

Changes of shape and composition of sea-salt aerosol particles in an urban atmosphere

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Sea salt is one of the most abundant natural aerosol particles and, thus, has important influences on local and global climate. Aerosol samples were collected in Los Angeles area during the CalNex (California Research at the Nexus of Air Quality and Climate Change) campaign in 2010. Their compositions and shapes were analyzed using transmission electron microscopes (TEMs). Sodium (Na), which characterizes sea salt aerosol (SSA) particles, was detected from 43% of analyzed particles with aerodynamic diameters between 50 and 300nm. Almost all those SSA particles also contain S. Although relatively fresh SSA particles contained Cl, many aged ones did not have Cl, suggesting that Cl was replaced with sulfate as they aged in the urban atmosphere. From TEM observations, SSA particles were classified either round- or sharp- edged ones. Round-edged SSA particles were more aged (>12 hour) and reacted with sulfate than sharp edged ones. Model calculations indicate that compositions and shapes of SSA particles, both of which change within several hours in urban atmosphere, affect their hygroscopicity and light scattering, respectively. These results indicate that the climate effects of SSA depend on their ages, and such effects need to be considered in climate modeling.

Keywords: Transmission electron microscope, sea salt aerosol particles, CalNex, atmospheric pollution, California, aerosol aging