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Holocene sea surface temperatures in the East African Coastal Current region and their relationship with North Atlantic climate

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The East African Coastal Current (EACC) is one of the western boundary currents of the Indian Ocean and represents the only pathway for southern water masses to enter the Arabian Sea. Today, sea surface temperatures (SST) in the western boundary currents region covary with those in large parts of the central tropical Indian Ocean. The latter play an important role in global climate by influencing the mean state of the North Atlantic Oscillation (NAO) and associated Atlantic SST anomalies (Hoerling et al., 2001). In the EACC region paleoclimate data are sparse and its Holocene temperature history is unexplored.

We present data from a 5 m long sediment core retrieved off northern Tanzania where the EACC flows northward year-round. Proximity to the Pangani River mouth provides a steady sediment supply. We have reconstructed SST from Mg/Ca and stable oxygen isotope ratios (∂^{18}O) of the surface-dwelling planktonic foraminifera species *Globigerinoides ruber* (sensu stricto). Our record spans the time period from 9700 to 1400 years BP at an average temporal resolution of 40 years. The Holocene is characterized by a sequence of intervals representing cool, warm, cool, and intermediate SST, with boundaries at 7.8, 5.6, and 4.4 ka BP. SST anomalies relative to the series mean range from -0.6 to +0.75 ˚C. This pattern strikingly resembles a Northwest Atlantic foraminiferal ∂^{18}O record (Cléroux et al., 2012), with warm Indian SST corresponding to low Atlantic foraminiferal ∂^{18}O (indicating low sea surface density). This matches the modern situation on the interdecadal time-scale, where a warm Indian Ocean leads to a shift of the NAO towards a positive mean state, which is accompanied by SST warming over much of the low- and mid-latitude western Atlantic and a displacement of the Gulf Stream path. We hypothesize that this mechanism also operates on millennial time-scales to explain the obvious similarities in the SST patterns observed in the Northwest Atlantic and western Indian Oceans.

References

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