The Cryosphere Discussions

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Comment on tc-2022-126

Anonymous Referee #2

Referee comment on "Slowdown of Shirase Glacier, East Antarctica, caused by strengthening alongshore winds" by Bertie W. J. Miles et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-126-RC2, 2022

This paper presents a relatively long time series of flow speeds and frontal positions of the Shirase glacier. It correlates those with along shore wind speeds from ERA5 and argues that it is these strengthening winds that, via decreased melt rates, drive the observed slowing of the glacier.

Major points are below and in text comments in the attached pdf:

It looks to me like there is no correspondence between the local measurement of wind speeds and the modeled ones from ERA5. (And that is probably why the local one is in the supplement and not in the main text)
Unless there is a good reason to think that the data from the station are representative of the wider area, should these data be included here? And if yes, the disagreement between the datasets needs to be addressed.
This is somewhat important to clean up, as the correlation between the flow speed and wind strength is the main scientific result of this paper.

The authors claim that during some intervals the buttressing from fast ice and ice tongue mixture doesn't matter (line 249) and that in other time intervals it matters (270).
I couldn't find in the paper where the authors quantify how thick the Shirase ice tongue needs to be to provide sufficient buttressing (the provided reference of Reese et al is not relevant to this claim as that paper doesn't address the buttressing evolution through time, only instantaneous change). In both cases the ice tongue is largely unconfined so supposedly its thickness changes would not have a significant dynamical impact?
Also, Kusahara et al highlight the role of fast ice for modulating the strength of warm water intrusions. How does that effect fit in with the story presented here? Do you see a correlation between fast ice cover and flow speeds, as flow speeds are inversely correlated to melt rates?

There is a really nice correlation between observed ice speed and modelled melt rates from about 2012 on. However, prior to that ~2008-2012 the sign of the correlation is opposite, high flow speeds associated with low modeled melt rates. Can you explain the full time series? At the moment the story is only consistent with the post 2012 period.

I have checked a few of the many references and found some of them to be incorrect or inaccurate, some examples are in the pdf. Mainly, the authors should cite observational references for observational claims, and clarify when a cited paper shows a result, hypothesizes about it, or cites that claim from elsewhere (in which case that other cited paper should really be referenced).

Would it be possible to also plot precipitation time series on Figure 3 and analyze the relative importance of the precipitation vs melt rate changes? This would be useful, as it seems from the way the paper is set up (at least at the beginning), that the authors discovered winds to be the main driver of flow speed changes while before it was thought to be precipitation. It is probably not exactly like that but that is the feeling the paper passes on at first.

The authors claim that their results of wind driven-basal melt induced-speed control mechanism extend to the whole of Queen Maud Land. While that is very reasonable hypothesis it is something that was not shown in the manuscript, so this should probably remain as a hypothesis in the abstract and other places.

Is there some evidence that ERA5 provides reliable wind info over the studied time period at Shirase or at least over QML?

Please also note the supplement to this comment:
https://tc.copernicus.org/preprints/tc-2022-126/tc-2022-126-RC2-supplement.pdf