

*Many thanks for your comments. Please see our replies in blue below.*

Topical Editor Decision: Publish subject to minor revisions (review by editor) (04 Sep 2018) by Julia Hargreaves

Comments to the Author:

Thanks for the revised manuscript. Referencing the line numbers for edits to the paper would have enabled a quicker response.

Nearly there I hope. A few comments.

1.

Reviewer:"9. Figure 1: How do we define polar amplification? as a mean of ratios or a ratio of means? 15 Hind et al., Scientific Reports (2016)."

Response:"How to quantify polar amplification in a multi-model ensemble is no doubt important for some applications but we do not think it is necessary to include it here. We prefer to keep our message simple and use this figure to show that polar amplification is robustly simulated in response to increases in CO<sub>2</sub>."

I think this is incorrect. There is no way of analysing an ensemble without adopting some method to do so. As someone who analyses ensembles, I'd very much like to know the most meaningful metric for the polar amplification community. I think what you have done for the Figure is actually something different from either of the two suggestions of the reviewer. The figure shows a mean of normalised fields, so if you took the polar to equator ratio it would be a ratio of normalised means...?

*We agree that Hind et al make some good points, and have replotted Figure 1 as a ratio of means. However, there is also diversity in the literature about whether polar amplification is defined by polar warming versus the global average, or versus the tropical average etc; as a 'ratio of trends' or a 'trend of a ratios'; which variable to use (surface temperature or something else); whether it is appropriate to calculate 'regional amplification' based on a limited longitude range, etc. We do attempt to resolve these issues in this paper, which is intended to document the protocol for multi-model experiments. The key point is that the model simulations are undertaken consistently so the community can effectively apply any metric and iterate towards a definition of best practice after further analysis.*

2.

The general idea is that a modeller, armed with a state of the art climate model and a nice big computer, should be able to set up and run the experiments using only the paper and permanently archived open access resources referenced in the paper. I think you are quite close but...

A. The Data request section is a bit difficult to understand. A modeller needs to know what the minimum set of requirements is. I think this might be the DCPD set plus Table 3, but I am not sure. Please clarify.

*Yes, you are correct, and we have clarified the data request.*

B. This is probably my stupidity, but I like to think that the aforementioned modeller should be allowed to be almost as thick as me. I could not find the boundary conditions for the experiments on input4mips. Either some more details need to be included in the appendix to help the modeller find what they need, or you need to upload the data to the database.

*The boundary condition fields are currently being tested and will be uploaded to the database as soon as possible. We have changed the first line in Appendix A to say that the data "will be" available from input4MIPs.*