Short range forecasting using Feature Model technique for Brazil Current eddies offshore Cabo Frio, RJ

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The circulation off the Brazilian coast can be considered complex and highly variable, because its meso-scale activity and because the water moves in distinct directions according to vertical layers. In the vicinity of the southeast Brazil shelf break and in the oceanic area, the Brazil Current (BC) and Intermediate Western Boundary Current (IWBC) system exhibit intense mesoscale activity, which are commonly associated to unstably-growing cyclonic meanders. It is evident the existence of recurrent eddies, as described in literature, such as the Vitória Eddy, the Cabo de São Tomé Eddy and the Cabo Frio Eddy (CFE), along the southeast Brazilian coast. The CFE occurrence is a consequence of the abrupt change of the coastline orientation combined with the steepness bottom bathymetry and its growth is due to baroclinic instability. Thus, it should be essential for an oceanic forecast system to accurately predict the mesoscale activity, its features and its location.

In this context, the aim of this study is to evaluate a new comprehensive technique of building synoptic thermohaline and momentum structures based on a feature model (FM) approach. So the intention is to build a Feature-Oriented Regional Model System (FORMS) that accurately represents the BC synoptic scenarios, as well as its meanders and associated eddies. Once this is established, the system could be used to investigate trigger process which culminate in the mesoscale features, as in the study conducted. The FORMS was applied as a part of a data assimilation system based on Regional Ocean Modeling System (ROMS) in order to forecast the CFE in a synoptic context. The Single-Image Edge Detection (SIED) algorithm was also applied for building the BC Feature Model and for validating the short range forecasting.

The highlighted issues make a Brazilian Ocean Forecast System important for supporting off-shore activities, such as oil industry, military and research activities. The Thematic Network for Ocean Observation and Modeling (REMO) was created aiming to establish a Brazilian oceanic forecast system through the development of oceanic numerical models, which are based on data assimilation schemes. Its final product is a short-forecast validated from satellite and field measurements. Thus, an essential part of the project concerns the acquisition and formulation of synoptic data from the Brazilian oceanic domain.