

Interactive comment on “The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP): overview and description of models, simulations and climate diagnostics” by J.-F. Lamarque et al.

M.G. Schultz (Referee)

m.schultz@fz-juelich.de

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The manuscript by Lamarque et al. provides a concise and comprehensive overview about the ACCMIP models and simulations and could indeed serve as "central repository of information" concerning this important model intercomparison. Unfortunately, the authors cannot fully decide themselves on the scope of this paper, but this can be corrected with few minor changes. Since the purpose of this manuscript is to provide an overview (and in fact an excellent documentation of a large variety of global chemistry transport and chemistry climate models), it does not present many new de-

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velopments per se. Yet, I think that the paper is totally adequate for GMD, and I strongly recommend publication after minor revisions as outlined below.

1) General comment: font sizes of figures (and sometimes tables) are too small. I had trouble reading some of them even with my glasses. Please keep an eye on this during the production process.

2) Manuscript scope: The abstract states that this paper "introduces the various simulations [...] and the associated model output". In the introduction the term "central repository of information" is used instead, which is a little more ambitious. To my knowledge, there is no other comprehensive ACCMIP overview paper, and this manuscript fulfills at least 90% of the requirements for such a paper. Hence, I suggest to add one more paragraph on the general idea of ACCMIP and the way it has been organized. Then rephrase the abstract and introduction to state clearly that this *is* the ACCMIP overview paper. [should I be wrong and there is another general paper on ACCMIP then this has to be mentioned!]

3) Introduction: this should start with a more general sentence about what CMIP is. This is well known to climate modellers, but not to other (atmospheric) scientists.

4) Abstract and introduction should state the number of models that participated and quantify the number of experiments that were defined.

5) p2448/8: it may be confusing to readers to see the jump from CMIP3 to CMIP5. What happened to CMIP4. This should perhaps be mentioned?

6) p2450/8: remove "note that" and "only". It should perhaps be mentioned that you mean "sensitivity simulations" by "additional simulations"? At least this is what the conclusions suggest.

7) p2450/11 (and again /20): "long lived concentrations" is jargon.

8) p2452/9: add "concentrations" between "radical" and "photolysis rates".

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- 9) p2452/13: remove paranthesis "(the only..." This is evident from the sentence above.
- 10) p2452/25: "no" instead of "on"
- 11) p2453/6: while the number of participating models hasn't been mentioned up to this point, it now occurs twice within 5 lines. Re-phrase.
- 12) p2453/15: "all classes of models": do CTMs also simulate an indirect effect?
- 13) p2454/12: information on STOC-HadAM3 is confusing: is the resolution 2.5x3.75 or 5x5?
- 14) p2454/19: the necessity of a convective parameterisation is undisputed. This is almost a "motherhood statement". I think the reader can be expected to know this, and if he/she doesn't, this statement will not be very helpful either, because it singles out convection, while in effect there are several other physical processes that need to be parameterized in global models. Suggest to cut this sentence.
- 15) p2454/27: "(Collins, 2002, that..." this sentence seems to be corrupted. Why make the insertion within parantheses?
- 16) p2456: "Natural emissions" - remove ": lightning, biogenic, ..."
- 17) p2456/5: slightly misleading to refer to methane in section 3.5 in this context. Perhaps better to state explicitly "... methane is generally treated as boundary condition and therefore described in section 3.5" (or remove this insertion)
- 18) p2456/17: it is easy to see for the reader that the range of soil NO_x emissions is similar to the range of NO_x emissions. What is harder to find out is how the model range compares with literature estimates. This is done for lightning (ref to Martin et al., 2007), but not for soil NO_x.
- 19) p2457/3: please describe briefly what was done for ocean, volcanic emissions and other natural sources. No need to go in details for each model, but at least say if everyone used prescribed emissions (and perhaps even the same?) or if some models

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had interactive parameterisations.

- 20) p2457/15: "use" and "using" - could repa second occurence with "applying"
- 21) p2458/10: "A drawback" instead of "An additional drawback". There was none mentioned before.
- 22) same: out of curiosity: to my knowledge there has not been any systematic evaluation of j-value calculations in global models yet. Should this be mentioned perhaps?
- 23) p2458/26: after "model atmosphere" one could add "and NMVOC reactivity as well as yields of radicals and intermediate product species such as formaldehyde and glyoxal."
- 24) p2459/8: this sentence almost reads as a recommendation to include the NO+HO₂->HNO₃ reaction in new models. However, JPL-2011 states: "Until the results have been confirmed by other groups and are better understood, no recommendation can be made. These rate parameters are provided for the purposes of model evaluation only and do not constitute a recommendation by the Panel." - this should be expressed more clearly.
- 25) p2460/8: Insert "In" before "CICERO"
- 26) p2460/13: it's not emissions of ozone precursors that matter in the LS, but concentrations
- 27) p2461 (afterthought on RF section): where the models use climatologies: do they vary with time? Or do some use, for example, a 2000 aerosol climatology for 1850?
- 28) p2462/2: "differences" to what? Please state more explicitly what is meant (I assume you want to say that there are only small differences between the various reanalyses)
- 29) p2463/8: Insert "of the present-day and future scenarios " before "compared to 1850"

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- 30) p2463/25: Insert "in" before "the remaining"
- 31) p2464/10: Conclusion is not that "there is a feedback on the methane lifetime", but that this feedback shows considerable spread among models. Please rephrase.
- 32) p2464/27: replace "latest" with "latter"
- 33) p2465/ end: coming back to the broadening of the paper scope, you could mention that ACCMIP will live on as a part of the SPARC CCMI.
- 34) ref list: I haven't checked this carefully, but I have the impression that some references are included here which are not referred to in the text, but only in the SOM. Please double-check.
- 35) Table 1: I suggest to add a line to the caption stating that there were additional simulations requested for years 1910, ... (as stated in the text)
- 36) Table 2: font size differs between parts of this table; sometimes it gets too small. Also, there should be some space between table lines to make them more readable. I hope that you can get some support for typesetting these tables from the publisher.
- 37) Figure 4: exchange green color for red?
- 38) Figures 6&7: ERA and NCEP barely visible. Increase line thickness? By combining these two into one figure you could save one legend.
- 39) Figures 8&9: these figures are not entirely convincing, because (as you state) the number of model submissions varies for each scenario. The supplement should contain a version of these graphs for a common subset of models, or even a series of plots giving the response of each model individually. At a minimum, the text should state what the outcome would be if only the subset of models that did all scenarios were used. – out of curiosity: it is interesting to see that the temperature response at 700 hPa is only about 75% of the (surface) temperature response suggested by the RCP names. Is this a well-documented feature? This could be stated in the text.

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- 40) Supplement, title page: please provide a more explicit table of contents
- 41) Supplement: CICERO description - font for references differs
- 42) Supplement References: C.D. Jones sorted in wrong place and starts with initials rather than lastname

Interactive comment on Geosci. Model Dev. Discuss., 5, 2445, 2012.

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