Responses to the editor

We are grateful for the comments provided by the editor. Please find below our answers in red to the editor's comments in black and the suggested changes in the MS main text in red.

On behalf of all authors,

Jiangjun Ran

Comments to the Author:
Dear Drs. Ran et al.,

Thanks for submitting your manuscript to The Cryosphere Discussions and your thorough response to the two reviewers' comments. I am generally satisfied with both your responses and revisions to the manuscript. The arguments are clearer and now better focused on the most significant and defensible elements of your seasonal mass-anomaly analysis, rather than the mass trend or the areas with seasonal signals that aren't yet clearly significant. The latter half of the manuscript is particularly strong now. Below I have several minor comments for consideration prior to a final decision on your manuscript.

We appreciate the insightful comments by the editor. We have changed the manuscript accordingly. For more details, please see the text below.

The abstract still misses the mark a bit and doesn't highlight the key discovery from this study as well as the title does. I have several suggestions for it:
- If appropriate (I believe it is), add "and previous studies" to the end of the sentence that starts with "This estimate…".

Done.

- For the sentence that presently starts with "Most importantly,", I suggest a revision along the lines of: "We further identify a seasonal mass anomaly throughout the GRACE record that peaks in July at 80–120 Gt and which we interpret to be due to a combination of englacial and subglacial water storage generated by summer surface melting.

Done. Thank you very much for this suggestion, which makes the abstract better hightlight the key discovery from this study.

- Add a concluding sentence on what future studies could do be better understand the seasonal mass anomaly or its broader significance in the glaciological investigation of the GrIS. This is important to connect with the second sentence of the abstract, which refers to needing a better understanding of "mechanisms driving the observed mass loss" but the rest of the abstract doesn't really address that need.

Done. We add

"With the improved quantification of meltwater storage at the seasonal scale, we highlight its importance to understand glacio-hydrological processes and their contributions to the ice sheet mass variability."

- 1/10: SE and NW abbreviations not needed or then used in abstract.

Done. We have removed the abbreviations.

- 1/12: “Gt” should be spelled out if not associated with a specific value.

Done. Thanks.

Other minor comments:
1/15: “(0.4–1.2)” range seems unnecessary here.

Done.

1/17: Already defined GrIS on 1/14.

Done.

2/12-14: Reword the new sentence as it is awkward and unclear as presently constructed.

Done. We changed to
“Importantly, ice flow velocities have increased during the last decade and shown different spatial and temporal patterns (Moon et al., 2012).”

2/21: “…a few marine-terminating glaciers were investigated by, e.g., Howat et al…”

Done.

2/24: I suggest changing this first sentence to: “GrIS mass balance also depends on supra-, en- and subglacial meltwater storage”.

Done.

2/26: Change to: “However, time-varying total englacial and subglacial meltwater retention…has been poorly quantified…”.

Done.

2/32: “So far, no attempt to quantify…”

Done.

3/13: “components” not “compartments”.

Done.

6/13: “Previous studies on the…”

Done.

Figure 2: X-axis label is wrong. Should simply be “Year CE” rather “Time (Yr)”. Same applies to all other figures whose x axes cover multiple years, e.g., Figure 10.

Done.

9/21: Mass anomalies or mass change anomalies? Unclear

Done. We have changed it to “mass change anomalies”.

9/22: “…contributes 75% of the total acceleration…”

Done.

9/25-26: “However, we note that the…”

Done.

10/1: “…we refer the reader to…”

Done.

Figure 7 caption: Not necessary to mention unit at end of caption.

Done.

Figure 8: Stack these three panels to make better use of space.

Done. We did the same for Figure 7. Thanks.

20/7: “…revealed the presence of the short-term…”

Done.

Throughout the manuscript:
- Gt yr–1 not Gt/yr.

Done.

- Spell out “Gt” as “gigatonnes” when not assigning the unit a specific value, e.g., 13/29.

Done.

- No need to hyphenate “englacial” or “subglacial” except “en-“ on 2/2.

Done.

- 2/5 and elsewhere: “(mass per unit time)” not “(Gt per time unit)” or “(mass per time unit)”.

Done.

- 2/15: Am I correct in thinking that “intra-annual” and “seasonal” effectively mean the same

thing here? If possible, it would be good to select one and use throughout. IMO, “seasonal” is more evocative and correct.

Done. We have unified to use “seasonal”. Thanks.

- 2/24: “retention” and “storage” are also effectively synonyms here, so it would be best to pick one and stick with it.

Done. We choose to use “storage”. Thanks.

- For all figures that showing months with all or a portion of the seasonal cycle, it would be more accurate visually to show the seasonal patterns at the middle of the month rather than its beginning, given that they are monthly averages. Further, the x axis label should then be month abbreviation instead of numbers, since month names are referred to in the text, not month numbers. For example, for Figure 6: A M J J A S O N instead of 4-11, with the labels and values shown at 4.5-11.5 instead of 4-11 and across a new range of 4-12.

Done.