

A transect of orbital-scale water isotope proxy records in East Asia shows a ‘sweet spot’ for detecting summer monsoon variability in the Yangtze River Valley

ELIZABETH K. THOMAS¹, STEVEN C. CLEMENS²

¹Department of Geology, University at Buffalo, Buffalo, NY
14260 ekthomas@buffalo.edu

²Department of Earth, Environmental and Planetary Sciences,
Brown University, Providence, RI 02912
steven_clemens@brown.edu

Orbital-scale (10^4 - 10^5 yr) East Asian Monsoon rainfall reconstructions are key to gaining a mechanistic understanding of monsoon response to changes in forcing mechanisms. Yet there is an active decade-long discussion regarding whether water isotope proxies are unambiguous recorders of summer rainfall amount. Moreover, the precession-dominated, large-amplitude Hulu/Sanbao $\delta^{18}\text{O}_{\text{cave}}$ record in the Yangtze River Valley has not been reproduced by other proxy data or models. This lack of clarity regarding proxy interpretations substantially limits the utility of proxy records in understanding the mechanisms underlying changes in monsoon rainfall.

In temperate regions, leaf waxes are produced with distinct seasonality. Leaf wax $\delta^2\text{H}$ thereby provides a means to test the seasonality of other precipitation isotope proxies. We present a suite of orbital-scale water isotope proxy records (including $\delta^{18}\text{O}_{\text{cave}}$ and $\delta^2\text{H}_{\text{wax}}$) spanning a latitudinal gradient from the South China Sea to the Chinese Loess Plateau. We include a preliminary $\delta^2\text{H}_{\text{wax}}$ record from IODP Site U1429 in the East China Sea, which reflects summer precipitation $\delta^2\text{H}$ in the Yangtze River Valley. The two Yangtze River Valley water isotope records contain strong similarities, in both timing and amplitude. We assess the seasonality and source signals contained in the water isotope proxy record transect using independent proxy and model records of summer and winter monsoon variability from these same regions. We find that most water isotope proxy records are influenced by multiple seasons and/or mechanisms (i.e., temperature, rainfall amount), but that the Yangtze River Valley water isotope records may reflect only summer precipitation isotopes.