Establishing an Ocean Observing and Prediction Network for the Red Sea

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The Red Sea

1925 x ~250 km
Max depth ~ 2800 m

T_{min} = 21.5
S_{max} = 40.6
IOP Research Investigations – Initial Questions

• Role of eddies in north-central Red Sea and their variability, effect on pelagic biology & reef systems;

• Convective processes in the North Red Sea, and fluxes between the surface and deep Red Sea;

• Resolve the annual cycle of the Red Sea from a physical and biogeochemical perspective;

• What nutrients limit and control productivity of the Red Sea? What processes affect nutrients cycling?

• Is there an oceanographic connection between the annual aggregation of whale sharks near Shib Habil off Al Lith?
Seasonal Forcing – Monsoonally Driven
(from Sofianos and Johns, JGR, 2003)

Winter

Summer
Characteristics of the Circulation

- Strong Thermohaline Circulation
- Significant role of eddies in the circulation

Yao et al., JGR, 2014
Surface Current Mapping
What is possible?

US West Coast Snapshot for October 20, 2013, 0900 GMT

Kingdom of Saudi Arabia

~1500 km
Surface Current Mapping Phase 1
First Radial Patterns – 8/27/2015

- APMs excellent
- Range
  - Expected 70-80 km
  - Realized 100-120
First Vector Map on August 27, 2015

100 km
Long Term Glider Lines

Wind forced model with AXBT and MCSST assimilation

MODIS ocean color image
Ocean Sensing and Observing
Modeling and Forecasting
Collaborators: I. Hoteit

Models

Physical Model

Biogeochemical Models
Progress

- Permanent Installation of KAUST-Rabigh sites by mid-October
- Permanent Installation of Duba sites by early November
- Permanent Installation of Jizan sites in early 2016.
Summary

• Initiation of the Red Sea Observing System with CODARs, Gliders, and profiling floats
• First CODAR systems using 16 MHz
• Good range and performance (beyond expectations)
  • Perhaps explainable by higher salinity of Red Sea
• Leading towards operational real-time modeling and prediction system for currents and surface waves
  • Oil spill response (drilling, shipping, coastal terminals)
  • Products for ports and shipping
  • Interaction with biological systems
    • Reef connectivity
    • Basin exchange
    • Etc