Geophysical Research Abstracts
Vol. 17, EGU2015-4443-1, 2015
EGU General Assembly 2015

The Red Sea Modeling and Forecasting System

Ibrahim Hoteit (1), Ganesh Gopalakrishnan (2), Hatem Latif (1), Habib Toye (1), Peng Zhan (1), Aditya R. Kartadikaria (1), Yesubabu Viswanadhapalli (1), Fengchao Yao (1), George Triantafyllou (3), Sabique Langodan (1), Luigi Cavaleri (4), Daquan Guo (1), and Burt Johns (1)

(1) King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia, (2) Scripps Institution of Oceanography (SIO), San Diego, USA, (3) Hellenic Centre for Marine Research (HCMR), Gournes, Greece, (4) Institute for Marine Science (ISMAR), Bologna, Italy

Despite its importance for a variety of socio-economical and political reasons and the presence of extensive coral reef gardens along its shores, the Red Sea remains one of the most under-studied large marine physical and biological systems in the global ocean. This contribution will present our efforts to build advanced modeling and forecasting capabilities for the Red Sea, which is part of the newly established Saudi ARAMCO Marine Environmental Research Center at KAUST (SAMERCK).

Our Red Sea modeling system compromises both regional and nested costal MIT general circulation models (MITgcm) with resolutions varying between 8 km and 250 m to simulate the general circulation and mesoscale dynamics at various spatial scales, a 10-km resolution Weather Research Forecasting (WRF) model to simulate the atmospheric conditions, a 4-km resolution European Regional Seas Ecosystem Model (ERSEM) to simulate the Red Sea ecosystem, and a 1-km resolution WAVEWATCH-III model to simulate the wind driven surface waves conditions. We have also implemented an oil spill model, and a probabilistic dispersion and larval connectivity modeling system (CMS) based on a stochastic Lagrangian framework and incorporating biological attributes. We are using the models outputs together with available observational data to study all aspects of the Red Sea circulations.

Advanced monitoring capabilities are being deployed in the Red Sea as part of the SAMERCK, comprising multiple gliders equipped with hydrographical and biological sensors, high frequency (HF) surface current/wave mapping, buoys/ moorings, etc, complementing the available satellite ocean and atmospheric observations and Automatic Weather Stations (AWS). The Red Sea models have also been equipped with advanced data assimilation capabilities. Fully parallel ensemble-based Kalman filtering (EnKF) algorithms have been implemented with the MITgcm and ERSEM for assimilating all available multivariate satellite and in-situ data sets. We have also developed advanced visualization tools to interactively analyze the forecasts and their ensemble-based uncertainties.