Verification of the Quantitative Tephra Fall Prediction with the JMA Meso-Scale Tracer Transport Model of Volcanic Ash

Toshiki Shimbori[1]; Yuri Aikawa[1]; Naoko Seino[2]

[1] JMA; [2] MRI

http://www.seisvol.kishou.go.jp/tokyo/STOCK/kouhai/kouhai.html

As one of the Forecasts on Volcanic Phenomena, the Japan Meteorological Agency (JMA) has implemented the Tephra Fall Forecast on 31 March 2008. This is a 6-hour forecast of volcanic ash-fall areas, and is disseminated in graphical format when large eruption (e.g. the height of ash plume is greater than 3000 m above the crater rim or the Volcanic Alert Level is more than 3) occurs in Japan. The forecast is based on the outputs of the JMA Meso-Scale Tracer Transport Model of volcanic ash: This model is the JMA Tracer Transport Model using the meteorological fields predicted by the operational JMA Meso-Scale Model (MSM). The initial condition of the volcanic ash plume is set up with the observational data of plume height and continuance of eruption.

At 2008 Fall Annual Meeting of the Volcanological Society of Japan, we explained the formulation of the JMA Meso-Scale Tracer Transport Model of volcanic ash and the tephra fall forecasts for the eruptions at Sakurajima volcano on 28 July 2008. From the qualitative point of view, these forecasts about ash-fall areas were almost right in comparison with observations. However, from the quantitative point of view, these forecasts about amount of ash-fall were light around the foot of the volcano, namely the negative bias problem has been existed in the present formulation.

To solve this problem, we have studied the transformation method which derives amount of ash-fall from each virtual mass of tracer volcanic-ash particles. Each virtual mass of tracer particles is divided by the total mass of volcanic ejecta following to grain size distribution and the mass of ash-fall per unit area (i.e. surface density of ash-fall mass) is calculated with the MSM horizontal grid size of 5 km. This grid size is, however, too coarse to calculate the surface density around the foot of the volcano, because the gradient of amount of ash-fall is steep. Then we have investigated the effects that the change of grid size on the transformation method affects the prediction of amount of ash-fall.

In this lecture, we report that the quantitative prediction of ash-fall around the foot of the volcano is improved with fine gird size on the transformation method, and think that the quantitative tephra fall prediction needs high resolution tracer transport model of volcanic ash.