Tectonic and climatic controls on the paleogeographic distribution of isotopic ratios ($\delta^{13}C$, $\delta^{18}O$) from pedogenic carbonates in Plio-Pleistocene hominin habitats at Koobi Fora, Kenya

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ABSTRACT

Plio-Pleistocene East African aridity and grassland expansion is attributed to global climate change and temporally correlated with faunal evolution including that of our own lineage. Terrestrial depositional basins from where environmental proxy records are amassed respond to climate with different sensitivities and thresholds; thus, interpretations should consider basin size and partitioning, accommodation space, volcanicity and tectonic regime in addition to climate as primary influences of environmental setting and change through time.

Here we reconstruct the paleogeographic distribution of vegetation (C_3–C_4 pathways) and soil water parameters by pedogenic carbonate isotopes ($\delta^{13}C$, $\delta^{18}O$) from the Plio-Pleistocene Koobi Fora region, northeast Lake Turkana Basin, Kenya. We compare depositional landscapes in a stratigraphic interval (2.0–1.5 Ma) of the Koobi Fora Formation that temporally brackets grassland ascendancy in East Africa. During this time the Turkana Basin gradually transformed from a lake system to a flow-through river system. As a result, there was a decrease in the residence time of Omo River water in the basin, leading to reduced proportions of wooded floras and the establishment of habitats suitable for grassland communities. The paleogeographic and temporal distribution of soil carbonate isotopes coincides with the path and character of the ancestral Omo River and precursors of Lake Turkana, which we argue were controlled by tectonics *and* climate.