Paper title:

tidal-insar-sim: an open-source toolkit for tide-aware ranking of NISAR L-band acquisitions over Antarctic grounding lines

https://egusphere.copernicus.org/preprints/2026/egusphere-2026-2542/

Comments to the author

1. Summary and general comments

The presented work describes software developed to rank and optimize the acquisition plan of NASA's NISAR mission over the Antarctic coast, with the aim of prioritizing acquisition triplets that are most suitable for successfully deriving grounding-line positions using InSAR.

The NISAR mission is particularly well suited for observations of the Antarctic Ice Sheet, with a short repeat-pass interval and, consequently, the potential to acquire a large amount of data. The main objective of the present work is to identify which InSAR triplets (three acquisitions from consecutive 12-day repeat cycles) are most suitable for producing Double-Difference InSAR (DDInSAR) grounding lines, given the mission acquisition plan and the ocean tides. For this purpose, the author developed the Python tool *tidal-insar-sim*, which is presented in this paper.

The paper describes a tool that has become relevant to the scientific community with the availability of new satellite missions in recent years. I find the underlying idea and the presented results very interesting.

The algorithms and computational methodology are described in considerable detail. The *tidal-insar-sim* toolkit performs the following main tasks:

1. ingests the operational NISAR observation plan;
2. evaluates the ocean tide at the exact acquisition times;
3. enumerates feasible 12-day triplets;
4. predicts DDInSAR fringe counts;
5. ranks the triplets according to their predicted suitability;
6. demonstrates the resulting yield over the major glaciers draining into the Amundsen Sea, including Thwaites, Pine Island, and the Pope/Smith/Kohler region.

I have mainly three major comments/suggestions to this paper.

The manuscript contains a substantial amount of implementation-specific information that, in my opinion, is not essential for evaluating the scientific methodology and results. In particular, Section 3 includes detailed descriptions of software dependencies, file formats, web-interface functionality, testing infrastructure, continuous integration, and software deployment. While I appreciate the authors' efforts to provide a reproducible and openly accessible tool, these details could be substantially condensed and moved to the software documentation or repository. The

manuscript would benefit from focusing Section 3 on the scientific methodology and algorithmic aspects that are necessary to understand and reproduce the results, while providing a concise description of the software and a reference to the openly available repository for implementation details.

More importantly, I suggest that the author distinguishes more explicitly between the predicted DDInSAR yield derived from the acquisition plan and tidal model and actual successful grounding-line retrievals from NISAR observations. The reported percentages and the inferred biweekly monitoring capability appear to represent predicted opportunities for increasing the temporal resolution of grounding-line observations rather than demonstrated retrieval performance. This distinction should be made clear throughout the manuscript, particularly when discussing the implications for grounding-line monitoring.

I also suggest adding a section in which actual grounding lines derived from NISAR DDInSAR data are presented, if such data are already available. This would provide an important validation of whether the predicted relationship between fringe count and the successful retrieval of grounding lines holds under real NISAR data conditions. A comparison of grounding-line retrievals from NISAR and Sentinel-1, where suitable data triplets are available, would further strengthen the scientific value of the paper.

2. Specific comments, minor comments & typos

Please use a consistent and conventional text formatting for software tools, variables, functions, and other code-related elements throughout the manuscript. Consistent formatting would make the manuscript more fluent and easier to read.

Line 19: ROP acronym to be added. Later in the text it appears sometimes as “rop” and not capital letters.

Lines 23-24 (and throughout the text): The grounding line itself does not contribute to sea-level rise. A more accurate wording should refer to the major glaciers/ice streams draining through these grounding lines, which contribute to Antarctic ice mass loss and consequently to global mean sea-level rise.

Line 54: across the **mission** repeat **cycle**

Line71: explain or cross reference **high-tide-** and **low-tide-at-t2**

Line 86 (and later): Poor formatting of equations (small and almost unreadable, underscore characters).

Lines 87 - 92: please recheck the flexural length numerically and define what it means.

Using the stated parameters and (H=800) m, I calculate:

$\beta \approx 4.86 \times 10^{-4}$ m^{-1}, $1/\beta \approx 2.06$ km, $\pi/\beta \approx 6.46$ km.

This does not reproduce the reported 12 km. Also, 1/β is the exponential decay length; π/β requires a separate physical definition. Correct the value or explain which alternative parameters or width convention were used.

Lines 98 to 108: please correct /complete the fringe count derivation equations. The transition from Eq. (3) to Eq. (4) needs clarification. Eq. (4) is consistent with the net phase excursion between the grounding line and the far-field floating shelf, but it does not follow from integrating the phase itself over a flexure half-width.

Line 110 (+ abstract & conclusions): please justify the need for n_fr >= 3. The three- and five-fringe thresholds carry much of the argument, yet their applicability needs stronger justification. Rignot et al., 2011 does not mention the minimum required number of fringes needed to make a grounding line delineation. Please provide a more direct reference or a calibration experiment.

Line 119: of M2 **and** S2 **tidal constituents,** and the compound K1+…

Section 3.1: Missing cross-reference of Figure 1

Line 125: and though entire section: some details can be moved into the software documentation.

Line 131: TLE acronym not explained.

Line 141: Caption of Table 1 above the table.

Line 171: explain CATSValidationError . Is this a flag?

Line 195: ASE acronym (Amundsen Sea Embayment) not explained.

Section 4.1: Missing cross reference to Figure 2.

Sections 4.2 – 4.3 Table 2, Figures 2,4, and 5: please reconcile the figures with the reported results. The fringe count n_fr agrees in Figure 2 and Figure 4, but is different in Table 2 (see my table below). Also in Figure 5 (left) n_fr goes up to approximately 6.5. The reported number of triplets over Thwaites is 274 in Table 2 and much larger (1013+844) in Figure 5. If the figures and tables were created from different subsets of the triplets, please specify. I would recommend that all figures and numbers in the tables be derived from the same set of the triplets for each ROI.

Quantity	**Table/text**	**Figure**
Thwaites triplets	274	Figure 5: 1,013 + 844 = **1,857**
Maximum Thwaites fringes	5.69	Figures 2/4: **6.53**
Maximum Pine Island fringes	5.10	Figures 2/4: **6.81**
Maximum Smith fringes	5.64	Figures 2/4: **6.42**

Line 214: for every () combination **resulted from the yield predicted in Section 4.1** we read …

Line 218: wrong cross reference: **Figure 3** (instead of Figure 2).

Section 4.3: Missing cross references to Figure 4 and Figure 5. The caption of Figure 5 is too long. I suggest to split and move the descriptions to the main text. Add cross reference to eq. 4.

Section 4.4 (line271): At this cadence the toolkit elevates **the potential** NISAR's Antarctic GL **migration**-rate sensitivity…

Line 274: Figure 6: Legend of the triplets counts obstructs/overlaps the upper left panel.

Line 292: **Figure** instead of Fig.

Line 295: please explain 25% **cull**

Line 321: please explain **ConstellationDescriptor abstraction**