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ATMOSPHERIC SLANT PATH TRANSMISSION IN THE 15μ CO_2 BAND

by S. Roland Drayson

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IN THE 15μ CO_2 BAND

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ABSTRACT

Calculations have been made of high-resolution atmospheric slant path transmission in the 15μ CO_2 band, by direct integration across the band. Mixed Doppler-Lorentz broadening has been used at pressures lower than 100mb and a method to eliminate the Curtis-Godson approximation has been developed and applied. Comparison with band model calculations show large discrepancies. Some applications are discussed, together with an outline of future work. FORTRAN programs and transmission tables are presented in the appendices.

1. INTRODUCTION

In recent years there has been a growing interest in atmospheric infrared radiative transfer, with applications to the earth and other planets. On the earth these applications include the investigation of radiative heating and cooling, and the interpretation of satellite instrument measurements, while the composition, surface pressure, temperature etc., of planetary atmospheres may be found from suitable remote radiometric observations. At the same time there have been increasing demands on the accuracy of calculations; broad band radiometers are being supplemented and replaced by instruments of much higher spectral resolution and photometric accuracy.

One of the chief problems stems from the difficulty in calculating atmospheric transmission functions due to molecular band absorption. These functions are generally obtained in one of two ways:

a. From laboratory absorption cell measurements. These are subject to experimental errors, which, in the case of low concentrations of the absorbing gas, may be severe. Considerable extrapolation over temperature, pressure, and path length is required before application to atmospheric conditions can be made. In addition, such transmission functions have an instrument response function built in, and the spectral resolution is limited by the measuring instrument.

b. By theoretical calculations using band models. These are generally unsatisfactory, for reasons which are discussed in detail in a later section. They cannot be applied to certain sections of the absorption bands, which are of extreme importance in the upper atmosphere.

The procedure adopted here was to integrate directly across the band, using theoretically calculated line positions and strengths. The accuracy of the transmission function is governed by our knowledge of the absorption band structure. The 15μ CO_2 band was chosen because the line position and strengths are known fairly accurately, whereas those of the rotational water vapor band, ozone etc., are less well known. However, it should be emphasised that the method is quite general and can be applied to any absorbing gas.

2. LINE SHAPES

The question of line shapes is extremely important in the calculation of atmospheric absorption and must be adequately known before calculations are made. The theory governing the shapes and half-widths is difficult to apply; furthermore experimental work is hampered by such factors as the overlapping of lines, the difficulty in obtaining suitable high-resolution instruments and the effect of instrument aperture functions on the spectra. However, there is good evidence to support the use of the Lorentz line shape where pressure broadening is the dominant feature and the mixed Doppler-Lorentz line shape at lower pressures.

2.1 THE LORENTZ LINE SHAPE

This has a very simple form and has the great advantage that it is easy to deal with analytically. The absorption coefficient at frequency, ν, for a single line strength, S, centered at frequency, ν_0, is given by

$$k_\nu = \frac{S}{\pi} \frac{\alpha_L}{(\nu-\nu_0)^2+\alpha_L^2} \tag{1}$$

where α_L is the Lorentz half-width at temperature T, and pressure p. The dependence of α_L upon these parameters is given by

$$\alpha_L = \alpha_0 \frac{p}{p_0}\sqrt{\frac{T_0}{T}} \tag{2}$$

α_0 being the half-width at temperature T_0, and pressure p_0.

There are references in the literature to deviations from the Lorentz line shape in the far wings of CO_2 lines. In a recently published article[1] Winters et al., have given details of experimental measurements on the 4.3μ CO_2 band. Their results show that beyond about 5 cm^{-1} from the line center, the absorption coefficient drops away much more sharply with frequency than is predicted by Eq. (1), and an empirical modification, which is almost exponential, is given. However, it should be noted that these experimental results were obtained for N_2-CO_2 and O_2-CO_2 mixtures in which the proportion of CO_2 was very high compared with the concentration in the earth's atmosphere. Moreover, the empirical modification was dependent on these concentrations. It was decided that there was no justification in altering the line shape until experimental data are available for lower concentrations. For other planetary atmospheres, where the CO_2 concentration is much greater, the question must be reexamined. Much more important is the uncertainty in half-width. In the present calculation all lines were assumed to have a half-width of 0.064 cm^{-1} at 298°K and a pressure of 1 atm (Kaplan and Eggers[2]). It is known that there are important variations in half-width from line to line (Madden[3]), but not enough is known to be taken into account in the present calculations. It is an area where a detailed theoretical and experimental investigation could be very useful.

In calculating the transmissivity due to a single line in a thin atmospheric slab, where the temperature variation is so small that it may be considered isothermal, Young[4] has shown that the Curtis-Godson approximation is capable of a simple interpretation: for an absorbing gas with a constant mixing ratio the value of k_ν is calculated by substituting the average pressure for the layer. It will be shown that the Curtis-Godson approximation may be entirely eliminated by integrating the line shape with respect to pressure.

Consider a plane parallel atmospheric slab bound by pressure levels p_1 and p_2. The transmissivity of a path through this slab is given by

$$\tau_\nu = \exp\left(-\int_{p_1}^{p_2} k_\nu \, du\right) \qquad p_2 > p_1$$

where u is the optical mass at pressure p.

Since the mixing ratio is constant

$$du = c \, dp$$

where c is constant.

Thus

$$\tau_\nu = \exp\left(-c\int_{p_1}^{p_2} k_\nu \, dp\right) \tag{3}$$

Equation (3) is valid for any line shape. For certain special cases the integral may be evaluated analytically. In the isothermal slab Eq. (2) shows that α_L depends directly on pressure, $\alpha_L = \alpha_1$ p say. Equation (3) becomes

$$\gamma_\nu = \exp\left(-\frac{cS}{\pi}\int_{p_1}^{p_2} \frac{\alpha_1 \, p \, dp}{(\nu-\nu_o)^2+\alpha_1{}^2p^2}\right)$$

$$= \exp\left(-\frac{cS}{2\pi\alpha_1}\, \ell n \left[\frac{\alpha_1{}^2p_2{}^2+(\nu-\nu_o)^2}{\alpha_1{}^2p_1{}^2+(\nu-\nu_o)^2}\right]\right) \qquad (4)$$

cf. Goody,[5] page 233.

The corresponding value using the Curtis-Godson approximation is

$$\gamma_\nu = \exp\left(-\frac{cS\alpha_1}{2\pi}\, \frac{p_2{}^2-p_1{}^2}{(\nu-\nu_o)^2+\alpha_1{}^2((p_1+p_2)/2)^2}\right) \qquad (5)$$

It is interesting to compare the two results. At the line center ($\nu = \nu_o$), the latter gives

$$\gamma_{\nu_o} = \exp\left(-\frac{2cS}{\pi\alpha_1}\cdot\frac{p_2-p_1}{p_2+p_1}\right) \qquad (6)$$

whereas Eq. (4) yields

$$\gamma_{\nu_o} = \exp\left(-\frac{cS}{\pi\alpha_1}\, \ell n\, \frac{p_2}{p_1}\right) \qquad (7)$$

For thin slabs (i.e., where the value of p_2/p_1 is near unity) the approximation is fairly good, but not for thicker slabs. If $p_2 = 2p_1$ the Curtis-Godson approximation gives

$$\gamma_{\nu_o} = \exp\left(-\frac{2}{3}\,\frac{cS}{\pi\alpha_1}\right)$$

and the pressure integrated value is

$$\gamma_{\nu_o} = \exp\left(-\frac{cS}{\pi\alpha_1}\, \ell n\, 2\right)$$

while for $p_2 = 9\ p_1$ the values are

$$\gamma_{\nu_0} = \exp\left(-\ 1.6\frac{cS}{\pi\alpha_1}\right)$$

and

$$\gamma_{\nu_0} = \exp\left(-\ \ln 9\ \frac{cS}{\pi\alpha_1}\right), \text{ respectively}$$

Further out in the wings the difference again becomes less. As $(\nu-\nu_0)$ becomes large, we can expand Eq. (4)

$$\gamma_\nu = \exp\left[-\frac{cS}{2\pi\alpha_1}\left\{\frac{\alpha_1^{\ 2}}{(\nu-\nu_0)^2}\left(p_2^2 - p_1^2\right) - \frac{\alpha_1^{\ 4}}{2(\nu-\nu_0)^4}\left(p_2^4 - p_1^4\right) + \text{higher order terms}\right\}\right] \quad (8)$$

and Eq. (5) becomes

$$\gamma_\nu = \exp\left[-\frac{cS}{2\pi\alpha_1}\left\{\frac{\alpha_1^{\ 2}(p_2^{\ 2}-p_1^{\ 2})}{(\nu-\nu_0)^2} - \frac{\alpha_1^{\ 4}}{(\nu-\nu_0)^4}\,\frac{(p_2^{\ 2}-p_1^{\ 2})(p_1+p_2)^2}{4} + \text{higher order terms}\right\}\right] \quad (9)$$

The first terms in the expansions are equivalent, while the difference in the second terms is

$$-\frac{\alpha_1^{\ 4}(p_2^{\ 2}-p_1^{\ 2})}{(\nu-\nu_0)^4}\left(\frac{p_2-p_1}{2}\right)^2$$

As $\nu-\nu_0$ becomes large this term becomes small, so that the Curtis-Godson approximation becomes good.

At the line center the exact pressure integration gives more absorption but away from the center the absorption due to the Curtis-Godson approximation is always greater. To compare the total absorption for a single isolated line the equivalent width, A, was calculated for a number of different values of p_1 and p_2.

A is given by

$$A = \int_0^\infty (1-\gamma_\nu)\, d\nu \tag{10}$$

and by substitution of Eqs. (4) and (5) the equivalent width for the pressure integration, A_{PI}, and Curtis-Godson approximation A_{CG} may be calculated. A slight modification was made by substituting

$$u = c(p_2-p_1)$$

and calculating the equivalent widths for different values of Su from 10.0 to $1.0 \times 10^{-6} cm^{-1}$.

The numerical evaluation of A_{PI} was accomplished by Gaussian quadrature over a fine mesh of subintervals, whose length depended on the distance from the line center. A_{CG} was determined from the Landenberg-Reiche formula.[6] To check the accuracy of the quadrature technique, A_{CG} was also calculated numerically and the length of the subintervals adjusted until close agreement was obtained with the Landenberg-Reiche method.

The results agree with those obtained by Kaplan, but have been extended to include paths between arbitrary pressure levels, using numerical integration techniques. The value of A_{CG} is always greater than A_{PI} but the difference becomes small for very large and very small values of Su and for values of p_2/p_1 near unity.

Figure 1 shows the maximum error in using the Curtis-Godson approximation between pressure levels of p mb and 1000 mb. For $p < 350$ mb the maximum error is greater than 1%. Even for $p = 800$ mb (800 and 1000 mb were actually used as pressure limits of one slab in the final calculations) the error is as high as 0.05%, which is outside the limits of accuracy required. The maximum occurs for $Su = 0.6\ cm^{-1}$. For a vertical path in the earth's atmosphere between 800 and 1000 mb, $u \simeq 50$ atm cm, giving the maximum error for $S = 0.012\ (atm\ cm)^{-1}\ cm^{-1}$, a line of medium strength, important for radiative transfer in regions of the band away from the center.

Figure 2 shows a typical distribution of error with values of Su, in this case for paths between 10 and 100 mb. The error is greater than half a percent for values of Su ranging over more than two orders of magnitude.

Reasons for the success of the approximation in dealing with the Lorentz line shape are:

a. In many cases the center of the line is completely blacked out.

b. For a weak line the absorption is almost independent of the line

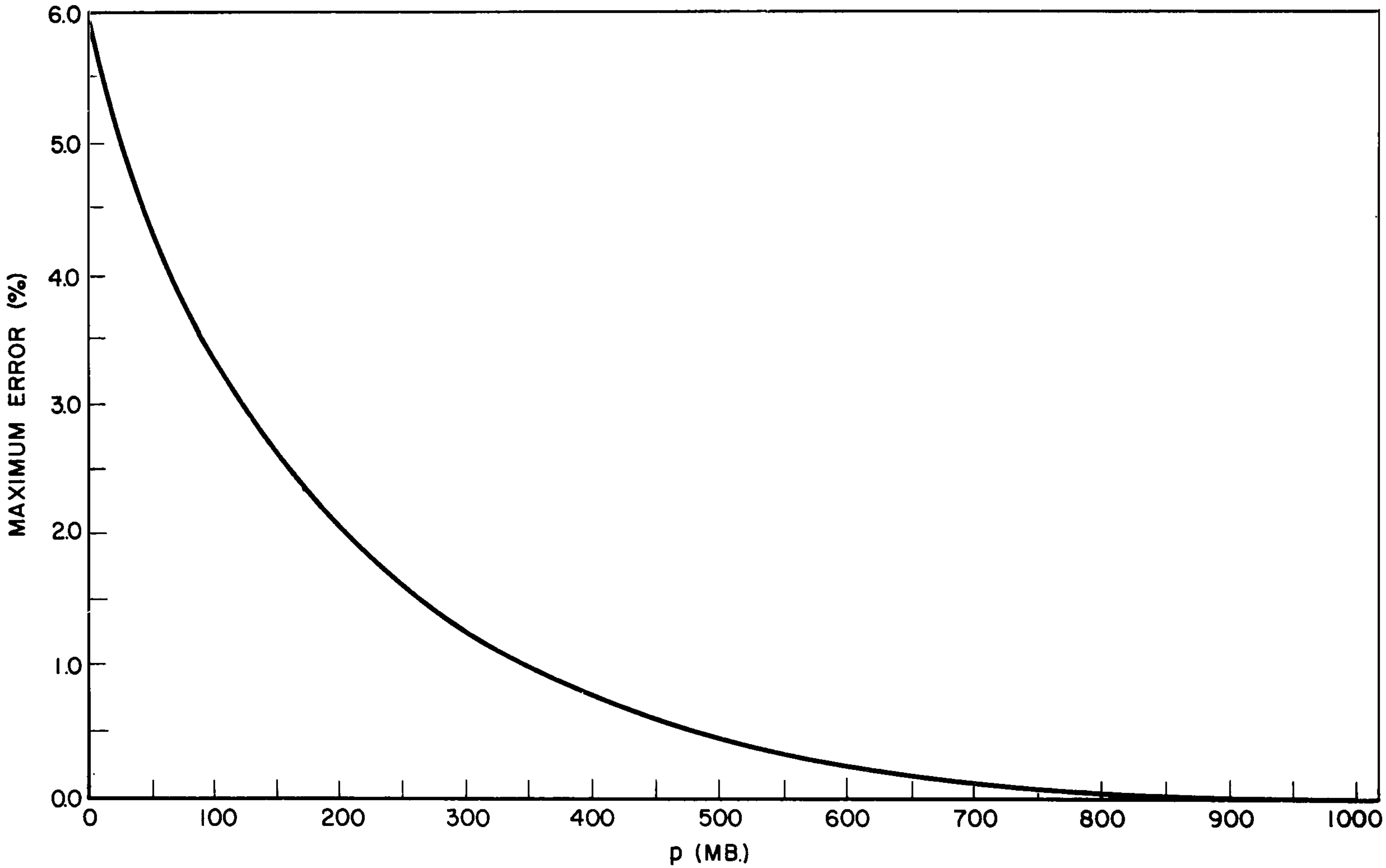

Fig. 1. Maximum error in using Curtis-Godson approximation for paths between p and 1000 mb.

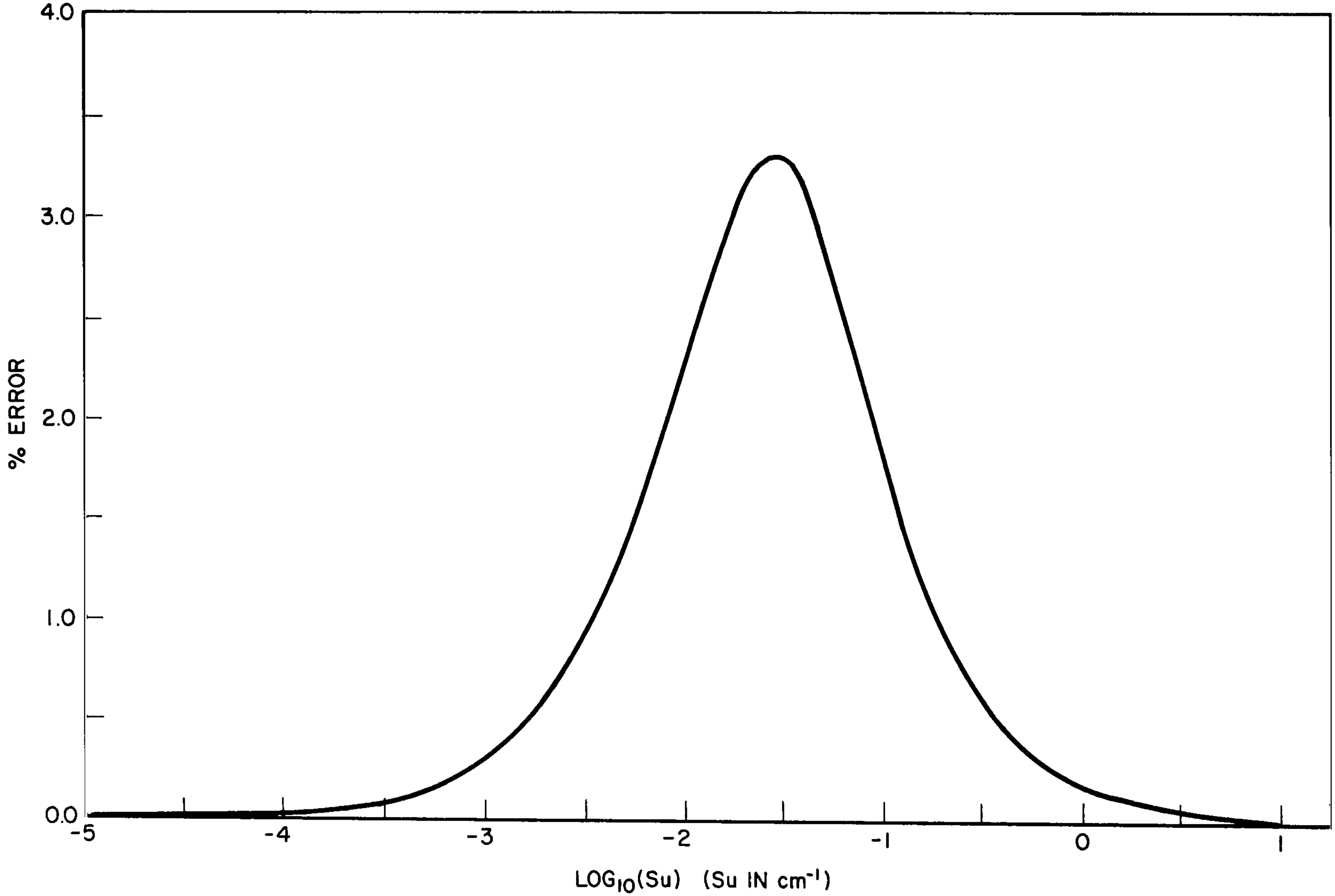

Fig. 2. Error in Curtis-Godson approximation for paths between 10 and 100 mb.

shape—it depends only on the line strength and the optical mass of the path.

For intermediate cases, where strong absorption takes place near the center of the line, but complete absorption is not present, the pressure integration method supplies a much higher degree of precision. Because the present calculations were made with a high degree of accuracy, the Curtis-Godson approximation was excluded in favor of the pressure integration method.

2.2 MIXED LINE SHAPE

As the atmospheric pressure decreases the Lorentz half-width becomes less and the influence of Doppler broadening becomes more marked. For the 15μ CO_2 band the Doppler and Lorentz half-widths are equal at about 10 mb and at lower pressure the Doppler half-width is the greater. Thus, over a wide range of atmospheric pressures it is necessary to consider the mixed Doppler-Lorentz line shape.

The absorption coefficient for mixed broadening is given by[4,6]

$$k_\nu = \frac{k_o\, y}{\pi} \int_{-\infty}^{\infty} \frac{e^{-t^2}}{y^2+(x-t)^2}\, dt \tag{11}$$

where

$$k_o = \frac{S}{\alpha_D}\left(\frac{\ln 2}{\pi}\right)^{1/2}$$

$$y = \frac{\alpha_L}{\alpha_D}(\ln 2)^{1/2}$$

$$x = \frac{(\nu-\nu_o)}{\alpha_D}(\ln 2)^{1/2}$$

The Doppler half-width, α_D, depends linearly on frequency and linearly on the square root of the absolute temperature, T.

$$\alpha_D = 3.58 \times 10^{-7}\left(\frac{T}{M}\right)^{1/2} \nu_o$$

M = molecular weight

The Doppler absorption coefficient is given by

$$k_\nu = k_o \exp(-x^2) \tag{12}$$

As the pressure becomes small, α_L tends to zero and Eq. (11) reduces to the Doppler case. Similarly, for large pressures α_L/α_D becomes large and in the limit becomes Eq. (1).

The integral (11) cannot be evaluated analytically and numerical method must be used. Although there is no difficulty in obtaining as accurate a value as desired, it is not an easy task to find an efficient way to calculate its value, bearing in mind that this may have to be done many times for different values of x and y in the course of a single computer program. Young[4] has summarized the methods available and has now improved his technique, resulting in an efficient subroutine (KNUMIX) over wide ranges of values of x and y which are encountered in the earth's atmosphere.

Because of the analytical difficulties involved, it has generally been assumed in the past that Doppler effects may be neglected in terrestial radiative transfer calculations. Plass and Fivel[8] showed that for very weak or very strong lines its influence was negligible up to altitudes of at least 50 km, but were not able to reach any conclusion for lines of intermediate strength. Accordingly, an investigation was conducted to determine the values of pressure over which it is necessary to use the mixed line shape. In this analysis homogeneous paths of constant temperature and pressure were chosen. The equivalent width, A, of a line of strength S, and path of optical mass u, was computed for a number of different pressures p, using both the Lorentz and mixed line shapes. In addition, the strong and weak line approximation were evaluated and compared with the equivalent widths.

The result for $p = 0.5$ mb is illustrated in Fig. 3. In general it agrees with Plass and Fivel,[8] namely, that for very strong lines the strong line approximation, A_S, Lorentz equivalent width, A_L, and mixed equivalent width, A_M, are coincident, and that for very weak lines the weak-line approximation, A_W, is equal to A_L and A_M. Between these two extremes the behavior is quite interesting.

Firstly, A_W is an upper bound for both the mixed and Lorentz equivalent width. In fact, it is easy to show that this result is true for an arbitrary line shape. Since

$$k_\nu u \geq 0 \quad \text{for all } \nu \text{ and } u$$

$$1 - e^{-k_\nu u} \leq k_\nu u$$

Therefore

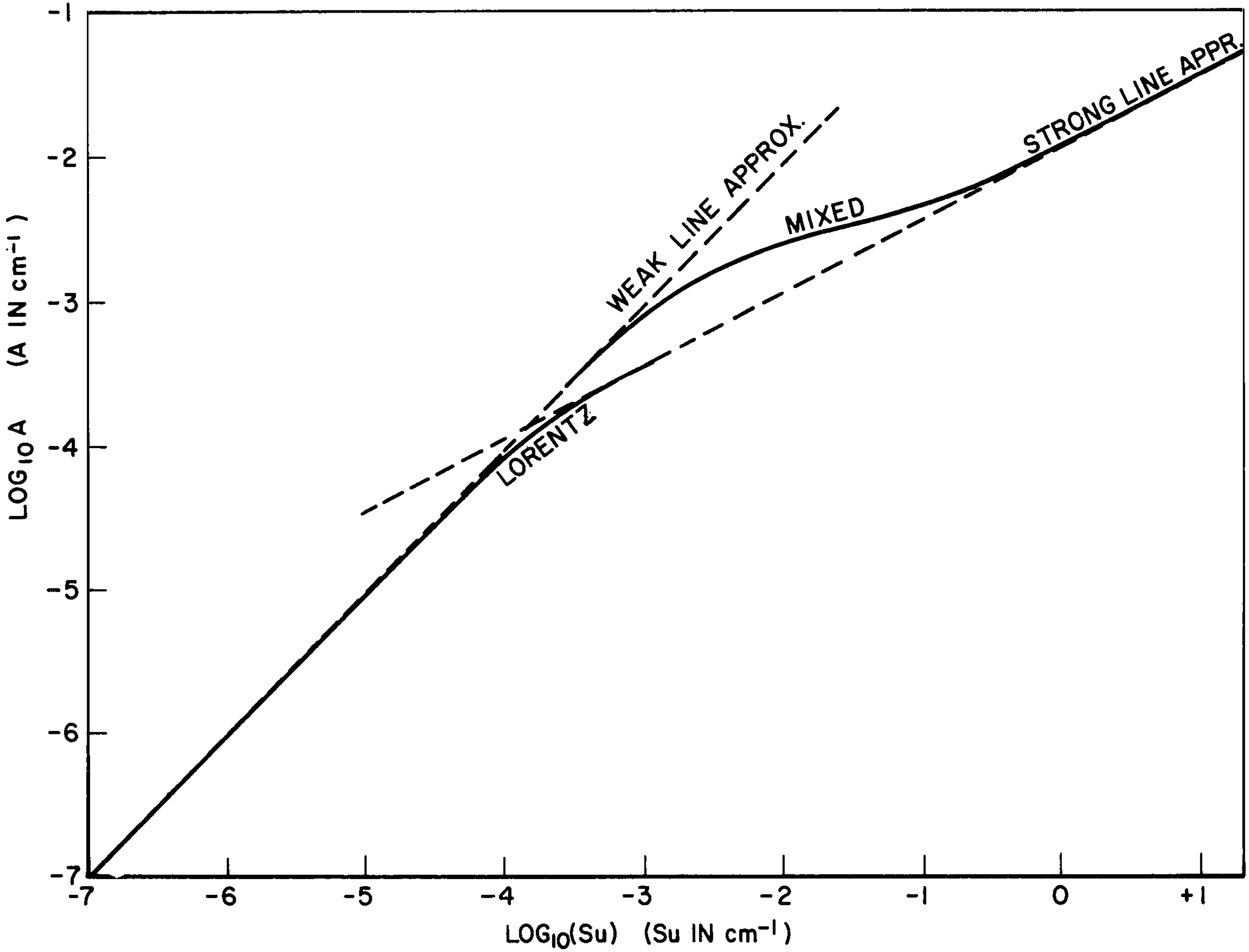

Fig. 3. Equivalent widths for homogeneous paths at 0.5 mb pressure, 250°K, and frequency 700 cm^{-1}.

$$A = \int (1-e^{-k_\nu u})d\nu \leq \int k_\nu u \, d\nu = Su = A_W$$

$$\text{i.e.,} \qquad A \leq A_W$$

Secondly, A_S is an upper bound for A_L, but not for A_M. For intermediate values of Su the value of A_M is almost three times the values of A_L and A_S. As Su increases A_M approaches A_S from above, while A_L approaches A_S from below.

At higher pressures these characteristics are maintained, although the differences decrease in magnitude. Above 20 mb, however, the strong-line approximation is an upper bound for both the mixed and Lorentz absorption.

To minimize computation time, it is important to know the pressures where pure Lorentz broadening may be used and where it is necessary to use the mixed Doppler-Lorentz. The maximum errors (over all Su) of the equivalent widths for a number of pressures have been plotted in Fig. 4. They vary from 60% to 0.5 mb to 0.05% at 100 mb. The criterion adopted was to use pure Lorentz broadening above 100 mb and mixed Doppler-Lorentz at lower pressures.

It is possible to apply the Curtis-Godson approximation to the mixed line shape as well as pure pressure broadening. It will be shown that it can be eliminated in the same way, although the analysis is necessarily more complicated.

Equation (3) is again the appropriate one to use and this necessitates the evaluation of the integral:

$$\int_{p_1}^{p_2} k_\nu \, dp = \int_{p_1}^{p_2} \frac{k_o \, y}{\pi} \int_{-\infty}^{\infty} \frac{e^{-t^2}}{y^2+(x-t)^2} \, dt \, dp \qquad (13)$$

There are two obvious approaches to its evaluation.

a. Evaulation of Eq. (6) using the subroutine KNUMIX, and applying Gaussian quadrature to the pressure integral.

b. The order of integration may be reversed:

$$\gamma_\nu = \exp\left\{-\int_{-\infty}^{\infty} \int_{p_1}^{p_2} \frac{c \, k_o \, y}{\pi} \frac{e^{-t^2} \, dp}{y^2+(x-t)^2} \, dt\right\} \qquad (14)$$

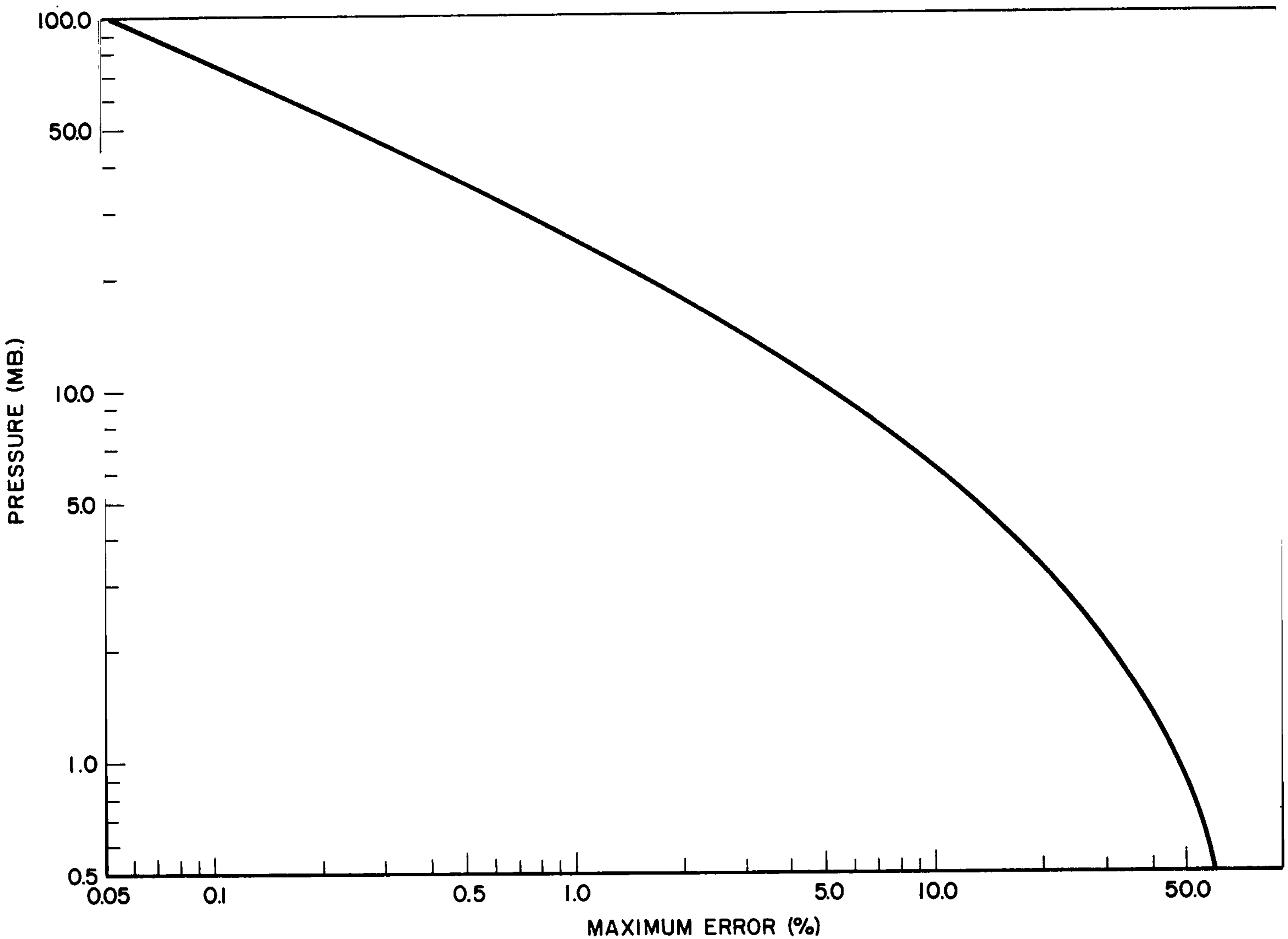

Fig. 4. Maximum error in equivalent widths using Lorentz broadening at low pressures.

Again the assumption is made of an isothermal slab. y is the only pressure dependent term and may be written in the form

$$y = y_o\, p$$

Substituting

$$\gamma_\nu = \exp\left(-\int_{-\infty}^{\infty}\int_{p_1}^{p_2} \frac{ck_o y_o\, e^{-t^2}}{\pi} \frac{p\, dp}{y_o^2 p^2+(x-t)^2}\, dt\right)$$

$$= \exp\left(-\frac{ck_o}{2\pi y_o}\int_{-\infty}^{\infty} e^{-t^2}\, \ell n\left(\frac{y_o^2 p_2^2+(x-t)^2}{y_o^2 p_1^2+(x-t)^2}\right) dt\right) \qquad (15)$$

This integral shares many of the characteristics of Eq. (11). The integrand has a sharp maximum at $t = x$ and any method of numerical integration must be capable of reproducing the effect of the peak in the neighborhood of $t = x$. Hermite-Gauss quadrature is the obvious method, but for values where $|\nu-\nu_o| < .003\ \mathrm{cm}^{-1}$ and $p < 10$ mb, the integral does not converge as the number of points of quadrature approaches 20. It was found that two methods could be employed in this region.

Firstly, the interval $(-\infty,\infty)$ was divided into subintervals whose length was dependent on the distance from $t = x$. By taking small intervals around this point and successively larger ones as the distance increased, the integral could be successfully evaluated by Gaussian quadrature. With the subdivisions used, the sixth significant figure was always the same for 10- and 16-point quadrature, over a wide range of x and p. Those regions of overlap with the 20-point Gauss-Hermite quadrature showed agreement between the two methods, with the discrepancy in the sixth significant figure never exceeding one. Whereas the Gauss-Hermite quadrature is fast and efficient, the method of subdivision is slow and tedious. A quicker solution was sought.

As an efficient method of evaluating Eq. (11) was already available (subroutine KNUMIX), Gaussian quadrature of the mixed line shape integral with respect to pressure was investigated. Two-point Gaussian quadrature was found to give a high degree of accuracy, almost as good as the subdivision technique, with a much smaller execution time.

For $|\nu-\nu_o| > 0.2\ \mathrm{cm}^{-1}$ or $p > 100$ mb pressure broadening was found to be sufficiently accurate and much faster.

To summarize, three different methods were employed to evaluate the appropriate pressure integrated line shape. They are illustrated in Fig. 5.

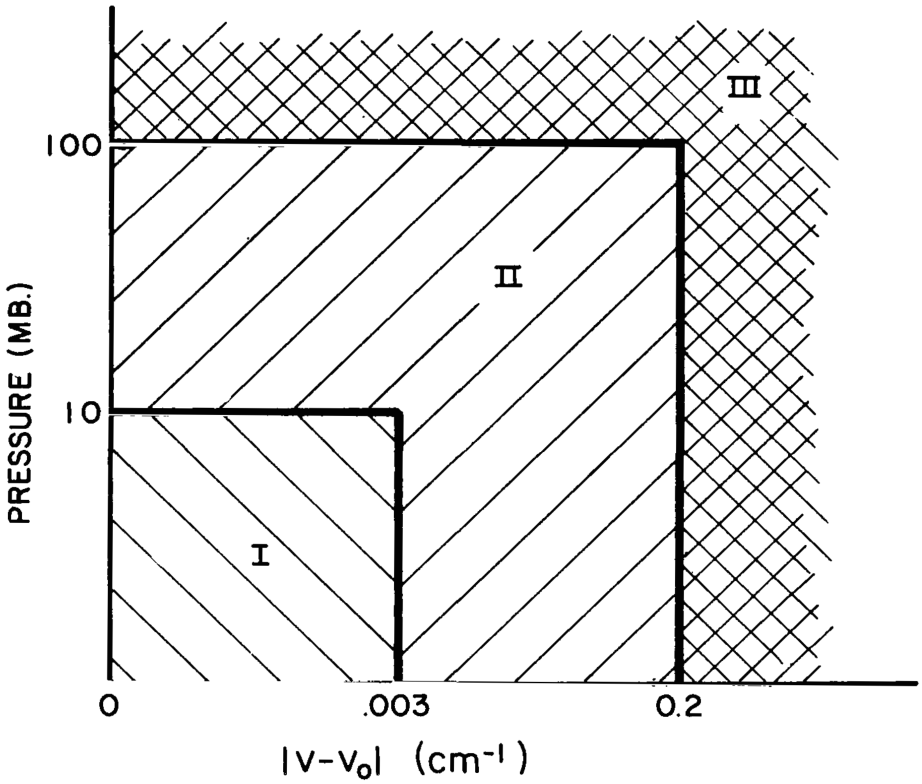

Fig. 5. Regions of validity of line shape integration methods.

Region I. 2-point Gaussian quadrature of the mixed line shape integral.

Region II. 20-point Gauss-Hermite quadrature of Eq. (15).

Region III. Pressure broadening only, using Eq. (4).

Work continues to find better methods of particularly in Region I where execution time is greatest.

3. BAND MODELS

Because of the great complexity of molecular absorption bands it has become a widespread practice to calculate atmospheric absorption with the help of band models. They assume that the line positions and strengths are distributed in a way that gives a simple solution for the transmission function, averaged over some interval. The most commonly used band models are:

a. The Elsasser or regular model[6,9] assumes spectral lines of equal intensity, equally spaced and with identical half-widths. The transmission function is averaged over an interval equal to the spacing between the line centers.

b. In the statistical or random model,[6,10] originally developed for water vapor, the positions and strength of the lines are given by a probability function.

c. The random-Elsasser model[6] which assumes a random superposition of different elasser bands.

d. The quasi-random model.[11] This is by far the best available model and is capable of fairly accurate representation of the band provided the averaging interval is made sufficiently small.

There are fundamental objections to the use of band models in accurate transmission calculations.

a. The spectral resolution with which the calculations can be made is limited in most models, e.g., for the Elsasser model it is a multiple of the line spacing. Where the resolution is not limited (e.g., quasi-random) the amount of calculation required for high resolution is large.

b. The solutions lose their simple form when mixed broadening is introduced in place of the less complicated pressure broadening.

c. By their very nature the models are such that they can only simulate the actual line intensities and distributions. For instance, a cursory glance at the 15μ CO_2 band will show that neither the random nor the regular band adequately describes the situation. This is particularly true for regions such as the main Q-branch at $667.4\ cm^{-1}$, where the distribution is definitely not random or regular. This Q-branch is very important for radiative transfer, particularly in the upper atmosphere.

d. It is difficult—if not impossible—to avoid the use of the Curtis-Godson approximation.

The quasi-random model has done much to remove the objections above; in fact, as the width, δ, of the averaging intervals tends to zero, the model distribution approaches the actual distribution. However, if δ is small the advantage of using the model disappears and the calculations become increasingly lengthy. In extensive computations of CO_2 transmission, Stull et al.,[12] have used 5 cm^{-1} for the value of δ, but this is too large in some of the regions of greatest interest. In the interval entered at 665 cm^{-1}, for example, nearly all the very strong lines are concentrated at one end of the interval, between 667.4 and 667.5 cm^{-1}. Yet the model assumes them to be randomly distributed throughout the interval, seriously overestimating the absorption.

With increasingly sophisticated instruments coming into general use, it has become apparent that a more accurate approach must be made. At the time when band models were introduced it was impossible to make complicated calculations and hence the growth in popularity of the models. In recent years, with the advent of high-speed digital computers with large storage capacities, the situation has changed radically. With a suitably efficient program it is now possible to make transmission calculations by integrating directly with respect to frequency. Accordingly, calculations have been made without the use of a band model; they cover the entire 15μ CO_2 band, from 500 to 859 cm^{-1}, and are averaged over 0.1 cm^{-1} intervals. This high resolution has the additional advantage that the transmission function may be averaged over larger intervals, taking into account instrument response functions. An example of such an application is given in a later section.

The calculations were made of the transmission from a point outside the earth's atmosphere down to a total of 34 pressure levels, ranging from 0.3 mb to 1013.25 mb. Slant paths for six zenith angles were used, 0, 15, 30, 45, 60, and 75 degrees. The atmosphere was assumed to be plane parallel, with a constant mixing ratio of 0.0314% by volume of CO_2. The atmospheric temperature structure used was the U. S. Standard Atmosphere, 1962.[13] Test calculations were made for differing temperature structures and their effect on the transmissivity will be discussed in a later section of this report.

4. CALCULATION DETAILS

The position and strength of some 2000 lines in the 15μ CO_2 band have been listed by Young,[4] at six temperatures between 175° and 300°K. Dr. Young kindly provided a duplicate card deck.

This deck was modified in two ways:

a. Where two or more lines had a coincident frequency, they were replaced by a single line whose intensity was the sum of the separate intensities.

b. It was found from test calculations that only those lines whose intensities were greater than 1.0×10^{-4} cm^{-1} $(atm\ cm)^{-1}$ at 275°K had any marked influence outside the 0.1 cm^{-1} interval within which they were contained. Therefore the deck was split into two parts, containing 982 strong lines and 1008 weak lines, respectively. These strong and weak lines were treated in rather different ways by the main program.

4.1 STRONG LINES

Beyond 0.2 cm^{-1} from the line center the pressure broadening completely dominates the line shape, for all atmospheric temperatures and pressures, and hence the absorption coefficient, k_ν, for a line of strength, S, may be written

$$k_\nu = \frac{S}{\pi} \frac{\alpha_L}{(\Delta\nu)^2 + \alpha_L^2} \tag{16}$$

Whenever $\left(\frac{\alpha_L}{\Delta\nu}\right)^2 < 1$ this may be expanded as

$$k_\nu = \frac{S}{\pi} \frac{\alpha_L}{(\Delta\nu)^2} \left[1 - \frac{\alpha_L^2}{(\Delta\nu)^2} + \text{higher order terms}\right]$$

Now

$$\alpha_L < .07\ cm^{-1} ,$$

so that the error in neglecting the term $(\alpha_L^2/\Delta\nu^2)$ is less than 1 part in 10^{-4}, provided that $|\Delta\nu| > 7.0\ cm^{-1}$ (for most values of pressure the error is much less than 1 part in 10^{-4}). Hence for

$$|\Delta\nu| > 7.0 \text{ cm}^{-1}$$

the approximation

$$k_\nu = \frac{S}{\pi}\frac{\alpha_L}{\Delta\nu^2} \tag{17}$$

was used.

For each 1 cm^{-1} interval the sum

$$SM(T_j, \nu_o) = \sum \frac{S_i}{(\nu_i - \nu_o)^2} \tag{18}$$

was calculated. The sum was taken over all strong lines at a distance greater than 7.5 cm^{-1} from the center of the interval, and was computed for three values of ν_o, the center and the two end points of the interval, as well as for six temperatures, T_j, 175° to 300°K in 25°K steps. In order to find the value of $SM(T,\nu)$ three-point Lagrange interpolation over both temperature and frequency was employed.

The approximation (17) can be used for many values of $|\Delta\nu| < 7 \text{ cm}^{-1}$. If $|\Delta\nu| < .009$ p, where p is the pressure in mb, $\Delta\nu$ in cm^{-1}, the error in using (17) is less than 1 part in 5×10^{-5} and this inequality was adopted as a criterion for the use of approximation (17). In addition, if the magnitude of the expression $S/(\Delta\nu)^2$ was sufficiently small (< 0.001) the Eq. (17) was employed.

It should be emphasized that these approximations are an essential part of the calculations. Without them the expression in Eq. (4), involving a natural logarithm, would have to be evaluated for each strong line at each pressure level and each frequency, ν, a procedure which would be prohibitively time consuming. The approximations were checked both theoretically and in actual calculations over small test portions of the band, with satisfactory results in all cases.

Where the use of Eq. (4) could not be avoided it was found that the logarithm could be written in the form

$$\ell n(1+x) \qquad x \geq 0$$

where, in the majority of cases, x was small. For $x \leq 0.2$, a simple expansion was used to evaluate the logarithm, it being both quicker and frequently more accurate than the library subroutine. For $x > 0.2$ the library subroutine was used. This applies to all places in the program where the function $\ln(1+x)$ had to be evaluated, for example the evaluation of Eq. (15) for the mixed line shape.

Integration with respect to frequency was performed as follows: as previously mentioned, the transmission was averaged over 0.1 cm^{-1} intervals. If a strong line lay within the interval an especially fine subdivision for quadrature had to be developed up to a distance of 0.01 cm^{-1} from the line center: 4-point Gaussian quadrature was applied over the intervals formed by points distance 0.0, 0.001, 0.002, 0.003, 0.005, and 0.01 cm^{-1} from the line center. Four-point Gaussian quadrature was also applied to the remaining subintervals, subject to this modification: where a subinterval had length greater than 0.03 cm^{-1} and was situated nearer than 0.1 cm^{-1} from a line of strength greater than 0.1 $(atm\ cm)^{-1}\ cm^{-1}$, the subinterval was further subdivided into three smaller subintervals.

For a given frequency, ν, determined by the Gaussian quadrature abscissae, the value of the expression

$$\gamma_\nu = \exp\left\{-\int_0^{p_i} k_\nu \, du\right\} \tag{19}$$

was calculated for each of the pressure levels, p_i, $i=1\ldots34$, and for six slant paths. The integral was expressed in the form

$$\int_0^{p_i} k_\nu \, du = \sum_{j=i}^{i} \int_{p_{j-1}}^{p_j} k_\nu \, du \tag{20}$$

The pressure slab between pressures p_i and p_{i+1} was considered isothermal, with the temperature the average of the values at the top and bottom. Since the difference was never more than a few degrees, little error results in this assumption.

The transmission function was determined by multiplying the values of γ_ν by the appropriate quadrature weights and interval lengths.

4.2 WEAK LINES

The average transmission over the 0.1 cm^{-1} interval due to the weak lines was calculated separately, using a quadrature technique similar to that employed for the strong lines. Finally this transmission was multiplied by the transmission from the strong lines to obtain the correct value of the transmissivity in the 0.1 cm^{-1} interval.

4.3 THE PROGRAMS

Most of the preliminary work, testing approximations and producing a rough draft of the final programs, was done at The University of Michigan Computing Center, using the IBM 7090 computer. MAD language was employed because, while it produces a slightly less efficient object program, it complies much more quickly and has a greater flexability than FORTRAN. The rough MAD programs were then translated into FORTRAN II, and largely debugged at The University of Michigan.

A block of free computer time was very kindly made available at the National Center for Atmospheric Research Computer Facility, in Boulder, Colorado, on the CDC 3600. Only slight modifications were needed to the FORTRAN II programs to convert them to CDC 3600 FORTRAN. These CDC programs appear in Appendix A. For comparison purposes the CDC 3600 is roughly twice as fast as the IBM 7090.

Because of the large number of storage locations needed in the calculations, the program was written in two parts.

4.3.1 Program SUBPROG

Together with its subroutine GRONK, this program determined:

a. The number and position of the weak and strong lines within each 0.1 cm^{-1} interval.

b. Produced a code giving information when the strong and weak lines were the end points of an interval.

c. Gave the subintervals over which Gaussian quadrature was applied.

d. Formed the sum (18) for the temperature and frequencies required.

e. Gave a number of other details concerning the input of strong- and weak-line strengths and positions. These results were written on binary tape (tape 20) and were used as input by program MAIN.

SUBPROG was somewhat complicated because of the many special cases that had to be tested for in the course of execution. However, since it is largely integer arithmetic, it was very fast in execution. The time taken for the entire band was approximately 5.3 minutes on the CDC 3600.

4.3.2 Program MAIN

Together with its three subroutines, LOOKAT, CENTRE, and KNUMIX, Program MAIN computed the transmission. Initially MAIN set up various constants and also arrays which were dependent on the pressure levels. Secondly, it calculated $\int_{u_1}^{u_2} k_\nu \, du$ for an isolated line at various distances $\Delta\nu$ from the line center, for values of u_1, u_2 corresponding to the pressure levels. Since the integral involves the mixed line shape, which varies slowly with frequency, it was recalculated every 10 cm^{-1}. In addition strong and weak lines were read in (from the binary tape) during this second section of the program.

Thirdly, the actual transmission calculations were performed, in three stages:

a. Transmission was calculated for the intervals between the strong lines, using subroutine LOOKAT.

b. Transmission was calculatedin the neighborhood of the strong lines involving subroutines CENTRE and LOOKAT.

c. Modification due to weak lines was made using subroutine CENTRE.

The transmission functions were written on magnetic tape in BCD mode. The total execution time for the whole band (499.5-859.5 cm^{-1}) was 109.4 minutes on the CDC 3600.

A CDC 3600 FORTRAN listing for both programs and their subroutines is found in Appendix A. In order to reduce execution time all two-dimensional arrays were written with linear subscripts, except in some I/O statements where it was difficult and inconvenient not to use two subscripts.

The subroutine KNUMIX which evaluated the mixed line shape integral (Eq. (13)) was written in MAD by Dr. Charles Young. The version of KNUMIX listed here is a translation into FORTRAN.

5. DISCUSSION OF THE RESULTS

5.1 GENERAL

Because of the large amount of data obtained it is impossible to reproduce more than a small fraction in this report. The emphasis has been placed on supplying coefficients that may be useful in atmospheric radiation calculations, and in comparison with previously published results. In addition, an example of an application to an instrument function is presented. The complete results are available on magnetic tapes.

In keeping with the first aim, the transmission coefficients have been averaged over 5 cm^{-1} intervals, for the vertical path only, with entries every 1 cm^{-1} (Appendix B). The frequency at the top of each column is that of the center of the 5 cm^{-1} interval. No attempt has been made to smooth the data, as may be seen from Fig. 6, which is a plot of transmission versus frequency for four of the pressure levels.

The main Q-branch (667.4 cm^{-1}) dominates the absorption at low pressures. It is composed of a large number of strong lines, neither regularly nor randomly distributed, which cannot be adequately represented by a band model. Accordingly, more detailed results are given in this region: Appendix C contains tables of transmission coefficients at 0.1 cm^{-1} resolution between 665.5 and 670.5 cm^{-1}, for the vertical path. Figure 7 illustrates some of these coefficients; the triangles at the top represent the line positions, the height indicating the intensity decade in which the line strength falls.

5.2 COMPARISON WITH PREVIOUS RESULTS

It is somewhat difficult to compare the present calculation results with those obtained by other authors, due to the fact that atmospheric slant paths have been used in the computation, rather than fixed temperature and pressure paths. However, Plass[14] has used his previously published results[12] to calculate atmospheric slant path transmission from four different altitudes (15, 25, 30, and 50 km) to the outer limits of the earth's atmosphere.

Comparison shows considerable disagreement between the two calculations (Fig. 8). The differences are most severe in the Q-branch regions, both at the main Q-branch (667.4 cm^{-1}) and those at approximately 620 cm^{-1} and 720 cm^{-1}. The integrated absorptions, I,

$$I = \int_0^\infty A_\nu \, d\nu$$

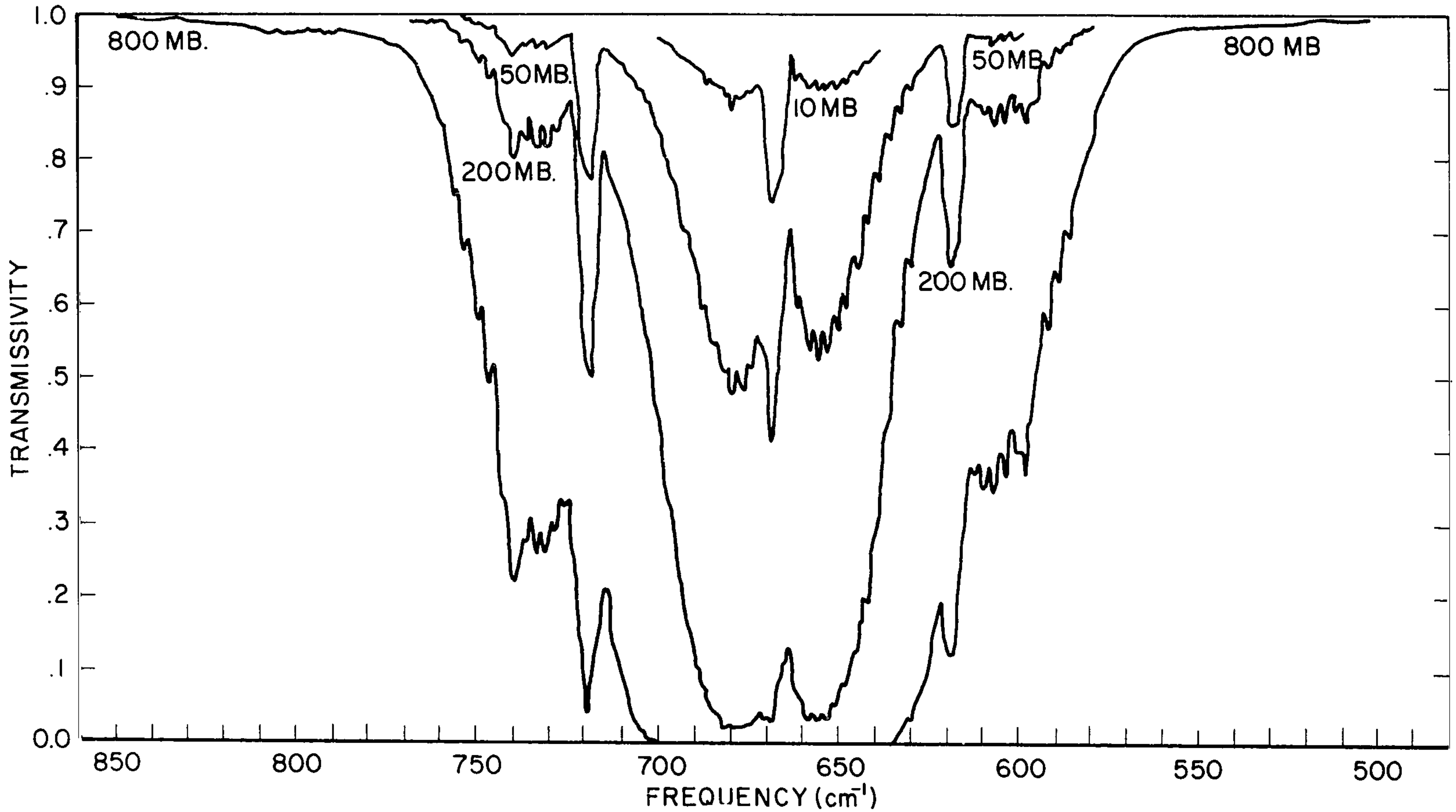

Fig. 6. Transmissivity averaged over 5 cm^{-1} intervals.

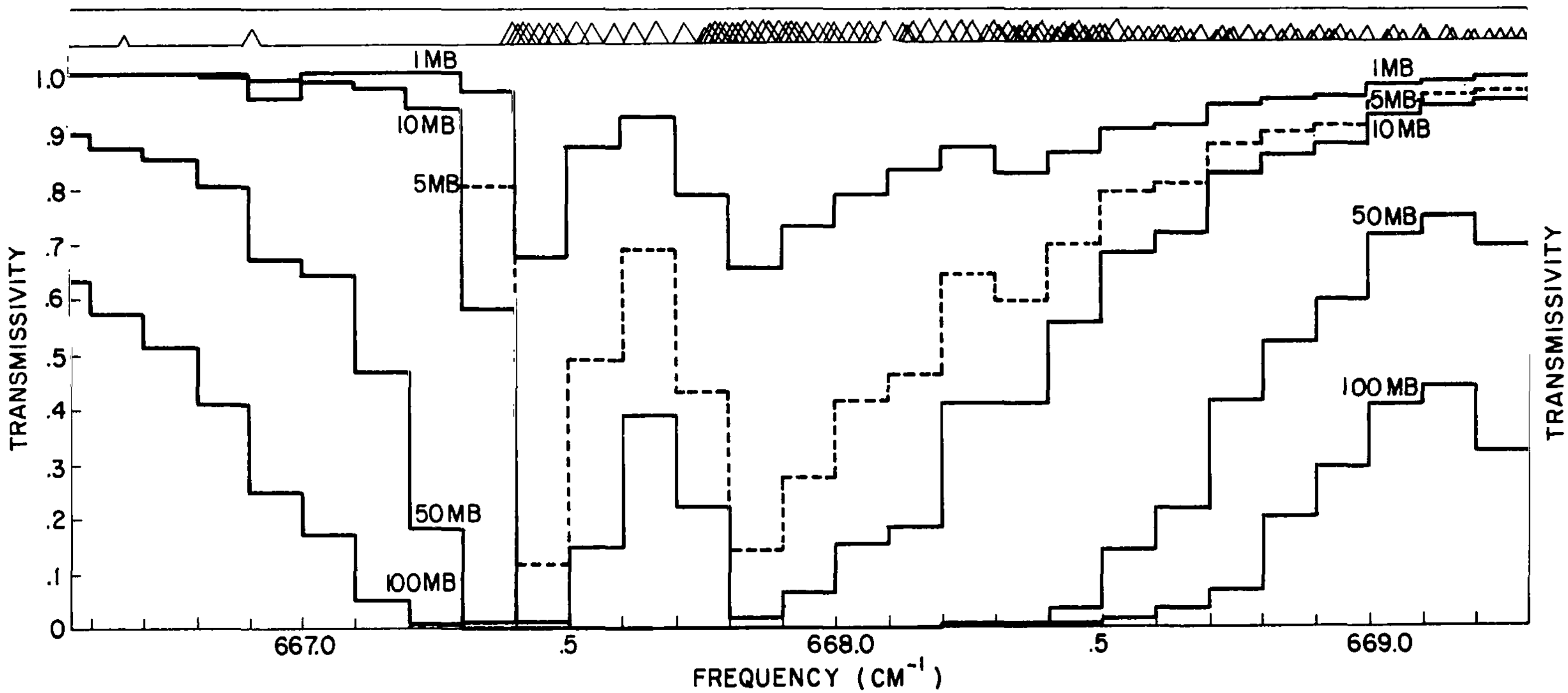

Fig. 7. High resolution atmospheric transmission at centre of 15μ CO_2 band.

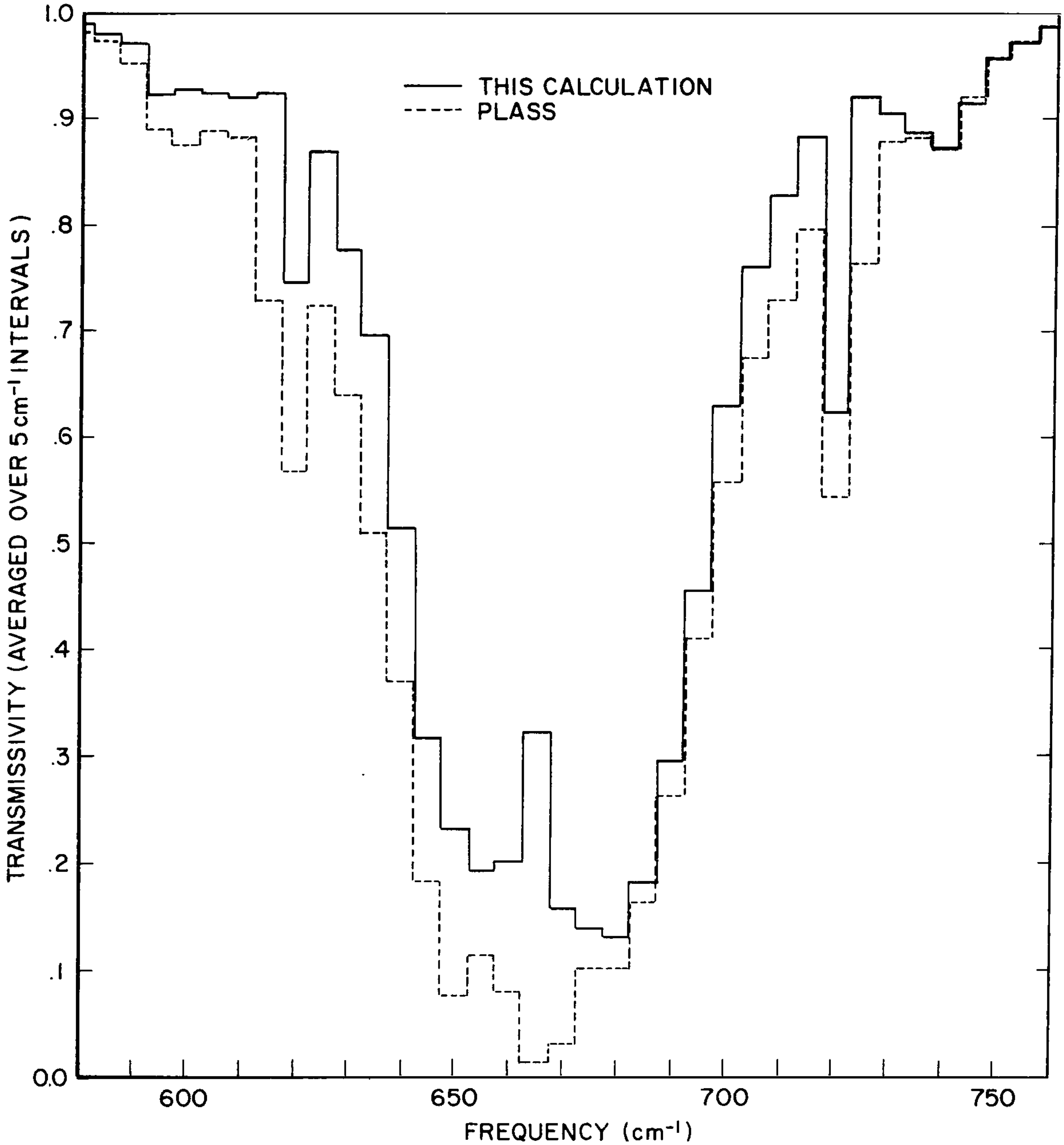

Fig. 8. Transmission for the vertical path from 15 km.

for the different altitudes have been calculated (Table I) and show large

TABLE I. INTEGRATED ABSORPTION, I, FOR THE 15μ CO_2 BAND VERTICAL PATH FROM THE INDICATED ALTITUDES

	Altitude (km)			
	15	25	30	50
I (this calc)	60.0	17.9	9.38	1.28
I (Plass)	73.9	27.4	13.0	1.05

divergences. There are many possible reasons for this, including the following:

a. The present calculation used 0.0314% CO_2 by volume compared with 0.033% used by Plass; the effect on the calculations is small.

b. Plass was forced to use the Curtis-Godson approximation which, as has been shown, tends to overestimate the absorption.

c. The line strengths used were not in perfect agreement.

d. Probably the greatest single cause is the use of the quasi-random band model. The generally unsatisfactory nature of this model in the region of the Q-branches has already been discussed and is fully borne out by comparison in Fig. 8. The present calculations indicate a marked minimum of absorption between the main P- and Q-branches (665.0 cm^{-1}), while the model exhibits a maximum at the same point (it should be pointed out that Plass' results have been considerably smoothed by the calculation technique).

The path from 50 km (Fig. 9) deserves particular attention as it is quite different from the other three altitudes: the integrated absorption of this calculation is actually greater than that obtained by Plass. This phenomenon admits a very simple explanation, in terms of the mixed Doppler-Lorentz broadening. Near the center of the band where strong lines predominate in the absorption, the two calculations are in rough agreement (allowing for the data smoothing). But away from the center, particularly in the two Q-branches at 620 and 720 cm^{-1}, the predominant lines are of medium intensity. The value of u for the vertical path from 50 km is approximately 0.2 atm cm, and in these Q-branches there are many strong lines

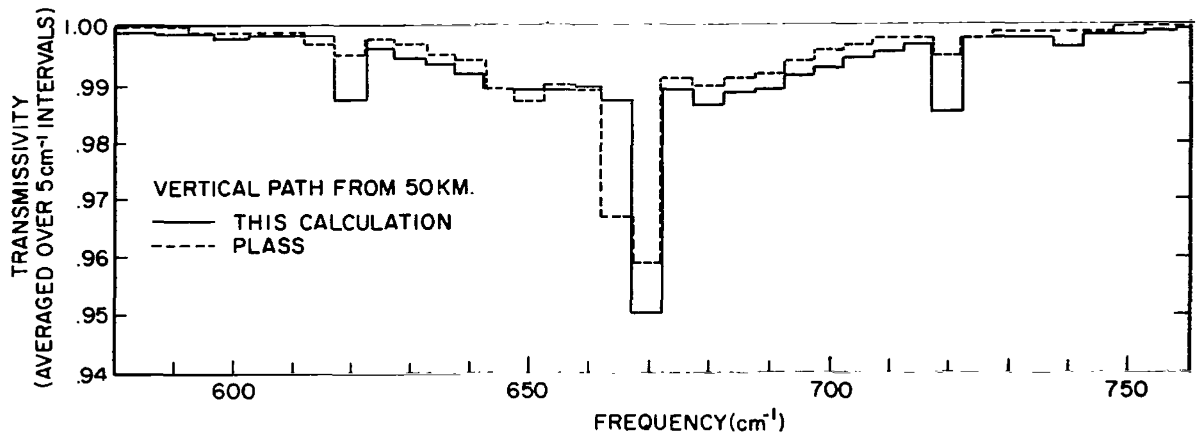

Fig. 9. Transmission for the vertical path from 50 km.

of strength between 0.2 and 0.02 (atm cm)$^{-1}$ cm^{-1}. This corresponds to values of Su in the range 0.04 to 0.004 cm^{-1}. Reference to Fig. 3 shows that these values are precisely the ones for which the difference between the pure Lorentz and mixed Doppler-Lorentz absorption is greatest. It must be concluded that mixed Doppler-Lorentz broadening is of critical importance at this altitude.

On the other hand, a factor which operates at higher pressures is not of importance around 50 km. Because the band may very nearly be considered as a collection of isolated lines, the fact that the band model distributes them randomly, rather than leaving them in 'clumps' has little influence.

Summarizing, the main theoretical objections to the quasi-random model have been demonstrated to be of crucial importance in atmospheric transmission calculations and the use of the mixed Doppler-Lorentz broadening has been shown to be mandatory at altitudes near 50 km.

5.3 APPLICATION TO THE SATELLITE INFRARED SPECTROMETER (SIRS)

The SIRS was built to measure the vertical component of the outgoing radiation from the earth and its atmosphere, at several frequencies in the 15μ CO_2 band, as well as one at 899 cm^{-1} in the window region. In principle, these measurements can be used to infer the temperature structure of the atmosphere, by the inversion of an integral equation of the first kind. A simple error analysis is sufficient to show that, in order to produce reliable solutions, we must be able to calculate the outgoing radiation from a given atmospheric temperature structure with extreme accuracy. It was this problem that, in part, precipitated the investigations outlined in this report.

The SIRS has a resolution of 5 cm^{-1} and a response function which is nominally triangular in shape. The intensity of radiation measured by the instrument is

$$\bar{I}_{\nu_o} = \int_0^\infty \phi_{\nu_o}(\nu) I_\nu \, d\nu \Big/ \int_0^\infty \phi_{\nu_o}(\nu) \, d\nu \qquad (21)$$

where I_ν is the intensity of radiation at frequency, ν

ν_o is the center of the instrument channel

and $\phi_{\nu_o}(\nu)$ is the instrument response at frequency, ν. For the SIRS

$$\left.\begin{aligned} \phi_{\nu_o}(\nu) &= 1 - \frac{|\nu-\nu_o|}{5} & |\nu-\nu_o| \le 5 \\ &= 0 & |\nu-\nu_o| > 5 \end{aligned}\right\} \qquad (22)$$

and

$$\int_0^\infty \phi_{\nu_o}(\nu) \, d\nu = 5$$

Now

$$I_\nu = I_\nu(\gamma_\nu) = \int_0^{p_s} B(\nu,p) \frac{\partial \gamma_\nu(p)}{\partial p} dp + \epsilon_s \gamma_\nu(p_s) B(\nu,T_s) \qquad (23)$$

where

- B = the Planck black body function at frequency, ν, temperature, T
- ϵ_s = the emissivity of the earth's surface
- T_s = the temperature of the earth's surface
- p_s = the atmospheric surface pressure
- $\gamma_\nu(p)$ = the transmissivity for a vertical path down to pressure p at frequency, ν.

Substituting in Eq. (21)

$$\left(\int_0^{\infty} \phi_{\nu_0}(\nu)d\nu\right)\cdot\bar{I}_{\nu_0} = \int_{\nu=0}^{\infty}\phi_{\nu_0}(\nu)\left\{\int_0^{p_s} B(\nu,p)\frac{\partial\gamma_\nu(p)}{\partial p}dp+\epsilon_s\gamma_\nu(p_s)B(\nu,T_s)\right\}d\nu$$

$$= \int_0^{p_s}\int_{\nu=0}^{\infty} B(\nu,p)\frac{\partial(\phi_{\nu_0}\gamma_\nu(p))}{\partial p}d\nu dp+\int_{\nu=0}^{\infty} B(\nu,T_s)\epsilon_s(\phi_{\nu_0}(\nu)\gamma_\nu(p_s))d\nu$$

Now, if the spectral region under consideration is narrow, we can replace $B(\nu,p)$ by $B(\nu_0,p)$, and also consider ϵ_s to be constant. Hence

$$\left(\int_0^{\infty} \phi_{\nu_0}(\nu)d\nu\right)\cdot I_\nu = \int_0^{p_s} B(\nu_0,p)\ \frac{\partial}{\partial p}\left[\int_0^{\infty} \phi_{\nu_0}\ \gamma_\nu\ d\nu\right]dp$$

$$+\ B(\nu_0,T_s)\epsilon_s\int_0^{\infty} \phi_{\nu_0}\ \gamma_\nu(p_s)d\nu \qquad (24)$$

Comparing with Eq. (23)

$$\bar{I}_{\nu_0} = I_{\nu_0}(\bar{\gamma}_{\nu_0})$$

where

$$\bar{\gamma}_{\nu_0}(p) = \frac{\int_0^{\infty} \phi_{\nu_0}\ \gamma_\nu(p)d\nu}{\int_0^{\infty} \phi_{\nu_0}\ d\nu} \qquad (25)$$

This equation is quite general, and can be used for any response function, provided $B(\nu,T)$ is a slowly varying function of frequency throughout the interval.

With the transmissivity averaged over 0.1 cm^{-1} intervals, it is easy to evaluate Eq. (25) quite accurately, to obtain values of $\bar{\gamma}_{\nu_0}(p)$ at any desired frequency, ν_0, and pressure, p. Calculations have been made between 665 and 714 cm^{-1} in 1 cm^{-1} steps (Table II) and the results have been plotted for some

TABLE II. TRANSMISSIVITIES FOR THE SIRS INSTRUMENT RESPONSE FUNCTION BETWEEN 665 AND 674 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

665.0	666.0	667.0	668.0	669.0	670.0	671.0	672.0	673.0	674.0	PRESS(MB.)	
.9833	.9674	.9588	.9595	.9699	.9755	.9814	.9874	.9924	.9933	.30	1
.9784	.9705	.9622	.9560	.9605	.9677	.9752	.9828	.9894	.9906	.60	2
.9721	.9621	.9515	.9436	.9490	.9581	.9675	.9770	.9852	.9868	1.00	3
.9673	.9558	.9435	.9343	.9405	.9509	.9618	.9727	.9820	.9838	1.30	4
.9626	.9495	.9356	.9253	.9324	.9440	.9562	.9685	.9789	.9808	1.60	5
.9565	.9415	.9254	.9137	.9218	.9351	.9489	.9629	.9747	.9767	2.00	6
.9491	.9318	.9133	.8999	.9094	.9244	.9402	.9562	.9695	.9716	2.50	7
.9420	.9228	.9019	.8869	.8976	.9143	.9319	.9496	.9643	.9665	3.00	8
.9289	.9062	.8813	.8635	.8762	.8956	.9161	.9368	.9538	.9561	4.00	9
.9171	.8914	.8632	.8429	.8570	.8786	.9015	.9245	.9435	.9458	5.00	10
.9011	.8720	.8397	.8162	.8319	.8557	.8812	.9069	.9280	.9302	6.50	11
.8868	.8551	.8195	.7934	.8099	.8352	.8625	.8900	.9125	.9147	8.00	12
.8694	.8352	.7961	.7672	.7841	.8105	.8393	.8684	.8921	.8941	10.00	13
.8460	.8091	.7662	.7339	.7503	.7772	.8070	.8373	.8618	.8634	13.00	14
.8245	.7861	.7403	.7055	.7206	.7470	.7769	.8074	.8318	.8330	16.00	15
.7979	.7584	.7099	.6724	.6851	.7101	.7391	.7690	.7925	.7931	20.00	16
.7664	.7264	.6756	.6356	.6450	.6673	.6944	.7228	.7447	.7444	25.00	17
.7361	.6962	.6437	.6020	.6080	.6272	.6521	.6784	.6983	.6971	30.00	18
.6776	.6387	.5845	.5405	.5400	.5531	.5730	.5952	.6108	.6078	40.00	19
.6214	.5840	.5293	.4843	.4783	.4857	.5010	.5191	.5306	.5262	50.00	20
.5417	.5070	.4530	.4082	.3958	.3961	.4055	.4185	.4251	.4190	65.00	21
.4682	.4363	.3845	.3411	.3244	.3196	.3247	.3338	.3369	.3302	80.00	22
.3806	.3525	.3053	.2653	.2457	.2367	.2380	.2436	.2438	.2371	100.00	23
.2719	.2492	.2107	.1777	.1580	.1469	.1453	.1479	.1460	.1400	130.00	24
.1886	.1708	.1413	.1157	.0987	.0880	.0856	.0863	.0839	.0789	160.00	25
.1107	.0986	.0795	.0625	.0501	.0416	.0393	.0388	.0367	.0333	200.00	26
.0530	.0462	.0362	.0270	.0198	.0144	.0129	.0124	.0112	.0096	250.00	27
.0238	.0203	.0155	.0110	.0073	.0044	.0037	.0034	.0029	.0024	300.00	28
.0040	.0033	.0025	.0017	.0009	.0003	.0002	.0002	.0001	.0001	400.00	29
.0005	.0004	.0003	.0002	.0001	.0000	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

of these values (Fig. 10). It can be seen that the curves representing the main R-branch of the 15μ CO_2 band form a family, the members of which are similar in shape, only displaced downward as the distance from the center of the band increases. 678.0 cm^{-1} represents the maximum absorption in the R-branch at atmospheric temperatures.

At frequencies near the main Q-branch, the behavior is somewhat different. At low pressures the absorption is much greater than in the R-branch but does not increase as rapidly with increasing pressure. This gives rise to a striking feature of the graph: below about 60 mb the absorption for a vertical path in the strongest part of the R-branch, is greater than the strongest part of the Q-branch, for the SIRS instrument response function. This characteristic can also be observed in the transmissivities averaged over 5 cm^{-1} intervals, although it occurs at a higher pressure.

The calculations also make it clear that in the upper atmosphere, for the SIRS instrument response function, the maximum absorption takes place at 668 cm^{-1}, rather than at 669 cm^{-1} where the 5 cm^{-1} interval transmissivities have an absorption maximum. On the basis of these figures, the present channel at 669 cm^{-1} should be moved to 668 cm^{-1}, where absorption is greater at high altitudes.

The outgoing vertical intensity of radiation, as seen by the SIRS, has been determined for the U. S. Standard Atmosphere, 1962, between 665 and 714 cm^{-1} and is presented in Fig. 11.

Comparision of Table II with Appendix C show that it is important to calculate absorption for an instrument response function, rather than an average over an interval in the band corresponding to the instrument's resolution. This is a persuasive argument against the use of a band model.

5.4 ACCURACY OF THE CALCULATIONS

Throughout this report a number of assumptions have been made, which affect the accuracy of the calculations. The most critical of these are listed below and their influence discussed.

a. In the author's view the most important factor is the Lorentz half-width, α_L, which was taken to be 0.064 cm^{-1} for all lines. Test calculations showed that the effect of variations in α_L depended on the pressure, line strength, and position relative to other lines. Its effect was least at low pressures.

b. The accuracy of the line strengths and positions has been fully discussed by Young.[4]

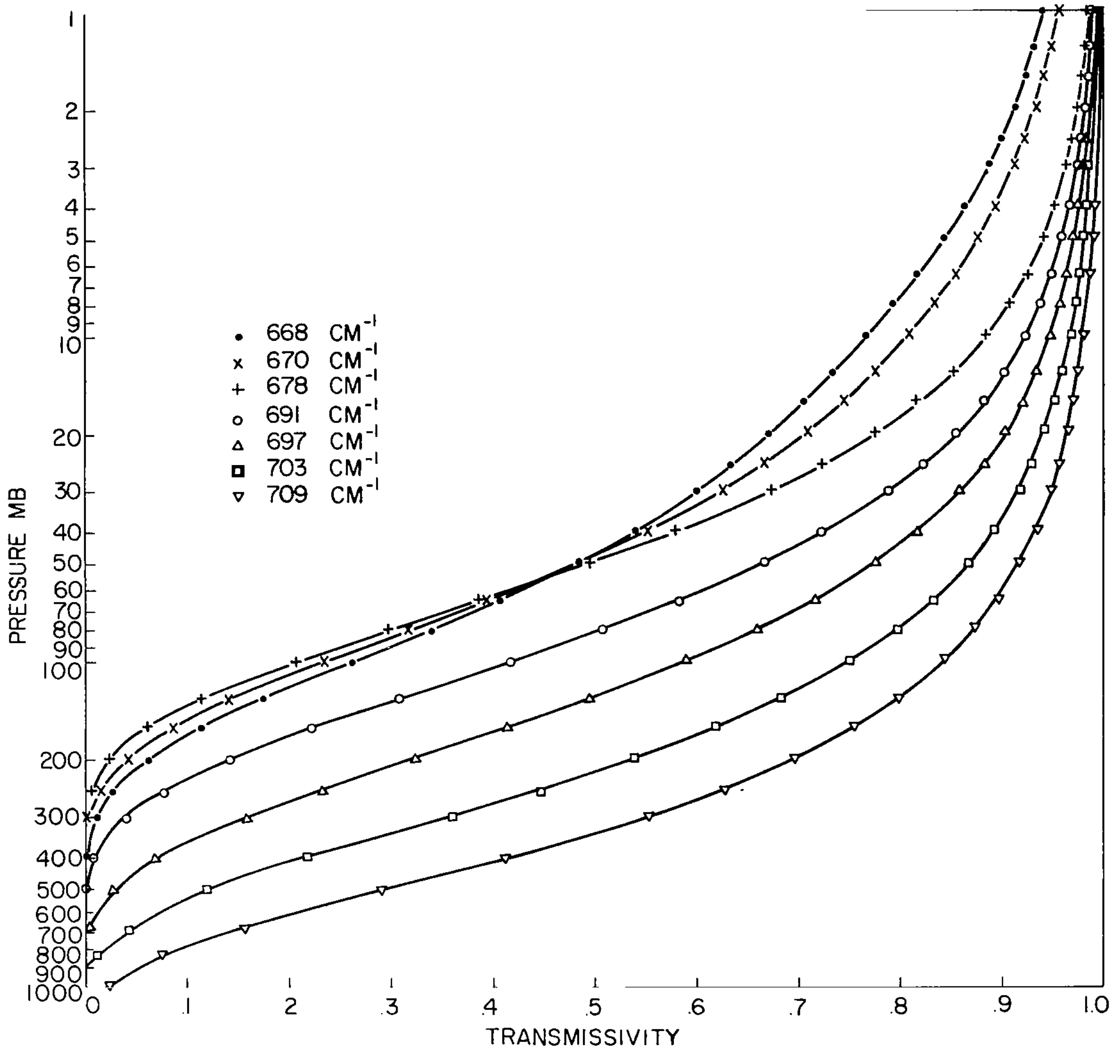

Fig. 10. Transmission for a vertical path starting outside the earth's atmosphere down to given pressure levels. SIRS response function (5 cm^{-1} resolution, triangular shape).

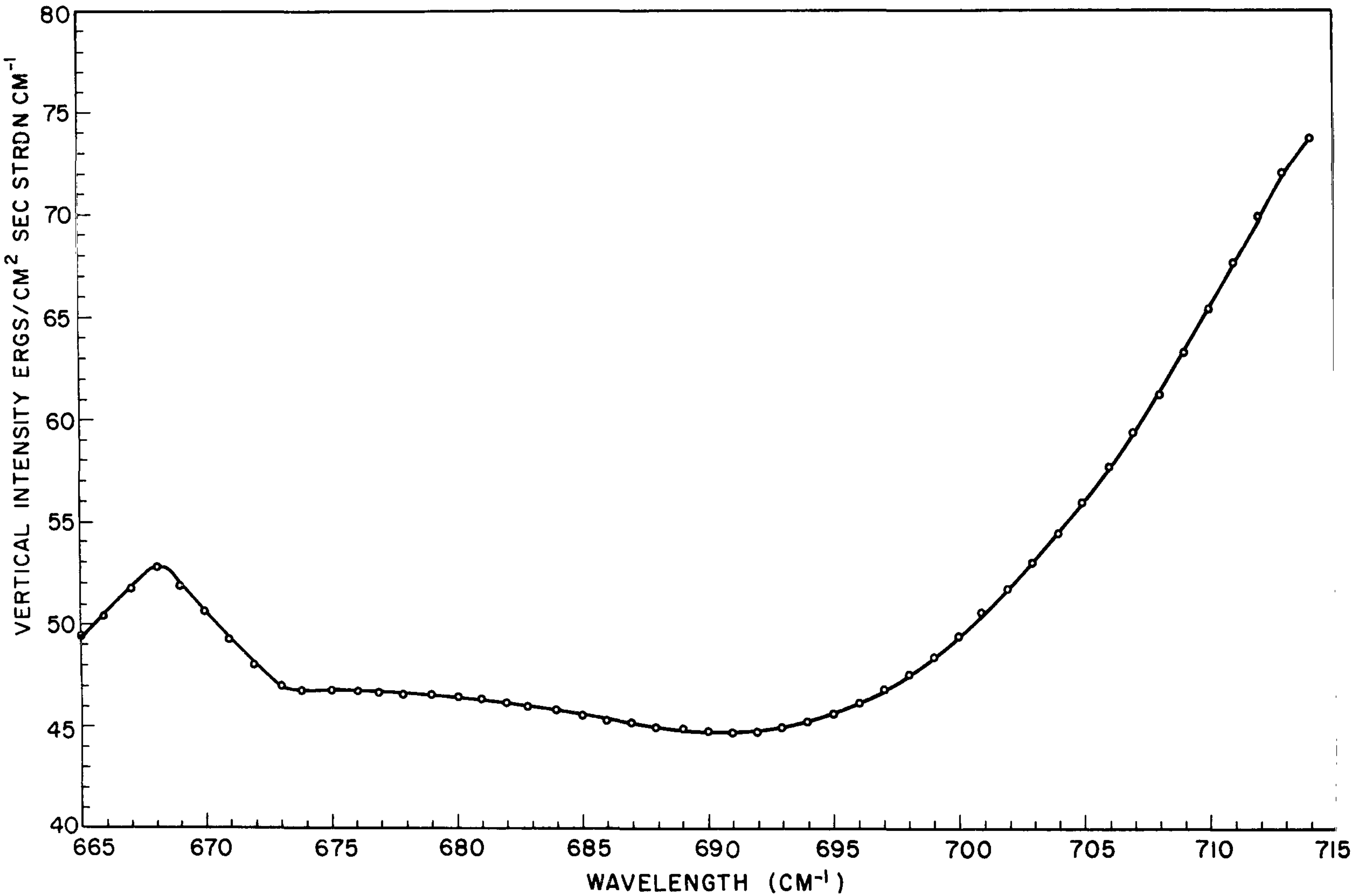

Fig. 11. Vertical component of outgoing atmospheric radiation as seen by SIRS. U. S. Standard Atmosphere, 1962.

c. Departures of temperatures from the U. S. Standard Atmosphere are important in some parts of the band, where the line strengths are rapidly varying functions of the temperature. Calculations were made for small portions of the band with a temperature profile exactly 10°K less than the U. S. Standard Atmosphere (Table III).

TABLE III. COMPARISON BETWEEN TRANSMISSIVITIES AVERAGED OVER 1.0 cm^{-1} INTERVALS. CALCULATED FOR U. S. STANDARD ATMOSPHERE, 1962, AND SAME ATMOSPHERE LESS 10°K AT ALL LEVELS.

	556 cm^{-1}		652 cm^{-1}		661 cm^{-1}		669 cm^{-1}	
p(mb)	U.S. Stand.	-10°K	U.S. Stand.	-10°K	U.S. Stand.	-10°K	U.S. Stand.	-10°K
1	1.0000	1.0000	.9832	.9832	.9871	.9870	.9525	.9592
5	.9999	1.0000	.9295	.9302	.9432	.9416	.8945	.9019
20	.9999	.9999	.7403	.7427	.7714	.7684	.7525	.7871
50	.9997	.9998	.4341	.4384	.4785	.4737	.5066	.5584
200	.9982	.9984	.0117	.0120	.0187	.0183	.0225	.0316
1000	.9601	.9629	.0000	.0000	.0000	.0000	.0000	.0000

Comparison shows that the higher temperature produces a greater absorption in most regions (up to 10% between 668.5 and 669.5 cm^{-1}), although in other parts of the band where the absorption is dominated by strong lines whose strength decreases with increasing temperature, the opposite effect may be observed (660.5 to 661.5 cm^{-1}). As the temperature increases the shape of the absorption curve can be expected to change slowly and the total absorption for the band to increase slightly. The effect of temperature on line half-widths (Doppler and Lorentz) seems to be of secondary importance.

d. Small variations in the CO_2 concentration, provided a constant mixing ratio is retained, have a negligible influence, but corrected transmissions may be obtained by interpolation over the zenith angle; increasing the zenith angle from Θ_1 to Θ_2 is equivalent to multiplying the CO_2 concentration by $\cos \Theta_1/\cos \Theta_2$.

All transmissivities have been given to four significant figures; the fourth figure should be correct in almost all cases.

In view of these approximations, it is tempting to argue that there is no point in carrying out calculations to such a high degree of accuracy. This ignores two basic points.

a. The present calculations should be regarded as preliminary: when more accurate data are available the techniques will be fully developed for their utilization. Until recently, the theoretical knowledge of the 15μ CO_2 band exceeded the capacity to put it to use; the situation is now reversed.

b. For some problems, e.g., radiative cooling in the atmosphere, it is *extremely important*, with given initial assumptions, to be able to calculate radiative transfer precisely. It is not sufficient to be able to obtain a rough representation of most of a band with a band model if it cannot predict transfer in special regions (e.g., Q-branches in the 15μ CO_2 band), which are particularly influential.

5.5 COMPARISON WITH GATES ET AL.[15,16]

Shortly after the present calculations were initiated, a paper by Gates, et al.,[15] appeared in which transmission calculations for the 2.7μ water vapor band were presented, made by integration across the band rather than by use of a band model. The approach is fundamentally the same but the emphasis here has been placed on atmospheric slant paths, rather than homogeneous paths. In addition the wide range of pressure has made it necessary to use mixed Doppler-Lorentz broadening.

6. CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

As a result of the calculations that have been made, it is possible to come to some significant conclusions regarding atmospheric radiative transfer in the 15μ CO_2 band.

a. Band models can no longer be considered useful where accurate work is required. Even the best model falls far short especially for certain regions of fundamental importance. The models can be criticized on several grounds:

   (1) Most important, they do not adequately represent the line positions and strengths.

   (2) They force the use of the Curtis-Godson approximations.

   (3) Their simplicity is lost when the mixed line shape is introduced.

   (4) Instrument response functions cannot be built in.

   (5) Variation of Lorentz half-widths are not easy to accommodate. Although the present calculations assume a fixed α_L, it would be easy to modify the program for a variable half-width.

b. The mixed Doppler-Lorentz line shape should be used at pressures lower than 100 mb. Below 10 mb the errors introduced by the use of pure Lorentz broadening can become quite severe.

c. The Curtis-Godson approximation, which has undeniable utility for rough calculations, should be abandoned for highly accurate work. A method for its elimination has been developed.

d. Values of transmission for instruments should be obtained by integration of the instrument response function. These values can differ radically from the average transmission over a frequency interval equal to the instrument's resolution.

It is now evident that a considerable amount of investigation should be carried out in the near future.

a. A concerted effort should be made to determine the variation of α_L from line to line.

b. Calculations are now underway of the transmission for homogeneous paths, so that direct comparison can be made with laboratory data (cf., Gates *et al.*[15,16]) and other theoretical calculations. As a result of the comparisons it may be possible to arrive at some more accurate values of band intensities or half-widths.

c. A renewed attempt will be made to find the cooling rate in the upper atmosphere due to the 15μ CO_2 band.

It is hoped the tables presented will be useful for atmospheric infrared radiation calculations, particularly in those regions where reliable theoretical data were hitherto unobtainable.

7. REFERENCES

1. Winters, B. H., Silverman, S., and Benedict, W. S., "Line Shape in the Wing Beyond the Band Head of the 4.3μ band of CO_2," J. Quant. Spectrosc. Radiat. Transfer, 4, 527 (1964).

2. Kaplan, L. D. and Eggers, D. F., Jr., "Intensity and Line-Width of the 15-Micron CO_2 Band, Determined by a Curve-of-Growth Method," J. Chemical Physics, 25, 876 (1956).

3. Madden, R. P., "A High Resolution Study of CO_2 Absorption Spectra Between 15 and 18 Microns," J. Chemical Physics, 35, 2083 (1961).

4. Young, C., "A Study of the Influence of Carbon Dioxide on Infrared Radiative Transfer in the Stratosphere and Mesosphere," University of Michigan, Department of Meteorology and Oceanography, Technical Report 04682-1-T, March, 1964.

5. Goody, R. M., Atmospheric Radiation. I. Theoretical Basis, Oxford, 1964.

6. Plass, G. N., "Models for Spectral Band Absorption," J. Opt. Society of America, 48, 690 (1958).

7. Kaplan, L. D., "A Method for Calculation of Infrared Flux for Use in Numerical Models of Atmospheric Motion," The Atmosphere and Sea in Motion, Rossby Memorial Volume, 1959, p. 170.

8. Plass, G. N. and Fivel, D. I., "Influence of Doppler Effects and Damping on Line-Absorption Coefficient and Atmospheric Radiation Transfer, Astrophys. J., 117, 225 (1953).

9. Elasser, W. M., "Mean Absorption and Equivalent Absorption Coefficient of a Band Spectrum," Physical Review, 34, 126 (1938).

10. Goody, R. M., "A Statistical Model for Water-Vapor Absorption," Q.J.R.M.S., 78, 165 (1952).

11. Wyatt, P. J., Stull, V. R., and Plass, G. N., "Quasi-Random Model of Band Absorption," J. Opt. Soc. of America, 52, 1209 (1962).

12. Stull, V. R., Wyatt, P. J., and Plass, G. N., "Infrared Transmission Studies," Final Report, Vol. III, The Infrared Absorption of Carbon Dioxide, Report No. SSD-TDR-62-127-Volume III (1963).

13. U. S. Standard Atmosphere, 1962, U. S. Government Printing Office, Washington D. C. (1962).

14. Plass, G. N., "Transmittance Tables for Slant Paths in the Stratosphere, Infrared Transmission Studies," Final Report, Volume V, Report No. SSD-TDR-62-127, Volume V (1963).

15. Gates, D. M., Calfee, R. F. and Hansen, D. W., "Computed Transmission Spectra for 2.7 Micron H_2O Band," Applied Optics, 2, 1117 (1963).

16. Gates, D. M., Calfee, R. F., Hansen, D. W. and Benedict, W. S., "Line Parameters and Computed Spectra for Water Vapor Bands at 2.7μ," NBS Monograph 71, August, 1964.

APPENDIX A

CDC 3600 FORTRAN PROGRAMS FOR COMPUTING THE TRANSMISSIVITIES

```
      PROGRAM SUBPROG
      COMMON NOSTRG,L,NOINT,NOIN,NEND,IWARN
      DIMENSION NOSTRG(10),L(100),NOINT(72),NEND(144),IWARN(10)
      DIMENSION ISTRGL(100),IWEAKL(100),IVST(300),BNUS(1000),INUS(1000),
     1IHORLO(100),IBELOW(100),BNUW(1010),INUW(1010),NOWEAK(10),MIWEAK(10
     10),D(1000),SM(18),ISS(1010),ST(6,982),WT(6,1010)
      DIMENSION ENDPT(144),HIORLO(100),BELOW(100)
  200 FORMAT (F6.2,6E10.4)
  201 FORMAT (F6.2,I5)
  281 FORMAT (6X,7I5,F7.1)
  250 FORMAT (1H1,F6.2,12I2,2I4,11I2,10I1/(6X,6E10.4))
  251 FORMAT (6X,14(I1,I4))
  252 FORMAT (6X,14(2I1,I3))
  253 FORMAT ((6X,24(I3)))
  260 FORMAT (24H0 TOTAL EXECUTION TIME = F6.2, 8H. MINUTES)
      TIMA=TIMEF(0)
      REWIND 20
      READ INPUT TAPE 5, 200,(BNUS(I),(ST(J,I),J=1,6),I=1,982),(BNUW(I),
     1(WT(J,I),J=1,6),I=1,1008)
      DO 301 I=1,982
  301 ISS(I)=(I-1)*6
      I1=1
      I2=1
      IONE=1
      ITWO=0
      I3=1
      KID=1
      INUS(983)=100000
      INUW(1009)=100000
      ISTO = 1
      IO = 1
      DO 302 I=1,1008
  302 INUW(I)=(BNUW(I)+.001)*100.
      JJ = 1
      JJJ=4
      DO 303 I=1,982
      IF ( ST(JJJ)-.1) 304,304,305
  305 IVST(JJ) = I
      JJ = JJ+1
  304 JJJ = JJJ+6
  303 INUS(I)=(BNUS(I)+.001)*100.
      JJ = JJ-1
  300 READ INPUT TAPE 5,201,ANUZ,NUMBER
      ICOUNT=0
  802 NUZ=ANUZ+.001
      NUZZ=(NUZ/10)*10
      AVNU=NUZZ
      AVNU=4.5+AVNU
      NUZY=NUZZ*100
      NUZX = NUZY-750
      IS=IONE
      DO 600 I=IS,982
      IF (NUZX-INUS(I)) 601,601,600
  601 IONE=I
      GO TO 602
  600 CONTINUE
      IONE=983
      ITWO1=982
      GO TO 607
```

```
602 NUZV = NUZY+1650
    IS=XMAXOF(ITWO,1)
    DO 603 I=IS,982
    IF (NUZV-INUS(I)) 604,603,603
604 ITWO1=I-1
    GO TO 607
603 CONTINUE
    ITWO1=982
607 CONTINUE
    IOUT = XMAXOF(ITWO+1,IONE)
    ITWO=ITWO1
    NUZY=NUZY-50
    IS=I3
    DO 620 I=IS,1008
    IF (INUW(I)-NUZY) 620,621,621
621 I3=I
    GO TO 622
620 CONTINUE
    I3=1009
622 IS=I3
    NUZY=NUZY+1000
    DO 623 I=IS,1008
    IF (INUW(I)-NUZY) 623,623,624
624 I4=I-1
    GO TO 630
623 CONTINUE
    I4=1008
630 IMAXW=I4-I3+1
    IK=I3-1
    WRITE OUTPUT TAPE 6,281, IONE,ITWO,IOUT,IMAXW,IK,I3,I4,AVNU
    WRITE TAPE 20,IONE,ITWO,IMAXW,IK,AVNU
    IF (IOUT-ITWO) 611,611,610
611 WRITE TAPE 20,(BNUS(I),(ST(J,I),J=1,6),I=IOUT,ITWO)
610 CONTINUE
    IF (IMAXW) 627,627,626
626 WRITE TAPE 20,(BNUW(I),(WT(J,I),J=1,6),I=I3,I4)
627 CONTINUE
801 NUZ=(ANUZ-.499)*100.
    DO 307 K=IO,1008
    IF (INUW(K)-NUZ) 308,309,309
309 I=K
    GO TO 310
308 CONTINUE
307 CONTINUE
    I=1009
310 CONTINUE
    DO 311 K = ISTO,982
    IF (INUS(K)-NUZ) 311,313,313
313 IST = K
    GO TO 312
311 CONTINUE
    IST=983
312 NUZ = ANUZ+.001
    NUZM=NUZ*100-60
    DO 320 K = KID,JJ
    KK = IVST(K)
    KD = K
    IF (INUS(KK)-NUZM) 320,320,322
320 CONTINUE
```

```
      KD=JJ+1
  322 KID = KD-1
      II = 1
      ITOTAL = 0
      IIS = 1
      JTOTAL = 0
      DO 351 J=1,10
      INUZM = NUZM + 10*J
      MIDNU = INUZM+5
  331 IF (982-KID) 445,446,446
  445 IWARN(J)=1
      GO TO 336
  446 KAD=IVST(KID)
      IF (MIDNU-INUS(KAD)-10) 332,332,333
  333 KID = KID+1
      GO TO 331
  332 IWARN(J) = 1
      IF(XABSF(MIDNU-INUS(KAD))-10) 335,336,336
  335 IWARN(J) = 0
  336 NOWEAK(J) = 0
      NOSTRG(J) = 0
  340 IF (1009-I) 342,342,440
  440 IALFA=INUW(I)-INUZM
      IF (IALFA-10) 341,341,342
  341 NOWEAK(J) = NOWEAK(J)+1
      ITOTAL = ITOTAL +1
      IWEAKL(II)=I
      MTWEAK(II)=1
      IF (IALFA-10) 343,344,343
  344 MTWEAK(II) = 2
      II = II+1
      GO TO 342
  343 IF (IALFA) 346,346,345
  346 MTWEAK(II) = 2
  345 II = II+1
      I = I+1
      GO TO 340
  342 CONTINUE
      IO = I
  400 IF (IST-983) 410,351,351
  410 JALFA=INUS(IST)-INUZM
      IF (JALFA-10) 350,350,351
  350 L(IIS) = JALFA
      NOSTRG(J) = NOSTRG(J)+1
      JTOTAL = JTOTAL+1
      ISTRGL(IIS)=IST
      IF (JALFA-10) 352,353,352
  353 IHORLO(IIS) = 1
      IBELOW(IIS) = 1
      IF (INUS(IST)-INUS(IST-1)-1) 354,354,355
  354 IBELOW(IIS) = 0
  355 IIS = IIS+1
      GO TO 351
  352 IF (JALFA) 356,356,357
  356 IHORLO(IIS) = 1
      IBELOW(IIS) = 1
      IF (INUS(IST+1)-INUS(IST)-1) 358,358,359
  358 IBELOW(IIS) = 0
  359 GO TO 360
```

```
357 IHORLO(IIS) = 2
    IBELOW(IIS) = 2
    IF (INUS(IST+1)-INUS(IST)-1) 361,361,362
361 IBELOW(IIS) = 1
362 IF (INUS(IST)-INUS(IST-1)-1) 363,363,364
363 IBELOW(IIS) = IBELOW(IIS)-1
364 CONTINUE
360 IIS = IIS+1
    IST = IST+1
    GO TO 400
351 CONTINUE
    ISTO=IST
    BNU = ANUZ-7.5
    IS=XMAXOF(1,I1)
    DO 460 I=IS,982
    IF (BNU-BNUS(I)) 461,460,460
461 I1 = I-1
    GO TO 462
460 CONTINUE
    I1=982
462 BNU = ANUZ +7.5
    IS=I2
    DO 463 I=IS,982
    IF (BNU-BNUS(I)) 464,464,463
464 I2 = I
    GO TO 465
463 CONTINUE
    I2=983
465 IFIRST = I1+1
    ILAST = I2-1
    KK = 0
    DO 370 M1=0,2
    Y = M1-1
    BNU = ANUZ+Y/2.
    IF (I1)401,401,402
402 DO 371 I=1,I1
371 D(I) = (BNUS(I)-BNU)*(BNUS(I)-BNU)
    IF(982-I2) 403,401,401
401 DO 372 I=I2,982
372 D(I) = (BNUS(I)-BNU)*(BNUS(I)-BNU)
403 DO 370 K=1,6
    S = 0.
    KK = KK+1
    IF (I1) 405,405,406
406 DO 373 I=1,I1
    ISUB = ISS(I)+K
373 S = S+ST(ISUB)/D(I)
    IF (982-I2) 370,405,405
405 DO 374 I=I2,982
    ISUB = ISS(I)+K
374 S = S+ST(ISUB)/D(I)
370 SM(KK) = S
    CALL GRONK
    WRITE OUTPUT TAPE 6,250,ANUZ,ITOTAL,(NOWEAK(I),I=1,10),JTOTAL,
   1IFIRST,ILAST,(NOSTRG(I),I=1,10),NOIN,(NOINT(I),I=1,10),(SM(I),I=1,
   218)
    WRITE TAPE 20,ANUZ,ITOTAL,(NOWEAK(I),I=1,10),JTOTAL,IFIRST,ILAST,
   1(NOSTRG(I),I=1,10),NOIN,(NOINT(I),I=1,10),(SM(I),I=1,18)
    IF (ITOTAL) 380,380,381
```

```
381 WRITE OUTPUT TAPE 6,251,(MTWEAK(I),IWEAKL(I),I=1,ITOTAL)
    WRITE TAPE 20,(MTWEAK(I),IWEAKL(I),I=1,ITOTAL)
380 IF (JTOTAL) 383,383,382
382 WRITE OUTPUT TAPE6,252,(IBELOW(I),IHORLO(I),ISTRGL(I),I=1,JTOTAL)
    DO 900 I=1,JTOTAL
    BELOW(I)=IBELOW(I)
900 HIORLO(I)=IHORLO(I)
    WRITE TAPE 20,(BELOW(I),HIORLO(I),ISTRGL(I),I=1,JTOTAL)
383 IF (NOIN) 385,385,384
384 NON = NOIN*2
    WRITE OUTPUT TAPE 6,253,(NEND(I),I=1,NON)
    DO 901 I=1,NON
901 ENDPT(I)=NEND(I)*.01
    WRITE TAPE 20,(ENDPT(I),I=1,NON)
385 CONTINUE
    ICOUNT=ICOUNT+1
    IF (NUMBER-ICOUNT) 300,300,306
306 ANUZ = ANUZ +1.
    NUZ=ANUZ+.001
    IF (NUZ-(NUZ/10)*10) 801,802,801
300 TIMB=TIMEF(0)
    TOTTIM=(TIMB-TIMA)*.001/60.
    WRITE OUTPUT TAPE 6,260,TOTTIM
    END FILE 20
    REWIND 20
    END
```

```
      SUBROUTINE GRONK
      COMMON NOSTRG,L,NOINT,NOIN,NEND,IWARN
      DIMENSION NOSTRG(10),L(100),NOINT(72),NEND(144),IWARN(10)
      KK = 1
      M1 = 1
      DO 300 I = 1,10
      MINIT = M1
      M = 0
      J = NOSTRG(I)
      IF (J) 301,301,302
  301 NEND(M1) = 0
      NEND(M1+1) = 10
      M1 = M1+2
      M = 1
      GO TO 320
  302 K = 1
      IF (L(KK)-2) 330,303,303
  303 NEND(M1) = 0
      NEND(M1+1) = L(KK)-1
      M1 = M1+2
      M = M+1
  330 IF(K-J) 304,340,304
  304 IF (L(KK+1)-L(KK)-2) 305,305,306
  306 NEND(M1) = L(KK)+1
      NEND(M1+1) = L(KK+1)-1
      M1 = M1+2
      M = M+1
  305 K = K+1
      KK = KK+1
      IF(K-J)  330,340,330
  340 IF (L(KK)-8)  307,307,350
  307 NEND(M1) = L(KK)+1
      NEND(M1+1) = 10
      M = M+1
      M1 = M1+2
  350 KK = KK+1
  320 CONTINUE
      IF (IWARN(I)) 311,311,312
  311 MZERO = M
      JJ=1
  201 IF (JJ-MZERO) 321,321,380
  321 IF (NEND(MINIT+1)-NEND(MINIT)-3) 360,360,323
  323 M=M+2
      IX=NEND(MINIT+1)-NEND(MINIT)
      I1=(IX+1)/3
      I2=(2*IX+1)/3
      MALL = M1 - MINIT -1
      DO 370 II=1,MALL
      MSUB = M1-II
  370 NEND(MSUB+4)=NEND(MSUB)
      NEND(MINIT+1)=NEND(MINIT)+I1
      NEND(MINIT+2)=NEND(MINIT+1)
      NEND(MINIT+3)=NEND(MINIT)+I2
      NEND(MINIT+4)=NEND(MINIT+3)
      M1=M1+4
      MINIT=MINIT+4
  360 MINIT = MINIT+2
      JJ=JJ+1
      GO TO 201
```

```
  380 CONTINUE
  312 NOINT(I) = M
  300 CONTINUE
      M1 = M1-1
      NOIN = M1/2
      RETURN
      END
```

```
$DATA

        DATA IS-

          982 STRONG LINE POSITION AND STRENGTH CARDS
         1008    WEAK LINE POSITION AND STRENGTH CARDS
         STARTING FREQUENCY(=500.0) AND NUMBER(=360) OF INTERVALS
```

```
      PROGRAM MAIN
      COMMON AKNU,ALFA,ANU,ANUZ,BETA,CNR,CO2PI2,G,GAMA,PZ,PZA,SEC,SN,
     1SQTA,SRZ,SRZA,SSL,ST,TRAN,TRANC,TRANS,WAIT,WWA,II,IST,JMAX,KADD,
     2KMAX,KSLA,M,KMESS,KSTOP
      DIMENSION AKNU(1260),ANU(225),ALFA(35),BETA(35),CNR(35),G(36),
     1GAMA(35),PZ(35),    SEC(6),SSL(6,225),SN(150),SRZ(36),ST(7875),
     2            TRANC(210),TRANS(210),WAIT(36),IST(225),PZA(35),SRZA(3
     35),SQTA(35)  ,TRAN(10,210)
       DIMENSION AL(35),BELOW(100),ENDPT(100),ENGTH(36),ENG(9),PI(36),
     1P(35),PDI(35),SM(18),SQT(35),TI(36),T(35),TM(35),W(36),WWL(6,120),
     2WT(35),WAB(4),ISTRGL(100),IWEAKL(100),IA(225),ITN(35),MTWEAK(100),
     3NOINT(10),NOSTRG(10),NOWEAK(10),HIORLO(100),IZEN(6)
      DIMENSION PDIG(35),ADOP(35),PAV(35),ZA(20),ZW(20),GNU(36),JUMP(35)
      TIMA=TIMEF(0)
      CALL TRAP
      TIMEON = TIMA
      REWIND 20
      REWIND 21
      MAXNU=859
      G(1)=1.
      SRZ(1)=0.
      CALL KNUMIX(X,Y,OUT,1)
      READ INPUT TAPE 5,800,KMAX,KSLA,PCO2,Y1,Y2,(W(I),I=1,4),(ZA(I),I=1
     1,10),(ZW(I),I=1,10),(ENDPT(I),I=1,10),(ENG(I),I=1,9),(IZEN(I),
     2SEC(I),I=1,KSLA)
      DO 530 I=1,10
      ZA(I+10)=-ZA(I)
  530 ZW(I+10)=ZW(I)
      DO 531 I=1,9
      WBA=(ENDPT(I+1)-ENDPT(I))/2.
      WBB = WBA+ENDPT(I)
      WAA1=WBA*Y1
      WAA2=WBA*Y2
      GNU(4*I-3)=WBB-WAA1
      GNU(4*I-2)=WBB-WAA2
      GNU(4*I-1)=WBB+WAA2
  531 GNU(4*I)=WBB+WAA1
      AAA= .064
      PPP=1013.25
      TTT=298.0
      DOP=5.974E-4/(700.*SQRTF(250.))
      ELOG2=LOGF(2.)
      PILOG=SQRTF(ELOG2/3.1415927)
      ELOG2=SQRTF(ELOG2)
      DOPA=DOP/ELOG2
      ROOTPI=SQRTF(3.1415927)
      ALLAIR=7600./1.2250*1.35951/288.15*273.15
      ALLCO2=ALLAIR*PCO2
      CO2PMB=ALLCO2/PPP
      CO2PI=CO2PMB/3.1415927
      CO2PI2=CO2PI/2.
      DO 510 K=5,36
  510 W(K)=W(K-4)
      DO 511 J=1,36
      L=(J+3)/4
  511 ENGTH(J)=W(J)*ENG(L)
      KMESS=10*(KMAX*KSLA-1)
       KO= KMAX*KSLA
      KLOT=KO*10
```

```
      KNU = KMAX*36
      AAA=AAA/PPP
      ALPHA=AAA*AAA*TTT
      DO 500 I=1,225
      JA = I-1
      IST(I) = KMAX*JA
  500 IA(I)=6*JA
      KADD = KMAX*10
      ISWCH = 1
      KPLUS=KMAX+1
      READ INPUT TAPE 5, 801,(PI(K),TI(K),K=1,KPLUS)
      I1=-1
      PLOOK=10.
      DO 100 K=1,KMAX
      KPLUS=K+1
      P(K)=PI(KPLUS)
      T(K)=TI(KPLUS)
      TA=(TI(K)+T(K))/2.
      SQT(K)=SQRTF(TA)
      SRZ(KPLUS) = P(K)*P(K)
      PZA(K) = .009*P(K)
      SRZA(K) = SRZ(KPLUS) - SRZ(K)
      PZ(K) = .00025*P(K)
      ALFA(K) = ALPHA/TA
      SQTA(K)=SQRTF(ALFA(K))
      CNR(K)=CO2PI2/SQTA(K)
      BETA(K)=ALFA(K)*SRZA(K)
      GAMA(K) = ALFA(K)*SRZ(K)
      AL(K)=SQTA(K)*(PI(K)+P(K))/2.
      PDI(K)=(P(K)-PI(K))*CO2PMB
      ADOP(K)=DOPA*SQT(K)
      PAV(K)=(PI(K)+P(K))/2.
      PDIG(K)=(P(K)-PI(K))/2.
      IF (P(K)-PLOOK) 970,970,971
  971 I1=I1+1
      PLOOK=PLOOK*11.
  970 JUMP(K)=I1
      TAA = TA - 325.
      DO 101 N = 1,6
      TAA = TAA + 25.
      IF (TAA) 101,101,102
  102 ITN(K) = N
      GO TO 103
  101 CONTINUE
  103 TN = ITN(K)
      TP = 325. - 25.*TN
  100 TM(K) = (TA-TP)/25.
      TIMB=TIMEF(0)
      TIM = (TIMB-TIMA)*.001
      WRITE OUTPUT TAPE 6,860,TIM
      TIMA=TIMB
  110 READ TAPE 20,IFIRST,ILAST,IMAXW,IK,AVNU
      ISUB=1
      DO 900 I=1,36
      DELNU=GNU(I)
      IF (DELNU-.003)  901,902,902
  901 I1=-1
      GO TO 903
  902 IF (DELNU-.2) 904,905,905
```

```
904 I1=0
    GO TO 903
905 I1=1
903 CONTINUE
    DO 909 K=1,KMAX
    IF (JUMP(K)) 910,911,940
910 IF (I1) 920,930,940
911 IF (I1) 930,930,940
940 YB=BETA(K)/(GAMA(K)+DELNU*DELNU)
    YB=YB/(YB+2.)
    YC=YB*YB
    OUT=CO2PI/SQTA(K)*YB*(1.+YC*(.33333333+.2*YC))
    GO TO 950
930 OUT=0.
    DOPLER=AVNU*ADOP(K)
    DO 931 J=1,20
    YB=BETA(K)/(GAMA(K)+(DELNU-ZA(J)*DOPLER)*(DELNU-ZA(J)*DOPLER))
    IF (YB-.2) 932,932,933
932 YB=YB/(YB+2.)
    YC=YB*YB
    OUT=OUT+YB*(1.+YC*(.33333333+.2*YC))*ZW(J)*2.
    GO TO 931
933 OUT=OUT+LOGF(1.+YB)*ZW(J)
931 CONTINUE
    OUT=OUT/ROOTPI*CNR(K)
    GO TO 950
920 DOPLER = AVNU*ADOP(K)
    YY=SQTA(K)/DOPLER
    X=DELNU/DOPLER
    Y=YY*(PAV(K)-.57735027*PDIG(K))
    CALL KNUMIX(X,Y,OUT1,2)
    Y=YY*(PAV(K)+.57735027*PDIG(K))
    CALL KNUMIX(X,Y,OUT,2)
    OUT=(OUT+OUT1)*PDIG(K)/DOPLER*CO2PMB/ROOTPI
950 AKNU(ISUB)=OUT
909 ISUB=ISUB+1
900 CONTINUE
    IJ = IFIRST-1
    IMAX = ILAST-IJ
    GO TO (401,402),ISWCH
401 IJKL=1
    GO TO 403
402 IJK=ILASTA-IFIRST+1
    IF(IJK)401,401,404
404 ISHIFT=IMAXA-IJK
    IF (ISHIFT) 410,410,411
411 DO 405 I=1,IJK
    J = I+ISHIFT
405 ANU(I)=ANU(J)
    ISHIFT = ISHIFT*KMAX
    IJKJ = IJK*KMAX
    DO 406 I=1,IJKJ
    J=I+ISHIFT
406 ST(I)=ST(J)
410 IJKL = IJK+1
403 IF (IMAX-IJKL) 412,413,413
413 READ TAPE 20          ,(ANU(I),(SSL(J,I),J=1,6),I=IJKL,IMAX)
    ISUB=IST(IJKL)
    DO 450 I=IJKL,IMAX
```

```
      DO 450 K=1,KMAX
      ISUB=ISUB+1
      JA = IA(I)+ITN(K)
      SSL1 = SSL(JA-1)
      SSL2 = SSL(JA)
      SSL3 = SSL(JA+1)
  450 ST(ISUB) = SSL2+((SSL1+SSL3-SSL2-SSL2)*TM(K)+SSL1-SSL3)*TM(K)/2.
  412 ILASTA = ILAST
      IMAXA = IMAX
      ISWCH = 2
      IF (IMAXW) 420,420,421
  421 READ TAPE 20,(DUMMY,(WWL(J,I),J=1,6),I=1,IMAXW)
  420 CONTINUE
      TIMB=TIMEF(0)
      TIM = (TIMB-TIMA)*.001
      WRITE OUTPUT TAPE 6,861,TIM
      TIMA=TIMB
  120 READ TAPE 20,          ANUZ,ITOTAL ,(NOWEAK(I),I=1,10),JTOTAL,I1,I2
     1,(NOSTRG(I),I=1,10),NOIN,(NOINT(I),I=1,10),(SM(I),I=1,18)
      IF (ITOTAL) 380,380,381
  381 READ TAPE 20,          (MTWEAK(I),IWEAKL(I),I=1,ITOTAL)
  380 IF (JTOTAL) 383,383,382
  382 READ TAPE 20,          (BELOW(I),HIORLO(I),ISTRGL(I),I=1,JTOTAL)
  383 IF (NOIN) 385,385,384
  384 NON = NOIN*2
      READ TAPE 20,          (ENDPT(I),I=1,NON)
  385 CONTINUE
      I1 = I1 - IJ
      I2 = I2-IJ
      DO 130 K=1,KMAX
      DO 130 N=1,3
      JA = IA(N)+ITN(K)
      SUM1 = SM(JA-1)
      SUM2 = SM(JA)
      SUM3 = SM(JA+1)
      ISUB = IST(N) + K
  130 SN(ISUB)=SUM2+((SUM3+SUM1-SUM2-SUM2)*TM(K)+SUM1-SUM3)*TM(K)/2.
      M1 = 1
      M2 = 1
      M3 = 1
      DO 303 M = 1,10
      ANUO = M-6
      ANUO = ANUZ + ANUO*.1
      IF  (NOINT(M)) 304,304,305
  304 DO 1304 I=1,KO
 1304 TRAN(M,I)=0.
      GO TO 2304
  305 NOIN = NOINT(M)
      DO 999 I=1,KO
  999 TRANS(I)=0.
      DO 306 MM = 1,NOIN
      WA = ENDPT(M1)
      WB = ENDPT(M1+1)
      KSTOP = KMAX+1
      WBA=(WB-WA)/2.
      WBAA=WBA*10.
      WBB=WBA+WA
      WAA1=WBA*Y1
      WAA2=WBA*Y2
```

```
      WAB(1) = WBB - WAA1
      WAB(2) = WBB - WAA2
      WAB(3) = WBB + WAA2
      WAB(4) = WBB + WAA1
      DO 200 III = 1,4
      II = III
      BAD = WAB(II) + ANUO
      WWA = W(II)*WBAA
      CALL LOOKAT(BAD,I1,I2,1)
  200 CONTINUE
  306 M1 = M1+2
 2304 CONTINUE
      IF (NOSTRG(M)) 307,307,308
  308 NOST = NOSTRG(M)
      DO 309 MM = 1,NOST
      LS = ISTRGL(M2)-IJ
      FACTER = HIORLO(M2)*.05
      FACTOR = BELOW(M2)*.05
      DO 211 K=1,KO
  211 TRANC(K) = 0.
      DO 212 J = 1,12
  212 WAIT(J) = W(J)/10.*FACTER
      DO 213 J=13,16
  213 WAIT(J) = W(J)/5.*FACTER
      DO 214 J=17,20
  214 WAIT(J) = W(J)/2.*FACTOR
      JMAX = 20
      ISUB=IST(LS)+1
      CALL CENTRE(ST(ISUB))
      IF (LS-I1) 203,203,202
  202 CALL LOOKAT(ANU(LS),I1,LS-1,2)
  203 CALL LOOKAT(ANU(LS),LS+1,I2,3)
  309 M2 = M2+1
  307 CONTINUE
      IF (NOWEAK(M)) 303,303,311
  311 NOWE = NOWEAK(M)
      IWSCH=0
      DO 312 MM = 1,NOWE
      ISUB = IWEAKL(M3)-IK
      DO 600 K=1,KMAX
      JA = IA(ISUB)+ITN(K)
      SSL1 = WWL(JA-1)
      SSL2 = WWL(JA)
      SSL3 = WWL(JA+1)
  600 WT(K) = SSL2+((SSL1+SSL3-SSL2-SSL2)*TM(K)+SSL1-SSL3)*TM(K)/2.
      IF (MTWEAK(M3)-1) 601,601,602
  601 DO 603 K=1,KO
  603 TRANC(K) =-19.
      IF (IWSCH-1) 650,605,650
  650 IWSCH=1
      DO 604 J=1,36
  604 WAIT(J)=10.*ENGTH(J)
      GO TO 605
  602 DO 606 K=1,KO
  606 TRANC(K) = -9.
      IF (IWSCH-2) 651,605,651
  651 IWSCH=2
      DO 607 J = 1,36
  607 WAIT(J)=5.*ENGTH(J)
```

```
 605 JMAX = 36
     CALL CENTRE(WT)
     KSUB = M
     DO 620 K=1,KO
     TRAN(KSUB)=TRAN(KSUB)*TRANC(K)
 620 KSUB = KSUB+10
 312 M3 = M3+1
 303 CONTINUE
     WRITE OUTPUT TAPE 6,850,ANUZ,IZEN(I),((TRAN(J,K),J=1,10),P(K),K,
    1K=1,KMAX)
     WRITE OUTPUT TAPE 21,851,ANUZ,(TRAN(K),K=1,KLOT)
     TIMB=TIMEF(0)
     TIM = (TIMB-TIMA)*.001
     WRITE OUTPUT TAPE 6,862,TIM
     TIMA=TIMB
     NUZ=ANUZ+1.1
     IF(MAXNU-NUZ) 1000,1001,1001
1001 IF(NUZ-(NUZ/10)*10) 110,110,120
1000 TIMB=TIMEF(0)
     TIM=(TIMB-TIMEON)*.001/60.
     WRITE OUTPUT TAPE 6,863,TIM
     REWIND 20
     END FILE 21
     REWIND 21
 800 FORMAT (2I3,F6.4,2F10.8/4F12.10/5F14.8/5F14.8/5E14.8/5E14.8/
    110F6.3/9F6.3/(5(I3,F10.7)))
 801 FORMAT (F7.2,F6.1)
 850 FORMAT (56H1 TRANSMISSION IN THE ONE INVERSE CM INTERVAL CENTRED A
    1T F6.1,51H INVERSE CM, AVERAGED OVER .1 INVERSE CM INTERVALS. /
    216H0 ZENITH ANGLE = I3,8H DEGREES/1H0,10F8.4,F10.2,I5/(1H ,10F8.4,
    3F10.2,I5))
 860 FORMAT (43H0 TIME FOR FIRST SECTION OF THE PROGRAM  = F6.1,8H SECO
    1NDS)
 861 FORMAT (43H0 TIME FOR MIDDLE SECTION OF THE PROGRAM = F6.1,8H SECO
    1NDS)
 862 FORMAT (43H0 TIME FOR CALCULATION IN THIS INTERVAL  = F6.1,8H SECO
    1NDS)
 863 FORMAT (43H0 TOTAL EXECUTION TIME FOR THE PROGRAM   = F6.1,8H MINU
    1TES)
 851 FORMAT (1H1,F6.1/(1H 17F7.4))
     END
```

```
      SUBROUTINE LOOKAT (FREQUE,III1,III2,II4)
      COMMON AKNU,ALFA,ANU,ANUZ,BETA,CNR,CQ2PI2,G,GAMA,PZ,PZA,SEC,SN,
     1SQTA,SRZ,SRZA,SSL,ST,TRAN,TRANC,TRANS,WAIT,WWA,II,IST,JMAX,KADD,
     2KMAX,KSLA,M,KMESS,KSTOP
      DIMENSION AKNU(1260),ANU(225),ALFA(35),BETA(35),CNR(35),G(36),
     1GAMA(35),PZ(35),    SEC(6),SSL(6,225),SN(150),SRZ(36),ST(7875),
     2            TRANC(210),TRANS(210),WAIT(36),IST(225),PZA(35),SRZA(3
     35),SQTA(35) ,TRAN(10,210)
      DIMENSION ANY(225),ANZ(225),KN(225),GI(6)
      II1 = III1
      II2 = III2
      FREQ = FREQUE
      KSLANT=0
      JSLANT=M+KMESS
      F = 0.
      DO 200 I=II1,II2
      ANZ(I) = ANU(I)-FREQ
      ANY(I) = ANZ(I)*ANZ(I)
      KN(I) = 2
      ISUB = IST(I) +1
      IF ( ST(ISUB)/(ANY(I)*ANY(I))-.001 ) 200,200,201
  201 KN(I) = 1
  200 CONTINUE
      ANUN=FREQ-ANUZ
      DO 202 K=1,KMAX
      SRE = 0.
      KP = K+1
      SNNU = 0.
      IF ( G(K)-.00005 ) 300,300,203
  203 IF ( K-KSTOP ) 204,300,300
  204 GO TO (303,304,303),II4
  303 SN1 = SN(K)
      JA = K+KMAX
      SN2 = SN(JA)
      JA = JA+KMAX
      SN3 = SN(JA)
      SNNU = ((SN3+SN1-SN2-SN2)*ANUN*2.+SN3-SN1)*ANUN+SN2
  304 CONTINUE
      DO 214 I=II1,II2
      KK = KN(I)
      GO TO (206,207), KK
  206 IF (ABSF(ANZ(I))-PZA(K) ) 208,208,207
  208 ISUB=IST(I)+K
      YB=BETA(K)/(ANY(I)+GAMA(K))
      IF (YB-.2) 210,210,209
  209 SNNUA=LOGF(1.+YB)
      GO TO 501
  210 YB=YB/(2.+YB)
      YC=YB*YB
      SNNUA=2.*YB*(1.+YC*(.33333333+.2*YC))
  501 SRE=SRE-SNNUA*ST(ISUB)*CNR(K)
      GO TO 214
  207 ISUB = IST(I)+K
      SNNU = SNNU + ST(ISUB)/ANY(I)
  214 CONTINUE
      F=F+SRE-SNNU*SRZA(K)*SQTA(K)*CO2PI2
      DO 310 ISLANT = 1,KSLA
  310 GI(ISLANT)=EXPF(F*SEC(ISLANT))
      G(KP)=GI(1)
```

```
      GO TO 215
  300 G(KP) = 0.
      DO 311 ISLANT=1,KSLA
  311 GI(ISLANT) = 0.
  215 CONTINUE
      JSLANT=JSLANT-KMESS
      GO TO (220,217,218),II4
  220 DO 340 ISLANT=1,KSLA
      KSLANT = KSLANT+1
      TRANS(KSLANT)=TRANS(KSLANT)+WWA*GI(ISLANT)
      TRAN(JSLANT)=TRANS(KSLANT)
  340 JSLANT=JSLANT+KADD
      GO TO 202
  217 KSLANT=K
      DO 321 ISLANT=1,KSLA
      TRANC(KSLANT)=TRANC(KSLANT)*GI(ISLANT)
  321 KSLANT=KSLANT+KMAX
      GO TO 202
  218 KSLANT=K
      DO 322 ISLANT = 1,KSLA
      TRAN(JSLANT) = TRAN(JSLANT) + TRANC(KSLANT)*GI(ISLANT)
      KSLANT=KSLANT+KMAX
  322 JSLANT = JSLANT+KADD
  202 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CENTRE(WT)
      COMMON AKNU,ALFA,ANU,ANUZ,BETA,CNR,CO2PI2,G,GAMA,PZ,PZA,SEC,SN,
     1SQTA,SRZ,SRZA,SSL,ST,TRAN,TRANC,TRANS,WAIT,WWA,II,IST,JMAX,KADD,
     2KMAX,KSLA,M,KMESS,KSTOP
      DIMENSION AKNU(1260),ANU(225),ALFA(35),BETA(35),CNR(35),G(36),
     1GAMA(35),PZ(35),    SEC(6),SSL(6,225),SN(150),SRZ(36),ST(7875),
     2             TRANC(210),TRANS(210),WAIT(36),IST(225),PZA(35),SRZA(3
     35),SQTA(35) ,TRAN(10,210)
      DIMENSION WT(40)
      DO 200 J =1,JMAX
      EXPIT = 0.
      ISUB = IST(J)
      DO 201 K = 1,KMAX
      IF (EXPIT+9.25) 200,200,211
  211 ISUB = ISUB+1
      EXPIT = EXPIT-AKNU(ISUB)*WT(K)
      KSUB = K
      DO 202 ISLANT = 1,KSLA
      TRANC(KSUB)=TRANC(KSUB)+WAIT(J)*EXPF(EXPIT*SEC(ISLANT))
  202 KSUB = KSUB+KMAX
  201 CONTINUE
  200 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE KNUMIX(XIN,YIN,OUT,I1)
      DIMENSION A(42),HH(10),XX(10)
      DIMENSION RA(32),CA(32),RB(32),CB(32),B(44),AK(5),AM(5),DY(4)
      GO TO (400,401),I1
  400 READ INPUT TAPE 5,710,(HH(I),I=1,10),(XX(I),I=1,10),(A(I),I=1,42)
      RETURN
  710 FORMAT (5E14.8/5E14.8/5F14.8/5F14.8/(5E14.8))
  401 X=XIN
      Y = YIN
      X2 = X*X
      Y2 = Y*Y
      IF (X-10.) 200,201,201
  200 IF (Y-1.) 202,202,203
  203 RA(1) = 0.
      CA(1) = 0.
      RB(1) = 1.
      CB(1) = 0.
      RA(2) = X
      CA(2) = Y
      RB(2) = .5-X2+Y2
      CB(2) = -2.*X*Y
      CB1 = CB(2)
      UV1=0.
      DO 250 J=2,31
      JMINUS = J-1
      JPLUS = J+1
      FLOATJ = JMINUS
      RB1 = 2.*FLOATJ+RB(2)
      RA1 = -FLOATJ*(2.*FLOATJ-1.)/2.
      RA(JPLUS)=RB1*RA(J)-CB1*CA(J)+RA1*RA(JMINUS)
      CA(JPLUS)=RB1*CA(J)+CB1*RA(J)+RA1*CA(JMINUS)
      RB(JPLUS)=RB1*RB(J)-CB1*CB(J)+RA1*RB(JMINUS)
      CB(JPLUS)=RB1*CB(J)+CB1*RB(J)+RA1*CB(JMINUS)
      UV=(CA(JPLUS)*RB(JPLUS)-RA(JPLUS)*CB(JPLUS))/(RB(JPLUS)*RB(JPLUS)+
     1CB(JPLUS)*CB(JPLUS))
      IF (ABSF(UV-UV1)-1.E-6) 251,250,250
  250 UV1=UV
  251 OUT = UV/1.772454
      RETURN
  202 IF (X-2.) 301,301,302
  301 AINT = 1.
      MAX = 12.+5.*X2
      KMAX = MAX-1
      DO 303 K=0,KMAX
      AJ = MAX-K
  303 AINT = AINT*(-2.*X2)/(2.*AJ+1.)+1.
      U = -2.*X*AINT
      GO TO 304
  302 IF (X-4.5) 305,306,306
  305 B(43)=0.
      B(44) = 0.
      J = 42
      DO 307 K = 1,42
      B(J) = .4*X*B(J+1)-B(J+2)+A(J)
  307 J = J-1
      U = B(3)-B(1)
      GO TO 304
  306 AINT = 1.0
      MAX = 2.+40./X
```

```
      AMAX = MAX
      DO 308 K=1,MAX
      AINT = AINT*(2.*AMAX-1.)/(2.*X2)+1.
  308 AMAX = AMAX -1.
      U = -AINT/X
  304 V=1.772454*EXPF(-X2)
      H = .02
      JM = Y/H
      IF (JM) 310,311,310
  311 H=Y
  310 Z = 0.
      L = 0
      DY(1) = 0.
  312 DY(2) = H/2.
      DY(3) = DY(2)
      DY(4) = H
  318 AK(1) = 0.
      AM(1) = 0.
      DO 313 J=1,4
      YY = Z+DY(J)
      UU = U+.5*AK(J)
      VV = V+.5*AM(J)
      AK(J+1) = 2.*(YY*UU+X*VV)*H
      AM(J+1) = -2.*(1.+X*UU-YY*VV)*H
      IF (J-3) 313,314,313
  314 AK(4)=2.*AK(4)
      AM(4) = AM(4)+AM(4)
  313 CONTINUE
      Z=Z+H
      L = L+1
      U = U+.1666667*(AK(2)+2.*AK(3)+AK(4)+AK(5))
      V = V+.1666667*(AM(2)+AM(3)+AM(3)+AM(4)+AM(5))
      IF(JM) 315,320,315
  315 IF (L-JM) 318,317,320
  317 AJM = JM
      H = Y-AJM*H
      GO TO 312
  320 OUT = V/1.772454
      RETURN
  201 F1 = 0.
      DO 330 J=1,10
  330 F1=F1+HH(J)/(Y2+(X-XX(J))*(X-XX(J)))+HH(J)/(Y2+(X+XX(J))*(X+XX(J))
     1)
      OUT = Y*F1/3.1415927
      RETURN
      END
```

```
$DATA
  .46224367E 0   .28667551E 0   .10901721E 0   .24810521E-1   .32437733E-2
  .22833864E-3   .78025565E-5   .10860694E-6   .43993410E-9  .22939360E-12
     .24534071       .73747373     1.2340762      1.7385377      2.254974
    2.7888061      3.3478546      3.944764       4.6036824      5.3874809
  .00000000E 0   .19999999E 0   .00000000E 0-0.18400000E 0   .00000000E 0
  .15583999E 0   .00000000E 0-0.12166400E 0   .00000000E 0   .87708159E-1
  .00000000E 0-0.58514124E-1   .00000000E 0   .36215730E-1   .00000000E 0
-0.20849765E-1   .00000000E-0   .11196011E-1   .00000000E 0-0.56231896E-2
  .00000000E 0   .26487634E-2   .00000000E 0-0.11732670E-2   .00000000E 0
  .48995199E-3   .00000000E 0-0.19336308E-3   .00000000E 0   .72287745E-4
  .00000000E00-0.25655512E-4   .00000000E 0   .86620736E-5   .00000000E 0
-0.27876379E-5   .00000000E 0   .85668736E-6   .00000000E00-0.25184337E-6
  .00000000E 0   .70936022E-7
 34   6 .0314 .86113631 .33998104
 .3478548451 .6521451549 .6521451549 .3478548451
     .24534071       .73747373     1.2340762      1.7385377      2.254974
    2.7888061      3.3478546      3.944764       4.6036824      5.3874809
  .46224367E 0   .28667551E 0   .10901721E 0   .24810521E-1   .32437733E-2
  .22833864E-3   .78025565E-5   .10860694E-6   .43993410E-9  .22939360E-12
  .000   .001   .002   .003   .005   .010   .040   .100   .500 1.000
  .001   .001   .001   .002   .005   .030   .060   .400   .500
  0 1.0000000 15 1.0352762 30 1.1547005 45 1.4142136 60 2.0000000
 75 3.8637033
0000.00 270.7
0000.30 270.7
0000.60 270.7
0001.00 270.7
0001.30 267.10
0001.60 262.6
0002.00 257.9
0002.50 253.2
0003.00 249.4
0004.00 243.6
0005.00 239.2
0006.50 234.1
0008.00 230.1
0010.00 227.7
0013.00 226.0
0016.00 224.6
0020.00 223.1
0025.00 221.7
0030.00 220.5
0040.00 218.6
0050.00 217.2
0065.00 216.7
0080.00 216.7
0100.00 216.7
0130.00 216.7
0160.00 216.7
0200.00 216.7
0250.00 220.7
0300.00 228.5
0400.00 241.5
0500.00 251.9
0650.00 264.8
0800.00 275.5
1000.00 287.5
1013.25 288.2
```

APPENDIX B

TRANSMISSIVITIES AVERAGED OVER 5.0 cm^{-1} INTERVALS BETWEEN 502.0 AND 857.0 cm^{-1}

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 502.0 AND 511.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

502.0	503.0	504.0	505.0	506.0	507.0	508.0	509.0	510.0	511.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	40.00	19
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	50.00	20
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	65.00	21
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	80.00	22
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	100.00	23
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	130.00	24
.9997	.9997	.9997	.9997	.9996	.9996	.9996	.9996	.9996	.9996	160.00	25
.9995	.9995	.9995	.9995	.9994	.9994	.9994	.9994	.9994	.9994	200.00	26
.9992	.9992	.9992	.9991	.9991	.9991	.9991	.9991	.9991	.9991	250.00	27
.9988	.9988	.9988	.9988	.9988	.9987	.9987	.9987	.9987	.9987	300.00	28
.9979	.9979	.9979	.9978	.9978	.9978	.9977	.9977	.9977	.9977	400.00	29
.9968	.9967	.9967	.9966	.9966	.9965	.9965	.9964	.9964	.9963	500.00	30
.9945	.9945	.9944	.9943	.9943	.9942	.9941	.9940	.9939	.9938	650.00	31
.9918	.9917	.9916	.9915	.9913	.9912	.9911	.9909	.9908	.9907	800.00	32
.9872	.9870	.9869	.9867	.9865	.9863	.9861	.9859	.9856	.9855	1000.00	33
.9869	.9867	.9865	.9863	.9861	.9859	.9857	.9855	.9852	.9851	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 512.0 AND 521.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

512.0	513.0	514.0	515.0	516.0	517.0	518.0	519.0	520.0	521.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	40.00	19
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	50.00	20
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	65.00	21
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	80.00	22
.9999	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9997	100.00	23
.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9996	.9996	.9996	130.00	24
.9996	.9996	.9996	.9996	.9996	.9996	.9996	.9995	.9995	.9995	160.00	25
.9994	.9994	.9994	.9994	.9994	.9993	.9993	.9993	.9993	.9992	200.00	26
.9991	.9991	.9990	.9990	.9990	.9990	.9989	.9989	.9989	.9988	250.00	27
.9987	.9986	.9986	.9986	.9985	.9985	.9985	.9984	.9984	.9984	300.00	28
.9976	.9976	.9975	.9975	.9974	.9974	.9973	.9972	.9972	.9971	400.00	29
.9963	.9962	.9961	.9961	.9960	.9959	.9958	.9957	.9957	.9955	500.00	30
.9937	.9936	.9935	.9933	.9933	.9931	.9929	.9927	.9927	.9924	650.00	31
.9905	.9903	.9901	.9899	.9898	.9895	.9892	.9889	.9889	.9884	800.00	32
.9852	.9849	.9846	.9842	.9840	.9835	.9831	.9825	.9826	.9817	1000.00	33
.9848	.9845	.9842	.9838	.9836	.9831	.9826	.9821	.9821	.9813	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 522.0 AND 531.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

522.0	523.0	524.0	525.0	526.0	527.0	528.0	529.0	530.0	531.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	16.00	15
1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	20.00	16
1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	25.00	17
1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	30.00	18
1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	40.00	19
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	50.00	20
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	65.00	21
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9997	.9998	80.00	22
.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9996	.9996	.9997	100.00	23
.9996	.9996	.9996	.9996	.9996	.9995	.9996	.9995	.9995	.9995	130.00	24
.9995	.9995	.9995	.9994	.9993	.9993	.9993	.9993	.9992	.9993	160.00	25
.9992	.9992	.9992	.9991	.9991	.9990	.9990	.9989	.9989	.9990	200.00	26
.9988	.9987	.9988	.9987	.9986	.9985	.9986	.9985	.9984	.9985	250.00	27
.9983	.9982	.9982	.9981	.9980	.9980	.9980	.9979	.9978	.9979	300.00	28
.9970	.9969	.9969	.9967	.9966	.9965	.9965	.9963	.9962	.9963	400.00	29
.9953	.9952	.9952	.9949	.9947	.9945	.9946	.9943	.9941	.9943	500.00	30
.9921	.9918	.9919	.9914	.9911	.9908	.9910	.9904	.9901	.9904	650.00	31
.9880	.9875	.9876	.9869	.9864	.9860	.9863	.9854	.9850	.9855	800.00	32
.9811	.9804	.9806	.9794	.9787	.9780	.9785	.9770	.9764	.9772	1000.00	33
.9806	.9799	.9801	.9788	.9781	.9774	.9780	.9764	.9758	.9766	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 532.0 AND 541.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

532.0	533.0	534.0	535.0	536.0	537.0	538.0	539.0	540.0	541.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	13.00	14
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	16.00	15
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	20.00	16
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	25.00	17
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	30.00	18
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	40.00	19
.9999	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	50.00	20
.9998	.9997	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	65.00	21
.9998	.9997	.9998	.9998	.9997	.9998	.9998	.9998	.9998	.9998	80.00	22
.9997	.9996	.9997	.9997	.9996	.9997	.9997	.9997	.9997	.9998	100.00	23
.9995	.9994	.9995	.9995	.9994	.9994	.9995	.9994	.9995	.9995	130.00	24
.9993	.9992	.9993	.9993	.9992	.9992	.9993	.9992	.9993	.9993	160.00	25
.9990	.9989	.9990	.9989	.9989	.9989	.9989	.9989	.9989	.9990	200.00	26
.9985	.9983	.9984	.9984	.9983	.9984	.9984	.9983	.9984	.9984	250.00	27
.9978	.9977	.9978	.9978	.9976	.9977	.9977	.9977	.9977	.9978	300.00	28
.9962	.9960	.9961	.9961	.9959	.9960	.9961	.9959	.9961	.9961	400.00	29
.9942	.9938	.9940	.9940	.9937	.9939	.9939	.9937	.9939	.9940	500.00	30
.9902	.9896	.9900	.9899	.9894	.9897	.9898	.9894	.9897	.9899	650.00	31
.9852	.9842	.9848	.9847	.9839	.9845	.9846	.9841	.9845	.9848	800.00	32
.9768	.9753	.9763	.9761	.9749	.9758	.9760	.9752	.9759	.9762	1000.00	33
.9762	.9747	.9756	.9755	.9742	.9752	.9753	.9745	.9752	.9756	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 542.0 AND 551.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

542.0	543.0	544.0	545.0	546.0	547.0	548.0	549.0	550.0	551.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	10.00	13
1.0000	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	.9999	.9999	.9999	13.00	14
1.0000	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	.9999	.9999	.9999	16.00	15
1.0000	1.0000	1.0000	1.0000	.9999	1.0000	1.0000	.9999	.9999	.9999	20.00	16
1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	25.00	17
1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	30.00	18
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	40.00	19
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	50.00	20
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	65.00	21
.9998	.9997	.9997	.9997	.9996	.9997	.9997	.9997	.9997	.9997	80.00	22
.9997	.9997	.9997	.9996	.9996	.9996	.9996	.9995	.9996	.9995	100.00	23
.9995	.9994	.9994	.9994	.9993	.9994	.9994	.9994	.9994	.9993	130.00	24
.9992	.9992	.9992	.9991	.9991	.9991	.9991	.9991	.9991	.9991	160.00	25
.9988	.9988	.9988	.9987	.9986	.9987	.9987	.9986	.9987	.9986	200.00	26
.9983	.9982	.9982	.9981	.9980	.9982	.9981	.9980	.9980	.9979	250.00	27
.9976	.9975	.9975	.9974	.9972	.9974	.9973	.9972	.9972	.9971	300.00	28
.9958	.9956	.9956	.9954	.9952	.9954	.9954	.9951	.9951	.9950	400.00	29
.9935	.9932	.9932	.9929	.9926	.9929	.9928	.9924	.9925	.9922	500.00	30
.9891	.9886	.9886	.9881	.9876	.9881	.9879	.9872	.9873	.9868	650.00	31
.9835	.9828	.9827	.9820	.9812	.9819	.9817	.9806	.9807	.9799	800.00	32
.9743	.9731	.9729	.9718	.9706	.9716	.9714	.9697	.9698	.9685	1000.00	33
.9736	.9724	.9722	.9711	.9698	.9709	.9706	.9688	.9690	.9677	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 552.0 AND 561.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

552.0	553.0	554.0	555.0	556.0	557.0	558.0	559.0	560.0	561.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	4.00	9
1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	5.00	10
1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	6.50	11
1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	8.00	12
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	10.00	13
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	13.00	14
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	16.00	15
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	20.00	16
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	25.00	17
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	30.00	18
.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	.9998	40.00	19
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9997	50.00	20
.9998	.9998	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	65.00	21
.9997	.9997	.9996	.9996	.9996	.9996	.9996	.9996	.9995	.9995	80.00	22
.9995	.9995	.9995	.9995	.9995	.9994	.9994	.9995	.9994	.9994	100.00	23
.9993	.9993	.9993	.9992	.9992	.9992	.9992	.9992	.9991	.9991	130.00	24
.9991	.9990	.9990	.9989	.9989	.9989	.9988	.9989	.9987	.9987	160.00	25
.9986	.9985	.9985	.9984	.9984	.9984	.9983	.9984	.9982	.9982	200.00	26
.9979	.9978	.9977	.9977	.9976	.9976	.9975	.9976	.9974	.9973	250.00	27
.9970	.9969	.9969	.9968	.9967	.9966	.9966	.9966	.9964	.9963	300.00	28
.9949	.9947	.9946	.9944	.9943	.9941	.9940	.9940	.9936	.9935	400.00	29
.9920	.9918	.9915	.9913	.9911	.9908	.9906	.9906	.9900	.9898	500.00	30
.9865	.9861	.9857	.9853	.9848	.9844	.9840	.9839	.9828	.9823	650.00	31
.9795	.9788	.9781	.9775	.9767	.9761	.9753	.9752	.9734	.9725	800.00	32
.9678	.9666	.9654	.9644	.9630	.9619	.9606	.9601	.9572	.9557	1000.00	33
.9669	.9657	.9645	.9634	.9619	.9609	.9595	.9590	.9560	.9544	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 562.0 AND 571.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

562.0	563.0	564.0	565.0	566.0	567.0	568.0	569.0	570.0	571.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	.9998	1.30	4
1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	1.60	5
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	2.00	6
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	2.50	7
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	3.00	8
.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	.9997	4.00	9
.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	.9997	5.00	10
.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	.9996	6.50	11
.9999	.9999	.9999	.9999	.9998	.9998	.9997	.9997	.9997	.9996	8.00	12
.9999	.9999	.9999	.9999	.9998	.9998	.9997	.9997	.9997	.9996	10.00	13
.9999	.9999	.9998	.9998	.9998	.9998	.9997	.9997	.9996	.9995	13.00	14
.9999	.9998	.9998	.9998	.9998	.9998	.9997	.9997	.9996	.9994	16.00	15
.9998	.9998	.9998	.9998	.9998	.9997	.9996	.9996	.9996	.9994	20.00	16
.9998	.9998	.9998	.9998	.9997	.9997	.9996	.9995	.9995	.9993	25.00	17
.9998	.9998	.9998	.9997	.9997	.9997	.9995	.9995	.9995	.9992	30.00	18
.9997	.9997	.9997	.9996	.9996	.9995	.9994	.9993	.9993	.9990	40.00	19
.9997	.9997	.9996	.9995	.9995	.9995	.9993	.9992	.9992	.9988	50.00	20
.9996	.9996	.9995	.9994	.9994	.9993	.9991	.9991	.9990	.9986	65.00	21
.9995	.9994	.9994	.9993	.9993	.9992	.9990	.9989	.9988	.9983	80.00	22
.9993	.9993	.9992	.9991	.999[illegible]	.9990	.9987	.9986	.9985	.9980	100.00	23
.9990	.9989	.9989	.9987	.9987	.9986	.9982	.9981	.9979	.9973	130.00	24
.9986	.9986	.9985	.9983	.9983	.9981	.9977	.9975	.9973	.9966	160.00	25
.9980	.9980	.9979	.9976	.9976	.9974	.9969	.9967	.9964	.9955	200.00	26
.9971	.9970	.9969	.9966	.9965	.9963	.9957	.9954	.9951	.9939	250.00	27
.9960	.9959	.9957	.9954	.9952	.9949	.9941	.9938	.9934	.9919	300.00	28
.9931	.9929	.9926	.9920	.9917	.9912	.9899	.9893	.9886	.9863	400.00	29
.9891	.9888	.9883	.9873	.9869	.9860	.9840	.9830	.9819	.9784	500.00	30
.9811	.9805	.9795	.9778	.9769	.9752	.9716	.9699	.9679	.9617	650.00	31
.9705	.9694	.9677	.9649	.9634	.9607	.9548	.9523	.9489	.9393	800.00	32
.9522	.9502	.9473	.9427	.9399	.9353	.9256	.9215	.9158	.9009	1000.00	33
.9508	.9488	.9458	.9410	.9382	.9334	.9234	.9192	.9133	.8980	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 572.0 AND 581.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

572.0	573.0	574.0	575.0	576.0	577.0	578.0	579.0	580.0	581.0	PRESS(MB.)	
1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.30	1
.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	.9997	.9997	.60	2
.9999	.9999	.9998	.9998	.9998	.9997	.9997	.9997	.9995	.9995	1.00	3
.9998	.9998	.9998	.9998	.9997	.9996	.9996	.9995	.9994	.9994	1.30	4
.9998	.9998	.9997	.9997	.9997	.9995	.9996	.9995	.9993	.9993	1.60	5
.9998	.9998	.9997	.9997	.9996	.9995	.9995	.9994	.9992	.9992	2.00	6
.9998	.9997	.9996	.9996	.9996	.9994	.9994	.9993	.9991	.9990	2.50	7
.9997	.9997	.9996	.9996	.9995	.9993	.9993	.9992	.9990	.9990	3.00	8
.9997	.9997	.9995	.9995	.9995	.9992	.9992	.9991	.9988	.9988	4.00	9
.9996	.9996	.9995	.9994	.9994	.9991	.9991	.9989	.9986	.9986	5.00	10
.9996	.9996	.9994	.9994	.9993	.9990	.9990	.9988	.9985	.9984	6.50	11
.9995	.9995	.9993	.9993	.9992	.9989	.9989	.9987	.9983	.9982	8.00	12
.9995	.9995	.9993	.9992	.9991	.9988	.9988	.9985	.9981	.9980	10.00	13
.9995	.9994	.9992	.9991	.9990	.9986	.9986	.9983	.9978	.9977	13.00	14
.9994	.9993	.9990	.9990	.9989	.9984	.9984	.9981	.9976	.9975	16.00	15
.9993	.9993	.9989	.9989	.9988	.9982	.9982	.9979	.9972	.9971	20.00	16
.9992	.9992	.9988	.9987	.9986	.9980	.9980	.9976	.9968	.9967	25.00	17
.9992	.9991	.9986	.9986	.9984	.9977	.9977	.9973	.9964	.9963	30.00	18
.9989	.9988	.9983	.9983	.9981	.9972	.9972	.9967	.9956	.9955	40.00	19
.9987	.9986	.9981	.9980	.9977	.9968	.9967	.9961	.9949	.9947	50.00	20
.9985	.9984	.9977	.9976	.9973	.9961	.9961	.9953	.9938	.9936	65.00	21
.9982	.9980	.9972	.9971	.9967	.9954	.9953	.9944	.9927	.9924	80.00	22
.9978	.9976	.9966	.9965	.9960	.9944	.9943	.9932	.9911	.9907	100.00	23
.9971	.9968	.9956	.9954	.9949	.9929	.9927	.9913	.9887	.9882	130.00	24
.9963	.9960	.9946	.9944	.9937	.9913	.9911	.9894	.9861	.9855	160.00	25
.9952	.9948	.9931	.9928	.9919	.9890	.9887	.9866	.9826	.9818	200.00	26
.9935	.9930	.9909	.9904	.9893	.9858	.9853	.9827	.9777	.9766	250.00	27
.9914	.9908	.9882	.9876	.9862	.9817	.9811	.9778	.9715	.9702	300.00	28
.9855	.9844	.9803	.9793	.9770	.9702	.9691	.9638	.9539	.9520	400.00	29
.9771	.9754	.9690	.9675	.9640	.9538	.9521	.9439	.9293	.9265	500.00	30
.9595	.9565	.9457	.9430	.9372	.9204	.9173	.9037	.8800	.8758	650.00	31
.9358	.9312	.9147	.9106	.9015	.8771	.8723	.8520	.8180	.8122	800.00	32
.8954	.8882	.8629	.8564	.8426	.8070	.7996	.7698	.7216	.7135	1000.00	33
.8923	.8850	.8591	.8524	.8383	.8020	.7943	.7639	.7148	.7065	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 582.0 AND 591.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

582.0	583.0	584.0	585.0	586.0	587.0	588.0	589.0	590.0	591.0	PRESS(MB.)	
.9998	.9998	.9998	.9997	.9996	.9997	.9996	.9994	.9995	.9994	.30	1
.9996	.9995	.9996	.9995	.9993	.9994	.9993	.9991	.9992	.9991	.60	2
.9995	.9993	.9993	.9992	.9990	.9991	.9989	.9987	.9989	.9988	1.00	3
.9993	.9991	.9992	.9990	.9988	.9989	.9988	.9985	.9987	.9986	1.30	4
.9992	.9990	.9990	.9989	.9986	.9988	.9986	.9983	.9986	.9985	1.60	5
.9991	.9988	.9989	.9988	.9985	.9986	.9985	.9981	.9984	.9983	2.00	6
.9989	.9986	.9987	.9986	.9982	.9984	.9983	.9979	.9982	.9981	2.50	7
.9988	.9985	.9986	.9985	.9981	.9983	.9981	.9977	.9981	.9979	3.00	8
.9986	.9983	.9984	.9982	.9978	.9980	.9978	.9973	.9978	.9975	4.00	9
.9984	.9980	.9982	.9980	.9975	.9978	.9976	.9970	.9975	.9972	5.00	10
.9983	.9978	.9979	.9977	.9972	.9974	.9972	.9965	.9971	.9968	6.50	11
.9981	.9975	.9977	.9975	.9969	.9972	.9969	.9961	.9967	.9963	8.00	12
.9979	.9973	.9974	.9972	.9965	.9968	.9964	.9956	.9963	.9958	10.00	13
.9975	.9968	.9971	.9967	.9959	.9962	.9958	.9947	.9956	.9949	13.00	14
.9972	.9965	.9967	.9962	.9953	.9957	.9952	.9939	.9948	.9941	16.00	15
.9969	.9959	.9962	.9957	.9946	.9950	.9943	.9928	.9939	.9929	20.00	16
.9963	.9952	.9955	.9949	.9936	.9941	.9933	.9914	.9927	.9916	25.00	17
.9959	.9946	.9949	.9941	.9926	.9932	.9922	.9900	.9915	.9901	30.00	18
.9949	.9934	.9937	.9927	.9907	.9915	.9902	.9874	.9892	.9874	40.00	19
.9940	.9922	.9925	.9913	.9889	.9897	.9882	.9847	.9869	.9847	50.00	20
.9927	.9904	.9908	.9892	.9862	.9872	.9852	.9807	.9835	.9807	65.00	21
.9913	.9885	.9890	.9871	.9834	.9846	.9821	.9767	.9800	.9766	80.00	22
.9894	.9860	.9866	.9841	.9796	.9811	.9779	.9713	.9752	.9711	100.00	23
.9865	.9821	.9828	.9796	.9737	.9756	.9716	.9630	.9679	.9627	130.00	24
.9834	.9781	.9788	.9750	.9677	.9700	.9659	.9546	.9604	.9542	160.00	25
.9791	.9726	.9734	.9686	.9596	.9623	.9561	.9432	.9502	.9426	200.00	26
.9732	.9650	.9659	.9599	.9486	.9518	.9441	.9280	.9364	.9272	250.00	27
.9658	.9557	.9568	.9494	.9355	.9393	.9299	.9103	.9202	.9094	300.00	28
.9453	.9301	.9316	.9212	.9009	.9063	.8934	.8661	.8792	.8656	400.00	29
.9171	.8957	.8981	.8845	.8571	.8641	.8481	.8129	.8292	.8133	500.00	30
.8623	.8308	.8349	.8176	.7798	.7886	.7692	.7241	.7432	.7255	650.00	31
.7950	.7534	.7598	.7403	.6937	.7032	.6822	.6302	.6494	.6312	800.00	32
.6927	.6396	.6494	.6298	.5754	.5838	.5631	.5065	.5224	.5043	1000.00	33
.6855	.6318	.6419	.6223	.5675	.5759	.5552	.4985	.5141	.4960	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 592.0 AND 601.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

592.0	593.0	594.0	595.0	596.0	597.0	598.0	599.0	600.0	601.0	PRESS(MB.)	
.9992	.9994	.9993	.9988	.9988	.9987	.9984	.9987	.9989	.9988	.30	1
.9988	.9990	.9990	.9981	.9980	.9979	.9976	.9979	.9984	.9984	.60	2
.9984	.9987	.9987	.9974	.9972	.9971	.9967	.9971	.9979	.9980	1.00	3
.9982	.9986	.9985	.9969	.9967	.9966	.9961	.9965	.9976	.9978	1.30	4
.9981	.9984	.9984	.9965	.9962	.9961	.9955	.9960	.9973	.9976	1.60	5
.9978	.9983	.9982	.9961	.9956	.9955	.9949	.9955	.9969	.9973	2.00	6
.9976	.9981	.9980	.9955	.9950	.9949	.9942	.9948	.9965	.9969	2.50	7
.9973	.9978	.9977	.9950	.9944	.9943	.9935	.9942	.9961	.9966	3.00	8
.9969	.9975	.9974	.9942	.9934	.9933	.9923	.9932	.9954	.9959	4.00	9
.9965	.9972	.9970	.9934	.9925	.9923	.9912	.9922	.9947	.9952	5.00	10
.9959	.9967	.9964	.9922	.9913	.9910	.9897	.9908	.9937	.9942	6.50	11
.9954	.9962	.9959	.9912	.9902	.9899	.9883	.9896	.9927	.9932	8.00	12
.9946	.9956	.9952	.9898	.9888	.9884	.9865	.9880	.9915	.9918	10.00	13
.9935	.9947	.9942	.9878	.9867	.9861	.9838	.9857	.9896	.9897	13.00	14
.9924	.9937	.9931	.9858	.9847	.9840	.9813	.9835	.9879	.9878	16.00	15
.9909	.9925	.9917	.9832	.9820	.9813	.9779	.9806	.9854	.9850	20.00	16
.9891	.9909	.9900	.9800	.9788	.9778	.9737	.9769	.9825	.9817	25.00	17
.9872	.9894	.9882	.9768	.9757	.9745	.9696	.9734	.9795	.9783	30.00	18
.9836	.9863	.9848	.9707	.9695	.9680	.9616	.9665	.9738	.9717	40.00	19
.9800	.9833	.9814	.9647	.9636	.9617	.9539	.9599	.9681	.9651	50.00	20
.9746	.9788	.9764	.9559	.9549	.9525	.9425	.9500	.9597	.9553	65.00	21
.9693	.9743	.9713	.9472	.9463	.9433	.9312	.9402	.9512	.9455	80.00	22
.9621	.9682	.9645	.9358	.9350	.9313	.9164	.9273	.9398	.9325	100.00	23
.9512	.9589	.9542	.9192	.9185	.9135	.8946	.9082	.9225	.9130	130.00	24
.9403	.9495	.9439	.9031	.9023	.8962	.8733	.8894	.9051	.8934	160.00	25
.9256	.9366	.9299	.8822	.8813	.8736	.8458	.8649	.8818	.8673	200.00	26
.9061	.9193	.9112	.8558	.8543	.8450	.8111	.8337	.8515	.8339	250.00	27
.8840	.8995	.8900	.8272	.8247	.8137	.7737	.7997	.8177	.7980	300.00	28
.8309	.8511	.8393	.7643	.7565	.7428	.6914	.7231	.7398	.7196	400.00	29
.7697	.7936	.7801	.6975	.6819	.6665	.6059	.6410	.6537	.6372	500.00	30
.6710	.6973	.6823	.5954	.5667	.5502	.4821	.5171	.5228	.5158	650.00	31
.5698	.5944	.5790	.4933	.4543	.4382	.3697	.3997	.4006	.4033	800.00	32
.4403	.4583	.4433	.3653	.3204	.3065	.2460	.2658	.2641	.2752	1000.00	33
.4322	.4496	.4346	.3573	.3124	.2987	.2389	.2580	.2563	.2677	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 602.0 AND 611.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

602.0	603.0	604.0	605.0	606.0	607.0	608.0	609.0	610.0	611.0	PRESS(MB.)	
.9990	.9990	.9987	.9990	.9989	.9986	.9989	.9990	.9990	.9990	.30	1
.9987	.9987	.9983	.9987	.9986	.9982	.9986	.9986	.9986	.9986	.60	2
.9985	.9984	.9979	.9983	.9983	.9978	.9983	.9983	.9982	.9983	1.00	3
.9983	.9982	.9977	.9982	.9981	.9976	.9981	.9981	.9980	.9980	1.30	4
.9981	.9981	.9974	.9980	.9979	.9973	.9979	.9979	.9978	.9978	1.60	5
.9979	.9978	.9971	.9977	.9976	.9970	.9976	.9976	.9975	.9975	2.00	6
.9976	.9975	.9967	.9974	.9973	.9966	.9973	.9973	.9972	.9972	2.50	7
.9973	.9972	.9963	.9971	.9970	.9961	.9969	.9970	.9968	.9969	3.00	8
.9968	.9966	.9955	.9964	.9963	.9953	.9962	.9963	.9961	.9962	4.00	9
.9962	.9960	.9947	.9958	.9957	.9944	.9956	.9956	.9954	.9955	5.00	10
.9954	.9951	.9935	.9949	.9947	.9932	.9946	.9947	.9945	.9946	6.50	11
.9945	.9943	.9923	.9939	.9937	.9919	.9936	.9937	.9935	.9937	8.00	12
.9935	.9931	.9908	.9927	.9924	.9903	.9923	.9925	.9922	.9925	10.00	13
.9918	.9913	.9884	.9909	.9905	.9878	.9904	.9906	.9903	.9906	13.00	14
.9902	.9897	.9862	.9891	.9886	.9854	.9885	.9887	.9883	.9888	16.00	15
.9880	.9873	.9830	.9866	.9861	.9821	.9860	.9862	.9858	.9864	20.00	16
.9853	.9845	.9792	.9836	.9829	.9781	.9828	.9830	.9826	.9833	25.00	17
.9826	.9816	.9754	.9806	.9798	.9742	.9797	.9799	.9795	.9803	30.00	18
.9772	.9759	.9679	.9746	.9736	.9664	.9734	.9737	.9731	.9743	40.00	19
.9719	.9702	.9605	.9686	.9674	.9587	.9672	.9675	.9668	.9683	50.00	20
.9639	.9617	.9494	.9597	.9581	.9474	.9579	.9581	.9572	.9593	65.00	21
.9558	.9531	.9383	.9506	.9488	.9362	.9485	.9487	.9476	.9503	80.00	22
.9451	.9417	.9237	.9386	.9362	.9213	.9359	.9359	.9345	.9382	100.00	23
.9287	.9244	.9018	.9204	.9171	.8992	.9168	.9166	.9147	.9198	130.00	24
.9120	.9067	.8800	.9019	.8977	.8772	.8974	.8968	.8945	.9011	160.00	25
.8895	.8829	.8511	.8769	.8717	.8483	.8715	.8700	.8669	.8757	200.00	26
.8602	.8520	.8145	.8445	.8379	.8114	.8378	.8350	.8311	.8429	250.00	27
.8279	.8183	.7756	.8093	.8011	.7720	.8014	.7970	.7923	.8073	300.00	28
.7554	.7429	.6920	.7312	.7195	.6863	.7209	.7127	.7066	.7281	400.00	29
.6760	.6609	.6054	.6469	.6316	.5967	.6346	.6222	.6154	.6421	500.00	30
.5536	.5358	.4796	.5193	.4994	.4657	.5045	.4872	.4804	.5105	650.00	31
.4354	.4167	.3653	.3994	.3773	.3479	.3832	.3638	.3572	.3857	800.00	32
.2968	.2797	.2396	.2637	.2428	.2211	.2478	.2294	.2230	.2444	1000.00	33
.2886	.2716	.2324	.2559	.2352	.2140	.2400	.2218	.2154	.2363	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 612.0 AND 621.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

612.0	613.0	614.0	615.0	616.0	617.0	618.0	619.0	620.0	621.0	PRESS(MB.)	
.9991	.9990	.9991	.9991	.9936	.9920	.9920	.9919	.9918	.9973	.30	1
.9987	.9987	.9987	.9986	.9918	.9894	.9893	.9891	.9890	.9958	.60	2
.9983	.9983	.9982	.9981	.9900	.9868	.9866	.9864	.9861	.9943	1.00	3
.9981	.9980	.9980	.9978	.9888	.9851	.9848	.9846	.9843	.9934	1.30	4
.9979	.9978	.9978	.9976	.9875	.9835	.9832	.9829	.9826	.9927	1.60	5
.9977	.9975	.9975	.9972	.9859	.9814	.9810	.9808	.9804	.9919	2.00	6
.9973	.9972	.9971	.9969	.9839	.9789	.9785	.9782	.9778	.9910	2.50	7
.9971	.9969	.9968	.9966	.9819	.9764	.9760	.9757	.9753	.9901	3.00	8
.9964	.9963	.9963	.9960	.9779	.9717	.9712	.9708	.9704	.9886	4.00	9
.9958	.9957	.9957	.9953	.9741	.9671	.9665	.9661	.9657	.9872	5.00	10
.9950	.9948	.9948	.9944	.9685	.9606	.9599	.9595	.9590	.9851	6.50	11
.9941	.9939	.9940	.9936	.9633	.9544	.9537	.9532	.9527	.9832	8.00	12
.9937	.9928	.9930	.9924	.9569	.9468	.9459	.9454	.9448	.9807	10.00	13
.9913	.9911	.9914	.9907	.9480	.9360	.9350	.9344	.9338	.9769	13.00	14
.9895	.9893	.9898	.9889	.9399	.9261	.9249	.9242	.9237	.9731	16.00	15
.9873	.9871	.9877	.9866	.9304	.9142	.9126	.9119	.9113	.9681	20.00	16
.9844	.9842	.9851	.9837	.9199	.9008	.8989	.8980	.8975	.9618	25.00	17
.9815	.9814	.9825	.9808	.9109	.8889	.8867	.8857	.8852	.9557	30.00	18
.9757	.9757	.9773	.9749	.8957	.8682	.8654	.8640	.8637	.9436	40.00	19
.9699	.9701	.9721	.9691	.8830	.8505	.8469	.8453	.8452	.9320	50.00	20
.9609	.9616	.9643	.9602	.8668	.8271	.8226	.8205	.8208	.9149	65.00	21
.9518	.9530	.9563	.9511	.8523	.8061	.8005	.7980	.7988	.8980	80.00	22
.9395	.9414	.9454	.9386	.8345	.7804	.7734	.7704	.7720	.8761	100.00	23
.9205	.9238	.9287	.9194	.8095	.7454	.7363	.7325	.7355	.8446	130.00	24
.9009	.9058	.9115	.8996	.7852	.7133	.7021	.6976	.7023	.8147	160.00	25
.8742	.8812	.8880	.8723	.7531	.6736	.6596	.6541	.6615	.7768	200.00	26
.8393	.8490	.8568	.8360	.7123	.6259	.6084	.6016	.6128	.7297	250.00	27
.8013	.8139	.8222	.7957	.6692	.5773	.5560	.5479	.5632	.6794	300.00	28
.7189	.7347	.7421	.7035	.5773	.4786	.4492	.4380	.4607	.5686	400.00	29
.6300	.6472	.6520	.6024	.4842	.3866	.3495	.3357	.3633	.4555	500.00	30
.4959	.5114	.5103	.4514	.3544	.2703	.2250	.2098	.2383	.3018	650.00	31
.3705	.3815	.3753	.3169	.2440	.1797	.1326	.1192	.1426	.1806	800.00	32
.2307	.2348	.2261	.1793	.1348	.0950	.0551	.0471	.0614	.0771	1000.00	33
.2228	.2264	.2177	.1719	.1291	.0907	.0516	.0439	.0577	.0723	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 622.0 AND 631.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

622.0	623.0	624.0	625.0	626.0	627.0	628.0	629.0	630.0	631.0	PRESS(MB.)	
.9985	.9983	.9980	.9979	.9976	.9974	.9975	.9973	.9966	.9967	.30	1
.9977	.9974	.9971	.9969	.9966	.9964	.9965	.9962	.9953	.9954	.60	2
.9969	.9965	.9962	.9960	.9956	.9954	.9955	.9951	.9940	.9941	1.00	3
.9964	.9960	.9957	.9955	.9950	.9947	.9948	.9944	.9932	.9932	1.30	4
.9960	.9955	.9952	.9950	.9944	.9941	.9942	.9938	.9924	.9925	1.60	5
.9955	.9950	.9947	.9944	.9938	.9934	.9935	.9930	.9914	.9915	2.00	6
.9950	.9945	.9940	.9937	.9930	.9926	.9927	.9921	.9903	.9904	2.50	7
.9945	.9939	.9935	.9931	.9923	.9918	.9920	.9912	.9892	.9894	3.00	8
.9936	.9930	.9923	.9919	.9909	.9903	.9905	.9895	.9870	.9873	4.00	9
.9928	.9921	.9913	.9908	.9896	.9888	.9890	.9878	.9848	.9854	5.00	10
.9916	.9907	.9897	.9891	.9876	.9865	.9869	.9854	.9817	.9825	6.50	11
.9904	.9895	.9882	.9875	.9858	.9845	.9848	.9830	.9786	.9797	8.00	12
.9889	.9878	.9863	.9854	.9833	.9816	.9821	.9799	.9746	.9760	10.00	13
.9866	.9854	.9833	.9822	.9795	.9774	.9780	.9752	.9686	.9706	13.00	14
.9843	.9829	.9804	.9790	.9757	.9731	.9738	.9704	.9624	.9651	16.00	15
.9812	.9795	.9764	.9747	.9706	.9673	.9682	.9641	.9544	.9579	20.00	16
.9773	.9754	.9716	.9695	.9644	.9602	.9613	.9562	.9444	.9489	25.00	17
.9735	.9712	.9667	.9642	.9582	.9532	.9544	.9484	.9346	.9399	30.00	18
.9658	.9630	.9571	.9538	.9462	.9396	.9410	.9332	.9156	.9223	40.00	19
.9582	.9550	.9476	.9435	.9347	.9264	.9280	.9184	.8974	.9052	50.00	20
.9468	.9428	.9334	.9282	.9175	.9068	.9086	.8965	.8709	.8800	65.00	21
.9351	.9303	.9191	.9128	.9001	.8871	.8890	.8744	.8450	.8553	80.00	22
.9193	.9135	.8999	.8920	.8766	.8609	.8628	.8449	.8111	.8227	100.00	23
.8952	.8878	.8709	.8604	.8410	.8214	.8229	.8005	.7615	.7746	130.00	24
.8706	.8616	.8418	.8285	.8053	.7820	.7828	.7566	.7134	.7272	160.00	25
.8374	.8263	.8028	.7859	.7579	.7305	.7299	.6999	.6522	.6659	200.00	26
.7938	.7800	.7527	.7309	.6976	.6663	.6632	.6299	.5783	.5905	250.00	27
.7454	.7284	.6981	.6713	.6327	.5991	.5928	.5575	.5036	.5132	300.00	28
.6336	.6094	.5759	.5395	.4915	.4586	.4452	.4094	.3564	.3597	400.00	29
.5123	.4820	.4491	.4058	.3535	.3265	.3082	.2760	.2303	.2291	500.00	30
.3393	.3059	.2792	.2339	.1871	.1708	.1528	.1309	.1016	.0989	650.00	31
.2000	.1718	.1538	.1158	.0829	.0745	.0627	.0511	.0365	.0348	800.00	32
.0828	.0672	.0588	.0363	.0213	.0185	.0142	.0108	.0067	.0063	1000.00	33
.0775	.0628	.0549	.0333	.0193	.0167	.0128	.0096	.0059	.0055	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 632.0 AND 641.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

632.0	633.0	634.0	635.0	636.0	637.0	638.0	639.0	640.0	641.0	PRESS(MB.)	
.9965	.9955	.9959	.9958	.9952	.9952	.9951	.9945	.9946	.9945	.30	1
.9951	.9940	.9943	.9942	.9935	.9934	.9933	.9926	.9927	.9926	.60	2
.9937	.9923	.9927	.9925	.9916	.9915	.9914	.9904	.9905	.9903	1.00	3
.9928	.9912	.9916	.9914	.9903	.9903	.9901	.9888	.9890	.9887	1.30	4
.9920	.9902	.9906	.9904	.9890	.9891	.9888	.9872	.9875	.9871	1.60	5
.9909	.9889	.9894	.9891	.9874	.9876	.9871	.9851	.9856	.9850	2.00	6
.9897	.9873	.9880	.9875	.9854	.9857	.9851	.9825	.9832	.9824	2.50	7
.9885	.9857	.9866	.9860	.9835	.9838	.9830	.9799	.9808	.9798	3.00	8
.9862	.9827	.9838	.9830	.9796	.9803	.9791	.9749	.9762	.9747	4.00	9
.9840	.9797	.9812	.9800	.9759	.9768	.9753	.9700	.9717	.9697	5.00	10
.9807	.9754	.9773	.9757	.9704	.9717	.9696	.9628	.9651	.9624	6.50	11
.9776	.9712	.9735	.9715	.9651	.9667	.9640	.9557	.9586	.9551	8.00	12
.9735	.9657	.9686	.9661	.9581	.9601	.9567	.9465	.9500	.9456	10.00	13
.9674	.9576	.9613	.9579	.9477	.9502	.9457	.9326	.9371	.9313	13.00	14
.9612	.9495	.9539	.9497	.9373	.9403	.9346	.9188	.9242	.9170	16.00	15
.9532	.9388	.9441	.9388	.9236	.9272	.9199	.9005	.9070	.8980	20.00	16
.9433	.9258	.9321	.9254	.9067	.9108	.9016	.8780	.8857	.8744	25.00	17
.9336	.9132	.9204	.9122	.8901	.8946	.8834	.8559	.8645	.8511	30.00	18
.9148	.8887	.8976	.8865	.8580	.8626	.8475	.8127	.8227	.8052	40.00	19
.8968	.8655	.8756	.8616	.8272	.8313	.8123	.7711	.7818	.7604	50.00	20
.8707	.8322	.8438	.8254	.7827	.7853	.7607	.7111	.7217	.6952	65.00	21
.8450	.8000	.8127	.7898	.7397	.7402	.7104	.6538	.6633	.6325	80.00	22
.8111	.7585	.7720	.7434	.6847	.6820	.6460	.5821	.5889	.5536	100.00	23
.7609	.6989	.7125	.6767	.6076	.6001	.5562	.4853	.4866	.4474	130.00	24
.7114	.6424	.6552	.6136	.5373	.5250	.4756	.4015	.3972	.3568	160.00	25
.6475	.5719	.5823	.5355	.4535	.4358	.3827	.3088	.2982	.2594	200.00	26
.5688	.4886	.4947	.4448	.3611	.3388	.2864	.2176	.2022	.1687	250.00	27
.4885	.4069	.4081	.3585	.2784	.2542	.2073	.1477	.1309	.1043	300.00	28
.3311	.2569	.2503	.2087	.1471	.1261	.0967	.0597	.0472	.0340	400.00	29
.2009	.1435	.1346	.1053	.0666	.0527	.0384	.0201	.0140	.0090	500.00	30
.0783	.0485	.0425	.0292	.0152	.0103	.0069	.0027	.0016	.0008	650.00	31
.0240	.0125	.0102	.0059	.0024	.0013	.0008	.0002	.0001	.0000	800.00	32
.0034	.0013	.0010	.0004	.0001	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0029	.0011	.0009	.0003	.0001	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 642.0 AND 651.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

642.0	643.0	644.0	645.0	646.0	647.0	648.0	649.0	650.0	651.0	PRESS(MB.)	
.9941	.9943	.9942	.9935	.9935	.9936	.9932	.9936	.9936	.9931	.30	1
.9919	.9922	.9921	.9909	.9909	.9910	.9902	.9908	.9910	.9902	.60	2
.9893	.9897	.9895	.9874	.9876	.9876	.9862	.9872	.9875	.9860	1.00	3
.9872	.9879	.9875	.9848	.9852	.9851	.9831	.9844	.9848	.9828	1.30	4
.9852	.9860	.9856	.9822	.9828	.9825	.9801	.9817	.9822	.9796	1.60	5
.9826	.9836	.9830	.9788	.9796	.9792	.9761	.9782	.9787	.9754	2.00	6
.9793	.9807	.9798	.9746	.9758	.9752	.9711	.9738	.9743	.9702	2.50	7
.9761	.9778	.9766	.9704	.9719	.9711	.9662	.9695	.9699	.9650	3.00	8
.9697	.9720	.9704	.9621	.9644	.9631	.9565	.9609	.9612	.9547	4.00	9
.9634	.9663	.9642	.9541	.9570	.9553	.9470	.9525	.9526	.9445	5.00	10
.9542	.9579	.9550	.9423	.9463	.9438	.9331	.9402	.9397	.9295	6.50	11
.9451	.9497	.9459	.9309	.9359	.9327	.9196	.9282	.9269	.9147	8.00	12
.9332	.9389	.9340	.9161	.9222	.9180	.9019	.9124	.9099	.8955	10.00	13
.9154	.9226	.9161	.8938	.9017	.8961	.8758	.8887	.8847	.8673	13.00	14
.8978	.9063	.8983	.8719	.8813	.8741	.8501	.8651	.8595	.8397	16.00	15
.8746	.8848	.8747	.8430	.8542	.8451	.8167	.8340	.8263	.8037	20.00	16
.8461	.8580	.8454	.8079	.8210	.8095	.7763	.7956	.7854	.7599	25.00	17
.8181	.8315	.8166	.7738	.7883	.7745	.7373	.7582	.7453	.7173	30.00	18
.7639	.7795	.7601	.7087	.7251	.7068	.6638	.6860	.6681	.6362	40.00	19
.7122	.7291	.7056	.6479	.6649	.6427	.5959	.6180	.5956	.5610	50.00	20
.6387	.6561	.6275	.5639	.5802	.5533	.5036	.5244	.4967	.4600	65.00	21
.5699	.5867	.5543	.4881	.5025	.4725	.4224	.4411	.4102	.3733	80.00	22
.4860	.5008	.4652	.3994	.4105	.3790	.3308	.3462	.3141	.2787	100.00	23
.3773	.3880	.3510	.2910	.2973	.2674	.2256	.2356	.2060	.1755	130.00	24
.2885	.2953	.2599	.2084	.2105	.1852	.1510	.1561	.1317	.1071	160.00	25
.1975	.2003	.1695	.1300	.1281	.1099	.0850	.0856	.0688	.0520	200.00	26
.1181	.1178	.0941	.0679	.0637	.0532	.0379	.0365	.0273	.0185	250.00	27
.0663	.0647	.0480	.0323	.0284	.0231	.0149	.0136	.0094	.0056	300.00	28
.0169	.0156	.0092	.0051	.0038	.0030	.0015	.0013	.0007	.0003	400.00	29
.0033	.0028	.0011	.0005	.0003	.0002	.0001	.0001	.0000	.0000	500.00	30
.0002	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 652.0 AND 661.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

652.0	653.0	654.0	655.0	656.0	657.0	658.0	659.0	660.0	661.0	PRESS(MB.)	
.9938	.9934	.9936	.9937	.9934	.9934	.9938	.9932	.9938	.9944	.30	1
.9912	.9907	.9908	.9909	.9906	.9907	.9912	.9903	.9913	.9923	.60	2
.9875	.9869	.9871	.9871	.9868	.9870	.9876	.9862	.9880	.9893	1.00	3
.9848	.9840	.9842	.9843	.9839	.9842	.9850	.9831	.9855	.9871	1.30	4
.9821	.9812	.9814	.9814	.9810	.9813	.9822	.9800	.9829	.9848	1.60	5
.9785	.9774	.9775	.9776	.9771	.9775	.9786	.9757	.9794	.9818	2.00	6
.9740	.9726	.9727	.9729	.9722	.9727	.9740	.9705	.9751	.9779	2.50	7
.9695	.9678	.9679	.9682	.9673	.9679	.9695	.9652	.9707	.9740	3.00	8
.9607	.9583	.9582	.9588	.9573	.9582	.9603	.9546	.9618	.9661	4.00	9
.9518	.9488	.9484	.9494	.9473	.9485	.9511	.9441	.9528	.9582	5.00	10
.9386	.9345	.9335	.9354	.9321	.9338	.9373	.9285	.9394	.9461	6.50	11
.9254	.9204	.9186	.9214	.9169	.9193	.9235	.9132	.9259	.9340	8.00	12
.9081	.9015	.8986	.9029	.8964	.8998	.9051	.8930	.9080	.9179	10.00	13
.8821	.8733	.8685	.8753	.8657	.8707	.8777	.8633	.8811	.8938	13.00	14
.8564	.8451	.8386	.8479	.8350	.8417	.8505	.8340	.8544	.8697	16.00	15
.8224	.8079	.7993	.8118	.7945	.8032	.8146	.7958	.8192	.8378	20.00	16
.7807	.7619	.7512	.7675	.7450	.7557	.7705	.7490	.7758	.7983	25.00	17
.7398	.7169	.7046	.7243	.6970	.7092	.7274	.7036	.7332	.7594	30.00	18
.6614	.6306	.6163	.6416	.6065	.6201	.6448	.6173	.6514	.6838	40.00	19
.5879	.5507	.5353	.5646	.5242	.5376	.5680	.5378	.5747	.6119	50.00	20
.4880	.4443	.4284	.4611	.4165	.4283	.4645	.4325	.4711	.5129	65.00	21
.4007	.3546	.3387	.3719	.3271	.3367	.3755	.3439	.3816	.4252	80.00	22
.3035	.2590	.2436	.2745	.2337	.2404	.2780	.2495	.2838	.3260	100.00	23
.1938	.1574	.1440	.1676	.1370	.1405	.1707	.1498	.1767	.2122	130.00	24
.1185	.0920	.0814	.0968	.0766	.0784	.0994	.0861	.1058	.1330	160.00	25
.0567	.0414	.0347	.0419	.0318	.0327	.0436	.0376	.0497	.0668	200.00	26
.0195	.0130	.0100	.0121	.0087	.0091	.0130	.0113	.0170	.0253	250.00	27
.0057	.0034	.0023	.0028	.0019	.0021	.0032	.0029	.0051	.0087	300.00	28
.0003	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0003	.0008	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 662.0 AND 671.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

662.0	663.0	664.0	665.0	666.0	667.0	668.0	669.0	670.0	671.0	PRESS(MB.)	
.9939	.9948	.9955	.9920	.9685	.9650	.9642	.9634	.9668	.9899	.30	1
.9915	.9928	.9939	.9894	.9601	.9546	.9536	.9523	.9567	.9854	.60	2
.9882	.9902	.9919	.9858	.9493	.9420	.9404	.9385	.9444	.9801	1.00	3
.9857	.9883	.9904	.9830	.9410	.9326	.9307	.9282	.9354	.9763	1.30	4
.9831	.9863	.9889	.9801	.9327	.9236	.9211	.9182	.9266	.9727	1.60	5
.9797	.9837	.9868	.9763	.9219	.9120	.9089	.9053	.9154	.9682	2.00	6
.9753	.9804	.9843	.9717	.9089	.8984	.8944	.8901	.9020	.9627	2.50	7
.9708	.9769	.9816	.9673	.8967	.8856	.8809	.8757	.8892	.9574	3.00	8
.9619	.9702	.9762	.9593	.8748	.8629	.8564	.8497	.8656	.9469	4.00	9
.9528	.9632	.9708	.9519	.8557	.8431	.8349	.8267	.8443	.9366	5.00	10
.9392	.9527	.9625	.9414	.8311	.8179	.8072	.7967	.8161	.9213	6.50	11
.9257	.9421	.9540	.9314	.8104	.7968	.7835	.7709	.7915	.9063	8.00	12
.9077	.9280	.9428	.9183	.7870	.7730	.7565	.7410	.7628	.8864	10.00	13
.8810	.9069	.9257	.8989	.7582	.7435	.7221	.7026	.7260	.8568	13.00	14
.8548	.8857	.9085	.8795	.7342	.7188	.6928	.6695	.6943	.8274	16.00	15
.8206	.8576	.8854	.8535	.7071	.6907	.6589	.6308	.6575	.7889	20.00	16
.7790	.8228	.8564	.8212	.6775	.6599	.6213	.5879	.6167	.7418	25.00	17
.7388	.7883	.8273	.7891	.6505	.6319	.5870	.5490	.5795	.6961	30.00	18
.6625	.7211	.7693	.7263	.6003	.5801	.5243	.4791	.5119	.6099	40.00	19
.5917	.6567	.7119	.6657	.5528	.5314	.4671	.4172	.4510	.5310	50.00	20
.4959	.5665	.6284	.5801	.4854	.4627	.3898	.3367	.3697	.4266	65.00	21
.4122	.4849	.5493	.5017	.4225	.3989	.3219	.2690	.2996	.3388	80.00	22
.3186	.3901	.4523	.4087	.3463	.3226	.2455	.1963	.2226	.2458	100.00	23
.2115	.2761	.3278	.2934	.2497	.2278	.1581	.1186	.1379	.1481	130.00	24
.1363	.1912	.2293	.2046	.1743	.1560	.0977	.0691	.0821	.0866	160.00	25
.0719	.1129	.1351	.1207	.1028	.0902	.0480	.0315	.0382	.0396	200.00	26
.0295	.0549	.0643	.0580	.0496	.0430	.0175	.0104	.0128	.0131	250.00	27
.0110	.0249	.0283	.0260	.0224	.0194	.0056	.0030	.0037	.0037	300.00	28
.0012	.0043	.0046	.0044	.0039	.0034	.0004	.0002	.0002	.0002	400.00	29
.0001	.0006	.0006	.0006	.0005	.0005	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 672.0 AND 681.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

672.0	673.0	674.0	675.0	676.0	677.0	678.0	679.0	680.0	681.0	PRESS(MB.)	
.9931	.9937	.9931	.9935	.9934	.9933	.9928	.9933	.9924	.9933	.30	1
.9904	.9912	.9903	.9909	.9907	.9904	.9899	.9905	.9889	.9904	.60	2
.9865	.9877	.9864	.9871	.9867	.9862	.9856	.9863	.9840	.9862	1.00	3
.9835	.9850	.9834	.9842	.9836	.9829	.9823	.9831	.9801	.9830	1.30	4
.9804	.9822	.9803	.9812	.9806	.9797	.9790	.9800	.9763	.9798	1.60	5
.9763	.9785	.9762	.9772	.9764	.9752	.9745	.9756	.9710	.9755	2.00	6
.9712	.9738	.9710	.9721	.9711	.9696	.9689	.9703	.9646	.9702	2.50	7
.9660	.9691	.9658	.9670	.9658	.9639	.9632	.9648	.9580	.9648	3.00	8
.9558	.9596	.9552	.9567	.9552	.9525	.9519	.9539	.9451	.9541	4.00	9
.9456	.9501	.9447	.9464	.9446	.9409	.9406	.9431	.9322	.9433	5.00	10
.9306	.9358	.9288	.9308	.9287	.9233	.9237	.9268	.9131	.9273	6.50	11
.9157	.9214	.9130	.9152	.9128	.9056	.9068	.9106	.8943	.9113	8.00	12
.8961	.9024	.8919	.8943	.8917	.8822	.8845	.8891	.8698	.8903	10.00	13
.8669	.8739	.8605	.8630	.8603	.8472	.8513	.8571	.8339	.8588	13.00	14
.8380	.8457	.8294	.8319	.8292	.8129	.8184	.8254	.7991	.8278	16.00	15
.8000	.8085	.7886	.7906	.7885	.7682	.7754	.7839	.7545	.7870	20.00	16
.7535	.7628	.7388	.7399	.7388	.7142	.7231	.7333	.7015	.7374	25.00	17
.7083	.7182	.6904	.6903	.6908	.6626	.6727	.6843	.6512	.6895	30.00	18
.6225	.6333	.5992	.5960	.6003	.5668	.5780	.5920	.5588	.5991	40.00	19
.5435	.5546	.5160	.5096	.5179	.4813	.4925	.5080	.4766	.5167	50.00	20
.4389	.4495	.4074	.3970	.4103	.3726	.3823	.3985	.3715	.4092	65.00	21
.3519	.3602	.3184	.3055	.3215	.2857	.2930	.3084	.2864	.3203	80.00	22
.2575	.2640	.2268	.2123	.2288	.1979	.2020	.2150	.1993	.2274	100.00	23
.1583	.1604	.1332	.1194	.1321	.1102	.1111	.1195	.1113	.1309	130.00	24
.0941	.0929	.0750	.0636	.0714	.0575	.0571	.0617	.0582	.0707	160.00	25
.0436	.0407	.0316	.0245	.0277	.0211	.0205	.0222	.0214	.0275	200.00	26
.0144	.0123	.0090	.0060	.0068	.0048	.0045	.0049	.0049	.0068	250.00	27
.0041	.0032	.0021	.0012	.0013	.0008	.0008	.0008	.0009	.0013	300.00	28
.0002	.0001	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 682.0 AND 691.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

682.0	683.0	684.0	685.0	686.0	687.0	688.0	689.0	690.0	691.0	PRESS(MB.)	
.9928	.9933	.9934	.9934	.9930	.9936	.9929	.9938	.9935	.9941	.30	1
.9898	.9905	.9906	.9906	.9903	.9910	.9901	.9915	.9912	.9919	.60	2
.9856	.9864	.9867	.9868	.9864	.9875	.9861	.9882	.9881	.9890	1.00	3
.9824	.9833	.9837	.9838	.9834	.9847	.9830	.9857	.9857	.9867	1.30	4
.9791	.9802	.9807	.9809	.9805	.9821	.9799	.9832	.9834	.9845	1.60	5
.9747	.9760	.9766	.9769	.9765	.9784	.9758	.9799	.9802	.9815	2.00	6
.9693	.9708	.9716	.9720	.9716	.9740	.9708	.9757	.9763	.9779	2.50	7
.9638	.9655	.9665	.9671	.9666	.9695	.9657	.9717	.9724	.9742	3.00	8
.9529	.9551	.9565	.9573	.9568	.9606	.9558	.9635	.9646	.9669	4.00	9
.9420	.9447	.9466	.9476	.9471	.9519	.9461	.9555	.9569	.9597	5.00	10
.9257	.9292	.9317	.9330	.9327	.9388	.9318	.9436	.9456	.9491	6.50	11
.9096	.9137	.9170	.9184	.9184	.9259	.9179	.9318	.9344	.9386	8.00	12
.8883	.8932	.8976	.8990	.8996	.9088	.8998	.9163	.9197	.9248	10.00	13
.8565	.8626	.8686	.8699	.8716	.8834	.8731	.8932	.8976	.9042	13.00	14
.8251	.8322	.8400	.8407	.8439	.8582	.8471	.8702	.8757	.8837	16.00	15
.7837	.7922	.8023	.8020	.8074	.8249	.8131	.8401	.8469	.8568	20.00	16
.7334	.7433	.7563	.7546	.7630	.7841	.7720	.8030	.8114	.8238	25.00	17
.6846	.6958	.7116	.7084	.7199	.7442	.7325	.7668	.7767	.7915	30.00	18
.5925	.6056	.6270	.6213	.6382	.6679	.6580	.6974	.7097	.7291	40.00	19
.5086	.5232	.5491	.5420	.5631	.5965	.5896	.6322	.6461	.6699	50.00	20
.3992	.4151	.4457	.4378	.4631	.4988	.4971	.5420	.5568	.5865	65.00	21
.3093	.3259	.3582	.3508	.3779	.4128	.4160	.4614	.4754	.5101	80.00	22
.2167	.2333	.2643	.2583	.2857	.3161	.3248	.3688	.3804	.4195	100.00	23
.1229	.1376	.1628	.1596	.1846	.2060	.2196	.2595	.2667	.3083	130.00	24
.0660	.0776	.0958	.0949	.1159	.1295	.1448	.1793	.1832	.2234	160.00	25
.0257	.0327	.0430	.0436	.0583	.0652	.0791	.1057	.1074	.1420	200.00	26
.0064	.0092	.0133	.0140	.0215	.0242	.0334	.0504	.0512	.0762	250.00	27
.0013	.0021	.0034	.0037	.0067	.0076	.0123	.0214	.0218	.0374	300.00	28
.0000	.0001	.0001	.0002	.0004	.0005	.0011	.0027	.0027	.0065	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0002	.0008	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 692.0 AND 701.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

692.0	693.0	694.0	695.0	696.0	697.0	698.0	699.0	700.0	701.0	PRESS(MB.)	
.9941	.9943	.9941	.9943	.9944	.9946	.9948	.9946	.9951	.9953	.30	1
.9921	.9924	.9922	.9925	.9926	.9929	.9932	.9928	.9936	.9937	.60	2
.9894	.9899	.9897	.9902	.9904	.9908	.9914	.9910	.9920	.9921	1.00	3
.9873	.9879	.9878	.9885	.9887	.9893	.9900	.9896	.9908	.9909	1.30	4
.9853	.9860	.9859	.9869	.9871	.9878	.9887	.9883	.9896	.9898	1.60	5
.9825	.9834	.9834	.9846	.9849	.9859	.9870	.9865	.9882	.9884	2.00	6
.9792	.9802	.9804	.9819	.9822	.9835	.9848	.9844	.9863	.9865	2.50	7
.9758	.9770	.9773	.9792	.9796	.9811	.9827	.9822	.9844	.9847	3.00	8
.9691	.9705	.9713	.9738	.9743	.9763	.9785	.9780	.9808	.9812	4.00	9
.9625	.9641	.9653	.9684	.9691	.9717	.9744	.9738	.9773	.9777	5.00	10
.9528	.9545	.9565	.9606	.9614	.9648	.9683	.9677	.9721	.9726	6.50	11
.9432	.9449	.9479	.9529	.9539	.9580	.9623	.9618	.9671	.9677	8.00	12
.9305	.9322	.9366	.9427	.9440	.9492	.9544	.9539	.9604	.9612	10.00	13
.9117	.9132	.9196	.9274	.9292	.9359	.9425	.9422	.9505	.9515	13.00	14
.8929	.8941	.9028	.9121	.9145	.9226	.9307	.9306	.9407	.9418	16.00	15
.8681	.8691	.8806	.8919	.8950	.9050	.9149	.9152	.9277	.9291	20.00	16
.8376	.8384	.8532	.8668	.8709	.8833	.8952	.8963	.9117	.9134	25.00	17
.8077	.8085	.8264	.8420	.8472	.8619	.8757	.8776	.8959	.8980	30.00	18
.7496	.7509	.7744	.7932	.8009	.8199	.8372	.8411	.8649	.8678	40.00	19
.6942	.6963	.7246	.7460	.7565	.7794	.7995	.8058	.8346	.8385	50.00	20
.6156	.6197	.6540	.6780	.6928	.7207	.7442	.7545	.7898	.7957	65.00	21
.5428	.5492	.5880	.6135	.6329	.6646	.6905	.7050	.7457	.7540	80.00	22
.4553	.4649	.5077	.5338	.5591	.5945	.6224	.6423	.6884	.7005	100.00	23
.3444	.3579	.4040	.4284	.4617	.5002	.5292	.5562	.6065	.6250	130.00	24
.2564	.2723	.3191	.3396	.3790	.4185	.4473	.4800	.5304	.5552	160.00	25
.1688	.1855	.2305	.2451	.2888	.3275	.3548	.3928	.4390	.4711	200.00	26
.0949	.1099	.1492	.1575	.2008	.2365	.2606	.3021	.3393	.3778	250.00	27
.0492	.0606	.0915	.0955	.1334	.1644	.1843	.2262	.2528	.2945	300.00	28
.0100	.0142	.0278	.0285	.0496	.0690	.0805	.1145	.1246	.1623	400.00	29
.0014	.0023	.0062	.0063	.0144	.0237	.0289	.0496	.0523	.0785	500.00	30
.0000	.0001	.0004	.0004	.0014	.0033	.0042	.0101	.0104	.0204	650.00	31
.0000	.0000	.0000	.0000	.0001	.0003	.0004	.0014	.0014	.0037	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 702.0 AND 711.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

702.0	703.0	704.0	705.0	706.0	707.0	708.0	709.0	710.0	711.0	PRESS(MB.)	
.9954	.9957	.9959	.9962	.9959	.9966	.9964	.9970	.9971	.9973	.30	1
.9940	.9943	.9946	.9951	.9947	.9955	.9953	.9961	.9961	.9964	.60	2
.9925	.9929	.9932	.9939	.9934	.9944	.9942	.9951	.9952	.9955	1.00	3
.9914	.9920	.9923	.9931	.9925	.9937	.9935	.9945	.9946	.9949	1.30	4
.9904	.9911	.9914	.9923	.9917	.9930	.9928	.9939	.9940	.9944	1.60	5
.9891	.9900	.9903	.9913	.9906	.9921	.9919	.9931	.9933	.9938	2.00	6
.9875	.9886	.9889	.9901	.9894	.9911	.9909	.9922	.9925	.9930	2.50	7
.9859	.9872	.9875	.9889	.9881	.9901	.9899	.9914	.9917	.9923	3.00	8
.9828	.9845	.9849	.9866	.9856	.9880	.9879	.9896	.9901	.9908	4.00	9
.9797	.9818	.9822	.9843	.9831	.9860	.9860	.9879	.9885	.9895	5.00	10
.9753	.9779	.9784	.9810	.9796	.9831	.9831	.9854	.9863	.9874	6.50	11
.9709	.9741	.9747	.9777	.9762	.9803	.9804	.9830	.9842	.9854	8.00	12
.9652	.9692	.9699	.9735	.9718	.9767	.9768	.9798	.9813	.9828	10.00	13
.9567	.9618	.9627	.9671	.9652	.9711	.9714	.9751	.9770	.9788	13.00	14
.9483	.9544	.9555	.9607	.9587	.9656	.9661	.9704	.9728	.9749	16.00	15
.9372	.9448	.9460	.9522	.9502	.9583	.9591	.9641	.9671	.9696	20.00	16
.9236	.9328	.9344	.9418	.9399	.9492	.9505	.9563	.9601	.9629	25.00	17
.9101	.9211	.9229	.9314	.9299	.9403	.9420	.9486	.9531	.9562	30.00	18
.8838	.8980	.9004	.9111	.9105	.9226	.9253	.9332	.9391	.9429	40.00	19
.8581	.8753	.8784	.8912	.8918	.9051	.9090	.9181	.9252	.9296	50.00	20
.8199	.8414	.8457	.8617	.8644	.8793	.8849	.8955	.9045	.9099	65.00	21
.7819	.8073	.8133	.8321	.8373	.8536	.8609	.8731	.8840	.8904	80.00	22
.7320	.7618	.7703	.7926	.8011	.8192	.8289	.8433	.8567	.8646	100.00	23
.6595	.6947	.7071	.7340	.7474	.7678	.7811	.7988	.8159	.8262	130.00	24
.5910	.6298	.6462	.6768	.6949	.7174	.7340	.7550	.7753	.7882	160.00	25
.5070	.5483	.5699	.6037	.6277	.6524	.6731	.6983	.7224	.7389	200.00	26
.4123	.4536	.4809	.5161	.5468	.5733	.5986	.6285	.6565	.6775	250.00	27
.3265	.3647	.3967	.4304	.4667	.4942	.5232	.5573	.5882	.6140	300.00	28
.1885	.2155	.2514	.2758	.3181	.3449	.3768	.4173	.4500	.4850	400.00	29
.0984	.1144	.1469	.1604	.2004	.2245	.2532	.2959	.3250	.3664	500.00	30
.0304	.0363	.0561	.0598	.0867	.1053	.1235	.1608	.1795	.2212	650.00	31
.0071	.0087	.0169	.0176	.0308	.0424	.0511	.0767	.0857	.1184	800.00	32
.0006	.0008	.0023	.0023	.0056	.0098	.0120	.0230	.0253	.0423	1000.00	33
.0005	.0007	.0020	.0020	.0049	.0088	.0108	.0210	.0231	.0392	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 712.0 AND 721.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

712.0	713.0	714.0	715.0	716.0	717.0	718.0	719.0	720.0	721.0	PRESS(MB.)	
.9974	.9977	.9978	.9981	.9978	.9969	.9932	.9894	.9898	.9903	.30	1
.9965	.9968	.9970	.9972	.9968	.9953	.9908	.9862	.9867	.9876	.60	2
.9957	.9960	.9962	.9965	.9958	.9938	.9884	.9831	.9836	.9849	1.00	3
.9951	.9955	.9957	.9960	.9951	.9930	.9869	.9809	.9815	.9830	1.30	4
.9946	.9951	.9953	.9956	.9946	.9922	.9855	.9789	.9796	.9812	1.60	5
.9940	.9945	.9948	.9951	.9940	.9914	.9839	.9764	.9771	.9790	2.00	6
.9933	.9939	.9942	.9946	.9933	.9905	.9819	.9733	.9741	.9761	2.50	7
.9926	.9932	.9936	.9940	.9927	.9897	.9800	.9702	.9711	.9733	3.00	8
.9912	.9923	.9924	.9930	.9914	.9881	.9763	.9642	.9652	.9678	4.00	9
.9899	.9909	.9913	.9920	.9903	.9867	.9727	.9582	.9593	.9622	5.00	10
.9879	.9891	.9896	.9905	.9885	.9845	.9675	.9495	.9509	.9542	6.50	11
.9861	.9874	.9880	.9891	.9869	.9825	.9624	.9412	.9428	.9464	8.00	12
.9836	.9852	.9859	.9873	.9848	.9799	.9558	.9304	.9322	.9364	10.00	13
.9798	.9817	.9827	.9845	.9816	.9759	.9460	.9146	.9169	.9218	13.00	14
.9761	.9783	.9794	.9817	.9784	.9718	.9362	.8994	.9021	.9077	16.00	15
.9711	.9736	.9752	.9779	.9741	.9664	.9234	.8801	.8833	.8899	20.00	16
.9649	.9678	.9698	.9733	.9688	.9597	.9078	.8576	.8615	.8692	25.00	17
.9587	.9619	.9644	.9686	.9636	.9531	.8927	.8369	.8414	.8502	30.00	18
.9463	.9500	.9538	.9593	.9531	.9399	.8645	.8001	.8059	.8168	40.00	19
.9341	.9381	.9432	.9501	.9428	.9269	.8390	.7685	.7755	.7883	50.00	20
.9158	.9204	.9274	.9363	.9275	.9077	.8048	.7278	.7364	.7520	65.00	21
.8976	.9029	.9118	.9226	.9125	.8886	.7744	.6925	.7025	.7207	80.00	22
.8735	.8797	.8910	.9044	.8926	.8634	.7389	.6512	.6628	.6842	100.00	23
.8375	.8454	.8598	.8772	.8633	.8265	.6937	.5979	.6113	.6369	130.00	24
.8019	.8114	.8287	.8500	.8342	.7905	.6551	.5518	.5662	.5957	160.00	25
.7554	.7672	.7881	.8142	.7964	.7445	.6103	.4981	.5130	.5470	200.00	26
.6974	.7123	.7375	.7689	.7489	.6882	.5593	.4378	.4524	.4916	250.00	27
.6372	.6555	.6849	.7207	.6984	.6298	.5092	.3805	.3937	.4383	300.00	28
.5135	.5383	.5752	.6152	.5879	.5098	.4099	.2755	.2838	.3400	400.00	29
.3974	.4255	.4674	.5048	.4734	.3976	.3186	.1906	.1930	.2589	500.00	30
.2510	.2772	.3201	.3467	.3145	.2554	.2041	.1014	.0977	.1681	650.00	31
.1429	.1626	.1996	.2147	.1887	.1490	.1189	.0477	.0429	.1045	800.00	32
.0574	.0675	.0914	.0965	.0822	.0624	.0500	.0136	.0112	.0506	1000.00	33
.0537	.0632	.0862	.0909	.0774	.0586	.0469	.0124	.0101	.0479	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 722.0 AND 731.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

722.0	723.0	724.0	725.0	726.0	727.0	728.0	729.0	730.0	731.0	PRESS(MB.)	
.9914	.9953	.9991	.9989	.9989	.9988	.9987	.9987	.9986	.9982	.30	1
.9892	.9941	.9987	.9985	.9985	.9984	.9983	.9983	.9983	.9977	.60	2
.9869	.9928	.9982	.9980	.9980	.9980	.9979	.9979	.9979	.9972	1.00	3
.9853	.9919	.9980	.9978	.9978	.9977	.9976	.9976	.9976	.9969	1.30	4
.9838	.9910	.9977	.9976	.9976	.9975	.9974	.9974	.9974	.9966	1.60	5
.9817	.9899	.9975	.9973	.9973	.9972	.9971	.9971	.9970	.9962	2.00	6
.9791	.9884	.9971	.9969	.9969	.9968	.9967	.9967	.9966	.9957	2.50	7
.9765	.9869	.9969	.9966	.9966	.9964	.9963	.9963	.9962	.9951	3.00	8
.9713	.9840	.9963	.9960	.9959	.9957	.9955	.9955	.9954	.9941	4.00	9
.9662	.9811	.9958	.9953	.9953	.9950	.9947	.9947	.9946	.9930	5.00	10
.9587	.9769	.9950	.9944	.9944	.9940	.9936	.9935	.9934	.9915	6.50	11
.9515	.9729	.9943	.9935	.9934	.9929	.9924	.9924	.9922	.9899	8.00	12
.9421	.9677	.9933	.9923	.9922	.9915	.9909	.9909	.9907	.9879	10.00	13
.9286	.9604	.9918	.9905	.9904	.9895	.9886	.9887	.9884	.9849	13.00	14
.9156	.9535	.9903	.9886	.9885	.9874	.9863	.9864	.9861	.9819	16.00	15
.8992	.9452	.9883	.9862	.9860	.9847	.9831	.9834	.9830	.9779	20.00	16
.8804	.9360	.9858	.9832	.9829	.9813	.9792	.9796	.9791	.9730	25.00	17
.8632	.9281	.9833	.9802	.9799	.9780	.9753	.9759	.9753	.9681	30.00	18
.8335	.9150	.9782	.9741	.9736	.9712	.9673	.9684	.9677	.9585	40.00	19
.8086	.9044	.9730	.9680	.9672	.9645	.9594	.9610	.9602	.9491	50.00	20
.7776	.8910	.9650	.9589	.9576	.9543	.9474	.9498	.9490	.9352	65.00	21
.7517	.8788	.9568	.9496	.9477	.9442	.9354	.9384	.9377	.9214	80.00	22
.7223	.8629	.9455	.9371	.9342	.9305	.9192	.9230	.9224	.9031	100.00	23
.6853	.8386	.9277	.9179	.9134	.9097	.8948	.8992	.8993	.8760	130.00	24
.6536	.8137	.9089	.8981	.8919	.8887	.8704	.8751	.8760	.8494	160.00	25
.6161	.7809	.8825	.8711	.8625	.8602	.8377	.8425	.8449	.8144	200.00	26
.5727	.7365	.8468	.8356	.8243	.8233	.7959	.8003	.8048	.7702	250.00	27
.5298	.6899	.8064	.7968	.7829	.7836	.7515	.7548	.7618	.7235	300.00	28
.4430	.5891	.7122	.7091	.6918	.6960	.6560	.6562	.6681	.6237	400.00	29
.3580	.4865	.6071	.6128	.5952	.6026	.5578	.5545	.5700	.5221	500.00	30
.2450	.3461	.4506	.4667	.4533	.4642	.4180	.4103	.4280	.3798	650.00	31
.1569	.2321	.3140	.3327	.3267	.3389	.2973	.2865	.3028	.2596	800.00	32
.0787	.1250	.1730	.1914	.1942	.2049	.1743	.1625	.1741	.1419	1000.00	33
.0748	.1195	.1708	.1838	.1870	.1975	.1677	.1560	.1672	.1358	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 732.0 AND 741.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

732.0	733.0	734.0	735.0	736.0	737.0	738.0	739.0	740.0	741.0	PRESS(MB.)	
.9986	.9986	.9982	.9986	.9986	.9982	.9982	.9984	.9979	.9980	.30	1
.9983	.9982	.9977	.9983	.9983	.9977	.9977	.9977	.9969	.9970	.60	2
.9978	.9978	.9972	.9979	.9979	.9973	.9971	.9969	.9958	.9959	1.00	3
.9976	.9975	.9969	.9976	.9976	.9969	.9968	.9964	.9951	.9952	1.30	4
.9973	.9973	.9966	.9974	.9974	.9966	.9964	.9960	.9945	.9946	1.60	5
.9970	.9969	.9962	.9971	.9971	.9962	.9960	.9954	.9937	.9939	2.00	6
.9966	.9965	.9957	.9966	.9967	.9957	.9955	.9948	.9928	.9930	2.50	7
.9962	.9961	.9952	.9962	.9963	.9953	.9950	.9942	.9920	.9923	3.00	8
.9954	.9953	.9941	.9954	.9955	.9942	.9940	.9930	.9905	.9908	4.00	9
.9945	.9944	.9931	.9946	.9948	.9933	.9930	.9920	.9891	.9895	5.00	10
.9933	.9932	.9915	.9934	.9936	.9918	.9916	.9906	.9871	.9877	6.50	11
.9921	.9920	.9900	.9922	.9925	.9904	.9902	.9892	.9853	.9860	8.00	12
.9905	.9904	.9879	.9907	.9910	.9885	.9884	.9875	.9830	.9838	10.00	13
.9881	.9880	.9849	.9883	.9888	.9857	.9857	.9849	.9796	.9806	13.00	14
.9857	.9856	.9819	.9860	.9866	.9829	.9830	.9824	.9763	.9774	16.00	15
.9825	.9824	.9779	.9828	.9836	.9791	.9794	.9791	.9719	.9733	20.00	16
.9785	.9785	.9730	.9789	.9799	.9746	.9750	.9749	.9664	.9681	25.00	17
.9746	.9746	.9681	.9751	.9763	.9700	.9706	.9708	.9610	.9630	30.00	18
.9667	.9668	.9584	.9673	.9690	.9610	.9619	.9627	.9506	.9530	40.00	19
.9588	.9592	.9490	.9595	.9619	.9523	.9535	.9548	.9406	.9433	50.00	20
.9470	.9478	.9350	.9479	.9513	.9392	.9412	.9432	.9260	.9292	65.00	21
.9350	.9363	.9212	.9361	.9406	.9264	.9293	.9318	.9118	.9154	80.00	22
.9188	.9209	.9028	.9200	.9262	.9094	.9135	.9165	.8931	.8970	100.00	23
.8940	.8977	.8756	.8956	.9044	.8842	.8899	.8934	.8656	.8696	130.00	24
.8689	.8744	.8488	.8709	.8824	.8593	.8663	.8701	.8384	.8424	160.00	25
.8350	.8432	.8137	.8378	.8529	.8265	.8350	.8389	.8029	.8067	200.00	26
.7912	.8030	.7696	.7952	.8149	.7851	.7950	.7985	.7579	.7615	250.00	27
.7441	.7595	.7229	.7493	.7733	.7408	.7515	.7539	.7089	.7125	300.00	28
.6422	.6643	.6231	.6498	.6812	.6443	.6550	.6514	.5994	.6035	400.00	29
.5374	.5639	.5208	.5464	.5829	.5435	.5529	.5412	.4872	.4927	500.00	30
.3897	.4177	.3763	.3988	.4377	.3989	.4050	.3849	.3372	.3459	650.00	31
.2640	.2888	.2533	.2716	.3073	.2737	.2762	.2557	.2198	.2311	800.00	32
.1409	.1578	.1333	.1455	.1718	.1490	.1480	.1347	.1138	.1263	1000.00	33
.1346	.1509	.1271	.1389	.1645	.1425	.1413	.1286	.1085	.1210	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 742.0 AND 751.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

742.0	743.0	744.0	745.0	746.0	747.0	748.0	749.0	750.0	751.0	PRESS(MB.)	
.9984	.9985	.9985	.9991	.9992	.9989	.9991	.9993	.9992	.9993	.30	1
.9975	.9977	.9979	.9987	.9988	.9984	.9986	.9989	.9987	.9989	.60	2
.9966	.9969	.9973	.9984	.9985	.9980	.9981	.9986	.9983	.9984	1.00	3
.9960	.9964	.9969	.9982	.9983	.9978	.9979	.9984	.9981	.9982	1.30	4
.9955	.9959	.9966	.9981	.9981	.9976	.9977	.9983	.9979	.9980	1.60	5
.9948	.9953	.9962	.9979	.9980	.9974	.9975	.9981	.9976	.9978	2.00	6
.9941	.9947	.9957	.9977	.9978	.9971	.9973	.9979	.9974	.9976	2.50	7
.9934	.9941	.9953	.9975	.9976	.9969	.9970	.9977	.9972	.9973	3.00	8
.9922	.9930	.9944	.9970	.9972	.9964	.9966	.9974	.9968	.9970	4.00	9
.9911	.9921	.9937	.9967	.9969	.9959	.9962	.9971	.9965	.9966	5.00	10
.9896	.9907	.9925	.9960	.9963	.9952	.9956	.9967	.9960	.9962	6.50	11
.9882	.9895	.9914	.9954	.9957	.9946	.9950	.9963	.9955	.9958	8.00	12
.9865	.9879	.9900	.9946	.9951	.9937	.9943	.9958	.9948	.9952	10.00	13
.9839	.9856	.9879	.9934	.9940	.9924	.9931	.9949	.9938	.9944	13.00	14
.9814	.9833	.9858	.9922	.9929	.9910	.9920	.9941	.9929	.9935	16.00	15
.9781	.9803	.9830	.9906	.9915	.9893	.9905	.9930	.9915	.9924	20.00	16
.9739	.9765	.9795	.9885	.9896	.9870	.9885	.9916	.9899	.9910	25.00	17
.9698	.9728	.9761	.9864	.9878	.9848	.9866	.9902	.9882	.9895	30.00	18
.9619	.9655	.9694	.9824	.9842	.9804	.9828	.9875	.9850	.9868	40.00	19
.9542	.9583	.9628	.9785	.9807	.9761	.9792	.9848	.9818	.9840	50.00	20
.9430	.9476	.9531	.9725	.9753	.9697	.9736	.9807	.9770	.9799	65.00	21
.9319	.9367	.9433	.9663	.9699	.9631	.9681	.9766	.9723	.9758	80.00	22
.9171	.9220	.9302	.9581	.9624	.9543	.9606	.9710	.9657	.9702	100.00	23
.8950	.8999	.9107	.9456	.9511	.9410	.9493	.9624	.9558	.9616	130.00	24
.8729	.8777	.8914	.9328	.9395	.9276	.9379	.9536	.9457	.9529	160.00	25
.8437	.8483	.8659	.9156	.9237	.9097	.9226	.9417	.9322	.9412	200.00	26
.8062	.8106	.8331	.8927	.9024	.8869	.9025	.9256	.9143	.9254	250.00	27
.7648	.7690	.7972	.8666	.8779	.8591	.8795	.9068	.8935	.9070	300.00	28
.6699	.6748	.7167	.8045	.8183	.7952	.8238	.8596	.8423	.8602	400.00	29
.5690	.5769	.6322	.7325	.748[illegible]	.7221	.7585	.8021	.7817	.8033	500.00	30
.4307	.4422	.5097	.6154	.6327	.6058	.6512	.7037	.6820	.7068	650.00	31
.3135	.3295	.3962	.4954	.5143	.4896	.5400	.5972	.5780	.6035	800.00	32
.1939	.2131	.2654	.3465	.3672	.3483	.3987	.4556	.4435	.4673	1000.00	33
.1874	.2066	.2577	.3374	.3582	.3397	.3899	.4465	.4349	.4585	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 752.0 AND 761.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

752.0	753.0	754.0	755.0	756.0	757.0	758.0	759.0	760.0	761.0	PRESS(MB.)	
.9995	.9996	.9996	.9996	.9997	.9997	.9998	.9998	.9999	.9999	.30	1
.9992	.9993	.9992	.9993	.9995	.9995	.9996	.9997	.9997	.9997	.60	2
.9989	.9990	.9988	.9990	.9992	.9991	.9993	.9995	.9996	.9996	1.00	3
.9987	.9988	.9986	.9987	.9991	.9990	.9991	.9993	.9995	.9995	1.30	4
.9985	.9987	.9984	.9986	.9989	.9988	.9990	.9992	.9994	.9994	1.60	5
.9983	.9985	.9981	.9983	.9987	.9986	.9988	.9991	.9993	.9994	2.00	6
.9982	.9983	.9979	.9981	.9986	.9984	.9986	.9989	.9992	.9992	2.50	7
.9980	.9982	.9978	.9980	.9985	.9983	.9985	.9989	.9992	.9992	3.00	8
.9977	.9979	.9974	.9977	.9982	.9980	.9983	.9986	.9990	.9990	4.00	9
.9975	.9977	.9971	.9974	.9980	.9978	.9981	.9985	.9989	.9989	5.00	10
.9971	.9974	.9968	.9970	.9977	.9975	.9978	.9983	.9987	.9988	6.50	11
.9968	.9971	.9964	.9968	.9975	.9972	.9976	.9981	.9986	.9987	8.00	12
.9964	.9968	.9960	.9964	.9972	.9969	.9974	.9979	.9985	.9985	10.00	13
.9958	.9963	.9954	.9959	.9968	.9965	.9970	.9976	.9982	.9983	13.00	14
.9952	.9958	.9948	.9954	.9964	.9961	.9967	.9974	.9981	.9981	16.00	15
.9944	.9951	.9940	.9947	.9960	.9956	.9962	.9970	.9978	.9979	20.00	16
.9934	.9942	.9930	.9939	.9953	.9949	.9957	.9966	.9975	.9976	25.00	17
.9924	.9934	.9920	.9931	.9947	.9942	.9952	.9962	.9972	.9973	30.00	18
.9904	.9917	.9901	.9915	.9935	.9930	.9941	.9954	.9966	.9967	40.00	19
.9885	.9900	.9882	.9900	.9924	.9918	.9932	.9947	.9960	.9962	50.00	20
.9855	.9875	.9854	.9876	.9907	.9899	.9917	.9935	.9952	.9954	65.00	21
.9826	.9849	.9825	.9853	.9889	.9880	.9902	.9924	.9943	.9946	80.00	22
.9785	.9813	.9786	.9821	.9865	.9855	.9881	.9908	.9931	.9934	100.00	23
.9723	.9757	.9726	.9771	.9828	.9815	.9850	.9883	.9912	.9916	130.00	24
.9659	.9699	.9665	.9721	.9789	.9774	.9817	.9857	.9892	.9898	160.00	25
.9572	.9619	.9582	.9653	.9736	.9718	.9771	.9821	.9863	.9871	200.00	26
.9455	.9508	.9470	.9559	.9663	.9641	.9708	.9771	.9824	.9833	250.00	27
.9315	.9374	.9305	.9445	.9572	.9547	.9630	.9708	.9774	.9786	300.00	28
.8949	.9017	.8976	.9133	.9319	.9283	.9406	.9527	.9630	.9647	400.00	29
.8489	.8562	.8515	.8719	.8974	.8925	.9095	.9271	.9425	.9450	500.00	30
.7673	.7757	.7694	.7954	.8317	.8250	.8486	.8761	.9008	.9047	650.00	31
.6752	.6854	.6771	.7066	.7527	.7453	.7741	.8124	.8474	.8530	800.00	32
.5457	.5594	.5485	.5795	.6357	.6295	.6626	.7143	.7628	.7710	1000.00	33
.5371	.5510	.5400	.5709	.6276	.6216	.6550	.7075	.7567	.7651	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 762.0 AND 771.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

762.0	763.0	764.0	765.0	766.0	767.0	768.0	769.0	770.0	771.0	PRESS(MB.)	
.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	.60	2
.9997	.9998	.9998	.9998	.9998	.9999	.9999	.9999	.9999	.9999	1.00	3
.9996	.9997	.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9999	1.30	4
.9995	.9996	.9997	.9997	.9998	.9998	.9998	.9999	.9999	.9999	1.60	5
.9995	.9996	.9997	.9997	.9997	.9998	.9998	.9998	.9999	.9999	2.00	6
.9994	.9995	.9996	.9996	.9997	.9997	.9997	.9998	.9998	.9998	2.50	7
.9993	.9994	.9995	.9995	.9996	.9997	.9997	.9998	.9998	.9998	3.00	8
.9991	.9993	.9994	.9995	.9996	.9996	.9997	.9997	.9998	.9998	4.00	9
.9991	.9992	.9994	.9994	.9995	.9996	.9997	.9997	.9998	.9998	5.00	10
.9989	.9991	.9993	.9993	.9994	.9995	.9996	.9997	.9997	.9997	6.50	11
.9988	.9991	.9993	.9993	.9994	.9995	.9996	.9996	.9997	.9997	8.00	12
.9987	.9989	.9992	.9992	.9993	.9995	.9995	.9996	.9996	.9997	10.00	13
.9985	.9988	.9991	.9991	.9992	.9994	.9994	.9995	.9996	.9996	13.00	14
.9984	.9987	.9990	.9990	.9992	.9993	.9994	.9995	.9995	.9996	16.00	15
.9982	.9985	.9989	.9989	.9991	.9993	.9993	.9994	.9995	.9995	20.00	16
.9979	.9983	.9987	.9987	.9989	.9991	.9993	.9994	.9994	.9995	25.00	17
.9977	.9981	.9985	.9986	.9988	.9990	.9992	.9993	.9993	.9994	30.00	18
.9972	.9977	.9982	.9983	.9986	.9988	.9990	.9991	.9992	.9992	40.00	19
.9968	.9973	.9979	.9980	.9983	.9986	.9988	.9990	.9991	.9991	50.00	20
.9961	.9968	.9975	.9976	.9980	.9984	.9985	.9987	.9988	.9989	65.00	21
.9954	.9962	.9971	.9972	.9976	.9980	.9982	.9985	.9986	.9987	80.00	22
.9945	.9954	.9964	.9965	.9971	.9976	.9978	.9981	.9983	.9984	100.00	23
.9929	.9942	.9954	.9956	.9962	.9969	.9972	.9975	.9977	.9979	130.00	24
.9914	.9929	.9943	.9945	.9953	.9961	.9964	.9968	.9970	.9973	160.00	25
.9891	.9909	.9927	.9930	.9940	.9949	.9953	.9958	.9961	.9964	200.00	26
.9859	.9882	.9904	.9907	.9920	.9931	.9936	.9943	.9946	.9950	250.00	27
.9818	.9847	.9875	.9879	.9895	.9909	.9916	.9924	.9929	.9934	300.00	28
.9700	.9746	.9789	.9797	.9823	.9845	.9858	.9870	.9878	.9886	400.00	29
.9531	.9600	.9666	.9678	.9718	.9753	.9774	.9792	.9806	.9820	500.00	30
.9180	.9297	.9404	.9426	.9498	.9559	.9598	.9629	.9656	.9681	650.00	31
.8720	.8891	.9050	.9085	.9198	.9293	.9358	.9404	.9452	.9492	800.00	32
.7973	.8216	.8445	.8503	.8681	.8832	.8941	.9013	.9096	.9164	1000.00	33
.7918	.8166	.8399	.8460	.8642	.8797	.8909	.8983	.9069	.9138	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 772.0 AND 781.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

772.0	773.0	774.0	775.0	776.0	777.0	778.0	779.0	780.0	781.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.00	3
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.30	4
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.60	5
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	2.00	6
.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	2.50	7
.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.00	8
.9998	.9998	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	4.00	9
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9999	5.00	10
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9999	6.50	11
.9997	.9997	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	8.00	12
.9997	.9997	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	10.00	13
.9997	.9997	.9997	.9998	.9998	.9998	.9998	.9998	.9998	.9998	13.00	14
.9996	.9996	.9997	.9997	.9997	.9997	.9997	.9997	.9998	.9998	16.00	15
.9996	.9996	.9996	.9997	.9997	.9997	.9997	.9997	.9997	.9998	20.00	16
.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9997	.9997	.9997	25.00	17
.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9996	.9997	30.00	18
.9993	.9993	.9994	.9994	.9995	.9995	.9995	.9995	.9995	.9995	40.00	19
.9992	.9992	.9993	.9993	.9994	.9994	.9994	.9995	.9995	.9995	50.00	20
.9990	.9990	.9991	.9992	.9992	.9992	.9992	.9993	.9993	.9993	65.00	21
.9989	.9989	.9990	.9990	.9990	.9990	.9990	.9991	.9991	.9991	80.00	22
.9985	.9986	.9987	.9987	.9988	.9988	.9988	.9989	.9989	.9989	100.00	23
.9981	.9981	.9983	.9983	.9983	.9984	.9984	.9984	.9985	.9985	130.00	24
.9975	.9975	.9977	.9977	.9978	.9979	.9979	.9980	.9980	.9980	160.00	25
.9966	.9967	.9969	.9969	.9970	.9971	.9971	.9972	.9973	.9973	200.00	26
.9953	.9954	.9957	.9958	.9959	.9960	.9960	.9961	.9962	.9963	250.00	27
.9938	.9939	.9943	.9943	.9945	.9946	.9946	.9948	.9949	.9950	300.00	28
.9893	.9895	.9902	.9903	.9906	.9909	.9909	.9913	.9914	.9916	400.00	29
.9831	.9835	.9846	.9849	.9854	.9858	.9859	.9865	.9868	.9870	500.00	30
.9702	.9711	.9731	.9737	.9746	.9756	.9758	.9770	.9775	.9780	650.00	31
.9527	.9544	.9575	.9588	.9603	.9621	.9626	.9646	.9655	.9663	800.00	32
.9223	.9254	.9306	.9331	.9357	.9391	.9400	.9436	.9450	.9465	1000.00	33
.9200	.9231	.9286	.9312	.9338	.9374	.9383	.9421	.9435	.9451	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 782.0 AND 791.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

782.0	783.0	784.0	785.0	786.0	787.0	788.0	789.0	790.0	791.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	.9999	1.0000	1.0000	2.00	6
.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	.9999	1.0000	1.0000	2.50	7
.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	.9999	.9999	.9999	3.00	8
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	.9999	.9999	.9999	4.00	9
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	.9999	.9999	.9999	5.00	10
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	.9999	.9999	.9999	6.50	11
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	.9999	.9999	.9999	8.00	12
.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	10.00	13
.9998	.9998	.9998	.9999	.9998	.9999	.9999	.9998	.9998	.9998	13.00	14
.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9998	.9998	.9998	16.00	15
.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9997	.9998	.9998	20.00	16
.9997	.9998	.9998	.9998	.9998	.9998	.9999	.9997	.9997	.9998	25.00	17
.9997	.9997	.9997	.9998	.9997	.9998	.9999	.9996	.9997	.9997	30.00	18
.9996	.9996	.9996	.9997	.9996	.9998	.9998	.9995	.9996	.9996	40.00	19
.9995	.9995	.9995	.9996	.9995	.9997	.9997	.9994	.9995	.9995	50.00	20
.9993	.9994	.9994	.9995	.9994	.9996	.9997	.9993	.9994	.9994	65.00	21
.9992	.9992	.9993	.9993	.9993	.9994	.9996	.9991	.9992	.9992	80.00	22
.9990	.9990	.9991	.9992	.9991	.9993	.9994	.9989	.9989	.9990	100.00	23
.9985	.9986	.9987	.9988	.9987	.9990	.9992	.9985	.9986	.9987	130.00	24
.9981	.9982	.9982	.9984	.9983	.9986	.9989	.9980	.9982	.9983	160.00	25
.9974	.9976	.9976	.9978	.9977	.9981	.9984	.9974	.9975	.9977	200.00	26
.9964	.9966	.9966	.9969	.9967	.9973	.9976	.9964	.9966	.9968	250.00	27
.9952	.9954	.9955	.9958	.9956	.9963	.9967	.9952	.9955	.9958	300.00	28
.9919	.9923	.9924	.9929	.9927	.9937	.9944	.9921	.9925	.9930	400.00	29
.9875	.9881	.9884	.9891	.9889	.9903	.9913	.9880	.9886	.9893	500.00	30
.9789	.9800	.9804	.9818	.9815	.9837	.9853	.9800	.9810	.9821	650.00	31
.9678	.9695	.9702	.9723	.9720	.9752	.9776	.9698	.9713	.9730	800.00	32
.9492	.9519	.9531	.9566	.9564	.9613	.9648	.9531	.9553	.9580	1000.00	33
.9478	.9506	.9518	.9554	.9552	.9602	.9639	.9519	.9542	.9568	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 792.0 AND 801.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

792.0	793.0	794.0	795.0	796.0	797.0	798.0	799.0	800.0	801.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	1.30	4
1.0000	.9999	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	1.60	5
1.0000	.9999	1.0000	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	2.00	6
.9999	.9999	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	2.50	7
.9999	.9999	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.00	8
.9999	.9999	1.0000	.9999	.9999	.9999	.9999	.9999	.9999	.9999	4.00	9
.9999	.9999	1.0000	.9999	.9999	.9999	.9999	.9998	.9999	.9999	5.00	10
.9999	.9998	.9999	.9999	.9999	.9999	.9999	.9998	.9999	.9999	6.50	11
.9999	.9998	.9999	.9999	.9999	.9999	.9999	.9998	.9998	.9998	8.00	12
.9998	.9998	.9999	.9999	.9998	.9999	.9998	.9998	.9998	.9998	10.00	13
.9998	.9998	.9999	.9999	.9998	.9998	.9998	.9997	.9998	.9998	13.00	14
.9998	.9997	.9999	.9999	.9998	.9998	.9998	.9997	.9998	.9998	16.00	15
.9997	.9997	.9999	.9998	.9997	.9998	.9997	.9996	.9997	.9997	20.00	16
.9997	.9997	.9999	.9998	.9997	.9998	.9997	.9996	.9997	.9997	25.00	17
.9997	.9996	.9998	.9998	.9997	.9997	.9997	.9996	.9997	.9996	30.00	18
.9996	.9995	.9998	.9997	.9996	.9996	.9996	.9995	.9996	.9996	40.00	19
.9994	.9994	.9997	.9996	.9994	.9995	.9994	.9993	.9994	.9994	50.00	20
.9993	.9992	.9996	.9995	.9993	.9994	.9994	.9992	.9993	.9993	65.00	21
.9991	.9990	.9995	.9994	.9992	.9993	.9992	.9989	.9991	.9991	80.00	22
.9989	.9988	.9994	.9992	.9991	.9991	.9990	.9987	.9989	.9989	100.00	23
.9986	.9984	.9991	.9989	.9986	.9988	.9986	.9983	.9986	.9985	130.00	24
.9981	.9979	.9988	.9986	.9982	.9984	.9982	.9979	.9981	.9981	160.00	25
.9975	.9973	.9983	.9980	.9975	.9978	.9976	.9972	.9975	.9974	200.00	26
.9966	.9963	.9976	.9972	.9967	.9970	.9967	.9962	.9966	.9966	250.00	27
.9955	.9951	.9967	.9963	.9956	.9960	.9957	.9951	.9956	.9955	300.00	28
.9925	.9920	.9944	.9938	.9928	.9933	.9929	.9921	.9927	.9926	400.00	29
.9886	.9879	.9915	.9905	.9891	.9898	.9892	.9881	.9890	.9887	500.00	30
.9811	.9800	.9857	.9843	.9821	.9831	.9821	.9804	.9816	.9811	650.00	31
.9715	.9700	.9784	.9763	.9732	.9745	.9730	.9706	.9723	.9713	800.00	32
.9557	.9537	.9664	.9632	.9587	.9615	.9581	.9547	.9571	.9554	1000.00	33
.9546	.9524	.9655	.9622	.9576	.9595	.9570	.9535	.9560	.9542	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 802.0 AND 811.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

802.0	803.0	804.0	805.0	806.0	807.0	808.0	809.0	810.0	811.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.00	3
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.30	4
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.60	5
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	2.00	6
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	2.50	7
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	3.00	8
.9998	.9999	.9999	.9998	.9999	.9999	.9999	.9999	.9999	.9999	4.00	9
.9998	.9999	.9999	.9998	.9999	.9999	.9998	.9999	.9999	.9999	5.00	10
.9998	.9999	.9999	.9998	.9999	.9999	.9998	.9999	.9999	.9999	6.50	11
.9998	.9998	.9998	.9998	.9998	.9999	.9998	.9999	.9999	.9999	8.00	12
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	.9999	.9998	10.00	13
.9997	.9998	.9998	.9997	.9998	.9998	.9998	.9998	.9998	.9998	13.00	14
.9997	.9998	.9998	.9997	.9998	.9998	.9997	.9998	.9998	.9998	16.00	15
.9996	.9997	.9997	.9996	.9997	.9998	.9997	.9998	.9998	.9998	20.00	16
.9996	.9997	.9997	.9996	.9997	.9997	.9996	.9997	.9998	.9997	25.00	17
.9995	.9996	.9996	.9995	.9997	.9997	.9996	.9997	.9997	.9997	30.00	18
.9994	.9996	.9996	.9994	.9996	.9996	.9995	.9997	.9997	.9996	40.00	19
.9992	.9994	.9994	.9993	.9994	.9995	.9994	.9996	.9996	.9996	50.00	20
.9991	.9992	.9992	.9991	.9993	.9993	.9992	.9994	.9995	.9994	65.00	21
.9989	.9991	.9991	.9989	.9992	.9993	.9991	.9994	.9994	.9993	80.00	22
.9986	.9989	.9989	.9987	.9990	.9990	.9989	.9992	.9992	.9991	100.00	23
.9982	.9985	.9985	.9983	.9986	.9987	.9985	.9989	.9990	.9988	130.00	24
.9977	.9981	.9981	.9978	.9983	.9983	.9981	.9985	.9986	.9985	160.00	25
.9971	.9975	.9975	.9972	.9977	.9977	.9975	.9980	.9982	.9980	200.00	26
.9961	.9966	.9966	.9962	.9969	.9969	.9967	.9973	.9975	.9972	250.00	27
.9949	.9956	.9955	.9951	.9959	.9959	.9956	.9964	.9966	.9964	300.00	28
.9918	.9927	.9925	.9920	.9932	.9932	.9929	.9940	.9943	.9940	400.00	29
.9877	.9889	.9886	.9880	.9896	.9896	.9891	.9908	.9911	.9907	500.00	30
.9796	.9815	.9808	.9800	.9826	.9823	.9816	.9844	.9848	.9841	650.00	31
.9694	.9721	.9708	.9698	.9735	.9729	.9720	.9761	.9766	.9756	800.00	32
.9527	.9565	.9544	.9532	.9585	.9573	.9561	.9623	.9627	.9613	1000.00	33
.9515	.9554	.9532	.9519	.9574	.9562	.9549	.9612	.9617	.9603	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 812.0 AND 821.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

812.0	813.0	814.0	815.0	816.0	817.0	818.0	819.0	820.0	821.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	4.00	9
.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	5.00	10
.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	6.50	11
.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	8.00	12
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	10.00	13
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	13.00	14
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	1.0000	16.00	15
.9998	.9999	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	20.00	16
.9998	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	25.00	17
.9998	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	30.00	18
.9997	.9998	.9997	.9998	.9999	.9998	.9999	.9999	.9999	.9999	40.00	19
.9997	.9997	.9997	.9998	.9998	.9998	.9998	.9999	.9999	.9999	50.00	20
.9995	.9996	.9995	.9997	.9997	.9997	.9997	.9998	.9998	.9998	65.00	21
.9995	.9995	.9995	.9996	.9997	.9996	.9997	.9998	.9997	.9998	80.00	22
.9993	.9994	.9993	.9995	.9996	.9995	.9996	.9997	.9996	.9997	100.00	23
.9991	.9992	.9991	.9993	.9994	.9993	.9994	.9995	.9995	.9995	130.00	24
.9983	.9989	.9988	.9991	.9992	.9991	.9992	.9994	.9993	.9994	160.00	25
.9984	.9985	.9984	.9987	.9988	.9988	.9989	.9990	.9990	.9991	200.00	26
.9978	.9980	.9978	.9982	.9983	.9983	.9984	.9986	.9986	.9987	250.00	27
.9970	.9972	.9971	.9975	.9977	.9976	.9978	.9981	.9980	.9982	300.00	28
.9949	.9953	.9950	.9958	.9961	.9959	.9963	.9967	.9966	.9969	400.00	29
.9921	.9927	.9923	.9934	.9939	.9937	.9942	.9948	.9947	.9951	500.00	30
.9865	.9874	.9868	.9887	.9895	.9891	.9900	.9911	.9909	.9915	650.00	31
.9793	.98[illegible]5	.9795	.9825	.9837	.9831	.9844	.9862	.9858	.9869	800.00	32
.9670	.9687	.9673	.9720	.9738	.9728	.9750	.9779	.9772	.9789	1000.00	33
.9661	.9678	.9664	.9712	.9731	.9720	.9742	.9772	.9766	.9783	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 822.0 AND 831.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

822.0	823.0	824.0	825.0	826.0	827.0	828.0	829.0	830.0	831.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
.9999	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	1.0000	1.0000	40.00	19
.9999	1.0000	1.0000	1.0000	.9999	.9999	.9999	.9999	1.0000	1.0000	50.00	20
.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	65.00	21
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9999	.9999	80.00	22
.9997	.9997	.9997	.9998	.9997	.9998	.9998	.9998	.9998	.9999	100.00	23
.9996	.9996	.9996	.9996	.9996	.9996	.9997	.9997	.9997	.9998	130.00	24
.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9996	160.00	25
.9992	.9993	.9993	.9993	.9993	.9993	.9993	.9993	.9993	.9994	200.00	26
.9988	.9989	.9989	.9989	.9989	.9989	.9989	.9990	.9990	.9991	250.00	27
.9984	.9984	.9984	.9985	.9984	.9984	.9985	.9985	.9986	.9987	300.00	28
.9971	.9972	.9972	.9973	.9972	.9973	.9973	.9974	.9975	.9977	400.00	29
.9954	.9957	.9957	.9958	.9956	.9957	.9958	.9959	.9960	.9964	500.00	30
.9922	.9926	.9926	.9928	.9925	.9925	.9927	.9929	.9932	.9939	650.00	31
.988[illegible]	.9887	.9886	.9889	.9884	.9884	.9887	.9890	.9895	.9917	800.00	32
[illegible]	.982[illegible]	.9818	.9822	.9812	.9813	.9819	.9823	.9833	.9853	1000.00	33
.9804	.9815	.9813	.9817	.9807	.9807	.9813	.9818	.9828	.9849	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 832.0 AND 841.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

832.0	833.0	834.0	835.0	836.0	837.0	838.0	839.0	840.0	841.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	40.00	19
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	50.00	20
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	65.00	21
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	80.00	22
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	100.00	23
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	130.00	24
.9996	.9996	.9996	.9997	.9997	.9997	.9997	.9997	.9997	.9997	160.00	25
.9994	.9994	.9994	.9995	.9995	.9995	.9995	.9995	.9995	.9995	200.00	26
.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9992	.9992	.9992	250.00	27
.9987	.9987	.9987	.9988	.9988	.9988	.9988	.9988	.9989	.9989	300.00	28
.9977	.9977	.9978	.9978	.9978	.9979	.9979	.9979	.9979	.9980	400.00	29
.9964	.9965	.9965	.9966	.9966	.9966	.9967	.9967	.9967	.9968	500.00	30
.9940	.9940	.9941	.9942	.9943	.9943	.9944	.9945	.9946	.9946	650.00	31
.9908	.9910	.9911	.9912	.9913	.9914	.9915	.9916	.9918	.9918	800.00	32
.9855	.9858	.9861	.9861	.9863	.9866	.9867	.9868	.9871	.9872	1000.00	33
.9852	.9854	.9857	.9858	.9860	.9862	.9863	.9865	.9867	.9868	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 842.0 AND 851.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

842.0	843.0	844.0	845.0	846.0	847.0	848.0	849.0	850.0	851.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	40.00	19
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	50.00	20
.9999	.9999	.9999	.9999	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	65.00	21
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	80.00	22
.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	100.00	23
.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	130.00	24
.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	160.00	25
.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9995	.9996	200.00	26
.9992	.9992	.9992	.9992	.9993	.9993	.9993	.9993	.9993	.9993	250.00	27
.9989	.9989	.9989	.9989	.9989	.9989	.9990	.9990	.9990	.9990	300.00	28
.9981	.9980	.9981	.9981	.9981	.9981	.9982	.9982	.9982	.9982	400.00	29
.9968	.9969	.9969	.9970	.9970	.9971	.9971	.9971	.9972	.9972	500.00	30
.9947	.9948	.9948	.9949	.9949	.9950	.9951	.9951	.9952	.9953	650.00	31
.9919	.9921	.9921	.9922	.9924	.9925	.9926	.9927	.9928	.9928	800.00	32
.9873	.9876	.9877	.9879	.9881	.9882	.9883	.9885	.9886	.9868	1000.00	33
.9870	.9872	.9873	.9875	.9877	.9878	.9880	.9882	.9883	.9885	1013.25	34

TRANSMISSIVITIES AVERAGED OVER FIVE WAVENUMBER INTREVALS, BETWEEN 852.0 AND 857.0 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

852.0	853.0	854.0	855.0	856.0	857.0	PRESS(MB.)	
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.30	4
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.60	5
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.00	6
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.50	7
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	3.00	8
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	4.00	9
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	5.00	10
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	6.50	11
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	8.00	12
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	10.00	13
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	13.00	14
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	16.00	15
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	20.00	16
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	25.00	17
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	30.00	18
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	40.00	19
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	50.00	20
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	65.00	21
.9999	.9999	.9999	.9999	.9999	.9999	80.00	22
.9999	.9999	.9999	.9999	.9999	.9999	100.00	23
.9998	.9998	.9998	.9998	.9998	.9998	130.00	24
.9997	.9997	.9997	.9997	.9997	.9997	160.00	25
.9996	.9996	.9996	.9996	.9996	.9996	200.00	26
.9993	.9993	.9993	.9993	.9993	.9993	250.00	27
.9990	.9990	.9990	.9990	.9990	.9991	300.00	28
.9982	.9983	.9983	.9983	.9983	.9983	400.00	29
.9973	.9973	.9973	.9974	.9974	.9974	500.00	30
.9953	.9954	.9955	.9955	.9956	.9956	650.00	31
.9929	.9930	.9931	.9932	.9933	.9934	800.00	32
.9889	.9891	.9892	.9894	.9895	.9897	1000.00	33
.9887	.9888	.9890	.9891	.9892	.9894	1013.25	34

APPENDIX C

TRANSMISSIVITIES AVERAGED OVER 0.1 cm^{-1} INTERVALS BETWEEN 665.5 and 670.5 cm^{-1}

TRANSMISSIVITIES AVERAGED OVER 0.1 WAVENUMBER INTERVALS, BETWEEN 665.5 AND 666.5 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

665.55	.65	.75	.85	.95	666.05	.15	.25	.35	666.45	PRESS(MB.)	
1.0000	.9999	1.0000	.9714	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.30	1
1.0000	.9999	.9999	.9649	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.60	2
1.0000	.9998	.9998	.9552	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.00	3
.9999	.9997	.9997	.9470	.9998	.9999	.9999	.9999	.9999	.9999	1.30	4
.9999	.9996	.9995	.9379	.9997	.9999	.9999	.9999	.9999	.9999	1.60	5
.9999	.9995	.9992	.9249	.9995	.9998	.9999	.9999	.9999	.9998	2.00	6
.9998	.9993	.9987	.9077	.9992	.9997	.9998	.9998	.9998	.9998	2.50	7
.9997	.9992	.9981	.8899	.9988	.9996	.9997	.9997	.9997	.9997	3.00	8
.9995	.9987	.9964	.8539	.9978	.9992	.9994	.9995	.9994	.9994	4.00	9
.9992	.9982	.9943	.8179	.9964	.9987	.9991	.9991	.9991	.9990	5.00	10
.9986	.9972	.9901	.7649	.9938	.9978	.9984	.9985	.9985	.9984	6.50	11
.9979	.9959	.9846	.7133	.9903	.9967	.9976	.9978	.9977	.9975	8.00	12
.9966	.9938	.9754	.6478	.9846	.9947	.9962	.9965	.9964	.9961	10.00	13
.9943	.9897	.9580	.5578	.9735	.9909	.9935	.9940	.9939	.9933	13.00	14
.9912	.9846	.9365	.4775	.9596	.9861	.9901	.9909	.9907	.9899	16.00	15
.9862	.9761	.9021	.3846	.9369	.9781	.9844	.9858	.9855	.9842	20.00	16
.9784	.9630	.8516	.2891	.9026	.9657	.9756	.9778	.9773	.9753	25.00	17
.9689	.9470	.7951	.2141	.8623	.9507	.9649	.9681	.9674	.9645	30.00	18
.9450	.9075	.6732	.1126	.7688	.9132	.9380	.9436	.9425	.9374	40.00	19
.9148	.8587	.5523	.0561	.6656	.8668	.9043	.9129	.9112	.9037	50.00	20
.8595	.7723	.3933	.0180	.5113	.7841	.8429	.8566	.8541	.8421	65.00	21
.7945	.6762	.2696	.0051	.3746	.6912	.7713	.7905	.7871	.7704	80.00	22
.6977	.5438	.1548	.0008	.2333	.5615	.6659	.6921	.6875	.6650	100.00	23
.5440	.3606	.0602	.0000	.1029	.3783	.5026	.5365	.5305	.5015	130.00	24
.3979	.2174	.0204	.0000	.0403	.2312	.3526	.3892	.3826	.3514	160.00	25
.2376	.0965	.0039	.0000	.0095	.1038	.1964	.2288	.2228	.1952	200.00	26
.1074	.0290	.0004	.0000	.0012	.0309	.0794	.1003	.0962	.0783	250.00	27
.0419	.0074	.0000	.0000	.0001	.0076	.0270	.0373	.0350	.0260	300.00	28
.0043	.0003	.0000	.0000	.0000	.0003	.0019	.0032	.0028	.0017	400.00	29
.0003	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER 0.1 WAVENUMBER INTERVALS, BETWEEN 666.5 AND 667.5 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

666.55	.65	.75	.85	.95	667.05	.15	.25	.35	667.45	PRESS(MB.)	
1.0000	.9998	1.0000	1.0000	.9949	1.0000	1.0000	.9999	.9827	.7945	.30	1
1.0000	.9996	1.0000	1.0000	.9910	.9999	.9999	.9998	.9761	.7419	.60	2
1.0000	.9993	.9999	.9999	.9872	.9998	.9997	.9994	.9645	.6627	1.00	3
.9999	.9991	.9999	.9998	.9850	.9997	.9996	.9990	.9543	.5994	1.30	4
.9999	.9989	.9998	.9998	.9832	.9996	.9993	.9985	.9430	.5360	1.60	5
.9998	.9987	.9997	.9996	.9813	.9994	.9989	.9976	.9269	.4557	2.00	6
.9997	.9984	.9996	.9994	.9793	.9990	.9983	.9962	.9056	.3667	2.50	7
.9996	.9981	.9994	.9992	.9776	.9985	.9976	.9944	.8837	.2920	3.00	8
.9993	.9976	.9990	.9985	.9743	.9974	.9956	.9898	.8390	.1809	4.00	9
.9989	.9969	.9984	.9977	.9711	.9959	.9930	.9838	.7938	.1083	5.00	10
.9981	.9958	.9973	.9961	.9662	.9929	.9879	.9720	.7257	.0461	6.50	11
.9971	.9944	.9958	.9941	.9610	.9892	.9815	.9571	.6576	.0175	8.00	12
.9955	.9923	.9934	.9909	.9535	.9829	.9708	.9326	.5700	.0041	10.00	13
.9924	.9884	.9888	.9847	.9407	.9710	.9504	.8870	.4511	.0003	13.00	14
.9884	.9835	.9831	.9769	.9259	.9560	.9252	.8325	.3497	.0000	16.00	15
.9819	.9755	.9736	.9641	.9035	.9316	.8848	.7497	.2415	.0000	20.00	16
.9718	.9632	.9589	.9444	.8714	.8947	.8248	.6371	.1446	.0000	25.00	17
.9595	.9485	.9411	.9209	.8354	.8513	.7567	.5234	.0819	.0000	30.00	18
.9289	.9121	.8973	.8637	.7540	.7496	.6076	.3216	.0221	.0000	40.00	19
.8908	.8674	.8438	.7953	.6641	.6362	.4585	.1766	.0047	.0000	50.00	20
.8219	.7878	.7497	.6790	.5241	.4647	.2686	.0602	.0003	.0000	65.00	21
.7426	.6979	.6459	.5567	.3912	.3133	.1388	.0171	.0000	.0000	80.00	22
.6278	.5712	.5048	.4013	.2428	.1642	.0479	.0024	.0000	.0000	100.00	23
.4551	.3895	.3150	.2154	.0987	.0485	.0068	.0001	.0000	.0000	130.00	24
.3035	.2406	.1741	.0991	.0322	.0108	.0007	.0000	.0000	.0000	160.00	25
.1553	.1086	.0655	.0279	.0052	.0010	.0000	.0000	.0000	.0000	200.00	26
.0549	.0317	.0144	.0040	.0003	.0000	.0000	.0000	.0000	.0000	250.00	27
.0157	.0072	.0024	.0004	.0000	.0000	.0000	.0000	.0000	.0000	300.00	28
.0007	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER 0.1 WAVENUMBER INTERVALS, BETWEEN 667.5 AND 668.5 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

667.55	.65	.75	.85	.95	668.05	.15	.25	.35	668.45	PRESS(MB.)	
.9137	.9469	.8538	.7699	.8169	.8550	.8895	.9087	.8924	.9218	.30	1
.8935	.9352	.8207	.7189	.7758	.8216	.8603	.8866	.8543	.8877	.60	2
.8633	.9188	.7766	.6468	.7216	.7804	.8218	.8615	.8156	.8544	1.00	3
.8375	.9049	.7422	.5896	.6789	.7484	.7914	.8430	.7908	.8342	1.30	4
.8093	.8897	.7079	.5331	.6360	.7161	.7606	.8248	.7690	.8172	1.60	5
.7693	.8676	.6636	.4614	.5801	.6735	.7195	.8007	.7428	.7976	2.00	6
.7173	.8379	.6119	.3805	.5137	.6215	.6688	.7708	.7129	.7761	2.50	7
.6647	.8067	.5648	.3108	.4525	.5716	.6197	.7412	.6850	.7564	3.00	8
.5617	.7423	.4845	.2030	.3464	.4797	.5277	.6831	.6331	.7201	4.00	9
.4654	.6769	.4196	.1305	.2617	.3994	.4452	.6277	.5857	.6867	5.00	10
.3388	.5803	.3420	.0660	.1684	.2995	.3400	.5501	.5215	.6402	6.50	11
.2371	.4885	.2800	.0329	.1061	.2216	.2559	.4797	.4645	.5977	8.00	12
.1396	.3778	.2129	.0124	.0553	.1445	.1717	.3957	.3968	.5449	10.00	13
.0578	.2429	.1364	.0024	.0189	.0711	.0911	.2892	.3083	.4705	13.00	14
.0221	.1469	.0829	.0004	.0057	.0322	.0470	.2060	.2348	.4024	16.00	15
.0055	.0692	.0387	.0000	.0010	.0099	.0189	.1270	.1583	.3221	20.00	16
.0007	.0242	.0128	.0000	.0001	.0019	.0057	.0667	.0920	.2386	25.00	17
.0001	.0076	.0036	.0000	.0000	.0003	.0015	.0339	.0506	.1727	30.00	18
.0000	.0006	.0002	.0000	.0000	.0000	.0001	.0081	.0131	.0845	40.00	19
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0017	.0028	.0380	50.00	20
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0002	.0098	65.00	21
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0021	80.00	22
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	100.00	23
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	130.00	24
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	160.00	25
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	200.00	26
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	250.00	27
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	300.00	28
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER 0.1 WAVENUMBER INTERVALS, BETWEEN 668.5 AND 669.5 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

668.55	.65	.75	.85	.95	669.05	.15	.25	.35	669.45	PRESS(MB.)	
.9407	.9467	.9707	.9779	.9815	.9898	.9927	.9953	.9745	.9979	.30	1
.9175	.9216	.9535	.9629	.9677	.9816	.9865	.9910	.9673	.9959	.60	2
.8961	.8997	.9376	.9482	.9536	.9727	.9792	.9857	.9589	.9932	1.00	3
.8830	.8869	.9282	.9397	.9453	.9673	.9746	.9822	.9527	.9914	1.30	4
.8717	.8764	.9206	.9330	.9387	.9631	.9708	.9792	.9468	.9899	1.60	5
.8586	.8644	.9120	.9256	.9318	.9585	.9669	.9760	.9392	.9881	2.00	6
.8437	.8512	.9029	.9180	.9247	.9540	.9628	.9727	.9298	.9863	2.50	7
.8298	.8393	.8948	.9115	.9187	.9502	.9595	.9699	.9206	.9848	3.00	8
.8037	.8172	.8802	.9000	.9085	.9438	.9540	.9650	.9026	.9820	4.00	9
.7791	.7968	.8670	.8898	.8996	.9383	.9493	.9608	.8852	.9795	5.00	10
.7442	.7680	.8487	.8758	.8877	.9310	.9432	.9549	.8601	.9758	6.50	11
.7115	.7411	.8317	.8629	.8770	.9244	.9377	.9494	.8360	.9720	8.00	12
.6699	.7068	.8100	.8464	.8635	.9160	.9306	.9419	.8050	.9667	10.00	13
.6090	.6561	.7772	.8214	.8432	.9030	.9198	.9296	.7593	.9574	13.00	14
.5507	.6066	.7442	.7959	.8227	.8895	.9085	.9161	.7148	.9465	16.00	15
.4778	.5437	.7202	.7615	.7950	.8707	.8925	.8960	.6579	.9296	20.00	16
.3960	.4708	.6461	.7181	.7600	.8458	.8708	.8677	.5920	.9046	25.00	17
.3249	.4049	.5935	.6749	.7251	.8197	.8477	.8364	.5327	.8757	30.00	18
.2132	.2943	.4946	.5908	.6558	.7648	.7973	.7668	.4307	.8077	40.00	19
.1362	.2097	.4057	.5113	.5885	.7071	.7427	.6910	.3446	.7291	50.00	20
.0661	.1279	.2914	.4018	.4914	.6173	.6547	.5732	.2383	.6007	65.00	21
.0301	.0661	.2001	.3058	.4005	.5265	.5631	.4591	.1580	.4714	80.00	22
.0095	.0275	.1135	.2024	.2935	.4104	.4431	.3250	.0863	.3166	100.00	23
.0014	.0064	.0427	.0989	.1701	.2616	.2852	.1761	.0310	.1485	130.00	24
.0001	.0013	.0140	.0434	.0899	.1523	.1668	.0859	.0096	.0575	160.00	25
.0000	.0001	.0026	.0124	.0333	.0644	.0704	.0282	.0016	.0121	200.00	26
.0000	.0000	.0002	.0019	.0074	.0172	.0186	.0053	.0001	.0011	250.00	27
.0000	.0000	.0000	.0002	.0011	.0033	.0036	.0007	.0000	.0001	300.00	28
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

TRANSMISSIVITIES AVERAGED OVER 0.1 WAVENUMBER INTERVALS, BETWEEN 669.5 AND 670.5 WAVENUMBERS

ZENITH ANGLE = 0 DEGREES

669.55	.65	.75	.85	.95	670.05	.15	.25	.35	670.45	PRESS(MB.)	
.9987	.9991	.9626	.9996	.9998	.9998	.9722	1.0000	1.0000	1.0000	.30	1
.9974	.9982	.9484	.9991	.9996	.9995	.9642	.9999	.9999	1.0000	.60	2
.9957	.9968	.9249	.9983	.9993	.9990	.9552	.9998	.9998	.9999	1.00	3
.9944	.9957	.9057	.9975	.9990	.9985	.9489	.9998	.9998	.9999	1.30	4
.9934	.9946	.8856	.9968	.9988	.9980	.9430	.9997	.9997	.9998	1.60	5
.9921	.9931	.8582	.9956	.9984	.9973	.9354	.9996	.9996	.9998	2.00	6
.9908	.9911	.8238	.9939	.9980	.9963	.9261	.9994	.9995	.9997	2.50	7
.9895	.9888	.7896	.9919	.9974	.9952	.9169	.9992	.9994	.9996	3.00	8
.9871	.9835	.7228	.9870	.9961	.9926	.8991	.9988	.9991	.9993	4.00	9
.9846	.9768	.6587	.9807	.9945	.9894	.8819	.9983	.9987	.9990	5.00	10
.9806	.9644	.5686	.9686	.9915	.9836	.8576	.9972	.9980	.9984	6.50	11
.9760	.9489	.4863	.9533	.9876	.9767	.8349	.9960	.9971	.9976	8.00	12
.9689	.9237	.3897	.9283	.9813	.9659	.8063	.9939	.9956	.9962	10.00	13
.9559	.8776	.2728	.8824	.9692	.9464	.7663	.9899	.9927	.9937	13.00	14
.9401	.8235	.1852	.8283	.9540	.9233	.7292	.9849	.9891	.9904	16.00	15
.9148	.7431	.1051	.7478	.9294	.8884	.6837	.9768	.9832	.9851	20.00	16
.8771	.6370	.0476	.6413	.8919	.8399	.6316	.9641	.9739	.9768	25.00	17
.8333	.5331	.0195	.5368	.8481	.7883	.5836	.9489	.9627	.9667	30.00	18
.7320	.3531	.0024	.3559	.7457	.6815	.4967	.9113	.9346	.9413	40.00	19
.6203	.2211	.0002	.2231	.6319	.5760	.4195	.8652	.8996	.9094	50.00	20
.4534	.1001	.0000	.1014	.4614	.4289	.3198	.7832	.8360	.8512	65.00	21
.3080	.0407	.0000	.0414	.3124	.3033	.2380	.6911	.7621	.7830	80.00	22
.1655	.0104	.0000	.0106	.1667	.1760	.1542	.5623	.6539	.6820	100.00	23
.0531	.0009	.0000	.0009	.0525	.0650	.0732	.3797	.4877	.5233	130.00	24
.0137	.0001	.0000	.0001	.0131	.0193	.0308	.2325	.3371	.3748	160.00	25
.0016	.0000	.0000	.0000	.0015	.0027	.0080	.1044	.1831	.2157	200.00	26
.0001	.0000	.0000	.0000	.0001	.0001	.0011	.0307	.0711	.0916	250.00	27
.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0072	.0228	.0328	300.00	28
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0014	.0026	400.00	29
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	500.00	30
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	650.00	31
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	800.00	32
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1000.00	33
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1013.25	34

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