

***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.

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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.

We have made almost all of the minor corrections described below.

P12434, L3: Change made (many for most).

P12434, L9: Linear has been removed from the abstract and text.

P12436, L2: Citation Added.

P12436, L18: Supersaturation is important for the specific processes mentioned. This was not meant to imply it is generally important (that is the subject of this paper). Clarified in the text.

P12438, L20: The discussion has been substantially modified.

P12439, L19 & 20: Done

P12440, L15: Done

P12440, L20: Done P12441, L5: Discussion changed: the lifetime does not change, as total precipitable water changes at the same rate (5\%). This is due to the decrease in tropospheric humidity, and is noted in the text

P12444, L12: We have revised the discussion, and noted a likely cause of the seasonal asymmetry: humidities and cloud fractions are higher in boreal summer so the changes in clouds are larger (and the radiative effect is larger). This has been noted here and

in the discussion.

P12444 & 12445: Section 3.4 has been clarified: the temperature changes appear to be forced by radiative changes in the tropics and communicated to high latitudes with a reduced circulation. In addition, changes in the temperature structure and circulation affect wave propagation which likely impact the circulation.

P12446-8: Section 3.5 also touches on some important chemical issues that have appeared in the literature, and discussed by several others. We do note that these changes are not that important, and this section is important to properly characterize and explain the small ozone changes. We have decided it is best to leave this section in.

P12449: Section 4.1, discussion. We have modified this section to try to clarify and better summarize the discussion. Hopefully it is now more useful and less redundant.

P12452, L7-18: Thanks, this change helps.

P12453, L3: Actually it does improve the simulation. The seasonal cycle is harder to get right than the absolute value, which is a function of the mean tropopause temperature and can be adjusted with gravity waves. We have noted this briefly here.

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

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