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DEPARTMENT OF COMMERCE
WEATHER BUREAU

METEOROLOGICAL SATELLITE LABORATORY
REPORT NO. 10

Infrared Flux and Surface Temperature Determinations from TIROS Radiometer Measurements

WASHINGTON, D. C.
AUGUST 1962

UNITED STATES DEPARTMENT OF COMMERCE
WEATHER BUREAU
WASHINGTON

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ERRATA

Page 6. Footnote at bottom of page should read: "*TIROS IV did not carry a channel 4 radiometer".

Page 9. Last line should read: "Data for TIROS II, III and IV are presented".

Page 10. Legend for solid points should read: "Observed values with $P_e = 0.015 \sim 0.023$".

Page 20. Legend should read: "Figure 5j. Interval 775-800 cm^{-1}".

Because of an error in computer programming, all values of intensity in the 9.6 μ ozone band, interval 36 (948-1100 cm^{-1}), were incorrect, except those for $\Theta = 0$. As a result, it will be necessary to recompute the intensities and to determine new values for many of the constants given in this report; in addition, the values in Appendix B will require revision. A correction will be issued soon as a supplement to this report. It is emphasized, however, that changes will be small in most instances. Delete the last sentence of the second paragraph on page 39.

The surface values in the Appendix A profile listings are missing for atmospheric models 11, 20, 49, 50 and 51, all with clear skies. Although these models are incomplete, the effect is that of inserting overcast cloud tops at the first listed levels; the intensities given for these models in Appendix B are correct for such overcast conditions. The surface levels of models 52 and 100 are also missing, but clouds at higher levels leave the radiation values unaffected. Appropriate corrections will be included in the supplement.

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U. S. WEATHER BUREAU

F. W. Reichelderfer, Chief

METEOROLOGICAL SATELLITE LABORATORY

REPORT NO. 10

INFRARED FLUX AND SURFACE TEMPERATURE DETERMINATIONS FROM TIROS RADIOMETER MEASUREMENTS

by D. Q. Wark, G. Yamamoto and J. Lienesch

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INFRARED FLUX AND SURFACE TEMPERATURE DETERMINATIONS FROM TIROS RADIOMETER MEASUREMENTS

ABSTRACT

The TIROS II meteorological satellite carried a multiple channel radiometer of medium resolution (about 5 degrees). Two of the channels were designed to measure the upward radiation in the "window" at 8-12 microns, and over the broad spectral region of 7-30 microns. To deduce surface temperatures and total upward flux values from the measurements in these two channels, additional operations must be carried out on the data. As a basis for these transformations, the specific spectral intensity over the entire infrared region was calculated at five zenith angles for each of 106 atmospheric models. In the 7-30 micron channel, an empirical relation was found to transform measured values to total intensity; and, from the limb-darkening exhibited by the 106 individual models, a method of calculating flux was formulated; in this case, the results contain inaccuracies of only about two percent attributable to the method used. In the 8-12 micron channel, the influence of ozone and water vapor was determined for the model atmospheres, and curves were developed for the direct transformation from measured values to surface temperature; however, if a knowledge of the water vapor content of the viewed column is lacking, errors in the inferred surface temperature can range from near zero to ten degrees or more. A series of radiative flux maps over Europe, calculated from the 7-30 micron data, have values whose magnitudes are in accord with other estimates and measurements. Corrected satellite 8-12 micron data are compared with shelter temperatures for several stations in a cloudless area; the range of the satellite data from 3.5 degrees higher to 5.0 degrees lower than the shelter data is discussed.

I. INTRODUCTION

Radiometers of relatively high angular resolution and low spectral resolution have been designed to measure from satellites the radiation emanating from the earth and the atmosphere. Their purpose is to provide measurements of temperature and of the heat balance for meteorological use. However, the desired quantities are not immediately derivable from the measurements, but require consideration of the spectral response of the instruments and of the processes giving rise to the radiation, as will be shown. In the ensuing discussion, the TIROS II radiometers and the measurements obtained by them are cited, but the principles are applicable to any similar instrument.

The satellites, TIROS II, III, and IV each carried a multiple channel radiometer with a resolution of about five degrees. Details of this experiment are discussed elsewhere (Astheimer, DeWaard and Jackson, [1] ; Hanel and Wark, [15] . Essentially, there were five broad band channels, two at short (solar) wavelengths and three at long (terrestrial) wavelengths. The earth was scanned by the radiometer, mounted at 45 degrees from the spin axis of the satellite; progressive scan swaths can be reconstructed as radiation maps. The response versus frequency for each channel is shown by Hanel and Wark.

The radiation data from a channel of the TIROS radiometer contain the spectral characteristics of both the filter and the radiation; although each

is variable through the spectrum, the filter remains constant while the spectral shape of the radiation changes with the meteorological conditions. The two are not yet separated. In addition, each radiometer response does not necessarily cover a spectral band interval which is necessary and sufficient for the deduction of meteorologically significant quantities. These problems are examined in this paper, and methods of deducing desired quantities, specifically the outgoing infrared flux and the surface temperature, are explored. The discussion will be confined to channels 2 and 4, which are sensitive in the ranges 700-1400 cm.$^{-1}$ and 300-1400 cm.$^{-1}$, respectively.

II. ACCOUNTING FOR THE INFLUENCE OF THE FILTERS

Because of the rather high angular resolution of the TIROS radiometer, the sensed radiation comes from a small area within which the direction of propagation is nearly constant relative to the local vertical; dimensionally, then, specific intensity is implicit in a measurement. In addition, however, the radiation is filtered before arriving at the sensor. Therefore, the quantity measured by the TIROS radiometer is

$$I_\varphi(\vartheta) = \int_0^\infty I_\nu(\vartheta)\,\varphi_\nu\,d\nu = \int_{\nu_1}^{\nu_2} I_\nu(\vartheta)\,\varphi_\nu\,d\nu \qquad (1)$$

where $I_\varphi(\vartheta)$ is the total specific intensity passing through a filter in the direction ϑ, the zenith angle; $I_\nu(\vartheta)$ is the outgoing intensity from the earth's atmosphere at wave number ν; φ_ν is the filter transmittance; and the limiting wavenumbers ν_1, and ν_2 determine an interval outside which $\varphi_\nu = 0$. By the mean value theorem for the integrals, (1) can be written as

$$I_\varphi(\vartheta) = \varphi \int_{\nu_1}^{\nu_2} I_\nu(\vartheta)\,d\nu \qquad (2)$$

where φ defined by (2), is the average value of φ_ν between ν_1 and ν_2. The integral $\int_{\nu_1}^{\nu_2} I_\nu(\vartheta)d\nu$ is a meteorologically significant quantity and should be estimated from the observed data. However, since φ depends not only on ν_1, and ν_2, but also on the functional shape of $I_\nu(\vartheta)$, a unique relation between $I_\varphi(\vartheta)$ and $\int_{\nu_1}^{\nu_2} I_\nu(\vartheta)d\nu$ does not exist theoretically. This is an inevitable consequence of using a broad band filter with a varying transmittance with respect to wave number. Practically, if the variability of φ with respect to the different values of $\int_{\nu_1}^{\nu_2} I_\nu(\vartheta)d\nu$ which we encounter in the earth's atmosphere is tolerably small, then we can evaluate $\int_{\nu_1}^{\nu_2} I_\nu(\vartheta)d\nu$ within reasonable limits. Furthermore, since the filter transmittance drops rapidly at both ends, it is possible to use the following relation instead of (2):

$$I_\varphi(\vartheta) = \varphi' \int_{\nu_1'}^{\nu_2'} I_\nu(\vartheta)\,d\nu \qquad (3)$$

where $\nu_1' > \nu_1$, and $\nu_2' < \nu_2$. The new average filter transmittance, φ', is made as invariable as possible with varying atmospheric conditions by suitably choosing ν_1' and ν_2'. In order to do this, it is necessary to calculate the outgoing intensities with and without a filter for as many different atmospheric conditions as possible and to determine from these the limits ν_1' and ν_2'.

Next, in order to be able to evaluate the outgoing intensity for the interval outside the limits of our filter transmittance, it is necessary to find some empirical relationship between this quantity and the observed quantity.

In studying these problems, the outgoing intensity was calculated for 106 atmospheric models at five zenith angles ($\theta = 0^\circ$, 20°, 45°, 60°, and 78.5°). The models were taken from radiosonde data from all latitudes and seasons, 59 of them with clear sky conditions and 47 with overcast conditions at different cloud altitudes (clouds are assumed to be black). All the soundings used went to at least 25 mb. and the temperatures were extrapolated parallel to a standard atmosphere (Minzner et al., [17]) to the pressure 0.1 mb. Humidity was extrapolated to conform in general to observed stratospheric values (See, for example, the summary by Barclay, et al., [3]) with constant frost points above 100 mb. and constant mixing ratios above 10 mb. The ozone distributions for different latitudes and seasons were assumed from the work of Dütsch [8] and of Craig [5].

Appendix A lists the pressure, temperature, water vapor, and ozone distributions of the 106 atmospheric models which were used in the calculation of the outgoing intensity. In addition, the sky condition and total water vapor and ozone masses are listed with each model. The location and time of the radiosonde release are also presented.

III. TRANSMISSION

To calculate the outgoing radiation, the spectrum was divided into 77 intervals, most of which are 25 $cm.^{-1}$ wide.

The transmission for each interval of the H_2O bands, except the window region, was expressed graphically as shown in figure 1 with use of two parameters; $l_\nu u/2$ and P_e , where

$$u = \frac{1}{g}\int_0^p q\, dp \tag{4}$$

$$P_e = \frac{\int_0^u p\, du}{p_0 u} = \frac{\int_0^u \alpha\, du}{\alpha_0 u} \tag{5}$$

and l_ν is the generalized absorption coefficient defined by Elsasser [9], g is the acceleration due to gravity, q (in $gm.kg.^{-1}$) is the mixing-ratio, p is the pressure, p_0 is the standard pressure (1013.25 mb.), and α and α_0 are the half-width at p and p_0 respectively. The shape of the transmission curve for $P_e = 1$ is based on Cowling's "universal" curve [4], which, according to him, can be used with adequate accuracy for every 25 $cm.^{-1}$ intervals of the H_2O spectrum. Later Goody [12] has shown that the transmission due to his random model agrees well with this curve, and Yamamoto [27] has used it in constructing his radiation chart. In order to express the pressure effect

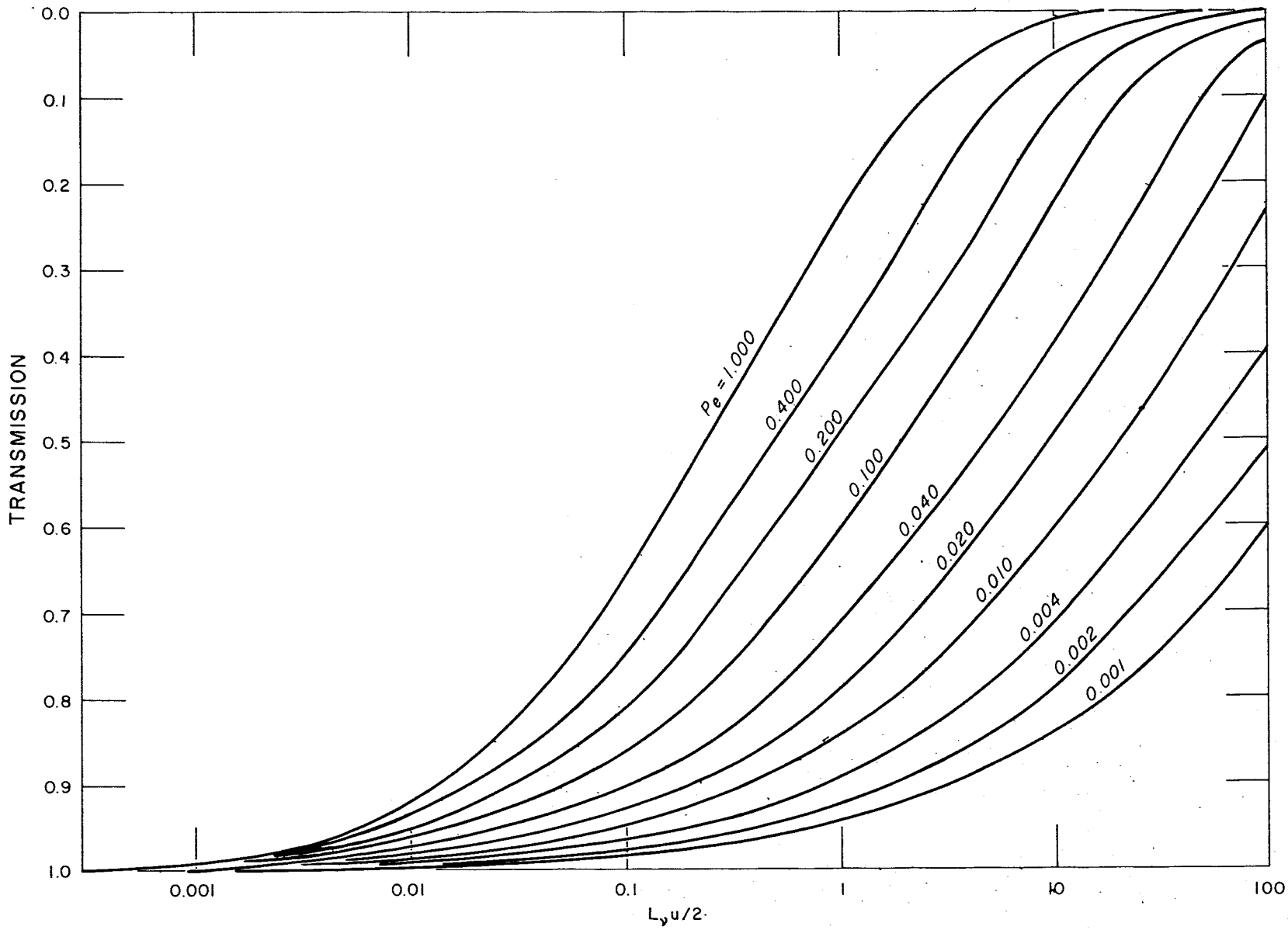


Figure 1. Transmission curves of the water vapor bands, except in the window region. Curves for different values of P_e are shown as a function of $\ell_\nu u/2$.

reasonably (refer to Yamamoto and Sasamori [30]) the transmission curves with different values of P_e are shown in figure 1. Construction of these curves is based on measurements of Howard, Burch, and Williams [16] in the 6.3 micron H_2O band. The value of ℓ_ν for each 25 $cm.^{-1}$ interval is shown in Table 1. The values for the rotational band are those compiled by Yamamoto [27], based on Yamamoto and Onishi's theoretical values [28], corresponding to T = 260K on the whole rotational band and Weber and Randall's measurements [25] for the 400 to 600 $cm.^{-1}$ interval*. The values of ℓ_ν for the 6.3 micron band are newly evaluated based on measurements carried out in our laboratory (unpublished) and referring to measurements of Howard, Burch, and Williams [16] and also of Fowle [10].

For the window region from 778 to 1232 $cm.^{-1}$ the outgoing radiation was first calculated on the basis of data and a formula proposed by Roach and Goody [21]. However, because this procedure is too sophisticated for practical application, the use of the formula was discontinued. It was found instead that the outgoing intensity calculated by the Roach and Goody formula can be approximated fairly well by using the fractional absorption curves shown in figure 3, which are very close to the exponential curve and which are expressed as a function of the effective optical path u_e given by

$$u_e = \frac{1}{g}\int_0^p q \frac{p}{p_0}\, dp \tag{6}$$

The transmission values for each interval in the window region are shown in figure 3.

The transmission values of the 9.6 micron ozone band for the interval from 948 to 1100 $cm.^{-1}$ were evaluated from the measurements of Walshaw [24] and were expressed as functions of the ozone path length $u(O_3)$, and the pressure parameter $P_e(O_3)$, where

$$u(O_3) = \int_0^p \rho(O_3)\, dp \tag{7}$$

---

*After completion of the computation of the outgoing intensity, a recent investigation of the absorption of the rotational band of H_2O by Palmer [20] was noted. He measured the fractional absorption of the rotational band between 200 and 500 $cm.^{-1}$. The value of p^*u for 50 percent absorption was taken by him as a measure of the band intensity and plotted as a function of the wave number as shown in figure 2; here u is the vapor optical path in gm. $cm.^{-2}$ and $p^* = p_t + b p_w$ with p_t the total pressure and p_w the partial pressure of water vapor. Therefore in order to compare our transmission with Palmer's, the value of u for 50 percent absorption for $P_e = 1$ assuming T = 300K was obtained from Yamamoto's paper [27] and is shown in figure 2. It will be seen that Palmer's experimental values and our values based on theoretical calculation agree fairly well.

TABLE 1. GENERALIZED ABSORPTION COEFFICIENT OF THE H_2O BANDS AND TRANSMITTANCE OF FILTERS

INTERVAL	Band Limits (cm^{-1})	Band Center (cm^{-1})	$\Delta\nu$ (cm^{-1})	ℓ_ν (T= 260 K)	Transmittance: TIROS II Channel 2	TIROS II Channel 4	TIROS III Channel 2	TIROS III Channel 4	TIROS IV* Channel 2
1	0-25	12.5	25	12					
2	25-50	37.5	25	330					
3	50-75	62.5	25	650					
4	75-100	87.5	25	970					
5	100-125	112.5	25	1200					
6	125-150	137.5	25	1250					
7	150-175	162.5	25	1230					
8	175-200	187.5	25	1100					
9	200-225	212.5	25	700					
10	225-250	237.5	25	600					
11	250-275	262.5	25	400					
12	275-300	287.5	25	260					
13	300-325	312.5	25	170		0.033		0.046	
14	325-350	337.5	25	96		0.108		0.164	
15	350-375	362.5	25	52		0.152		0.255	
16	375-400	387.5	25	30		0.193		0.353	
17	400-425	412.5	25	18		0.189	0.001	0.356	0.001
18	425-450	437.5	25	12		0.195	0.002	0.402	0.002
19	450-475	462.5	25	7.5	0.002	0.213	0.008	0.457	0.008
20	475-500	487.5	25	5.0	0.006	0.213	0.017	0.508	0.017
21	500-525	512.5	25	3.3	0.012	0.200	0.032	0.527	0.032
22	525-550	537.5	25	2.25	0.024	0.199	0.047	0.550	0.047
23	550-575	562.5	25	1.60	0.032	0.200	0.070	0.570	0.070
24	575-600	587.5	25	1.15	0.040	0.203	0.092	0.593	0.092
25	600-625	612.5	25	0.74	0.038	0.201	0.094	0.612	0.094
26	625-650	637.5	25	0.54	0.022	0.184	0.060	0.620	0.060
27	650-675	662.5	25	0.40	0.011	0.170	0.015	0.631	0.015
28	675-700	687.5	25	0.305	0.006	0.201	0.008	0.637	0.008
29	700-725	712.5	25	0.225	0.015	0.275	0.017	0.587	0.017
30	725-750	737.5	25	0.185	0.047	0.259	0.070	0.582	0.070
31	750-778	764.0	28	0.140	0.119	0.254	0.160	0.568	0.160
32	778-814	796.0	36		0.168	0.245	0.253	0.555	0.253
33	814-871	842.5	57		0.360	0.333	0.345	0.541	0.345
34	871-908	889.5	37		0.465	0.313	0.410	0.524	0.410
35	908-948	928.0	40		0.467	0.297	0.460	0.508	0.460
36	948-1100	1024.0	152		0.468	0 308	0.477	0.454	0.477
37	1100-1149	1124.5	49		0.418	0.304	0.440	0.396	0.440
38	1149-1198	1173.5	49		0.374	0.291	0.375	0.355	0.375
39	1198-1232	1215.0	34		0.331	0.266	0.320	0.310	0.320
40	1232-1250	1241.0	18	0.32	0.328	0.261	0.294	0.279	0.294
41	1250-1275	1262.5	25	0.53	0.321	0.257	0.262	0.245	0.262
42	1275-1300	1287.5	25	0.95	0.302	0.231	0.205	0.188	0.205
43	1300-1325	1312.5	25	1.90	0.250	0.176	0.140	0.083	0.140
44	1325-1350	1337.5	25	4.4	0.159	0.122	0.086	0.016	0.086
45	1350-1375	1362.5	25	10.0	0.064	0.048	0.041		0.041
46	1375-1400	1387.5	25	13.0	0.015	0.007	~~0.002~~ 0.020		~~0.002~~ 0.020
47	1400-1425	1412.5	25	48.			0.002		0.002
48	1425-1450	1437.5	25	78.					
49	1450-1475	1462.5	25	130.					
50	1475-1500	1487.5	25	270.					
51	1500-1525	1512.5	25	450.					
52	1525-1550	1537.5	25	410.					
53	1550-1575	1562.5	25	160.					
54	1575-1600	1587.5	25	55.					
55	1600-1625	1612.5	25	145.					
56	1625-1650	1637.5	25	245.					
57	1650-1675	1662.5	25	270.					
58	1675-1700	1687.5	25	245.					
59	1700-1725	1712.5	25	155.					
60	1725-1750	1737.5	25	70.					
61	1750-1775	1762.5	25	36.					
62	1775-1800	1787.5	25	18.					
63	1800-1825	1812.5	25	9.3					
64	1825-1850	1837.5	25	5.0					
65	1850-1875	1862.5	25	2.8					
66	1875-1900	1887.5	25	1.8					
67	1900-1925	1912.5	25	1.12					
68	1925-1950	1937.5	25	0.70					
69	1950-1975	1962.5	25	0.43					
70	1975-2000	1987.5	25	0.26					
71	2000-2025	2012.5	25	0.17					
72	2025-2050	2037.5	25	0.085					
73	2050-2075	2067.5	25	0.050					
74	2075-2100	2087.5	25	0.024					
75	2100-2125	2112.5	25	0.011					
76	2125-2160	2142.5	~~25~~ 35	0.005					
77	2160-2500	2330.0	~~25~~ 340	0.000					

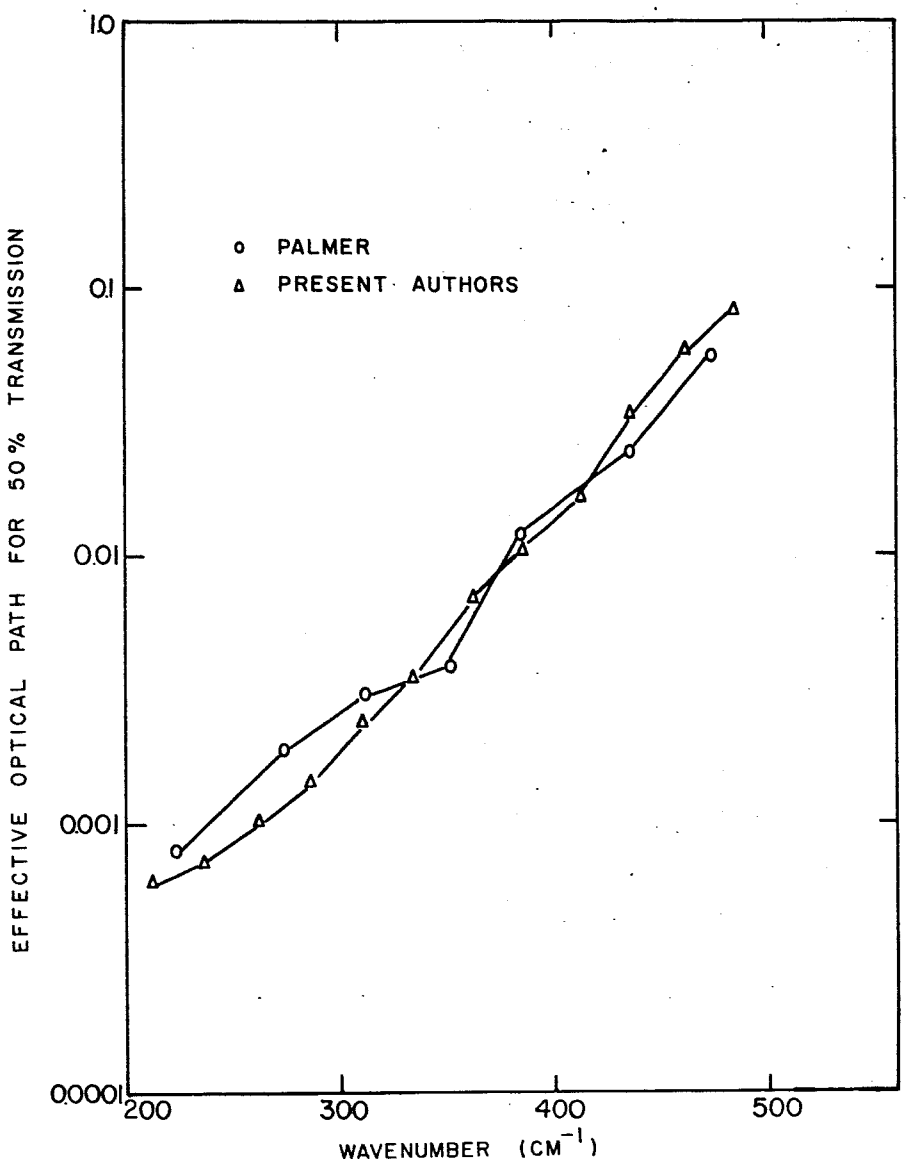


Figure 2. Comparison of Palmer's transmission to that used by the authors. The value of u for 50 percent absorption for $P_e = 1$ assuming T = 300K is used for comparison.

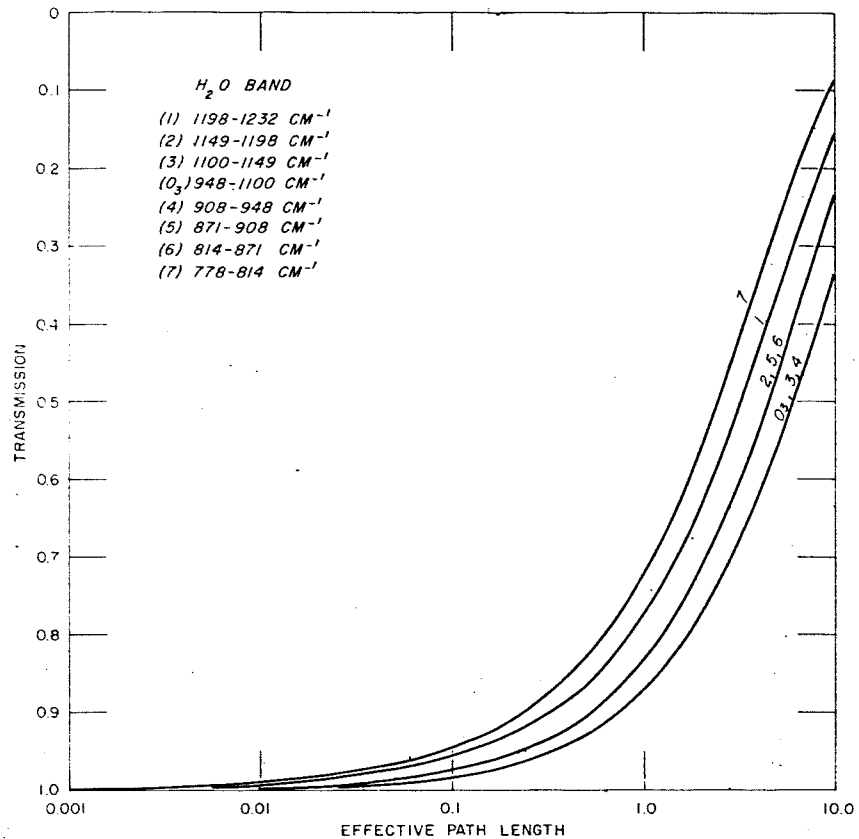


Figure 3. Water vapor transmission curves for the window region (778 to 1232 cm.$^{-1}$). Transmission values for each interval in this region are shown as a function of the effective optical path.

$$P_e(O_3) = \frac{\int_0^{u(O_3)} p \, du(O_3)}{P_o \, u(O_3)} \tag{8}$$

and $p(O_3)$ is the ozone concentration in cm.-atmo. per mb. The transmission values for the 9.6 micron ozone band are shown in figure 4, in which the band interval was taken to be 138 cm.$^{-1}$ as Walshaw did. However, because in the present study the band interval was assumed to be 152 cm.$^{-1}$, following Roach and Goody, the actual transmission value which was used is given by

$$\tau = 1 - \frac{138}{152}(1 - \tau') \tag{9}$$

where τ' is the fractional transmission shown in figure 4 and τ is that used in the present study.

It should be noted that the temperature effect on transmission has been neglected in both the H_2O and O_3 transmissions. The 15 micron CO_2 band transmission is based mainly on the work of Yamamoto and Sasamori [29] and of Sasamori [22], but some modifications were made as a result of measurements which were carried out in our laboratory. The transmission values for each sub-interval are shown in figure 5a through 5j, in each of which (a) indicates the pressure effect on transmission at 300K and (b) the temperature effect on transmission at normal pressure. The transmission values for the 4.3 micron CO_2 band are based on the measurements of Howard, Burch, and Williams, and on our own laboratory measurements, which are shown in figure 6.

IV. THE OUTGOING INTENSITY

The outgoing intensity for each interval was calculated at the five zenith angles from

$$I_{\bar{\nu}}(\theta) = \left[B_{\bar{\nu}}(T_{0.1}) + \sum_{i=1}^{200} \tau_{\bar{\nu}_i}(\theta) \left(\frac{\partial B_{\bar{\nu}}(T)}{\partial T} \right)_i (\Delta T)_i \right] \tag{10}$$

by assuming the 0.1 mb. level as the top of the atmosphere and by dividing the atmosphere into 200 layers, where $\bar{\nu}$ is the center of the interval $\Delta\nu$, T is temperature, $T_{0.1}$ the temperature at 0.1 mb., B is the Planck intensity, and $\tau_{\bar{\nu}_i}$ is the transmission from the 0.1 mb. level to a given level. For the interval in which the H_2O and CO_2 (or O_3) bands overlap, $\tau_{\bar{\nu}_i}$ is taken to be the product of the transmissions of the separate gases.

The outgoing intensity which passes through a filter is found by multiplying the average filter transmittance within the interval $\Delta\nu$ by the quantity evaluated in (10). Appendix B lists the outgoing intensity and the filtered outgoing intensity for each atmospheric model at the five zenith angles. Data for TIROS II and III are presented.

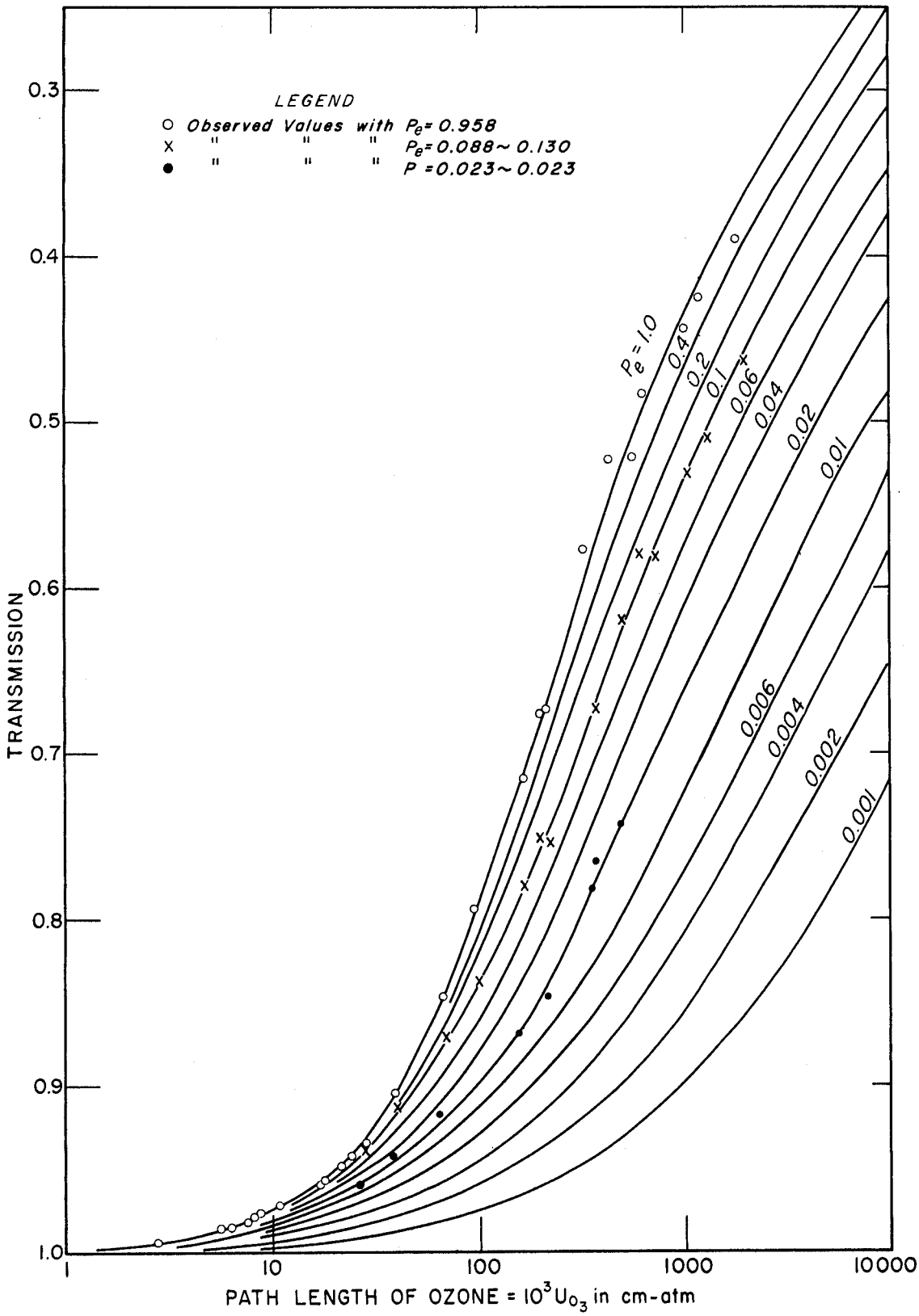


Figure 4. Transmission values of the 9.6 micron ozone band for a band interval of 138 cm.$^{-1}$. Curves for different values of P_e are drawn as a function of the ozone path length.

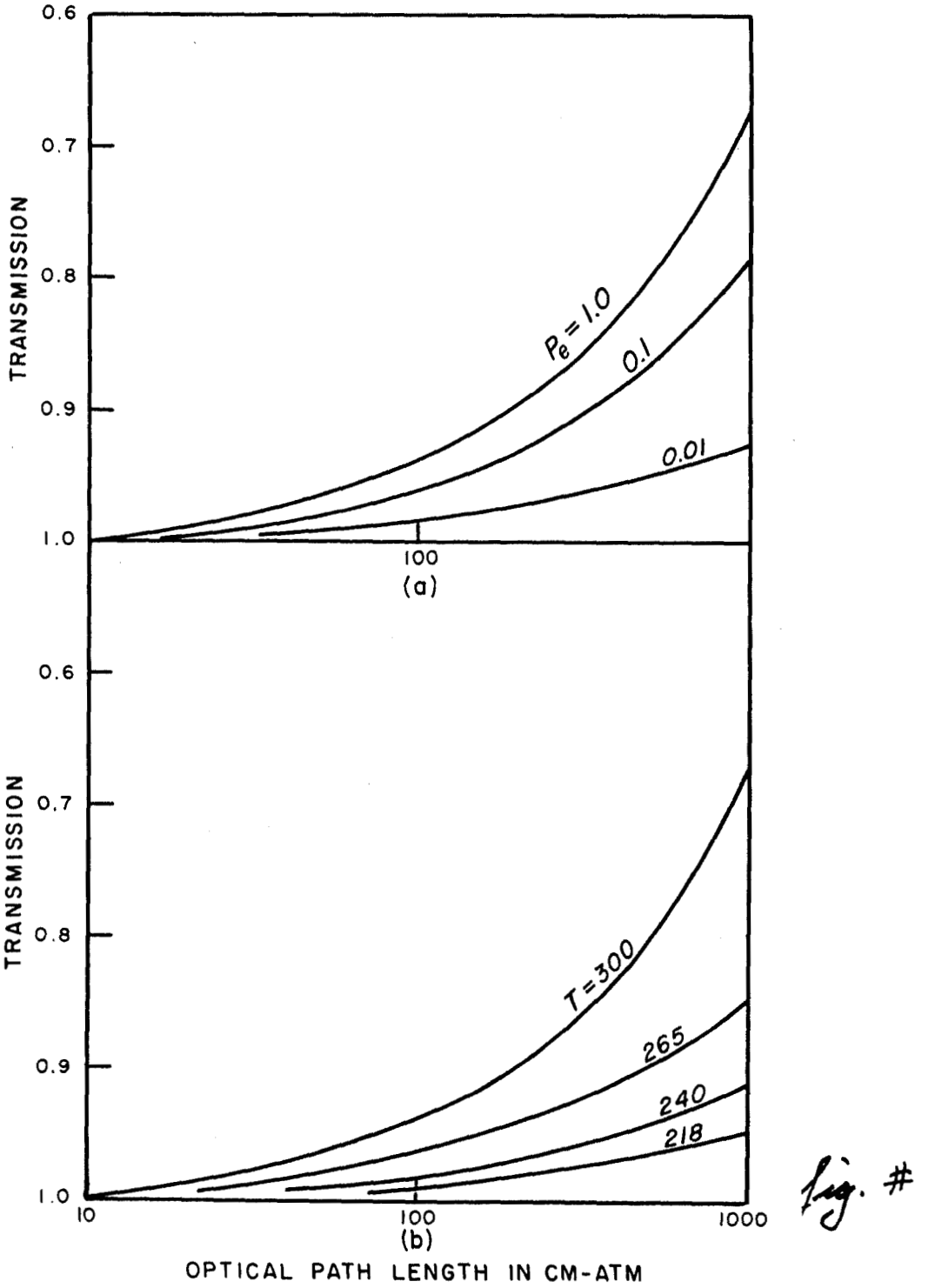


Figure 5a. Interval 550-575 cm.$^{-1}$.

The transmission values for each sub-interval of the 15 micron CO_2 band are shown. The upper section (a) of each figure indicates the pressure effect on transmission at 300K and the lower section (b) indicates the temperature effect on transmission at normal pressure.

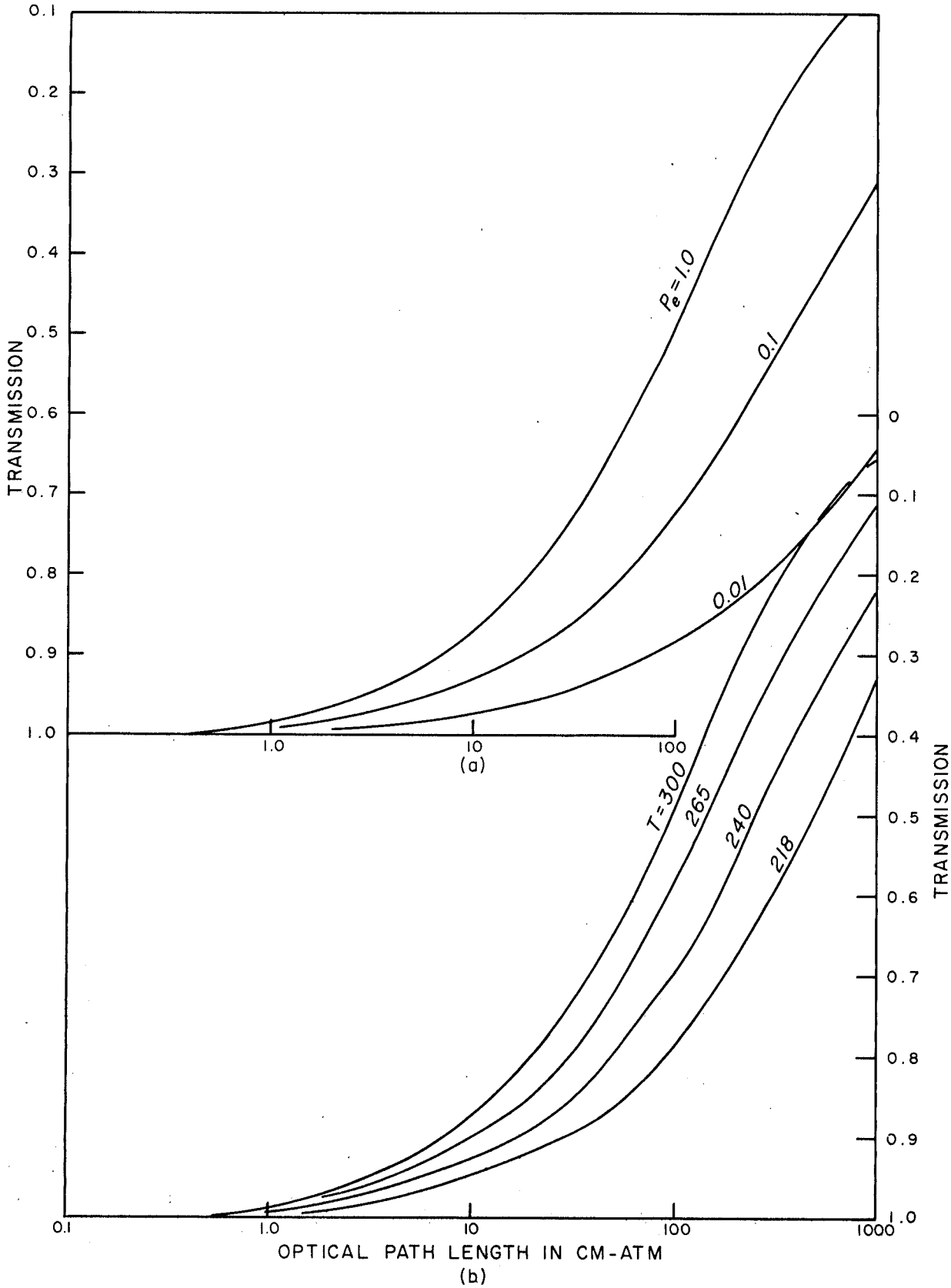


Figure 5b. Interval 575-600 cm.$^{-1}$

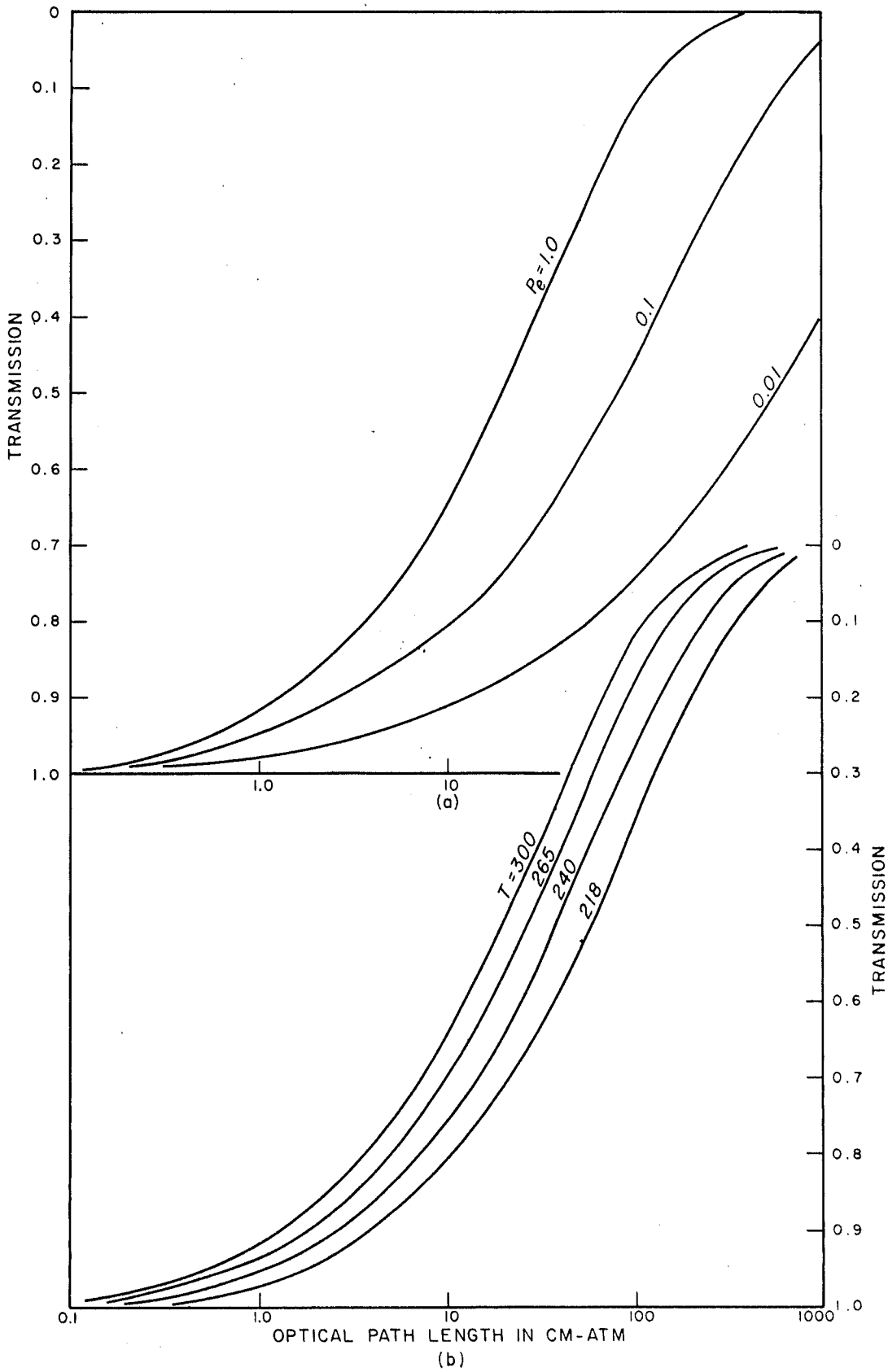


Figure 5c. Interval 600-625 cm.$^{-1}$

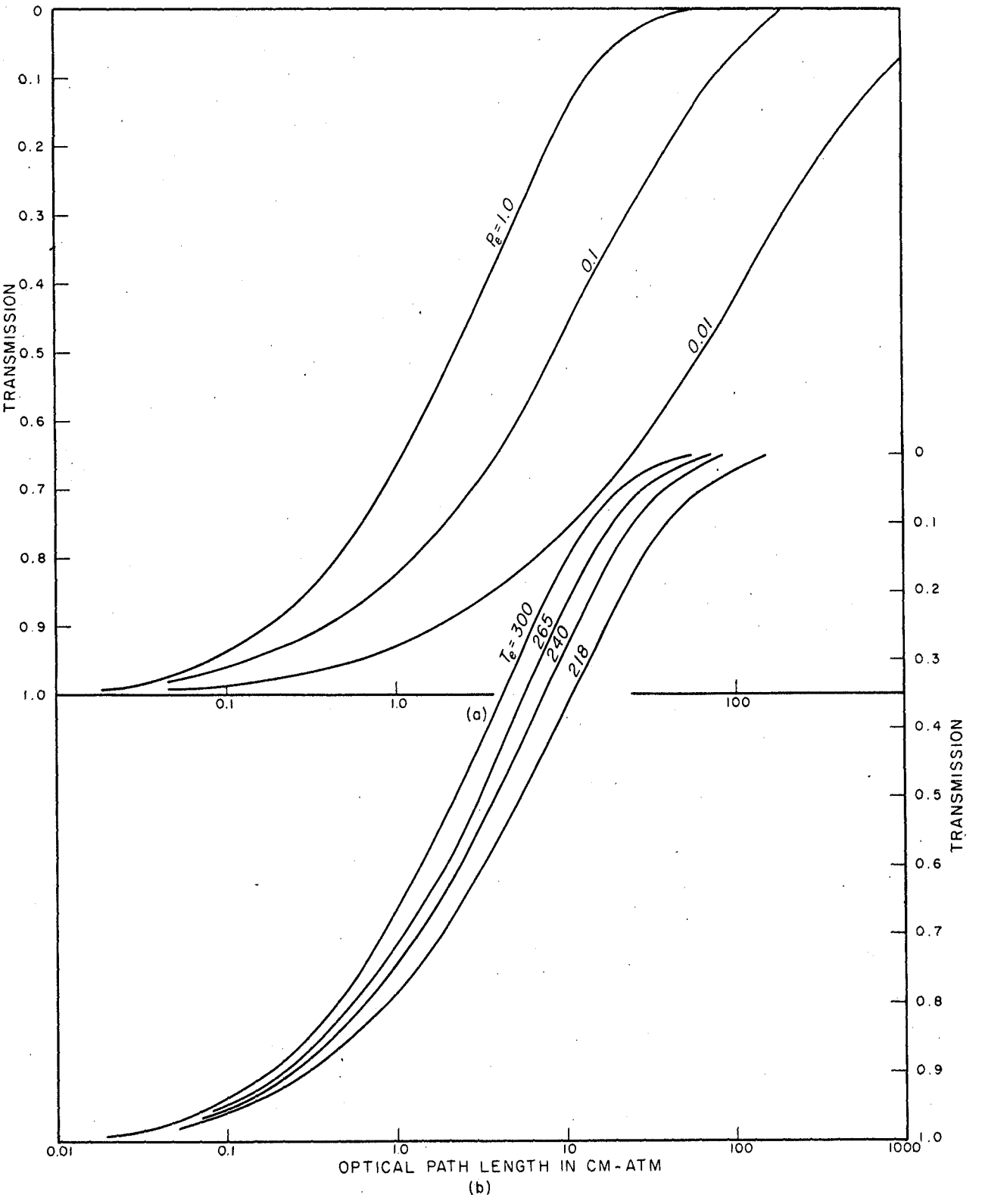


Figure 5d. Interval 625-650 cm.$^{-1}$

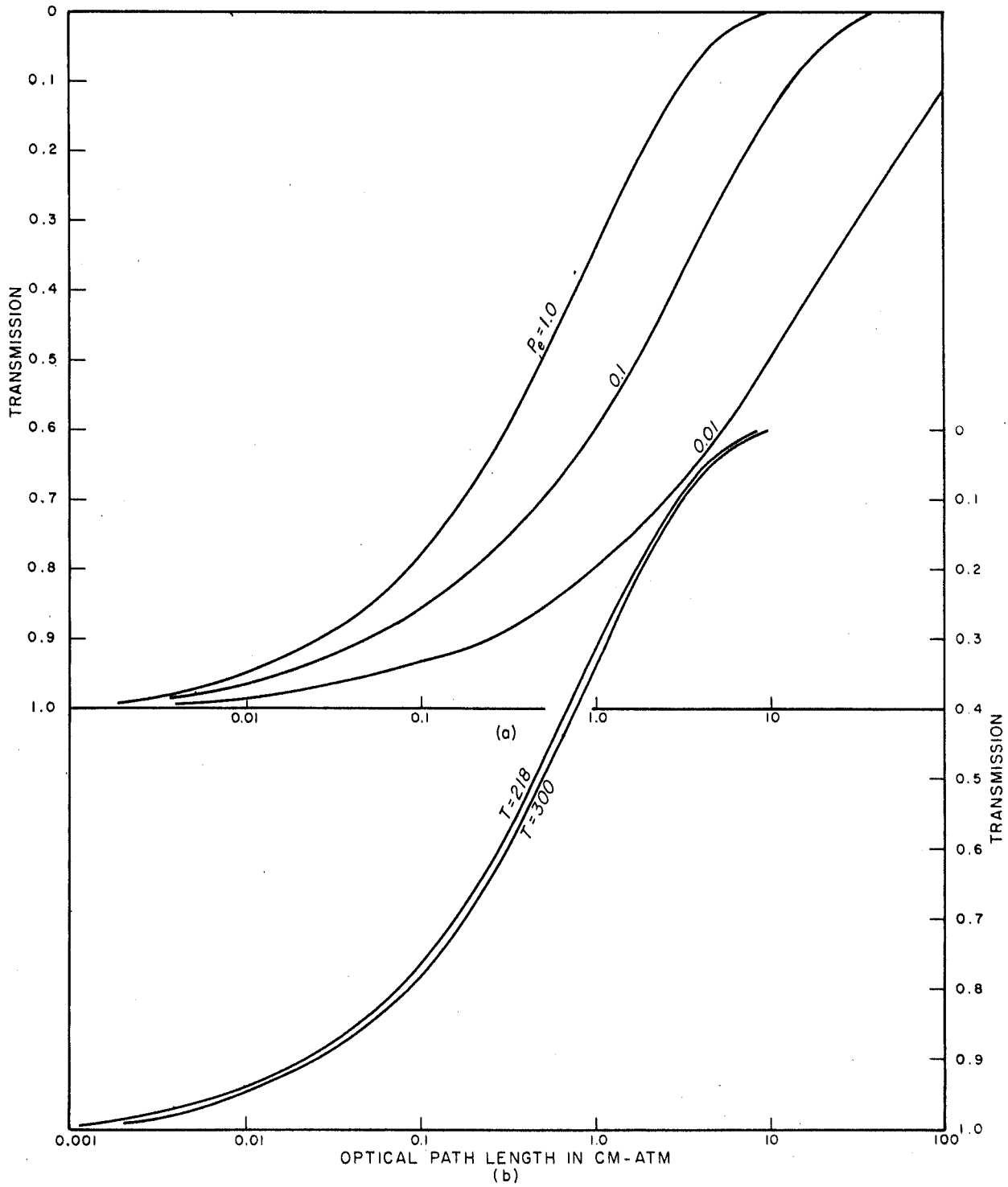


Figure 5e. Interval 650-675 cm.$^{-1}$

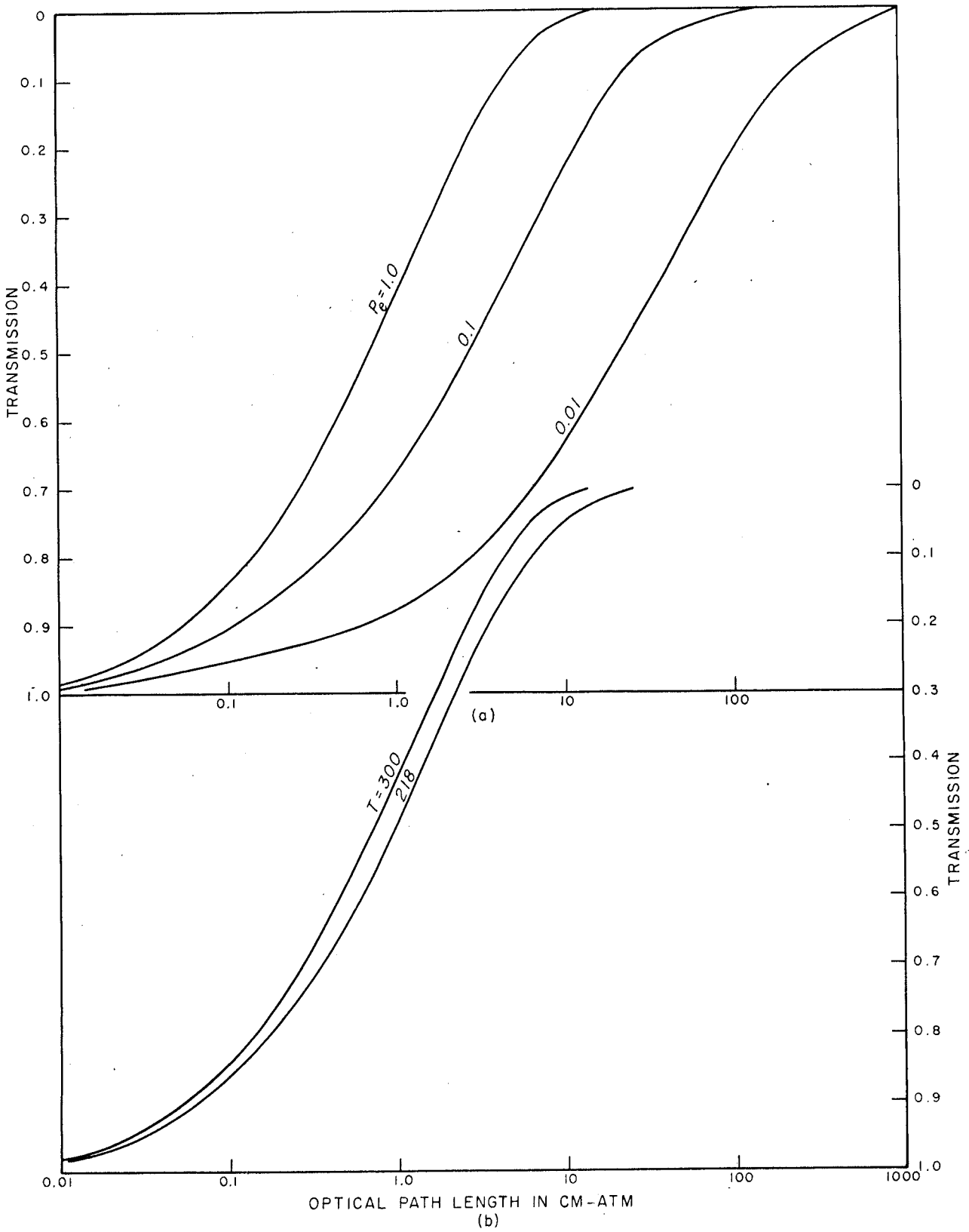


Figure 5f. Interval 675-700 cm.$^{-1}$

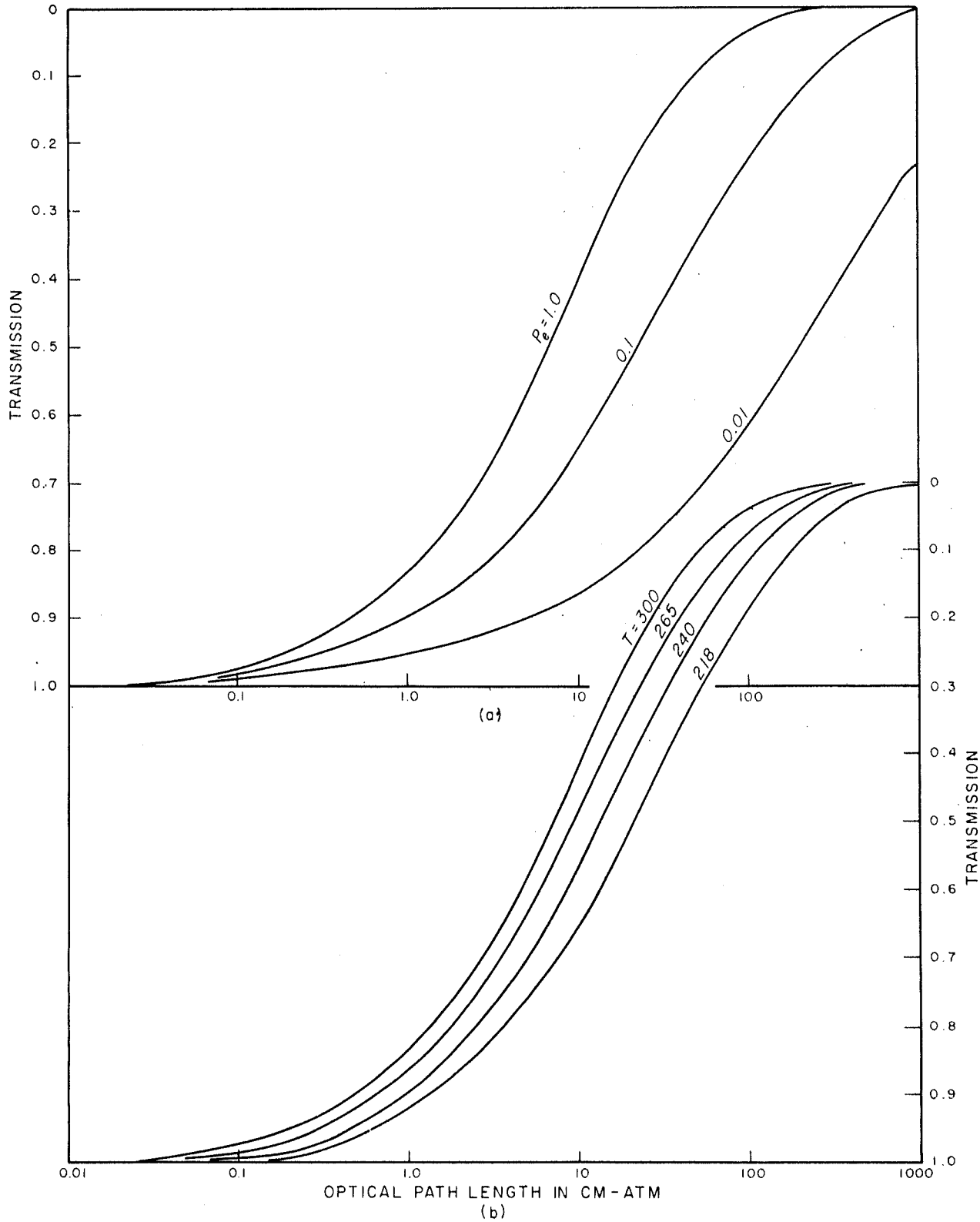


Figure 5g. Interval 700-725 cm.$^{-1}$

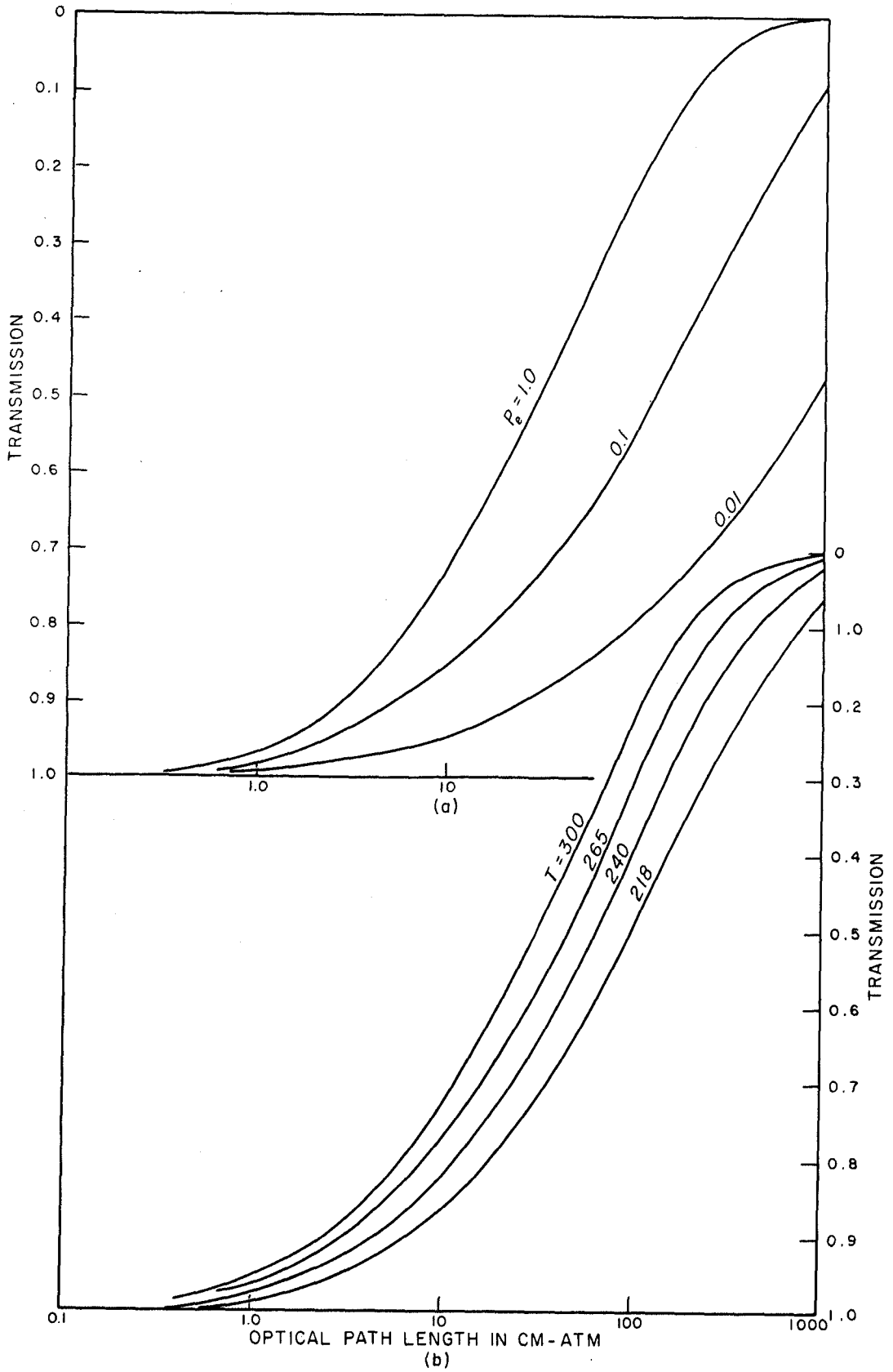


Figure 5h. Interval 725-750 cm.$^{-1}$

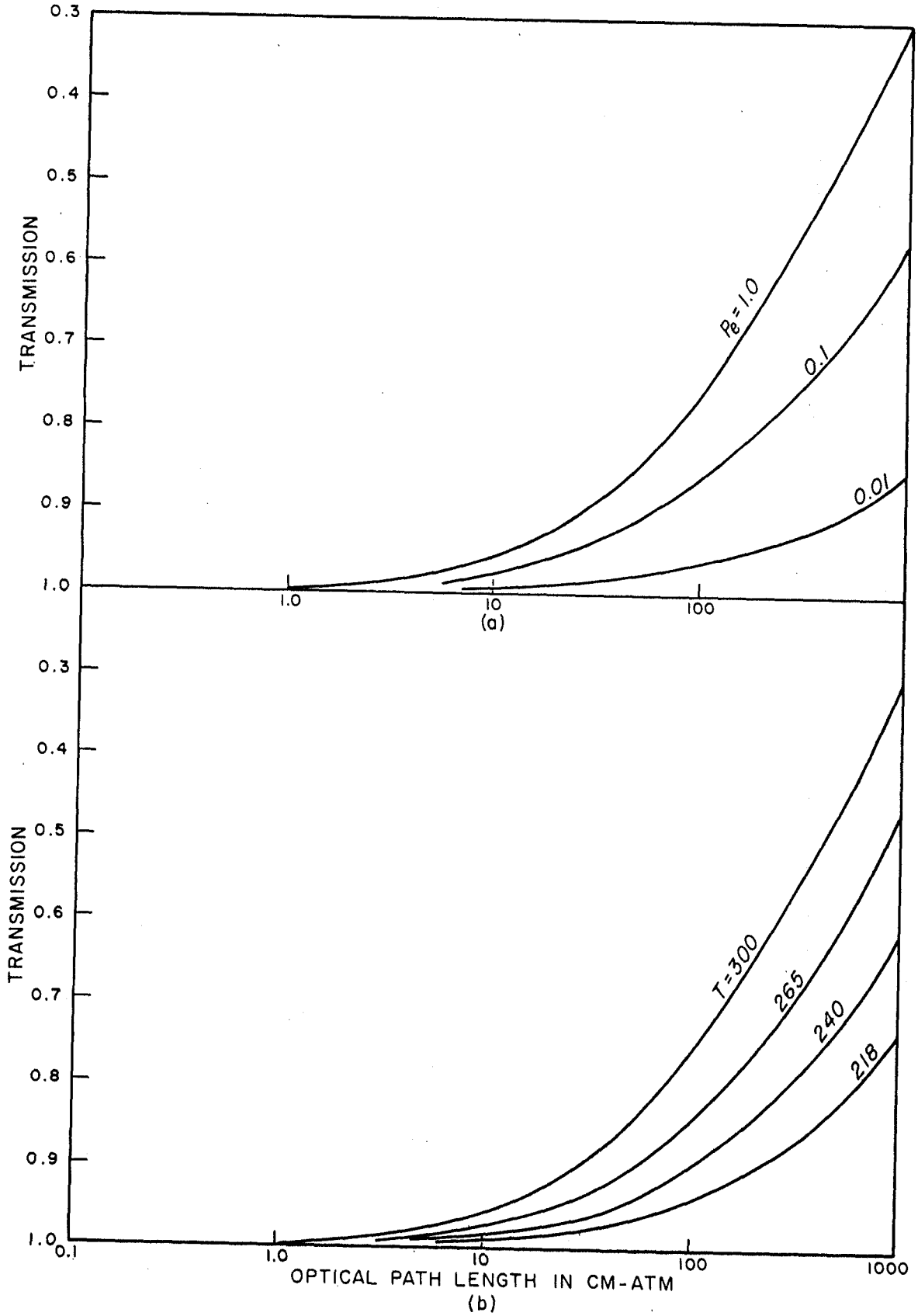
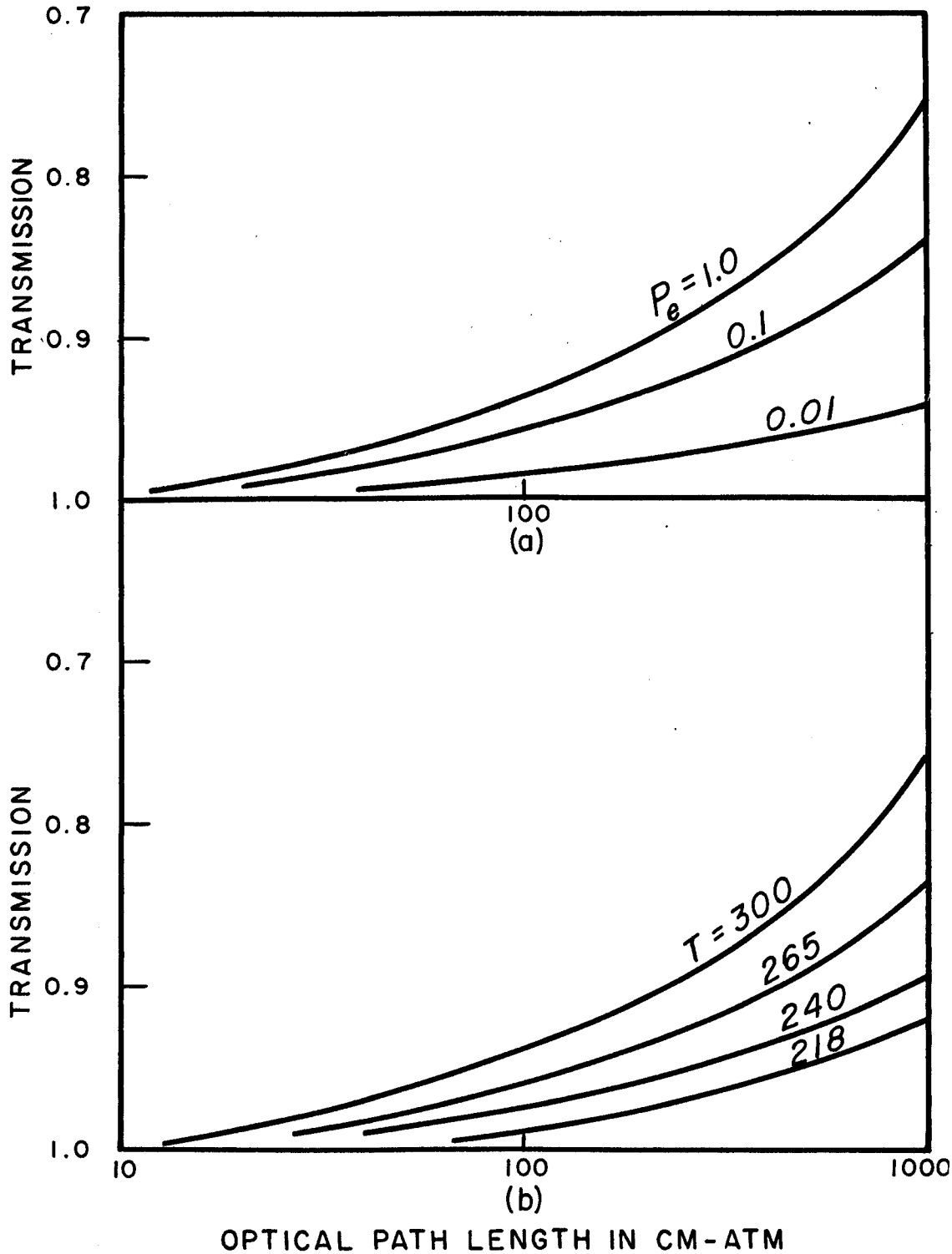


Figure 5i. Interval 750-775 cm.$^{-1}$


0.7
0.8
0.9
1.0
TRANSMISSION
$P_e = 1.0$
0.1
0.01
100
(a)
0.7
0.8
0.9
1.0
TRANSMISSION
T = 300
265
240
218
10
100
1000
(b)
OPTICAL PATH LENGTH IN CM-ATM

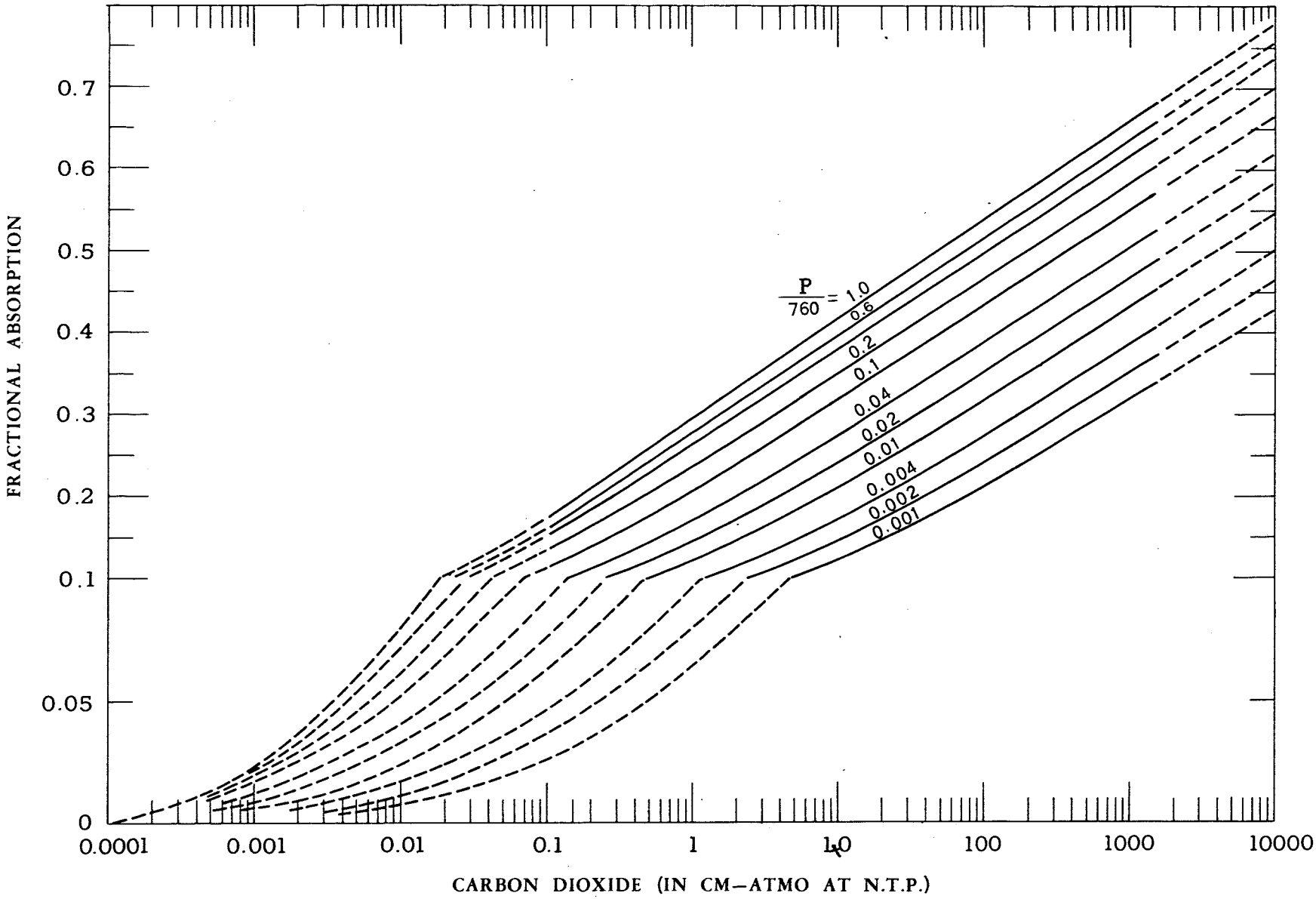


Figure 6. Absorption curves for the 4.3 micron CO_2 band are shown for different values of P/760, (P_e). The solid segments of the curves represent laboratory measurements and the dashed segments are extrapolations.

The computed outgoing intensities at $\vartheta = 0^{\circ}$ under three atmospheric conditions are shown in figure 7. At the left are the atmospheric models, with pressure versus air temperature drawn as solid lines (the extrapolated parts are dotted) and pressure versus dew points as dashed lines. At the right the corresponding intensities, in c.g.s. units, versus wave number are drawn as heavy lines; the lighter lines represent the Planck intensities versus wave number for a range of temperatures, as indicated. These three diagrams represent (a) cloudless conditions in the Arctic in winter; (b) cloudless conditions in the western United States in summer; and (c) overcast conditions in the Tropics. The influence of the strong absorption bands is evident at 600-800 cm.$^{-1}$ (carbon dioxide), 950-1100 cm.$^{-1}$ (ozone), and 1300-1900 cm.$^{-1}$ (water vapor).
15μ 9.6μ ~6μ

V. ESTIMATION OF THE OUTGOING INTENSITY FROM TIROS DATA

Using the computed results for 106 model atmospheres, it was found, after several trials that the values of ν_1', and ν_2' given in Table 2 gave the least scatter of outgoing intensity between these limits plotted against values of intensity through the filter (Eq.1); these relations for TIROS II (TIROS II will hereafter be cited unless specific reference is made to another satellite) are shown in single mean lines in figures 8 a and b, for channels 2 and 4, respectively.

TABLE 2. VALUES OF THE LIMITS ν_1' AND ν_2' FOR TIROS II, III and IV

TIROS II	Channel 2	814 cm.$^{-1}$	1325 cm.$^{-1}$
	Channel 4	350 cm.$^{-1}$	1325 cm.$^{-1}$
TIROS III	Channel 2	750 cm.$^{-1}$	1250 cm.$^{-1}$
	Channel 4	350 cm.$^{-1}$	1149 cm.$^{-1}$
TIROS IV	Channel 2	750 cm.$^{-1}$	1250 cm.$^{-1}$

The intensities between these limits for TIROS II, III and IV are shown in Appendix B.

Because the dependence on ϑ is small, single mean lines in figures 8 a and b, which include values for $\vartheta = 0^{\circ}$, 60°, and 78.5°, provide satisfactory transformations, with negligible error; values for $\vartheta = 78.5^{\circ}$ lie above the mean lines and those for $\vartheta = 0^{\circ}$ lie below for channel 2; the reverse is true for channel 4. The mean deviations of the points from the mean lines are about 0.4 percent for channel 2 and 0.6 percent for channel 4.

However, in the case of channel 4 it is not sufficient to obtain the intensity between 350 and 1325 cm.$^{-1}$ The desired quantity is the intensity over the entire infrared spectrum, which includes spectral regions outside the observed portion. In these outer regions the average absorption by the atmospheric gases is greater than the average in the observed region, so that one cannot account exactly for the unobserved portion of the spectrum nor should the variation of intensity with zenith angle be the same in the observed and unobserved portions. In figure 9 the intensity over the entire infrared spectrum is plotted versus the intensity through the channel 4 filter: calculated values at three zenith angles for the 106 model atmospheres are shown, with mean lines drawn for $\vartheta = 0^{\circ}$, 60° and 78.5°. The variability of the

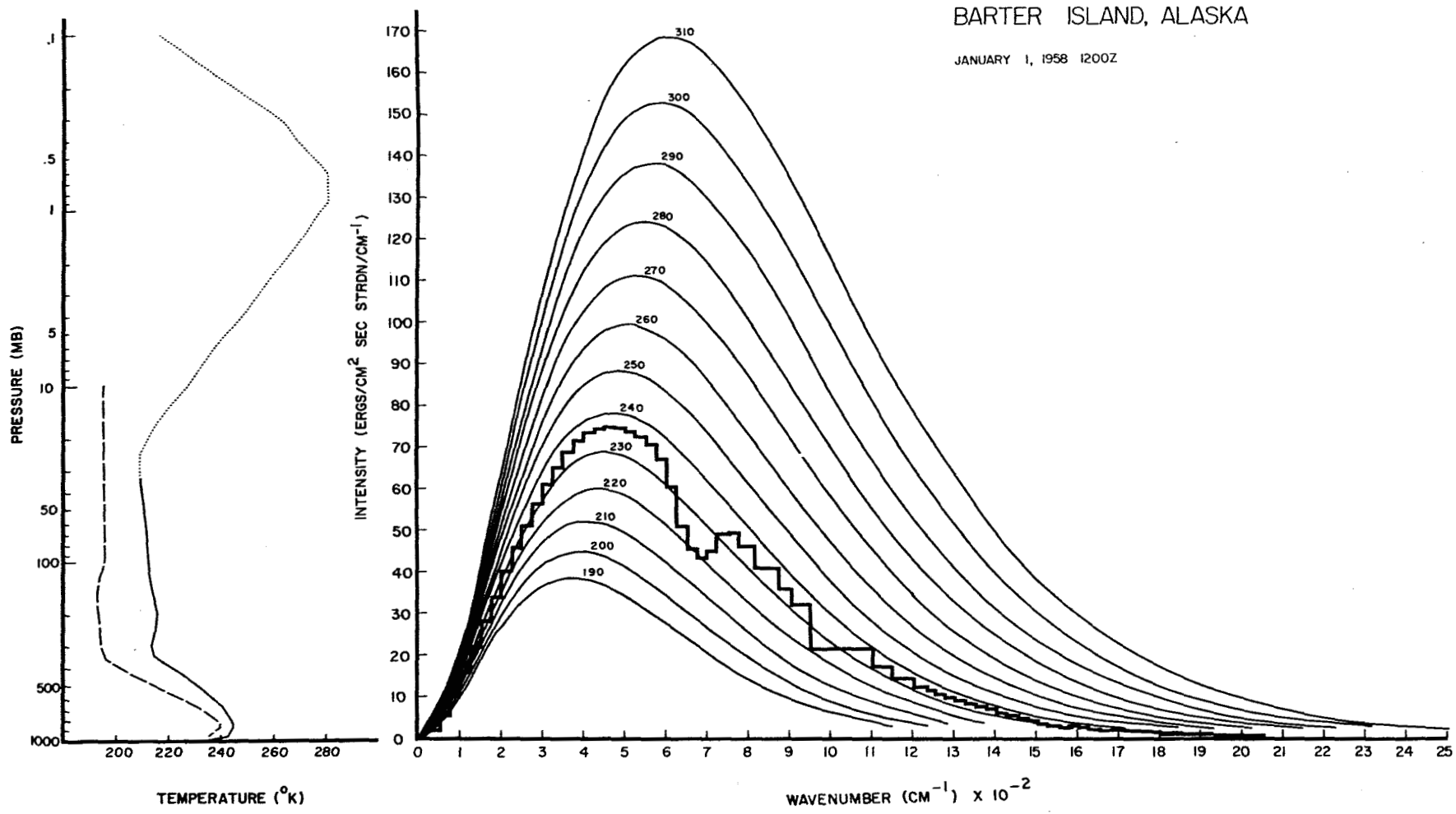


Figure 7. The computed outgoing specific spectral intensities at $\theta = 0^{\circ}$ for 3 atmospheric models. At the left, pressure versus temperature is shown as a solid line, with the extrapolated part a dotted line; pressure versus dew point is a dashed line. At the right, intensity in c.g.s. units versus wave number is drawn as a heavy line; the lighter lines represent Planck intensities at the indicated temperatures.

a. Cloudless winter Arctic

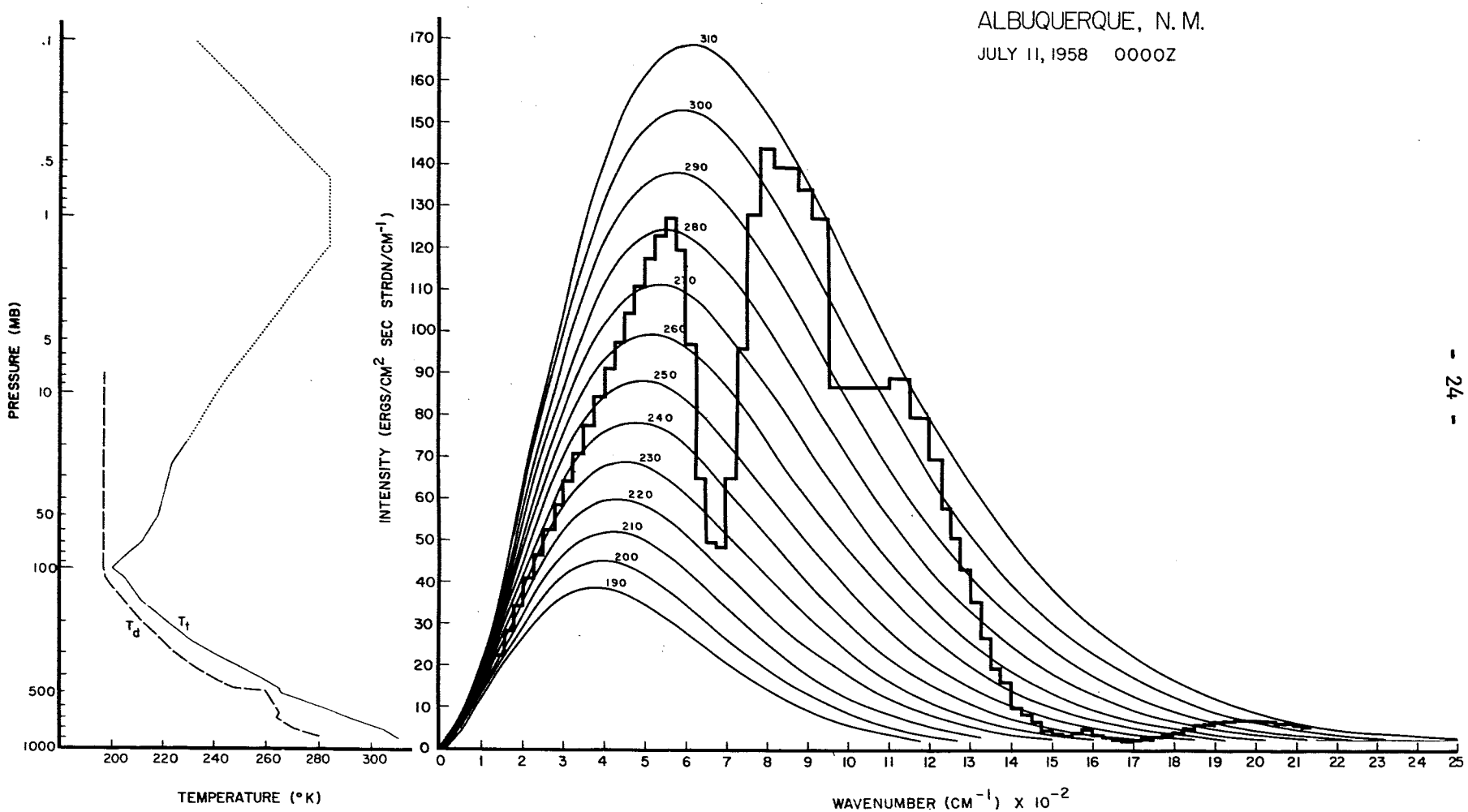


Figure 7b. Cloudless western United States in summer.

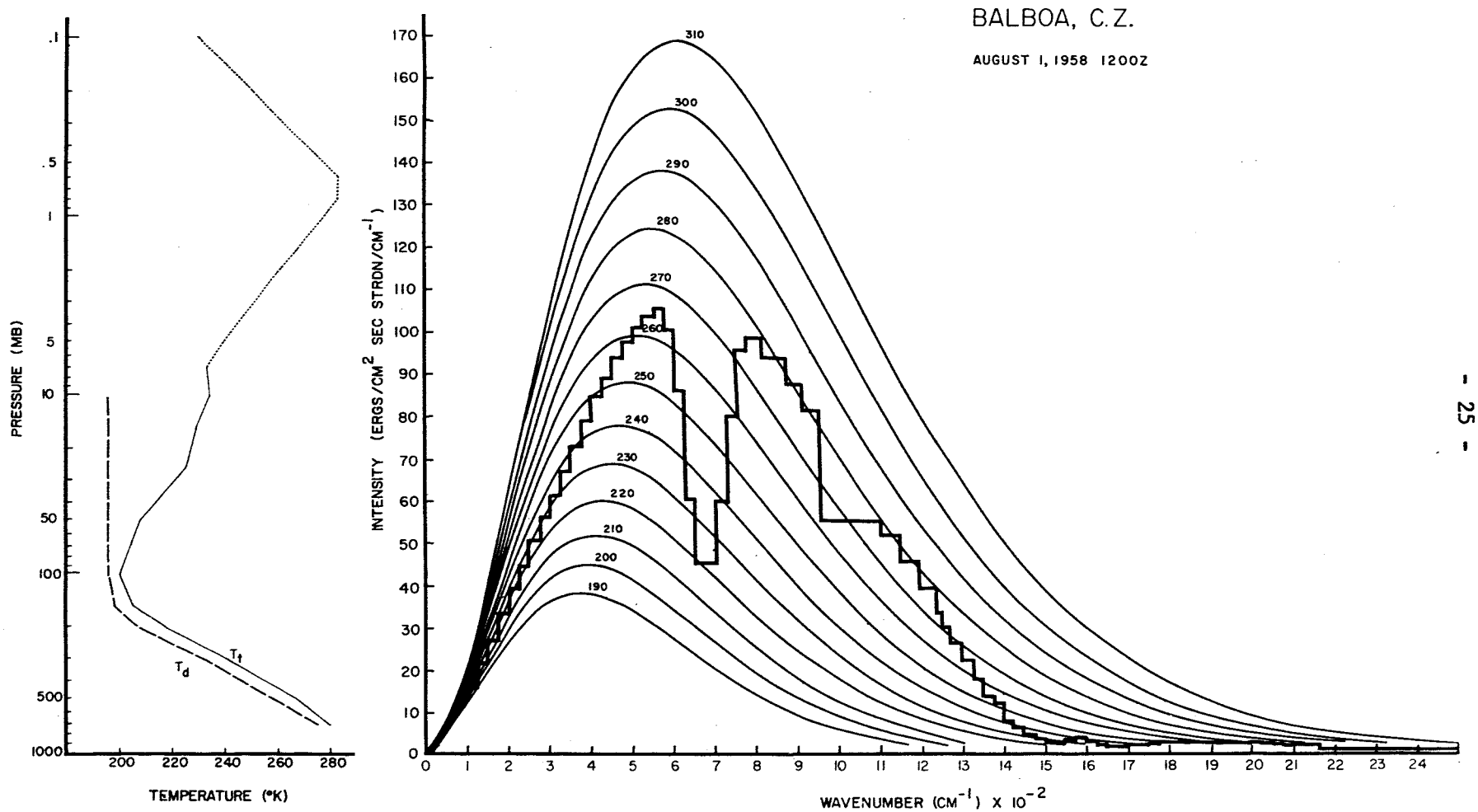
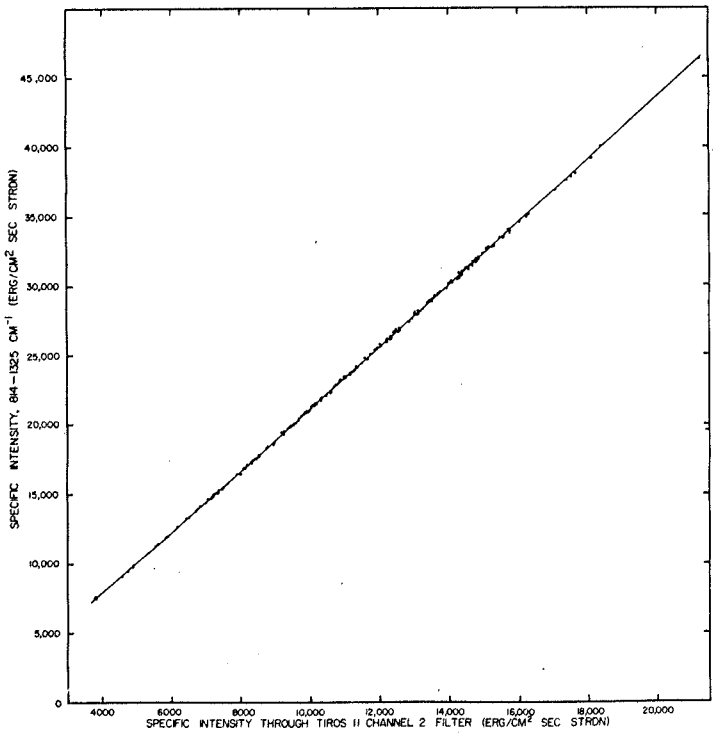
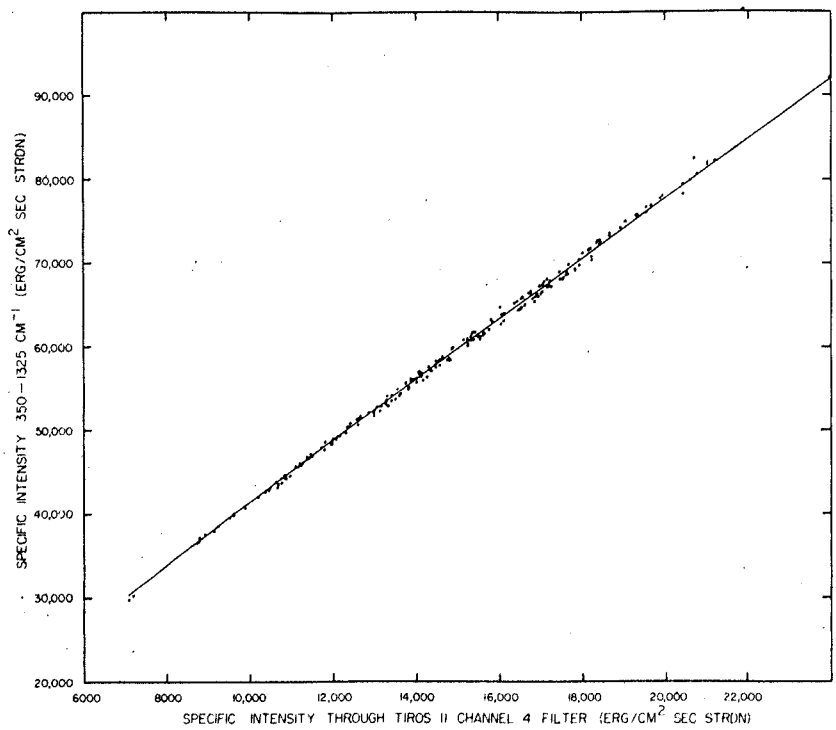


Figure 7c. Overcast conditions in the Tropics.



(a)



(b)

Figure 8. (a) Specific intensity, 814-1325 cm.$^{-1}$, versus specific intensity through the TIROS II channel 2 filter; (b) specific intensity, 350-1325 cm.$^{-1}$, versus specific intensity through the TIROS II channel 4 filter. The data include values for $\vartheta = 0^{\circ}$, 60°, and 78.5°, calculated from 106 model atmospheres.

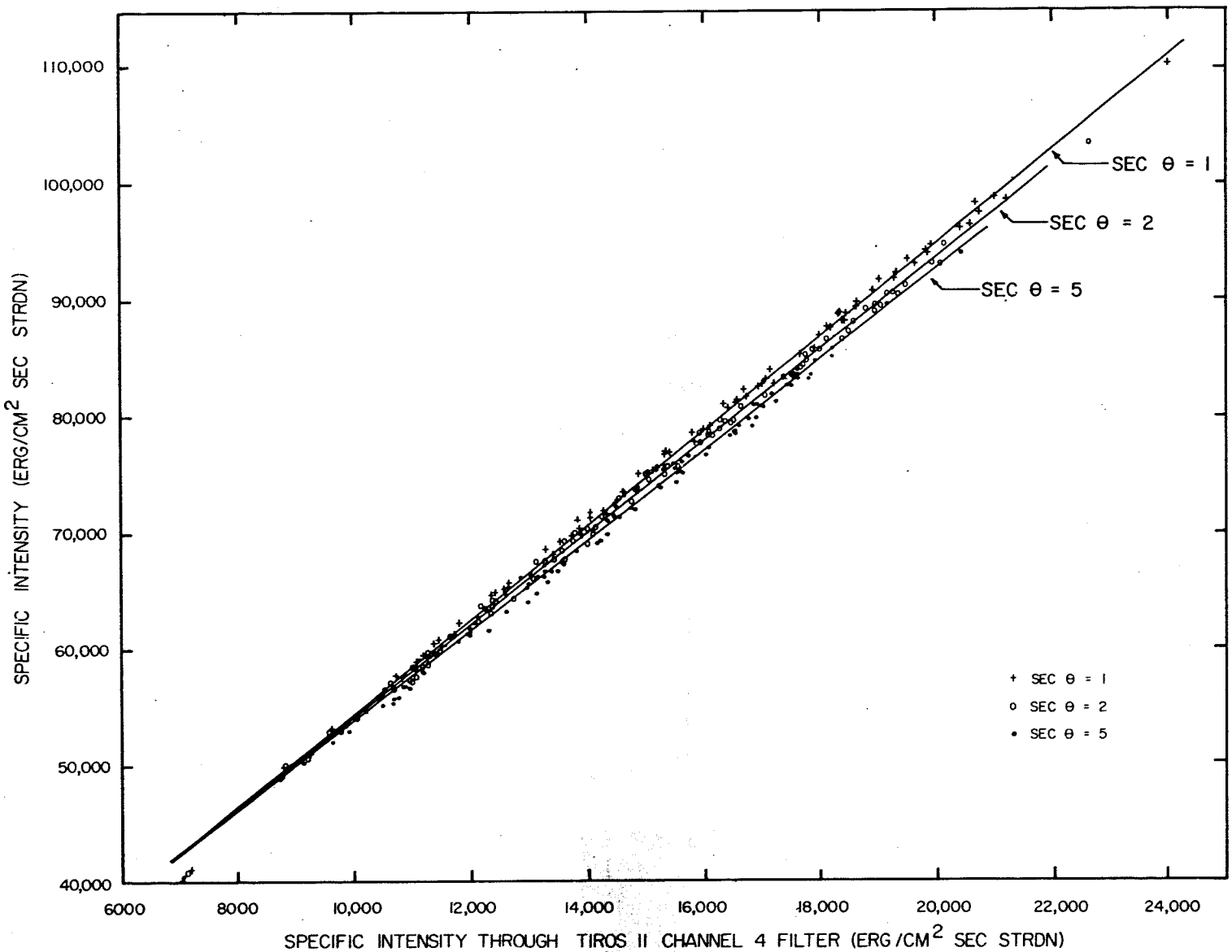


Figure 9. Total specific intensity versus specific intensity through the TIROS II channel 4 filter. Data were calculated from 106 model atmospheres; mean lines are drawn for $\theta = 0^{\circ}$, 60° and 78.5°.

total intensity is somewhat greater than for the 350 to 1325 cm.$^{-1}$ interval, as can be seen from a comparison of figures 8 b and 9, but it is still small; only a small correction for zenith angle is required. The transformation of the data in figure 9 can be represented well by the empirical formula

$$I(\vartheta) = r + s I_\varphi(\vartheta) + t\left[I_\varphi(\vartheta) - {}^{\circ}I_\varphi \right] \vartheta^2 \tag{11a}$$

where r = 14,100 and s = 4.040 are evaluated from the $\vartheta = 0$ line; t = -2.6×10^{-5}, and ${}^{\circ}I_\varphi = 7500$; the final term in (11a) is small, at all times less than 3 percent. For TIROS III, the angular dependence given by the last term in (11a) is negligible; for this satellite, however, the transformation is not quite linear, but can be expressed by

$$I(\vartheta) = r' + s' I_\varphi(\vartheta) + t' \left[I_\varphi(\vartheta) \right]^2 \tag{11b}$$

where r' =10,500, s' = 1.971 and t' = 6.419×10^{-6}. In the case of TIROS IV, there was no channel 4; by using channel 2, nevertheless, a fair approximation of $I(\vartheta)$ is possible. In figure 10, the channel 2 intensity is plotted versus $I(\vartheta)$; the mean lines can be expressed by

$$I(\vartheta) = r'' + s'' I_\varphi(\vartheta) + \left\{ t'' + v'' I_\varphi(\vartheta) + w'' \left[I_\varphi(\vartheta) \right]^2 \right\} \left\{ 1 - \left(\frac{\vartheta}{\vartheta_0} \right)^2 \right\} \tag{11c}$$

where r" = 31,180, s" = 3.426, t" =-6,130, v" = 1.126, w" =-2.92×10^{-5}, $\vartheta_0 = 78.5^{\circ}$ and $I_\varphi(\vartheta)$ is the channel 2 intensity; the scatter of points is seen to be about 1.5 percent. Thus, for each of the three satellites a different empirical formula is found to be most suitable.

Initially it was thought that a better estimation of the outgoing intensity over the whole spectrum might be achieved through the combined use of channels 2 and 4. The spectral regions outside the channel 4 filter are characterized by strong absorption; this is also the case for the interval 350 to 814 cm.$^{-1}$, the difference between the intervals of the channel 2 and channel 4 filters. From a mean relation between the intensities in the difference interval and outside the channel 4 interval, using the calculated values for the 106 model atmospheres, the outgoing intensities over the entire spectrum were estimated. The mean error by this method (0.7 percent) was the same as that obtained when using Eq. (11a). Because the difference method offers no advantage in the calculated case, system noise in the actual TIROS measurements makes the use of the channel 4 data alone preferable.

VI. ESTIMATION OF THE OUTGOING FLUX

From the meteorological point of view the outgoing flux is more significant than the outgoing intensity because the former is the radiation leaving a unit area of the atmosphere in all directions, whereas the latter is the radiation in one direction only. The outgoing flux F is given by

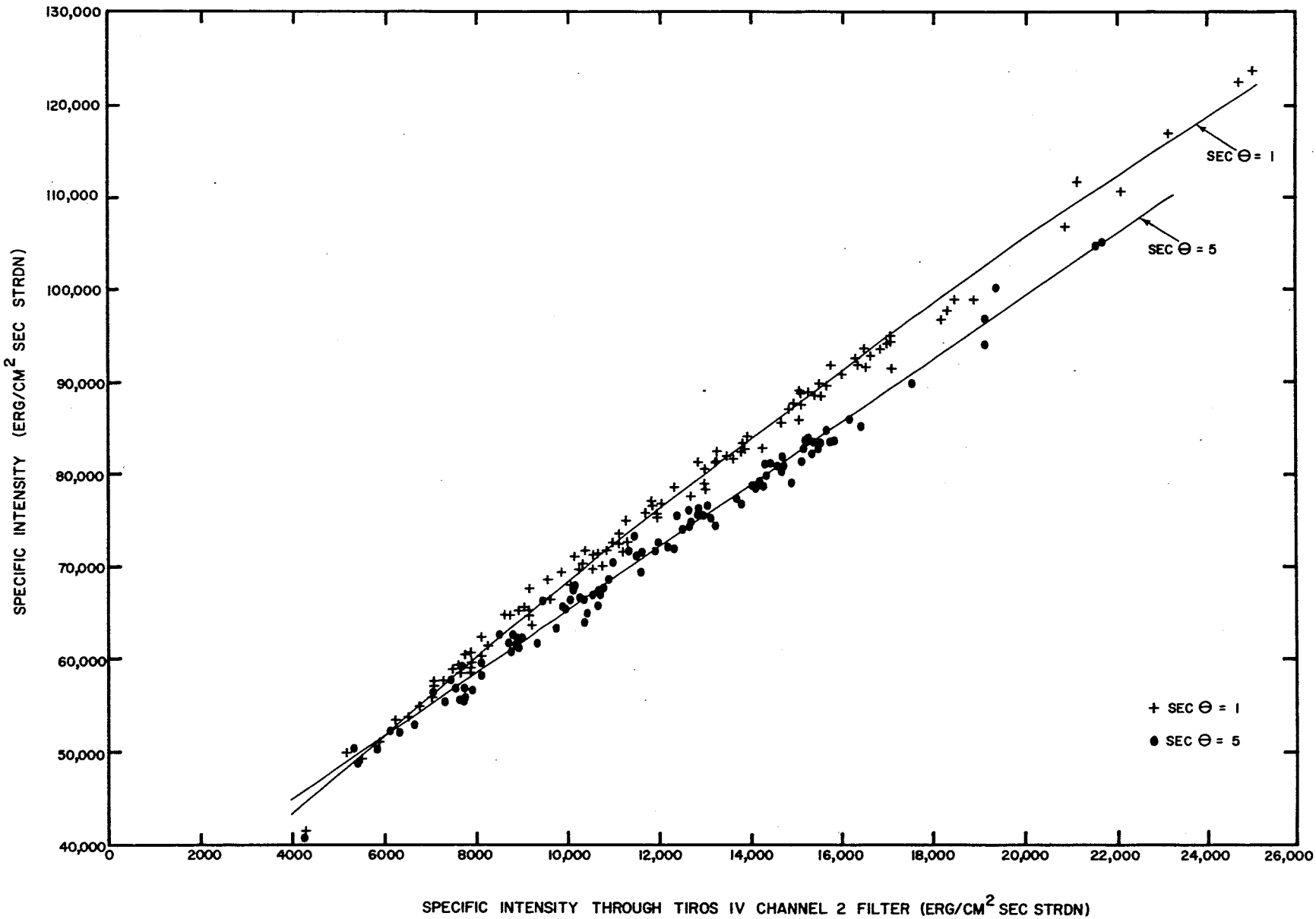


Figure 10. Total specific intensity versus specific intensity through the TIROS IV channel 2 filter. Data were calculated from 106 model atmospheres; mean lines are drawn for $\theta = 0^{\circ}$ and 78.5°.

$$F = 2\pi \int_0^{\frac{\pi}{2}} I(\vartheta) \sin\vartheta \cos\vartheta \, d\vartheta \tag{12}$$

where $I(\vartheta)$ represents the outgoing intensity over the entire infrared spectrum in the direction ϑ. Because the TIROS radiometer measures only the outgoing intensity in a given direction, the angular dependence of the outgoing intensity has to be known in order to evaluate F from the observed data.

The limb-darkening effect was examined by calculating the outgoing intensity for $\vartheta = 0$, 20°, 45°, 60°, and 78.5° for the 106 model atmospheres. In figure 11 is shown the limb-darkening for several model atmospheres, including extreme cases in which the largest amounts of water vapor are in clear sky conditions and the smallest amounts are in overcast conditions, and the mean for the 106 models. Limb-darkening is here defined in the usual way, as the ratio of the intensity in direction ϑ to the intensity in the vertical; $I(\vartheta)/I(0)$ is drawn versus ϑ in this figure. The limb-darkening effect is large where the amount of water vapor and the temperature lapse rate in the troposphere are large, as usually occurs at lower latitudes; at high latitudes or in high thick overcast conditions, where the amount of water vapor and the temperature lapse rate are less, the effect is smaller. As a first approximation, the limb-darkening for any atmospheric condition might be assumed to be that of the average for the 106 model atmospheres. This average curve may be expressed with considerable accuracy by the empirical formula

$$I(\vartheta) = I(0)(1 + a\vartheta + b\vartheta^2 + c\vartheta^3) \tag{13}$$

with $a = -1.989 \times 10^{-4}$, $b = 5.876 \times 10^{-6}$, $c = -1.928 \times 10^{-7}$, and ϑ in degrees. However, it is apparent from the curves shown in figure 11 for several different atmospheres that the use of the average limb-darkening curve for all conditions will introduce errors. These errors will be systematic, rather than random, giving for large zenith angle measurements an overestimation of flux in high latitudes and areas of overcast conditions, and an underestimation for warm moist conditions encountered at low latitudes; the reverse is true at very small zenith angles. Equation (13) must therefore be modified to allow a more exact calculation of the intensity for any atmospheric condition.

From Eq. (13), $[(I(\vartheta)/I(0)) - 1]/[a\vartheta + b\vartheta^2 + c\vartheta^3] = \gamma = 1$ for the mean intensity of the 106 models. For each individual model, however, γ is not necessarily unity. In figure 12 γ is plotted vs. $I(0)$ with $\vartheta = 20^\circ$, 45°, 60°, and 78.5° for each of the 106 model atmospheres, showing the change of limb-darkening effect with increasing intensity. The value of γ is about zero for small intensities and about 2 for large intensities, with $\gamma = 1$ for the average value $I(0) = 75{,}574$. Because the data in this figure can be closely approximated by a straight line, Eq. (13), expressing the average limb-darkening, may be corrected to represent any specific case by setting γ, the quantity in the ordinate, equal to $\alpha + \beta I(0)$. Hence, the intensity can be expressed by the empirical formula

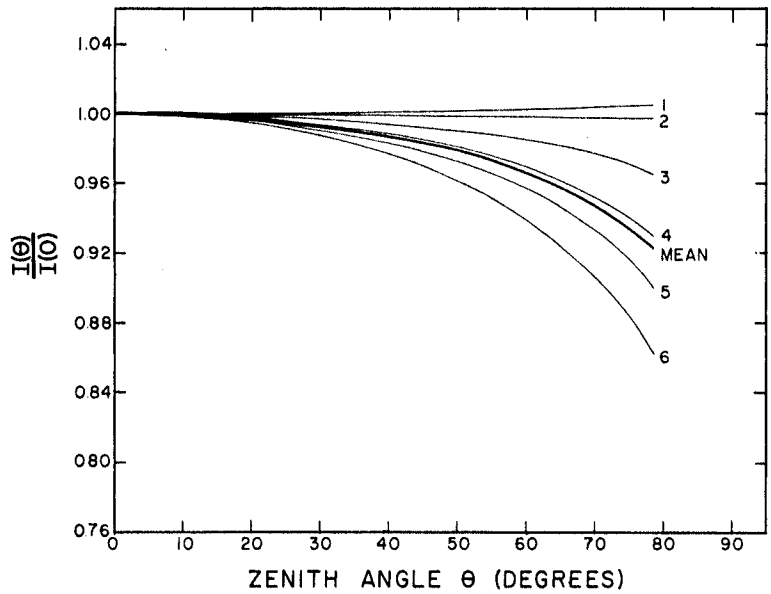


Figure 11. Calculated limb-darkening for the mean of 106 model atmospheres, and (1) Isachsen (79°N., 104°W.), Feb. 21, 1958, clear skies and large surface inversion; (2) El Paso (32°N., 106°W.), Mar. 1, 1958, overcast at 400 mb.; (3) Mould Bay (76°N., 119°W.), Apr. 1, 1958, clear skies and small surface inversion; (4) Green Bay (44°N., 88°W.), Oct. 24, 1958, overcast at 700 mb.; (5) Albany (43°N, 76°W), Aug. 1, 1958, overcast at 930 mb.; (6) Albuquerque (35°N., 107°W), July 11, 1958, clear skies and high humidity aloft.

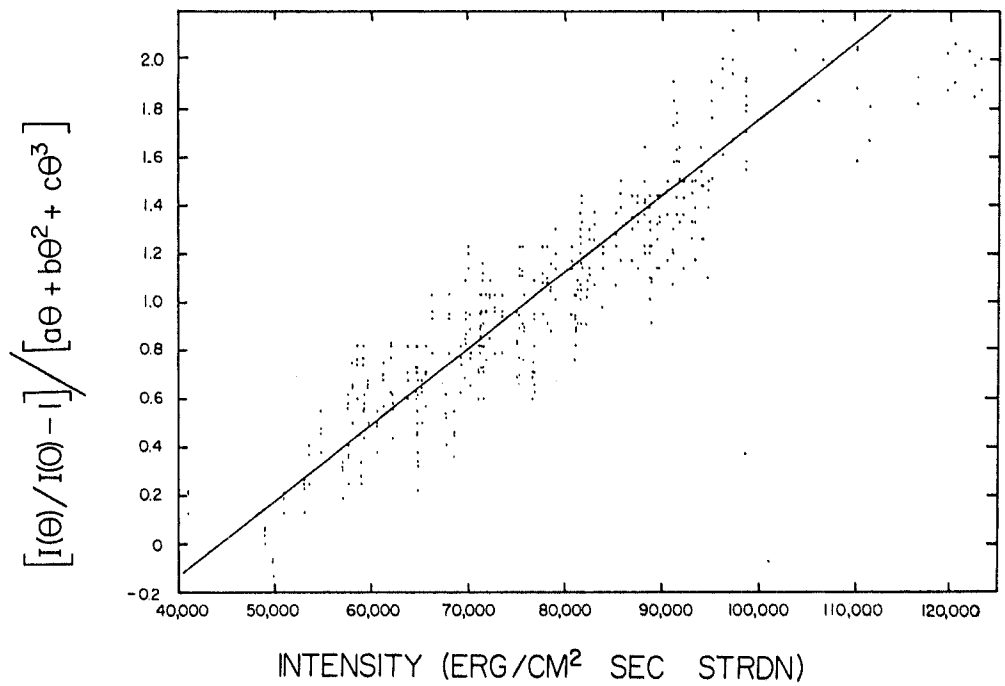


Figure 12. Change of limb-darkening with total specific intensity. The ordinate indicates the scale of the limb-darkening relative to that for the mean limb-darkening. Calculated data at Θ = 20°, 45°, 60° and 78.5° for 106 model atmospheres were used.

$$I(\vartheta) = I(0)\left\{1 + [\alpha + \beta I(0)][a\vartheta + b\vartheta^2 + c\vartheta^3]\right\} \tag{14}$$

where $\alpha = -1.375$ and $\beta = 3.129\text{X}10^{-5}$. It may seem that the scattering of points in figure 12 is quite large. However, it should be borne in mind that the quantity $[\alpha + \beta I(0)][a\vartheta + b\vartheta^2 + c\vartheta^3]$ does not exceed 0.15 or 0.20, so that the average error introduced by calculating $I(0)$ from (14) will be 2 percent or less.

Inserting (14) into (12), we have

$$F = I(0)[A + CI(0)] \tag{15}$$

where

$$A = 2\pi\int_0^{\frac{\pi}{2}} [1 + \alpha(a\vartheta + b\vartheta^2 + c\vartheta^3)]\sin\vartheta\cos\vartheta d\vartheta = 3.238 \tag{16}$$

$$C = 2\pi\int_0^{\frac{\pi}{2}} \beta(a\vartheta + b\vartheta^2 + c\vartheta^3)\sin\vartheta\cos\vartheta d\vartheta = -2.198\times10^{-6} \tag{17}$$

The procedure in calculating radiative flux from the TIROS data, $I_\varphi(\vartheta)$, is thus to determine $I(\vartheta)$ from (11), solve (14) for $I(0)$, and insert the resulting value into (15).

This method of calculating flux cannot, of course, give an exact solution. First, the assumption of a plane parallel atmosphere which was made in solving Eq. (10) becomes invalid at very large angles; at 78.5° the total air mass is about 4.9 atmospheres, compared with 5 atmospheres in the plane parallel assumption, and the difference increases rapidly at greater angles. Second, the extrapolation of the limb-darkening to 90° by means of (14) leads to substantial errors at very large angles, where the increasing influence of the higher atmosphere can even lead to a reversal of the slope of the limb-darkening curve. Third, the assumption of circular symmetry in the radiation field which is implicit in (12) is contrary to the scale of horizontal variations which occur in the atmosphere, although this is not important in light of the resolution of the instrument under consideration; the viewed area is 40 miles or more across whereas the vertical dimension of the part of the atmosphere contributing substantially to the outgoing radiation is much less. However, the radiation at large zenith angles does not contribute greatly to the flux; from angles greater than 60° the contribution is about 25 percent, and for angles greater than 78.5° it is only about 4 percent. Flux, calculated from the TIROS intensity data, which do not occur for ϑ greater than about 75°, should therefore contain only small systematic or random errors induced by the method outlined above.

Until now, c.g.s units have been used exclusively. It is the practice in meteorology, however, to express radiative flux in langleys (cal/cm^2) per minute; in addition, the TIROS satellite data, as described in the Data Users' Manual [6], are expressed as radiative flux in watts per meter^2. Equations (11), (14) and (15) can be applied directly to the TIROS II data, $I_\varphi(\vartheta)$ by appropriate changes of the constants; the values of the constants for TIROS II, III and IV are given in Table 3.

Table 3. CONSTANTS FOR TRANSFORMATION OF TIROS DATA TO RADIATIVE FLUX

TIROS II	TIROS III	TIROS IV
$r = .06348$ ly/min	$r' = .04727$ ly/min	$r'' = .1404$ ly/min
$s = .005789 \frac{\text{ly m}^2}{\text{w min}}$	$s' = .002628 \frac{\text{ly m}^2}{\text{w min}}$	$s'' = .004909 \frac{\text{ly m}^2}{\text{w min}}$
$t = -3.73\text{X}10^{-8} \frac{\text{ly m}^2}{\text{w min}}$	$t' = 2.928\text{X}10^{-6} \frac{\text{ly m}^4}{\text{w}^2 \text{ min}}$	$t'' = -.02760 \frac{\text{ly}}{\text{min}}$
$I_\varphi = 23.56$ w/m^2		$v'' = .001614$ ly m^2/w min
		$w'' = -1.332\text{X}10^{-5}$ ly m^4/w^{2}min
		$\vartheta_0 = 78.5^\circ$
$\alpha = -1.375$	$\alpha = -1.375$	$\alpha = -1.375$
$\beta = 6.950$ min/ly	$\beta = 6.950$ min/ly	$\beta = 6.950$ min/ly
$A = 1.0307$	$A = 1.0307$	$A = 1.0307$
$C = -.1554$ min/ly	$C = -.1554$ min/ly	$C = -.1554$ min/ly

Other satellites would require the evaluation of new empirical formulae and sets of constants.

The TIROS radiation data are compiled onto magnetic tapes for use on electronic computers; complete details are contained in the Data Users' Manual [6]. In the case of TIROS II, the radiation data on these tapes are expressed in watts per meter^2, defined by Eq. (1) multiplied by π. For TIROS III and TIROS IV, however, it was decided to express the infrared data by the "effective black body temperature", defined by

$$\overline{W} = \pi \int_0^\infty I_\nu(\vartheta)\, \varphi_\nu\, d\nu = \pi \int_0^\infty B_\nu(T_B)\, \varphi_\nu\, d\nu \tag{18}$$

where $B_\nu(T_B)$ is the Planck intensity at ν, and T_B is the "effective black body temperature", the constant π is included to transform Planck intensity to the black body flux. Table 4 gives the values of $\overline{W}$ and T_B for channels 2 and 4 for each satellite.

In partly cloudy conditions the limb-darkening effect is somewhat different from that of clear or overcast conditions. Consider the influence of partial cloudiness on the limb-darkening by assuming a cloud pattern composed of scattered cumulus type clouds, a typical cloud pattern. In such a case the outgoing intensity which reaches the radiometer in the TIROS will be a weighted mean value of the intensities originating from the cloud-covered area and from the cloud-free area. Because of the vertical extension of cloud masses, the apparent area covered by clouds increases with increasing zenith angle. This makes the limb-darkening effect somewhat greater than that for the overcast or

Table 4. VALUES OF $\overline{W}$ AND T_B FOR CHANNELS 2 AND 4 OF TIROS II, III AND IV.

T_B (°K)	$\overline{W}$ (w/m^2)					
	TIROS II		TIROS III		TIROS IV	
	Ch. 2	Ch. 4	Ch.2	Ch. 4	Ch. 2 +	Ch. 4 *
170			2.48	14.55	2.48	
180	3.09	9.07				
190			5.33	25.15	5.33	
200	6.45	14.62				
210			10.10	40.01	10.10	
220	11.93	23.13				
230			17.37	59.66	17.37	
240	20.11	34.60				
250			27.65	84.50	27.65	
260	31.50	49.04				
270			41.38	114.8	41.38	
280	46.77	67.20				
290			58.89	150.6	58.89	
300	65.71	88.48				
310			80.41	191.9	80.41	
320	88.90	112.8				
330			106.1	238.8	106.1	
340	116.4	142.7				
350			135.9	290.9	135.9	

clear sky conditions because of the increasing weight given to the colder clouds with increasing zenith angle. Consider now the error of estimation of the outgoing flux when the limb-darkening curve as calculated from clear and overcast conditions is applied to the scattered cloud conditions. Because of the difference of the limb-darkening effects, when the TIROS is viewing vertically above an area of scattered clouds, the outgoing flux from the area will, in the average, be overestimated; whereas, when the TIROS is viewing obliquely at a large angle, the outgoing flux from the area will be underestimated; there will be a tendency for the errors due to this effect to average out for large numbers of data. Nevertheless, there will be a range of angles in which the error of estimation is very small, even when applying the limb-darkening curve calculated from clear and overcast conditions to the scattered cloud conditions. Further, when the individual cloud masses are large enough to be comparable with the area viewed by the TIROS radiometer, the cloud height and thickness become negligible relative to the cloud diameter and the ratio of clouded to unclouded areas is virtually independent of the viewing angle; accordingly,

+ *Filter same as that in TIROS III*
* TIROS IV did not carry a channel 4 radiometer

the limb-darkening effect will approach that of overcast or clear sky conditions, which were discussed earlier. It may be concluded, therefore, that the use of the limb-darkening curve obtained from the clear and overcast conditions is not so serious as might at first be thought. This remains to be verified through the examination of simultaneous satellite photographs and radiation data.

Examples of estimated values of outgoing flux calculated from TIROS II data are shown in figures 13a, 13b, and 13c. The surface weather chart analysis for 1200 GMT on November 27, 28, and 29, 1960, made by the National Weather Analysis Center of the U. S. Weather Bureau, is shown in the upper part of each figure; the lower part of each figure is an analysis of the radiative flux, calculated by the method given in this section.

In this sequence of maps the radiation values are mostly indicative of the amount and height of clouds: it is seen that the front moving across Europe is associated with lower values than are the high pressure areas, and the development of the open wave over southern Europe is evidenced by the corresponding development of a center of low radiation values. Low radiation values over Syria and southern USSR on Nov. 27 show an extensive shield of clouds to be associated with the Low over the eastern Mediterranean; on Nov. 28 the Low has filled and the clouds have evidently moved eastward to the edge of the map, as one might infer from the radiation values. In general, the values range from 0.2 to 0.4 ly./min. which is in accord with the theoretical values predicted by Yamamoto [27] and with the Explorer VII measurements found by Suomi [23] and Weinstein and Suomi [26] .

However, the channel 4 data are not mere indicators of clouds, for the channel 2 data are better adapted to this purpose. Rather, it is to be hoped that radiative flux information can eventually be incorporated into evaluations of the energy regime of the atmosphere. For such use, the resolution indicated by figure 13 is probably not required, but this resolution is required if the method set forth in this section is to be employed.

VII. ESTIMATION OF SURFACE TEMPERATURE

Because the TIROS channel 2 filter covers the window region, in which the absorption coefficient of water vapor is small, the outgoing intensity in this region is not changed greatly by absorption and radiation within the atmosphere from the intensity emitted by the underlying surface. Several authors (Bandeen et al., [2], Fritz and Winston, [11] , and Hanel and Stroud, [14]) have shown that, by assuming the Planckian intensity distribution for the outgoing intensity observed by the TIROS channel 2 radiometer, both the surface air temperature under clear sky conditions and the cloud top temperature when the sky is covered by relatively dense clouds such as stratocumulus or altostratus can approximated; however, the estimated temperature is almost invariably too low by several degrees under clear sky conditions. Similar results are found by Nordberg et al., [19] for TIROS III. As was seen in figure 7, the intensity within the 9.6 micron ozone band is generally less than that over the rest of the window region; furthermore, because the layers of the atmosphere within which the water vapor is concentrated are usually cooler than the surface, the outgoing intensity throughout the window region

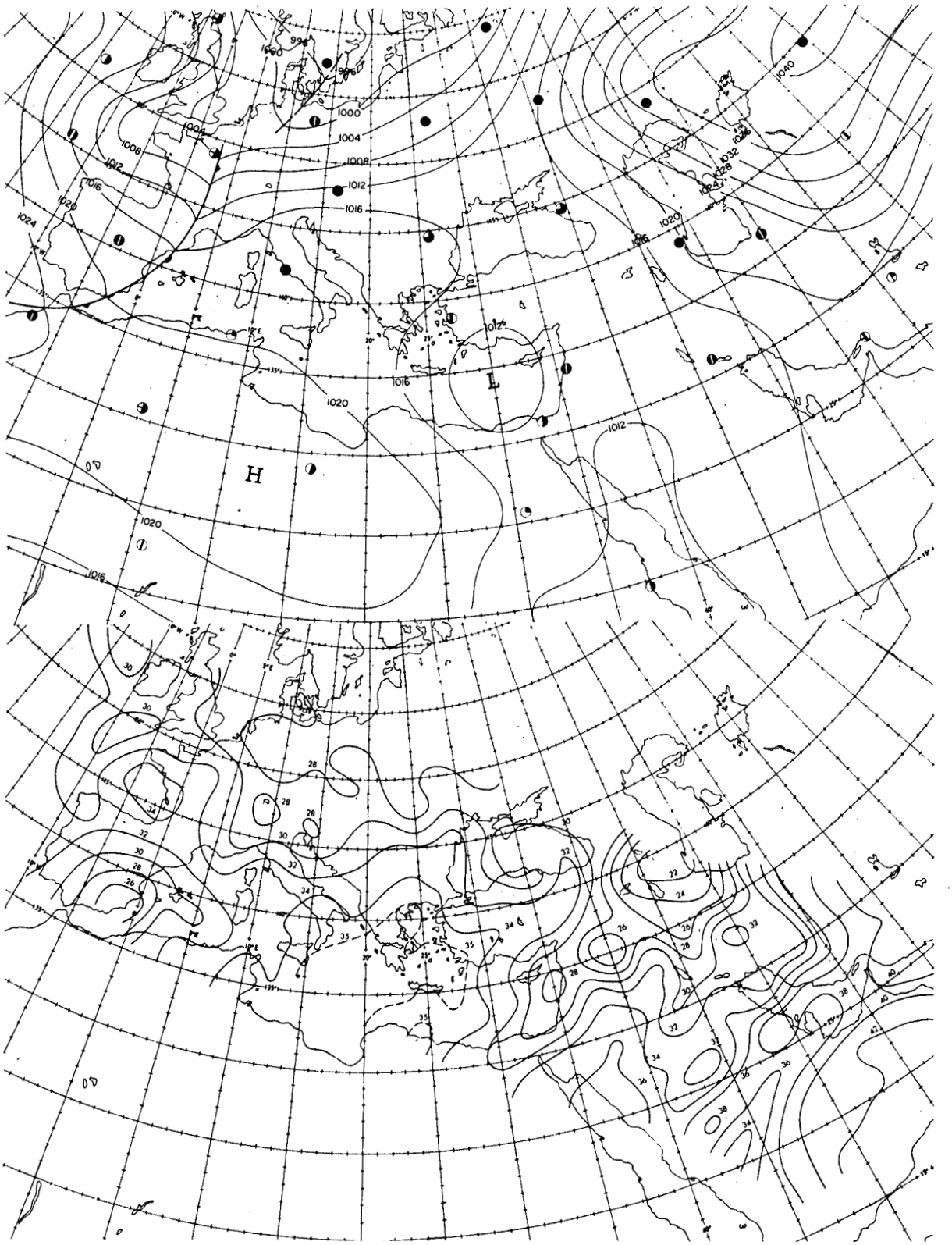


Figure 13. Charts of radiative flux over Europe, derived from TIROS II channel 4 data, and corresponding surface analyses; three consecutive days are shown.
a. November 27, 1960

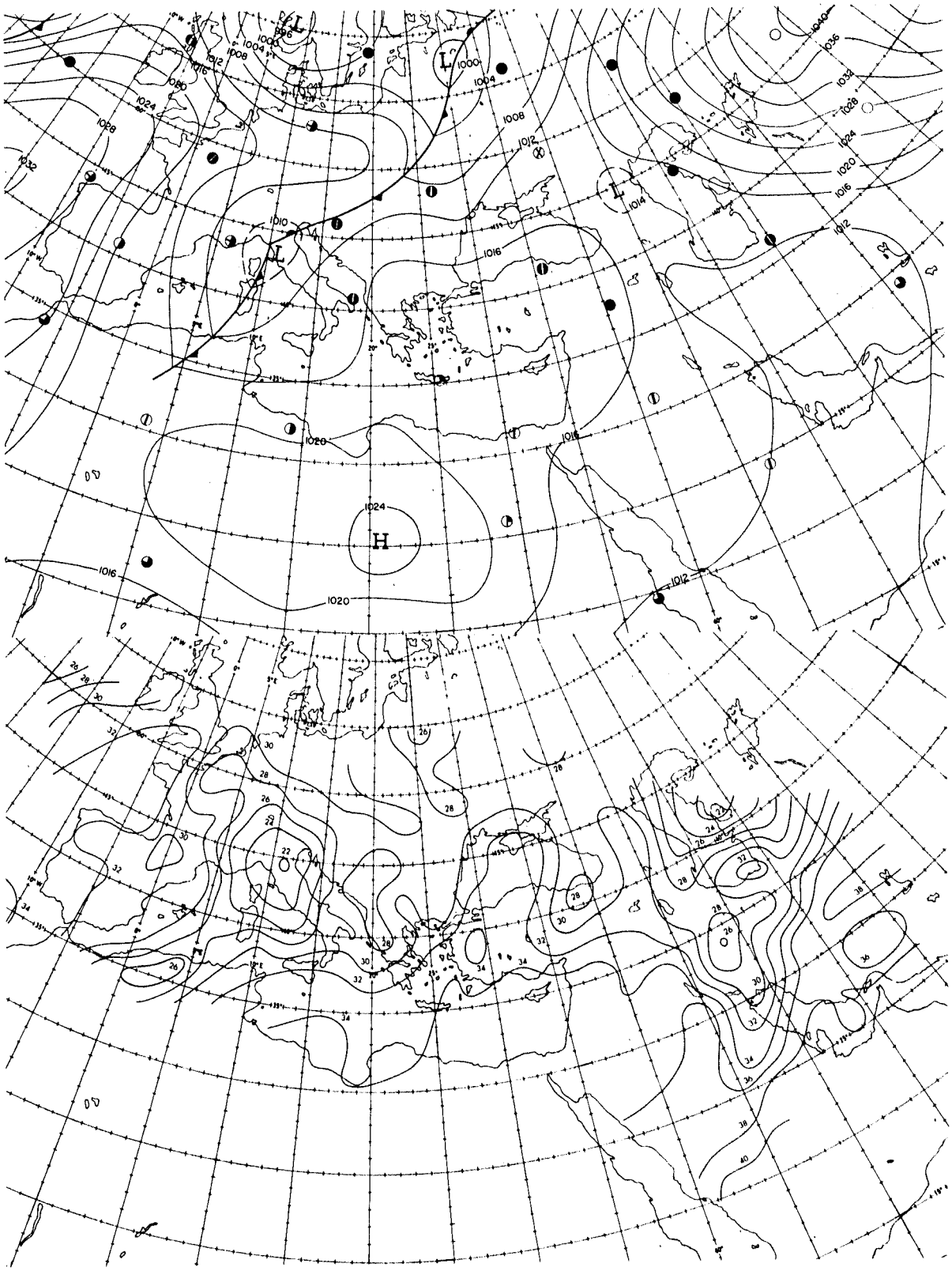


Figure 13b. November 28, 1960

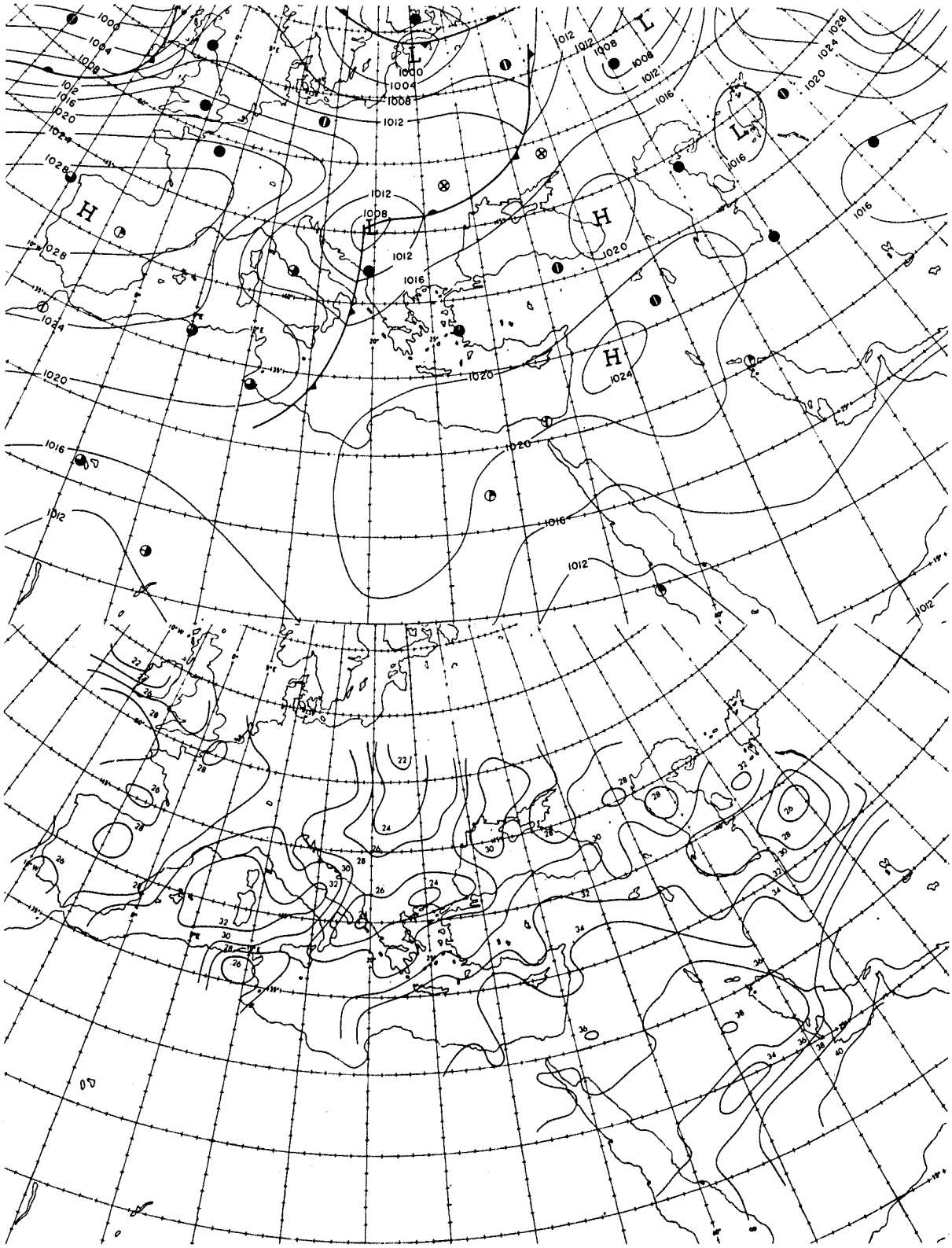


Figure 13c. November 29, 1960

is less than the intensity emitted by the underlying surface. For a better estimation of the surface temperature from the TIROS channel 2 data, corrections are necessary to account for the influences by ozone and water vapor upon the outgoing intensity.

Water vapor and ozone are largely concentrated in separate layers of the atmosphere, near the surface and in the stratosphere, respectively. The difference between the outgoing intensity in the ozone band interval and the intensity within the same interval coming from below the ozonosphere is caused by the net effect of emission and absorption by the ozone layer alone. Little change takes place in the amount and distribution of ozone and the temperature of the ozone layer with seasons and latitudes, whereas there are large changes of surface and cloud top temperatures with seasons, latitudes, and cloud heights. Therefore, the emission of the ozone layer, which depends upon its temperature and emissivity, changes little compared with the absorption of the surface intensity by the ozone layer; the latter depends upon the surface temperature and the absorptivity of the ozone layer. It is, therefore, expected that the difference between the surface intensity and the outgoing intensity within the ozone band interval changes primarily with the change of the temperature of the underlying surface, the quantity to be estimated. As a first approximation, the outgoing intensity from the window region without ozone correction, may be used to determine the ozone correction. Figure 14a shows the difference between the outgoing intensity in the ozone interval (948-1100 cm.$^{-1}$) for an ozone-free atmosphere and that with ozone present, plotted versus the outgoing intensity of the 814 to 1325 cm.$^{-1}$ interval at zero zenith angle; these data were computed for 40 selected atmospheres. It is seen that the relation is linear, with little scattering of points. It has been found that the same corrections apply to other angles.

Unlike ozone, water vapor amounts in the atmosphere vary greatly with season and latitude. Although the total water vapor varies roughly with surface temperature, this is obviously not a satisfactory gage. Minimum amounts are found in winter Arctic or sub-Arctic regimes; maximum amounts are found within tropical maritime air masses; but intermediate amounts may be found both in moderate middle latitude conditions and over the summertime desert. It is therefore not possible to account for the effect of water vapor on the outgoing intensity from the data of channel 2 alone. The problem is further complicated by the influence of inversions and by abnormal water vapor distributions. The inference of surface temperature from the satellite data requires consideration of the air mass being viewed in order to make a satisfactory correction for water vapor. Figure 14b shows the difference between the intensity at the surface in the interval 814 to 1325 cm.$^{-1}$ and the outgoing intensity from the atmosphere with water vapor present (but without ozone), plotted versus the outgoing intensity over the interval, as calculated from the 106 model atmospheres. The large scatter of points is a consequence mostly of the variable water vapor amounts in the models, but surface inversions and abnormal water vapor distributions also contribute markedly to the scattering. The main characteristics are evident, as shown by the two curves sketched on the figure: the upper curve may be considered to represent the corrections for very moist atmospheres to be added to the measured intensity to obtain the intensity at the surface; the lower curve represents atmospheres with low water vapor content. The values between the two curves represent

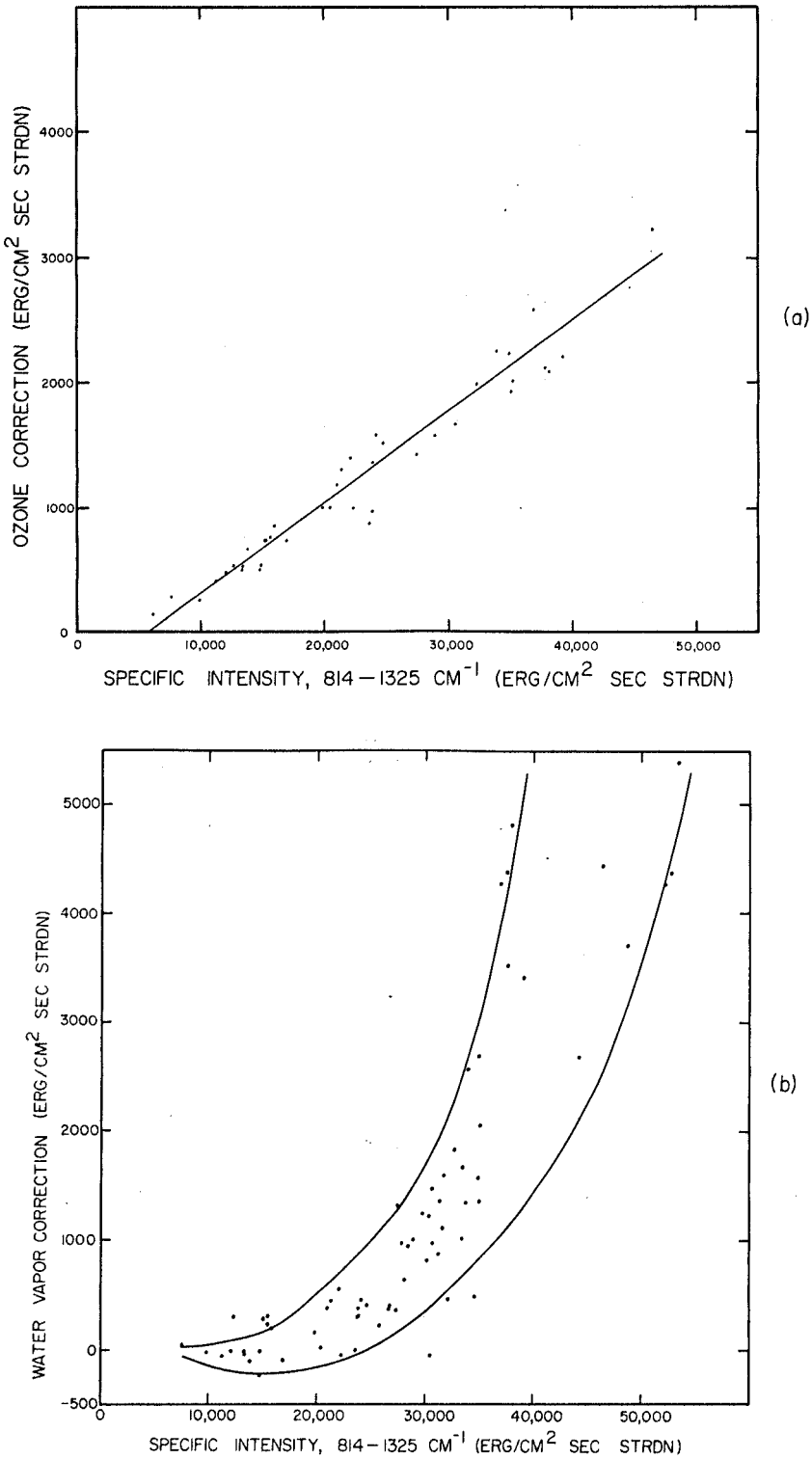


Figure 14. (a) Ozone correction versus specific intensity 814-1325 cm.$^{-1}$.
(b) Water vapor correction versus specific intensity 814-1325 cm.$^{-1}$.
The curves indicate corrections for typical high (upper curve) and low (lower curve) humidity cases. The corrections are additive, with due regard to sign, to the abscissa values.

atmospheres containing intermediate amounts of water vapor, and, of course, these more or less normal atmospheres are in the great majority. The negative values indicate the existence of surface inversions; atmospheres with low water vapor content are more likely to have strong surface inversions, and the lower curve has therefore been drawn to include the negative values.

The total correction required to obtain surface temperature from the TIROS II data is the sum of the ozone and water vapor corrections. If the values indicated by the curves in figures 14a and 14b are used, the results shown in figure 15 are obtained. This figure gives the transformation from TIROS II channel 2 data, with $\vartheta = 0$, to surface radiation temperature: the dashed curve gives the effective temperature versus the filtered radiative flux, as given in the Data Users' Manual [6] ; the two solid curves give the surface radiative temperature for atmospheres of high (upper curve) and low (lower curve) water vapor content. The abscissa is shown in c.g.s. intensity units at the bottom, and in w./m.^{2} of flux at the top.

Limb-darkening for channel 2 is considerably less than for channel 4 at small angles, but at $\vartheta = 78.5^\circ$ the two are about equal. One may ignore the channel 2 limb-darkening at angles up to about $\vartheta = 30^\circ$, but it is desirable to take account of it at greater angles. The limb-darkening effect can be seen qualitatively in figure 16: here the abscissa is T_ϑ , the effective temperature at angle ϑ, taken from the dashed curve in figure 15; the ordinate is $(\Delta T)_\vartheta = T_S - T_\vartheta$, where T_S is the surface temperature. The examples are extremes, with $\vartheta = 0$ in the upper part and $\vartheta = 78.5^\circ$ in the lower part; the curves in each correspond once more to atmospheres of high and low water vapor content. From this figure, and from similar curves for other angles, an empirical relation has been found to relate T_ϑ with T_S:

$$(\Delta T)_\vartheta = \frac{K}{\eta G - D T_\vartheta} - \xi H \tag{19}$$

where

$$\eta = 1 - 1.018 \times 10^{-7} \vartheta^{3.1} \tag{20}$$

$$\xi = 7.50 \times 10^{-7} \vartheta^{3.1} + 1 \tag{21}$$

K = 516, G = 350 and H - 3.9; ϑ is in degrees. The parameter D describes the degree of moisture of the air mass, varying from 1.069 to 1.000 for the moist and dry atmospheres and having an average value of about 1.040. Similar empirical relations for TIROS III and IV can be developed.

Orbit 4 of TIROS II on November 23, 1960, afforded a good opportunity to examine the channel 2 data over a large clear area at about noon. This case

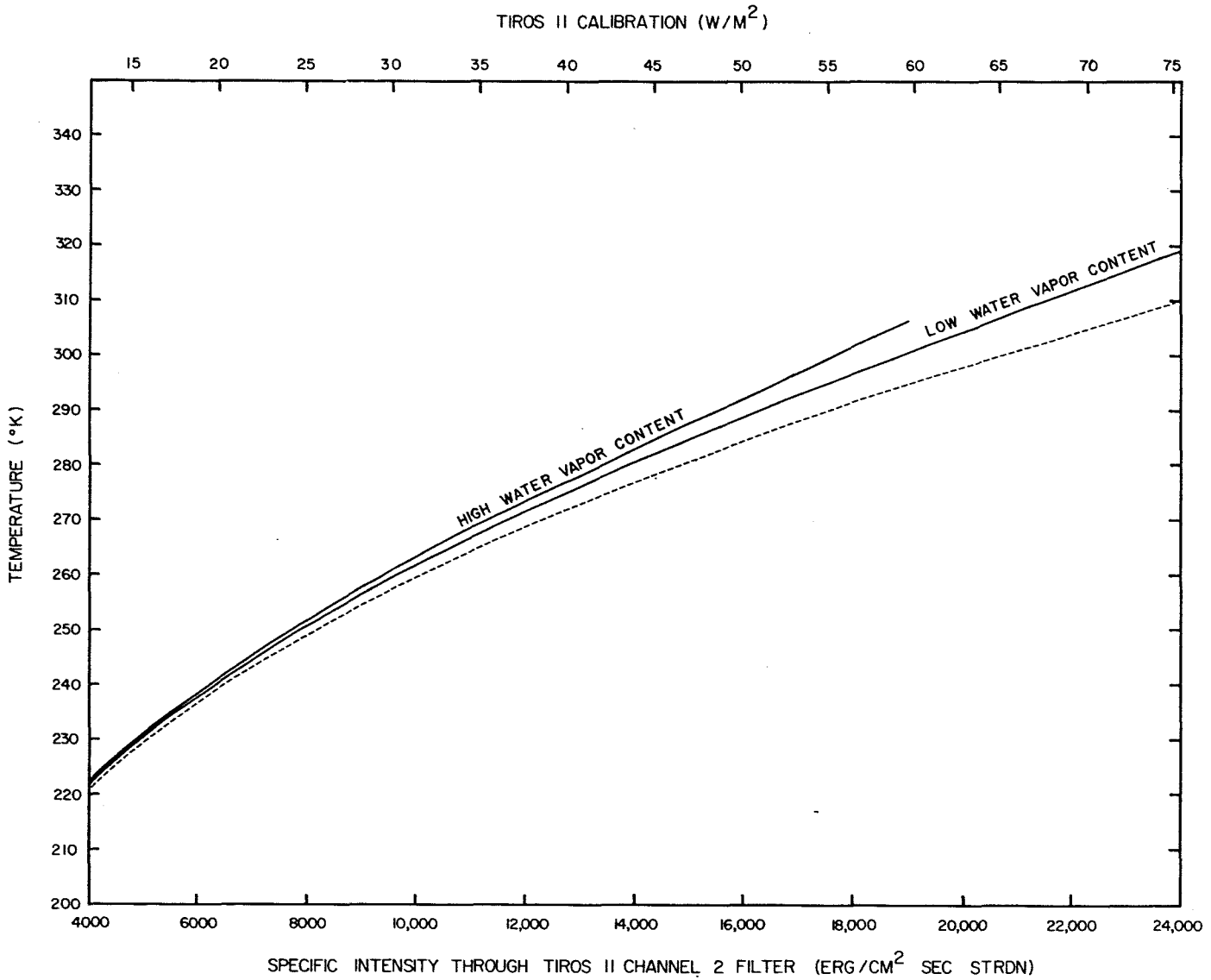


Figure 15. Transformation from TIROS II data to temperature for $\vartheta = 0$. The abscissa is given in c.g.s. units of specific intensity and in w/m^2 of flux. The dashed curve is the equivalent black body transformation; the solid curves give the surface radiation temperature for atmospheres of high and low humidity.

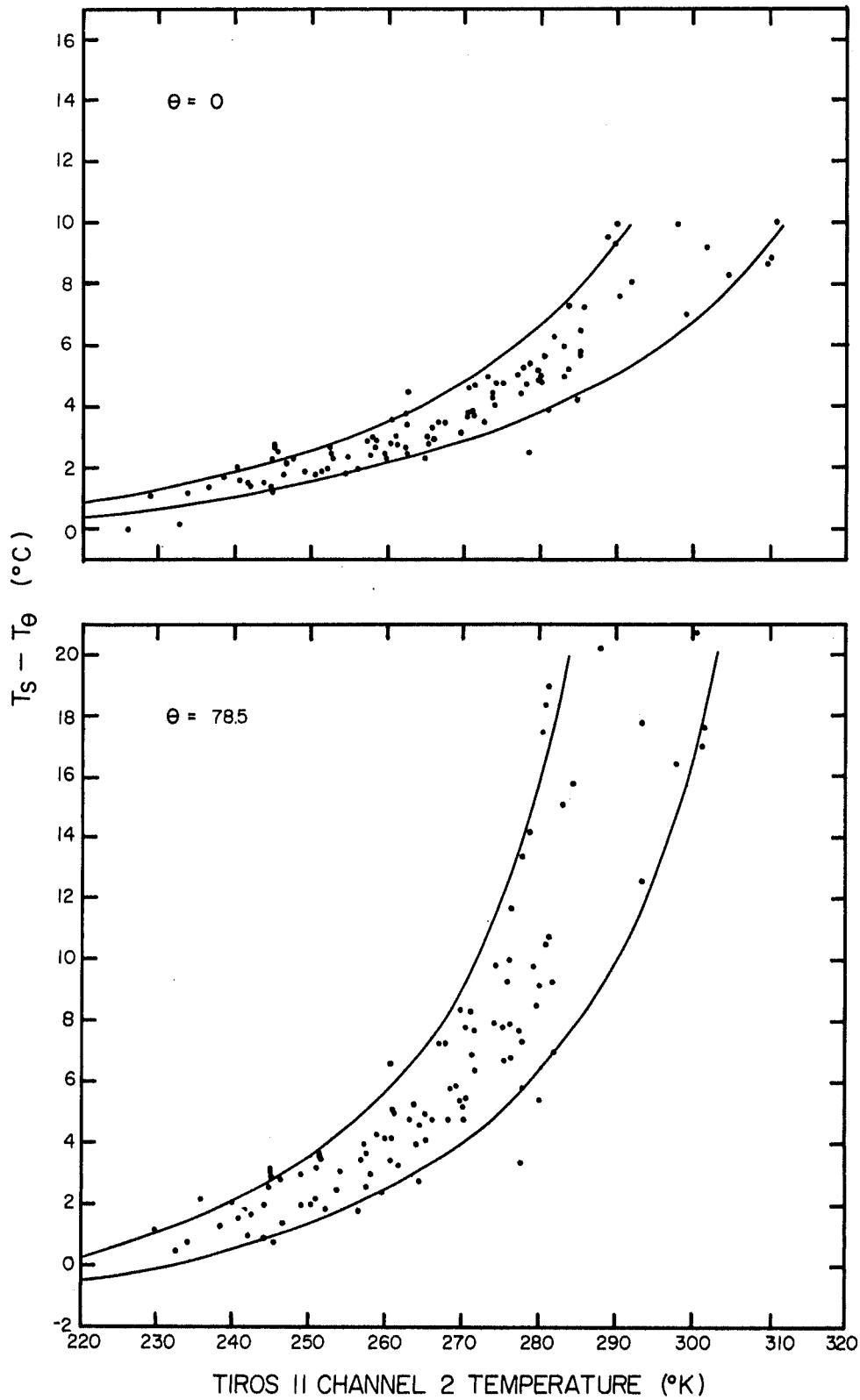


Figure 16. Variation of temperature corrections with zenith angle. Curves of high and low humidity correspond to those shown in figures 14(b) and 15.

is discussed at length by Fritz and Winston [11], but in essence there was a frontal system over the area east of the Appalachians and a large High covering the central United States east of the Rocky Mountains. In Table 5 are listed the effective temperature obtained from the average around each station by the measurement of TIROS II, the corrected surface temperature using the dashed curve in figure 15 and Eqs. (19), (20), and (21), the surface air (shelter) temperature for several stations at the time when TIROS II was passing (about 1810 GMT), and the difference between the last two. The sky was clear at each station; D was taken to be 1.040. The corrections for the combined effects of ozone and water vapor (Eq. 18) are not large, averaging about 5°C. in this situation; the air within this high pressure area was rather dry and the surface temperatures were moderate. Agreement between the inferred surface temperature and the shelter temperature seems to be remarkably good in most cases; average values are 280.8°K. and 281.1°K., respectively. Although the mean values agree well, the differences for the individual stations vary from minus 5.0°C. to plus 3.5°C. Although this might be thought to indicate the accuracy of measurement by TIROS II, the negative values may possibly be attributed to thin clouds, not reported by the observer; at all but three stations some cloudiness was reported within three hours of the TIROS observation. Small uncertainties in the geographical location of the TIROS observation also may be responsible for the disagreement. It is well known, however, that the shelter temperature usually differs substantially from the temperature of the actual surface, so that such agreement between satellite and normal meteorological measurements of temperature can result from the nature of the surface, or it can be the fortuitous consequence of some other factor such as the time of day or the wind velocity.

In any case, the temperature inferred from the satellite measurements is the surface radiative temperature. If the emissivity of the surface is less than unity, and it surely is to some degree, then the actual surface temperature would be underestimated from a satellite. A good correction can be made for the ozone, and, if care is observed, the water vapor correction can be estimated rather well. No account has been taken of scattering by aerosols in the atmosphere, but Deirmendjian [7] has indicated that the extinction coefficients due to the scattering are about an order of magnitude smaller than the water vapor absorption coefficients at the wavelengths being discussed; also unaccounted for is emission by the atmospheric aerosols, and no estimate of this effect is available. Scattered clouds will normally lead to an underestimation of surface temperature, and thin cirrus which cannot be seen in television pictures can prove troublesome. Altogether, the hazards estimating surface temperatures from satellites are numerous and have no exact solution from satellite measurements alone. Estimation of cloud top temperature is likewise subject to some uncertainty, inasmuch as the optical depth of the cloud is dependent upon both the density and nature of the cloud particles. Many clouds, particularly cirriform, may not be totally absorbing, so that the background of a lower cloud layer or the surface can make a significant contribution to the upward radiation and thereby lead to a fictitious temperature. Partial cloudiness will have a similar influence upon inferred temperatures.

Although the inference of surface temperature from measurements in a single spectral interval leads to the ambiguities apparent in the foregoing

TABLE 5. COMPARISON OF TIROS TEMPERATURES WITH SHELTER TEMPERATURES
PASS 4, 1808-1814 GMT, NOVEMBER 23, 1960

Station	T_e TIROS II Effective Temperature	T_s TIROS II Corrected (Surface) Temperature	T_a Surface Air (Shelter) Temperature	$T_s - T_a$
	(°K)	(°K)	(°K)	(°C)
Flint	275.3	279.5	279.9	-0.4
Detroit	272.6	276.5	279.9	-3.4
Evansville	275.9	280.3	283.2	-2.9
Springfield	277.1	282.1	282.6	-0.5
St. Louis	278.3	283.2	279.9	3.3
Muskegon	277.8	282.4	279.9	2.5
Akron	277.1	281.6	281.0	0.6
Ft. Smith	275.3	280.4	285.4	-5.0
Tulsa	277.1	282.6	282.6	0.0
Cincinnati	277.1	281.6	281.0	0.6
Mansfield	276.5	280.9	279.9	1.0
Oklahoma City	277.1	282.7	283.2	-0.5
Dayton	277.1	281.6	278.8	2.8
Peoria	275.9	280.2	280.4	-0.2
Columbia	274.0	278.2	280.4	-2.2
Green Bay	273.3	277.3	278.8	-1.5
Sault Ste. Marie	272.6	276.6	277.6	-1.0
Amarillo	277.1	284.5	281.0	3.5
Little Rock	277.1	282.6	286.0	-3.4
Pittsburgh	275.9	280.2	279.9	0.3

discussion, measurements in other spectral intervals can be used to improve estimated values substantially. For example, Möller [18] has shown that simultaneous measurements in channels 1 (6-6.5 micron) and 2 (8-12 micron) can be used to determine the mean relative humidity in the atmosphere; with the humidity known, the parameter D in Eq. (15) can be evaluated. One might also make use of channel 3 (0.2-5 micron) or channel 5 (0.55-0.75 micron) in the sunlit part of the earth to estimate cloud amount, so that account can be taken of the influence of clouds upon the upward intensity; this problem has not yet been investigated, and it is possible that other measurements, such as that proposed by Hanel [13] and Yamamoto and Wark [31] to measure the cloud top height, might also be incorporated. The channel 2 measurements are useful in themselves, without adjustments of any kind, but the desirability of knowing surface temperatures dictates additional study directed toward the resolution of the problems indicated in this section. Whereas the method of Sec. VI for calculating flux from channel 4 measurements brings the results within acceptable uncertainty, the reliable inference of surface temperature from channel 2 measurements requires additional refinements to account for water vapor amount and distribution, for the temperature structure, and for the nature and distribution of clouds.

Note:

Recently the NASA has obtained the results of spectral emissivity tests made on thermistors of the type used in the TIROS 5-channel radiometers. These show some spectral dependence, whereas it had previously been assumed that the emissivity of a thermistor was independent of wavelength. The TIROS II data contained in the Final Meteorological Radiation Tapes are given as $\overline{W}$, defined by Eq. (18) and the filter functions shown in Table 1; those for TIROS III and IV will be given as T_B, determined from the calibration of the radiometers with a black body. Therefore, although the relations and constants given in this report will give reasonable results, systematic corrections may be required to account for modification of the filter function φ_ν resulting from inclusion of the thermistor emissivity. Additional information may be obtained from the authors, upon request, when it becomes available.

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APPENDIX A

TEMPERATURE, WATER VAPOR, AND OZONE PROFILES OF 106 MODEL ATMOSPHERES

The atmospheric models used to calculate outgoing intensities are given here as profile listings of pressure, temperature, water vapor, and ozone. The temperature and water vapor profiles as functions of pressure were obtained from radiosonde data listed in the Northern Hemisphere Data Tabulations published by the U. S. Weather Bureau. The ozone profiles were assumed with regard to season and latitude, from the work of Dütsch [8] and Craig [5].

Each model atmosphere is identified by a number, the name of the radiosonde station, and the date and time of launching. The sky condition is indicated by 'clear' or by the height (in mb.) of the top of the undercast. The total water vapor mass in a vertical column is given in centimeters of precipitable water and the total ozone mass in centimeter atmospheres. The total water vapor mass includes all water vapor from the surface to the 0.1 mb. level for clear conditions and from the cloud top to the 0.1 mb. level for overcast conditions.

Pressures are expressed in millibars, temperatures in degrees Kelvin, water vapor mixing ratios in grams per kilogram, and ozone in centimeters-atmospheres per millibar.

MODEL ATMOSPHERES

1
HAVANA, CUBA SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 4.247 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	299.0	019.0000	00000.00
0850.0	290.0	010.4000	00000.50
0700.0	282.0	005.0000	00001.00
0500.0	264.0	001.1200	00002.50
0400.0	254.0	000.6000	00004.00
0300.0	239.0	000.1500	00006.00
0200.0	217.0	000.0210	00012.50
0150.0	207.0	000.0140	00020.50
0100.0	199.0	000.0110	00042.00
0050.0	217.0	000.0220	00131.00
0025.0	226.0	000.0450	00330.00
0020.0	225.0	000.0560	00398.00
0015.0	232.0	000.0750	00460.00
0010.0	234.0	000.1120	00513.00
0006.0	244.0	000.1120	00563.50
0004.0	254.0	000.1120	00642.50
0003.0	260.0	000.1120	00623.00
0002.0	270.0	000.1120	00547.50
0001.2	283.0	000.1120	00337.50
0000.6	283.0	000.1120	00033.70
0000.4	271.0	000.1120	00003.70
0000.3	262.0	000.1120	00002.10
0000.2	251.0	000.1120	00001.70
0000.1	231.0	000.1120	00000.10

2
KENITRA, MOROCCO SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 2.890 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	293.0	010.1000	00000.00
0850.0	294.0	003.3000	00000.50
0700.0	281.0	007.8000	00001.00
0500.0	260.0	000.8000	00002.50
0400.0	248.0	000.2200	00004.00
0250.0	219.0	000.1400	00008.00
0200.0	212.0	000.1200	00012.50
0150.0	209.0	000.0070	00020.50
0100.0	211.0	000.0110	00042.00
0050.0	216.0	000.0220	00131.00
0025.0	226.0	000.0450	00330.00
0020.0	229.0	000.0560	00398.00
0015.0	228.0	000.0750	00460.00
0010.0	235.0	000.1120	00513.00
0006.0	245.0	000.1120	00563.50
0004.0	254.0	000.1120	00642.50
0003.0	260.0	000.1120	00623.00
0002.0	270.0	000.1120	00547.50
0001.2	283.0	000.1120	00357.50
0000.6	283.0	000.1120	000035.7
0000.4	271.0	000.1120	00003.50
0000.3	262.0	000.1120	00002.50
0000.2	251.0	000.1120	00001.50
0000.1	231.0	000.1120	00000.10

3
OAKLAND, CALIF. SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 2.596 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1009.0	289.0	009.4000	00000.00
1000.0	288.0	009.4000	00000.00
0997.0	293.0	008.9000	00000.00
0906.0	301.0	006.9000	00000.30
0850.0	295.0	005.2000	00000.50
0500.0	265.0	001.6000	00002.50
0400.0	252.0	000.3000	00004.00
0250.0	224.0	000.0320	00008.00
0228.0	218.0	000.0210	00010.00
0185.0	210.0	000.0080	00014.00
0150.0	212.0	000.0140	00020.50
0100.0	206.0	000.0110	00042.00
0093.0	205.0	000.0120	00047.50
0050.0	212.0	000.0220	00131.00
0025.0	222.0	000.0450	00330.00
0015.0	225.0	000.0750	00460.00
0012.0	226.0	000.0940	00492.50
0010.0	230.0	000.1120	00513.00
0006.0	241.0	000.1120	00563.50
0004.0	249.0	000.1120	00642.50
0003.0	256.0	000.1120	00623.00
0002.0	265.0	000.1120	00547.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00002.50
0000.3	262.0	000.1120	00001.50
0000.2	251.0	000.1120	00000.50
0000.1	231.0	000.1120	00000.10

4
NANTUCKET, MASS. SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 1.284 O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1014.0	284.0	006.2000	00000.00
0836.0	273.0	003.4000	00000.50
0812.0	276.0	001.1000	00000.60
0700.0	270.0	000.5000	00001.00
0651.0	266.0	000.5000	00001.50
0610.0	268.0	000.6000	00001.80
0500.0	258.0	000.9000	00002.50
0300.0	232.0	000.1400	00006.00
0250.0	225.0	000.0700	00008.00
0200.0	224.0	000.0210	00012.50
0150.0	218.0	000.0130	00020.50
0100.0	213.0	000.0110	00042.50
0050.0	218.0	000.0220	00140.50
0025.0	221.0	000.0450	00375.00
0015.0	225.0	000.0750	00490.00
0010.0	233.0	000.1120	00530.00
0006.0	244.0	000.1120	00590.00
0004.0	253.0	000.1120	00654.00
0003.0	259.0	000.1120	00639.50
0002.0	269.0	000.1120	00558.00
0001.1	283.0	000.1120	00287.50
0000.6	283.0	000.1120	00028.70
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

5
BUFFALO, N.Y. SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 1.250 O3 MASS = 0.267

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0998.0	278.0	005.1000	00000.00
0977.0	283.0	006.4000	00000.00
0794.0	271.0	002.2000	00000.60
0749.0	270.0	000.9000	00000.80
0725.0	271.0	000.6000	00000.90
0700.0	270.0	000.6000	00001.00
0580.0	264.0	000.2000	00002.20
0500.0	257.0	001.1000	00002.50
0400.0	246.0	000.3000	00004.00
0248.0	221.0	000.0170	00007.90
0216.0	217.0	000.0160	00011.00
0200.0	220.0	000.0140	00012.50
0150.0	218.0	000.0020	00020.50
0100.0	218.0	000.0110	00042.50
0079.0	213.0	000.0140	00065.00
0050.0	220.0	000.0220	00140.50
0025.0	224.0	000.0450	00375.00
0015.0	226.0	000.0750	00490.00
0010.0	227.0	000.1120	00530.00
0006.0	238.0	000.1120	00590.00
0004.0	247.0	000.1120	00654.00
0003.0	253.0	000.1120	00639.50
0002.0	263.0	000.1120	00558.00
0001.0	279.0	000.1120	00255.00
0000.9	283.0	000.1120	00162.50
0000.6	283.0	000.1120	00016.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

6
MANIWAKI, QUEBEC SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 1.393 O3 MASS = 0.272

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0996.0	274.0	004.1000	00000.00
0960.0	280.0	005.3000	00000.10
0927.0	280.0	004.7000	00000.20
0850.0	275.0	004.2000	00000.50
0700.0	263.0	002.0000	00001.00
0682.0	264.0	001.7000	00001.20
0941.0	262.0	000.6000	00001.60
0622.0	263.0	000.9000	00001.80
0500.0	253.0	001.0000	00002.50
0300.0	225.0	000.1060	00006.00
0250.0	217.0	000.0320	00008.00
0200.0	223.0	000.0210	00012.50
0168.0	224.0	000.0120	00017.00
0100.0	218.0	000.0110	00042.50
0050.0	219.0	000.0220	00140.50
0026.0	222.0	000.0430	00362.50
0020.0	228.0	000.0560	00439.00
0010.0	240.0	000.1120	00530.00
0006.0	251.0	000.1120	00590.00
0004.0	260.0	000.1120	00654.00
0003.0	267.0	000.1120	00639.50
0002.0	276.0	000.1120	00558.00
0001.5	283.0	000.1120	00466.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.00

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

7
FT. SMITH, ARK. SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 0.634 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0998.0	267.0	002.3000	00000.00
0980.0	277.0	003.4000	00000.10
0886.0	271.0	003.0000	00000.40
0850.0	270.0	001.3000	00000.50
0686.0	259.0	000.3000	00001.20
0400.0	226.0	000.0230	00004.00
0351.0	219.0	000.0180	00005.00
0280.0	213.0	000.0100	00006.80
0206.0	224.0	000.0100	00012.00
0150.0	222.0	000.0100	00020.50
0100.0	222.0	000.0110	00042.00
0050.0	221.0	000.0220	00131.00
0040.0	222.0	000.0280	00184.00
0032.0	221.0	000.0350	00250.00
0025.0	221.0	000.0450	00330.00
0015.0	231.0	000.0750	00460.00
0010.0	238.0	000.1120	00513.00
0006.0	249.0	000.1120	00563.50
0004.0	258.0	000.1120	00642.50
0003.0	264.0	000.1120	00623.00
0002.0	274.0	000.1120	00547.50
0001.5	283.0	000.1120	00445.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00044.50
0000.4	271.0	000.1120	00004.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

8
THULE, GREENLAND SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 0.410 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	267.0	001.2000	00000.00
0850.0	264.0	001.5000	00000.50
0700.0	259.0	000.3000	00001.00
0500.0	242.0	000.1120	00002.50
0400.0	232.0	000.0540	00004.00
0300.0	227.0	000.0240	00006.00
0250.0	229.0	000.0190	00008.00
0200.0	224.0	000.0180	00012.50
0150.0	225.0	000.0140	00020.50
0100.0	225.0	000.0110	00042.00
0050.0	223.0	000.0220	00131.00
0025.0	220.0	000.0450	00330.00
0015.0	219.0	000.0750	00460.00
0010.0	219.0	000.1120	00513.00
0007.0	219.0	000.1120	00543.00
0005.0	220.0	000.1120	00599.00
0004.0	220.0	000.1120	00642.50
0003.0	227.0	000.1120	00623.00
0002.0	237.0	000.1120	00547.50
0001.0	255.0	000.1120	00255.00
0000.5	277.0	000.1120	00025.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

9
ISACHSEN, N.W.T. SEPT. 29, 1958
1200GMT CLEAR
H2O MASS = 0.265 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1013.0	246.0	000.3000	00000.00
0995.0	255.0	000.7000	00000.00
0921.0	258.0	001.0000	00000.30
0850.0	257.0	000.6000	00000.50
0794.0	254.0	000.4000	00000.70
0700.0	251.0	000.3000	00001.00
0500.0	237.0	000.1500	00002.50
0326.0	220.0	000.0320	00005.00
0300.0	219.0	000.0210	00006.00
0250.0	226.0	000.0190	00008.00
0150.0	226.0	000.0140	00020.50
0100.0	225.0	000.0110	00042.00
0050.0	222.0	000.0220	00131.00
0025.0	219.0	000.0450	00330.00
0020.0	220.0	000.0560	00398.00
0013.0	221.0	000.0860	00482.00
0010.0	226.0	000.1120	00513.00
0006.0	237.0	000.1120	00563.50
0004.0	247.0	000.1120	00642.50
0003.0	253.0	000.1120	00623.00
0002.0	262.0	000.1120	00547.50
0001.0	280.0	000.1120	00255.00
0000.9	283.0	000.1120	00197.00
0000.6	283.0	000.1120	00020.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

10
CHAGUARAMAS BAY, TRIN APR. 1, 1958
1200GMT CLEAR
H2O MASS = 3.904 O3 MASS = 0.304

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	298.0	014.9000	00000.00
0850.0	289.0	009.8000	00001.00
0700.0	283.0	005.5000	00002.50
0500.0	268.0	000.8000	00005.00
0400.0	259.0	000.5000	00006.50
0250.0	232.0	000.1120	00012.50
0150.0	207.0	000.0240	00034.00
0100.0	194.0	000.0820	00066.00
0050.0	203.0	000.1650	00175.00
0025.0	221.0	000.3300	00345.00
0020.0	227.0	000.4130	00395.00
0015.0	229.0	000.5500	00452.50
0010.0	238.0	000.8260	00510.00
0006.0	249.0	000.8260	00540.00
0004.0	258.0	000.8260	00515.00
0003.0	265.0	000.8260	00465.00
0002.0	274.0	000.8260	00354.00
0001.4	283.0	000.8260	00257.50
0001.0	283.0	000.8260	00185.00
0000.6	283.0	000.8260	00048.00
0000.4	271.0	000.8260	00005.00
0000.3	262.0	000.8260	00004.00
0000.2	251.0	000.8260	00003.00
0000.1	231.0	000.8260	00002.00

11
CLARK FIELD, P.I. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 1.495 O3 MASS = 0.303

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	290.0	011.9000	00001.00
0700.0	283.0	001.4400	00002.50
0500.0	266.0	001.5600	00005.00
0400.0	255.0	000.3600	00006.50
0300.0	241.0	000.1800	00010.00
0200.0	218.0	000.0400	00020.00
0150.0	207.0	000.0140	00034.00
0100.0	196.0	000.0044	00066.00
0050.0	207.0	000.0087	00175.00
0025.0	221.0	000.0170	00345.00
0020.0	225.0	000.0220	00395.00
0010.0	239.0	000.0440	00510.00
0006.0	250.0	000.0440	00540.00
0004.0	258.0	000.0440	00515.00
0003.0	264.0	000.0440	00465.00
0002.0	274.0	000.0440	00354.00
0001.4	283.0	000.0440	00262.50
0001.0	283.0	000.0440	00185.00
0000.6	283.0	000.0440	00045.00
0000.4	271.0	000.0440	00000.50
0000.3	262.0	000.0440	00000.40
0000.2	251.0	000.0440	00000.20
0000.1	231.0	000.0440	00000.10

12
TUCSON, ARIZ. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 1.124 O3 MASS = 0.302

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0923.0	282.0	005.2000	00000.50
0904.0	285.0	004.6000	00000.60
0850.0	282.0	004.5000	00001.00
0775.0	276.0	004.0000	00001.80
0700.0	272.0	001.1000	00002.50
0641.0	268.0	000.8000	00003.20
0627.0	268.0	000.6000	00003.40
0500.0	257.0	000.8000	00005.00
0300.0	229.0	000.0350	00010.00
0236.0	217.0	000.0090	00014.50
0150.0	215.0	000.0100	00034.00
0112.0	213.0	000.0100	00055.00
0100.0	209.0	000.0110	00066.00
0096.0	207.0	000.0120	00070.00
0054.0	219.0	000.0210	00157.50
0050.0	219.0	000.0220	00175.00
0025.0	224.0	000.0450	00345.00
0018.0	227.0	000.0620	00417.50
0010.0	238.0	000.1120	00510.00
0006.0	249.0	000.1120	00540.00
0004.0	258.0	000.1120	00515.00
0003.0	264.0	000.1120	00465.00
0002.0	274.0	000.1120	00354.00
0001.4	283.0	000.1120	00257.50
0001.0	283.0	000.1120	00185.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

13
WASHINGTON, D.C. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.970 O3 MASS = 0.303

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1003.0	278.0	004.1000	00000.00
0916.0	272.0	003.1000	00000.40
0898.0	273.0	003.4000	00000.70
0850.0	272.0	002.7000	00001.00
0700.0	264.0	001.3000	00002.50
0670.0	263.0	000.6000	00002.90
0500.0	249.0	000.1860	00005.00
0400.0	236.0	000.1400	00006.50
0311.0	222.0	000.0340	00009.50
0244.0	218.0	000.0250	00013.50
0200.0	220.0	000.0210	00020.00
0150.0	221.0	000.0140	00034.00
0100.0	219.0	000.0110	00066.00
0050.0	221.0	000.0220	00175.00
0025.0	226.0	000.0450	00345.00
0015.0	232.0	000.0750	00452.50
0010.0	237.0	000.1120	00510.00
0006.0	242.0	000.1120	00540.00
0004.0	251.0	000.1120	00515.00
0003.0	258.0	000.1120	00465.00
0002.0	267.0	000.1120	00354.00
0001.1	283.0	000.1120	00195.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

14
NASHVILLE, TENN. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.922 O3 MASS = 0.303

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0998.0	275.0	004.4000	00000.00
0982.0	281.0	005.2000	00000.10
0837.0	272.0	002.5000	00001.10
0796.0	275.0	000.8000	00001.60
0700.0	270.0	000.6000	00002.50
0609.0	265.0	000.5000	00003.40
0400.0	240.0	000.1080	00006.50
0300.0	225.0	000.0040	00010.00
0226.0	212.0	000.0120	00015.50
0150.0	215.0	000.0120	00034.00
0100.0	215.0	000.0110	00066.00
0050.0	220.0	000.0220	00175.00
0025.0	227.0	000.0450	00345.00
0015.0	230.0	000.0750	00452.50
0011.0	232.0	000.1020	00497.50
0010.0	234.0	000.1120	00510.00
0006.0	245.0	000.1120	00540.00
0004.0	254.0	000.1120	00515.00
0003.0	260.0	000.1120	00465.00
0002.0	270.0	000.1120	00354.00
0001.2	283.0	000.1120	00218.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

15
MANIWAKI, QUEBEC APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.699 O3 MASS = 0.355

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1003.0	270.0	002.6000	00000.00
1000.0	271.0	002.6000	00000.00
0966.0	278.0	003.4000	00000.20
0850.0	268.0	001.9000	00001.00
0752.0	260.0	001.3000	00002.00
0732.0	261.0	001.1000	00002.20
0700.0	259.0	000.3000	00002.50
0636.0	257.0	000.2000	00003.20
0570.0	249.0	000.1850	00004.80
0400.0	234.0	000.0700	00007.50
0261.0	216.0	000.0140	00013.50
0200.0	221.0	000.0130	00024.00
0150.0	221.0	000.0120	00042.50
0100.0	223.0	000.0110	00080.00
0050.0	219.0	000.0220	00225.00
0025.0	224.0	000.0450	00406.00
0022.0	223.0	000.0510	00433.00
0015.0	231.0	000.0750	00495.00
0010.0	239.0	000.1120	00537.00
0006.0	250.0	000.1120	00557.50
0004.0	258.0	000.1120	00543.00
0003.0	265.0	000.1120	00509.00
0002.0	274.0	000.1120	00395.00
0001.4	283.0	000.1120	00276.00
0001.0	283.0	000.1120	00187.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

16
NITCHEQUON, QUEBEC APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.372 O3 MASS = 0.354

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0958.0	260.0	001.1000	00000.30
0948.0	268.0	002.2000	00000.40
0938.0	269.0	002.4000	00000.50
0862.0	264.0	001.6000	00000.90
0850.0	265.0	001.3000	00001.00
0807.0	265.0	000.7000	00001.40
0700.0	260.0	000.3000	00002.50
0610.0	254.0	000.2000	00003.40
0400.0	231.0	000.0480	00007.50
0272.0	213.0	000.0060	00012.50
0195.0	220.0	000.0060	00025.00
0150.0	220.0	000.0070	00042.50
0100.0	222.0	000.0110	00080.00
0050.0	220.0	000.0220	00225.00
0025.0	222.0	000.0450	00406.00
0015.0	231.0	000.0750	00495.00
0010.0	240.0	000.1120	00537.00
0006.0	250.0	000.1120	00557.50
0004.0	259.0	000.1120	00543.00
0003.0	265.0	000.1120	00509.00
0002.0	275.0	000.1120	00395.00
0001.5	283.0	000.1120	00290.00
0001.0	283.0	000.1120	00187.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

17
CORAL HARBAR, N.W.T. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.268 O3 MASS = 0.394

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1011.0	248.0	000.3000	00000.00
1000.0	254.0	000.6000	00000.00
0850.0	263.0	000.3000	00001.00
0747.0	260.0	000.6000	00001.50
0726.0	261.0	000.7000	00001.70
0500.0	242.0	000.2000	00006.00
0400.0	233.0	000.0700	00009.00
0264.0	212.0	000.0080	00018.50
0190.0	221.0	000.0080	00035.50
0150.0	222.0	000.0090	00054.50
0100.0	224.0	000.0110	00100.00
0050.0	222.0	000.0220	00245.00
0025.0	217.0	000.0450	00420.00
0016.0	217.0	000.0700	00496.50
0010.0	226.0	000.1120	00543.50
0006.0	236.0	000.1120	00562.00
0004.0	245.0	000.1120	00547.50
0003.0	252.0	000.1120	00517.50
0002.0	261.0	000.1120	00413.00
0001.0	277.0	000.1120	00188.00
0000.8	283.0	000.1120	00127.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

18
HALL LAKE, N.W.T. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.141 O3 MASS = 0.395

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1013.0	242.0	000.2000	00000.00
1000.0	242.0	000.2000	00000.00
0962.0	244.0	000.2000	00000.30
0930.0	248.0	000.4000	00000.50
0850.0	248.0	000.3000	00001.00
0760.0	248.0	000.3000	00002.00
0700.0	246.0	000.2000	00002.50
0500.0	237.0	000.0700	00006.00
0380.0	228.0	000.0450	00010.00
0300.0	226.0	000.0450	00014.00
0200.0	226.0	000.0310	00032.50
0150.0	227.0	000.0210	00054.50
0130.0	224.0	000.0160	00068.50
0100.0	226.0	000.0110	00100.00
0050.0	219.0	000.0220	00245.00
0040.0	219.0	000.0280	00307.00
0025.0	218.0	000.0450	00420.00
0020.0	218.0	000.0560	00462.50
0010.0	230.0	000.1120	00543.50
0006.0	241.0	000.1120	00562.00
0004.0	249.0	000.1120	00547.50
0003.0	256.0	000.1120	00517.50
0002.0	265.0	000.1120	00413.00
0001.0	283.0	000.1120	00188.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

19
MOULD BAY, N.W.T. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.146 O3 MASS = 0.394

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	240.0	000.1000	00000.00
0990.0	244.0	000.2000	00000.10
0940.0	247.0	000.4000	00000.40
0850.0	246.0	000.4000	00001.00
0700.0	241.0	000.2000	00002.50
0500.0	229.0	000.0700	00006.00
0410.0	222.0	000.0420	00009.00
0300.0	222.0	000.0350	00014.00
0250.0	226.0	000.0250	00020.00
0200.0	227.0	000.0240	00032.50
0150.0	226.0	000.0180	00054.50
0100.0	222.0	000.0110	00100.00
0050.0	219.0	000.0220	00245.00
0025.0	217.0	000.0450	00420.00
0020.0	218.0	000.0560	00462.50
0015.0	215.0	000.0750	00504.50
0010.0	213.0	000.1120	00543.50
0006.0	224.0	000.1120	00562.00
0004.0	232.0	000.1120	00547.50
0003.0	239.0	000.1120	00517.50
0002.0	249.0	000.1120	00413.00
0001.0	266.0	000.1120	00188.00
0000.6	282.0	000.1120	00054.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

20
CLARK FIELD, P.I. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 1.278 O3 MASS = 0.275

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	291.0	010.4000	00001.00
0700.0	283.0	001.4000	00002.00
0500.0	268.0	000.8000	00004.00
0300.0	240.0	000.2000	00008.50
0250.0	233.0	000.1120	00011.00
0150.0	206.0	000.0180	00024.50
0100.0	195.0	000.0090	00050.00
0050.0	212.0	000.0180	00147.50
0025.0	218.0	000.0370	00357.50
0015.0	227.0	000.0610	00454.50
0010.0	234.0	000.0920	00474.00
0006.0	245.0	000.0920	00485.00
0004.0	255.0	000.0920	00498.00
0003.0	261.0	000.0920	00487.50
0002.0	270.0	000.0920	00451.00
0001.2	283.0	000.0920	00370.00
0000.6	283.0	000.0920	00187.50
0000.4	271.0	000.0920	00095.00
0000.3	262.0	000.0920	00020.00
0000.2	251.0	000.0920	00002.00
0000.1	231.0	000.0920	00000.10

21
TUCSON, ARIZ. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 1.201 O3 MASS = 0.274

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0929.0	286.0	002.2000	00000.50
0861.0	286.0	002.8000	00000.90
0700.0	274.0	004.7000	00002.00
0590.0	264.0	000.8000	00003.00
0500.0	256.0	000.3000	00004.00
0478.0	255.0	000.3400	00004.40
0300.0	228.0	000.0450	00008.50
0233.0	215.0	000.0120	00012.00
0200.0	219.0	000.0100	00015.00
0159.0	220.0	000.0100	00021.50
0100.0	209.0	000.0110	00050.00
0050.0	214.0	000.0220	00147.50
0025.0	220.0	000.0450	00357.50
0016.0	221.0	000.0700	00448.50
0010.0	230.0	000.1120	00474.00
0006.0	240.0	000.1120	00485.00
0004.0	249.0	000.1120	00498.00
0003.0	255.0	000.1120	00487.50
0002.0	265.0	000.1120	00451.00
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

22
GREENSBORO, N.C. APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.988 O3 MASS = 0.304

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0983.0	279.0	005.6000	00000.10
0850.0	272.0	003.1000	00001.00
0831.0	273.0	002.7000	00001.20
0767.0	269.0	002.3000	00001.80
0741.0	270.0	000.9000	00002.10
0700.0	268.0	000.5000	00002.50
0500.0	250.0	000.2000	00005.00
0300.0	224.0	000.0160	00010.00
0219.0	215.0	000.0110	00016.50
0200.0	220.0	000.0100	00020.00
0150.0	219.0	000.0100	00034.00
0100.0	216.0	000.0110	00066.00
0050.0	219.0	000.0220	00175.00
0025.0	226.0	000.0450	00345.00
0018.0	230.0	000.0620	00417.50
0010.0	242.0	000.1120	00510.00
0006.0	252.0	000.1120	00540.00
0004.0	261.0	000.1120	00515.00
0003.0	267.0	000.1120	00465.00
0002.0	277.0	000.1120	00354.00
0001.6	283.0	000.1120	00287.50
0001.0	283.0	000.1120	00185.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

23
STEPHENVILLE, TEXAS APR. 1, 1958
1200GMT CLEAR
H2O MASS = 0.566 O3 MASS = 0.355

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	274.0	002.1000	00000.00
0850.0	268.0	001.4000	00001.00
0700.0	257.0	000.7000	00002.50
0400.0	232.0	000.0550	00007.50
0300.0	220.0	000.0180	00011.00
0250.0	217.0	000.0080	00015.00
0200.0	220.0	000.0080	00024.00
0150.0	222.0	000.0090	00042.50
0100.0	223.0	000.0110	00080.00
0050.0	220.0	000.0220	00225.00
0025.0	225.0	000.0450	00406.00
0020.0	226.0	000.0560	00452.00
0015.0	230.0	000.0750	00495.00
0010.0	238.0	000.1120	00537.00
0006.0	249.0	000.1120	00557.50
0004.0	258.0	000.1120	00543.00
0003.0	265.0	000.1120	00509.00
0002.0	274.0	000.1120	00395.00
0001.4	283.0	000.1120	00275.00
0001.0	283.0	000.1120	00187.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0002.0	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

24
EL PASO, TEXAS JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.437 O3 MASS = 0.274

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0891.0	269.0	001.7000	00000.70
0881.0	274.0	001.6000	00000.80
0845.0	274.0	001.4000	00001.00
0814.0	272.0	001.2000	00001.30
0748.0	275.0	001.0000	00002.00
0480.0	253.0	000.4000	00004.00
0300.0	224.0	000.0570	00008.50
0231.0	215.0	000.0200	00012.00
0200.0	219.0	000.0140	00015.00
0169.0	219.0	000.0120	00019.50
0104.0	206.0	000.0110	00046.50
0100.0	206.0	000.0110	00050.00
0050.0	214.0	000.0220	00147.50
0025.0	217.0	000.0450	00357.50
0018.0	221.0	000.0620	00432.50
0010.0	218.0	000.1120	00474.00
0006.0	229.0	000.1120	00485.00
0004.0	237.0	000.1120	00498.00
0003.0	244.0	000.1120	00487.50
0002.0	254.0	000.1120	00451.00
0001.0	271.0	000.1120	00330.00
0000.7	283.0	000.1120	00235.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

25
DENVER, COLO. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.422 O3 MASS = 0.307

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0943.0	265.0	001.7000	00001.10
0830.0	273.0	001.4000	00001.20
0818.0	277.0	001.6000	00001.30
0500.0	251.0	000.4000	00004.00
0406.0	238.0	000.2000	00005.90
0400.0	237.0	000.0930	00006.00
0250.0	214.0	000.0080	00012.50
0210.0	209.0	000.0030	00017.00
0153.0	219.0	000.0050	00029.50
0117.0	213.0	000.0070	00049.00
0106.0	219.0	000.0090	00056.00
0100.0	217.0	000.0110	00062.00
0076.0	214.0	000.0150	00096.00
0044.0	223.0	000.0260	00225.00
0035.0	216.0	000.0320	00300.00
0025.0	218.0	000.0450	00402.50
0020.0	216.0	000.0560	00437.50
0010.0	228.0	000.1120	00480.00
0006.0	239.0	000.1120	00493.50
0004.0	248.0	000.1120	00511.50
0003.0	255.0	000.1120	00503.00
0002.0	264.0	000.1120	00462.50
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

26
EDMONTON, ALBERTA JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.943 O3 MASS = 0.309

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0939.0	262.0	001.3000	00000.40
0905.0	272.0	002.2000	00000.60
0876.0	275.0	002.2000	00000.80
0850.0	274.0	001.8000	00001.00
0790.0	270.0	002.1000	00001.40
0772.0	270.0	002.5000	00001.50
0700.0	267.0	002.6000	00002.00
0500.0	250.0	000.7000	00004.00
0400.0	237.0	000.2000	00006.00
0300.0	221.0	000.0570	00009.50
0225.0	207.0	000.0090	00015.00
0200.0	219.0	000.0050	00018.50
0182.0	216.0	000.0050	00021.50
0150.0	217.0	000.0060	00031.00
0100.0	219.0	000.0110	00062.00
0050.0	220.0	000.0220	00185.00
0040.0	220.0	000.0280	00255.00
0025.0	216.0	000.0450	00402.50
0014.0	208.0	000.0800	00468.00
0010.0	215.0	000.1120	00480.00
0006.0	226.0	000.1120	00493.50
0004.0	235.0	000.1120	00511.50
0003.0	241.0	000.1120	00503.00
0002.0	251.0	000.1120	00462.50
0001.0	268.0	000.1120	00330.00
0000.6	283.0	000.1120	00197.00
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	241.0	000.1120	00000.10

27
GLASGOW, MONT. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.441 O3 MASS = 0.310

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0941.0	258.0	001.1000	00000.40
0914.0	270.0	002.3000	00000.60
0897.0	270.0	001.6000	00000.70
0853.0	268.0	000.8000	00001.00
0832.0	270.0	001.0000	00001.10
0700.0	264.0	000.9000	00002.00
0500.0	250.0	000.3000	00004.00
0400.0	236.0	000.0880	00006.00
0260.0	212.0	000.0140	00012.00
0226.0	208.0	000.0070	00015.00
0155.0	220.0	000.0070	00029.00
0100.0	222.0	000.0110	00062.00
0050.0	219.0	000.0220	00185.00
0025.0	217.0	000.0450	00402.50
0022.0	216.0	000.0510	00425.00
0010.0	230.0	000.1120	00480.00
0006.0	241.0	000.1120	00493.50
0004.0	250.0	000.1120	00511.50
0003.0	256.0	000.1120	00503.00
0002.0	265.0	000.1120	00462.50
0001.0	281.0	000.1120	00330.00
0001.0	283.0	000.1120	00324.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

28
OMAHA, NEB. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.322 O3 MASS = 0.310

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0979.0	254.0	000.7000	00000.10
0967.0	262.0	001.2000	00000.20
0920.0	261.0	001.2000	00000.50
0910.0	264.0	001.3000	00000.60
0860.0	264.0	001.3000	00000.90
0850.0	263.0	001.1000	00001.00
0742.0	254.0	000.6000	00001.70
0700.0	254.0	000.2000	00002.00
0500.0	240.0	000.0990	00004.00
0400.0	230.0	000.0550	00006.00
0300.0	223.0	000.0210	00009.50
0250.0	224.0	000.0190	00012.50
0150.0	221.0	000.0140	00031.00
0125.0	223.0	000.0120	00043.00
0100.0	221.0	000.0110	00062.00
0050.0	217.0	000.0220	00185.00
0025.0	214.0	000.0450	00402.50
0020.0	214.0	000.0560	00437.50
0010.0	227.0	000.1120	00480.00
0006.0	238.0	000.1120	00493.50
0004.0	248.0	000.1120	00511.50
0003.0	254.0	000.1120	00503.00
0002.0	264.0	000.1120	00462.50
0001.0	280.0	000.1120	00330.00
0001.0	283.0	000.1120	00310.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

29
PORT HARRISON, QUEBEC JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.304 O3 MASS = 0.306

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1020.0	247.0	001.6000	00000.00
0937.0	247.0	000.4000	00000.40
0819.0	249.0	000.5000	00001.20
0810.0	251.0	000.6000	00001.30
0700.0	248.0	000.6000	00002.00
0648.0	246.0	000.4000	00002.50
0500.0	235.0	000.1360	00004.00
0400.0	226.0	000.0700	00006.00
0346.0	222.0	000.0560	00007.50
0250.0	221.0	000.0250	00012.50
0200.0	221.0	000.0210	00018.50
0150.0	219.0	000.0160	00031.00
0100.0	214.0	000.0110	00062.00
0060.0	210.0	000.0190	00137.50
0050.0	210.0	000.0220	00185.00
0025.0	210.0	000.0450	00402.50
0015.0	218.0	000.0750	00464.00
0010.0	226.0	000.1120	00480.00
0006.0	237.0	000.1120	00493.50
0004.0	246.0	000.1120	00511.50
0003.0	253.0	000.1120	00503.00
0002.0	262.0	000.1120	00462.50
0001.0	278.0	000.1120	00330.00
0000.9	283.0	000.1120	00275.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

30
NITCHEQUON, QUEBEC JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.268 O3 MASS = 0.305

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0952.0	243.0	000.2000	00000.30
0936.0	250.0	000.4000	00000.50
0882.0	252.0	000.6000	00000.80
0866.0	251.0	000.6000	00000.90
0806.0	256.0	000.9000	00001.20
0741.0	255.0	000.7000	00001.80
0692.0	256.0	000.4000	00002.10
0464.0	236.0	000.2000	00004.80
0336.0	221.0	000.0580	00007.00
0323.0	223.0	000.0530	00007.20
0265.0	218.0	000.0390	00009.50
0250.0	219.0	000.0320	00012.50
0158.0	220.0	000.0130	00022.00
0100.0	216.0	000.0110	00062.00
0050.0	209.0	000.0220	00185.00
0040.0	208.0	000.0280	00255.00
0025.0	208.0	000.0450	00402.50
0015.0	217.0	000.0750	00464.00
0010.0	225.0	000.1120	00480.00
0006.0	236.0	000.1120	00493.50
0004.0	245.0	000.1120	00511.50
0003.0	252.0	000.1120	00503.00
0002.0	261.0	000.1120	00462.50
0001.0	276.0	000.1120	00330.00
0000.8	283.0	000.1120	00270.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

31
BARTER ISLAND, ALAS. JAN. 1, 1958
1200GMT CLEAR
H2O MASS = 0.117 O3 MASS = 0.273

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1020.0	235.0	000.0500	00000.00
1000.0	237.0	000.7500	00000.00
0950.0	242.0	000.1700	00000.30
0850.0	244.0	000.2700	00001.00
0819.0	244.0	000.2900	00001.20
0656.0	241.0	000.1300	00002.40
0545.0	236.0	000.0570	00003.50
0500.0	232.0	000.0160	00004.00
0324.0	216.0	000.0030	00007.90
0300.0	215.0	000.0030	00008.50
0250.0	217.0	000.0030	00011.00
0200.0	218.0	000.0040	00015.00
0150.0	216.0	000.0060	00024.50
0100.0	215.0	000.0110	00050.00
0050.0	213.0	000.0220	00147.50
0034.0	212.0	000.0330	00252.50
0025.0	212.0	000.0450	00357.50
0015.0	221.0	000.0750	00454.50
0010.0	229.0	000.1120	00474.00
0006.0	239.0	000.1120	00485.00
0004.0	248.0	000.1120	00498.00
0003.0	254.0	000.1120	00487.50
0002.0	263.0	000.1120	00451.00
0001.0	278.0	000.1120	00330.00
0000.9	283.0	000.1120	00275.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

32
KINDLEY BERM, BERMUDA AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 5.078 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	300.0	018.0000	00000.00
0700.0	283.0	007.8000	00001.00
0500.0	267.0	000.8000	00002.50
0400.0	257.0	000.5000	00004.00
0250.0	232.0	000.0690	00008.00
0150.0	209.0	000.0100	00020.50
0100.0	201.0	000.0110	00042.00
0050.0	217.0	000.0220	00131.00
0025.0	224.0	000.0450	00330.00
0020.0	227.0	000.0560	00398.00
0010.0	234.0	000.1120	00513.00
0007.0	233.0	000.1120	00543.50
0005.0	235.0	000.1120	00600.00
0004.0	238.0	000.1120	00642.50
0003.0	241.0	000.1120	00623.00
0002.0	251.0	000.1120	00547.50
0001.0	268.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

33
SHREVEPORT, LA. AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 3.791 O3 MASS = 0.252

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1008.0	298.0	017.8000	00000.00
1000.0	298.0	016.9000	00000.00
0942.0	297.0	015.8000	00000.20
0919.0	298.0	007.3000	00000.30
0760.0	286.0	009.5000	00000.80
0700.0	284.0	004.7000	00001.00
0670.0	281.0	004.6000	00001.20
0652.0	281.0	002.7000	00001.40
0500.0	269.0	000.8000	00002.50
0400.0	257.0	000.6000	00004.00
0300.0	242.0	000.2000	00006.00
0200.0	221.0	000.0310	00012.50
0150.0	207.0	000.0060	00020.50
0123.0	200.0	000.0060	00028.50
0100.0	200.0	000.0110	00042.00
0092.0	201.0	000.0120	00048.50
0077.0	211.0	000.0140	00065.50
0050.0	217.0	000.0220	00131.00
0025.0	227.0	000.0450	00330.00
0015.0	230.0	000.0750	00460.00
0010.0	233.0	000.1120	00513.00
0007.0	241.0	000.1120	00543.00
0004.0	253.0	000.1120	00642.50
0003.0	260.0	000.1120	00623.00
0002.0	269.0	000.1120	00547.50
0001.2	283.0	000.1120	00337.50
0000.6	283.0	000.1120	00034.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

34
PORTLAND, MAINE AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 1.780 O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1013.0	292.0	010.6000	00000.00
1000.0	292.0	008.8000	00000.00
0978.0	293.0	006.9000	00000.10
0805.0	279.0	004.8000	00000.70
0772.0	280.0	001.4000	00000.90
0700.0	277.0	000.8000	00001.00
0622.0	274.0	000.9000	00001.40
0500.0	262.0	000.6000	00002.50
0300.0	236.0	000.1170	00006.00
0286.0	233.0	000.0980	00006.50
0250.0	230.0	000.0690	00008.00
0150.0	215.0	000.0160	00020.50
0138.0	214.0	000.0140	00024.00
0100.0	215.0	000.0110	00042.50
0050.0	224.0	000.0220	00140.50
0025.0	227.0	000.0450	00375.00
0015.0	232.0	000.0750	00490.00
0010.0	236.0	000.1120	00530.00
0009.0	237.0	000.1120	00535.50
0006.0	246.0	000.1120	00590.00
0004.0	254.0	000.1120	00654.00
0003.0	261.0	000.1120	00639.50
0002.0	270.0	000.1120	00558.00
0001.2	283.0	000.1120	00370.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

35
GRAND JUNCTION COLO. AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 1.520 O3 MASS = 0.253

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0856.0	291.0	005.2000	00000.50
0821.0	294.0	005..000	00000.60
0727.0	288.0	004.6000	00000.90
0700.0	285.0	005.1000	00001.00
0566.0	269.0	002.9000	00002.00
0537.0	268.0	001.1000	00002.20
0500.0	266.0	000.6000	00002.50
0400.0	256.0	000.4000	00004.00
0300.0	243.0	000.2000	00006.00
0200.0	222.0	000.0350	00012.50
0150.0	209.0	000.0100	00020.50
0116.0	203.0	000.0070	00032.50
0100.0	207.0	000.0110	00042.00
0050.0	221.0	000.0220	00131.00
0044.0	224.0	000.0260	00160.00
0025.0	227.0	000.0450	00330.00
0015.0	233.0	000.0750	00460.00
0011.0	237.0	000.1020	00503.00
0010.0	238.0	000.1120	00513.00
0006.0	249.0	000.1120	00563.50
0004.0	258.0	000.1120	00642.50
0003.0	265.0	000.1120	00623.00
0002.0	275.0	000.1120	00547.50
0001.5	283.0	000.1120	00442.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

36
NORTH PLATE, NEB. AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 2.453 O3 MASS = 0.266

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0918.0	288.0	011.8000	00000.30
0872.0	293.0	009.5000	00000.40
0850.0	292.0	009.1000	00000.50
0767.0	288.0	005.8000	00000.80
0700.0	282.0	005.1000	00001.00
0662.0	278.0	004.6000	00001.30
0500.0	266.0	000.7000	00002.50
0400.0	254.0	000.4000	00004.00
0300.0	238.0	000.1240	00006.00
0246.0	230.0	000.0700	00008.50
0226.0	231.0	000.0410	00010.00
0150.0	213.0	000.0210	00020.50
0108.0	206.0	000.0100	00037.50
0100.0	206.0	000.0110	00042.50
0069.0	216.0	000.0160	00082.50
0050.0	219.0	000.0220	00140.50
0025.0	226.0	000.0450	00375.00
0015.0	230.0	000.0750	00490.00
0010.0	233.0	000.1120	00530.00
0008.0	235.0	000.1120	00544.00
0006.0	241.0	000.1120	00590.00
0004.0	249.0	000.1120	00654.00
0003.0	256.0	000.1120	00639.50
0002.0	266.0	000.1120	00558.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

37
CARIBOU, MAINE — AUG. 1, 1958
1200GMT — CLEAR
H2O MASS = 1.586 — O3 MASS = 0.259

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0992.0	288.0	008.3000	00000.00
0969.0	289.0	007.4000	00000.10
0850.0	279.0	003.9000	00000.50
0815.0	277.0	003.8000	00000.60
0790.0	277.0	003.1000	00000.70
0712.0	272.0	002.1000	00001.00
0700.0	271.0	001.7000	00001.00
0584.0	267.0	000.6000	00001.40
0500.0	258.0	000.7000	00002.50
0421.0	248.0	000.3000	00003.70
0400.0	245.0	000.1860	00004.00
0300.0	229.0	000.0570	00006.00
0266.0	223.0	000.0300	00007.50
0250.0	226.0	000.0250	00008.00
0200.0	228.0	000.0140	00012.50
0150.0	223.0	000.0140	00020.50
0100.0	221.0	000.0110	00042.50
0070.0	219.0	000.0120	00051.50
0050.0	225.0	000.0220	00140.50
0025.0	230.0	000.0450	00375.00
0015.0	235.0	000.0750	00490.00
0010.0	238.0	000.1120	00530.00
0009.0	239.0	000.1120	00535.50
0006.0	247.0	000.1120	00590.00
0004.0	256.0	000.1120	00654.00
0003.0	263.0	000.1120	00639.50
0002.0	272.0	000.1120	00558.00
0001.3	283.0	000.1120	00402.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

38
SLT. STE. MARIE, MICH — AUG. 1, 1958
1200GMT — CLEAR
H2O MASS = 2.100 — O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0993.0	285.0	007.9000	00000.00
0974.0	288.0	009.1000	00000.10
0938.0	291.0	007.2000	00000.20
0826.0	283.0	007.1000	00000.60
0807.0	283.0	002.6000	00000.70
0786.0	283.0	003.3000	00000.80
0700.0	280.0	002.4000	00001.00
0664.0	278.0	002.0000	00001.40
0500.0	264.0	000.6000	00002.50
0400.0	251.0	000.5000	00004.00
0250.0	225.0	000.0420	00008.00
0200.0	219.0	000.0270	00012.50
0150.0	218.0	000.0140	00020.50
0100.0	216.0	000.0110	00042.50
0050.0	222.0	000.0220	00140.50
0025.0	228.0	000.0450	00375.00
0015.0	231.0	000.0750	00490.00
0010.0	233.0	000.1120	00530.00
0006.0	244.0	000.1120	00590.00
0004.0	253.0	000.1120	00654.00
0003.0	260.0	000.1120	00639.50
0002.0	269.0	000.1120	00558.00
0001.1	283.0	000.1120	00337.50
0000.6	283.0	000.1120	00034.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

39
EUREKA, N.W.T. — AUG. 1, 1958
1200GMT — CLEAR
H2O MASS = 1.284 — O3 MASS = 0.253

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1021.0	278.0	004.0000	00000.00
1010.0	283.0	003.3000	00000.00
0865.0	274.0	002.6000	00000.50
0832.0	276.0	003.2000	00000.40
0752.0	271.0	003.0000	00000.80
0731.0	271.0	002.9000	00000.90
0700.0	270.0	002.4000	00001.00
0631.0	266.0	000.6000	00001.50
0500.0	255.0	000.9000	00002.50
0400.0	243.0	000.4000	00004.00
0300.0	227.0	000.0930	00006.00
0250.0	218.0	000.0320	00008.00
0229.0	217.0	000.0270	00009.50
0184.0	226.0	000.0190	00014.50
0150.0	226.0	000.0180	00020.50
0100.0	228.0	000.0110	00042.00
0050.0	231.0	000.0220	00131.00
0030.0	230.0	000.0370	00268.50
0025.0	232.0	000.0450	00330.00
0020.0	236.0	000.0560	00398.00
0012.0	239.0	000.0940	00492.50
0010.0	242.0	000.1120	00513.00
0006.0	253.0	000.1120	00563.50
0004.0	262.0	000.1120	00642.50
0003.0	268.0	000.1120	00623.00
0002.0	277.0	000.1120	00547.50
0001.6	283.0	000.1120	00475.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

40
FLINT, MICH. — AUG. 1, 1958
1200GMT — CLEAR
H2O MASS = 1.412 — O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0992.0	281.0	006.8000	00000.00
0976.0	289.0	009.1000	00000.10
0954.0	290.0	008.1000	00000.20
0850.0	286.0	002.1000	00000.50
0700.0	281.0	001.3000	00001.00
0500.0	264.0	000.5700	00002.50
0300.0	236.0	000.1170	00006.00
0261.0	228.0	000.0660	00008.00
0208.0	222.0	000.0340	00012.00
0190.0	222.0	000.0280	00013.50
0150.0	216.0	000.0180	00020.50
0116.0	212.0	000.0130	00032.50
0100.0	213.0	000.0110	00042.50
0050.0	221.0	000.0220	00140.50
0025.0	226.0	000.0450	00375.00
0015.0	231.0	000.0750	00490.00
0010.0	234.0	000.1120	00530.00
0006.0	246.0	000.1120	00590.00
0004.0	254.0	000.1120	00654.00
0003.0	261.0	000.1120	00639.50
0002.0	270.0	000.1120	00558.00
0001.2	283.0	000.1120	00362.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00025.50
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

41
THULE, GREENLAND — OCT. 20, 1958
0000GMT — CLEAR
H2O MASS = 0.159 — O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	260.0	000.6000	00000.00
0850.0	252.0	000.4000	00000.50
0700.0	252.0	000.1690	00001.00
0500.0	235.0	000.0620	00002.50
0300.0	214.0	000.0100	00006.00
0200.0	221.0	000.0090	00012.50
0150.0	220.0	000.0090	00020.50
0100.0	220.0	000.0110	00042.00
0050.0	215.0	000.0220	00131.00
0025.0	211.0	000.0450	00330.00
0020.0	210.0	000.0560	00398.00
0010.0	223.0	000.1120	00513.00
0006.0	234.0	000.1120	00563.50
0004.0	242.0	000.1120	00642.50
0003.0	249.0	000.1120	00623.00
0002.0	258.0	000.1120	00547.50
0001.0	275.0	000.1120	00255.00
0000.8	283.0	000.1120	00130.00
0000.6	283.0	000.1120	00013.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

42
PORT HARRISON, QUEBEC — DEC. 4, 1958
1200GMT — CLEAR
H2O MASS = 0.323 — O3 MASS = 0.310

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1004.0	255.0	000.6000	00000.00
0967.0	258.0	001.0000	00000.20
0827.0	251.0	000.7000	00001.20
0779.0	254.0	000.4000	00001.50
0700.0	252.0	000.2000	00002.00
0576.0	245.0	000.6000	00003.60
0526.0	244.0	000.2000	00003.90
0500.0	241.0	000.3000	00004.00
0400.0	233.0	000.1400	00006.00
0267.0	218.0	000.0340	00011.00
0200.0	225.0	000.0230	00018.50
0150.0	227.0	000.0180	00031.00
0100.0	228.0	000.0110	00062.00
0050.0	227.0	000.0220	00185.00
0025.0	224.0	000.0450	00402.50
0015.0	221.0	000.0750	00464.00
0010.0	220.0	000.1120	00480.00
0006.0	231.0	000.1120	00493.50
0004.0	240.0	000.1120	00511.50
0003.0	246.0	000.1120	00503.00
0002.0	256.0	000.1120	00462.50
0001.0	272.0	000.1120	00330.00
0000.7	283.0	000.1120	00237.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

43
ALBUQUERQUE, N. MEX. JULY 11, 1958
0000GMT CLEAR
H2O MASS = 1.363 O3 MASS = 0.289

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0838.0	311.0	008.0000	00001.70
0804.0	306.0	004.1000	00002.00
0700.0	293.0	002.8000	00003.00
0653.0	287.0	003.2000	00003.60
0500.0	266.0	003.0000	00005.50
0492.0	265.0	002.8000	00005.60
0476.0	265.0	000.9700	00005.80
0400.0	256.0	000.4400	00007.00
0300.0	239.0	000.1450	00010.00
0250.0	230.0	000.0990	00012.50
0200.0	222.0	000.0570	00016.50
0150.0	211.0	000.0240	00026.50
0122.0	204.0	000.0120	00038.50
0115.0	205.0	000.0110	00043.00
0100.0	200.0	000.0110	00054.50
0071.0	212.0	000.0160	00093.50
0050.0	218.0	000.0220	00157.50
0025.0	223.0	000.0450	00352.50
0019.0	228.0	000.0590	00427.50
0010.0	240.0	000.1120	00525.00
0006.0	251.0	000.1120	00553.00
0004.0	260.0	000.1120	00557.50
0003.0	267.0	000.1120	00523.50
0002.0	276.0	000.1120	00400.00
0001.4	283.0	000.1120	00295.00
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

44
GREEN BAY, WIS. NOV. 7, 1958
0000GMT CLEAR
H2O MASS = 0.527 O3 MASS = 0.311

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0988.0	275.0	003.1000	00000.10
0973.0	276.0	002.0000	00000.20
0850.0	267.0	001.6000	00001.00
0700.0	255.0	000.6000	00002.00
0663.0	255.0	000.5000	00002.40
0500.0	241.0	000.1120	00004.00
0426.0	233.0	000.0520	00005.50
0400.0	233.0	000.0380	00006.00
0320.0	227.0	000.0250	00009.00
0200.0	226.0	000.0180	00018.50
0150.0	223.0	000.0140	00031.00
0100.0	222.0	000.0110	00062.00
0050.0	218.0	000.0220	00185.00
0039.0	216.0	000.0290	00262.50
0025.0	218.0	000.0450	00402.50
0014.0	221.0	000.0800	00468.00
0010.0	227.0	000.1120	00480.00
0006.0	237.0	000.1120	00493.50
0004.0	246.0	000.1120	00511.50
0003.0	253.0	000.1120	00503.00
0002.0	261.0	000.1120	00462.50
0001.0	277.0	000.1120	00330.00
0000.8	283.0	000.1120	00270.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

45
PORT HARRISON, QUEBEC DEC. 4, 1958
1200GMT CLEAR
H2O MASS = 0.320 O3 MASS = 0.310

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1004.0	255.0	000.6000	00000.00
0967.0	258.0	001.0000	00000.30
0850.0	252.0	000.7000	00001.00
0827.0	251.0	000.7000	00001.40
0779.0	254.0	000.4000	00001.60
0700.0	252.0	000.2000	00002.00
0576.0	245.0	000.6000	00002.80
0526.0	244.0	000.2000	00003.00
0500.0	241.0	000.3000	00004.00
0400.0	233.0	000.1400	00006.00
0300.0	223.0	000.0570	00009.50
0267.0	218.0	000.0500	00012.00
0250.0	219.0	000.0420	00012.50
0200.0	225.0	000.0310	00018.50
0150.0	227.0	000.0180	00031.00
0100.0	228.0	000.0110	00062.00
0050.0	227.0	000.0220	00185.00
0025.0	224.0	000.0450	00402.50
0015.0	221.0	000.0750	00464.00
0010.0	220.0	000.1120	00480.00
0006.0	231.0	000.1120	00493.50
0004.0	240.0	000.1120	00511.50
0003.0	247.0	000.1120	00503.00
0002.0	256.0	000.1120	00462.50
0001.0	271.0	000.1120	00330.00
0000.7	283.0	000.1120	00235.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

46
NOME, ALASKA DEC. 2, 1958
1200GMT CLEAR
H2O MASS = 0.188 O3 MASS = 0.275

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1008.0	252.0	000.5000	00000.00
0994.0	261.0	000.8000	00000.10
0895.0	256.0	000.5000	00000.50
0808.0	259.0	000.2000	00001.50
0700.0	253.0	000.2000	00002.00
0609.0	250.0	000.1740	00002.50
0500.0	244.0	000.1370	00004.00
0400.0	233.0	000.0700	00006.00
0319.0	226.0	000.0370	00007.50
0250.0	224.0	000.0280	00011.00
0150.0	226.0	000.0180	00024.50
0100.0	228.0	000.0110	00050.00
0050.0	223.0	000.0220	00147.50
0025.0	220.0	000.0450	00357.50
0015.0	220.0	000.0750	00454.50
0010.0	220.0	000.1120	00474.00
0006.0	231.0	000.1120	00485.00
0004.0	240.0	000.1120	00498.00
0003.0	246.0	000.1120	00487.50
0002.0	256.0	000.1120	00451.00
0001.0	272.0	000.1120	00330.00
0000.7	283.0	000.1120	00235.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

47
RESOLUTE, N.W.T. NOV. 9, 1958
1200GMT CLEAR
H2O MASS = 0.214 O3 MASS = 0.275

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1002.0	245.0	000.2900	00000.00
0948.0	245.0	000.2500	00000.20
0927.0	255.0	000.5900	00000.30
0882.0	259.0	000.4700	00000.90
0818.0	258.0	000.5600	00001.40
0700.0	252.0	000.4500	00002.00
0500.0	237.0	000.0790	00004.00
0300.0	214.0	000.0091	00008.50
0250.0	214.0	000.0081	00011.00
0200.0	219.0	000.0088	00015.00
0150.0	221.0	000.0100	00024.50
0100.0	220.0	000.0110	00050.00
0050.0	216.0	000.0220	00147.50
0025.0	213.0	000.0450	00357.50
0020.0	211.0	000.0560	00415.00
0010.0	224.0	000.1120	00474.00
0006.0	234.0	000.1120	00485.00
0004.0	244.0	000.1120	00498.00
0003.0	251.0	000.1120	00487.50
0002.0	260.0	000.1120	00451.00
0001.0	277.0	000.1120	00330.00
0000.8	283.0	000.1120	00272.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

48
BARROW, ALASKA OCT. 21, 1958
1200GMT CLEAR
H2O MASS = 0.256 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	254.0	000.6500	00000.00
0993.0	262.0	000.9300	00000.10
0800.0	250.0	000.5200	00000.50
0700.0	244.0	000.3100	00001.00
0500.0	229.0	000.0890	00002.50
0391.0	219.0	000.0340	00003.50
0270.0	227.0	000.0170	00007.50
0150.0	226.0	000.0140	00020.50
0100.0	224.0	000.0110	00042.00
0050.0	220.0	000.0220	00131.00
0025.0	218.0	000.0450	00330.00
0022.0	218.0	000.0510	00372.50
0010.0	234.0	000.1120	00513.00
0006.0	244.0	000.1120	00563.50
0004.0	254.0	000.1120	00642.50
0003.0	260.0	000.1120	00623.00
0002.0	269.0	000.1120	00547.50
0001.1	283.0	000.1120	00316.20
0000.6	283.0	000.1120	00000.00
0000.4	271.0	000.1120	00000.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

49
KEFLAVIK, ICELAND — JAN. 29, 1958
1200GMT — CLEAR
H2O MASS = 0.402 — O3 MASS = 0.274

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	269.0	002.1000	00001.00
0700.0	258.0	001.0300	00002.00
0500.0	237.0	000.2100	00004.00
0400.0	227.0	000.0780	00006.00
0300.0	220.0	000.0350	00008.50
0200.0	216.0	000.0210	00015.00
0150.0	215.0	000.0160	00024.50
0100.0	215.0	000.0110	00050.00
0050.0	223.0	000.0220	00147.50
0025.0	254.0	000.0450	00357.50
0015.0	264.0	000.0750	00454.50
0010.0	271.0	000.1120	00474.00
0005.6	283.0	000.1120	00487.50
0004.0	283.0	000.1120	00498.00
0003.0	283.0	000.1120	00487.50
0002.0	283.0	000.1120	00451.00
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

50
CHATEAUROUX, FRANCE — JAN. 25, 1958
1200GMT — CLEAR
H2O MASS = 0.437 — O3 MASS = 0.311

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	275.0	001.7800	00001.00
0700.0	267.0	001.0300	00002.00
0500.0	251.0	000.5700	00004.00
0400.0	240.0	000.1200	00006.00
0200.0	202.0	000.0026	00018.50
0150.0	211.0	000.0034	00031.00
0100.0	213.0	000.0110	00062.00
0050.0	223.0	000.0220	00185.00
0025.0	248.0	000.0450	00402.50
0015.0	258.0	000.0750	00464.00
0010.0	266.0	000.1120	00480.00
0006.0	276.0	000.1120	00493.50
0004.6	283.0	000.1120	00505.00
0003.0	283.0	000.1120	00503.00
0002.0	283.0	000.1120	00462.50
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

51
RITBURG, GERMANY — JAN. 25, 1958
1200GMT — CLEAR
H2O MASS = 0.170 — O3 MASS = 0.311

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	268.0	000.4500	00001.00
0700.0	263.0	000.3700	00002.00
0500.0	246.0	000.3500	00004.00
0400.0	234.0	000.0700	00006.00
0250.0	212.0	000.0081	00012.50
0200.0	205.0	000.0041	00018.50
0150.0	211.0	000.0040	00031.00
0100.0	216.0	000.0112	00062.00
0050.0	226.0	000.0220	00185.00
0025.0	248.0	000.0450	00402.50
0015.0	258.0	000.0750	00464.00
0010.0	266.0	000.1120	00480.00
0006.0	276.0	000.1120	00493.50
0004.3	283.0	000.1120	00508.80
0003.0	283.0	000.1120	00503.00
0002.0	283.0	000.1120	00462.50
0001.0	283.0	000.1120	00530.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

52
CHATEAUROUX, FRANCE — JULY 12, 1958
1200GMT — UNDERCAST AT 500 MB
H2O MASS = 0.161 — O3 MASS = 0.332

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	292.0	007.9500	00001.50
0700.0	279.0	005.8900	00003.00
0500.0	261.0	002.2000	00005.50
0400.0	249.0	000.2700	00007.50
0250.0	223.0	000.0320	00015.00
0200.0	214.0	000.0100	00021.50
0150.0	218.0	000.0087	00034.00
0100.0	220.0	000.0110	00065.00
0050.0	225.0	000.0220	00185.00
0025.0	233.0	000.0450	00410.00
0015.0	236.0	000.0750	00515.00
0010.0	240.0	000.1120	00552.00
0007.0	243.0	000.1120	00570.00
0005.0	244.0	000.1120	00575.00
0004.0	245.0	000.1120	00572.50
0003.0	252.0	000.1120	00541.50
0002.0	261.0	000.1120	00400.00
0001.0	277.0	000.1120	00175.00
0000.8	283.0	000.1120	00100.00
0000.6	283.0	000.1120	00010.00
0000.4	271.0	000.1120	00000.00
0000.3	262.0	000.1120	00000.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

53
PT. HARDY, B.C. — JAN. 24, 1958
1200GMT — UNDERCAST AT 830 MB
H2O MASS = 0.344 — O3 MASS = 0.307

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0991.0	275.0	004.1500	00000.10
0958.0	280.0	005.7100	00000.30
0884.0	274.0	004.0200	00000.50
0830.0	275.0	003.6900	00001.20
0757.0	272.0	001.3300	00001.80
0700.0	266.0	000.5000	00002.00
0500.0	247.0	000.1700	00004.00
0400.0	234.0	000.1600	00006.00
0286.0	216.0	000.0071	00009.80
0230.0	226.0	000.0077	00015.00
0200.0	227.0	000.0076	00018.50
0150.0	228.0	000.0087	00031.00
0100.0	227.0	000.0110	00062.00
0087.0	224.0	000.0130	00075.80
0050.0	225.0	000.0220	00185.00
0025.0	225.0	000.0450	00402.50
0017.0	224.0	000.0660	00455.00
0010.0	235.0	000.1120	00480.00
0006.0	246.0	000.1120	00493.50
0004.0	254.0	000.1120	00511.50
0003.0	261.0	000.1120	00503.00
0002.0	271.0	000.1120	00462.50
0001.2	283.0	000.1120	00374.50
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

54
ALERT, N.W.T. — JAN. 24, 1958
1200GMT — UNDERCAST AT 703 MB
H2O MASS = 0.292 — O3 MASS = 0.272

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	273.0	002.8200	00000.00
1000.0	273.0	002.8400	00000.00
0976.0	275.0	002.5000	00000.10
0862.0	272.0	002.6200	00000.40
0823.0	273.0	002.5400	00001.20
0703.0	264.0	001.9900	00001.90
0678.0	264.0	001.9200	00002.60
0500.0	248.0	000.3200	00004.00
0400.0	236.0	000.0780	00006.00
0300.0	219.0	000.0160	00008.50
0215.0	203.0	000.0020	00012.70
0150.0	206.0	000.0034	00024.50
0126.0	206.0	000.0047	00032.50
0100.0	203.0	000.0110	00050.00
0050.0	197.0	000.0220	00147.50
0025.0	195.0	000.0450	00357.50
0023.0	195.0	000.0490	00382.50
0010.0	212.0	000.1120	00474.00
0006.0	223.0	000.1120	00485.00
0004.0	232.0	000.1120	00498.00
0003.0	239.0	000.1120	00487.50
0002.0	249.0	000.1120	00451.00
0001.0	266.0	000.1120	00330.00
0000.6	282.0	000.1120	00197.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

55
SANTA MONICA, CALIF. JULY 15, 1958
1200GMT UNDERCAST AT 908 MB
H2O MASS = 1.340 O3 MASS = 0.283

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1008.0	292.0	010.7000	00000.00
0982.0	289.0	009.6300	00000.70
0908.0	285.0	007.8600	00000.90
0875.0	286.0	007.1200	00001.20
0850.0	292.0	006.3800	00001.50
0742.0	285.0	002.6000	00002.10
0718.0	286.0	002.4900	00002.60
0700.0	285.0	001.5700	00003.00
0532.0	267.0	000.6600	00004.90
0417.0	259.0	000.4700	00006.00
0364.0	250.0	000.3200	00007.50
0292.0	242.0	000.1900	00012.50
0200.0	219.0	000.0270	00016.50
0150.0	209.0	000.0120	00026.50
0127.0	203.0	000.0065	00010.00
0091.0	203.0	000.0120	00063.00
0063.0	216.0	000.0180	00112.50
0050.0	218.0	000.0220	00157.50
0025.0	228.0	000.0450	00352.50
0015.0	233.0	000.0750	00474.00
0010.0	236.0	000.1120	00525.00
0006.0	247.0	000.1120	00553.00
0004.0	256.0	000.1120	00557.50
0003.0	263.0	000.1120	00523.50
0002.0	273.0	000.1120	00400.00
0001.3	283.0	000.1120	00262.50
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

56
EUREKA, N.W.T. JAN. 24, 1958
1200GMT UNDERCAST AT 526 MB
H2O MASS = 0.056 O3 MASS = 0.269

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1013.0	269.0	002.0600	00000.00
0979.0	274.0	002.9000	00000.20
0850.0	266.0	001.7800	00001.00
0824.0	267.0	001.4500	00001.30
0709.0	266.0	002.7200	00002.20
0526.0	249.0	000.8700	00003.80
0482.0	248.0	000.3300	00004.00
0400.0	237.0	000.0880	00006.00
0300.0	221.0	000.0240	00008.50
0211.0	205.0	000.0028	00012.50
0160.0	211.0	000.0051	00021.50
0100.0	209.0	000.0112	00050.00
0050.0	204.0	000.0220	00147.50
0023.0	197.0	000.0490	00345.00
0015.0	205.0	000.0750	00454.50
0010.0	213.0	000.1120	00474.00
0006.0	224.0	000.1120	00485.00
0004.0	233.0	000.1120	00498.00
0003.0	240.0	000.1120	00487.50
0002.0	250.0	000.1120	00451.00
0001.0	267.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

57
ISACHSEN, N.W.T. FEB. 21, 1958
1200GMT CLEAR
H2O MASS = 0.148 O3 MASS = 0.396

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	226.0	000.0350	00000.00
1000.0	225.0	000.0440	00000.00
0979.0	227.0	000.0400	00000.10
0948.0	245.0	000.3300	00000.20
0840.0	247.0	000.3400	00001.20
0560.0	237.0	000.1700	00005.00
0435.0	224.0	000.0570	00008.20
0332.0	223.0	000.0460	00012.50
0250.0	228.0	000.0280	00020.00
0157.0	234.0	000.0130	00050.00
0100.0	229.0	000.0110	00100.00
0050.0	222.0	000.0220	00245.00
0025.0	215.0	000.0450	00420.00
0020.0	214.0	000.0560	00462.50
0017.0	215.0	000.0660	00487.50
0010.0	226.0	000.1120	00543.50
0006.0	237.0	000.1120	00562.00
0004.0	246.0	000.1120	00547.50
0003.0	253.0	000.1120	00517.50
0002.0	262.0	000.1120	00413.00
0001.0	279.0	000.1120	00188.00
0000.9	283.0	000.1120	00160.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

58
ENIWETOK ATOL OCT. 14, 1958
1200GMT UNDERCAST AT 400 MB
H2O MASS = 0.158 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	300.0	017.9700	00000.00
0850.0	290.0	011.9200	00000.50
0500.0	267.0	003.0300	00002.50
0400.0	257.0	002.1200	00004.00
0300.0	241.0	000.3900	00006.00
0250.0	232.0	000.1800	00008.00
0200.0	218.0	000.0670	00012.50
0150.0	204.0	000.0180	00020.50
0100.0	189.0	000.0037	00042.00
0050.0	205.0	000.0075	00131.00
0025.0	218.0	000.0150	00330.00
0015.0	224.0	000.0250	00460.00
0010.0	229.0	000.0370	00513.00
0007.0	230.0	000.0530	00542.50
0005.0	236.0	000.0750	00552.50
0004.0	243.0	000.0930	00642.50
0003.0	242.0	000.1200	00623.00
0002.0	251.0	000.1140	00547.50
0001.0	268.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

59
PONAPE, CAROLINE IS. MAY 17, 1958
1200GMT UNDERCAST AT 850 MB
H2O MASS = 2.637 O3 MASS = 0.293

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	300.0	019.1300	00000.00
0850.0	291.0	012.7300	00001.50
0700.0	283.0	006.3300	00003.00
0500.0	269.0	002.3900	00005.50
0400.0	258.0	000.9500	00007.00
0300.0	245.0	000.2300	00010.00
0250.0	234.0	000.1100	00012.50
0200.0	222.0	000.0520	00016.50
0150.0	206.0	000.0180	00026.50
0100.0	187.0	000.0027	00054.50
0050.0	205.0	000.0054	00157.50
0025.0	219.0	000.0110	00352.50
0020.0	220.0	000.0140	00415.00
0010.0	236.0	000.0270	00525.00
0006.0	246.0	000.0450	00553.00
0004.0	255.0	000.0680	00557.50
0003.0	261.0	000.0900	00523.50
0002.0	271.0	000.1400	00400.00
0001.3	283.0	000.1300	00245.00
0001.0	283.0	000.1100	00175.00
0000.6	283.0	000.1100	00000.00
0000.4	271.0	000.1100	00018.00
0000.3	262.0	000.1100	00003.00
0000.2	251.0	000.1100	00002.00
0000.1	231.0	000.1100	00000.10

60
NANTUCKET, MASS. JUNE 22, 1958
1200GMT UNDERCAST AT 500 MB
H2O MASS = 0.202 O3 MASS = 0.332

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	287.0	010.0400	00000.00
1000.0	287.0	009.4500	00000.00
0938.0	286.0	008.8200	00001.20
0738.0	275.0	005.1900	00002.50
0700.0	274.0	005.0900	00003.00
0614.0	271.0	004.6400	00004.50
0500.0	261.0	002.2000	00005.50
0400.0	248.0	000.5900	00007.50
0300.0	234.0	000.1800	00012.00
0215.0	220.0	000.0490	00014.00
0170.0	215.0	000.0240	00028.80
0150.0	216.0	000.0180	00034.00
0100.0	218.0	000.0110	00065.00
0050.0	220.0	000.0220	00185.00
0025.0	222.0	000.0450	00410.00
0022.0	224.0	000.0510	00465.00
0010.0	240.0	000.1120	00552.00
0006.0	250.0	000.1120	00570.00
0004.0	260.0	000.1120	00572.50
0003.0	266.0	000.1120	00541.50
0002.0	275.0	000.1120	00400.00
0001.5	283.0	000.1120	00295.00
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

61
CANTON ISLAND MAR. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 1.112 O3 MASS = 0.304

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	301.0	017.9700	00000.00
0850.0	292.0	009.7500	00001.00
0700.0	283.0	008.4100	00002.50
0500.0	269.0	000.8400	00005.00
0400.0	259.0	000.5400	00006.50
0300.0	242.0	000.1800	00010.00
0200.0	220.0	000.0520	00020.00
0150.0	204.0	000.0160	00034.00
0100.0	192.0	000.0060	00066.00
0050.0	207.0	000.0120	00175.00
0025.0	214.0	000.0240	00345.00
0015.0	225.0	000.0400	00452.50
0010.0	233.0	000.0600	00510.00
0006.0	243.0	000.1000	00540.00
0004.0	252.0	000.1120	00515.00
0003.0	258.0	000.1120	00465.00
0002.0	268.0	000.1120	00354.00
0001.1	283.0	000.1120	00205.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

62
MIAMI, FLA. MAR. 1, 1958
1200GMT UNDERCAST AT 652 MB
H2O MASS = 0.418 O3 MASS = 0.298

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1016.0	294.0	014.6400	00000.00
1000.0	294.0	014.8800	00000.00
0850.0	287.0	011.9200	00001.00
0700.0	281.0	007.8400	00002.50
0664.0	278.0	006.2200	00003.10
0652.0	274.0	004.7100	00003.20
0578.0	269.0	001.4700	00003.80
0552.0	269.0	001.1900	00004.20
0500.0	266.0	000.7000	00005.00
0462.0	263.0	000.5700	00005.50
0400.0	255.0	000.3600	00006.50
0265.0	229.0	000.0830	00010.40
0261.0	230.0	000.0840	00009.80
0200.0	220.0	000.0520	00020.00
0172.0	214.0	000.0360	00025.20
0150.0	211.0	000.0280	00034.00
0100.0	197.0	000.0110	00066.00
0078.0	194.0	000.0140	00095.00
0050.0	206.0	000.0220	00175.00
0034.0	217.0	000.0330	00265.00
0025.0	220.0	000.0450	00345.00
0015.0	226.0	000.0750	00452.50
0010.0	234.0	000.1120	00510.00
0006.0	245.0	000.1120	00540.00
0004.0	253.0	000.1120	00515.00
0003.0	260.0	000.1120	00465.00
0002.0	270.0	000.1120	00354.00
0001.2	283.0	000.1120	00212.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

63
BROWNSVILLE, TEXAS MAR. 1, 1958
1200GMT UNDERCAST AT 754 MB
H2O MASS = 0.506 O3 MASS = 0.300

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1009.0	292.0	012.1700	00000.00
0964.0	291.0	011.1900	00000.20
0850.0	284.0	007.9500	00001.00
0766.0	278.0	006.2200	00001.80
0754.0	283.0	005.8700	00002.10
0700.0	280.0	001.7100	00002.50
0544.0	268.0	000.7000	00003.80
0400.0	248.0	000.2400	00006.50
0372.0	247.0	000.2300	00007.50
0300.0	237.0	000.1200	00010.00
0250.0	230.0	000.0540	00012.50
0218.0	222.0	000.0280	00016.80
0200.0	219.0	000.0140	00020.00
0150.0	208.0	000.0120	00034.00
0130.0	203.0	000.0120	00043.80
0085.0	197.0	000.0130	00085.00
0058.0	214.0	000.0190	00143.80
0025.0	224.0	000.0450	00345.00
0021.0	228.0	000.0530	00385.00
0010.0	242.0	000.1120	00510.00
0006.0	252.0	000.1120	00540.00
0004.0	261.0	000.1120	00515.00
0003.0	268.0	000.1120	00465.00
0001.6	283.0	000.1120	00285.00
0001.0	283.0	000.1120	00185.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

64
EL PASO, TEXAS MAR. 1, 1958
1200GMT UNDERCAST AT 400 MB
H2O MASS = 0.012 O3 MASS = 0.302

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0876.0	276.0	003.0100	00000.40
0865.0	279.0	002.0600	00000.50
0850.0	278.0	001.7800	00001.00
0807.0	276.0	002.0400	00001.30
0700.0	265.0	001.8600	00002.50
0500.0	244.0	000.4800	00005.00
0400.0	230.0	000.1400	00006.50
0340.0	224.0	000.0310	00008.80
0300.0	226.0	000.0140	00010.00
0250.0	223.0	000.0140	00012.50
0220.0	226.0	000.0110	00020.00
0150.0	221.0	000.0100	00034.00
0100.0	216.0	000.0110	00066.00
0071.0	210.0	000.0160	00110.00
0050.0	216.0	000.0220	00175.00
0025.0	221.0	000.0450	00345.00
0016.0	223.0	000.0750	00442.50
0010.0	232.0	000.1120	00510.00
0006.0	242.0	000.1120	00540.00
0004.0	251.0	000.1120	00515.00
0003.0	258.0	000.1120	00465.00
0002.0	267.0	000.1120	00354.00
0001.0	283.0	000.1120	00185.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

65
CARIBOU, MAINE MAR. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 0.630 O3 MASS = 0.361

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0981.0	270.0	002.4900	00000.10
0917.0	267.0	002.2800	00000.40
0885.0	267.0	002.5500	00001.20
0845.0	273.0	004.2100	00001.70
0700.0	267.0	003.4900	00002.50
0500.0	253.0	001.2000	00005.50
0400.0	241.0	000.4900	00007.50
0250.0	217.0	000.0420	00015.00
0200.0	224.0	000.0180	00024.00
0173.0	225.0	000.0160	00032.50
0150.0	222.0	000.0140	00042.50
0096.0	213.0	000.0120	00097.50
0050.0	214.0	000.0220	00225.00
0025.0	218.0	000.0450	00406.00
0012.0	224.0	000.0940	00521.20
0010.0	228.0	000.1120	00537.00
0006.0	239.0	000.1120	00557.50
0004.0	248.0	000.1120	00543.00
0003.0	254.0	000.1120	00509.00
0002.0	264.0	000.1120	00395.00
0001.0	280.0	000.1120	00187.50
0000.9	283.0	000.1120	00160.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

66
SLT. STE. MARIE, MICH MAR. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 0.526 O3 MASS = 0.355

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0983.0	271.0	002.6800	00000.10
0936.0	269.0	002.4100	00000.40
0920.0	271.0	002.8600	00000.70
0810.0	264.0	002.2000	00001.20
0789.0	267.0	003.1000	00002.10
0700.0	266.0	002.7600	00002.50
0600.0	264.0	001.9900	00003.80
0400.0	243.0	000.3600	00007.50
0300.0	226.0	000.0730	00011.00
0224.0	213.0	000.0160	00019.00
0200.0	217.0	000.0160	00024.00
0150.0	220.0	000.0120	00042.50
0100.0	217.0	000.0110	00080.00
0050.0	216.0	000.0220	00225.00
0025.0	216.0	000.0450	00406.00
0015.0	222.0	000.0750	00495.00
0010.0	227.0	000.1120	00537.00
0006.0	238.0	000.1120	00557.50
0004.0	247.0	000.1120	00543.00
0003.0	254.0	000.1120	00509.00
0002.0	263.0	000.1120	00395.00
0000.9	283.0	000.1120	00160.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

67
MANIWAKI, QUEBEC — MAR. 1, 1958
1200GMT — UNDERCAST AT 568 MB
H2O MASS = 0.195 — O3 MASS = 0.355

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0987.0	271.0	002.6700	00000.10
0970.0	272.0	002.9300	00000.20
0850.0	265.0	001.9300	00001.00
0789.0	271.0	003.6000	00001.40
0568.0	261.0	002.1100	00005.00
0500.0	254.0	000.9200	00005.50
0400.0	240.0	000.2700	00007.50
0315.0	232.0	000.0890	00010.40
0239.0	218.0	000.0300	00016.50
0200.0	223.0	000.0180	00024.00
0150.0	224.0	000.0140	00042.50
0094.0	215.0	000.0120	00092.50
0050.0	217.0	000.0220	00225.00
0025.0	218.0	000.0450	00406.00
0017.0	218.0	000.0660	00477.50
0010.0	231.0	000.1120	00537.00
0006.0	242.0	000.1120	00557.50
0004.0	251.0	000.1120	00543.00
0003.0	258.0	000.1120	00509.00
0002.0	267.0	000.1120	00395.00
0001.0	283.0	000.1120	00187.50
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

68
BARROW, ALASKA — MAR. 1, 1958
1200GMT — UNDERCAST AT 500 MB
H2O MASS = 0.036 — O3 MASS = 0.393

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1017.0	248.0	000.3100	00000.00
0973.0	248.0	000.3300	00000.20
0920.0	255.0	000.6500	00000.60
0850.0	258.0	000.6400	00001.00
0826.0	259.0	000.4600	00001.90
0716.0	255.0	000.9200	00002.40
0500.0	238.0	000.2300	00006.00
0400.0	229.0	000.1100	00009.00
0289.0	219.0	000.0470	00015.00
0206.0	226.0	000.0300	00028.80
0150.0	226.0	000.0180	00054.50
0100.0	224.0	000.0110	00100.00
0050.0	220.0	000.0220	00245.00
0025.0	217.0	000.0450	00420.00
0014.0	213.0	000.0800	00512.50
0010.0	220.0	000.1120	00543.50
0006.0	230.0	000.1120	00562.00
0004.0	239.0	000.1120	00547.50
0003.0	245.0	000.1120	00517.50
0002.0	254.0	000.1120	00413.00
0001.0	271.0	000.1120	00188.00
0000.6	283.0	000.1120	00055.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

69
EUREKA, N.W.T. — MAR. 1, 1958
1200GMT — UNDERCAST AT 700 MB
H2O MASS = 0.096 — O3 MASS = 0.393

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1013.0	242.0	000.1400	00000.00
0960.0	242.0	000.1800	00000.50
0894.0	246.0	000.3200	00000.80
0813.0	255.0	000.8100	00001.30
0744.0	249.0	000.5600	00001.70
0720.0	250.0	000.6400	00002.20
0700.0	248.0	000.5400	00002.50
0500.0	232.0	000.1400	00006.00
0423.0	225.0	000.0660	00008.80
0400.0	226.0	000.0550	00009.00
0300.0	228.0	000.0400	00014.00
0250.0	230.0	000.0320	00020.00
0200.0	230.0	000.0240	00032.50
0150.0	229.0	000.0180	00054.50
0100.0	226.0	000.0110	00100.00
0050.0	221.0	000.0220	00245.00
0025.0	213.0	000.0450	00420.00
0013.0	209.0	000.0860	00523.00
0010.0	214.0	000.1120	00543.50
0006.0	225.0	000.1120	00562.00
0004.0	233.0	000.1120	00547.50
0003.0	239.0	000.1120	00517.50
0002.0	248.0	000.1120	00413.00
0001.0	264.0	000.1120	00188.00
0000.6	282.0	000.1120	00055.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

70
ALERT, N.W.T. — MAR. 1, 1958
1200GMT — UNDERCAST AT 700 MB
H2O MASS = 0.102 — O3 MASS = 0.394

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0997.0	253.0	000.6000	00000.10
0978.0	255.0	000.6700	00000.20
0850.0	249.0	000.4900	00001.00
0808.0	252.0	000.6800	00001.30
0760.0	251.0	000.6600	00001.70
0734.0	251.0	000.7500	00002.10
0700.0	250.0	000.6000	00002.50
0500.0	235.0	000.1100	00006.00
0400.0	229.0	000.0780	00009.00
0374.0	228.0	000.0750	00010.00
0300.0	230.0	000.0510	00014.00
0200.0	230.0	000.0310	00032.50
0150.0	228.0	000.0180	00054.50
0100.0	224.0	000.0110	00100.00
0050.0	218.0	000.0220	00245.00
0025.0	212.0	000.0450	00420.00
0020.0	209.0	000.0560	00462.50
0015.0	208.0	000.0750	00504.50
0010.0	217.0	000.1120	00543.50
0006.0	226.0	000.1120	00562.00
0004.0	234.0	000.1120	00547.50
0003.0	241.0	000.1120	00517.50
0002.0	250.0	000.1120	00413.00
0001.0	266.0	000.1120	00188.00
0000.6	283.0	000.1120	00055.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	261.0	000.1120	00000.10

71
MIDLAND, TEXAS — AUG. 1, 1958
1200GMT — UNDERCAST AT 476 MB
H2O MASS = 0.287 — O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0916.0	296.0	016.2800	00000.10
0903.0	300.0	013.6300	00000.20
0876.0	300.0	010.1100	00000.30
0850.0	298.0	009.7500	00000.50
0700.0	288.0	009.0300	00001.00
0476.0	264.0	003.1900	00002.70
0400.0	258.0	001.5000	00004.00
0382.0	256.0	000.7500	00004.50
0300.0	243.0	000.3900	00006.00
0250.0	232.0	000.2800	00008.00
0176.0	213.0	000.0350	00015.00
0150.0	207.0	000.0180	00020.50
0100.0	201.0	000.0110	00042.00
0050.0	216.0	000.0220	00131.00
0025.0	224.0	000.0450	00330.00
0015.0	227.0	000.0750	00460.00
0010.0	229.0	000.1120	00513.00
0006.0	241.0	000.1120	00563.50
0004.0	250.0	000.1120	00642.50
0003.0	257.0	000.1120	00623.00
0002.0	267.0	000.1120	00547.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

72
CAPE HATTERAS, N.C. — AUG. 1, 1958
1200GMT — UNDERCAST AT 466 MB
H2O MASS = 0.186 — O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1014.0	300.0	020.0600	00000.00
0990.0	299.0	019.3300	00000.10
0971.0	300.0	019.7200	00000.30
0850.0	292.0	012.7300	00000.50
0736.0	286.0	005.6000	00000.90
0700.0	282.0	006.3300	00001.00
0534.0	269.0	003.9200	00002.50
0466.0	265.0	002.5700	00002.90
0400.0	257.0	000.7900	00004.00
0300.0	243.0	000.2100	00006.00
0250.0	233.0	000.1100	00008.00
0178.0	215.0	000.0200	00015.10
0114.0	202.0	000.0110	00034.00
0100.0	204.0	000.0110	00042.00
0050.0	219.0	000.0220	00131.00
0043.0	222.0	000.0260	00180.00
0025.0	227.0	000.0450	00330.00
0013.0	232.0	000.0860	00482.50
0010.0	238.0	000.1120	00513.00
0006.0	249.0	000.1120	00563.50
0004.0	258.0	000.1120	00642.50
0003.0	264.0	000.1120	00623.00
0002.0	274.0	000.1120	00547.50
0001.4	283.0	000.1120	00420.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

73
BALBOA, CANAL ZONE — AUG. 1, 1958
1200GMT — UNDERCAST AT 700 MB
H2O MASS = 1.232 — O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	298.0	019.1300	00000.00
0850.0	290.0	011.9700	00000.50
0700.0	280.0	006.3300	00001.00
0500.0	267.0	002.3800	00002.50
0300.0	241.0	000.3500	00006.00
0200.0	218.0	000.0310	00012.50
0150.0	205.0	000.0100	00020.50
0100.0	200.0	000.0110	00042.00
0050.0	208.0	000.0220	00131.00
0025.0	225.0	000.0450	00330.00
0015.0	229.0	000.0750	00460.00
0010.0	234.0	000.1120	00513.00
0007.0	233.0	000.1120	00542.50
0005.0	239.0	000.1120	00600.00
0004.0	244.0	000.1120	00642.50
0003.0	251.0	000.1120	00623.00
0002.0	260.0	000.1120	00547.50
0001.0	277.0	000.1120	00255.00
0000.8	283.0	000.1120	00130.00
0000.6	283.0	000.1120	00013.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

74
DAYTON, OHIO — AUG. 1, 1958
1200GMT — UNDERCAST AT 810 MB
H2O MASS = 1.924 — O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0983.0	292.0	013.3400	00000.10
0940.0	289.0	011.4900	00000.20
0925.0	292.0	012.4600	00000.30
0810.0	285.0	008.9300	00000.50
0776.0	285.0	008.1300	00000.70
0700.0	281.0	006.3300	00001.00
0500.0	265.0	001.4400	00002.50
0442.0	259.0	000.4900	00003.10
0426.0	260.0	000.5000	00003.60
0400.0	255.0	000.5900	00004.00
0300.0	241.0	000.2300	00006.00
0262.0	212.0	000.0130	00017.50
0130.0	208.0	000.0120	00026.20
0100.0	208.0	000.0110	00042.50
0050.0	220.0	000.0220	00140.50
0025.0	229.0	000.0450	00375.00
0015.0	233.0	000.0750	00490.00
0010.0	236.0	000.1120	00530.00
0006.0	247.0	000.1120	00590.00
0004.0	256.0	000.1120	00654.00
0003.0	263.0	000.1120	00639.50
0002.0	272.0	000.1120	00558.00
0001.3	283.0	000.1120	00400.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

75
ALBANY, N.Y. — AUG. 1, 1958
1200GMT — UNDERCAST AT 930 MB
H2O MASS = 1.367 — O3 MASS = 0.271

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	290.0	012.2000	00000.00
1000.0	290.0	011.5100	00000.00
0959.0	288.0	010.5400	00000.10
0930.0	289.0	010.1800	00000.30
0850.0	284.0	006.9100	00000.50
0811.0	282.0	004.7200	00000.70
0791.0	283.0	001.7700	00000.80
0716.0	279.0	001.0000	00000.90
0700.0	279.0	001.0900	00001.00
0669.0	279.0	001.0700	00001.80
0500.0	263.0	000.5200	00002.50
0400.0	250.0	000.2700	00004.00
0300.0	236.0	000.1200	00006.00
0287.0	234.0	000.0860	00007.00
0200.0	225.0	000.0400	00012.50
0140.0	213.0	000.0190	00022.50
0100.0	214.0	000.0110	00042.50
0050.0	221.0	000.0220	00140.50
0025.0	226.0	000.0450	00375.00
0017.0	230.0	000.0660	00470.00
0010.0	241.0	000.1120	00530.00
0006.0	252.0	000.1120	00590.00
0004.0	261.0	000.1120	00654.00
0003.0	268.0	000.1120	00639.50
0002.0	277.0	000.1120	00558.00
0001.6	283.0	000.1120	00480.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.00
0000.1	231.0	000.1120	00000.10

76
COLD BAY, ALASKA — AUG. 1, 1958
1200GMT — UNDERCAST AT 932 MB
H2O MASS = 1.525 — O3 MASS = 0.271

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1022.0	281.0	006.6000	00000.00
1000.0	281.0	006.2900	00000.00
0943.0	278.0	005.8000	00000.20
0932.0	276.0	004.7400	00000.30
0894.0	281.0	004.9500	00000.40
0850.0	281.0	004.5000	00000.50
0801.0	280.0	003.5500	00000.80
0700.0	276.0	002.9800	00001.00
0500.0	261.0	001.1000	00002.50
0485.0	259.0	001.1300	00002.70
0400.0	249.0	000.5400	00004.00
0300.0	235.0	000.3200	00006.00
0200.0	225.0	000.0350	00012.50
0188.0	212.0	000.0250	00013.50
0150.0	219.0	000.0210	00020.50
0100.0	218.0	000.0110	00042.50
0050.0	223.0	000.0220	00140.50
0025.0	228.0	000.0450	00375.00
0020.0	230.0	000.0560	00439.00
0012.0	234.0	000.0940	00516.20
0010.0	238.0	000.1120	00530.00
0006.0	249.0	000.1120	00590.00
0004.0	258.0	000.1120	00654.00
0003.0	265.0	000.1120	00639.50
0002.0	274.0	000.1120	00558.00
0001.4	283.0	000.1120	00432.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

77
RESOLUTE, N.W.T. — AUG. 1, 1958
1200GMT — UNDERCAST AT 500 MB
H2O MASS = 0.135 — O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1004.0	276.0	004.4000	00000.00
0967.0	274.0	003.9500	00000.10
0954.0	279.0	005.7300	00000.30
0894.0	280.0	006.1200	00000.40
0700.0	271.0	004.3900	00001.00
0610.0	266.0	003.1700	00002.00
0500.0	256.0	001.5600	00002.50
0400.0	245.0	000.3600	00004.00
0300.0	229.0	000.1000	00006.00
0232.0	217.0	000.0310	00009.50
0192.0	228.0	000.0250	00013.60
0150.0	228.0	000.0180	00020.50
0100.0	229.0	000.0110	00042.00
0050.0	231.0	000.0220	00131.00
0025.0	234.0	000.0450	00330.00
0020.0	236.0	000.0560	00398.00
0010.0	250.0	000.1120	00513.00
0006.0	260.0	000.1120	00563.50
0004.0	269.0	000.1120	00642.50
0003.0	276.0	000.1120	00623.00
0002.2	283.0	000.1120	00570.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

78
YAKUTAT, ALASKA — AUG. 1, 1960
1200GMT — UNDERCAST AT 500 MB
H2O MASS = 0.107 — O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1012.0	284.0	007.6300	00000.00
0964.0	283.0	007.0000	00000.20
0850.0	276.0	005.2100	00000.50
0750.0	270.0	003.7900	00000.80
0611.0	263.0	002.4800	00001.90
0500.0	253.0	001.2000	00002.50
0400.0	241.0	000.3300	00004.00
0327.0	228.0	000.0850	00005.00
0238.0	217.0	000.0300	00009.00
0218.0	225.0	000.0250	00010.50
0200.0	226.0	000.0240	00012.50
0150.0	226.0	000.0180	00020.50
0100.0	226.0	000.0110	00042.50
0050.0	226.0	000.0220	00140.50
0025.0	228.0	000.0450	00375.00
0015.0	233.0	000.0750	00490.00
0010.0	237.0	000.1120	00530.00
0006.0	248.0	000.1120	00590.00
0004.0	257.0	000.1120	00654.00
0003.0	264.0	000.1120	00639.50
0002.0	274.0	000.1120	00558.00
0001.4	283.0	000.1120	00427.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

79
THULE, GREENLAND — AUG. 1, 1960
1200GMT — UNDERCAST AT 400 MB
H2O MASS = 0.068 — O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	280.0	004.7500	00000.00
0850.0	274.0	004.1800	00000.50
0700.0	271.0	004.3900	00001.00
0500.0	255.0	001.5600	00002.50
0400.0	244.0	000.6600	00004.00
0250.0	220.0	000.0690	00008.00
0150.0	226.0	000.0240	00020.50
0100.0	227.0	000.0110	00042.00
0050.0	229.0	000.0220	00131.00
0025.0	230.0	000.0450	00330.00
0015.0	235.0	000.0750	00460.00
0010.0	241.0	000.1120	00513.00
0006.0	252.0	000.1120	00563.50
0004.0	261.0	000.1120	00642.50
0003.0	268.0	000.1120	00623.00
0001.6	263.0	000.1120	00475.00
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

80
AKLAVIK, N.W.T. — AUG. 1, 1960
1200GMT — UNDERCAST AT 806 MB
H2O MASS = 0.497 — O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1012.0	281.0	005.8000	00000.00
0865.0	272.0	003.2800	00000.40
0832.0	272.0	003.6900	00000.60
0806.0	268.0	002.5900	00000.70
0747.0	264.0	001.2400	00000.80
0721.0	266.0	001.4000	00000.90
0680.0	265.0	001.4800	00001.80
0485.0	249.0	000.6500	00003.20
0400.0	237.0	000.2700	00004.00
0307.0	226.0	000.0810	00005.40
0226.0	234.0	000.0460	00010.00
0150.0	233.0	000.0240	00020.50
0100.0	233.0	000.0110	00042.00
0050.0	234.0	000.0220	00131.00
0040.0	234.0	000.0280	00183.80
0024.0	238.0	000.0470	00342.50
0015.0	247.0	000.0750	00460.00
0010.0	254.0	000.1120	00513.00
0006.0	264.0	000.1120	00563.50
0004.0	273.0	000.1120	00642.50
0002.6	283.0	000.1120	00587.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

81
NAKNEK, ALASKA — MAY 15, 1958
1200GMT — UNDERCAST AT 500 MB
H2O MASS = 0.040 — O3 MASS = 0.338

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	277.0	004.4200	00000.00
0850.0	266.0	002.6600	00001.50
0700.0	255.0	001.1100	00003.00
0500.0	242.0	000.3900	00005.50
0421.0	233.0	000.1200	00007.50
0330.0	224.0	000.0520	00010.00
0200.0	230.0	000.0210	00021.50
0139.0	223.0	000.0150	00040.00
0085.0	216.0	000.0130	00085.00
0050.0	218.0	000.0220	00185.00
0024.0	220.0	000.0470	00445.00
0015.0	229.0	000.0750	00515.00
0010.0	237.0	000.1120	00552.00
0006.0	249.0	000.1120	00570.00
0004.0	258.0	000.1120	00572.50
0003.0	264.0	000.1120	00541.50
0002.0	273.0	000.1120	00400.00
0001.3	283.0	000.1120	00262.50
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

82
GOOSE BAY, LAB. — OCT. 20, 1958
1200GMT — UNDERCAST AT 400 MB
H2O MASS = 0.027 — O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	270.0	001.9300	00000.00
0850.0	262.0	001.7800	00000.50
0700.0	252.0	000.8600	00001.00
0500.0	241.0	000.3900	00002.50
0400.0	233.0	000.2200	00004.00
0300.0	221.0	000.0730	00006.00
0250.0	225.0	000.0480	00008.00
0200.0	228.0	000.0270	00012.50
0150.0	227.0	000.0180	00020.50
0100.0	225.0	000.0110	00042.50
0050.0	221.0	000.0220	00140.50
0025.0	222.0	000.0450	00375.00
0020.0	224.0	000.0560	00439.00
0015.0	224.0	000.0750	00490.00
0010.0	223.0	000.1120	00530.00
0007.0	230.0	000.1120	00547.50
0005.0	230.0	000.1120	00635.00
0004.0	231.0	000.1120	00654.00
0003.0	233.0	000.1120	00639.50
0002.0	243.0	000.1120	00558.00
0001.0	260.0	000.1120	00255.00
0000.6	282.0	000.1120	00007.50
0000.4	271.0	000.1120	00000.80
0000.3	262.0	000.1120	00000.40
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

83
NANTUCKET, MASS. — NOV. 7, 1958
1200GMT — UNDERCAST AT 800 MB
H2O MASS = 0.361 — O3 MASS = 0.305

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1008.0	280.0	004.0800	00000.00
0850.0	268.0	002.1000	00001.00
0800.0	264.0	002.2300	00001.20
0730.0	265.0	001.5100	00002.00
0593.0	256.0	000.4400	00002.70
0400.0	233.0	000.0700	00006.00
0365.0	230.0	000.0860	00007.00
0300.0	237.0	000.1200	00009.50
0250.0	239.0	000.1800	00012.50
0200.0	234.0	000.1400	00018.50
0132.0	217.0	000.0310	00039.50
0100.0	217.0	000.0110	00062.00
0088.0	213.0	000.0130	00065.00
0050.0	211.0	000.0220	00185.00
0025.0	212.0	000.0450	00402.50
0020.0	214.0	000.0560	00437.50
0010.0	228.0	000.1120	00480.00
0006.0	238.0	000.1120	00493.50
0004.0	247.0	000.1120	00511.50
0003.0	254.0	000.1120	00503.00
0002.0	263.0	000.1120	00462.50
0001.0	278.0	000.1120	00330.00
0000.9	283.0	000.1120	00300.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

84
GREEN BAY, WIS. — NOV. 9, 1958
0000GMT — UNDERCAST AT 722 MB
H2O MASS = 0.254 — O3 MASS = 0.310

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0969.0	277.0	004.5600	00000.10
0861.0	269.0	003.0600	00000.80
0722.0	263.0	002.2800	00001.90
0596.0	253.0	000.4800	00003.00
0500.0	245.0	000.2300	00004.00
0442.0	237.0	000.1600	00005.20
0400.0	235.0	000.1100	00006.00
0300.0	233.0	000.0730	00009.50
0200.0	229.0	000.0400	00018.50
0150.0	225.0	000.0240	00031.00
0100.0	223.0	000.0110	00062.00
0052.0	215.0	000.0220	00175.00
0025.0	216.0	000.0450	00402.50
0021.0	216.0	000.0530	00430.00
0010.0	230.0	000.1120	00480.00
0006.0	240.0	000.1120	00493.50
0004.0	249.0	000.1120	00511.50
0003.0	256.0	000.1120	00503.00
0002.0	265.0	000.1120	00462.50
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

85
GREEN BAY, WIS. OCT. 24, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 0.443 O3 MASS = 0.267

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0983.0	292.0	006.8600	00000.20
0700.0	266.0	002.9800	00001.00
0543.0	254.0	001.0100	00002.60
0400.0	235.0	000.2400	00004.00
0355.0	229.0	000.1400	00005.00
0311.0	236.0	000.0490	00005.30
0250.0	234.0	000.0420	00008.00
0200.0	231.0	000.0310	00012.50
0150.0	225.0	000.0180	00020.50
0100.0	218.0	000.0110	00042.50
0072.0	214.0	000.0160	00077.00
0050.0	217.0	000.0220	00140.50
0025.0	220.0	000.0450	00375.00
0014.0	221.0	000.0800	00500.00
0010.0	228.0	000.1120	00530.00
0006.0	238.0	000.1120	00590.00
0004.0	247.0	000.1120	00654.00
0003.0	253.0	000.1120	00639.50
0002.0	263.0	000.1120	00558.00
0001.0	279.0	000.1120	00255.00
0000.9	283.0	000.1120	00187.50
0000.6	283.0	000.1120	00018.70
0000.4	271.0	000.1120	00009.00
0000.3	262.0	000.1120	00005.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

86
PORT HARRISON, QUEBEC DEC. 15, 1958
1200GMT UNDERCAST AT 720 MB
H2O MASS = 0.098 O3 MASS = 0.309

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1010.0	255.0	000.7100	00000.00
1000.0	255.0	000.6600	00000.00
0895.0	248.0	000.4700	00000.30
0872.0	251.0	000.6300	00000.80
0850.0	251.0	000.6400	00001.00
0720.0	248.0	000.5300	00002.50
0500.0	233.0	000.1400	00004.00
0444.0	226.0	000.0790	00005.10
0400.0	224.0	000.0550	00006.00
0300.0	214.0	000.0210	00009.50
0217.0	222.0	000.0130	00015.50
0150.0	222.0	000.0100	00031.00
0100.0	218.0	000.0110	00062.00
0091.0	216.0	000.0120	00072.50
0050.0	212.0	000.0220	00185.00
0075.0	208.0	000.0450	00402.50
0020.0	208.0	000.0560	00437.50
0010.0	220.0	000.1120	00480.00
0006.0	231.0	000.1120	00493.50
0004.0	239.0	000.1120	00511.50
0003.0	246.0	000.1120	00503.00
0002.0	255.0	000.1120	00462.50
0001.0	272.0	000.1120	00330.00
0000.7	283.0	000.1120	00237.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

87
RESOLUTE, N.W.T. DEC. 31, 1958
1200GMT UNDERCAST AT 400 MB
H2O MASS = 0.007 O3 MASS = 0.273

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1006.0	238.0	000.1700	00000.00
0955.0	240.0	000.1100	00000.10
0874.0	243.0	000.1800	00000.50
0795.0	241.0	000.1500	00001.30
0757.0	241.0	000.1500	00001.80
0700.0	239.0	000.1200	00002.00
0500.0	231.0	000.0600	00004.00
0400.0	221.0	000.0200	00006.00
0318.0	210.0	000.0048	00007.50
0250.0	212.0	000.0061	00011.00
0200.0	214.0	000.0065	00015.00
0150.0	213.0	000.0075	00024.50
0100.0	209.0	000.0110	00050.00
0050.0	198.0	000.0220	00147.50
0032.0	194.0	000.0350	00275.00
0025.0	195.0	000.0450	00357.50
0015.0	205.0	000.0750	00454.50
0010.0	213.0	000.1120	00474.00
0006.0	224.0	000.1120	00485.00
0004.0	233.0	000.1120	00498.00
0003.0	239.0	000.1120	00487.50
0002.0	249.0	000.1120	00451.00
0001.0	265.0	000.1120	00330.00
0000.6	282.0	000.1120	00197.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

88
ALERT, N.W.T. DEC. 12, 1958
1200GMT UNDERCAST AT 818 MB
H2O MASS = 0.069 O3 MASS = 0.275

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1001.0	241.0	000.2000	00000.00
1000.0	243.0	000.2200	00000.00
0988.0	243.0	000.1600	00000.20
0964.0	242.0	000.1700	00000.30
0927.0	244.0	000.2800	00000.40
0898.0	243.0	000.2600	00000.50
0880.0	247.0	000.4000	00000.80
0818.0	248.0	000.4300	00001.30
0651.0	243.0	000.1100	00002.60
0500.0	232.0	000.0390	00004.00
0467.0	231.0	000.0330	00004.90
0400.0	223.0	000.0150	00006.00
0300.0	215.0	000.0068	00008.50
0200.0	220.0	000.0076	00015.00
0150.0	217.0	000.0087	00024.50
0100.0	214.0	000.0110	00050.00
0050.0	206.0	000.0220	00147.50
0027.0	199.0	000.0420	00332.50
0025.0	199.0	000.0450	00357.50
0015.0	208.0	000.0750	00454.50
0010.0	216.0	000.1120	00474.00
0006.0	227.0	000.1120	00485.00
0004.0	237.0	000.1120	00498.00
0003.0	244.0	000.1120	00487.50
0002.0	254.0	000.1120	00451.00
0001.0	272.0	000.1120	00330.00
0000.7	283.0	000.1120	00237.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

89
WASHINGTON, D.C. JAN. 31, 1958
1200GMT UNDERCAST AT 500 MB
H2O MASS = 0.053 O3 MASS = 0.271

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0997.0	275.0	003.3100	00000.10
0979.0	274.0	002.6900	00000.20
0953.0	278.0	003.2100	00000.40
0850.0	272.0	002.8700	00001.00
0670.0	257.0	001.2700	00002.20
0570.0	254.0	000.8800	00003.20
0500.0	246.0	000.5700	00004.00
0400.0	236.0	000.1200	00006.00
0300.0	221.0	000.0450	00008.50
0283.0	221.0	000.0370	00008.80
0212.0	228.0	000.0190	00012.60
0150.0	223.0	000.0140	00024.50
0100.0	221.0	000.0110	00050.00
0068.0	218.0	000.0170	00092.50
0050.0	221.0	000.0220	00147.50
0025.0	230.0	000.0450	00357.50
0023.0	229.0	000.0490	00382.50
0015.0	237.0	000.0750	00454.50
0010.0	245.0	000.1120	00474.00
0006.0	255.0	000.1120	00485.00
0004.0	264.0	000.1120	00498.00
0003.0	270.0	000.1120	00487.50
0001.8	283.0	000.1120	00433.70
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

90
WASHINGTON, D.C. JULY 12, 1958
1200GMT UNDERCAST AT 370 MB
H2O MASS = 0.038 O3 MASS = 0.293

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1002.0	296.0	017.9400	00000.00
0946.0	293.0	015.7500	00000.50
0932.0	296.0	017.0000	00000.70
0850.0	292.0	009.7500	00001.50
0700.0	280.0	005.8900	00003.00
0500.0	264.0	001.7000	00005.50
0370.0	251.0	000.4800	00007.50
0300.0	240.0	000.1700	00010.00
0200.0	219.0	000.0180	00016.50
0153.0	207.0	000.0039	00025.00
0100.0	210.0	000.0110	00054.50
0050.0	220.0	000.0220	00157.50
0025.0	228.0	000.0450	00352.50
0015.0	235.0	000.0750	00474.00
0010.0	241.0	000.1120	00525.00
0006.0	252.0	000.1120	00553.00
0004.0	261.0	000.1120	00557.50
0003.0	268.0	000.1120	00523.50
0001.6	283.0	000.1120	00325.00
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	00001.50
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

91
KEY WEST, FLA. AUG. 1, 1958
1200GMT CLEAR
H2O MASS = 2.843 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	300.0	016.8800	00000.00
0850.0	294.0	003.8800	00000.50
0700.0	282.0	002.7600	00001.00
0500.0	266.0	002.2000	00002.50
0400.0	255.0	000.6600	00004.00
0300.0	240.0	000.1700	00006.00
0250.0	230.0	000.0880	00008.00
0200.0	219.0	000.0400	00012.50
0150.0	209.0	000.0240	00020.50
0100.0	201.0	000.0110	00042.00
0050.0	213.0	000.0220	00131.00
0025.0	230.0	000.0450	00330.00
0020.0	228.0	000.0560	00398.00
0015.0	231.0	000.0750	00460.00
0010.0	232.0	000.1120	00513.00
0006.0	244.0	000.1120	00563.50
0004.0	252.0	000.1120	00642.50
0003.0	259.0	000.1120	00623.00
0002.0	268.0	000.1120	00547.50
0001.1	283.0	000.1120	00312.50
0000.6	283.0	000.1120	00031.30
0000.4	271.0	000.1120	00003.00
0000.3	262.0	000.1120	00002.00
0000.2	251.0	000.1120	00001.50
0000.1	231.0	000.1120	00000.10

92
CURACAO, W.I. NOV. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 1.174 O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1012.0	301.0	017.7500	00000.00
1000.0	301.0	017.9700	00000.00
0933.0	295.0	015.0000	00000.10
0919.0	297.0	011.0100	00000.40
0850.0	293.0	006.0100	00001.00
0700.0	284.0	009.0300	00002.00
0500.0	269.0	000.8400	00004.00
0400.0	258.0	000.4900	00006.00
0300.0	242.0	000.1800	00008.50
0200.0	220.0	000.0520	00015.00
0150.0	207.0	000.0160	00024.50
0132.0	201.0	000.0110	00030.00
0115.0	198.0	000.0098	00040.00
0106.0	198.0	000.0091	00045.00
0095.0	194.0	000.0086	00050.00
0060.0	210.0	000.0140	00112.50
0050.0	211.0	000.0160	00147.50
0025.0	222.0	000.0330	00357.50
0015.0	229.0	000.0550	00454.50
0010.0	234.0	000.0820	00474.00
0008.0	238.0	000.1000	00478.50
0007.5	239.0	000.1120	00480.00
0005.0	248.0	000.1120	00492.50
0004.0	253.0	000.1120	00498.00
0003.0	259.0	000.1120	00487.50
0002.0	268.0	000.1120	00451.00
0001.1	283.0	000.1120	00350.00
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

93
KINDLEY BERM, BERMUDA AUG. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 1.076 O3 MASS = 0.255

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	300.0	017.9700	00000.00
0850.0	292.0	012.7300	00000.50
0700.0	283.0	007.3100	00001.00
0500.0	267.0	001.4400	00002.50
0400.0	257.0	000.4400	00004.00
0300.0	242.0	000.1800	00006.00
0200.0	221.0	000.0590	00012.50
0150.0	209.0	000.0240	00020.50
0100.0	201.0	000.0110	00042.00
0050.0	217.0	000.0220	00131.00
0025.0	224.0	000.0450	00330.00
0020.0	227.0	000.0560	00398.00
0015.0	229.0	000.0750	00460.00
0010.0	234.0	000.1120	00513.00
0007.0	232.0	000.1120	00543.00
0005.0	235.0	000.1120	00600.00
0003.0	241.0	000.1120	00623.00
0002.0	250.0	000.1120	00547.50
0001.0	266.0	000.1120	00255.00
0000.7	283.0	000.1120	00007.50
0000.6	283.0	000.1120	00000.80
0000.4	271.0	000.1120	00000.40
0000.3	262.0	000.1120	00000.30
0000.2	251.0	000.1120	00000.20
0000.1	231.0	000.1120	00000.10

94
JOHNSTON ISLAND MAY 1, 1958
1200GMT UNDERCAST AT 850 MB
H2O MASS = 1.765 O3 MASS = 0.294

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	297.0	014.8300	00000.00
0850.0	289.0	009.1100	00001.50
0700.0	283.0	004.7200	00003.00
0500.0	268.0	000.7600	00005.50
0400.0	258.0	000.4900	00007.00
0300.0	240.0	000.1700	00010.00
0250.0	231.0	000.0880	00012.50
0200.0	219.0	000.0460	00016.50
0150.0	206.0	000.0160	00026.50
0100.0	197.0	000.0110	00054.50
0050.0	208.0	000.0220	00157.50
0025.0	222.0	000.0450	00352.50
0020.0	225.0	000.0560	00415.00
0015.0	227.0	000.0750	00474.00
0010.0	227.0	000.1120	00525.00
0007.0	235.0	000.1120	00547.00
0005.0	239.0	000.1120	00557.50
0003.0	240.0	000.1120	00523.50
0002.0	250.0	000.1120	00400.00
0001.0	266.0	000.1120	00175.00
0000.7	283.0	000.1120	00018.50
0000.6	283.0	000.1120	00009.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	0002.500
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

95
JOHNSTON ISLAND FEB. 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 1.021 O3 MASS = 0.304

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	297.0	014.8300	00000.00
0850.0	288.0	012.7300	00001.00
0700.0	278.0	007.8400	00002.50
0500.0	267.0	000.7000	00005.00
0400.0	256.0	000.4400	00006.50
0300.0	240.0	000.1700	00010.00
0200.0	220.0	000.0520	00020.00
0150.0	207.0	000.0210	00034.00
0100.0	196.0	000.0110	00066.00
0050.0	205.0	000.0220	00175.00
0025.0	222.0	000.0450	00345.00
0015.0	225.0	000.0750	00452.50
0010.0	224.0	000.1120	00510.00
0007.0	230.0	000.1120	00530.00
0004.0	243.0	000.1120	00515.00
0003.0	249.0	000.1120	00465.00
0002.0	259.0	000.1120	00354.00
0001.0	275.0	000.1120	00185.00
0000.8	283.0	000.1120	00128.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

96
KEY WEST, FLA. FEB. 1, 1958
1200GMT UNDERCAST AT 850 MB
H2O MASS = 0.894 O3 MASS = 0.304

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	293.0	013.1100	00000.00
0850.0	285.0	006.8700	00001.00
0700.0	281.0	001.2100	00002.50
0500.0	263.0	000.5700	00005.00
0400.0	250.0	000.2700	00006.50
0300.0	234.0	000.1100	00010.00
0200.0	220.0	000.0350	00020.00
0150.0	212.0	000.0210	00034.00
0100.0	202.0	000.0110	00066.00
0050.0	213.0	000.0220	00175.00
0025.0	220.0	000.0450	00345.00
0020.0	221.0	000.0560	00395.00
0010.0	234.0	000.1120	00510.00
0006.0	245.0	000.1120	00540.00
0004.0	254.0	000.1120	00515.00
0003.0	260.0	000.1120	00465.00
0002.0	270.0	000.1120	00354.00
0001.2	283.0	000.1120	00225.00
0001.0	283.0	000.1120	00185.00
0000.6	283.0	000.1120	00045.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

* UNITS OF TEN TO THE MINUS 5TH

97
KINDLEY BERM, BERMUDA NOV. 1, 1958
1200GMT UNDERCAST AT 850 MB
H2O MASS = 1.264 O3 MASS = 0.275

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	295.0	010.0100	00000.00
0850.0	282.0	011.9200	00001.00
0700.0	278.0	001.0300	00002.00
0500.0	262.0	000.5700	00004.00
0400.0	252.0	000.3300	00006.00
0300.0	235.0	000.1000	00008.50
0200.0	216.0	000.0270	00015.00
0150.0	209.0	000.0160	00024.50
0100.0	206.0	000.0110	00050.00
0050.0	217.0	000.0220	00147.50
0025.0	220.0	000.0450	00357.50
0020.0	221.0	000.0560	00415.00
0015.0	227.0	000.0750	00454.50
0010.0	223.0	000.1120	00474.00
0006.0	234.0	000.1120	00485.00
0004.0	243.0	000.1120	00498.00
0003.0	250.0	000.1120	00487.50
0002.0	260.0	000.1120	00451.00
0001.0	276.0	000.1120	00330.00
0000.8	283.0	000.1120	00272.50
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

98
SEVEN ISLANDS, QUEBEC AUG. 1, 1958
1200GMT UNDERCAST AT 724 MB
H2O MASS = 0.428 O3 MASS = 0.270

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1003.0	290.0	007.7000	00000.00
1000.0	291.0	008.2700	00000.00
0900.0	283.0	007.0000	00000.30
0850.0	282.0	005.6000	00000.50
0724.0	273.0	003.9300	00000.80
0700.0	271.0	003.2300	00001.00
0641.0	269.0	001.2100	00002.10
0500.0	255.0	000.7600	00002.50
0400.0	241.0	000.1400	00004.00
0300.0	226.0	000.0240	00006.00
0243.0	230.0	000.0150	00008.30
0200.0	230.0	000.0100	00012.50
0150.0	227.0	000.0100	00020.50
0100.0	225.0	000.0110	00042.50
0050.0	225.0	000.0220	00140.50
0025.0	227.0	000.0450	00375.00
0020.0	228.0	000.0560	00439.00
0010.0	243.0	000.1120	00530.00
0006.0	254.0	000.1120	00590.00
0004.0	262.0	000.1120	00654.00
0003.0	269.0	000.1120	00639.50
0002.0	278.0	000.1120	00558.00
0001.7	283.0	000.1120	00487.50
0001.0	283.0	000.1120	00255.00
0000.6	283.0	000.1120	00026.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

99
ALBANY, N.Y. NOV. 1, 1958
1200GMT UNDERCAST AT 900 MB
H2O MASS = 0.457 O3 MASS = 0.309

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1002.0	275.0	003.0600	00000.00
0989.0	276.0	002.6600	00000.10
0900.0	271.0	003.6700	00000.30
0879.0	275.0	001.8700	00000.70
0651.0	265.0	000.4400	00002.30
0619.0	266.0	000.5600	00002.60
0400.0	244.0	000.1700	00006.00
0300.0	231.0	000.0570	00009.50
0209.0	215.0	000.0097	00015.50
0146.0	221.0	000.0100	00032.50
0108.0	213.0	000.0100	00047.50
0100.0	214.0	000.0110	00062.00
0050.0	214.0	000.0220	00185.00
0030.0	221.0	000.0370	00360.00
0025.0	218.0	000.0450	00402.50
0018.0	216.0	000.0620	00450.00
0010.0	228.0	000.1120	00480.00
0006.0	239.0	000.1120	00493.50
0004.0	248.0	000.1120	00511.50
0003.0	255.0	000.1120	00503.00
0002.0	264.0	000.1120	00462.50
0001.0	283.0	000.1120	00330.00
0000.6	283.0	000.1120	00187.50
0000.4	271.0	000.1120	00095.00
0000.3	262.0	000.1120	00020.00
0000.2	251.0	000.1120	00002.00
0000.1	231.0	000.1120	00000.10

100
ATTU, ALASKA MAY 1, 1958
1200GMT UNDERCAST AT 700 MB
H2O MASS = 0.203 O3 MASS = 0.335

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0850.0	264.0	001.9300	00001.50
0700.0	255.0	001.0300	00003.00
0400.0	233.0	000.1100	00007.50
0300.0	223.0	000.0350	00012.00
0250.0	226.0	000.0250	00015.00
0200.0	228.0	000.0180	00021.50
0100.0	223.0	000.0110	00065.00
0050.0	222.0	000.0220	00185.00
0025.0	222.0	000.0450	00410.00
0020.0	224.0	000.0560	00467.50
0010.0	237.0	000.1120	00552.00
0006.0	248.0	000.1120	00570.00
0004.0	256.0	000.1120	00572.50
0003.0	263.0	000.1120	00541.50
0002.0	272.0	000.1120	00400.00
0001.3	283.0	000.1120	00257.50
0001.0	283.0	000.1120	00175.00
0000.6	283.0	000.1120	00018.00
0000.4	271.0	000.1120	00005.00
0000.3	262.0	000.1120	00003.00
0000.2	251.0	000.1120	0001.500
0000.1	231.0	000.1120	00000.10

101
BEER-YA AQOV, ISRAEL AUG. 26, 1960
1200GMT CLEAR
H2O MASS = 1.535 O3 MASS = 0.250

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	306.0	008.2700	00000.00
0850.0	295.0	003.8800	00000.50
0700.0	287.0	001.1100	00001.00
0500.0	270.0	000.3900	00002.50
0400.0	258.0	000.1900	00004.00
0300.0	247.0	000.0730	00006.00
0200.0	227.0	000.0210	00012.50
0150.0	217.0	000.0100	00020.50
0100.0	206.0	000.0044	00042.00
0050.0	206.0	000.0087	00131.00
0025.0	206.0	000.0170	00330.00
0015.0	216.0	000.0290	00398.00
0010.0	224.0	000.0440	00513.00
0006.0	235.0	000.0440	00563.50
0004.0	244.0	000.0440	00642.50
0003.0	251.0	000.0440	00623.00
0002.0	261.0	000.0440	00547.50
0000.9	283.0	000.0440	00196.50
0000.6	283.0	000.0440	00020.00
0000.4	271.0	000.0440	00010.00
0000.3	262.0	000.0440	00005.00
0000.2	251.0	000.0440	00004.00
0000.1	231.0	000.0440	00003.00

102
BAHREIN, ARABIA JULY 19, 1960
0000GMT CLEAR
H2O MASS = 4.245 O3 MASS = 0.254

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	308.0	025.9500	00000.00
0850.0	304.0	003.8800	00000.50
0700.0	292.0	005.0900	00001.00
0500.0	268.0	004.1900	00002.50
0400.0	262.0	000.4000	00004.00
0300.0	246.0	000.1700	00006.00
0200.0	225.0	000.0310	00012.50
0150.0	211.0	000.0087	00020.50
0100.0	194.0	000.0013	00042.00
0050.0	209.0	000.0027	00131.00
0030.0	218.0	000.0045	00270.00
0025.0	218.0	000.0054	00330.00
0015.0	228.0	000.0090	00460.00
0010.0	236.0	000.0130	00513.00
0006.0	247.0	000.0130	00563.50
0004.0	256.0	000.0130	00642.50
0003.0	263.0	000.0130	00623.00
0002.0	273.0	000.0130	00547.50
0001.3	283.0	000.0130	00393.50
0000.6	283.0	000.0130	00040.00
0000.4	271.0	000.0130	00030.00
0000.3	262.0	000.0130	00020.00
0000.2	251.0	000.0130	00010.00
0000.1	231.0	000.0130	00005.00

* UNITS OF TEN TO THE MINUS 5TH

MODEL ATMOSPHERES

103
AOULEF, ALGERIA AUG. 16, 1960
1200GMT CLEAR
H2O MASS = 1.329 O3 MASS = 0.252

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	319.0	005.1000	00000.00
0850.0	302.0	003.1000	00000.50
0700.0	289.0	001.7100	00001.00
0500.0	268.0	000.6300	00002.50
0400.0	258.0	000.2700	00004.00
0300.0	246.0	000.1300	00006.00
0200.0	230.0	000.0460	00012.50
0150.0	218.0	000.0210	00020.50
0100.0	205.0	000.0060	00042.00
0070.0	209.0	000.0085	00077.50
0050.0	217.0	000.0120	00131.00
0025.0	231.0	000.0240	00330.00
0015.0	241.0	000.0400	00460.00
0010.0	250.0	000.0600	00513.00
0006.0	261.0	000.0600	00563.50
0004.0	269.0	000.0600	00642.50
0003.0	275.0	000.0600	00623.00
0002.0	283.0	000.0600	00547.50
0000.6	283.0	000.0600	00050.00
0000.4	271.0	000.0600	00040.00
0000.3	262.0	000.0600	00030.00
0000.2	251.0	000.0600	00020.00
0000.1	231.0	000.0600	00010.00

104
AOULEF, ALGERIA AUG. 25, 1960
1200GMT CLEAR
H2O MASS = 1.177 O3 MASS = 0.251

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	313.0	004.1100	00000.00
0850.0	297.0	003.3400	00000.50
0700.0	285.0	001.3200	00001.00
0500.0	265.0	000.4300	00002.50
0400.0	255.0	000.2400	00004.00
0300.0	239.0	000.0730	00006.00
0200.0	225.0	000.0210	00012.50
0150.0	216.0	000.0120	00020.50
0100.0	209.0	000.0082	00042.00
0070.0	211.0	000.0120	00077.50
0050.0	217.0	000.0160	00131.00
0030.0	222.0	000.0270	00270.00
0020.0	225.0	000.0410	00398.00
0010.0	239.0	000.0820	00513.00
0006.0	249.0	000.0820	00563.50
0004.0	258.0	000.0820	00642.50
0003.0	265.0	000.0820	00623.00
0002.0	274.0	000.0820	00547.50
0001.4	283.0	000.0820	00412.50
0000.6	283.0	000.0820	00040.00
0000.4	271.0	000.0820	00020.00
0000.3	262.0	000.0820	00010.00
0000.2	251.0	000.0820	00005.00
0000.1	231.0	000.0820	00002.00

105
AOULEF, ALGERIA AUG. 12, 1960
1200GMT CLEAR
H2O MASS = 1.344 O3 MASS = 0.251

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
1000.0	318.0	004.4200	00000.00
0850.0	304.0	003.6100	00000.50
0700.0	289.0	001.7100	00001.00
0500.0	267.0	000.5700	00002.50
0400.0	259.0	000.3300	00004.00
0300.0	244.0	000.0880	00006.00
0200.0	227.0	000.0270	00012.50
0150.0	217.0	000.0120	00020.50
0100.0	204.0	000.0044	00042.00
0070.0	207.0	000.0062	00077.50
0050.0	218.0	000.0087	00131.00
0030.0	226.0	000.0150	00270.00
0020.0	234.0	000.0220	00398.00
0010.0	249.0	000.0440	00513.00
0006.0	260.0	000.0440	00563.50
0004.0	269.0	000.0440	00642.50
0003.0	275.0	000.0440	00623.00
0002.0	283.0	000.0440	00547.50
0000.6	283.0	000.0440	00050.00
0000.4	271.0	000.0440	00040.00
0000.3	262.0	000.0440	00030.00
0000.2	251.0	000.0440	00020.00
0000.1	231.0	000.0440	00010.00

106
AOULEF, ALGERIA AUG. 15, 1960
1200GMT CLEAR
H2O MASS = 1.515 O3 MASS = 0.251

PRESS (MB.)	TEMP (DEG.K)	H2O (G./KG.)	O3* (CM./MB.)
0977.0	321.0	004.2100	00000.00
0850.0	305.0	003.6100	00000.50
0700.0	291.0	002.5500	00001.00
0500.0	267.0	001.2000	00002.50
0400.0	259.0	000.5400	00004.00
0300.0	244.0	000.1800	00006.00
0200.0	227.0	000.0400	00012.50
0150.0	218.0	000.0180	00020.50
0100.0	205.0	000.0051	00042.00
0070.0	208.0	000.0073	00077.50
0050.0	215.0	000.0100	00131.00
0030.0	223.0	000.0170	00270.00
0020.0	231.0	000.0250	00398.00
0010.0	245.0	000.0510	00513.00
0006.0	255.0	000.0510	00563.50
0004.0	264.0	000.0510	00642.50
0003.0	270.0	000.0510	00623.00
0001.7	283.0	000.0510	00498.00
0000.6	283.0	000.0510	00040.00
0000.4	271.0	000.0510	00020.00
0000.3	262.0	000.0510	00010.00
0000.2	251.0	000.0510	00005.00
0000.1	231.0	000.0510	00002.00

* UNITS OF TEN TO THE MINUS 5TH

APPENDIX B

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

The total unfiltered outgoing intensity, the filtered (channels 2 and 4) outgoing intensity, and partial integrals of the unfiltered outgoing intensities, as determined by the limits ν_1', and ν_2', are listed for each model atmosphere at five zenith angles ($\theta = 0^o$, 20°, 45°, 60°, and 78.5^o). Each model atmosphere is identified by the number appearing above the station name in Appendix A.

Values of the intensities for each angle are listed according to the following scheme:

	Channel 2	Channel 4
	Total unfiltered	
TIROS II	Filtered	Filtered
	Partial unfiltered	Partial unfiltered
TIROS III	Filtered	Filtered
	Partial unfiltered	Partial unfiltered
TIROS IV	Filtered	
	Partial unfiltered	

where "total unfiltered" is $\int_0^\infty I_\nu(\theta)\,d\nu$; "filtered" is $\int_0^\infty I_\nu(\theta)\varphi_\nu\,d\nu$; and "partial unfiltered" is $\int_{\nu_1'}^{\nu_2'} I_\nu(\theta)\,d\nu$, with ν_1' and ν_2' as given in table 2, page 22 of the main text. Thus, total infrared intensity is given at the top, and the channel 2 and channel 4 filtered and partial unfiltered intensities for the indicated satellites are given at the left and right, respectively.

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 1	96486.		95994.		93603.		90629.		82763.	
TIROS 11	17405.	20599.	17331.	20498.	16960.	19996.	16438.	19346.	14788.	17517.
	37579.	79871.	37419.	79472.	36626.	77482.	35497.	74955.	31895.	68043.
TIROS 111	18081.	38862.	18003.	38671.	17612.	37710.	17069.	36501.	15364.	33238.
	42481.	71698.	42310.	71356.	41445.	69647.	40213.	67489.	36212.	61643.
TIROS 1V	18081.		18003.		17612.		17069.		15364.	
	42481.		42310.		41445.		40213.		36212.	
NO. 2	91295.		90834.		88749.		86209.		79134.	
TIROS 11	16313.	19528.	16257.	19436.	15999.	19017.	15640.	18485.	14286.	16854.
	35122.	75951.	35015.	75575.	34481.	73860.	33723.	71720.	30814.	65409.
TIROS 111	16979.	37042.	16916.	36860.	16639.	36026.	16260.	34999.	14846.	32018.
	39909.	68327.	39763.	67996.	39178.	66500.	38346.	64656.	35039.	59286.
TIROS 1V	16979.		16916.		16639.		16260.		14846.	
	39909.		39763.		39178.		38346.		35039.	
NO. 3	93208.		92835.		91158.		89168.		83461.	
TIROS 11	16076.	19656.	16051.	19591.	15955.	19301.	15836.	18950.	15156.	17805.
	34558.	76813.	34519.	76534.	34347.	75266.	34141.	73737.	32763.	69033.
TIROS 111	16750.	37411.	16721.	37271.	16610.	36638.	16473.	35881.	15735.	33624.
	39205.	69067.	39150.	68811.	38991.	67666.	38763.	66315.	37135.	62284.
TIROS 1V	16750.		16721.		16610.		16473.		15735.	
	39205.		39150.		38991.		38763.		37135.	
NO. 4	85828.		85511.		83928.		81987.		76826.	
TIROS 11	14338.	17925.	14308.	17866.	14152.	17562.	13928.	17172.	13127.	16051.
	30711.	70415.	30649.	70168.	30341.	68887.	29893.	67278.	28205.	62795.
TIROS 111	14978.	34449.	14946.	34330.	14773.	33701.	14532.	32918.	13684.	30780.
	34992.	63766.	34927.	63547.	34583.	62407.	34067.	60990.	32153.	57127.
TIROS 1V	14978.		14946.		14773.		14532.		13684.	
	34992.		34927.		34583.		34067.		32153.	
NO. 5	82691.		82427.		81104.		79499.		75262.	
TIROS 11	13191.	17026.	13176.	16981.	13089.	16747.	12961.	16450.	12496.	15605.
	28114.	67354.	28085.	67160.	27933.	66142.	27695.	64877.	26784.	61358.
TIROS 111	13824.	33014.	13807.	32918.	13705.	32412.	13561.	31789.	13050.	30091.
	32164.	61259.	32140.	61083.	31961.	60153.	31689.	59010.	30581.	55909.
TIROS 1V	13824.		13807.		13705.		13561.		13050.	
	32164.		32140.		31961.		31689.		30581.	
NO. 6	78258.		78027.		76880.		75522.		72010.	
TIROS 11	12309.	16079.	12298.	16039.	12226.	15826.	12117.	15563.	11714.	14816.
	26153.	63775.	26132.	63596.	26009.	62666.	25807.	61531.	25023.	58401.
TIROS 111	12928.	31386.	12915.	31299.	12830.	30841.	12708.	30289.	12264.	28792.
	30080.	58220.	30064.	58056.	29929.	57206.	29710.	56185.	28754.	53449.
TIROS 1V	12928.		12915.		12830.		12708.		12264.	
	30080.		30064.		29929.		29710.		28754.	
NO. 7	75818.		75636.		74706.		73724.		71066.	
TIROS 11	11023.	15152.	11019.	15125.	10993.	14975.	10979.	14821.	10872.	14352.
	23286.	60778.	23283.	60655.	23271.	59983.	23256.	59282.	23154.	57167.
TIROS 111	11619.	29907.	11612.	29847.	11573.	29508.	11553.	29167.	11408.	28143.
	26794.	55770.	26789.	55653.	26739.	55009.	26780.	54349.	26533.	52380.
TIROS 1V	11619.		11612.		11573.		11553.		11408.	
	26794.		26789.		26739.		26780.		26533.	
NO. 8	71269.		71095.		70227.		69172.		66367.	
TIROS 11	9959.	14086.	9954.	14060.	9924.	13924.	9885.	13754.	9748.	13278.
	20913.	56767.	20906.	56651.	20871.	56047.	20821.	55293.	20627.	53176.
TIROS 111	10541.	28002.	10534.	27944.	10494.	27635.	10442.	27254.	10272.	26200.
	24254.	52392.	24243.	52282.	24191.	51703.	24114.	50987.	23805.	49001.
TIROS 1V	10541.		10534.		10494.		10442.		10272.	
	24254.		24243.		24191.		24114.		23805.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 9	60630.		60555.		60135.		59655.		58465.	
TIROS 11	7261.	11475.	7262.	11466.	7264.	11405.	7270.	11334.	7298.	11148.
	14930.	47165.	14935.	47122.	14958.	46840.	14990.	46511.	15128.	45601.
TIROS 111	7797.	23510.	7797.	23489.	7793.	23343.	7792.	23177.	7799.	22727.
	17683.	44212.	17688.	44169.	17705.	43885.	17735.	43552.	17816.	42643.
TIROS 1V	7797.		7797.		7793.		7792.		7799.	
	17683.		17688.		17705.		17735.		17816.	
NO. 10	96263.		95803.		93533.		90751.		83481.	
TIROS 11	17098.	20438.	17032.	20344.	16697.	19866.	16232.	19253.	14731.	17517.
	36895.	79405.	36753.	79028.	36041.	77113.	35041.	74703.	31786.	68068.
TIROS 111	17772.	38640.	17703.	38459.	17348.	37531.	16862.	36374.	15304.	33236.
	41753.	71233.	41601.	70910.	40826.	69251.	39733.	67179.	36099.	61527.
TIROS 1V	17772.		17703.		17348.		16862.		15304.	
	41753.		41601.		40826.		39733.		36099.	
NO. 11	92616.		92401.		90564.		88095.		82121.	
TIROS 11	15881.	19537.	15817.	19466.	15667.	19137.	15474.	18710.	14683.	17503.
	34168.	76435.	34003.	76173.	33715.	74773.	33367.	72958.	31710.	68096.
TIROS 111	16545.	37262.	16483.	37126.	16316.	36434.	16099.	35556.	15258.	33239.
	38747.	68724.	38571.	68524.	38262.	67271.	37880.	65642.	36031.	61441.
TIROS 1V	16545.		16483.		16316.		16099.		15258.	
	38747.		38571.		38262.		37880.		36031.	
NO. 12	85379.		85085.		83693.		81944.		77407.	
TIROS 11	13929.	17693.	13907.	17640.	13803.	17387.	13641.	17050.	13053.	16104.
	29792.	69746.	29751.	69521.	29549.	68433.	29238.	67016.	28045.	63152.
TIROS 111	14566.	34136.	14541.	34027.	14426.	33492.	14245.	32800.	13613.	30957.
	33992.	63189.	33946.	62988.	33760.	62010.	33399.	60745.	32007.	57393.
TIROS 1V	14566.		14541.		14426.		14245.		13613.	
	33992.		33946.		33760.		33399.		32007.	
NO. 13	81628.		81366.		80008.		78411.		74112.	
TIROS 11	12939.	16757.	12918.	16710.	12795.	16457.	12632.	16149.	12030.	15242.
	27582.	66362.	27539.	66165.	27317.	65098.	26993.	63817.	25762.	60146.
TIROS 111	13559.	32545.	13536.	32450.	13396.	31924.	13219.	31304.	12573.	29554.
	31597.	60394.	31553.	60219.	31259.	59254.	30894.	58116.	29425.	54907.
TIROS 1V	13559.		13536.		13396.		13219.		12573.	
	31597.		31553.		31259.		30894.		29425.	
NO. 14	82450.		82215.		81120.		79748.		76206.	
TIROS 11	12576.	16701.	12566.	16664.	12527.	16490.	12461.	16259.	12213.	15616.
	26742.	66481.	26729.	66320.	26666.	65550.	26567.	64543.	26157.	61775.
TIROS 111	13199.	32583.	13187.	32503.	13137.	32119.	13056.	31620.	12765.	30281.
	30586.	60560.	30567.	60410.	30526.	59692.	30403.	58757.	29825.	56249.
TIROS 1V	13199.		13187.		13137.		13056.		12765.	
	30586.		30567.		30526.		30403.		29825.	
NO. 15	76822.		76621.		75608.		74532.		71503.	
TIROS 11	11373.	15437.	11363.	15404.	11312.	15231.	11263.	15049.	11000.	14465.
	24093.	61732.	24078.	61589.	24005.	60831.	23904.	60033.	23435.	57544.
TIROS 111	11970.	30371.	11959.	30302.	11894.	29923.	11840.	29538.	11540.	28345.
	27724.	56517.	27709.	56385.	27599.	55678.	27559.	54952.	26924.	52711.
TIROS 1V	11970.		11959.		11894.		11840.		11540.	
	27724.		27709.		27599.		27559.		26924.	
NO. 16	71072.		70939.		70237.		69405.		67407.	
TIROS 11	9547.	13868.	9544.	13850.	9530.	13744.	9512.	13614.	9467.	13284.
	19983.	56180.	19983.	56100.	19979.	55629.	19977.	55053.	19976.	53558.
TIROS 111	10127.	27761.	10123.	27722.	10099.	27483.	10070.	27196.	9996.	26477.
	23238.	51932.	23235.	51854.	23216.	51395.	23186.	50836.	23103.	49408.
TIROS 1V	10127.		10123.		10099.		10070.		9996.	
	23238.		23235.		23216.		23186.		23103.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 17	62277.		62191.		61711.		61147.		59650.	
TIROS 11	7498.	11814.	7499.	11804.	7502.	11738.	7510.	11660.	7532.	11437.
	15437.	48512.	15442.	48466.	15467.	48168.	15505.	47808.	15659.	46738.
TIROS 111	8044.	24140.	8045.	24118.	8041.	23961.	8042.	23778.	8035.	23241.
	18287.	45371.	18292.	45324.	18316.	45020.	18357.	44655.	18406.	43577.
TIROS 1V	8044.		8045.		8041.		8042.		8035.	
	18287.		18292.		18316.		18357.		18406.	
NO. 18	57723.		57674.		57380.		57042.		56220.	
TIROS 11	6539.	10726.	6539.	10720.	6535.	10677.	6532.	10627.	6520.	10493.
	13362.	44324.	13362.	44299.	13365.	44107.	13369.	43883.	13386.	43279.
TIROS 111	7056.	22166.	7055.	22154.	7047.	22054.	7040.	21940.	7015.	21646.
	15954.	41745.	15954.	41719.	15952.	41529.	15954.	41307.	15935.	40711.
TIROS 1V	7056.		7055.		7047.		7040.		7015.	
	15954.		15954.		15952.		15954.		15935.	
NO. 19	54887.		54822.		54468.		54056.		52986.	
TIROS 11	6205.	10208.	6204.	10198.	6197.	10143.	6190.	10079.	6163.	9900.
	12666.	42202.	12665.	42161.	12664.	41913.	12662.	41621.	12656.	40798.
TIROS 111	6702.	21103.	6700.	21083.	6688.	20953.	6676.	20803.	6633.	20389.
	15176.	39787.	15175.	39747.	15166.	39502.	15160.	39216.	15098.	38414.
TIROS 1V	6702.		6700.		6688.		6676.		6633.	
	15176.		15175.		15166.		15160.		15098.	
NO. 20	94108.		93733.		91847.		89565.		83530.	
TIROS 11	16229.	19869.	16197.	19802.	16053.	19467.	15846.	19043.	15090.	17825.
	34915.	77672.	34860.	77398.	34581.	75957.	34176.	74174.	32616.	69216.
TIROS 111	16902.	37816.	16865.	37683.	16705.	36969.	16478.	36095.	15669.	33723.
	39511.	69783.	39457.	69539.	39149.	68243.	38704.	66657.	36955.	62350.
TIROS 1V	16902.		16865.		16705.		16478.		15669.	
	39511.		39457.		39149.		38704.		36955.	
NO. 21	88317.		87981.		86332.		84265.		78687.	
TIROS 11	14805.	18435.	14776.	18375.	14626.	18070.	14401.	17669.	13583.	16497.
	31750.	72345.	31692.	72093.	31396.	70808.	30949.	69153.	29250.	64462.
TIROS 111	15451.	35307.	15420.	35184.	15254.	34549.	15009.	33739.	14139.	31489.
	36140.	65357.	36080.	65134.	35762.	63988.	35241.	62525.	33258.	58466.
TIROS 1V	15451.		15420.		15254.		15009.		14139.	
	36140.		36080.		35762.		35241.		33258.	
NO. 22	84001.		83742.		82458.		80866.		76720.	
TIROS 11	13249.	17182.	13230.	17137.	13128.	16907.	12978.	16606.	12440.	15752.
	28262.	68064.	28225.	67877.	28034.	66899.	27753.	65644.	26675.	62171.
TIROS 111	13877.	33339.	13856.	33249.	13740.	32767.	13573.	32155.	12990.	30504.
	32297.	61867.	32257.	61698.	32039.	60814.	31691.	59688.	30372.	56643.
TIROS 1V	13877.		13856.		13740.		13573.		12990.	
	32297.		32257.		32039.		31691.		30372.	
NO. 23	77305.		77568.		76424.		75062.		71474.	
TIROS 11	12042.	15851.	12024.	15808.	11936.	15594.	11811.	15329.	11336.	14566.
	25615.	62995.	25583.	62800.	25419.	61881.	25179.	60760.	24227.	57625.
TIROS 111	12642.	30961.	12622.	30871.	12521.	30419.	12383.	29875.	11869.	28382.
	29446.	57481.	29409.	57314.	29224.	56483.	28954.	55483.	27790.	52752.
TIROS 1V	12642.		12622.		12521.		12383.		11869.	
	29446.		29409.		29224.		28954.		27790.	
NO. 24	75729.		75506.		74375.		72992.		69487.	
TIROS 11	11292.	15316.	11285.	15283.	11244.	15100.	11188.	14867.	11008.	14248.
	23872.	61196.	23862.	61046.	23811.	60231.	23735.	59202.	23461.	56468.
TIROS 111	11898.	30068.	11888.	29993.	11834.	29580.	11762.	29063.	11541.	27715.
	27537.	56036.	27524.	55893.	27459.	55119.	27357.	54149.	27002.	51617.
TIROS 1V	11898.		11888.		11834.		11762.		11541.	
	27537.		27524.		27459.		27357.		27002.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 25	73544.		73358.		72440.		71292.		68562.	
TIROS II	10481.	14643.	10476.	14615.	10448.	14470.	10407.	14278.	10307.	13813.
	22060.	58853.	22054.	58729.	22025.	58080.	21982.	57232.	21856.	55150.
TIROS III	11077.	28997.	11069.	28935.	11030.	28607.	10974.	28180.	10844.	27162.
	25558.	54119.	25549.	54000.	25508.	53379.	25430.	52573.	25280.	50633.
TIROS IV	11077.		11069.		11030.		10974.		10844.	
	25558.		25549.		25508.		25430.		25280.	
NO. 26	69819.		69633.		68671.		67693.		64910.	
TIROS II	9910.	13938.	9907.	13910.	9884.	13754.	9890.	13606.	9817.	13135.
	20821.	56076.	20821.	55947.	20820.	55238.	20839.	54546.	20782.	52384.
TIROS III	10490.	27684.	10484.	27620.	10448.	27256.	10449.	26910.	10343.	25835.
	24204.	51673.	24199.	51550.	24156.	50868.	24265.	50210.	24180.	48185.
TIROS IV	10490.		10484.		10448.		10449.		10343.	
	24204.		24199.		24156.		24265.		24180.	
NO. 27	69366.		69228.		68502.		67623.		65604.	
TIROS II	9250.	13549.	9250.	13531.	9245.	13425.	9239.	13292.	9271.	12991.
	19310.	54949.	19313.	54866.	19333.	54384.	19364.	53778.	19517.	52339.
TIROS III	9830.	27172.	9828.	27131.	9814.	26884.	9795.	26577.	9802.	25870.
	22529.	50863.	22531.	50781.	22540.	50304.	22539.	49708.	22711.	48306.
TIROS IV	9830.		9828.		9814.		9795.		9802.	
	22529.		22531.		22540.		22539.		22711.	
NO. 28	65664.		65544.		64906.		64159.		62344.	
TIROS II	8459.	12668.	8457.	12651.	8447.	12554.	8434.	12439.	8414.	12151.
	17596.	51578.	17598.	51503.	17601.	51065.	17605.	50545.	17649.	49212.
TIROS III	9013.	25555.	9011.	25517.	8991.	25290.	8968.	25026.	8923.	24367.
	20615.	47947.	20615.	47874.	20602.	47442.	20580.	46934.	20559.	45648.
TIROS IV	9013.		9011.		8991.		8968.		8923.	
	20615.		20615.		20602.		20580.		20559.	
NO. 29	58573.		58478.		57954.		57318.		55735.	
TIROS II	7205.	11167.	7203.	11153.	7187.	11069.	7166.	10962.	7091.	10676.
	14869.	45713.	14866.	45652.	14849.	45276.	14826.	44801.	14732.	43535.
TIROS III	7723.	22742.	7720.	22712.	7697.	22520.	7668.	22280.	7569.	21659.
	17646.	42787.	17641.	42729.	17616.	42365.	17580.	41908.	17411.	40708.
TIROS IV	7723.		7720.		7697.		7668.		7569.	
	17646.		17641.		17616.		17580.		17411.	
NO. 30	57594.		57519.		57078.		56539.		55171.	
TIROS II	6720.	10844.	6722.	10836.	6727.	10776.	6735.	10698.	6763.	10487.
	13760.	44686.	13765.	44648.	13791.	44370.	13829.	44010.	13986.	42997.
TIROS III	7239.	22266.	7241.	22248.	7240.	22102.	7241.	21916.	7242.	21405.
	16413.	41965.	16419.	41926.	16447.	41641.	16488.	41274.	16562.	40248.
TIROS IV	7239.		7241.		7240.		7241.		7242.	
	16413.		16419.		16447.		16488.		16562.	
NO. 31	53150.		53130.		52955.		52749.		52227.	
TIROS II	5583.	9620.	5584.	9620.	5587.	9601.	5594.	9581.	5617.	9526.
	11301.	40035.	11304.	40036.	11319.	39961.	11341.	39877.	11425.	39637.
TIROS III	6062.	20014.	6063.	20015.	6063.	19971.	6067.	19925.	6079.	19805.
	13625.	37920.	13629.	37920.	13641.	37838.	13664.	37745.	13728.	37476.
TIROS IV	6062.		6063.		6063.		6067.		6079.	
	13625.		13629.		13641.		13664.		13728.	
NO. 32	97492.		96973.		94461.		91334.		83312.	
TIROS II	17528.	20777.	17446.	20671.	17043.	20143.	16483.	19462.	14858.	17635.
	37833.	80585.	37656.	80166.	36794.	78089.	35580.	75455.	32026.	68535.
TIROS III	18208.	39193.	18123.	38992.	17700.	37986.	17117.	36722.	15441.	33433.
	42748.	72355.	42557.	71998.	41608.	70210.	40277.	67953.	36376.	62068.
TIROS IV	18208.		18123.		17700.		17117.		15441.	
	42748.		42557.		41608.		40277.		36376.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 33	98823.		98336.		96125.		93366.		85881.	
TIROS 11	17638.	21019.	17576.	20924.	17292.	20485.	16886.	19914.	15479.	18238.
	38071.	81658.	37952.	81270.	37356.	79490.	36497.	77215.	33455.	70768.
TIROS 111	18325.	39703.	18257.	39514.	17956.	38649.	17527.	37553.	16065.	34504.
	42955.	73216.	42794.	72876.	42155.	71331.	41204.	69374.	37818.	63886.
TIROS 1V	18325.		18257.		17956.		17527.		16065.	
	42955.		42794.		42155.		41204.		37818.	
NO. 34	94261.		93881.		92064.		89701.		83525.	
TIROS 11	16294.	19851.	16253.	19780.	16056.	19433.	15749.	18954.	14702.	17603.
	35084.	77564.	34998.	77271.	34586.	75831.	33975.	73886.	31739.	68580.
TIROS 111	16960.	37803.	16916.	37663.	16705.	36963.	16373.	36020.	15277.	33512.
	39649.	69798.	39559.	69543.	39139.	68282.	38385.	66582.	35870.	62052.
TIROS 1V	16960.		16916.		16705.		16373.		15277.	
	39649.		39559.		39139.		38385.		35870.	
NO. 35	94897.		94569.		92801.		90658.		84863.	
TIROS 11	16273.	19943.	16247.	19886.	16087.	19559.	15855.	19145.	14982.	17918.
	34989.	77985.	34928.	77747.	34617.	76369.	34141.	74661.	32313.	69780.
TIROS 111	16952.	38029.	16926.	37916.	16749.	37235.	16500.	36405.	15576.	34086.
	39601.	70213.	39565.	70006.	39224.	68781.	38721.	67285.	36624.	63108.
TIROS 1V	16952.		16926.		16749.		16500.		15576.	
	39601.		39565.		39224.		38721.		36624.	
NO. 36	92368.		92040.		90349.		88341.		82775.	
TIROS 11	15584.	19322.	15559.	19266.	15421.	18960.	15236.	18585.	14484.	17442.
	33439.	75758.	33388.	75519.	33132.	74216.	32765.	72647.	31219.	68027.
TIROS 111	16256.	36969.	16229.	36853.	16073.	36204.	15871.	35435.	15065.	33221.
	37948.	68339.	37901.	68127.	37607.	66955.	37209.	65569.	35402.	61578.
TIROS 1V	16256.		16229.		16073.		15871.		15065.	
	37948.		37901.		37607.		37209.		35402.	
NO. 37	90672.		90332.		88680.		86675.		81063.	
TIROS 11	15266.	18911.	15226.	18846.	15033.	18523.	14766.	18114.	13755.	16861.
	32782.	74175.	32699.	73910.	32304.	72579.	31747.	70927.	29597.	66039.
TIROS 111	15918.	36239.	15875.	36112.	15668.	35465.	15384.	34671.	14324.	32359.
	37148.	67045.	37057.	66814.	36622.	65649.	36002.	64219.	33527.	60037.
TIROS 1V	15918.		15875.		15668.		15384.		14324.	
	37148.		37057.		36622.		36002.		33527.	
NO. 38	89517.		89198.		87669.		85844.		80941.	
TIROS 11	14874.	18667.	14850.	18611.	14740.	18337.	14592.	17999.	13995.	16999.
	31873.	73417.	31827.	73178.	31623.	71997.	31339.	70557.	30128.	66440.
TIROS 111	15531.	35890.	15505.	35774.	15380.	35191.	15215.	34488.	14572.	32521.
	36178.	66363.	36129.	66148.	35911.	65082.	35606.	63797.	34220.	60215.
TIROS 1V	15531.		15505.		15380.		15215.		14572.	
	36178.		36129.		35911.		35606.		34220.	
NO. 39	82521.		82192.		80968.		79537.		75649.	
TIROS 11	13126.	16976.	13091.	16910.	12972.	16673.	12816.	16384.	12205.	15515.
	27940.	67226.	27899.	66950.	27664.	65949.	27342.	64747.	26078.	61252.
TIROS 111	13765.	33072.	13721.	32934.	13590.	32449.	13423.	31875.	12773.	30228.
	32010.	61290.	31882.	61035.	31626.	60141.	31298.	59085.	29811.	56068.
TIROS 1V	13765.		13721.		13590.		13423.		12773.	
	32010.		31882.		31626.		31298.		29811.	
NO. 40	89016.		88759.		87429.		85869.		81993.	
TIROS 11	14298.	18360.	14294.	18323.	14265.	18113.	14224.	17861.	14079.	17194.
	30545.	72584.	30546.	72412.	30535.	71459.	30499.	70317.	30317.	67320.
TIROS 111	14955.	35486.	14950.	35402.	14905.	34919.	14848.	34350.	14661.	32893.
	34696.	65696.	34700.	65534.	34676.	64632.	34641.	63567.	34393.	60869.
TIROS 1V	14955.		14950.		14905.		14848.		14661.	
	34696.		34700.		34676.		34641.		34393.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 41	68035.		67869.		67045.		66027.		63370.	
TIROS 11	9465.	13416.	9458.	13390.	9423.	13257.	9373.	13085.	9197.	12606.
	19868.	54092.	19857.	53978.	19807.	53388.	19734.	52637.	19445.	50555.
TIROS 111	10023.	26680.	10014.	26624.	9969.	26327.	9907.	25950.	9697.	24927.
	23114.	49987.	23099.	49880.	23028.	49321.	22922.	48614.	22500.	46687.
TIROS 1V	10023.		10014.		9969.		9907.		9697.	
	23114.		23099.		23028.		22922.		22500.	
NO. 42	64759.		64632.		64006.		63250.		61302.	
TIROS 11	8561.	12613.	8555.	12592.	8524.	12484.	8482.	12348.	8335.	11972.
	17833.	51210.	17824.	51118.	17778.	50640.	17711.	50044.	17453.	48404.
TIROS 111	9115.	25448.	9108.	25404.	9070.	25165.	9019.	24871.	8849.	24072.
	20916.	47629.	20904.	47543.	20844.	47092.	20757.	46536.	20418.	45032.
TIROS 1V	9115.		9108.		9070.		9019.		8849.	
	20916.		20904.		20844.		20757.		20418.	
NO. 43	110386.		109830.		107022.		103599.		93995.	
TIROS 11	21265.	24028.	21198.	23921.	20833.	23356.	20311.	22637.	18377.	20434.
	46331.	92185.	46184.	91747.	45435.	89447.	44311.	86587.	40087.	78158.
TIROS 111	21971.	44555.	21901.	44347.	21512.	43231.	20967.	41866.	18965.	37915.
	51860.	81566.	51721.	81196.	50879.	79231.	49678.	76829.	44945.	69875.
TIROS 1V	21971.		21901.		21512.		20967.		18965.	
	51860.		51721.		50879.		49678.		44945.	
NO. 44	79038.		78786.		77562.		76099.		72131.	
TIROS 11	12306.	16113.	12288.	16068.	12198.	15847.	12073.	15574.	11588.	14769.
	26206.	63946.	26174.	63755.	26011.	62799.	25769.	61637.	24800.	58316.
TIROS 111	12909.	31372.	12888.	31278.	12785.	30802.	12646.	30231.	12120.	28626.
	30051.	58295.	30012.	58122.	29824.	57254.	29551.	56213.	28367.	53294.
TIROS 1V	12909.		12888.		12785.		12646.		12120.	
	30051.		30012.		29824.		29551.		28367.	
NO. 45	64777.		64650.		64023.		63266.		61321.	
TIROS 11	8565.	12618.	8559.	12597.	8529.	12489.	8488.	12353.	8344.	11978.
	17841.	51232.	17833.	51140.	17788.	50660.	17722.	50062.	17471.	48424.
TIROS 111	9120.	25459.	9113.	25414.	9075.	25175.	9025.	24880.	8857.	24082.
	20927.	47648.	20916.	47562.	20857.	47109.	20772.	46551.	20441.	45047.
TIROS 1V	9120.		9113.		9075.		9025.		8857.	
	20927.		20916.		20857.		20772.		20441.	
NO. 46	64891.		64788.		64245.		63598.		61870.	
TIROS 11	8171.	12437.	8169.	12423.	8160.	12343.	8148.	12246.	8105.	11967.
	16934.	50779.	16933.	50718.	16931.	50359.	16928.	49922.	16915.	48652.
TIROS 111	8727.	25225.	8725.	25194.	8708.	25008.	8689.	24786.	8621.	24151.
	19896.	47355.	19894.	47295.	19882.	46943.	19870.	46515.	19772.	45286.
TIROS 1V	8727.		8725.		8708.		8689.		8621.	
	19896.		19894.		19882.		19870.		19772.	
NO. 47	59409.		59329.		58872.		58340.		56938.	
TIROS 11	7033.	11197.	7033.	11187.	7034.	11124.	7038.	11051.	7049.	10842.
	14447.	46054.	14450.	46013.	14469.	45728.	14497.	45393.	14607.	44410.
TIROS 111	7558.	22915.	7557.	22894.	7551.	22744.	7549.	22572.	7535.	22079.
	17158.	43186.	17161.	43144.	17176.	42856.	17203.	42516.	17233.	41527.
TIROS 1V	7558.		7557.		7551.		7549.		7535.	
	17158.		17161.		17176.		17203.		17233.	
NO. 48	63793.		63669.		63055.		62346.		60686.	
TIROS 11	8428.	12402.	8423.	12380.	8394.	12271.	8355.	12139.	8229.	11804.
	17559.	50364.	17552.	50269.	17514.	49780.	17457.	49195.	17239.	47727.
TIROS 111	8972.	25015.	8965.	24969.	8928.	24724.	8879.	24437.	8732.	23737.
	20584.	46859.	20573.	46770.	20516.	46306.	20433.	45758.	20145.	44418.
TIROS 1V	8972.		8965.		8928.		8879.		8732.	
	20584.		20573.		20516.		20433.		20145.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 49	75476.		75314.		74526.		73623.		71642.	
TIROS 11	11290.	15231.	11277.	15200.	11208.	15041.	11112.	14845.	10755.	14337.
	23868.	60875.	23844.	60743.	23719.	60072.	23536.	59259.	22807.	57238.
TIROS 111	11895.	30110.	11880.	30050.	11800.	29737.	11694.	29364.	11311.	28489.
	27537.	55931.	27509.	55813.	27367.	55212.	27159.	54495.	26289.	52795.
TIROS 1V	11895.		11880.		11800.		11694.		11311.	
	27537.		27509.		27367.		27159.		26289.	
NO. 50	81210.		81000.		80002.		78825.		76050.	
TIROS 11	12541.	16551.	12526.	16514.	12451.	16328.	12347.	16098.	11961.	15479.
	26641.	65830.	26615.	65671.	26480.	64885.	26283.	63919.	25501.	61420.
TIROS 111	13170.	32411.	13153.	32336.	13066.	31963.	12950.	31511.	12535.	30391.
	30555.	60106.	30525.	59962.	30376.	59254.	30157.	58395.	29258.	56255.
TIROS 1V	13170.		13153.		13066.		12950.		12535.	
	30555.		30525.		30376.		30157.		29258.	
NO. 51	76990.		76838.		76104.		75236.		73317.	
TIROS 11	11166.	15370.	11158.	15344.	11115.	15214.	11055.	15049.	10844.	14632.
	23562.	61668.	23548.	61559.	23481.	61004.	23382.	60308.	22996.	58584.
TIROS 111	11777.	30451.	11767.	30401.	11715.	30140.	11644.	29817.	11406.	29062.
	27167.	56672.	27151.	56572.	27070.	56060.	26947.	55426.	26445.	53915.
TIROS 1V	11777.		11767.		11715.		11644.		11406.	
	27167.		27151.		27070.		26947.		26445.	
NO. 52	71722.		71584.		70892.		70057.		67921.	
TIROS 11	9746.	14070.	9741.	14049.	9715.	13939.	9679.	13801.	9551.	13419.
	20389.	56891.	20381.	56801.	20345.	56321.	20291.	55722.	20086.	54079.
TIROS 111	10343.	28178.	10337.	28135.	10303.	27895.	10258.	27600.	10103.	26811.
	23734.	52640.	23726.	52555.	23684.	52100.	23621.	51537.	23351.	50019.
TIROS 1V	10343.		10337.		10303.		10258.		10103.	
	23734.		23726.		23684.		23621.		23351.	
NO. 53	81357.		81121.		79954.		78561.		74965.	
TIROS 11	12527.	16567.	12514.	16528.	12451.	16327.	12363.	16077.	12043.	15378.
	26638.	65927.	26617.	65758.	26515.	64876.	26366.	63791.	25782.	60792.
TIROS 111	13148.	32374.	13134.	32292.	13056.	31855.	12954.	31323.	12594.	29879.
	30493.	60093.	30468.	59937.	30343.	59121.	30160.	58125.	29410.	55434.
TIROS 1V	13148.		13134.		13056.		12954.		12594.	
	30493.		30468.		30343.		30160.		29410.	
NO. 54	70148.		69934.		68864.		67545.		64046.	
TIROS 11	10133.	14013.	10124.	13980.	10081.	13808.	10022.	13589.	9811.	12981.
	21339.	56142.	21327.	55998.	21265.	55237.	21174.	54281.	20822.	51649.
TIROS 111	10705.	27567.	10695.	27494.	10639.	27102.	10566.	26614.	10313.	25298.
	24808.	51624.	24793.	51487.	24717.	50766.	24607.	49865.	24158.	47422.
TIROS 1V	10705.		10695.		10639.		10566.		10313.	
	24808.		24793.		24717.		24607.		24158.	
NO. 55	91752.		91441.		90020.		88210.		83722.	
TIROS 11	15038.	19034.	15023.	18985.	14968.	18755.	14869.	18444.	14530.	17619.
	32220.	74987.	32198.	74767.	32099.	73747.	31942.	72388.	31317.	68862.
TIROS 111	15702.	36606.	15684.	36498.	15619.	35990.	15501.	35316.	15120.	33621.
	36493.	67679.	36465.	67477.	36424.	66540.	36236.	65294.	35524.	62168.
TIROS 1V	15702.		15684.		15619.		15501.		15120.	
	36493.		36465.		36424.		36236.		35524.	
NO. 56	60231.		60112.		59485.		58718.		56604.	
TIROS 11	7528.	11513.	7525.	11497.	7511.	11406.	7491.	11292.	7423.	10960.
	15574.	46972.	15571.	46901.	15558.	46498.	15539.	45998.	15463.	44537.
TIROS 111	8052.	23259.	8049.	23223.	8027.	23011.	7999.	22751.	7903.	22009.
	18429.	43858.	18426.	43789.	18406.	43395.	18377.	42910.	18244.	41502.
TIROS 1V	8052.		8049.		8027.		7999.		7903.	
	18429.		18426.		18406.		18377.		18244.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 57	49915.		49931.		49947.		50001.		50158.	
TIROS 11	4646.	8802.	4649.	8808.	4666.	8821.	4693.	8845.	4785.	8907.
	9207.	37144.	9214.	37169.	9250.	37226.	9304.	37321.	9519.	37530.
TIROS 111	5117.	18755.	5121.	18768.	5138.	18790.	5166.	18834.	5257.	18932.
	11255.	35495.	11266.	35516.	11312.	35556.	11390.	35629.	11629.	35763.
TIROS 1V	5117.		5121.		5138.		5166.		5257.	
	11255.		11266.		11312.		11390.		11629.	
NO. 58	66312.		66149.		65316.		64303.		61686.	
TIROS 11	8983.	13061.	8978.	13038.	8952.	12910.	8918.	12750.	8795.	12310.
	18725.	52812.	18718.	52708.	18685.	52139.	18636.	51434.	18447.	49527.
TIROS 111	9557.	26138.	9551.	26086.	9516.	25793.	9471.	25436.	9317.	24497.
	21939.	48993.	21932.	48893.	21896.	48347.	21844.	47675.	21612.	45885.
TIROS 1V	9557.		9551.		9516.		9471.		9317.	
	21939.		21932.		21896.		21844.		21612.	
NO. 59	91619.		91227.		89249.		86791.		80072.	
TIROS 11	15770.	19326.	15727.	19253.	15508.	18874.	15191.	18384.	14053.	16935.
	33876.	75492.	33787.	75193.	33337.	73633.	32674.	71652.	30244.	66018.
TIROS 111	16441.	36822.	16396.	36678.	16159.	35908.	15821.	34943.	14627.	32256.
	38532.	68034.	38440.	67774.	37952.	66401.	37220.	64674.	34477.	59834.
TIROS 1V	16441.		16396.		16159.		15821.		14627.	
	38532.		38440.		37952.		37220.		34477.	
NO. 60	70342.		70195.		69446.		68554.		66337.	
TIROS 11	9684.	13887.	9677.	13863.	9646.	13737.	9602.	13581.	9444.	13154.
	20266.	56070.	20255.	55968.	20209.	55412.	20139.	54730.	19868.	52899.
TIROS 111	10276.	27786.	10268.	27737.	10228.	27459.	10174.	27124.	9988.	26246.
	23627.	51864.	23616.	51768.	23564.	51244.	23486.	50607.	23152.	48930.
TIROS 1V	10276.		10268.		10228.		10174.		9988.	
	23627.		23616.		23564.		23486.		23152.	
NO. 61	87562.		87250.		85683.		83733.		78606.	
TIROS 11	14225.	18160.	14206.	18109.	14106.	17843.	13956.	17495.	13415.	16508.
	30392.	71598.	30355.	71381.	30167.	70230.	29887.	68757.	28808.	64691.
TIROS 111	14884.	34993.	14862.	34886.	14748.	34309.	14579.	33577.	13989.	31610.
	34678.	64812.	34640.	64615.	34457.	63564.	34138.	62228.	32904.	58623.
TIROS 1V	14884.		14862.		14748.		14579.		13989.	
	34678.		34640.		34457.		34138.		32904.	
NO. 62	80765.		80523.		79294.		77809.		73965.	
TIROS 11	12305.	16431.	12295.	16395.	12240.	16196.	12165.	15947.	11889.	15248.
	26095.	65406.	26078.	65245.	25992.	64373.	25867.	63294.	25374.	60314.
TIROS 111	12938.	32096.	12926.	32017.	12858.	31577.	12768.	31038.	12450.	29588.
	29977.	59673.	29959.	59523.	29866.	58706.	29727.	57704.	29141.	54986.
TIROS 1V	12938.		12926.		12858.		12768.		12450.	
	29977.		29959.		29866.		29727.		29141.	
NO. 63	88933.		88646.		87210.		85483.		81054.	
TIROS 11	14351.	18350.	14335.	18304.	14250.	18058.	14132.	17751.	13698.	16895.
	30689.	72434.	30660.	72233.	30514.	71168.	30299.	69853.	29459.	66288.
TIROS 111	15006.	35396.	14987.	35298.	14887.	34768.	14753.	34120.	14273.	32414.
	34911.	65532.	34878.	65348.	34718.	64372.	34487.	63179.	33506.	60027.
TIROS 1V	15006.		14987.		14887.		14753.		14273.	
	34911.		34878.		34718.		34487.		33506.	
NO. 64	49049.		49047.		48991.		48935.		48881.	
TIROS 11	4932.	8782.	4932.	8782.	4930.	8773.	4928.	8762.	4920.	8743.
	9908.	36729.	9908.	36732.	9907.	36694.	9905.	36653.	9897.	36596.
TIROS 111	5387.	18489.	5387.	18492.	5384.	18474.	5380.	18455.	5368.	18443.
	12046.	34975.	12046.	34978.	12043.	34941.	12039.	34901.	12019.	34849.
TIROS 1V	5387.		5387.		5384.		5380.		5368.	
	12046.		12046.		12043.		12039.		12019.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 65	71552.		71346.		70306.		69061.		65783.	
TIROS 11	10599.	14461.	10586.	14425.	10518.	14235.	10425.	13998.	10067.	13319.
	22362.	57819.	22339.	57661.	22219.	56830.	22044.	55811.	21343.	52964.
TIROS 111	11189.	28554.	11174.	28477.	11095.	28063.	10989.	27560.	10594.	26177.
	25983.	53129.	25956.	52985.	25825.	52221.	25637.	51292.	24813.	48752.
TIROS 1V	11189.		11174.		11095.		10989.		10594.	
	25983.		25956.		25825.		25637.		24813.	
NO. 66	72350.		72151.		71169.		69978.		66893.	
TIROS 11	10498.	14514.	10488.	14481.	10437.	14312.	10365.	14099.	10105.	13505.
	22117.	58189.	22100.	58045.	22016.	57301.	21893.	56374.	21409.	53841.
TIROS 111	11092.	28718.	11080.	28647.	11018.	28275.	10934.	27814.	10639.	26580.
	25682.	53509.	25661.	53376.	25569.	52683.	25430.	51827.	24855.	49534.
TIROS 1V	11092.		11080.		11018.		10934.		10639.	
	25682.		25661.		25569.		25430.		24855.	
NO. 67	69764.		69614.		68819.		67859.		65382.	
TIROS 11	9605.	13759.	9599.	13736.	9566.	13604.	9520.	13438.	9355.	12976.
	20116.	55540.	20109.	55438.	20061.	54851.	19990.	54122.	19713.	52121.
TIROS 111	10189.	27483.	10182.	27433.	10139.	27137.	10082.	26773.	9886.	25794.
	23465.	51335.	23457.	51238.	23399.	50683.	23315.	49999.	22956.	48155.
TIROS 1V	10189.		10182.		10139.		10082.		9886.	
	23465.		23457.		23399.		23315.		22956.	
NO. 68	53555.		53512.		53249.		52935.		52086.	
TIROS 11	5926.	9892.	5925.	9886.	5918.	9845.	5909.	9794.	5874.	9643.
	12058.	40982.	12057.	40957.	12049.	40772.	12038.	40546.	11996.	39873.
TIROS 111	6416.	20540.	6414.	20529.	6404.	20435.	6391.	20322.	6344.	19985.
	14495.	38732.	14493.	38708.	14482.	38529.	14465.	38311.	14391.	37666.
TIROS 1V	6416.		6414.		6404.		6391.		6344.	
	14495.		14493.		14482.		14465.		14391.	
NO. 69	59746.		59648.		59135.		58513.		56895.	
TIROS 11	7352.	11385.	7349.	11369.	7329.	11283.	7303.	11175.	7210.	10879.
	15179.	46601.	15175.	46531.	15150.	46141.	15114.	45658.	14972.	44340.
TIROS 111	7879.	23226.	7874.	23191.	7848.	22990.	7814.	22743.	7700.	22080.
	17993.	43615.	17986.	43548.	17950.	43174.	17897.	42714.	17680.	41479.
TIROS 1V	7879.		7874.		7848.		7814.		7700.	
	17993.		17986.		17950.		17897.		17680.	
NO. 70	61324.		61215.		60656.		59977.		58201.	
TIROS 11	7661.	11734.	7657.	11717.	7637.	11625.	7609.	11510.	7512.	11192.
	15854.	47933.	15849.	47856.	15824.	47440.	15786.	46924.	15639.	45516.
TIROS 111	8197.	23852.	8192.	23813.	8165.	23597.	8129.	23333.	8008.	22624.
	18747.	44770.	18739.	44698.	18702.	44298.	18648.	43807.	18423.	42485.
TIROS 1V	8197.		8192.		8165.		8129.		8008.	
	18747.		18739.		18702.		18648.		18423.	
NO. 71	72459.		72274.		71340.		70219.		67390.	
TIROS 11	10338.	14495.	10331.	14467.	10296.	14316.	10247.	14128.	10073.	13612.
	21698.	58247.	21688.	58123.	21636.	57455.	21559.	56631.	21263.	54408.
TIROS 111	10945.	28786.	10937.	28725.	10891.	28387.	10831.	27975.	10625.	26896.
	25199.	53711.	25189.	53594.	25134.	52962.	25053.	52187.	24707.	50137.
TIROS 1V	10945.		10937.		10891.		10831.		10625.	
	25199.		25189.		25134.		25053.		24707.	
NO. 72	75038.		74873.		74022.		73001.		70434.	
TIROS 11	10592.	14899.	10586.	14874.	10555.	14740.	10512.	14572.	10359.	14115.
	22242.	59918.	22233.	59812.	22189.	59218.	22124.	58488.	21874.	56535.
TIROS 111	11209.	29593.	11202.	29541.	11161.	29240.	11107.	28876.	10924.	27933.
	25764.	55228.	25755.	55128.	25707.	54565.	25636.	53878.	25328.	52076.
TIROS 1V	11209.		11202.		11161.		11107.		10924.	
	25764.		25755.		25707.		25636.		25328.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 73	82799.		82502.		81032.		79199.		74351.	
TIROS 11	13522.	17232.	13499.	17179.	13384.	16910.	13211.	16558.	12574.	15549.
	28830.	67906.	28785.	67681.	28558.	66530.	28219.	65054.	26910.	60963.
TIROS 111	14167.	33298.	14142.	33188.	14014.	32616.	13823.	31887.	13138.	29916.
	33039.	61721.	32994.	61520.	32775.	60482.	32400.	59161.	30908.	55585.
TIROS 1V	14167.		14142.		14014.		13823.		13138.	
	33039.		32994.		32775.		32400.		30908.	
NO. 74	88366.		88025.		86433.		84503.		79321.	
TIROS 11	14696.	18449.	14665.	18387.	14519.	18089.	14313.	17714.	13540.	16607.
	31442.	72520.	31386.	72257.	31099.	71005.	30680.	69452.	29067.	65033.
TIROS 111	15360.	35500.	15325.	35371.	15163.	34754.	14941.	33998.	14121.	31895.
	35838.	65671.	35760.	65435.	35450.	64316.	34999.	62945.	33155.	59126.
TIROS 1V	15360.		15325.		15163.		14941.		14121.	
	35838.		35760.		35450.		34999.		33155.	
NO. 75	93509.		93167.		91490.		89465.		84020.	
TIROS 11	15751.	19529.	15721.	19468.	15571.	19161.	15365.	18776.	14595.	17639.
	33842.	76610.	33781.	76357.	33490.	75062.	33076.	73460.	31489.	68889.
TIROS 111	16417.	37366.	16383.	37244.	16218.	36608.	15994.	35831.	15174.	33658.
	38262.	69057.	38194.	68832.	37875.	67675.	37419.	66261.	35578.	62297.
TIROS 1V	16417.		16383.		16218.		15994.		15174.	
	38262.		38194.		37875.		37419.		35578.	
NO. 76	81684.		81452.		80274.		78880.		75274.	
TIROS 11	12853.	16783.	12843.	16743.	12779.	16534.	12686.	16276.	12328.	15544.
	27329.	66546.	27312.	66373.	27207.	65451.	27036.	64332.	26354.	61244.
TIROS 111	13492.	32726.	13479.	32642.	13403.	32184.	13297.	31636.	12898.	30152.
	31329.	60663.	31314.	60505.	31206.	59658.	31038.	58646.	30213.	55928.
TIROS 1V	13492.		13479.		13403.		13297.		12898.	
	31329.		31314.		31206.		31038.		30213.	
NO. 77	68651.		68567.		68119.		67593.		66383.	
TIROS 11	8952.	13299.	8948.	13286.	8928.	13209.	8900.	13112.	8800.	12855.
	18612.	54094.	18606.	54037.	18576.	53701.	18533.	53282.	18364.	52185.
TIROS 111	9538.	26944.	9534.	26918.	9508.	26758.	9474.	26561.	9356.	26061.
	21759.	50362.	21753.	50308.	21719.	49993.	21668.	49603.	21446.	48606.
TIROS 1V	9538.		9534.		9508.		9474.		9356.	
	21759.		21753.		21719.		21668.		21446.	
NO. 78	65285.		65198.		64725.		64163.		62768.	
TIROS 11	8352.	12585.	8349.	12571.	8331.	12493.	8306.	12394.	8214.	12121.
	17321.	51299.	17316.	51242.	17291.	50896.	17254.	50465.	17110.	49278.
TIROS 111	8917.	25549.	8913.	25523.	8889.	25353.	8857.	25145.	8746.	24582.
	20346.	47853.	20341.	47799.	20311.	47471.	20265.	47065.	20065.	45964.
TIROS 1V	8917.		8913.		8889.		8857.		8746.	
	20346.		20341.		20311.		20265.		20065.	
NO. 79	59028.		58981.		58748.		58482.		57939.	
TIROS 11	6923.	11098.	6921.	11090.	6911.	11048.	6898.	10997.	6851.	10865.
	14183.	45714.	14181.	45681.	14167.	45501.	14148.	45279.	14071.	44719.
TIROS 111	7454.	22922.	7452.	22908.	7439.	22824.	7423.	22723.	7366.	22480.
	16863.	43031.	16861.	43000.	16845.	42830.	16823.	42621.	16722.	42108.
TIROS 1V	7454.		7452.		7439.		7423.		7366.	
	16863.		16861.		16845.		16823.		16722.	
NO. 80	76755.		76613.		75875.		75016.		72927.	
TIROS 11	11176.	15345.	11165.	15318.	11105.	15173.	11024.	14994.	10715.	14499.
	23566.	61523.	23545.	61408.	23438.	60780.	23282.	60019.	22662.	57988.
TIROS 111	11797.	30490.	11784.	30437.	11716.	30135.	11625.	29774.	11292.	28832.
	27183.	56656.	27159.	56554.	27037.	55985.	26865.	55307.	26128.	53552.
TIROS 1V	11797.		11784.		11716.		11625.		11292.	
	27183.		27159.		27037.		26865.		26128.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 81	57111.		57074.		56817.		56516.		55816.	
TIROS 11	6531.	10631.	6530.	10626.	6522.	10584.	6511.	10532.	6471.	10393.
	13357.	43875.	13355.	43856.	13346.	43671.	13333.	43445.	13282.	42851.
TIROS 111	7044.	21957.	7042.	21949.	7031.	21857.	7015.	21746.	6962.	21467.
	15944.	41332.	15942.	41314.	15929.	41136.	15909.	40919.	15819.	40359.
TIROS 1V	7044.		7042.		7031.		7015.		6962.	
	15944.		15942.		15929.		15909.		15819.	
NO. 82	50995.		50977.		50844.		50687.		50264.	
TIROS 11	5351.	9263.	5350.	9260.	5346.	9239.	5342.	9214.	5325.	9139.
	10801.	38591.	10800.	38579.	10796.	38487.	10791.	38376.	10771.	38044.
TIROS 111	5823.	19412.	5822.	19407.	5817.	19361.	5811.	19306.	5787.	19141.
	13054.	36663.	13053.	36651.	13048.	36562.	13040.	36454.	13004.	36136.
TIROS 1V	5823.		5822.		5817.		5811.		5787.	
	13054.		13053.		13048.		13040.		13004.	
NO. 83	71925.		71750.		70824.		69709.		66858.	
TIROS 11	10206.	14303.	10199.	14276.	10159.	14121.	10105.	13929.	9911.	13404.
	21461.	57502.	21449.	57381.	21393.	56690.	21310.	55839.	20982.	53558.
TIROS 111	10798.	28386.	10789.	28326.	10738.	27973.	10670.	27542.	10442.	26419.
	24914.	52979.	24899.	52865.	24826.	52212.	24721.	51415.	24284.	49319.
TIROS 1V	10798.		10789.		10738.		10670.		10442.	
	24914.		24899.		24826.		24721.		24284.	
NO. 84	71310.		71145.		70298.		69283.		66711.	
TIROS 11	10006.	14116.	9998.	14089.	9957.	13943.	9900.	13763.	9699.	13275.
	21018.	56830.	21006.	56712.	20944.	56067.	20853.	55278.	20495.	53176.
TIROS 111	10593.	28091.	10584.	28033.	10532.	27705.	10463.	27309.	10232.	26280.
	24425.	52436.	24409.	52325.	24330.	51719.	24215.	50985.	23757.	49070.
TIROS 1V	10593.		10584.		10532.		10463.		10232.	
	24425.		24409.		24330.		24215.		23757.	
NO. 85	72850.		72667.		71728.		70598.		67668.	
TIROS 11	10609.	14586.	10598.	14555.	10540.	14385.	10460.	14174.	10165.	13585.
	22356.	58421.	22336.	58283.	22238.	57538.	22095.	56624.	21525.	54143.
TIROS 111	11206.	28852.	11193.	28785.	11125.	28409.	11032.	27952.	10704.	26738.
	25909.	53780.	25886.	53654.	25772.	52965.	25609.	52128.	24932.	49906.
TIROS 1V	11206.		11193.		11125.		11032.		10704.	
	25909.		25886.		25772.		25609.		24932.	
NO. 86	58572.		58463.		57886.		57186.		55372.	
TIROS 11	7333.	11229.	7329.	11212.	7308.	11117.	7280.	10997.	7180.	10666.
	15162.	45877.	15158.	45803.	15132.	45378.	15095.	44846.	14947.	43380.
TIROS 111	7849.	22808.	7844.	22772.	7816.	22556.	7779.	22288.	7653.	21562.
	17975.	42892.	17968.	42821.	17932.	42414.	17878.	41906.	17649.	40526.
TIROS 1V	7849.		7844.		7816.		7779.		7653.	
	17975.		17968.		17932.		17878.		17649.	
NO. 87	41161.		41146.		41027.		40887.		40495.	
TIROS 11	3827.	7200.	3827.	7199.	3825.	7182.	3822.	7162.	3812.	7101.
	7602.	30317.	7602.	30310.	7601.	30235.	7600.	30151.	7595.	29893.
TIROS 111	4216.	15239.	4216.	15236.	4212.	15196.	4208.	15150.	4191.	15017.
	9409.	29034.	9409.	29028.	9405.	28954.	9401.	28870.	9382.	28615.
TIROS 1V	4216.		4216.		4212.		4208.		4191.	
	9409.		9409.		9405.		9401.		9382.	
NO. 88	59259.		59151.		58563.		57847.		55927.	
TIROS 11	7347.	11284.	7344.	11269.	7327.	11180.	7305.	11069.	7228.	10756.
	15200.	46108.	15196.	46041.	15181.	45645.	15157.	45155.	15064.	43770.
TIROS 111	7860.	22851.	7856.	22818.	7832.	22611.	7801.	22358.	7696.	21659.
	17992.	43088.	17986.	43024.	17957.	42639.	17915.	42166.	17733.	40839.
TIROS 1V	7860.		7856.		7832.		7801.		7696.	
	17992.		17986.		17957.		17915.		17733.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 89	60494.		60451.		60168.		59846.		59118.	
TIROS 11	7191.	11389.	7189.	11383.	7179.	11336.	7165.	11279.	7116.	11126.
	14780.	46812.	14778.	46789.	14766.	46587.	14748.	46344.	14679.	45697.
TIROS 111	7725.	23395.	7723.	23386.	7709.	23289.	7691.	23175.	7628.	22885.
	17523.	43955.	17521.	43934.	17505.	43740.	17480.	43509.	17367.	42907.
TIROS 1V	7725.		7723.		7709.		7691.		7628.	
	17523.		17521.		17505.		17480.		17367.	
NO. 90	64822.		64743.		64318.		63823.		62680.	
TIROS 11	7999.	12336.	7997.	12326.	7986.	12263.	7972.	12186.	7924.	11994.
	16528.	50436.	16526.	50391.	16515.	50115.	16498.	49790.	16435.	48990.
TIROS 111	8562.	25106.	8559.	25085.	8543.	24944.	8522.	24783.	8458.	24414.
	19479.	47131.	19476.	47088.	19462.	46820.	19442.	46507.	19352.	45752.
TIROS 1V	8562.		8559.		8543.		8522.		8458.	
	19479.		19476.		19462.		19442.		19352.	
NO. 91	98823.		98332.		96026.		93031.		85131.	
TIROS 11	18115.	21221.	18053.	21124.	17751.	20660.	17262.	20020.	15724.	18222.
	39186.	82102.	39059.	81708.	38418.	79823.	37378.	77301.	34035.	70403.
TIROS 111	18799.	39892.	18732.	39702.	18413.	38788.	17902.	37573.	16303.	34323.
	44209.	73454.	44063.	73114.	43389.	71494.	42252.	69327.	38490.	63542.
TIROS 1V	18799.		18732.		18413.		17902.		16303.	
	44209.		44063.		43389.		42252.		38490.	
NO. 92	88845.		88532.		86954.		85023.		79913.	
TIROS 11	14556.	18461.	14535.	18410.	14425.	18136.	14267.	17787.	13687.	16782.
	31118.	72705.	31078.	72484.	30875.	71311.	30570.	69838.	29398.	65728.
TIROS 111	15220.	35535.	15197.	35427.	15072.	34841.	14897.	34114.	14267.	32135.
	35446.	65800.	35405.	65601.	35187.	64533.	34857.	63207.	33520.	59583.
TIROS 1V	15220.		15197.		15072.		14897.		14267.	
	35446.		35405.		35187.		34857.		33520.	
NO. 93	87538.		87227.		85685.		83779.		78640.	
TIROS 11	14356.	18203.	14335.	18151.	14226.	17882.	14067.	17536.	13471.	16522.
	30676.	71688.	30634.	71465.	30426.	70314.	30115.	68854.	28911.	64702.
TIROS 111	15016.	35063.	14993.	34953.	14870.	34379.	14695.	33658.	14049.	31651.
	34960.	64965.	34920.	64764.	34714.	63720.	34383.	62408.	32993.	58749.
TIROS 1V	15016.		14993.		14870.		14695.		14049.	
	34960.		34920.		34714.		34383.		32993.	
NO. 94	91921.		91533.		89692.		87445.		81325.	
TIROS 11	15601.	19302.	15568.	19234.	15415.	18904.	15198.	18486.	14394.	17250.
	33494.	75603.	33434.	75315.	33136.	73919.	32701.	72180.	31035.	67195.
TIROS 111	16269.	36843.	16233.	36701.	16062.	36006.	15826.	35151.	14967.	32750.
	38030.	68105.	37951.	67846.	37630.	66592.	37160.	65047.	35266.	60697.
TIROS 1V	16269.		16233.		16062.		15826.		14967.	
	38030.		37951.		37630.		37160.		35266.	
NO. 95	83160.		82879.		81656.		76726.		71722.	
TIROS 11	13093.	17094.	13078.	17049.	12999.	16814.	2262.	9896.	2015.	9328.
	27864.	67716.	27836.	67522.	27695.	66498.	3103.	46432.	2612.	43951.
TIROS 111	13735.	33169.	13718.	33073.	13625.	32557.	3158.	25699.	2883.	24463.
	31931.	61569.	31902.	61391.	31759.	60446.	4187.	45675.	3634.	43350.
TIROS 1V	13735.		13718.		13625.		3158.		2883.	
	31931.		31902.		31759.		4187.		3634.	
NO. 96	89736.		89416.		87833.		85907.		80900.	
TIROS 11	14781.	18663.	14762.	18610.	14666.	18339.	14529.	17996.	14035.	17031.
	31670.	73472.	31637.	73245.	31467.	72068.	31216.	70599.	30253.	66563.
TIROS 111	15435.	35852.	15414.	35741.	15302.	35155.	15147.	34430.	14604.	32486.
	35973.	66312.	35936.	66105.	35756.	65028.	35476.	63697.	34358.	60125.
TIROS 1V	15435.		15414.		15302.		15147.		14604.	
	35973.		35936.		35756.		35476.		34358.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 97	87013.		86699.		85187.		83344.		78497.	
TIROS 11	14107.	18011.	14087.	17959.	13995.	17702.	13865.	17376.	13395.	16455.
	30146.	71071.	30114.	70846.	29951.	69730.	29713.	68337.	28800.	64484.
TIROS 111	14755.	34726.	14732.	34614.	14624.	34055.	14477.	33366.	13959.	31500.
	34341.	64361.	34296.	64154.	34118.	63129.	33849.	61862.	32779.	58431.
TIROS 1V	14755.		14732.		14624.		14477.		13959.	
	34341.		34296.		34118.		33849.		32779.	
NO. 98	81050.		80856.		79850.		78648.		75571.	
TIROS 11	12201.	16356.	12190.	16324.	12129.	16147.	12045.	15926.	11736.	15311.
	25860.	65238.	25841.	65098.	25739.	64325.	25590.	63376.	25002.	60788.
TIROS 111	12833.	32119.	12820.	32052.	12747.	31668.	12651.	31203.	12307.	29962.
	29669.	59690.	29646.	59562.	29528.	58850.	29356.	57986.	28640.	55685.
TIROS 1V	12833.		12820.		12747.		12651.		12307.	
	29669.		29646.		29528.		29356.		28640.	
NO. 99	78603.		78383.		77284.		75959.		72584.	
TIROS 11	11673.	15822.	11665.	15788.	11619.	15610.	11557.	15389.	11348.	14791.
	24714.	63210.	24701.	63062.	24638.	62274.	24546.	61304.	24193.	58708.
TIROS 111	12288.	31047.	12277.	30973.	12219.	30573.	12142.	30087.	11896.	28817.
	28431.	57815.	28415.	57675.	28335.	56932.	28214.	56025.	27773.	53645.
TIROS 1V	12288.		12277.		12219.		12142.		11896.	
	28431.		28415.		28335.		28214.		27773.	
NO. 100	65306.		65199.		64627.		63946.		62285.	
TIROS 11	8557.	12669.	8552.	12651.	8523.	12549.	8483.	12422.	8339.	12083.
	17811.	51476.	17802.	51398.	17758.	50948.	17694.	50392.	17443.	48938.
TIROS 111	9117.	25597.	9110.	25560.	9074.	25336.	9025.	25063.	8858.	24367.
	20909.	47892.	20898.	47819.	20843.	47396.	20761.	46879.	20425.	45557.
TIROS 1V	9117.		9110.		9074.		9025.		8858.	
	20909.		20898.		20843.		20761.		20425.	
NO. 101	111521.		111014.		108524.		105453.		96913.	
TIROS 11	20340.	23706.	20291.	23617.	20039.	23165.	19683.	22587.	18381.	20853.
	44203.	91661.	44101.	91291.	43594.	89411.	42860.	87049.	40092.	80199.
TIROS 111	21039.	44211.	20987.	44030.	20714.	43100.	20335.	41947.	18969.	38671.
	49248.	81347.	49142.	81025.	48586.	79375.	47770.	77327.	44650.	71481.
TIROS 1V	21039.		20987.		20714.		20335.		18969.	
	49248.		49142.		48586.		47770.		44650.	
NO. 102	106691.		106096.		103322.		99790.		89912.	
TIROS 11	20061.	23009.	19972.	22889.	19549.	22318.	18940.	21563.	16809.	19299.
	43541.	88530.	43358.	88052.	42441.	85787.	41132.	82850.	36441.	74378.
TIROS 111	20771.	42877.	20677.	42646.	20235.	41550.	19599.	40140.	17403.	36154.
	48938.	78851.	48721.	78445.	47752.	76527.	46285.	74053.	41082.	66995.
TIROS 1V	20771.		20677.		20235.		19599.		17403.	
	48938.		48721.		47752.		46285.		41082.	
NO. 103	123094.		122473.		119397.		115638.		105112.	
TIROS 11	24148.	26775.	24070.	26658.	23665.	26053.	23093.	25282.	20986.	22925.
	52875.	102358.	52707.	101880.	51863.	99425.	50633.	96364.	46013.	87372.
TIROS 111	24864.	49218.	24784.	48992.	24355.	47812.	23761.	46363.	21589.	42186.
	58481.	89970.	58316.	89570.	57384.	87492.	56058.	84945.	50940.	77583.
TIROS 1V	24864.		24784.		24355.		23761.		21589.	
	58481.		58316.		57384.		56058.		50940.	
NO. 104	116520.		115913.		113154.		109697.		100197.	
TIROS 11	22321.	25181.	22251.	25067.	21919.	24537.	21437.	23841.	19691.	21766.
	48726.	96668.	48592.	96196.	47898.	94024.	46892.	91230.	43096.	83201.
TIROS 111	23026.	46550.	22949.	46321.	22597.	45272.	22089.	43933.	20279.	40169.
	54128.	85309.	53952.	84902.	53219.	83044.	52079.	80678.	47849.	74021.
TIROS 1V	23026.		22949.		22597.		22089.		20279.	
	54128.		53952.		53219.		52079.		47849.	

INFRARED SPECIFIC INTENSITIES OF MODEL ATMOSPHERES

	THETA = 0		THETA = 20		THETA = 45		THETA = 60		THETA = 78.5	
NO. 105	122407.		121813.		118802.		115087.		104807.	
TIROS 11	23873.	26569.	23800.	26457.	23413.	25870.	22865.	25115.	20853.	22838.
	52244.	101658.	52085.	101203.	51281.	98813.	50117.	95805.	45708.	87098.
TIROS 111	24589.	48886.	24514.	48671.	24103.	47520.	23530.	46091.	21456.	42043.
	57819.	89409.	57668.	89028.	56782.	87001.	55499.	84486.	50630.	77347.
TIROS 1V	24589.		24514.		24103.		23530.		21456.	
	57819.		57668.		56782.		55499.		50630.	
NO. 106	121900.		121227.		117916.		113825.		102202.	
TIROS 11	24435.	26749.	24342.	26616.	23857.	25940.	23172.	25070.	20639.	22377.
	53542.	101874.	53336.	101340.	52305.	98627.	50822.	95207.	45227.	85059.
TIROS 111	25153.	48990.	25057.	48738.	24548.	47439.	23838.	45821.	21235.	41104.
	59350.	89489.	59148.	89045.	58029.	86772.	56414.	83946.	50234.	75669.
TIROS 1V	25153.		25057.		24548.		23838.		21235.	
	59350.		59148.		58029.		56414.		50234.	

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METEOROLOGICAL SATELLITE LABORATORY

SUPPLEMENT TO REPORT NO. 10

INFRARED FLUX AND SURFACE TEMPERATURE DETERMINATIONS FROM TIROS RADIOMETER MEASUREMENTS

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April 1963

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SUPPLEMENT TO M.S.L. REPORT NO.10

INFRARED FLUX AND SURFACE TEMPERATURE DETERMINATIONS FROM TIROS RADIOMETER MEASUREMENTS

ABSTRACT

Changes in M.S.L. Report No. 10 are required because of the results from recent tests on the spectral emissivity of thermistor detectors, and because of some small errors in the computation of spectral intensities for model atmospheres. The spectral emissivity of the thermistor detectors of the TIROS radiometers is presented; these data are included in new filter transmission values for TIROS III and IV. Small changes and corrections were introduced into the computer program to produce new intensity values for the 106 model atmospheres. Corrected constants and additional empirical equations for the determination of radiative flux and surface temperature are given.

I. CHANGES IN THE FILTER TRANSMITTANCE VALUES

Table 1 of M.S.L. No. 10 lists the filter transmittance values for TIROS II, III, and IV which were available at the time of the publication. It had been assumed, in using these values, that the emissivity of the detector was unity throughout the infrared (see Hanel and Wark, 1961).

More recently, the NASA has obtained the results of tests on the emissivity of thermistor bolometers. These showed a marked spectral dependence. Therefore, the "effective filter transmittance", defined by the product of the emissivity and the filter transmittance, must be substituted for Φ_ν in the operations performed in M.S.L. No. 10.

The accompanying Correction to Table 1 lists the emissivity and the new "effective filter transmittance" for each interval with a non-zero value; the interval numbers are the same as those of Table 1 of M.S.L. No. 10. Only TIROS III and IV transmittance values have been changed in this corrected table. Changes to the TIROS II values can be made, if desired, from the values of emissivity and transmittance listed in this table. However, because TIROS II radiation data have been compiled in terms of $\overline{W}$ (Eq. 18, M.S.L. No. 10), while the data of TIROS III and IV are in T_B (effective black body temperature), the former would entail a greater effort than the latter in the form of additional transformations to the data; tests have shown that less than 1 percent change in the final flux values would result, and it is not profitable to pursue this further.

New values of $\overline{W}$ as functions of T_B are required by the changes in effective filter transmittance. The values, altered for TIROS III and IV, but not for TIROS II, are given in the accompanying Correction to Table 4.

Correction to Table 1: Thermistor Emissivity
and Effective Filter Transmittance

Interval	Thermistor Emissivity	Transmittance TIROS II+		Effective Filter Transmittance TIROS III		TIROS IV*
		Chan. 2	Chan. 4	Chan. 2	Chan. 4	Chan. 2
13	0.660	-	0.033	-	0.030	-
14	0.660	-	0.108	-	0.108	-
15	0.662	-	0.152	-	0.169	-
16	0.659	-	0.193	-	0.233	-
17	0.683	-	0.189	0.001	0.243	0.001
18	0.682	-	0.195	0.001	0.274	0.001
19	0.707	0.002	0.213	0.006	0.323	0.006
20	0.732	0.006	0.213	0.012	0.372	0.012
21	0.739	0.012	0.200	0.024	0.389	0.024
22	0.738	0.024	0.199	0.035	0.406	0.035
23	0.737	0.032	0.200	0.052	0.420	0.052
24	0.736	0.040	0.203	0.068	0.436	0.068
25	0.734	0.038	0.201	0.069	0.449	0.069
26	0.733	0.022	0.184	0.044	0.454	0.044
27	0.732	0.011	0.170	0.011	0.464	0.011
28	0.731	0.006	0.201	0.006	0.466	0.006
29	0.730	0.015	0.275	0.012	0.429	0.012
30	0.730	0.047	0.259	0.051	0.425	0.051
31	0.730	0.119	0.254	0.117	0.415	0.117
32	0.732	0.168	0.245	0.185	0.406	0.185
33	0.778	0.360	0.333	0.268	0.421	0.268
34	0.757	0.465	0.313	0.310	0.397	0.310
35	0.703	0.467	0.297	0.323	0.357	0.323
36	0.783	0.468	0.308	0.373	0.355	0.373
37	0.839	0.418	0.304	0.369	0.332	0.369
38	0.810	0.374	0.291	0.304	0.288	0.304
39	0.843	0.331	0.266	0.270	0.261	0.270
40	0.846	0.328	0.261	0.249	0.236	0.249
41	0.839	0.321	0.257	0.220	0.206	0.220
42	0.829	0.302	0.231	0.170	0.156	0.170
43	0.818	0.250	0.176	0.115	0.068	0.115
44	0.807	0.159	0.122	0.069	0.013	0.069
45	0.795	0.064	0.048	0.033	0.000	0.033
46	0.781	0.015	0.007	0.016	-	0.016
47	0.763	-	-	0.002	-	0.002

+Does not include the emissivity term.

*TIROS IV did not carry a channel 4 radiometer.

Correction to Table 4: Values of $\overline{W}$ and T_B for Channels 2 and 4 of TIROS II, III, and IV.

T_B (°K)	$\overline{W}$ (w/m^2)				
	TIROS II+		TIROS III		TIROS IV*
	Ch. 2	Ch. 4	Ch. 2	Ch. 4	Ch. 2
170	--	--	1.87	10.49	1.87
180	3.09	9.07	--	--	--
190	--	--	4.05	18.27	4.05
200	6.45	14.62	--	--	--
210	--	--	7.71	29.30	7.71
220	11.93	23.13	--	--	--
230	--	--	13.32	44.02	13.32
240	20.11	34.60	--	--	--
250	--	--	21.30	62.79	21.30
260	31.50	49.04	--	--	--
270	--	--	31.98	85.87	31.98
280	46.77	67.20	--	--	--
290	--	--	45.64	113.4	45.64
300	65.71	88.48	--	--	--
310	--	--	62.46	145.4	62.46
320	88.90	112.8	--	--	--
330	--	--	82.57	182.0	82.57
340	116.4	142.7	--	--	--
350	--	--	106.0	222.9	106.0

+Does not include the emissivity term.

*TIROS IV did not carry a channel 4 radiometer.

II. RECALCULATION OF THE OUTGOING INTENSITY

In the calculation of outgoing intensity (Eq. 10 of M.S.L. No. 10) an error was made in the ozone interval (948-1100 cm^{-1}). The computer program omitted the sec θ term for this interval only, giving incorrect transmittance values for all angles except $\theta = 0$.

This error, along with several others of minor importance, has been corrected, and the spectral intensities have been recalculated for the 106 model atmospheres.

Using the new intensities and the new filter functions as given in the previous section, the quantities given in Appendix B of M.S.L. No. 10 have been recalculated. The limits of integration ν_1' and ν_2', defined by Eq. 3 and listed in Table 2 of M.S.L. No. 10, are unaffected by the slight changes in effective filter transmittance.

III. FLUX CALCULATION

With the new values of $I_\phi(\theta)$, new constants used in the calculation of radiative flux from Eqs. 11a, 11c, 14, and 15 have been determined. These are shown in the Correction to Table 3.

This table now includes constants which permit the use of Eq. 11c for the calculation of radiative flux from the channel 2 data of TIROS II and III, as well as TIROS IV.

The compilation of the TIROS III and IV radiation data in terms of T_B (effective black body temperature) requires that an additional transformation be made to obtain $I_\phi(\theta)$. The following expression gives this transformation for channel 2 of TIROS III and IV.

$$I_\phi(\theta) = g T_B^3 + f T_B^2 + e T_B + d \qquad \text{(11d)}$$

where the constants are given in the Correction to Table 3, $I_\phi(\theta)$ is the channel 2 intensity at angle θ, and T_B is the effective black body temperature in °K.

In the case of channel 4 TIROS III, the transformations of T_B to $I_\phi(\theta)$ and $I_\phi(\theta)$ to $I(\theta)$ are of such a form that they can be combined into a single transformation with sufficient accuracy. The TIROS III channel 4 data in terms of T_B are given as $I(\theta)$ by the expression

$$I(\theta) = g' T_B^3 + f' T_B^2 + e' T_B + d' \qquad \text{(11e)}$$

where the values g', f', e', and d' are given in the Correction to Table 3.

Correction to Table 3: Constants for Transformation of TIROS Data to Radiative Flux

TIROS II		TIROS III		TIROS IV
Channel 2	Channel 4	Channel 2	Channel 4	Channel 2
Equation 11c	Equation 11a	Equation 11d & 11c	Equation 11e	Equation 11d & 11c
$r''=0.1444$ ly/min	$r=0.06124$ ly/min	$g=7.958\times10^{-6}\frac{w}{m^2 deg^3}$	$g'=6.797\times10^{-8}\frac{ly}{min\ deg^3}$	$g=7.958\times10^{-6}\frac{w}{m^2 deg^3}$
$s''=0.005109\ \frac{ly\ m^2}{w\ min}$	$s=0.00584\ \frac{ly\ m^2}{w\ min}$	$f=-2.624\times10^{-3}\frac{w}{m^2 deg^2}$	$f'=-2.225\times10^{-5}\frac{ly}{min\ deg^2}$	$f=-2.624\times10^{-3}\frac{w}{m^2 deg^2}$
$t''=-0.01571$ ly/min	$t=-4.26\times10^{-8}\frac{ly\ m^2}{w\ min}$	$e=+0.278\ w/m^2 deg$	$e'=0.00298\ \frac{ly}{min\ deg}$	$e=+0.278\ w/m^2 deg$
$v''=0.001360\ \frac{ly\ m^2}{w\ min}$	${}^{\circ}I_{\phi}=25.23\ w/m^2$	$d=-8.63\ w/m^2$	$d'=-0.1085$ ly/min	$d=-8.63 w/m^2$
$w''=-1.240\times10^{-5}\frac{ly\ m^4}{w^2 min}$		$r''=0.1407$ ly/min		$r''=0.1407$ ly/min
$\theta_o=78.5°$		$s''=0.006450\ \frac{ly\ m^2}{w\ min}$		$s''=0.006450\ \frac{ly\ m^2}{w\ min}$
		$t''=-0.01827$ ly/min		$t''=-0.01827$ ly/min
		$v''=0.001752\ \frac{ly\ m^2}{w\ min}$		$v''=0.001752\ \frac{ly\ m^2}{w\ min}$
		$w''=-1.969\times10^{-5}\frac{ly\ m^4}{w\ min}$		$w''=-1.969\times10^{-5}\frac{ly\ m^4}{w^2 min}$
		$\theta_o=78.5°$		$\theta_o=78.5°$

$\alpha = -1.215$

$\beta = 6.31$ min/ly

$A = 1.0335$

$C = -0.1737$ min/ly

$a = -2.145\times10^{-4}$

$b = 5.551\times10^{-6}$

$c = -2.188\times10^{-7}$

(These values are applicable to TIROS II, III and IV.)

IV. SURFACE TEMPERATURE DETERMINATION

In determining surface temperature from the channel 2 data, the following changes should be made in Eqs. 20 and 21:

$$\eta = 1.0 - 5.772 \times 10^{-6} \; \theta^{2.22} \tag{20a}$$

$$\xi = 5.707 \times 10^{-10} \; \theta^{4.7} + 1.0 \tag{21a}$$

The other constants are unchanged.

Because the data in Table 5 were mostly for small θ, the values are nearly the same when they are recalculated.

V. SUMMARY OF FLUX AND TEMPERATURE CALCULATIONS

The procedure for the calculation of radiative flux from channels 2 and 4 of TIROS II, III, and IV is outlined below. This combines and summarizes the steps presented in M.S.L. No. 10 and the preceding sections of this supplement.

TIROS II Channel 2

Determine $I(\theta)$ from Eq. 11c of M.S.L. No. 10
Substitute $I(\theta)$ in Eq. 14 to determine $I(0)$
Substitute $I(0)$ in Eq. 15 to obtain flux

TIROS II Channel 4

Determine $I(\theta)$ from Eq. 11a of M.S.L. No. 10
Substitute $I(\theta)$ in Eq. 14 to determine $I(0)$
Substitute $I(0)$ in Eq. 15 to obtain flux

TIROS III and IV Channel 2

Determine $I_\phi(\theta)$ from Eq. 11d of this supplement
Substitute $I_\phi(\theta)$ in Eq. 11c of M.S.L. No. 10 to determine $I(\theta)$
Substitute $I(\theta)$ in Eq. 14 to determine $I(0)$
Substitute $I(0)$ in Eq. 15 to obtain flux

TIROS III Channel 4

Determine $I(\theta)$ from Eq. 11e of this supplement
Substitute $I(\theta)$ in Eq. 14 to determine $I(0)$
Substitute $I(0)$ in Eq. 15 to obtain flux

The constants to be used in all of the above calculations are those appearing in the Correction to Table 3.

Equation 19 of M.S.L. No. 10 and equations 20a and 21a of this supplement provide the estimation of surface temperatures. The procedure is as follows:

Calculate (ΔT_θ) from eq. 19, 20a and 21a.
Determine surface temperature (T_S) from the relation $T_S = T_\theta + (\Delta T_\theta)$, where T_θ is the effective temperature at angle θ.

VI. REMARKS

The effects of the changes given in this Supplement are small. Radiative flux is affected by only about 1 percent, and surface temperature determination by less than 1 degree in most cases. Much more serious to the satellite data are:

1. The assumption that the sky is either clear or solid overcast. When the sky is clear or the clouds are thin, limb-darkening can deviate from the values implied in this study. It is likely that, on the average, the degree of limb-darkening does not vary markedly with the absolute value of $I_\phi(\theta)$, but tends to be greater than indicated in this study. This will be the subject of a later report.

2. Changes taking place in the response of the radiometers. There has been a clear indication that, in some instances, the signal from the radiometers degrades with time. Great care should be observed in implying absolute values to the data. Further information on this problem may be obtained from the authors.

Because the changes made in this supplement have only small effects upon the determination of flux and surface temperature, the revised Appendix B is not reproduced here. However, copies of the revised Appendix B may be obtained upon request to the authors.