Characteristics of Cloud Condensation Nuclei over the Urban Areas Measured at Tokyo Skytree

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Atmospheric aerosols influence the Earth’ s radiation budget directly through absorption and scattering of solar radiation, and indirectly by modifying the properties of clouds. However, climate models still face large uncertainties as a result of insufficient understanding of aerosol-cloud interactions[1]. Thus, further studies on aerosol-cloud interaction are needed to improve climate models and to make better predictions of climate change. To investigate cloud condensation nuclei (CCN) characteristics over the urban areas, where few fixed-point observations are conducted in the world, CCN properties of atmospheric aerosols were observed at the Tokyo Skytree (TST) in Tokyo.

Measurements were carried out at TST (35.71˚N, 139.81˚E, 458m,a.g.l), from 3 to 30 June 2016. In this study, aerosol number size distribution, condensation nuclei (CN) number concentrations (N_{CN}), CCN number concentrations (N_{CCN}) with four supersaturations (SS%) were measured. Fog droplet size distributions and fog droplet number concentrations (N_{Fog}) were also measured. Using these data, we obtained the hygroscopic parameter (κ) and the effective radius (R_{eff}) of fog droplets.The results obtained at TST were compared with observation data of the summit of Mt. Fuji[2] where similar observations were made.

The average value of N_{CCN} at TST was larger than that of the summit of Mt. Fuji.[2]. The average value of κ at TST was smaller than that of the summit of Mt. Fuji . The CCN properties of aerosols did not vary significantly with air mass origins. As a result of the CCN characteristics of the period covered with clouds without drizzle, there was no positive correlation between the N_{Fog} and N_{CCN}. Also, there was no negative correlation between R_{eff} and N_{CCN} like the microphysical relationship known as the Twomey effect[3]. This is considered to be due to the small variation of N_{CCN} at TST. The relationship between R_{eff} and N_{CCN} under SS0.12% could be regarded as part of the negative correlation between R_{eff} and N_{CCN} obtained at the summit of Mt. Fuji .

References

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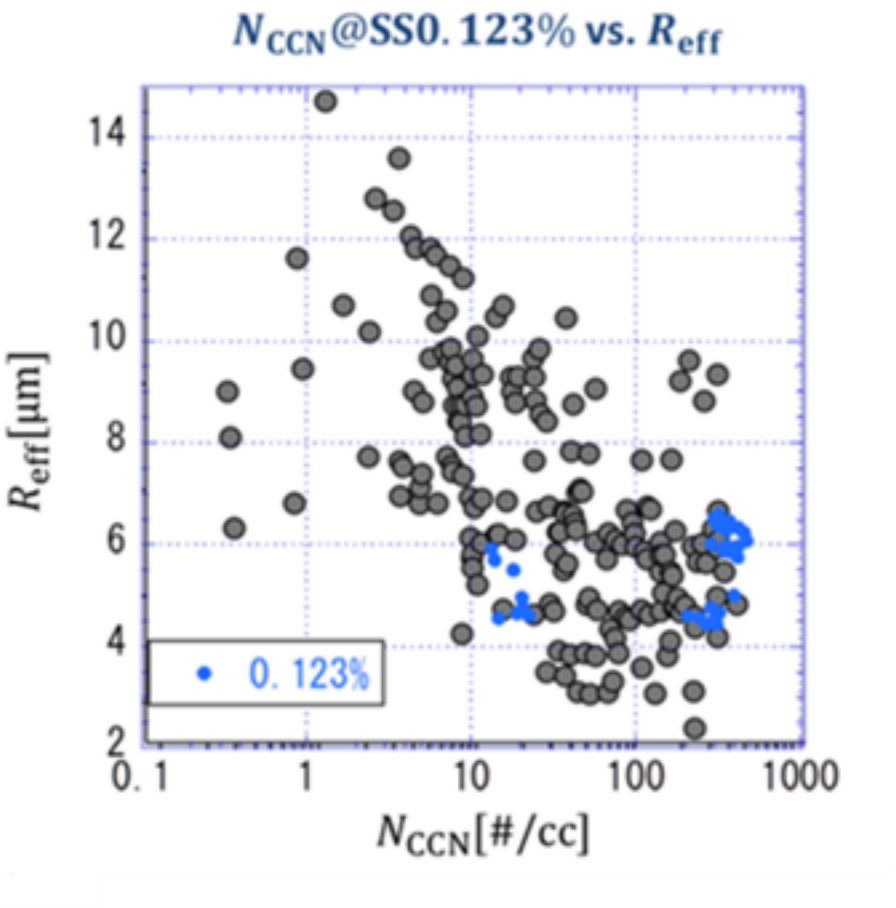

図 R_{eff}とN_{CCN}@SS0.123%（青）、
N_{CCN}@SS0.15%（渡辺, 2015）（黒）の関係

