

Interactive comment on “Mid-Pliocene Atlantic Meridional Overturning Circulation simulated in PlioMIP2” by Zhongshi Zhang et al.

Anonymous Referee #2

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Review of “Mid-Pliocene Atlantic Meridional Overturning Circulation simulated in PlioMIP2” by Zhang et al. (2020)

The variation of AMOC in a warmer climate has always been the focus of climate research. The authors examined the response of AMOC and the associated changes in OHT and SST during the mid-Pliocene based on multi models in PlioMIP2. They reported a consistent increase in AMOC strength across models, whereas large model spread in terms of OHT and the depth of AMOC. More importantly, they highlighted that increased Pliocene AMOC and northward OHT maybe not a requisite for stronger warming over sub-polar North Atlantic, which is widely argued as the case in proxies. The manuscript is well written and organized and should be an important contribution to the understanding of the Pliocene climate.

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While acceptable as it is, I think the following issue that deserves additional discussion to further improve the quality of the manuscript and may have a far-reaching impact beyond the scope of Pliocene. That is, why the increased AMOC is not accompanied by enhanced northward OHT or warming (e.g., in CCSM/CESM family), as this relationship, I think, was once considered to be “true” in most cases targeting paleoclimate. Is it possible that stronger AMOC transports more energy to the deep ocean (e.g., below mix layer?) instead of the surface?

Very minor comments: Line 53, add “over North Atlantic” after “warm climate”

Lines 70-73, investigation of polar ice sheets is also an important aspect of Pliocene climates, which should be discussed here.

Line 76, the pre-industrial->the pre-industrial level

Line 85, mid-Pliocene-> mPWP for consistency throughout the manuscript

Line 87, add “the” before “state-of-the-art”

Line 101, participated in-> participating

Line 136, why use the median value instead of the multimodel ensemble mean? Please discuss

Line 142, how to measure the depth of AMOC in models? The mean depth of the AMOC cell (e.g., positive stream function?). Please define.

Line 205, considers-> consider

Line 206, participated in-> participated

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