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Carbon Dioxide Fluxes in Relation to Seasonality in Environmental Forcings in the Bay of Bengal

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The Northern Indian Ocean, separated into the Arabian Sea on the west and the Bay of Bengal to the east by the Indian subcontinent, exhibits dissimilar physico-chemical and biological characteristics in the two regions. Measurements of total carbon dioxide (TCO2) and computations of partial pressure of carbon dioxide (pCO2) exhibited seasonal and spatial variability in the Bay. The north-south gradients in the pCO2 levels were closely related to the gradients in salinity caused by the fresh water discharge in the north. The other atmospheric features like light limitation due to the suspended load and cloud cover inhibit carbon fixation. However, eddies that are most frequently observed in the Bay of Bengal help in enhancing the nutrients availability in the subsurface waters. These phenomena elevate the carbon dioxide draw down by increasing the productivity during the fair seasons. The physico-chemical & biological processes supported by environmental forcings play an important role in pCO2 distribution in the euphotic zone. Evaluation of fluxes of carbon dioxide during the southwest monsoon indicate an average flux of 5.3 mmol m –2 d-1. However, the northern region (18-20°N) which is characterized by strong gradients in salinity suggests absorption of CO2 from the atmosphere. During the fall intermonsoon an average flux of 2.0 mmol m-2 d-1 is observed. Changes in physical forcings and moderately higher production result in significantly lower CO2 flux in this season. The winter monsoon shows the highest average flux of 12.4 mmol m-2 d-1 among the three seasons. The northern region shows elevation in the salinity levels in the surface layer compared to the other two seasons indicating the decrease in the influx of riverine fresh water discharge. Seasonal average fluxes of carbon dioxide are estimated to be 0.64 mol m-2 for the southwest monsoon, 0.25 mol m-2 for fall intermonsoon and 1.53 mol m-2 for winter monsoon.