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# Ozone observations with light from clear and cloudy zenith skies

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To make effective use of ozone measurements in Meteorology, *daily* observations of total ozone at a number of suitably distributed stations is necessary.

Dobson has shown that on days when the sky is clouded, measurements can be made with the light from the zenith sky. This method is followed at many stations in middle and high latitudes but has not generally been used in tropical latitudes. To try out whether the same method can be used with cloudy skies in tropical latitudes, zenith sky measurements were made during the period June 1957 to June 1958 at Mt. Abu (24°N) on days which were cloudy but on which direct sun observation could also be taken within a few hours of the zenith sky observation. For comparison, zenith sky measurements were made on many occasions along with direct sun observations when the zenith sky was blue.

The measurements were made with the wavelength pair $\lambda\lambda$ $CC'$ and also with the pairs $A$ and $D$ in the manner suggested by Dobson and Normand. The amount of ozone was calculated from each direct sun observation. Fig. 1 (a) shows the plot of $N_C$ and $N_{A-D}$ against $\mu$ on days with blue zenith skies for different values of ozone ranging from 0·221 to 0·255 cm. These are divided into three groups—

(*i*) 0·250 to 0·255 cm, (*ii*) 0·237 to 0·242 cm and (*iii*) 0·221 to 0·228 cm.

Fig. 1 (b) shows a similar plot of $N_C$ and $N_{A-D}$ against $\mu$ on days with uniform thick clouds for different values of ozone. The range of ozone values is the same as in Fig. 1 (a).

With direct sunlight, ozone measurements can be made with a relative error of about 1 per cent (Dobson and Meetham 1934). In the absence of direct sunlight also, the ozone amount can be determined from observations on the zenith sky, but with less accuracy. Errors in total ozone which may occur with observations made on the zenith blue or cloudy sky have been discussed by Tonsberg and Olsen (1944) and Langlo (1952).

From Fig.1 (a) relating to blue zenith skies, it is clear that the $N$ values show systematic variations with $\mu$ with a possible error of $\pm$ 0·005 cm when the average value of ozone is 0·240 cm.

From the chart relating to cloudy zenith skies (Fig. 1 b), it is noticed that :

(*i*) Points on both $\lambda\lambda$ $CC'$ and $A$—$D$ curves are more scattered than those on blue zenith sky curves.

(*ii*) An estimated maximum error of $\pm$0·010 cm can occur with $\lambda\lambda$ $CC'$, if the sky is clouded with uniform clouds of nearly constant illumination. The error would be markedly less with $A$—$D$.

Most of the days in sub-tropical latitudes are clear, but if the zenith is covered with thick uniform clouds, the ozone amount can be determined with reasonable accuracy using Fig. 1(b).

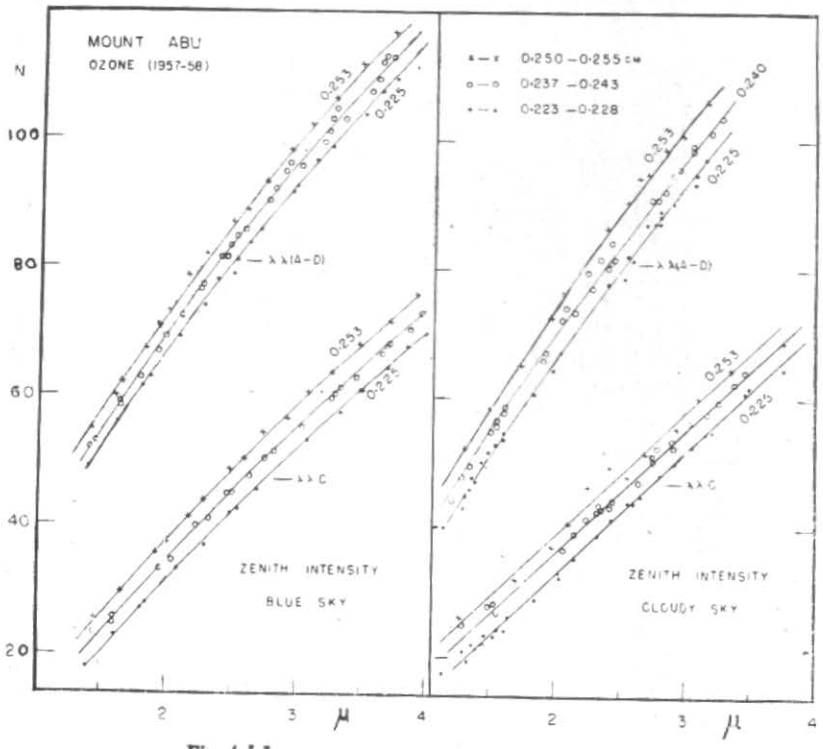


Fig. 1 (a) Fig. 1 (b)

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