

Seasonal variability of salinity in the Indian Ocean in response to riverine freshwater forcing using ROMS

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Indian Ocean exhibits large spatial and temporal variability in the sea surface salinity distribution. The unique geographical features causes the salinity distribution over the Arabian sea and Bay of Bengal quite different. The Arabian sea being connected to highly saline waters from Red Sea and Persian Gulf remains salty when compared to the Bay of Bengal. Major rivers such as Ganges, Brahmaputra, Mahanadi, Godavari, Krishna, and Irrawaddy debouch an excess amount of freshwater into the Bay. In addition to this, the annual precipitation over Bay of Bengal always remains higher than evaporation when compared to Arabian Sea. Due to these factors the Bay remains fresher than Arabian sea throughout the year and also exhibits large seasonal variability in the circulation patterns. The seasonal variability of sea surface salinity in the Indian ocean is studied by using a ocean general circulation model 'Regional Ocean Modeling System' (ROMS). The model domain extends from 30° S-30°N, 30°E-120°E with quarter degree resolution in the horizontal and 40 sigma levels. The model is initialized with annual mean climatology of tracer fields from World Ocean Atlas 2013 (WOA13) and forced with daily climatological winds from Quikscat and ASCAT and other atmospheric forcing fields from TropFlux. It is found that there is significant contribution to freshening from riverine freshwater discharge in coastal regions near river mouths. Over the Indian Ocean, northern boundaries of Bay of Bengal found to have largest impact of river discharges on SSS simulations during monsoon (June-September) season when the peak discharge from major rivers Ganges, Brahmaputra, and Irrawaddy accumulate freshwater plume along coastal regions in Bay of Bengal. The impact of continental freshwater discharge on the seasonal salinity pattern are investigated. Satellite and in-situ observations are also used to understand the response of riverine freshwater forcing in controlling the spatial and seasonal variations of salinity in various sectors of the Indian Ocean.

Keywords: Indian Ocean, Sea Surface Salinity, Seasonal Variability, River Discharge