ABSTRACT

High resolution Ocean state simulations are carried out using the Regional Ocean Modeling System (ROMS) in the Bay of Bengal (BOB) to understand the mesoscale features, mechanism of boundary currents and the formation of gyres and eddies. The model is able to resolve most of the known circulation features of the BOB in reasonable agreement with earlier analyses and observations. Some new features are also observed in the model simulations. The formation of northward flowing Western Boundary Current (WBC) in the spring and southward flowing East India Coastal Current (EICC) during autumn associated with eddies are well simulated by the model in the climatological simulation. The current patterns and magnitudes are comparable with the geostrophic current derived from TOPEX sea surface height anomalies. The model simulated coastal upwelling, locations of eddies, north equatorial current (NEC) and the south westerly monsoon current (SMC) are quite comparable with previous studies. Another set of experiments with OceanSat II (OS2) and NCEP winds are carried out to study the response of the BOB circulations to the wind forcing. The OS2 winds are capable of reproducing the more realistic features than the NCEP winds. The magnitudes of the simulated salinity and temperature fields are more in the climatological simulation compared to that with OS2 and NCEP winds experiments. The advection of tracers by the WBC during February-March and the formation of a shallow hammerhead high-salinity structure are simulated for the first time with the realistic wind forcing experiments which are also supported by satellite chlorophyll observation. Unfortunately, observational synoptic section data for the BOB are rare; thus, physical validation of the simulated eddies and the frontal transport values are restricted at particular sections where data and published results are available. The study also focuses on the improvement of initial fields for the model by incorporating observational datasets for the short term (10 days) hindcasting/forecasting for the first time for the BOB. The assessments of the hindcast experiments show that this modeling setup is a suitable platform for the ocean state forecasting system. An algorithm has been outlined to use this modeling setup for ocean state forecasting for operational use.

Keywords: BOB, ROMS, Objective Analysis, WBC, EICC, ARGO, NCEP, Eddy