PP42D-1138 - Heterogeneous Hydroclimate and Vegetation in the Middle Miocene East African Rift Valley

Thursday, 15 December 2022

09:00 - 12:30

McCormick Place - Poster Hall, Hall A (South, Level 3)

Abstract

Paleoenvironmental reconstructions of eastern Africa suggest that arid-adapted C_4 vegetation began to spread at sites during the Middle Miocene, earlier than previously anticipated. Here we compare new (n=219) and published (n=103) enamel stable carbon and oxygen isotopic values ($\delta^{13}C$ and $\delta^{18}O$ values) from Kenyan Early and Middle Miocene paleontological sites (Rusinga, Loperot, Locherengan, Buluk, Maboko, Tugen Hills, Fort Ternan, and Napudet) to evaluate how hydroclimate may have influenced vegetation diversity. We observe c. 15 ‰ total variation in faunal $\delta^{18}O$ values across all sites and variation in mean $\delta^{18}O$ values between sites as high as 6 ‰, without clear temporal or geographic partitioning. Fort Ternan and Locherengan are characterized by the most evaporatively enriched water sources, while Tugen Hills and Napudet are characterized by the least enriched water sources and provide evidence for limited mixed C_3-C_4 feeding among artiodactyls, proboscideans, and rhinocerotids. Across all Middle Miocene sites, proboscideans, rhinocerotids, and anthracotheres have consistently low $\delta^{18}O$ values suggesting physiological reliance on surface water sources, whereas giraffids have consistently high $\delta^{18}O$ values indicative of ingesting evaporatively enriched water from vegetation. Proboscidean and giraffid $\delta^{18}O$ values suggest wettest conditions at Loperot (>17 Ma) and Maboko (15 Ma), and driest conditions at Locherengan (17 Ma) and Fort Ternan (14 Ma). Other taxa reveal patterns of water use in the Middle Miocene with implications for regional ecology. Over time, tragulids increase their consumption of high $\delta^{13}C$, water-stressed plants, while their mean $\delta^{18}O$ values decline, suggesting the development of a browsing niche over this period. At Locherengan, primates behave ecologically similar to giraffids, with high $\delta^{13}C$ and $\delta^{18}O$ values indicative of a canopy browsing niche. At nearby Buluk however, primates have exceptionally low $\delta^{18}O$ values, suggesting that some primates may exploit radically different water resources depending on specific ecological contexts. Compiled new and published enamel isotope data provide new insights into spatially variable hydroclimate, ecosystems, and ecological niche partitioning of large mammals in the Neogene of eastern Africa.