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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Cloud microphysics and aerosol indirect effects in the global climate model ECHAM5-HAM" *by* U. Lohmann et al.

Anonymous Referee #3

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Review of Cloud microphysics and aerosol indirect effects in the global climate model ECHAM5-HAM by Lohmann et al,

In general this is a straightforward presentation of a new formulation of the ECHAM5 general circulation model. It should be acceptable for publication in ACP with minor revisions as described below. The manuscript is generally well written and clear in its presentation.

Beyond minor technical issues there are a few general points which could be clarified or discussed in the manuscript. It would be nice to separate for the reader what is new in this manuscript beyond the documentation of the microphysics scheme by Stier et al 2005, to highlight the key features of this work.

It would be nice to see some discussion of the stability of the model physics to horizontal resolution in particular. Does the microphysics change substantially at resolutions higher than T42? Do the aerosol affects change? Since more of the vertical velocity might be resolved, it might change things.

It would also be nice to estimate what the effect of including the more detailed cirrus scheme might be on total aerosol indirect effects. Would the glaciation effect be enhanced and reduce the total indirect effect?

Specific comments:

P4, L104: What pieces of the discussion in section 2.1 are different from Stier et al 2005. Please indicate what is new, and eliminate that which is covered elsewhere.

P4, L108: Where does alpha come from? What is it, and how is it chosen?

P6, L160-169: This section was very confusing. Is 'this threshold' the 0.5mg kg-1 threshold? I think you are saying that you follow water saturation until you reach 0.5mg kg-1 ice, then drop to ice saturation, both with a hard limit. I do not understand exactly how this differs from ECHAM5-REF and ECHAM4. The word 'intended' is awkward.

P11, L323: I do not see a secondary liquid water path maximum in the tropics in figure 1. At what latitude?

P14, L409: Does the model also reproduce aerosol values in clean regions? Can you show a plot with data from a pristine region in Figure 3 too? I am quite worried about large values of black carbon in the stratosphere which are a factor of 2-5 too large. This might substantially alter the radiation balance either (a) directly or (b) indirectly by changing tropopause temperatures. Can you show that this does not impact the stratospheric radiation balance?

Figure 5 would be easier to interpret as a series of joint PDFs: with IWC/TWC v. Temperature.

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P19,L574: Cloud drop number concentrations are not shown in Figure 8.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3719, 2007.