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Version: Revision II

Title: Dynamic and Steric Sea-level Changes due to a Collapsing AMOC in the Community Earth System Model

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Point-by-point reply to reviewers

April 10, 2026

Reviewer #2

van Westen et al. have generally well addressed the comments in my previous review. In particular, the methods section is significantly clearer (although it could be streamlined). Moreover, I appreciate the addition of section 4.2. However, I still think the manuscript would benefit from more clarity in the language used, since many descriptions and statements are still very convoluted and/or conflicting. Overall, I think these would be simplifications or reductions of what is currently written. Lastly, I think it is important that the authors take more care to distinguish the 'AMOC-collapse induced' and 'AMOC-induced' effects on DSL, since these are very different. This is particularly relevant in the conclusions. I would recommend publication once these have been addressed. All line comments are relative to those in the tracked change version.

Author's reply:

We thank the reviewer again for their careful reading and for the useful comments on the revised manuscript. We incorporated the reviewer's suggestion and further streamlined parts of the manuscript, please see our replies below.

Specific Comments:

1. *L19: For broader framing in the introduction (or elsewhere), the authors may want to cite this recent study: K. Seeger, P. S. J. Minderhoud, Sea level much higher than assumed in most coastal hazard assessments. Nature, (2026).*

Author's reply:

Seeger and Minderhoud provide a method to improve the estimation of sea surface height compared to land elevation. Here, we only provide changes in sea level over time rather than compared to the land because we do not study flooding of land areas.

Changes in manuscript:

No changes in the manuscript.

2. *L42: It would be good to cite: W. Liu, S.-P. Xie, Z. Liu, J. Zhu, Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in warming climate. Science Advances, 3, e1601666 (2017).*

Author's reply:

This is indeed a relevant reference here.

Changes in manuscript:

Reference was included.

3. *L61: I think the methods section is generally much better organised. It might be helpful to have the advantages and disadvantages and what is possible with each experiment put more succinctly in a table, rather than introducing and comparing each one in the text (which is currently very convoluted).*

Author's reply:

Agreed, an overview of the different experiments will be helpful for the reader.

Changes in manuscript:

We have included Table 1 in the revised Methods, which provides an overview of the different experiments. To streamline the text, the discussion of advantages and disadvantages has been reduced.

4. *L88: By 'cancelled', do the authors mean to say the effects of F_H are equal?*

   Author's reply:

   Correct. The F_H contribution to DSL is identical for a given F_H within the multi-stable regime and differences in DSL are therefore attributed to different AMOC regimes.

   Changes in manuscript:

   We have rephrased this sentence.

5. *L98 – L103: As they're currently written, these lines are quite vague and confuses the messaging. I'm not sure if they're necessary. I will leave it up to the editor/authors to keep or delete this.*

   Author's reply:

   It is good to keep the statement that only a single realisation is available, suggested by Reviewer #1, but we agree that the remaining part is not needed.

   Changes in manuscript:

   Most sentences were removed here.

6. *L158 – L160: As it is written, this appears to conflict with the linear approximation in d(DSL)/d(AMOC). Does consistent just mean monotonic?*

   Author's reply:

   Correct, monotonic fits better here.

   Changes in manuscript:

   Suggestion followed.

7. *L203 – L210: I still don't follow the arguments here. Are the authors trying to say that, through the equation of state, the haline contribution to density varies approximately linearly with AMOC through the AMOC weakening/collapse phase once this has been integrated over a region? Is there a temperature contribution? (see comment for L158-L160).*

Author's reply:

There is indeed a temperature contribution that tends to counteract the large-scale freshening, however, the freshening is dominant when expressed in terms of ocean buoyancy.

Changes in manuscript:

We have streamlined these sentences and also discuss the smaller temperature contribution.

8. *L491: I think the authors need to take more care here, and in similar places through the manuscript – these high values only apply for when the AMOC is collapsing and are significantly less if the AMOC were to only weaken, as most CMIP models suggest under realistic forcing scenarios. The introduction presents somewhat conflicting expectations of the AMOC's future evolution (e.g., compare L29-30 with L39-40), which, when taken with the conclusions, leaves the reader uncertain as to whether the 'AMOC-induced' changes are really that important for contemporary climate change (say up to 2100). Ultimately, these high values need to be properly framed as AMOC-collapse driven, following the manuscript's title, otherwise the results are overstated.*

   Author's reply:

   We agree with the reviewer that we need to make a better distinction between AMOC weakening and a fully-collapsed AMOC. Indeed, the very high DSL values are only relevant under a fully-collapsed AMOC.

   Changes in manuscript:

   We have streamlined the introduction and first discuss AMOC weakening effects on DSL, which is followed by a discussion on AMOC collapse effects. We also revised 'AMOC-induced DSL responses' where needed.

Technical Points:

1. *L5-7: This should probably be two separate sentences.*

   Author's reply:

   Agreed.

Changes in manuscript:

Suggestion followed.

2. *L63: Maybe just "Fully-coupled climate model simulations"?*

   Author's reply:

   Agreed.

   Changes in manuscript:

   Suggestion followed.

3. *L104: Maybe just "Ocean-only simulations"?*

   Author's reply:

   Agreed.

   Changes in manuscript:

   Suggestion followed.

4. *L145: The authors switch between 'zeta' and 'DSL' – perhaps just stick to one?*

   Author's reply:

   Agreed.

   Changes in manuscript:

   Suggestion followed.