EGU2020-597, updated on 27 Sep 2020
https://doi.org/10.5194/egusphere-egu2020-597
EGU General Assembly 2020

Persistent high latitude amplification over the past 10 million years

Xiaoqing Liu[1], Matthew Huber[2], Gavin L Foster[3], R Mark Leckie[4], and Yi Ge Zhang[1]

[1]Department of Oceanography, Texas A&M University, College Station, Texas 77843, USA (liuxiaoqingdiy@tamu.edu)
[2]Department of Earth, Atmospheric and Planetary Sciences, Purdue University, West Lafayette, Indiana 47907, USA
[3]School of Ocean and Earth Science, University of Southampton, National Oceanography Centre Southampton, Southampton, SO14 3ZH, UK
[4]Department of Geosciences, University of Massachusetts-Amherst, Amherst, Massachusetts 01003,USA

When the Earth warms, the high latitudes often warm more than the low latitudes, a phenomenon commonly known as high latitude amplification. Although high latitude amplification has been observed by both climate data and models, the trajectory of high latitude amplification in our future changing climate is uncertain. Pacific-wide reconstructions of sea surface temperature variability from past climates are important for establishing the historical records of high latitude amplification. Multiple extratropical temperature records have been established for the past 10 million years (Myr). However, it is debated whether the warmest end member, the Western Pacific Warm Pool (WPWP), warmed during the late Miocene (~12 to 5 million years ago, Ma) and Pliocene (5 to 3 Ma). Here we present new multi-proxy, multi-site paleotemperature records from the WPWP. These results, based on lipid biomarkers and foraminiferal Mg/Ca, unequivocally show warmer temperatures in the past, and a secular cooling over the last 10 Myr. We combine these new data, along with the previously established paleotemperature records, to reveal a persistent pattern of change in the Pacific described by a high latitude amplification factor of ~1.7, which does not seem to be affected by the major climate changes over the past 10 Myr. The evolution of spatial temperature gradients in the Pacific is also evident in climate model output and instrumental observations covering the last 160 years, and thus appears to be a robust and predictable feature of the climate system. These results therefore confirm that climate models can capture the major features of past climate change, providing increased confidence in their predictions of future patterns that are likely to be similar to those reconstructed here.

How to cite: Liu, X., Huber, M., Foster, G. L., Leckie, R. M., and Zhang, Y. G.: Persistent high latitude amplification over the past 10 million years, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-597, https://doi.org/10.5194/egusphere-egu2020-597, 2019