Abstract View

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A Numerical Study of Loop Current Eddy Interaction with Topography in the Western Gulf of Mexico

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ABSTRACT

Anticyclones originating from the Loop Current are known to propagate into the western Gulf of Mexico. Their frequency of generation, their long lifetimes, and satellite data suggest that at any one time one or more eddies may occupy the Gulf. Given the eddy sizes (100–200 km) and geometric confinement of the Gulf, it would appear that there may be significant interactions of individual eddies and/or interactions of the eddies with bottom topography. These possibilities are explored through the use of a two-layer primitive equation model. Variable parameters in this model study are eddy strength, vertical structure, lateral friction, and initial location relative to topography.

Results indicate that eddy motion is governed by two dynamical regimes depending on its lower layer rotational strength. Anticyclones with significant lower layer anticyclonic structure develop offshore directed self advective tendencies associated with topographic dispersion which induces asymmetry in the eddy. Eddies with weaker lower layer flow rapidly evolve through topographic dispersion to upper layer features and propagate independently of topography, interacting with the coastal boundary. The boundary can also include eddy asymmetry with resulting alongshore self advection tendencies leading to northward motion for anticyclones along the western boundary.