A Neural Network Approach for the Detection of Oil Spills Applied to SAR Imagery

Juan Pinales

Detection and classification of hydrocarbon films with spaceborne synthetic aperture radar (SAR) is possible because the dampening effects of these discharges contrasts with the standard wind-borne undulation of ocean surfaces. Given the scope and impact of events like the Deepwater Horizon oil spill, the need for improved, automated and expedient monitoring of hydrocarbon-related marine anomalies has become a pressing and complex issue for governments, as well as the extraction industry. With this rationale, the objective of the research presented here is the development, training, and utilization of a neural network that can detect marine oil spills in an automated, semi-supervised manner utilizing SAR data as primary inputs. The neural network input layers are derived from collocated SAR images, related radar-borne variables (normalized radar cross-section SAR image data, incidence angle, etc.) and ancillary data (wind speed, textural descriptors, etc.). Shape files produced by an experienced human analyst served as targets (reference) during the training portion of the investigation. Several images with their ancillary data were analyzed to determine algorithm effectiveness as well as optimal conditions for oil detection in SAR data. Preliminary results show that further work must go into optimizing the training dataset to develop a network capable of accurate detection under a wide range of conditions (incidence angle, wind speed, etc.) in order to reduce misclassification of imaging artefacts with signatures similar to those of oil spills.

Updated by Roland Romeiser, 2015-04-14 15:33