

Interactive comment on “Comparison of past and future simulations of ENSO in CMIP5/PMIP3 and CMIP6/PMIP4 models” by Josephine R. Brown et al.

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General response: We appreciate the positive comments of the reviewer and the kind words written about our text and the manner in which we've approached the manuscript. We would be happy to revise the text to address the issues identified by the reviewer.

Comment: Though the paper is well written, I think there are parts that need further clarification. Specifically, the authors should be clearer about the updated models compared to the previous models. At points, they suggest they will be comparing new simulations with previous generations models (I assume CMIP6/PMIP4 versus

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CMIP5/PMIP3?) but their results suggest that the models are more lumped together. The paper would be improved if the authors clarified when and how the newest generation models add to our understanding of changes in ENSO with respect to the simulations from previous generations models. Response: We agree that we have not discussed or quantified the differences between CMIP6 and CMIP5 model results as extensively as we should have. We will address this by including Supplementary Figures showing the two ensembles separately, as well as revising the text to highlight where the model ensembles agree on a consistent result and where the new CMIP6 models may provide new insight.

Scientific Questions/Issues Comment: Lines 55-58 – There is an even newer reference from White et al., 2020 that can be added to this set of references (<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019GL085504>). Response: This reference will be added.

Comment: Lines 74-84 – This paragraph could benefit from updated references. For example, Cobb et al. 2013 is now superseded by Grothe et al. (in press at Geophysical Research Letters <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2019GL083906>), which does show a strong reduction of ENSO variability during the mid-Holocene. Also, there's a paper by White et al. 2019 (<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017GL075433>) that shows a long-term trend in ENSO strength through the Holocene, contradicting some of the mid-Holocene ENSO reduction studies. Response: These references will be added and the discussion updated.

Comment: Section 2.1 Models – I think it would be useful to add just a few more sentences here about the models as not all readers of this journal will have that background. This can be brief and may only include one or two sentences, and then refer the reader to the website for more information. For example, what are the main differences/ improvements in CMIP6, since this paper is really about using the new gener-

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ation of coupled atmosphere-ocean climate models for both past and future climates. Or maybe just more broadly, what is it about CMIP6/PMIP4 that allows for an updated view of looking at changes in ENSO? I see that the authors add little bits of this specifically sprinkled throughout section 2.2, so I think just a more broad/general description to set up the context of this study would be beneficial. Response: The discussion of models in Section 2.1 will be expanded to describe the models in more detail, and we will identify any relevant changes in CMIP6/PMIP4 generation models that may provide new information about changes in ENSO.

Comment: In Sections 4-6, when talking about the model ensemble and trends, it is useful to mention the model agreement. The authors do this at times, for example, on lines 338- 343, but I think it would strengthen the observations if this were done more consistently throughout these sections. Response: Model agreement will be included consistently in the discussion of results in Sections 4-6.

Comment: Figures – note what the stippled pattern indicates in the legend (as done in Figure 11 and 12). Response: This figure legend will be updated to add this information.

Technical Issues Comment: Line 223 should read “all available data are: : :” Response: This will be corrected. Comment: Line 407 and 410 should be Niño. Response: This will be corrected. Comment: Line 414 – remove parentheses around Collins et al. Response: This will be corrected. Comment: Line 484 – Merryfield 2006 reference is not in the parentheses with the other references. Response: This will be corrected. Comment: Line 491 – Should read “This includes: : :” Response: This will be corrected.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-155>, 2020.

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