Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.25611

Oxygen Deficient Zone variability for the past 943 years: Insights from benthic foraminiferal morphogroups from the Andaman Basin.

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Understanding the oxygen-deficient zone (ODZ) variability has become crucial due to the significant role it plays in marine biodiversity, biogeochemical cycling of elements, redox environment, and trace gases production. Over recent decades, ODZs of oceans have expanded. However, the history of ODZs is not well understood, hampering a mechanistic prediction of how they might evolve in the future under global warming. In this study we reconstruct decadal scale benthic foraminiferal assemblage from the Andaman Basin to infer changes in ODZ variability for the past 943 yr upto 1007 AD. The multicore sample was collected onboard *RV* Sindhu Sankalp (SSK 164, MC- 28) from a water depth of 433 m. Here we make use of temporal variations in coarse fraction (%), organic carbon (C_{org}), calcium carbonate ($CaCO_3$), Total Carbon (TC), Total Foraminiferal Number (TFN), Benthic Foraminiferal Abundance (TBF), and, benthic foraminiferal morphogroups (abundances of ecologically sensitive species) to understand the variability in ODZ. We made use of oxygen-sensitive benthic morpho groups and classified them into low-oxygen (tapered cylindrical) and high-oxygen (flattened tapered) groups based on their association with changing dissolved oxygen levels. Temporal changes in oxygen sensitive benthic foraminiferal morpho groups exhibit a prominent shift at 1385 AD when high oxygen taxa (flattened tapered) were replaced by benthic morpho groups that represent a low oxygen environment (tapered cylindrical) suggesting an intensification of ODZ between 1007 AD and 1385 AD. The higher agglutinated foraminiferal abundance at about 1007 - 1385 AD suggest a low pH under lower dissolved oxygen concentration. At periods associated with an intensified ODZ (1007- 1400 AD) the C_{org} content is low. This is also a period associated with higher coarse fraction % indicating higher terrestrial influx due to the strong monsoon of the Medieval Warm Period (MWP). The coarser grains associated with higher run off resulted in degradation of organic carbon and lower C_{org}. Our results suggest that between 1400 and 1850 AD a predominantly colder period of little ice age caused weaker monsoon, lower productivity and weak ODZ while between 1007 and 1385 AD, medieval warm period intensification of monsoon caused higher productivity and intensification of ODZ.