

Improving Near Bottom Currents Calculated By The GEM Kinematic Model-Phase I

Project Characteristics:

- *Evaluation of Gulf Eddy Model (GEM)*
- *LCE signatures in the deep Gulf of Mexico*
- *Near bottom currents in the Gulf of Mexico*
- *Role of LCEs in generating strong near-bottom currents*

Over the past two decades, the CASE-EJIP (offshore oil and gas joint industry partnership) has supported the use of a Gulf Eddy Model (GEM) to estimate currents generated by Loop Current Eddies (LCE). The model proved to be robust, and represents upper layer eddy currents sufficiently. However, little attention had been given to assess the accuracy of model predictions in the near bottom layer, where eddy currents are generally weaker.

To test the hypothesis that eddy currents below 1000m are due to eddy motion and equal to the eddy translation velocity, three primary objectives were established: 1) to identify deep current measurements at sites deeper than 500m and within 100m off the bottom under the influence of an LCE; 2) match the measurements with the GEM model output; and 3) compare GEM output with measured, near bottom currents. GEM was run using exact coordinates of the measurement sites and for the list of prior eddies in the Gulf.

53 measurement records of near bottom currents that span periods of LCE presence were identified. To test if the eddy translation velocity hypothesis improves the accuracy of GEM predictions, correlations between GEM output and measured currents with and without the eddy translation velocity were made. Results were used to determine the depth at which model and actual currents become uncorrelated. EOF analysis on the data from five full water column moorings was performed to define the role of eddy currents in the near-bottom layer.



The analyses revealed :

- GEM-generated near bottom currents and concurrent near bottom currents are uncorrelated most of the time. GEM-generated currents and the eddy component of the observed current are also uncorrelated.
- Correlation between GEM output and measured currents drops dramatically below approximately 500-700m.
- For intermediate layers, adding the eddy translation velocity to the velocity profile does not often improve the match between actual data and GEM output.
- Presence of an LCE does not indicate a near-bottom strong current event will develop, suggesting the role of LCE motion in generating strong near bottom currents has been relatively small.