Complementary Microscopies on Atmospheric Aerosols

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Analytical methods range from those that examine a limited number of individual particles to those that analyze bulk samples.

Over the last decade, our groups have developed a framework for examining single particle measurements and combining detailed measurements to provide insight into atmopsheric processing of aerosols. Sample collection is co-located with a broad range of other experiments and instrumentation that aid in selection of samples for detailed measurements. Then thousands to tens of thousands of particles are examined using scanning electron microscopy with elemental analysis to provide a statistical analysis of particle types. This allows us to develop a strategy for more detailed scanning transmission X-ray microscopy (STXM) experiments which explore the chemical bonding and oxidation state information. By collecting samples at multiple locations along the air trajectory, changes in the particle type distributions as well as changes in bonding of a particular particle type is determined. These results can then be incorporated into models. During this presentation, results focused on sea salt aerosols from several field locations will be presented. These include fresh sea salt aerosols from Pt. Reyes in California, sea salt aged by deposited organic material during transport to an inland location (Sacramento, CA). Complimentary laboratory experiements provide support for the proposed aging mechanisms. These results are contrasted to sea salt aging in Antarctica where the absence of organic aerosol sources result in disimilar aging processes.

Developing methods that allow us to take the detailed information such as composition, morphology, and sample heterogeneity, and infer properties of the bulk or ensemble are essential to fully expoit the strengths of these methods.