Early-middle Holocene transition in palaeoceanographic record of NE Arabian Sea: Implications from multi-proxy approach

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We analysed a 1 m sedimentary core from offshore Saurashtra, NE Arabian Sea to reconstruct the changes in palaeoceanography during early-middle Holocene. The multi-proxy analysis document high-resolution signatures of early-middle Holocene Transition (EMHT) spanning ~900 years between ~7.3-6.4 Ka. The EMHT acted as a transitional phase of significant productivity and depositional changes in the area. Pre-EMHT corresponds to dominance of marine algal as well as terrigenous organic matter (MAOM and TOM respectively) over planktonic organic matter (POM). At ~10 Ka, the area experienced hypoxic condition (due to intensified Oxygen Minimum Zone (OMZ)) which led to better preservation of organic matter. On the other hand, freshening of surface water has been recorded which could have acted as source of oxygen to the OMZ, hence resulting in better oxidation of organic matter and decreased Total Organic Carbon (TOC) trend within the pre-EMHT. During EMHT, decreased TOC and Total Nitrogen (TN) has been observed along with 4 fold increase in sedimentation rate and low Coarse Fraction (>63μm). The surface water freshening continued, suggesting continuous supply of oxygen to the OMZ. This could have resulted in decreased TOC and TN due to better oxidation organic matter. During post-EMHT, strengthened monsoon has been recorded, but the oxygen supply to the sub-surface waters was insufficient possibly due to intensified OMZ. Therefore, increased denitrification as well as better preservation of organic matter has been recorded. The proxy record suggest that the EMHT was a regional climatic phenomenon, which could have been resulted due to combined effects of declined carbonate relict sedimentation in the surrounding area and intensified Arabian Sea OMZ. This may have led to carbonate dissolution as well as sudden increase in foraminiferal productivity in the area.