Environmental Studies Program: Ongoing Study

Title	Hydrocarbon Seeps in the Lower Cook Inlet, Gulf of Alaska, Chukchi Sea and Beaufort Sea OCS Planning Areas (AK-18-x11)
Administered by	Alaska Regional Office
BOEM Contact(s)	Jenna Foreman (jennafer.foreman@boem.gov)
Procurement Type(s)	Cooperative Agreement
Conducting Organizations(s)	UAF
Total BOEM Cost	$200,000
Performance Period	FY 2019–2022
Final Report Due	April 2022
Date Revised	September 16, 2022
PICOC Summary	
Problem	Information regarding location and extent of natural hydrocarbon seeps on the OCS off Alaska is limited. Information that does exist is dispersed throughout the body of scientific literature or is held by government agencies and other entities.
Intervention	Currently available information about the locations, volumes, and chemical and weathering characteristics of hydrocarbon seeps on the Alaska OCS, as well as information regarding hydrocarbon-consuming organisms in the area will be identified, gathered, and analyzed. Recommendations for collection of additional field data will also be developed.
Comparison	This study will provide baseline information regarding natural hydrocarbon seeps on the OCS.
Outcome	Data about seeps will assist BOEM geoscientists in identifying locations of undiscovered oil and gas resources on the Alaska OCS and determining the fair market value of leased OCS blocks. Results from this project will also support analyses under NEPA by helping to quantify the associated contributions of hydrocarbons to the environment.
Context	All Alaska OCS Planning Areas

BOEM Information Need(s): Hydrocarbon seep composition, location and volume information is needed to address multiple aspects of BOEM's mission: 1) Hydrocarbon surface seeps can be a direct indicator of subsurface hydrocarbon prospects. Information about area seeps will inform BOEM geoscientists in estimating the undiscovered oil and gas resources of the Alaska OCS and determining the fair market value of leased OCS blocks. 2) Natural seeps represent a large portion of the petroleum input to the sea, providing natural background concentrations of hydrocarbons in the environment. Better knowledge of area seeps will provide insight into consideration of cumulative effects in agency NEPA analyses of exploration and development of hydrocarbon prospects in the Alaskan OCS. 3) Chemosynthetic communities have been shown to populate near hydrocarbon seeps. Evaluating these communities will provide further inform NEPA analyses on the effects of exploration and development activities in the Alaska OCS.

Background: Hydrocarbon seep locations and compositions have been used in prospecting for oil and gas fields. It has been observed that the compositions of hydrocarbon seeps can be a direct indicator of hydrocarbons filling a subsurface prospect. It has also been shown that the composition of gas seeps can be used to determine whether a hydrocarbon prospect is filled with oil or gas (Jones and Drozd, 1983). Whether a prospect is filled with oil or with gas has important implications for estimating undiscovered technically and economically recoverable oil and gas.

Limited information is available about the spatial extent or volume of release from natural hydrocarbon seeps on the Alaska OCS, or the disposition and residence time of the hydrocarbons in the environment. Some information about the location and extent of natural hydrocarbon seeps in the Chukchi and Beaufort OCS exists in the form of sniffer and shallow core surveys, but there is little data available for seeps in the Lower Cook Inlet and Gulf of Alaska.

We have little knowledge of the chemical properties of Alaska OCS hydrocarbon seeps, how seeped hydrocarbons are affected by weathering, or how they compare to known hydrocarbon types in other development areas. The presence of natural hydrocarbon seeps is indicative of organisms adapted to metabolize the hydrocarbons. These organisms in turn indicate the capacity for microbial remediation of hydrocarbons in the environment, or natural bioremediation through the means of reducing pollutants by way of resident oil-eating bacteria. Oil-eating, cold-water bacteria in the Gulf of Mexico waters were a major factor contributing to removal of spilled oil from the Macondo spill in 2010.

Objectives:

- Identify available geological, geophysical, and geochemical data that can provide insight into the location and extent of likely oil seeps in the Lower Cook Inlet, Gulf of Alaska, Chukchi and Beaufort OCS Program Areas
- Provide recommendations for future field-sampling efforts to augment the results and to facilitate estimation of seep volume, chemical characterization of oil (water column and/or sediment) samples, and identification of communities of hydrocarbon-associated organisms.

Methods: Researchers will search the available literature, including the large volume of information from the OCSEAP program of the 1980s and 1990s, to identify and gather any available information about the locations, volumes, and chemical and weathering characteristics of hydrocarbon seeps on the Alaska OCS, as well as information regarding hydrocarbon-consuming organisms in the area. A map of known seeps will be produced. Researchers and BOEM scientists will convene two to three meetings to discuss results of these efforts and suggest geographic areas for future field-sampling endeavors. Topics of discussion shall include, but not necessarily be limited to: additional geophysical survey data (e.g. multibeam echosounder and sub-bottom profiler data) needed to expand the spatial coverage; identification of prospective sites for coring and geochemical analysis; methodologies for evaluation of seep volume, chemical composition of oil, and microbial communities.

Specific Research Question(s):

1. What information is available regarding natural hydrocarbon seeps in the Lower Cook Inlet, Gulf of Alaska, Beaufort, and Chukchi Program Areas?
2. What is best approach for evaluating the volume of the natural hydrocarbon seeps and the variations in chemical composition?

3. What sampling is required to evaluate the type of microbes or other organisms populate the vicinity of the hydrocarbon seeps?

Current Status: Completed.

Publications Completed: None

Affiliated WWW Sites:

http://www.boem.gov/akstudies/

https://marinecadastre.gov/espis/#/search/study/100239

References:

Jones, V.T., and Drozd, R.J., 1983, *Predictions of oil or gas potential by near-surface geochemistry.* AAPG, V.67, no. 6, p. 932-952.