

Assessing Replication of Pyrogenic Organic Compounds in Coeval Tropical Stalagmites

Jonathan Azenon and Rhawn Denniston

Human activity and climate change are altering natural rates and intensities of wildfire, but the scale and extent of burning prior to the modern era are poorly understood. Prehistoric fire activity can be reconstructed using a variety of records including charcoal deposited along with sediment at the bottom of lakes and burn scars on tree rings, but these are not available in all environmental settings. We are developing a new paleofire proxy: polycyclic aromatic hydrocarbons (PAHs) in stalagmites. PAHs are produced by the burning of vegetation, with molecular weights reflecting combustion conditions. After being formed in a fire, PAHs are transported downward by infiltrating rainwater and in cave areas can become incorporated into stalagmites as they crystallize from drip water in underlying caves (Perrette et al., 2008; Denniston et al., 2018). Thus, the potential exists for PAHs in stalagmites to preserve evidence of the presence and intensity of fire through time. Because this is a new method, several important tests need to be performed to evaluate its veracity. I assessed how well PAH abundances, ratios, and trends replicate between two coeval stalagmites from cave KNI-51 located in the tropics of Western Australia. Stalagmite KNI-51-F was previously analyzed and I analyzed the overlapping portion of stalagmite KNI-51-G: overlap in age from CE 1310-1630. This work was done at Ca' Foscari University, Venice, in the fall of 2022, under the direction of Dr. Elena Argiriadis. The results show similarities between the area of overlap in the G and F stalagmites. The commonalities of the concentrations of PAH in the stalagmites indicate confidence in the developed method in assessing pyrogenic compounds in coeval stalagmites.