

## **Trace metal deficiency and suboxia limit productivity of upwelled water in the Arabian Sea**

Summer-time upwelling of subsurface waters along both the eastern and western boundaries of the Arabian Sea has been known to cause large-scale fertilization of euphotic zone and widespread phytoplankton blooms, but a direct comparison of the intensity and biogeochemical impact of this process over the two margins has not been possible so far due to lack of data. We carried out the first-ever survey covering, with the same vessel and during the same season (late southwest monsoon of 2004), the Indian and Omani continental shelves as well as open Arabian Sea, and observed much lower rates of primary production (PP) than would be expected in macronutrient-replete upwelled waters. Contrary to the prevalent belief, over the well-ventilated Omani shelf PP appears to be at times limited by low levels of iron, the uptake of which by phytoplankton may be further inhibited by extremely low copper concentrations. By contrast, along the Indian coast, where the upwelled water loses all dissolved oxygen (O<sub>2</sub>) due to a longer residence time, elevated PP occurs only within a thin oxygenated layer, implying that even though phytoplankton produce O<sub>2</sub>, its unavailability for metabolic requirement may inhibit their growth. These measurements of PP, combined with more extensive chlorophyll and hydrographic data, when compared with the JGOFS observations, do not support the recently reported intensification of upwelling and large enhancement of phytoplankton biomass in the Arabian Sea linked to a decrease in the winter/spring Eurasian snow cover since 1997. Trace-metal limitation of PP in the western Arabian Sea has potentially important implications for regional biogeochemistry including the formation and future evolution of the globally-significant denitrification zone and nitrous oxide fluxes to the atmosphere.

## **Volatile halocarbons in coastal Arabian Sea**

The central west coast of India has been recognized to experience annual cycles of hypoxia following the southwest monsoon upwelling and the resultant high biological production. In view of the occurrence of world record levels of nitrous oxide and dimethylsulphide in these oxygen-starved waters, we have initiated measurements of climatically important halocarbons (Chloroform, Carbontetrachloride and dichloromethane). Time-series measurements indicated seasonal cycles in their abundances with the highest occurring in transition periods between summer and winter monsoons. Chloroform concentrations exhibited positive linear relations with pigment levels.

## **New Time-series measurements in the coastal Bay of Bengal**

Under the Indian SOLAS-IMBER initiative new time-series sections are being studied in coastal waters off Vizag on the east coast of India. This project is funded initially for 3 years by the Department of Science and Technology, New Delhi. These time-series measurements are envisaged to carry out for longer period by amalgamating/supplementing with other IGBP/Climate related projects.