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Author: Mr. Abdul Lawal
University of Glasgow, Space Advanced Research Team, United Kingdom

Prof. Gianmarco Radice
University of Glasgow, United Kingdom
Dr. Matteo Ceriotti
University of Glasgow, United Kingdom

INVESTIGATING SAR ALGORITHM FOR SPACEBORNE INTERFEROMETRIC OIL SPILL DETECTION

Abstract

The environmental damages and recovery of terrestrial ecosystems from oil spills can last decades. Oil spills have been responsible for loss of aquamarine lives, organisms, trees, vegetation, birds and wildlife. Although there are several methods through which oil spills can be detected, it can be argued that remote sensing via the use of spaceborne platforms provides enormous benefits. This paper will provide more efficient means and methods that can assist in improving oil spill responses. The objective of this research is to develop a signal processing algorithm that can be used for detecting oil spills using spaceborne SAR interferometry (InSAR) data. To this end, a pendulum formation of multistatic smallSAR carrying platforms in a near equatorial orbit is described. The characteristic parameters such as the effects of incidence angles on radar backscatter, which support the detection of oil spills, will be the main drivers for determining the relative positions of the small satellites in formation. The orbit design and baseline distances between each spaceborne SAR platform will also be discussed. Furthermore, results from previous analysis on coverage assessment and revisit time shall be highlighted. Finally, an evaluation of automatic algorithm techniques for oil spill detection in SAR images will be conducted and results presented. The framework for the automatic algorithm considered consists of three major steps. The segmentation stage, where techniques that suggest the use of thresholding for dark spot segmentation within the captured InSAR image scene is conducted. The feature extraction stage involves the geometry and shape of the segmented region where elongation of the oil slick is considered an important feature and a function of the width and the length of the oil slick. For the classification stage, where the major objective is to distinguish oil spills from look-alikes, a Mahalanobis classifier will be used to estimate the probability of the extracted features being oil spills. The validation process of the algorithm will be conducted by using NASA's UAVSAR data obtained over the Gulf of coast oil spill and RADARSAT-1 data.