Redox Sensitive North Indian Ocean: a Natural Laboratory for Trace Element Transformations

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The biogeochemical status or structure of an ecosystem is a result of physical setting driven by climate. The North Indian Ocean contains regions of varied biogeochemical systems as the biological activities are regionally highly variable. Intensely high organic matter production in the Arabian Sea in monsoons leads to the formation of highly oxygen deficient sub-surface waters. The bacteria in these waters then turn to other trace species as oxidants for organic material decomposition. Here, reduction of Fe (III) to Fe(II), for example, assumes significance as Fe is a major stimulant of biological productivity. Simultaneously there are several other species of sulphur (thiosulphate), nitrogen (nitrous oxide) and Iodine (Iodocarbons) that undergo bacterial utilization. Their relative significances in the active denitrification zone of the Arabian Sea are not well known. On the other hand, the mid-depth water column of the Bay of Bengal is almost equally oxygen-deficient but with passive denitrification. Therefore, the redox sensitivity between the Arabian Sea and the Bay of Bengal are quite different that would influence redox sensitive trace species distributions/combinations differently. In these kind of settings, it is of utmost importance to find how the redox sensitive species are effected as many of these could be potentially used in bacterial reduction of organic matter. For instance CCl4, is mainly of anthropogenic nature and hence used in tracing watermasses, is found to be susceptible to be an oxidant, under hypoxic conditions of the Arabian Sea. However, how CCl4 behaves in mid-depth layers of the Bay of Bengal is not known. Similarly, how biologically important polyvalent elements Mo, Cu, and Se or geochemically important U behave in these oxygen deficient zones; whether they are have a control of biological productivity in surface layers is not known. It is important these issues are addressed to better understand our neighbouring ecosystems. The North Indian Ocean holds promise to understand the transformations of redox sensitive elements in the ocean in a short time and space.