TESTING THE LONG CHAIN DIOLS AS SEA SURFACE TEMPERATURE AND UPWELLING PROXIES: EXAMPLES FROM THE ARABIAN SEA

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Investigations on environmental changes during major climatic events, particularly during the glacial-interglacial transitions, play an important role in understanding the currently changing climate. Such investigations take into account various tools and proxies, e.g., micropaleontology, biomarkers, organic and inorganic geochemistry etc. In terms of reconstructing the past climates multi proxy approaches are favourable because ideally with each proxy different environmental factors can be investigated. Accordingly, proxy development has become an extensive area of research in paleoceanography and paleoclimatology.

The Arabian Sea has been one of the key regions for paleo-studies because of its characteristics. The SW monsoon induces intense upwelling and high productivity resulting in the development of a strongly developed oxygen minimum zone in the water column. Relatively high sedimentation rates and pronounced oxygen minimum conditions allow the preservation of the organic material. Therefore, the underlying sediments are suitable for biomarker and organic geochemistry investigations.

In the present study, we present new results from two sediment cores collected from the Arabian Sea (Figure 1), NIOP905 and 74KL, covering the last 23 thousand years. We applied two proxy indices based on the long chain diols; i.e. the Long chain Diol Index (LDI) for sea surface temperature (SST) (Rampen et al.,2012) and the Diol Index for upwelling intensity/high nutrient conditions (Rampen et al., 2008). The long chain diols form a group of lipids with chain length generally varying between C28 to C32. The commonly observed long chain diols in Quaternary marine sediments are C28-32 1,13-, 1,14- and 1,15-diols (Versteegh et al., 1997; Rampen et al 2014). The ratio between 1,13- and 1,15-diols has been used for LDI SST, whereas the ratio of 1,14-diol versus 1,13- or 1,15-diols is proposed to be an upwelling indicator. Other well-known organic SST proxies, TEX86 and UK'37, were already applied to these cores (Huguet et al., 2006), whereas the Diol Index for the upwelling/high nutrient conditions was only applied to the NIOP905 core (Rampen et al., 2008). The Diol Index of core NIOP905 showed enhanced upwelling during the Holocene compared to the last Glacial with maximum values during the mid-Holocene (ca. 4 ka cal BP). This trend is in accordance with other productivity proxies, i.e. organic carbon content, barium/aluminium ratios and the abundance of specific foraminiferal species. Similar analysis on core 74KL together with SST reconstruction using different biomarkers will lead to better understanding of the upwelling variations on a spatial scale in the Arabian Sea since the last Glacial. This study also presents the first time that LDI SST proxy is applied to Arabian Sea sediment cores.

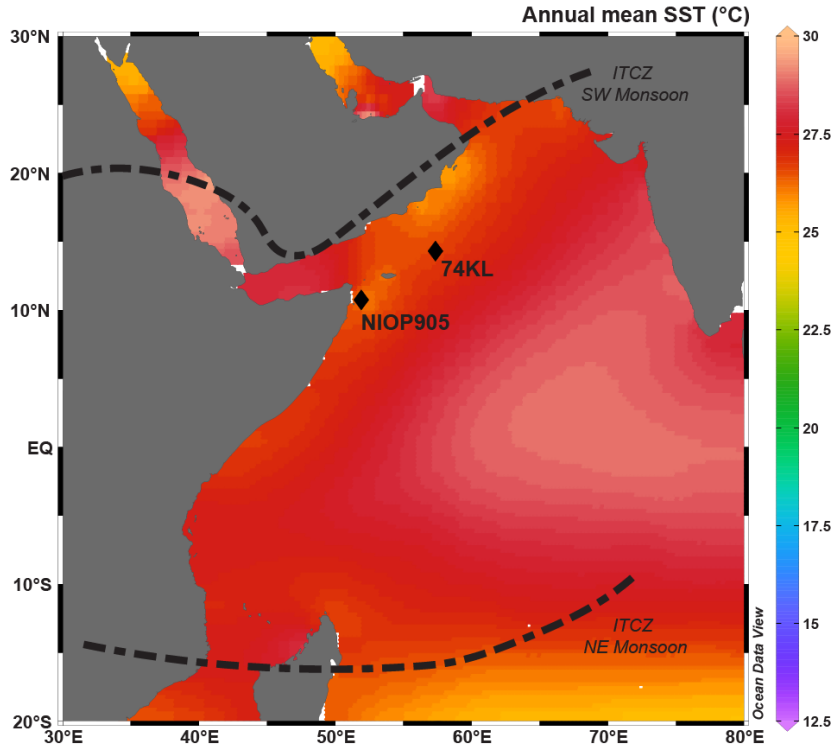

Figure 1 *Map of the research area showing the core locations (diamonds) and the position of the Intertropical Convergence Zone (ITCZ) during different monsoons (modified after Huguet et al., 2006) together with annual mean SST (°C). Map prepared using ODV (Schlitzer, 2010).*

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