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Late Pleistocene drivers of climate and vegetation in the Western Sahel from leaf wax biomarker isotopes

Rachel Lupien[1], Kevin Uno[1], Peter de Menocal[2]
[1]Lamont-Doherty Earth Observatory, Palisades, NY, USA
[2]Woods Hole Oceanographic Institution, Woods Hole, MA, USA

The Sahel is highly sensitive to flooding, droughts, and wildfires, risking food and other resources on which nearly 100 million people depend. Understanding how natural variations of precipitation and vegetation fluctuate during high-amplitude glacial-interglacial cycles can help constrain the regional sensitivity to a wide range of external forcings. Further, the interactions between climate and ecosystem changes remain uncertain for sub-Saharan Africa due to the lack of long, highly-resolved, quantitative, terrestrial records. Here we present precipitation and vegetation records from ~215 ka to present, derived from long leaf wax hydrogen (δD_{wax}) and carbon ($\delta^{13}C_{wax}$) isotopes, respectively. These geochemical records are derived from ODP Site 959 in the Gulf of Guinea, where westerly winds and major river systems transport Western Sahel-sourced terrestrial leaf waxes. We find that, unlike many African records that are precessionally-driven, obliquity plays an important role in West African late Pleistocene hydroclimate, suggesting that a cross-equatorial insolation gradient may be more important in this area and certainly that drivers of orbital-scale precipitation change are regionally-specific. Further, vegetation changes appear to have a complex relationship with hydroclimate over this mid-late Pleistocene interval. A potential shift in this climate-environment coupling at MIS6 ~130 ka, which is a time when there is also a shift in forcing mechanisms in East Africa, suggests that the global boundary condition changes associated with large glacial-interglacial cycling may affect equatorial climate.