Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SVC50-P02 Room:Poster Time:May 2 16:15-17:30

Evaluation of wind data for tephra dispersion simulations

KIYOSUGI, Koji[1*] ; KOYAGUCHI, Takehiro[1] ; SUZUKI, Yujiro[1]

[1]Earthquake Research Institute, University of Tokyo, Tokyo, Japan

Understanding how pyroclasts disperse from volcanic plumes is a fundamental problem of volcanology to reconstruct eruption conditions from tephra fallout deposits. Tephra dispersion is not only a scientifically interesting but also socially and economically important problem. For this reason, advection-diffusion models for tephra transportation have been developed with simplified assumptions (e.g. TEPHA2, PUFF, FALL3D). Simulation results of these advection-diffusion models are affected by the input wind data. For example, in a case study of the Kirishima 2011 eruption with PUFF, simulation results with finer temporal-spatial resolution wind data (Japan Meteorological Agency Mesoscale Model and ERA Interim) reproduced a more wavy shape of observed eastward extending plume (about 900 km from the vent) than that with coarser temporal-spatial resolution wind data (NCEP/NCAR Reanalysis).

Some wind data are available from Japan Meteorological Agency Mesoscale Model, ERA Interim of the European Center for Medium-Range Weather Forecasts and NCEP/NCAR Reanalysis of the National Oceanic and Atmospheric Administration of the United States. Between these wind data, there are differences in data assimilation methods, forecast models and temporal-spatial resolution. In addition, a finer temporal-spatial resolution wind data can be generated with using weather forecast models, such as the Weather Research and Forecasting (WRF) model. The WRF model is a fully compressible, Euler non-hydrostatic mesoscale forecast model developed by a multiagency collaboration. The WRF model is suitable for use in a broad spectrum of applications across scales ranging from meters to thousands of kilometers.

We are developing a system to generate wind data suitable for simulations of the advection-diffusion models. Such wind data should have a spatial resolution of several hundred meters near the vent, that of several kilometers far from the vent and vertically several tens of layers. In addition, it must be required to reproduce the interaction between ambient atmosphere and volcanic plumes. For this purpose, we are carrying out numerical calculations with the WRF model and the available wind data sets; we attempt to generate wind data with higher temporal-spatial resolution using data assimilation based on the observations from the regions of interest (e.g. volcano locations and downwind area) and other observations (e.g. the radar observations).

Keywords: Tephra dispersion simulation, Weather forecast model