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Alkenone based constraints of the hydrological development in the mozambique channel over the last 39, 000 years

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Indian Ocean surface circulation through the Mozambique Channel forms the upstream source for the Agulhas Current, which is the main mechanism for transporting warm and salty waters from the Indian Ocean into the Atlantic via the Agulhas Leakage (Lutjeharms 2006). However, the Agulhas Leakage was reduced substantially during glacial times due to the northward migration of the subtropical fronts and shifts in the wind fields, and resulted in accumulation of warm and saline waters in the Southwest Indian Ocean (Peeters et al., 2004).
A better understanding of the interactions between sea surface temperatures (SST) and sea surface salinity (SSS) in the Agulhas source region are fundamental for reconstructing past changes in this surface warm water route of the global conveyor and ocean-continent climate linkage with respect to South Africa. Here we present a record of the stable hydrogen isotope composition of the combined di- and tri- unsaturated alkenones (Dalkenone) that might relate to past SSS variations. We compare the variations of the Dalkenone with UK'37 SST records from sediment core 64PE304-80 located in the Mozambique Channel off the Zambezi River mouth. To estimate the influence of freshwater input at this site the alkenone hydrogen isotope record was compared to BIT Index values and Ca/Ti ratios reflecting the input of soil organic matter and lithogenic material on the core site, respectively.
During the last glacial maximum (LGM) and the onset of Heinrich event 1 (HE1) at ∼18,000 years, Dalkenone and UK'37 are positively correlated. The Dalkenone is more enriched during HE1 corresponding with high BIT values, increased Ca/Ti ratios, and relatively cold SST values. After ∼16 ka, Dalkenone values decrease when UK'37 SST increases throughout the early Holocene, suggesting an increase of the continental precipitation and runoff during periods of increased SST. This period can be related to postglacial warming of the tropical ocean or due to a latitudinal shift in the ITCZ over Africa (e.g. Schefuss et al., 2011). Alternatively, the change in the paleosalinity signal may result from the change in the position of the Zambezi River and transport of the river plume by coastal currents and relative to the core location as a result of eustatic sea level rise. For the late Holocene the Dalkenone record shows relatively stable conditions that are interrupted by an excursion to more positive values from approximately 5000 to 1600 years BP. This excursion could be explained by variations of freshwater input related to the Zambezi run off.