Review for "Brief Communication: Comparing ICESat-2 Altimetry and COSMO-SkyMed Synthetic Aperture Radar Interferometry Grounding Zone Products over Antarctica"

This work compares two independent grounding zone products over Antarctica: the ICESat-2 laser-altimetry grounding zone features of Li et al. (2022) and a COSMO-SkyMed DInSAR grounding lines from Ross et al. (2025). It quantifies the distances between the altimetry-derived features (F, Ib, H) and the interferometric grounding line. This work compares recent datasets and the regional breakdown into East Antarctica, West Antarctica and the Antarctic Peninsula is a helpful way to summarise the comparison.

My main concerns are about the methodological framework of the paper and Figure 1C and D. The main takeaway, which is that the break-in-slope (Ib) is closer to the DInSAR grounding line than the landward flexure limit (F), reversing the expected ordering, is very poorly justified and in my view, an incorrect interpretation of the computed metrics. The same inference is not reproduced when the mean absolute separation metric used by Li et al. (2022) is applied. The authors go back on their novel claim in the conclusion, where they admit that the variance of Ib-GL distances is much greater than F-GL distances, "However, we note that the Ib-GL offsets exhibit the largest standard deviations among the three ICESat-2 point classes, indicating that while Ib points appear closer to the DInSAR grounding line on average, this result is not statistically robust and should be interpreted with caution." It makes me wonder why they came upon the order reversal idea in the first place.

Furthermore, the temporal offset between the two datasets (ICESat-2 2019-2020 and CSK 2020-2022), is not negligible in the rapidly retreating parts of West Antarctica. This might have further skewed the measured distances. The 1 km, 5 km and 10 km buffers used for filtering F, Ib, H respectively, are not well justified. This filtering scheme also wrongly leads to the conclusion '73% of F points do not correspond to a CSK grounding line' as the filtering removes a majority of points anyway.

Figure 1C and D seem to imply that the true grounding line is detected in double difference interferograms. It is widely acknowledged in literature that the hinge line is the feature which is detected by all tidal remote sensing methods. I could not find any justification for the grounding zone representation depicted in Figure 1C, D anywhere in the paper.

While I think the theme of this work is suited to Brief Communication, the main method and findings are contentious and poorly supported by the statistics presented in Table 1. I urge the authors to carefully check literature, especially about the grounding zone features which are detectable from tidal remote sensing methods (Friedl et al., 2020). I recommend major revisions before publication. Detailed below are my specific and technical comments.

Specific comments

1. Line 35: Please also cite Fricker and Padman (2006).
2. Lines 39-41: There is virtually no difference in the description of RTLA and PCRA.
3. Line 43: Bindschadler et al. (2011) and Scambos et al. (2007) are the works being mentioned by Li et al. (2022) and should be cited here instead.
4. Lines 48-49: How does specialized preprocessing hinder the comparison of grounding lines?
5. Line 51: What do you mean by 'grounding line elevation-based data'?
6. Lines 60-61: The temporal offset of the datasets used here for the comparison is described as acceptable but contradicts the earlier sentences in Lines 45-47.
7. Figure 1
   (a) A, B: It is hard for me to map the bins to grid and the labels on the x axis. It seems like the bin edges do not correspond to the displayed numbers. I would suggest plotting both the histrograms on the same figure, in different colors. This would make them easier to compare and would also immediately convey the message that Ib-GL distances have a near 0 mean Gaussian distribution while F-GL is slightly skewed and has a smaller standard deviation.

(b) C, D: I did not find sufficient evidence up to this point or later in sections about the ordering of the grounding zone features as shown here. All existing literature concerning remotely sensed grounding lines state that the grounding zone feature detected in DInSAR phase is closer to the hinge line, i.e., the landward limit of ice tidal flexure. Even though Friedl et al. (2020) states "... F derived by remote sensing is usually located somewhat seaward of the true limit of tidal flexure ($\approx$ 100 m – a few km), depending on the method's sensitivity to vertical deformation (< 1 cm – tens of cm) (Rignot et al., 2011a; Rosier et al., 2017; Vaughan, 1994).", they clearly state, "Tidal remote sensing methods aim at measuring a landward limit of **ice flexure associated with F.**". The only documented case where the first break in slope is landwards of the landward limit of flexure is for ice plains (Brunt et al., 2011). The BedMachine surface elevation profile does not seem to indicate the presence of an ice plain for Bailey. Please check with other ice elevation datasets.

8. Lines 84-85: I suppose the authors are trying to advertise a dataset from their research group but I think saying it is 'fundamental' for accurately mapping grounding lines is a bit exaggerated. There are plenty of grounding line datasets which are more spatially and temporally dense than this one such as MEaSUREs (Rignot et al., 2016), CryoSAT grounding lines (Dawson and Bamber, 2017) and AIS_cci (Floricioiu et al., 2021).

9. Section 2.1: Again, I am not against advertising your own group's work, but this section does not add any useful information. The same papers have been cited twice. You could briefly mention examples of the "invaluable insights for monitoring ice sheet stability and advancing climate-related research" provided by this dataset?

10. Section 2.3 and Table 1: I think using the 1 km, 5 km and 10 km lines excludes too many ICESat-2 points from your comparison. Reporting all three on a common buffer, with a sensitivity test, would make the comparison more robust.

11. Table 1: The temporal separation of ICESat-2 (Mar 2019-Sep 2020) and CSK (2020-2022) are up to 2 years apart in sectors that are actively retreating. The systematic downstream position of F (74% of points) is consistent with grounding-line retreat between the two epochs. Please justify the offset for West Antarctica specifically, or separate the technique difference from possible retreat, e.g. by restricting to near-contemporaneous acquisitions.

12. Table 1 and Results: Fig. 8 in Li et al. (2022) shows the maximum distance of F points from Sentinel-1 grounding lines as 2 km. I suppose most of the F points are in the 1-2 km range. The central result that Ib lies closer to the DInSAR grounding line than F is based on a signed mean distance, whereas Li et al. (2022) report the mean absolute separation. Because the F points are predominantly on one side of the line ($\sim$70% downstream) while the Ib points scatter on both sides, the small Ib mean arises mainly through cancellation rather than proximity. Recomputed as a mean absolute separation, the ordering reverts to F closer than Ib. I recommend reporting Table 1 as absolute separations and adjusting the abstract accordingly.

13. I would recommend plotting region-wide and Antarctic wide histograms of F-GL, Ib-GL and H-GL distances, either in the same plot or in subplots sharing the same distance axis.

14. Conclusion: the larger Ib spread is attributed to noisier Ib measurements. Li et al. (2022) actually assign Ib the smallest positional uncertainty of the three features ($\sim$10 m, versus $\sim$80 m for F); the spread therefore reflects the real, variable offset between the break-in-slope and the grounding line, e.g. over ice plains, where Ib can lie several km landward of F (Brunt et al., 2011; Friedl et al., 2020), rather than measurement noise. Please reword.

15. Lines 188-189: please clarify that the $\sim$0.02 km agreement is the pan-Antarctic mean absolute separation between ICESat-2 Point F and the 2018 DInSAR Point F reported by Li et al. (2022), rather than a Larsen C specific value. Correct the sentence "mean differences were are also".

Technical comments

1. Line 43: Remove capitalization for grounding line

2. Line 49: The pan-Antarctic ICESat-2 grounding zone product is Li et al. (2022); Li et al. (2020) covers only the Larsen C Ice Shelf. Please correct the attribution.

3. Line 59: You mean to reference Figure 2?

4. Switch the order of Figure 1 and 2 to match the order in which they are referenced

5. Figure 1:
   (a) Please remake the figure with at least 300 dpi
   (b) Replot with a fixed aspect ratio so it does not look like the figure is squashed
   (c) Please correct this sentence in the caption for (C) "green star stands for H point location for ICESat-2 data for grounding zone data"
   (d) The bedrock profile is attributed to BedMachine via Morlighem et al., 2017, which is BedMachine Greenland. For Antarctica, cite Morlighem et al., 2020.

6. Figure 2:
   (a) Please remake the figure with at least 300 dpi
   (b) Replot with a fixed aspect ratio.
   (c) I find glacier/ice stream names to crowd the figure. You could only print those of the examples you show in the subplots and mention the others in a supplementary list/table.
   (d) There is too much information in the subplots. The colors and contours clash with the grounding lines and points. I recommend making the ice velocity map a little more translucent and changing the color of the Ib points to something that contrasts the velocity colormap.

7. Lines 95-96: Split into two sentences

8. Table 1:
   (a) Correct the title of columns "Points in upstream/downstream" to "Points upstream/downstream"
   (b) Add '%' next to the numbers in last column
   (c) The header "Mean Distance + Standard deviation" should use "±".

9. Lines 122: if the exact number of ICESat-2 points is known the 'about' should be removed.

10. Line 122: suggested rewording 'of which 20%, 63% and 17% of the points are F, Ib, H respectively.'

11. Line 125: Maximum discrepancy could simply be stated as maximum distance

12. Line 149: "upstream" is inconsistent with the 96% of H points reported downstream in the same paragraph; this should read "downstream".

13. Line 156: 3973 Ib points here versus 3974 in Table 1. Please reconcile.

References

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Scambos, T. A., Haran, T. M., Fahnestock, M., Painter, T., and Bohlander, J.: MODIS-based Mosaic of Antarctica (MOA) data sets: Continent-wide surface morphology and snow grain size, Remote sensing of environment, 111, 242–257, 2007.