

Response to Interactive comment by J. C. Hargreaves (Editor) on “The Cloud Feedback Model Intercomparison Project (CFMIP) contribution to CMIP6” by Mark J. Webb et al.

Reviewer comments below are shown in bold and our responses are in italics.

Dear Julia,

This seems to me to be a pretty good MIP manuscript. You do have the advantage that the protocols for the experiments are relatively simple to describe, but I still think it very well organised.

Thank you.

I haven't checked all the protocols - just a couple that I am particularly interested in - but the information seemed complete for those. However, please do check through your revised manuscript to make sure that a third party could set up each run from the information provided.

We have done this, and have made a few changes to clarify some issues:

We have updated the amip-future4K experiment definition in Section 2.1 to include the sentence:

“Care should be taken to ensure that SSTs are increased in any inland bodies of water and near coastal edges, for example by linearly interpolating the provided warming pattern dataset to fill in missing data before re-gridding to the target resolution. “

In section 2.7 we have inserted the word ‘open’ into the sentence:

“The magnitude of the uniform increase is taken from each model's global, climatological annual mean open SST change between abrupt-4xCO₂ and piControl (using the mean of years 111-140 of abrupt-4xCO₂, and the parallel 30-year section of piControl).”

We have also re-written part of Section 2.6 to make it clearer:

“Time-varying feedbacks in the amip experiment could alternatively be diagnosed by subtracting a time-varying radiative forcing diagnosed from RFMIP experiments. However, the amip-piForcing approach has the benefit of diagnosing the time-varying feedbacks over the full 1870-present period rather than the last 36 years, and does so with reference to a single experiment, which reduces noise compared to that which would be present with a double difference of the amip experiment and two RFMIP experiments.”

We have also added the following text to Appendix B:

“Ozone values are provided up to 0.28hPa (about 60km altitude in mid-latitudes). For models with tops above this level, we recommend that the value at the top level in the forcing dataset is applied

above 0.28hPa so as to give a profile which is constant with height above 0.28hPa. We are currently looking into providing an alternative ozone forcing dataset with a higher top. If such a dataset becomes available we will publish it via the CFMIP website."

The remaining peculiarity is the reference to boundary conditions that will become available through other papers in this special issue - are there now references that can be provided for these papers?

We will add the following:

"Most of the CFMIP-3 experiments are based on CO₂ concentration forced amip, piControl and abrupt-4xCO₂ CMIP DECK (Diagnostic, Evaluation and Characterization of Klima) experiments (Eyring et al., 2016). Unless otherwise specified below, the CFMIP-3 experiments should be configured consistently with the DECK experiments on which they are based, using consistent model formulation, and forcings and boundary conditions as specified by Eyring et al., 2016."

The thing I spotted in the reviewers' comments that I am unsure about is the suggestion to abbreviate the citations to increase readability. Here's an example, "Temperature and humidity tendency terms in particular have been shown to be useful for understanding the roles of different parts of the model physics in cloud feedbacks and adjustments (Kamae and Watanabe 2012; Williams et al., 2013; Webb and Lock 2013; Demoto et al., 2013; Sherwood et al., 2014; Ogura et al., 2014; Brient et al., 2015) "

I generally don't like the idea of reducing the citations, but that is an awful lot of references all apparently showing the same thing! As a reader I'd want to know what the difference is between these papers, and which one I should look up in order to learn about the thing I am specifically interested in. The obvious solution would be to add a little more description, so that the reader has more knowledge about the content of the references. Doing so will make the manuscript longer, which could get out of hand, but maybe there is a middle way which produces a more readable and more useful manuscript.

We have addressed this in the manuscript as follows. We have reduced the number of citations in the introduction, in particular where there is duplication with Section 2. Throughout, where several citations are made together, we have broken them into smaller groups as suggested to give the reader a better idea of what distinguishes them.

For example, in the case highlighted above, we have updated the manuscript to read:

"Temperature and humidity tendency terms in particular have been shown to be useful for understanding the roles of different parts of the model physics in cloud feedbacks (e.g. Webb and Lock 2013; Demoto et al., 2013; Sherwood et al., 2014; Brient et al., 2015) and cloud adjustments (e.g. Kamae and Watanabe 2012; Ogura et al., 2014) as well as in understanding clouds and circulation in the present climate (e.g. Williams et al., 2013; Oueslati and Bellon, 2013; Xavier et al., 2015). "

We hope that these changes strike the required balance effectively.