

***AEROSOL CHEMICAL COMPOSITION AND ITS EFFECTS ON CLOUD-AEROSOL INTERACTIONS DURING THE 2007 CHAPS EXPERIMENT***

Y.-N. Lee, L. Alexander, M. Newburn, J. Jayne, J. Hubbe, S. Springston, G. Senum,  
E. Andrews, J. Ogren, L. Kleinman, P. Daum, L. Berg, and C. Berkowitz

*For presentation at the*  
American Geophysical Union Fall Meeting  
San Francisco, CA  
December 10-14, 2007

**Environmental Sciences Department/Atmospheric Sciences Division**  
**Brookhaven National Laboratory**  
P.O. Box, Upton, NY  
[www.bnl.gov](http://www.bnl.gov)

**ABSTRACT**

Chemical composition of submicron aerosol particles was determined using an Aerodyne Time-of-Flight Aerosol Mass Spectrometer (AMS) outfitted on the DOE G-1 aircraft during the Cumulus Humilis Aerosol Processing Study (CHAPS) conducted in Oklahoma City area in June 2007. The primary objective of CHAPS was to investigate the effects of urban emissions on cloud aerosol interactions as a function of processing of the emissions. Aerosol composition was typically determined at three different altitudes: below, in, and above cloud, in both upwind and downwind regions of the urban area. Aerosols were sampled from an isokinetic inlet with an upper size cut-off of ~1.5 micrometer. During cloud passages, the AMS also sampled particles that were dried from cloud droplets collected using a counter-flow virtual impactor (CVI) sampler. The aerosol mass concentrations were typically below 10 microgram per cubic meter, and were dominated by organics and sulfate. Ammonium was often less than required for complete neutralization of sulfate. Aerosol nitrate levels were very low. We noted that nitrate levels were significantly enhanced in cloud droplets compared to aerosols, most likely resulting from dissolution of gaseous nitric acid. Organic to sulfate ratios appeared to be lower in cloud droplets than in aerosols, suggesting cloud condensation nuclei properties of aerosol particles might be affected by loading and nature of the organic components in aerosols. In-cloud formation of sulfate was considered unimportant because of the very low SO<sub>2</sub> concentration in the region. A detailed examination of the sources of the aerosol organic components (based on hydrocarbons determined using a proton transfer reaction mass spectrometer) and their effects on cloud formation as a function of atmospheric processing (based on the degree of oxidation of the organic components) will be presented.

---

**NOTICE:** This manuscript has been authored by employees of Brookhaven Science Associates, LLC under Contract No. DE-AC02-98CH10886 with the U.S. Department of Energy. The publisher by accepting the manuscript for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this manuscript, or allow others to do so, for United States Government purposes.