

# How to locate Sea-Floor Sources of marine natural oil seeps from radar detected Sea-Surface Outbreaks ?

## Application to the Gulf of Mexico.

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### Study framework

#### Oil seeps migration from deep sediments to sea surface

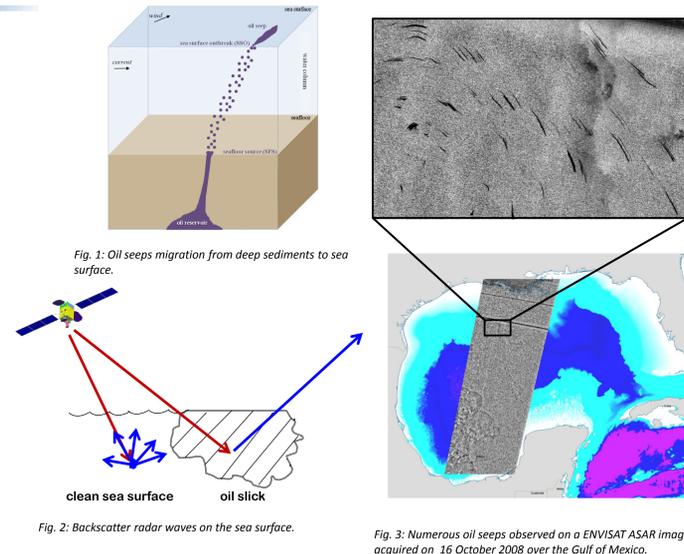
Offshore natural oil seeps are streams of naturally occurring oils that migrate from the sediments below the seafloor and flow through the water column as oil drops, resulting in telltale slicks on the sea surface (Fig.1).

#### Oil seeps in radar images

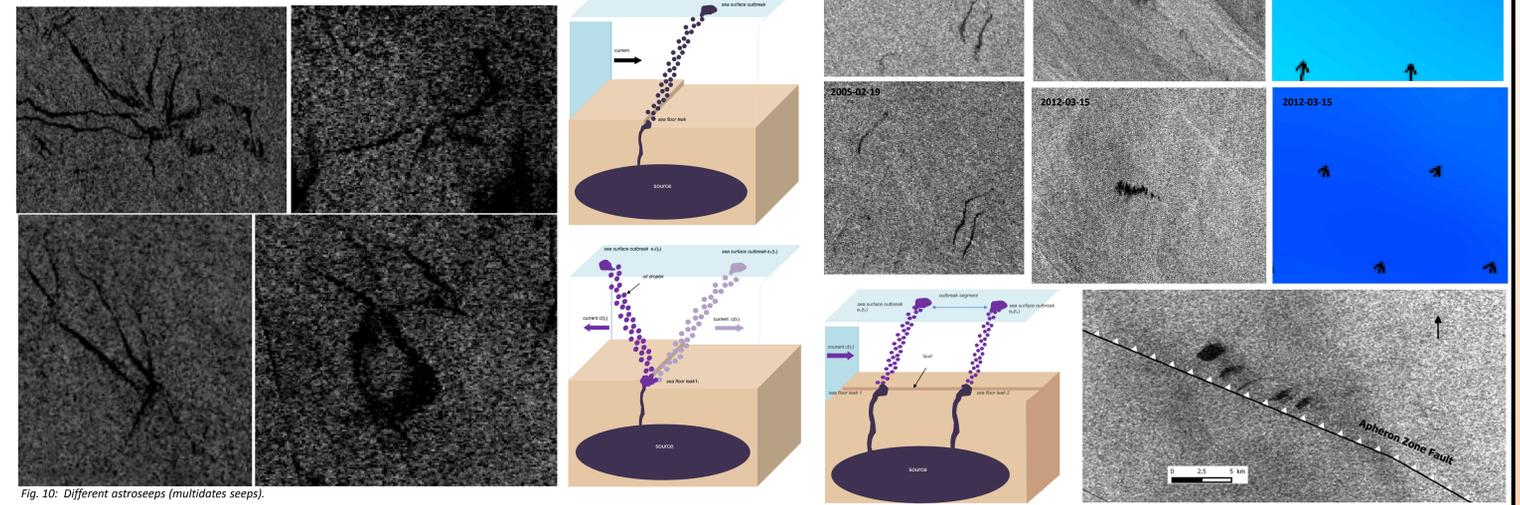
Oil seeps floating on the sea surface becomes visible on radar images because it damps the short gravity-capillary waves that are responsible for the radar backscattering (Fig.2, Fig.3).

#### The Vertical Drift Model

Our goal is to locate the SeaFloor Source (SFS) from the oil seeps Sea Surface Outbreaks (SSO) observed on the radar images.



### Oil seeps case examples



### Methodology

#### SAR images preprocessing

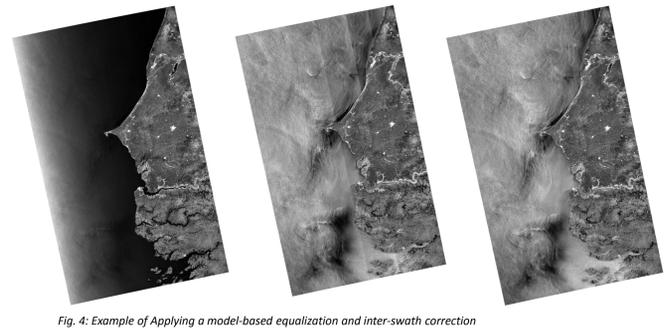
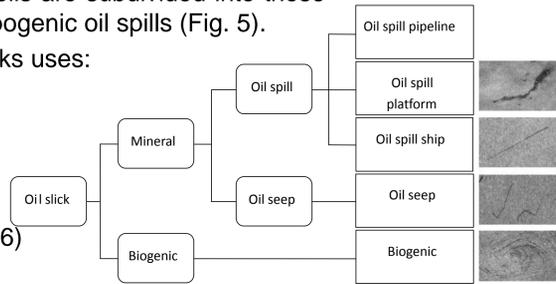
Original methods have been developed to numerically process the images (Fig.4).

#### Oil seeps detection from SAR images

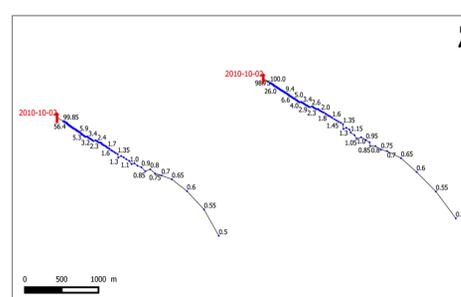
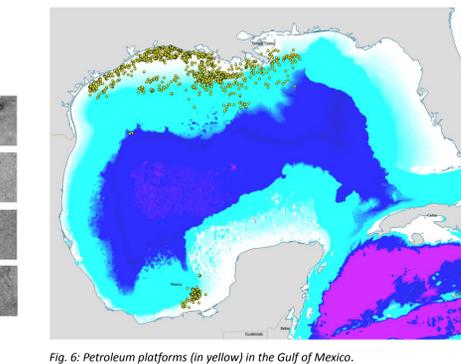
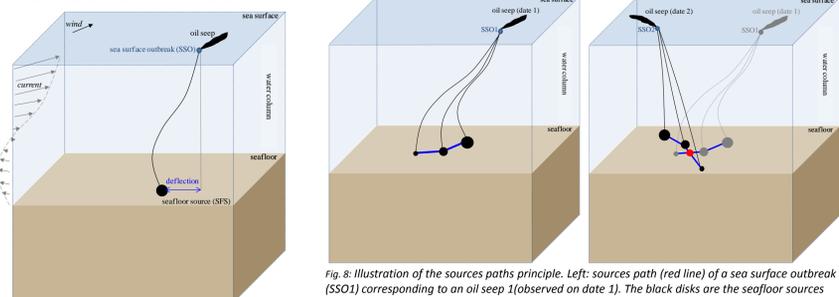
Oil slicks are visible in SAR images because they reduce the backscattering of the returning microwave signal resulting in dark signature in radar images. Oil slicks are divided into two major categories: biogenic and mineral. The mineral oils are subdivided into those of natural seeps or anthropogenic oil spills (Fig. 5).

The classification of oil slicks uses:

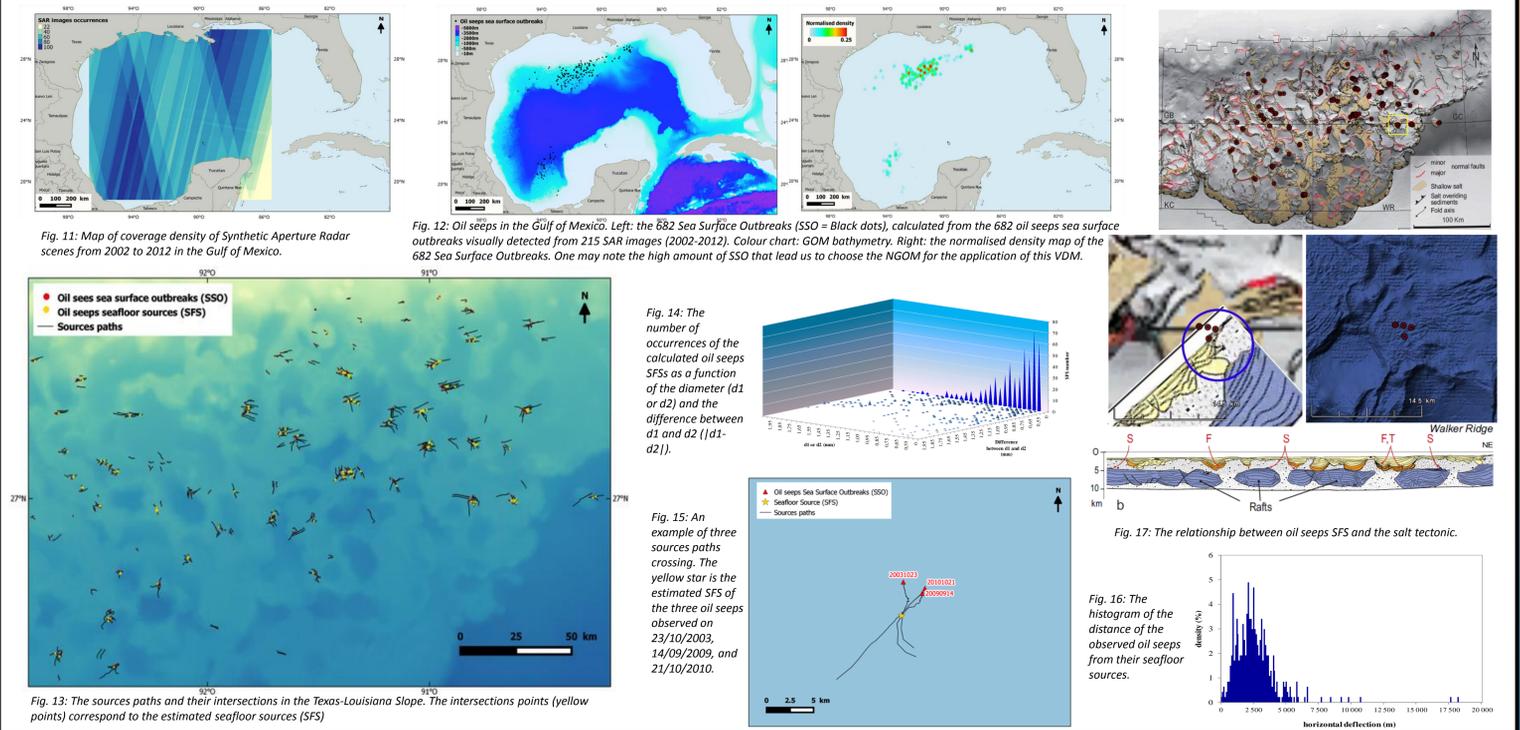
- Geological data
- Wind fields
- Sea surface current
- Bathymetric data
- Petroleum platforms (Fig. 6)
- AIS ...



#### Vertical Drift Model



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### References

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