On the Development of an Efficient Ensemble Data Assimilation and forecasting System for the Red Sea at KAUST

Sivareddy Sanikommu[*], Habib Toye, Peng Zhan, Naila Raboudi, and Ibrahim Hoteit

**King Abdullah University of Science and Technology (KAUST),
Thuwal 23955-6900, Saudi Arabia**

E-mail Id of Corresponding Author: sivareddy.sanikommu@kaust.edu.sa

Abstract

The Red Sea, which lies between Africa and the Arabian Peninsula and connects with the Indian Ocean in the south through the narrow strait of Bab-El-Mandab, is one of the warmest and saltiest bodies of seawaters in the world, and yet hosts a unique ecological system fringed with coral reefs. The general circulation of the Red Sea consists of a strong quasi-stationary mesoscale eddy variability, which can only be captured by eddy-resolving ocean models. It also features a unique seasonally-reversing overturning circulation driven by the Indian Monsoon, and important interannual variability in response to major climate indices such as ENSO and NAO.

We have recently developed an efficient ensemble ocean data assimilation system to analyze and predict the Red Sea at eddy resolving scales. The system is based on the Data Research Test bed (DART) and a 4km-resolution MITgcm nested in the MERCATOR global ocean fields and is capable of assimilating all available remote sensing and in-situ observations. The system performance was validated by carefully examining the results of various assimilation experiments. The aim is to develop the most efficient system, in term of performances and computing load, while focusing on the design of the background covariance through different ensemble generation strategies: (i) adaptively selected ensemble from a large dictionary of members, (ii) flow dependent ensemble generated by accounting for various sources of uncertainties in the mode, and (iii) Hybrid ensemble combining members from (i) and (ii). The talk will give an overview of the system, analyzing in particular the performances of different ensemble generation strategies .