

Environmental Studies Program: Ongoing Studies

Study Area(s): Beaufort Sea

Administered By: Alaska OCS Region

Title: Development of a Very High-resolution Regional Circulation Model of Beaufort Sea Nearshore Areas (AK-15-02)

BOEM Information Need(s) to be Addressed: BOEM uses coupled ice-ocean circulation model results as input to oil-spill trajectory analysis. Results with higher spatial resolution are needed to more fully represent nearshore circulation processes, particularly those near rivers, barrier islands and coastal lagoons within the nearshore Beaufort Sea. Development and application of state-of-the-art circulation models will support future OSRA-based NEPA analyses for Development and Production Plans within Stefansson Sound and the nearshore Beaufort Sea.

Total BOEM Cost: \$489,735

Period of Performance: FY 2015-2018

Conducting Organization: Rutgers University

Principal Investigator(s): Dr. Enrique Curchitser

BOEM Contact: [Dr. Heather Crowley](#)

Description:

Background: Offshore barrier islands, coastal features, and freshwater river outflow are known to affect the fine-scale ocean circulation in nearshore areas. Previous oil spill trajectory analyses, conducted by BOEM, in Stefansson Sound used both nearshore 2-D circulation and offshore 3-D coupled ice-ocean circulation model results. The spatial resolution of the current Arctic Circulation Model study is too coarse to adequately resolve the barrier islands within Stefansson Sound and the lagoons and other coastal features along the Beaufort Sea coast and produce high-quality simulations of the associated fine-scale circulation processes.

Objectives:

- Adapt and maximize the utility of an existing regional 3-D coupled ice-ocean circulation hindcast model to obtain high-resolution model fields that represent fine-scale processes associated with barrier islands and coastal features in the Beaufort Sea nearshore areas.
- Provide BOEM with ten to twenty years of relevant modeled fields, such as gridded wind, surface water and ice velocity, ice cover, and limited other modeled fields as agreed to between the contractor and BOEM.

- Evaluate the modeled under-ice currents in consideration of information derived from the study Idealized Process Model Studies of Circulation in the Landfast Ice Zone of the Alaskan Beaufort Sea (OCS Study BOEMRE 2011-056).

Methods: A coupled ice-ocean model will be modified to maximize utility in the Beaufort Sea nearshore areas. The model will possess sufficient spatial resolution to accurately represent circulation processes associated with barrier islands and coastal features. Conduct the standard suite of sensitivity testing and validation of the model and results.

Current Status: Complete

Final Report Due: February 2018

Publications Completed:

Curchitser, E.N., K. Hedstrom, S. Danielson and J. Kasper. 2017. Development of a Very High-Resolution Regional Circulation Model of Beaufort Sea Nearshore Areas. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Alaska OCS Region, Anchorage, AK. OCS Study BOEM 2018-018. 81 pp.

Hedstrom, K. 2018. Technical Manual for a Coupled Sea-Ice/Ocean Circulation Model (Version 5). U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Alaska OCS Region. OCS Study BOEM 2018-007. 182 pp.

Hedstrom, K., S. Danielson, E. Curchitser, J. Kasper. 2018. Arctic Ice-Ocean Circulation Modeling: Recent Improvements and Application. Poster HE44A-2978, presented at 2018 Ocean Sciences Meeting, Portland, OR, 12-16 Feb.

Hedstrom, K., S. Danielson, J. Kasper, E. Curchitser. 2018. Arctic Ice-Ocean Circulation Modeling: Recent Improvements and Applications. Oral presentation at the Alaska Marine Science Symposium, January 2018, Anchorage, AK.

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>
<https://marinecadastre.gov/espis/#/search/study/100076>

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