

## **BOEMRE ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES**

**Region:** National (Gulf of Mexico)

**Planning Area(s):** Gulf of Mexico and Deepwater

**Title:** Extension of the Ocean Model Calculations (NT-07-X10)

**Total Cost:** \$ 199,978

**Period of Performance:** (2007-2009)

**Conducting Organization:** Dr. Lie Yauw Oey, Princeton University

**BOEMRE Contact:** Dr. Walter R. Johnson

### **Description:**

Background: The circulation of the Gulf of Mexico has been studied through previous model simulations. The models were subjected to many sensitivity calculations and skill was assessed by teams of oceanographers. The conclusion of these studies was that the models have significant skill in simulating the ocean surface currents. The studies delivered current fields simulated by the models, using wind forcing and river input for the period 1986-1999. The BOEMRE has continued field programs, particularly in the deepwater areas of the Gulf of Mexico from 2000 through 2006, particularly the Exploratory Study of Deepwater Currents in the Gulf of Mexico (GM-01-02) and the Survey of Deepwater Currents in the Western Gulf of Mexico (GM-03-01).

Objectives: The objective is to perform additional hindcast simulations of the circulation of the Gulf of Mexico using an ocean model, which has significant skill in simulating the near-surface currents, compared to drifting buoy data, and other data sets. Additional simulations of the ocean current using the wind forcing in the time period (2000-2006) will provide additional comparison of the model to data, and would extend the time period of the model application to provide additional environmental variability in the Oil Spill Risk Analysis calculations.

Methods: The method is to use a numerical ocean model to simulate the current fields in the Gulf of Mexico, developed in the ocean modeling studies for additional years of simulation past the scope of the original contracts. The wind forcing will be derived from the products of an atmospheric model, at least for the period of 2000-2008. Skill assessment comparisons against field observations, i.e. current meters and drifting buoy velocities, will be performed.

Importance to BOEMRE: The results of the study will be used by BOEMRE to improve the OSRA estimates of oil spill trajectories. The ocean models have been shown to have skill in estimating the near surface currents. This study will extend the time series of simulated currents to compare to other field projects that have been conducted in the Gulf of Mexico, as well as the use in the OSRA calculations.

**Final Report Due:** 4/15/11

**Publications:**

Berntsen, J. and L.-Y. Oey, 2010: Estimation of the internal pressure gradient in  $\sigma$ -coordinate ocean models: comparison of second-, fourth-, and sixth-order schemes. *Ocean Dyn.* 60, 317-330. DOI 10.1007/s10236-009-0245-y.

Oey, L.-Y., Y.-L. Chang, Z.-B. Sun & X.-H. Lin, 2009: Topocaustics. *Ocean Modelling*, 29, 277-286.

**Affiliated WWW site:** <http://aos.princeton.edu/WWWPUBLIC/PROFS/>

**Revised Date:** April 6, 2010