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Planktonic foraminifer record of a stronger Indian winter monsoon during the Last Glacial period in a deep sea core from the equatorial Indian Ocean

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In the present work, we record planktonic foraminifer (PF) assemblages in a gravity core retrieved from a water depth of 2251m atop the northern Cape Cameron Ridge (050 45.13'N; 76054.90'E) in the tropical Equatorial Indian Ocean (EIO) region. Comparison with adjacent core MD900963 [1] suggests the presence of the Late Pleistocene (LP) – Early Holocene (EH) sequence in this 60 cm dominantly foraminifer-rich hemi pelagic core representing the ~20.5 Ka to ~6 ka time interval. Annual, winter and summer paleo-SSTs were estimated with the help of PF census data applying the artificial neural network (ANN) method, which record variation in the SSTs of the order of 0.50C to 1.250C on millennium- to multi-centennial scale during the Last glacial (LP) – Interglacial (EH) transition in the tropical EIO.

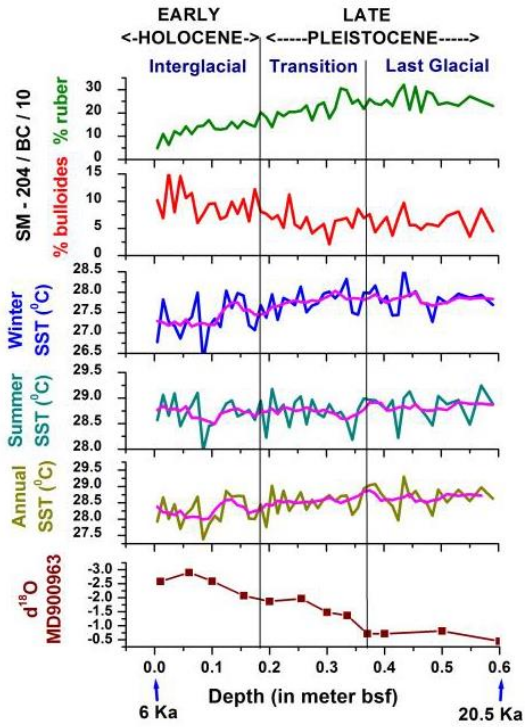

Figure 1: Depth-age model of the core SM-204-BC-10 with estimated Paleo - SSTs during LG-

Estimated SSTs in the LG section (60cm - 37cm level; 20.5 ka to 14.5 ka) for winter season (December- February), which is a proxy for NE Indian monsoon (NEM), was found to be around 0.50C higher on millennium scale than the EH sections (0 -18 cm level; 10 ka to 6 ka) with fluctuations of the order of ~1.250C on the multi-centennial scale. This suggests that the winter monsoon (NEM) was stronger in the tropical equatorial Indian Ocean during LG then EH, and substantiates the oxygen isotope derived claim by earlier workers [2, 3]. Interestingly, estimated summer (June-August) SSTs, which reflect the SW Indian Monsoon (SWM), show trend similar to winter SSTs, but with lesser amplitude for EH section on the millennium scale. This has been interpreted as reduction in surface SSTs due to enhanced upwelling and mixing of underlying colder water with warmer surface waters due to strengthening of SWM

from the LG to EH in the tropical Indian Ocean. This reduction in surface SST from the LG to EH is also indicated by two to three fold increase in the upwelling indicator PF *Globigerina bulloides* and a gradual decrease in the temperature sensitive shallowest water dwelling tropical PF *Globigerinoides (Gs.) ruber from* as high as 30% in the LG section to 10% in the EH section.

Estimated annual SSTs, which shows a gradual decline from the LG to EH, also mimics the trend in *Gs. ruber,* further conforming that higher SSTs during the LGM was largely due to enhanced winter SSTs as compared to the EH.

Transition phase (37cm - 18cm level; 14.5 ka to 10 ka) from glacial to interglacial climatic conditions shows a gradual decline in summer, winter and annual SSTs with a lesser amplitudes of abrupt cooling/warming events on mutli-centennial scale. This is the first report of paleo-SST estimates derived from PF census data of a Late Quaternary sediment core from the Northern Cape Cameron Ridge, tropical EIO, for Indian monsoon evaluation.

References:

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