

Vries et al. (2025) - Seasonal ... - Minor revisions

June 12 2025

First of all, we would like to thank Ken Mankoff for his time in reviewing the revised manuscript and pointing out some remaining concerns. Responses to the issues raised (in blue) are written in black, and changes in the manuscript are written in red.

The authors have addressed my concern over use of MOA.

They have explained why they are using yet-another-region definition. I don't think it's a good idea or particularly helpful or useful to the study or the community, but it's not a flaw in the study. Most of the minor issues I raised have been addressed. I have a few remaining concerns.

** Flux vs mass flow rate

I strongly urge the editor to make the correct use of technical terminology a requirement for publication. Text and figure captions.

I would be very happy to be proven wrong on this opinion. I don't want to be that annoying reviewer who insists on this change, nor the editor who is continuously asking for this change. It's tiring. But I've looked into this from Wikipedia to ISO standards to textbooks, and I have not found any evidence to support use of the word 'flux' with dimensions 'mass / time' (or 'volume / time'). Flux dimensions are 'mass / time / length²'. Without area, the correct term is 'mass flow rate' (or 'volume flow rate'). Please let me know if you have solid evidence to the contrary (i.e., not just other earth science papers which may be perpetuating an error).

Based on my research, the use of flux is incorrect when attached to units Gt yr^{-1} . Citing other papers that used it incorrectly isn't a good idea. Most of our community uses this term incorrectly, which may be why the authors want to continue this tradition. It's a bit uncomfortable to start using a term that most people are not using. But it's the right thing to do. Words have meanings. I'm OK with language evolving over time, but technical terminology has a higher bar than colloquial terms.

Throughout the paper the authors now make frequent use of "input" instead of flux. That's an improvement, but 'flux' could (should not but could) actually be used in some places throughout the text where you're talking about broader concepts and there are no associated units. 'input' is better. 'mass flow rate' is the correct term because the units are implied from elsewhere in the document. But 'flux' would not be terrible. The places where it now remains in the paper are the worst places for it to remain - immediately next to units. One of the two should change. I suggest changing the word, rather than re-doing all the analysis to change the units, because the correct units ($\text{Gt yr}^{-1} \text{ km}^{-2}$) are not useful.

Following the reviewer's recommendation, we have changed the figure labeling to replace 'Flux' with 'Freshwater input' on the y-axes for improved clarity and consistency in the terminology, as well as where the word flux is next to a unit.

**** All sources**

I wrote:

"L164: Basal amount is mostly steady state. What is the goal of reporting this small amount on this month? What is the significance of this sentence?"

Reply was:

"It is true basal melt is small with low temporal variability. The sentence is included because all terms are discussed, and we want to be consistent by discussing every term."

I disagree that all terms are discussed. Please see graphics at <https://github.com/mankoff/sankey> I believe this work is missing at least frontal retreat, grounding line retreat, and sub-shelf melt if not other terms. These combined are ~80 Gt/yr in Greenland, or ~3x grounded ice basal melt.

I recommend removing basal melt from the table, adding a paragraph discussing other sources and/or limitations where you list basal melt and other terms. This could be done where you discuss the temporal issues introduced by sea ice.

We thank the reviewer for highlighting this. Basal melt is included in our study because it constitutes a component of freshwater input for which estimates are available, hence providing a more complete picture compared to leaving it out. To provide improved context, we now extend the discussion in the revised manuscript from line 352 onwards, as follows:

Solid ice discharge is determined by applying fixed flux gates, which comes with the advantage that the solid ice discharge in this study is consistent with earlier work (Mouginot et al., 2019; King et al., 2020; Mankoff et al., 2020). However, the disadvantage is that we neglect solid ice discharge due to systematic glacier front retreat, which is estimated to average 42 Gt yr⁻¹ since 2000 for the total ice sheet (Greene et al., 2024), i.e. similar to or larger in magnitude than basal melt over the studied period. Because the glacier front advances in winter and retreats in summer (63±6 Gt seasonally (Mankoff et al., 2020, Greene et al., 2024)) — the use of fixed flux gates likely leads to an underestimation of solid ice discharge in summer and an overestimation in winter. This error is however less important for a study addressing freshwater input assuming fixed outlines of the fjord, like we do here, than one addressing the freshwater budget of fjords.

**** Figure colors**

Please add

```
import matplotlib.pyplot as plt
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plt.style.use('tableau-colorblind10')
```

Or something similar and remake your figures so that they can be viewed by people who may not be able to distinguish current colors.

We share the reviewer's concern for accessibility of the manuscript. For this reason, we have ensured that the figures are well interpretable by checking our figures using the color blindness simulator Coblis (<https://www.color-blindness.com/coblis-color-blindness-simulator/>) for Anomalous Trichromacy and Dichromatic view.