

Evolution of meridional and zonal sea surface temperature gradients in the Pacific Ocean during the Quaternary period

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Long-term change of meridional and zonal temperature gradients in the Pacific Ocean is key to understanding the evolution of the global climate change. The asymmetric zonal SST pattern in the modern tropical Pacific, i.e. warm pool in the west and cold tongue in the east, has been gradually evolved since the Plio-Pleistocene climate transition. This zonal SST gradient has been attributed to a strengthening of the Walker Circulation. Here, we conduct planktonic foraminiferal Mg/Ca temperature reconstruction in the western Pacific warm pool (WPWP) using two species, *Globigerinoides ruber sensu stricto* and *Trilobatus trilobus*. In the modern tropical Pacific, both species calcify in mixed layer and show similar Mg/Ca temperature with a bit deeper signature in *T. trilobus*. Our temperature reconstruction using *T. trilobus* is consistent with that of ODP806, which is also in WPWP region, indicating regional representativeness. Temperature reconstruction using *G. ruber* is significantly higher than that using *T. trilobus* before 1.7 Ma, suggesting a deepening of the western thermocline at that time. This vertical temperature gradient change is accompanied by SST drop in the eastern equatorial Pacific. Therefore, our data support the strengthening of the Walker Circulation. Further, both northern and southern subpolar SST dropped at similar timing, which indicates a steepening of the meridional temperature gradient. We infer that the strengthening of the Walker Circulation at 1.7 Ma was induced by the steepening of meridional temperature gradient in the course of Northern Hemisphere Glaciation.

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