To: Peter Haynes, Editor, ACP

Subject: Revision of Manuscript Reference Number egusphere-2022-974

Prof. Peter Haynes,

My impression is that you have responded adequately to the latest comments of the referees and certainly the quality of the figures is much improved over the previous version of your paper. The paper therefore seems to me to be almost ready for publication in ACP.

Reply: We sincerely appreciate your approval of our revision. We furth thank your effort and time in handling our manuscript.

I have chosen the option of 'publish subject to minor revisions (review by editor)' rather than 'publish as is' because of a concern over the way the results on low-frequency variation are presented/described. This is in part prompted by a referee comment questioning your results on the AMO (Figure 8a). Figures 8(a) and 8(d) show what seem to be very large differences in the range of periods greater than about 30 years. But you say yourself 'these findings are limited by the data available, especially for multi-decadal signals, with less than 100-year long simulations available for SAI'. So the question is whether the reader should interpret the >30 year period results in Figures 8(a) and 8(d) as having ANY sort of significance (in a general sense rather than a statistical sense). What exactly does variability with such periods mean in simulations which are less than 100 years in length? The fact that you comment on changes in this long-period variability in your final section suggests that you do expect the reader to treat these results seriously. Please can you be clearer on this point -- for example a reminder of the limitations of the simulations should be added to your comments in the final section. You might even decide that the results for periods greater than say 30 years or 40 years are so unreliable that it would be better to remove the relevant parts of the graphs.

Reply: Yes, this is a fair point. In fact, the limits for how close to the data boundary can be investigated meaningfully with wavelets is open, with a range of possibilities depending on how much one may consider a signal being useful, for example the discussion

https://www.mathworks.com/help/wavelet/ug/boundary-effects-and-the-cone-of-influence.html.

One commonly used fraction is √2*s where s is the scale (Torrence and Compo, 1998). So, for an 80 year record the scale unaffected by the boundaries can be up to about 30 years. But other authors (Norbach et al., 2007) have proposed less conservative limits than Torrence and Compo.

Therefore, we have removed the >35-year periods in Figs. 8 and S6 because of these concerns, particularly for SAI scenario with ≤80-year length simulations. We accordingly removed the multi-decadal/interdecadal related explanations in the main text of the paper (please see new Figs. 8 and S6 as well as the highlighted parts in the manuscript such as lines 35-36, 46-47, 219-220, 370-371, 375-389, 434, 455-455, 503-504, 535-536, etc.).

Ref:

Torrence, C., and G. Compo. "A Practical Guide to Wavelet Analysis." Bulletin of the American Meteorological Society. Vol. 79, Number 1, 1998, pp. 61–78.

Nobach, H., Tropea, C., Cordier, L., Bonnet, J. P., Delville, J., Lewalle, J., Farge, M., Schneider, K., and R. J. Adrian. "Review of Some Fundamentals of Data Processing." Springer Handbook of Experimental Fluid Mechanics (C. Tropea, A. L. Yarin, and J. F. Foss, eds.). Berlin, Heidelberg: Springer, 2007, pp. 1337–1398.

An accompanying straightforward point is that I found it very difficult to work out how long the different simulations actually were. Please can you give this information explicitly in Section 2.

Reply: Implemented (please see lines 147-148 for CECM1 outputs and 157, 158 and 162-164 for CECM2 simulations in Section 2).

Please consider the above comments and provide a new version of the paper revised as you see fit. I will then accept it for publication.

Reply: We have provided a new version addressing your concerns.