

Impact from anthropogenic emissions on cloud condensation nuclei concentrations measured at Cheju Island in spring

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Ground based measurement of Cloud Condensation Nuclei (CCN) was made at Gosan station on Cheju Island, Korea, during the Atmospheric Brown Cloud ? East Asian Regional Experiment 2005 (ABC-EAREX2005) campaign conducted in March ? April 2005. The CCN concentration is key parameter to estimate the magnitude of the indirect effect of aerosols on radiative forcing, because CCN can modify cloud microphysics. In spite of the great importance of CCN activity of aerosols however, CCN measurements are still very limited especially in Asia. In this study, impacts of anthropogenic emissions on CCN concentrations are evaluated.

During ABC-EAREX2005, the CCN number was measured at Gosan at four supersaturations, $S = 1.0, 0.6, 0.3,$ and 0.1% . An averaged CCN number concentration was 3600 cm^{-3} at $S = 1.0\%$, which is higher than the previously reported CCN concentrations in the maritime (less than 1000 cm^{-3}) and continental (about 2000 cm^{-3}) airmasses. When airmasses which had been strongly affected by anthropogenic emissions over Asian continent were transported to Gosan, CCN concentrations increased by a factor of 2-6.

In this study, observed temporal variation of CCN number concentrations are interpreted by three factors; 1) change in total aerosol number, 2) change in aerosol size distribution, and 3) change in chemical composition of aerosol. The results show that while the CCN concentrations at $S = 1.0$ and 0.6% are primarily explained by the temporal change in aerosol total number, the aerosol size distribution becomes more important for the CCN concentration at $S = 0.3$ and 0.1% . Factors controlling aerosols which are important for CCN are also discussed.