

***AEROSOL CHEMICAL COMPOSITION CHARACTERIZATION AT THE ARM
SOUTHERN GREAT PLAINS (SGP) SITE USING AN AEROSOL CHEMICAL
SPECIATION MONITOR***

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ABSTRACT

An Aerosol Chemical Speciation Monitor (ACSM, Aerodyne Research Inc., Billerica, MA) was integrated into the Aerosol Observing System (AOS) at the Atmospheric Radiation Measurement (ARM) SGP site in Oklahoma in Nov 2010. This instrument has been measuring concentrations of sulfate, ammonium, nitrate, total organics, and chloride in submicron non-refractory particles (diameter ~50 nm to 600 nm) at a time resolution of ~30 min. The data collected so far showed a total mass concentration ranging from ~2 to ~25 microgram per cubic meter except for high loading episodes due most likely to biomass burning. The non-refractory components were dominated by organics. Using the data of June 2011 as an example, the mean fractions of organic and sulfate of the total mass were 70% and 15%, respectively. In addition, sulfate and nitrate were nearly always neutralized by ammonium. Based on air back trajectories, high aerosol loading events were associated with air coming from the south and low loading events with air from the north. Using a simplified algorithm developed by Ng et al (Environ Sci Technol, 45, 910, 2011), which was based on positive matrix factorization (PMF) analysis of urban data sets most of which obtained with high-resolution Aerosol Mass Spectrometer, organic aerosol (OA) observed at the SGP site was found to be comprised mainly of oxygenated OA with minor contributions from hydrocarbon-like OA, indicating that the OA at the SGP site was highly processed. The implications of the ACSM data will be investigated in the context of aerosol light scattering and cloud nucleating properties simultaneously determined at the SGP AOS. PMF analysis will be performed to verify the oxidation state of the OA at the SGP site and the applicability of the simplified algorithm for non-urban atmospheric environment.

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