How has the North American Monsoon (NAM) changed over the Common Era?

Has its relationship with sea surface temperatures (SSTs) stayed constant through time?

**BACKGROUND**

Alkenones are a type of lipid that are produced by coccolith species that are ubiquitous in the world’s oceans. These alkenones are formed with more double bonds when SSTs are low. This framework is the basis of alkenone paleothermometry, which we will be using here to look at past NAM behavior in the Gulf of California (GoC). Previous work has also shown that leaf wax hydrogen (δD) isotopes in the basin are related to the amount of relative warm season precipitation. Using this framework, we also analyzed the δD of leaf wax fatty acids in the sediments in order to further understand how the source of monsoon moisture may have changed through time. Because these sediments are from the anoxic Guaymas Basin, they are deposited in varves, allowing for a high resolution reconstruction of SSTs and other biomarkers.

**METHODS**

Sediment samples from the Guaymas Basin in the Gulf of California were dehydrated using a freeze drier and crushed into fine powder. Total lipid extracts (TLEs) were collected and separated using column chromatography. Alkenones were measured on GC to quantifying C37 saturation level (2 vs. 3 double bonds). Fatty acids were methylated, resulting in fatty acid methyl esters (FAMES). FAMES were purified and measured on GC-FID system, and then δD was measured on the C30 fatty acid via GC-IR-MS.

**FUTURE WORK**

We will continue to analyze parts of BAM80, a Kasten core that’s from the same location as our and Goni et al.’s box cores to investigate these decadal structures in GoC SSTs through the Common Era.

This is part of a larger study that is looking at the hydroclimate of the North American Monsoon and how it has changed over the last 2000 years. To learn more about the methods used in this work, check out a virtual lab experience that is described by Kira Harris in her talk in Education titled, “Virtual Field-Meets-Lab Experiences: Using VFEs to Showcase Organic Geochemistry and Paleoecological Research” in session ED51A-08, or at this short link or QR code here:

https://tinyurl.com/OGChemLab

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