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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 #2

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

The paper reports some changes in the cloud microphysics of the global climate model ECHAM5-HAM that would be of interest for a user of the ECHAM5 model.

The main conclusion is that the better performance of ECHAM5 compared to ECHAM4 are attributable to the prognostic aerosol concentrations and the parameterization of the Bergeron-Findeisen process. This would be of interest for a general reader. But I have a major concern that this is not adequately supported by the analysis. This

concern should be considered before publication in ACP.

Major concern
The changes between simulations ECHAM4 and ECHAM5-REF are so numerous that it makes difficult to believe the authors in their attribution to the sole difference in microphysics the difference between the two simulations. When reading carefully along the text, it appears that the simulations have been run over different periods (10 yr vs. 5 yr), with differences in spatial resolution (T30 vs. T42), advection scheme, radiative scheme, aerosol scavenging, diagnostic of effective ice crystal radius, etc. For example, p3732, l11, the increased frequency of deep convection is attributed to the changes in the radiative scheme. But it might be also due to the increased spatial resolution, the decrease in the aerosol content, a cloud feedback, etc.

In order to "focus only on those differences between ECHAM4 and ECHAM5 that are related to the different treatment of aerosols and cloud microphysics", as it is stated in the introduction, I strongly suggest to redo a simulation by including the ECHAM4 aerosols and cloud microphysics into the ECHAM5 model using the same set-up as for ECHAM5 simulations. Otherwise, the paper should focus on the sensitivity differences between the ECHAM5 simulations (and the comparison between ECHAM4 and ECHAM5-REF should be cited for reference only).

Specific comments
p3723, section 2.1. The radiative properties for aerosols have to be described. Is there any differences between those of ECHAM4 and of ECHAM5?
p3724, l15. I suppose that TKE is diagnosed. This should be described.
p3728, l11. Table 1 should be introduced in the first paragraph of section 2, before the presentations on the aerosol and cloud schemes that refer to the different simulations.
p3728, l16. The time step should be given.

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Interactive Comment