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Frequency of Cyclonic Disturbances and Changing Productivity Patterns in the North Indian Ocean Region: A Study Using Sea Surface Temperature and Ocean Colour Data

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ABSTRACT

In recent years we are observing devastating cyclones like Nargis, Gonu, Sidr, Liala, Phet etc in the North Indian Ocean associated with heavy rains, thunderstorm, high tide and intense winds that caused shocking destructions in the coastal areas. As these are originating over the Ocean and propagating towards land, they also change physical property as well as biological structure of the Ocean. In recent years, several attempts were made to associate tropical cyclone trends with climate change resulting from green house warming. The studies have indicated an increase in intense cyclones in the Arabian Sea. Time series analysis of ocean colour data have revealed rapid and profound change in the productivity pattern over the last few years in the Arabian Sea that appears to be related to the warming trends being experienced over the Asian subcontinent. In view of the above, a study was carried out to examine the frequency of cyclonic disturbances in the Arabian Sea and the Bay of Bengal and its effect in modulating the productivity patterns. Data on the monthly and annual occurrences of tropical cyclones in the Bay of Bengal and the Arabian Sea were collected from 1908 to 2007 from SAARC Meteorological Research Centre and Indian Meteorological Department. Sea surface temperature (SST) from NOAA-AVHRR and phytoplankton biomass indexed as chlorophyll-a concentration from Sea WIFs for ten years (1998-2007) were used to study the physical and biological effects of cyclonic events in the Arabian Sea (AS) and the Bay of Bengal (BOB). Analysis of the monthly and annual occurrences of tropical cyclone reveals an increasing trend of cyclonic disturbances in the AS whereas there is a decreasing trend in the BOB in the last decade (1998-2007). SST analysis indicates decrease in monthly average SST by 1.5°C to 1.75°C in the AS and 1.5°C to 1.25°C in the BOB in the pre-monsoon season. Phytoplankton biomass was observed to increase by a factor of two after the passage of cyclone. Results of the ten year analysis and comparison with the climatology showed that frequent occurrence of cyclonic events that cause short term-nutrient enrichment of upper-stratified ocean resulting in enhanced biological productivity and perturbations in the otherwise stable and seasonally-varying ecological structure of the North Indian Ocean.

KEYWORDS

Cyclonic Events; Arabian Sea; Bay of Bengal; SST; Chlorophyll-a; Ecological Structure

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