
A 20-year High resolution Red Sea Reanalysis using a Hybrid ensemble data assimilation

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Abstract

A 20-year (2001-2020) eddy resolving reanalysis is generated for the Red Sea by assimilating satellite and in situ observations of sea surface temperature, sea surface height, ocean temperature and salinity profiles into a 4 km Massachusetts Institute of Technology general circulation model (MITgcm). The assimilation is performed using a Hybrid system combining a monthly varying quasi-static ensemble and a flow-dependent ensemble from the ensemble adjustment Kalman filter (EAKF) of the Data Assimilation Research Testbed (DART). The flow-dependent ensemble integrates 50 different MITgcms to account for uncertainties in initial conditions, model physics, and atmospheric forcing. The system is forced with 50-member atmospheric ensemble from the European Center for Medium Range Weather Forecast (ECMWF) available at 50 km every 6 hours, and open boundary conditions from the Mercator ocean reanalysis. The generated reanalysis is compared against available global ocean reanalyses products to show its relevance. This high resolution long-term reanalysis of the Red Sea is important not only for exploring the circulation of this historically sparsely observed basin, but to also deepen our understanding of its biological processes.

Keywords: Red Sea Reanalysis, Hybrid Ensemble Data Assimilation, DART, MITgcm

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