MMS ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Area: Beaufort Sea

Title: Beaufort Sea Mesoscale Meteorology (AK-06-05)

MMS Information Need(s) to be Addressed: The final modeled data will improve the predictive capabilities of the MMS oil spill trajectory model and the Foundation for Scientific and Industrial Resources of the Norwegian Institute of Technology [Norwegian acronym] (SINTEF) weathering model for the Beaufort Sea. Information will be used in NEPA analysis and documentation for Beaufort Sea Lease Sales, Exploration Plans (EPs), and Development and Production Plan (DPPs).

Total Cost: $350,000 **Period of Performance:** FY 2006-2008

Conducting Organization: UAF, Geophysical Institute

MMS Contact: Chief, Alaska Environmental Studies Section

Description:

Background The 2003 MMS workshop on physical oceanography of the Beaufort Sea brought together international experts in Arctic oceanography to review the state-of-knowledge of Beaufort Sea processes and recommend long range goals for research to meet MMS needs. One recommendation was for improvements in understanding the mesoscale meteorology. Critical issues requiring study are the wind and surface stress fields established by mesoscale variations in regional meteorology and sea ice distribution and deformation fields. Accurate specification of the surface wind and stress field is essential to predicting ocean and ice circulation. The Beaufort Sea shelf is likely subject to substantial along and cross shore gradients in the surface wind velocity with these gradients possibly involving changes in both wind speed and direction. At present, wind gradients are not captured adequately by winds derived from synoptic pressure fields (typically prepared by weather forecasting and climate centers) and/or extrapolated from coastal meteorological stations, both of which are often used in estimating the shelf wind field. Oil spill models that rely on winds measured from coastal stations or from synoptic pressure fields could be seriously biased.

Objectives Evaluate existing mesoscale meteorology models that can predict along shore and cross-shelf wind speed and direction for the Beaufort Sea, Alaska. Determine the appropriate technical enhancements, funding levels and partnerships needed to build an enhanced mesoscale meteorological model for the Beaufort Sea that will optimize the prediction of spatial variability of winds, accounting for sea breeze and orographic effects.

Methods

Phase I:

1. Identify Potential Interagency Agreements or Partnerships with other Public, Private, or International Groups that are interested in Cost or Logistics sharing during Phase I.

2. Produce a Procite bibliographic database and report summary of potential mesoscale meteorological models and data collection efforts for the project study area
3. Conduct Comparative Data Analysis and Model Evaluation
4. Based upon the comparative data analysis, and other analytical tools at the contractors discretion, describe how well the mesoscale meteorological model represents the observational data with regards to orographics steering effects, sea breeze affects, and along shore and cross shelf wind spatial coherence.
5. Produce a Phase II plan to develop a Mesoscale Meteorological Model for the Beaufort Sea that will meet MMS objectives

Phase II:

1. Collect additional data as required for model implementation based upon the analysis of Phase I data, model priorities, and cost:
   a. Improved sea ice measurements.
   b. Measurement of surface winds from portable, temporary meteorological stations, buoys, on the landfast ice, pack ice and other proposed meteorological stations on offshore islands or offshore oil platforms of opportunity.
   c. Spatially varying surface variables such as soil moisture, canopy temperature and water content, terrain height, land roughness, land percentage etc.
   d. Other data.
2. Incorporate newly collected field data and develop preliminary model results that can predict the spatial and temporal variability of the along and cross shore surface wind and stress fields for the Beaufort Sea.
3. Produce an improved mesoscale meteorological model that meets MMS objectives.

Current Status:

Continuing to improve WRF model capability to reproduce seabreeze and orographic affects. Improving inputs to model, examining model physics, and comparing model output to station observations along the Beaufort Sea coast.

Final Report Due: Final Phase I report is due in August 2008.

Publications Completed: See web site below for publications.

Affiliated WWW Sites: http://mms-meso.gi.alaska.edu/

Revised Date: March 2008