

# Properties Analysis of Oil Spills by Polarimetric SAR Data

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**Abstract:** Oil spills occurred frequently with the rapid development of modern petroleum industry and tanker transportation. The detection and early warning of oil spills plays an extremely important role in reducing the economical cost as well as protecting the marine ecosystem. Synthetic Aperture Radar (SAR) has been used in various remote sensing applications for several key advantages and there are also a variety of studies on SAR oil spills detection in recent years. Most of these studies concentrate on distinguishing oil slicks from surrounding seawater and using intensity of single polarimetric SAR data and polarimetric parameters extracted from multi-polarimetric SAR data to detect and classify oil spills from other look-alikes. However for estimating the influence and emergency response to oil spills hazards, characters such as thickness and concentration of oil spills are also very crucial. There are several studies on the properties retrieve of oil spills based on optical sensors, however very few studies were carried on SAR data for some difficulties.

In this paper, tilted Bragg scattering model are used to describe the effect of oil spills on the sea surface. Its effects of on the reflectivity ( $I$ ) and wave spectrum ( $W$ ) density of sea surface are separated. Based on L-band Multi-look polarimetric UAVSAR data, the characters described by  $I$  and  $W$  are extracted. The distribution pattern of these parameters within the oil slick is analyzed. It is found that both of them are heterogeneously distributed and can vary a lot in very short distance. Then oil-covered regions are classified by two dimensional  $I/W$  characters. The classification results are linked to Bonn Agreement for Oil Appearance Codes (BAOAC) based on thickness and status of the oil. Cases prove that the proposed method has larger potential for discriminating different type of oils than the one dimensional oil/water mixing index (Mdex). Verification was also made according to areal optical images, which proves the soundness of the implemented method.

Keyword : Oil spills, Synthetic Aperture Radar (SAR), Polarimetry, Bragg scattering