

Interactive comment on “Simulating aerosol microphysics with the ECHAM/MADE GCM – Part II: Results from a first multiannual integration” by A. Lauer and J. Hendricks

Anonymous Referee #3

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This article is the second of currently two related articles describing the new model system ECHAM4/MADE. ECHAM4/MADE is one of only a few GCMs including an aerosol model which is able not only to resolve aerosol mass but also the number concentration and the size distribution. The authors present results from a first multiannual integration. They focus on the budgets and lifetimes of the aerosol components and evaluate the importance of individual source and sink processes for particle number and mass concentrations for the Aitken mode and the accumulation mode independently. The most important result is that the so-called “aerosol dynamical processes” are essential for the correct simulation of particle number and size distributions. Although considering aerosol dynamics (or (micro-)physics) improves the calculation of particle mass

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concentration, it is not vital to get reasonable results.

I recommend the paper for publishing in ACP after some minor corrections:

Specific Comments:

- NO_3 and NH_4 : In the abstract it is mentioned that nitrate and ammonium are taken into account as aerosol components within MADE in the present model simulation (p. 7520, l. 9). A few lines below (l. 12/13) the budget (lifetime) of nitrate is missing. In Section 3.3 all budgets are listed, but the lifetimes for both, NO_3 and NH_4 , are left out. In Section 3.2/Fig.5 the percentages of nitrate and ammonium of the overall particle composition are given without any analysis. Nitrate and ammonium are solely mentioned in these three places and not further analysed or even mentioned. It is desirable to get more information about these aerosol components. I understand that a comprehensive evaluation of nitrate and ammonium in the aerosol phase would be too much for this paper, but it would be good to give a reason why you do not go into detail about nitrate and ammonium, but concentrate on sulfate, OM and BC. Maybe you can refer to a (to-be) third part of this article series?
- Please be more precise about what was already done in other model studies. You give the impression that your model is the only one calculating prognostically size distributions and number concentrations. There are already some aerosol models working with modal or bin schemes (see publications of the AEROCOM project). Especially with regard to the citation of Stier et al., 2005 (p. 7521, l. 8) it would be desirable to clarify the differences and the similarities of both approaches (e.g. the usage of EQSAM in MADE) as M7 is also a modal aerosol model.
- In Section 3.3 (p. 7532, l. 21 ff.) the lifetimes of all aerosol components except sea salt are listed. Why is sea salt left out whereas mineral dust is analysed,

when both are dominated by coarse mode particles?

Technical Corrections:

- p. 7521, l. 11: Please write “evaluated” instead of “validated” (models will never be “valid”).
- p. 7521, l. 3: Write “separated” instead of “speparated”.
- p. 7535, l. 15: It is unclear to which concentration “These concentrations” refer to (“ 20 cm^{-3} ”?). Do you really mean “larger”? Please rephrase the sentence.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 7519, 2006.

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