Atmos. Chem. Phys. Discuss., 7, S7009–S7010, 2007
www.atmos-chem-phys-discuss.net/7/S7009/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global anthropogenic aerosol effects on convective clouds in ECHAM5-HAM" *by* U. Lohmann

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Received and published: 19 November 2007

This is a highly welcome study of combined aerosol-cloud effects in a suite of global climate models from the ECHAM5 family. It extends beyond former studies by including also effects on convective clouds, including the mixed phase microphysics. Clearly this is an improvement due to more complexity in the physical parameterisations. As is the case with such studies, a number of parameters are set at sometimes kind of arbitrary values. This, however, does not lessen the strength of this study, but gives way for further improvements in the future. Since a number of such parameterisations were changed or newly included, it is not easy to determine what led to which effects. The discussion sections in part 3 try to do best. The paper is well organized and nicely written and it is hoped it will foster further studies in this field. Overall, I feel that it is

ready for publication in ACP after some discussion of the subjects mentioned below.

The new model set-up ECHAM5-conv is superior to others in some aspects but not in all, reminding us of the need for further tuning – or the inclusion of cloud dynamics beyond the bulk mass flux approach used here, plus retuning.

A number of the parameterisations look quite arbitrary or ad-hoc, so SQRT(CAPE) in Eq. 3 (although taken from a former publication of the author), the cut-off for precipitation in convective clouds (25 nm), or the use of wu=0.5 m/s to obtain cloud cover. More information/discussion would be appreciated here. The Hoose et al (2007) paper is submitted but not published – so a bit more information should be given on the cooling by turbulent motions. Also: what were the inconsistencies in the BF process (this might help interpreting former publications!).

As mentioned above, retuning is probably not yet completed. How can one be sure that autoconversion and aggregation are the right knobs to turn? The sensitivity of the ECHAM5-conv model version seems to be appropriate, even though the means are not always satisfying (see Fig.5).

In the discussion of the relative contribution of large scale and convective precipitation in ECHAM5-conv vs. –strat I find a total of c+ls of 85% and 80%, respectively. What about the rest? Or did I get the numbers wrong?

Chapters 3.1 and 3.2 are evaluation, not validation!

A mass-mixing ratio cannot detrain.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14639, 2007.