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# Observations by the JMA weather radar network and quantitative predictions of tephra-fall with the JMA RATM for the eruptions at Shinmoe-dake volcano in 2011

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The JMA implemented the Volcanic Ash Fall Forecast in March 2008 and is considering the predictions of lapilli-fall. The Tokyo VAAC has also been provided the Volcanic Ash Dispersion Chart for Sakurajima and Shinmoe-dake volcanoes on trial since July 2010. The technical methods are based on the JMA Regional Atmospheric Transport Model (RATM) driven by the GPVs of operational Mesoscale Model (MSM) or Local Forecast Model (LFM), both of which originated from the JMA Nonhydrostatic Model (NHM).

The RATM for volcanic ash and others has been developed at the MRI (Shimbori et al., 2010; Saito et al., 2013). This is an off-line Lagrangian model which considered the processes of three-dimensional advection, horizontal and vertical diffusion, gravitational settling, dry deposition and wet scavenging. When using the GPVs of LFM (hourly intervals up to 9 hours, 2 km grid spacing, 60 hybrid layers), the number of tracers is 250,000 and the calculation grid spacing of concentration or deposition is 2 km in latitude-longitude coordinate. For the quantitative predictions of tephra-fall, the initial condition of RATM is given by the eruption column model according to Suzuki (1983). Variable input parameters of the model are eruption column height and duration.

In the case of the 2011 eruptions of Shinmoe-dake, one of the active volcanoes in the Kirishima volcano group located in southwestern Japan, many eruption clouds were observed by weather radars. From the radar reflectivity factor observed by JMA's operational C-band weather Doppler radars at Tanegashima, Fukuoka and Kagoshima airport, the time series of the eruption cloud echo heights have been analyzed in detail (Shimbori et al., 2013). Hashimoto et al. (2012) showed that these radar observations yield effective initial data of the eruption column model to well simulate the ash deposition pattern. In the presentation, results of RATM calculations using the radar data will be shown with comparison to the observed ash-fall quantity and lapilli-fall area.

## References

Hashimoto, A., T. Shimbori and K. Fukui, 2012: Tephra fall simulation for the eruptions at Mt. Shinmoe-dake during 26-27 January 2011 with JMANHM. *SOLA*, 8, 37-40.

Saito, K., T. Shimbori and R. Draxler, 2013: JMA's Regional ATM calculations for the WMO technical task team on meteorological analyses for Fukushima Daiichi Nuclear Power Plant accident. *Extended abstract, 93rd Amer. Met. Soc. Annual Meeting*.

Shimbori, T., Y. Aikawa, K. Fukui, A. Hashimoto, N. Seino and H. Yamasato, 2010: Quantitative tephra fall prediction with the JMA mesoscale tracer transport model for volcanic ash. *Pap. Met. Geophys.*, 61, 13-29 (in Japanese).

Shimbori, T., T. Sakurai, M. Tahara and K. Fukui, 2013: Observation of eruption clouds with weather radars and meteorological satellites. Submitted to *Q. J. Seismol.* (in Japanese).

Suzuki, T., 1983: A theoretical model for dispersion of tephra. Arc Volcanism. TERRAPUB, 95-113.