Comparison of Regional Ocean Modeling System (ROMS) Simulations with the RAMA Buoy Observations

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In the present study, we compare the Regional Ocean Modeling System (ROMS) simulations for the period 1Jan2009 to 31Dec2009 with the RAMA moored buoy observations at various locations in the Indian Ocean. ROMS is a primitive equation, free surface Ocean General Circulation Model (OGCM), with terrain following sigma coordianate system in the vertical1. The present setup of the model, with a domain covering entire tropical Indian Ocean (30120^{o}E, 30^{o}S30^{o}N), has a horizontal resolution of 0.25^{o}x0.25^o and 40 sigma levels in the vertical. A bulk aerodynamic formulation is used for the flux correction of the SST. Vertical mixing scheme is based on Large et al (1994)2. The model sea surface salinity is relaxed to the Levitus monthly mean climatology. The model is spun up for 20 years using climatological forcing and then it is integrated with realistic forcing (QuickSCAT wind fields and NCEP Reanalysis airsea fluxes) for the period 20002008. From 2008 July onwards, it is forced with analyzed fields from the T254L61 model of National Centre for Medium Range Weather Forecast (NCMRWF), New Delhi. In this paper, we validate the Sea Surface Temperature (SST), Mixed Layer Depth (MLD) which is defined as the depth at which the temperature is less than the SST by 0.5^{o}C, depth of 20oC isotherm and the zonal and meridional components of the surface current fields. A detailed comparison shows that the model could simulate the observed variation in these fields quite realistically. The root mean square error (RMSE) of SST is around 0.4 ^{o}C. The correlation between model and observed SST is 0.85, which is highly significant (above 99%). Similarly, RMSE the depth of 20^{o}C isotherm in most of the locations where the buoy observations are available is 1.5m. The correlction coefficient is 0.6. The MLD simulated by the model is having an RMSE of about 14m. The correlation between the model and observed MLD is around 0.8. While both the components of the surface current near the equatorial Indian Ocean are quite realistic with the correlation coefficient of aroung 0.75, the model could not capture the variation of the same in the Bay of Bengal quite realistically.

Keywords : Regional Ocean Modeling System, Ocean General Circulation Model, RAMA moored buoy, Validation.

References

[1]A. F. Shchepetkin, and J. C. McWilliams, Ocean Modeling 9, 347404 (2005).
[2]W. G. Large, J. C. McWilliams, and S. C. Doney, *Rev. Geophys.* 32, 363–403 (1994).