

We would like to thank Martin Schultz for his thorough and constructive review. We are showing below the original review comments in italics and our response in plain text, indicating our plan for the revised version.

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.*

Sorry about this. We will increase as much as possible the font size in the figures. We will try to reformat some of the Tables to increase readability.

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!]*

This is indeed in the only peer-reviewed overview paper (there was a description in the IGAC Newsletter). So it is indeed a good idea to add a general description of ACCMIP itself and clarify the abstract, as suggested.

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.*

Good point. We will introduce the concept and goal of CMIP.

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

We will add that information.

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?*

This has been confusing many people. We will mention how the naming convention changed to align itself with the IPCC Assessment reports.

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.*

Sorry for lack of clarity. Yes, “additional” means “sensitivity”.

7) *p2450/11 (and again /20): "long lived concentrations" is jargon.* 8) *p2452/9: add*

"concentrations" between "radical" and "photolysis rates".

We will rephrase to “long-lived specie concentrations” and make the suggested correction.

9) p2452/13: *remove paranthesis "(the only..." This is evident from the sentence above.*

It is indeed evident. Text will be removed.

10) p2452/25: *"no" instead of "on"*

OK.

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.*

We will remove the first occurrence.

12) p2453/15: *"all classes of models": do CTMs also simulate an indirect effect?*

Yes, CICERO does.

13) p2454/12: *information on STOC-HadAM3 is confusing: is the resolution 2.5x3.75 or 5x5?*

It is indeed confusing. While the model physics is run at 2.5x3.75, the remapping associated with the Lagrangian advection remapped at 5x5, hence the output is available at that resolution. We will clarify.

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.*

Agreed. Sentence will be removed.

15) p2454/27: *"(Collins, 2002, that..." this sentence seems to be corrupted. Why make the insertion within parantheses?*

There is a typo in the text. It should read: “ Collins et al., 2002; this uses convective ...)

16) p2456: *"Natural emissions" - remove ": lightning, biogenic, ..."*

Will do.

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)*

Good point. We will change the text as suggested.

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.*

We will add a short discussion and references to Stavrakou et al. (2008) and Steinkamp and Lawrence (2011).

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 modelshad interactive parameterisations.*

This information is contained in Table 3 but we will include a few sentences summarizing the range of methods used.

20) p2457/15: *"use" and "using" - could repace second occurence with "applying"*

Will do.

21) p2458/10: *"A drawback" instead of "An additional drawback". There was none mentioned before.*

We'll remove "additional".

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?*

Not in the peer-reviewed literature. There was a PhotoComp exercise for the most recent CCMVal report, but no publications. While this has a specific stratospheric bias, we will however mention the existence of this report.

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."*

Will change the text as suggested.

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.*

Sorry for the confusion. This is not an endorsement, but instead a description of its

potential impact. We will make that clear in the next version.

25) p2460/8: *Insert "In" before "CICERO"*

OK.

26) p2460/13: *it's not emissions of ozone precursors that matter in the LS, but concentrations*

Indeed, we will change “emissions” to “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?*

While it is mentioned for some models, we will make it clear which models have time-varying climatologies or not.

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)*

Yes, that is the meaning. We'll clarify.

29) p2463/8: *Insert "of the present-day and future scenarios " before "compared to 1850"*

Will do.

30) p2463/25: *Insert "in" before "the remaining"*

Will do.

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.*

We will rephrase the sentence to “Indeed, as discussed in Voulgarakis et al. (2012), there is considerable spread in the climate feedback on the methane lifetime (0.33 ± 0.13 yrK⁻¹)”.

32) p2464/27: *replace "latest" with "latter"*

Will do.

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.*

While that is a good point, since CCMI is still being created, it seems premature to include such statement.

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.

While it may not be in the text, many references were used in Table 3. We will however check again.

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)

We will do that. Following reviewer 1, we will also change the content of the table to list “Core” and “Optional” instead of Core and Tier 1.

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.

We will reduce the column width to allow for a larger typeset.

37) Figure 4: exchange green color for red?

Yes. This will make it much more different from the blue and black.

38) Figures 6&7: ERA and NCEP barely visible. Increase line thickness? By combining these two into one figure you could save one legend.

We will remove NCEP since it is almost indistinguishable. We will keep the figures separate though since they apply to different fields.

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.

That is a good point. We will include the figure below (done with only a consistent set of models) in the SOM, and leave the existing figure in the main text.

- *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 tis a well-documented feature? This could be stated in the text.*

I don't quite know if this fact is well-documented; but it is also important to remember to the temperature response is a showing a mix of CMIP5 and AR4 (i.e. SRES) simulations. So a clear signal might not be easy to extract from those.

40) Supplement, title page: please provide a more explicit table of contents 41)

Will do.

Supplement: CICERO description - font for references differs

We'll fix the font.

42) Supplement References: C.D. Jones sorted in wrong place and starts with initials rather than lastname

Thanks for catching that.

