LIDAR/RADIOMETRIC STUDY OF THE URBAN AEROSOL*

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ABSTRACT

As part of the METROMEX* study of inadvertent climatic modification by urban areas, coordinated lidar and radiometric observations have been made of the urban aerosol structure and optical properties over St. Louis, Missouri, U.S.A. during the last three summers. This paper will review instrumentation techniques used, present examples of collected data, and discuss some results in terms of regional climatic modification by urban areas.

The lidar observations have provided information on the temporal and spatial variation of the geometry and relative optical density of aerosol and cloud layers. The diurnal pattern of aerosol and cloud structure depends greatly on regional weather. However, a consistent pattern is observed during most air pollution episodes and the general features of these patterns show correlation with solar radiation data. On the basis of the lidar data, a five layer diurnal model of atmospheric structure is derived for use in realistically computing the transport of solar radiation over urban areas.

The radiometric observations have provided information on aerosol optical depths as a function of wavelength, on the vertically integrated particle size distributions and water vapor concentrations, and on the wavelength-integrated aerosol scattering properties. These data combine with the lidar observations to provide quantitative aerosol properties for use in theoretical studies of aerosol climatic effects that have characteristically been limited by a lack of such experimental data.

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