A N. Atlantic TEX_{86} and $U^{k'}_{37}$ Sea Surface Temperature Transect Across the Middle Miocene Climatic Optimum

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The Middle Miocene Climatic Optimum (MMCO; ~16.9-14.7 Ma) was characterized by globally elevated temperatures, interrupting the gradual Neogene cooling trend [1]. This warm period ended with the middle Miocene Climate Transition (MMCT), a time bottom water temperatures declined globally (as recorded by the $\delta^{18}O$ of benthic foraminifera), and the Antarctic Ice Sheet expanded. The MMCO and MMCT present an opportunity to study global climate when pCO_2 was similar to or somewhat higher than modern (~250 to ~500 ppm) [2]. The evaluation of regionally variable responses to complex climatic forcing and comparision of proxy data to modeling results is, however, complicated by sparse sea surface temperature (SST) records [3].

Here we constrain North Atlantic latitudinal temperature gradients over the MMCO and late Miocene (~18 to ~6 Ma) through paired $U^{k'}_{37}$-TEX_{86} SST records at ODP Site 999 (Caribbean, ~9°N at 15 Ma), DSDP Site 608 (North Atlantic, ~39°N at 15 Ma), and ODP Site 982 (North Atlantic, ~53°N at 15 Ma), at a resolution of ~200 kyr. Initial TEX_{86}^{H} data from the MMCO suggest that Site 999 and Site 608 had similar SSTs (28°C +/- 2.5°C) whereas the gradient between Sites 999 and 982 (~24°C +/- 2.5°C) was ~4°C. Following the MMCO (14 Ma – 10 Ma) the TEX_{86}^{H} SST gradient increased to ~7°C between Sites 999 (~27°C+/- 2.5°C) and 982 (~20°C+/- 2.5°C) whereas Site 608 (~24°C +/- 2.5°C) cooled ~3°C relative to Site 999. Temperatures averaged across specified intervals. $U^{k'}_{37}$ SST estimates were on average higher by ~2°C relative to TEX_{86}^{H}, but reached the calibration maximum (28.54°C) for most of the Site 999 record, preventing gradient reconstruction. The MMCO was characterized by low latitudinal gradients in the North Atlantic relative to the Late Miocene and tropical temperatures extended into the mid-latitudes at Site 608.

[1] Holbourn, Kuhnt, Lyle, Schneider, Romero & Andersen (2014), *Geology*, 42(1), 19-22. [2] Zhang, Pagani, Liu, Bohaty & DeConto (2013), *Phil. Trans. R. Soc. A*, 371(2001), 20130096. [3] Herold, Huber, Müller & Seton (2012), *Paleoceanography* 27(1).

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