

COMPLEX REFRACTIVE INDEX OF AIRBORNE PARTICULATES

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ABSTRACT

The angular variation of the intensity of light scattered from a collimated laser beam by airborne particulates and the size distribution of the particles were measured simultaneously on the NASA Convair 990 Airborne Laboratory in January 1973. The scattered-light measurements were made with the airborne polar nephelometer described by Grams (1973). Particle size distributions were determined by analysis of particles collected by the airborne impactor described by Blifford and Ringer (1969) and Grams et al. (1972). These measurements were used to obtain an estimate of the complex index of refraction of airborne particulates following the procedure outlined by Grams et al. (1974). In that procedure, polar scattering diagrams are calculated for the observed particle size distribution and for a number of assumed values of the complex refractive index. The most probable value of the complex refractive index is taken to be that which provides the best fit between observed and calculated polar scattering diagrams.

Thirty polar scattering diagrams were measured during these experiments. Data were obtained at a variety of altitudes extending from the surface to about 41,000 ft (12.5 km). Standard microscopic

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analysis procedures were employed to determine the real refractive index; the value 1.525 was taken to be representative. By using this value for the real part of the refractive index, the value of the imaginary part was determined to be no greater than about 0.01 (with an uncertainty factor of about two). Additional studies of the Convair-990 data are in process and new data are expected during Summer 1974 using the same equipment on the NCAR Electra aircraft. However, until more data of this type become available, our present recommendation for a refractive index value for interpreting laser radar data on backscattering coefficients of particles in the troposphere and lower stratosphere is $m = 1.525 - 0.01i$.

References

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