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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of preindustrial to present-day black carbon and its albedo forcing from ACCMIP (Atmospheric Chemistry and Climate Model Intercomparison Project)" *by* Y. H. Lee et al.

Anonymous Referee #1

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Lee et al. present a study analysing and evaluating the simulations of the ACCMIP with respect to black carbon. Overall, this is a well-done model intercomparison and evaluation study. The evaluation using various data sources goes as deep as possible in the limits of one paper investigating several models, and the conclusions include a discussion of the resulting black carbon – albedo forcing and its uncertainty range. The manuscript is generally well written, with a good choice of Tables and Figures. My main suggestion is to include the statistical model-data comparisons now tabulated in detail in the Supplementary Material in a summarised form in the main manuscript.

Specific comments

Title: I suggest to put the full name in the title and the acronym in brackets: "...from the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP)"

p21617 l18: This is a possible definition, but its of course not unique.

p21717 l10: Sentence flawed

p21718 l11: Is there a specification missing for the factor 7?

p21720 l13: consist l15: Does neither year show a strong El Niño / La Niña? Or does this not matter? l19: But the SST/SIC was repeated as the fixed year?

p21721 l13: That is, in the lowermost layer? Which two models inject higher?

p21722 l22: "incorporated new information" l23: "apply"

p21724 l10: and down to which depth for layer 4?

p21725 l24: why is then still the ratio between dry and wet deposition in HadGEM2 the same as in most other models?

p21726 l2: Why not "Textor et al.", which would be the common formulation? l15: It is very unlikely that the precipitation characteristics are so different between a nudged and non-nudged model version, so this explanation does not seem credible.

p21727 l1: From Fig. 3, it rather seems 1 or higher. l7: Rather, the column burden MMM shown in Fig. 3a l12: "Relatively large": I think it really is surprisingly low compared to the large RSD in the burden. This should be discussed rather than the slight – and expected – difference in deposition RSD compared to the source regions.

p21730 l4: It would be better to convert the Table S1 into a figure and present it in the main text. It might be useful to summarize the full data to show just the average correlation coefficient, LMNB and LMNE for each model, for the Arctic, European and North American stations as discussed in the text. l25: "Unlike BC": It seems that in

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fact the BC seasonality is not very different among the three stations either. Or does this statement rather refers to the model skills? If so, this needs to be explained better. Also the phase difference between models and observations needs explanation.

p21733 l6: As before, I think the average LMNB/LMNE should be reported in the main text. l8: ,.

p21734 l11: A central conclusion before has been that the transport to the Arctic is a main uncertainty. It comes thus at little surprise that the meteorology matters. It would be good to provide a deeper analysis of the differences in the two choices for the driving meteorology.

p21736 l3: The sentence needs to be completed.

p21745 l3: compared

p21761 Table 3: The unit for the emissions is also “Tg yr-1”, I believe? Why are emissions and wet+dry deposition not balanced?

p21766 Fig. 3: The color scale for the RSD of the BC column burden is saturated throughout the Arctic region. How far does the RSD exceed 1? It may be useful to show an Arctic projection (such as for the deposition fluxes) also for the burden.

p21767 Fig. 4: It would be better to use a balanced color scale (i.e., 2 corresponds to 1/2, 3 to 1/3 etc.).

p21768 Fig. 5: The reader should be reminded that for 1930, GFDL and HadGEM2 are not included. For color scale, see above.

p21770 Fig. 7: Since anyway a logarithmic scale is used, it seems preferable to use the same units (ng m-3) for all panels and extend the scale to 6000 nm.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21713, 2012.