Variability of Mixing State of Aerosols observed at a Surface Site in Korea in the Spring of 2016

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Aerosols have large influence on the radiative balance of the Earth’ s atmosphere by scattering or absorbing solar visible radiation (direct effect) and by altering cloud microphysical properties (indirect effect) (IPCC, 2013). These effects can significantly depend on the chemical composition and mixing state of aerosol particles. Specifically, the mixing state of sulfate, nitrate, and organics with black carbon (BC) is a key parameter for estimating the aerosol direct and indirect effects (Bond and Bergstrom 2006, Adachi et al. 2010). However, there have been few studies on real-time measurements of chemical compositions mixed with BC in the atmosphere. The purpose of this study is to investigate the chemical composition of aerosol particles classified by the mixing state with BC in Asian outflow.
Ambient measurements were conducted in Korea from March 1 to April 7, 2016. A laser induced incandescence-mass spectrometric analyzer (LII-MS, Miyakawa et al. 2014) was used for the measurements. The LII-MS consists of a series of laser induced incandescence (LII) and mass spectrometric (MS) detectors. In the LII section, BC containing particles can be efficiently vaporized and emit incandescence signals by rapid heating in a near-infrared laser cavity. The sample air is subsequently introduced into the MS section to quantify chemical compositions of aerosol particles. The classification of aerosol particles with respect to the mixing state with BC (internal and external mixture) can be achieved by turning on and off the LII laser.
Nitrate, sulfate, and organics were the major species of PM_1 aerosols. On average, nitrate was most abundant and the fraction of internal mixture for sulfate was higher than that for the others. We found no systematic difference exceeding experimental errors between external and internal mixtures for nitrate and sulfate. Details of the temporal variation of chemical composition will be presented and discussed.

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