

Astronomically forced climate change in the Baringo Basin, Kenyan Rift Valley 2.7-2.55 Ma

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Global climate change, linked to astronomical factors, has been implicated in faunal evolutionary change, including the origin and diversification of hominin lineages. Empirical terrestrial data from East Africa demonstrating that orbital forcing has a significant effect, or is detectable, at early hominin sites in equatorial continental interiors during the Pliocene, however, remain limited. Fluviolacustrine sediments of the Chemeron Formation exposed in the Barsemoi River drainage, Tugen Hills, Kenya, contains a package of five successive diatomite/fluvial cycles that record the periodic development of freshwater lakes within the axial portion of the Central Kenya Rift. Chronostratigraphic tie points established by $^{40}\text{Ar}/^{39}\text{Ar}$ dating of intercalated tuffs, indicate that the sequence spans the interval 3.1–2.35 Ma, with the diatomites confined to between 2.7 and 2.55 Ma. The overwhelming abundance in the diatomites of planktonic species of the genera *Aulacoseira* and *Stephanodiscus*, and the virtual absence of benthic littoral diatoms and detrital material indicate areally extensive, deep (>30–40 m, plausibly >150m) lake systems. The diatomites recur at an orbital precessional interval of 23 kyr, and are centered on a broad eccentricity maximum. These diatomite/fluvial cycles reflect a narrow interval of orbitally forced wet/dry climatic conditions that may be expressed regionally across East Africa and coincide with the onset of northern hemisphere glaciation. The timing of the lacustrine pulses relative to predicted insolation models favors origination of moisture from the northern Africa monsoon, rather than local circulation driven by direct equatorial insolation. This local succession spans thirty-five fossil vertebrate localities, including three hominin localities, providing a unique opportunity to assess the evolutionary effect of short-term climatic flux on late Pliocene East African terrestrial communities.