

Abstract

Core SK291/GC17 collected off Goa coast, eastern Arabian Sea (EAS) provides an opportunity to look into the paleoceanographic history of the region since ~40,000 to ~3,500 cal yr BP. Based on the assemblages of foraminifera (benthic and planktic) and pteropods, the stable isotope ratios of benthic foraminifera and pteropods, and the total organic carbon (TOC) content in the sediments, significant shifts in the monsoon induced productivity have been inferred. During the ~40,000-35,000 cal yr BP, when the sea level was low, high productivity and increased continental influx (from Goa hinterland) due to intensified summer monsoon (ISM) caused a eutrophic condition in the shallow EAS. Dysoxic-suboxic benthic foraminifera dominate the assemblage and intact pteropod shells are rarely preserved in this interval, whereas, partial pyritization of the microfossil shells is quite common. During the Last Glacial Maximum (LGM) from ~21,000-18,000 cal yr BP, high positive values of $\delta^{18}\text{O}$ in pteropod *Heliconoides inflatus* suggest a dry phase of monsoon in the EAS. However, compared to the western and northern regions of the Arabian Sea, intensity of upwelling did not decrease significantly in this region. During the early Holocene, the ISM winds resulted in intense upwelling-induced productivity off Goa coast, causing higher abundance of *Globigerina bulloides* and thermocline dwelling planktic foraminifera. The strength of monsoon induced upwelling decreased from middle to late Holocene. The signature of 4.2 ka dry event is captured by the $\delta^{18}\text{O}$ in *H. inflatus*, showing a sharp increase in the values. Possibly, the cold and dry winter monsoon winds were strengthened during the 4.2 ka event, causing low temperature and high salinity of the surface waters in the EAS. However, the TOC value does not decrease during this time, which might be caused by the winter-wind driven particle-flux and convective mixing of the subsurface water to the surface layer inducing more productivity in the EAS. Our data indicate dysoxic-suboxic assemblage of benthic foraminifera did not recover following the LGM drop in their population, suggesting a permanent shift from hypoxic to better oxygenated condition off the coast of Goa.

Keywords: Indian Summer and Winter Monsoons; Eastern Arabian Sea; Upwelling; Foraminifera; Pteropods; Last Glacial Maximum; 4.2 ka event; Holocene