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Tracing late Quaternary tropical wetland dynamics in the Congo catchment using microbial biomarker records from deep sea fan sediments

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Methane is a climatically active gas with a global warming potential 72 time that of CO_2 over 20 years. Release of methane into the atmosphere has been suggested as a potential source of warming in palaeoclimate studies. This has implications for future climate as increased global temperatures could destabilise sources of sedimentary methane releasing it to the atmosphere. It is therefore important to establish the possible sinks of methane that could attenuate methane emissions.
We present a high resolution record from the Congo deep sea fan (ODP 1075) of amino-bacteriohopanepolyols (amino-BHPs). The methanotrophic source of aminopentol, a biomarker for aerobic methane oxidation (AMO), in ODP 1075 is supported by compound specific δ13C isotope values of -41‰ for aminopentol precursors. High resolution intervals of isotope stages 10 to 13 ($\sim$500 to $\sim$400 kyrs BP) confirm aminopentol to vary on glacial-interglacial timescales. High concentrations of amino-BHPs are recorded during warm, interglacial stages 11 and 13 with low concentrations of amino-BHPs during cold, glacial stages 10 and 12. This increase in AMO intensity (as suggested by aminopentol concentrations) during stages 11 and 13 is likely an imported signature from the Congo hinterland. Sediments analysed for amino-BHPs from floodplain wetlands show similar biomarker signatures as the marine sediments, suggesting a common source.
Wetlands are important and widespread sub-environments in all large tropical river catchments. Their extent responds to fluctuations in humidity, which changes at glacial-interglacial and shorter time scales in response to the level of humidity. Humidity in the interior of tropical Africa has been shown to be driven by fluctuations in the difference in sea surface temperature (SST) between the subtropical and tropical South Atlantic (Schefuss et al., 2004).
D-SST profiles based on UK 37 from the Angola (ODP 1082) and Congo basins (ODP 1077, Geob 1082) show an inverse relationship with amino-BHP profiles with minimum Delta-SST values coinciding high amino-BHP concentrations. Therefore periods of high humidity (as inferred from minimum Delta-SST) coincide with periods of intense AMO biomarker production and export, supporting the novel approach to use amino BHPs in marine sediments to reconstruct tropical wetland dynamics in the past.

Schefuss, E., Damste, J.S.S., Jansen, J.H.F., 2004. Forcing of tropical Atlantic sea surface temperatures during the mid-Pleistocene transition. Paleoceanography 19.