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Last 35 kyr sedimentary lipid biomarker variation in the Eastern Arabian Sea: a contribution to the Last Glacial carbon-burial

Vikesano Rosaline Punyu (1) and Virupaxa K Banakar (2)

(1) Indian Institute of Science Education and Research Kolkata, Department of Earth Sciences, Mohanpur, India (rpunyu@gmail.com), (2) (Retired) - Present address: Zeib Castle, La-Oceana 2, Behind International Centre, Dona Paula-403004, Goa, India

Lipids are essential constituents of organic matter (OM) and are relatively resistant to post-depositional bacterial degradation in marine sediments as compared to other components of the OM. This property renders the lipids as powerful biomarkers to understand past changes in the marine productivity and associated environmental conditions. A set of lipid biomarkers are analyzed in a radiocarbon dated sediment core retrieved from a water depth of 1500 m in the Eastern Arabian Sea (EAS) that covers the complete Last Glacial Maximum (LGM) and Early Holocene periods.

The marine productivity indicators (phytol and brassicasterol) exhibit elevated concentrations (ave. 73 and 61 ng/g, respectively) during LGM (29 – 14 ky BP) as opposed to significantly decreased concentrations (ave. 30 and 28 ng/g, respectively) during the Holocene (14 – 5.5 ky BP). The Carbon Preference Index (CPI) of higher-molecular-weight n-alkanes and n-alkanols and the C/N molar ratios are relatively higher during the former period compared to the latter, collectively suggesting an increased contribution of soil-OM to the total sedimentary-OM during the LGM. A marginal enrichment of δ13Corg by $\sim$1 ‰ and longer average chain length (ACL) of n-alkanes and n-alkanols in sediment deposited during the LGM indicate enhanced input of soil-OM of C4-type to the EAS during the preceding coldest period.

On one hand, the increased marine productivity during the LGM can be attributed to the intensification of deep winter-mixing resulting in enhanced deep-nutrient supply to the photic layer; and, on the other hand, an enhanced input of C4 soil-OM to the EAS could have been the result of intensified north-easterly winter-monsoon winds blowing from the Indian sub-continent towards the surrounding marine regime. This interpretation is of significance, because, enhanced burial of both marine- and land-derived carbon during the LGM might have contributed to the overall reduction in the global atmospheric CO_2