

211. Mitsunaga, Bryce, Ouertani, Samantha, Lupien, Rachel, Stubbs, Brandon, Deino, Alan, Kingston, John, Stockhecke, Mona, Brown, Erik, and Russell, James, 2022, Tropical East Africa became wetter at 3 Ma: A compound-specific leaf wax biomarker record from the Baringo-Tugen Hills-Barsemoi Basin, Kenya. PAGES 6th Open Science Meeting, Agadir, Morocco

The Plio-Pleistocene (0-5 million years before present (Ma)) witnessed high-latitude cooling, the intensification of northern hemisphere glaciation (iNHG), the development of zonal sea surface temperature (SST) gradients in the tropics, and shifts in the frequency and amplitude of glacial-interglacial cycles. Although global trends are well-characterized in marine records, the dearth of continental cores hampers our understanding of terrestrial hydroclimatic changes during this time. Hominid fossil-rich East African strata are of particular interest, as paired geochemical-sedimentological and anthropological analyses can elucidate the environmental context of early hominin evolution.

The Hominin Sites and Paleolakes Drilling Project recovered a near-continuous core from a ~3.3–2.6 Ma section of the Baringo-Tugen Hills-Barsemoi (BTB) Basin, spanning iNHG, the intensification of 41,000-year (41-kyr) glacial-interglacial cycles, and key developments in Australopithecine and Homo lineages. Previous sedimentological, paleontological, and phytolith-based proxies from the BTB core suggest a shift to deeper-lake but more variable conditions around 3.04 Ma. These data could indicate a generally wetter and more variable climate, in contrast to evidence for Plio-Pleistocene drying elsewhere in Africa, but these proxies may also be affected by local geomorphic change in the BTB area.

Here, we present a new record of n-alkane-specific leaf wax hydrogen ($\delta^2\text{H}_{\text{wax}}$) and carbon ($\delta^{13}\text{C}_{\text{wax}}$) isotopes, proxies for precipitation amount and vegetation type, respectively, measured at suborbital resolution (~2 kyr). $\delta^2\text{H}_{\text{wax}}$ values record large-scale changes in atmospheric circulation, providing regional context for basin-scale records. In accordance with prior work, our data show a sudden shift to wetter, more variable conditions between 3 and 3.1 Ma, suggesting that changes in BTB hydrology were symptomatic of broader rainfall patterns. Enhanced rainfall during global cooling is contrary to thermodynamic expectations and drying observed elsewhere (North Africa, in particular). However, $\delta^2\text{H}_{\text{wax}}$ values closely correspond to the Indian Ocean west-east SST gradient, suggesting that fluctuations in Indian Ocean zonal (Walker) circulation are the primary control on East African rainfall during this time. Hemispherically synchronous high-latitude cooling around 3 Ma may also influence the observed depletion in $\delta^2\text{H}_{\text{wax}}$ values, as bipolar cooling would compress the Intertropical Convergence Zone equatorward, increasing precipitation in equatorial Africa and the BTB Basin while favoring drying over the subtropics.

Although our understanding of Plio-Pleistocene African climate is far from complete, this new evidence suggests that continental paleoenvironmental conditions were more spatially variable than previously thought. These heterogeneous landscapes may have promoted diversification and dispersal during a key period in hominin evolution.

