Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SVC46-17 Room:304 Time:May 25 12:05-12:20

Observations of Sakurajima Volcanic Ash Column with X-band Polarimetric Radar and Ka-band Doppler Radar

MAKI, Masayuki[1*] ; MAESAKA, Takeshi[2] ; TANADA, Toshikazu[2]

[1]Research and Education Center for Natural Hazards, Kagoshima University, [2]National Research Institute for Science and Disaster Prevention

X-band polarimetric radar and Ka-band Doppler radar data from two explosive eruptions of Sakurajima volcano were analyzed to reveal the inner structures of their respective volcanic ash columns. The first case analyzed was the eruption that occurred on August 18, 2013. The ash column height during that event was 5.5 km above the crater, and falling ash hindered surface traffic visibility in the downtown area of Kagoshima City, which is located about 13km west of the Showa crater. A linear interpolation in time and space was applied to the X-band polarimetric radar data, with 5-minute intervals and 12-tilt elevation angles, to construct a three-dimensional distribution of the radar parameters with a one minute interval and a 250m spatial resolution. The three-dimensional distribution of reflectivity in the ash column reveals a non-uniform structure; the ash column consists of several reflectivity cores which correspond to individual explosions. The pyroclastic material ascent speed, detected from Doppler velocity analysis, was about 60 ms-1 just above the crater. Analyses of reflectivity, differential reflectivity, and co-polar correlation coefficient suggest that the uniformity of ash particle size distribution and particle shape proceeds due to a size sorting mechanism in the ash column when it is moving in a down-wind direction. In the second eruption analyzed, which occurred on May 10, 2014, the ash column reached a height of 4500m above the crater. This eruption was observed by a Ka-band research Doppler radar, set up 3.6km from the crater, and an X-band operational polarimetric radar. RHI scanning of the ash column with the Ka-band radar showed it to have a fine kinematic structure.

Keywords: Weather radar, Ka-band radar, volcanic ash column, reflectivity, Doppler velocity, size sorting