Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., author comment AC1
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Reply on RC1

Zhiping Tian et al.

Author comment on "Transient climate simulations of the Holocene (version 1) – experimental design and boundary conditions" by Zhiping Tian et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-49-AC1, 2022

We agree that models generally show some variability of the AMOC on inter annual to decadal time scales. We have drawn the time series of the AMOC strength (defined as the maximum of the mean meridional mass overturning streamfunction below 500 m north of 28°N in the Atlantic) for the 1500 years in the early Holocene spin-up experiment. Although it shows some variability on inter annual to decadal time scales, the AMOC strength is relatively stable for the last 100 years with an amplitude of approximately 25.4 Sv. This AMOC amplitude is reasonable, since it lies within the range of the 10 PMIP4 models and is comparable to the amplitude in GISS-E2-1-G and FGOAL-f3-L for the preindustrial experiments as shown in Brierley et al. (2020). The stable trends of the AMOC amplitude as well as global mean surface air and sea surface temperatures for the last 100 years in the spin-up experiment mean that the model has reached a quasi-equilibrium state as suggested by Kageyama et al. (2018). Therefore, it is reasonable to start the transient experiment from this quasi-equilibrium state. We have added the amplitude of the AMOC in the revised manuscript accordingly (Line 216).

References:

Brierley, C. M., Zhao, A., Harrison, S. P., et al.: Large-scale features and evaluation of the PMIP4-CMIP6 midHolocene simulations, Clim. Past, 16, 1847–1872, doi:10.5194/cp-16-1847-2020, 2020.

Kageyama, M., Braconnot, P., Harrison, S. P., et al.: The PMIP4 contribution to CMIP6 – Part 1: Overview and over-arching analysis plan, Geosci. Model Dev., 11, 1033–1057, doi:10.5194/gmd-11-1033-2018, 2018.