

Reviewer #1

General comments

The authors have done a great job at addressing most of my comments. There are nonetheless two points that still need to be improved:

First of all, we would like to express our sincere gratitude to the reviewer for their thorough comments and constructive suggestions, which have greatly contributed to improving the quality of our manuscript. We also appreciate the reviewer's recognition of our efforts during the revision process, and we have learned a great deal through this experience. Next, we will address the two remaining points raised by the reviewer.

1- To keep a realistic freshwater budget for the ocean in the accelerated approach, the authors suggest "applying periodic restoration techniques to adjust the ocean's salinity and temperature fields using observed or targeted values". For multi-centennial projections, which are identified as the ideal target for the accelerated approach, such restoring nonetheless requires the prior knowledge of temperature and salinity projections. Hence, the accelerated approach would only be applicable for a kind of downscaling of the CMIP simulations with an ice sheet-ocean model, not for a fully coupled climate model with interactive ice sheets. This should be mentioned in the discussion.

We thank the reviewer for pointing out the limitation of 'applying periodic restoration techniques to adjust the ocean's salinity and temperature fields using observed or targeted values' in fully coupled climate models with interactive ice sheets. In lines 571-574 of the revised version of the manuscript, we have incorporated a discussion of this limitation, which states: "For multi-centennial projections, the ideal target for the accelerated approach, such restoration requires prior knowledge of temperature and salinity projections. As a result, the accelerated approach is most applicable for downscaling simulations from the Coupled Model Intercomparison Project (CMIP) using an ice sheet-ocean model, rather than for fully coupled climate models with interactive ice sheets."

2- It is a problem that the abstract does not clearly state the caveats (challenges) of this approach. Currently, the abstract ends with "When appropriately applied, the accelerated approach can be a useful tool in coupled ice sheet-ocean modelling", which is not really demonstrated given the remaining questions on the mixed time scales (seasonal to climate trends) in realistic simulations and the associated challenge to close the ocean freshwater budget (see previous point).

We apologize for the omission in the abstract. To address the caveats of the accelerated forcing approach in the abstract, we have replaced the sentence "When appropriately applied, the accelerated approach can be a useful tool in coupled ice sheet-ocean modelling" with "We have also discussed the limitations

of applying the accelerated forcing approach to real-world scenarios, as it may not be applicable in coupled modeling studies addressing climate variability on sub-decadal, decadal, and mixed timescales, or in fully coupled climate models with interactive ice sheets. Nevertheless, when appropriately applied, the accelerated approach can be a useful tool in process-oriented coupled ice sheet-ocean modeling or for downscaling climate simulations with a coupled ice sheet-ocean model.” This revision has been made in the abstract of the revised version of the manuscript (lines 18-23).