MMS ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Title: Simulation of Landfast Sea Ice along the Alaska Coast (AK-04-x11)

MMS Information Need(s) 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. Information from this study will be used for NEPA analysis and documentation for Beaufort Sea Lease Sales, Chukchi Sea/Hope Basin Lease Sales, DPPs, and review of oil-spill-contingency plans for OCS and coastal facilities.

Total Cost: $120,000 **Period of Performance:** FY 2004-2008

Conducting Organization: CRREL

MMS Contact: Chief, Alaska Environmental Studies Section

Description:

Background The study addresses MMS's need for high-resolution sea ice modeling in the landfast ice zone of the Beaufort and Chukchi Seas. The study will implement a unique sea ice modeling approach developed by CRREL and funded by NASA. The sea ice model uses a Lagrangian-discrete-element-based approach that is well suited to tracking ice trajectories for oil spill transport modeling and simulating ice effects on man-made structures. The model has the ability to vary resolution at sub-kilometer resolution at the coast to 20-30 kilometer resolution in the central basin. This study will cooperate with the state-of-the-art ice modeling MMS Inter-agency Agreement (IA) with National Aeronautics and Space Administration (NASA). Other models available to, or being developed by MMS, have or anticipate problems with modeling the landfast ice regime where oil development is occurring in Beaufort Sea.

Objectives Develop a nearshore Beaufort Sea ice model for the landfast ice zone:

1. Construct a high-resolution model for simulation of the Beaufort Sea coastal landfast zone based on the existing CRREL/NASA Lagrangian Arctic Basin sea ice model.

2. Demonstrate the model through a series of simulations of sufficient duration to encompass a range of processes from formation to break-up.

Methods

1. Employ kilometer or sub-kilometer resolution at the model coast in the region of interest and 20-30 kilometer resolution in the remainder of the basin.

2. The model region is a 100-200 kilometer section of the Beaufort Sea coast and extending 50-100 kilometers offshore.
3. As available, the sea ice model will incorporate high-resolution ocean currents in the region of interest, to be obtained from other MMS studies. Coupling issues will be addressed.
4. A coast line data set is discretized by CRREL at sub-kilometer resolution from remote sensing images. The model incorporates available bathymetry.

Current Status:

A computer model has been constructed to simulate grounded ridge formation. Simulations of grounded pressure riding have been run. Parameterization of the seaward rate of ridge growth has been incorporated into a high-resolution sea ice model to simulate coastal grounded ridge formation. The primary investigator is working on the Final Report.

Final Report Due: Reviewing draft report, April 2008

Publications Completed: None

Affiliated WWW Sites: http://www.mms.gov/alaska/
http://www.crrel.usace.army.mil/

Revised Date: March 2008