PHYSICAL PARAMETERS OF THE MARTIAN ATMOSPHERE

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Abstract. The following physical parameters have been computed from 0 to 200 km altitude; (1) pressure, (2) density (3), speed of sound, (4) density, (5) number density, (6) mean free path, (7) viscosity, (8) pressure scale, (9) mean particle velocity, (10) collisional frequency and (11) columnar mass.

The Viking measurements have been used as input data. A critical comparison of the computed pressures and densities, is given, useful for future explorations.

1. Introduction

A number of different works, have been published for the study of the Mars atmosphere. All these works have used observations and measurements from the spacecrafts; Mariner 4 (1965), Mariner 6, 7, 9 (1969–72), Mars 2 (1971), Mars 4, 6 (1974) and the Viking 1 and 2. Viking 1 landed on July 20, 1976 at the latitude of 22°5′ N and longitude of 48° W, approximately four hours after the local noon. Viking 2 landed on September 3, 1976 at a latitude 48° N and longitude of 226°W, ten hours after local midnight. In the present work we computed the physical parameters of the Mars atmosphere by using Vikings data.

2. The Mars Atmosphere

Models have been constructed for the Mars atmosphere based on the measurements of the spacecraft. Anon (Mariners 6, 7, 1970–1974), Macris-Petropoulos (Mariners (6, 7, 9) 1972, 1973, 1977), Marov (Mars, 6, 1976) and West (Mariner 9, 1977). Seif (1978) have proposed a cool and a warm model of the pressure and density from 0 to 100 km altitude, based on Viking 1 and 2 measurements.

The errors of measurements are 1° for the measured by Viking temperatures near the surface and 3° for the measured temperature at higher altitudes. Viking 1 and 2 have measured daily variations of the temperature near the surface (T_s), of 55 K amplitude and of the pressure near the surface (P_s), of 0.5 amplitude (Hess, 1976). The Viking also measured seasonal variations of T_s: 60K amplitude and of P_s: 1.5 mb (Leovy, 1977).

The daily variations of P_s and T_s can be attributed to the thermal tide (Seiff,

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1977) and to heat exchange (Marov, 1976). Since the atmosphere of Mars is not very dense and the conductivity of the soil is low (Tang, 1977), the heat exchange leads to large temperature contrasts as a result of diurnal changes. Different models (Murray, 1966) have been proposed to explain the seasonal change, which are correlated with the sublimation of polar ice of CO_2 and with the absorption of CO_2 by the regolith soil of Mars. It was found that the changes of temperature produced from the quantity of dust that the atmosphere contained after a storm (Seiff, 1978).

The chemical composition of the Mars atmosphere have been measured by Viking 1 and 2 using mass spectrometry. The day of the landing the measured atmosphere composition was (Owen, 1976).

$$94.8\%\ CO_2,\quad 3\%\ N_2,\quad 2\%\ Ar,\quad 0.2\%\ O_2\,.$$

After some months the following composition was found (Owen, 1977)

$$95.32\%\ CO_2,\quad 2.7\%\ N_2,\quad 1.6\%\ Ar,\quad 0.13\%\ O_2,\quad 0.07\%\ CO,$$
$$0.03\%\ H_2H\quad 2.5\ \text{ppm Ne},\quad 0.3\ \text{ppm Kr},\quad 0.08\ \text{ppm Xe},\quad 0.03\ \text{ppm}\ O_3\,.$$

The first composition gives a molecular weight of 43.48. The direct measurements of Viking 1 and 2 respectively $\mu_1 = 44.36$ and $\mu_2 = 43.34$. These values have been assumed constants from 0 to 100 km. Since in the Viking 2 parachute phase, data were essentially isothermal, the molecular weight can also be, calculated for the isotherm relationship (Kirk and Seiff, 1977), giving 43.82 at $h = 2.5$ km and $T = 223°\ K$.

The temperature distribution, function the altitude have been measured using two different methods.

(1) Mass Spectroscopy method (Nier, 1977); (2) Accelerometer method (Kirk–Seiff, 1977). The temperature from 0 to 100 km change with the thermal tide (Seiff, 1978).

3. Physical Parameters of the Mars Atmosphere

We have computed the following physical parameters of the Mars atmosphere (pressure, density, speed of sound, density scale, number density, mean free path, viscosity, pressure scale, mean particle velocity, collision frequency, columnar mass), as a function of altitude. For the calculation we have used the program of Pitts (1968) assuming hydrostatic equilibrium.

The following data, obtained from the Viking measurements have been used for the computation of two atmospheric models, one for Viking 1 and one for Viking 2. (1) The chemical composition (I), of the Martian atmosphere near the surface measured by Viking 1 and Viking 2 (Owen, 1976), and the temperature distribution function the altitude (Nier, 1977; Kirk *et al.*, 1977). (2) The measured pressures and temperature near the surface (Hess, 1977).

$$P_s = 7.64\ \text{mb},\ T_s = 239.8\ \text{K}\quad \text{(Viking 1)}$$
$$P_s = 7.82\ \text{mb},\ T_s = 225.06\ \text{K}\quad \text{(Viking 2)}.$$

TABLE I

Model of the martian atmosphere based on the data of Viking 1 measurements construction parameters

Surface pressure = 7.64 mb	Surface temperature = 239.00 K	Surface density = 0.167 gm/cc
Base of exosphere = 4000.00 (km)	Molecular weight = 43.425	Surface gravity = 375.000 cm/sec/sec
Radius of Mars = 3389.00 (km)	Percent Hydrogen = 0.0	Percent CO_2 = 94.800
Percent oxygen = 0.200	Percent argon = 2.000	Percent neon = 0.0
Percent nitrogen = 3.000	Percent Helium = 0.0	Percent water = 0.0
Percent CO = 0.0	Percent SO_2 = 0.0	

Temperature and molecular weight distribution

At 5.00 Geom km	Temperature = 214.00 K	and molecular weight = 44.35999
At 10.00 Geom km	Temperature = 204.00 K	and molecular weight = 44.35999
At 15.00 Geom km	Temperature = 196.00 K	and molecular weight = 44.35999
At 20.00 Geom km	Temperature = 184.00 K	and molecular weight = 44.35999
At 25.00 Geom km	Temperature = 188.00 K	and molecular weight = 44.35999
At 30.00 Geom km	Temperature = 180 K	and molecular weight = 44.35999
At 35.00 Geom km	Temperature = 168.00 K	and molecular weight = 44.35999
At 40.00 Geom km	Temperature = 156.00 K	and molecular weight = 44.35999
At 45.00 Geom km	Temperature = 146.00 K	and molecular weight = 44.35999
At 50.00 Geom km	Temperature = 140.00 K	and molecular weight = 44.35999
At 55.00 Geom km	Temperature = 138.00 K	and molecular weight = 44.35999
At 60.00 Geom km	Temperature = 150.00 K	and molecular weight = 44.35999
At 65.00 Geom km	Temperature = 158.00 K	and molecular weight = 44.35999
At 70.00 Geom km	Temperature = 145.00 K	and molecular weight = 44.35999
At 75.00 Geom km	Temperature = 130.00 K	and molecular weight = 44.35999
At 80.00 Geom km	Temperature = 136.00 K	and molecular weight = 44.35999
At 85.00 Geom km	Temperature = 150.00 K	and molecular weight = 44.35999
At 90.00 Geom km	Temperature = 140.00 K	and molecular weight = 44.35999
At 95.00 Geom Km	Temperature = 142.00 K	and molecular weight = 44.35999
At 100.00 Geom km	Temperature = 154.00 K	and molecular weight = 42.62799
At 105.00 Geom km	Temperature = 148.00 K	and molecular weight = 42.41199
At 110.00 Geom km	Temperature = 147.00 K	and molecular weight = 42.18599
At 115.00 Geom km	Temperature = 152.00 K	and molecular weight = 41.96399
At 120.00 Geom km	Temperature = 135.00 K	and molecular weight = 41.38599
At 125.00 Geom km	Temperature = 114.00 K	and molecular weight = 41.28099
At 130.00 Geom km	Temperature = 120.00 K	and molecular weight = 41.08600
At 135.00 Geom km	Temperature = 146.00 K	and molecular weight = 40.75299
At 140.00 Geom km	Temperature = 166.00 K	and molecular weight = 40.38599

Temperature and molecular weight distribution

At 145.00 Geom km	Temperature = 176.00 K	and molecular weight = 40.11499
At 150.00 Geom km	Temperature = 182.00 K	and molecular weight = 39.72600
At 155.00 Geomkm	Temperature = 186.00 K	and molecular weight = 39.47299
At 160.00 Geom km	Temperature = 184.00 K	and molecular weight = 39.17499
At 165.00 Geom km	Temperature = 112.00 K	and molecular weight = 38.88599
At 170.00 Geom km	Temperature = 165.00 K	and molecular weight = 38.53299
At 175.00 Geom km	Temperature = 156.00 K	and molecular weight = 38.25999
At 180.00 Geom km	Temperature = 146.00 K	and molecular weight = 38.00200
At 185.00 Geom km	Temperature = 138.00 K	and molecular weight = 37.73199
At 190.00 Geom km	Temperature = 142.00 K	and molecular weight = 37.70699
At 195.00 Geom km	Temperature = 120.00 K	and molecular weight = 37.38499
At 200.00 Geop km	Temperature = 100.00 K	and molecular weight = 36.96300

Calculated quantities

Height (km)	Temp. (K)	Pressure (Mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	Dens. scale (km)	Number density (per cc)	Mean free path (m)	Viscosity (p + 5)	Press scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
0	239.0	7.04E 00	1.67E-05	246.	43.4	16.39	2.32E 17	6.29E-06	1.21	12.20	341.	5.43E 07	0.0
1	234.0	7.03E 00	1.58E-05	243.	43.6	17.18	2.18E 17	6.69E-06	1.18	11.90	337.	5.04E 07	1.622E 00
2	229.0	6.46E 00	1.49E-05	241.	43.6	16.68	2.04E 17	7.13E-06	1.16	11.61	353.	4.67E 07	3.153E 00
3	224.0	5.92E 00	1.40E-05	238.	44.0	16.20	1.91E 17	7.61E-06	1.14	11.31	328.	4.32E 07	4.594E 00
4	219.0	5.41E 00	1.31E-05	235.	44.2	15.72	1.79E 17	8.13E-06	1.12	11.02	324	3.98E 07	5.948E 00
5	214.0	4.94E 00	1.23E-05	232.	44.4	15.25	1.67E 17	8.71E-06	1.10	10.73	320.	3.67E 07	7.219E 00
6	212.0	4.49E 00	1.13E-05	231.	44.4	11.82	1.54E 17	9.48E-06	1.09	10.63	318.	3.36E 07	8.399E 00
7	210.0	4.09E 00	1.04E-05	230.	44.4	11.72	1.41E 17	1.03E-05	1.08	10.54	317.	3.07E 07	9.483E 00
8	208.0	3.72E 00	9.54E-06	229.	44.4	11.61	1.29E 17	1.12E-05	1.07	10.44	315.	2.80E 07	1.048E 01
9	206.0	3.38E 00	8.75E-06	228.	44.4	11.51	1.19E 17	1.23E-05	1.06	10.35	314.	2.56E 07	1.139E 01
10	204.0	3.06E 00	8.02E-06	227.	44.4	11.40	1.09E 17	1.64E-05	1.05	10.26	312.	2.33E 07	1.223E 01
11	202.4	2.78E 00	7.33E-06	226.	44.4	11.07	9.95E 16	1.46E-05	1.05	10.18	311.	2.12E 07	1.300E 01
12	200.8	2.52E 00	6.69E-06	225.	44.4	10.99	9.08E 16	1.60E-05	1.04	10.11	310.	1.93E 07	1.370E 01
13	199.2	2.28E 00	6.11E-06	225.	44.4	10.91	8.29E 16	1.76E-05	1.03	10.03	308.	1.76E-05	1.433E 01
14	197.6	2.00E 00	5.57E-06	224.	44.4	10.83	7.56E 16	1.93E-05	1.02	9.96	307.	1.60E 07	1.492E 01

15	196.0	1.87E 00	5.08E-06	223.	44.4	10.75	5.89E 16	2.11E-05	1.01	9.88	306.	1.45E 07	1.545E 01
16	193.6	1.68E 00	4.64E-06	222.	44.4	11.12	6.30E 16	2.31E-05	0.99	9.77	304.	1.32E 07	1.594E 01
17	191.2	1.52E 00	4.24E-06	220.	44.4	10.98	5.76E 16	2.53E-05	0.97	9.65	302.	1.19E 07	1.638E 01
18	188.8	1.37E 00	3.87E-06	219.	44.4	10.85	5.52E 16	2.77E-05	0.95	9.54	300.	1.08E 07	1.678E 01
19	186.4	1.23E 00	3.53E-06	218.	44.4	10.72	4.79E 16	3.04E-05	0.94	9.42	298.	9.81E 06	1.715E 01
20	184.0	1.11E 00	3.21E-06	216.	44.4	10.59	4.36E 16	3.34E-05	0.92	9.31	296.	8.87E 06	1.749E 01
21	184.8	9.95E-01	2.87E-06	217.	44.4	8.99	3.90E 16	3.73E-05	0.93	9.35	297.	7.96E 06	1.779E 01
22	185.6	8.94E-01	2.57E-06	217.	44.4	9.03	3.48E 16	4.17E-05	0.93	9.40	298.	7.13E 06	1.807E 01
23	186.4	8.04E-01	2.30E-06	218.	44.4	9.08	3.12E 16	4.66E-05	0.94	9.44	298.	6.40E 06	1.831E 01
24	187.2	7.24E-01	2.06E-06	218.	44.4	9.12	2.80E 16	5.20E-05	0.94	9.49	299.	5.75E 06	1.853E 01
25	188.0	6.51E-01	1.85E-06	219.	44.4	9.16	2.51E 16	5.80E-05	0.95	9.54	300.	5.16E 06	1.872E 01
26	186.4	5.86E-01	1.68E-06	218.	44.4	10.30	2.28E 16	6.39E-05	0.94	9.46	298.	4.67E 06	1.890E 01
27	154.8	5.27E-01	1.52E-06	217.	44.4	10.21	2.07E 16	7.04E-05	0.93	9.38	297.	4.22E 06	1.906E 01
28	183.2	4.74E-01	1.36E-06	216.	44.4	10.13	1.87E 16	7.77E-05	0.92	9.31	296.	3.80E 06	1.920E 01
29	181.6	4.25E-01	1.25E-06	215.	44.4	10.05	1.70E 16	8.58E-05	0.91	9.23	294.	3.43E 06	1.933E 01
30	180.0	3.81E-01	1.13E-06	214.	44.4	9.97	1.54E 16	9.48E-06	0.89	9.16	293.	3.09E 06	1.945E 01
31	177.6	3.42E-01	1.03E-06	213.	44.4	10.30	1.39E 16	1.04E-04	0.88	9.04	291.	2.79E 06	1.956E 01
32	175.2	3.06E-01	9.31E-07	211.	44.4	10.17	1.26E 16	1.16E-04	0.86	8.92	289.	2.51E 06	1.966E 01
33	172.8	2.73E-01	8.43E-07	210.	44.4	10.03	1.14E 16	1.27E-04	0.85	8.81	287.	2,26E 06	1.975E 01
34	170.4	2.44E-01	7.63E-07	209.	44.4	9.90	1.04E 16	1.41E-04	0.83	8.69	285.	2.03E 06	1.983E 01
35	168.0	2.17E-01	6.89E-07	207.	44.4	9.77	9.35E 15	1.56E-04	0.82	8.57	283	1.82E 06	1.990E 01
36	165.6	1.93E-01	6.22E-07	206.	44.4	9.64	8.44F 15	1.73E-04	0.81	8.45	281.	1.63E 06	1.997E 01
37	163.2	171E-01	5.60E-07	205.	44.4	9.50	7.60E 15	1.92E-04	0.79	8.34	279.	1.46E 06	2.002E 01
38	160.8	1.52E-01	5.04E-07	203.	44.4	9.37	6.84E 15	2.13E-04	0.78	8.22	277.	1.30E 06	2.008E 01
39	158.4	1.34E-01	4.52E-07	202.	44.4	9.23	6.14E 15	2.37E-04	0.77	8.10	275.	1.16E 06	2.012E 01
40	156.0	1.19E-01	4.05E-07	200.	44.4	9.10	5.51E 15	2.64E-04	0.75	7.98	273.	1.03E 06	2.017E 01
41	154.0	1.05E-01	3.62E-07	199.	44.4	8.78	4.92E 15	2.96E-04	0.74	7.88	271.	9.16E 05	2.021E 01
42	152.0	9.20E-02	3.23E-07	198.	44.4	8.68	4.38E 15	3.32E-04	0.73	7.79	269.	8.11E 05	2.024E 01
43	150.0	8.08E-02	2.88E-07	197.	44.4	8.57	3.90E 15	3.73E-04	0.72	7.69	268.	7.18E 05	2.027E 01
44	148.0	7.09E-02	2.56E-07	195.	44.4	8.46	3.47E 15	4.19E-04	0.71	7.59	266.	6.34E 05	2.030E 01
45	146.0	6.21E-02	2.27E-07	194.	44.4	8.35	3.08E 15	4.72E-04	0.70	7.49	264.	5.59E 05	2.032E 01
46	144.8	5.43E-02	2.00E-07	193.	44.4	7.92	2.72E 15	5.36E-04	0.69	7.43	263.	4.91E 05	2.034E 01
47	143.6	4.75E-02	1.76E-07	193.	44.4	7.86	2.39E 15	6.08E-04	0.69	7.38	262.	4.31E 05	2.036E 01
48	142.4	4.14E-02	1.55F-07	192	44.4	7.30	2.11E 15	6.91E-04	0.68	7.32	261.	3.77E 05	2.039E 01
49	141.2	3.61E-02	1.36E-07	191.	44.4	7.74	1.85E 15	7.86E-04	0.68	7.26	260.	3.30E 05	2.039E 01
50	140.0	3.15E-02	1.20E-07	190.	44.4	7.68	1.63E 15	8.95E-04	0.67	7.21	258.	2.89E 05	2.041E 01
51	139.6	2.74E-02	1.05E-07	190.	44.4	7.34	1.42E 15	1.02E-03	0.67	7.19	258.	2.52E 05	2.042E 01
52	139.2	2.38E-02	9.13E-08	190.	44.4	7.32	1.24E 15	1.17E-03	0.67	7.17	258.	2.19E 05	2.043E 01
53	138.8	2.07E-02	7.96E-08	189.	44.4	7.31	1.08E 15	1.35E-03	0.66	7.16	257.	1.91E 05	2.044F 01
54	138.4	1.80E-02	6.94E-08	189.	44.4	7.29	9.43E 14	1.54E-03	0.66	7.14	257.	1.66E 05	2.044E 01
55	138.0	1.57E-02	6.05E-08	189.	44.4	7.27	8.22E 14	1.77E-03	0.66	7.12	257.	1.45E 05	2.045E 01

TABLE I (Continued)

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	Dens. scale (km)	Number density (cc^{-1})	Mean free path (m)	Viscosity (E+5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
56	140.4	1.36E-02	5.18E-08	190.	44.4	6.45	7.03E 14	2.07E-03	0.67	7.25	259.	1.25F 05	2.045E 01
57	142.8	1.19E-02	4.44E-08	192.	44.4	6.56	6.03E 14	2.42E-03	0.68	7.38	261.	1.08E 05	2.046E 01
58	145.2	1.04E-02	3.82E-08	194.	44.4	6.68	5.18E 14	2.81E-03	0.70	7.51	263.	9.37E 04	2.046EE 01
59	147.6	9.10E-03	3.29E-08	195.	44.4	6.79	4.47E 14	3.26E-03	0.71	7.64	265.	8.14E 04	2.047E 01
60	150.0	7.99E-03	2.84E-08	197.	44.4	6.91	3.86E 14	3.77E-03	0.72	7.76	268.	7.09E 04	2.047E 01
61	151.6	7.03E-03	2.47E-08	198.	44.4	7.25	3.36E 14	4.33E-03	0.73	7.85	269.	6.21E 04	2.047E 01
62	153.2	6.20E-03	2.16E-08	199.	44.4	7.33	2.93E 14	4.97E-03	0.74	7.94	270.	5.44E 04	2.048E 01
63	154.8	5.47E-03	1.88E-08	199.	44.4	7.41	2.56E 14	5.69E-03	0.75	8.03	272.	4.78E 04	2.048E 01
64	156.4	4.83E-03	1.65E-08	200.	44.4	7.49	2.24E 14	6.51E-03	0.75	8.12	273.	4.20E 04	2.048E 01
65	158.0	4.27E-03	1.44F-08	201.	44.4	7.57	1.96E 14	7.43E-03	0.76	8.20	275.	3.69E 04	2.048F 01
66	155.4	3.78E-03	1.30E-08	200.	4.44	9.33	1.76E 14	8.27E-03	0.75	8.07	272.	3.29F 04	2.048E 01
67	152.8	5.33E-03	1.16E-08	198.	44.4	9.18	1.58E 14	9.21E-03	0.73	7.94	270.	2.93E 04	2.048E 01
68	150.2	2.94E-03	1.04E-08	197.	44.4	9.03	1.42E 14	1.03E-02	0.72	7.81	268.	2.61E 04	2.048E 01
69	147.6	2.58E-03	9.33E-09	195.	44.4	8.88	1.27E 14	1.15E-02	0.71	7.68	265.	2.31E 04	2.049E 01
70	145.0	2.26E-03	8.33E-09	193.	44.4	8.73	1.13E 14	1.29E-02	0.69	7.55	263.	2.04E 04	2.049F 01
71	142.0	1.98E-03	7.44E-09	192.	44.4	8.77	1.01E 14	1.44E-02	0.68	7.40	260.	1.81E 04	2.049E 01
72	139.0	1.73E-05	6.63E-09	190.	44.4	8.59	9.00E 13	1.62E-02	0.66	7.25	258.	1.59E 04	2.049E 01
73	136.0	1.50E-03	5.89E-09	188.	44.4	8.41	8.00E 13	1.82E-02	0.65	7.09	255.	1.40E 04	2.049E 01
74	133.0	1.30E-03	5.23E-09	186	44.4	8.23	7.10E 13	2.05E-02	0.64	6.94	252.	1.23E 04	2.049E 01
75	130.0	1.13E-03	4.62E-09	184.	44.4	8.05	6.28E 13	2.32E-02	0.62	6.79	249.	1.07E 04	2.04E 01
76	131.2	9.73E-04	3.96E-09	184.	44.4	6.45	5.37E 13	2.71E-02	0.63	6.85	250.	9.23E 03	2.048E 01
77	132.4	8.41E-04	3.39E-09	185.	44.4	6.51	4.60E 13	3.16E-02	0.63	6.92	251.	7.95R 03	2.049R 02
78	133.6	7.29E-04	2.91E-09	186.	44.4	6.58	3.95E 13	3.69E-02	0.64	6.99	253.	6.85E 03	2.049F 01
79	134.8	6.32E-04	2.50E-09	187.	44.4	6.64	3.40E 13	4.29E-02	0.64	7.06	254.	5.92E 03	2.049E 01
80	136.0	5.49E-04	2.15F-09	188.	44.4	6.70	2.92E 13	4.98E-02	0.65	7.12	255.	5.12E 03	2.049E 01
81	136.8	4.78E-04	1.84E-09	189.	44.4	6.34	2.49E 13	5.84E-02	0.66	7.27	257.	4.41E 03	2.049E 01
82	141.6	4.17E-04	1.57E-09	191.	44.4	6.47	2.13E 13	6.85E-02	0.68	7.42	260.	3.81E 03	2.049E 01
83	144.4	3.65E-04	1.35E-09	193.	44.4	6.61	1.83E 13	7.96E-02	0.69	7.58	263.	3.30E 03	2.049E 01
84	147.2	3.20E-04	1.16E-09	195.	44.4	6.74	1.58E 13	9.24E-02	0.71	7.73	265.	2.87E 03	2.049E 01
85	150.0	2.82E-04	1.00E-09	197.	44.4	6.87	1.36E 13	1.07E-01	0.72	7.88	268	2.50E 03	2.049E 01
86	148.0	2.48E-04	8.93E-10	195	44.4	8.59	1.21E 13	1.20E-01	0.71	7.78	266.	2.21E 03	2.049E 01

87	146.0	2.18E-04	7.96E-10	194.	44.4	8.58	1.08E 13	1.35E-01	0.70	7.68	264.	1.96E 03	2.049E 01
88	144.0	1.91E-04	7.08F-10	193.	44.4	8.47	9.61E 12	1.52E-01	0.69	7.58	262.	1.73E 03	2.049F 01
89	142.0	1.67E-04	6.28E-10	192.	44.4	8.38	8.53E 12	1.71E-01	0.68	7.47	260.	1.53E 03	2.049E 01
90	140.0	1.46E-04	5.57E-10	190.	44.4	8.24	7.56E 12	1.93E-01	0.67	7.37	258.	1.34E 03	2.049F 01
91	140.4	1.28E-04	4.85E-10	190.	44.4	7.25	6.58E 12	2.21E-01	0.67	7.40	259.	1.17E 03	2.049E 01
92	140.8	1.12E-04	4.23E-10	191.	44.4	7.27	5.74E 12	2.54E-01	0.67	7.42	259.	1.02E 03	2.049E 01
93	141.2	9.75E-05	3.68E-10	191.	44.4	7.30	5.00E 12	2.91E-01	0.68	7.45	260.	8.92E 02	2.049E 01
94	141.6	8.53E-05	3.21E-10	191.	44.4	7.32	4.36E 12	3.34E-01	0.68	7.48	260.	7.79E 02	2.049E 01
95	142.0	7.46E-05	2.80E-10	192.	44.4	7.35	3.81E 12	3.83E-01	0.68	7.50	260.	6.81E 02	2.049E 01
96	144.4	6.54E-05	2.40E-10	194.	44.0	6.48	3.28E 12	4.44E-01	0.69	7.69	264.	5.94E 02	2.049E 01
97	146.8	5.75E-05	2.06E-10	196.	43.7	6.63	2.84E 12	5.13E-01	0.70	7.89	267.	5.20E 02	2.049F 01
98	149.2	5.08E-05	1.77E-10	198.	43.3	6.78	2.46E 12	5.91E-01	0.72	8.08	270.	4.57E 02	2.049E 01
99	151.6	4.49E-05	1.53E-10	201.	43.0	6.93	2.15E 12	6.78E-01	0.73	8.29	273.	4.03E 02	2.049E 01
100	154.0	3.99E-05	1.33E-10	203.	42.6	7.08	1.88E 12	7.76E-01	0.74	8.49	277.	3.56E 02	2.049E 01
101	152.8	3.54E-05	1.19E-10	202.	42.6	8.95	1.68E 12	8.67E-01	0.73	8.44	276.	3.18E 02	2.049E 01
102	151.6	3.15E-05	1.06E-10	202.	42.5	8.90	1.50E 12	9.69E-01	0.73	8.38	275.	2.84E 01	2.049E 01
103	150.4	2.79E-05	9.48E-11	201.	42.5	8.84	1.34E 12	1.08E 00	0.72	8.33	274.	2.53F 02	2.049E 01
104	149.2	2.47E-05	8.47E-11	200.	42.5	8.79	1.20E 12	1.21E 00	0.72	8.28	273.	2.25E 02	2.049E 01
105	148.0	2.19E-05	7.55E-11	200.	42.4	8.73	1.07E 12	1.36E 00	0.71	8.22	272.	2.00E 02	2.049E 01
106	147.8	1.94E-05	6.69E-11	200.	42.4	8.25	9.51E 11	1.53E 00	0.71	8.23	272.	1.78E 02	2.049E 01
107	147.6	1.72E-05	5.93E-11	200.	42.3	8.25	8.44E 11	1.73E 00	0.71	8.23	272.	1.57E 02	2.049E 01
108	147.4	1.52E-05	5.25E-11	200.	42.3	8.25	7.48E 11	1.95E 00	0.71	8.23	272.	1.40E 02	2.049E 01
109	147.2	1.35E-05	4.65E-11	200.	42.2	8.25	6.64F 11	2.19E 00	0.71	8.23	272.	1.24E 02	2.049E 01
110	147.0	1.19E-05	4.12E-11	200.	42.2	8.26	5.89F 11	2.47E 00	0.70	8.24	272.	1.10E 02	2.049E 01
111	148.0	1.06E-05	3.63E-11	200.	42.1	7.80	5.18E 11	2.81E 00	0.71	8.31	273.	9.71E 01	2.049E 01
112	149.0	9.39E-06	3.19E-11	201.	42.1	7.86	4.57E 11	3.19E 00	0.71	8.37	274.	8.59E 01	2.049E 01
113	150.0	8.34E-06	2.81E-11	202.	42.1	7.93	4.03E 11	3.62E 00	0.72	8.44	275.	7.60E 01	2.049E 01
114	151.0	7.41E-06	2.48E-11	203.	42.0	7.99	3.56E 11	4.09E 00	0.73	8.51	276.	6.74E 01	2.049E 01
115	152.0	6.59E-00	2.19E-11	203.	42.0	8.06	3.14E 11	4.63E 00	0.73	8.59	277.	5.98E 01	2.049E 01
116	148.6	5.86E-06	1.99E-11	201.	41.8	10.14	2.86E 11	5.09E 00	0.71	8.42	274.	5.38E 01	2.049E 01
117	145.2	5.20E-00	1.80E-11	200.	41.7	9.95	2.59E 11	5.61E 00	0.70	8.26	271.	4.84F 01	2.049F 01
118	141.8	4.60E-06	1.62E-11	198.	41.6	9.76	2.35E 11	6.19E 00	0.68	8.09	269.	4.34E 01	2.049E 01
119	138.4	4.06E-06	1.46E-11	196.	41.5	9.57	2.13E 11	6.85E 00	0.66	7.92	266.	3.88F 01	2.049E 01
120	135.0	3.57E-06	1.32E-11	194.	41.4	9.37	1.92E 11	7.59E 00	0.64	7.75	263.	3.46E 01	2.049E 01
121	130.8	3.14E-06	1.19E-11	191.	41.4	9.87	1.74E 11	8.38E 00	0.63	7.52	259.	3.09E 01	2.049E 01
122	126.6	2.74E-06	1.08E-11	188.	41.3	9.56	1.57E 11	9.29E 00	0.61	7.29	255.	2.74E 01	2.049E 01
123	122.4	2.38E-06	9.67E-12	185.	41.3	9.26	1.41E 11	1.03E 01	0.59	7.05	250.	2.43E 01	2.049E 01
124	118.2	2.06E-06	8.67E-12	182.	41.3	8.95	1.26E 11	1.15E 01	0.57	6.82	246.	2.14E 01	2.049E 01
125	114.0	1.78E-06	7.74E-12	179.	41.3	8.65	1.13E 11	1.29E 01	0.55	6.58	242.	1.87E 01	2.049E 01
126	115.2	1.53E-06	6.58E-12	180.	41.2	6.19	9.60E 10	1.52E 01	0.55	6.66	243.	1.60E 01	2.049E 01

TABLE I (Continued)

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	Dens. scale (km)	Number density (cc^{-1})	Mean free path (m)	Viscosity (E+5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
127	116.4	1.32E-06	5.60E-12	181.	41.2	6.27	8.19E 10	1.78E 01	0.56	6.74	245.	1.38E 01	2.049E 01
128	117.6	1.14E-06	4.78E-12	182.	41.2	6.34	6.99F 10	2.08E 01	0.57	6.82	246.	1.18E 01	2.049E 01
129	118.8	9.81E-07	4.09E-12	183.	41.1	6.41	5.98E 10	2.48E 01	0.57	6.90	247.	1.02E 01	2.049E 01
130	120.0	8.50E-07	3.50E-12	184.	41.1	6.49	5.13F 10	2.84E 01	0.58	6.98	249.	8.76E 00	2.049E 01
131	125.2	7.39E-07	2.91E-12	188.	41.0	5.55	4.27E 10	3.41E 01	0.60	7.30	254.	7.46E 00	2.049E 01
132	130.4	6.46E-07	2.44E-12	191.	41.0	5.79	3.59E 10	4.06E 01	0.62	7.62	260.	6.40E 00	2.049E 01
133	135.6	5.68E-07	2.06E-12	195.	40.9	6.03	3.03E 10	4.80E 01	0.65	7.94	265.	5.52E 00	2.049E 01
134	140.8	5.02E-07	1.75E-12	199.	40.8	6.27	2.58E 10	5.64E 01	0.67	8.26	270.	4.80E 00	2.049E 01
135	146.0	4.46E-07	1.50E-12	202.	40.8	6.51	2.21E 10	6.58E 01	0.70	8.59	275.	4.19E 00	2.049E 01
136	150.0	3.98E-07	1.30E-12	205.	40.7	7.07	1.92E 10	7.58E 01	0.72	8.85	279.	3.69E 00	2.049E 01
137	154.0	3.58E-07	1.13E-12	208.	40.6	7.27	1.67E 10	8.70E 01	0.74	9.10	283.	3.26E 00	2.049E 01
138	158.0	3.19E-07	9.85E-13	211.	40.5	7.47	1.46E 10	9.95E 01	0.76	9.36	287.	2.89E 00	2.049E 01
139	162.0	2.87E-07	8.63E-13	213.	40.5	7.67	1.28E 10	1.13E 02	0.79	9.62	291.	2.57E 00	2.049E 01
140	166.0	2.59E-07	7.59E-13	216.	40.4	7.87	1.13E 10	1.29E 02	0.81	9.88	295.	2.29E 00	2.049E 01
141	168.0	2.34E-07	6.77E-13	217.	40.3	8.85	1.01E 10	1.44E 02	0.82	10.02	297.	2.06F 00	2.049E 01
142	170.0	2.12E-07	6.05E-13	219.	40.3	8.97	9.05E 09	1.61E 02	0.83	10.16	299.	1.86E 00	2.049E 01
143	172.0	1.93E-07	5.42E-13	220.	40.2	9.09	8.11E 09	1.80E 02	0.84	10.30	301.	1.68E 00	2.049E 01
144	174.0	1.75E-07	4.85E-13	222.	40.2	9.21	7.28E 09	2.00E 02	0.86	10.44	303.	1.51E 00	2.049E 01
145	176.0	1.59E-07	4.368-13	223.	40.1	9.33	6.54E 09	2.23E 02	0.87	10.58	305.	1.37E 00	2.049E 01
146	177.2	1.45E-07	3.93E-13	224.	40.0	9.77	5.91E 09	2.46E 02	0.88	10.68	306.	1.24F 00	2.049E 01
147	178.4	1.32E-07	3.55E-13	225.	40.0	9.56	5.35E 09	2.72E 02	0.88	10.78	307.	1.13E 00	2.049E 01
148	179.6	1.20E-07	3.21E-13	226.	39.9	9.94	4.85E 09	3.00E 02	0.89	10.88	309.	1.03E 00	2.049E 01
149	180.8	1.10E-07	2.90E-13	227.	39.8	10.03	4.39E 09	3.31E 02	0.90	10.98	310.	9.36-01	2.049E 01
150	182.0	1.00E-07	2.63E-13	227.	39.7	10.12	3.99E 09	3.65E 02	0.91	11.08	311.	8.53E-01	2.049E 01
151	182.8	9.15E-08	2.39E-13	228.	39.7	10.49	3.63E 09	4.01E 02	0.91	11.15	312.	7.78E-01	2.049E 01
152	183.6	8.37E-08	2.17E-13	229.	39.6	10.55	3.30E 09	4.41E 02	0.92	11.22	313.	7.11E-01	2.049E 01
153	184.4	7.66E-08	1.98E-13	229.	39.6	10.61	3.01E 09	4.84E 02	0.92	11.29	314.	5.93E-01	2.049E 01
154	185.2	7.01E-08	1.80E-13	230.	39.5	10.68	2.74E 09	5.31E 02	0.93	11.35	315.	5.93E-01	2.049E 01
155	166.0	6.42E-08	1.84E-13	231.	39.5	10.74	2.50E 09	5.82E 02	0.93	11.42	316.	4.98E-01	2.049E 01
156	165.6	5.88E-08	1.50E-13	230.	39.4	11.51	2.30E 09	6.34E 2	0.93	11.42	316.	4.57E-01	2.049F 01
157	165.2	5.39E-08	1.38E-13	230.	39.4	11.51	2.11E 09	6.90E 02	0.93	11.42	316.	4.57E-01	2.049E 01
158	184.8	4.94E-09	1.26E-13	230.	39.3	11.51	1.94E 09	7.52E 02	0.93	11.42	316.	4.20E-01	2.049F 01

159	184.4	4.53E-08	1.16E-13	230.	39.2	11.51	1.78E 09	8.19E 02	0.92	11.42	315.	3.85F-01	2.049F 01
160	184.0	4.15E-08	1.06E-13	230.	39.2	11.51	1.63E 09	8.92E 02	0.92	11.42	315.	3.54E 01	2.049E 01
161	169.6	6.79E-08	1.05E-13	222.	39.1	87.65	1.62E 09	9.00E 02	0.83	10.55	303.	3.37E-01	2.049E 01
162	155.2	3.43E-08	1.04E-13	213.	39.1	82.16	1.60E 09	9.10E 02	0.75	9.67	290.	3.19F-01	2.049E 01
163	140.8	3.08E-08	1.03E-13	202.	39.0	76.38	1.58E 09	9.20E 02	0.67	8.79	276.	3.01E-01	2.049E 01
164	126.4	2.73E-08	1.01E-13	193.	38.9	70.32	1.56E 09	9.31E 02	0.60	7.91	262.	2.82E-01	2.049E 01
165	112.0	2.39E-08	9.97E-14	183.	38.9	63.94	1.54F 09	9.43E 02	0.54	7.02	247.	2.62E-01	2.049E 01
166	122.6	2.08E-08	7.93E-14	191.	38.8	4.59	1.23E 09	1.18E 03	0.59	7.71	259.	2.19E-01	2.049E 01
167	133.2	1.64E-08	6.44E-14	199.	38.7	4.99	1.00E 09	1.46E 03	0.64	8.39	270.	185E-01	2.049F 01
168	143.8	1.64E-08	5.31E-14	206.	38.7	5.39	8.26F 08	1.76E 03	0.69	9.08	281.	1.59E-01	2.049F 01
169	154.4	1.47E-08	4.44E-14	214.	38.6	5.79	6.92E 08	2.10E 03	0.74	9.78	291.	1.38E-01	2.049E 01
170	165.0	1.34E-08	6.75E-14	221.	38.5	6.20	5.87E 08	2.48E 03	0.80	10.47	301.	1.21E-01	2.049E 01
171	163.2	1.21E-08	3.44E-14	220.	38.5	11.53	5.39E 08	2.70E 03	0.79	10.38	300.	1.11E-01	2.049E 01
172	161.4	1.10E-08	3.16E-14	219.	38.4	11.42	4.95E 08	2.94E 03	0.78	10.28	298.	1.01E-01	2.049E 01
173	159.6	1.00E-08	2.89E-14	218.	38.4	11.32	4.54E 08	3.21E 03	0.77	10.19	297.	9.25E-02	2.049E 01
174	157.8	9.06E-09	2.65E-14	217.	38.3	11.22	4.16E 08	3.50E 03	0.76	10.09	295.	8.34E-02	2.049E 01
175	156.0	8.20E-09	2.42E-14	216.	38.3	11.12	3.81E 08	3.82E 03	0.75	10.00	294.	7.69E-02	2.049E 01
176	154.0	7.42E-09	2.21E-14	214.	38.2	11.17	3.49E 08	4.17E 03	0.74	9.89	292.	7.00E-07	2.049E 01
177	152.0	6.70E-09	2.02E-14	213.	38.2	11.05	3.19E 08	4.56E 03	0.73	9.78	290.	6.37E-02	2.049F 01
178	150.0	6.04E-09	1.85E-14	212.	38.1	10.93	2.92E 08	4.99E 03	0.72	9.67	289.	5.79E-02	2.049E 01
179	148.0	5.45E-09	1.68E-14	211.	38.1	10.81	2.67E 08	5.46E 03	0.71	9.56	287.	5.36E-02	2.049F 01
180	146.0	4.90E-09	1.53E-14	210.	38.0	10.69	2.43E 08	5.98E 03	0.70	9.45	285.	4.77E-02	2.048E 01
181	144.4	4.41E-09	1.39E-14	209.	37.9	10.29	2.21E 08	6.58E 03	0.69	9.36	284.	4.31F-02	2.049E 01
182	142.8	3.96E-09	1.26E-14	208.	37.9	10.20	2.01E 08	7.25E 03	0.68	9.28	282.	3.90E-02	2.049E 01
183	141.2	3.55E-09	1.15E-14	207.	37.8	10.11	1.82E 08	7.99E 03	0.68	9.19	281.	3.52E-02	2.049E 01
184	139.6	3.19E-09	1.04F-14	206.	37.8	10.02	1.65E 08	8.81F 03	0.67	9.10	280.	3.18F-02	2.049E 01
185	138.0	2.65E-09	9.38E-15	205.	37.7	9.93	1.50E 08	9.72E 03	0.66	9.02	278.	2.86E-02	2.049E 01
186	136.8	2.55E-09	8.35E-15	205.	37.7	8.52	1.33F 08	1.09E 04	0.66	9.08	279.	2.56E-02	2.049E 01
187	139.6	2.29E-09	7.44E-15	206.	37.7	8.67	1.19E 08	1.23E 04	0.67	9.14	280.	2.28F-02	2.049E 01
188	140.4	2.05E-09	6.63E-15	207.	37.7	8.73	1.06E 08	1.38E 04	0.67	9.19	281.	2.04E-02	2.049E 01
189	141.2	1.64E-09	5.91E-15	207.	37.7	8.78	9.45E 07	1.54E 04	0.68	9.25	282.	1.83E-02	2.049E 01
190	142.0	1.65E-09	5.28E-15	208.	37.7	8.84	8.43E 07	1.73E 04	0.68	9.31	282.	1.64F-02	2.049E 01
191	137.6	1.48E-09	4.88E-15	205.	37.6	12.45	7.80E 07	1.87E 04	0.66	9.04	278.	1.49E-02	2.049E 01
192	133.2	1.33E-09	4.50E-15	202.	37.6	12.09	7.21E 07	2.02E 04	0.64	8.77	274.	1.36E-02	2.049E 01
193	128.8	1.18E-09	4.13E-15	199.	37.5	11.74	6.64E 07	2.19E 04	0.62	8.50	270.	1.23E-02	2.049E 01
194	124.4	1.05E-09	3.79E-15	196.	37.4	11.38	6.10E 07	2.39E 04	0.60	8.23	265.	1.11E-02	2.049E 01
195	120.0	9.26E-10	3.47E-15	193.	37.4	11.01	6.59E 07	2.61E 04	0.58	7.96	261.	1.00F-02	2.049E 01
196	118.9	8.16E-10	3.08E-15	192.	37.4	8.50	4.97E 07	2.93E 04	0.57	7.89	260.	8.86E-03	2.049E 01
197	117.7	7.18E-10	2.74E-15	191.	37.3	8.42	4.42E 07	3.29E 04	0.57	7.83	258.	7.85E-03	2.049E 01
198	116.6	6.37E-10	2.43E-15	190.	37.3	8.35	3.93E 07	3.71E 04	0.56	7.76	257.	6.94E-03	2.049E 01
199	115.4	5.55E-10	2.16E-15	189.	37.3	8.28	3.48E 07	4.18E 04	0.56	7.69	256.	6.13E-03	2.049E 01
200	114.3	4.87E-10	1.91E-15	188.	37.3	8.21	3.09E 07	4.71E 04	0.55	7.63	255.	5.41E-03	2.049E 01

TABLE II

Model of the martian atmosphere based on the data of Viking 2 measurements. Construction parameters

Surface pressure = 7.82 Mb	Surface temperature = 225.60 K	Surface density = 0.181E-04 gm cc^{-1}
Base of exosphere = 4000.00 (km)	Molecular weight = 43.425	Surface gravity 375.000 cm sec^{-1}
Radius of Mars = 3389.00 (km)	Percent hydrogen = 0.0	Percent CO^2 = 94.800
Percent oxygen = 0.200	Percent argon = 2.000	Percent neon = 0.0
Percent nitrogen = 3.000	Percent helium = 0.0	Percent water = 0.0
Percent CO = 0.0	Percent SO_2 = 0.0	

Temperature and molecular weight distribution

At 5.00 Geom km	Temperature = 210.00 K	and molecular weight = 43.35999
At 10.00 Geom km	Temperature = 200.00 K	and molecular weight = 43.35999
At 15.00 Geom km	Temperature = 190.00 K	and molecular weight = 43.35999
At 20.00 Geom km	Tempperature = 184.00	and molecular weight = 43.35999
At 25.00 Geom km	Temperature = 180.00 K	and molecular weight = 43.35999
At 30.00 Geom km	Temperature = 190.00 K	and molecular weight = 43.35999
At 35.00 Geom km	Temperature = 164.00 K	and molecular weight = 43.35999
At 40.00 Geom Km	Temperature = 164.00 K	and molecular weight = 43.35999
At 45.00 Geom km	Temperature = 168.00 K	and molecular weight = 43.35999
At 50.00 Geom km	Temperature = 166.00 K	and molecular weight = 43.35999
At 55.00 Geom km	Temperature = 147.00 K	and molecular weight = 43.35999
At 60.00 Geom km	Temperature = 138.00 K	and molecular weight = 43.35999
At 65.00 Geom km	Temperature = 142.00 K	and molecular weight = 43.35999
At 70.00 Geom km	Temperature = 136.00 K	and molecular weight = 43.35999
At 75.00 Geom km	Temperature = 106.00 K	and molecular weight = 43.35999
At 80.00 Geom km	Temperature = 126.00 K	and molecular weight = 43.35999
At 80.00 Geom km	Temperature = 126.00 K	and molecular weight = 43.35999
At 85.00 Geom km	Temperature = 130.00 K	and molecular weight = 43.35999
At 90.00 Geom km	Temperature = 156.00 K	and molecular weight = 43.35999
At 95.00 Geom km	Temperature = 132.00 K	and molecular weight = 43.35999
At 100.00 Geom km	Temperature = 145.00 K	and molecular weight = 43.35999
At 105.00 Geom km	Temperature = 128.00 K	and molecular weight = 43.78000
At 110.00 Geom km	Temperature = 118.00 K	and molecular weight = 43.74399
At 115.00 Geom km	Temperature = 116.00,	and molecular weight = 43.73399
At 120.00 Geom km	Temperature = 118.00 K	and molecular weight = 43.43500
At 125.00 Geom km	Temperature = 137.00 K	and molecular weight = 43.38100
At 130.00 Geom km	Temperature = 138.00 K	and molecular weight = 43.33600
At 135.00 Geom km	Temperature = 130.00 K	and molecular weight = 43.14299

At 140.00 Geom km Temperature = 136.00 K and molecular weight = 4310999
At 145.00 Geom km Temperature = 122.00 K and molecular weight = 42.96500
At 150.00 Geom km Temperature = 146.00 K and molecular weight = 42.51999
At 155.00 Geom km Temperature = 126.00 K and molecular weight = 41.59299
At 160.00 Geom km Temperature = 118.99 K and molecular weight = 41.59299
At 200.00 Geom km Temperature = 260.00 K and molecular weight = 36.96300

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed (m sec^{-1})	Molecular weight	Dens. scale (km)	Number density (cc^{-1})	Mean free (m)	Viscosity (E + 5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
0	225.6	7.82E 00	1.81E-05	240.	43.4	13.70	2.51E 17	5.80E-06	1.15	11.52	332.	5.72E 07	1.0
1	222.5	7.17E 00	1.68E-05	239.	43.4	13.47	2.33E 17	6.24E-06	1.13	11.37	329.	5.28E 07	1.745E 00
2	219.4	6.56E 00	1.56E-05	237.	43.4	13.30	2.17E 17	6.72E-06	1.12	11.22	327.	4.87E 07	3.365E 00
3	216.2	6.00E 00	1.45E-05	236.	43.4	13.12	2.01E 17	7.25E-06	1.11	11.07	325.	4.48 07	4.868E 00
4	213.1	5.47E 00	1.34E-05	234.	43.4	12.95	1.86E 17	7.82E-06	1.00	10.92	323.	4.12E 07	6.262E 00
5	210.0	4.99E 00	1.24E-05	233.	43.4	12.77	1.72E 17	8.45E-06	1.08	10.77	320.	3.79E 07	7.549E 00
6	208.0	4.55E 00	1.14E-05	232.	43.4	11.90	1.58E 17	9.19E-06	1.07	10.67	319.	3.47E 07	8.738E 00
7	206.0	4.14E 00	1.05E-05	231.	43.4	11.79	1.46E 17	1.00E-05	1.06	10.58	317.	3.17E 07	9.831E 00
8	204.0	3.76E 00	9.62E-06	230.	43.4	11.68	1.34E 17	1.09E-05	1.05	10.48	315.	2.90E 07	1.064E 01
9	202.0	3.42E 00	8.83E-06	229.	43.4	11.57	1.23E 17	1.19E-05	1.04	10.38	314.	2.65E 07	1.176E 01
10	200.0	3.10E 00	8.19E-06	228.	43.4	11.47	1.12E 17	1.29E-05	1.04	10.29	313.	2.41E 07	1.262E 01
11	198.0	2.82E 00	7.42E-06	227.	43.4	11.36	1.03E 17	1.41E-05	1.02	10.19	311.	2.20E 07	1.338E 01
12	196.0	2.55E 00	6.79E-06	225.	43.4	11.25	9.43E 16	1.54E-05	1.01	10.29	309	2.00E 07	1.409E 01
13	194.0	2.31E 00	6.21E-06	224.	43.4	11.14	8.62E 16	1.69E-05	0.99	10.00	308.	1.82E 07	1.474E 01
14	192.0	2.09E 00	5.67E-06	223.	43.4	11.04	7.88E 16	1.85E-05	0.98	9.90	306.	1.66E 07	1.533E 01
15	190.0	1.89E 00	5.18E-06	222.	43.4	10.93	7.19E 16	2.02E-05	0.96	10.80	305.	1.51E 07	1.587E 01
16	188.8	1.70E 00	4.71E-06	222.	43.4	10.39	6.54E 16	2.23E-05	0.95	9.75	304.	1.36E 07	1.637E 01
17	187.6	1.54E 00	4.27E-06	221.	43.4	10.33	5.93E 16	2.45E-05	0.95	9.69	303.	1.23E 07	1.681E 01
18	186.4	1.39E 00	3.98E-06	220.	43.4	10.27	5.39E 16	2.70E-05	0.94	9.63	302.	1.12E 07	1.722E 01
19	185.2	1.25E 00	3.52E-06	220.	43.4	10.21	4.88E 16	2.98E-05	0.93	9.58	301.	1.01E 07	1.759E 01
20	184.0	1.12E 00	3.19E-06	219.	43.4	10.15	4.43E 16	3.29E-5	0.92	9.52	300.	9.12E 06	1.793E 01
21	183.2	1.01E 00	2.88E-06	218.	43.4	9.89	4.00E 16	3.64e-05	0.92	9.48	299.	8.22e 06	1.823E 01
22	182.4	9.11E-01	2.60E-06	218.	43.4	9.86	3.62E 16	4.02E-05	0.91	9.45	298.	7.42E 06	1.850E 01
23	181.6	8.19E-01	2.35E06	218.	43.4	9.82	3.27E 16	4.46E-05	0.91	9.41	298.	6.68E 06	1.875E 01
24	180.8	7.37E-01	2.12E-06	217.	43.4	9.78	2.95E 16	4.93E-05	0.90	9.38	297.	6.02E 06	1.897E 01
25	180.0	6.62E-01	1.92E-06	217.	43.4	9.74	2.66E 16	5.47E-05	0.89	9.34	296.	5.42E 06	1.918E 01

TABLE II (Continued)

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	dens. scale (km)	Number density (cc^{-1})	Mean free path (m)	Viscosity (E+5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
26	132.0	5.95E-01	1.71E-06	218.	43.4	8.56	2.37E 16	6.15E-05	0.81	9.45	298.	4.85E 06	1.9365 01
27	184.0	5.36E-01	1.52E-06	219.	43.4	8.66	2.11E 16	6.90E-05	0.92	9.56	300.	4.34E 06	1.952E 01
28	136.0	4.83E-01	1.35EA06	220.	43.4	8.76	1.88E 16	7.74E-05	0.93	9.67	301.	3.89E 06	1.966E 01
29	188.0	4.36E-01	1.21E-06	221.	43.4	8.86	1.68E 16	8.68E-05	0.95	9.78	303.	3.49E 06	1.979E 01
30	190.0	3.93E-01	1.08E-06	222.	43.4	8.96	1.50E 16	9.71E-05	0.96	9.89	305.	3.14E 06	1.990E 01
31	184.8	3.55E-01	1.00E-06	219.	43.4	13.20	1.39E 16	1.05E-04	0.93	9.62	300.	2.87E 06	2.901E 01
32	179.6	3.20E-01	9.28E-07	216.	43.4	12.84	1.29E 16	1.13E-04	0.89	9.36	296.	2.62E 06	2.910E 01
33	174.4	2.87E-01	8.58E-07	213.	43.4	12.47	1.19E 16	1.22E-04	0.86	9.09	292.	2.39E 06	2.918E 01
34	169.2	2.56E-01	7.90E-07	210.	43.4	12.11	1.10E 16	1.33E-04	0.83	8.82	287.	2.17E 06	2.927E 01
35	164.0	2.29E-01	7.27E-07	207.	43.4	11.74	1.01E 16	1.44E-04	0.80	8.56	283.	1.96E 06	2.935E 01
36	164.0	2.03E-01	6.47E-07	207.	43.4	8.57	8.98E 15	1.62E-04	0.80	8.57	283.	1.75E 06	2.942E 01
37	164.0	1.81E-01	5.76E-07	207.	43.4	9.57	7.99E 15	1.82E-04	0.80	8.57	283.	1.55E 06	1.148E 01
38	164.0	1.61E-01	5.12E-07	207.	43.4	8.58	7.11E 15	2.95E-04	0.80	8.58	283.	1.38E 06	2.953E 01
39	164.0	1.43E-01	4.56E-07	207.	43.4	8.58	6.33E 15	2.30E-04	0.80	8.58	283.	1.23E 06	2.058E 01
40	164.0	1.28E-01	4.36E-07	207.	43.4	8.59	5.63E 15	2.58E-06	0.80	8.58	283.	1.10E 06	2.962E 01
41	164.8	1.14E-01	3.59E-07	208.	43.4	8.28	4.99E 15	2.92E-04	0.80	8.63	284.	9.73F 05	2.965E 01
43	166.4	9.02E-02	2.83E-07	228.	43.4	8.37	3.93E 15	3.71E-04	0.81	8.73	285.	7.69E 05	2.073E 01
44	167.2	8.05E-02	2.51E-07	209.	43.4	8.42	3.49E 15	4.18E-04	0.82	8.77	286.	6.84E 05	2.975E 01
45	168.2	7.18E-02	2.23E-07	210.	43.4	8.46	3.10E 15	4.70E-04	0.82	8.82	286.	6.08E 05	2.978E 01
46	167.6	6.41E-02	199E-07	209.	43.4	8.99	2.77E 15	5.25E-04	0.82	8.80	286.	5.44E 05	2.080E 01
47	167.2	5.72E-02	1.78E-07	209.	43.4	8.98	2.48E 15	5.87E-04	0.82	8.79	286.	4.87E 05	2.082E 01
48	166.8	5.11E-02	1.60E-07	209.	43.4	8.96	2.22E 15	6.56E-04	0.81	8.77	285.	4.35E 05	2.083E 01
49	166.4	4.56E-02	1.43E-07	209.	43.4	8.94	1.98E 15	7.34E-04	0.81	8.76	285.	3.88E 05	2.085E 01
50	166.0	4.06E-02	1.28E-07	209.	43.4	8.93	1.77E 15	8.21E-04	0.81	8.74	285.	3.47E 05	2.086E 01
51	162.2	3.62E-02	1.16E-07	206.	43.4	10.69	1.62E 15	9.01E-04	0.79	8.55	281.	3.13E 05	2.087E 01
52	158.4	3.22E-02	1.06E-07	204.	43.4	10.44	1.47E 15	9.90E-04	0.77	8.35	278.	2.81E 05	2.089E 01
53	154.6	2.85E-02	9.61E-08	202.	43.4	10.20	1.33E 15	1.09E-03	0.74	8.15	275.	2.52E 05	2.090E 01
54	150.8	2.52E-02	8.70E-08	199.	43.4	9.95	1.21E 15	1.20E-03	0.72	7.96	271.	2.25E 05	2.091E 01
55	147.0	2.22E-02	7.86E-08	197.	43.4	9.71	1.09E 15	1.33E-03	0.70	7.76	268.	2.01E 05	2.091E 01
56	145.2	1.95E-02	6.99E-08	196.	43.4	8.48	9.71E 14	1.50E-03	0.70	7.67	266.	1.78E 05	2.092E 01
57	143.4	1.71E-02	6.21E-08	195.	43.4	8.38	8.62E 14	1.69E-03	0.69	7.58	265.	1.57E 05	2.098E 01

58	141.6	1.50E-02	5.51E-08	193.	43.4	8.28	7.65E 14	1.90E-02	0.68	7.49	263.	1.38E 05	2.093E 01
59	139.8	1.31F-02	4.88E-08	192.	43.4	8.18	6.77E 14	2.15E-03	0.67	7.40	261.	1.22E 05	2.094E 01
60	138.0	1.14E-02	4.31E-08	191.	43.4	8.08	5.99E 14	2.43E-03	0.66	7.31	260.	1.07E 05	2.094E 01
61	139.2	9.96E-03	3.73E-08	192.	43.4	6.93	5.18E 14	2.81E-03	0.67	7.38	261.	9.28E 04	2.095E 01
62	140.4	8.70E-03	3.23E-08	193.	43.4	7.00	4.49E 14	3.24E-03	0.67	7.44	262.	8.07E 04	2.095E 01
63	141.6	7.61E-03	2.80E-08	193.	43.4	7.06	3.89E 14	3.74E-03	0.68	7.51	263.	7.03E 04	2.995E 01
64	142.8	6.67E-03	2.43E-08	194.	43.4	7.13	3.38E 14	4.31E-03	0.68	7.58	264.	6.13E 04	2.096F 01
65	144.0	5.85E-03	2.12E-08	195.	43.4	7.19	2.94E 14	4.95E-03	0.69	7.65	265.	5.36E 04	2.096E 01
66	142.4	5.13E-03	1.88E-08	194.	43.3	8.27	2.61E 14	5.58E-03	0.68	7.57	264.	4.72E 04	2.096E 01
67	140.8	4.49E-03	1.66E-08	193.	43.4	8.18	2.31E 14	6.30E-03	0.67	7.49	262.	4.16E 04	2.096E 01
68	139.2	3.92E-03	1.47E-08	192.	43.4	8.10	2.04E 14	7.13E-03	0.67	7.41	261.	3.66E 04	2.096E 01
69	137.6	3.43E-03	1.30E-08	191.	43.4	8.01	1.80E 14	8.07E-03	0.66	7.33	259.	3.21E 04	2.097E 01
70	136.0	2.99E-03	1.15E-08	190.	43.4	7.92	1.59E 14	9.15E-03	0.65	7.24	258.	2.82E 04	2.098E 01
71	130.0	2.59E-03	1.04E-08	186.	43.4	10.19	1.45E 14	1.01E-02	0.62	6.93	252.	2.50E 04	2.097E 01
72	124.0	2.24E-03	0.41E-09	182.	43.4	9.72	1.31E 14	1.11F-02	0.50	6.61	246.	2.21E 04	2.097E 01
73	118.0	1.92E-03	0.47E-09	177.	43.4	9.26	1.18E 14	1.24E-02	0.57	6.30	240.	1.94E 04	2.097E 01
74	112.0	1.63E-03	7.58E-09	173.	43.4	8.80	1.05E 14	1.38E-02	0.54	5.98	234.	1.69E 04	2.097E 01
75	106.0	1.37E-03	6.74E-09	169.	43.4	8.33	9.37E 13	1.55E-02	0.52	5.66	268.	1.45E 04	2.097E 21
76	110.0	1.15E-03	5.47E-09	172.	43.4	4.84	7.59E 13	1.92E-02	0.53	5.88	232.	1.21E	2.097E 01
77	114.0	9.76E-04	4.46E-09	175.	43.4	5.02	6.20E 13	2.35E-02	0.55	6.10	236.	1.00E 04	2.097E 01
78	118.0	8.30E-04	3.67E-09	177.	43.4	6.20	5.10E 13	2.96E-02	0.57	6.32	240.	8.40E 03	2.097E 01
79	122.0	7.11E-04	3.04E-09	180.	43.4	5.38	4.22E 13	3.45E-22	0.58	6.53	244.	7.07E 03	2.097E 01
80	126.0	6.11E-04	2.53E-09	183.	43.4	5.56	3.51E 13	4.14E-02	0.60	6.75	248.	5.99E 03	2.097E 01
81	126.8	5.27E-O4	2.17E-09	184	43.4	6.52	3.01E 13	4.83E-02	0.61	6.80	249.	5.15E 03	2.097E 01
82	127.6	4.55E-04	1.86E-09	184.	43.4	6.56	2.59E 13	5.63E-02	0.61	6.84	2.50.	4.43E 03	2.097E 01
83	128.4	3.94E-04	1.60E-09	185.	43.4	6.61	2.22E 13	6.55E-02	0.61	6.89	250.	3.82E 03	2.097E 01
84	129.2	3.41E-04	1.38E-09	185.	43.4	6.65	1.91E 13	7.62E-02	0.62	6.94	251.	3.30E 03	2.097E 01
85	130.0	2.95E-04	1.18E-09	186.	43.4	6.70	1.64E 13	8.85E-02	0.62	6.98	252.	2.85E 03	2.097E 01
86	135.2	2.56E-04	9.89E-10	189.	43.4	5.68	1.37E 13	1.06E-01	0.65	7.27	257.	2.43E 03	2.097E 01
87	140.4	2.24E-04	8.32E-10	193.	43.4	5.90	1.16E 13	1.26E-01	0.67	7.55	262.	2.08E 03	2.097E 01
88	145.6	1.97E-24	7.05E-10	196.	43.4	6.12	9.79E 12	1.49F-01	0.70	7.84	267.	1.79E 03	2.097E 01
89	152.8	1.74E-04	6.00E-10	199.	43.4	6.35	8.34E 12	1.75E-01	0.72	8.12	271.	1.55E 00	2.097E 01
90	156.0	1.54E-04	5.14E-10	203.	43.4	6.57	7.14E 12	2.04E-01	0.75	8.41	276.	1.35E 03	2.097E 01
91	151.2	1.36E-04	4.70E-10	200.	43.4	11.00	6.53E 12	2.23E-01	0.73	8.15	272.	122E 03	2.097E 01
92	146.4	1.20E-04	4.29E-10	197.	43.4	10.66	5.96E 12	2.44E-01	0.70	7.90	257.	1.09E 03	2.097E 01
93	141.6	1.06E-04	3.90E-10	193.	43.4	10.32	5.41E 12	2.69E-01	0.68	7.64	263.	9.78E 02	2.097E 01
94	136.8	9.26E-05	3.53E-10	190.	43.4	9.97	4.91E 12	2.97E-01	0.65	7.39	258.	8.71E 02	2.097E 01
95	132.0	8.07E-05	3.19E-10	187.	43.4	9.63	4.43E 12	3.29E-01	0.62	7.33	254.	7.72E 02	2.097E 01
96	136.6	7.03E-05	2.72E-10	189.	23.4	6.38	3.78E 12	3.85E-01	0.64	7.28	256.	6.66E 02	0.097E 21
97	137.2	6.13E-05	2.33F-10	191.	43.4	6.51	3.24E 12	4.50E-01	0.66	7.42	259.	5.76F 02	2.097E 01

TABLE II (Continued)

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	dens. scale (km)	Number density (cc^{-1})	Mean free path (m)	Viscosity (E + 5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
98	139.8	5.37E-05	2.00E-10	192.	43.4	6.63	2.78E 12	5.24E-01	0.67	7.57	261.	4.99E 02	2.097E 01
99	142.4	4.71E-05	1.72E-10	194.	43.4	6.76	2.39E 12	6.08E-01	0.68	7.71	264.	4.34E 02	2.097E 01
100	145.0	4.14E-05	1.49E-10	196.	43.4	6.89	2.07E 12	7.04E-01	0.69	7.86	266.	3.78E 02	2.097E 01
101	141.6	3.64E-05	1.34E-10	193.	43.4	9.57	1.86E 12	7.82E-01	0.68	7.66	263.	3.36E 02	2.097E 01
102	138.2	3.19E-05	1.21E-10	191.	43.5	9.32	1.67E 12	8.71E-01	0.66	7.47	259.	2.98E 02	2.097E 01
103	134.8	2.78E-05	1.08E-10	188.	43.6	9.07	1.50E 12	9.73E-01	0.64	7.28	256.	2.63E 02	2.097E 01
104	131.4	2.42E-05	9.69E-11	186.	43.7	8.82	1.34E 12	1.09E 00	0.63	7.08	252.	2.31E 6	2.097E 01
105	128.0	2.10E-05	8.64E-11	184.	43.8	8.57	1.19E 12	1.23E 00	0.61	6.89	249.	2.03E 02	2.097E 01
106	126.0	1.81E-05	7.58E-11	182.	43.8	7.60	1.04E 12	1.40F 00	0.60	6.79	247.	1.77E 02	2.097E 01
107	124.0	1.56E-05	6.64F-11	181.	43.8	7.48	9.13E 11	1.59E 00	0.59	6.68	245.	1.54E 02	2.097E 01
108	122.0	1.34E-05	5.80E-11	179.	43.8	7.37	7.98E 11	1.82E 00	0.58	6.58	243.	1.33E 02	2.097E 01
109	120.0	1.15E-05	5.06E-11	178.	43.8	7.25	8.96E 11	2.09F 00	0.58	6.48	241.	1.15E 02	2.097E 01
110	118.0	9.88E-06	4.40F-11	177.	43.7	7.14	6.06F 11	2.40E 00	0.57	6.38	239.	9.95E 01	2.097E 01
111	117.6	8.44E-06	3.78E-11	176.	43.7	6.50	5.20E 11	2.80E 00	0.57	6.36	239.	8.52E 01	2.097E 01
112	117.2	7.21E-06	3.24E-11	176.	43.7	6.48	4.46E 11	3.27E 00	0.56	6.34	238.	7.29E 01	2.097E 01
113	116.8	6.16E-06	2.77E-11	176.	43.7	6.46	3.82E 11	3.81E 00	0.56	6.32	238.	6.24E 01	2.097E 01
114	116.4	5.26E-06	2.37E-11	175.	43.7	6.44	3.27E 11	4.45E 00	0.56	6.30	237.	5.33E 01	2.097E 01
115	116.0	4.48E-06	2.03E-11	175.	43.7	6.42	2.80E 11	5.20E 00	0.56	6.29	237.	4.56E 01	2.097E 01
116	116.4	3.83E-06	1.73E-11	176.	43.7	6.13	2.38E 11	6.11E 00	0.56	6.32	238.	3.88E 01	2.097E 01
117	116.8	3.27E-06	1.47E-11	176.	43.6	6.17	2.03E 11	7.18E 00	0.56	6.35	238.	3.31E 01	2.097E 01
118	117.2	2.79E-06	1.25E-11	176.	43.6	6.20	1.73E 11	8.43E 00	0.56	6.39.	239.	2.83E 01	2.097E 01
119	117.6	2.39E-06	1.06E-11	177.	43.5	6.23	1.47E 11	9.89E 00	0.57	6.43	239.	2.42E 01	2.097E 01
120	118.0	2.05E-06	9.06E-12	177.	43.4	6.27	1.26E 11	1.16E 01	0.57	6.46	240.	2.07E 01	2.097E 01
121	121.3	1.76E-06	7.53E-12	180.	43.4	5.51	1.04E 11	1.39E 01	0.58	6.67	244.	1.75E 01	2.097E 01
122	125.6	1.52E-06	6.30E-12	183.	43.4	5.69	8.74E 10	1.67E 01	0.60	6.88	247.	1.49E 01	2.097E 01
123	129.4	1.32E-06	5.30E-12	185.	43.4	5.87	7.35E 01	1.98E 01	0.62	7.10	251.	1.27E 01	2.097E 01
124	133.2	1.14E-06	4.48E-12	188.	43.4	6.06	6.22E 10	2.34E 01	0.64	7.31	255.	1.09E 01	2.097E 01
125	137.0	9.99E-07	3.81E-12	190.	43.4	6.22	5.28E 10	2.76E 01	0.65	7.53	259.	9.38E 00	2.097E 01
126	136.3	8.75E-07	3.33E-12	190.	43.3	7.57	4.63E 10	3.14E 01	0.65	7.53	258.	8.23E 00	2.097E 01
127	136.6	7.66E-07	2.92E-12	190.	43.3	7.57	4.06E 10	3.58E 01	0.65	7.53	258.	7.21E 00	2.097E 01
128	136.4	6.71E-07	2.56E-12	190.	43.4	7.57	3.56E 10	4.09E 01	0.65	7.52	258.	6.32E 00	2.097E 01

129	136.2	5.87E-07	2.24E-12	190.	43.3	7.57	3.12E 01	4.66E 01	0.65	7.52	2588.	5.54E 00	2.097E 01
130	136.0	5.14E-07	1.97E-12	190.	43.2	7.56	2.76E 10	5.31E 01	0.65	7.52	258.	4.86E 00	2.097E 01
131	134.3	4.50E-07	1.74E-12	189.	43.2	7.97	2.42E 10	6.02E 01	0.64	7.46	257.	4.27E 00	2.097E 01
132	133.6	3.93E-07	1.53E-12	189	43.2	7.91	2.13E 10	6.92E 01	0.64	7.40	256.	3.75E 00	2.097E 01
133	132.4	3.44E-07	1.35E-12	188.	43.2	7.84	1.88E 10	7.75E 01	0.63	7.34	255.	3.29E 00	2.097E 01
134	131.2	3.00E-07	1.19E-12	187.	43.2	7.78	1.65E 10	8.80E 01	0.63	7.28	254.	2.88E 00	2.097E 01
135	130.2	2.61E-07	1.04E-12	186.	43.1	7.72	1.45E 10	1.00E 02	0.62	7.22	253.	2.52E 00	2.097E 01
136	131.2	2.27E-07	8.99E-13	187.	43.1	6.83	1.26E 10	1.16E 02	0.63	7.30	254.	2.19E 00	2.097E 01
137	132.4	1.98E-07	7.78E-13	188.	43.1	6.90	1.09E 10	1.34E 02	0.63	7.37	255.	1.90E 00	2.097E 01
138	133.6	1.73E-07	6.72E-13	189.	43.1	6.97	9.40E 09	1.55E 02	0.64	7.44	256.	1.65E 00	2.097E 01
139	134.8	1.52E-07	5.83E-13	190.	43.1	7.03	8.15E 09	1.79E 02	0.64	7.51	2.57.	1.64E 00	2.097E 01
140	136.0	1.33E-07	5.07E-13	190.	43.1	7.10	7.08E 09	2.26E 02	0.65	7.58	258.	1.26E 00	2.097E 01
141	133.2	1.16E-07	4.52E-13	189.	43.1	8.76	6.32E 09	2.30E 02	0.64	7.44	256.	1.11E 00	2.097E 01
142	130.4	1.02E-07	4.03E-13	187.	43.1	8.59	5.64E 09	2.58E 02	0.62	7.29	253.	9.81E 01	2.097E 01
143	127.6	8.84E-08	3.58E-13	185.	43.0	8.42	5.02E 09	2.90E 02	0.61	7.14	251.	8.64E-01	2.097E 01
144	124.8	7.67E-08	3.18E-13	183.	43.0	8.25	4.455E 09	3.27E 02	0.60	6.99	248.	7.58E-01	2.097E 01
145	122.0	6.64E-08	2.81E-13	181.	43.2	8.08	3.94E 09	3.69E 02	0.58	6.85	245.	6.64E-01	2.097E 01
146	125.6	5.75E-08	2.36E-13	184.	42.9	5.81	3.32E 09	4.29E 02	0.60	7.07	249.	5.67E-01	2.097E 01
147	129.2	5.00E-08	1.99E-13	186.	42.8	5.98	2.80E 09	5.10E 02	0.62	7.29	253.	4.87E-01	2.097E 01
148	132.8	4.37E-08	1.69E-13	139.	42.7	6.16	2.38E 09	6.11E 02	0.63	7.51	257.	4.20E-01	2.097E 01
149	136.4	3.83E-08	1.44E-13	192.	42.6	6.34	2.04E 09	7.15E 02	0.65	7.74	260.	3.64E-01	2.097E 01
150	140.0	3.37E-08	1.23E-13	194.	42.5	6.52	1.75E 09	8.34F 02	0.67	7.96	264.	3.17E-01	2.097E 01
151	137.2	2.97E-08	1.10E-13	193.	42.3	8.96	1.57E 09	9.27E 02	0.66	7.84	262.	2.82E-01	2.097E 01
152	134.4	2.61E-08	9.86E-14	191.	42.1	8.83	1.41E 09	1.03E 03	0.64	7.72	260.	2.52E-01	2.097E 01
153	131.6	2.29E-08	8.80E-14	190.	42.0	8.70	1.26E 09	1.15E 03	0.63	7.59	258.	2.24E-01	2.097E 01
154	128.9	2.01E-08	7.84E-14	188.	41.8	8.57	1.13E 03	1.29E 03	0.62	7.47	255.	1.98E-01	2.097E 01
155	126.0	1.76E-08	6.97E-14	187.	41.6	8.44	1.01E 09	1.44E 03	0.60	7.34	253.	1.76E-01	2.097E 01
156	124.4	1.53E-08	0.12E-14	186.	41.3	7.64	8.92E 08	1.63E 03	0.60	7.31	253.	1.55E-01	2.097E 01
157	122.8	1.34E-08	5.36E-14	186.	41.0	7.60	7.88E 08	1.85E 03	0.59	7.27	252.	1.36E-01	2.097E 01
158	121.2	1.16E-08	4.70E-14	185.	40.7	7.56	6.95E 08	2.09E 03	0.58	7.22	251.	1.20E-01	2.097E 01
159	119.6	1.01E-08	4.12E-14	185.	40.5	7.53	6.13E 08	2.37E 03	0.57	7.18	250.	1.05E-01	2.097E 01
160	118.0	8.80E-09	3.61E-14	184.	40.2	7.49	5.40E 08	2.69E 03	0.57	7.14	249.	9.26E-02	2.097E 01
161	120.7	7.67E-09	3.06E-14	186.	40.1	6.22	4.60E 08	3.16E 03	0.58	7.32	252.	7.98E-02	2.097E 01
162	123.5	6.70E-09	2.61E-14	189.	40.1	6.37	3.93F 08	3.70E 03	0.59	7.50	255.	6.90E-02	2.097E 01
163	126.2	5.87E-09	2.24E-14	191.	40.0	6.52	3.37E 08	4.32E 03	0.60	7.69	259.	6.99E-02	2.097E 01
164	129.0	5.16E-09	1.92E-14	193.	39.9	6.68	2.90E 08	5.02E 03	0.62	7.87	262.	5.21E-02	2.097E 01
165	131.7	4.56E-09	1.66E-14	195.	39.9	6.83	2.51E 08	5.81E 03	0.63	8.05	264.	4.55E-02	2.097E 01
166	134.4	4.03E-09	1.43E-14	197.	39.8	6.98	2.17E 08	6.71E 03	0.64	8.24	267.	3.99E-02	2.097E 01
167	137.2	3.57E-09	1.25E-14	199.	39.7	7.14	1.89E 08	7.71E 03	0.66	8.42	270.	3.50E-02	2.097E 01
168	139.9	3.18E-09	1.08E-14	201.	39.7	7.29	1.65E 08	8.85E 03	0.67	8.61	273.	3.09E-02	2.097E 01
169	142.6	2.83E-09	9.46E-15	203.	39.6	7.44	1.44E 08	1.01E 04	0.68	8.80	276.	2.73E-02	2.097E 01

TABLE II (Continued)

Calculated quantities

Height (km)	Temp. (K)	Pressure (mb)	Density (gm cc^{-1})	Speed of sound (m sec^{-1})	Molecular weight	Dens. scale (km)	Number density (cc^{-1})	Mean free path (m)	Viscosity (E + 5)	Press. scale (km)	Mean particle velocity (m sec^{-1})	Coll. freq. (sec^{-1})	Columnar mass
170	145.3	2.53E-09	8.29E-15	205.	39.6	7.60	1.26E 08	1.15E 04	0.70	8.98	279.	2.42E-02	2.097E 01
171	148.1	2.27E-09	7.27E-15	207.	39.5	7.75	1.11E 08	1.31E 04	0.71	9.17	282.	2.15E-02	2.097E 01
172	150.9	2.04E-00	6.40E-15	209.	39.4	7.91	9.78E 07	1.49E 04	0.72	9.36	285.	1.91E-02	2.097E 01
173	153.5	1.83E-09	5.65E-15	211.	39.4	8.07	8.64E 07	1.69E 04	0.74	9.55	287.	1.71E-02	2.097E 01
174	156.2	1.65E-09	5.00E-15	213.	39.3	8.22	7.65E 07	1.90E 04	0.75	9.74	290.	1.52E-02	2.097E 01
175	159.0	1.49E-09	4.43E-15	215.	39.2	8.38	6.79E 07	2.14E 04	0.77	9.93	293.	137E-02	2.097E 01
176	161.7	135E-09	3.93E-15	217.	39.2	8.54	6.05E 07	2.41E 04	0.78	10.12	296.	1.23E-02	2.097E 01
177	164.4	1.22E-09	3.50E-15	219.	39.1	8.69	5.39E 07	2.70E 04	0.80	10.31	298.	1.10E-02	2.097E 01
178	167.1	1.11E-09	3.13E-15	220.	39.1	8.85	4.82E 07	3.02E 04	0.82	10.51	301.	9.96E-03	2.097E 01
179	169.8	1.01E-09	2.79E-15	222.	39.0	9.01	4.31E 07	3.37E 04	0.83	10.70	304.	9.00E-03	2.097E 01
180	172.5	9.22E-10	2.50E-15	224.	38.9	9.17	3.87E 07	3.76E 04	0.85	10.90	306.	8.15E-03	2.097E 01
181	175.3	8.42E-10	2.25E-15	226.	38.9	9.33	3.48E 07	4.18E 04	0.86	11.09	309.	7.38E-03	2.097E 01
182	178.0	7.70E10	2.02E-15	228.	38.8	9.49	3.13E 07	4.65E 04	0.88	11.29	312.	6.71E-03	2.097E-01
183	180.7	7.05E-10	1.82E-15	230.	38.8	9.65	2.83E 07	5.15E 04	0.90	11.48	314.	6.10E-03	2.097E 01
184	183.4	6.47E-10	1.64E-15	231.	38.7	9.81	2.56E 07	5.70E 04	0.92	11.68	317.	5.56E-03	2.097E 01
185	186.1	5.94E-10	1.48E-15	233.	38.6	9.97	2.31E 07	6.29E 04	0.94	11.88	319.	5.07E-03	2.097E 01
186	188.8	5.47E-10	1.35E-15	235.	38.6	10.13	2.10E 07	6.94E 04	0.95	12.07	322.	4.64E-03	2.097E 01
188	194.2	4.64E-10	1.11E-15	238.	38.5	10.46	1.73E 07	8.40E 04	0.99	12.47	327.	3.89E-03	2.097E 01
189	196.9	4.29E-10	1.01E-15	240.	38.4	10.62	1.58E 07	9.23E 04	1.01	12.67	330.	3.57E-03	2.097E 01
190	199.6	3.97E-10	9.16E-16	242.	38.3	10.78	1.44E 07	1.01E 05	1.03	12.88	332.	3.28E-03	2.097E 01
191	202.3	3.57E-10	8.36E-16	243.	38.3	10.95	1.31E 07	1.11E 5	1.05	13.08	335.	3.02E-03	2.097E 01
192	205.0	3.40E-10	7.63E-16	245.	38.2	11.11	1.20E 07	1.21E 05	1.06	13.28	337.	2.78E-03	2.097E 01
193	207.7	3.16E-10	6.98E-16	247.	38.1	11.27	1.10E 07	1.32E 05	1.07	13.48	340.	2.57E-03	2.097E 01
194	210.4	2.93E-10	6.39E-16	248.	38.1	11.44	1.01E 07	1.44E 05	1.08	13.60	342	2.37E-03	2.097E 01
195	213.1	2.73E-10	5.86E-16	250.	38.0	11.60	9.28E 06	1.57E 05	1.09	13.89	344.	2.20E-03	2.097E 01
196	215.7	2.54E-10	5.38E-16	252.	38.0	11.77	8.53E 06	1.71E 05	1.10	14.10	347.	2.03E-03	2.097E 01
197	215.7	2.54E-10	5.38E-16	252.	38.0	11.77	8.53E 06	1.71E 05	1.10	14.10	347.	2.03E-03	2.097E 01
197	218.4	2.37E-10	4.94E-16	253.	37.9	11.94	7.85E 06	1.85E 05	1.11	14.31	349.	1.88E-03	2.097E 01
198	221.1	2.21E-10	4.55E-16	255.	37.8	12.10	7.24E 06	2.01E 05	1.13	14.51	352.	1.75E-03	2.097E 01
199	223.8	2.06E-10	4.19E-16	256.	37.8	12.27	6.68E 06	2.18E 05	1.14	14.72	354.	1.62E-03	2.097E 01
200	226.5	1.93E-10	3.86E-16	258.	37.7	12.44	6.17E 06	2.36E 05	1.15	14.93	357.	1.51E-03	2.097E 01

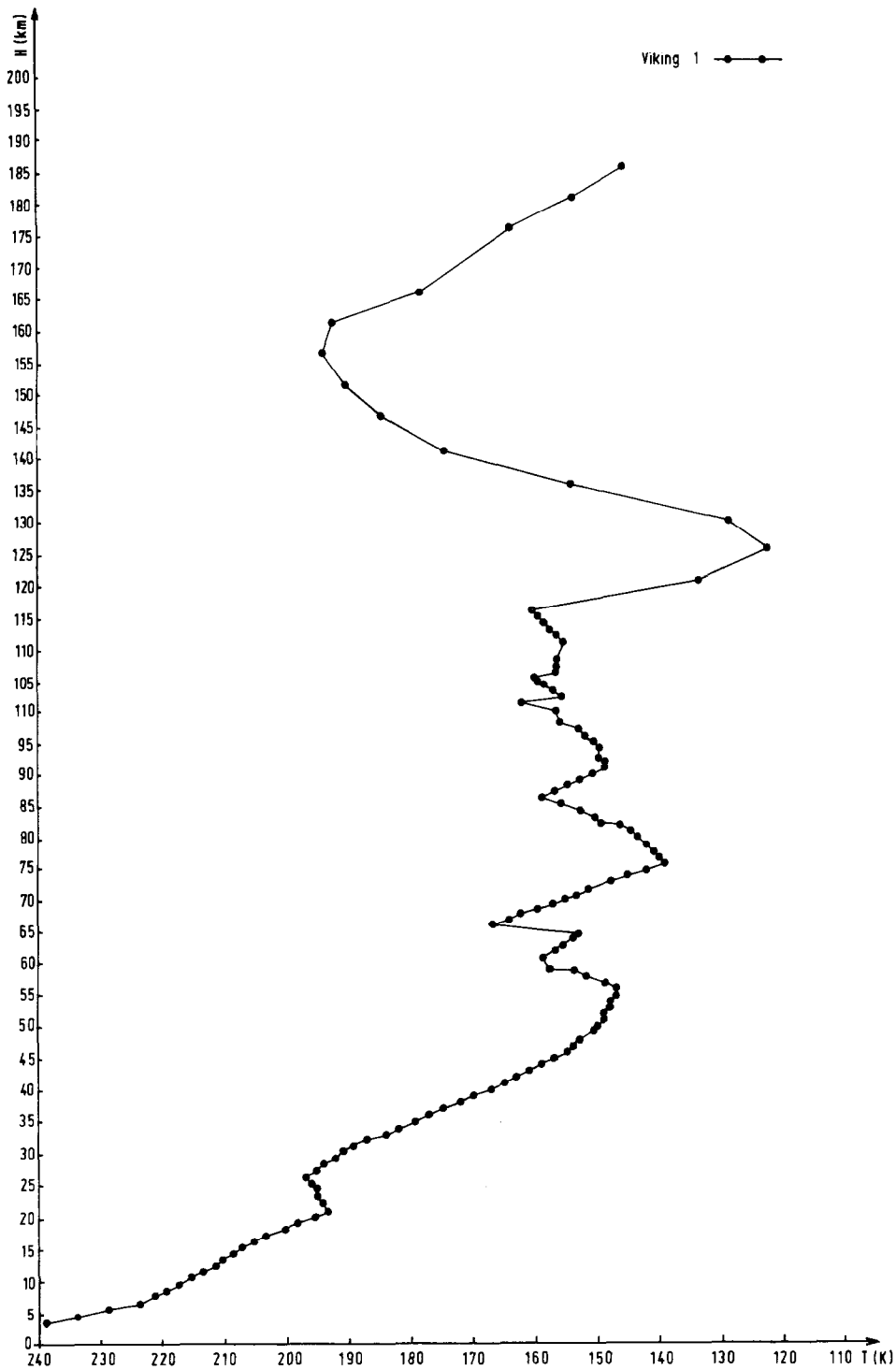

Fig. 1. The temperature versus altitude (Viking 1).

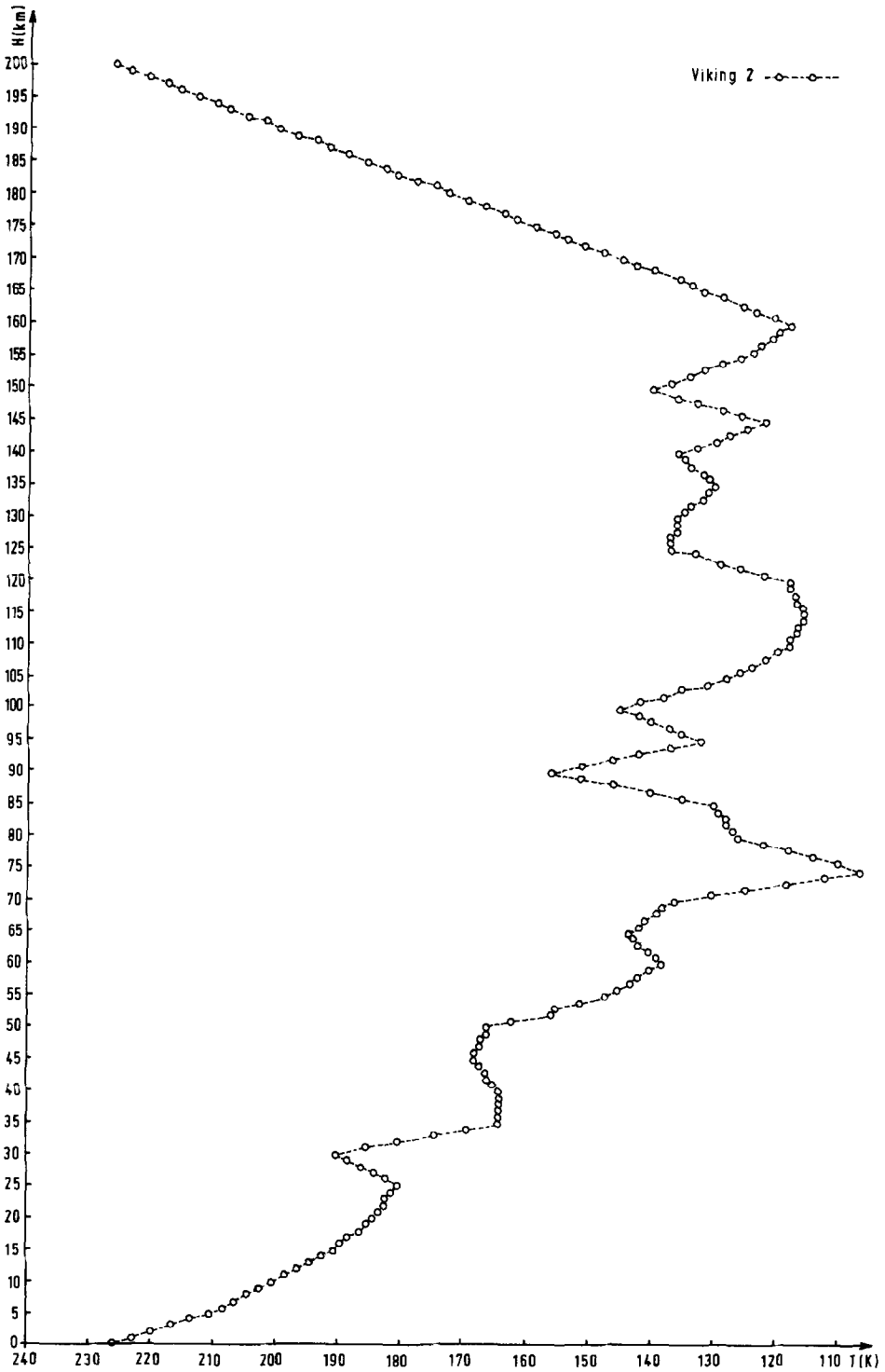

Fig. 2. The temperature versus altitude (Viking 2).

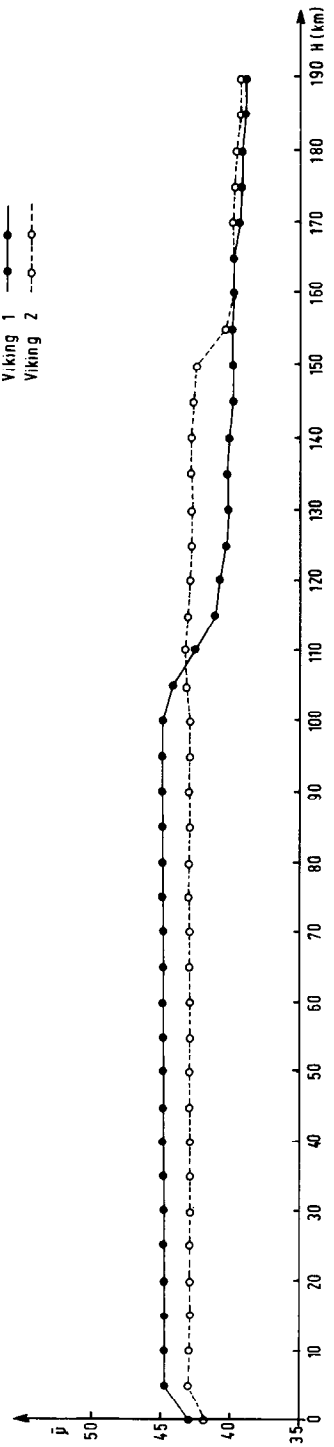

Fig. 3. The molecular weight versus altitude.

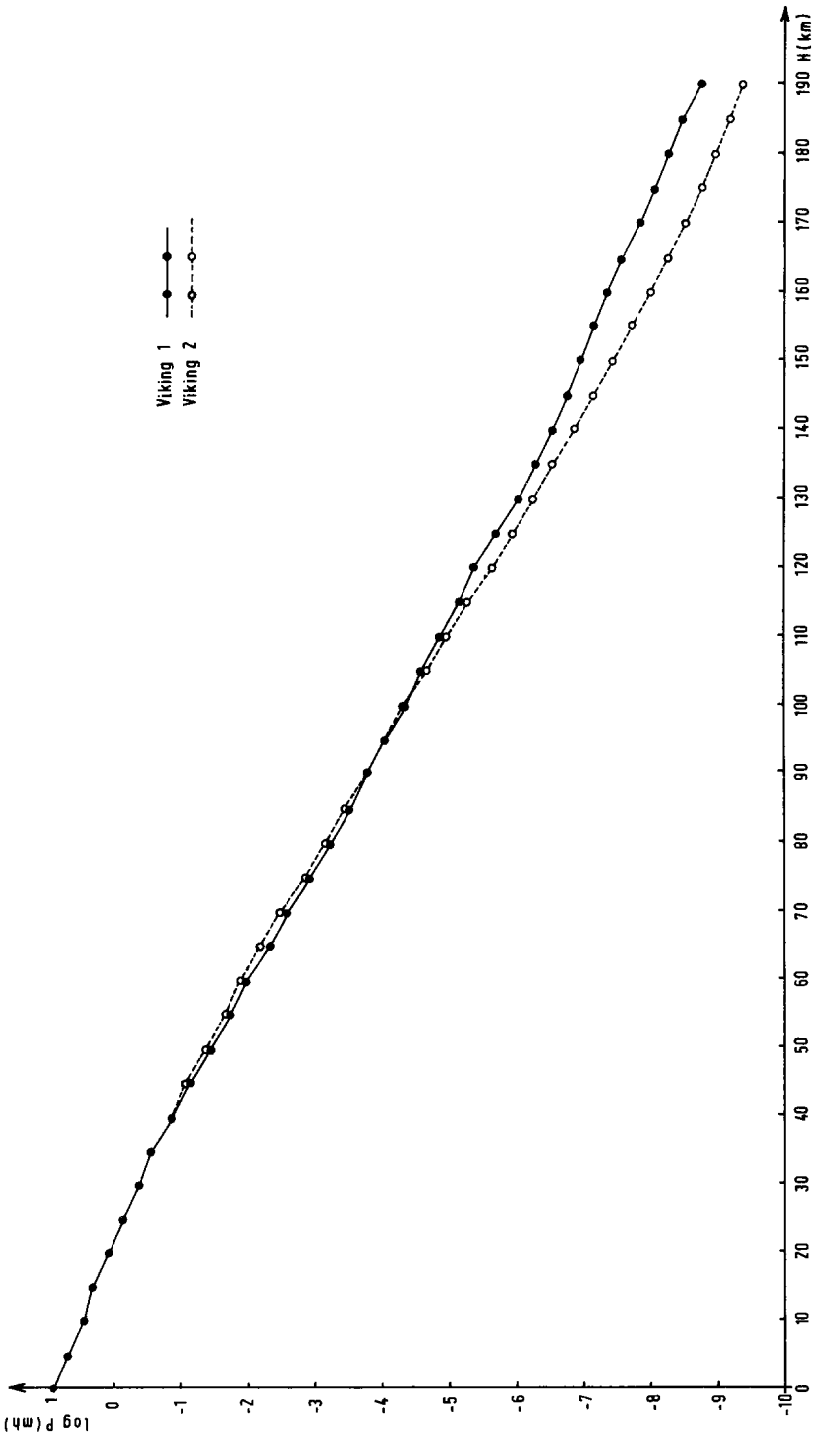

Fig. 4. The pressure versus altitude.

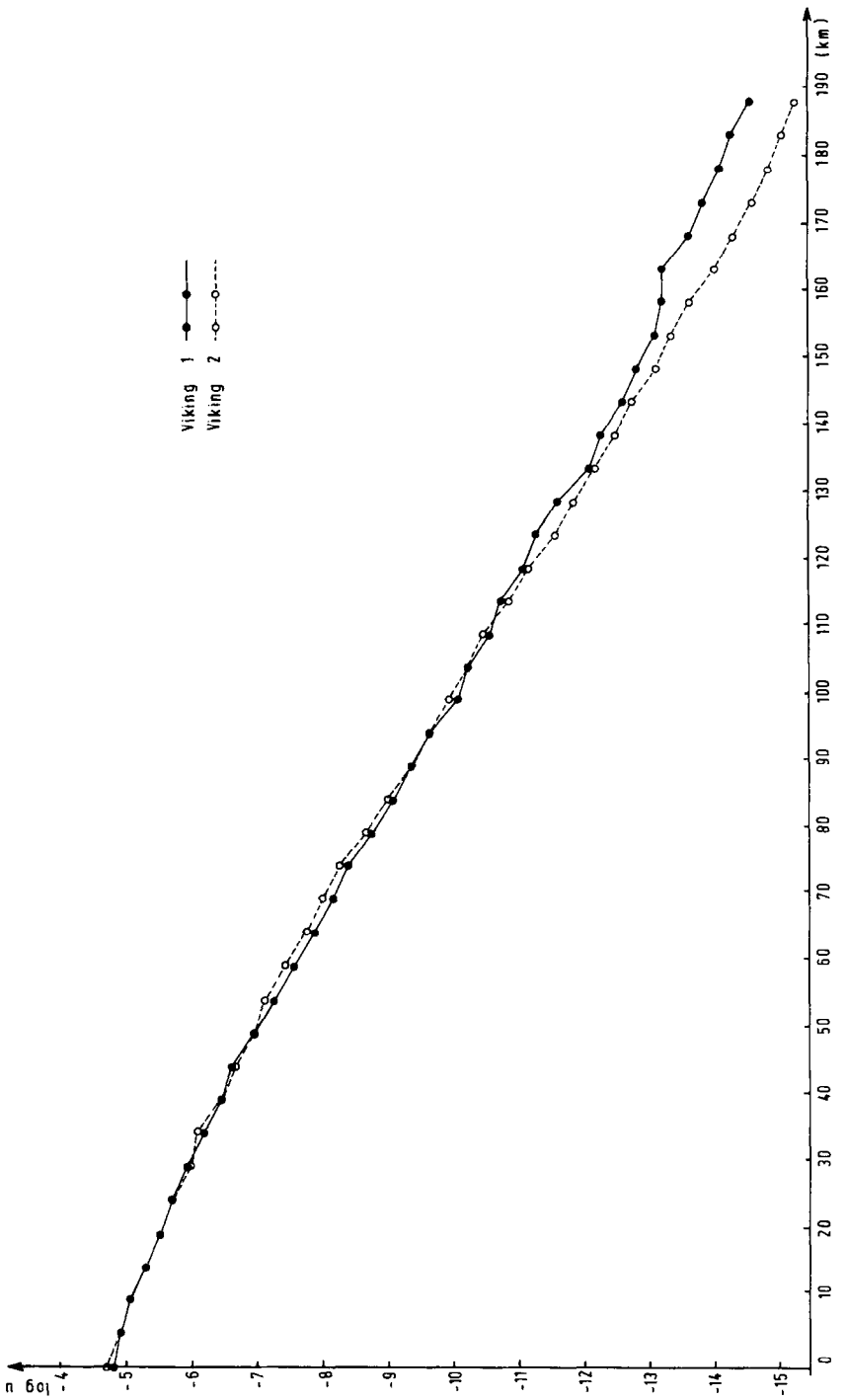

Fig. 5. The density versus altitude.

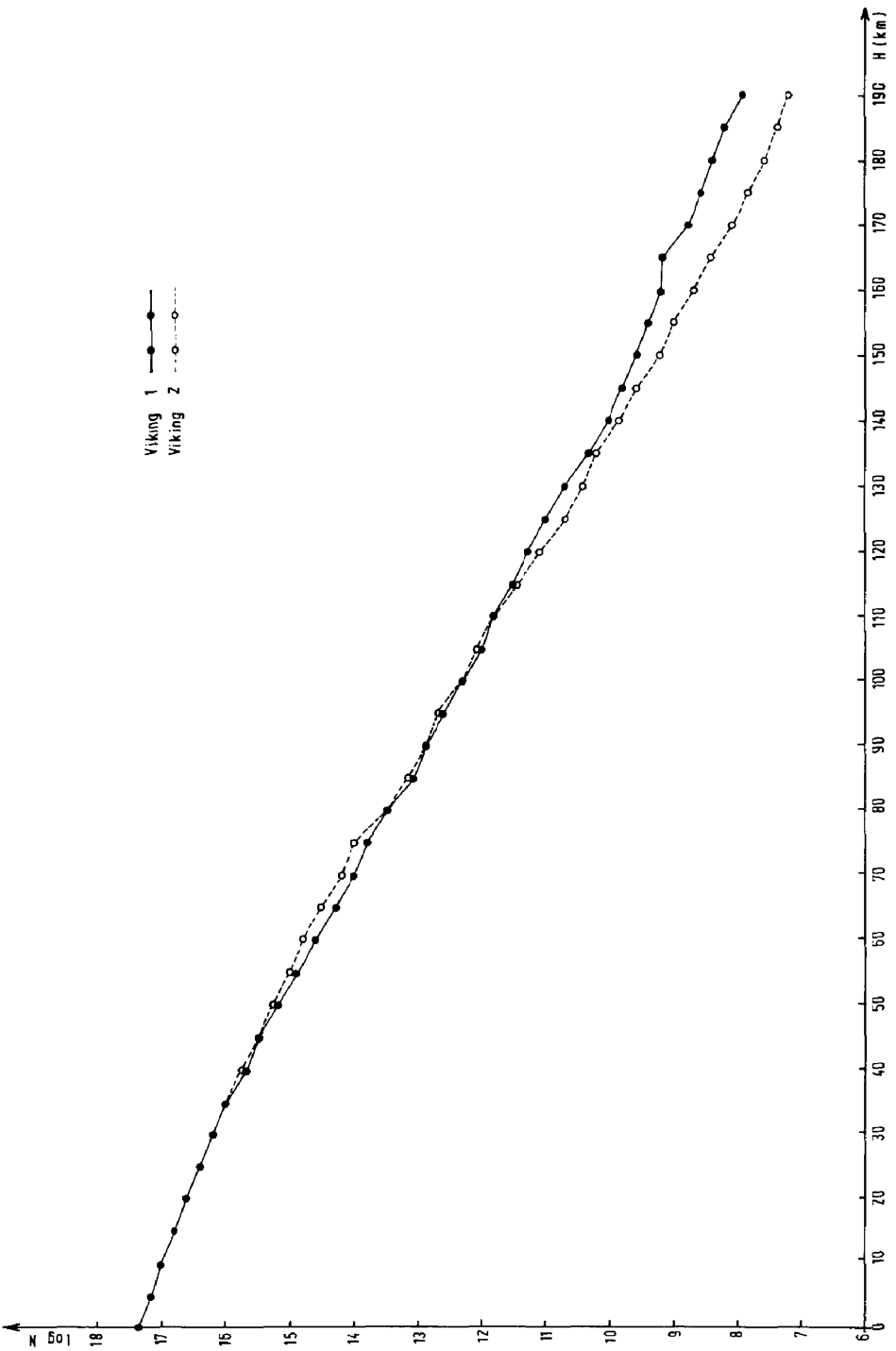

Fig. 6. The number density versus altitude.

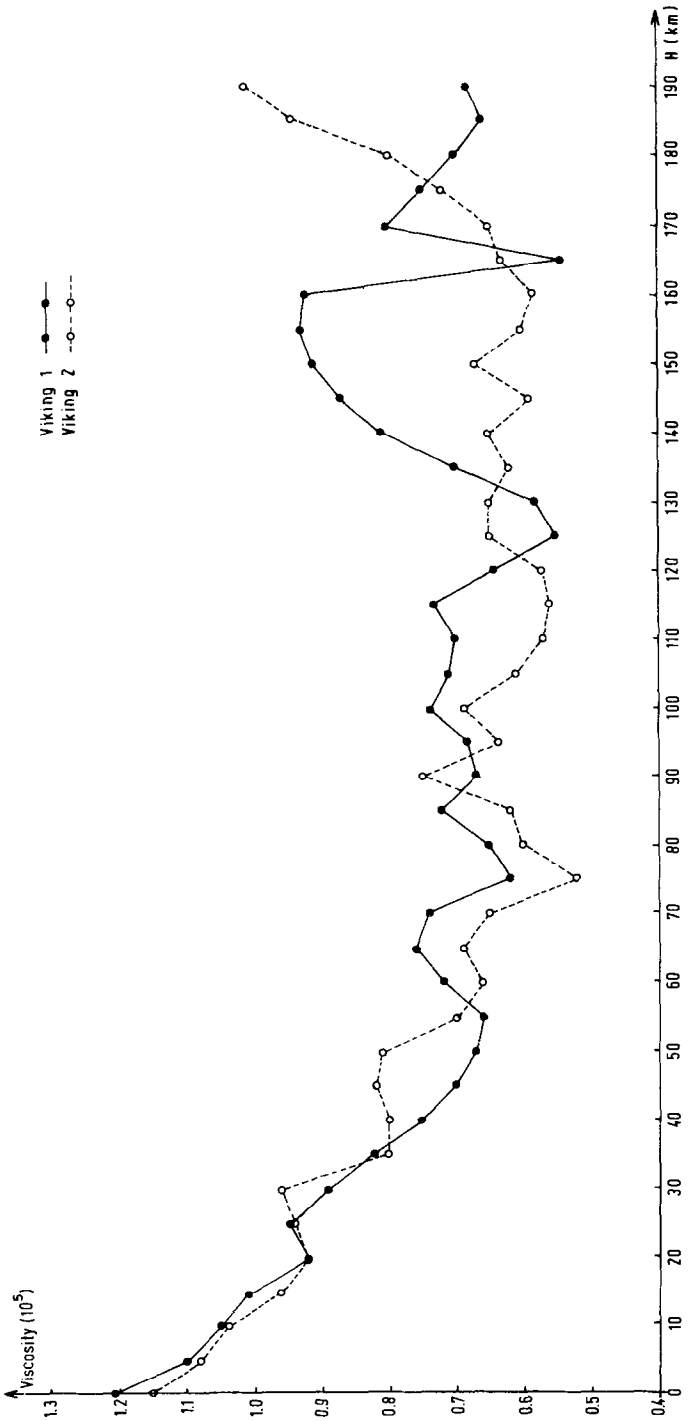

Fig. 7. The viscosity versus altitude.

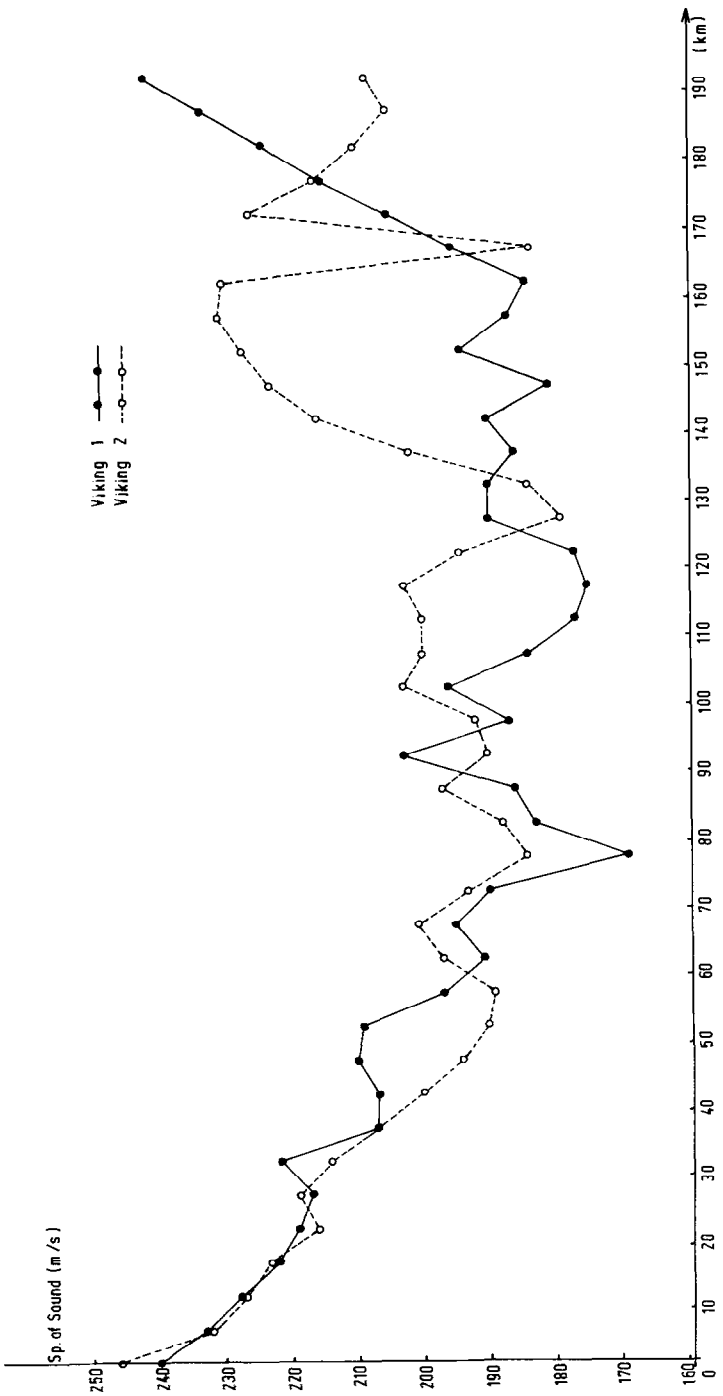

Fig. 8. The speed of sound versus altitude.

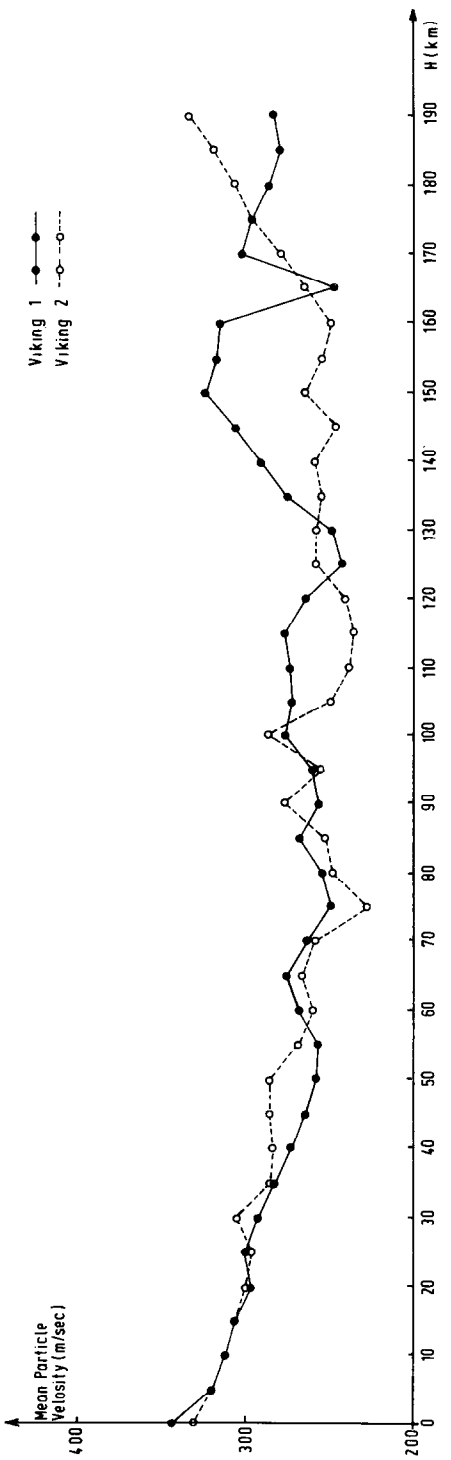

Fig. 9. The mean particle velocity versus altitude.

(3) The radius of the planet Mars measured by Viking 1, $R_0 = 3389$ km and the acceleration of gravity at the surface $g_0 = 375\,\mathrm{cm\,sec^{-2}}$ (Nier, 1977). (4) The mean molecular weight $\bar{\mu}_1 = 43.36$ measured by Viking 1 and $\bar{\mu}_2 = 44.36$ by Viking 2. A third model with $\bar{\mu}_2 = 43.82$ has been computed for Viking 2 but not included in this work. (5) The Viking 1 and 2 measurements of the density (n) of various species of the atmosphere (CO_2, O_2, CO, NO, Ar) as a function of altitude, can be described by the following empirical relation from 100 to 200 km, that has been used to compute $\bar{\mu}$:

$$\log n_{(0)}(h) = a + bh\,,$$

TABLE III

Comparison of the computed and measured pressures $P_{(h)}/P_{(0)}$ from 0 to 100 km altitude

h(km)	Viking 1 Meas. values (Kirk and Seiff, 1977)	Viking 1 Comp. values in this work	Viking 2 Meas. values (Kirk and Seiff, 1977)	Viking 2 Comp. values in this work	Viking Standard model Mean values (Seiff, 1978)	Mars 6 Comp. values (Marov, 1976)
0	1	1	1	1	1	1
2	0.84	0.84	0.84	0.83	—	0.84
4	0.71	0.71	0.70	0.70	0.69	0.71
6	—	0.58	—	0.58	—	0.59
8	—	0.49	—	0.48	0.49	0.49
10	—	0.40	—	0.39	—	0.41
12	—	0.33	—	0.33	0.34	0.33
14	—	0.27	—	0.27	—	0.28
16	—	0.22	—	0.22	0.23	0.22
18	—	0.18	—	0.18	—	0.18
20	—	0.14	—	0.14	0.15	0.15
22	—	0.12	—	0.12	—	0.12
24	—	0.94×10^{-1}	—	0.94×10^{-1}	0.101	0.90×10^{-1}
26	—	0.76×10^{-1}	—	0.76×10^{-1}	—	0.70×10^{-1}
28	0.68×10^{-1}	0.62×10^{-1}	0.51×10^{-1}	0.62×10^{-1}	0.66×10^{-1}	0.59×10^{-1}
32	0.41×10^{-1}	0.40×10^{-1}	0.32×10^{-1}	0.41×10^{-1}	0.43×10^{-1}	0.47×10^{-1}
36	0.26×10^{-1}	0.25×10^{-1}	0.20×10^{-1}	0.26×10^{-1}	0.28×10^{-1}	0.22×10^{-1}
40	0.16×10^{-1}	0.16×10^{-1}	0.13×10^{-1}	0.16×10^{-1}	0.17×10^{-1}	0.13×10^{-1}
44	0.98×10^{-2}	0.92×10^{-2}	0.79×10^{-2}	1.02×10^{-2}	0.47×10^{-2}	0.83×10^{-2}
48	0.58×10^{-2}	0.54×10^{-2}	0.50×10^{-2}	0.65×10^{-2}	0.67×10^{-2}	0.51×10^{-2}
50	0.35×10^{-2}	0.56×10^{-2}	0.31×10^{-2}	0.41×10^{-2}	0.41×10^{-2}	0.31×10^{-2}
56	0.20×10^{-2}	0.18×10^{-2}	0.19×10^{-2}	0.25×10^{-2}	0.25×10^{-2}	0.19×10^{-2}
60	$0.12^{-2}\times10^{-2}$	0.10×10^{-2}	0.11×10^{-2}	0.55×10^{-2}	0.15×10^{-2}	0.12×10^{-2}
64	0.72×10^{-3}	0.63×10^{-3}	0.63×10^{-3}	0.85×10^{-3}	0.90×10^{-3}	0.72×10^{-3}
68	0.45×10^{-3}	0.38×10^{-3}	0.37×10^{-3}	0.50×10^{-3}	0.54×10^{-3}	0.44×10^{-3}
72	0.42×10^{-3}	0.23×10^{-3}	0.21×10^{-3}	0.29×10^{-3}	0.32×10^{-3}	0.27×10^{-3}
76	0.15×10^{-3}	0.13×10^{-3}	0.12×10^{-3}	0.15×10^{-3}	0.19×10^{-3}	0.17×10^{-3}
80	0.88×10^{-4}	0.72×10^{-4}	0.65×10^{-4}	0.78×10^{-4}	0.11×10^{-3}	0.10×10^{-3}
84	0.51×10^{-4}	0.42×10^{-4}	0.37×10^{-4}	0.44×10^{-4}	0.67×10^{-4}	0.64×10^{-4}
88	0.30×10^{-4}	0.25×10^{-4}	0.22×10^{-4}	0.25×10^{-4}	0.40×10^{-4}	0.54×10^{-4}
92	0.18×10^{-4}	0.15×10^{-4}	0.14×10^{-4}	0.30×10^{-4}	0.24×10^{-4}	024×10^{-4}
96	1.05×10^{-5}	0.86×10^{-5}	0.84×10^{-5}	1.44×10^{-5}	1.51×10^{-5}	1.51×10^{-5}
100	0.05×10^{-5}	0.52×10^{-5}	0.51×10^{-5}	0.53×10^{-5}	0.86×10^{-5}	0.93×10^{-5}

where h: is the height above the mean surface of the planet a, b = are given by Nier (1977) for both Viking 1 and Viking 2.

Using the above data we have computed the physical parameters of the Mars atmosphere for Viking 1 and Viking 2, these together with interpolated values of the temperatures and molecular weights are given in Tables I and II. Figures 1–9, represent the variations of some physical parameters with altitude.

4. Conclusions

The computed pressures and densities of Tables I and II are compared in Tables III, IIIa and IV, IVb, (a) with the values of pressures and densities that Marov (1976) has computed by use of the Mars 6 measurements; (b) with the computed values of pressures and densities of the standard model (Seiff, 1978).

For the comparison of our computed pressures $P_{(h)}$ with the measured one or with the previously calculated pressures (Seiff, 1978) we have used the ratio $P_{(h)}/P_{(0)}$, where $P_{(h)}$ is the pressure at altitude h; and $P_{(0)}$ is the pressure near the surface.

TABLE IIIa

Comparison of the computed and measured pressures $P_{(h)}/P_{(0)}$ from 100 to 200 km altitude

VIKING 1			VIKING 2		
h (km)	Meas. values (Kirk and Seiff, 1977)	Comp. values	h (km)	Meas. values (Kirk and Seiff, 1977)	Comp. values
104	0.40×10^{-5}	0.32×10^{-5}	104	0.30×10^{-5}	0.31×10^{-5}
108	0.24×10^{-5}	0.20×10^{-5}	108	0.17×10^{-5}	0.17×10^{-5}
112	0.15×10^{-5}	0.12×10^{-5}	112	0.89×10^{-6}	0.92×10^{-6}
116	0.91×10^{-5}	0.77×10^{-6}	116	0.48×10^{-6}	0.49×10^{-6}
120	0.54×10^{-6}	0.47×10^{-6}	120	0.25×10^{-6}	0.26×10^{-6}
130	1.15×10^{-7}	1.11×10^{-7}	128	0.81×10^{-7}	0.85×10^{-7}
135	0.55×10^{-7}	0.58×10^{-7}	132	0.49×10^{-7}	0.50×10^{-7}
140	0.31×10^{-7}	0.34×10^{-7}	136	0.29×10^{-7}	0.29×10^{-7}
145	0.19×10^{-7}	0.21×10^{-7}	140	0.17×10^{-7}	0.17×10^{-7}
150	0.12×10^{-7}	0.13×10^{-7}	144	0.10×10^{-7}	0.98×10^{-8}
155	0.76×10^{-8}	0.84×10^{-8}	148	0.64×10^{-8}	0.56×10^{-8}
160	0.50×10^{-8}	0.54×10^{-8}	152	0.39×10^{-8}	0.33×10^{-8}
165	0.32×10^{-8}	0.31×10^{-8}	156	0.23×10^{-8}	0.19×10^{-8}
170	0.21×10^{-8}	0.18×10^{-8}	160	0.141×10^{-8}	0.11×10^{-8}
175	0.13×10^{-8}	0.11×10^{-9}	162	0.108×10^{-8}	0.86×10^{-8}
180	0.65×10^{-9}	0.64×10^{-9}	166	0.64×10^{-9}	0.53×10^{-9}
185	0.53×10^{-9}	0.37×10^{-9}	170	0.39×10^{-9}	0.32×10^{-9}
190	0.33×10^{-9}	0.21×10^{-9}	174	0.25×10^{-9}	0.22×10^{-9}
195	0.22×10^{-9}	0.22×10^{-9}	—	—	—
200	0.14×10^{-9}	0.06×10^{-9}			

TABLE IV

Comparison of the computed and measured densities

h (km)	VIKING 1		VIKING 2			
	Measured densities ($kg\ m^{-3}$) (Kirk and Seiff 1977)	Computed densities ($kg\ m^{-3}$)	Measured densities ($kg\ m^{-3}$) (Kirk and Seiff 1977)	Computed densities ($kg\ m^{-3}$)	Viking computed densities (Seiff, 1978) Mean model	Mars 6 computed densities (Marov, 1976)
0	1.68×10^{-2}	1.67×10^{-2}	1.81×10^{-2}	1.81×10^{-2}	1.67×10^{-2}	1.36×10^{-2}
2	1.45×10^{-2}	1.49×10^{-2}	1.53×10^{-2}	1.56×10^{-2}	—	1.17×10^{-2}
4	1.26×10^{-2}	1.31×10^{-2}	1.29×10^{-2}	1.34×10^{-2}	1.16×10^{-2}	1.00×10^{-2}
8	—	9.54×10^{-3}	—	9.62×10^{-3}	8.49×10^{-2}	7.30×10^{-3}
12	—	6.69×10^{-3}	—	6.79×10^{-3}	6.06×10^{-3}	5.25×10^{-3}
16	—	4.64×10^{-3}	—	4.71×10^{-3}	4.23×10^{-3}	3.71×10^{-3}
20	—	3.21×10^{-3}	—	3.19×10^{-3}	2.94×10^{-3}	2.57×10^{-3}
24	—	2.06×10^{-3}	—	2.12×10^{-3}	2.00×10^{-3}	1.75×10^{-3}
28	1.38×10^{-3}	1.38fl10^{-3}	1.22×10^{-3}	1.35×10^{-3}	1.35×10^{-3}	1.17×10^{-3}
32	3.34×10^{-4}	9.31×10^{-4}	7.92×10^{-4}	9.28×10^{-4}	$9.0 \times 10^{\times 4}$	7.35×10^{-4}
36	6.25×10^{-4}	6.22×10^{-4}	5.04×10^{-4}	6.47×10^{-4}	5.95×10^{-4}	4.48×10^{-4}
40	4.10×10^{-4}	4.05×10^{-4}	3.14×10^{-4}	4.06×10^{-4}	3.91×10^{-4}	2.73×10^{-4}
44	2.65×10^{-4}	2.56×10^{-4}	1.94×10^{-4}	2.51×10^{-4}	2.51×10^{-4}	1.67×10^{-4}
48	1.57×10^{-4}	1.55×10^{-4}	1.20×10^{-4}	1.60×10^{-4}	1.60×10^{-4}	1.02×10^{-4}
52	9.56×10^{-5}	9.13×10^{-5}	8.23×10^{-5}	1.06×10^{-4}	1.01×10^{-4}	6.25×10^{-5}
56	5.96×10^{-5}	5.18×10^{-5}	5.27×10^{-5}	6.99×10^{-5}	6.25×10^{-5}	3.83×10^{-5}
60	3.19×10^{-5}	2.84×10^{-5}	3.26×10^{-5}	4.31×10^{-5}	3.84×10^{-5}	2.36×10^{-5}
64	1.88×10^{-5}	1.65×10^{-5}	1.82×10^{-5}	2.43×10^{-5}	2.33×10^{-5}	1.44×10^{-5}
68	1.17×10^{-5}	1.04×10^{-5}	1.07×10^{-5}	1.47×10^{-5}	1.41×10^{-5}	8.88×10^{-6}
72	7.70×10^{-5}	6.13×10^{-6}	6.71×10^{-6}	9.41×10^{-6}	0.65×10^{-5}	5.46×10^{-6}
76	4.66×10^{-6}	3.96×10^{-6}	3.83×10^{-6}	5.47×10^{-6}	5.03×10^{-6}	3.37×10^{-6}
80	2.57×10^{-6}	2.15×10^{-6}	2.11×10^{-6}	2.53×10^{-6}	3.00×10^{-6}	3.54×10^{-6}
84	1.40×10^{-6}	1.16×10^{-6}	1.06×10^{-6}	1.38×10^{-6}	1.79×10^{-6}	3.53×10^{-6}
88	8.33×10^{-7}	7.08×10^{-7}	5.79×10^{-7}	5.07×10^{-6}	1.07×10^{-6}	1.28×10^{-6}
92	5.39×10^{-7}	4.23×10^{-7}	3.63×10^{-7}	4.29×10^{-7}	0.65×10^{-6}	7.94×10^{-7}
96	2.88×10^{-7}	2.40×10^{-7}	2.30×10^{-7}	2.72×10^{-7}	3.87×10^{-7}	4.91×10^{-7}
100	1.67×10^{-7}	1.33×10^{-7}	1.42×10^{-7}	1.49×10^{-7}	2.33×10^{-7}	1.89×10^{-7}

For the comparison with standard model, our values have been compared with the average values

$$\frac{P_{(h)}}{P_{(0)}} = \frac{1}{2}\left(\frac{P_{(h)}}{P_{(0)}}_{warm} + \frac{P_{(h)}}{P_{(0)}}_{cool}\right).$$

The calculated pressure in this work are very closed to the measured by Viking 1 and 2 except for the altitude 44–52 km, 64–72 km and 80–88 km. For these altitudes the computed by Seiff and Marov values are also in disagreement with the measured one.

TABLE IVa

Comparison of the computed and measured densities (kg m^{-3})

VIKING 1			VIKING 2		
h (k)	Computed densities in this work	Measured densities (Kirk and Seiff, 1977)	h (km)	Computed densities in this work	Measured densities (Kirk and Seiff, 1977)
104	8.47×10^{-8}	1.06×10^{-7}	104	9.69×10^{-8}	9.36×10^{-8}
108	5.25×10^{-8}	6.59×10^{-8}	108	5.80×10^{-8}	5.62×10^{-8}
112	3.19×10^{-8}	3.95×10^{-8}	112	3.24×10^{-8}	3.08×10^{-8}
116	1.99×10^{-8}	2.42×10^{-8}	116	1.73×10^{-8}	1.69×10^{-8}
120	1.32×10^{-8}	1.60×10^{-8}	120	9.06×10^{-9}	8.86×10^{-9}
133	3.50×10^{-9}	3.80×10^{-9}	128	2.56×10^{-9}	2.31×10^{-9}
135	1.50×10^{-9}	1.59×10^{-9}	132	1.53×10^{-9}	1.43×10^{-9}
140	7.59×10^{-10}	7.25×10^{-10}	136	8.99×10^{-10}	8.65×10^{-10}
145	4.36×10^{-10}	4.10×10^{-10}	140	5.07×10^{-10}	4.90×10^{-0}
150	2.63×10^{-10}	2.41×10^{-10}	144	3.18×10^{-10}	2.75×10^{-10}
155	1.64×10^{-10}	1.48×10^{-10}	148	1.69×10^{-10}	1.81×10^{-10}
160	1.06×10^{-10}	9.35×10^{-11}	152	9.86×10^{-11}	1.13×10^{10}
165	9.97×10^{-11}	6.27×10^{-11}	156	6.12×10^{-11}	6.82×10^{-11}
170	3.75×10^{-11}	4.21×10^{-11}	160	3.61×10^{-11}	4.15×10^{-11}
175	2.42×10^{-11}	2.77×10^{-11}	162	2.61×10^{-11}	3.23×10^{-11}
180	1.53×10^{-11}	1.00×10^{-11}	166	1.43×10^{-11}	1.90×10^{-11}
185	9.38×10^{-12}	1.13×10^{-11}	170	8.29×10^{-12}	1.07×10^{-11}
190	5.26×10^{-12}	6.62×10^{-12}	174	5.00×10^{-12}	5.80×10^{-12}
195	3.47×10^{-12}	4.70×10^{-12}			
200	1.91×10^{-12}	3.30×10^{-12}			

The above differences can be attributed to the meteorologic phenomena that appear in the Mars atmosphere (James, 1977).

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