Analysis of individual aerosol particles collected at the top of Mt. Fuji in 2014 and 2015

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Atmospheric aerosol particles impact on climate effects by scattering and absorbing solar radiation directly, and by changing radiative properties of clouds indirectly as cloud condensation nuclei (CCN). Climate effects of atmospheric aerosol depend to a large extent on physicochemical properties of individual particles. Morphological features and mixing states of individual particles in the free troposphere are important to investigate aging of particles during long-range transport and its potential impacts on climate. To elucidate morphological features and chemical composition of individual particles according to their sources and weather conditions, we collected aerosol samples at the summit of Mt. Fuji (35.36°N, 138.73°E, 3776 m a.s.l) located in the free troposphere during summer in 2014 and 2015.
The aerosol samples were obtained using a cascade impactor (the 50 % cut-off diameters of the stages were 0.25 μm and 1.0 μm) on carbon-coated collodion films for 1 hour at flow rate of about 0.55 L/min. To measure the heights of individual particles, particles were coated with Pt / Pd alloy at a shadowing angle of arctan 0.5. Size and chemical composition of individual particles were analyzed using a transmission electron microscope (TEM) equipped with an energy-dispersive X-ray (EDX) analyzer. In this study, 11 samples were obtained and analyzed. The backward trajectories and the average relative humidity (RH) along the trajectories were computed using the HYSPLIT trajectory model (https://ready.arl.noaa.gov/HYSPLIT_traj.php).
In this study, the particles were classified into 9 types (Figure1) based on their morphological features (Ueda *et al.*, 2011). Most of particles were classified as *eroded, dome-like or cluster* particles. In this study, particles classified as the *cluster* particles were included in 6 samples. The *cluster* particles were comprised of some units of *spherical* or *coccoid* particles. It is reported that the *cluster* particles are formed under low RH and rich in sulfur (Ueda. *et al.*, 2011). In this study, however the *cluster* particles were formed under high RH condition. Analysis based on backward trajectories indicates that the sizes of individual particles that constituted *cluster* particles depend on sources and weather conditions. Therefore, the formation mechanism of cluster particles has to be investigated further.

Keywords: Atmospheric aerosol, TEM, Individual particles analyses

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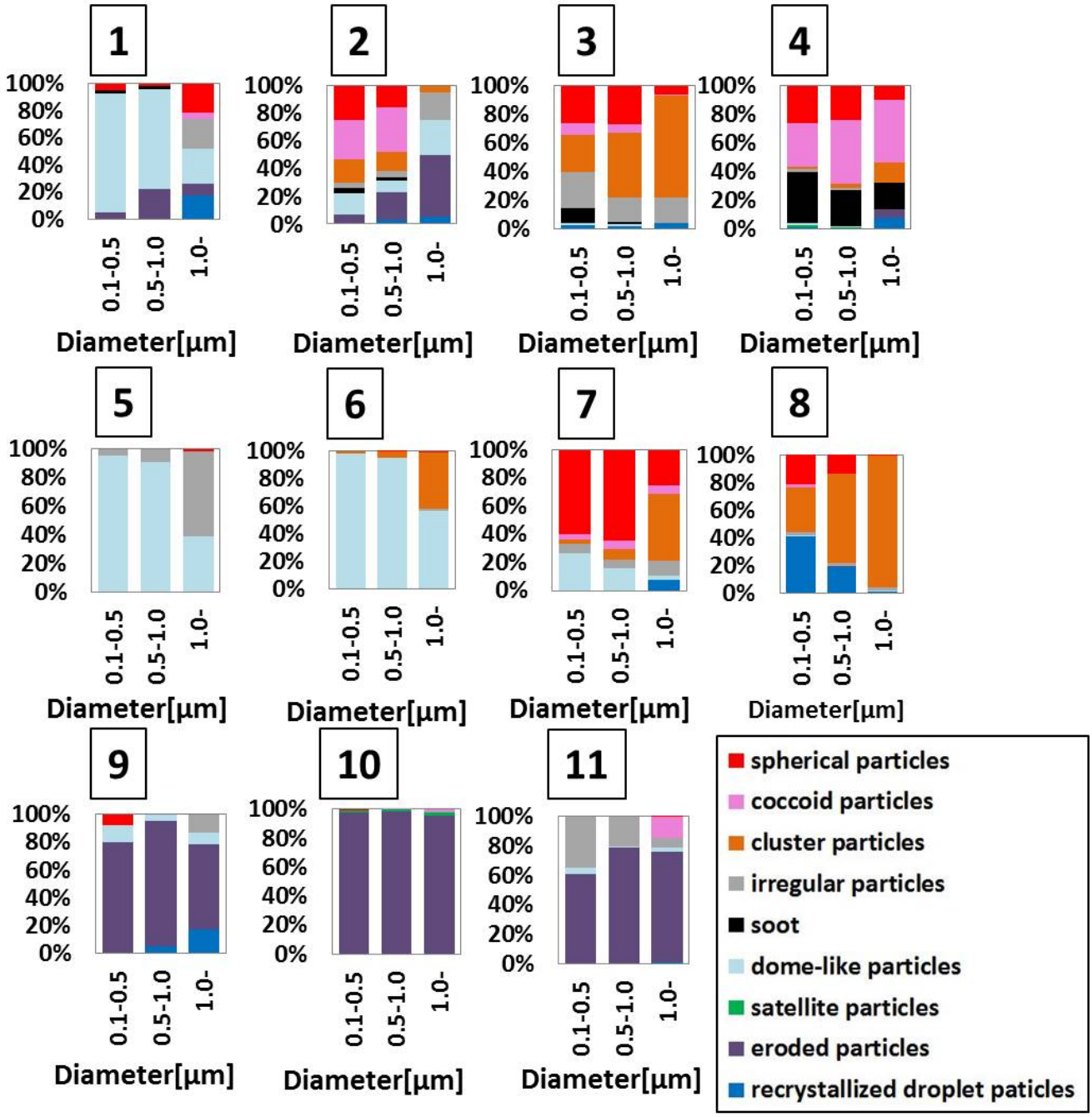

Figure. 1 Size-segregated number proportions of morphological types of particles for samples.

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