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The magnitude of sea surface temperature changes in the Benguela upwelling system from the Holocene to the Anthropocene era

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Paleoclimatic reconstitutions achieved so far have investigated a wide range of timescales, and evidenced a large spectrum of climate forcings that manifest themselves at different timescales. Although this statement applies to marine sediments, very few paleoceanographic records report the magnitude of sea surface temperature (SST) changes over a hierarchy of timescales and with paleo-SST estimations rigorously comparable. Here we present one alkenone-derived SST record composed of three shallow marine cores collected within the Benguela upwelling system. These cores were retrieved along a transect perpendicular to the coastline within high-accumulation rates mudbelts, and with time windows of highest sedimentation rates that overlap from site to site. In parallel, multicores were collected at the same sites, and 210Pb data indicate that the modern interfaces were sampled by these multicores.

When disturbed sedimentary horizons linked to winnowing are accounted for, some SST features provide constraints on sedimentary processes and climate dynamics. For example, the magnitude of long-term SST trends recorded over the Holocene epoch can be compared to the SST signature of the historical centennial-scale climatic anomalies that occurred during the last millennium. The magnitude of these secular SST changes however depend on the sedimentation rates of the sequences, highlighting the importance of syn-sedimentary processes such as bioturbation that minimizes the sedimentary signal by attenuating it. Also, the smooth millennial to centennial-scale climatic signatures contrast with prominent SST drops recorded in contemporaneous sediments as revealed by the multicores core-tops signals. The likely anthropogenic effect on the low-latitude atmospheric circulation and associated feedbacks on the upwelling systems will be discussed.