

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-121

Anonymous Referee #2

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-RC2>, 2022

This study investigates potential drivers of trends in near-surface pressure and winds over the Amundsen Sea, with a view to understanding the decline of the West Antarctic Ice Sheet over the past century. It uses a paleoclimate reconstruction of global fields alongside a series of large ensemble simulations with different forcings. The study concludes that internal climate variability has played a dominant role, particularly in the ice shelf and break region, with forced variability (greenhouse gases and ozone depletion) significantly contributing in the later 20th century and future.

This paper addresses an important issue in understanding and attributing the drivers of West Antarctic climate change. I enjoyed reading the study and found the text and figures to be clear and logically-structured. I think that this study is very suitable for publication in The Cryosphere and have just a few minor comments, which I hope the authors will find useful.

Minor comments:

1. In my view, the main caveat with this study is the reliability of the paleoclimate

reconstruction used. In the short period of overlap between the satellite era (using ERA5) and the reconstruction, correlations of zonal winds are relatively modest at 0.35-0.6 (Fig 4). The paper does a good job of acknowledging and discussing this caveat, however I think that it would benefit from a little more detail on the reliability of the reconstruction. I would suggest that the authors include a comparison with the full ERA5 record (1950-present) in Fig 4. Although the reanalysis will also be substantially less reliable before the satellite era, there are in situ observations that will lend some skill during this time period, such that I believe the comparison is worthwhile.

2. L411, Fig 6: The text discusses the correlations as statistically significant, indicating a strong relationship between the IPO and internal variability in zonal wind in the three regions. However, although the (annual) correlations are significant, I think it should also be mentioned that they are relatively small, meaning that the IPO can only explain at most ~25% of the variance in internal variability.

3. L580: It is discussed here that future wind trends on the shelf are determined only by internal variability (not emissions scenario). It is also stated (e.g. L638) that mitigation of wind-driven ice loss will require strong emissions mitigation. This may perhaps be confusing, and so I would suggest some discussion here of whether winds over the deep ocean, shelf break, or shelf are expected to play the larger role in driving ice loss. If the shelf winds are thought to dominate, then these results might suggest emissions mitigation will have little impact on wind-driven ice loss.