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# Tracing long term cycles of monsoon induced OMZ expansion in the Indian Ocean

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Oxygen Minimum Zones (OMZs), are regions of low dissolved oxygen in ocean water. Apart from impacting all marine ecosystems, they also serve as primary areas for nitrogen loss to the atmosphere and sinks for atmospheric $CO_2$. The Maldives archipelago, houses a tropical record of past oceanographic processes operating in the Equatorial Indian Ocean (EIO), in the sediments of the shallow-marine depositional basin called the Inner Sea, which lies at 300-500m water depth and is within the OMZ. Presently, the OMZ in the Inner Sea (< 1 ml/l dissolved $O_2$) [1] is produced due to seasonal upwelling induced by monsoon winds. Although, the OMZ in the EIO is suggested to have been emplaced around ~13 Ma [2], its phases of expansion and retraction with the evolution of monsoon, remains highly debated. This study aims at delineating fluctuations of the OMZ since the past ~20 Ma, to understand the variations in monsoon wind stress over the EIO. Trace metal geochemistry of redox sensitive elements, using High Resolution – Inductively Coupled Plasma – Mass Spectrometer (HR-ICP-MS), was carried out on marine sediment samples procured via IODP Expedition 359, from sites U1467 and U1468. Many trace and minor elements exhibit multiple valence states, with differing solubility in oxygenated or oxygen-deficient seawater, like Manganese (Mn), Uranium (U), Vanadium (V) Molybdenum (Mo) and Cadmium (Cd). Under ideal oceanographic conditions, in wind induced upwelling regions, Mn depletion and U, V, Cd and Mo enrichment is observed in the sediments during strong OMZ, hence, during strong monsoon periods [3]. Results obtained show that the depositional environment was oxygen rich till ~13 Ma, after which, oxygen deficient conditions existed, with brief excursions to oxygenated values at ~9 – 7 Ma and ~5.5 – 4.5 Ma. The general curve trends of U, V, Mo and Cd co-varies, whereas Mn shows an inverse trend. Onset of modern like monsoon winds probably established between ~12 Ma and 14 Ma.

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