Preliminary Results of in-situ Measurements of Aerosol Optical and Water Uptake Properties from the ARM Mobile Facility in Niger

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The second deployment of the ARM Mobile Facility was in November of 2005 to Niamey, Niger. The year-long deployment is part of the AMF Radiative Divergence using AMF, GERB and AMMA Stations (RADAGAST) field campaign. The goal of this campaign is to provide direct estimates of the divergence of solar and thermal radiation across the atmosphere as well as study the role of clouds, aerosol and water on surface solar radiation. The site in Niger is located in the Sahel at the southwestern edge of the Sahara Desert. The aerosol of this region is a mix of desert dust and smoke from biofuel burning. Changes in the air mass between the wet and dry seasons will allow us to look at the influence of the aerosol on direct, clear-sky, radiative forcing as well as how cloud processing and wet deposition influence aerosol properties.

We show preliminary results from the first three months of in-situ aerosol measurements of aerosol light scattering and absorption, water uptake properties of the particles and their ability to act as cloud condensation nuclei. The winter months are during the dry season. Aerosol loading is relatively high with average scattering coefficients for the sub 10 um size aerosol at 550 nm near 100 Mm^{-1}. Most of the aerosol scattering resides in the super micron size mode. The Ångstrom exponent for the 550/700 nm pair for sub10 um size aerosol is between -0.5 and 0.5, indicating a large particle size. The aerosol single scattering albedo at 550 nm indicates a relatively dark aerosol with values ranging from 0.55-0.8 for subum size aerosol and 0.7 to 0.95 for sub 10um size aerosol.

The water uptake properties of the particles are important in determining both direct and indirect aerosol radiative forcing. The hygroscopic growth factor, which is a measure of the increase in the aerosol scattering coefficient for a relative humidity increase from 40 to 85%, is remarkably low for both sub10 um and submicron size particles, averaging about 1.0 and 1.2, respectively. Cloud condensation nuclei (CCN) are measured at five supersaturations. We observe a distinct diurnal variation in the CCN number concentration that coincides with observer observations of nighttime biofuel burning.

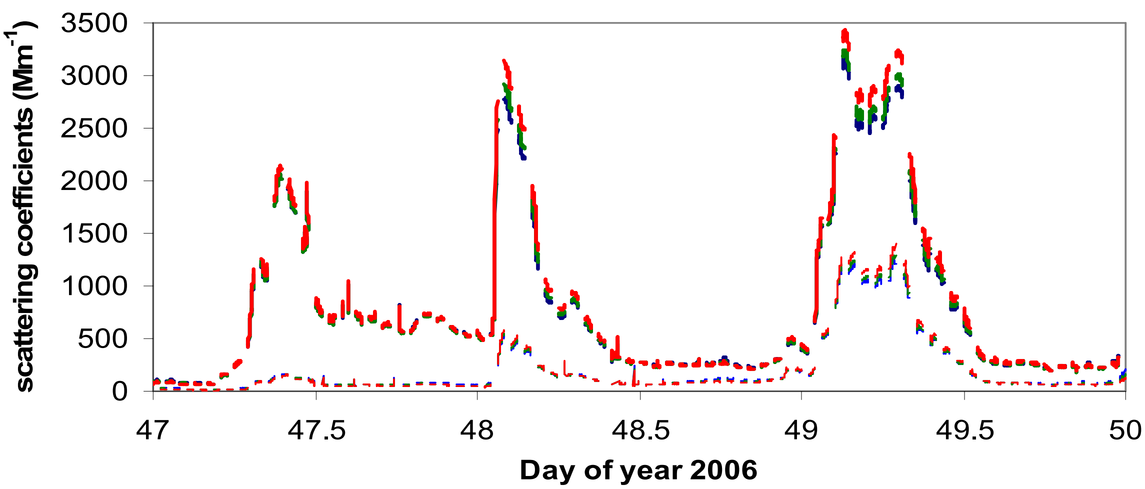

Figure 1. Aerosol sub *u*m (lower traces) and sub 10 *u*m (upper traces) scattering coefficients at 450 (blue), 550(green) and 700 (red) nm from Feb. 16-18 of 2006 depicting three large dust events.