

The Cryosphere Discuss., referee comment RC1 https://doi.org/10.5194/tc-2022-55-RC1, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

Comment on tc-2022-55

Anonymous Referee #1

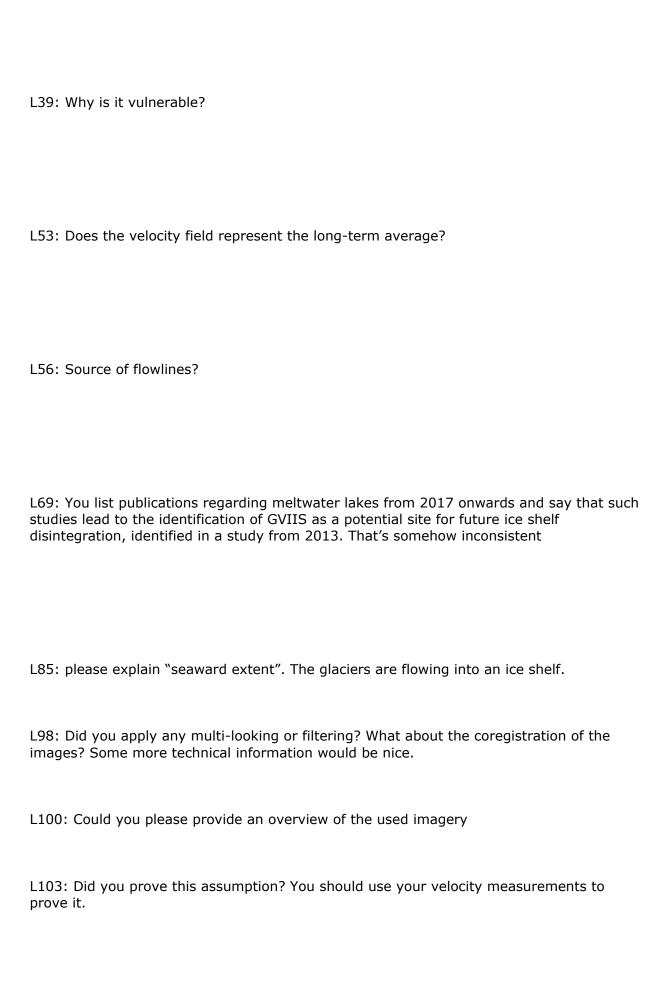
Referee comment on "Seasonal land-ice-flow variability in the Antarctic Peninsula" by Karla Boxall et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-55-RC1, 2022

The authors present a comprehensive analysis of the glacier flow variability of the GVIIS tributaries. The analysis relies on Sentinel-1 data and is backed up with independent Landsat measurements. Overall the paper is well structured and most sections of the analysis are well performed. However, there are some issues that must be addressed:

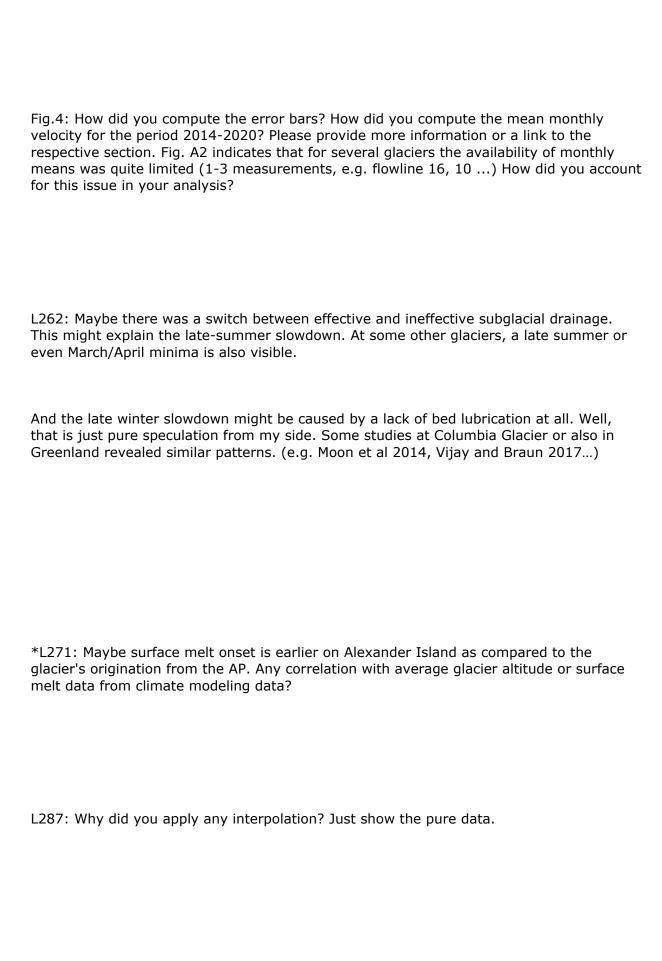
Most important, the authors state that surface meltwater cannot be the trigger of the observed seasonal variations. However, I am not convinced by the presented justification. Recent publications indicate the warming and also increased surface melt on the AP (e.g. Carrasco et al. 2021, Banwell et al. 2021). So, the authors should also consider surface meltwater in the discussion of their findings or provide evidence that surface meltwater can be neglected as a potential driver. (see also comments below, abstract, discussion, and conclusions need to be adjusted accordingly)

Moreover, the description of the methodology has some shortcomings. Please provide here more precise information and be always clear on which region (spatial extent), i.e. whole glacier or just the 10km² areas, is your analysis and interpretation based. Please justify the interpolation in Fig.6 and explain the applied approach. The error analysis should be also extended. See detailed comments below for some specific issues.

Here are also some questions that came to my mind regarding your analysis. Could you please address them?
Why is the ice flow higher in March-November for wide regions further inland of the grounding line (GL) and why is it lower during summer?
Why is the speedup only visible close to the GL. Why is there now speed up further up?
Is there any correlation of speedup with altitude (either the area affected by the speed up or the general hypsometric profile or hypsometric index of the glaciers)? Difference Alexander Island vs. AP?
Tides are also affected by the season. Could the seasonal changes of the tides affect the glacier, in particular the GL? E.g. stronger tides lead to a wider grounding zone.
Detailed comments:
l10: What about the short-term summer speed ups reported by Seehaus et al. 2015 and Seehaus et al. 2016 at Dinsmoor-Bombardier-Edgewoth Glaciers at Sjögren Inlet.



L119: Please describe here briefly how the uncertainty was estimated and what is a "valid pixel". This would be beneficial for the reader
L122: This information should be provided in section 3.1. and here you can refer to 3.1.
L127: Here you can refer to Friedl et al. 2021 as well. Their study is based on the same satellite data.
L130: what is sigma? The average of all pixels?
L136ff: Unclear explanation. You are using intensity tracking, thus you measure also displacements in azimuth direction and not only in range (LOS) direction. For sure, the shifts in the phase center depth can affect your measurements. But please rephrase this section to be more clear. Did you account for this shift in LOS direction? How much would it be? Any suggestion on how to estimate the bias? A brief statement would be nice at the end of this section.
L152: On which spatial scales did you apply the analysis. Throughout the whole glacier area? Only for the 10km^2 areas next to the GL? Please clarify
L153: Is this analysis based on the monthly mosaics or single velocity fields?
L165: Do you remove pixels that had no coverage for a specific month or even for single SAR image pairs? Please clarify.
L167: What about very slow-flowing regions? Will they be discarded? (or did you analyze fast-flowing regions only?, see comment above)
L193: feature tracking
Fig.3: Why is the pattern so noisy? Any explanation? Could you also include the glacier numbers in the upper maps?



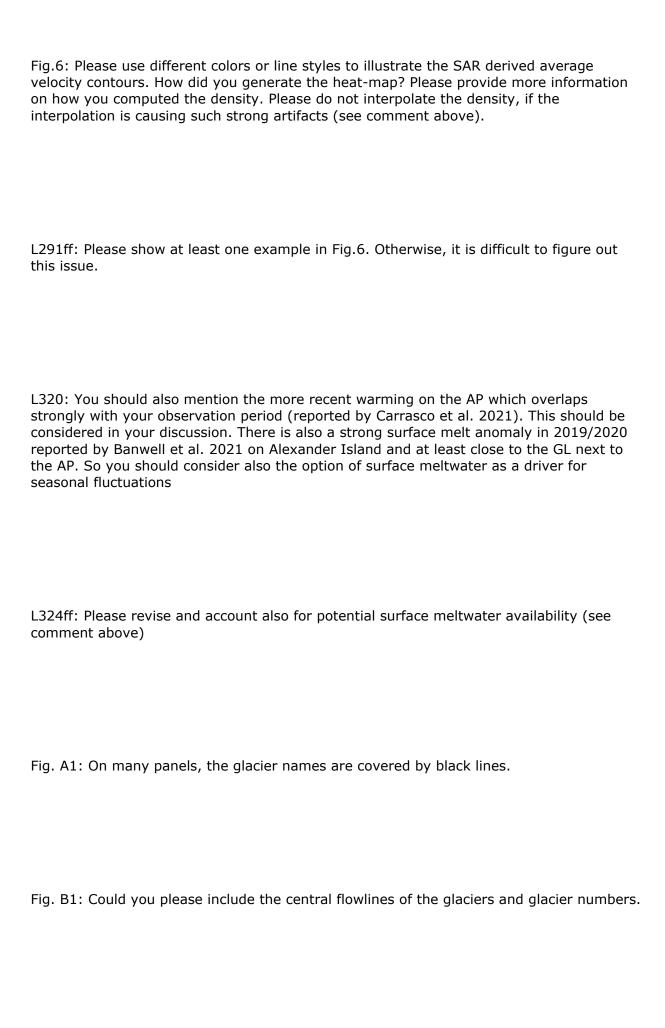


Fig.C...: what about 2019-2020?

Table D1: Could you also include the most dominant frequency