

Reviewer 2 (A. Gettelman)

This manuscript describes simulations for the Cloud Feedback Model Intercomparison Project (CFMIP) with the motivation for the different simulations. The simulations are generally well described. Some of the text is a bit hard to follow, so this should be publishable with minor revisions. I like the description of why the experiments are requested. Also, the forcing data needs to have a DOI, and the data request should be attached in some way (supplement likely) to the manuscript.

We thank the reviewer for their positive and thoughtful comments on the manuscript.

Specific comments:

Page 3, L75: I think this imbalance has since turned around....

It depends on the timescale considered. There has indeed been a slight decline in EEI post-2023, but we don't want to overinterpret short-term EEI variations, and our focus is on the longer-term trend since 2000.

Page 4, L81: What about cloud processes themselves and how they contribute to cloud feedbacks and the spread of cloud feedbacks? There is lots of interesting recent work on this (disclaimer: some of it this reviewer has done): e.g. Gettelman et al 2024, Duffy et al 2023. Relevant for aerosols as well (L80).

Gettelman, A., T. Eidhammer, M. L. Duffy, D. T. McCoy, C. Song, and D. Watson-Parris. 2024. "The Interaction Between Climate Forcing and Feedbacks." *Journal of Geophysical Research: Atmospheres* 129 (18): e2024JD040857. <https://doi.org/10.1029/2024JD040857>.

Duffy, Margaret L., Brian Medeiros, Andrew Gettelman, and Trude Eidhammer. 2023. "Perturbing Parameters to Understand Cloud Contributions to Climate Change." *Journal of Climate*. *Journal of Climate* 37 (1): 213–27. <https://doi.org/10.1175/JCLI-D-23-0250.1>.

Thanks for pointing us to these papers. We certainly agree that cloud process studies are fully within the scope of Q1 of the CFMIP4 proposal, and we already cite several studies on this topic (first paragraph of section Q1). We will add some brief extra discussion of process studies, including the papers referenced here.

Page 4, L104: maybe a phrase or sentence on what the AMIP-piForcing experiment is?

We will add a brief description of the experiment, with a reference to Table 1 for a more detailed description.

Page 5, L120: Circulation shift research predates 2020....maybe need to cite some earlier work?

Agreed – we will add a couple of earlier references.

Page 5, L124: again, please describe what these experiments are in a few words: or supply a table.

We will expand the text here to briefly describe these experiments.

Page 7, Table 1: piSST-pxK simulation: do you need to specify where in the 4xCO₂ run you want the Δ SST measured from? And how is this different from a4SSTice?

Thanks for catching this – it should be years 111–140 of 4xCO₂ (now added to the table; this was already mentioned in the text). piSST-pxK uses a spatially and temporally uniform x-K SST increase, whereas a4SSTice uses actual time-varying SST and sea-ice from 4xCO₂.

Page 10, L235: Has anyone ever done AMIP-p4k-turb? Not a big fan of speculative MIP experiments. Especially if someone tried it and it had little impact, why ask everyone to do it? Seems a bit disingenuous to ask model groups to do it.

In any event, how this experiment could be done needs to be noted if no one has published it before? Or is there detailed documentation somewhere already?

Yes, these experiments have been performed in two studies with two different models – MIROC6 (Ogura et al. 2023, 10.1029/2023GL104786) and Webb et al. (in revision). Although it is already cited elsewhere, we will add a reference to Ogura et al. 2023 where we introduce the new experiments.

As for the second point: we hope that the description of the protocol in the present paper is sufficient for other modelling groups to reproduce the experiment. If the reviewer feels that details are missing, we would welcome his feedback.

Page 10, L236: please state the purpose of the piClim-deltaSST experiment. It's implied (pattern effect?) but could be better stated here. Again, has anyone done this before with a single GCM? If not, I question whether it is useful (especially considering the last attempt doesn't seem like it was useful).

We will specify that the aim of the experiment is “to represent the climate response to *model-specific* CO₂-forced SST change”. This experiment has been performed by Jonathan Gregory, with a paper in preparation, and also by Wang et al. (10.1175/JCLI-D-23-0528.1).

Page 11, L259: what is a ‘forcing index’?

We mean the “f” indices in the variant labels (e.g. r1i1p1f1, f2, etc.). This will be clarified.

Page 12, L288: when you say monthly and daily I assume you mean monthly and daily averages right?

Correct. The wording will be clarified to avoid ambiguity.

Page 12, L307: The data request as it stands at time of paper publication probably needs to be put in a static archive. Is this a web page or a document?

Suggest you make a supplement with the data request and attach it to this manuscript.

The CMIP7 data request (including CFMIP as well as other MIPs) is a live webpage, available from <https://wcrp-cmip.org/tag/data-request/>. Successive versions of the data request are also archived on Zenodo (<https://doi.org/10.5281/zenodo.17986580>). We will provide DOI links rather than attaching this to the manuscript.

Page 13, L325: probably needs a DOI. Also, the variables need to be attached in some way to this manuscript record (see comment above).

[See our reply to the previous comment.](#)