Environmental Studies Program: Ongoing Studies

Study Area(s): Chukchi Sea

Administered By: Alaska OCS Region

Title: Development and Testing of a Low-Cost Satellite-Tracked Ice Drifter for Arctic Waters (AK-13-03-07)

BOEM Information Need(s) to be Addressed: The products of this study will respond to BOEM's and the State of Alaska's needs to better understand ocean currents within the water column underlying sea ice and to better estimate oil and contaminant trajectories in the nearshore in the event of a spill during the winter months. These low-cost ice drifters will be able to be easily deployed in ice-infested waters. The results from the ice drift study will provide new information on the stability of landfast ice, including in those areas that are heavily used by subsistence hunters. The capability to monitor large fragments of detached coastal sea ice in real-time would allow local communities, the State of Alaska, and Federal Agencies to track the movement of large ridges of ice that have the potential to be offshore marine mammal habitat or potential maritime hazards to shipping operations or subsistence hunting. Information from this study will support NEPA analyses for future lease sales, EPs, and DPPs.

Total BOEM Cost: $243,286 plus Joint Funding ($215,123)

Period of Performance: FY 2014-2018

Conducting Organization: CMI, UAF

Principal Investigator(s): Dr. Jeremy Kasper

BOEM Contact: Warren Horowitz

Description:

Background: This study will develop and test a limited number of ice drifters to measure small scale ice motion within the nearshore and offshore sea ice off Barrow. Sea ice movement is an important concern with respect to offshore oil and gas operations, the shipment of goods to the villages, scientific research activities, and the safety of subsistence hunting activities. Through the use of satellite-tracked buoys and satellite imagery, our understanding of large-scale ice motion within the deep ocean has improved significantly over the past few decades, although our knowledge of the impacts of small scale ice motions are limited, especially in the nearshore and offshore areas of the shallow shelf areas of the Chukchi Sea. Recent scientific investigations described in OCS Study BOEM 2012-079, *Application of High Frequency Radar to Potential Hydrocarbon Development Areas in the Northeast Chukchi Sea*, have shown a complex set of ocean currents within this area of the shelf during the open water season. Other investigations have shown large breakout events of landfast ice along the northeast Chukchi coast. In one of these breakout events on April 9, 2012, a large mass of ice over 40 km in length broke off the coast seaward of Wainwright and drifted into offshore areas of the Chukchi Shelf.

Objectives:

- Design, develop, test, and deploy low-cost satellite-tracked ice drifters that will collect position data during winter conditions in the northeast Chukchi Sea. The drifters should be easily deployed by local residents using snow-machines or walking on ice; survive low altitude deployments from helicopters; transmit real-time position data via Iridium Satellite; and float and continue sending position data after the ice flow has melted.
- Obtain ice motion information from the collection and analysis of sub-daily position data from clusters of deployed drifters within the coastal ice and within offshore ice flows.
- Obtain ice thickness and velocity data from the tagged ice floes, when possible, as they pass over co-located Ice Profiler and Acoustic Doppler Current Profiler situated beneath the coastal ice and at offshore locations.

Methods: The proposal plans to design, develop, and test a new type of satellite-tracked ice drifter that can be deployed on coastal landfast ice by local hunters or on top of freely drifting mobile pack ice by helicopter to track the movement of sea ice in the northeast Chukchi Sea. The movement and velocity data from the ice-drifters will compliment other data collection efforts currently underway that measures nearshore ice movements, current velocities, and ice thickness from X-Band Coastal Radar, moored Acoustic Doppler Current Profilers (ADCP), and Ice Profiling Sonars (IPS), respectively. Sub-daily position data from the clusters of drifters and X-Band Coastal Radar will improve our understanding of small scale ice dynamics of the coastal attached sea ice. As the fragments of ice detach from the landfast ice during the spring and early summer months, the co-located ADCP and IPS, and the coastal meteorological station in Barrow will provide additional information on potential forces driving the detachment process and movements of sea ice within the nearshore area. Farther offshore large ice floes will be tagged with clusters of ice drifters to track their movements. Twenty (20) prototype ice drifters will be deployed in stages to ensure that any design flaws may be corrected with later deployments. Improvements to the design of the drifters will be made as needed to ensure success.

Current Status: Completed

Final Report Due: September 2018

Publications Completed:

Cook S, Daley S, Saupe S., Lindeberg M., Morris M., Morrow K., Myers R., Park A. 2018. ShoreZone Imaging and Mapping Along the Alaska Peninsula. Anchorage (AK): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-037, 301 p.

Affiliated WWW Sites: http://www.boem.gov/akstudies/
http://www.cfos.uaf.edu/cmi/
http://www.ims.uaf.edu/artlab/projects/IceTrackers/

https://www.youtube.com/watch?v=r6RWwE5Ugpc
https://marinecadastre.gov/espis/#/search/study/26908

Revised Date: February 4, 2019