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A comparison of submesoscale dynamics in the Gulf of Aden and Oman and their impact on the Red Sea and Persian Gulf outflows

Mathieu Morvan, Xavier Carton, Stéphanie Corréard, Rémy Baraille, and Pierre L'Hégaret
LOPS/IUEM/University of Brest, France

In the northern Arabian Sea, the Gulf of Aden (GA) and the Gulf of Oman (GO) are semi enclosed gulfs, connected to marginal seas which are evaporation basins. These basins produce dense and salty waters which flow into the gulfs as subsurface outflows. In those two basins, influenced by the monsoon regimes, the surface circulation is dominated by mesoscale eddies alternatively signed propagating westwards. Thanks to high resolution realistic numerical simulation performed with the HYCOM model over both regions, we will show the formation of submesoscale eddies and filaments at the surface and at depth. At the surface, submesoscale structures are triggered by friction of mesoscale current along the coast and by interaction between mesoscale currents and the wind stress. At depth, the friction over sloping or irregular topography is the main interaction leading to the generation of submesoscale eddies. The processes at play will be described in terms of instabilities and energy transfer over various scales. Then, we will investigate the role of such submesoscale structures on the spreading of salty waters formed in the Red Sea (for the GA) and in the Persian Gulf (for the GO).