

***Interactive comment on* “The global impact of supersaturation in a coupled chemistry-climate model” by A. Gettelman and D. E. Kinnison**

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We are preparing a revised manuscript to answer the concerns of the reviewer and of all reviewers. Below we make some general points, and then respond directly to the reviewer's concerns. The replies discuss changes we will make to a revised version of the manuscript which we will send to the editor.

In general, we agree that we should better describe the supersaturation scheme, despite this being a sensitivity study. We have spent some time and rewritten our description of the supersaturation scheme, including adding an additional figure that illustrates the performance of the scheme relative to recently published observations of relative humidity and supersaturation. This was a point raised by several of the reviewers, and we acknowledge it could have been clearer. There were also one or two mistakes in the description (such as the thresholds for condensation) that we have corrected.

In addition, we highlight that this really is a sensitivity study, and not a detailed treatment of supersaturation, which is beyond the scope of this paper. We are attempting a sensitivity study to look at the chemical, dynamical and radiative effects of supersaturation, not a detailed physical study of how supersaturation should be properly represented. We will highlight this better in the revised text to avoid confusion

We have further made changes to the manuscript to clarify various points raised by the reviewers. These points are valuable for clarifying several confusing points, and we thank the reviewers for their time and effort.

Specific Replies:

1. We thank the reviewer for their comments. With respect to the general comments, we have tried to more clearly state that this is a sensitivity study.

2. With regard to the specific comments:

Introduction: we have removed the sentence in question

Methodology: We have added resolution to section 2.1

Results: cloud fraction clarified

Results: NO_x and Ozone effects have been clarified

Discussion: Convection, there is really not much impact of this change on convection. Convective clouds are closed a different way, and this change would only affect convective anvils. The only impact is through feedbacks on the convection from changes to the basic state. We have tried to clarify this in the scheme description.

'Improvement' has been reworded.

Discussion: we have tried to better characterize this part of the discussion and the treatment of this issue throughout.

3. Technical Comments:

We have tried to correct the indicated typos and formatting errors.

We do not think color is necessary for all these figures. Also, we have experimented with putting in a zero contour in many of the figures as suggested. Based on looking at them, we do not think it wise to add the zero contour to most of the figures. We are only interested in changes that are far from zero, and adding a zero contour enhances the effect of 'spurious changes' around zero which may not be significant. There is a zero contour in the ozone figure (old figure 10, now figure 11) that demonstrates this problem. Regarding this figure, we have redone the contour intervals in the bottom panel as requested.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 12433, 2006.

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