

BOEM ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Mapping and Characterization of Recurring Polynyas and Landfast Ice in the Chukchi and Beaufort Seas (AK-09-04)

BOEM Information Need(s) to be Addressed: Because the predominant oil-spill movement in the Chukchi OCS Planning Area would be from east to west, the potential interaction of oil and wildlife in the polynya system is a major concern. A better understanding of locations and characteristics of the polynyas and landfast ice could inform estimates of oil-spill trajectories. In addition, this information is useful for validating ice models. This study addresses aspects of USGS recommendations 3.01, 3.02, and 4.01.

Total Cost: \$462,000 plus Joint Funding

Period of Performance: FY 2009-2012

Conducting Organization: CMI, UAF

Principal Investigator: Dr. Hajo Eicken, Dr. Andy Mahoney, Lewis Shapiro, Allison Graves Gaylord

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Description:

Background: Polynyas in the Chukchi Sea reoccur every year to the west of Barrow. The size, frequency, and latitudinal extent of these polynyas are poorly defined south of Icy Cape along the U.S. eastern Chukchi coast and along the Russian Chukchi coast. A recently completed MMS study by Eicken et al. (OCS Study MMS 2005-068) mapped and quantified the spatial and temporal extent of landfast ice and leads, including Polynyas along the Beaufort Sea coast and a portion of the Chukchi coast utilizing high resolution satellite imagery. Data from this completed study was incorporated into the MMS Oil-Spill-Risk Analysis (OSRA), and in our EIS for the Beaufort Sea. In the study, polynyas along a small northeast segment of the Chukchi Sea coast and lease area were mapped, but areas to the south of Icy Cape, consisting of most of the Chukchi lease sale area were not. This new study effort will quantify the spatial and temporal extent of the leads, polynyas and landfast ice, including any recent changes in their extent south of Icy Cape, and update the information from the previous study effort for the Chukchi Sea and the Beaufort Sea.

It is also important to obtain better information on how polynyas and the mobile ice pack interact because this interaction is the key to how much spilled oil gets encapsulated in pack ice and impacts biota associated with these systems. Bowhead whales migrate to Barrow along these leads and head eastward toward the Canadian Beaufort in the spring. Polar bears are also found along these leads during the winter months. The leads are also heavily used by spring migrating waterfowl.

Objectives:

- Document spatial and temporal extent of recurring polynyas and leads to the west and south of Icy Cape, and their extent across the Chukchi Sea.
- Document temporal and spatial occurrence of shoreward landfast ice line across the Alaskan and Russian and Chukchi Sea.
- Update the spatial and temporal extent of the landfast ice and leads for the Beaufort and Chukchi seas based upon the previous work done for MMS OCS study 2005-068.
- Examine the effect of Climate State on polynya and landfast ice characteristics.
- Provide mean, minimum, and maximum monthly shoreward land fast ice line.
- Provide monthly mean, minimum, and maximum polynya extent along the Chukchi and Beaufort seas coasts. Provide monthly probability lead statistics as gridded data.
- Provide summaries of ice dynamics within the Beaufort and Chukchi seas.
- Develop a web site that documents the studies progress and provides interim products to the study team.
- Conduct a literature search on the impacts of sea ice by Icebreakers
- Develop a comprehensive ArcGIS database and final report

Methods: Collect and analyze current and historical remote-sensing imagery for recurring polynyas and shoreward landfast ice line. Review and synthesize literature and local information sources. Create a Geographic Information System (GIS) database which quantifies the spatial and temporal distribution of spring leads in the Alaskan Chukchi Sea, in addition to updated information for the Beaufort Sea. Provide individual years as well as statistical representation of polynya/lead occurrence and distribution. Create a GIS database and statistical summaries showing the monthly distribution of the shoreward landfast ice line across the Chukchi Sea to the Russian Chukchi Coast at 174 W. Provide individual months per year as well as statistical representation of landfast ice occurrence and distribution. Analyze ice dynamics within the Beaufort and Chukchi seas. Provide relevant attributes to spatial data for use in a GIS. Provide a final report, database, and database documentation. Provide a project team web site.

Current Status: Ongoing

Final Report Due: September 2012

Publications Completed: See project web site below.

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>
<http://boemre-new.gina.alaska.edu>

Revised Date: March 2012