Response to the review of *"Projected climate change will double the Late Holocene maximum to present ice loss in Eastern Nuussuaq, Central-Western Greenland by 2070,"* submitted to *The Cryosphere*.

Reviewer 2

I read with attention and interest the article by Bonsoms et al "Projected climate change will double the late Holocene maximum...", and found it well written and organized, full of results relevant not only to cryosphere/paleoclimate specialists, but also to those dealing with the impacts of climate warming on the Arctic ecosystem in general.

My opinion is positive and I have not found any formal or substantial weaknesses. It is a modelling paper, and therefore it is not easy to read for those who are not into this subject. The data are many, the text constantly refers to acronyms, and rightly some methodological aspects are not discussed in depth. I believe that this is the only way to write papers of this type, and in any case the results in terms of glacial extension and paleoclimate are clearly expressed and usable in other scientific contexts. The use of chronological data (CRE ages) relating to glacial landforms is a point of merit, which makes the modeling even more robust.

Authors: We want to express our sincere gratitude for your review.

Please find a detailed response to your comments below.

The reviewer's comments are shown in blue, while the author's responses are shown in black

The results are discussed in light of other data available for the same area and for the Arctic region in general, and the conclusions are concise. The authors may consider adding a short list of the main results at the beginning, to help the reader to recap before reading the final comments.

The abstract has been modified to improve readability and highlight the main conclusions for a more general audience, not specifically focused on modeling. The conclusions are modified according to the suggestion, adding a short list of the main results at the beginning:

“This study provides a long-term perspective on the dynamics of Eastern Nuussuaq, Central-Western Greenland's GICs in response to climate change. By integrating geological records, ice thickness estimates, and climate model projections, we contextualize present and future glacier loss within the Late Holocene.

The IGM was calibrated and validated using various parameterizations to accurately simulate glacier ice thickness and area. After a long-term spin-up simulation, the model stabilized, closely matching available ice thickness data and satellite observations from RGI6.0. The optimal configuration reproduced ice-thickness estimates with an error of less than 10% of the total accumulated ice thickness for the modelled area. Subsequently, the model was forced with an different temperature and precipitation scenarios, validated with CRE records, enabling the quantification of glacier retreat since the MIE of the Late Holocene. For future projections, IGM was driven by CMIP6 climate scenarios (SSP2-4.5 and SSP5-8.5), providing a comparative framework for past and future glacier recession in a changing climate. The main conclusions of this study are as follows:

- The MIE of the Late Holocene was reached when temperatures were 0.75°C to 1°C lower than the baseline climate period (1960-1990) under a calibrated melt rate factor.
- Currently, glaciated area ice thickness has retreated by 15% (low-end melt rate) to 20% (calibrated melt rate) compared to the MIE of the Late Holocene.
- Glacier mass loss is projected to occur at an unprecedented rate within the Late Holocene. Future simulations for 2070-2080 indicate a retreat more than double (-56±6%) compared to the ice loss from the MIE of the Late Holocene to the present.
- The glaciated area is expected to disappear towards 2090-2100.

Results confirm the ongoing imbalance of Eastern Nuussuaq, Central-Western Greenland GICs and highlight the unprecedented nature of current glacier shrinkage within the Late Holocene. Projections suggest that climate change will accelerate ice loss beyond historical trends, transforming Arctic landscapes, increasing deglaciated areas, and promoting the formation of new lakes. These findings enhance our understanding of Arctic peripheral glacier responses to anthropogenic climate change, with broad implications for hydrological and ecological systems.”