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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Volcanic ash modeling with the on-line NMMB/BSC-ASHv1.0 model: model description, case simulation and evaluation" *by* Alejandro Marti et al.

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General comments:

The paper presents a detailed description of the new on-line multiscale meteorological and transport model NMMB/BSC-ASH v1.0. The model, which includes two-way feedback mechanisms, is aimed at forecasting atmospheric volcanic ash dispersion. Applications of the model to two volcanic eruptions are presented.

The paper is scientifically interesting, thorough and well written. I recommend publication after minor revision.

Specific comments:



The fact that the NMMB/BSC-ASH model, which is intended for future operational use, involves two-way on-line coupling between meteorology and dispersion of volcanic ash is obviously an advantage and a step forward. However, the associated computational cost is probably sizable. There are large inherent uncertainties associated with forecasting dispersion of tephra, both regarding the source description and the meteorological parameters. The source model description encompasses the temporal evolution of the release of tephra, the ash column height and the initial vertical distribution of ash, all of which can fluctuate rapidly, as well as the ash particle size distribution. The uncertainty of numerical weather prediction can also be substantial with large effects on dispersion prediction, and a proper description requires use of costly ensemble prediction methods. Thus, the question is if the computational cost of carrying out two-way on-line coupling is justified against the costs of taking into account the uncertainties mentioned? I would appreciate that the authors include a related discussion of such a cost-benefit analysis.

Furthermore, I expect that the effect of on-line coupling is significant only fairly close to the eruption site, where the ash plume influences the radiation budget and the meteorological parameters. Please, comment.

The NMMB/BSC-ASH model is optimized for running on an HPC facility by employing distributed-memory parallelization (MPI). However, modern and future HPC facilities are, and will be, based on multi- or many-core processors, and thus shared-memory parallelization and thread scalability, as well as vectorization (AVX), is essential for obtaining significant performance on future HPC facilities. The authors are encouraged to comment on the model's thread scalability properties, and on possibilities for using e.g. OpenMP and OpenACL on the model code.

Technical corrections:

In addition to the many technical corrections listed by the other reviewer, Larry Mastin, I have only a single comment:

In the caption of Fig. 2, the word Europe should probably be replaced by South America.

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