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A high resolution 2000 year record of monsoon variability in the Arabian Sea

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Sediment cores from the Oman margin in the northwestern Arabian Sea and from the northeastern Arabian Sea off Pakistan are studied to reconstruct the natural monsoon variability at interannual to centennial time scales during the late Holocene. Due to high sedimentation rates both cores represent a highly resolved unique record of monsoonal climate variability over the past 2000 years. The lamination of the sediment core obtained in the oxygen minimum zone off Pakistan is varve-like with alternating dark and light sediment layers and enables us to reconstruct climate change with a temporal resolution of years or even seasons. Here, the organic carbon content, C/N ratios as well as stable nitrogen isotopes were determined to reconstruct productivity and mid-water oxygenation reflecting monsoon intensities. In order to reconstruct past sea surface temperatures the alkenone index $U^{k'}_{37}$ was used.

On the Pakistan Margin light-colored sediment layers show low total organic carbon contents (0.5-0.8%), C/N ratios (5.5-7) and δ^{15}N values (5.5-7‰). These thick layers were interpreted as event deposits caused by short-term heavy rainfall periods, which occurred mainly during the winter season. Furthermore, thin dark layers, which were rich in marine organic matter reflect deposition during the high productivity season of the late summer monsoon whereas thin light sediment layers were assumed to be of terrigenous origin deposited during winter monsoon (von Rad et al., 1999). In fact, measured high organic carbon contents of about 1.6% and δ^{15}N values ranging from 7.8-8.4‰ indicate high productivity and a well developed oxygen minimum zone during deposition of dark sediment layers. This multi-proxy record is compared with characteristic, northern hemispheric climate periods of the late Holocene such as the Little Ice Age, the Medieval Warm Period, the Cold Dark Ages and the Roman Warm Period.