

Clim. Past Discuss., referee comment RC2
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Comment on cp-2022-63

Anonymous Referee #2

Referee comment on "No changes in overall AMOC strength in interglacial PMIP4 time slices" by Zhiyi Jiang et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2022-63-RC2>, 2022

Review of "No changes in overall AMOC strength in interglacial PMIP4 Timeslices " by Jiang et al.

This manuscript examines modelled AMOC and its impact on surface temperature and precipitation in PMIP4 mid-Holocene (6 ka) and LIG (127 ka) simulations in comparison to the pre-industrial control. It is found that PMIP4 models generally show no significant changes in AMOC strength during the past interglacials and imply limited forcing effects of the orbital parameters. The authors also discussed the influence of AMOC on the surface climate, which is not obvious during the interglacials. Based on these results the authors argued that interpretations of proxy reconstructions as driven by AMOC may not be evident during the past interglacials. The manuscript is generally clearly written and easy to understand its message. I recommend its publication pending a few minor revisions, as follows.

L45 The continental configuration should be specified. It will also be useful to include a figure showing the insolation differences between interglacials and PI as a function of calendar month and latitude.

L39&L78&Table1 More models doing MH simulations compared to LIG simulations should be consistent with the definition of Entry card.

L87&L91 The observation periods of RAPID and OSNAP are just a couple of years, and should be reflected in the comparison and discussion. The difference in AMOC strength between PI and present-day can be mentioned (e.g. Dima et al. 2022).

L104-110 Please reorganize this part of data processing to make it easier to read.

L143 Max AMOC strength at 10.3 Sv is very small.

L187 onwards I think a spectral analysis can be more accurate in estimating low frequency variability of AMOC. Also, the different lengths of each simulation can affect the significance of r^2 .

L205 Please rephrase 1.3x here.

Sec 4.2 The impacts of AMOC on the N-S surface temperature gradient and shift in precip center (e.g. ITCZ location) can also be quantified by regression. The conclusion in L272 may need to be modified.

L279 The reconstructed AMOC provides useful constraints for the model. These results should also be included in the abstract.

L287 Provide more details for changes in the atmospheric circulation.

L298-300 In an equilibrated state there can be intrinsic multi-centennial AMOC variability, e.g. as proposed by Li and Yang (2022), even after the abrupt events.

L322 This is a strong statement. I feel it is not fully supported by the current results. More analysis on the impacts of AMOC on precip center (as I mentioned before) can make it more convincing.

Fig. 4 The surface temperature changes due to AMOC forcing are robust in the Nordic Seas. I am curious how the sea-ice would respond and potentially feed back to AMOC strength.

Refs

Dima, M., Nichita, D. R., Lohmann, G., Ionita, M., & Voiculescu, M. (2021). Early-onset of Atlantic Meridional Overturning Circulation weakening in response to atmospheric CO₂ concentration. *Npj Climate and Atmospheric Science*, 4(1), 1-8.

Li, Y., & Yang, H. (2022). A Theory for Self-Sustained Multi-Centennial Oscillation of the

Atlantic Meridional Overturning Circulation. *Journal of Climate*, 1-48.