

Balloon-borne Observation of Volcanic Ash from Shinmoe-dake (Kirishima) Volcano in March 2011

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Tephra which is released into the atmosphere will cause various damages in wide region such as cancellation of aircraft operations in wide area not only on the society in the neighbor district. Ash plume observation by airborne in-situ measurement was to be performed at the time of the 2010 Eyjafjallajokull eruption in Iceland, Operations within volcanic plume on the vicinity area has not been performed because there is a risk of failure of aircraft. We have tried to observe the interior of ash plume of vulcanian eruption of Shinmoe-dake(1421m a.s.l.) using the balloon sonde designed for meteorological measurement. The rising speed of the balloon is 6 meters per second. Two types of monitoring devices are used in addition to normal weather sonde. Hydrometeor videozonde (HIVIS) is a device that wirelessly transmits captured videimage particles adhered to the film coated with silicone oil. The HIVIS covers the size range of 10 micro meter to 2 mm. Aerosol sonde (OPC) irradiate a continuous laser beam to the particles contained in the pumped air and measures the intensity of the forward-scattering light by photodiode. The OPC covers nominally the size range of 0.3-10 micro meter (8 channels).

The observation was carried out in late March 2011. The height of the plume was 4700m a.s.l. obtained from radar observations of the eruption on March 23, which is the only eruption that occurred during this period. The total amount of tephra erupted in the 23 March eruption is about 5×10^6 kg. In the balloon release after the eruption from the site of the 18km downwind of the vent, volcanic ash particles have been detected. In the range from ground level(162m) to 1800m altitude, the size of coarse particles reached about 30-80 micro meter. The proportion of particles of about 3-10 micro meter was relatively high in the range of 1800-6000m altitude. Altitude above 6000 m, particles were composed of less than 10 micro meter. Probably coarse particles of low altitude are volcanic ash origin, however these are considered reworked particles and/or ash released from subsequent weak ash emission in the crater because unfortunately the observation started two hours after the main ash emission period of the eruption. Particles of the middle to high altitude range are considered likely to contain particles Yellow Dust origin.