Reviewer 1

Review comments for "Slowdown of Shirase Glacier caused by strengthening alongshore winds" by Miles et al. (tc-2022-126)

General comments: This study estimated a time series of ice flow speed of Shirase Glacier for 47 years (from the early 1970s to the present) and showed that Shirase Glacier had experienced a long-term slowdown.ã□□While many Antarctic ice sheets/glaciers are losing their mass, the behavior of the glacier is very unique among Antarctic ice sheets/glaciers. The authors have collected several different datasets (position and thickness of ice sheets/glaciers, wind speeds, ice-shelf basal melt rate, and so on) and integrated them into their conclusion. The main conclusion of this study is that alongshore easterly wind plays an important role in regulating the glacier dynamics (speed and thickness) through the wind-driven CDW transport onto the continental shelf regions. Although I have put several comments below, the paper is nicely written and prepared, and thus I recommend publishing in The Cryosphere.

We thank the reviewers for their positive comments on our manuscript and the constructive suggestions listed below.

1. Abstract and Introduction.

Sentences about the mean field and the temporal variability are mixed up. It is very confusing. The present form gave me (readers) an impression that it is very natural for warm ice shelves to experience increases in ice-shelf basal melting over decades (and future). As this paper's subject, I think it is not obvious.

This is a good point. We have amended parts of the abstract and introduction accordingly. Specifically highlighting having mCDW on the continental shelf does not cause mass loss or gain, it is how the inflow changes through time.

2. Figure 1

Please add information of longitude and latitude.

We have added longitude and latitude to figure plots

3. L97: ">10 km" Is the inequality sign orientation correct?

The sign is correct

4. L147 In my reading of the reference, they used ERA-Interim (not ERA5) to force the ocean model.

Amended

5. L162: I don't understand the equation. Alongshore wind can be calculated from the inner product between the defined unit vector and wind vector.

The equation calculates wind speed relative to the alongshore direction (80°) to give alongshore wind

6. L170: The expression "extent" should be "length" if the unit of some figures uses "km"/"m/a".

Amended

7 Figure2e: Which side is grounded/floated?

We have added a label confirming which side is grounded and floating

L189-203: How did you calculate the percentages (8% and 4%)? What is the reference speed?

The reference speed is the speed from the first year given in the date range. For example:

"Between 1988 and 1996 we observe a 2 ±7% slowdown" - refers to ice speed being 2 ±7% slower in 1996 relative to 1988.

9. Figure3

Vertical axes for "Ice speeds" and "Alongshore Wind Speed" should be exchanged to place the explanatory variables on the right side. Please add short tic marks showing 1-year interval on the horizontal axis. Since data for the 1960s and 1970s are available in ERA5, please extend the black line for wind speed.

We have exchanged the axis and added the tic marks. We have not extended the ERA5 record back to the 1960s and 1970s. This is because large uncertainties have been documented in the ERA5 product in Antarctica before the 1980s. Please see Bell et al. 2021

Bell, B., Hersbach, H., Simmons, A., Berrisford, P., Dahlgren, P., Horányi, A., et al. (2021) The ERA5 global reanalysis: Preliminary extension to 1950. Q J R Meteorol Soc, 147(741, 4186– 4227. Available from: https://doi.org/10.1002/qj.4174

10. Section4.2

It would be helpful for readers to insert a figure showing the linear trend of wind (e.g., 1979-2020 or the full length of your analysis 1960-2020), like Fig 2a in Hazel & Stewart (2019).

We have added a figure showing the linear trend in zonal wind over the wider region between 1979 and 2021. This shows a spatially widespread trend for increasing easterly winds over the continental shelf boundary in Enderby Land and more limited change in zonal wind in Dronning Maud Land.

11. 331-335: The sentence is just speculation and is unsuitable in conclusion, although it is ok in Discussion (4.2).

We have removed this sentence from the conclusion.

12. I feel that some figures/panes showing precipitation are missing. Please consider adding the panel in Fig. 3.

We have added this to figure 3. This shows that while precipitation has very strong interannual variability, there is no obvious trend nor any obvious link with the slowdown of Shirase Glacier.