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SYSTEMS AND TOOLS FOR LOCATING BLOOM OF JELLYFISH AND PREDICTING THEIR DISPLACEMENT TOWARDS THE COAST

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Identifying potentially harmful jellyfish blooms using SAR Sentinel 1 images

Identificazione delle 'fioriture' di meduse potenzialmente dannose utilizzando le immagini Sentinel 1 del SAR

Arianna Orasi*, Roberta De Angelis, Antonello Bruschi
ISPRA Centro Nazionale per la caratterizzazione ambientale e la protezione della fascia costiera, la climatologia marina e l'oceanografia operativa.

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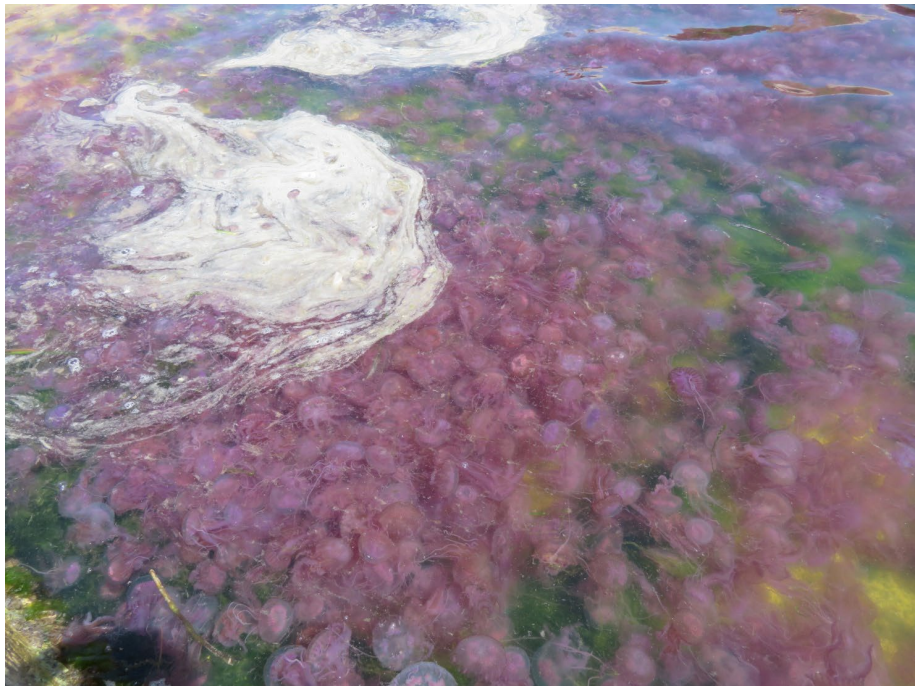
WHY SEACHING FOR JELLYFISH ON THE SEA?

- The oceans are increasingly undergoing a process of "jellyfication" due to human impacts ranging from overfishing to global warming.
- Jellyfish blooms impact on fisheries, aquaculture, power generation and tourism.



Pelagia noctiluca blooms – Photo: Courtesy University of Malta

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USING REMOTE SENSING DATA TO FIND JELLYFISH BLOOMS

AIM: explore the potential of Synthetic Aperture Radar SAR to detect jellyfish blooms

HOW: damped radar return

WHAT: high specular reflection and lower dB values

THEN: input for advection/dispersion models coupled with oceanographic models

ESA: Sentinel 1-A

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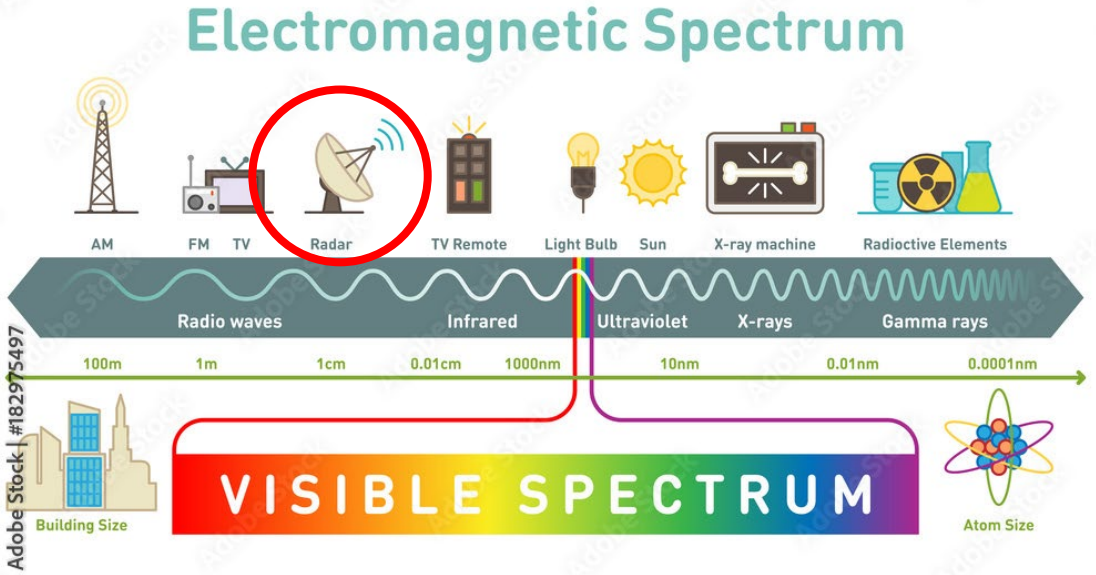
SYNTHETIC APERTUR RADAR (SAR)

ACTIVE SYSTEMS



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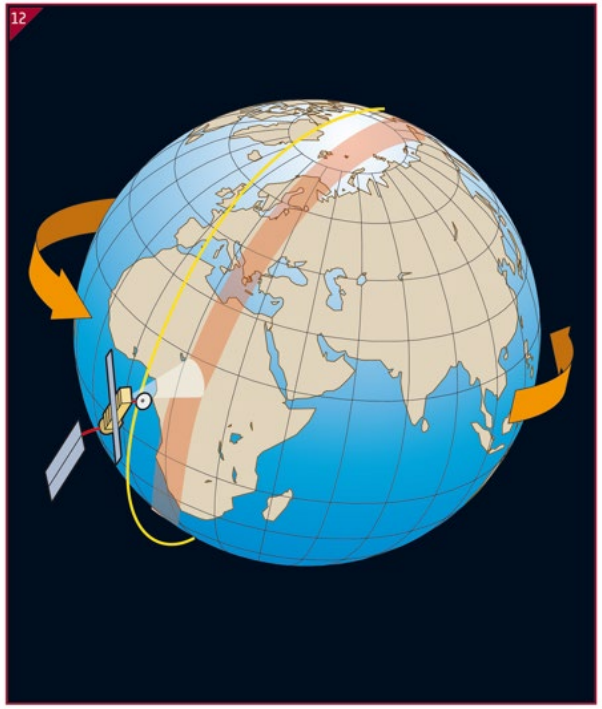
ESA COPERNICUS SPACE SENTINEL 1-A AND 1-B MISSION



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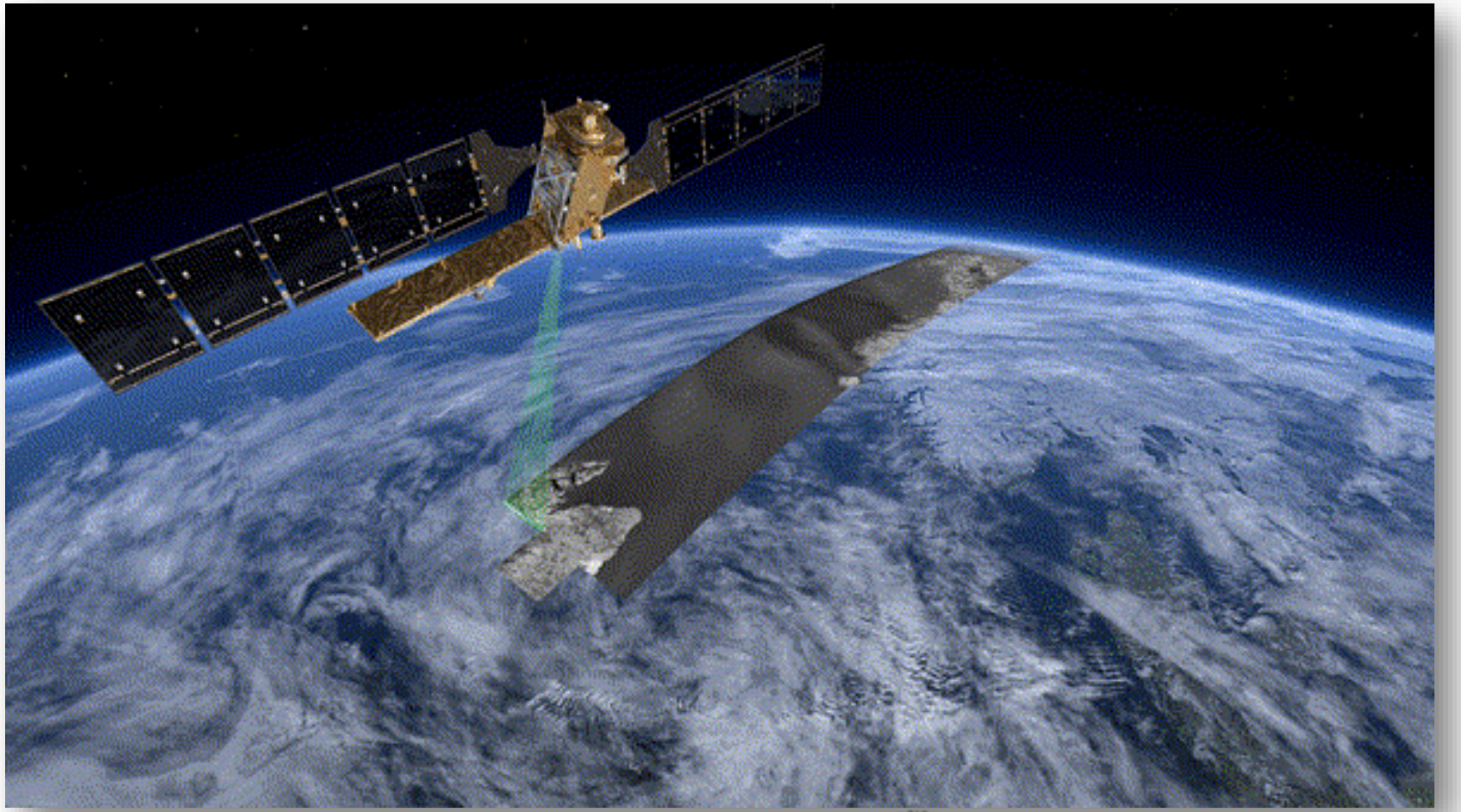

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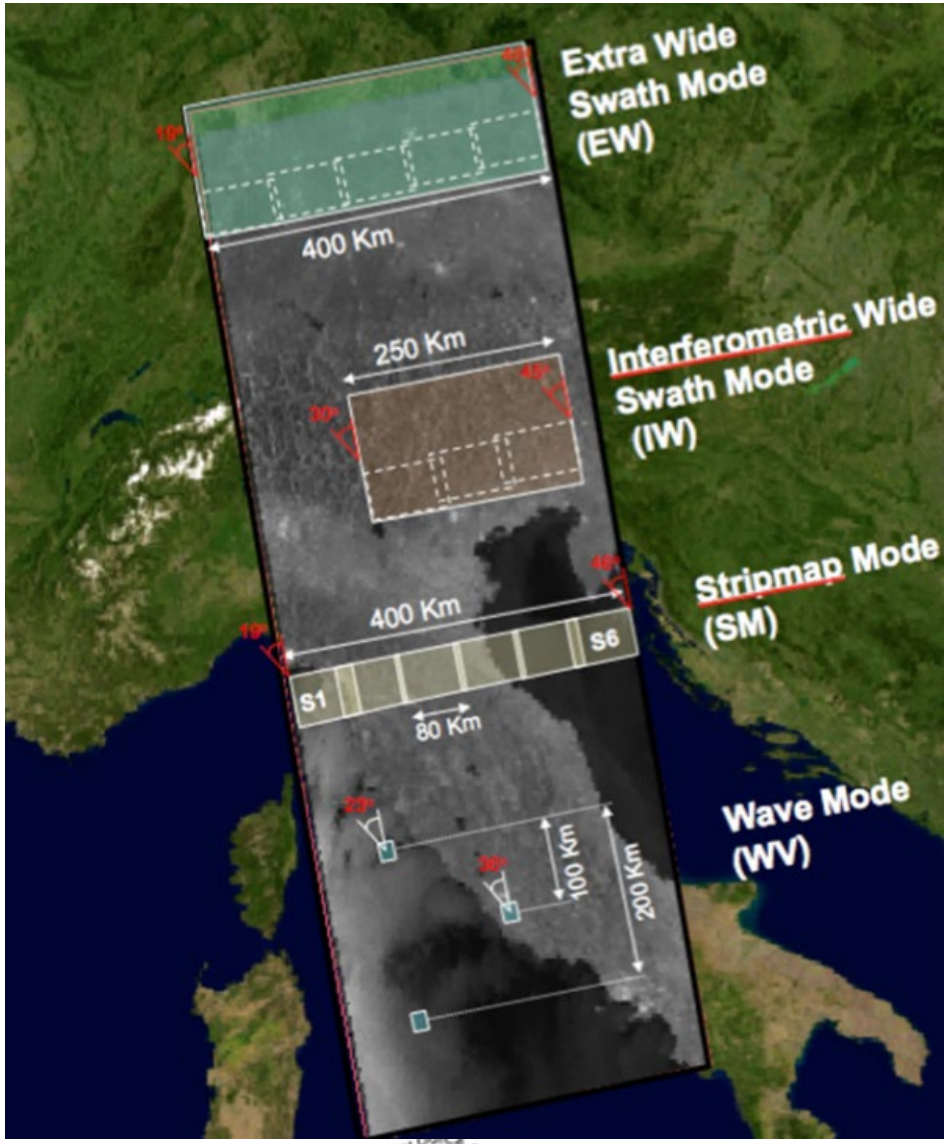
SENTINEL-1 SWATH COVERAGE



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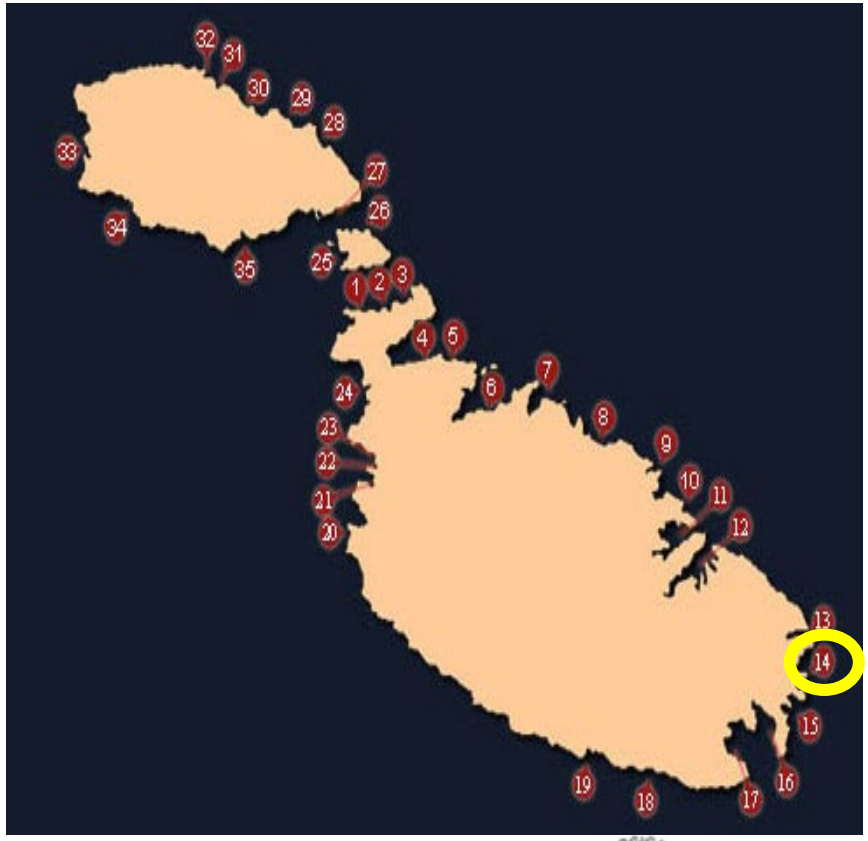
THE EVENT OF 11th JUNE 2016

During the first two weeks of June 2016 an intense bloom of ***Pelagia noctiluca*** was identified along all the Maltese coast



The bloom was identified the 11th June 2016 offshore in the code *zone 14 according to the* **Spot the Jellyfish** code zone classification

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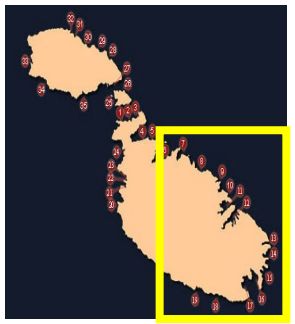
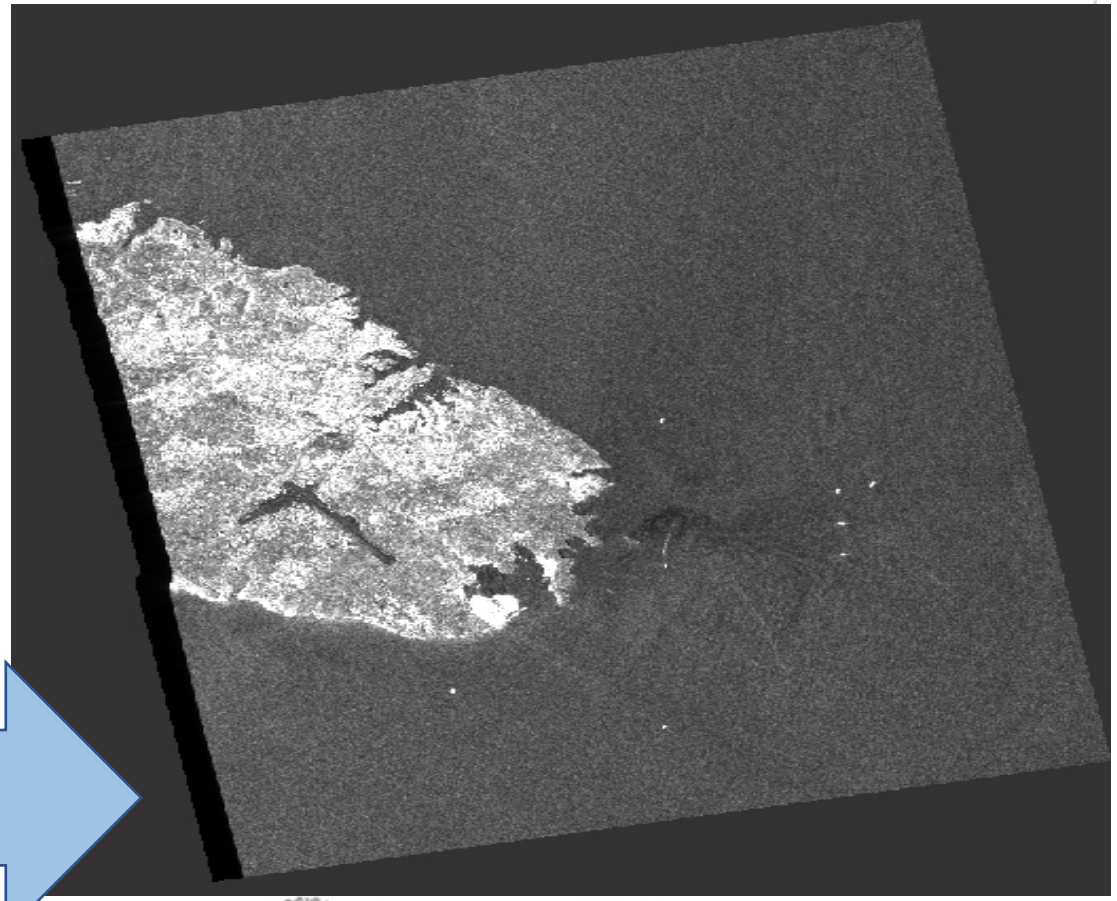
THE EVENT OF 11th JUNE 2016



Zoom of Sentinel 1-A image in the bloom area



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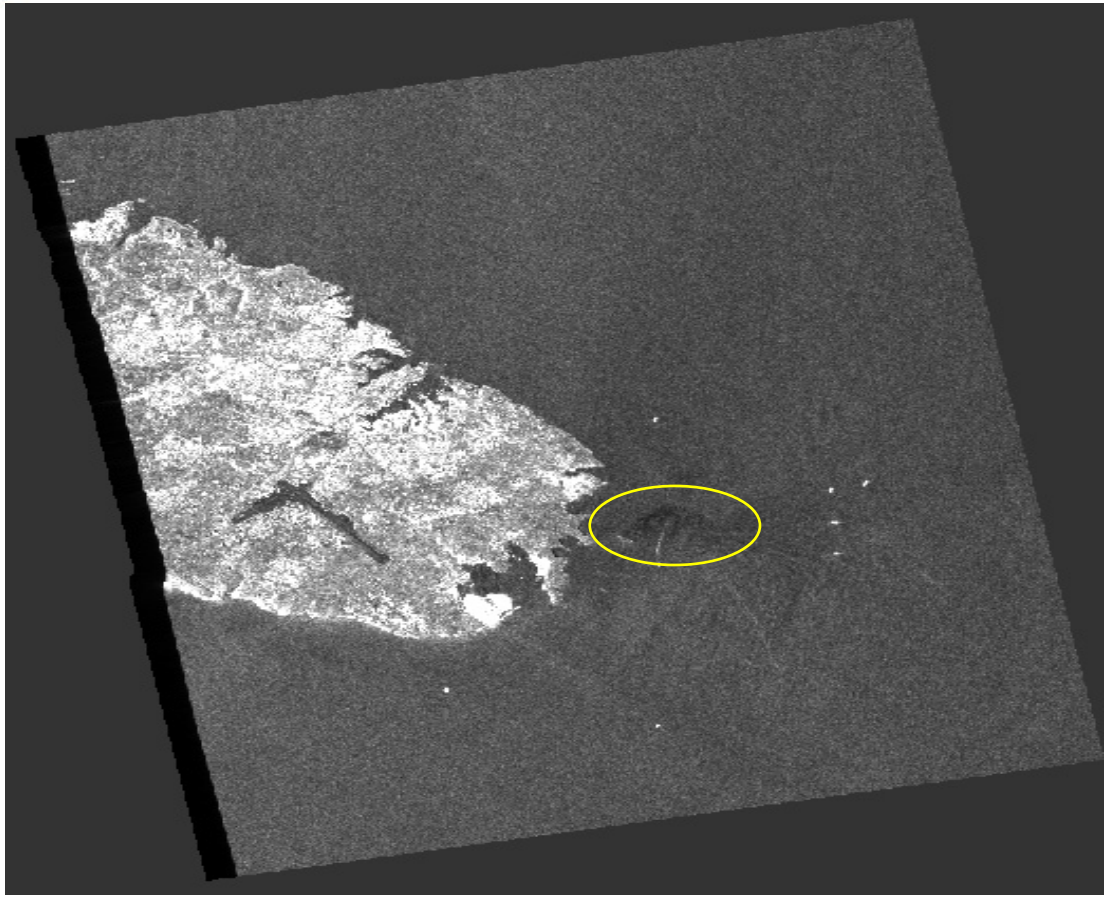
THE EVENT OF 11th JUNE 2016



A dark area was found in correspondence of the area where the jellyfish bloom was detected

dB values in the Yellow Area range from 16 to 18

We acquired an archive imagery (with no jellyfish observation) of 18th May 2016 to compare the image of 11th June 2016

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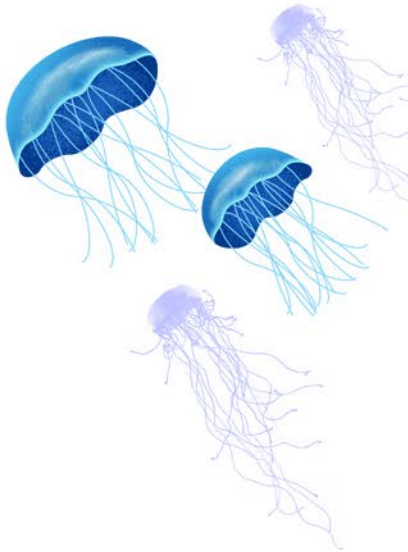
SATELLITE IMAGES PROCESSING



Calibration

- To associate the pixel value of the scene directly with the microwaves reflection

Multilooking

- To reduce image noise by degrading output

Ellipsoid correction

- To perform a geolocation grid since there is no terrain effects to be corrected over the ocean

Band math operation

- dB_11June2016 – dB_18May2016 < T
- T is a value greater than the difference in dB between the June 2016 and May 2016 over the dark area but less than the difference where there is no jellyfish

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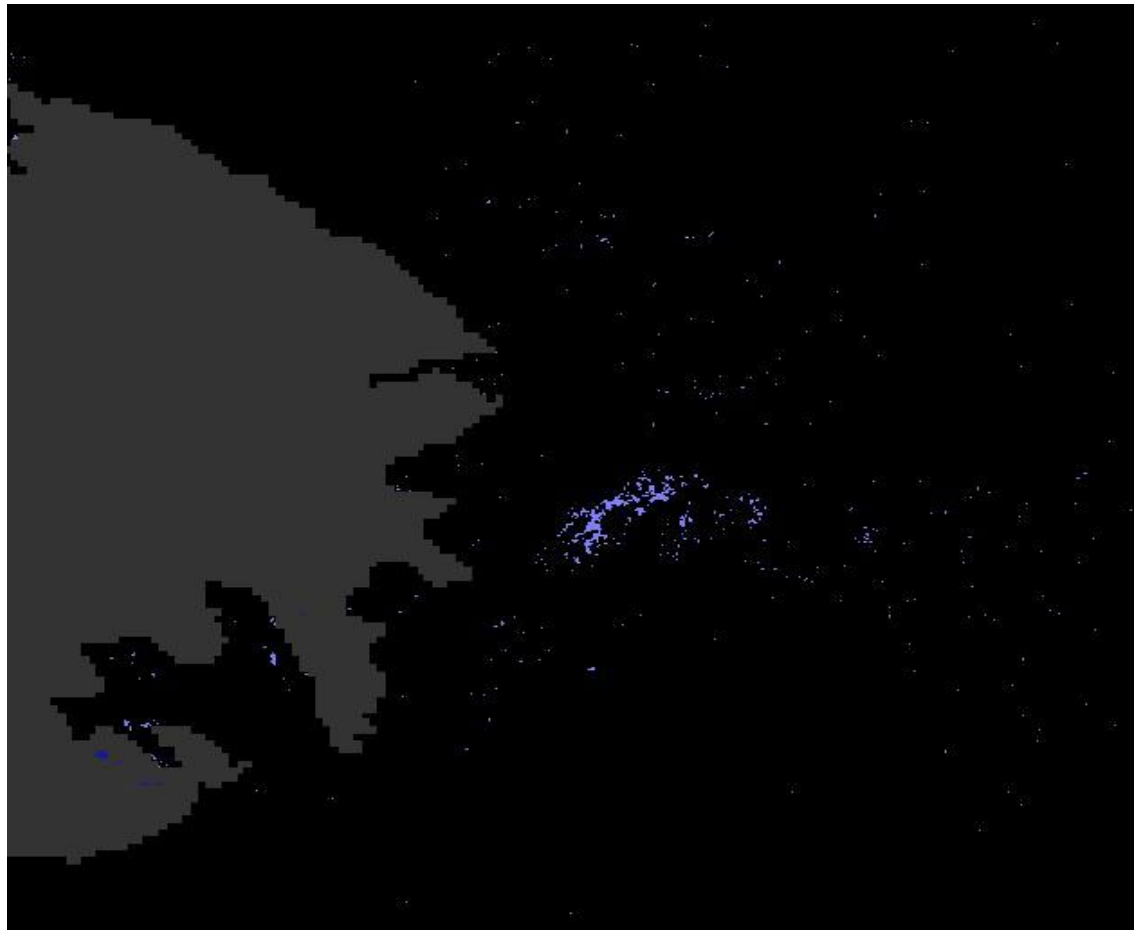
SATELLITE IMAGE PROCESSING RESULTS

Mask from band math processing



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SNAP OIL SPILL DETECTION TOOL RESULTS

SNAP oil spill detection tool on 11th June2016

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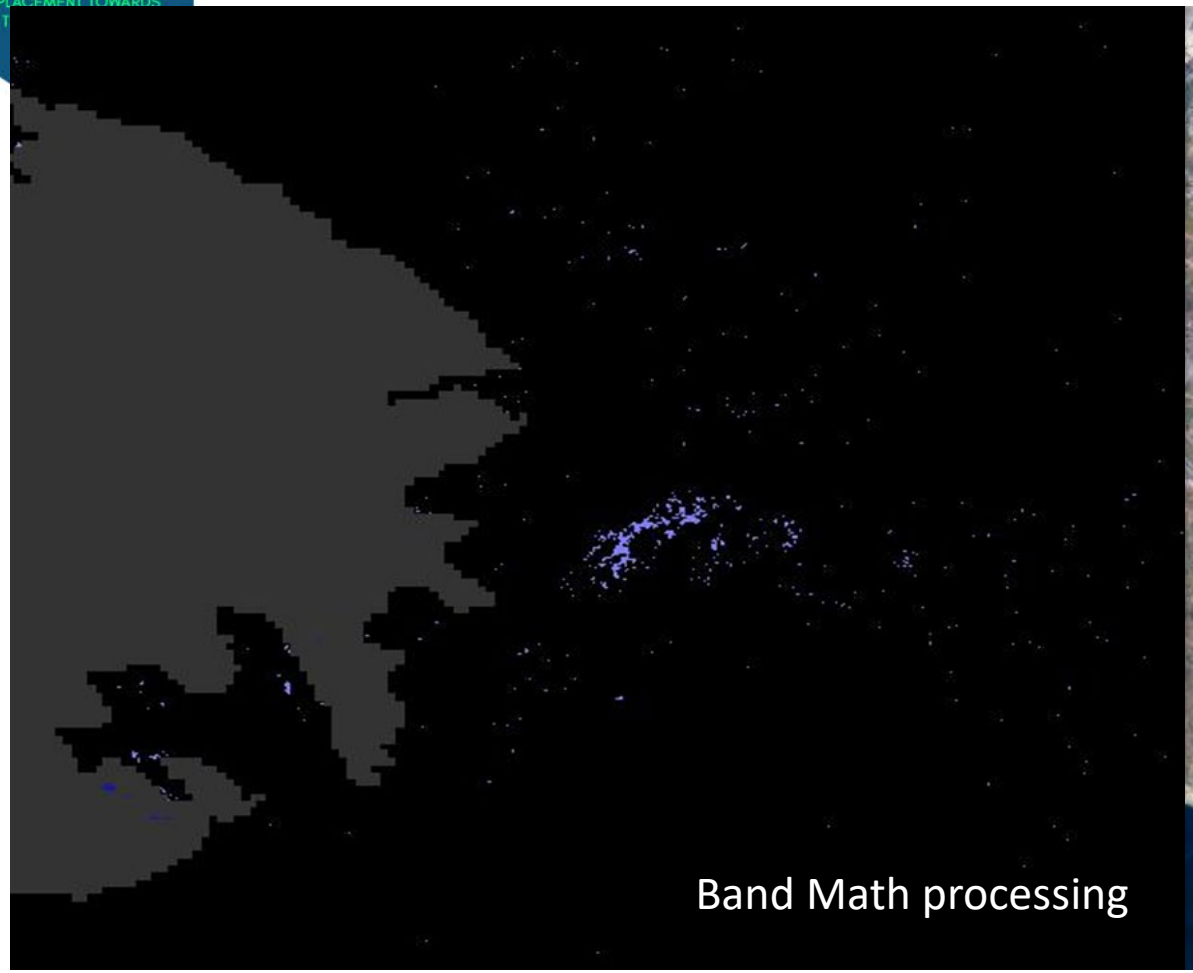
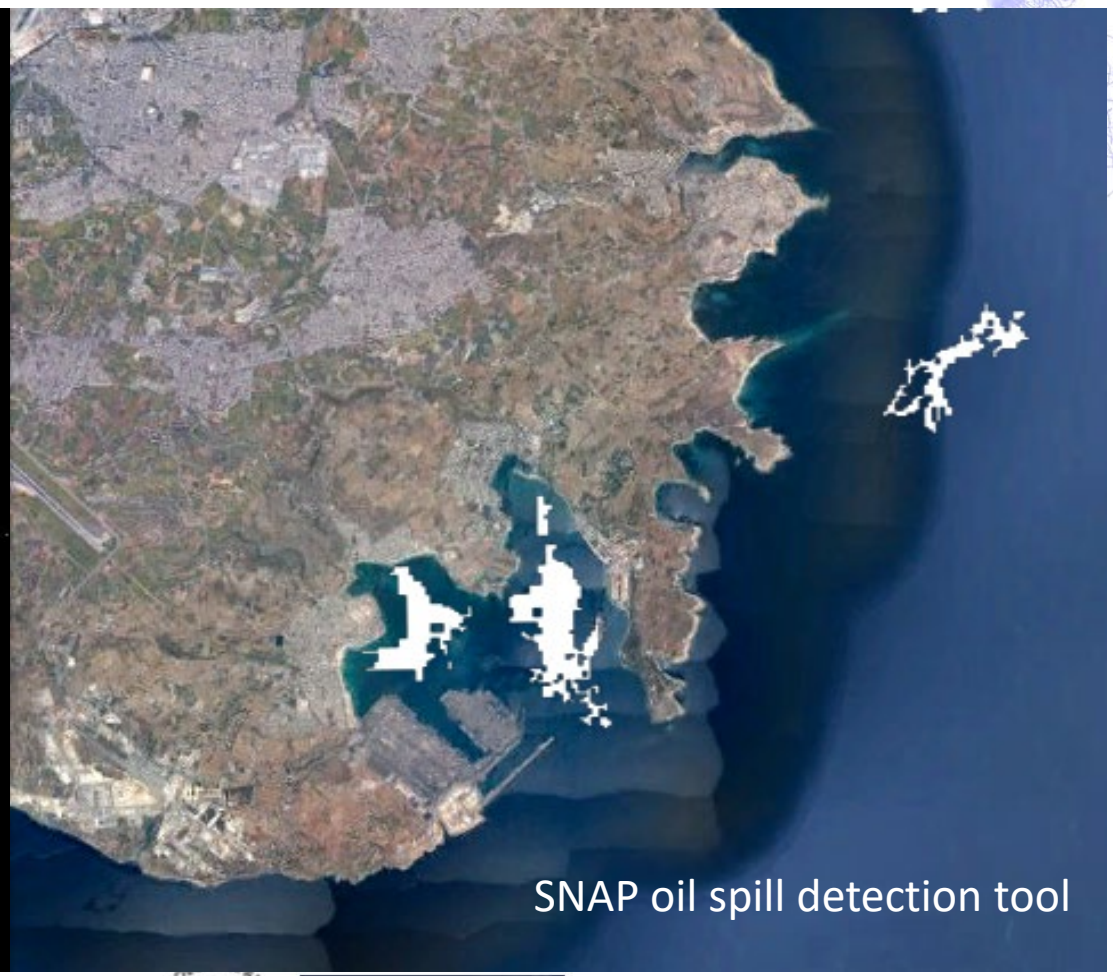
COMPARISON OF RESULTS



Band Math processing



SNAP oil spill detection tool

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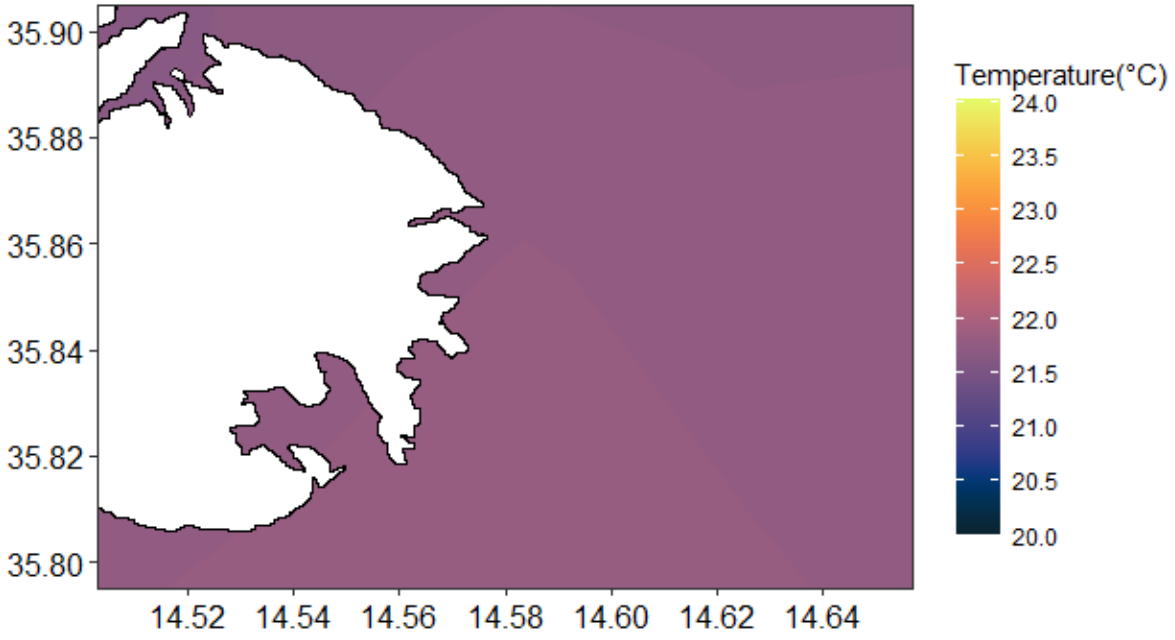
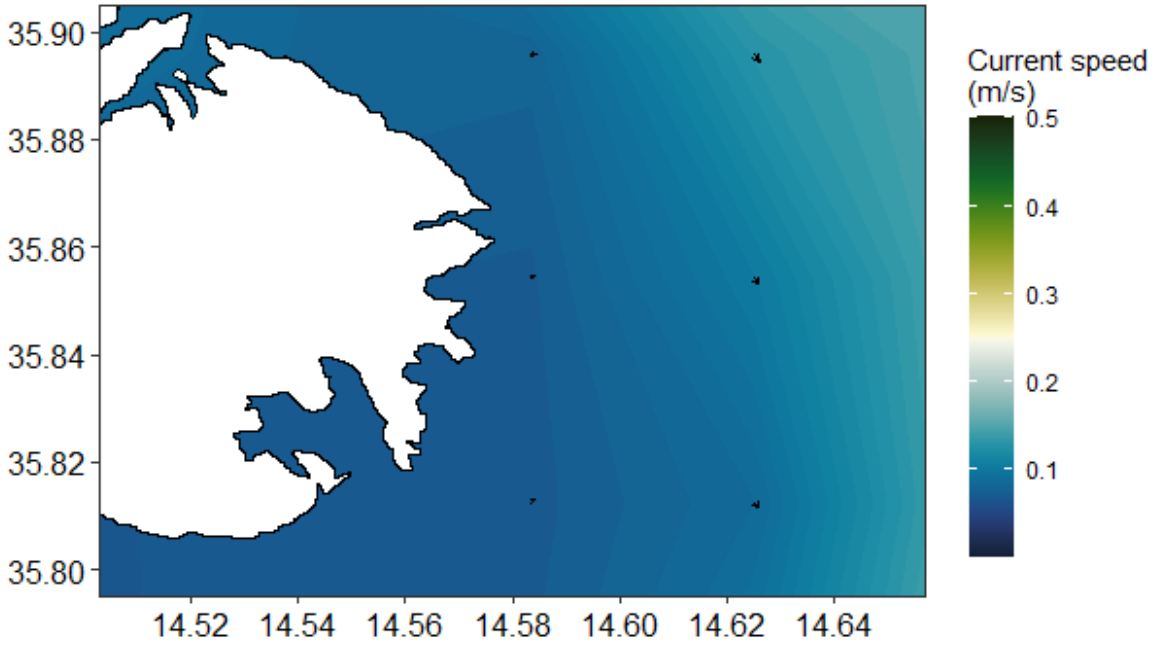
COULD PHYSICAL PARAMTERS BE USEFUL TO DISCRIMINATE/PREDICT JELLYFISH BLOOMS?





Elaboration of 11th June 2016 daily mean data from the Med MFC physical reanalysis product available at Copernicus Marine Service https://marine.copernicus.eu/MEMS

Copernicus Marine Service

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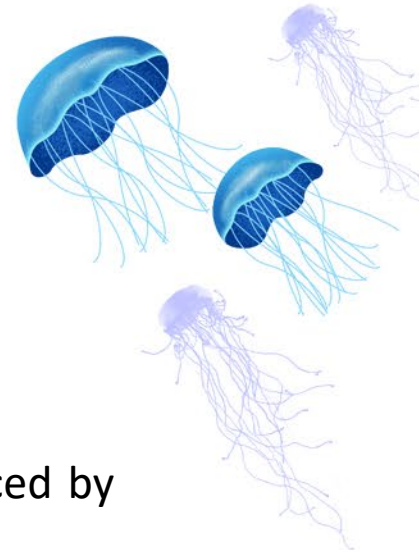

RESULTS and CONCLUSIONS

The effect on the water surface produced by gelatinous zooplankton is the same produced by an oil slick but in this case is a phenomenon of *look-alike* produced by the bloom.

An effort still needs to be made to discriminate between jellyfish blooms and oil spills. The contribution of Information about related physical parameters as current and sea temperature in the detection of jellyfish blooms have to be investigated.

The detection of jellyfish blooms in the open sea, connected to availability of operational oceanographic model (e.g. available on Copernicus Marine Core Service) could lead to the possibility to build up an early-warning system to identify the coastal areas that will be hit by the bloom in the following days.

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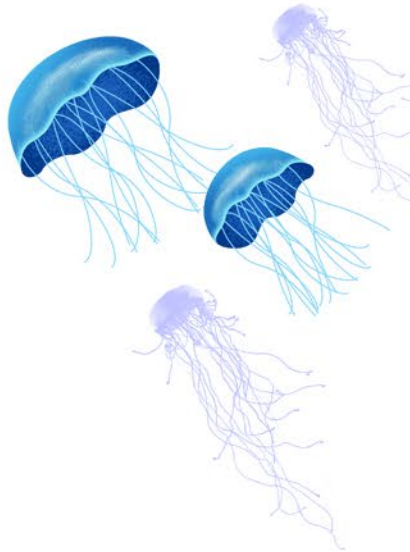

THANK YOU

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