

## Transport and transformation of nitrogen compounds in East Asia

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Recent economic development in East Asia leads to the increase of emission for atmospheric pollutants. Seasonal monsoon in winter prevails from Chinese continent to Pacific Ocean, which brings atmospheric pollutants to Japan. Nitrogen oxides are initially emitted as NO and NO<sub>2</sub>, then they are transformed to HNO<sub>3</sub>, NH<sub>4</sub>NO<sub>3</sub> and NaNO<sub>3</sub> over the city area in China and during transport over East China Sea. In order to examine the trans-boundary transport of total reactive nitrogen, it is necessary to study secondary formed nitrogen compounds as mentioned above.

We have started the measurement for particulate nitrate (PM<sub>10</sub>NO<sub>3</sub><sup>-</sup>) using R&P8400 at Cape Hedo Atmosphere and Aerosol Monitoring Station (CHAAMS) in Okinawa Island by NIES. Together with the measurement of NO<sub>x</sub><sup>\*</sup>, HNO<sub>3</sub> and NO<sub>y</sub> (total reactive nitrogen compounds), we have studied the seasonal variation, transformation of nitrate during the trans-boundary transport in East Asia.

Results showed that all reactive nitrogen compounds (PM<sub>10</sub>NO<sub>3</sub><sup>-</sup>, NO<sub>x</sub><sup>\*</sup>, HNO<sub>3</sub> and NO<sub>y</sub>) was higher in spring and was lower in summer. According to the back trajectory calculation using NOAA HYSPLIT4, air mass was transported from Chinese continent in spring, while it was from Pacific Ocean in summer. Seasonal variation is mainly due to the air mass origin.

Distribution of nitrate in aerosol and nitrogen compounds in gas phase was studied. In spring, nitrate in aerosol is higher in total reactive nitrogen (NO<sub>y</sub>), while in summer it was lower in NO<sub>y</sub>. It is known that NH<sub>4</sub>NO<sub>3</sub> in aerosol is thermally dissociated into NH<sub>3</sub> and HNO<sub>3</sub>, which evaporates to the gas phase. Since temperature is high in summer, NH<sub>4</sub>NO<sub>3</sub> in aerosol is evaporated into gas phase. As a result nitrate in aerosol is low in NO<sub>y</sub>.

Distribution of nitrate in fine and coarse particle was also studied. In China, NO<sub>3</sub><sup>-</sup> was well correlated with NH<sub>4</sub><sup>+</sup>, which indicates that NH<sub>4</sub>NO<sub>3</sub> is mainly in fine particle. At CHAAMS, it was found that most of nitrate was in coarse particle (PM<sub>10</sub>NO<sub>3</sub><sup>-</sup>). This indicates that nitrate in fine particle evaporates and adsorbs on coarse particle such as dust and sea salt during transport over East China Sea.