Paleoclimate during the emergence of *Homo erectus*: evidence from a ~1.9-1.7 Ma record of lake-margin sedimentation in northwestern Kenya

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ABSTRACT

Many studies suggest that the emergence of early African *Homo erectus* ~1.8 Ma was influenced by increased aridity and periodically cooler and dryer conditions in East Africa, caused by an intensification of the obliquity (~41-ky)-driven glacial cycles in the Northern Hemisphere. However, understanding the precise relationship between these events has been hampered by the inability to recovery high-resolution paleoclimatic data at East African hominin sites.

To address these issues we examined lake-margin facies cycles, including deepwater thinly-bedded siltstones, fluvial and beach sandstones, paleosols, and nearshore bioclastic carbonates, from the KBS Member (~1.9-1.7 Ma) of the Koobi Fora Formation, northeast Turkana Basin in Kenya.

Results suggest a humid period in the northeast Turkana Basin at 1.9-1.8 Ma, for lake-margin waters were deeper, well circulated and fresher during this time. In contrast, waters became shallower, more restricted and saline-alkaline after about 1.8 Ma, suggesting increased aridity at 1.8-1.7 Ma. It is presently unclear as to the cause of these environmental changes; however, we argue that tectonics and climate are two possibilities. Nonetheless, as the ages of the 11-bioclastic levels in the examined stratigraphic sequence correspond to insolation maxima in Northern Hemisphere summer, a ~21-ky precessional rhythm is suggested for their period of deposition, supporting a direct link between monsoon intensity and orbitally modulated insolation.

The present evidence suggests that *Homo erectus* appears in the Turkana Basin at 2.0-1.8 Ma. Our evidence rejects the supposition that this species emerged in a dry period during which short-term environmental variability was primarily regulated by glacial activity.