Monsoon-driven Hypoxia along the Northern Coast of Oman, Gulf of Oman

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An ocean observatory, consisting of real-time reporting cabled current profilers equipped with dissolved oxygen sensors deployed off the northern coast of Abu Bakara, in the Gulf of Oman between 65 and 1000 m, reveals strong seasonality of dissolved oxygen concentration in the water column. Seasonal monsoonal winds drive the waters of the northeastern Arabian Sea causing intense upwelling and downwelling zones along this coastline at yearly intervals. The seasonal cycle of variability of dissolved oxygen concentration seen in Abu Bakara resembles a saw-tooth pattern with abrupt transition from low (< 10 μM) to high concentrations (~200 μM) in late November and December. This is followed by a gradual decline during the rest of the year. The pattern is remarkably consistent at the three inshore stations of the cabled array. The pattern is most clear near bottom and is associated with the deep Indian Central Water layer of the Indian Ocean. The abrupt ventilation of the lower layers is coincident with the transition of monsoonal winds from the northeast, resulting in strong and persistent current flow to the southeast and along the coast. Currents are largely quiescent the rest of year. Temperature records at each location indicates that upwelling processes are more likely responsible for the variability than in situ respiration (water column or benthic). There is considerable variability over this seasonal trend that indicates that hypoxic conditions can occur in this region at any time of the year. The persistence of the low oxygen conditions, is longer (order of weeks) in late summer and fall, while non-fall hypoxic events tend to be shorter (order of days). The extreme variability of the dissolved oxygen is linked to the variability of the ocean currents. Reoccurring mass mortalities of fish in the Omani waters is raising serious concern about the health of the ecosystem and the potential damage to fisheries resources and recreational activities.

DiMarco, S.F., L. Al-Kharusi, L. Belabbassi, M. Stoessel, M. K. Howard, and A. E. Jochens. 2009. Monsoon-driven hypoxia along the northern coast of Oman, Gulf of Oman. Coastal Estuarine Research Foundation (CERF) 20th Biennial Conference: Estuaries and Coasts in a Changing World, Session SCI-044: Exploring Impacts of Hypoxia on Coastal Ecosystems, 1-5 November 2009, Portland, OR.