PP22E-0879 - Grass in the Past: Eastern African Chemotaxonomy from Plant Wax n-Alkanes

Tuesday, 13 December 2022

09:00 - 12:30

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

Abstract

Reconstructing the ecology of eastern Africa during primate and large mammal evolution can provide insight into the role of climate and environment on evolutionary trait selection. The late Miocene (around 10 Ma) expansion of C4 grasslands in eastern Africa majorly impacted mammal diets, and the presence of savannas has been connected to hominin traits such as bipedalism. The distinct isotopic signatures of C3 and C4 photosynthesis, recorded in the $\delta^{13}C$ of plant waxes (among other archives), have provided evidence for C4 grassland expansion. However, while isotopes are useful for distinguishing between C3 vegetation and C4 grasses, this technique cannot identify C3 grasslands in the paleorecord as they are isotopically identical to C3 woody vegetation. Resolving the nature of the C3 ecosystem (i.e. the extent to which it was grassy versus woody) prior to 10 Ma would improve understanding of both regional climate dynamics and mammalian trait selection. Previous work suggests that a different aspect of plant waxes – the relative abundances of *n*-alkane chain length homologues – may differentiate between plant functional types (PFTs) within eastern African plants. However, C3 grasses are a highly underrepresented PFT in existing datasets. We present *n*-alkane isotope and chain length data from over 200 samples from a representative variety of modern plants, differing in photosynthetic pathways, growth forms, habitats, and geographic locations. Notably, we include 23 C3 grass samples. Using analytical techniques including PCA and random forest linear regression, we examine the diagnostic potential of *n*-alkane distributions for PFT fingerprinting in eastern Africa. Preliminary findings show that C3 and C4 grasses have a higher abundance of long chain *n*-alkanes when compared to C3 woody vegetation. Therefore, by pairing isotopic measurements with relative chain length abundances, it may be possible to better characterize the abundance of grassy vegetation in the paleorecord. Such a proxy would be a valuable tool for eastern African paleoecology, potentially providing important insights into the C3 ecosystem structure prior to the spread of C4 grasslands, which has implications for understanding large scale ecological changes as well as the habitats of Neogene primates.