Environmental Studies Program: Ongoing Studies

Study Area(s): Beaufort Sea, Chukchi Sea

Administered By: Alaska OCS Region

Title: Changes in Beaufort-Chukchi Seas Intense Storm Activity and Impacts on Surface Climate and Ocean Properties (AK-13-03-18)

BOEM Information Need(s) to be Addressed: BOEM needs a better understanding of seasonal and regional changes in storm activities and their impacts on sea ice and the ocean to support environmental analyses associated with offshore oil and gas exploration and development activities. Assessments of these changes using high-resolution models and observational data are needed for evaluating the potential ecological and socioeconomic effects of possible OCS activities. Results from this study may be used for NEPA analysis for future EPs and DPPs.

Total BOEM Cost: $25,000 plus Joint Funding ($25,000)

Period of Performance: FY 2016-2018

Conducting Organization: CMI, UAF

Principal Investigator(s): Ms. Yang Yang

BOEM Contact: Warren Horowitz

Description:

Background: BOEM completed two regional modeling study efforts for the Chukchi and Beaufort seas over the past few years. The *Beaufort and Chukchi Seas Mesoscale Meteorology Modeling Study* (OCS Study BOEM 2013-0119) produced thirty years (1979-2009) of atmospheric model data output whereas second study entitled *Adaptation of the Arctic Circulation Model* BOEM (OCS Study BOEM 2013-202) produced a coupled sea ice-ocean model for the Beaufort and Chukchi Seas. This study will analyze outputs from the Chukchi-Beaufort Seas High resolution Atmospheric Reanalysis (CBHAR) and the coupled Arctic Regional Atmospheric-Ocean-Sea ice model to identify the distribution of storm tracks and intensities for the Chukchi and Beaufort Seas and document how these storm tracks impacted changes to surface wind stress, ice coverage, and ocean conditions. Observational data from moored Acoustic Doppler Current Profilers (ADCP) from the BOEM funded study *Circulation and Water Property Variations in the Nearshore Alaska Beaufort Sea (1999-2007)* (OCS Study MMS 2009-035) will be used to compare storm tracks and intensities from the model data to changes in ocean conditions as measured from these moorings. Satellite data will also be used to examine the impact that these storm tracks had on known breakout events along the Beaufort and Chukchi coasts.

Objectives:

- Develop an improved meteorological modeling storm tracking algorithm.
- Develop a climatology of storm tracks and storm intensities from the CBHAR and Regional Ocean model data sets for the Beaufort and Chukchi Seas.
- Document interannual and decadal storm climatologies based on outputs from the model simulations.
- Document how storms impact surface wind direction, wind speed, temperature and heat budgets.
- Document how the storm tracks and associated climate variables impact sea ice and ocean conditions based upon observational data.

Methods: This study will document the climatology and changes in storm tracks and storm intensities for the Beaufort and Chukchi Seas from 1979-2009, including their impacts on surface wind stress, sea ice and ocean conditions from the outputs of the Chukchi-Beaufort Seas High resolution Atmospheric Reanalysis CBHAR and the Coupled Arctic Regional Atmospheric-Ocean-Sea ice models, and from observations measured from oceanographic moorings. Researchers will improve the storm tracking algorithm by optimizing the output for the Beaufort and Chukchi Seas. They will construct the storm track climatology for the Beaufort and Chukchi Seas through the use of data outputs from the CBHAR and HIRHAM-NAOSIM models. Study products will include regional climatological means for spatial distribution and spatial average for storm count duration, lifetime, and intensity for each month. Climatological results between the CBHAR and HIRHAM-NAOSIM data outputs will be compared and their inherent biases assessed.

Current Status: Completed

Final Report Due: February 2018

Publications Completed:

Yang, Y., X. Zhang, A. Rinke. 2017. Storm Activities over the Chukchi-Beaufort Seas and Associated Surface Climate. Poster, Alaska Marine Science Symposium, Anchorage, AK, January 2017.

Yang, Y. 2018. Chukchi-Beaufort Seas Storms and Their Influence on Surface Climate. In: CMI Graduate Student Projects: Volume 1. University of Alaska Coastal Marine Institute, Fairbanks, Alaska. OCS Study BOEM 2018-021.

Affiliated WWW Sites: http://www.boem.gov/akstudies/
http://www.cfos.uaf.edu/cmi/
https://marinecadastre.gov/espis/#/search/study/100134

Revised Date: August 8, 2018