

Dear Etienne

Thank you for your latest assessment of our paper: 'Unravelling the long-term, locally-heterogenous response of Greenland glaciers observed in archival photography'. We are very pleased to see that our paper has been accepted, subject to us making some final minor changes. We have now acted upon these, and detail how we have responded to these below. Your comments are indicated in red text, with the line-number on which each comment is found in the previous version of the manuscript. How we have dealt with and responded to each comment then follows in black text.

You also mentioned a new paper that we could perhaps reference in our paper. However, we are a bit reluctant to do so for fear of not doing it justice, and in case it appears as if we have added it in at the last minute. We hope that is acceptable.

We hope that you will find our responses to each point below satisfactory.

Kind regards

David

Line 16: To which time period does this value refer to? A single mass balance year? Is not 375 Gt/yr sufficient?

We agree that we do not need to state this sea level rise equivalent, so we have removed this as proposed. This opening passage now reads:

"Two decades ago, the GrIS was considered to exist in a state of quasi-stability with its regional climate, but recent climatic warming trends have resulted in it becoming by far the largest contributor to global sea level rise (Hanna et al., 2012; Van den Broeke et al., 2016). Between 1992 and 2018, (3902 ± 342) Gt of ice was lost from the GrIS (Shepherd and IMBIE Team, 2020), but this has accelerated to an annual loss of 375 Gt a⁻¹ of ice (on average) in the last decade (Enderlin et al., 2014; Van den Broeke et al., 2016)."

Line 19: We are now in 2022, the sentence does not work.

This is a legacy of when we first started working on this paper. However, we have now modified this sentence so that it now reads:

"In 2021, surface melting across large parts of the southern and coastal regions of the GrIS was observed, with 2021 being the joint 14th highest melt year to date, with volumes substantially greater than the 1981-2021 average (<http://nsidc.org/greenland-today/>)."

Line 47: I think the work by Haeberli refers to glacier in the sense of glaciers and ice caps, disconnected from the ice sheets (and inventoried on the RGI). Here you only deal with outlet glaciers of the ice sheet (am I right?). Make sure you do not create any confusion between these two entities. I feel the whole paragraph below does not exactly distinguish the two. There is a bit of room for clarification.

update : I see this is clarified later in the text. Maybe mention here that your focus is on both outlet glaciers and glaciers disconnected from the ice sheet?

You are correct that we are interested in both outlet glaciers and glaciers that are not connected to the ice sheet (although as stated later on in our text: *“The vast majority of the glaciers in our study are outlets of the GrIS but... a small number are identified as being smaller local glaciers and ice caps (GICs) peripheral to the margins of the main GrIS”*). On that basis, we believe it is acceptable to retain the Haeberli (2000) reference. We are, however, a bit reluctant to mention at this point that we are exploring both outlet and disconnected glaciers. In the paragraph here in the introduction, we are simply describing how glaciers and ice masses change in response to climate and the fact that there is often substantial variability between ice masses. We feel that it would be out of place to state at this point what our precise interest is, since we do this in the subsection entitled ‘Study area’. We feel this is the correct place to make it clear where our interest lies.

Line 48: Maybe the 2019 SROCC IPCC report is the best reference here?

We agree and have changed the reference as suggested.

Line 49: To be updated.

According to the IPCC’s website, AR6 is still to be cited as ‘in press’. See: <https://www.ipcc.ch/report/ar6/wg2/about/how-to-cite-this-report/>

Line 95: It seems a lot to me for an individual glacier. Maybe you can double check? Also if this is the discharge, should not you use a positive sign. Make sure you do not describe mass balance values here for which a negative sign would be relevant.

You are absolutely correct and we can only apologise for this error. We are deriving these data from the ‘Dataset_S02’ document associated with the cited Mouginot et al. (2019) paper. However, we incorrectly have quoted from the datasheet that details cumulative mass balance data. We have thus corrected this and now quote averaged MB data over the period 2000-2017 for both Kangerlussuaq and Helheim glaciers. The text now reads:

“(e.g. Kangerlussuaq (mean mass balance over the period 2000-2017 of -8.52 Gt a^{-1} ; Mouginot et al. (2019)) and Helheim (mean mass balance over the period 2000-2017 of -6.4 Gt a^{-1} ; Mouginot et al. (2019)))”.

Line 318: did you clearly define that "local glaciers" are the one from Rastner et al. Would be worth doing so already and clearly in the introduction and then stick to this terminology.

Yes, on lines 99-100 of the previous version of our manuscript, we stated:

“The vast majority of the glaciers in our study are outlets of the GrIS but as shown in Figure 1, a small number are identified as being smaller local glaciers and ice caps (GICs) peripheral to the margins of the main GrIS (Rastner et al., 2012)”.