

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

Anonymous Referee #4

Received and published: 29 December 2006

1 General comments

The paper presents an important sensitivity study on the impact of the ice-cloud parameterization in a CCM on stratospheric water vapour, including consequences for dynamics and chemistry, and implications for climate change assessments. However, it should be clearly stated in the introduction and also the abstract, that the simple and crude parameter changes in the cloud scheme were introduced only for the purpose of a consistent sensitivity study, but not for improvement of the model or comparison with observations. With this in mind, it does not matter if the threshold in relative humidity is shifted by 20 or 30% as arbitrary number. It is just coincidence that the shift by 20% results in a change in tropical stratospheric water vapor in the order of typical biases

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(0.5ppmv) in CCMs (see also e.g. Lelieveld et al., 2006). Nevertheless, the study might give some hints how to tune a CCM for a better representation of stratospheric water vapour.

The study should be published in ACP after revision, including improvement of the quality of the figures.

2 Specific comments

Introduction, line 22: The sentence is misleading since low clouds should be not much affected.

Methodology: The resolution issues in section 2.3 should go into section 2.1

Results, line 14: unclear, is the resulting cloud fraction here 0.03?

Results, page 12447, line 28: This is somewhat in contradiction to the paragraph above. Or is the NO_x enhancement via lightning?

Discussion: I would expect an impact of the ice cloud parameterization on convection and induced transport. Was there any analysis on this carried out?

Better don't use 'improvement' (line 12) for the sensitivity study, reword.

Discussion, section 4.2, par 2: increased upwelling IR radiation leads to more heating in the lower and middle stratosphere which should enhance upward mean motion. The text is confusing here because of obviously compensating effects.

3 Technical comments

The greyscales in the figures should be replaced by colour. Also it is a bad idea to omit the zero contours in difference plots. In the lower panel of figure 10 also a nonlinear contour spacing would be helpful for interpretation.

Referee 1 already pointed to a lot of typos to be corrected, including missing Latex-control-keys. There are several more like missing \$-signs for sub- and superscripts.

4 References

Lelieveld, J., et al.: Stratospheric dryness, Atmos.Chem.Phys.Discuss. 6, 11247, 2006.

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

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6, S5807–S5809, 2006

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