PP22E-0874 - Controls on PAH production in modern East African soils using satellite data

Tuesday, 13 December 2022

09:00 - 12:30 *10:00 - 13:30 EST*

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

Abstract

Polycyclic aromatic hydrocarbons (PAHs) are a suite of molecules produced by incomplete combustion processes (i.e., pyrogenic) as well as by thermal maturation of organic matter (i.e., petrogenic processes). PAHs are increasingly being used to reconstruct fire activity in ancient environments amid efforts to determine best practices for PAH-biomass normalization and efforts to differentiate between petrogenic and pyrogenic sources. Long chain alkanes (LCAs) are commonly used account for changes in biomass production (or biomarker preservation) relative to PAH production, but this normalization hasn't been tested with modern observations. Other indices for PAH sources (e.g., APDI), fuel types (e.g., DMP_x and DMP_y) and transport pathways (e.g., LMW ratios) have been developed based on data from burn experiments and environmental chemistry literature, but there are limited studies linking PAH distributions to natural fire characteristics. We measured PAHs in a collection of modern soil samples spanning a range of environments in East Africa. Previous work on this sample set includes soil carbonate and plant wax carbon isotope measurements, two common paleoenvironmental proxies for vegetation. We used satellite data (MODIS and GFED burn products) to estimate the burned area, fire return frequency, and fire intensity experienced by each of the sites in the decade preceding soil sample collection. We compared our measured soil PAH data to satellite-inferred fire characteristics and existing plant wax carbon isotope data to assess both the fidelity of PAH-LCA normalization and the utility of PAH proxies such as DMP_x, DMP_y, and APDI in the East African paleo-record.