

MMS ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Title: Sea Ice-Ocean-Oil Spill Modeling System (SIOMS) for the Nearshore Beaufort and Chukchi Seas: Improvement and Parameterization (Phase II) (AK-93-48-58)

MMS Information Needs to be Addressed: The Circulation and Oil-Spill-Trajectory Model is a cornerstone to regional EISs, environmental assessments, and oil-spill-contingency planning. Model results are used by MMS, industry, and other agencies to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune protective lease-sale stipulations. The MMS is currently using an Arctic basin model with 20-km grid spacing to project oil spill trajectories within 10-km of land for ongoing developmental EISs. This study will provide a better model resolution. It is critical to continue efforts to improve the art and reliability of circulation and trajectory models used in nearshore portion of the central Beaufort Sea. Information from this study will be used in preparing NEPA analysis and documentation for Beaufort Sea and Chukchi Sea Lease Sales, DPPs, and oil-spill-contingency plans for OCS and coastal facilities.

Total Cost: \$579,000

Period of Performance: FY 2004-2008

Conducting Organization: CMI, UAF

MMS Contact: [Chief, Alaska Environmental Studies Section](#)

Description:

Background The study addresses MMS's needs in terms of modeling at smaller scales in the Beaufort nearshore. The study will implement recommendations from MMS CMI workshop on small-scale SIOM for the nearshore Beaufort and Chukchi Seas held at UAF in August 2002. Recent satellite imagery demonstrates the importance of eddies in the coastal Beaufort Sea and thus the need for smaller scale, eddy-resolving modeling such as proposed here. This study will cooperate with the state-of-the-art ice modeling MMS IA with NASA. The study continues development of a CMI model of the Arctic Basin, focusing on the nearshore Beaufort Sea. MMS adoption of circulation model products for use our leasing program's NEPA documents requires a high degree comfort for MMS modelers doing the adoption or by Regional analysts tasked with coordinating use the resulting Oil Spill Risk Analysis in EISs and then responding to public comments on that analysis. Other models available to MMS do not resolve the coastal barrier islands in the Beaufort Sea, where oil development is occurring.

Objectives The objective of this study is to implement a finer resolution (1-3 km) stretched grid coupled ice-ocean-oil model in the nearshore Beaufort and Chukchi Seas. The entire model is extended to an existing Arctic and North Atlantic Ocean model and includes an open Bering Strait.

Methods

1. Set minimum model depth to 5 meters, and extend the stretched domain through the 500-m isobath.
2. Parameterize sea ice thickness to represent thin ice, new ice, level ice, rafted ice, rubble ice, and ridged ice.
3. Parameterize the landfast ice, which can be ridged and anchored, based on existing theory and observations.
4. Couple the oilspill model developed during the prior CMI study with this SIOMS.
5. Annual review of modeling effort by MMS Modeling Review Board

Current Status:

The project was reviewed in May 2007 by the MMS Modeling Review Board and specific recommendations to improve the modeling were provided to the Principle Investigator. The MMS is completing review of the draft final report and modeling products.

Final Report Due: April 30, 2008

Publications Completed:

- Wu, B., Wang, J.; and J.E. Walsh. 2006. Dipole anomaly in the winter Arctic atmosphere and its association with Arctic sea ice motion. *J. Climate* 19(2), 210-225.
- Wang, J. Sea-Ice-Ocean-Oil-Spill Modeling System (SIOMS) for the Nearshore Beaufort and Chukchi Sea: Improvement and Parameterization (Phase II). 2005. Proceedings of the Tenth MMS Information Transfer Meeting and Barrow Information Update Meeting. MMS OCS Study 2005-036, pp. 19-20. Anchorage, AK, Prepared by MBC Applied Environmental Sciences, Costa Mesa, CA for MMS Alaska OCS Region.
- Wang, J. and Jin, M. Sea-Ice-Ocean-Oil-Spill Modeling System (SIOMS) for the Nearshore Beaufort and Chukchi Sea: Improvement and Parameterization (Phase II) [abstract]. 2005. University of Alaska Coastal Marine Institute. Annual Report No.11. Fairbanks, AK, University of Alaska, Coastal Marine Institute and USDO, MMS, Alaska OCS Region.
- Wang, J. Liu, Q., Jin, M., Ikeda, M., and F.J. Saucier. 2005. A Coupled Ice-Ocean Model in the Pan-Arctic and North Atlantic Ocean: Simulation of Seasonal Cycles. *Journal of Oceanography* 61: 213-33.
- Wang, J., H. Hu, and K. Mizobata. 2007. Simulating Ice-Ocean Downscaling Characteristics in the Beaufort-Chukchi Seas by an IARC Coupled Ice-Ocean Model (CIOM)." *Geophysical Research Abstracts* 9, no. 05977.
- Wang, J., Wu, B., Tang, C.C.L., Walsh J.E., and M. Ikeda. 2004. Seesaw Structure of Subsurface Temperature Anomalies Between the Barents Sea and the Labrador Sea. *Geophysical Research Letters* 2004; 31: 4 pp.

Affiliated WWW Sites: <http://denali.frontier.iarc.uaf.edu/~jwang/>
<http://www.mms.gov/alaska/>
<http://www.sfos.uaf.edu/cmi/>

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