



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس التوثيق الإلكتروني والميكروفيلم

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Cairo University

**MONITORING OIL SPILLS ALONG THE EGYPTIAN
COASTS USING OPTICAL AND SYNTHETIC
APERTURE RADAR REMOTE SENSING**

By

Mohamed Ramadan Abdallah Zakzouk

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Petroleum Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Monitoring oil Spills Along the Egyptian Coasts Using Optical and Synthetic Aperture Radar Remote Sensing

Key Words:

Egypt Coasts; Oil spills; Remote Sensing; Synthetic Aperture Radar (SAR);
Multispectral imaging

Summary:

Egypt has an extended marine environment along the Red sea and the Mediterranean, exposed to hazards of oil spill pollution which is harming the marine ecosystem. The damage of oil spills may extend for a long time and normally requires costly and time-consuming efforts to remediate the environment. Early detection of these spills is the first and most important step for immediate remediation operations.

The present study uses Sentinel-1 SAR images for oil spill detection and mapping over the hot spot pollution areas along the Egyptian coasts. The study compared SAR and optical multispectral data for oil spill detection and found that optical multispectral data is not solely enough to reliably detect oil spills but can be used as an auxiliary detection tool to SAR imagery. Also, SAR sensors have the fortune to capture images day and night and are not affected by the weather conditions. The present work analyzed nearly 3000 scenes of Sentinel 1 data and 2000 scenes of both Landsat 8 and Sentinel 2 for 8 potential areas over 3 years' time span between 2017 and 2019. More than 270 pollution sites could be detected from SAR and only 20 large cases from multispectral data with a total pollution area nearly equal 2500 km² during the three years. The coastal area near Port Said reported the highest in pollution rates. These results are validated against some real reported cases of oil pollution, which confirmed the reliability of the present system for oil spill monitoring.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the reference section.

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Date:

Signature

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