

Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Assessing the Impact of Oil Spills Using Three-Dimensional Oil Spill Modeling (PC-16-03)
Administered by	Pacific OCS Regional Office
BOEM Contact(s)	Susan Zaleski (susan.zaleski@boem.gov)
Procurement Type(s)	Interagency Agreement
Conducting Organization(s)	National Oceanic and Atmospheric Administration, Office of Response and Restoration
Total BOEM Cost	\$478,000 (includes Environmental Studies Program and Pacific Region funds)
Performance Period	FY 2016–2023
Final Report Due	December 1, 2023
Date Revised	November 1, 2023
Problem	BOEM has limited ability to assess the impact of a potential oil spill to subsurface biota.
Intervention	Pilot test a 3D oil spill model and expand BOEM Pacific Region’s oil spill modeling capability.
Comparison	Compare new model outputs to previous analyses.
Outcome	Updated oil spill modeling capability
Context	Southern California Planning Area

BOEM Information Need(s): Currently the offshore oil and gas risk analysis conducted by the BOEM Pacific Region is based on a two-dimensional oil spill model, which only predicts surface transport of oil spills. However, oil spills can have significant impact to the subsurface. The impact of oil spills to the subsurface can only be predicted using three-dimensional oil spill modeling. The aim of this study is to implement a three-dimensional oil spill model in southern California and to assess the impact of oil spills to subsurface biota. This study will expand BOEM Pacific Region’s capability to conduct oil spill risk analysis in southern California.

Background: BOEM Pacific region currently uses the General NOAA Oil Modeling Environment (GNOME), which is a two-dimensional oil spill model, for oil and gas risk analysis. This model can only predict oil spill risk to surface biota and to habitats located on the beach and in the intertidal zone. However, oil spills transport oil and its by-products into the subsurface, both the water column and the sediments, posing a risk to pelagic and benthic biota. Through this study, the fate and transport of oil spills in southern California will be predicted using a high-resolution, three-dimensional oil spill model. Predicting the three-dimensional fate and transport of oil spills will allow BOEM to assess the risk to subsurface biota and meet the needs of the BOEM Pacific Region’s offshore oil and gas program.

Objective(s): There are two objectives to this study:

1. Implement three-dimensional oil spill modeling; and
2. Assess the oil spill risk to subsurface biota.

Methods: The three-dimensional oil spill model will be based on a high-resolution (1 km) Regional Ocean Modeling System (ROMS) and will use particle tracking to simulate the fate and transport of the oil. Using particle tracking to simulate the fate and transport of oil spills is a widely used and well-accepted practice. The ROMS predictions for 11 years from 2004–2014 were developed by the University of California, Los Angeles through a BOEM-funded study (Dong et al. 2017). The particle tracking for this study will be modified so that the particles represent the physical properties of oil. Using realistic oil spill scenarios over a range of different oceanographic regimes (such as upwelling, relaxation, and eddy-driven flow), the three-dimensional fate and transport of the oil will be simulated. BOEM will supply realistic oil spill scenarios and a range of oil products to be modeled. By simulating these oil spill scenarios, areas of high risk in the subsurface, both the water column and benthos, can be identified. Using available geologic and marine habitat maps of the region, the impact of oil spills on these biota will be assessed.

Specific Research Question(s):

1. Can GNOME perform well in a 3D environment?
2. Will analysts be able to run oil spill models through the online GNOME and TAP interfaces?
3. Can analysts use the 3D model output to assess effects from a potential subsurface oil spill?

Current Status: The BOEM-NOAA interagency agreement was awarded April 22, 2016. Work is underway to update GNOME and TAP. The beta versions of GNOME online interface and online TAP viewer are complete. BOEM and NOAA presented the project at the International Oil Spill Conference 2017 in Long Beach, California. BOEM and NOAA planned to present the project at the International Oil Spill Conference 2020 in New Orleans, Louisiana, but the conference was cancelled due to COVID-19. Web TAP is complete: <https://tap.orr.noaa.gov/#locations/south-california/>. PIs are working on final report.

Publications Completed: None

Affiliated WWW Sites: None

References: None