

Seasonality in Terminus Ablation Rates for the Glaciers in Kalaallit Nunaat (Greenland)

Manuscript by Aman KC et al.

*Reviewed by Chad Greene of NASA Jet Propulsion Laboratory,
December 18, 2024.*

Overall impression

In this paper, Aman KC and colleagues describe the seasonal advance and retreat of 49 marine-terminating glaciers around Greenland. The paper is well written, and the language and figures are polished to perfection. The technical approach employed here is strong and the methods are well described. I know from experience that the task of combining multiple terminus datasets is not an easy one, yet the authors have done an excellent job of making it *seem* easy, due to the well-reasoned logic they employ and clarity with which they describe it. Overall, the manuscript is of high quality and I believe it will be ready for publication if the results can be framed with a little more context.

The greatest room for improvement lies in the presentation of the current results in relation to previous studies that have conducted similar types of analysis. **I would like to see clear and direct statements in the abstract and discussion/conclusion sections that offer insight into how the present results confirm, upend, or reshape our understanding of previous studies.** Many previous studies have presented observations of terminus advance and retreat in Greenland, so what makes this one different? How do the current results change the narrative, what's different about this study, what's the big takeaway, and what guidance might the authors give to IMBIE, the IPCC, ice sheet modelers, or whomever might want to build on this work? Do these results support/strengthen our understanding of something that was already known, or introduce something new?

Although the discussion section includes a review of previous studies of physical processes that can cause seasonal advance and retreat, what's missing is a direct comparison of the present results to previous results. Several previous assessments of terminus variability are even cited in this paper, but they are constrained to the Introduction section as a means of providing motivation for the present study. I'd like to see the authors circle back at the end to place the new results in context of previous studies by Black, Joughin, Moon, Kochtitzky, Catania, Fried, Wood, Schild, Cassotto, Howat, Greene, etc. I don't mean to be too prescriptive here, so adjust that list according to taste. Direct quantitative comparisons to all those previous papers may be impossible due to differences in observation periods, but the authors have the intuition and expertise here to guide readers to find key similarities or difference between the present study and previous ones.

Note: The data and code availability statements in this paper point to links that do not currently exist. Accordingly, this review does not apply to the data or code, and I'm taking it on blind faith that the data is of adequate quality and will be made available as promised.

Minor comments

Line 11 Regarding this sentence in the abstract:

“for the northwest and central west sectors, where the fraction of outlet glaciers included in our estimates is greatest, the average difference between the annual maximum and minimum in terminus ablation are ~51Gt/yr and ~25Gt/yr, respectively, compared to only ~5Gt/yr for discharge.”

That’s really hard to parse, especially for someone who has not yet read the paper. I recommend rewording to reduce the number of comma-bound clauses, because they tend to break the flow and force the reader to mentally keep track of too many little concepts and their relationships to each other.

The sentence also requires the reader to have a prior understanding of what is meant by the somewhat ambiguous phrase “annual maximum and minimum terminus ablation”, which I can try to guess the meaning of, but not confidently enough to understand the significance of its quantified rates of 51 Gt/yr vs 25 Gt/yr.

Line 115 and elsewhere I think AERODEM should be written in all caps?

<https://www.nodc.noaa.gov/archive/arc0088/0145405/1.1/data/0-data/G150AERODEM/>

Figure 4 is very nice. I appreciate how the simplicity of the diagram focuses attention on the issues that can cause anomalous terminus position picks, so the figure will be useful to anyone who has not encountered these issues firsthand.

Line 157-168 The equations in Sec 2.2.1 are relatively innocuous, but I think they’re relatively standard mathematical formulations, right? If there’s something nonstandard going on here, be sure to mention it explicitly, otherwise I think it would be sufficient to say you plot the power spectral density of the terminus ablation time series and remove the equations.

Rather than reading equations, **in this section I would like to see PSD plot(s) that illustrate seasonal vs erratic glaciers because a major conclusion of the paper depends entirely on how the PSD is interpreted.** Showing those PSD plots will help readers gain an intuition for how the results are obtained and how sensitive the overall findings might be to subjective differences in interpretation.

Figures 5-7 I think I’m missing something here, because panel c is presented at monthly resolution, whereas the observations in panel b are presented in irregular intervals. I would expect the overall Mass time series to be the integral of the Ice Flux time series, but that’s not what these panels look like. Please explain how they’re related to each other.