

Chemical analysis of transported and urban aerosols

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East Asia is a source of large amounts of anthropogenic SO₂, NO_x, and volatile organic compounds in the atmosphere. The region's economy is developing rapidly, and energy consumption is also increasing. There is serious concern that the emissions of atmospheric pollutants will increase accordingly. Fukuoka City is located in the northern Kyushu and is influenced by anthropogenic pollutants transported from the continent. On the other hand, Fukuoka City is a large city, which has a population of 1.5 million and is a source of large amounts of anthropogenic pollutants. It is thought that there are pollutants from the local area and the continent in Fukuoka City in spring. We measured chemical components and mass concentrations of atmospheric aerosols at Fukuoka University and analyzed the data by Positive Matrix Factorization (PMF) method in order to research the influence of trans-boundary air pollution on air quality of urban areas.

Chemical components of atmospheric aerosols were measured by Aerosol Mass Spectrometer (Q-AMS) at the fourth floor of Building 18 (Faculty of Science), Fukuoka University. The chemical components were sulfate, nitrate, ammonium, chloride and organics. Mass concentration of PM_{2.5} was observed by TEOM (RP1400) at the roof of Building 18.

The observation showed periods in which sulfate was rich and in which nitrate and organics were rich. The previous measurement by Q-AMS at Fukue Island, Nagasaki and Cape Hedo, Okinawa implied sulfate-rich period was influenced by long-range transport from the continent and nitrate and organics-rich period was influenced by atmospheric pollutants from Japan and Korea.

In sulfate-rich period, the size distribution had one mode of around 0.6micrometer and was similar to the results at Fukue Island and Cape Hedo. Analysis by back trajectory (NOAA-HYSPLIT4) showed the air mass was transported from China. In nitrate and organics-rich period, the size distribution had two modes of around 0.2 and 0.6micrometer. In the cases where air quality was influenced by pollutants from only urban areas, a single mode was around 0.1micrometer. Sulfate, nitrate and organics showed bi-modal distribution characteristically and nitrate was rich in a mode of smaller size in this measurement. These results suggested air quality in Fukuoka City was not mainly influenced by long-range transport. However because sulfate concentration was relatively high and the m/z=44 signal corresponding to COO fragment in the mass spectra was observed, the pollutants both from the continent (long-range transport) and from domestic sources and Korea (middle-range transport: at most 100-200km) were transported to Fukuoka City.

Organics were analyzed using PMF method. As a result the factors corresponding to aerosols from urban areas and the continent were obtained. The contribution of each factor was also estimated.

Keywords: Fine Particle, Fukuoka, Q-AMS, PMF