 1.066 | 298.8 | 1.452 | 4.772 |
| 23000 | 22917 | 222.75 | −50.40 | 3.18 | 3.752 | 1.082 | 5.867 | 1.067 | 299.2 | 1.455 | 4.784 |
| 23500 | 23413 | 223.35 | −49.80 | 3.28 | 3.477 | 1.083 | 5.423 | 1.067 | 299.6 | 1.458 | 4.796 |
| 24000 | 23910 | 223.94 | −49.21 | 3.38 | 3.223 + 1 | 1.084 | 5.014 − 2 | 1.068 | 300.0 | 1.461 − 5 | 4.809 − 6 |
| 24500 | 24406 | 224.54 | −48.61 | 3.48 | 2.988 | 1.086 | 4.636 | 1.069 | 300.4 | 1.465 | 4.820 |
| 25000 | 24902 | 225.13 | −48.02 | 3.58 | 2.771 | 1.087 | 4.288 | 1.070 | 300.8 | 1.468 | 4.832 |
| 25500 | 25398 | 225.73 | −47.42 | 3.68 | 2.571 | 1.088 | 3.967 | 1.071 | 301.2 | 1.471 | 4.844 |
| 26000 | 25894 | 226.32 | −46.83 | 3.78 | 2.385 | 1.090 | 3.671 | 1.072 | 301.6 | 1.474 | 4.856 |
| 26500 | 26390 | 226.92 | −46.23 | 3.88 | 2.213 | 1.091 | 3.398 | 1.073 | 302.0 | 1.477 | 4.867 |
| 27000 | 26886 | 227.51 | −45.64 | 3.98 | 2.054 | 1.093 | 3.145 | 1.074 | 302.4 | 1.481 | 4.879 |
| 27500 | 27382 | 228.45 | −44.70 | 4.42 | 1.907 | 1.094 | 2.908 | 1.073 | 303.0 | 1.486 | 4.898 |
| 28000 | 27877 | 229.49 | −43.66 | 4.96 | 1.771 | 1.096 | 2.689 | 1.072 | 303.7 | 1.491 | 4.919 |
| 28500 | 28373 | 230.53 | −42.62 | 5.51 | 1.645 | 1.098 | 2.487 | 1.071 | 304.4 | 1.497 | 4.939 |

TABLE 5.1.—*Continued*
45° N, July
GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k-cal m$^{-1}$ sec$^{-1}$(°K)$^{-1}$ |
| 29000 | 29133 | 231.85 | −41.30 | 6.20 | 1.500 + 1 | 1.100 | 2.254 − 2 | 1.071 | 305.2 | 1.504 − 5 | 4.966 − 6 |
| 29500 | 29638 | 232.90 | −40.25 | 6.75 | 1.394 | 1.102 | 2.084 | 1.071 | 305.9 | 1.510 | 4.986 |
| 30000 | 30142 | 233.95 | −39.20 | 7.30 | 1.295 | 1.105 | 1.929 | 1.071 | 306.6 | 1.515 | 5.007 |
| 30500 | 30647 | 235.00 | −38.15 | 7.85 | 1.204 | 1.108 | 1.785 | 1.071 | 307.3 | 1.521 | 5.028 |
| 31000 | 31152 | 236.05 | −37.10 | 8.40 | 1.120 | 1.111 | 1.653 | 1.071 | 308.0 | 1.526 | 5.049 |
| 31500 | 31657 | 237.10 | −36.05 | 8.95 | 1.042 | 1.114 | 1.531 | 1.071 | 308.7 | 1.532 | 5.069 |
| 32000 | 32162 | 238.15 | −35.00 | 9.50 | 9.697 + 0 | 1.117 | 1.418 | 1.071 | 309.4 | 1.537 | 5.090 |
| 33000 | 33172 | 240.65 | −32.50 | 9.20 | 8.407 | 1.124 | 1.217 | 1.081 | 311.0 | 1.550 | 5.139 |
| 34000 | 34183 | 243.15 | −30.00 | 8.90 | 7.300 | 1.130 | 1.046 | 1.088 | 312.6 | 1.564 | 5.189 |
| 35000 | 35194 | 245.65 | −27.50 | 8.60 | 6.348 | 1.136 | 9.002 − 3 | 1.096 | 314.2 | 1.577 | 5.238 |
| 36000 | 36205 | 248.15 | −25.00 | 8.30 | 5.527 + 0 | 1.141 | 7.760 − 3 | 1.103 | 315.8 | 1.590 − 5 | 5.287 − 6 |
| 37000 | 37217 | 250.65 | −22.50 | 8.00 | 4.820 | 1.146 | 6.699 | 1.110 | 317.4 | 1.602 | 5.335 |
| 38000 | 38229 | 253.15 | −20.00 | 7.70 | 4.208 | 1.152 | 5.791 | 1.117 | 319.0 | 1.615 | 5.384 |
| 39000 | 39241 | 255.65 | −17.50 | 7.40 | 3.680 | 1.156 | 5.014 | 1.123 | 320.5 | 1.628 | 5.433 |
| 40000 | 40253 | 258.15 | −15.00 | 7.10 | 3.221 | 1.161 | 4.347 | 1.129 | 322.1 | 1.641 | 5.481 |
| 41000 | 41266 | 260.65 | −12.50 | 6.80 | 2.824 | 1.165 | 3.774 | 1.135 | 323.6 | 1.654 | 5.529 |
| 42000 | 42279 | 263.15 | −10.00 | 6.50 | 2.479 | 1.169 | 3.281 | 1.140 | 325.2 | 1.666 | 5.577 |
| 43000 | 43293 | 265.65 | −7.50 | 6.20 | 2.178 | 1.173 | 2.856 | 1.145 | 326.7 | 1.679 | 5.626 |
| 44000 | 44307 | 268.15 | −5.00 | 5.90 | 1.916 | 1.176 | 2.490 | 1.151 | 328.3 | 1.691 | 5.674 |
| 45000 | 45321 | 270.65 | −2.50 | 5.60 | 1.688 | 1.180 | 2.173 | 1.155 | 329.8 | 1.704 | 5.721 |
| 46000 | 46335 | 273.15 | −0.00 | 5.30 | 1.489 + 0 | 1.183 | 1.899 − 3 | 1.159 | 331.3 | 1.716 − 5 | 5.769 − 6 |
| 47000 | 47350 | 275.65 | 2.50 | 5.00 | 1.315 | 1.185 | 1.661 | 1.163 | 332.8 | 1.728 | 5.817 |
| 48000 | 48365 | 275.65 | 2.50 | 5.00 | 1.161 | 1.188 | 1.468 | 1.167 | 332.8 | 1.728 | 5.817 |
| 49000 | 49381 | 275.65 | 2.50 | 5.00 | 1.026 | 1.191 | 1.297 | 1.169 | 332.8 | 1.728 | 5.817 |
| 50000 | 50396 | 275.65 | 2.50 | 5.00 | 9.064 − 1 | 1.194 | 1.145 | 1.172 | 332.8 | 1.728 | 5.817 |
| 51000 | 51413 | 275.65 | 2.50 | 5.00 | 8.007 | 1.196 | 1.012 | 1.174 | 332.8 | 1.728 | 5.817 |
| 52000 | 52429 | 275.65 | 2.50 | 5.00 | 7.074 | 1.199 | 8.940 − 4 | 1.177 | 332.8 | 1.728 | 5.817 |
| 53000 | 53446 | 273.15 | −0.00 | 4.50 | 6.246 | 1.202 | 7.966 | 1.182 | 331.3 | 1.716 | 5.769 |
| 54000 | 54463 | 270.65 | −2.50 | 4.00 | 5.508 | 1.204 | 7.090 | 1.186 | 329.8 | 1.704 | 5.721 |
| 55000 | 55480 | 268.15 | −5.00 | 3.50 | 4.852 | 1.206 | 6.304 | 1.190 | 328.3 | 1.691 | 5.674 |
| 56000 | 56498 | 265.65 | −7.50 | 3.00 | 4.269 − 1 | 1.208 | 5.599 − 4 | 1.194 | 326.7 | 1.679 − 5 | 5.626 − 6 |
| 57000 | 57516 | 263.15 | −10.00 | 2.50 | 3.752 | 1.210 | 4.967 | 1.198 | 325.2 | 1.666 | 5.577 |
| 58000 | 58534 | 260.65 | −12.50 | 2.00 | 3.293 | 1.211 | 4.401 | 1.202 | 323.6 | 1.654 | 5.529 |
| 59000 | 59553 | 258.15 | −15.00 | 1.50 | 2.887 | 1.212 | 3.895 | 1.205 | 322.1 | 1.641 | 5.481 |
| 60000 | 60572 | 255.65 | −17.50 | 1.00 | 2.527 | 1.213 | 3.444 | 1.208 | 320.5 | 1.628 | 5.433 |
| 61000 | 61591 | 253.15 | −20.00 | 0.50 | 2.210 | 1.213 | 3.041 | 1.211 | 319.0 | 1.615 | 5.384 |
| 62000 | 62611 | 250.65 | −22.50 | 2.00 | 1.929 | 1.214 | 2.681 | 1.205 | 317.4 | 1.602 | 5.335 |
| 63000 | 63631 | 246.15 | −27.00 | 1.50 | 1.681 | 1.216 | 2.380 | 1.208 | 314.5 | 1.579 | 5.247 |
| 64000 | 64651 | 241.65 | −31.50 | 1.00 | 1.462 | 1.216 | 2.107 | 1.211 | 311.6 | 1.556 | 5.159 |
| 65000 | 65672 | 237.15 | −36.00 | 0.50 | 1.267 | 1.217 | 1.862 | 1.214 | 308.7 | 1.532 | 5.070 |
| 66000 | 66692 | 232.65 | −40.50 | −0.00 | 1.096 − 1 | 1.217 | 1.641 − 4 | 1.217 | 305.8 | 1.508 − 5 | 4.981 − 6 |
| 67000 | 67714 | 228.15 | −45.00 | −0.50 | 9.467 − 2 | 1.217 | 1.443 | 1.219 | 302.8 | 1.484 | 4.892 |
| 68000 | 68735 | 223.65 | −49.50 | −1.00 | 8.121 | 1.216 | 1.265 | 1.221 | 299.8 | 1.460 | 4.802 |
| 69000 | 69757 | 219.15 | −54.00 | −1.50 | 6.960 | 1.215 | 1.106 | 1.223 | 296.8 | 1.435 | 4.712 |
| 70000 | 70779 | 214.65 | −58.50 | −2.00 | 5.946 | 1.214 | 9.649 − 5 | 1.225 | 293.7 | 1.411 | 4.621 |
| 71000 | 71802 | 210.15 | −63.00 | −2.50 | 5.062 | 1.212 | 8.392 | 1.226 | 290.6 | 1.386 | 4.530 |
| 72000 | 72825 | 205.65 | −67.50 | −3.00 | 4.295 | 1.209 | 7.276 | 1.227 | 287.5 | 1.360 | 4.439 |
| 73000 | 73848 | 201.15 | −72.00 | −3.50 | 3.631 | 1.206 | 6.288 | 1.227 | 284.3 | 1.335 | 4.347 |
| 74000 | 74872 | 196.65 | −76.50 | −4.00 | 3.058 | 1.202 | 5.417 | 1.226 | 281.1 | 1.309 | 4.255 |
| 75000 | 75896 | 192.15 | −81.00 | −4.50 | 2.565 | 1.198 | 4.650 | 1.225 | 277.9 | 1.284 | 4.163 |
| 76000 | 76920 | 187.65 | −85.50 | −5.00 | 2.143 − 2 | 1.192 | 3.978 − 5 | 1.224 | 274.6 | 1.257 − 5 | 4.070 − 6 |
| 77000 | 77944 | 183.15 | −90.00 | −5.50 | 1.782 | 1.186 | 3.390 | 1.222 | 271.3 | 1.231 | 3.977 |
| 78000 | 78969 | 178.65 | −94.50 | −6.00 | 1.475 | 1.179 | 2.877 | 1.219 | 267.9 | 1.204 | 3.884 |
| 79000 | 79994 | 174.15 | −99.00 | −6.50 | 1.216 | 1.171 | 2.432 | 1.215 | 264.5 | 1.178 | 3.790 |
| 80000 | 81020 | 169.64 | −103.51 | −11.01 | 9.965 − 3 | 1.160 | 2.046 | 1.236 | 261.1 | 1.150 | 3.696 |
| 81000 | 82046 | 169.13 | −104.02 | −15.52 | 8.125 | 1.143 | 1.714 | 1.250 | 257.6 | 1.123 | 3.601 |
| 82000 | 83072 | 169.11 | −104.04 | −15.54 | 6.607 | 1.123 | 1.394 | 1.228 | 257.6 | 1.123 | 3.601 |
| 83000 | 84098 | 169.10 | −104.05 | −15.55 | 5.372 | 1.103 | 1.133 | 1.207 | 257.6 | 1.123 | 3.601 |
| 84000 | 85125 | 169.09 | −104.06 | −15.56 | 4.368 | 1.084 | 9.215 − 6 | 1.185 | 257.6 | 1.123 | 3.601 |
| 85000 | 86152 | 169.08 | −104.07 | −15.57 | 3.552 | 1.065 | 7.493 | 1.165 | 257.6 | 1.123 | 3.601 |
| 86000 | 87180 | 169.07 | −104.08 | −15.58 | 2.888 − 3 | 1.046 | 6.093 − 6 | 1.144 | 257.6 | 1.123 − 5 | 3.601 − 6 |
| 87000 | 88207 | 169.06 | −104.09 | −15.59 | 2.349 | 1.027 | 4.954 | 1.124 | 257.6 | 1.123 | 3.601 |
| 88000 | 89235 | 169.04 | −104.11 | −15.61 | 1.910 | 1.009 | 4.028 | 1.104 | 257.6 | 1.123 | 3.601 |
| 89000 | 90264 | 169.03 | −104.12 | −15.62 | 1.553 | 0.992 | 3.276 | 1.089 | 257.6 | 1.123 | 3.601 |
| 90000 | 91293 | 169.02 | −104.13 | −15.63 | 1.265 | 0.974 | 2.618 | 1.067 | 260.1 | 1.143 | 3.669 |
| 92000 | 93351 | 169.00 | −104.15 | −15.65 | 8.695 − 4 | 0.941 | 1.693 | 1.027 | 265.0 | 1.181 | 3.802 |
| 94000 | 95411 | 168.99 | −104.16 | −15.66 | 5.786 | 0.912 | 1.113 | 0.992 | 269.8 | 1.219 | 3.936 |
| 96000 | 97472 | 168.97 | −104.18 | −15.68 | 3.994 | 0.886 | 7.419 − 7 | 0.959 | 274.5 | 1.257 | 4.068 |
| 98000 | 99535 | 168.96 | −104.19 | −15.69 | 2.791 | 0.863 | 5.014 | 0.931 | 279.2 | 1.294 | 4.200 |
| 100000 | 101598 | 168.95 | −104.20 | −15.70 | 1.974 | 0.840 | 3.432 | 0.917 | 283.8 | 1.331 | 4.331 |
| 102000 | 103663 | 211.29 | −61.86 | −16.39 | 1.425 − 4 | 0.823 | 2.263 − 7 | 0.859 | 296.9 | 1.436 − 5 | 4.716 − 6 |
| 104000 | 105730 | 226.12 | −47.03 | −0.24 | 1.057 | 0.817 | 1.545 | 0.821 | 309.5 | 1.538 | 5.093 |
| 106000 | 107798 | 244.80 | −28.35 | −2.13 | 8.021 − 5 | 0.820 | 1.086 | 0.796 | 321.6 | 1.636 | 5.464 |
| 108000 | 109867 | 261.35 | −11.80 | 4.91 | 6.208 | 0.830 | 7.828 − 8 | 0.781 | 333.2 | 1.731 | 5.829 |
| 110000 | 111937 | 277.74 | 4.59 | 2.55 | 4.887 | 0.842 | 5.767 | 0.799 | 344.5 | 1.823 | 6.186 |
| 112000 | 114009 | 294.23 | 21.08 | 0.66 | 3.920 | 0.855 | 4.202 | 0.791 | 361.4 | 1.962 | 6.733 |
| 114000 | 116082 | 310.47 | 37.32 | 16.73 | 3.206 | 0.871 | 3.148 | 0.789 | 377.6 | 2.094 | 7.264 |
| 116000 | 118156 | 326.02 | 52.87 | 23.90 | 2.665 | 0.889 | 2.414 | 0.792 | 393.1 | 2.221 | 7.781 |

TABLE 5.1.—*Continued*
45° N. July
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m' | $T$, °K | $t$, °C | $T-T_{std}$ | $P$, mb | $\frac{P}{P_{std}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ m sec$^{-1}$ | $\mu$ kg m$^{-1}$ sec$^{-1}$ | $k$ k-cal m$^{-1}$ sec$^{-1}$ (°K) |
| 29000 | 28868 | 231.57 | −41.58 | 6.05 | 1.529 + 1 | 1.100 | 2.301 − 2 | 1.071 | 305.1 | 1.502 − 5 | 4.960 − 6 |
| 29500 | 29364 | 232.61 | −40.54 | 6.60 | 1.422 | 1.102 | 2.129 | 1.071 | 305.7 | 1.503 | 4.981 |
| 30000 | 29859 | 233.65 | −39.50 | 7.14 | 1.322 | 1.105 | 1.971 | 1.071 | 306.4 | 1.514 | 5.001 |
| 30500 | 30354 | 234.69 | −38.46 | 7.69 | 1.230 | 1.107 | 1.826 | 1.071 | 307.1 | 1.519 | 5.022 |
| 31000 | 30850 | 235.73 | −37.42 | 8.23 | 1.145 | 1.110 | 1.692 | 1.071 | 307.8 | 1.525 | 5.042 |
| 31500 | 31345 | 236.77 | −36.38 | 8.78 | 1.066 | 1.113 | 1.568 | 1.072 | 308.5 | 1.530 | 5.063 |
| 32000 | 31840 | 237.81 | −35.34 | 9.32 | 9.922 + 0 | 1.116 | 1.454 | 1.072 | 309.1 | 1.536 | 5.084 |
| 33000 | 32830 | 240.22 | −32.93 | 9.25 | 8.613 | 1.123 | 1.249 | 1.080 | 310.7 | 1.548 | 5.131 |
| 34000 | 33819 | 242.70 | −30.45 | 8.95 | 7.488 | 1.129 | 1.075 | 1.087 | 312.3 | 1.561 | 5.180 |
| 35000 | 34808 | 245.17 | −27.98 | 8.69 | 6.519 | 1.135 | 9.263 − 3 | 1.095 | 313.9 | 1.574 | 5.228 |
| 36000 | 35797 | 247.64 | −25.51 | 8.46 | 5.684 + 0 | 1.140 | 7.996 − 3 | 1.102 | 315.5 | 1.587 − 5 | 5.277 − 6 |
| 37000 | 36786 | 250.11 | −23.04 | 8.06 | 4.963 | 1.146 | 6.912 | 1.108 | 317.0 | 1.600 | 5.325 |
| 38000 | 37774 | 252.58 | −20.57 | 7.77 | 4.339 | 1.151 | 5.984 | 1.115 | 318.6 | 1.612 | 5.373 |
| 39000 | 38762 | 255.05 | −18.10 | 7.47 | 3.799 | 1.155 | 5.188 | 1.121 | 320.2 | 1.625 | 5.421 |
| 40000 | 39750 | 257.52 | −15.63 | 7.17 | 3.330 | 1.160 | 4.505 | 1.127 | 321.7 | 1.638 | 5.469 |
| 41000 | 40737 | 259.99 | −13.16 | 6.88 | 2.923 | 1.164 | 3.917 | 1.133 | 323.2 | 1.650 | 5.517 |
| 42000 | 41724 | 262.46 | −10.69 | 6.58 | 2.569 | 1.168 | 3.410 | 1.139 | 324.8 | 1.663 | 5.564 |
| 43000 | 42711 | 264.93 | −8.22 | 6.29 | 2.261 | 1.171 | 2.973 | 1.144 | 326.3 | 1.675 | 5.612 |
| 44000 | 43698 | 267.39 | −5.76 | 5.99 | 1.992 | 1.175 | 2.595 | 1.149 | 327.8 | 1.687 | 5.659 |
| 45000 | 44684 | 269.86 | −3.29 | 5.69 | 1.757 | 1.178 | 2.268 | 1.154 | 329.3 | 1.700 | 5.706 |
| 46000 | 45669 | 272.32 | −0.83 | 5.40 | 1.552 + 0 | 1.182 | 1.985 − 3 | 1.158 | 330.8 | 1.712 − 5 | 5.753 − 6 |
| 47000 | 46655 | 274.79 | 1.64 | 5.10 | 1.372 | 1.185 | 1.739 | 1.163 | 332.3 | 1.724 | 5.800 |
| 48000 | 47640 | 275.65 | 2.50 | 5.00 | 1.214 | 1.187 | 1.535 | 1.165 | 332.8 | 1.728 | 5.817 |
| 49000 | 48625 | 275.65 | 2.50 | 5.00 | 1.075 | 1.190 | 1.358 | 1.168 | 332.8 | 1.728 | 5.817 |
| 50000 | 49610 | 275.65 | 2.50 | 5.00 | 9.513 − 1 | 1.192 | 1.202 | 1.171 | 332.8 | 1.728 | 5.817 |
| 51000 | 50594 | 275.65 | 2.50 | 5.00 | 8.420 | 1.195 | 1.064 | 1.173 | 332.8 | 1.728 | 5.817 |
| 52000 | 51578 | 275.65 | 2.50 | 5.00 | 7.453 | 1.198 | 9.420 − 4 | 1.176 | 332.8 | 1.728 | 5.817 |
| 53000 | 52562 | 274.25 | 1.10 | 4.72 | 6.597 | 1.201 | 8.380 | 1.180 | 332.0 | 1.721 | 5.790 |
| 54000 | 53545 | 271.79 | −1.36 | 4.23 | 5.833 | 1.203 | 7.477 | 1.184 | 330.5 | 1.709 | 5.743 |
| 55000 | 54528 | 269.33 | −3.82 | 3.73 | 5.152 | 1.205 | 6.664 | 1.188 | 329.0 | 1.697 | 5.696 |
| 56000 | 55511 | 266.87 | −6.28 | 3.24 | 4.546 − 1 | 1.207 | 5.934 − 4 | 1.192 | 327.5 | 1.685 − 5 | 5.649 − 6 |
| 57000 | 56493 | 264.42 | −8.73 | 2.75 | 4.006 | 1.209 | 5.278 | 1.196 | 326.0 | 1.673 | 5.602 |
| 58000 | 57476 | 261.96 | −11.19 | 2.26 | 3.527 | 1.210 | 4.690 | 1.200 | 324.5 | 1.660 | 5.555 |
| 59000 | 58457 | 259.51 | −13.64 | 1.77 | 3.101 | 1.212 | 4.163 | 1.203 | 322.9 | 1.648 | 5.507 |
| 60000 | 59439 | 257.05 | −16.10 | 1.28 | 2.723 | 1.213 | 3.691 | 1.207 | 321.4 | 1.635 | 5.460 |
| 61000 | 60420 | 254.60 | −18.55 | 0.79 | 2.389 | 1.213 | 3.269 | 1.209 | 319.9 | 1.623 | 5.412 |
| 62000 | 61401 | 252.15 | −21.00 | 1.10 | 2.093 | 1.214 | 2.892 | 1.208 | 318.3 | 1.610 | 5.364 |
| 63000 | 62382 | 248.93 | −24.22 | 1.61 | 1.831 | 1.214 | 2.563 | 1.206 | 316.3 | 1.594 | 5.302 |
| 64000 | 63362 | 244.52 | −28.63 | 1.32 | 1.599 | 1.216 | 2.278 | 1.209 | 313.5 | 1.571 | 5.216 |
| 65000 | 64342 | 240.11 | −33.04 | 0.83 | 1.392 | 1.216 | 2.020 | 1.213 | 310.6 | 1.548 | 5.129 |
| 66000 | 65322 | 235.70 | −37.45 | 0.34 | 1.210 − 1 | 1.217 | 1.788 − 4 | 1.215 | 307.8 | 1.526 − 5 | 5.042 − 6 |
| 67000 | 66301 | 231.29 | −41.86 | −0.15 | 1.048 | 1.217 | 1.579 | 1.218 | 304.9 | 1.501 | 4.955 |
| 68000 | 67280 | 226.89 | −46.26 | −0.64 | 9.058 − 2 | 1.217 | 1.391 | 1.220 | 302.0 | 1.477 | 4.867 |
| 69000 | 68259 | 222.48 | −50.67 | −1.13 | 7.805 | 1.216 | 1.222 | 1.222 | 299.0 | 1.453 | 4.779 |
| 70000 | 69238 | 218.08 | −55.07 | −1.62 | 6.706 | 1.215 | 1.071 | 1.224 | 296.0 | 1.429 | 4.690 |
| 71000 | 70216 | 213.68 | −59.47 | −2.11 | 5.744 | 1.213 | 9.365 − 5 | 1.225 | 293.0 | 1.405 | 4.602 |
| 72000 | 71194 | 209.28 | −63.87 | −2.60 | 4.905 | 1.211 | 8.165 | 1.226 | 290.0 | 1.381 | 4.513 |
| 73000 | 72171 | 204.88 | −68.27 | −3.09 | 4.174 | 1.209 | 7.098 | 1.227 | 286.9 | 1.356 | 4.423 |
| 74000 | 73148 | 200.48 | −72.67 | −3.58 | 3.540 | 1.205 | 6.152 | 1.227 | 283.8 | 1.331 | 4.334 |
| 75000 | 74125 | 196.09 | −77.06 | −4.06 | 2.992 | 1.202 | 5.315 | 1.226 | 280.7 | 1.306 | 4.244 |
| 76000 | 75102 | 191.69 | −81.46 | −4.55 | 2.519 − 2 | 1.197 | 4.578 − 5 | 1.225 | 277.6 | 1.281 − 5 | 4.154 − 6 |
| 77000 | 76078 | 187.30 | −85.85 | −5.04 | 2.112 | 1.192 | 3.929 | 1.224 | 274.4 | 1.255 | 4.063 |
| 78000 | 77054 | 182.90 | −90.25 | −5.53 | 1.764 | 1.186 | 3.360 | 1.222 | 271.1 | 1.230 | 3.972 |
| 79000 | 78030 | 178.51 | −94.64 | −6.02 | 1.467 | 1.179 | 2.863 | 1.219 | 267.8 | 1.204 | 3.881 |
| 80000 | 79006 | 174.12 | −99.03 | −6.53 | 1.214 | 1.171 | 2.429 | 1.215 | 264.5 | 1.177 | 3.789 |
| 81000 | 79981 | 169.74 | −103.43 | −10.93 | 1.000 | 1.161 | 2.053 | 1.235 | 261.2 | 1.151 | 3.698 |
| 82000 | 80956 | 165.33 | −107.82 | −15.32 | 8.200 − 3 | 1.144 | 1.728 | 1.250 | 257.8 | 1.124 | 3.606 |
| 83000 | 81930 | 165.12 | −108.03 | −15.53 | 6.703 | 1.124 | 1.414 | 1.230 | 257.6 | 1.123 | 3.601 |
| 84000 | 82904 | 165.10 | −108.05 | −15.55 | 5.480 | 1.105 | 1.156 | 1.209 | 257.6 | 1.123 | 3.601 |
| 85000 | 83878 | 165.09 | −108.06 | −15.56 | 4.480 | 1.086 | 9.450 − 6 | 1.188 | 257.6 | 1.123 | 3.601 |
| 86000 | 84852 | 165.08 | −108.07 | −15.57 | 3.663 − 3 | 1.067 | 7.726 − 6 | 1.168 | 257.6 | 1.123 − 5 | 3.601 − 6 |
| 87000 | 85825 | 165.07 | −108.08 | −15.58 | 2.995 | 1.049 | 6.317 | 1.148 | 257.6 | 1.123 | 3.601 |
| 88000 | 86798 | 165.06 | −108.09 | −15.59 | 2.449 | 1.031 | 5.165 | 1.128 | 257.6 | 1.123 | 3.601 |
| 89000 | 87771 | 165.05 | −108.10 | −15.60 | 2.002 | 1.013 | 4.224 | 1.109 | 257.6 | 1.123 | 3.601 |
| 90000 | 88743 | 165.04 | −108.11 | −15.61 | 1.637 | 0.996 | 3.454 | 1.090 | 257.6 | 1.123 | 3.601 |
| 92000 | 90687 | 165.02 | −108.13 | −15.64 | 1.101 | 0.962 | 2.259 | 1.053 | 261.8 | 1.156 | 3.715 |
| 94000 | 92630 | 165.72 | −107.43 | −16.84 | 7.516 − 4 | 0.932 | 1.481 | 1.015 | 266.5 | 1.193 | 3.844 |
| 96000 | 94572 | 166.46 | −106.69 | −17.49 | 5.198 | 0.904 | 9.895 − 7 | 0.982 | 271.2 | 1.230 | 3.974 |
| 98000 | 96512 | 167.75 | −105.40 | −18.53 | 3.640 | 0.880 | 6.702 | 0.951 | 275.7 | 1.266 | 4.102 |
| 100000 | 98451 | 168.91 | −104.24 | −19.51 | 2.579 | 0.857 | 4.598 | 0.924 | 280.2 | 1.302 | 4.230 |
| 102000 | 100389 | 197.82 | −75.33 | −22.04 | 1.848 − 4 | 0.836 | 3.155 − 7 | 0.903 | 286.4 | 1.351 − 5 | 4.406 − 6 |
| 104000 | 102326 | 214.04 | −59.11 | −15.14 | 1.355 | 0.821 | 2.122 | 0.852 | 299.0 | 1.453 | 4.778 |
| 106000 | 104261 | 230.36 | −42.83 | −8.28 | 1.018 | 0.817 | 1.473 | 0.817 | 311.1 | 1.551 | 5.142 |
| 108000 | 106196 | 246.42 | −26.73 | −1.43 | 7.816 − 5 | 0.821 | 1.051 | 0.796 | 322.7 | 1.646 | 5.500 |
| 110000 | 108129 | 262.41 | −10.74 | 5.41 | 6.110 | 0.831 | 7.671 − 8 | 0.780 | 333.9 | 1.737 | 5.852 |
| 112000 | 110061 | 274.60 | 0.49 | 2.75 | 4.853 | 0.842 | 5.709 | 0.798 | 349.0 | 1.828 | 6.203 |
| 114000 | 111991 | 306.11 | 33.76 | 9.59 | 3.924 | 0.856 | 4.208 | 0.791 | 361.3 | 1.961 | 6.731 |
| 116000 | 113921 | 327.46 | 54.31 | 16.45 | 3.230 | 0.870 | 3.183 | 0.789 | 376.9 | 2.089 | 7.244 |
| 118000 | 115849 | 349.06 | 75.91 | 23.33 | 2.701 | 0.887 | 2.461 | 0.791 | 391.9 | 2.212 | 7.742 |

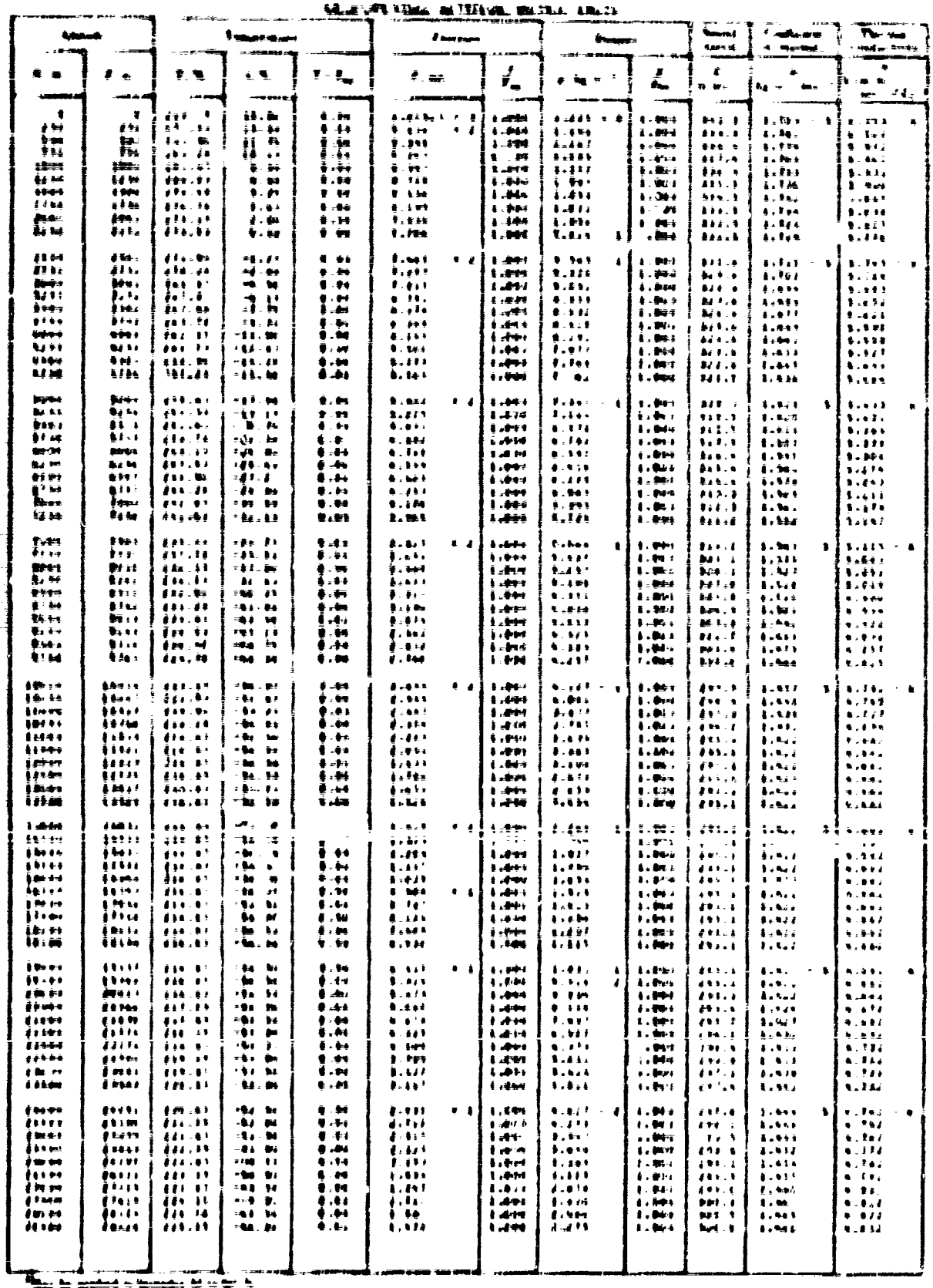

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Table 5.1 – Continued

[illegible]

GEOPOTENTIAL ALTITUDE, [illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, m | Z, m | T, K | t, °C | [illegible] | P, mb | [illegible] | ρ, kg m⁻³ | [illegible] | [illegible] | [illegible] | [illegible] |
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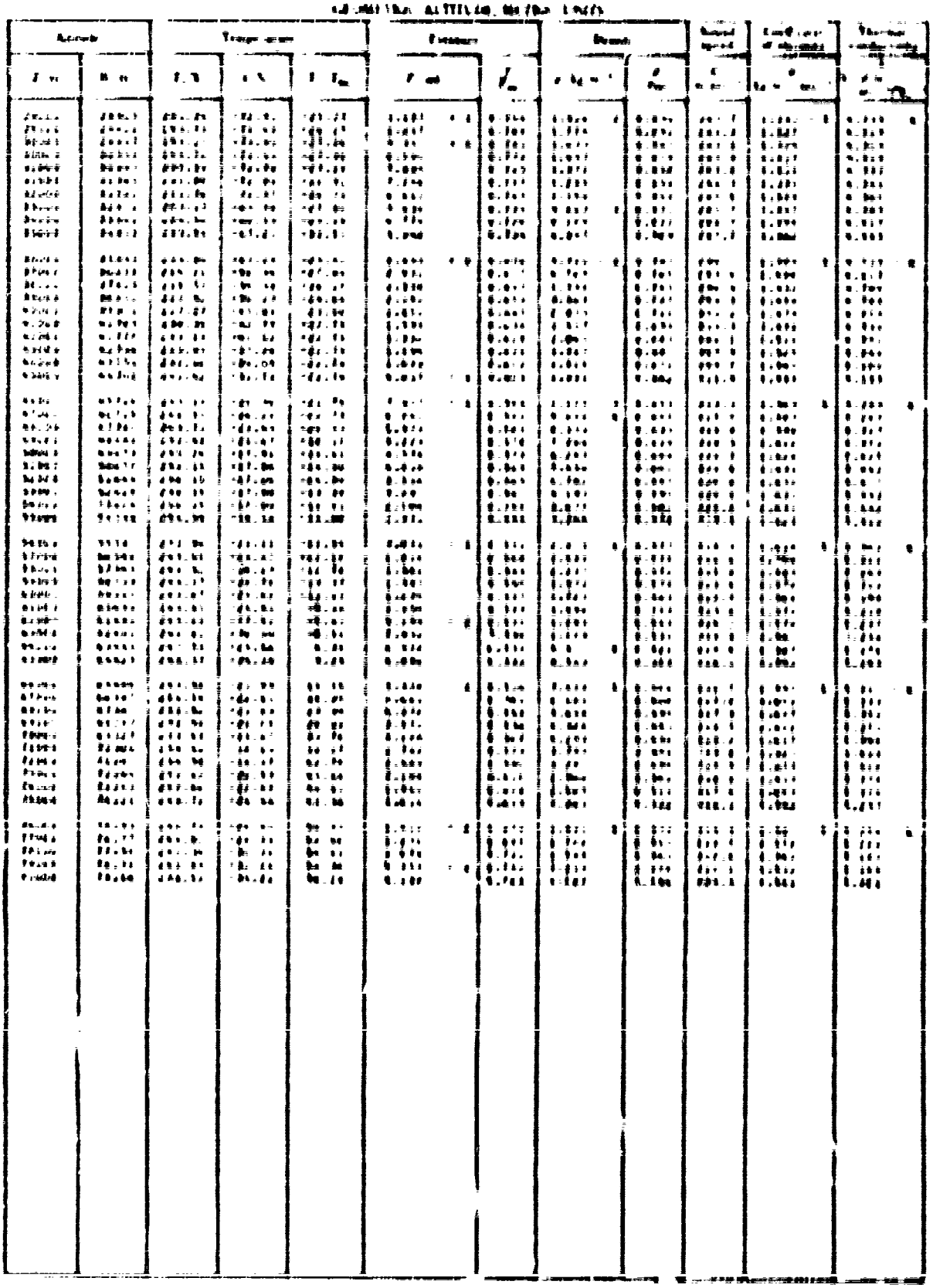

Table 5.1 - Continued

GEOPOTENTIAL ALTITUDE, METERS (1 m/T)

| Altitude | | Temperature | | | Pressure | | Density | | Normal speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

Table 5.1 – Continued

GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, K | $t$, °C | $T/T_{SL}$ | $P$, Pa | $P/P_{SL}$ | $\rho$, kg/m$^3$ | $\rho/\rho_{SL}$ | $a$, m/s | $\mu$, kg/(m·s) | $k$, W/(m·K) |
| 0 | 0 | 288.150 | 15.000 | 1.0000 | 1.0133 × 10$^5$ | 1.0000 | 1.2250 | 1.0000 | 340.29 | 1.7894 × 10$^{-5}$ | 2.5348 × 10$^{-2}$ |
| 500 | 500 | 284.900 | 11.750 | 0.9755 | 9.5461 × 10$^4$ | 0.9421 | 1.1673 | 0.9529 | 338.37 | 1.7579 × 10$^{-5}$ | 2.5071 × 10$^{-2}$ |
| 1000 | 1000 | 281.651 | 8.501 | 0.9511 | 8.9876 × 10$^4$ | 0.8870 | 1.1117 | 0.9075 | 336.43 | 1.7260 × 10$^{-5}$ | 2.4788 × 10$^{-2}$ |
| 1500 | 1500 | 278.401 | 5.251 | 0.9267 | 8.4559 × 10$^4$ | 0.8345 | 1.0581 | 0.8638 | 334.48 | 1.6938 × 10$^{-5}$ | 2.4502 × 10$^{-2}$ |
| 2000 | 2000 | 275.151 | 2.001 | 0.9023 | 7.9501 × 10$^4$ | 0.7846 | 1.0066 | 0.8217 | 332.52 | 1.6612 × 10$^{-5}$ | 2.4213 × 10$^{-2}$ |
| 2500 | 2500 | 271.901 | −1.249 | 0.8779 | 7.4701 × 10$^4$ | 0.7372 | 0.9569 | 0.7812 | 330.56 | 1.6282 × 10$^{-5}$ | 2.3919 × 10$^{-2}$ |
| 3000 | 3000 | 268.650 | −4.500 | 0.8535 | 7.0121 × 10$^4$ | 0.6920 | 0.9092 | 0.7423 | 328.58 | 1.5949 × 10$^{-5}$ | 2.3622 × 10$^{-2}$ |
| 3500 | 3500 | 265.400 | −7.750 | 0.8291 | 6.5770 × 10$^4$ | 0.6490 | 0.8633 | 0.7048 | 326.59 | 1.5612 × 10$^{-5}$ | 2.3321 × 10$^{-2}$ |
| 4000 | 4000 | 262.150 | −11.000 | 0.8047 | 6.1660 × 10$^4$ | 0.6085 | 0.8192 | 0.6689 | 324.59 | 1.5272 × 10$^{-5}$ | 2.3016 × 10$^{-2}$ |
| 4500 | 4500 | 258.900 | −14.250 | 0.7803 | 5.7768 × 10$^4$ | 0.5701 | 0.7768 | 0.6343 | 322.58 | 1.4928 × 10$^{-5}$ | 2.2707 × 10$^{-2}$ |
| 5000 | 5000 | 255.650 | −17.500 | 0.7559 | 5.4095 × 10$^4$ | 0.5338 | 0.7361 | 0.6012 | 320.55 | 1.4580 × 10$^{-5}$ | 2.2394 × 10$^{-2}$ |
| 5500 | 5500 | 252.400 | −20.750 | 0.7315 | 5.0630 × 10$^4$ | 0.4996 | 0.6971 | 0.5694 | 318.52 | 1.4228 × 10$^{-5}$ | 2.2076 × 10$^{-2}$ |
| 6000 | 6000 | 249.150 | −24.000 | 0.7071 | 4.7365 × 10$^4$ | 0.4675 | 0.6597 | 0.5389 | 316.47 | 1.3873 × 10$^{-5}$ | 2.1754 × 10$^{-2}$ |
| 6500 | 6500 | 245.900 | −27.250 | 0.6827 | 4.4292 × 10$^4$ | 0.4372 | 0.6238 | 0.5096 | 314.42 | 1.3513 × 10$^{-5}$ | 2.1427 × 10$^{-2}$ |
| 7000 | 7000 | 242.650 | −30.500 | 0.6583 | 4.1411 × 10$^4$ | 0.4088 | 0.5895 | 0.4816 | 312.35 | 1.3150 × 10$^{-5}$ | 2.1096 × 10$^{-2}$ |
| 7500 | 7500 | 239.400 | −33.750 | 0.6339 | 3.8713 × 10$^4$ | 0.3821 | 0.5567 | 0.4546 | 310.26 | 1.2782 × 10$^{-5}$ | 2.0760 × 10$^{-2}$ |
| 8000 | 8000 | 236.150 | −37.000 | 0.6095 | 3.6182 × 10$^4$ | 0.3572 | 0.5252 | 0.4289 | 308.16 | 1.2411 × 10$^{-5}$ | 2.0419 × 10$^{-2}$ |
| 8500 | 8500 | 232.900 | −40.250 | 0.5851 | 3.3821 × 10$^4$ | 0.3339 | 0.4952 | 0.4044 | 306.04 | 1.2036 × 10$^{-5}$ | 2.0073 × 10$^{-2}$ |
| 9000 | 9000 | 229.650 | −43.500 | 0.5607 | 3.1620 × 10$^4$ | 0.3122 | 0.4665 | 0.3810 | 303.91 | 1.1656 × 10$^{-5}$ | 1.9722 × 10$^{-2}$ |
| 9500 | 9500 | 226.400 | −46.750 | 0.5363 | 2.9577 × 10$^4$ | 0.2920 | 0.4390 | 0.3585 | 301.76 | 1.1272 × 10$^{-5}$ | 1.9366 × 10$^{-2}$ |
| 10000 | 10000 | 223.150 | −50.000 | 0.5119 | 2.7676 × 10$^4$ | 0.2733 | 0.4127 | 0.3371 | 299.59 | 1.0884 × 10$^{-5}$ | 1.9004 × 10$^{-2}$ |
| 10500 | 10500 | 219.900 | −53.250 | 0.4875 | 2.5911 × 10$^4$ | 0.2558 | 0.3876 | 0.3166 | 297.40 | 1.0491 × 10$^{-5}$ | 1.8636 × 10$^{-2}$ |
| 11000 | 11000 | 216.650 | −56.500 | 0.4631 | 2.4272 × 10$^4$ | 0.2396 | 0.3636 | 0.2971 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 11500 | 11500 | 216.650 | −56.500 | 0.4387 | 2.2716 × 10$^4$ | 0.2242 | 0.3402 | 0.2778 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 12000 | 12000 | 216.650 | −56.500 | 0.4143 | 2.1246 × 10$^4$ | 0.2097 | 0.3182 | 0.2599 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 12500 | 12500 | 216.650 | −56.500 | 0.3899 | 1.9876 × 10$^4$ | 0.1962 | 0.2977 | 0.2431 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 13000 | 13000 | 216.650 | −56.500 | 0.3655 | 1.8594 × 10$^4$ | 0.1835 | 0.2785 | 0.2275 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 13500 | 13500 | 216.650 | −56.500 | 0.3411 | 1.7399 × 10$^4$ | 0.1717 | 0.2606 | 0.2128 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 14000 | 14000 | 216.650 | −56.500 | 0.3167 | 1.6285 × 10$^4$ | 0.1607 | 0.2439 | 0.1992 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 14500 | 14500 | 216.650 | −56.500 | 0.2923 | 1.5242 × 10$^4$ | 0.1504 | 0.2283 | 0.1865 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 15000 | 15000 | 216.650 | −56.500 | 0.2679 | 1.4268 × 10$^4$ | 0.1408 | 0.2138 | 0.1746 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 15500 | 15500 | 216.650 | −56.500 | 0.2435 | 1.3355 × 10$^4$ | 0.1318 | 0.2001 | 0.1634 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 16000 | 16000 | 216.650 | −56.500 | 0.2191 | 1.2501 × 10$^4$ | 0.1234 | 0.1873 | 0.1530 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 16500 | 16500 | 216.650 | −56.500 | 0.1947 | 1.1701 × 10$^4$ | 0.1155 | 0.1754 | 0.1432 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 17000 | 17000 | 216.650 | −56.500 | 0.1703 | 1.0951 × 10$^4$ | 0.1081 | 0.1642 | 0.1341 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 17500 | 17500 | 216.650 | −56.500 | 0.1459 | 1.0249 × 10$^4$ | 0.1012 | 0.1537 | 0.1255 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 18000 | 18000 | 216.650 | −56.500 | 0.1215 | 9.5940 × 10$^3$ | 0.0947 | 0.1438 | 0.1175 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 18500 | 18500 | 216.650 | −56.500 | 0.0971 | 8.9800 × 10$^3$ | 0.0887 | 0.1347 | 0.1100 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 19000 | 19000 | 216.650 | −56.500 | 0.0727 | 8.4050 × 10$^3$ | 0.0830 | 0.1261 | 0.1030 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 19500 | 19500 | 216.650 | −56.500 | 0.0483 | 7.8670 × 10$^3$ | 0.0777 | 0.1180 | 0.0964 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |
| 20000 | 20000 | 216.650 | −56.500 | 0.0239 | 7.3650 × 10$^3$ | 0.0727 | 0.1105 | 0.0903 | 295.19 | 1.0093 × 10$^{-5}$ | 1.8263 × 10$^{-2}$ |

Table 5.1 – Continued

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $z$, m | $T$, K | $\theta$, °C | $T/T_{sl}$ | $P$, mb | $P/P_{sl}$ | $\rho$, kg/m³ | $\rho/\rho_{sl}$ | $a$, m/s | $\mu$, kg/(m·s) | $k$, J/(m·s·K) |
| 20000 | 19937 | 216.65 | −56.50 | 0.7519 | 54.748 | 0.05405 | 0.08803 | 0.07365 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 21000 | 20917 | 216.65 | −56.50 | 0.7519 | 46.565 | 0.04596 | 0.07486 | 0.06265 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 22000 | 21895 | 216.65 | −56.50 | 0.7519 | 39.616 | 0.03911 | 0.06368 | 0.05328 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 23000 | 22872 | 216.65 | −56.50 | 0.7519 | 33.701 | 0.03327 | 0.05418 | 0.04533 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 24000 | 23847 | 216.65 | −56.50 | 0.7519 | 28.676 | 0.02830 | 0.04609 | 0.03856 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 25000 | 24821 | 216.65 | −56.50 | 0.7519 | 24.400 | 0.02409 | 0.03921 | 0.03281 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 26000 | 25793 | 216.65 | −56.50 | 0.7519 | 20.760 | 0.02049 | 0.03336 | 0.02791 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 27000 | 26763 | 216.65 | −56.50 | 0.7519 | 17.660 | 0.01743 | 0.02838 | 0.02375 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 28000 | 27732 | 216.65 | −56.50 | 0.7519 | 15.026 | 0.01483 | 0.02415 | 0.02020 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 29000 | 28699 | 216.65 | −56.50 | 0.7519 | 12.786 | 0.01262 | 0.02055 | 0.01719 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 30000 | 29664 | 216.65 | −56.50 | 0.7519 | 10.880 | 0.01074 | 0.01749 | 0.01463 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 31000 | 30628 | 216.65 | −56.50 | 0.7519 | 9.2570 | 0.00914 | 0.01488 | 0.01245 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 32000 | 31591 | 216.65 | −56.50 | 0.7519 | 7.8760 | 0.00778 | 0.01266 | 0.01059 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 33000 | 32551 | 216.65 | −56.50 | 0.7519 | 6.7010 | 0.00661 | 0.01077 | 0.00901 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 34000 | 33509 | 216.65 | −56.50 | 0.7519 | 5.7020 | 0.00563 | 0.00917 | 0.00767 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 35000 | 34466 | 216.65 | −56.50 | 0.7519 | 4.8520 | 0.00479 | 0.00780 | 0.00652 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 36000 | 35421 | 216.65 | −56.50 | 0.7519 | 4.1290 | 0.00407 | 0.00664 | 0.00555 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 37000 | 36374 | 216.65 | −56.50 | 0.7519 | 3.5140 | 0.00347 | 0.00565 | 0.00472 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 38000 | 37325 | 216.65 | −56.50 | 0.7519 | 2.9910 | 0.00295 | 0.00481 | 0.00402 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 39000 | 38274 | 216.65 | −56.50 | 0.7519 | 2.5460 | 0.00251 | 0.00409 | 0.00342 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 40000 | 39222 | 216.65 | −56.50 | 0.7519 | 2.1670 | 0.00214 | 0.00348 | 0.00291 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 41000 | 40167 | 216.65 | −56.50 | 0.7519 | 1.8450 | 0.00182 | 0.00296 | 0.00248 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 42000 | 41110 | 216.65 | −56.50 | 0.7519 | 1.5710 | 0.00155 | 0.00252 | 0.00211 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 43000 | 42052 | 216.65 | −56.50 | 0.7519 | 1.3380 | 0.00132 | 0.00215 | 0.00180 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 44000 | 42991 | 216.65 | −56.50 | 0.7519 | 1.1390 | 0.00112 | 0.00183 | 0.00153 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 45000 | 43929 | 216.65 | −56.50 | 0.7519 | 0.9700 | 0.00096 | 0.00156 | 0.00130 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 46000 | 44864 | 216.65 | −56.50 | 0.7519 | 0.8260 | 0.00081 | 0.00133 | 0.00111 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 47000 | 45798 | 216.65 | −56.50 | 0.7519 | 0.7030 | 0.00069 | 0.00113 | 0.00095 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 48000 | 46730 | 216.65 | −56.50 | 0.7519 | 0.5990 | 0.00059 | 0.00096 | 0.00081 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 49000 | 47659 | 216.65 | −56.50 | 0.7519 | 0.5100 | 0.00050 | 0.00082 | 0.00069 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 50000 | 48587 | 216.65 | −56.50 | 0.7519 | 0.4350 | 0.00043 | 0.00070 | 0.00059 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 51000 | 49513 | 216.65 | −56.50 | 0.7519 | 0.3700 | 0.00036 | 0.00059 | 0.00050 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 52000 | 50437 | 216.65 | −56.50 | 0.7519 | 0.3150 | 0.00031 | 0.00051 | 0.00043 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 53000 | 51359 | 216.65 | −56.50 | 0.7519 | 0.2680 | 0.00026 | 0.00043 | 0.00036 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 54000 | 52280 | 216.65 | −56.50 | 0.7519 | 0.2280 | 0.00022 | 0.00037 | 0.00031 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 55000 | 53198 | 216.65 | −56.50 | 0.7519 | 0.1940 | 0.00019 | 0.00031 | 0.00026 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 56000 | 54115 | 216.65 | −56.50 | 0.7519 | 0.1650 | 0.00016 | 0.00026 | 0.00022 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 57000 | 55030 | 216.65 | −56.50 | 0.7519 | 0.1400 | 0.00014 | 0.00023 | 0.00019 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 58000 | 55943 | 216.65 | −56.50 | 0.7519 | 0.1190 | 0.00011 | 0.00019 | 0.00016 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 59000 | 56853 | 216.65 | −56.50 | 0.7519 | 0.1010 | 0.00010 | 0.00016 | 0.00014 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |
| 60000 | 57762 | 216.65 | −56.50 | 0.7519 | 0.0860 | 0.00008 | 0.00014 | 0.00011 | 295.07 | $1.422 \times 10^{-5}$ | $2.281 \times 10^{-2}$ |

Table 5.1 —

(GEOMETRIC ALTITUDE, METRIC UNITS)

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

TABLE A.1.—Continued

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, K | $t$, °C | $T/T_{SL}$ | $P$, mb | $P/P_{SL}$ | $\rho$, kg m$^{-3}$ | $\rho/\rho_{SL}$ | $C$, m s$^{-1}$ | $\mu$, kg m$^{-1}$ s$^{-1}$ | $k$, J m$^{-1}$ s$^{-1}$ K$^{-1}$ |
| 0 | 0 | 288.150 | 15.000 | 1.0000 | 1.0132E+3 | 1.0000 | 1.2250 | 1.0000 | 340.29 | 1.7894 - 5 | 0.2534 - 4 |
| 500 | 500 | 284.900 | 11.750 | 0.9930 | 9.5461E+2 | 0.9421 | 1.1673 | 0.9529 | 338.37 | 1.7579 | 0.2491 |
| 1000 | 1000 | 281.650 | 8.500 | 0.9861 | 8.9876E+2 | 0.8870 | 1.1117 | 0.9075 | 336.43 | 1.7260 | 0.2447 |
| 1500 | 1500 | 278.400 | 5.250 | 0.9792 | 8.4559E+2 | 0.8345 | 1.0581 | 0.8638 | 334.48 | 1.6938 | 0.2402 |
| 2000 | 2000 | 275.150 | 2.000 | 0.9723 | 7.9501E+2 | 0.7846 | 1.0066 | 0.8217 | 332.52 | 1.6612 | 0.2357 |
| 2500 | 2500 | 271.900 | -1.250 | 0.9653 | 7.4691E+2 | 0.7372 | 0.9569 | 0.7812 | 330.54 | 1.6282 | 0.2311 |
| 3000 | 3000 | 268.650 | -4.500 | 0.9584 | 7.0121E+2 | 0.6920 | 0.9092 | 0.7423 | 328.55 | 1.5949 | 0.2265 |
| 3500 | 3500 | 265.400 | -7.750 | 0.9515 | 6.5780E+2 | 0.6492 | 0.8633 | 0.7048 | 326.54 | 1.5612 | 0.2218 |
| 4000 | 4000 | 262.150 | -11.000 | 0.9446 | 6.1660E+2 | 0.6085 | 0.8191 | 0.6689 | 324.52 | 1.5272 | 0.2171 |
| 4500 | 4500 | 258.900 | -14.250 | 0.9377 | 5.7754E+2 | 0.5700 | 0.7768 | 0.6343 | 322.48 | 1.4928 | 0.2123 |
| 5000 | 5000 | 255.650 | -17.500 | 0.9309 | 5.4054E+2 | 0.5335 | 0.7361 | 0.6010 | 320.43 | 1.4581 | 0.2075 |
| 5500 | 5500 | 252.400 | -20.750 | 0.9240 | 5.0555E+2 | 0.4990 | 0.6971 | 0.5691 | 318.36 | 1.4230 | 0.2026 |
| 6000 | 6000 | 249.150 | -24.000 | 0.9171 | 4.7248E+2 | 0.4664 | 0.6597 | 0.5385 | 316.28 | 1.3875 | 0.1977 |
| 6500 | 6500 | 245.900 | -27.250 | 0.9102 | 4.4128E+2 | 0.4355 | 0.6238 | 0.5092 | 314.18 | 1.3516 | 0.1927 |
| 7000 | 7000 | 242.650 | -30.500 | 0.9033 | 4.1189E+2 | 0.4065 | 0.5895 | 0.4812 | 312.07 | 1.3154 | 0.1877 |
| 7500 | 7500 | 239.400 | -33.750 | 0.8964 | 3.8423E+2 | 0.3792 | 0.5567 | 0.4546 | 309.94 | 1.2787 | 0.1826 |
| 8000 | 8000 | 236.150 | -37.000 | 0.8895 | 3.5826E+2 | 0.3536 | 0.5252 | 0.4292 | 307.80 | 1.2417 | 0.1775 |
| 8500 | 8500 | 232.900 | -40.250 | 0.8826 | 3.3391E+2 | 0.3296 | 0.4952 | 0.4050 | 305.64 | 1.2043 | 0.1723 |
| 9000 | 9000 | 229.650 | -43.500 | 0.8757 | 3.1112E+2 | 0.3071 | 0.4665 | 0.3819 | 303.46 | 1.1665 | 0.1671 |
| 9500 | 9500 | 226.400 | -46.750 | 0.8688 | 2.8984E+2 | 0.2860 | 0.4391 | 0.3599 | 301.26 | 1.1282 | 0.1618 |
| 10000 | 9999 | 223.150 | -50.000 | 0.8619 | 2.6999E+2 | 0.2663 | 0.4130 | 0.3389 | 299.04 | 1.0896 | 0.1565 |
| 10500 | 10499 | 219.900 | -53.250 | 0.8550 | 2.5153E+2 | 0.2481 | 0.3881 | 0.3189 | 296.80 | 1.0505 | 0.1511 |
| 11000 | 10998 | 216.650 | -56.500 | 0.8481 | 2.3439E+2 | 0.2312 | 0.3643 | 0.2999 | 294.53 | 1.0110 | 0.1457 |
| 11500 | 11497 | 216.650 | -56.500 | 0.8481 | 2.1829E+2 | 0.2154 | 0.3394 | 0.2771 | 294.53 | 1.0110 | 0.1457 |
| 12000 | 11996 | 216.650 | -56.500 | 0.8481 | 2.0327E+2 | 0.2006 | 0.3162 | 0.2582 | 294.53 | 1.0110 | 0.1457 |
| 12500 | 12495 | 216.650 | -56.500 | 0.8481 | 1.8928E+2 | 0.1868 | 0.2945 | 0.2405 | 294.53 | 1.0110 | 0.1457 |
| 13000 | 12994 | 216.650 | -56.500 | 0.8481 | 1.7628E+2 | 0.1740 | 0.2743 | 0.2240 | 294.53 | 1.0110 | 0.1457 |
| 13500 | 13493 | 216.650 | -56.500 | 0.8481 | 1.6422E+2 | 0.1621 | 0.2555 | 0.2086 | 294.53 | 1.0110 | 0.1457 |
| 14000 | 13992 | 216.650 | -56.500 | 0.8481 | 1.5298E+2 | 0.1510 | 0.2380 | 0.1943 | 294.53 | 1.0110 | 0.1457 |
| 14500 | 14491 | 216.650 | -56.500 | 0.8481 | 1.4252E+2 | 0.1407 | 0.2217 | 0.1810 | 294.53 | 1.0110 | 0.1457 |
| 15000 | 14990 | 216.650 | -56.500 | 0.8481 | 1.3278E+2 | 0.1311 | 0.2065 | 0.1686 | 294.53 | 1.0110 | 0.1457 |
| 15500 | 15489 | 216.650 | -56.500 | 0.8481 | 1.2372E+2 | 0.1221 | 0.1925 | 0.1572 | 294.53 | 1.0110 | 0.1457 |
| 16000 | 15988 | 216.650 | -56.500 | 0.8481 | 1.1528E+2 | 0.1138 | 0.1793 | 0.1464 | 294.53 | 1.0110 | 0.1457 |
| 16500 | 16487 | 216.650 | -56.500 | 0.8481 | 1.0741E+2 | 0.1060 | 0.1671 | 0.1364 | 294.53 | 1.0110 | 0.1457 |
| 17000 | 16986 | 216.650 | -56.500 | 0.8481 | 1.0008E+2 | 0.0988 | 0.1556 | 0.1271 | 294.53 | 1.0110 | 0.1457 |
| 17500 | 17485 | 216.650 | -56.500 | 0.8481 | 9.3249E+1 | 0.0920 | 0.1450 | 0.1184 | 294.53 | 1.0110 | 0.1457 |
| 18000 | 17984 | 216.650 | -56.500 | 0.8481 | 8.6885E+1 | 0.0857 | 0.1351 | 0.1103 | 294.53 | 1.0110 | 0.1457 |
| 18500 | 18483 | 216.650 | -56.500 | 0.8481 | 8.0961E+1 | 0.0799 | 0.1259 | 0.1028 | 294.53 | 1.0110 | 0.1457 |
| 19000 | 18982 | 216.650 | -56.500 | 0.8481 | 7.5452E+1 | 0.0745 | 0.1173 | 0.0958 | 294.53 | 1.0110 | 0.1457 |
| 19500 | 19481 | 216.650 | -56.500 | 0.8481 | 7.0335E+1 | 0.0694 | 0.1094 | 0.0893 | 294.53 | 1.0110 | 0.1457 |
| 20000 | 19980 | 216.650 | -56.500 | 0.8481 | 6.5579E+1 | 0.0647 | 0.1019 | 0.0833 | 294.53 | 1.0110 | 0.1457 |
| 20500 | 20479 | 216.650 | -56.500 | 0.8481 | 6.1142E+1 | 0.0604 | 0.0950 | 0.0776 | 294.53 | 1.0110 | 0.1457 |
| 21000 | 20978 | 216.650 | -56.500 | 0.8481 | 5.7012E+1 | 0.0563 | 0.0886 | 0.0723 | 294.53 | 1.0110 | 0.1457 |
| 21500 | 21477 | 216.650 | -56.500 | 0.8481 | 5.3164E+1 | 0.0525 | 0.0826 | 0.0674 | 294.53 | 1.0110 | 0.1457 |
| 22000 | 21976 | 216.650 | -56.500 | 0.8481 | 4.9577E+1 | 0.0489 | 0.0771 | 0.0629 | 294.53 | 1.0110 | 0.1457 |
| 22500 | 22475 | 216.650 | -56.500 | 0.8481 | 4.6239E+1 | 0.0457 | 0.0719 | 0.0587 | 294.53 | 1.0110 | 0.1457 |
| 23000 | 22974 | 216.650 | -56.500 | 0.8481 | 4.3133E+1 | 0.0426 | 0.0670 | 0.0547 | 294.53 | 1.0110 | 0.1457 |
| 23500 | 23473 | 216.650 | -56.500 | 0.8481 | 4.0242E+1 | 0.0397 | 0.0626 | 0.0510 | 294.53 | 1.0110 | 0.1457 |
| 24000 | 23972 | 216.650 | -56.500 | 0.8481 | 3.7548E+1 | 0.0371 | 0.0584 | 0.0476 | 294.53 | 1.0110 | 0.1457 |
| 24500 | 24471 | 216.650 | -56.500 | 0.8481 | 3.5035E+1 | 0.0346 | 0.0545 | 0.0444 | 294.53 | 1.0110 | 0.1457 |
| 25000 | 24970 | 216.650 | -56.500 | 0.8481 | 3.2690E+1 | 0.0323 | 0.0508 | 0.0415 | 294.53 | 1.0110 | 0.1457 |

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, m | $H$, m | $T$, K | $t$, °C | $T - T_{sl}$ | $P$, mb | $\frac{P}{P_{sl}}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_{sl}}$ | $a$, m s$^{-1}$ | $\mu$, kg s$^{-1}$ m$^{-1}$ | $k$, cal m$^{-1}$ s$^{-1}$ K$^{-1}$ |
| 0 | 0 | 288.15 | 15.00 | 0.00 | 1.0132 × 10$^{3}$ | 0.9999 | 1.225 × 10$^{0}$ | 0.9991 | 340.3 | 1.791 × 10$^{-5}$ | 0.0058 × 10$^{-4}$ |
| 100 | 100 | 287.81 | 14.66 | 0.48 | 1.0045 × 10$^{3}$ | 0.9967 | 1.213 | 0.9901 | 339.6 | 1.784 | 0.0057 |
| 200 | 200 | 287.48 | 14.33 | 0.84 | 9.946 × 10$^{2}$ | 0.9935 | 1.202 | 0.9811 | 338.9 | 1.777 | 0.0056 |
| 300 | 300 | 287.14 | 13.99 | 1.18 | 9.839 | 0.9902 | 1.190 | 0.9711 | 338.2 | 1.770 | 0.0055 |
| 400 | 400 | 286.81 | 13.66 | 1.51 | 9.733 | 0.9869 | 1.178 | 0.9611 | 337.5 | 1.763 | 0.0054 |
| 500 | 500 | 286.48 | 13.33 | 1.84 | 9.627 | 0.9836 | 1.167 | 0.9511 | 336.8 | 1.756 | 0.0053 |
| 600 | 600 | 286.14 | 12.99 | 2.18 | 9.521 | 0.9803 | 1.155 | 0.9411 | 336.1 | 1.749 | 0.0052 |
| 700 | 700 | 285.81 | 12.66 | 2.51 | 9.415 | 0.9770 | 1.143 | 0.9311 | 335.4 | 1.742 | 0.0051 |
| 800 | 800 | 285.48 | 12.33 | 2.84 | 9.310 | 0.9737 | 1.131 | 0.9211 | 334.7 | 1.735 | 0.0050 |
| 900 | 900 | 285.14 | 11.99 | 3.18 | 9.205 | 0.9704 | 1.120 | 0.9111 | 334.0 | 1.728 | 0.0049 |
| 1000 | 1000 | 284.81 | 11.66 | 3.51 | 9.100 × 10$^{2}$ | 0.9671 | 1.108 | 0.9011 | 333.3 | 1.721 × 10$^{-5}$ | 0.0048 × 10$^{-4}$ |
| 1100 | 1100 | 284.48 | 11.33 | 3.84 | 8.996 | 0.9638 | 1.096 | 0.8911 | 332.6 | 1.713 | 0.0047 |
| 1200 | 1200 | 284.14 | 10.99 | 4.18 | 8.892 | 0.9605 | 1.085 | 0.8811 | 331.9 | 1.706 | 0.0046 |
| 1300 | 1300 | 283.81 | 10.66 | 4.51 | 8.788 | 0.9572 | 1.073 | 0.8711 | 331.2 | 1.699 | 0.0045 |
| 1400 | 1400 | 283.48 | 10.33 | 4.84 | 8.684 | 0.9539 | 1.062 | 0.8611 | 330.5 | 1.691 | 0.0044 |
| 1500 | 1500 | 283.14 | 9.99 | 5.18 | 8.581 | 0.9506 | 1.050 | 0.8511 | 329.8 | 1.684 | 0.0043 |
| 1600 | 1600 | 282.81 | 9.66 | 5.51 | 8.478 | 0.9473 | 1.039 | 0.8411 | 329.1 | 1.677 | 0.0042 |
| 1700 | 1700 | 282.48 | 9.33 | 5.84 | 8.376 | 0.9440 | 1.027 | 0.8311 | 328.4 | 1.670 | 0.0041 |
| 1800 | 1800 | 282.14 | 8.99 | 6.18 | 8.274 | 0.9407 | 1.016 | 0.8211 | 327.7 | 1.662 | 0.0040 |
| 1900 | 1900 | 281.81 | 8.66 | 6.51 | 8.172 | 0.9374 | 1.005 | 0.8111 | 327.0 | 1.655 | 0.0039 |
| 2000 | 2000 | 281.48 | 8.33 | 6.84 | 8.070 × 10$^{2}$ | 0.9341 | 9.939 × 10$^{-1}$ | 0.8011 | 326.3 | 1.648 × 10$^{-5}$ | 0.0038 × 10$^{-4}$ |
| 2100 | 2100 | 281.14 | 7.99 | 7.18 | 7.969 | 0.9308 | 9.828 | 0.7911 | 325.6 | 1.641 | 0.0037 |
| 2200 | 2200 | 280.81 | 7.66 | 7.51 | 7.868 | 0.9275 | 9.717 | 0.7811 | 324.9 | 1.633 | 0.0036 |
| 2300 | 2300 | 280.48 | 7.33 | 7.84 | 7.768 | 0.9242 | 9.607 | 0.7711 | 324.2 | 1.626 | 0.0035 |
| 2400 | 2400 | 280.14 | 6.99 | 8.18 | 7.667 | 0.9209 | 9.496 | 0.7611 | 323.5 | 1.619 | 0.0034 |
| 2500 | 2500 | 279.81 | 6.66 | 8.51 | 7.568 | 0.9176 | 9.386 | 0.7511 | 322.8 | 1.611 | 0.0033 |
| 2600 | 2600 | 279.48 | 6.33 | 8.84 | 7.468 | 0.9143 | 9.276 | 0.7411 | 322.1 | 1.604 | 0.0032 |
| 2700 | 2700 | 279.14 | 5.99 | 9.18 | 7.369 | 0.9110 | 9.166 | 0.7311 | 321.4 | 1.597 | 0.0031 |
| 2800 | 2800 | 278.81 | 5.66 | 9.51 | 7.270 | 0.9077 | 9.056 | 0.7211 | 320.7 | 1.589 | 0.0030 |
| 2900 | 2900 | 278.48 | 5.33 | 9.84 | 7.172 | 0.9044 | 8.946 | 0.7111 | 320.0 | 1.582 | 0.0029 |
| 3000 | 3000 | 278.14 | 4.99 | 10.18 | 7.073 × 10$^{2}$ | 0.9011 | 8.836 × 10$^{-1}$ | 0.7011 | 319.3 | 1.575 × 10$^{-5}$ | 0.0028 × 10$^{-4}$ |
| 3100 | 3100 | 277.81 | 4.66 | 10.51 | 6.975 | 0.8978 | 8.727 | 0.6911 | 318.6 | 1.567 | 0.0027 |
| 3200 | 3200 | 277.48 | 4.33 | 10.84 | 6.877 | 0.8945 | 8.617 | 0.6811 | 317.9 | 1.560 | 0.0026 |
| 3300 | 3300 | 277.14 | 3.99 | 11.18 | 6.779 | 0.8912 | 8.508 | 0.6711 | 317.2 | 1.553 | 0.0025 |
| 3400 | 3400 | 276.81 | 3.66 | 11.51 | 6.681 | 0.8879 | 8.398 | 0.6611 | 316.5 | 1.545 | 0.0024 |
| 3500 | 3500 | 276.48 | 3.33 | 11.84 | 6.584 | 0.8846 | 8.289 | 0.6511 | 315.8 | 1.538 | 0.0023 |
| 3600 | 3600 | 276.14 | 2.99 | 12.18 | 6.486 | 0.8813 | 8.180 | 0.6411 | 315.1 | 1.530 | 0.0022 |
| 3700 | 3700 | 275.81 | 2.66 | 12.51 | 6.389 | 0.8780 | 8.071 | 0.6311 | 314.4 | 1.523 | 0.0021 |
| 3800 | 3800 | 275.48 | 2.33 | 12.84 | 6.292 | 0.8747 | 7.962 | 0.6211 | 313.7 | 1.515 | 0.0020 |
| 3900 | 3900 | 275.14 | 1.99 | 13.18 | 6.195 | 0.8714 | 7.853 | 0.6111 | 313.0 | 1.508 | 0.0019 |
| 4000 | 4000 | 274.81 | 1.66 | 13.51 | 6.098 × 10$^{2}$ | 0.8681 | 7.744 × 10$^{-1}$ | 0.6011 | 312.3 | 1.500 × 10$^{-5}$ | 0.0018 × 10$^{-4}$ |
| 4100 | 4100 | 274.48 | 1.33 | 13.84 | 6.002 | 0.8648 | 7.636 | 0.5911 | 311.6 | 1.493 | 0.0017 |
| 4200 | 4200 | 274.14 | 0.99 | 14.18 | 5.905 | 0.8615 | 7.527 | 0.5811 | 310.9 | 1.485 | 0.0016 |
| 4300 | 4300 | 273.81 | 0.66 | 14.51 | 5.809 | 0.8582 | 7.419 | 0.5711 | 310.2 | 1.478 | 0.0015 |
| 4400 | 4400 | 273.48 | 0.33 | 14.84 | 5.714 | 0.8549 | 7.311 | 0.5611 | 309.5 | 1.470 | 0.0014 |
| 4500 | 4500 | 273.14 | -0.01 | 15.18 | 5.618 | 0.8516 | 7.203 | 0.5511 | 308.8 | 1.463 | 0.0013 |
| 4600 | 4600 | 272.81 | -0.34 | 15.51 | 5.523 | 0.8483 | 7.095 | 0.5411 | 308.1 | 1.455 | 0.0012 |
| 4700 | 4700 | 272.48 | -0.67 | 15.84 | 5.428 | 0.8450 | 6.987 | 0.5311 | 307.4 | 1.448 | 0.0011 |
| 4800 | 4800 | 272.14 | -1.01 | 16.18 | 5.333 | 0.8417 | 6.879 | 0.5211 | 306.7 | 1.440 | 0.0010 |
| 4900 | 4900 | 271.81 | -1.34 | 16.51 | 5.238 | 0.8384 | 6.772 | 0.5111 | 306.0 | 1.433 | 0.0009 |
| 5000 | 5000 | 271.48 | -1.67 | 16.84 | 5.143 × 10$^{2}$ | 0.8351 | 6.664 × 10$^{-1}$ | 0.5011 | 305.3 | 1.425 × 10$^{-5}$ | 0.0008 × 10$^{-4}$ |
| 5100 | 5100 | 271.14 | -2.01 | 17.18 | 5.049 | 0.8318 | 6.557 | 0.4911 | 304.6 | 1.418 | 0.0007 |
| 5200 | 5200 | 270.81 | -2.34 | 17.51 | 4.955 | 0.8285 | 6.450 | 0.4811 | 303.9 | 1.410 | 0.0006 |
| 5300 | 5300 | 270.48 | -2.67 | 17.84 | 4.861 | 0.8252 | 6.343 | 0.4711 | 303.2 | 1.403 | 0.0005 |
| 5400 | 5400 | 270.14 | -3.01 | 18.18 | 4.767 | 0.8219 | 6.236 | 0.4611 | 302.5 | 1.395 | 0.0004 |
| 5500 | 5500 | 269.81 | -3.34 | 18.51 | 4.673 | 0.8186 | 6.130 | 0.4511 | 301.8 | 1.388 | 0.0003 |
| 5600 | 5600 | 269.48 | -3.67 | 18.84 | 4.580 | 0.8153 | 6.024 | 0.4411 | 301.1 | 1.380 | 0.0002 |
| 5700 | 5700 | 269.14 | -4.01 | 19.18 | 4.487 | 0.8120 | 5.918 | 0.4311 | 300.4 | 1.373 | 0.0001 |
| 5800 | 5800 | 268.81 | -4.34 | 19.51 | 4.394 | 0.8087 | 5.812 | 0.4211 | 299.7 | 1.365 | 0.0000 |
| 5900 | 5900 | 268.48 | -4.67 | 19.84 | 4.301 | 0.8054 | 5.706 | 0.4111 | 299.0 | 1.358 | 0.0000 |
| 6000 | 6000 | 268.14 | -5.01 | 20.18 | 4.209 × 10$^{2}$ | 0.8021 | 5.601 × 10$^{-1}$ | 0.4011 | 298.3 | 1.350 × 10$^{-5}$ | 0.0000 × 10$^{-4}$ |
| 6100 | 6100 | 267.81 | -5.34 | 20.51 | 4.117 | 0.7988 | 5.495 | 0.3911 | 297.6 | 1.343 | 0.0000 |
| 6200 | 6200 | 267.48 | -5.67 | 20.84 | 4.025 | 0.7955 | 5.390 | 0.3811 | 296.9 | 1.335 | 0.0000 |
| 6300 | 6300 | 267.14 | -6.01 | 21.18 | 3.933 | 0.7922 | 5.285 | 0.3711 | 296.2 | 1.328 | 0.0000 |
| 6400 | 6400 | 266.81 | -6.34 | 21.51 | 3.842 | 0.7889 | 5.180 | 0.3611 | 295.5 | 1.320 | 0.0000 |
| 6500 | 6500 | 266.48 | -6.67 | 21.84 | 3.751 | 0.7856 | 5.076 | 0.3511 | 294.8 | 1.313 | 0.0000 |
| 6600 | 6600 | 266.14 | -7.01 | 22.18 | 3.660 | 0.7823 | 4.971 | 0.3411 | 294.1 | 1.305 | 0.0000 |
| 6700 | 6700 | 265.81 | -7.34 | 22.51 | 3.569 | 0.7790 | 4.867 | 0.3311 | 293.4 | 1.298 | 0.0000 |
| 6800 | 6800 | 265.48 | -7.67 | 22.84 | 3.479 | 0.7757 | 4.763 | 0.3211 | 292.7 | 1.290 | 0.0000 |
| 6900 | 6900 | 265.14 | -8.01 | 23.18 | 3.389 | 0.7724 | 4.659 | 0.3111 | 292.0 | 1.283 | 0.0000 |
| 7000 | 7000 | 264.81 | -8.34 | 23.51 | 3.299 × 10$^{2}$ | 0.7691 | 4.556 × 10$^{-1}$ | 0.3011 | 291.3 | 1.275 × 10$^{-5}$ | 0.0000 × 10$^{-4}$ |
| 7100 | 7100 | 264.48 | -8.67 | 23.84 | 3.209 | 0.7658 | 4.452 | 0.2911 | 290.6 | 1.268 | 0.0000 |
| 7200 | 7200 | 264.14 | -9.01 | 24.18 | 3.120 | 0.7625 | 4.349 | 0.2811 | 289.9 | 1.260 | 0.0000 |
| 7300 | 7300 | 263.81 | -9.34 | 24.51 | 3.031 | 0.7592 | 4.246 | 0.2711 | 289.2 | 1.253 | 0.0000 |
| 7400 | 7400 | 263.48 | -9.67 | 24.84 | 2.942 | 0.7559 | 4.144 | 0.2611 | 288.5 | 1.245 | 0.0000 |
| 7500 | 7500 | 263.14 | -10.01 | 25.18 | 2.853 | 0.7526 | 4.041 | 0.2511 | 287.8 | 1.238 | 0.0000 |
| 7600 | 7600 | 262.81 | -10.34 | 25.51 | 2.765 | 0.7493 | 3.939 | 0.2411 | 287.1 | 1.230 | 0.0000 |
| 7700 | 7700 | 262.48 | -10.67 | 25.84 | 2.677 | 0.7460 | 3.837 | 0.2311 | 286.4 | 1.223 | 0.0000 |
| 7800 | 7800 | 262.14 | -11.01 | 26.18 | 2.589 | 0.7427 | 3.735 | 0.2211 | 285.7 | 1.215 | 0.0000 |
| 7900 | 7900 | 261.81 | -11.34 | 26.51 | 2.501 | 0.7394 | 3.633 | 0.2111 | 285.0 | 1.208 | 0.0000 |
| 8000 | 8000 | 261.48 | -11.67 | 26.84 | 2.414 × 10$^{2}$ | 0.7361 | 3.532 × 10$^{-1}$ | 0.2011 | 284.3 | 1.200 × 10$^{-5}$ | 0.0000 × 10$^{-4}$ |
| 8100 | 8100 | 261.14 | -12.01 | 27.18 | 2.327 | 0.7328 | 3.431 | 0.1911 | 283.6 | 1.193 | 0.0000 |
| 8200 | 8200 | 260.81 | -12.34 | 27.51 | 2.240 | 0.7295 | 3.330 | 0.1811 | 282.9 | 1.185 | 0.0000 |
| 8300 | 8300 | 260.48 | -12.67 | 27.84 | 2.154 | 0.7262 | 3.229 | 0.1711 | 282.2 | 1.178 | 0.0000 |
| 8400 | 8400 | 260.14 | -13.01 | 28.18 | 2.068 | 0.7229 | 3.128 | 0.1611 | 281.5 | 1.170 | 0.0000 |
| 8500 | 8500 | 259.81 | -13.34 | 28.51 | 1.982 | 0.7196 | 3.028 | 0.1511 | 280.8 | 1.163 | 0.0000 |
| 8600 | 8600 | 259.48 | -13.67 | 28.84 | 1.897 | 0.7163 | 2.928 | 0.1411 | 280.1 | 1.155 | 0.0000 |
| 8700 | 8700 | 259.14 | -14.01 | 29.18 | 1.812 | 0.7130 | 2.828 | 0.1311 | 279.4 | 1.148 | 0.0000 |
| 8800 | 8800 | 258.81 | -14.34 | 29.51 | 1.727 | 0.7097 | 2.728 | 0.1211 | 278.7 | 1.140 | 0.0000 |
| 8900 | 8900 | 258.48 | -14.67 | 29.84 | 1.642 | 0.7064 | 2.628 | 0.1111 | 278.0 | 1.133 | 0.0000 |
| 9000 | 8999 | 258.14 | -15.01 | 30.18 | 1.558 | 0.7031 | 2.529 | 0.1011 | 277.3 | 1.125 | 0.0000 |
| 9100 | 9099 | 257.81 | -15.34 | 30.51 | 1.474 | 0.6998 | 2.430 | 0.0911 | 276.6 | 1.118 | 0.0000 |
| 9200 | 9199 | 257.48 | -15.67 | 30.84 | 1.390 | 0.6965 | 2.331 | 0.0811 | 275.9 | 1.110 | 0.0000 |
| 9300 | 9299 | 257.14 | -16.01 | 31.18 | 1.306 | 0.6932 | 2.232 | 0.0711 | 275.2 | 1.103 | 0.0000 |
| 9400 | 9399 | 256.81 | -16.34 | 31.51 | 1.223 | 0.6899 | 2.133 | 0.0611 | 274.5 | 1.095 | 0.0000 |
| 9500 | 9499 | 256.48 | -16.67 | 31.84 | 1.140 | 0.6866 | 2.035 | 0.0511 | 273.8 | 1.088 | 0.0000 |
| 9600 | 9599 | 256.14 | -17.01 | 32.18 | 1.057 | 0.6833 | 1.937 | 0.0411 | 273.1 | 1.080 | 0.0000 |
| 9700 | 9699 | 255.81 | -17.34 | 32.51 | 0.975 | 0.6800 | 1.839 | 0.0311 | 272.4 | 1.073 | 0.0000 |
| 9800 | 9799 | 255.48 | -17.67 | 32.84 | 0.893 | 0.6767 | 1.741 | 0.0211 | 271.7 | 1.065 | 0.0000 |
| 9900 | 9899 | 255.14 | -18.01 | 33.18 | 0.811 | 0.6734 | 1.643 | 0.0111 | 271.0 | 1.058 | 0.0000 |
| 10000 | 9999 | 254.81 | -18.34 | 33.51 | 0.730 | 0.6701 | 1.546 | 0.0011 | 270.3 | 1.050 | 0.0000 |

TABLE 5.1 — Continued

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $h$, m | $z$, m | $T$, K | $t$, °C | $T/T_{sl}$ | $p$, mb | $p/p_{sl}$ | $\rho$, kg m$^{-3}$ | $\rho/\rho_{sl}$ | $c$, m s$^{-1}$ | $\mu$, kg m$^{-1}$ s$^{-1}$ | $k$, J m$^{-1}$ s$^{-1}$ K$^{-1}$ |
| 0 | 0.000 | 288.15 | 15.00 | 1.0000 | 1013.25 | 1.0000 | 1.2250 | 1.0000 | 340.29 | $1.7894 \times 10^{-5}$ | $2.5325 \times 10^{-2}$ |
| 1000 | 999.97 | 281.65 | 8.50 | 0.9785 | 898.76 | 0.8870 | 1.1117 | 0.9075 | 336.43 | $1.7579 \times 10^{-5}$ | $2.4884 \times 10^{-2}$ |
| 2000 | 1999.87 | 275.15 | 2.00 | 0.9569 | 794.95 | 0.7846 | 1.0066 | 0.8217 | 332.53 | $1.7260 \times 10^{-5}$ | $2.4437 \times 10^{-2}$ |
| 3000 | 2999.69 | 268.65 | -4.50 | 0.9352 | 701.08 | 0.6919 | 0.9093 | 0.7423 | 328.58 | $1.6937 \times 10^{-5}$ | $2.3984 \times 10^{-2}$ |
| 4000 | 3999.43 | 262.15 | -11.00 | 0.9133 | 616.40 | 0.6085 | 0.8194 | 0.6689 | 324.59 | $1.6610 \times 10^{-5}$ | $2.3525 \times 10^{-2}$ |
| 5000 | 4999.08 | 255.65 | -17.50 | 0.8913 | 540.48 | 0.5335 | 0.7364 | 0.6012 | 320.55 | $1.6278 \times 10^{-5}$ | $2.3059 \times 10^{-2}$ |
| 6000 | 5998.64 | 249.15 | -24.00 | 0.8692 | 472.17 | 0.4660 | 0.6601 | 0.5389 | 316.45 | $1.5942 \times 10^{-5}$ | $2.2587 \times 10^{-2}$ |
| 7000 | 6998.12 | 242.65 | -30.50 | 0.8470 | 411.05 | 0.4057 | 0.5900 | 0.4817 | 312.30 | $1.5601 \times 10^{-5}$ | $2.2108 \times 10^{-2}$ |
| 8000 | 7997.50 | 236.15 | -37.00 | 0.8246 | 356.51 | 0.3519 | 0.5258 | 0.4292 | 308.08 | $1.5256 \times 10^{-5}$ | $2.1622 \times 10^{-2}$ |
| 9000 | 8996.79 | 229.65 | -43.50 | 0.8021 | 308.00 | 0.3040 | 0.4671 | 0.3813 | 303.80 | $1.4906 \times 10^{-5}$ | $2.1129 \times 10^{-2}$ |
| 10000 | 9995.99 | 223.15 | -50.00 | 0.7794 | 264.99 | 0.2615 | 0.4135 | 0.3376 | 299.46 | $1.4551 \times 10^{-5}$ | $2.0629 \times 10^{-2}$ |
| 11000 | 10995.09 | 216.65 | -56.50 | 0.7565 | 227.03 | 0.2240 | 0.3648 | 0.2978 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 12000 | 11994.10 | 216.65 | -56.50 | 0.7335 | 194.04 | 0.1915 | 0.3119 | 0.2546 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 13000 | 12993.11 | 216.65 | -56.50 | 0.7104 | 165.84 | 0.1636 | 0.2666 | 0.2176 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 14000 | 13992.12 | 216.65 | -56.50 | 0.6873 | 141.76 | 0.1399 | 0.2279 | 0.1860 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 15000 | 14991.13 | 216.65 | -56.50 | 0.6642 | 121.17 | 0.1195 | 0.1948 | 0.1590 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 16000 | 15990.14 | 216.65 | -56.50 | 0.6411 | 103.57 | 0.1022 | 0.1665 | 0.1359 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 17000 | 16989.15 | 216.65 | -56.50 | 0.6180 | 88.54 | 0.0873 | 0.1423 | 0.1162 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 18000 | 17988.16 | 216.65 | -56.50 | 0.5949 | 75.69 | 0.0747 | 0.1217 | 0.0993 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 19000 | 18987.17 | 216.65 | -56.50 | 0.5718 | 64.71 | 0.0638 | 0.1040 | 0.0849 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 20000 | 19986.18 | 216.65 | -56.50 | 0.5487 | 55.32 | 0.0546 | 0.0889 | 0.0726 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 21000 | 20985.19 | 216.65 | -56.50 | 0.5256 | 47.30 | 0.0466 | 0.0760 | 0.0621 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 22000 | 21984.20 | 216.65 | -56.50 | 0.5025 | 40.45 | 0.0399 | 0.0650 | 0.0531 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 23000 | 22983.21 | 216.65 | -56.50 | 0.4794 | 34.59 | 0.0341 | 0.0555 | 0.0453 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 24000 | 23982.22 | 216.65 | -56.50 | 0.4563 | 29.58 | 0.0292 | 0.0475 | 0.0388 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 25000 | 24981.23 | 216.65 | -56.50 | 0.4332 | 25.30 | 0.0249 | 0.0406 | 0.0332 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 26000 | 25980.24 | 216.65 | -56.50 | 0.4101 | 21.64 | 0.0213 | 0.0348 | 0.0284 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 27000 | 26979.25 | 216.65 | -56.50 | 0.3870 | 18.51 | 0.0182 | 0.0297 | 0.0243 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 28000 | 27978.26 | 216.65 | -56.50 | 0.3639 | 15.83 | 0.0156 | 0.0255 | 0.0208 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 29000 | 28977.27 | 216.65 | -56.50 | 0.3408 | 13.55 | 0.0133 | 0.0218 | 0.0178 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 30000 | 29976.28 | 216.65 | -56.50 | 0.3177 | 11.59 | 0.0114 | 0.0186 | 0.0152 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 31000 | 30975.29 | 216.65 | -56.50 | 0.2946 | 9.92 | 0.0097 | 0.0159 | 0.0130 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 32000 | 31974.30 | 216.65 | -56.50 | 0.2715 | 8.49 | 0.0083 | 0.0136 | 0.0111 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 33000 | 32973.31 | 216.65 | -56.50 | 0.2484 | 7.26 | 0.0071 | 0.0116 | 0.0095 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 34000 | 33972.32 | 216.65 | -56.50 | 0.2253 | 6.21 | 0.0061 | 0.0099 | 0.0081 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 35000 | 34971.33 | 216.65 | -56.50 | 0.2022 | 5.31 | 0.0052 | 0.0085 | 0.0069 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 36000 | 35970.34 | 216.65 | -56.50 | 0.1791 | 4.54 | 0.0044 | 0.0072 | 0.0059 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 37000 | 36969.35 | 216.65 | -56.50 | 0.1560 | 3.89 | 0.0038 | 0.0062 | 0.0050 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 38000 | 37968.36 | 216.65 | -56.50 | 0.1329 | 3.33 | 0.0032 | 0.0053 | 0.0043 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 39000 | 38967.37 | 216.65 | -56.50 | 0.1098 | 2.85 | 0.0028 | 0.0045 | 0.0037 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 40000 | 39966.38 | 216.65 | -56.50 | 0.0867 | 2.44 | 0.0024 | 0.0039 | 0.0032 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 41000 | 40965.39 | 216.65 | -56.50 | 0.0636 | 2.09 | 0.0020 | 0.0033 | 0.0027 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 42000 | 41964.40 | 216.65 | -56.50 | 0.0405 | 1.79 | 0.0017 | 0.0028 | 0.0023 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 43000 | 42963.41 | 216.65 | -56.50 | 0.0174 | 1.53 | 0.0015 | 0.0024 | 0.0020 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 44000 | 43962.42 | 216.65 | -56.50 | 0.0043 | 1.31 | 0.0013 | 0.0020 | 0.0017 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 45000 | 44961.43 | 216.65 | -56.50 | 0.0012 | 1.12 | 0.0011 | 0.0017 | 0.0014 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 46000 | 45960.44 | 216.65 | -56.50 | 0.0001 | 0.96 | 0.0009 | 0.0015 | 0.0012 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 47000 | 46959.45 | 216.65 | -56.50 | 0.0000 | 0.82 | 0.0008 | 0.0012 | 0.0010 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 48000 | 47958.46 | 216.65 | -56.50 | 0.0000 | 0.70 | 0.0007 | 0.0011 | 0.0009 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 49000 | 48957.47 | 216.65 | -56.50 | 0.0000 | 0.60 | 0.0006 | 0.0009 | 0.0007 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |
| 50000 | 49956.48 | 216.65 | -56.50 | 0.0000 | 0.51 | 0.0005 | 0.0008 | 0.0006 | 295.04 | $1.4191 \times 10^{-5}$ | $2.0121 \times 10^{-2}$ |

TABLE 5.1 — Continued

[illegible]

GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, m | H, m | T, K | t, °C | T − T_m | P, mb | P/P_0 | ρ, kg m^-3 | ρ/ρ_0 | C, m sec^-1 | μ, kg m^-1 sec^-1 | k |

TABLE 3.1 – Continued

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, K | $t$, °C | $T - T_{sl}$, K | $P$, mb | $\frac{P}{P_{sl}}$ | $\rho$, kg/m$^3$ | $\frac{\rho}{\rho_{sl}}$ | $a = \sqrt{\gamma RT}$, m/s | $\mu$, kg/m·s | $k$, W/m·K |
| 0 | 0 | 288.15 | 15.00 | 0.00 | 1.0132 × 10$^3$ | 1.0000 | 1.2250 | 1.0000 | 340.3 | 1.789 × 10$^{-5}$ | 2.533 × 10$^{-2}$ |
| 250 | 250 | 286.91 | 13.76 | −1.24 | 9.823 × 10$^2$ | 0.9695 | 1.1946 | 0.9752 | 339.4 | 1.784 | 2.524 |
| 500 | 500 | 285.65 | 12.50 | −2.50 | 9.546 | 0.9421 | 1.1673 | 0.9528 | 338.4 | 1.779 | 2.515 |
| 750 | 750 | 284.40 | 11.25 | −3.75 | 9.273 | 0.9151 | 1.1417 | 0.9319 | 337.4 | 1.774 | 2.506 |
| 1000 | 1000 | 283.15 | 10.00 | −5.00 | 9.012 | 0.8893 | 1.1167 | 0.9116 | 336.4 | 1.768 | 2.497 |
| 1250 | 1250 | 281.90 | 8.75 | −6.25 | 8.754 | 0.8639 | 1.0922 | 0.8916 | 335.4 | 1.763 | 2.488 |
| 1500 | 1499 | 280.65 | 7.50 | −7.50 | 8.502 | 0.8390 | 1.0683 | 0.8721 | 334.4 | 1.758 | 2.479 |
| 1750 | 1749 | 279.40 | 6.25 | −8.75 | 8.255 | 0.8147 | 1.0449 | 0.8531 | 333.4 | 1.753 | 2.470 |
| 2000 | 1999 | 278.15 | 5.00 | −10.00 | 8.013 | 0.7908 | 1.0220 | 0.8344 | 332.4 | 1.748 | 2.461 |
| 2250 | 2249 | 276.91 | 3.76 | −11.24 | 7.776 | 0.7674 | 0.9996 | 0.8162 | 331.4 | 1.743 | 2.452 |
| 2500 | 2499 | 275.65 | 2.50 | −12.50 | 7.544 | 0.7445 | 0.9777 | 0.7983 | 330.4 | 1.738 | 2.443 |
| 2750 | 2749 | 274.40 | 1.25 | −13.75 | 7.316 | 0.7221 | 0.9562 | 0.7808 | 329.4 | 1.733 | 2.434 |
| 3000 | 2998 | 273.15 | 0.00 | −15.00 | 7.094 | 0.7001 | 0.9352 | 0.7637 | 328.4 | 1.728 | 2.425 |
| 3250 | 3248 | 271.90 | −1.25 | −16.25 | 6.876 | 0.6786 | 0.9146 | 0.7469 | 327.4 | 1.723 | 2.416 |
| 3500 | 3498 | 270.65 | −2.50 | −17.50 | 6.663 | 0.6576 | 0.8945 | 0.7305 | 326.4 | 1.718 | 2.407 |
| 3750 | 3748 | 269.40 | −3.75 | −18.75 | 6.454 | 0.6370 | 0.8748 | 0.7144 | 325.4 | 1.713 | 2.398 |
| 4000 | 3997 | 268.15 | −5.00 | −20.00 | 6.250 | 0.6169 | 0.8556 | 0.6987 | 324.4 | 1.708 | 2.389 |
| 4250 | 4247 | 266.90 | −6.25 | −21.25 | 6.049 | 0.5971 | 0.8368 | 0.6833 | 323.4 | 1.703 | 2.380 |
| 4500 | 4496 | 265.65 | −7.50 | −22.50 | 5.853 | 0.5778 | 0.8185 | 0.6683 | 322.4 | 1.698 | 2.371 |
| 4750 | 4746 | 264.40 | −8.75 | −23.75 | 5.661 | 0.5588 | 0.8006 | 0.6536 | 321.4 | 1.693 | 2.362 |
| 5000 | 4995 | 263.15 | −10.00 | −25.00 | 5.474 | 0.5403 | 0.7831 | 0.6393 | 320.4 | 1.688 | 2.353 |
| 5250 | 5245 | 261.90 | −11.25 | −26.25 | 5.290 | 0.5221 | 0.7661 | 0.6253 | 319.4 | 1.683 | 2.344 |
| 5500 | 5494 | 260.65 | −12.50 | −27.50 | 5.111 | 0.5044 | 0.7495 | 0.6117 | 318.4 | 1.678 | 2.335 |
| 5750 | 5743 | 259.40 | −13.75 | −28.75 | 4.936 | 0.4870 | 0.7333 | 0.5984 | 317.4 | 1.673 | 2.326 |
| 6000 | 5992 | 258.15 | −15.00 | −30.00 | 4.765 | 0.4701 | 0.7175 | 0.5854 | 316.4 | 1.668 | 2.317 |
| 6250 | 6241 | 256.90 | −16.25 | −31.25 | 4.598 | 0.4536 | 0.7021 | 0.5728 | 315.4 | 1.663 | 2.308 |
| 6500 | 6490 | 255.65 | −17.50 | −32.50 | 4.435 | 0.4375 | 0.6870 | 0.5605 | 314.4 | 1.658 | 2.299 |
| 6750 | 6738 | 254.40 | −18.75 | −33.75 | 4.276 | 0.4218 | 0.6724 | 0.5485 | 313.4 | 1.653 | 2.290 |
| 7000 | 6987 | 253.15 | −20.00 | −35.00 | 4.121 | 0.4065 | 0.6581 | 0.5369 | 312.4 | 1.648 | 2.281 |
| 7250 | 7235 | 251.90 | −21.25 | −36.25 | 3.971 | 0.3916 | 0.6442 | 0.5256 | 311.4 | 1.643 | 2.272 |
| 7500 | 7484 | 250.65 | −22.50 | −37.50 | 3.824 | 0.3771 | 0.6307 | 0.5146 | 310.4 | 1.638 | 2.263 |
| 7750 | 7732 | 249.40 | −23.75 | −38.75 | 3.681 | 0.3630 | 0.6176 | 0.5039 | 309.4 | 1.633 | 2.254 |
| 8000 | 7981 | 248.15 | −25.00 | −40.00 | 3.542 | 0.3493 | 0.6048 | 0.4935 | 308.4 | 1.628 | 2.245 |
| 8250 | 8229 | 246.90 | −26.25 | −41.25 | 3.407 | 0.3360 | 0.5923 | 0.4833 | 307.4 | 1.623 | 2.236 |
| 8500 | 8478 | 245.65 | −27.50 | −42.50 | 3.275 | 0.3230 | 0.5802 | 0.4735 | 306.4 | 1.618 | 2.227 |
| 8750 | 8726 | 244.40 | −28.75 | −43.75 | 3.147 | 0.3104 | 0.5684 | 0.4639 | 305.4 | 1.613 | 2.218 |
| 9000 | 8975 | 243.15 | −30.00 | −45.00 | 3.023 | 0.2982 | 0.5569 | 0.4546 | 304.4 | 1.608 | 2.209 |
| 9250 | 9223 | 241.90 | −31.25 | −46.25 | 2.903 | 0.2863 | 0.5457 | 0.4455 | 303.4 | 1.603 | 2.200 |
| 9500 | 9472 | 240.65 | −32.50 | −47.50 | 2.787 | 0.2748 | 0.5348 | 0.4367 | 302.4 | 1.598 | 2.191 |
| 9750 | 9720 | 239.40 | −33.75 | −48.75 | 2.674 | 0.2637 | 0.5242 | 0.4281 | 301.4 | 1.593 | 2.182 |
| 10000 | 9969 | 238.15 | −35.00 | −50.00 | 2.565 | 0.2529 | 0.5139 | 0.4197 | 300.4 | 1.588 | 2.173 |
| 10250 | 10217 | 236.90 | −36.25 | −51.25 | 2.460 | 0.2425 | 0.5038 | 0.4115 | 299.4 | 1.583 | 2.164 |
| 10500 | 10465 | 235.65 | −37.50 | −52.50 | 2.358 | 0.2325 | 0.4940 | 0.4035 | 298.4 | 1.578 | 2.155 |
| 10750 | 10713 | 234.40 | −38.75 | −53.75 | 2.260 | 0.2228 | 0.4845 | 0.3957 | 297.4 | 1.573 | 2.146 |
| 11000 | 10961 | 233.15 | −40.00 | −55.00 | 2.166 | 0.2135 | 0.4752 | 0.3881 | 296.4 | 1.568 | 2.137 |
| 11250 | 11209 | 231.90 | −41.25 | −56.25 | 2.075 | 0.2046 | 0.4662 | 0.3807 | 295.4 | 1.563 | 2.128 |
| 11500 | 11457 | 230.65 | −42.50 | −57.50 | 1.988 | 0.1960 | 0.4575 | 0.3736 | 294.4 | 1.558 | 2.119 |
| 11750 | 11705 | 229.40 | −43.75 | −58.75 | 1.904 | 0.1877 | 0.4490 | 0.3667 | 293.4 | 1.553 | 2.110 |
| 12000 | 11952 | 228.15 | −45.00 | −60.00 | 1.824 | 0.1798 | 0.4407 | 0.3599 | 292.4 | 1.548 | 2.101 |
| 12250 | 12200 | 226.90 | −46.25 | −61.25 | 1.747 | 0.1722 | 0.4327 | 0.3534 | 291.4 | 1.543 | 2.092 |
| 12500 | 12447 | 225.65 | −47.50 | −62.50 | 1.673 | 0.1649 | 0.4249 | 0.3470 | 290.4 | 1.538 | 2.083 |
| 12750 | 12694 | 224.40 | −48.75 | −63.75 | 1.602 | 0.1579 | 0.4173 | 0.3408 | 289.4 | 1.533 | 2.074 |
| 13000 | 12941 | 223.15 | −50.00 | −65.00 | 1.534 | 0.1512 | 0.4099 | 0.3348 | 288.4 | 1.528 | 2.065 |
| 13250 | 13188 | 221.90 | −51.25 | −66.25 | 1.469 | 0.1448 | 0.4027 | 0.3289 | 287.4 | 1.523 | 2.056 |
| 13500 | 13435 | 220.65 | −52.50 | −67.50 | 1.407 | 0.1387 | 0.3957 | 0.3232 | 286.4 | 1.518 | 2.047 |
| 13750 | 13682 | 219.40 | −53.75 | −68.75 | 1.347 | 0.1328 | 0.3889 | 0.3176 | 285.4 | 1.513 | 2.038 |
| 14000 | 13929 | 218.15 | −55.00 | −70.00 | 1.290 | 0.1272 | 0.3823 | 0.3122 | 284.4 | 1.508 | 2.029 |
| 14250 | 14176 | 216.90 | −56.25 | −71.25 | 1.235 | 0.1218 | 0.3758 | 0.3069 | 283.4 | 1.503 | 2.020 |
| 14500 | 14423 | 215.65 | −57.50 | −72.50 | 1.183 | 0.1166 | 0.3695 | 0.3017 | 282.4 | 1.498 | 2.011 |
| 14750 | 14670 | 214.40 | −58.75 | −73.75 | 1.132 | 0.1116 | 0.3634 | 0.2967 | 281.4 | 1.493 | 2.002 |
| 15000 | 14917 | 213.15 | −60.00 | −75.00 | 1.084 | 0.1068 | 0.3574 | 0.2918 | 280.4 | 1.488 | 1.993 |
| 15250 | 15164 | 211.90 | −61.25 | −76.25 | 1.037 | 0.1022 | 0.3515 | 0.2870 | 279.4 | 1.483 | 1.984 |
| 15500 | 15411 | 210.65 | −62.50 | −77.50 | 9.926 × 10$^1$ | 0.0978 | 0.3458 | 0.2824 | 278.4 | 1.478 | 1.975 |
| 15750 | 15658 | 209.40 | −63.75 | −78.75 | 9.498 | 0.0936 | 0.3402 | 0.2778 | 277.4 | 1.473 | 1.966 |
| 16000 | 15905 | 208.15 | −65.00 | −80.00 | 9.087 | 0.0895 | 0.3347 | 0.2734 | 276.4 | 1.468 | 1.957 |
| 16250 | 16152 | 206.90 | −66.25 | −81.25 | 8.693 | 0.0856 | 0.3293 | 0.2691 | 275.4 | 1.463 | 1.948 |
| 16500 | 16399 | 205.65 | −67.50 | −82.50 | 8.315 | 0.0819 | 0.3241 | 0.2648 | 274.4 | 1.458 | 1.939 |
| 16750 | 16646 | 204.40 | −68.75 | −83.75 | 7.953 | 0.0783 | 0.3189 | 0.2606 | 273.4 | 1.453 | 1.930 |
| 17000 | 16893 | 203.15 | −70.00 | −85.00 | 7.607 | 0.0749 | 0.3139 | 0.2565 | 272.4 | 1.448 | 1.921 |
| 17250 | 17140 | 201.90 | −71.25 | −86.25 | 7.275 | 0.0717 | 0.3089 | 0.2524 | 271.4 | 1.443 | 1.912 |
| 17500 | 17387 | 200.65 | −72.50 | −87.50 | 6.958 | 0.0685 | 0.3040 | 0.2484 | 270.4 | 1.438 | 1.903 |
| 17750 | 17634 | 199.40 | −73.75 | −88.75 | 6.655 | 0.0655 | 0.2992 | 0.2445 | 269.4 | 1.433 | 1.894 |
| 18000 | 17881 | 198.15 | −75.00 | −90.00 | 6.365 | 0.0627 | 0.2944 | 0.2406 | 268.4 | 1.428 | 1.885 |
| 18250 | 18128 | 196.90 | −76.25 | −91.25 | 6.089 | 0.0599 | 0.2898 | 0.2368 | 267.4 | 1.423 | 1.876 |
| 18500 | 18375 | 195.65 | −77.50 | −92.50 | 5.825 | 0.0573 | 0.2852 | 0.2330 | 266.4 | 1.418 | 1.867 |
| 18750 | 18622 | 194.40 | −78.75 | −93.75 | 5.573 | 0.0548 | 0.2807 | 0.2293 | 265.4 | 1.413 | 1.858 |
| 19000 | 18869 | 193.15 | −80.00 | −95.00 | 5.333 | 0.0525 | 0.2763 | 0.2257 | 264.4 | 1.408 | 1.849 |
| 19250 | 19116 | 191.90 | −81.25 | −96.25 | 5.104 | 0.0502 | 0.2720 | 0.2221 | 263.4 | 1.403 | 1.840 |
| 19500 | 19363 | 190.65 | −82.50 | −97.50 | 4.885 | 0.0481 | 0.2677 | 0.2186 | 262.4 | 1.398 | 1.831 |
| 19750 | 19610 | 189.40 | −83.75 | −98.75 | 4.676 | 0.0460 | 0.2635 | 0.2152 | 261.4 | 1.393 | 1.822 |
| 20000 | 19857 | 188.15 | −85.00 | −100.00 | 4.477 | 0.0441 | 0.2594 | 0.2118 | 260.4 | 1.388 | 1.813 |
| 20250 | 20104 | 186.90 | −86.25 | −101.25 | 4.287 | 0.0422 | 0.2553 | 0.2085 | 259.4 | 1.383 | 1.804 |
| 20500 | 20351 | 185.65 | −87.50 | −102.50 | 4.105 | 0.0404 | 0.2513 | 0.2053 | 258.4 | 1.378 | 1.795 |
| 20750 | 20598 | 184.40 | −88.75 | −103.75 | 3.932 | 0.0387 | 0.2473 | 0.2021 | 257.4 | 1.373 | 1.786 |
| 21000 | 20845 | 183.15 | −90.00 | −105.00 | 3.767 | 0.0371 | 0.2434 | 0.1989 | 256.4 | 1.368 | 1.777 |
| 21250 | 21092 | 181.90 | −91.25 | −106.25 | 3.609 | 0.0355 | 0.2395 | 0.1957 | 255.4 | 1.363 | 1.768 |
| 21500 | 21339 | 180.65 | −92.50 | −107.50 | 3.458 | 0.0340 | 0.2357 | 0.1926 | 254.4 | 1.358 | 1.759 |
| 21750 | 21586 | 179.40 | −93.75 | −108.75 | 3.314 | 0.0326 | 0.2319 | 0.1895 | 253.4 | 1.353 | 1.750 |
| 22000 | 21833 | 178.15 | −95.00 | −110.00 | 3.176 | 0.0312 | 0.2282 | 0.1865 | 252.4 | 1.348 | 1.741 |
| 22250 | 22080 | 176.90 | −96.25 | −111.25 | 3.044 | 0.0299 | 0.2245 | 0.1835 | 251.4 | 1.343 | 1.732 |
| 22500 | 22327 | 175.65 | −97.50 | −112.50 | 2.918 | 0.0287 | 0.2209 | 0.1805 | 250.4 | 1.338 | 1.723 |
| 22750 | 22574 | 174.40 | −98.75 | −113.75 | 2.798 | 0.0275 | 0.2173 | 0.1776 | 249.4 | 1.333 | 1.714 |
| 23000 | 22821 | 173.15 | −100.00 | −115.00 | 2.683 | 0.0264 | 0.2138 | 0.1747 | 248.4 | 1.328 | 1.705 |
| 23250 | 23068 | 171.90 | −101.25 | −116.25 | 2.572 | 0.0253 | 0.2103 | 0.1718 | 247.4 | 1.323 | 1.696 |
| 23500 | 23315 | 170.65 | −102.50 | −117.50 | 2.467 | 0.0243 | 0.2069 | 0.1690 | 246.4 | 1.318 | 1.687 |
| 23750 | 23562 | 169.40 | −103.75 | −118.75 | 2.366 | 0.0233 | 0.2035 | 0.1662 | 245.4 | 1.313 | 1.678 |
| 24000 | 23809 | 168.15 | −105.00 | −120.00 | 2.269 | 0.0223 | 0.2001 | 0.1635 | 244.4 | 1.308 | 1.669 |
| 24250 | 24056 | 166.90 | −106.25 | −121.25 | 2.177 | 0.0214 | 0.1968 | 0.1608 | 243.4 | 1.303 | 1.660 |
| 24500 | 24303 | 165.65 | −107.50 | −122.50 | 2.089 | 0.0206 | 0.1936 | 0.1581 | 242.4 | 1.298 | 1.651 |
| 24750 | 24550 | 164.40 | −108.75 | −123.75 | 2.004 | 0.0197 | 0.1904 | 0.1555 | 241.4 | 1.293 | 1.642 |
| 25000 | 24797 | 163.15 | −110.00 | −125.00 | 1.924 | 0.0189 | 0.1872 | 0.1529 | 240.4 | 1.288 | 1.633 |

TABLE I—Continued
30° N. January
GEOMETRIC ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, m | H, m | T, K | t, °C | $T - T_M$ | P, mb | $P/P_0$ | ρ, kg m⁻³ | $\rho/\rho_0$ | $C_s$, m sec⁻¹ | μ, kg m⁻¹ sec⁻¹ | k |
| 0 | 0 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.1 – Continued
25° N Standard Atmosphere

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $h$, m | $z$, m | $T$, K | $t$, °C | $T - T_{std}$, K | $p$, mb | $p/p_0$ | $\rho$, kg/m³ | $\rho/\rho_0$ | $a$, m/s | $\mu$, kg/(m·s) | $k$, W/(m·K) |
| 0 | 0 | 299.84 | +26.69 | +0.69 | 1.0130 × 10³ | 1.0000 | 1.1767 × 0 | 1.0000 | 346.5 | 1.8494 × 5 | 2.6241 × 2 |
| 250 | 250 | 298.09 | +24.94 | +0.69 | 9.796 × 2 | 0.9668 | 1.1441 | 0.9723 | 345.6 | 1.8459 | 2.6224 |
| 500 | 499 | 296.32 | +23.17 | +0.68 | 9.588 | 0.9463 | 1.1117 | 0.9447 | 344.7 | 1.8423 | 2.6207 |
| 750 | 749 | 294.56 | +21.41 | +0.68 | 9.385 | 0.9262 | 1.0797 | 0.9175 | 343.8 | 1.8387 | 2.6189 |
| 1000 | 999 | 292.79 | +19.64 | +0.67 | 9.184 | 0.9064 | 1.0481 | 0.8907 | 342.9 | 1.8351 | 2.6172 |
| 1250 | 1249 | 291.02 | +17.87 | +0.66 | 8.988 | 0.8871 | 1.0170 | 0.8643 | 342.0 | 1.8314 | 2.6154 |
| 1500 | 1499 | 289.25 | +16.10 | +0.65 | 8.796 | 0.8681 | 0.9863 | 0.8382 | 341.1 | 1.8278 | 2.6136 |
| 1750 | 1749 | 287.47 | +14.32 | +0.64 | 8.607 | 0.8495 | 0.9560 | 0.8125 | 340.2 | 1.8241 | 2.6118 |
| 2000 | 1999 | 285.69 | +12.54 | +0.63 | 8.422 | 0.8312 | 0.9262 | 0.7871 | 339.3 | 1.8204 | 2.6100 |
| 2250 | 2249 | 283.91 | +10.76 | +0.61 | 8.241 | 0.8133 | 0.8968 | 0.7621 | 338.4 | 1.8167 | 2.6082 |
| 2500 | 2499 | 282.12 | +8.97 | +0.60 | 8.063 | 0.7957 | 0.8679 | 0.7375 | 337.5 | 1.8130 | 2.6063 |
| 2750 | 2749 | 280.33 | +7.18 | +0.59 | 7.889 | 0.7785 | 0.8394 | 0.7133 | 336.6 | 1.8093 | 2.6045 |
| 3000 | 2998 | 278.54 | +5.39 | +0.58 | 7.719 | 0.7617 | 0.8114 | 0.6894 | 335.7 | 1.8056 | 2.6026 |
| 3250 | 3248 | 276.74 | +3.59 | +0.56 | 7.552 | 0.7452 | 0.7838 | 0.6659 | 334.8 | 1.8018 | 2.6008 |
| 3500 | 3498 | 274.94 | +1.79 | +0.55 | 7.389 | 0.7291 | 0.7567 | 0.6428 | 333.9 | 1.7981 | 2.5989 |
| 3750 | 3748 | 273.14 | +0.00 | +0.54 | 7.230 | 0.7134 | 0.7300 | 0.6201 | 333.0 | 1.7943 | 2.5970 |
| 4000 | 3997 | 271.33 | −1.81 | +0.53 | 7.074 | 0.6980 | 0.7038 | 0.5978 | 332.1 | 1.7905 | 2.5951 |
| 4250 | 4247 | 269.52 | −3.62 | +0.51 | 6.922 | 0.6829 | 0.6781 | 0.5759 | 331.2 | 1.7867 | 2.5932 |
| 4500 | 4497 | 267.71 | −5.44 | +0.50 | 6.773 | 0.6682 | 0.6528 | 0.5544 | 330.2 | 1.7829 | 2.5913 |
| 4750 | 4747 | 265.90 | −7.25 | +0.49 | 6.628 | 0.6538 | 0.6279 | 0.5333 | 329.3 | 1.7790 | 2.5894 |
| 5000 | 4996 | 264.08 | −9.07 | +0.48 | 6.486 | 0.6398 | 0.6035 | 0.5126 | 328.4 | 1.7752 | 2.5874 |
| 5250 | 5246 | 262.26 | −10.89 | +0.46 | 6.347 | 0.6261 | 0.5795 | 0.4923 | 327.5 | 1.7713 | 2.5855 |
| 5500 | 5496 | 260.44 | −12.71 | +0.45 | 6.211 | 0.6127 | 0.5560 | 0.4724 | 326.5 | 1.7674 | 2.5835 |
| 5750 | 5745 | 258.62 | −14.53 | +0.44 | 6.079 | 0.5996 | 0.5329 | 0.4528 | 325.6 | 1.7635 | 2.5815 |
| 6000 | 5995 | 256.79 | −16.36 | +0.42 | 5.949 | 0.5868 | 0.5103 | 0.4336 | 324.7 | 1.7596 | 2.5795 |
| 6250 | 6245 | 254.96 | −18.19 | +0.41 | 5.822 | 0.5743 | 0.4880 | 0.4147 | 323.7 | 1.7556 | 2.5775 |
| 6500 | 6494 | 253.13 | −20.02 | +0.40 | 5.698 | 0.5621 | 0.4662 | 0.3962 | 322.8 | 1.7516 | 2.5755 |
| 6750 | 6744 | 251.30 | −21.85 | +0.38 | 5.577 | 0.5501 | 0.4448 | 0.3781 | 321.8 | 1.7476 | 2.5734 |
| 7000 | 6993 | 249.46 | −23.69 | +0.37 | 5.458 | 0.5384 | 0.4238 | 0.3602 | 320.9 | 1.7436 | 2.5713 |
| 7250 | 7243 | 247.62 | −25.53 | +0.35 | 5.342 | 0.5270 | 0.4033 | 0.3427 | 319.9 | 1.7395 | 2.5692 |
| 7500 | 7492 | 245.78 | −27.37 | +0.34 | 5.229 | 0.5158 | 0.3832 | 0.3256 | 319.0 | 1.7354 | 2.5671 |
| 7750 | 7742 | 243.94 | −29.21 | +0.32 | 5.118 | 0.5048 | 0.3635 | 0.3088 | 318.0 | 1.7313 | 2.5650 |
| 8000 | 7991 | 242.09 | −31.06 | +0.31 | 5.009 | 0.4941 | 0.3443 | 0.2925 | 317.0 | 1.7272 | 2.5628 |
| 8250 | 8241 | 240.24 | −32.91 | +0.29 | 4.903 | 0.4836 | 0.3255 | 0.2765 | 316.1 | 1.7230 | 2.5606 |
| 8500 | 8490 | 238.39 | −34.76 | +0.28 | 4.799 | 0.4733 | 0.3071 | 0.2609 | 315.1 | 1.7188 | 2.5584 |
| 8750 | 8739 | 236.54 | −36.61 | +0.26 | 4.697 | 0.4633 | 0.2891 | 0.2456 | 314.1 | 1.7146 | 2.5562 |
| 9000 | 8988 | 234.68 | −38.47 | +0.25 | 4.597 | 0.4534 | 0.2715 | 0.2307 | 313.1 | 1.7104 | 2.5540 |
| 9250 | 9237 | 232.82 | −40.33 | +0.23 | 4.499 | 0.4437 | 0.2544 | 0.2161 | 312.1 | 1.7062 | 2.5518 |
| 9500 | 9486 | 230.96 | −42.19 | +0.21 | 4.403 | 0.4342 | 0.2376 | 0.2018 | 311.1 | 1.7019 | 2.5495 |
| 9750 | 9735 | 229.10 | −44.05 | +0.20 | 4.309 | 0.4249 | 0.2213 | 0.1880 | 310.1 | 1.6976 | 2.5472 |
| 10000 | 9984 | 227.23 | −45.92 | +0.18 | 4.217 | 0.4158 | 0.2053 | 0.1744 | 309.1 | 1.6933 | 2.5449 |
| 10250 | 10233 | 225.36 | −47.79 | +0.16 | 4.127 | 0.4069 | 0.1898 | 0.1613 | 308.1 | 1.6890 | 2.5426 |
| 10500 | 10482 | 223.48 | −49.67 | +0.14 | 4.038 | 0.3981 | 0.1746 | 0.1484 | 307.1 | 1.6847 | 2.5403 |
| 10750 | 10731 | 221.60 | −51.55 | +0.12 | 3.951 | 0.3895 | 0.1599 | 0.1359 | 306.1 | 1.6804 | 2.5380 |
| 11000 | 10980 | 219.72 | −53.43 | +0.10 | 3.866 | 0.3811 | 0.1455 | 0.1236 | 305.1 | 1.6760 | 2.5356 |
| 11250 | 11229 | 217.84 | −55.31 | +0.08 | 3.782 | 0.3728 | 0.1316 | 0.1118 | 304.1 | 1.6717 | 2.5333 |
| 11500 | 11478 | 215.95 | −57.20 | +0.06 | 3.700 | 0.3647 | 0.1180 | 0.1003 | 303.1 | 1.6673 | 2.5309 |
| 11750 | 11727 | 214.06 | −59.09 | +0.04 | 3.620 | 0.3568 | 0.1049 | 0.0891 | 302.1 | 1.6629 | 2.5285 |
| 12000 | 11976 | 212.17 | −60.98 | +0.02 | 3.541 | 0.3490 | 0.0921 | 0.0783 | 301.1 | 1.6585 | 2.5261 |
| 12250 | 12225 | 210.27 | −62.88 | +0.00 | 3.463 | 0.3413 | 0.0797 | 0.0677 | 300.1 | 1.6541 | 2.5237 |
| 12500 | 12474 | 208.37 | −64.78 | −0.02 | 3.387 | 0.3338 | 0.0677 | 0.0575 | 299.1 | 1.6497 | 2.5213 |
| 12750 | 12723 | 206.47 | −66.68 | −0.04 | 3.312 | 0.3264 | 0.0561 | 0.0476 | 298.1 | 1.6453 | 2.5188 |
| 13000 | 12972 | 204.57 | −68.58 | −0.06 | 3.239 | 0.3192 | 0.0448 | 0.0381 | 297.1 | 1.6408 | 2.5164 |
| 13250 | 13221 | 202.66 | −70.49 | −0.08 | 3.167 | 0.3121 | 0.0339 | 0.0288 | 296.1 | 1.6364 | 2.5139 |
| 13500 | 13470 | 200.75 | −72.40 | −0.10 | 3.096 | 0.3051 | 0.0234 | 0.0199 | 295.1 | 1.6319 | 2.5114 |
| 13750 | 13719 | 198.84 | −74.31 | −0.12 | 3.027 | 0.2983 | 0.0133 | 0.0113 | 294.1 | 1.6274 | 2.5089 |
| 14000 | 13968 | 196.93 | −76.22 | −0.14 | 2.959 | 0.2916 | 0.0035 | 0.0030 | 293.1 | 1.6229 | 2.5064 |
| 14250 | 14217 | 195.01 | −78.14 | −0.16 | 2.892 | 0.2850 | −0.0059 | −0.0050 | 292.1 | 1.6184 | 2.5039 |
| 14500 | 14466 | 193.09 | −80.06 | −0.18 | 2.827 | 0.2786 | −0.0151 | −0.0128 | 291.1 | 1.6139 | 2.5013 |
| 14750 | 14715 | 191.17 | −81.98 | −0.20 | 2.763 | 0.2723 | −0.0241 | −0.0204 | 290.1 | 1.6093 | 2.4988 |
| 15000 | 14964 | 189.25 | −83.90 | −0.22 | 2.700 | 0.2661 | −0.0329 | −0.0278 | 289.1 | 1.6048 | 2.4962 |
| 15250 | 15213 | 187.33 | −85.82 | −0.24 | 2.639 | 0.2600 | −0.0415 | −0.0350 | 288.1 | 1.6002 | 2.4936 |
| 15500 | 15462 | 185.40 | −87.75 | −0.26 | 2.579 | 0.2541 | −0.0499 | −0.0420 | 287.1 | 1.5956 | 2.4910 |
| 15750 | 15711 | 183.48 | −89.67 | −0.28 | 2.520 | 0.2483 | −0.0581 | −0.0488 | 286.1 | 1.5910 | 2.4884 |
| 16000 | 15960 | 181.55 | −91.60 | −0.30 | 2.462 | 0.2426 | −0.0662 | −0.0555 | 285.1 | 1.5864 | 2.4858 |
| 16250 | 16209 | 179.62 | −93.53 | −0.32 | 2.406 | 0.2370 | −0.0741 | −0.0620 | 284.1 | 1.5818 | 2.4832 |
| 16500 | 16458 | 177.69 | −95.46 | −0.34 | 2.350 | 0.2315 | −0.0818 | −0.0683 | 283.1 | 1.5771 | 2.4805 |
| 16750 | 16707 | 175.76 | −97.39 | −0.36 | 2.296 | 0.2262 | −0.0894 | −0.0745 | 282.1 | 1.5725 | 2.4779 |
| 17000 | 16956 | 173.83 | −99.32 | −0.38 | 2.243 | 0.2209 | −0.0969 | −0.0806 | 281.1 | 1.5678 | 2.4752 |
| 17250 | 17205 | 171.89 | −101.26 | −0.40 | 2.191 | 0.2158 | −0.1042 | −0.0866 | 280.1 | 1.5631 | 2.4725 |
| 17500 | 17454 | 169.96 | −103.19 | −0.42 | 2.140 | 0.2108 | −0.1114 | −0.0926 | 279.1 | 1.5584 | 2.4698 |
| 17750 | 17703 | 168.02 | −105.13 | −0.44 | 2.090 | 0.2059 | −0.1185 | −0.0985 | 278.1 | 1.5537 | 2.4671 |
| 18000 | 17952 | 166.08 | −107.07 | −0.46 | 2.041 | 0.2010 | −0.1255 | −0.1043 | 277.1 | 1.5490 | 2.4644 |
| 18250 | 18201 | 164.14 | −109.01 | −0.48 | 1.993 | 0.1963 | −0.1323 | −0.1100 | 276.1 | 1.5443 | 2.4617 |
| 18500 | 18450 | 162.20 | −110.95 | −0.50 | 1.946 | 0.1917 | −0.1391 | −0.1156 | 275.1 | 1.5396 | 2.4589 |
| 18750 | 18699 | 160.26 | −112.89 | −0.52 | 1.900 | 0.1871 | −0.1457 | −0.1211 | 274.1 | 1.5348 | 2.4562 |
| 19000 | 18948 | 158.32 | −114.83 | −0.54 | 1.855 | 0.1827 | −0.1523 | −0.1266 | 273.1 | 1.5301 | 2.4534 |
| 19250 | 19197 | 156.37 | −116.78 | −0.56 | 1.810 | 0.1783 | −0.1587 | −0.1319 | 272.1 | 1.5253 | 2.4506 |
| 19500 | 19446 | 154.43 | −118.72 | −0.58 | 1.767 | 0.1740 | −0.1651 | −0.1372 | 271.1 | 1.5205 | 2.4478 |
| 19750 | 19695 | 152.48 | −120.67 | −0.60 | 1.724 | 0.1698 | −0.1713 | −0.1424 | 270.1 | 1.5157 | 2.4450 |
| 20000 | 19944 | 150.53 | −122.62 | −0.62 | 1.682 | 0.1657 | −0.1775 | −0.1476 | 269.1 | 1.5109 | 2.4422 |
| 20250 | 20193 | 148.58 | −124.57 | −0.64 | 1.641 | 0.1616 | −0.1836 | −0.1526 | 268.1 | 1.5061 | 2.4393 |
| 20500 | 20442 | 146.63 | −126.52 | −0.66 | 1.601 | 0.1577 | −0.1897 | −0.1576 | 267.1 | 1.5013 | 2.4365 |
| 20750 | 20691 | 144.68 | −128.47 | −0.68 | 1.562 | 0.1538 | −0.1957 | −0.1626 | 266.1 | 1.4964 | 2.4336 |
| 21000 | 20940 | 142.73 | −130.42 | −0.70 | 1.523 | 0.1500 | −0.2016 | −0.1675 | 265.1 | 1.4916 | 2.4307 |
| 21250 | 21189 | 140.77 | −132.38 | −0.72 | 1.485 | 0.1463 | −0.2075 | −0.1724 | 264.1 | 1.4867 | 2.4278 |
| 21500 | 21438 | 138.82 | −134.33 | −0.74 | 1.448 | 0.1426 | −0.2133 | −0.1772 | 263.1 | 1.4818 | 2.4249 |
| 21750 | 21687 | 136.86 | −136.29 | −0.76 | 1.412 | 0.1391 | −0.2190 | −0.1820 | 262.1 | 1.4769 | 2.4220 |
| 22000 | 21936 | 134.90 | −138.25 | −0.78 | 1.377 | 0.1356 | −0.2247 | −0.1867 | 261.1 | 1.4720 | 2.4190 |
| 22250 | 22185 | 132.94 | −140.21 | −0.80 | 1.342 | 0.1322 | −0.2303 | −0.1914 | 260.1 | 1.4671 | 2.4161 |
| 22500 | 22434 | 130.98 | −142.17 | −0.82 | 1.308 | 0.1288 | −0.2359 | −0.1960 | 259.1 | 1.4621 | 2.4131 |
| 22750 | 22683 | 129.02 | −144.13 | −0.84 | 1.274 | 0.1255 | −0.2414 | −0.2006 | 258.1 | 1.4572 | 2.4101 |
| 23000 | 22932 | 127.05 | −146.10 | −0.86 | 1.241 | 0.1223 | −0.2469 | −0.2052 | 257.1 | 1.4522 | 2.4071 |
| 23250 | 23181 | 125.09 | −148.06 | −0.88 | 1.209 | 0.1191 | −0.2523 | −0.2097 | 256.1 | 1.4472 | 2.4041 |
| 23500 | 23430 | 123.12 | −150.03 | −0.90 | 1.178 | 0.1160 | −0.2577 | −0.2142 | 255.1 | 1.4422 | 2.4011 |
| 23750 | 23679 | 121.15 | −152.00 | −0.92 | 1.147 | 0.1130 | −0.2630 | −0.2186 | 254.1 | 1.4372 | 2.3980 |
| 24000 | 23928 | 119.18 | −153.97 | −0.94 | 1.117 | 0.1100 | −0.2683 | −0.2230 | 253.1 | 1.4321 | 2.3950 |
| 24250 | 24177 | 117.21 | −155.94 | −0.96 | 1.087 | 0.1071 | −0.2735 | −0.2274 | 252.1 | 1.4271 | 2.3919 |
| 24500 | 24426 | 115.24 | −157.91 | −0.98 | 1.058 | 0.1042 | −0.2787 | −0.2317 | 251.1 | 1.4220 | 2.3888 |
| 24750 | 24675 | 113.27 | −159.88 | −1.00 | 1.030 | 0.1014 | −0.2838 | −0.2360 | 250.1 | 1.4169 | 2.3857 |
| 25000 | 24924 | 111.30 | −161.85 | −1.02 | 1.002 | 0.0987 | −0.2889 | −0.2402 | 249.1 | 1.4118 | 2.3826 |

[illegible]

| [illegible] | | |

Table 3.1 – Continued

[illegible]

[illegible] METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, K | $t$, °C | $T/T_{SL}$ | $p$, mb | $p/p_{SL}$ | $\rho$, kg m$^{-3}$ | $\rho/\rho_{SL}$ | $a$, m s$^{-1}$ | $\mu$, kg m$^{-1}$ s$^{-1}$ | $k$, W m$^{-1}$ K$^{-1}$ |
| [illegible] | | | | | | | | | | | |
| [illegible] | | | | | | | | | | | |
| [illegible] | | | | | | | | | | |

Table 5.1 – Continued

[illegible]

GEOMETRIC ALTITUDE, METERS UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 57 — Continued

GEOPOTENTIAL ALTITUDE, METRIC UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, m | Z, m | T, °K | t, °C | T − T_m | P, mb | P/P_0 | ρ | ρ/ρ_0 | $C_s$ | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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Table 5.2

Sea level to 390,000 ft

TEMPERATURE, PRESSURE, DENSITY, SOUND SPEED, COEFFICIENT OF VISCOSITY AND THERMAL CONDUCTIVITY

English Units

TABLE 32 [illegible]

GEOPOTENTIAL ALTITUDE ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | [illegible] | P, in Hg | $P/P_{0}$ | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| Geopotential | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$ | $Z$ | $T$ | $t$ | $T-T_{std}$ | $P$ | $P/P_{sea}$ | $\rho$ | $\rho/\rho_{sea}$ | $a$ | $\mu$ | $k$ |
| km | m | K | °C | K | mb | | kg/m³ | | m/s | kg/(m·s) | W/(m·K) |
| 0 | 0 | 300.00 | 26.85 | 21.50 | 1.013 | 1.000 | 1.225 | 1.000 | 347.89 | 1.846 × 10⁻⁵ | 0.0256 |
| 0.050 | 50 | 299.35 | 26.20 | 21.50 | 1.007 | 0.994 | 1.219 | 0.995 | 346.96 | 1.842 × 10⁻⁵ | 0.0255 |
| 0.100 | 100 | 298.70 | 25.55 | 21.50 | 1.001 | 0.988 | 1.213 | 0.990 | 346.03 | 1.838 × 10⁻⁵ | 0.0254 |
| 0.150 | 150 | 298.05 | 24.90 | 21.50 | 0.995 | 0.982 | 1.207 | 0.985 | 345.10 | 1.834 × 10⁻⁵ | 0.0253 |
| 0.200 | 200 | 297.40 | 24.25 | 21.50 | 0.989 | 0.976 | 1.201 | 0.980 | 344.17 | 1.830 × 10⁻⁵ | 0.0252 |
| 0.250 | 250 | 296.75 | 23.60 | 21.50 | 0.983 | 0.970 | 1.195 | 0.975 | 343.24 | 1.826 × 10⁻⁵ | 0.0251 |
| 0.300 | 300 | 296.10 | 22.95 | 21.50 | 0.977 | 0.964 | 1.189 | 0.970 | 342.31 | 1.822 × 10⁻⁵ | 0.0250 |
| 0.350 | 350 | 295.45 | 22.30 | 21.50 | 0.971 | 0.958 | 1.183 | 0.965 | 341.38 | 1.818 × 10⁻⁵ | 0.0249 |
| 0.400 | 400 | 294.80 | 21.65 | 21.50 | 0.965 | 0.952 | 1.177 | 0.960 | 340.45 | 1.814 × 10⁻⁵ | 0.0248 |
| 0.450 | 450 | 294.15 | 21.00 | 21.50 | 0.959 | 0.946 | 1.171 | 0.955 | 339.52 | 1.810 × 10⁻⁵ | 0.0247 |
| 0.500 | 500 | 293.50 | 20.35 | 21.50 | 0.953 | 0.940 | 1.165 | 0.950 | 338.59 | 1.806 × 10⁻⁵ | 0.0246 |
| 0.550 | 550 | 292.85 | 19.70 | 21.50 | 0.947 | 0.934 | 1.159 | 0.945 | 337.66 | 1.802 × 10⁻⁵ | 0.0245 |
| 0.600 | 600 | 292.20 | 19.05 | 21.50 | 0.941 | 0.928 | 1.153 | 0.940 | 336.73 | 1.798 × 10⁻⁵ | 0.0244 |
| 0.650 | 650 | 291.55 | 18.40 | 21.50 | 0.935 | 0.922 | 1.147 | 0.935 | 335.80 | 1.794 × 10⁻⁵ | 0.0243 |
| 0.700 | 700 | 290.90 | 17.75 | 21.50 | 0.929 | 0.916 | 1.141 | 0.930 | 334.87 | 1.790 × 10⁻⁵ | 0.0242 |
| 0.750 | 750 | 290.25 | 17.10 | 21.50 | 0.923 | 0.910 | 1.135 | 0.925 | 333.94 | 1.786 × 10⁻⁵ | 0.0241 |
| 0.800 | 800 | 289.60 | 16.45 | 21.50 | 0.917 | 0.904 | 1.129 | 0.920 | 333.01 | 1.782 × 10⁻⁵ | 0.0240 |
| 0.850 | 850 | 288.95 | 15.80 | 21.50 | 0.911 | 0.898 | 1.123 | 0.915 | 332.08 | 1.778 × 10⁻⁵ | 0.0239 |
| 0.900 | 900 | 288.30 | 15.15 | 21.50 | 0.905 | 0.892 | 1.117 | 0.910 | 331.15 | 1.774 × 10⁻⁵ | 0.0238 |
| 0.950 | 950 | 287.65 | 14.50 | 21.50 | 0.899 | 0.886 | 1.111 | 0.905 | 330.22 | 1.770 × 10⁻⁵ | 0.0237 |
| 1.000 | 1000 | 287.00 | 13.85 | 21.50 | 0.893 | 0.880 | 1.105 | 0.900 | 329.29 | 1.766 × 10⁻⁵ | 0.0236 |
| 1.050 | 1050 | 286.35 | 13.20 | 21.50 | 0.887 | 0.874 | 1.099 | 0.895 | 328.36 | 1.762 × 10⁻⁵ | 0.0235 |
| 1.100 | 1100 | 285.70 | 12.55 | 21.50 | 0.881 | 0.868 | 1.093 | 0.890 | 327.43 | 1.758 × 10⁻⁵ | 0.0234 |
| 1.150 | 1150 | 285.05 | 11.90 | 21.50 | 0.875 | 0.862 | 1.087 | 0.885 | 326.50 | 1.754 × 10⁻⁵ | 0.0233 |
| 1.200 | 1200 | 284.40 | 11.25 | 21.50 | 0.869 | 0.856 | 1.081 | 0.880 | 325.57 | 1.750 × 10⁻⁵ | 0.0232 |
| 1.250 | 1250 | 283.75 | 10.60 | 21.50 | 0.863 | 0.850 | 1.075 | 0.875 | 324.64 | 1.746 × 10⁻⁵ | 0.0231 |
| 1.300 | 1300 | 283.10 | 9.95 | 21.50 | 0.857 | 0.844 | 1.069 | 0.870 | 323.71 | 1.742 × 10⁻⁵ | 0.0230 |
| 1.350 | 1350 | 282.45 | 9.30 | 21.50 | 0.851 | 0.838 | 1.063 | 0.865 | 322.78 | 1.738 × 10⁻⁵ | 0.0229 |
| 1.400 | 1400 | 281.80 | 8.65 | 21.50 | 0.845 | 0.832 | 1.057 | 0.860 | 321.85 | 1.734 × 10⁻⁵ | 0.0228 |
| 1.450 | 1450 | 281.15 | 8.00 | 21.50 | 0.839 | 0.826 | 1.051 | 0.855 | 320.92 | 1.730 × 10⁻⁵ | 0.0227 |
| 1.500 | 1500 | 280.50 | 7.35 | 21.50 | 0.833 | 0.820 | 1.045 | 0.850 | 319.99 | 1.726 × 10⁻⁵ | 0.0226 |
| 1.550 | 1550 | 279.85 | 6.70 | 21.50 | 0.827 | 0.814 | 1.039 | 0.845 | 319.06 | 1.722 × 10⁻⁵ | 0.0225 |
| 1.600 | 1600 | 279.20 | 6.05 | 21.50 | 0.821 | 0.808 | 1.033 | 0.840 | 318.13 | 1.718 × 10⁻⁵ | 0.0224 |
| 1.650 | 1650 | 278.55 | 5.40 | 21.50 | 0.815 | 0.802 | 1.027 | 0.835 | 317.20 | 1.714 × 10⁻⁵ | 0.0223 |
| 1.700 | 1700 | 277.90 | 4.75 | 21.50 | 0.809 | 0.796 | 1.021 | 0.830 | 316.27 | 1.710 × 10⁻⁵ | 0.0222 |
| 1.750 | 1750 | 277.25 | 4.10 | 21.50 | 0.803 | 0.790 | 1.015 | 0.825 | 315.34 | 1.706 × 10⁻⁵ | 0.0221 |
| 1.800 | 1800 | 276.60 | 3.45 | 21.50 | 0.797 | 0.784 | 1.009 | 0.820 | 314.41 | 1.702 × 10⁻⁵ | 0.0220 |
| 1.850 | 1850 | 275.95 | 2.80 | 21.50 | 0.791 | 0.778 | 1.003 | 0.815 | 313.48 | 1.698 × 10⁻⁵ | 0.0219 |
| 1.900 | 1900 | 275.30 | 2.15 | 21.50 | 0.785 | 0.772 | 0.997 | 0.810 | 312.55 | 1.694 × 10⁻⁵ | 0.0218 |
| 1.950 | 1950 | 274.65 | 1.50 | 21.50 | 0.779 | 0.766 | 0.991 | 0.805 | 311.62 | 1.690 × 10⁻⁵ | 0.0217 |
| 2.000 | 2000 | 274.00 | 0.85 | 21.50 | 0.773 | 0.760 | 0.985 | 0.800 | 310.69 | 1.686 × 10⁻⁵ | 0.0216 |
| 2.050 | 2050 | 273.35 | 0.20 | 21.50 | 0.767 | 0.754 | 0.979 | 0.795 | 309.76 | 1.682 × 10⁻⁵ | 0.0215 |
| 2.100 | 2100 | 272.70 | −0.45 | 21.50 | 0.761 | 0.748 | 0.973 | 0.790 | 308.83 | 1.678 × 10⁻⁵ | 0.0214 |
| 2.150 | 2150 | 272.05 | −1.10 | 21.50 | 0.755 | 0.742 | 0.967 | 0.785 | 307.90 | 1.674 × 10⁻⁵ | 0.0213 |
| 2.200 | 2200 | 271.40 | −1.75 | 21.50 | 0.749 | 0.736 | 0.961 | 0.780 | 306.97 | 1.670 × 10⁻⁵ | 0.0212 |
| 2.250 | 2250 | 270.75 | −2.40 | 21.50 | 0.743 | 0.730 | 0.955 | 0.775 | 306.04 | 1.666 × 10⁻⁵ | 0.0211 |
| 2.300 | 2300 | 270.10 | −3.05 | 21.50 | 0.737 | 0.724 | 0.949 | 0.770 | 305.11 | 1.662 × 10⁻⁵ | 0.0210 |
| 2.350 | 2350 | 269.45 | −3.70 | 21.50 | 0.731 | 0.718 | 0.943 | 0.765 | 304.18 | 1.658 × 10⁻⁵ | 0.0209 |
| 2.400 | 2400 | 268.80 | −4.35 | 21.50 | 0.725 | 0.712 | 0.937 | 0.760 | 303.25 | 1.654 × 10⁻⁵ | 0.0208 |
| 2.450 | 2450 | 268.15 | −5.00 | 21.50 | 0.719 | 0.706 | 0.931 | 0.755 | 302.32 | 1.650 × 10⁻⁵ | 0.0207 |
| 2.500 | 2500 | 267.50 | −5.65 | 21.50 | 0.713 | 0.700 | 0.925 | 0.750 | 301.39 | 1.646 × 10⁻⁵ | 0.0206 |
| 2.550 | 2550 | 266.85 | −6.30 | 21.50 | 0.707 | 0.694 | 0.919 | 0.745 | 300.46 | 1.642 × 10⁻⁵ | 0.0205 |
| 2.600 | 2600 | 266.20 | −6.95 | 21.50 | 0.701 | 0.688 | 0.913 | 0.740 | 299.53 | 1.638 × 10⁻⁵ | 0.0204 |
| 2.650 | 2650 | 265.55 | −7.60 | 21.50 | 0.695 | 0.682 | 0.907 | 0.735 | 298.60 | 1.634 × 10⁻⁵ | 0.0203 |
| 2.700 | 2700 | 264.90 | −8.25 | 21.50 | 0.689 | 0.676 | 0.901 | 0.730 | 297.67 | 1.630 × 10⁻⁵ | 0.0202 |
| 2.750 | 2750 | 264.25 | −8.90 | 21.50 | 0.683 | 0.670 | 0.895 | 0.725 | 296.74 | 1.626 × 10⁻⁵ | 0.0201 |
| 2.800 | 2800 | 263.60 | −9.55 | 21.50 | 0.677 | 0.664 | 0.889 | 0.720 | 295.81 | 1.622 × 10⁻⁵ | 0.0200 |
| 2.850 | 2850 | 262.95 | −10.20 | 21.50 | 0.671 | 0.658 | 0.883 | 0.715 | 294.88 | 1.618 × 10⁻⁵ | 0.0199 |
| 2.900 | 2900 | 262.30 | −10.85 | 21.50 | 0.665 | 0.652 | 0.877 | 0.710 | 293.95 | 1.614 × 10⁻⁵ | 0.0198 |
| 2.950 | 2950 | 261.65 | −11.50 | 21.50 | 0.659 | 0.646 | 0.871 | 0.705 | 293.02 | 1.610 × 10⁻⁵ | 0.0197 |
| 3.000 | 3000 | 261.00 | −12.15 | 21.50 | 0.653 | 0.640 | 0.865 | 0.700 | 292.09 | 1.606 × 10⁻⁵ | 0.0196 |
| 3.050 | 3050 | 260.35 | −12.80 | 21.50 | 0.647 | 0.634 | 0.859 | 0.695 | 291.16 | 1.602 × 10⁻⁵ | 0.0195 |
| 3.100 | 3100 | 259.70 | −13.45 | 21.50 | 0.641 | 0.628 | 0.853 | 0.690 | 290.23 | 1.598 × 10⁻⁵ | 0.0194 |
| 3.150 | 3150 | 259.05 | −14.10 | 21.50 | 0.635 | 0.622 | 0.847 | 0.685 | 289.30 | 1.594 × 10⁻⁵ | 0.0193 |
| 3.200 | 3200 | 258.40 | −14.75 | 21.50 | 0.629 | 0.616 | 0.841 | 0.680 | 288.37 | 1.590 × 10⁻⁵ | 0.0192 |
| 3.250 | 3250 | 257.75 | −15.40 | 21.50 | 0.623 | 0.610 | 0.835 | 0.675 | 287.44 | 1.586 × 10⁻⁵ | 0.0191 |
| 3.300 | 3300 | 257.10 | −16.05 | 21.50 | 0.617 | 0.604 | 0.829 | 0.670 | 286.51 | 1.582 × 10⁻⁵ | 0.0190 |
| 3.350 | 3350 | 256.45 | −16.70 | 21.50 | 0.611 | 0.598 | 0.823 | 0.665 | 285.58 | 1.578 × 10⁻⁵ | 0.0189 |
| 3.400 | 3400 | 255.80 | −17.35 | 21.50 | 0.605 | 0.592 | 0.817 | 0.660 | 284.65 | 1.574 × 10⁻⁵ | 0.0188 |
| 3.450 | 3450 | 255.15 | −18.00 | 21.50 | 0.599 | 0.586 | 0.811 | 0.655 | 283.72 | 1.570 × 10⁻⁵ | 0.0187 |
| 3.500 | 3500 | 254.50 | −18.65 | 21.50 | 0.593 | 0.580 | 0.805 | 0.650 | 282.79 | 1.566 × 10⁻⁵ | 0.0186 |
| 3.550 | 3550 | 253.85 | −19.30 | 21.50 | 0.587 | 0.574 | 0.799 | 0.645 | 281.86 | 1.562 × 10⁻⁵ | 0.0185 |
| 3.600 | 3600 | 253.20 | −19.95 | 21.50 | 0.581 | 0.568 | 0.793 | 0.640 | 280.93 | 1.558 × 10⁻⁵ | 0.0184 |
| 3.650 | 3650 | 252.55 | −20.60 | 21.50 | 0.575 | 0.562 | 0.787 | 0.635 | 280.00 | 1.554 × 10⁻⁵ | 0.0183 |
| 3.700 | 3700 | 251.90 | −21.25 | 21.50 | 0.569 | 0.556 | 0.781 | 0.630 | 279.07 | 1.550 × 10⁻⁵ | 0.0182 |
| 3.750 | 3750 | 251.25 | −21.90 | 21.50 | 0.563 | 0.550 | 0.775 | 0.625 | 278.14 | 1.546 × 10⁻⁵ | 0.0181 |
| 3.800 | 3800 | 250.60 | −22.55 | 21.50 | 0.557 | 0.544 | 0.769 | 0.620 | 277.21 | 1.542 × 10⁻⁵ | 0.0180 |
| 3.850 | 3850 | 249.95 | −23.20 | 21.50 | 0.551 | 0.538 | 0.763 | 0.615 | 276.28 | 1.538 × 10⁻⁵ | 0.0179 |
| 3.900 | 3900 | 249.30 | −23.85 | 21.50 | 0.545 | 0.532 | 0.757 | 0.610 | 275.35 | 1.534 × 10⁻⁵ | 0.0178 |
| 3.950 | 3950 | 248.65 | −24.50 | 21.50 | 0.539 | 0.526 | 0.751 | 0.605 | 274.42 | 1.530 × 10⁻⁵ | 0.0177 |
| 4.000 | 4000 | 248.00 | −25.15 | 21.50 | 0.533 | 0.520 | 0.745 | 0.600 | 273.49 | 1.526 × 10⁻⁵ | 0.0176 |

TABLE XX — Continued

35° N Azimuth

GEOPOTENTIAL ALTITUDE VALUES (CONT)

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | t, °F | t, °C | T, °R | P, lb/ft² | P/P₀ | ρ, slug/ft³ | ρ/ρ₀ | a, ft/sec | μ, lb-sec/ft² | k, Btu/ft-sec-°R |
| 0 | 0 | 59.00 | 15.00 | 518.67 | 2.1162 | 1.0000 | 2.3769 E-3 | 1.0000 | 1116.4 | 3.7373 E-7 | 1.2673 E-6 |
| 1000 | 1000 | 55.40 | 13.00 | 515.07 | 2.0360 | 0.9621 | 2.3668 | 0.9957 | 1112.9 | 3.7259 | 1.2634 |
| 2000 | 2000 | 51.81 | 11.01 | 511.48 | 1.9579 | 0.9251 | 2.3567 | 0.9915 | 1109.4 | 3.7145 | 1.2595 |
| 3000 | 3000 | 48.21 | 9.01 | 507.88 | 1.8818 | 0.8892 | 2.3466 | 0.9872 | 1105.9 | 3.7030 | 1.2556 |
| 4000 | 4000 | 44.61 | 7.01 | 504.28 | 1.8078 | 0.8543 | 2.3365 | 0.9830 | 1102.4 | 3.6915 | 1.2517 |
| 5000 | 5000 | 41.02 | 5.01 | 500.69 | 1.7357 | 0.8203 | 2.3264 | 0.9787 | 1098.9 | 3.6800 | 1.2478 |
| 6000 | 6000 | 37.42 | 3.01 | 497.09 | 1.6656 | 0.7872 | 2.3163 | 0.9745 | 1095.4 | 3.6685 | 1.2439 |
| 7000 | 7000 | 33.82 | 1.01 | 493.49 | 1.5974 | 0.7550 | 2.3062 | 0.9702 | 1091.9 | 3.6570 | 1.2400 |
| 8000 | 8000 | 30.23 | -0.99 | 489.90 | 1.5312 | 0.7237 | 2.2961 | 0.9660 | 1088.4 | 3.6455 | 1.2361 |
| 9000 | 9000 | 26.63 | -2.99 | 486.30 | 1.4668 | 0.6933 | 2.2860 | 0.9617 | 1084.9 | 3.6340 | 1.2322 |
| 10000 | 10000 | 23.04 | -4.99 | 482.71 | 1.4043 | 0.6637 | 2.2759 | 0.9574 | 1081.4 | 3.6225 | 1.2283 |
| 11000 | 11000 | 19.44 | -6.99 | 479.11 | 1.3436 | 0.6350 | 2.2658 | 0.9532 | 1077.9 | 3.6110 | 1.2244 |
| 12000 | 12000 | 15.84 | -8.99 | 475.51 | 1.2847 | 0.6072 | 2.2557 | 0.9489 | 1074.4 | 3.5995 | 1.2205 |
| 13000 | 13000 | 12.25 | -10.99 | 471.92 | 1.2276 | 0.5802 | 2.2456 | 0.9447 | 1070.9 | 3.5880 | 1.2166 |
| 14000 | 14000 | 8.65 | -12.99 | 468.32 | 1.1723 | 0.5540 | 2.2355 | 0.9404 | 1067.4 | 3.5765 | 1.2127 |
| 15000 | 15000 | 5.06 | -14.99 | 464.73 | 1.1187 | 0.5287 | 2.2254 | 0.9362 | 1063.9 | 3.5650 | 1.2088 |
| 16000 | 16000 | 1.46 | -16.99 | 461.13 | 1.0668 | 0.5042 | 2.2153 | 0.9319 | 1060.4 | 3.5535 | 1.2049 |
| 17000 | 17000 | -2.14 | -18.99 | 457.53 | 1.0166 | 0.4805 | 2.2052 | 0.9277 | 1056.9 | 3.5420 | 1.2010 |
| 18000 | 18000 | -5.73 | -20.99 | 453.94 | 0.9680 | 0.4575 | 2.1951 | 0.9234 | 1053.4 | 3.5305 | 1.1971 |
| 19000 | 19000 | -9.33 | -22.99 | 450.34 | 0.9210 | 0.4353 | 2.1850 | 0.9192 | 1049.9 | 3.5190 | 1.1932 |
| 20000 | 20000 | -12.93 | -24.99 | 446.75 | 0.8756 | 0.4138 | 2.1749 | 0.9149 | 1046.4 | 3.5075 | 1.1893 |
| 21000 | 21000 | -16.52 | -26.99 | 443.15 | 0.8317 | 0.3931 | 2.1648 | 0.9106 | 1042.9 | 3.4960 | 1.1854 |
| 22000 | 22000 | -20.12 | -28.99 | 439.56 | 0.7893 | 0.3730 | 2.1547 | 0.9064 | 1039.4 | 3.4845 | 1.1815 |
| 23000 | 23000 | -23.72 | -30.99 | 435.96 | 0.7484 | 0.3537 | 2.1446 | 0.9021 | 1035.9 | 3.4730 | 1.1776 |
| 24000 | 24000 | -27.31 | -32.99 | 432.37 | 0.7089 | 0.3350 | 2.1345 | 0.8979 | 1032.4 | 3.4615 | 1.1737 |
| 25000 | 25000 | -30.91 | -34.99 | 428.77 | 0.6708 | 0.3170 | 2.1244 | 0.8936 | 1028.9 | 3.4500 | 1.1698 |
| 26000 | 26000 | -34.51 | -36.99 | 425.18 | 0.6341 | 0.2996 | 2.1143 | 0.8894 | 1025.4 | 3.4385 | 1.1659 |
| 27000 | 27000 | -38.10 | -38.99 | 421.58 | 0.5988 | 0.2829 | 2.1042 | 0.8851 | 1021.9 | 3.4270 | 1.1620 |
| 28000 | 28000 | -41.70 | -40.99 | 417.98 | 0.5647 | 0.2668 | 2.0941 | 0.8809 | 1018.4 | 3.4155 | 1.1581 |
| 29000 | 29000 | -45.30 | -42.99 | 414.39 | 0.5320 | 0.2513 | 2.0840 | 0.8766 | 1014.9 | 3.4040 | 1.1542 |
| 30000 | 30000 | -48.89 | -44.99 | 410.79 | 0.5005 | 0.2365 | 2.0739 | 0.8723 | 1011.4 | 3.3925 | 1.1503 |
| 31000 | 31000 | -52.49 | -46.99 | 407.20 | 0.4702 | 0.2221 | 2.0638 | 0.8681 | 1007.9 | 3.3810 | 1.1464 |
| 32000 | 32000 | -56.09 | -48.99 | 403.60 | 0.4411 | 0.2084 | 2.0537 | 0.8638 | 1004.4 | 3.3695 | 1.1425 |
| 33000 | 33000 | -59.68 | -50.99 | 400.00 | 0.4132 | 0.1952 | 2.0436 | 0.8596 | 1000.9 | 3.3580 | 1.1386 |
| 34000 | 34000 | -63.28 | -52.99 | 396.41 | 0.3864 | 0.1825 | 2.0335 | 0.8553 | 997.4 | 3.3465 | 1.1347 |
| 35000 | 35000 | -66.88 | -54.99 | 392.81 | 0.3608 | 0.1705 | 2.0234 | 0.8511 | 993.9 | 3.3350 | 1.1308 |
| 36000 | 36000 | -70.47 | -56.99 | 389.22 | 0.3362 | 0.1588 | 2.0133 | 0.8468 | 990.4 | 3.3235 | 1.1269 |
| 37000 | 37000 | -74.07 | -58.99 | 385.62 | 0.3127 | 0.1477 | 2.0032 | 0.8425 | 986.9 | 3.3120 | 1.1230 |
| 38000 | 38000 | -77.67 | -60.99 | 382.02 | 0.2902 | 0.1371 | 1.9931 | 0.8383 | 983.4 | 3.3005 | 1.1191 |
| 39000 | 39000 | -81.26 | -62.99 | 378.43 | 0.2688 | 0.1270 | 1.9830 | 0.8340 | 979.9 | 3.2890 | 1.1152 |
| 40000 | 40000 | -84.86 | -64.99 | 374.83 | 0.2483 | 0.1173 | 1.9729 | 0.8298 | 976.4 | 3.2775 | 1.1113 |
| 41000 | 41000 | -88.46 | -66.99 | 371.24 | 0.2289 | 0.1081 | 1.9628 | 0.8255 | 972.9 | 3.2660 | 1.1074 |
| 42000 | 42000 | -92.05 | -68.99 | 367.64 | 0.2104 | 0.0994 | 1.9527 | 0.8213 | 969.4 | 3.2545 | 1.1035 |
| 43000 | 43000 | -95.65 | -70.99 | 364.04 | 0.1929 | 0.0911 | 1.9426 | 0.8170 | 965.9 | 3.2430 | 1.0996 |
| 44000 | 44000 | -99.25 | -72.99 | 360.45 | 0.1763 | 0.0833 | 1.9325 | 0.8128 | 962.4 | 3.2315 | 1.0957 |
| 45000 | 45000 | -102.84 | -74.99 | 356.85 | 0.1607 | 0.0759 | 1.9224 | 0.8085 | 958.9 | 3.2200 | 1.0918 |
| 46000 | 46000 | -106.44 | -76.99 | 353.26 | 0.1459 | 0.0689 | 1.9123 | 0.8042 | 955.4 | 3.2085 | 1.0879 |
| 47000 | 47000 | -110.04 | -78.99 | 349.66 | 0.1321 | 0.0624 | 1.9022 | 0.8000 | 951.9 | 3.1970 | 1.0840 |
| 48000 | 48000 | -113.63 | -80.99 | 346.06 | 0.1191 | 0.0563 | 1.8921 | 0.7957 | 948.4 | 3.1855 | 1.0801 |
| 49000 | 49000 | -117.23 | -82.99 | 342.47 | 0.1070 | 0.0506 | 1.8820 | 0.7915 | 944.9 | 3.1740 | 1.0762 |
| 50000 | 50000 | -120.83 | -84.99 | 338.87 | 0.0957 | 0.0452 | 1.8719 | 0.7872 | 941.4 | 3.1625 | 1.0723 |
| 51000 | 51000 | -124.42 | -86.99 | 335.28 | 0.0852 | 0.0403 | 1.8618 | 0.7830 | 937.9 | 3.1510 | 1.0684 |
| 52000 | 52000 | -128.02 | -88.99 | 331.68 | 0.0755 | 0.0357 | 1.8517 | 0.7787 | 934.4 | 3.1395 | 1.0645 |
| 53000 | 53000 | -131.62 | -90.99 | 328.09 | 0.0666 | 0.0315 | 1.8416 | 0.7745 | 930.9 | 3.1280 | 1.0606 |
| 54000 | 54000 | -135.21 | -92.99 | 324.49 | 0.0584 | 0.0276 | 1.8315 | 0.7702 | 927.4 | 3.1165 | 1.0567 |
| 55000 | 55000 | -138.81 | -94.99 | 320.89 | 0.0509 | 0.0241 | 1.8214 | 0.7660 | 923.9 | 3.1050 | 1.0528 |
| 56000 | 56000 | -142.41 | -96.99 | 317.30 | 0.0442 | 0.0209 | 1.8113 | 0.7617 | 920.4 | 3.0935 | 1.0489 |
| 57000 | 57000 | -146.00 | -98.99 | 313.70 | 0.0381 | 0.0180 | 1.8012 | 0.7574 | 916.9 | 3.0820 | 1.0450 |
| 58000 | 58000 | -149.60 | -100.99 | 310.11 | 0.0327 | 0.0155 | 1.7911 | 0.7532 | 913.4 | 3.0705 | 1.0411 |
| 59000 | 59000 | -153.20 | -102.99 | 306.51 | 0.0279 | 0.0132 | 1.7810 | 0.7489 | 909.9 | 3.0590 | 1.0372 |
| 60000 | 60000 | -156.79 | -104.99 | 302.92 | 0.0237 | 0.0112 | 1.7709 | 0.7447 | 906.4 | 3.0475 | 1.0333 |

Table 3.2 - (continued)

15° N. Lat.

GEOPOTENTIAL ALTITUDE - ENGLISH UNITS

TABLE 5.2 – (Continued)

(SI Units)

COMPUTATIONAL ALGORITHM, UNIFORM FLOW

| Area | | Temperature | | | Pressure | | Density | | Sound speed | Specific heat at constant volume | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $A/A^*$ | $A/A_1$ | $T/T_0$ | $t$, °C | $T-T_{ref}$ | $P$, atm | $P/P_{02}$ | $\rho/\rho_0$ | $\rho/\rho_{ref}$ | $a/a_{ref}$ | $b=c_v/c_{v,ref}$ | $k/k_{ref}$ |
| 1.000 | 1.000 | 0.9833 | 37.00 | 0.000 | 0.9511 | 0.9564 | 0.9674 | 0.9674 | 1.0082 | 1.0000 | 1.0000 |
| 1.0001 | 1.0001 | 0.9832 | 36.97 | −0.003 | 0.9508 | 0.9561 | 0.9671 | 0.9671 | 1.0081 | 0.9999 | 0.9999 |
| 1.0004 | 1.0004 | 0.9829 | 36.91 | −0.009 | 0.9502 | 0.9555 | 0.9665 | 0.9665 | 1.0079 | 0.9997 | 0.9997 |
| 1.0009 | 1.0009 | 0.9824 | 36.81 | −0.019 | 0.9492 | 0.9545 | 0.9655 | 0.9655 | 1.0076 | 0.9994 | 0.9994 |
| 1.0016 | 1.0016 | 0.9817 | 36.67 | −0.033 | 0.9478 | 0.9531 | 0.9641 | 0.9641 | 1.0071 | 0.9989 | 0.9989 |
| 1.0025 | 1.0025 | 0.9808 | 36.49 | −0.051 | 0.9460 | 0.9513 | 0.9623 | 0.9623 | 1.0065 | 0.9983 | 0.9983 |
| 1.0036 | 1.0036 | 0.9797 | 36.27 | −0.073 | 0.9438 | 0.9491 | 0.9601 | 0.9601 | 1.0058 | 0.9975 | 0.9975 |
| 1.0049 | 1.0049 | 0.9784 | 36.01 | −0.099 | 0.9412 | 0.9465 | 0.9575 | 0.9575 | 1.0049 | 0.9966 | 0.9966 |
| 1.0064 | 1.0064 | 0.9769 | 35.71 | −0.129 | 0.9382 | 0.9435 | 0.9545 | 0.9545 | 1.0039 | 0.9955 | 0.9955 |
| 1.0081 | 1.0081 | 0.9752 | 35.37 | −0.163 | 0.9348 | 0.9401 | 0.9511 | 0.9511 | 1.0027 | 0.9943 | 0.9943 |
| 1.0100 | 1.0100 | 0.9733 | 34.99 | −0.201 | 0.9310 | 0.9363 | 0.9473 | 0.9473 | 1.0014 | 0.9929 | 0.9929 |
| 1.0121 | 1.0121 | 0.9712 | 34.57 | −0.243 | 0.9268 | 0.9321 | 0.9431 | 0.9431 | 1.0000 | 0.9914 | 0.9914 |
| 1.0144 | 1.0144 | 0.9689 | 34.11 | −0.289 | 0.9222 | 0.9275 | 0.9385 | 0.9385 | 0.9984 | 0.9897 | 0.9897 |
| 1.0169 | 1.0169 | 0.9664 | 33.61 | −0.339 | 0.9172 | 0.9225 | 0.9335 | 0.9335 | 0.9967 | 0.9879 | 0.9879 |
| 1.0196 | 1.0196 | 0.9637 | 33.07 | −0.393 | 0.9118 | 0.9171 | 0.9281 | 0.9281 | 0.9948 | 0.9859 | 0.9859 |
| 1.0225 | 1.0225 | 0.9608 | 32.49 | −0.451 | 0.9060 | 0.9113 | 0.9223 | 0.9223 | 0.9928 | 0.9838 | 0.9838 |
| 1.0256 | 1.0256 | 0.9577 | 31.87 | −0.513 | 0.8998 | 0.9051 | 0.9161 | 0.9161 | 0.9907 | 0.9815 | 0.9815 |
| 1.0289 | 1.0289 | 0.9544 | 31.21 | −0.579 | 0.8932 | 0.8985 | 0.9095 | 0.9095 | 0.9884 | 0.9791 | 0.9791 |
| 1.0324 | 1.0324 | 0.9509 | 30.51 | −0.649 | 0.8862 | 0.8915 | 0.9025 | 0.9025 | 0.9860 | 0.9765 | 0.9765 |
| 1.0361 | 1.0361 | 0.9472 | 29.77 | −0.723 | 0.8788 | 0.8841 | 0.8951 | 0.8951 | 0.9834 | 0.9738 | 0.9738 |
| 1.0400 | 1.0400 | 0.9433 | 28.99 | −0.801 | 0.8710 | 0.8763 | 0.8873 | 0.8873 | 0.9807 | 0.9709 | 0.9709 |
| 1.0441 | 1.0441 | 0.9392 | 28.17 | −0.883 | 0.8628 | 0.8681 | 0.8791 | 0.8791 | 0.9779 | 0.9679 | 0.9679 |
| 1.0484 | 1.0484 | 0.9349 | 27.31 | −0.969 | 0.8542 | 0.8595 | 0.8705 | 0.8705 | 0.9749 | 0.9647 | 0.9647 |
| 1.0529 | 1.0529 | 0.9304 | 26.41 | −1.059 | 0.8452 | 0.8505 | 0.8615 | 0.8615 | 0.9718 | 0.9614 | 0.9614 |
| 1.0576 | 1.0576 | 0.9257 | 25.47 | −1.153 | 0.8358 | 0.8411 | 0.8521 | 0.8521 | 0.9685 | 0.9579 | 0.9579 |
| 1.0625 | 1.0625 | 0.9208 | 24.49 | −1.251 | 0.8260 | 0.8313 | 0.8423 | 0.8423 | 0.9651 | 0.9543 | 0.9543 |
| 1.0676 | 1.0676 | 0.9157 | 23.47 | −1.353 | 0.8158 | 0.8211 | 0.8321 | 0.8321 | 0.9615 | 0.9505 | 0.9505 |
| 1.0729 | 1.0729 | 0.9104 | 22.41 | −1.459 | 0.8052 | 0.8105 | 0.8215 | 0.8215 | 0.9578 | 0.9466 | 0.9466 |
| 1.0784 | 1.0784 | 0.9049 | 21.31 | −1.569 | 0.7942 | 0.7995 | 0.8105 | 0.8105 | 0.9539 | 0.9425 | 0.9425 |
| 1.0841 | 1.0841 | 0.8992 | 20.17 | −1.683 | 0.7828 | 0.7881 | 0.7991 | 0.7991 | 0.9499 | 0.9383 | 0.9383 |
| 1.0900 | 1.0900 | 0.8933 | 18.99 | −1.801 | 0.7710 | 0.7763 | 0.7873 | 0.7873 | 0.9457 | 0.9339 | 0.9339 |
| 1.0961 | 1.0961 | 0.8872 | 17.77 | −1.923 | 0.7588 | 0.7641 | 0.7751 | 0.7751 | 0.9414 | 0.9294 | 0.9294 |
| 1.1024 | 1.1024 | 0.8809 | 16.51 | −2.049 | 0.7462 | 0.7515 | 0.7625 | 0.7625 | 0.9369 | 0.9247 | 0.9247 |
| 1.1089 | 1.1089 | 0.8744 | 15.21 | −2.179 | 0.7332 | 0.7385 | 0.7495 | 0.7495 | 0.9322 | 0.9199 | 0.9199 |
| 1.1156 | 1.1156 | 0.8677 | 13.87 | −2.313 | 0.7198 | 0.7251 | 0.7361 | 0.7361 | 0.9274 | 0.9149 | 0.9149 |
| 1.1225 | 1.1225 | 0.8608 | 12.49 | −2.451 | 0.7060 | 0.7113 | 0.7223 | 0.7223 | 0.9224 | 0.9098 | 0.9098 |
| 1.1296 | 1.1296 | 0.8537 | 11.07 | −2.593 | 0.6918 | 0.6971 | 0.7081 | 0.7081 | 0.9173 | 0.9045 | 0.9045 |
| 1.1369 | 1.1369 | 0.8464 | 9.61 | −2.739 | 0.6772 | 0.6825 | 0.6935 | 0.6935 | 0.9120 | 0.8991 | 0.8991 |
| 1.1444 | 1.1444 | 0.8389 | 8.11 | −2.889 | 0.6622 | 0.6675 | 0.6785 | 0.6785 | 0.9065 | 0.8935 | 0.8935 |
| 1.1521 | 1.1521 | 0.8312 | 6.57 | −3.043 | 0.6468 | 0.6521 | 0.6631 | 0.6631 | 0.9008 | 0.8878 | 0.8878 |
| 1.1600 | 1.1600 | 0.8233 | 4.99 | −3.201 | 0.6310 | 0.6363 | 0.6473 | 0.6473 | 0.8950 | 0.8819 | 0.8819 |
| 1.1681 | 1.1681 | 0.8152 | 3.37 | −3.363 | 0.6148 | 0.6201 | 0.6311 | 0.6311 | 0.8890 | 0.8759 | 0.8759 |
| 1.1764 | 1.1764 | 0.8069 | 1.71 | −3.529 | 0.5982 | 0.6035 | 0.6145 | 0.6145 | 0.8828 | 0.8697 | 0.8697 |
| 1.1849 | 1.1849 | 0.7984 | 0.00 | −3.699 | 0.5812 | 0.5865 | 0.5975 | 0.5975 | 0.8764 | 0.8633 | 0.8633 |
| 1.1936 | 1.1936 | 0.7897 | −1.76 | −3.873 | 0.5638 | 0.5691 | 0.5801 | 0.5801 | 0.8698 | 0.8568 | 0.8568 |
| 1.2025 | 1.2025 | 0.7808 | −3.57 | −4.052 | 0.5460 | 0.5513 | 0.5623 | 0.5623 | 0.8631 | 0.8501 | 0.8501 |
| 1.2116 | 1.2116 | 0.7717 | −5.41 | −4.235 | 0.5277 | 0.5330 | 0.5440 | 0.5440 | 0.8561 | 0.8433 | 0.8433 |
| 1.2209 | 1.2209 | 0.7624 | −7.29 | −4.422 | 0.5090 | 0.5143 | 0.5253 | 0.5253 | 0.8489 | 0.8364 | 0.8364 |
| 1.2304 | 1.2304 | 0.7529 | −9.21 | −4.613 | 0.4899 | 0.4952 | 0.5062 | 0.5062 | 0.8415 | 0.8293 | 0.8293 |
| 1.2401 | 1.2401 | 0.7432 | −11.17 | −4.809 | 0.4703 | 0.4756 | 0.4866 | 0.4866 | 0.8339 | 0.8221 | 0.8221 |
| 1.2500 | 1.2500 | 0.7333 | −13.17 | −5.009 | 0.4503 | 0.4556 | 0.4666 | 0.4666 | 0.8261 | 0.8147 | 0.8147 |
| 1.2601 | 1.2601 | 0.7232 | −15.21 | −5.213 | 0.4299 | 0.4352 | 0.4462 | 0.4462 | 0.8181 | 0.8072 | 0.8072 |
| 1.2704 | 1.2704 | 0.7129 | −17.29 | −5.422 | 0.4090 | 0.4143 | 0.4253 | 0.4253 | 0.8099 | 0.7995 | 0.7995 |
| 1.2809 | 1.2809 | 0.7024 | −19.41 | −5.635 | 0.3877 | 0.3930 | 0.4040 | 0.4040 | 0.8014 | 0.7917 | 0.7917 |
| 1.2916 | 1.2916 | 0.6917 | −21.57 | −5.853 | 0.3659 | 0.3712 | 0.3822 | 0.3822 | 0.7927 | 0.7837 | 0.7837 |
| 1.3025 | 1.3025 | 0.6808 | −23.77 | −6.075 | 0.3437 | 0.3490 | 0.3600 | 0.3600 | 0.7838 | 0.7755 | 0.7755 |
| 1.3136 | 1.3136 | 0.6697 | −26.01 | −6.302 | 0.3210 | 0.3263 | 0.3373 | 0.3373 | 0.7747 | 0.7671 | 0.7671 |
| 1.3249 | 1.3249 | 0.6584 | −28.29 | −6.533 | 0.2979 | 0.3032 | 0.3142 | 0.3142 | 0.7653 | 0.7585 | 0.7585 |
| 1.3364 | 1.3364 | 0.6469 | −30.61 | −6.769 | 0.2743 | 0.2796 | 0.2906 | 0.2906 | 0.7557 | 0.7497 | 0.7497 |
| 1.3481 | 1.3481 | 0.6352 | −32.97 | −7.009 | 0.2503 | 0.2556 | 0.2666 | 0.2666 | 0.7458 | 0.7407 | 0.7407 |
| 1.3600 | 1.3600 | 0.6233 | −35.37 | −7.254 | 0.2258 | 0.2311 | 0.2421 | 0.2421 | 0.7357 | 0.7315 | 0.7315 |
| 1.3721 | 1.3721 | 0.6112 | −37.81 | −7.503 | 0.2009 | 0.2062 | 0.2172 | 0.2172 | 0.7253 | 0.7221 | 0.7221 |
| 1.3844 | 1.3844 | 0.5989 | −40.29 | −7.757 | 0.1755 | 0.1808 | 0.1918 | 0.1918 | 0.7147 | 0.7125 | 0.7125 |
| 1.3969 | 1.3969 | 0.5864 | −42.81 | −8.016 | 0.1497 | 0.1550 | 0.1660 | 0.1660 | 0.7038 | 0.7027 | 0.7027 |
| 1.4096 | 1.4096 | 0.5737 | −45.37 | −8.279 | 0.1234 | 0.1287 | 0.1397 | 0.1397 | 0.6926 | 0.6928 | 0.6928 |
| 1.4225 | 1.4225 | 0.5608 | −47.97 | −8.547 | 0.0967 | 0.1020 | 0.1130 | 0.1130 | 0.6812 | 0.6827 | 0.6827 |
| 1.4356 | 1.4356 | 0.5477 | −50.61 | −8.820 | 0.0695 | 0.0748 | 0.0858 | 0.0858 | 0.6695 | 0.6725 | 0.6725 |
| 1.4489 | 1.4489 | 0.5344 | −53.29 | −9.098 | 0.0419 | 0.0472 | 0.0582 | 0.0582 | 0.6575 | 0.6622 | 0.6622 |
| 1.4624 | 1.4624 | 0.5209 | −56.01 | −9.380 | 0.0139 | 0.0192 | 0.0302 | 0.0302 | 0.6452 | 0.6518 | 0.6518 |

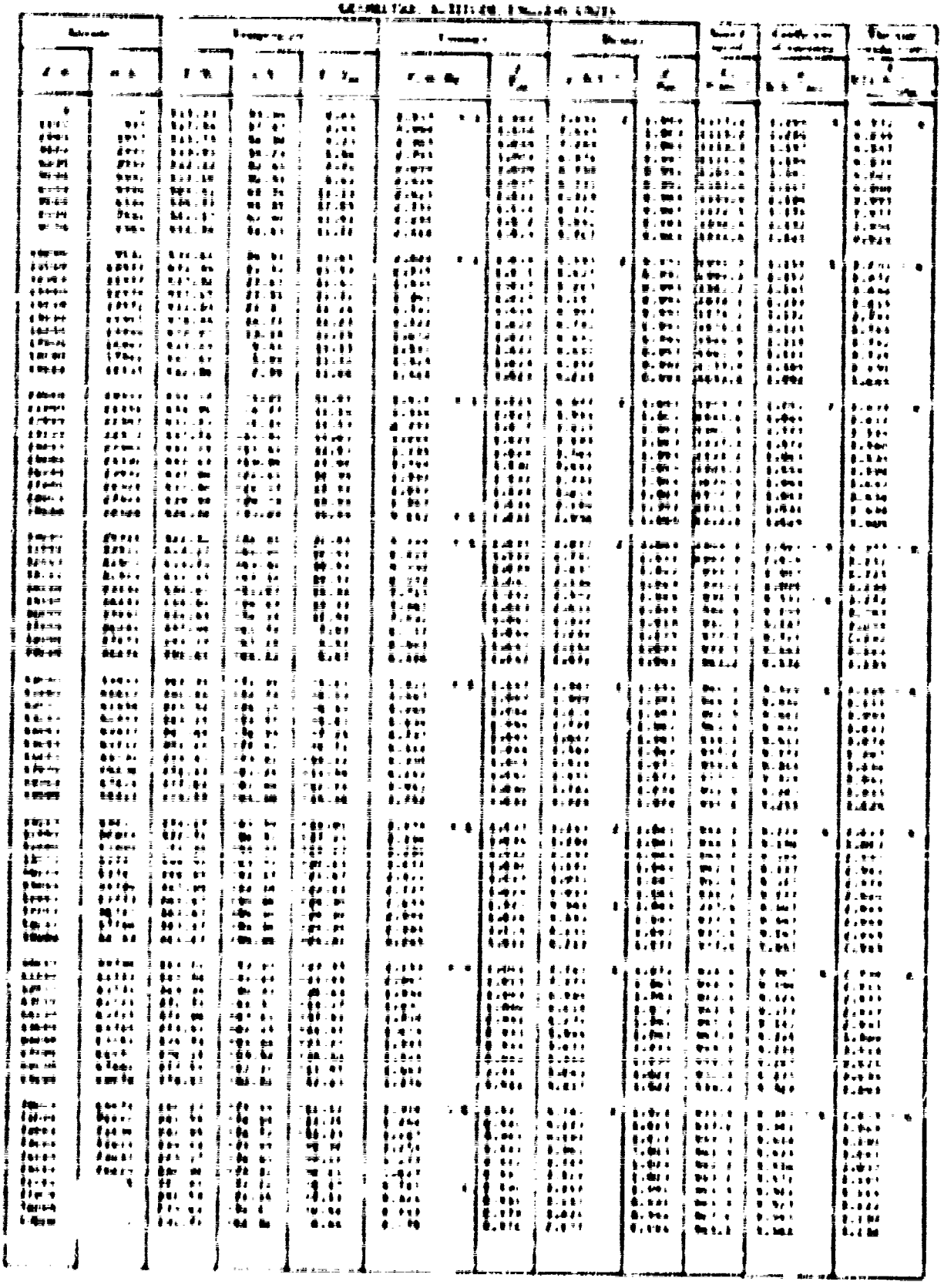


TABLE I.2 — Continued

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | [illegible] | P, in Hg | $P/P_0$ | [illegible] | $\rho/\rho_0$ | $C_s$ | $\mu$ | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.2 - Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $H$, ft | $T$, °R | $t$, °F | $T - T_{SL}$, °R | $p$, lb/ft² | $p/p_{SL}$ | $\rho$, slug/ft³ | $\rho/\rho_{SL}$ | $a$, ft/sec | $\mu$, lb-sec/ft² | $k$, Btu/ft-sec-°R |
| 0 | 0 | 518.67 | 59.00 | 0.00 | 2116.2 | 1.000 | 0.002377 | 1.000 | 1116.4 | $3.737 \times 10^{-7}$ | $1.278 \times 10^{-8}$ |
| 1000 | 1000.188 | 515.49 | 55.82 | -3.18 | 2040.9 | 0.9644 | 0.002308 | 0.9711 | 1112.7 | $3.717 \times 10^{-7}$ | $1.272 \times 10^{-8}$ |
| 2000 | 2000.752 | 512.31 | 52.64 | -6.36 | 1967.7 | 0.9298 | 0.002241 | 0.9428 | 1109.0 | $3.697 \times 10^{-7}$ | $1.266 \times 10^{-8}$ |
| 3000 | 2999.624 | 509.13 | 49.46 | -9.54 | 1896.8 | 0.8962 | 0.002175 | 0.9151 | 1105.3 | $3.677 \times 10^{-7}$ | $1.260 \times 10^{-8}$ |
| 4000 | 3998.812 | 505.95 | 46.28 | -12.72 | 1828.0 | 0.8637 | 0.002111 | 0.8881 | 1101.5 | $3.657 \times 10^{-7}$ | $1.254 \times 10^{-8}$ |
| 5000 | 4997.324 | 502.77 | 43.10 | -15.90 | 1761.2 | 0.8321 | 0.002048 | 0.8617 | 1097.8 | $3.637 \times 10^{-7}$ | $1.248 \times 10^{-8}$ |
| 6000 | 5995.168 | 499.59 | 39.92 | -19.08 | 1696.5 | 0.8015 | 0.001987 | 0.8359 | 1094.1 | $3.617 \times 10^{-7}$ | $1.242 \times 10^{-8}$ |
| 7000 | 6992.351 | 496.41 | 36.74 | -22.26 | 1633.7 | 0.7718 | 0.001927 | 0.8108 | 1090.3 | $3.597 \times 10^{-7}$ | $1.236 \times 10^{-8}$ |
| 8000 | 7988.881 | 493.23 | 33.56 | -25.44 | 1572.8 | 0.7430 | 0.001868 | 0.7862 | 1086.6 | $3.577 \times 10^{-7}$ | $1.230 \times 10^{-8}$ |
| 9000 | 8984.765 | 490.05 | 30.38 | -28.62 | 1513.8 | 0.7151 | 0.001811 | 0.7622 | 1082.8 | $3.557 \times 10^{-7}$ | $1.224 \times 10^{-8}$ |
| 10000 | 9980.010 | 486.87 | 27.20 | -31.80 | 1456.6 | 0.6881 | 0.001756 | 0.7388 | 1079.0 | $3.537 \times 10^{-7}$ | $1.218 \times 10^{-8}$ |
| 11000 | 10974.623 | 483.69 | 24.02 | -34.98 | 1401.3 | 0.6619 | 0.001702 | 0.7159 | 1075.2 | $3.517 \times 10^{-7}$ | $1.212 \times 10^{-8}$ |
| 12000 | 11968.610 | 480.51 | 20.84 | -38.16 | 1347.7 | 0.6366 | 0.001649 | 0.6936 | 1071.4 | $3.497 \times 10^{-7}$ | $1.206 \times 10^{-8}$ |
| 13000 | 12961.978 | 477.33 | 17.66 | -41.34 | 1295.8 | 0.6121 | 0.001598 | 0.6719 | 1067.6 | $3.477 \times 10^{-7}$ | $1.200 \times 10^{-8}$ |
| 14000 | 13954.734 | 474.15 | 14.48 | -44.52 | 1245.6 | 0.5884 | 0.001548 | 0.6507 | 1063.7 | $3.457 \times 10^{-7}$ | $1.194 \times 10^{-8}$ |
| 15000 | 14946.884 | 470.97 | 11.30 | -47.70 | 1197.1 | 0.5655 | 0.001499 | 0.6301 | 1059.9 | $3.437 \times 10^{-7}$ | $1.188 \times 10^{-8}$ |
| 16000 | 15938.434 | 467.79 | 8.12 | -50.88 | 1150.1 | 0.5433 | 0.001452 | 0.6100 | 1056.0 | $3.417 \times 10^{-7}$ | $1.182 \times 10^{-8}$ |
| 17000 | 16929.390 | 464.61 | 4.94 | -54.06 | 1104.7 | 0.5218 | 0.001406 | 0.5905 | 1052.1 | $3.397 \times 10^{-7}$ | $1.176 \times 10^{-8}$ |
| 18000 | 17919.757 | 461.43 | 1.76 | -57.24 | 1060.9 | 0.5011 | 0.001361 | 0.5714 | 1048.2 | $3.377 \times 10^{-7}$ | $1.170 \times 10^{-8}$ |
| 19000 | 18909.542 | 458.25 | -1.42 | -60.42 | 1018.6 | 0.4810 | 0.001318 | 0.5529 | 1044.3 | $3.357 \times 10^{-7}$ | $1.164 \times 10^{-8}$ |
| 20000 | 19898.750 | 455.07 | -4.60 | -63.60 | 977.8 | 0.4616 | 0.001276 | 0.5348 | 1040.4 | $3.337 \times 10^{-7}$ | $1.158 \times 10^{-8}$ |
| 21000 | 20887.386 | 451.89 | -7.78 | -66.78 | 938.5 | 0.4429 | 0.001235 | 0.5173 | 1036.4 | $3.317 \times 10^{-7}$ | $1.152 \times 10^{-8}$ |
| 22000 | 21875.457 | 448.71 | -10.96 | -69.96 | 900.7 | 0.4250 | 0.001196 | 0.5002 | 1032.5 | $3.297 \times 10^{-7}$ | $1.146 \times 10^{-8}$ |
| 23000 | 22862.967 | 445.53 | -14.14 | -73.14 | 864.3 | 0.4077 | 0.001157 | 0.4836 | 1028.5 | $3.277 \times 10^{-7}$ | $1.140 \times 10^{-8}$ |
| 24000 | 23849.921 | 442.35 | -17.32 | -76.32 | 829.3 | 0.3911 | 0.001120 | 0.4675 | 1024.5 | $3.257 \times 10^{-7}$ | $1.134 \times 10^{-8}$ |
| 25000 | 24836.324 | 439.17 | -20.50 | -79.50 | 795.7 | 0.3752 | 0.001084 | 0.4518 | 1020.5 | $3.237 \times 10^{-7}$ | $1.128 \times 10^{-8}$ |
| 26000 | 25822.181 | 435.99 | -23.68 | -82.68 | 763.5 | 0.3599 | 0.001048 | 0.4366 | 1016.5 | $3.217 \times 10^{-7}$ | $1.122 \times 10^{-8}$ |
| 27000 | 26807.496 | 432.81 | -26.86 | -85.86 | 732.6 | 0.3453 | 0.001014 | 0.4219 | 1012.5 | $3.197 \times 10^{-7}$ | $1.116 \times 10^{-8}$ |
| 28000 | 27792.274 | 429.63 | -30.04 | -89.04 | 703.0 | 0.3313 | 0.0009805 | 0.4076 | 1008.5 | $3.177 \times 10^{-7}$ | $1.110 \times 10^{-8}$ |
| 29000 | 28776.520 | 426.45 | -33.22 | -92.22 | 674.7 | 0.3179 | 0.0009481 | 0.3938 | 1004.4 | $3.157 \times 10^{-7}$ | $1.104 \times 10^{-8}$ |
| 30000 | 29760.237 | 423.27 | -36.40 | -95.40 | 647.7 | 0.3052 | 0.0009168 | 0.3805 | 1000.4 | $3.137 \times 10^{-7}$ | $1.098 \times 10^{-8}$ |
| 31000 | 30743.431 | 420.09 | -39.58 | -98.58 | 621.9 | 0.2930 | 0.0008866 | 0.3677 | 996.3 | $3.117 \times 10^{-7}$ | $1.092 \times 10^{-8}$ |
| 32000 | 31726.105 | 416.91 | -42.76 | -101.76 | 597.3 | 0.2814 | 0.0008575 | 0.3555 | 992.2 | $3.097 \times 10^{-7}$ | $1.086 \times 10^{-8}$ |
| 33000 | 32708.263 | 413.73 | -45.94 | -104.94 | 573.8 | 0.2704 | 0.0008294 | 0.3437 | 988.1 | $3.077 \times 10^{-7}$ | $1.080 \times 10^{-8}$ |
| 34000 | 33689.911 | 410.55 | -49.12 | -108.12 | 551.5 | 0.2599 | 0.0008023 | 0.3324 | 984.0 | $3.057 \times 10^{-7}$ | $1.074 \times 10^{-8}$ |
| 35000 | 34671.050 | 407.37 | -52.30 | -111.30 | 530.2 | 0.2499 | 0.0007762 | 0.3216 | 979.8 | $3.037 \times 10^{-7}$ | $1.068 \times 10^{-8}$ |
| 36000 | 35651.686 | 404.19 | -55.48 | -114.48 | 509.9 | 0.2403 | 0.0007511 | 0.3113 | 975.6 | $3.017 \times 10^{-7}$ | $1.062 \times 10^{-8}$ |
| 37000 | 36631.823 | 401.01 | -58.66 | -117.66 | 490.6 | 0.2312 | 0.0007268 | 0.3013 | 971.4 | $2.997 \times 10^{-7}$ | $1.056 \times 10^{-8}$ |
| 38000 | 37611.464 | 397.83 | -61.84 | -120.84 | 472.2 | 0.2225 | 0.0007035 | 0.2917 | 967.2 | $2.977 \times 10^{-7}$ | $1.050 \times 10^{-8}$ |
| 39000 | 38590.615 | 394.65 | -65.02 | -124.02 | 454.7 | 0.2143 | 0.0006810 | 0.2824 | 963.0 | $2.957 \times 10^{-7}$ | $1.044 \times 10^{-8}$ |
| 40000 | 39569.278 | 391.47 | -68.20 | -127.20 | 437.9 | 0.2063 | 0.0006594 | 0.2735 | 958.7 | $2.937 \times 10^{-7}$ | $1.038 \times 10^{-8}$ |
| 41000 | 40547.458 | 388.29 | -71.38 | -130.38 | 421.9 | 0.1988 | 0.0006385 | 0.2649 | 954.4 | $2.917 \times 10^{-7}$ | $1.032 \times 10^{-8}$ |
| 42000 | 41525.160 | 385.11 | -74.56 | -133.56 | 406.6 | 0.1916 | 0.0006185 | 0.2566 | 950.1 | $2.897 \times 10^{-7}$ | $1.026 \times 10^{-8}$ |
| 43000 | 42502.387 | 381.93 | -77.74 | -136.74 | 391.9 | 0.1847 | 0.0005992 | 0.2486 | 945.8 | $2.877 \times 10^{-7}$ | $1.020 \times 10^{-8}$ |
| 44000 | 43479.144 | 378.75 | -80.92 | -139.92 | 377.8 | 0.1781 | 0.0005806 | 0.2409 | 941.5 | $2.857 \times 10^{-7}$ | $1.014 \times 10^{-8}$ |
| 45000 | 44455.435 | 375.57 | -84.10 | -143.10 | 364.3 | 0.1717 | 0.0005627 | 0.2335 | 937.2 | $2.837 \times 10^{-7}$ | $1.008 \times 10^{-8}$ |
| 46000 | 45431.263 | 372.39 | -87.28 | -146.28 | 351.3 | 0.1656 | 0.0005455 | 0.2264 | 932.8 | $2.817 \times 10^{-7}$ | $1.002 \times 10^{-8}$ |
| 47000 | 46406.633 | 369.21 | -90.46 | -149.46 | 338.8 | 0.1597 | 0.0005289 | 0.2195 | 928.4 | $2.797 \times 10^{-7}$ | $9.960 \times 10^{-9}$ |
| 48000 | 47381.548 | 366.03 | -93.64 | -152.64 | 326.8 | 0.1541 | 0.0005129 | 0.2129 | 924.0 | $2.777 \times 10^{-7}$ | $9.900 \times 10^{-9}$ |
| 49000 | 48356.012 | 362.85 | -96.82 | -155.82 | 315.3 | 0.1486 | 0.0004975 | 0.2065 | 919.6 | $2.757 \times 10^{-7}$ | $9.840 \times 10^{-9}$ |
| 50000 | 49330.029 | 359.67 | -100.00 | -159.00 | 304.2 | 0.1434 | 0.0004827 | 0.2003 | 915.2 | $2.737 \times 10^{-7}$ | $9.780 \times 10^{-9}$ |
| 51000 | 50303.602 | 356.49 | -103.18 | -162.18 | 293.5 | 0.1383 | 0.0004684 | 0.1944 | 910.8 | $2.717 \times 10^{-7}$ | $9.720 \times 10^{-9}$ |
| 52000 | 51276.735 | 353.31 | -106.36 | -165.36 | 283.2 | 0.1335 | 0.0004546 | 0.1887 | 906.3 | $2.697 \times 10^{-7}$ | $9.660 \times 10^{-9}$ |
| 53000 | 52249.432 | 350.13 | -109.54 | -168.54 | 273.3 | 0.1288 | 0.0004414 | 0.1832 | 901.8 | $2.677 \times 10^{-7}$ | $9.600 \times 10^{-9}$ |
| 54000 | 53221.696 | 346.95 | -112.72 | -171.72 | 263.8 | 0.1243 | 0.0004286 | 0.1779 | 897.3 | $2.657 \times 10^{-7}$ | $9.540 \times 10^{-9}$ |
| 55000 | 54193.530 | 343.77 | -115.90 | -174.90 | 254.7 | 0.1200 | 0.0004163 | 0.1728 | 892.8 | $2.637 \times 10^{-7}$ | $9.480 \times 10^{-9}$ |
| 56000 | 55164.938 | 340.59 | -119.08 | -178.08 | 245.9 | 0.1159 | 0.0004045 | 0.1679 | 888.3 | $2.617 \times 10^{-7}$ | $9.420 \times 10^{-9}$ |
| 57000 | 56135.923 | 337.41 | -122.26 | -181.26 | 237.5 | 0.1119 | 0.0003931 | 0.1631 | 883.8 | $2.597 \times 10^{-7}$ | $9.360 \times 10^{-9}$ |
| 58000 | 57106.488 | 334.23 | -125.44 | -184.44 | 229.4 | 0.1081 | 0.0003821 | 0.1586 | 879.2 | $2.577 \times 10^{-7}$ | $9.300 \times 10^{-9}$ |
| 59000 | 58076.637 | 331.05 | -128.62 | -187.62 | 221.6 | 0.1044 | 0.0003716 | 0.1542 | 874.6 | $2.557 \times 10^{-7}$ | $9.240 \times 10^{-9}$ |
| 60000 | 59046.373 | 327.87 | -131.80 | -190.80 | 214.1 | 0.1009 | 0.0003615 | 0.1500 | 870.0 | $2.537 \times 10^{-7}$ | $9.180 \times 10^{-9}$ |
| 61000 | 60015.699 | 324.69 | -134.98 | -193.98 | 206.9 | 0.09747 | 0.0003518 | 0.1459 | 865.4 | $2.517 \times 10^{-7}$ | $9.120 \times 10^{-9}$ |
| 62000 | 60984.619 | 321.51 | -138.16 | -197.16 | 199.9 | 0.09419 | 0.0003424 | 0.1421 | 860.8 | $2.497 \times 10^{-7}$ | $9.060 \times 10^{-9}$ |
| 63000 | 61953.136 | 318.33 | -141.34 | -200.34 | 193.2 | 0.09103 | 0.0003335 | 0.1383 | 856.1 | $2.477 \times 10^{-7}$ | $9.000 \times 10^{-9}$ |
| 64000 | 62921.252 | 315.15 | -144.52 | -203.52 | 186.7 | 0.08798 | 0.0003249 | 0.1347 | 851.4 | $2.457 \times 10^{-7}$ | $8.940 \times 10^{-9}$ |
| 65000 | 63888.972 | 311.97 | -147.70 | -206.70 | 180.5 | 0.08504 | 0.0003167 | 0.1313 | 846.7 | $2.437 \times 10^{-7}$ | $8.880 \times 10^{-9}$ |
| 66000 | 64856.298 | 308.79 | -150.88 | -209.88 | 174.5 | 0.08221 | 0.0003088 | 0.1280 | 842.0 | $2.417 \times 10^{-7}$ | $8.820 \times 10^{-9}$ |
| 67000 | 65823.233 | 305.61 | -154.06 | -213.06 | 168.7 | 0.07948 | 0.0003013 | 0.1248 | 837.3 | $2.397 \times 10^{-7}$ | $8.760 \times 10^{-9}$ |
| 68000 | 66789.781 | 302.43 | -157.24 | -216.24 | 163.1 | 0.07685 | 0.0002941 | 0.1218 | 832.5 | $2.377 \times 10^{-7}$ | $8.700 \times 10^{-9}$ |
| 69000 | 67755.943 | 299.25 | -160.42 | -219.42 | 157.7 | 0.07432 | 0.0002872 | 0.1189 | 827.7 | $2.357 \times 10^{-7}$ | $8.640 \times 10^{-9}$ |
| 70000 | 68721.723 | 296.07 | -163.60 | -222.60 | 152.5 | 0.07188 | 0.0002806 | 0.1161 | 822.9 | $2.337 \times 10^{-7}$ | $8.580 \times 10^{-9}$ |
| 71000 | 69687.124 | 292.89 | -166.78 | -225.78 | 147.5 | 0.06953 | 0.0002743 | 0.1134 | 818.1 | $2.317 \times 10^{-7}$ | $8.520 \times 10^{-9}$ |
| 72000 | 70652.147 | 289.71 | -169.96 | -228.96 | 142.6 | 0.06727 | 0.0002683 | 0.1108 | 813.3 | $2.297 \times 10^{-7}$ | $8.460 \times 10^{-9}$ |
| 73000 | 71616.797 | 286.53 | -173.14 | -232.14 | 137.9 | 0.06510 | 0.0002626 | 0.1083 | 808.4 | $2.277 \times 10^{-7}$ | $8.400 \times 10^{-9}$ |
| 74000 | 72581.075 | 283.35 | -176.32 | -235.32 | 133.4 | 0.06301 | 0.0002571 | 0.1059 | 803.5 | $2.257 \times 10^{-7}$ | $8.340 \times 10^{-9}$ |
| 75000 | 73544.984 | 280.17 | -179.50 | -238.50 | 129.0 | 0.06100 | 0.0002519 | 0.1035 | 798.6 | $2.237 \times 10^{-7}$ | $8.280 \times 10^{-9}$ |
| 76000 | 74508.528 | 276.99 | -182.68 | -241.68 | 124.7 | 0.05907 | 0.0002469 | 0.1013 | 793.7 | $2.217 \times 10^{-7}$ | $8.220 \times 10^{-9}$ |
| 77000 | 75471.708 | 273.81 | -185.86 | -244.86 | 120.6 | 0.05721 | 0.0002422 | 0.09917 | 788.7 | $2.197 \times 10^{-7}$ | $8.160 \times 10^{-9}$ |
| 78000 | 76434.529 | 270.63 | -189.04 | -248.04 | 116.6 | 0.05542 | 0.0002377 | 0.09711 | 783.8 | $2.177 \times 10^{-7}$ | $8.100 \times 10^{-9}$ |
| 79000 | 77396.993 | 267.45 | -192.22 | -251.22 | 112.7 | 0.05370 | 0.0002335 | 0.09511 | 778.8 | $2.157 \times 10^{-7}$ | $8.040 \times 10^{-9}$ |
| 80000 | 78359.102 | 264.27 | -195.40 | -254.40 | 108.9 | 0.05205 | 0.0002295 | 0.09316 | 773.8 | $2.137 \times 10^{-7}$ | $7.980 \times 10^{-9}$ |

TABLE 3.2 – Continued

[illegible]

[illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Acceleration of gravity | Viscosity coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 0 | 0 | 518.67 | 59.00 | 459.67 | 2.1162 | 1.0000 | 2.3769 | 1.0000 | 1116.7 | 1.0000 | 3.7373 |
| 1000 | 1000 | 503.51 | 43.84 | 459.67 | 2.0360 | 0.9623 | 2.3506 | 0.9889 | 1112.7 | 1.0000 | 3.7284 |
| 2000 | 2000 | 488.37 | 28.70 | 459.67 | 1.9583 | 0.9254 | 2.3243 | 0.9778 | 1108.6 | 1.0000 | 3.7195 |
| 3000 | 3000 | 473.22 | 13.55 | 459.67 | 1.8830 | 0.8898 | 2.2980 | 0.9667 | 1104.5 | 1.0000 | 3.7106 |
| 4000 | 4000 | 458.08 | -1.59 | 459.67 | 1.8101 | 0.8553 | 2.2717 | 0.9556 | 1100.4 | 1.0000 | 3.7017 |
| 5000 | 5000 | 442.94 | -16.73 | 459.67 | 1.7395 | 0.8220 | 2.2454 | 0.9445 | 1096.3 | 1.0000 | 3.6928 |
| 6000 | 6000 | 427.80 | -31.87 | 459.67 | 1.6711 | 0.7896 | 2.2191 | 0.9334 | 1092.2 | 1.0000 | 3.6839 |
| 7000 | 7000 | 412.66 | -47.01 | 459.67 | 1.6049 | 0.7583 | 2.1928 | 0.9223 | 1088.1 | 1.0000 | 3.6750 |
| 8000 | 8000 | 397.52 | -62.15 | 459.67 | 1.5409 | 0.7280 | 2.1665 | 0.9112 | 1084.0 | 1.0000 | 3.6661 |
| 9000 | 9000 | 382.38 | -77.29 | 459.67 | 1.4789 | 0.6987 | 2.1402 | 0.9001 | 1079.9 | 1.0000 | 3.6572 |
| 10000 | 10000 | 367.24 | -92.43 | 459.67 | 1.4190 | 0.6704 | 2.1139 | 0.8890 | 1075.8 | 1.0000 | 3.6483 |
| 11000 | 11000 | 352.10 | -107.57 | 459.67 | 1.3611 | 0.6431 | 2.0876 | 0.8779 | 1071.7 | 1.0000 | 3.6394 |
| 12000 | 12000 | 336.96 | -122.71 | 459.67 | 1.3051 | 0.6166 | 2.0613 | 0.8668 | 1067.6 | 1.0000 | 3.6305 |
| 13000 | 13000 | 321.82 | -137.85 | 459.67 | 1.2510 | 0.5911 | 2.0350 | 0.8557 | 1063.5 | 1.0000 | 3.6216 |
| 14000 | 14000 | 306.68 | -152.99 | 459.67 | 1.1988 | 0.5665 | 2.0087 | 0.8446 | 1059.4 | 1.0000 | 3.6127 |
| 15000 | 15000 | 291.54 | -168.13 | 459.67 | 1.1485 | 0.5428 | 1.9824 | 0.8335 | 1055.3 | 1.0000 | 3.6038 |
| 16000 | 16000 | 276.40 | -183.27 | 459.67 | 1.1000 | 0.5199 | 1.9561 | 0.8224 | 1051.2 | 1.0000 | 3.5949 |
| 17000 | 17000 | 261.26 | -198.41 | 459.67 | 1.0533 | 0.4978 | 1.9298 | 0.8113 | 1047.1 | 1.0000 | 3.5860 |
| 18000 | 18000 | 246.12 | -213.55 | 459.67 | 1.0084 | 0.4765 | 1.9035 | 0.8002 | 1043.0 | 1.0000 | 3.5771 |
| 19000 | 19000 | 230.98 | -228.69 | 459.67 | 0.9652 | 0.4561 | 1.8772 | 0.7891 | 1038.9 | 1.0000 | 3.5682 |
| 20000 | 20000 | 215.84 | -243.83 | 459.67 | 0.9238 | 0.4365 | 1.8509 | 0.7780 | 1034.8 | 1.0000 | 3.5593 |
| 21000 | 21000 | 200.70 | -258.97 | 459.67 | 0.8840 | 0.4177 | 1.8246 | 0.7669 | 1030.7 | 1.0000 | 3.5504 |
| 22000 | 22000 | 185.56 | -274.11 | 459.67 | 0.8458 | 0.3996 | 1.7983 | 0.7558 | 1026.6 | 1.0000 | 3.5415 |
| 23000 | 23000 | 170.42 | -289.25 | 459.67 | 0.8092 | 0.3823 | 1.7720 | 0.7447 | 1022.5 | 1.0000 | 3.5326 |
| 24000 | 24000 | 155.28 | -304.39 | 459.67 | 0.7741 | 0.3657 | 1.7457 | 0.7336 | 1018.4 | 1.0000 | 3.5237 |
| 25000 | 25000 | 140.14 | -319.53 | 459.67 | 0.7405 | 0.3498 | 1.7194 | 0.7225 | 1014.3 | 1.0000 | 3.5148 |
| 26000 | 26000 | 125.00 | -334.67 | 459.67 | 0.7084 | 0.3346 | 1.6931 | 0.7114 | 1010.2 | 1.0000 | 3.5059 |
| 27000 | 27000 | 109.86 | -349.81 | 459.67 | 0.6776 | 0.3201 | 1.6668 | 0.7003 | 1006.1 | 1.0000 | 3.4970 |
| 28000 | 28000 | 94.72 | -364.95 | 459.67 | 0.6482 | 0.3062 | 1.6405 | 0.6892 | 1002.0 | 1.0000 | 3.4881 |
| 29000 | 29000 | 79.58 | -380.09 | 459.67 | 0.6201 | 0.2929 | 1.6142 | 0.6781 | 997.9 | 1.0000 | 3.4792 |
| 30000 | 30000 | 64.44 | -395.23 | 459.67 | 0.5933 | 0.2802 | 1.5879 | 0.6670 | 993.8 | 1.0000 | 3.4703 |
| 31000 | 31000 | 49.30 | -410.37 | 459.67 | 0.5677 | 0.2681 | 1.5616 | 0.6559 | 989.7 | 1.0000 | 3.4614 |
| 32000 | 32000 | 34.16 | -425.51 | 459.67 | 0.5433 | 0.2566 | 1.5353 | 0.6448 | 985.6 | 1.0000 | 3.4525 |
| 33000 | 33000 | 19.02 | -440.65 | 459.67 | 0.5200 | 0.2456 | 1.5090 | 0.6337 | 981.5 | 1.0000 | 3.4436 |
| 34000 | 34000 | 3.88 | -455.79 | 459.67 | 0.4978 | 0.2351 | 1.4827 | 0.6226 | 977.4 | 1.0000 | 3.4347 |
| 35000 | 35000 | -11.26 | -470.93 | 459.67 | 0.4766 | 0.2251 | 1.4564 | 0.6115 | 973.3 | 1.0000 | 3.4258 |
| 36000 | 36000 | -26.40 | -486.07 | 459.67 | 0.4563 | 0.2155 | 1.4301 | 0.6004 | 969.2 | 1.0000 | 3.4169 |
| 37000 | 37000 | -41.54 | -501.21 | 459.67 | 0.4369 | 0.2063 | 1.4038 | 0.5893 | 965.1 | 1.0000 | 3.4080 |
| 38000 | 38000 | -56.68 | -516.35 | 459.67 | 0.4184 | 0.1976 | 1.3775 | 0.5782 | 961.0 | 1.0000 | 3.3991 |
| 39000 | 39000 | -71.82 | -531.49 | 459.67 | 0.4007 | 0.1892 | 1.3512 | 0.5671 | 956.9 | 1.0000 | 3.3902 |
| 40000 | 40000 | -86.96 | -546.63 | 459.67 | 0.3838 | 0.1812 | 1.3249 | 0.5560 | 952.8 | 1.0000 | 3.3813 |
| 41000 | 41000 | -102.10 | -561.77 | 459.67 | 0.3676 | 0.1736 | 1.2986 | 0.5449 | 948.7 | 1.0000 | 3.3724 |
| 42000 | 42000 | -117.24 | -576.91 | 459.67 | 0.3522 | 0.1663 | 1.2723 | 0.5338 | 944.6 | 1.0000 | 3.3635 |
| 43000 | 43000 | -132.38 | -592.05 | 459.67 | 0.3374 | 0.1593 | 1.2460 | 0.5227 | 940.5 | 1.0000 | 3.3546 |
| 44000 | 44000 | -147.52 | -607.19 | 459.67 | 0.3233 | 0.1527 | 1.2197 | 0.5116 | 936.4 | 1.0000 | 3.3457 |
| 45000 | 45000 | -162.66 | -622.33 | 459.67 | 0.3098 | 0.1463 | 1.1934 | 0.5005 | 932.3 | 1.0000 | 3.3368 |
| 46000 | 46000 | -177.80 | -637.47 | 459.67 | 0.2969 | 0.1402 | 1.1671 | 0.4894 | 928.2 | 1.0000 | 3.3279 |
| 47000 | 47000 | -192.94 | -652.61 | 459.67 | 0.2845 | 0.1344 | 1.1408 | 0.4783 | 924.1 | 1.0000 | 3.3190 |
| 48000 | 48000 | -208.08 | -667.75 | 459.67 | 0.2727 | 0.1288 | 1.1145 | 0.4672 | 920.0 | 1.0000 | 3.3101 |
| 49000 | 49000 | -223.22 | -682.89 | 459.67 | 0.2614 | 0.1235 | 1.0882 | 0.4561 | 915.9 | 1.0000 | 3.3012 |
| 50000 | 50000 | -238.36 | -698.03 | 459.67 | 0.2506 | 0.1184 | 1.0619 | 0.4450 | 911.8 | 1.0000 | 3.2923 |
| 51000 | 51000 | -253.50 | -713.17 | 459.67 | 0.2403 | 0.1135 | 1.0356 | 0.4339 | 907.7 | 1.0000 | 3.2834 |
| 52000 | 52000 | -268.64 | -728.31 | 459.67 | 0.2304 | 0.1088 | 1.0093 | 0.4228 | 903.6 | 1.0000 | 3.2745 |
| 53000 | 53000 | -283.78 | -743.45 | 459.67 | 0.2209 | 0.1043 | 0.9830 | 0.4117 | 899.5 | 1.0000 | 3.2656 |
| 54000 | 54000 | -298.92 | -758.59 | 459.67 | 0.2118 | 0.1000 | 0.9567 | 0.4006 | 895.4 | 1.0000 | 3.2567 |
| 55000 | 55000 | -314.06 | -773.73 | 459.67 | 0.2031 | 0.0959 | 0.9304 | 0.3895 | 891.3 | 1.0000 | 3.2478 |
| 56000 | 56000 | -329.20 | -788.87 | 459.67 | 0.1947 | 0.0919 | 0.9041 | 0.3784 | 887.2 | 1.0000 | 3.2389 |
| 57000 | 57000 | -344.34 | -804.01 | 459.67 | 0.1867 | 0.0882 | 0.8778 | 0.3673 | 883.1 | 1.0000 | 3.2300 |
| 58000 | 58000 | -359.48 | -819.15 | 459.67 | 0.1790 | 0.0845 | 0.8515 | 0.3562 | 879.0 | 1.0000 | 3.2211 |
| 59000 | 59000 | -374.62 | -834.29 | 459.67 | 0.1716 | 0.0810 | 0.8252 | 0.3451 | 874.9 | 1.0000 | 3.2122 |
| 60000 | 60000 | -389.76 | -849.43 | 459.67 | 0.1645 | 0.0777 | 0.7989 | 0.3340 | 870.8 | 1.0000 | 3.2033 |
| 61000 | 61000 | -404.90 | -864.57 | 459.67 | 0.1577 | 0.0745 | 0.7726 | 0.3229 | 866.7 | 1.0000 | 3.1944 |
| 62000 | 62000 | -420.04 | -879.71 | 459.67 | 0.1512 | 0.0714 | 0.7463 | 0.3118 | 862.6 | 1.0000 | 3.1855 |
| 63000 | 63000 | -435.18 | -894.85 | 459.67 | 0.1450 | 0.0685 | 0.7200 | 0.3007 | 858.5 | 1.0000 | 3.1766 |
| 64000 | 64000 | -450.32 | -909.99 | 459.67 | 0.1390 | 0.0657 | 0.6937 | 0.2896 | 854.4 | 1.0000 | 3.1677 |
| 65000 | 65000 | -465.46 | -925.13 | 459.67 | 0.1333 | 0.0630 | 0.6674 | 0.2785 | 850.3 | 1.0000 | 3.1588 |
| 66000 | 66000 | -480.60 | -940.27 | 459.67 | 0.1278 | 0.0604 | 0.6411 | 0.2674 | 846.2 | 1.0000 | 3.1499 |
| 67000 | 67000 | -495.74 | -955.41 | 459.67 | 0.1226 | 0.0579 | 0.6148 | 0.2563 | 842.1 | 1.0000 | 3.1410 |
| 68000 | 68000 | -510.88 | -970.55 | 459.67 | 0.1175 | 0.0555 | 0.5885 | 0.2452 | 838.0 | 1.0000 | 3.1321 |
| 69000 | 69000 | -526.02 | -985.69 | 459.67 | 0.1127 | 0.0532 | 0.5622 | 0.2341 | 833.9 | 1.0000 | 3.1232 |
| 70000 | 70000 | -541.16 | -1000.83 | 459.67 | 0.1080 | 0.0510 | 0.5359 | 0.2230 | 829.8 | 1.0000 | 3.1143 |
| 71000 | 71000 | -556.30 | -1015.97 | 459.67 | 0.1036 | 0.0489 | 0.5096 | 0.2119 | 825.7 | 1.0000 | 3.1054 |
| 72000 | 72000 | -571.44 | -1031.11 | 459.67 | 0.0993 | 0.0469 | 0.4833 | 0.2008 | 821.6 | 1.0000 | 3.0965 |
| 73000 | 73000 | -586.58 | -1046.25 | 459.67 | 0.0952 | 0.0450 | 0.4570 | 0.1897 | 817.5 | 1.0000 | 3.0876 |
| 74000 | 74000 | -601.72 | -1061.39 | 459.67 | 0.0913 | 0.0431 | 0.4307 | 0.1786 | 813.4 | 1.0000 | 3.0787 |
| 75000 | 75000 | -616.86 | -1076.53 | 459.67 | 0.0875 | 0.0413 | 0.4044 | 0.1675 | 809.3 | 1.0000 | 3.0698 |
| 76000 | 76000 | -632.00 | -1091.67 | 459.67 | 0.0839 | 0.0396 | 0.3781 | 0.1564 | 805.2 | 1.0000 | 3.0609 |
| 77000 | 77000 | -647.14 | -1106.81 | 459.67 | 0.0804 | 0.0380 | 0.3518 | 0.1453 | 801.1 | 1.0000 | 3.0520 |
| 78000 | 78000 | -662.28 | -1121.95 | 459.67 | 0.0771 | 0.0364 | 0.3255 | 0.1342 | 797.0 | 1.0000 | 3.0431 |
| 79000 | 79000 | -677.42 | -1137.09 | 459.67 | 0.0739 | 0.0349 | 0.2992 | 0.1231 | 792.9 | 1.0000 | 3.0342 |
| 80000 | 80000 | -692.56 | -1152.23 | 459.67 | 0.0708 | 0.0334 | 0.2729 | 0.1120 | 788.8 | 1.0000 | 3.0253 |

TABLE 1.2 – CONTINUED

1962 U.S. STANDARD ATMOSPHERE, SUPPLEMENTS

| Altitude | | Temperature | | | Pressure | | Density | | Number density | Collision frequency | Molecular weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, km | $H$, km | $T$, K | $t$, °C | $T/T_0$ | $P$, mb | $P/P_0$ | $\rho$, kg/m³ | $\rho/\rho_0$ | $n$, m⁻³ | $\nu$, s⁻¹ | $M$, kg/kmol |
| 0 | 0 | 288.150 | 15.000 | 1.0000 | 1.0132 × 10³ | 1.0000 | 1.2250 | 1.0000 | 2.5470 × 10²⁵ | 7.4325 × 10⁹ | 28.964 |
| 1.000 | 1.000 | 281.651 | 8.501 | 0.9778 | 8.9874 × 10² | 0.8870 | 1.1117 | 0.9075 | 2.3109 × 10²⁵ | 6.8744 × 10⁹ | 28.964 |
| 2.000 | 1.999 | 275.154 | 2.004 | 0.9548 | 7.9501 × 10² | 0.7846 | 1.0066 | 0.8217 | 2.0924 × 10²⁵ | 6.2455 × 10⁹ | 28.964 |
| 3.000 | 2.999 | 268.659 | −6.491 | 0.9321 | 7.0121 × 10² | 0.6920 | 0.9093 | 0.7423 | 1.8900 × 10²⁵ | 5.6554 × 10⁹ | 28.964 |
| 4.000 | 3.998 | 262.166 | −12.984 | 0.9095 | 6.1660 × 10² | 0.6085 | 0.8194 | 0.6689 | 1.7032 × 10²⁵ | 5.1035 × 10⁹ | 28.964 |
| 5.000 | 4.997 | 255.676 | −19.474 | 0.8869 | 5.4048 × 10² | 0.5334 | 0.7364 | 0.6012 | 1.5314 × 10²⁵ | 4.5888 × 10⁹ | 28.964 |
| 6.000 | 5.996 | 249.187 | −25.963 | 0.8643 | 4.7217 × 10² | 0.4660 | 0.6601 | 0.5389 | 1.3718 × 10²⁵ | 4.1102 × 10⁹ | 28.964 |
| 7.000 | 6.995 | 242.700 | −32.450 | 0.8417 | 4.1105 × 10² | 0.4057 | 0.5900 | 0.4817 | 1.2263 × 10²⁵ | 3.6660 × 10⁹ | 28.964 |
| 8.000 | 7.994 | 236.215 | −38.935 | 0.8191 | 3.5651 × 10² | 0.3519 | 0.5258 | 0.4292 | 1.0929 × 10²⁵ | 3.2545 × 10⁹ | 28.964 |
| 9.000 | 8.993 | 229.733 | −45.417 | 0.7965 | 3.0800 × 10² | 0.3040 | 0.4671 | 0.3813 | 9.7080 × 10²⁴ | 2.8744 × 10⁹ | 28.964 |
| 10.000 | 9.992 | 223.252 | −51.898 | 0.7739 | 2.6499 × 10² | 0.2615 | 0.4135 | 0.3376 | 8.5970 × 10²⁴ | 2.5242 × 10⁹ | 28.964 |
| 11.000 | 10.991 | 216.774 | −56.376 | 0.7519 | 2.2699 × 10² | 0.2240 | 0.3648 | 0.2978 | 7.5870 × 10²⁴ | 2.2270 × 10⁹ | 28.964 |
| 12.000 | 11.990 | 216.774 | −56.376 | 0.7519 | 1.9399 × 10² | 0.1915 | 0.3119 | 0.2546 | 6.4858 × 10²⁴ | 1.9040 × 10⁹ | 28.964 |
| 13.000 | 12.989 | 216.774 | −56.376 | 0.7519 | 1.6579 × 10² | 0.1636 | 0.2665 | 0.2176 | 5.5417 × 10²⁴ | 1.6270 × 10⁹ | 28.964 |
| 14.000 | 13.988 | 216.774 | −56.376 | 0.7519 | 1.4170 × 10² | 0.1399 | 0.2278 | 0.1860 | 4.7364 × 10²⁴ | 1.3906 × 10⁹ | 28.964 |
| 15.000 | 14.987 | 216.774 | −56.376 | 0.7519 | 1.2112 × 10² | 0.1195 | 0.1948 | 0.1590 | 4.0486 × 10²⁴ | 1.1887 × 10⁹ | 28.964 |
| 16.000 | 15.986 | 216.774 | −56.376 | 0.7519 | 1.0353 × 10² | 0.1022 | 0.1665 | 0.1359 | 3.4611 × 10²⁴ | 1.0162 × 10⁹ | 28.964 |
| 17.000 | 16.985 | 216.774 | −56.376 | 0.7519 | 8.8497 × 10¹ | 0.0873 | 0.1423 | 0.1162 | 2.9588 × 10²⁴ | 8.6864 × 10⁸ | 28.964 |
| 18.000 | 17.984 | 216.774 | −56.376 | 0.7519 | 7.5652 × 10¹ | 0.0747 | 0.1216 | 0.0993 | 2.5292 × 10²⁴ | 7.4249 × 10⁸ | 28.964 |
| 19.000 | 18.983 | 216.774 | −56.376 | 0.7519 | 6.4677 × 10¹ | 0.0638 | 0.1040 | 0.0849 | 2.1619 × 10²⁴ | 6.3477 × 10⁸ | 28.964 |
| 20.000 | 19.982 | 216.774 | −56.376 | 0.7519 | 5.5293 × 10¹ | 0.0546 | 0.0889 | 0.0726 | 1.8479 × 10²⁴ | 5.4263 × 10⁸ | 28.964 |
| 21.000 | 20.981 | 217.581 | −55.569 | 0.7547 | 4.7289 × 10¹ | 0.0467 | 0.0758 | 0.0619 | 1.5789 × 10²⁴ | 4.6383 × 10⁸ | 28.964 |
| 22.000 | 21.980 | 218.574 | −54.576 | 0.7582 | 4.0475 × 10¹ | 0.0400 | 0.0646 | 0.0528 | 1.3498 × 10²⁴ | 3.9660 × 10⁸ | 28.964 |
| 23.000 | 22.979 | 219.567 | −53.583 | 0.7616 | 3.4668 × 10¹ | 0.0342 | 0.0551 | 0.0450 | 1.1541 × 10²⁴ | 3.3918 × 10⁸ | 28.964 |
| 24.000 | 23.978 | 220.560 | −52.590 | 0.7650 | 2.9693 × 10¹ | 0.0293 | 0.0470 | 0.0384 | 9.8670 × 10²³ | 2.8997 × 10⁸ | 28.964 |
| 25.000 | 24.977 | 221.552 | −51.598 | 0.7684 | 2.5422 × 10¹ | 0.0251 | 0.0401 | 0.0328 | 8.4346 × 10²³ | 2.4790 × 10⁸ | 28.964 |
| 26.000 | 25.976 | 222.545 | −50.605 | 0.7718 | 2.1760 × 10¹ | 0.0215 | 0.0342 | 0.0280 | 7.2109 × 10²³ | 2.1196 × 10⁸ | 28.964 |
| 27.000 | 26.975 | 223.538 | −49.612 | 0.7752 | 1.8628 × 10¹ | 0.0184 | 0.0292 | 0.0239 | 6.1650 × 10²³ | 1.8119 × 10⁸ | 28.964 |
| 28.000 | 27.974 | 224.531 | −48.619 | 0.7786 | 1.5942 × 10¹ | 0.0157 | 0.0249 | 0.0204 | 5.2702 × 10²³ | 1.5490 × 10⁸ | 28.964 |
| 29.000 | 28.973 | 225.523 | −47.627 | 0.7820 | 1.3644 × 10¹ | 0.0135 | 0.0212 | 0.0174 | 4.5071 × 10²³ | 1.3248 × 10⁸ | 28.964 |
| 30.000 | 29.972 | 226.516 | −46.634 | 0.7854 | 1.1677 × 10¹ | 0.0115 | 0.0181 | 0.0148 | 3.8546 × 10²³ | 1.1329 × 10⁸ | 28.964 |
| 31.000 | 30.971 | 227.509 | −45.641 | 0.7888 | 9.9929 × 10⁰ | 0.0099 | 0.0154 | 0.0126 | 3.2960 × 10²³ | 9.6880 × 10⁷ | 28.964 |
| 32.000 | 31.970 | 228.502 | −44.648 | 0.7922 | 8.5502 × 10⁰ | 0.0084 | 0.0131 | 0.0107 | 2.8180 × 10²³ | 8.2837 × 10⁷ | 28.964 |
| 33.000 | 32.969 | 229.494 | −43.656 | 0.7956 | 7.3150 × 10⁰ | 0.0072 | 0.0112 | 0.0091 | 2.4094 × 10²³ | 7.0837 × 10⁷ | 28.964 |
| 34.000 | 33.968 | 230.487 | −42.663 | 0.7990 | 6.2588 × 10⁰ | 0.0062 | 0.0095 | 0.0078 | 2.0606 × 10²³ | 6.0579 × 10⁷ | 28.964 |
| 35.000 | 34.967 | 231.480 | −41.670 | 0.8024 | 5.3554 × 10⁰ | 0.0053 | 0.0081 | 0.0066 | 1.7622 × 10²³ | 5.1810 × 10⁷ | 28.964 |
| 36.000 | 35.966 | 232.473 | −40.677 | 0.8058 | 4.5824 × 10⁰ | 0.0045 | 0.0069 | 0.0057 | 1.5071 × 10²³ | 4.4309 × 10⁷ | 28.964 |
| 37.000 | 36.965 | 233.465 | −39.685 | 0.8092 | 3.9203 × 10⁰ | 0.0039 | 0.0059 | 0.0048 | 1.2890 × 10²³ | 3.7894 × 10⁷ | 28.964 |
| 38.000 | 37.964 | 234.458 | −38.692 | 0.8126 | 3.3540 × 10⁰ | 0.0033 | 0.0050 | 0.0041 | 1.1024 × 10²³ | 3.2407 × 10⁷ | 28.964 |
| 39.000 | 38.963 | 235.451 | −37.699 | 0.8160 | 2.8700 × 10⁰ | 0.0028 | 0.0043 | 0.0035 | 9.4281 × 10²² | 2.7715 × 10⁷ | 28.964 |
| 40.000 | 39.962 | 236.444 | −36.706 | 0.8194 | 2.4557 × 10⁰ | 0.0024 | 0.0036 | 0.0030 | 8.0623 × 10²² | 2.3703 × 10⁷ | 28.964 |
| 41.000 | 40.961 | 237.436 | −35.714 | 0.8228 | 2.1010 × 10⁰ | 0.0021 | 0.0031 | 0.0025 | 6.8944 × 10²² | 2.0268 × 10⁷ | 28.964 |
| 42.000 | 41.960 | 238.429 | −34.721 | 0.8262 | 1.7975 × 10⁰ | 0.0018 | 0.0026 | 0.0022 | 5.8958 × 10²² | 1.7331 × 10⁷ | 28.964 |
| 43.000 | 42.959 | 239.422 | −33.728 | 0.8296 | 1.5378 × 10⁰ | 0.0015 | 0.0022 | 0.0018 | 5.0417 × 10²² | 1.4823 × 10⁷ | 28.964 |
| 44.000 | 43.958 | 240.415 | −32.735 | 0.8330 | 1.3156 × 10⁰ | 0.0013 | 0.0019 | 0.0016 | 4.3122 × 10²² | 1.2679 × 10⁷ | 28.964 |
| 45.000 | 44.957 | 241.407 | −31.743 | 0.8364 | 1.1254 × 10⁰ | 0.0011 | 0.0016 | 0.0013 | 3.6886 × 10²² | 1.0845 × 10⁷ | 28.964 |
| 46.000 | 45.956 | 242.400 | −30.750 | 0.8398 | 9.6270 × 10⁻¹ | 0.0009 | 0.0014 | 0.0011 | 3.1552 × 10²² | 9.2773 × 10⁶ | 28.964 |
| 47.000 | 46.955 | 243.393 | −29.757 | 0.8432 | 8.2350 × 10⁻¹ | 0.0008 | 0.0012 | 0.0010 | 2.6990 × 10²² | 7.9356 × 10⁶ | 28.964 |
| 48.000 | 47.954 | 244.386 | −28.764 | 0.8466 | 7.0446 × 10⁻¹ | 0.0007 | 0.0010 | 0.0008 | 2.3088 × 10²² | 6.7880 × 10⁶ | 28.964 |
| 49.000 | 48.953 | 245.378 | −27.772 | 0.8500 | 6.0270 × 10⁻¹ | 0.0006 | 0.0009 | 0.0007 | 1.9748 × 10²² | 5.8054 × 10⁶ | 28.964 |
| 50.000 | 49.952 | 246.371 | −26.779 | 0.8534 | 5.1546 × 10⁻¹ | 0.0005 | 0.0007 | 0.0006 | 1.6893 × 10²² | 4.9663 × 10⁶ | 28.964 |
| 51.000 | 50.951 | 247.364 | −25.786 | 0.8568 | 4.4090 × 10⁻¹ | 0.0004 | 0.0006 | 0.0005 | 1.4452 × 10²² | 4.2488 × 10⁶ | 28.964 |
| 52.000 | 51.950 | 248.357 | −24.793 | 0.8602 | 3.7719 × 10⁻¹ | 0.0004 | 0.0005 | 0.0004 | 1.2365 × 10²² | 3.6345 × 10⁶ | 28.964 |
| 53.000 | 52.949 | 249.349 | −23.801 | 0.8636 | 3.2265 × 10⁻¹ | 0.0003 | 0.0004 | 0.0003 | 1.0577 × 10²² | 3.1092 × 10⁶ | 28.964 |
| 54.000 | 53.948 | 250.342 | −22.808 | 0.8670 | 2.7600 × 10⁻¹ | 0.0003 | 0.0004 | 0.0003 | 9.0481 × 10²¹ | 2.6594 × 10⁶ | 28.964 |
| 55.000 | 54.947 | 251.335 | −21.815 | 0.8704 | 2.3605 × 10⁻¹ | 0.0002 | 0.0003 | 0.0002 | 7.7396 × 10²¹ | 2.2746 × 10⁶ | 28.964 |
| 56.000 | 55.946 | 252.327 | −20.823 | 0.8738 | 2.0187 × 10⁻¹ | 0.0002 | 0.0003 | 0.0002 | 6.6202 × 10²¹ | 1.9455 × 10⁶ | 28.964 |
| 57.000 | 56.945 | 253.320 | −19.830 | 0.8772 | 1.7268 × 10⁻¹ | 0.0002 | 0.0002 | 0.0002 | 5.6624 × 10²¹ | 1.6640 × 10⁶ | 28.964 |
| 58.000 | 57.944 | 254.313 | −18.837 | 0.8806 | 1.4772 × 10⁻¹ | 0.0001 | 0.0002 | 0.0001 | 4.8434 × 10²¹ | 1.4233 × 10⁶ | 28.964 |
| 59.000 | 58.943 | 255.305 | −17.845 | 0.8840 | 1.2636 × 10⁻¹ | 0.0001 | 0.0002 | 0.0001 | 4.1430 × 10²¹ | 1.2174 × 10⁶ | 28.964 |
| 60.000 | 59.942 | 256.298 | −16.852 | 0.8874 | 1.0808 × 10⁻¹ | 0.0001 | 0.0001 | 0.0001 | 3.5438 × 10²¹ | 1.0413 × 10⁶ | 28.964 |
| 61.000 | 60.941 | 257.291 | −15.859 | 0.8908 | 9.2457 × 10⁻² | 0.0001 | 0.0001 | 0.0001 | 3.0312 × 10²¹ | 8.9071 × 10⁵ | 28.964 |
| 62.000 | 61.940 | 258.284 | −14.866 | 0.8942 | 7.9081 × 10⁻² | 0.0001 | 0.0001 | 0.0001 | 2.5931 × 10²¹ | 7.6199 × 10⁵ | 28.964 |
| 63.000 | 62.939 | 259.276 | −13.874 | 0.8976 | 6.7648 × 10⁻² | 0.0001 | 0.0001 | 0.0001 | 2.2182 × 10²¹ | 6.5172 × 10⁵ | 28.964 |
| 64.000 | 63.938 | 260.269 | −12.881 | 0.9010 | 5.7864 × 10⁻² | 0.0001 | 0.0001 | 0.0000 | 1.8972 × 10²¹ | 5.5737 × 10⁵ | 28.964 |
| 65.000 | 64.937 | 261.262 | −11.888 | 0.9044 | 4.9496 × 10⁻² | 0.0000 | 0.0001 | 0.0000 | 1.6227 × 10²¹ | 4.7684 × 10⁵ | 28.964 |
| 66.000 | 65.936 | 262.254 | −10.896 | 0.9078 | 4.2345 × 10⁻² | 0.0000 | 0.0001 | 0.0000 | 1.3882 × 10²¹ | 4.0797 × 10⁵ | 28.964 |
| 67.000 | 66.935 | 263.247 | −9.903 | 0.9112 | 3.6230 × 10⁻² | 0.0000 | 0.0001 | 0.0000 | 1.1878 × 10²¹ | 3.4907 × 10⁵ | 28.964 |
| 68.000 | 67.934 | 264.240 | −8.910 | 0.9146 | 3.1000 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 1.0164 × 10²¹ | 2.9866 × 10⁵ | 28.964 |
| 69.000 | 68.933 | 265.233 | −7.917 | 0.9180 | 2.6526 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 8.6972 × 10²⁰ | 2.5559 × 10⁵ | 28.964 |
| 70.000 | 69.932 | 266.225 | −6.925 | 0.9214 | 2.2696 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 7.4417 × 10²⁰ | 2.1869 × 10⁵ | 28.964 |
| 71.000 | 70.931 | 267.218 | −5.932 | 0.9248 | 1.9416 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 6.3664 × 10²⁰ | 1.8708 × 10⁵ | 28.964 |
| 72.000 | 71.930 | 268.211 | −4.939 | 0.9282 | 1.6607 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 5.4466 × 10²⁰ | 1.6004 × 10⁵ | 28.964 |
| 73.000 | 72.929 | 269.203 | −3.947 | 0.9316 | 1.4206 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 4.6601 × 10²⁰ | 1.3693 × 10⁵ | 28.964 |
| 74.000 | 73.928 | 270.196 | −2.954 | 0.9350 | 1.2156 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 3.9877 × 10²⁰ | 1.1719 × 10⁵ | 28.964 |
| 75.000 | 74.927 | 271.189 | −1.961 | 0.9384 | 1.0404 × 10⁻² | 0.0000 | 0.0000 | 0.0000 | 3.4127 × 10²⁰ | 1.0030 × 10⁵ | 28.964 |
| 76.000 | 75.926 | 272.181 | −0.969 | 0.9418 | 8.9029 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 2.9208 × 10²⁰ | 8.5837 × 10⁴ | 28.964 |
| 77.000 | 76.925 | 273.174 | 0.024 | 0.9452 | 7.6189 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 2.4997 × 10²⁰ | 7.3451 × 10⁴ | 28.964 |
| 78.000 | 77.924 | 274.167 | 1.017 | 0.9486 | 6.5191 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 2.1390 × 10²⁰ | 6.2851 × 10⁴ | 28.964 |
| 79.000 | 78.923 | 275.159 | 2.010 | 0.9520 | 5.5779 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 1.8302 × 10²⁰ | 5.3779 × 10⁴ | 28.964 |
| 80.000 | 79.922 | 276.152 | 3.002 | 0.9554 | 4.7731 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 1.5661 × 10²⁰ | 4.6016 × 10⁴ | 28.964 |
| 81.000 | 80.921 | 277.145 | 3.995 | 0.9588 | 4.0850 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 1.3403 × 10²⁰ | 3.9387 × 10⁴ | 28.964 |
| 82.000 | 81.920 | 278.137 | 4.988 | 0.9622 | 3.4966 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 1.1472 × 10²⁰ | 3.3716 × 10⁴ | 28.964 |
| 83.000 | 82.919 | 279.130 | 5.980 | 0.9656 | 2.9931 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 9.8189 × 10¹⁹ | 2.8862 × 10⁴ | 28.964 |
| 84.000 | 83.918 | 280.123 | 6.973 | 0.9690 | 2.5617 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 8.4048 × 10¹⁹ | 2.4707 × 10⁴ | 28.964 |
| 85.000 | 84.917 | 281.115 | 7.966 | 0.9724 | 2.1923 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 7.1949 × 10¹⁹ | 2.1147 × 10⁴ | 28.964 |
| 86.000 | 85.916 | 282.108 | 8.958 | 0.9758 | 1.8763 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 6.1577 × 10¹⁹ | 1.8095 × 10⁴ | 28.964 |
| 87.000 | 86.915 | 283.101 | 9.951 | 0.9792 | 1.6059 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 5.2697 × 10¹⁹ | 1.5486 × 10⁴ | 28.964 |
| 88.000 | 87.914 | 284.093 | 10.944 | 0.9826 | 1.3746 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 4.5107 × 10¹⁹ | 1.3254 × 10⁴ | 28.964 |
| 89.000 | 88.913 | 285.086 | 11.936 | 0.9860 | 1.1767 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 3.8612 × 10¹⁹ | 1.1346 × 10⁴ | 28.964 |
| 90.000 | 89.912 | 286.079 | 12.929 | 0.9894 | 1.0072 × 10⁻³ | 0.0000 | 0.0000 | 0.0000 | 3.3048 × 10¹⁹ | 9.7124 × 10³ | 28.964 |

TABLE 3.2 – Continued

SI Units

ATMOSPHERE AT ALTITUDE, KILOMETRES (CONT.)

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Dynamic viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, km | $Z$, km | $T$, K | $t$, °C | $T - T_{std}$, K | $P$, mb | $\frac{P}{P_0}$ | $\rho$, kg m$^{-3}$ | $\frac{\rho}{\rho_0}$ | $\frac{a}{a_0}$ | $\mu$, kg m$^{-1}$ s$^{-1}$ | $k$, W m$^{-1}$ K$^{-1}$ |
| 0.000 | 0.000 | 288.150 | 15.000 | 0.000 | 1013.250 | 1.0000 | 1.2250 | 1.0000 | 340.294 | 1.789 × 10$^{-5}$ | 2.533 × 10$^{-2}$ |
| 0.050 | 0.050 | 287.925 | 14.775 | 0.000 | 1007.187 | 0.9940 | 1.2217 | 0.9973 | 339.999 | 1.787 × 10$^{-5}$ | 2.531 × 10$^{-2}$ |
| 0.100 | 0.100 | 287.700 | 14.550 | 0.000 | 1001.125 | 0.9881 | 1.2184 | 0.9946 | 339.704 | 1.785 × 10$^{-5}$ | 2.529 × 10$^{-2}$ |
| 0.150 | 0.150 | 287.475 | 14.325 | 0.000 | 995.063 | 0.9821 | 1.2151 | 0.9919 | 339.408 | 1.783 × 10$^{-5}$ | 2.527 × 10$^{-2}$ |
| 0.200 | 0.200 | 287.250 | 14.100 | 0.000 | 989.000 | 0.9762 | 1.2118 | 0.9892 | 339.112 | 1.781 × 10$^{-5}$ | 2.525 × 10$^{-2}$ |
| 0.250 | 0.250 | 287.025 | 13.875 | 0.000 | 982.938 | 0.9702 | 1.2085 | 0.9865 | 338.816 | 1.779 × 10$^{-5}$ | 2.523 × 10$^{-2}$ |
| 0.300 | 0.300 | 286.800 | 13.650 | 0.000 | 976.875 | 0.9643 | 1.2052 | 0.9838 | 338.520 | 1.777 × 10$^{-5}$ | 2.521 × 10$^{-2}$ |
| 0.350 | 0.350 | 286.575 | 13.425 | 0.000 | 970.813 | 0.9583 | 1.2019 | 0.9811 | 338.224 | 1.775 × 10$^{-5}$ | 2.519 × 10$^{-2}$ |
| 0.400 | 0.400 | 286.350 | 13.200 | 0.000 | 964.750 | 0.9524 | 1.1986 | 0.9784 | 337.928 | 1.773 × 10$^{-5}$ | 2.517 × 10$^{-2}$ |
| 0.450 | 0.450 | 286.125 | 12.975 | 0.000 | 958.688 | 0.9464 | 1.1953 | 0.9757 | 337.632 | 1.771 × 10$^{-5}$ | 2.515 × 10$^{-2}$ |
| 0.500 | 0.500 | 285.900 | 12.750 | 0.000 | 952.625 | 0.9405 | 1.1920 | 0.9730 | 337.336 | 1.769 × 10$^{-5}$ | 2.513 × 10$^{-2}$ |
| 0.550 | 0.550 | 285.675 | 12.525 | 0.000 | 946.563 | 0.9345 | 1.1887 | 0.9703 | 337.040 | 1.767 × 10$^{-5}$ | 2.511 × 10$^{-2}$ |
| 0.600 | 0.600 | 285.450 | 12.300 | 0.000 | 940.500 | 0.9286 | 1.1854 | 0.9676 | 336.744 | 1.765 × 10$^{-5}$ | 2.509 × 10$^{-2}$ |
| 0.650 | 0.650 | 285.225 | 12.075 | 0.000 | 934.438 | 0.9226 | 1.1821 | 0.9649 | 336.448 | 1.763 × 10$^{-5}$ | 2.507 × 10$^{-2}$ |
| 0.700 | 0.700 | 285.000 | 11.850 | 0.000 | 928.375 | 0.9167 | 1.1788 | 0.9622 | 336.152 | 1.761 × 10$^{-5}$ | 2.505 × 10$^{-2}$ |
| 0.750 | 0.750 | 284.775 | 11.625 | 0.000 | 922.313 | 0.9107 | 1.1755 | 0.9595 | 335.856 | 1.759 × 10$^{-5}$ | 2.503 × 10$^{-2}$ |
| 0.800 | 0.800 | 284.550 | 11.400 | 0.000 | 916.250 | 0.9048 | 1.1722 | 0.9568 | 335.560 | 1.757 × 10$^{-5}$ | 2.501 × 10$^{-2}$ |
| 0.850 | 0.850 | 284.325 | 11.175 | 0.000 | 910.188 | 0.8988 | 1.1689 | 0.9541 | 335.264 | 1.755 × 10$^{-5}$ | 2.499 × 10$^{-2}$ |
| 0.900 | 0.900 | 284.100 | 10.950 | 0.000 | 904.125 | 0.8929 | 1.1656 | 0.9514 | 334.968 | 1.753 × 10$^{-5}$ | 2.497 × 10$^{-2}$ |
| 0.950 | 0.950 | 283.875 | 10.725 | 0.000 | 898.063 | 0.8869 | 1.1623 | 0.9487 | 334.672 | 1.751 × 10$^{-5}$ | 2.495 × 10$^{-2}$ |
| 1.000 | 1.000 | 283.650 | 10.500 | 0.000 | 892.000 | 0.8810 | 1.1590 | 0.9460 | 334.376 | 1.749 × 10$^{-5}$ | 2.493 × 10$^{-2}$ |
| 1.050 | 1.050 | 283.425 | 10.275 | 0.000 | 885.938 | 0.8750 | 1.1557 | 0.9433 | 334.080 | 1.747 × 10$^{-5}$ | 2.491 × 10$^{-2}$ |
| 1.100 | 1.100 | 283.200 | 10.050 | 0.000 | 879.875 | 0.8691 | 1.1524 | 0.9406 | 333.784 | 1.745 × 10$^{-5}$ | 2.489 × 10$^{-2}$ |
| 1.150 | 1.150 | 282.975 | 9.825 | 0.000 | 873.813 | 0.8631 | 1.1491 | 0.9379 | 333.488 | 1.743 × 10$^{-5}$ | 2.487 × 10$^{-2}$ |
| 1.200 | 1.200 | 282.750 | 9.600 | 0.000 | 867.750 | 0.8572 | 1.1458 | 0.9352 | 333.192 | 1.741 × 10$^{-5}$ | 2.485 × 10$^{-2}$ |
| 1.250 | 1.250 | 282.525 | 9.375 | 0.000 | 861.688 | 0.8512 | 1.1425 | 0.9325 | 332.896 | 1.739 × 10$^{-5}$ | 2.483 × 10$^{-2}$ |
| 1.300 | 1.300 | 282.300 | 9.150 | 0.000 | 855.625 | 0.8453 | 1.1392 | 0.9298 | 332.600 | 1.737 × 10$^{-5}$ | 2.481 × 10$^{-2}$ |
| 1.350 | 1.350 | 282.075 | 8.925 | 0.000 | 849.563 | 0.8393 | 1.1359 | 0.9271 | 332.304 | 1.735 × 10$^{-5}$ | 2.479 × 10$^{-2}$ |
| 1.400 | 1.400 | 281.850 | 8.700 | 0.000 | 843.500 | 0.8334 | 1.1326 | 0.9244 | 332.008 | 1.733 × 10$^{-5}$ | 2.477 × 10$^{-2}$ |
| 1.450 | 1.450 | 281.625 | 8.475 | 0.000 | 837.438 | 0.8274 | 1.1293 | 0.9217 | 331.712 | 1.731 × 10$^{-5}$ | 2.475 × 10$^{-2}$ |
| 1.500 | 1.500 | 281.400 | 8.250 | 0.000 | 831.375 | 0.8215 | 1.1260 | 0.9190 | 331.416 | 1.729 × 10$^{-5}$ | 2.473 × 10$^{-2}$ |
| 1.550 | 1.550 | 281.175 | 8.025 | 0.000 | 825.313 | 0.8155 | 1.1227 | 0.9163 | 331.120 | 1.727 × 10$^{-5}$ | 2.471 × 10$^{-2}$ |
| 1.600 | 1.600 | 280.950 | 7.800 | 0.000 | 819.250 | 0.8096 | 1.1194 | 0.9136 | 330.824 | 1.725 × 10$^{-5}$ | 2.469 × 10$^{-2}$ |
| 1.650 | 1.650 | 280.725 | 7.575 | 0.000 | 813.188 | 0.8036 | 1.1161 | 0.9109 | 330.528 | 1.723 × 10$^{-5}$ | 2.467 × 10$^{-2}$ |
| 1.700 | 1.700 | 280.500 | 7.350 | 0.000 | 807.125 | 0.7977 | 1.1128 | 0.9082 | 330.232 | 1.721 × 10$^{-5}$ | 2.465 × 10$^{-2}$ |
| 1.750 | 1.750 | 280.275 | 7.125 | 0.000 | 801.063 | 0.7917 | 1.1095 | 0.9055 | 329.936 | 1.719 × 10$^{-5}$ | 2.463 × 10$^{-2}$ |
| 1.800 | 1.800 | 280.050 | 6.900 | 0.000 | 795.000 | 0.7858 | 1.1062 | 0.9028 | 329.640 | 1.717 × 10$^{-5}$ | 2.461 × 10$^{-2}$ |
| 1.850 | 1.850 | 279.825 | 6.675 | 0.000 | 788.938 | 0.7798 | 1.1029 | 0.9001 | 329.344 | 1.715 × 10$^{-5}$ | 2.459 × 10$^{-2}$ |
| 1.900 | 1.900 | 279.600 | 6.450 | 0.000 | 782.875 | 0.7739 | 1.0996 | 0.8974 | 329.048 | 1.713 × 10$^{-5}$ | 2.457 × 10$^{-2}$ |
| 1.950 | 1.950 | 279.375 | 6.225 | 0.000 | 776.813 | 0.7679 | 1.0963 | 0.8947 | 328.752 | 1.711 × 10$^{-5}$ | 2.455 × 10$^{-2}$ |
| 2.000 | 2.000 | 279.150 | 6.000 | 0.000 | 770.750 | 0.7620 | 1.0930 | 0.8920 | 328.456 | 1.709 × 10$^{-5}$ | 2.453 × 10$^{-2}$ |
| 2.050 | 2.050 | 278.925 | 5.775 | 0.000 | 764.688 | 0.7560 | 1.0897 | 0.8893 | 328.160 | 1.707 × 10$^{-5}$ | 2.451 × 10$^{-2}$ |
| 2.100 | 2.100 | 278.700 | 5.550 | 0.000 | 758.625 | 0.7501 | 1.0864 | 0.8866 | 327.864 | 1.705 × 10$^{-5}$ | 2.449 × 10$^{-2}$ |
| 2.150 | 2.150 | 278.475 | 5.325 | 0.000 | 752.563 | 0.7441 | 1.0831 | 0.8839 | 327.568 | 1.703 × 10$^{-5}$ | 2.447 × 10$^{-2}$ |
| 2.200 | 2.200 | 278.250 | 5.100 | 0.000 | 746.500 | 0.7382 | 1.0798 | 0.8812 | 327.272 | 1.701 × 10$^{-5}$ | 2.445 × 10$^{-2}$ |
| 2.250 | 2.250 | 278.025 | 4.875 | 0.000 | 740.438 | 0.7322 | 1.0765 | 0.8785 | 326.976 | 1.699 × 10$^{-5}$ | 2.443 × 10$^{-2}$ |
| 2.300 | 2.300 | 277.800 | 4.650 | 0.000 | 734.375 | 0.7263 | 1.0732 | 0.8758 | 326.680 | 1.697 × 10$^{-5}$ | 2.441 × 10$^{-2}$ |
| 2.350 | 2.350 | 277.575 | 4.425 | 0.000 | 728.313 | 0.7203 | 1.0699 | 0.8731 | 326.384 | 1.695 × 10$^{-5}$ | 2.439 × 10$^{-2}$ |
| 2.400 | 2.400 | 277.350 | 4.200 | 0.000 | 722.250 | 0.7144 | 1.0666 | 0.8704 | 326.088 | 1.693 × 10$^{-5}$ | 2.437 × 10$^{-2}$ |
| 2.450 | 2.450 | 277.125 | 3.975 | 0.000 | 716.188 | 0.7084 | 1.0633 | 0.8677 | 325.792 | 1.691 × 10$^{-5}$ | 2.435 × 10$^{-2}$ |
| 2.500 | 2.500 | 276.900 | 3.750 | 0.000 | 710.125 | 0.7025 | 1.0600 | 0.8650 | 325.496 | 1.689 × 10$^{-5}$ | 2.433 × 10$^{-2}$ |
| 2.550 | 2.550 | 276.675 | 3.525 | 0.000 | 704.063 | 0.6965 | 1.0567 | 0.8623 | 325.200 | 1.687 × 10$^{-5}$ | 2.431 × 10$^{-2}$ |
| 2.600 | 2.600 | 276.450 | 3.300 | 0.000 | 698.000 | 0.6906 | 1.0534 | 0.8596 | 324.904 | 1.685 × 10$^{-5}$ | 2.429 × 10$^{-2}$ |
| 2.650 | 2.650 | 276.225 | 3.075 | 0.000 | 691.938 | 0.6846 | 1.0501 | 0.8569 | 324.608 | 1.683 × 10$^{-5}$ | 2.427 × 10$^{-2}$ |
| 2.700 | 2.700 | 276.000 | 2.850 | 0.000 | 685.875 | 0.6787 | 1.0468 | 0.8542 | 324.312 | 1.681 × 10$^{-5}$ | 2.425 × 10$^{-2}$ |
| 2.750 | 2.750 | 275.775 | 2.625 | 0.000 | 679.813 | 0.6727 | 1.0435 | 0.8515 | 324.016 | 1.679 × 10$^{-5}$ | 2.423 × 10$^{-2}$ |
| 2.800 | 2.800 | 275.550 | 2.400 | 0.000 | 673.750 | 0.6668 | 1.0402 | 0.8488 | 323.720 | 1.677 × 10$^{-5}$ | 2.421 × 10$^{-2}$ |
| 2.850 | 2.850 | 275.325 | 2.175 | 0.000 | 667.688 | 0.6608 | 1.0369 | 0.8461 | 323.424 | 1.675 × 10$^{-5}$ | 2.419 × 10$^{-2}$ |
| 2.900 | 2.900 | 275.100 | 1.950 | 0.000 | 661.625 | 0.6549 | 1.0336 | 0.8434 | 323.128 | 1.673 × 10$^{-5}$ | 2.417 × 10$^{-2}$ |
| 2.950 | 2.950 | 274.875 | 1.725 | 0.000 | 655.563 | 0.6489 | 1.0303 | 0.8407 | 322.832 | 1.671 × 10$^{-5}$ | 2.415 × 10$^{-2}$ |
| 3.000 | 3.000 | 274.650 | 1.500 | 0.000 | 649.500 | 0.6430 | 1.0270 | 0.8380 | 322.536 | 1.669 × 10$^{-5}$ | 2.413 × 10$^{-2}$ |
| 3.050 | 3.050 | 274.425 | 1.275 | 0.000 | 643.438 | 0.6370 | 1.0237 | 0.8353 | 322.240 | 1.667 × 10$^{-5}$ | 2.411 × 10$^{-2}$ |
| 3.100 | 3.100 | 274.200 | 1.050 | 0.000 | 637.375 | 0.6311 | 1.0204 | 0.8326 | 321.944 | 1.665 × 10$^{-5}$ | 2.409 × 10$^{-2}$ |
| 3.150 | 3.150 | 273.975 | 0.825 | 0.000 | 631.313 | 0.6251 | 1.0171 | 0.8299 | 321.648 | 1.663 × 10$^{-5}$ | 2.407 × 10$^{-2}$ |
| 3.200 | 3.200 | 273.750 | 0.600 | 0.000 | 625.250 | 0.6192 | 1.0138 | 0.8272 | 321.352 | 1.661 × 10$^{-5}$ | 2.405 × 10$^{-2}$ |
| 3.250 | 3.250 | 273.525 | 0.375 | 0.000 | 619.188 | 0.6132 | 1.0105 | 0.8245 | 321.056 | 1.659 × 10$^{-5}$ | 2.403 × 10$^{-2}$ |
| 3.300 | 3.300 | 273.300 | 0.150 | 0.000 | 613.125 | 0.6073 | 1.0072 | 0.8218 | 320.760 | 1.657 × 10$^{-5}$ | 2.401 × 10$^{-2}$ |
| 3.350 | 3.350 | 273.075 | −0.075 | 0.000 | 607.063 | 0.6013 | 1.0039 | 0.8191 | 320.464 | 1.655 × 10$^{-5}$ | 2.399 × 10$^{-2}$ |
| 3.400 | 3.400 | 272.850 | −0.300 | 0.000 | 601.000 | 0.5954 | 1.0006 | 0.8164 | 320.168 | 1.653 × 10$^{-5}$ | 2.397 × 10$^{-2}$ |
| 3.450 | 3.450 | 272.625 | −0.525 | 0.000 | 594.938 | 0.5894 | 0.9973 | 0.8137 | 319.872 | 1.651 × 10$^{-5}$ | 2.395 × 10$^{-2}$ |
| 3.500 | 3.500 | 272.400 | −0.750 | 0.000 | 588.875 | 0.5835 | 0.9940 | 0.8110 | 319.576 | 1.649 × 10$^{-5}$ | 2.393 × 10$^{-2}$ |
| 3.550 | 3.550 | 272.175 | −0.975 | 0.000 | 582.813 | 0.5775 | 0.9907 | 0.8083 | 319.280 | 1.647 × 10$^{-5}$ | 2.391 × 10$^{-2}$ |
| 3.600 | 3.600 | 271.950 | −1.200 | 0.000 | 576.750 | 0.5716 | 0.9874 | 0.8056 | 318.984 | 1.645 × 10$^{-5}$ | 2.389 × 10$^{-2}$ |
| 3.650 | 3.650 | 271.725 | −1.425 | 0.000 | 570.688 | 0.5656 | 0.9841 | 0.8029 | 318.688 | 1.643 × 10$^{-5}$ | 2.387 × 10$^{-2}$ |
| 3.700 | 3.700 | 271.500 | −1.650 | 0.000 | 564.625 | 0.5597 | 0.9808 | 0.8002 | 318.392 | 1.641 × 10$^{-5}$ | 2.385 × 10$^{-2}$ |
| 3.750 | 3.750 | 271.275 | −1.875 | 0.000 | 558.563 | 0.5537 | 0.9775 | 0.7975 | 318.096 | 1.639 × 10$^{-5}$ | 2.383 × 10$^{-2}$ |
| 3.800 | 3.800 | 271.050 | −2.100 | 0.000 | 552.500 | 0.5478 | 0.9742 | 0.7948 | 317.800 | 1.637 × 10$^{-5}$ | 2.381 × 10$^{-2}$ |
| 3.850 | 3.850 | 270.825 | −2.325 | 0.000 | 546.438 | 0.5418 | 0.9709 | 0.7921 | 317.504 | 1.635 × 10$^{-5}$ | 2.379 × 10$^{-2}$ |
| 3.900 | 3.900 | 270.600 | −2.550 | 0.000 | 540.375 | 0.5359 | 0.9676 | 0.7894 | 317.208 | 1.633 × 10$^{-5}$ | 2.377 × 10$^{-2}$ |
| 3.950 | 3.950 | 270.375 | −2.775 | 0.000 | 534.313 | 0.5299 | 0.9643 | 0.7867 | 316.912 | 1.631 × 10$^{-5}$ | 2.375 × 10$^{-2}$ |
| 4.000 | 4.000 | 270.150 | −3.000 | 0.000 | 528.250 | 0.5240 | 0.9610 | 0.7840 | 316.616 | 1.629 × 10$^{-5}$ | 2.373 × 10$^{-2}$ |
| 4.050 | 4.050 | 269.925 | −3.225 | 0.000 | 522.188 | 0.5180 | 0.9577 | 0.7813 | 316.320 | 1.627 × 10$^{-5}$ | 2.371 × 10$^{-2}$ |
| 4.100 | 4.100 | 269.700 | −3.450 | 0.000 | 516.125 | 0.5121 | 0.9544 | 0.7786 | 316.024 | 1.625 × 10$^{-5}$ | 2.369 × 10$^{-2}$ |
| 4.150 | 4.150 | 269.475 | −3.675 | 0.000 | 510.063 | 0.5061 | 0.9511 | 0.7759 | 315.728 | 1.623 × 10$^{-5}$ | 2.367 × 10$^{-2}$ |
| 4.200 | 4.200 | 269.250 | −3.900 | 0.000 | 504.000 | 0.5002 | 0.9478 | 0.7732 | 315.432 | 1.621 × 10$^{-5}$ | 2.365 × 10$^{-2}$ |
| 4.250 | 4.250 | 269.025 | −4.125 | 0.000 | 497.938 | 0.4942 | 0.9445 | 0.7705 | 315.136 | 1.619 × 10$^{-5}$ | 2.363 × 10$^{-2}$ |
| 4.300 | 4.300 | 268.800 | −4.350 | 0.000 | 491.875 | 0.4883 | 0.9412 | 0.7678 | 314.840 | 1.617 × 10$^{-5}$ | 2.361 × 10$^{-2}$ |
| 4.350 | 4.350 | 268.575 | −4.575 | 0.000 | 485.813 | 0.4823 | 0.9379 | 0.7651 | 314.544 | 1.615 × 10$^{-5}$ | 2.359 × 10$^{-2}$ |
| 4.400 | 4.400 | 268.350 | −4.800 | 0.000 | 479.750 | 0.4764 | 0.9346 | 0.7624 | 314.248 | 1.613 × 10$^{-5}$ | 2.357 × 10$^{-2}$ |
| 4.450 | 4.450 | 268.125 | −5.025 | 0.000 | 473.688 | 0.4704 | 0.9313 | 0.7597 | 313.952 | 1.611 × 10$^{-5}$ | 2.355 × 10$^{-2}$ |
| 4.500 | 4.500 | 267.900 | −5.250 | 0.000 | 467.625 | 0.4645 | 0.9280 | 0.7570 | 313.656 | 1.609 × 10$^{-5}$ | 2.353 × 10$^{-2}$ |
| 4.550 | 4.550 | 267.675 | −5.475 | 0.000 | 461.563 | 0.4585 | 0.9247 | 0.7543 | 313.360 | 1.607 × 10$^{-5}$ | 2.351 × 10$^{-2}$ |
| 4.600 | 4.600 | 267.450 | −5.700 | 0.000 | 455.500 | 0.4526 | 0.9214 | 0.7516 | 313.064 | 1.605 × 10$^{-5}$ | 2.349 × 10$^{-2}$ |
| 4.650 | 4.650 | 267.225 | −5.925 | 0.000 | 449.438 | 0.4466 | 0.9181 | 0.7489 | 312.768 | 1.603 × 10$^{-5}$ | 2.347 × 10$^{-2}$ |
| 4.700 | 4.700 | 267.000 | −6.150 | 0.000 | 443.375 | 0.4407 | 0.9148 | 0.7462 | 312.472 | 1.601 × 10$^{-5}$ | 2.345 × 10$^{-2}$ |
| 4.750 | 4.750 | 266.775 | −6.375 | 0.000 | 437.313 | 0.4347 | 0.9115 | 0.7435 | 312.176 | 1.599 × 10$^{-5}$ | 2.343 × 10$^{-2}$ |
| 4.800 | 4.800 | 266.550 | −6.600 | 0.000 | 431.250 | 0.4288 | 0.9082 | 0.7408 | 311.880 | 1.597 × 10$^{-5}$ | 2.341 × 10$^{-2}$ |
| 4.850 | 4.850 | 266.325 | −6.825 | 0.000 | 425.188 | 0.4228 | 0.9049 | 0.7381 | 311.584 | 1.595 × 10$^{-5}$ | 2.339 × 10$^{-2}$ |
| 4.900 | 4.900 | 266.100 | −7.050 | 0.000 | 419.125 | 0.4169 | 0.9016 | 0.7354 | 311.288 | 1.593 × 10$^{-5}$ | 2.337 × 10$^{-2}$ |
| 4.950 | 4.950 | 265.875 | −7.275 | 0.000 | 413.063 | 0.4109 | 0.8983 | 0.7327 | 310.992 | 1.591 × 10$^{-5}$ | 2.335 × 10$^{-2}$ |
| 5.000 | 5.000 | 265.650 | −7.500 | 0.000 | 407.000 | 0.4050 | 0.8950 | 0.7300 | 310.696 | 1.589 × 10$^{-5}$ | 2.333 × 10$^{-2}$ |

TABLE 3.2 — Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, ft | H, ft | T, °R | t, °F | T − T₀ | P, in. Hg | P/P₀ | ρ | ρ/ρ₀ | C, ft/sec | μ | [illegible] |

Table 5.2 – Continued

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, m | $Z$, m | $T$, K | $t$, °C | $T - T_{ISA}$, K | $P / P_0$ | $P$, Pa | $\rho / \rho_0$ | $\rho$, kg/m³ | $a$, m/s | $\mu$, Pa·s | $\lambda$, W/(m·K) |
| 0 | 0 | 288.15 | 15.00 | 0.00 | 1.0000 | 101325 | 1.0000 | 1.2250 | 340.29 | $1.7894 \cdot 10^{-5}$ | $2.5348 \cdot 10^{-2}$ |
| 500 | 500 | 284.90 | 11.75 | 0.00 | 0.9421 | 95461 | 0.9529 | 1.1673 | 338.37 | $1.7579 \cdot 10^{-5}$ | $2.5120 \cdot 10^{-2}$ |
| 1000 | 1000 | 281.65 | 8.50 | 0.00 | 0.8870 | 89876 | 0.9075 | 1.1117 | 336.43 | $1.7260 \cdot 10^{-5}$ | $2.4889 \cdot 10^{-2}$ |
| 1500 | 1499 | 278.40 | 5.25 | 0.00 | 0.8345 | 84559 | 0.8638 | 1.0581 | 334.48 | $1.6938 \cdot 10^{-5}$ | $2.4656 \cdot 10^{-2}$ |
| 2000 | 1999 | 275.15 | 2.00 | 0.00 | 0.7846 | 79501 | 0.8217 | 1.0065 | 332.52 | $1.6612 \cdot 10^{-5}$ | $2.4419 \cdot 10^{-2}$ |
| 2500 | 2498 | 271.90 | -1.25 | 0.00 | 0.7372 | 74691 | 0.7812 | 0.9569 | 330.54 | $1.6282 \cdot 10^{-5}$ | $2.4179 \cdot 10^{-2}$ |
| 3000 | 2997 | 268.65 | -4.50 | 0.00 | 0.6920 | 70121 | 0.7423 | 0.9092 | 328.55 | $1.5949 \cdot 10^{-5}$ | $2.3936 \cdot 10^{-2}$ |
| 3500 | 3496 | 265.40 | -7.75 | 0.00 | 0.6492 | 65782 | 0.7048 | 0.8634 | 326.54 | $1.5612 \cdot 10^{-5}$ | $2.3689 \cdot 10^{-2}$ |
| 4000 | 3995 | 262.15 | -11.00 | 0.00 | 0.6085 | 61664 | 0.6689 | 0.8194 | 324.52 | $1.5271 \cdot 10^{-5}$ | $2.3439 \cdot 10^{-2}$ |
| 4500 | 4494 | 258.90 | -14.25 | 0.00 | 0.5700 | 57759 | 0.6343 | 0.7771 | 322.48 | $1.4926 \cdot 10^{-5}$ | $2.3185 \cdot 10^{-2}$ |
| 5000 | 4992 | 255.65 | -17.50 | 0.00 | 0.5334 | 54056 | 0.6012 | 0.7364 | 320.43 | $1.4577 \cdot 10^{-5}$ | $2.2928 \cdot 10^{-2}$ |
| 5500 | 5491 | 252.40 | -20.75 | 0.00 | 0.4988 | 50548 | 0.5694 | 0.6972 | 318.36 | $1.4223 \cdot 10^{-5}$ | $2.2667 \cdot 10^{-2}$ |
| 6000 | 5989 | 249.15 | -24.00 | 0.00 | 0.4660 | 47228 | 0.5389 | 0.6597 | 316.27 | $1.3865 \cdot 10^{-5}$ | $2.2402 \cdot 10^{-2}$ |
| 6500 | 6487 | 245.90 | -27.25 | 0.00 | 0.4350 | 44086 | 0.5096 | 0.6236 | 314.16 | $1.3502 \cdot 10^{-5}$ | $2.2133 \cdot 10^{-2}$ |
| 7000 | 6985 | 242.65 | -30.50 | 0.00 | 0.4057 | 41113 | 0.4817 | 0.5890 | 312.03 | $1.3135 \cdot 10^{-5}$ | $2.1860 \cdot 10^{-2}$ |
| 7500 | 7483 | 239.40 | -33.75 | 0.00 | 0.3780 | 38302 | 0.4550 | 0.5558 | 309.88 | $1.2763 \cdot 10^{-5}$ | $2.1583 \cdot 10^{-2}$ |
| 8000 | 7981 | 236.15 | -37.00 | 0.00 | 0.3519 | 35645 | 0.4296 | 0.5239 | 307.70 | $1.2387 \cdot 10^{-5}$ | $2.1301 \cdot 10^{-2}$ |
| 8500 | 8479 | 232.90 | -40.25 | 0.00 | 0.3272 | 33136 | 0.4054 | 0.4932 | 305.51 | $1.2006 \cdot 10^{-5}$ | $2.1015 \cdot 10^{-2}$ |
| 9000 | 8977 | 229.65 | -43.50 | 0.00 | 0.3040 | 30768 | 0.3825 | 0.4638 | 303.29 | $1.1621 \cdot 10^{-5}$ | $2.0725 \cdot 10^{-2}$ |
| 9500 | 9474 | 226.40 | -46.75 | 0.00 | 0.2821 | 28535 | 0.3607 | 0.4355 | 301.05 | $1.1230 \cdot 10^{-5}$ | $2.0430 \cdot 10^{-2}$ |
| 10000 | 9971 | 223.15 | -50.00 | 0.00 | 0.2615 | 26430 | 0.3400 | 0.4084 | 298.79 | $1.0835 \cdot 10^{-5}$ | $2.0130 \cdot 10^{-2}$ |
| 10500 | 10468 | 219.90 | -53.25 | 0.00 | 0.2421 | 24448 | 0.3204 | 0.3824 | 296.51 | $1.0435 \cdot 10^{-5}$ | $1.9826 \cdot 10^{-2}$ |
| 11000 | 10965 | 216.65 | -56.50 | 0.00 | 0.2240 | 22583 | 0.3019 | 0.3576 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 11500 | 11462 | 216.65 | -56.50 | 0.00 | 0.2072 | 20897 | 0.2793 | 0.3309 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 12000 | 11958 | 216.65 | -56.50 | 0.00 | 0.1917 | 19330 | 0.2584 | 0.3061 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 12500 | 12454 | 216.65 | -56.50 | 0.00 | 0.1774 | 17888 | 0.2391 | 0.2832 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 13000 | 12950 | 216.65 | -56.50 | 0.00 | 0.1641 | 16550 | 0.2212 | 0.2620 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 13500 | 13446 | 216.65 | -56.50 | 0.00 | 0.1519 | 15317 | 0.2047 | 0.2425 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 14000 | 13942 | 216.65 | -56.50 | 0.00 | 0.1405 | 14170 | 0.1894 | 0.2243 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 14500 | 14438 | 216.65 | -56.50 | 0.00 | 0.1300 | 13110 | 0.1752 | 0.2076 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 15000 | 14933 | 216.65 | -56.50 | 0.00 | 0.1203 | 12130 | 0.1621 | 0.1920 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 15500 | 15428 | 216.65 | -56.50 | 0.00 | 0.1113 | 11223 | 0.1500 | 0.1776 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 16000 | 15923 | 216.65 | -56.50 | 0.00 | 0.1030 | 10387 | 0.1388 | 0.1644 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 16500 | 16418 | 216.65 | -56.50 | 0.00 | 0.0953 | 9614 | 0.1285 | 0.1521 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 17000 | 16913 | 216.65 | -56.50 | 0.00 | 0.0882 | 8898 | 0.1189 | 0.1408 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 17500 | 17408 | 216.65 | -56.50 | 0.00 | 0.0817 | 8240 | 0.1101 | 0.1303 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 18000 | 17902 | 216.65 | -56.50 | 0.00 | 0.0756 | 7627 | 0.1019 | 0.1206 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 18500 | 18396 | 216.65 | -56.50 | 0.00 | 0.0700 | 7061 | 0.0944 | 0.1116 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 19000 | 18890 | 216.65 | -56.50 | 0.00 | 0.0649 | 6540 | 0.0874 | 0.1033 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 19500 | 19384 | 216.65 | -56.50 | 0.00 | 0.0601 | 6060 | 0.0810 | 0.0957 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 20000 | 19877 | 216.65 | -56.50 | 0.00 | 0.0557 | 5619 | 0.0750 | 0.0887 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 20500 | 20370 | 216.65 | -56.50 | 0.00 | 0.0516 | 5215 | 0.0696 | 0.0822 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 21000 | 20863 | 216.65 | -56.50 | 0.00 | 0.0478 | 4845 | 0.0645 | 0.0762 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 21500 | 21355 | 216.65 | -56.50 | 0.00 | 0.0443 | 4507 | 0.0598 | 0.0707 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 22000 | 21847 | 216.65 | -56.50 | 0.00 | 0.0411 | 4198 | 0.0554 | 0.0655 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 22500 | 22339 | 216.65 | -56.50 | 0.00 | 0.0381 | 3916 | 0.0514 | 0.0607 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 23000 | 22830 | 216.65 | -56.50 | 0.00 | 0.0353 | 3659 | 0.0476 | 0.0563 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 23500 | 23321 | 216.65 | -56.50 | 0.00 | 0.0328 | 3425 | 0.0442 | 0.0522 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 24000 | 23812 | 216.65 | -56.50 | 0.00 | 0.0304 | 3211 | 0.0410 | 0.0485 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 24500 | 24302 | 216.65 | -56.50 | 0.00 | 0.0283 | 3016 | 0.0381 | 0.0450 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 25000 | 24792 | 216.65 | -56.50 | 0.00 | 0.0262 | 2838 | 0.0353 | 0.0417 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 25500 | 25282 | 216.65 | -56.50 | 0.00 | 0.0244 | 2676 | 0.0328 | 0.0387 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 26000 | 25771 | 216.65 | -56.50 | 0.00 | 0.0226 | 2528 | 0.0304 | 0.0359 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 26500 | 26260 | 216.65 | -56.50 | 0.00 | 0.0210 | 2393 | 0.0282 | 0.0333 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 27000 | 26749 | 216.65 | -56.50 | 0.00 | 0.0195 | 2270 | 0.0262 | 0.0309 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 27500 | 27237 | 216.65 | -56.50 | 0.00 | 0.0181 | 2158 | 0.0243 | 0.0287 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 28000 | 27725 | 216.65 | -56.50 | 0.00 | 0.0168 | 2057 | 0.0225 | 0.0266 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 28500 | 28213 | 216.65 | -56.50 | 0.00 | 0.0156 | 1966 | 0.0209 | 0.0247 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 29000 | 28700 | 216.65 | -56.50 | 0.00 | 0.0145 | 1885 | 0.0194 | 0.0229 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 29500 | 29187 | 216.65 | -56.50 | 0.00 | 0.0135 | 1814 | 0.0180 | 0.0213 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |
| 30000 | 29674 | 216.65 | -56.50 | 0.00 | 0.0126 | 1752 | 0.0167 | 0.0198 | 294.20 | $1.0030 \cdot 10^{-5}$ | $1.9516 \cdot 10^{-2}$ |

TABLE A.2 – Continued
U.S. Standard
U.S. CUSTOMARY UNITS (ENGLISH ENGINEERING UNITS)

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $Z$, ft | $T$, °R | $t$, °F | $T - T_{sl}$, °R | $p$, lb/ft² | $p/p_{sl}$ | $\rho$, slug/ft³ | $\rho/\rho_{sl}$ | $a$, ft/sec | $\mu$, lb-sec/ft² | $k$, Btu/ft-sec-°R |
| 0 | 0 | 518.67 | 59.00 | 0.00 | 2.1162 × 10² | 1.0000 | 2.3769 × 10⁻³ | 1.0000 | 1116.9 | 3.7373 × 10⁻⁷ | 1.2673 × 10⁻⁵ |
| 1000 | 1000 | 515.50 | 55.83 | −3.17 | 2.0360 | 0.9621 | 2.3668 | 0.9957 | 1112.7 | 3.7271 | 1.2637 |
| 2000 | 2000 | 512.33 | 52.67 | −6.34 | 1.9587 | 0.9255 | 2.3568 | 0.9915 | 1108.5 | 3.7169 | 1.2601 |
| 3000 | 3000 | 509.16 | 49.50 | −9.51 | 1.8841 | 0.8903 | 2.3469 | 0.9872 | 1104.3 | 3.7067 | 1.2565 |
| 4000 | 4000 | 505.99 | 46.33 | −12.68 | 1.8120 | 0.8563 | 2.3370 | 0.9830 | 1100.1 | 3.6965 | 1.2529 |
| 5000 | 5000 | 502.82 | 43.16 | −15.85 | 1.7424 | 0.8234 | 2.3272 | 0.9787 | 1095.9 | 3.6863 | 1.2493 |
| 6000 | 6000 | 499.65 | 39.99 | −19.02 | 1.6752 | 0.7916 | 2.3174 | 0.9745 | 1091.7 | 3.6761 | 1.2457 |
| 7000 | 7000 | 496.48 | 36.82 | −22.19 | 1.6103 | 0.7609 | 2.3077 | 0.9703 | 1087.5 | 3.6659 | 1.2421 |
| 8000 | 8000 | 493.31 | 33.65 | −25.36 | 1.5477 | 0.7313 | 2.2980 | 0.9661 | 1083.3 | 3.6557 | 1.2385 |
| 9000 | 9000 | 490.14 | 30.48 | −28.53 | 1.4873 | 0.7028 | 2.2883 | 0.9619 | 1079.1 | 3.6455 | 1.2349 |
| 10000 | 9999 | 486.97 | 27.31 | −31.70 | 1.4292 | 0.6753 | 2.2787 | 0.9577 | 1074.8 | 3.6353 | 1.2313 |
| 11000 | 10999 | 483.80 | 24.14 | −34.87 | 1.3732 | 0.6489 | 2.2692 | 0.9536 | 1070.6 | 3.6251 | 1.2277 |
| 12000 | 11998 | 480.63 | 20.97 | −38.04 | 1.3194 | 0.6235 | 2.2597 | 0.9494 | 1066.4 | 3.6149 | 1.2241 |
| 13000 | 12997 | 477.46 | 17.80 | −41.21 | 1.2676 | 0.5990 | 2.2502 | 0.9453 | 1062.2 | 3.6047 | 1.2205 |
| 14000 | 13996 | 474.29 | 14.63 | −44.38 | 1.2178 | 0.5754 | 2.2408 | 0.9412 | 1057.9 | 3.5945 | 1.2169 |
| 15000 | 14995 | 471.12 | 11.46 | −47.55 | 1.1700 | 0.5528 | 2.2314 | 0.9371 | 1053.7 | 3.5843 | 1.2133 |
| 16000 | 15994 | 467.95 | 8.29 | −50.72 | 1.1242 | 0.5311 | 2.2220 | 0.9330 | 1049.5 | 3.5741 | 1.2097 |
| 17000 | 16993 | 464.78 | 5.12 | −53.89 | 1.0802 | 0.5103 | 2.2127 | 0.9289 | 1045.2 | 3.5639 | 1.2061 |
| 18000 | 17992 | 461.61 | 1.95 | −57.06 | 1.0380 | 0.4904 | 2.2034 | 0.9248 | 1041.0 | 3.5537 | 1.2025 |
| 19000 | 18991 | 458.44 | −1.22 | −60.23 | 0.9976 | 0.4713 | 2.1942 | 0.9208 | 1036.8 | 3.5435 | 1.1989 |
| 20000 | 19990 | 455.27 | −4.39 | −63.40 | 0.9589 | 0.4531 | 2.1850 | 0.9167 | 1032.5 | 3.5333 | 1.1953 |
| 21000 | 20989 | 452.10 | −7.56 | −66.57 | 0.9218 | 0.4356 | 2.1758 | 0.9126 | 1028.3 | 3.5231 | 1.1917 |
| 22000 | 21988 | 448.93 | −10.73 | −69.74 | 0.8864 | 0.4188 | 2.1667 | 0.9086 | 1024.0 | 3.5129 | 1.1881 |
| 23000 | 22987 | 445.76 | −13.90 | −72.91 | 0.8525 | 0.4028 | 2.1576 | 0.9045 | 1019.8 | 3.5027 | 1.1845 |
| 24000 | 23986 | 442.59 | −17.07 | −76.08 | 0.8201 | 0.3875 | 2.1485 | 0.9004 | 1015.5 | 3.4925 | 1.1809 |
| 25000 | 24985 | 439.42 | −20.24 | −79.25 | 0.7891 | 0.3728 | 2.1395 | 0.8964 | 1011.3 | 3.4823 | 1.1773 |
| 26000 | 25984 | 436.25 | −23.41 | −82.42 | 0.7595 | 0.3588 | 2.1305 | 0.8923 | 1007.0 | 3.4721 | 1.1737 |
| 27000 | 26983 | 433.08 | −26.58 | −85.59 | 0.7312 | 0.3454 | 2.1215 | 0.8883 | 1002.8 | 3.4619 | 1.1701 |
| 28000 | 27982 | 429.91 | −29.75 | −88.76 | 0.7042 | 0.3327 | 2.1126 | 0.8842 | 998.5 | 3.4517 | 1.1665 |
| 29000 | 28981 | 426.74 | −32.92 | −91.93 | 0.6784 | 0.3205 | 2.1037 | 0.8802 | 994.2 | 3.4415 | 1.1629 |
| 30000 | 29980 | 423.57 | −36.09 | −95.10 | 0.6538 | 0.3089 | 2.0948 | 0.8761 | 990.0 | 3.4313 | 1.1593 |
| 31000 | 30979 | 420.40 | −39.26 | −98.27 | 0.6303 | 0.2978 | 2.0859 | 0.8721 | 985.7 | 3.4211 | 1.1557 |
| 32000 | 31978 | 417.23 | −42.43 | −101.44 | 0.6079 | 0.2872 | 2.0771 | 0.8680 | 981.4 | 3.4109 | 1.1521 |
| 33000 | 32977 | 414.06 | −45.60 | −104.61 | 0.5865 | 0.2771 | 2.0683 | 0.8640 | 977.2 | 3.4007 | 1.1485 |
| 34000 | 33976 | 410.89 | −48.77 | −107.78 | 0.5661 | 0.2675 | 2.0595 | 0.8599 | 972.9 | 3.3905 | 1.1449 |
| 35000 | 34975 | 407.72 | −51.94 | −110.95 | 0.5466 | 0.2583 | 2.0508 | 0.8559 | 968.6 | 3.3803 | 1.1413 |
| 36000 | 35974 | 404.55 | −55.11 | −114.12 | 0.5280 | 0.2495 | 2.0421 | 0.8518 | 964.3 | 3.3701 | 1.1377 |
| 37000 | 36973 | 401.38 | −58.28 | −117.29 | 0.5102 | 0.2411 | 2.0334 | 0.8478 | 960.1 | 3.3599 | 1.1341 |
| 38000 | 37972 | 398.21 | −61.45 | −120.46 | 0.4932 | 0.2331 | 2.0248 | 0.8437 | 955.8 | 3.3497 | 1.1305 |
| 39000 | 38971 | 395.04 | −64.62 | −123.63 | 0.4770 | 0.2254 | 2.0162 | 0.8397 | 951.5 | 3.3395 | 1.1269 |
| 40000 | 39970 | 391.87 | −67.79 | −126.80 | 0.4615 | 0.2181 | 2.0076 | 0.8356 | 947.2 | 3.3293 | 1.1233 |
| 41000 | 40969 | 388.70 | −70.96 | −129.97 | 0.4466 | 0.2111 | 1.9991 | 0.8316 | 942.9 | 3.3191 | 1.1197 |
| 42000 | 41968 | 385.53 | −74.13 | −133.14 | 0.4324 | 0.2044 | 1.9906 | 0.8275 | 938.6 | 3.3089 | 1.1161 |
| 43000 | 42967 | 382.36 | −77.30 | −136.31 | 0.4187 | 0.1979 | 1.9821 | 0.8235 | 934.3 | 3.2987 | 1.1125 |
| 44000 | 43966 | 379.19 | −80.47 | −139.48 | 0.4056 | 0.1917 | 1.9736 | 0.8194 | 930.0 | 3.2885 | 1.1089 |
| 45000 | 44965 | 376.02 | −83.64 | −142.65 | 0.3929 | 0.1857 | 1.9652 | 0.8154 | 925.7 | 3.2783 | 1.1053 |
| 46000 | 45964 | 372.85 | −86.81 | −145.82 | 0.3808 | 0.1800 | 1.9568 | 0.8113 | 921.4 | 3.2681 | 1.1017 |
| 47000 | 46963 | 369.68 | −89.98 | −148.99 | 0.3691 | 0.1745 | 1.9484 | 0.8073 | 917.1 | 3.2579 | 1.0981 |
| 48000 | 47962 | 366.51 | −93.15 | −152.16 | 0.3578 | 0.1691 | 1.9401 | 0.8032 | 912.8 | 3.2477 | 1.0945 |
| 49000 | 48961 | 363.34 | −96.32 | −155.33 | 0.3469 | 0.1640 | 1.9317 | 0.7992 | 908.5 | 3.2375 | 1.0909 |
| 50000 | 49960 | 360.17 | −99.49 | −158.50 | 0.3365 | 0.1590 | 1.9234 | 0.7951 | 904.2 | 3.2273 | 1.0873 |
| 51000 | 50959 | 356.99 | −102.67 | −161.68 | 0.3264 | 0.1543 | 1.9152 | 0.7911 | 899.9 | 3.2171 | 1.0837 |
| 52000 | 51958 | 353.82 | −105.84 | −164.85 | 0.3167 | 0.1497 | 1.9069 | 0.7870 | 895.6 | 3.2069 | 1.0801 |
| 53000 | 52957 | 350.65 | −109.01 | −168.02 | 0.3073 | 0.1453 | 1.8987 | 0.7830 | 891.3 | 3.1967 | 1.0765 |
| 54000 | 53956 | 347.48 | −112.18 | −171.19 | 0.2983 | 0.1410 | 1.8905 | 0.7789 | 887.0 | 3.1865 | 1.0729 |
| 55000 | 54955 | 344.31 | −115.35 | −174.36 | 0.2895 | 0.1369 | 1.8824 | 0.7749 | 882.7 | 3.1763 | 1.0693 |
| 56000 | 55954 | 341.14 | −118.52 | −177.53 | 0.2811 | 0.1329 | 1.8742 | 0.7708 | 878.4 | 3.1661 | 1.0657 |
| 57000 | 56953 | 337.97 | −121.69 | −180.70 | 0.2729 | 0.1290 | 1.8661 | 0.7668 | 874.1 | 3.1559 | 1.0621 |
| 58000 | 57952 | 334.80 | −124.86 | −183.87 | 0.2650 | 0.1253 | 1.8580 | 0.7627 | 869.8 | 3.1457 | 1.0585 |
| 59000 | 58951 | 331.63 | −128.03 | −187.04 | 0.2573 | 0.1217 | 1.8500 | 0.7587 | 865.5 | 3.1355 | 1.0549 |
| 60000 | 59950 | 328.46 | −131.20 | −190.21 | 0.2499 | 0.1182 | 1.8419 | 0.7546 | 861.2 | 3.1253 | 1.0513 |
| 61000 | 60949 | 325.29 | −134.37 | −193.38 | 0.2427 | 0.1148 | 1.8339 | 0.7506 | 856.9 | 3.1151 | 1.0477 |
| 62000 | 61948 | 322.12 | −137.54 | −196.55 | 0.2357 | 0.1115 | 1.8259 | 0.7465 | 852.6 | 3.1049 | 1.0441 |
| 63000 | 62947 | 318.95 | −140.71 | −199.72 | 0.2289 | 0.1083 | 1.8180 | 0.7425 | 848.3 | 3.0947 | 1.0405 |
| 64000 | 63946 | 315.78 | −143.88 | −202.89 | 0.2224 | 0.1052 | 1.8100 | 0.7384 | 844.0 | 3.0845 | 1.0369 |
| 65000 | 64945 | 312.61 | −147.05 | −206.06 | 0.2160 | 0.1022 | 1.8021 | 0.7344 | 839.7 | 3.0743 | 1.0333 |
| 66000 | 65944 | 309.44 | −150.22 | −209.23 | 0.2098 | 0.0992 | 1.7942 | 0.7303 | 835.4 | 3.0641 | 1.0297 |
| 67000 | 66943 | 306.27 | −153.39 | −212.40 | 0.2038 | 0.0964 | 1.7863 | 0.7263 | 831.1 | 3.0539 | 1.0261 |
| 68000 | 67942 | 303.10 | −156.56 | −215.57 | 0.1980 | 0.0936 | 1.7784 | 0.7222 | 826.8 | 3.0437 | 1.0225 |
| 69000 | 68941 | 299.93 | −159.73 | −218.74 | 0.1923 | 0.0909 | 1.7706 | 0.7182 | 822.5 | 3.0335 | 1.0189 |
| 70000 | 69940 | 296.76 | −162.90 | −221.91 | 0.1868 | 0.0883 | 1.7628 | 0.7141 | 818.2 | 3.0233 | 1.0153 |
| 71000 | 70939 | 293.59 | −166.07 | −225.08 | 0.1814 | 0.0858 | 1.7550 | 0.7101 | 813.9 | 3.0131 | 1.0117 |
| 72000 | 71938 | 290.42 | −169.24 | −228.25 | 0.1762 | 0.0833 | 1.7472 | 0.7060 | 809.6 | 3.0029 | 1.0081 |
| 73000 | 72937 | 287.25 | −172.41 | −231.42 | 0.1711 | 0.0809 | 1.7395 | 0.7020 | 805.3 | 2.9927 | 1.0045 |
| 74000 | 73936 | 284.08 | −175.58 | −234.59 | 0.1662 | 0.0786 | 1.7318 | 0.6979 | 801.0 | 2.9825 | 1.0009 |
| 75000 | 74935 | 280.91 | −178.75 | −237.76 | 0.1614 | 0.0763 | 1.7241 | 0.6939 | 796.7 | 2.9723 | 0.9973 |
| 76000 | 75934 | 277.74 | −181.92 | −240.93 | 0.1567 | 0.0741 | 1.7164 | 0.6898 | 792.4 | 2.9621 | 0.9937 |
| 77000 | 76933 | 274.57 | −185.09 | −244.10 | 0.1522 | 0.0719 | 1.7088 | 0.6858 | 788.1 | 2.9519 | 0.9901 |
| 78000 | 77932 | 271.40 | −188.26 | −247.27 | 0.1478 | 0.0699 | 1.7012 | 0.6817 | 783.8 | 2.9417 | 0.9865 |
| 79000 | 78931 | 268.23 | −191.43 | −250.44 | 0.1435 | 0.0679 | 1.6936 | 0.6777 | 779.5 | 2.9315 | 0.9829 |
| 80000 | 79930 | 265.06 | −194.60 | −253.61 | 0.1393 | 0.0659 | 1.6860 | 0.6736 | 775.2 | 2.9213 | 0.9793 |
| 81000 | 80929 | 261.89 | −197.77 | −256.78 | 0.1353 | 0.0640 | 1.6785 | 0.6696 | 770.9 | 2.9111 | 0.9757 |
| 82000 | 81928 | 258.72 | −200.94 | −259.95 | 0.1313 | 0.0621 | 1.6710 | 0.6655 | 766.6 | 2.9009 | 0.9721 |
| 83000 | 82927 | 255.55 | −204.11 | −263.12 | 0.1275 | 0.0603 | 1.6635 | 0.6615 | 762.3 | 2.8907 | 0.9685 |
| 84000 | 83926 | 252.38 | −207.28 | −266.29 | 0.1237 | 0.0585 | 1.6560 | 0.6574 | 758.0 | 2.8805 | 0.9649 |
| 85000 | 84925 | 249.21 | −210.45 | −269.46 | 0.1201 | 0.0568 | 1.6485 | 0.6534 | 753.7 | 2.8703 | 0.9613 |
| 86000 | 85924 | 246.04 | −213.62 | −272.63 | 0.1165 | 0.0551 | 1.6411 | 0.6493 | 749.4 | 2.8601 | 0.9577 |
| 87000 | 86923 | 242.87 | −216.79 | −275.80 | 0.1131 | 0.0535 | 1.6337 | 0.6453 | 745.1 | 2.8499 | 0.9541 |
| 88000 | 87922 | 239.70 | −219.96 | −278.97 | 0.1097 | 0.0519 | 1.6263 | 0.6412 | 740.8 | 2.8397 | 0.9505 |
| 89000 | 88921 | 236.53 | −223.13 | −282.14 | 0.1065 | 0.0504 | 1.6189 | 0.6372 | 736.5 | 2.8295 | 0.9469 |
| 90000 | 89920 | 233.36 | −226.30 | −285.31 | 0.1033 | 0.0489 | 1.6115 | 0.6331 | 732.2 | 2.8193 | 0.9433 |
| 91000 | 90919 | 230.19 | −229.47 | −288.48 | 0.1002 | 0.0474 | 1.6042 | 0.6291 | 727.9 | 2.8091 | 0.9397 |
| 92000 | 91918 | 227.02 | −232.64 | −291.65 | 0.0972 | 0.0460 | 1.5969 | 0.6250 | 723.6 | 2.7989 | 0.9361 |
| 93000 | 92917 | 223.85 | −235.81 | −294.82 | 0.0943 | 0.0446 | 1.5896 | 0.6210 | 719.3 | 2.7887 | 0.9325 |
| 94000 | 93916 | 220.68 | −238.98 | −297.99 | 0.0914 | 0.0433 | 1.5823 | 0.6169 | 715.0 | 2.7785 | 0.9289 |
| 95000 | 94915 | 217.51 | −242.15 | −301.16 | 0.0886 | 0.0419 | 1.5750 | 0.6129 | 710.7 | 2.7683 | 0.9253 |
| 96000 | 95914 | 214.34 | −245.32 | −304.33 | 0.0859 | 0.0407 | 1.5678 | 0.6088 | 706.4 | 2.7581 | 0.9217 |
| 97000 | 96913 | 211.17 | −248.49 | −307.50 | 0.0832 | 0.0394 | 1.5606 | 0.6048 | 702.1 | 2.7479 | 0.9181 |
| 98000 | 97912 | 208.00 | −251.66 | −310.67 | 0.0806 | 0.0382 | 1.5534 | 0.6007 | 697.8 | 2.7377 | 0.9145 |
| 99000 | 98911 | 204.83 | −254.83 | −313.84 | 0.0781 | 0.0370 | 1.5462 | 0.5967 | 693.5 | 2.7275 | 0.9109 |
| 100000 | 99910 | 201.66 | −258.00 | −317.01 | 0.0756 | 0.0358 | 1.5390 | 0.5926 | 689.2 | 2.7173 | 0.9073 |

TABLE XI – Continued

(EXPERIMENTAL ELECTRICAL ENGINE DATA)

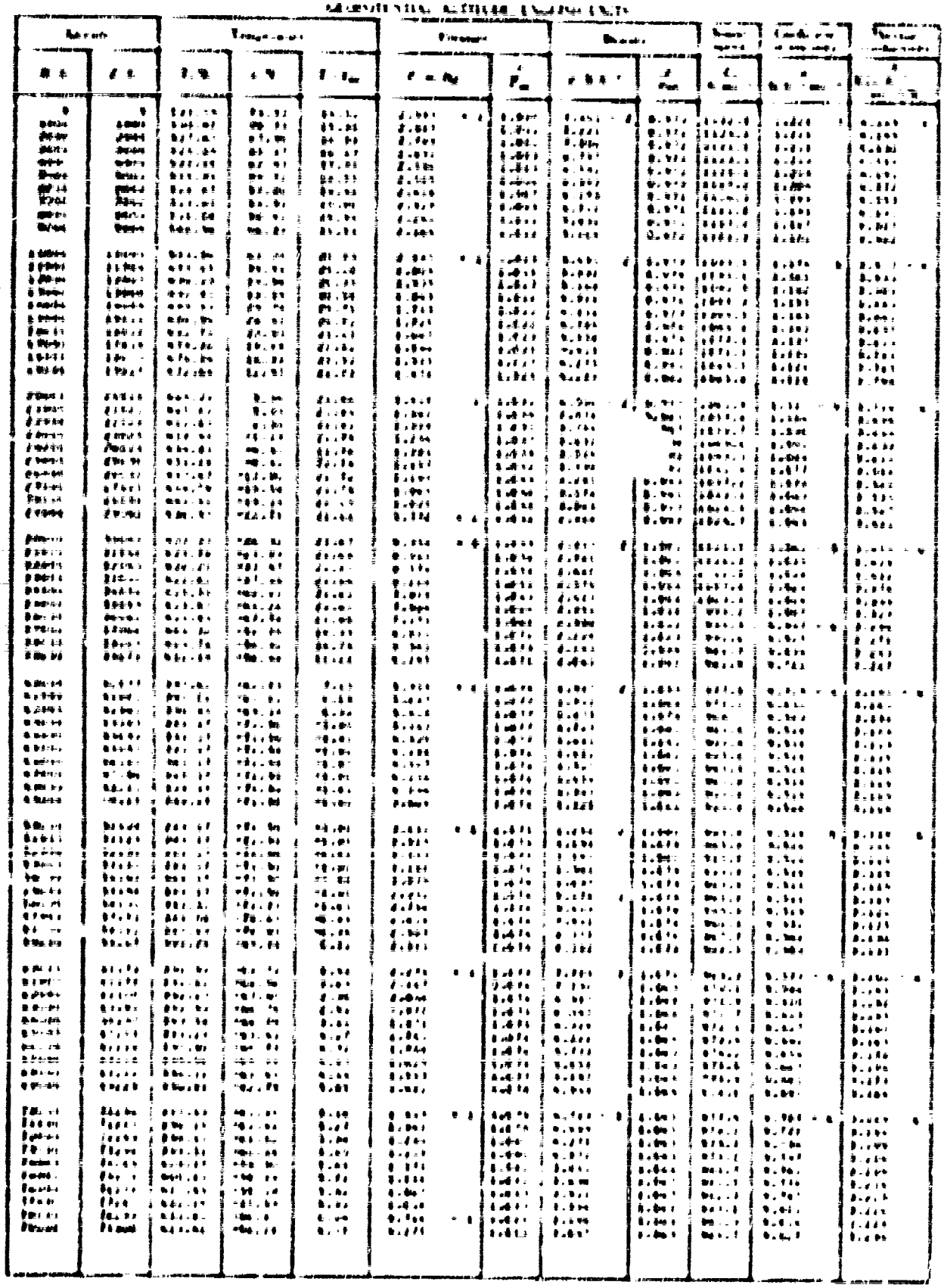
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Table 5.2 – Continued

[illegible]

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z ft | H ft | T °R | t °F | T − T_sl | P in Hg | P/P_sl | ρ | ρ/ρ_sl | a ft/sec | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |



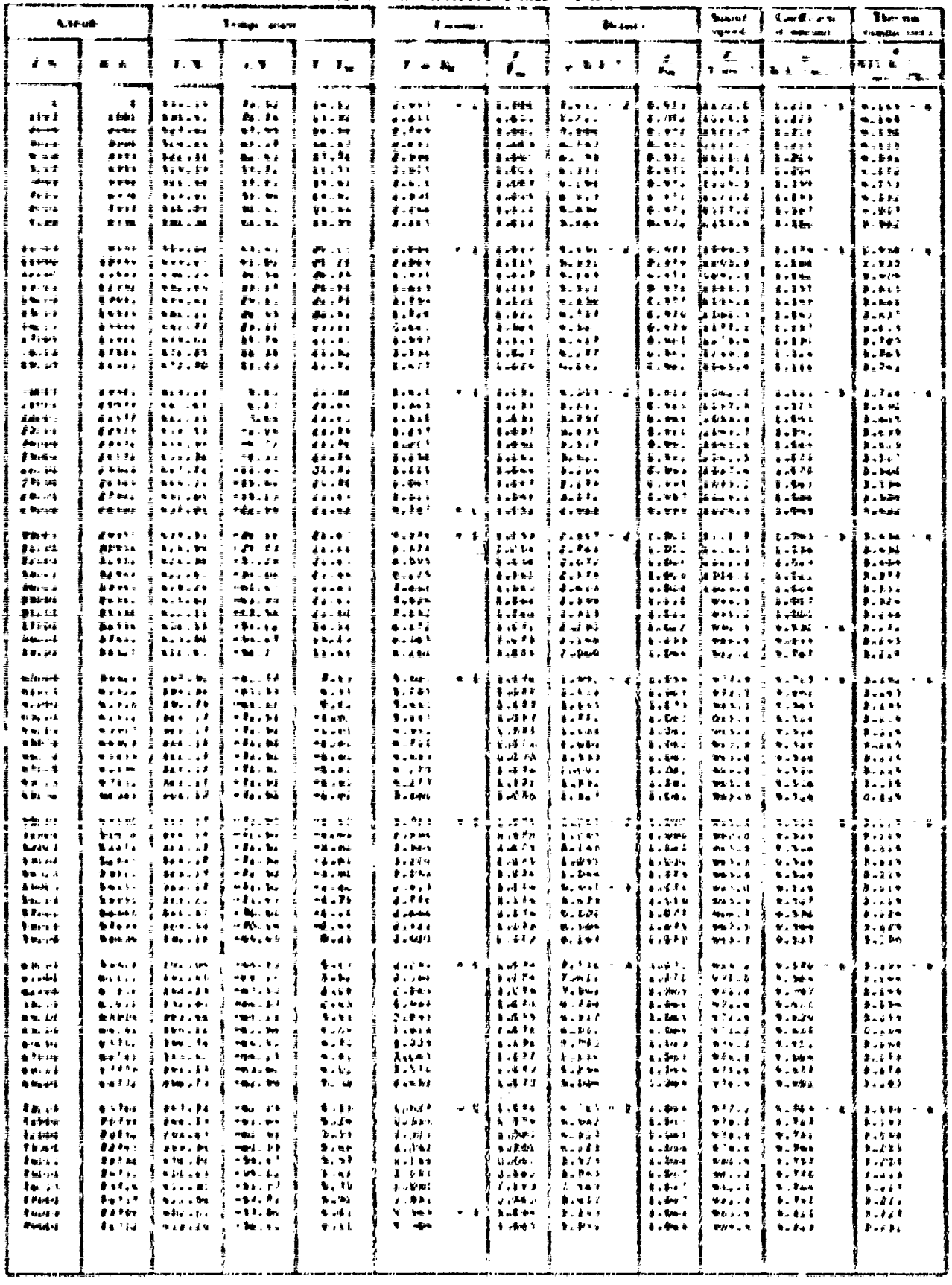


TABLE 3.2 – Continued

65° N Jan

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | T/T_sl | P, in. Hg | P/P_sl | ρ, lb ft⁻³ | ρ/ρ_sl | C_s, ft sec⁻¹ | μ, lb ft⁻¹ sec⁻¹ | k, BTU ft⁻¹ sec⁻¹ °R⁻¹ |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.1 – Continued
45° N Jan
[illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, ft | H, ft | T, °R | t, °F | [illegible] | P, in. Hg | $P/P_0$ | ρ [illegible] | $\rho/\rho_0$ | $C_s$ [illegible] | μ [illegible] | k, BTU [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 5.2 – *Continued*

*Thermodynamic Properties of Air*

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TABLE 3.2 – Continued



| Altitude | | Temperature | | | Pressure | | Density | | Number density | Gas Constant at one meter | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.2 – Continued

[illegible]

[illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | T - T_m | P, in. Hg | P/P_0 | ρ | ρ/ρ_0 | C_s | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

*[illegible]

Table 5.2 – Continued
Mid-Latitude Spring/Fall*
GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, ft | H, ft | T, °R | t, °F | [illegible] | P, in Hg | $P/P_0$ | ρ | $\rho/\rho_0$ | $C_s$, ft/sec | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

*[illegible]

Table X.1 — Continued

65° N, January

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 0 | 0 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 3.2 —Continued
60° N January
(b) METRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 0 | 0 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 5.2 - Continued

60° N January

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | T − T_m | P, in. Hg | P/P_sl | ρ | ρ/ρ_sl | $C_s$ | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table XI - Continued

[illegible]

| Saturated | | Temperature | | | Pressure | | Density | | Internal energy | Coefficient of cubical expansion | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $p$ | $v_g$ | $T$, °R | $t$, °F | $T - T_{sat}$ | $p$, lb/sq in. abs | $p_{sat}$ | $\rho$, lb/cu ft | $\rho_{sat}$ | $u$, Btu/lb | $\beta$, 1/°R | $k$, Btu/(hr)(sq ft)(°F/ft) |
| [illegible] | | | | | | | | | | | |

[illegible]

[illegible]

TABLE 5.2 – Continued

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.2.—Continued

[illegible]

[illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Kinematic viscosity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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TABLE 5.2. — Continued
60° N January (Cont'd)
[illegible]

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, ft | H, ft | T, °R | t, °F | [illegible] | P, in. Hg | $P/P_0$ | ρ | $\rho/\rho_0$ | $C_s$ | μ | k |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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Table 5.2 – Continued

60° N January Warm

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Kinematic viscosity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | T − T[illegible] | P, in Hg | P/P[illegible] | ρ, [illegible] | ρ/ρ[illegible] | $C_s$ | μ | ν |
| 0 | 0 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 3.2 – Continued

| Molecular | | Temperature | | | Pressure | | Density | | Specific heat | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

TABLE 5.2 – Continued
[illegible]
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H, ft | Z, ft | T, °R | t, °F | T − T[illegible] | P, in. Hg | P/P[illegible] | ρ, [illegible] | ρ/ρ[illegible] | C, ft/sec | μ, [illegible] | k, BTU [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
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| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

Table 5.1 – Continued

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$ | $H$ | $T$ | $t$ | $T - T_{sl}$ | $p$ | $p/p_{sl}$ | $\rho$ | $\rho/\rho_{sl}$ | $a$ | $\mu$ | $k$ |
| ft | ft | °R | °F | °R | lb/ft² | | slug/ft³ | | ft/sec | lb sec/ft² | Btu/ft sec °R |
| 0 | 0 | 518.69 | 58.99 | 0.00 | 2116.2 | 1.000 | 0.002378 | 1.000 | 1116.5 | $3.737 \times 10^{-7}$ | $1.367 \times 10^{-6}$ |
| 1000 | 1000 | 515.50 | 55.81 | −3.19 | 2040.9 | 0.9644 | 0.002355 | 0.9904 | 1112.7 | $3.720 \times 10^{-7}$ | $1.360 \times 10^{-6}$ |
| 2000 | 2000 | 512.31 | 52.62 | −6.38 | 1967.7 | 0.9298 | 0.002332 | 0.9807 | 1108.9 | $3.703 \times 10^{-7}$ | $1.354 \times 10^{-6}$ |
| 3000 | 3000 | 509.12 | 49.43 | −9.57 | 1896.7 | 0.8962 | 0.002309 | 0.9710 | 1105.1 | $3.686 \times 10^{-7}$ | $1.348 \times 10^{-6}$ |
| 4000 | 4000 | 505.93 | 46.24 | −12.76 | 1827.8 | 0.8637 | 0.002286 | 0.9613 | 1101.3 | $3.669 \times 10^{-7}$ | $1.342 \times 10^{-6}$ |
| 5000 | 5000 | 502.74 | 43.05 | −15.95 | 1761.0 | 0.8320 | 0.002263 | 0.9515 | 1097.5 | $3.652 \times 10^{-7}$ | $1.336 \times 10^{-6}$ |
| 6000 | 6000 | 499.55 | 39.86 | −19.14 | 1696.2 | 0.8014 | 0.002241 | 0.9418 | 1093.7 | $3.635 \times 10^{-7}$ | $1.330 \times 10^{-6}$ |
| 7000 | 7000 | 496.36 | 36.67 | −22.33 | 1633.4 | 0.7717 | 0.002218 | 0.9320 | 1089.9 | $3.618 \times 10^{-7}$ | $1.324 \times 10^{-6}$ |
| 8000 | 8000 | 493.17 | 33.48 | −25.52 | 1572.5 | 0.7430 | 0.002196 | 0.9222 | 1086.1 | $3.601 \times 10^{-7}$ | $1.318 \times 10^{-6}$ |
| 9000 | 9000 | 489.98 | 30.29 | −28.71 | 1513.5 | 0.7151 | 0.002173 | 0.9125 | 1082.3 | $3.584 \times 10^{-7}$ | $1.312 \times 10^{-6}$ |
| 10000 | 10000 | 486.79 | 27.10 | −31.90 | 1456.4 | 0.6882 | 0.002151 | 0.9027 | 1078.5 | $3.567 \times 10^{-7}$ | $1.306 \times 10^{-6}$ |
| 11000 | 11000 | 483.60 | 23.91 | −35.09 | 1401.1 | 0.6621 | 0.002128 | 0.8929 | 1074.7 | $3.550 \times 10^{-7}$ | $1.300 \times 10^{-6}$ |
| 12000 | 12000 | 480.41 | 20.72 | −38.28 | 1347.7 | 0.6369 | 0.002106 | 0.8832 | 1070.9 | $3.533 \times 10^{-7}$ | $1.294 \times 10^{-6}$ |
| 13000 | 13000 | 477.22 | 17.53 | −41.47 | 1296.0 | 0.6125 | 0.002084 | 0.8734 | 1067.1 | $3.516 \times 10^{-7}$ | $1.288 \times 10^{-6}$ |
| 14000 | 14000 | 474.03 | 14.34 | −44.66 | 1246.1 | 0.5889 | 0.002061 | 0.8636 | 1063.3 | $3.499 \times 10^{-7}$ | $1.282 \times 10^{-6}$ |
| 15000 | 15000 | 470.84 | 11.15 | −47.85 | 1197.9 | 0.5661 | 0.002039 | 0.8539 | 1059.5 | $3.482 \times 10^{-7}$ | $1.276 \times 10^{-6}$ |
| 16000 | 16000 | 467.65 | 7.96 | −51.04 | 1151.4 | 0.5441 | 0.002017 | 0.8441 | 1055.7 | $3.465 \times 10^{-7}$ | $1.270 \times 10^{-6}$ |
| 17000 | 17000 | 464.46 | 4.77 | −54.23 | 1106.5 | 0.5229 | 0.001995 | 0.8343 | 1051.9 | $3.448 \times 10^{-7}$ | $1.264 \times 10^{-6}$ |
| 18000 | 18000 | 461.27 | 1.58 | −57.42 | 1063.3 | 0.5025 | 0.001973 | 0.8246 | 1048.1 | $3.431 \times 10^{-7}$ | $1.258 \times 10^{-6}$ |
| 19000 | 19000 | 458.08 | −1.61 | −60.61 | 1021.7 | 0.4828 | 0.001951 | 0.8148 | 1044.3 | $3.414 \times 10^{-7}$ | $1.252 \times 10^{-6}$ |
| 20000 | 20000 | 454.89 | −4.80 | −63.80 | 981.7 | 0.4639 | 0.001929 | 0.8050 | 1040.5 | $3.397 \times 10^{-7}$ | $1.246 \times 10^{-6}$ |
| 21000 | 21000 | 451.70 | −7.99 | −66.99 | 943.2 | 0.4457 | 0.001907 | 0.7953 | 1036.7 | $3.380 \times 10^{-7}$ | $1.240 \times 10^{-6}$ |
| 22000 | 22000 | 448.51 | −11.18 | −70.18 | 906.3 | 0.4282 | 0.001885 | 0.7855 | 1032.9 | $3.363 \times 10^{-7}$ | $1.234 \times 10^{-6}$ |
| 23000 | 23000 | 445.32 | −14.37 | −73.37 | 870.8 | 0.4114 | 0.001863 | 0.7757 | 1029.1 | $3.346 \times 10^{-7}$ | $1.228 \times 10^{-6}$ |
| 24000 | 24000 | 442.13 | −17.56 | −76.56 | 836.8 | 0.3953 | 0.001841 | 0.7660 | 1025.3 | $3.329 \times 10^{-7}$ | $1.222 \times 10^{-6}$ |
| 25000 | 25000 | 438.94 | −20.75 | −79.75 | 804.2 | 0.3799 | 0.001819 | 0.7562 | 1021.5 | $3.312 \times 10^{-7}$ | $1.216 \times 10^{-6}$ |
| 26000 | 26000 | 435.75 | −23.94 | −82.94 | 772.9 | 0.3651 | 0.001797 | 0.7464 | 1017.7 | $3.295 \times 10^{-7}$ | $1.210 \times 10^{-6}$ |
| 27000 | 27000 | 432.56 | −27.13 | −86.13 | 742.9 | 0.3509 | 0.001775 | 0.7367 | 1013.9 | $3.278 \times 10^{-7}$ | $1.204 \times 10^{-6}$ |
| 28000 | 28000 | 429.37 | −30.32 | −89.32 | 714.3 | 0.3374 | 0.001753 | 0.7269 | 1010.1 | $3.261 \times 10^{-7}$ | $1.198 \times 10^{-6}$ |
| 29000 | 29000 | 426.18 | −33.51 | −92.51 | 686.8 | 0.3244 | 0.001731 | 0.7172 | 1006.3 | $3.244 \times 10^{-7}$ | $1.192 \times 10^{-6}$ |
| 30000 | 30000 | 422.99 | −36.70 | −95.70 | 660.5 | 0.3120 | 0.001709 | 0.7074 | 1002.5 | $3.227 \times 10^{-7}$ | $1.186 \times 10^{-6}$ |
| 31000 | 31000 | 419.80 | −39.89 | −98.89 | 635.3 | 0.3001 | 0.001687 | 0.6976 | 998.7 | $3.210 \times 10^{-7}$ | $1.180 \times 10^{-6}$ |
| 32000 | 32000 | 416.61 | −43.08 | −102.08 | 611.2 | 0.2887 | 0.001665 | 0.6879 | 994.9 | $3.193 \times 10^{-7}$ | $1.174 \times 10^{-6}$ |
| 33000 | 33000 | 413.42 | −46.27 | −105.27 | 588.1 | 0.2778 | 0.001643 | 0.6781 | 991.1 | $3.176 \times 10^{-7}$ | $1.168 \times 10^{-6}$ |
| 34000 | 34000 | 410.23 | −49.46 | −108.46 | 566.0 | 0.2674 | 0.001621 | 0.6684 | 987.3 | $3.159 \times 10^{-7}$ | $1.162 \times 10^{-6}$ |
| 35000 | 35000 | 407.04 | −52.65 | −111.65 | 544.9 | 0.2574 | 0.001599 | 0.6586 | 983.5 | $3.142 \times 10^{-7}$ | $1.156 \times 10^{-6}$ |
| 36000 | 36000 | 403.85 | −55.84 | −114.84 | 524.8 | 0.2479 | 0.001577 | 0.6488 | 979.7 | $3.125 \times 10^{-7}$ | $1.150 \times 10^{-6}$ |
| 37000 | 37000 | 400.66 | −59.03 | −118.03 | 505.6 | 0.2388 | 0.001555 | 0.6391 | 975.9 | $3.108 \times 10^{-7}$ | $1.144 \times 10^{-6}$ |
| 38000 | 38000 | 397.47 | −62.22 | −121.22 | 487.4 | 0.2302 | 0.001533 | 0.6293 | 972.1 | $3.091 \times 10^{-7}$ | $1.138 \times 10^{-6}$ |
| 39000 | 39000 | 394.28 | −65.41 | −124.41 | 470.1 | 0.2220 | 0.001511 | 0.6196 | 968.3 | $3.074 \times 10^{-7}$ | $1.132 \times 10^{-6}$ |
| 40000 | 40000 | 391.09 | −68.60 | −127.60 | 453.7 | 0.2143 | 0.001489 | 0.6098 | 964.5 | $3.057 \times 10^{-7}$ | $1.126 \times 10^{-6}$ |
| 41000 | 41000 | 387.90 | −71.79 | −130.79 | 438.2 | 0.2069 | 0.001467 | 0.6000 | 960.7 | $3.040 \times 10^{-7}$ | $1.120 \times 10^{-6}$ |
| 42000 | 42000 | 384.71 | −74.98 | −133.98 | 423.5 | 0.2000 | 0.001445 | 0.5903 | 956.9 | $3.023 \times 10^{-7}$ | $1.114 \times 10^{-6}$ |
| 43000 | 43000 | 381.52 | −78.17 | −137.17 | 409.6 | 0.1934 | 0.001423 | 0.5805 | 953.1 | $3.006 \times 10^{-7}$ | $1.108 \times 10^{-6}$ |
| 44000 | 44000 | 378.33 | −81.36 | −140.36 | 396.4 | 0.1872 | 0.001401 | 0.5708 | 949.3 | $2.989 \times 10^{-7}$ | $1.102 \times 10^{-6}$ |
| 45000 | 45000 | 375.14 | −84.55 | −143.55 | 383.9 | 0.1813 | 0.001379 | 0.5610 | 945.5 | $2.972 \times 10^{-7}$ | $1.096 \times 10^{-6}$ |
| 46000 | 46000 | 371.95 | −87.74 | −146.74 | 372.1 | 0.1757 | 0.001357 | 0.5512 | 941.7 | $2.955 \times 10^{-7}$ | $1.090 \times 10^{-6}$ |
| 47000 | 47000 | 368.76 | −90.93 | −149.93 | 360.9 | 0.1705 | 0.001335 | 0.5415 | 937.9 | $2.938 \times 10^{-7}$ | $1.084 \times 10^{-6}$ |
| 48000 | 48000 | 365.57 | −94.12 | −153.12 | 350.3 | 0.1655 | 0.001313 | 0.5317 | 934.1 | $2.921 \times 10^{-7}$ | $1.078 \times 10^{-6}$ |
| 49000 | 49000 | 362.38 | −97.31 | −156.31 | 340.3 | 0.1608 | 0.001291 | 0.5220 | 930.3 | $2.904 \times 10^{-7}$ | $1.072 \times 10^{-6}$ |
| 50000 | 50000 | 359.19 | −100.50 | −159.50 | 330.8 | 0.1563 | 0.001269 | 0.5122 | 926.5 | $2.887 \times 10^{-7}$ | $1.066 \times 10^{-6}$ |
| 51000 | 51000 | 356.00 | −103.69 | −162.69 | 321.8 | 0.1521 | 0.001247 | 0.5024 | 922.7 | $2.870 \times 10^{-7}$ | $1.060 \times 10^{-6}$ |
| 52000 | 52000 | 352.81 | −106.88 | −165.88 | 313.3 | 0.1481 | 0.001225 | 0.4927 | 918.9 | $2.853 \times 10^{-7}$ | $1.054 \times 10^{-6}$ |
| 53000 | 53000 | 349.62 | −110.07 | −169.07 | 305.3 | 0.1443 | 0.001203 | 0.4829 | 915.1 | $2.836 \times 10^{-7}$ | $1.048 \times 10^{-6}$ |
| 54000 | 54000 | 346.43 | −113.26 | −172.26 | 297.7 | 0.1407 | 0.001181 | 0.4732 | 911.3 | $2.819 \times 10^{-7}$ | $1.042 \times 10^{-6}$ |
| 55000 | 55000 | 343.24 | −116.45 | −175.45 | 290.5 | 0.1373 | 0.001159 | 0.4634 | 907.5 | $2.802 \times 10^{-7}$ | $1.036 \times 10^{-6}$ |
| 56000 | 56000 | 340.05 | −119.64 | −178.64 | 283.7 | 0.1341 | 0.001137 | 0.4537 | 903.7 | $2.785 \times 10^{-7}$ | $1.030 \times 10^{-6}$ |
| 57000 | 57000 | 336.86 | −122.83 | −181.83 | 277.3 | 0.1311 | 0.001115 | 0.4439 | 899.9 | $2.768 \times 10^{-7}$ | $1.024 \times 10^{-6}$ |
| 58000 | 58000 | 333.67 | −126.02 | −185.02 | 271.2 | 0.1282 | 0.001093 | 0.4341 | 896.1 | $2.751 \times 10^{-7}$ | $1.018 \times 10^{-6}$ |
| 59000 | 59000 | 330.48 | −129.21 | −188.21 | 265.5 | 0.1255 | 0.001071 | 0.4244 | 892.3 | $2.734 \times 10^{-7}$ | $1.012 \times 10^{-6}$ |
| 60000 | 60000 | 327.29 | −132.40 | −191.40 | 260.1 | 0.1230 | 0.001049 | 0.4146 | 888.5 | $2.717 \times 10^{-7}$ | $1.006 \times 10^{-6}$ |
| 61000 | 61000 | 324.10 | −135.59 | −194.59 | 255.0 | 0.1206 | 0.001027 | 0.4049 | 884.7 | $2.700 \times 10^{-7}$ | $1.000 \times 10^{-6}$ |
| 62000 | 62000 | 320.91 | −138.78 | −197.78 | 250.2 | 0.1183 | 0.001005 | 0.3951 | 880.9 | $2.683 \times 10^{-7}$ | $9.940 \times 10^{-7}$ |
| 63000 | 63000 | 317.72 | −141.97 | −200.97 | 245.7 | 0.1162 | 0.000983 | 0.3854 | 877.1 | $2.666 \times 10^{-7}$ | $9.880 \times 10^{-7}$ |
| 64000 | 64000 | 314.53 | −145.16 | −204.16 | 241.5 | 0.1142 | 0.000961 | 0.3756 | 873.3 | $2.649 \times 10^{-7}$ | $9.820 \times 10^{-7}$ |
| 65000 | 65000 | 311.34 | −148.35 | −207.35 | 237.5 | 0.1123 | 0.000939 | 0.3659 | 869.5 | $2.632 \times 10^{-7}$ | $9.760 \times 10^{-7}$ |
| 66000 | 66000 | 308.15 | −151.54 | −210.54 | 233.8 | 0.1106 | 0.000917 | 0.3561 | 865.7 | $2.615 \times 10^{-7}$ | $9.700 \times 10^{-7}$ |
| 67000 | 67000 | 304.96 | −154.73 | −213.73 | 230.4 | 0.1089 | 0.000895 | 0.3463 | 861.9 | $2.598 \times 10^{-7}$ | $9.640 \times 10^{-7}$ |
| 68000 | 68000 | 301.77 | −157.92 | −216.92 | 227.2 | 0.1074 | 0.000873 | 0.3366 | 858.1 | $2.581 \times 10^{-7}$ | $9.580 \times 10^{-7}$ |
| 69000 | 69000 | 298.58 | −161.11 | −220.11 | 224.2 | 0.1060 | 0.000851 | 0.3268 | 854.3 | $2.564 \times 10^{-7}$ | $9.520 \times 10^{-7}$ |
| 70000 | 70000 | 295.39 | −164.30 | −223.30 | 221.5 | 0.1047 | 0.000829 | 0.3171 | 850.5 | $2.547 \times 10^{-7}$ | $9.460 \times 10^{-7}$ |

TABLE 5.2 – Continued

[illegible]

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 3.2 — Continued

[illegible]

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Z, ft | H, ft | T, °R | t, °F | T − T_m | P, lb/ft² | P/P_0 | ρ, slug/ft³ | ρ/ρ_0 | C_s, ft/sec | μ, lb sec/ft² | k, BTU ft⁻¹ sec⁻¹ °R⁻¹ |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

TABLE 5.2 – Continued

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Acceleration of gravity | Viscosity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |

TABLE XI – Continued

GEOMETRIC ALTITUDE, FEET (M)

| Altitude | | Temperature | | | Pressure | | Density | | Speed of sound | Coefficient of viscosity | Viscosity parameter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$ | $Z$ | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, atm | $\frac{P}{P_{std}}$ | $\sigma$, lb s²/ft⁴ | $\frac{\sigma}{\sigma_{std}}$ | $a$, ft/sec | $\mu$, lb/ft sec | $\frac{\mu}{\mu_{std}}$ |
| 0 | 0 | 518.67 | +59.00 | 0.00 | 1.0000 | 1.0000 | 2.3769 – 3 | 1.0000 | 1116.4 | 3.737 – 7 | 1.0000 |
| 1000 | 1000 | 515.50 | +55.83 | 0.00 | 0.9644 | 0.9644 | 2.3081 | 0.9711 | 1112.6 | 3.721 | 0.9957 |
| 2000 | 2000 | 512.33 | +52.66 | 0.00 | 0.9298 | 0.9298 | 2.2411 | 0.9429 | 1108.7 | 3.705 | 0.9914 |
| 3000 | 3000 | 509.16 | +49.49 | 0.00 | 0.8962 | 0.8962 | 2.1758 | 0.9154 | 1104.9 | 3.690 | 0.9871 |
| 4000 | 4000 | 505.99 | +46.32 | 0.00 | 0.8637 | 0.8637 | 2.1122 | 0.8886 | 1101.0 | 3.674 | 0.9828 |
| 5000 | 5000 | 502.82 | +43.15 | 0.00 | 0.8320 | 0.8320 | 2.0502 | 0.8625 | 1097.1 | 3.658 | 0.9785 |
| 6000 | 6000 | 499.65 | +39.98 | 0.00 | 0.8014 | 0.8014 | 1.9898 | 0.8371 | 1093.2 | 3.643 | 0.9742 |
| 7000 | 7000 | 496.48 | +36.81 | 0.00 | 0.7717 | 0.7717 | 1.9309 | 0.8123 | 1089.3 | 3.627 | 0.9699 |
| 8000 | 8000 | 493.31 | +33.64 | 0.00 | 0.7430 | 0.7430 | 1.8736 | 0.7882 | 1085.4 | 3.611 | 0.9656 |
| 9000 | 9000 | 490.14 | +30.47 | 0.00 | 0.7152 | 0.7152 | 1.8178 | 0.7647 | 1081.5 | 3.596 | 0.9613 |
| 10000 | 10000 | 486.97 | +27.30 | 0.00 | 0.6883 | 0.6883 | 1.7634 | 0.7418 | 1077.6 | 3.580 | 0.9570 |
| 11000 | 11000 | 483.80 | +24.13 | 0.00 | 0.6623 | 0.6623 | 1.7105 | 0.7196 | 1073.7 | 3.564 | 0.9527 |
| 12000 | 12000 | 480.63 | +20.96 | 0.00 | 0.6371 | 0.6371 | 1.6590 | 0.6979 | 1069.8 | 3.548 | 0.9484 |
| 13000 | 13000 | 477.46 | +17.79 | 0.00 | 0.6128 | 0.6128 | 1.6089 | 0.6768 | 1065.9 | 3.533 | 0.9441 |
| 14000 | 14000 | 474.29 | +14.62 | 0.00 | 0.5893 | 0.5893 | 1.5601 | 0.6563 | 1061.9 | 3.517 | 0.9398 |
| 15000 | 15000 | 471.12 | +11.45 | 0.00 | 0.5666 | 0.5666 | 1.5127 | 0.6363 | 1058.0 | 3.501 | 0.9355 |
| 16000 | 16000 | 467.95 | +8.28 | 0.00 | 0.5447 | 0.5447 | 1.4665 | 0.6169 | 1054.1 | 3.485 | 0.9312 |
| 17000 | 17000 | 464.78 | +5.11 | 0.00 | 0.5236 | 0.5236 | 1.4216 | 0.5980 | 1050.1 | 3.469 | 0.9269 |
| 18000 | 18000 | 461.61 | +1.94 | 0.00 | 0.5032 | 0.5032 | 1.3779 | 0.5796 | 1046.2 | 3.453 | 0.9226 |
| 19000 | 19000 | 458.44 | –1.23 | 0.00 | 0.4836 | 0.4836 | 1.3354 | 0.5617 | 1042.2 | 3.437 | 0.9183 |
| 20000 | 20000 | 455.27 | –4.40 | 0.00 | 0.4647 | 0.4647 | 1.2941 | 0.5443 | 1038.2 | 3.421 | 0.9140 |
| 21000 | 20998 | 452.10 | –7.57 | 0.00 | 0.4465 | 0.4465 | 1.2539 | 0.5274 | 1034.3 | 3.405 | 0.9097 |
| 22000 | 21996 | 448.93 | –10.74 | 0.00 | 0.4289 | 0.4289 | 1.2148 | 0.5110 | 1030.3 | 3.389 | 0.9054 |
| 23000 | 22994 | 445.76 | –13.91 | 0.00 | 0.4120 | 0.4120 | 1.1768 | 0.4950 | 1026.3 | 3.373 | 0.9011 |
| 24000 | 23992 | 442.59 | –17.08 | 0.00 | 0.3957 | 0.3957 | 1.1398 | 0.4795 | 1022.3 | 3.357 | 0.8968 |
| 25000 | 24990 | 439.42 | –20.25 | 0.00 | 0.3800 | 0.3800 | 1.1038 | 0.4643 | 1018.3 | 3.341 | 0.8925 |
| 26000 | 25988 | 436.25 | –23.42 | 0.00 | 0.3649 | 0.3649 | 1.0688 | 0.4496 | 1014.3 | 3.325 | 0.8882 |
| 27000 | 26986 | 433.08 | –26.59 | 0.00 | 0.3504 | 0.3504 | 1.0348 | 0.4353 | 1010.3 | 3.309 | 0.8839 |
| 28000 | 27984 | 429.91 | –29.76 | 0.00 | 0.3364 | 0.3364 | 1.0017 | 0.4214 | 1006.3 | 3.293 | 0.8796 |
| 29000 | 28982 | 426.74 | –32.93 | 0.00 | 0.3230 | 0.3230 | 0.9695 | 0.4078 | 1002.3 | 3.277 | 0.8753 |
| 30000 | 29980 | 423.57 | –36.10 | 0.00 | 0.3101 | 0.3101 | 0.9382 | 0.3946 | 998.3 | 3.261 | 0.8710 |
| 31000 | 30978 | 420.40 | –39.27 | 0.00 | 0.2977 | 0.2977 | 0.9077 | 0.3818 | 994.3 | 3.245 | 0.8667 |
| 32000 | 31976 | 417.23 | –42.44 | 0.00 | 0.2858 | 0.2858 | 0.8781 | 0.3693 | 990.3 | 3.229 | 0.8624 |
| 33000 | 32974 | 414.06 | –45.61 | 0.00 | 0.2744 | 0.2744 | 0.8493 | 0.3572 | 986.3 | 3.213 | 0.8581 |
| 34000 | 33972 | 410.89 | –48.78 | 0.00 | 0.2634 | 0.2634 | 0.8213 | 0.3454 | 982.3 | 3.197 | 0.8538 |
| 35000 | 34970 | 407.72 | –51.95 | 0.00 | 0.2529 | 0.2529 | 0.7941 | 0.3340 | 978.3 | 3.181 | 0.8495 |
| 36000 | 35968 | 404.55 | –55.12 | 0.00 | 0.2428 | 0.2428 | 0.7677 | 0.3229 | 974.3 | 3.165 | 0.8452 |
| 37000 | 36966 | 401.38 | –58.29 | 0.00 | 0.2331 | 0.2331 | 0.7420 | 0.3121 | 970.3 | 3.149 | 0.8409 |
| 38000 | 37964 | 398.21 | –61.46 | 0.00 | 0.2238 | 0.2238 | 0.7171 | 0.3016 | 966.3 | 3.133 | 0.8366 |
| 39000 | 38962 | 395.04 | –64.63 | 0.00 | 0.2149 | 0.2149 | 0.6929 | 0.2914 | 962.3 | 3.117 | 0.8323 |
| 40000 | 39960 | 391.87 | –67.80 | 0.00 | 0.2063 | 0.2063 | 0.6694 | 0.2815 | 958.3 | 3.101 | 0.8280 |
| 41000 | 40958 | 388.70 | –70.97 | 0.00 | 0.1982 | 0.1982 | 0.6466 | 0.2719 | 954.3 | 3.085 | 0.8237 |
| 42000 | 41956 | 385.53 | –74.14 | 0.00 | 0.1903 | 0.1903 | 0.6245 | 0.2626 | 950.3 | 3.069 | 0.8194 |
| 43000 | 42954 | 382.36 | –77.31 | 0.00 | 0.1828 | 0.1828 | 0.6030 | 0.2536 | 946.3 | 3.053 | 0.8151 |
| 44000 | 43952 | 379.19 | –80.48 | 0.00 | 0.1756 | 0.1756 | 0.5822 | 0.2448 | 942.3 | 3.037 | 0.8108 |
| 45000 | 44950 | 376.02 | –83.65 | 0.00 | 0.1687 | 0.1687 | 0.5620 | 0.2363 | 938.3 | 3.021 | 0.8065 |
| 46000 | 45948 | 372.85 | –86.82 | 0.00 | 0.1621 | 0.1621 | 0.5424 | 0.2281 | 934.3 | 3.005 | 0.8022 |
| 47000 | 46946 | 369.68 | –89.99 | 0.00 | 0.1558 | 0.1558 | 0.5234 | 0.2201 | 930.3 | 2.989 | 0.7979 |
| 48000 | 47944 | 366.51 | –93.16 | 0.00 | 0.1498 | 0.1498 | 0.5050 | 0.2124 | 926.3 | 2.973 | 0.7936 |
| 49000 | 48942 | 363.34 | –96.33 | 0.00 | 0.1440 | 0.1440 | 0.4871 | 0.2049 | 922.3 | 2.957 | 0.7893 |
| 50000 | 49940 | 360.17 | –99.50 | 0.00 | 0.1385 | 0.1385 | 0.4698 | 0.1976 | 918.3 | 2.941 | 0.7850 |
| 51000 | 50938 | 357.00 | –102.67 | 0.00 | 0.1332 | 0.1332 | 0.4530 | 0.1905 | 914.3 | 2.925 | 0.7807 |
| 52000 | 51936 | 353.83 | –105.84 | 0.00 | 0.1281 | 0.1281 | 0.4367 | 0.1837 | 910.3 | 2.909 | 0.7764 |
| 53000 | 52934 | 350.66 | –109.01 | 0.00 | 0.1232 | 0.1232 | 0.4209 | 0.1770 | 906.3 | 2.893 | 0.7721 |
| 54000 | 53932 | 347.49 | –112.18 | 0.00 | 0.1185 | 0.1185 | 0.4056 | 0.1706 | 902.3 | 2.877 | 0.7678 |
| 55000 | 54930 | 344.32 | –115.35 | 0.00 | 0.1140 | 0.1140 | 0.3908 | 0.1644 | 898.3 | 2.861 | 0.7635 |
| 56000 | 55928 | 341.15 | –118.52 | 0.00 | 0.1097 | 0.1097 | 0.3764 | 0.1584 | 894.3 | 2.845 | 0.7592 |
| 57000 | 56926 | 337.98 | –121.69 | 0.00 | 0.1055 | 0.1055 | 0.3625 | 0.1525 | 890.3 | 2.829 | 0.7549 |
| 58000 | 57924 | 334.81 | –124.86 | 0.00 | 0.1015 | 0.1015 | 0.3490 | 0.1468 | 886.3 | 2.813 | 0.7506 |
| 59000 | 58922 | 331.64 | –128.03 | 0.00 | 0.0976 | 0.0976 | 0.3360 | 0.1414 | 882.3 | 2.797 | 0.7463 |
| 60000 | 59920 | 328.47 | –131.20 | 0.00 | 0.0939 | 0.0939 | 0.3234 | 0.1361 | 878.3 | 2.781 | 0.7420 |
| 61000 | 60918 | 325.30 | –134.37 | 0.00 | 0.0903 | 0.0903 | 0.3112 | 0.1309 | 874.3 | 2.765 | 0.7377 |
| 62000 | 61916 | 322.13 | –137.54 | 0.00 | 0.0868 | 0.0868 | 0.2994 | 0.1260 | 870.3 | 2.749 | 0.7334 |
| 63000 | 62914 | 318.96 | –140.71 | 0.00 | 0.0835 | 0.0835 | 0.2880 | 0.1212 | 866.3 | 2.733 | 0.7291 |
| 64000 | 63912 | 315.79 | –143.88 | 0.00 | 0.0803 | 0.0803 | 0.2770 | 0.1165 | 862.3 | 2.717 | 0.7248 |
| 65000 | 64910 | 312.62 | –147.05 | 0.00 | 0.0772 | 0.0772 | 0.2664 | 0.1121 | 858.3 | 2.701 | 0.7205 |
| 66000 | 65908 | 309.45 | –150.22 | 0.00 | 0.0742 | 0.0742 | 0.2561 | 0.1078 | 854.3 | 2.685 | 0.7162 |
| 67000 | 66906 | 306.28 | –153.39 | 0.00 | 0.0713 | 0.0713 | 0.2462 | 0.1036 | 850.3 | 2.669 | 0.7119 |
| 68000 | 67904 | 303.11 | –156.56 | 0.00 | 0.0685 | 0.0685 | 0.2366 | 0.0996 | 846.3 | 2.653 | 0.7076 |
| 69000 | 68902 | 299.94 | –159.73 | 0.00 | 0.0658 | 0.0658 | 0.2273 | 0.0957 | 842.3 | 2.637 | 0.7033 |
| 70000 | 69900 | 296.77 | –162.90 | 0.00 | 0.0632 | 0.0632 | 0.2184 | 0.0919 | 838.3 | 2.621 | 0.6990 |
| 71000 | 70898 | 293.60 | –166.07 | 0.00 | 0.0607 | 0.0607 | 0.2098 | 0.0883 | 834.3 | 2.605 | 0.6947 |
| 72000 | 71896 | 290.43 | –169.24 | 0.00 | 0.0583 | 0.0583 | 0.2015 | 0.0848 | 830.3 | 2.589 | 0.6904 |
| 73000 | 72894 | 287.26 | –172.41 | 0.00 | 0.0560 | 0.0560 | 0.1935 | 0.0814 | 826.3 | 2.573 | 0.6861 |
| 74000 | 73892 | 284.09 | –175.58 | 0.00 | 0.0538 | 0.0538 | 0.1858 | 0.0782 | 822.3 | 2.557 | 0.6818 |
| 75000 | 74890 | 280.92 | –178.75 | 0.00 | 0.0516 | 0.0516 | 0.1784 | 0.0751 | 818.3 | 2.541 | 0.6775 |
| 76000 | 75888 | 277.75 | –181.92 | 0.00 | 0.0496 | 0.0496 | 0.1713 | 0.0721 | 814.3 | 2.525 | 0.6732 |
| 77000 | 76886 | 274.58 | –185.09 | 0.00 | 0.0476 | 0.0476 | 0.1645 | 0.0692 | 810.3 | 2.509 | 0.6689 |
| 78000 | 77884 | 271.41 | –188.26 | 0.00 | 0.0457 | 0.0457 | 0.1579 | 0.0664 | 806.3 | 2.493 | 0.6646 |
| 79000 | 78882 | 268.24 | –191.43 | 0.00 | 0.0439 | 0.0439 | 0.1516 | 0.0638 | 802.3 | 2.477 | 0.6603 |
| 80000 | 79880 | 265.07 | –194.60 | 0.00 | 0.0421 | 0.0421 | 0.1455 | 0.0612 | 798.3 | 2.461 | 0.6560 |
| 81000 | 80878 | 261.90 | –197.77 | 0.00 | 0.0404 | 0.0404 | 0.1397 | 0.0588 | 794.3 | 2.445 | 0.6517 |
| 82000 | 81876 | 258.73 | –200.94 | 0.00 | 0.0388 | 0.0388 | 0.1341 | 0.0564 | 790.3 | 2.429 | 0.6474 |
| 83000 | 82874 | 255.56 | –204.11 | 0.00 | 0.0372 | 0.0372 | 0.1287 | 0.0542 | 786.3 | 2.413 | 0.6431 |
| 84000 | 83872 | 252.39 | –207.28 | 0.00 | 0.0357 | 0.0357 | 0.1235 | 0.0520 | 782.3 | 2.397 | 0.6388 |
| 85000 | 84870 | 249.22 | –210.45 | 0.00 | 0.0343 | 0.0343 | 0.1185 | 0.0499 | 778.3 | 2.381 | 0.6345 |
| 86000 | 85868 | 246.05 | –213.62 | 0.00 | 0.0329 | 0.0329 | 0.1137 | 0.0479 | 774.3 | 2.365 | 0.6302 |
| 87000 | 86866 | 242.88 | –216.79 | 0.00 | 0.0316 | 0.0316 | 0.1091 | 0.0459 | 770.3 | 2.349 | 0.6259 |
| 88000 | 87864 | 239.71 | –219.96 | 0.00 | 0.0303 | 0.0303 | 0.1047 | 0.0441 | 766.3 | 2.333 | 0.6216 |
| 89000 | 88862 | 236.54 | –223.13 | 0.00 | 0.0291 | 0.0291 | 0.1004 | 0.0423 | 762.3 | 2.317 | 0.6173 |
| 90000 | 89860 | 233.37 | –226.30 | 0.00 | 0.0279 | 0.0279 | 0.0963 | 0.0405 | 758.3 | 2.301 | 0.6130 |

TABLE 3.2 – Continued
35° N January
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ ft sec$^{-1}$ | $\mu$ lb ft$^{-1}$ sec$^{-1}$ | $k$ BTU ft$^{-1}$ sec$^{-1}$ °R$^{-1}$ |
| 0 | 0 | 498.39 | -11.08 | -70.08 | 2.993 | + 1 | 1.000 | 8.844 - 2 | 1.157 | 1098.3 | 1.074 - 5 | 3.566 - 6 |
| 1000 | 998 | 490.24 | -9.43 | -84.86 | 2.871 | | 0.995 | 8.452 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 1996 | 491.90 | -7.77 | -84.04 | 2.754 | | 0.990 | 8.078 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 2994 | 483.55 | -6.12 | -84.42 | 2.642 | | 0.985 | 7.722 | 1.104 | 1044.0 | 1.081 | 3.602 |
| 4000 | 3992 | 485.21 | -4.46 | -89.20 | 2.535 | | 0.981 | 7.383 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 4990 | 486.49 | -3.18 | -44.34 | 2.433 | | 0.977 | 7.066 | 1.072 | 1047.4 | 1.087 | 3.624 |
| 6000 | 5988 | 483.46 | -6.21 | -83.81 | 2.335 | | 0.974 | 6.826 | 1.068 | 1043.9 | 1.081 | 3.602 |
| 7000 | 6987 | 480.41 | -9.24 | -83.28 | 2.240 | | 0.970 | 6.595 | 1.064 | 1040.4 | 1.075 | 3.580 |
| 8000 | 7985 | 477.39 | -12.28 | -82.75 | 2.149 | | 0.967 | 6.366 | 1.059 | 1036.9 | 1.070 | 3.558 |
| 9000 | 8984 | 474.36 | -15.31 | -82.21 | 2.060 | | 0.963 | 6.146 | 1.055 | 1033.4 | 1.064 | 3.536 |
| 10000 | 9982 | 471.33 | -18.34 | -81.68 | 1.975 | + 1 | 0.960 | 5.932 - 2 | 1.050 | 1029.9 | 1.059 - 5 | 3.513 - 6 |
| 11000 | 10981 | 468.30 | -21.37 | -81.14 | 1.892 | | 0.956 | 5.723 | 1.045 | 1026.3 | 1.052 | 3.491 |
| 12000 | 11980 | 465.27 | -24.40 | -80.60 | 1.813 | | 0.953 | 5.521 | 1.042 | 1022.8 | 1.046 | 3.469 |
| 13000 | 12979 | 462.25 | -27.42 | -80.06 | 1.736 | | 0.949 | 5.325 | 1.037 | 1019.2 | 1.040 | 3.447 |
| 14000 | 13978 | 459.22 | -30.45 | -79.52 | 1.662 | | 0.946 | 5.134 | 1.033 | 1015.6 | 1.034 | 3.425 |
| 15000 | 14977 | 456.20 | -33.47 | -78.98 | 1.591 | | 0.943 | 4.949 | 1.028 | 1012.0 | 1.028 | 3.402 |
| 16000 | 15976 | 453.18 | -36.49 | -78.43 | 1.522 | | 0.939 | 4.769 | 1.024 | 1008.5 | 1.022 | 3.380 |
| 17000 | 16976 | 450.16 | -39.51 | -77.89 | 1.456 | | 0.935 | 4.594 | 1.020 | 1004.8 | 1.016 | 3.358 |
| 18000 | 17975 | 447.13 | -42.54 | -77.35 | 1.392 | | 0.932 | 4.425 | 1.015 | 1001.2 | 1.010 | 3.335 |
| 19000 | 18975 | 444.11 | -45.56 | -76.80 | 1.331 | | 0.928 | 4.261 | 1.011 | 997.6 | 1.004 | 3.313 |
| 20000 | 19974 | 441.09 | -48.58 | -76.26 | 1.272 | + 1 | 0.925 | 4.101 - 2 | 1.006 | 993.9 | 9.981 - 6 | 3.290 - 6 |
| 21000 | 20974 | 438.07 | -51.60 | -75.71 | 1.215 | | 0.922 | 3.947 | 1.002 | 990.3 | 9.920 | 3.268 |
| 22000 | 21974 | 435.05 | -54.62 | -75.17 | 1.160 | | 0.918 | 3.797 | 0.998 | 986.6 | 9.859 | 3.245 |
| 23000 | 22974 | 432.03 | -57.64 | -74.62 | 1.108 | | 0.915 | 3.652 | 0.993 | 982.9 | 9.798 | 3.223 |
| 24000 | 23974 | 429.01 | -60.66 | -74.07 | 1.057 | | 0.911 | 3.511 | 0.989 | 979.2 | 9.737 | 3.200 |
| 25000 | 24974 | 425.99 | -63.68 | -73.53 | 1.008 | | 0.908 | 3.375 | 0.985 | 975.5 | 9.676 | 3.178 |
| 26000 | 25974 | 422.97 | -66.70 | -72.98 | 9.615 | + 0 | 0.904 | 3.243 | 0.980 | 971.8 | 9.614 | 3.155 |
| 27000 | 26974 | 419.95 | -69.72 | -72.44 | 9.165 | | 0.901 | 3.116 | 0.976 | 968.0 | 9.552 | 3.132 |
| 28000 | 27975 | 417.24 | -72.43 | -71.58 | 8.733 | | 0.898 | 2.990 | 0.971 | 964.7 | 9.497 | 3.112 |
| 29000 | 28975 | 416.97 | -72.70 | -70.26 | 8.321 | | 0.895 | 2.850 | 0.960 | 964.3 | 9.491 | 3.110 |
| 30000 | 29976 | 416.69 | -72.98 | -69.99 | 7.927 | + 0 | 0.892 | 2.718 - 2 | 0.959 | 964.0 | 9.485 - 6 | 3.108 - 6 |
| 31000 | 30977 | 416.42 | -73.25 | -71.70 | 7.552 | | 0.890 | 2.591 | 0.940 | 963.7 | 9.480 | 3.106 |
| 32000 | 31977 | 416.14 | -73.53 | -68.41 | 7.194 | | 0.888 | 2.470 | 0.930 | 963.3 | 9.474 | 3.104 |
| 33000 | 32978 | 415.87 | -73.80 | -65.12 | 6.853 | | 0.886 | 2.354 | 0.920 | 963.0 | 9.468 | 3.102 |
| 34000 | 33979 | 415.59 | -74.08 | -61.83 | 6.528 | | 0.884 | 2.244 | 0.912 | 962.6 | 9.463 | 3.100 |
| 35000 | 34980 | 415.32 | -74.35 | -58.53 | 6.218 | | 0.883 | 2.139 | 0.903 | 962.3 | 9.457 | 3.098 |
| 36000 | 35981 | 415.05 | -74.62 | -55.24 | 5.923 | | 0.882 | 2.039 | 0.894 | 961.9 | 9.451 | 3.095 |
| 37000 | 36983 | 414.77 | -74.90 | -55.20 | 5.641 | | 0.882 | 1.944 | 0.894 | 961.6 | 9.446 | 3.093 |
| 38000 | 37984 | 414.49 | -75.22 | -55.52 | 5.373 | | 0.881 | 1.853 | 0.894 | 961.2 | 9.439 | 3.091 |
| 39000 | 38985 | 414.01 | -75.66 | -55.96 | 5.117 | | 0.881 | 1.767 | 0.894 | 960.7 | 9.430 | 3.088 |
| 40000 | 39987 | 413.58 | -76.09 | -56.39 | 4.873 | + 0 | 0.880 | 1.684 - 2 | 0.894 | 960.1 | 9.421 - 6 | 3.084 - 6 |
| 41000 | 40989 | 413.14 | -76.53 | -56.83 | 4.641 | | 0.879 | 1.606 | 0.895 | 959.6 | 9.412 | 3.081 |
| 42000 | 41990 | 412.70 | -76.97 | -57.27 | 4.419 | | 0.879 | 1.531 | 0.895 | 959.0 | 9.403 | 3.078 |
| 43000 | 42992 | 412.26 | -77.41 | -57.71 | 4.208 | | 0.878 | 1.459 | 0.895 | 958.5 | 9.394 | 3.074 |
| 44000 | 43994 | 411.82 | -77.85 | -58.15 | 4.006 | | 0.877 | 1.391 | 0.896 | 957.9 | 9.385 | 3.071 |
| 45000 | 44996 | 411.38 | -78.29 | -58.59 | 3.814 | | 0.876 | 1.326 | 0.896 | 957.4 | 9.376 | 3.068 |
| 46000 | 45998 | 410.94 | -78.73 | -59.03 | 3.631 | | 0.875 | 1.264 | 0.896 | 956.8 | 9.366 | 3.065 |
| 47000 | 47000 | 410.50 | -79.17 | -59.47 | 3.457 | | 0.874 | 1.204 | 0.895 | 956.3 | 9.357 | 3.061 |
| 48000 | 48003 | 410.06 | -79.61 | -59.91 | 3.291 | | 0.873 | 1.148 | 0.895 | 955.7 | 9.348 | 3.058 |
| 49000 | 49005 | 409.63 | -80.04 | -60.34 | 3.132 | | 0.872 | 1.094 | 0.895 | 955.1 | 9.339 | 3.055 |
| 50000 | 50008 | 409.19 | -80.48 | -60.78 | 2.981 | + 0 | 0.870 | 1.042 - 2 | 0.895 | 954.6 | 9.330 - 6 | 3.051 - 6 |
| 51000 | 51010 | 408.75 | -80.92 | -61.22 | 2.837 | | 0.869 | 9.931 - 3 | 0.895 | 954.0 | 9.321 | 3.048 |
| 52000 | 52013 | 408.31 | -81.36 | -61.66 | 2.700 | | 0.868 | 9.462 | 0.895 | 953.5 | 9.312 | 3.045 |
| 53000 | 53016 | 407.87 | -81.80 | -62.10 | 2.570 | | 0.867 | 9.015 | 0.894 | 952.9 | 9.303 | 3.041 |
| 54000 | 54019 | 407.43 | -82.24 | -62.54 | 2.445 | | 0.865 | 8.588 | 0.894 | 952.4 | 9.294 | 3.038 |
| 55000 | 55022 | 406.99 | -82.68 | -62.98 | 2.327 | | 0.864 | 8.182 | 0.894 | 951.8 | 9.284 | 3.035 |
| 56000 | 56025 | 406.55 | -83.12 | -63.42 | 2.214 | | 0.862 | 7.794 | 0.893 | 951.3 | 9.275 | 3.031 |
| 57000 | 57028 | 406.11 | -83.56 | -63.86 | 2.106 | | 0.861 | 7.424 | 0.893 | 950.7 | 9.266 | 3.028 |
| 58000 | 58031 | 405.67 | -84.00 | -64.30 | 2.004 | | 0.860 | 7.071 | 0.892 | 950.2 | 9.257 | 3.025 |
| 59000 | 59034 | 405.24 | -84.43 | -64.73 | 1.906 | | 0.858 | 6.734 | 0.891 | 949.6 | 9.248 | 3.021 |
| 60000 | 60038 | 404.80 | -84.87 | -65.17 | 1.813 | + 0 | 0.856 | 6.414 - 3 | 0.891 | 949.1 | 9.239 - 6 | 3.016 - 6 |
| 61000 | 61041 | 404.36 | -85.31 | -65.61 | 1.725 | | 0.855 | 6.108 | 0.890 | 948.5 | 9.230 | 3.015 |
| 62000 | 62045 | 403.92 | -85.75 | -66.05 | 1.641 | | 0.853 | 5.816 | 0.889 | 947.9 | 9.220 | 3.011 |
| 63000 | 63049 | 403.77 | -85.90 | -66.20 | 1.560 | | 0.851 | 5.534 | 0.888 | 947.8 | 9.217 | 3.010 |
| 64000 | 64053 | 403.77 | -85.90 | -66.20 | 1.484 | | 0.849 | 5.263 | 0.886 | 947.8 | 9.217 | 3.010 |
| 65000 | 65057 | 403.77 | -85.90 | -66.20 | 1.411 | | 0.848 | 5.006 | 0.884 | 947.8 | 9.217 | 3.010 |
| 66000 | 66061 | 403.77 | -85.90 | -66.41 | 1.342 | | 0.846 | 4.761 | 0.883 | 947.8 | 9.217 | 3.010 |
| 67000 | 67065 | 403.77 | -85.90 | -66.96 | 1.277 | | 0.844 | 4.528 | 0.882 | 947.8 | 9.217 | 3.010 |
| 68000 | 68069 | 403.77 | -85.90 | -67.51 | 1.214 | | 0.842 | 4.307 | 0.881 | 947.8 | 9.217 | 3.010 |
| 69000 | 69073 | 403.77 | -85.90 | -68.05 | 1.155 | | 0.840 | 4.096 | 0.881 | 947.8 | 9.217 | 3.010 |
| 70000 | 70078 | 403.77 | -85.90 | -68.60 | 1.098 | + 0 | 0.838 | 3.896 - 3 | 0.880 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 71000 | 71082 | 403.77 | -85.90 | -69.15 | 1.045 | | 0.836 | 3.705 | 0.879 | 947.8 | 9.217 | 3.010 |
| 72000 | 72087 | 403.77 | -85.90 | -69.70 | 9.936 | - 1 | 0.834 | 3.524 | 0.878 | 947.8 | 9.217 | 3.010 |
| 73000 | 73092 | 403.77 | -85.90 | -70.25 | 9.450 | | 0.832 | 3.352 | 0.877 | 947.8 | 9.217 | 3.010 |
| 74000 | 74096 | 403.77 | -85.90 | -70.80 | 8.988 | | 0.830 | 3.188 | 0.876 | 947.8 | 9.217 | 3.010 |
| 75000 | 75101 | 403.77 | -85.90 | -71.35 | 8.548 | | 0.827 | 3.032 | 0.875 | 947.8 | 9.217 | 3.010 |
| 76000 | 76106 | 403.77 | -85.90 | -71.90 | 8.130 | | 0.825 | 2.883 | 0.874 | 947.8 | 9.217 | 3.010 |
| 77000 | 77111 | 403.77 | -85.90 | -72.44 | 7.732 | | 0.823 | 2.742 | 0.873 | 947.8 | 9.217 | 3.010 |
| 78000 | 78116 | 403.77 | -85.90 | -72.99 | 7.354 | | 0.821 | 2.608 | 0.871 | 947.8 | 9.217 | 3.010 |
| 79000 | 79122 | 403.77 | -85.90 | -73.54 | 6.994 | | 0.818 | 2.481 | 0.870 | 947.8 | 9.217 | 3.010 |

TABLE 5.2 Continued

75° N January

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ ft sec$^{-1}$ | $\mu$ lb ft$^{-1}$ sec$^{-1}$ | $k$ BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 0 | 0 | 448.59 | -11.08 | -70.08 | 2.993 | + 1 | 1.000 | 8.844 - 2 | 1.157 | 1038.3 | 1.072 - 5 | 3.566 - 6 |
| 1000 | 1002 | 450.25 | -9.42 | -68.86 | 2.870 | | 0.995 | 8.491 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 2004 | 451.90 | -7.77 | -59.63 | 2.753 | | 0.990 | 8.077 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 3006 | 453.56 | -6.11 | -54.41 | 2.641 | | 0.985 | 7.720 | 1.103 | 1044.0 | 1.081 | 3.603 |
| 4000 | 4008 | 455.22 | -4.45 | -49.19 | 2.534 | | 0.981 | 7.381 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 5010 | 456.46 | -3.21 | -44.38 | 2.432 | | 0.977 | 7.064 | 1.072 | 1047.4 | 1.087 | 3.624 |
| 6000 | 6012 | 458.43 | -6.24 | -43.85 | 2.334 | | 0.973 | 6.823 | 1.067 | 1043.9 | 1.081 | 3.602 |
| 7000 | 7013 | 460.39 | -9.28 | -43.33 | 2.239 | | 0.970 | 6.590 | 1.063 | 1040.4 | 1.075 | 3.579 |
| 8000 | 8015 | 462.35 | -12.32 | -42.80 | 2.147 | | 0.966 | 6.363 | 1.058 | 1036.9 | 1.069 | 3.557 |
| 9000 | 9016 | 464.31 | -15.36 | -42.28 | 2.059 | | 0.962 | 6.142 | 1.054 | 1033.3 | 1.064 | 3.535 |
| 10000 | 10018 | 441.28 | -18.39 | -41.75 | 1.973 | + 1 | 0.959 | 5.928 - 2 | 1.050 | 1029.8 | 1.058 - 5 | 3.513 - 6 |
| 11000 | 11019 | 438.24 | -21.43 | -41.22 | 1.891 | | 0.955 | 5.720 | 1.045 | 1026.2 | 1.052 | 3.491 |
| 12000 | 12020 | 435.21 | -24.46 | -40.69 | 1.811 | | 0.952 | 5.517 | 1.041 | 1022.7 | 1.046 | 3.469 |
| 13000 | 13021 | 432.18 | -27.49 | -40.16 | 1.735 | | 0.948 | 5.321 | 1.036 | 1019.1 | 1.040 | 3.446 |
| 14000 | 14022 | 429.16 | -30.51 | -39.62 | 1.661 | | 0.945 | 5.130 | 1.032 | 1015.6 | 1.034 | 3.424 |
| 15000 | 15023 | 426.13 | -33.54 | -39.08 | 1.589 | | 0.941 | 4.944 | 1.027 | 1012.0 | 1.028 | 3.402 |
| 16000 | 16024 | 423.11 | -36.56 | -38.55 | 1.521 | | 0.938 | 4.765 | 1.023 | 1008.4 | 1.022 | 3.379 |
| 17000 | 17024 | 420.08 | -39.59 | -38.01 | 1.455 | | 0.934 | 4.590 | 1.018 | 1004.8 | 1.016 | 3.357 |
| 18000 | 18025 | 417.06 | -42.61 | -37.49 | 1.391 | | 0.930 | 4.421 | 1.014 | 1001.1 | 1.010 | 3.335 |
| 19000 | 19025 | 414.03 | -45.64 | -36.94 | 1.329 | | 0.926 | 4.257 | 1.009 | 997.5 | 1.004 | 3.312 |
| 20000 | 20026 | 411.01 | -48.66 | -36.40 | 1.270 | + 1 | 0.923 | 4.097 - 2 | 1.005 | 993.8 | 9.979 - 6 | 3.290 - 6 |
| 21000 | 21026 | 407.99 | -51.68 | -35.87 | 1.214 | | 0.919 | 3.943 | 1.000 | 990.2 | 9.919 | 3.267 |
| 22000 | 22026 | 404.97 | -54.70 | -35.33 | 1.159 | | 0.916 | 3.793 | 0.996 | 986.5 | 9.858 | 3.245 |
| 23000 | 23026 | 401.95 | -57.72 | -34.79 | 1.106 | | 0.913 | 3.648 | 0.992 | 982.8 | 9.797 | 3.222 |
| 24000 | 24026 | 398.93 | -60.74 | -34.25 | 1.056 | | 0.909 | 3.508 | 0.987 | 979.1 | 9.736 | 3.200 |
| 25000 | 25026 | 395.91 | -63.76 | -33.71 | 1.007 | | 0.906 | 3.372 | 0.983 | 975.4 | 9.674 | 3.177 |
| 26000 | 26026 | 392.89 | -66.78 | -33.18 | 9.603 | + 0 | 0.903 | 3.240 | 0.979 | 971.7 | 9.612 | 3.154 |
| 27000 | 27026 | 389.87 | -69.80 | -32.64 | 9.154 | | 0.899 | 3.112 | 0.974 | 968.0 | 9.551 | 3.132 |
| 28000 | 28025 | 387.16 | -72.51 | -31.79 | 8.723 | | 0.895 | 2.987 | 0.969 | 964.6 | 9.495 | 3.111 |
| 29000 | 29025 | 386.34 | -73.33 | -29.06 | 8.310 | | 0.892 | 2.852 | 0.959 | 963.6 | 9.478 | 3.105 |
| 30000 | 30024 | 385.51 | -74.16 | -26.33 | 7.917 | + 0 | 0.889 | 2.722 - 2 | 0.950 | 962.5 | 9.461 - 6 | 3.099 - 6 |
| 31000 | 31023 | 384.69 | -74.98 | -23.59 | 7.541 | | 0.887 | 2.599 | 0.941 | 961.5 | 9.444 | 3.093 |
| 32000 | 32023 | 383.87 | -75.80 | -20.86 | 7.182 | | 0.884 | 2.480 | 0.932 | 960.5 | 9.427 | 3.087 |
| 33000 | 33022 | 383.05 | -76.62 | -18.13 | 6.840 | | 0.882 | 2.367 | 0.924 | 959.4 | 9.410 | 3.080 |
| 34000 | 34021 | 382.22 | -77.45 | -15.39 | 6.513 | | 0.880 | 2.259 | 0.915 | 958.4 | 9.393 | 3.074 |
| 35000 | 35020 | 381.40 | -78.27 | -12.66 | 6.201 | | 0.877 | 2.155 | 0.908 | 957.4 | 9.376 | 3.068 |
| 36000 | 36019 | 380.58 | -79.09 | -9.93 | 5.904 | | 0.877 | 2.056 | 0.900 | 956.3 | 9.359 | 3.062 |
| 37000 | 37017 | 379.76 | -79.91 | -10.21 | 5.620 | | 0.876 | 1.962 | 0.900 | 955.3 | 9.342 | 3.056 |
| 38000 | 38016 | 378.94 | -80.73 | -11.03 | 5.350 | | 0.875 | 1.872 | 0.900 | 954.3 | 9.325 | 3.049 |
| 39000 | 39015 | 378.11 | -81.56 | -11.86 | 5.092 | | 0.873 | 1.785 | 0.901 | 953.2 | 9.308 | 3.043 |
| 40000 | 40013 | 377.29 | -82.38 | -12.68 | 4.845 | + 0 | 0.872 | 1.702 - 2 | 0.901 | 952.2 | 9.291 - 6 | 3.037 - 6 |
| 41000 | 41011 | 376.47 | -83.20 | -13.50 | 4.611 | | 0.870 | 1.624 | 0.901 | 951.2 | 9.274 | 3.031 |
| 42000 | 42010 | 375.65 | -84.02 | -14.32 | 4.387 | | 0.869 | 1.548 | 0.902 | 950.1 | 9.256 | 3.024 |
| 43000 | 43008 | 374.83 | -84.84 | -15.14 | 4.174 | | 0.867 | 1.476 | 0.902 | 949.1 | 9.239 | 3.018 |
| 44000 | 44006 | 374.01 | -85.66 | -15.96 | 3.970 | | 0.865 | 1.407 | 0.902 | 948.1 | 9.222 | 3.012 |
| 45000 | 45004 | 373.19 | -86.48 | -16.78 | 3.776 | | 0.863 | 1.341 | 0.902 | 947.0 | 9.205 | 3.006 |
| 46000 | 46002 | 372.36 | -87.31 | -17.61 | 3.592 | | 0.861 | 1.279 | 0.902 | 946.0 | 9.188 | 3.000 |
| 47000 | 47000 | 371.54 | -88.13 | -18.43 | 3.415 | | 0.859 | 1.219 | 0.901 | 944.9 | 9.171 | 2.993 |
| 48000 | 47997 | 370.72 | -88.95 | -19.25 | 3.248 | | 0.857 | 1.161 | 0.902 | 943.9 | 9.153 | 2.987 |
| 49000 | 48995 | 369.90 | -89.77 | -20.07 | 3.088 | | 0.855 | 1.107 | 0.901 | 942.8 | 9.136 | 2.981 |
| 50000 | 49992 | 369.08 | -90.59 | -20.89 | 2.935 | + 0 | 0.852 | 1.054 - 2 | 0.900 | 941.8 | 9.119 - 6 | 2.975 - 6 |
| 51000 | 50990 | 368.26 | -91.41 | -21.71 | 2.790 | | 0.850 | 1.004 | 0.900 | 940.7 | 9.102 | 2.968 |
| 52000 | 51987 | 367.44 | -92.23 | -22.53 | 2.652 | | 0.847 | 9.568 - 3 | 0.899 | 939.7 | 9.085 | 2.962 |
| 53000 | 52984 | 366.62 | -93.05 | -23.35 | 2.520 | | 0.845 | 9.113 | 0.899 | 938.6 | 9.067 | 2.956 |
| 54000 | 53981 | 365.80 | -93.87 | -24.17 | 2.395 | | 0.842 | 8.679 | 0.898 | 937.6 | 9.050 | 2.950 |
| 55000 | 54979 | 364.98 | -94.69 | -24.99 | 2.275 | | 0.839 | 8.265 | 0.896 | 936.5 | 9.033 | 2.943 |
| 56000 | 55975 | 364.16 | -95.51 | -25.81 | 2.162 | | 0.836 | 7.870 | 0.895 | 935.5 | 9.015 | 2.937 |
| 57000 | 56972 | 363.34 | -96.33 | -26.63 | 2.054 | | 0.833 | 7.492 | 0.894 | 934.4 | 8.998 | 2.931 |
| 58000 | 57969 | 362.79 | -96.88 | -27.18 | 1.991 | | 0.830 | 7.127 | 0.892 | 933.7 | 8.986 | 2.927 |
| 59000 | 58966 | 362.46 | -97.21 | -27.51 | 1.853 | | 0.827 | 6.776 | 0.890 | 933.3 | 8.979 | 2.924 |
| 60000 | 59962 | 362.13 | -97.54 | -27.84 | 1.759 | + 0 | 0.824 | 6.441 - 3 | 0.887 | 932.9 | 8.973 - 6 | 2.922 - 6 |
| 61000 | 60959 | 361.81 | -97.86 | -28.16 | 1.671 | | 0.821 | 6.123 | 0.885 | 932.5 | 8.966 | 2.919 |
| 62000 | 61955 | 361.48 | -98.19 | -28.49 | 1.587 | | 0.818 | 5.820 | 0.882 | 932.0 | 8.959 | 2.917 |
| 63000 | 62951 | 361.15 | -98.52 | -28.82 | 1.507 | | 0.815 | 5.532 | 0.879 | 931.6 | 8.952 | 2.914 |
| 64000 | 63948 | 360.82 | -98.85 | -29.15 | 1.431 | | 0.811 | 5.257 | 0.877 | 931.2 | 8.945 | 2.912 |
| 65000 | 64944 | 360.49 | -99.18 | -29.48 | 1.359 | | 0.808 | 4.997 | 0.874 | 930.8 | 8.938 | 2.909 |
| 66000 | 65940 | 360.17 | -99.50 | -29.80 | 1.290 | | 0.805 | 4.749 | 0.872 | 930.3 | 8.931 | 2.907 |
| 67000 | 66936 | 359.84 | -99.83 | -30.77 | 1.225 | | 0.802 | 4.513 | 0.870 | 929.9 | 8.924 | 2.904 |
| 68000 | 67931 | 359.51 | -100.16 | -31.65 | 1.163 | | 0.798 | 4.289 | 0.868 | 929.5 | 8.917 | 2.902 |
| 69000 | 68927 | 359.18 | -100.49 | -32.52 | 1.104 | | 0.794 | 4.075 | 0.867 | 929.1 | 8.910 | 2.899 |
| 70000 | 69923 | 358.85 | -100.82 | -33.39 | 1.048 | + 0 | 0.791 | 3.872 - 3 | 0.865 | 928.7 | 8.903 - 6 | 2.897 - 6 |
| 71000 | 70918 | 358.53 | -101.14 | -34.26 | 9.951 | - 1 | 0.787 | 3.679 | 0.863 | 928.2 | 8.896 | 2.894 |
| 72000 | 71914 | 358.20 | -101.47 | -35.14 | 9.447 | | 0.784 | 3.496 | 0.861 | 927.8 | 8.889 | 2.892 |
| 73000 | 72909 | 357.87 | -101.80 | -36.01 | 8.967 | | 0.780 | 3.322 | 0.859 | 927.4 | 8.882 | 2.889 |
| 74000 | 73904 | 357.54 | -102.13 | -36.88 | 8.511 | | 0.776 | 3.156 | 0.856 | 927.0 | 8.875 | 2.887 |
| 75000 | 74899 | 357.22 | -102.45 | -37.75 | 8.078 | | 0.772 | 2.998 | 0.854 | 926.5 | 8.868 | 2.884 |
| 76000 | 75894 | 356.89 | -102.78 | -38.63 | 7.667 | | 0.768 | 2.848 | 0.851 | 926.1 | 8.861 | 2.882 |
| 77000 | 76889 | 356.56 | -103.11 | -39.50 | 7.277 | | 0.764 | 2.705 | 0.849 | 925.7 | 8.854 | 2.879 |
| 78000 | 77884 | 356.23 | -103.44 | -40.37 | 6.906 | | 0.760 | 2.570 | 0.846 | 925.3 | 8.847 | 2.877 |
| 79000 | 78879 | 355.91 | -103.76 | -41.24 | 6.554 | | 0.756 | 2.441 | 0.843 | 924.8 | 8.840 | 2.874 |

TABLE 5.2 — Continued
75° N January
GEOPOTENTIAL ALTITUDE ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $a$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ °R$^{-1}$ |
| 80000 | 80127 | 373.77 | -85.90 | -24.08 | 6.652 - 1 | 0.816 | 2.359 - 3 | 0.868 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 81000 | 81133 | 373.77 | -85.90 | -24.64 | 6.527 | 0.813 | 2.244 | 0.867 | 947.8 | 9.217 | 3.010 |
| 82000 | 82138 | 373.77 | -85.90 | -25.19 | 6.017 | 0.811 | 2.134 | 0.865 | 947.8 | 9.217 | 3.010 |
| 83000 | 83144 | 373.77 | -85.90 | -25.74 | 5.723 | 0.808 | 2.030 | 0.864 | 947.8 | 9.217 | 3.010 |
| 84000 | 84150 | 373.77 | -85.90 | -26.28 | 5.443 | 0.805 | 1.931 | 0.862 | 947.8 | 9.217 | 3.010 |
| 85000 | 85155 | 373.77 | -85.90 | -26.83 | 5.177 | 0.803 | 1.836 | 0.860 | 947.8 | 9.217 | 3.010 |
| 86000 | 86161 | 373.77 | -85.90 | -27.38 | 4.924 | 0.800 | 1.746 | 0.859 | 947.8 | 9.217 | 3.010 |
| 87000 | 87167 | 373.77 | -85.90 | -27.93 | 4.683 | 0.797 | 1.661 | 0.857 | 947.8 | 9.217 | 3.010 |
| 88000 | 88174 | 373.77 | -85.90 | -28.48 | 4.454 | 0.794 | 1.580 | 0.855 | 947.8 | 9.217 | 3.010 |
| 89000 | 89180 | 373.77 | -85.90 | -29.03 | 4.236 | 0.792 | 1.502 | 0.853 | 947.8 | 9.217 | 3.010 |
| 90000 | 90186 | 373.77 | -85.90 | -29.58 | 4.029 - 1 | 0.789 | 1.429 - 3 | 0.851 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 91000 | 91193 | 373.77 | -85.90 | -30.12 | 3.832 | 0.786 | 1.359 | 0.849 | 947.8 | 9.217 | 3.010 |
| 92000 | 92199 | 373.77 | -85.90 | -30.67 | 3.644 | 0.783 | 1.293 | 0.847 | 947.8 | 9.217 | 3.010 |
| 93000 | 93206 | 373.77 | -85.90 | -31.22 | 3.466 | 0.780 | 1.229 | 0.845 | 947.8 | 9.217 | 3.010 |
| 94000 | 94213 | 373.77 | -85.90 | -31.77 | 3.297 | 0.777 | 1.169 | 0.843 | 947.8 | 9.217 | 3.010 |
| 95000 | 95219 | 373.77 | -85.90 | -32.32 | 3.135 | 0.774 | 1.112 | 0.841 | 947.8 | 9.217 | 3.010 |
| 96000 | 96226 | 373.77 | -85.90 | -32.87 | 2.982 | 0.771 | 1.058 | 0.839 | 947.8 | 9.217 | 3.010 |
| 97000 | 97233 | 373.77 | -85.90 | -33.42 | 2.836 | 0.768 | 1.006 | 0.838 | 947.8 | 9.217 | 3.010 |
| 98000 | 98240 | 373.77 | -85.90 | -33.97 | 2.698 | 0.764 | 9.567 - 4 | 0.834 | 947.8 | 9.217 | 3.010 |

Table 5.2 — *Continued*

75° N January

GEOMETRIC ALTITUDE ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T - T_{sea}$ | $P$, in. Hg | $\frac{P}{P_{sea}}$ | $\rho$, lb/ft³ | $\frac{\rho}{\rho_{sea}}$ | $C$, ft/sec | $\mu$, lb/ft-sec | $k$, BTU/ft-sec-°R |
| 80000 | 79874 | 373.77 | -85.90 | -23.92 | 6.695 - 1 | 0.809 | 2.379 - 3 | 0.861 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 81000 | 80868 | 373.77 | -85.90 | -24.47 | 6.369 | 0.807 | 2.259 | 0.860 | 947.8 | 9.217 | 3.010 |
| 82000 | 81863 | 373.77 | -85.90 | -25.01 | 6.059 | 0.804 | 2.144 | 0.858 | 947.8 | 9.217 | 3.010 |
| 83000 | 82857 | 373.77 | -85.90 | -25.56 | 5.764 | 0.801 | 2.044 | 0.856 | 947.8 | 9.217 | 3.010 |
| 84000 | 83851 | 373.77 | -85.90 | -26.10 | 5.484 | 0.799 | 1.945 | 0.855 | 947.8 | 9.217 | 3.010 |
| 85000 | 84845 | 373.77 | -85.90 | -26.64 | 5.217 | 0.796 | 1.850 | 0.853 | 947.8 | 9.217 | 3.010 |
| 86000 | 85840 | 373.77 | -85.90 | -27.19 | 4.964 | 0.793 | 1.760 | 0.851 | 947.8 | 9.217 | 3.010 |
| 87000 | 86834 | 373.77 | -85.90 | -27.73 | 4.722 | 0.791 | 1.675 | 0.849 | 947.8 | 9.217 | 3.010 |
| 88000 | 87827 | 373.77 | -85.90 | -28.28 | 4.493 | 0.788 | 1.593 | 0.848 | 947.8 | 9.217 | 3.010 |
| 89000 | 88821 | 373.77 | -85.90 | -28.82 | 4.274 | 0.785 | 1.516 | 0.845 | 947.8 | 9.217 | 3.010 |
| 90000 | 89815 | 373.77 | -85.90 | -29.36 | 4.066 - 1 | 0.782 | 1.442 - 3 | 0.843 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 91000 | 90809 | 373.77 | -85.90 | -29.91 | 3.869 | 0.779 | 1.372 | 0.841 | 947.8 | 9.217 | 3.010 |
| 92000 | 91802 | 373.77 | -85.90 | -30.45 | 3.681 | 0.776 | 1.305 | 0.840 | 947.8 | 9.217 | 3.010 |
| 93000 | 92796 | 373.77 | -85.90 | -31.00 | 3.502 | 0.773 | 1.242 | 0.837 | 947.8 | 9.217 | 3.010 |
| 94000 | 93789 | 373.77 | -85.90 | -31.54 | 3.332 | 0.770 | 1.182 | 0.835 | 947.8 | 9.217 | 3.010 |
| 95000 | 94782 | 373.77 | -85.90 | -32.08 | 3.170 | 0.767 | 1.124 | 0.833 | 947.8 | 9.217 | 3.010 |
| 96000 | 95775 | 373.77 | -85.90 | -32.63 | 3.016 | 0.764 | 1.070 | 0.830 | 947.8 | 9.217 | 3.010 |
| 97000 | 96768 | 373.77 | -85.90 | -33.17 | 2.869 | 0.761 | 1.018 | 0.828 | 947.8 | 9.217 | 3.010 |
| 98000 | 97761 | 373.77 | -85.90 | -33.71 | 2.730 | 0.757 | 9.682 - 4 | 0.826 | 947.8 | 9.217 | 3.010 |

TABLE 5.2 – Continued

75° N January (Cold)

GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $a$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, Btu ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 0 | 0 | 448.59 | -11.08 | -70.08 | 2.993 + 1 | 1.000 | 8.844 - 2 | 1.157 | 1038.3 | 1.072 - 5 | 3.586 - 6 |
| 1000 | 998 | 450.24 | -9.43 | -66.68 | 2.871 | 0.995 | 8.652 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 1996 | 451.90 | -7.77 | -59.64 | 2.754 | 0.990 | 8.078 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 2994 | 453.55 | -6.12 | -54.42 | 2.642 | 0.985 | 7.722 | 1.104 | 1044.0 | 1.081 | 3.602 |
| 4000 | 3992 | 455.21 | -4.46 | -49.20 | 2.535 | 0.981 | 7.383 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 4990 | 456.49 | -3.18 | -44.34 | 2.433 | 0.977 | 7.066 | 1.072 | 1047.4 | 1.087 | 3.624 |
| 6000 | 5988 | 457.46 | -2.21 | -43.81 | 2.335 | 0.974 | 6.826 | 1.068 | 1048.9 | 1.081 | 3.602 |
| 7000 | 6987 | 458.43 | -1.24 | -43.28 | 2.240 | 0.970 | 6.593 | 1.064 | 1040.4 | 1.075 | 3.580 |
| 8000 | 7985 | 447.39 | -12.28 | -42.75 | 2.149 | 0.967 | 6.366 | 1.059 | 1036.9 | 1.070 | 3.558 |
| 9000 | 8984 | 444.36 | -15.31 | -42.21 | 2.060 | 0.963 | 6.146 | 1.055 | 1033.4 | 1.064 | 3.536 |
| 10000 | 9982 | 441.33 | -18.34 | -41.68 | 1.975 + 1 | 0.960 | 5.932 - 2 | 1.050 | 1029.9 | 1.058 - 5 | 3.513 - 6 |
| 11000 | 10981 | 438.30 | -21.37 | -41.14 | 1.892 | 0.956 | 5.723 | 1.046 | 1026.3 | 1.052 | 3.491 |
| 12000 | 11980 | 435.27 | -24.40 | -40.60 | 1.813 | 0.953 | 5.521 | 1.042 | 1022.8 | 1.046 | 3.469 |
| 13000 | 12979 | 432.25 | -27.42 | -40.06 | 1.736 | 0.949 | 5.325 | 1.037 | 1019.2 | 1.040 | 3.447 |
| 14000 | 13978 | 429.22 | -30.45 | -39.52 | 1.662 | 0.946 | 5.134 | 1.033 | 1015.6 | 1.034 | 3.425 |
| 15000 | 14977 | 426.20 | -33.47 | -38.98 | 1.591 | 0.943 | 4.949 | 1.028 | 1012.0 | 1.028 | 3.402 |
| 16000 | 15976 | 423.18 | -36.49 | -38.43 | 1.522 | 0.939 | 4.769 | 1.024 | 1008.5 | 1.022 | 3.380 |
| 17000 | 16976 | 420.16 | -39.51 | -37.89 | 1.456 | 0.935 | 4.594 | 1.020 | 1004.8 | 1.016 | 3.358 |
| 18000 | 17975 | 417.13 | -42.54 | -37.35 | 1.392 | 0.932 | 4.425 | 1.015 | 1001.2 | 1.010 | 3.335 |
| 19000 | 18975 | 414.11 | -45.56 | -36.80 | 1.331 | 0.928 | 4.261 | 1.011 | 997.6 | 1.004 | 3.313 |
| 20000 | 19974 | 411.09 | -48.58 | -36.26 | 1.272 + 1 | 0.925 | 4.101 - 2 | 1.006 | 993.9 | 9.981 - 6 | 3.290 - 6 |
| 21000 | 20974 | 408.07 | -51.60 | -35.71 | 1.215 | 0.922 | 3.947 | 1.002 | 990.3 | 9.920 | 3.268 |
| 22000 | 21974 | 405.05 | -54.62 | -35.17 | 1.160 | 0.918 | 3.797 | 0.998 | 986.6 | 9.859 | 3.245 |
| 23000 | 22974 | 402.03 | -57.64 | -34.62 | 1.108 | 0.915 | 3.652 | 0.993 | 982.9 | 9.798 | 3.223 |
| 24000 | 23974 | 399.01 | -60.66 | -34.07 | 1.057 | 0.911 | 3.511 | 0.989 | 979.2 | 9.737 | 3.200 |
| 25000 | 24974 | 395.99 | -63.68 | -33.53 | 1.008 | 0.908 | 3.375 | 0.985 | 975.5 | 9.676 | 3.178 |
| 26000 | 25974 | 392.97 | -66.70 | -32.98 | 9.615 + 0 | 0.904 | 3.243 | 0.980 | 971.8 | 9.614 | 3.155 |
| 27000 | 26974 | 389.95 | -69.72 | -32.44 | 9.165 | 0.901 | 3.116 | 0.976 | 968.0 | 9.552 | 3.132 |
| 28000 | 27975 | 387.18 | -72.49 | -31.64 | 8.733 | 0.898 | 2.990 | 0.971 | 964.6 | 9.495 | 3.112 |
| 29000 | 28975 | 386.96 | -73.31 | -28.90 | 8.320 | 0.895 | 2.855 | 0.962 | 963.6 | 9.478 | 3.105 |
| 30000 | 29976 | 385.53 | -74.14 | -26.15 | 7.926 + 0 | 0.892 | 2.725 - 2 | 0.953 | 962.6 | 9.461 - 6 | 3.099 - 6 |
| 31000 | 30977 | 384.71 | -74.96 | -23.41 | 7.549 | 0.889 | 2.601 | 0.944 | 961.5 | 9.444 | 3.093 |
| 32000 | 31977 | 383.89 | -75.78 | -20.67 | 7.190 | 0.887 | 2.483 | 0.935 | 960.5 | 9.427 | 3.087 |
| 33000 | 32978 | 383.06 | -76.61 | -17.92 | 6.847 | 0.885 | 2.369 | 0.926 | 959.5 | 9.410 | 3.081 |
| 34000 | 33979 | 382.24 | -77.43 | -15.18 | 6.520 | 0.883 | 2.261 | 0.918 | 958.4 | 9.393 | 3.074 |
| 35000 | 34980 | 381.42 | -78.25 | -12.44 | 6.207 | 0.882 | 2.157 | 0.910 | 957.4 | 9.376 | 3.068 |
| 36000 | 35981 | 380.60 | -79.07 | -9.69 | 5.909 | 0.880 | 2.058 | 0.903 | 956.4 | 9.359 | 3.062 |
| 37000 | 36983 | 379.77 | -79.90 | -10.20 | 5.625 | 0.879 | 1.964 | 0.903 | 955.3 | 9.342 | 3.056 |
| 38000 | 37984 | 378.95 | -80.72 | -11.02 | 5.354 | 0.878 | 1.873 | 0.904 | 954.3 | 9.325 | 3.049 |
| 39000 | 38985 | 378.13 | -81.54 | -11.84 | 5.095 | 0.877 | 1.786 | 0.904 | 953.3 | 9.308 | 3.043 |
| 40000 | 39987 | 377.30 | -82.37 | -12.67 | 4.849 + 0 | 0.876 | 1.704 - 2 | 0.905 | 952.2 | 9.291 - 6 | 3.037 - 6 |
| 41000 | 40989 | 376.48 | -83.19 | -13.49 | 4.613 | 0.874 | 1.624 | 0.905 | 951.2 | 9.274 | 3.031 |
| 42000 | 41990 | 375.66 | -84.01 | -14.31 | 4.389 | 0.873 | 1.549 | 0.906 | 950.1 | 9.257 | 3.025 |
| 43000 | 42992 | 374.83 | -84.84 | -15.14 | 4.175 | 0.871 | 1.477 | 0.906 | 949.1 | 9.239 | 3.018 |
| 44000 | 43994 | 374.01 | -85.66 | -15.96 | 3.971 | 0.869 | 1.408 | 0.906 | 948.1 | 9.222 | 3.012 |
| 45000 | 44996 | 373.19 | -86.48 | -16.78 | 3.777 | 0.867 | 1.342 | 0.907 | 947.0 | 9.205 | 3.006 |
| 46000 | 45998 | 372.37 | -87.30 | -17.60 | 3.592 | 0.865 | 1.279 | 0.906 | 946.0 | 9.188 | 3.000 |
| 47000 | 47000 | 371.54 | -88.13 | -18.43 | 3.415 | 0.863 | 1.219 | 0.906 | 944.9 | 9.171 | 2.993 |
| 48000 | 48003 | 370.72 | -88.95 | -19.25 | 3.247 | 0.861 | 1.161 | 0.906 | 943.9 | 9.153 | 2.987 |
| 49000 | 49005 | 369.90 | -89.77 | -20.07 | 3.087 | 0.859 | 1.106 | 0.905 | 942.8 | 9.136 | 2.981 |
| 50000 | 50008 | 369.07 | -90.60 | -20.90 | 2.934 + 0 | 0.857 | 1.054 - 2 | 0.905 | 941.8 | 9.119 - 6 | 2.975 - 6 |
| 51000 | 51010 | 368.25 | -91.42 | -21.72 | 2.789 | 0.854 | 1.004 | 0.904 | 940.7 | 9.102 | 2.968 |
| 52000 | 52013 | 367.43 | -92.24 | -22.54 | 2.650 | 0.852 | 9.562 - 3 | 0.905 | 939.7 | 9.084 | 2.962 |
| 53000 | 53016 | 366.60 | -93.07 | -23.37 | 2.518 | 0.849 | 9.106 | 0.903 | 938.6 | 9.067 | 2.956 |
| 54000 | 54019 | 365.78 | -93.89 | -24.19 | 2.393 | 0.847 | 8.671 | 0.903 | 937.6 | 9.050 | 2.950 |
| 55000 | 55022 | 364.96 | -94.71 | -25.01 | 2.273 | 0.844 | 8.256 | 0.902 | 936.5 | 9.032 | 2.943 |
| 56000 | 56025 | 364.14 | -95.53 | -25.83 | 2.159 | 0.841 | 7.860 | 0.901 | 935.5 | 9.015 | 2.937 |
| 57000 | 57028 | 363.31 | -96.36 | -26.66 | 2.051 | 0.838 | 7.482 | 0.900 | 934.4 | 8.998 | 2.931 |
| 58000 | 58031 | 362.78 | -96.89 | -27.19 | 1.947 | 0.835 | 7.116 | 0.898 | 933.7 | 8.986 | 2.927 |
| 59000 | 59034 | 362.45 | -97.22 | -27.52 | 1.849 | 0.832 | 6.764 | 0.895 | 933.3 | 8.979 | 2.924 |
| 60000 | 60038 | 362.12 | -97.55 | -27.85 | 1.756 + 0 | 0.829 | 6.429 - 3 | 0.893 | 932.9 | 8.972 - 6 | 2.922 - 6 |
| 61000 | 61041 | 361.79 | -97.88 | -28.18 | 1.667 | 0.826 | 6.110 | 0.890 | 932.4 | 8.965 | 2.919 |
| 62000 | 62045 | 361.46 | -98.21 | -28.51 | 1.583 | 0.823 | 5.806 | 0.888 | 932.0 | 8.958 | 2.917 |
| 63000 | 63049 | 361.13 | -98.54 | -28.84 | 1.503 | 0.820 | 5.518 | 0.885 | 931.6 | 8.951 | 2.914 |
| 64000 | 64053 | 360.80 | -98.87 | -29.17 | 1.427 | 0.817 | 5.243 | 0.883 | 931.2 | 8.944 | 2.912 |
| 65000 | 65057 | 360.47 | -99.20 | -29.50 | 1.355 | 0.814 | 4.982 | 0.880 | 930.7 | 8.937 | 2.909 |
| 66000 | 66061 | 360.15 | -99.52 | -30.03 | 1.286 | 0.810 | 4.734 | 0.878 | 930.3 | 8.930 | 2.907 |
| 67000 | 67065 | 359.82 | -99.85 | -30.91 | 1.221 | 0.807 | 4.498 | 0.876 | 929.9 | 8.923 | 2.904 |
| 68000 | 68069 | 359.49 | -100.18 | -31.79 | 1.159 | 0.804 | 4.274 | 0.875 | 929.5 | 8.916 | 2.902 |
| 69000 | 69073 | 359.16 | -100.51 | -32.67 | 1.100 | 0.800 | 4.060 | 0.873 | 929.0 | 8.909 | 2.899 |
| 70000 | 70078 | 358.83 | -100.84 | -33.55 | 1.044 + 0 | 0.797 | 3.857 - 3 | 0.871 | 928.6 | 8.902 - 6 | 2.897 - 6 |
| 71000 | 71082 | 358.50 | -101.17 | -34.42 | 9.909 - 1 | 0.793 | 3.664 | 0.869 | 928.2 | 8.895 | 2.894 |
| 72000 | 72087 | 358.17 | -101.50 | -35.30 | 9.404 | 0.790 | 3.481 | 0.867 | 927.8 | 8.888 | 2.892 |
| 73000 | 73092 | 357.84 | -101.83 | -36.18 | 8.924 | 0.786 | 3.308 | 0.865 | 927.3 | 8.881 | 2.889 |
| 74000 | 74096 | 357.51 | -102.16 | -37.06 | 8.469 | 0.782 | 3.140 | 0.863 | 926.9 | 8.874 | 2.887 |
| 75000 | 75101 | 357.18 | -102.49 | -37.94 | 8.036 | 0.778 | 2.982 | 0.861 | 926.5 | 8.867 | 2.884 |
| 76000 | 76106 | 356.85 | -102.82 | -38.81 | 7.625 | 0.774 | 2.833 | 0.858 | 926.1 | 8.860 | 2.882 |
| 77000 | 77111 | 356.52 | -103.15 | -39.69 | 7.235 | 0.770 | 2.690 | 0.856 | 925.6 | 8.853 | 2.879 |
| 78000 | 78116 | 356.20 | -103.47 | -40.57 | 6.864 | 0.766 | 2.555 | 0.853 | 925.2 | 8.846 | 2.877 |
| 79000 | 79122 | 355.87 | -103.80 | -41.45 | 6.512 | 0.762 | 2.426 | 0.851 | 924.8 | 8.839 | 2.874 |

TABLE 5.2 — *Continued*

75° N January (Cold)

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft sec$^{-1}$ °R$^{-1}$ |
| 0 | 0 | 448.59 | -11.08 | -70.08 | 2.993 + 1 | 1.000 | 8.844 - 2 | 1.157 | 1038.3 | 1.072 - 5 | 3.586 - 6 |
| 1000 | 1002 | 450.25 | -9.42 | -68.86 | 2.870 | 0.995 | 8.451 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 2004 | 451.90 | -7.77 | -59.63 | 2.753 | 0.990 | 8.077 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 3006 | 453.56 | -6.11 | -58.41 | 2.641 | 0.985 | 7.720 | 1.103 | 1044.0 | 1.081 | 3.603 |
| 4000 | 4008 | 455.22 | -4.45 | -69.19 | 2.534 | 0.981 | 7.381 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 5010 | 456.46 | -3.21 | -66.38 | 2.432 | 0.977 | 7.064 | 1.072 | 1047.4 | 1.087 | 3.624 |
| 6000 | 6012 | 458.43 | -6.24 | -63.85 | 2.334 | 0.973 | 6.823 | 1.067 | 1045.9 | 1.081 | 3.602 |
| 7000 | 7013 | 460.39 | -9.28 | -63.33 | 2.239 | 0.970 | 6.590 | 1.063 | 1040.4 | 1.079 | 3.579 |
| 8000 | 8015 | 447.35 | -12.32 | -62.80 | 2.147 | 0.966 | 6.363 | 1.058 | 1036.9 | 1.069 | 3.557 |
| 9000 | 9016 | 444.31 | -15.36 | -62.28 | 2.059 | 0.962 | 6.142 | 1.054 | 1033.3 | 1.064 | 3.535 |
| 10000 | 10018 | 441.28 | -18.39 | -61.75 | 1.973 + 1 | 0.959 | 5.928 - 2 | 1.050 | 1029.8 | 1.058 - 5 | 3.513 - 6 |
| 11000 | 11019 | 438.24 | -21.43 | -61.22 | 1.891 | 0.955 | 5.720 | 1.045 | 1026.2 | 1.052 | 3.491 |
| 12000 | 12020 | 435.21 | -24.46 | -60.69 | 1.811 | 0.952 | 5.517 | 1.041 | 1022.7 | 1.046 | 3.469 |
| 13000 | 13021 | 432.18 | -27.49 | -60.16 | 1.735 | 0.948 | 5.321 | 1.036 | 1019.1 | 1.040 | 3.446 |
| 14000 | 14022 | 429.16 | -30.51 | -59.62 | 1.661 | 0.945 | 5.130 | 1.032 | 1015.6 | 1.034 | 3.424 |
| 15000 | 15023 | 426.13 | -33.54 | -59.08 | 1.589 | 0.941 | 4.944 | 1.027 | 1012.0 | 1.028 | 3.402 |
| 16000 | 16024 | 423.11 | -36.56 | -58.55 | 1.521 | 0.938 | 4.765 | 1.023 | 1008.4 | 1.022 | 3.379 |
| 17000 | 17024 | 420.08 | -39.59 | -58.01 | 1.455 | 0.934 | 4.590 | 1.018 | 1004.8 | 1.016 | 3.357 |
| 18000 | 18025 | 417.06 | -42.61 | -57.48 | 1.391 | 0.930 | 4.421 | 1.014 | 1001.1 | 1.010 | 3.335 |
| 19000 | 19025 | 414.03 | -45.64 | -56.94 | 1.329 | 0.926 | 4.257 | 1.009 | 997.5 | 1.004 | 3.312 |
| 20000 | 20026 | 411.01 | -48.66 | -56.40 | 1.270 + 1 | 0.923 | 4.097 - 2 | 1.005 | 993.8 | 9.979 - 6 | 3.290 - 6 |
| 21000 | 21026 | 407.99 | -51.68 | -55.87 | 1.214 | 0.919 | 3.943 | 1.000 | 990.2 | 9.919 | 3.267 |
| 22000 | 22026 | 404.97 | -54.70 | -55.33 | 1.159 | 0.916 | 3.793 | 0.996 | 986.5 | 9.858 | 3.245 |
| 23000 | 23026 | 401.95 | -57.72 | -54.79 | 1.106 | 0.913 | 3.648 | 0.992 | 982.8 | 9.797 | 3.222 |
| 24000 | 24026 | 398.93 | -60.74 | -54.25 | 1.056 | 0.909 | 3.508 | 0.987 | 979.1 | 9.736 | 3.200 |
| 25000 | 25026 | 395.91 | -63.76 | -53.71 | 1.007 | 0.906 | 3.372 | 0.983 | 975.4 | 9.674 | 3.177 |
| 26000 | 26026 | 392.89 | -66.78 | -53.18 | 9.603 + 0 | 0.903 | 3.240 | 0.979 | 971.7 | 9.612 | 3.154 |
| 27000 | 27026 | 389.87 | -69.80 | -52.64 | 9.154 | 0.899 | 3.112 | 0.974 | 968.0 | 9.551 | 3.132 |
| 28000 | 28025 | 387.23 | -72.44 | -51.72 | 8.723 | 0.895 | 2.986 | 0.969 | 964.7 | 9.496 | 3.112 |
| 29000 | 29025 | 386.96 | -72.71 | -28.44 | 8.311 | 0.892 | 2.867 | 0.958 | 964.3 | 9.491 | 3.110 |
| 30000 | 30024 | 386.69 | -72.98 | -25.15 | 7.916 + 0 | 0.889 | 2.714 - 2 | 0.947 | 964.0 | 9.485 - 6 | 3.108 - 6 |
| 31000 | 31023 | 386.41 | -73.26 | -21.87 | 7.543 | 0.887 | 2.588 | 0.937 | 963.6 | 9.479 | 3.106 |
| 32000 | 32023 | 386.14 | -73.53 | -18.59 | 7.186 | 0.885 | 2.467 | 0.927 | 963.3 | 9.474 | 3.104 |
| 33000 | 33022 | 385.86 | -73.81 | -15.31 | 6.846 | 0.883 | 2.352 | 0.918 | 963.0 | 9.468 | 3.102 |
| 34000 | 34021 | 385.59 | -74.08 | -12.03 | 6.522 | 0.881 | 2.242 | 0.908 | 962.6 | 9.463 | 3.100 |
| 35000 | 35020 | 385.32 | -74.35 | -8.75 | 6.212 | 0.880 | 2.137 | 0.900 | 962.3 | 9.457 | 3.097 |
| 36000 | 36019 | 385.04 | -74.63 | -5.47 | 5.918 | 0.879 | 2.037 | 0.892 | 961.9 | 9.451 | 3.095 |
| 37000 | 37017 | 384.77 | -74.90 | -5.20 | 5.637 | 0.878 | 1.942 | 0.890 | 961.6 | 9.446 | 3.093 |
| 38000 | 38016 | 384.45 | -75.22 | -5.52 | 5.369 | 0.878 | 1.851 | 0.890 | 961.2 | 9.439 | 3.091 |
| 39000 | 39015 | 384.01 | -75.66 | -5.96 | 5.114 | 0.877 | 1.765 | 0.891 | 960.6 | 9.430 | 3.088 |
| 40000 | 40013 | 383.57 | -76.10 | -6.40 | 4.870 + 0 | 0.876 | 1.683 - 2 | 0.891 | 960.1 | 9.421 - 6 | 3.084 - 6 |
| 41000 | 41011 | 383.13 | -76.54 | -6.84 | 4.638 | 0.875 | 1.605 | 0.891 | 959.5 | 9.412 | 3.081 |
| 42000 | 42010 | 382.69 | -76.98 | -7.28 | 4.417 | 0.874 | 1.530 | 0.891 | 959.0 | 9.403 | 3.078 |
| 43000 | 43008 | 382.26 | -77.41 | -7.71 | 4.206 | 0.874 | 1.459 | 0.891 | 958.5 | 9.394 | 3.074 |
| 44000 | 44006 | 381.82 | -77.85 | -8.15 | 4.005 | 0.873 | 1.391 | 0.891 | 957.9 | 9.385 | 3.071 |
| 45000 | 45004 | 381.38 | -78.29 | -8.59 | 3.814 | 0.872 | 1.326 | 0.891 | 957.4 | 9.376 | 3.068 |
| 46000 | 46002 | 380.94 | -78.73 | -9.03 | 3.631 | 0.871 | 1.264 | 0.891 | 956.8 | 9.366 | 3.064 |
| 47000 | 47000 | 380.50 | -79.17 | -9.47 | 3.457 | 0.869 | 1.204 | 0.891 | 956.3 | 9.357 | 3.061 |
| 48000 | 47997 | 380.07 | -79.60 | -9.90 | 3.291 | 0.868 | 1.148 | 0.891 | 955.7 | 9.348 | 3.054 |
| 49000 | 48995 | 379.63 | -80.04 | -10.34 | 3.133 | 0.867 | 1.094 | 0.891 | 955.2 | 9.339 | 3.055 |
| 50000 | 49992 | 379.19 | -80.48 | -10.78 | 2.982 + 0 | 0.866 | 1.043 - 2 | 0.890 | 954.6 | 9.330 - 6 | 3.051 - 6 |
| 51000 | 50990 | 378.75 | -80.92 | -11.22 | 2.839 | 0.864 | 9.936 - 3 | 0.890 | 954.0 | 9.321 | 3.048 |
| 52000 | 51987 | 378.31 | -81.36 | -11.66 | 2.702 | 0.863 | 9.468 | 0.890 | 953.5 | 9.312 | 3.045 |
| 53000 | 52984 | 377.88 | -81.79 | -12.09 | 2.572 | 0.862 | 9.022 | 0.890 | 952.9 | 9.303 | 3.041 |
| 54000 | 53981 | 377.44 | -82.23 | -12.53 | 2.448 | 0.860 | 8.598 | 0.889 | 952.4 | 9.294 | 3.038 |
| 55000 | 54979 | 377.00 | -82.67 | -12.97 | 2.329 | 0.859 | 8.195 | 0.888 | 951.8 | 9.285 | 3.035 |
| 56000 | 55975 | 376.56 | -83.11 | -13.41 | 2.217 | 0.857 | 7.803 | 0.888 | 951.3 | 9.276 | 3.031 |
| 57000 | 56972 | 376.13 | -83.54 | -13.84 | 2.109 | 0.856 | 7.434 | 0.887 | 950.7 | 9.266 | 3.028 |
| 58000 | 57969 | 375.69 | -83.98 | -14.28 | 2.007 | 0.854 | 7.081 | 0.887 | 950.2 | 9.257 | 3.025 |
| 59000 | 58966 | 375.25 | -84.42 | -14.72 | 1.909 | 0.852 | 6.746 | 0.886 | 949.6 | 9.248 | 3.021 |
| 60000 | 59962 | 374.81 | -84.86 | -15.16 | 1.817 + 0 | 0.851 | 6.425 - 3 | 0.885 | 949.1 | 9.239 - 6 | 3.018 - 6 |
| 61000 | 60959 | 374.38 | -85.29 | -15.59 | 1.728 | 0.849 | 6.120 | 0.884 | 948.5 | 9.230 | 3.015 |
| 62000 | 61955 | 373.94 | -85.73 | -16.03 | 1.644 | 0.847 | 5.829 | 0.884 | 948.0 | 9.221 | 3.012 |
| 63000 | 62951 | 373.77 | -85.90 | -16.20 | 1.564 | 0.845 | 5.547 | 0.882 | 947.8 | 9.217 | 3.010 |
| 64000 | 63948 | 373.77 | -85.90 | -16.20 | 1.488 | 0.843 | 5.277 | 0.880 | 947.8 | 9.217 | 3.010 |
| 65000 | 64944 | 373.77 | -85.90 | -16.20 | 1.415 | 0.841 | 5.020 | 0.878 | 947.8 | 9.217 | 3.010 |
| 66000 | 65940 | 373.77 | -85.90 | -16.20 | 1.346 | 0.840 | 4.775 | 0.877 | 947.8 | 9.217 | 3.010 |
| 67000 | 66936 | 373.77 | -85.90 | -16.84 | 1.281 | 0.838 | 4.543 | 0.876 | 947.8 | 9.217 | 3.010 |
| 68000 | 67931 | 373.77 | -85.90 | -17.38 | 1.218 | 0.836 | 4.321 | 0.875 | 947.8 | 9.217 | 3.010 |
| 69000 | 68927 | 373.77 | -85.90 | -17.93 | 1.159 | 0.834 | 4.111 | 0.874 | 947.8 | 9.217 | 3.010 |
| 70000 | 69923 | 373.77 | -85.90 | -18.47 | 1.103 + 0 | 0.832 | 3.911 - 3 | 0.873 | 947.8 | 9.217 - 6 | 3.010 - 6 |
| 71000 | 70918 | 373.77 | -85.90 | -19.02 | 1.049 | 0.830 | 3.720 | 0.872 | 947.8 | 9.217 | 3.010 |
| 72000 | 71914 | 373.77 | -85.90 | -19.56 | 9.979 - 1 | 0.828 | 3.539 | 0.871 | 947.8 | 9.217 | 3.010 |
| 73000 | 72909 | 373.77 | -85.90 | -20.11 | 9.493 | 0.825 | 3.367 | 0.870 | 947.8 | 9.217 | 3.010 |
| 74000 | 73904 | 373.77 | -85.90 | -20.65 | 9.031 | 0.823 | 3.203 | 0.869 | 947.8 | 9.217 | 3.010 |
| 75000 | 74899 | 373.77 | -85.90 | -21.20 | 8.591 | 0.821 | 3.047 | 0.868 | 947.8 | 9.217 | 3.010 |
| 76000 | 75894 | 373.77 | -85.90 | -21.74 | 8.173 | 0.819 | 2.899 | 0.867 | 947.8 | 9.217 | 3.010 |
| 77000 | 76889 | 373.77 | -85.90 | -22.29 | 7.775 | 0.817 | 2.758 | 0.865 | 947.8 | 9.217 | 3.010 |
| 78000 | 77884 | 373.77 | -85.90 | -22.83 | 7.397 | 0.814 | 2.623 | 0.864 | 947.8 | 9.217 | 3.010 |
| 79000 | 78879 | 373.77 | -85.90 | -23.38 | 7.037 | 0.812 | 2.496 | 0.862 | 947.8 | 9.217 | 3.010 |

TABLE 5.2 – *Continued*
75° N. January (Cold)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 80000 | 80127 | 355.94 | -104.13 | -42.32 | 8.178 - 1 | 0.758 | 2.303 - 3 | 0.848 | 924.3 | 8.832 - 6 | 2.871 - 6 |
| 81000 | 81133 | 355.21 | -104.46 | -43.20 | 5.860 | 0.753 | 2.187 | 0.845 | 923.9 | 8.825 | 2.869 |
| 82000 | 82138 | 354.88 | -104.79 | -44.06 | 5.559 | 0.749 | 2.077 | 0.842 | 923.5 | 8.818 | 2.866 |
| 83000 | 83144 | 354.87 | -105.80 | -44.44 | 5.273 | 0.745 | 1.970 | 0.838 | 923.5 | 8.818 | 2.866 |
| 84000 | 84150 | 354.87 | -104.80 | -45.18 | 5.002 | 0.740 | 1.868 | 0.834 | 923.5 | 8.818 | 2.866 |
| 85000 | 85155 | 354.87 | -104.80 | -45.73 | 4.744 | 0.736 | 1.772 | 0.830 | 923.5 | 8.818 | 2.866 |
| 86000 | 86161 | 354.87 | -104.80 | -46.28 | 4.500 | 0.731 | 1.681 | 0.826 | 923.5 | 8.818 | 2.866 |
| 87000 | 87167 | 354.87 | -104.80 | -46.83 | 4.269 | 0.727 | 1.595 | 0.823 | 923.5 | 8.818 | 2.866 |
| 88000 | 88174 | 354.87 | -104.80 | -47.38 | 4.049 | 0.722 | 1.513 | 0.819 | 923.5 | 8.818 | 2.866 |
| 89000 | 89180 | 354.87 | -104.80 | -47.93 | 3.841 | 0.718 | 1.435 | 0.815 | 923.5 | 8.818 | 2.866 |
| 90000 | 90186 | 354.87 | -104.80 | -48.48 | 3.643 - 1 | 0.713 | 1.361 - 3 | 0.811 | 923.5 | 8.818 - 6 | 2.866 - 6 |
| 91000 | 91193 | 354.87 | -104.80 | -49.02 | 3.456 | 0.709 | 1.291 | 0.807 | 923.5 | 8.818 | 2.866 |
| 92000 | 92199 | 354.87 | -104.80 | -49.57 | 3.278 | 0.704 | 1.225 | 0.802 | 923.5 | 8.818 | 2.866 |
| 93000 | 93206 | 354.87 | -104.80 | -50.12 | 3.109 | 0.700 | 1.162 | 0.798 | 923.5 | 8.818 | 2.866 |
| 94000 | 94213 | 354.87 | -104.80 | -50.67 | 2.949 | 0.695 | 1.102 | 0.794 | 923.5 | 8.818 | 2.866 |
| 95000 | 95219 | 354.87 | -104.80 | -51.22 | 2.798 | 0.690 | 1.045 | 0.790 | 923.5 | 8.818 | 2.866 |
| 96000 | 96226 | 354.87 | -104.80 | -51.77 | 2.654 | 0.686 | 9.913 - 4 | 0.786 | 923.5 | 8.818 | 2.866 |
| 97000 | 97233 | 354.87 | -104.80 | -52.32 | 2.517 | 0.681 | 9.403 | 0.782 | 923.5 | 8.818 | 2.866 |
| 98000 | 98240 | 354.87 | -104.80 | -52.87 | 2.388 | 0.677 | 8.919 | 0.778 | 923.5 | 8.818 | 2.866 |

TABLE 5.2.—*Continued*
75° N. January (Cold)
GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 80000 | 79874 | 355.58 | -104.09 | -42.11 | 6.219 - 1 | 0.752 | 2.319 - 3 | 0.841 | 924.4 | 8.833 - 6 | 2.872 - 6 |
| 81000 | 80868 | 355.25 | -104.42 | -42.99 | 5.901 | 0.747 | 2.202 | 0.838 | 924.0 | 8.826 | 2.869 |
| 82000 | 81863 | 354.92 | -104.75 | -43.86 | 5.599 | 0.743 | 2.091 | 0.835 | 923.6 | 8.819 | 2.867 |
| 83000 | 82857 | 354.87 | -104.80 | -44.46 | 5.313 | 0.739 | 1.985 | 0.831 | 923.5 | 8.818 | 2.866 |
| 84000 | 83851 | 354.87 | -104.80 | -45.00 | 5.041 | 0.734 | 1.883 | 0.827 | 923.5 | 8.818 | 2.866 |
| 85000 | 84845 | 354.87 | -104.80 | -45.54 | 4.783 | 0.730 | 1.787 | 0.823 | 923.5 | 8.818 | 2.866 |
| 86000 | 85840 | 354.87 | -104.80 | -46.09 | 4.539 | 0.725 | 1.695 | 0.820 | 923.5 | 8.818 | 2.866 |
| 87000 | 86834 | 354.87 | -104.80 | -46.63 | 4.306 | 0.721 | 1.609 | 0.816 | 923.5 | 8.818 | 2.866 |
| 88000 | 87827 | 354.87 | -104.80 | -47.18 | 4.086 | 0.716 | 1.526 | 0.812 | 923.5 | 8.818 | 2.866 |
| 89000 | 88821 | 354.87 | -104.80 | -47.72 | 3.877 | 0.712 | 1.448 | 0.808 | 923.5 | 8.818 | 2.866 |
| 90000 | 89815 | 354.87 | -104.80 | -48.26 | 3.679 - 1 | 0.707 | 1.374 - 3 | 0.804 | 923.5 | 8.818 - 6 | 2.866 - 6 |
| 91000 | 90809 | 354.87 | -104.80 | -48.81 | 3.491 | 0.703 | 1.304 | 0.800 | 923.5 | 8.818 | 2.866 |
| 92000 | 91802 | 354.87 | -104.80 | -49.35 | 3.312 | 0.698 | 1.237 | 0.796 | 923.5 | 8.818 | 2.866 |
| 93000 | 92796 | 354.87 | -104.80 | -49.90 | 3.143 | 0.694 | 1.174 | 0.791 | 923.5 | 8.818 | 2.866 |
| 94000 | 93789 | 354.87 | -104.80 | -50.44 | 2.982 | 0.689 | 1.114 | 0.787 | 923.5 | 8.818 | 2.866 |
| 95000 | 94782 | 354.87 | -104.80 | -50.98 | 2.830 | 0.685 | 1.057 | 0.783 | 923.5 | 8.818 | 2.866 |
| 96000 | 95775 | 354.87 | -104.80 | -51.53 | 2.685 | 0.680 | 1.003 | 0.779 | 923.5 | 8.818 | 2.866 |
| 97000 | 96768 | 354.87 | -104.80 | -52.07 | 2.548 | 0.676 | 9.519 - 4 | 0.775 | 923.5 | 8.818 | 2.866 |
| 98000 | 97761 | 354.87 | -104.80 | -52.61 | 2.418 | 0.671 | 9.033 | 0.771 | 923.5 | 8.818 | 2.866 |

TABLE 5.2.—*Continued*
75° N. January (Warm)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ °R$^{-1}$ |
| 0 | 0 | 448.59 | -11.08 | -70.08 | 2.993 | 1.000 | 8.849 − 4 | 1.157 | 1038.3 | 1.072 − 5 | 3.566 − 6 |
| 1000 | 998 | 450.24 | -9.43 | -69.66 | 2.871 | 0.995 | 8.492 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 1996 | 451.90 | -7.77 | -69.24 | 2.754 | 0.990 | 8.078 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 2994 | 453.55 | -6.12 | -68.82 | 2.642 | 0.985 | 7.722 | 1.104 | 1044.0 | 1.081 | 3.602 |
| 4000 | 3992 | 455.21 | -4.46 | -68.40 | 2.535 | 0.981 | 7.383 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 4990 | 456.87 | -2.80 | -67.98 | 2.433 | 0.977 | 7.066 | 1.072 | 1047.8 | 1.087 | 3.624 |
| 6000 | 5988 | 458.46 | -1.21 | -67.57 | 2.335 | 0.973 | 6.826 | 1.068 | 1049.7 | 1.081 | 3.602 |
| 7000 | 6987 | 460.13 | +0.46 | -67.10 | 2.240 | 0.970 | 6.593 | 1.064 | 1051.6 | 1.075 | 3.580 |
| 8000 | 7985 | 461.79 | +2.12 | -66.73 | 2.149 | 0.967 | 6.366 | 1.059 | 1053.5 | 1.070 | 3.558 |
| 9000 | 8984 | 463.36 | +3.69 | -66.31 | 2.060 | 0.963 | 6.146 | 1.055 | 1055.4 | 1.064 | 3.536 |
| 10000 | 9982 | 465.03 | +5.36 | -65.88 | 1.975 | 1.000 | 5.932 − 4 | 1.050 | 1057.3 | 1.058 − 5 | 3.513 − 6 |
| 11000 | 10981 | 466.70 | +7.03 | -65.46 | 1.892 | 0.956 | 5.723 | 1.046 | 1059.2 | 1.052 | 3.491 |
| 12000 | 11980 | 468.27 | +8.60 | -65.00 | 1.813 | 0.953 | 5.521 | 1.042 | 1061.1 | 1.046 | 3.469 |
| 13000 | 12979 | 469.93 | +10.26 | -64.58 | 1.736 | 0.949 | 5.325 | 1.037 | 1063.0 | 1.040 | 3.447 |
| 14000 | 13978 | 471.60 | +11.93 | -64.16 | 1.662 | 0.946 | 5.134 | 1.033 | 1064.9 | 1.034 | 3.425 |
| 15000 | 14977 | 473.27 | +13.60 | -63.73 | 1.591 | 0.943 | 4.949 | 1.028 | 1066.8 | 1.028 | 3.402 |
| 16000 | 15976 | 474.84 | +15.17 | -63.31 | 1.522 | 0.939 | 4.769 | 1.024 | 1068.7 | 1.022 | 3.380 |
| 17000 | 16976 | 476.51 | +16.84 | -62.89 | 1.456 | 0.935 | 4.594 | 1.020 | 1070.6 | 1.016 | 3.358 |
| 18000 | 17975 | 478.18 | +18.51 | -62.47 | 1.392 | 0.932 | 4.425 | 1.015 | 1072.5 | 1.010 | 3.335 |
| 19000 | 18975 | 479.75 | +20.08 | -62.05 | 1.331 | 0.928 | 4.261 | 1.011 | 1074.4 | 1.004 | 3.313 |
| 20000 | 19974 | 481.42 | +21.75 | -61.63 | 1.272 | 0.925 | 4.101 − 4 | 1.006 | 1076.3 | 9.981 − 6 | 3.290 − 6 |
| 21000 | 20974 | 483.09 | +23.42 | -61.21 | 1.215 | 0.922 | 3.947 | 1.002 | 1078.2 | 9.920 | 3.268 |
| 22000 | 21974 | 484.76 | +25.09 | -60.78 | 1.160 | 0.918 | 3.797 | 0.998 | 1080.1 | 9.859 | 3.245 |
| 23000 | 22974 | 486.43 | +26.76 | -60.36 | 1.108 | 0.915 | 3.652 | 0.993 | 1082.0 | 9.798 | 3.223 |
| 24000 | 23974 | 488.01 | +28.34 | -59.78 | 1.057 | 0.911 | 3.511 | 0.989 | 1083.9 | 9.737 | 3.200 |
| 25000 | 24974 | 489.68 | +30.01 | -59.36 | 1.008 | 0.908 | 3.375 | 0.985 | 1085.8 | 9.676 | 3.178 |
| 26000 | 25974 | 491.35 | +31.68 | -58.94 | 9.615 | 0.904 | 3.243 | 0.980 | 1087.8 | 9.614 | 3.155 |
| 27000 | 26974 | 493.02 | +33.35 | -58.52 | 9.165 | 0.901 | 3.116 | 0.976 | 1089.7 | 9.552 | 3.132 |
| 28000 | 27975 | 494.59 | +34.92 | -58.09 | 8.733 | 0.898 | 2.988 | 0.971 | 1091.6 | 9.491 | 3.110 |
| 29000 | 28975 | 496.26 | +36.59 | -57.67 | 8.322 | 0.895 | 2.864 | 0.966 | 1093.5 | 9.430 | 3.087 |
| 30000 | 29976 | 497.93 | +38.26 | -57.25 | 7.931 | 0.893 | 2.744 − 4 | 0.962 | 1095.4 | 9.369 − 6 | 3.065 − 6 |
| 31000 | 30977 | 499.60 | +39.93 | -56.83 | 7.560 | 0.890 | 2.628 | 0.957 | 1097.3 | 9.308 | 3.042 |
| 32000 | 31977 | 501.27 | +41.60 | -56.40 | 7.208 | 0.887 | 2.516 | 0.953 | 1099.2 | 9.247 | 3.020 |
| 33000 | 32978 | 502.84 | +43.17 | -55.98 | 6.873 | 0.884 | 2.408 | 0.948 | 1101.1 | 9.186 | 2.997 |
| 34000 | 33979 | 504.51 | +44.84 | -55.56 | 6.555 | 0.881 | 2.304 | 0.944 | 1103.0 | 9.125 | 2.975 |
| 35000 | 34980 | 506.18 | +46.51 | -55.14 | 6.253 | 0.878 | 2.204 | 0.939 | 1104.9 | 9.064 | 2.952 |
| 36000 | 35981 | 507.85 | +48.18 | -54.72 | 5.966 | 0.875 | 2.107 | 0.935 | 1106.8 | 9.003 | 2.930 |
| 37000 | 36983 | 509.52 | +49.85 | -54.30 | 5.693 | 0.872 | 2.014 | 0.930 | 1108.7 | 8.942 | 2.907 |
| 38000 | 37984 | 511.19 | +51.52 | -53.88 | 5.433 | 0.869 | 1.925 | 0.926 | 1110.6 | 8.881 | 2.885 |
| 39000 | 38985 | 512.86 | +53.19 | -53.45 | 5.184 | 0.866 | 1.839 | 0.921 | 1112.5 | 8.820 | 2.862 |
| 40000 | 39987 | 514.53 | +54.86 | -53.03 | 4.946 | 0.863 | 1.756 − 4 | 0.917 | 1114.4 | 8.759 − 6 | 2.840 − 6 |
| 41000 | 40989 | 516.20 | +56.53 | -52.61 | 4.720 | 0.860 | 1.677 | 0.912 | 1116.3 | 8.698 | 2.817 |
| 42000 | 41990 | 517.87 | +58.20 | -52.19 | 4.504 | 0.857 | 1.601 | 0.908 | 1118.2 | 8.637 | 2.795 |
| 43000 | 42992 | 519.54 | +59.87 | -51.77 | 4.298 | 0.854 | 1.529 | 0.903 | 1120.1 | 8.576 | 2.772 |
| 44000 | 43994 | 521.21 | +61.54 | -51.34 | 4.101 | 0.851 | 1.459 | 0.899 | 1122.0 | 8.515 | 2.750 |
| 45000 | 44996 | 522.88 | +63.21 | -50.92 | 3.913 | 0.848 | 1.393 | 0.894 | 1123.9 | 8.454 | 2.727 |
| 46000 | 45998 | 524.55 | +64.88 | -50.50 | 3.734 | 0.845 | 1.329 | 0.890 | 1125.8 | 8.393 | 2.705 |
| 47000 | 47000 | 526.22 | +66.55 | -50.08 | 3.563 | 0.842 | 1.268 | 0.885 | 1127.7 | 8.332 | 2.682 |
| 48000 | 48003 | 527.89 | +68.22 | -49.66 | 3.400 | 0.839 | 1.210 | 0.881 | 1129.6 | 8.271 | 2.660 |
| 49000 | 49005 | 529.56 | +69.89 | -49.23 | 3.244 | 0.836 | 1.154 | 0.876 | 1131.5 | 8.210 | 2.637 |
| 50000 | 50008 | 531.23 | +71.56 | -48.81 | 3.095 | 0.833 | 1.101 − 4 | 0.872 | 1133.4 | 8.149 − 6 | 2.615 − 6 |
| 51000 | 51010 | 532.90 | +73.23 | -48.39 | 2.954 | 0.830 | 1.050 | 0.867 | 1135.3 | 8.088 | 2.592 |
| 52000 | 52013 | 534.57 | +74.90 | -47.97 | 2.818 | 0.827 | 1.002 | 0.863 | 1137.2 | 8.027 | 2.570 |
| 53000 | 53016 | 536.24 | +76.57 | -47.55 | 2.689 | 0.824 | 9.562 − 5 | 0.858 | 1139.1 | 7.966 | 2.547 |
| 54000 | 54019 | 537.91 | +78.24 | -47.13 | 2.566 | 0.821 | 9.126 | 0.854 | 1141.0 | 7.905 | 2.525 |
| 55000 | 55022 | 539.58 | +79.91 | -46.71 | 2.449 | 0.818 | 8.710 | 0.849 | 1142.9 | 7.844 | 2.502 |
| 56000 | 56025 | 541.25 | +81.58 | -46.29 | 2.337 | 0.815 | 8.313 | 0.845 | 1144.8 | 7.783 | 2.480 |
| 57000 | 57028 | 542.92 | +83.25 | -45.87 | 2.230 | 0.812 | 7.935 | 0.840 | 1146.7 | 7.722 | 2.457 |
| 58000 | 58031 | 544.59 | +84.92 | -45.45 | 2.128 | 0.809 | 7.575 | 0.836 | 1148.6 | 7.661 | 2.435 |
| 59000 | 59034 | 546.26 | +86.59 | -45.03 | 2.030 | 0.806 | 7.232 | 0.831 | 1150.5 | 7.600 | 2.412 |
| 60000 | 60038 | 547.93 | +88.26 | -44.61 | 1.938 | 0.803 | 6.905 − 5 | 0.827 | 1152.4 | 7.539 − 6 | 2.390 − 6 |
| 61000 | 61041 | 549.60 | +89.93 | -44.19 | 1.849 | 0.800 | 6.593 | 0.822 | 1154.3 | 7.478 | 2.367 |
| 62000 | 62045 | 551.27 | +91.60 | -43.77 | 1.765 | 0.797 | 6.295 | 0.818 | 1156.2 | 7.417 | 2.345 |
| 63000 | 63049 | 552.94 | +93.27 | -43.35 | 1.684 | 0.794 | 6.011 | 0.813 | 1158.1 | 7.356 | 2.322 |
| 64000 | 64053 | 554.61 | +94.94 | -42.93 | 1.608 | 0.791 | 5.741 | 0.809 | 1160.0 | 7.295 | 2.300 |
| 65000 | 65057 | 556.28 | +96.61 | -42.51 | 1.534 | 0.788 | 5.483 | 0.804 | 1161.9 | 7.234 | 2.277 |
| 66000 | 66061 | 557.95 | +98.28 | -42.09 | 1.465 | 0.785 | 5.237 | 0.800 | 1163.8 | 7.173 | 2.255 |
| 67000 | 67065 | 559.62 | +99.95 | -41.67 | 1.398 | 0.782 | 5.002 | 0.795 | 1165.7 | 7.112 | 2.232 |
| 68000 | 68069 | 561.29 | +101.62 | -41.25 | 1.335 | 0.779 | 4.777 | 0.791 | 1167.6 | 7.051 | 2.210 |
| 69000 | 69073 | 562.96 | +103.29 | -40.83 | 1.274 | 0.776 | 4.563 | 0.786 | 1169.5 | 6.990 | 2.187 |
| 70000 | 70078 | 564.63 | +104.96 | -40.41 | 1.216 | 0.773 | 4.358 − 5 | 0.782 | 1171.4 | 6.929 − 6 | 2.165 − 6 |
| 71000 | 71082 | 566.30 | +106.63 | -39.99 | 1.161 | 0.770 | 4.162 | 0.777 | 1173.3 | 6.868 | 2.142 |
| 72000 | 72087 | 567.97 | +108.30 | -39.57 | 1.108 | 0.767 | 3.975 | 0.773 | 1175.2 | 6.807 | 2.120 |
| 73000 | 73092 | 569.64 | +109.97 | -39.15 | 1.058 | 0.764 | 3.797 | 0.768 | 1177.1 | 6.746 | 2.097 |
| 74000 | 74096 | 571.31 | +111.64 | -38.73 | 1.010 | 0.761 | 3.627 | 0.764 | 1179.0 | 6.685 | 2.075 |
| 75000 | 75101 | 572.98 | +113.31 | -38.31 | 9.646 | 0.758 | 3.465 | 0.759 | 1180.9 | 6.624 | 2.052 |
| 76000 | 76106 | 574.65 | +114.98 | -37.89 | 9.210 | 0.755 | 3.312 | 0.755 | 1182.8 | 6.563 | 2.030 |
| 77000 | 77111 | 576.32 | +116.65 | -37.47 | 8.794 | 0.752 | 3.166 | 0.750 | 1184.7 | 6.502 | 2.007 |
| 78000 | 78116 | 577.99 | +118.32 | -37.05 | 8.397 | 0.749 | 3.027 | 0.746 | 1186.6 | 6.441 | 1.985 |
| 79000 | 79122 | 579.66 | +119.99 | -36.63 | 8.019 | 0.746 | 2.895 | 0.741 | 1188.5 | 6.380 | 1.962 |

TABLE 5.2.—*Continued*
75° N, January (Warm)
GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in. Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $\lambda$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 0 | 0 | 448.59 | -11.08 | -70.08 | 29.93 | + 1 | 1.000 | 0.894 - 2 | 1.157 | 1038.3 | 1.072 - 5 | 3.566 - 6 |
| 1000 | 1002 | 450.45 | -9.42 | -69.86 | 28.870 | | 0.995 | 8.451 | 1.138 | 1040.2 | 1.075 | 3.578 |
| 2000 | 2004 | 451.90 | -7.77 | -69.63 | 27.793 | | 0.990 | 8.077 | 1.120 | 1042.1 | 1.078 | 3.590 |
| 3000 | 3006 | 453.36 | -6.11 | -69.41 | 26.741 | | 0.985 | 7.720 | 1.103 | 1044.0 | 1.081 | 3.603 |
| 4000 | 4008 | 454.22 | -4.45 | -69.19 | 25.714 | | 0.981 | 7.381 | 1.087 | 1045.9 | 1.085 | 3.615 |
| 5000 | 5010 | 456.08 | -3.21 | -68.38 | 24.712 | | 0.977 | 7.060 | 1.072 | 1047.8 | 1.087 | 3.624 |
| 6000 | 6012 | 456.63 | -0.24 | -68.85 | 23.734 | | 0.973 | 6.823 | 1.067 | 1048.9 | 1.081 | 3.602 |
| 7000 | 7013 | 458.39 | +0.28 | -68.33 | 22.239 | | 0.970 | 6.590 | 1.063 | 1050.4 | 1.075 | 3.579 |
| 8000 | 8015 | 447.35 | -12.32 | -62.80 | 21.147 | | 0.966 | 6.363 | 1.058 | 1036.9 | 1.069 | 3.557 |
| 9000 | 9016 | 444.31 | -15.36 | -62.28 | 20.259 | | 0.962 | 6.142 | 1.054 | 1033.3 | 1.064 | 3.535 |
| 10000 | 10018 | 441.28 | -18.39 | -61.75 | 19.373 | + 1 | 0.959 | 5.928 - 2 | 1.050 | 1029.8 | 1.058 - 5 | 3.513 - 6 |
| 11000 | 11019 | 438.24 | -21.43 | -61.22 | 18.491 | | 0.955 | 5.720 | 1.045 | 1026.2 | 1.052 | 3.491 |
| 12000 | 12020 | 435.21 | -24.46 | -60.69 | 17.611 | | 0.952 | 5.517 | 1.041 | 1022.7 | 1.046 | 3.469 |
| 13000 | 13021 | 432.18 | -27.49 | -60.16 | 16.735 | | 0.948 | 5.321 | 1.036 | 1019.1 | 1.040 | 3.446 |
| 14000 | 14022 | 429.16 | -30.51 | -59.62 | 15.861 | | 0.945 | 5.130 | 1.032 | 1015.6 | 1.034 | 3.424 |
| 15000 | 15023 | 426.13 | -33.54 | -59.08 | 14.989 | | 0.941 | 4.944 | 1.027 | 1012.0 | 1.028 | 3.402 |
| 16000 | 16024 | 423.11 | -36.56 | -58.55 | 14.121 | | 0.938 | 4.765 | 1.023 | 1008.4 | 1.022 | 3.379 |
| 17000 | 17024 | 420.08 | -39.59 | -58.01 | 13.255 | | 0.934 | 4.590 | 1.018 | 1004.8 | 1.016 | 3.357 |
| 18000 | 18025 | 417.06 | -42.61 | -57.48 | 12.391 | | 0.930 | 4.421 | 1.014 | 1001.1 | 1.010 | 3.335 |
| 19000 | 19025 | 414.03 | -45.64 | -56.94 | 11.529 | | 0.926 | 4.257 | 1.009 | 997.5 | 1.004 | 3.312 |
| 20000 | 20026 | 411.01 | -48.66 | -56.40 | 10.670 | + 1 | 0.923 | 4.097 - 2 | 1.005 | 993.8 | 9.979 - 6 | 3.290 - 6 |
| 21000 | 21026 | 407.99 | -51.68 | -55.87 | 10.214 | | 0.919 | 3.943 | 1.000 | 990.2 | 9.919 | 3.267 |
| 22000 | 22026 | 404.97 | -54.70 | -55.33 | 11.159 | | 0.916 | 3.793 | 0.996 | 986.5 | 9.858 | 3.245 |
| 23000 | 23026 | 401.95 | -57.72 | -54.79 | 11.106 | | 0.913 | 3.648 | 0.992 | 982.8 | 9.797 | 3.222 |
| 24000 | 24026 | 398.93 | -60.74 | -54.25 | 11.056 | | 0.909 | 3.508 | 0.987 | 979.1 | 9.736 | 3.200 |
| 25000 | 25026 | 395.91 | -63.76 | -53.71 | 11.007 | | 0.906 | 3.372 | 0.983 | 975.4 | 9.674 | 3.177 |
| 26000 | 26026 | 392.89 | -66.78 | -53.18 | 9.603 | + 0 | 0.903 | 3.240 | 0.979 | 971.7 | 9.612 | 3.154 |
| 27000 | 27026 | 389.87 | -69.80 | -52.64 | 9.154 | | 0.899 | 3.112 | 0.974 | 968.0 | 9.551 | 3.132 |
| 28000 | 28025 | 387.48 | -72.19 | -51.47 | 8.723 | | 0.895 | 2.988 | 0.968 | 965.0 | 9.502 | 3.114 |
| 29000 | 29025 | 389.02 | -70.65 | -48.38 | 8.312 | | 0.892 | 2.868 | 0.953 | 966.9 | 9.533 | 3.125 |
| 30000 | 30024 | 390.55 | -69.12 | -45.28 | 7.922 | + 0 | 0.890 | 2.669 - 2 | 0.938 | 968.8 | 9.565 - 6 | 3.137 - 6 |
| 31000 | 31023 | 392.09 | -67.58 | -46.19 | 7.552 | | 0.888 | 2.553 | 0.924 | 970.7 | 9.596 | 3.148 |
| 32000 | 32023 | 393.62 | -66.05 | -41.10 | 7.200 | | 0.886 | 2.425 | 0.911 | 972.6 | 9.627 | 3.160 |
| 33000 | 33022 | 395.16 | -64.51 | -40.01 | 6.866 | | 0.885 | 2.303 | 0.899 | 974.5 | 9.659 | 3.171 |
| 34000 | 34021 | 396.69 | -62.98 | -0.92 | 6.549 | | 0.885 | 2.188 | 0.887 | 976.4 | 9.690 | 3.183 |
| 35000 | 35020 | 398.23 | -61.44 | -0.16 | 6.248 | | 0.885 | 2.080 | 0.876 | 978.3 | 9.721 | 3.194 |
| 36000 | 36019 | 399.76 | -59.91 | 0.25 | 5.961 | | 0.886 | 1.977 | 0.865 | 980.2 | 9.752 | 3.206 |
| 37000 | 37017 | 399.87 | -59.80 | 0.90 | 5.689 | | 0.886 | 1.886 | 0.865 | 980.3 | 9.755 | 3.207 |
| 38000 | 38016 | 399.87 | -59.80 | 0.90 | 5.428 | | 0.887 | 1.800 | 0.866 | 980.3 | 9.755 | 3.207 |
| 39000 | 39015 | 399.87 | -59.80 | 0.90 | 5.180 | | 0.888 | 1.717 | 0.866 | 980.3 | 9.755 | 3.207 |
| 40000 | 40013 | 399.87 | -59.80 | 0.90 | 4.943 | + 0 | 0.889 | 1.639 - 2 | 0.867 | 980.3 | 9.755 - 6 | 3.207 - 6 |
| 41000 | 41011 | 399.87 | -59.80 | 0.90 | 4.717 | | 0.890 | 1.564 | 0.868 | 980.3 | 9.755 | 3.207 |
| 42000 | 42010 | 399.87 | -59.80 | 0.90 | 4.502 | | 0.891 | 1.492 | 0.869 | 980.3 | 9.755 | 3.207 |
| 43000 | 43008 | 399.87 | -59.80 | 0.90 | 4.296 | | 0.892 | 1.424 | 0.870 | 980.3 | 9.755 | 3.207 |
| 44000 | 44006 | 399.87 | -59.80 | 0.90 | 4.100 | | 0.893 | 1.359 | 0.871 | 980.3 | 9.755 | 3.207 |
| 45000 | 45004 | 399.87 | -59.80 | 0.90 | 3.912 | | 0.894 | 1.297 | 0.872 | 980.3 | 9.755 | 3.207 |
| 46000 | 46002 | 399.87 | -59.80 | 0.90 | 3.733 | | 0.895 | 1.238 | 0.873 | 980.3 | 9.755 | 3.207 |
| 47000 | 47000 | 399.87 | -59.80 | 0.90 | 3.563 | | 0.896 | 1.181 | 0.874 | 980.3 | 9.755 | 3.207 |
| 48000 | 47997 | 399.87 | -59.80 | 0.90 | 3.400 | | 0.897 | 1.127 | 0.875 | 980.3 | 9.755 | 3.207 |
| 49000 | 48995 | 399.87 | -59.80 | 0.90 | 3.245 | | 0.898 | 1.076 | 0.876 | 980.3 | 9.755 | 3.207 |
| 50000 | 49992 | 399.87 | -59.80 | 0.90 | 3.097 | + 0 | 0.899 | 1.027 - 2 | 0.877 | 980.3 | 9.755 - 6 | 3.207 - 6 |
| 51000 | 50990 | 399.87 | -59.80 | 0.90 | 2.955 | | 0.900 | 9.797 - 3 | 0.878 | 980.3 | 9.755 | 3.207 |
| 52000 | 51987 | 399.87 | -59.80 | 0.90 | 2.820 | | 0.901 | 9.349 | 0.879 | 980.3 | 9.755 | 3.207 |
| 53000 | 52984 | 399.87 | -59.80 | 0.90 | 2.691 | | 0.902 | 8.922 | 0.880 | 980.3 | 9.755 | 3.207 |
| 54000 | 53981 | 399.87 | -59.80 | 0.90 | 2.568 | | 0.903 | 8.515 | 0.881 | 980.3 | 9.755 | 3.207 |
| 55000 | 54979 | 399.87 | -59.80 | 0.90 | 2.451 | | 0.904 | 8.126 | 0.881 | 980.3 | 9.755 | 3.207 |
| 56000 | 55975 | 399.93 | -59.74 | 0.96 | 2.339 | | 0.905 | 7.754 | 0.882 | 980.4 | 9.756 | 3.207 |
| 57000 | 56972 | 400.20 | -59.47 | 10.23 | 2.233 | | 0.906 | 7.395 | 0.883 | 980.7 | 9.761 | 3.209 |
| 58000 | 57969 | 400.47 | -59.20 | 10.50 | 2.131 | | 0.907 | 7.053 | 0.883 | 981.0 | 9.767 | 3.211 |
| 59000 | 58966 | 400.75 | -58.92 | 10.78 | 2.034 | | 0.908 | 6.727 | 0.884 | 981.4 | 9.772 | 3.213 |
| 60000 | 59962 | 401.02 | -58.65 | 11.05 | 1.941 | + 0 | 0.909 | 6.417 - 3 | 0.884 | 981.7 | 9.778 - 6 | 3.215 - 6 |
| 61000 | 60959 | 401.29 | -58.38 | 11.32 | 1.853 | | 0.910 | 6.120 | 0.884 | 982.0 | 9.784 | 3.217 |
| 62000 | 61955 | 401.57 | -58.10 | 11.60 | 1.769 | | 0.911 | 5.838 | 0.885 | 982.4 | 9.789 | 3.219 |
| 63000 | 62951 | 401.84 | -57.83 | 11.87 | 1.688 | | 0.913 | 5.569 | 0.885 | 982.7 | 9.795 | 3.221 |
| 64000 | 63948 | 402.11 | -57.56 | 12.14 | 1.612 | | 0.914 | 5.313 | 0.886 | 983.0 | 9.800 | 3.223 |
| 65000 | 64944 | 402.39 | -57.28 | 12.42 | 1.539 | | 0.915 | 5.069 | 0.887 | 983.4 | 9.806 | 3.226 |
| 66000 | 65940 | 402.66 | -57.01 | 12.59 | 1.469 | | 0.916 | 4.836 | 0.888 | 983.7 | 9.811 | 3.228 |
| 67000 | 66936 | 402.93 | -56.74 | 12.32 | 1.402 | | 0.918 | 4.613 | 0.889 | 984.0 | 9.817 | 3.230 |
| 68000 | 67931 | 403.21 | -56.46 | 12.05 | 1.339 | | 0.919 | 4.402 | 0.891 | 984.4 | 9.822 | 3.232 |
| 69000 | 68927 | 403.48 | -56.19 | 11.78 | 1.278 | | 0.920 | 4.200 | 0.893 | 984.7 | 9.828 | 3.234 |
| 70000 | 69923 | 403.75 | -55.92 | 11.51 | 1.221 | + 0 | 0.921 | 4.007 - 3 | 0.895 | 985.0 | 9.833 - 6 | 3.236 - 6 |
| 71000 | 70918 | 404.03 | -55.64 | 11.23 | 1.165 | | 0.922 | 3.824 | 0.897 | 985.4 | 9.839 | 3.238 |
| 72000 | 71914 | 404.30 | -55.37 | 10.96 | 1.113 | | 0.924 | 3.649 | 0.898 | 985.7 | 9.844 | 3.240 |
| 73000 | 72909 | 404.57 | -55.10 | 10.69 | 1.063 | | 0.924 | 3.482 | 0.900 | 986.0 | 9.850 | 3.242 |
| 74000 | 73904 | 404.85 | -54.82 | 10.42 | 1.015 | | 0.925 | 3.323 | 0.901 | 986.4 | 9.855 | 3.244 |
| 75000 | 74899 | 405.12 | -54.55 | 10.15 | 9.691 | - 1 | 0.927 | 3.171 | 0.903 | 986.7 | 9.861 | 3.246 |
| 76000 | 75894 | 405.39 | -54.28 | 9.88 | 9.255 | | 0.927 | 3.027 | 0.905 | 987.0 | 9.866 | 3.248 |
| 77000 | 76889 | 405.66 | -54.01 | 9.60 | 8.839 | | 0.928 | 2.889 | 0.906 | 987.4 | 9.872 | 3.250 |
| 78000 | 77884 | 405.94 | -53.73 | 9.33 | 8.442 | | 0.929 | 2.757 | 0.908 | 987.7 | 9.877 | 3.252 |
| 79000 | 78879 | 406.21 | -53.46 | 9.06 | 8.064 | | 0.930 | 2.632 | 0.909 | 988.0 | 9.883 | 3.254 |

TABLE 5.2.—*Continued*
75° N. January (Warm)
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $\lambda$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 80000 | 80127 | 406.52 | −53.15 | 8.66 | 7.657 − 1 | 0.939 | 2.497 − 3 | 0.919 | 988.4 | 9.889 − 6 | 3.256 − 6 |
| 81000 | 81133 | 406.79 | −52.88 | 8.38 | 7.312 | 0.940 | 2.383 | 0.921 | 988.7 | 9.895 | 3.258 |
| 82000 | 82138 | 407.07 | −52.60 | 8.11 | 6.983 | 0.941 | 2.274 | 0.922 | 989.1 | 9.900 | 3.260 |
| 83000 | 83144 | 407.88 | −51.79 | 8.37 | 6.669 | 0.942 | 2.168 | 0.922 | 990.1 | 9.916 | 3.265 |
| 84000 | 84150 | 408.70 | −50.97 | 8.64 | 6.370 | 0.943 | 2.066 | 0.923 | 991.1 | 9.933 | 3.273 |
| 85000 | 85155 | 409.52 | −50.15 | 8.92 | 6.085 | 0.944 | 1.970 | 0.923 | 992.0 | 9.950 | 3.279 |
| 86000 | 86161 | 410.35 | −49.32 | 9.19 | 5.813 | 0.945 | 1.878 | 0.923 | 993.0 | 9.966 | 3.285 |
| 87000 | 87167 | 411.17 | −48.50 | 9.47 | 5.553 | 0.946 | 1.790 | 0.924 | 994.0 | 9.983 | 3.291 |
| 88000 | 88174 | 411.99 | −47.68 | 9.74 | 5.306 | 0.947 | 1.707 | 0.924 | 995.0 | 9.999 | 3.297 |
| 89000 | 89180 | 412.82 | −46.85 | 10.02 | 5.070 | 0.948 | 1.628 | 0.925 | 996.0 | 1.002 − 5 | 3.303 |
| 90000 | 90186 | 413.64 | −46.03 | 10.29 | 4.846 − 1 | 0.949 | 1.553 − 3 | 0.925 | 997.0 | 1.003 − 5 | 3.309 − 6 |
| 91000 | 91193 | 414.46 | −45.21 | 10.57 | 4.631 | 0.950 | 1.481 | 0.926 | 998.0 | 1.005 | 3.315 |
| 92000 | 92199 | 415.28 | −44.39 | 10.86 | 4.427 | 0.951 | 1.413 | 0.926 | 999.0 | 1.006 | 3.322 |
| 93000 | 93206 | 416.11 | −43.56 | 11.11 | 4.231 | 0.952 | 1.348 | 0.926 | 1000.0 | 1.008 | 3.328 |
| 94000 | 94213 | 416.93 | −42.74 | 11.39 | 4.045 | 0.953 | 1.286 | 0.927 | 1001.0 | 1.010 | 3.334 |
| 95000 | 95219 | 417.75 | −41.92 | 11.66 | 3.868 | 0.954 | 1.227 | 0.928 | 1002.0 | 1.011 | 3.340 |
| 96000 | 96226 | 418.58 | −41.09 | 11.94 | 3.698 | 0.956 | 1.171 | 0.929 | 1003.0 | 1.013 | 3.346 |
| 97000 | 97233 | 419.40 | −40.27 | 12.21 | 3.536 | 0.957 | 1.118 | 0.929 | 1003.9 | 1.015 | 3.352 |
| 98000 | 98240 | 420.22 | −39.45 | 12.48 | 3.382 | 0.958 | 1.067 | 0.930 | 1004.9 | 1.016 | 3.358 |

TABLE 5.2.—*Continued*
75° N, January (Warm)
GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ ft sec$^{-1}$ | $\mu$ lb ft$^{-1}$ sec$^{-1}$ | $k$ BTU ft$^{-1}$ sec$^{-1}$(°R)$^{-1}$ |
| 80000 | 79874 | 406.48 | −53.19 | 8.79 | 7.702 − 1 | 0.931 | 2.512 − 3 | 0.911 | 988.4 | 9.888 − 6 | 3.256 − 6 |
| 81000 | 80868 | 406.76 | −52.91 | 8.52 | 7.357 | 0.932 | 2.398 | 0.912 | 988.7 | 9.894 | 3.258 |
| 82000 | 81863 | 407.03 | −52.64 | 8.25 | 7.027 | 0.933 | 2.289 | 0.914 | 989.0 | 9.899 | 3.260 |
| 83000 | 82857 | 407.76 | −51.91 | 8.43 | 6.713 | 0.933 | 2.182 | 0.914 | 989.9 | 9.914 | 3.266 |
| 84000 | 83851 | 408.58 | −51.09 | 8.71 | 6.414 | 0.934 | 2.081 | 0.914 | 990.9 | 9.931 | 3.272 |
| 85000 | 84845 | 409.40 | −50.27 | 8.98 | 6.128 | 0.935 | 1.984 | 0.914 | 991.9 | 9.947 | 3.278 |
| 86000 | 85840 | 410.21 | −49.46 | 9.26 | 5.855 | 0.936 | 1.892 | 0.915 | 992.9 | 9.963 | 3.284 |
| 87000 | 86834 | 411.03 | −48.64 | 9.53 | 5.596 | 0.937 | 1.805 | 0.915 | 993.9 | 9.980 | 3.290 |
| 88000 | 87827 | 411.85 | −47.82 | 9.80 | 5.348 | 0.938 | 1.721 | 0.916 | 994.9 | 9.996 | 3.296 |
| 89000 | 88821 | 412.67 | −47.00 | 10.08 | 5.112 | 0.939 | 1.642 | 0.916 | 995.9 | 1.001 − 5 | 3.302 |
| 90000 | 89815 | 413.49 | −46.18 | 10.35 | 4.886 − 1 | 0.940 | 1.567 − 3 | 0.916 | 996.8 | 1.003 − 5 | 3.308 − 6 |
| 91000 | 90809 | 414.30 | −45.37 | 10.62 | 4.671 | 0.941 | 1.495 | 0.916 | 997.8 | 1.005 | 3.314 |
| 92000 | 91802 | 415.12 | −44.55 | 10.90 | 4.466 | 0.942 | 1.426 | 0.917 | 998.8 | 1.006 | 3.320 |
| 93000 | 92796 | 415.94 | −43.73 | 11.17 | 4.271 | 0.943 | 1.361 | 0.917 | 999.8 | 1.008 | 3.326 |
| 94000 | 93789 | 416.76 | −42.91 | 11.45 | 4.084 | 0.944 | 1.299 | 0.918 | 1000.8 | 1.009 | 3.332 |
| 95000 | 94782 | 417.57 | −42.10 | 11.72 | 3.906 | 0.945 | 1.240 | 0.918 | 1001.8 | 1.011 | 3.338 |
| 96000 | 95775 | 418.39 | −41.28 | 11.99 | 3.735 | 0.946 | 1.184 | 0.919 | 1002.7 | 1.013 | 3.345 |
| 97000 | 96768 | 419.21 | −40.46 | 12.27 | 3.573 | 0.947 | 1.130 | 0.919 | 1003.7 | 1.014 | 3.351 |
| 98000 | 97761 | 420.03 | −39.64 | 12.54 | 3.418 | 0.948 | 1.079 | 0.920 | 1004.7 | 1.016 | 3.357 |

TABLE 5.2.—*Continued*
75° N. July
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T - T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$ ft sec$^{-1}$ | $\mu$ lb ft$^{-1}$ sec$^{-1}$ | $k$ BTU ft$^{-1}$ sec$^{-1}$(°R)$^{-1}$ |
| 0 | 0 | 502.06 | 42.39 | -16.61 | 2.990 | + 1 0.999 | 7.895 - 2 | 1.032 | 1098.4 | 1.172 - 5 | 3.950 - 6 |
| 1000 | 998 | 500.56 | 40.89 | -14.54 | 2.880 | 0.998 | 7.628 | 1.027 | 1096.8 | 1.169 | 3.940 |
| 2000 | 1996 | 499.06 | 39.39 | -12.48 | 2.774 | 0.997 | 7.369 | 1.022 | 1095.1 | 1.167 | 3.929 |
| 3000 | 2994 | 497.56 | 37.89 | -10.41 | 2.672 | 0.996 | 7.118 | 1.017 | 1093.5 | 1.164 | 3.918 |
| 4000 | 3992 | 496.06 | 36.39 | -8.34 | 2.573 | 0.996 | 6.876 | 1.012 | 1091.8 | 1.161 | 3.908 |
| 5000 | 4990 | 494.57 | 34.90 | -6.27 | 2.477 | 0.995 | 6.640 | 1.008 | 1090.2 | 1.158 | 3.897 |
| 6000 | 5988 | 493.07 | 33.40 | -4.20 | 2.385 | 0.995 | 6.412 | 1.003 | 1088.6 | 1.156 | 3.887 |
| 7000 | 6987 | 491.60 | 31.93 | -2.11 | 2.296 | 0.994 | 6.191 | 0.999 | 1086.9 | 1.153 | 3.876 |
| 8000 | 7985 | 490.15 | 30.48 | 0.01 | 2.210 | 0.995 | 5.977 | 0.994 | 1085.3 | 1.150 | 3.866 |
| 9000 | 8984 | 488.97 | 27.27 | 0.30 | 2.127 | 0.994 | 5.790 | 0.994 | 1081.8 | 1.144 | 3.843 |
| 10000 | 9982 | 483.27 | 23.60 | 0.27 | 2.046 | + 1 0.994 | 5.613 - 2 | 0.994 | 1077.7 | 1.138 - 5 | 3.817 - 6 |
| 11000 | 10981 | 479.61 | 19.94 | 0.17 | 1.968 | 0.994 | 5.440 | 0.994 | 1073.6 | 1.131 | 3.791 |
| 12000 | 11980 | 475.95 | 16.28 | 0.07 | 1.892 | 0.994 | 5.271 | 0.994 | 1069.5 | 1.124 | 3.764 |
| 13000 | 12979 | 472.29 | 12.62 | -0.02 | 1.819 | 0.995 | 5.106 | 0.994 | 1065.4 | 1.117 | 3.738 |
| 14000 | 13978 | 468.67 | 9.00 | -0.07 | 1.748 | 0.994 | 4.944 | 0.995 | 1061.3 | 1.110 | 3.712 |
| 15000 | 14977 | 465.06 | 5.39 | -0.11 | 1.679 | 0.995 | 4.786 | 0.995 | 1057.2 | 1.103 | 3.686 |
| 16000 | 15976 | 461.46 | 1.79 | -0.15 | 1.613 | 0.994 | 4.633 | 0.995 | 1053.1 | 1.096 | 3.660 |
| 17000 | 16976 | 457.85 | -1.82 | -0.20 | 1.548 | 0.994 | 4.482 | 0.995 | 1048.9 | 1.090 | 3.634 |
| 18000 | 17975 | 454.24 | -5.43 | -0.24 | 1.486 | 0.995 | 4.336 | 0.995 | 1044.8 | 1.083 | 3.607 |
| 19000 | 18975 | 450.63 | -9.04 | -0.28 | 1.426 | 0.994 | 4.193 | 0.995 | 1040.7 | 1.076 | 3.581 |
| 20000 | 19974 | 447.03 | -12.64 | -0.31 | 1.367 | + 1 0.994 | 4.054 - 2 | 0.995 | 1036.5 | 1.069 - 5 | 3.555 - 6 |
| 21000 | 20974 | 443.45 | -16.22 | -0.33 | 1.311 | 0.995 | 3.919 | 0.995 | 1032.3 | 1.062 | 3.529 |
| 22000 | 21974 | 439.87 | -19.80 | -0.34 | 1.256 | 0.994 | 3.788 | 0.995 | 1028.1 | 1.055 | 3.503 |
| 23000 | 22974 | 436.29 | -23.38 | -0.36 | 1.204 | 0.994 | 3.658 | 0.995 | 1024.0 | 1.048 | 3.476 |
| 24000 | 23974 | 432.71 | -26.96 | -0.38 | 1.153 | 0.994 | 3.532 | 0.995 | 1019.7 | 1.041 | 3.450 |
| 25000 | 24974 | 429.12 | -30.55 | -0.39 | 1.104 | 0.994 | 3.410 | 0.995 | 1015.5 | 1.034 | 3.424 |
| 26000 | 25974 | 425.54 | -34.13 | -0.41 | 1.056 | 0.994 | 3.291 | 0.995 | 1011.3 | 1.027 | 3.397 |
| 27000 | 26974 | 421.97 | -37.70 | -0.41 | 1.011 | 0.994 | 3.175 | 0.995 | 1007.0 | 1.020 | 3.371 |
| 28000 | 27975 | 418.40 | -41.27 | -0.42 | 9.667 | + 0 0.994 | 3.063 | 0.995 | 1002.7 | 1.013 | 3.345 |
| 29000 | 28975 | 414.83 | -44.84 | -0.42 | 9.242 | 0.994 | 2.953 | 0.995 | 998.5 | 1.006 | 3.318 |
| 30000 | 29976 | 411.26 | -48.41 | -0.43 | 8.832 | + 0 0.994 | 2.847 - 2 | 0.995 | 994.1 | 9.984 - 6 | 3.292 - 6 |
| 31000 | 30977 | 407.68 | -51.99 | -0.43 | 8.436 | 0.994 | 2.743 | 0.995 | 989.8 | 9.913 | 3.265 |
| 32000 | 31977 | 407.54 | -52.13 | 2.99 | 8.057 | 0.996 | 2.621 | 0.987 | 989.6 | 9.910 | 3.264 |
| 33000 | 32978 | 408.09 | -51.58 | 7.10 | 7.695 | 0.995 | 2.500 | 0.977 | 990.3 | 9.921 | 3.268 |
| 34000 | 33979 | 408.63 | -51.04 | 11.21 | 7.350 | 0.996 | 2.384 | 0.968 | 991.0 | 9.932 | 3.272 |
| 35000 | 34980 | 409.18 | -50.49 | 15.32 | 7.021 | 0.997 | 2.275 | 0.960 | 991.6 | 9.943 | 3.276 |
| 36000 | 35981 | 409.72 | -49.95 | 19.43 | 6.706 | 0.999 | 2.170 | 0.952 | 992.3 | 9.954 | 3.280 |
| 37000 | 36983 | 410.27 | -49.40 | 20.30 | 6.407 | 1.002 | 2.070 | 0.952 | 993.0 | 9.965 | 3.284 |
| 38000 | 37984 | 410.82 | -48.85 | 20.85 | 6.121 | 1.004 | 1.975 | 0.953 | 993.6 | 9.976 | 3.288 |
| 39000 | 38985 | 411.37 | -48.30 | 21.40 | 5.848 | 1.006 | 1.885 | 0.954 | 994.3 | 9.987 | 3.292 |
| 40000 | 39987 | 411.92 | -47.75 | 21.95 | 5.588 | + 0 1.009 | 1.798 - 2 | 0.955 | 994.9 | 9.998 - 6 | 3.297 - 6 |
| 41000 | 40989 | 412.46 | -47.21 | 22.49 | 5.339 | 1.012 | 1.716 | 0.957 | 995.6 | 1.001 - 5 | 3.301 |
| 42000 | 41990 | 413.01 | -46.66 | 23.04 | 5.102 | 1.014 | 1.638 | 0.958 | 996.3 | 1.002 | 3.305 |
| 43000 | 42992 | 413.56 | -46.11 | 23.59 | 4.876 | 1.017 | 1.563 | 0.959 | 996.9 | 1.003 | 3.309 |
| 44000 | 43994 | 414.11 | -45.56 | 24.14 | 4.660 | 1.020 | 1.492 | 0.961 | 997.6 | 1.004 | 3.313 |
| 45000 | 44996 | 414.27 | -45.40 | 24.30 | 4.454 | 1.023 | 1.425 | 0.968 | 997.8 | 1.004 | 3.314 |
| 46000 | 45998 | 414.27 | -45.40 | 24.30 | 4.257 | 1.026 | 1.362 | 0.965 | 997.8 | 1.004 | 3.314 |
| 47000 | 47000 | 414.27 | -45.40 | 24.30 | 4.069 | 1.028 | 1.302 | 0.968 | 997.8 | 1.004 | 3.314 |
| 48000 | 48003 | 414.27 | -45.40 | 24.30 | 3.889 | 1.031 | 1.244 | 0.971 | 997.8 | 1.004 | 3.314 |
| 49000 | 49005 | 414.27 | -45.40 | 24.30 | 3.717 | 1.034 | 1.189 | 0.973 | 997.8 | 1.004 | 3.314 |
| 50000 | 50008 | 414.27 | -45.40 | 24.30 | 3.552 | + 0 1.037 | 1.137 - 2 | 0.977 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 51000 | 51010 | 414.27 | -45.40 | 24.30 | 3.395 | 1.040 | 1.086 | 0.979 | 997.8 | 1.004 | 3.314 |
| 52000 | 52013 | 414.27 | -45.40 | 24.30 | 3.245 | 1.043 | 1.038 | 0.982 | 997.8 | 1.004 | 3.314 |
| 53000 | 53016 | 414.27 | -45.40 | 24.30 | 3.101 | 1.046 | 9.924 - 3 | 0.985 | 997.8 | 1.004 | 3.314 |
| 54000 | 54019 | 414.27 | -45.40 | 24.30 | 2.964 | 1.049 | 9.485 | 0.987 | 997.8 | 1.004 | 3.314 |
| 55000 | 55022 | 414.27 | -45.40 | 24.30 | 2.833 | 1.052 | 9.066 | 0.990 | 997.8 | 1.004 | 3.314 |
| 56000 | 56025 | 414.27 | -45.40 | 24.30 | 2.708 | 1.055 | 8.665 | 0.993 | 997.8 | 1.004 | 3.314 |
| 57000 | 57028 | 414.27 | -45.40 | 24.30 | 2.588 | 1.058 | 8.281 | 0.996 | 997.8 | 1.004 | 3.314 |
| 58000 | 58031 | 414.27 | -45.40 | 24.30 | 2.473 | 1.061 | 7.915 | 0.999 | 997.8 | 1.004 | 3.314 |
| 59000 | 59034 | 414.27 | -45.40 | 24.30 | 2.364 | 1.064 | 7.565 | 1.001 | 997.8 | 1.004 | 3.314 |
| 60000 | 60038 | 414.27 | -45.40 | 24.30 | 2.259 | + 0 1.067 | 7.230 - 3 | 1.004 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 61000 | 61041 | 414.27 | -45.40 | 24.30 | 2.160 | 1.070 | 6.910 | 1.007 | 997.8 | 1.004 | 3.314 |
| 62000 | 62045 | 414.27 | -45.40 | 24.30 | 2.064 | 1.073 | 6.605 | 1.010 | 997.8 | 1.004 | 3.314 |
| 63000 | 63049 | 414.27 | -45.40 | 24.30 | 1.973 | 1.076 | 6.312 | 1.013 | 997.8 | 1.004 | 3.314 |
| 64000 | 64053 | 414.27 | -45.40 | 24.30 | 1.885 | 1.079 | 6.033 | 1.016 | 997.8 | 1.004 | 3.314 |
| 65000 | 65057 | 414.27 | -45.40 | 24.30 | 1.802 | 1.082 | 5.766 | 1.019 | 997.8 | 1.004 | 3.314 |
| 66000 | 66061 | 414.27 | -45.40 | 24.09 | 1.722 | 1.085 | 5.511 | 1.022 | 997.8 | 1.004 | 3.314 |
| 67000 | 67065 | 414.27 | -45.40 | 23.54 | 1.646 | 1.088 | 5.267 | 1.026 | 997.8 | 1.004 | 3.314 |
| 68000 | 68069 | 414.27 | -45.40 | 22.99 | 1.573 | 1.091 | 5.034 | 1.030 | 997.8 | 1.004 | 3.314 |
| 69000 | 69073 | 414.27 | -45.40 | 22.44 | 1.504 | 1.094 | 4.812 | 1.035 | 997.8 | 1.004 | 3.314 |
| 70000 | 70078 | 414.27 | -45.40 | 21.90 | 1.437 | + 0 1.097 | 4.599 - 3 | 1.039 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 71000 | 71082 | 414.27 | -45.40 | 21.35 | 1.374 | 1.100 | 4.395 | 1.043 | 997.8 | 1.004 | 3.314 |
| 72000 | 72087 | 414.27 | -45.40 | 20.80 | 1.313 | 1.102 | 4.201 | 1.047 | 997.8 | 1.004 | 3.314 |
| 73000 | 73092 | 414.27 | -45.40 | 20.25 | 1.255 | 1.105 | 4.015 | 1.051 | 997.8 | 1.004 | 3.314 |
| 74000 | 74096 | 414.27 | -45.40 | 19.70 | 1.199 | 1.107 | 3.838 | 1.055 | 997.8 | 1.004 | 3.314 |
| 75000 | 75101 | 414.27 | -45.40 | 19.15 | 1.146 | 1.110 | 3.668 | 1.059 | 997.8 | 1.004 | 3.314 |
| 76000 | 76106 | 414.27 | -45.40 | 18.60 | 1.096 | 1.112 | 3.506 | 1.062 | 997.8 | 1.004 | 3.314 |
| 77000 | 77111 | 414.27 | -45.40 | 18.06 | 1.047 | 1.114 | 3.351 | 1.066 | 997.8 | 1.004 | 3.314 |
| 78000 | 78116 | 414.86 | -44.81 | 18.10 | 1.001 | 1.117 | 3.198 | 1.068 | 998.5 | 1.006 | 3.318 |
| 79000 | 79122 | 415.52 | -44.15 | 18.21 | 9.566 | - 1 1.119 | 3.052 | 1.070 | 999.3 | 1.007 | 3.323 |

TABLE 5.2.—*Continued*
75° N, July
GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 0 | 0 | 502.06 | 42.39 | -16.61 | 2.990 | + 1 | 0.999 | 7.895 - 2 | 1.032 | 1098.9 | 1.172 - 5 | 3.950 - 6 |
| 1000 | 1002 | 500.56 | 40.89 | -14.55 | 2.880 | | 0.998 | 7.627 | 1.027 | 1096.8 | 1.169 | 3.940 |
| 2000 | 2004 | 499.05 | 39.38 | -12.48 | 2.774 | | 0.997 | 7.364 | 1.022 | 1095.1 | 1.167 | 3.929 |
| 3000 | 3006 | 497.55 | 37.88 | -10.42 | 2.671 | | 0.996 | 7.111 | 1.017 | 1093.5 | 1.164 | 3.918 |
| 4000 | 4008 | 496.05 | 36.38 | -8.36 | 2.572 | | 0.995 | 6.874 | 1.012 | 1091.8 | 1.161 | 3.908 |
| 5000 | 5010 | 494.55 | 34.88 | -6.29 | 2.476 | | 0.995 | 6.638 | 1.007 | 1090.2 | 1.158 | 3.897 |
| 6000 | 6012 | 493.06 | 33.39 | -4.22 | 2.384 | | 0.994 | 6.410 | 1.003 | 1088.5 | 1.156 | 3.886 |
| 7000 | 7013 | 491.56 | 31.91 | -2.14 | 2.295 | | 0.994 | 6.188 | 0.998 | 1086.9 | 1.153 | 3.876 |
| 8000 | 8015 | 490.13 | 30.46 | -0.02 | 2.209 | | 0.994 | 5.974 | 0.993 | 1085.3 | 1.150 | 3.866 |
| 9000 | 9016 | 488.88 | 27.21 | 0.29 | 2.125 | | 0.994 | 5.767 | 0.993 | 1081.7 | 1.144 | 3.842 |
| 10000 | 10018 | 483.21 | 23.54 | 0.29 | 2.045 | + 1 | 0.994 | 5.610 - 2 | 0.993 | 1077.6 | 1.137 - 5 | 3.816 - 6 |
| 11000 | 11019 | 479.54 | 19.87 | 0.08 | 1.967 | | 0.993 | 5.458 | 0.993 | 1073.5 | 1.131 | 3.790 |
| 12000 | 12020 | 475.88 | 16.21 | -0.02 | 1.891 | | 0.994 | 5.267 | 0.993 | 1069.4 | 1.124 | 3.764 |
| 13000 | 13021 | 472.21 | 12.54 | -0.13 | 1.817 | | 0.994 | 5.102 | 0.994 | 1065.3 | 1.117 | 3.737 |
| 14000 | 14022 | 468.59 | 8.92 | -0.18 | 1.746 | | 0.993 | 4.941 | 0.994 | 1061.2 | 1.110 | 3.711 |
| 15000 | 15023 | 464.98 | 5.31 | -0.23 | 1.678 | | 0.993 | 4.783 | 0.994 | 1057.1 | 1.103 | 3.685 |
| 16000 | 16024 | 461.37 | 1.70 | -0.28 | 1.611 | | 0.993 | 4.629 | 0.994 | 1053.0 | 1.096 | 3.659 |
| 17000 | 17024 | 457.76 | -1.91 | -0.33 | 1.547 | | 0.993 | 4.479 | 0.994 | 1048.8 | 1.089 | 3.633 |
| 18000 | 18025 | 454.15 | -5.52 | -0.38 | 1.484 | | 0.993 | 4.333 | 0.993 | 1044.7 | 1.083 | 3.607 |
| 19000 | 19025 | 450.54 | -9.13 | -0.43 | 1.424 | | 0.992 | 4.190 | 0.994 | 1040.5 | 1.076 | 3.581 |
| 20000 | 20026 | 446.94 | -12.73 | -0.47 | 1.366 | + 1 | 0.993 | 4.051 - 2 | 0.994 | 1036.4 | 1.069 - 5 | 3.554 - 6 |
| 21000 | 21026 | 443.36 | -16.31 | -0.50 | 1.309 | | 0.992 | 3.915 | 0.993 | 1032.2 | 1.062 | 3.528 |
| 22000 | 22026 | 439.78 | -19.89 | -0.52 | 1.255 | | 0.992 | 3.783 | 0.993 | 1028.0 | 1.055 | 3.502 |
| 23000 | 23026 | 436.19 | -23.48 | -0.54 | 1.202 | | 0.992 | 3.654 | 0.993 | 1023.8 | 1.048 | 3.476 |
| 24000 | 24026 | 432.61 | -27.06 | -0.57 | 1.152 | | 0.992 | 3.529 | 0.993 | 1019.6 | 1.041 | 3.449 |
| 25000 | 25026 | 429.03 | -30.64 | -0.59 | 1.103 | | 0.992 | 3.407 | 0.993 | 1015.4 | 1.034 | 3.423 |
| 26000 | 26026 | 425.45 | -34.22 | -0.61 | 1.055 | | 0.992 | 3.288 | 0.993 | 1011.2 | 1.027 | 3.397 |
| 27000 | 27026 | 421.88 | -37.79 | -0.63 | 1.010 | | 0.992 | 3.173 | 0.993 | 1006.9 | 1.020 | 3.370 |
| 28000 | 28025 | 418.31 | -41.36 | -0.64 | 9.656 | + 0 | 0.991 | 3.060 | 0.993 | 1002.6 | 1.013 | 3.344 |
| 29000 | 29025 | 414.74 | -44.93 | -0.66 | 9.231 | | 0.991 | 2.951 | 0.993 | 998.3 | 1.005 | 3.317 |
| 30000 | 30024 | 411.17 | -48.50 | -0.67 | 8.822 | + 0 | 0.991 | 2.844 - 2 | 0.992 | 994.0 | 9.983 - 6 | 3.291 - 6 |
| 31000 | 31023 | 407.60 | -52.07 | -0.68 | 8.427 | | 0.991 | 2.741 | 0.992 | 989.7 | 9.911 | 3.264 |
| 32000 | 32023 | 407.55 | -52.12 | 2.82 | 8.049 | | 0.991 | 2.618 | 0.984 | 989.7 | 9.910 | 3.264 |
| 33000 | 33022 | 408.10 | -51.57 | 6.92 | 7.687 | | 0.991 | 2.497 | 0.974 | 990.3 | 9.921 | 3.268 |
| 34000 | 34021 | 408.64 | -51.03 | 11.02 | 7.343 | | 0.992 | 2.382 | 0.965 | 991.0 | 9.932 | 3.272 |
| 35000 | 35020 | 409.19 | -50.48 | 15.12 | 7.014 | | 0.994 | 2.272 | 0.957 | 991.6 | 9.943 | 3.276 |
| 36000 | 36019 | 409.73 | -49.94 | 19.22 | 6.701 | | 0.995 | 2.168 | 0.949 | 992.3 | 9.954 | 3.280 |
| 37000 | 37017 | 410.28 | -49.39 | 20.31 | 6.402 | | 0.998 | 2.068 | 0.948 | 993.0 | 9.965 | 3.284 |
| 38000 | 38016 | 410.83 | -48.84 | 20.86 | 6.116 | | 1.000 | 1.974 | 0.949 | 993.6 | 9.976 | 3.288 |
| 39000 | 39015 | 411.38 | -48.29 | 21.41 | 5.844 | | 1.002 | 1.883 | 0.950 | 994.3 | 9.987 | 3.292 |
| 40000 | 40013 | 411.92 | -47.75 | 21.95 | 5.584 | + 0 | 1.005 | 1.797 - 2 | 0.951 | 995.0 | 9.998 - 6 | 3.297 - 6 |
| 41000 | 41011 | 412.47 | -47.20 | 22.50 | 5.337 | | 1.007 | 1.715 | 0.952 | 995.6 | 1.001 - 5 | 3.301 |
| 42000 | 42010 | 413.02 | -46.65 | 23.05 | 5.100 | | 1.010 | 1.637 | 0.953 | 996.3 | 1.002 | 3.305 |
| 43000 | 43008 | 413.57 | -46.10 | 23.60 | 4.874 | | 1.012 | 1.562 | 0.954 | 996.9 | 1.003 | 3.309 |
| 44000 | 44006 | 414.11 | -45.56 | 24.14 | 4.659 | | 1.015 | 1.491 | 0.956 | 997.6 | 1.004 | 3.313 |
| 45000 | 45004 | 414.27 | -45.40 | 24.30 | 4.453 | | 1.018 | 1.425 | 0.959 | 997.8 | 1.004 | 3.314 |
| 46000 | 46002 | 414.27 | -45.40 | 24.30 | 4.257 | | 1.021 | 1.362 | 0.961 | 997.8 | 1.004 | 3.314 |
| 47000 | 47000 | 414.27 | -45.40 | 24.30 | 4.069 | | 1.023 | 1.302 | 0.963 | 997.8 | 1.004 | 3.314 |
| 48000 | 47997 | 414.27 | -45.40 | 24.30 | 3.889 | | 1.026 | 1.244 | 0.966 | 997.8 | 1.004 | 3.314 |
| 49000 | 48995 | 414.27 | -45.40 | 24.30 | 3.717 | | 1.029 | 1.190 | 0.969 | 997.8 | 1.004 | 3.314 |
| 50000 | 49992 | 414.27 | -45.40 | 24.30 | 3.553 | + 0 | 1.032 | 1.137 - 2 | 0.971 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 51000 | 50990 | 414.27 | -45.40 | 24.30 | 3.397 | | 1.034 | 1.087 | 0.974 | 997.8 | 1.004 | 3.314 |
| 52000 | 51987 | 414.27 | -45.40 | 24.30 | 3.247 | | 1.037 | 1.039 | 0.976 | 997.8 | 1.004 | 3.314 |
| 53000 | 52984 | 414.27 | -45.40 | 24.30 | 3.104 | | 1.040 | 9.931 - 3 | 0.979 | 997.8 | 1.004 | 3.314 |
| 54000 | 53981 | 414.27 | -45.40 | 24.30 | 2.967 | | 1.043 | 9.493 | 0.982 | 997.8 | 1.004 | 3.314 |
| 55000 | 54979 | 414.27 | -45.40 | 24.30 | 2.836 | | 1.046 | 9.074 | 0.984 | 997.8 | 1.004 | 3.314 |
| 56000 | 55975 | 414.27 | -45.40 | 24.30 | 2.711 | | 1.049 | 8.674 | 0.987 | 997.8 | 1.004 | 3.314 |
| 57000 | 56972 | 414.27 | -45.40 | 24.30 | 2.591 | | 1.052 | 8.292 | 0.990 | 997.8 | 1.004 | 3.314 |
| 58000 | 57969 | 414.27 | -45.40 | 24.30 | 2.477 | | 1.054 | 7.926 | 0.992 | 997.8 | 1.004 | 3.314 |
| 59000 | 58966 | 414.27 | -45.40 | 24.30 | 2.368 | | 1.057 | 7.577 | 0.995 | 997.8 | 1.004 | 3.314 |
| 60000 | 59962 | 414.27 | -45.40 | 24.30 | 2.263 | + 0 | 1.060 | 7.243 - 3 | 0.998 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 61000 | 60959 | 414.27 | -45.40 | 24.30 | 2.164 | | 1.063 | 6.923 | 1.000 | 997.8 | 1.004 | 3.314 |
| 62000 | 61955 | 414.27 | -45.40 | 24.30 | 2.068 | | 1.066 | 6.618 | 1.003 | 997.8 | 1.004 | 3.314 |
| 63000 | 62951 | 414.27 | -45.40 | 24.30 | 1.977 | | 1.069 | 6.326 | 1.006 | 997.8 | 1.004 | 3.314 |
| 64000 | 63948 | 414.27 | -45.40 | 24.30 | 1.890 | | 1.071 | 6.048 | 1.009 | 997.8 | 1.004 | 3.314 |
| 65000 | 64944 | 414.27 | -45.40 | 24.30 | 1.807 | | 1.074 | 5.781 | 1.011 | 997.8 | 1.004 | 3.314 |
| 66000 | 65940 | 414.27 | -45.40 | 24.30 | 1.727 | | 1.077 | 5.526 | 1.014 | 997.8 | 1.004 | 3.314 |
| 67000 | 66936 | 414.27 | -45.40 | 23.66 | 1.651 | | 1.080 | 5.283 | 1.018 | 997.8 | 1.004 | 3.314 |
| 68000 | 67931 | 414.27 | -45.40 | 23.11 | 1.578 | | 1.083 | 5.050 | 1.022 | 997.8 | 1.004 | 3.314 |
| 69000 | 68927 | 414.27 | -45.40 | 22.57 | 1.509 | | 1.085 | 4.828 | 1.027 | 997.8 | 1.004 | 3.314 |
| 70000 | 69923 | 414.27 | -45.40 | 22.02 | 1.442 | + 0 | 1.088 | 4.615 - 3 | 1.030 | 997.8 | 1.004 - 5 | 3.314 - 6 |
| 71000 | 70918 | 414.27 | -45.40 | 21.48 | 1.379 | | 1.091 | 4.412 | 1.034 | 997.8 | 1.004 | 3.314 |
| 72000 | 71914 | 414.27 | -45.40 | 20.93 | 1.318 | | 1.094 | 4.217 | 1.038 | 997.8 | 1.004 | 3.314 |
| 73000 | 72909 | 414.27 | -45.40 | 20.39 | 1.260 | | 1.096 | 4.032 | 1.042 | 997.8 | 1.004 | 3.314 |
| 74000 | 73904 | 414.27 | -45.40 | 19.84 | 1.204 | | 1.098 | 3.854 | 1.046 | 997.8 | 1.004 | 3.314 |
| 75000 | 74899 | 414.27 | -45.40 | 19.30 | 1.151 | | 1.101 | 3.685 | 1.049 | 997.8 | 1.004 | 3.314 |
| 76000 | 75894 | 414.27 | -45.40 | 18.76 | 1.101 | | 1.103 | 3.522 | 1.053 | 997.8 | 1.004 | 3.314 |
| 77000 | 76889 | 414.27 | -45.40 | 18.21 | 1.052 | | 1.105 | 3.367 | 1.057 | 997.8 | 1.004 | 3.314 |
| 78000 | 77884 | 414.79 | -44.88 | 18.18 | 1.006 | | 1.107 | 3.215 | 1.059 | 998.4 | 1.005 | 3.318 |
| 79000 | 78879 | 415.44 | -44.23 | 18.29 | 9.618 | - 1 | 1.110 | 3.069 | 1.061 | 999.2 | 1.007 | 3.323 |

TABLE 5.2 — *Continued*
75° N. July
GEOPOTENTIAL ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H$, ft | $Z$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. $Hg$ | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $k$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 80000 | 80127 | 416.16 | -43.49 | 18.32 | 9.144 - 1 | 1.121 | 2.913 - 3 | 1.072 | 1000.1 | 1.008 - 5 | 3.328 - 6 |
| 81000 | 81133 | 416.64 | -42.83 | 18.43 | 8.742 | 1.124 | 2.780 | 1.074 | 1000.9 | 1.010 | 3.333 |
| 82000 | 82138 | 417.30 | -42.17 | 18.54 | 8.358 | 1.126 | 2.654 | 1.076 | 1001.7 | 1.011 | 3.338 |
| 83000 | 83144 | 418.15 | -41.52 | 18.65 | 7.991 | 1.128 | 2.533 | 1.078 | 1002.4 | 1.012 | 3.343 |
| 84000 | 84150 | 418.81 | -40.86 | 18.76 | 7.641 | 1.131 | 2.419 | 1.080 | 1003.2 | 1.014 | 3.348 |
| 85000 | 85155 | 419.47 | -40.20 | 18.87 | 7.307 | 1.133 | 2.309 | 1.082 | 1004.0 | 1.015 | 3.353 |
| 86000 | 86161 | 420.13 | -39.54 | 18.98 | 6.988 | 1.136 | 2.205 | 1.084 | 1004.8 | 1.016 | 3.357 |
| 87000 | 87167 | 420.79 | -38.88 | 19.09 | 6.683 | 1.138 | 2.105 | 1.086 | 1005.6 | 1.017 | 3.362 |
| 88000 | 88174 | 421.45 | -38.22 | 19.20 | 6.392 | 1.140 | 2.011 | 1.089 | 1006.4 | 1.019 | 3.367 |
| 89000 | 89180 | 422.10 | -37.57 | 19.31 | 6.114 | 1.143 | 1.920 | 1.090 | 1007.2 | 1.020 | 3.372 |
| 90000 | 90186 | 422.76 | -36.91 | 19.42 | 5.849 - 1 | 1.145 | 1.834 - 3 | 1.092 | 1008.0 | 1.021 - 5 | 3.377 - 6 |
| 91000 | 91193 | 423.42 | -36.25 | 19.53 | 5.596 | 1.148 | 1.752 | 1.095 | 1008.7 | 1.023 | 3.382 |
| 92000 | 92199 | 424.08 | -35.59 | 19.63 | 5.354 | 1.150 | 1.673 | 1.097 | 1009.5 | 1.024 | 3.387 |
| 93000 | 93206 | 424.74 | -34.93 | 19.74 | 5.122 | 1.153 | 1.599 | 1.099 | 1010.3 | 1.025 | 3.391 |
| 94000 | 94213 | 425.40 | -34.27 | 19.85 | 4.901 | 1.155 | 1.527 | 1.101 | 1011.1 | 1.027 | 3.396 |
| 95000 | 95219 | 426.05 | -33.62 | 19.96 | 4.690 | 1.157 | 1.459 | 1.103 | 1011.9 | 1.028 | 3.401 |
| 96000 | 96226 | 426.71 | -32.96 | 20.07 | 4.488 | 1.160 | 1.394 | 1.106 | 1012.7 | 1.029 | 3.406 |
| 97000 | 97233 | 427.37 | -32.30 | 20.18 | 4.296 | 1.163 | 1.332 | 1.108 | 1013.4 | 1.030 | 3.411 |
| 98000 | 98240 | 428.03 | -31.64 | 20.29 | 4.112 | 1.165 | 1.273 | 1.110 | 1014.2 | 1.032 | 3.416 |

TABLE 5.2.—*Continued*
75° N. July

GEOMETRIC ALTITUDE, ENGLISH UNITS

| Altitude | | Temperature | | | Pressure | | Density | | Sound speed | Coefficient of viscosity | Thermal conductivity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Z$, ft | $H$, ft | $T$, °R | $t$, °F | $T-T_{std}$ | $P$, in. Hg | $\frac{P}{P_{std}}$ | $\rho$, lb ft$^{-3}$ | $\frac{\rho}{\rho_{std}}$ | $C_s$, ft sec$^{-1}$ | $\mu$, lb ft$^{-1}$ sec$^{-1}$ | $\frac{k}{}$, BTU ft$^{-1}$ sec$^{-1}$ (°R)$^{-1}$ |
| 80000 | 79874 | 416.10 | -43.57 | 18.40 | 9.197 - 1 | 1.112 | 2.930 - 3 | 1.062 | 1000.0 | 1.008 - 5 | 3.328 - 6 |
| 81000 | 80868 | 416.75 | -42.92 | 18.51 | 8.796 | 1.114 | 2.797 | 1.064 | 1000.8 | 1.009 | 3.332 |
| 82000 | 81863 | 417.41 | -42.26 | 18.62 | 8.410 | 1.116 | 2.671 | 1.066 | 1001.6 | 1.011 | 3.337 |
| 83000 | 82857 | 418.06 | -41.61 | 18.73 | 8.043 | 1.118 | 2.550 | 1.068 | 1002.3 | 1.012 | 3.342 |
| 84000 | 83851 | 418.72 | -40.95 | 18.84 | 7.692 | 1.120 | 2.435 | 1.070 | 1003.1 | 1.013 | 3.347 |
| 85000 | 84845 | 419.37 | -40.30 | 18.95 | 7.358 | 1.123 | 2.326 | 1.072 | 1003.9 | 1.015 | 3.352 |
| 86000 | 85840 | 420.02 | -39.65 | 19.07 | 7.038 | 1.125 | 2.221 | 1.074 | 1004.7 | 1.016 | 3.357 |
| 87000 | 86834 | 420.68 | -38.99 | 19.18 | 6.733 | 1.127 | 2.122 | 1.076 | 1005.5 | 1.017 | 3.362 |
| 88000 | 87827 | 421.33 | -38.34 | 19.29 | 6.442 | 1.130 | 2.027 | 1.078 | 1006.3 | 1.019 | 3.366 |
| 89000 | 88821 | 421.99 | -37.68 | 19.40 | 6.163 | 1.132 | 1.936 | 1.080 | 1007.0 | 1.020 | 3.371 |
| 90000 | 89815 | 422.64 | -37.03 | 19.51 | 5.897 - 1 | 1.134 | 1.850 - 3 | 1.082 | 1007.8 | 1.021 - 5 | 3.376 - 6 |
| 91000 | 90809 | 423.30 | -36.37 | 19.62 | 5.643 | 1.136 | 1.767 | 1.084 | 1008.6 | 1.022 | 3.381 |
| 92000 | 91802 | 423.95 | -35.72 | 19.73 | 5.401 | 1.139 | 1.689 | 1.086 | 1009.4 | 1.024 | 3.386 |
| 93000 | 92796 | 424.60 | -35.07 | 19.84 | 5.169 | 1.141 | 1.614 | 1.087 | 1010.1 | 1.025 | 3.390 |
| 94000 | 93789 | 425.26 | -34.41 | 19.95 | 4.947 | 1.143 | 1.542 | 1.090 | 1010.9 | 1.026 | 3.395 |
| 95000 | 94782 | 425.91 | -33.76 | 20.06 | 4.735 | 1.146 | 1.474 | 1.092 | 1011.7 | 1.028 | 3.400 |
| 96000 | 95775 | 426.57 | -33.10 | 20.17 | 4.533 | 1.148 | 1.409 | 1.094 | 1012.5 | 1.029 | 3.405 |
| 97000 | 96768 | 427.22 | -32.45 | 20.28 | 4.340 | 1.150 | 1.347 | 1.096 | 1013.3 | 1.030 | 3.410 |
| 98000 | 97761 | 427.87 | -31.80 | 20.39 | 4.155 | 1.153 | 1.287 | 1.098 | 1014.0 | 1.031 | 3.415 |

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Table 5.3

Sea level to 30 km

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

244-408 O - 67 - 15

TABLE 5.3

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

| P, mb | Pressure Altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 31850 | 29320 | 30019 | 30944 | 30878 | 31151 | 31452 | 31786 | 31915 | |
| 11 | 30620 | 28199 | 29420 | 29814 | 30227 | 30500 | 30798 | 31125 | 31252 | |
| 12 | 29543 | 28212 | 28873 | 29382 | 29694 | 29904 | 30206 | 30523 | 30649 | |
| 13 | 28553 | 27286 | 28369 | 28872 | 29107 | 29362 | 29661 | 29976 | 30095 | |
| 14 | 27623 | 27375 | 27905 | 28404 | 28617 | 28859 | 29136 | 29471 | 29583 | 29633 |
| 15 | 26750 | 26856 | 27471 | 27946 | 28161 | 28397 | 28694 | 29000 | 29109 | 29351 |
| 16 | 25963 | 26462 | 27070 | 27559 | 27735 | 27961 | 28262 | 28563 | 28668 | 28904 |
| 17 | 25265 | 26095 | 26692 | 27177 | 27337 | 27559 | 27858 | 28153 | 28254 | 28484 |
| 18 | 24578 | 25768 | 26335 | 26816 | 26966 | 27181 | 27478 | 27769 | 27863 | 28091 |
| 19 | 23916 | 25420 | 25997 | 26477 | 26612 | 26823 | 27118 | 27408 | 27496 | 27718 |
| 20 | 23281 | 25108 | 25680 | 26133 | 26279 | 26484 | 26778 | 27063 | 27150 | 27365 |
| 21 | 22673 | 24811 | 25378 | 25804 | 25948 | 26164 | 26456 | 26739 | 26821 | 27029 |
| 22 | 22090 | 24528 | 25069 | 25554 | 25642 | 25859 | 26151 | 26430 | 26506 | 26711 |
| 23 | 21532 | 24256 | 24814 | 25276 | 25356 | 25568 | 25859 | 26135 | 26206 | 26407 |
| 24 | 20994 | 24000 | 24551 | 25005 | 25101 | 25291 | 25581 | 25852 | 25919 | 26116 |
| 25 | 20479 | 23751 | 24299 | 24748 | 24839 | 25026 | 25314 | 25582 | 25646 | 25837 |
| 26 | 19984 | 23512 | 24057 | 24500 | 24588 | 24771 | 25058 | 25322 | 25383 | 25570 |
| 27 | 19510 | 23283 | 23823 | 24262 | 24347 | 24526 | 24812 | 25073 | 25130 | 25314 |
| 28 | 19056 | 23062 | 23597 | 24034 | 24118 | 24292 | 24576 | 24836 | 24887 | 25067 | |
| 29 | 18620 | 22849 | 23379 | 23813 | 23896 | 24066 | 24350 | 24603 | 24653 | 24829 |
| 30 | 18199 | 22642 | 23168 | 23600 | 23677 | 23849 | 24132 | 24381 | 24427 | 24599 |
| 31 | 17797 | 22443 | 22964 | 23394 | 23468 | 23639 | 23921 | 24165 | 24209 | 24377 |
| 32 | 17412 | 22251 | 22766 | 23194 | 23270 | 23436 | 23716 | 23957 | 23998 | 24163 |
| 33 | 17044 | 22064 | 22575 | 23000 | 23076 | 23239 | 23518 | 23755 | 23796 | 23955 |
| 34 | 16692 | 21882 | 22389 | 22812 | 22888 | 23049 | 23326 | 23559 | 23597 | 23753 |
| 35 | 16356 | 21706 | 22208 | 22629 | 22705 | 22864 | 23141 | 23370 | 23405 | 23558 |
| 36 | 16035 | 21534 | 22033 | 22451 | 22528 | 22686 | 22961 | 23186 | 23220 | 23368 |
| 37 | 15729 | 21367 | 21862 | 22279 | 22356 | 22514 | 22785 | 23007 | 23039 | 23183 |
| 38 | 15437 | 21206 | 21697 | 22111 | 22190 | 22343 | 22616 | 22834 | 22863 | 23004 |
| 39 | 15158 | 21048 | 21535 | 21948 | 22027 | 22179 | 22451 | 22665 | 22692 | 22829 |
| 40 | 14892 | 20894 | 21377 | 21788 | 21870 | 22019 | 22291 | 22500 | 22525 | 22658 |
| 41 | 14638 | 20744 | 21222 | 21632 | 21716 | 21864 | 22134 | 22340 | 22362 | 22492 |
| 42 | 14396 | 20598 | 21071 | 21480 | 21566 | 21713 | 21982 | 22183 | 22203 | 22329 |
| 43 | 14165 | 20455 | 20924 | 21332 | 21420 | 21565 | 21833 | 22030 | 22047 | 22170 |
| 44 | 13945 | 20315 | 20780 | 21188 | 21278 | 21422 | 21688 | 21881 | 21896 | 22015 |
| 45 | 13736 | 20178 | 20640 | 21046 | 21139 | 21283 | 21546 | 21735 | 21748 | 21864 |
| 46 | 13537 | 20045 | 20503 | 20908 | 21003 | 21146 | 21408 | 21592 | 21604 | 21716 |
| 47 | 13347 | 19914 | 20368 | 20772 | 20870 | 21013 | 21272 | 21453 | 21462 | 21571 |
| 48 | 13166 | 19786 | 20236 | 20640 | 20741 | 20884 | 21140 | 21317 | 21323 | 21429 |
| 49 | 12993 | 19660 | 20107 | 20510 | 20614 | 20757 | 21010 | 21184 | 21187 | 21291 |
| 50 | 12828 | 19538 | 19980 | 20383 | 20490 | 20633 | 20884 | 21054 | 21054 | 21154 |
| 51 | 12669 | 19417 | 19856 | 20258 | 20369 | 20511 | 20760 | 20926 | 20923 | 21021 |
| 52 | 12517 | 19299 | 19734 | 20136 | 20251 | 20392 | 20639 | 20801 | 20796 | 20890 |
| 53 | 12370 | 19183 | 19615 | 20015 | 20136 | 20276 | 20520 | 20678 | 20670 | 20762 |
| 54 | 12229 | 19069 | 19498 | 19898 | 20020 | 20163 | 20404 | 20557 | 20547 | 20636 |
| 55 | 12093 | 18958 | 19382 | 19782 | 19909 | 20051 | 20289 | 20439 | 20426 | 20512 |
| 56 | 11962 | 18848 | 19269 | 19669 | 19799 | 19942 | 20177 | 20323 | 20307 | 20391 |
| 57 | 11836 | 18741 | 19158 | 19557 | 19692 | 19835 | 20067 | 20210 | 20191 | 20271 |
| 58 | 11714 | 18635 | 19049 | 19448 | 19586 | 19730 | 19959 | 20098 | 20076 | 20154 |
| 59 | 11596 | 18531 | 18941 | 19340 | 19480 | 19627 | 19854 | 19988 | 19963 | 20039 |
| 60 | 11482 | 18428 | 18836 | 19235 | 19381 | 19525 | 19750 | 19880 | 19852 | 19926 |
| 61 | 11371 | 18328 | 18732 | 19131 | 19281 | 19426 | 19647 | 19774 | 19744 | 19814 |
| 62 | 11264 | 18229 | 18629 | 19028 | 19183 | 19329 | 19547 | 19670 | 19637 | 19705 |
| 63 | 11160 | 18131 | 18529 | 18928 | 19087 | 19233 | 19448 | 19568 | 19531 | 19597 |
| 64 | 11060 | 18035 | 18430 | 18828 | 18992 | 19139 | 19351 | 19467 | 19428 | 19492 |
| 65 | 10962 | 17941 | 18332 | 18730 | 18898 | 19046 | 19256 | 19366 | 19325 | 19387 |
| 66 | 10867 | 17847 | 18235 | 18634 | 18807 | 18955 | 19162 | 19270 | 19225 | 19284 |
| 67 | 10774 | 17755 | 18141 | 18539 | 18717 | 18864 | 19069 | 19174 | 19126 | 19183 |
| 68 | 10683 | 17665 | 18047 | 18446 | 18628 | 18779 | 18978 | 19079 | 19028 | 19083 |
| 69 | 10595 | 17576 | 17955 | 18354 | 18540 | 18692 | 18889 | 18988 | 18932 | 18984 |
| 70 | 10509 | 17488 | 17864 | 18263 | 18454 | 18607 | 18801 | 18894 | 18837 | 18887 |
| 71 | 10425 | 17401 | 17775 | 18174 | 18369 | 18523 | 18714 | 18804 | 18743 | 18792 |
| 72 | 10343 | 17315 | 17687 | 18085 | 18286 | 18441 | 18628 | 18715 | 18651 | 18697 |
| 73 | 10263 | 17231 | 17600 | 17998 | 18203 | 18360 | 18544 | 18627 | 18560 | 18604 |
| 74 | 10184 | 17148 | 17514 | 17912 | 18122 | 18281 | 18460 | 18540 | 18471 | 18513 |
| 75 | 10107 | 17066 | 17430 | 17827 | 18042 | 18202 | 18379 | 18455 | 18382 | 18422 |
| 76 | 10032 | 16985 | 17346 | 17744 | 17963 | 18124 | 18298 | 18371 | 18295 | 18333 |
| 77 | 9957 | 16905 | 17263 | 17661 | 17885 | 18048 | 18218 | 18287 | 18208 | 18245 |
| 78 | 9885 | 16826 | 17181 | 17580 | 17809 | 17972 | 18140 | 18205 | 18123 | 18159 |
| 79 | 9814 | 16748 | 17101 | 17499 | 17735 | 17899 | 18062 | 18124 | 18039 | 18073 |
| 80 | 9744 | 16671 | 17021 | 17420 | 17658 | 17826 | 17986 | 18044 | 17956 | 17988 |
| 81 | 9676 | 16595 | 16943 | 17341 | 17584 | 17754 | 17910 | 17966 | 17874 | 17904 |
| 82 | 9608 | 16519 | 16865 | 17264 | 17512 | 17682 | 17836 | 17888 | 17794 | 17822 |
| 83 | 9542 | 16445 | 16789 | 17187 | 17440 | 17612 | 17762 | 17811 | 17714 | 17740 |
| 84 | 9477 | 16371 | 16713 | 17111 | 17368 | 17543 | 17690 | 17735 | 17635 | 17659 |
| 85 | 9413 | 16299 | 16638 | 17036 | 17296 | 17474 | 17618 | 17660 | 17557 | 17580 |
| 86 | 9350 | 16227 | 16564 | 16962 | 17225 | 17407 | 17547 | 17586 | 17480 | 17501 |
| 87 | 9288 | 16156 | 16491 | 16889 | 17160 | 17341 | 17477 | 17513 | 17404 | 17423 |
| 88 | 9227 | 16085 | 16419 | 16817 | 17092 | 17275 | 17408 | 17441 | 17329 | 17346 |
| 89 | 9167 | 16016 | 16347 | 16745 | 17025 | 17210 | 17340 | 17369 | 17254 | 17270 |
| 90 | 9108 | 15947 | 16276 | 16675 | 16958 | 17146 | 17273 | 17299 | 17181 | 17194 |
| 91 | 9050 | 15879 | 16206 | 16605 | 16892 | 17083 | 17206 | 17229 | 17108 | 17120 |
| 92 | 8993 | 15812 | 16137 | 16536 | 16827 | 17020 | 17140 | 17160 | 17036 | 17046 |
| 93 | 8936 | 15745 | 16068 | 16467 | 16762 | 16958 | 17075 | 17091 | 16964 | 16973 |
| 94 | 8880 | 15679 | 16001 | 16399 | 16699 | 16897 | 17011 | 17024 | 16894 | 16901 |
| 95 | 8825 | 15614 | 15933 | 16332 | 16635 | 16837 | 16948 | 16957 | 16824 | 16830 |
| 96 | 8770 | 15550 | 15867 | 16266 | 16573 | 16778 | 16885 | 16890 | 16755 | 16759 |
| 97 | 8717 | 15486 | 15801 | 16200 | 16511 | 16719 | 16823 | 16825 | 16687 | 16690 |
| 98 | 8664 | 15423 | 15736 | 16135 | 16449 | 16660 | 16762 | 16760 | 16619 | 16621 |
| 99 | 8612 | 15361 | 15671 | 16070 | 16388 | 16603 | 16702 | 16695 | 16552 | 16552 |
| 100 | 8560 | 15299 | 15607 | 16006 | 16328 | 16545 | 16642 | 16632 | 16486 | 16485 |
| 101 | 8509 | 15238 | 15544 | 15943 | 16268 | 16488 | 16582 | 16569 | 16421 | 16418 |
| 102 | 8459 | 15178 | 15481 | 15881 | 16209 | 16432 | 16523 | 16506 | 16356 | 16352 |
| 103 | 8409 | 15118 | 15420 | 15819 | 16150 | 16376 | 16465 | 16444 | 16292 | 16287 |
| 104 | 8359 | 15059 | 15359 | 15757 | 16092 | 16321 | 16407 | 16383 | 16229 | 16222 |
| 105 | 8310 | 15000 | 15299 | 15697 | 16034 | 16266 | 16350 | 16323 | 16166 | 16158 |
| 106 | 8261 | 14941 | 15238 | 15636 | 15977 | 16212 | 16293 | 16263 | 16104 | 16094 |
| 107 | 8213 | 14883 | 15180 | 15577 | 15920 | 16158 | 16236 | 16204 | 16043 | 16031 |
| 108 | 8165 | 14825 | 15121 | 15518 | 15864 | 16105 | 16181 | 16145 | 15981 | 15968 |
| 109 | 8118 | 14768 | 15063 | 15459 | 15808 | 16052 | 16125 | 16086 | 15920 | 15906 |

*Pressure altitude is defined as the indicated altitude of a pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

| P, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 15375 | 14731 | 15006 | 15401 | 15783 | 16000 | 16070 | 16049 | 15859 | 15866 |
| 111 | 15518 | 14865 | 15068 | 15544 | 15936 | 16148 | 16216 | 16172 | 15989 | 15982 |
| 112 | 15661 | 14999 | 15131 | 15687 | 16089 | 16296 | 16363 | 16296 | 16119 | 16101 |
| 113 | 15805 | 15134 | 15195 | 15831 | 16243 | 16445 | 16510 | 16420 | 16250 | 16221 |
| 114 | 15949 | 15269 | 15258 | 15975 | 16396 | 16594 | 16658 | 16545 | 16380 | 16341 |
| 115 | 16093 | 15405 | 15322 | 16120 | 16550 | 16744 | 16806 | 16670 | 16511 | 16462 |
| 116 | 16238 | 15542 | 15386 | 16265 | 16704 | 16895 | 16955 | 16796 | 16642 | 16583 |
| 117 | 16384 | 15679 | 15451 | 16411 | 16858 | 17047 | 17104 | 16923 | 16774 | 16705 |
| 118 | 16530 | 15816 | 15517 | 16557 | 17013 | 17200 | 17254 | 17051 | 16907 | 16828 |
| 119 | 16677 | 15954 | 15583 | 16703 | 17168 | 17353 | 17405 | 17179 | 17040 | 16951 |
| 120 | 16823 | 16092 | 15650 | 16850 | 17327 | 17506 | 17556 | 17308 | 17174 | 17075 |
| 121 | 16971 | 16231 | 15717 | 16997 | 17487 | 17661 | 17708 | 17438 | 17309 | 17200 |
| 122 | 17119 | 16370 | 15784 | 17145 | 17648 | 17817 | 17861 | 17569 | 17445 | 17326 |
| 123 | 17267 | 16510 | 15852 | 17293 | 17810 | 17974 | 18015 | 17701 | 17582 | 17453 |
| 124 | 17416 | 16650 | 15920 | 17442 | 17973 | 18132 | 18170 | 17834 | 17720 | 17581 |
| 125 | 17565 | 16790 | 15988 | 17591 | 18137 | 18291 | 18326 | 17968 | 17859 | 17710 |
| 126 | 17714 | 16930 | 16140 | 17740 | 18302 | 18451 | 18483 | 18103 | 17999 | 17840 |
| 127 | 17864 | 17071 | 16290 | 17890 | 18468 | 18612 | 18641 | 18239 | 18140 | 17971 |
| 128 | 18014 | 17212 | 16440 | 18040 | 18635 | 18775 | 18800 | 18376 | 18282 | 18104 |
| 129 | 18163 | 17353 | 16590 | 18190 | 18787 | 18938 | 18960 | 18514 | 18425 | 18238 |
| 130 | 18313 | 17495 | 16741 | 18340 | 18940 | 19102 | 19121 | 18653 | 18569 | 18373 |
| 131 | 18467 | 17637 | 16892 | 18491 | 19098 | 19267 | 19283 | 18793 | 18714 | 18509 |
| 132 | 18619 | 17780 | 17043 | 18643 | 19257 | 19432 | 19446 | 18934 | 18860 | 18646 |
| 133 | 18771 | 17923 | 17195 | 18794 | 19416 | 19600 | 19610 | 19076 | 19007 | 18784 |
| 134 | 18924 | 18066 | 17347 | 18946 | 19575 | 19768 | 19775 | 19218 | 19154 | 18922 |
| 135 | 19077 | 18209 | 17500 | 19099 | 19735 | 19936 | 19940 | 19361 | 19302 | 19061 |
| 136 | 19230 | 18353 | 17653 | 19252 | 19896 | 20104 | 20106 | 19504 | 19450 | 19200 |
| 137 | 19383 | 18498 | 17805 | 19405 | 20058 | 20272 | 20272 | 19648 | 19599 | 19340 |
| 138 | 19537 | 18643 | 17958 | 19558 | 20221 | 20441 | 20439 | 19792 | 19748 | 19480 |
| 139 | 19691 | 18789 | 18112 | 19712 | 20384 | 20610 | 20606 | 19937 | 19898 | 19621 |
| 140 | 19846 | 18936 | 18268 | 19867 | 20548 | 20781 | 20774 | 20083 | 20049 | 19763 |
| 141 | 20001 | 19082 | 18424 | 20021 | 20713 | 20952 | 20942 | 20229 | 20200 | 19906 |
| 142 | 20156 | 19229 | 18579 | 20176 | 20877 | 21124 | 21111 | 20375 | 20352 | 20050 |
| 143 | 20311 | 19376 | 18735 | 20332 | 21042 | 21296 | 21280 | 20522 | 20504 | 20194 |
| 144 | 20467 | 19523 | 18891 | 20488 | 21207 | 21469 | 21450 | 20669 | 20657 | 20339 |
| 145 | 20623 | 19670 | 19047 | 20644 | 21373 | 21642 | 21620 | 20817 | 20810 | 20484 |
| 146 | 20780 | 19817 | 19204 | 20800 | 21539 | 21816 | 21791 | 20965 | 20964 | 20630 |
| 147 | 20937 | 19965 | 19361 | 20956 | 21706 | 21990 | 21962 | 21114 | 21118 | 20776 |
| 148 | 21094 | 20112 | 19518 | 21113 | 21873 | 22165 | 22134 | 21262 | 21273 | 20923 |
| 149 | 21251 | 20260 | 19676 | 21270 | 22040 | 22340 | 22306 | 21411 | 21428 | 21070 |
| 150 | 21408 | 20409 | 19834 | 21427 | 22208 | 22516 | 22479 | 21560 | 21583 | 21218 |
| 151 | 21566 | 20557 | 19992 | 21585 | 22376 | 22692 | 22652 | 21710 | 21739 | 21366 |
| 152 | 21724 | 20706 | 20149 | 21743 | 22545 | 22869 | 22826 | 21860 | 21895 | 21514 |
| 153 | 21883 | 20855 | 20308 | 21901 | 22714 | 23046 | 23000 | 22010 | 22052 | 21662 |
| 154 | 22042 | 21004 | 20466 | 22060 | 22883 | 23224 | 23175 | 22161 | 22209 | 21810 |
| 155 | 22200 | 21154 | 20625 | 22218 | 23053 | 23402 | 23350 | 22312 | 22366 | 21958 |
| 156 | 22360 | 21304 | 20784 | 22377 | 23224 | 23581 | 23526 | 22463 | 22523 | 22106 |
| 157 | 22519 | 21454 | 20943 | 22537 | 23395 | 23760 | 23702 | 22614 | 22680 | 22254 |
| 158 | 22679 | 21604 | 21103 | 22696 | 23566 | 23940 | 23878 | 22765 | 22837 | 22402 |
| 159 | 22839 | 21755 | 21262 | 22856 | 23738 | 24120 | 24054 | 22916 | 22994 | 22550 |
| 160 | 23199 | 22386 | 21622 | 23016 | 23937 | 23766 | 23818 | 23068 | 23380 | 23318 |
| 161 | 23160 | 22367 | 22983 | 22976 | 23616 | 23728 | 23780 | 23628 | 23367 | 23276 |
| 162 | 23120 | 22308 | 22543 | 22937 | 23380 | 23669 | 23741 | 23589 | 23306 | 23235 |
| 163 | 23081 | 22270 | 22504 | 22898 | 23342 | 23651 | 23703 | 23550 | 23265 | 23194 |
| 164 | 23043 | 22232 | 22465 | 22859 | 23303 | 23613 | 23665 | 23512 | 23225 | 23153 |
| 165 | 23004 | 22194 | 22426 | 22820 | 23266 | 23575 | 23627 | 23473 | 23185 | 23112 |
| 166 | 22966 | 22156 | 22388 | 22781 | 23228 | 23537 | 23589 | 23435 | 23145 | 23072 |
| 167 | 22928 | 22118 | 22349 | 22743 | 23191 | 23500 | 23552 | 23397 | 23106 | 23032 |
| 168 | 22890 | 22081 | 22311 | 22705 | 23154 | 23462 | 23515 | 23359 | 23066 | 22992 |
| 169 | 22852 | 22044 | 22273 | 22667 | 23117 | 23425 | 23478 | 23321 | 23027 | 22952 |
| 170 | 22815 | 22007 | 22236 | 22630 | 23080 | 23388 | 23440 | 23284 | 22988 | 22912 |
| 171 | 22777 | 21971 | 22198 | 22592 | 23043 | 23351 | 23403 | 23247 | 22950 | 22872 |
| 172 | 22740 | 21934 | 22161 | 22555 | 23007 | 23314 | 23367 | 23210 | 22911 | 22833 |
| 173 | 22704 | 21896 | 22124 | 22518 | 22971 | 23276 | 23330 | 23173 | 22873 | 22794 |
| 174 | 22667 | 21862 | 22087 | 22482 | 22935 | 23241 | 23294 | 23137 | 22835 | 22755 |
| 175 | 22631 | 21826 | 22051 | 22445 | 22899 | 23205 | 23258 | 23101 | 22798 | 22716 |
| 176 | 22595 | 21791 | 22014 | 22408 | 22863 | 23169 | 23222 | 23064 | 22760 | 22678 |
| 177 | 22559 | 21756 | 21979 | 22372 | 22828 | 23134 | 23186 | 23029 | 22723 | 22640 |
| 178 | 22523 | 21720 | 21943 | 22336 | 22792 | 23098 | 23150 | 22993 | 22686 | 22602 |
| 179 | 22488 | 21685 | 21907 | 22300 | 22757 | 23063 | 23115 | 22957 | 22649 | 22564 |
| 180 | 22452 | 21651 | 21872 | 22265 | 22722 | 23028 | 23080 | 22922 | 22612 | 22526 |
| 181 | 22417 | 21616 | 21837 | 22229 | 22688 | 22993 | 23045 | 22887 | 22576 | 22489 |
| 182 | 22382 | 21582 | 21802 | 22194 | 22653 | 22958 | 23010 | 22852 | 22540 | 22452 |
| 183 | 22347 | 21548 | 21768 | 22159 | 22619 | 22923 | 22975 | 22817 | 22504 | 22415 |
| 184 | 22313 | 21514 | 21733 | 22124 | 22585 | 22888 | 22941 | 22783 | 22468 | 22379 |
| 185 | 22278 | 21480 | 21699 | 22089 | 22551 | 22853 | 22906 | 22748 | 22432 | 22342 |
| 186 | 22244 | 21446 | 21665 | 22055 | 22517 | 22819 | 22871 | 22714 | 22396 | 22306 |
| 187 | 22210 | 21412 | 21631 | 22020 | 22483 | 22784 | 22837 | 22680 | 22361 | 22270 |
| 188 | 22176 | 21379 | 21597 | 21986 | 22450 | 22750 | 22803 | 22647 | 22326 | 22235 |
| 189 | 22143 | 21345 | 21563 | 21952 | 22416 | 22716 | 22769 | 22613 | 22291 | 22199 |
| 190 | 22109 | 21312 | 21530 | 21918 | 22383 | 22683 | 22735 | 22580 | 22256 | 22164 |
| 191 | 22076 | 21279 | 21497 | 21885 | 22350 | 22649 | 22701 | 22546 | 22221 | 22129 |
| 192 | 22043 | 21247 | 21463 | 21851 | 22317 | 22616 | 22668 | 22513 | 22187 | 22094 |
| 193 | 22010 | 21214 | 21430 | 21818 | 22284 | 22582 | 22635 | 22480 | 22152 | 22059 |
| 194 | 21977 | 21182 | 21397 | 21785 | 22252 | 22549 | 22602 | 22446 | 22118 | 22024 |
| 195 | 21945 | 21149 | 21365 | 21752 | 22219 | 22516 | 22569 | 22413 | 22084 | 21990 |
| 196 | 21912 | 21117 | 21332 | 21719 | 22187 | 22483 | 22536 | 22380 | 22050 | 21955 |
| 197 | 21880 | 21085 | 21300 | 21686 | 22155 | 22451 | 22503 | 22347 | 22017 | 21921 |
| 198 | 21848 | 21054 | 21268 | 21654 | 22123 | 22418 | 22470 | 22314 | 21983 | 21887 |
| 199 | 21816 | 21022 | 21235 | 21621 | 22091 | 22385 | 22438 | 22281 | 21950 | 21854 |
| 200 | 21784 | 20991 | 21204 | 21589 | 22060 | 22353 | 22405 | 22248 | 21917 | 21820 |
| 205 | 21627 | 20835 | 21046 | 21431 | 21903 | 22193 | 22245 | 22088 | 21755 | 21655 |
| 210 | 21475 | 20684 | 20893 | 21277 | 21750 | 22037 | 22089 | 21931 | 21596 | 21494 |
| 215 | 21325 | 20538 | 20744 | 21127 | 21600 | 21883 | 21935 | 21777 | 21442 | 21337 |
| 220 | 21180 | 20394 | 20598 | 20980 | 21453 | 21732 | 21783 | 21627 | 21290 | 21185 |
| 225 | 21037 | 20253 | 20455 | 20835 | 21307 | 21584 | 21634 | 21479 | 21142 | 21035 |
| 230 | 20898 | 20114 | 20316 | 20694 | 21164 | 21439 | 21488 | 21334 | 20997 | 20888 |
| 235 | 20760 | 9979 | 20179 | 20555 | 21025 | 21295 | 21343 | 21192 | 20856 | 20744 |
| 240 | 20626 | 9848 | 20045 | 20419 | 20887 | 21154 | 21202 | 21052 | 20717 | 20604 |
| 245 | 20493 | 9719 | 9914 | 20287 | 20753 | 21016 | 21063 | 20916 | 20580 | 20468 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

| P, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 10363 | 9502 | 9785 | 10152 | 10420 | 10879 | 10926 | 10777 | 10447 | 10334 |
| 255 | 10235 | 9468 | 9660 | 10018 | 10298 | 10745 | 10792 | 10644 | 10317 | 10203 |
| 260 | 10109 | 9396 | 9537 | 9905 | 10261 | 10613 | 10660 | 10513 | 10189 | 10076 |
| 265 | 9984 | 9324 | 9415 | 9787 | 10135 | 10482 | 10531 | 10383 | 10064 | 9947 |
| 270 | 9862 | 9109 | 9295 | 9661 | 10109 | 10356 | 10402 | 10255 | 9941 | 9823 |
| 275 | 9741 | 8993 | 9179 | 9542 | 9985 | 10230 | 10275 | 10130 | 9819 | 9702 |
| 280 | 9623 | 8879 | 9064 | 9425 | 9864 | 10105 | 10150 | 10007 | 9700 | 9582 |
| 285 | 9505 | 8768 | 8953 | 9309 | 9745 | 9983 | 10027 | 9885 | 9582 | 9465 |
| 290 | 9390 | 8658 | 8842 | 9195 | 9627 | 9862 | 9905 | 9766 | 9465 | 9350 |
| 295 | 9276 | 8551 | 8733 | 9082 | 9511 | 9743 | 9786 | 9649 | 9350 | 9236 |
| 300 | 9164 | 8445 | 8626 | 8971 | 9398 | 9625 | 9667 | 9528 | 9236 | 9124 |
| 305 | 9053 | 8341 | 8521 | 8862 | 9285 | 9509 | 9551 | 9413 | 9125 | 9013 |
| 310 | 8944 | 8238 | 8417 | 8754 | 9174 | 9394 | 9436 | 9299 | 9015 | 8903 |
| 315 | 8836 | 8136 | 8315 | 8647 | 9063 | 9281 | 9322 | 9187 | 8906 | 8795 |
| 320 | 8729 | 8036 | 8214 | 8542 | 8954 | 9170 | 9210 | 9075 | 8799 | 8688 |
| 325 | 8624 | 7937 | 8114 | 8438 | 8847 | 9061 | 9099 | 8965 | 8692 | 8583 |
| 330 | 8520 | 7839 | 8016 | 8335 | 8742 | 8952 | 8989 | 8857 | 8587 | 8479 |
| 335 | 8418 | 7742 | 7919 | 8234 | 8636 | 8844 | 8881 | 8750 | 8483 | 8377 |
| 340 | 8316 | 7647 | 7823 | 8134 | 8533 | 8737 | 8775 | 8645 | 8381 | 8276 |
| 345 | 8216 | 7552 | 7729 | 8035 | 8431 | 8632 | 8669 | 8541 | 8280 | 8176 |
| 350 | 8117 | 7459 | 7635 | 7938 | 8330 | 8529 | 8564 | 8438 | 8180 | 8076 |
| 355 | 8019 | 7367 | 7542 | 7841 | 8230 | 8427 | 8461 | 8335 | 8082 | 7978 |
| 360 | 7923 | 7277 | 7450 | 7746 | 8132 | 8326 | 8359 | 8234 | 7984 | 7882 |
| 365 | 7827 | 7187 | 7359 | 7652 | 8035 | 8226 | 8258 | 8134 | 7887 | 7786 |
| 370 | 7732 | 7099 | 7270 | 7559 | 7938 | 8126 | 8158 | 8035 | 7792 | 7691 |
| 375 | 7639 | 7012 | 7181 | 7467 | 7842 | 8027 | 8060 | 7938 | 7697 | 7598 |
| 380 | 7546 | 6925 | 7093 | 7376 | 7746 | 7930 | 7963 | 7841 | 7603 | 7505 |
| 385 | 7455 | 6840 | 7007 | 7286 | 7651 | 7835 | 7865 | 7746 | 7511 | 7414 |
| 390 | 7364 | 6755 | 6921 | 7196 | 7562 | 7740 | 7769 | 7651 | 7419 | 7323 |
| 395 | 7274 | 6671 | 6836 | 7108 | 7471 | 7646 | 7674 | 7558 | 7328 | 7234 |
| 400 | 7185 | 6587 | 6752 | 7021 | 7380 | 7552 | 7580 | 7465 | 7237 | 7144 |
| 405 | 7098 | 6505 | 6668 | 6934 | 7291 | 7460 | 7487 | 7374 | 7149 | 7056 |
| 410 | 7011 | 6424 | 6585 | 6848 | 7202 | 7369 | 7395 | 7284 | 7061 | 6969 |
| 415 | 6924 | 6343 | 6503 | 6763 | 7114 | 7279 | 7304 | 7194 | 6974 | 6882 |
| 420 | 6839 | 6264 | 6422 | 6680 | 7028 | 7189 | 7214 | 7104 | 6887 | 6797 |
| 425 | 6754 | 6185 | 6342 | 6597 | 6941 | 7100 | 7125 | 7016 | 6801 | 6713 |
| 430 | 6671 | 6107 | 6263 | 6515 | 6855 | 7012 | 7037 | 6928 | 6716 | 6629 |
| 435 | 6588 | 6029 | 6184 | 6433 | 6770 | 6925 | 6949 | 6842 | 6632 | 6546 |
| 440 | 6506 | 5953 | 6106 | 6352 | 6686 | 6839 | 6862 | 6757 | 6549 | 6464 |
| 445 | 6424 | 5877 | 6029 | 6272 | 6603 | 6753 | 6776 | 6672 | 6467 | 6383 |
| 450 | 6344 | 5802 | 5952 | 6193 | 6521 | 6669 | 6690 | 6588 | 6385 | 6303 |
| 455 | 6264 | 5728 | 5876 | 6115 | 6440 | 6585 | 6605 | 6505 | 6303 | 6223 |
| 460 | 6184 | 5654 | 5801 | 6037 | 6359 | 6502 | 6522 | 6422 | 6223 | 6143 |
| 465 | 6106 | 5581 | 5726 | 5960 | 6279 | 6419 | 6438 | 6341 | 6143 | 6064 |
| 470 | 6028 | 5509 | 5652 | 5883 | 6199 | 6337 | 6356 | 6260 | 6064 | 5986 |
| 475 | 5951 | 5437 | 5578 | 5807 | 6121 | 6256 | 6274 | 6179 | 5986 | 5909 |
| 480 | 5874 | 5365 | 5506 | 5732 | 6043 | 6176 | 6193 | 6098 | 5908 | 5833 |
| 485 | 5798 | 5295 | 5434 | 5657 | 5966 | 6098 | 6112 | 6019 | 5831 | 5757 |
| 490 | 5723 | 5225 | 5363 | 5583 | 5889 | 6017 | 6032 | 5941 | 5755 | 5682 |
| 495 | 5648 | 5155 | 5292 | 5510 | 5812 | 5939 | 5953 | 5863 | 5678 | 5607 |
| 500 | 5574 | 5086 | 5222 | 5437 | 5736 | 5861 | 5874 | 5787 | 5603 | 5532 |
| 510 | 5428 | 4950 | 5082 | 5294 | 5588 | 5707 | 5719 | 5636 | 5454 | 5386 |
| 520 | 5284 | 4817 | 4945 | 5153 | 5441 | 5557 | 5566 | 5488 | 5308 | 5243 |
| 530 | 5142 | 4686 | 4810 | 5014 | 5296 | 5407 | 5416 | 5336 | 5163 | 5101 |
| 540 | 5003 | 4556 | 4677 | 4877 | 5154 | 5260 | 5269 | 5190 | 5021 | 4961 |
| 550 | 4865 | 4429 | 4546 | 4742 | 5014 | 5115 | 5123 | 5047 | 4882 | 4823 |
| 560 | 4730 | 4303 | 4417 | 4609 | 4875 | 4973 | 4980 | 4905 | 4745 | 4688 |
| 570 | 4596 | 4180 | 4290 | 4479 | 4739 | 4833 | 4838 | 4767 | 4608 | 4554 |
| 580 | 4464 | 4058 | 4165 | 4350 | 4605 | 4695 | 4699 | 4629 | 4475 | 4422 |
| 590 | 4335 | 3938 | 4041 | 4223 | 4472 | 4558 | 4562 | 4495 | 4342 | 4292 |
| 600 | 4206 | 3819 | 3919 | 4098 | 4342 | 4423 | 4427 | 4361 | 4212 | 4164 |
| 610 | 4080 | 3702 | 3799 | 3974 | 4213 | 4290 | 4294 | 4230 | 4084 | 4038 |
| 620 | 3955 | 3587 | 3680 | 3852 | 4085 | 4158 | 4162 | 4100 | 3957 | 3912 |
| 630 | 3832 | 3474 | 3563 | 3732 | 3960 | 4029 | 4034 | 3972 | 3832 | 3789 |
| 640 | 3711 | 3362 | 3447 | 3613 | 3836 | 3901 | 3906 | 3846 | 3709 | 3667 |
| 650 | 3591 | 3251 | 3333 | 3495 | 3713 | 3775 | 3778 | 3721 | 3588 | 3547 |
| 660 | 3472 | 3142 | 3221 | 3379 | 3592 | 3650 | 3653 | 3598 | 3468 | 3429 |
| 670 | 3355 | 3034 | 3110 | 3265 | 3472 | 3527 | 3529 | 3478 | 3349 | 3311 |
| 680 | 3239 | 2928 | 3000 | 3152 | 3354 | 3405 | 3407 | 3356 | 3232 | 3196 |
| 690 | 3125 | 2823 | 2892 | 3041 | 3237 | 3285 | 3287 | 3237 | 3117 | 3081 |
| 700 | 3012 | 2719 | 2785 | 2930 | 3122 | 3165 | 3168 | 3119 | 3002 | 2968 |
| 710 | 2901 | 2616 | 2680 | 2821 | 3008 | 3048 | 3050 | 3003 | 2890 | 2856 |
| 720 | 2790 | 2514 | 2576 | 2714 | 2895 | 2931 | 2934 | 2889 | 2779 | 2746 |
| 730 | 2681 | 2414 | 2473 | 2608 | 2784 | 2816 | 2819 | 2776 | 2668 | 2636 |
| 740 | 2573 | 2315 | 2371 | 2503 | 2674 | 2702 | 2706 | 2664 | 2559 | 2528 |
| 750 | 2466 | 2217 | 2271 | 2399 | 2565 | 2589 | 2593 | 2553 | 2452 | 2421 |
| 760 | 2361 | 2120 | 2172 | 2297 | 2457 | 2478 | 2482 | 2443 | 2345 | 2316 |
| 770 | 2256 | 2024 | 2074 | 2195 | 2350 | 2368 | 2372 | 2335 | 2239 | 2211 |
| 780 | 2153 | 1929 | 1978 | 2095 | 2244 | 2260 | 2264 | 2227 | 2135 | 2108 |
| 790 | 2050 | 1835 | 1882 | 1996 | 2139 | 2152 | 2156 | 2121 | 2032 | 2006 |
| 800 | 1949 | 1743 | 1787 | 1898 | 2036 | 2045 | 2050 | 2016 | 1930 | 1905 |
| 810 | 1849 | 1651 | 1694 | 1802 | 1933 | 1940 | 1944 | 1911 | 1829 | 1805 |
| 820 | 1749 | 1560 | 1602 | 1706 | 1832 | 1836 | 1840 | 1808 | 1729 | 1707 |
| 830 | 1651 | 1470 | 1511 | 1612 | 1732 | 1732 | 1738 | 1706 | 1630 | 1610 |
| 840 | 1554 | 1381 | 1420 | 1519 | 1632 | 1630 | 1635 | 1606 | 1532 | 1513 |
| 850 | 1457 | 1294 | 1331 | 1426 | 1534 | 1529 | 1534 | 1506 | 1435 | 1418 |
| 860 | 1362 | 1207 | 1242 | 1334 | 1437 | 1429 | 1434 | 1407 | 1339 | 1324 |
| 870 | 1267 | 1121 | 1154 | 1244 | 1341 | 1330 | 1335 | 1309 | 1244 | 1230 |
| 880 | 1173 | 1037 | 1068 | 1154 | 1246 | 1231 | 1236 | 1212 | 1150 | 1138 |
| 890 | 1081 | 953 | 982 | 1064 | 1152 | 1134 | 1139 | 1116 | 1056 | 1047 |
| 900 | 988 | 871 | 897 | 976 | 1059 | 1037 | 1042 | 1021 | 964 | 957 |
| 910 | 897 | 790 | 814 | 889 | 967 | 942 | 946 | 926 | 872 | 867 |
| 920 | 807 | 709 | 731 | 803 | 875 | 847 | 851 | 833 | 782 | 779 |
| 930 | 717 | 630 | 649 | 718 | 785 | 753 | 757 | 741 | 692 | 691 |
| 940 | 628 | 551 | 568 | 633 | 695 | 659 | 664 | 649 | 602 | 605 |
| 950 | 540 | 474 | 488 | 550 | 606 | 567 | 571 | 558 | 514 | 519 |
| 960 | 453 | 397 | 409 | 467 | 518 | 475 | 480 | 468 | 427 | 434 |
| 970 | 366 | 321 | 331 | 384 | 431 | 384 | 389 | 379 | 340 | 349 |
| 980 | 281 | 246 | 253 | 303 | 345 | 295 | 298 | 290 | 254 | 266 |
| 990 | 195 | 171 | 177 | 222 | 260 | 205 | 209 | 203 | 169 | 183 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.3.—*Continued*

GEOPOTENTIAL ALTITUDE IN METERS AS A FUNCTION OF PRESSURE IN MILLIBARS

| $P$, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 111 | 98 | 101 | 142 | 175 | 116 | 119 | 116 | 89 | 101 |
| 1010 | 27 | 25 | 26 | 43 | 91 | 28 | 91 | 30 | | 20 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

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Table 5.4

Sea level to 100,000 ft

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

TABLE 5.4

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

| P, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 101886 | 96194 | 98488 | 00210 | 101273 | 102201 | 103189 | 104285 | 104708 | |
| 11 | 99801 | 94288 | 96522 | 98215 | 99170 | 100066 | 101063 | 102116 | 102533 | |
| 12 | 97910 | 92559 | 94726 | 96398 | 97257 | 98110 | 99101 | 100141 | 100554 | |
| 13 | 96171 | 90985 | 93074 | 94724 | 95495 | 96342 | 97318 | 98340 | 98737 | |
| 14 | 94564 | 89485 | 91552 | 93189 | 93888 | 94682 | 95663 | 96690 | 97057 | 97817 |
| 15 | 93071 | 88110 | 90126 | 91752 | 92392 | 93166 | 94140 | 95149 | 95502 | 96296 |
| 16 | 91677 | 86816 | 88812 | 90417 | 90996 | 91752 | 92723 | 93711 | 94055 | 94829 |
| 17 | 90371 | 85594 | 87572 | 89160 | 89688 | 90417 | 91398 | 92365 | 92697 | 93451 |
| 18 | 89140 | 84475 | 86401 | 87979 | 88465 | 89177 | 90151 | 91106 | 91414 | 92162 |
| 19 | 87979 | 83359 | 85292 | 86867 | 87330 | 88002 | 88970 | 89921 | 90210 | 90938 |
| 20 | 86880 | 82375 | 84252 | 85804 | 86217 | 86890 | 87854 | 88789 | 89075 | 89780 |
| 21 | 85837 | 81401 | 83261 | 84797 | 85180 | 85840 | 86798 | 87726 | 87995 | 88678 |
| 22 | 84843 | 80472 | 82313 | 83839 | 84193 | 84839 | 85797 | 86713 | 86962 | 87635 |
| 23 | 83891 | 79587 | 81411 | 82920 | 83255 | 83885 | 84834 | 85745 | 85978 | 86637 |
| 24 | 82986 | 78740 | 80568 | 82037 | 82352 | 82976 | 83927 | 84816 | 85038 | 85682 |
| 25 | 82116 | 77923 | 79721 | 81194 | 81493 | 82106 | 83051 | 83930 | 84140 | 84767 |
| 26 | 81280 | 77139 | 78927 | 80381 | 80669 | 81270 | 82211 | 83077 | 83278 | 83891 |
| 27 | 80479 | 76386 | 78159 | 79600 | 79879 | 80466 | 81404 | 82260 | 82446 | 83051 |
| 28 | 79705 | 75663 | 77418 | 78852 | 79117 | 79698 | 80630 | 81476 | 81650 | 82241 |
| 29 | 78963 | 74969 | 76703 | 78127 | 78386 | 78957 | 79888 | 80719 | 80883 | 81460 |
| 30 | 78245 | 74285 | 76010 | 77428 | 77680 | 78245 | 79173 | 79990 | 80141 | 80705 |
| 31 | 77549 | 73632 | 75341 | 76752 | 76998 | 77556 | 78481 | 79281 | 79426 | 79977 |
| 32 | 76877 | 73002 | 74692 | 76098 | 76345 | 76890 | 77808 | 78599 | 78734 | 79275 |
| 33 | 76227 | 72388 | 74065 | 75459 | 75709 | 76243 | 77159 | 77936 | 78064 | 78593 |
| 34 | 75597 | 71791 | 73455 | 74843 | 75092 | 75620 | 76529 | 77293 | 77418 | 77930 |
| 35 | 74987 | 71214 | 72861 | 74242 | 74491 | 75013 | 75922 | 76673 | 76788 | 77290 |
| 36 | 74393 | 70650 | 72287 | 73658 | 73911 | 74429 | 75331 | 76070 | 76181 | 76667 |
| 37 | 73816 | 70102 | 71726 | 73094 | 73346 | 73858 | 74757 | 75482 | 75587 | 76060 |
| 38 | 73255 | 69573 | 71184 | 72543 | 72802 | 73304 | 74199 | 74915 | 75010 | 75472 |
| 39 | 72710 | 69055 | 70653 | 72008 | 72267 | 72766 | 73658 | 74360 | 74449 | 74898 |
| 40 | 72178 | 68550 | 70135 | 71483 | 71752 | 72241 | 73133 | 73819 | 73901 | 74337 |
| 41 | 71660 | 68058 | 69626 | 70971 | 71247 | 71732 | 72618 | 73294 | 73366 | 73793 |
| 42 | 71155 | 67579 | 69131 | 70472 | 70755 | 71237 | 72119 | 72779 | 72844 | 73258 |
| 43 | 70659 | 67110 | 68648 | 69987 | 70276 | 70751 | 71631 | 72277 | 72333 | 72736 |
| 44 | 70177 | 66650 | 68176 | 69514 | 69810 | 70282 | 71155 | 71788 | 71837 | 72228 |
| 45 | 69708 | 66201 | 67717 | 69049 | 69354 | 69826 | 70689 | 71309 | 71352 | 71732 |
| 46 | 69249 | 65764 | 67267 | 68596 | 68907 | 69377 | 70236 | 70840 | 70879 | 71247 |
| 47 | 68799 | 65335 | 66824 | 68150 | 68471 | 68940 | 69790 | 70384 | 70413 | 70771 |
| 48 | 68360 | 64915 | 66391 | 67717 | 68048 | 68517 | 69357 | 69938 | 69957 | 70305 |
| 49 | 67930 | 64501 | 65968 | 67290 | 67631 | 68100 | 68930 | 69501 | 69511 | 69852 |
| 50 | 67507 | 64101 | 65551 | 66873 | 67224 | 67694 | 68517 | 69075 | 69075 | 69403 |
| 51 | 67093 | 63704 | 65144 | 66463 | 66827 | 67293 | 68110 | 68655 | 68645 | 68967 |
| 52 | 66690 | 63317 | 64744 | 66063 | 66440 | 66903 | 67713 | 68245 | 68228 | 68537 |
| 53 | 66293 | 62936 | 64354 | 65666 | 66056 | 66522 | 67323 | 67841 | 67815 | 68117 |
| 54 | 65902 | 62562 | 63970 | 65282 | 65682 | 66152 | 66942 | 67444 | 67411 | 67703 |
| 55 | 65522 | 62198 | 63589 | 64902 | 65318 | 65784 | 66565 | 67057 | 67014 | 67297 |
| 56 | 65148 | 61837 | 63219 | 64531 | 64957 | 65427 | 66198 | 66677 | 66624 | 66900 |
| 57 | 64777 | 61486 | 62854 | 64163 | 64606 | 65075 | 65837 | 66306 | 66243 | 66506 |
| 58 | 64416 | 61138 | 62497 | 63806 | 64259 | 64731 | 65482 | 65938 | 65866 | 66122 |
| 59 | 64062 | 60797 | 62142 | 63451 | 63921 | 64393 | 65138 | 65577 | 65495 | 65745 |
| 60 | 63711 | 60459 | 61798 | 63107 | 63586 | 64058 | 64797 | 65223 | 65131 | 65374 |
| 61 | 63366 | 60131 | 61457 | 62766 | 63258 | 63734 | 64459 | 64875 | 64777 | 65007 |
| 62 | 63024 | 59806 | 61119 | 62428 | 62936 | 63415 | 64131 | 64534 | 64426 | 64649 |
| 63 | 62697 | 59485 | 60791 | 62100 | 62621 | 63100 | 63806 | 64199 | 64078 | 64295 |
| 64 | 62369 | 59170 | 60466 | 61772 | 62310 | 62792 | 63488 | 63868 | 63740 | 63950 |
| 65 | 62047 | 58862 | 60144 | 61450 | 62001 | 62487 | 63176 | 63543 | 63402 | 63606 |
| 66 | 61729 | 58553 | 59826 | 61135 | 61703 | 62188 | 62867 | 63222 | 63074 | 63268 |
| 67 | 61414 | 58251 | 59518 | 60823 | 61407 | 61896 | 62562 | 62907 | 62749 | 62936 |
| 68 | 61106 | 57956 | 59209 | 60518 | 61115 | 61611 | 62264 | 62595 | 62428 | 62608 |
| 69 | 60804 | 57664 | 58907 | 60217 | 60827 | 61325 | 61972 | 62290 | 62113 | 62283 |
| 70 | 60505 | 57375 | 58609 | 59918 | 60545 | 61047 | 61683 | 61988 | 61801 | 61965 |
| 71 | 60210 | 57090 | 58317 | 59626 | 60266 | 60771 | 61398 | 61693 | 61493 | 61654 |
| 72 | 59918 | 56808 | 58028 | 59334 | 59993 | 60502 | 61115 | 61401 | 61191 | 61342 |
| 73 | 59629 | 56532 | 57743 | 59049 | 59721 | 60236 | 60840 | 61112 | 60892 | 61037 |
| 74 | 59347 | 56260 | 57461 | 58766 | 59455 | 59977 | 60564 | 60827 | 60600 | 60738 |
| 75 | 59068 | 55991 | 57185 | 58488 | 59193 | 59718 | 60299 | 60548 | 60308 | 60440 |
| 76 | 58793 | 55725 | 56909 | 58215 | 58934 | 59462 | 60033 | 60272 | 60023 | 60148 |
| 77 | 58520 | 55463 | 56637 | 57943 | 58678 | 59213 | 59770 | 59997 | 59738 | 59859 |
| 78 | 58251 | 55203 | 56368 | 57677 | 58428 | 58963 | 59514 | 59728 | 59459 | 59577 |
| 79 | 57989 | 54948 | 56106 | 57411 | 58179 | 58724 | 59259 | 59462 | 59183 | 59295 |
| 80 | 57726 | 54695 | 55843 | 57152 | 57933 | 58484 | 59009 | 59199 | 58911 | 59016 |
| 81 | 57467 | 54446 | 55587 | 56893 | 57690 | 58248 | 58760 | 58944 | 58642 | 58740 |
| 82 | 57211 | 54196 | 55331 | 56640 | 57454 | 58012 | 58517 | 58688 | 58379 | 58471 |
| 83 | 56959 | 53953 | 55082 | 56388 | 57218 | 57782 | 58274 | 58435 | 58117 | 58202 |
| 84 | 56709 | 53711 | 54833 | 56138 | 56982 | 57556 | 58038 | 58186 | 57858 | 57936 |
| 85 | 56463 | 53474 | 54587 | 55892 | 56752 | 57329 | 57802 | 57940 | 57602 | 57677 |
| 86 | 56220 | 53238 | 54344 | 55650 | 56522 | 57110 | 57569 | 57697 | 57349 | 57418 |
| 87 | 55981 | 53005 | 54104 | 55410 | 56299 | 56893 | 57339 | 57457 | 57100 | 57162 |
| 88 | 55741 | 52772 | 53868 | 55174 | 56076 | 56677 | 57113 | 57221 | 56854 | 56909 |
| 89 | 55509 | 52546 | 53632 | 54938 | 55856 | 56463 | 56890 | 56985 | 56606 | 56660 |
| 90 | 55276 | 52320 | 53399 | 54708 | 55636 | 56253 | 56670 | 56755 | 56368 | 56411 |
| 91 | 55046 | 52096 | 53169 | 54478 | 55420 | 56047 | 56450 | 56526 | 56129 | 56168 |
| 92 | 54816 | 51877 | 52943 | 54252 | 55207 | 55840 | 56234 | 56299 | 55892 | 55925 |
| 93 | 54593 | 51657 | 52717 | 54026 | 54993 | 55636 | 56020 | 56073 | 55656 | 55686 |
| 94 | 54370 | 51440 | 52497 | 53802 | 54787 | 55430 | 55810 | 55853 | 55427 | 55449 |
| 95 | 54150 | 51227 | 52274 | 53583 | 54577 | 55240 | 55604 | 55633 | 55197 | 55217 |
| 96 | 53934 | 51017 | 52057 | 53366 | 54373 | 55046 | 55397 | 55413 | 54970 | 54984 |
| 97 | 53717 | 50807 | 51841 | 53150 | 54170 | 54852 | 55194 | 55200 | 54747 | 54757 |
| 98 | 53504 | 50600 | 51627 | 52936 | 53967 | 54659 | 54993 | 54987 | 54524 | 54531 |
| 99 | 53291 | 50397 | 51414 | 52723 | 53766 | 54472 | 54797 | 54774 | 54304 | 54304 |
| 100 | 53084 | 50196 | 51204 | 52513 | 53570 | 54281 | 54600 | 54567 | 54088 | 54085 |
| 101 | 52877 | 49993 | 50997 | 52306 | 53373 | 54098 | 54403 | 54360 | 53875 | 53865 |
| 102 | 52671 | 49797 | 50791 | 52103 | 53179 | 53911 | 54209 | 54154 | 53661 | 53648 |
| 103 | 52467 | 49600 | 50591 | 51900 | 52986 | 53727 | 54019 | 53950 | 53451 | 53435 |
| 104 | 52267 | 49408 | 50390 | 51696 | 52795 | 53547 | 53829 | 53750 | 53245 | 53222 |
| 105 | 52067 | 49213 | 50194 | 51499 | 52605 | 53366 | 53642 | 53553 | 53038 | 53012 |
| 106 | 51870 | 49019 | 49997 | 51299 | 52418 | 53189 | 53455 | 53356 | 52835 | 52802 |
| 107 | 51677 | 48829 | 49803 | 51106 | 52231 | 53012 | 53268 | 53163 | 52635 | 52595 |
| 108 | 51483 | 48638 | 49610 | 50912 | 52047 | 52834 | 53087 | 52969 | 52431 | 52388 |
| 109 | 51289 | 48451 | 49419 | 50719 | 51864 | 52664 | 52904 | 52776 | 52231 | 52185 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

| $P$, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 51094 | 48264 | 49232 | 50528 | 51683 | 52493 | 52723 | 52587 | 52081 | 51982 |
| 111 | 50912 | 48081 | 49042 | 50341 | 51503 | 52323 | 52546 | 52402 | 51834 | 51778 |
| 112 | 50725 | 47897 | 48855 | 50154 | 51325 | 52152 | 52372 | 52216 | 51637 | 51578 |
| 113 | 50541 | 47717 | 48671 | 49970 | 51148 | 51982 | 52198 | 52034 | 51444 | 51381 |
| 114 | 50358 | 47536 | 48484 | 49787 | 50974 | 51814 | 52028 | 51854 | 51253 | 51184 |
| 115 | 50174 | 47359 | 48304 | 49606 | 50801 | 51657 | 51857 | 51673 | 51060 | 50988 |
| 116 | 49993 | 47185 | 48123 | 49426 | 50630 | 51500 | 51690 | 51496 | 50873 | 50797 |
| 117 | 49816 | 47011 | 47943 | 49249 | 50459 | 51344 | 51522 | 51322 | 50686 | 50607 |
| 118 | 49639 | 46837 | 47766 | 49072 | 50292 | 51188 | 51358 | 51145 | 50505 | 50423 |
| 119 | 49465 | 46667 | 47589 | 48894 | 50125 | 51040 | 51194 | 50974 | 50322 | 50236 |
| 120 | 49288 | 46496 | 47415 | 48720 | 49957 | 50892 | 51030 | 50801 | 50141 | 50052 |
| 121 | 49117 | 46329 | 47241 | 48547 | 49793 | 50692 | 50869 | 50627 | 49964 | 49872 |
| 122 | 48947 | 46161 | 47067 | 48376 | 49629 | 50531 | 50709 | 50456 | 49787 | 49692 |
| 123 | 48776 | 45997 | 46896 | 48205 | 49469 | 50374 | 50548 | 50285 | 49610 | 49514 |
| 124 | 48609 | 45833 | 46729 | 48038 | 49308 | 50217 | 50390 | 50118 | 49436 | 49337 |
| 125 | 48442 | 45669 | 46558 | 47871 | 49147 | 50062 | 50233 | 49951 | 49265 | 49160 |
| 126 | 48274 | 45505 | 46391 | 47703 | 48990 | 49908 | 50079 | 49783 | 49091 | 48983 |
| 127 | 48110 | 45344 | 46227 | 47539 | 48829 | 49754 | 49925 | 49619 | 48921 | 48809 |
| 128 | 47946 | 45184 | 46063 | 47375 | 48671 | 49603 | 49770 | 49455 | 48753 | 48635 |
| 129 | 47785 | 45023 | 45899 | 47211 | 48514 | 49452 | 49616 | 49295 | 48586 | 48461 |
| 130 | 47625 | 44865 | 45738 | 47047 | 48360 | 49301 | 49465 | 49136 | 48419 | 48291 |
| 131 | 47464 | 44706 | 45577 | 46886 | 48205 | 49154 | 49318 | 48973 | 48251 | 48123 |
| 132 | 47306 | 44554 | 45417 | 46729 | 48054 | 49003 | 49167 | 48819 | 48087 | 47953 |
| 133 | 47149 | 44400 | 45259 | 46568 | 47900 | 48852 | 49019 | 48661 | 47927 | 47789 |
| 134 | 46995 | 44245 | 45104 | 46411 | 47753 | 48704 | 48875 | 48507 | 47766 | 47621 |
| 135 | 46841 | 44094 | 44948 | 46257 | 47602 | 48556 | 48727 | 48353 | 47605 | 47457 |
| 136 | 46686 | 43947 | 44793 | 46102 | 47454 | 48412 | 48583 | 48202 | 47444 | 47293 |
| 137 | 46532 | 43799 | 44639 | 45948 | 47303 | 48268 | 48438 | 48048 | 47283 | 47129 |
| 138 | 46381 | 43652 | 44488 | 45794 | 47156 | 48123 | 48297 | 47900 | 47126 | 46969 |
| 139 | 46230 | 43504 | 44337 | 45643 | 47011 | 47979 | 48156 | 47749 | 46969 | 46808 |
| 140 | 46083 | 43360 | 44186 | 45495 | 46867 | 47838 | 48015 | 47602 | 46814 | 46650 |
| 141 | 45935 | 43215 | 44042 | 45344 | 46722 | 47697 | 47874 | 47454 | 46660 | 46493 |
| 142 | 45787 | 43074 | 43894 | 45197 | 46578 | 47559 | 47736 | 47310 | 46506 | 46335 |
| 143 | 45640 | 42933 | 43750 | 45052 | 46437 | 47418 | 47598 | 47165 | 46352 | 46178 |
| 144 | 45495 | 42792 | 43606 | 44905 | 46296 | 47280 | 47461 | 47021 | 46201 | 46024 |
| 145 | 45351 | 42651 | 43461 | 44760 | 46155 | 47142 | 47323 | 46877 | 46050 | 45869 |
| 146 | 45210 | 42510 | 43320 | 44619 | 46014 | 47005 | 47185 | 46736 | 45902 | 45719 |
| 147 | 45069 | 42372 | 43179 | 44475 | 45876 | 46870 | 47047 | 46596 | 45755 | 45568 |
| 148 | 44928 | 42231 | 43038 | 44334 | 45738 | 46736 | 46909 | 46453 | 45607 | 45417 |
| 149 | 44787 | 42093 | 42900 | 44193 | 45600 | 46601 | 46775 | 46316 | 45463 | 45266 |
| 150 | 44646 | 41959 | 42762 | 44052 | 45466 | 46467 | 46640 | 46178 | 45318 | 45118 |
| 151 | 44508 | 41821 | 42625 | 43914 | 45328 | 46335 | 46509 | 46040 | 45174 | 44970 |
| 152 | 44370 | 41686 | 42484 | 43776 | 45197 | 46204 | 46375 | 45906 | 45033 | 44826 |
| 153 | 44236 | 41552 | 42349 | 43638 | 45062 | 46073 | 46243 | 45768 | 44892 | 44678 |
| 154 | 44101 | 41417 | 42211 | 43504 | 44928 | 45945 | 46112 | 45633 | 44751 | 44534 |
| 155 | 43963 | 41288 | 42077 | 43366 | 44797 | 45814 | 45984 | 45499 | 44610 | 44390 |
| 156 | 43832 | 41155 | 41942 | 43232 | 44665 | 45682 | 45853 | 45367 | 44472 | 44249 |
| 157 | 43698 | 41024 | 41808 | 43100 | 44537 | 45551 | 45722 | 45233 | 44334 | 44108 |
| 158 | 43566 | 40892 | 41677 | 42966 | 44406 | 45423 | 45594 | 45102 | 44196 | 43970 |
| 159 | 43435 | 40764 | 41542 | 42835 | 44278 | 45292 | 45463 | 44970 | 44056 | 43832 |
| 160 | 43304 | 40636 | 41411 | 42703 | 44150 | 45164 | 45335 | 44843 | 43924 | 43694 |
| 161 | 43176 | 40509 | 41283 | 42572 | 44022 | 45039 | 45210 | 44711 | 43789 | 43556 |
| 162 | 43045 | 40381 | 41152 | 42444 | 43894 | 44911 | 45082 | 44583 | 43655 | 43422 |
| 163 | 42917 | 40256 | 41024 | 42316 | 43773 | 44787 | 44957 | 44455 | 43520 | 43287 |
| 164 | 42792 | 40131 | 40896 | 42188 | 43645 | 44662 | 44833 | 44331 | 43389 | 43153 |
| 165 | 42664 | 40007 | 40768 | 42060 | 43524 | 44537 | 44708 | 44203 | 43258 | 43018 |
| 166 | 42539 | 39882 | 40643 | 41932 | 43399 | 44413 | 44583 | 44078 | 43127 | 42887 |
| 167 | 42415 | 39757 | 40515 | 41808 | 43278 | 44291 | 44462 | 43953 | 42999 | 42756 |
| 168 | 42290 | 39636 | 40390 | 41683 | 43156 | 44167 | 44341 | 43829 | 42867 | 42625 |
| 169 | 42165 | 39514 | 40266 | 41558 | 43035 | 44045 | 44219 | 43704 | 42740 | 42493 |
| 170 | 42044 | 39393 | 40144 | 41437 | 42913 | 43924 | 44096 | 43583 | 42612 | 42362 |
| 171 | 41919 | 39275 | 40020 | 41312 | 42792 | 43802 | 43973 | 43461 | 42487 | 42231 |
| 172 | 41798 | 39154 | 39898 | 41191 | 42674 | 43681 | 43855 | 43340 | 42359 | 42103 |
| 173 | 41680 | 39035 | 39777 | 41070 | 42556 | 43563 | 43734 | 43219 | 42234 | 41975 |
| 174 | 41558 | 38917 | 39656 | 40951 | 42438 | 43442 | 43615 | 43100 | 42110 | 41847 |
| 175 | 41440 | 38799 | 39537 | 40830 | 42320 | 43323 | 43497 | 42982 | 41988 | 41719 |
| 176 | 41322 | 38684 | 39416 | 40709 | 42201 | 43205 | 43379 | 42861 | 41864 | 41594 |
| 177 | 41204 | 38570 | 39301 | 40591 | 42087 | 43091 | 43261 | 42746 | 41742 | 41470 |
| 178 | 41086 | 38451 | 39183 | 40472 | 41969 | 42972 | 43143 | 42628 | 41621 | 41345 |
| 179 | 40971 | 38337 | 39065 | 40354 | 41854 | 42858 | 43028 | 42510 | 41499 | 41220 |
| 180 | 40853 | 38225 | 38950 | 40240 | 41739 | 42743 | 42913 | 42395 | 41378 | 41096 |
| 181 | 40738 | 38110 | 38835 | 40121 | 41627 | 42628 | 42799 | 42280 | 41260 | 40974 |
| 182 | 40623 | 37999 | 38720 | 40007 | 41512 | 42513 | 42684 | 42165 | 41142 | 40853 |
| 183 | 40509 | 37887 | 38609 | 39892 | 41401 | 42398 | 42569 | 42051 | 41024 | 40732 |
| 184 | 40397 | 37776 | 38496 | 39777 | 41289 | 42283 | 42457 | 41939 | 40906 | 40614 |
| 185 | 40282 | 37664 | 38383 | 39662 | 41178 | 42169 | 42343 | 41824 | 40787 | 40492 |
| 186 | 40171 | 37552 | 38271 | 39551 | 41066 | 42057 | 42228 | 41713 | 40669 | 40374 |
| 187 | 40059 | 37441 | 38159 | 39438 | 40955 | 41942 | 42116 | 41601 | 40554 | 40256 |
| 188 | 39948 | 37333 | 38048 | 39324 | 40846 | 41831 | 42005 | 41493 | 40440 | 40141 |
| 189 | 39839 | 37221 | 37936 | 39213 | 40735 | 41719 | 41893 | 41381 | 40325 | 40023 |
| 190 | 39728 | 37113 | 37828 | 39101 | 40627 | 41611 | 41781 | 41273 | 40210 | 39908 |
| 191 | 39619 | 37005 | 37720 | 38993 | 40518 | 41499 | 41670 | 41161 | 40095 | 39793 |
| 192 | 39511 | 36900 | 37608 | 38881 | 40410 | 41391 | 41562 | 41053 | 39984 | 39678 |
| 193 | 39403 | 36791 | 37500 | 38773 | 40302 | 41280 | 41453 | 40945 | 39869 | 39564 |
| 194 | 39295 | 36686 | 37392 | 38665 | 40197 | 41171 | 41345 | 40833 | 39757 | 39449 |
| 195 | 39190 | 36578 | 37287 | 38556 | 40089 | 41063 | 41237 | 40725 | 39646 | 39337 |
| 196 | 39081 | 36473 | 37178 | 38448 | 39984 | 40955 | 41129 | 40617 | 39534 | 39222 |
| 197 | 38976 | 36368 | 37073 | 38340 | 39879 | 40850 | 41020 | 40509 | 39426 | 39111 |
| 198 | 38871 | 36266 | 36969 | 38235 | 39774 | 40741 | 40912 | 40400 | 39314 | 38999 |
| 199 | 38766 | 36161 | 36860 | 38127 | 39669 | 40633 | 40807 | 40292 | 39206 | 38891 |
| 200 | 38661 | 36060 | 36759 | 38022 | 39567 | 40528 | 40699 | 40184 | 39098 | 38780 |
| 205 | 38146 | 35548 | 36240 | 37503 | 39052 | 40003 | 40174 | 39654 | 38566 | 38238 |
| 210 | 37644 | 35052 | 35738 | 36998 | 38550 | 39491 | 39662 | 39144 | 38045 | 37710 |
| 215 | 37156 | 34573 | 35249 | 36506 | 38058 | 38986 | 39157 | 38638 | 37539 | 37195 |
| 220 | 36680 | 34101 | 34770 | 36024 | 37575 | 38491 | 38658 | 38146 | 37041 | 36696 |
| 225 | 36211 | 33638 | 34301 | 35548 | 37096 | 38005 | 38169 | 37661 | 36555 | 36204 |
| 230 | 35755 | 33182 | 33845 | 35085 | 36627 | 37530 | 37690 | 37185 | 36079 | 35722 |
| 235 | 35302 | 32740 | 33396 | 34629 | 36171 | 37057 | 37215 | 36719 | 35617 | 35249 |
| 240 | 34862 | 32310 | 32958 | 34185 | 35719 | 36594 | 36752 | 36260 | 35161 | 34790 |
| 245 | 34426 | 31886 | 32526 | 33750 | 35279 | 36142 | 36296 | 35807 | 34711 | 34344 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

| P, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 33999 | 31470 | 32103 | 33323 | 34843 | 35692 | 35846 | 35358 | 34275 | 32906 |
| 255 | 33579 | 31063 | 31693 | 32907 | 34416 | 35253 | 35407 | 34921 | 33868 | 33476 |
| 260 | 33166 | 30663 | 31289 | 32497 | 33993 | 34820 | 34974 | 34491 | 33428 | 33051 |
| 265 | 32756 | 30269 | 30889 | 32093 | 33579 | 34396 | 34551 | 34065 | 33018 | 32635 |
| 270 | 32350 | 29883 | 30495 | 31696 | 33166 | 33976 | 34127 | 33645 | 32615 | 32228 |
| 275 | 31959 | 29505 | 30115 | 31306 | 32759 | 33563 | 33711 | 33235 | 32219 | 31831 |
| 280 | 31572 | 29131 | 29741 | 30922 | 32362 | 33153 | 33301 | 32831 | 31824 | 31437 |
| 285 | 31184 | 28766 | 29373 | 30541 | 31972 | 32753 | 32897 | 32431 | 31437 | 31093 |
| 290 | 30807 | 28406 | 29009 | 30167 | 31585 | 32356 | 32497 | 32036 | 31053 | 30676 |
| 295 | 30433 | 28059 | 28652 | 29797 | 31206 | 31965 | 32106 | 31644 | 30676 | 30302 |
| 300 | 30066 | 27707 | 28301 | 29432 | 30833 | 31578 | 31716 | 31260 | 30302 | 29934 |
| 305 | 29701 | 27365 | 27956 | 29075 | 30463 | 31198 | 31335 | 30883 | 29938 | 29570 |
| 310 | 29344 | 27028 | 27615 | 28720 | 30098 | 30820 | 30958 | 30509 | 29577 | 29209 |
| 315 | 28990 | 26693 | 27280 | 28369 | 29734 | 30449 | 30584 | 30141 | 29219 | 28855 |
| 320 | 28638 | 26365 | 26949 | 28025 | 29377 | 30085 | 30217 | 29774 | 28868 | 28504 |
| 325 | 28294 | 26040 | 26621 | 27684 | 29026 | 29728 | 29852 | 29413 | 28517 | 28159 |
| 330 | 27953 | 25719 | 26299 | 27346 | 28681 | 29370 | 29491 | 29058 | 28173 | 27818 |
| 335 | 27618 | 25400 | 25981 | 27014 | 28339 | 29016 | 29137 | 28707 | 27831 | 27484 |
| 340 | 27283 | 25089 | 25666 | 26686 | 27995 | 28665 | 28789 | 28363 | 27497 | 27152 |
| 345 | 26955 | 24777 | 25358 | 26362 | 27661 | 28320 | 28442 | 28022 | 27165 | 26824 |
| 350 | 26631 | 24472 | 25049 | 26043 | 27329 | 27982 | 28097 | 27684 | 26837 | 26498 |
| 355 | 26309 | 24170 | 24744 | 25725 | 27001 | 27648 | 27759 | 27346 | 26516 | 26175 |
| 360 | 25994 | 23875 | 24442 | 25413 | 26680 | 27316 | 27425 | 27014 | 26194 | 25860 |
| 365 | 25679 | 23579 | 24144 | 25105 | 26362 | 26988 | 27093 | 26680 | 25876 | 25545 |
| 370 | 25367 | 23291 | 23852 | 24800 | 26043 | 26660 | 26765 | 26362 | 25564 | 25233 |
| 375 | 25062 | 23005 | 23560 | 24498 | 25728 | 26335 | 26444 | 26043 | 25253 | 24928 |
| 380 | 24757 | 22720 | 23271 | 24199 | 25420 | 26017 | 26125 | 25725 | 24944 | 24623 |
| 385 | 24459 | 22441 | 22989 | 23904 | 25115 | 25705 | 25804 | 25413 | 24642 | 24324 |
| 390 | 24160 | 22162 | 22707 | 23609 | 24810 | 25394 | 25489 | 25102 | 24341 | 24026 |
| 395 | 23865 | 21886 | 22428 | 23320 | 24511 | 25085 | 25177 | 24797 | 24042 | 23734 |
| 400 | 23573 | 21611 | 22152 | 23035 | 24213 | 24777 | 24869 | 24491 | 23743 | 23436 |
| 405 | 23287 | 21342 | 21877 | 22749 | 23921 | 24475 | 24564 | 24193 | 23455 | 23150 |
| 410 | 23002 | 21076 | 21604 | 22467 | 23629 | 24177 | 24262 | 23898 | 23166 | 22864 |
| 415 | 22717 | 20810 | 21335 | 22188 | 23340 | 23881 | 23963 | 23602 | 22881 | 22579 |
| 420 | 22438 | 20551 | 21070 | 21916 | 23056 | 23586 | 23668 | 23307 | 22595 | 22300 |
| 425 | 22159 | 20292 | 20807 | 21644 | 22772 | 23294 | 23376 | 23018 | 22313 | 22024 |
| 430 | 21886 | 20036 | 20548 | 21375 | 22490 | 23005 | 23087 | 22730 | 22034 | 21749 |
| 435 | 21614 | 19780 | 20289 | 21106 | 22211 | 22720 | 22799 | 22448 | 21759 | 21476 |
| 440 | 21345 | 19531 | 20033 | 20840 | 21936 | 22438 | 22513 | 22169 | 21486 | 21207 |
| 445 | 21076 | 19281 | 19780 | 20577 | 21663 | 22156 | 22231 | 21890 | 21217 | 20942 |
| 450 | 20814 | 19035 | 19528 | 20318 | 21394 | 21880 | 21949 | 21614 | 20948 | 20679 |
| 455 | 20551 | 18793 | 19278 | 20062 | 21129 | 21604 | 21670 | 21342 | 20679 | 20417 |
| 460 | 20289 | 18550 | 19032 | 19806 | 20863 | 21332 | 21398 | 21070 | 20417 | 20154 |
| 465 | 20033 | 18310 | 18788 | 19554 | 20600 | 21060 | 21122 | 20804 | 20154 | 19895 |
| 470 | 19777 | 18074 | 18543 | 19301 | 20338 | 20791 | 20853 | 20538 | 19895 | 19639 |
| 475 | 19524 | 17838 | 18301 | 19052 | 20082 | 20525 | 20584 | 20272 | 19639 | 19386 |
| 480 | 19272 | 17602 | 18064 | 18806 | 19826 | 20262 | 20318 | 20007 | 19383 | 19137 |
| 485 | 19022 | 17372 | 17828 | 18560 | 19573 | 20000 | 20052 | 19747 | 19131 | 18888 |
| 490 | 18774 | 17142 | 17595 | 18317 | 19321 | 19741 | 19790 | 19491 | 18881 | 18642 |
| 495 | 18530 | 16913 | 17362 | 18077 | 19068 | 19485 | 19531 | 19236 | 18629 | 18396 |
| 500 | 18287 | 16686 | 17133 | 17838 | 18819 | 19229 | 19272 | 18980 | 18383 | 18150 |
| 510 | 17808 | 16240 | 16673 | 17369 | 18333 | 18724 | 18763 | 18484 | 17894 | 17671 |
| 520 | 17336 | 15804 | 16229 | 16906 | 17851 | 18232 | 18261 | 17992 | 17415 | 17201 |
| 530 | 16870 | 15374 | 15781 | 16450 | 17375 | 17740 | 17769 | 17507 | 16939 | 16736 |
| 540 | 16414 | 14948 | 15344 | 16001 | 16909 | 17257 | 17287 | 17028 | 16473 | 16276 |
| 550 | 15961 | 14531 | 14915 | 15558 | 16450 | 16781 | 16808 | 16558 | 16017 | 15823 |
| 560 | 15518 | 14117 | 14491 | 15121 | 15994 | 16316 | 16339 | 16093 | 15566 | 15381 |
| 570 | 15079 | 13714 | 14075 | 14695 | 15548 | 15856 | 15873 | 15640 | 15118 | 14941 |
| 580 | 14646 | 13314 | 13665 | 14272 | 15108 | 15404 | 15417 | 15187 | 14692 | 14508 |
| 590 | 14222 | 12920 | 13258 | 13855 | 14672 | 14954 | 14967 | 14747 | 14265 | 14081 |
| 600 | 13799 | 12530 | 12858 | 13445 | 14245 | 14511 | 14524 | 14308 | 13819 | 13661 |
| 610 | 13386 | 12146 | 12466 | 13038 | 13822 | 14075 | 14088 | 13878 | 13399 | 13248 |
| 620 | 12976 | 11768 | 12073 | 12634 | 13402 | 13642 | 13655 | 13451 | 12982 | 12835 |
| 630 | 12572 | 11398 | 11690 | 12244 | 12992 | 13219 | 13228 | 13031 | 12572 | 12431 |
| 640 | 12175 | 11030 | 11309 | 11854 | 12585 | 12799 | 12808 | 12618 | 12169 | 12051 |
| 650 | 11781 | 10666 | 10935 | 11467 | 12182 | 12385 | 12395 | 12208 | 11772 | 11637 |
| 660 | 11391 | 10308 | 10568 | 11086 | 11785 | 11975 | 11985 | 11804 | 11378 | 11250 |
| 670 | 11007 | 9954 | 10203 | 10712 | 11391 | 11572 | 11578 | 11404 | 10988 | 10863 |
| 680 | 10627 | 9606 | 9843 | 10341 | 11004 | 11171 | 11178 | 11010 | 10604 | 10486 |
| 690 | 10253 | 9262 | 9486 | 9977 | 10620 | 10778 | 10784 | 10620 | 10226 | 10108 |
| 700 | 9882 | 8921 | 9137 | 9613 | 10243 | 10384 | 10394 | 10233 | 9849 | 9738 |
| 710 | 9518 | 8583 | 8793 | 9255 | 9869 | 10000 | 10007 | 9852 | 9482 | 9370 |
| 720 | 9159 | 8248 | 8451 | 8904 | 9498 | 9616 | 9626 | 9478 | 9117 | 9009 |
| 730 | 8796 | 7920 | 8114 | 8556 | 9134 | 9239 | 9249 | 9108 | 8753 | 8648 |
| 740 | 8442 | 7595 | 7779 | 8212 | 8773 | 8865 | 8878 | 8740 | 8396 | 8294 |
| 750 | 8091 | 7274 | 7451 | 7871 | 8415 | 8494 | 8507 | 8376 | 8045 | 7943 |
| 760 | 7746 | 6955 | 7126 | 7536 | 8061 | 8130 | 8143 | 8015 | 7694 | 7598 |
| 770 | 7402 | 6640 | 6804 | 7201 | 7710 | 7769 | 7782 | 7661 | 7346 | 7254 |
| 780 | 7064 | 6329 | 6490 | 6873 | 7362 | 7415 | 7428 | 7308 | 7005 | 6916 |
| 790 | 6726 | 6020 | 6175 | 6549 | 7018 | 7060 | 7073 | 6959 | 6667 | 6581 |
| 800 | 6394 | 5719 | 5863 | 6227 | 6680 | 6709 | 6726 | 6614 | 6332 | 6250 |
| 810 | 6066 | 5417 | 5558 | 5912 | 6342 | 6365 | 6378 | 6270 | 6001 | 5922 |
| 820 | 5738 | 5116 | 5256 | 5597 | 6010 | 6024 | 6037 | 5932 | 5673 | 5600 |
| 830 | 5417 | 4823 | 4957 | 5289 | 5682 | 5682 | 5702 | 5597 | 5348 | 5282 |
| 840 | 5098 | 4531 | 4659 | 4984 | 5354 | 5348 | 5364 | 5269 | 5026 | 4964 |
| 850 | 4780 | 4245 | 4367 | 4678 | 5033 | 5016 | 5033 | 4941 | 4708 | 4652 |
| 860 | 4469 | 3960 | 4075 | 4377 | 4715 | 4688 | 4705 | 4616 | 4393 | 4344 |
| 870 | 4157 | 3676 | 3786 | 4081 | 4400 | 4364 | 4380 | 4295 | 4081 | 4035 |
| 880 | 3848 | 3402 | 3509 | 3786 | 4088 | 4039 | 4055 | 3976 | 3773 | 3734 |
| 890 | 3547 | 3127 | 3222 | 3491 | 3700 | 3720 | 3737 | 3661 | 3465 | 3435 |
| 900 | 3241 | 2858 | 2943 | 3202 | 3474 | 3402 | 3419 | 3350 | 3163 | 3140 |
| 910 | 2943 | 2592 | 2671 | 2917 | 3173 | 3091 | 3104 | 3038 | 2861 | 2846 |
| 920 | 2648 | 2326 | 2398 | 2635 | 2871 | 2779 | 2792 | 2733 | 2566 | 2556 |
| 930 | 2352 | 2067 | 2129 | 2356 | 2575 | 2470 | 2484 | 2431 | 2270 | 2267 |
| 940 | 2060 | 1808 | 1864 | 2077 | 2280 | 2162 | 2178 | 2129 | 1975 | 1985 |
| 950 | 1772 | 1555 | 1601 | 1804 | 1988 | 1860 | 1873 | 1831 | 1686 | 1703 |
| 960 | 1486 | 1302 | 1342 | 1532 | 1699 | 1558 | 1575 | 1535 | 1401 | 1424 |
| 970 | 1201 | 1053 | 1086 | 1260 | 1414 | 1260 | 1276 | 1243 | 1115 | 1145 |
| 980 | 922 | 807 | 830 | 994 | 1132 | 968 | 978 | 951 | 833 | 873 |
| 990 | 640 | 561 | 581 | 728 | 853 | 673 | 686 | 666 | 554 | 600 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

TABLE 5.4.—*Continued*

GEOPOTENTIAL ALTITUDE IN FEET AS A FUNCTION OF PRESSURE IN MILLIBARS

| $P$, mb | Pressure altitude* | 75° N. Jan | 60° N. Jan | 45° N. Jan | 30° N. Jan | 15° N. Annual | 30° N. July | 45° N. July | 60° N. July | 75° N. July |
|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 364 | 322 | 331 | 446 | 576 | 381 | 390 | 381 | 276 | 331 |
| 1010 | 89 | 82 | 85 | 207 | 299 | 92 | 102 | 98 | | 86 |

*Pressure altitude is defined as the indicated altitude of pressure altimeter when the altimeter is set at 1013.25 mb and calibrated with the Standard Atmosphere.

# PART 6

## Tables of Properties of Supplementary Atmospheres above 120 Kilometers

Part 6.1

120 km to 1000 km

Winter Models

# TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 600° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 333.5 | 17.055 | 16.984 | 17.763 | 13.567 | | 27.12 | 10.82 | 3.631 - 5 | -4.440 | 3.551 - 8 | -7.4496 |
| 125 | 361.6 | 16.793 | 16.836 | 17.529 | 13.517 | | 26.78 | 11.90 | 2.338 | -4.631 | 2.083 | -7.6813 |
| 130 | 386.8 | 16.553 | 16.701 | 17.315 | 13.473 | | 26.43 | 12.92 | 1.563 | -4.806 | 1.285 | -7.8912 |
| 135 | 408.9 | 16.331 | 16.578 | 17.118 | 13.433 | | 26.07 | 13.87 | 1.076 | -4.968 | 8.251 - 9 | -8.0835 |
| 140 | 428.9 | 16.123 | 16.464 | 16.933 | 13.397 | | 25.69 | 14.78 | 7.589 - 6 | -5.120 | 5.468 | -8.2622 |
| 145 | 446.6 | 15.926 | 16.357 | 16.759 | 13.363 | | 25.30 | 15.65 | 5.464 | -5.263 | 3.723 | -8.4291 |
| 150 | 462.8 | 15.739 | 16.255 | 16.593 | 13.332 | | 24.90 | 16.51 | 4.003 | -5.398 | 2.591 | -8.5865 |
| 155 | 477.4 | 15.559 | 16.159 | 16.434 | 13.303 | | 24.49 | 17.34 | 2.979 - 6 | -5.526 | 1.838 - 9 | -8.7356 |
| 160 | 490.7 | 15.386 | 16.066 | 16.281 | 13.276 | | 24.08 | 18.16 | 2.248 | -5.648 | 1.327 | -8.8773 |
| 165 | 502.5 | 15.219 | 15.977 | 16.133 | 13.250 | | 23.65 | 18.96 | 1.717 | -5.765 | 9.721 -10 | -9.0123 |
| 170 | 513.3 | 15.056 | 15.891 | 15.990 | 13.225 | | 23.23 | 19.75 | 1.326 | -5.877 | 7.218 | -9.1416 |
| 175 | 523.2 | 14.898 | 15.808 | 15.850 | 13.201 | | 22.81 | 20.53 | 1.035 | -5.985 | 5.425 | -9.2656 |
| 180 | 532.1 | 14.744 | 15.727 | 15.714 | 13.178 | | 22.39 | 21.30 | 8.146 - 7 | -6.089 | 4.123 | -9.3848 |
| 185 | 540.1 | 14.593 | 15.649 | 15.581 | 13.156 | | 21.98 | 22.06 | 6.468 | -6.189 | 3.166 | -9.4995 |
| 190 | 547.6 | 14.445 | 15.572 | 15.451 | 13.134 | | 21.58 | 22.82 | 5.177 | -6.286 | 2.453 | -9.6103 |
| 195 | 554.5 | 14.299 | 15.496 | 15.323 | 13.113 | | 21.18 | 23.58 | 4.173 | -6.380 | 1.917 | -9.7173 |
| 200 | 561.0 | 14.156 | 15.422 | 15.197 | 13.093 | | 20.80 | 24.32 | 3.387 | -6.470 | 1.510 | -9.8209 |
| 205 | 567.3 | 14.015 | 15.349 | 15.072 | 13.073 | | 20.44 | 25.08 | 2.766 - 7 | -6.558 | 1.199 -10 | -9.9214 |
| 210 | 573.3 | 13.875 | 15.277 | 14.950 | 13.053 | | 20.09 | 25.82 | 2.273 | -6.643 | 9.577 -11 | -10.0188 |
| 215 | 579.3 | 13.738 | 15.206 | 14.829 | 13.034 | | 19.75 | 26.58 | 1.878 | -6.726 | 7.700 | -10.1135 |
| 220 | 585.3 | 13.602 | 15.136 | 14.709 | 13.015 | | 19.43 | 27.33 | 1.560 | -6.807 | 6.231 | -10.2054 |
| 225 | 587.2 | 13.470 | 15.069 | 14.594 | 12.997 | | 19.13 | 27.89 | 1.302 | -6.885 | 5.102 | -10.2923 |
| 230 | 588.9 | 13.339 | 15.003 | 14.479 | 12.980 | | 18.85 | 28.44 | 1.090 | -6.963 | 4.196 | -10.3771 |
| 235 | 590.3 | 13.208 | 14.937 | 14.364 | 12.963 | | 18.58 | 28.97 | 9.158 - 8 | -7.038 | 3.466 | -10.4602 |
| 240 | 591.6 | 13.079 | 14.872 | 14.251 | 12.947 | | 18.32 | 29.48 | 7.718 | -7.112 | 2.875 | -10.5414 |
| 245 | 592.7 | 12.949 | 14.807 | 14.137 | 12.930 | | 18.08 | 29.98 | 6.524 | -7.186 | 2.393 | -10.6210 |
| 250 | 593.7 | 12.821 | 14.742 | 14.025 | 12.914 | | 17.85 | 30.46 | 5.529 | -7.257 | 1.999 | -10.6991 |
| 255 | 594.5 | 12.692 | 14.677 | 13.912 | 12.897 | | 17.63 | 30.92 | 4.698 - 8 | -7.328 | 1.676 -11 | -10.7758 |
| 260 | 595.2 | 12.565 | 14.613 | 13.800 | 12.881 | | 17.43 | 31.37 | 4.001 | -7.398 | 1.409 | -10.8511 |
| 265 | 595.8 | 12.437 | 14.549 | 13.689 | 12.865 | | 17.23 | 31.81 | 3.416 | -7.467 | 1.188 | -10.9251 |
| 270 | 596.4 | 12.310 | 14.486 | 13.578 | 12.849 | | 17.05 | 32.23 | 2.922 | -7.534 | 1.005 | -10.9980 |
| 275 | 596.9 | 12.184 | 14.422 | 13.467 | 12.833 | | 16.87 | 32.65 | 2.504 | -7.601 | 8.514 -12 | -11.0698 |
| 280 | 597.3 | 12.057 | 14.359 | 13.356 | 12.817 | | 16.70 | 33.05 | 2.151 | -7.667 | 7.233 | -11.1407 |
| 285 | 597.6 | 11.931 | 14.296 | 13.246 | 12.801 | | 16.54 | 33.45 | 1.851 | -7.733 | 6.158 | -11.2105 |
| 290 | 597.9 | 11.805 | 14.233 | 13.136 | 12.785 | | 16.37 | 33.85 | 1.595 | -7.797 | 5.254 | -11.2795 |
| 295 | 598.2 | 11.680 | 14.170 | 13.026 | 12.769 | | 16.22 | 34.25 | 1.377 | -7.861 | 4.490 | -11.3477 |
| 300 | 598.4 | 11.555 | 14.107 | 12.916 | 12.754 | | 16.06 | 34.65 | 1.191 | -7.924 | 3.844 | -11.4152 |
| 310 | 598.8 | 11.305 | 13.982 | 12.696 | 12.722 | | 15.74 | 35.47 | 8.955 - 9 | -8.048 | 2.831 -12 | -11.5480 |
| 320 | 599.1 | 11.057 | 13.858 | 12.480 | 12.691 | | 15.41 | 36.35 | 6.778 | -8.169 | 2.098 | -11.6783 |
| 330 | 599.3 | 10.809 | 13.734 | 12.263 | 12.660 | | 15.06 | 37.33 | 5.167 | -8.287 | 1.562 | -11.8064 |
| 340 | 599.5 | 10.562 | 13.611 | 12.047 | 12.629 | | 14.68 | 38.43 | 3.967 | -8.401 | 1.168 | -11.9324 |
| 350 | 599.6 | 10.316 | 13.487 | 11.831 | 12.598 | | 14.25 | 39.70 | 3.071 | -8.513 | 8.780 -13 | -12.0565 |
| 360 | 599.7 | 10.071 | 13.365 | 11.617 | 12.568 | | 13.78 | 41.21 | 2.398 | -8.620 | 6.625 | -12.1788 |
| 370 | 599.8 | 9.826 | 13.243 | 11.403 | 12.537 | | 13.24 | 43.00 | 1.891 | -8.723 | 5.021 | -12.2992 |
| 380 | 599.8 | 9.583 | 13.121 | 11.189 | 12.506 | | 12.65 | 45.16 | 1.507 | -8.822 | 3.821 | -12.4178 |
| 390 | 599.9 | 9.340 | 12.999 | 10.977 | 12.476 | | 12.00 | 47.75 | 1.215 | -8.916 | 2.922 | -12.5343 |
| 400 | 599.9 | 9.097 | 12.878 | 10.765 | 12.446 | | 11.30 | 50.87 | 9.914 -10 | -9.004 | 2.245 | -12.6487 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 599.9 | 8.856 | 12.757 | 10.553 | 12.416 | | 10.55 | 54.61 | 8.199 -10 | -9.086 | 1.735 -13 | -12.7607 |
| 420 | 599.9 | 8.615 | 12.637 | 10.342 | 12.385 | | 9.78 | 59.08 | 6.875 | -9.163 | 1.349 | -12.8701 |
| 430 | 600.0 | 8.375 | 12.517 | 10.132 | 12.355 | | 9.01 | 64.38 | 5.845 | -9.233 | 1.055 | -12.9766 |
| 440 | 600.0 | 8.136 | 12.397 | 9.923 | 12.325 | | 8.24 | 70.59 | 5.038 | -9.298 | 8.320 -14 | -13.0799 |
| 450 | 600.0 | 7.897 | 12.278 | 9.714 | 12.296 | | 7.50 | 77.81 | 4.402 | -9.356 | 6.615 | -13.1795 |
| 460 | 600.0 | 7.659 | 12.159 | 9.505 | 12.266 | | 6.80 | 86.06 | 3.895 | -9.409 | 5.307 | -13.2751 |
| 470 | 600.0 | 7.422 | 12.040 | 9.298 | 12.236 | | 6.15 | 95.37 | 3.488 | -9.457 | 4.301 | -13.3664 |
| 480 | 600.0 | 7.185 | 11.922 | 9.091 | 12.207 | | 5.57 | 105.69 | 3.157 | -9.501 | 3.524 | -13.4530 |
| 490 | 600.0 | 6.950 | 11.804 | 8.884 | 12.177 | | 5.05 | 116.92 | 2.886 | -9.540 | 2.920 | -13.5347 |
| 500 | 600.0 | 6.714 | 11.687 | 8.678 | 12.148 | 12.121 | 4.59 | 128.93 | 2.660 | -9.575 | 2.448 | -13.6113 |
| 510 | 600.0 | 6.480 | 11.569 | 8.473 | 12.118 | 12.113 | 4.19 | 141.53 | 2.470 -10 | -9.607 | 2.077 -14 | -13.6826 |
| 520 | 600.0 | 6.246 | 11.452 | 8.268 | 12.089 | 12.106 | 3.85 | 154.50 | 2.309 | -9.637 | 1.783 | -13.7488 |
| 530 | 600.0 | 6.013 | 11.336 | 8.064 | 12.060 | 12.098 | 3.56 | 167.62 | 2.170 | -9.664 | 1.549 | -13.8099 |
| 540 | 600.0 | 5.781 | 11.220 | 7.861 | 12.031 | 12.091 | 3.31 | 180.68 | 2.048 | -9.689 | 1.361 | -13.8662 |
| 550 | 600.0 | 5.549 | 11.104 | 7.658 | 12.002 | 12.084 | 3.10 | 193.49 | 1.942 | -9.712 | 1.208 | -13.9179 |
| 560 | 600.0 | 5.318 | 10.988 | 7.456 | 11.973 | 12.077 | 2.92 | 205.92 | 1.847 | -9.734 | 1.083 | -13.9654 |
| 570 | 600.0 | 5.087 | 10.873 | 7.254 | 11.944 | 12.069 | 2.77 | 217.86 | 1.762 | -9.754 | 9.791 -15 | -14.0092 |
| 580 | 600.0 | 4.858 | 10.758 | 7.053 | 11.915 | 12.062 | 2.64 | 229.25 | 1.685 | -9.773 | 8.923 | -14.0495 |
| 590 | 600.0 | 4.629 | 10.644 | 6.852 | 11.887 | 12.055 | 2.53 | 240.07 | 1.614 | -9.792 | 8.189 | -14.0868 |
| 600 | 600.0 | 4.400 | 10.529 | 6.652 | 11.858 | 12.048 | 2.43 | 250.33 | 1.550 | -9.810 | 7.561 | -14.1214 |
| 610 | 600.0 | 4.172 | 10.416 | 6.453 | 11.830 | 12.040 | 2.35 | 260.06 | 1.490 -10 | -9.827 | 7.019 -15 | -14.1537 |
| 620 | 600.0 | 3.945 | 10.302 | 6.254 | 11.801 | 12.033 | 2.28 | 269.31 | 1.435 | -9.843 | 6.546 | -14.1841 |
| 630 | 600.0 | 3.719 | 10.189 | 6.056 | 11.773 | 12.026 | 2.21 | 278.12 | 1.384 | -9.859 | 6.128 | -14.2127 |
| 640 | 600.0 | 3.493 | 10.076 | 5.858 | 11.745 | 12.019 | 2.15 | 286.56 | 1.335 | -9.874 | 5.757 | -14.2398 |
| 650 | 600.0 | 3.268 | 9.963 | 5.661 | 11.717 | 12.012 | 2.10 | 294.67 | 1.290 | -9.889 | 5.425 | -14.2656 |
| 660 | 600.0 | 3.043 | 9.851 | 5.465 | 11.688 | 12.005 | 2.05 | 302.52 | 1.248 | -9.904 | 5.125 | -14.2903 |
| 670 | 600.0 | 2.819 | 9.739 | 5.268 | 11.660 | 11.998 | 2.00 | 310.14 | 1.208 | -9.918 | 4.852 | -14.3141 |
| 680 | 600.0 | 2.596 | 9.627 | 5.073 | 11.633 | 11.991 | 1.96 | 317.57 | 1.170 | -9.932 | 4.603 | -14.3370 |
| 690 | 600.0 | 2.374 | 9.516 | 4.878 | 11.605 | 11.984 | 1.92 | 324.86 | 1.134 | -9.945 | 4.374 | -14.3591 |
| 700 | 600.0 | 2.152 | 9.405 | 4.684 | 11.577 | 11.977 | 1.89 | 332.04 | 1.100 | -9.959 | 4.163 | -14.3806 |
| 710 | 600.0 | 1.930 | 9.294 | 4.490 | 11.549 | 11.970 | 1.85 | 339.12 | 1.068 -10 | -9.972 | 3.968 -15 | -14.4015 |
| 720 | 600.0 | 1.709 | 9.184 | 4.297 | 11.522 | 11.963 | 1.82 | 346.14 | 1.037 | -9.984 | 3.786 | -14.4218 |
| 730 | 600.0 | 1.489 | 9.074 | 4.104 | 11.494 | 11.956 | 1.79 | 353.10 | 1.008 | -9.997 | 3.617 | -14.4416 |
| 740 | 600.0 | 1.270 | 8.964 | 3.912 | 11.467 | 11.949 | 1.76 | 360.03 | 9.799 -11 | -10.009 | 3.459 | -14.4610 |
| 750 | 600.0 | 1.051 | 8.855 | 3.720 | 11.439 | 11.942 | 1.73 | 366.92 | 9.533 | -10.021 | 3.311 | -14.4800 |
| 760 | 600.0 | 0.833 | 8.746 | 3.529 | 11.412 | 11.935 | 1.71 | 373.80 | 9.279 | -10.033 | 3.173 | -14.4986 |
| 770 | 600.0 | 0.615 | 8.637 | 3.339 | 11.385 | 11.928 | 1.68 | 380.65 | 9.036 | -10.044 | 3.043 | -14.5168 |
| 780 | 600.0 | 0.398 | 8.529 | 3.149 | 11.358 | 11.922 | 1.65 | 387.50 | 8.804 | -10.055 | 2.920 | -14.5346 |
| 790 | 600.0 | 0.182 | 8.420 | 2.959 | 11.331 | 11.915 | 1.63 | 394.33 | 8.581 | -10.066 | 2.805 | -14.5521 |
| 800 | 600.0 | -0.034 | 8.312 | 2.770 | 11.304 | 11.908 | 1.61 | 401.15 | 8.368 | -10.077 | 2.696 | -14.5692 |
| 820 | 600.0 | -0.464 | 8.097 | 2.394 | 11.250 | 11.894 | 1.56 | 414.77 | 7.968 -11 | -10.099 | 2.497 -15 | -14.6026 |
| 840 | 600.0 | -0.892 | 7.884 | 2.020 | 11.196 | 11.881 | 1.52 | 428.32 | 7.599 | -10.119 | 2.319 | -14.6347 |
| 860 | 600.0 | -1.319 | 7.672 | 1.647 | 11.143 | 11.868 | 1.48 | 441.80 | 7.249 | -10.140 | 2.158 | -14.6656 |
| 880 | 600.0 | -1.739 | 7.460 | 1.277 | 11.090 | 11.854 | 1.45 | 455.15 | 6.941 | -10.159 | 2.015 | -14.6956 |
| 900 | 600.0 | -2.160 | 7.249 | 0.909 | 11.038 | 11.841 | 1.42 | 468.37 | 6.647 | -10.177 | 1.886 | -14.7245 |
| 920 | 600.0 | -2.578 | 7.040 | 0.543 | 10.985 | 11.828 | 1.38 | 481.42 | 6.372 | -10.196 | 1.769 | -14.7523 |
| 940 | 600.0 | -2.994 | 6.832 | 0.179 | 10.933 | 11.815 | 1.36 | 494.27 | 6.116 | -10.213 | 1.663 | -14.7792 |
| 960 | 600.0 | -3.407 | 6.626 | -0.183 | 10.882 | 11.802 | 1.33 | 506.90 | 5.877 | -10.231 | 1.566 | -14.8051 |
| 980 | 600.0 | -3.818 | 6.420 | -0.543 | 10.830 | 11.789 | 1.30 | 519.27 | 5.652 | -10.248 | 1.479 | -14.8302 |
| 1000 | 600.0 | -4.228 | 6.216 | -0.901 | 10.779 | 11.776 | 1.28 | 531.38 | 5.441 | -10.264 | 1.399 | -14.8543 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 333.6 | 17.057 | 16.985 | 17.764 | 13.567 | | 27.12 | 10.83 | 3.646 - 5 | -4.438 | 3.565 - 8 | -7.4480 |
| 125 | 373.9 | 16.784 | 16.824 | 17.570 | 13.509 | | 26.79 | 12.30 | 2.365 | -4.626 | 2.039 | -7.6907 |
| 130 | 409.9 | 16.543 | 16.683 | 17.304 | 13.459 | | 26.46 | 13.68 | 1.609 | -4.793 | 1.250 | -7.9032 |
| 135 | 440.9 | 16.327 | 16.559 | 17.110 | 13.416 | | 26.13 | 14.92 | 1.135 | -4.945 | 8.086 - 9 | -8.0923 |
| 140 | 468.6 | 16.127 | 16.446 | 16.933 | 13.378 | | 25.78 | 16.10 | 8.219 - 6 | -5.085 | 5.437 | -8.2646 |
| 145 | 493.3 | 15.942 | 16.343 | 16.768 | 13.344 | | 25.44 | 17.20 | 6.087 | -5.216 | 3.775 | -8.4231 |
| 150 | 515.5 | 15.768 | 16.246 | 16.613 | 13.313 | | 25.08 | 18.25 | 4.591 | -5.338 | 2.687 | -8.5707 |
| 155 | 535.5 | 15.603 | 16.155 | 16.466 | 13.284 | | 24.73 | 19.27 | 3.517 - 6 | -5.454 | 1.953 - 9 | -8.7093 |
| 160 | 553.5 | 15.445 | 16.069 | 16.326 | 13.257 | | 24.37 | 20.24 | 2.730 | -5.564 | 1.446 | -8.8399 |
| 165 | 569.5 | 15.294 | 15.988 | 16.192 | 13.232 | | 24.01 | 21.17 | 2.145 | -5.669 | 1.087 | -8.9637 |
| 170 | 584.0 | 15.148 | 15.909 | 16.063 | 13.208 | | 23.64 | 22.08 | 1.702 | -5.769 | 8.286 -10 | -9.0816 |
| 175 | 597.2 | 15.007 | 15.834 | 15.939 | 13.186 | | 23.28 | 22.96 | 1.353 | -5.866 | 6.390 | -9.1945 |
| 180 | 609.1 | 14.870 | 15.761 | 15.817 | 13.165 | | 22.92 | 23.83 | 1.101 | -5.958 | 4.982 | -9.3026 |
| 185 | 619.7 | 14.736 | 15.690 | 15.700 | 13.144 | | 22.56 | 24.66 | 8.956 - 7 | -6.048 | 3.922 | -9.4065 |
| 190 | 629.5 | 14.606 | 15.622 | 15.584 | 13.124 | | 22.21 | 25.49 | 7.337 | -6.134 | 3.113 | -9.5068 |
| 195 | 638.4 | 14.478 | 15.555 | 15.472 | 13.105 | | 21.86 | 26.30 | 6.049 | -6.218 | 2.491 | -9.6036 |
| 200 | 646.7 | 14.352 | 15.489 | 15.361 | 13.087 | | 21.52 | 27.10 | 5.016 | -6.300 | 2.008 | -9.6973 |
| 205 | 654.6 | 14.229 | 15.425 | 15.252 | 13.069 | | 21.19 | 27.90 | 4.182 - 7 | -6.379 | 1.628 -10 | -9.7882 |
| 210 | 662.0 | 14.107 | 15.361 | 15.145 | 13.051 | | 20.87 | 28.70 | 3.505 | -6.455 | 1.329 | -9.8765 |
| 215 | 669.2 | 13.987 | 15.299 | 15.039 | 13.034 | | 20.56 | 29.49 | 2.951 | -6.530 | 1.091 | -9.9624 |
| 220 | 676.2 | 13.869 | 15.238 | 14.935 | 13.017 | | 20.26 | 30.29 | 2.497 | -6.603 | 8.998 -11 | -10.0458 |
| 225 | 683.3 | 13.752 | 15.177 | 14.832 | 13.000 | | 19.97 | 31.09 | 2.122 | -6.673 | 7.459 | -10.1273 |
| 230 | 685.5 | 13.639 | 15.120 | 14.733 | 12.985 | | 19.70 | 31.68 | 1.809 | -6.743 | 6.252 | -10.2039 |
| 235 | 687.5 | 13.526 | 15.063 | 14.635 | 12.971 | | 19.43 | 32.25 | 1.547 | -6.810 | 5.260 | -10.2790 |
| 240 | 689.2 | 13.415 | 15.006 | 14.537 | 12.956 | | 19.18 | 32.81 | 1.327 | -6.877 | 4.441 | -10.3525 |
| 245 | 690.6 | 13.304 | 14.950 | 14.439 | 12.942 | | 18.94 | 33.35 | 1.141 | -6.943 | 3.762 | -10.4246 |
| 250 | 691.9 | 13.193 | 14.895 | 14.342 | 12.927 | | 18.70 | 33.88 | 9.831 - 8 | -7.007 | 3.196 | -10.4954 |
| 255 | 693.0 | 13.083 | 14.839 | 14.246 | 12.913 | | 18.48 | 34.39 | 8.491 - 8 | -7.071 | 2.724 -11 | -10.5648 |
| 260 | 693.9 | 12.973 | 14.784 | 14.150 | 12.899 | | 18.27 | 34.89 | 7.350 | -7.134 | 2.328 | -10.6331 |
| 265 | 694.7 | 12.864 | 14.729 | 14.054 | 12.885 | | 18.07 | 35.37 | 6.375 | -7.196 | 1.994 | -10.7002 |
| 270 | 695.4 | 12.755 | 14.674 | 13.958 | 12.871 | | 17.88 | 35.83 | 5.540 | -7.257 | 1.713 | -10.7662 |
| 275 | 696.1 | 12.646 | 14.620 | 13.863 | 12.858 | | 17.70 | 36.29 | 4.822 | -7.317 | 1.475 | -10.8312 |
| 280 | 696.6 | 12.538 | 14.566 | 13.768 | 12.844 | | 17.53 | 36.73 | 4.205 | -7.376 | 1.273 | -10.8953 |
| 285 | 697.0 | 12.429 | 14.511 | 13.674 | 12.830 | | 17.36 | 37.15 | 3.673 | -7.435 | 1.100 | -10.9584 |
| 290 | 697.4 | 12.322 | 14.457 | 13.579 | 12.817 | | 17.21 | 37.57 | 3.213 | -7.493 | 9.534 -12 | -11.0207 |
| 295 | 697.8 | 12.214 | 14.403 | 13.485 | 12.803 | | 17.06 | 37.97 | 2.814 | -7.551 | 8.276 | -11.0822 |
| 300 | 698.1 | 12.107 | 14.350 | 13.391 | 12.790 | | 16.92 | 38.37 | 2.469 | -7.607 | 7.196 | -11.1429 |
| 310 | 698.6 | 11.893 | 14.242 | 13.204 | 12.763 | | 16.65 | 39.13 | 1.907 - 8 | -7.720 | 5.467 -12 | -11.2623 |
| 320 | 698.9 | 11.679 | 14.136 | 13.017 | 12.736 | | 16.39 | 39.88 | 1.481 | -7.829 | 4.177 | -11.3791 |
| 330 | 699.2 | 11.467 | 14.029 | 12.831 | 12.709 | | 16.15 | 40.62 | 1.155 | -7.937 | 3.209 | -11.4937 |
| 340 | 699.4 | 11.255 | 13.924 | 12.646 | 12.683 | | 15.91 | 41.37 | 9.051 - 9 | -8.043 | 2.476 | -11.6063 |
| 350 | 699.5 | 11.045 | 13.818 | 12.461 | 12.656 | | 15.67 | 42.14 | 7.123 | -8.147 | 1.919 | -11.7170 |
| 360 | 699.7 | 10.834 | 13.713 | 12.277 | 12.630 | | 15.42 | 42.96 | 5.631 | -8.249 | 1.492 | -11.8261 |
| 370 | 699.7 | 10.625 | 13.608 | 12.093 | 12.604 | | 15.15 | 43.84 | 4.472 | -8.350 | 1.165 | -11.9337 |
| 380 | 699.8 | 10.416 | 13.504 | 11.911 | 12.578 | | 14.87 | 44.80 | 3.568 | -8.448 | 9.122 -13 | -12.0399 |
| 390 | 699.9 | 10.208 | 13.400 | 11.728 | 12.552 | | 14.57 | 45.88 | 2.862 | -8.543 | 7.166 | -12.1447 |
| 400 | 699.9 | 10.000 | 13.296 | 11.546 | 12.526 | | 14.24 | 47.09 | 2.308 | -8.637 | 5.647 | -12.2482 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 699.9 | 9.793 | 13.192 | 11.365 | 12.500 | | 13.88 | 48.46 | 1.872 - 9 | -8.728 | 4.463 -13 | -12.3504 |
| 420 | 699.9 | 9.587 | 13.089 | 11.185 | 12.474 | | 13.48 | 50.04 | 1.528 | -8.816 | 3.538 | -12.4512 |
| 430 | 700.0 | 9.381 | 12.986 | 11.004 | 12.448 | | 13.05 | 51.85 | 1.255 | -8.901 | 2.814 | -12.5506 |
| 440 | 700.0 | 9.176 | 12.884 | 10.825 | 12.422 | | 12.58 | 53.93 | 1.039 | -8.983 | 2.246 | -12.6486 |
| 450 | 700.0 | 8.971 | 12.781 | 10.646 | 12.397 | | 12.08 | 56.33 | 8.665 -10 | -9.062 | 1.799 | -12.7451 |
| 460 | 700.0 | 8.767 | 12.679 | 10.467 | 12.371 | | 11.55 | 59.08 | 7.285 | -9.138 | 1.446 | -12.8398 |
| 470 | 700.0 | 8.564 | 12.578 | 10.289 | 12.346 | | 11.00 | 62.23 | 6.177 | -9.209 | 1.167 | -12.9328 |
| 480 | 700.0 | 8.361 | 12.476 | 10.112 | 12.321 | | 10.43 | 65.83 | 5.283 | -9.277 | 9.467 -14 | -13.0238 |
| 490 | 700.0 | 8.159 | 12.375 | 9.935 | 12.295 | | 9.85 | 69.90 | 4.559 | -9.341 | 7.715 | -13.1126 |
| 500 | 700.0 | 7.957 | 12.274 | 9.758 | 12.270 | 11.553 | 9.27 | 74.48 | 3.968 | -9.401 | 6.322 | -13.1992 |
| 510 | 700.0 | 7.756 | 12.174 | 9.582 | 12.245 | 11.547 | 8.70 | 79.59 | 3.485 -10 | -9.458 | 5.210 -14 | -13.2832 |
| 520 | 700.0 | 7.556 | 12.074 | 9.407 | 12.220 | 11.541 | 8.15 | 85.26 | 3.086 | -9.511 | 4.321 | -13.3644 |
| 530 | 700.0 | 7.356 | 11.974 | 9.232 | 12.195 | 11.534 | 7.62 | 91.43 | 2.756 | -9.560 | 3.607 | -13.4428 |
| 540 | 700.0 | 7.157 | 11.874 | 9.058 | 12.170 | 11.528 | 7.12 | 98.12 | 2.480 | -9.606 | 3.033 | -13.5181 |
| 550 | 700.0 | 6.958 | 11.775 | 8.884 | 12.145 | 11.522 | 6.65 | 105.28 | 2.247 | -9.648 | 2.569 | -13.5902 |
| 560 | 700.0 | 6.760 | 11.676 | 8.710 | 12.120 | 11.516 | 6.23 | 112.85 | 2.050 | -9.688 | 2.193 | -13.6589 |
| 570 | 700.0 | 6.563 | 11.577 | 8.538 | 12.096 | 11.509 | 5.84 | 120.73 | 1.882 | -9.725 | 1.887 | -13.7242 |
| 580 | 700.0 | 6.366 | 11.479 | 8.365 | 12.071 | 11.503 | 5.48 | 128.86 | 1.737 | -9.760 | 1.637 | -13.7860 |
| 590 | 700.0 | 6.170 | 11.380 | 8.193 | 12.046 | 11.497 | 5.17 | 137.12 | 1.611 | -9.793 | 1.431 | -13.8444 |
| 600 | 700.0 | 5.974 | 11.283 | 8.022 | 12.022 | 11.491 | 4.89 | 145.42 | 1.501 | -9.824 | 1.260 | -13.8995 |
| 610 | 700.0 | 5.779 | 11.185 | 7.851 | 11.997 | 11.485 | 4.64 | 153.67 | 1.404 -10 | -9.853 | 1.119 -14 | -13.9512 |
| 620 | 700.0 | 5.584 | 11.088 | 7.680 | 11.973 | 11.479 | 4.42 | 161.78 | 1.318 | -9.880 | 1.000 | -13.9998 |
| 630 | 700.0 | 5.390 | 10.991 | 7.511 | 11.949 | 11.472 | 4.23 | 169.68 | 1.240 | -9.906 | 9.005 -15 | -14.0455 |
| 640 | 700.0 | 5.196 | 10.894 | 7.341 | 11.925 | 11.466 | 4.06 | 177.31 | 1.171 | -9.931 | 8.158 | -14.0884 |
| 650 | 700.0 | 5.003 | 10.797 | 7.172 | 11.900 | 11.460 | 3.91 | 184.64 | 1.108 | -9.955 | 7.434 | -14.1288 |
| 660 | 700.0 | 4.811 | 10.701 | 7.004 | 11.876 | 11.454 | 3.77 | 191.64 | 1.051 | -9.979 | 6.811 | -14.1668 |
| 670 | 700.0 | 4.619 | 10.605 | 6.836 | 11.852 | 11.448 | 3.66 | 198.30 | 9.981 -11 | -10.001 | 6.271 | -14.2026 |
| 680 | 700.0 | 4.428 | 10.509 | 6.668 | 11.828 | 11.442 | 3.55 | 204.63 | 9.497 | -10.022 | 5.799 | -14.2366 |
| 690 | 700.0 | 4.237 | 10.414 | 6.501 | 11.805 | 11.436 | 3.46 | 210.65 | 9.051 | -10.043 | 5.384 | -14.2689 |
| 700 | 700.0 | 4.046 | 10.319 | 6.334 | 11.781 | 11.430 | 3.38 | 216.37 | 8.637 | -10.064 | 5.016 | -14.2996 |
| 710 | 700.0 | 3.857 | 10.224 | 6.168 | 11.757 | 11.424 | 3.31 | 221.81 | 8.251 -11 | -10.083 | 4.688 -15 | -14.3290 |
| 720 | 700.0 | 3.667 | 10.129 | 6.003 | 11.733 | 11.418 | 3.24 | 227.01 | 7.892 | -10.103 | 4.393 | -14.3572 |
| 730 | 700.0 | 3.479 | 10.035 | 5.838 | 11.710 | 11.412 | 3.18 | 232.00 | 7.555 | -10.122 | 4.127 | -14.3843 |
| 740 | 700.0 | 3.291 | 9.941 | 5.673 | 11.686 | 11.406 | 3.12 | 236.80 | 7.240 | -10.140 | 3.886 | -14.4105 |
| 750 | 700.0 | 3.103 | 9.847 | 5.509 | 11.663 | 11.400 | 3.07 | 241.45 | 6.943 | -10.158 | 3.665 | -14.4359 |
| 760 | 700.0 | 2.916 | 9.754 | 5.345 | 11.639 | 11.395 | 3.02 | 245.97 | 6.664 | -10.176 | 3.463 | -14.4606 |
| 770 | 700.0 | 2.729 | 9.660 | 5.181 | 11.616 | 11.389 | 2.98 | 250.39 | 6.401 | -10.194 | 3.277 | -14.4846 |
| 780 | 700.0 | 2.543 | 9.567 | 5.019 | 11.593 | 11.383 | 2.94 | 254.73 | 6.153 | -10.211 | 3.104 | -14.5080 |
| 790 | 700.0 | 2.358 | 9.475 | 4.856 | 11.570 | 11.377 | 2.90 | 259.01 | 5.918 | -10.228 | 2.945 | -14.5309 |
| 800 | 700.0 | 2.173 | 9.382 | 4.694 | 11.546 | 11.371 | 2.86 | 263.25 | 5.695 | -10.244 | 2.796 | -14.5534 |
| 820 | 700.0 | 1.804 | 9.198 | 4.372 | 11.500 | 11.360 | 2.78 | 271.69 | 5.285 -11 | -10.277 | 2.528 -15 | -14.5972 |
| 840 | 700.0 | 1.438 | 9.015 | 4.051 | 11.455 | 11.348 | 2.72 | 280.16 | 4.915 | -10.308 | 2.293 | -14.6398 |
| 860 | 700.0 | 0.711 | 8.651 | 3.415 | 11.364 | 11.325 | 2.59 | 297.51 | 4.279 | -10.369 | 1.901 | -14.7213 |
| 900 | 700.0 | 0.351 | 8.471 | 3.099 | 11.319 | 11.314 | 2.52 | 306.51 | 4.005 | -10.397 | 1.736 | -14.7603 |
| 920 | 700.0 | -0.007 | 8.292 | 2.786 | 11.274 | 11.302 | 2.46 | 315.78 | 3.756 | -10.425 | 1.589 | -14.7988 |
| 940 | 700.0 | -0.364 | 8.114 | 2.474 | 11.229 | 11.291 | 2.40 | 325.36 | 3.529 | -10.452 | 1.457 | -14.8365 |
| 960 | 700.0 | -0.718 | 7.937 | 2.163 | 11.185 | 11.280 | 2.35 | 335.25 | 3.321 | -10.479 | 1.338 | -14.8734 |
| 980 | 700.0 | -1.071 | 7.760 | 1.855 | 11.141 | 11.269 | 2.29 | 345.47 | 3.132 | -10.504 | 1.231 | -14.9096 |
| 1000 | 700.0 | -1.421 | 7.585 | 1.548 | 11.097 | 11.258 | 2.23 | 356.03 | 2.958 | -10.529 | 1.135 | -14.9451 |

## WINTER MODEL ATMOSPHERIC TEMPERATURE = 300° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 333.7 | 17.056 | 16.985 | 17.764 | 13.567 | | 27.12 | 10.83 | 3.645 - 5 | -4.438 | 3.563 - 8 | -7.4482 |
| 125 | 386.0 | 16.774 | 16.812 | 17.509 | 13.501 | | 26.80 | 12.70 | 2.382 | -4.623 | 1.989 | -7.7014 |
| 130 | 432.4 | 16.532 | 16.666 | 17.291 | 13.446 | | 26.48 | 14.42 | 1.647 | -4.783 | 1.213 | -7.9161 |
| 135 | 472.2 | 16.320 | 16.541 | 17.101 | 13.401 | | 26.17 | 15.95 | 1.185 | -4.926 | 7.898 - 9 | -8.1025 |
| 140 | 507.9 | 16.128 | 16.430 | 16.929 | 13.361 | | 25.86 | 17.40 | 8.779 - 6 | -5.057 | 5.375 | -8.2696 |
| 145 | 539.2 | 15.952 | 16.329 | 16.772 | 13.326 | | 25.54 | 18.77 | 6.656 | -5.177 | 3.792 | -8.4211 |
| 150 | 567.5 | 15.789 | 16.236 | 16.626 | 13.295 | | 25.23 | 19.98 | 5.141 | -5.289 | 2.749 | -8.5609 |
| 155 | 592.5 | 15.635 | 16.150 | 16.489 | 13.266 | | 24.91 | 21.16 | 4.031 - 6 | -5.395 | 2.039 - 9 | -8.6906 |
| 160 | 615.2 | 15.490 | 16.069 | 16.360 | 13.240 | | 24.60 | 22.29 | 3.203 | -5.495 | 1.540 | -8.8125 |
| 165 | 635.4 | 15.351 | 15.992 | 16.236 | 13.216 | | 24.28 | 23.36 | 2.572 | -5.590 | 1.182 | -8.9273 |
| 170 | 653.6 | 15.218 | 15.920 | 16.118 | 13.193 | | 23.96 | 24.39 | 2.086 | -5.681 | 9.197 -10 | -9.0364 |
| 175 | 670.3 | 15.090 | 15.850 | 16.005 | 13.172 | | 23.64 | 25.38 | 1.707 | -5.768 | 7.240 | -9.1402 |
| 180 | 685.2 | 14.966 | 15.784 | 15.895 | 13.151 | | 23.33 | 26.33 | 1.406 | -5.852 | 5.760 | -9.2396 |
| 185 | 698.5 | 14.846 | 15.719 | 15.789 | 13.132 | | 23.02 | 27.25 | 1.167 | -5.933 | 4.625 | -9.3349 |
| 190 | 710.6 | 14.728 | 15.657 | 15.685 | 13.114 | | 22.71 | 28.14 | 9.745 - 7 | -6.011 | 3.744 | -9.4266 |
| 195 | 721.5 | 14.614 | 15.596 | 15.584 | 13.096 | | 22.40 | 29.01 | 8.179 | -6.087 | 3.054 | -9.5151 |
| 200 | 731.7 | 14.502 | 15.537 | 15.485 | 13.079 | | 22.10 | 29.87 | 6.901 | -6.161 | 2.507 | -9.6009 |
| 205 | 741.2 | 14.392 | 15.479 | 15.388 | 13.063 | | 21.80 | 30.71 | 5.851 - 7 | -6.233 | 2.070 -10 | -9.6840 |
| 210 | 749.9 | 14.284 | 15.423 | 15.293 | 13.047 | | 21.51 | 31.54 | 4.983 | -6.303 | 1.719 | -9.7647 |
| 215 | 758.2 | 14.177 | 15.367 | 15.199 | 13.031 | | 21.22 | 32.37 | 4.261 | -6.370 | 1.435 | -9.8432 |
| 220 | 766.0 | 14.072 | 15.312 | 15.107 | 13.016 | | 20.95 | 33.19 | 3.658 | -6.437 | 1.203 | -9.9197 |
| 225 | 774.0 | 13.968 | 15.258 | 15.015 | 13.000 | | 20.68 | 34.02 | 3.153 | -6.501 | 1.013 | -9.9944 |
| 230 | 781.9 | 13.866 | 15.205 | 14.925 | 12.985 | | 20.42 | 34.86 | 2.727 | -6.564 | 8.564 -11 | -10.0673 |
| 235 | 789.3 | 13.767 | 15.155 | 14.838 | 12.972 | | 20.16 | 35.46 | 2.366 | -6.626 | 7.314 | -10.1359 |
| 240 | 796.5 | 13.669 | 15.105 | 14.752 | 12.959 | | 19.92 | 36.05 | 2.057 | -6.687 | 6.265 | -10.2031 |
| 245 | 798.3 | 13.571 | 15.056 | 14.667 | 12.947 | | 19.68 | 36.63 | 1.792 | -6.747 | 5.382 | -10.2690 |
| 250 | 789.9 | 13.474 | 15.007 | 14.581 | 12.934 | | 19.45 | 37.19 | 1.565 | -6.805 | 4.636 | -10.3338 |
| 255 | 791.2 | 13.377 | 14.958 | 14.497 | 12.922 | | 19.23 | 37.74 | 1.370 - 7 | -6.863 | 4.004 -11 | -10.3975 |
| 260 | 792.4 | 13.281 | 14.910 | 14.412 | 12.909 | | 19.02 | 38.28 | 1.201 | -6.920 | 3.466 | -10.4601 |
| 265 | 793.5 | 13.185 | 14.861 | 14.328 | 12.897 | | 18.81 | 38.81 | 1.055 | -6.977 | 3.008 | -10.5217 |
| 270 | 794.3 | 13.090 | 14.813 | 14.245 | 12.885 | | 18.61 | 39.32 | 9.282 - 8 | -7.032 | 2.616 | -10.5824 |
| 275 | 795.1 | 12.995 | 14.766 | 14.161 | 12.873 | | 18.42 | 39.82 | 8.180 | -7.087 | 2.280 | -10.6421 |
| 280 | 795.8 | 12.900 | 14.718 | 14.078 | 12.861 | | 18.24 | 40.31 | 7.220 | -7.141 | 1.991 | -10.7009 |
| 285 | 796.3 | 12.805 | 14.670 | 13.995 | 12.849 | | 18.07 | 40.79 | 6.383 | -7.195 | 1.742 | -10.7589 |
| 290 | 796.8 | 12.710 | 14.623 | 13.912 | 12.837 | | 17.91 | 41.25 | 5.650 | -7.248 | 1.527 | -10.8161 |
| 295 | 797.3 | 12.616 | 14.576 | 13.830 | 12.825 | | 17.75 | 41.70 | 5.009 | -7.300 | 1.341 | -10.8726 |
| 300 | 797.6 | 12.522 | 14.529 | 13.748 | 12.813 | | 17.60 | 42.15 | 4.446 | -7.352 | 1.180 | -10.9283 |
| 310 | 798.2 | 12.335 | 14.435 | 13.584 | 12.789 | | 17.31 | 43.00 | 3.515 - 8 | -7.454 | 9.169 -12 | -11.0377 |
| 320 | 798.7 | 12.148 | 14.341 | 13.420 | 12.766 | | 17.05 | 43.81 | 2.792 | -7.554 | 7.168 | -11.1446 |
| 330 | 799.0 | 11.962 | 14.248 | 13.257 | 12.743 | | 16.81 | 44.60 | 2.226 | -7.652 | 5.633 | -11.2492 |
| 340 | 799.3 | 11.777 | 14.156 | 13.095 | 12.719 | | 16.58 | 45.36 | 1.783 | -7.749 | 4.448 | -11.3518 |
| 350 | 799.4 | 11.593 | 14.063 | 12.934 | 12.696 | | 16.37 | 46.10 | 1.432 | -7.844 | 3.527 | -11.4526 |
| 360 | 799.6 | 11.409 | 13.971 | 12.773 | 12.673 | | 16.16 | 46.85 | 1.155 | -7.937 | 2.807 | -11.5517 |
| 370 | 799.7 | 11.225 | 13.880 | 12.612 | 12.650 | | 15.95 | 47.59 | 9.347 - 9 | -8.029 | 2.243 | -11.6493 |
| 380 | 799.8 | 11.042 | 13.788 | 12.452 | 12.627 | | 15.75 | 48.36 | 7.588 | -8.120 | 1.797 | -11.7454 |
| 390 | 799.8 | 10.860 | 13.697 | 12.292 | 12.604 | | 15.54 | 49.16 | 6.181 | -8.209 | 1.444 | -11.8403 |
| 400 | 799.9 | 10.679 | 13.606 | 12.133 | 12.582 | | 15.32 | 50.00 | 5.052 | -8.297 | 1.164 | -11.9343 |

| Altitude Z, km | Temp. T, °K | Number density $m^{-3}$ | | | | | Molecular weight M | Scale height $H_p$, km | Pressure P, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 799.9 | 10.497 | 13.516 | 11.375 | 12.559 | | 15.10 | 50.89 | 4.143 - 9 | -8.383 | 9.407 -13 | -12.0265 |
| 420 | 799.9 | 10.317 | 13.425 | 11.817 | 12.536 | | 14.86 | 51.87 | 3.410 | -8.467 | 7.620 | -12.1180 |
| 430 | 799.9 | 10.137 | 13.335 | 11.659 | 12.514 | | 14.61 | 52.93 | 2.818 | -8.550 | 6.188 | -12.2084 |
| 440 | 800.0 | 9.957 | 13.246 | 11.502 | 12.491 | | 14.33 | 54.10 | 2.337 | -8.631 | 5.037 | -12.2979 |
| 450 | 800.0 | 9.778 | 13.156 | 11.345 | 12.469 | | 14.04 | 55.40 | 1.947 | -8.711 | 4.109 | -12.3862 |
| 460 | 800.0 | 9.600 | 13.067 | 11.189 | 12.447 | | 13.72 | 56.85 | 1.629 | -8.788 | 3.361 | -12.4736 |
| 470 | 800.0 | 9.422 | 12.979 | 11.033 | 12.425 | | 13.38 | 58.47 | 1.370 | -8.863 | 2.755 | -12.5599 |
| 480 | 800.0 | 9.245 | 12.889 | 10.878 | 12.402 | | 13.01 | 60.29 | 1.157 | -8.937 | 2.264 | -12.6451 |
| 490 | 800.0 | 9.068 | 12.801 | 10.723 | 12.380 | | 12.62 | 62.33 | 9.832 -10 | -9.007 | 1.866 | -12.7291 |
| 500 | 800.0 | 8.891 | 12.713 | 10.569 | 12.358 | 11.102 | 12.21 | 64.62 | 8.398 | -9.076 | 1.542 | -12.8120 |
| 510 | 800.0 | 8.715 | 12.625 | 10.415 | 12.336 | 11.096 | 11.78 | 67.19 | 7.215 -10 | -9.142 | 1.278 -13 | -12.8935 |
| 520 | 800.0 | 8.540 | 12.537 | 10.261 | 12.314 | 11.091 | 11.33 | 70.05 | 6.236 | -9.205 | 1.062 | -12.9737 |
| 530 | 800.0 | 8.365 | 12.450 | 10.108 | 12.292 | 11.085 | 10.87 | 73.23 | 5.423 | -9.266 | 8.864 -14 | -13.0524 |
| 540 | 800.0 | 8.191 | 12.362 | 9.956 | 12.271 | 11.080 | 10.40 | 76.76 | 4.746 | -9.324 | 7.421 | -13.1295 |
| 550 | 800.0 | 8.017 | 12.276 | 9.803 | 12.249 | 11.074 | 9.93 | 80.65 | 4.179 | -9.379 | 6.238 | -13.2049 |
| 560 | 800.0 | 7.844 | 12.189 | 9.652 | 12.227 | 11.069 | 9.46 | 84.92 | 3.704 | -9.431 | 5.266 | -13.2786 |
| 570 | 800.0 | 7.671 | 12.102 | 9.500 | 12.206 | 11.063 | 8.99 | 89.56 | 3.302 | -9.481 | 4.464 | -13.3503 |
| 580 | 800.0 | 7.499 | 12.016 | 9.350 | 12.184 | 11.058 | 8.54 | 94.59 | 2.962 | -9.528 | 3.803 | -13.4199 |
| 590 | 800.0 | 7.327 | 11.930 | 9.199 | 12.162 | 11.053 | 8.10 | 99.98 | 2.673 | -9.573 | 3.255 | -13.4874 |
| 600 | 800.0 | 7.156 | 11.845 | 9.049 | 12.141 | 11.047 | 7.68 | 105.71 | 2.425 | -9.615 | 2.801 | -13.5526 |
| 610 | 800.0 | 6.985 | 11.759 | 8.900 | 12.120 | 11.042 | 7.29 | 111.76 | 2.212 -10 | -9.655 | 2.424 -14 | -13.6155 |
| 620 | 800.0 | 6.814 | 11.674 | 8.751 | 12.099 | 11.036 | 6.92 | 118.09 | 2.027 | -9.693 | 2.109 | -13.6760 |
| 630 | 800.0 | 6.645 | 11.589 | 8.602 | 12.077 | 11.031 | 6.57 | 124.64 | 1.867 | -9.729 | 1.845 | -13.7340 |
| 640 | 800.0 | 6.475 | 11.505 | 8.454 | 12.056 | 11.026 | 6.26 | 131.35 | 1.727 | -9.763 | 1.624 | -13.7894 |
| 650 | 800.0 | 6.306 | 11.420 | 8.306 | 12.035 | 11.020 | 5.96 | 138.17 | 1.603 | -9.795 | 1.437 | -13.8424 |
| 660 | 800.0 | 6.138 | 11.336 | 8.158 | 12.014 | 11.015 | 5.70 | 145.03 | 1.494 | -9.826 | 1.280 | -13.8929 |
| 670 | 800.0 | 5.970 | 11.252 | 8.011 | 11.993 | 11.010 | 5.46 | 151.87 | 1.396 | -9.855 | 1.146 | -13.9409 |
| 680 | 800.0 | 5.803 | 11.168 | 7.865 | 11.972 | 11.005 | 5.24 | 158.63 | 1.309 | -9.883 | 1.031 | -13.9866 |
| 690 | 800.0 | 5.636 | 11.085 | 7.719 | 11.951 | 10.999 | 5.04 | 165.25 | 1.231 | -9.910 | 9.334 -15 | -14.0299 |
| 700 | 800.0 | 5.469 | 11.001 | 7.573 | 11.930 | 10.994 | 4.87 | 171.69 | 1.160 | -9.936 | 8.490 | -14.0711 |
| 710 | 800.0 | 5.303 | 10.918 | 7.427 | 11.909 | 10.989 | 4.71 | 177.91 | 1.095 -10 | -9.960 | 7.760 -15 | -14.1102 |
| 720 | 800.0 | 5.138 | 10.836 | 7.283 | 11.889 | 10.984 | 4.57 | 183.88 | 1.037 | -9.984 | 7.124 | -14.1473 |
| 730 | 800.0 | 4.973 | 10.753 | 7.138 | 11.868 | 10.978 | 4.45 | 189.58 | 9.825 -11 | -10.008 | 6.568 | -14.1826 |
| 740 | 800.0 | 4.808 | 10.671 | 6.994 | 11.847 | 10.973 | 4.34 | 195.00 | 9.327 | -10.030 | 6.079 | -14.2162 |
| 750 | 800.0 | 4.644 | 10.589 | 6.850 | 11.827 | 10.968 | 4.24 | 200.13 | 8.867 | -10.052 | 5.647 | -14.2482 |
| 760 | 800.0 | 4.480 | 10.507 | 6.707 | 11.806 | 10.963 | 4.15 | 204.98 | 8.440 | -10.074 | 5.262 | -14.2788 |
| 770 | 800.0 | 4.317 | 10.425 | 6.564 | 11.786 | 10.958 | 4.07 | 209.56 | 8.042 | -10.095 | 4.919 | -14.3081 |
| 780 | 800.0 | 4.154 | 10.344 | 6.421 | 11.766 | 10.953 | 4.00 | 213.87 | 7.671 | -10.115 | 4.610 | -14.3363 |
| 790 | 800.0 | 3.992 | 10.263 | 6.279 | 11.745 | 10.948 | 3.93 | 217.94 | 7.324 | -10.135 | 4.332 | -14.3633 |
| 800 | 800.0 | 3.830 | 10.182 | 6.138 | 11.725 | 10.942 | 3.88 | 221.78 | 6.998 | -10.155 | 4.079 | -14.3895 |
| 820 | 800.0 | 3.507 | 10.021 | 5.855 | 11.685 | 10.932 | 3.78 | 228.85 | 6.404 -11 | -10.194 | 3.637 -15 | -14.4392 |
| 840 | 800.0 | 3.187 | 9.860 | 5.575 | 11.645 | 10.922 | 3.70 | 235.24 | 5.875 | -10.231 | 3.264 | -14.4862 |
| 860 | 800.0 | 2.551 | 9.542 | 5.018 | 11.565 | 10.902 | 3.56 | 246.58 | 4.977 | -10.303 | 2.667 | -14.5739 |
| 900 | 800.0 | 2.236 | 9.385 | 4.742 | 11.526 | 10.892 | 3.51 | 251.77 | 4.593 | -10.338 | 2.424 | -14.6154 |
| 920 | 800.0 | 1.922 | 9.229 | 4.468 | 11.486 | 10.882 | 3.46 | 256.78 | 4.246 | -10.372 | 2.209 | -14.6557 |
| 940 | 800.0 | 1.610 | 9.072 | 4.195 | 11.447 | 10.873 | 3.42 | 261.69 | 3.930 | -10.406 | 2.018 | -14.6951 |
| 960 | 800.0 | 1.300 | 8.917 | 3.923 | 11.409 | 10.863 | 3.37 | 266.57 | 3.644 | -10.438 | 1.847 | -14.7336 |
| 980 | 800.0 | 0.992 | 8.763 | 3.653 | 11.370 | 10.853 | 3.33 | 271.46 | 3.383 | -10.471 | 1.693 | -14.7714 |
| 1000 | 800.0 | 0.685 | 8.609 | 3.384 | 11.332 | 10.843 | 3.29 | 276.42 | 3.144 | -10.502 | 1.554 | -14.8086 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 333.9 | 17.055 | 16.984 | 17.763 | 13.567 | | 27.12 | 10.84 | 3.640 - 5 | -4.439 | 3.555 - 8 | -7.4491 |
| 125 | 397.3 | 16.764 | 16.801 | 17.499 | 13.493 | | 26.80 | 13.07 | 2.394 | -4.621 | 1.942 | -7.7117 |
| 130 | 453.5 | 16.521 | 16.651 | 17.279 | 13.434 | | 26.50 | 15.11 | 1.678 | -4.775 | 1.179 | -7.9283 |
| 135 | 501.8 | 16.313 | 16.524 | 17.091 | 13.387 | | 26.21 | 16.93 | 1.228 | -4.911 | 7.715 - 9 | -8.1127 |
| 140 | 545.0 | 16.127 | 16.413 | 16.924 | 13.346 | | 25.92 | 18.62 | 9.271 - 6 | -5.033 | 5.302 | -8.2755 |
| 145 | 582.6 | 15.959 | 16.315 | 16.773 | 13.310 | | 25.63 | 20.16 | 7.164 | -5.145 | 3.790 | -8.4213 |
| 150 | 616.6 | 15.804 | 16.225 | 16.634 | 13.279 | | 25.34 | 21.61 | 5.639 | -5.249 | 2.788 | -8.5548 |
| 155 | 646.6 | 15.659 | 16.143 | 16.505 | 13.250 | | 25.06 | 22.96 | 4.506 - 6 | -5.346 | 2.100 - 9 | -8.6777 |
| 160 | 673.9 | 15.523 | 16.066 | 16.384 | 13.224 | | 24.78 | 24.24 | 3.645 | -5.438 | 1.612 | -8.7927 |
| 165 | 698.3 | 15.394 | 15.993 | 16.269 | 13.201 | | 24.49 | 25.44 | 2.981 | -5.526 | 1.257 | -8.9005 |
| 170 | 720.5 | 15.271 | 15.925 | 16.159 | 13.179 | | 24.21 | 26.60 | 2.459 | -5.609 | 9.941 -10 | -9.0026 |
| 175 | 740.3 | 15.153 | 15.860 | 16.055 | 13.158 | | 23.93 | 27.69 | 2.046 | -5.689 | 7.954 | -9.0994 |
| 180 | 758.3 | 15.039 | 15.798 | 15.954 | 13.139 | | 23.65 | 28.74 | 1. 14 | -5.766 | 6.428 | -9.1919 |
| 185 | 774.5 | 14.929 | 15.738 | 15.856 | 13.120 | | 23.37 | 29.75 | 1.444 | -5.840 | 5.243 | -9.2804 |
| 190 | 789.2 | 14.822 | 15.680 | 15.761 | 13.103 | | 23.10 | 30.72 | 1.224 | -5.912 | 4.309 | -9.3656 |
| 195 | 802.4 | 14.717 | 15.625 | 15.669 | 13.086 | | 22.83 | 31.66 | 1.043 | -5.982 | 3.568 | -9.4476 |
| 200 | 814.5 | 14.616 | 15.571 | 15.579 | 13.070 | | 22.55 | 32.57 | 8.925 - 7 | -6.049 | 2.973 | -9.5269 |
| 205 | 825.8 | 14.516 | 15.518 | 15.491 | 13.055 | | 22.29 | 33.47 | 7.671 - 7 | -6.115 | 2.490 -10 | -9.6038 |
| 210 | 836.1 | 14.418 | 15.466 | 15.405 | 13.040 | | 22.02 | 34.35 | 6.620 | -6.179 | 2.097 | -9.6784 |
| 215 | 845.8 | 14.322 | 15.415 | 15.320 | 13.025 | | 21.76 | 35.22 | 5.733 | -6.242 | 1.774 | -9.7510 |
| 220 | 854.8 | 14.227 | 15.366 | 15.236 | 13.011 | | 21.51 | 36.07 | 4.983 | -6.303 | 1.508 | -9.8216 |
| 225 | 863.6 | 14.133 | 15.317 | 15.154 | 12.997 | | 21.26 | 36.92 | 4.345 | -6.362 | 1.286 | -9.8906 |
| 230 | 872.1 | 14.041 | 15.269 | 15.072 | 12.984 | | 21.02 | 37.77 | 3.801 | -6.420 | 1.102 | -9.9580 |
| 235 | 880.2 | 13.950 | 15.221 | 14.992 | 12.970 | | 20.78 | 38.62 | 3.335 | -6.477 | 9.467 -11 | -10.0238 |
| 240 | 882.9 | 13.862 | 15.176 | 14.915 | 12.959 | | 20.55 | 39.23 | 2.933 | -6.533 | 8.209 | -10.0857 |
| 245 | 885.2 | 13.775 | 15.132 | 14.839 | 12.947 | | 20.32 | 39.84 | 2.584 | -6.588 | 7.135 | -10.1466 |
| 250 | 887.2 | 13.689 | 15.089 | 14.763 | 12.936 | | 20.10 | 40.43 | 2.282 | -6.642 | 6.217 | -10.2064 |
| 255 | 888.9 | 13.602 | 15.045 | 14.687 | 12.925 | | 19.88 | 41.00 | 2.018 - 7 | -6.695 | 5.429 -11 | -10.2653 |
| 260 | 890.4 | 13.517 | 15.002 | 14.612 | 12.914 | | 19.67 | 41.57 | 1.788 | -6.748 | 4.751 | -10.3232 |
| 265 | 891.7 | 13.431 | 14.959 | 14.537 | 12.903 | | 19.47 | 42.13 | 1.586 | -6.800 | 4.167 | -10.3802 |
| 270 | 892.8 | 13.346 | 14.916 | 14.463 | 12.892 | | 19.27 | 42.68 | 1.410 | -6.851 | 3.661 | -10.4364 |
| 275 | 893.8 | 13.261 | 14.873 | 14.388 | 12.881 | | 19.08 | 43.22 | 1.255 | -6.901 | 3.223 | -10.4917 |
| 280 | 894.6 | 13.177 | 14.831 | 14.314 | 12.870 | | 18.90 | 43.74 | 1.119 | -6.951 | 2.843 | -10.5463 |
| 285 | 895.3 | 13.092 | 14.788 | 14.240 | 12.859 | | 18.72 | 44.26 | 9.986 - 8 | -7.001 | 2.511 | -10.6001 |
| 290 | 896.0 | 13.008 | 14.746 | 14.167 | 12.849 | | 18.55 | 44.77 | 8.925 | -7.049 | 2.223 | -10.6531 |
| 295 | 896.5 | 12.924 | 14.704 | 14.093 | 12.838 | | 18.39 | 45.27 | 7.987 | -7.098 | 1.970 | -10.7055 |
| 300 | 897.0 | 12.841 | 14.662 | 14.020 | 12.828 | | 18.23 | 45.75 | 7.156 | -7.145 | 1.749 | -10.7572 |
| 310 | 897.7 | 12.674 | 14.579 | 13.874 | 12.806 | | 17.93 | 46.70 | 5.764 - 8 | -7.239 | 1.384 -11 | -10.8587 |
| 320 | 898.3 | 12.508 | 14.496 | 13.729 | 12.786 | | 17.65 | 47.60 | 4.662 | -7.331 | 1.102 | -10.9579 |
| 330 | 898.7 | 12.343 | 14.413 | 13.584 | 12.765 | | 17.39 | 48.47 | 3.786 | -7.422 | 8.813 -12 | -11.0549 |
| 340 | 899.0 | 12.178 | 14.330 | 13.440 | 12.744 | | 17.16 | 49.31 | 3.086 | -7.511 | 7.082 | -11.1498 |
| 350 | 899.3 | 12.014 | 14.248 | 13.296 | 12.724 | | 16.93 | 50.12 | 2.524 | -7.598 | 5.715 | -11.2430 |
| 360 | 899.5 | 11.850 | 14.166 | 13.153 | 12.703 | | 16.72 | 50.91 | 2.070 | -7.684 | 4.630 | -11.3344 |
| 370 | 899.6 | 11.687 | 14.085 | 13.010 | 12.683 | | 16.52 | 51.68 | 1.704 | -7.769 | 3.764 | -11.4243 |
| 380 | 899.7 | 11.525 | 14.004 | 12.868 | 12.662 | | 16.33 | 52.45 | 1.406 | -7.852 | 3.070 | -11.5128 |
| 390 | 899.8 | 11.363 | 13.923 | 12.726 | 12.642 | | 16.15 | 53.21 | 1.164 | -7.934 | 2.512 | -11.6000 |
| 400 | 899.8 | 11.201 | 13.842 | 12.585 | 12.622 | | 15.97 | 53.98 | 9.655 - 9 | -8.015 | 2.061 | -11.6860 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 899.9 | 11.040 | 13.761 | 12.444 | 12.602 | | 15.79 | 54.76 | 8.033 - 9 | -8.095 | 1.695 -12 | -11.7708 |
| 420 | 899.9 | 10.880 | 13.681 | 12.303 | 12.582 | | 15.60 | 55.57 | 6.701 | -8.174 | 1.398 | -11.8546 |
| 430 | 899.9 | 10.720 | 13.601 | 12.163 | 12.561 | | 15.42 | 56.41 | 5.605 | -8.251 | 1.155 | -11.9375 |
| 440 | 899.9 | 10.560 | 13.521 | 12.023 | 12.542 | | 15.22 | 57.30 | 4.701 | -8.328 | 9.564 -13 | -12.0194 |
| 450 | 900.0 | 10.401 | 13.442 | 11.884 | 12.522 | | 15.02 | 58.24 | 3.953 | -8.403 | 7.936 | -12.1004 |
| 460 | 900.0 | 10.243 | 13.362 | 11.745 | 12.502 | | 14.81 | 59.26 | 3.335 | -8.477 | 6.599 | -12.1805 |
| 470 | 900.0 | 10.084 | 13.283 | 11.607 | 12.482 | | 14.58 | 60.35 | 2.821 | -8.550 | 5.498 | -12.2598 |
| 480 | 900.0 | 9.927 | 13.204 | 11.469 | 12.462 | | 14.34 | 61.54 | 2.394 | -8.621 | 4.589 | -12.3383 |
| 490 | 900.0 | 9.769 | 13.126 | 11.331 | 12.443 | | 14.09 | 62.84 | 2.038 | -8.691 | 3.837 | -12.4160 |
| 500 | 900.0 | 9.613 | 13.047 | 11.194 | 12.423 | 10.734 | 13.81 | 64.27 | 1.742 | -8.759 | 3.215 | -12.4928 |
| 510 | 900.0 | 9.456 | 12.969 | 11.057 | 12.403 | 10.729 | 13.52 | 65.84 | 1.493 - 9 | -8.826 | 2.699 -13 | -12.5688 |
| 520 | 900.0 | 9.301 | 12.891 | 10.921 | 12.384 | 10.725 | 13.22 | 67.57 | 1.285 | -8.891 | 2.270 | -12.6439 |
| 530 | 900.0 | 9.145 | 12.814 | 10.785 | 12.365 | 10.720 | 12.89 | 69.48 | 1.111 | -8.954 | 1.914 | -12.7182 |
| 540 | 900.0 | 8.990 | 12.736 | 10.649 | 12.345 | 10.715 | 12.55 | 71.58 | 9.640 -10 | -9.016 | 1.616 | -12.7915 |
| 550 | 900.0 | 8.836 | 12.659 | 10.514 | 12.326 | 10.710 | 12.19 | 73.90 | 8.401 | -9.076 | 1.368 | -12.8638 |
| 560 | 900.0 | 8.682 | 12.582 | 10.379 | 12.307 | 10.705 | 11.82 | 76.46 | 7.354 | -9.133 | 1.161 | -12.9351 |
| 570 | 900.0 | 8.528 | 12.505 | 10.244 | 12.287 | 10.700 | 11.43 | 79.26 | 6.468 | -9.189 | 9.880 -14 | -13.0052 |
| 580 | 900.0 | 8.375 | 12.429 | 10.110 | 12.268 | 10.695 | 11.04 | 82.33 | 5.715 | -9.243 | 8.428 | -13.0743 |
| 590 | 900.0 | 8.222 | 12.352 | 9.977 | 12.249 | 10.691 | 10.63 | 85.69 | 5.073 | -9.295 | 7.210 | -13.1421 |
| 600 | 900.0 | 8.070 | 12.276 | 9.843 | 12.230 | 10.686 | 10.23 | 89.34 | 4.525 | -9.344 | 6.186 | -13.2086 |
| 610 | 900.0 | 7.918 | 12.200 | 9.710 | 12.211 | 10.681 | 9.82 | 93.30 | 4.055 -10 | -9.392 | 5.324 -14 | -13.2738 |
| 620 | 900.0 | 7.767 | 12.124 | 9.578 | 12.192 | 10.676 | 9.42 | 97.56 | 3.652 | -9.437 | 4.598 | -13.3374 |
| 630 | 900.0 | 7.616 | 12.049 | 9.446 | 12.173 | 10.671 | 9.03 | 102.13 | 3.304 | -9.481 | 3.985 | -13.3996 |
| 640 | 900.0 | 7.465 | 11.974 | 9.314 | 12.154 | 10.667 | 8.64 | 107.01 | 3.002 | -9.523 | 3.466 | -13.4602 |
| 650 | 900.0 | 7.315 | 11.899 | 9.182 | 12.136 | 10.662 | 8.26 | 112.19 | 2.740 | -9.562 | 3.026 | -13.5191 |
| 660 | 900.0 | 7.165 | 11.824 | 9.051 | 12.117 | 10.657 | 7.90 | 117.63 | 2.512 | -9.600 | 2.653 | -13.5763 |
| 670 | 900.0 | 7.016 | 11.749 | 8.921 | 12.098 | 10.653 | 7.56 | 123.33 | 2.312 | -9.636 | 2.335 | -13.6316 |
| 680 | 900.0 | 6.867 | 11.675 | 8.790 | 12.080 | 10.648 | 7.23 | 129.26 | 2.136 | -9.670 | 2.065 | -13.6852 |
| 690 | 900.0 | 6.719 | 11.601 | 8.660 | 12.061 | 10.643 | 6.93 | 135.37 | 1.980 | -9.703 | 1.833 | -13.7368 |
| 700 | 900.0 | 6.571 | 11.527 | 8.531 | 12.042 | 10.639 | 6.64 | 141.62 | 1.842 | -9.735 | 1.635 | -13.7866 |
| 710 | 900.0 | 6.423 | 11.453 | 8.402 | 12.024 | 10.634 | 6.37 | 147.98 | 1.719 -10 | -9.765 | 1.464 -14 | -13.8344 |
| 720 | 900.0 | 6.276 | 11.379 | 8.273 | 12.006 | 10.629 | 6.13 | 154.39 | 1.609 | -9.793 | 1.317 | -13.8803 |
| 730 | 900.0 | 6.129 | 11.306 | 8.144 | 11.987 | 10.625 | 5.90 | 160.82 | 1.510 | -9.821 | 1.190 | -13.9244 |
| 740 | 900.0 | 5.983 | 11.233 | 8.016 | 11.969 | 10.620 | 5.69 | 167.21 | 1.421 | -9.847 | 1.080 | -13.9666 |
| 750 | 900.0 | 5.837 | 11.160 | 7.889 | 11.951 | 10.615 | 5.50 | 173.52 | 1.340 | -9.873 | 9.842 -15 | -14.0069 |
| 760 | 900.0 | 5.692 | 11.087 | 7.761 | 11.933 | 10.611 | 5.32 | 179.71 | 1.266 | -9.898 | 9.005 | -14.0455 |
| 770 | 900.0 | 5.546 | 11.014 | 7.634 | 11.914 | 10.606 | 5.16 | 185.75 | 1.199 | -9.921 | 8.272 | -14.0824 |
| 780 | 900.0 | 5.402 | 10.942 | 7.507 | 11.896 | 10.602 | 5.02 | 191.60 | 1.137 | -9.944 | 7.626 | -14.1177 |
| 790 | 900.0 | 5.257 | 10.870 | 7.381 | 11.878 | 10.597 | 4.89 | 197.24 | 1.080 | -9.967 | 7.057 | -14.1514 |
| 800 | 900.0 | 5.114 | 10.798 | 7.255 | 11.860 | 10.593 | 4.77 | 202.66 | 1.027 | -9.988 | 6.551 | -14.1837 |
| 820 | 900.0 | 4.827 | 10.655 | 7.004 | 11.824 | 10.584 | 4.57 | 212.76 | 9.329 -11 | -10.030 | 5.699 -15 | -14.2442 |
| 840 | 900.0 | 4.542 | 10.512 | 6.755 | 11.789 | 10.575 | 4.41 | 221.86 | 8.509 | -10.070 | 5.013 | -14.2999 |
| 860 | 900.0 | 3.977 | 10.230 | 6.260 | 11.718 | 10.557 | 4.17 | 237.22 | 7.149 | -10.146 | 3.983 | -14.3998 |
| 900 | 900.0 | 3.697 | 10.089 | 6.015 | 11.683 | 10.548 | 4.08 | 243.65 | 6.579 | -10.182 | 3.588 | -14.4451 |
| 920 | 900.0 | 3.418 | 9.950 | 5.771 | 11.648 | 10.539 | 4.01 | 249.39 | 6.066 | -10.217 | 3.250 | -14.4881 |
| 940 | 900.0 | 3.141 | 9.811 | 5.528 | 11.613 | 10.530 | 3.95 | 254.55 | 5.603 | -10.252 | 2.958 | -14.5291 |
| 960 | 900.0 | 2.865 | 9.674 | 5.287 | 11.579 | 10.522 | 3.90 | 259.24 | 5.184 | -10.285 | 2.701 | -14.5684 |
| 980 | 900.0 | 2.591 | 9.536 | 5.047 | 11.545 | 10.513 | 3.86 | 263.55 | 4.802 | -10.319 | 2.475 | -14.6064 |
| 1000 | 900.0 | 2.318 | 9.400 | 4.808 | 11.511 | 10.505 | 3.82 | 267.56 | 4.454 | -10.351 | 2.273 | -14.6433 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1000° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 334.1 | 17.056 | 16.984 | 17.763 | 13.567 | | 27.12 | 10.84 | 3.645 - 5 | -4.438 | 3.558 - 8 | -7.4488 |
| 125 | 407.2 | 16.757 | 16.792 | 17.491 | 13.487 | | 26.81 | 13.39 | 2.410 | -4.618 | 1.908 | -7.7193 |
| 130 | 472.0 | 16.513 | 16.638 | 17.270 | 13.425 | | 26.52 | 15.72 | 1.709 | -4.767 | 1.155 | -7.9375 |
| 135 | 527.8 | 16.307 | 16.511 | 17.084 | 13.375 | | 26.24 | 17.79 | 1.268 | -4.897 | 7.580 - 9 | -8.1203 |
| 140 | 577.9 | 16.126 | 16.401 | 16.920 | 13.333 | | 25.96 | 19.71 | 9.711 - 6 | -5.013 | 5.248 | -9.2800 |
| 145 | 621.6 | 15.964 | 16.304 | 16.774 | 13.297 | | 25.70 | 21.45 | 7.617 | -5.118 | 3.787 | -8.4217 |
| 150 | 661.2 | 15.815 | 16.216 | 16.640 | 13.265 | | 25.44 | 23.09 | 6.085 | -5.216 | 2.815 | -8.5505 |
| 155 | 696.2 | 15.677 | 16.136 | 16.517 | 13.237 | | 25.18 | 24.60 | 4.934 - 6 | -5.307 | 2.146 - 9 | -8.6684 |
| 160 | 728.1 | 15.548 | 16.062 | 16.402 | 13.211 | | 24.92 | 26.04 | 4.050 | -5.393 | 1.667 | -8.7780 |
| 165 | 756.5 | 15.427 | 15.993 | 16.293 | 13.188 | | 24.66 | 27.38 | 3.359 | -5.474 | 1.317 | -8.8805 |
| 170 | 782.3 | 15.311 | 15.927 | 16.190 | 13.166 | | 24.41 | 28.65 | 2.810 | -5.551 | 1.054 | -8.9770 |
| 175 | 805.6 | 15.200 | 15.866 | 16.092 | 13.146 | | 24.15 | 29.86 | 2.368 | -5.626 | 8.540 -10 | -9.0685 |
| 180 | 826.7 | 15.094 | 15.807 | 15.997 | 13.127 | | 23.90 | 31.01 | 2.009 | -5.697 | 6.988 | -9.1557 |
| 185 | 845.7 | 14.992 | 15.751 | 15.906 | 13.109 | | 23.65 | 32.11 | 1.715 | -5.766 | 5.769 | -9.2389 |
| 190 | 863.1 | 14.892 | 15.697 | 15.818 | 13.092 | | 23.40 | 33.17 | 1.471 | -5.832 | 4.799 | -9.3189 |
| 195 | 878.8 | 14.796 | 15.645 | 15.733 | 13.076 | | 23.16 | 34.18 | 1.268 | -5.897 | 4.020 | -9.3958 |
| 200 | 893.2 | 14.702 | 15.594 | 15.650 | 13.061 | | 22.91 | 35.17 | 1.098 | -5.959 | 3.388 | -9.4701 |
| 205 | 906.4 | 14.610 | 15.545 | 15.568 | 13.047 | | 22.67 | 36.13 | 9.544 - 7 | -6.020 | 2.871 -10 | -9.5420 |
| 210 | 918.5 | 14.520 | 15.497 | 15.489 | 13.032 | | 22.43 | 37.05 | 8.325 | -6.080 | 2.445 | -9.6117 |
| 215 | 929.6 | 14.432 | 15.450 | 15.411 | 13.019 | | 22.19 | 37.96 | 7.288 | -6.138 | 2.092 | -9.6795 |
| 220 | 939.8 | 14.345 | 15.405 | 15.335 | 13.006 | | 21.96 | 38.84 | 6.396 | -6.194 | 1.797 | -9.7453 |
| 225 | 949.7 | 14.259 | 15.359 | 15.259 | 12.993 | | 21.73 | 39.73 | 5.632 | -6.249 | 1.550 | -9.8098 |
| 230 | 959.2 | 14.175 | 15.315 | 15.185 | 12.980 | | 21.50 | 40.61 | 4.973 | -6.303 | 1.341 | -9.8727 |
| 235 | 968.6 | 14.092 | 15.271 | 15.111 | 12.967 | | 21.28 | 41.50 | 4.403 | -6.356 | 1.163 | -9.9343 |
| 240 | 977.9 | 14.009 | 15.228 | 15.039 | 12.955 | | 21.06 | 42.39 | 3.908 | -6.408 | 1.013 | -9.9946 |
| 245 | 980.9 | 13.931 | 15.188 | 14.969 | 12.945 | | 20.85 | 43.02 | 3.477 | -6.459 | 8.889 -11 | -10.0512 |
| 250 | 983.3 | 13.852 | 15.148 | 14.901 | 12.934 | | 20.64 | 43.63 | 3.098 | -6.509 | 7.820 | -10.1068 |
| 255 | 985.5 | 13.774 | 15.109 | 14.832 | 12.924 | | 20.43 | 44.23 | 2.764 - 7 | -6.558 | 6.895 -11 | -10.1615 |
| 260 | 987.4 | 13.697 | 15.070 | 14.764 | 12.914 | | 20.23 | 44.83 | 2.471 | -6.607 | 6.090 | -10.2154 |
| 265 | 989.0 | 13.619 | 15.031 | 14.696 | 12.904 | | 20.04 | 45.41 | 2.212 | -6.655 | 5.389 | -10.2685 |
| 270 | 990.5 | 13.542 | 14.992 | 14.629 | 12.894 | | 19.85 | 45.98 | 1.982 | -6.703 | 4.778 | -10.3208 |
| 275 | 991.7 | 13.466 | 14.953 | 14.562 | 12.884 | | 19.66 | 46.55 | 1.779 | -6.750 | 4.242 | -10.3724 |
| 280 | 992.8 | 13.390 | 14.915 | 14.495 | 12.874 | | 19.48 | 47.11 | 1.599 | -6.796 | 3.773 | -10.4233 |
| 285 | 993.8 | 13.313 | 14.877 | 14.428 | 12.865 | | 19.30 | 47.65 | 1.439 | -6.842 | 3.362 | -10.4735 |
| 290 | 994.6 | 13.238 | 14.839 | 14.362 | 12.855 | | 19.13 | 48.19 | 1.298 | -6.887 | 2.999 | -10.5230 |
| 295 | 995.3 | 13.162 | 14.801 | 14.296 | 12.845 | | 18.96 | 48.72 | 1.169 | -6.932 | 2.680 | -10.5719 |
| 300 | 995.9 | 13.087 | 14.763 | 14.230 | 12.836 | | 18.80 | 49.25 | 1.056 | -6.976 | 2.398 | -10.6202 |
| 310 | 996.9 | 12.936 | 14.687 | 14.098 | 12.817 | | 18.49 | 50.27 | 8.636 - 8 | -7.064 | 1.927 -11 | -10.7151 |
| 320 | 997.7 | 12.787 | 14.613 | 13.967 | 12.798 | | 18.21 | 51.25 | 7.092 | -7.149 | 1.557 | -10.8078 |
| 330 | 998.2 | 12.638 | 14.538 | 13.837 | 12.779 | | 17.94 | 52.21 | 5.846 | -7.233 | 1.263 | -10.8985 |
| 340 | 998.7 | 12.490 | 14.464 | 13.707 | 12.761 | | 17.69 | 53.13 | 4.835 | -7.316 | 1.030 | -10.9872 |
| 350 | 999.0 | 12.342 | 14.390 | 13.578 | 12.742 | | 17.45 | 54.02 | 4.012 | -7.397 | 8.429 -12 | -11.0742 |
| 360 | 999.2 | 12.195 | 14.316 | 13.449 | 12.724 | | 17.23 | 54.88 | 3.339 | -7.476 | 6.925 | -11.1596 |
| 370 | 999.4 | 12.048 | 14.243 | 13.320 | 12.705 | | 17.03 | 55.72 | 2.786 | -7.555 | 5.710 | -11.2434 |
| 380 | 999.6 | 11.902 | 14.169 | 13.192 | 12.687 | | 16.83 | 56.54 | 2.332 | -7.632 | 4.723 | -11.3258 |
| 390 | 999.7 | 11.756 | 14.097 | 13.064 | 12.669 | | 16.65 | 57.34 | 1.956 | -7.709 | 3.918 | -11.4069 |
| 400 | 999.8 | 11.610 | 14.024 | 12.937 | 12.650 | | 16.47 | 58.14 | 1.645 | -7.784 | 3.260 | -11.4868 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 999.8 | 11.465 | 13.951 | 12.810 | 12.632 | | 16.30 | 58.92 | 1.387 - 8 | -7.858 | 2.719 -12 | -11.5655 |
| 420 | 999.9 | 11.321 | 13.879 | 12.684 | 12.614 | | 16.14 | 59.71 | 1.172 | -7.931 | 2.274 | -11.6432 |
| 430 | 999.9 | 11.177 | 13.807 | 12.558 | 12.596 | | 15.97 | 60.50 | 9.920 - 9 | -8.003 | 1.906 | -11.7199 |
| 440 | 999.9 | 11.033 | 13.735 | 12.432 | 12.578 | | 15.81 | 61.31 | 8.418 | -8.075 | 1.601 | -11.7957 |
| 450 | 999.9 | 10.890 | 13.664 | 12.307 | 12.560 | | 15.64 | 62.13 | 7.159 | -8.145 | 1.347 | -11.8706 |
| 460 | 1000.0 | 10.747 | 13.592 | 12.182 | 12.542 | | 15.48 | 62.99 | 6.101 | -8.215 | 1.136 | -11.9447 |
| 470 | 1000.0 | 10.605 | 13.521 | 12.057 | 12.525 | | 15.31 | 63.89 | 5.211 | -8.283 | 9.593 -13 | -12.0180 |
| 480 | 1000.0 | 10.463 | 13.450 | 11.933 | 12.507 | | 15.13 | 64.83 | 4.461 | -8.351 | 8.117 | -12.0906 |
| 490 | 1000.0 | 10.322 | 13.379 | 11.809 | 12.489 | | 14.94 | 65.83 | 3.828 | -8.417 | 6.879 | -12.1624 |
| 500 | 1000.0 | 10.181 | 13.309 | 11.685 | 12.471 | 10.430 | 14.75 | 66.89 | 3.292 | -8.482 | 5.840 | -12.2336 |
| 510 | 1000.0 | 10.040 | 13.238 | 11.562 | 12.454 | 10.426 | 14.54 | 68.03 | 2.839 - 9 | -8.547 | 4.965 -13 | -12.3040 |
| 520 | 1000.0 | 9.900 | 13.168 | 11.439 | 12.436 | 10.421 | 14.33 | 69.25 | 2.454 | -8.610 | 4.229 | -12.3738 |
| 530 | 1000.0 | 9.760 | 13.098 | 11.317 | 12.419 | 10.417 | 14.10 | 70.58 | 2.127 | -8.672 | 3.607 | -12.4429 |
| 540 | 1000.0 | 9.620 | 13.029 | 11.195 | 12.401 | 10.412 | 13.86 | 72.01 | 1.848 | -8.733 | 3.081 | -12.5113 |
| 550 | 1000.0 | 9.481 | 12.959 | 11.073 | 12.384 | 10.408 | 13.60 | 73.57 | 1.611 | -8.793 | 2.636 | -12.5790 |
| 560 | 1000.0 | 9.343 | 12.890 | 10.952 | 12.367 | 10.404 | 13.34 | 75.27 | 1.408 | -8.851 | 2.259 | -12.6460 |
| 570 | 1000.0 | 9.204 | 12.821 | 10.831 | 12.349 | 10.399 | 13.05 | 77.11 | 1.235 | -8.908 | 1.939 | -12.7123 |
| 580 | 1000.0 | 9.066 | 12.752 | 10.710 | 12.332 | 10.395 | 12.76 | 79.13 | 1.087 | -8.964 | 1.668 | -12.7779 |
| 590 | 1000.0 | 8.929 | 12.683 | 10.590 | 12.315 | 10.391 | 12.45 | 81.32 | 9.594 -10 | -9.018 | 1.437 | -12.8426 |
| 600 | 1000.0 | 8.792 | 12.615 | 10.470 | 12.298 | 10.386 | 12.13 | 83.70 | 8.498 | -9.071 | 1.240 | -12.9066 |
| 610 | 1000.0 | 8.655 | 12.546 | 10.350 | 12.281 | 10.382 | 11.80 | 86.29 | 7.555 -10 | -9.122 | 1.072 -13 | -12.9697 |
| 620 | 1000.0 | 8.519 | 12.478 | 10.231 | 12.264 | 10.378 | 11.46 | 89.11 | 6.740 | -9.171 | 9.292 -14 | -13.0319 |
| 630 | 1000.0 | 8.383 | 12.410 | 10.112 | 12.247 | 10.373 | 11.11 | 92.15 | 6.036 | -9.219 | 8.069 | -13.0932 |
| 640 | 1000.0 | 8.248 | 12.342 | 9.993 | 12.230 | 10.369 | 10.76 | 95.45 | 5.425 | -9.266 | 7.022 | -13.1535 |
| 650 | 1000.0 | 8.113 | 12.275 | 9.875 | 12.213 | 10.365 | 10.41 | 98.99 | 4.895 | -9.310 | 6.126 | -13.2128 |
| 660 | 1000.0 | 7.978 | 12.208 | 9.757 | 12.196 | 10.361 | 10.05 | 102.80 | 4.433 | -9.353 | 5.358 | -13.2710 |
| 670 | 1000.0 | 7.844 | 12.140 | 9.639 | 12.179 | 10.356 | 9.69 | 106.87 | 4.029 | -9.395 | 4.698 | -13.3281 |
| 680 | 1000.0 | 7.710 | 12.073 | 9.522 | 12.162 | 10.352 | 9.34 | 111.21 | 3.676 | -9.435 | 4.131 | -13.3840 |
| 690 | 1000.0 | 7.576 | 12.007 | 9.405 | 12.146 | 10.348 | 9.00 | 115.82 | 3.366 | -9.473 | 3.642 | -13.4387 |
| 700 | 1000.0 | 7.443 | 11.940 | 9.289 | 12.129 | 10.344 | 8.66 | 120.69 | 3.093 | -9.510 | 3.221 | -13.4920 |
| 710 | 1000.0 | 7.310 | 11.874 | 9.172 | 12.112 | 10.340 | 8.33 | 125.81 | 2.852 -10 | -9.545 | 2.857 -14 | -13.5441 |
| 720 | 1000.0 | 7.178 | 11.807 | 9.056 | 12.096 | 10.335 | 8.01 | 131.16 | 2.638 | -9.579 | 2.542 | -13.5948 |
| 730 | 1000.0 | 7.045 | 11.741 | 8.941 | 12.079 | 10.331 | 7.71 | 136.73 | 2.449 | -9.611 | 2.270 | -13.6441 |
| 740 | 1000.0 | 6.914 | 11.675 | 8.826 | 12.063 | 10.327 | 7.42 | 142.50 | 2.279 | -9.642 | 2.033 | -13.6919 |
| 750 | 1000.0 | 6.782 | 11.610 | 8.711 | 12.046 | 10.323 | 7.14 | 148.43 | 2.128 | -9.672 | 1.827 | -13.7382 |
| 760 | 1000.0 | 6.652 | 11.544 | 8.596 | 12.030 | 10.319 | 6.88 | 154.51 | 1.992 | -9.701 | 1.648 | -13.7831 |
| 770 | 1000.0 | 6.521 | 11.479 | 8.482 | 12.014 | 10.315 | 6.63 | 160.69 | 1.869 | -9.728 | 1.491 | -13.8265 |
| 780 | 1000.0 | 6.391 | 11.414 | 8.368 | 11.997 | 10.311 | 6.40 | 166.94 | 1.759 | -9.755 | 1.354 | -13.8684 |
| 790 | 1000.0 | 6.261 | 11.349 | 8.254 | 11.981 | 10.307 | 6.19 | 173.23 | 1.658 | -9.780 | 1.234 | -13.9087 |
| 800 | 1000.0 | 6.131 | 11.294 | 8.141 | 11.965 | 10.302 | 5.99 | 179.51 | 1.567 | -9.805 | 1.128 | -13.9476 |
| 820 | 1000.0 | 5.873 | 11.155 | 7.915 | 11.933 | 10.294 | 5.63 | 191.95 | 1.407 -10 | -9.852 | 9.526 -15 | -14.0211 |
| 840 | 1000.0 | 5.617 | 11.027 | 7.690 | 11.901 | 10.286 | 5.33 | 203.99 | 1.272 | -9.896 | 8.147 | -14.0890 |
| 880 | 1000.0 | 5.108 | 10.773 | 7.245 | 11.837 | 10.270 | 4.86 | 226.11 | 1.056 | -9.976 | 6.171 | -14.2096 |
| 900 | 1000.0 | 4.856 | 10.647 | 7.024 | 11.805 | 10.262 | 4.68 | 235.95 | 9.683 -11 | -10.014 | 5.454 | -14.2613 |
| 920 | 1000.0 | 4.605 | 10.521 | 6.804 | 11.774 | 10.254 | 4.54 | 244.90 | 8.910 | -10.050 | 4.862 | -14.3132 |
| 940 | 1000.0 | 4.356 | 10.396 | 6.586 | 11.743 | 10.247 | 4.42 | 252.98 | 8.223 | -10.085 | 4.367 | -14.3598 |
| 960 | 1000.0 | 4.108 | 10.272 | 6.369 | 11.712 | 10.239 | 4.32 | 260.24 | 7.606 | -10.119 | 3.949 | -14.4036 |
| 980 | 1000.0 | 3.861 | 10.149 | 6.153 | 11.681 | 10.231 | 4.23 | 266.75 | 7.050 | -10.152 | 3.590 | -14.4449 |
| 1000 | 1000.0 | 3.615 | 10.026 | 5.938 | 11.650 | 10.223 | 4.17 | 272.59 | 6.546 | -10.184 | 3.280 | -14.4841 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log n($O_3$) | log n(O) | log n($N_2$) | log n(He) | log n(H) | | | | | | |
| 120 | 333.4 | 17.056 | 16.985 | 17.764 | 13.568 | | 27.12 | 10.82 | 3.640 - 5 | -4.439 | 3.561 - 8 | -7.4484 |
| 125 | 414.2 | 16.750 | 16.785 | 17.484 | 13.483 | | 26.81 | 13.62 | 2.415 | -4.617 | 1.880 | -7.7259 |
| 130 | 486.3 | 16.506 | 16.628 | 17.261 | 13.418 | | 26.52 | 16.19 | 1.726 | -4.763 | 1.132 | -7.9461 |
| 135 | 548.6 | 16.301 | 16.500 | 17.076 | 13.366 | | 26.25 | 18.48 | 1.293 | -4.888 | 7.444 - 9 | -8.1282 |
| 140 | 604.8 | 16.123 | 16.389 | 16.914 | 13.323 | | 26.00 | 20.60 | 1.001 | -4.999 | 5.176 | -8.2860 |
| 145 | 654.3 | 15.964 | 16.293 | 16.771 | 13.286 | | 25.74 | 22.54 | 7.941 - 6 | -5.100 | 3.758 | -8.4250 |
| 150 | 699.2 | 15.820 | 16.206 | 16.641 | 13.254 | | 25.50 | 24.36 | 6.416 | -5.193 | 2.814 | -8.5506 |
| 155 | 739.4 | 15.687 | 16.127 | 16.522 | 13.225 | | 25.26 | 26.05 | 5.262 - 6 | -5.279 | 2.162 - 9 | -8.6652 |
| 160 | 776.0 | 15.563 | 16.055 | 16.411 | 13.199 | | 25.02 | 27.64 | 4.367 | -5.360 | 1.693 | -8.7712 |
| 165 | 808.9 | 15.447 | 15.988 | 16.307 | 13.176 | | 24.78 | 29.13 | 3.662 | -5.436 | 1.349 | -8.8699 |
| 170 | 839.0 | 15.336 | 15.925 | 16.208 | 13.154 | | 24.55 | 30.55 | 3.097 | -5.509 | 1.090 | -8.9626 |
| 175 | 866.2 | 15.231 | 15.865 | 16.115 | 13.134 | | 24.31 | 31.89 | 2.639 | -5.579 | 8.909 -10 | -9.0502 |
| 180 | 891.1 | 15.131 | 15.809 | 16.025 | 13.115 | | 24.08 | 33.17 | 2.263 | -5.645 | 7.356 | -9.1334 |
| 185 | 913.5 | 15.034 | 15.755 | 15.939 | 13.098 | | 23.85 | 34.38 | 1.952 | -5.710 | 6.130 | -9.2126 |
| 190 | 934.1 | 14.941 | 15.704 | 15.856 | 13.081 | | 23.63 | 35.55 | 1.692 | -5.772 | 5.146 | -9.2885 |
| 195 | 952.8 | 14.850 | 15.654 | 15.776 | 13.066 | | 23.40 | 36.67 | 1.473 | -5.832 | 4.351 | -9.3614 |
| 200 | 970.0 | 14.762 | 15.606 | 15.698 | 13.051 | | 23.18 | 37.75 | 1.288 | -5.890 | 3.701 | -9.4317 |
| 205 | 985.8 | 14.677 | 15.560 | 15.622 | 13.037 | | 22.96 | 38.79 | 1.130 - 6 | -5.947 | 3.165 -10 | -9.4996 |
| 210 | 1000.1 | 14.593 | 15.515 | 15.548 | 13.023 | | 22.74 | 39.79 | 9.950 - 7 | -6.002 | 2.721 | -9.5653 |
| 215 | 1013.6 | 14.511 | 15.471 | 15.475 | 13.010 | | 22.52 | 40.78 | 8.789 | -6.056 | 2.349 | -9.6292 |
| 220 | 1026.1 | 14.431 | 15.428 | 15.404 | 12.997 | | 22.31 | 41.75 | 7.786 | -6.109 | 2.036 | -9.6913 |
| 225 | 1037.8 | 14.351 | 15.386 | 15.334 | 12.985 | | 22.10 | 42.69 | 6.916 | -6.160 | 1.771 | -9.7518 |
| 230 | 1048.7 | 14.274 | 15.345 | 15.266 | 12.973 | | 21.89 | 43.62 | 6.159 | -6.210 | 1.546 | -9.8108 |
| 235 | 1059.7 | 14.197 | 15.304 | 15.198 | 12.961 | | 21.68 | 44.56 | 5.499 | -6.260 | 1.353 | -9.8686 |
| 240 | 1070.6 | 14.121 | 15.264 | 15.131 | 12.950 | | 21.48 | 45.51 | 4.922 | -6.308 | 1.188 | -9.9253 |
| 245 | 1074.3 | 14.049 | 15.227 | 15.067 | 12.940 | | 21.28 | 46.17 | 4.413 | -6.355 | 1.051 | -9.9782 |
| 250 | 1077.6 | 13.977 | 15.191 | 15.004 | 12.930 | | 21.08 | 46.81 | 3.963 | -6.402 | 9.327 -11 | -10.0303 |
| 255 | 1080.4 | 13.905 | 15.154 | 14.942 | 12.921 | | 20.89 | 47.43 | 3.564 - 7 | -6.448 | 8.289 -11 | -10.0815 |
| 260 | 1082.9 | 13.834 | 15.118 | 14.879 | 12.911 | | 20.70 | 48.05 | 3.210 | -6.494 | 7.380 | -10.1319 |
| 265 | 1085.0 | 13.764 | 15.083 | 14.817 | 12.902 | | 20.51 | 48.66 | 2.895 | -6.538 | 6.582 | -10.1816 |
| 270 | 1086.9 | 13.693 | 15.047 | 14.756 | 12.893 | | 20.33 | 49.26 | 2.614 | -6.583 | 5.880 | -10.2306 |
| 275 | 1088.6 | 13.624 | 15.012 | 14.695 | 12.884 | | 20.15 | 49.85 | 2.363 | -6.627 | 5.260 | -10.2790 |
| 280 | 1090.0 | 13.554 | 14.977 | 14.634 | 12.875 | | 19.97 | 50.43 | 2.138 | -6.670 | 4.713 | -10.3267 |
| 285 | 1091.3 | 13.484 | 14.942 | 14.573 | 12.866 | | 19.80 | 51.01 | 1.938 | -6.713 | 4.229 | -10.3738 |
| 290 | 1092.4 | 13.415 | 14.907 | 14.512 | 12.857 | | 19.63 | 51.57 | 1.758 | -6.755 | 3.800 | -10.4202 |
| 295 | 1093.3 | 13.346 | 14.872 | 14.452 | 12.848 | | 19.47 | 52.13 | 1.596 | -6.797 | 3.419 | -10.4661 |
| 300 | 1094.2 | 13.278 | 14.838 | 14.392 | 12.839 | | 19.31 | 52.68 | 1.451 | -6.838 | 3.080 | -10.5115 |
| 310 | 1095.5 | 13.141 | 14.769 | 14.272 | 12.822 | | 19.00 | 53.76 | 1.202 - 7 | -6.920 | 2.508 -11 | -10.6006 |
| 320 | 1096.6 | 13.005 | 14.701 | 14.152 | 12.805 | | 18.71 | 54.82 | 1.000 | -7.000 | 2.052 | -10.6877 |
| 330 | 1097.4 | 12.869 | 14.633 | 14.034 | 12.788 | | 18.44 | 55.84 | 8.348 - 8 | -7.078 | 1.687 | -10.7730 |
| 340 | 1098.0 | 12.734 | 14.565 | 13.916 | 12.771 | | 18.18 | 56.84 | 6.990 | -7.156 | 1.392 | -10.8564 |
| 350 | 1098.5 | 12.600 | 14.498 | 13.798 | 12.754 | | 17.94 | 57.80 | 5.871 | -7.231 | 1.153 | -10.9382 |
| 360 | 1098.8 | 12.466 | 14.431 | 13.680 | 12.737 | | 17.71 | 58.74 | 4.945 | -7.306 | 9.584 -12 | -11.0184 |
| 370 | 1099.1 | 12.332 | 14.364 | 13.564 | 12.720 | | 17.49 | 59.65 | 4.177 | -7.379 | 7.995 | -11.0972 |
| 380 | 1099.3 | 12.199 | 14.298 | 13.447 | 12.704 | | 17.29 | 60.54 | 3.536 | -7.451 | 6.690 | -11.1746 |
| 390 | 1099.5 | 12.067 | 14.231 | 13.331 | 12.687 | | 17.10 | 61.41 | 3.002 | -7.523 | 5.614 | -11.2507 |
| 400 | 1099.6 | 11.934 | 14.165 | 13.215 | 12.670 | | 16.92 | 62.26 | 2.553 | -7.593 | 4.725 | -11.3256 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1099.7 | 11.803 | 14.099 | 13.100 | 12.654 | | 16.75 | 63.09 | 2.177 - 8 | -7.662 | 3.987 -12 | -11.3994 |
| 420 | 1099.8 | 11.671 | 14.033 | 12.985 | 12.637 | | 16.58 | 63.91 | 1.860 | -7.731 | 3.372 | -11.4721 |
| 430 | 1099.8 | 11.540 | 13.968 | 12.870 | 12.621 | | 16.42 | 64.72 | 1.592 | -7.798 | 2.859 | -11.5438 |
| 440 | 1099.9 | 11.410 | 13.903 | 12.756 | 12.605 | | 16.27 | 65.53 | 1.365 | -7.865 | 2.429 | -11.6146 |
| 450 | 1099.9 | 11.280 | 13.838 | 12.642 | 12.588 | | 16.12 | 66.35 | 1.173 | -7.931 | 2.067 | -11.6846 |
| 460 | 1099.9 | 11.150 | 13.773 | 12.528 | 12.572 | | 15.97 | 67.17 | 1.010 | -7.996 | 1.763 | -11.7537 |
| 470 | 1099.9 | 11.020 | 13.708 | 12.415 | 12.556 | | 15.82 | 68.00 | 8.710 - 9 | -8.060 | 1.506 | -11.8220 |
| 480 | 1100.0 | 10.891 | 13.643 | 12.302 | 12.540 | | 15.67 | 68.85 | 7.526 | -8.123 | 1.289 | -11.8897 |
| 490 | 1100.0 | 10.763 | 13.579 | 12.189 | 12.524 | | 15.52 | 69.73 | 6.514 | -8.186 | 1.105 | -11.9566 |
| 500 | 1100.0 | 10.634 | 13.515 | 12.077 | 12.508 | 10.175 | 15.36 | 70.64 | 5.649 | -8.248 | 9.488 -13 | -12.0228 |
| 510 | 1100.0 | 10.507 | 13.451 | 11.965 | 12.492 | 10.171 | 15.20 | 71.59 | 4.908 - 9 | -8.309 | 8.158 -13 | -12.0884 |
| 520 | 1100.0 | 10.379 | 13.387 | 11.854 | 12.476 | 10.167 | 15.03 | 72.59 | 4.273 | -8.369 | 7.024 | -12.1534 |
| 530 | 1100.0 | 10.252 | 13.324 | 11.742 | 12.460 | 10.163 | 14.86 | 73.64 | 3.726 | -8.429 | 6.056 | -12.2178 |
| 540 | 1100.0 | 10.125 | 13.260 | 11.631 | 12.444 | 10.159 | 14.68 | 74.76 | 3.256 | -8.487 | 5.229 | -12.2816 |
| 550 | 1100.0 | 9.999 | 13.197 | 11.521 | 12.428 | 10.155 | 14.50 | 75.95 | 2.852 | -8.545 | 4.520 | -12.3448 |
| 560 | 1100.0 | 9.873 | 13.134 | 11.410 | 12.412 | 10.151 | 14.30 | 77.21 | 2.503 | -8.602 | 3.913 | -12.4075 |
| 570 | 1100.0 | 9.747 | 13.071 | 11.300 | 12.397 | 10.147 | 14.09 | 78.57 | 2.201 | -8.657 | 3.392 | -12.4696 |
| 580 | 1100.0 | 9.622 | 13.009 | 11.191 | 12.381 | 10.143 | 13.88 | 80.03 | 1.940 | -8.712 | 2.944 | -12.5311 |
| 590 | 1100.0 | 9.497 | 12.946 | 11.081 | 12.365 | 10.139 | 13.65 | 81.60 | 1.714 | -8.766 | 2.559 | -12.5920 |
| 600 | 1100.0 | 9.372 | 12.884 | 10.972 | 12.350 | 10.135 | 13.41 | 83.29 | 1.519 | -8.819 | 2.227 | -12.6523 |
| 610 | 1100.0 | 9.248 | 12.822 | 10.863 | 12.334 | 10.131 | 13.16 | 85.11 | 1.348 - 9 | -8.870 | 1.941 -13 | -12.7121 |
| 620 | 1100.0 | 9.124 | 12.760 | 10.755 | 12.319 | 10.127 | 12.90 | 87.07 | 1.201 | -8.921 | 1.694 | -12.7712 |
| 630 | 1100.0 | 9.000 | 12.698 | 10.647 | 12.303 | 10.123 | 12.63 | 89.19 | 1.072 | -8.970 | 1.480 | -12.8297 |
| 640 | 1100.0 | 8.877 | 12.636 | 10.539 | 12.288 | 10.119 | 12.35 | 91.47 | 9.594 -10 | -9.018 | 1.296 | -12.8875 |
| 650 | 1100.0 | 8.754 | 12.575 | 10.431 | 12.272 | 10.115 | 12.06 | 93.94 | 8.613 | -9.065 | 1.136 | -12.9446 |
| 660 | 1100.0 | 8.632 | 12.514 | 10.324 | 12.257 | 10.111 | 11.77 | 96.58 | 7.754 | -9.110 | 9.975 -14 | -13.0011 |
| 670 | 1100.0 | 8.510 | 12.453 | 10.217 | 12.242 | 10.108 | 11.46 | 99.43 | 7.002 | -9.155 | 8.774 | -13.0568 |
| 680 | 1100.0 | 8.388 | 12.392 | 10.111 | 12.227 | 10.104 | 11.15 | 102.49 | 6.342 | -9.198 | 7.732 | -13.1117 |
| 690 | 1100.0 | 8.267 | 12.331 | 10.004 | 12.211 | 10.100 | 10.84 | 105.76 | 5.761 | -9.240 | 6.825 | -13.1659 |
| 700 | 1100.0 | 8.146 | 12.271 | 9.898 | 12.196 | 10.096 | 10.52 | 109.26 | 5.249 | -9.280 | 6.037 | -13.2192 |
| 710 | 1100.0 | 8.025 | 12.210 | 9.793 | 12.181 | 10.092 | 10.20 | 112.99 | 4.797 -10 | -9.319 | 5.350 -14 | -13.2716 |
| 720 | 1100.0 | 7.904 | 12.150 | 9.687 | 12.166 | 10.089 | 9.88 | 116.96 | 4.397 | -9.357 | 4.752 | -13.3232 |
| 730 | 1100.0 | 7.784 | 12.090 | 9.582 | 12.151 | 10.085 | 9.57 | 121.16 | 4.043 | -9.393 | 4.229 | -13.3737 |
| 740 | 1100.0 | 7.665 | 12.030 | 9.477 | 12.136 | 10.081 | 9.25 | 125.60 | 3.728 | -9.429 | 3.773 | -13.4234 |
| 750 | 1100.0 | 7.545 | 11.970 | 9.373 | 12.121 | 10.077 | 8.95 | 130.27 | 3.448 | -9.462 | 3.373 | -13.4720 |
| 760 | 1100.0 | 7.426 | 11.911 | 9.269 | 12.106 | 10.073 | 8.65 | 135.18 | 3.197 | -9.495 | 3.023 | -13.5195 |
| 770 | 1100.0 | 7.307 | 11.852 | 9.165 | 12.092 | 10.070 | 8.36 | 140.30 | 2.974 | -9.527 | 2 717 | -13.5660 |
| 780 | 1100.0 | 7.189 | 11.792 | 9.061 | 12.077 | 10.066 | 8.07 | 145.63 | 2.773 | -9.557 | 2.447 | -13.6114 |
| 790 | 1100.0 | 7.071 | 11.733 | 8.958 | 12.062 | 10.062 | 7.80 | 151.16 | 2.592 | -9.586 | 2.210 | -13.6556 |
| 800 | 1100.0 | 6.953 | 11.674 | 8.855 | 12.047 | 10.059 | 7.54 | 156.86 | 2.429 | -9.615 | 2.001 | -13.6987 |
| 820 | 1100.0 | 6.719 | 11.557 | 8.649 | 12.018 | 10.051 | 7.05 | 168.71 | 2.148 -10 | -9.668 | 1.655 -14 | -13.7813 |
| 840 | 1100.0 | 6.486 | 11.441 | 8.445 | 11.989 | 10.044 | 6.60 | 180.99 | 1.916 | -9.718 | 1.383 | -13.8591 |
| 860 | 1100.0 | 6.023 | 11.209 | 8.040 | 11.931 | 10.029 | 5.87 | 205.97 | 1.557 | -9.808 | 9.993 -15 | -14.0003 |
| 900 | 1100.0 | 5.794 | 11.095 | 7.840 | 11.902 | 10.022 | 5.57 | 218.22 | 1.417 | -9.849 | 8.630 | -14.0640 |
| 920 | 1100.0 | 5.566 | 10.981 | 7.640 | 11.874 | 10.015 | 5.31 | 230.07 | 1.296 | -9.887 | 7.529 | -14.1233 |
| 940 | 1100.0 | 5.339 | 10.867 | 7.441 | 11.845 | 10.008 | 5.09 | 241.34 | 1.191 | -9.924 | 6.629 | -14.1785 |
| 960 | 1100.0 | 5.113 | 10.755 | 7.244 | 11.817 | 10.001 | 4.90 | 251.93 | 1.098 | -9.959 | 5.888 | -14.2300 |
| 980 | 1100.0 | 4.889 | 10.642 | 7.047 | 11.789 | 9.994 | 4.75 | 261.76 | 1.016 | -9.993 | 5.271 | -14.2781 |
| 1000 | 1100.0 | 4.666 | 10.531 | 6.852 | 11.761 | 9.987 | 4.61 | 270.82 | 9.423 -11 | -10.026 | 4.752 | -14.3231 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1300° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 333.2 | 17.056 | 16.985 | 17.764 | 13.568 | | 27.12 | 10.81 | 3.637 - 5 | -4.439 | 3.960 - 8 | -7.4485 |
| 125 | 424.5 | 16.742 | 16.775 | 17.476 | 13.476 | | 26.81 | 13.96 | 2.425 | -4.615 | 1.842 | -7.7346 |
| 130 | 506.7 | 16.496 | 16.614 | 17.251 | 13.407 | | 26.54 | 16.86 | 1.752 | -4.756 | 1.104 | -7.9571 |
| 135 | 579.1 | 16.293 | 16.483 | 17.066 | 13.353 | | 26.28 | 19.48 | 1.330 | -4.876 | 7.262 - 9 | -8.1389 |
| 140 | 645.0 | 16.118 | 16.372 | 16.907 | 13.308 | | 26.04 | 21.93 | 1.045 | -4.981 | 5.074 | -8.2946 |
| 145 | 703.7 | 15.964 | 16.276 | 16.767 | 13.270 | | 25.81 | 24.18 | 8.412 - 6 | -5.075 | 3.711 | -8.4305 |
| 150 | 757.8 | 15.824 | 16.191 | 16.641 | 13.237 | | 25.58 | 26.31 | 6.900 | -5.161 | 2.802 | -8.5525 |
| 155 | 807.2 | 15.697 | 16.113 | 16.526 | 13.207 | | 25.37 | 28.31 | 5.746 - 6 | -5.241 | 2.172 - 9 | -8.6632 |
| 160 | 852.5 | 15.579 | 16.043 | 16.420 | 13.181 | | 25.15 | 30.20 | 4.843 | -5.315 | 1.719 | -8.7648 |
| 165 | 893.7 | 15.469 | 15.977 | 16.322 | 13.157 | | 24.94 | 31.98 | 4.124 | -5.385 | 1.384 | -8.8588 |
| 170 | 931.7 | 15.366 | 15.917 | 16.229 | 13.135 | | 24.73 | 33.67 | 3.541 | -5.451 | 1.131 | -8.9467 |
| 175 | 966.4 | 15.268 | 15.860 | 16.141 | 13.115 | | 24.53 | 35.26 | 3.063 | -5.514 | 9.351 -10 | -9.0291 |
| 180 | 998.6 | 15.175 | 15.806 | 16.058 | 13.096 | | 24.33 | 36.80 | 2.666 | -5.574 | 7.813 | -9.1072 |
| 185 | 1028.1 | 15.086 | 15.755 | 15.978 | 13.079 | | 24.13 | 38.26 | 2.334 | -5.632 | 6.588 | -9.1813 |
| 190 | 1055.4 | 15.001 | 15.707 | 15.902 | 13.063 | | 23.93 | 39.65 | 2.052 | -5.688 | 5.598 | -9.2520 |
| 195 | 1080.3 | 14.918 | 15.661 | 15.829 | 13.047 | | 23.74 | 40.99 | 1.813 | -5.742 | 4.792 | -9.3195 |
| 200 | 1103.5 | 14.838 | 15.616 | 15.758 | 13.033 | | 23.55 | 42.27 | 1.608 | -5.794 | 4.127 | -9.3844 |
| 205 | 1124.8 | 14.761 | 15.573 | 15.689 | 13.019 | | 23.36 | 43.51 | 1.431 - 6 | -5.844 | 3.574 -10 | -9.4469 |
| 210 | 1144.4 | 14.686 | 15.532 | 15.622 | 13.006 | | 23.17 | 44.70 | 1.278 | -5.894 | 3.111 | -9.5071 |
| 215 | 1162.8 | 14.612 | 15.492 | 15.557 | 12.993 | | 22.98 | 45.85 | 1.144 | -5.942 | 2.719 | -9.5655 |
| 220 | 1179.8 | 14.541 | 15.453 | 15.493 | 12.981 | | 22.79 | 46.97 | 1.027 | -5.988 | 2.387 | -9.6222 |
| 225 | 1195.8 | 14.470 | 15.415 | 15.431 | 12.970 | | 22.61 | 48.07 | 9.246 - 7 | -6.034 | 2.103 | -9.6772 |
| 230 | 1210.6 | 14.401 | 15.378 | 15.370 | 12.958 | | 22.43 | 49.13 | 8.342 | -6.079 | 1.859 | -9.7307 |
| 235 | 1225.1 | 14.334 | 15.341 | 15.310 | 12.947 | | 22.25 | 50.20 | 7.544 | -6.122 | 1.648 | -9.7831 |
| 240 | 1239.0 | 14.267 | 15.305 | 15.251 | 12.936 | | 22.07 | 51.25 | 6.836 | -6.165 | 1.465 | -9.8342 |
| 245 | 1252.1 | 14.201 | 15.270 | 15.193 | 12.926 | | 21.90 | 52.28 | 6.207 | -6.207 | 1.306 | -9.8842 |
| 250 | 1257.5 | 14.139 | 15.238 | 15.138 | 12.917 | | 21.73 | 53.00 | 5.644 | -6.248 | 1.173 | -9.9307 |
| 255 | 1262.3 | 14.077 | 15.206 | 15.084 | 12.909 | | 21.56 | 53.71 | 5.139 - 7 | -6.289 | 1.056 -10 | -9.9765 |
| 260 | 1266.5 | 14.016 | 15.175 | 15.030 | 12.900 | | 21.39 | 54.39 | 4.685 | -6.329 | 9.517 -11 | -10.0215 |
| 265 | 1270.3 | 13.955 | 15.144 | 14.977 | 12.892 | | 21.22 | 55.07 | 4.276 | -6.369 | 8.593 | -10.0659 |
| 270 | 1273.6 | 13.895 | 15.113 | 14.924 | 12.884 | | 21.06 | 55.73 | 3.907 | -6.408 | 7.770 | -10.1096 |
| 275 | 1276.6 | 13.834 | 15.083 | 14.871 | 12.876 | | 20.89 | 56.38 | 3.574 | -6.447 | 7.035 | -10.1527 |
| 280 | 1279.2 | 13.775 | 15.052 | 14.818 | 12.868 | | 20.73 | 57.02 | 3.272 | -6.485 | 6.379 | -10.1953 |
| 285 | 1281.5 | 13.715 | 15.022 | 14.766 | 12.860 | | 20.58 | 57.65 | 2.999 | -6.523 | 5.791 | -10.2372 |
| 290 | 1283.6 | 13.656 | 14.992 | 14.714 | 12.852 | | 20.42 | 58.27 | 2.751 | -6.561 | 5.264 | -10.2787 |
| 295 | 1285.5 | 13.597 | 14.962 | 14.663 | 12.845 | | 20.27 | 58.88 | 2.526 | -6.598 | 4.790 | -10.3197 |
| 300 | 1287.1 | 13.538 | 14.933 | 14.611 | 12.837 | | 20.12 | 59.49 | 2.321 | -6.634 | 4.364 | -10.3602 |
| 310 | 1289.8 | 13.422 | 14.874 | 14.509 | 12.822 | | 19.82 | 60.69 | 1.965 - 7 | -6.707 | 3.633 -11 | -10.4397 |
| 320 | 1292.0 | 13.306 | 14.816 | 14.407 | 12.807 | | 19.54 | 61.84 | 1.669 | -6.777 | 3.037 | -10.5176 |
| 330 | 1293.7 | 13.190 | 14.758 | 14.306 | 12.792 | | 19.27 | 62.98 | 1.422 | -6.847 | 2.548 | -10.5938 |
| 340 | 1295.0 | 13.076 | 14.700 | 14.206 | 12.778 | | 19.01 | 64.09 | 1.215 | -6.915 | 2.146 | -10.6684 |
| 350 | 1296.1 | 12.961 | 14.643 | 14.106 | 12.763 | | 18.77 | 65.18 | 1.041 | -6.983 | 1.813 | -10.7417 |
| 360 | 1296.9 | 12.848 | 14.586 | 14.006 | 12.749 | | 18.53 | 66.25 | 8.940 - 8 | -7.049 | 1.536 | -10.8135 |
| 370 | 1297.6 | 12.734 | 14.529 | 13.907 | 12.735 | | 18.31 | 67.29 | 7.697 | -7.114 | 1.306 | -10.8840 |
| 380 | 1298.1 | 12.622 | 14.473 | 13.808 | 12.721 | | 18.09 | 68.31 | 6.641 | -7.178 | 1.113 | -10.9533 |
| 390 | 1298.5 | 12.509 | 14.416 | 13.710 | 12.707 | | 17.89 | 69.31 | 5.743 | -7.241 | 9.518 -12 | -11.0214 |
| 400 | 1298.8 | 12.397 | 14.360 | 13.612 | 12.692 | | 17.70 | 70.29 | 4.977 | -7.303 | 8.157 | -11.0884 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1299.1 | 12.286 | 14.304 | 13.514 | 12.678 | | 17.52 | 71.24 | 4.321 - 8 | -7.364 | 7.308 -12 | -11.1544 |
| 420 | 1299.3 | 12.174 | 14.249 | 13.417 | 12.665 | | 17.35 | 72.18 | 3.758 | -7.425 | 6.035 | -11.2193 |
| 430 | 1299.4 | 12.064 | 14.193 | 13.320 | 12.651 | | 17.18 | 73.09 | 3.275 | -7.485 | 5.208 | -11.2833 |
| 440 | 1299.5 | 11.953 | 14.138 | 13.223 | 12.637 | | 17.02 | 74.00 | 2.859 | -7.544 | 4.504 | -11.3464 |
| 450 | 1299.6 | 11.843 | 14.083 | 13.126 | 12.623 | | 16.87 | 74.89 | 2.499 | -7.602 | 3.902 | -11.4087 |
| 460 | 1299.7 | 11.733 | 14.028 | 13.030 | 12.609 | | 16.73 | 75.76 | 2.189 | -7.660 | 3.387 | -11.4701 |
| 470 | 1299.8 | 11.623 | 13.973 | 12.934 | 12.595 | | 16.59 | 76.63 | 1.919 | -7.717 | 2.946 | -11.5308 |
| 480 | 1299.8 | 11.514 | 13.919 | 12.839 | 12.582 | | 16.45 | 77.50 | 1.686 | -7.773 | 2.566 | -11.5908 |
| 490 | 1299.9 | 11.405 | 13.864 | 12.743 | 12.568 | | 16.32 | 78.36 | 1.483 | -7.829 | 2.239 | -11.6500 |
| 500 | 1299.9 | 11.297 | 13.810 | 12.648 | 12.555 | 9.772 | 16.19 | 79.22 | 1.306 | -7.884 | 1.956 | -11.7087 |
| 510 | 1299.9 | 11.189 | 13.756 | 12.554 | 12.541 | 9.769 | 16.06 | 80.09 | 1.152 - 8 | -7.939 | 1.711 -12 | -11.7666 |
| 520 | 1299.9 | 11.081 | 13.702 | 12.459 | 12.528 | 9.766 | 15.93 | 80.97 | 1.017 | -7.992 | 1.500 | -11.8241 |
| 530 | 1299.9 | 10.973 | 13.648 | 12.365 | 12.514 | 9.762 | 15.80 | 81.86 | 8.999 - 9 | -8.046 | 1.316 | -11.8803 |
| 540 | 1300.0 | 10.866 | 13.594 | 12.271 | 12.501 | 9.759 | 15.67 | 82.77 | 7.969 | -8.099 | 1.156 | -11.9372 |
| 550 | 1300.0 | 10.759 | 13.541 | 12.177 | 12.487 | 9.755 | 15.54 | 83.71 | 7.067 | -8.151 | 1.016 | -11.9930 |
| 560 | 1300.0 | 10.652 | 13.488 | 12.084 | 12.474 | 9.752 | 15.41 | 84.66 | 6.275 | -8.202 | 8.949 -13 | -12.0482 |
| 570 | 1300.0 | 10.546 | 13.434 | 11.991 | 12.461 | 9.749 | 15.28 | 85.65 | 5.580 | -8.253 | 7.888 | -12.1030 |
| 580 | 1300.0 | 10.440 | 13.381 | 11.898 | 12.447 | 9.745 | 15.14 | 86.68 | 4.969 | -8.304 | 6.961 | -12.1574 |
| 590 | 1300.0 | 10.334 | 13.328 | 11.806 | 12.434 | 9.742 | 15.00 | 87.75 | 4.430 | -8.354 | 6.149 | -12.2112 |
| 600 | 1300.0 | 10.229 | 13.276 | 11.713 | 12.421 | 9.739 | 14.85 | 88.86 | 3.956 | -8.403 | 5.437 | -12.2646 |
| 610 | 1300.0 | 10.124 | 13.223 | 11.621 | 12.408 | 9.735 | 14.70 | 90.03 | 3.538 - 9 | -8.451 | 4.813 -13 | -12.3176 |
| 620 | 1300.0 | 10.019 | 13.171 | 11.529 | 12.395 | 9.732 | 14.55 | 91.26 | 3.168 | -8.499 | 4.264 | -12.3702 |
| 630 | 1300.0 | 9.914 | 13.119 | 11.438 | 12.382 | 9.729 | 14.39 | 92.55 | 2.841 | -8.546 | 3.782 | -12.4223 |
| 640 | 1300.0 | 9.810 | 13.066 | 11.347 | 12.369 | 9.725 | 14.22 | 93.92 | 2.552 | -8.593 | 3.357 | -12.4740 |
| 650 | 1300.0 | 9.706 | 13.014 | 11.256 | 12.356 | 9.722 | 14.04 | 95.36 | 2.296 | -8.639 | 2.984 | -12.5253 |
| 660 | 1300.0 | 9.602 | 12.963 | 11.165 | 12.343 | 9.719 | 13.86 | 96.89 | 2.070 | -8.684 | 2.654 | -12.5761 |
| 670 | 1300.0 | 9.499 | 12.911 | 11.075 | 12.330 | 9.716 | 13.67 | 98.51 | 1.868 | -8.729 | 2.363 | -12.6265 |
| 680 | 1300.0 | 9.396 | 12.859 | 10.984 | 12.317 | 9.712 | 13.48 | 100.23 | 1.689 | -8.772 | 2.106 | -12.6765 |
| 690 | 1300.0 | 9.293 | 12.808 | 10.894 | 12.304 | 9.709 | 13.27 | 102.06 | 1.530 | -8.815 | 1.879 | -12.7261 |
| 700 | 1300.0 | 9.191 | 12.757 | 10.805 | 12.291 | 9.706 | 13.06 | 104.00 | 1.389 | -8.857 | 1.678 | -12.7752 |
| 710 | 1300.0 | 9.089 | 12.706 | 10.715 | 12.278 | 9.703 | 12.84 | 106.06 | 1.263 - 9 | -8.899 | 1.500 -13 | -12.8239 |
| 720 | 1300.0 | 8.987 | 12.655 | 10.626 | 12.266 | 9.700 | 12.62 | 108.26 | 1.150 | -8.939 | 1.343 | -12.8721 |
| 730 | 1300.0 | 8.885 | 12.604 | 10.537 | 12.253 | 9.696 | 12.39 | 110.59 | 1.050 | -8.979 | 1.203 | -12.9198 |
| 740 | 1300.0 | 8.784 | 12.553 | 10.448 | 12.240 | 9.693 | 12.15 | 113.06 | 9.598 -10 | -9.018 | 1.079 | -12.9670 |
| 750 | 1300.0 | 8.683 | 12.503 | 10.360 | 12.228 | 9.690 | 11.91 | 115.69 | 8.794 | -9.056 | 9.688 -14 | -13.0138 |
| 760 | 1300.0 | 8.582 | 12.452 | 10.272 | 12.215 | 9.687 | 11.66 | 118.48 | 8.074 | -9.093 | 8.710 | -13.0600 |
| 770 | 1300.0 | 8.482 | 12.402 | 10.184 | 12.202 | 9.684 | 11.41 | 121.44 | 7.428 | -9.129 | 7.840 | -13.1057 |
| 780 | 1300.0 | 8.382 | 12.352 | 10.096 | 12.190 | 9.680 | 11.15 | 124.57 | 6.848 | -9.164 | 7.066 | -13.1508 |
| 790 | 1300.0 | 8.282 | 12.302 | 10.009 | 12.177 | 9.677 | 10.89 | 127.88 | 6.327 | -9.199 | 6.377 | -13.1954 |
| 800 | 1300.0 | 8.182 | 12.252 | 9.922 | 12.165 | 9.674 | 10.63 | 131.37 | 5.857 | -9.232 | 5.762 | -13.2394 |
| 820 | 1300.0 | 7.984 | 12.153 | 9.748 | 12.140 | 9.668 | 10.11 | 138.92 | 5.051 -10 | -9.297 | 4.725 -14 | -13.3256 |
| 840 | 1300.0 | 7.786 | 12.055 | 9.575 | 12.115 | 9.662 | 9.59 | 147.25 | 4.391 | -9.357 | 3.898 | -13.4092 |
| 860 | 1300.0 | 7.395 | 11.859 | 9.233 | 12.067 | 9.649 | 8.59 | 166.22 | 3.400 | -9.469 | 2.703 | -13.5681 |
| 900 | 1300.0 | 7.201 | 11.762 | 9.063 | 12.042 | 9.643 | 8.12 | 176.79 | 3.025 | -9.519 | 2.274 | -13.6432 |
| 920 | 1300.0 | 7.008 | 11.665 | 8.894 | 12.018 | 9.637 | 7.68 | 188.00 | 2.711 | -9.567 | 1.927 | -13.7152 |
| 940 | 1300.0 | 6.816 | 11.569 | 8.726 | 11.994 | 9.631 | 7.27 | 199.76 | 2.445 | -9.612 | 1.645 | -13.7839 |
| 960 | 1300.0 | 6.625 | 11.474 | 8.559 | 11.970 | 9.625 | 6.89 | 211.93 | 2.219 | -9.654 | 1.414 | -13.8495 |
| 980 | 1300.0 | 6.435 | 11.379 | 8.392 | 11.947 | 9.619 | 6.54 | 224.39 | 2.024 | -9.694 | 1.225 | -13.9117 |
| 1000 | 1300.0 | 6.247 | 11.285 | 8.227 | 11.923 | 9.613 | 6.23 | 236.99 | 1.856 | -9.731 | 1.070 | -13.9708 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1500° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 333.3 | 17.056 | 16.985 | 17.764 | 13.568 | | 27.12 | 10.82 | 3.639 - 5 | -4.439 | 3.561 - 8 | -7.4484 |
| 125 | 429.0 | 16.739 | 16.772 | 17.472 | 13.474 | | 26.81 | 14.10 | 2.432 | -4.614 | 1.828 | -7.7379 |
| 130 | 516.3 | 16.491 | 16.608 | 17.246 | 13.403 | | 26.54 | 17.17 | 1.765 | -4.753 | 1.092 | -7.9819 |
| 135 | 594.5 | 16.288 | 16.476 | 17.061 | 13.347 | | 26.30 | 19.99 | 1.349 | -4.870 | 7.174 - 9 | -8.1442 |
| 140 | 666.6 | 16.114 | 16.354 | 16.902 | 13.301 | | 26.06 | 22.65 | 1.067 | -4.972 | 5.015 | -8.2997 |
| 145 | 732.6 | 15.961 | 16.267 | 16.763 | 13.261 | | 25.84 | 25.15 | 8.651 - 6 | -5.063 | 3.670 | -8.4353 |
| 150 | 793.6 | 15.824 | 16.180 | 16.638 | 13.227 | | 25.63 | 27.51 | 7.154 | -5.145 | 2.779 | -8.5562 |
| 155 | 849.4 | 15.699 | 16.103 | 16.525 | 13.197 | | 25.42 | 29.73 | 6.008 - 6 | -5.221 | 2.162 - 9 | -8.6651 |
| 160 | 901.6 | 15.584 | 16.033 | 16.421 | 13.170 | | 25.22 | 31.86 | 5.107 | -5.292 | 1.718 | -8.7649 |
| 165 | 950.3 | 15.477 | 15.968 | 16.325 | 13.145 | | 25.02 | 33.89 | 4.386 | -5.358 | 1.389 | -8.8572 |
| 170 | 995.6 | 15.377 | 15.909 | 16.235 | 13.122 | | 24.83 | 35.84 | 3.800 | -5.420 | 1.140 | -8.9431 |
| 175 | 1037.7 | 15.282 | 15.852 | 16.150 | 13.102 | | 24.64 | 37.69 | 3.317 | -5.479 | 9.475 -10 | -9.0234 |
| 180 | 1077.0 | 15.193 | 15.799 | 16.070 | 13.083 | | 24.46 | 39.48 | 2.914 | -5.536 | 7.959 | -9.0991 |
| 185 | 1113.6 | 15.108 | 15.749 | 15.993 | 13.065 | | 24.28 | 41.19 | 2.574 | -5.589 | 6.750 | -9.1707 |
| 190 | 1147.8 | 15.026 | 15.702 | 15.920 | 13.048 | | 24.10 | 42.83 | 2.285 | -5.641 | 5.771 | -9.2387 |
| 195 | 1179.5 | 14.948 | 15.657 | 15.850 | 13.032 | | 23.92 | 44.41 | 2.038 | -5.691 | 4.971 | -9.3035 |
| 200 | 1209.2 | 14.873 | 15.614 | 15.783 | 13.018 | | 23.75 | 45.93 | 1.824 | -5.739 | 4.309 | -9.3656 |
| 205 | 1236.7 | 14.800 | 15.572 | 15.718 | 13.004 | | 23.58 | 47.39 | 1.639 - 6 | -5.785 | 3.758 -10 | -9.4251 |
| 210 | 1262.2 | 14.730 | 15.533 | 15.655 | 12.991 | | 23.41 | 48.79 | 1.477 | -5.831 | 3.295 | -9.4822 |
| 215 | 1286.2 | 14.661 | 15.494 | 15.594 | 12.978 | | 23.24 | 50.15 | 1.335 | -5.874 | 2.901 | -9.5374 |
| 220 | 1308.5 | 14.595 | 15.457 | 15.535 | 12.966 | | 23.07 | 51.47 | 1.210 | -5.917 | 2.566 | -9.5907 |
| 225 | 1329.7 | 14.530 | 15.421 | 15.477 | 12.954 | | 22.91 | 52.76 | 1.099 | -5.959 | 2.278 | -9.6424 |
| 230 | 1349.7 | 14.466 | 15.386 | 15.421 | 12.943 | | 22.75 | 54.01 | 1.001 | -6.000 | 2.029 | -9.6927 |
| 235 | 1368.6 | 14.404 | 15.352 | 15.366 | 12.932 | | 22.59 | 55.24 | 9.135 - 7 | -6.039 | 1.813 | -9.7415 |
| 240 | 1386.4 | 14.343 | 15.319 | 15.312 | 12.922 | | 22.43 | 56.44 | 8.353 | -6.078 | 1.625 | -9.7891 |
| 245 | 1403.6 | 14.283 | 15.286 | 15.259 | 12.912 | | 22.27 | 57.62 | 7.652 | -6.116 | 1.460 | -9.8355 |
| 250 | 1420.0 | 14.224 | 15.255 | 15.207 | 12.902 | | 22.12 | 58.79 | 7.022 | -6.154 | 1.316 | -9.8808 |
| 255 | 1427.3 | 14.169 | 15.226 | 15.158 | 12.894 | | 21.97 | 59.61 | 6.454 - 7 | -6.190 | 1.194 -10 | -9.9229 |
| 260 | 1434.6 | 14.114 | 15.197 | 15.109 | 12.886 | | 21.82 | 60.41 | 5.938 | -6.226 | 1.086 | -9.9642 |
| 265 | 1441.1 | 14.059 | 15.169 | 15.061 | 12.878 | | 21.67 | 61.19 | 5.469 | -6.262 | 9.890 -11 | -10.0048 |
| 270 | 1446.9 | 14.005 | 15.141 | 15.014 | 12.871 | | 21.52 | 61.95 | 5.043 | -6.297 | 9.021 | -10.0448 |
| 275 | 1452.0 | 13.952 | 15.113 | 14.967 | 12.863 | | 21.37 | 62.69 | 4.654 | -6.332 | 8.239 | -10.0841 |
| 280 | 1456.7 | 13.899 | 15.086 | 14.920 | 12.856 | | 21.23 | 63.42 | 4.299 | -6.367 | 7.535 | -10.1229 |
| 285 | 1460.9 | 13.846 | 15.059 | 14.874 | 12.849 | | 21.08 | 64.13 | 3.975 | -6.401 | 6.900 | -10.1612 |
| 290 | 1464.7 | 13.794 | 15.032 | 14.828 | 12.841 | | 20.94 | 64.83 | 3.678 | -6.434 | 6.326 | -10.1989 |
| 295 | 1468.1 | 13.741 | 15.006 | 14.782 | 12.834 | | 20.80 | 65.52 | 3.407 | -6.468 | 5.806 | -10.2361 |
| 300 | 1471.2 | 13.690 | 14.979 | 14.737 | 12.828 | | 20.66 | 66.19 | 3.158 | -6.501 | 5.334 | -10.2729 |
| 310 | 1476.6 | 13.587 | 14.927 | 14.646 | 12.814 | | 20.39 | 67.52 | 2.719 - 7 | -6.566 | 4.517 -11 | -10.3452 |
| 320 | 1480.9 | 13.485 | 14.876 | 14.557 | 12.800 | | 20.13 | 68.81 | 2.348 | -6.629 | 3.839 | -10.4158 |
| 330 | 1484.4 | 13.384 | 14.825 | 14.468 | 12.787 | | 19.88 | 70.06 | 2.033 | -6.692 | 3.274 | -10.4849 |
| 340 | 1487.3 | 13.283 | 14.774 | 14.380 | 12.774 | | 19.63 | 71.29 | 1.765 | -6.753 | 2.802 | -10.5526 |
| 350 | 1489.7 | 13.184 | 14.724 | 14.293 | 12.762 | | 19.39 | 72.50 | 1.536 | -6.814 | 2.404 | -10.6190 |
| 360 | 1491.6 | 13.084 | 14.674 | 14.206 | 12.749 | | 19.16 | 73.68 | 1.339 | -6.873 | 2.070 | -10.6841 |
| 370 | 1493.1 | 12.986 | 14.624 | 14.120 | 12.736 | | 18.94 | 74.83 | 1.171 | -6.932 | 1.786 | -10.7481 |
| 380 | 1494.4 | 12.888 | 14.575 | 14.034 | 12.724 | | 18.73 | 75.97 | 1.025 | -6.989 | 1.546 | -10.8109 |
| 390 | 1495.4 | 12.790 | 14.526 | 13.948 | 12.711 | | 18.53 | 77.08 | 8.996 - 8 | -7.046 | 1.341 | -10.8727 |
| 400 | 1496.3 | 12.692 | 14.477 | 13.863 | 12.699 | | 18.34 | 78.17 | 7.908 | -7.102 | 1.166 | -10.9334 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log n($O_2$) | log n(O) | log n($N_2$) | log n(He) | log n(H) | | | | | | |
| 410 | 1497.0 | 12.595 | 14.429 | 13.778 | 12.687 | | 18.15 | 79.24 | 6.965 - 8 | -7.157 | 1.016 -11 | -10.9932 |
| 420 | 1497.5 | 12.499 | 14.380 | 13.693 | 12.675 | | 17.97 | 80.29 | 6.144 | -7.212 | 8.869 -12 | -11.0521 |
| 430 | 1498.0 | 12.403 | 14.332 | 13.609 | 12.663 | | 17.80 | 81.32 | 5.429 | -7.265 | 7.760 | -11.1101 |
| 440 | 1498.4 | 12.307 | 14.284 | 13.525 | 12.651 | | 17.64 | 82.33 | 4.804 | -7.318 | 6.803 | -11.1673 |
| 450 | 1498.7 | 12.211 | 14.236 | 13.441 | 12.639 | | 17.48 | 83.33 | 4.258 | -7.371 | 5.975 | -11.2237 |
| 460 | 1498.9 | 12.116 | 14.188 | 13.358 | 12.627 | | 17.33 | 84.31 | 3.779 | -7.423 | 5.257 | -11.2793 |
| 470 | 1499.1 | 12.021 | 14.141 | 13.274 | 12.615 | | 17.19 | 85.27 | 3.359 | -7.474 | 4.632 | -11.3342 |
| 480 | 1499.3 | 11.926 | 14.093 | 13.192 | 12.603 | | 17.05 | 86.22 | 2.989 | -7.524 | 4.089 | -11.3884 |
| 490 | 1499.4 | 11.832 | 14.046 | 13.109 | 12.591 | | 16.92 | 87.16 | 2.663 | -7.575 | 3.615 | -11.4419 |
| 500 | 1499.5 | 11.737 | 13.999 | 13.027 | 12.579 | 9.474 | 16.79 | 88.09 | 2.376 | -7.624 | 3.200 | -11.4948 |
| 510 | 1499.6 | 11.644 | 13.952 | 12.944 | 12.567 | 9.471 | 16.67 | 89.02 | 2.122 - 8 | -7.673 | 2.837 -12 | -11.5471 |
| 520 | 1499.7 | 11.550 | 13.905 | 12.862 | 12.556 | 9.468 | 16.55 | 89.94 | 1.898 | -7.722 | 2.518 | -11.5989 |
| 530 | 1499.7 | 11.457 | 13.859 | 12.781 | 12.544 | 9.465 | 16.43 | 90.85 | 1.699 | -7.770 | 2.239 | -11.6503 |
| 540 | 1499.8 | 11.364 | 13.812 | 12.699 | 12.532 | 9.462 | 16.31 | 91.77 | 1.523 | -7.817 | 1.992 | -11.7007 |
| 550 | 1499.8 | 11.271 | 13.766 | 12.618 | 12.521 | 9.459 | 16.20 | 92.68 | 1.366 | -7.864 | 1.775 | -11.7508 |
| 560 | 1499.9 | 11.179 | 13.720 | 12.537 | 12.509 | 9.456 | 16.08 | 93.60 | 1.227 | -7.911 | 1.583 | -11.8005 |
| 570 | 1499.9 | 11.086 | 13.674 | 12.457 | 12.498 | 9.454 | 15.97 | 94.53 | 1.104 | -7.957 | 1.413 | -11.8497 |
| 580 | 1499.9 | 10.994 | 13.628 | 12.376 | 12.486 | 9.451 | 15.86 | 95.48 | 9.933 - 9 | -8.003 | 1.263 | -11.8985 |
| 590 | 1499.9 | 10.903 | 13.582 | 12.296 | 12.475 | 9.448 | 15.75 | 96.43 | 8.950 | -8.048 | 1.130 | -11.9468 |
| 600 | 1499.9 | 10.811 | 13.536 | 12.216 | 12.463 | 9.445 | 15.64 | 97.40 | 8.073 | -8.093 | 1.012 | -11.9947 |
| 610 | 1499.9 | 10.720 | 13.491 | 12.136 | 12.452 | 9.442 | 15.52 | 98.39 | 7.289 - 9 | -8.137 | 9.073 -13 | -12.0422 |
| 620 | 1500.0 | 10.629 | 13.445 | 12.057 | 12.441 | 9.439 | 15.41 | 99.41 | 6.588 | -8.181 | 8.140 | -12.0894 |
| 630 | 1500.0 | 10.539 | 13.400 | 11.977 | 12.429 | 9.436 | 15.29 | 100.45 | 5.960 | -8.225 | 7.309 | -12.1361 |
| 640 | 1500.0 | 10.449 | 13.355 | 11.898 | 12.418 | 9.433 | 15.17 | 101.53 | 5.398 | -8.268 | 6.569 | -12.1825 |
| 650 | 1500.0 | 10.358 | 13.310 | 11.819 | 12.407 | 9.431 | 15.05 | 102.64 | 4.895 | -8.310 | 5.908 | -12.2285 |
| 660 | 1500.0 | 10.269 | 13.265 | 11.741 | 12.395 | 9.428 | 14.93 | 103.79 | 4.443 | -8.352 | 5.318 | -12.2742 |
| 670 | 1500.0 | 10.179 | 13.220 | 11.662 | 12.384 | 9.425 | 14.80 | 104.98 | 4.037 | -8.394 | 4.791 | -12.3195 |
| 680 | 1500.0 | 10.090 | 13.175 | 11.584 | 12.373 | 9.422 | 14.67 | 106.22 | 3.672 | -8.435 | 4.320 | -12.3645 |
| 690 | 1500.0 | 10.001 | 13.131 | 11.506 | 12.362 | 9.419 | 14.54 | 107.51 | 3.344 | -8.476 | 3.898 | -12.4092 |
| 700 | 1500.0 | 9.912 | 13.086 | 11.428 | 12.351 | 9.417 | 14.40 | 108.86 | 3.049 | -8.516 | 3.519 | -12.4535 |
| 710 | 1500.0 | 9.823 | 13.042 | 11.351 | 12.340 | 9.414 | 14.25 | 110.27 | 2.783 - 9 | -8.556 | 3.180 -13 | -12.4975 |
| 720 | 1500.0 | 9.735 | 12.998 | 11.274 | 12.329 | 9.411 | 14.10 | 111.74 | 2.543 | -8.595 | 2.876 | -12.5412 |
| 730 | 1500.0 | 9.647 | 12.954 | 11.197 | 12.318 | 9.408 | 13.95 | 113.29 | 2.327 | -8.633 | 2.603 | -12.5845 |
| 740 | 1500.0 | 9.559 | 12.910 | 11.120 | 12.307 | 9.405 | 13.79 | 114.91 | 2.132 | -8.671 | 2.358 | -12.6275 |
| 750 | 1500.0 | 9.472 | 12.866 | 11.043 | 12.296 | 9.403 | 13.63 | 116.62 | 1.955 | -8.709 | 2.137 | -12.6702 |
| 760 | 1500.0 | 9.384 | 12.823 | 10.967 | 12.285 | 9.400 | 13.46 | 118.41 | 1.796 | -8.746 | 1.938 | -12.7126 |
| 770 | 1500.0 | 9.297 | 12.779 | 10.890 | 12.274 | 9.397 | 13.29 | 120.29 | 1.651 | -8.782 | 1.760 | -12.7546 |
| 780 | 1500.0 | 9.211 | 12.736 | 10.814 | 12.263 | 9.394 | 13.11 | 122.27 | 1.521 | -8.818 | 1.599 | -12.7963 |
| 790 | 1500.0 | 9.124 | 12.692 | 10.739 | 12.252 | 9.392 | 12.93 | 124.35 | 1.402 | -8.853 | 1.453 | -12.8376 |
| 800 | 1500.0 | 9.038 | 12.649 | 10.663 | 12.241 | 9.389 | 12.74 | 126.54 | 1.295 | -8.888 | 1.322 | -12.8786 |
| 820 | 1500.0 | 8.866 | 12.563 | 10.512 | 12.220 | 9.384 | 12.35 | 131.26 | 1.109 - 9 | -8.955 | 1.098 -13 | -12.9595 |
| 840 | 1500.0 | 8.695 | 12.478 | 10.363 | 12.199 | 9.378 | 11.94 | 136.49 | 9.546 -10 | -9.020 | 9.142 -14 | -13.0390 |
| 860 | 1500.0 | 8.526 | 12.393 | 10.216 | 12.178 | 9.373 | 11.52 | 142.29 | 8.207 | -9.086 | 7.859 | -13.1048 |
| 880 | 1500.0 | 8.356 | 12.308 | 10.066 | 12.156 | 9.368 | 11.09 | 148.59 | 7.207 | -9.142 | 6.410 | -13.1932 |
| 900 | 1500.0 | 8.187 | 12.224 | 9.919 | 12.135 | 9.362 | 10.65 | 155.55 | 6.318 | -9.199 | 5.398 | -13.2678 |
| 920 | 1500.0 | 8.020 | 12.141 | 9.772 | 12.114 | 9.357 | 10.22 | 163.14 | 5.572 | -9.254 | 4.564 | -13.3406 |
| 940 | 1500.0 | 7.854 | 12.057 | 9.627 | 12.093 | 9.352 | 9.78 | 171.38 | 4.944 | -9.306 | 3.876 | -13.4116 |
| 960 | 1500.0 | 7.688 | 11.975 | 9.482 | 12.073 | 9.346 | 9.35 | 180.29 | 4.412 | -9.355 | 3.306 | -13.4807 |
| 980 | 1500.0 | 7.524 | 11.892 | 9.338 | 12.052 | 9.341 | 8.92 | 189.85 | 3.960 | -9.402 | 2.833 | -13.5477 |
| 1000 | 1500.0 | 7.360 | 11.811 | 9.195 | 12.032 | 9.336 | 8.52 | 200.04 | 3.574 | -9.447 | 2.440 | -13.6126 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 333.7 | 17.056 | 16.985 | 17.764 | 13.567 | | 27.12 | 10.83 | 3.643 - 5 | -4.438 | 3.561 - 8 | -7.4484 |
| 125 | 430.4 | 16.738 | 16.771 | 17.472 | 13.473 | | 26.82 | 14.15 | 2.437 | -4.613 | 1.826 | -7.7385 |
| 130 | 519.6 | 16.491 | 16.606 | 17.245 | 13.401 | | 26.55 | 17.28 | 1.771 | -4.752 | 1.089 | -7.9631 |
| 135 | 600.8 | 16.287 | 16.473 | 17.059 | 13.345 | | 26.30 | 20.20 | 1.356 | -4.868 | 7.141 - 9 | -8.1463 |
| 140 | 676.5 | 16.112 | 16.360 | 16.899 | 13.297 | | 26.07 | 22.98 | 1.076 | -4.968 | 4.985 | -8.3023 |
| 145 | 746.5 | 15.959 | 16.262 | 14.760 | 13.257 | | 25.85 | 25.61 | 8.755 - 6 | -5.058 | 3.647 | -8.4381 |
| 150 | 812.2 | 15.822 | 16.175 | 16.636 | 13.222 | | 25.64 | 28.14 | 7.268 | -5.139 | 2.760 | -8.5591 |
| 155 | 873.2 | 15.698 | 16.097 | 16.523 | 13.191 | | 25.44 | 30.53 | 6.129 - 6 | -5.213 | 2.148 - 9 | -8.6680 |
| 160 | 930.9 | 15.584 | 16.026 | 16.419 | 13.163 | | 25.25 | 32.85 | 5.234 | -5.281 | 1.707 | -8.7677 |
| 165 | 985.4 | 15.478 | 15.961 | 16.323 | 13.137 | | 25.06 | 35.09 | 4.518 | -5.345 | 1.382 | -8.8595 |
| 170 | 1036.8 | 15.379 | 15.900 | 16.234 | 13.114 | | 24.88 | 37.25 | 3.934 | -5.405 | 1.135 | -8.9449 |
| 175 | 1085.0 | 15.286 | 15.844 | 16.150 | 13.092 | | 24.70 | 39.32 | 3.453 | -5.462 | 9.453 -10 | -9.0244 |
| 180 | 1130.6 | 15.198 | 15.791 | 16.071 | 13.073 | | 24.52 | 41.33 | 3.050 | -5.516 | 7.957 | -9.0992 |
| 185 | 1173.3 | 15.115 | 15.741 | 15.996 | 13.054 | | 24.35 | 43.26 | 2.710 | -5.567 | 6.765 | -9.1697 |
| 190 | 1213.7 | 15.035 | 15.694 | 15.925 | 13.037 | | 24.18 | 45.13 | 2.420 | -5.616 | 5.800 | -9.2366 |
| 195 | 1251.8 | 14.959 | 15.649 | 15.856 | 13.021 | | 24.02 | 46.94 | 2.171 | -5.663 | 5.010 | -9.3001 |
| 200 | 1287.8 | 14.886 | 15.607 | 15.791 | 13.006 | | 23.86 | 48.69 | 1.956 | -5.709 | 4.357 | -9.3608 |
| 205 | 1321.6 | 14.816 | 15.566 | 15.728 | 12.991 | | 23.70 | 50.39 | 1.768 - 6 | -5.753 | 3.812 -10 | -9.4188 |
| 210 | 1353.3 | 14.748 | 15.527 | 15.667 | 12.978 | | 23.54 | 52.02 | 1.603 | -5.795 | 3.354 | -9.4744 |
| 215 | 1383.2 | 14.682 | 15.489 | 15.609 | 12.965 | | 23.38 | 53.60 | 1.459 | -5.836 | 2.966 | -9.5279 |
| 220 | 1411.2 | 14.619 | 15.453 | 15.552 | 12.952 | | 23.23 | 55.13 | 1.330 | -5.876 | 2.634 | -9.5794 |
| 225 | 1437.7 | 14.557 | 15.418 | 15.497 | 12.941 | | 23.08 | 56.62 | 1.217 | -5.915 | 2.349 | -9.6292 |
| 230 | 1462.7 | 14.497 | 15.384 | 15.443 | 12.930 | | 22.93 | 58.07 | 1.115 | -5.953 | 2.102 | -9.6773 |
| 235 | 1486.5 | 14.438 | 15.352 | 15.391 | 12.919 | | 22.78 | 59.48 | 1.024 | -5.990 | 1.888 | -9.7240 |
| 240 | 1509.1 | 14.381 | 15.320 | 15.340 | 12.908 | | 22.64 | 60.86 | 9.424 - 7 | -6.026 | 1.700 | -9.7694 |
| 245 | 1530.8 | 14.324 | 15.288 | 15.290 | 12.898 | | 22.50 | 62.27 | 8.689 | -6.061 | 1.535 | -9.8139 |
| 250 | 1554.1 | 14.269 | 15.257 | 15.240 | 12.886 | | 22.36 | 63.67 | 8.026 | -6.095 | 1.389 | -9.8574 |
| 255 | 1572.3 | 14.215 | 15.228 | 15.193 | 12.879 | | 22.22 | 64.91 | 7.426 - 7 | -6.129 | 1.262 -10 | -9.8989 |
| 260 | 1588.0 | 14.164 | 15.201 | 15.148 | 12.871 | | 22.08 | 65.86 | 6.879 | -6.162 | 1.154 | -9.9378 |
| 265 | 1592.8 | 14.114 | 15.175 | 15.104 | 12.863 | | 21.94 | 66.78 | 6.380 | -6.195 | 1.057 | -9.9759 |
| 270 | 1601.7 | 14.064 | 15.148 | 15.060 | 12.854 | | 21.81 | 67.67 | 5.923 | -6.227 | 9.699 -11 | -10.0133 |
| 275 | 1609.9 | 14.015 | 15.123 | 15.017 | 12.849 | | 21.67 | 68.54 | 5.503 | -6.259 | 8.912 | -10.0500 |
| 280 | 1617.4 | 13.967 | 15.097 | 14.974 | 12.842 | | 21.54 | 69.39 | 5.118 | -6.291 | 8.199 | -10.0862 |
| 285 | 1624.3 | 13.918 | 15.072 | 14.931 | 12.835 | | 21.41 | .21 | 4.765 | -6.322 | 7.554 | -10.1218 |
| 290 | 1630.7 | 13.871 | 15.048 | 14.889 | 12.828 | | 21.28 | .02 | 4.439 | -6.353 | 6.968 | -10.1572 |
| 295 | 1636.4 | 13.823 | 15.023 | 14.848 | 12.821 | | 21.15 | ..82 | 4.139 | -6.383 | 6.435 | -10.1915 |
| 300 | 1641.8 | 13.776 | 14.999 | 14.806 | 12.815 | | 21.03 | 72.59 | 3.862 | -6.413 | 5.949 | -10.2255 |
| 310 | 1651.1 | 13.683 | 14.951 | 14.724 | 12.802 | | 20.78 | 74.10 | 3.370 - 7 | -6.472 | 5.101 -11 | -10.2924 |
| 320 | 1658.9 | 13.591 | 14.904 | 14.644 | 12.789 | | 20.53 | 75.56 | 2.948 | -6.530 | 4.390 | -10.3576 |
| 330 | 1665.5 | 13.500 | 14.858 | 14.564 | 12.777 | | 20.30 | 76.98 | 2.586 | -6.587 | 3.791 | -10.4213 |
| 340 | 1671.0 | 13.410 | 14.812 | 14.485 | 12.765 | | 20.07 | 78.35 | 2.274 | -6.643 | 3.284 | -10.4836 |
| 350 | 1675.6 | 13.321 | 14.767 | 14.406 | 12.753 | | 19.84 | 79.69 | 2.003 | -6.698 | 2.854 | -10.5446 |
| 360 | 1679.5 | 13.232 | 14.722 | 14.329 | 12.742 | | 19.63 | 81.00 | 1.769 | -6.752 | 2.486 | -10.6044 |
| 370 | 1682.8 | 13.144 | 14.678 | 14.251 | 12.730 | | 19.42 | 82.28 | 1.565 | -6.805 | 2.172 | -10.6632 |
| 380 | 1685.6 | 13.057 | 14.633 | 14.175 | 12.719 | | 19.21 | 83.54 | 1.387 | -6.858 | 1.902 | -10.7208 |
| 390 | 1687.9 | 12.970 | 14.590 | 14.099 | 12.708 | | 19.02 | 84.77 | 1.232 | -6.909 | 1.669 | -10.7775 |
| 400 | 1689.8 | 12.883 | 14.546 | 14.023 | 12.697 | | 18.83 | 85.97 | 1.096 | -6.960 | 1.468 | -10.8332 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1691.4 | 12.797 | 14.503 | 13.947 | 12.686 | | 18.65 | 87.15 | 9.761 - 8 | -7.010 | 1.294 -11 | -10.8880 |
| 420 | 1692.8 | 12.711 | 14.460 | 13.872 | 12.675 | | 18.47 | 88.31 | 8.710 | -7.060 | 1.143 | -10.9420 |
| 430 | 1694.0 | 12.626 | 14.417 | 13.797 | 12.664 | | 18.30 | 89.45 | 7.783 | -7.109 | 1.011 | -10.9951 |
| 440 | 1694.9 | 12.541 | 14.374 | 13.723 | 12.653 | | 18.14 | 90.57 | 6.965 | -7.157 | 8.964 -12 | -11.0475 |
| 450 | 1695.7 | 12.456 | 14.332 | 13.649 | 12.642 | | 17.98 | 91.68 | 6.241 | -7.205 | 7.959 | -11.0991 |
| 460 | 1696.4 | 12.372 | 14.290 | 13.575 | 12.632 | | 17.83 | 92.76 | 5.599 | -7.252 | 7.079 | -11.1500 |
| 470 | 1697.0 | 12.288 | 14.248 | 13.501 | 12.621 | | 17.69 | 93.83 | 5.030 | -7.298 | 6.305 | -11.2003 |
| 480 | 1697.5 | 12.204 | 14.206 | 13.428 | 12.611 | | 17.55 | 94.88 | 4.524 | -7.344 | 5.625 | -11.2499 |
| 490 | 1697.9 | 12.121 | 14.164 | 13.355 | 12.600 | | 17.41 | 95.91 | 4.074 | -7.390 | 5.025 | -11.2989 |
| 500 | 1698.2 | 12.038 | 14.122 | 13.282 | 12.590 | 9.249 | 17.28 | 96.94 | 3.673 | -7.435 | 4.495 | -11.3472 |
| 510 | 1698.5 | 11.955 | 14.081 | 13.210 | 12.579 | 9.246 | 17.16 | 97.94 | 3.315 - 8 | -7.480 | 4.027 -12 | -11.3950 |
| 520 | 1698.7 | 11.872 | 14.039 | 13.137 | 12.569 | 9.244 | 17.04 | 98.94 | 2.994 | -7.524 | 3.612 | -11.4423 |
| 530 | 1698.9 | 11.790 | 13.998 | 13.065 | 12.559 | 9.241 | 16.92 | 99.93 | 2.708 | -7.567 | 3.243 | -11.4890 |
| 540 | 1699.1 | 11.708 | 13.957 | 12.993 | 12.548 | 9.238 | 16.80 | 100.91 | 2.451 | -7.611 | 2.916 | -11.5353 |
| 550 | 1699.3 | 11.626 | 13.916 | 12.922 | 12.538 | 9.236 | 16.69 | 101.85 | 2.221 | -7.653 | 2.624 | -11.5810 |
| 560 | 1699.4 | 11.544 | 13.875 | 12.850 | 12.528 | 9.233 | 16.58 | 102.86 | 2.014 | -7.696 | 2.364 | -11.6263 |
| 570 | 1699.5 | 11.463 | 13.835 | 12.779 | 12.518 | 9.231 | 16.48 | 103.82 | 1.829 | -7.738 | 2.133 | -11.6711 |
| 580 | 1699.6 | 11.382 | 13.794 | 12.708 | 12.508 | 9.228 | 16.37 | 104.79 | 1.661 | -7.780 | 1.925 | -11.7155 |
| 590 | 1699.6 | 11.301 | 13.754 | 12.637 | 12.497 | 9.225 | 16.27 | 105.76 | 1.511 | -7.821 | 1.740 | -11.7595 |
| 600 | 1699.7 | 11.220 | 13.713 | 12.566 | 12.487 | 9.223 | 16.17 | 106.73 | 1.375 | -7.862 | 1.574 | -11.8031 |
| 610 | 1699.7 | 11.140 | 13.673 | 12.496 | 12.477 | 9.220 | 16.07 | 107.70 | 1.253 - 8 | -7.902 | 1.425 -12 | -11.8463 |
| 620 | 1699.8 | 11.059 | 13.633 | 12.426 | 12.467 | 9.218 | 15.97 | 108.69 | 1.142 | -7.942 | 1.291 | -11.8892 |
| 630 | 1699.8 | 10.980 | 13.593 | 12.356 | 12.457 | 9.215 | 15.87 | 109.68 | 1.042 | -7.982 | 1.170 | -11.9316 |
| 640 | 1699.8 | 10.900 | 13.553 | 12.286 | 12.447 | 9.213 | 15.77 | 110.69 | 9.517 - 9 | -8.021 | 1.062 | -11.9738 |
| 650 | 1699.9 | 10.820 | 13.513 | 12.217 | 12.437 | 9.210 | 15.67 | 111.71 | 8.699 | -8.061 | 9.648 -13 | -12.0156 |
| 660 | 1699.9 | 10.741 | 13.474 | 12.147 | 12.427 | 9.208 | 15.58 | 112.74 | 7.957 | -8.099 | 8.769 | -12.0570 |
| 670 | 1699.9 | 10.662 | 13.434 | 12.078 | 12.418 | 9.205 | 15.47 | 113.80 | 7.285 | -8.138 | 7.976 | -12.0982 |
| 680 | 1699.9 | 10.583 | 13.395 | 12.009 | 12.408 | 9.203 | 15.37 | 114.88 | 6.675 | -8.176 | 7.260 | -12.1391 |
| 690 | 1699.9 | 10.505 | 13.356 | 11.940 | 12.398 | 9.200 | 15.27 | 115.99 | 6.121 | -8.213 | 6.613 | -12.1796 |
| 700 | 1699.9 | 10.426 | 13.316 | 11.872 | 12.388 | 9.198 | 15.17 | 117.12 | 5.618 | -8.250 | 6.027 | -12.2199 |
| 710 | 1700.0 | 10.348 | 13.277 | 11.803 | 12.378 | 9.195 | 15.06 | 118.29 | 5.160 - 9 | -8.287 | 5.498 -13 | -12.2598 |
| 720 | 1700.0 | 10.270 | 13.238 | 11.735 | 12.369 | 9.193 | 14.95 | 119.49 | 4.744 | -8.324 | 5.017 | -12.2995 |
| 730 | 1700.0 | 10.193 | 13.200 | 11.667 | 12.359 | 9.190 | 14.84 | 120.72 | 4.365 | -8.360 | 4.582 | -12.3389 |
| 740 | 1700.0 | 10.115 | 13.161 | 11.599 | 12.349 | 9.188 | 14.72 | 122.00 | 4.020 | -8.396 | 4.187 | -12.3781 |
| 750 | 1700.0 | 10.038 | 13.122 | 11.531 | 12.339 | 9.186 | 14.61 | 123.32 | 3.705 | -8.431 | 3.829 | -12.4169 |
| 760 | 1700.0 | 9.961 | 13.084 | 11.464 | 12.330 | 9.183 | 14.49 | 124.69 | 3.418 | -8.466 | 3.503 | -12.4555 |
| 770 | 1700.0 | 9.884 | 13.045 | 11.397 | 12.320 | 9.181 | 14.36 | 126.11 | 3.156 | -8.501 | 3.207 | -12.4939 |
| 780 | 1700.0 | 9.807 | 13.007 | 11.330 | 12.311 | 9.178 | 14.24 | 127.59 | 2.917 | -8.535 | 2.938 | -12.5319 |
| 790 | 1700.0 | 9.731 | 12.969 | 11.263 | 12.301 | 9.176 | 14.11 | 129.12 | 2.698 | -8.569 | 2.693 | -12.5697 |
| 800 | 1700.0 | 9.655 | 12.931 | 11.196 | 12.292 | 9.173 | 13.98 | 130.71 | 2.498 | -8.602 | 2.470 | -12.6073 |
| 820 | 1700.0 | 9.503 | 12.855 | 11.063 | 12.273 | 9.169 | 13.70 | 134.10 | 2.148 - 9 | -8.668 | 2.082 -13 | -12.6816 |
| 840 | 1700.0 | 9.352 | 12.779 | 10.931 | 12.254 | 9.164 | 13.41 | 137.79 | 1.854 | -8.732 | 1.759 | -12.7548 |
| 860 | 1700.0 | 9.053 | 12.630 | 10.669 | 12.216 | 9.155 | 12.78 | 146.16 | 1.398 | -8.854 | 1.264 | -12.8981 |
| 900 | 1700.0 | 8.905 | 12.556 | 10.539 | 12.198 | 9.150 | 12.45 | 150.92 | 1.222 | -8.913 | 1.076 | -12.9681 |
| 920 | 1700.0 | 8.757 | 12.482 | 10.410 | 12.179 | 9.145 | 12.10 | 156.10 | 1.073 | -8.970 | 9.183 -14 | -13.0370 |
| 940 | 1700.0 | 8.610 | 12.408 | 10.282 | 12.161 | 9.141 | 11.74 | 161.74 | 9.458 -10 | -9.024 | 7.857 | -13.1047 |
| 960 | 1700.0 | 8.464 | 12.335 | 10.154 | 12.143 | 9.136 | 11.38 | 167.86 | 8.377 | -9.077 | 6.742 | -13.1712 |
| 980 | 1700.0 | 8.319 | 12.263 | 10.027 | 12.124 | 9.131 | 11.00 | 174.49 | 7.453 | -9.128 | 5.802 | -13.2364 |
| 1000 | 1700.0 | 8.175 | 12.191 | 9.901 | 12.106 | 9.127 | 10.63 | 181.66 | 6.661 | -9.176 | 5.008 | -13.3003 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 1900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ log $n(O_2)$ | log $n$(O) | log $n(N_2)$ | log $n$(He) | log $n$(H) | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | 333.4 | 17.056 | 16.985 | 17.764 | 13.568 | | 27.12 | 10.82 | 3.644 - 5 | -4.438 | 3.565 - 8 | -7.4480 |
| 125 | 429.8 | 16.739 | 16.771 | 17.472 | 13.473 | | 26.82 | 14.13 | 2.436 | -4.613 | 1.328 | -7.7381 |
| 130 | 519.5 | 16.490 | 16.606 | 17.244 | 13.401 | | 26.55 | 17.28 | 1.770 | -4.752 | 1.088 | -7.9634 |
| 135 | 602.2 | 16.286 | 16.471 | 17.057 | 13.344 | | 26.30 | 20.25 | 1.356 | -4.868 | 7.121 - 9 | -8.1475 |
| 140 | 680.2 | 16.110 | 16.357 | 16.897 | 13.296 | | 26.07 | 23.10 | 1.076 | -4.968 | 4.961 | -8.3045 |
| 145 | 753.3 | 15.956 | 16.258 | 16.757 | 13.255 | | 25.86 | 25.84 | 8.771 - 6 | -5.057 | 3.621 | -8.4412 |
| 150 | 822.6 | 15.819 | 16.170 | 16.632 | 13.219 | | 25.65 | 28.49 | 7.296 | -5.137 | 2.736 | -8.5629 |
| 155 | 888.1 | 15.696 | 16.091 | 16.519 | 13.187 | | 25.45 | 31.04 | 6.167 - 6 | -5.210 | 2.126 - 9 | -8.6725 |
| 160 | 950.3 | 15.580 | 16.019 | 16.415 | 13.158 | | 25.26 | 33.52 | 5.282 | -5.277 | 1.689 | -8.7724 |
| 165 | 1009.3 | 15.474 | 15.953 | 16.319 | 13.132 | | 25.08 | 35.92 | 4.574 | -5.340 | 1.367 | -8.8643 |
| 170 | 1065.6 | 15.376 | 15.892 | 16.230 | 13.108 | | 24.90 | 38.25 | 3.997 | -5.398 | 1.123 | -8.9495 |
| 175 | 1119.4 | 15.283 | 15.835 | 16.146 | 13.085 | | 24.73 | 40.53 | 3.520 | -5.453 | 9.352 -10 | -9.0291 |
| 180 | 1170.7 | 15.196 | 15.782 | 16.067 | 13.065 | | 24.56 | 42.74 | 3.122 | -5.506 | 7.876 | -9.1037 |
| 185 | 1219.5 | 15.113 | 15.732 | 15.993 | 13.046 | | 24.39 | 44.89 | 2.785 | -5.555 | 6.700 | -9.1739 |
| 190 | 1265.9 | 15.035 | 15.685 | 15.922 | 13.028 | | 24.23 | 46.98 | 2.498 | -5.602 | 5.751 | -9.2403 |
| 195 | 1309.9 | 14.960 | 15.640 | 15.855 | 13.011 | | 24.07 | 49.00 | 2.251 | -5.648 | 4.975 | -9.3032 |
| 200 | 1351.8 | 14.889 | 15.597 | 15.791 | 12.996 | | 23.92 | 50.98 | 2.037 | -5.691 | 4.334 | -9.3631 |
| 205 | 1391.7 | 14.820 | 15.556 | 15.729 | 12.981 | | 23.77 | 52.89 | 1.850 - 6 | -5.733 | 3.799 -10 | -9.4203 |
| 210 | 1429.5 | 14.754 | 15.518 | 15.670 | 12.967 | | 23.62 | 54.76 | 1.686 | -5.773 | 3.350 | -9.4750 |
| 215 | 1465.4 | 14.690 | 15.480 | 15.612 | 12.953 | | 23.47 | 56.57 | 1.541 | -5.812 | 2.969 | -9.5275 |
| 220 | 1499.3 | 14.628 | 15.445 | 15.557 | 12.941 | | 23.33 | 58.32 | 1.412 | -5.850 | 2.643 | -9.5779 |
| 225 | 1531.8 | 14.568 | 15.410 | 15.504 | 12.929 | | 23.19 | 60.04 | 1.298 | -5.887 | 2.363 | -9.6265 |
| 230 | 1562.7 | 14.510 | 15.377 | 15.452 | 12.917 | | 23.05 | 61.71 | 1.196 | -5.922 | 2.121 | -9.6734 |
| 235 | 1591.9 | 14.454 | 15.344 | 15.401 | 12.906 | | 22.91 | 63.34 | 1.104 | -5.957 | 1.911 | -9.7188 |
| 240 | 1619.5 | 14.399 | 15.313 | 15.352 | 12.896 | | 22.78 | 64.91 | 1.021 | -5.991 | 1.727 | -9.7627 |
| 245 | 1646.7 | 14.345 | 15.283 | 15.304 | 12.885 | | 22.65 | 66.49 | 9.461 - 7 | -6.024 | 1.565 | -9.8055 |
| 250 | 1673.0 | 14.293 | 15.253 | 15.257 | 12.875 | | 22.52 | 68.05 | 8.784 | -6.056 | 1.422 | -9.8471 |
| 255 | 1697.7 | 14.241 | 15.224 | 15.212 | 12.866 | | 22.39 | 69.56 | 8.168 - 7 | -6.088 | 1.296 -10 | -9.8875 |
| 260 | 1712.4 | 14.193 | 15.198 | 15.169 | 12.858 | | 22.26 | 70.66 | 7.606 | -6.119 | 1.189 | -9.9247 |
| 265 | 1726.0 | 14.146 | 15.173 | 15.127 | 12.850 | | 22.13 | 71.74 | 7.090 | -6.149 | 1.094 | -9.9611 |
| 270 | 1738.6 | 14.099 | 15.148 | 15.086 | 12.843 | | 22.01 | 72.78 | 6.617 | -6.179 | 1.007 | -9.9968 |
| 275 | 1750.3 | 14.053 | 15.123 | 15.045 | 12.836 | | 21.89 | 73.80 | 6.180 | -6.209 | 9.295 -11 | -10.0318 |
| 280 | 1761.2 | 14.007 | 15.099 | 15.005 | 12.829 | | 21.76 | 74.78 | 5.778 | -6.238 | 8.588 | -10.0661 |
| 285 | 1771.2 | 13.962 | 15.075 | 14.965 | 12.822 | | 21.64 | 75.75 | 5.407 | -6.267 | 7.946 | -10.0999 |
| 290 | 1780.6 | 13.918 | 15.052 | 14.926 | 12.815 | | 21.52 | 76.69 | 5.063 | -6.296 | 7.361 | -10.1330 |
| 295 | 1789.2 | 13.874 | 15.029 | 14.887 | 12.808 | | 21.40 | 77.60 | 4.746 | -6.324 | 6.828 | -10.1657 |
| 300 | 1797.3 | 13.830 | 15.006 | 14.849 | 12.802 | | 21.29 | 78.50 | 4.451 | -6.352 | 6.341 | -10.1978 |
| 310 | 1811.6 | 13.744 | 14.961 | 14.773 | 12.789 | | 21.06 | 80.23 | 3.924 - 7 | -6.406 | 5.486 -11 | -10.2608 |
| 320 | 1824.0 | 13.659 | 14.917 | 14.698 | 12.777 | | 20.83 | 81.90 | 3.469 | -6.460 | 4.765 | -10.3220 |
| 330 | 1834.6 | 13.576 | 14.874 | 14.625 | 12.766 | | 20.61 | 83.51 | 3.074 | -6.512 | 4.153 | -10.3816 |
| 340 | 1843.8 | 13.493 | 14.832 | 14.552 | 12.754 | | 20.39 | 85.07 | 2.730 | -6.564 | 3.632 | -10.4398 |
| 350 | 1851.6 | 13.411 | 14.790 | 14.480 | 12.743 | | 20.18 | 86.58 | 2.430 | -6.614 | 3.186 | -10.4968 |
| 360 | 1858.4 | 13.331 | 14.749 | 14.409 | 12.732 | | 19.98 | 88.04 | 2.167 | -6.664 | 2.802 | -10.5525 |
| 370 | 1864.2 | 13.250 | 14.708 | 14.339 | 12.722 | | 19.78 | 89.47 | 1.936 | -6.713 | 2.471 | -10.6072 |
| 380 | 1869.2 | 13.171 | 14.668 | 14.269 | 12.711 | | 19.59 | 90.87 | 1.733 | -6.761 | 2.184 | -10.6607 |
| 390 | 1873.5 | 13.092 | 14.628 | 14.200 | 12.701 | | 19.40 | 92.23 | 1.554 | -6.809 | 1.935 | -10.7133 |
| 400 | 1877.2 | 13.014 | 14.588 | 14.132 | 12.690 | | 19.22 | 93.56 | 1.395 | -6.855 | 1.718 | -10.7650 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1880.4 | 12.936 | 14.549 | 14.063 | 12.680 | | 19.04 | 94.87 | 1.255 - 7 | -6.902 | 1.528 -11 | -10.8159 |
| 420 | 1883.1 | 12.859 | 14.510 | 13.996 | 12.670 | | 18.87 | 96.15 | 1.130 | -6.947 | 1.362 | -10.8659 |
| 430 | 1885.5 | 12.782 | 14.471 | 13.928 | 12.661 | | 18.71 | 97.40 | 1.019 | -6.992 | 1.216 | -10.9151 |
| 440 | 1887.5 | 12.705 | 14.433 | 13.861 | 12.651 | | 18.55 | 98.64 | 9.201 - 8 | -7.036 | 1.087 | -10.9636 |
| 450 | 1889.3 | 12.629 | 14.395 | 13.794 | 12.641 | | 18.39 | 99.85 | 8.319 | -7.080 | 9.741 -12 | -11.0114 |
| 460 | 1890.8 | 12.553 | 14.356 | 13.728 | 12.631 | | 18.24 | 101.04 | 7.531 | -7.123 | 8.740 | -11.0585 |
| 470 | 1892.1 | 12.477 | 14.319 | 13.662 | 12.622 | | 18.10 | 102.22 | 6.825 | -7.166 | 7.853 | -11.1053 |
| 480 | 1893.2 | 12.402 | 14.281 | 13.596 | 12.612 | | 17.96 | 103.37 | 6.192 | -7.208 | 7.066 | -11.1508 |
| 490 | 1894.1 | 12.327 | 14.243 | 13.530 | 12.603 | | 17.83 | 104.51 | 5.624 | -7.250 | 6.367 | -11.1961 |
| 500 | 1894.9 | 12.253 | 14.206 | 13.465 | 12.593 | 9.077 | 17.70 | 105.63 | 5.114 | -7.291 | 5.744 | -11.2408 |
| 510 | 1895.7 | 12.178 | 14.169 | 13.400 | 12.584 | 9.075 | 17.57 | 106.73 | 4.654 - 8 | -7.332 | 5.189 -12 | -11.2849 |
| 520 | 1896.3 | 12.104 | 14.131 | 13.335 | 12.575 | 9.072 | 17.45 | 107.82 | 4.240 | -7.373 | 4.693 | -11.3286 |
| 530 | 1896.8 | 12.030 | 14.094 | 13.270 | 12.565 | 9.070 | 17.33 | 108.90 | 3.866 | -7.413 | 4.249 | -11.3717 |
| 540 | 1897.2 | 11.957 | 14.058 | 13.206 | 12.556 | 9.067 | 17.22 | 109.97 | 3.529 | -7.452 | 3.852 | -11.4144 |
| 550 | 1897.6 | 11.883 | 14.021 | 13.141 | 12.547 | 9.065 | 17.11 | 111.02 | 3.223 | -7.492 | 3.495 | -11.4566 |
| 560 | 1898.0 | 11.810 | 13.984 | 13.077 | 12.538 | 9.063 | 17.00 | 112.07 | 2.947 | -7.531 | 3.175 | -11.4983 |
| 570 | 1898.2 | 11.737 | 13.948 | 13.013 | 12.528 | 9.060 | 16.89 | 113.11 | 2.697 | -7.569 | 2.886 | -11.5396 |
| 580 | 1898.5 | 11.664 | 13.911 | 12.950 | 12.519 | 9.058 | 16.79 | 114.14 | 2.469 | -7.607 | 2.627 | -11.5805 |
| 590 | 1898.7 | 11.592 | 13.875 | 12.886 | 12.510 | 9.056 | 16.69 | 115.17 | 2.263 | -7.645 | 2.393 | -11.6211 |
| 600 | 1898.9 | 11.520 | 13.839 | 12.823 | 12.501 | 9.053 | 16.60 | 116.19 | 2.076 | -7.683 | 2.182 | -11.6612 |
| 610 | 1899.0 | 11.448 | 13.803 | 12.760 | 12.492 | 9.051 | 16.50 | 117.21 | 1.905 - 8 | -7.720 | 1.991 -12 | -11.7009 |
| 620 | 1899.2 | 11.376 | 13.767 | 12.697 | 12.483 | 9.049 | 16.41 | 118.23 | 1.750 | -7.757 | 1.818 | -11.7403 |
| 630 | 1899.3 | 11.304 | 13.731 | 12.635 | 12.474 | 9.046 | 16.31 | 119.24 | 1.609 | -7.794 | 1.662 | -11.7794 |
| 640 | 1899.4 | 11.233 | 13.696 | 12.572 | 12.465 | 9.044 | 16.22 | 120.27 | 1.480 | -7.830 | 1.520 | -11.8181 |
| 650 | 1899.5 | 11.162 | 13.660 | 12.510 | 12.456 | 9.042 | 16.13 | 121.29 | 1.362 | -7.866 | 1.391 | -11.8565 |
| 660 | 1899.5 | 11.091 | 13.625 | 12.448 | 12.447 | 9.040 | 16.04 | 122.32 | 1.255 | -7.901 | 1.275 | -11.8946 |
| 670 | 1899.6 | 11.020 | 13.589 | 12.386 | 12.439 | 9.037 | 15.95 | 123.36 | 1.157 | -7.937 | 1.168 | -11.9324 |
| 680 | 1899.7 | 10.950 | 13.554 | 12.324 | 12.430 | 9.035 | 15.86 | 124.41 | 1.067 | -7.972 | 1.072 | -11.9699 |
| 690 | 1899.7 | 10.879 | 13.519 | 12.262 | 12.421 | 9.033 | 15.77 | 125.47 | 9.850 - 9 | -8.007 | 9.837 -13 | -12.0071 |
| 700 | 1899.8 | 10.809 | 13.484 | 12.201 | 12.412 | 9.031 | 15.69 | 126.54 | 9.098 | -8.041 | 9.035 | -12.0441 |
| 710 | 1899.8 | 10.739 | 13.449 | 12.140 | 12.403 | 9.028 | 15.60 | 127.63 | 8.410 - 9 | -8.075 | 8.304 -13 | -12.0807 |
| 720 | 1899.8 | 10.670 | 13.414 | 12.079 | 12.395 | 9.026 | 15.51 | 128.74 | 7.779 | -8.109 | 7.636 | -12.1171 |
| 730 | 1899.8 | 10.600 | 13.379 | 12.018 | 12.386 | 9.024 | 15.42 | 129.87 | 7.200 | -8.143 | 7.026 | -12.1533 |
| 740 | 1899.9 | 10.531 | 13.344 | 11.957 | 12.377 | 9.022 | 15.32 | 131.02 | 6.668 | -8.176 | 6.469 | -12.1892 |
| 750 | 1899.9 | 10.462 | 13.310 | 11.897 | 12.369 | 9.020 | 15.23 | 132.19 | 6.181 | -8.209 | 5.959 | -12.2248 |
| 760 | 1899.9 | 10.393 | 13.275 | 11.836 | 12.360 | 9.018 | 15.14 | 133.39 | 5.732 | -8.242 | 5.493 | -12.2602 |
| 770 | 1899.9 | 10.324 | 13.241 | 11.776 | 12.351 | 9.015 | 15.04 | 134.61 | 5.320 | -8.274 | 5.065 | -12.2954 |
| 780 | 1899.9 | 10.255 | 13.207 | 11.716 | 12.343 | 9.013 | 14.95 | 135.87 | 4.941 | -8.306 | 4.674 | -12.3303 |
| 790 | 1899.9 | 10.187 | 13.173 | 11.656 | 12.334 | 9.011 | 14.84 | 137.17 | 4.592 | -8.338 | 4.315 | -12.3650 |
| 800 | 1899.9 | 10.119 | 13.138 | 11.597 | 12.326 | 9.009 | 14.74 | 138.49 | 4.270 | -8.370 | 3.986 | -12.3995 |
| 820 | 1900.0 | 9.983 | 13.071 | 11.478 | 12.309 | 9.005 | 14.53 | 141.27 | 3.701 - 9 | -8.432 | 3.406 -13 | -12.4678 |
| 840 | 1900.0 | 9.848 | 13.003 | 11.360 | 12.292 | 9.000 | 14.32 | 144.22 | 3.217 | -8.492 | 2.916 | -12.5352 |
| 860 | 1900.0 | 9.580 | 12.869 | 11.125 | 12.258 | 8.992 | 13.85 | 150.74 | 2.453 | -8.610 | 2.150 | -12.6675 |
| 900 | 1900.0 | 9.448 | 12.803 | 11.009 | 12.242 | 8.988 | 13.60 | 154.36 | 2.151 | -8.667 | 1.852 | -12.7323 |
| 920 | 1900.0 | 9.316 | 12.737 | 10.893 | 12.225 | 8.984 | 13.34 | 158.24 | 1.893 | -8.723 | 1.598 | -12.7963 |
| 940 | 1900.0 | 9.184 | 12.671 | 10.779 | 12.209 | 8.979 | 13.07 | 162.42 | 1.671 | -8.777 | 1.382 | -12.8595 |
| 960 | 1900.0 | 9.054 | 12.606 | 10.664 | 12.193 | 8.975 | 12.79 | 166.92 | 1.480 | -8.830 | 1.198 | -12.9217 |
| 980 | 1900.0 | 8.924 | 12.541 | 10.550 | 12.176 | 8.971 | 12.49 | 171.77 | 1.315 | -8.881 | 1.040 | -12.9831 |
| 1000 | 1900.0 | 8.795 | 12.476 | 10.437 | 12.160 | 8.967 | 12.19 | 176.98 | 1.172 | -8.931 | 9.047 -14 | -13.0435 |

## WINTER MODEL, EXOSPHERIC TEMPERATURE = 2100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 333.1 | 17.056 | 16.985 | 17.764 | 13.568 | | 27.12 | 10.81 | 3.641 - 5 | -4.439 | 3.565 - 8 | -7.4479 |
| 125 | 429.8 | 16.738 | 16.771 | 17.472 | 13.473 | | 26.82 | 14.13 | 2.433 | -4.614 | 1.826 | -7.7385 |
| 130 | 520.6 | 16.489 | 16.605 | 17.243 | 13.401 | | 26.55 | 17.31 | 1.769 | -4.752 | 1.085 | -7.9646 |
| 135 | 605.1 | 16.284 | 16.469 | 17.055 | 13.343 | | 26.30 | 20.34 | 1.356 | -4.868 | 7.088 - 9 | -8.1495 |
| 140 | 685.4 | 16.108 | 16.354 | 16.895 | 13.294 | | 26.07 | 23.28 | 1.078 | -4.967 | 4.931 | -8.3071 |
| 145 | 761.1 | 15.954 | 16.255 | 16.754 | 13.252 | | 25.86 | 26.11 | 8.801 - 6 | -5.055 | 3.596 | -8.4441 |
| 150 | 833.4 | 15.816 | 16.166 | 16.629 | 13.216 | | 25.66 | 28.86 | 7.336 | -5.135 | 2.716 | -8.5661 |
| 155 | 902.2 | 15.692 | 16.087 | 16.516 | 13.183 | | 25.46 | 31.53 | 6.216 - 6 | -5.206 | 2.110 - 9 | -8.6758 |
| 160 | 968.3 | 15.577 | 16.014 | 16.412 | 13.153 | | 25.27 | 34.14 | 5.338 | -5.273 | 1.676 | -8.7758 |
| 165 | 1031.9 | 15.472 | 15.947 | 16.316 | 13.127 | | 25.09 | 36.70 | 4.635 | -5.334 | 1.356 | -8.8679 |
| 170 | 1092.9 | 15.374 | 15.886 | 16.227 | 13.102 | | 24.92 | 39.20 | 4.062 | -5.391 | 1.114 | -8.9531 |
| 175 | 1151.3 | 15.282 | 15.829 | 16.144 | 13.079 | | 24.75 | 41.64 | 3.590 | -5.445 | 9.282 -10 | -9.0323 |
| 180 | 1207.5 | 15.195 | 15.775 | 16.065 | 13.059 | | 24.59 | 44.02 | 3.194 | -5.496 | 7.823 | -9.1066 |
| 185 | 1261.6 | 15.114 | 15.725 | 15.991 | 13.039 | | 24.43 | 46.37 | 2.860 | -5.544 | 6.660 | -9.1765 |
| 190 | 1313.3 | 15.036 | 15.677 | 15.921 | 13.020 | | 24.28 | 48.65 | 2.574 | -5.589 | 5.722 | -9.2424 |
| 195 | 1362.6 | 14.962 | 15.632 | 15.855 | 13.003 | | 24.13 | 50.87 | 2.328 | -5.633 | 4.957 | -9.3048 |
| 200 | 1409.9 | 14.892 | 15.590 | 15.791 | 12.987 | | 23.98 | 53.04 | 2.114 | -5.675 | 4.325 | -9.3641 |
| 205 | 1455.1 | 14.825 | 15.549 | 15.731 | 12.972 | | 23.83 | 55.15 | 1.928 - 6 | -5.715 | 3.797 -10 | -9.4205 |
| 210 | 1498.2 | 14.760 | 15.511 | 15.672 | 12.957 | | 23.69 | 57.21 | 1.763 | -5.754 | 3.354 | -9.4744 |
| 215 | 1539.5 | 14.697 | 15.473 | 15.616 | 12.944 | | 23.55 | 59.23 | 1.618 | -5.791 | 2.978 | -9.5261 |
| 220 | 1578.9 | 14.637 | 15.438 | 15.562 | 12.931 | | 23.42 | 61.19 | 1.489 | -5.827 | 2.657 | -9.5756 |
| 225 | 1616.6 | 14.579 | 15.404 | 15.510 | 12.918 | | 23.28 | 63.10 | 1.374 | -5.862 | 2.381 | -9.6233 |
| 230 | 1652.5 | 14.523 | 15.371 | 15.460 | 12.907 | | 23.15 | 64.97 | 1.271 | -5.896 | 2.142 | -9.6692 |
| 235 | 1687.1 | 14.468 | 15.339 | 15.411 | 12.895 | | 23.02 | 66.80 | 1.178 | -5.929 | 1.934 | -9.7135 |
| 240 | 1720.2 | 14.415 | 15.308 | 15.363 | 12.885 | | 22.90 | 68.59 | 1.094 | -5.961 | 1.752 | -9.7565 |
| 245 | 1752.1 | 14.363 | 15.278 | 15.317 | 12.874 | | 22.77 | 70.35 | 1.018 | -5.992 | 1.592 | -9.7981 |
| 250 | 1782.8 | 14.313 | 15.249 | 15.272 | 12.864 | | 22.65 | 72.08 | 9.493 - 7 | -6.023 | 1.451 | -9.8384 |
| 255 | 1811.9 | 14.264 | 15.221 | 15.228 | 12.854 | | 22.53 | 73.76 | 8.865 - 7 | -6.052 | 1.326 -10 | -9.8775 |
| 260 | 1830.5 | 14.218 | 15.196 | 15.187 | 12.846 | | 22.41 | 75.03 | 8.289 | -6.082 | 1.221 | -9.9135 |
| 265 | 1847.9 | 14.172 | 15.171 | 15.147 | 12.839 | | 22.29 | 76.26 | 7.759 | -6.110 | 1.126 | -9.9485 |
| 270 | 1864.2 | 14.128 | 15.147 | 15.107 | 12.831 | | 22.18 | 77.45 | 7.270 | -6.138 | 1.040 | -9.9829 |
| 275 | 1879.4 | 14.084 | 15.123 | 15.069 | 12.824 | | 22.06 | 78.61 | 6.819 | -6.166 | 9.627 -11 | -10.0165 |
| 280 | 1893.6 | 14.041 | 15.100 | 15.030 | 12.817 | | 21.95 | 79.74 | 6.401 | -6.194 | 8.924 | -10.0495 |
| 285 | 1907.0 | 13.998 | 15.077 | 14.993 | 12.810 | | 21.83 | 80.83 | 6.015 | -6.221 | 8.284 | -10.0818 |
| 290 | 1919.4 | 13.956 | 15.055 | 14.956 | 12.804 | | 21.72 | 81.90 | 5.657 | -6.247 | 7.700 | -10.1135 |
| 295 | 1931.1 | 13.915 | 15.033 | 14.919 | 12.797 | | 21.61 | 82.95 | 5.324 | -6.274 | 7.166 | -10.1447 |
| 300 | 1942.0 | 13.874 | 15.011 | 14.883 | 12.791 | | 21.50 | 83.97 | 5.014 | -6.300 | 6.678 | -10.1754 |
| 310 | 1961.7 | 13.793 | 14.969 | 14.811 | 12.778 | | 21.29 | 85.94 | 4.457 - 7 | -6.351 | 5.817 -11 | -10.2353 |
| 320 | 1979.0 | 13.714 | 14.927 | 14.741 | 12.767 | | 21.08 | 87.83 | 3.973 | -6.401 | 5.089 | -10.2934 |
| 330 | 1994.1 | 13.636 | 14.886 | 14.673 | 12.755 | | 20.87 | 89.64 | 3.550 | -6.450 | 4.468 | -10.3499 |
| 340 | 2007.3 | 13.559 | 14.847 | 14.605 | 12.744 | | 20.67 | 91.39 | 3.178 | -6.498 | 3.936 | -10.4050 |
| 350 | 2018.9 | 13.483 | 14.807 | 14.539 | 12.734 | | 20.47 | 93.08 | 2.852 | -6.545 | 3.478 | -10.4587 |
| 360 | 2029.0 | 13.408 | 14.769 | 14.473 | 12.723 | | 20.28 | 94.72 | 2.564 | -6.591 | 3.081 | -10.5112 |
| 370 | 2037.9 | 13.334 | 14.731 | 14.408 | 12.713 | | 20.09 | 96.31 | 2.309 | -6.637 | 2.737 | -10.5627 |
| 380 | 2045.7 | 13.261 | 14.694 | 14.343 | 12.703 | | 19.91 | 97.86 | 2.083 | -6.681 | 2.438 | -10.6130 |
| 390 | 2052.4 | 13.189 | 14.657 | 14.280 | 12.693 | | 19.73 | 99.37 | 1.882 | -6.725 | 2.176 | -10.6624 |
| 400 | 2058.4 | 13.117 | 14.620 | 14.217 | 12.684 | | 19.55 | 100.84 | 1.703 | -6.769 | 1.946 | -10.7109 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 2063.6 | 13.045 | 14.584 | 14.154 | 12.674 | | 19.38 | 102.28 | 1.544 - 7 | -6.811 | 1.744 -11 | -10.7585 |
| 420 | 2068.1 | 12.974 | 14.548 | 14.092 | 12.665 | | 19.22 | 103.69 | 1.401 | -6.854 | 1.566 | -10.8053 |
| 430 | 2072.1 | 12.904 | 14.512 | 14.030 | 12.656 | | 19.06 | 105.06 | 1.273 | -6.895 | 1.408 | -10.8514 |
| 440 | 2075.6 | 12.834 | 14.477 | 13.969 | 12.646 | | 18.90 | 106.42 | 1.158 | -6.936 | 1.268 | -10.8967 |
| 450 | 2078.6 | 12.764 | 14.442 | 13.908 | 12.637 | | 18.75 | 107.74 | 1.055 | -6.977 | 1.144 | -10.9414 |
| 460 | 2081.3 | 12.695 | 14.407 | 13.847 | 12.628 | | 18.61 | 109.05 | 9.617 - 8 | -7.017 | 1.034 | -10.9854 |
| 470 | 2083.6 | 12.626 | 14.372 | 13.787 | 12.620 | | 18.47 | 110.33 | 8.779 | -7.057 | 9.358 -12 | -11.0288 |
| 480 | 2085.7 | 12.558 | 14.338 | 13.727 | 12.611 | | 18.33 | 111.59 | 8.023 | -7.096 | 8.480 | -11.0716 |
| 490 | 2087.5 | 12.490 | 14.303 | 13.667 | 12.602 | | 18.20 | 112.83 | 7.339 | -7.134 | 7.694 | -11.1138 |
| 500 | 2089.0 | 12.422 | 14.269 | 13.608 | 12.593 | 8.945 | 18.07 | 114.05 | 6.720 | -7.173 | 6.990 | -11.1555 |
| 510 | 2090.4 | 12.354 | 14.235 | 13.548 | 12.585 | 8.943 | 17.94 | 115.26 | 6.158 - 8 | -7.211 | 6.358 -12 | -11.1967 |
| 520 | 2091.6 | 12.287 | 14.202 | 13.489 | 12.576 | 8.941 | 17.82 | 116.45 | 5.649 | -7.248 | 5.789 | -11.2374 |
| 530 | 2092.7 | 12.220 | 14.168 | 13.431 | 12.568 | 8.938 | 17.70 | 117.62 | 5.187 | -7.285 | 5.277 | -11.2776 |
| 540 | 2093.6 | 12.153 | 14.134 | 13.372 | 12.559 | 8.936 | 17.59 | 118.78 | 4.766 | -7.322 | 4.816 | -11.3173 |
| 550 | 2094.4 | 12.086 | 14.101 | 13.314 | 12.551 | 8.934 | 17.48 | 119.93 | 4.383 | -7.358 | 4.399 | -11.3566 |
| 560 | 2095.1 | 12.020 | 14.068 | 13.256 | 12.543 | 8.931 | 17.37 | 121.06 | 4.034 | -7.394 | 4.023 | -11.3955 |
| 570 | 2095.7 | 11.954 | 14.035 | 13.198 | 12.534 | 8.929 | 17.27 | 122.18 | 3.715 | -7.430 | 3.682 | -11.4339 |
| 580 | 2096.2 | 11.888 | 14.002 | 13.140 | 12.526 | 8.927 | 17.17 | 123.29 | 3.425 | -7.465 | 3.373 | -11.4720 |
| 590 | 2096.7 | 11.823 | 13.969 | 13.083 | 12.518 | 8.925 | 17.07 | 124.39 | 3.159 | -7.500 | 3.093 | -11.5097 |
| 600 | 2097.1 | 11.757 | 13.936 | 13.025 | 12.509 | 8.923 | 16.97 | 125.49 | 2.916 | -7.535 | 2.838 | -11.5470 |
| 610 | 2097.5 | 11.692 | 13.903 | 12.968 | 12.501 | 8.921 | 16.88 | 126.57 | 2.694 - 8 | -7.570 | 2.607 -12 | -11.5839 |
| 620 | 2097.8 | 11.627 | 13.871 | 12.911 | 12.493 | 8.919 | 16.78 | 127.65 | 2.490 | -7.604 | 2.396 | -11.6205 |
| 630 | 2098.1 | 11.562 | 13.838 | 12.855 | 12.485 | 8.916 | 16.69 | 128.73 | 2.303 | -7.638 | 2.204 | -11.6568 |
| 640 | 2098.3 | 11.497 | 13.806 | 12.798 | 12.477 | 8.914 | 16.60 | 129.80 | 2.132 | -7.671 | 2.029 | -11.6928 |
| 650 | 2098.5 | 11.433 | 13.774 | 12.742 | 12.469 | 8.912 | 16.52 | 130.87 | 1.974 | -7.705 | 1.869 | -11.7284 |
| 660 | 2098.7 | 11.369 | 13.742 | 12.685 | 12.461 | 8.910 | 16.43 | 131.94 | 1.829 | -7.738 | 1.723 | -11.7638 |
| 670 | 2098.9 | 11.305 | 13.710 | 12.629 | 12.453 | 8.908 | 16.35 | 133.01 | 1.696 | -7.770 | 1.589 | -11.7988 |
| 680 | 2099.0 | 11.241 | 13.678 | 12.573 | 12.445 | 8.906 | 16.26 | 134.08 | 1.574 | -7.803 | 1.467 | -11.8336 |
| 690 | 2099.1 | 11.177 | 13.646 | 12.518 | 12.437 | 8.904 | 16.18 | 135.16 | 1.461 | -7.835 | 1.355 | -11.8681 |
| 700 | 2099.2 | 11.114 | 13.614 | 12.462 | 12.429 | 8.902 | 16.10 | 136.24 | 1.358 | -7.867 | 1.252 | -11.9023 |
| 710 | 2099.3 | 11.050 | 13.583 | 12.407 | 12.421 | 8.900 | 16.02 | 137.32 | 1.262 - 8 | -7.899 | 1.158 -12 | -11.9363 |
| 720 | 2099.4 | 10.987 | 13.551 | 12.351 | 12.413 | 8.898 | 15.94 | 138.42 | 1.174 | -7.930 | 1.072 | -11.9700 |
| 730 | 2099.5 | 10.924 | 13.520 | 12.296 | 12.405 | 8.896 | 15.86 | 139.52 | 1.092 | -7.962 | 9.920 -13 | -12.0035 |
| 740 | 2099.6 | 10.862 | 13.488 | 12.241 | 12.397 | 8.894 | 15.78 | 140.63 | 1.017 | -7.993 | 9.189 | -12.0367 |
| 750 | 2099.6 | 10.799 | 13.457 | 12.187 | 12.389 | 8.892 | 15.70 | 141.76 | 9.473 - 9 | -8.024 | 8.517 | -12.0697 |
| 760 | 2099.7 | 10.737 | 13.426 | 12.132 | 12.382 | 8.890 | 15.61 | 142.90 | 8.830 | -8.054 | 7.898 | -12.1025 |
| 770 | 2099.7 | 10.674 | 13.395 | 12.078 | 12.374 | 8.888 | 15.53 | 144.06 | 8.236 | -8.084 | 7.328 | -12.1350 |
| 780 | 2099.7 | 10.612 | 13.364 | 12.023 | 12.366 | 8.886 | 15.45 | 145.23 | 7.686 | -8.114 | 6.802 | -12.1674 |
| 790 | 2099.8 | 10.551 | 13.333 | 11.969 | 12.358 | 8.884 | 15.37 | 146.42 | 7.176 | -8.144 | 6.317 | -12.1995 |
| 800 | 2099.8 | 10.489 | 13.302 | 11.915 | 12.351 | 8.882 | 15.28 | 147.63 | 6.704 | -8.174 | 5.870 | -12.2314 |
| 820 | 2099.8 | 10.366 | 13.240 | 11.808 | 12.335 | 8.878 | 15.12 | 150.13 | 5.862 - 9 | -8.232 | 5.075 -13 | -12.2946 |
| 840 | 2099.9 | 10.244 | 13.179 | 11.701 | 12.320 | 8.875 | 14.94 | 152.73 | 5.130 | -8.289 | 4.39[illegible] | -12.3570 |
| 860 | 2099.9 | 10.002 | 13.058 | 11.489 | 12.290 | 8.867 | 14.57 | 158.32 | 3.971 | -8.401 | 3.315 | -12.4795 |
| 900 | 2099.9 | 9.882 | 12.998 | 11.383 | 12.275 | 8.863 | 14.38 | 161.34 | 3.504 | -8.455 | 2.886 | -12.5397 |
| 920 | 2100.0 | 9.762 | 12.939 | 11.279 | 12.260 | 8.859 | 14.18 | 164.53 | 3.099 | -8.509 | 2.517 | -12.5991 |
| 940 | 2100.0 | 9.643 | 12.879 | 11.175 | 12.245 | 8.856 | 13.97 | 167.91 | 2.748 | -8.561 | 2.199 | -12.6578 |
| 960 | 2100.0 | 9.525 | 12.820 | 11.071 | 12.230 | 8.852 | 13.75 | 171.49 | 2.442 | -8.612 | 1.924 | -12.7158 |
| 980 | 2100.0 | 9.408 | 12.761 | 10.969 | 12.215 | 8.848 | 13.53 | 175.31 | 2.176 | -8.662 | 1.686 | -12.7731 |
| 1000 | 2100.0 | 9.291 | 12.703 | 10.866 | 12.201 | 8.845 | 13.29 | 179.37 | 1.944 | -8.711 | 1.480 | -12.8297 |

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Part 6.2

120 km to 1000 km

Summer Models

# TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 600° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 380.0 | 16.763 | 16.810 | 17.500 | 13.503 | | 26.77 | 12.49 | 2.303 - 5 | -4.638 | 1.952 - 8 | -7.7096 |
| 125 | 413.0 | 16.528 | 16.674 | 17.290 | 13.455 | | 26.44 | 13.77 | 1.574 | -4.803 | 1.212 | -7.9165 |
| 130 | 441.2 | 16.315 | 16.554 | 17.100 | 13.415 | | 26.10 | 14.92 | 1.111 | -4.954 | 7.905 - 9 | -8.1021 |
| 135 | 464.2 | 16.119 | 16.445 | 16.926 | 13.379 | | 25.76 | 15.93 | 8.034 - 6 | -5.095 | 5.362 | -8.2707 |
| 140 | 483.9 | 15.936 | 16.344 | 16.763 | 13.347 | | 25.40 | 16.87 | 5.923 | -5.227 | 3.740 | -8.4271 |
| 145 | 499.8 | 15.762 | 16.250 | 16.610 | 13.319 | | 25.04 | 17.70 | 4.436 | -5.353 | 2.673 | -8.5730 |
| 150 | 513.6 | 15.596 | 16.161 | 16.462 | 13.292 | | 24.67 | 18.50 | 3.365 | -5.473 | 1.944 | -8.7113 |
| 155 | 525.1 | 15.436 | 16.076 | 16.321 | 13.267 | | 24.28 | 19.24 | 2.582 - 6 | -5.588 | 1.436 - 9 | -8.8428 |
| 160 | 535.0 | 15.281 | 15.995 | 16.184 | 13.244 | | 23.90 | 19.95 | 2.000 | -5.699 | 1.075 | -8.9687 |
| 165 | 543.2 | 15.130 | 15.916 | 16.051 | 13.222 | | 23.50 | 20.63 | 1.563 | -5.806 | 8.136 -10 | -9.0896 |
| 170 | 550.2 | 14.982 | 15.839 | 15.921 | 13.200 | | 23.11 | 21.28 | 1.232 | -5.910 | 6.221 | -9.2061 |
| 175 | 556.2 | 14.837 | 15.764 | 15.793 | 13.180 | | 22.71 | 21.92 | 9.771 - 7 | -6.010 | 4.799 | -9.3189 |
| 180 | 561.1 | 14.694 | 15.691 | 15.668 | 13.160 | | 22.32 | 22.54 | 7.803 | -6.108 | 3.733 | -9.4280 |
| 185 | 564.8 | 14.554 | 15.619 | 15.545 | 13.141 | | 21.92 | 23.13 | 6.269 | -6.203 | 2.927 | -9.5336 |
| 190 | 568.2 | 14.415 | 15.548 | 15.423 | 13.123 | | 21.54 | 23.73 | 5.064 | -6.296 | 2.309 | -9.6367 |
| 195 | 570.2 | 14.277 | 15.479 | 15.302 | 13.105 | | 21.16 | 24.27 | 4.111 | -6.386 | 1.835 | -9.7364 |
| 200 | 574.1 | 14.140 | 15.409 | 15.181 | 13.086 | | 20.79 | 24.91 | 3.355 | -6.474 | 1.461 | -9.8354 |
| 205 | 577.5 | 14.003 | 15.339 | 15.062 | 13.068 | | 20.43 | 25.54 | 2.752 - 7 | -6.560 | 1.171 -10 | -9.9315 |
| 210 | 580.5 | 13.869 | 15.271 | 14.943 | 13.050 | | 20.08 | 26.15 | 2.268 | -6.644 | 9.437 -11 | -10.0252 |
| 215 | 583.0 | 13.735 | 15.203 | 14.826 | 13.032 | | 19.75 | 26.75 | 1.877 | -6.726 | 7.649 | -10.1164 |
| 220 | 585.3 | 13.602 | 15.136 | 14.709 | 13.015 | | 19.44 | 27.33 | 1.560 | -6.807 | 6.232 | -10.2054 |
| 225 | 587.2 | 13.470 | 15.069 | 14.594 | 12.997 | | 19.13 | 27.89 | 1.302 | -6.885 | 5.102 | -10.2922 |
| 230 | 588.9 | 13.339 | 15.003 | 14.479 | 12.980 | | 18.85 | 28.44 | 1.090 | -6.963 | 4.196 | -10.3771 |
| 235 | 590.3 | 13.208 | 14.937 | 14.365 | 12.963 | | 18.58 | 28.97 | 9.158 - 8 | -7.038 | 3.466 | -10.4601 |
| 240 | 591.6 | 13.079 | 14.872 | 14.251 | 12.947 | | 18.32 | 29.48 | 7.718 | -7.112 | 2.875 | -10.5414 |
| 245 | 592.7 | 12.949 | 14.807 | 14.138 | 12.930 | | 18.08 | 29.98 | 6.524 | -7.186 | 2.393 | -10.6210 |
| 250 | 593.7 | 12.821 | 14.742 | 14.025 | 12.914 | | 17.85 | 30.46 | 5.529 | -7.257 | 1.999 | -10.6991 |
| 255 | 594.5 | 12.692 | 14.677 | 13.912 | 12.897 | | 17.63 | 30.92 | 4.698 - 8 | -7.328 | 1.676 -11 | -10.7757 |
| 260 | 595.2 | 12.565 | 14.613 | 13.800 | 12.881 | | 17.43 | 31.37 | 4.001 | -7.398 | 1.409 | -10.8511 |
| 265 | 595.8 | 12.437 | 14.549 | 13.689 | 12.865 | | 17.23 | 31.81 | 3.415 | -7.467 | 1.188 | -10.9251 |
| 270 | 596.4 | 12.310 | 14.486 | 13.578 | 12.849 | | 17.05 | 32.23 | 2.922 | -7.534 | 1.005 | -10.9980 |
| 275 | 596.9 | 12.184 | 14.422 | 13.467 | 12.833 | | 16.87 | 32.64 | 2.504 | -7.601 | 8.514 -12 | -11.0699 |
| 280 | 597.3 | 12.057 | 14.359 | 13.356 | 12.817 | | 16.70 | 33.05 | 2.151 | -7.667 | 7.233 | -11.1407 |
| 285 | 597.6 | 11.931 | 14.296 | 13.246 | 12.801 | | 16.54 | 33.45 | 1.850 | -7.733 | 6.158 | -11.2106 |
| 290 | 597.9 | 11.806 | 14.233 | 13.136 | 12.785 | | 16.37 | 33.85 | 1.595 | -7.797 | 5.253 | -11.2796 |
| 295 | 598.2 | 11.680 | 14.170 | 13.026 | 12.769 | | 16.22 | 34.25 | 1.377 | -7.861 | 4.490 | -11.3478 |
| 300 | 598.4 | 11.555 | 14.107 | 12.916 | 12.754 | | 16.06 | 34.65 | 1.191 | -7.924 | 3.844 | -11.4152 |
| 310 | 598.8 | 11.305 | 13.982 | 12.698 | 12.722 | | 15.74 | 35.47 | 8.954 - 9 | -8.048 | 2.831 -12 | -11.5480 |
| 320 | 599.1 | 11.057 | 13.858 | 12.480 | 12.691 | | 15.41 | 36.35 | 6.778 | -8.169 | 2.097 | -11.6783 |
| 330 | 599.3 | 10.809 | 13.734 | 12.263 | 12.660 | | 15.06 | 37.33 | 5.166 | -8.287 | 1.562 | -11.8064 |
| 340 | 599.5 | 10.562 | 13.610 | 12.047 | 12.629 | | 14.68 | 38.43 | 3.967 | -8.402 | 1.168 | -11.9324 |
| 350 | 599.6 | 10.316 | 13.487 | 11.832 | 12.598 | | 14.25 | 39.70 | 3.071 | -8.513 | 8.779 -13 | -12.0566 |
| 360 | 599.7 | 10.071 | 13.365 | 11.617 | 12.568 | | 13.78 | 41.21 | 2.398 | -8.620 | 6.625 | -12.1788 |
| 370 | 599.8 | 9.826 | 13.242 | 11.403 | 12.537 | | 13.24 | 43.00 | 1.891 | -8.723 | 5.020 | -12.2993 |
| 380 | 599.8 | 9.583 | 13.121 | 11.189 | 12.506 | | 12.65 | 45.16 | 1.507 | -8.822 | 3.821 | -12.4178 |
| 390 | 599.9 | 9.340 | 12.999 | 10.977 | 12.476 | | 12.00 | 47.75 | 1.215 | -8.916 | 2.922 | -12.5344 |
| 400 | 599.9 | 9.097 | 12.878 | 10.765 | 12.446 | | 11.30 | 50.87 | 9.913 -10 | -9.004 | 2.245 | -12.6487 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 599.9 | 8.856 | 12.757 | 10.553 | 12.416 | | 10.55 | 54.61 | 8.199 -10 | -9.086 | 1.735 -13 | -12.7608 |
| 420 | 599.9 | 8.615 | 12.637 | 10.343 | 12.385 | | 9.78 | 59.08 | 6.874 | -9.163 | 1.348 | -12.8702 |
| 430 | 600.0 | 8.375 | 12.517 | 10.132 | 12.355 | | 9.01 | 64.38 | 5.844 | -9.233 | 1.055 | -12.9767 |
| 440 | 600.0 | 8.136 | 12.397 | 9.923 | 12.325 | | 8.24 | 70.60 | 5.038 | -9.298 | 8.319 -14 | -13.0799 |
| 450 | 600.0 | 7.897 | 12.278 | 9.714 | 12.296 | | 7.50 | 77.81 | 4.402 | -9.356 | 6.614 | -13.1795 |
| 460 | 600.0 | 7.659 | 12.159 | 9.506 | 12.266 | | 6.80 | 86.07 | 3.895 | -9.409 | 5.307 | -13.2751 |
| 470 | 600.0 | 7.422 | 12.040 | 9.298 | 12.236 | | 6.15 | 95.37 | 3.488 | -9.457 | 4.301 | -13.3664 |
| 480 | 600.0 | 7.186 | 11.922 | 9.091 | 12.207 | | 5.57 | 105.69 | 3.157 | -9.501 | 3.523 | -13.4530 |
| 490 | 600.0 | 6.950 | 11.804 | 8.884 | 12.177 | | 5.05 | 116.93 | 2.886 | -9.540 | 2.919 | -13.5347 |
| 500 | 600.0 | 6.715 | 11.686 | 8.679 | 12.148 | 12.121 | 4.59 | 128.94 | 2.660 | -9.575 | 2.447 | -13.6113 |
| 510 | 600.0 | 6.480 | 11.569 | 8.473 | 12.118 | 12.113 | 4.19 | 141.53 | 2.470 -10 | -9.607 | 2.077 -14 | -13.6826 |
| 520 | 600.0 | 6.246 | 11.452 | 8.269 | 12.089 | 12.106 | 3.85 | 154.50 | 2.309 | -9.637 | 1.783 | -13.7488 |
| 530 | 600.0 | 6.013 | 11.336 | 8.065 | 12.060 | 12.098 | 3.56 | 167.62 | 2.169 | -9.664 | 1.549 | -13.8099 |
| 540 | 600.0 | 5.781 | 11.220 | 7.861 | 12.031 | 12.091 | 3.31 | 180.68 | 2.048 | -9.689 | 1.361 | -13.8662 |
| 550 | 600.0 | 5.549 | 11.104 | 7.658 | 12.002 | 12.084 | 3.10 | 193.50 | 1.942 | -9.712 | 1.208 | -13.9179 |
| 560 | 600.0 | 5.318 | 10.988 | 7.456 | 11.973 | 12.077 | 2.92 | 205.93 | 1.847 | -9.734 | 1.083 | -13.9655 |
| 570 | 600.0 | 5.088 | 10.873 | 7.254 | 11.944 | 12.069 | 2.77 | 217.87 | 1.762 | -9.754 | 9.791 -15 | -14.0092 |
| 580 | 600.0 | 4.858 | 10.758 | 7.053 | 11.915 | 12.062 | 2.64 | 229.26 | 1.685 | -9.773 | 8.923 | -14.0495 |
| 590 | 600.0 | 4.629 | 10.644 | 6.853 | 11.887 | 12.055 | 2.53 | 240.08 | 1.614 | -9.792 | 8.189 | -14.0868 |
| 600 | 600.0 | 4.400 | 10.529 | 6.653 | 11.858 | 12.048 | 2.43 | 250.34 | 1.550 | -9.810 | 7.561 | -14.1214 |
| 610 | 600.0 | 4.173 | 10.415 | 6.453 | 11.830 | 12.040 | 2.35 | 260.07 | 1.490 -10 | -9.827 | 7.019 -15 | -14.1537 |
| 620 | 600.0 | 3.945 | 10.302 | 6.254 | 11.801 | 12.033 | 2.28 | 269.31 | 1.435 | -9.843 | 6.545 | -14.1841 |
| 630 | 600.0 | 3.719 | 10.189 | 6.056 | 11.773 | 12.026 | 2.22 | 278.12 | 1.384 | -9.859 | 6.128 | -14.2127 |
| 640 | 600.0 | 3.493 | 10.076 | 5.858 | 11.745 | 12.019 | 2.15 | 286.56 | 1.335 | -9.874 | 5.757 | -14.2398 |
| 650 | 600.0 | 3.268 | 9.963 | 5.661 | 11.717 | 12.012 | 2.10 | 294.67 | 1.290 | -9.889 | 5.425 | -14.2656 |
| 660 | 600.0 | 3.043 | 9.851 | 5.465 | 11.688 | 12.005 | 2.05 | 302.52 | 1.248 | -9.904 | 5.125 | -14.2903 |
| 670 | 600.0 | 2.820 | 9.739 | 5.269 | 11.660 | 11.998 | 2.00 | 310.14 | 1.208 | -9.918 | 4.852 | -14.3141 |
| 680 | 600.0 | 2.596 | 9.627 | 5.073 | 11.633 | 11.991 | 1.96 | 317.57 | 1.170 | -9.932 | 4.603 | -14.3370 |
| 690 | 600.0 | 2.374 | 9.516 | 4.878 | 11.605 | 11.984 | 1.92 | 324.86 | 1.134 | -9.945 | 4.374 | -14.3591 |
| 700 | 600.0 | 2.152 | 9.405 | 4.684 | 11.577 | 11.977 | 1.89 | 332.04 | 1.100 | -9.959 | 4.163 | -14.3806 |
| 710 | 600.0 | 1.930 | 9.294 | 4.490 | 11.549 | 11.970 | 1.85 | 339.12 | 1.068 -10 | -9.972 | 3.968 -15 | -14.4015 |
| 720 | 600.0 | 1.710 | 9.184 | 4.297 | 11.522 | 11.963 | 1.82 | 346.14 | 1.037 | -9.984 | 3.786 | -14.4218 |
| 730 | 600.0 | 1.489 | 9.074 | 4.104 | 11.494 | 11.956 | 1.79 | 353.10 | 1.008 | -9.997 | 3.617 | -14.4416 |
| 740 | 600.0 | 1.270 | 8.964 | 3.912 | 11.467 | 11.949 | 1.76 | 360.03 | 9.799 -11 | -10.009 | 3.459 | -14.4610 |
| 750 | 600.0 | 1.051 | 8.855 | 3.720 | 11.439 | 11.942 | 1.73 | 366.92 | 9.533 | -10.021 | 3.311 | -14.4800 |
| 760 | 600.0 | 0.833 | 8.746 | 3.529 | 11.412 | 11.935 | 1.71 | 373.80 | 9.279 | -10.033 | 3.173 | -14.4986 |
| 770 | 600.0 | 0.615 | 8.637 | 3.339 | 11.385 | 11.928 | 1.68 | 380.65 | 9.036 | -10.044 | 3.043 | -14.5168 |
| 780 | 600.0 | 0.398 | 8.528 | 3.149 | 11.358 | 11.922 | 1.65 | 387.50 | 8.804 | -10.055 | 2.920 | -14.5346 |
| 790 | 600.0 | 0.182 | 8.420 | 2.959 | 11.331 | 11.915 | 1.63 | 394.33 | 8.581 | -10.066 | 2.805 | -14.5521 |
| 800 | 600.0 | -0.034 | 8.312 | 2.770 | 11.304 | 11.908 | 1.61 | 401.15 | 8.368 | -10.077 | 2.696 | -14.5692 |
| 820 | 600.0 | -0.464 | 8.097 | 2.394 | 11.250 | 11.894 | 1.56 | 414.77 | 7.968 -11 | -10.099 | 2.497 -15 | -14.6026 |
| 840 | 600.0 | -0.891 | 7.883 | 2.020 | 11.196 | 11.881 | 1.52 | 428.32 | 7.599 | -10.119 | 2.319 | -14.6347 |
| 860 | 600.0 | -1.319 | 7.669 | 1.648 | 11.142 | 11.854 | 1.45 | 455.15 | 6.941 | -10.159 | 2.015 | -14.6956 |
| 900 | 600.0 | -2.160 | 7.249 | 0.910 | 11.038 | 11.841 | 1.42 | 488.37 | 6.647 | -10.177 | 1.886 | -14.7245 |
| 920 | 600.0 | -2.578 | 7.040 | 0.544 | 10.985 | 11.928 | 1.38 | 481.42 | 6.372 | -10.196 | 1.769 | -14.7523 |
| 940 | 600.0 | -2.994 | 6.832 | 0.180 | 10.933 | 11.815 | 1.36 | 494.27 | 6.116 | -10.213 | 1.663 | -14.7792 |
| 960 | 600.0 | -3.407 | 6.626 | -0.182 | 10.882 | 11.802 | 1.33 | 506.90 | 5.877 | -10.231 | 1.566 | -14.8051 |
| 980 | 600.0 | -3.818 | 6.420 | -0.542 | 10.830 | 11.789 | 1.30 | 519.27 | 5.652 | -10.248 | 1.479 | -14.8302 |
| 1000 | 600.0 | -4.227 | 6.215 | -0.901 | 10.779 | 11.776 | 1.28 | 531.38 | 5.441 | -10.264 | 1.399 | -14.8543 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_s$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 380.6 | 16.762 | 16.809 | 17.499 | 13.502 | | 26.77 | 12.51 | 2.302 - 5 | -4.638 | 1.947 - 8 | -7.7106 |
| 125 | 429.1 | 16.515 | 16.660 | 17.277 | 13.446 | | 26.45 | 14.30 | 1.585 | -4.800 | 1.175 | -7.9299 |
| 130 | 470.7 | 16.300 | 16.532 | 17.083 | 13.399 | | 26.13 | 15.90 | 1.138 | -4.944 | 7.601 - 9 | -8.1191 |
| 135 | 504.8 | 16.109 | 16.421 | .917 | 13.360 | | 25.81 | 17.29 | 8.424 - 6 | -5.074 | 5.181 | -8.2856 |
| 140 | 534.1 | 15.933 | 16.321 | .755 | 13.326 | | 25.49 | 18.56 | 6.374 | -5.196 | 3.659 | -8.4366 |
| 145 | 558.0 | 15.770 | 16.230 | .611 | 13.296 | | 25.17 | 19.66 | 4.907 | -5.309 | 2.662 | -8.5748 |
| 150 | 578.5 | 15.617 | 16.146 | 16.474 | 13.269 | | 24.84 | 20.69 | 3.830 | -5.417 | 1.978 | -8.7037 |
| 155 | 595.6 | 15.471 | 16.067 | 16.345 | 13.245 | | 24.51 | 21.62 | 3.024 - 6 | -5.519 | 1.497 - 9 | -8.8248 |
| 160 | 610.2 | 15.331 | 15.991 | 16.221 | 13.222 | | 24.18 | 22.49 | 2.410 | -5.618 | 1.149 | -8.9397 |
| 165 | 622.8 | 15.197 | 15.920 | 16.102 | 13.201 | | 23.85 | 23.28 | 1.937 | -5.713 | 8.933 -10 | -9.0490 |
| 170 | 632.3 | 15.065 | 15.851 | 15.987 | 13.181 | | 23.51 | 24.04 | 1.568 | -5.805 | 7.013 | -9.1541 |
| 175 | 641.0 | 14.938 | 15.784 | 15.874 | 13.162 | | 23.17 | 24.77 | 1.278 | -5.894 | 5.555 | -9.2553 |
| 180 | 648.3 | 14.812 | 15.719 | 15.764 | 13.144 | | 22.83 | 25.46 | 1.047 | -5.980 | 4.435 | -9.3531 |
| 185 | 654.1 | 14.690 | 15.655 | 15.656 | 13.127 | | 22.49 | 26.11 | 8.625 - 7 | -6.064 | 3.567 | -9.4476 |
| 190 | 659.0 | 14.569 | 15.593 | 15.549 | 13.110 | | 22.16 | 26.75 | 7.139 | -6.146 | 2.887 | -9.5396 |
| 195 | 662.0 | 14.450 | 15.533 | 15.445 | 13.094 | | 21.83 | 27.32 | 5.933 | -6.227 | 2.353 | -9.6284 |
| 200 | 665.7 | 14.331 | 15.472 | 15.341 | 13.078 | | 21.50 | 27.93 | 4.951 | -6.305 | 1.923 | -9.7160 |
| 205 | 670.3 | 14.213 | 15.412 | 15.237 | 13.062 | | 21.18 | 28.60 | 4.148 - 7 | -6.382 | 1.576 -10 | -9.8024 |
| 210 | 674.3 | 14.096 | 15.352 | 15.134 | 13.046 | | 20.86 | 29.24 | 3.490 | -6.457 | 1.299 | -9.8865 |
| 215 | 677.7 | 13.980 | 15.293 | 15.033 | 13.030 | | 20.56 | 29.88 | 2.947 | -6.531 | 1.075 | -9.9686 |
| 220 | 680.7 | 13.866 | 15.235 | 14.932 | 13.015 | | 20.26 | 30.49 | 2.497 | -6.603 | 8.937 -11 | -10.0488 |
| 225 | 683.3 | 13.752 | 15.177 | 14.832 | 13.000 | | 19.97 | 31.09 | 2.123 | -6.673 | 7.462 | -10.1271 |
| 230 | 685.5 | 13.639 | 15.120 | 14.733 | 12.985 | | 19.70 | 31.68 | 1.810 | -6.742 | 6.255 | -10.2038 |
| 235 | 687.5 | 13.526 | 15.063 | 14.635 | 12.970 | | 19.43 | 32.25 | 1.548 | -6.810 | 5.262 | -10.2788 |
| 240 | 689.2 | 13.415 | 15.007 | 14.537 | 12.956 | | 19.18 | 32.81 | 1.327 | -6.877 | 4.443 | -10.3523 |
| 245 | 690.6 | 13.304 | 14.951 | 14.439 | 12.942 | | 18.93 | 33.35 | 1.141 | -6.943 | 3.763 | -10.4244 |
| 250 | 691.9 | 13.193 | 14.895 | 14.342 | 12.927 | | 18.70 | 33.88 | 9.835 - 8 | -7.007 | 3.198 | -10.4952 |
| 255 | 693.0 | 13.083 | 14.840 | 14.246 | 12.913 | | 18.48 | 34.39 | 8.495 - 8 | -7.071 | 2.725 -11 | -10.5646 |
| 260 | 693.9 | 12.973 | 14.784 | 14.150 | 12.899 | | 18.27 | 34.89 | 7.354 | -7.133 | 2.329 | -10.6329 |
| 265 | 694.7 | 12.864 | 14.729 | 14.054 | 12.885 | | 18.07 | 35.37 | 6.378 | -7.195 | 1.995 | -10.7000 |
| 270 | 695.4 | 12.755 | 14.675 | 13.958 | 12.871 | | 17.88 | 35.84 | 5.542 | -7.256 | 1.714 | -10.7660 |
| 275 | 696.1 | 12.646 | 14.620 | 13.863 | 12.858 | | 17.70 | 36.29 | 4.825 | -7.317 | 1.476 | -10.8310 |
| 280 | 696.6 | 12.538 | 14.566 | 13.768 | 12.844 | | 17.53 | 36.73 | 4.207 | -7.376 | 1.273 | -10.8951 |
| 285 | 697.0 | 12.429 | 14.512 | 13.674 | 12.830 | | 17.36 | 37.15 | 3.675 | -7.435 | 1.101 | -10.9582 |
| 290 | 697.4 | 12.322 | 14.458 | 13.579 | 12.817 | | 17.21 | 37.57 | 3.215 | -7.493 | 9.539 -12 | -11.0205 |
| 295 | 697.8 | 12.214 | 14.404 | 13.485 | 12.803 | | 17.06 | 37.97 | 2.816 | -7.550 | 8.280 | -11.0820 |
| 300 | 698.1 | 12.107 | 14.350 | 13.391 | 12.790 | | 16.92 | 38.37 | 2.470 | -7.607 | 7.200 | -11.1427 |
| 310 | 698.6 | 11.893 | 14.243 | 13.204 | 12.763 | | 16.65 | 39.14 | 1.908 - 8 | -7.719 | 5.470 -12 | -11.2620 |
| 320 | 698.9 | 11.679 | 14.136 | 13.017 | 12.736 | | 16.39 | 39.88 | 1.482 | -7.829 | 4.280 | -11.3789 |
| 330 | 699.2 | 11.467 | 14.030 | 12.831 | 12.709 | | 16.15 | 40.62 | 1.156 | -7.937 | 3.210 | -11.4934 |
| 340 | 699.4 | 11.255 | 13.924 | 12.646 | 12.683 | | 15.91 | 41.37 | 9.056 - 9 | -8.043 | 2.477 | -11.6060 |
| 350 | 699.5 | 11.045 | 13.818 | 12.461 | 12.656 | | 15.67 | 42.14 | 7.127 | -8.147 | 1.920 | -11.7168 |
| 360 | 699.7 | 10.834 | 13.713 | 12.277 | 12.630 | | 15.42 | 42.96 | 5.634 | -8.249 | 1.493 | -11.8259 |
| 370 | 699.7 | 10.625 | 13.608 | 12.094 | 12.604 | | 15.16 | 43.84 | 4.474 | -8.349 | 1.166 | -11.9335 |
| 380 | 699.8 | 10.416 | 13.504 | 11.911 | 12.578 | | 14.87 | 44.80 | 3.570 | -8.447 | 9.128 -13 | -12.0396 |
| 390 | 699.9 | 10.208 | 13.400 | 11.728 | 12.551 | | 14.57 | 45.87 | 2.864 | -8.543 | 7.170 | -12.1445 |
| 400 | 699.9 | 10.000 | 13.296 | 11.547 | 12.526 | | 14.24 | 47.08 | 2.309 | -8.637 | 5.650 | -12.2479 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 699.9 | 9.793 | 13.192 | 11.365 | 12.500 | | 13.88 | 48.46 | 1.873 - 9 | -8.728 | 4.466 -13 | -12.3501 |
| 420 | 699.9 | 9.587 | 13.089 | 11.185 | 12.474 | | 13.48 | 50.03 | 1.528 | -8.816 | 3.540 | -12.4509 |
| 430 | 700.0 | 9.381 | 12.986 | 11.005 | 12.448 | | 13.05 | 51.84 | 1.256 | -8.901 | 2.816 | -12.5504 |
| 440 | 700.0 | 9.176 | 12.884 | 10.825 | 12.422 | | 12.58 | 53.92 | 1.039 | -8.983 | 2.247 | -12.6484 |
| 450 | 700.0 | 8.971 | 12.782 | 10.646 | 12.397 | | 12.08 | 56.32 | 8.668 -10 | -9.062 | 1.800 | -12.7448 |
| 460 | 700.0 | 8.767 | 12.680 | 10.467 | 12.371 | | 11.55 | 59.07 | 7.288 | -9.137 | 1.447 | -12.8396 |
| 470 | 700.0 | 8.564 | 12.578 | 10.289 | 12.346 | | 11.00 | 62.22 | 6.179 | -9.209 | 1.168 | -12.9326 |
| 480 | 700.0 | 8.361 | 12.477 | 10.112 | 12.320 | | 10.43 | 65.81 | 5.285 | -9.277 | 9.472 -14 | -13.0236 |
| 490 | 700.0 | 8.159 | 12.375 | 9.935 | 12.295 | | 9.85 | 69.88 | 4.560 | -9.341 | 7.719 | -13.1124 |
| 500 | 700.0 | 7.957 | 12.275 | 9.758 | 12.270 | 11.553 | 9.27 | 74.46 | 3.969 | -9.401 | 6.325 | -13.1990 |
| 510 | 700.0 | 7.756 | 12.174 | 9.582 | 12.245 | 11.547 | 8.70 | 79.57 | 3.486 -10 | -9.458 | 5.212 -14 | -13.2830 |
| 520 | 700.0 | 7.556 | 12.074 | 9.407 | 12.220 | 11.541 | 8.15 | 85.22 | 3.087 | -9.510 | 4.323 | -13.3643 |
| 530 | 700.0 | 7.356 | 11.974 | 9.232 | 12.195 | 11.534 | 7.62 | 91.41 | 2.756 | -9.560 | 3.609 | -13.4426 |
| 540 | 700.0 | 7.157 | 11.875 | 9.058 | 12.170 | 11.528 | 7.12 | 98.10 | 2.480 | -9.606 | 3.034 | -13.5179 |
| 550 | 700.0 | 6.958 | 11.775 | 8.884 | 12.145 | 11.522 | 6.66 | 105.26 | 2.247 | -9.648 | 2.570 | -13.5900 |
| 560 | 700.0 | 6.760 | 11.676 | 8.710 | 12.120 | 11.516 | 6.23 | 112.82 | 2.050 | -9.688 | 2.194 | -13.6587 |
| 570 | 700.0 | 6.563 | 11.577 | 8.538 | 12.096 | 11.509 | 5.84 | 120.71 | 1.882 | -9.725 | 1.888 | -13.7241 |
| 580 | 700.0 | 6.366 | 11.479 | 8.365 | 12.071 | 11.503 | 5.49 | 128.83 | 1.737 | -9.760 | 1.637 | -13.7859 |
| 590 | 700.0 | 6.170 | 11.381 | 8.193 | 12.046 | 11.497 | 5.17 | 137.09 | 1.611 | -9.793 | 1.431 | -13.8443 |
| 600 | 700.0 | 5.974 | 11.283 | 8.022 | 12.022 | 11.491 | 4.89 | 145.39 | 1.501 | -9.824 | 1.261 | -13.8994 |
| 610 | 700.0 | 5.779 | 11.185 | 7.851 | 11.997 | 11.485 | 4.64 | 153.64 | 1.404 -10 | -9.853 | 1.119 -14 | -13.9511 |
| 620 | 700.0 | 5.584 | 11.088 | 7.681 | 11.973 | 11.479 | 4.42 | 161.75 | 1.318 | -9.880 | 1.001 | -13.9998 |
| 630 | 700.0 | 5.390 | 10.991 | 7.511 | 11.949 | 11.472 | 4.23 | 169.65 | 1.240 | -9.906 | 9.006 -15 | -14.0455 |
| 640 | 700.0 | 5.196 | 10.894 | 7.341 | 11.925 | 11.466 | 4.06 | 177.29 | 1.171 | -9.931 | 8.159 | -14.0884 |
| 650 | 700.0 | 5.003 | 10.798 | 7.172 | 11.900 | 11.460 | 3.91 | 184.62 | 1.108 | -9.955 | 7.435 | -14.1287 |
| 660 | 700.0 | 4.811 | 10.701 | 7.004 | 11.876 | 11.454 | 3.77 | 191.62 | 1.051 | -9.979 | 6.812 | -14.1667 |
| 670 | 700.0 | 4.619 | 10.605 | 6.836 | 11.852 | 11.448 | 3.66 | 198.29 | 9.980 -11 | -10.001 | 6.272 | -14.2026 |
| 680 | 700.0 | 4.428 | 10.510 | 6.668 | 11.828 | 11.442 | 3.55 | 204.62 | 9.497 | -10.022 | 5.800 | -14.2366 |
| 690 | 700.0 | 4.237 | 10.414 | 6.501 | 11.805 | 11.436 | 3.46 | 210.64 | 9.051 | -10.043 | 5.384 | -14.2689 |
| 700 | 700.0 | 4.046 | 10.319 | 6.334 | 11.781 | 11.430 | 3.38 | 216.36 | 8.636 | -10.064 | 5.016 | -14.2996 |
| 710 | 700.0 | 3.857 | 10.224 | 6.168 | 11.757 | 11.424 | 3.31 | 221.80 | 8.251 -11 | -10.083 | 4.688 -15 | -14.3290 |
| 720 | 700.0 | 3.667 | 10.130 | 6.003 | 11.733 | 11.418 | 3.24 | 227.01 | 7.891 | -10.103 | 4.393 | -14.3572 |
| 730 | 700.0 | 3.479 | 10.035 | 5.838 | 11.710 | 11.412 | 3.18 | 231.99 | 7.555 | -10.122 | 4.127 | -14.3843 |
| 740 | 700.0 | 3.291 | 9.941 | 5.673 | 11.686 | 11.406 | 3.12 | 236.80 | 7.239 | -10.140 | 3.886 | -14.4105 |
| 750 | 700.0 | 3.103 | 9.847 | 5.509 | 11.663 | 11.400 | 3.07 | 241.45 | 6.943 | -10.158 | 3.665 | -14.4359 |
| 760 | 700.0 | 2.916 | 9.754 | 5.345 | 11.639 | 11.395 | 3.02 | 245.97 | 6.664 | -10.176 | 3.463 | -14.4606 |
| 770 | 700.0 | 2.729 | 9.661 | 5.182 | 11.616 | 11.389 | 2.98 | 250.39 | 6.401 | -10.194 | 3.276 | -14.4846 |
| 780 | 700.0 | 2.543 | 9.568 | 5.019 | 11.593 | 11.383 | 2.94 | 254.73 | 6.152 | -10.211 | 3.104 | -14.5080 |
| 790 | 700.0 | 2.358 | 9.475 | 4.856 | 11.570 | 11.377 | 2.90 | 259.01 | 5.917 | -10.228 | 2.945 | -14.5310 |
| 800 | 700.0 | 2.173 | 9.382 | 4.694 | 11.546 | 11.371 | 2.86 | 263.26 | 5.695 | -10.245 | 2.796 | -14.5534 |
| 820 | 700.0 | 1.804 | 9.198 | 4.372 | 11.500 | 11.360 | 2.78 | 271.70 | 5.285 -11 | -10.277 | 2.528 -15 | -14.5972 |
| 840 | 700.0 | 1.438 | 9.015 | 4.051 | 11.455 | 11.348 | 2.72 | 280.18 | 4.915 | -10.308 | 2.293 | -14.6396 |
| 860 | 700.0 | 0.711 | 8.652 | 3.415 | 11.364 | 11.325 | 2.59 | 297.51 | 4.279 | -10.369 | 1.901 | -14.7210 |
| 900 | 700.0 | 0.351 | 8.471 | 3.099 | 11.319 | 11.314 | 2.52 | 306.52 | 4.005 | -10.397 | 1.736 | -14.7604 |
| 920 | 700.0 | -0.007 | 8.292 | 2.786 | 11.274 | 11.302 | 2.46 | 315.79 | 3.756 | -10.425 | 1.589 | -14.7988 |
| 940 | 700.0 | -0.364 | 8.114 | 2.474 | 11.229 | 11.291 | 2.40 | 325.37 | 3.528 | -10.452 | 1.457 | -14.8365 |
| 960 | 700.0 | -0.718 | 7.937 | 2.163 | 11.185 | 11.280 | 2.35 | 335.26 | 3.321 | -10.479 | 1.338 | -14.8735 |
| 980 | 700.0 | -1.071 | 7.761 | 1.855 | 11.141 | 11.269 | 2.29 | 345.48 | 3.132 | -10.504 | 1.231 | -14.9096 |
| 1000 | 700.0 | -1.421 | 7.585 | 1.548 | 11.097 | 11.258 | 2.23 | 356.04 | 2.958 | -10.529 | 1.135 | -14.9451 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 800° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 380.1 | 16.761 | 16.809 | 17.498 | 13.502 | | 26.77 | 12.50 | 2.294 - 5 | -4.639 | 1.943 - 8 | -7.7116 |
| 125 | 443.8 | 16.502 | 16.646 | 17.263 | 13.437 | | 26.45 | 14.79 | 1.589 | -4.799 | 1.139 | -7.9433 |
| 130 | 498.7 | 16.284 | 16.511 | 17.067 | 13.384 | | 26.12 | 16.84 | 1.159 | -4.936 | 7.306 - 9 | -8.1353 |
| 135 | 544.3 | 16.096 | 16.398 | 16.897 | 13.342 | | 25.85 | 18.62 | 8.739 - 6 | -5.059 | 4.992 | -8.3017 |
| 140 | 583.5 | 15.936 | 16.298 | 16.745 | 13.306 | | 25.56 | 20.22 | 6.755 | -5.170 | 3.559 | -8.4486 |
| 145 | 615.7 | 15.772 | 16.210 | 16.607 | 13.275 | | 25.27 | 21.61 | 5.319 | -5.274 | 2.626 | -8.5807 |
| 150 | 643.4 | 15.629 | 16.128 | 16.479 | 13.248 | | 24.98 | 22.88 | 4.249 | -5.372 | 1.984 | -8.7024 |
| 155 | 666.1 | 15.494 | 16.054 | 16.359 | 13.223 | | 24.69 | 24.00 | 3.433 - 6 | -5.464 | 1.531 - 9 | -8.8151 |
| 160 | 685.6 | 15.366 | 15.983 | 16.246 | 13.201 | | 24.40 | 25.03 | 2.799 | -5.553 | 1.198 | -8.9214 |
| 165 | 701.7 | 15.244 | 15.917 | 16.137 | 13.181 | | 24.11 | 25.97 | 2.301 | -5.638 | 9.510 -10 | -9.0218 |
| 170 | 715.6 | 15.126 | 15.854 | 16.033 | 13.162 | | 23.83 | 26.85 | 1.904 | -5.720 | 7.624 | -9.1178 |
| 175 | 727.2 | 15.011 | 15.793 | 15.932 | 13.144 | | 23.53 | 27.67 | 1.585 | -5.800 | 6.168 | -9.2098 |
| 180 | 737.0 | 14.899 | 15.734 | 15.833 | 13.127 | | 23.23 | 28.44 | 1.326 | -5.877 | 5.029 | -9.2985 |
| 185 | 744.9 | 14.790 | 15.677 | 15.737 | 13.111 | | 22.93 | 29.15 | 1.115 | -5.953 | 4.130 | -9.3840 |
| 190 | 751.5 | 14.683 | 15.622 | 15.643 | 13.096 | | 22.65 | 29.84 | 9.411 - 7 | -6.026 | 3.411 | -9.4671 |
| 195 | 757.1 | 14.578 | 15.567 | 15.550 | 13.081 | | 22.36 | 30.50 | 7.974 | -6.098 | 2.832 | -9.5479 |
| 200 | 761.5 | 14.473 | 15.514 | 15.458 | 13.067 | | 22.07 | 31.13 | 6.780 | -6.169 | 2.363 | -9.6265 |
| 205 | 765.0 | 14.371 | 15.462 | 15.368 | 13.053 | | 21.78 | 31.73 | 5.783 - 7 | -6.238 | 1.980 -10 | -9.7033 |
| 210 | 767.6 | 14.269 | 15.410 | 15.279 | 13.040 | | 21.50 | 32.30 | 4.946 | -6.306 | 1.666 | -9.7783 |
| 215 | 772.0 | 14.167 | 15.358 | 15.189 | 13.026 | | 21.22 | 32.97 | 4.244 | -6.372 | 1.403 | -9.8530 |
| 220 | 775.8 | 14.066 | 15.306 | 15.100 | 13.012 | | 20.95 | 33.61 | 3.652 | -6.437 | 1.186 | -9.9259 |
| 225 | 779.0 | 13.965 | 15.255 | 15.012 | 12.998 | | 20.68 | 34.24 | 3.151 | -6.501 | 1.006 | -9.9973 |
| 230 | 781.9 | 13.866 | 15.205 | 14.925 | 12.985 | | 20.42 | 34.86 | 2.727 | -6.564 | 8.565 -11 | -10.0673 |
| 235 | 784.3 | 13.767 | 15.154 | 14.838 | 12.972 | | 20.17 | 35.46 | 2.365 | -6.626 | 7.314 | -10.1358 |
| 240 | 786.5 | 13.669 | 15.105 | 14.752 | 12.959 | | 19.92 | 36.05 | 2.057 | -6.687 | 6.265 | -10.2031 |
| 245 | 788.3 | 13.571 | 15.056 | 14.667 | 12.947 | | 19.68 | 36.62 | 1.792 | -6.747 | 5.382 | -10.2690 |
| 250 | 789.9 | 13.474 | 15.007 | 14.582 | 12.934 | | 19.45 | 37.19 | 1.565 | -6.805 | 4.636 | -10.3339 |
| 255 | 791.2 | 13.378 | 14.958 | 14.497 | 12.922 | | 19.23 | 37.74 | 1.370 - 7 | -6.863 | 4.004 -11 | -10.3975 |
| 260 | 792.4 | 13.281 | 14.909 | 14.413 | 12.909 | | 19.02 | 38.28 | 1.201 | -6.921 | 3.466 | -10.4602 |
| 265 | 793.5 | 13.186 | 14.861 | 14.329 | 12.897 | | 18.81 | 38.80 | 1.055 | -6.977 | 3.008 | -10.5218 |
| 270 | 794.3 | 13.090 | 14.813 | 14.245 | 12.885 | | 18.62 | 39.32 | 9.280 - 8 | -7.032 | 2.616 | -10.5824 |
| 275 | 795.1 | 12.995 | 14.765 | 14.161 | 12.873 | | 18.43 | 39.82 | 8.178 | -7.087 | 2.280 | -10.6421 |
| 280 | 795.8 | 12.900 | 14.718 | 14.078 | 12.861 | | 18.25 | 40.31 | 7.219 | -7.142 | 1.991 | -10.7010 |
| 285 | 796.3 | 12.805 | 14.670 | 13.995 | 12.849 | | 18.07 | 40.78 | 6.381 | -7.195 | 1.742 | -10.7590 |
| 290 | 796.8 | 12.711 | 14.623 | 13.913 | 12.837 | | 17.91 | 41.25 | 5.649 | -7.248 | 1.527 | -10.8162 |
| 295 | 797.3 | 12.616 | 14.576 | 13.830 | 12.825 | | 17.75 | 41.70 | 5.007 | -7.300 | 1.341 | -10.8726 |
| 300 | 797.6 | 12.522 | 14.528 | 13.748 | 12.813 | | 17.60 | 42.14 | 4.444 | -7.352 | 1.179 | -10.9284 |
| 310 | 798.2 | 12.335 | 14.435 | 13.584 | 12.789 | | 17.31 | 42.99 | 3.514 - 8 | -7.454 | 9.167 -12 | -11.0378 |
| 320 | 798.7 | 12.148 | 14.341 | 13.420 | 12.766 | | 17.05 | 43.81 | 2.791 | -7.554 | 7.167 | -11.1447 |
| 330 | 799.0 | 11.963 | 14.248 | 13.258 | 12.743 | | 16.81 | 44.59 | 2.226 | -7.653 | 5.632 | -11.2493 |
| 340 | 799.3 | 11.777 | 14.156 | 13.095 | 12.719 | | 16.58 | 45.35 | 1.782 | -7.749 | 4.447 | -11.3520 |
| 350 | 799.4 | 11.593 | 14.063 | 12.934 | 12.696 | | 16.37 | 46.10 | 1.432 | -7.844 | 3.526 | -11.4527 |
| 360 | 799.6 | 11.409 | 13.971 | 12.773 | 12.673 | | 16.16 | 46.84 | 1.155 | -7.938 | 2.807 | -11.5518 |
| 370 | 799.7 | 11.225 | 13.879 | 12.612 | 12.650 | | 15.95 | 47.59 | 9.344 - 9 | -8.029 | 2.242 | -11.6494 |
| 380 | 799.8 | 11.043 | 13.788 | 12.452 | 12.627 | | 15.75 | 48.36 | 7.586 | -8.120 | 1.796 | -11.7456 |
| 390 | 799.9 | 10.860 | 13.697 | 12.293 | 12.604 | | 15.54 | 49.16 | 6.179 | -8.209 | 1.444 | -11.8405 |
| 400 | 799.9 | 10.679 | 13.606 | 12.134 | 12.582 | | 15.33 | 50.00 | 5.050 | -8.297 | 1.164 | -11.9341 |

| Altitude $Z$, km | Temp. $T$, °K | Number density: log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 410 | 799.9 | 10.498 | 13.515 | 11.975 | 12.559 | | 15.10 | 50.89 | 4.142 - 9 | -8.383 | 9.404 -13 | -12.0267 |
| 420 | 799.9 | 10.317 | 13.425 | 11.817 | 12.536 | | 14.86 | 51.87 | 3.409 | -8.467 | 7.618 | -12.1182 |
| 430 | 799.9 | 10.137 | 13.335 | 11.659 | 12.514 | | 14.61 | 52.93 | 2.817 | -8.550 | 6.186 | -12.2086 |
| 440 | 800.0 | 9.957 | 13.245 | 11.502 | 12.491 | | 14.33 | 54.10 | 2.337 | -8.631 | 5.035 | -12.2980 |
| 450 | 800.0 | 9.778 | 13.156 | 11.346 | 12.469 | | 14.04 | 55.40 | 1.946 | -8.711 | 4.108 | -12.3864 |
| 460 | 800.0 | 9.600 | 13.067 | 11.189 | 12.447 | | 13.72 | 56.85 | 1.629 | -8.788 | 3.359 | -12.4737 |
| 470 | 800.0 | 9.422 | 12.978 | 11.034 | 12.424 | | 13.38 | 58.48 | 1.369 | -8.863 | 2.754 | -12.5600 |
| 480 | 800.0 | 9.245 | 12.889 | 10.878 | 12.402 | | 13.01 | 60.30 | 1.157 | -8.937 | 2.263 | -12.6452 |
| 490 | 800.0 | 9.068 | 12.801 | 10.723 | 12.380 | | 12.62 | 62.34 | 9.829 -10 | -9.008 | 1.865 | -12.7293 |
| 500 | 800.0 | 8.892 | 12.712 | 10.569 | 12.358 | 11.102 | 12.21 | 64.63 | 8.396 | -9.076 | 1.541 | -12.8121 |
| 510 | 800.0 | 8.716 | 12.624 | 10.415 | 12.336 | 11.096 | 11.78 | 67.19 | 7.213 -10 | -9.142 | 1.277 -13 | -12.8937 |
| 520 | 800.0 | 8.540 | 12.537 | 10.262 | 12.314 | 11.091 | 11.33 | 70.05 | 6.235 | -9.205 | 1.062 | -12.9738 |
| 530 | 800.0 | 8.366 | 12.449 | 10.109 | 12.292 | 11.085 | 10.87 | 73.24 | 5.422 | -9.266 | 8.860 -14 | -13.0525 |
| 540 | 800.0 | 8.191 | 12.362 | 9.956 | 12.271 | 11.080 | 10.40 | 76.77 | 4.745 | -9.324 | 7.419 | -13.1297 |
| 550 | 800.0 | 8.017 | 12.275 | 9.804 | 12.249 | 11.074 | 9.93 | 80.66 | 4.178 | -9.379 | 6.236 | -13.2051 |
| 560 | 800.0 | 7.844 | 12.189 | 9.652 | 12.227 | 11.069 | 9.46 | 84.93 | 3.703 | -9.431 | 5.264 | -13.2787 |
| 570 | 800.0 | 7.671 | 12.102 | 9.501 | 12.205 | 11.063 | 8.99 | 89.57 | 3.302 | -9.481 | 4.463 | -13.3504 |
| 580 | 800.0 | 7.499 | 12.016 | 9.350 | 12.184 | 11.058 | 8.54 | 94.60 | 2.962 | -9.528 | 3.802 | -13.4200 |
| 590 | 800.0 | 7.327 | 11.930 | 9.199 | 12.162 | 11.053 | 8.10 | 99.99 | 2.672 | -9.573 | 3.254 | -13.4875 |
| 600 | 800.0 | 7.156 | 11.845 | 9.049 | 12.141 | 11.047 | 7.68 | 105.73 | 2.424 | -9.615 | 2.801 | -13.5527 |
| 610 | 800.0 | 6.985 | 11.759 | 8.900 | 12.120 | 11.042 | 7.29 | 111.78 | 2.211 -10 | -9.655 | 2.423 -14 | -13.6156 |
| 620 | 800.0 | 6.815 | 11.674 | 8.751 | 12.098 | 11.036 | 6.92 | 118.10 | 2.027 | -9.693 | 2.108 | -13.6761 |
| 630 | 800.0 | 6.645 | 11.589 | 8.602 | 12.077 | 11.031 | 6.57 | 124.65 | 1.867 | -9.729 | 1.845 | -13.7341 |
| 640 | 800.0 | 6.475 | 11.504 | 8.454 | 12.056 | 11.026 | 6.26 | 131.37 | 1.726 | -9.763 | 1.624 | -13.7895 |
| 650 | 800.0 | 6.307 | 11.420 | 8.306 | 12.035 | 11.020 | 5.96 | 138.19 | 1.603 | -9.795 | 1.437 | -13.8425 |
| 660 | 800.0 | 6.138 | 11.336 | 8.159 | 12.014 | 11.015 | 5.70 | 145.05 | 1.494 | -9.826 | 1.279 | -13.8930 |
| 670 | 800.0 | 5.970 | 11.252 | 8.012 | 11.993 | 11.010 | 5.46 | 151.89 | 1.396 | -9.855 | 1.145 | -13.9410 |
| 680 | 800.0 | 5.803 | 11.168 | 7.865 | 11.972 | 11.005- | 5.24 | 158.64 | 1.309 | -9.883 | 1.031 | -13.9867 |
| 690 | 800.0 | 5.636 | 11.085 | 7.719 | 11.951 | 10.999 | 5.04 | 165.27 | 1.231 | -9.910 | 9.332 -15 | -14.0300 |
| 700 | 800.0 | 5.469 | 11.001 | 7.573 | 11.930 | 10.994 | 4.87 | 171.71 | 1.160 | -9.936 | 8.489 | -14.0712 |
| 710 | 800.0 | 5.303 | 10.918 | 7.428 | 11.909 | 10.989 | 4.71 | 177.93 | 1.095 -10 | -9.960 | 7.758 -15 | -14.1102 |
| 720 | 800.0 | 5.138 | 10.836 | 7.283 | 11.889 | 10.984 | 4.57 | 183.90 | 1.036 | -9.984 | 7.123 | -14.1473 |
| 730 | 800.0 | 4.973 | 10.753 | 7.138 | 11.868 | 10.978 | 4.45 | 189.59 | 9.824 -11 | -10.008 | 6.567 | -14.1826 |
| 740 | 800.0 | 4.808 | 10.671 | 6.994 | 11.847 | 10.973 | 4.33 | 195.01 | 9.327 | -10.030 | 6.078 | -14.2162 |
| 750 | 800.0 | 4.644 | 10.589 | 6.850 | 11.827 | 10.968 | 4.24 | 200.14 | 8.866 | -10.052 | 5.646 | -14.2482 |
| 760 | 800.0 | 4.480 | 10.507 | 6.707 | 11.806 | 10.963 | 4.15 | 204.99 | 8.439 | -10.074 | 5.262 | -14.2789 |
| 770 | 800.0 | 4.317 | 10.425 | 6.564 | 11.786 | 10.958 | 4.07 | 209.57 | 8.042 | -10.095 | 4.918 | -14.3082 |
| 780 | 800.0 | 4.154 | 10.344 | 6.422 | 11.766 | 10.953 | 4.00 | 213.88 | 7.671 | -10.115 | 4.610 | -14.3363 |
| 790 | 800.0 | 3.992 | 10.263 | 6.280 | 11.745 | 10.948 | 3.93 | 217.95 | 7.324 | -10.135 | 4.331 | -14.3634 |
| 800 | 800.0 | 3.830 | 10.182 | 6.138 | 11.725 | 10.942 | 3.88 | 221.78 | 6.998 | -10.155 | 4.078 | -14.3895 |
| 820 | 800.0 | 3.508 | 10.020 | 5.856 | 11.685 | 10.932 | 3.78 | 228.86 | 6.404 -11 | -10.194 | 3.637 -15 | -14.4393 |
| 840 | 800.0 | 3.187 | 9.860 | 5.575 | 11.645 | 10.922 | 3.70 | 235.25 | 5.875 | -10.231 | 3.264 | -14.4862 |
| 860 | 800.0 | 2.551 | 9.542 | 5.018 | 11.565 | 10.902 | 3.56 | 246.58 | 4.977 | -10.303 | 2.667 | -14.5739 |
| 900 | 800.0 | 2.236 | 9.385 | 4.742 | 11.526 | 10.892 | 3.51 | 251.77 | 4.593 | -10.338 | 2.424 | -14.6154 |
| 920 | 800.0 | 1.922 | 9.228 | 4.468 | 11.486 | 10.882 | 3.46 | 256.79 | 4.245 | -10.372 | 2.209 | -14.6558 |
| 940 | 800.0 | 1.610 | 9.072 | 4.195 | 11.447 | 10.873 | 3.41 | 261.70 | 3.930 | -10.406 | 2.018 | -14.6951 |
| 960 | 800.0 | 1.300 | 8.917 | 3.923 | 11.409 | 10.863 | 3.37 | 266.57 | 3.644 | -10.438 | 1.847 | -14.7336 |
| 980 | 800.0 | 0.992 | 8.763 | 3.653 | 11.370 | 10.853 | 3.33 | 271.46 | 3.382 | -10.471 | 1.693 | -14.7715 |
| 1000 | 800.0 | 0.685 | 8.609 | 3.385 | 11.332 | 10.843 | 3.29 | 276.42 | 3.144 | -10.502 | 1.554 | -14.8087 |

## SUMMER MODEL. EXOSPHERIC TEMPERATURE = 900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 377.6 | 16.360 | 16.809 | 17.495 | 13.503 | | 26.76 | 12.48 | 2.287 - 5 | -4.641 | 1.939 - 8 | -7.7123 |
| 125 | 457.3 | 16.490 | 16.631 | 17.252 | 13.429 | | 26.45 | 15.24 | 1.593 | -4.798 | 1.109 | -7.9552 |
| 130 | 524.8 | 16.270 | 16.494 | 17.051 | 13.372 | | 26.16 | 17.71 | 1.176 | -4.930 | 7.052 - 9 | -8.1517 |
| 135 | 581.4 | 16.084 | 16.378 | 16.882 | 13.326 | | 25.88 | 19.86 | 9.014 - 6 | -5.045 | 4.827 | -8.3163 |
| 140 | 630.1 | 15.919 | 16.278 | 16.734 | 13.289 | | 25.62 | 21.78 | 7.090 | -5.149 | 3.467 | -8.4601 |
| 145 | 670.4 | 15.772 | 16.191 | 16.602 | 13.257 | | 25.35 | 23.45 | 5.684 | -5.245 | 2.586 | -8.5874 |
| 150 | 705.1 | 15.636 | 16.114 | 16.480 | 13.220 | | 25.09 | 24.96 | 4.624 | -5.335 | 1.979 | -8.7035 |
| 155 | 733.6 | 15.513 | 16.041 | 16.368 | 13.205 | | 24.83 | 26.28 | 3.804 - 6 | -5.420 | 1.549 - 9 | -8.8100 |
| 160 | 758.2 | 15.391 | 15.974 | 16.262 | 13.184 | | 24.58 | 27.49 | 3.159 | -5.500 | 1.232 | -8.9096 |
| 165 | 778.7 | 15.278 | 15.912 | 16.162 | 13.163 | | 24.32 | 28.58 | 2.643 | -5.578 | 9.927 -10 | -9.0032 |
| 170 | 796.4 | 15.170 | 15.853 | 16.065 | 13.144 | | 24.06 | 29.59 | 2.226 | -5.653 | 8.087 | -9.0922 |
| 175 | 810.9 | 15.065 | 15.797 | 15.973 | 13.128 | | 23.80 | 30.50 | 1.884 | -5.725 | 6.652 | -9.1770 |
| 180 | 823.3 | 14.964 | 15.743 | 15.883 | 13.112 | | 23.54 | 31.35 | 1.603 | -5.795 | 5.514 | -9.2586 |
| 185 | 833.7 | 14.865 | 15.690 | 15.796 | 13.096 | | 23.28 | 32.15 | 1.370 | -5.863 | 4.601 | -9.3372 |
| 190 | 842.5 | 14.768 | 15.640 | 15.711 | 13.082 | | 23.03 | 32.90 | 1.174 | -5.930 | 3.861 | -9.4134 |
| 195 | 849.7 | 14.673 | 15.590 | 15.627 | 13.068 | | 22.77 | 33.61 | 1.011 | -5.995 | 3.257 | -9.4872 |
| 200 | 855.7 | 14.580 | 15.542 | 15.547 | 13.055 | | 22.51 | 34.29 | 8.721 - 7 | -6.059 | 2.760 | -9.5592 |
| 205 | 860.7 | 14.488 | 15.495 | 15.464 | 13.042 | | 22.26 | 34.94 | 7.548 - 7 | -6.122 | 2.348 -10 | -9.6294 |
| 210 | 864.8 | 14.396 | 15.448 | 15.384 | 13.030 | | 22.00 | 35.55 | 6.550 | -6.184 | 2.005 | -9.6979 |
| 215 | 868.5 | 14.306 | 15.402 | 15.305 | 13.018 | | 21.75 | 36.14 | 5.697 | -6.244 | 1.718 | -9.7650 |
| 220 | 869.5 | 14.217 | 15.357 | 15.227 | 13.006 | | 21.50 | 36.70 | 4.966 | -6.304 | 1.477 | -9.8306 |
| 225 | 873.6 | 14.127 | 15.311 | 15.148 | 12.994 | | 21.26 | 37.36 | 4.339 | -6.363 | 1.270 | -9.8963 |
| 230 | 877.2 | 14.038 | 15.266 | 15.070 | 12.982 | | 21.01 | 38.00 | 3.800 | -6.420 | 1.095 | -9.9607 |
| 235 | 880.2 | 13.950 | 15.221 | 14.992 | 12.970 | | 20.78 | 38.62 | 3.335 | -6.477 | 9.467 -11 | -10.0238 |
| 240 | 882.9 | 13.862 | 15.177 | 14.915 | 12.959 | | 20.54 | 39.24 | 2.933 | -6.533 | 8.208 | -10.0857 |
| 245 | 885.2 | 13.775 | 15.132 | 14.839 | 12.947 | | 20.32 | 39.84 | 2.585 | -6.588 | 7.135 | -10.1466 |
| 250 | 887.2 | 13.689 | 15.089 | 14.763 | 12.936 | | 20.10 | 40.43 | 2.282 | -6.642 | 6.217 | -10.2064 |
| 255 | 888.9 | 13.602 | 15.045 | 14.687 | 12.925 | | 19.88 | 41.01 | 2.018 - 7 | -6.695 | 5.429 -11 | -10.2653 |
| 260 | 890.4 | 13.516 | 15.002 | 14.612 | 12.914 | | 19.67 | 41.58 | 1.788 | -6.748 | 4.751 | -10.3232 |
| 265 | 891.7 | 13.431 | 14.959 | 14.537 | 12.903 | | 19.47 | 42.13 | 1.587 | -6.800 | 4.167 | -10.3802 |
| 270 | 892.8 | 13.346 | 14.916 | 14.463 | 12.892 | | 19.27 | 42.68 | 1.410 | -6.851 | 3.661 | -10.4364 |
| 275 | 893.8 | 13.261 | 14.873 | 14.388 | 12.881 | | 19.08 | 43.22 | 1.255 | -6.901 | 3.223 | -10.4917 |
| 280 | 894.6 | 13.176 | 14.831 | 14.314 | 12.870 | | 18.90 | 43.75 | 1.119 | -6.951 | 2.843 | -10.5462 |
| 285 | 895.3 | 13.092 | 14.789 | 14.240 | 12.859 | | 18.72 | 44.26 | 9.987 - 8 | -7.001 | 2.512 | -10.6000 |
| 290 | 896.0 | 13.008 | 14.746 | 14.167 | 12.849 | | 18.55 | 44.77 | 8.926 | -7.049 | 2.223 | -10.6531 |
| 295 | 896.5 | 12.924 | 14.704 | 14.093 | 12.838 | | 18.38 | 45.27 | 7.988 | -7.098 | 1.970 | -10.7055 |
| 300 | 897.0 | 12.841 | 14.662 | 14.020 | 12.828 | | 18.23 | 45.76 | 7.157 | -7.145 | 1.749 | -10.7572 |
| 310 | 897.7 | 12.676 | 14.579 | 13.874 | 12.807 | | 17.93 | 46.70 | 5.765 - 8 | -7.239 | 1.385 -11 | -10.8587 |
| 320 | 898.3 | 12.508 | 14.496 | 13.729 | 12.786 | | 17.65 | 47.61 | 4.663 | -7.331 | 1.102 | -10.9578 |
| 330 | 898.7 | 12.343 | 14.413 | 13.584 | 12.765 | | 17.39 | 48.48 | 3.787 | -7.422 | 8.815 -12 | -11.0548 |
| 340 | 899.0 | 12.178 | 14.331 | 13.440 | 12.744 | | 17.15 | 49.31 | 3.087 | -7.511 | 7.083 | -11.1498 |
| 350 | 899.3 | 12.014 | 14.248 | 13.296 | 12.724 | | 16.93 | 50.13 | 2.524 | -7.598 | 5.716 | -11.2429 |
| 360 | 899.5 | 11.850 | 14.167 | 13.153 | 12.703 | | 16.72 | 50.91 | 2.071 | -7.684 | 4.631 | -11.3343 |
| 370 | 899.6 | 11.687 | 14.085 | 13.010 | 12.683 | | 16.52 | 51.69 | 1.704 | -7.768 | 3.765 | -11.4242 |
| 380 | 899.7 | 11.525 | 14.004 | 12.968 | 12.662 | | 16.33 | 52.45 | 1.406 | -7.852 | 3.071 | -11.5127 |
| 390 | 899.8 | 11.363 | 13.923 | 12.726 | 12.642 | | 16.15 | 53.21 | 1.164 | -7.934 | 2.512 | -11.5999 |
| 400 | 899.8 | 11.201 | 13.842 | 12.585 | 12.622 | | 15.97 | 53.98 | 9.657 - 9 | -8.015 | 2.061 | -11.6859 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 999.9 | 11.040 | 13.761 | 12.444 | 12.607 | | 15.79 | 54.76 | 8.035 - 9 | -8.095 | 1.695 -12 | -11.7707 |
| 420 | 999.9 | 10.880 | 13.681 | 12.303 | 12.582 | | 15.60 | 55.57 | 6.703 | -8.174 | 1.398 | -11.8545 |
| 430 | 999.9 | 10.720 | 13.601 | 12.163 | 12.567 | | 15.42 | 56.41 | 5.606 | -8.251 | 1.155 | -11.9374 |
| 440 | 999.9 | 10.560 | 13.521 | 12.023 | 12.542 | | 15.22 | 57.30 | 4.702 | -8.328 | 9.566 -13 | -12.0193 |
| 450 | 500.0 | 10.401 | 13.442 | 11.884 | 12.522 | | 15.02 | 58.24 | 3.954 | -8.403 | 7.939 | -12.1003 |
| 460 | 500.0 | 10.242 | 13.363 | 11.745 | 12.502 | | 14.81 | 59.25 | 3.335 | -8.477 | 6.601 | -12.1804 |
| 470 | 500.0 | 10.084 | 13.283 | 11.607 | 12.482 | | 14.58 | 60.35 | 2.822 | -8.549 | 5.499 | -12.2597 |
| 480 | 500.0 | 9.927 | 13.205 | 11.469 | 12.462 | | 14.34 | 61.54 | 2.395 | -8.621 | 4.590 | -12.3382 |
| 490 | 500.0 | 9.769 | 13.126 | 11.331 | 12.443 | | 14.09 | 62.84 | 2.039 | -8.691 | 3.838 | -12.4159 |
| 500 | 500.0 | 9.613 | 13.048 | 11.194 | 12.423 | 10.734 | 13.81 | 64.27 | 1.742 | -8.759 | 3.216 | -12.4927 |
| 510 | 500.0 | 9.456 | 12.969 | 11.057 | 12.403 | 10.729 | 13.52 | 65.84 | 1.494 - 9 | -8.826 | 2.700 -13 | -12.5687 |
| 520 | 500.0 | 9.300 | 12.892 | 10.920 | 12.384 | 10.725 | 13.22 | 67.57 | 1.286 | -8.891 | 2.271 | -12.6438 |
| 530 | 500.0 | 9.145 | 12.814 | 10.784 | 12.365 | 10.720 | 12.89 | 69.48 | 1.111 | -8.954 | 1.914 | -12.7180 |
| 540 | 500.0 | 8.990 | 12.736 | 10.649 | 12.345 | 10.715 | 12.55 | 71.58 | 9.642 -10 | -9.016 | 1.617 | -12.7913 |
| 550 | 500.0 | 8.836 | 12.659 | 10.514 | 12.326 | 10.710 | 12.19 | 73.90 | 8.403 | -9.076 | 1.369 | -12.8637 |
| 560 | 500.0 | 8.682 | 12.582 | 10.379 | 12.307 | 10.705 | 11.82 | 76.45 | 7.356 | -9.133 | 1.162 | -12.9349 |
| 570 | 500.0 | 8.528 | 12.505 | 10.244 | 12.287 | 10.700 | 11.43 | 79.26 | 6.469 | -9.189 | 9.883 -14 | -13.0051 |
| 580 | 500.0 | 8.375 | 12.429 | 10.110 | 12.268 | 10.695 | 11.04 | 82.33 | 5.716 | -9.243 | 8.430 | -13.0742 |
| 590 | 500.0 | 8.222 | 12.352 | 9.976 | 12.249 | 10.691 | 10.63 | 85.69 | 5.074 | -9.295 | 7.211 | -13.1420 |
| 600 | 500.0 | 8.070 | 12.276 | 9.843 | 12.230 | 10.686 | 10.23 | 89.34 | 4.526 | -9.344 | 6.187 | -13.2085 |
| 610 | 500.0 | 7.918 | 12.200 | 9.710 | 12.211 | 10.681 | 9.82 | 93.29 | 4.056 -10 | -9.392 | 5.325 -14 | -13.2736 |
| 620 | 500.0 | 7.767 | 12.125 | 9.578 | 12.192 | 10.676 | 9.43 | 97.55 | 3.652 | -9.437 | 4.599 | -13.3373 |
| 630 | 500.0 | 7.616 | 12.049 | 9.445 | 12.173 | 10.671 | 9.03 | 102.13 | 3.304 | -9.481 | 3.986 | -13.3995 |
| 640 | 500.0 | 7.465 | 11.974 | 9.314 | 12.154 | 10.667 | 8.64 | 107.01 | 3.003 | -9.522 | 3.467 | -13.4601 |
| 650 | 500.0 | 7.315 | 11.899 | 9.182 | 12.136 | 10.662 | 8.26 | 112.19 | 2.741 | -9.562 | 3.027 | -13.5190 |
| 660 | 500.0 | 7.165 | 11.824 | 9.051 | 12.117 | 10.657 | 7.90 | 117.63 | 2.512 | -9.600 | 2.654 | -13.5762 |
| 670 | 500.0 | 7.016 | 11.749 | 8.921 | 12.098 | 10.653 | 7.56 | 123.33 | 2.312 | -9.636 | 2.336 | -13.6315 |
| 680 | 500.0 | 6.867 | 11.675 | 8.790 | 12.080 | 10.648 | 7.23 | 129.25 | 2.136 | -9.670 | 2.065 | -13.6851 |
| 690 | 500.0 | 6.719 | 11.601 | 8.660 | 12.061 | 10.643 | 6.93 | 135.36 | 1.980 | -9.703 | 1.833 | -13.7367 |
| 700 | 500.0 | 6.571 | 11.527 | 8.531 | 12.043 | 10.639 | 6.64 | 141.61 | 1.842 | -9.735 | 1.635 | -13.7865 |
| 710 | 500.0 | 6.423 | 11.453 | 8.402 | 12.024 | 10.634 | 6.37 | 147.97 | 1.720 -10 | -9.765 | 1.464 -14 | -13.8343 |
| 720 | 500.0 | 6.276 | 11.379 | 8.273 | 12.006 | 10.629 | 6.13 | 154.38 | 1.609 | -9.793 | 1.317 | -13.8803 |
| 730 | 500.0 | 6.129 | 11.306 | 8.144 | 11.987 | 10.625 | 5.90 | 160.81 | 1.510 | -9.821 | 1.190 | -13.9243 |
| 740 | 500.0 | 5.983 | 11.233 | 8.016 | 11.969 | 10.620 | 5.69 | 167.20 | 1.421 | -9.847 | 1.080 | -13.9665 |
| 750 | 500.0 | 5.837 | 11.160 | 7.888 | 11.951 | 10.615 | 5.50 | 173.51 | 1.340 | -9.873 | 9.844 -15 | -14.0068 |
| 760 | 500.0 | 5.691 | 11.087 | 7.761 | 11.933 | 10.611 | 5.32 | 179.70 | 1.266 | -9.897 | 9.007 | -14.0454 |
| 770 | 500.0 | 5.546 | 11.014 | 7.634 | 11.914 | 10.606 | 5.16 | 185.74 | 1.199 | -9.921 | 8.273 | -14.0823 |
| 780 | 500.0 | 5.402 | 10.942 | 7.507 | 11.896 | 10.602 | 5.02 | 191.59 | 1.137 | -9.944 | 7.628 | -14.1176 |
| 790 | 500.0 | 5.257 | 10.870 | 7.381 | 11.878 | 10.597 | 4.89 | 197.23 | 1.080 | -9.967 | 7.058 | -14.1513 |
| 800 | 500.0 | 5.113 | 10.798 | 7.255 | 11.860 | 10.593 | 4.77 | 202.65 | 1.027 | -9.988 | 6.552 | -14.1836 |
| 820 | 500.0 | 4.827 | 10.655 | 7.004 | 11.824 | 10.584 | 4.57 | 212.75 | 9.330 -11 | -10.030 | 5.700 -15 | -14.2441 |
| 840 | 500.0 | 4.542 | 10.512 | 6.755 | 11.789 | 10.575 | 4.41 | 221.86 | 8.510 | -10.070 | 5.013 | -14.2999 |
| 860 | 500.0 | 3.977 | 10.230 | 6.260 | 11.718 | 10.557 | 4.17 | 237.22 | 7.150 | -10.146 | 3.983 | -14.3997 |
| 900 | 500.0 | 3.696 | 10.090 | 6.014 | 11.683 | 10.548 | 4.08 | 243.65 | 6.579 | -10.182 | 3.589 | -14.4451 |
| 920 | 500.0 | 3.418 | 9.950 | 5.770 | 11.648 | 10.539 | 4.01 | 249.39 | 6.067 | -10.217 | 3.251 | -14.4880 |
| 940 | 500.0 | 3.141 | 9.812 | 5.528 | 11.613 | 10.530 | 3.95 | 254.55 | 5.604 | -10.252 | 2.958 | -14.5290 |
| 960 | 500.0 | 2.865 | 9.674 | 5.286 | 11.579 | 10.522 | 3.90 | 259.23 | 5.184 | -10.285 | 2.702 | -14.5684 |
| 980 | 500.0 | 2.591 | 9.537 | 5.046 | 11.545 | 10.513 | 3.86 | 263.54 | 4.802 | -10.319 | 2.475 | -14.6064 |
| 1000 | 500.0 | 2.318 | 9.400 | 4.808 | 11.511 | 10.505 | 3.82 | 267.55 | 4.454 | -10.351 | 2.274 | -14.6433 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1000° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 379.3 | 16.759 | 16.808 | 17.497 | 13.503 | | 26.76 | 12.47 | 2.282 - 5 | -4.642 | 1.936 - 8 | -7.7130 |
| 125 | 469.2 | 16.480 | 16.623 | 17.241 | 13.422 | | 26.45 | 15.63 | 1.597 | -4.797 | 1.083 | -7.9653 |
| 130 | 547.8 | 16.258 | 16.478 | 17.039 | 13.361 | | 26.17 | 18.48 | 1.151 | -4.924 | 6.845 - 9 | -8.1646 |
| 135 | 614.2 | 16.073 | 16.361 | 16.870 | 13.313 | | 25.91 | 20.96 | 9.243 - 6 | -5.034 | 4.690 | -8.3288 |
| 140 | 671.9 | 15.912 | 16.261 | 16.725 | 13.274 | | 25.66 | 23.19 | 7.370 | -5.133 | 3.385 | -8.4704 |
| 145 | 720.2 | 15.770 | 16.174 | 16.596 | 13.241 | | 25.42 | 25.13 | 5.993 | -5.222 | 2.544 | -8.5945 |
| 150 | 761.9 | 15.640 | 16.097 | 16.479 | 13.213 | | 25.18 | 26.88 | 4.945 | -5.306 | 1.965 | -8.7065 |
| 155 | 796.6 | 15.520 | 16.028 | 16.372 | 13.188 | | 24.94 | 28.41 | 4.127 - 6 | -5.384 | 1.554 - 9 | -8.8085 |
| 160 | 826.6 | 15.408 | 15.964 | 16.272 | 13.166 | | 24.71 | 29.81 | 3.476 | -5.459 | 1.250 | -8.9032 |
| 165 | 851.4 | 15.302 | 15.904 | 16.178 | 13.147 | | 24.48 | 31.04 | 2.949 | -5.530 | 1.020 | -8.9915 |
| 170 | 872.9 | 15.201 | 15.848 | 16.088 | 13.129 | | 24.25 | 32.18 | 2.518 | -5.599 | 8.411 -10 | -9.0751 |
| 175 | 890.8 | 15.104 | 15.796 | 16.002 | 13.112 | | 24.01 | 33.21 | 2.161 | -5.665 | 7.006 | -9.1545 |
| 180 | 906.3 | 15.010 | 15.745 | 15.919 | 13.097 | | 23.78 | 34.16 | 1.863 | -5.730 | 5.879 | -9.2307 |
| 185 | 919.1 | 14.919 | 15.696 | 15.838 | 13.082 | | 23.55 | 35.04 | 1.612 | -5.793 | 4.969 | -9.3038 |
| 190 | 930.1 | 14.831 | 15.649 | 15.760 | 13.069 | | 23.32 | 35.87 | 1.400 | -5.854 | 4.222 | -9.3744 |
| 195 | 939.2 | 14.744 | 15.604 | 15.684 | 13.056 | | 23.09 | 36.63 | 1.220 | -5.914 | 3.607 | -9.4429 |
| 200 | 947.1 | 14.658 | 15.559 | 15.608 | 13.043 | | 22.86 | 37.37 | 1.066 | -5.972 | 3.093 | -9.5096 |
| 205 | 953.7 | 14.574 | 15.516 | 15.534 | 13.031 | | 22.63 | 38.07 | 9.333 - 7 | -6.030 | 2.664 -10 | -9.5745 |
| 210 | 959.1 | 14.492 | 15.473 | 15.462 | 13.020 | | 22.40 | 38.74 | 8.194 | -6.086 | 2.302 | -9.6379 |
| 215 | 963.3 | 14.410 | 15.431 | 15.390 | 13.008 | | 22.17 | 39.37 | 7.209 | -6.142 | 1.996 | -9.6998 |
| 220 | 966.2 | 14.329 | 15.390 | 15.319 | 12.998 | | 21.95 | 39.95 | 6.355 | -6.197 | 1.736 | -9.7604 |
| 225 | 968.8 | 14.249 | 15.350 | 15.249 | 12.987 | | 21.72 | 40.54 | 5.613 | -6.251 | 1.514 | -9.8200 |
| 230 | 970.7 | 14.169 | 15.309 | 15.179 | 12.977 | | 21.50 | 41.10 | 4.966 | -6.304 | 1.323 | -9.8785 |
| 235 | 974.5 | 14.089 | 15.269 | 15.108 | 12.966 | | 21.28 | 41.75 | 4.401 | -6.356 | 1.156 | -9.9371 |
| 240 | 977.9 | 14.010 | 15.228 | 15.039 | 12.955 | | 21.06 | 42.39 | 3.908 | -6.408 | 1.012 | -9.9946 |
| 245 | 980.8 | 13.931 | 15.188 | 14.969 | 12.945 | | 20.85 | 43.01 | 3.476 | -6.459 | 8.888 -11 | -10.0512 |
| 250 | 983.3 | 13.852 | 15.148 | 14.901 | 12.934 | | 20.64 | 43.63 | 3.097 | -6.509 | 7.820 | -10.1068 |
| 255 | 985.5 | 13.774 | 15.109 | 14.832 | 12.924 | | 20.44 | 44.23 | 2.764 - 7 | -6.558 | 6.894 -11 | -10.1615 |
| 260 | 987.4 | 13.697 | 15.069 | 14.764 | 12.914 | | 20.24 | 44.82 | 2.470 | -6.607 | 6.089 | -10.2154 |
| 265 | 989.0 | 13.620 | 15.030 | 14.696 | 12.904 | | 20.04 | 45.41 | 2.211 | -6.655 | 5.389 | -10.2685 |
| 270 | 990.5 | 13.543 | 14.992 | 14.629 | 12.894 | | 19.85 | 45.98 | 1.982 | -6.703 | 4.777 | -10.3208 |
| 275 | 991.7 | 13.466 | 14.953 | 14.562 | 12.884 | | 19.66 | 46.55 | 1.779 | -6.750 | 4.242 | -10.3724 |
| 280 | 992.8 | 13.390 | 14.915 | 14.495 | 12.874 | | 19.48 | 47.10 | 1.599 | -6.796 | 3.773 | -10.4233 |
| 285 | 993.8 | 13.314 | 14.877 | 14.429 | 12.865 | | 19.30 | 47.65 | 1.439 | -6.842 | 3.361 | -10.4735 |
| 290 | 994.6 | 13.238 | 14.839 | 14.362 | 12.855 | | 19.13 | 48.19 | 1.296 | -6.887 | 2.999 | -10.5231 |
| 295 | 995.3 | 13.162 | 14.801 | 14.296 | 12.845 | | 18.96 | 48.72 | 1.169 | -6.932 | 2.679 | -10.5720 |
| 300 | 995.9 | 13.087 | 14.763 | 14.230 | 12.836 | | 18.80 | 49.25 | 1.056 | -6.976 | 2.397 | -10.6203 |
| 310 | 996.9 | 12.937 | 14.687 | 14.098 | 12.817 | | 18.49 | 50.27 | 8.635 - 8 | -7.064 | 1.927 -11 | -10.7152 |
| 320 | 997.7 | 12.787 | 14.612 | 13.967 | 12.798 | | 18.21 | 51.25 | 7.091 | -7.149 | 1.556 | -10.8079 |
| 330 | 998.2 | 12.638 | 14.538 | 13.837 | 12.779 | | 17.94 | 52.21 | 5.844 | -7.233 | 1.263 | -10.8985 |
| 340 | 998.7 | 12.490 | 14.464 | 13.707 | 12.760 | | 17.69 | 53.13 | 4.834 | -7.316 | 1.030 | -10.9873 |
| 350 | 999.0 | 12.342 | 14.390 | 13.578 | 12.742 | | 17.45 | 54.02 | 4.011 | -7.397 | 8.428 -12 | -11.0743 |
| 360 | 999.2 | 12.195 | 14.316 | 13.449 | 12.723 | | 17.23 | 54.88 | 3.338 | -7.477 | 6.924 | -11.1596 |
| 370 | 999.4 | 12.048 | 14.243 | 13.320 | 12.705 | | 17.03 | 55.72 | 2.786 | -7.555 | 5.709 | -11.2435 |
| 380 | 999.6 | 11.902 | 14.169 | 13.192 | 12.687 | | 16.83 | 56.54 | 2.331 | -7.632 | 4.722 | -11.3259 |
| 390 | 999.7 | 11.756 | 14.096 | 13.064 | 12.668 | | 16.65 | 57.34 | 1.956 | -7.709 | 3.918 | -11.4070 |
| 400 | 999.8 | 11.611 | 14.024 | 12.937 | 12.650 | | 16.47 | 58.13 | 1.645 | -7.784 | 3.259 | -11.4869 |

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 999.8 | 11.466 | 13.951 | 12.810 | 12.632 | | 16.30 | 58.92 | 1.386 - 8 | -7.858 | 2.719 -12 | -11.5656 |
| 420 | 999.9 | 11.321 | 13.879 | 12.684 | 12.614 | | 16.14 | 59.71 | 1.171 | -7.931 | 2.273 | -11.6433 |
| 430 | 999.9 | 11.177 | 13.807 | 12.558 | 12.596 | | 15.97 | 60.50 | 9.917 - 9 | -8.004 | 1.905 | -11.7200 |
| 440 | 999.9 | 11.034 | 13.735 | 12.432 | 12.578 | | 15.81 | 61.31 | 8.416 | -8.075 | 1.600 | -11.7958 |
| 450 | 999.9 | 10.890 | 13.664 | 12.307 | 12.560 | | 15.64 | 62.13 | 7.157 | -8.145 | 1.347 | -11.8707 |
| 460 | 1000.0 | 10.748 | 13.592 | 12.182 | 12.542 | | 15.48 | 62.99 | 6.100 | -8.215 | 1.135 | -11.9448 |
| 470 | 1000.0 | 10.605 | 13.521 | 12.057 | 12.524 | | 15.31 | 63.89 | 5.210 | -8.283 | 9.591 -13 | -12.0181 |
| 480 | 1000.0 | 10.463 | 13.450 | 11.933 | 12.507 | | 15.13 | 64.83 | 4.460 | -8.351 | 8.115 | -12.0907 |
| 490 | 1000.0 | 10.322 | 13.379 | 11.809 | 12.489 | | 14.94 | 65.83 | 3.827 | -8.417 | 6.878 | -12.1626 |
| 500 | 1000.0 | 10.181 | 13.309 | 11.685 | 12.471 | 10.430 | 14.75 | 66.89 | 3.292 | -8.483 | 5.839 | -12.2337 |
| 510 | 1000.0 | 10.040 | 13.238 | 11.562 | 12.454 | 10.426 | 14.54 | 68.03 | 2.838 - 9 | -8.547 | 4.964 -13 | -12.3042 |
| 520 | 1000.0 | 9.900 | 13.168 | 11.439 | 12.436 | 10.421 | 14.33 | 69.25 | 2.453 | -8.610 | 4.227 | -12.3739 |
| 530 | 1000.0 | 9.760 | 13.098 | 11.317 | 12.419 | 10.417 | 14.10 | 70.58 | 2.126 | -8.672 | 3.606 | -12.4430 |
| 540 | 1000.0 | 9.620 | 13.029 | 11.195 | 12.401 | 10.412 | 13.86 | 72.01 | 1.848 | -8.733 | 3.080 | -12.5114 |
| 550 | 1000.0 | 9.481 | 12.959 | 11.073 | 12.384 | 10.408 | 13.60 | 73.57 | 1.611 | -8.793 | 2.635 | -12.5791 |
| 560 | 1000.0 | 9.343 | 12.890 | 10.952 | 12.367 | 10.404 | 13.34 | 75.27 | 1.408 | -8.851 | 2.259 | -12.6462 |
| 570 | 1000.0 | 9.205 | 12.821 | 10.831 | 12.349 | 10.399 | 13.05 | 77.12 | 1.235 | -8.908 | 1.939 | -12.7124 |
| 580 | 1000.0 | 9.067 | 12.752 | 10.710 | 12.332 | 10.395 | 12.76 | 79.13 | 1.087 | -8.964 | 1.667 | -12.7780 |
| 590 | 1000.0 | 8.929 | 12.683 | 10.590 | 12.315 | 10.391 | 12.45 | 81.32 | 9.592 -10 | -9.018 | 1.436 | -12.8427 |
| 600 | 1000.0 | 8.792 | 12.614 | 10.470 | 12.298 | 10.386 | 12.13 | 83.71 | 8.496 | -9.071 | 1.240 | -12.9067 |
| 610 | 1000.0 | 8.656 | 12.546 | 10.350 | 12.281 | 10.382 | 11.80 | 86.30 | 7.553 -10 | -9.122 | 1.072 -13 | -12.9698 |
| 620 | 1000.0 | 8.519 | 12.478 | 10.231 | 12.264 | 10.378 | 11.46 | 89.11 | 6.739 | -9.171 | 9.289 -14 | -13.0320 |
| 630 | 1000.0 | 8.383 | 12.410 | 10.112 | 12.247 | 10.373 | 11.11 | 92.16 | 6.035 | -9.219 | 8.067 | -13.0933 |
| 640 | 1000.0 | 8.248 | 12.342 | 9.993 | 12.230 | 10.369 | 10.76 | 95.45 | 5.424 | -9.266 | 7.021 | -13.1536 |
| 650 | 1000.0 | 8.113 | 12.275 | 9.875 | 12.213 | 10.365 | 10.41 | 99.00 | 4.894 | -9.310 | 6.125 | -13.2129 |
| 660 | 1000.0 | 7.978 | 12.207 | 9.757 | 12.196 | 10.361 | 10.05 | 102.80 | 4.432 | -9.353 | 5.357 | -13.2711 |
| 670 | 1000.0 | 7.844 | 12.140 | 9.639 | 12.179 | 10.356 | 9.69 | 106.88 | 4.029 | -9.395 | 4.697 | -13.3282 |
| 680 | 1000.0 | 7.710 | 12.073 | 9.522 | 12.162 | 10.352 | 9.34 | 111.22 | 3.676 | 435 | 4.130 | -13.3841 |
| 690 | 1000.0 | 7.576 | 12.006 | 9.405 | 12.146 | 10.348 | 9.00 | 115.83 | 3.366 | -9473 | 3.641 | -13.4388 |
| 700 | 1000.0 | 7.443 | 11.940 | 9.289 | 12.129 | 10.344 | 8.66 | 120.70 | 3.093 | -9.510 | 3.220 | -13.4921 |
| 710 | 1000.0 | 7.310 | 11.873 | 9.172 | 12.112 | 10.340 | 8.33 | 125.81 | 2.852 -10 | -9.545 | 2.856 -14 | -13.5442 |
| 720 | 1000.0 | 7.178 | 11.807 | 9.056 | 12.096 | 10.335 | 8.01 | 131.17 | 2.638 | -9.579 | 2.542 | -13.5949 |
| 730 | 1000.0 | 7.046 | 11.741 | 8.941 | 12.079 | 10.331 | 7.71 | 136.74 | 2.448 | -9.611 | 2.269 | -13.6441 |
| 740 | 1000.0 | 6.914 | 11.675 | 8.826 | 12.063 | 10.327 | 7.42 | 142.51 | 2.279 | -9.642 | 2.032 | -13.6923 |
| 750 | 1000.0 | 6.783 | 11.610 | 8.711 | 12.046 | 10.323 | 7.14 | 148.44 | 2.128 | -9.672 | 1.827 | -13.7383 |
| 760 | 1000.0 | 6.652 | 11.544 | 8.596 | 12.030 | 10.319 | 6.88 | 154.52 | 1.992 | -9.701 | 1.647 | -13.7832 |
| 770 | 1000.0 | 6.521 | 11.479 | 8.482 | 12.014 | 10.315 | 6.63 | 160.70 | 1.869 | -9.728 | 1.491 | -13.8266 |
| 780 | 1000.0 | 6.391 | 11.414 | 8.368 | 11.997 | 10.311 | 6.40 | 166.95 | 1.758 | -9.755 | 1.354 | -13.8684 |
| 790 | 1000.0 | 6.261 | 11.349 | 8.254 | 11.981 | 10.307 | 6.19 | 173.24 | 1.658 | -9.780 | 1.234 | -13.9088 |
| 800 | 1000.0 | 6.132 | 11.284 | 8.141 | 11.965 | 10.302 | 5.99 | 179.52 | 1.567 | -9.805 | 1.128 | -13.9477 |
| 820 | 1000.0 | 5.874 | 11.155 | 7.915 | 11.933 | 10.294 | 5.63 | 191.96 | 1.407 -10 | -9.852 | 9.525 -15 | -14.0212 |
| 840 | 1000.0 | 5.617 | 11.027 | 7.690 | 11.901 | 10.286 | 5.33 | 204.00 | 1.272 | -9.896 | 8.146 | -14.0890 |
| 860 | 1000.0 | 5.108 | 10.773 | 7.245 | 11.837 | 10.270 | 4.86 | 226.12 | 1.056 | -9.976 | 6.171 | -14.2097 |
| 900 | 1000.0 | 4.856 | 10.646 | 7.024 | 11.805 | 10.262 | 4.68 | 235.95 | 9.682 -11 | -10.014 | 5.453 | -14.2634 |
| 920 | 1000.0 | 4.605 | 10.521 | 6.804 | 11.774 | 10.254 | 4.54 | 244.90 | 8.910 | -10.050 | 4.861 | -14.3133 |
| 940 | 1000.0 | 4.356 | 10.396 | 6.586 | 11.743 | 10.247 | 4.42 | 252.98 | 8.222 | -10.085 | 4.367 | -14.3599 |
| 960 | 1000.0 | 4.108 | 10.272 | 6.369 | 11.712 | 10.239 | 4.32 | 260.25 | 7.606 | -10.119 | 3.948 | -14.4036 |
| 980 | 1000.0 | 3.861 | 10.149 | 6.153 | 11.681 | 10.231 | 4.23 | 266.75 | 7.050 | -10.152 | 3.590 | -14.4449 |
| 1000 | 1000.0 | 3.616 | 10.026 | 5.938 | 11.650 | 10.223 | 4.17 | 272.59 | 6.546 | -10.184 | 3.280 | -14.4842 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n$($O_2$) | log $n$(O) | log $n$($N_2$) | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 379.7 | 16.758 | 16.808 | 17.496 | 13.502 | | 26.76 | 12.49 | 2.281 - 5 | -4.642 | 1.934 - 8 | -7.7136 |
| 125 | 479.8 | 16.473 | 16.614 | 17.234 | 13.416 | | 26.46 | 15.99 | 1.604 | -4.795 | 1.064 | -7.9732 |
| 130 | 567.8 | 16.249 | 16.466 | 17.029 | 13.352 | | 26.19 | 19.14 | 1.206 | -4.919 | 6.690 - 9 | -8.1746 |
| 135 | 642.9 | 16.066 | 16.347 | 16.861 | 13.302 | | 25.94 | 21.92 | 9.453 - 6 | -5.024 | 4.587 | -8.3395 |
| 140 | 708.5 | 15.907 | 16.247 | 16.717 | 13.261 | | 25.70 | 24.42 | 7.618 | -5.118 | 3.324 | -8.4784 |
| 145 | 763.9 | 15.768 | 16.161 | 16.591 | 13.228 | | 25.47 | 26.60 | 6.263 | -5.203 | 2.412 | -8.6001 |
| 150 | 812.0 | 15.642 | 16.085 | 16.478 | 13.199 | | 25.25 | 28.57 | 5.225 | -5.282 | 1.754 | -8.7091 |
| 155 | 852.4 | 15.527 | 16.017 | 16.375 | 13.174 | | 25.03 | 30.30 | 4.409 - 6 | -5.356 | 1.557 - 9 | -8.8077 |
| 160 | 887.6 | 15.420 | 15.954 | 16.279 | 13.152 | | 24.82 | 31.87 | 3.754 | -5.426 | 1.262 | -8.8988 |
| 165 | 917.0 | 15.320 | 15.897 | 16.189 | 13.133 | | 24.60 | 33.26 | 3.220 | -5.492 | 1.039 | -8.9834 |
| 170 | 942.5 | 15.224 | 15.843 | 16.104 | 13.115 | | 24.39 | 34.54 | 2.778 | -5.556 | 8.648 -10 | -9.0631 |
| 175 | 963.8 | 15.133 | 15.793 | 16.023 | 13.098 | | 24.18 | 35.68 | 2.410 | -5.618 | 7.271 | -9.1384 |
| 180 | 982.4 | 15.045 | 15.745 | 15.945 | 13.083 | | 23.97 | 36.75 | 2.099 | -5.678 | 6.159 | -9.2105 |
| 185 | 998.0 | 14.960 | 15.699 | 15.869 | 13.069 | | 23.76 | 37.72 | 1.835 | -5.736 | 5.255 | -9.2795 |
| 190 | 1011.5 | 14.877 | 15.654 | 15.796 | 13.056 | | 23.55 | 38.63 | 1.610 | -5.793 | 4.508 | -9.3460 |
| 195 | 1022.9 | 14.796 | 15.612 | 15.725 | 13.044 | | 23.34 | 39.47 | 1.416 | -5.849 | 3.887 | -9.4104 |
| 200 | 1032.6 | 14.717 | 15.570 | 15.655 | 13.032 | | 23.13 | 40.27 | 1.250 | -5.903 | 3.366 | -9.4728 |
| 205 | 1040.9 | 14.639 | 15.529 | 15.587 | 13.020 | | 22.92 | 41.02 | 1.105 - 6 | -5.957 | 2.926 -10 | -9.5337 |
| 210 | 1047.6 | 14.563 | 15.490 | 15.519 | 13.009 | | 22.71 | 41.73 | 9.791 - 7 | -6.009 | 2.553 | -9.5929 |
| 215 | 1053.4 | 14.488 | 15.451 | 15.453 | 12.999 | | 22.50 | 42.41 | 8.694 | -6.061 | 2.234 | -9.6509 |
| 220 | 1058.0 | 14.413 | 15.413 | 15.388 | 12.988 | | 22.30 | 43.06 | 7.734 | -6.112 | 1.961 | -9.7076 |
| 225 | 1061.5 | 14.339 | 15.375 | 15.323 | 12.978 | | 22.09 | 43.67 | 6.892 | -6.162 | 1.725 | -9.7632 |
| 230 | 1063.9 | 14.267 | 15.338 | 15.259 | 12.969 | | 21.89 | 44.25 | 6.151 | -6.211 | 1.522 | -9.8176 |
| 235 | 1066.4 | 14.194 | 15.301 | 15.195 | 12.959 | | 21.68 | 44.84 | 5.498 | -6.260 | 1.345 | -9.8714 |
| 240 | 1070.6 | 14.121 | 15.264 | 15.131 | 12.949 | | 21.48 | 45.51 | 4.922 | -6.308 | 1.188 | -9.9253 |
| 245 | 1074.3 | 14.049 | 15.227 | 15.068 | 12.939 | | 21.28 | 46.16 | 4.413 | -6.355 | 1.052 | -9.9782 |
| 250 | 1077.6 | 13.977 | 15.190 | 15.005 | 12.930 | | 21.09 | 46.80 | 3.963 | -6.402 | 9.328 -11 | -10.0302 |
| 255 | 1080.4 | 13.905 | 15.154 | 14.942 | 12.920 | | 20.89 | 47.43 | 3.564 - 7 | -6.448 | 8.290 -11 | -10.0815 |
| 260 | 1082.9 | 13.834 | 15.118 | 14.880 | 12.911 | | 20.70 | 48.05 | 3.210 | -6.494 | 7.381 | -10.1319 |
| 265 | 1085.0 | 13.764 | 15.082 | 14.818 | 12.902 | | 20.52 | 48.65 | 2.894 | -6.538 | 6.582 | -10.1816 |
| 270 | 1086.9 | 13.693 | 15.047 | 14.756 | 12.893 | | 20.33 | 49.25 | 2.613 | -6.583 | 5.880 | -10.2306 |
| 275 | 1088.6 | 13.624 | 15.012 | 14.695 | 12.883 | | 20.15 | 49.84 | 2.363 | -6.627 | 5.261 | -10.2790 |
| 280 | 1090.0 | 13.554 | 14.977 | 14.634 | 12.874 | | 19.98 | 50.43 | 2.138 | -6.670 | 4.713 | -10.3267 |
| 285 | 1091.3 | 13.484 | 14.942 | 14.573 | 12.866 | | 19.80 | 51.00 | 1.938 | -6.713 | 4.229 | -10.3737 |
| 290 | 1092.4 | 13.415 | 14.907 | 14.512 | 12.857 | | 19.64 | 51.57 | 1.758 | -6.755 | 3.800 | -10.4202 |
| 295 | 1093.3 | 13.346 | 14.872 | 14.452 | 12.848 | | 19.47 | 52.13 | 1.596 | -6.797 | 3.419 | -10.4661 |
| 300 | 1094.2 | 13.278 | 14.838 | 14.392 | 12.839 | | 19.31 | 52.68 | 1.451 | -6.838 | 3.080 | -10.5115 |
| 310 | 1095.5 | 13.141 | 14.769 | 14.272 | 12.822 | | 19.00 | 53.76 | 1.202 - 7 | -6.920 | 2.508 -11 | -10.6006 |
| 320 | 1096.6 | 13.005 | 14.701 | 14.153 | 12.805 | | 18.71 | 54.81 | 1.000 | -7.000 | 2.052 | -10.6878 |
| 330 | 1097.4 | 12.869 | 14.633 | 14.034 | 12.787 | | 18.44 | 55.84 | 8.346 - 8 | -7.079 | 1.687 | -10.7730 |
| 340 | 1098.0 | 12.734 | 14.565 | 13.916 | 12.770 | | 18.18 | 56.83 | 6.989 | -7.156 | 1.392 | -10.8565 |
| 350 | 1098.5 | 12.600 | 14.498 | 13.798 | 12.753 | | 17.94 | 57.80 | 5.870 | -7.231 | 1.153 | -10.9383 |
| 360 | 1098.8 | 12.466 | 14.431 | 13.681 | 12.737 | | 17.71 | 58.74 | 4.944 | -7.306 | 9.583 -12 | -11.0185 |
| 370 | 1099.1 | 12.332 | 14.364 | 13.564 | 12.720 | | 17.49 | 59.65 | 4.176 | -7.379 | 7.993 | -11.0973 |
| 380 | 1099.3 | 12.199 | 14.297 | 13.447 | 12.703 | | 17.29 | 60.54 | 3.535 | -7.452 | 6.688 | -11.1747 |
| 390 | 1099.5 | 12.067 | 14.231 | 13.331 | 12.687 | | 17.10 | 61.41 | 3.001 | -7.523 | 5.613 | -11.2508 |
| 400 | 1099.6 | 11.934 | 14.165 | 13.215 | 12.670 | | 16.92 | 62.25 | 2.553 | -7.593 | 4.724 | -11.3257 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1099.7 | 11.803 | 14.099 | 13.100 | 12.654 | | 16.75 | 63.09 | 2.176 - 8 | -7.662 | 3.986 -12 | -11.3995 |
| 420 | 1099.8 | 11.671 | 14.033 | 12.985 | 12.637 | | 16.58 | 63.91 | 1.859 | -7.731 | 3.371 | -11.4722 |
| 430 | 1099.8 | 11.540 | 13.968 | 12.870 | 12.621 | | 16.42 | 64.72 | 1.591 | -7.798 | 2.858 | -11.5439 |
| 440 | 1099.9 | 11.410 | 13.903 | 12.756 | 12.604 | | 16.27 | 65.53 | 1.365 | -7.865 | 2.428 | -11.6148 |
| 450 | 1099.9 | 11.280 | 13.837 | 12.642 | 12.588 | | 16.12 | 66.34 | 1.173 | -7.931 | 2.067 | -11.6847 |
| 460 | 1099.9 | 11.150 | 13.773 | 12.529 | 12.572 | | 15.97 | 67.16 | 1.010 | -7.996 | 1.763 | -11.7538 |
| 470 | 1099.9 | 11.020 | 13.708 | 12.415 | 12.556 | | 15.82 | 68.00 | 8.707 - 9 | -8.060 | 1.506 | -11.8222 |
| 480 | 1100.0 | 10.891 | 13.643 | 12.302 | 12.539 | | 15.67 | 68.85 | 7.523 | -8.124 | 1.289 | -11.8898 |
| 490 | 1100.0 | 10.763 | 13.579 | 12.190 | 12.523 | | 15.52 | 69.73 | 6.512 | -8.186 | 1.105 | -11.9567 |
| 500 | 1100.0 | 10.634 | 13.515 | 12.077 | 12.507 | 10.175 | 15.36 | 70.64 | 5.647 | -8.248 | 9.485 -13 | -12.0230 |
| 510 | 1100.0 | 10.506 | 13.451 | 11.965 | 12.491 | 10.171 | 15.20 | 71.59 | 4.906 - 9 | -8.309 | 8.155 -13 | -12.0886 |
| 520 | 1100.0 | 10.379 | 13.387 | 11.854 | 12.475 | 10.167 | 15.04 | 72.59 | 4.271 | -8.369 | 7.022 | -12.1536 |
| 530 | 1100.0 | 10.252 | 13.324 | 11.742 | 12.459 | 10.163 | 14.86 | 73.64 | 3.725 | -8.429 | 6.054 | -12.2180 |
| 540 | 1100.0 | 10.125 | 13.260 | 11.632 | 12.444 | 10.159 | 14.68 | 74.76 | 3.255 | -8.487 | 5.227 | -12.2818 |
| 550 | 1100.0 | 9.999 | 13.197 | 11.521 | 12.428 | 10.155 | 14.50 | 75.94 | 2.851 | -8.545 | 4.519 | -12.3450 |
| 560 | 1100.0 | 9.873 | 13.134 | 11.411 | 12.412 | 10.151 | 14.30 | 77.21 | 2.502 | -8.602 | 3.912 | -12.4076 |
| 570 | 1100.0 | 9.747 | 13.071 | 11.300 | 12.396 | 10.147 | 14.09 | 78.57 | 2.200 | -8.658 | 3.391 | -12.4697 |
| 580 | 1100.0 | 9.622 | 13.008 | 11.191 | 12.381 | 10.143 | 13.88 | 80.03 | 1.939 | -8.712 | 2.943 | -12.5312 |
| 590 | 1100.0 | 9.497 | 12.946 | 11.081 | 12.365 | 10.139 | 13.65 | 81.59 | 1.714 | -8.766 | 2.558 | -12.5922 |
| 600 | 1100.0 | 9.372 | 12.884 | 10.972 | 12.349 | 10.135 | 13.41 | 83.28 | 1.518 | -8.819 | 2.226 | -12.6525 |
| 610 | 1100.0 | 9.248 | 12.822 | 10.864 | 12.334 | 10.131 | 13.16 | 85.10 | 1.348 - 9 | -8.870 | 1.940 -13 | -12.7122 |
| 620 | 1100.0 | 9.124 | 12.760 | 10.755 | 12.318 | 10.127 | 12.90 | 87.07 | 1.200 | -8.921 | 1.693 | -12.7713 |
| 630 | 1100.0 | 9.000 | 12.698 | 10.647 | 12.303 | 10.123 | 12.63 | 89.18 | 1.071 | -8.970 | 1.480 | -12.8298 |
| 640 | 1100.0 | 8.877 | 12.636 | 10.539 | 12.288 | 10.119 | 12.35 | 91.47 | 9.590 -10 | -9.018 | 1.295 | -12.8877 |
| 650 | 1100.0 | 8.754 | 12.575 | 10.432 | 12.272 | 10.115 | 12.06 | 93.93 | 8.609 | -9.065 | 1.135 | -12.9448 |
| 660 | 1100.0 | 8.632 | 12.514 | 10.326 | 12.257 | 10.111 | 11.77 | 96.58 | 7.751 | -9.111 | 9.971 -14 | -13.0013 |
| 670 | 1100.0 | 8.510 | 12.453 | 10.217 | 12.242 | 10.108 | 11.46 | 99.42 | 6.999 | -9.155 | 8.771 | -13.0570 |
| 680 | 1100.0 | 8.388 | 12.392 | 10.111 | 12.226 | 10.104 | 11.15 | 102.48 | 6.338 | -9.198 | 7.728 | -13.1119 |
| 690 | 1100.0 | 8.267 | 12.331 | 10.005 | 12.211 | 10.100 | 10.84 | 105.75 | 5.758 | -9.240 | 6.823 | -13.1661 |
| 700 | 1100.0 | 8.146 | 12.270 | 9.899 | 12.196 | 10.096 | 10.52 | 109.25 | 5.246 | -9.280 | 6.034 | -13.2194 |
| 710 | 1100.0 | 8.025 | 12.210 | 9.793 | 12.181 | 10.092 | 10.20 | 112.98 | 4.795 -10 | -9.319 | 5.348 -14 | -13.2718 |
| 720 | 1100.0 | 7.904 | 12.150 | 9.687 | 12.166 | 10.089 | 9.88 | 116.94 | 4.395 | -9.357 | 4.750 | -13.3233 |
| 730 | 1100.0 | 7.784 | 12.090 | 9.582 | 12.151 | 10.085 | 9.57 | 121.15 | 4.041 | -9.394 | 4.227 | -13.3739 |
| 740 | 1100.0 | 7.665 | 12.030 | 9.478 | 12.136 | 10.081 | 9.26 | 125.58 | 3.726 | -9.429 | 3.771 | -13.4236 |
| 750 | 1100.0 | 7.545 | 11.970 | 9.373 | 12.121 | 10.077 | 8.95 | 130.26 | 3.446 | -9.463 | 3.372 | -13.4722 |
| 760 | 1100.0 | 7.426 | 11.911 | 9.269 | 12.106 | 10.073 | 8.65 | 135.16 | 3.196 | -9.495 | 3.022 | -13.5197 |
| 770 | 1100.0 | 7.307 | 11.851 | 9.165 | 12.091 | 10.070 | 8.36 | 140.28 | 2.972 | -9.527 | 2.715 | -13.5662 |
| 780 | 1100.0 | 7.189 | 11.792 | 9.061 | 12.076 | 10.066 | 8.07 | 145.61 | 2.771 | -9.557 | 2.446 | -13.6116 |
| 790 | 1100.0 | 7.071 | 11.733 | 8.958 | 12.062 | 10.062 | 7.80 | 151.14 | 2.590 | -9.587 | 2.209 | -13.6558 |
| 800 | 1100.0 | 6.953 | 11.674 | 8.855 | 12.047 | 10.059 | 7.54 | 156.84 | 2.427 | -9.615 | 2.000 | -13.6989 |
| 820 | 1100.0 | 6.719 | 11.557 | 8.650 | 12.018 | 10.051 | 7.05 | 168.69 | 2.147 -10 | -9.668 | 1.654 -14 | -13.7815 |
| 840 | 1100.0 | 6.486 | 11.440 | 8.445 | 11.988 | 10.044 | 6.61 | 180.97 | 1.914 | -9.718 | 1.383 | -13.8593 |
| 860 | 1100.0 | 6.023 | 11.209 | 8.041 | 11.931 | 10.029 | 5.87 | 205.95 | 1.556 | -9.808 | 9.987 -15 | -14.0005 |
| 900 | 1100.0 | 5.794 | 11.095 | 7.840 | 11.902 | 10.022 | 5.57 | 218.21 | 1.416 | -9.849 | 8.625 | -14.0642 |
| 920 | 1100.0 | 5.566 | 10.981 | 7.640 | 11.873 | 10.015 | 5.31 | 230.05 | 1.295 | -9.888 | 7.524 | -14.1235 |
| 940 | 1100.0 | 5.339 | 10.867 | 7.442 | 11.845 | 10.008 | 5.09 | 241.32 | 1.190 | -9.924 | 6.625 | -14.1788 |
| 960 | 1100.0 | 5.113 | 10.754 | 7.244 | 11.817 | 10.001 | 4.90 | 251.91 | 1.097 | -9.960 | 5.885 | -14.2303 |
| 980 | 1100.0 | 4.889 | 10.642 | 7.048 | 11.789 | 9.994 | 4.75 | 261.75 | 1.015 | -9.993 | 5.268 | -14.2784 |
| 1000 | 1100.0 | 4.666 | 10.531 | 6.852 | 11.761 | 9.987 | 4.61 | 270.81 | 9.417 -11 | -10.026 | 4.749 | -14.3234 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1300° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 379.7 | 16.758 | 16.807 | 17.496 | 13.502 | | 26.76 | 12.49 | 2.277 - 5 | -4.643 | 1.930 - 8 | -7.7144 |
| 125 | 493.4 | 16.463 | 16.603 | 17.223 | 13.409 | | 26.46 | 18.44 | 1.609 | -4.793 | 1.038 | -7.9838 |
| 130 | 594.8 | 16.236 | 16.449 | 17.015 | 13.340 | | 26.20 | 20.04 | 1.223 | -4.913 | 6.478 - 9 | -8.1886 |
| 135 | 683.5 | 16.053 | 16.327 | 16.847 | 13.288 | | 25.96 | 23.28 | 9.705 - 6 | -5.013 | 4.434 | -8.3532 |
| 140 | 762.0 | 15.897 | 16.226 | 16.705 | 13.245 | | 25.74 | 26.21 | 7.929 | -5.101 | 3.222 | -8.4919 |
| 145 | 829.4 | 15.762 | 16.140 | 16.582 | 13.210 | | 25.53 | 28.81 | 6.612 | -5.180 | 2.448 | -8.6111 |
| 150 | 889.2 | 15.641 | 16.064 | 16.472 | 13.180 | | 25.33 | 31.18 | 5.597 | -5.252 | 1.918 | -8.7172 |
| 155 | 940.9 | 15.531 | 15.997 | 16.372 | 13.154 | | 25.14 | 33.30 | 4.793 - 6 | -5.319 | 1.540 - 9 | -8.8124 |
| 160 | 986.3 | 15.429 | 15.936 | 16.281 | 13.131 | | 24.95 | 35.23 | 4.142 | -5.383 | 1.260 | -8.8996 |
| 165 | 1024.9 | 15.335 | 15.880 | 16.196 | 13.111 | | 24.76 | 36.94 | 3.607 | -5.443 | 1.048 | -8.9797 |
| 170 | 1058.9 | 15.246 | 15.829 | 16.117 | 13.093 | | 24.58 | 38.51 | 3.159 | -5.500 | 8.818 -10 | -9.0546 |
| 175 | 1087.9 | 15.162 | 15.781 | 16.042 | 13.076 | | 24.39 | 39.92 | 2.781 | -5.556 | 7.499 | -9.1253 |
| 180 | 1113.7 | 15.082 | 15.736 | 15.970 | 13.061 | | 24.21 | 41.24 | 2.459 | -5.609 | 6.428 | -9.1919 |
| 185 | 1135.7 | 15.004 | 15.693 | 15.901 | 13.047 | | 24.03 | 42.44 | 2.182 | -5.661 | 5.552 | -9.2556 |
| 190 | 1155.2 | 14.929 | 15.652 | 15.835 | 13.034 | | 23.85 | 43.56 | 1.942 | -5.712 | 4.822 | -9.3167 |
| 195 | 1172.0 | 14.857 | 15.612 | 15.770 | 13.022 | | 23.67 | 44.60 | 1.734 | -5.761 | 4.212 | -9.3755 |
| 200 | 1186.7 | 14.786 | 15.574 | 15.708 | 13.011 | | 23.49 | 45.57 | 1.552 | -5.809 | 3.695 | -9.4324 |
| 205 | 1199.5 | 14.717 | 15.537 | 15.647 | 13.000 | | 23.31 | 44.49 | 1.392 - 6 | -5.856 | 3.254 -10 | -9.4876 |
| 210 | 1210.3 | 14.649 | 15.501 | 15.587 | 12.989 | | 23.13 | 47.34 | 1.252 | -5.903 | 2.877 | -9.5411 |
| 215 | 1219.8 | 14.583 | 15.466 | 15.528 | 12.979 | | 22.95 | 48.16 | 1.127 | -5.948 | 2.551 | -9.5933 |
| 220 | 1227.9 | 14.517 | 15.432 | 15.471 | 12.970 | | 22.78 | 48.93 | 1.017 | -5.993 | 2.268 | -9.6443 |
| 225 | 1234.7 | 14.453 | 15.399 | 15.414 | 12.960 | | 22.60 | 49.66 | 9.187 - 7 | -6.037 | 2.022 | -9.6941 |
| 230 | 1240.3 | 14.389 | 15.366 | 15.358 | 12.951 | | 22.42 | 50.35 | 8.313 | -6.080 | 1.808 | -9.7429 |
| 235 | 1245.1 | 14.326 | 15.334 | 15.302 | 12.943 | | 22.25 | 51.02 | 7.532 | -6.123 | 1.619 | -9.7908 |
| 240 | 1249.1 | 14.263 | 15.302 | 15.247 | 12.934 | | 22.07 | 51.67 | 6.833 | -6.165 | 1.452 | -9.8379 |
| 245 | 1252.1 | 14.201 | 15.270 | 15.193 | 12.926 | | 21.90 | 52.28 | 6.206 | -6.207 | 1.306 | -9.8842 |
| 250 | 1257.5 | 14.139 | 15.238 | 15.138 | 12.917 | | 21.73 | 53.00 | 5.644 | -6.248 | 1.173 | -9.9307 |
| 255 | 1262.3 | 14.077 | 15.206 | 15.084 | 12.909 | | 21.56 | 53.70 | 5.139 - 7 | -6.289 | 1.056 -10 | -9.9765 |
| 260 | 1266.5 | 14.016 | 15.175 | 15.030 | 12.900 | | 21.39 | 54.39 | 4.685 | -6.329 | 9.516 -11 | -10.0215 |
| 265 | 1270.3 | 13.955 | 15.144 | 14.977 | 12.892 | | 21.22 | 55.07 | 4.276 | -6.369 | 8.592 | -10.0659 |
| 270 | 1273.6 | 13.895 | 15.113 | 14.924 | 12.884 | | 21.06 | 55.73 | 3.907 | -6.408 | 7.769 | -10.1096 |
| 275 | 1276.6 | 13.835 | 15.082 | 14.871 | 12.876 | | 20.89 | 56.38 | 3.574 | -6.447 | 7.035 | -10.1527 |
| 280 | 1279.2 | 13.775 | 15.052 | 14.818 | 12.868 | | 20.73 | 57.02 | 3.272 | -6.485 | 6.379 | -10.1953 |
| 285 | 1281.5 | 13.715 | 15.022 | 14.766 | 12.860 | | 20.58 | 57.65 | 2.999 | -6.523 | 5.791 | -10.2373 |
| 290 | 1283.6 | 13.656 | 14.992 | 14.714 | 12.852 | | 20.42 | 58.27 | 2.751 | -6.561 | 5.263 | -10.2787 |
| 295 | 1285.5 | 13.597 | 14.962 | 14.663 | 12.845 | | 20.27 | 58.88 | 2.526 | -6.598 | 4.790 | -10.3197 |
| 300 | 1287.1 | 13.538 | 14.933 | 14.611 | 12.837 | | 20.12 | 59.49 | 2.321 | -6.634 | 4.363 | -10.3602 |
| 310 | 1289.8 | 13.422 | 14.874 | 14.509 | 12.822 | | 19.82 | 60.68 | 1.965 - 7 | -6.707 | 3.633 -11 | -10.4398 |
| 320 | 1292.0 | 13.306 | 14.815 | 14.407 | 12.807 | | 19.54 | 61.84 | 1.669 | -6.777 | 3.037 | -10.5176 |
| 330 | 1293.7 | 13.190 | 14.758 | 14.306 | 12.792 | | 19.27 | 62.98 | 1.422 | -6.847 | 2.548 | -10.5938 |
| 340 | 1295.0 | 13.076 | 14.700 | 14.206 | 12.778 | | 19.01 | 64.09 | 1.215 | -6.915 | 2.145 | -10.6685 |
| 350 | 1296.1 | 12.961 | 14.643 | 14.106 | 12.763 | | 18.77 | 65.18 | 1.041 | -6.983 | 1.813 | -10.7417 |
| 360 | 1296.9 | 12.848 | 14.586 | 14.006 | 12.749 | | 18.53 | 66.25 | 8.939 - 8 | -7.049 | 1.536 | -10.8135 |
| 370 | 1297.6 | 12.735 | 14.529 | 13.907 | 12.735 | | 18.31 | 67.29 | 7.696 | -7.114 | 1.306 | -10.8841 |
| 380 | 1298.1 | 12.622 | 14.472 | 13.808 | 12.721 | | 18.09 | 68.31 | 6.641 | -7.178 | 1.113 | -10.9534 |
| 390 | 1298.5 | 12.509 | 14.416 | 13.710 | 12.706 | | 17.89 | 69.31 | 5.743 | -7.241 | 9.517 -12 | -11.0215 |
| 400 | 1298.8 | 12.397 | 14.360 | 13.612 | 12.692 | | 17.70 | 70.28 | 4.976 | -7.303 | 8.157 | -11.0885 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1299.1 | 12.286 | 14.304 | 13.514 | 12.678 | | 17.52 | 71.24 | 4.320 - 8 | -7.364 | 7.007 -12 | -11.1544 |
| 420 | 1299.3 | 12.175 | 14.249 | 13.417 | 12.664 | | 17.35 | 72.18 | 3.758 | -7.425 | 6.034 | -11.2194 |
| 430 | 1299.4 | 12.064 | 14.193 | 13.320 | 12.651 | | 17.18 | 73.09 | 3.275 | -7.485 | 5.207 | -11.2834 |
| 440 | 1299.5 | 11.953 | 14.138 | 13.223 | 12.637 | | 17.02 | 74.00 | 2.858 | -7.544 | 4.503 | -11.3465 |
| 450 | 1299.6 | 11.843 | 14.083 | 13.126 | 12.623 | | 16.87 | 74.88 | 2.499 | -7.602 | 3.902 | -11.4087 |
| 460 | 1299.7 | 11.733 | 14.028 | 13.030 | 12.609 | | 16.73 | 75.76 | 2.188 | -7.660 | 3.387 | -11.4702 |
| 470 | 1299.8 | 11.624 | 13.973 | 12.934 | 12.595 | | 16.59 | 76.63 | 1.919 | -7.717 | 2.945 | -11.5309 |
| 480 | 1299.8 | 11.514 | 13.919 | 12.839 | 12.582 | | 16.45 | 77.50 | 1.686 | -7.773 | 2.566 | -11.5908 |
| 490 | 1299.9 | 11.406 | 13.864 | 12.743 | 12.568 | | 16.32 | 78.36 | 1.483 | -7.829 | 2.238 | -11.6501 |
| 500 | 1299.9 | 11.297 | 13.810 | 12.648 | 12.555 | 9.772 | 16.19 | 79.22 | 1.306 | -7.884 | 1.956 | -11.7087 |
| 510 | 1299.9 | 11.189 | 13.756 | 12.554 | 12.541 | 9.769 | 16.06 | 80.09 | 1.152 - 8 | -7.939 | 1.711 -12 | -11.7667 |
| 520 | 1299.9 | 11.081 | 13.702 | 12.459 | 12.528 | 9.766 | 15.93 | 80.97 | 1.017 | -7.993 | 1.499 | -11.8241 |
| 530 | 1299.9 | 10.973 | 13.648 | 12.365 | 12.514 | 9.762 | 15.80 | 81.86 | 8.997 - 9 | -8.046 | 1.315 | -11.8809 |
| 540 | 1300.0 | 10.866 | 13.594 | 12.271 | 12.501 | 9.759 | 15.67 | 82.77 | 7.968 | -8.099 | 1.155 | -11.9372 |
| 550 | 1300.0 | 10.759 | 13.541 | 12.177 | 12.487 | 9.755 | 15.54 | 83.71 | 7.066 | -8.151 | 1.016 | -11.9930 |
| 560 | 1300.0 | 10.652 | 13.487 | 12.084 | 12.474 | 9.752 | 15.41 | 84.66 | 6.275 | -8.202 | 8.948 -13 | -12.0483 |
| 570 | 1300.0 | 10.546 | 13.434 | 11.991 | 12.461 | 9.749 | 15.28 | 85.65 | 5.579 | -8.253 | 7.887 | -12.1031 |
| 580 | 1300.0 | 10.440 | 13.381 | 11.898 | 12.447 | 9.745 | 15.14 | 86.68 | 4.968 | -8.304 | 6.960 | -12.1574 |
| 590 | 1300.0 | 10.334 | 13.328 | 11.806 | 12.434 | 9.742 | 15.00 | 87.75 | 4.430 | -8.354 | 6.148 | -12.2113 |
| 600 | 1300.0 | 10.229 | 13.276 | 11.713 | 12.421 | 9.739 | 14.85 | 88.86 | 3.955 | -8.403 | 5.436 | -12.2647 |
| 610 | 1300.0 | 10.124 | 13.223 | 11.621 | 12.408 | 9.735 | 14.70 | 90.03 | 3.537 - 9 | -8.451 | 4.812 -13 | -12.3177 |
| 620 | 1300.0 | 10.019 | 13.171 | 11.529 | 12.395 | 9.732 | 14.55 | 91.26 | 3.168 | -8.499 | 4.264 | -12.3702 |
| 630 | 1300.0 | 9.914 | 13.118 | 11.438 | 12.382 | 9.729 | 14.39 | 92.55 | 2.841 | -8.547 | 3.781 | -12.4224 |
| 640 | 1300.0 | 9.810 | 13.066 | 11.347 | 12.369 | 9.725 | 14.22 | 93.92 | 2.552 | -8.593 | 3.357 | -12.4741 |
| 650 | 1300.0 | 9.706 | 13.014 | 11.256 | 12.356 | 9.722 | 14.04 | 95.36 | 2.296 | -8.639 | 2.983 | -12.5253 |
| 660 | 1300.0 | 9.603 | 12.963 | 11.165 | 12.343 | 9.719 | 13.86 | 96.89 | 2.069 | -8.684 | 2.653 | -12.5762 |
| 670 | 1300.0 | 9.499 | 12.911 | 11.075 | 12.330 | 9.716 | 13.67 | 98.51 | 1.868 | -8.729 | 2.363 | -12.6266 |
| 680 | 1300.0 | 9.396 | 12.859 | 10.984 | 12.317 | 9.712 | 13.47 | 100.23 | 1.689 | -8.772 | 2.106 | -12.6766 |
| 690 | 1300.0 | 9.293 | 12.808 | 10.894 | 12.304 | 9.709 | 13.27 | 102.06 | 1.530 | -8.815 | 1.879 | -12.7262 |
| 700 | 1300.0 | 9.191 | 12.757 | 10.805 | 12.291 | 9.706 | 13.06 | 104.00 | 1.388 | -8.857 | 1.678 | -12.7753 |
| 710 | 1300.0 | 9.089 | 12.706 | 10.715 | 12.278 | 9.703 | 12.84 | 106.06 | 1.262 - 9 | -8.899 | 1.500 -13 | -12.8239 |
| 720 | 1300.0 | 8.987 | 12.655 | 10.626 | 12.266 | 9.700 | 12.62 | 108.26 | 1.150 | -8.939 | 1.342 | -12.8721 |
| 730 | 1300.0 | 8.885 | 12.604 | 10.537 | 12.253 | 9.696 | 12.39 | 110.59 | 1.049 | -8.979 | 1.203 | -12.9198 |
| 740 | 1300.0 | 8.784 | 12.553 | 10.448 | 12.240 | 9.693 | 12.15 | 113.07 | 9.597 -10 | -9.018 | 1.079 | -12.9671 |
| 750 | 1300.0 | 8.683 | 12.503 | 10.360 | 12.228 | 9.690 | 11.91 | 115.70 | 8.793 | -9.056 | 9.687 -14 | -13.0138 |
| 760 | 1300.0 | 8.582 | 12.452 | 10.272 | 12.215 | 9.687 | 11.66 | 118.48 | 8.073 | -9.093 | 8.709 | -13.0600 |
| 770 | 1300.0 | 8.482 | 12.402 | 10.184 | 12.202 | 9.684 | 11.41 | 121.44 | 7.427 | -9.129 | 7.839 | -13.1057 |
| 780 | 1300.0 | 8.382 | 12.352 | 10.096 | 12.190 | 9.680 | 11.15 | 124.57 | 6.847 | -9.164 | 7.065 | -13.1509 |
| 790 | 1300.0 | 8.282 | 12.302 | 10.009 | 12.177 | 9.677 | 10.89 | 127.88 | 6.326 | -9.199 | 6.376 | -13.1955 |
| 800 | 1300.0 | 8.182 | 12.252 | 9.922 | 12.165 | 9.674 | 10.63 | 131.37 | 5.856 | -9.232 | 5.762 | -13.2395 |
| 820 | 1300.0 | 7.984 | 12.153 | 9.748 | 12.140 | 9.668 | 10.11 | 138.93 | 5.050 -10 | -9.297 | 4.725 -14 | -13.3256 |
| 840 | 1300.0 | 7.786 | 12.055 | 9.575 | 12.115 | 9.662 | 9.59 | 147.25 | 4.391 | -9.357 | 3.897 | -13.4092 |
| 860 | 1300.0 | 7.395 | 11.859 | 9.233 | 12.066 | 9.649 | 8.59 | 166.22 | 3.399 | -9.469 | 2.703 | -13.5682 |
| 900 | 1300.0 | 7.201 | 11.762 | 9.063 | 12.042 | 9.643 | 8.12 | 176.79 | 3.025 | -9.519 | 2.274 | -13.6433 |
| 920 | 1300.0 | 7.008 | 11.665 | 8.894 | 12.018 | 9.637 | 7.68 | 188.00 | 2.711 | -9.567 | 1.927 | -13.7152 |
| 940 | 1300.0 | 6.816 | 11.569 | 8.726 | 11.994 | 9.631 | 7.27 | 199.76 | 2.445 | -9.612 | 1.644 | -13.7840 |
| 960 | 1300.0 | 6.625 | 11.474 | 8.559 | 11.970 | 9.625 | 6.89 | 211.93 | 2.218 | -9.654 | 1.414 | -13.8495 |
| 980 | 1300.0 | 6.436 | 11.379 | 8.392 | 11.946 | 9.619 | 6.54 | 224.34 | 2.024 | -9.694 | 1.225 | -13.9118 |
| 1000 | 1300.0 | 6.247 | 11.285 | 8.227 | 11.923 | 9.613 | 6.23 | 236.99 | 1.856 | -9.731 | 1.070 | -13.9708 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1500° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 379.8 | 16.757 | 16.807 | 17.495 | 13.502 | | 26.76 | 12.49 | 2.274 - 5 | -4.643 | 1.927 - 8 | -7.7151 |
| 125 | 499.5 | 16.457 | 16.598 | 17.218 | 13.406 | | 26.46 | 16.84 | 1.610 | -4.793 | 1.026 | -7.9888 |
| 130 | 607.8 | 16.230 | 16.442 | 17.008 | 13.335 | | 26.20 | 20.48 | 1.229 | -4.910 | 6.375 - 9 | -8.1955 |
| 135 | 704.4 | 16.046 | 16.318 | 16.839 | 13.280 | | 25.97 | 23.98 | 9.816 - 6 | -5.008 | 4.353 | -8.3612 |
| 140 | 791.4 | 15.890 | 16.215 | 16.697 | 13.236 | | 25.76 | 27.20 | 8.073 | -5.093 | 3.161 | -8.5002 |
| 145 | 868.4 | 15.755 | 16.127 | 16.574 | 13.199 | | 25.56 | 30.13 | 6.781 | -5.169 | 2.401 | -8.6196 |
| 150 | 937.3 | 15.636 | 16.050 | 16.465 | 13.168 | | 25.37 | 32.82 | 5.785 | -5.238 | 1.884 | -8.7250 |
| 155 | 997.2 | 15.528 | 15.983 | 16.367 | 13.141 | | 25.19 | 35.22 | 4.995 - 6 | -5.302 | 1.517 - 9 | -8.8189 |
| 160 | 1051.0 | 15.429 | 15.922 | 16.277 | 13.117 | | 25.01 | 37.44 | 4.353 | -5.361 | 1.246 | -8.9046 |
| 165 | 1098.5 | 15.337 | 15.867 | 16.195 | 13.096 | | 24.84 | 39.47 | 3.822 | -5.418 | 1.039 | -8.9832 |
| 170 | 1141.0 | 15.251 | 15.816 | 16.117 | 13.077 | | 24.67 | 41.34 | 3.377 | -5.471 | 8.781 -10 | -9.0564 |
| 175 | 1178.0 | 15.170 | 15.768 | 16.045 | 13.060 | | 24.50 | 43.04 | 3.000 | -5.523 | 7.504 | -9.1247 |
| 180 | 1211.2 | 15.093 | 15.724 | 15.976 | 13.045 | | 24.33 | 44.63 | 2.677 | -5.572 | 6.467 | -9.1893 |
| 185 | 1240.5 | 15.020 | 15.682 | 15.910 | 13.030 | | 24.17 | 46.09 | 2.397 | -5.620 | 5.617 | -9.2505 |
| 190 | 1266.8 | 14.949 | 15.642 | 15.847 | 13.017 | | 24.01 | 47.46 | 2.154 | -5.667 | 4.910 | -9.3089 |
| 195 | 1290.0 | 14.881 | 15.604 | 15.787 | 13.005 | | 23.84 | 48.73 | 1.942 | -5.712 | 4.316 | -9.3649 |
| 200 | 1310.6 | 14.815 | 15.567 | 15.728 | 12.993 | | 23.68 | 49.92 | 1.754 | -5.756 | 3.813 | -9.4187 |
| 205 | 1328.9 | 14.750 | 15.532 | 15.671 | 12.982 | | 23.52 | 51.04 | 1.589 - 6 | -5.799 | 3.383 -10 | -9.4707 |
| 210 | 1344.9 | 14.688 | 15.498 | 15.615 | 12.972 | | 23.36 | 52.08 | 1.442 | -5.841 | 3.013 | -9.5210 |
| 215 | 1359.3 | 14.626 | 15.465 | 15.561 | 12.962 | | 23.21 | 53.08 | 1.311 | -5.882 | 2.693 | -9.5698 |
| 220 | 1371.8 | 14.566 | 15.433 | 15.508 | 12.952 | | 23.05 | 54.01 | 1.194 | -5.923 | 2.414 | -9.6173 |
| 225 | 1383.1 | 14.507 | 15.402 | 15.456 | 12.943 | | 22.89 | 54.91 | 1.090 | -5.963 | 2.169 | -9.6637 |
| 230 | 1392.9 | 14.449 | 15.371 | 15.404 | 12.934 | | 22.74 | 55.77 | 9.955 - 7 | -6.002 | 1.954 | -9.7090 |
| 235 | 1401.4 | 14.392 | 15.341 | 15.354 | 12.926 | | 22.58 | 56.58 | 9.107 | -6.041 | 1.765 | -9.7533 |
| 240 | 1408.6 | 14.335 | 15.312 | 15.304 | 12.918 | | 22.43 | 57.35 | 8.342 | -6.079 | 1.597 | -9.7966 |
| 245 | 1414.8 | 14.280 | 15.283 | 15.255 | 12.910 | | 22.27 | 58.09 | 7.650 | -6.116 | 1.448 | -9.8391 |
| 250 | 1420.0 | 14.224 | 15.255 | 15.207 | 12.902 | | 22.12 | 58.79 | 7.022 | -6.154 | 1.316 | -9.8809 |
| 255 | 1427.8 | 14.169 | 15.226 | 15.158 | 12.894 | | 21.97 | 59.62 | 6.454 - 7 | -6.190 | 1.194 -10 | -9.9229 |
| 260 | 1434.8 | 14.114 | 15.197 | 15.109 | 12.886 | | 21.82 | 60.42 | 5.938 | -6.226 | 1.086 | -9.9642 |
| 265 | 1441.1 | 14.059 | 15.169 | 15.061 | 12.878 | | 21.67 | 61.19 | 5.469 | -6.262 | 9.890 -11 | -10.0048 |
| 270 | 1446.9 | 14.005 | 15.141 | 15.014 | 12.870 | | 21.52 | 61.95 | 5.043 | -6.297 | 9.020 | -10.0448 |
| 275 | 1452.0 | 13.952 | 15.114 | 14.967 | 12.863 | | 21.37 | 62.70 | 4.654 | -6.332 | 8.239 | -10.0841 |
| 280 | 1456.7 | 13.899 | 15.086 | 14.920 | 12.856 | | 21.23 | 63.42 | 4.299 | -6.367 | 7.535 | -10.1229 |
| 285 | 1460.9 | 13.846 | 15.059 | 14.874 | 12.848 | | 21.08 | 64.13 | 3.975 | -6.401 | 6.900 | -10.1612 |
| 290 | 1464.7 | 13.793 | 15.032 | 14.828 | 12.841 | | 20.94 | 64.83 | 3.678 | -6.434 | 6.326 | -10.1989 |
| 295 | 1468.1 | 13.741 | 15.006 | 14.782 | 12.834 | | 20.80 | 65.52 | 3.407 | -6.468 | 5.806 | -10.2361 |
| 300 | 1471.2 | 13.690 | 14.980 | 14.736 | 12.827 | | 20.66 | 66.20 | 3.158 | -6.501 | 5.334 | -10.2729 |
| 310 | 1476.6 | 13.587 | 14.927 | 14.646 | 12.814 | | 20.39 | 67.52 | 2.719 - 7 | -6.566 | 4.517 -11 | -10.3452 |
| 320 | 1480.9 | 13.485 | 14.876 | 14.557 | 12.800 | | 20.13 | 68.81 | 2.348 | -6.629 | 3.839 | -10.4158 |
| 330 | 1484.4 | 13.384 | 14.825 | 14.468 | 12.787 | | 19.87 | 70.07 | 2.033 | -6.692 | 3.274 | -10.4849 |
| 340 | 1487.3 | 13.283 | 14.774 | 14.380 | 12.774 | | 19.63 | 71.30 | 1.765 | -6.753 | 2.802 | -10.5526 |
| 350 | 1489.7 | 13.184 | 14.724 | 14.293 | 12.761 | | 19.39 | 72.50 | 1.536 | -6.814 | 2.405 | -10.6190 |
| 360 | 1491.5 | 13.084 | 14.674 | 14.206 | 12.749 | | 19.16 | 73.68 | 1.339 | -6.873 | 2.070 | -10.6841 |
| 370 | 1493.1 | 12.986 | 14.624 | 14.120 | 12.736 | | 18.94 | 74.84 | 1.171 | -6.932 | 1.786 | -10.7480 |
| 380 | 1494.4 | 12.888 | 14.575 | 14.034 | 12.724 | | 18.73 | 75.97 | 1.025 | -6.989 | 1.546 | -10.8109 |
| 390 | 1495.4 | 12.790 | 14.526 | 13.948 | 12.711 | | 18.53 | 77.08 | 8.997 - 8 | -7.046 | 1.341 | -10.8726 |
| 400 | 1496.3 | 12.692 | 14.477 | 13.863 | 12.699 | | 18.33 | 78.17 | 7.910 | -7.102 | 1.166 | -10.9334 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1497.0 | 12.595 | 14.429 | 13.778 | 12.687 | | 18.15 | 79.24 | 6.966 - 8 | -7.157 | 1.016 -11 | -10.9932 |
| 420 | 1497.5 | 12.499 | 14.380 | 13.693 | 12.675 | | 17.97 | 80.29 | 6.145 | -7.211 | 8.870 -12 | -11.0521 |
| 430 | 1498.0 | 12.402 | 14.332 | 13.609 | 12.663 | | 17.80 | 81.32 | 5.430 | -7.265 | 7.761 | -11.1101 |
| 440 | 1498.4 | 12.307 | 14.284 | 13.525 | 12.650 | | 17.64 | 82.34 | 4.805 | -7.318 | 6.804 | -11.1673 |
| 450 | 1498.7 | 12.211 | 14.236 | 13.441 | 12.638 | | 17.48 | 83.33 | 4.259 | -7.371 | 5.976 | -11.2236 |
| 460 | 1498.9 | 12.116 | 14.189 | 13.358 | 12.627 | | 17.33 | 84.31 | 3.780 | -7.423 | 5.257 | -11.2792 |
| 470 | 1499.1 | 12.021 | 14.141 | 13.274 | 12.615 | | 17.19 | 85.27 | 3.359 | -7.474 | 4.633 | -11.3341 |
| 480 | 1499.3 | 11.926 | 14.094 | 13.191 | 12.603 | | 17.05 | 86.23 | 2.990 | -7.524 | 4.090 | -11.3883 |
| 490 | 1499.4 | 11.831 | 14.046 | 13.109 | 12.591 | | 16.92 | 87.17 | 2.664 | -7.574 | 3.615 | -11.4418 |
| 500 | 1499.5 | 11.737 | 13.999 | 13.026 | 12.579 | 9.474 | 16.79 | 88.10 | 2.377 | -7.624 | 3.201 | -11.4947 |
| 510 | 1499.6 | 11.644 | 13.952 | 12.944 | 12.567 | 9.471 | 16.67 | 89.02 | 2.123 - 8 | -7.673 | 2.838 -12 | -11.5470 |
| 520 | 1499.7 | 11.550 | 13.906 | 12.862 | 12.556 | 9.468 | 16.54 | 89.94 | 1.898 | -7.722 | 2.519 | -11.5988 |
| 530 | 1499.7 | 11.457 | 13.859 | 12.781 | 12.544 | 9.465 | 16.43 | 90.85 | 1.700 | -7.770 | 2.239 | -11.6500 |
| 540 | 1499.8 | 11.364 | 13.812 | 12.699 | 12.532 | 9.462 | 16.31 | 91.77 | 1.523 | -7.817 | 1.992 | -11.7006 |
| 550 | 1499.8 | 11.271 | 13.766 | 12.618 | 12.521 | 9.459 | 16.20 | 92.68 | 1.367 | -7.864 | 1.775 | -11.7508 |
| 560 | 1499.9 | 11.179 | 13.720 | 12.537 | 12.509 | 9.456 | 16.08 | 93.61 | 1.228 | -7.911 | 1.583 | -11.8004 |
| 570 | 1499.9 | 11.086 | 13.674 | 12.456 | 12.498 | 9.454 | 15.97 | 94.53 | 1.104 | -7.957 | 1.414 | -11.8496 |
| 580 | 1499.9 | 10.994 | 13.629 | 12.376 | 12.486 | 9.451 | 15.86 | 95.47 | 9.935 - 9 | -8.003 | 1.264 | -11.8984 |
| 590 | 1499.9 | 10.903 | 13.582 | 12.296 | 12.475 | 9.448 | 15.75 | 96.43 | 8.952 | -8.048 | 1.131 | -11.9467 |
| 600 | 1499.9 | 10.811 | 13.536 | 12.216 | 12.463 | 9.445 | 15.64 | 97.40 | 8.074 | -8.093 | 1.012 | -11.9946 |
| 610 | 1499.9 | 10.720 | 13.491 | 12.136 | 12.452 | 9.442 | 15.52 | 98.39 | 7.290 - 9 | -8.137 | 9.075 -13 | -12.0421 |
| 620 | 1500.0 | 10.629 | 13.445 | 12.056 | 12.440 | 9.439 | 15.41 | 99.41 | 6.589 | -8.181 | 8.142 | -12.0893 |
| 630 | 1500.0 | 10.539 | 13.400 | 11.977 | 12.429 | 9.436 | 15.29 | 100.45 | 5.962 | -8.225 | 7.311 | -12.1360 |
| 640 | 1500.0 | 10.449 | 13.355 | 11.898 | 12.418 | 9.433 | 15.18 | 101.53 | 5.400 | -8.268 | 6.570 | -12.1824 |
| 650 | 1500.0 | 10.358 | 13.310 | 11.819 | 12.407 | 9.431 | 15.05 | 102.63 | 4.896 | -8.310 | 5.910 | -12.2284 |
| 660 | 1500.0 | 10.269 | 13.265 | 11.741 | 12.395 | 9.428 | 14.93 | 103.78 | 4.444 | -8.352 | 5.320 | -12.2741 |
| 670 | 1500.0 | 10.179 | 13.220 | 11.662 | 12.384 | 9.425 | 14.80 | 104.98 | 4.038 | -8.394 | 4.792 | -12.3194 |
| 680 | 1500.0 | 10.090 | 13.175 | 11.584 | 12.373 | 9.422 | 14.67 | 106.22 | 3.673 | -8.435 | 4.321 | -12.3644 |
| 690 | 1500.0 | 10.001 | 13.131 | 11.506 | 12.362 | 9.419 | 14.54 | 107.51 | 3.345 | -8.476 | 3.899 | -12.4091 |
| 700 | 1500.0 | 9.912 | 13.087 | 11.428 | 12.351 | 9.417 | 14.40 | 108.85 | 3.049 | -8.516 | 3.520 | -12.4534 |
| 710 | 1500.0 | 9.823 | 13.042 | 11.351 | 12.340 | 9.414 | 14.25 | 110.26 | 2.783 - 9 | -8.555 | 3.181 -13 | -12.4974 |
| 720 | 1500.0 | 9.735 | 12.998 | 11.273 | 12.329 | 9.411 | 14.11 | 111.74 | 2.544 | -8.595 | 2.877 | -12.5411 |
| 730 | 1500.0 | 9.647 | 12.954 | 11.196 | 12.318 | 9.408 | 13.95 | 113.28 | 2.327 | -8.633 | 2.604 | -12.5844 |
| 740 | 1500.0 | 9.559 | 12.910 | 11.120 | 12.307 | 9.405 | 13.79 | 114.91 | 2.132 | -8.671 | 2.358 | -12.6274 |
| 750 | 1500.0 | 9.472 | 12.866 | 11.043 | 12.296 | 9.403 | 13.63 | 116.61 | 1.955 | -8.709 | 2.137 | -12.6701 |
| 760 | 1500.0 | 9.384 | 12.823 | 10.966 | 12.285 | 9.400 | 13.46 | 118.40 | 1.796 | -8.746 | 1.939 | -12.7125 |
| 770 | 1500.0 | 9.297 | 12.779 | 10.890 | 12.274 | 9.397 | 13.29 | 120.28 | 1.652 | -8.782 | 1.760 | -12.7545 |
| 780 | 1500.0 | 9.211 | 12.736 | 10.814 | 12.263 | 9.394 | 13.11 | 122.26 | 1.521 | -8.818 | 1.599 | -12.7962 |
| 790 | 1500.0 | 9.124 | 12.693 | 10.738 | 12.252 | 9.392 | 12.93 | 124.34 | 1.402 | -8.853 | 1.454 | -12.8375 |
| 800 | 1500.0 | 9.038 | 12.649 | 10.663 | 12.241 | 9.389 | 12.74 | 126.53 | 1.295 | -8.888 | 1.323 | -12.8785 |
| 820 | 1500.0 | 8.866 | 12.563 | 10.512 | 12.220 | 9.384 | 12.35 | 131.25 | 1.109 - 9 | -8.955 | 1.098 -13 | -12.9594 |
| 840 | 1500.0 | 8.695 | 12.478 | 10.363 | 12.198 | 9.378 | 11.94 | 136.47 | 9.547 -10 | -9.020 | 9.144 -14 | -13.0389 |
| 860 | 1500.0 | 8.356 | 12.308 | 10.066 | 12.156 | 9.368 | 11.09 | 148.57 | 7.207 | -9.142 | 6.411 | -13.1931 |
| 900 | 1500.0 | 8.187 | 12.224 | 9.919 | 12.135 | 9.362 | 10.66 | 155.53 | 6.318 | -9.199 | 5.399 | -13.2677 |
| 920 | 1500.0 | 8.020 | 12.141 | 9.772 | 12.114 | 9.357 | 10.22 | 163.11 | 5.573 | -9.254 | 4.565 | -13.3406 |
| 940 | 1500.0 | 7.854 | 12.057 | 9.627 | 12.093 | 9.352 | 9.78 | 171.36 | 4.944 | -9.306 | 3.877 | -13.4115 |
| 960 | 1500.0 | 7.688 | 11.975 | 9.482 | 12.073 | 9.346 | 9.35 | 180.26 | 4.412 | -9.355 | 3.307 | -13.4806 |
| 980 | 1500.0 | 7.524 | 11.893 | 9.338 | 12.052 | 9.341 | 8.92 | 189.82 | 3.960 | -9.402 | 2.834 | -13.5476 |
| 1000 | 1500.0 | 7.360 | 11.811 | 9.194 | 12.032 | 9.336 | 8.52 | 200.00 | 3.574 | -9.447 | 2.440 | -13.6125 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 379.4 | 16.757 | 16.807 | 17.495 | 13.502 | | 26.76 | 12.48 | 2.272 - 5 | -4.643 | 1.928 - 8 | -7.7149 |
| 125 | 500.3 | 16.457 | 16.597 | 17.217 | 13.405 | | 26.46 | 16.87 | 1.609 | -4.793 | 1.024 | -7.9898 |
| 130 | 611.2 | 16.228 | 16.439 | 17.006 | 13.334 | | 26.21 | 20.59 | 1.230 | -4.910 | 6.342 - 9 | -8.1978 |
| 135 | 712.2 | 16.042 | 16.313 | 16.835 | 13.278 | | 25.98 | 24.24 | 9.836 - 6 | -5.007 | 4.315 | -8.3650 |
| 140 | 804.3 | 15.886 | 16.209 | 16.692 | 13.232 | | 25.77 | 27.64 | 8.111 | -5.091 | 3.126 | -8.5051 |
| 145 | 887.3 | 15.751 | 16.120 | 16.568 | 13.194 | | 25.57 | 30.77 | 6.835 | -5.165 | 2.369 | -8.6254 |
| 150 | 962.6 | 15.631 | 16.042 | 16.458 | 13.161 | | 25.39 | 33.68 | 5.853 | -5.233 | 1.856 | -8.7313 |
| 155 | 1029.6 | 15.523 | 15.974 | 16.361 | 13.133 | | 25.21 | 36.34 | 5.074 - 6 | -5.295 | 1.494 - 9 | -8.8256 |
| 160 | 1090.7 | 15.424 | 15.912 | 16.271 | 13.109 | | 25.04 | 38.62 | 4.442 | -5.352 | 1.226 | -8.9114 |
| 165 | 1145.6 | 15.333 | 15.856 | 16.189 | 13.087 | | 24.87 | 41.10 | 3.919 | -5.407 | 1.023 | -8.9899 |
| 170 | 1195.4 | 15.248 | 15.804 | 16.112 | 13.067 | | 24.71 | 43.24 | 3.481 | -5.458 | 8.655 -10 | -9.0627 |
| 175 | 1239.8 | 15.169 | 15.756 | 16.040 | 13.049 | | 24.55 | 45.21 | 3.109 | -5.507 | 7.405 | -9.1305 |
| 180 | 1280.1 | 15.093 | 15.711 | 15.973 | 13.033 | | 24.39 | 47.05 | 2.790 | -5.554 | 6.394 | -9.1942 |
| 185 | 1316.2 | 15.022 | 15.670 | 15.908 | 13.018 | | 24.24 | 48.76 | 2.513 | -5.600 | 5.567 | -9.2544 |
| 190 | 1349.0 | 14.953 | 15.630 | 15.847 | 13.004 | | 24.09 | 50.36 | 2.272 | -5.644 | 4.880 | -9.3116 |
| 195 | 1378.6 | 14.887 | 15.592 | 15.788 | 12.991 | | 23.94 | 51.87 | 2.060 | -5.686 | 4.303 | -9.3662 |
| 200 | 1405.5 | 14.823 | 15.556 | 15.731 | 12.979 | | 23.79 | 53.30 | 1.874 | -5.727 | 3.814 | -9.4186 |
| 205 | 1430.0 | 14.761 | 15.521 | 15.676 | 12.967 | | 23.64 | 54.65 | 1.708 - 6 | -5.768 | 3.396 -10 | -9.4691 |
| 210 | 1451.9 | 14.701 | 15.488 | 15.623 | 12.957 | | 23.49 | 55.92 | 1.560 | -5.807 | 3.036 | -9.5176 |
| 215 | 1471.8 | 14.643 | 15.456 | 15.571 | 12.946 | | 23.35 | 57.12 | 1.428 | -5.845 | 2.725 | -9.5647 |
| 220 | 1489.4 | 14.586 | 15.425 | 15.520 | 12.937 | | 23.20 | 58.25 | 1.310 | -5.883 | 2.454 | -9.6102 |
| 225 | 1505.5 | 14.530 | 15.395 | 15.471 | 12.928 | | 23.06 | 59.34 | 1.203 | -5.920 | 2.216 | -9.6545 |
| 230 | 1519.8 | 14.476 | 15.365 | 15.423 | 12.919 | | 22.92 | 60.37 | 1.106 | -5.956 | 2.007 | -9.6975 |
| 235 | 1532.8 | 14.422 | 15.337 | 15.375 | 12.910 | | 22.78 | 61.36 | 1.019 | -5.992 | 1.821 | -9.7396 |
| 240 | 1544.3 | 14.369 | 15.309 | 15.329 | 12.902 | | 22.63 | 62.30 | 9.400 - 7 | -6.027 | 1.657 | -9.7807 |
| 245 | 1555.5 | 14.317 | 15.281 | 15.283 | 12.894 | | 22.49 | 63.23 | 8.680 | -6.061 | 1.510 | -9.8211 |
| 250 | 1565.9 | 14.265 | 15.254 | 15.237 | 12.886 | | 22.36 | 64.15 | 8.025 | -6.096 | 1.378 | -9.8608 |
| 255 | 1575.3 | 14.215 | 15.228 | 15.193 | 12.879 | | 22.22 | 64.91 | 7.426 - 7 | -6.129 | 1.262 -10 | -9.8989 |
| 260 | 1583.0 | 14.164 | 15.201 | 15.148 | 12.871 | | 22.08 | 65.86 | 6.880 | -6.162 | 1.154 | -9.9377 |
| 265 | 1592.8 | 14.114 | 15.174 | 15.104 | 12.863 | | 21.94 | 66.78 | 6.380 | -6.195 | 1.057 | -9.9758 |
| 270 | 1601.7 | 14.065 | 15.148 | 15.060 | 12.856 | | 21.81 | 67.67 | 5.923 | -6.227 | 9.699 -11 | -10.0133 |
| 275 | 1609.9 | 14.015 | 15.123 | 15.017 | 12.849 | | 21.68 | 68.54 | 5.503 | -6.259 | 8.912 | -10.0500 |
| 280 | 1617.4 | 13.967 | 15.097 | 14.974 | 12.842 | | 21.54 | 69.39 | 5.119 | -6.291 | 8.200 | -10.0862 |
| 285 | 1624.3 | 13.919 | 15.072 | 14.931 | 12.835 | | 21.41 | 70.21 | 4.765 | -6.322 | 7.554 | -10.1218 |
| 290 | 1630.7 | 13.871 | 15.048 | 14.889 | 12.828 | | 21.28 | 71.02 | 4.439 | -6.353 | 6.968 | -10.1569 |
| 295 | 1636.4 | 13.823 | 15.023 | 14.848 | 12.821 | | 21.15 | 71.81 | 4.139 | -6.383 | 6.435 | -10.1914 |
| 300 | 1641.8 | 13.776 | 14.999 | 14.808 | 12.815 | | 21.03 | 72.59 | 3.862 | -6.413 | 5.949 | -10.2255 |
| 310 | 1651.1 | 13.683 | 14.951 | 14.724 | 12.802 | | 20.78 | 74.10 | 3.370 - 7 | -6.472 | 5.101 -11 | -10.2924 |
| 320 | 1658.9 | 13.591 | 14.904 | 14.644 | 12.789 | | 20.54 | 75.56 | 2.948 | -6.530 | 4.390 | -10.3576 |
| 330 | 1665.5 | 13.500 | 14.858 | 14.564 | 12.777 | | 20.30 | 76.97 | 2.586 | -6.587 | 3.791 | -10.4213 |
| 340 | 1671.0 | 13.410 | 14.812 | 14.485 | 12.765 | | 20.07 | 78.35 | 2.274 | -6.643 | 3.284 | -10.4836 |
| 350 | 1675.6 | 13.321 | 14.767 | 14.406 | 12.753 | | 19.84 | 79.69 | 2.003 | -6.698 | 2.854 | -10.5445 |
| 360 | 1679.5 | 13.232 | 14.722 | 14.329 | 12.742 | | 19.63 | 81.00 | 1.769 | -6.752 | 2.486 | -10.6044 |
| 370 | 1682.8 | 13.144 | 14.678 | 14.252 | 12.730 | | 19.42 | 82.28 | 1.565 | -6.805 | 2.172 | -10.6632 |
| 380 | 1685.6 | 13.057 | 14.633 | 14.175 | 12.719 | | 19.21 | 83.53 | 1.387 | -6.858 | 1.902 | -10.7209 |
| 390 | 1687.9 | 12.970 | 14.590 | 14.099 | 12.708 | | 19.02 | 84.76 | 1.232 | -6.909 | 1.669 | -10.7775 |
| 400 | 1689.8 | 12.883 | 14.546 | 14.023 | 12.697 | | 18.83 | 85.97 | 1.096 | -6.960 | 1.468 | -10.8332 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1691.4 | 12.797 | 14.503 | 13.947 | 12.686 | | 18.65 | 87.15 | 9.761 - 8 | -7.011 | 1.294 -11 | -10.8880 |
| 420 | 1692.8 | 12.711 | 14.460 | 13.872 | 12.675 | | 18.47 | 88.31 | 8.709 | -7.060 | 1.143 | -10.9420 |
| 430 | 1694.0 | 12.626 | 14.417 | 13.798 | 12.664 | | 18.30 | 89.45 | 7.783 | -7.109 | 1.011 | -10.9951 |
| 440 | 1694.9 | 12.541 | 14.374 | 13.723 | 12.653 | | 18.14 | 90.57 | 6.964 | -7.157 | 8.964 -12 | -11.0475 |
| 450 | 1695.7 | 12.456 | 14.332 | 13.649 | 12.643 | | 17.98 | 91.67 | 6.241 | -7.205 | 7.959 | -11.0991 |
| 460 | 1696.4 | 12.372 | 14.290 | 13.575 | 12.632 | | 17.83 | 92.76 | 5.599 | -7.252 | 7.079 | -11.1501 |
| 470 | 1697.0 | 12.288 | 14.248 | 13.502 | 12.621 | | 17.69 | 93.82 | 5.030 | -7.298 | 6.305 | -11.2003 |
| 480 | 1697.5 | 12.204 | 14.206 | 13.428 | 12.611 | | 17.55 | 94.88 | 4.524 | -7.344 | 5.625 | -11.2499 |
| 490 | 1697.9 | 12.121 | 14.164 | 13.355 | 12.600 | | 17.41 | 95.91 | 4.074 | -7.390 | 5.025 | -11.2989 |
| 500 | 1698.2 | 12.038 | 14.122 | 13.282 | 12.590 | 9.249 | 17.28 | 96.93 | 3.673 | -7.435 | 4.495 | -11.3472 |
| 510 | 1698.5 | 11.955 | 14.081 | 13.210 | 12.579 | 9.246 | 17.16 | 97.94 | 3.314 - 8 | -7.480 | 4.027 -12 | -11.3950 |
| 520 | 1698.7 | 11.872 | 14.039 | 13.137 | 12.569 | 9.244 | 17.04 | 98.94 | 2.994 | -7.524 | 3.612 | -11.4423 |
| 530 | 1698.9 | 11.790 | 13.998 | 13.065 | 12.559 | 9.241 | 16.92 | 99.93 | 2.708 | -7.567 | 3.243 | -11.4890 |
| 540 | 1699.1 | 11.708 | 13.957 | 12.993 | 12.548 | 9.238 | 16.80 | 100.91 | 2.451 | -7.611 | 2.916 | -11.5353 |
| 550 | 1699.3 | 11.626 | 13.916 | 12.922 | 12.538 | 9.236 | 16.69 | 101.89 | 2.221 | -7.653 | 2.624 | -11.5810 |
| 560 | 1699.4 | 11.544 | 13.875 | 12.850 | 12.528 | 9.233 | 16.58 | 102.86 | 2.014 | -7.696 | 2.364 | -11.6263 |
| 570 | 1699.5 | 11.463 | 13.835 | 12.779 | 12.518 | 9.231 | 16.48 | 103.82 | 1.829 | -7.738 | 2.132 | -11.6711 |
| 580 | 1699.6 | 11.382 | 13.794 | 12.708 | 12.508 | 9.228 | 16.37 | 104.79 | 1.661 | -7.780 | 1.925 | -11.7155 |
| 590 | 1699.6 | 11.301 | 13.754 | 12.637 | 12.497 | 9.225 | 16.27 | 105.76 | 1.511 | -7.821 | 1.740 | -11.7595 |
| 600 | 1699.7 | 11.220 | 13.713 | 12.567 | 12.487 | 9.223 | 16.17 | 106.73 | 1.375 | -7.862 | 1.574 | -11.8031 |
| 610 | 1699.7 | 11.140 | 13.673 | 12.496 | 12.477 | 9.220 | 16.07 | 107.70 | 1.253 - 8 | -7.902 | 1.425 -12 | -11.8463 |
| 620 | 1699.8 | 11.059 | 13.633 | 12.426 | 12.467 | 9.218 | 15.97 | 108.69 | 1.142 | -7.942 | 1.291 | -11.8892 |
| 630 | 1699.8 | 10.980 | 13.593 | 12.356 | 12.457 | 9.215 | 15.87 | 109.68 | 1.042 | -7.982 | 1.170 | -11.9317 |
| 640 | 1699.8 | 10.900 | 13.553 | 12.286 | 12.447 | 9.213 | 15.77 | 110.69 | 9.517 - 9 | -8.022 | 1.062 | -11.9739 |
| 650 | 1699.9 | 10.820 | 13.513 | 12.217 | 12.437 | 9.210 | 15.67 | 111.71 | 8.698 | -8.061 | 9.647 -13 | -12.0156 |
| 660 | 1699.9 | 10.741 | 13.474 | 12.147 | 12.427 | 9.208 | 15.58 | 112.74 | 7.957 | -8.099 | 8.769 | -12.0571 |
| 670 | 1699.9 | 10.662 | 13.434 | 12.078 | 12.418 | 9.205 | 15.47 | 113.80 | 7.285 | -8.138 | 7.976 | -12.0982 |
| 680 | 1699.9 | 10.583 | 13.395 | 12.009 | 12.408 | 9.203 | 15.37 | 114.88 | 6.674 | -8.176 | 7.260 | -12.1391 |
| 690 | 1699.9 | 10.505 | 13.356 | 11.940 | 12.398 | 9.200 | 15.27 | 115.99 | 6.121 | -8.213 | 6.613 | -12.1796 |
| 700 | 1699.9 | 10.426 | 13.316 | 11.872 | 12.388 | 9.198 | 15.16 | 117.12 | 5.617 | -8.250 | 6.027 | -12.2199 |
| 710 | 1700.0 | 10.348 | 13.277 | 11.803 | 12.378 | 9.195 | 15.06 | 118.29 | 5.160 - 9 | -8.287 | 5.497 -13 | -12.2599 |
| 720 | 1700.0 | 10.270 | 13.238 | 11.735 | 12.369 | 9.193 | 14.95 | 119.49 | 4.744 | -8.324 | 5.017 | -12.2995 |
| 730 | 1700.0 | 10.193 | 13.200 | 11.667 | 12.359 | 9.190 | 14.84 | 120.73 | 4.365 | -8.360 | 4.582 | -12.3390 |
| 740 | 1700.0 | 10.115 | 13.161 | 11.599 | 12.349 | 9.188 | 14.72 | 122.00 | 4.019 | -8.396 | 4.187 | -12.3781 |
| 750 | 1700.0 | 10.038 | 13.122 | 11.532 | 12.339 | 9.186 | 14.61 | 123.33 | 3.705 | -8.431 | 3.829 | -12.4169 |
| 760 | 1700.0 | 9.961 | 13.084 | 11.464 | 12.330 | 9.183 | 14.49 | 124.69 | 3.418 | -8.466 | 3.503 | -12.4555 |
| 770 | 1700.0 | 9.884 | 13.045 | 11.397 | 12.320 | 9.181 | 14.36 | 126.12 | 3.156 | -8.501 | 3.207 | -12.4939 |
| 780 | 1700.0 | 9.807 | 13.007 | 11.330 | 12.311 | 9.178 | 14.24 | 127.59 | 2.916 | -8.535 | 2.938 | -12.5319 |
| 790 | 1700.0 | 9.731 | 12.969 | 11.263 | 12.301 | 9.176 | 14.11 | 129.12 | 2.698 | -8.569 | 2.693 | -12.5698 |
| 800 | 1700.0 | 9.655 | 12.931 | 11.196 | 12.292 | 9.173 | 13.98 | 130.72 | 2.498 | -8.602 | 2.470 | -12.6073 |
| 820 | 1700.0 | 9.503 | 12.855 | 11.063 | 12.273 | 9.169 | 13.70 | 134.11 | 2.148 - 9 | -8.668 | 2.082 -13 | -12.6816 |
| 840 | 1700.0 | 9.352 | 12.779 | 10.931 | 12.254 | 9.164 | 13.41 | 137.79 | 1.854 | -8.732 | 1.758 | -12.7543 |
| 860 | 1700.0 | 9.053 | 12.630 | 10.669 | 12.216 | 9.155 | 12.78 | 146.17 | 1.398 | -8.854 | 1.264 | -12.8982 |
| 900 | 1700.0 | 8.905 | 12.556 | 10.539 | 12.198 | 9.150 | 12.45 | 150.92 | 1.222 | -8.913 | 1.076 | -12.9682 |
| 920 | 1700.0 | 8.757 | 12.482 | 10.410 | 12.179 | 9.145 | 12.10 | 156.10 | 1.073 | -8.970 | 9.182 -14 | -13.0370 |
| 940 | 1700.0 | 8.610 | 12.408 | 10.282 | 12.161 | 9.141 | 11.74 | 161.74 | 9.458 -10 | -9.024 | 7.857 | -13.1047 |
| 960 | 1700.0 | 8.464 | 12.335 | 10.154 | 12.143 | 9.136 | 11.38 | 167.86 | 8.377 | -9.077 | 6.742 | -13.1712 |
| 980 | 1700.0 | 8.319 | 12.263 | 10.027 | 12.124 | 9.131 | 11.00 | 174.50 | 7.453 | -9.128 | 5.802 | -13.2364 |
| 1000 | 1700.0 | 8.175 | 12.191 | 9.901 | 12.106 | 9.127 | 10.63 | 181.67 | 6.661 | -9.176 | 5.008 | -13.3004 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 1900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 379.7 | 16.756 | 16.807 | 17.494 | 13.532 | | 26.76 | 12.49 | 2.269 - 5 | -4.644 | 1.923 - 8 | -7.7161 |
| 125 | 500.7 | 16.455 | 16.596 | 17.216 | 13.405 | | 26.46 | 16.88 | 1.607 | -4.794 | 1.021 | -7.9908 |
| 130 | 612.8 | 16.226 | 16.438 | 17.004 | 13.333 | | 26.20 | 20.65 | 1.228 | -4.911 | 6.318 - 9 | -8.1994 |
| 135 | 716.3 | 16.040 | 16.311 | 16.833 | 13.276 | | 25.98 | 24.38 | 9.835 - 6 | -5.007 | 4.290 | -8.3678 |
| 140 | 811.7 | 15.882 | 16.205 | 16.688 | 13.229 | | 25.77 | 27.89 | 8.121 | -5.090 | 3.101 | -8.5085 |
| 145 | 898.9 | 15.746 | 16.115 | 16.564 | 13.190 | | 25.58 | 31.17 | 6.856 | -5.164 | 2.346 | -8.6298 |
| 150 | 978.9 | 15.626 | 16.036 | 16.454 | 13.157 | | 25.39 | 34.24 | 5.884 | -5.230 | 1.836 | -8.7362 |
| 155 | 1051.6 | 15.518 | 15.967 | 16.355 | 13.128 | | 25.22 | 37.10 | 5.114 - 6 | -5.291 | 1.475 - 9 | -8.8311 |
| 160 | 1118.2 | 15.419 | 15.904 | 16.266 | 13.103 | | 25.05 | 39.77 | 4.491 | -5.348 | 1.210 | -8.9172 |
| 165 | 1178.3 | 15.329 | 15.847 | 16.184 | 13.080 | | 24.89 | 42.25 | 3.975 | -5.401 | 1.010 | -8.9957 |
| 170 | 1233.7 | 15.244 | 15.795 | 16.107 | 13.060 | | 24.73 | 44.58 | 3.543 | -5.451 | 8.543 -10 | -9.0688 |
| 175 | 1284.1 | 15.165 | 15.747 | 16.036 | 13.041 | | 24.58 | 46.76 | 3.176 | -5.498 | 7.311 | -9.1360 |
| 180 | 1330.5 | 15.091 | 15.702 | 15.968 | 13.024 | | 24.43 | 48.83 | 2.860 | -5.544 | 6.316 | -9.1995 |
| 185 | 1372.6 | 15.020 | 15.660 | 15.905 | 13.009 | | 24.28 | 50.75 | 2.587 | -5.587 | 5.504 | -9.2593 |
| 190 | 1411.5 | 14.952 | 15.620 | 15.844 | 12.994 | | 24.14 | 52.59 | 2.348 | -5.629 | 4.830 | -9.3161 |
| 195 | 1446.8 | 14.887 | 15.582 | 15.786 | 12.981 | | 23.99 | 54.31 | 2.139 | -5.670 | 4.266 | -9.3700 |
| 200 | 1479.5 | 14.825 | 15.546 | 15.730 | 12.968 | | 23.85 | 55.95 | 1.953 | -5.709 | 3.788 | -9.4216 |
| 205 | 1509.5 | 14.765 | 15.511 | 15.676 | 12.956 | | 23.71 | 57.50 | 1.788 - 6 | -5.748 | 3.379 -10 | -9.4712 |
| 210 | 1536.8 | 14.706 | 15.478 | 15.624 | 12.945 | | 23.58 | 58.98 | 1.641 | -5.785 | 3.028 | -9.5189 |
| 215 | 1562.0 | 14.650 | 15.447 | 15.574 | 12.935 | | 23.44 | 60.39 | 1.509 | -5.821 | 2.724 | -9.5647 |
| 220 | 1584.9 | 14.595 | 15.416 | 15.525 | 12.925 | | 23.30 | 61.72 | 1.391 | -5.857 | 2.460 | -9.6091 |
| 225 | 1606.1 | 14.541 | 15.386 | 15.477 | 12.915 | | 23.17 | 63.01 | 1.284 | -5.892 | 2.227 | -9.6522 |
| 230 | 1625.5 | 14.489 | 15.357 | 15.431 | 12.906 | | 23.04 | 64.23 | 1.187 | -5.926 | 2.023 | -9.6941 |
| 235 | 1643.0 | 14.437 | 15.329 | 15.385 | 12.897 | | 22.90 | 65.40 | 1.099 | -5.959 | 1.842 | -9.7347 |
| 240 | 1658.6 | 14.387 | 15.302 | 15.341 | 12.889 | | 22.77 | 66.50 | 1.018 | -5.992 | 1.682 | -9.7742 |
| 245 | 1673.3 | 14.338 | 15.275 | 15.297 | 12.881 | | 22.64 | 67.58 | 9.451 - 7 | -6.025 | 1.538 | -9.8130 |
| 250 | 1686.8 | 14.289 | 15.249 | 15.254 | 12.873 | | 22.51 | 68.61 | 8.782 | -6.056 | 1.410 | -9.8508 |
| 255 | 1697.7 | 14.241 | 15.224 | 15.212 | 12.866 | | 22.39 | 69.56 | 8.169 - 7 | -6.088 | 1.296 -10 | -9.8875 |
| 260 | 1712.4 | 14.193 | 15.198 | 15.169 | 12.858 | | 22.26 | 70.67 | 7.607 | -6.119 | 1.189 | -9.9247 |
| 265 | 1726.0 | 14.146 | 15.173 | 15.127 | 12.850 | | 22.13 | 71.74 | 7.091 | -6.149 | 1.094 | -9.9611 |
| 270 | 1738.6 | 14.099 | 15.148 | 15.086 | 12.843 | | 22.01 | 72.79 | 6.617 | -6.179 | 1.007 | -9.9968 |
| 275 | 1750.3 | 14.053 | 15.123 | 15.045 | 12.835 | | 21.89 | 73.80 | 6.181 | -6.209 | 9.295 -11 | -10.0317 |
| 280 | 1761.2 | 14.007 | 15.099 | 15.005 | 12.828 | | 21.76 | 74.79 | 5.779 | -6.238 | 8.588 | -10.0661 |
| 285 | 1771.2 | 13.962 | 15.076 | 14.965 | 12.822 | | 21.64 | 75.75 | 5.407 | -6.267 | 7.946 | -10.0999 |
| 290 | 1780.6 | 13.918 | 15.052 | 14.926 | 12.815 | | 21.52 | 76.69 | 5.064 | -6.296 | 7.362 | -10.1330 |
| 295 | 1789.2 | 13.874 | 15.029 | 14.887 | 12.808 | | 21.40 | 77.61 | 4.746 | -6.324 | 6.829 | -10.1657 |
| 300 | 1797.3 | 13.830 | 15.006 | 14.849 | 12.802 | | 21.29 | 78.50 | 4.452 | -6.351 | 6.341 | -10.1978 |
| 310 | 1811.6 | 13.744 | 14.961 | 14.773 | 12.789 | | 21.05 | 80.24 | 3.925 - 7 | -6.406 | 5.486 -11 | -10.2607 |
| 320 | 1824.0 | 13.669 | 14.918 | 14.698 | 12.777 | | 20.83 | 81.91 | 3.469 | -6.460 | 4.765 | -10.3219 |
| 330 | 1834.6 | 13.576 | 14.874 | 14.625 | 12.766 | | 20.61 | 83.52 | 3.074 | -6.512 | 4.154 | -10.3816 |
| 340 | 1843.8 | 13.493 | 14.832 | 14.552 | 12.754 | | 20.39 | 85.07 | 2.730 | -6.564 | 3.632 | -10.4398 |
| 350 | 1851.6 | 13.411 | 14.790 | 14.480 | 12.743 | | 20.18 | 86.58 | 2.430 | -6.614 | 3.186 | -10.4967 |
| 360 | 1858.4 | 13.330 | 14.749 | 14.409 | 12.732 | | 19.98 | 88.05 | 2.167 | -6.664 | 2.802 | -10.5525 |
| 370 | 1864.2 | 13.250 | 14.708 | 14.339 | 12.721 | | 19.78 | 89.48 | 1.936 | -6.713 | 2.471 | -10.6071 |
| 380 | 1869.2 | 13.171 | 14.668 | 14.269 | 12.711 | | 19.59 | 90.87 | 1.733 | -6.761 | 2.184 | -10.6607 |
| 390 | 1873.5 | 13.092 | 14.628 | 14.200 | 12.701 | | 19.40 | 92.23 | 1.554 | -6.809 | 1.935 | -10.7133 |
| 400 | 1877.2 | 13.014 | 14.589 | 14.132 | 12.690 | | 19.22 | 93.57 | 1.395 | -6.855 | 1.718 | -10.7650 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1880.4 | 12.936 | 14.549 | 14.063 | 12.680 | | 19.04 | 94.87 | 1.255 - 7 | -6.901 | 1.52[illegible] -11 | -10.8158 |
| 420 | 1883.1 | 12.858 | 14.510 | 1[illegible].996 | 12.670 | | 18.87 | 96.15 | 1.130 | -6.947 | 1.362 | -10.8658 |
| 430 | 1885.5 | 12.781 | 14.472 | 13.928 | 12.660 | | 18.71 | 97.41 | 1.019 | -6.992 | 1.216 | -10.9150 |
| 440 | 1887.5 | 12.705 | 14.433 | 13.861 | 12.651 | | 18.55 | 98.64 | 9.203 - 8 | -7.036 | 1.088 | -10.9635 |
| 450 | 1889.3 | 12.629 | 14.395 | 13.794 | 12.641 | | 18.39 | 99.85 | 8.321 | -7.080 | 9.743 -12 | -11.0113 |
| 460 | 1890.8 | 12.553 | 14.357 | 13.728 | 12.631 | | 18.24 | 101.05 | 7.532 | -7.123 | 8.741 | -11.0584 |
| 470 | 1892.1 | 12.477 | 14.319 | 13.662 | 12.622 | | 18.10 | 102.22 | 6.826 | -7.166 | 7.854 | -11.1049 |
| 480 | 1893.2 | 12.402 | 14.281 | 13.596 | 12.612 | | 17.96 | 103.37 | 6.194 | -7.208 | 7.067 | -11.1507 |
| 490 | 1894.1 | 12.327 | 14.243 | 13.530 | 12.603 | | 17.83 | 104.51 | 5.626 | -7.250 | 6.368 | -11.1960 |
| 500 | 1894.9 | 12.252 | 14.206 | 13.465 | 12.593 | 9.077 | 17.70 | 105.63 | 5.115 | -7.291 | 5.745 | -11.2407 |
| 510 | 1895.7 | 12.178 | 14.169 | 13.400 | 12.584 | 9.075 | 17.57 | 106.73 | 4.655 - 8 | -7.332 | 5.190 -12 | -11.2849 |
| 520 | 1896.3 | 12.104 | 14.132 | 13.335 | 12.574 | 9.072 | 17.45 | 107.83 | 4.241 | -7.373 | 4.694 | -11.3285 |
| 530 | 1896.8 | 12.030 | 14.095 | 13.270 | 12.565 | 9.070 | 17.33 | 108.90 | 3.867 | -7.413 | 4.250 | -11.3716 |
| 540 | 1897.2 | 11.956 | 14.058 | 13.205 | 12.556 | 9.067 | 17.22 | 109.97 | 3.529 | -7.452 | 3.852 | -11.4143 |
| 550 | 1897.6 | 11.883 | 14.021 | 13.141 | 12.547 | 9.065 | 17.11 | 111.03 | 3.224 | -7.492 | 3.496 | -11.4565 |
| 560 | 1898.0 | 11.810 | 13.984 | 13.077 | 12.537 | 9.063 | 17.00 | 112.07 | 2.948 | -7.531 | 3.175 | -11.4982 |
| 570 | 1898.2 | 11.737 | 13.948 | 13.013 | 12.528 | 9.060 | 16.89 | 113.11 | 2.697 | -7.569 | 2.887 | -11.5395 |
| 580 | 1898.5 | 11.664 | 13.911 | 12.950 | 12.519 | 9.058 | 16.79 | 114.14 | 2.470 | -7.607 | 2.628 | -11.5805 |
| 590 | 1898.7 | 11.592 | 13.875 | 12.886 | 12.510 | 9.056 | 16.69 | 115.17 | 2.264 | -7.645 | 2.393 | -11.6210 |
| 600 | 1898.9 | 11.520 | 13.839 | 12.823 | 12.501 | 9.053 | 16.60 | 116.19 | 2.076 | -7.683 | 2.182 | -11.6611 |
| 610 | 1899.0 | 11.448 | 13.803 | 12.760 | 12.492 | 9.051 | 16.50 | 117.21 | 1.906 - 8 | -7.720 | 1.991 -12 | -11.7009 |
| 620 | 1899.2 | 11.376 | 13.767 | 12.697 | 12.483 | 9.049 | 16.41 | 118.23 | 1.750 | -7.757 | 1.819 | -11.7403 |
| 630 | 1899.3 | 11.304 | 13.731 | 12.635 | 12.474 | 9.046 | 16.31 | 119.24 | 1.609 | -7.793 | 1.662 | -11.7793 |
| 640 | 1899.4 | 11.233 | 13.696 | 12.572 | 12.465 | 9.044 | 16.22 | 120.27 | 1.480 | -7.830 | 1.520 | -11.8180 |
| 650 | 1899.5 | 11.162 | 13.660 | 12.510 | 12.456 | 9.042 | 16.13 | 121.29 | 1.362 | -7.866 | 1.392 | -11.8564 |
| 660 | 1899.5 | 11.091 | 13.625 | 12.448 | 12.447 | 9.040 | 16.04 | 122.32 | 1.255 | -7.901 | 1.275 | -11.8945 |
| 670 | 1899.6 | 11.020 | 13.589 | 12.386 | 12.438 | 9.037 | 15.95 | 123.36 | 1.157 | -7.937 | 1.169 | -11.9323 |
| 680 | 1899.7 | 10.950 | 13.554 | 12.324 | 12.430 | 9.035 | 15.86 | 124.41 | 1.067 | -7.972 | 1.072 | -11.9698 |
| 690 | 1899.7 | 10.879 | 13.519 | 12.[illegible]62 | 12.421 | 9.033 | 15.77 | 125.47 | 9.852 - 9 | -8.006 | 9.839 -13 | -12.0070 |
| 700 | 1899.8 | 10.809 | 13.484 | 12.201 | 12.412 | 9.031 | 15.69 | 126.54 | 9.100 | -8.041 | 9.037 | -12.0440 |
| 710 | 1899.8 | 10.739 | 13.449 | 12.140 | 12.403 | 9.028 | 15.60 | 127.63 | 8.411 - 9 | -8.075 | 8.305 -13 | -12.0806 |
| 720 | 1899.8 | 10.670 | 13.414 | 12.079 | 12.395 | 9.026 | 15.51 | 128.74 | 7.780 | -8.109 | 7.638 | -12.1170 |
| 730 | 1899.8 | 10.600 | 13.379 | 12.[illegible]18 | 12.386 | 9.024 | 15.42 | 129.86 | 7.201 | -8.143 | 7.028 | -12.1537 |
| 740 | 1899.9 | 10.531 | 13.345 | 11.[illegible]57 | 12.377 | 9.022 | 15.32 | 131.01 | 6.670 | -8.176 | 6.470 | -12.1891 |
| 750 | 1899.9 | 10.462 | 13.310 | 11.397 | 12.369 | 9.020 | 15.23 | 132.18 | 6.182 | -8.209 | 5.[illegible]60 | -12.2247 |
| 760 | 1899.9 | 10.393 | 13.275 | 11.836 | 12.360 | 9.018 | 15.14 | 133.38 | 5.733 | -8.242 | 5.494 | -12.2601 |
| 770 | 1899.9 | 10.324 | 13.241 | 11.776 | 12.351 | 9.015 | 15.04 | 134.61 | 5.321 | -8.274 | 5.066 | -12.2953 |
| 780 | 1899.9 | 10.255 | 13.207 | 11.716 | 12.343 | 9.013 | 14.94 | 135.87 | 4.942 | -8.306 | 4.675 | -12.3302 |
| 790 | 1899.9 | 10.187 | 13.173 | 11.656 | 12.334 | 9.011 | 14.84 | 137.16 | 4.593 | -8.338 | 4.316 | -12.3649 |
| 800 | 1899.9 | 10.119 | 13.139 | 11.597 | 12.326 | 9.009 | 14.74 | 138.49 | 4.271 | -8.369 | 3.986 | -12.3994 |
| 820 | 1900.0 | 9.983 | 13.071 | 11.478 | 12.309 | 9.005 | 14.53 | 141.26 | 3.702 - 9 | -8.432 | 3.406 -13 | -12.4677 |
| 840 | 1900.0 | 9.848 | 13.003 | 11.360 | 12.292 | 9.000 | 14.32 | 144.21 | 3.218 | -8.492 | 2.916 | -12.5351 |
| 880 | 1900.0 | 9.580 | 12.869 | 11.125 | 12.258 | 8.992 | 13.85 | 150.73 | 2.453 | -8.610 | 2.151 | -12.6674 |
| 900 | 1900.0 | 9.448 | 12.803 | 11.009 | 12.242 | 8.988 | 13.60 | 154.35 | 2.152 | -8.667 | 1.852 | -12.7323 |
| 920 | 1900.0 | 9.316 | 12.737 | 10.893 | 12.225 | 8.984 | 13.34 | 158.23 | 1.893 | -8.723 | 1.599 | -12.7962 |
| 940 | 1900.0 | 9.184 | 12.671 | 10.778 | 12.209 | 8.979 | 13.07 | 162.41 | 1.671 | -8.777 | 1.382 | -12.8594 |
| 960 | 1900.0 | 9.054 | 12.606 | 10.664 | 12.192 | 8.975 | 12.79 | 166.91 | 1.480 | -8.830 | 1.198 | -12.9216 |
| 980 | 1900.0 | 8.924 | 12.541 | 10.550 | 12.176 | 8.971 | 12.49 | 171.75 | 1.315 | -8.881 | 1.040 | -12.9830 |
| 1000 | 1900.0 | 8.795 | 12.476 | 10.437 | 12.160 | 8.967 | 12.19 | 176.96 | 1.172 | -8.931 | 9.049 -14 | -13.0434 |

## SUMMER MODEL, EXOSPHERIC TEMPERATURE = 2100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 379.6 | 16.757 | 16.807 | 17.495 | 13.502 | | 26.76 | 12.48 | 2.272 - 5 | -4.644 | 1.927 - 8 | -7.7157 |
| 125 | 501.4 | 16.456 | 16.596 | 17.216 | 13.405 | | 26.46 | 16.70 | 1.610 | -4.793 | 1.022 | -7.9906 |
| 130 | 615.2 | 16.226 | 16.436 | 17.004 | 13.332 | | 26.21 | 20.72 | 1.231 | -4.910 | 6.309 - 9 | -8.2000 |
| 135 | 721.4 | 16.039 | 16.308 | 16.831 | 13.274 | | 25.98 | 24.55 | 9.869 - 6 | -5.006 | 4.275 | -8.3690 |
| 140 | 819.9 | 15.881 | 16.202 | 16.687 | 13.227 | | 25.78 | 28.17 | 8.163 | -5.088 | 3.087 | -8.5105 |
| 145 | 910.6 | 15.745 | 16.111 | 16.562 | 13.188 | | 25.59 | 31.57 | 6.904 | -5.161 | 2.333 | -8.6321 |
| 150 | 994.6 | 15.624 | 16.031 | 16.451 | 13.154 | | 25.41 | 34.77 | 5.938 | -5.226 | 1.824 | -8.7389 |
| 155 | 1071.4 | 15.516 | 15.961 | 16.353 | 13.124 | | 25.24 | 37.77 | 5.173 - 6 | -5.286 | 1.466 - 9 | -8.8340 |
| 160 | 1142.6 | 15.418 | 15.898 | 16.263 | 13.098 | | 25.07 | 40.61 | 4.553 | -5.342 | 1.202 | -8.9202 |
| 165 | 1207.9 | 15.327 | 15.841 | 16.181 | 13.075 | | 24.92 | 43.26 | 4.042 | -5.393 | 1.003 | -8.9988 |
| 170 | 1268.4 | 15.243 | 15.788 | 16.105 | 13.054 | | 24.76 | 45.78 | 3.612 | -5.442 | 8.482 -10 | -9.0715 |
| 175 | 1323.8 | 15.165 | 15.740 | 16.034 | 13.035 | | 24.61 | 48.14 | 3.248 | -5.488 | 7.263 | -9.1389 |
| 180 | 1375.3 | 15.091 | 15.694 | 15.967 | 13.017 | | 24.47 | 50.39 | 2.934 | -5.533 | 6.279 | -9.2021 |
| 185 | 1422.7 | 15.021 | 15.652 | 15.904 | 13.001 | | 24.33 | 52.51 | 2.663 | -5.575 | 5.476 | -9.2616 |
| 190 | 1466.7 | 14.954 | 15.612 | 15.844 | 12.986 | | 24.19 | 54.53 | 2.425 | -5.615 | 4.810 | -9.3178 |
| 195 | 1507.2 | 14.890 | 15.574 | 15.786 | 12.972 | | 24.05 | 56.44 | 2.216 | -5.654 | 4.253 | -9.3713 |
| 200 | 1544.8 | 14.829 | 15.538 | 15.731 | 12.959 | | 23.92 | 58.26 | 2.031 | -5.692 | 3.782 | -9.4221 |
| 205 | 1579.7 | 14.770 | 15.504 | 15.679 | 12.947 | | 23.78 | 60.00 | 1.866 - 6 | -5.729 | 3.380 -10 | -9.4711 |
| 210 | 1611.8 | 14.713 | 15.471 | 15.628 | 12.936 | | 23.65 | 61.65 | 1.719 | -5.765 | 3.036 | -9.5179 |
| 215 | 1641.8 | 14.658 | 15.440 | 15.578 | 12.925 | | 23.52 | 63.24 | 1.587 | -5.799 | 2.735 | -9.5631 |
| 220 | 1669.4 | 14.605 | 15.409 | 15.531 | 12.915 | | 23.40 | 64.76 | 1.468 | -5.833 | 2.474 | -9.6066 |
| 225 | 1695.1 | 14.552 | 15.380 | 15.484 | 12.905 | | 23.27 | 66.21 | 1.360 | -5.867 | 2.245 | -9.6488 |
| 230 | 1718.8 | 14.502 | 15.351 | 15.439 | 12.896 | | 23.14 | 67.61 | 1.262 | -5.899 | 2.044 | -9.6896 |
| 235 | 1740.8 | 14.452 | 15.324 | 15.395 | 12.887 | | 23.02 | 68.95 | 1.173 | -5.931 | 1.865 | -9.7293 |
| 240 | 1761.0 | 14.404 | 15.297 | 15.352 | 12.878 | | 22.90 | 70.23 | 1.091 | -5.962 | 1.707 | -9.7678 |
| 245 | 1779.6 | 14.356 | 15.271 | 15.310 | 12.870 | | 22.77 | 71.46 | 1.017 | -5.993 | 1.566 | -9.8053 |
| 250 | 1796.5 | 14.309 | 15.246 | 15.268 | 12.862 | | 22.65 | 72.63 | 9.489 - 7 | -6.023 | 1.439 | -9.8419 |
| 255 | 1811.9 | 14.264 | 15.221 | 15.228 | 12.854 | | 22.53 | 73.76 | 8.863 - 7 | -6.052 | 1.326 -10 | -9.8776 |
| 260 | 1830.5 | 14.218 | 15.196 | 15.187 | 12.847 | | 22.41 | 75.02 | 8.287 | -6.082 | 1.220 | -9.9135 |
| 265 | 1847.9 | 14.173 | 15.171 | 15.147 | 12.839 | | 22.30 | 76.25 | 7.757 | -6.110 | 1.126 | -9.9486 |
| 270 | 1864.2 | 14.128 | 15.147 | 15.107 | 12.831 | | 22.18 | 77.44 | 7.268 | -6.139 | 1.040 | -9.9830 |
| 275 | 1879.4 | 14.084 | 15.123 | 15.069 | 12.824 | | 22.06 | 78.60 | 6.817 | -6.166 | 9.625 -11 | -10.0166 |
| 280 | 1893.6 | 14.041 | 15.100 | 15.030 | 12.817 | | 21.95 | 79.73 | 6.400 | -6.194 | 8.922 | -10.0495 |
| 285 | 1907.0 | 13.999 | 15.077 | 14.993 | 12.810 | | 21.84 | 80.83 | 6.013 | -6.221 | 8.282 | -10.0819 |
| 290 | 1919.4 | 13.956 | 15.055 | 14.956 | 12.804 | | 21.72 | 81.90 | 5.655 | -6.248 | 7.698 | -10.1136 |
| 295 | 1931.1 | 13.915 | 15.033 | 14.919 | 12.797 | | 21.61 | 82.94 | 5.322 | -6.274 | 7.165 | -10.1448 |
| 300 | 1942.0 | 13.874 | 15.011 | 14.883 | 12.791 | | 21.50 | 83.96 | 5.013 | -6.300 | 6.676 | -10.1755 |
| 310 | 1961.7 | 13.793 | 14.968 | 14.811 | 12.779 | | 21.29 | 85.93 | 4.456 - 7 | -6.351 | 5.816 -11 | -10.2354 |
| 320 | 1979.0 | 13.714 | 14.927 | 14.741 | 12.767 | | 21.08 | 87.82 | 3.972 | -6.401 | 5.088 | -10.2935 |
| 330 | 1994.1 | 13.636 | 14.886 | 14.673 | 12.755 | | 20.87 | 89.64 | 3.548 | -6.450 | 4.467 | -10.3500 |
| 340 | 2007.3 | 13.559 | 14.846 | 14.605 | 12.744 | | 20.67 | 91.39 | 3.177 | -6.498 | 3.935 | -10.4051 |
| 350 | 2018.9 | 13.483 | 14.807 | 14.539 | 12.734 | | 20.47 | 93.08 | 2.851 | -6.545 | 3.477 | -10.4588 |
| 360 | 2029.0 | 13.408 | 14.769 | 14.473 | 12.723 | | 20.28 | 94.71 | 2.563 | -6.591 | 3.081 | -10.5114 |
| 370 | 2037.9 | 13.334 | 14.731 | 14.408 | 12.713 | | 20.09 | 96.30 | 2.308 | -6.637 | 2.737 | -10.5628 |
| 380 | 2045.7 | 13.261 | 14.693 | 14.344 | 12.703 | | 19.91 | 97.85 | 2.082 | -6.681 | 2.437 | -10.6131 |
| 390 | 2052.4 | 13.189 | 14.656 | 14.280 | 12.693 | | 19.73 | 99.36 | 1.881 | -6.726 | 2.175 | -10.6625 |
| 400 | 2058.4 | 13.117 | 14.620 | 14.217 | 12.684 | | 19.55 | 100.83 | 1.703 | -6.769 | 1.945 | -10.7110 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 2063.6 | 13.045 | 14.583 | 14.154 | 12.674 | | 19.39 | 102.27 | 1.543 - 7 | -6.812 | 1.743 -11 | -10.7586 |
| 420 | 2068.1 | 12.974 | 14.548 | 14.092 | 12.665 | | 19.22 | 103.68 | 1.400 | -6.854 | 1.565 | -10.8055 |
| 430 | 2072.1 | 12.904 | 14.512 | 14.030 | 12.656 | | 19.06 | 105.06 | 1.272 | -6.895 | 1.408 | -10.8515 |
| 440 | 2075.6 | 12.834 | 14.477 | 13.969 | 12.646 | | 18.91 | 106.41 | 1.157 | -6.937 | 1.268 | -10.8969 |
| 450 | 2078.6 | 12.765 | 14.441 | 13.908 | 12.637 | | 18.76 | 107.74 | 1.054 | -6.977 | 1.144 | -10.9415 |
| 460 | 2081.3 | 12.695 | 14.407 | 13.847 | 12.628 | | 18.61 | 109.04 | 9.613 - 8 | -7.017 | 1.034 | -10.9856 |
| 470 | 2083.6 | 12.626 | 14.372 | 13.787 | 12.620 | | 18.47 | 110.32 | 8.776 | -7.057 | 9.355 -12 | -11.0290 |
| 480 | 2085.7 | 12.558 | 14.337 | 13.727 | 12.611 | | 18.33 | 111.58 | 8.019 | -7.096 | 8.477 | -11.0719 |
| 490 | 2087.5 | 12.490 | 14.303 | 13.667 | 12.602 | | 18.20 | 112.83 | 7.336 | -7.135 | 7.691 | -11.1143 |
| 500 | 2089.0 | 12.422 | 14.269 | 13.608 | 12.593 | 8.945 | 18.07 | 114.05 | 6.717 | -7.173 | 6.987 | -11.1557 |
| 510 | 2090.4 | 12.354 | 14.235 | 13.548 | 12.585 | 8.943 | 17.94 | 115.25 | 6.156 - 8 | -7.211 | 6.355 -12 | -11.1969 |
| 520 | 2091.6 | 12.287 | 14.201 | 13.489 | 12.576 | 8.941 | 17.82 | 116.44 | 5.647 | -7.248 | 5.787 | -11.2376 |
| 530 | 2092.7 | 12.220 | 14.168 | 13.431 | 12.568 | 8.938 | 17.70 | 117.62 | 5.184 | -7.285 | 5.275 | -11.2778 |
| 540 | 2093.6 | 12.153 | 14.134 | 13.372 | 12.559 | 8.936 | 17.59 | 118.78 | 4.764 | -7.322 | 4.814 | -11.3175 |
| 550 | 2094.4 | 12.087 | 14.101 | 13.314 | 12.551 | 8.934 | 17.48 | 119.92 | 4.381 | -7.358 | 4.398 | -11.3568 |
| 560 | 2095.1 | 12.020 | 14.068 | 13.256 | 12.543 | 8.931 | 17.37 | 121.05 | 4.032 | -7.394 | 4.021 | -11.3957 |
| 570 | 2095.7 | 11.954 | 14.035 | 13.198 | 12.534 | 8.929 | 17.27 | 122.18 | 3.714 | -7.430 | 3.680 | -11.4341 |
| 580 | 2096.2 | 11.888 | 14.002 | 13.140 | 12.526 | 8.927 | 17.17 | 123.29 | 3.423 | -7.466 | 3.371 | -11.4722 |
| 590 | 2096.7 | 11.823 | 13.969 | 13.083 | 12.518 | 8.925 | 17.07 | 124.39 | 3.158 | -7.501 | 3.091 | -11.5099 |
| 600 | 2097.1 | 11.757 | 13.936 | 13.025 | 12.510 | 8.923 | 16.97 | 125.48 | 2.915 | -7.535 | 2.837 | -11.5472 |
| 610 | 2097.5 | 11.692 | 13.903 | 12.968 | 12.501 | 8.921 | 16.88 | 126.57 | 2.692 - 8 | -7.570 | 2.605 -12 | -11.5841 |
| 620 | 2097.9 | 11.627 | 13.871 | 12.911 | 12.493 | 8.919 | 16.78 | 127.65 | 2.489 | -7.604 | 2.395 | -11.6207 |
| 630 | 2098.1 | 11.562 | 13.838 | 12.855 | 12.485 | 8.916 | 16.69 | 128.73 | 2.302 | -7.638 | 2.203 | -11.6571 |
| 640 | 2098.3 | 11.497 | 13.806 | 12.798 | 12.477 | 8.914 | 16.60 | 129.80 | 2.131 | -7.672 | 2.028 | -11.6931 |
| 650 | 2098.5 | 11.433 | 13.774 | 12.742 | 12.469 | 8.912 | 16.52 | 130.87 | 1.973 | -7.705 | 1.868 | -11.7288 |
| 660 | 2098.7 | 11.369 | 13.742 | 12.685 | 12.461 | 8.910 | 16.43 | 131.94 | 1.829 | -7.738 | 1.722 | -11.7642 |
| 670 | 2098.9 | 11.305 | 13.709 | 12.629 | 12.453 | 8.908 | 16.35 | 133.01 | 1.696 | -7.771 | 1.588 | -11.7990 |
| 680 | 2099.0 | 11.241 | 13.678 | 12.573 | 12.445 | 8.906 | 16.26 | 134.08 | 1.573 | -7.803 | 1.466 | -11.8338 |
| 690 | 2099.1 | 11.177 | 13.646 | 12.518 | 12.437 | 8.904 | 16.18 | 135.16 | 1.461 | -7.835 | 1.354 | -11.8683 |
| 700 | 2099.2 | 11.114 | 13.614 | 12.462 | 12.429 | 8.902 | 16.10 | 136.24 | 1.357 | -7.867 | 1.252 | -11.9025 |
| 710 | 2099.3 | 11.050 | 13.582 | 12.407 | 12.421 | 8.900 | 16.02 | 137.32 | 1.261 - 8 | -7.899 | 1.157 -12 | -11.9365 |
| 720 | 2099.4 | 10.987 | 13.551 | 12.351 | 12.413 | 8.898 | 15.94 | 138.42 | 1.173 | -7.931 | 1.071 | -11.9702 |
| 730 | 2099.5 | 10.924 | 13.519 | 12.296 | 12.405 | 8.896 | 15.86 | 139.52 | 1.092 | -7.962 | 9.915 -13 | -12.0037 |
| 740 | 2099.6 | 10.862 | 13.488 | 12.241 | 12.397 | 8.894 | 15.78 | 140.64 | 1.016 | -7.993 | 9.185 | -12.0369 |
| 750 | 2099.6 | 10.799 | 13.457 | 12.187 | 12.389 | 8.892 | 15.69 | 141.76 | 9.469 - 9 | -8.024 | 8.513 | -12.0699 |
| 760 | 2099.7 | 10.737 | 13.425 | 12.132 | 12.382 | 8.890 | 15.61 | 142.90 | 8.826 | -8.054 | 7.894 | -12.1027 |
| 770 | 2099.7 | 10.675 | 13.394 | 12.078 | 12.374 | 8.888 | 15.53 | 144.06 | 8.232 | -8.084 | 7.324 | -12.1352 |
| 780 | 2099.7 | 10.613 | 13.363 | 12.023 | 12.366 | 8.886 | 15.45 | 145.23 | 7.682 | -8.115 | 6.799 | -12.1676 |
| 790 | 2099.8 | 10.551 | 13.332 | 11.969 | 12.358 | 8.884 | 15.37 | 146.42 | 7.173 | -8.144 | 6.314 | -12.1997 |
| 800 | 2099.8 | 10.489 | 13.302 | 11.915 | 12.351 | 8.882 | 15.28 | 147.64 | 6.701 | -8.174 | 5.867 | -12.2316 |
| 820 | 2099.8 | 10.366 | 13.240 | 11.808 | 12.335 | 8.878 | 15.11 | 150.14 | 5.859 - 9 | -8.232 | 5.072 -13 | -12.2948 |
| 840 | 2099.9 | 10.244 | 13.179 | 11.701 | 12.320 | 8.875 | 14.94 | 152.74 | 5.134 | -8.290 | 4.393 | -12.3572 |
| 860 | 2099.9 | 10.002 | 13.058 | 11.489 | 12.290 | 8.867 | 14.57 | 158.33 | 3.969 | -8.401 | 3.313 | -12.4797 |
| 900 | 2099.9 | 9.882 | 12.999 | 11.383 | 12.275 | 8.863 | 14.38 | 161.35 | 3.502 | -8.456 | 2.885 | -12.5399 |
| 920 | 2100.0 | 9.762 | 12.938 | 11.279 | 12.260 | 8.959 | 14.18 | 164.54 | 3.098 | -8.509 | 2.536 | -12.5993 |
| 940 | 2100.0 | 9.643 | 12.879 | 11.175 | 12.245 | 8.856 | 13.97 | 167.92 | 2.747 | -8.561 | 2.198 | -12.6580 |
| 960 | 2100.0 | 9.525 | 12.820 | 11.071 | 12.230 | 8.852 | 13.75 | 171.51 | 2.441 | -8.612 | 1.923 | -12.7160 |
| 980 | 2100.0 | 9.408 | 12.761 | 10.969 | 12.215 | 8.848 | 13.53 | 175.33 | 2.175 | -8.662 | 1.685 | -12.7733 |
| 1000 | 2100.0 | 9.291 | 12.702 | 10.866 | 12.201 | 8.845 | 13.29 | 179.39 | 1.943 | -8.711 | 1.480 | -12.8299 |

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Part 6.3

120 km to 1000 km

Spring/Fall Models

# TEMPERATURE, PRESSURE, DENSITY, SCALE HEIGHT, MOLECULAR WEIGHT, AND NUMBER DENSITIES

Metric Units

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 600° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 387.1 | 16.625 | 16.737 | 17.378 | 13.482 | | 26.56 | 12.85 | 1.794 | -4.746 | 1.481 | -7.8296 |
| 130 | 415.0 | 16.398 | 16.609 | 17.176 | 13.438 | | 26.21 | 13.98 | 1.236 | -4.908 | 9.389 - 9 | -8.0274 |
| 135 | 439.3 | 16.190 | 16.492 | 16.991 | 13.400 | | 25.85 | 15.02 | 8.755 - 6 | -5.058 | 6.198 | -8.2078 |
| 140 | 460.3 | 15.995 | 16.384 | 16.817 | 13.366 | | 25.49 | 16.00 | 6.343 | -5.198 | 4.223 | -8.3743 |
| 145 | 478.6 | 15.811 | 16.284 | 16.654 | 13.334 | | 25.11 | 16.91 | 4.681 | -5.330 | 2.953 | -8.5297 |
| 150 | 494.6 | 15.636 | 16.189 | 16.499 | 13.305 | | 24.72 | 17.77 | 3.508 | -5.455 | 2.109 | -8.6759 |
| 155 | 508.4 | 15.468 | 16.099 | 16.351 | 13.278 | | 24.33 | 18.59 | 2.665 - 6 | -5.574 | 1.534 - 9 | -8.8142 |
| 160 | 520.4 | 15.306 | 16.013 | 16.208 | 13.253 | | 23.93 | 19.38 | 2.048 | -5.689 | 1.133 | -8.9460 |
| 165 | 530.8 | 15.149 | 15.931 | 16.070 | 13.229 | | 23.53 | 20.13 | 1.590 | -5.799 | 8.475 -10 | -9.0719 |
| 170 | 539.9 | 14.997 | 15.851 | 15.935 | 13.206 | | 23.13 | 20.87 | 1.246 | -5.905 | 6.417 | -9.1927 |
| 175 | 547.8 | 14.848 | 15.773 | 15.804 | 13.185 | | 22.72 | 21.58 | 9.841 - 7 | -6.007 | 4.910 | -9.3089 |
| 180 | 554.6 | 14.702 | 15.697 | 15.675 | 13.164 | | 22.32 | 22.27 | 7.835 | -6.106 | 3.793 | -9.4211 |
| 185 | 560.6 | 14.558 | 15.623 | 15.549 | 13.143 | | 21.93 | 22.96 | 6.281 | -6.202 | 2.955 | -9.5295 |
| 190 | 565.7 | 14.417 | 15.550 | 15.425 | 13.124 | | 21.54 | 23.62 | 5.067 | -6.295 | 2.320 | -9.6345 |
| 195 | 570.2 | 14.277 | 15.479 | 15.302 | 13.105 | | 21.16 | 24.27 | 4.112 | -6.386 | 1.835 | -9.7362 |
| 200 | 574.1 | 14.140 | 15.409 | 15.181 | 13.086 | | 20.79 | 24.91 | 3.356 | -6.474 | 1.461 | -9.8352 |
| 205 | 577.5 | 14.004 | 15.339 | 15.062 | 13.068 | | 20.43 | 25.54 | 2.753 - 7 | -6.560 | 1.171 -10 | -9.9314 |
| 210 | 580.5 | 13.869 | 15.271 | 14.943 | 13.050 | | 20.08 | 26.15 | 2.268 | -6.644 | 9.439 -11 | -10.0251 |
| 215 | 583.0 | 13.735 | 15.203 | 14.826 | 13.032 | | 19.75 | 26.75 | 1.878 | -6.726 | 7.651 | -10.1163 |
| 220 | 585.3 | 13.602 | 15.136 | 14.710 | 13.015 | | 19.44 | 27.33 | 1.561 | -6.807 | 6.234 | -10.2053 |
| 225 | 587.2 | 13.470 | 15.069 | 14.594 | 12.997 | | 19.13 | 27.89 | 1.302 | -6.885 | 5.104 | -10.2921 |
| 230 | 588.9 | 13.339 | 15.003 | 14.479 | 12.980 | | 18.85 | 28.44 | 1.090 | -6.962 | 4.198 | -10.3770 |
| 235 | 590.3 | 13.208 | 14.937 | 14.365 | 12.964 | | 18.58 | 28.97 | 9.161 - 8 | -7.038 | 3.467 | -10.4600 |
| 240 | 591.6 | 13.079 | 14.872 | 14.251 | 12.947 | | 18.32 | 29.48 | 7.720 | -7.112 | 2.876 | -10.5413 |
| 245 | 592.7 | 12.949 | 14.807 | 14.138 | 12.930 | | 18.08 | 29.98 | 6.525 | -7.185 | 2.394 | -10.6209 |
| 250 | 593.7 | 12.821 | 14.742 | 14.025 | 12.914 | | 17.85 | 30.46 | 5.530 | -7.257 | 2.000 | -10.6990 |
| 255 | 594.5 | 12.692 | 14.678 | 13.913 | 12.897 | | 17.63 | 30.92 | 4.699 - 8 | -7.328 | 1.676 -11 | -10.7756 |
| 260 | 595.2 | 12.565 | 14.613 | 13.801 | 12.881 | | 17.43 | 31.37 | 4.002 | -7.398 | 1.409 | -10.8509 |
| 265 | 595.8 | 12.437 | 14.549 | 13.689 | 12.865 | | 17.23 | 31.81 | 3.416 | -7.466 | 1.188 | -10.9250 |
| 270 | 596.4 | 12.310 | 14.486 | 13.578 | 12.849 | | 17.05 | 32.23 | 2.922 | -7.534 | 1.005 | -10.9979 |
| 275 | 596.9 | 12.184 | 14.422 | 13.467 | 12.833 | | 16.87 | 32.64 | 2.505 | -7.601 | 8.517 -12 | -11.0697 |
| 280 | 597.3 | 12.057 | 14.359 | 13.356 | 12.817 | | 16.70 | 33.05 | 2.151 | -7.667 | 7.235 | -11.1406 |
| 285 | 597.6 | 11.931 | 14.296 | 13.246 | 12.801 | | 16.54 | 33.45 | 1.851 | -7.733 | 6.160 | -11.2104 |
| 290 | 597.9 | 11.806 | 14.233 | 13.136 | 12.785 | | 16.37 | 33.85 | 1.595 | -7.797 | 5.255 | -11.2794 |
| 295 | 598.2 | 11.680 | 14.170 | 13.026 | 12.770 | | 16.22 | 34.25 | 1.377 | -7.861 | 4.491 | -11.3476 |
| 300 | 598.4 | 11.555 | 14.107 | 12.916 | 12.754 | | 16.06 | 34.65 | 1.191 | -7.924 | 3.845 | -11.4151 |
| 310 | 598.8 | 11.305 | 13.982 | 12.698 | 12.722 | | 15.74 | 35.47 | 8.957 - 9 | -8.048 | 2.832 -12 | -11.5479 |
| 320 | 599.1 | 11.057 | 13.858 | 12.480 | 12.691 | | 15.41 | 36.35 | 6.780 | -8.169 | 2.098 | -11.6782 |
| 330 | 599.3 | 10.809 | 13.734 | 12.263 | 12.660 | | 15.06 | 37.33 | 5.168 | -8.287 | 1.562 | -11.8063 |
| 340 | 599.5 | 10.562 | 13.611 | 12.047 | 12.629 | | 14.68 | 38.43 | 3.968 | -8.401 | 1.169 | -11.9323 |
| 350 | 599.6 | 10.316 | 13.488 | 11.832 | 12.598 | | 14.25 | 39.70 | 3.072 | -8.513 | 8.781 -13 | -12.0564 |
| 360 | 599.7 | 10.071 | 13.365 | 11.617 | 12.568 | | 13.78 | 41.21 | 2.399 | -8.620 | 6.627 | -12.1787 |
| 370 | 599.8 | 9.826 | 13.243 | 11.403 | 12.537 | | 13.24 | 43.00 | 1.891 | -8.723 | 5.022 | -12.2991 |
| 380 | 599.8 | 9.583 | 13.121 | 11.190 | 12.507 | | 12.65 | 45.15 | 1.507 | -8.822 | 3.822 | -12.4177 |
| 390 | 599.9 | 9.340 | 12.999 | 10.977 | 12.476 | | 12.00 | 47.75 | 1.215 | -8.915 | 2.923 | -12.5342 |
| 400 | 599.9 | 9.097 | 12.878 | 10.765 | 12.446 | | 11.30 | 50.86 | 9.915 -10 | -9.004 | 2.246 | -12.6486 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 599.9 | 8.856 | 12.757 | 10.553 | 12.416 | | 10.55 | 54.61 | 8.200 -10 | -9.086 | 1.735 -13 | -12.7607 |
| 420 | 599.9 | 8.615 | 12.637 | 10.343 | 12.386 | | 9.79 | 50.08 | 6.876 | -9.163 | 1.349 | -12.8701 |
| 430 | 600.0 | 8.375 | 12.517 | 10.132 | 12.355 | | 9.01 | 64.38 | 5.846 | -9.233 | 1.055 | -12.9766 |
| 440 | 600.0 | 8.136 | 12.397 | 9.923 | 12.326 | | 8.24 | 70.59 | 5.039 | -9.298 | 8.322 -14 | -13.0798 |
| 450 | 600.0 | 7.897 | 12.278 | 9.714 | 12.296 | | 7.50 | 77.80 | 4.403 | -9.356 | 6.616 | -13.1794 |
| 460 | 600.0 | 7.659 | 12.159 | 9.506 | 12.266 | | 6.80 | 86.06 | 3.876 | -9.409 | 5.308 | -13.2753 |
| 470 | 600.0 | 7.422 | 12.040 | 9.298 | 12.236 | | 6.15 | 95.36 | 3.488 | -9.457 | 4.302 | -13.3663 |
| 480 | 600.0 | 7.186 | 11.922 | 9.091 | 12.207 | | 5.57 | 105.68 | 3.158 | -9.501 | 3.524 | -13.4529 |
| 490 | 600.0 | 6.950 | 11.804 | 8.885 | 12.177 | | 5.05 | 116.92 | 2.886 | -9.540 | 2.920 | -13.5346 |
| 500 | 600.0 | 6.715 | 11.687 | 8.679 | 12.148 | 12.121 | 4.59 | 128.92 | 2.660 | -9.575 | 2.448 | -13.6112 |
| 510 | 600.0 | 6.480 | 11.569 | 8.473 | 12.118 | 12.113 | 4.19 | 141.52 | 2.470 -10 | -9.607 | 2.077 -14 | -13.6826 |
| 520 | 600.0 | 6.246 | 11.452 | 8.269 | 12.089 | 12.106 | 3.85 | 154.49 | 2.309 | -9.637 | 1.783 | -13.7487 |
| 530 | 600.0 | 6.013 | 11.336 | 8.065 | 12.060 | 12.098 | 3.56 | 167.61 | 2.170 | -9.664 | 1.549 | -13.8099 |
| 540 | 600.0 | 5.781 | 11.220 | 7.861 | 12.031 | 12.091 | 3.31 | 180.67 | 2.049 | -9.689 | 1.361 | -13.8661 |
| 550 | 600.0 | 5.549 | 11.104 | 7.658 | 12.002 | 12.084 | 3.10 | 193.48 | 1.942 | -9.712 | 1.208 | -13.9179 |
| 560 | 600.0 | 5.318 | 10.988 | 7.456 | 11.973 | 12.077 | 2.92 | 205.91 | 1.847 | -9.734 | 1.083 | -13.9654 |
| 570 | 600.0 | 5.088 | 10.873 | 7.254 | 11.944 | 12.069 | 2.77 | 217.85 | 1.762 | -9.754 | 9.793 -15 | -14.0091 |
| 580 | 600.0 | 4.858 | 10.758 | 7.053 | 11.915 | 12.062 | 2.64 | 229.24 | 1.685 | -9.773 | 8.925 | -14.0496 |
| 590 | 600.0 | 4.629 | 10.644 | 6.853 | 11.887 | 12.055 | 2.53 | 240.06 | 1.615 | -9.792 | 8.190 | -14.0867 |
| 600 | 600.0 | 4.400 | 10.529 | 6.653 | 11.858 | 12.048 | 2.43 | 250.32 | 1.550 | -9.810 | 7.562 | -14.1213 |
| 610 | 600.0 | 4.173 | 10.416 | 6.453 | 11.830 | 12.040 | 2.35 | 260.05 | 1.490 -10 | -9.827 | 7.020 -15 | -14.1537 |
| 620 | 600.0 | 3.945 | 10.302 | 6.254 | 11.801 | 12.033 | 2.28 | 269.29 | 1.435 | -9.843 | 6.546 | -14.1840 |
| 630 | 600.0 | 3.719 | 10.189 | 6.056 | 11.773 | 12.026 | 2.21 | 278.11 | 1.384 | -9.859 | 6.129 | -14.2126 |
| 640 | 600.0 | 3.493 | 10.076 | 5.858 | 11.745 | 12.019 | 2.15 | 286.54 | 1.336 | -9.874 | 5.758 | -14.2397 |
| 650 | 600.0 | 3.268 | 9.963 | 5.661 | 11.717 | 12.012 | 2.10 | 294.66 | 1.290 | -9.889 | 5.425 | -14.2656 |
| 660 | 600.0 | 3.043 | 9.851 | 5.465 | 11.689 | 12.005 | 2.05 | 302.50 | 1.248 | -9.904 | 5.125 | -14.2903 |
| 670 | 600.0 | 2.820 | 9.739 | 5.269 | 11.661 | 11.998 | 2.00 | 310.12 | 1.208 | -9.918 | 4.853 | -14.3140 |
| 680 | 600.0 | 2.596 | 9.627 | 5.073 | 11.633 | 11.991 | 1.96 | 317.56 | 1.170 | -9.932 | 4.603 | -14.3369 |
| 690 | 600.0 | 2.374 | 9.516 | 4.878 | 11.605 | 11.984 | 1.92 | 324.85 | 1.134 | -9.945 | 4.375 | -14.3591 |
| 700 | 600.0 | 2.152 | 9.405 | 4.684 | 11.577 | 11.977 | 1.89 | 332.02 | 1.100 | -9.959 | 4.164 | -14.3805 |
| 710 | 600.0 | 1.930 | 9.294 | 4.490 | 11.549 | 11.970 | 1.85 | 339.11 | 1.068 -10 | -9.972 | 3.968 -15 | -14.4014 |
| 720 | 600.0 | 1.710 | 9.184 | 4.297 | 11.522 | 11.963 | 1.82 | 346.12 | 1.037 | -9.984 | 3.786 | -14.4218 |
| 730 | 600.0 | 1.489 | 9.074 | 4.104 | 11.494 | 11.956 | 1.79 | 353.09 | 1.008 | -9.997 | 3.617 | -14.4416 |
| 740 | 600.0 | 1.270 | 8.964 | 3.912 | 11.467 | 11.949 | 1.76 | 360.01 | 9.799 -11 | -10.009 | 3.459 | -14.4610 |
| 750 | 600.0 | 1.051 | 8.855 | 3.721 | 11.439 | 11.942 | 1.73 | 366.90 | 9.533 | -10.021 | 3.312 | -14.4800 |
| 760 | 600.0 | 0.833 | 8.746 | 3.529 | 11.412 | 11.935 | 1.71 | 373.78 | 9.279 | -10.032 | 3.173 | -14.4985 |
| 770 | 600.0 | 0.615 | 8.637 | 3.339 | 11.385 | 11.928 | 1.68 | 380.63 | 9.036 | -10.044 | 3.043 | -14.5167 |
| 780 | 600.0 | 0.398 | 8.528 | 3.149 | 11.358 | 11.922 | 1.65 | 387.48 | 8.804 | -10.055 | 2.920 | -14.5346 |
| 790 | 600.0 | 0.182 | 8.420 | 2.959 | 11.331 | 11.915 | 1.63 | 394.31 | 8.582 | -10.066 | 2.805 | -14.5523 |
| 800 | 600.0 | -0.034 | 8.312 | 2.771 | 11.304 | 11.908 | 1.61 | 401.14 | 8.369 | -10.077 | 2.697 | -14.5697 |
| 820 | 600.0 | -0.464 | 8.097 | 2.394 | 11.250 | 11.894 | 1.56 | 414.75 | 7.968 -11 | -10.099 | 2.497 -15 | -14.6028 |
| 840 | 600.0 | -0.891 | 7.884 | 2.020 | 11.196 | 11.881 | 1.52 | 428.30 | 7.599 | -10.119 | 2.319 | -14.6347 |
| 860 | 600.0 | -1.319 | 7.670 | 1.648 | 11.143 | 11.867 | 1.48 | 441.80 | 7.258 | -10.139 | 2.159 | -14.6655 |
| 880 | 600.0 | -1.739 | 7.460 | 1.278 | 11.090 | 11.854 | 1.45 | 455.13 | 6.941 | -10.159 | 2.015 | -14.6955 |
| 900 | 600.0 | -2.160 | 7.250 | 0.910 | 11.038 | 11.841 | 1.42 | 468.35 | 6.647 | -10.177 | 1.886 | -14.7245 |
| 920 | 600.0 | -2.578 | 7.040 | 0.544 | 10.985 | 11.828 | 1.38 | 481.40 | 6.373 | -10.196 | 1.769 | -14.7523 |
| 940 | 600.0 | -2.994 | 6.833 | 0.180 | 10.933 | 11.815 | 1.36 | 494.26 | 6.117 | -10.213 | 1.663 | -14.7792 |
| 960 | 600.0 | -3.407 | 6.626 | -0.182 | 10.882 | 11.802 | 1.33 | 506.88 | 5.877 | -10.231 | 1.566 | -14.8051 |
| 980 | 600.0 | -3.818 | 6.420 | -0.562 | 10.830 | 11.789 | 1.31 | 519.26 | 5.652 | -10.248 | 1.479 | -14.8301 |
| 1000 | 600.0 | -4.227 | 6.214 | -0.901 | 10.779 | 11.776 | 1.28 | 531.36 | 5.441 | -10.264 | 1.399 | -14.8543 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 401.3 | 16.613 | 16.723 | 17.366 | 13.472 | | 26.57 | 13.32 | 1.808 | -4.743 | 1.439 | -7.8418 |
| 130 | 441.4 | 16.385 | 16.588 | 17.161 | 13.423 | | 26.24 | 14.85 | 1.268 | -4.897 | 9.062 - 9 | -8.0428 |
| 135 | 476.2 | 16.181 | 16.470 | 16.978 | 13.382 | | 25.91 | 16.25 | 9.192 - 6 | -5.037 | 6.815 | -8.2208 |
| 140 | 506.2 | 15.994 | 16.363 | 16.812 | 13.345 | | 25.57 | 17.53 | 6.837 | -5.165 | 4.154 | -8.3815 |
| 145 | 532.3 | 15.822 | 16.266 | 16.658 | 13.313 | | 25.24 | 18.70 | 5.188 | -5.285 | 2.959 | -8.5288 |
| 150 | 554.8 | 15.660 | 16.176 | 16.514 | 13.283 | | 24.90 | 19.79 | 4.001 | -5.398 | 2.160 | -8.6655 |
| 155 | 574.3 | 15.506 | 16.092 | 16.378 | 13.257 | | 24.56 | 20.80 | 3.128 - 6 | -5.505 | 1.609 - 9 | -8.7935 |
| 160 | 591.2 | 15.360 | 16.012 | 16.248 | 13.232 | | 24.22 | 21.75 | 2.473 | -5.607 | 1.218 | -8.9142 |
| 165 | 605.8 | 15.219 | 15.937 | 16.123 | 13.209 | | 23.88 | 22.64 | 1.974 | -5.705 | 9.337 -10 | -9.0289 |
| 170 | 618.4 | 15.083 | 15.864 | 16.003 | 13.188 | | 23.53 | 23.49 | 1.589 | -5.799 | 7.273 | -9.1383 |
| 175 | 629.4 | 14.951 | 15.794 | 15.887 | 13.168 | | 23.19 | 24.30 | 1.289 | -5.890 | 5.712 | -9.2432 |
| 180 | 638.9 | 14.822 | 15.727 | 15.773 | 13.148 | | 22.84 | 25.08 | 1.053 | -5.978 | 4.528 | -9.3441 |
| 185 | 647.1 | 14.696 | 15.661 | 15.662 | 13.130 | | 22.50 | 25.82 | 8.651 - 7 | -6.063 | 3.618 | -9.4410 |
| 190 | 654.2 | 14.573 | 15.597 | 15.553 | 13.112 | | 22.16 | 26.55 | 7.147 | -6.146 | 2.912 | -9.5358 |
| 195 | 660.3 | 14.451 | 15.534 | 15.446 | 13.095 | | 21.83 | 27.25 | 5.935 | -6.227 | 2.359 | -9.6272 |
| 200 | 665.7 | 14.331 | 15.472 | 15.341 | 13.078 | | 21.50 | 27.93 | 4.951 | -6.305 | 1.923 | -9.7160 |
| 205 | 670.3 | 14.213 | 15.412 | 15.237 | 13.062 | | 21.18 | 28.59 | 4.148 - 7 | -6.382 | 1.576 -10 | -9.8024 |
| 210 | 674.3 | 14.098 | 15.352 | 15.135 | 13.046 | | 20.86 | 29.24 | 3.490 | -6.457 | 1.299 | -9.8863 |
| 215 | 677.7 | 13.980 | 15.293 | 15.033 | 13.030 | | 20.56 | 29.87 | 2.947 | -6.531 | 1.075 | -9.9686 |
| 220 | 680.7 | 13.856 | 15.235 | 14.932 | 13.015 | | 20.26 | 30.49 | 2.497 | -6.603 | 8.938 -11 | -10.0488 |
| 225 | 683.3 | 13.752 | 15.177 | 14.832 | 13.000 | | 19.97 | 31.09 | 2.123 | -6.673 | 7.463 | -10.1271 |
| 230 | 685.5 | 13.639 | 15.120 | 14.733 | 12.985 | | 19.70 | 31.68 | 1.810 | -6.742 | 6.255 | -10.2038 |
| 235 | 687.5 | 13.527 | 15.063 | 14.635 | 12.971 | | 19.43 | 32.25 | 1.548 | -6.810 | 5.263 | -10.2788 |
| 240 | 689.2 | 13.415 | 15.007 | 14.537 | 12.956 | | 19.18 | 32.81 | 1.327 | -6.877 | 4.443 | -10.3523 |
| 245 | 690.6 | 13.304 | 14.951 | 14.440 | 12.942 | | 18.94 | 33.35 | 1.141 | -6.943 | 3.763 | -10.4244 |
| 250 | 691.9 | 13.193 | 14.895 | 14.343 | 12.927 | | 18.70 | 33.88 | 9.835 - 8 | -7.007 | 3.198 | -10.4952 |
| 255 | 693.0 | 13.083 | 14.839 | 14.246 | 12.913 | | 18.48 | 34.39 | 8.495 - 8 | -7.071 | 2.725 -11 | -10.5646 |
| 260 | 693.9 | 12.973 | 14.784 | 14.150 | 12.899 | | 18.27 | 34.89 | 7.353 | -7.134 | 2.329 | -10.6329 |
| 265 | 694.7 | 12.864 | 14.729 | 14.054 | 12.885 | | 18.07 | 35.37 | 6.378 | -7.195 | 1.995 | -10.7000 |
| 270 | 695.4 | 12.755 | 14.675 | 13.959 | 12.872 | | 17.88 | 35.84 | 5.542 | -7.256 | 1.714 | -10.7660 |
| 275 | 696.1 | 12.646 | 14.620 | 13.863 | 12.858 | | 17.70 | 36.29 | 4.825 | -7.317 | 1.476 | -10.8310 |
| 280 | 696.6 | 12.538 | 14.566 | 13.768 | 12.844 | | 17.53 | 36.73 | 4.207 | -7.376 | 1.273 | -10.8951 |
| 285 | 697.0 | 12.430 | 14.512 | 13.674 | 12.830 | | 17.36 | 37.15 | 3.675 | -7.435 | 1.101 | -10.9582 |
| 290 | 697.4 | 12.322 | 14.458 | 13.579 | 12.817 | | 17.21 | 37.57 | 3.214 | -7.493 | 9.539 -12 | -11.0205 |
| 295 | 697.8 | 12.214 | 14.404 | 13.485 | 12.803 | | 17.05 | 37.97 | 2.816 | -7.550 | 8.280 | -11.0820 |
| 300 | 698.1 | 12.107 | 14.350 | 13.391 | 12.790 | | 16.92 | 38.37 | 2.470 | -7.607 | 7.199 | -11.1427 |
| 310 | 698.6 | 11.893 | 14.243 | 13.204 | 12.763 | | 16.65 | 39.13 | 1.908 - 8 | -7.719 | 5.469 -12 | -11.2621 |
| 320 | 698.9 | 11.680 | 14.136 | 13.017 | 12.736 | | 16.39 | 39.88 | 1.482 | -7.829 | 4.179 | -11.3789 |
| 330 | 699.2 | 11.467 | 14.030 | 12.831 | 12.709 | | 16.15 | 40.62 | 1.156 | -7.937 | 3.210 | -11.4935 |
| 340 | 699.4 | 11.256 | 13.924 | 12.646 | 12.683 | | 15.91 | 41.37 | 9.055 - 9 | -8.043 | 2.477 | -11.6060 |
| 350 | 699.5 | 11.045 | 13.818 | 12.461 | 12.656 | | 15.67 | 42.14 | 7.127 | -8.147 | 1.920 | -11.7168 |
| 360 | 699.7 | 10.834 | 13.713 | 12.277 | 12.630 | | 15.42 | 42.96 | 5.634 | -8.249 | 1.493 | -11.8259 |
| 370 | 699.7 | 10.625 | 13.608 | 12.094 | 12.604 | | 15.15 | 43.84 | 4.474 | -8.349 | 1.165 | -11.9335 |
| 380 | 699.8 | 10.416 | 13.504 | 11.911 | 12.578 | | 14.87 | 44.80 | 3.570 | -8.447 | 9.127 -13 | -12.0397 |
| 390 | 699.9 | 10.208 | 13.400 | 11.728 | 12.552 | | 14.57 | 45.87 | 2.863 | -8.543 | 7.170 | -12.1445 |
| 400 | 699.9 | 10.000 | 13.296 | 11.547 | 12.526 | | 14.24 | 47.08 | 2.309 | -8.637 | 5.650 | -12.2480 |

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 699.9 | 9.793 | 13.192 | 11.365 | 12.500 | | 13.88 | 48.46 | 1.873 - 9 | -8.728 | 4.465 -13 | -12.3501 |
| 420 | 699.9 | 9.587 | 13.089 | 11.185 | 12.474 | | 13.48 | 50.03 | 1.528 | -8.816 | 3.540 | -12.4510 |
| 430 | 700.0 | 9.381 | 12.986 | 11.005 | 12.448 | | 13.05 | 51.84 | 1.256 | -8.901 | 2.816 | -12.5504 |
| 440 | 700.0 | 9.176 | 12.884 | 10.825 | 12.422 | | 12.58 | 53.92 | 1.039 | -8.983 | 2.247 | -12.6484 |
| 450 | 700.0 | 8.971 | 12.781 | 10.646 | 12.397 | | 12.08 | 56.32 | 8.668 -10 | -9.062 | 1.799 | -12.7449 |
| 460 | 700.0 | 8.767 | 12.680 | 10.467 | 12.371 | | 11.55 | 59.07 | 7.288 | -9.137 | 1.447 | -12.8396 |
| 470 | 700.0 | 8.564 | 12.578 | 10.289 | 12.346 | | 11.00 | 62.23 | 6.179 | -9.209 | 1.168 | -12.9326 |
| 480 | 700.0 | 8.361 | 12.476 | 10.112 | 12.321 | | 10.43 | 65.82 | 5.285 | -9.277 | 9.471 -14 | -13.0236 |
| 490 | 700.0 | 8.159 | 12.375 | 9.935 | 12.295 | | 9.85 | 69.89 | 4.560 | -9.341 | 7.719 | -13.1125 |
| 500 | 700.0 | 7.958 | 12.275 | 9.759 | 12.270 | 11.553 | 9.27 | 74.47 | 3.970 | -9.401 | 6.324 | -13.1990 |
| 510 | 700.0 | 7.757 | 12.174 | 9.583 | 12.245 | 11.547 | 8.70 | 79.58 | 3.486 - | -9.458 | 5.212 -14 | -13.2830 |
| 520 | 700.0 | 7.556 | 12.074 | 9.407 | 12.220 | 11.541 | 8.15 | 85.23 | 3.087 | -9.510 | 4.323 | -13.3643 |
| 530 | 700.0 | 7.356 | 11.974 | 9.232 | 12.195 | 11.534 | 7.62 | 91.42 | 2.756 | -9.560 | 3.609 | -13.4426 |
| 540 | 700.0 | 7.157 | 11.874 | 9.058 | 12.170 | 11.528 | 7.12 | 98.11 | 2.480 | -9.606 | 3.034 | -13.5179 |
| 550 | 700.0 | 6.959 | 11.775 | 8.894 | 12.145 | 11.522 | 6.66 | 105.27 | 2.248 | -9.648 | 2.570 | -13.5900 |
| 560 | 700.0 | 6.761 | 11.676 | 8.711 | 12.120 | 11.516 | 6.23 | 112.83 | 2.051 | -9.688 | 2.194 | -13.6587 |
| 570 | 700.0 | 6.563 | 11.577 | 8.538 | 12.096 | 11.509 | 5.84 | 120.72 | 1.882 | -9.725 | 1.888 | -13.7240 |
| 580 | 700.0 | 6.366 | 11.479 | 8.365 | 12.071 | 11.503 | 5.49 | 128.84 | 1.737 | -9.760 | 1.637 | -13.7859 |
| 590 | 700.0 | 6.170 | 11.381 | 8.193 | 12.046 | 11.497 | 5.17 | 137.10 | 1.611 | -9.793 | 1.431 | -13.8443 |
| 600 | 700.0 | 5.974 | 11.283 | 8.022 | 12.022 | 11.491 | 4.89 | 145.40 | 1.501 | -9.824 | 1.261 | -13.8993 |
| 610 | 700.0 | 5.779 | 11.185 | 7.851 | 11.998 | 11.485 | 4.64 | 153.65 | 1.404 -10 | -9.853 | 1.119 -14 | -13.9511 |
| 620 | 700.0 | 5.584 | 11.088 | 7.681 | 11.973 | 11.479 | 4.42 | 161.76 | 1.318 | -9.880 | 1.001 | -13.9997 |
| 630 | 700.0 | 5.390 | 10.991 | 7.511 | 11.949 | 11.472 | 4.23 | 169.66 | 1.241 | -9.906 | 9.007 -15 | -14.0454 |
| 640 | 700.0 | 5.196 | 10.894 | 7.341 | 11.925 | 11.466 | 4.06 | 177.29 | 1.171 | -9.931 | 8.160 | -14.0883 |
| 650 | 700.0 | 5.003 | 10.798 | 7.172 | 11.901 | 11.460 | 3.91 | 184.62 | 1.108 | -9.955 | 7.436 | -14.1287 |
| 660 | 700.0 | 4.811 | 10.701 | 7.004 | 11.876 | 11.454 | 3.77 | 191.62 | 1.051 | -9.979 | 6.813 | -14.1667 |
| 670 | 700.0 | 4.619 | 10.605 | 6.836 | 11.852 | 11.448 | 3.66 | 198.29 | 9.982 -11 | -10.001 | 6.273 | -14.2026 |
| 680 | 700.0 | 4.428 | 10.510 | 6.668 | 11.829 | 11.442 | 3.55 | 204.62 | 9.499 | -10.022 | 5.801 | -14.2365 |
| 690 | 700.0 | 4.237 | 10.414 | 6.501 | 11.805 | 11.436 | 3.46 | 210.63 | 9.052 | -10.043 | 5.385 | -14.2688 |
| 700 | 700.0 | 4.047 | 10.319 | 6.335 | 11.781 | 11.430 | 3.38 | 216.35 | 8.638 | -10.064 | 5.017 | -14.2995 |
| 710 | 700.0 | 3.857 | 10.224 | 6.168 | 11.757 | 11.424 | 3.31 | 221.80 | 8.252 -11 | -10.083 | 4.689 -15 | -14.3289 |
| 720 | 700.0 | 3.668 | 10.130 | 6.003 | 11.733 | 11.418 | 3.24 | 227.00 | 7.893 | -10.103 | 4.394 | -14.3571 |
| 730 | 700.0 | 3.479 | 10.035 | 5.838 | 11.710 | 11.412 | 3.18 | 231.99 | 7.556 | -10.122 | 4.128 | -14.3843 |
| 740 | 700.0 | 3.291 | 9.941 | 5.673 | 11.686 | 11.406 | 3.12 | 236.79 | 7.241 | -10.140 | 3.886 | -14.4105 |
| 750 | 700.0 | 3.103 | 9.847 | 5.509 | 11.663 | 11.400 | 3.07 | 241.44 | 6.944 | -10.158 | 3.666 | -14.4358 |
| 760 | 700.0 | 2.916 | 9.754 | 5.345 | 11.639 | 11.395 | 3.02 | 245.96 | 6.665 | -10.176 | 3.463 | -14.4605 |
| 770 | 700.0 | 2.730 | 9.661 | 5.182 | 11.616 | 11.389 | 2.98 | 250.38 | 6.402 | -10.194 | 3.277 | -14.4845 |
| 780 | 700.0 | 2.544 | 9.568 | 5.019 | 11.593 | 11.383 | 2.94 | 254.72 | 6.153 | -10.211 | 3.105 | -14.5080 |
| 790 | 700.0 | 2.358 | 9.475 | 4.856 | 11.570 | 11.377 | 2.90 | 259.00 | 5.918 | -10.228 | 2.945 | -14.5309 |
| 800 | 700.0 | 2.173 | 9.382 | 4.694 | 11.547 | 11.371 | 2.86 | 263.24 | 5.696 | -10.244 | 2.797 | -14.5534 |
| 820 | 700.0 | 1.805 | 9.199 | 4.372 | 11.500 | 11.360 | 2.78 | 271.68 | 5.285 -11 | -10.277 | 2.529 -15 | -14.5971 |
| 840 | 700.0 | 1.438 | 9.015 | 4.051 | 11.455 | 11.348 | 2.72 | 280.15 | 4.916 | -10.308 | 2.293 | -14.6395 |
| 860 | 700.0 | 0.711 | 8.652 | 3.415 | 11.364 | 11.325 | 2.59 | 297.49 | 4.280 | -10.369 | 1.901 | -14.7210 |
| 900 | 700.0 | 0.351 | 8.471 | 3.099 | 11.319 | 11.314 | 2.52 | 306.50 | 4.005 | -10.397 | 1.737 | -14.7603 |
| 920 | 700.0 | -0.007 | 8.292 | 2.786 | 11.274 | 11.302 | 2.46 | 315.77 | 3.756 | -10.425 | 1.589 | -14.7988 |
| 940 | 700.0 | -0.364 | 8.114 | 2.474 | 11.229 | 11.291 | 2.40 | 325.34 | 3.529 | -10.452 | 1.457 | -14.8364 |
| 960 | 700.0 | -0.718 | 7.937 | 2.163 | 11.185 | 11.280 | 2.35 | 335.23 | 3.321 | -10.479 | 1.339 | -14.8734 |
| 980 | 700.0 | -1.071 | 7.761 | 1.855 | 11.141 | 11.269 | 2.29 | 345.45 | 3.132 | -10.504 | 1.231 | -14.9096 |
| 1000 | 700.0 | -1.421 | 7.585 | 1.548 | 11.097 | 11.258 | 2.23 | 356.01 | 2.958 | -10.529 | 1.135 | -14.9450 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 800° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 415.3 | 16.602 | 16.710 | 17.355 | 13.464 | | 26.57 | 13.78 | 1.821 | -4.740 | 1.401 | -7.8535 |
| 130 | 467.4 | 16.372 | 16.570 | 17.147 | 13.409 | | 26.26 | 15.71 | 1.297 | -4.887 | 8.785 - 9 | -8.0573 |
| 135 | 512.4 | 16.172 | 16.450 | 16.967 | 13.365 | | 25.95 | 17.46 | 9.594 - 6 | -5.018 | 5.845 | -8.2332 |
| 140 | 551.3 | 15.993 | 16.344 | 16.806 | 13.326 | | 25.65 | 19.04 | 7.295 | -5.137 | 4.082 | -8.3891 |
| 145 | 585.0 | 15.829 | 16.249 | 16.659 | 13.293 | | 25.35 | 20.47 | 5.664 | -5.247 | 2.952 | -8.5299 |
| 150 | 614.1 | 15.677 | 16.163 | 16.524 | 13.264 | | 25.05 | 21.78 | 4.470 | -5.350 | 2.193 | -8.6590 |
| 155 | 639.3 | 15.535 | 16.083 | 16.397 | 13.237 | | 24.75 | 22.98 | 3.575 - 6 | -5.447 | 1.685 - 9 | -8.7786 |
| 160 | 661.1 | 15.401 | 16.009 | 16.278 | 13.213 | | 24.45 | 24.09 | 2.891 | -5.539 | 1.286 | -8.8907 |
| 165 | 679.9 | 15.272 | 15.938 | 16.164 | 13.191 | | 24.15 | 25.12 | 2.366 | -5.627 | 1.008 | -8.9965 |
| 170 | 696.1 | 15.149 | 15.871 | 16.054 | 13.171 | | 23.85 | 26.09 | 1.941 | -5.712 | 7.998 -10 | -9.0970 |
| 175 | 710.2 | 15.030 | 15.808 | 15.949 | 13.152 | | 23.55 | 27.00 | 1.608 | -5.794 | 6.412 | -9.1930 |
| 180 | 722.4 | 14.914 | 15.746 | 15.847 | 13.133 | | 23.25 | 27.86 | 1.340 | -5.873 | 5.187 | -9.2851 |
| 185 | 732.9 | 14.801 | 15.687 | 15.747 | 13.116 | | 22.95 | 28.67 | 1.123 | -5.950 | 4.229 | -9.3738 |
| 190 | 742.0 | 14.691 | 15.629 | 15.650 | 13.100 | | 22.65 | 29.45 | 9.452 - 7 | -6.024 | 3.471 | -9.4595 |
| 195 | 749.8 | 14.583 | 15.572 | 15.555 | 13.084 | | 22.36 | 30.20 | 7.994 | -6.097 | 2.867 | -9.5426 |
| 200 | 756.6 | 14.477 | 15.517 | 15.462 | 13.069 | | 22.07 | 30.93 | 6.787 | -6.168 | 2.381 | -9.6232 |
| 205 | 762.5 | 14.372 | 15.463 | 15.370 | 13.054 | | 21.78 | 31.63 | 5.785 - 7 | -6.238 | 1.987 -10 | -9.7017 |
| 210 | 767.6 | 14.269 | 15.410 | 15.279 | 13.040 | | 21.50 | 32.31 | 4.947 | -6.306 | 1.666 | -9.7782 |
| 215 | 772.0 | 14.167 | 15.358 | 15.189 | 13.026 | | 21.22 | 32.97 | 4.244 | -6.372 | 1.403 | -9.8529 |
| 220 | 775.8 | 14.066 | 15.306 | 15.100 | 13.012 | | 20.94 | 33.61 | 3.653 | -6.437 | 1.186 | -9.9259 |
| 225 | 779.0 | 13.965 | 15.255 | 15.012 | 12.999 | | 20.68 | 34.24 | 3.152 | -6.501 | 1.006 | -9.9973 |
| 230 | 781.9 | 13.866 | 15.205 | 14.925 | 12.985 | | 20.42 | 34.86 | 2.727 | -6.564 | 8.568 -11 | -10.0672 |
| 235 | 784.3 | 13.767 | 15.155 | 14.838 | 12.972 | | 20.16 | 35.46 | 2.366 | -6.626 | 7.316 | -10.1358 |
| 240 | 786.5 | 13.669 | 15.105 | 14.752 | 12.959 | | 19.92 | 36.05 | 2.057 | -6.687 | 6.266 | -10.2030 |
| 245 | 788.3 | 13.571 | 15.056 | 14.667 | 12.947 | | 19.68 | 36.63 | 1.793 | -6.746 | 5.383 | -10.2690 |
| 250 | 789.9 | 13.474 | 15.007 | 14.582 | 12.934 | | 19.45 | 37.19 | 1.566 | -6.805 | 4.637 | -10.3338 |
| 255 | 791.2 | 13.378 | 14.958 | 14.497 | 12.922 | | 19.23 | 37.74 | 1.370 - 7 | -6.863 | 4.005 -11 | -10.3974 |
| 260 | 792.4 | 13.281 | 14.910 | 14.413 | 12.909 | | 19.02 | 38.28 | 1.201 | -6.920 | 3.467 | -10.4601 |
| 265 | 793.5 | 13.186 | 14.861 | 14.329 | 12.897 | | 18.81 | 38.81 | 1.055 | -6.977 | 3.008 | -10.5217 |
| 270 | 794.3 | 13.090 | 14.813 | 14.245 | 12.885 | | 18.61 | 39.32 | 9.283 - 8 | -7.032 | 2.616 | -10.5823 |
| 275 | 795.1 | 12.995 | 14.766 | 14.161 | 12.873 | | 18.43 | 39.82 | 8.181 | -7.087 | 2.280 | -10.6420 |
| 280 | 795.8 | 12.900 | 14.718 | 14.078 | 12.861 | | 18.24 | 40.31 | 7.221 | -7.141 | 1.991 | -10.7009 |
| 285 | 796.3 | 12.805 | 14.670 | 13.995 | 12.849 | | 18.07 | 40.79 | 6.384 | -7.195 | 1.742 | -10.7589 |
| 290 | 796.8 | 12.711 | 14.623 | 13.913 | 12.837 | | 17.91 | 41.25 | 5.651 | -7.248 | 1.527 | -10.8161 |
| 295 | 797.3 | 12.616 | 14.576 | 13.830 | 12.825 | | 17.75 | 41.70 | 5.009 | -7.300 | 1.341 | -10.8725 |
| 300 | 797.6 | 12.522 | 14.529 | 13.748 | 12.813 | | 17.60 | 42.14 | 4.446 | -7.352 | 1.180 | -10.9282 |
| 310 | 798.2 | 12.335 | 14.435 | 13.584 | 12.789 | | 17.31 | 43.00 | 3.515 - 8 | -7.454 | 9.170 -12 | -11.0376 |
| 320 | 798.7 | 12.148 | 14.341 | 13.420 | 12.766 | | 17.05 | 43.81 | 2.792 | -7.554 | 7.169 | -11.1445 |
| 330 | 799.0 | 11.963 | 14.248 | 13.258 | 12.743 | | 16.81 | 44.60 | 2.227 | -7.652 | 5.634 | -11.2492 |
| 340 | 799.3 | 11.777 | 14.156 | 13.095 | 12.719 | | 16.58 | 45.36 | 1.783 | -7.749 | 4.448 | -11.3518 |
| 350 | 799.4 | 11.593 | 14.063 | 12.934 | 12.696 | | 16.37 | 46.10 | 1.433 | -7.844 | 3.527 | -11.4526 |
| 360 | 799.6 | 11.409 | 13.971 | 12.773 | 12.673 | | 16.16 | 46.85 | 1.155 | -7.937 | 2.808 | -11.5516 |
| 370 | 799.7 | 11.225 | 13.880 | 12.612 | 12.650 | | 15.95 | 47.59 | 9.348 - 9 | -8.029 | 2.243 | -11.6492 |
| 380 | 799.8 | 11.043 | 13.788 | 12.452 | 12.627 | | 15.75 | 48.36 | 7.589 | -8.120 | 1.797 | -11.7454 |
| 390 | 799.8 | 10.860 | 13.697 | 12.293 | 12.605 | | 15.54 | 49.16 | 6.182 | -8.209 | 1.445 | -11.8403 |
| 400 | 799.9 | 10.679 | 13.606 | 12.134 | 12.582 | | 15.33 | 50.00 | 5.052 | -8.297 | 1.164 | -11.9340 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 799.9 | 10.498 | 13.516 | 11.975 | 12.559 | | 15.10 | 50.89 | 4.144 - 9 | -8.383 | 9.408 -13 | -12.0265 |
| 420 | 799.9 | 10.317 | 13.425 | 11.817 | 12.537 | | 14.86 | 51.87 | 3.411 | -8.467 | 7.621 | -12.1180 |
| 430 | 799.9 | 10.137 | 13.335 | 11.659 | 12.514 | | 14.61 | 52.93 | 2.818 | -8.550 | 6.189 | -12.2084 |
| 440 | 800.0 | 9.957 | 13.246 | 11.502 | 12.492 | | 14.33 | 54.10 | 2.338 | -8.631 | 5.037 | -12.2978 |
| 450 | 800.0 | 9.778 | 13.156 | 11.345 | 12.469 | | 14.04 | 55.40 | 1.947 | -8.711 | 4.110 | -12.3862 |
| 460 | 800.0 | 9.600 | 13.067 | 11.189 | 12.447 | | 13.72 | 56.85 | 1.629 | -8.788 | 3.361 | -12.4735 |
| 470 | 800.0 | 9.422 | 12.978 | 11.033 | 12.425 | | 13.38 | 58.47 | 1.370 | -8.863 | 2.755 | -12.5598 |
| 480 | 800.0 | 9.245 | 12.889 | 10.878 | 12.402 | | 13.01 | 60.29 | 1.158 | -8.936 | 2.264 | -12.6450 |
| 490 | 800.0 | 9.068 | 12.801 | 10.723 | 12.380 | | 12.62 | 62.33 | 9.833 -10 | -9.007 | 1.866 | -12.7291 |
| 500 | 800.0 | 8.892 | 12.713 | 10.569 | 12.358 | 11.102 | 12.21 | 64.62 | 8.399 | -9.076 | 1.542 | -12.8119 |
| 510 | 800.0 | 8.716 | 12.625 | 10.415 | 12.336 | 11.096 | 11.78 | 67.19 | 7.216 -10 | -9.142 | 1.278 -13 | -12.8935 |
| 520 | 800.0 | 8.540 | 12.537 | 10.261 | 12.314 | 11.091 | 11.33 | 70.05 | 6.237 | -9.205 | 1.063 | -12.9736 |
| 530 | 800.0 | 8.366 | 12.450 | 10.108 | 12.292 | 11.085 | 10.87 | 73.23 | 5.424 | -9.266 | 9.864 -14 | -13.0523 |
| 540 | 800.0 | 8.191 | 12.362 | 9.956 | 12.271 | 11.080 | 10.40 | 76.76 | 4.746 | -9.324 | 9.422 | -13.1295 |
| 550 | 800.0 | 8.017 | 12.276 | 9.804 | 12.249 | 11.074 | 9.93 | 80.65 | 4.180 | -9.379 | 6.239 | -13.2049 |
| 560 | 800.0 | 7.844 | 12.189 | 9.652 | 12.227 | 11.069 | 9.46 | 84.92 | 3.704 | -9.431 | 5.266 | -13.2785 |
| 570 | 800.0 | 7.671 | 12.102 | 9.501 | 12.206 | 11.063 | 8.99 | 89.56 | 3.303 | -9.481 | 4.465 | -13.3502 |
| 580 | 800.0 | 7.499 | 12.016 | 9.350 | 12.184 | 11.058 | 8.54 | 94.59 | 2.963 | -9.528 | 3.803 | -13.4199 |
| 590 | 800.0 | 7.327 | 11.930 | 9.199 | 12.163 | 11.053 | 8.10 | 99.98 | 2.673 | -9.573 | 3.256 | -13.4873 |
| 600 | 800.0 | 7.156 | 11.845 | 9.049 | 12.141 | 11.047 | 7.68 | 105.72 | 2.425 | -9.615 | 2.802 | -13.5526 |
| 610 | 800.0 | 6.985 | 11.759 | 8.900 | 12.120 | 11.042 | 7.29 | 111.77 | 2.212 -10 | -9.655 | 2.424 -14 | -13.6155 |
| 620 | 800.0 | 6.815 | 11.674 | 8.751 | 12.098 | 11.036 | 6.92 | 118.09 | 2.028 | -9.693 | 2.109 | -13.6759 |
| 630 | 800.0 | 6.645 | 11.589 | 8.602 | 12.077 | 11.031 | 6.57 | 124.64 | 1.867 | -9.729 | 1.845 | -13.7335 |
| 640 | 800.0 | 6.475 | 11.505 | 8.454 | 12.056 | 11.026 | 6.26 | 131.35 | 1.727 | -9.763 | 1.624 | -13.7894 |
| 650 | 800.0 | 6.307 | 11.420 | 8.306 | 12.035 | 11.020 | 5.96 | 138.17 | 1.603 | -9.795 | 1.438 | -13.8424 |
| 660 | 800.0 | 6.138 | 11.336 | 8.158 | 12.014 | 11.015 | 5.70 | 145.03 | 1.494 | -9.826 | 1.280 | -13.8929 |
| 670 | 800.0 | 5.970 | 11.252 | 8.011 | 11.993 | 11.010 | 5.46 | 151.87 | 1.397 | -9.855 | 1.146 | -13.9409 |
| 680 | 800.0 | 5.803 | 11.168 | 7.865 | 11.972 | 11.005 | 5.24 | 158.63 | 1.309 | -9.883 | 1.031 | -13.9865 |
| 690 | 800.0 | 5.636 | 11.085 | 7.719 | 11.951 | 10.999 | 5.04 | 165.25 | 1.231 | -9.910 | 9.335 -15 | -14.0299 |
| 700 | 800.0 | 5.469 | 11.002 | 7.573 | 11.930 | 10.994 | 4.87 | 171.69 | 1.160 | -9.936 | 8.491 | -14.0710 |
| 710 | 800.0 | 5.303 | 10.919 | 7.428 | 11.909 | 10.989 | 4.71 | 177.91 | 1.096 -10 | -9.960 | 7.761 -15 | -14.1101 |
| 720 | 800.0 | 5.138 | 10.836 | 7.283 | 11.889 | 10.984 | 4.57 | 183.88 | 1.037 | -9.984 | 7.125 | -14.1472 |
| 730 | 800.0 | 4.973 | 10.753 | 7.138 | 11.868 | 10.978 | 4.45 | 189.58 | 9.826 -11 | -10.008 | 6.569 | -14.1825 |
| 740 | 800.0 | 4.808 | 10.671 | 6.994 | 11.847 | 10.973 | 4.34 | 195.00 | 9.328 | -10.030 | 6.080 | -14.2161 |
| 750 | 800.0 | 4.644 | 10.589 | 6.850 | 11.827 | 10.968 | 4.24 | 200.13 | 8.868 | -10.052 | 5.648 | -14.2481 |
| 760 | 800.0 | 4.480 | 10.507 | 6.707 | 11.806 | 10.963 | 4.15 | 204.98 | 8.441 | -10.074 | 5.263 | -14.2788 |
| 770 | 800.0 | 4.317 | 10.425 | 6.564 | 11.786 | 10.958 | 4.07 | 209.56 | 8.043 | -10.095 | 4.920 | -14.3081 |
| 780 | 800.0 | 4.154 | 10.344 | 6.422 | 11.766 | 10.953 | 4.00 | 213.87 | 7.672 | -10.115 | 4.611 | -14.3362 |
| 790 | 800.0 | 3.992 | 10.263 | 6.280 | 11.745 | 10.948 | 3.93 | 217.94 | 7.325 | -10.135 | 4.332 | -14.3633 |
| 800 | 800.0 | 3.830 | 10.182 | 6.138 | 11.725 | 10.942 | 3.88 | 221.77 | 6.999 | -10.155 | 4.079 | -14.3894 |
| 820 | 800.0 | 3.508 | 10.021 | 5.856 | 11.685 | 10.932 | 3.78 | 228.85 | 6.405 -11 | -10.193 | 3.638 -15 | -14.4392 |
| 840 | 800.0 | 3.187 | 9.860 | 5.575 | 11.645 | 10.922 | 3.70 | 235.24 | 5.876 | -10.231 | 3.265 | -14.4861 |
| 860 | 800.0 | 2.551 | 9.542 | 5.018 | 11.565 | 10.902 | 3.57 | 246.57 | 4.977 | -10.303 | 2.668 | -14.5738 |
| 900 | 800.0 | 2.236 | 9.385 | 4.742 | 11.526 | 10.892 | 3.51 | 251.77 | 4.596 | -10.338 | 2.425 | -14.6154 |
| 920 | 800.0 | 1.922 | 9.228 | 4.468 | 11.486 | 10.882 | 3.46 | 256.78 | 4.246 | -10.372 | 2.210 | -14.6557 |
| 940 | 800.0 | 1.610 | 9.072 | 4.195 | 11.447 | 10.873 | 3.42 | 261.69 | 3.931 | -10.405 | 2.018 | -14.6950 |
| 960 | 800.0 | 1.300 | 8.917 | 3.923 | 11.409 | 10.863 | 3.37 | 266.56 | 3.644 | -10.438 | 1.847 | -14.7336 |
| 980 | 800.0 | 0.992 | 8.763 | 3.653 | 11.370 | 10.853 | 3.33 | 271.45 | 3.383 | -10.471 | 1.693 | -14.7714 |
| 1000 | 800.0 | 0.685 | 8.609 | 3.385 | 11.332 | 10.843 | 3.29 | 276.41 | 3.145 | -10.502 | 1.554 | -14.8086 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log n($O_2$) | log n(O) | log n($N_2$) | log n(He) | log n(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 428.2 | 16.592 | 16.699 | 17.344 | 13.456 | | 26.58 | 14.20 | 1.832 | -4.737 | 1.368 | -7.8640 |
| 130 | 491.6 | 16.361 | 16.553 | 17.134 | 13.397 | | 26.28 | 16.52 | 1.323 | -4.878 | 8.506 - 9 | -8.0703 |
| 135 | 546.4 | 16.163 | 16.431 | 16.956 | 13.350 | | 25.99 | 18.59 | 9.949 - 6 | -5.002 | 5.692 | -8.2447 |
| 140 | 593.9 | 15.990 | 16.326 | 16.799 | 13.310 | | 25.71 | 20.46 | 7.702 | -5.113 | 4.010 | -8.3968 |
| 145 | 635.0 | 15.833 | 16.233 | 16.658 | 13.276 | | 25.44 | 22.14 | 6.090 | -5.215 | 2.934 | -8.5325 |
| 150 | 670.6 | 15.689 | 16.150 | 16.530 | 13.246 | | 25.17 | 23.67 | 4.896 | -5.310 | 2.210 | -8.6556 |
| 155 | 701.4 | 15.556 | 16.073 | 16.410 | 13.220 | | 24.90 | 25.06 | 3.988 - 6 | -5.399 | 1.703 - 9 | -8.7689 |
| 160 | 728.1 | 15.431 | 16.003 | 16.299 | 13.196 | | 24.63 | 26.34 | 3.283 | -5.484 | 1.336 | -8.8742 |
| 165 | 751.2 | 15.312 | 15.936 | 16.193 | 13.175 | | 24.36 | 27.51 | 2.727 | -5.564 | 1.064 | -8.9732 |
| 170 | 771.2 | 15.198 | 15.874 | 16.092 | 13.155 | | 24.10 | 28.60 | 2.282 | -5.642 | 8.576 -10 | -9.0667 |
| 175 | 788.5 | 15.089 | 15.814 | 15.995 | 13.137 | | 23.83 | 29.61 | 1.922 | -5.716 | 6.986 | -9.1557 |
| 180 | 803.4 | 14.983 | 15.758 | 15.902 | 13.119 | | 23.57 | 30.56 | 1.628 | -5.788 | 5.742 | -9.2409 |
| 185 | 816.4 | 14.881 | 15.703 | 15.811 | 13.103 | | 23.30 | 31.46 | 1.385 | -5.858 | 4.756 | -9.3228 |
| 190 | 827.6 | 14.781 | 15.650 | 15.723 | 13.088 | | 23.04 | 32.30 | 1.184 | -5.927 | 3.965 | -9.4018 |
| 195 | 837.4 | 14.683 | 15.598 | 15.637 | 13.073 | | 22.78 | 33.11 | 1.016 | -5.993 | 3.325 | -9.4782 |
| 200 | 845.8 | 14.587 | 15.548 | 15.552 | 13.059 | | 22.52 | 33.88 | 8.753 - 7 | -6.058 | 2.803 | -9.5524 |
| 205 | 853.1 | 14.493 | 15.499 | 15.469 | 13.045 | | 22.26 | 34.62 | 7.565 - 7 | -6.121 | 2.374 -10 | -9.6245 |
| 210 | 859.4 | 14.400 | 15.451 | 15.387 | 13.032 | | 22.00 | 35.33 | 6.557 | -6.183 | 2.019 | -9.6948 |
| 215 | 864.8 | 14.308 | 15.404 | 15.307 | 13.019 | | 21.75 | 36.03 | 5.700 | -6.244 | 1.724 | -9.7634 |
| 220 | 869.5 | 14.217 | 15.357 | 15.227 | 13.006 | | 21.50 | 36.70 | 4.967 | -6.304 | 1.477 | -9.8305 |
| 225 | 873.6 | 14.127 | 15.311 | 15.148 | 12.994 | | 21.26 | 37.36 | 4.340 | -6.363 | 1.270 | -9.8962 |
| 230 | 877.2 | 14.038 | 15.266 | 15.070 | 12.982 | | 21.01 | 38.00 | 3.801 | -6.420 | 1.095 | -9.9605 |
| 235 | 880.2 | 13.950 | 15.221 | 14.992 | 12.970 | | 20.78 | 38.62 | 3.336 | -6.477 | 9.470 -11 | -10.0236 |
| 240 | 882.9 | 13.862 | 15.177 | 14.915 | 12.959 | | 20.55 | 39.24 | 2.934 | -6.533 | 8.211 | -10.0856 |
| 245 | 885.2 | 13.775 | 15.133 | 14.839 | 12.947 | | 20.32 | 39.84 | 2.585 | -6.588 | 7.137 | -10.1465 |
| 250 | 887.2 | 13.689 | 15.089 | 14.763 | 12.936 | | 20.10 | 40.43 | 2.282 | -6.642 | 6.219 | -10.2063 |
| 255 | 888.9 | 13.602 | 15.045 | 14.687 | 12.925 | | 19.88 | 41.01 | 2.019 - 7 | -6.695 | 5.430 -11 | -10.2652 |
| 260 | 890.4 | 13.517 | 15.002 | 14.612 | 12.914 | | 19.67 | 41.58 | 1.788 | -6.748 | 4.753 | -10.3231 |
| 265 | 891.7 | 13.431 | 14.959 | 14.537 | 12.903 | | 19.47 | 42.13 | 1.587 | -6.799 | 4.168 | -10.3801 |
| 270 | 892.8 | 13.346 | 14.916 | 14.463 | 12.892 | | 19.27 | 42.68 | 1.411 | -6.851 | 3.662 | -10.4362 |
| 275 | 893.8 | 13.261 | 14.873 | 14.388 | 12.881 | | 19.08 | 43.22 | 1.256 | -6.901 | 3.224 | -10.4916 |
| 280 | 894.6 | 13.177 | 14.831 | 14.314 | 12.870 | | 18.90 | 43.75 | 1.119 | -6.951 | 2.844 | -10.5461 |
| 285 | 895.3 | 13.092 | 14.789 | 14.240 | 12.859 | | 18.72 | 44.26 | 9.989 - 8 | -7.000 | 2.512 | -10.5999 |
| 290 | 896.0 | 13.008 | 14.746 | 14.167 | 12.849 | | 18.55 | 44.77 | 8.928 | -7.049 | 2.223 | -10.6530 |
| 295 | 896.5 | 12.924 | 14.704 | 14.093 | 12.838 | | 18.39 | 45.27 | 7.990 | -7.097 | 1.971 | -10.7054 |
| 300 | 897.0 | 12.841 | 14.662 | 14.020 | 12.828 | | 18.23 | 45.75 | 7.158 | -7.145 | 1.750 | -10.7571 |
| 310 | 897.7 | 12.674 | 14.579 | 13.874 | 12.807 | | 17.93 | 46.70 | 5.766 - 8 | -7.239 | 1.385 -11 | -10.8586 |
| 320 | 898.3 | 12.508 | 14.496 | 13.729 | 12.786 | | 17.65 | 47.60 | 4.664 | -7.331 | 1.102 | -10.9577 |
| 330 | 898.7 | 12.343 | 14.413 | 13.584 | 12.765 | | 17.39 | 48.47 | 3.788 | -7.422 | 8.817 -12 | -11.0547 |
| 340 | 899.0 | 12.179 | 14.331 | 13.440 | 12.744 | | 17.15 | 49.31 | 3.087 | -7.510 | 7.085 | -11.1497 |
| 350 | 899.3 | 12.014 | 14.248 | 13.296 | 12.724 | | 16.93 | 50.12 | 2.525 | -7.598 | 5.717 | -11.2428 |
| 360 | 899.5 | 11.850 | 14.167 | 13.153 | 12.703 | | 16.72 | 50.91 | 2.071 | -7.684 | 4.642 | -11.3343 |
| 370 | 899.6 | 11.687 | 14.085 | 13.010 | 12.683 | | 16.52 | 51.69 | 1.704 | -7.768 | 3.766 | -11.4242 |
| 380 | 899.7 | 11.525 | 14.004 | 12.868 | 12.662 | | 16.33 | 52.45 | 1.407 | -7.852 | 3.071 | -11.5127 |
| 390 | 899.8 | 11.363 | 13.923 | 12.726 | 12.642 | | 16.15 | 53.21 | 1.164 | -7.934 | 2.513 | -11.5998 |
| 400 | 899.8 | 11.201 | 13.842 | 12.585 | 12.622 | | 15.97 | 53.98 | 9.659 - 9 | -8.015 | 2.062 | -11.6858 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 899.9 | 11.040 | 13.767 | 12.444 | 12.602 | | 15.79 | 54.76 | 8.036 - 9 | -8.095 | 1.696 -12 | -11.7707 |
| 420 | 899.9 | 10.880 | 13.681 | 12.303 | 12.582 | | 15.60 | 55.57 | 6.704 | -8.174 | 1.398 | -11.8545 |
| 430 | 899.9 | 10.720 | 13.601 | 12.163 | 12.562 | | 15.42 | 56.41 | 5.607 | -8.251 | 1.155 | -11.9373 |
| 440 | 899.9 | 10.560 | 13.521 | 12.023 | 12.542 | | 15.22 | 57.30 | 4.703 | -8.328 | 9.568 -13 | -12.0192 |
| 450 | 900.0 | 10.401 | 13.442 | 11.884 | 12.522 | | 15.02 | 58.24 | 3.955 | -8.403 | 7.940 | -12.1002 |
| 460 | 900.0 | 10.243 | 13.363 | 11.745 | 12.502 | | 14.81 | 59.25 | 3.336 | -8.477 | 6.602 | -12.1803 |
| 470 | 900.0 | 10.084 | 13.283 | 11.607 | 12.482 | | 14.58 | 60.35 | 2.822 | -8.549 | 5.500 | -12.2596 |
| 480 | 900.0 | 9.927 | 13.205 | 11.469 | 12.462 | | 14.34 | 61.54 | 2.395 | -8.621 | 4.591 | -12.3381 |
| 490 | 900.0 | 9.770 | 13.126 | 11.331 | 12.443 | | 14.09 | 62.84 | 2.039 | -8.691 | 3.839 | -12.4158 |
| 500 | 900.0 | 9.613 | 13.048 | 11.194 | 12.423 | 10.734 | 13.81 | 64.27 | 1.742 | -8.759 | 3.216 | -12.4926 |
| 510 | 900.0 | 9.456 | 12.970 | 11.057 | 12.404 | 10.729 | 13.52 | 65.84 | 1.494 - 9 | -8.826 | 2.700 -13 | -12.5686 |
| 520 | 900.0 | 9.301 | 12.892 | 10.921 | 12.384 | 10.725 | 13.22 | 67.57 | 1.286 | -8.891 | 2.271 | -12.6437 |
| 530 | 900.0 | 9.145 | 12.814 | 10.785 | 12.365 | 10.720 | 12.89 | 69.48 | 1.111 | -8.954 | 1.914 | -12.7180 |
| 540 | 900.0 | 8.990 | 12.736 | 10.649 | 12.345 | 10.715 | 12.55 | 71.58 | 9.643 -10 | -9.016 | 1.617 | -12.7913 |
| 550 | 900.0 | 8.836 | 12.659 | 10.514 | 12.326 | 10.710 | 12.19 | 73.90 | 8.404 | -9.075 | 1.369 | -12.8636 |
| 560 | 900.0 | 8.682 | 12.582 | 10.379 | 12.307 | 10.705 | 11.82 | 76.45 | 7.357 | -9.133 | 1.162 | -12.9349 |
| 570 | 900.0 | 8.528 | 12.505 | 10.244 | 12.287 | 10.700 | 11.43 | 79.26 | 6.470 | -9.189 | 9.864 -14 | -13.0051 |
| 580 | 900.0 | 8.375 | 12.429 | 10.110 | 12.268 | 10.695 | 11.04 | 82.33 | 5.717 | -9.243 | 8.431 | -13.0741 |
| 590 | 900.0 | 8.222 | 12.352 | 9.977 | 12.249 | 10.691 | 10.63 | 85.69 | 5.075 | -9.295 | 7.213 | -13.1419 |
| 600 | 900.0 | 8.070 | 12.276 | 9.843 | 12.230 | 10.686 | 10.23 | 89.34 | 4.527 | -9.344 | 6.188 | -13.2084 |
| 610 | 900.0 | 7.918 | 12.200 | 9.710 | 12.211 | 10.681 | 9.82 | 93.29 | 4.057 -10 | -9.392 | 5.326 -14 | -13.2736 |
| 620 | 900.0 | 7.76 | 12.125 | 9.578 | 12.192 | 10.676 | 9.42 | 97.55 | 3.653 | -9.437 | 4.600 | -13.3373 |
| 630 | 900.0 | 7.616 | 12.049 | 9.446 | 12.173 | 10.671 | 9.03 | 102.13 | 3.305 | -9.481 | 3.986 | -13.3994 |
| 640 | 900.0 | 7.465 | 11.974 | 9.314 | 12.154 | 10.667 | 8.64 | 107.01 | 3.003 | -9.522 | 3.467 | -13.4600 |
| 650 | 900.0 | 7.315 | 11.899 | 9.182 | 12.136 | 10.662 | 8.26 | 112.18 | 2.741 | -9.562 | 3.027 | -13.5189 |
| 660 | 900.0 | 7.165 | 11.824 | 9.051 | 12.117 | 10.657 | 7.90 | 117.63 | 2.513 | -9.600 | 2.654 | -13.5761 |
| 670 | 900.0 | 7.016 | 11.749 | 8.921 | 12.098 | 10.653 | 7.56 | 123.33 | 2.312 | -9.636 | 2.336 | -13.6315 |
| 680 | 900.0 | 6.867 | 11.675 | 8.790 | 12.080 | 10.648 | 7.23 | 129.25 | 2.136 | -9.670 | 2.065 | -13.6850 |
| 690 | 900.0 | 6.719 | 11.601 | 8.660 | 12.061 | 10.643 | 6.93 | 135.36 | 1.981 | -9.703 | 1.834 | -13.7367 |
| 700 | 900.0 | 6.571 | 11.527 | 8.531 | 12.043 | 10.639 | 6.64 | 141.61 | 1.843 | -9.735 | 1.635 | -13.7864 |
| 710 | 900.0 | 6.423 | 11.453 | 8.402 | 12.024 | 10.634 | 6.37 | 147.97 | 1.720 -10 | -9.765 | 1.465 -14 | -13.8342 |
| 720 | 900.0 | 6.276 | 11.379 | 8.273 | 12.006 | 10.629 | 6.13 | 154.38 | 1.610 | -9.793 | 1.318 | -13.8802 |
| 730 | 900.0 | 6.129 | 11.306 | 8.144 | 11.987 | 10.625 | 5.90 | 160.81 | 1.511 | -9.821 | 1.191 | -13.9242 |
| 740 | 900.0 | 5.983 | 11.233 | 8.016 | 11.969 | 10.620 | 5.69 | 167.20 | 1.421 | -9.847 | 1.080 | -13.9664 |
| 750 | 900.0 | 5.837 | 11.160 | 7.889 | 11.951 | 10.615 | 5.50 | 173.51 | 1.340 | -9.873 | 9.845 -15 | -14.0068 |
| 760 | 900.0 | 5.692 | 11.087 | 7.761 | 11.933 | 10.611 | 5.32 | 179.70 | 1.267 | -9.897 | 9.008 | -14.0454 |
| 770 | 900.0 | 5.547 | 11.015 | 7.634 | 11.914 | 10.606 | 5.16 | 185.74 | 1.199 | -9.921 | 8.274 | -14.0823 |
| 780 | 900.0 | 5.402 | 10.942 | 7.507 | 11.896 | 10.602 | 5.02 | 191.59 | 1.137 | -9.944 | 7.629 | -14.1175 |
| 790 | 900.0 | 5.258 | 10.870 | 7.381 | 11.878 | 10.597 | 4.89 | 197.23 | 1.080 | -9.967 | 7.059 | -14.1513 |
| 800 | 900.0 | 5.114 | 10.798 | 7.255 | 11.860 | 10.593 | 4.77 | 202.65 | 1.027 | -9.988 | 6.553 | -14.1835 |
| 820 | 900.0 | 4.827 | 10.655 | 7.004 | 11.824 | 10.584 | 4.57 | 212.75 | 9.332 -11 | -10.030 | 5.701 -15 | -14.2441 |
| 840 | 900.0 | 4.542 | 10.512 | 6.755 | 11.789 | 10.575 | 4.41 | 221.86 | 8.511 | -10.070 | 5.014 | -14.2998 |
| 860 | 900.0 | 3.977 | 10.230 | 6.260 | 11.718 | 10.557 | 4.17 | 237.22 | 7.151 | -10.146 | 3.984 | -14.3997 |
| 900 | 900.0 | 3.697 | 10.090 | 6.015 | 11.683 | 10.548 | 4.08 | 243.65 | 6.581 | -10.182 | 3.589 | -14.4450 |
| 920 | 900.0 | 3.418 | 9.950 | 5.771 | 11.648 | 10.539 | 4.01 | 249.38 | 6.068 | -10.217 | 3.251 | -14.4879 |
| 940 | 900.0 | 3.141 | 9.812 | 5.528 | 11.614 | 10.530 | 3.95 | 254.54 | 5.605 | -10.251 | 2.959 | -14.5289 |
| 960 | 900.0 | 2.865 | 9.674 | 5.287 | 11.579 | 10.522 | 3.90 | 259.23 | 5.185 | -10.285 | 2.702 | -14.5683 |
| 980 | 900.0 | 2.591 | 9.537 | 5.047 | 11.545 | 10.513 | 3.86 | 263.54 | 4.803 | -10.318 | 2.476 | -14.6063 |
| 1000 | 900.0 | 2.318 | 9.400 | 4.808 | 11.511 | 10.505 | 3.82 | 267.55 | 4.455 | -10.351 | 2.274 | -14.6432 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1000° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 439.5 | 16.583 | 16.689 | 17.435 | 13.449 | | 26.58 | 14.58 | 1.842 | -4.735 | 1.340 | -7.8730 |
| 130 | 513.0 | 16.351 | 16.539 | 17.123 | 13.387 | | 26.29 | 17.23 | 1.345 | -4.871 | 8.289 - 9 | -8.0815 |
| 135 | 576.9 | 16.156 | 16.416 | 16.946 | 13.337 | | 26.02 | 19.60 | 1.025 | -4.989 | 5.560 | -8.2549 |
| 140 | 632.3 | 15.986 | 16.311 | 16.792 | 13.296 | | 25.76 | 21.74 | 8.046 - 6 | -5.094 | 3.943 | -8.4042 |
| 145 | 680.5 | 15.835 | 16.219 | 16.656 | 13.261 | | 25.51 | 23.66 | 6.456 | -5.190 | 2.910 | -8.5361 |
| 150 | 722.4 | 15.697 | 16.138 | 16.532 | 13.231 | | 25.26 | 25.41 | 5.266 | -5.279 | 2.214 | -8.6547 |
| 155 | 758.8 | 15.570 | 16.064 | 16.419 | 13.205 | | 25.01 | 26.99 | 4.351 - 6 | -5.361 | 1.725 - 9 | -8.7632 |
| 160 | 790.4 | 15.452 | 15.995 | 16.313 | 13.181 | | 24.77 | 28.43 | 3.633 | -5.440 | 1.369 | -8.8635 |
| 165 | 817.9 | 15.340 | 15.932 | 16.213 | 13.160 | | 24.53 | 29.75 | 3.059 | -5.514 | 1.104 | -8.9572 |
| 170 | 841.8 | 15.234 | 15.873 | 16.119 | 13.141 | | 24.29 | 30.97 | 2.595 | -5.586 | 9.006 -10 | -9.0455 |
| 175 | 862.5 | 15.132 | 15.817 | 16.028 | 13.123 | | 24.05 | 32.10 | 2.214 | -5.655 | 7.427 | -9.1292 |
| 180 | 880.5 | 15.034 | 15.763 | 15.941 | 13.106 | | 23.81 | 33.15 | 1.900 | -5.721 | 6.180 | -9.2090 |
| 185 | 896.2 | 14.939 | 15.712 | 15.857 | 13.090 | | 23.58 | 34.13 | 1.637 | -5.786 | 5.181 | -9.2856 |
| 190 | 909.8 | 14.847 | 15.663 | 15.776 | 13.076 | | 23.34 | 35.05 | 1.417 | -5.849 | 4.373 | -9.3592 |
| 195 | 921.6 | 14.757 | 15.615 | 15.697 | 13.062 | | 23.11 | 35.92 | 1.231 | -5.910 | 3.712 | -9.4304 |
| 200 | 931.9 | 14.669 | 15.568 | 15.619 | 13.048 | | 22.87 | 36.75 | 1.073 | -5.970 | 3.166 | -9.4994 |
| 205 | 940.8 | 14.583 | 15.523 | 15.543 | 13.035 | | 22.64 | 37.54 | 9.376 - 7 | -6.028 | 2.713 -10 | -9.5665 |
| 210 | 948.6 | 14.498 | 15.479 | 15.468 | 13.023 | | 22.41 | 38.30 | 8.218 | -6.085 | 2.335 | -9.6319 |
| 215 | 955.3 | 14.414 | 15.436 | 15.394 | 13.011 | | 22.18 | 39.04 | 7.221 | -6.141 | 2.016 | -9.6955 |
| 220 | 961.2 | 14.332 | 15.393 | 15.322 | 12.999 | | 21.95 | 39.74 | 6.361 | -6.196 | 1.747 | -9.7577 |
| 225 | 966.3 | 14.250 | 15.351 | 15.250 | 12.988 | | 21.72 | 40.43 | 5.615 | -6.251 | 1.518 | -9.8187 |
| 230 | 970.7 | 14.169 | 15.310 | 15.179 | 12.977 | | 21.50 | 41.10 | 4.967 | -6.304 | 1.323 | -9.8784 |
| 235 | 974.5 | 14.089 | 15.269 | 15.109 | 12.966 | | 21.28 | 41.75 | 4.402 | -6.356 | 1.156 | -9.9370 |
| 240 | 977.9 | 14.010 | 15.228 | 15.039 | 12.955 | | 21.06 | 42.39 | 3.909 | -6.408 | 1.013 | -9.9945 |
| 245 | 980.9 | 13.931 | 15.188 | 14.970 | 12.945 | | 20.85 | 43.01 | 3.477 | -6.459 | 8.890 -11 | -10.0511 |
| 250 | 983.3 | 13.852 | 15.148 | 14.901 | 12.934 | | 20.64 | 43.63 | 3.098 | -6.509 | 7.821 | -10.1067 |
| 255 | 985.5 | 13.774 | 15.109 | 14.832 | 12.924 | | 20.44 | 44.23 | 2.765 - 7 | -6.558 | 6.895 -11 | -10.1614 |
| 260 | 987.4 | 13.697 | 15.070 | 14.764 | 12.914 | | 20.24 | 44.82 | 2.471 | -6.607 | 6.091 | -10.2153 |
| 265 | 989.0 | 13.620 | 15.031 | 14.697 | 12.904 | | 20.04 | 45.41 | 2.212 | -6.655 | 5.390 | -10.2684 |
| 270 | 990.5 | 13.543 | 14.992 | 14.629 | 12.894 | | 19.85 | 45.98 | 1.982 | -6.703 | 4.778 | -10.3208 |
| 275 | 991.7 | 13.466 | 14.953 | 14.562 | 12.884 | | 19.66 | 46.55 | 1.779 | -6.750 | 4.243 | -10.3723 |
| 280 | 992.8 | 13.390 | 14.915 | 14.495 | 12.874 | | 19.48 | 47.10 | 1.599 | -6.796 | 3.774 | -10.4232 |
| 285 | 993.8 | 13.314 | 14.877 | 14.429 | 12.865 | | 19.30 | 47.65 | 1.439 | -6.842 | 3.362 | -10.4734 |
| 290 | 994.6 | 13.238 | 14.839 | 14.362 | 12.855 | | 19.13 | 48.19 | 1.296 | -6.887 | 2.999 | -10.5230 |
| 295 | 995.3 | 13.162 | 14.801 | 14.296 | 12.845 | | 18.96 | 48.72 | 1.169 | -6.932 | 2.680 | -10.5719 |
| 300 | 995.9 | 13.087 | 14.763 | 14.230 | 12.836 | | 18.80 | 49.25 | 1.056 | -6.976 | 2.398 | -10.6202 |
| 310 | 996.9 | 12.937 | 14.687 | 14.098 | 12.817 | | 18.49 | 50.27 | 8.636 - 8 | -7.064 | 1.927 -11 | -10.7151 |
| 320 | 997.7 | 12.787 | 14.613 | 13.967 | 12.798 | | 18.21 | 51.25 | 7.092 | -7.149 | 1.557 | -10.8078 |
| 330 | 998.2 | 12.638 | 14.538 | 13.837 | 12.779 | | 17.94 | 52.21 | 5.846 | -7.233 | 1.263 | -10.8985 |
| 340 | 998.7 | 12.490 | 14.464 | 13.707 | 12.761 | | 17.69 | 53.13 | 4.835 | -7.316 | 1.030 | -10.9872 |
| 350 | 999.0 | 12.342 | 14.390 | 13.578 | 12.742 | | 17.45 | 54.02 | 4.011 | -7.397 | 8.429 -12 | -11.0742 |
| 360 | 999.2 | 12.195 | 14.316 | 13.449 | 12.724 | | 17.23 | 54.88 | 3.338 | -7.476 | 6.925 | -11.1596 |
| 370 | 999.4 | 12.048 | 14.243 | 13.320 | 12.705 | | 17.03 | 55.72 | 2.786 | -7.555 | 5.710 | -11.2434 |
| 380 | 999.6 | 11.902 | 14.169 | 13.192 | 12.687 | | 16.83 | 56.54 | 2.332 | -7.632 | 4.723 | -11.3258 |
| 390 | 999.7 | 11.756 | 14.096 | 13.065 | 12.669 | | 16.65 | 57.34 | 1.956 | -7.709 | 3.918 | -11.4069 |
| 400 | 999.8 | 11.611 | 14.024 | 12.937 | 12.650 | | 16.47 | 58.13 | 1.645 | -7.784 | 3.260 | -11.4868 |

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 999.9 | 11.466 | 13.951 | 12.810 | 12.632 | | 16.30 | 58.92 | 1.387 - 8 | -7.858 | 2.719 -12 | -11.5655 |
| 420 | 999.9 | 11.321 | 13.879 | 12.684 | 12.614 | | 16.14 | 59.71 | 1.171 | -7.931 | 2.274 | -11.6432 |
| 430 | 999.9 | 11.177 | 13.807 | 12.558 | 12.596 | | 15.97 | 60.50 | 9.919 - 9 | -8.004 | 1.906 | -11.7199 |
| 440 | 999.9 | 11.034 | 13.735 | 12.432 | 12.578 | | 15.81 | 61.31 | 8.417 | -8.075 | 1.601 | -11.7957 |
| 450 | 999.9 | 10.890 | 13.664 | 12.307 | 12.560 | | 15.64 | 62.14 | 7.158 | -8.145 | 1.347 | -11.8706 |
| 460 | 1000.0 | 10.748 | 13.592 | 12.182 | 12.542 | | 15.48 | 62.99 | 6.101 | -8.215 | 1.136 | -11.9447 |
| 470 | 1000.0 | 10.605 | 13.521 | 12.057 | 12.525 | | 15.30 | 63.89 | 5.211 | -8.283 | 9.593 -13 | -12.0181 |
| 480 | 1000.0 | 10.463 | 13.450 | 11.933 | 12.507 | | 15.13 | 64.83 | 4.461 | -8.351 | 8.117 | -12.0906 |
| 490 | 1000.0 | 10.322 | 13.379 | 11.809 | 12.489 | | 14.94 | 65.83 | 3.828 | -8.417 | 6.879 | -12.1625 |
| 500 | 1000.0 | 10.181 | 13.309 | 11.686 | 12.472 | 10.430 | 14.75 | 66.89 | 3.292 | -8.483 | 5.840 | -12.2336 |
| 510 | 1000.0 | 10.040 | 13.238 | 11.562 | 12.454 | 10.426 | 14.54 | 68.03 | 2.839 - 9 | -8.547 | 4.965 -13 | -12.3041 |
| 520 | 1000.0 | 9.900 | 13.169 | 11.440 | 12.436 | 10.421 | 14.33 | 69.25 | 2.454 | -8.610 | 4.228 | -12.3738 |
| 530 | 1000.0 | 9.760 | 13.098 | 11.317 | 12.419 | 10.417 | 14.10 | 70.58 | 2.127 | -8.672 | 3.606 | -12.4429 |
| 540 | 1000.0 | 9.621 | 13.029 | 11.195 | 12.401 | 10.412 | 13.86 | 72.02 | 1.848 | -8.733 | 3.081 | -12.5113 |
| 550 | 1000.0 | 9.481 | 12.959 | 11.073 | 12.384 | 10.408 | 13.60 | 73.57 | 1.611 | -8.793 | 2.636 | -12.5791 |
| 560 | 1000.0 | 9.343 | 12.890 | 10.952 | 12.367 | 10.404 | 13.34 | 75.27 | 1.408 | -8.851 | 2.259 | -12.6461 |
| 570 | 1000.0 | 9.205 | 12.821 | 10.831 | 12.349 | 10.399 | 13.05 | 77.12 | 1.235 | -8.908 | 1.939 | -12.7124 |
| 580 | 1000.0 | 9.067 | 12.752 | 10.710 | 12.332 | 10.395 | 12.76 | 79.13 | 1.087 | -8.964 | 1.668 | -12.7779 |
| 590 | 1000.0 | 8.929 | 12.683 | 10.590 | 12.315 | 10.391 | 12.45 | 81.32 | 9.594 -10 | -9.018 | 1.437 | -12.8427 |
| 600 | 1000.0 | 8.792 | 12.615 | 10.470 | 12.298 | 10.386 | 12.13 | 83.71 | 8.498 | -9.071 | 1.240 | -12.9066 |
| 610 | 1000.0 | 8.656 | 12.546 | 10.350 | 12.281 | 10.382 | 11.80 | 86.30 | 7.555 -10 | -9.122 | 1.072 -13 | -12.9697 |
| 620 | 1000.0 | 8.519 | 12.478 | 10.231 | 12.264 | 10.378 | 11.46 | 89.12 | 6.741 | -9.171 | 9.291 -14 | -13.0319 |
| 630 | 1000.0 | 8.383 | 12.410 | 10.112 | 12.247 | 10.373 | 11.11 | 92.16 | 6.036 | -9.219 | 8.068 | -13.0932 |
| 640 | 1000.0 | 8.248 | 12.342 | 9.993 | 12.230 | 10.369 | 10.76 | 95.45 | 5.426 | -9.266 | 7.022 | -13.1535 |
| 650 | 1000.0 | 8.113 | 12.275 | 9.875 | 12.213 | 10.365 | 10.40 | 99.00 | 4.895 | -9.310 | 6.126 | -13.2128 |
| 660 | 1000.0 | 7.978 | 12.207 | 9.757 | 12.196 | 10.361 | 10.05 | 102.81 | 4.433 | -9.353 | 5.358 | -13.2713 |
| 670 | 1000.0 | 7.844 | 12.140 | 9.640 | 12.179 | 10.356 | 9.69 | 106.88 | 4.030 | -9.395 | 4.698 | -13.3281 |
| 680 | 1000.0 | 7.710 | 12.073 | 9.522 | 12.162 | 10.352 | 9.34 | 111.23 | 3.677 | -9.435 | 4.131 | -13.3840 |
| 690 | 1000.0 | 7.576 | 12.007 | 9.405 | 12.146 | 10.348 | 8.99 | 115.83 | 3.367 | -9.473 | 3.642 | -13.4387 |
| 700 | 1000.0 | 7.443 | 11.940 | 9.289 | 12.129 | 10.344 | 8.66 | 120.70 | 3.094 | -9.510 | 3.221 | -13.4920 |
| 710 | 1000.0 | 7.310 | 11.874 | 9.173 | 12.112 | 10.340 | 8.33 | 125.82 | 2.852 -10 | -9.545 | 2.857 -14 | -13.5441 |
| 720 | 1000.0 | 7.178 | 11.807 | 9.057 | 12.096 | 10.335 | 8.01 | 131.18 | 2.639 | -9.579 | 2.542 | -13.5948 |
| 730 | 1000.0 | 7.046 | 11.741 | 8.941 | 12.079 | 10.331 | 7.71 | 136.75 | 2.449 | -9.611 | 2.270 | -13.6440 |
| 740 | 1000.0 | 6.914 | 11.675 | 8.826 | 12.063 | 10.327 | 7.41 | 142.52 | 2.280 | -9.642 | 2.033 | -13.6919 |
| 750 | 1000.0 | 6.783 | 11.610 | 8.711 | 12.046 | 10.323 | 7.14 | 148.45 | 2.128 | -9.672 | 1.827 | -13.7382 |
| 760 | 1000.0 | 6.652 | 11.544 | 8.596 | 12.030 | 10.319 | 6.88 | 154.53 | 1.992 | -9.701 | 1.648 | -13.7831 |
| 770 | 1000.0 | 6.521 | 11.479 | 8.482 | 12.014 | 10.315 | 6.63 | 160.71 | 1.870 | -9.728 | 1.491 | -13.8265 |
| 780 | 1000.0 | 6.391 | 11.414 | 8.368 | 11.997 | 10.311 | 6.40 | 166.96 | 1.759 | -9.755 | 1.354 | -13.8683 |
| 790 | 1000.0 | 6.261 | 11.349 | 8.254 | 11.981 | 10.307 | 6.19 | 173.25 | 1.659 | -9.780 | 1.234 | -13.9087 |
| 800 | 1000.0 | 6.132 | 11.284 | 8.141 | 11.965 | 10.302 | 5.99 | 179.53 | 1.567 | -9.805 | 1.128 | -13.9476 |
| 820 | 1000.0 | 5.874 | 11.155 | 7.915 | 11.933 | 10.294 | 5.63 | 191.97 | 1.407 -10 | -9.852 | 9.527 -15 | -14.0210 |
| 840 | 1000.0 | 5.617 | 11.027 | 7.690 | 11.901 | 10.286 | 5.33 | 204.01 | 1.272 | -9.896 | 8.149 | -14.0889 |
| 860 | 1000.0 | 5.109 | 10.773 | 7.245 | 11.837 | 10.270 | 4.86 | 226.13 | 1.056 | -9.976 | 6.172 | -14.2095 |
| 900 | 1000.0 | 4.856 | 10.647 | 7.024 | 11.805 | 10.262 | 4.68 | 235.96 | 9.686 -11 | -10.014 | 5.455 | -14.2632 |
| 920 | 1000.0 | 4.605 | 10.521 | 6.805 | 11.774 | 10.254 | 4.54 | 244.91 | 8.913 | -10.050 | 4.863 | -14.3131 |
| 940 | 1000.0 | 4.356 | 10.396 | 6.586 | 11.743 | 10.247 | 4.42 | 252.99 | 8.225 | -10.085 | 4.368 | -14.3597 |
| 960 | 1000.0 | 4.108 | 10.272 | 6.369 | 11.712 | 10.239 | 4.32 | 260.25 | 7.608 | -10.119 | 3.949 | -14.4035 |
| 980 | 1000.0 | 3.861 | 10.149 | 6.153 | 11.681 | 10.231 | 4.23 | 266.76 | 7.052 | -10.152 | 3.591 | -14.4448 |
| 1000 | 1000.0 | 3.616 | 10.026 | 5.938 | 11.650 | 10.223 | 4.17 | 272.59 | 6.548 | -10.184 | 3.281 | -14.4840 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.481 - 8 | -7.6089 |
| 125 | 448.9 | 16.576 | 16.681 | 17.328 | 13.444 | | 26.59 | 14.88 | 1.850 | -4.733 | 1.317 | -7.8803 |
| 130 | 531.0 | 16.343 | 16.527 | 17.114 | 13.378 | | 26.31 | 17.82 | 1.362 | -4.866 | 8.115 - 9 | -8.0907 |
| 135 | 602.7 | 16.149 | 16.403 | 16.938 | 13.327 | | 26.05 | 20.46 | 1.049 | -4.979 | 5.451 | -8.2635 |
| 140 | 665.4 | 15.982 | 16.298 | 16.786 | 13.285 | | 25.80 | 22.84 | 8.325 - 6 | -5.080 | 3.882 | -8.4110 |
| 145 | 720.2 | 15.835 | 16.207 | 16.653 | 13.249 | | 25.56 | 24.99 | 6.754 | -5.170 | 2.883 | -8.5401 |
| 150 | 768.1 | 15.702 | 16.126 | 16.533 | 13.219 | | 25.33 | 26.94 | 5.572 | -5.254 | 2.210 | -8.6557 |
| 155 | 809.9 | 15.580 | 16.054 | 16.423 | 13.192 | | 25.10 | 28.71 | 4.655 - 6 | -5.332 | 1.735 - 9 | -8.7606 |
| 160 | 846.5 | 15.466 | 15.988 | 16.322 | 13.168 | | 24.88 | 30.32 | 3.930 | -5.406 | 1.389 | -8.8573 |
| 165 | 878.4 | 15.360 | 15.926 | 16.226 | 13.147 | | 24.66 | 31.79 | 3.346 | -5.476 | 1.129 | -8.9471 |
| 170 | 906.4 | 15.259 | 15.869 | 16.137 | 13.128 | | 24.44 | 33.15 | 2.868 | -5.542 | 9.301 -10 | -9.0315 |
| 175 | 930.8 | 15.163 | 15.815 | 16.051 | 13.110 | | 24.22 | 34.40 | 2.474 | -5.607 | 7.741 | -9.1112 |
| 180 | 952.1 | 15.071 | 15.764 | 15.969 | 13.094 | | 24.00 | 35.56 | 2.144 | -5.669 | 6.501 | -9.1870 |
| 185 | 970.8 | 14.982 | 15.716 | 15.890 | 13.078 | | 23.79 | 36.65 | 1.867 | -5.729 | 5.502 | -9.2595 |
| 190 | 987.0 | 14.896 | 15.669 | 15.814 | 13.064 | | 23.57 | 37.66 | 1.632 | -5.787 | 4.687 | -9.3291 |
| 195 | 1001.3 | 14.812 | 15.624 | 15.740 | 13.050 | | 23.36 | 38.61 | 1.431 | -5.844 | 4.016 | -9.3962 |
| 200 | 1013.7 | 14.730 | 15.580 | 15.667 | 13.038 | | 23.14 | 39.51 | 1.259 | -5.900 | 3.458 | -9.4612 |
| 205 | 1024.6 | 14.650 | 15.538 | 15.596 | 13.025 | | 22.93 | 40.37 | 1.111 - 6 | -5.954 | 2.991 -10 | -9.5242 |
| 210 | 1034.1 | 14.571 | 15.497 | 15.527 | 13.013 | | 22.72 | 41.18 | 9.830 - 7 | -6.007 | 2.597 | -9.5854 |
| 215 | 1042.4 | 14.494 | 15.456 | 15.459 | 13.002 | | 22.51 | 41.97 | 8.716 | -6.060 | 2.264 | -9.6452 |
| 220 | 1049.7 | 14.417 | 15.417 | 15.392 | 12.991 | | 22.30 | 42.72 | 7.746 | -6.111 | 1.979 | -9.7035 |
| 225 | 1056.0 | 14.342 | 15.378 | 15.326 | 12.980 | | 22.09 | 43.45 | 6.897 | -6.161 | 1.735 | -9.7606 |
| 230 | 1061.6 | 14.268 | 15.339 | 15.260 | 12.970 | | 21.89 | 44.15 | 6.153 | -6.211 | 1.526 | -9.8165 |
| 235 | 1066.4 | 14.194 | 15.301 | 15.195 | 12.960 | | 21.68 | 44.84 | 5.499 | -6.260 | 1.345 | -9.8714 |
| 240 | 1070.6 | 14.121 | 15.264 | 15.131 | 12.950 | | 21.48 | 45.51 | 4.923 | -6.308 | 1.188 | -9.9252 |
| 245 | 1074.3 | 14.049 | 15.227 | 15.068 | 12.940 | | 21.28 | 46.16 | 4.414 | -6.355 | 1.052 | -9.9781 |
| 250 | 1077.6 | 13.977 | 15.191 | 15.005 | 12.930 | | 21.09 | 46.80 | 3.964 | -6.402 | 9.329 -11 | -10.0302 |
| 255 | 1080.4 | 13.905 | 15.154 | 14.942 | 12.921 | | 20.89 | 47.43 | 3.565 - 7 | -6.448 | 8.291 -11 | -10.0814 |
| 260 | 1082.9 | 13.834 | 15.118 | 14.880 | 12.911 | | 20.70 | 48.05 | 3.210 | -6.493 | 7.382 | -10.1318 |
| 265 | 1085.0 | 13.764 | 15.083 | 14.818 | 12.902 | | 20.52 | 48.65 | 2.895 | -6.538 | 6.584 | -10.1815 |
| 270 | 1086.9 | 13.693 | 15.047 | 14.756 | 12.893 | | 20.33 | 49.25 | 2.614 | -6.583 | 5.881 | -10.2305 |
| 275 | 1088.6 | 13.624 | 15.012 | 14.695 | 12.884 | | 20.15 | 49.84 | 2.363 | -6.627 | 5.261 | -10.2789 |
| 280 | 1090.0 | 13.554 | 14.977 | 14.634 | 12.875 | | 19.98 | 50.43 | 2.139 | -6.670 | 4.714 | -10.3266 |
| 285 | 1091.3 | 13.484 | 14.942 | 14.573 | 12.866 | | 19.80 | 51.00 | 1.938 | -6.713 | 4.230 | -10.3737 |
| 290 | 1092.4 | 13.415 | 14.907 | 14.512 | 12.857 | | 19.64 | 51.57 | 1.758 | -6.755 | 3.801 | -10.4202 |
| 295 | 1093.3 | 13.346 | 14.872 | 14.452 | 12.848 | | 19.47 | 52.13 | 1.596 | -6.797 | 3.419 | -10.4661 |
| 300 | 1094.2 | 13.278 | 14.838 | 14.392 | 12.840 | | 19.31 | 52.68 | 1.451 | -6.838 | 3.080 | -10.5114 |
| 310 | 1095.5 | 13.141 | 14.769 | 14.272 | 12.822 | | 19.00 | 53.76 | 1.202 - 7 | -6.920 | 2.509 -11 | -10.6006 |
| 320 | 1096.6 | 13.005 | 14.701 | 14.153 | 12.805 | | 18.71 | 54.81 | 1.000 | -7.000 | 2.053 | -10.6877 |
| 330 | 1097.4 | 12.869 | 14.633 | 14.034 | 12.788 | | 18.44 | 55.84 | 8.348 - 8 | -7.078 | 1.687 | -10.7729 |
| 340 | 1098.0 | 12.734 | 14.565 | 13.916 | 12.771 | | 18.18 | 56.83 | 6.990 | -7.156 | 1.392 | -10.8564 |
| 350 | 1098.5 | 12.600 | 14.498 | 13.798 | 12.754 | | 17.94 | 57.80 | 5.871 | -7.231 | 1.153 | -10.9382 |
| 360 | 1098.8 | 12.466 | 14.431 | 13.681 | 12.737 | | 17.71 | 58.74 | 4.945 | -7.306 | 9.585 -12 | -11.0184 |
| 370 | 1099.1 | 12.332 | 14.364 | 13.566 | 12.720 | | 17.49 | 59.65 | 4.176 | -7.379 | 7.995 | -11.0972 |
| 380 | 1099.3 | 12.199 | 14.297 | 13.447 | 12.704 | | 17.29 | 60.54 | 3.536 | -7.451 | 6.690 | -11.1746 |
| 390 | 1099.5 | 12.067 | 14.231 | 13.331 | 12.687 | | 17.10 | 61.41 | 3.00 | -7.523 | 5.614 | -11.2507 |
| 400 | 1099.6 | 11.934 | 14.165 | 13.216 | 12.670 | | 16.92 | 62.25 | 2.551 | -7.593 | 4.725 | -11.3256 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_3)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1099.7 | 11.803 | 14.099 | 13.100 | 12.654 | | 16.75 | 63.09 | 2.177 - 8 | -7.662 | 3.987 -12 | -11.3994 |
| 420 | 1099.8 | 11.671 | 14.033 | 12.985 | 12.638 | | 16.58 | 63.91 | 1.859 | -7.731 | 3.372 | -11.4721 |
| 430 | 1099.8 | 11.540 | 13.968 | 12.871 | 12.621 | | 16.42 | 64.72 | 1.592 | -7.798 | 2.858 | -11.5439 |
| 440 | 1099.9 | 11.410 | 13.903 | 12.756 | 12.605 | | 16.27 | 65.53 | 1.365 | -7.865 | 2.428 | -11.6147 |
| 450 | 1099.9 | 11.280 | 13.837 | 12.642 | 12.588 | | 16.12 | 66.34 | 1.173 | -7.931 | 2.067 | -11.6846 |
| 460 | 1099.9 | 11.150 | 13.773 | 12.529 | 12.572 | | 15.97 | 67.17 | 1.010 | -7.996 | 1.763 | -11.7537 |
| 470 | 1099.9 | 11.020 | 13.708 | 12.415 | 12.556 | | 15.82 | 68.00 | 8.709 - 9 | -8.060 | 1.506 | -11.8221 |
| 480 | 1100.0 | 10.891 | 13.643 | 12.302 | 12.540 | | 15.67 | 68.85 | 7.525 | -8.123 | 1.289 | -11.8897 |
| 490 | 1100.0 | 10.763 | 13.579 | 12.190 | 12.524 | | 15.52 | 69.73 | 6.514 | -8.186 | 1.105 | -11.9566 |
| 500 | 1100.0 | 10.634 | 13.515 | 12.077 | 12.508 | 10.175 | 15.36 | 70.64 | 5.649 | -8.248 | 9.487 -13 | -12.0229 |
| 510 | 1100.0 | 10.507 | 13.451 | 11.966 | 12.492 | 10.171 | 15.20 | 71.59 | 4.908 - 9 | -8.309 | 8.157 -13 | -12.0885 |
| 520 | 1100.0 | 10.379 | 13.387 | 11.854 | 12.476 | 10.167 | 15.03 | 72.59 | 4.272 | -8.369 | 7.023 | -12.1535 |
| 530 | 1100.0 | 10.252 | 13.324 | 11.743 | 12.460 | 10.163 | 14.86 | 73.65 | 3.726 | -8.429 | 6.055 | -12.2179 |
| 540 | 1100.0 | 10.125 | 13.260 | 11.632 | 12.444 | 10.159 | 14.68 | 74.76 | 3.256 | -8.487 | 5.228 | -12.2817 |
| 550 | 1100.0 | 9.999 | 13.197 | 11.521 | 12.428 | 10.155 | 14.50 | 75.95 | 2.851 | -8.545 | 4.520 | -12.3449 |
| 560 | 1100.0 | 9.873 | 13.134 | 11.411 | 12.412 | 10.151 | 14.30 | 77.22 | 2.502 | -8.602 | 3.912 | -12.4076 |
| 570 | 1100.0 | 9.747 | 13.071 | 11.301 | 12.397 | 10.147 | 14.09 | 78.58 | 2.203 | -8.657 | 3.391 | -12.4698 |
| 580 | 1100.0 | 9.622 | 13.009 | 11.191 | 12.381 | 10.143 | 13.88 | 80.03 | 1.940 | -8.712 | 2.944 | -12.5311 |
| 590 | 1100.0 | 9.497 | 12.946 | 11.081 | 12.365 | 10.139 | 13.65 | 81.60 | 1.714 | -8.766 | 2.558 | -12.5921 |
| 600 | 1100.0 | 9.372 | 12.884 | 10.972 | 12.350 | 10.135 | 13.41 | 83.29 | 1.518 | -8.819 | 2.226 | -12.6524 |
| 610 | 1100.0 | 9.248 | 12.822 | 10.864 | 12.334 | 10.131 | 13.16 | 85.11 | 1.348 - 9 | -8.870 | 1.940 -13 | -12.7121 |
| 620 | 1100.0 | 9.124 | 12.760 | 10.755 | 12.319 | 10.127 | 12.90 | 87.08 | 1.200 | -8.921 | 1.693 | -12.7712 |
| 630 | 1100.0 | 9.000 | 12.698 | 10.647 | 12.303 | 10.123 | 12.63 | 89.20 | 1.072 | -8.970 | 1.480 | -12.8297 |
| 640 | 1100.0 | 8.877 | 12.636 | 10.539 | 12.288 | 10.119 | 12.35 | 91.48 | 9.594 -10 | -9.018 | 1.296 | -12.8876 |
| 650 | 1100.0 | 8.754 | 12.575 | 10.432 | 12.273 | 10.115 | 12.06 | 93.94 | 8.612 | -9.065 | 1.136 | -12.9447 |
| 660 | 1100.0 | 8.632 | 12.514 | 10.324 | 12.257 | 10.111 | 11.76 | 96.59 | 7.754 | -9.110 | 9.974 -14 | -13.0011 |
| 670 | 1100.0 | 8.510 | 12.453 | 10.218 | 12.242 | 10.108 | 11.46 | 99.44 | 7.002 | -9.155 | 8.773 | -13.0568 |
| 680 | 1100.0 | 8.388 | 12.392 | 10.111 | 12.227 | 10.104 | 11.15 | 102.50 | 6.342 | -9.198 | 7.7[illegible] | -13.1118 |
| 690 | 1100.0 | 8.267 | 12.331 | 10.005 | 12.212 | 10.100 | 10.83 | 105.78 | 5.761 | -9.240 | 6.[illegible] | -13.1659 |
| 700 | 1100.0 | 8.146 | 12.270 | 9.899 | 12.196 | 10.096 | 10.52 | 109.28 | 5.249 | -9.280 | 6.[illegible] | -13.2192 |
| 710 | 1100.0 | 8.025 | 12.210 | 9.793 | 12.181 | 10.092 | 10.20 | 113.01 | 4.797 -10 | -9.319 | 5.350 -14 | -13.2717 |
| 720 | 1100.0 | 7.904 | 12.150 | 9.688 | 12.166 | 10.089 | 9.88 | 116.97 | 4.398 | -9.357 | 4.751 | -13.3232 |
| 730 | 1100.0 | 7.784 | 12.090 | 9.582 | 12.151 | 10.085 | 9.57 | 121.18 | 4.043 | -9.393 | 4.229 | -13.3738 |
| 740 | 1100.0 | 7.665 | 12.030 | 9.478 | 12.136 | 10.081 | 9.25 | 125.62 | 3.728 | -9.428 | 3.772 | -13.4234 |
| 750 | 1100.0 | 7.545 | 11.970 | 9.373 | 12.121 | 10.077 | 8.95 | 130.29 | 3.448 | -9.462 | 3.373 | -13.4720 |
| 760 | 1100.0 | 7.426 | 11.911 | 9.269 | 12.106 | 10.073 | 8.65 | 135.20 | 3.198 | -9.495 | 3.023 | -13.5195 |
| 770 | 1100.0 | 7.307 | 11.851 | 9.165 | 12.092 | 10.070 | 8.35 | 140.32 | 2.974 | -9.527 | 2.716 | -13.5660 |
| 780 | 1100.0 | 7.189 | 11.792 | 9.061 | 12.077 | 10.066 | 8.07 | 145.65 | 2.773 | -9.557 | 2.447 | -13.6114 |
| 790 | 1100.0 | 7.071 | 11.733 | 8.958 | 12.062 | 10.062 | 7.80 | 151.18 | 2.592 | -9.586 | 2.210 | -13.6556 |
| 800 | 1100.0 | 6.953 | 11.674 | 8.855 | 12.047 | 10.059 | 7.54 | 156.88 | 2.429 | -9.615 | 2.001 | -13.6987 |
| 820 | 1100.0 | 6.719 | 11.557 | 8.650 | 12.018 | 10.051 | 7.05 | 168.73 | 2.148 -10 | -9.668 | 1.655 -14 | -13.7813 |
| 840 | 1100.0 | 6.486 | 11.441 | 8.445 | 11.989 | 10.044 | 6.60 | 181.01 | 1.916 | -9.718 | 1.383 | -13.8590 |
| 860 | 1100.0 | 6.023 | 11.209 | 8.041 | 11.931 | 10.029 | 5.87 | 205.99 | 1.558 | -9.808 | 9.994 -15 | -14.0003 |
| 900 | 1100.0 | 5.794 | 11.095 | 7.840 | 11.902 | 10.022 | 5.57 | 218.25 | 1.418 | -9.848 | 8.631 | -14.0639 |
| 920 | 1100.0 | 5.566 | 10.981 | 7.640 | 11.874 | 10.015 | 5.31 | 230.09 | 1.297 | -9.887 | 7.529 | -14.1232 |
| 940 | 1100.0 | 5.339 | 10.867 | 7.442 | 11.845 | 10.008 | 5.09 | 241.36 | 1.191 | -9.924 | 6.630 | -14.1785 |
| 960 | 1100.0 | 5.113 | 10.754 | 7.244 | 11.817 | 10.001 | 4.90 | 251.95 | 1.098 | -9.959 | 5.889 | -14.2299 |
| 980 | 1100.0 | 4.889 | 10.642 | 7.048 | 11.789 | 9.994 | 4.75 | 261.78 | 1.016 | -9.993 | 5.272 | -14.2780 |
| 1000 | 1100.0 | 4.666 | 10.531 | 6.852 | 11.761 | 9.987 | 4.61 | 270.83 | 9.425 -11 | -10.026 | 4.753 | -14.3230 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1300° K

| Altitude Z, km | Temp. T, °K | Number density $m^{-3}$ | | | | | Molecular weight M | Scale height $H_p$, km | Pressure P, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log n($O_2$) | log n(O) | log n($N_2$) | log n(He) | log n(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 461.3 | 16.567 | 16.670 | 17.319 | 13.437 | | 26.59 | 15.29 | 1.859 | -4.731 | 1.289 | -7.8897 |
| 130 | 555.6 | 16.332 | 16.512 | 17.102 | 13.367 | | 26.32 | 18.63 | 1.384 | -4.859 | 7.886 - 9 | -8.1031 |
| 135 | 639.3 | 16.139 | 16.385 | 16.926 | 13.313 | | 26.08 | 21.68 | 1.080 | -4.967 | 5.297 | -8.2759 |
| 140 | 713.5 | 15.975 | 16.279 | 16.776 | 13.269 | | 25.85 | 24.45 | 8.693 - 6 | -5.061 | 3.787 | -8.4217 |
| 145 | 779.5 | 15.832 | 16.188 | 16.646 | 13.232 | | 25.63 | 26.98 | 7.157 | -5.145 | 2.830 | -8.5482 |
| 150 | 838.0 | 15.704 | 16.109 | 16.530 | 13.200 | | 25.42 | 29.29 | 5.991 | -5.222 | 2.186 | -8.6604 |
| 155 | 890.0 | 15.587 | 16.037 | 16.425 | 13.173 | | 25.21 | 31.40 | 5.081 - 6 | -5.294 | 1.731 - 9 | -8.7618 |
| 160 | 936.1 | 15.480 | 15.973 | 16.328 | 13.149 | | 25.01 | 33.34 | 4.354 | -5.361 | 1.399 | -8.8540 |
| 165 | 977.0 | 15.380 | 15.913 | 16.238 | 13.127 | | 24.82 | 35.13 | 3.763 | -5.424 | 1.150 | -8.9396 |
| 170 | 1013.3 | 15.286 | 15.858 | 16.154 | 13.107 | | 24.63 | 36.78 | 3.274 | -5.485 | 9.571 -10 | -9.0191 |
| 175 | 1045.5 | 15.197 | 15.807 | 16.074 | 13.089 | | 24.43 | 38.30 | 2.866 | -5.543 | 8.056 | -9.0939 |
| 180 | 1074.1 | 15.112 | 15.759 | 15.998 | 13.073 | | 24.25 | 39.72 | 2.521 | -5.598 | 6.845 | -9.1646 |
| 185 | 1099.5 | 15.030 | 15.713 | 15.926 | 13.058 | | 24.06 | 41.03 | 2.228 | -5.652 | 5.863 | -9.2319 |
| 190 | 1122.1 | 14.952 | 15.669 | 15.856 | 13.044 | | 23.87 | 42.27 | 1.976 | -5.704 | 5.056 | -9.2962 |
| 195 | 1142.1 | 14.876 | 15.628 | 15.789 | 13.030 | | 23.69 | 43.42 | 1.758 | -5.755 | 4.386 | -9.3579 |
| 200 | 1159.8 | 14.802 | 15.587 | 15.723 | 13.018 | | 23.51 | 44.51 | 1.569 | -5.804 | 3.825 | -9.4174 |
| 205 | 1175.6 | 14.730 | 15.549 | 15.660 | 13.006 | | 23.32 | 45.52 | 1.404 - 6 | -5.853 | 3.351 -10 | -9.4749 |
| 210 | 1189.6 | 14.660 | 15.511 | 15.598 | 12.995 | | 23.14 | 46.51 | 1.260 | -5.900 | 2.947 | -9.5306 |
| 215 | 1202.0 | 14.592 | 15.474 | 15.537 | 12.984 | | 22.96 | 47.44 | 1.133 | -5.946 | 2.602 | -9.5847 |
| 220 | 1213.0 | 14.524 | 15.439 | 15.478 | 12.973 | | 22.78 | 48.32 | 1.020 | -5.991 | 2.305 | -9.6374 |
| 225 | 1222.9 | 14.458 | 15.404 | 15.419 | 12.963 | | 22.60 | 49.17 | 9.208 - 7 | -6.036 | 2.047 | -9.6889 |
| 230 | 1231.5 | 14.393 | 15.370 | 15.362 | 12.954 | | 22.43 | 49.99 | 8.324 | -6.080 | 1.823 | -9.7392 |
| 235 | 1239.2 | 14.328 | 15.336 | 15.305 | 12.944 | | 22.25 | 50.78 | 7.538 | -6.123 | 1.628 | -9.7886 |
| 240 | 1246.0 | 14.265 | 15.303 | 15.249 | 12.935 | | 22.07 | 51.54 | 6.836 | -6.165 | 1.457 | -9.8367 |
| 245 | 1252.1 | 14.202 | 15.270 | 15.193 | 12.926 | | 21.90 | 52.28 | 6.209 | -6.207 | 1.306 | -9.8840 |
| 250 | 1257.5 | 14.139 | 15.238 | 15.139 | 12.917 | | 21.73 | 53.00 | 5.646 | -6.248 | 1.173 | -9.9306 |
| 255 | 1262.3 | 14.077 | 15.206 | 15.084 | 12.909 | | 21.56 | 53.71 | 5.141 - 7 | -6.289 | 1.056 -10 | -9.9763 |
| 260 | 1266.5 | 14.016 | 15.175 | 15.030 | 12.900 | | 21.39 | 54.39 | 4.687 | -6.329 | 9.520 -11 | -10.0214 |
| 265 | 1270.3 | 13.955 | 15.144 | 14.977 | 12.892 | | 21.22 | 55.07 | 4.278 | -6.369 | 8.595 | -10.0657 |
| 270 | 1273.6 | 13.895 | 15.113 | 14.924 | 12.884 | | 21.06 | 55.73 | 3.908 | -6.408 | 7.772 | -10.1095 |
| 275 | 1276.6 | 13.835 | 15.083 | 14.871 | 12.876 | | 20.89 | 56.38 | 3.575 | -6.447 | 7.037 | -10.1526 |
| 280 | 1279.2 | 13.775 | 15.052 | 14.819 | 12.868 | | 20.73 | 57.02 | 3.273 | -6.485 | 6.381 | -10.1951 |
| 285 | 1281.5 | 13.715 | 15.022 | 14.766 | 12.860 | | 20.58 | 57.65 | 3.000 | -6.523 | 5.793 | -10.2371 |
| 290 | 1283.6 | 13.656 | 14.992 | 14.715 | 12.853 | | 20.42 | 58.27 | 2.752 | -6.560 | 5.265 | -10.2786 |
| 295 | 1285.5 | 13.597 | 14.962 | 14.663 | 12.845 | | 20.27 | 58.88 | 2.527 | -6.597 | 4.791 | -10.3195 |
| 300 | 1287.1 | 13.538 | 14.933 | 14.611 | 12.837 | | 20.12 | 59.49 | 2.322 | -6.634 | 4.365 | -10.3600 |
| 310 | 1289.8 | 13.422 | 14.874 | 14.509 | 12.822 | | 19.82 | 60.68 | 1.966 - 7 | -6.706 | 3.634 -11 | -10.4396 |
| 320 | 1292.0 | 13.306 | 14.816 | 14.407 | 12.807 | | 19.54 | 61.84 | 1.670 | -6.777 | 3.038 | -10.5174 |
| 330 | 1293.7 | 13.190 | 14.758 | 14.306 | 12.793 | | 19.27 | 62.98 | 1.423 | -6.847 | 2.549 | -10.5936 |
| 340 | 1295.0 | 13.076 | 14.700 | 14.206 | 12.778 | | 19.01 | 64.09 | 1.215 | -6.915 | 2.146 | -10.6683 |
| 350 | 1296.1 | 12.962 | 14.643 | 14.106 | 12.764 | | 18.77 | 65.18 | 1.041 | -6.982 | 1.813 | -10.7415 |
| 360 | 1296.9 | 12.848 | 14.586 | 14.006 | 12.749 | | 18.53 | 66.25 | 8.943 - 8 | -7.049 | 1.537 | -10.8134 |
| 370 | 1297.6 | 12.735 | 14.529 | 13.907 | 12.735 | | 18.31 | 67.29 | 7.699 | -7.114 | 1.306 | -10.8839 |
| 380 | 1298.1 | 12.622 | 14.473 | 13.808 | 12.721 | | 18.09 | 68.31 | 6.643 | -7.178 | 1.114 | -10.9532 |
| 390 | 1298.5 | 12.509 | 14.416 | 13.710 | 12.707 | | 17.89 | 69.31 | 5.745 | -7.241 | 9.521 -12 | -11.0213 |
| 400 | 1298.8 | 12.397 | 14.360 | 13.612 | 12.693 | | 17.70 | 70.28 | 4.978 | -7.303 | 8.160 | -11.0883 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1299.1 | 12.286 | 14.305 | 13.514 | 12.679 | | 17.52 | 71.24 | 4.322 - 8 | -7.364 | 7.010 -12 | -11.1543 |
| 420 | 1299.3 | 12.175 | 14.249 | 13.417 | 12.665 | | 17.35 | 72.18 | 3.759 | -7.425 | 6.036 | -11.2192 |
| 430 | 1299.4 | 12.064 | 14.193 | 13.320 | 12.651 | | 17.18 | 73.09 | 3.276 | -7.485 | 5.209 | -11.2832 |
| 440 | 1299.5 | 11.953 | 14.138 | 13.223 | 12.637 | | 17.02 | 74.00 | 2.859 | -7.544 | 4.505 | -11.3463 |
| 450 | 1299.6 | 11.843 | 14.083 | 13.127 | 12.623 | | 16.87 | 74.89 | 2.500 | -7.602 | 3.903 | -11.4086 |
| 460 | 1299.7 | 11.733 | 14.028 | 13.030 | 12.609 | | 16.73 | 75.76 | 2.189 | -7.660 | 3.388 | -11.4700 |
| 470 | 1299.8 | 11.624 | 13.973 | 12.934 | 12.596 | | 16.59 | 76.63 | 1.920 | -7.717 | 2.946 | -11.5307 |
| 480 | 1299.8 | 11.514 | 13.919 | 12.839 | 12.582 | | 16.45 | 77.50 | 1.686 | -7.773 | 2.567 | -11.5907 |
| 490 | 1299.9 | 11.406 | 13.864 | 12.744 | 12.568 | | 16.32 | 78.36 | 1.483 | -7.829 | 2.239 | -11.6499 |
| 500 | 1299.9 | 11.297 | 13.810 | 12.649 | 12.555 | 9.772 | 16.19 | 79.22 | 1.306 | -7.884 | 1.956 | -11.7085 |
| 510 | 1299.9 | 11.189 | 13.756 | 12.554 | 12.541 | 9.769 | 16.06 | 80.09 | 1.152 - 8 | -7.938 | 1.712 -12 | -11.7665 |
| 520 | 1299.9 | 11.081 | 13.702 | 12.459 | 12.528 | 9.766 | 15.93 | 80.97 | 1.018 | -7.992 | 1.500 | -11.8239 |
| 530 | 1299.9 | 10.973 | 13.648 | 12.365 | 12.514 | 9.762 | 15.80 | 81.86 | 9.001 - 9 | -8.046 | 1.316 | -11.8808 |
| 540 | 1300.0 | 10.866 | 13.594 | 12.271 | 12.501 | 9.759 | 15.67 | 82.77 | 7.971 | -8.098 | 1.156 | -11.9371 |
| 550 | 1300.0 | 10.759 | 13.541 | 12.178 | 12.487 | 9.755 | 15.54 | 83.71 | 7.069 | -8.151 | 1.017 | -11.9928 |
| 560 | 1300.0 | 10.652 | 13.488 | 12.084 | 12.474 | 9.752 | 15.41 | 84.66 | 6.277 | -8.202 | 8.951 -13 | -12.0481 |
| 570 | 1300.0 | 10.546 | 13.434 | 11.991 | 12.461 | 9.749 | 15.28 | 85.65 | 5.582 | -8.253 | 7.890 | -12.1029 |
| 580 | 1300.0 | 10.440 | 13.381 | 11.898 | 12.448 | 9.745 | 15.14 | 86.68 | 4.970 | -8.304 | 6.962 | -12.1572 |
| 590 | 1300.0 | 10.334 | 13.329 | 11.806 | 12.434 | 9.742 | 15.00 | 87.75 | 4.432 | -8.353 | 6.150 | -12.2111 |
| 600 | 1300.0 | 10.229 | 13.276 | 11.713 | 12.421 | 9.739 | 14.85 | 88.86 | 3.957 | -8.403 | 5.438 | -12.2645 |
| 610 | 1300.0 | 10.124 | 13.223 | 11.621 | 12.408 | 9.735 | 14.70 | 90.03 | 3.538 - 9 | -8.451 | 4.814 -13 | -12.3175 |
| 620 | 1300.0 | 10.019 | 13.171 | 11.530 | 12.395 | 9.732 | 14.55 | 91.26 | 3.169 | -8.499 | 4.265 | -12.3701 |
| 630 | 1300.0 | 9.914 | 13.119 | 11.438 | 12.382 | 9.729 | 14.39 | 92.55 | 2.842 | -8.546 | 3.783 | -12.4222 |
| 640 | 1300.0 | 9.810 | 13.067 | 11.347 | 12.369 | 9.725 | 14.22 | 93.92 | 2.553 | -8.593 | 3.358 | -12.4739 |
| 650 | 1300.0 | 9.706 | 13.015 | 11.256 | 12.356 | 9.722 | 14.04 | 95.36 | 2.297 | -8.639 | 2.984 | -12.5252 |
| 660 | 1300.0 | 9.603 | 12.963 | 11.165 | 12.343 | 9.719 | 13.86 | 96.89 | 2.070 | -8.684 | 2.655 | -12.5760 |
| 670 | 1300.0 | 9.499 | 12.911 | 11.075 | 12.330 | 9.716 | 13.67 | 98.51 | 1.869 | -8.728 | 2.364 | -12.6264 |
| 680 | 1300.0 | 9.396 | 12.860 | 10.984 | 12.317 | 9.712 | 13.47 | 100.23 | 1.690 | -8.772 | 2.107 | -12.6764 |
| 690 | 1300.0 | 9.293 | 12.808 | 10.895 | 12.304 | 9.709 | 13.27 | 102.06 | 1.531 | -8.815 | 1.879 | -12.7260 |
| 700 | 1300.0 | 9.191 | 12.757 | 10.805 | 12.291 | 9.706 | 13.06 | 104.00 | 1.389 | -8.857 | 1.678 | -12.7751 |
| 710 | 1300.0 | 9.089 | 12.706 | 10.715 | 12.279 | 9.703 | 12.84 | 106.05 | 1.263 - 9 | -8.899 | 1.501 -13 | -12.8238 |
| 720 | 1300.0 | 8.987 | 12.655 | 10.626 | 12.266 | 9.700 | 12.62 | 108.26 | 1.150 | -8.939 | 1.343 | -12.8720 |
| 730 | 1300.0 | 8.885 | 12.604 | 10.537 | 12.253 | 9.696 | 12.39 | 110.59 | 1.050 | -8.979 | 1.203 | -12.9197 |
| 740 | 1300.0 | 8.784 | 12.553 | 10.449 | 12.240 | 9.693 | 12.15 | 113.07 | 9.600 -10 | -9.018 | 1.079 | -12.9669 |
| 750 | 1300.0 | 8.683 | 12.503 | 10.360 | 12.228 | 9.690 | 11.91 | 115.70 | 8.797 | -9.056 | 9.691 -14 | -13.0137 |
| 760 | 1300.0 | 8.582 | 12.453 | 10.272 | 12.215 | 9.687 | 11.66 | 118.49 | 8.076 | -9.093 | 8.712 | -13.0599 |
| 770 | 1300.0 | 8.482 | 12.402 | 10.184 | 12.203 | 9.684 | 11.41 | 121.44 | 7.430 | -9.129 | 7.842 | -13.1056 |
| 780 | 1300.0 | 8.382 | 12.352 | 10.096 | 12.190 | 9.680 | 11.15 | 124.57 | 6.850 | -9.164 | 7.068 | -13.1507 |
| 790 | 1300.0 | 8.282 | 12.302 | 10.009 | 12.178 | 9.677 | 10.89 | 127.88 | 6.328 | -9.199 | 6.378 | -13.1953 |
| 800 | 1300.0 | 8.182 | 12.253 | 9.922 | 12.165 | 9.674 | 10.63 | 131.37 | 5.858 | -9.232 | 5.764 | -13.2393 |
| 820 | 1300.0 | 7.984 | 12.153 | 9.748 | 12.140 | 9.668 | 10.11 | 138.93 | 5.052 -10 | -9.297 | 4.727 -14 | -13.3255 |
| 840 | 1300.0 | 7.787 | 12.055 | 9.575 | 12.116 | 9.662 | 9.59 | 147.26 | 4.393 | -9.357 | 3.899 | -13.4091 |
| 860 | 1300.0 | 7.395 | 11.859 | 9.233 | 12.067 | 9.649 | 8.59 | 166.22 | 3.401 | -9.468 | 2.704 | -13.5680 |
| 900 | 1300.0 | 7.201 | 11.762 | 9.063 | 12.042 | 9.643 | 8.12 | 176.80 | 3.026 | -9.519 | 2.275 | -13.6431 |
| 920 | 1300.0 | 7.008 | 11.666 | 8.894 | 12.018 | 9.637 | 7.68 | 188.01 | 2.712 | -9.567 | 1.927 | -13.7150 |
| 940 | 1300.0 | 6.816 | 11.570 | 8.726 | 11.994 | 9.631 | 7.27 | 199.76 | 2.446 | -9.612 | 1.645 | -13.7838 |
| 960 | 1300.0 | 6.625 | 11.474 | 8.559 | 11.970 | 9.625 | 6.89 | 211.94 | 2.219 | -9.654 | 1.415 | -13.8493 |
| 980 | 1300.0 | 6.436 | 11.379 | 8.393 | 11.947 | 9.619 | 6.54 | 224.39 | 2.025 | -9.694 | 1.226 | -13.9116 |
| 1000 | 1300.0 | 6.247 | 11.285 | 8.227 | 11.923 | 9.613 | 6.23 | 236.99 | 1.857 | -9.731 | 1.070 | -13.9706 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1500° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 466.4 | 16.564 | 16.666 | 17.315 | 13.434 | | 26.59 | 15.46 | 1.863 | -4.730 | 1.278 | -7.8936 |
| 130 | 566.9 | 16.326 | 16.505 | 17.096 | 13.362 | | 26.33 | 19.01 | 1.393 | -4.856 | 7.781 - 9 | -8.1090 |
| 135 | 657.7 | 16.133 | 16.376 | 16.919 | 13.306 | | 26.09 | 22.29 | 1.093 | -4.961 | 5.216 | -8.2827 |
| 140 | 739.6 | 15.970 | 16.269 | 16.770 | 13.260 | | 25.87 | 25.32 | 8.861 - 6 | -5.053 | 3.727 | -8.4286 |
| 145 | 813.6 | 15.827 | 16.177 | 16.640 | 13.222 | | 25.66 | 28.13 | 7.349 | -5.134 | 2.787 | -8.5548 |
| 150 | 880.4 | 15.701 | 16.096 | 16.525 | 13.189 | | 25.46 | 30.72 | 6.200 | -5.208 | 2.156 | -8.6663 |
| 155 | 940.6 | 15.586 | 16.025 | 16.421 | 13.161 | | 25.27 | 33.12 | 5.301 - 6 | -5.276 | 1.713 - 9 | -8.7663 |
| 160 | 995.0 | 15.481 | 15.960 | 16.326 | 13.136 | | 25.08 | 35.35 | 4.581 | -5.339 | 1.389 | -8.8574 |
| 165 | 1044.2 | 15.384 | 15.901 | 16.238 | 13.113 | | 24.90 | 37.43 | 3.993 | -5.399 | 1.145 | -8.9411 |
| 170 | 1088.5 | 15.293 | 15.846 | 16.156 | 13.093 | | 24.72 | 39.36 | 3.505 | -5.455 | 9.575 -10 | -9.0189 |
| 175 | 1128.5 | 15.207 | 15.796 | 16.079 | 13.074 | | 24.55 | 41.16 | 3.096 | -5.509 | 8.099 | -9.0916 |
| 180 | 1164.7 | 15.126 | 15.748 | 16.006 | 13.057 | | 24.37 | 42.84 | 2.749 | -5.561 | 6.918 | -9.1600 |
| 185 | 1197.3 | 15.048 | 15.703 | 15.937 | 13.042 | | 24.20 | 44.42 | 2.451 | -5.611 | 5.959 | -9.2248 |
| 190 | 1226.7 | 14.974 | 15.661 | 15.871 | 13.027 | | 24.04 | 45.90 | 2.194 | -5.659 | 5.171 | -9.2865 |
| 195 | 1253.3 | 14.902 | 15.621 | 15.807 | 13.014 | | 23.87 | 47.29 | 1.971 | -5.705 | 4.515 | -9.3454 |
| 200 | 1277.3 | 14.833 | 15.582 | 15.745 | 13.001 | | 23.70 | 48.60 | 1.776 | -5.751 | 3.964 | -9.4019 |
| 205 | 1299.0 | 14.766 | 15.545 | 15.686 | 12.989 | | 23.54 | 49.85 | 1.604 - 6 | -5.795 | 3.497 -10 | -9.4563 |
| 210 | 1318.5 | 14.701 | 15.509 | 15.628 | 12.977 | | 23.38 | 51.03 | 1.453 | -5.838 | 3.098 | -9.5089 |
| 215 | 1336.2 | 14.637 | 15.474 | 15.571 | 12.967 | | 23.22 | 52.15 | 1.319 | -5.880 | 2.756 | -9.5597 |
| 220 | 1352.1 | 14.575 | 15.440 | 15.516 | 12.956 | | 23.06 | 53.22 | 1.199 | -5.921 | 2.460 | -9.6091 |
| 225 | 1366.5 | 14.514 | 15.408 | 15.462 | 12.946 | | 22.90 | 54.24 | 1.093 | -5.961 | 2.202 | -9.6571 |
| 230 | 1379.5 | 14.455 | 15.376 | 15.410 | 12.937 | | 22.74 | 55.22 | 9.974 - 7 | -6.001 | 1.977 | -9.7039 |
| 235 | 1391.2 | 14.396 | 15.345 | 15.358 | 12.928 | | 22.58 | 56.16 | 9.117 | -6.040 | 1.780 | -9.7496 |
| 240 | 1401.8 | 14.338 | 15.314 | 15.307 | 12.919 | | 22.43 | 57.07 | 8.347 | -6.078 | 1.606 | -9.7942 |
| 245 | 1411.3 | 14.281 | 15.284 | 15.256 | 12.910 | | 22.27 | 57.94 | 7.652 | -6.116 | 1.452 | -9.8379 |
| 250 | 1420.0 | 14.225 | 15.255 | 15.207 | 12.902 | | 22.12 | 58.79 | 7.023 | -6.153 | 1.316 | -9.8808 |
| 255 | 1427.8 | 14.169 | 15.226 | 15.158 | 12.894 | | 21.97 | 59.61 | 6.455 - 7 | -6.190 | 1.194 -10 | -9.9228 |
| 260 | 1434.9 | 14.114 | 15.197 | 15.109 | 12.886 | | 21.82 | 60.41 | 5.939 | -6.226 | 1.086 | -9.9641 |
| 265 | 1441.1 | 14.060 | 15.169 | 15.061 | 12.878 | | 21.67 | 61.19 | 5.470 | -6.262 | 9.892 -11 | -10.0047 |
| 270 | 1446.9 | 14.006 | 15.141 | 15.014 | 12.871 | | 21.52 | 61.95 | 5.043 | -6.297 | 9.022 | -10.0447 |
| 275 | 1452.0 | 13.952 | 15.113 | 14.967 | 12.863 | | 21.37 | 62.69 | 4.654 | -6.332 | 8.240 | -10.0841 |
| 280 | 1456.7 | 13.899 | 15.086 | 14.920 | 12.856 | | 21.23 | 63.42 | 4.300 | -6.367 | 7.536 | -10.1228 |
| 285 | 1460.9 | 13.846 | 15.059 | 14.874 | 12.849 | | 21.08 | 64.13 | 3.975 | -6.401 | 6.901 | -10.1611 |
| 290 | 1464.7 | 13.794 | 15.032 | 14.829 | 12.841 | | 20.94 | 64.83 | 3.679 | -6.434 | 6.327 | -10.1988 |
| 295 | 1468.1 | 13.742 | 15.006 | 14.782 | 12.834 | | 20.80 | 65.52 | 3.407 | -6.468 | 5.807 | -10.2361 |
| 300 | 1471.2 | 13.690 | 14.979 | 14.737 | 12.827 | | 20.66 | 66.19 | 3.158 | -6.501 | 5.335 | -10.2729 |
| 310 | 1476.6 | 13.587 | 14.927 | 14.646 | 12.814 | | 20.39 | 67.52 | 2.719 - 7 | -6.566 | 4.517 -11 | -10.3451 |
| 320 | 1480.9 | 13.485 | 14.876 | 14.557 | 12.800 | | 20.13 | 68.81 | 2.348 | -6.629 | 3.839 | -10.4157 |
| 330 | 1484.4 | 13.384 | 14.825 | 14.468 | 12.787 | | 19.88 | 70.06 | 2.033 | -6.692 | 3.275 | -10.4848 |
| 340 | 1487.3 | 13.284 | 14.774 | 14.380 | 12.774 | | 19.63 | 71.29 | 1.765 | -6.753 | 2.802 | -10.5525 |
| 350 | 1489.7 | 13.184 | 14.724 | 14.293 | 12.762 | | 19.39 | 72.50 | 1.536 | -6.814 | 2.405 | -10.6189 |
| 360 | 1491.6 | 13.085 | 14.674 | 14.206 | 12.749 | | 19.16 | 73.68 | 1.339 | -6.873 | 2.070 | -10.6841 |
| 370 | 1493.1 | 12.986 | 14.624 | 14.120 | 12.736 | | 18.94 | 74.83 | 1.171 | -6.932 | 1.786 | -10.7480 |
| 380 | 1494.4 | 12.888 | 14.575 | 14.034 | 12.724 | | 18.73 | 75.96 | 1.025 | -6.989 | 1.546 | -10.8109 |
| 390 | 1495.4 | 12.790 | 14.526 | 13.948 | 12.711 | | 18.53 | 77.08 | 8.997 - 8 | -7.046 | 1.341 | -10.8726 |
| 400 | 1496.3 | 12.693 | 14.477 | 13.863 | 12.699 | | 18.34 | 78.17 | 7.909 | -7.102 | 1.166 | -10.9334 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 1497.0 | 12.596 | 14.429 | 13.778 | 12.687 | | 18.15 | 79.24 | 6.966 - 8 | -7.157 | 1.016 -11 | -10.9932 |
| 420 | 1497.5 | 12.499 | 14.380 | 13.693 | 12.675 | | 17.97 | 80.29 | 6.145 | -7.211 | 8.870 -12 | -11.0521 |
| 430 | 1498.0 | 12.403 | 14.332 | 13.609 | 12.663 | | 17.80 | 81.32 | 5.430 | -7.265 | 7.761 | -11.1101 |
| 440 | 1498.4 | 12.307 | 14.284 | 13.525 | 12.651 | | 17.64 | 82.33 | 4.805 | -7 [illegible] | 6.804 | -11.1673 |
| 450 | 1498.7 | 12.211 | 14.236 | 13.441 | 12.639 | | 17.48 | 83.33 | 4.259 | -7 [illegible] | 5.975 | -11.2236 |
| 460 | 1498.9 | 12.116 | 14.188 | 13.358 | 12.627 | | 17.33 | 84.31 | 3.780 | -7 [illegible] | 5.257 | -11.2792 |
| 470 | 1499.1 | 12.021 | 14.141 | 13.275 | 12.615 | | 17.19 | 85.27 | 3.359 | -7.4[illegible] | 4.633 | -11.3341 |
| 480 | 1499.3 | 11.926 | 14.094 | 13.192 | 12.603 | | 17.05 | 86.22 | 2.989 | -7.524 | 4.089 | -11.3883 |
| 490 | 1499.4 | 11.832 | 14.046 | 13.109 | 12.591 | | 16.92 | 87.16 | 2.664 | -7.575 | 3.615 | -11.4419 |
| 500 | 1499.5 | 11.738 | 13.999 | 13.027 | 12.579 | 9.474 | 16.79 | 88.09 | 2.376 | -7.624 | 3.201 | -11.4948 |
| 510 | 1499.6 | 11.644 | 13.952 | 12.944 | 12.567 | 9.471 | 16.67 | 89.02 | 2.123 - 8 | -7.673 | 2.837 -12 | -11.5471 |
| 520 | 1499.7 | 11.550 | 13.906 | 12.863 | 12.556 | 9.468 | 16.55 | 89.94 | 1.898 | -7.722 | 2.519 | -11.5988 |
| 530 | 1499.7 | 11.457 | 13.859 | 12.781 | 12.544 | 9.465 | 16.43 | 90.85 | 1.699 | -7.770 | 2.239 | -11.6500 |
| 540 | 1499.8 | 11.364 | 13.812 | 12.699 | 12.532 | 9.462 | 16.31 | 91.77 | 1.523 | -7.817 | 1.992 | -11.7006 |
| 550 | 1499.8 | 11.271 | 13.766 | 12.618 | 12.521 | 9.459 | 16.20 | 92.68 | 1.367 | -7.864 | 1.775 | -11.7508 |
| 560 | 1499.9 | 11.179 | 13.720 | 12.537 | 12.509 | 9.456 | 16.08 | 93.60 | 1.227 | -7.911 | 1.583 | -11.8005 |
| 570 | 1499.9 | 11.087 | 13.674 | 12.457 | 12.498 | 9.454 | 15.97 | 94.53 | 1.104 | -7.957 | 1.414 | -11.8497 |
| 580 | 1499.9 | 10.995 | 13.628 | 12.376 | 12.486 | 9.451 | 15.86 | 95.47 | 9.934 - 9 | -8.003 | 1.263 | -11.8984 |
| 590 | 1499.9 | 10.903 | 13.582 | 12.296 | 12.475 | 9.448 | 15.75 | 96.43 | 8.951 | -8.048 | 1.130 | -11.9468 |
| 600 | 1499.9 | 10.812 | 13.536 | 12.216 | 12.463 | 9.445 | 15.64 | 97.40 | 8.073 | -8.093 | 1.012 | -11.9947 |
| 610 | 1499.9 | 10.721 | 13.491 | 12.136 | 12.452 | 9.442 | 15.52 | 98.39 | 7.289 - 9 | -8.137 | 9.074 -13 | -12.0422 |
| 620 | 1500.0 | 10.630 | 13.445 | 12.057 | 12.441 | 9.439 | 15.41 | 99.41 | 6.588 | -8.181 | 8.141 | -12.0893 |
| 630 | 1500.0 | 10.539 | 13.400 | 11.977 | 12.429 | 9.436 | 15.29 | 100.45 | 5.961 | -8.225 | 7.310 | -12.1361 |
| 640 | 1500.0 | 10.449 | 13.355 | 11.898 | 12.418 | 9.433 | 15.18 | 101.53 | 5.399 | -8.268 | 6.570 | -12.1825 |
| 650 | 1500.0 | 10.359 | 13.310 | 11.819 | 12.407 | 9.431 | 15.05 | 102.64 | 4.895 | -8.310 | 5.909 | -12.2285 |
| 660 | 1500.0 | 10.269 | 13.265 | 11.741 | 12.395 | 9.428 | 14.93 | 103.78 | 4.443 | -8.352 | 5.319 | -12.2742 |
| 670 | 1500.0 | 10.179 | 13.220 | 11.662 | 12.384 | 9.425 | 14.80 | 104.98 | 4.037 | -8.394 | 4.792 | -12.3195 |
| 680 | 1500.0 | 10.090 | 13.175 | 11.584 | 12.373 | 9.422 | 14.67 | 106.22 | 3.672 | -8.435 | 4.320 | -12.3645 |
| 690 | 1500.0 | 10.001 | 13.131 | 11.506 | 12.362 | 9.419 | 14.54 | 107.51 | 3.344 | -8.476 | 3.898 | -12.4091 |
| 700 | 1500.0 | 9.912 | 13.086 | 11.428 | 12.351 | 9.417 | 14.40 | 108.86 | 3.049 | -8.516 | 3.520 | -12.4535 |
| 710 | 1500.0 | 9.824 | 13.042 | 11.351 | 12.340 | 9.414 | 14.25 | 110.27 | 2.783 - 9 | -8.555 | 3.181 -13 | -12.4975 |
| 720 | 1500.0 | 9.735 | 12.998 | 11.274 | 12.329 | 9.411 | 14.11 | 111.74 | 2.543 | -8.595 | 2.876 | -12.5411 |
| 730 | 1500.0 | 9.647 | 12.954 | 11.197 | 12.318 | 9.408 | 13.95 | 113.29 | 2.327 | -8.633 | 2.603 | -12.5845 |
| 740 | 1500.0 | 9.560 | 12.910 | 11.120 | 12.307 | 9.405 | 13.79 | 114.91 | 2.132 | -8.671 | 2.358 | -12.6275 |
| 750 | 1500.0 | 9.472 | 12.866 | 11.043 | 12.296 | 9.403 | 13.63 | 116.61 | 1.955 | -8.709 | 2.137 | -12.6702 |
| 760 | 1500.0 | 9.385 | 12.823 | 10.967 | 12.285 | 9.400 | 13.46 | 118.40 | 1.796 | -8.746 | 1.938 | -12.7125 |
| 770 | 1500.0 | 9.298 | 12.779 | 10.890 | 12.274 | 9.397 | 13.29 | 120.28 | 1.651 | -8.782 | 1.760 | -12.7546 |
| 780 | 1500.0 | 9.211 | 12.736 | 10.814 | 12.263 | 9.394 | 13.11 | 122.26 | 1.521 | -8.818 | 1.599 | -12.7962 |
| 790 | 1500.0 | 9.124 | 12.692 | 10.739 | 12.252 | 9.392 | 12.93 | 124.34 | 1.402 | -8.853 | 1.454 | -12.8376 |
| 800 | 1500.0 | 9.038 | 12.649 | 10.663 | 12.241 | 9.389 | 12.74 | 126.53 | 1.295 | -8.888 | 1.323 | -12.8786 |
| 820 | 1500.0 | 8.866 | 12.563 | 10.513 | 12.220 | 9.384 | 12.35 | 131.26 | 1.109 - 9 | -8.955 | 1.098 -13 | -12.9595 |
| 840 | 1500.0 | 8.695 | 12.478 | 10.363 | 12.199 | 9.378 | 11.94 | 136.48 | 9.547 -10 | -9.020 | 9.143 -14 | -13.0389 |
| 860 | 1500.0 | 8.356 | 12.308 | 10.066 | 12.156 | 9.3[illegible]8 | 11.09 | 148.59 | 7.207 | -9.142 | 6.610 | -13.1931 |
| 900 | 1500.0 | 8.188 | 12.224 | 9.919 | 12.135 | 9.362 | 10.66 | 155.54 | 6.318 | -9.199 | 5.398 | -13.2678 |
| 920 | 1500.0 | 8.020 | 12.141 | 9.772 | 12.114 | 9.357 | 10.22 | 163.13 | 5.572 | -9.254 | 4.565 | -13.3406 |
| 940 | 1500.0 | 7.854 | 12.057 | 9.627 | 12.093 | 9.352 | 9.78 | 171.37 | 4.944 | -9.306 | 3.876 | -13.4116 |
| 960 | 1500.0 | 7.689 | 11.975 | 9.482 | 12.073 | 9.346 | 9.35 | 180.28 | 4.412 | -9.355 | 3.306 | -13.4806 |
| 980 | 1500.0 | 7.524 | 11.892 | 9.338 | 12.052 | 9.341 | 8.92 | 189.83 | 3.960 | -9.402 | 2.834 | -13.5477 |
| 1000 | 1500.0 | 7.361 | 11.811 | 9.195 | 12.032 | 9.336 | 8.52 | 200.02 | 3.574 | -9.447 | 2.440 | -13.6126 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1700° K

| Altitude $Z$, km | Temp. $T$, °K | Number density m$^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg m$^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 467.3 | 16.563 | 16.665 | 17.314 | 13.433 | | 26.59 | 15.49 | 1.864 | -4.730 | 1.275 | -7.8943 |
| 130 | 570.3 | 16.324 | 16.503 | 17.094 | 13.361 | | 26.33 | 19.12 | 1.395 | -4.855 | 7.746 - 9 | -8.1109 |
| 135 | 664.6 | 16.130 | 16.372 | 16.916 | 13.304 | | 26.09 | 22.52 | 1.097 | -4.960 | 5.179 | -8.2857 |
| 140 | 751.1 | 15.966 | 16.264 | 16.766 | 13.257 | | 25.87 | 25.71 | 8.914 - 6 | -5.050 | 3.693 | -8.4326 |
| 145 | 830.3 | 15.824 | 16.171 | 16.636 | 13.217 | | 25.67 | 28.69 | 7.416 | -5.130 | 2.757 | -8.5595 |
| 150 | 903.0 | 15.697 | 16.089 | 16.520 | 13.183 | | 25.47 | 31.49 | 6.281 | -5.202 | 2.131 | -8.6714 |
| 155 | 969.5 | 15.583 | 16.016 | 16.416 | 13.154 | | 25.29 | 34.11 | 5.393 - 6 | -5.268 | 1.692 - 9 | -8.7717 |
| 160 | 1030.5 | 15.478 | 15.951 | 16.321 | 13.128 | | 25.11 | 36.57 | 4.681 | -5.330 | 1.372 | -8.8627 |
| 165 | 1086.4 | 15.381 | 15.891 | 16.234 | 13.104 | | 24.93 | 38.89 | 4.100 | -5.387 | 1.132 | -8.9462 |
| 170 | 1137.7 | 15.291 | 15.836 | 16.153 | 13.083 | | 24.76 | 41.06 | 3.618 | -5.441 | 9.473 -10 | -9.0235 |
| 175 | 1184.6 | 15.207 | 15.785 | 16.077 | 13.064 | | 24.60 | 43.11 | 3.213 | -5.493 | 8.024 | -9.0956 |
| 180 | 1227.7 | 15.127 | 15.737 | 16.005 | 13.046 | | 24.44 | 45.04 | 2.869 | -5.542 | 6.867 | -9.1632 |
| 185 | 1267.1 | 15.051 | 15.693 | 15.937 | 13.030 | | 24.28 | 46.87 | 2.573 | -5.590 | 5.928 | -9.2271 |
| 190 | 1303.3 | 14.979 | 15.650 | 15.872 | 13.015 | | 24.12 | 48.59 | 2.317 | -5.635 | 5.157 | -9.2876 |
| 195 | 1336.4 | 14.910 | 15.610 | 15.810 | 13.001 | | 23.96 | 50.23 | 2.094 | -5.679 | 4.516 | -9.3452 |
| 200 | 1366.8 | 14.843 | 15.572 | 15.750 | 12.988 | | 23.81 | 51.78 | 1.899 | -5.722 | 3.978 | -9.4004 |
| 205 | 1394.6 | 14.778 | 15.535 | 15.692 | 12.975 | | 23.66 | 53.25 | 1.726 - 6 | -5.763 | 3.522 -10 | -9.4532 |
| 210 | 1420.1 | 14.716 | 15.500 | 15.637 | 12.963 | | 23.51 | 54.66 | 1.573 | -5.803 | 3.133 | -9.5041 |
| 215 | 1443.5 | 14.655 | 15.466 | 15.583 | 12.952 | | 23.36 | 55.99 | 1.437 | -5.842 | 2.798 | -9.5532 |
| 220 | 1464.9 | 14.596 | 15.434 | 15.530 | 12.942 | | 23.21 | 57.27 | 1.316 | -5.881 | 2.508 | -9.6007 |
| 225 | 1484.5 | 14.538 | 15.402 | 15.479 | 12.932 | | 23.07 | 58.49 | 1.207 | -5.918 | 2.256 | -9.6467 |
| 230 | 1502.5 | 14.482 | 15.371 | 15.429 | 12.922 | | 22.92 | 59.67 | 1.109 | -5.955 | 2.035 | -9.6914 |
| 235 | 1519.0 | 14.427 | 15.341 | 15.380 | 12.913 | | 22.78 | 60.79 | 1.021 | -5.991 | 1.841 | -9.7349 |
| 240 | 1534.1 | 14.373 | 15.312 | 15.332 | 12.904 | | 22.64 | 61.88 | 9.409 - 7 | -6.026 | 1.670 | -9.7773 |
| 245 | 1548.0 | 14.319 | 15.283 | 15.285 | 12.895 | | 22.50 | 62.92 | 8.684 | -6.061 | 1.518 | -9.8187 |
| 250 | 1560.7 | 14.267 | 15.255 | 15.239 | 12.887 | | 22.36 | 63.93 | 8.026 | -6.095 | 1.383 | -9.8592 |
| 255 | 1572.3 | 14.215 | 15.228 | 15.193 | 12.879 | | 22.22 | 64.91 | 7.427 - 7 | -6.129 | 1.262 -10 | -9.8989 |
| 260 | 1583.0 | 14.164 | 15.201 | 15.148 | 12.871 | | 22.08 | 65.85 | 6.880 | -6.162 | 1.154 | -9.9377 |
| 265 | 1592.8 | 14.114 | 15.174 | 15.104 | 12.863 | | 21.95 | 66.77 | 6.380 | -6.195 | 1.057 | -9.9758 |
| 270 | 1601.7 | 14.065 | 15.148 | 15.060 | 12.856 | | 21.81 | 67.66 | 5.923 | -6.227 | 9.701 -11 | -10.0132 |
| 275 | 1609.9 | 14.015 | 15.123 | 15.017 | 12.849 | | 21.68 | 68.53 | 5.504 | -6.259 | 8.913 | -10.0500 |
| 280 | 1617.4 | 13.967 | 15.097 | 14.974 | 12.842 | | 21.54 | 69.38 | 5.119 | -6.291 | 8.201 | -10.0861 |
| 285 | 1624.3 | 13.919 | 15.072 | 14.932 | 12.835 | | 21.41 | 70.21 | 4.765 | -6.322 | 7.555 | -10.1217 |
| 290 | 1630.7 | 13.871 | 15.048 | 14.889 | 12.828 | | 21.28 | 71.02 | 4.439 | -6.353 | 6.969 | -10.1568 |
| 295 | 1636.4 | 13.823 | 15.023 | 14.848 | 12.821 | | 21.16 | 71.81 | 4.139 | -6.383 | 6.436 | -10.1914 |
| 300 | 1641.8 | 13.776 | 14.999 | 14.806 | 12.815 | | 21.03 | 72.59 | 3.862 | -6.413 | 5.950 | -10.2255 |
| 310 | 1651.1 | 13.683 | 14.951 | 14.725 | 12.802 | | 20.78 | 74.10 | 3.370 - 7 | -6.472 | 5.101 -11 | -10.2923 |
| 320 | 1658.9 | 13.591 | 14.904 | 14.644 | 12.789 | | 20.54 | 75.55 | 2.948 | -6.530 | 4.390 | -10.3575 |
| 330 | 1665.5 | 13.500 | 14.858 | 14.564 | 12.777 | | 20.30 | 76.97 | 2.586 | -6.587 | 3.791 | -10.4212 |
| 340 | 1671.0 | 13.410 | 14.812 | 14.485 | 12.765 | | 20.07 | 78.35 | 2.274 | -6.643 | 3.284 | -10.4836 |
| 350 | 1675.6 | 13.321 | 14.767 | 14.407 | 12.753 | | 19.85 | 79.69 | 2.003 | -6.698 | 2.854 | -10.5446 |
| 360 | 1679.5 | 13.232 | 14.722 | 14.329 | 12.742 | | 19.63 | 81.00 | 1.769 | -6.752 | 2.486 | -10.6044 |
| 370 | 1682.8 | 13.144 | 14.677 | 14.252 | 12.730 | | 19.42 | 82.28 | 1.565 | -6.805 | 2.172 | -10.6631 |
| 380 | 1685.6 | 13.057 | 14.633 | 14.175 | 12.719 | | 19.22 | 83.53 | 1.387 | -6.858 | 1.902 | -10.7208 |
| 390 | 1687.9 | 12.970 | 14.590 | 14.099 | 12.708 | | 19.02 | 84.76 | 1.232 | -6.909 | 1.669 | -10.7775 |
| 400 | 1689.8 | 12.883 | 14.546 | 14.023 | 12.697 | | 18.83 | 85.96 | 1.096 | -6.960 | 1.468 | -10.8332 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1691.4 | 12.797 | 14.503 | 12.948 | 12.686 | | 18.65 | 87.15 | 9.761 - 8 | -7.011 | 1.294 -11 | -10.8880 |
| 420 | 1692.8 | 12.711 | 14.460 | 13.872 | 12.675 | | 18.47 | 88.31 | 8.709 | -7.060 | 1.143 | -10.9420 |
| 430 | 1694.0 | 12.626 | 14.417 | 13.798 | 12.664 | | 18.30 | 89.45 | 7.782 | -7.109 | 1.011 | -10.9951 |
| 440 | 1694.9 | 12.541 | 14.374 | 13.723 | 12.653 | | 18.14 | 90.57 | 6.964 | -7.157 | 8.954 -12 | -11.0475 |
| 450 | 1695.7 | 12.456 | 14.332 | 13.649 | 12.643 | | 17.98 | 91.67 | 6.240 | -7.205 | 7.959 | -11.0991 |
| 460 | 1696.4 | 12.372 | 14.290 | 13.575 | 12.632 | | 17.83 | 92.75 | 5.599 | -7.252 | 7.078 | -11.1501 |
| 470 | 1697.0 | 12.288 | 14.248 | 13.502 | 12.621 | | 17.69 | 93.82 | 5.030 | -7.298 | 6.305 | -11.2003 |
| 480 | 1697.5 | 12.204 | 14.206 | 13.428 | 12.611 | | 17.55 | 94.87 | 4.524 | -7.344 | 5.625 | -11.2499 |
| 490 | 1697.9 | 12.121 | 14.164 | 13.355 | 12.600 | | 17.41 | 95.91 | 4.074 | -7.390 | 5.025 | -11.2989 |
| 500 | 1698.2 | 12.038 | 14.122 | 13.282 | 12.590 | 9.249 | 17.28 | 96.93 | 3.672 | -7.435 | 4.495 | -11.3473 |
| 510 | 1698.5 | 11.955 | 14.081 | 13.210 | 12.580 | 9.246 | 17.16 | 97.94 | 3.314 - 8 | -7.480 | 4.026 -12 | -11.3951 |
| 520 | 1698.7 | 11.872 | 14.039 | 13.138 | 12.569 | 9.244 | 17.04 | 98.94 | 2.994 | -7.524 | 3.611 | -11.4423 |
| 530 | 1698.9 | 11.790 | 13.998 | 13.065 | 12.559 | 9.241 | 16.92 | 99.93 | 2.708 | -7.567 | 3.243 | -11.4891 |
| 540 | 1699.1 | 11.708 | 13.957 | 12.994 | 12.549 | 9.238 | 16.80 | 100.91 | 2.451 | -7.611 | 2.915 | -11.5353 |
| 550 | 1699.3 | 11.626 | 13.916 | 12.922 | 12.538 | 9.236 | 16.69 | 101.89 | 2.221 | -7.653 | 2.624 | -11.5810 |
| 560 | 1699.4 | 11.544 | 13.875 | 12.850 | 12.528 | 9.233 | 16.58 | 102.86 | 2.014 | -7.696 | 2.364 | -11.6263 |
| 570 | 1699.5 | 11.463 | 13.835 | 12.779 | 12.518 | 9.231 | 16.48 | 103.82 | 1.828 | -7.738 | 2.132 | -11.6712 |
| 580 | 1699.6 | 11.382 | 13.794 | 12.708 | 12.508 | 9.228 | 16.37 | 104.79 | 1.661 | -7.780 | 1.925 | -11.7156 |
| 590 | 1699.6 | 11.301 | 13.754 | 12.637 | 12.498 | 9.225 | 16.27 | 105.76 | 1.511 | -7.821 | 1.740 | -11.7596 |
| 600 | 1699.7 | 11.220 | 13.713 | 12.567 | 12.488 | 9.223 | 16.17 | 106.73 | 1.375 | -7.862 | 1.573 | -11.8032 |
| 610 | 1699.7 | 11.140 | 13.673 | 12.496 | 12.477 | 9.220 | 16.07 | 107.70 | 1.253 - 8 | -7.902 | 1.424 -12 | -11.8464 |
| 620 | 1699.8 | 11.059 | 13.633 | 12.426 | 12.467 | 9.218 | 15.97 | 108.69 | 1.142 | -7.942 | 1.291 | -11.8892 |
| 630 | 1699.8 | 10.980 | 13.593 | 12.356 | 12.457 | 9.215 | 15.87 | 109.68 | 1.042 | -7.982 | 1.170 | -11.9317 |
| 640 | 1699.8 | 10.900 | 13.553 | 12.286 | 12.447 | 9.213 | 15.77 | 110.69 | 9.516 - 9 | -8.022 | 1.062 | -11.9738 |
| 650 | 1699.9 | 10.820 | 13.513 | 12.217 | 12.437 | 9.210 | 15.67 | 111.71 | 8.698 | -8.061 | 9.646 -13 | -12.0156 |
| 660 | 1699.9 | 10.741 | 13.474 | 12.147 | 12.428 | 9.208 | 15.58 | 112.75 | 7.956 | -8.099 | 8.768 | -12.0571 |
| 670 | 1699.9 | 10.662 | 13.434 | 12.078 | 12.418 | 9.205 | 15.47 | 113.80 | 7.284 | -8.138 | 7.975 | -12.0983 |
| 680 | 1699.9 | 10.583 | 13.395 | 12.009 | 12.408 | 9.203 | 15.37 | 114.88 | 6.674 | -8.176 | 7.259 | -12.1391 |
| 690 | 1699.9 | 10.505 | 13.356 | 11.940 | 12.398 | 9.200 | 15.27 | 115.99 | 6.120 | -8.213 | 6.612 | -12.1797 |
| 700 | 1699.9 | 10.426 | 13.316 | 11.872 | 12.388 | 9.198 | 15.16 | 117.12 | 5.617 | -8.251 | 6.026 | -12.2199 |
| 710 | 1700.0 | 10.348 | 13.277 | 11.803 | 12.378 | 9.195 | 15.06 | 118.29 | 5.159 - 9 | -8.287 | 5.497 -13 | -12.2599 |
| 720 | 1700.0 | 10.270 | 13.238 | 11.735 | 12.369 | 9.193 | 14.95 | 119.49 | 4.743 | -8.324 | 5.017 | -12.2996 |
| 730 | 1700.0 | 10.193 | 13.199 | 11.667 | 12.359 | 9.190 | 14.84 | 120.73 | 4.364 | -8.360 | 4.581 | -12.3390 |
| 740 | 1700.0 | 10.115 | 13.161 | 11.599 | 12.349 | 9.188 | 14.72 | 122.01 | 4.019 | -8.396 | 4.187 | -12.3781 |
| 750 | 1700.0 | 10.038 | 13.122 | 11.532 | 12.340 | 9.186 | 14.61 | 123.33 | 3.704 | -8.431 | 3.828 | -12.4170 |
| 760 | 1700.0 | 9.961 | 13.084 | 11.464 | 12.330 | 9.183 | 14.49 | 124.70 | 3.417 | -8.466 | 3.503 | -12.4556 |
| 770 | 1700.0 | 9.884 | 13.045 | 11.397 | 12.320 | 9.181 | 14.36 | 126.12 | 3.155 | -8.501 | 3.207 | -12.4939 |
| 780 | 1700.0 | 9.807 | 13.007 | 11.330 | 12.311 | 9.178 | 14.24 | 127.60 | 2.916 | -8.535 | 2.938 | -12.5320 |
| 790 | 1700.0 | 9.731 | 12.969 | 11.263 | 12.301 | 9.176 | 14.11 | 129.13 | 2.698 | -8.569 | 2.693 | -12.5698 |
| 800 | 1700.0 | 9.655 | 12.931 | 11.196 | 12.292 | 9.173 | 13.98 | 130.72 | 2.498 | -8.602 | 2.470 | -12.6074 |
| 820 | 1700.0 | 9.503 | 12.855 | 11.064 | 12.273 | 9.169 | 13.70 | 134.11 | 2.148 - 9 | -8.668 | 2.081 -13 | -12.6817 |
| 840 | 1700.0 | 9.352 | 12.779 | 10.931 | 12.254 | 9.164 | 13.41 | 137.80 | 1.854 | -8.732 | 1.758 | -12.7549 |
| 860 | 1700.0 | 9.053 | 12.630 | 10.670 | 12.216 | 9.155 | 12.78 | 146.18 | 1.398 | -8.854 | 1.264 | -12.8982 |
| 900 | 1700.0 | 8.905 | 12.555 | 10.540 | 12.198 | 9.150 | 12.44 | 150.94 | 1.222 | -8.913 | 1.076 | -12.9682 |
| 920 | 1700.0 | 8.757 | 12.482 | 10.410 | 12.179 | 9.145 | 12.10 | 156.12 | 1.073 | -8.970 | 9.181 -14 | -13.0371 |
| 940 | 1700.0 | 8.610 | 12.408 | 10.282 | 12.161 | 9.141 | 11.74 | 161.76 | 9.458 -10 | -9.024 | 7.856 | -13.1048 |
| 960 | 1700.0 | 8.464 | 12.335 | 10.154 | 12.143 | 9.136 | 11.37 | 167.88 | 8.377 | -9.077 | 6.741 | -13.1713 |
| 980 | 1700.0 | 8.319 | 12.263 | 10.027 | 12.125 | 9.131 | 11.00 | 174.52 | 7.453 | -9.128 | 5.801 | -13.2365 |
| 1000 | 1700.0 | 8.175 | 12.191 | 9.901 | 12.107 | 9.127 | 10.63 | 181.69 | 6.661 | -9.176 | 5.007 | -13.3004 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 1900° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 467.1 | 16.563 | 16.665 | 17.314 | 13.433 | | 26.59 | 15.48 | 1.863 | -4.730 | 1.276 | -7.8942 |
| 130 | 571.0 | 16.324 | 16.502 | 17.094 | 13.360 | | 26.33 | 19.15 | 1.395 | -4.855 | 7.735 - 9 | -8.1115 |
| 135 | 667.4 | 16.129 | 16.371 | 16.915 | 13.302 | | 26.09 | 22.62 | 1.097 | -4.960 | 5.160 | -8.2873 |
| 140 | 756.8 | 15.964 | 16.261 | 16.763 | 13.255 | | 25.87 | 25.90 | 8.929 - 6 | -5.049 | 3.672 | -8.4352 |
| 145 | 839.7 | 15.821 | 16.167 | 16.632 | 13.215 | | 25.67 | 29.01 | 7.442 | -5.128 | 2.736 | -8.5628 |
| 150 | 916.6 | 15.693 | 16.084 | 16.516 | 13.180 | | 25.48 | 31.96 | 6.316 | -5.200 | 2.111 | -8.6754 |
| 155 | 988.0 | 15.579 | 16.010 | 16.412 | 13.149 | | 25.30 | 34.75 | 5.436 - 6 | -5.265 | 1.674 - 9 | -8.7762 |
| 160 | 1054.1 | 15.474 | 15.944 | 16.317 | 13.122 | | 25.12 | 37.39 | 4.732 | -5.325 | 1.356 | -8.8676 |
| 165 | 1115.5 | 15.378 | 15.884 | 16.229 | 13.098 | | 24.95 | 39.90 | 4.158 | -5.381 | 1.119 | -8.9513 |
| 170 | 1172.4 | 15.288 | 15.828 | 16.148 | 13.076 | | 24.79 | 42.27 | 3.682 | -5.434 | 9.362 -10 | -9.0286 |
| 175 | 1225.1 | 15.204 | 15.776 | 16.072 | 13.056 | | 24.63 | 44.53 | 3.281 | -5.484 | 7.933 | -9.1006 |
| 180 | 1274.1 | 15.125 | 15.728 | 16.001 | 13.038 | | 24.47 | 46.68 | 2.940 | -5.532 | 6.792 | -9.1680 |
| 185 | 1319.5 | 15.050 | 15.683 | 15.933 | 13.021 | | 24.32 | 48.72 | 2.648 | -5.577 | 5.869 | -9.2314 |
| 190 | 1361.6 | 14.979 | 15.641 | 15.869 | 13.005 | | 24.17 | 50.66 | 2.394 | -5.621 | 5.111 | -9.2915 |
| 195 | 1400.7 | 14.911 | 15.601 | 15.808 | 12.991 | | 24.02 | 52.52 | 2.173 | -5.663 | 4.482 | -9.3485 |
| 200 | 1436.9 | 14.845 | 15.562 | 15.749 | 12.977 | | 23.87 | 54.29 | 1.979 | -5.704 | 3.955 | -9.4029 |
| 205 | 1470.5 | 14.782 | 15.526 | 15.693 | 12.964 | | 23.73 | 55.98 | 1.807 - 6 | -5.743 | 3.508 -10 | -9.4549 |
| 210 | 1501.6 | 14.722 | 15.491 | 15.639 | 12.952 | | 23.59 | 57.59 | 1.655 | -5.781 | 3.127 | -9.5048 |
| 215 | 1530.5 | 14.663 | 15.457 | 15.586 | 12.941 | | 23.45 | 59.14 | 1.519 | -5.818 | 2.800 | -9.5529 |
| 220 | 1557.3 | 14.605 | 15.425 | 15.535 | 12.930 | | 23.31 | 60.62 | 1.398 | -5.855 | 2.516 | -9.5992 |
| 225 | 1582.2 | 14.550 | 15.394 | 15.486 | 12.919 | | 23.18 | 62.05 | 1.288 | -5.890 | 2.270 | -9.6441 |
| 230 | 1605.2 | 14.496 | 15.363 | 15.437 | 12.910 | | 23.04 | 63.42 | 1.190 | -5.925 | 2.054 | -9.6875 |
| 235 | 1626.6 | 14.443 | 15.334 | 15.390 | 12.900 | | 22.91 | 64.73 | 1.100 | -5.959 | 1.864 | -9.7296 |
| 240 | 1646.4 | 14.391 | 15.305 | 15.344 | 12.891 | | 22.78 | 66.00 | 1.019 | -5.992 | 1.696 | -9.7706 |
| 245 | 1664.8 | 14.340 | 15.278 | 15.299 | 12.882 | | 22.64 | 67.23 | 9.455 - 7 | -6.024 | 1.547 | -9.8105 |
| 250 | 1681.9 | 14.290 | 15.251 | 15.255 | 12.874 | | 22.52 | 68.41 | 8.783 | -6.056 | 1.414 | -9.8495 |
| 255 | 1697.7 | 14.241 | 15.224 | 15.212 | 12.866 | | 22.39 | 69.56 | 8.169 - 7 | -6.088 | 1.296 -10 | -9.8875 |
| 260 | 1712.4 | 14.193 | 15.198 | 15.169 | 12.858 | | 22.26 | 70.66 | 7.607 | -6.119 | 1.189 | -9.9247 |
| 265 | 1726.0 | 14.146 | 15.173 | 15.127 | 12.850 | | 22.13 | 71.74 | 7.091 | -6.149 | 1.094 | -9.9611 |
| 270 | 1738.6 | 14.099 | 15.148 | 15.086 | 12.843 | | 22.01 | 72.78 | 6.617 | -6.179 | 1.008 | -9.9967 |
| 275 | 1750.3 | 14.053 | 15.123 | 15.045 | 12.836 | | 21.89 | 73.80 | 6.181 | -6.209 | 9.296 -11 | -10.0317 |
| 280 | 1761.2 | 14.007 | 15.099 | 15.005 | 12.829 | | 21.76 | 74.79 | 5.779 | -6.238 | 8.589 | -10.0661 |
| 285 | 1771.2 | 13.962 | 15.076 | 14.965 | 12.822 | | 21.64 | 75.75 | 5.407 | -6.267 | 7.947 | -10.0998 |
| 290 | 1780.6 | 13.918 | 15.052 | 14.926 | 12.815 | | 21.52 | 76.69 | 5.064 | -6.296 | 7.362 | -10.1330 |
| 295 | 1789.2 | 13.874 | 15.029 | 14.887 | 12.808 | | 21.40 | 77.60 | 4.746 | -6.324 | 6.829 | -10.1657 |
| 300 | 1797.3 | 13.830 | 15.006 | 14.849 | 12.802 | | 21.29 | 78.50 | 4.452 | -6.351 | 6.342 | -10.1978 |
| 310 | 1811.6 | 13.744 | 14.961 | 14.773 | 12.790 | | 21.06 | 80.24 | 3.925 - 7 | -6.406 | 5.486 -11 | -10.2607 |
| 320 | 1824.0 | 13.659 | 14.918 | 14.698 | 12.777 | | 20.83 | 81.90 | 3.469 | -6.460 | 4.765 | -10.3219 |
| 330 | 1834.6 | 13.576 | 14.874 | 14.625 | 12.766 | | 20.61 | 83.51 | 3.074 | -6.512 | 4.154 | -10.3816 |
| 340 | 1843.8 | 13.493 | 14.832 | 14.552 | 12.754 | | 20.39 | 85.07 | 2.730 | -6.564 | 3.632 | -10.4398 |
| 350 | 1851.6 | 13.411 | 14.790 | 14.480 | 12.743 | | 20.18 | 86.58 | 2.430 | -6.614 | 3.186 | -10.4967 |
| 360 | 1858.4 | 13.331 | 14.749 | 14.410 | 12.732 | | 19.98 | 88.04 | 2.167 | -6.664 | 2.802 | -10.5525 |
| 370 | 1864.2 | 13.250 | 14.708 | 14.339 | 12.722 | | 19.78 | 89.47 | 1.936 | -6.713 | 2.471 | -10.6071 |
| 380 | 1869.2 | 13.171 | 14.668 | 14.269 | 12.711 | | 19.59 | 90.87 | 1.733 | -6.761 | 2.184 | -10.6607 |
| 390 | 1873.5 | 13.092 | 14.628 | 14.200 | 12.701 | | 19.40 | 92.23 | 1.554 | -6.809 | 1.935 | -10.7133 |
| 400 | 1877.2 | 13.014 | 14.589 | 14.132 | 12.691 | | 19.22 | 93.56 | 1.395 | -6.855 | 1.718 | -10.7650 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 410 | 1880.4 | 12.936 | 14.549 | 14.063 | 12.680 | | 19.04 | 94.87 | 1.255 - 7 | -6.901 | 1.528 -11 | -10.8158 |
| 420 | 1883.1 | 12.859 | 14.510 | 13.996 | 12.670 | | 18.87 | 96.15 | 1.130 | -6.947 | 1.362 | -10.8658 |
| 430 | 1885.5 | 12.782 | 14.471 | 13.928 | 12.661 | | 18.71 | 97.41 | 1.019 | -6.992 | 1.216 | -10.9151 |
| 440 | 1887.5 | 12.705 | 14.433 | 13.861 | 12.651 | | 18.55 | 98.64 | 9.202 - 8 | -7.036 | 1.088 | -10.9635 |
| 450 | 1889.3 | 12.629 | 14.395 | 13.794 | 12.641 | | 18.39 | 99.85 | 8.320 | -7.080 | 9.743 -12 | -11.0113 |
| 460 | 1890.8 | 12.553 | 14.357 | 13.728 | 12.631 | | 18.24 | 101.04 | 7.532 | -7.123 | 8.741 | -11.0584 |
| 470 | 1892.1 | 12.477 | 14.319 | 13.662 | 12.622 | | 18.10 | 102.22 | 6.826 | -7.166 | 7.854 | -11.1049 |
| 480 | 1893.2 | 12.402 | 14.281 | 13.596 | 12.612 | | 17.96 | 103.37 | 6.193 | -7.208 | 7.067 | -11.1508 |
| 490 | 1894.1 | 12.327 | 14.243 | 13.530 | 12.603 | | 17.83 | 104.51 | 5.625 | -7.250 | 6.368 | -11.1960 |
| 500 | 1894.9 | 12.253 | 14.206 | 13.465 | 12.593 | 9.077 | 17.70 | 105.63 | 5.115 | -7.291 | 5.745 | -11.2407 |
| 510 | 1895.7 | 12.178 | 14.169 | 13.400 | 12.584 | 9.075 | 17.57 | 106.73 | 4.655 - 8 | -7.332 | 5.189 -12 | -11.2849 |
| 520 | 1896.3 | 12.104 | 14.131 | 13.335 | 12.575 | 9.072 | 17.45 | 107.82 | 4.241 | -7.373 | 4.693 | -11.3285 |
| 530 | 1896.8 | 12.030 | 14.094 | 13.270 | 12.565 | 9.070 | 17.33 | 108.90 | 3.867 | -7.413 | 4.250 | -11.3716 |
| 540 | 1897.2 | 11.957 | 14.058 | 13.206 | 12.556 | 9.067 | 17.22 | 109.97 | 3.529 | -7.452 | 3.852 | -11.4143 |
| 550 | 1897.6 | 11.883 | 14.021 | 13.141 | 12.547 | 9.065 | 17.11 | 111.03 | 3.224 | -7.492 | 3.495 | -11.4565 |
| 560 | 1898.0 | 11.810 | 13.984 | 13.077 | 12.538 | 9.063 | 17.00 | 112.07 | 2.947 | -7.531 | 3.175 | -11.4982 |
| 570 | 1898.2 | 11.737 | 13.948 | 13.013 | 12.528 | 9.060 | 16.89 | 113.11 | 2.697 | -7.569 | 2.887 | -11.5396 |
| 580 | 1898.5 | 11.665 | 13.911 | 12.950 | 12.519 | 9.058 | 16.79 | 114.14 | 2.470 | -7.607 | 2.627 | -11.5805 |
| 590 | 1898.7 | 11.592 | 13.875 | 12.886 | 12.510 | 9.056 | 16.69 | 115.17 | 2.263 | -7.645 | 2.393 | -11.6210 |
| 600 | 1898.9 | 11.520 | 13.839 | 12.823 | 12.501 | 9.053 | 16.60 | 116.19 | 2.076 | -7.683 | 2.182 | -11.6611 |
| 610 | 1899.0 | 11.448 | 13.803 | 12.760 | 12.492 | 9.051 | 16.50 | 117.21 | 1.905 - 8 | -7.720 | 1.991 -12 | -11.7009 |
| 620 | 1899.2 | 11.376 | 13.767 | 12.697 | 12.483 | 9.049 | 16.41 | 118.23 | 1.750 | -7.757 | 1.819 | -11.7403 |
| 630 | 1899.3 | 11.305 | 13.731 | 12.635 | 12.474 | 9.046 | 16.31 | 119.24 | 1.609 | -7.793 | 1.662 | -11.7793 |
| 640 | 1899.4 | 11.233 | 13.696 | 12.572 | 12.465 | 9.044 | 16.22 | 120.27 | 1.480 | -7.830 | 1.520 | -11.8181 |
| 650 | 1899.5 | 11.162 | 13.660 | 12.510 | 12.456 | 9.042 | 16.13 | 121.29 | 1.362 | -7.866 | 1.392 | -11.8565 |
| 660 | 1899.5 | 11.091 | 13.625 | 12.448 | 12.447 | 9.040 | 16.04 | 122.32 | 1.255 | -7.901 | 1.275 | -11.8946 |
| 670 | 1899.6 | 11.020 | 13.589 | 12.386 | 12.439 | 9.037 | 15.95 | 123.36 | 1.157 | -7.937 | 1.169 | -11.9324 |
| 680 | 1899.7 | 10.950 | 13.554 | 12.325 | 12.430 | 9.035 | 15.86 | 124.41 | 1.067 | -7.972 | 1.072 | -11.9699 |
| 690 | 1899.7 | 10.879 | 13.519 | 12.262 | 12.421 | 9.033 | 15.77 | 125.47 | 9.851 - 9 | -8.007 | 9.839 -13 | -12.0071 |
| 700 | 1899.8 | 10.809 | 13.484 | 12.201 | 12.412 | 9.031 | 15.69 | 126.54 | 9.100 | -8.041 | 9.037 | -12.0440 |
| 710 | 1899.8 | 10.739 | 13.449 | 12.140 | 12.403 | 9.028 | 15.60 | 127.63 | 8.411 - 9 | -8.075 | 8.305 -13 | -12.0807 |
| 720 | 1899.8 | 10.670 | 13.414 | 12.079 | 12.395 | 9.026 | 15.51 | 128.74 | 7.780 | -8.109 | 7.637 | -12.1171 |
| 730 | 1899.8 | 10.600 | 13.379 | 12.018 | 12.386 | 9.024 | 15.42 | 129.87 | 7.201 | -8.143 | 7.027 | -12.1532 |
| 740 | 1899.9 | 10.531 | 13.344 | 11.957 | 12.377 | 9.022 | 15.32 | 131.01 | 6.669 | -8.176 | 6.470 | -12.1891 |
| 750 | 1899.9 | 10.462 | 13.310 | 11.897 | 12.369 | 9.020 | 15.23 | 132.19 | 6.181 | -8.209 | 5.960 | -12.2247 |
| 760 | 1899.9 | 10.393 | 13.275 | 11.836 | 12.360 | 9.018 | 15.14 | 133.39 | 5.733 | -8.242 | 5.493 | -12.2602 |
| 770 | 1899.9 | 10.324 | 13.241 | 11.776 | 12.351 | 9.015 | 15.04 | 134.61 | 5.321 | -8.274 | 5.066 | -12.2953 |
| 780 | 1899.9 | 10.256 | 13.207 | 11.716 | 12.343 | 9.013 | 14.94 | 135.87 | 4.941 | -8.306 | 4.675 | -12.3303 |
| 790 | 1899.9 | 10.187 | 13.173 | 11.656 | 12.334 | 9.011 | 14.84 | 137.16 | 4.592 | -8.338 | 4.315 | -12.3650 |
| 800 | 1899.9 | 10.119 | 13.139 | 11.597 | 12.326 | 9.009 | 14.74 | 138.49 | 4.271 | -8.369 | 3.986 | -12.3995 |
| 820 | 1900.0 | 9.983 | 13.071 | 11.478 | 12.309 | 9.005 | 14.53 | 141.27 | 3.702 - 9 | -8.432 | 3.406 -13 | -12.4677 |
| 840 | 1900.0 | 9.848 | 13.003 | 11.360 | 12.292 | 9.000 | 14.32 | 144.22 | 3.218 | -8.492 | 2.916 | -12.5352 |
| 860 | 1900.0 | 9.581 | 12.869 | 11.125 | 12.258 | 8.992 | 13.85 | 150.74 | 2.453 | -8.610 | 2.151 | -12.6674 |
| 900 | 1900.0 | 9.448 | 12.803 | 11.009 | 12.242 | 8.988 | 13.60 | 154.36 | 2.152 | -8.667 | 1.852 | -12.7323 |
| 920 | 1900.0 | 9.316 | 12.737 | 10.894 | 12.225 | 8.984 | 13.34 | 158.24 | 1.893 | -8.723 | 1.599 | -12.7963 |
| 940 | 1900.0 | 9.184 | 12.671 | 10.779 | 12.209 | 8.979 | 13.07 | 162.42 | 1.671 | -8.777 | 1.382 | -12.8594 |
| 960 | 1900.0 | 9.054 | 12.606 | 10.664 | 12.193 | 8.975 | 12.79 | 166.92 | 1.480 | -8.830 | 1.198 | -12.9216 |
| 980 | 1900.0 | 8.924 | 12.541 | 10.551 | 12.176 | 8.971 | 12.49 | 171.76 | 1.315 | -8.881 | 1.040 | -12.9830 |
| 1000 | 1900.0 | 8.795 | 12.476 | 10.437 | 12.160 | 8.967 | 12.19 | 176.98 | 1.172 | -8.931 | 9.048 -14 | -13.0434 |

## SPRING/FALL MODEL, EXOSPHERIC TEMPERATURE = 2100° K

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n$(He) | log $n$(H) | | | | | | |
| 120 | 355.0 | 16.875 | 16.881 | 17.602 | 13.531 | | 26.90 | 11.62 | 2.700 - 5 | -4.569 | 2.461 - 8 | -7.6089 |
| 125 | 467.6 | 16.563 | 16.665 | 17.314 | 13.433 | | 26.59 | 15.50 | 1.864 | -4.730 | 1.275 | -7.8946 |
| 130 | 573.0 | 16.323 | 16.501 | 17.093 | 13.359 | | 26.33 | 19.21 | 1.398 | -4.855 | 7.715 - 9 | -8.1127 |
| 135 | 671.5 | 16.127 | 16.368 | 16.913 | 13.301 | | 26.09 | 22.76 | 1.100 | -4.959 | 5.139 | -8.2891 |
| 140 | 763.7 | 15.962 | 16.258 | 16.761 | 13.253 | | 25.88 | 26.14 | 8.960 - 6 | -5.048 | 3.651 | -8.4375 |
| 145 | 850.0 | 15.818 | 16.163 | 16.630 | 13.212 | | 25.68 | 29.36 | 7.481 | -5.126 | 2.718 | -8.5657 |
| 150 | 930.6 | 15.691 | 16.079 | 16.513 | 13.176 | | 25.49 | 32.43 | 6.363 | -5.196 | 2.096 | -8.6786 |
| 155 | 1006.1 | 15.576 | 16.005 | 16.409 | 13.145 | | 25.31 | 35.37 | 5.490 - 6 | -5.260 | 1.661 - 9 | -8.7796 |
| 160 | 1076.7 | 15.472 | 15.938 | 16.314 | 13.117 | | 25.14 | 38.17 | 4.792 | -5.319 | 1.346 | -8.8711 |
| 165 | 1142.8 | 15.376 | 15.877 | 16.226 | 13.093 | | 24.97 | 40.84 | 4.227 | -5.374 | 1.110 | -8.9546 |
| 170 | 1204.5 | 15.287 | 15.821 | 16.145 | 13.070 | | 24.81 | 43.39 | 3.750 | -5.426 | 9.290 -10 | -9.0320 |
| 175 | 1262.3 | 15.203 | 15.769 | 16.070 | 13.050 | | 24.66 | 45.83 | 3.352 | -5.475 | 7.875 | -9.1037 |
| 180 | 1316.4 | 15.125 | 15.721 | 15.999 | 13.031 | | 24.51 | 48.16 | 3.014 | -5.521 | 6.748 | -9.1708 |
| 185 | 1367.0 | 15.051 | 15.676 | 15.932 | 13.014 | | 24.36 | 50.39 | 2.723 | -5.565 | 5.836 | -9.2339 |
| 190 | 1414.3 | 14.981 | 15.633 | 15.869 | 12.997 | | 24.21 | 52.52 | 2.471 | -5.607 | 5.088 | -9.2934 |
| 195 | 1458.5 | 14.913 | 15.593 | 15.808 | 12.982 | | 24.07 | 54.57 | 2.251 | -5.648 | 4.468 | -9.3499 |
| 200 | 1499.9 | 14.849 | 15.555 | 15.750 | 12.968 | | 23.93 | 56.53 | 2.057 | -5.687 | 3.948 | -9.4036 |
| 205 | 1538.7 | 14.787 | 15.519 | 15.695 | 12.955 | | 23.80 | 58.41 | 1.886 - 6 | -5.725 | 3.508 -10 | -9.4550 |
| 210 | 1574.9 | 14.728 | 15.484 | 15.642 | 12.943 | | 23.66 | 60.21 | 1.733 | -5.761 | 3.132 | -9.5042 |
| 215 | 1608.8 | 14.670 | 15.450 | 15.590 | 12.931 | | 23.53 | 61.95 | 1.597 | -5.797 | 2.809 | -9.5514 |
| 220 | 1640.5 | 14.615 | 15.418 | 15.541 | 12.920 | | 23.40 | 63.62 | 1.475 | -5.831 | 2.530 | -9.5969 |
| 225 | 1670.1 | 14.561 | 15.387 | 15.492 | 12.909 | | 23.27 | 65.23 | 1.365 | -5.865 | 2.287 | -9.6407 |
| 230 | 1697.9 | 14.508 | 15.358 | 15.445 | 12.899 | | 23.15 | 66.78 | 1.265 | -5.898 | 2.074 | -9.6832 |
| 235 | 1723.8 | 14.457 | 15.329 | 15.400 | 12.889 | | 23.02 | 68.27 | 1.175 | -5.930 | 1.887 | -9.7243 |
| 240 | 1748.1 | 14.407 | 15.301 | 15.355 | 12.880 | | 22.90 | 69.71 | 1.093 | -5.962 | 1.721 | -9.7642 |
| 245 | 1770.8 | 14.358 | 15.273 | 15.312 | 12.871 | | 22.77 | 71.11 | 1.018 | -5.992 | 1.574 | -9.8029 |
| 250 | 1792.1 | 14.311 | 15.247 | 15.269 | 12.863 | | 22.65 | 72.46 | 9.493 - 7 | -6.023 | 1.443 | -9.8407 |
| 255 | 1811.9 | 14.264 | 15.221 | 15.228 | 12.854 | | 22.53 | 73.76 | 8.866 - 7 | -6.052 | 1.326 -10 | -9.8775 |
| 260 | 1830.5 | 14.218 | 15.196 | 15.187 | 12.847 | | 22.41 | 75.03 | 8.290 | -6.081 | 1.221 | -9.9134 |
| 265 | 1847.9 | 14.173 | 15.171 | 15.147 | 12.839 | | 22.29 | 76.26 | 7.759 | -6.110 | 1.126 | -9.9485 |
| 270 | 1864.2 | 14.128 | 15.147 | 15.107 | 12.831 | | 22.18 | 77.45 | 7.271 | -6.138 | 1.040 | -9.9828 |
| 275 | 1879.4 | 14.084 | 15.124 | 15.069 | 12.824 | | 22.06 | 78.61 | 6.819 | -6.166 | 9.628 -11 | -10.0164 |
| 280 | 1893.6 | 14.041 | 15.100 | 15.031 | 12.817 | | 21.95 | 79.74 | 6.402 | -6.194 | 8.925 | -10.0494 |
| 285 | 1907.0 | 13.999 | 15.077 | 14.993 | 12.810 | | 21.83 | 80.83 | 6.016 | -6.221 | 8.285 | -10.0817 |
| 290 | 1919.4 | 13.956 | 15.055 | 14.956 | 12.804 | | 21.72 | 81.90 | 5.657 | -6.247 | 7.701 | -10.1135 |
| 295 | 1931.1 | 13.915 | 15.033 | 14.919 | 12.797 | | 21.61 | 82.95 | 5.324 | -6.274 | 7.167 | -10.1447 |
| 300 | 1942.0 | 13.874 | 15.011 | 14.883 | 12.791 | | 21.50 | 83.97 | 5.015 | -6.300 | 6.678 | -10.1753 |
| 310 | 1961.7 | 13.793 | 14.969 | 14.811 | 12.779 | | 21.29 | 85.94 | 4.458 - 7 | -6.351 | 5.818 -11 | -10.2352 |
| 320 | 1979.0 | 13.714 | 14.927 | 14.742 | 12.767 | | 21.08 | 87.83 | 3.973 | -6.401 | 5.089 | -10.2933 |
| 330 | 1994.1 | 13.636 | 14.886 | 14.673 | 12.756 | | 20.87 | 89.64 | 3.550 | -6.450 | 4.468 | -10.3499 |
| 340 | 2007.3 | 13.559 | 14.847 | 14.605 | 12.744 | | 20.67 | 91.39 | 3.179 | -6.498 | 3.936 | -10.4049 |
| 350 | 2018.9 | 13.483 | 14.807 | 14.539 | 12.734 | | 20.47 | 93.08 | 2.852 | -6.545 | 3.478 | -10.4587 |
| 360 | 2029.0 | 13.408 | 14.769 | 14.473 | 12.723 | | 20.28 | 94.72 | 2.564 | -6.591 | 3.082 | -10.5112 |
| 370 | 2037.9 | 13.334 | 14.731 | 14.408 | 12.713 | | 20.09 | 96.31 | 2.309 | -6.637 | 2.738 | -10.5626 |
| 380 | 2045.7 | 13.261 | 14.694 | 14.344 | 12.703 | | 19.91 | 97.86 | 2.083 | -6.681 | 2.438 | -10.6130 |
| 390 | 2052.4 | 13.189 | 14.657 | 14.280 | 12.693 | | 19.73 | 99.37 | 1.882 | -6.725 | 2.176 | -10.6623 |
| 400 | 2058.4 | 13.117 | 14.620 | 14.217 | 12.684 | | 19.55 | 100.84 | 1.703 | -6.769 | 1.946 | -10.7108 |

| Altitude $Z$, km | Temp. $T$, °K | Number density $m^{-3}$ | | | | | Molecular weight $M$ | Scale height $H_p$, km | Pressure $P$, mb | Log pressure | Density $\rho$, kg $m^{-3}$ | Log density |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | log $n(O_2)$ | log $n(O)$ | log $n(N_2)$ | log $n(He)$ | log $n(H)$ | | | | | | |
| 410 | 2063.6 | 13.045 | 14.584 | 14.154 | 12.674 | | 19.38 | 102.28 | 1.544 - 7 | -6.811 | 1.744 -11 | -10.7585 |
| 420 | 2068.1 | 12.974 | 14.548 | 14.092 | 12.665 | | 19.22 | 103.68 | 1.401 | -6.854 | 1.566 | -10.8053 |
| 430 | 2072.1 | 12.904 | 14.512 | 14.030 | 12.656 | | 19.06 | 105.06 | 1.273 | -6.895 | 1.408 | -10.8513 |
| 440 | 2075.6 | 12.834 | 14.477 | 13.969 | 12.646 | | 18.90 | 106.42 | 1.158 | -6.936 | 1.269 | -10.8967 |
| 450 | 2078.6 | 12.765 | 14.442 | 13.908 | 12.637 | | 18.75 | 107.74 | 1.055 | -6.977 | 1.145 | -10.9413 |
| 460 | 2081.3 | 12.695 | 14.407 | 13.847 | 12.629 | | 18.61 | 109.05 | 9.618 - 8 | -7.017 | 1.034 | -10.9854 |
| 470 | 2083.6 | 12.626 | 14.372 | 13.787 | 12.620 | | 18.47 | 110.33 | 8.780 | -7.056 | 9.359 -12 | -11.0287 |
| 480 | 2085.7 | 12.558 | 14.338 | 13.727 | 12.611 | | 18.33 | 111.59 | 8.024 | -7.096 | 8.481 | -11.0716 |
| 490 | 2087.5 | 12.490 | 14.303 | 13.667 | 12.602 | | 18.20 | 112.83 | 7.340 | -7.134 | 7.695 | -11.1138 |
| 500 | 2089.0 | 12.422 | 14.269 | 13.608 | 12.594 | 8.945 | 18.07 | 114.05 | 6.720 | -7.173 | 6.991 | -11.1555 |
| 510 | 2090.4 | 12.354 | 14.235 | 13.548 | 12.585 | 8.943 | 17.94 | 115.26 | 6.159 - 8 | -7.210 | 6.358 -12 | -11.1967 |
| 520 | 2091.6 | 12.287 | 14.202 | 13.489 | 12.576 | 8.941 | 17.82 | 116.45 | 5.650 | -7.248 | 5.790 | -11.2373 |
| 530 | 2092.7 | 12.220 | 14.168 | 13.431 | 12.568 | 8.939 | 17.70 | 117.62 | 5.187 | -7.285 | 5.278 | -11.2775 |
| 540 | 2093.6 | 12.153 | 14.135 | 13.372 | 12.559 | 8.936 | 17.59 | 118.78 | 4.766 | -7.322 | 4.817 | -11.3173 |
| 550 | 2094.4 | 12.087 | 14.101 | 13.314 | 12.551 | 8.934 | 17.48 | 119.93 | 4.383 | -7.358 | 4.400 | -11.3566 |
| 560 | 2095.1 | 12.020 | 14.068 | 13.256 | 12.543 | 8.931 | 17.37 | 121.06 | 4.034 | -7.394 | 4.023 | -11.3954 |
| 570 | 2095.7 | 11.954 | 14.035 | 13.198 | 12.534 | 8.929 | 17.27 | 122.18 | 3.716 | -7.430 | 3.682 | -11.4339 |
| 580 | 2096.2 | 11.888 | 14.002 | 13.140 | 12.526 | 8.927 | 17.17 | 123.29 | 3.425 | -7.465 | 3.373 | -11.4719 |
| 590 | 2096.7 | 11.823 | 13.969 | 13.083 | 12.518 | 8.925 | 17.07 | 124.39 | 3.159 | -7.500 | 3.093 | -11.5096 |
| 600 | 2097.1 | 11.757 | 13.936 | 13.025 | 12.510 | 8.923 | 16.97 | 125.49 | 2.916 | -7.535 | 2.838 | -11.5469 |
| 610 | 2097.5 | 11.692 | 13.903 | 12.968 | 12.501 | 8.921 | 16.88 | 126.57 | 2.694 - 8 | -7.570 | 2.607 -12 | -11.5839 |
| 620 | 2097.8 | 11.627 | 13.871 | 12.911 | 12.493 | 8.919 | 16.78 | 127.65 | 2.490 | -7.604 | 2.396 | -11.6205 |
| 630 | 2098.1 | 11.562 | 13.839 | 12.855 | 12.485 | 8.916 | 16.69 | 128.73 | 2.303 | -7.638 | 2.204 | -11.6568 |
| 640 | 2098.3 | 11.497 | 13.806 | 12.798 | 12.477 | 8.914 | 16.60 | 129.80 | 2.132 | -7.671 | 2.029 | -11.6927 |
| 650 | 2098.5 | 11.433 | 13.774 | 12.742 | 12.469 | 8.912 | 16.52 | 130.87 | 1.974 | -7.705 | 1.869 | -11.7284 |
| 660 | 2098.7 | 11.369 | 13.742 | 12.685 | 12.461 | 8.910 | 16.43 | 131.94 | 1.830 | -7.738 | 1.723 | -11.7637 |
| 670 | 2098.9 | 11.305 | 13.710 | 12.629 | 12.453 | 8.908 | 16.35 | 133.01 | 1.697 | -7.770 | 1.589 | -11.7988 |
| 680 | 2099.0 | 11.241 | 13.678 | 12.573 | 12.445 | 8.906 | 16.26 | 134.08 | 1.574 | -7.803 | 1.467 | -11.8336 |
| 690 | 2099.1 | 11.177 | 13.646 | 12.518 | 12.437 | 8.904 | 16.18 | 135.16 | 1.462 | -7.835 | 1.355 | -11.8681 |
| 700 | 2099.2 | 11.114 | 13.614 | 12.462 | 12.429 | 8.902 | 16.10 | 136.24 | 1.358 | -7.867 | 1.252 | -11.9023 |
| 710 | 2099.3 | 11.050 | 13.583 | 12.407 | 12.421 | 8.900 | 16.02 | 137.32 | 1.262 - 8 | -7.899 | 1.158 -12 | -11.9362 |
| 720 | 2099.4 | 10.987 | 13.551 | 12.352 | 12.413 | 8.898 | 15.94 | 138.42 | 1.174 | -7.930 | 1.072 | -11.9700 |
| 730 | 2099.5 | 10.924 | 13.520 | 12.296 | 12.405 | 8.896 | 15.86 | 139.52 | 1.092 | -7.962 | 9.921 -13 | -12.0034 |
| 740 | 2099.6 | 10.862 | 13.488 | 12.241 | 12.397 | 8.894 | 15.78 | 140.63 | 1.017 | -7.993 | 9.190 | -12.0367 |
| 750 | 2099.6 | 10.799 | 13.457 | 12.187 | 12.389 | 8.892 | 15.70 | 141.76 | 9.474 - 9 | -8.023 | 8.518 | -12.0697 |
| 760 | 2099.7 | 10.737 | 13.426 | 12.132 | 12.382 | 8.890 | 15.61 | 142.90 | 8.831 | -8.054 | 7.899 | -12.1024 |
| 770 | 2099.7 | 10.675 | 13.395 | 12.078 | 12.374 | 8.888 | 15.53 | 144.06 | 8.237 | -8.084 | 7.329 | -12.1350 |
| 780 | 2099.7 | 10.613 | 13.364 | 12.023 | 12.366 | 8.886 | 15.45 | 145.23 | 7.686 | -8.114 | 6.803 | -12.1673 |
| 790 | 2099.8 | 10.551 | 13.333 | 11.969 | 12.358 | 8.884 | 15.37 | 146.42 | 7.177 | -8.144 | 6.318 | -12.1994 |
| 800 | 2099.8 | 10.489 | 13.302 | 11.915 | 12.351 | 8.882 | 15.28 | 147.63 | 6.705 | -8.174 | 5.870 | -12.2313 |
| 820 | 2099.8 | 10.366 | 13.240 | 11.808 | 12.335 | 8.878 | 15.12 | 150.13 | 5.862 - 9 | -8.232 | 5.075 -13 | -12.2945 |
| 840 | 2099.9 | 10.244 | 13.179 | 11.701 | 12.320 | 8.875 | 14.94 | 152.73 | 5.137 | -8.289 | 4.396 | -12.3570 |
| 860 | 2099.9 | 10.002 | 13.058 | 11.489 | 12.290 | 8.867 | 14.57 | 158.32 | 3.972 | -8.401 | 3.315 | -12.4795 |
| 900 | 2099.9 | 9.882 | 12.998 | 11.383 | 12.275 | 8.863 | 14.38 | 161.34 | 3.504 | -8.455 | 2.886 | -12.5396 |
| 920 | 2100.0 | 9.762 | 12.938 | 11.279 | 12.260 | 8.859 | 14.18 | 164.53 | 3.100 | -8.509 | 2.517 | -12.5991 |
| 940 | 2100.0 | 9.643 | 12.879 | 11.175 | 12.245 | 8.856 | 13.97 | 167.91 | 2.748 | -8.561 | 2.199 | -12.6578 |
| 960 | 2100.0 | 9.525 | 12.820 | 11.071 | 12.230 | 8.852 | 13.75 | 171.49 | 2.443 | -8.612 | 1.924 | -12.7158 |
| 980 | 2100.0 | 9.408 | 12.761 | 10.969 | 12.215 | 8.848 | 13.53 | 175.31 | 2.176 | -8.662 | 1.686 | -12.7730 |
| 1000 | 2100.0 | 9.291 | 12.703 | 10.866 | 12.201 | 8.845 | 13.29 | 179.37 | 1.944 | -8.711 | 1.480 | -12.8296 |

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# CORRIGENDA

for

# U.S. STANDARD ATMOSPHERE, 1962

1. Page 5, Table 1.2.1

   Change Metric value of $R^*$ to $8.31432 \times 10^3$ joules $(°K)^{-1}$ $(kg\text{-}mol)^{-1}$

   Change English value of $R^*$ to 1545.31 ft lbf $(°R)^{-1}$ $(lb\text{-}mol)^{-1}$
   or 49719.0 lb $ft^2$ $sec^{-2}$ $(°R)^{-1}$ $(lb\text{-}mol)^{-1}$

2. Page 9, Right-hand column, line 16:

   Change "1948" to read "1947"

3. Page 10, Table 1.2.8

   Change dimension of $M_0$ from "(dimensionless)" to "kg $(kg\text{-}mol)^{-1}$" and "lb $(lb\text{-}mol)^{-1}$"

4. Page 13, Figure 1.3.5, abscissa label:

   Change "Mean free path, km" to read "Mean free path, m."

5. Page 16, Table 1.4(e), $Z = 170$, 190, 230 km.

   Change "26.40, 24.70, 1103.4, 1205.4, 1322.3" to read "26.45, 24.69, 1105.5, 1205.5, 1321.7," respectively.

6. Page 28, Table II.3(b), integrals:

   Change "$\log_e (Z - 284.01768)$" in line 9 and "$\log_e (Z - 216.23225)$" in line 14 to read "$\log_e (284.01768 - Z)$, $\log_e (216.23225 - Z)$," respectively.

NOTE: Pages 80 through 85 and 182 through 189.—For molecular weight above 90 km minor oscillations will sometimes be noted which cause certain values to be slightly greater than a preceding value at a lower altitude. These discrepancies result from the particular analytic function utilized to fit predetermined defining points and are not intentional. Several of the figures on pages 11 to 15 show oscillations which do not appear in the tabulated values.