

Changing Vegetation in Northeast Africa: Plant Wax Carbon Isotope Ratios Indicate Late Miocene Appearance of C₄ Grasses

Kevin E. Jackson¹, Kevin T. Uno², Pratigya J. Polissar², Peter B. deMenocal²

¹Department of Geology and Environmental Geosciences, Lafayette College, Easton, PA 18042

²Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York 10964

Carbon isotope ratios in mammalian tooth enamel, soil carbonates, and plant waxes indicate a significant global expansion of C₄ grasslands first occurred during the Late Miocene in areas such as northeast Africa. This northeast African vegetation change is of particular interest because of its potential impact on mammalian evolution, including that of hominins. While evidence from soil carbonate and tooth enamel are extensive, marine core isotopic records have been limited to Deep Sea Drilling Project (DSDP) Site 231 in the Gulf of Aden. We measured carbon isotope ratios of *n*-alkanes in 46 samples from DSDP Sites 228 and 232 located in the Red Sea and Gulf of Aden, respectively, as well as from Sites 235 and 241 in the Somali Basin to extend spatial and temporal coverage of vegetation records from marine cores. DSDP cores were chosen based on sediment age and proximity to hominin fossil localities in the Turkana and Awash basins. Sample ages span the last 24 Ma based on updated age-depth models at all four sites using nannofossil biostratigraphy and tephra ages. Carbon isotope data from the Somali Basin suggest that C₄ grasses first appeared in the Late Miocene (~10 Ma). In addition, data from all four sites indicate C₄ expansion persisted through the Pleistocene. The correlation of our findings with previous mammalian tooth enamel, soil carbonate, and plant wax measurements indicate that C₄ expansion played a major role in vegetative variation and mammalian evolution in northeast Africa.