

## Aerial observations for nitrogen compounds over the East China Sea

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In order to clarify long-range transport of air pollutants from the Asian continent, we have conducted aerial observation over the East China Sea and measured air pollutants centering on aerosols, as part of Grant-in-Aid for Scientific Research on Innovative Areas “ Impacts of Aerosols in East Asia on Plants and Human Health (ASEPH) ” . In this presentation, the results of nitrogen compounds such as nitrate are mainly described.

The aerial observations were conducted in October, 2009 (autumn), December, 2010 (winter) and March, 2012 (spring) over the East China Sea. The flights were performed between Fukue Island and the southern offing of Jeju Island and the flight altitudes were 500, 1000, 2000 and 3000 m. Onboard measurements of gaseous total odd nitrogen species, gaseous nitric acid ( $\text{HNO}_3(\text{g})$ ),  $\text{O}_3$ ,  $\text{SO}_2$ , CO and black carbon were made and particles were collected on filters for ionic and metal component analyses.

The concentration ratios of particulate nitrate ( $\text{NO}_3^-(\text{p})$ ) to inorganic total nitrate ( $\text{T.NO}_3 = \text{HNO}_3(\text{g}) + \text{NO}_3^-(\text{p})$ ) were less than 0.5 in most of the flights except under high concentrations of dust particles (Kosa) or transboundary air pollutants. Most of  $\text{NO}_3^-(\text{p})$  would be  $\text{NaNO}_3$  formed by the reaction of gaseous nitric acid ( $\text{HNO}_3(\text{g})$ ) with sea salt aerosols during the observations in autumn and winter except on October 17 and December 11, when high concentrations of Kosa were transported. In the spring observation, the fraction of  $\text{NaNO}_3$  in  $\text{NO}_3^-(\text{p})$  was low and a large part of  $\text{NO}_3^-(\text{p})$  would be originated from reactions of  $\text{HNO}_3(\text{g})$  with gas phase ammonia and soil dust particles.

$\text{O}_3$  concentrations decreased with altitude in autumn and increased in winter. Positive and negative correlations between  $\text{NO}_y$ - $\text{T.NO}_3$  and  $\text{O}_3$  concentrations were observed throughout the flights in autumn and winter, respectively. This indicates that the major components of  $\text{NO}_y$ - $\text{T.NO}_3$  were secondary photochemical nitrogen oxides such as PANs and  $\text{NO}_x$ , in autumn and winter, respectively. The differences of vertical distribution and  $\text{NO}_y$  components between autumn and winter may be caused by the variation of solar radiation intensity.

Keywords: aerial observation, nitrate, total odd nitrogen species, East Asia