AD A058505
AU No.
DDC FILE COPY

AFGL-TR-78-0051
AIR FORCE SURVEYS IN GEOPHYSICS, NO. 382

LEVEL II

Air Force Reference Atmospheres

ALLEN E. COLE
ARTHUR J. KANTOR

DDC
SEP 13 1978
F

28 February 1978

Approved for public release; distribution unlimited.

METEOROLOGY DIVISION PROJECT 6670
AIR FORCE GEOPHYSICS LABORATORY
HANSCOM AFB, MASSACHUSETTS 01731

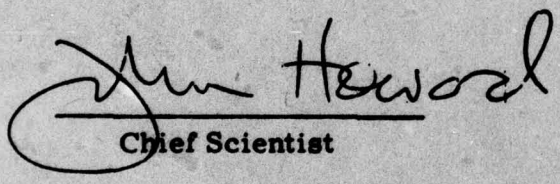
AIR FORCE SYSTEMS COMMAND, USAF

78 14 08 267

This report has been reviewed by the ESD Information Office (OI) and is releasable to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER



Chief Scientist

Qualified requestors may obtain additional copies from the Defense Documentation Center. All others should apply to the National Technical Information Service.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: AFGL-TR-78-0051 AFGL-AFSG-382	2. GOVT ACCESSION NO. 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): AIR FORCE REFERENCE ATMOSPHERES	5. TYPE OF REPORT & PERIOD COVERED: Scientific. Interim.
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Allen E. Cole, Arthur J. Kantor	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Air Force Geophysics Laboratory (LYD), Hanscom AFB, Massachusetts 01731	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62101F 66700902 17 09
11. CONTROLLING OFFICE NAME AND ADDRESS: Air Force Geophysics Laboratory (LYD), Hanscom AFB, Massachusetts 01731	12. REPORT DATE: February 1978 (11 28)
	13. NUMBER OF PAGES: 78
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited. (12) 76 p.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(9) Air Force surveys in geophysics,

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Reference atmospheres
Stratospheric and mesospheric temperatures
Stratospheric and mesospheric densities

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Sets of mean monthly reference atmospheres that describe seasonal changes in the vertical distributions of temperature, density, and pressure up to 90 km are presented for 15° intervals of latitude between the equator and pole. Specialized atmospheres are included that portray longitudinal variations in monthly median values of temperature, density, and pressure during the winter months. Other models illustrate the magnitude of the changes in the vertical distributions of these atmospheric properties during winter warmings and coolings of the stratosphere and mesosphere in arctic and subarctic

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

78 14 08 267
409 578

20. (Cont)

regions. Estimates of the day-to-day variations around the monthly median values of temperature and density are provided for each set of models.

ACCESSION for
NTIS
DDC
UNANNOUNCED
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
DIST. SPECIAL
A

Contents

1.	INTRODUCTION	7
2.	BASIC ASSUMPTIONS AND FORMULAS	8
	2.1 The Static Atmosphere and Perfect Gas Law	9
	2.2 Geopotential	9
	2.3 Pressure	10
3.	DATA	10
4.	ANALYSIS	12
5.	DISTRIBUTION OF OBSERVED TEMPERATURES AND DENSITIES	16
6.	LONGITUDINAL VARIATIONS	28
7.	COLD AND WARM WINTER STRATOSPHERE/MESOSPHERE	31
REFERENCES		37
APPENDIX A:	Tables of Monthly Thermodynamic Properties of the Atmosphere	41
APPENDIX B:	Tables of Thermodynamic Properties Representative of Cold and Warm Stratospheric Regimes Between 60°N and 75°N	63
APPENDIX C:	Break-Point Tables in Geopotential Kilometers and Temperature for all Models	69

Illustrations

1.	Mean January and July Pressure Height Maps for 0.4 mb	13
2.	Mean January and July Temperature Maps (°K) for 0.4 mb	14
3.	Latitudinal Distribution of Median 30-km Temperature for January and July	15
4.	Latitudinal Temperature-Height Cross-Sections of Monthly Temperatures for January and July	17
5.	Latitudinal Density-Height Cross-Sections for January and July	18
6.	Mean Monthly Temperature-Height Profiles for the 60°N Models at Longitudes 10°, 100°, and 140°W	29
7.	Mean Monthly Temperature-Height Profiles for the 75°N Models at 10° and 140°W	29
8.	Density-Height Profiles for the 60°N Models at 10°, 100° and 140°W	30
9.	Density-Height Profiles for the 75°N Models at 10° and 140°W	31
10.	Temperature-Height Profiles Associated With Extreme Warm and Cold Regimes in the Winter Stratosphere and Mesosphere Near 60°N	32
11a.	Density Profiles (Warm) Associated With Extreme Temperatures in the Upper Stratosphere and Mean January Conditions at 60°N	34
11b.	Density Profiles Associated With Extreme Temperatures in the Upper Stratosphere and Mean January Conditions at 60°N	35

Tables

1.	Sea-Level Acceleration of Gravity and the Effective Radius, r_ϕ, of the Earth for Each Latitude	10
2.	Observational Sites	11
3.	Median, High, and Low Percentile Values of Temperatures for January and July at 30°, 45°, 60°, and 75°N	19
4.	Median, High, and Low Percentile Values of Densities for January and July, at 30°, 45°, 60°, and 75°N	23
5.	Standard Deviations of Observed Day-to-Day Variations in Temperatures (°K) and Densities (%) at Ascension (8°S) at Altitudes up to 50 km During the Mid-Season Months	27
6.	Standard Deviations of Observed Densities and Temperatures Around the Mean Annual Values at Ascension/Natal	28
A1.	Monthly Temperature at the Equator and for 15° Intervals of Latitude	42
A2.	Monthly Density at the Equator and for 15° Intervals of Latitude	49
A3.	Monthly Pressure at the Equator and for 15° Intervals of Latitude	56

Tables

B1.	Temperature in January for 60°N and 75°N at Specific Longitudes	64
B2.	Density in January for 60°N and 75°N at Specified Longitudes	65
B3.	Pressure in January for 60°N and 75°N at Specified Longitudes	66
B4.	High-Latitude Thermodynamic Properties for Cold and Warm Winter Stratosphere/Mesosphere	67
C1.	Temperature-Height Profiles at the Equator and for 15° Intervals of Latitude	70
C2.	January Temperature-Height Profiles for Specified Longitudes at 60°N and 75°N	77
C3.	High-Latitude Temperature-Height Profiles for Cold and Warm Winter Stratosphere/Mesosphere	78

Air Force Reference Atmospheres

1. INTRODUCTION

The Reference Atmospheres presented in this report were developed to provide AF engineers and designers of aerospace systems with up-to-date information on the seasonal, latitudinal, longitudinal, and day-to-day variability of the thermodynamic properties of the atmosphere for altitudes between the surface and 90 km. They expand upon and update information contained in the U.S. Standard Atmosphere Supplements, 1966.

There has been a substantial increase in the number of meteorological rocket observations taken on a routine basis during the past ten years. These data enable relatively detailed analyses to be made of seasonal, day-to-day, latitudinal, and longitudinal (10°W to 140°W) variations of the thermodynamic properties of the atmosphere for altitudes up to 55 km. The increase in the number of available measurements derived from grenade, pressure gauge, and falling sphere experiments for altitudes between 55 and 90 km has been much smaller. Consequently, the periodic and day-to-day variations that are given for these altitudes are more speculative than those provided for altitudes below 55 km.

The seasonal and latitudinal variability of the atmosphere is shown by a series of mean monthly atmospheric models, presented in tabular form in Appendix A for 15° intervals of latitude, including the Equator and North Pole. All these

(Received for publication on 28 February 1978)

PRECEDING PAGE BLANK-NOT FILMED

atmospheric models with the exception of those for 90°N extend from the surface to 90 km. The lack of observations at the higher altitudes in polar regions made it impractical to extend the 90°N models above 55 km. Special models are included (Appendix B) that portray longitudinal variations in the monthly median values of temperature, pressure, and density up to 55 km during the winter months near 60° and 75°N. Additional models which illustrate the magnitude of the changes in the vertical distributions of these atmospheric properties during extreme winter warmings and coolings of the stratosphere and mesosphere in arctic and subarctic regions are also included (Appendix B).

Additional information on the construction of the models, the extremes that occur in the arctic winter stratospheres, and the periodic variations of the thermodynamic properties of the atmosphere is contained in References 1 through 4.

2. BASIC ASSUMPTIONS AND FORMULAS

The monthly atmospheres are defined by temperature-altitude profiles in which vertical gradients of temperature are linear with respect to geopotential altitude. It is assumed that the air is dry, is in hydrostatic equilibrium, and behaves as a perfect gas. The molecular weight of air at sea level, 28.9644 kg(k-mol)$^{-1}$, is assumed to be constant to 90 km. Actually, dissociation of molecular oxygen begins to take place near 80 km and molecular weight starts decreasing slowly with height. Consequently, the molecular-scale temperatures (T_M) given in Appendix A for altitudes above 80 km are slightly but not significantly larger than the ambient kinetic temperature (T), as $T_M=(M_o/M)T$, where M_o is sea-level molecular weight and M is the molecular weight of air at a specific altitude. Molecular weight is assumed constant below 80 km; therefore, molecular-scale and ambient temperatures are identical at those altitudes.

Numerical values for the various thermodynamic and physical constants used in computing the tables of atmospheric properties for these atmospheres are identical to those used in the preparation of the U.S. Standard Atmosphere, 1976, with two exceptions. Surface conditions for the atmospheres are based on mean monthly

1. Cole, A.E., and Kantor, A.J. (1975) Tropical Atmospheres, 0 to 90 km, AFCRL-TR-75-0527.
2. Kantor, A.J., and Cole, A.E. (1976) Monthly Midlatitude Atmospheres, Surface to 90 km, AFGL-TR-76-0140.
3. Cole, A.E., and Kantor, A.J. (1977) Arctic and Subarctic Atmospheres, 0 to 90 km, AFGL-TR-77-0046.
4. Kantor, A.J., and Cole, A.E. (1977) Monthly 90°N Atmospheres and High-Latitude Warm and Cold Winter Stratosphere/Mesosphere, AFCRL-TR-77-0289.

sea-level values of pressure and temperature for the appropriate latitude rather than on standard conditions. The acceleration due to gravity at sea level for the latitudes were obtained from the following expression by Lambert[5] in which gravity, g, varies with latitude ϕ:

$$g_\phi = 9.780356\,(1 + 0.0052885 \sin^2 \phi - 0.0000059 \sin^2 2\phi)\,. \tag{1}$$

2.1 The Static Atmosphere and Perfect Gas Law

The air is assumed to be in hydrostatic equilibrium and to satisfy the differential equation

$$dP = -\rho g\, dZ \tag{2}$$

which relates air pressure (P) to density (ρ), acceleration of free fall (g), and height (Z). The perfect gas law relates air pressure to density and temperature as follows:

$$P = \frac{\rho R^* T_M}{M_o} \tag{3}$$

where R* is the universal gas constant, 8.31432×10^3 JK^{-1} $(k\text{-}mol)^{-1}$.

2.2 Geopotential

The relationship between geopotential altitude and geometric altitude is the same as that used for the U.S. Standard Atmosphere Supplements, 1966:

$$H = \left(\frac{r_\phi Z}{r_\phi + Z}\right)\left(\frac{g_\phi}{G}\right) \tag{4}$$

where H is the geopotential altitude in geopotential meters (m'), Z is the geometric altitude, r_ϕ is the effective earth radius, g_ϕ is the sea-level value for acceleration of gravity at a specific latitude ϕ, as given by Lambert's equation,[5] and G is the unit geopotential set equal to 9.80665 m^2 sec^{-2} $(m')^{-1}$. Values of r_ϕ and g_ϕ are given in Table 1.

---

5. List, R.J. (Ed.) (1968) Smithsonian Meteorological Tables, Smithsonian Inst. Press, Washington, D.C.

Table 1. Sea-Level Acceleration of Gravity and the Effective Radius, r_ϕ, of the Earth for Each Latitude

Latitude ϕ	Sea Level Gravity g_ϕ (m sec^{-2})	Effective Earth's Radius r_ϕ, (km)
0	9.78036	6334.984
15	9.78381	6337.838
30	9.79324	6345.653
45	9.80665	6356.766
60	9.81911	6367.103
75	9.82860	6374.972
90	9.82308	6377.862

2.3 Pressure

Vertical distributions of pressure were computed from appropriate temperature-height profiles and associated mean monthly surface pressures, according to the following barometric equations:

$$\frac{P}{P_b} = \left(\frac{T_{Mb}}{T_{Mb} + Lh} \right)^{\frac{g_\phi M_o}{R^* L}} \quad (L \neq 0) \tag{5}$$

$$\frac{P}{P_b} = \exp \left(\frac{-g_\phi M_o h}{R^* T_{Mb}} \right) \quad (L=0) \tag{6}$$

where $h = H - H_b$; H_b is the geopotential altitude at the base of a particular layer characterized by a specific value of L, which is the vertical gradient of molecular-scale temperature with geopotential height (dT_M/dh); and T_{Mb} and P_b are the respective values of temperature and pressure at altitude H_b.

3. DATA

Initial sea-level pressures for each atmosphere were taken from mean monthly sea-level charts for the Northern Hemisphere.[6,7,8] Mean monthly temperature-height profiles for altitudes up to 30 km were obtained for specific latitudes by giving equal weight to radiosonde temperatures[8-11] interpolated for each 10° of longitude.

Temperature distributions between 30 and 55 km are based on Meteorological Rocket Network (MRN) observations[12] taken at the locations given in the upper

(Because of the large number of references cited above, they will not be listed here. See Reference Page 37, for References 6 through 12.

section of Table 2, and sets of 5-, 2-, and 0.4-mb constant-pressure maps prepared by the Upper Air Branch of the National Weather Service on a weekly basis for the years 1964 through 1968 and from January 1972 through June 1974.[13-19] Prior to 1972 these maps were based on meteorological rocketsonde observations and extrapolated radiosonde data and covered the area between 0° and 160°W in the Northern Hemisphere. Since 1972 efforts have been made to expand the coverage by using data from satellite radiance measurements. However, there are still questions concerning the accuracy of temperature data derived from satellite measurements; consequently, the data used from these maps are confined to areas where rocket data can be applied to confirm the analyses.

The MRN temperature observations were corrected as suggested by Krumins and Lyons[20] for altitudes between 30 and 55 km. They were not used for altitudes above 55 km, since thermistor measurements are subject to large uncertainties above 55 km. The temperature distributions between 55 and 90 km are based on values derived from grenade, falling sphere, and pressure gauge experiments conducted at locations indicated in the lower portion of Table 2.[21-35]

Table 2. Observational Sites

Meteorological Rockets			
Stations	Latitude	Longitude	Period of Record
Ascension	8°S	14°W	Jan 1964 - Dec 1976
Ft. Sherman	9°N	80°W	Dec 1966 - Dec 1976
Antigua	17°N	62°W	Jan 1965 - Dec 1976
Barking Sands	22°N	160°W	Dec 1966 - Dec 1976
Cape Kennedy	28°N	80°W	Jan 1964 - Dec 1976
White Sands	32°N	106°W	Jan 1965 - Dec 1976
Point Mugu	34°N	119°W	Jan 1965 - Dec 1976
Wallops Isiand	38°N	75°W	Jan 1965 - Dec 1976
Volgograd	49°N	44°E	Jan 1968 - Feb 1976
Shemya	53°N	174°E	Jan 1975 - Mar 1976
Primrose Lake	55°N	110°W	Apr 1967 - Dec 1976
West Geirinish	57°N	7°W	Jan 1965 - Jan 1972
Churchill	59°N	94°W	Jan 1965 - Dec 1976
Ft. Greely	64°N	146°W	Jan 1965 - Dec 1976
Thule	77°N	69°W	Jan 1965 - Dec 1976
Heiss Island	81°N	58°E	Jan 1968 - Feb 1976

(Because of the large number of references cited above, they will not be listed here. See Reference Page 37, for References 13 through 35.)

Table 2. Observational Sites (Cont)

Experimental Rockets			
Stations	Latitude	Longitude	Period of Record
Woomera	31°S	137°E	1957 - 1973
Ascension Island	8°S	14°W	1964 - 1965
Natal	6°S	35°W	1966 - 1968
Kourou	5°N	52°W	1971
Guam	13°N	145°E	1958
White Sands	32°N	106°W	1965 - 1971
Wallops Island	38°N	75°W	1961 - 1971
Churchill	59°N	94°W	1957 - 1971
Barrow	71°N	157°W	1965 - 1972

4. ANALYSIS

Mean monthly pressure-height and temperature maps were developed for 5.0, 2.0, and 0.4 mb from grid point data taken from the weekly pressure-height maps prepared at these levels by the National Weather Service for the Northern Hemisphere. Mean January and July pressure-height and temperature maps for the 0.4 mb level are shown in Figures 1 and 2, respectively.

Medians of monthly temperatures and densities were derived at 5-km intervals of altitude between 30 and 90 km from meteorological and experimental rocket observations taken at the locations given in Table 2. Bimonthly running medians were obtained for altitudes and locations where data for one or more months were missing.

The median monthly temperatures and densities for each location and level were subjected to harmonic analysis for annual and semiannual cycles. The analyses smoothed the data and gave regression equations of the form

$$Y = \overline{Y} + A_1 \sin(x+\phi_1) + A_2 (\sin 2x+\phi_2) \qquad (7)$$

where A is amplitude, Y is either density or temperature, $\overline{Y}$ is the mean annual value, x=iz, z=360°/period, i=0, 2---11, where 0 represents 15 January, 1 represents 15 February, etc.

Due to the sparsity of observations above 50 km, it was necessary to combine the temperatures derived from experimental observations taken at Ascension, Natal, Kourou, and Guam to obtain an adequate data sample on which to base the median monthly values between 55 and 90 km in tropical regions.

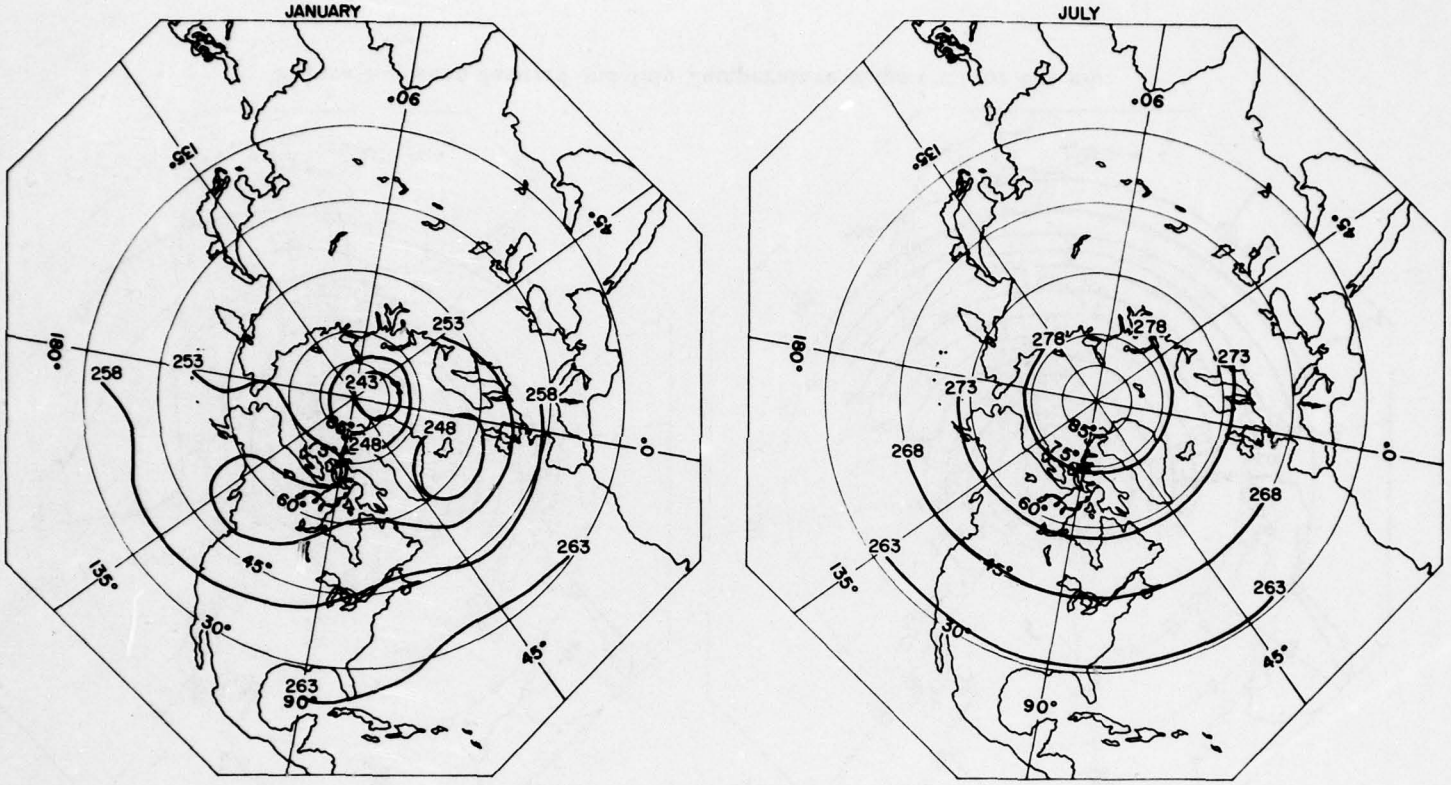


Figure 1. Mean January and July Pressure Height Maps for 0.4 mb

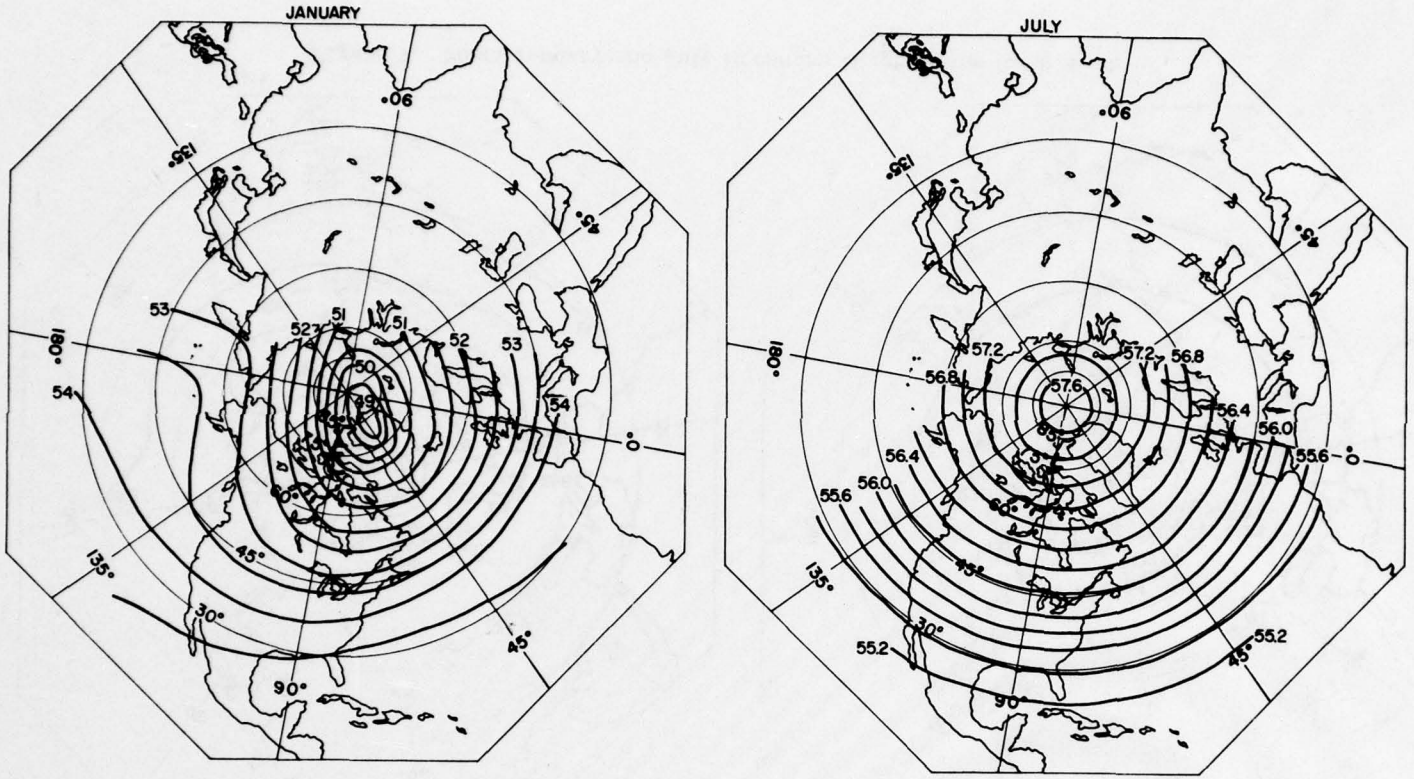


Figure 2. Mean January and July Temperature Maps (°K) for 0.4 mb

Monthly temperatures from the individual harmonic curves and those derived from the mean monthly maps for 5, 2, and 0.4 mb were plotted vs latitude for 5-km height increments between 30 and 80 km. Third degree polynomial curves were fitted to the data. The curves appeared to provide reasonable estimates of the temperature gradients from the North Pole to the Equator at altitudes below 55 km where data are relatively plentiful, as well as at altitudes above 55 km during the summer months when longitudinal and latitudinal temperature variations are relatively small. The latitudinal distributions of 30-km temperatures during January and July are shown in Figure 3. During the Northern Hemisphere winter when longitudinal and latitudinal temperature variations are large, especially above 50 km, the polynomials do not provide realistic estimates of the latitudinal temperature gradients for altitudes between 50 and 90 km. Fourth and fifth degree polynomial fits provided even poorer estimates. Consequently, linear interpolations and subjectively drawn curves were used to obtain estimates of the monthly median temperature at 15° intervals of latitude at altitudes above 50 km for the winter months.

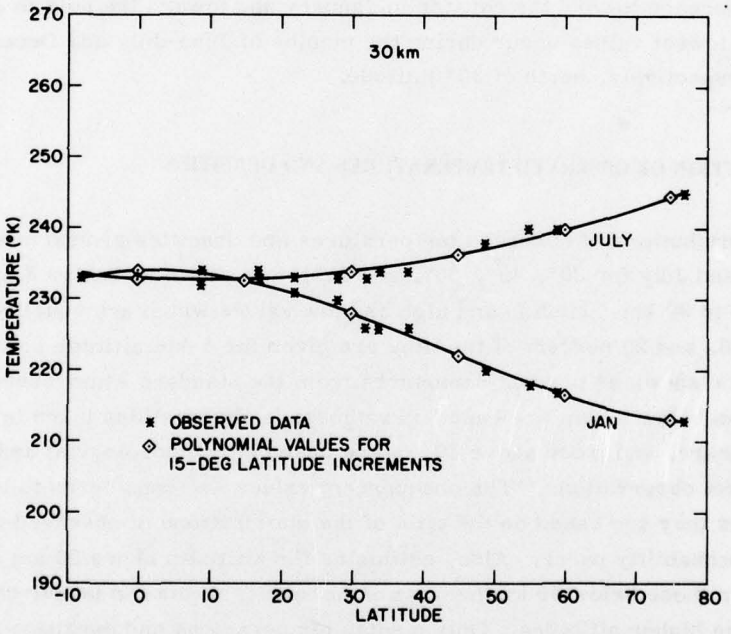


Figure 3. Latitudinal Distribution of Median 30-km Temperatures for January and July

Median monthly temperatures obtained from MRN soundings for 1-km intervals of altitude from 45 to 55 and 75 to 85 km were analyzed to determine the monthly variations in the height and thickness of isothermal layers associated with the stratopause and mesopause. Latitudinal temperature-height cross-sections of the adopted monthly temperatures for January and July are shown in Figure 4 for altitudes between 10 and 90 km.

The temperature-height profiles adopted for each of the monthly atmospheres are defined in Appendix C. The vertical temperature gradients between breakpoints are linear with geopotential altitude.

The latitudinal distribution of atmospheric density based on values from the January and July atmospheres is shown in Figure 5. Densities at the various latitudes and altitudes are expressed as percentages of the densities of the U.S. Standard Atmosphere, 1976. The largest January and July departures of density from standard occur near 75° latitude between 65 and 75 km. At these altitudes the January densities, 50 percent of standard, are roughly one third of the July densities which are 165 percent of standard. Mean monthly densities between 30 and 90 km generally increase toward the equator in January and toward the pole in July. The highest and lowest values occur during the months of June-July and December-January, respectively, north of 30° latitude.

5. DISTRIBUTION OF OBSERVED TEMPERATURES AND DENSITIES

The distributions of observed temperatures and densities around median values in January and July for 30°, 45°, 60°, and 75°N are shown in Tables 3 and 4 for altitudes up to 80 km. Median and high and low values which are equalled or exceeded 1, 10, and 20 percent of the time are given for 5-km altitude increments. Densities are shown as percent departures from the Standard Atmosphere densities. Distributions below 30 km are based on radiosonde observations taken in the Northern Hemisphere, and those above 30 km are based on meteorological and experimental rocket observations. The one-percent values are considered to be rough estimates as they are based on the tails of the distributions of observed values plotted on probability paper. Also, estimates for altitudes above 50 km are less reliable than those below 50 km because of the paucity of data and larger observational errors at the higher altitudes. Only median temperatures and densities are given above 55 km at 75°N for July due to the small number of observations that are available for the higher altitudes in polar regions in summer.

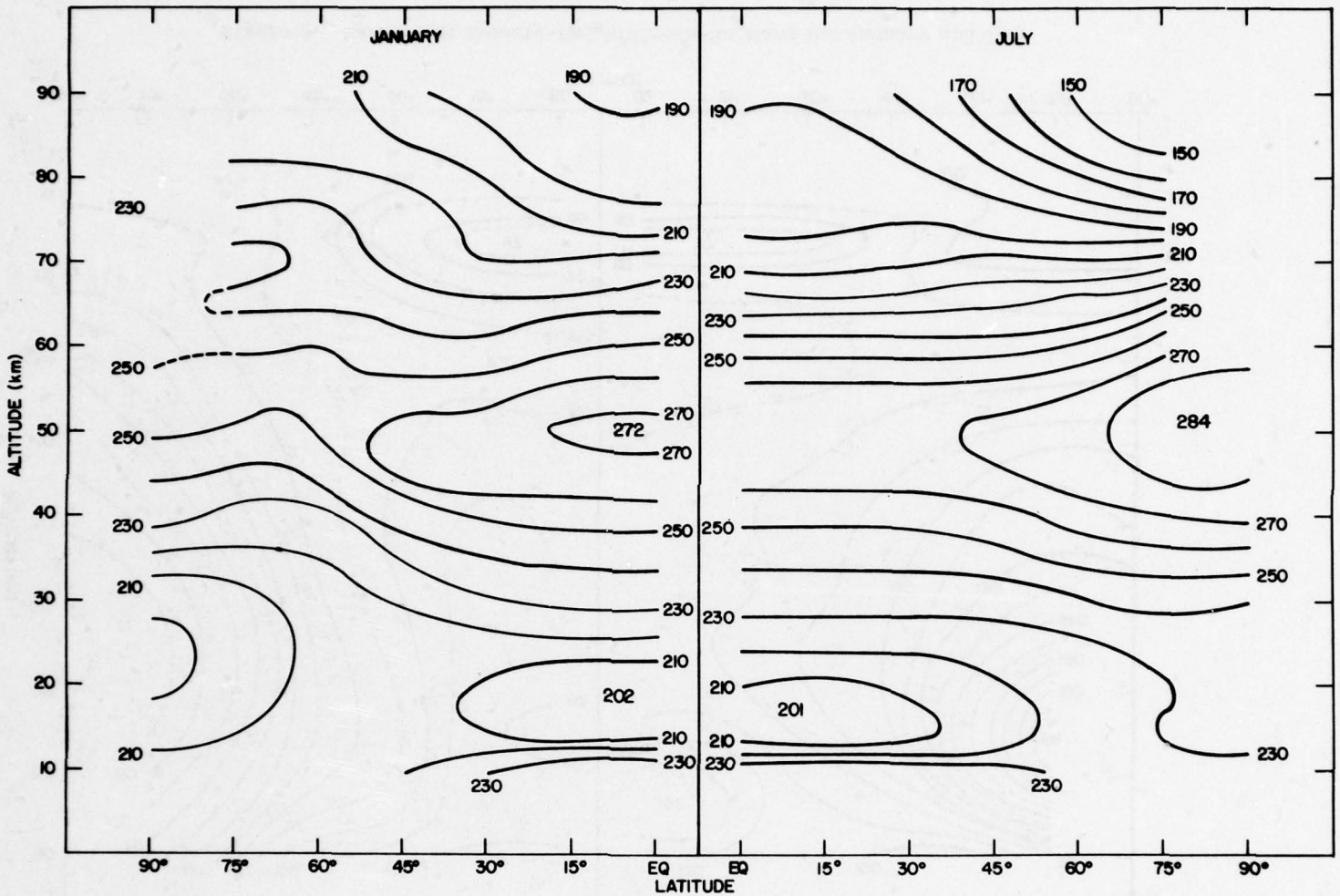


Figure 4. Latitudinal Temperature-Height Cross-Sections of Monthly Temperatures for January and July

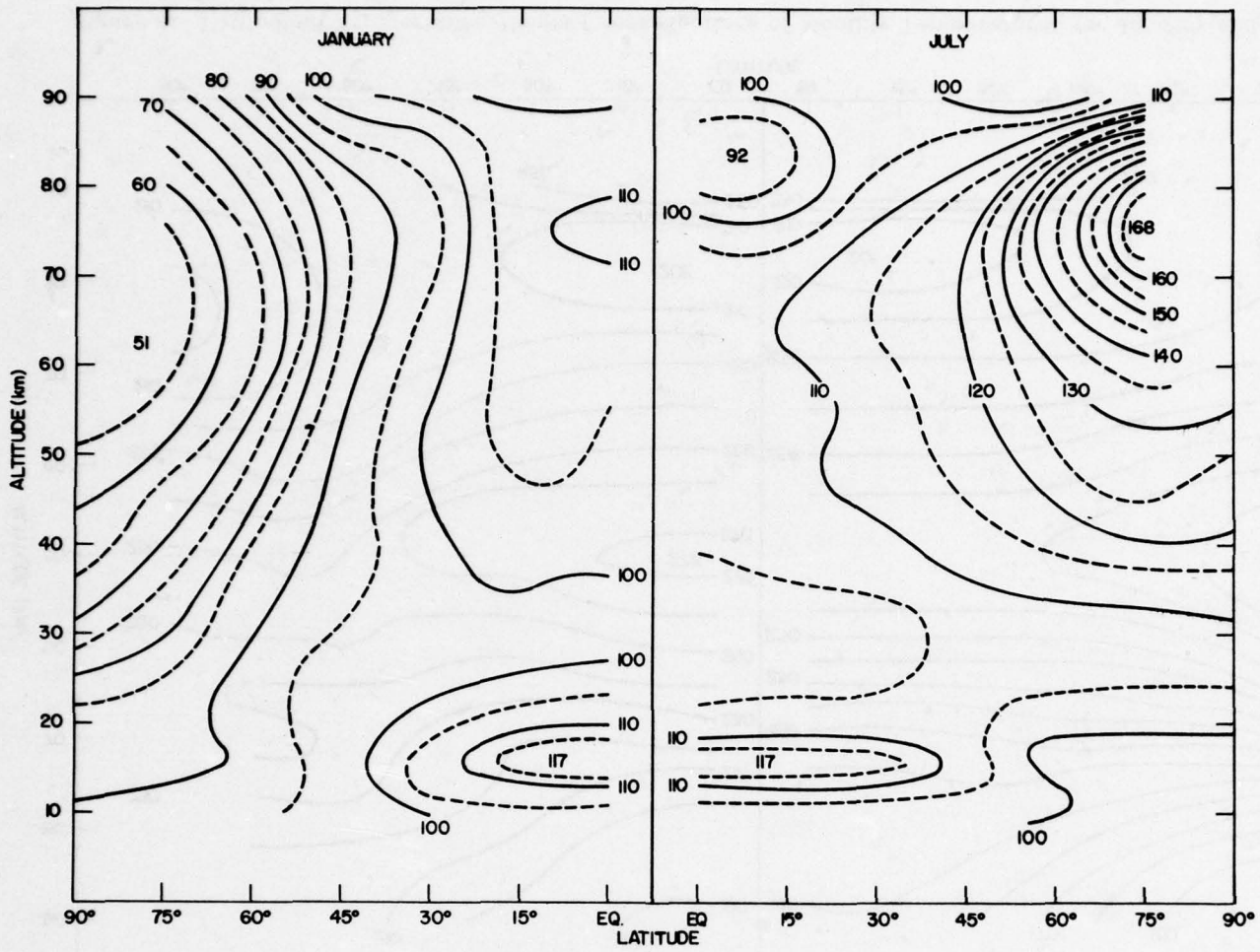


Figure 5. Latitudinal Density-Height Cross-Sections for January and July

Table 3a. Median, High, and Low Percentile Values of Temperatures for January and July at 30°N

Altitude (km)	Median (°K)	1%		10%		20%	
		High (°K)	Low (°K)	High (°K)	Low (°K)	High (°K)	Low (°K)
J A N U A R Y							
5	262	272	251	267	256	265	258
10	229	239	219	235	223	233	225
15	208	221	198	216	203	214	205
20	208	222	200	216	203	214	204
25	220	231	210	226	216	224	217
30	229	239	218	236	224	234	226
35	240	254	222	248	232	245	235
40	252	270	240	262	249	258	250
45	264	283	253	277	258	272	260
50	266	281	256	276	260	273	262
55	254	272	231	267	243	263	248
60	243	254	223	248	232	246	235
65	231	254	218	242	226	238	228
70	220	235	198	227	204	225	210
75	218	253	197	237	203	227	208
80	209	243	187	230	194	217	197
J U L Y							
5	272	278	262	274	266	275	268
10	238	249	227	246	232	242	234
15	204	216	196	211	200	210	200
20	212	223	203	218	206	216	206
25	223	230	216	227	218	226	219
30	234	241	226	238	229	236	231
35	244	254	237	250	240	247	242
40	256	267	247	263	251	261	253
45	266	275	259	272	264	269	265
50	269	282	258	278	262	275	264
55	264	273	247	269	253	267	256
60	247	262	231	255	240	252	243
65	228	240	215	236	219	234	222
70	209	222	186	219	194	214	200
75	200	218	178	214	192	209	196
80	193	207	182	200	189	198	191

Table 3b. Median, High, and Low Percentile Values of Temperatures for January and July at 45°N (Cont)

Altitude (km)	Median (°K)	1%		10%		20%	
		High (°K)	Low (°K)	High (°K)	Low (°K)	High (°K)	Low (°K)
J A N U A R Y							
5	250	263	233	257	239	254	242
10	220	233	206	227	212	225	214
15	217	231	202	225	208	222	211
20	215	227	203	222	208	220	210
25	215	233	197	226	205	224	209
30	221	240	209	230	214	226	219
35	233	258	215	251	223	243	226
40	247	272	226	264	236	257	240
45	262	288	240	283	250	271	254
50	265	282	249	274	256	270	258
55	253	275	229	267	239	263	245
60	244	266	220	263	230	257	241
65	235	255	214	246	223	243	228
70	226	246	206	238	211	234	217
75	225	261	197	245	205	235	210
80	216	248	185	237	197	228	202
J U L Y							
5	267	277	255	274	259	272	262
10	235	247	222	240	227	239	230
15	216	227	205	222	206	220	212
20	219	233	207	227	213	225	215
25	225	233	216	229	217	228	221
30	234	242	228	239	231	237	232
35	245	254	238	250	241	248	243
40	256	268	250	265	254	263	255
45	268	280	260	276	263	272	265
50	273	283	264	279	268	277	270
55	264	273	249	269	255	267	260
60	247	270	230	264	235	260	238
65	230	245	216	241	223	238	220
70	213	226	188	219	196	216	202
75	195	210	175	205	186	201	190
80	183	203	154	195	163	191	170

Table 3c. Median, High, and Low Percentile Values of Temperatures for January and July at 60°N (Cont)

Altitude (km)	Median (°K)	1%		10%		20%	
		High (°K)	Low (°K)	High (°K)	Low (°K)	High (°K)	Low (°K)
JANUARY							
5	240	255	225	249	231	246	234
10	217	231	203	224	209	222	211
15	217	231	203	225	209	222	212
20	215	236	194	226	204	222	208
25	212	241	185	229	197	223	203
30	216	253	203	235	204	225	210
35	221	277	204	259	209	238	214
40	227	300	206	278	211	246	219
45	243	303	219	282	225	255	231
50	251	289	226	280	240	271	245
55	251	283	225	275	233	256	238
60	243	271	210	261	224	253	234
65	238	262	208	258	218	249	222
70	239	264	212	253	219	249	225
75	232	255	180	249	203	246	213
80	223	248	173	243	195	239	204
JULY							
5	260	271	250	266	254	264	256
10	225	238	214	233	219	231	221
15	225	235	217	231	221	229	223
20	225	233	219	230	222	229	223
25	229	236	222	233	225	232	226
30	239	245	232	243	234	241	235
35	252	258	243	256	247	253	248
40	265	272	259	269	263	268	262
45	277	287	271	283	274	280	275
50	279	290	273	286	277	284	279
55	271	278	257	275	264	273	266
60	259	273	212	265	250	263	253
65	238	259	225	253	230	248	233
70	214	239	202	226	208	222	211
75	190	202	178	196	182	194	186
80	166	180	142	176	153	174	155

Table 3d. Median, High, and Low Percentile Values of Temperatures for January and July at 75°N (Cont)

Altitude (km)	Median (°K)	1%		10%		20%	
		High (°K)	Low (°K)	High (°K)	Low (°K)	High (°K)	Low (°K)
		J A N U A R Y					
5	235	246	222	241	229	238	230
10	214	224	202	219	207	217	209
15	209	219	195	213	201	211	203
20	204	225	179	215	189	210	194
25	205	233	181	221	193	216	198
30	209	255	194	231	198	224	202
35	219	256	199	249	210	236	213
40	229	284	207	256	219	248	224
45	239	281	203	264	224	260	233
50	249	282	201	265	225	259	229
55	255	291	208	262	221	253	226
60	247	303	206	263	213	255	219
65	238	310	186	277	202	263	209
70	242	297	166	277	201	261	207
75	234	289	183	259	201	261	207
80	224	277	165	254	194	240	201
		J U L Y					
5	254	264	244	259	248	257	250
10	229	238	219	234	223	232	225
15	230	237	225	235	228	233	229
20	230	237	227	235	228	234	229
25	230	240	226	238	227	237	229
30	243	262	233	247	235	246	240
35	256	262	238	260	246	258	250
40	268	275	252	271	260	270	262
45	281	292	268	287	275	284	278
50	284	296	270	291	279	288	280
55	281	288	254	284	270	283	275
60	268						
65	246	(insufficient data above 55 km in summer)					
70	218						
75	189						
80	161						

Table 4a. Median, High, and Low Percentile Values of Densities Given as Percentage Departures From U.S. Standard Atmosphere 1976 for January and July at 30°N

Altitude (km)	Median (% of Std)	1%		10%		20%		U.S. Std Density (kg m^{-3})
		High	Low	High	Low	High	Low	
J A N U A R Y								
5	-1	+1	-3	0	-2	0	-2	7.3643-1
10	+1	+4	-3	+3	-1	+2	0	4.1351
15	+7	+15	-1	+12	+4	+10	+5	1.9476
20	+3	+7	-2	+5	+1	+4	+2	8.8910-2
25	-2	+4	-6	+3	-4	+1	-2	4.0084
30	-4	+2	-10	-2	-8	-3	-6	1.8410
35	-3	+3	-12	0	-8	-1	-6	8.4634-3
40	-1	+2	-10	+1	-7	0	-5	3.9957
45	0	+8	-10	+3	-7	+2	-5	1.9663
50	+1	+12	-8	+7	-4	+5	-2	1.0269
55	0	+9	-10	+5	-6	+3	-4	5.6810-4
60	-2	+12	-15	+5	-9	+2	-6	3.0968
65	-4	+21	-25	+13	-13	+7	-6	1.6321
70	-5	+16	-26	+9	-17	+6	-12	8.2828-5
75	-7	+21	-25	+13	-15	+8	-10	3.9921
80	-4	+21	-22	+15	-13	+8	-7	1.8458
J U L Y								
5	-3	0	-5	-1	-4	-2	-4	7.3643-1
10	+1	+3	-1	+2	0	+2	0	4.1351
15	+16	+20	+11	+17	+13	+17	+14	1.9476
20	+8	+11	+14	+10	+5	+9	+6	8.8910-2
25	+4	+9	0	+7	+2	+6	+3	4.0084
30	+3	+7	-1	+5	+1	+4	+2	1.8410
35	+6	+10	+2	+8	+3	+7	+4	8.4634-3
40	+9	+15	+2	+11	+5	+10	+7	3.9957
45	+12	+19	+4	+14	+7	+13	+9	1.9663
50	+13	+23	+6	+17	+8	+15	+10	1.0269
55	+11	+20	+2	+15	+5	+13	+7	5.6810-4
60	+13	+24	-1	+21	+3	+19	+7	3.0968
65	+15	+43	-6	+38	0	+30	+6	1.6321
70	+15	+32	-9	+23	+1	+20	+8	8.2828-5
75	+10	+24	-11	+20	-6	+15	+1	3.9921
80	+6	+22	-15	+17	-6	+14	+1	1.8458

Table 4b. Median, High, and Low Percentile Values of Densities Given as Percentage Departures From U.S. Standard Atmosphere 1976 for January and July at 45°N (Cont)

Altitude (km)	Median (% of Std)	1%		10%		20%		U.S. Std Density (kg m^{-3})
		High	Low	High	Low	High	Low	
J A N U A R Y								
5	0	+4	-3	+3	-2	+2	-1	7.3643-1
10	-2	+6	-10	+3	-6	+1	-4	4.1351
15	-3	+4	-12	+1	-8	-1	-6	1.9476
20	-2	+2	-8	0	-6	-1	-5	8.8910-2
25	-2	+2	-8	0	-6	-1	-5	4.0084
30	-5	+1	-17	-2	-13	-4	-9	1.8410
35	-6	+2	-20	-2	-16	-4	-12	8.4634-3
40	-8	+5	-23	0	-17	-4	-13	3.9957
45	-9	+8	-22	+2	-16	-3	-14	1.9663
50	-8	+11	-20	+4	-16	-3	-14	1.0269
55	-9	+9	-25	+2	-18	-4	-16	5.6810-4
60	-12	+7	-28	0	-23	-7	-20	3.0968
65	-14	0	-38	-5	-34	-10	-28	1.6321
70	-15	+2	-38	-9	-30	-12	-26	8.2828-5
75	-16	-3	-38	-9	-30	-12	-26	3.9921
80	-23	-2	-42	-8	-36	-10	-30	1.8458
J U L Y								
5	-2	+1	-5	-1	-4	-1	-3	7.3643-1
10	0	+3	-4	+2	-2	+1	-1	4.1351
15	+8	+17	+2	+15	+4	+13	+5	1.9476
20	+6	+11	0	+8	+2	+7	+3	8.8910-3
25	+7	+10	+4	+9	+5	+8	+6	4.0084
30	+7	+12	0	+9	+2	+8	+4	1.8410
35	+9	+16	0	+12	+3	+10	+6	8.4634-3
40	+13	+21	+4	+16	+8	+14	+10	3.9957
45	+15	+26	+6	+20	+10	+18	+12	1.9663
50	+17	+31	+9	+25	+12	+21	+14	1.0269
55	+17	+32	+8	+25	+11	+22	+14	5.6810-4
60	+19	+30	+4	+26	+10	+24	+13	3.0968
65	+20	+40	+4	+35	+10	+30	+13	1.6321
70	+20	+37	0	+32	+9	+27	+12	8.2828-5
75	+19	+40	-2	+30	+7	+26	+11	3.9921
80	+14	+32	-4	+30	+4	+25	+9	1.8458

Table 4c. Median, High, and Low Percentile Values of Densities Given as Percentage Departures From U.S. Standard Atmosphere 1976 for January and July at 60°N (Cont)

Altitude (km)	Median (% of Std)	1%		10%		20%		U.S. Std Density ($kg\ m^{-3}$)
		High	Low	High	Low	High	Low	
JANUARY								
5	+1	+6	-3	+4	-1	+2	0	7.3643-1
10	-6	+3	-15	+2	-15	-3	-10	4.1351
15	-9	-2	-15	-5	-12	-6	-11	1.9476
20	-8	-1	-15	-5	-11	-6	-10	8.8910-2
25	-7	+3	-16	-2	-12	-4	-10	4.0084
30	-10	+7	-32	+2	-18	-2	-15	1.8410
35	-12	+8	-35	+3	-27	-3	-19	8.4634-3
40	-15	+10	-36	+5	-30	-4	-20	3.9957
45	-21	+12	-39	+5	-34	-10	-24	1.9663
50	-26	+14	-43	+3	-36	-15	-29	1.0269
55	-32	+9	-48	-10	-39	-20	-35	5.6810-4
60	-36	+4	-54	-12	-40	-25	-39	3.0968
65	-36	-5	-50	-16	-46	-27	-42	1.6321
70	-37	-12	-54	-25	-49	-32	-43	8.2828-5
75	-35	-10	-53	-24	-47	-30	-42	3.9921
80	-28	-11	-53	-17	-47	-21	-40	1.8458
JULY								
5	-2	+2	-5	+1	-4	0	-3	7.3643-1
10	0	+7	-8	+4	-5	+2	-3	4.1351
15	0	+6	-7	+3	-4	+2	-2	1.9476
20	+3	+7	-2	+6	0	+5	+1	8.8910-2
25	+5	+8	+1	+7	+2	+6	+3	4.0084
30	+7	+12	-1	+9	+2	+8	+4	1.8410
35	+10	+18	0	+14	+3	+12	+7	8.4634-3
40	+15	+23	+5	+19	+10	+17	+12	3.9957
45	+20	+28	+7	+25	+13	+23	+16	1.9663
50	+25	+35	+10	+30	+16	+28	+22	1.0269
55	+27	+35	+11	+30	+16	+29	+22	5.6810-4
60	+28	+42	+11	+39	+16	+33	+22	3.0968
65	+35	+50	+11	+44	+18	+39	+28	1.6321
70	+42	+52	+12	+46	+20	+44	+30	8.2828-5
75	+44	+58	+12	+52	+20	+48	+35	3.9921
80	+40	+56	+10	+50	+18	+44	+30	1.8458

Table 4d. Median, High, and Low Percentile Values of Densities Given as Percentage Departures From U.S. Standard Atmosphere 1976 for January and July at 75°N (Cont)

Altitude (km)	Median (% of Std)	1%		10%		20%		U.S. Std Density (kg m^{-3})
		High	Low	High	Low	High	Low	
J A N U A R Y								
5	+2	+6	-1	+5	0	+4	+1	7.3643-1
10	-8	+2	-18	-3	-13	-5	-10	4.1351
15	-10	-1	-18	-6	-14	-8	-13	1.9476
20	-12	-1	-22	-6	-17	-8	-15	8.8910-2
25	-15	-2	-28	-8	-20	-10	-18	4.0084
30	-21	-4	-36	-9	-26	-16	-24	1.8410
35	-25	0	-43	-10	-32	-16	-30	8.4634-3
40	-29	+4	-48	-9	-38	-16	-38	3.9957
45	-33	+8	-52	-6	-45	-16	-39	1.9663
50	-38	+4	-56	-8	-48	-20	-42	1.0269
55	-44	+5	-65	-10	-56	-23	-50	5.6810-4
60	-46	0	-70	-16	-60	-32	-55	3.0968
65	-47	+1	-66	-27	-62	-35	-58	1.6321
70	-48	-1	-69	-21	-62	-35	-60	8.2828-5
75	-45	-10	-65	-25	-57	-35	-53	3.9921
80	-40	-8	-55	-24	-50	-34	-45	1.8458
J U L Y								
5	1	+4	-2	+3	-1	+2	0	7.3643-1
10	-4	+5	-12	+3	-10	0	-7	4.1351
15	-4	+2	-9	0	-7	-2	-6	1.9476
20	+1	+6	-4	+4	-2	+3	-1	8.8910-2
25	+1	+10	-8	+6	-3	+5	-2	4.0084
30	+7	+13	+2	+10	+5	+8	+6	1.8410
35	+12	+25	+3	+18	+8	+16	+10	8.4634-3
40	+19	+27	+6	+23	+13	+21	+16	3.9957
45	+25	+35	+10	+30	+18	+28	+21	1.9663
50	+27	+40	+10	+35	+20	+32	+24	1.0269
55	+32	+42	+10	+39	+20	+35	+25	5.6810-4
60	+37							3.0968
65	+48	(Insufficient data above 55 km in summer)						1.6321
70	+60							8.2828-5
75	+67							3.9921
80	+64							1.8458

In tropical regions, 0° to 15° latitude, the monthly temperature and density distributions are nearly normal at altitudes up to 50 km. Consequently, a reasonably accurate estimate of the distributions of temperature and density in the tropics can be obtained from the standard deviations. The standard deviations of observed temperatures (°K) and density (%) around the mean monthly values at Ascension, Table 5, are typical of the day-to-day variations found in the tropics. There is little change in the magnitude of the variations with longitude.

Table 5. Standard Deviations of Observed Day-to-Day Variations in Temperatures (°K) and Densities (%) at Ascension (8°S) at Altitudes up to 50 km During the Mid-season Months

Altitude (km)	Jan	April		July	Oct
5	0.8	0.6	S. D. of Temperature (°K)	0.7	0.6
10	0.8	1.0		0.8	1.1
15	1.6	2.0		1.9	1.5
20	2.2	2.2		2.4	2.1
25	2.2	2.2		2.7	2.1
30	3.1	2.8		3.8	3.6
35	3.7	3.2		3.7	3.8
40	5.2	3.9		3.3	3.5
45	3.6	2.8		3.2	3.3
50	5.8	2.9		3.9	3.0
5	0.4	0.3	S. D. of Density (% of Monthly Mean)	0.3	0.4
10	0.4	0.4		0.4	0.4
15	0.8	0.7		0.8	0.7
20	1.5	1.3		1.8	1.3
25	1.3	1.3		1.2	1.3
30	1.2	1.2		1.4	1.2
35	1.8	1.8		1.4	1.2
40	2.3	2.1		1.8	1.8
45	2.3	2.3		2.6	2.3
50	2.7	2.5		2.6	2.7

There are too few observations above 50 km in the tropics on which to determine monthly temperature and density distributions. Instead, the standard deviations of the observed values around mean annual temperatures and densities are

given in Table 6 for altitudes between 50 and 90 km. They are based on temperatures and densities derived from experimental observations taken at Ascension and Natal.

Table 6. Standard Deviations of Observed Densities and Temperatures Around the Mean Annual Values at Ascension/Natal

Altitude (km)	Density S. D. (% of mean)	Temperature S. D. (°K)	No. of Observations
50	4.1	6	33
55	4.3	3	33
60	4.8	6	33
65	4.7	7	33
70	6.4	9	32
75	8.6	10	31
80	7.8	10	30
85	10.2	13	29
90	12.3	21	28

6. LONGITUDINAL VARIATIONS

In summer longitudinal variations in the structure of the atmosphere are relatively small at all latitudes and at all altitudes above 20 km. Isotherms and contour lines on constant pressure charts in the stratosphere and mesosphere parallel the latitude circles, and the associated circulation pattern is symmetrical about the poles (Figure 2). During the winter season, changes with longitude remain relatively small at low latitudes but become as important as changes with latitude and season in arctic and subarctic regions. The magnitude of the longitudinal variations in arctic and subarctic regions during winter is illustrated in a set of atmospheric models depicting January conditions between the surface and 55 km at 10°, 100°, and 140°W for 60°N and at 10° and 140°W for 75°N. The models are based on radiosonde observations, constant-pressure maps at 5, 2, and 0.4 mb, rocketsonde observations, hydrostatic build-up techniques from the 5- and 10-mb levels, and the thermal wind equation. Tables of the atmospheric properties for these January models at 60° and 75°N are given in Appendix B. Temperature-height profiles are shown in Figures 6 and 7 and are defined in Appendix C.

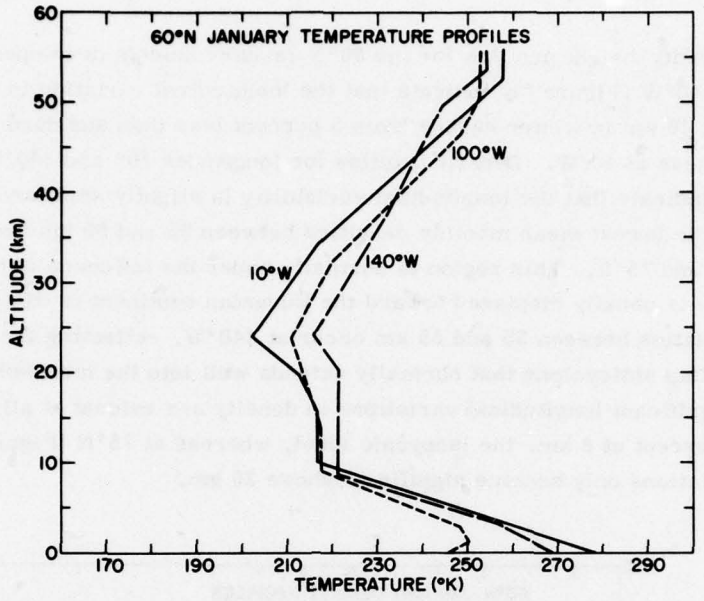


Figure 6. Mean Monthly Temperature-Height Profiles for the 60°N Models at Longitudes 10°, 100°, and 140°W

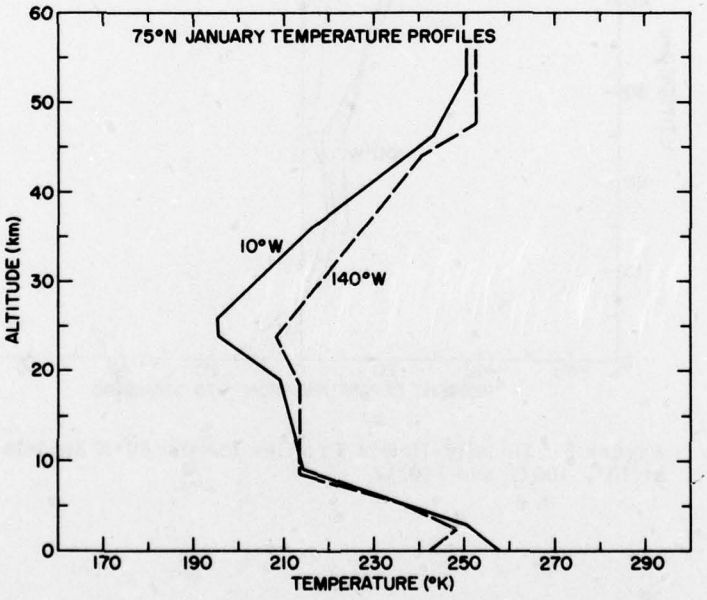


Figure 7. Mean Monthly Temperature-Height Profiles for the 75°N Models at 10° and 140°W

The density-height profiles for the 60°N January models developed for 10°, 100°, and 140°W (Figure 8), indicate that the longitudinal variation in mean monthly densities at 40 km in winter ranges from 5 percent less than standard at 140°W to 20 percent less at 10°W. Density profiles for longitudes 10° and 140°W at 75°N (Figure 9) indicate that the longitudinal variability is slightly smaller at 75°N than at 60°N. The lowest mean monthly densities between 35 and 55 km occur at 10°W at both 60° and 75°N. This region is normally under the influence of the polar cyclone that is usually displaced toward the Eurasian continent in winter. The highest densities between 35 and 55 km occur at 140°W, reflecting the presence of the Aleutian anticyclone that normally extends well into the mesosphere in winter. At 60°N significant longitudinal variations in density are evident at all altitudes (Figure 8) except at 8 km, the isopycnic level, whereas at 75°N (Figure 9) longitudinal variations only become significant above 25 km.

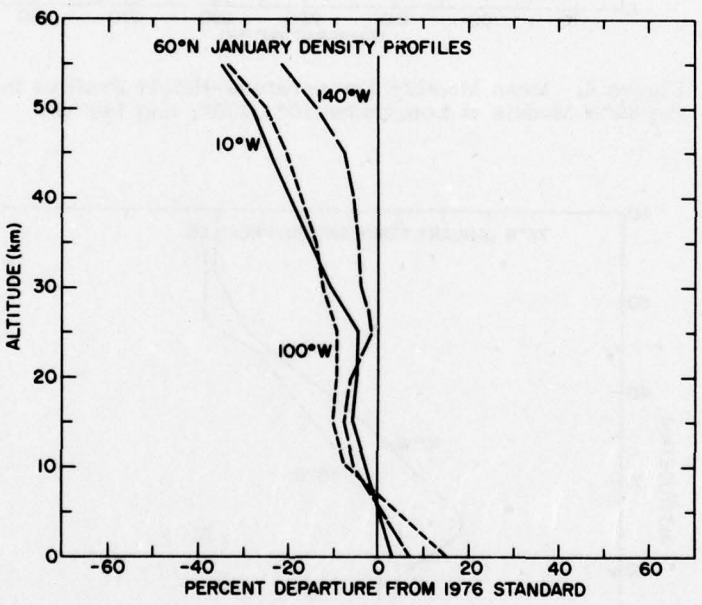


Figure 8. Density-Height Profiles for the 60°N Models at 10°, 100°, and 140°W

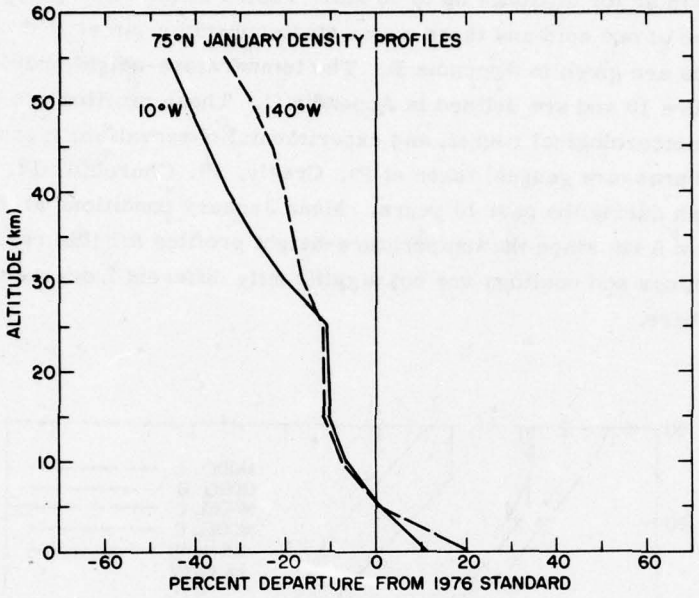


Figure 9. Density-Height Profiles for the 75°N Models at 10° and 140°W

7. COLD AND WARM WINTER STRATOSPHERE/MESOSPHERE

In arctic and subarctic regions sudden warmings and coolings of the winter stratosphere and mesosphere produce large changes in the vertical and horizontal structure of the atmosphere. Both the magnitude and altitude of maximum temperature and density fluctuations during major warmings and coolings vary considerably. Some of the largest changes in the vertical temperature profiles have been observed in the upper stratosphere between 35 and 45 km. The observed 35- to 45-km temperatures have a range of roughly 85K in winter compared with 20K in summer. As a result, mean monthly atmospheric models for the winter months are of limited value for specifying temperatures at these altitudes since the day-to-day variations in temperature are in some cases as great or greater than the seasonal or latitudinal changes. Although these warmings and coolings occur throughout the arctic and subarctic region, the largest changes generally occur between latitude 60° and 75°N; they have been observed much more frequently at some longitudes than at others.

A family of warm and cold atmospheric models, typical of the region between 60° and 75°N, has been prepared to provide an indication of the magnitude of the variations that may occur in the vertical distributions of temperature, density, and

pressure in winter for altitudes up to 90 km. Tables of the atmospheric properties representative of one cold and three warm stratospheric regimes that occur at these latitudes are given in Appendix B. The temperature-height profiles are shown in Figure 10 and are defined in Appendix C. These profiles are based on radiosonde, meteorological rocket, and experimental observations (grenades, falling spheres, and pressure gauges) taken at Ft. Greely, Ft. Churchill, Pt. Barrow, and West Geirinish during the past 15 years. Mean January conditions at 60°N are assumed below 9 km since the temperature-height profiles for this region during the various warmings and coolings are not significantly different from the mean January 60°N atmosphere.

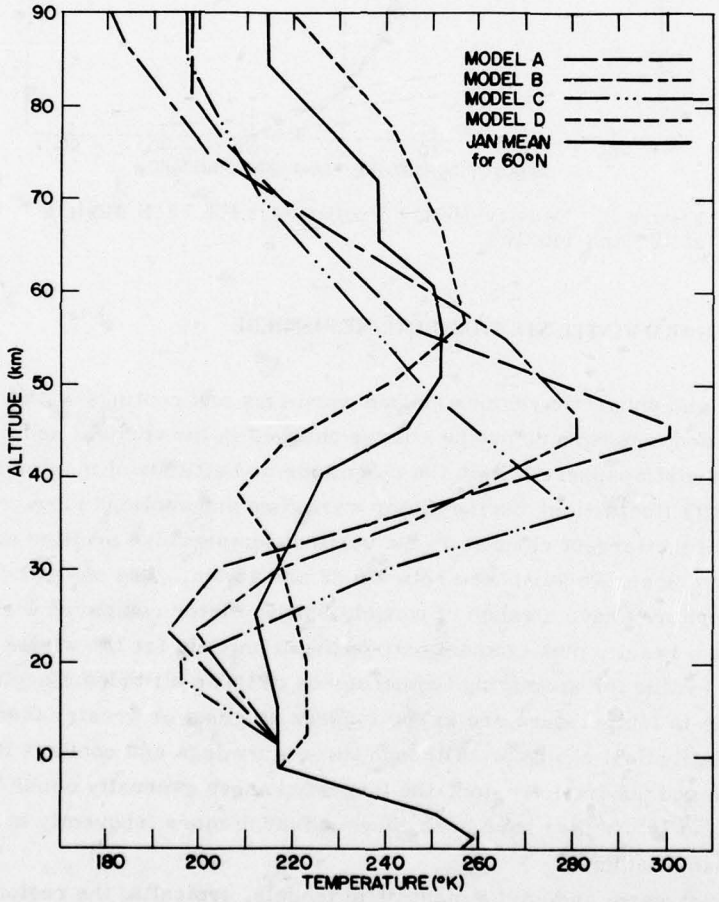


Figure 10. Temperature-Height Profiles Associated With Extreme Warm and Cold Regimes in the Winter Stratosphere and Mesosphere Near 60°N

The warm models are defined by the altitude and temperature of the stratopause. The temperature-height profile between 9 and 55 km for Model A (Figure 10), the model with the warmest stratopause, is based on an average of three MRN soundings (in different years) in which the maximum observed stratospheric temperature occurred between 44 and 46 km and was within 2° of 300K. Model B is based on an average of five MRN observations in which the maximum stratospheric temperature also occurred between 44 and 46 km and was within 2° of 280K. Model C is based on two MRN soundings in which a maximum stratospheric temperature of 280K, plus or minus 2°, occurred between 34 and 38 km. The three warm models could all occur during various stages of one large-scale warming. However, available observations indicate that a temperature of 300K at 45 km is equalled or exceeded 2 percent of the time at West Geirinish and 0.4 percent of the time at Ft. Churchill during January, whereas a temperature of 280K at 45 km is equalled or exceeded 10 percent of the time at West Geirinish and 4 percent of the time at Ft. Churchill. A temperature of 280K near 36 km is equalled or exceeded 0.6 percent of the time at West Geirinish and 0.1 percent of the time at Ft. Churchill. Frequencies of occurrence were obtained by plotting the observed temperature distributions on probability paper.

The cold profile, Model D, is based on an average of five observations in which the temperature at 45 km was within 2° of 223K. Observed data indicate that a temperature of 223K or colder occurs at Ft. Churchill 6 percent of the time, at West Gerinish 4 percent of the time, and at Ft. Greely 9 percent of the time in January.

The portions of the temperature-height profiles between 55 and 85 km are based on estimates obtained by using interlevel temperature correlations with the temperatures adopted at 40, 45, and 50 km. The correlation coefficients were developed[4] from data derived from 27 independent grenade and pressure gauge experiments conducted at Ft. Churchill in the years 1957-1972 between 20 December and 10 February.

The density profiles associated with both the warm and cold models are provided along with the mean January 60°N profile in Figures 11a and 11b. The densities are protrayed as percent departures from the 1976 Standard Atmosphere. Envelopes of the high and low values of density which are equalled or surpassed 5 percent of the time at 60°N in January are also shown. They are envelopes rather than realistic profiles, since 5-percent values do not occur simultaneously at all altitudes. The density profiles for the warm and cold models illustrate the negative correlations that exist between the densities at various levels in the atmosphere.[36,37,38]

---

36. Quiroz, R.S. (1971) The Determination of the Amplitude and Altitude of Stratospheric Warmings from Satellite-Measured Radiance Changes, JAM, Vol. 10, No. 3.

37. Labitzke, K. (1971) Synoptic-Scale Motions Above the Stratopause, NCAR Ms. No. 71-39.

38. Cole, A.E. (1972) Models of extreme arctic and subarctic atmospheres between 20 and 90 km, Space Research XII, Academie-Verlag, Berlin, p. 629.

For example, when the density is much less than the mean monthly value at altitudes between 25 and 40 km (Figure 11b), it is greater than the mean value between 45 and 75 km. In most cases the departures of density from the monthly mean fall within the 5-percent envelope. However, as shown in Figure 11, density profiles associated with an extreme winter warming or cooling will approach both the 5-percent maximum and 5-percent minimum values at different altitudes.

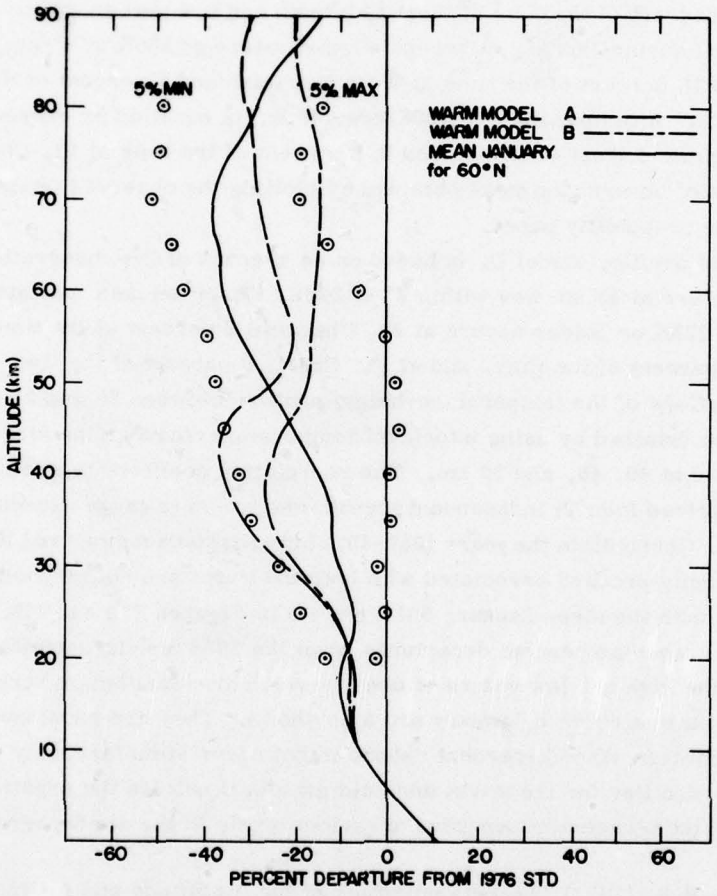


Figure 11a. Density Profiles (Warm) Associated With Extreme Temperatures in the Upper Stratosphere and Mean January Conditions at 60°N. Circled points form an envelope of high and low densities equalled or surpassed 5 percent of time

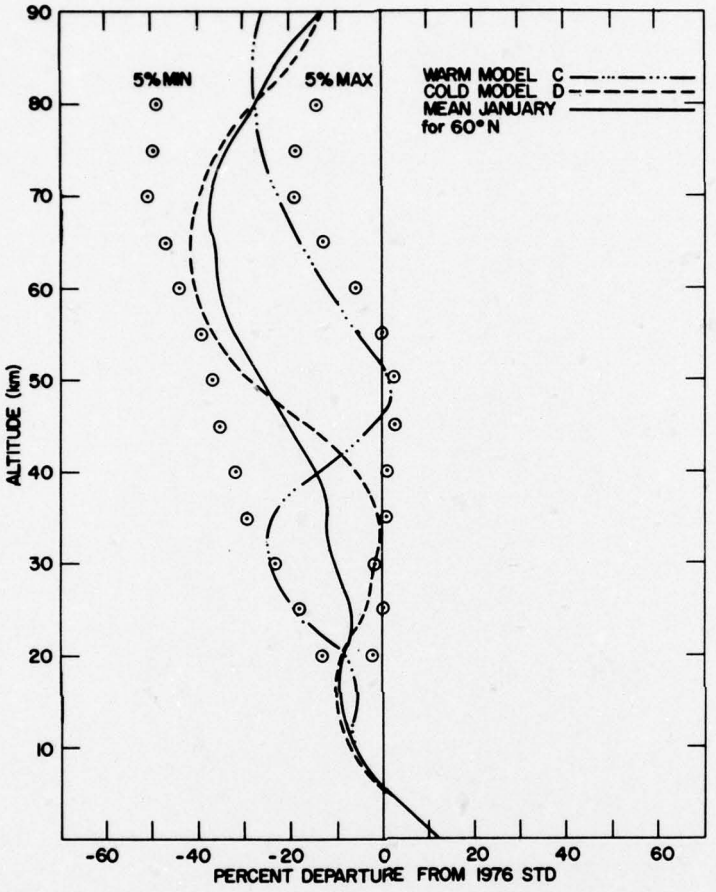


Figure 11b. Density Profiles Associated With Extreme Temperatures in the Upper Stratosphere and Mean January Conditions at 60°N. Circled points form an envelope of high and low densities equalled or surpassed 5 percent of time

The altitudes of the maximum density departures from the monthly mean are related to the altitudes of maximum temperature deviations in that the maximum density departures are roughly 10 to 20 km above the maximum temperature deviations. For example, the largest positive density departure for profile C (Figure 11b) occurs near 49 km, whereas the maximum stratospheric temperature, 280K for profile C (Figure 10), is at 36 km. The largest negative density departure for the same profile (Figure 11b) occurs near 33 km and its minimum stratospheric temperature, 196K (Figure 10), is at 18-20 km.

References

1. Cole, A.E., and Kantor, A.J. (1975) Tropical Atmospheres, 0 to 90 km, AFCRL-TR-75-0527.
2. Kantor, A.J., and Cole, A.E. (1976) Monthly Midlatitude Atmospheres, Surface to 90 km, AFGL-TR-76-0140.
3. Cole, A.E., and Kantor, A.J. (1977) Arctic and Subarctic Atmospheres, 0 to 90 km, AFGL-TR-77-0046.
4. Kantor, A.J., and Cole, A.E. (1977) Monthly 90°N Atmospheres and High-Latitude Warm and Cold Winter Stratosphere/Mesosphere, AFCRL-TR-77-0289.
5. List, R.J. (Ed.) (1968) Smithsonian Meteorological Tables, Smithsonian Inst. Press, Washington, D.C.
6. U.S. Weather Bureau (1952) Normal Weather Charts for the Northern Hemisphere, USWB Tech Paper No. 21.
7. Lahey, J.F., Bryson, R.A., and Wahl, E.W. (1958) Atlas of Five-day Normal Sea Level Pressure Charts for Northern Hemisphere, Scientific Report No. 7, Contract AF 19)604)-992, Univ. Wisconsin Press.
8. Crutcher, H., and Meserve, J.M. (1970) Selected Level Heights, Temperatures and Dew Points for the Northern Hemisphere, NAVAIR 50-1C-52, Commander, Naval Weather Service.
9. Goldie, N., Moore, J.G., and Austin, A.A. (1960) Upper Air Temperature over the World, Geophys, Memoirs, No. 101, Meteorological Office, London.
10. Egdon, R.A. (1970) Average Temperature, Contour Height and Winds at 50 Millibars over the Northern Hemisphere, Geophys. Memoirs No. 112, Meteorological Office, London.
11. Berry, F.A., Bollay, F., and Beers, N.R. (1945) Handbook of Meteorology, McGraw-Hill Book Co., Inc.
12. World Data Center A (1965-1976) Data Report Meteorological Rocket Network Firings, Ashville, N.C.

PRECEDING PAGE BLANK-NOT FILMED

References

13. Staff, Upper Air Branch, NMC (1967) Weekly Synoptic Analyses, 5-, 2-, and 0.4-mb Surface for 1964, ESSA TW WB-2.

14. Staff, Upper Air Branch, NMC (1967) Weekly Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for 1965, ESSA TR WB-3.

15. Staff, Upper Air Branch, NMC (1969) Weekly Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for 1966, ESSA TR WB-9.

16. Staff, Upper Air Branch, NMC (1970) Weekly Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for 1967, ESSA TR WB-12.

17. Staff, Upper Air Branch, NMC (1971) Weekly Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for 1968, NOAA TR NWS-14.

18. Staff, Upper Air Branch, NMC (1975) Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for Jan 1972 through Jun 1973, NASA SP-3091

19. Staff, Upper Air Branch, NMC (1976) Synoptic Analyses, 5-, 2-, and 0.4-mb Surfaces for Jul 1973 through Jun 1974, NASA SP-3102.

20. Krumins, M., and Lyons, W. (1972) Corrections for the Upper Atmosphere Temperatures using a Thin Film Loop Mount, NOLTR 72-152.

21. Smith, W., Katchen, L., Sacher, P., Swartz, P., and Theon, J. (1964) NASA TR R-211, Washington, D.C.

22. Smith, W., Theon, J., Katchen, L., and Swartz, P. (1966) NASA TR R-245, Washington, D.C.

23. Smith, W., Theon, J., Swartz, P., and Katchen, L. (1967) NASA TR R-263, Washington, D.C.

24. Smith, W., Theon, J., Swartz, P., and Katchen, L. (1968) NASA TR R-288, Washington, D.C.

25. Smith, W., Theon, J., and Swartz, P. (1968) NASA TR R-306, Washington, D.C.

26. Smith, W., Theon, J., Casey, J., and Horvath, J. (1970) NASA TR R-340, Washington, D.C.

27. Smith, W., Theon, J., Casey, J., and Horvath, J. (1971) NASA TR R-360, Washington, D.C.

28. Smith, W., Theon, J., Wright, D., Casey, J., and Horvath, J. (1972) NASA TR R-391, Washington, D.C.

29. Smith, W., Theon, J., Wright, D., Ramsdale, D., and Horvath, J. (1973) NASA TR G-7409, Washington, D.C.

30. Faire, A.C., and Champion, K.S.W. (1965) Space Research V, North-Holland Publishing Co., Amsterdam, p. 1039.

31. Faire, A.C., and Champion, K.S.W. (1966) Space Research VI, North-Holland Publishing Co., Amsterdam, p. 1048.

32. Faire, A.C., and Champion, K.S.W. (1967) Space Research VII, North-Holland Publishing Co., Amsterdam, p. 1046.

33. Faire, A.C., and Champion, K.S.W. (1968) Space Research VIII, North-Holland Publishing Co., Amsterdam, p. 895.

34. Faire, A.C., and Champion, K.S.W. (1969) Space Research IX, North-Holland Publishing Co., Amsterdam, p. 343.

35. Faire, A.C., Champion, K.S.W., and Murphy, E.A. (1972) ABRES Density Variations, AFCRL 72-0042.

36. Quiroz, R.S. (1971) The Determination of the Amplitude and Altitude of Stratospheric Warmings from Satellite-Measured Radiance Changes, JAM, Vol. 10, No. 3.

37. Labitzke, K. (1971) Synoptic-Scale Motions Above the Stratopause, NCAR Ms. No. 71-39.

38. Cole, A.E. (1972) Models of extreme arctic and subarctic atmospheres between 20 and 90 km, Space Research XII, Academie-Verlag, Berlin, p. 629.

Appendix A

Tables of Monthly Thermodynamic Properties of the Atmosphere

PRECEDING PAGE BLANK-NOT FILMED

Table A1. Monthly Temperature (°K) at the Equator

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	299.15	299.65	300.15	300.15	299.65	299.15	298.65	298.65	299.15	299.15	299.15	299.15
2.000	288.78	288.88	289.18	288.98	288.68	288.18	287.68	288.48	288.58	288.38	288.58	288.18
4.000	278.41	278.12	278.22	277.82	277.72	277.22	276.72	278.31	278.02	277.62	278.02	277.22
6.000	268.06	267.36	267.27	266.67	266.77	266.27	265.77	266.49	266.29	265.69	266.19	266.27
8.000	256.40	255.40	256.32	254.63	255.82	255.32	254.82	252.96	253.35	252.55	253.05	255.32
10.000	240.49	239.49	240.49	239.71	239.99	239.49	238.99	239.43	240.42	239.43	239.93	239.49
12.000	224.58	223.58	224.58	224.81	224.08	223.58	223.08	223.58	224.58	223.58	224.08	223.58
14.000	208.69	207.69	208.69	209.91	208.19	207.69	207.19	207.69	208.69	207.69	208.19	207.69
16.000	197.34	196.91	197.34	198.56	196.53	197.94	198.59	198.33	197.77	196.77	197.69	197.19
18.000	195.03	195.03	195.21	196.12	197.77	199.63	201.05	200.55	199.91	199.19	196.75	196.25
20.000	201.37	201.37	201.95	202.66	204.31	205.97	207.99	207.49	206.65	206.33	204.68	204.18
22.000	207.71	207.71	208.69	209.20	210.85	212.31	214.92	214.42	213.06	213.09	212.61	212.11
24.000	214.05	214.05	215.42	215.74	217.39	218.65	219.97	220.84	218.01	218.24	219.97	220.03
26.000	220.38	220.38	222.15	222.27	223.92	224.98	224.13	224.79	222.96	223.39	224.72	225.29
28.000	226.71	226.71	228.15	228.39	229.40	229.88	228.28	228.75	227.90	228.53	229.47	229.25
30.000	232.70	232.84	233.09	233.93	234.34	234.03	232.43	232.70	232.84	233.67	234.21	233.20
32.000	236.65	237.78	238.03	239.46	239.28	238.18	236.58	236.65	237.78	238.78	238.95	237.15
34.000	240.60	242.72	242.97	244.98	244.22	242.32	240.72	240.60	242.72	243.72	243.65	241.19
36.000	244.55	247.65	248.67	250.51	249.15	246.47	244.87	244.55	247.61	248.65	247.99	245.93
38.000	249.66	252.34	255.77	256.03	253.49	250.61	249.01	249.16	252.14	253.58	252.32	250.66
40.000	254.98	256.87	262.86	261.54	257.43	254.74	253.14	253.89	256.67	258.50	256.66	255.39
42.000	260.30	261.40	266.56	267.06	261.37	258.88	257.28	258.61	261.20	263.32	260.99	260.11
44.000	265.61	265.93	269.51	269.72	265.30	263.01	261.84	263.34	265.73	266.47	265.32	264.84
46.000	270.92	270.45	272.46	271.69	269.24	267.14	266.76	268.06	270.15	269.62	269.65	269.56
48.000	272.15	272.65	273.15	272.15	271.15	269.15	269.15	269.15	270.15	271.15	270.65	270.65
50.000	272.15	272.65	273.15	272.15	271.15	269.15	269.15	269.15	270.15	271.15	270.65	270.65
52.000	269.12	269.62	269.98	269.27	270.21	266.82	266.56	266.27	266.54	267.84	267.34	267.77
54.000	265.01	265.51	265.67	265.35	268.25	264.47	263.03	262.35	261.65	263.33	262.83	263.85
56.000	260.71	261.14	261.35	261.42	261.26	259.88	258.78	258.42	256.74	258.60	258.14	259.74
58.000	255.61	255.65	257.04	256.93	254.01	252.43	251.33	252.13	251.85	252.92	252.65	254.85
60.000	250.52	250.17	250.60	249.49	246.77	244.99	243.89	244.69	246.95	247.24	247.17	249.67
62.000	245.44	244.69	243.95	242.05	239.53	237.55	236.45	237.25	239.96	240.21	241.69	242.82
64.000	240.35	239.21	237.30	234.62	232.29	230.12	229.02	229.82	231.75	232.39	235.18	235.98
66.000	235.27	233.74	230.65	227.20	224.57	222.57	221.57	222.40	223.54	224.57	226.77	229.14
68.000	230.19	228.27	224.01	219.76	216.76	214.76	213.76	214.10	215.34	216.76	218.38	222.30
70.000	225.12	222.81	216.14	211.95	208.95	206.95	205.95	205.12	207.14	208.95	209.98	215.44
72.000	217.25	215.15	207.95	204.15	201.15	200.65	198.15	196.15	201.15	201.15	201.60	207.25
74.000	206.72	205.40	199.76	196.35	193.35	196.37	192.59	196.15	197.25	195.15	195.42	199.06
76.000	196.20	195.66	191.58	188.55	193.24	197.34	194.54	196.15	196.15	195.15	196.58	195.54
78.000	195.65	190.57	191.15	190.73	196.16	198.32	196.49	196.15	196.15	195.15	197.75	197.49
80.000	195.65	191.54	191.15	193.45	199.08	199.29	198.44	196.15	196.15	195.15	198.92	199.44
82.000	195.65	192.51	192.32	196.40	202.00	200.26	199.65	196.15	196.15	195.15	199.65	199.65
84.000	195.65	193.48	195.43	199.70	204.91	201.23	199.65	196.15	196.15	195.15	199.65	199.65
86.000	194.59	194.46	198.54	203.00	205.59	201.88	197.85	195.03	196.15	195.15	198.84	198.28
88.000	191.29	195.15	201.64	206.30	204.61	197.61	192.22	191.53	196.15	195.15	196.32	194.01
90.000	187.99	195.15	204.75	209.60	203.64	193.34	186.59	188.04	196.15	195.15	193.79	189.74

Table A1. (Continued) Monthly Temperature (°K) at 15°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	296.65	296.65	296.65	297.15	297.65	299.65	299.65	298.65	297.65	298.15	297.15	296.65
2.000	287.27	286.87	286.87	286.97	287.27	290.47	288.87	289.88	288.67	288.57	287.17	287.67
4.000	277.90	277.10	276.70	276.81	276.91	279.37	278.11	278.71	277.31	277.81	277.20	278.70
6.000	266.28	265.28	266.02	264.78	266.55	267.61	267.35	267.56	265.96	266.66	265.77	266.76
8.000	252.35	251.35	253.08	250.85	254.88	255.06	255.38	253.76	252.86	254.56	252.83	253.46
10.000	238.42	237.42	238.69	236.92	238.96	239.94	239.46	239.03	237.94	239.44	238.46	238.73
12.000	224.50	223.50	223.77	223.00	223.05	224.83	223.55	224.32	223.02	224.33	222.55	224.02
14.000	210.59	209.59	208.87	209.09	207.15	209.73	207.65	209.61	208.12	209.23	208.18	209.31
16.000	199.46	198.92	199.52	200.02	199.09	199.34	200.30	200.49	199.96	197.92	199.24	200.59
18.000	195.15	195.15	195.65	196.15	199.27	202.32	202.87	203.32	202.82	200.82	198.15	197.15
20.000	203.65	202.71	205.10	204.84	207.21	209.26	208.82	210.26	209.76	207.76	205.49	205.28
22.000	212.57	210.64	212.83	213.96	215.14	216.20	214.76	217.20	214.45	214.70	212.82	213.80
24.000	217.22	217.99	217.78	221.02	221.52	221.85	220.71	221.35	219.01	219.59	218.53	220.35
26.000	221.58	222.75	222.73	225.38	225.88	225.81	224.81	225.31	223.56	224.35	223.48	224.31
28.000	225.93	227.49	227.68	229.73	230.23	229.77	228.77	229.27	228.11	229.09	228.43	228.27
30.000	230.28	232.24	232.62	234.08	234.58	233.72	232.72	233.22	232.66	223.84	233.37	232.22
32.000	234.63	236.98	237.56	238.43	239.31	237.68	236.68	237.18	237.21	238.58	238.31	236.18
34.000	238.97	241.72	242.50	242.77	244.25	241.63	240.63	241.13	241.75	243.32	243.25	240.13
36.000	244.29	246.46	247.64	247.24	249.18	246.43	244.57	245.07	246.43	248.30	248.18	244.79
38.000	250.20	251.53	253.17	252.77	254.11	251.36	248.59	249.52	251.36	253.43	253.11	250.70
40.000	256.12	256.65	258.68	258.28	259.04	256.29	252.72	254.06	256.29	258.55	258.04	256.62
42.000	262.02	261.77	264.20	263.80	263.96	261.21	256.86	258.59	260.40	263.67	262.96	262.52
44.000	265.70	266.79	268.07	268.24	267.24	264.38	260.99	263.11	264.34	266.72	266.79	266.04
46.000	268.84	269.74	270.63	270.21	269.21	267.13	265.13	267.64	268.27	269.28	269.74	268.99
48.000	271.15	272.65	273.15	272.15	270.65	269.15	268.15	268.65	270.15	271.15	271.15	271.15
50.000	271.15	272.65	273.15	272.15	270.65	269.15	268.15	268.65	270.15	271.15	271.15	271.15
52.000	268.95	269.30	269.65	269.52	268.61	266.80	266.71	266.16	266.36	267.07	267.36	267.07
54.000	264.43	264.78	264.94	265.99	265.86	264.44	263.77	261.06	261.26	261.57	262.26	261.57
56.000	259.92	260.00	259.93	261.78	262.16	259.62	258.71	255.96	256.00	255.93	257.04	256.08
58.000	254.49	254.12	253.66	254.72	254.52	251.78	251.07	248.84	250.12	249.66	251.36	250.59
60.000	249.01	248.25	247.39	247.67	246.88	243.95	243.43	241.59	244.25	243.39	245.68	245.11
62.000	243.53	242.38	241.13	240.62	239.25	236.12	235.80	234.35	237.12	236.37	239.37	239.63
64.000	238.05	236.51	234.87	233.58	231.62	228.30	228.17	227.11	229.30	228.94	232.72	234.15
66.000	232.58	230.64	228.61	226.54	223.99	220.47	220.54	219.88	221.47	221.51	226.08	228.68
68.000	226.62	224.78	222.36	219.51	216.37	212.66	212.92	212.65	213.66	214.08	219.43	223.21
70.000	228.57	218.92	216.11	212.48	208.76	204.85	205.31	205.42	205.85	206.66	212.79	217.74
72.000	214.88	212.66	209.56	205.86	201.56	199.33	201.81	199.36	199.58	201.09	207.18	212.58
74.000	210.20	206.03	202.73	199.62	194.73	195.88	199.47	196.43	194.71	197.19	202.50	207.71
76.000	205.53	199.40	195.91	193.39	195.61	196.86	197.65	194.15	193.25	195.15	197.83	202.83
78.000	200.85	192.78	192.15	193.15	196.58	197.83	197.65	194.15	195.59	195.15	197.65	200.15
80.000	198.15	191.96	192.15	193.15	197.55	198.80	197.65	194.15	197.93	195.15	197.65	200.15
82.000	198.15	193.91	194.09	195.44	198.53	199.15	197.65	194.15	198.15	195.15	197.65	200.15
84.000	198.15	195.85	196.22	197.97	199.50	199.15	197.65	194.15	198.15	195.15	197.65	200.15
86.000	196.97	196.65	198.36	200.49	199.65	196.67	193.52	193.10	197.89	195.15	197.65	197.67
88.000	193.48	196.65	200.50	203.02	199.65	193.76	188.66	190.00	197.11	195.15	197.65	194.76
90.000	189.99	196.65	202.63	205.54	199.65	190.85	183.81	186.89	196.33	195.15	197.65	191.85

Table A1. (Continued) Monthly Temperature (°K) at 30°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	287.15	286.65	289.15	292.15	295.15	298.65	301.15	298.65	296.65	293.65	289.15	286.15
2.000	281.16	278.66	279.16	282.16	285.56	287.66	288.16	287.16	285.66	283.66	281.16	280.16
4.000	268.20	270.68	269.19	272.19	275.98	277.69	277.19	277.19	276.68	273.69	273.18	267.60
6.000	255.24	257.74	256.24	260.24	263.75	265.25	266.22	266.44	264.75	261.74	259.24	255.03
8.000	242.28	244.78	243.28	246.29	248.80	250.30	252.29	253.28	249.80	247.79	245.29	242.48
10.000	229.34	231.84	230.34	232.35	233.87	235.37	238.35	240.14	234.87	233.85	231.35	229.93
12.000	216.40	218.90	217.40	218.42	218.94	220.44	224.42	227.00	219.94	219.92	217.42	217.39
14.000	211.08	212.99	212.86	213.47	211.82	209.45	210.49	213.87	211.85	211.85	211.69	211.88
16.000	205.91	207.23	208.48	208.69	204.86	203.65	203.15	203.65	203.89	203.89	206.12	206.51
18.000	203.15	204.15	206.15	206.15	206.77	207.88	207.38	206.49	206.23	203.65	203.15	203.65
20.000	207.73	207.97	209.97	210.92	211.34	212.25	211.75	210.47	211.79	205.96	208.88	209.38
22.000	212.49	211.93	213.93	215.88	215.90	216.61	216.11	214.43	217.35	210.92	214.83	215.33
24.000	217.25	215.90	217.90	220.46	220.46	220.97	220.47	218.77	221.02	215.88	218.52	218.46
26.000	221.79	219.86	222.61	225.02	225.02	225.33	224.83	223.13	224.59	219.52	222.09	221.43
28.000	225.36	224.74	227.36	229.57	229.57	229.69	229.19	227.49	228.16	223.09	225.66	224.40
30.000	228.92	229.69	232.11	234.13	234.13	234.05	233.55	231.85	231.72	226.66	229.22	227.37
32.000	233.13	234.64	236.86	238.68	238.68	238.40	237.90	236.20	235.28	230.22	232.78	232.14
34.000	237.67	239.58	241.60	243.05	243.22	242.75	242.25	240.55	238.84	233.78	236.34	237.08
36.000	242.24	244.52	246.34	247.39	247.77	247.09	246.59	244.89	243.02	237.34	241.14	242.02
38.000	246.98	249.45	251.08	251.73	252.23	251.95	251.45	249.23	247.56	241.77	246.67	246.78
40.000	251.71	254.38	255.61	256.07	256.57	256.88	256.38	253.57	252.09	246.70	252.19	251.51
42.000	256.45	258.98	259.75	260.41	260.91	261.31	261.31	257.91	256.63	251.63	257.71	256.25
44.000	261.17	263.51	263.88	263.77	265.25	265.65	264.44	261.59	261.16	256.56	263.23	260.97
46.000	265.65	266.65	266.25	266.92	268.69	269.25	267.19	265.14	264.69	261.49	267.19	265.70
48.000	265.65	266.65	267.65	269.15	270.65	271.15	269.15	267.65	266.65	266.25	269.15	266.65
50.000	265.65	266.54	267.65	269.15	270.65	271.15	269.15	267.65	266.65	267.65	269.15	266.65
52.000	261.73	261.43	265.43	267.98	268.54	269.64	267.34	264.78	263.63	267.65	264.32	263.03
54.000	256.62	256.32	261.11	263.46	265.79	266.69	264.98	261.05	259.70	263.43	258.04	258.31
56.000	251.65	251.50	256.79	258.95	262.21	261.88	261.50	256.63	255.60	257.93	252.10	253.60
58.000	247.13	246.98	251.34	253.74	255.74	255.01	254.04	249.76	250.89	252.52	247.39	248.89
60.000	242.62	242.48	245.85	248.25	249.27	248.15	246.59	242.90	246.19	247.42	242.69	244.19
62.000	238.12	237.97	240.36	242.76	242.80	241.29	239.14	236.04	240.04	242.32	237.99	239.88
64.000	233.61	233.46	234.88	237.28	236.34	234.44	231.70	229.19	233.19	232.13	233.29	235.77
66.000	229.11	228.96	229.40	231.80	229.88	227.59	224.27	222.34	226.34	227.04	228.68	231.66
68.000	224.62	224.47	223.92	226.20	223.43	220.74	216.83	215.49	219.49	221.96	224.77	227.55
70.000	220.12	219.97	220.16	220.53	216.98	213.90	209.41	208.93	212.65	216.88	220.86	223.45
72.000	218.15	219.15	217.62	214.87	210.53	207.06	204.50	206.00	206.05	211.80	216.96	220.55
74.000	218.15	219.15	215.08	209.21	204.09	201.33	201.58	203.08	204.10	206.72	213.05	218.60
76.000	216.35	218.25	212.55	203.55	197.65	198.40	198.65	200.15	202.15	201.65	209.15	215.65
78.000	212.84	214.74	210.01	200.17	195.70	195.47	195.72	197.22	200.20	200.67	205.25	211.75
80.000	209.33	211.23	207.48	199.20	193.75	192.55	192.80	194.30	198.25	199.70	201.35	207.85
82.000	205.83	207.73	204.95	198.22	191.80	189.63	189.88	191.38	196.30	199.65	201.15	203.96
84.000	202.32	204.22	202.42	197.25	189.86	186.71	186.96	188.46	194.36	199.65	201.15	200.07
86.000	198.82	200.72	200.41	196.28	188.65	183.79	184.04	185.54	194.15	199.65	201.15	199.65
88.000	195.33	197.23	198.47	195.31	188.65	180.88	181.13	182.63	194.15	199.65	201.15	199.65
90.000	191.83	193.73	196.53	194.34	188.65	178.15	178.22	182.15	194.15	199.65	201.15	199.65

Table A1. (Continued) Monthly Temperature (°K) at 45°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	272.15	273.15	274.15	279.15	284.65	288.15	294.15	292.15	288.15	284.15	278.15	273.15
2.000	265.15	266.15	268.15	273.15	277.65	280.95	285.15	284.15	280.15	274.15	270.15	267.15
4.000	255.66	256.16	259.16	263.66	267.16	269.71	273.16	272.11	268.71	263.16	260.16	257.66
6.000	243.68	243.18	247.18	250.68	253.19	257.13	261.18	258.73	256.13	251.18	248.18	244.68
8.000	231.71	230.21	235.21	237.71	239.22	244.56	248.21	245.36	243.56	239.21	236.21	231.71
10.000	219.74	217.25	223.24	224.75	225.26	231.99	235.25	232.00	230.99	227.24	224.24	218.75
12.000	218.65	217.15	217.15	218.15	218.15	219.44	222.29	218.65	218.44	215.28	217.46	217.66
14.000	217.66	217.15	217.15	218.15	218.15	216.15	215.65	215.15	215.15	215.15	216.07	216.66
16.000	216.67	217.15	217.15	218.15	218.15	216.15	215.65	215.15	215.15	215.15	214.67	216.15
18.000	215.67	217.15	217.15	218.15	218.15	217.19	216.78	216.28	215.59	215.15	214.65	216.15
20.000	215.15	217.15	217.15	218.15	218.15	219.38	219.17	218.67	217.58	215.15	214.65	216.15
22.000	215.15	217.15	217.15	218.15	220.07	221.56	221.55	221.05	219.57	217.07	215.99	216.15
24.000	215.15	218.56	219.06	220.26	222.06	223.75	223.75	223.44	221.56	219.06	217.38	216.15
26.000	215.15	220.54	221.04	223.24	224.04	225.93	225.93	226.38	223.54	221.04	218.77	216.15
28.000	217.08	222.52	223.48	226.21	227.60	229.34	229.16	229.55	225.90	223.02	220.16	216.15
30.000	221.44	224.50	227.84	229.54	233.15	234.29	233.72	232.72	229.86	225.00	221.55	219.86
32.000	225.79	228.69	232.19	234.49	238.70	239.24	238.28	235.89	233.82	227.91	224.59	223.82
34.000	230.15	233.05	236.55	239.44	244.24	244.19	242.83	239.06	237.78	232.07	227.76	227.78
36.000	235.54	238.04	241.54	244.54	249.78	249.38	247.38	243.39	241.74	236.22	231.64	232.14
38.000	241.47	243.97	247.47	250.47	255.16	254.91	251.93	248.33	246.40	240.37	236.58	237.08
40.000	247.40	249.90	253.40	256.40	260.30	260.45	256.47	253.27	251.15	244.52	241.52	242.02
42.000	253.32	253.75	259.32	261.09	265.43	265.97	261.01	258.21	255.88	249.68	247.25	247.25
44.000	259.24	257.30	263.20	265.04	270.56	269.82	265.55	263.14	260.62	256.59	254.36	252.97
46.000	262.82	260.85	265.77	268.98	273.58	272.58	270.09	268.07	265.35	261.82	261.46	259.65
48.000	264.65	264.15	268.15	271.65	274.65	275.15	273.15	270.15	267.79	266.75	264.61	262.60
50.000	264.65	264.15	268.15	271.65	274.65	275.15	273.15	270.15	268.15	267.65	265.65	264.15
52.000	261.41	261.77	265.56	269.06	272.06	272.23	272.91	268.41	265.34	266.08	265.45	263.87
54.000	255.51	257.45	260.84	264.34	267.34	266.92	267.01	262.51	260.23	260.77	260.53	256.99
56.000	250.83	253.12	256.12	259.62	262.61	261.62	260.61	256.61	255.11	255.47	255.62	251.93
58.000	247.29	249.19	251.21	254.31	257.11	256.31	253.73	250.72	249.22	249.72	250.41	248.59
60.000	243.76	245.27	246.30	249.01	251.62	251.01	246.86	244.65	243.33	243.83	244.92	245.25
62.000	240.22	241.34	241.39	243.71	246.12	244.99	239.99	237.98	237.44	237.94	239.42	241.91
64.000	236.69	237.42	236.49	238.42	240.63	238.13	233.13	231.31	231.56	233.42	236.54	238.58
66.000	233.17	233.50	232.33	233.13	235.14	231.27	226.27	224.65	225.68	229.50	233.80	235.25
68.000	229.64	229.59	229.20	229.09	229.66	244.41	219.41	217.99	219.80	225.59	231.05	231.92
70.000	226.12	225.67	226.07	225.17	223.31	217.56	212.56	211.34	213.93	221.67	228.31	228.59
72.000	225.65	225.15	222.94	221.26	216.47	210.72	205.72	204.69	208.06	217.76	225.57	226.11
74.000	225.65	225.15	219.81	217.35	209.63	203.88	198.88	198.04	203.43	213.85	219.21	223.77
76.000	223.44	224.12	216.68	213.44	203.89	197.04	192.70	193.49	201.28	209.94	212.18	220.94
78.000	219.54	220.80	213.56	209.54	199.01	191.29	188.01	190.56	199.14	206.04	207.15	217.04
80.000	215.63	217.49	210.44	205.63	194.13	185.83	183.33	187.64	196.99	202.15	207.15	213.13
82.000	212.50	214.17	206.73	201.11	189.26	180.37	178.65	184.71	194.84	202.15	207.15	209.23
84.000	210.16	210.86	202.84	196.13	184.38	174.91	173.97	181.79	192.70	202.15	207.15	208.15
86.000	207.82	207.55	198.94	191.27	179.52	169.46	169.30	178.87	190.56	202.15	207.15	208.15
88.000	205.49	204.24	195.05	189.65	179.15	167.65	164.63	175.95	188.42	202.15	207.15	208.15
90.000	203.15	200.93	194.65	189.65	179.15	167.65	164.15	173.05	187.65	202.15	207.15	208.15

Table A1. (Continued) Monthly Temperature (°K) at 60°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	257.15	256.65	261.65	269.15	276.65	282.65	287.15	284.15	281.15	275.15	266.15	259.15
2.000	255.94	257.34	259.64	263.14	268.64	274.74	276.34	175.34	272.14	267.14	261.14	257.84
4.000	247.73	252.38	252.13	257.13	260.63	266.63	265.53	266.53	263.13	259.13	256.13	251.38
6.000	234.13	237.38	239.13	243.13	245.83	252.63	253.13	254.53	249.13	246.13	241.13	236.38
8.000	220.54	222.39	226.14	229.14	231.04	238.64	239.14	239.34	235.14	233.14	226.14	221.39
10.000	217.15	218.65	219.65	222.15	223.65	224.67	225.17	224.17	221.17	220.16	218.65	217.65
12.000	217.15	218.65	219.65	222.15	223.65	224.65	225.15	224.15	221.15	220.15	218.65	217.65
14.000	217.15	218.65	219.65	222.15	223.65	224.65	225.15	224.15	221.15	220.15	218.65	217.65
16.000	216.66	218.16	219.45	222.15	223.65	224.65	225.15	224.15	221.15	220.15	218.25	216.96
18.000	215.66	217.16	219.05	222.15	223.65	224.65	225.15	224.15	221.15	219.86	217.46	215.57
20.000	214.66	216.16	218.65	222.15	223.65	224.65	225.15	224.15	221.15	218.67	216.66	214.17
22.000	213.67	215.17	219.43	222.15	223.65	226.17	225.15	224.82	221.15	217.47	215.86	212.78
24.000	212.68	216.70	220.22	222.15	223.65	229.35	227.03	227.81	221.15	218.30	215.07	211.39
26.000	212.98	218.29	221.02	223.17	225.69	232.53	231.00	230.79	224.23	219.89	215.39	211.48
28.000	214.77	219.88	221.81	225.35	230.05	235.71	234.97	233.76	227.41	221.48	216.98	213.27
30.000	216.55	221.46	222.60	227.53	234.42	238.88	239.18	236.74	230.58	223.06	218.56	215.05
32.000	218.34	223.05	225.84	231.97	238.78	243.11	244.33	240.10	233.75	224.65	220.15	216.84
34.000	220.12	225.01	229.21	236.53	243.96	248.66	249.49	245.05	236.93	227.87	221.74	218.62
36.000	222.07	226.99	233.34	241.59	249.51	254.21	254.64	250.00	241.57	231.83	223.99	220.91
38.000	224.25	230.45	238.48	247.33	255.05	259.75	259.78	254.95	246.32	235.79	227.16	223.88
40.000	226.43	235.99	243.63	253.07	260.59	265.29	264.93	259.90	251.07	339.75	230.33	226.85
42.000	232.87	241.52	248.77	258.80	266.12	270.20	270.07	264.84	255.81	244.59	234.73	231.23
44.000	239.78	247.06	253.90	264.53	270.65	274.15	275.20	269.53	260.55	249.53	239.28	235.78
46.000	245.16	250.74	258.60	269.24	274.60	278.10	278.13	272.49	263.74	254.47	244.33	240.32
48.000	247.93	253.31	262.55	272.20	278.55	280.65	279.15	275.15	266.70	259.40	250.25	244.86
50.000	250.69	255.65	265.15	274.15	279.15	280.65	279.15	275.15	267.15	260.15	255.65	249.39
52.000	251.15	255.65	265.15	274.15	276.40	280.65	277.60	274.74	263.94	260.15	255.65	250.15
54.000	251.15	255.03	262.92	270.80	271.67	275.80	272.87	269.23	258.43	257.14	253.64	250.15
56.000	250.93	253.06	258.98	264.90	266.95	269.90	268.15	263.72	252.92	251.82	250.10	250.15
58.000	250.54	251.10	255.05	259.00	262.23	264.00	263.43	258.21	247.41	246.51	246.50	248.60
60.000	250.11	249.10	251.09	253.10	257.51	258.10	258.71	252.70	241.90	241.20	243.02	246.63
62.000	245.59	243.21	244.22	247.21	252.79	252.21	252.79	247.20	236.40	235.90	239.48	244.67
64.000	241.08	237.31	237.34	241.31	247.37	246.31	243.17	238.59	230.90	232.20	237.65	242.70
66.000	238.65	233.78	230.47	236.24	239.52	237.62	233.56	229.96	225.41	230.24	237.65	241.65
68.000	238.65	233.00	229.40	232.12	231.68	227.81	223.95	221.33	219.92	228.28	237.65	241.65
70.000	238.65	232.21	228.61	228.01	223.84	218.01	214.34	213.03	215.76	226.32	236.96	241.65
72.000	238.07	231.43	227.83	223.90	216.00	208.22	204.75	206.38	212.23	224.36	232.85	237.36
74.000	234.16	230.65	227.05	219.79	208.17	198.43	195.16	199.72	208.71	222.40	228.74	232.66
76.000	230.25	228.75	226.27	215.33	200.35	188.65	185.57	193.07	205.19	218.75	224.63	227.97
78.000	226.34	224.84	222.01	210.25	192.53	178.88	175.99	186.42	201.67	214.84	220.52	223.28
80.000	222.43	220.93	217.13	205.17	184.71	169.11	166.42	179.93	198.15	210.93	216.65	218.59
82.000	218.53	217.03	212.24	200.09	176.90	159.34	157.09	176.03	194.64	207.03	216.65	213.90
84.000	214.65	213.12	207.37	195.02	169.13	155.63	155.13	172.12	191.12	204.15	216.65	213.06
86.000	214.65	209.22	202.49	189.95	166.79	153.68	153.18	168.22	187.61	204.15	216.65	215.79
88.000	214.65	205.32	197.62	184.88	164.45	151.73	151.23	164.32	184.11	204.15	216.65	218.52
90.000	214.65	205.15	193.65	179.81	163.15	150.15	149.29	160.43	182.15	204.15	216.65	221.25

Table A1. (Continued) Monthly Temperature (°K) at 75°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	248.15	247.65	248.65	255.15	264.15	272.65	275.65	274.65	270.15	262.65	253.15	251.15
2.000	251.37	251.63	251.63	254.88	263.12	269.04	273.62	271.44	264.12	259.44	253.37	254.12
4.000	240.36	241.30	241.86	244.86	251.11	257.60	260.60	260.10	252.11	248.85	242.36	242.11
6.000	229.35	228.70	230.85	233.85	239.10	243.59	247.59	246.09	240.10	235.84	231.35	230.10
8.000	218.35	216.14	219.85	222.85	227.10	229.59	234.59	232.09	228.10	222.84	220.35	218.10
10.000	214.14	214.94	217.90	222.56	225.65	227.65	228.55	225.65	223.15	219.65	217.65	214.24
12.000	212.14	213.74	218.90	224.15	227.65	229.65	229.35	226.65	224.65	219.65	217.65	213.04
14.000	210.14	212.55	219.90	224.15	228.15	229.65	230.15	227.65	224.65	219.65	217.14	211.85
16.000	208.15	210.90	218.65	224.15	228.15	229.65	230.15	228.15	224.65	219.65	215.15	210.65
18.000	206.16	207.91	216.66	224.15	228.15	229.65	230.15	228.15	223.90	217.66	213.16	209.45
20.000	204.16	204.92	214.66	224.15	228.15	229.65	230.15	228.15	222.90	215.66	211.16	208.26
22.000	202.93	206.06	215.83	224.15	228.15	230.13	230.15	228.15	222.65	213.67	209.17	207.06
24.000	204.12	208.65	217.02	224.15	228.15	231.13	230.15	228.15	222.65	211.68	207.88	205.87
26.000	205.32	211.23	218.22	224.15	228.69	233.93	232.62	228.15	222.65	211.79	208.87	204.67
28.000	206.51	213.82	219.81	224.15	231.07	238.70	237.79	231.75	222.65	214.17	209.87	207.56
30.000	209.00	216.40	222.78	227.61	233.46	243.47	242.95	236.71	226.50	216.56	210.86	210.53
32.000	212.97	218.98	225.76	231.19	238.10	248.23	248.12	241.67	230.47	218.94	213.97	213.51
34.000	216.94	221.56	228.74	234.76	243.65	252.99	253.27	246.63	234.44	221.32	217.94	216.49
36.000	220.90	224.14	231.71	238.33	249.20	257.75	258.34	251.59	238.40	225.02	221.90	219.46
38.000	224.86	226.71	234.68	241.89	254.75	262.51	263.29	256.54	242.36	230.37	225.86	222.43
40.000	228.82	229.29	237.99	248.03	260.30	267.26	268.24	261.49	246.32	235.71	229.82	225.40
42.000	232.78	233.44	242.94	254.36	265.84	272.01	273.19	266.44	252.46	241.06	233.78	228.37
44.000	236.74	238.39	247.89	260.69	271.37	276.76	278.14	271.39	258.79	246.40	237.74	233.67
46.000	240.69	243.33	252.83	267.02	276.91	281.50	283.08	276.33	265.12	251.73	241.69	239.21
48.000	244.64	248.27	257.77	273.34	282.44	285.65	283.65	278.15	270.65	257.06	247.74	244.74
50.000	248.59	253.20	262.70	274.15	283.15	285.65	283.65	278.15	270.65	262.39	254.06	250.27
52.000	252.53	258.13	267.15	274.15	283.15	285.65	283.65	278.15	270.65	263.15	258.15	255.79
54.000	255.15	260.15	267.15	272.01	280.88	283.65	283.23	276.81	270.65	263.15	258.15	256.65
56.000	254.06	258.24	263.17	265.71	274.18	277.74	278.30	272.87	268.10	259.05	254.51	254.14
58.000	250.72	252.33	256.28	259.41	267.49	271.83	273.38	268.93	260.22	251.96	248.21	249.81
60.000	247.37	246.42	249.39	253.11	260.80	265.92	268.46	263.45	252.35	244.88	241.91	245.48
62.000	244.03	240.52	242.50	246.82	254.11	260.02	263.41	254.21	244.48	237.80	235.62	241.16
64.000	240.69	234.63	235.63	240.53	247.43	254.13	252.01	244.97	236.62	230.72	234.90	240.90
66.000	238.52	233.73	231.76	234.24	240.75	245.33	240.62	235.74	228.77	227.15	235.88	241.88
68.000	240.09	234.52	230.97	230.47	234.07	233.55	229.23	226.51	221.78	227.15	236.86	242.86
70.000	241.66	235.30	230.19	226.75	225.45	221.78	217.86	217.29	217.86	227.15	237.84	243.84
72.000	239.43	236.09	229.40	223.02	216.04	210.01	206.49	208.08	213.93	227.15	235.43	241.16
74.000	235.52	233.24	228.62	219.30	206.64	198.26	195.12	198.87	210.02	225.52	231.52	236.85
76.000	231.60	230.11	226.21	215.58	197.24	186.51	183.76	189.66	206.10	221.60	227.60	232.55
78.000	227.69	226.98	221.32	209.96	187.84	174.77	172.41	180.47	202.19	217.69	223.69	228.24
80.000	223.77	223.85	216.43	204.09	178.46	163.03	161.07	171.85	198.27	213.77	221.15	223.94
82.000	219.87	220.72	211.55	198.23	170.87	151.31	149.73	168.72	194.37	209.87	221.15	219.64
84.000	215.96	217.60	206.66	192.37	166.96	145.60	147.01	165.60	190.46	205.96	221.15	217.54
86.000	214.15	214.47	201.78	186.51	163.06	144.62	146.23	162.47	186.56	205.15	221.15	220.46
88.000	214.15	211.35	196.91	180.66	159.15	143.65	145.45	159.35	182.65	205.15	221.15	223.39
90.000	214.15	208.23	193.15	176.15	155.25	142.67	144.67	156.23	180.65	205.15	221.15	226.31

Table A1. (Continued) Monthly Temperature (°K) at 90°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D
0.000	237.15	240.65	242.15	248.65	260.65	272.15	273.15	273.15	264.15	252.65	245.65	243.15
2.000	245.88	247.12	246.63	252.12	260.62	265.73	271.12	268.13	264.12	254.37	251.87	248.14
4.000	236.61	237.11	238.61	242.11	249.60	255.10	260.09	257.59	252.10	243.35	240.85	238.85
6.000	226.60	227.10	228.60	232.10	238.59	243.09	246.88	244.58	240.09	232.34	229.84	227.84
8.000	216.59	217.09	218.59	222.09	227.59	231.08	233.67	231.58	228.08	221.34	218.84	216.84
10.000	212.64	214.19	217.66	221.91	225.18	227.17	228.76	226.16	223.36	220.16	216.15	213.09
12.000	210.64	213.59	219.64	224.15	229.65	231.15	231.15	228.15	225.15	222.14	216.15	211.69
14.000	208.63	212.13	217.64	224.15	229.65	231.15	231.15	230.14	225.15	220.14	215.59	210.29
16.000	204.64	208.14	215.64	224.15	229.65	231.15	231.15	229.55	225.14	218.14	213.39	208.89
18.000	200.65	204.15	213.65	224.15	229.65	231.15	231.15	228.95	223.95	216.15	211.20	207.50
20.000	196.67	200.17	212.49	224.15	229.65	231.15	231.15	228.35	222.75	214.16	209.01	206.10
22.000	196.65	202.13	213.88	224.15	229.65	231.15	231.15	227.75	222.15	212.16	206.82	204.71
24.000	196.65	204.12	215.28	224.66	229.65	231.15	231.15	227.15	222.15	210.17	205.15	203.65
26.000	196.65	206.11	216.67	226.85	232.00	233.48	233.48	229.50	222.15	210.15	205.15	203.65
28.000	196.65	208.10	218.06	229.04	234.39	236.67	236.67	231.89	222.15	210.15	205.15	203.65
30.000	203.04	212.09	220.24	231.23	236.77	239.84	239.84	234.27	222.15	210.15	206.02	203.65
32.000	209.59	216.86	225.20	233.41	239.79	243.02	243.02	237.54	225.99	210.15	209.99	208.07
34.000	216.14	221.62	230.16	236.16	245.15	249.82	249.82	244.09	229.96	213.99	213.96	212.63
36.000	222.69	226.38	235.12	241.12	250.50	256.76	256.76	250.64	233.93	217.96	217.93	217.19
38.000	229.23	231.14	240.08	246.08	254.89	263.70	263.70	257.18	237.89	221.93	221.89	221.75
40.000	232.98	235.89	245.03	251.03	258.85	270.63	270.63	263.71	242.53	225.89	225.85	226.31
42.000	236.55	239.98	249.65	255.98	262.81	276.31	275.90	269.48	247.48	231.71	229.98	230.86
44.000	240.11	243.14	252.61	260.93	266.77	280.27	278.86	271.46	251.77	237.65	234.93	235.41
46.000	243.67	246.31	255.58	265.87	270.72	284.22	281.83	273.43	255.72	243.58	239.87	239.96
48.000	247.22	249.47	258.54	270.15	274.68	286.65	283.65	274.15	259.15	249.51	244.81	244.50
50.000	250.78	252.63	261.51	270.15	276.15	286.65	283.65	274.15	259.15	253.15	249.15	249.05
52.000	252.15	254.65	262.65	270.15	276.15	286.65	283.65	274.15	259.15	253.15	249.15	249.65
54.000	252.15	254.65	262.65	270.15	276.15	286.65	283.65	274.15	259.15	253.15	249.15	249.65

Table A2. Monthly Density (kg m^{-3}) at the Equator

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.1761	1.1742	1.1717	1.1716	1.1742	1.1771	1.1797	1.1796	1.1776	1.1769	1.1761	1.1761	+0*
2.000	9.6636	9.6625	9.6516	9.6565	9.6684	9.6890	9.7077	9.6830	9.6819	9.6821	9.6695	9.6813	-1
4.000	7.8839	7.8935	7.8913	7.8992	7.9022	7.9163	7.9287	7.8931	7.9027	7.9068	7.8926	7.9100	
6.000	6.3834	6.3981	6.4010	6.4096	6.4073	6.4162	6.4239	6.4236	6.4273	6.4329	6.4213	6.4111	
8.000	5.1518	5.1659	5.1475	5.1728	5.1505	5.1555	5.1594	5.2083	5.1998	5.2053	5.1980	5.1514	
10.000	4.1779	4.1858	4.1732	4.1737	4.1738	4.1761	4.1775	4.1751	4.1608	4.1652	4.1612	4.1728	
12.000	3.3404	3.3434	3.3366	3.3219	3.3355	3.3357	3.3352	3.3342	3.3258	3.3261	3.3246	3.3330	
14.000	2.6276	2.6271	2.6246	2.6032	2.6223	2.6210	2.6191	2.6198	2.6161	2.6135	2.6137	2.6189	
16.000	1.9873	1.9791	1.9850	1.9726	1.9864	1.9679	1.9556	2.5973	1.9748	1.9701	1.9679	1.9704	
18.000	1.4185	1.4092	1.4156	1.4115	1.3951	1.3836	1.3723	1.9639	1.3855	1.3779	1.3973	1.3979	
20.000	0.9761	0.9697	0.9729	0.9725	0.9641	0.9602	0.9525	1.3786	0.9604	0.9524	0.9584	0.9579	
22.000	6.7966	6.7523	6.7705	6.7816	6.7424	6.7395	6.6925	9.5602	6.7484	6.6793	6.6703	6.6608	-2
24.000	4.7853	4.7541	4.7672	4.7828	4.7680	4.7808	4.7926	6.7114	4.8184	4.7657	4.7167	4.6947	
26.000	3.4046	3.3824	3.3939	3.4092	3.4072	3.4255	3.4691	4.7768	3.4673	3.4279	3.4065	3.3863	
28.000	2.4462	2.4304	2.4485	2.4585	2.4690	2.4916	2.5265	3.4645	2.5135	2.4848	2.4775	2.4720	
30.000	1.7766	1.7640	1.7883	1.7923	1.8063	1.8293	1.8509	2.5274	1.8351	1.8144	1.8140	1.8147	
32.000	1.3103	1.2966	1.3150	1.3165	1.3304	1.3506	1.3637	1.8541	1.3490	1.3343	1.3367	1.3393	
34.000	0.9715	0.9594	0.9732	0.9741	0.9862	1.0026	1.0103	1.0139	0.9981	0.9885	0.9914	0.9933	
36.000	7.2401	7.1431	7.2270	7.2575	7.3557	7.4817	7.5248	7.5560	7.4325	7.3687	7.4047	7.3869	-3
38.000	5.3993	5.3548	5.3796	5.4428	5.5307	5.6114	5.6332	5.6449	5.5743	5.5256	5.5596	5.5255	
40.000	4.0487	4.0382	4.0377	4.1077	4.1845	4.2293	4.2381	4.2390	4.2028	4.1672	4.1954	4.1564	
42.000	3.0546	3.0610	3.0890	3.1189	3.1800	3.2026	3.2037	3.2007	3.1851	3.1613	3.1815	3.1434	
44.000	2.3182	2.3317	2.3774	2.4044	2.4270	2.4364	2.4293	2.4294	2.4257	2.4237	2.4240	2.3897	
46.000	1.7692	1.7846	1.8353	1.8624	1.8599	1.8616	1.8493	1.8534	1.8569	1.8643	1.8553	1.8259	
48.000	1.3760	1.3832	1.4316	1.4527	1.4411	1.4392	1.4275	1.4382	1.4483	1.4467	1.4422	1.4188	
50.000	1.0753	1.0814	1.1198	1.1352	1.1252	1.1216	1.1125	1.1208	1.1297	1.1295	1.1255	1.1073	
52.000	8.4906	8.5425	8.8540	8.9597	8.8156	8.8095	8.7481	8.8223	8.9223	8.9199	8.8841	8.7273	-4
54.000	6.7090	6.7529	7.0059	7.0759	6.9232	6.9061	6.8831	6.9488	7.0523	7.0493	7.0179	6.8832	
56.000	5.2860	5.3245	5.5231	5.5694	5.5201	5.4470	5.4137	5.4543	5.5504	5.5537	5.5257	5.4140	
58.000	4.1600	4.1976	4.3377	4.3781	4.3786	4.3181	4.2874	4.3027	4.3489	4.3709	4.3441	4.2541	
60.000	3.2586	3.2926	3.4187	3.4619	3.4504	3.3999	3.3722	3.3869	3.3917	3.4219	3.3976	3.3312	
62.000	2.5402	2.5693	2.6800	2.7184	2.7002	2.6578	2.6331	2.6467	2.6535	2.6779	2.6432	2.6108	
64.000	1.9702	1.9940	2.0871	2.1189	2.0976	2.0617	2.0402	2.0525	2.0697	2.0863	2.0534	2.0323	
66.000	1.5200	1.5387	1.6141	1.6387	1.6198	1.5872	1.5679	1.5787	1.6002	1.6118	1.5948	1.5706	
68.000	1.1663	1.1803	1.2392	1.2568	1.2403	1.2123	1.1961	1.2082	1.2256	1.2341	1.2271	1.2046	
70.000	8.8979	8.9974	9.4882	9.5682	9.4057	9.1696	9.0350	9.1744	9.2919	9.3589	9.3476	9.1656	-5
72.000	6.8278	6.8779	7.2021	7.2109	7.0592	6.8177	6.7522	6.8822	6.8976	7.0241	7.0429	6.9509	
74.000	5.2406	5.2482	5.4076	5.3759	5.2393	4.9755	4.9325	4.9008	5.0349	5.1671	5.1871	5.2138	
76.000	3.9678	3.9531	4.0125	3.9611	3.7079	3.5306	3.4623	3.4906	3.6220	3.6738	3.6716	3.7795	
78.000	2.8323	2.8692	2.8397	2.7561	2.5956	2.5101	2.4394	2.4867	2.5758	2.6127	2.6048	2.6677	
80.000	2.0164	2.0158	2.0056	1.9224	1.8270	1.7879	1.7251	1.7719	1.8322	1.8585	1.8521	1.8898	
82.000	1.4358	1.4190	1.4087	1.3465	1.2928	1.2759	1.2285	1.2628	1.3036	1.3222	1.3225	1.3534	
84.000	1.0226	1.0009	0.9843	0.9471	0.9196	0.9122	0.8809	0.9002	0.9276	0.9409	0.9483	0.9705	
86.000	7.3229	7.0744	6.9182	6.7014	6.6394	6.5442	6.3733	6.4536	6.6029	6.6974	6.8284	7.0067	-6
88.000	5.2827	5.0165	4.8902	4.7692	4.8281	4.7969	4.6691	4.6629	4.7007	4.7680	4.9444	5.1068	
90.000	3.7900	3.5721	3.4758	3.4132	3.5063	3.4931	3.3898	3.3497	3.3472	3.3951	3.5660	3.6967	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 15°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.1891	1.1891	1.1885	1.1857	1.1830	1.1751	1.1751	1.1784	1.1831	1.1816	1.1860	1.1897	+0*
2.000	9.7230	9.7350	9.7361	9.7223	9.7095	9.6224	9.6694	9.6336	9.6689	9.6775	9.7192	9.7159	-1
4.000	7.8982	7.9156	7.9204	7.9159	7.9122	7.8792	7.8986	7.8849	7.9119	7.9044	7.9095	7.8848	
6.000	6.4218	6.4360	6.4124	6.4388	6.3983	6.4129	6.4017	6.4019	6.4211	6.4133	6.4225	6.4181	
8.000	5.2127	5.2200	5.1861	5.2202	5.1572	5.1879	5.1685	5.2011	5.1981	5.1764	5.1933	5.2023	
10.000	4.1820	4.1841	4.1713	4.1823	4.1766	4.1901	4.1875	4.1900	4.1872	4.1790	4.1767	4.1898	
12.000	3.3114	3.3097	3.3164	3.3066	3.3341	3.3379	3.3444	3.3298	3.3265	3.3274	3.3325	3.3287	
14.000	2.5835	2.5792	2.5957	2.5754	2.6179	2.6177	2.6275	2.6057	2.6014	2.6080	2.5967	2.6039	
16.000	1.9567	1.9466	1.9465	1.9299	1.9468	1.9724	1.9493	1.9564	1.9413	1.9722	1.9445	1.9486	
18.000	1.4158	1.4044	1.4063	1.3954	1.3811	1.3843	1.3730	1.3765	1.3644	1.3810	1.3863	1.4080	
20.000	9.6547	9.6140	9.5617	9.5265	9.5163	9.6289	9.5976	9.5919	9.4990	9.5802	9.5556	9.6527	-2
22.000	6.6802	6.6669	6.6700	6.6002	6.6509	6.7789	6.7780	6.7639	6.7524	6.7278	6.6743	6.7082	
24.000	4.7721	4.6991	4.7602	4.6845	4.7404	4.8526	4.8334	4.8752	4.8385	4.8169	4.7512	4.7691	
26.000	3.4372	3.3834	3.4237	3.3930	3.4360	3.5243	3.5029	3.5381	3.4917	3.4765	3.4211	3.4561	
28.000	2.4921	2.4536	2.4809	2.4733	2.5064	2.5743	2.5552	2.5826	2.5369	2.5268	2.4817	2.5193	
30.000	1.8183	1.7915	1.8106	1.8140	1.8395	1.8908	1.8743	1.8957	1.8552	1.8489	1.8130	1.8467	
32.000	1.3348	1.3166	1.3304	1.3383	1.3560	1.3963	1.3823	1.3990	1.3652	1.3617	1.3334	1.3611	
34.000	0.9857	0.9737	0.9839	0.9929	1.0051	1.0365	1.0248	1.0378	1.0107	1.0091	0.9871	1.0085	
36.000	7.2933	7.2456	7.3173	7.4043	7.4963	7.7094	7.6366	7.7384	7.5217	7.5165	7.3538	7.4894	-3
38.000	5.4221	5.4162	5.4691	5.5315	5.6241	5.7656	5.7168	5.7875	5.6253	5.6298	5.5108	5.5713	
40.000	4.0598	4.0723	4.1141	4.1592	4.2436	4.3371	4.2984	4.3503	4.2315	4.2419	4.1535	4.1739	
42.000	3.0605	3.0797	3.1140	3.1468	3.2195	3.2808	3.2475	3.2872	3.2099	3.2145	3.1478	3.1481	
44.000	2.3396	2.3430	2.3846	2.4043	2.4695	2.5100	2.4650	2.4964	2.4471	2.4664	2.4075	2.4091	
46.000	1.7981	1.8038	1.8404	1.8595	1.9081	1.9290	1.8795	1.9051	1.8374	1.9011	1.8535	1.8533	
48.000	1.3906	1.3931	1.4243	1.4412	1.4801	1.4907	1.4450	1.4779	1.4502	1.4728	1.4388	1.4341	
50.000	1.0856	1.0891	1.1140	1.1262	1.1550	1.1617	1.1250	1.1512	1.1311	1.1498	1.1233	1.1196	
52.000	8.5422	8.6118	8.8170	8.8794	9.0768	9.1240	8.8047	9.0470	8.9383	9.1029	8.8840	8.8638	-4
54.000	6.7568	6.8140	6.9831	7.0044	7.1359	7.1519	6.9145	7.1525	7.0678	7.2119	7.0311	7.0225	
56.000	5.3239	5.3760	5.5146	5.5228	5.6166	5.6448	5.4579	5.6294	5.5670	5.6898	5.5424	5.5371	
58.000	4.1913	4.2390	4.3539	4.3794	4.4643	4.4796	4.3247	4.4414	4.3732	4.4754	4.3552	4.3441	
60.000	3.2837	3.3245	3.4177	3.4507	3.5242	3.5295	3.4028	3.4821	3.4163	3.4993	3.4040	3.3904	
62.000	2.5592	2.5925	2.6666	2.7007	2.7619	2.7598	2.6574	2.7102	2.6660	2.7270	2.6521	2.6317	
64.000	1.9835	2.0098	2.0674	2.0987	2.1478	2.1404	2.0588	2.0932	2.0699	2.1125	2.0552	2.0312	
66.000	1.5285	1.5483	1.5921	1.6186	1.6565	1.6457	1.5815	1.6035	1.5934	1.6230	1.5812	1.5584	
68.000	1.1730	1.1850	1.2174	1.2384	1.2663	1.2536	1.2038	1.2177	1.2152	1.2360	1.2072	1.1882	
70.000	8.9430	9.0078	9.2403	9.3944	9.5898	9.4544	9.0750	9.1613	9.1774	9.3244	9.1429	9.0004	-5
72.000	6.7570	6.8095	6.9672	7.0488	7.1755	6.9830	6.6490	6.7859	6.8086	6.9050	6.8335	6.7617	
74.000	5.0487	5.1126	5.2128	5.2331	5.3061	5.0675	4.8263	4.9183	4.9777	5.0394	5.0502	5.0401	
76.000	3.7483	3.8035	3.8623	3.8493	3.7552	3.5924	3.4821	3.5371	3.5523	3.6236	3.7067	3.7314	
78.000	2.7644	2.8020	2.7905	2.7309	2.6614	2.5516	2.4867	2.5107	2.4926	2.5767	2.6496	2.7153	
80.000	2.0059	1.9882	1.9741	1.9355	1.8898	1.8157	1.7763	1.7826	1.7568	1.8326	1.8926	1.9477	
82.000	1.4343	1.3947	1.3851	1.3584	1.3444	1.2982	1.2690	1.2658	1.2548	1.3036	1.3522	1.3974	
84.000	1.0258	0.9820	0.9748	0.9568	0.9582	0.9300	0.9068	0.8991	0.8974	0.9276	0.9662	1.0028	
86.000	7.3799	6.9773	6.8885	6.7706	6.8673	6.7364	6.6002	6.4203	6.4281	6.6017	6.9065	7.2750	-6
88.000	5.3488	4.9796	4.8868	4.8129	4.9259	4.8678	4.7844	4.6153	4.6124	4.6993	4.9375	5.2657	
90.000	3.8549	3.5546	3.4801	3.4364	3.5341	3.5010	3.4399	3.3005	3.3059	3.3458	3.5305	3.7936	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 30°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.2363	1.2374	1.2254	1.2113	1.1967	1.1815	1.1717	1.1812	1.1906	1.2063	1.2272	1.2412	+0*
2.000	9.9321	9.9995	9.9833	9.8903	9.7789	9.7177	9.7103	9.7298	9.7778	9.8598	9.9355	9.9640	-1
4.000	8.1234	8.0317	8.0749	8.0172	7.9370	7.9095	7.9314	7.9165	7.9216	8.0015	7.9960	8.1328	
6.000	6.5793	6.5175	6.5443	6.4947	6.4561	6.4461	6.4266	6.4116	6.4410	6.4897	6.5231	6.5748	
8.000	5.2712	5.2333	5.2478	5.2446	5.2468	5.2450	5.2149	5.1897	5.2388	5.2471	5.2631	5.2592	
10.000	4.1727	4.1529	4.1583	4.1832	4.2102	4.2145	4.1827	4.1542	4.2076	4.1912	4.1940	4.1578	
12.000	3.2591	3.2525	3.2514	3.2908	3.3302	3.3387	3.3109	3.2844	3.3315	3.3023	3.2957	3.2445	
14.000	2.4310	2.4400	2.4211	2.4578	2.5104	2.5614	2.5823	2.5610	2.5245	2.5021	2.4657	2.4252	
16.000	1.7992	1.8152	1.7907	1.8223	1.8736	1.8918	1.9214	1.9391	1.8918	1.8579	1.8295	1.7985	
18.000	1.3073	1.3232	1.3042	1.3288	1.3334	1.3324	1.3521	1.3726	1.3416	1.3313	1.3308	1.3085	
20.000	9.1885	9.3448	9.2420	9.3798	9.4314	9.4489	9.5807	9.7276	9.4437	9.3893	9.3105	9.1626	-2
22.000	6.5057	6.6396	6.5878	6.6703	6.7219	6.7492	6.8380	6.9395	6.7096	6.6771	6.5737	6.4746	
24.000	4.6425	4.7486	4.7261	4.7883	4.8258	4.8543	4.9144	4.9750	4.8442	4.8106	4.7278	4.6703	
26.000	3.3411	3.4176	3.4019	3.4617	3.4888	3.5147	3.5556	3.5905	3.5181	3.4862	3.4211	3.3869	
28.000	2.4296	2.4660	2.4657	2.5195	2.5392	2.5611	2.5891	2.6082	2.5684	2.5398	2.4889	2.4672	
30.000	1.7760	1.7918	1.7994	1.8456	1.8600	1.8777	1.8969	1.9066	1.8847	1.8599	1.8201	1.8051	
32.000	1.3015	1.3111	1.3219	1.3603	1.3710	1.3848	1.3981	1.4021	1.3897	1.3687	1.3377	1.3174	
34.000	0.9582	0.9658	0.9772	1.0092	1.0165	1.0271	1.0363	1.0371	1.0297	1.0122	0.9879	0.9673	
36.000	7.0967	7.1606	7.2681	7.5300	7.5805	7.6606	7.7248	7.7143	7.6465	7.4956	7.2966	7.1493	-3
38.000	5.2832	5.3416	5.4372	5.6476	5.6857	5.7332	5.7729	5.7691	5.7018	5.5731	5.4098	5.3205	
40.000	3.9559	4.0084	4.0935	4.2575	4.2885	4.3144	4.3456	4.3368	4.2751	4.1689	4.0383	3.9829	
42.000	2.9787	3.0285	3.1016	3.2253	3.2506	3.2704	3.2867	3.2765	3.2225	3.1366	3.0342	2.9983	
44.000	2.2549	2.3003	2.3608	2.4632	2.4756	2.4917	2.5144	2.4931	2.4415	2.3732	2.2941	2.2693	
46.000	1.7174	1.7645	1.8156	1.8890	1.8998	1.9120	1.9321	1.9052	1.8655	1.8063	1.7542	1.7264	
48.000	1.3334	1.3713	1.4043	1.4582	1.4703	1.4805	1.4931	1.4669	1.4382	1.3971	1.3557	1.3367	
50.000	1.0354	1.0662	1.0925	1.1360	1.1470	1.1555	1.1632	1.1412	1.1178	1.0869	1.0562	1.0390	
52.000	8.1503	8.4296	8.5675	8.8895	9.0140	9.0680	9.1197	8.9669	8.7797	8.5800	8.3656	8.1775	-4
54.000	6.4162	6.6343	6.7496	7.0239	7.0844	7.1385	7.1504	7.0462	6.8964	6.7740	6.6276	6.4367	
56.000	5.0251	5.1915	5.2972	5.5281	5.5717	5.6430	5.6185	5.5331	5.4015	5.3200	5.2145	5.0451	
58.000	3.9109	4.0399	4.1572	4.3441	4.4100	4.4711	4.4591	4.3630	4.2233	4.1526	4.0630	3.9369	
60.000	3.0303	3.1297	3.2462	3.4001	3.4702	3.5207	3.5152	3.4181	3.2872	3.2253	3.1512	3.0581	
62.000	2.3371	2.4134	2.5211	2.6471	2.7140	2.7542	2.7514	2.6596	2.5606	2.4920	2.4322	2.3606	
64.000	1.7939	1.8521	1.9468	2.0495	2.1088	2.1397	2.1373	2.0545	1.9867	1.9149	1.8679	1.8129	
66.000	1.3701	1.4143	1.4945	1.5776	1.6275	1.6502	1.6469	1.5749	1.5300	1.4632	1.4266	1.3860	
68.000	1.0410	1.0744	1.1401	1.2075	1.2469	1.2628	1.2581	1.1975	1.1691	1.1114	1.0809	1.0548	
70.000	7.8672	8.1182	8.5806	9.1854	9.4816	9.5846	9.5234	9.0149	8.8592	8.3906	8.1523	7.9887	-5
72.000	5.8499	6.0103	6.3997	6.9386	7.1514	7.2108	7.0578	6.6283	6.6461	6.2932	6.1185	5.9902	
74.000	4.3090	4.4334	4.7576	5.2032	5.3477	5.3464	5.1557	4.8531	4.8470	4.6880	4.5690	4.4606	
76.000	3.1989	3.2837	3.5250	3.8718	3.9626	3.8869	3.7497	3.5380	3.5249	3.4675	3.3941	3.3276	
78.000	2.3840	2.4535	2.6029	2.8279	2.8524	2.8129	2.7148	2.5678	2.5560	2.5022	2.5078	2.4814	
80.000	1.7683	1.8247	1.9153	2.0362	2.0469	2.0263	1.9564	1.8551	1.8480	1.8032	1.8425	1.8406	
82.000	1.3053	1.3507	1.4043	1.4640	1.4643	1.4526	1.4031	1.3339	1.3321	1.2925	1.3250	1.3579	
84.000	0.9587	0.9948	1.0259	1.0512	1.0441	1.0362	1.0013	0.9545	0.9573	0.9264	0.9521	0.9961	
86.000	7.0051	7.2907	7.4503	7.5368	7.3941	7.3541	7.1100	6.7960	6.8064	6.6420	6.8431	7.1568	-6
88.000	5.0910	5.3146	5.3928	5.3958	5.2002	5.1918	5.0219	4.8137	4.8349	4.7628	4.9192	5.1319	
90.000	3.6793	3.8531	3.8919	3.8574	3.6581	3.6418	3.5279	3.3531	3.4351	3.4160	3.5369	3.6807	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 45°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.3013	1.2964	1.2911	1.2678	1.2409	1.2246	1.2003	1.2092	1.2286	1.2474	1.2757	1.2982	+0*
2.000	1.0357	1.0327	1.0260	1.0117	0.9978	0.9880	0.9780	0.9808	0.9937	1.0122	1.0238	1.0307	
4.000	8.2700	8.2680	8.2008	8.1340	8.0776	8.0351	7.9946	8.0167	8.0814	8.1810	8.2219	8.2463	-1
6.000	6.6018	6.6266	6.5670	6.5615	6.5572	6.5050	6.4769	6.5200	6.5372	6.5738	6.5896	6.6180	
8.000	5.2114	5.2478	5.2017	5.2336	5.2611	5.2114	5.2145	5.2455	5.2326	5.2270	5.2247	5.2487	
10.000	4.0631	4.1007	4.0711	4.1224	4.1662	4.1272	4.1502	4.1697	4.1399	4.1081	4.0934	4.1081	
12.000	2.9928	2.9983	3.0655	3.1158	3.1565	3.2268	3.2612	3.2702	3.2332	3.1874	3.0953	3.0218	
14.000	2.2009	2.1917	2.2408	2.2808	2.3107	2.3927	2.4580	2.4239	2.3941	2.3246	2.2759	2.2190	
16.000	1.6165	1.6024	1.6383	1.6700	1.6918	1.7468	1.7932	1.7670	1.7453	1.6946	1.6705	1.6242	
18.000	1.1859	1.1718	1.1980	1.2229	1.2389	1.2698	1.3021	1.2821	1.2700	1.2356	1.2173	1.1860	
20.000	8.6716	8.5707	8.7629	8.9578	9.0750	9.2105	9.4313	9.2800	9.1969	9.0114	8.8711	8.6623	-2
22.000	6.3254	6.2700	6.4105	6.5625	6.5989	6.7030	6.8564	6.7415	6.6808	6.5238	6.4319	6.3278	
24.000	4.6148	4.5614	4.6558	4.7676	4.8118	4.8944	5.0062	4.9153	4.8680	4.7364	4.6730	4.6233	
26.000	3.3675	3.3195	3.3906	3.4649	3.5192	3.5854	3.6673	3.5885	3.5578	3.4493	3.4027	3.3787	
28.000	2.4375	2.4231	2.4719	2.5294	2.5647	2.6217	2.6835	2.6290	2.6037	2.5196	2.4832	2.4695	
30.000	1.7546	1.7740	1.7961	1.8516	1.8661	1.9162	1.9638	1.9347	1.9011	1.8460	1.8161	1.7793	
32.000	1.2715	1.2918	1.3132	1.3540	1.3682	1.4101	1.4460	1.4299	1.3958	1.3512	1.3226	1.2883	
34.000	0.9272	0.9458	0.9659	0.9968	1.0106	1.0443	1.0712	1.0613	1.0304	0.9890	0.9672	0.9383	
36.000	6.7763	6.9486	7.1288	7.3817	7.5165	7.7763	7.9815	7.8759	7.6459	7.2803	7.0842	6.8619	-3
38.000	4.9797	5.1227	5.2786	5.4858	5.6312	5.8198	5.9797	5.8650	5.6876	5.3888	5.1979	5.0382	
40.000	3.6876	3.8051	3.9371	4.1059	4.2482	4.3835	4.5040	4.3937	4.2542	4.0101	3.8391	3.7235	
42.000	2.7508	2.8671	2.9571	3.1075	3.2231	3.3220	3.4100	3.3105	3.2000	2.9879	2.8447	2.7661	
44.000	2.0662	2.1719	2.2518	2.3692	2.4588	2.5469	2.5946	2.5082	2.4200	2.2277	2.1135	2.0648	
46.000	1.5752	1.6518	1.7286	1.8139	1.8990	1.9666	1.9836	1.9105	1.8397	1.6837	1.5834	1.4800	
48.000	1.2119	1.2623	1.3314	1.4007	1.4799	1.5237	1.5315	1.4770	1.4163	1.2809	1.2116	1.1807	
50.000	0.9399	0.9784	1.0360	1.0933	1.1583	1.1932	1.1971	1.1513	1.1005	0.9928	0.9366	0.9096	
52.000	7.3740	7.6494	8.1353	8.6128	9.1485	9.4382	9.3670	9.0326	8.6487	7.7661	7.2773	7.0590	-4
54.000	5.8169	6.0041	6.4162	6.8140	7.2567	7.5021	7.4642	7.1701	6.8288	6.1400	5.7427	5.5995	
56.000	4.5435	4.6940	5.0392	5.3690	5.7333	5.9366	5.9294	5.6626	5.3674	4.8317	4.5120	4.3849	
58.000	3.5198	3.6499	3.9433	4.2210	4.5230	4.6759	4.6911	4.4483	4.2104	3.7897	3.5329	3.3985	
60.000	2.7172	2.8272	3.0713	3.3023	3.5505	3.6652	3.6881	3.4774	3.2841	2.9575	2.7551	2.6253	
62.000	2.0900	2.1812	2.3805	2.5703	2.7726	2.8664	2.8804	2.7078	2.5465	2.2944	2.1369	2.0212	
64.000	1.6016	1.6760	1.8357	1.9898	2.1535	2.2348	2.2339	2.0939	1.9623	1.7597	1.6321	1.5507	
66.000	1.2227	1.2824	1.4040	1.5319	1.6631	1.7299	1.7196	1.6073	1.5022	1.3402	1.2421	1.1855	
68.000	0.9297	0.9769	1.0649	1.1670	1.2768	1.3291	1.3134	1.2242	1.1422	1.0161	0.9425	0.9030	
70.000	7.0413	7.4091	8.0490	8.8452	9.7765	1.0130	9.9476	9.2481	8.6218	7.6683	7.1291	6.8527	-5
72.000	5.2477	5.5195	6.0607	6.6727	7.4424	7.6552	7.4673	6.9249	6.4584	5.7589	5.3752	5.1631	
74.000	3.9033	4.1028	1.5461	5.0094	5.6171	5.7328	5.5522	5.1369	4.7714	4.3034	4.0979	3.8771	
76.000	2.9301	3.0635	3.3966	3.7419	4.1802	4.2518	4.0732	3.7357	3.4675	3.1991	3.1069	2.9091	
78.000	2.2067	2.3040	2.5275	2.7806	3.0756	3.1056	2.9407	2.6801	2.5118	2.3654	2.3127	2.1838	
80.000	1.6538	1.7257	1.8730	2.0551	2.2461	2.2448	2.1061	1.9133	1.8136	1.7391	1.6763	1.6312	
82.000	1.2290	1.2870	1.3854	1.5152	1.6275	1.6074	1.4957	1.3589	1.3050	1.2508	1.2153	1.2120	
84.000	0.9069	0.9556	1.0201	1.1105	1.1697	1.1394	1.0528	0.9601	0.9358	0.8998	0.8812	0.8851	
86.000	6.6705	7.0640	7.4687	8.0774	8.3349	7.9914	7.3426	6.7476	6.6878	6.4750	6.3919	6.4294	-6
88.000	4.8902	5.1972	5.4354	5.7400	5.7625	5.4369	5.0703	4.7154	4.7620	4.6600	4.6368	4.6712	
90.000	3.5731	3.8054	3.8715	4.0433	3.9767	3.6577	3.3925	3.2763	3.3565	3.3544	3.3643	3.3945	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 60°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.3742	1.3771	1.3504	1.3116	1.2759	1.2460	1.2252	1.2391	1.2530	1.2795	1.3252	1.3612	+0*
2.000	1.0590	1.0531	1.0468	1.0375	1.0224	1.0032	0.9987	1.0013	1.0109	1.0240	1.0420	1.0506	
4.000	8.3466	8.2236	8.2647	8.1648	8.1400	8.0276	8.0757	8.0380	8.0993	8.1419	8.1571	8.2489	-1
6.000	6.6507	6.6143	6.5980	6.5709	6.5891	6.5121	6.5120	6.4808	6.5515	6.5407	6.5825	6.6288	
8.000	5.2286	5.2457	5.2023	5.2213	5.2650	5.2207	5.2231	5.2270	5.2356	5.1931	5.2399	5.2518	
10.000	3.8811	3.9081	3.9351	3.9711	4.0191	4.1306	4.1345	4.1573	4.1275	4.0696	3.9774	3.9074	
12.000	2.8353	2.8612	2.8850	2.9216	2.9630	3.0496	3.0546	3.0673	3.0327	2.9860	2.9119	2.8566	
14.000	2.0717	2.0952	2.1156	2.1499	2.1849	2.2518	2.2570	2.2633	2.2286	2.1912	2.1323	2.0888	
16.000	1.5172	1.5377	1.5529	1.5823	1.6114	1.6630	1.6679	1.6704	1.6380	1.6082	1.5643	1.5321	
18.000	1.1126	1.1300	1.1406	1.1648	1.1886	1.2284	1.2329	1.2330	1.2041	1.1821	1.1488	1.1257	
20.000	8.1486	8.2940	8.3754	8.5768	8.7702	9.0756	9.1149	9.1036	8.8538	8.7162	8.4292	8.2566	-2
22.000	5.9605	6.0801	6.1194	6.3162	6.4719	6.6644	6.7399	6.7029	6.5112	6.4173	6.1788	6.0447	
24.000	4.3545	4.4077	4.4766	4.6523	4.7768	4.8773	4.9463	4.9001	4.7893	4.6790	4.5249	4.4171	
26.000	3.1592	3.2025	3.2792	3.4129	3.4967	3.5855	3.6143	3.5974	3.4822	3.4076	3.2946	3.2008	
28.000	2.2814	2.3327	2.4052	2.4976	2.5471	2.6474	2.6556	2.6521	2.5426	2.4879	2.3897	2.3061	
30.000	1.6522	1.7034	1.7664	1.8336	1.8668	1.9630	1.9598	1.9631	1.8650	1.8208	1.7377	1.6664	
32.000	1.2000	1.2469	1.2869	1.3391	1.3763	1.4557	1.4495	1.4565	1.3740	1.3358	1.2667	1.2076	
34.000	0.8740	0.9136	0.9416	0.9836	1.0174	1.0806	1.0791	1.0795	1.0167	0.9760	0.9257	0.8776	
36.000	6.3791	6.7134	6.9018	7.2550	7.5622	8.0763	8.0839	8.0505	7.5149	7.1469	6.7626	6.3826	-3
38.000	4.6657	4.9172	5.0698	5.3740	5.6583	6.0751	6.0918	6.0393	5.5856	5.2620	4.9411	4.6467	
40.000	3.4235	3.5938	3.7494	4.0089	4.2610	4.5981	4.6169	4.5564	4.1759	3.8948	3.6266	3.3977	
42.000	2.4799	2.6462	2.7909	3.0108	3.2285	3.5086	3.5184	3.4565	3.1397	2.8883	2.6612	2.4817	
44.000	1.8100	1.9624	2.0904	2.2758	2.4690	2.6985	2.6955	2.6384	2.3734	2.1543	1.9637	1.8229	
46.000	1.3411	1.4750	1.5776	1.7371	1.9001	2.0836	2.0908	2.0347	1.8129	1.6164	1.4546	1.3471	
48.000	1.0088	1.1174	1.1997	1.3395	1.4679	1.6227	1.6358	1.5755	1.3904	1.2197	1.0813	1.0013	
50.000	0.7615	0.8497	0.9206	1.0396	1.1506	1.2763	1.2850	1.2333	1.0786	0.9386	0.8112	0.7485	
52.000	5.8134	6.5302	7.1419	8.1322	9.1234	1.0041	1.0150	9.6703	8.4777	7.2462	6.2339	5.7016	-4
54.000	4.4471	5.0306	5.5847	6.4353	7.2619	8.0256	8.0867	7.7055	6.6921	5.6554	4.8263	4.3569	
56.000	3.4051	3.8907	4.3816	5.1181	5.7573	6.4097	6.4179	6.1120	5.2564	4.4337	3.7477	3.3298	
58.000	2.6086	3.0035	3.4255	4.0501	4.5463	5.0945	5.0734	4.8251	4.1075	3.4585	2.9002	2.5595	
60.000	1.9982	2.3146	2.6684	3.1882	3.5752	4.0288	3.9941	3.7903	3.1924	2.6836	2.2364	1.9670	
62.000	1.5522	1.8049	2.0922	2.4960	2.7995	3.1693	3.1454	2.9621	2.4673	2.0710	1.7182	1.5087	
64.000	1.2002	1.3991	1.6293	1.9429	2.1884	2.4794	2.4948	2.3284	1.8956	1.5788	1.3064	1.1549	
66.000	0.9162	1.0676	1.2597	1.4984	1.7160	1.9490	1.9607	1.8146	1.4474	1.1915	0.9853	0.8792	
68.000	6.9199	8.0393	9.4559	1.1456	1.3350	1.5243	1.5256	1.4010	1.0981	8.9728	7.4328	6.6638	-5
70.000	5.2271	6.0489	7.0830	8.7179	1.0298	1.1795	1.1742	1.0691	8.2285	6.7413	5.6237	5.0512	
72.000	3.9583	4.5477	5.3013	6.6024	7.8720	9.0218	8.9324	8.0215	6.1190	5.0531	4.3044	3.8898	
74.000	3.0319	3.4164	3.9645	4.9755	5.9590	6.8131	6.7071	5.9628	4.5286	3.7788	3.2795	2.9856	
76.000	2.3122	2.5763	2.9623	3.7359	4.4638	5.0735	4.9649	4.3890	3.3350	2.8382	2.4868	2.2796	
78.000	1.7555	1.9525	2.2419	2.7954	3.3061	3.7199	3.6178	3.1967	2.4436	2.1236	1.8764	1.7311	
80.000	1.3267	1.4728	1.6914	2.0773	2.4189	2.6809	2.5905	2.3002	1.7810	1.5808	1.4072	1.3072	
82.000	0.9979	1.1056	1.2682	1.5325	1.7464	1.8952	1.8162	1.6163	1.2910	1.1705	1.0342	0.9812	
84.000	7.4677	8.2579	9.4471	1.1220	1.2424	1.2684	1.1999	1.1270	9.3055	8.5777	7.6034	7.1992	-6
86.000	5.4751	6.1358	6.9894	8.1494	8.4736	8.3494	7.8878	7.7959	6.6680	6.1893	5.5905	5.2098	
88.000	4.0150	4.5345	5.1342	5.8691	5.7493	5.4682	5.1588	5.3473	4.7491	4.4668	4.1114	3.7862	
90.000	2.9448	3.2813	3.7264	4.1894	3.8579	3.5545	3.3563	3.6356	3.3349	3.2244	3.0241	2.7631	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 75°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.4244	1.2490	1.4255	1.3884	1.3412	1.2944	1.2778	1.2829	1.3044	1.3385	1.3945	1.4048	+0*
2.000	1.0711	1.0708	1.0726	1.0635	1.0385	1.0188	1.0032	1.0102	1.0333	1.0425	1.0649	1.0588	
4.000	8.4810	8.4653	8.4620	8.4225	8.3396	8.2133	8.1533	8.1578	8.3049	8.3111	8.4473	8.4352	-1
6.000	6.6428	6.6767	6.6382	6.6274	6.6260	6.6112	6.5568	6.5806	6.6047	6.6134	6.6301	6.6435	
8.000	5.1417	5.1954	5.1469	5.1557	5.2034	5.2545	5.2120	5.2427	5.1920	5.1955	5.1435	5.1666	
10.000	3.8185	3.8058	3.7952	3.7924	3.8663	3.9232	3.9747	3.9914	3.9118	3.8648	3.8069	3.8294	
12.000	2.7984	2.7836	2.7640	2.7756	2.8360	2.8856	2.9399	2.9387	2.8656	2.8327	2.7823	2.7979	
14.000	2.0452	2.0327	2.0163	2.0475	2.0985	2.1442	2.1773	2.1669	2.1153	2.0766	2.0383	2.0411	
16.000	1.4905	1.4851	1.4866	1.5106	1.5565	1.5935	1.6192	1.6035	1.5617	1.5226	1.5008	1.4866	
18.000	1.0832	1.0881	1.0972	1.1147	1.1547	1.1845	1.2043	1.1896	1.1566	1.1252	1.1021	1.0810	
20.000	7.8497	7.9389	8.0763	8.2281	8.5689	8.8069	8.9601	8.8276	8.5668	8.2945	8.0721	7.8486	-2
22.000	5.6510	5.6650	5.8559	6.0742	6.3595	6.5361	6.6671	6.5516	6.3189	6.0980	5.8955	5.6887	
24.000	4.0226	4.0308	4.2537	4.4850	4.7207	4.8464	4.9618	4.8632	4.6562	4.4711	4.2800	4.1164	
26.000	2.8697	2.8806	3.0959	3.3122	3.4968	3.5729	3.6569	3.6107	3.4316	3.2395	3.0744	2.9736	
28.000	2.0517	2.0675	2.2537	2.4465	2.5756	2.6270	2.6803	2.6440	2.5295	2.3289	2.2123	2.1091	
30.000	1.4615	1.4901	1.6363	1.7839	1.9034	1.9437	1.9781	1.9374	1.8379	1.6807	1.5948	1.5029	
32.000	1.0400	1.0784	1.1934	1.3068	1.3992	1.4468	1.4694	1.4291	1.3423	1.2175	1.1415	1.0762	
34.000	0.7448	0.7835	0.8741	0.9621	1.0320	1.0832	1.0985	1.0609	0.9859	0.8852	0.8188	0.7744	
36.000	5.3685	5.7154	6.4298	7.1172	7.6652	8.1550	8.2646	7.9245	7.2799	6.4248	5.9104	5.5993	-3
38.000	3.8925	4.1848	4.7489	5.2896	5.7318	6.1727	6.2554	5.9538	5.4034	4.6616	4.2916	4.0667	
40.000	2.8388	3.0755	3.5166	3.9134	4.3137	4.6964	4.7601	4.4985	4.0308	3.4080	3.1341	2.9667	
42.000	2.0819	2.2545	2.6007	2.9155	3.2665	3.5910	3.6410	3.4174	2.9986	2.5095	2.3016	2.1736	
44.000	1.5352	1.6579	1.9354	2.1882	2.4882	2.7591	2.7989	2.6097	2.2458	1.8607	1.6994	1.5854	
46.000	1.1379	1.2272	1.4490	1.6540	1.9061	2.1297	2.1619	2.0029	1.6941	1.3888	1.2612	1.1640	
48.000	0.8477	0.9140	1.0911	1.2586	1.4681	1.6547	1.7007	1.5607	1.2903	1.0431	0.9337	0.8608	
50.000	0.6347	0.6848	0.8262	0.9812	1.1540	1.3067	1.3408	1.2247	1.0057	0.7882	0.6959	0.6410	
52.000	4.7744	5.1610	6.3010	7.6739	9.0963	1.0321	1.0572	9.6119	7.8408	6.0836	5.2682	4.8051	-4
54.000	3.6259	3.9513	4.8968	6.0473	7.2261	8.2082	8.3501	7.5795	6.1133	4.7098	4.0583	3.6834	
56.000	2.7964	3.0720	3.8594	4.8196	5.8083	6.5954	6.6864	6.0187	4.8107	3.7001	3.1681	2.8594	
58.000	2.1707	2.4156	3.0588	3.8208	4.6442	5.2754	5.3337	4.7640	3.8419	2.9235	2.4857	2.2274	
60.000	1.6796	1.8890	2.4093	3.0122	3.6929	4.1995	4.2378	3.7797	3.0476	2.2949	1.9385	1.7278	
62.000	1.2952	1.4686	1.8854	2.3609	2.9195	3.3264	3.3550	3.0215	2.4002	1.7889	1.5021	1.3344	
64.000	0.9954	1.1348	1.4653	1.8391	2.2940	2.6212	2.7023	2.3958	1.8759	1.3842	1.1317	1.0105	
66.000	0.7587	0.8547	1.1168	1.4234	1.7909	2.0770	2.1552	1.8831	1.4542	1.0476	0.8474	0.7621	
68.000	0.5695	0.6396	0.8386	1.0840	1.3886	1.6487	1.7003	1.4661	1.1132	0.7798	0.6354	0.5756	
70.000	0.4284	0.4793	0.6292	0.8218	1.0773	1.2934	1.3256	1.1299	0.8354	0.5805	0.4771	0.4352	
72.000	0.3275	0.3595	0.4717	0.6203	0.8300	1.0014	1.0199	0.8611	0.6238	0.4323	0.3634	0.3341	
74.000	2.5119	2.7366	3.5342	4.6613	6.3218	7.6421	7.7331	6.4839	4.6342	3.2416	2.7747	2.5709	-5
76.000	1.9182	2.0781	2.6632	3.4859	4.7551	5.7370	5.7676	4.8177	3.4238	2.4457	2.1089	1.9691	
78.000	1.4583	1.5725	2.0190	2.6145	3.5280	4.2280	4.2228	3.5278	2.5154	1.8363	1.5956	1.5009	
80.000	1.1037	1.1854	1.5215	1.9477	2.5783	3.0511	3.0274	2.5337	1.8373	1.3719	1.1944	1.1383	
82.000	0.8313	0.8903	1.1394	1.4389	1.8347	2.1493	2.1187	1.7436	1.3338	1.0196	0.8831	0.8589	
84.000	0.6231	0.6660	0.8476	1.0535	1.2648	1.4190	1.3730	1.1917	0.9623	0.7537	0.6531	0.6384	
86.000	4.6052	4.9627	6.2629	7.6418	8.6457	9.0227	8.7593	8.0891	6.8971	5.4678	4.8309	4.6455	-6
88.000	3.3735	3.6825	4.5941	5.4874	5.8566	5.7209	5.5760	5.4506	4.9096	3.9511	3.5739	3.3953	
90.000	2.4717	2.7209	3.3259	3.8701	3.9301	3.6171	3.5420	3.6450	3.4370	2.8557	2.6445	2.4922	

*Power of 10 by which preceding numbers should be multiplied.

Table A2. (Continued) Monthly Density (kg m^{-3}) at 90°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.4910	1.4736	1.4674	1.4297	1.3632	1.3005	1.2919	1.2932	1.3399	1.3981	1.4436	1.4513	+0*
2.000	1.0854	1.0862	1.0902	1.0745	1.0483	1.0325	1.0120	1.0232	1.0340	1.0617	1.0716	1.0775	
4.000	8.4962	8.5334	8.5042	8.4831	8.3705	8.2737	8.1528	8,2143	8.3097	8.4294	8.4884	8.4572	-1
6.000	6.6028	6.6353	6.6233	6.6313	6.6166	6.5974	6.5576	6.5880	6.6079	6.6221	6.6514	6.6131	
8.000	5.0740	5.1020	5.1018	5.1285	5.1732	5.2016	5.2124	5.2212	5.1939	5.1425	5.1507	5.1093	
10.000	3.7553	3.7623	3.7401	3.7669	3.8556	3.9168	3.9519	3.9568	3.9092	3.7877	3.8036	3.7788	
12.000	2.7457	2.7419	2.7124	2.7470	2.8022	2.8576	2.9076	2.9041	2.8612	2.7569	2.7735	2.7582	
14.000	2.0020	2.0047	2.0035	2.0262	2.0820	2.1273	2.1645	2.1376	2.1132	2.0434	2.0278	2.0094	
16.000	1.4674	1.4770	1.4761	1.4947	1.5472	1.5839	1.6116	1.5931	1.5611	1.5107	1.4908	1.4611	
18.000	1.0692	1.0820	1.0846	1.1029	1.1499	1.1795	1.2001	1.1865	1.1586	1.1140	1.0927	1.0603	
20.000	7.7432	7.8797	7.9188	8.1399	8.5488	8.7853	8.9390	8.8325	8.5878	8.1936	7.9853	7.6805	-2
22.000	5.4786	5.5633	5.7172	6.0084	6.3563	6.5447	6.6592	6.5709	6.3403	6.0101	5.8172	5.5520	
24.000	3.8768	3.9415	4.1372	4.4260	4.7270	4.8765	4.9618	4.8854	4.6682	4.3964	4.2141	3.9991	
26.000	2.7438	2.8024	3.0007	3.2438	3.4855	3.6016	3.6647	3.5904	3.4377	3.1819	3.0256	2.8642	
28.000	1.9256	1.9995	2.1814	2.3849	2.5782	2.6615	2.7081	2.6471	2.5321	2.3031	2.1727	2.0519	
30.000	1.3392	1.4195	1.5838	1.7589	1.9132	1.9751	2.0097	1.9581	1.8653	1.6673	1.5542	1.4702	
32.000	9.3378	1.0118	1.1421	1.3011	1.4206	1.4718	1.4975	1.4479	1.3545	1.1889	1.1004	1.0348	
34.000	0.6584	0.7267	0.8297	0.9631	1.0506	1.0872	1.1062	1.0633	0.9886	0.8528	0.7844	0.7336	
36.000	4.6932	5.2574	6.0700	7.1019	7.8221	8.0955	8.2372	7.8741	7.2571	6.1550	5.6272	5.2399	-3
38.000	3.3786	3.8298	4.4705	5.2700	5.8812	6.0765	6.1828	5.8773	5.3555	4.4688	4.0619	3.7697	
40.000	2.4805	2.8085	3.3137	3.9347	4.4498	4.5959	4.6763	4.4201	3.9628	3.2409	2.9496	2.7307	
42.000	1.8316	2.0781	2.4747	2.9550	3.3818	3.5163	3.5829	3.3573	2.9468	2.3687	2.1527	1.9913	
44.000	1.3589	1.5505	1.8685	2.2319	2.5811	2.7191	2.7782	2.5959	2.2097	1.7450	1.5756	1.4613	
46.000	1.0128	1.1614	1.4157	1.6949	1.9781	2.1106	2.1604	2.0112	1.6671	1.2952	1.1610	1.0790	
48.000	0.7582	0.8733	1.0763	1.2970	1.5221	1.6527	1.6911	1.5680	1.2659	0.9767	0.8610	0.8013	
50.000	0.5700	0.6592	0.8209	1.0104	1.1856	1.3061	1.3332	1.2259	9.7580	0.7482	0.6440	0.5985	
52.000	0.4338	0.5015	0.6321	0.7872	0.9287	1.0323	1.0511	0.9586	0.7522	0.5732	0.4913	0.4558	
54.000	3.3209	3.8492	4.8914	6.1347	7.2768	8.1611	8.2891	7.4978	5.8004	4.3930	3.7490	3.4798	-4

*Power of 10 by which preceding numbers should be multiplied.

Table A3. Monthly Pressure (mb) at the Equator

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0100	1.0100	1.0096	1.0095	1.0100	1.0108	1.0114	1.0113	1.0113	1.0107	1.0100	1.0100	+3*
2.000	8.0106	8.0125	8.0119	8.0104	8.0119	8.0151	8.0167	8.0184	8.0203	8.0149	8.0100	8.0087	+2
4.000	6.3009	6.3018	6.3024	6.2997	6.2997	6.2996	6.2981	6.3059	6.3069	6.3010	6.2988	6.2946	
6.000	4.9119	4.9104	4.9108	4.9065	4.9065	4.9041	4.9007	4.9140	4.9130	4.9062	4.9066	4.9002	
8.000	3.7918	3.7873	3.7874	3.7810	3.7822	3.7785	3.7740	3.7819	3.7816	3.7737	3.7759	3.7755	
10.000	2.8842	2.8776	2.8809	2.8720	2.8753	2.8709	2.8659	2.8696	2.8715	2.8627	2.8659	2.8686	
12.000	2.1535	2.1459	2.1510	2.1437	2.1455	2.1409	2.1358	2.1399	2.1441	2.1347	2.1385	2.1392	
14.000	1.5741	1.5662	1.5723	1.5686	1.5671	1.5626	1.5577	1.5619	1.5672	1.5581	1.5620	1.5614	
16.000	1.1258	1.1187	1.1245	1.1243	1.1206	1.1182	1.1148	1.1180	1.1211	1.1128	1.1168	1.1154	
18.000	7.9414	7.8897	7.9329	7.9466	7.9201	7.9289	7.9201	7.9365	7.9508	7.8791	7.8920	7.8750	+1
20.000	5.6424	5.6057	5.6400	5.6576	5.6545	5.6774	5.6870	5.6941	5.6975	5.6412	5.6313	5.6144	
22.000	4.0525	4.0261	4.0559	4.0725	4.0809	4.1074	4.1290	4.1310	4.1273	4.0858	4.0709	4.0555	
24.000	2.9403	2.9212	2.9479	2.9619	2.9753	3.0006	3.0263	3.0281	3.0154	2.9857	2.9784	2.9652	
26.000	2.1538	2.1398	2.1642	2.1751	2.1900	2.2123	2.2319	2.2356	2.2191	2.1982	2.1975	2.1900	
28.000	1.5920	1.5816	1.6036	1.6118	1.6259	1.6442	1.6556	1.6596	1.6444	1.6300	1.6319	1.6268	
30.000	1.1867	1.1790	1.1965	1.2035	1.2151	1.2289	1.2349	1.2385	1.2266	1.2170	1.2196	1.2148	
32.000	8.9018	8.8508	8.9852	9.0499	9.1383	9.2343	9.2614	9.2902	9.2080	9.1464	9.1696	9.1178	+0
34.000	6.7103	6.6845	6.7880	6.8505	6.9137	6.9742	6.9815	7.0030	6.9543	6.9158	6.9339	6.8772	
36.000	5.0825	5.0779	5.1588	5.2189	5.2608	5.2933	5.2893	5.3042	5.2829	5.2595	5.2711	5.2148	
38.000	3.8695	3.8788	3.9497	4.0001	4.0245	4.0368	4.0266	4.0374	4.0346	4.0221	4.0269	3.9758	
40.000	2.9634	2.9777	3.0466	3.0840	3.0923	3.0927	3.0797	3.0894	3.0966	3.0923	3.0910	3.0471	
42.000	2.2824	2.2969	2.3636	2.3909	2.3859	2.3800	2.3661	2.3761	2.3882	2.3896	2.3835	2.3471	
44.000	1.7675	1.7799	1.8393	1.8616	1.8483	1.8394	1.8260	1.8364	1.8503	1.8540	1.8462	1.8167	
46.000	1.3759	1.3855	1.4354	1.4525	1.4375	1.4276	1.4161	1.4261	1.4400	1.4429	1.4361	1.4128	
48.000	1.0749	1.0825	1.1225	1.1349	1.1217	1.1119	1.1028	1.1111	1.1231	1.1260	1.1204	1.1023	
50.000	8.4007	8.4638	8.7805	8.8690	8.7581	8.6658	8.5953	8.6597	8.7611	8.7921	8.7445	8.6028	-1
52.000	6.5594	6.6117	6.8618	6.9254	6.8378	6.7474	6.6938	6.7433	6.8269	6.8580	6.8178	6.7082	
54.000	5.1036	5.1468	5.3428	5.3897	5.3310	5.2429	5.1970	5.2330	5.2968	5.3285	5.2947	5.2133	
56.000	3.9560	3.9913	4.1436	4.1795	4.1399	4.0634	4.0215	4.0461	4.0906	4.1227	4.0946	4.0368	
58.000	3.0525	3.0804	3.2006	3.2290	3.1927	3.1290	3.0932	3.1141	3.1440	3.1734	3.1505	3.1121	
60.000	2.3434	2.3645	2.4593	2.4793	2.4441	2.3910	2.3609	2.3789	2.4043	2.4286	2.4106	2.3875	
62.000	1.7897	1.8047	1.8767	1.8888	1.8566	1.8124	1.7873	1.8026	1.8278	1.8465	1.8338	1.8198	
64.000	1.3593	1.3692	1.4217	1.4271	1.3987	1.3619	1.3412	1.3541	1.3769	1.3917	1.3862	1.3767	
66.000	1.0265	1.0324	1.0687	1.0687	1.0442	1.0140	0.9972	1.0078	1.0268	1.0390	1.0382	1.0331	
68.000	7.7069	7.7343	7.9691	7.9288	7.7174	7.4738	7.3396	7.4257	7.5761	7.6789	7.6928	7.6872	-2
70.000	5.7500	5.7546	5.8869	5.8214	5.6415	5.4473	5.3414	5.4020	5.5250	5.6135	5.6345	5.6683	
72.000	4.2580	4.2477	4.2991	4.2257	4.0760	3.9268	3.8406	3.8750	3.9827	4.0557	4.0757	4.1352	
74.000	3.1098	3.0944	3.1008	3.0300	2.9709	2.8046	2.7270	2.7594	2.8508	2.8945	2.9097	2.9792	
76.000	2.2347	2.2203	2.2066	2.1440	2.0568	2.0001	1.9335	1.9654	2.0290	2.0580	2.0719	2.1215	
78.000	1.5906	1.5695	1.5581	1.5090	1.4616	1.4290	1.3759	1.4001	1.4429	1.4636	1.4786	1.5123	
80.000	1.1324	1.1083	1.1004	1.0675	1.0441	1.0228	0.9826	0.9977	1.0264	1.0411	1.0575	1.0819	
82.000	8.0642	7.4821	7.7771	7.5916	7.4968	7.3350	7.0408	7.1107	7.3026	7.4071	7.5795	7.7567	-3
84.000	5.7436	5.5595	5.5220	5.4293	5.4095	5.2695	5.0489	5.0689	5.1966	5.2710	5.4352	5.5623	
86.000	4.0905	3.9490	3.9428	3.9051	3.9182	3.7924	3.6196	3.6150	3.6988	3.7517	3.8975	3.9881	
88.000	2.9008	2.8101	2.8306	2.8243	2.8358	2.7211	2.5763	2.5637	2.6332	2.6709	2.7863	2.8441	
90.000	2.0453	2.0010	2.0429	2.0536	2.0497	1.9387	1.8156	1.8081	1.8750	1.9019	1.9837	2.0135	

*Power of 10 by which preceding numbers should be multiplied.

Table A3. (Continued) Monthly Pressure (mb) at 15°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0126	1.0126	1.0121	1.0114	1.0108	1.0108	1.0108	1.0103	1.0109	1.0113	1.0117	1.0131	+3*
2.000	8.0179	8.0166	8.0120	8.0090	8.0068	8.0233	8.0182	8.0162	8.0121	8.0165	8.0120	8.0231	+2
4.000	6.3007	6.2964	6.2912	6.2899	6.2983	6.3186	6.3057	6.3084	6.2982	6.6036	6.2939	6.3080	
6.000	4.9087	4.9011	4.8967	4.8940	4.8956	4.9264	4.9130	4.9169	4.9022	4.9091	4.8998	4.9148	
8.000	3.7760	3.7663	3.7677	3.7589	3.7732	3.7985	3.7889	3.7886	3.7730	3.7826	3.7691	3.7850	
10.000	2.8621	2.8516	2.8581	2.8444	2.8649	2.8860	2.8784	2.8750	2.8599	2.8723	2.8590	2.8713	
12.000	2.1340	2.1234	2.1303	2.1167	2.1347	2.1543	2.1462	2.1441	2.1297	2.1427	2.1290	2.1405	
14.000	1.5618	1.5518	1.5563	1.5457	1.5567	1.5760	1.5662	1.5679	1.5541	1.5664	1.5518	1.5646	
16.000	1.1203	1.1115	1.1148	1.1081	1.1126	1.1286	1.1208	1.1260	1.1142	1.1205	1.1122	1.1220	
18.000	7.9315	7.8673	7.8981	7.8573	7.9005	8.0399	7.9959	8.0345	7.9440	7.9611	7.8858	7.9683	+1
20.000	5.6442	5.5943	5.6295	5.6017	5.6604	5.7842	5.7531	5.7895	5.7197	5.7136	5.6366	5.6879	
22.000	4.0763	4.0311	4.0750	4.0537	4.1073	4.2071	4.1786	4.2172	4.1568	4.1464	4.0775	4.1170	
24.000	2.9757	2.9405	2.9758	2.9721	3.0144	3.0904	3.0622	3.0977	3.0419	3.0364	2.9804	3.0166	
26.000	2.1863	2.1634	2.1890	2.1952	2.2279	2.2845	2.2606	2.2883	2.2408	2.2389	2.1947	2.2254	
28.000	1.6163	1.6023	1.6214	1.6311	1.6565	1.6979	1.6780	1.6997	1.6612	1.6617	1.6272	1.6508	
30.000	1.2020	1.1943	1.2090	1.2189	1.2386	1.2686	1.2521	1.2691	1.2390	1.2411	1.2145	1.2310	
32.000	8.9907	8.9569	9.0725	9.1598	9.3153	9.5270	9.3917	9.5252	9.2963	9.3262	9.1222	9.2280	+0
34.000	6.7618	6.7569	6.8495	6.9201	7.0471	7.1895	7.0790	7.1839	7.0139	7.0486	6.8930	6.9515	
36.000	5.1143	5.1261	5.2017	5.2550	5.3620	5.4535	5.3614	5.4439	5.3208	5.3575	5.2389	5.2626	
38.000	3.8943	3.9107	3.9745	4.0135	4.1024	4.1601	4.0794	4.1454	4.0589	4.0956	4.0040	4.0094	
40.000	2.9848	3.0002	3.0550	3.0837	3.1554	3.1907	3.1183	3.1726	3.1131	3.1483	3.0766	3.0746	
42.000	2.3019	2.3142	2.3617	2.3829	2.4395	2.4600	2.3945	2.4400	2.3993	2.4330	2.3761	2.3724	
44.000	1.7844	1.7944	1.8350	1.8513	1.8944	1.9049	1.8468	1.8855	1.8568	1.8884	1.8438	1.8398	
46.000	1.3876	1.3967	1.4297	1.4423	1.4745	1.4792	1.4304	1.4636	1.4426	1.4695	1.4351	1.4311	
48.000	1.0823	1.0903	1.1168	1.1259	1.1499	1.1517	1.1123	1.1397	1.1246	1.1463	1.1199	1.1162	
50.000	8.4501	8.5238	8.7349	8.7980	8.9736	8.9754	8.6599	8.8777	8.7720	8.9499	8.7434	8.7148	-1
52.000	6.5948	6.6572	6.8248	6.8698	6.9987	6.9877	6.7410	6.9121	6.8342	6.9786	6.8182	6.7953	
54.000	5.1289	5.1791	5.3108	5.3482	5.4459	5.4290	5.2354	5.3599	5.3006	5.4152	5.2932	5.2729	
56.000	3.9723	4.0124	4.1147	4.1501	4.2268	4.2069	4.0533	4.1361	4.0911	4.1800	4.0895	4.0703	
58.000	3.0619	3.0923	3.1702	3.2022	3.2617	3.2377	3.1169	3.1725	3.1400	3.2073	3.1425	3.1249	
60.000	2.3472	2.3691	2.4271	2.4533	2.4975	2.4716	2.3778	2.4148	2.3953	2.4449	2.4007	2.3855	
62.000	1.7890	1.8038	1.8457	1.8654	1.8968	1.8706	1.7987	1.8232	1.8146	1.8503	1.8223	1.8103	
64.000	1.3554	1.3644	1.3938	1.4072	1.4280	1.4027	1.3484	1.3646	1.3624	1.3883	1.3730	1.3653	
66.000	1.0204	1.0251	1.0448	1.0526	1.0651	1.0415	1.0012	1.0121	1.0130	1.0320	1.0261	1.0230	
68.000	7.6307	7.6467	7.7710	7.8036	7.8654	7.6529	7.3582	7.4332	7.4536	7.5958	7.6045	7.6133	-2
70.000	5.6623	5.6609	5.7323	5.7300	5.7467	5.5595	5.3484	5.4022	5.4230	5.5316	5.5848	5.6256	
72.000	4.1680	4.1569	4.1911	4.1655	4.1516	3.9957	3.8519	3.8834	3.9008	3.9860	4.0641	4.1262	
74.000	3.0464	3.0237	3.0336	2.9988	2.9660	2.8494	2.7636	2.7733	2.7821	2.8526	2.9357	3.0051	
76.000	2.2114	2.1771	2.1720	2.1369	2.1085	2.0301	1.9756	1.9712	1.9707	2.0299	2.1050	2.1726	
78.000	1.5938	1.5506	1.5391	1.5141	1.5018	1.4490	1.4108	1.3992	1.3995	1.4434	1.5033	1.5600	
80.000	1.1409	1.0956	1.0889	1.0731	1.0717	1.0362	1.0078	0.9934	0.9981	1.0266	1.0738	1.1190	
82.000	8.1586	7.7635	7.7172	7.6212	7.6620	7.4215	7.2002	7.0549	7.1375	7.3031	7.6719	8.0287	-3
84.000	5.8351	5.5214	5.4911	5.4373	5.4879	5.3168	5.1453	5.0110	5.1048	5.1963	5.4823	5.7614	
86.000	4.1728	3.9386	3.9224	3.8967	3.9356	3.8031	3.6665	3.5589	3.6514	3.6981	3.9185	4.1280	
88.000	2.9707	2.8109	2.8125	2.8048	2.8230	2.7074	2.5911	2.5172	2.6097	2.6324	2.8013	2.9439	
90.000	2.1023	2.0065	2.0242	2.0275	2.0254	1.9180	1.8150	1.7707	1.8631	1.8742	2.0031	2.0892	

*Power of 10 by which preceding numbers should be multiplied.

Table A3. (Continued) Monthly Pressure (mb) at 30°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0191	1.0182	1.0171	1.0159	1.0139	1.0129	1.0129	1.0127	1.0139	1.0169	1.0186	0.0196	+3*
2.000	8.0160	7.9987	8.0002	8.0108	8.0160	8.0244	8.0323	8.0204	8.0179	8.0286	8.0188	8.0131	+2
4.000	6.2540	6.2406	6.2389	6.2640	6.2879	6.3048	6.3110	6.2990	6.2916	6.2863	6.2703	6.2473	
6.000	4.8205	4.8220	4.8136	4.8518	4.8880	4.9081	4.9112	4.9037	4.8950	4.8760	4.8543	4.8133	
8.000	3.6661	3.6772	3.6649	3.7079	3.7473	3.7686	3.7768	3.7733	3.7566	3.7323	3.7059	3.6607	
10.000	2.7470	2.7637	2.7494	2.7901	2.8264	2.8475	2.8618	2.8636	2.8367	2.8135	2.7853	2.7443	
12.000	2.0245	2.0437	2.0291	2.0633	2.0929	2.1127	2.1329	2.1402	2.1034	2.0847	2.0569	2.0247	
14.000	1.4729	1.4918	1.4793	1.5060	1.5264	1.5398	1.5603	1.5723	1.5352	1.5216	1.4983	1.4751	
16.000	1.0634	1.0798	1.0716	1.0917	1.1018	1.1059	1.1204	1.1336	1.1073	1.0974	1.0825	1.0661	
18.000	7.6236	7.7542	7.7182	7.8633	7.9146	7.9510	8.0491	8.1367	7.9426	7.8713	7.7607	7.6496	+1
20.000	5.4791	5.5787	5.5704	5.6791	5.7217	5.7570	5.8235	5.8770	5.7415	5.6849	5.5825	5.5070	
22.000	3.9683	4.0394	4.0457	4.1336	4.1660	4.1967	4.2420	4.2716	4.1862	4.1378	4.0538	4.0020	
24.000	2.8952	2.9429	2.9562	3.0303	3.0540	3.0792	3.1103	3.1243	3.0735	3.0315	2.9657	2.9288	
26.000	2.1271	2.1569	2.1738	2.2361	2.2536	2.2734	2.2948	2.2998	2.2681	2.2325	2.1811	2.1528	
28.000	1.5717	1.5909	1.6092	1.6604	1.6734	1.6886	1.7034	1.7032	1.6822	1.6525	1.6122	1.5893	
30.000	1.1670	1.1814	1.1989	1.2404	1.2501	1.2615	1.2717	1.2689	1.2536	1.2291	1.1976	1.1781	
32.000	8.7098	8.8309	8.9879	9.3203	9.3933	9.4769	9.5480	9.5067	9.3863	9.1856	8.9388	8.7789	+0
34.000	6.5377	6.6422	6.7774	7.0416	7.0974	7.1574	7.2069	7.1614	7.0596	6.8961	6.7026	6.5831	
36.000	4.9348	5.0260	5.1396	5.3475	5.3915	5.4336	5.4680	5.4230	5.3342	5.2020	5.0508	4.9668	
38.000	3.7456	3.8250	3.9188	4.0811	4.1167	4.1465	4.1705	4.1275	4.0518	3.9467	3.8306	3.7690	
40.000	2.8584	2.9270	3.0036	3.1296	3.1586	3.1814	3.1982	3.1568	3.0937	3.0113	2.9235	2.8756	
42.000	2.1927	2.2515	2.3126	2.4110	2.4346	2.4532	2.4654	2.4258	2.3739	2.3100	2.2447	2.2055	
44.000	1.6905	1.7400	1.7883	1.8650	1.8849	1.9001	1.9087	1.8721	1.8304	1.7813	1.7334	1.7000	
46.000	1.3096	1.3506	1.3876	1.4473	1.4653	1.4778	1.4819	1.4500	1.4174	1.3805	1.3455	1.3167	
48.000	1.0168	1.0496	1.0789	1.1266	1.1423	1.1523	1.1536	1.1270	1.1008	1.0734	1.0474	1.0232	
50.000	7.8958	8.1583	8.3939	8.7773	8.9118	8.9942	8.9876	8.7682	8.5564	8.3510	8.1603	7.9530	-1
52.000	6.1234	6.3260	6.5279	6.8383	6.9485	7.0187	6.9986	6.8156	6.6443	6.4881	6.3475	6.1743	
54.000	4.7265	4.8814	5.0591	5.3121	5.4051	5.4648	5.4389	5.2802	5.1412	5.0155	4.9092	4.7729	
56.000	3.6300	3.7480	3.9047	4.1092	4.1938	4.2420	4.2174	4.0761	3.9632	3.8563	3.7736	3.6727	
58.000	2.7745	2.8642	2.9993	3.1641	3.2375	3.2729	3.2518	3.1280	3.0417	2.9493	2.8854	2.8128	
60.000	2.1105	2.1784	2.2909	2.4229	2.4831	2.5078	2.4883	2.3832	2.3231	2.2435	2.1953	2.1436	
62.000	1.5975	1.6486	1.7394	1.8447	1.8916	1.9076	1.8888	1.8020	1.7644	1.6969	1.6616	1.6255	
64.000	1.2030	1.2412	1.3126	1.3959	1.4307	1.4399	1.4216	1.3516	1.3298	1.2760	1.2509	1.2269	
66.000	0.9011	0.9295	0.9841	1.0497	1.0739	1.0781	1.0602	1.0051	0.9941	0.9536	0.9365	0.9217	
68.000	6.7122	6.9230	7.3290	7.8411	7.9977	8.0021	7.8313	7.4077	7.3663	7.0818	6.9747	6.8900	-2
70.000	4.9711	5.1262	5.4229	5.8149	5.9056	5.8851	5.7247	5.4068	5.4079	5.2237	5.1686	5.1241	
72.000	3.6632	3.7809	3.9979	4.2797	4.3219	4.2860	4.1432	3.9196	3.9311	3.8261	3.8105	3.7924	
74.000	2.6983	2.7889	2.9374	3.1248	3.1330	3.0898	2.9833	2.8291	2.8397	2.7819	2.7943	2.7991	
76.000	1.9867	2.0572	2.1507	2.2623	2.2483	2.2136	2.1382	2.0327	2.0454	2.0072	2.0378	2.0599	
78.000	1.4565	1.5124	1.5692	1.6249	1.6024	1.5784	1.5253	1.4537	1.4689	1.4414	1.4775	1.5083	
80.000	1.0626	1.1064	1.1407	1.1643	1.1384	1.1200	1.0827	1.0347	1.0517	1.0336	1.0650	1.0982	
82.000	7.7126	8.0543	8.2622	8.3308	8.0622	7.9074	7.6480	7.3283	7.5066	7.4076	7.6512	7.9504	-3
84.000	5.5682	5.8324	5.9613	5.9522	5.6905	5.5539	5.3742	5.1639	5.3411	5.3096	5.4978	5.7209	
86.000	3.9981	4.2008	4.2861	4.2465	4.0040	3.8800	3.7563	3.6197	3.7933	3.8065	3.9513	4.1016	
88.000	2.8545	3.0089	3.0724	3.0251	2.8160	2.6957	2.6111	2.5236	2.6945	2.7295	2.8404	2.9411	
90.000	2.0260	2.1428	2.1956	2.1519	1.9809	1.8623	1.8048	1.7532	1.9144	1.9577	2.0422	2.1094	

*Power of 10 by which preceding numbers should be multiplied.

Table A3. (Continued) Monthly Pressure (mb) at 45°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0166	1.0165	1.0161	1.0159	1.0140	1.0130	1.0135	1.0141	1.0163	1.0175	1.0186	1.0179	+3*
2.000	7.8835	7.8902	7.8982	7.9327	7.9528	7.9680	8.0057	8.0006	7.9913	7.9662	7.9394	7.9048	+2
4.000	6.0693	6.0797	6.1009	6.1563	6.1948	6.2210	6.2688	6.2620	6.2337	6.1801	6.1402	6.0993	
6.000	4.6180	4.6259	4.6596	4.7216	4.7657	4.8014	4.8560	4.8425	4.8064	4.7399	4.6946	4.6483	
8.000	3.4662	3.4679	3.5121	3.5712	3.6127	3.6586	3.7154	3.6946	3.6584	3.5891	3.5426	3.4911	
10.000	2.5629	2.5573	2.6088	2.6596	2.6939	2.7485	2.8026	2.7769	2.7451	2.6797	2.6349	2.5796	
12.000	1.8785	1.8689	1.9108	1.9511	1.9766	2.0326	2.0810	2.0525	2.0273	1.9697	1.9322	1.8880	
14.000	1.3751	1.3661	1.3968	1.4283	1.4469	1.4846	1.5215	1.4970	1.4786	1.4356	1.4116	1.3801	
16.000	1.0054	9.9885	1.0212	1.0457	1.0594	1.0838	1.1100	1.0913	1.0779	1.0466	1.0294	1.0077	
18.000	7.3420	7.3043	7.4680	7.6583	7.7585	7.9173	8.1030	7.9604	7.8600	7.6313	7.5005	7.3590	+1
20.000	5.3555	5.3424	5.4622	5.6094	5.6828	5.8002	5.9336	5.8251	5.7442	5.5654	5.4660	5.3746	
22.000	3.9065	3.9083	3.9959	4.1095	4.1687	4.2632	4.3606	4.2779	4.2108	4.0651	3.9879	3.9261	
24.000	2.8501	2.8617	2.9276	3.0144	3.0672	3.1436	3.2154	3.1526	3.0960	2.9783	2.9160	2.8686	
26.000	2.0797	2.1015	2.1514	2.2204	2.2633	2.3253	2.3784	2.3319	2.2830	2.1886	2.1369	2.0963	
28.000	1.5189	1.5478	1.5857	1.6425	1.6757	1.7259	1.7653	1.7324	1.6884	1.6131	1.5693	1.5322	
30.000	1.1153	1.1433	1.1746	1.2200	1.2489	1.2887	1.3175	1.2925	1.2544	1.1923	1.1550	1.1230	+0
32.000	8.2413	8.4806	8.7531	9.1144	9.3754	9.6842	9.8912	9.6830	9.3692	8.8406	8.5273	8.2779	
34.000	6.1259	6.3273	6.5592	6.8516	7.0854	7.3209	7.4672	7.2835	7.0333	6.5885	6.3236	6.1356	
36.000	4.5816	4.7480	4.9428	5.1817	5.3894	5.5667	5.6678	5.5026	5.3057	4.9367	4.7105	4.5726	
38.000	3.4517	3.5676	3.7498	3.9442	4.1246	4.2586	4.3244	4.1808	4.0230	3.7183	3.5300	3.4288	
40.000	2.6188	2.7295	2.8638	3.0220	3.1742	3.2772	3.3159	3.1944	3.0670	2.8147	2.6616	2.5868	
42.000	2.0003	2.0884	2.2012	2.3290	2.4558	2.5363	2.5549	2.4537	2.3505	2.1415	2.0191	1.9632	
44.000	1.5376	1.6041	1.7013	1.8025	1.9096	1.9727	1.9778	1.8946	1.8105	1.6408	1.5432	1.4994	
46.000	1.1884	1.2368	1.3187	1.4006	1.4913	1.5388	1.5379	1.4701	1.4013	1.2654	1.1884	1.1031	
48.000	0.9207	0.9571	1.0248	1.0922	1.1667	1.2035	1.2008	1.1454	1.0887	0.9808	0.9203	0.8900	
50.000	7.1403	7.4191	7.9744	8.5260	9.1324	9.4243	9.3866	8.9287	8.4713	7.6277	7.1426	6.8970	-1
52.000	5.5334	5.7481	6.2016	6.6521	7.1447	7.3757	7.3382	6.9596	6.5876	5.9319	5.5453	5.3469	
54.000	4.2665	4.4371	4.8041	5.1704	5.5689	5.7483	5.7211	5.4031	5.1011	4.5962	4.2948	4.1308	
56.000	3.2713	3.4107	3.7048	4.0012	4.3221	4.4583	4.4357	4.1712	3.9307	3.5432	3.3108	3.1711	
58.000	2.4986	2.6109	2.8435	3.0814	3.3382	3.4404	3.4168	3.2015	3.0121	2.7166	2.5395	2.4251	
60.000	1.9012	1.9905	2.1714	2.3604	2.5644	2.6410	2.6135	2.4421	2.2939	2.0700	1.9370	1.8482	
62.000	1.4412	1.5111	1.6495	1.7981	1.9589	2.0159	1.9844	1.8498	1.7357	1.5671	1.4686	1.4036	
64.000	1.0882	1.1422	1.2462	1.3618	1.4875	1.5276	1.4949	1.3903	1.3043	1.1791	1.1082	1.0620	
66.000	0.8184	0.8595	0.9363	1.0252	1.1226	1.1484	1.1169	1.0365	0.9732	0.8829	0.8336	0.8006	
68.000	6.1291	6.4386	7.0068	7.6744	8.4179	8.5622	8.2726	7.6611	7.2070	6.5802	6.2513	6.0119	-2
70.000	4.5704	4.7997	5.2233	5.7172	6.2671	6.3265	6.0699	5.6105	5.2947	4.8795	4.6723	4.4967	
72.000	3.3991	3.5672	3.8786	4.2381	4.6246	4.6305	4.4096	4.0688	3.8574	3.5999	3.4806	3.3513	
74.000	2.5283	2.6516	2.8685	3.1254	3.3801	3.3551	3.1697	2.9203	2.7864	2.6417	2.5787	2.4904	
76.000	1.8794	1.9709	2.1127	2.2926	2.4466	2.4049	2.2531	2.0749	2.0035	1.9279	1.8923	1.8450	
78.000	1.3907	1.4603	1.5495	1.6725	1.7570	1.7053	1.5871	1.4661	1.4358	1.3990	1.3752	1.3606	
80.000	1.0237	1.0773	1.1314	1.2131	1.2516	1.1975	1.1083	1.0305	1.0255	1.0091	0.9968	0.9980	
82.000	7.4973	7.9125	8.2220	8.7433	8.8423	8.3226	7.6707	7.2056	7.2993	7.2585	7.2268	7.2801	-3
84.000	5.4712	5.7844	5.9400	6.2526	6.1914	5.7212	5.2582	5.0106	5.1759	5.2217	5.2404	5.2885	
86.000	3.9795	4.2086	4.2652	4.4348	4.2951	3.8874	3.5684	3.4646	3.6583	3.7572	3.8008	3.8415	
88.000	2.8846	3.0470	3.0433	3.1248	2.9634	2.6165	2.3961	2.3816	2.5756	2.7040	2.7572	2.7911	
90.000	2.0837	2.1949	2.1632	2.2011	2.0450	1.7602	1.5985	1.6273	1.8080	1.9465	2.0005	2.0282	

*Power of 10 by which preceding numbers should be multiplied.

Table A3. (Continued) Monthly Pressure (mb) at 60°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0144	1.0146	1.0143	1.0134	1.0133	1.0110	1.0099	1.0107	1.0113	1.0106	1.0125	1.0126	+3*
2.000	7.7806	7.7800	7.8020	7.8374	7.8847	7.9095	7.9221	7.9147	7.8977	7.8528	7.8114	7.7766	+2
4.000	5.9354	5.9577	5.9816	6.0265	6.0899	6.1441	6.1556	6.1499	6.1176	6.0564	5.9974	5.9523	
6.000	4.4699	4.5071	4.5292	4.5860	4.6498	4.7225	4.7319	4.7352	4.6853	4.6213	4.5563	4.4979	
8.000	3.3102	3.3489	3.3772	3.4344	3.4919	3.5764	3.5855	3.5912	3.5340	3.4755	3.4016	3.3377	
10.000	2.4192	2.4529	2.4811	2.5323	2.5802	2.6639	2.6724	2.6752	2.6204	2.5720	2.4964	2.4412	
12.000	1.7673	1.7958	1.8190	1.8631	1.9022	1.9666	1.9742	1.9736	1.9252	1.8870	1.8276	1.7847	
14.000	1.2914	1.3150	1.3339	1.3709	1.4027	1.4521	1.4587	1.4563	1.4147	1.3847	1.3383	1.3050	
16.000	0.9436	0.9629	0.9783	1.0090	1.0345	1.0724	1.0780	1.0748	1.0398	1.0163	0.9800	0.9542	
18.000	6.8878	7.0442	7.1727	7.4282	7.6313	7.9216	7.9683	7.9337	7.6442	7.4607	7.1714	6.9661	+1
20.000	5.0213	5.1466	5.2569	5.4693	5.6304	5.8525	5.8909	5.8575	5.6205	5.4712	5.2425	5.0762	
22.000	3.6559	3.7554	3.8545	4.0277	4.1549	4.3268	4.3560	4.3259	4.1334	4.0062	3.8287	3.6921	
24.000	2.6584	2.7418	2.8300	2.9667	3.0667	3.2111	3.2235	3.2043	3.0403	2.9321	2.7935	2.6803	
26.000	1.9314	2.0067	2.0805	2.1863	2.2653	2.3933	2.3966	2.3832	2.2414	2.1509	2.0370	1.9431	
28.000	1.4065	1.4723	1.5314	1.6156	1.6820	1.7913	1.7912	1.7796	1.6598	1.5817	1.4884	1.4118	
30.000	1.0271	1.0829	1.1287	1.1976	1.2562	1.3461	1.3455	1.3340	1.2344	1.1659	1.0902	1.0287	
32.000	0.7521	0.7983	0.8343	0.8917	0.9434	1.0158	1.0167	1.0039	0.9220	0.8614	0.8005	0.7517	+0
34.000	5.5230	5.9013	6.1959	6.6787	7.1254	7.7135	7.7286	7.5939	6.9150	6.3843	5.8925	5.5080	
36.000	4.0665	4.3744	4.6229	5.0313	5.4162	5.8934	5.9090	5.7775	5.2111	4.7562	4.3483	4.0475	
38.000	3.0035	3.2528	3.4707	3.8154	4.1427	4.5298	4.5428	4.4199	3.9494	3.5616	3.2220	2.9862	
40.000	2.2252	2.4345	2.6221	2.9122	3.1874	3.5016	3.5111	3.3993	3.0096	2.6804	2.3978	2.2125	
42.000	1.6577	1.8346	1.9920	2.2367	2.4663	2.7214	2.7277	2.6278	2.3055	2.0279	1.7932	1.6473	
44.000	1.2458	1.3917	1.5236	1.7281	1.9182	2.1236	2.1294	2.0413	1.7751	1.5431	1.3488	1.2337	
46.000	0.9438	1.0617	1.1711	1.3426	1.4977	1.6634	1.6693	1.5915	1.3725	1.1807	1.0202	0.9293	
48.000	7.1802	8.1254	9.0419	1.0466	1.1737	1.3072	1.3108	1.2443	1.0644	9.0823	7.7681	7.0385	-1
50.000	5.4799	6.2361	7.0073	8.1813	9.2205	1.0282	1.0297	9.7412	8.2717	7.0097	5.9531	5.3590	
52.000	4.1911	4.7922	5.4358	6.3997	7.2394	8.0895	8.0887	7.6266	6.4232	5.4112	4.5747	4.0941	
54.000	3.2060	3.6828	4.2149	5.0026	5.6632	6.3540	6.3343	5.9551	4.9644	4.1744	3.5140	3.1285	
56.000	2.4528	2.8263	3.2574	3.8918	4.4118	4.9660	4.9401	4.6269	3.8162	3.2050	2.6906	2.3910	
58.000	1.8761	2.1649	2.5079	3.0111	3.4222	3.8607	3.8364	3.5763	2.9171	2.4473	2.0526	1.8265	
60.000	1.4346	1.6551	1.9233	2.3164	2.6428	2.9849	2.9661	2.7495	2.2168	1.8581	1.5601	1.3926	
62.000	1.0942	1.2600	1.4667	1.7712	2.0315	2.2945	2.2825	2.1020	1.6743	1.4024	1.1812	1.0596	
64.000	0.8306	0.9531	1.1100	1.3459	1.5540	1.7531	1.7415	1.5947	1.2564	1.0524	0.8912	0.8046	
66.000	0.6276	0.7164	0.8334	1.0161	1.1799	1.3294	1.3145	1.1978	0.9365	0.7875	0.6721	0.6099	
68.000	4.7405	5.3770	6.2268	7.6335	8.8786	9.9684	9.8076	8.9013	6.9322	5.8798	5.0705	4.6224	-2
70.000	3.5808	4.0321	4.6483	5.7060	6.6171	7.3818	7.2253	6.5383	5.0963	4.3796	3.8253	3.5038	
72.000	2.7051	3.0212	3.4671	4.2435	4.8811	5.3924	5.2499	4.7521	3.7278	3.2544	2.8771	2.6503	
74.000	2.0379	2.2619	2.5839	3.1391	3.5610	3.8808	3.7574	3.4185	2.7131	2.4125	2.1533	1.9940	
76.000	1.5282	1.6917	1.9241	2.3092	2.5672	2.7475	2.6448	2.4325	1.9644	1.7822	1.6035	1.4917	
78.000	1.1406	1.2601	1.4288	1.6871	1.8272	1.9101	1.8277	1.7107	1.4146	1.3096	1.1878	1.1095	
80.000	0.8471	0.9340	1.0542	1.2234	1.2826	1.3014	1.2375	1.1880	1.0130	0.9571	0.8751	0.8202	
82.000	6.2598	6.8878	7.7269	8.8026	8.8686	8.6690	8.1900	8.1672	7.2132	6.9561	6.4322	6.0251	-3
84.000	4.6013	5.0520	5.6235	6.2813	6.0322	5.6667	5.3435	5.5687	5.1054	5.0267	4.7285	4.4031	
86.000	3.3735	3.6851	4.0627	4.4435	4.0571	3.6834	3.4685	3.7646	3.5912	3.6270	3.4767	3.2272	
88.000	2.4738	2.6726	2.9125	3.1148	2.7141	2.3818	2.2396	2.5224	2.5099	2.6176	2.5568	2.3750	
90.000	1.8144	1.9323	2.0714	2.1624	1.8067	1.5320	1.4383	1.6743	1.7437	1.8895	1.8807	1.7548	

*Power of 10 by which preceding numbers should be multiplied.

Table A3 (Continued) Monthly Pressure (mb) at 75°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	0.0147	1.0159	0.0175	1.0169	1.0170	1.0131	1.0111	1.0115	1.0116	1.0092	1.0134	1.0128	+3*
2.000	7.7293	7.7351	7.7483	7.7818	7.8442	7.8682	7.8803	7.8718	7.8347	7.7639	7.7453	7.7240	+2
4.000	5.8516	5.8638	5.8749	5.9201	6.0113	6.0734	6.0994	6.0909	6.0102	5.9371	5.8769	5.8623	
6.000	4.3734	4.3832	4.3990	4.4489	4.5478	4.6229	4.6602	4.6487	4.5521	4.4773	4.4031	4.3881	
8.000	3.2228	3.2235	3.2482	3.2982	3.3921	3.4630	3.5098	3.4929	3.3996	3.3235	3.2535	3.2347	
10.000	2.3472	2.3482	2.3739	2.4228	2.5044	2.5638	2.6077	2.5854	2.5058	2.4368	2.3784	2.3550	
12.000	1.7041	1.7079	1.7368	1.7859	1.8533	1.9022	1.9355	1.9119	1.8479	1.7860	1.7383	1.7111	
14.000	1.2337	1.2402	1.2728	1.3174	1.3743	1.4135	1.4384	1.4160	1.3641	1.3093	1.2705	1.2412	
16.000	0.8906	0.8991	0.9331	0.9720	1.0194	1.0505	1.0697	1.0501	1.0071	0.9600	0.9269	0.8989	
18.000	6.4106	6.4945	6.8238	7.1729	7.5629	7.8088	7.9568	7.7912	7.4343	7.0305	6.7441	6.4999	+1
20.000	4.6004	4.6701	4.9767	5.2942	5.6118	5.8056	5.9195	5.7813	5.4816	5.1350	4.8930	4.6920	
22.000	3.2919	3.3509	3.6280	3.9083	4.1649	4.3178	4.4046	4.2907	4.0386	3.7403	3.5399	3.3813	
24.000	2.3570	2.4142	2.6500	2.8857	3.0916	3.2154	3.2780	3.1850	2.9758	2.7169	2.5540	2.4326	
26.000	1.6913	1.7467	1.9393	2.1311	2.2955	2.3992	2.4419	2.3646	2.1932	1.9695	1.8433	1.7471	
28.000	1.2162	1.2690	1.4220	1.5741	1.7084	1.8000	1.8295	1.7589	1.6167	1.4318	1.3328	1.2566	
30.000	0.8768	0.9256	1.0465	1.1656	1.2756	1.3584	1.3795	1.3165	1.1949	1.0448	0.9653	0.9083	
32.000	0.6358	0.6778	0.7734	0.8672	0.9563	1.0309	1.0466	0.9914	0.8880	0.7652	0.7011	0.6596	
34.000	4.6386	4.9834	5.7397	6.4835	7.2181	7.8666	7.9867	7.5114	6.6348	5.6244	5.1228	4.8130	+0
36.000	3.4042	3.6773	4.2767	4.8691	5.4834	6.0339	6.1289	5.7232	4.9820	4.1500	3.7648	3.5275	
38.000	2.5126	2.7234	3.1992	3.6729	4.1915	4.6514	4.7279	4.3845	3.7593	3.0827	2.7825	2.5966	
40.000	1.8647	2.0242	2.4025	2.7863	3.2232	3.6030	3.6654	3.3767	2.8501	2.3059	2.0677	1.9196	
42.000	1.3912	1.5108	1.8137	2.1288	2.4927	2.8039	2.8553	2.6137	2.1731	1.7365	1.5446	1.4249	
44.000	1.0432	1.1345	1.3772	1.6375	1.9383	2.1919	2.2346	2.0330	1.6684	1.3161	1.1597	1.0634	
46.000	0.7862	0.8571	1.0516	1.2678	1.5151	1.7209	1.7567	1.5887	1.2893	1.0035	0.8750	0.7992	
48.000	0.5953	0.6513	0.8073	0.9876	1.1903	1.3568	1.3847	1.2461	1.0025	0.7697	0.6640	0.6047	
50.000	0.4529	0.4977	0.6230	0.7722	0.9380	1.0714	1.0917	0.9778	0.7814	0.5937	0.5075	0.4605	
52.000	3.4610	3.8242	4.8320	6.0390	7.3934	8.4629	8.6086	7.6745	6.0915	4.5954	3.9039	3.5282	-1
54.000	2.6556	2.9507	3.7551	4.7219	5.8263	6.6833	6.7889	6.0228	4.7495	3.5576	3.0073	2.7136	
56.000	2.0394	2.2773	2.9156	3.6761	4.5715	5.2583	5.3417	4.7145	3.7023	2.7515	2.3146	2.0860	
58.000	1.5623	1.7497	2.2502	2.8452	3.5660	4.1164	4.1856	3.6778	2.8699	2.1145	1.7711	1.5973	
60.000	1.1926	1.3362	1.7248	2.1886	2.7646	3.2057	3.2658	2.8584	2.2076	1.6132	1.3461	1.2178	
62.000	0.9073	1.0140	1.3125	1.6727	1.1296	2.4829	2.5368	2.2048	1.6845	1.2211	1.0159	0.9237	
64.000	0.6877	0.7643	0.9911	1.2698	1.6293	1.9121	1.9549	1.6847	1.2742	0.9168	0.7631	0.6987	
66.000	0.5195	0.5734	0.7430	0.9571	1.2376	1.4627	1.4886	1.2743	0.9549	0.6831	0.5738	0.5291	
68.000	0.3925	0.4306	0.5560	0.7171	0.9330	1.1053	1.1189	0.9533	0.7087	0.5084	0.4320	0.4012	
70.000	2.9720	3.2375	4.1581	5.3494	6.9724	8.2343	8.2902	7.0478	5.2249	3.7856	3.2579	3.0468	-2
72.000	2.2512	2.4366	3.1067	3.9715	5.1474	6.0375	6.0456	5.1436	3.8313	2.8189	2.4563	2.3130	
74.000	1.6982	1.8322	2.3194	2.9343	3.7498	4.3493	4.3314	3.7014	2.7938	2.0985	1.8440	1.7480	
76.000	1.2753	1.3727	1.7294	2.1572	2.6923	3.0715	3.0425	2.6230	2.0256	1.5558	1.3778	1.3144	
78.000	0.9531	1.0245	1.2827	1.5758	1.9024	2.1211	2.0899	1.8276	1.4599	1.1475	1.0245	0.9834	
80.000	0.7089	0.7617	0.9453	1.1411	1.3208	1.4279	1.3997	1.2499	1.0457	0.8419	0.7582	0.7317	
82.000	5.2469	5.6411	6.9191	8.1878	8.9993	9.3353	9.1071	8.4448	7.4423	6.1426	5.6065	5.4155	-3
84.000	3.8628	4.1603	5.0287	5.8179	6.0622	5.9310	5.7944	5.6652	5.2612	4.4562	4.1461	3.9865	
86.000	2.8309	3.0553	3.6277	4.0914	4.0467	3.7458	3.6768	3.7727	3.6935	3.2199	3.0667	2.9399	
88.000	2.0738	2.2341	2.5967	2.8457	2.6757	2.3590	2.3281	2.4933	2.5742	2.3267	2.2688	2.1773	
90.000	1.5194	1.6264	1.8440	1.9569	1.7515	1.4814	1.4709	1.6347	1.7822	1.6817	1.6787	1.6190	

*Power of 10 by which preceding numbers should be multiplied.

Table A3. (Continued) Monthly Pressure (mb) at 90°N

Alt (km)	J	F	M	A	M	J	J	A	S	O	N	D	
0.000	1.0150	1.0180	1.0200	1.0205	1.0200	1.0160	1.0130	1.0140	1.0160	1.0140	1.0180	1.0130	+3*
2.000	7.6613	7.7057	7.7188	7.7772	7.8432	7.8759	7.8763	7.8758	7.8397	7.7527	7.7483	7.6750	+2
4.000	5.7706	5.8081	5.8249	5.8956	5.9975	6.0586	6.0870	6.0740	6.0134	5.8884	5.8687	5.7986	
6.000	4.2948	4.3255	4.3462	4.4181	4.5317	4.6037	4.6473	4.6254	4.5540	4.4166	4.3884	4.3252	
8.000	3.1547	3.1795	3.2013	3.2696	3.3797	3.4504	3.4964	3.4708	3.4006	3.2674	3.2356	3.1803	
10.000	2.2922	2.3132	2.3368	2.3996	2.4922	2.5541	2.5951	2.5688	2.5064	2.3937	2.3600	2.3114	
12.000	1.6602	1.6811	1.7101	1.7675	1.8473	1.8961	1.9293	1.9020	1.8492	1.7580	1.7208	1.6760	
14.000	1.1990	1.2207	1.2517	1.3037	1.3725	1.4115	1.4362	1.4122	1.3658	1.2913	1.2549	1.2130	
16.000	0.8620	0.8825	0.9137	0.9617	1.0199	1.0509	1.0693	1.0497	1.0089	0.9460	0.9132	0.8761	
18.000	6.1588	6.3411	6.6522	7.0967	7.5808	7.8263	7.9632	7.7982	7.4487	6.9124	6.6249	6.3161	+1
20.000	4.3714	4.5276	4.8302	5.2374	5.6355	5.8292	5.9312	5.7897	5.4913	5.0370	4.7910	4.5441	
22.000	3.0926	3.2279	3.5101	3.8660	4.1902	4.3426	4.4185	4.2959	4.0431	3.6603	3.4536	3.2625	
24.000	2.1884	2.3094	2.5566	2.8544	3.1161	3.2356	3.2922	3.1856	2.9768	2.6524	2.4816	2.3378	
26.000	1.5488	1.6580	1.8663	2.1123	2.3212	2.4139	2.4562	2.3653	2.1922	1.9194	1.7817	1.6744	
28.000	1.0869	1.1944	1.3654	1.5680	1.7346	1.8081	1.8398	1.7620	1.6146	1.3893	1.2795	1.1995	
30.000	0.7805	0.8642	1.0013	1.1674	1.3003	1.3598	1.3836	1.3168	1.1895	1.0058	0.9191	0.8594	
32.000	0.5618	0.6298	0.7383	0.8718	0.9778	1.0267	1.0447	0.9873	0.8787	0.7303	0.6633	0.6180	
34.000	4.0855	4.6233	5.4821	6.5297	7.3935	7.7970	7.9335	7.4504	6.5265	5.3358	4.8178	4.4778	+0
36.000	3.0000	3.4165	4.0969	4.9156	5.6247	5.9669	6.0713	5.6651	4.8732	3.9211	3.5202	3.2669	
38.000	2.2231	2.5411	3.0809	3.7226	4.3032	4.5997	4.6802	4.3389	3.6572	2.8978	2.5872	2.3996	
40.000	1.6590	1.9018	2.3308	2.8353	3.3065	3.5704	3.6329	3.3460	2.7589	2.1556	1.9123	1.7740	
42.000	1.2437	1.4316	1.7734	2.1714	2.5513	2.7890	2.8376	2.5970	2.0934	1.6158	1.4211	1.3196	
44.000	0.9366	1.0822	1.3549	1.6717	1.9765	2.1876	2.2240	2.0228	1.5970	1.2201	1.0626	0.9875	
46.000	0.7084	0.8211	1.0386	1.2935	1.5372	1.7220	1.7478	1.5786	1.2238	0.9277	0.7994	0.7432	
48.000	0.5380	0.6254	0.7988	1.0058	1.2001	1.3599	1.3770	1.2339	0.9417	0.7097	0.6050	0.5624	
50.000	0.4103	0.4780	0.6162	0.7835	0.9398	1.0747	1.0855	0.9647	0.7258	0.5437	0.4605	0.4279	
52.000	3.1400	3.6660	4.7664	6.1049	7.3623	8.4947	8.5588	7.5443	5.5961	4.1658	3.5139	3.2664	-1
54.000	2.4037	2.8137	3.6879	4.7573	5.7683	6.7152	6.7492	5.9004	4.3149	3.1923	2.6813	2.4937	

*Power of 10 by which preceding numbers should be multiplied.

Appendix B

Tables of Thermodynamic Properties Representative of Cold and Warm Stratospheric Regimes Between 60°N and 75°N

Table B1. Temperature (°K) in January for 60°N and 75°N at Specified Longitudes

Altitude	60°N			75°N	
(km)	10°W	100°W	140°W	10°W	140°W
0.000	278.15	246.15	269.15	257.65	242.15
2.000	265.73	248.64	261.14	252.64	246.95
4.000	253.33	242.13	251.73	244.11	242.12
6.000	240.93	232.14	238.13	232.10	232.34
8.000	228.54	222.14	224.54	220.10	217.34
10.000	216.16	217.15	221.15	213.64	213.65
12.000	216.15	217.15	221.15	212.64	213.65
14.000	216.15	217.15	221.15	211.65	213.65
16.000	216.15	215.96	221.15	210.65	213.65
18.000	214.17	214.76	221.15	209.65	213.65
20.000	212.18	213.57	221.15	206.40	212.16
22.000	207.27	212.37	218.22	200.82	210.17
24.000	202.29	211.18	215.24	195.25	208.18
26.000	204.84	213.07	217.46	195.15	211.27
28.000	207.62	215.06	219.84	199.22	214.45
30.000	210.40	217.04	222.22	203.39	217.63
32.000	213.18	219.03	224.60	207.56	220.80
34.000	215.95	221.94	226.98	211.73	223.98
36.000	220.38	224.91	229.36	215.89	227.15
38.000	224.94	227.88	231.73	221.17	230.32
40.000	229.49	232.65	234.03	226.51	233.49
42.000	234.03	237.59	236.20	231.86	236.66
44.000	238.58	242.53	238.37	237.20	239.82
46.000	243.12	247.47	240.55	242.53	242.80
48.000	247.66	249.85	242.72	244.89	245.77
50.000	252.19	251.82	245.83	246.87	248.73
52.000	256.73	252.15	250.76	248.84	251.69
54.000	257.55	252.15	254.15	250.15	252.15

Table B2. Density (kg m^{-3}) in January for 60°N and 75°N at Specified Longitudes

Altitude	60°N			75°N		
(km)	10°W	100°W	140°W	10°W	140°W	
0.000	1.2555	1.4400	1.3075	1.3608	1.4681	+0*
2.000	1.0219	1.0829	1.0412	1.0612	1.0880	
4.000	8.2374	8.4250	8.2788	8.3467	8.4007	-1
6.000	6.5693	6.5882	6.6212	6.5870	6.5674	
8.000	5.1775	5.0972	5.2271	5.1341	5.1802	
10.000	4.0275	3.8155	3.9010	3.8527	3.8306	
12.000	2.9382	2.7874	2.8660	2.8103	2.7832	
14.000	2.1438	2.0367	2.1061	2.0473	2.0226	
16.000	1.5645	1.4954	1.5479	1.4895	1.4701	
18.000	1.1508	1.0963	1.1379	1.0822	1.0688	
20.000	8.4435	8.0254	8.3672	7.9325	7.8198	-2
22.000	6.2514	5.8655	6.2233	5.8370	5.7198	
24.000	4.5969	4.2802	4.6120	4.2589	4.1721	
26.000	3.2519	3.0803	3.3352	3.0083	2.9732	
28.000	2.3090	2.2230	2.4190	2.0881	2.1291	
30.000	1.6474	1.6094	1.7610	1.4600	1.5325	
32.000	1.1808	1.1689	1.2865	1.0284	1.1085	
34.000	8.5018	8.4851	9.4326	7.2973	8.0574	-3
36.000	6.1087	6.1851	6.9392	5.2134	5.8840	
38.000	4.4174	4.5282	5.1221	3.7332	4.3165	
40.000	3.2158	3.3069	3.7944	2.6943	3.1806	
42.000	2.3561	2.4296	2.8208	1.9597	2.3537	
44.000	1.7370	1.7967	2.1031	1.4361	1.7491	
46.000	1.2881	1.3370	1.5724	1.0599	1.3059	
48.000	0.9607	1.0100	1.1790	0.7959	0.9788	
50.000	7.2057	7.6608	8.8318	6.0021	7.3628	-4
52.000	5.4328	5.8578	6.6017	4.5369	5.5581	
54.000	4.1700	4.4858	4.9924	3.4462	4.2473	

*Power of 10 by which preceding numbers should be multiplied.

Table B3. Pressure (mb) in January for 60°N and 75°N at Specified Longitudes

Altitude	60°N			75°N		
(km)	10°W	100°W	140°W	10°W	140°W	
0.000	1.0025	1.0175	1.0102	1.0065	1.0205	+3*
2.000	7.7954	7.7292	7.8054	7.6963	7.7132	+2
4.000	5.9903	5.8559	5.9823	5.8488	5.8387	
6.000	4.5435	4.3901	4.5261	4.3886	4.3801	
8.000	3.3967	3.2504	3.3693	3.2438	3.2318	
10.000	2.4991	2.3783	2.4764	2.3628	2.3493	
12.000	1.8230	1.7375	1.8194	1.7154	1.7069	
14.000	1.3301	1.2695	1.3370	1.2438	1.2404	
16.000	9.7072	9.2705	9.8268	9.0069	9.0164	+1
18.000	7.0753	6.7589	7.2240	6.5134	6.5550	
20.000	5.1428	4.9201	5.3116	4.6998	4.7625	
22.000	3.7194	3.5758	3.8983	3.3648	3.4508	
24.000	2.6695	2.5947	2.8495	2.3870	2.4933	
26.000	1.9122	1.8840	2.0819	1.6852	1.8032	
28.000	1.3762	1.3723	1.5266	1.1941	1.3106	
30.000	0.9949	1.0027	1.1233	0.8524	0.9573	
32.000	7.2258	7.3493	8.2951	6.1279	7.0263	+0
34.000	5.2703	5.4058	6.1459	4.4351	5.1805	
36.000	3.8645	3.9933	4.5687	3.2309	3.8367	
38.000	2.8523	2.9621	3.4072	2.3701	2.8539	
40.000	2.1184	2.2084	2.5490	1.7519	2.1318	
42.000	1.5829	1.6570	1.9126	1.3043	1.5990	
44.000	1.1896	1.2508	1.4391	0.9778	1.2041	
46.000	0.8990	0.9498	1.0858	0.7379	0.9102	
48.000	6.8305	7.2441	8.2146	5.5957	6.9055	-1
50.000	5.2165	5.5378	6.2323	4.2534	5.2570	
52.000	4.0037	4.2399	4.7520	3.2407	4.0156	
54.000	3.0829	3.2468	3.6422	2.4746	3.0742	

*Power of 10 by which preceding numbers should be multiplied.

Table B4. High-Latitude Thermodynamic Properties of Warm and Cold Winter Stratosphere/Mesosphere

Altitude (km)	Model A (Warm)	Model B (Warm)	Model C (Warm)	Model D (Cold)	Model A (Warm)	Model B (Warm)	Model C (Warm)	Model D (Cold)	Model A (Warm)	Model B (Warm)	Model C (Warm)	Model D (Cold)	
	TEMPERATURE (°K)				DENSITY (kg m^{-3})				PRESSURE (mb)				
0.000	257.15	257.15	257.15	257.15	1.3742	1.3742	1.3742	1.3742	+0*	1.0144	1.0144	1.0144	1.0144	+3*
2.000	255.94	255.94	255.94	255.94	1.0590	1.0590	1.0590	1.0590		7.7806	7.7806	7.7806	7.7806	+2
4.000	247.73	247.73	247.73	247.73	8.3466	8.3466	8.3466	8.3466	-1	5.9354	5.9354	5.9354	5.9354	
6.000	234.13	234.13	234.13	234.13	6.6507	6.6507	6.6507	6.6507		4.4699	4.4699	4.4699	4.4699	
8.000	220.54	220.54	220.54	220.54	5.2286	5.2286	5.2286	5.2286		3.3102	3.3102	3.3102	3.3102	
10.000	217.15	217.15	217.15	219.39	3.8811	3.8811	3.8811	3.8460		2.4192	2.4192	2.4192	2.4221	
12.000	215.16	215.66	214.17	222.38	2.8495	2.8534	2.8716	2.7866		1.7661	1.7664	1.7654	1.7789	
14.000	211.17	212.66	208.18	223.15	2.1163	2.1050	2.1394	2.0461		1.2829	1.2850	1.2785	1.3106	
16.000	207.19	209.68	202.21	223.15	1.5577	1.5465	1.5806	1.5080		9.2646	9.3087	9.1750	9.6600	+1
18.000	203.20	206.69	196.23	223.15	1.1399	1.1314	1.1574	1.1116		6.6496	6.7132	6.5200	7.1210	
20.000	199.22	203.70	196.15	223.15	8.2929	8.2419	8.1870	8.1965	-2	4.7425	4.8194	4.6097	5.2503	
22.000	195.24	200.72	204.93	222.17	5.9953	5.9767	5.5825	6.0670		3.3601	3.4436	3.2840	3.8693	
24.000	194.56	201.50	213.88	221.18	4.2395	4.2401	3.8671	4.4895		2.3677	2.4525	2.3742	2.8481	
26.000	197.54	206.46	222.82	220.18	2.9535	2.9667	2.7200	3.3130		1.6747	1.7583	1.7397	2.0940	
28.000	200.51	211.43	231.75	219.19	2.0692	2.0939	1.9402	2.4439		1.1910	1.2708	1.2908	1.5377	
30.000	203.49	216.39	240.68	218.20	1.4576	1.4901	1.4021	1.8006		0.8514	0.9256	0.9687	1.1278	
32.000	215.87	227.36	253.37	217.21	0.9942	1.0447	1.0122	1.3251		6.1609	6.8189	7.3624	8.2621	+0
34.000	228.75	238.66	266.25	214.35	6.9184	7.4429	7.4226	9.8119	-3	4.5429	5.0991	5.6730	6.0374	
36.000	241.63	248.52	279.13	211.38	4.9118	5.4164	5.5241	7.2403		3.4068	3.8640	4.4261	4.3933	
38.000	254.49	256.44	275.59	208.41	3.5505	4.0156	4.3868	5.3208		2.5938	2.9560	3.4704	3.1832	
40.000	267.35	264.35	270.64	211.39	2.6084	3.0049	3.4878	3.8002		2.0018	2.2802	2.7096	2.3060	
42.000	282.87	272.26	265.70	214.95	1.9283	2.2683	2.7617	2.7224		1.5657	1.7727	2.1063	1.6798	
44.000	298.67	278.41	260.76	219.78	1.4478	1.7360	2.1775	1.9506		1.2413	1.3874	1.6299	1.2306	
46.000	296.64	280.65	255.83	226.69	1.1640	1.3537	1.7093	1.3979		0.9912	1.0906	1.2553	0.9097	
48.000	285.79	278.24	250.89	233.60	0.9585	1.0732	1.3357	1.0121		7.8635	8.5719	9.6204	6.7872	-1
50.000	274.94	274.30	246.43	240.50	0.7834	0.8530	1.0370	0.7398		6.1836	6.7169	7.3358	5.1080	
52.000	264.10	270.36	242.89	245.76	6.3533	6.7591	7.9903	5.4900	-4	4.8166	5.2456	5.5710	3.8730	
54.000	253.27	266.42	239.34	250.68	5.1074	5.3380	6.1340	4.1041		3.7132	4.0823	4.2143	2.9533	
56.000	244.48	260.58	235.80	255.60	4.0350	4.2290	4.6913	3.0861		2.8317	3.1633	3.1754	2.2643	
58.000	240.55	254.29	232.26	255.87	3.1084	3.3379	3.5739	2.3716		2.1464	2.4365	2.3828	1.7419	
60.000	236.61	248.00	228.72	254.89	2.3847	2.6194	2.7118	1.8302		1.6197	1.8647	1.7804	1.3391	
62.000	232.69	241.71	225.18	253.91	1.8217	2.0431	2.0492	1.4112		1.2168	1.4176	1.3246	1.0285	
64.000	228.76	235.43	221.65	252.92	1.3855	1.5835	1.5419	1.0872		0.9098	1.0701	0.9810	0.7893	
66.000	224.83	229.15	218.11	251.94	1.0489	1.2190	1.1551	0.8369		6.7699	8.0188	7.2325	6.0527	-2
68.000	220.91	222.87	214.59	250.28	7.9039	9.3184	8.6146	6.4526	-5	5.0122	5.9616	5.3064	4.6359	
70.000	216.99	216.60	211.32	248.32	5.9267	7.0697	6.3867	4.9718		3.6917	4.3957	3.8742	3.5440	
72.000	213.07	210.33	209.36	246.36	4.4216	5.3212	4.6899	3.8235		2.7045	3.2128	2.8186	2.7040	
74.000	209.16	204.07	207.40	244.40	3.2815	3.9716	3.4346	2.9348		1.9702	2.3266	2.0448	2.0590	
76.000	205.35	199.73	205.45	242.45	2.4210	2.9126	2.5084	2.2482		1.4271	1.6699	1.4793	1.5646	
78.000	202.41	196.60	203.49	239.80	1.7700	2.1123	1.8268	1.7234		1.0284	1.1921	1.0671	1.1863	
80.000	199.48	193.47	201.54	236.67	1.2884	1.5244	1.3266	1.3195		7.3779	8.4664	7.6749	8.9645	-3
82.000	198.15	190.35	199.59	233.55	0.9268	1.0945	0.9605	1.0068		5.2718	5.9806	5.5034	6.7501	
84.000	198.15	187.23	197.63	230.43	6.6205	7.8172	6.9347	7.6561	-6	3.7657	4.2013	3.9342	5.0642	
86.000	198.15	184.68	196.65	227.31	4.7301	5.5370	4.9689	5.8011		2.6904	2.9354	2.8049	3.7852	
88.000	198.15	182.73	196.65	223.82	3.3802	3.8948	3.5417	4.3861		1.9226	2.0430	1.9992	2.8181	
90.000	198.15	180.79	196.65	219.93	2.4160	2.7299	2.5250	3.3072		1.3742	1.4167	1.4253	2.0879	

*Power of 10 by which preceding numbers should be multiplied.

Appendix C

Break-Point Tables in Geopotential Kilometers And Temperature For All Models

PRECEDING PAGE BLANK-NOT FILMED

Table C1. Temperature-Height Profiles at the Equator

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1010.0	Sfc	299.15	7.5	260.15	14.5	204.15	17.0	192.15	29.5	232.15	36.0	245.15
		46.0	272.15	50.0	272.15	55.0	261.65	70.0	222.65	75.0	195.65	84.0	195.65
		89.0	187.15										
FEB	1010.0	Sfc	299.65	7.5	259.15	14.5	203.15	17.0	192.15	29.5	232.15	36.5	249.65
		46.5	272.65	50.0	272.65	55.0	262.15	70.0	220.15	76.0	190.15	86.0	195.15
		89.0	195.15										
MAR	1009.6	Sfc	300.15	8.0	256.15	14.5	204.15	17.0	192.15	27.0	226.15	35.0	246.15
		40.0	264.15	46.0	273.15	50.0	273.15	57.5	256.65	67.5	222.65	75.0	191.15
		80.0	191.15	90.0	207.15								
APR	1009.5	Sfc	300.15	7.5	258.15	14.5	205.65	17.0	193.15	27.0	226.15	42.0	268.15
		46.0	272.15	50.0	272.15	57.0	258.15	67.0	220.15	75.0	188.15	80.0	195.15
		90.0	212.15										
MAY	1010.0	Sfc	299.65	8.0	255.65	14.0	207.65	16.5	193.15	26.5	226.15	36.5	251.15
		46.5	271.15	50.5	271.15	53.5	268.15	63.5	231.15	73.5	191.15	83.5	206.15
		89.5	203.15										
JUNE	1010.8	Sfc	299.15	8.0	255.15	14.0	207.15	16.5	195.15	26.5	227.15	46.5	269.15
		49.5	269.15	54.5	263.15	64.5	225.15	69.5	205.15	72.5	196.15	84.5	202.15
		89.5	191.15										
JULY	1011.4	Sfc	298.65	8.0	254.65	14.0	206.65	16.5	196.15	22.5	217.15	42.5	259.15
		46.5	269.15	50.0	269.15	55.0	260.15	65.0	222.15	72.5	192.15	80.0	199.65
		84.0	199.65	89.0	185.15								
AUG	1011.3	Sfc	298.65	5.0	273.15	10.0	239.15	14.0	207.15	16.5	195.65	23.5	220.15
		36.0	245.15	46.0	269.15	50.0	269.15	56.0	257.15	66.0	219.15	71.0	196.15
		84.0	196.15	89.0	187.15								
SEPT	1011.3	Sfc	299.15	5.0	272.65	10.0	240.15	14.5	204.15	16.5	195.15	21.5	212.15
		35.5	247.15	45.5	270.15	50.0	270.15	60.0	245.15	70.0	203.15	74.0	195.15
		89.0	195.15										
OCT	1010.7	Sfc	299.15	5.0	272.15	10.0	239.15	14.5	203.15	16.5	194.15	21.5	212.15
		31.5	238.15	41.5	263.15	46.5	271.15	50.0	271.15	55.0	259.65	60.0	245.15
		72.5	195.15	89.0	195.15								
NOV	1010.0	Sfc	299.15	5.0	272.65	10.0	239.65	14.5	203.65	17.0	193.15	23.5	219.15
		33.5	243.15	46.0	270.65	50.0	270.65	55.0	259.15	62.5	238.15	72.5	195.15
		80.0	199.65	84.0	199.65	89.0	193.15						
DEC	1010.0	Sfc	299.15	8.0	255.15	14.5	203.15	17.0	192.65	24.5	222.65	33.5	240.65
		46.0	270.65	50.0	270.65	55.0	260.65	59.0	250.65	69.0	215.65	74.0	194.65
		79.0	199.65	84.0	199.65	89.0	188.65						

Table C1. (Continued) Temperature-Height Profiles at 15°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1012.6	Sfc	296.65	5.0	273.15	15.0	203.15	17.0	195.15	18.0	195.15	22.0	213.15
		34.5	240.65	42.0	263.15	47.0	271.15	50.5	271.15	55.5	259.65	65.5	231.65
		70.5	216.15	78.0	198.15	84.0	198.15	89.0	189.15				
FEB	1012.6	Sfc	296.65	5.0	272.15	15.0	202.15	17.0	195.15	18.0	195.15	23.5	217.15
		36.0	247.15	43.5	266.65	47.5	272.65	50.0	272.65	55.0	261.15	70.0	216.15
		77.5	190.65	83.5	196.65	89.0	196.65						
MAR	1012.1	Sfc	296.65	5.5	269.15	8.5	249.65	14.5	204.65	17.0	195.65	18.0	195.65
		21.0	210.65	35.0	245.65	42.5	266.65	47.5	273.15	50.0	273.15	55.0	261.15
		70.0	213.15	76.0	192.15	79.0	192.15	89.0	203.15				
APR	1011.4	Sfc	297.15	5.0	271.65	14.5	205.15	17.0	196.15	18.0	196.15	23.0	219.15
		35.5	246.65	43.0	267.65	47.5	272.15	50.0	272.15	55.0	263.15	70.0	209.15
		75.0	193.15	79.0	193.15	89.0	206.15						
MAY	1010.8	Sfc	297.65	7.5	258.65	14.5	202.65	16.5	197.65	17.5	197.65	23.0	219.65
		30.5	236.15	42.5	266.15	47.0	270.65	50.0	270.65	55.0	263.65	70.0	205.15
		73.0	194.65	83.0	199.65	89.0	199.65						
JUNE	1010.8	Sfc	299.65	2.5	288.15	7.5	258.65	15.0	201.65	16.0	199.15	17.0	199.15
		23.0	220.15	34.0	242.15	42.0	262.15	47.0	269.15	49.5	269.15	54.5	263.15
		69.5	203.15	72.5	195.65	79.5	199.15	83.0	199.15	89.0	190.15		
JULY	1010.8	Sfc	299.65	7.5	259.15	14.5	203.15	16.0	200.15	17.0	200.15	24.0	221.15
		37.0	247.15	47.0	268.15	50.5	268.15	54.5	262.15	69.5	203.65	74.5	197.65
		83.0	197.65	89.0	182.65								
AUG	1010.3	Sfc	298.65	1.5	292.65	6.5	264.65	14.0	209.15	16.0	200.15	17.0	200.15
		22.0	217.65	36.0	245.65	46.0	268.65	50.5	268.65	55.5	255.65	70.5	200.15
		74.5	194.15	84.0	194.15	89.0	186.15						
SEPT	1010.9	Sfc	297.65	2.0	288.65	7.0	260.15	14.0	207.65	16.0	199.65	17.0	199.65
		20.0	210.15	35.0	244.65	40.0	257.15	46.5	270.15	50.0	270.15	55.0	257.15
		60.0	242.15	70.0	202.15	74.0	192.15	79.0	198.15	84.0	198.15	89.0	196.15
OCT	1011.3	Sfc	298.15	2.5	286.15	7.5	258.15	15.0	201.15	16.0	197.65	17.0	197.65
		22.0	215.15	34.5	245.15	42.0	264.65	47.0	271.15	50.0	271.15	55.0	257.15
		60.0	241.15	70.0	203.15	74.0	195.15	89.0	195.15				
NOV	1011.7	Sfc	297.15	5.0	272.15	9.0	246.15	13.5	210.15	16.5	196.65	17.5	196.65
		22.5	215.15	42.5	265.14	46.5	271.15	50.0	271.15	55.0	258.15	60.0	243.65
		70.0	209.65	75.0	197.65	89.0	197.65						
DEC	1013.1	Sfc	296.65	4.0	278.65	7.0	260.65	14.5	205.15	17.0	197.15	18.0	197.15
		23.0	218.65	35.0	242.65	42.0	263.65	47.0	271.15	50.0	271.15	70.0	215.15
		76.0	200.15	83.0	200.15	89.0	191.15						

Table C1. (Continued) Temperature-Height Profiles at 30°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1019.1	Sfc	287.15	2.0	281.15	12.0	216.15	17.0	203.15	18.0	203.15	25.5	221.15
		30.5	230.15	35.5	241.65	45.5	265.65	50.0	265.65	55.0	252.65	70.0	218.15
		74.0	218.15	89.0	191.15								
FEB	1018.2	Sfc	286.65	4.0	270.65	12.0	218.65	17.0	204.15	18.0	204.15	26.0	220.15
		40.0	255.15	45.0	266.65	49.5	266.65	54.5	253.65	69.5	219.15	74.5	219.15
		89.5	192.15										
MAR	1017.1	Sfc	289.15	4.0	269.15	12.0	217.15	17.0	206.15	18.0	206.15	24.0	218.15
		39.0	254.15	44.0	264.65	47.0	267.65	50.5	267.65	55.5	256.65	68.0	221.65
		83.0	202.15	89.0	196.15								
APR	1015.9	Sfc	292.15	5.0	267.15	12.0	218.15	17.0	206.15	18.0	206.15	22.0	216.15
		32.0	239.15	42.0	261.15	47.0	269.15	51.0	269.15	56.0	257.65	66.0	229.65
		76.0	200.65	90.0	193.65								
MAY	1013.9	Sfc	295.15	5.0	271.15	12.0	218.65	16.0	204.65	17.0	204.65	37.0	250.65
		44.5	267.15	47.0	270.65	50.0	270.65	55.0	263.65	75.0	197.65	84.0	188.65
		89.0	188.65										
JUNE	1012.9	Sfc	298.65	1.0	292.65	5.0	272.65	12.0	220.15	15.0	203.65	16.0	203.65
		36.0	247.65	40.0	257.65	45.0	268.65	47.5	271.15	50.5	271.15	54.5	265.15
		72.5	202.15	88.5	178.15	90.0	178.15						
JULY	1012.9	Sfc	301.15	1.0	293.65	6.0	266.15	15.0	203.15	16.0	203.15	36.0	247.15
		42.0	262.15	47.0	269.15	50.0	269.15	55.0	263.15	70.0	206.15	90.0	176.15
AUG	1012.7	Sfc	298.65	1.0	292.15	5.5	269.65	15.5	203.65	16.5	203.65	22.0	214.65
		42.0	258.65	47.0	267.65	50.0	267.65	55.0	258.15	69.0	209.15	87.0	82.15
		89.0	182.15										
SEPT	1013.9	Sfc	296.65	1.0	290.15	5.0	272.15	12.0	219.65	16.0	203.65	17.0	203.65
		22.0	217.65	34.5	240.15	44.5	263.15	47.0	266.65	50.0	266.65	55.0	256.65
		60.0	244.65	71.0	206.15	83.0	194.15	89.0	194.15				
OCT	1016.9	Sfc	293.65	5.0	268.65	12.0	219.65	16.0	203.65	17.0	203.65	22.0	216.15
		34.5	238.65	45.5	266.15	47.0	267.65	50.0	267.65	55.0	253.65	75.0	201.65
		79.0	199.65	89.0	199.65								
NOV	1018.6	Sfc	289.15	4.0	273.15	12.0	217.15	17.0	203.15	18.0	203.15	22.0	215.15
		34.5	237.65	44.5	265.65	47.0	269.15	50.0	269.15	55.0	253.15	65.0	229.15
		79.0	201.15	89.0	201.15								
DEC	1019.6	Sfc	286.15	2.0	280.15	12.0	217.15	17.0	203.65	18.0	203.65	22.0	215.65
		30.0	227.65	36.0	242.65	46.0	266.65	50.0	266.65	60.0	242.65	70.0	221.65
		74.0	217.65	83.0	199.65	89.0	199.65						

Table C1. (Continued) Temperature-Height Profiles at 45°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1016.6	Sfc	272.15	3.0	261.65	10.0	219.65	19.0	215.15	27.0	215.15	34.5	231.65
		44.5	261.65	47.5	264.65	50.5	264.65	54.5	252.65	69.5	225.65	74.0	225.65
		80.0	213.65	90.0	201.65								
FEB	1016.5	Sfc	273.15	3.0	262.65	10.0	217.15	22.5	217.15	30.0	224.65	35.0	235.65
		40.0	250.65	47.5	264.15	50.5	264.15	55.5	253.15	69.5	225.15	74.5	225.15
		89.5	199.65										
MAR	1016.1	Sfc	274.15	3.0	265.15	11.0	217.15	22.0	217.15	27.5	222.65	35.0	239.15
		42.5	261.65	47.5	268.15	50.5	268.15	55.5	256.15	64.5	233.65	79.5	209.65
		87.0	194.65	89.0	194.65								
APR	1015.9	Sfc	279.15	3.0	270.15	11.0	218.15	22.5	218.15	29.5	228.65	35.5	243.65
		40.5	258.65	47.0	271.65	50.5	271.65	65.5	232.65	79.5	204.65	85.5	189.65
		89.0	189.65										
MAY	1014.0	Sfc	284.65	3.0	274.15	11.0	218.15	20.0	218.15	27.0	225.15	37.0	253.15
		44.5	272.65	47.0	274.65	50.5	274.65	55.5	262.65	68.0	227.65	74.0	206.65
		85.0	179.15	89.0	179.14								
JUNE	1013.0	Sfc	288.15	2.5	279.15	12.5	216.15	17.0	216.15	27.0	227.15	35.0	247.15
		42.0	268.15	47.5	275.15	50.5	275.15	60.5	248.15	75.5	195.65	85.5	167.65
		89.0	167.65										
JULY	1013.5	Sfc	294.15	2.0	285.15	16.0	261.15	13.0	215.65	17.0	215.65	22.0	221.65
		27.0	227.15	47.0	273.15	51.5	273.15	54.5	264.15	74.5	194.15	87.0	164.15
		89.0	164.15										
AUG	1014.1	Sfc	292.15	2.5	282.15	12.5	215.15	17.0	215.15	24.5	224.15	34.5	240.15
		46.5	270.15	51.0	270.15	59.0	246.15	74.0	195.15	89.0	172 65		
SEPT	1016.3	Sfc	288.15	2.5	278.15	12.5	215.15	17.5	215.15	27.5	225.15	36.0	242.15
		46.0	266.15	48.0	268.15	50.5	268.15	55.5	255.15	72.5	204.15	87.5	187.65
		89.0	187.65										
OCT	1017.5	Sfc	284.15	3.0	269.15	12.0	215.15	20.0	215.15	31.0	226.15	41.0	247.15
		44.0	257.65	48.0	267.65	51.0	267.65	56.0	254.15	62.0	236.15	79.0	202.15
		89.0	202.15										
NOV	1018.6	Sfc	278.15	3.0	266.15	11.0	218.15	16.0	214.65	20.0	214.65	30.0	221.65
		35.0	229.65	41.0	244.65	46.0	262.65	48.5	265.65	51.5	265.65	56.5	253.15
		61.5	239.15	71.5	225.15	76.5	207.15	90.0	207.15				
DEC	1017.9	Sfc	273.15	3.0	264.15	10.0	218.65	15.0	216.15	28.0	216.15	35.0	230.15
		41.0	245.15	46.0	259.65	48.5	264.15	51.5	264.15	54.5	253.65	69.5	228.15
		74.5	222.15	81.5	208.15	89.0	208.15						

Table C1. (Continued) Temperature-Height Profiles at 60°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1014.4	Sfc	257.15	1.0	259.15	3.5	251.15	8.5	217.15	15.0	217.15	25.0	212.15
		35.0	221.15	40.0	226.65	45.0	244.15	50.0	251.15	54.5	251.15	59.5	250.15
		64.5	238.65	71.0	238.65	83.0	214.65	89.0	214.65				
FEB	1014.6	Sfc	256.65	1.0	258.15	3.5	256.15	8.5	218.65	15.0	218.65	22.0	215.15
		32.0	223.15	37.0	228.15	44.5	249.15	49.5	255.65	53.0	255.65	59.5	249.15
		64.5	234.15	74.5	230.15	87.0	205.15	89.0	205.15				
MAR	1014.3	Sfc	261.65	3.0	258.65	9.0	219.65	15.0	219.65	20.0	218.65	30.0	222.65
		35.0	231.15	45.0	257.15	49.0	265.15	52.5	265.15	59.5	251.15	65.5	230.15
		75.5	226.15	88.5	193.65	89.0	193.65						
APR	1013.4	Sfc	269.15	4.0	257.15	9.0	222.15	25.0	222.15	30.0	227.65	35.0	239.15
		45.0	268.15	49.0	274.15	52.5	274.15	64.5	238.15	74.5	217.15	89.5	178.15
MAY	1013.3	Sfc	276.65	4.0	260.65	9.0	223.65	25.0	223.65	32.5	240.15	42.5	268.15
		48.0	279.15	50.5	279.15	63.0	249.15	83.0	169.15	88.0	163.15	89.0	163.15
JUNE	1011.0	Sfc	282.65	4.0	266.65	10.0	224.65	21.0	224.65	31.0	240.65	41.0	268.65
		47.0	280.65	52.0	280.65	64.0	244.65	81.5	157.15	88.5	150.15	89.0	150.15
JULY	1009.9	Sfc	287.15	5.0	260.15	10.0	225.15	23.0	225.15	29.5	238.15	44.5	277.15
		47.0	279.15	51.0	279.15	61.0	255.15	81.0	157.15	89.0	149.15		
AUG	1010.7	Sfc	284.15	5.0	262.15	10.0	224.15	21.5	224.15	31.5	239.15	43.5	269.15
		47.5	275.15	51.5	275.15	61.5	247.15	69.0	214.15	79.0	180.15	89.0	160.15
SEPT	1011.3	Sfc	281.15	4.0	263.15	10.0	221.15	24.0	221.15	34.0	237.15	44.0	261.15
		48.0	267.15	50.5	267.15	68.0	218.15	88.0	182.15	89.0	182.15		
OCT	1010.6	Sfc	275.15	4.0	259.15	10.0	220.15	17.5	220.15	22.5	217.15	32.5	225.15
		40.0	240.15	48.0	260.15	52.5	260.15	62.5	233.15	73.5	222.15	82.5	204.15
		89.0	204.15										
NOV	1012.5	Sfc	266.15	4.0	256.15	9.0	218.65	15.0	218.65	25.0	214.65	35.0	222.65
		40.0	230.65	45.0	242.15	49.5	255.65	52.5	255.65	62.5	237.65	69.0	237.65
		79.0	216.65	89.0	216.65								
DEC	1012.6	Sfc	259.15	1.0	259.65	3.5	255.15	8.5	217.65	15.0	217.65	25.0	210.65
		35.0	219.65	40.0	227.15	50.0	250.15	56.0	250.15	64.5	241.65	69.5	241.65
		82.0	211.65	89.5	222.15								

Table C1. (Continued) Temperature-Height Profiles at 75°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1014.7	Sfc	248.15	1.5	254.15	8.5	215.65	21.5	202.65	29.0	207.15	53.0	255.15
		55.0	255.15	65.0	238.15	70.0	242.15	84.0	214.15	89.0	214.15		
FEB	1015.9	Sfc	247.65	1.5	253.65	3.0	247.65	8.0	216.15	15.5	211.65	20.5	204.15
		40.5	230.15	52.5	260.15	55.0	260.15	64.0	233.15	71.5	236.15	89.0	208.15
MAR	1017.5	Sfc	248.65	1.5	253.15	2.5	250.15	8.5	217.15	14.5	220.15	20.0	214.65
		27.5	219.15	39.5	237.15	51.5	267.15	54.5	267.15	64.5	232.15	74.5	228.15
		88.5	193.15										
APR	1016.9	Sfc	255.15	1.5	256.65	2.5	253.15	8.5	220.15	11.0	224.15	28.0	224.15
		38.0	242.15	48.0	274.15	53.0	274.15	65.5	234.15	75.5	215.15	88.5	176.15
MAY	1017.0	Sfc	264.15	2.0	263.15	8.5	224.15	12.5	228.15	25.5	228.15	30.5	234.15
		48.0	283.15	53.0	283.15	68.0	232.15	80.5	172.15	89.0	155.15		
JUNE	1013.1	Sfc	272.65	2.5	268.15	8.5	226.15	12.0	229.65	21.0	229.65	25.0	231.65
		47.5	285.65	53.0	285.65	64.5	251.15	82.0	146.15	89.0	142.65		
JULY	1011.1	Sfc	275.65	2.0	273.65	9.0	228.15	14.0	230.15	25.0	230.15	35.0	256.15
		46.0	283.65	53.5	283.65	61.5	263.65	81.5	147.65	89.0	144.65		
AUG	1011.5	Sfc	274.65	2.5	270.65	9.0	225.15	15.0	228.15	26.5	228.15	46.5	278.15
		53.0	278.15	59.0	266.15	79.0	172.15	89.0	156.15				
SEPT	1011.6	Sfc	270.15	1.5	267.15	9.0	222.15	11.5	224.65	16.5	224.65	20.5	222.65
		28.0	222.65	40.0	246.65	47.5	270.65	55.0	270.65	67.0	222.65	88.0	180.65
		89.0	180.65										
OCT	1009.2	Sfc	262.65	2.5	258.65	8.5	219.65	16.0	219.65	25.0	210.65	35.0	222.65
		50.0	263.15	54.5	263.15	64.5	227.15	72.5	227.15	83.5	205.15	89.0	205.15
NOV	1013.4	Sfc	253.15	1.5	256.15	8.5	217.65	13.5	217.65	23.5	207.65	30.5	211.15
		46.0	242.15	51.0	258.15	54.5	258.15	62.0	234.15	70.0	238.15	78.5	221.15
		89.0	221.15										
DEC	1012.8	Sfc	251.15	2.0	254.15	8.5	215.15	26.0	204.65	42.0	228.65	52.0	256.65
		54.5	256.65	62.0	240.15	70.0	244.15	82.5	216.65	89.5	227.15		

Table C1. (Continued) Temperature-Height Profiles at 90°N

MONTH	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
JAN	1015.0	Sfc	237.15	1.5	247.65	2.5	244.15	8.5	214.15	14.0	208.65	20.0	196.65
		28.0	196.65	38.0	229.65	50.5	252.15	55.0	252.15				
FEB	1018.0	Sfc	240.65	1.5	249.65	8.5	214.65	13.5	213.15	20.0	200.15	28.5	208.65
		41.0	238.65	51.0	254.65	55.0	254.65						
MAR	1020.0	Sfc	242.15	1.5	248.15	3.0	243.65	8.5	216.15	12.0	219.65	19.5	212.15
		29.5	219.15	41.5	249.15	50.5	262.65	55.0	262.65				
APR	1020.5	Sfc	248.65	1.5	254.65	8.5	219.65	11.5	224.15	23.5	224.15	33.5	235.15
		47.5	270.15	55.0	270.15								
MAY	1020.0	Sfc	260.65	2.0	260.65	9.0	222.15	11.5	229.65	24.0	229.65	31.5	238.65
		36.5	252.15	48.5	276.15	55.0	276.15						
JUNE	1016.0	Sfc	272.15	2.5	264.15	9.0	225.15	12.0	231.15	24.5	231.15	32.0	243.15
		41.0	274.65	47.0	286.65	55.0	286.65						
JULY	1013.0	Sfc	273.15	2.0	271.15	4.0	260.15	9.0	227.15	11.5	231.15	24.5	231.15
		32.0	243.15	41.0	274.65	47.0	283.65	55.0	283.65				
AUG	1014.0	Sfc	273.15	1.5	270.15	3.0	264.15	9.0	225.15	14.0	230.15	24.0	227.15
		31.5	236.15	42.0	267.65	47.0	277.15	55.0	277.15				
SEPT	1016.0	Sfc	264.15	2.0	264.15	9.0	222.15	11.5	225.15	16.0	225.15	21.0	222.15
		30.0	222.15	38.5	239.15	42.5	249.15	47.5	259.15	55.0	259.15		
OCT	1014.0	Sfc	252.65	1.5	257.15	8.5	218.65	12.0	222.15	24.0	210.15	30.0	210.15
		38.5	227.15	46.5	255.15	55.0	255.15						
NOV	1018.0	Sfc	245.65	1.5	254.65	8.5	216.15	13.5	216.15	23.5	205.15	29.5	205.15
		51.5	249.15	55.0	249.15								
DEC	1013.0	Sfc	243.15	1.5	249.15	2.5	247.15	8.5	214.15	23.5	203.65	30.0	203.65
		50.0	249.65	55.0	249.65								

Table C2. January Temperature-Height Profiles for Specified Longitudes at 60°N and 75°N

LAT./LONG.	SURFACE PRESSURE (mb)	BREAK-POINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
60°N, 10°W	1002.5	Sfc	278.15	10.0	216.15	16.0	216.15	20.0	212.15	24.0	202.15	34.0	216.15
		52.0	257.55	55.0	257.55								
60°N, 100°W	1017.5	Sfc	246.15	1.0	250.15	3.0	247.15	9.0	217.15	14.0	217.15	24.0	211.15
		32.0	219.15	38.0	228.15	46.0	248.15	55.0	252.15	55.0	252.15		
60°N, 140°W	1010.25	Sfc	269.15	3.5	255.15	8.5	221.15	20.0	221.15	24.0	215.15	39.0	233.15
		49.0	244.15	53.0	254.15	55.0	254.15						
75°N, 10°W	1006.5	Sfc	257.65	3.0	250.15	9.0	214.15	19.0	209.15	24.0	195.15	26.0	195.15
		36.0	216.15	46.0	243.15	53.0	250.15	55.0	250.15				
75°N, 140°W	1020.5	Sfc	242.15	2.5	248.15	5.5	236.15	8.5	213.65	18.5	213.65	24.0	208.15
		44.0	240.15	52.0	252.15	55.0	252.15						

Table C3. High-Latitude Temperature-Height Profiles for Cold and Warm Winter Stratosphere/Mesosphere

	SURFACE PRESSURE (mb)	BREAKPOINTS IN GEOPOTENTIAL KILOMETERS AND TEMPERATURE (°K)											
		Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K	Alt	°K
MODEL A (warm)	1014.4	Sfc	257.15	1.0	259.15	3.5	251.15	8.5	217.15	11.0	217.15	23.0	193.15
		30.0	203.65	40.0	268.65	44.0	300.65	45.0	300.65	55.0	245.65	75.0	205.65
		80.0	198.15	90.0	198.15								
MODEL B (warm)	1014.4	Sfc	257.15	1.0	259.15	3.5	251.15	8.5	217.15	11.0	217.15	23.0	199.15
		30.0	216.65	35.0	245.15	42.0	273.15	44.5	280.65	46.5	280.65	54.0	265.65
		74.0	201.65	84.0	185.65	89.0	180.65						
MODEL C (warm)	1014.4	Sfc	257.15	1.0	259.15	3.5	251.15	8.5	217.15	11.0	217.15	18.0	196.15
		20.0	196.15	30.0	241.15	36.0	280.15	49.0	247.65	69.0	211.65	84.0	196.65
		90.0	196.65										
MODEL D (cold)	1014.4	Sfc	257.15	1.0	259.15	3.5	251.15	8.5	217.15	12.5	223.15	20.0	223.15
		32.0	217.15	38.0	208.15	43.0	217.15	50.0	241.65	56.0	256.65	66.0	251.65
		76.0	241.65	86.0	225.65	89.0	219.65						