A 18,000-YEAR HIGH-RESOLUTION RECORD OF PAST ATMOSPHERIC CONVECTION AND TEMPERATURE FROM THE INDO-PACIFIC WARM POOL

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Deep convection of the tropical atmosphere over the Indo-Pacific Warm Pool (IPWP) provides a large amount of heat and moisture to the global atmosphere, influencing tropical and global climate variability. Spatial coverage of long, continuous and high-resolution paleoclimate records from this vast region remains scant, however, which hampers insight in and understanding of climatic and dynamical changes that occurred during the last deglaciation as well as the Holocene period.

Here we present a continuous 18,000 year-long, precisely dated and decadal-scale lacustrine multi-proxy record from Southern Thailand, at the northwestern edge of the now inundated Sunda shelf. We use leaf wax hydrogen isotopes (δD_{wax}), branched glycerol dialkyl glycerol tetraethers (brGDGTs) and plant macrofossils plus leaf wax carbon isotopes. For some of our molecular proxies we arrive at somewhat novel interpretations than is typically done..
We performed a local brGDGT temperature proxy calibration by comparing results from a surface core with the instrumental record. We conclude that the amount of incoming solar radiation during the wet season – driven by the precessional cycle - exerts a primary control on both temperature and convective activity; this wet season-solar irradiance (WSI) control on convection is also apparent from other IPWP and tropical water isotope-based records. Rising atmospheric CO_2 levels and temperature, and not moisture availability, were primary controls on changes from C4- to C3-dominated vegetation over the deglacial period. Lowest δD_{wax} values, combined with an excursion back towards more C4 vegetation during the Bölling/Allerød indicates a large influence of Sundaland, which caused a stronger land-sea effect during the boreal summer and equator-deep penetration of the cold and dry East Asian winter Monsoon until the onset of the Holocene, promoting biomass burning and suppression of C3 forests.

The close resemblance of water isotope-based records in Monsoonal SE Asia with our - downstream located - δD_{wax} record indicates that the isotopic composition of Indian Ocean and IPWP moisture is a main factor that dictates these isotope records, ultimately driven by the precessional cycle in the central tropics, but modulated by global sea level change which regionally influences the continentality of the IPWP region over glacial cycles. Our new proxy record fills a spatial gap of the paleoclimate information from this vast and globally important region for heat and moisture export to higher latitudes.