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Late Quaternary climate variability in Madagascar and its connection to South-East Africa hydroclimate changes and atmospheric circulation patterns

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Madagascar is characterized by high climatic heterogeneity and its topography plays a key role in modulating the regional hydroclimate variability in South and East Africa. However, knowledge on past climate of Madagascar very limited, in line with the general scarcity of paleoclimate records from the southern tropics and subtropics. We generated a 26 kyr paleoclimate record from Madagascar, located in the southwestern Indian Ocean spanning the Last Glacial Maximum (LGM) to the late Holocene. In particular, we present a deuterium/hydrogen isotopic ratio of terrestrial leaf waxes (δ^2H_{wax}) from a sediment core taken from the central eastern part of the island near the capital Antananarivo. The δ^2H records of both the aquatic and terrestrial plant derived *n*-alkanes exhibit similar long-term trends implying that they all record changes in the isotopic composition of source water, namely meteoric water that recharges soil and lake waters. In this tropical region, the δ^2H variability of precipitation recorded by *n*-alkanes δ^2H is mainly influenced by the amount effect resulting in lower values for periods with high rainfall. We observe five long-term trends: (i) stable and relatively dry conditions during the Last Glacial Maximum (LGM) (ii) gradually wetter conditions from 17.5 ka to 11.5 ka, especially during the Heinrich stadial 1 (HS1) and the Younger Dryas (YD) (iii) an arid interval from 11.5 ka to 8.5 ka, and (iv) a general trend to more humid climate until 3.0 ka, followed by (v) a drier interval until 1.0 ka. The Madagascar climatic signal is opposite to other records from South Africa and East Africa records especially during the YD and early to middle Holocene period. This regional dipole mode is consistent with the modern rainfall anomaly pattern associated with the variability of Mozambique Channel Trough and the migration of austral summer Intertropical Convergence Zone (ITCZ) position as a response to changes in local summer insolation orbital and/or Northern Hemisphere cold events, such as the YD and HS1.