Detection of potential natural oil seeps in the marine environment of Hudson Bay/Strait and Foxe Channel from RADARSAT-2 imagery

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ABSTRACT

Synthetic aperture radar (SAR) is a well-recognized tool to detect oil slicks on the sea surface. In this presentation, we describe a project currently underway to analyze hundreds of RADARSAT images in order to identify the locations of potential natural oil seeps in Hudson Bay/Strait and Foxe Channel, Nunavut, Canada. The project aims to help improve knowledge of hydrocarbon potential in Hudson Bay/Strait and Foxe Channel considering natural oil slicks originate from subsurface deposits of oil and gas. The current work builds upon results obtained from a series of previous SAR studies that focused on Baffin Bay, Davis Strait, Hudson Bay and Foxe Basin using SAR data collected between 2010 and 2012. The present project is based on these images in addition to new RADARSAT-2 images acquired in August, September and October of 2015 and 2016 with similar acquisitions expected for 2017. In addition to the manual inspection of the images for oil slick detection, an automated approach is adopted. The developed method relies on three main modules: dark target detection, feature extraction and preliminary false positives removals, and finally, spatio-temporal analysis. The dark target detection algorithm is primarily based on image segmentation. The feature extraction process quantifies geometrical, signal, and contextual measures of the detected dark targets while incorporating wind data information. After preliminary false positive identification and removal steps based on feature characteristics, the dark targets are vectorized and ingested into a GIS for both visualization and analysis. The geospatial analysis aims at identifying temporal persistence of oil slick candidates in the same area to produce a higher confidence in potential seep candidates. Interface with the analysis is facilitated by generating heat maps. An overview of the methodology, supported by examples, will be presented with a focus on the GIS aspects of the project.