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2011年1月の新燃岳噴火での大気境界層内火山灰濃度の時間変化に関する数値実験
Numerical study on time-series of ash concentration in the atmospheric boundary layer during the eruptions at Mt. Shinmo

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An estimation of ash concentration in the planetary boundary layer (PBL), is of practical interest in discussion on volcanic ash impacts on critical infrastructure. For estimating ash concentration in the atmosphere, numerical simulations with an ash transport- and deposition-model have become a powerful tool (e.g. Folch 2012). However, the ash concentration in the PBL, where the ash transport processes strongly depend on meteorological conditions, has not fully discussed, while that for the atmosphere and the ground deposition have been actively examined.

In the present study, we consider a test case corresponding to the eruption at Mt, Shinmoe-dake on January 2011; the eruption column height is approximately 8000m and the total mass flow rate is about 5e9 kg during 2 hr.

We have used two models to represent the interaction between dispersion- and meteorological- processes: one is the CRIEPI weather forecasting and analysis system, NuWFAS, which consist of a numerical weather model, WRF, and some pre- and post-processing tools; the other is an ash transport- and deposition-model, Fall3D. The numerical weather-model parameters, such as the horizontal- and vertical-grid spacing and PBL scheme, are set to correctly predict advection and turbulence diffusion processes in the PBL, which are chosen through the sensitively test.

After verifying the capability of this setup through the comparison with the observations of isomap of ash deposition, we discuss the predicted ash concentration in the atmospheric surface layer in detail; the time-series of ash concentration near the ground, especially near the vent, depict complex wave forms and there values fluctuates; this is due to the change in the advection and turbulence diffusion processes of volcanic ash.

More details will be presented in the presentation, and we believe that our study must be helpful to comprehend essential characteristics of ash transport process in the PBL.

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