

The Cryosphere Discuss., referee comment RC2 https://doi.org/10.5194/tc-2022-176-RC2, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

## Comment on tc-2022-176

Anonymous Referee #2

Referee comment on "Weekly to monthly terminus variability of Greenland's marineterminating outlet glaciers" by Taryn E. Black and Ian Joughin, The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-176-RC2, 2022

## Summary:

In the manuscript Black and Joughin present a monthly (to sub-monthly) dataset of terminus positions for >200 marine-terminating glaciers of the Greenland Ice sheet between 2015 and 2021. The authors use this data set to characterise and evaluate seasonal variability. Specifically, they find: 75 % of their studied glaciers show significant seasonal variability; seasonal retreat to begin in mid-May and advance in early October, on average; retreat events to peak in late summer and reach a minima in late winter; and a stronger correlation between seasonal magnitude and velocity as opposed to magnitude and glacier width.

Whilst several aspects of the work have been reported on before, the scale at which the analysis has been conducted is unique and provides new insights into ice-sheet-wide trends of seasonal terminus position variability and—for the six-day data—the frequency and seasonality of glacier retreat events.

Overall the manuscript is well written and structured, and the dataset will be a useful (and impressive) addition to the growing availability of ice-sheet-wide studies of glacier termini. I recommend the manuscript be accepted after some minor revisions outlined below.

## Main points:

- As highlighted in the review of RC1 (07 Oct 2022), the data analysis and comparison with other data (e.g. Section 5.3 and 5.4) misses opportunity for more thorough investigation. For example, furthering their comment 2, there is no real investigation/discussion on how or if seasonality has changed over your study period, or longer, at glacier or sector scale. This is important as highlighted in the abstract and elsewhere (e.g. Felikson et al. [2022] doi:10.1029/2021JF006249) seasonal fluctuations can influence longer-term glacier dynamics. A more thorough analysis here would certainly strengthen the manuscript and further highlight the glaciological application of the dataset.
- One of the more novel findings of the work is the association between seasonal magnitude and velocity as opposed to glacier width, but some of this analysis is buried in the supporting material. It would be worth merging Figures S6 b and S7 and placing these in the main manuscript.

## Specific points:

- Lines 57 -60. You specify that a detailed investigation of the causes of seasonal variability is beyond the scope of the manuscript, but include some basic analysis and arguments in this regard in Section 5.2. Consider rewording to better highlight the comparisons. `...beyond the scope of the paper, rather we discuss the potential role these factors may have.'?
- Lines 80-81. Please provide an indication of how much data is missed (e.g. median % coverage of the glaciers).
- Lines 107-113. This method feels more akin to the curvilinear box method. If so I'd also reference Lea et al. (2014) doi: 10.3189/2014JoG13J061.
- Line 130. How were the data detrended? Linear as per Section 3.2?
- Line 142. 'threshold value of 50 m' à 'threshold value of 50 m (i.e.  $2\sigma$ )'
- Line 163. `...as described above' à `...as described in Section x.x'.
- Line 240-242. Have you explored if there is any relationship between duration of retreat and magnitude of retreat? Could be worth exploring?
- Line 266. Add references to Howat et al. (2010) doi: 10.3189/002214310793146232 and Bevan et al. (2019) doi: 10.5194/tc-13-2303-2019.
- Line 315. More recent papers by Brough et al. (2019) doi: 10.3389/feart.2019.00123 and Bevan et al. (2019) doi: 10.5194/tc-13-2303-2019 highlight similar findings for Kangerlussuaq and cover more of your study period. Include these references here too.