Review of Petlicki et al. The Cryosphere

Petlicki et al. report possible mechanisms of ice front retreat with of San Quintin Glacier in the northern Patagonian icefield with their new helicopter-borne ice radar survey. The study reports a unique ice radar dataset, although I think the results of the study are not convincing enough to lead the discussion and conclusion. Their ice radar survey is quite limited in space to prove their opinion. Unfortunately, I generally wonder if the quality of the paper is enough to be considered for publishing in the journal. I hope my comments are useful to improve the manuscript.

General comments

1. Is it possible to say there is a floating ice tongue and grounding line with your dataset? At least, I've not convinced by their results. Part of the ice front may be afloat indicated by tabular icebergs observed in the lake. However, what we expect by saying floating ice tongue is the entire region of the ice front floats. It looks like the authors' opinions are largely based on their longitudinal radar profile along the centerline of the glacier. Because the centerline of the glacier is expected to have deep bed topography, it is not possible to extend their interpretation to the entire terminus region. Furthermore, if the ice front showed "fingers" of tabular shape, it is rather suggested that the lateral part of the ice front is grounded and caused shear strain to the tear ice front. I do not agree that the entire ice front is floating as you interpreted in Figure 8.

2. I'm not sure how the authors defined the ice-bed interface. It benefits showing the original radargram without the red interpolated line since it looks blurry, especially for the longitudinal profile AA'. Also, what is the difference in ice thickness or bedrock elevation at the crossing point between AA' and BB' and between AA' and CC'?

3. I'm a bit confused with the structure of the paper. I think the most important result of the study is the ice radar survey. I would suggest that the authors first explain their radar survey before the satellite dataset in the method and result sections.

4. I think the authors need to improve their description of satellite image analysis and its results. For example, what is the uncertainty of the annual ice speed obtained from optical satellite imagery? These are the regions where we have many cloudy days, it is fair to mention the number of images used to calculate the annual ice speed with an estimated uncertainty range. Why don't you show a time series of ice front position (or ice extent area) change somewhere in your figure? Figure 3a is not a bit busy and not easy to see to distinguish how the glacier front changes over time.

Specific comments

Abstract: Can be more qualitative? For example, what is the maximum ice thickness you observed, how close to flotation, or what is the rate of ice front change?

Abstract L7-8: Can it be more precise about how your study contributes to the study topic? Even after reading your discussion, it was not clear to me how your result gives insight into processes governing the frontal retreat of lake-terminating glaciers.

P1, L7-17: Is there any relevant paper about the lobe?

P3 Figure 1: label a and b is missing in the figure.

P4 L12: 2.1. Satellite imagery,… What are the estimated errors of the satellite-derived dataset used in your study?

P5 L4: m・s^-1… I don't know if it is common to indicate a dot between the units.

Please check the same problem throughout the manuscript and correct it if it is necessary.

P5 L13-14: I wonder how this uncertainty propagates your floatation calculation.

P5 L17, 23: How did you define n1 and n2 for obtaining the bedrock reflective power? Need more descriptions.

P5 L18: At the first glance at Figure 4a, I was not sure where is the ice-rock interface without the red line. How did you obtain the red line to conduct the following analysis?

P7 Fig 2: Why you are not showing data for the longitudinal profile AA'?

P7 Fig 2 caption: …200m… It looks like space is missing between the value and the unit.

P7 L8: What is the overall error of your floatation calculation that arises from the uncertainties in thickness, ice surface elevation, and ice density?

P8 Section 3.1: It may be worth also showing time series of ice front position changes or changes in the terminus ice area. It is not easy to distinguish where the ice front retreat in which year in Figure 3a.

P10 L4: … only slightly negative… But I can also see the most negative thinning occurring near the middle of the terminus.

P10 L4 … with high variability …. It can be more qualitative like from *** to **

P10 L10-11: What is the difference in ice thickness or bedrock elevation at the cross-over point between cross-sectional and longitudinal profiles?

P10 Fig 4: How do you define the red line defined as the ice-bed interface? It looks like the reflection is weak to define the boundary. I wonder what it looks like without the red line. Can you indicate where is the location you have transect profiles on the panel a?

On the lower panels of the BRPr and IRP, there is no legend or description of which plot represents which variables. Add legend and description in the caption.

P11 Fig 5: Is it possible to calculate the ice buoyancy along cross-sectional profiles? It may help interpret your spatial classification of floating, near floating, and grounding in Figure 8. I would use different color codes for panels a and b to avoid confusion. It looks a space is missing in the x label before the unit. The location of the dot over Z looks strange.

P11 Fig 6: You could also show a time series of changes in the ice front position or a time series of the lobe area. I also wonder what is the uncertainty of the annual ice speed you are showing. The number of velocity maps may be significantly different over the year, and you need some more caution to using annual ice speed. Particularly, the glacier shows large seasonal ice speed variations with SAR-derived ice speed.

P13 Fig 7a: Why the topography is not observed between 5 and 6 km from the ice front? How did you calculate ice buoyance for the region without knowing bed topography?

P13 Fig 7c: What the dotted horizontal lines mean? Always better explain it in the caption or legend.

P14 Fig 8: How did you classify those spatial classifications of the close flotation and grounded regions?

P14 Section 3.6: How did you compare your observed thickness with a modeled thickness which has a quite different spatial resolution? Do you have any suggestions to improve the modeling thickness by finding the large discrepancy between observed and modeled ice thicknesses? Also, this section sounds better placed in the Discussion.

P5 Figure 9: There is a typo in the x-tick label: “120” should be “1200”. Explain what the black dotted line means.

P15 L10-11: How did your study overcome these challenges? I would appreciate it if you could add some description in the method or introduction.

P15 L16-18: I’m not sure where is the region you are explaining about.

P16 L3-4: I would expect different sedimentation rates by considering the substantial difference in the ice speed between the glaciers (e.g., Koppes et al., 2015 Nature). San Rafael glacier flows an order of magnitude faster than San Quintin glacier (e.g., Mouginot and Rignot 2014 GRL).

P16 L9: …spreading along the coast. You could refer to Figure 1.

P16 L10: Have you consider to compare your results with the previous study published recently (Tober et al., 2023 JGR)?

P16 L17-33: It looks not like this paragraph is logical. In the first sentence, you say that you will compare the disintegration of San Quintin with other Patagonian lake-terminating glaciers. But the following discussions are all about lake properties.

P16 L25: Would it be ice mélange, since it comes from French?

P17 L4: The authors may need more caution to compare the lake-terminating glacier with the ice shelf. Even if San Quinin Glacier has a floating tongue, this is not an ice shelf so you could not simply compare each other. Also, the scale of the glaciers you are comparing is one to two orders of magnitude different.

P18 Conclusions: I think the conclusion is not based on their study and includes many speculations. I would suggest the authors rewrite the conclusions based on their results in a qualitative way.

P18 L6: …grounding line is located… I wonder how you can locate the grounding line with your three thickness survey profiles.

P18 L9: Have you discussed your data with the previous study discussion? It is not common to cite a paper in the conclusion. Because you are not discussed your thickness observation in the previous study, I was a bit surprised by your sudden argument about the potential destabilization of the entire ice field in the following sentences.