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Eddy Mediated Biological Productivity in the Bay of Bengal

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The Bay of Bengal situated in the eastern part of the north Indian Ocean, is traditionally considered to be a region of lesser biological production compared to its western counter part, the Arabian Sea. Despite the contrasting chlorophyll and primary productivity pattern, sediment trap data shows that annual fluxes of organic carbon reach comparable rates in both the basins. This is intriguing considering the fact that both these basins are located in similar latitude and subjected to similar seasonally reversing atmospheric forcing. As there is no evidence of strong upwelling in the Bay of Bengal except for much localized ones close to the southwestern boundary during summer, the traditional mechanisms of nutrient supply to the upper ocean waters cannot account for the observed annual flux of organic carbon from sediment trap. In the present paper we show that eddies are an integral part of the Bay of Bengal circulation based on the in situ data collected during 2001-2005 under the Bay of Bengal Process Studies (BOBPS). These eddies do not show any surface expression in the thermo-haline fields due to the freshwater cap. We propose eddy- pumping as a possible mechanism of vertical transfer of nutrients across the nutricline to inject nutrients to the oligotrophic waters in the Bay of Bengal. These eddies enhance the biological productivity by more than double (2 to 8 times) compared to the oligotrophic non-eddy region. Though the surface chlorophyll concentration remains low, the enhanced subsurface chlorophyll concentrations will result in net increased biological production in the Bay. Near the river mouths the plumes enriched in nutrients together with eddy-pumping at the base of the halocline significantly increases the nutrient supply to the upper layers. The organic carbon thus produced in the Bay of Bengal may be lost from the euphotic zone much faster under the ballasting by lithogenic sediments. The eddy-mediated biological productivity though may not fully answer the observed comparable annual average rates of organic carbon fluxes in the Bay of Bengal and the Arabian Sea; this definitely suggests alternate processes and mechanisms that may be unique to the Bay of Bengal.