Pleistocene Water Isotope Reconstructions from the Indian Monsoon Region

*Steven C Clemens[1], Masanobu Yamamoto[2], Sarah McGrath[1], Kaustubh Thirumalai[3], Yongsong Huang[1], Kerr Katrina [4], Richey Julie [5], Rosenthal Yair[6]

1. Brown University, 2. Hokkaido University, 3. University of Arizona, 4. Open University, 5. USGS, 6. Rutgers University

We synthesize results of orbital-scale Late Pleistocene water-isotope records from the Indian Monsoon region including previously published and new records of seawater $\delta^{18}O$, speleothem $\delta^{18}O$, and leaf wax δD. These records are widely distributed, spanning the core monsoon zone, the Himalayas, the northeast Indian Margin, and the Andaman Sea.

These three proxy types share large-scale aspects of Indian monsoon circulation (e.g., seasonality and oceanic moisture source), but differ in how the signal is recorded. For example, seawater $\delta^{18}O$ monitors direct rainfall as well as runoff and mixing in the ocean environment. Speleothem $\delta^{18}O$ and leaf wax δD are both influenced by soil processes while speleothem $\delta^{18}O$ may be additionally influenced by karst and cave environmental factors. Employing a multi-proxy approach provides a means of identifying common signals among the proxies and helps to unravel the processes that impact the recorded signals on orbital timescales.

To accomplish this, we examine these proxy time series in the context of spectral structure and phase in order to ascertain the extent to which they do or do not covary with one another and the extent to which they monitor aspects of local rainfall and/or larger-scale moisture source and transport path dynamics. We find common variance among the speleothem $\delta^{18}O$ and leaf wax δD records which differ in significant and systematic ways from the seawater $\delta^{18}O$ records. On the basis of model results, we provisionally interpret the differences in the context of changes in vapor transport path dynamics having an influence on the leaf wax and speleothem records, causing them to lead the seawater isotopic response at orbital time scales.

Keywords: Indian Monsoon , Oxygen isotopes, Pleistocene

