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Russell, J. M., Lupien, R., Cohen, A.S., Beck, C., Campisano, C. J., Castaneda, I., Deino, A. L., Feibel, C. S., Kingston, J., Lamb, H. F., and Potts, R. (2018). PP31A-07: Orbital-scale controls on Plio-Pleistocene African climate. AGU Fall Meeting, Washington, D.C.

Orbitally-induced insolation changes, ice-sheet extent, greenhouse gas concentrations, and tectonic events are all hypothesized to have affected East African hydroclimate on long timescales. Evaluating the impacts of these forcings has been challenging due to the lack of long, high resolution terrestrial hydroclimate records. Here we synthesize new, high-resolution records of the hydrogen isotopic composition of terrestrial leaf waxes (δDwax) preserved in drill cores from multiple East African paleolakes that together span key intervals of the last 3.3 million years. These records are derived from different locales within East Africa, so we correct for geographical differences in the δD of precipitation using local Holocene δDwax records to obtain a Plio-Pleistocene record of hydroclimate representative of the region. We observe a ~15 per mil enrichment in δDwax at ~2.7 Ma, coincident with the onset of North Hemisphere glaciation. This suggests that the establishment of large permanent ice sheets influences tropical hydroclimate, perhaps through southward displacement of the tropical rain belt or through global cooling at that time. However, we observe little trend in δDwax over the last ~1.5 Ma, suggesting a threshold response of African climate to northern hemisphere glaciation. Precession-band variance is found throughout the Plio-Pleistocene and dominates the variability in these records. We observe little 41-kyr or 100-kyr variability until the latest Pleistocene, when a 100-kyr sawtooth pattern is apparent alongside precession-band variations. The lack of mid-Pleistocene obliquity variations, together with 100-kyr variability in the late Pleistocene, further indicates threshold responses to global climate boundary conditions associated with glacial-interglacial variations. This compilation provides a climatic context to interpret how precipitation mean and variability influenced hominin evolution in East Africa.