

Volcanic ash plume observation by weather radars

*Eiichi Sato¹, Keiichi Fukui¹, Toshiki Shimbori¹, Kensuke Ishii¹, Tetsuo Tokumoto¹, Masayuki Maki², Masato Iguchi³

1. Meteorological Research Institute, 2. Kagoshima University, 3. Kyoto University

In spite of the existence of many eruption cases observed by weather radars (e.g. Sawada (2003), Marzano et al. (2013)), the quantitative ash estimation (QAE) technique is not established yet. One of the reason is an uncertainty of reflectivity. Roughly speaking, the parameter represents both size and number of clutters, however, we can't separate it into the components. In other words, only with reflectivity, we can't determine the particle size distribution (PSD) of targets.

In such a circumstance, it is expected that polarimetric weather radar can obtain information about the PSD inside volcanic ash plume. Generally, polarimetric radars transmit horizontal and vertical radio waves at the same time, and receive the backscattered waves, thus, we can get the ratio and the correlation coefficient of two components. We think these parameters are effective for QAE.

Another way we think effective for observing volcanic ash plume is a fast-scan radar. As fast-scan radars can get a 3D image of a volcanic ash plume in a moment, we believe that this kind of radars can contribute to better understanding of dynamics of volcanic ash plume.

Meteorological Research Institute (MRI) installed an X-band multi-parameter (polarimetric) radar (MRI-XMP) and a Ku-band fast-scan radar (MRI-Ku) near Sakurajima volcano, and started observation from March, 2016. In this presentation, we will present some cases of volcanic ash plume observed by these radars, and discuss the problems and the prospects of the future.

References:

Sawada, Y., 2003: Record of eruption cloud echoes measured with weather radars, *Weather Service Bulletin*, **70.4**, 119-169 (in Japanese).

Marzano, F. S., E. Picciotti, M. Montopoli, and G. Vulpiani, 2013: Inside volcanic clouds: Remote sensing of ash plumes using microwave weather radars, *Bull. Amer. Meteor. Soc.*, **94**, 1567–1586, DOI: 10.1175/BAMS-D-11-00160.1.

Keywords: volcanic ash plume, weather radar, polarimetric radar, fast-scan radar, Sakurajima volcano