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Simulation of thermohaline and circulation features in the North Indian Ocean

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The unique geographical setting of tropical Indian Ocean plays a crucial role in regulating the regional and global climate. The northern boundary of the Indian Ocean lies in the tropics and is closed by the Indian subcontinent land masses. The Indian peninsula splits the North Indian Ocean (NIO) into two basins, namely Arabian Sea (AS) and Bay of Bengal (BoB) with different oceanographic features. The BoB is less saline than AS almost throughout the year due to the contribution of fresh water influx from both river runoff and heavy precipitation than evaporation. Variability in the dynamics along the east and west coast of India because of seasonal reversal of the wind pattern causes the exchange of salt between two basins. In the present study the Regional Ocean Modeling System (ROMS) is used to simulate climatological features of sea surface temperature (SST), profiles of salinity, temperature and currents in the Indian Ocean. ROMS is a free-surface primitive equation model with hydrostatic approximation which implements the terrain following sigma coordinates in the vertical. The model domain comprises the tropical Indian Ocean confined between 30°S-30°N, 30°E-120°E. The northern and western boundaries are closed and eastern and southern boundaries are relaxed to climatology. The model is initialized with annual mean climatology of temperature and salinity and forced at the surface by monthly climatology from Comprehensive Ocean Atmosphere Data Sets (COADS) and the model is spun-up for 20 years. Model simulations are validated with the available in-situ observations and satellite derived data sets. The ROMS model in general is able to capture the seasonal variations of temperature and currents. Ocean Surface Current Analyses Real time (OSCAR) monthly mean sea surface currents are used for assessing the zonal and meridional currents simulated by the model. Monthly climatological simulations from ROMS model and their departure from observations are discussed.

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