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Comprehensive analyses of air pollutants at Suzu, Noto peninsula, Japan

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Recent remarkable economic progress in East Asia has increased emissions of air pollutants such as nitrogen oxides, sulfur dioxide, ammonia and volatile organic compounds. Such pollutants are transported over a long distance with photochemical reactions and then arrive at Japan as aged species such as gas phase nitric acid (HNO_3), particulate nitrate (NO_3^-), sulfate (SO_4), peroxy nitrates (PNs), organic nitrates (ONs), ammonium (NH_4^+), organic aerosol (Org) and so on. Many researches on the transboundary pollution in Japan focus on the areas of western Japan near the Asian continent. On the other hand, it is important to investigate the transboundary air pollution in the central Japan area because there are many large cities. In addition, the central Japan is moderately far from the Asian continent, so that more aged air mass from the Asian continent would come at the central Japan. In this research, continuous observations of such air pollutants at Suzu, Noto peninsula, Japan. Suzu is representative remote area and located at the central Japan.

Observations are performed at NOTOGRO (NOTO Ground-based Research Observatory) supersite (37.45^{o}N, 137.36^{o}E) in Suzu. Total odd nitrogen species (NO_y) and total nitrate (T.NO_3 = HNO_3 + NO_3^-) were measured by a scrubber difference / NO-O_3 chemiluminescence method. PNs and ONs were measured by a thermal dissociation / cavity attenuated phase shift spectroscopy method. CO, O_3 and SO_2 were observed by non-dispersive IR, UV absorption, and pulsed UV fluorescence methods, respectively. Org, NH_4^+, SO_4 and fine NO_3^- were measured by an aerosol mass spectrometer. SO_4 was also measured by a thermal reduction / pulsed UV fluorescence method.

Results of SO_4 and T.NO_3 were reported in this abstract. The air mass origins were classified into five groups; China and Korea (CK) North China (NC), Japan (JP), Russia (RU), and Sea (S), by backward trajectory analyses. Concentrations of air pollutants from CK air mass origin were generally high. In many cases, SO_4 concentrations from JP were lower than those from CK, while T.NO_3 concentrations from JP were similar to those from CK. In addition, SO_4 concentrations from CK were very high, but T.NO_3 concentrations from CK were not, in August 2013 and June 2014. Many of SO_4 in remote area is present as fine particles while NO_3^- exists as coarse particles mainly. The deposition velocity of coarse particles (ca. 0.03-1.24 cm s^{-1}) is larger than that of fine aerosols (ca. 0.05-0.6 cm s^{-1}). In addition, the deposition velocity of HNO_3 (ca. 1-8 cm s^{-1}) is larger than that of NO_3^-. The lifetime of SO_4 is longer than that of T.NO_3, so that SO_4 contributes strongly to the transboundary air pollution at Suzu, in comparison with T.NO_3. In this presentation, more detailed results and discussion, including other air pollutants will be described.

Keywords: Long-range transport, Air pollutants, East Asia