EGU24-11155, updated on 07 Sep 2024
https://doi.org/10.5194/egusphere-egu24-11155
EGU General Assembly 2024

Paleogeographic impacts on the ocean biogeochemistry during the mid-Miocene

Yousheng Li[1], Alexander Farnsworth[1,2], and Paul Valdes[1,2]
[1]School of Geographical Sciences, University of Bristol, Bristol, United Kingdom of Great Britain – England, Scotland, Wales (ys.li@bristol.ac.uk)
[2]Cabot Institute for the Environment, University of Bristol, Bristol, United Kingdom of Great Britain – England, Scotland, Wales

Projections for the future under high scenarios using state-of-the-art Earth System Models suggest a warmer climate for both the land and the ocean, and this leads to ocean acidification globally and ocean deoxygenation. Strengthened denitrification and anammox from Oxygen Minimum Zones (OMZs) or hypoxic coastal areas would possibly enhance nitrous oxide emissions which is one of the main greenhouse gases (GHGs). However, the global dynamics of nitrous oxide are largely uncertain. Considering current emission rates, revisiting past warm periods (e.g., the Paleocene-Eocene Thermal Maximum and the Mid-Miocene Climatic Optimum) would improve our understanding of the biogeochemical-climate feedback. One of the uncertainties in such studies is the paleogeographic boundary condition which is shown to have significant impacts on the global climate and the ocean circulations. However, to date, few studies have been able to explore how paleogeographic features could impact the ocean biogeochemical processes during past warm periods. We applied a suite of sensitivity simulations with modifications only to the topographic features based on three sets of paleogeographies for the mid-Miocene, namely the Getech, the Scotese, and the Robertsons. We found there are huge differences in the ocean circulation patterns, with the strength of the Atlantic Meridional Overturning Circulation (AMOC) ranging from 0Sv to over 12Sv. We will likely see apparent biogeochemical responses accordingly, especially in tropical upwelling regions and the North Atlantic. Results TBC.