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Hydrological and Vegetation Shifts in the Equatorial Sulawesi since the Last Glacial Maximum: Perspectives from Hydrogen and Carbon Isotopes of Terrestrial Leaf Wax Compounds

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The Indo-Pacific Warm Pool (IPWP) is a major epicenter of the tropical convective activity that drives both the Walker and Hadley circulations. The island of Sulawesi is situated at the heart of the Maritime Continent within the IPWP, and despite the region's importance, published proxy records and numerical simulations of convection and precipitation patterns from Sulawesi and across the Maritime Continent since the Last Glacial Maximum (LGM) display some substantial disagreement. Today, precipitation over Sulawesi is strongly influenced by variations in topography and wind pattern, which include land-sea breezes, orographically-forced winds, and monsoonal winds related to the seasonal migration of the Intertropical Convergence Zone. To better understand the interplay between such variations and high latitude climate dynamics during the last deglaciation, we developed high resolution records of the deuterium isotopic composition of terrestrial leaf waxes (long-chain n-alkanoic acids; $\delta\mathrm{D}_{wax}$) from a marine core (3.63 ºS, 119.36 ºE, water depth: 688 m) retrieved 10 km west of Sulawesi in close proximity to a major river delta. At low latitudes, $\delta\mathrm{D}_{wax}$ has been used to reconstruct the δD of catchment-integrated precipitation, often interpreted as an indicator of regional rainfall amounts and large-scale convective activity.

Our record displays relatively depleted values during the height of LGM, followed by a gradual enrichment that reached its peak (up to 10‰ enrichment) during the Younger Dryas (YD). Following the YD, $\delta\mathrm{D}_{wax}$ becomes more depleted into the Holocene, reaching values nearly identical to the LGM. The deglacial pattern observed in our $\delta\mathrm{D}_{wax}$, derived from a predominantly high-altitude catchment in the southwestern arm of Sulawesi, is similar to that of $\delta\mathrm{D}_{wax}$ record from Lake Towuti (2.5 ºS, 121.5 ºE, surface elevation: 319 m) in the southeastern arm of Sulawesi. The synoptic deglacial shifts seen in both catchments demonstrate that the equatorial Maritime Continent hydrological cycle is sensitive to Northern Hemisphere high-latitude climate events. Despite the lowering of global temperature during both the LGM and YD, the contrasting precipitation signals between the two events over Sulawesi also suggest that different climatic forcing and/or propagation mechanisms might have operated at different time scales. In addition, we will measure carbon isotopes of terrestrial leaf wax compounds ($\delta^{13}\mathrm{C}_{wax}$) to investigate changes in local terrestrial vegetation assemblages and, by inference, the climate in which they grew. Covariation between our $\delta\mathrm{D}_{wax}$ and $\delta^{13}\mathrm{C}_{wax}$ records may corroborate our interpretation of $\delta\mathrm{D}_{wax}$ as a robust tropical paleoprecipitation proxy.