

Author response for egusphere-2025-2326

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Letter to the Editor and to the Reviewers

Dear Editor, and Reviewer 2,

We deeply appreciate the points raised in this last iteration of the review process of our manuscript. From the ten comments provided by Reviewer 2, we have addressed all those related to textual clarity by rephrasing the sentences to improve readability and consistency with the results. We have also reorganized the items of the mathematical framework to include the model drift component before the interior transformations and have retained Figure A2, as it demonstrates that the model drift is negligible. In addition, we have addressed the concern regarding the clarity of the multidecadal oscillation in the Arctic winter sea-ice time series shown in Figure 3 by adding a superimposed fifteen-year rolling mean, which highlights the low-frequency variability more clearly.

Regarding Figure 1, we decided not to modify the remapped ρ -AMOC field as suggested by the reviewer. The alternative approach, mentioned by Reviewer 2, was carefully tested during the development of the diagnostic tools used in this study and was found to introduce numerical artifacts and to fail to ensure monotonic vertical coordinates of the density classes. The approach adopted in our analysis instead relies on the cumulative sum of density-class layer thicknesses to obtain the vertical coordinates, which guarantees monotonicity and a physically consistent streamfunction. This implementation was thoroughly validated using the FESOM, ICON, and MITgcm models, and consistently produced the most robust and interpretable results. For these reasons, and to maintain consistency with the established FESOM diagnostics, we have chosen to retain the current version of Figure 1.

Sincerely,

Fernanda D. A. O. Matos

(On behalf of the authors)