We thank the three anonymous referees for their valuable comments and constructive criticism.

All the referees' minor comments (including Figures, Tables, and typos) will be incorporated in the revised version of the manuscript. We will provide tracked changes and a detailed description of how, and where, each minor comment is addressed in the revised manuscript.

Below, we explain how the main (major) comments will be addressed in the revised manuscript:

1) **Clearly defining the meaning of tipping point** (raised by all referees), and more in general, **avoiding too vague terminology in the text** (raised by Referee #1);

In the revised version of the manuscript the meaning of tipping point will be clearly defined early in the text. To directly answer the referees: in this study we refer to the following definition of tipping point from Lenton, Early warning of climate tipping points, Nature Climate Change, 2011: *"A climate 'tipping point' occurs when a small change in forcing triggers a strongly nonlinear response in the internal dynamics of part of the climate system, qualitatively changing its future state".* This is exactly what we find in our study: a minor change in the initial Surface Mass Balance forcing (SMB: from 255 Gt/yr to 230 Gt/yr) and global mean temperature (from 3.2 K to 3.4 K) triggers an abrupt nonlinear change in the Greenland ice sheet equilibrium volume (from 50% mass to nearly complete deglaciation). Our study does not aim to address either the multistability or the reversibility of the Greenland ice sheet: we will add explicit clarification in the manuscript. For instance, in the introduction:

"Although the concept of a 'tipping point' is often associated with irreversibility, hysteresis, and self-perpetuating mechanisms, it is important to clarify that the primary focus of our study is not to investigate the multistability or the reversibility of the Greenland Ice Sheet (GrIS). Instead, we are primarily concerned with understanding the potential surface mass balance (SMB) threshold for complete melt of the GrIS, the processes that control this threshold, and whether it exhibits characteristics commonly associated with tipping points, such as sensitivity to external forcings.",

and in the discussion section 4.2 where we discuss the implications:

"In this discussion section, we examine the behavior of the Greenland Ice Sheet (GrIS) with a specific focus on the potential tipping point associated with the surface mass balance (SMB) threshold for complete melt. While we discuss the GrIS's responses to sustained melt, the non-linear and abrupt nature of those responses and the sensitivity to external factors, it is important to reiterate here that our primary objective is to explore the SMB threshold itself, rather than the aspects of multistability or reversibility often associated with tipping points. "

As for other too vague terminology ("runaway", "stabilising", "topographically-controlled tipping point", "pinning point"), changes will be made to define specific terminology upfront or rephrase more clearly.

2) **Estimating uncertainties to test the robustness of the presented result** (raised by Referee #1);

To explore uncertainties related to the GIA parametrization, we have repeated two key simulations (before and after tipping point, i.e. +3.2 K and +3.4 K, respectively) while varying two model parameters (i) the viscoelastic relaxation time of the mantle (default value: 3000 years; values explored 1000, 6000, 10000), (ii) the lithosphere flexural rigidity (default value: 0.24e25; values explored 0.24e24, 0.24e26). The choice of model parameters and their values was guided by results presented in Zweck and Huybrechts, Modeling of the northern hemisphere ice sheets during the last glacial cycle and glaciological sensitivity, Journal of Geophysical Research, 2005. From a first-order analysis of the new set of runs (ice volume timeseries) our results seem robust: the Greenland ice sheet loses more than 80% of its mass for a +3.4 K forcing independently from the values of the mantle viscoelastic relaxation time and lithosphere flexural rigidity. A more detailed analysis of this set of experiments will be included in the new version of this manuscript, drawing conclusions on how robust the SMB threshold with respect to the GIA parametrization is.

Referee #1 has also asked us to assess the robustness of our results for different values of the lapse-rate air temperature correction. Unfortunately, this is not technically feasible. The SMB forcing at multiple Elevation Classes used in our study has been previously calculated (using a fixed lapse rate air temperature correction of -6 K/km) in the fully coupled CESM2/CISM2 1pctCO2 simulation described in Muntjewerf et al., Accelerated Greenland Ice Sheet Mass Loss Under High Greenhouse Gas Forcing as Simulated by the Coupled CESM2.1-CISM2.1, JAMES, 2020. Testing the sensitivity of the SMB threshold found here to the temperature lapse-rate correction would require coupled land/ice sheet model (CLM5-CISM2) simulations forced with atmospheric forcing data (see "CLM5.0 User's Guide, Section 1.5.7"). This model setup is in theory feasible but has never been tested before. Moreover, 3-hourly (!) atmospheric forcing data needed to force such land/ice sheet simulations are not available, as they were not saved from the fully coupled 1pctCO2 CESM2/CISM2 simulation (Muntjewerf et al 2020) to avoid excessive output storage. Therefore, producing atmospheric forcing data would require first running again fully coupled CESM2/CISM2 segments. Overall, running additional simulations suggested by Referee #1 to test the impact of the lapse would require an amount of model development and computing time beyond those available for this study. The impact of different lapse-rate correction values on the CLM prognostic melt energy and SMB gradients over the Greenland ice sheet using the Elevation Classes method has been discussed in detail in Sellevold et al., Surface mass balance downscaling through elevation classes in an Earth system model: application to the Greenland ice sheet, The Cryosphere, 2019. In the revised version of the manuscript, we will include this reference, and an explanation of why different values of the temperature lapse-rate correction cannot be explored.

3) **Proving our hypothesis that the topography is a major control on the Greenland ice sheet tipping point** (raised by Referee #1);

We thank Referee #1 for suggesting an interesting approach to strengthening our case, that is: "*If the authors wanted to prove this statement, they could for example prevent this region from deglaciating in the strong warming simulations (by not changing the SMB there for example) and showing that this means also the rest of the ice sheet does not vanish*". We followed this suggestion by repeating 'high-melt' simulations +3.4 K, +3.6 K, and +3.8 K while inhibiting the SMB-height feedback around the high-topography region in the Central West (red region in Figure 1 below). This means that in the highlighted region the SMB is held constant, as suggested by Referee #1. Keeping the SMB fixed in this region prevents the Greenland ice sheet complete mass loss in the 3.4 K and 3.6 K runs, with a final ice sheet volume of ~50% and ~40% of the preindustrial value. This proves that the surface topography in the central West exerts a major control on the ice sheet tipping point. In the 3.8 K run, the SMB forcing is sufficiently high for the ice sheet to detach from the central western fixed-SMB region and then rapidly retreat all the way to the East. The revised version of the manuscript will include a thorough description of these new experiments, with additional figures showing the bedrock and surface topography in the central West.

Figure 1: the red area indicates the region where the SMB-height feedback is inhibited (and as such, the SMB is held constant).