Atmos. Chem. Phys. Discuss., 10, C1810–C1814, 2010
www.atmos-chem-phys-discuss.net/10/C1810/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulation of aerosol optical thickness during IMPACT (May 2008, The Netherlands) with ECHAM5-HAM" *by* G.-J. Roelofs et al.

Anonymous Referee #2

Received and published: 19 April 2010

Roelofs et al. present a study on the evaluation of aerosol properties as simulated with a global aerosol-climate model with the help of a comprehensive dataset obtained in a field campaign. While in my opinion, overall the study will not advance the field of aerosol science in an extraordinary way, there are several methods and results which make it indeed interesting. A particular strength of the study is the application of a multitude of aircraft- and ground-based measurements for the evaluation of a global model. The results are mixed, but good enough to allow for a reasonable comparison, and the authors are able to draw several interesting conclusions, where they point to a couple of shortcomings of the model and point to possible solutions (e.g., too strong boundary-layer mixing, lack of nitrate aerosols).

The study is original and interesting, its topic fits well into the scope of Atmos. Chem. Phys., and the manuscript is clear and written in an excellent English.
In the following, I propose a couple of minor modifications.

Title: The authors should consider revising the title. I suggest something like "Evaluation of aerosol properties simulated with the global aerosol-climate model ECHAM5-HAM using observations from the IMPACT field campaign".
The study is more about evaluation of the model than pure simulation. It is evaluating not just aerosol optical thickness, but a large variety of aerosol properties, including also the Ångström exponent, chemical compositions, number concentrations, and profiles. It is a funny idea that the authors put the time and location of the campaign in the title, but I rather propose to specify that it is a field campaign, and I also suggest to explain that ECHAM5-HAM is a global aerosol-climate model.

p5912
l5: I think it would be good to specify what aerosol properties are meant by "aerosol"
l6: The "realistic" representation of the meteorology is due to the nudging, isn't it?
l23: I suggest to mention "direct" effects before the "indirect" ones, otherwise it might sound strange to readers not too familiar with the field.

p5913
l20: The Bellouin et al. value if for clear-sky only. For the all-sky mean they estimate -0.8 Wm^{-2}.

p5915
l8: Are these heights valid for the Cabauw grid-point?

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l9: Which ECMWF dataset is used?
l14: I suggest, “emissions of primary aerosol and aerosol precursors”

p5916
l9 (and frequently later in the manuscript) I think it should be “Cabauw grid point”, and not only “grid”.
l15: the acronym “CDNC” is introduced here and should be spelled out.
l18: you might want to add that this implies that no aerosol indirect effects are taken into account here (which, admittedly, is quite irrelevant to your study)
l24 “at the Cabauw grid point”

p5917
l12: Is this really meant as an instantaneous error bar, or rather some “uncertainty” in a statistical sense?

p5919
l16: If you talk about correlations, could you give the correlation coefficients?
l22: Please specify here what is meant by PM10. Is it the mass of particles with dry radii (or diameter?) larger than 10 μm?
l23: The URL seems to be wrong
l25: the observations (and model results) are for the surface layer. How much of the long-range transported dust is found so low?

p5921
l18: Is this local time?

p5923
l14: How is the standard deviation computed?
l29: Is the relative humidity also sampled for the liquid water path thresholds?

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p5924
l13: I think, it should be “Table 1” here.
l15: What is meant by “Cloudsat”?

p5925
l23: I suggest, “cycle with a similar”
l24: This is in my opinion not plausible. The layer is not well-mixed, but shows two maxima. Is this perhaps detrainment from shallow convection?

p5927
l25: The Derksen and Roelofs (2010) reference is missing in the reference list

p5931
l31: Brenguier

p5936
It would be nice if you could give the statistical metrics in this figure. What is the correlation coefficient, what the bias and the rms?

p5937
for (b), it would be good to mention the size range in the caption

p5938
it might be useful to show daily mean values also for the model. It merits mentioning that for the model, the total aerosol mass rather than PM10 is shown. Could you indicate for the model the coarse-mode contribution to the total mass?

p5939

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Is it possible to quantify from the model (using the modal description) how much of the mass is in the size range above 56mm in diameter? And is it really mm and not μm?

p5941
What is “standard deviation” here? Is it for the temporal variability? Is it computed in the log space?

p5945
see Fig. 4 (not 2)

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 5911, 2010.