

Response to Interactive comment by Anonymous Referee #2 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 Referee,

This manuscript outlines the CFMIP-3 experimental strategies, the associated model output, and the motivation and anticipated results of these experiments. Overall the manuscript is clearly written and accurately summarizes the plans for CFMIP-3, and in many ways represents more of a review of past CFMIP achievements, which in itself is a useful contribution. I recommend acceptance with only minor revisions as outlined in my suggestions below.

Thank you for your careful consideration of our manuscript and for these helpful comments.

The authors are very generous in their citations of other work, which is commendable, but it detracts from the readability of the manuscript. I recommend the authors consider focusing on a few select highlights of the previous CFMIPs that illustrate the main contributions, rather than attempting an exhaustive summary of everything that’s been learned from CFMIP experiments. In the current form, it’s difficult to identify what the key contributions of CFMIP have been.

We appreciate that the many citations do make the manuscript difficult to read in places. We are glad that the review of the main CFMIP achievements is appreciated, and agree that this could be achieved with fewer citations. However, we also consider it important to communicate the full breadth of studies arising from CFMIP, as this will we think help to inform the decisions made by modelling groups on which CFMIP experiments to perform and which model outputs to provide. Following guidance in the subsequent interactive comment from the Editor (Julia Hargreaves) we will reduce the number of citations in the introduction, in particular where there is duplication with Section 2. Throughout, where several citations are made together, we will break them into smaller groups as suggested to give the reader a better idea of what distinguishes them.

Section 2.1 reads more as a review of all previous studies that used CFMIP data, rather than a description of the CFMIP-3. I would recommend moving much of this to the previous section which reviews past CFMIPs and identify any changes/deletions from the past CFMIPs before then proceeding to describe the new additions to the CFMIP-3 set of experiments.

We appreciate that there is some duplication between the text in the introduction and in Section 2.1, in particular in the case of citations. We will address this by modifying the text in the introduction, as described above. We considered the referee’s suggestion to move the bulk of this to the introduction, and to then to describe these Tier I experiments in terms of changes/deletions compared to those in previous CFMIPs. However, as pointed out in the subsequent comment by the Editor, it is important that, as a MIP documentation paper, we document the experiments in such a way as to allow a third

party could set up each run from the information provided. We think that recapping on the CFMIP-2 experiment protocol in the introduction and then introducing aspects of the CFMIP-3 protocol as changes relative to this would make it harder for modelling groups to use this paper as the definitive specification for the CFMIP-3 experiments, and so prefer to leave the structure as it is presently.

It would also be useful to define what a "DECK" is.

We will modify the first paragraph of section 2 to read:

"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)."

There is rightfully considerable attention within CFMIP devoted to isolating and quantifying the fast adjustments. However the fast adjustments arise from both atmospheric radiative heating changes and land warming.

We agree. We checked the manuscript, and all references to tropospheric adjustments do also refer land warming.

It would be useful to isolate these contributions (beyond the use of aqua planets, whose utility in quantifying CGCM feedbacks is a little over sold here IMO). Has there been any efforts to develop experiments for this? If not, this issue might warrant some discussion in reference to the experiments designed to quantify adjustments.

We agree that experiments designed to separate the effects of land warming and atmospheric heating in realistic experiments would be useful. However we are not aware of any published studies which demonstrate a way to do this. To be recommended for CMIP by CFMIP, we generally require new experiments to have been piloted and ideally written up with at least one GCM previously. If such an experiment can be demonstrated to provide new insights which are relevant to the objectives of CFMIP then we will certainly consider it in the future.