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# INTENSIVE AIRBORNE AND SURFACE MEASUREMENTS OF AEROSOL MICROPHYSICAL AND OPTICAL PROPERTIES AND INFLUENCES ON SHORTWAVE RADIATION

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**ABSTRACT**

Knowledge of pertinent aerosol optical properties (e.g., optical thickness, single scatter albedo, backscatter fraction) is required to accurately calculate aerosol forcing. The Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) program has been systematically measuring aerosol properties at the surface and limited measurements aloft from light aircraft. Lidar and airborne in-situ measurements show that much of the aerosol at the ARM Southern Great Plains (SGP) site is aloft, often in layers decoupled from the surface, raising questions of the representativeness of surface aerosol properties for such calculations. Initial comparisons of aerosol optical thickness and aerosol extinction, two key aerosol properties, have revealed discrepancies among the lidar, Sun photometer, and airborne in situ measurements. Detailed measurements of aerosol optical properties are required to resolve these discrepancies, as well as to more completely characterize the aerosol optical, microphysical, and chemical properties at the surface and above the SGP site required for accurately computing radiative fluxes. Such well-characterized data would permit a more detailed evaluation of the performance of radiative transfer models to compute flux profiles and heating rates. In an effort to acquire these data, ARM will conduct an Aerosol Intensive Operational Period (IOP) in May 2003 at the ARM Southern Great Plains (SGP) site in north central Oklahoma. This experiment will use ground and airborne measurements of aerosol absorption, scattering, and extinction over the ARM SGP site to characterize the routine ARM aerosol measurements, and help resolve differences between measurements and models of diffuse irradiance at the surface. The assessments of aerosol optical thickness and aerosol absorption will be carried out in conjunction with measurements of downwelling direct and diffuse irradiance as a function of wavelength and altitude. The IOP will carry out a variety of closure experiments on aerosol optical properties and their radiative influence. Measurements of the aerosol chemical composition and size distribution will allow testing of the ability to reconstruct optical properties from these measurements. Additional effort will be directed toward measurement of cloud condensation nucleus concentration as a function of supersaturation and relating CCN concentration to aerosol composition and size distribution. This relation is central to description of the aerosol indirect effect. This poster describes the airborne and surface instruments that will be used in this IOP and the use of these data to conduct specific closure experiments relating to aerosol optical properties, radiative fluxes, and cloud condensation nuclei.

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