I thank the authors for their thorough answers. They have notably included a few important points in the discussion. I still have some minor suggestions to make the paper more convincing.

- 1) The simulated ice sheets in the course of the simulations show a negative trend in ice volume, leading to a ~40-50% ice loss from their initial value. I previously pointed out that such transient response may raise doubt in the experiment setup: is the imposed forcing too strong to maintain an ice sheet?
The authors put forward three points that can explain this trend: i- ice volume hysteresis; ii- orbital variability and iii- refreezing / sub-shelf ice accretion.
The two first points are indeed expected. A simple way to close the debate, and thus to reinforce your conclusions, would be to present the results of your ice reconstructions when the orbital forcing is also included, following the setup of a previous paper in your group (Banderas et al., 2018). In doing so and showing that your setup can broadly reproduce the expected Eurasian ice sheet volume change (e.g. a maximum ice volume between 26 to 21 k), readers will be definitively convinced of the validity of your setup, strengthening your conclusions.

We have followed the referee's suggestion by performing two additional simulations and made a new accompanying figure. Figure S6 shows the ice volume evolution when the orbital forcing is also included. This figure clearly shows that we can reproduce "the expected Eurasian ice sheet volume change (e.g. a maximum ice volume between 26 to 21 k)." Therefore, as the referee points out, it proves the validity of our setup.

Please see new Figure S6. A reference to this new figure has been added in the Discussion section of the manuscript.

Finally, refreezing does occur below the grounded and floating ice. Refreezing is by definition melt water that turns back to ice under certain conditions. I agree that locally this refreezing can lead to ice accretion. On a larger scale however, refreezing leads, at best, to a net zero mass balance. In order to have model grid-size scale (40km) ice accretion, it means that ocean waters turn into ice. This might happen but I doubt that a substantial ice-sheet scale ice growth (i.e. a few metres of SLE per millenia) can be due to this phenomenon.

We appreciate this final nuancing of the role of ice accretion by the referee. Indeed, we already removed refreezing under the ice shelves in the previous version of the manuscript. Thus, the current experimental set up totally satisfies the referee's view on refreezing.

- 2) I appreciate the discussion on the limitations of the model on the grounding line migration, although you only discuss the role of resolution. You should also mention that there are ways to cope with coarse resolution models such as flux adjustment derived from analytical formulations (e.g. Schoof, 2007) or subgrid grounding line computations and basal friction scaling (e.g. Winkelmann et al., 2011).

We agree with the referee and have included a sentence in the Discussion section, where we discuss these other methods of treating the grounding line. It reads: "Sub-grid parameterizations (e.g. Feldmann et al., 2014; Winkelmann et al., 2011) or flux adjustment derived from analytic formulations (e.g. Schoof, 2007) have been proposed as methods to treat the grounding line in coarse resolution models"
We have also included the references to the mentioned studies.

- 3) I previously asked for a 2D map of the imposed forcing changes, i.e. SMB and sub-shelf basal melting rate, around an idealised DO event (for example a change from beta=-1. to beta=1. On top of your initial topography). This allows the reader to have a grasp of what the ice sheet is actually experiencing. In your answer you point me to Fig. 1 and 3 which show the absolute temperature and precipitation and their changes. However: i- Fig. 1 and 3 are the direct outputs from CLIMBER3 (not scaled to NGRIP) and thus it is not what you actually use as a forcing; and ii- it is not straightforward to convert a summer temperature to a SMB.
I agree that the paper is already long but this kind of figure seems to me even more important than Fig. 3 which shows climatic fields that are not directly used by the ice sheet model.

As a side note: I do not understand what is depicted in the figure of your answer R2 SC3b. I assume it is interstadial minus stadial since you have a more negative SMB at the margins. Also, there is no indication on which beta change this figure is based on, nor if it is computed after the atmospheric scaling. In any case, this kind of figure along with the sub-shelf melting anomaly (or potential melt if there is no ice shelf) would be an important addition to the paper.

We have now included a new figure (Figure S5) which shows the SMB and sub-shelf basal melting (basal mass balance; BMB) anomaly fields as requested by the referee. This new figure is built by choosing the periods around DO12 as we did for figure 7. The stadial period previous to DO12 has a value of beta of ca. - 0.5 and the posterior interstadial a value of ca. 1.5. We have referenced the new figure in the Results section.

As previously stated in the paper: *"The rate of ice loss by basal melting is similar to that resulting from the increase in ablation (as reflected in the SMB) during the peak of a stadial-to-interstadial period. However, basal melting is much more efficient than surface mass balance in decreasing volume along the whole duration of an interstadial. This is due to the fact that ablation is restricted to the southern borders of the EIS. Thus, when the ice sheet has retreated to areas of no ablation, in spite of a slight further loss provided by the elevation feedback it rapidly equilibrates and a negative surface mass balance cannot propagate further inland. In contrast, when enhanced basal melting from higher oceanic temperatures is applied, the associated retreat can propagate further inland occupying a large proportion of the Bjørnøyrenna basin and facilitating high rates of volume loss (although similar in amplitude with respect to SMB) during the whole interstadial period (see the animation corresponding to ALLsrf and Figure S5 in the Supplementary Information)".*

This description is now furtherly supported by the inclusion of Figure S5.

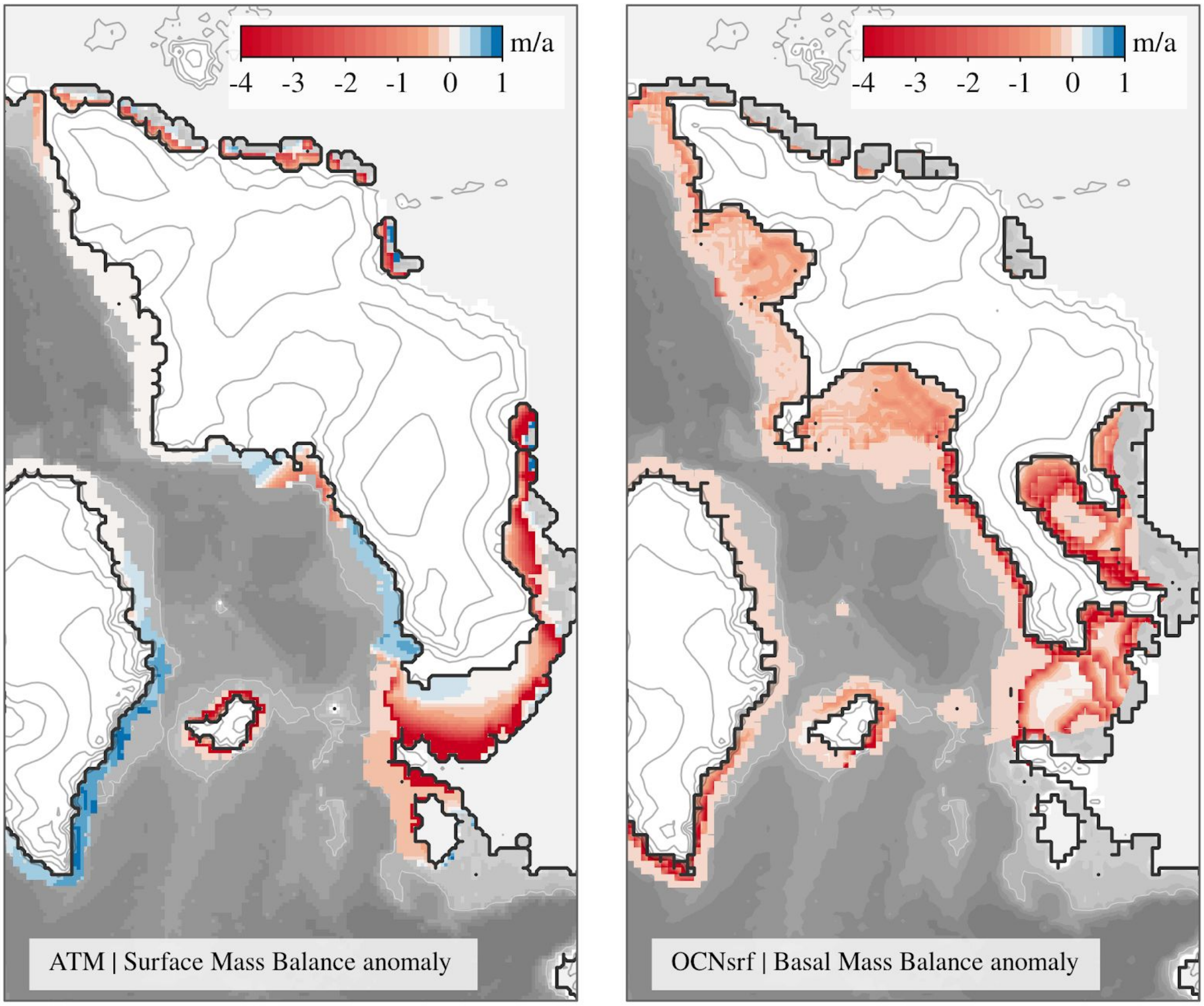

Figure S5 | Surface (left) and basal (right) mass balance anomalies during DO12 (i.e. SMB and BMB fields at 47.5 ka BP minus those fields evaluated at 45.6 ka BP).

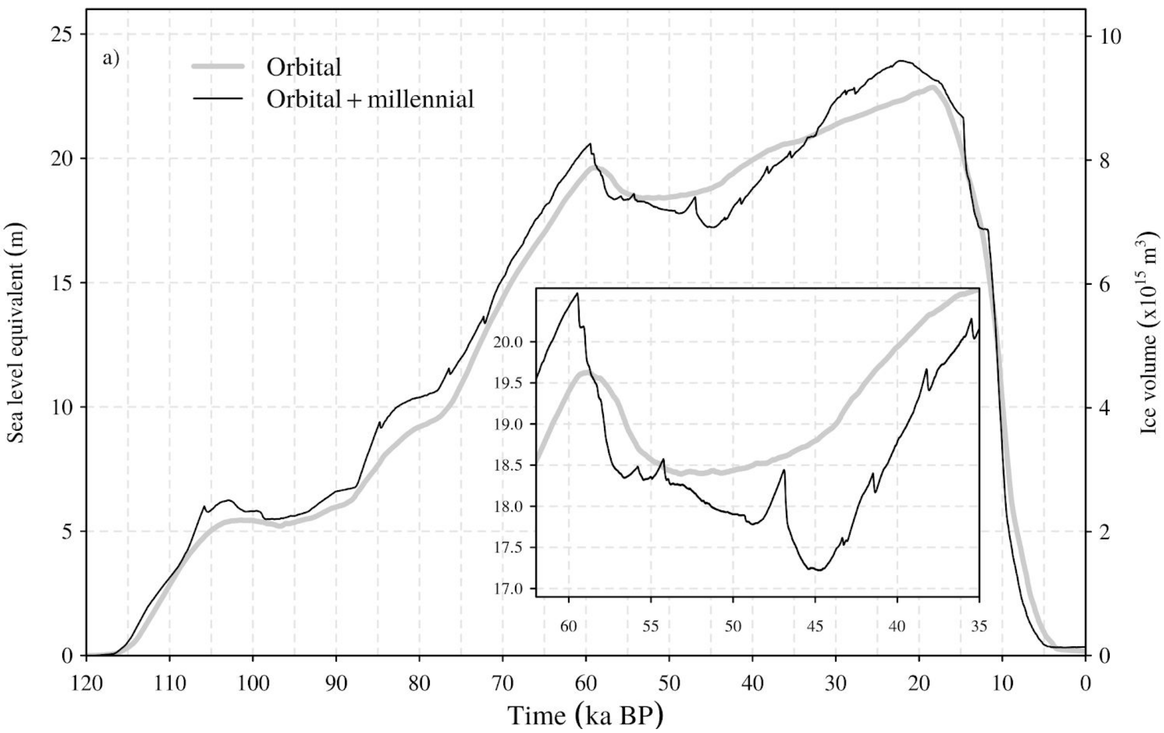

Figure S6 | Eurasian ice volume evolution for the last glacial period when including the orbital forcing alone (grey) and the orbital and millennial components together (black). The inset shows the evolution during MIS3.