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Earth Observations and Hydrodynamic Modeling to Monitor and Simulate the Oil Pollution in the Gulf of Suez, Red Sea, Egypt

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Abstract : Maine environment and coastal zone are wealthy with natural resources that contribute to the local economy of Egypt. The Gulf of Suez and Red Sea area accommodates diverse human activities that contribute to the local economy, including oil exploration and production, touristic activities, export and import harbors, etc, however, it is always under the threat of pollution due to human interaction and activities. This research aimed at integrating in-situ measurements and remotely sensed data with hydrodynamic model to map and simulate the oil pollution. High-resolution satellite sensors including Sentinel 2 and Plantlab were functioned to trace the oil pollution. Spectral band ratio of band 4 (infrared) over band 3 (red) underpinned the mapping of the point source pollution from the oil industrial estates. This ratio is supporting the absorption windows detected in the hyperspectral profiles. ASD in-situ hyperspectral device was used to measure experimentally the oil pollution in the marine environment. The experiment used to measure water behavior in three cases a) clear water without oil, b) water covered with raw oil, and c) water after a while from throwing the raw oil. The spectral curve is clearly identified absorption windows for oil pollution, particularly at 600-700nm. MIKE 21 model was applied to simulate the dispersion of the oil contamination and create scenarios for crises management. The model requires precise data preparation of the bathymetry, tides, waves, atmospheric parameters, which partially obtained from online modeled data and other from historical in-situ stations. The simulation enabled to project the movement of the oil spill and could create a warning system for mitigation. Details of the research results will be described in the paper.

Keywords : oil pollution, remote sensing, modelling, Red Sea, Egypt
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