

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-121

Anonymous Referee #1

Referee comment on "Anthropogenic and internal drivers of wind changes over the Amundsen Sea, West Antarctica, during the 20th and 21st centuries" by Paul R. Holland et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-121-RC1>, 2022

Overview – this study investigates historical (1920-2000) and future (2000-2080) changes in near surface pressure and winds over the South Pacific using a combination of a spatially complete paleoclimate reconstruction and a large suite of climate model simulations. It provides convincing evidence of the relative roles of internal variability and forced variability (from greenhouse gases and ozone depletion). Importantly, the paper also provides a much-needed possible narrative for the roles of natural variability followed by external forcing to understand historical variations in ice loss from the WAIS since 1940s.

The paper is very well written, easy to follow, and the scientific analysis in my perspective is sound. The team is to be commended on this excellent study, which is well conceived and an important scientific advancement. The authors note many caveats to the present study, which I also appreciate.

My main concern is that the paper is primarily based on gridded model or paleoclimate-based reconstruction data, and does not incorporate the wealth of observations other than ERA5 after 1979. It would be helpful to see the agreement between the reconstruction at least and pressure observations (available across all SH midlatitudes since 1920, and Orcadas since 1903) to see at least the agreement in South America / South Atlantic. For more complete investigation on the agreement (and for some aspects of the deepening of the ASL), comparisons could be made with Antarctic data after 1957 when trends seem quite large (making note to include the critical point of Byrd station in West Antarctica as another potential estimate of observed change near the Amundsen Sea apart from

measurements along the Antarctic Peninsula). I do feel the point observations comparisons with the reconstructions would help to understand changes in observations apart from paleoclimate data and climate model data, and would round out the paper well (1 more figure), and provide further validation for the reconstruction that is not provided in the preceding O'Connor et al. paper.

Minor comments:

Abstract – would be ideal to clarify the ice loss was not in reference to sea ice, but the grounded ice sheet

L255-260, Fig. 1f – I also suspect the response to ozone is weaker as it is seasonally varying (strongest in DJF at the surface), so the annual mean reduces this signal.

Wondering what role incorrect sea ice trends in the model may play in both the historical and future simulations? The climate model tends to overestimate observed sea ice trends compared to observations. Importantly, the sea ice trends have been most pronounced in the Pacific sector in observations, which is the area of study, so it is possible that there could be some impact of this on the pressure and wind trends in the region from the model, especially in the model ensemble means. Can the authors comment on this potential error, where appropriate, in the paper?

L595-603 – really appreciate mentioning the caveats to the study. I think it is also important to mention that the study masks seasonal variability, limited by the paleoclimate reconstruction, that is important for tropical teleconnections (i.e., internal variability) and the role of ozone forcing.