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MEASUREMENTS OF AEROSOL PHYSICAL, CHEMICAL AND HYGROSCOPIC PROPERTIES AT CHEJU ISLAND, KOREA DURING ACE-ASIA

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ABSTRACT

Measurements of ambient particle size distributions, single particle chemical composition, and size-dependent particle water uptake were conducted between April 1 and May 1, 2001 at Cheju Island, Korea during the Aerosol Characterization Experiment – Asia (ACE-Asia). A major goal of the ground-based measurements was to quantify differences in the observed aerosol properties between periods with and without intense dust input from the Asian continent. Size distributions were measured using a Twin Scanning Electrical Mobility Sizer (TSEMS) recently developed at Brookhaven National Laboratory (BNL). In the TSEMS, two differential mobility analyzers (DMA) are simultaneously scanned, one Nano-DMA (TSI Model 3085) and one Long-DMA (TSI Model 3081), to observe particle diameters between 5 and 800nm. Simultaneous measurements of single particle chemical composition were performed using the BNL Single Particle Laser Ablation Time-of-Flight Mass Spectrometer (SPLAT-MS). The SPLAT-MS provides composition information for particle diameters as small as 70nm.

During ACE-Asia, a new scanning relative humidity (RH) system was deployed to investigate the size-dependent water uptake of ambient particles as a function of RH. This system consists of a DMA to select dry, monodisperse particles and a series of humidifiers and driers to allow both deliquescence and efflorescence to be studied. For deliquescence studies, RH scans are conducted over a 30 minute period between 10% and 90% RH, while efflorescence studies are conducted by first passing the monodisperse particles through a humidifier at 90% RH and then decreasing the RH to 10% over a 30 minute period. The RH scanning system was coupled to the SPLAT-MS to examine the compositional differences between droplets of different diameters produced by exposing ambient monodisperse dry particles to a given RH. To accomplish this, the SPLAT-MS inlet has been temperature controlled so that the RH, and therefore droplet size, is kept constant when droplets enter the vacuum chamber. Rapid measurements of compositional differences between droplets formed on singly, doubly, and possibly higher charged particles exiting the DMA are possible with the integrated SPLAT-MS/RH scanning system. Preliminary results from our measurements will be presented, with special attention to periods corresponding to dust storms.

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