



## Pleistocene sea surface temperature, monsoonal hydrological variability and OMZ extension in the Northern Indian Ocean (Maldives Sea)

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The Maldives Inner Sea is a natural sediment trap located in the northern Indian Ocean affected by the South Asian Monsoon (SAM) seasonal reversing wind and precipitation patterns, which drives modern oceanography in the region, including variations in oceanic productivity and in the extension of the oxygen minimum zone (OMZ) of the Northern Indian Ocean. In 2015, International Ocean Discovery Program (IODP) Expedition 359 drilled eight sites (U1465-U1472) in the Maldives Inner Sea aligned in two east-west transects north and south of the Goidhoo atoll in order to unravel the unread history of this region intimately linked to the SAM. In this work, we studied mid and late Pleistocene sediments from IODP Site U1467 (4°51.031'N, 73°17.020'E; 487 m water depth). Our study is focused on the last ~1.2 Ma in order to evaluate changes in the SAM linked to the emergence of the 100 ka cycles during the Mid-Pleistocene Transition (MPT). Lipid biomarkers have been analyzed with the aim of reconstructing sea surface temperature (SST, using the alkenone unsaturation index,  $Uk'_{37}$ ), past surface ocean productivity (using total alkenone concentration) and bottom water oxygenation (BWO, using a ratio between *n*-alkan-1-ols and *n*-alkanes). Additionally, data from scanning x-ray fluorescence (XRF) from this site has been used to provide information about the winter and summer monsoon intensity and ostracod assemblages allowed us to identify changes in BWO and possibly the influence of Antarctic Intermediate water in the region.

At present, seasonal SST variation is rather small in the Maldives Inner Sea (less than 1°C) and our reconstructed SST record also shows very small variability between glacial and interglacial periods (less than 1°C), but with strong coherence with other Indian Ocean and equatorial records. Our SST record shows rather warm temperatures before MIS 30, with muted glacial-interglacial variability. After MIS 30, both glacial and interglacial temperatures show a decreasing trend until MIS 22, which represents the first interval with considerably colder glacial SST. Between MIS 22

and 13, SST remains relatively warm, not showing large changes between glacial and interglacial periods. It is remarkable the absence of lukewarm interglacials during this interval. The BWO record shows a similar pattern and can also be divided in the same intervals. BWO starts to increase during glacial periods at MIS 22, which is supported by the ostracod assemblages. This indicates a contraction of the OMZ during glacial periods. Starting at MIS 12, glacial periods show colder glacial SST and enhanced ventilation. The terrigenous elements (K, Fe, Al, Ti) from XRF suggest an increase in aridity at MIS 22, with stronger winter monsoon (higher aridity) during glacial periods, in agreement with the *n*-alkanes record. The comparison of IODP Site U1467 reconstructions with other records provides key information to improve our understanding of the evolution of SAM, global climate and ocean circulation during the Pleistocene.