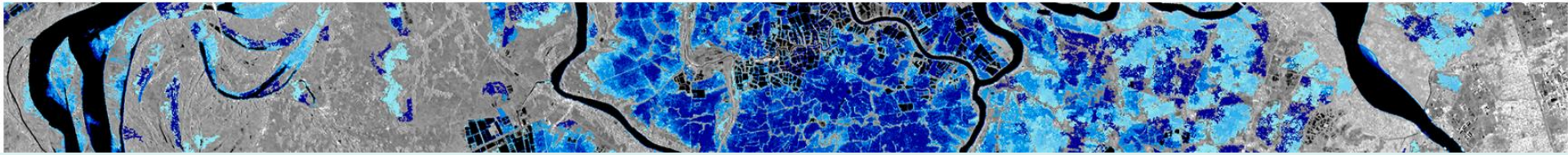

RETRIEVAL AND MULTI-TEMPORAL CHARACTERIZATION OF OIL SPILLS FROM MULTI-SENSOR EARTH OBSERVATION IMAGERY

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Luxembourg National Research Fund
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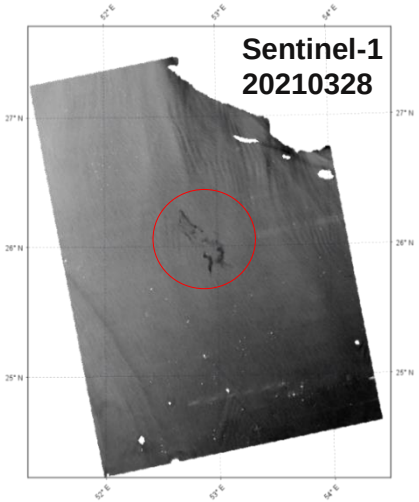
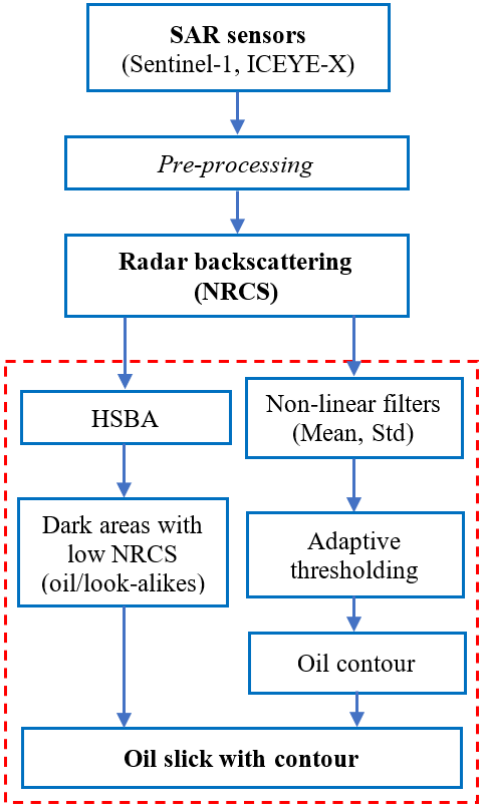
CONTEXT

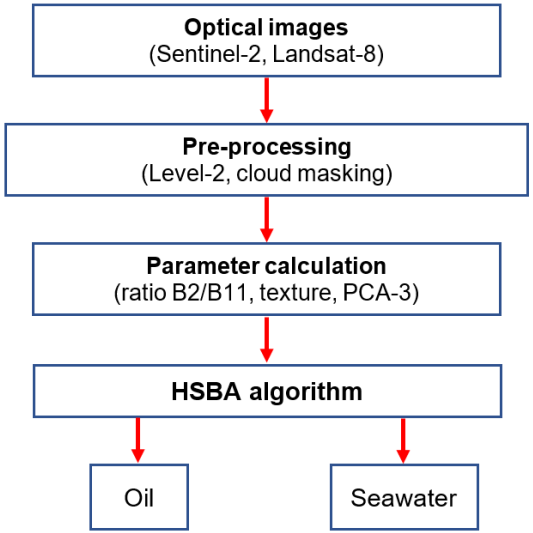
- Different threats to the marine environment: ***oil spills*** represent a major cause of marine pollution.
- Statistics : **3.2 million tonnes of oil per year** are released from all sources into the environment.
- Systematic revisit of satellite imaging sensors and their capability of covering large areas of the sea with unprecedented spatial resolution → enable a satellite-based **oil spill monitoring worldwide**.
- Synthetic Aperture Radar (SAR) and multi-spectral **satellite images** together with meteocean data are exploited in order to delineate oil spill.

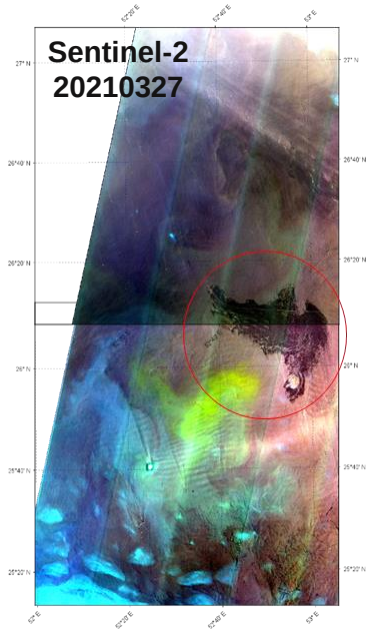
- Propose an **oil spill detection methodology** that can be applied to both SAR and multi-spectral data.
- Automatically observe oil spills with various sensors → an effective solution to **monitor the spatio-temporal oil spill evolution at different stages**.

METHODOLOGY









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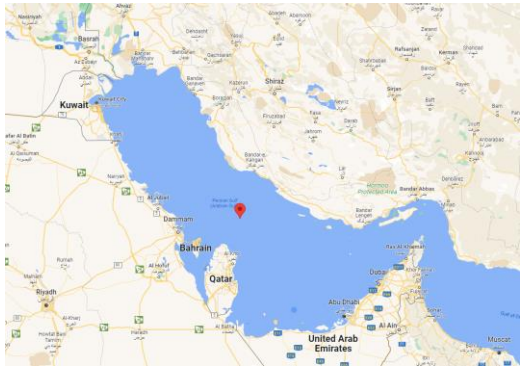
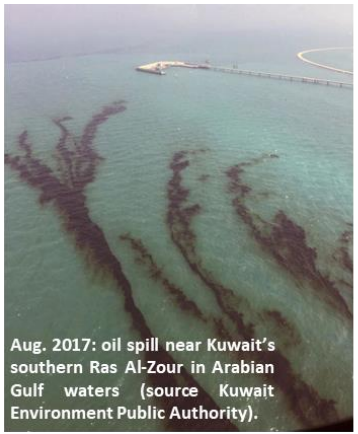
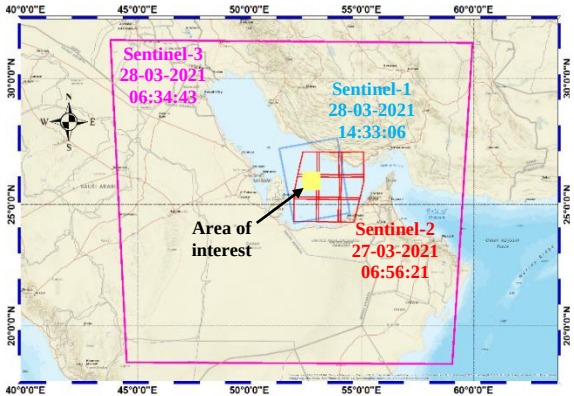
EXPERIMENTAL RESULTS

Persian Gulf

- One of the most strategic waterways in the world and also one of the most polluted.
- 34 oilfields with more than 800 wells.
- 25,000 tanker movements sail in and out of the Strait of Hormuz, passage that connects the Persian Gulf to the open sea; accidental spilling is unavoidable: on average, 100–160 thousand tons of oil and oil products end up in the Gulf every year.




Aug. 2017: oil spill near Kuwait's southern Ras Al-Zour in Arabian Gulf waters (source Kuwait Environment Public Authority).



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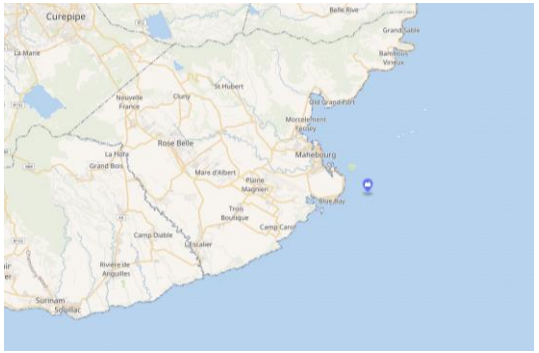
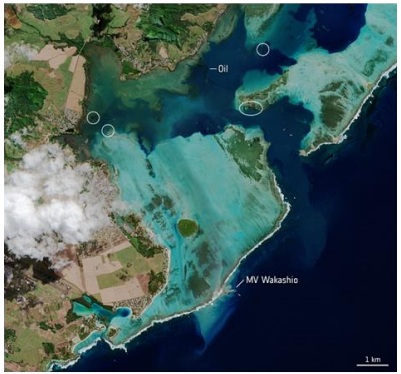
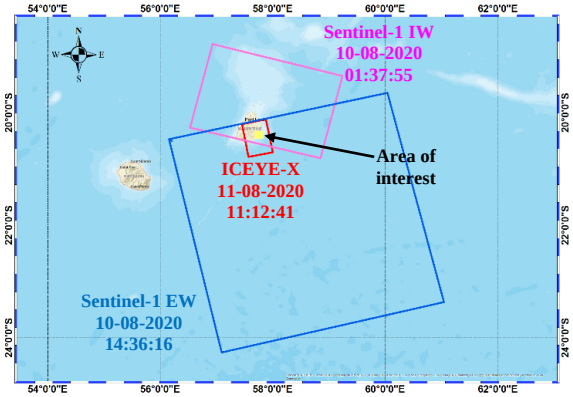
EXPERIMENTAL RESULTS

MV Wakashio oil spill in south of Mauritius

- The Japanese bulk carrier Wakashio ran aground on a coral reef on 25 July 2020.
- Oil began to leak from the ship on 6 August 2020.
- More than 1,000 tons of fuel have leaked out of the ship and into the lagoon.







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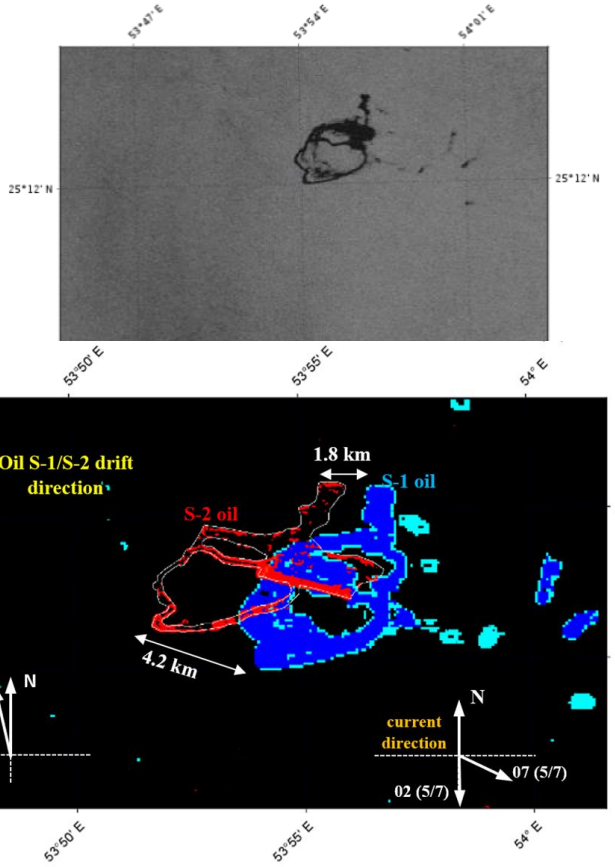
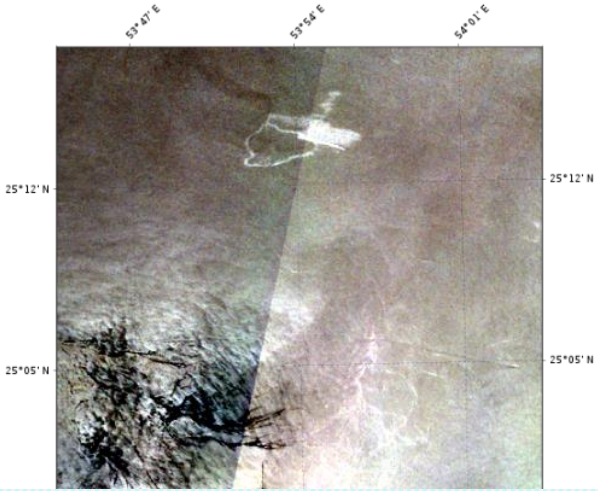
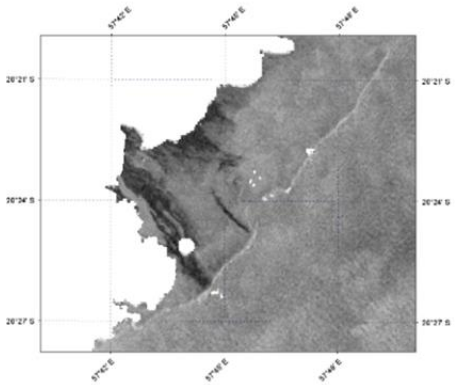
EXPERIMENTAL RESULTS



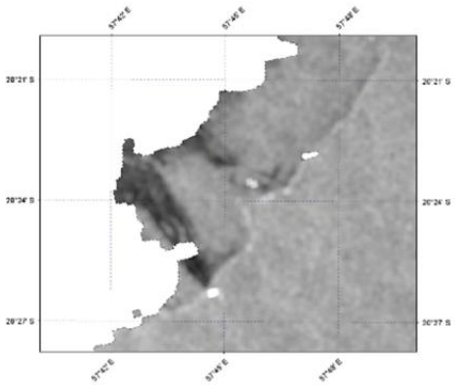


- The oil slick is assumed to move northwestwards.
- The oil tail seems to move more quickly than the head one.
- The oil shape is only slightly deformed with some small oil pixels disappearing.

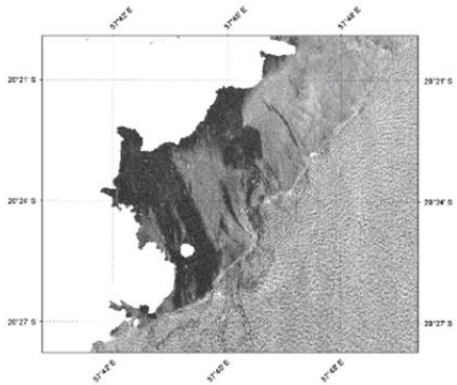
EXPERIMENTAL RESULTS



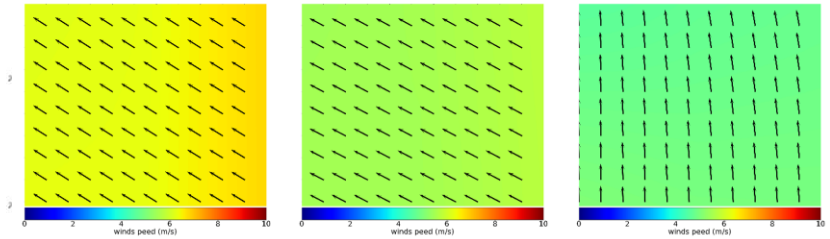
Sentinel-1 IW (Aug. 10, 01:37:55 UTC)

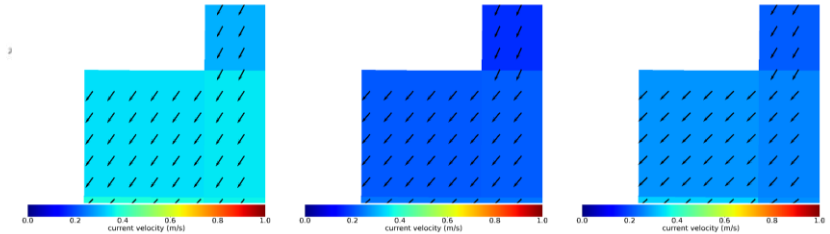


Sentinel-1 EW (Aug. 10, 14:36:16 UTC)

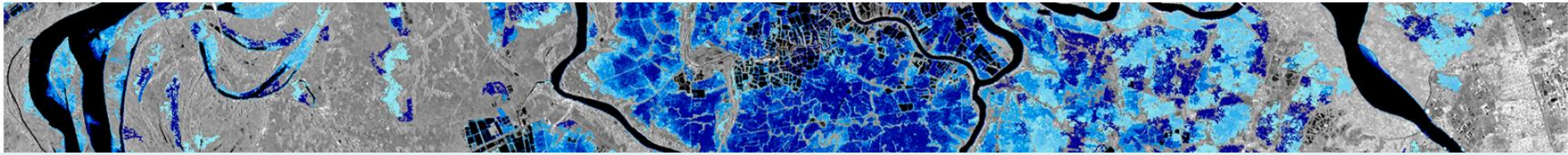


ICEYE-X (Aug. 11, 11:12:41 UTC)





- **The surface wind field is the main factor of oil drift, and oil spill moves in the same direction as the wind direction.**
- **For the ICEYE image due to low wind intensity oil spill is more significant.**
- **Low wind intensity facilitates oil drift spreading over an area larger than under strong wind conditions.**



thank you

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