Conference Agenda

Presentations

WS#2 ID.32235: Extreme Weather Monitoring
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Oral

The Taylor Energy Oil Spill: Time-Series Of PolSAR Data To Support Continuous And Effective Observation

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Satellite Synthetic Aperture Radar (SAR) has been proved to be a key tool for a broad range of environmental applications in the context of oceans and coastal areas monitoring, including ship detection, coastline extraction, land use/cover classification, oil spill observation and sea surface parameters retrieval. In particular, the capability of satellite SAR measurements to support operational activities in case of natural disasters and environmental hazards as the Deepwater Horizon oil spill accident occurred in the Gulf of Mexico in 2010 or the most recent Sanchi accidental oil spill occurred off the eastern coast of China.

In this study, we focused on one of the richest areas in offshore oil seepages, i. e, the northern part of the Gulf of Mexico near the Mississippi river delta, where the Taylor Energy oil drilling platform is located (28°56'17''N,88°58'16''W). The platform was destroyed by the Hurricane Ivan in 2004 and, since then, the underwater wells were continuously leaking oil. It was estimated that more than 100 oil gallons enters into the marine environment from the Taylor Energy platform site. This results in surface oil slicks whose average thickness and life–time are about 1 μm and 4 days, respectively.

The area was continuously observed from satellite SAR platforms since the accidental oil spill occurred. Space-borne SAR imagery witness that this coastal area was almost persistently affected by this anthropogenic oil seep as the slicks were detected in about 80% of the data collected over the site. Even if strictly speaking this leakage cannot be considered as a natural oil seep, the underwater origin of the oil seep together with the involved weathering and aging processes are fairly the same.

Hence, it represents a good opportunity to have a large and consistent time series of SAR imagery that covers a well-known oil seepage. A large time series of dual-polarimetric co-polarized TerraSAR-X high-resolution (1.2 x 6.6 slant range x azimuth nominal spatial resolution) SAR imagery, collected in StripMap mode between July 2011 and April 2016 in a wide range of incidence angles (25° - 45°) and sea state conditions (low-to-moderate wind conditions applied, i. e., 1.5 m/s – 8.5 m/s), is exploited.

In this study, despite of the rather high noise floor that characterizes TerraSAR-X StripMap SAR imagery (an estimated noise equivalent sigma zero, NESZ, in the range -20 dB – -23 dB), the time series is effectively exploited to monitor the Taylor Energy oil spill. A multi-polarization analysis, that includes co-polarized intensity and phase difference information, is undertaken on which the oil spill detection and characterization is grounded.