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Measurement of Cloud Condensation Nuclei at the Summit of Mt. Fuji

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1. Introduction

Aerosols serve as Cloud Condensation Nuclei (CCN) when cloud is formed and control the effect of cooling earth by cloud. Aerosol particles in the atmosphere have the various critical supersaturation by its solubility and size on dry condition. Generally, the higher supersaturation is, the more particles that can serve as CCN are because the smaller size that particles begin to grow as cloud droplets is. The relationship between CCN concentration and supersaturation is called supersaturation spectrum and this is used by some researchers when they take observations of CCN. The example of fixed point observations of CCN in Japan is a few. It is particularly a few in the mountain atmosphere, so we observed CCN at the summit of Mt. Fuji in summer.

2. Methods

This observation is done at the Mt. Fuji Weather Station from 17 July 2010 to 25 Aug. 2010. We used CCNC (Cloud Condensation Nuclei Counter ; DMT Inc.) as measuring instrument. This CCNC makes supersaturation inside, so we can experimentally make clouds. CCNC can count the number of CCNs grown according to the condition if CCN is contained in sample air. In this time, we set 6 stages of supersaturation between 0.1% and 0.44%.

In analysis, we used the backward trajectory (NOAA HYSPLIT) and drew supersaturation spectra by its origin.

3. Results and Discussion

There was a difference in the shape of supersaturation spectra between continental air and maritime air, and CCN concentration of continental air was higher than maritime air. When air had come from the sea and the land of Japan, supersaturation spectra lay between continental air and maritime air. This is suggested that the CCN concentration depends on how long the air has been on the land. Concerning its shape, this result correspond to the results that Uchida (1971) observed CCN at the Youth House and Tarobo at the bases of Mt. Fuji (650m and 1,300m levels) in spring. The years and seasons that Uchida observed there are different from this observation, so it is necessary to observe at the summit of Mt. Fuji and Tarobo at one time.

Also, the power of supersaturation spectra of the summit of Mt. Fuji was higher than other area's observations (Seinfeld and Pandis, 2006). The power depends on the size distribution and the chemical compound of particles then. We set the narrow range of supersaturation against other area's observations in terms of the size distribution, which some researchers set supersaturation between about 0.1% and 1%. So, we concerned that the size particles begin to grow as cloud droplets is large and the range of supersaturation made the difference of the power wide in comparison. Therefore it is necessary to be compared in the same range of supersaturation from now on. Then, we must consider whether the power is still high, and which of the effects is larger, by the size distribution or the chemical composition of particles.

References

Uchida, E., Study on Local Distribution of Cloud Nuclei -Observation at Irozaki, Izu Peninsula, and Mt. Fuji-, Papers in Meteorology and Geophysics, Meteorological Research Institute, 22, 23-42, 1971

Seinfeld, J.H. and S.N. Pandis, Atmospheric Chemistry and Physics, From Air Pollution to Climate Change, Second Edition, Cambridge Press, p793, 2006

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