

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

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Dear Editor and the reviewer,

Sorry for the delay. After the discussion within the PlioMIP2 group, we reply this question now.

Although an enhanced AMOC can warm high-latitudes up, observations of strong high-latitude warming in the North Atlantic are not sufficient to constrain the strength of the AMOC or OHT (Zhang et al., 2013).

The strength of AMOC measures the V contrast between upper and lower branch of the Atlantic transport, but the OHT is also influenced by the T contrast as well as the depth of AMOC. Moreover, OHT can be decomposed into a (vertical) MOC component

and a (horizontal) gyre component. While the MOC component dominates in most of the Atlantic region, the gyre component has a comparable magnitude in the subpolar region (Williams et al., 2015). Therefore, there is not a one-to-one correspondence between MOC and OHT, especially in the subpolar regions.

Furthermore, the SST warming pattern is not entirely determined by OHT. The PlioMIP models show this effect prominently, although there is probably some warming due to the simulated enhanced OHT. As suggested by an early study (Feng et al., 2017), enhanced warming in the Northern high latitudes is primarily a result of regional feedbacks.

Regards

Zhongshi Zhang and all coauthors

Zhang, Z., Nisancioglu, K.H., and Ninnemann, U.S.: Increased ventilation of Antarctic deep water during the warm mid-Pliocene. *Nature Communications*. 4, 1499, 2013.

Williams, R.G., Roussenov, V., Lozier, M.S., Smith, D.: Mechanisms of Heat Content and Thermocline Change in the Subtropical and Subpolar North Atlantic. *Journal of Climate*, 28 (24), 9803–9815, 2015.

Feng, R., Otto-Bliesner, B. L., Fletcher, T. L., Tabor, C. R., Ballantyne, A. P., & Brady, E. C.: Amplified Late Pliocene terrestrial warmth in northern high latitudes from greater radiative forcing and closed Arctic Ocean gateways. *Earth and Planetary Science Letters*, 466, 129-138, 2017.

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Discussion paper

