

RC2: ['Comment on egusphere-2025-2515'](#), Ola Fredin, 02 Feb 2026

We appreciate the time and expertise invested in reviewing our manuscript. We thank you for the valuable feedback and for the opportunity to strengthen our study. We have carefully considered the comments and addressed them below. Our answers are in italics.

**Specific comments:**

**Chronology and Interpretation of AIO**

The core of the paper's argument rests on the shift from older Acid Insoluble Organic (AIO) chronologies (~14 cal. ka BP) to the new foraminiferal-based radiocarbon ages (~12.5 cal. ka BP). The authors justify this by citing potential contamination in AIO dates. I recommend providing a more robust sensitivity analysis or a deeper discussion on why the foraminiferal ages are more representative of the GL retreat rather than a change in environmental conditions. Moreover, the ages derived from sparse specimens in subglacial till (~28.7 to 34.5 cal. ka BP) are interpreted as "maximum glaciation" ages. The authors should clarify the degree to which these specimens might be reworked and how this affects the "prior to ~12.5 ka BP" advance claim.

*We will provide additional explanation in the method section and additional explanation for the AIO and the reworking. The species used for the maximum glaciation age are not in situ species and they are retrieved from the subglacial till and therefore reworked. The maximum age does not influence the prior to 12.5 ka advance claim (ice was grounded at the continental shelf break ~prior to 12.5 ka BP), because this is a reconstructed minimum age from in situ foraminifera. The reworked foraminifera were not used to make this claim. The grounding line retreat was finished around 12.5 ka from the outer shelf.*

**Oceanographic Forcing and the "Dense Shelf" Regime**

The manuscript attributes the post-LGM retreat of the GL to the intrusion of modified Circumpolar Deep Water (mCDW) onto the shelf. However, the authors also identify this region as a "dense shelf regime" characterized by strong fronts and the Antarctic Slope Current (ASC), which typically act as a dynamical barrier to such intrusions. To my understanding, in current dense shelf regimes, cross-slope water exchange is generally inhibited by the density of the shelf water and the strength of the slope front. For mCDW to reach the GL at ~12.5 cal. ka BP, a breaching mechanism would have been required. I'm not an oceanographer and could be mistaken, but I suggest the authors expand their discussion (Section 6.2) to address which of the following processes likely dominated during the deglacial period:

1. Wind-Driven Shoaling? Did a shift in the westerly wind belt or local katabatic wind stress reduce the ASC barrier, allowing the thermocline to shoal?
2. DSW "Buffer" Weakening? Did an initial freshening of the shelf (perhaps from increased ice-shelf meltwater) reduce the volume of Dense Shelf Water (DSW), thereby weakening the physical buffer that separates the ice front from offshore heat sources?
3. Topographic Steering? Given the complex bathymetry of the Nielsen Basin and Iceberg Alley, did specific sills or troughs provide geostrophic pathways for

## mCDW to bypass the slope front even under a cold shelf regime?

Explicitly discussing these ocean-ice interactions would strengthen the study's conclusions regarding the "resilience" and subsequent "accelerated retreat" of the East Antarctic Ice Sheet in this sector. The authors are surely aware of the following papers, but I think they might aid in this discussion.

<https://doi.org/10.1029/2021ms002468>

<https://doi.org/10.1175/jpo-d-21-0143.1>

<https://doi.org/10.5194/tc-19-1873-2025>

<https://doi.org/10.1175/jcli-d-15-0808.1>

<https://doi.org/10.1029/2018jc014907>

<https://doi.org/10.1175/jpo-d-12-0205.1>

*We agree and will expand the discussion. We will add the following processes (1) southward migration of westerlies and upwelling of CDW. Herefore, we will carefully check your suggested and some other additional references, if needed.*

*We also will add an explanation for topographic steering, because Iceberg Alley and Nielsen Basin are deeper cross-shelf troughs.*

## GZW Dynamics and Stabilization

The study identifies several small GZWs on the mid-shelf, suggesting episodic retreat and short re-advance/stabilization phases. It would be beneficial to include a brief calculation or discussion on the sediment flux required to build these features within the proposed post-12.5 ka BP timeframe to ensure the geomorphology is physically consistent with the rapid retreat chronology.

*We agree that sediment fluxes and/or calculations would be beneficial for reconstructing these short-term stabilization events. Unfortunately, sediment fluxes from GL are not available for this area of the Antarctic continental shelf. We also did not find enough foraminifera for radiocarbon dating in cores 41-1 and 42-1 to calculate sedimentation rates for the GZWs. In general, it is really difficult to calculate sediment fluxes for paleo ice streams because the supply might change from basin to basin.*

*We inferred the short-term stabilization events from the small size of the GZWs and the short timing between GL retreat from outer shelf core PS128\_45-1 (12.5 ka BP) and mid shelf core PS128\_39-1 (11 ka BP). The retrograde topography of the basin between these two core locations will also likely have led to an acceleration in GL retreat.*

## Technical Corrections

### Acronym and Nomenclature

- **AABW/CDBW Transition:** On page 3, the authors introduce "CDBW" (Cape Darnley Bottom Water). In the discussion (Section 6.2), they shift to "AABW" (Antarctic Bottom Water). It should be explicitly stated that CDBW is a specific local variety of AABW to prevent confusion for readers unfamiliar with the Cape Darnley polynya.

*We agree and will add this.*

- **CDW vs. mCDW:** It seems to me the authors uses "CDW" and "mCDW" (modified Circumpolar Deep Water) somewhat interchangeably. Given that pureCDW rarely reaches the inner shelf without modification, the authors should standardize this to "mCDW" when discussing shelf-based triggers.

*We will check again and change accordingly.*

- **"cal. ka BP" vs "cal. ka before present":** In line 30, page 1, the authors write "12,5 calibrated kiloyears before the present (i.e., 1950 CE, cal. ka BP)". This is redundant.

*We will remove it.*

#### **Potential Typos and Unclear Wording**

*We apologize for typos and unclear wording and will correct them.*

- **Page 3, Line 77:** "As part of the East Antarctic craton, the prominent found on the Mac. Robertson Land..." . A noun is missing here (likely "prominent lithologies" or "rocks"). *Thank you for noticing, we will change it.*

- **Page 9, Line 229:** "PS128\_46-1 and 47-1 are heavily bioturbated... likewise abundant in calcareous microfossils..." . This sentence is a bit of a dangling descriptor; it would be clearer as: "The upper units of PS128\_46-1 and 47-1 are heavily bioturbated..." .

*We will rephrase the paragraph.*

- **Page 11, Table 2:** Some cells in the table appear untidy or have line break issues; it is hard to figure out some of the individual cells. This should be checked in the final typesetting.

*We will clean it.*

- **Page 18, Line 400:** "Borchers et al. (2016) propose a similar AIO deglaciation age... for the mid-shelf of the East from Nielsen Basin situated Burton Basin" . This phrasing "East from Nielsen Basin situated" is hard to read. A clearer version could be: "...situated in the Burton Basin, east of

*We will rephrase it.*