A multiproxy record from Sumatra indicates continous Holocene warming but a Mid-Holocene rainfall maximum

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The maritime continent (MC) forms the central part of the Indo-Pacific Warm Pool (IPWP). This tropical region is a critical component of the global climate system by providing large amounts of latent heat to the higher latitudes via deep atmospheric convection. Paleoclimate information remains relatively scarce from the MC despite its global importance, calling for additional records from the region. We generated a multisite-multiproxy record from Sumatra, with a main focus on the glycerol dialkyl glycerol tetraethers (GDGTs) and leaf wax hydrogen isotopic composition (δD_{wax}) allowing reconstructions of past temperatures and rainfall. We investigated one homogenous peat core (Padang, 0-8 ka BP) and one paludified lake (Diatas, 0-11 ka BP), but also compared the GDGT results with those from a deep lake and of a soil altitude transect. Principle Component Analysis of these differently sourced GDGTs from the same region, allowed assessment to what extent their provenance (soil erosion, peat, lake) determine GDGT distributions, besides temperature. The GDGT sources remained constant at the Padang site, allowing a robust temperature reconstruction that shows gradual warming during the last 8 ka, including a plateau 3-5 ka BP

The finding of ongoing warming over the past 8 ka agrees with several climate model simulations for Sumatra and nearby marine SST reconstructions from the Indian Ocean (western IPWP). This trend is opposite to previous marine reconstructions in the eastern IPWP, which may be related to long-term changes in the Walker circulation. Of note is that there is little to no seasonal bias in our equatorial peatland site and bacterial lipid source, something that has been implicated as biasing temperature proxies.

The δD_{wax} values of both records indicate an increasingly humid Holocene with a maximum between 4-6 kyr BP. This mid-Holocene wet maximum is also apparent from higher Paq index values at Diatas, and highest $\delta^{13}C$, indicating a largest contribution of peat-forming aquatic macrophytes during this period. After 4ka BP all proxies indicate a decline in precipitation strength that is coincident with the reorganization and general drying and cooling of global climate at the start of the Meghalayan age. Our multi-proxy data set indicates that the last two centuries were seeing a return to wet conditions.

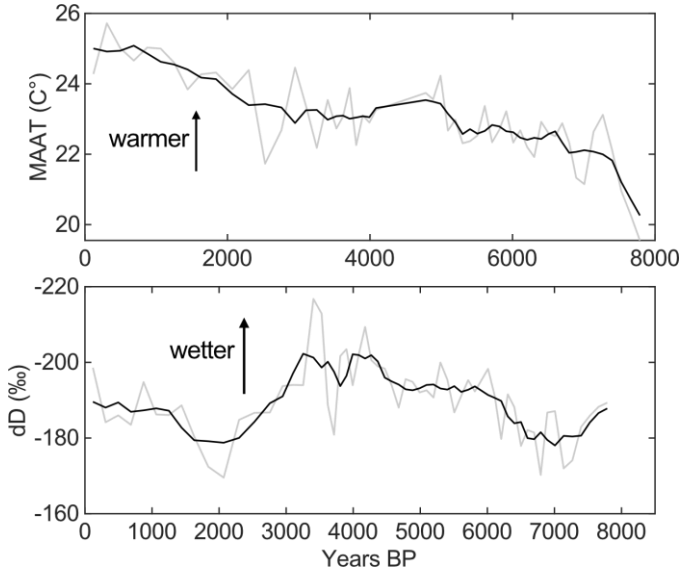

Figure 1. Reconstructed temperature and precipitation on Sumatra over the Holocene indicating continuous Holocene warming, but a Mid-Holocene rainfall maximum.