

March 4, 2025

Denis-Didier Rousseau
Co-editor-in-chief
Climate of the Past

Dear Denis,

Please find below our responses (in red) to the four comments by Lorraine Lisiecki, where we have revised the paper in each case according to her suggestions. I hope you find these satisfactory.

Thank you for your very efficient handling of this paper.

Best regards,

Peter

- Line 36: I found this sentence difficult to parse. Consider “These results point to changes in deep ocean circulation ... as the cause of increased ocean heat uptake and HSE.”

We changed this to read:

These results point to an increase in ocean heat uptake and HSE during the MPT in response to changes in deep ocean circulation driven largely by surface forcing of the Southern Ocean.

- Lines 678-680: I have trouble understanding how this sentence follows from the previous one. Please clarify whether the warming at 45N is causing the Southern Ocean warming or if these are associated with two separate mechanisms.

We changed this to read:

Ice-sheet forcing in the ORB+ICE+GHG simulation thus significantly enhances intermediate-depth warming that is otherwise largely occurring through wind-driven ventilation in the Southern Ocean (Fig. 14C).

- Line 692-694: Is this lag estimate derived from the ICE+ORB+GHG simulation? If so it might be worth clarifying to draw a contrast with the next paragraph that includes meltwater forcing.

Yes. We have clarified in two places that the lag is found in the ICE+ORB+GHG simulation:

During the deglaciation, the iTRACE ORB+ICE+GHG simulation shows that MOT warming lags SST warming by several thousand years, reflecting the timescale of warming the ocean interior by ventilation of intermediate waters and resulting in an average transient HSE ~0.5 that disagrees with proxy records (Zhu et al., 2024). However, this simulation shows that the lag is too short to prevent equilibrium MOT warming from being reached during the present interglaciation and HSE reaches ~1.

- Line 695: I found it hard to parse the phrase “the lag is too short to prevent equilibrium MOT

warming”. Why not state it more directly as something like “the lag is short enough to allow MOT warming to reach equilibrium...”

We have changed this as suggested.