

Interactive comment on “The Polar Amplification Model Intercomparison Project (PAMIP) contribution to CMIP6: investigating the causes and consequences of polar amplification” by Doug M. Smith et al.

Anonymous Referee #1

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This manuscript outlines the rationale and protocol for the Polar Amplification MIP, one of the many CMIP6 contributed MIPs. Overall, the paper is clearly written and provides sound rationale for the proposed experiments. I only have a few technical comments.

1. Page 3, Line 30: Huang, Xia and Tan (JGR, 2017) argue that the pattern of CO₂ radiative forcing also contributes to polar amplification.
2. Page 5, Line 19: England, Polvani and Sun (JCLIM 2018) have also shown an equatorward shift of the SH jet in response to Antarctic sea ice loss.

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3. Page 8, Line 31: The proposed AMIP-style experiments (in experiment set 1) aim to investigate the relative contributions of local SIC changes and remote SST changes to polar amplification, but there is no experiment that quantifies the total polar amplification. Is it safe to assume that the SIC and SST perturbation experiments are linearly additive?
4. Page 9, Line 11: Should be Blackport and Kushner
5. Page 12, Line 21: Based on Table 1, seems like most of these are tier 1.
6. Page 13, Line 12: Observations are not a "control" experiment - how do we know that the climatological refractive index that one would compute from observations is not already perturbed by climate change?
7. Table 1: Experiment set 2 - what does 'pa' stand for?
8. Table 2: I do not understand why 1.9-1.1 is in the future column. Also, there is no reference to experiment 1.10 anywhere in this table.
9. Figure 1: How do we define polar amplification? as a mean of ratios or a ratio of means? Hind et al., Scientific Reports (2016).
10. Figure 2: 31 models are used in Figure 1 but only 25 in Figure 2. Why?
11. Page 36, Lines 29-31: Maybe I am mixing things up, but, shouldn't this read this way: "For future, the **lower (upper)** quartile regression is used for SIC/SIT (SST), in order to give more weight to models with less sea ice and warmer SST. Conversely, for the pre-industrial period, the **upper (lower)** quartile is used ..."

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-82>, 2018.

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