

Interactive comment on “Designing and Documenting Experiments in CMIP6” by Charlotte Pascoe et al.

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General Comments

My biggest general comment is that the title is very misleading. I could see where some scientists involved in designing the CMIP6 experiments/simulations would be surprised that they did not do what is claimed in the title. The title needs changed. My recommendation is “A system for documenting models and experiments in CMIP6”. While I agree the authors had a big positive impact on the simulation implementation and in some cases design in CMIP6. This by identifying problems with design, variable list and etc., they should not take credit for the whole thing...especially the science aspects as the current title suggests. The authors acknowledge this fact in the paper –

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see page 3, lines 30 – 31 as one example.

My last detailed point on effective and equilibrium climate sensitivity is also very important. See below.

Finally, I have lots of wording suggestions for the authors to consider. Most are trying to improve the clarity of the discussion.

I recommend that the paper be published with major revisions. I would like to see the paper again before it is accepted. I think all of my changes are relatively easy to address. Normally a review of this kind would be minor revisions. However, I feel that the current title or the current ECS discussion is important enough to change my recommendation to major revisions.

Detailed Comments

1. Page 1, Title – Important! - See above.
2. Page 1, Lines 2-3 – editorial - may communicate primarily – Change to “typically communicate”. Reads better and is closer to what happens.
3. Page 1, Lines 9-10 – expected methodology – I am not sure what this means. I think it means – paths to those goals.
4. Page 1, Line 10 – editorial – was intended – is intended.
5. Page 1, Line 19 – editorial clarity – Add “for MIPs” after “protocols”.
6. Page 2, Figure 1 caption – The last 2 sentences in the figure need to be moved into the text. They are too important to leave in the caption.
7. Page 3 top – Needs a reference to figure 1a somewhere.
8. Page 3, line 5 – Add reference to Eyring et al. after “DECK”.
9. Page 3, line 14 – conform as best they can – Change to “attempt to conform”. Reads better.

10. Page 3, lines 30 – 31 – I note in passing that these lines make my point about the title being misleading.
11. Page 4, line 5 – heritage – Reference needed or define. It is not clear what is meant by the word – heritage.
12. Page 4, line 11 – editorial - shifted slightly in terms – Change to “shifted slightly from the past in terms”. Clearer.
13. Page 5, line 1 – Thus the DCPD ... - It is not clear to me why this follows. Delete or make clear.
14. Page 5, figure 3 caption – Change “intercomparison projects” to “MIPs”. Why introduce new nomenclature?
15. Page 7, line 2 – explicitly calling out the failure – More is needed here. Exactly what kind of information is missing? Give few examples.
16. Page 7, line 2 – Add “published” before “papers”.
17. Page 7, line 4 – 6 – This paragraph hangs. Add more or delete. If kept, explain how the present structure improves on the past in some detail and/or examples.
18. Page 7, line 9 – Add “a controlled vocabulary (CV)” before “introduced in Mattoso”.
19. Page 7, line 23 – I think adding “climate” before “experiments” makes things clear for the reader.
20. Page 8, line 19 – Add “climate modeling” between “major” and “centers”.
21. Page 8, line 21 – driven – This is too strong. It implies the IPCC drives the process which is incorrect. The WCRP/WGCM/CMIP Panel drives the process with the IPCC timelines in view. Change “driven” to “associated with”.
22. Page 8, lines 23 – 25 – Investigating differences in the models’ response is missing from this list. It is the reason a 1% CO₂ simulation was included and the main reason

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for starting CMIP. The current list is very misleading.

23. Page 9, Table 3, Rationale for the DECK – Investigating the causes for differences in the models' response is missing again (see point 22 above). Again, this investigation was the main reason for starting CMIP. It continues to be important today. It is important that the rationale for these experiments be clear and accurate.

24. Page 9, line 6 – editorial – Change “project leaders” to “Panel”. Clearer.

25. Page 10, lines 8 – 10 – The last sentence in this section hangs. More is needed. It needs to be clear that there are many MIPs ongoing outside of CMIP (more than 50, the last count I saw).

26. Page 10, line 12 – Add “experimental” before “design process”. Clearer.

27. Page 14, lines 3 – 12 – forcing and temporal constraints need to be better defined. I think I understand what they are but am not sure. Some more examples would be helpful. Forcing constraints could be thought of as radiative forcing constraints, for example.

28. Page 14, line 7 – Assuming I understand things...add “i.e., length of simulation” after “temporal constraints”.

29. Page 14, lines 10 – 12 – I do not understand the point here. Is the point that different MIPs and simulations use differing start and end dates. Or length of simulation? If so, what is the scientific problem? Is there one? Also, it seems that these details should be documented in ES-DOCs. I assume they are and if so, this then is an issue between the authors and the MIP leaders...which makes no sense to me. I am lost.

30. Page 15, line 27 – What is a “triples”?

31. Page 23, 24, figures 5 and 6 – Both on my screen and in printed versions, the lines are very hard to see. The lines being hard to see means that the points made in the text are lost.

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32. Page 26, rationale for the switch-on 4X simulation – The experiment does not define the equilibrium climate sensitivity (EqCS). It defines the effective climate sensitivity (EfCS). One can use the effective climate sensitivity to estimate the equilibrium climate sensitivity. See AR5 WG1 report for a discussion of this point. This is an important. Some in our community is using the two term interchangeably. This is causing problems. They are not the same thing. EfCO2 is a transient value (changes in time). EqCS is an equilibrium value, constant in time.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-98>, 2019.

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