Ocean Dynamics of the Shelf and Bays of the Eastern Agulhas Bank: A Process-Oriented Numerical Modeling Study

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Abstract

A bay scale configuration of the Regional Ocean Modeling System (ROMS) will be used to investigate key questions with regards to the physical oceanographic processes of Algoa Bay and St Francis Bay and the adjoining continental shelf. This bay scale model will be nested within a larger domain encompassing the eastern Agulhas bank, which in turn will be nested within the ARC112 domain. The ARC112 dataset, derived from a 1/12°, eddy-resolving ROMS implementation encompassing most of the African continent and Indian Ocean, effectively captures the prominent characteristics and behavior of the greater Agulhas Current to provide vertical boundary conditions to the nested models. The NCEP Climate Forecast System Reanalysis (CFSR) dataset will be used to provide surface forcing conditions. Once an adequately performing bay scale ROMS configuration is implemented, a methodology of parameterization, boundary forcing modification and exclusion experiments will be used to investigate the following key research questions:

- How oceanographic processes in Algoa Bay and St Francis Bay are governed by the dynamics of regional wind patterns and the Agulhas current
- How frontal weather systems and coastal trapped waves influence oceanographic processes with Algoa Bay
- How the profile of the coast and sea floor topography of Algoa Bay and the adjacent Agulhas bank region influence the processes within the Bay

The insights, models and datasets produced during the course of this study will provide an excellent platform for *ex situ* experimentation to better understand how oceanographic processes, marine ecology, population dynamics and biogeochemical processes may be influenced by climate change, coastal infrastructure development, and other anthropogenic activities.