

# **Integrated Radarsat Monitoring of Marine Oil Spills in Canadian Waters**

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Bordering three oceans, Canada has the world's longest coastline and her shipping lanes linking Asia and Europe with North America are heavily travelled.

Canadian waters serve as important commercial fishing grounds and represent significant habitats for marine birds. Unfortunately, it is estimated that at least 300,000 sea birds are killed every year by oil off the south coast of Newfoundland alone and at least equivalent numbers may be dying annually on the Pacific coast, because of accidental and intentional oil discharges from ships.

Canada's ability to effectively monitor its vast marine area which spans from the coastline to the 200 nm exclusive economic zone (EEZ), could be improved by using Earth Observation (EO) satellites such as Canada's Radarsat-1 and Radarsat-2, as well as the future Radarsat Constellation Mission. The MarineSAR research project in the Remote Sensing and Geospatial Technology Laboratory at the Faculty of Environment, University of Waterloo, Canada, is motivated by the requirement for synthetic aperture radar (SAR) image analysis algorithms and technologies to support the accurate and reliable oil spill information extraction towards the effective risk mapping in Canadian waters. In this paper the objectives, of the MarineSAR project are first introduced.

Preliminary results obtained using a novel statistical region-based segmentation approach by combining Voronoi tessellation, Bayesian inference, reversible jump Markov chain Monte Carlo (RJMCMC), and maximum a posteriori (MAP) algorithms to detect oil spills in Radarsat-1 SAR images are then demonstrated.

Following the examination of the characteristics of Radarsat -2 and the future Radarsat Constellation Mission, their potential for oil spill detection to improve satellite-based marine pollution surveillance is explored. The schematic framework of an integrated real-time marine oil spill monitoring system through effective use of Radarsat -2 and the future Radarsat Constellation Mission is finally outlined.