Response to Reviewer Comment #1 (RC1)

We are grateful for the Reviewer's time spent evaluating the manuscript, and for the valuable comments, which we believe have helped improve the manuscript. Please find our response to individual comments below - the Reviewer's original comments appear in black text, while our responses appear in blue.

In this brief communication, Andersen et al. present an updated mapping of glacier grounding lines in the Amundsen Sea Embayment of West Antarctica, using Sentinel-1 Synthetic Aperture Radar (SAR) images acquired with a 1-day repeat-pass during the commissioning phase of Sentinel-1C. These data offer an excellent opportunity to comprehensively update the grounding line record for Pine Island, Thwaites and other glaciers in the Amundsen-sea, which are crucial in the mass balance and stability of West Antarctica.

The authors find grounding line retreat of between 2 and 7 km on Pine Island Glacier since the last available grounding line data from 2011, while Thwaites Glacier grounding lines are within previous mapping efforts of 2023. In the Crosson-Dotson region they find that grounding lines have largely stabilised on their 2020 position.

The manuscript is well written and easy to follow, with excellent quality data. The new up-to-date GL product which the authors make available is valuable to the Antarctic glaciology community. I commend the authors for making this available promptly after the Sentinel-1 acquisitions earlier this year. The authors also do a good job of highlighting the value in short-repeat pass interferometry for ice sheet monitoring, I thank them for this effort.

Overall, the manuscript is timely, significant and will be useful to all glaciologists with an interest in West Antarctica. I have one main general comment which I think it is important to address, plus minor comments on a line-by-line and figure-by-figure basis. I hope that these will be useful in improving and revising the paper.

Thank you for your overall positive evaluation of the manuscript. One goal of the paper was indeed to highlight the value of short repeat-pass interferometry, particularly for monitoring highly dynamic regions such as ASE, so we are happy that this point came across. We address your general, line-by-line, and Figure comments below.

General comment:

My main concern with this manuscript is in how uncertainty in the grounding line position and grounding zone width is reported. I understand that there is a limited amount of data for historic periods and that any grounding line delineation from a single (3 or 4 constituent acquisition) differential InSAR result is only a snapshot of grounding line position in a zone that we know displays substantial tidal migration. However, even with this caveat, I think that the authors could and should provide a more detailed discussion of the impact of this uncertainty on the measured GL retreat. In my opinion, the sentence at line 105: 'Consequently, the reported changes in GL location should be viewed as approximate, as they stem from a comparison of discrete acquisitions' does a disservice to the volume and quality of data available.

The authors quote from Mohajerani et al. 2021 that 'estimates of grounding zone width in the ASE are mostly around 1km but may locally exceed 5km'. This range of 1 to 5 km is comparable to the retreat rates that the authors quote throughout the article and consequently deserves a more thorough quantitative treatment. I do not want to be too prescriptive, given the Brief

Communication format, but suggestions for how to do this could include quoting the grounding zone width from the Mohajerani data where possible, or expanding the supplementary figures to show the estimated grounding zone width where data is available, as it has been done for Cosgrove Ice Shelf and Getz Ice Shelf.

Improving the quantification of these impacts in the manuscript would make the grounding line retreat results substantially more useful to the community by qualifying the results with an uncertainty.

First off, we improved the 2025 ASE GL dataset by utilizing all available double-difference interferograms to generate separate GL retrievals for each double-difference product (and, hence, at different tidal conditions), rather than aiming to generate one contiguous/common grounding line. While this does not allow for an exact estimation of the full grounding zone (as in Mohajerani et al. 2021), this does provide some more context to the 2025 dataset, as most sectors now feature 3-7 retrievals, revealing local effects of short-term, tide-induced GL migration, and hence a "partial sampling" of the grounding zone.

At the same time, we updated Figure 3 (and the associated text in the Results section) to also include a comparison with the 2018 retrievals from Mohajerani et al. (2021) where available, as this is the only dataset that provides a realistic measure of the actual grounding zone (along with the Rignot et al. (2024) Thwaites ICEYE dataset). In some places, e.g. where the Mohajerani et al. dataset is not available, we still make a comparison with the historic single-acquisition GL retrievals, however, we caution that the magnitude of such estimates may, of course, partially be influenced by tide/pressure-induced fluctuations. Here, we argue that the added context of several 2025 retrievals reduces the uncertainty somewhat.

Below we paste the updated paragraphs of the Results section (lines 97-118), which now clearly underlines the difference between datasets providing single-acquisition GLs ("historic" datasets), full grounding zone estimates (Mohajerani et al.), and our "intermediate" product consisting of 1-7 retrievals. It also introduces the updated Text S1/Table S1 (featuring a description of the procedure for estimating tide/pressure-induced Sea Surface Height for all of the double-difference products) and an additional Figure (Figure S2, which documents examples of short-term GL variation). This metadata has also been added to the updated GeoPackage, containing the 2025 ASE GL dataset (contained in the updated Zenodo archive).

"...For the majority of the region, multiple GL delineations were made spanning different tidal and atmospheric conditions (Text S1, Table S1). GLs near the Abbott and Cosgrove ice shelves were captured in 1-2 delineations, while the remaining regions were captured in 3-7 separate retrievals. While this sampling density is insufficient to robustly resolve the full grounding zone, the availability of multiple delineations enables partial observation of short-term, tide- and pressure-induced GL variability. Examples of such short-term GL migration, varying from a few hundred meters to several kilometers, are shown in Figure S2.

Figure 3 shows a comparison between the new 2025 GL delineations and the MEaSUREs Antarctica grounding line product (Rignot et al., 2016), which contains retrievals from the period 1992-2014 for nearly the full region, the ESA CCI grounding line product (ESA AIS CCI, 2021), containing retrievals from the period 1994-2020 for select glaciers, and the COSMO-SkyMed grounding line dataset from Milillo et al. (2022), covering the Pope, Smith, and Kohler glaciers during 2016-2020, overlaid on the BedMachine v3 bed elevation product (Morlighem, 2022). These historic GL products generally rely *on single or sporadic acquisitions per year and therefore represent snapshots of the GL at varying tidal and atmospheric conditions, rather than the full grounding zone. In contrast, the deep learning-based 2018 GL dataset of Mohajerani et al. (2021), although not covering the fastest-flowing glaciers (e.g., Pine Island, Thwaites, Smith), provides an estimate of grounding zone width based on all available 2018 Sentinel-1 data. In the ASE, grounding zone widths inferred from this product vary from less than 1 km to locally more than 5 km.*

Taken together, these differences in temporal sampling imply that apparent GL advances or retreats between products, particularly between single-acquisition historic delineations and the 2025 retrievals, should be interpreted with caution. Where offsets of several kilometers are observed, part of the apparent change may reflect the incomplete capturing of the grounding zone, rather than solely long-term migration. The 2025 dataset occupies an intermediate position between single-acquisition historical products and fully resolved grounding zone estimates, providing improved, although partial, constraints on short-term GL variability."

Line-by-line comments:

8: In my opinion, it would be useful to quantify the increase in mass loss or ice discharge in this opening sentence.

We included the following sentence (line 9), to quantify the mass loss increase: "*Mass loss from West Antarctica increased from 39.5 +/- 19 Gt/y during 1992-2001 to 103.6 +/- 10.8 Gt/y during 2002-2020 (Otosaka et al., 2023).*"

11: perhaps clarify with 'As ocean temperatures rise…'

We expanded the sentence to be more explanatory - the sentence now reads (lines 10-11): "*Melting peaks near the grounding line (GL), the boundary between grounded and floating ice. As warm and saline circumpolar deep water is advected below the ice shelf, GL retreat into deeper basins accelerates ice flow and dynamic thinning, further promoting retreat and decreasing the buttressing potential of ice shelves.*"

14: The source for the quoted 1.2m potential SLR is not clear to me, as the references that follow this are all about GL retreat. This is not trivial, as there are multiple bed products that could support this statement, each with different methodologies and associated errors.

The number stems from Morlighem et al., (2020) (reference pasted below). The 1.2 m figure stems from summing all of the glacier basins in ASE. We now properly reference this (line 16), and provide the number with associated error estimate as obtained from Morlighem et al. (1.26 +/- 0.02 m).

Morlighem, M., Rignot, E., Binder, T. *et al.* Deep glacial troughs and stabilizing ridges unveiled beneath the margins of the Antarctic ice sheet. *Nat. Geosci.* 13, 132–137 (2020). https://doi.org/10.1038/s41561-019-0510-8

22: Here I would also recommend citing Milillo et al. (2022) and Freer et al. (2023) for remote-sensing observations of the tidal GL migration process.

We added the reference to Milillo et al., (2022) and Freer et al., (2023) at the end of this sentence (line 24).

54: I think the text in brackets is unnecessary here

The sentence describes how Sentinel-1C restored the nominal 6-day repeat coverage, but that only happened after the end of the commissioning phase, so we think it is relevant to include this note.

58: Here the authors might also comment on the impact of deformation and strain on InSAR coherence. Decorrelation is observable in the shear margins of PIG and Smith glacier in Figure 2, so it would be useful to include in this paragraph.

We added "shear deformation" as one of the sources of decorrelation (line 59).

86: Can the authors give an indication of the impact of not having the POE products for S-1C?

This entirely depends on the quality of the individual SAFE product orbit state vectors. Generally, uncertainties in the orbits will cause a degraded coregistration (and hence noisier interferograms - to the point of complete decorrelation in the extreme case). In our experience, using the nominal SAFE orbit files instead of the refined POE (or RES) often leads to no discernable noise increases. For this dataset, we did notice a tendency for residual phase discontinuities at burst boundaries (see Figure S3, previously S2), which could be caused by degraded coregistration. However, while these phase jumps can be problematic if one intends to perform phase unwrapping, they do not really hinder the delineation of grounding lines. So, in conclusion, we do not consider the lack of POE orbits to be a significant source of error for the GL retrieval, yet still find it relevant to mention the fact that precise orbits were not used for S-1C images, to accurately describe the processing.

121: If manuscript length allows it would be good to give an explicit example of one of these local exceptions.

We have added arrows in Figure S2c-d (Figure S3c-d in the updated Supplementary), which indicate the locations where the 2025 GL lies inland of the 2018 GZ estimate. Manuscript length requirements do not allow an extra main text Figure, so we keep this one in the Supplementary Material.

123: I find the references to East/West in this paragraph to describe the geometry of PIG to be quite confusing. I think the authors are referring to East/West in terms of the grid directions of the polar stereographic (EPSG:3031) grid. Typically, many authors talk about the geometry of the shelf with respect to true north, eg the northern and southern shear margins, and to me this is far more intuitive.

We recognize that this description was unclear and ambiguous. We have updated the paragraph accordingly and added labels to Figure 3. We now refer to three separate regions: "Main trunk", "Piglet Glacier", and "Lucchitta and Larter glaciers" - all of which are labelled in Figure 3. Additionally, when referring to a direction, we refer to true north/south (adding a true north arrow to Figures 1-3) instead of the "pseudo" east/west directions in the polar-stereographic map projection. The updated paragraph now reads (lines 140-150):

"*At Pine Island Ice Shelf, the main trunk GL shows an apparent further retreat of approximately 2-7 km since 2011, following a larger retreat of 15-20 km during 1992-2011. In the main trunk of the glacier - the region with the fastest ice flow - the northern section has retreated by up to 7 km, while the central part has pulled back by approximately 1-3 km. The southern section of the main trunk appears to have been dislodged from a sill in the bedrock topography at a depth of -1000 m and subsequently retreated by around 5 km (Figure 3b). In this critical part of the glacier, where ice* *discharge is at its maximum, the GL has retreated more significantly along the northern and southern flanks than at the center. The southern tributary glacier, sometimes referred to as Piglet Glacier, which flows toward the Pine Island Ice Shelf front, has experienced widespread GL retreat during 2016-2018, averaging around 3 km with localized retreats reaching up to 6 km, particularly in areas where the bedrock slope is slightly retrograde. In 2025, we observe an additional apparent retreat of around 2 km, compared to the 2018 grounding zone (Figure 3b). Conversely, at the northern tributaries (Lucchitta and Larter glaciers), the GL has remained relatively stable, situated on a more pronounced, mountainous, and prograde topography (Figure 3b).*"

132: If article length allows it would be interesting to mention the evolution of the pinning point/ephemeral grounding point in the central PIG shelf which appears in your interferograms.
Good point. We have added the following sentence to comment on this (lines 150-152), as well as a reference to a recent manuscript, which studied this ephemeral grounding feature in detail (Qian et al., 2025): "*Finally, the 2025 interferogram shows the presence of a pinning point in the central part of the ice shelf (Figure 2b), which has previously been identified as an ephemeral feature (Rignot et al., 2014; Qian et al., 2025).*"

Figures:
Figure 1 – I understand that this colourmap has been used in the past to represent MEaSUREs ice speed data, so there are some historical reasons to use it, but in my opinion this is not well-aligned to Copernicus Publications' guidelines for figure composition (https://publications.copernicus.org/for_authors/manuscript_preparation.html#manuscriptcomposition) . I encourage the authors to choose a colourmap that is perceptually uniform.
The underlying optical image mosaic could be clipped to the boundary used for the ice speed data; this would make the figure much neater.
The figure caption should specify which underlying image mosaic is being used.
We changed the colormap for the ice velocity mosaic. Although this version still has some "rainbow" to it, it has far fewer ambiguities than the previous version (we tested it with the Coblis Color Blindness Simulator and did not find it problematic with any types of colorblindness). Also, the main purpose of the ice velocity map here is simply to show where fast-flowing glaciers are located, not to read off exact values from the map.
We generated a true-color mosaic from Sentinel-2 imagery (from January-March 2025) to use as underlay in the updated Figure. This mosaic gives a more representative picture of the ice shelf extent during the period we are investigating. We clipped the ice velocity map to the (approximate) January-March 2025 extent (see comment below). We updated the caption to specify the Sentinel-2 underlay.

Figure 2 – Including a boundary for the current ice shelf calving front, perhaps in white, would be useful for identifying where the InSAR is incoherent due to factors like the shear margin and where it is just ocean.
We added ice shelf calving fronts as white lines in Figures 2 and 3. We manually delineated the front lines based on intensity images from the Sentinel-1 1-day (January-March 2025) dataset.

Figure 3 – the use of green for MEaSUREs, blue for CCI and blue for bathymetry make this figure difficult to interpret. It's quite hard for me to make out the GL in some places, for example on PIG for

the 2014 MEaSUREs GL and on Smith West. For a colour deficient reader I'm concerned that it could be prohibitively difficult. A solution may be to simplify the plot so that MEaSUREs, CCI and Milillo are on a single colour scheme based on the year.
We recognize that the previous Figure 3 was challenging to analyse, due to the different color palettes. We have updated the Figure by tweaking the colors, so that none of the GL datasets intersect with the underlying bed elevation colormap. The MEaSUREs and CCI datasets now share the same color scheme, as they approximately cover the same period. Note that we have also added the updated 2025 GL to include all individual delineations as well as the Mohajerani et al. (2021) dataset (cf. our response to your General Comment).

Milillo is spelt wrong in the legend for Figure 3.
Corrected.

Response to Reviewer Comment #2 (RC2)

We are grateful for the Reviewer's time spent evaluating the manuscript, and for the valuable comments, which we believe have helped improve the manuscript. Please find our response to individual comments below - the Reviewer's original comments appear in black text, while our responses appear in blue.

Summary:

In this brief communication, the authors present a new, near-continuous grounding line (GL) delineation for the Amundsen Sea Embayment (ASE) derived from a unique set of 1-day repeat-pass Sentinel-1 SAR data acquired during the 2025 Sentinel-1C in-orbit commissioning phase. The short repeat interval represents a rare opportunity to overcome the severe coherence limitations that typically hinder InSAR-based GL mapping in this region, caused by fast flow, heavy crevassing, surface melt, snowfall, and rapid GL retreat. As a result, the study provides an important and timely update to existing GL products in the region, which in places have not been observed for several years. The authors find minimal GL change at Abbot, Cosgrove, and Getz ice shelves since they were last observed, while Pine Island Glacier has retreated by approximately 2–7 km since 2011. At Thwaites Glacier, the 2025 grounding line is largely located within the grounding zone region identified in recent ICEYE observations (Rignot et al., 2024) and also shows evidence of upstream seawater intrusions.

Overall assessment:

This is a well-written and timely manuscript that presents valuable new insights alongside a high-quality dataset of clear relevance to the wider glaciological community. In particular, this study demonstrates the substantial improvement in GL detection achievable with 1-day repeat-pass synthetic aperture radar data and provides an important, up-to-date GL dataset for the Amundsen Sea Embayment; one of the most rapidly evolving sectors of the Antarctic Ice Sheet. I recommend this manuscript for publication, subject to the authors addressing one general (moderate) concern regarding uncertainties associated with tidal GL migration, along with several minor suggested edits to the text and figures to improve clarity, as detailed below.

Thank you for the positive overall assessment. Please find our responses to your general and specific comments below.

General comments:

The interpretation of the new GL dataset would benefit from a more explicit discussion of how differences in coincident sea surface height (SSH) at the time of each SAR acquisition – driven by tides and dynamic atmospheric contributions – affect the vertical deflection and GL position recorded in each double-difference interferogram. This would help clarify how tidal GL migration may influence the reported long-term GL retreat rates and better constrain the associated uncertainties, which I appreciate are difficult to explicitly quantify. Several of the reported GL retreat distances are comparable to grounding zone (GZ) widths (of order 1–5 km) inferred in previous studies, making the tidal context of each new GL delineation particularly important for interpretation.

Specifically, I recommend that the authors provide the precise acquisition time (not just the date) and corresponding SSH for each SAR image, as well as the maximum SSH and relative SSH difference between the four images used to form each interferogram. Previous studies have emphasized the importance of presenting new GL products alongside this contextual metadata (e.g. Freer et al., 2023), and this could be readily addressed by adding the information to Table S1. Additionally, it would be useful to comment on whether – where multiple interferograms are available from repeated acquisition cycles along the same track – there are any signals of tidal GL migration that could help to constrain variability in GZ width.

We have updated the dataset by providing a separate GL delineation for all of the processed double-difference interferograms, yielding multiple retrievals for the vast majority of the ASE region (the exception being Cosgrove Ice Shelf, which is only mapped once). As the Reviewer points out, this does indeed provide additional, useful information in distinguishing short-term GL variation due to tidal/atmosphere effects (i.e., migration within the GZ) and long-term retreat/advance. Although the limited number of acquisitions still does not enable us to robustly map an exact GZ width, the vast majority of the study area now features 2 to 7 separate delineations, which, we argue, does provide partial constraints on the local effects of short-term GL migration (i.e., a "partial sampling" of the GZ). In the updated Results section, we stress the differences between the single-acquisition historic products, the 2018 Mohajerani et al. 2018 grounding zone product, and our "intermediary" 2025 product in the following paragraphs (lines 107-118): "*These historic GL products generally rely on single or sporadic acquisitions per year and therefore represent snapshots of the GL at varying tidal and atmospheric conditions, rather than the full grounding zone. In contrast, the deep learning-based 2018 GL dataset of Mohajerani et al. (2021), although not covering the fastest-flowing glaciers (e.g., Pine Island, Thwaites, Smith), provides an estimate of grounding zone width based on all available 2018 Sentinel-1 data. In the ASE, grounding zone widths inferred from this product vary from less than 1 km to locally more than 5 km.*

Taken together, these differences in temporal sampling imply that apparent GL advances or retreats between products, particularly between single-acquisition historic delineations and the 2025 retrievals, should be interpreted with caution. Where offsets of several kilometers are observed, part of the apparent change may reflect the incomplete capturing of the grounding zone, rather than solely long-term migration. The 2025 dataset occupies an intermediate position between single-acquisition historical products and fully resolved grounding zone estimates, providing improved, although partial, constraints on short-term GL variability."

We estimated relative ("double-difference") SSH, as well as maximum SSH, for each of the DInSAR products using the *pyTMD* software for tide elevation estimation and ERA5 reanalysis data for estimating the Inverse Barometer Effect. We now include this additional information in Table S1, along with precise Sentinel-1 timestamps, as suggested (we also include a brief section outlining the SSH estimation procedure in the Supplementary Material, see Text S1). We include a Supplementary Figure (Figure S2), which shows local examples of short-term GL migration, ranging from a few hundred meters to several kilometers (this Figure is referenced in line 101 in the main text). While we do observe a close agreement between relative SSH difference and the observed vertical displacement difference (i.e., fringe count), we do not (generally) observe a clear correspondence between max. SSH and inland GL location.

When inferring GL retreat, we now compare the 2025 GL retrievals with the estimated 2018 grounding zone from Mohajerani et al. (2021) wherever available, which provides a more realistic assessment of GL migration (vs. comparing with just the single-acquisition historic products).

Finally, the 2025 GL product is now contained in a GeoPackage, which contains all of the individual delineations along with metadata from Table S1, and can be downloaded from the updated Zenodo archive (along with double-difference interferograms, now stored as regular GeoTIFFs).

Specific comments:

• Abbreviations - Please ensure consistent use of the abbreviated term "GL" throughout the manuscript. The text currently alternates between "grounding line" and "GL". The same applies to any other abbreviations.

We replaced occurrences of "grounding line" with the "GL" abbreviation everywhere except for the abstract, figure captions, section headers, and when used in reference to specific product names (e.g., "the MEaSUREs Antarctica grounding line product"). We also replaced the majority of instances of "Amundsen Sea Embayment" with "ASE".

• Capitalisation - Please ensure consistent capitalization of "glacier(s)" and "ice shelf/ice shelves", particularly where plurals are used. For example, "Pope, Smith, and Kohler Glaciers" (L102) versus "Pope, Smith, and Kohler glaciers" (L98, L142), and "Crosson and Dotson Ice Shelves" (L142) versus "Dotson ice shelf" (L157). While this may ultimately be governed by journal style, I believe that the general convention is to capitalize singular proper names (e.g. "Pine Island Glacier", "Dotson Ice Shelf") and to use lower case for plural or generic references.

Fixed. Capital letters are now used consistently for specific glacier/shelf names (singular), while lower case is used for generic/plural references.

• Grounding zone definition - Please clarify how the grounding zone (and its width) are defined. In the existing literature, the term has been used to describe both the full region experiencing tidal flexure (i.e. between Points F and H) and the distance over which the grounding line migrates with the tide (sometimes termed the "ice grounding zone") – the authors seem to use the latter definition, but it would be useful to state explicitly.

We introduce 'grounding zone' in line 21 (line 22 in the updated manuscript): "*The need for frequent observations is compounded by the fact that the true GL fluctuates during a tidal cycle within a grounding zone, which may be several kilometers wide, depending on factors such as tide magnitude, ice thickness, and bedrock slope*". We argue that this aligns explicitly with the latter definition - we changed "*grounding zone"* to "*ice grounding zone*" in the above sentence, to be consistent with previous literature.

• L116 – Add a reference to Fig S2a-b in this first sentence where the results for Cosgrove Ice Shelf are first described.

We moved the reference to the Figure (Figure S3 in the updated Supplementary) to the end of the first sentence.

• L123-132 – The description of the retreat patterns across Pine Island Ice Shelf are difficult to follow, I think due to the discrepancy between true vs grid compass directions. This section would benefit from some text refinement and addition of some more descriptive labels in Fig. 3b.

We recognize that this description was unclear and ambiguous. In line with your comments below (and comments from RC1), we have re-written the paragraph and edited Figure 3. We now refer to three separate regions: "Main trunk", "Piglet Glacier", "Lucchitta Glacier", and "Larter Glacier" - all of

which are labelled in Figure 3. Additionally, when referring to a direction, we refer to true north/south (adding a true north arrow to Figures 1-3) instead of the "pseudo" east/west directions in the polar-stereographic map projection. The updated paragraph now reads (lines 140-150):
"*At Pine Island Ice Shelf, the main trunk GL shows an apparent further retreat of approximately 2-7 km since 2011, following a larger retreat of 15-20 km during 1992-2011. In the main trunk of the glacier - the region with the fastest ice flow - the northern section has retreated by up to 7 km, while the central part has pulled back by approximately 1-3 km. The southern section of the main trunk appears to have been dislodged from a sill in the bedrock topography at a depth of -1000 m and subsequently retreated by around 5 km (Figure 3b). In this critical part of the glacier, where ice discharge is at its maximum, the GL has retreated more significantly along the northern and southern flanks than at the center. The southern tributary glacier, sometimes referred to as Piglet Glacier, which flows toward the Pine Island Ice Shelf front, has experienced widespread GL retreat during 2016-2018, averaging around 3 km with localized retreats reaching up to 6 km, particularly in areas where the bedrock slope is slightly retrograde. In 2025, we observe an additional apparent retreat of around 2 km, compared to the 2018 grounding zone (Figure 3b). Conversely, at the northern tributaries (Lucchitta and Larter glaciers), the GL has remained relatively stable, situated on a more pronounced, mountainous, and prograde topography (Figure 3b).*"

o L125 – The text here states that the western section of the main trunk has retreated by up to 7km, followed by a statement that the western section of the main trunk […] has retreated by around 5 km. Is this latter sentence meant to refer to the eastern section instead, or perhaps to the adjacent glacier trunk (grid west) on the other side of the bedrock high? Adding labels to Fig 3b would help to clarify this here.
Please see our response above.

o L127 – Please clarify what is meant by 'in this critical part of the glacier'?
This sector is where ice velocity (and hence discharge) is highest, as noted in the sentence (line 144): "*In this critical part of the glacier, where ice discharge is at its maximum, ...*".

o L128 – It is unclear what is meant by the 'eastern branch of Pine Island Glacier'. If this refers to the tributary glacier (sometimes referred to as 'Piglet'), please state this explicitly and add labels to Fig. 3b.
Indeed, this refers to the "Piglet" tributary, as now clarified in the text (lines 145-146, or see response to comment L123-132).

• L135 – The authors state that the 2025 GL lies within the 2023 GZ, but this is not shown in Fig 3c. Is there a reason why the 2023 ICEYE grounding zone has not been included on the map? As currently presented, Fig. 3c gives the impression of substantial GL retreat since the last available observations (ESA CCI 2016), which is potentially misleading without the 2023 ICEYE context.
We added the 2023 ICEYE GL retrievals to Figure 3c (omitting the inland intrusion/subglacial water related delineations). The reasoning for not adding them originally is that the Figure was already quite cluttered with various GL delineations, but we believe we've managed to make things more legible in the updated Figure.

• L138 – These seawater intrusions are important observations and are clearly visible as bulls-eye patterns in the interferogram in Fig 2c. I suggest adding labels or dotted outlines to highlight these features and aid interpretation. While the comparison with Rignot et al. (2024) in Fig. S3 is informative, not all readers will consult the supplementary material, so additional annotation in Fig. 2c would strengthen the main text.

We included an arrow/label pointing to the seawater intrusion in Figure 2c. Note that we have updated the arrows/labels in Figure S3 (now Figure S4), to accurately distinguish between apparent seawater intrusions (just behind the "main GL") and apparent subglacial freshwater propagation (further inland) - previously, all instances were labelled as seawater intrusions.

• L140 – Do the regions that you have observed higher retreat rates coincide with these subglacial discharge outflows? If so, this is an interesting finding, and these features should be labelled on Fig. 3c. If not, this sentence feels somewhat out of place and disconnected from the otherwise descriptive results presented in this paragraph.

The lake drainage event described by Gourmelen et al., (2025) was found to propagate to approximately the same sector of the grounding line behind which the 2023-2025 seawater intrusions were observed - indeed, a sector which has seen extensive retreat. We added this comment in the sentence (lines 161-163): "*...upstream lake drainages previously enhanced ocean melting near the grounding line in the same sector as the observed seawater intrusions, promoting further retreat*". While the specific drainage event from Gourmelen et al., (2025) occurred much earlier than 2025, we found it relevant to make a note of the observations, as similar events could be responsible for future GL evolution in this sector.

• L157 – It is not clear from Fig 3d where the two pinning points reported as having been lost since 2016 on Dotson Ice Shelf are located. To me it appears that only the smaller pinning point closer to the main GL (grid east) is no longer grounded according to the updated 2025 GL. Please clarify this point and/or annotate the figure accordingly.

On further inspection, it appears that the pinning points in question were potentially lost prior to 2025, as the latest delineations in the MEaSUREs/CCI datasets are from 2011 and 2014, respectively (these were erroneously read off as 2016 previously). The pinning points are not present in the Milillo et al. (2022) or Mohajerani et al. (2018) datasets (although it is possible that this is due to limitations in coverage or coherence). Still, we decided to omit the sentence, to avoid a misleading conclusion.

• L158 – The GL retreat observed at these smaller glaciers is interesting, but their locations are missing from any of the figures. Please add their locations to Fig. 1a and consider adding supplementary figures to show these results.

We added a Supplementary Figure (Figure S5), which shows multiple glaciers (Bunner, Holt, Philbin Inlet, Singer, and McClinton) for which all 2025 GL retrievals lie just at (or fully behind) the inland limit of the 2018 grounding zone (from Mohajerani et al.). We take this as indications of modest GL retreat during 2018-2025 (with Holt Glacier being the most obvious example, showing a retreat of 2-3 km). We describe these results in the updated paragraph (lines 178-183):

"*Finally, we note apparent GL retreat at a series of smaller glaciers, including Bunner, Holt, McClinton, Singer, and Philbin Inlet glaciers (Figure S5). These glaciers generally exhibit wide grounding zones (5-10 km), as estimated from 2018 data (Mohajerani et al., 2018), complicating the prescription of long-term migration based on few observations. However, we note that all 2025 GL* *delineations (3-5 retrievals per glacier) lie at the inland limit of the 2018 grounding zones, with only a small fraction (or none) of the 2018 delineations extending comparably far inland, suggesting a modest retreat. The clearest example is Holt Glacier, for which 2025 delineations lie 2-3 km inland of any 2018 retrievals (Figure S5a).”*

Figure comments

• Please add North arrows to all figure panels with maps. This is particularly important given that true and grid north are often opposite in this region, which makes it difficult to interpret the results described in the main text.

We have added true north arrows to all Figures.

Figure 1

• Please add additional labels with the names of the major glaciers/ice shelves highlighted in each box (i.e. Abbot, Pine Island, Thwaites, Dotson/Crosson), as well as the other glaciers referenced in the text (e.g. Philbin Inlet, Singer Glacier, McClinton glaciers).

• I also suggest adding inset boxes for Cosgrove and Getz ice shelves, which are discussed in the manuscript and shown in Fig S2.

We have added labels for all the major ice shelves described in the text. We also added dashed boxes and labels for Cosgrove and Getz. We avoid labelling the smaller glaciers (Philbin/Singer/McClinton) here, and instead label those in Figure S5.

Figure 2

• Consider changing the colour of the labels for ‘Pine Island Ice Shelf’, ‘Thwaites Glacier’ and ‘Crosson Ice Shelf’, as the current white text is difficult to read against the background.

• Fig 2d – Please remove the stray light blue ‘2016’ label at Pope Glacier.

Colors have been changed for the Pine Island/Thwaites/Crosson labels to increase readability. We also deleted the stray ‘2016’ label (good catch!)

Figure 3

• Please adjust either the colour scale of the MEaSUREs/CCI grounding lines or the background bathymetry, as the current colours are very similar and make the grounding lines – particularly those shown in light green – difficult to distinguish.

We have tweaked the colors of the GL datasets, such that they don’t intersect with the underlying bed elevation colormap.

• Please add a line showing the location of the ice shelf fronts where they fall within the mapped domain.

We manually mapped ice shelf front lines using intensity images from the 1-day Sentinel-1 dataset (January-March 2025). They are now shown as white lines in Figures 2-3 and S3.

• Fig 3b – Please add additional descriptive labels such as ‘main trunk’, ‘tributary’, ‘western branch’ etc. to match the terminology used in the main text.

We added labels for “Main trunk”, “Piglet Glacier”, “Lucchitta Glacier”, and “Larter Glacier” and now reference these in the text (cf. our response to your previous L123-132 comment).

• Fig 3c – Please add the 2023 ICEYE GZ region to the map, and label both the seawater intrusions (those seen here and by Rignot et al., 2024) and any prominent ice shelf basal channels, to support the statements discussed in L134-140.

We added the 2023 ICEYE GZ delineations to Figure 3c. We omit the seawater intrusion delineations here (and instead highlight these in Figures 2 and S4). We also do not highlight basal channels, to avoid overly cluttering the Figure.

• Fig 3d – Please remove the stray light blue '2016' label at Pope Glacier.

Removed.

Figure S2 - Please add a citation for the BedMachine v3 bed elevation dataset in the caption.

Done. (Figure is now Figure S3).

Table S1 - Please add the time stamp and coincident SSH information for each SAR image and interferogram, as requested above.

Table S1 now contains exact timestamps for the acquisitions used in each double-difference interferogram, along with the estimated SSH double-difference and maximum for each product (cf. our response to your General Comment). This metadata is also included in the updated GeoPackage, containing the GL dataset.