

Review of the revised manuscript „Network connectivity between the winter Arctic Oscillation and summer sea ice in CMIP6 models and observations“ by Gregory et al.

I thank the authors for their thorough revision of the manuscript. They addressed all my comments in a satisfactory manner. I especially appreciate their effort in adding a discussion on the role of internal variability to the results. Overall, this is a very interesting and well-prepared study and I recommend the revised manuscript for publication after consideration of a few additional minor/technical comments (line numbers refer to the version with tracked changes).

- L250 and in the captions of Figure 4, 6, 10, 15: The ensemble members in an initial-condition large ensemble have the same physics and forcing but slightly different/perturbed initial conditions (see e.g. Deser et al., 2020: <https://www.nature.com/articles/s41558-020-0731-2>). I suggest changing “which contain the same initial conditions, physics, and forcing” to “which contain the same physics and forcing but slightly perturbed initial conditions” or similar.
- Thanks for adding the discussion on internal variability based on the CanESM ensemble. What I would find even more interesting to discuss than the comparison of the two sub-ensembles with different model physics (p1/p2) is a comparison of the CanESM ensemble (intra-model spread) to the entire CMIP6 multi-model ensemble (inter-model spread), which can give an indication of how much of the spread is due to internal variability and how much is due to different model physics. Particularly for the AO – sea ice teleconnection (Fig. 13), the spread in D seems to be as large in the CanESM model as within the CMIP6 models. But I also understand that this aspect cannot be discussed in all details here and also accept the current version.
- I find Figs. 6, 10, 15 very interesting but could also see them going into the supplementary material to keep the main paper concise (up to the authors).
- Thanks for adding the units to the covariance. It took me a moment to verify because I didn't remember that SLP is on a lat-lon grid while SIC is on a polar grid. Maybe you can add that information to the text in L146, e.g.: “[...] for a regular latitude-longitude grid (sea-level pressure data), where θ is the latitude of grid cell p , or simply $w_p=d_p$ for a polar stereographic area grid (sea-ice concentration data), where d_p is the area in km^2 of grid cell p [...]”.

Also, it is not quite clear to me why you don't square-root the area weights for the SIC anomaly time series in the computation of the AO – sea ice covariance (L340-343). It seems a bit inconsistent to me, but maybe I'm missing something here. I also think that keeping [Pa km^2] (or [Pa km]) as the unit might be more intuitive than Newton.