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New particle production observed at the summit of Mt. Fuji

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Sulphur and organic species originated from ocean make new particles to increase the number of cloud condensation nuclei and change properties of cloud (Charlson et al., 1987). However, in the planetary boundary layer, there are many seasalt particles that provide surfaces for heterogeneous chemical reactions with sulphur or organic gases. There are a few papers of new particle production observed in the boundary layer under a high-pressure system (ex. Covert et al., 1996). It suggests that particles are produced in the free atmosphere. As the summit of Mt. Fuji, Japan is usually positioned in the free troposphere, we can measure the variation of aerosol in the free troposphere. Our purpose is studying the new particle production and particle growing process.

Size distributions from 4.4 nm to 5000 nm in diameter were measured with a scanning mobility particle sizer (SMPS, TSI 3936N25 or 3936L22) and an optical particle counter (OPC, RION KR1 2 or KC01C), at the summit (3776m, 35.36N, 138.73E) and the base Tarobo (1300 m) in July and August 2006 to 2009. Sample air was dried to lower than 20% with a diffusion dryer.

One topic of the results is a peak measured with SMPS at the summit. This peak of 10 nm appeared at about 11 o'clock on 9th and 10th August 2006 and increased their size during daytime. Volume distributions kept almost constant value during increasing their size. This suggests that this size increasing was due to coagulation and these phenomena happened in the wide area. Moreover, these events did not synchronized at Tarobo. This suggests that these peaks may be the new particle production by gas to particle conversion in the free troposphere around the summit. The event on 9th was occurred after a passing of a typhoon. It is expected that sulphur and organic species winded up by the typhoon produce new particles in the free troposphere.

The burst of the particles smaller than 20nm in diameter continuing longer than 3 hrs was observed 68 times during observation periods, 108 days. These events were more observed in the daytime (23) than at night (45). Most of these events did not synchronize at Tarobo.

Air mass of thirteen times events in 2009 was estimated with a weather map, a prediction of chemical weather map by CFORS, and surface weather elements. The results showed that the continental, maritime, and local sources were estimated 7 times, 5 times, once, respectively. It is found that the concentration just before the maritime event showed low.

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References
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