

Interactive comment on “Initial fate of fine ash and sulfur from large volcanic eruptions” by U. Niemeier et al.

U. Niemeier et al.

ulrike.niemeier@zmaw.de

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We thank Ingo Kirchner for his comments and remarks. They helped us to strengthen the focus of the paper.

– *‘In the introduction there is no motivation why the two specific cases (Mt. Pinatubo and Katmai) were simulated.’*

We tried to clarify the focus of the paper and added a motivation for simulating two eruption locations. The main impact of fine ash in the atmosphere occurs via radiative processes. The solar radiative input differs substantially between the tropics and higher latitudes, as well as the background flow does. Accordingly we got quite different results at the two locations.

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– *‘What was the outline of the experiments?’*

The fine ash has a short lifetime but the impact of the heated ash cloud on flow pattern influences also the evolution of the sulfur cloud, which has a much longer lifetime. Therefore we had to concentrate also on the sulfate and show comparisons to measurements for short term as well as long term periods.

– *‘For each sensitivity case study an ensemble must be simulated. The authors do not describe the ensemble generation. Where do the initial conditions come from?’*

The five main experiments described in the manuscript base on an ensemble of five simulations. We included a short description of the ensemble generation as well as the accomplishment of the experiments. The model was used in the climate mode, no nudging, no assimilation, and the volcano erupted after 17 months of initial simulation. The variation in each ensemble group was small. So we got a strong signal, especially as the volcanic cloud strongly disturbed the background flow. Simulations under different meteorological conditions but at the same season gave similar results and confirm our findings.

– *‘In the discussion of the sulfate evolution the figures 3 and 4 can be combined with the same time axis. In figure 6 the scales of the time axis are different.’*

We combined figure 3 and 4 with the same time axis and improved the time axis in figure 4. The units in figure 2 are changed to μm and mm. Also the presentation of the AOD of fine ash (Figure 6 and 9) has been improved.

– *‘The number of figures can be reduced.’*

Some figures have been skipped (10b, 11 (middle), 15b, 16 (middle), 18) and several figures have been combined (1, 2, 8, 11, 14). The description of the results under different meteorological conditions has been skipped as well. Therefore we added a simulation under winter conditions in order to fulfill the request of reviewer 1.