

BOEM ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

BOEM OCS Region: Gulf of Mexico

Title: Remote Sensing Assessment of Surface Oil Transport and Fate during Spills in the Gulf of Mexico (GM-12-02)

Planning Area: Gulfwide

Total Cost: \$800,000

Period of Performance: FY 2013-2015

Conducting Organization: Florida State University

BOEM Contact: Dr. Rebecca Green

Description:

Background: The Bureau of Ocean Energy Management (BOEM) invests in ocean research through its Environmental Studies Program to provide science in support of management decisions. An objective of the bureau's Oil Spill Modeling Program and physical oceanography studies is to conduct research that will improve estimates of oil-spill transport, fate, and impacts to the environment. Several studies have previously been funded to improve understanding of interactions between spill transport and physical forcing mechanisms. With relevance to surface spill movements, BOEM and its predecessors deployed oil-spill-simulating drifters in the Gulf of Mexico in the late 1990's as nonpolluting oil spill proxies to compare their movements against results from the Oil Spill Risk Analysis (OSRA) model. Such comparisons have helped test parameterizations of spill velocity based on surface ocean currents and an empirical wind-induced drift. With regards to recent events, a wealth of remote sensing, overflight, and in situ measurements have been collected in recent years during spill events in the Gulf of Mexico. It is important that BOEM learns from these observations, in conjunction with physical forcing fields, to more precisely quantify wind and ocean current forcing on oil spill movement.

Objectives: The purpose of this 3-year study is to develop a better understanding of the movement, properties, and fate of surface oil from past spills in the Gulf of Mexico. Because the physical and chemical processes affecting oil movement can be unique to each spill, this study will address several historical spills. This study will elucidate the most likely mechanisms responsible for oil movement in surface waters through developing and applying remote sensing products and an oil-spill transport and weathering model.

Methods: The objectives of this study are being met through utilization of remote sensing products which describe the location and characteristics of surface oil during spill events. The first task is to further develop satellite-based algorithms for estimating the extent and properties of the oil, including thickness and type (e.g., oil slick, thinner oil sheen, and emulsified oil). Existing in situ measurements of the oil collected during the

spills are critical for ground-truthing the remote sensing algorithms. The second task is application of the satellite-based algorithms to determining a time series of oil extent and properties through the duration of several oil spills. The analysis of several spills should help elucidate the mechanisms unique to each event in determining oil movement, as well as those mechanisms which are similar between events. The third task is comparison of image products to various physical oceanographic fields (e.g., SSH, SST, winds, and currents) to determine the primary physical mechanisms responsible for oil transport. This includes determination of the relative contributions of spreading, advection by currents, advection by winds, turbulent mixing, and diffusion. Quantification is being made of the relationship between ocean material boundaries and spill movement. Consideration is also being given to weathering processes which attenuate the oil with distance from the spill site.

Products: Synthesis Reports, Datasets, Peer Reviewed Publications, and Conference Presentations

Importance to BOEM: This study will assess the movement, properties, and fate of surface oil from spills using remote sensing products and an oil-spill transport and weathering model. The study will provide information on the primary physical mechanisms that have controlled the transport of spilled oil during past spill events (e.g., advection, wind forcing, flow boundaries, etc.) for use in NEPA documents.

Current Status: This study was awarded in August, 2012 and is ongoing.

Final Report Due: August 2015

Publications: IGARSS Conference paper (Garcia-Pineda et al., 2013); *Oceanography* 26(2) paper (Garcia-Pineda et al., 2013); Conference presentations at GoMRI 2014, Estuarine and Coastal Ocean Modeling-San Diego 2013, FAMOS WHOI 2013, OTC 2013.

Affiliated WWW Sites: none

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