

Japan Geoscience Union Meeting 2011

(May 22-27 2011 at Makuhari, Chiba, Japan)

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MIS026-P01

Room:Convention Hall

Time:May 24 14:00-16:30

A Year-round Observation of Size Distribution of Aerosol Particles at the Cape Ochiishi, Japan

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New particle formation by nucleation of gas-phase compounds emitted from marine biogenic sources is very important for climate change. To clarify the mechanism of the formation, size distribution of submicron aerosols was measured at the Cape Ochiishi, facing the North Western Pacific Ocean where primary productivity is high. To perform an automatic year-round observation, a test observation was done from 22nd May to 18th June 2008 and a year-round observation was performed from 16th October 2009 to 7th September 2010.

The size distribution from 10 nm to 487 nm and from 300 nm to 5000 nm in diameter was measured with a scanning mobility particle sizer (SMPS, TSI 3034) and optical particle counters (OPC, RION KC01D, KC01E, KR12A), respectively. Sample air was dried to lower than 40% with a ribbon heater. Transport of sulfate, organic carbon (OC), and black carbon (BC) was estimated with Chemical weather FORcasting System (CFORS). CFORS was developed by Prof. Itsushi Uno and Mr. Koji Ishihara in Research Institute for Applied Mechanics (RIAM), Kyushu University, Japan. The system migrated to National Institute for Environmental Studies (NIES) with financial support by Center for Global Environmental Research (CGER) in June 2002. (<http://www-cfors.nies.go.jp/~cfors/research/>). Outline of RIAM-CFORS (by Prof. Uno, RIAM, Kyushu Univ.) is shown in the web (<http://www-cfors.nies.go.jp/~cfors/outline.html>). Existence of inversion layer was estimated with temperature profile measured at surface, 10m, 30m, and 50m in altitude.

The burst of the particles smaller than 20nm in diameter continuing longer than 3 hrs was observed 36 times during these observation periods. Seven events were observed in early summer and the other was in autumn and winter. Banana shape was faintly observed 21 times. Transport of sulfate, OC, and BC was observed 11, 26, 30 times, respectively. Source of air mass was estimated with these elements, weather map, surface wind direction and backward trajectory analysis. The air mass of 26 events was estimated to continental. It suggests that the maritime nucleation is observed during a year, however clearly nucleation related to marine sources was not observed.

Acknowledgments

This study was partly supported by the Grant-in-Aids for Scientific Research on Priority Areas from the Ministry of Education, Culture, Sports, Science and Technology, Japan (18067005). The observation was performed at the monitoring station of the National Institute for Environmental Studies.

Keywords: size distribution, new particle formation, CFORS