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Modelling oxygen isotopes in the Pliocene: Large Scale Features over the Land and Ocean.

Julia Tindall and Alan Haywood

University of Leeds, School of Earth and Environment, Leeds, United Kingdom (earjcti@leeds.ac.uk)

Simulations of the mid Pliocene warm period (∼3.205Ma), performed with the isotope enabled version of the Hadley Centre GCM (HadCM3) are used to discuss the interpretation of δ^{18}O proxies in a warm climate.

The model suggests that spatial patterns of ocean surface δ^{18}O were similar in the Pliocene and the Preindustrial; however there were some differences, particularly over high latitudes and coastal regions. Modelled ocean surface Pliocene δ^{18}O is closely related to modelled ocean surface Pliocene salinity, which supports using δ^{18}O as a paleosalinity proxy for this time period.

Modelled δ^{18}O in precipitation ($\delta^{18}\mathrm{O}_P$) is generally enriched relative to the preindustrial, with the enrichment greater at high latitudes, and reaching up to 25permil over Antarctica. Pliocene minus preindustrial changes in $\delta^{18}\mathrm{O}_P$ are associated with precipitation changes at low latitudes and temperature changes at high latitudes; however $\delta^{18}\mathrm{O}_P$ changes are more strongly associated with regional climate than local climate. The model suggests that when interpreting oxygen isotope proxies the location of the climate signal recorded can be more uncertain than the amplitude, and that the absence of a signal in δ^{18}O does not necessarily imply the absence of a climate signal.

The results of this study could lead to enhanced cohesion between models and oxygen isotope data for warm climates.