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Temperature, vegetation and precipitation variability in the Nile River drainage during the past 27,000 years: Insights from molecular and isotopic proxies

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The paleoclimate history of the Eastern Mediterranean (EM) region is of much interest due to its long history of human occupation. To date, much of our knowledge of past climate in the EM region comes from marine sedimentary records. These indicate that since the Last Glacial Maximum, major and sometimes abrupt sea surface temperature (SST) fluctuations occurred in response to global climate events including the Younger Dryas (YD), the Bølling-Allerød, and Heinrich Event 1 (H1). In comparison, less is known regarding continental paleoclimate conditions in this region due to a scarcity of well-dated continuous climate archives, particularly from Saharan North Africa. Here, we present new reconstructions of continental precipitation (plant leaf wax δD), C_3 vs. C_4 vegetation (plant leaf wax δ^{13}C) and soil temperature (MBT/CBT paleothermometer) in the Nile River catchment in conjunction with previously published $U^{k'}_{37}$ and TEX_{86}SST reconstructions from the EM Sea. Our multiproxy records indicate that relative to the present, the LGM was characterized by arid conditions with cooler SST and soil temperatures in the catchment. The H1 event stands out as a major excursion in nearly all proxies and is characterized by an abrupt decrease in SST and the most arid conditions of the past 27,000 years. The African Humid Period (AHP) of the early Holocene is the wettest interval of the entire record and is observed from ~10,000 to 5,500 cal BP, with maximum wet conditions noted at ~8,000 cal BP. Interestingly, a rather abrupt cooling is noted in the MBT/CBT record at ~5.5 cal kyr, coinciding with the end of the AHP off west Africa; however, the transition out of the AHP is more gradual in the δD record. Overall both the continental and marine climate records indicate millennial scale climate variability. Our records also shed light on shifting sources of organic matter in response to the sequential cessation and re-initiation of different tributaries to the main flow of the Nile River.