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Atmospheric Chemistry and Physics Discussions

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Interactive Comment

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

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** general comment

The paper investigates the effects of fine ash and sulfur on the atmospheric circulation. A series of sensitivity simulations was performed and analysed with respect to the short term and long term effects of fine ash and sulfur, which both will be injected by large volcanoes. The presentation of the results is partly not well balanced between the two components, ash and sulfur, and this leads away from the topic. The outline of the paper should be strengthened and the number of figures should be reduced.

** more specific comments

In the introduction there is no motivation why the two specific cases (Mt. Pintubo and

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Katmai) were simulated. What is the major difference between these both cases and what is the objective for both related to the fine ash and sulfur?

What was the outline of the experiments? In the first sentence the five ensemble simulations were highlighted, but this is not the main objective of the simulations. The sensitivity study will investigate systematically the effects of the volcanoes with respect to the eruption strenght, the evolution of the aerosols, the existences of ash feedbacks and the location of the volcano. Well for all of these cases ensemble simulation should be used to estimate the uncertainty, but these are missing for most of the simulation classes. Therefore the outline of the experiments should be described more logical and many additional experimentes will be needed. For each sensitivity case study an ensemble must be simulated. The authors don't describe the ensemble generation. Where do the initial conditions come from, they based on an AMIP-Simulation or what ever? Or was the model running in the data assimilation mode? The length of each simulation is unclear.

In the discussion of the sulfate evolution the figures 3 and 4 can be combined with the same time axis. This makes it more consitent with the discussion. In addition from figure 4 (due to the time axis scaling) it is not so clear, that the evolution of particle size is different between the two layers. Is it also a relevant information for the message of the paper?

In figure 6 the scales of the time axises are different. It seems to be that the SAGE II figures has a quit different time axis scale as the others, because the local maxium at northern latitudes in the first winter after the eruption is much early than in the AVHRR plot. What is the effect due to fine ash in that global view? This is not discussed here, why not?

The discussion of circulation effects is very complicated, because of the dynamical feedback to the local heating rates on one side and on the other side due to the uncertainty of the weather conditions. The uncertainties due to the weather conditions

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are given by the rapid growth rate of disturbances during few days after disturbing the circulation. Therefore small changes in the initial conditions (e.g. with or without ash feedbacks) can produce after few days complete different circulation pattern. An ensemble will help to estimate these uncertainty, but for most of the discussed simulations no ensembles are available. From that point of view it is problematically to compare the Pinatubo with the Katmai case.

The markers of HIRS/2 data in figure 1 are very large. Is it caused by the errorbars?

The scale in figure 2 should be the same or the region with observations (lower figure) should marked in the picture with the simulated ash fall out. The unis should be the same or e.g. the equivalent of 1 mm (equivalent to g/m*m) should be marked in the upper figure.

Many of the isoline figures are hard to read (fig.s 7, 9, 10, 12, 14, 15, 19 and 20), better to use three different colors, one for each time but for the same data value and plot shaded areas.

** answers to the different aspects of the manuscript evaluation

1. Does the paper address relevant scientific questions within the scope of ACP?

yes

2. Does the paper present novel concepts, ideas, tools, or data?

yes

3. Are substantial conclusions reached?

yes

4. Are the scientific methods and assumptions valid and clearly outlined?

missing major points of the experiment description

5. Are the results sufficient to support the interpretations and conclusions?

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yes, but the uncertainty is still open for few points

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)

no

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

yes

8. Does the title clearly reflect the content of the paper?

clarification needed, e.g. which time scale was mainly in the focus, the short term or the long term effects?

9. Does the abstract provide a concise and complete summary?

yes

10. Is the overall presentation well structured and clear?

The structure is clear, the presentation of the results can be strengthened with respect to the objective of the paper.

11. Is the language fluent and precise?

I think yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

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The number of figures can be reduced.

14. Are the number and quality of references appropriate?

yes

15. Is the amount and quality of supplementary material appropriate?

no evaluation.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 17531, 2009.

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