

4.063 Effect of transboundary transport of air pollution from the Asian continent for the new particle formation by aerial observation in Fukue Island, Japan.

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Abstract:

Vertical distributions of atmospheric particles number concentrations (measured by CPC, model 3781, TSI Inc., USA; $D_p > 6$ nm; altitude of < 1.2 km) were investigated at Fukue Island (32.75°N, 128.68°E) by using a Kite-plane from April 13 to 16, 2017. Based on a comparison of those data, we characterized the event/non-event days into three cases: [Case 1] The strong new particle formation event (NPF) was observed on 13 April under the high-pressure systems and SO₂ rich condition. The maximum number of particle concentrations ($\sim 3.6 \times 10^3 \text{ cm}^{-3}$) was observed at an altitude of ~ 400 m, which was correspondence to the high RH layer. Ground based measurement indicated that NPF event occurred starting from 3 nm particles and subsequently observed growth of particle size to several tens nm. [Case 2] The weak NPF event was observed in the afternoon on April 14 by changing the air mass origin, which was due to the local domestic emission. An increase of particle number concentration was started from 20 nm under the higher SO₂ concentration. [Case 3] There was no NPF event and the particle number concentrations were almost constant ($\sim 2 \times 10^3 \text{ cm}^{-3}$) below 0.8 km. In this case, higher sulfate concentration in PM₁ was observed by Aerodyne Aerosol Chemical Speciation Monitor. Based on Aerosol Optical Depth data and air mass backward trajectory analysis, anthropogenic emissions from Shanghai region in China could affect high sulfate concentrations at ground-based site and suggesting that sulfates could be in the size range between 600 nm and 1 μm and highly aged during transport over the East China

Sea. These results indicated that strong NPF could be occurred in the upstream region and high altitude before reaching to the ground-based site and NPF could affect vertical distribution of atmospheric nanoparticles over the Fukue Island.