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RST analysis of optical satellite data for oil spill detection and monitoring: the deepwater horizon platform accident

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The recent Deepwater Horizon explosion in the Gulf of Mexico demonstrated how oil spill disaster can seriously threaten marine and coastal environment. In order to mitigate the consequences of this kind of hazard, timely detection and continuously updated information on polluted areas are necessary.
In particular, satellite remote sensing by passive optical sensors on board meteorological satellites, thanks to their high temporal resolution (from a few hours to 15 minutes, depending on the characteristics of the platform/sensor), can give a significant contribution to this aim, provided that reliable techniques will be developed. Up to now, in fact, available techniques for oil spill monitoring in the optical range are mainly devoted to "a posteriori" mapping of already known oil spill discharges and they often require a supervised approach.
The technique proposed in this paper, instead, is designed to timely and automatically detect oil spill presence on the sea both with high sensitivity (identification of thin/old oil films) and reliability (up to zero false alarms occurrence). It is based on the general RST (Robust Satellite Technique) approach which exploits multi-temporal satellite records in order to obtain a former characterization of the measured signal, in terms of expected value and natural variability, providing a further identification of signal anomalies by an automatic, unsupervised change detection step. Results obtained by using both AVHRR (Advanced Very High Resolution Radiometer) and MODIS (Moderate Resolution Imaging Spectroradiometer) Thermal Infrared data, in different geographic areas and observational conditions, demonstrated good capabilities in a timely and robust identification of oil spill affected areas.
In this paper, results obtained applying the proposed methodology to the recent oil spill disaster of Deepwater Horizon Platform in the gulf of Mexico, that discharged over 5 million barrels (550 million litres) in the ocean, will be shown. A dense time series of RST-based oil spill maps, obtained by using MODIS TIR records, will be shown and commented, emphasizing and discussing main peculiarities and specific characteristics of this event. Preliminary findings, possible residual limits and future perspectives will be also presented and discussed.