

***Detailed response to the reviewer of the manuscript
“Mechanism for potential strengthening of Atlantic overturning prior to collapse”
by D. Ehlert and A. Levermann***

Referee #1 (A Cimatoribus)

I think that the manuscript has been substantially improved in its new version. While the work presented has remained essentially the same, the authors now discuss more thoroughly the critical elements of their approach. I also appreciated the addition of the results from the EMIC. In my view, the manuscript can be published after minor revision. In particular, I have two comments:

- Line 286: I cannot understand this sentence, the authors should explain this point more clearly.

Response: Thank you for the detailed reading. The sentence has been rephrased to (see new manuscript page 9, line 286):

Consequently, only solutions of the pycnocline depth for the governing equation (equation A7) under freshwater forcing which fulfill the parametrization of the northern sinking (equation 1) are allowed.

- In section 5, the author should discuss the different definition of the forcing flux between the EMIC and the box model, which may possibly be the essential difference.

Response: We agree with the reviewer that the different forcing fluxes might be relevant, especially due to the lack of thermal feedbacks in the conceptual model. We have added a discussion to emphasize this difference. We further mention that the simple geometry and the equilibrium assumption of the conceptual model are further possible reasons for the different behaviour. (See new manuscript page 11, lines 350-356)

- I would also suggest to re-edit the new parts, which do not read as smoothly as the old ones.

Response: Thank you for the comment. Minor edits have been made in the new paragraphs in order to improve the writing. (See new manuscript p7, lines ~200 and p11, lines 340-360)