Fourth Meeting of The Global High Frequency Radar Network

Heraklion, Crete, Greece
22-23 September 2015

HF Radar monitoring systems and response against marine Oil Spills in the Malta Channel

GIUSEPPE CIRAOLO
(University of Palermo - Calypso Project Sicilian Focal Point)

Aldo Drago, Simone Cosoli, Rosario Sinatra, Francesco Raffa
IOM – Malta *OGS – Trieste* *CUTGANA – UNICT* *CNR –IAMC*

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INFO:
www.capemalta.net/calypso

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Italia Malta
2007 - 2013

WHO WE ARE
UNIPA – DICAM main Remote Sensing activities
Land

- Remote Sensing applied to Hydrology;
- Estimating actual Evapotranspiration by means of surface energy balance models;
- Soil humidity mapping by means of VIS/NIR and thermal images;
- Soil humidity by means of radar images.
- Correlation of climatic data – vegetation indices;
- Droughts;
- Landslides – SAR Differential Interferometry

WHO WE ARE
UNIPA – DICAM main RS ACTIVITIES - water

1. Coastal areas and lagoon monitoring - Water quality
2. mapping submerged vegetation dynamics
3. airborne, satellite and field data
4. Primary production - Phytoplankton
5. Sea Surface Temperature (fronts)
6. **Oil spill detection**
7. Surface water currents monitoring
8. Lakes Water quality
9. Occurrence of toxic blooms monitoring

UNIPA-Medilab RS laboratory- Equipments

The Lab

Hardware

Software

GIS

- ARCINFO
- ARCVIEW GIS
- ARCGIS
- ARCIMS
- ARCPAD

Image Processing

- IDL
- ENVI
- ERDAS IMAGINE
- ER MAPPER
- IDRISI

Data Processing

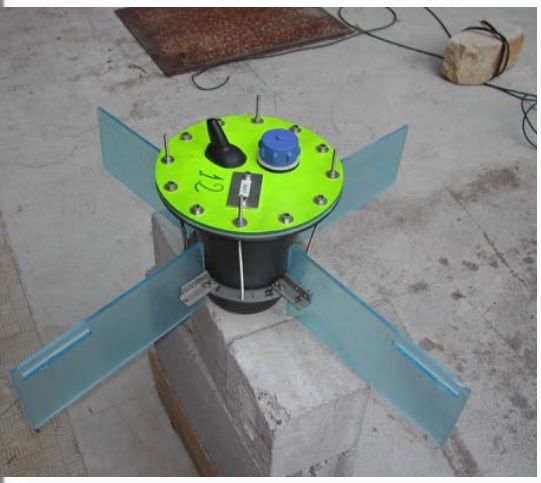
- EASY TRACE
- CARTALINX
- LEICA GPSs
- SURFER

Equipments

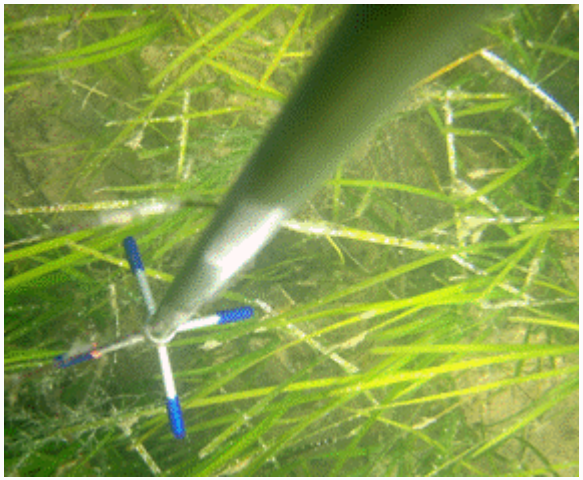
Medilab - Equipments

Vector

StreamPro - profiler



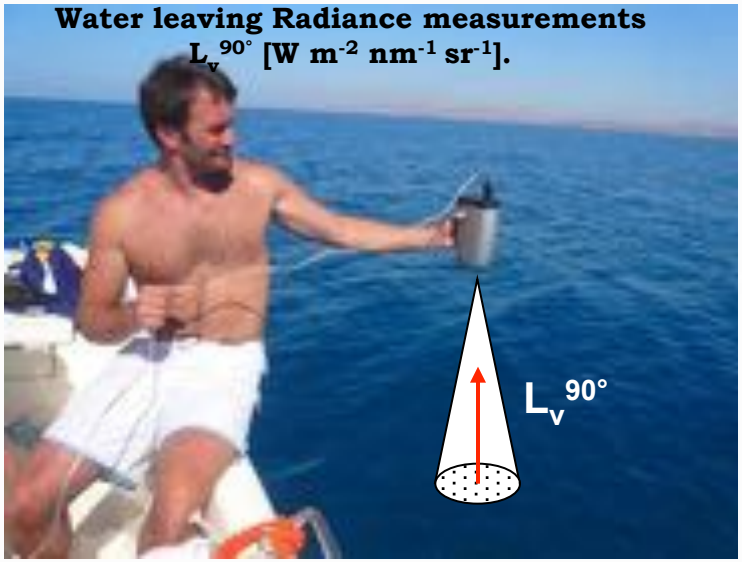
Buoy - GPS and GSM - Radio

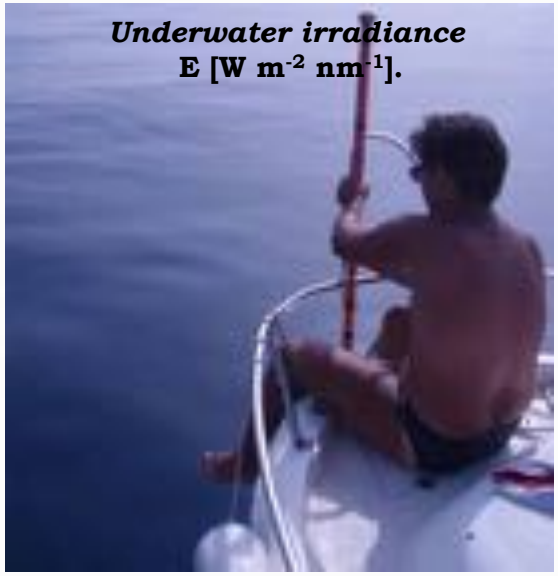


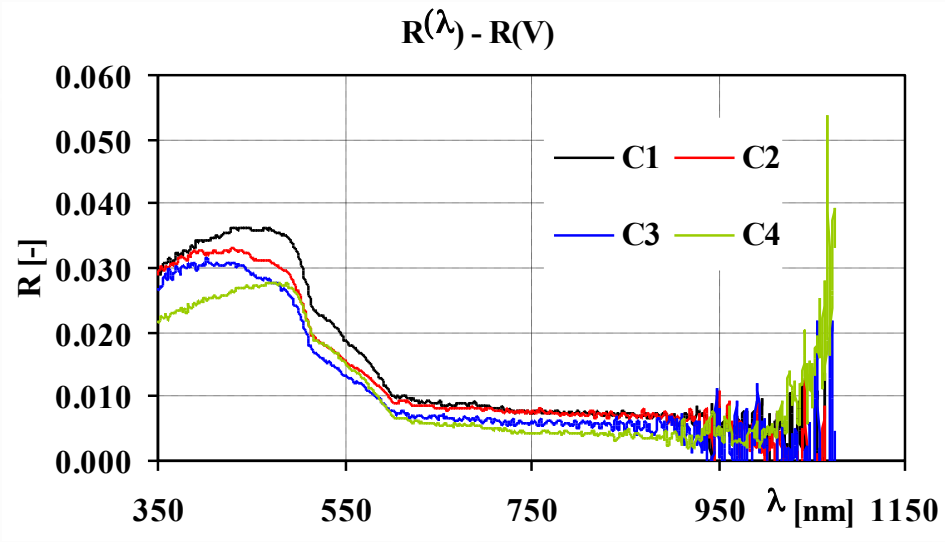
Vectrino

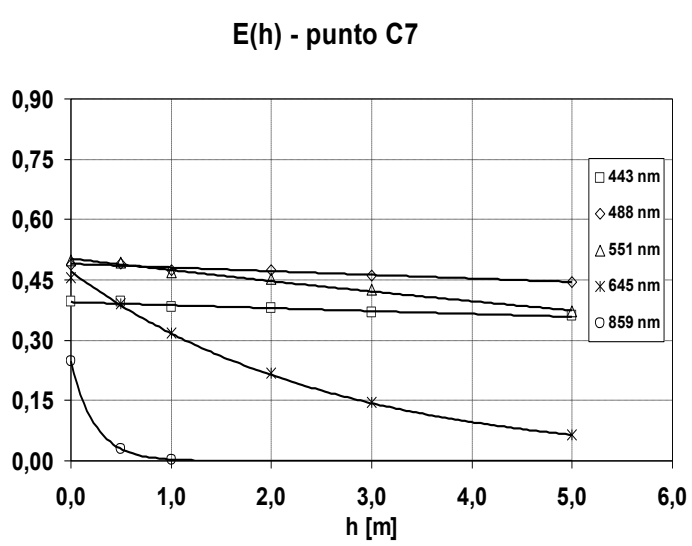
Sontek ADCP - profiler

Medilab - Equipments









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Calypso Project Outline

PRIORITY AXIS	***Axis II: Environment, Energy and Risk prevention***
SPECIFIC OBJECTIVES	***2.3. Promoting joint actions in the sphere of prevention of risks resulting from both natural and human causes***
PROJECT CODE	**A1.2.3-31**
DURATION	***2 years*** ***15/4/2011 – 14/4/2013 (October 2013)***
BUDGET	***1.455399 M Euro*** ***of which 100KEuro Additional funds provided by ARPA Sicilia***

LEAD PARTNER	***University of Malta***
PARTNERS	***4 Maltese; 4 Italians***

additional and coherent activities have been funded in a project extension (CALYPSO FO) to install a new antenna in Sicily (to ensure robustness and redundancy of the system)

CALYPSO FO will end on the 14th of November 2015

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Project Partners

1	UNIVERSITY OF MALTA (UOM) - Prof. Aldo Drago PROJECT LEADER
2	TRANSPORT MALTA (TM)
3	CIVIL PROTECTION DEPARTMENT (CPD)
4	ARMED FORCES OF MALTA (AFM)
5	ARPA Sicilia – Regional Agency Environmental Protection
6	Istituto per l'Ambiente Marino Costiero uos di Capo Granitola, Consiglio Nazionale delle Ricerche (IAMC-CNR CAPO GRANITOLA)
7	UNIVERSITA' DEGLI STUDI DI PALERMO Prof. Giuseppe Ciraolo SICILIAN FOCAL POINT Polo Universitario di Trapani (UNIPA)
8	UNIVERSITA' DI CATANIA (CUTGANA)

OGS (Trieste) is also directly involved

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Main Project Targets

Setup a Permanent and fully operational HF radar observing system, capable of recording (in real-time with hourly updates) surface currents in the Malta Channel.

Data + Numerical models = Applications

*optimise intervention in case of **oil spill** response; tools for security, safer navigation; improved meteo-marine forecasts; monitoring of currents in critical areas such as ports; **search and rescue** and better management of the marine space between Malta and Sicily.*

Network of stakeholders and responsible entities

direct activities for the exchange of information, practices and the preparation of common protocols for collaborative surveillance and operational interventions in the case of accidents and emergencies between Maltese and Sicilian counterparts (Guradia Costiera Italiana, Civil Protection, etc).

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Background Analysis

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Marine Traffic (AIS)

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https://www.marinetraffic.com/it/

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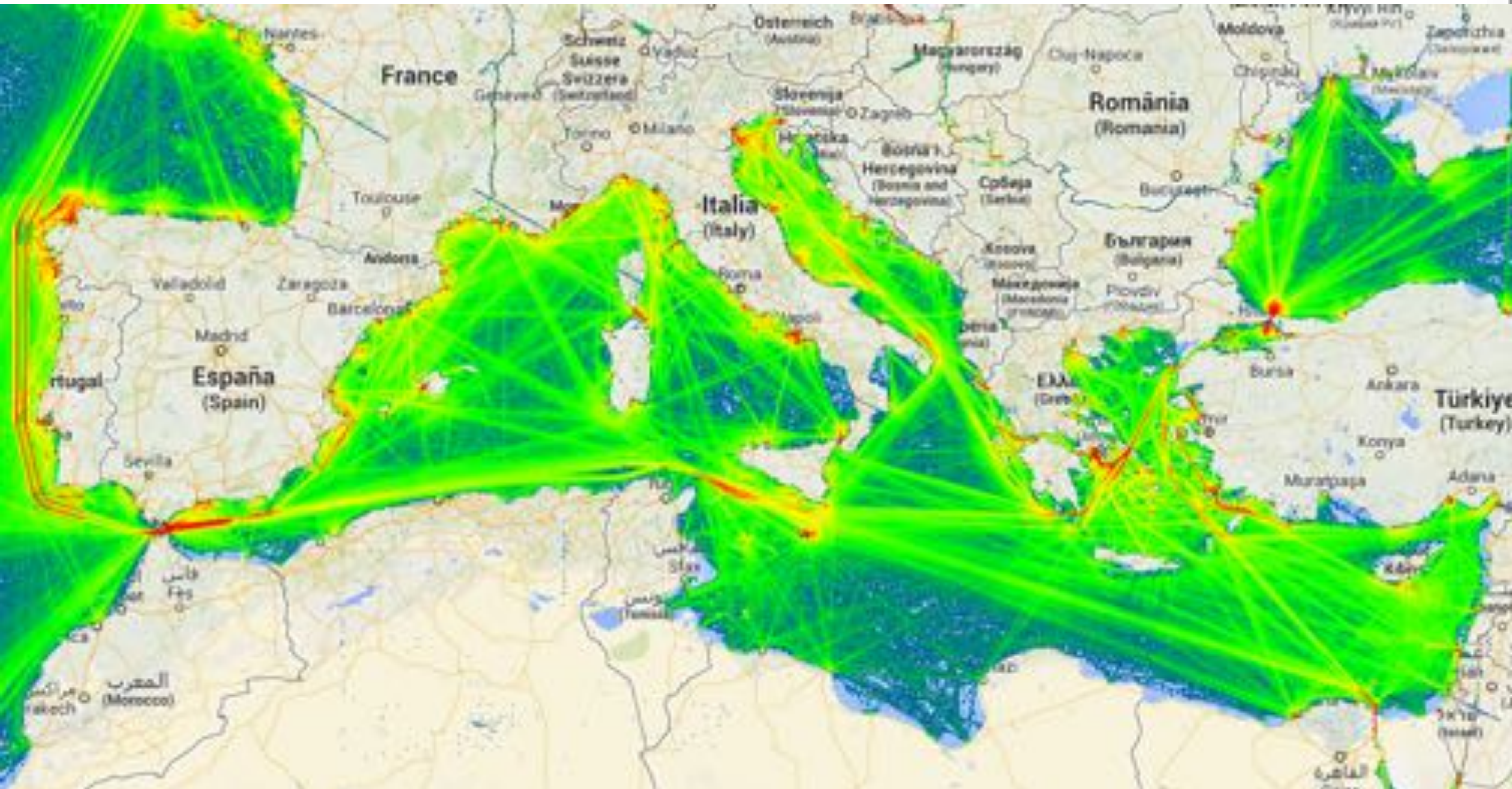
Marine Traffic (AIS)



https://www.marinetraffic.com/it/

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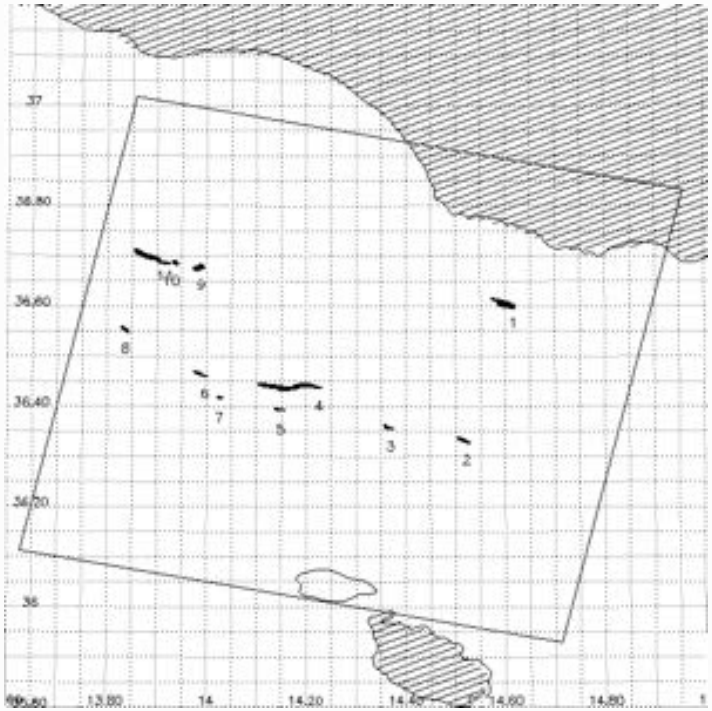
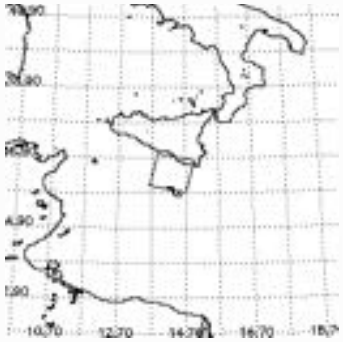
UNIPA Oil spill detection activities (remote sensing)





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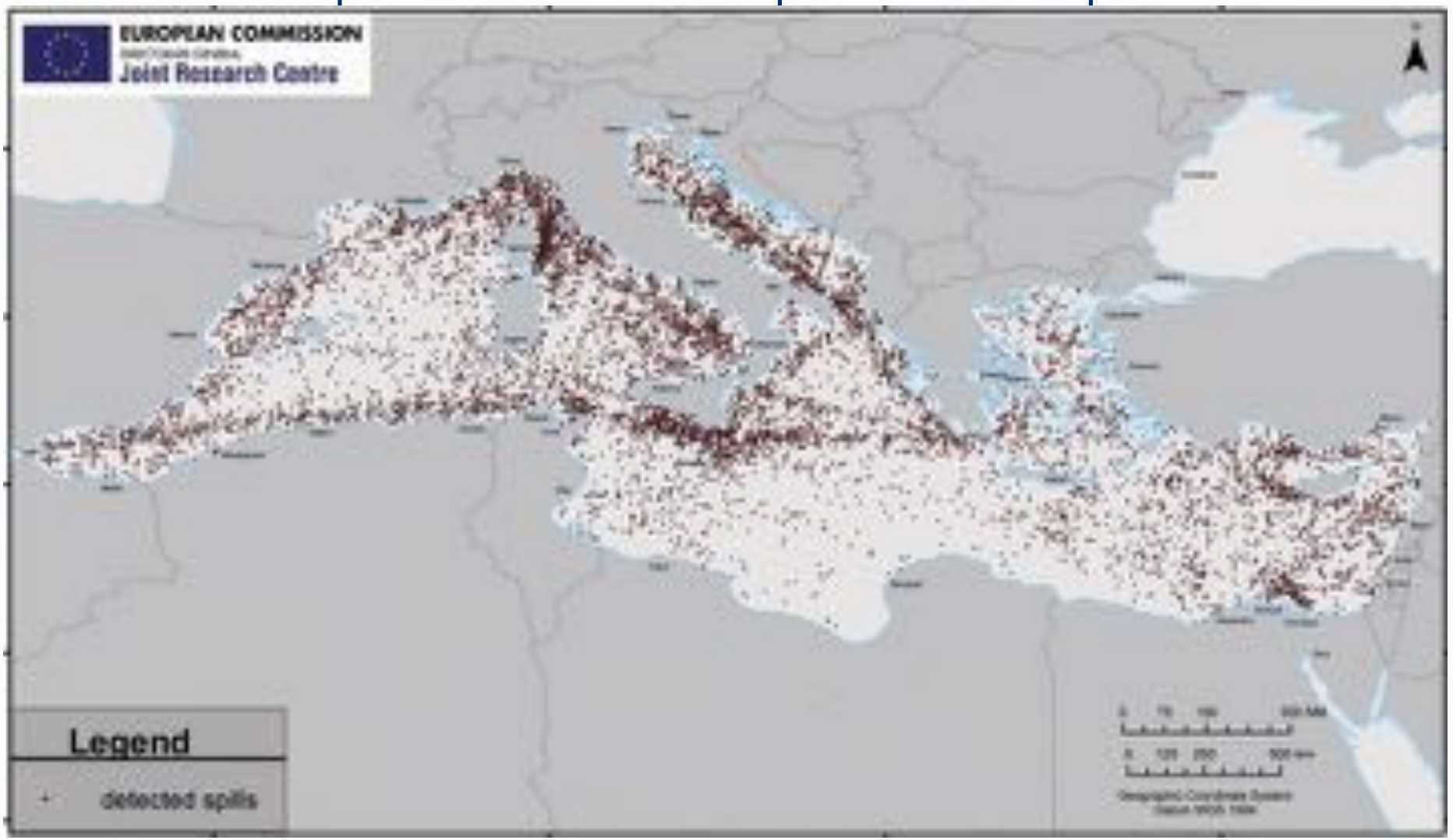
Why CALYPSO in the Malta channel

Oil spills in the 1999-2004 period: 18.947 spills



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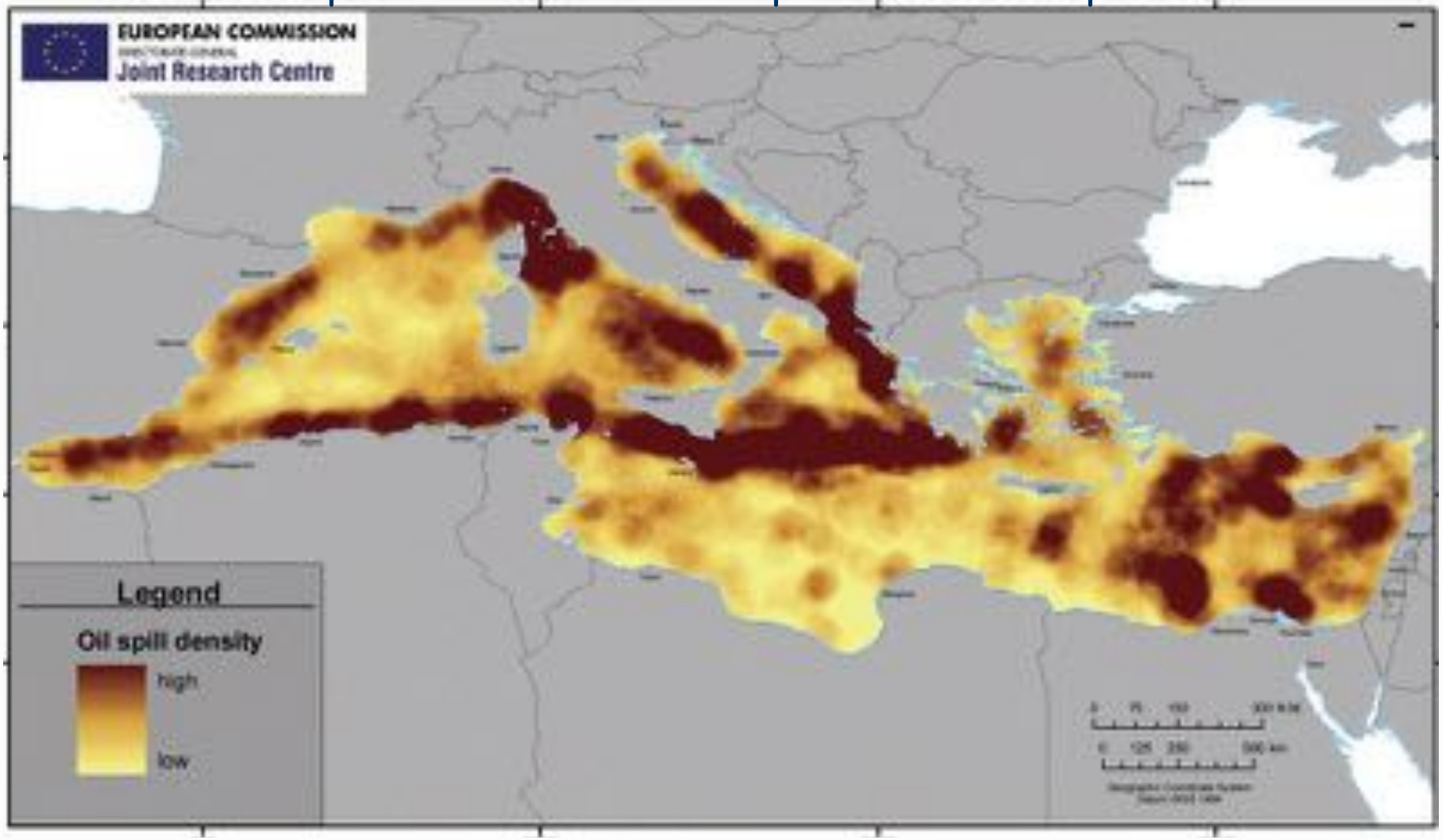

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The Calypso HF Seasonde network (3 antennas @ 13.5 MHz)

The Pozzallo HF antenna completed the CALYPSO HF network in August 2013

The installation has been completed on 13th of August

The Pozzallo HF installation

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The Pozzallo HF installation

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The Pozzallo HF installation

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The Calypso HF system Validation

1) Drifters release (validation)

2) ADCP survey (validation)

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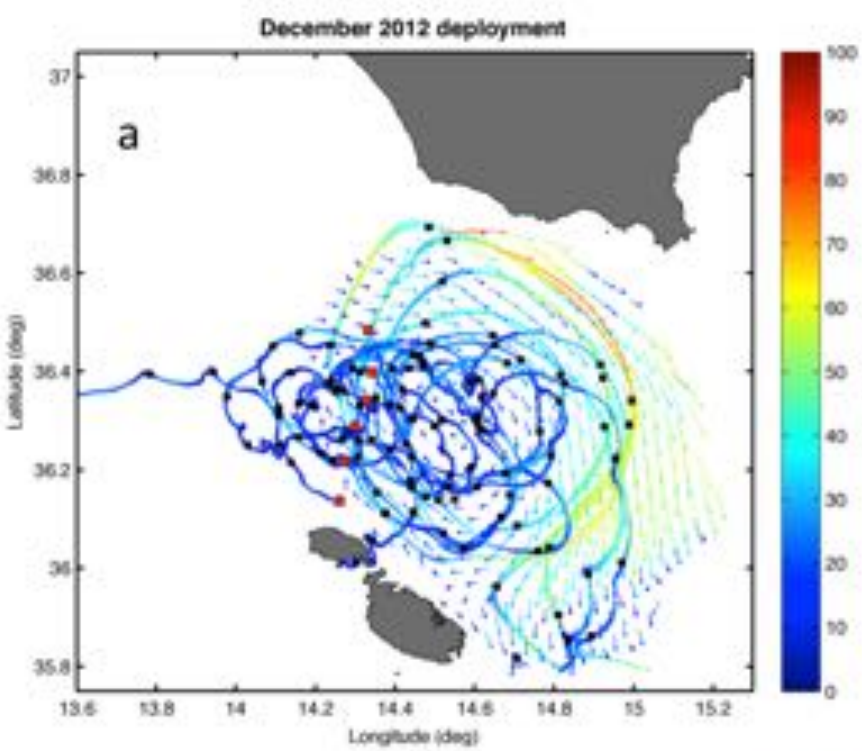
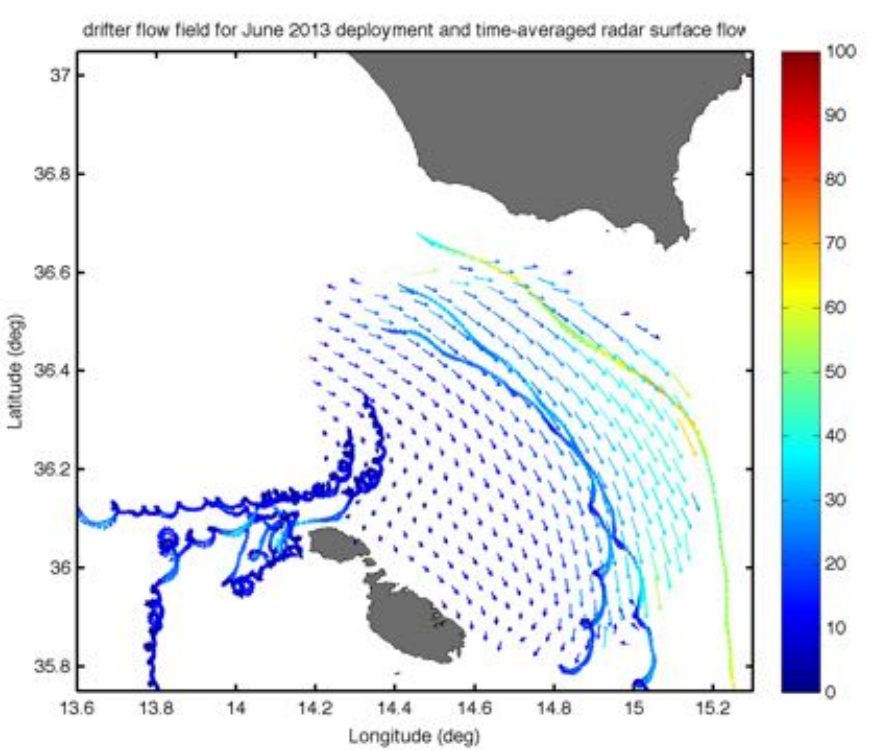
VALIDATION





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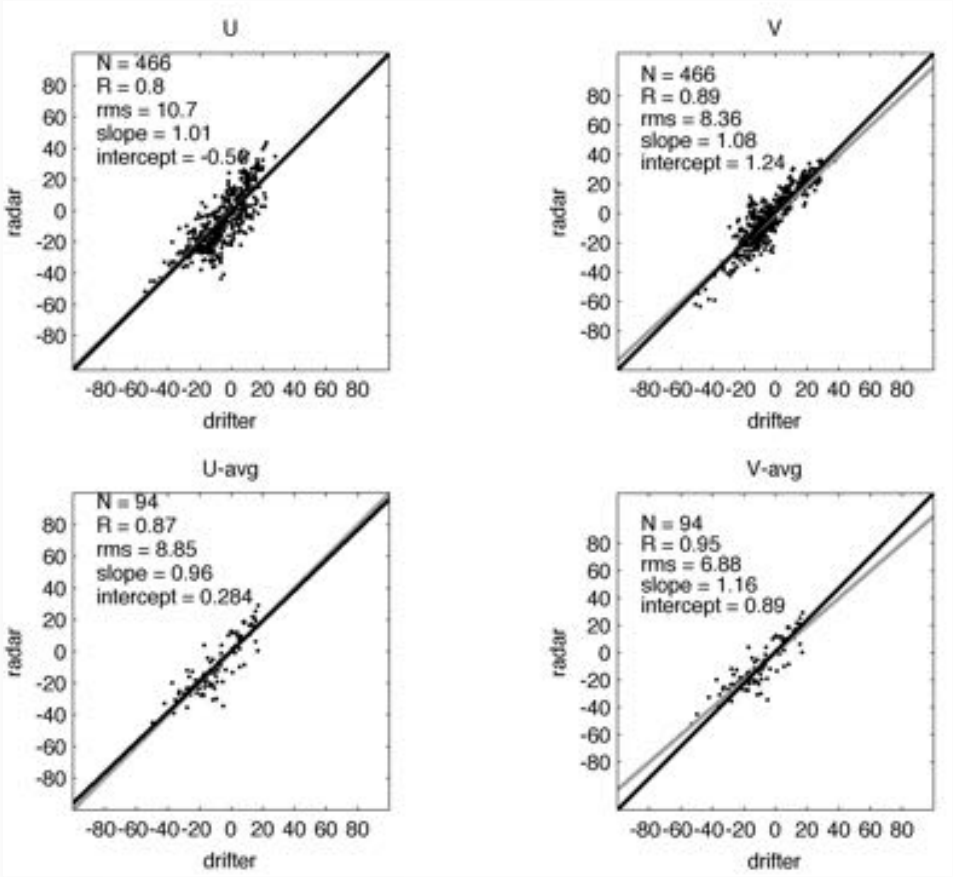
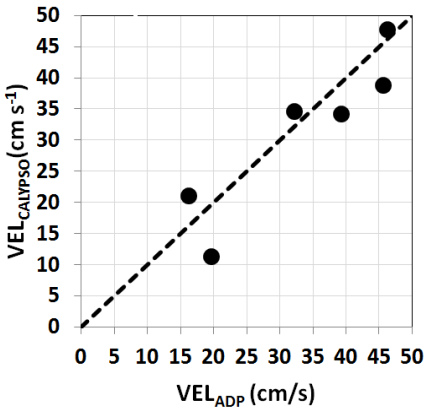
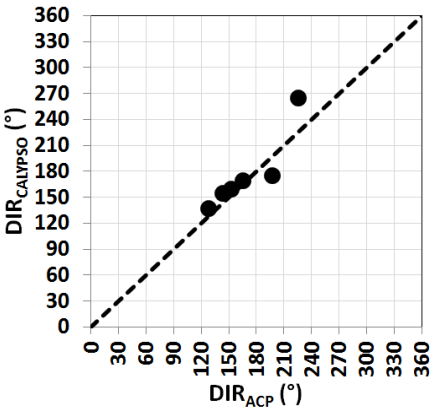
VALIDATION

drifters



ADCP





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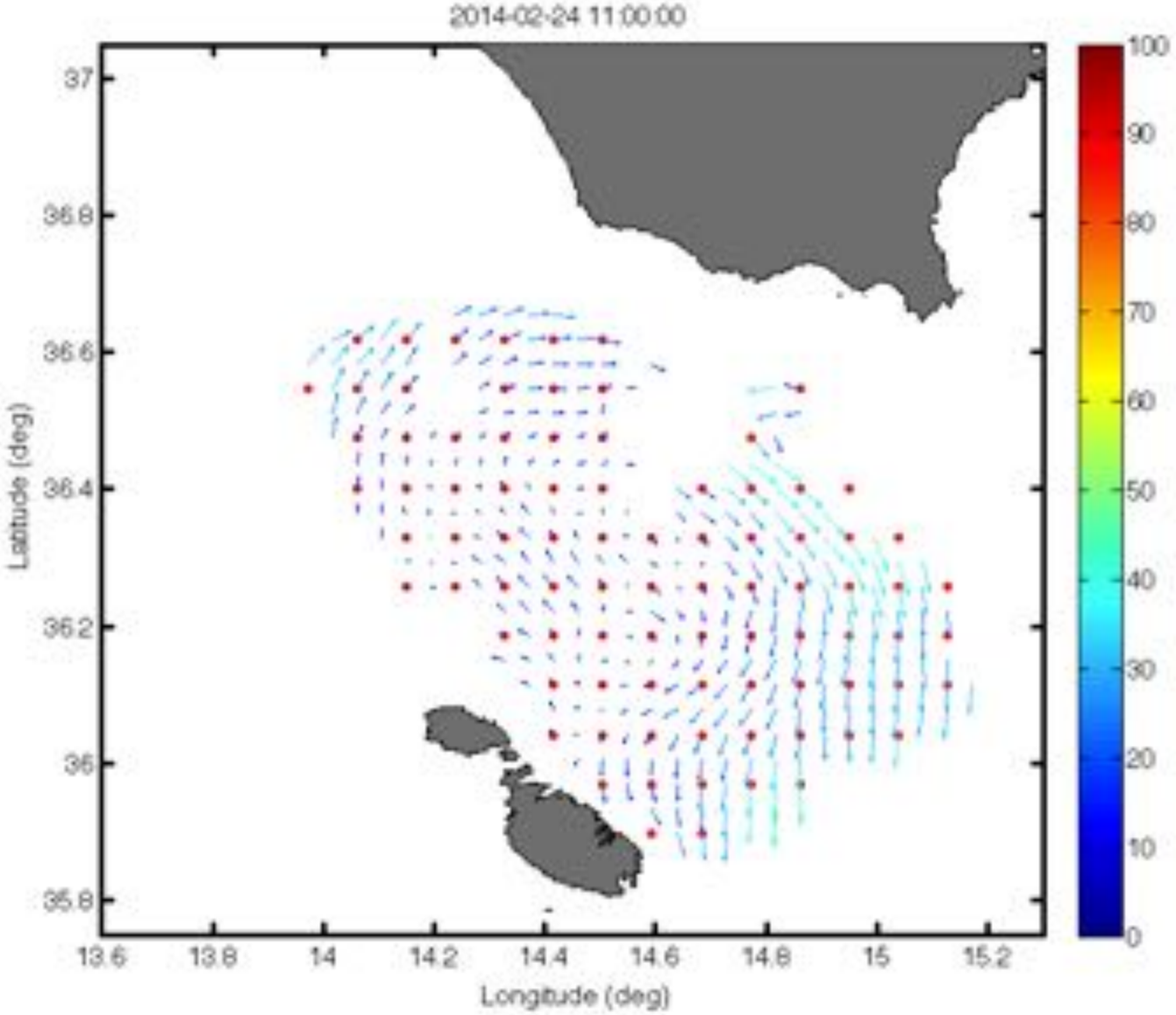
VALIDATION



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RFI Noise interference problem

source of spectrum scans: http://websdr.ewi.utwente.nl:8901/

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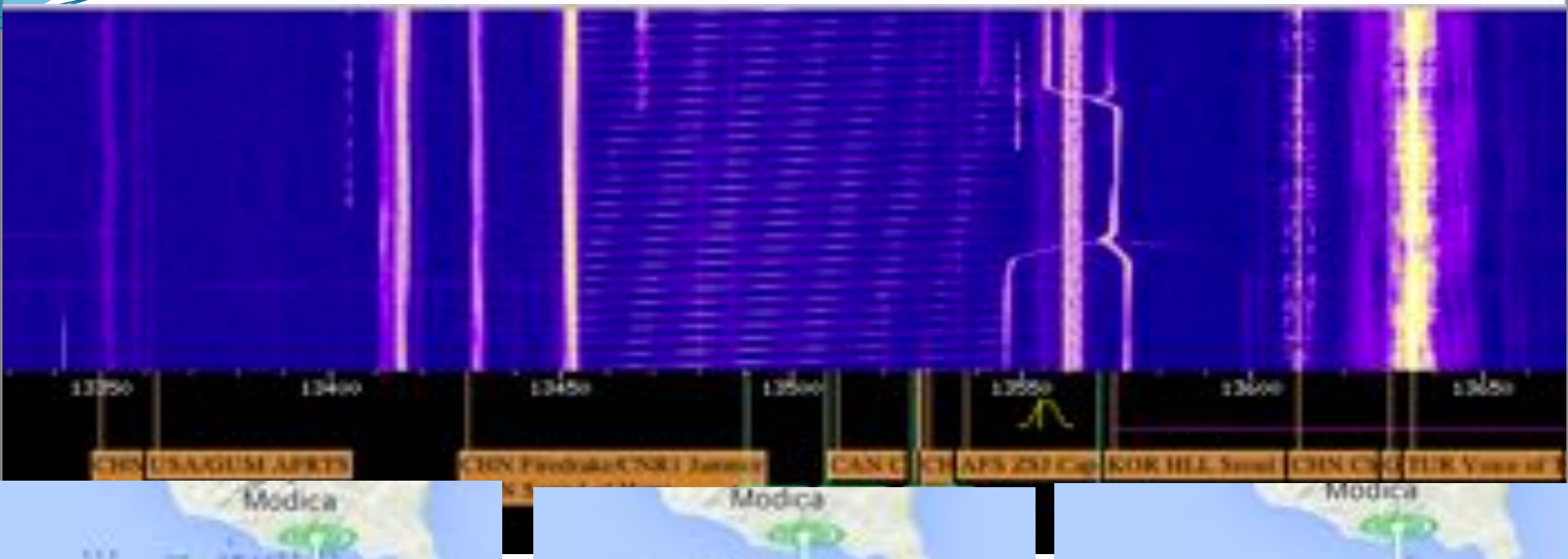

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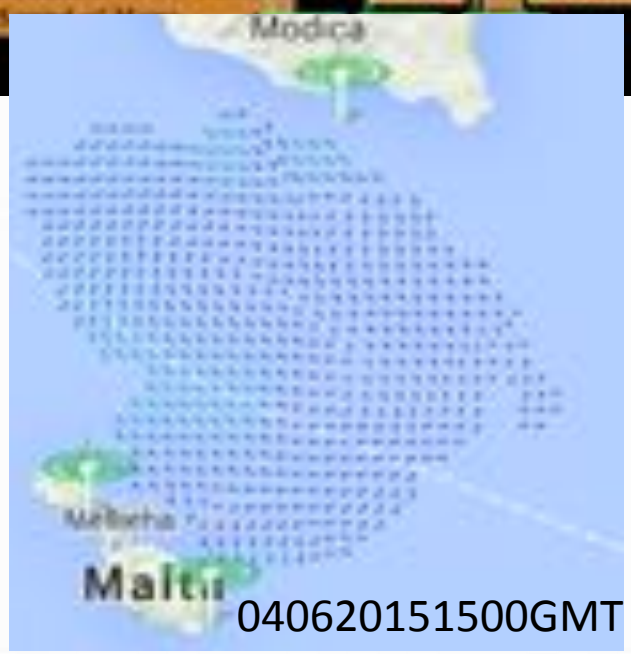

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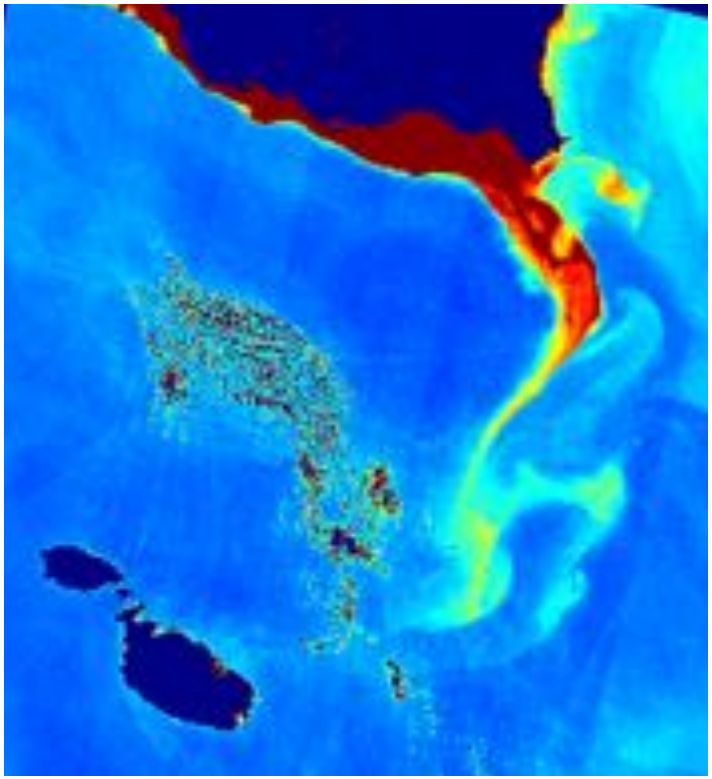
CHL-a *vs* Surface currents

comparison with the Landsat 8 derived map



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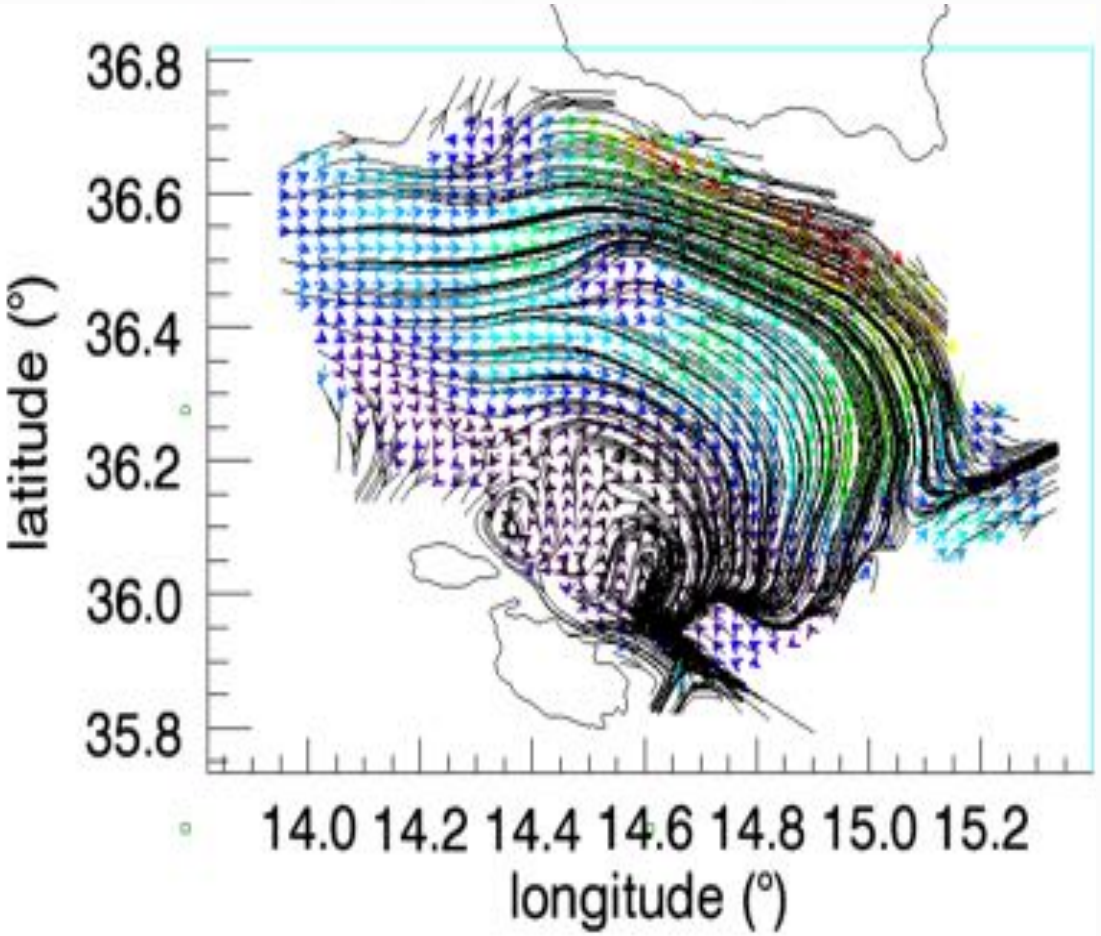
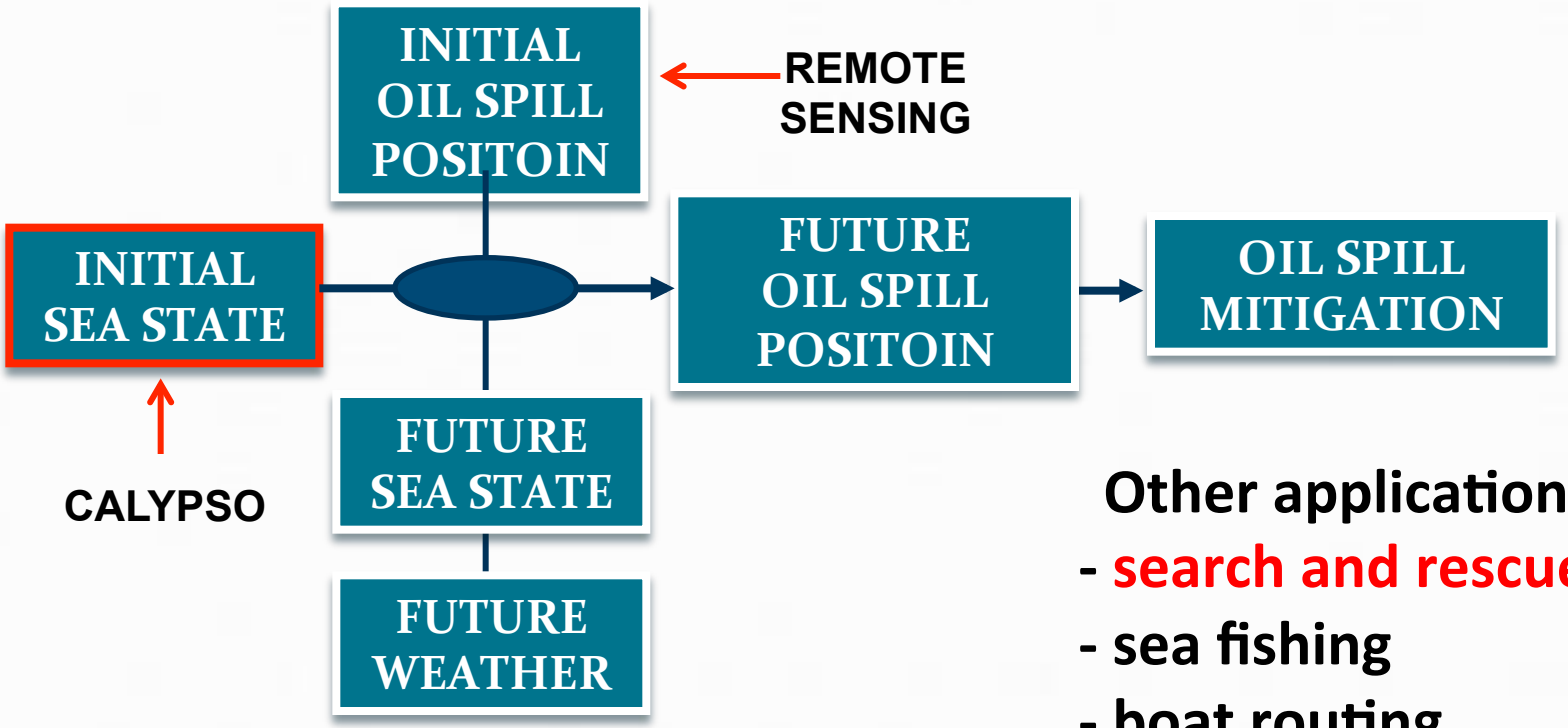


Expected use of the system

The CALYPSO network will be maintained up for at least 5 years
During this period CALYPSO data will be useful in:

- improving the reliability of sea currents forecasting
- oil spill chain response (forecasting of the oil fate and mitigation)



Other applications

- **search and rescue**
- **sea fishing**
- **boat routing**

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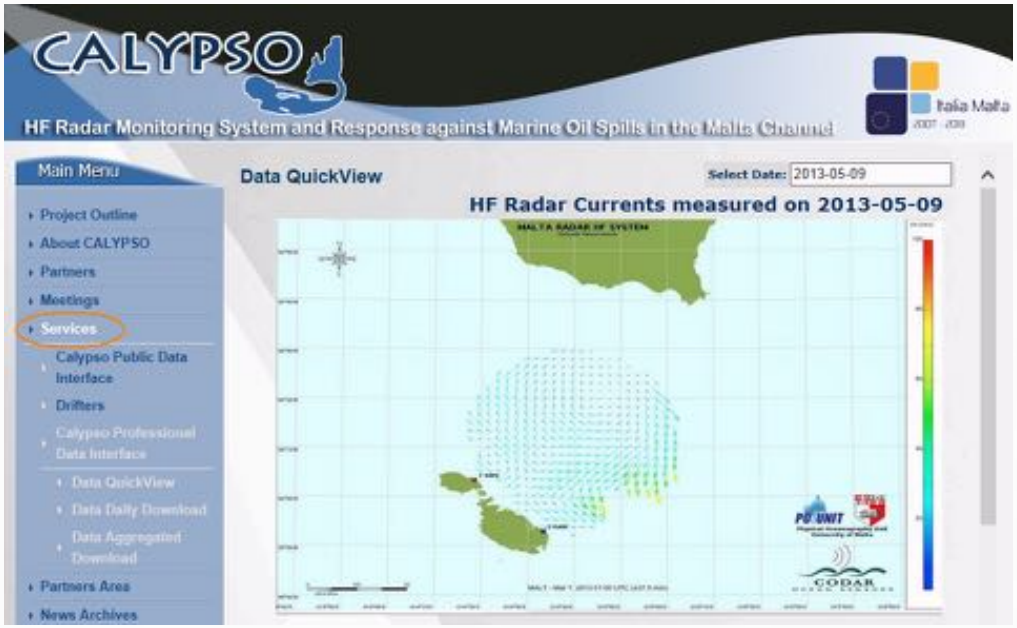
Data Access – www.capemalta.net/calypso

User friendly web interfaces for the display of data in real-time are being developed. These provide information in the form of maps for 2D display as well as time series at selected points in the area of coverage.



The **Public Interface** is aimed for the general public. It provides plots and statistics for 9 different regions in the Malta-Sicily channel.

Register online to get access to data

.

The **Professional Interface** targets experts. This will show quick view plots and make possible the downloading of data (NetCDF, ASCII), the extraction of data sub-sets and also handle special data requests. Access to the Calypso Professional Data Interface is restricted to registered users. New users can register on the Calypso portal.

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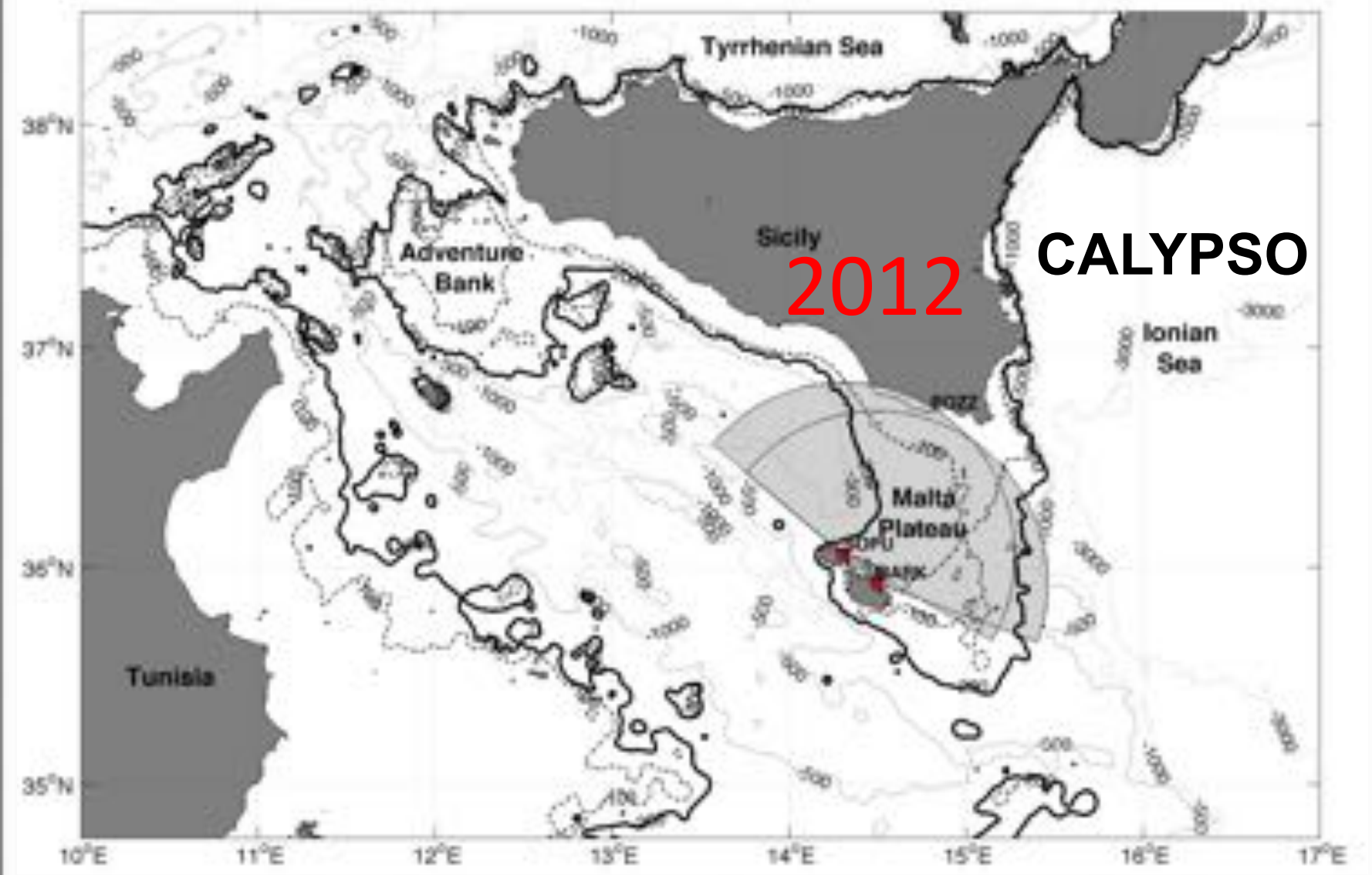
Network expansion and challenges



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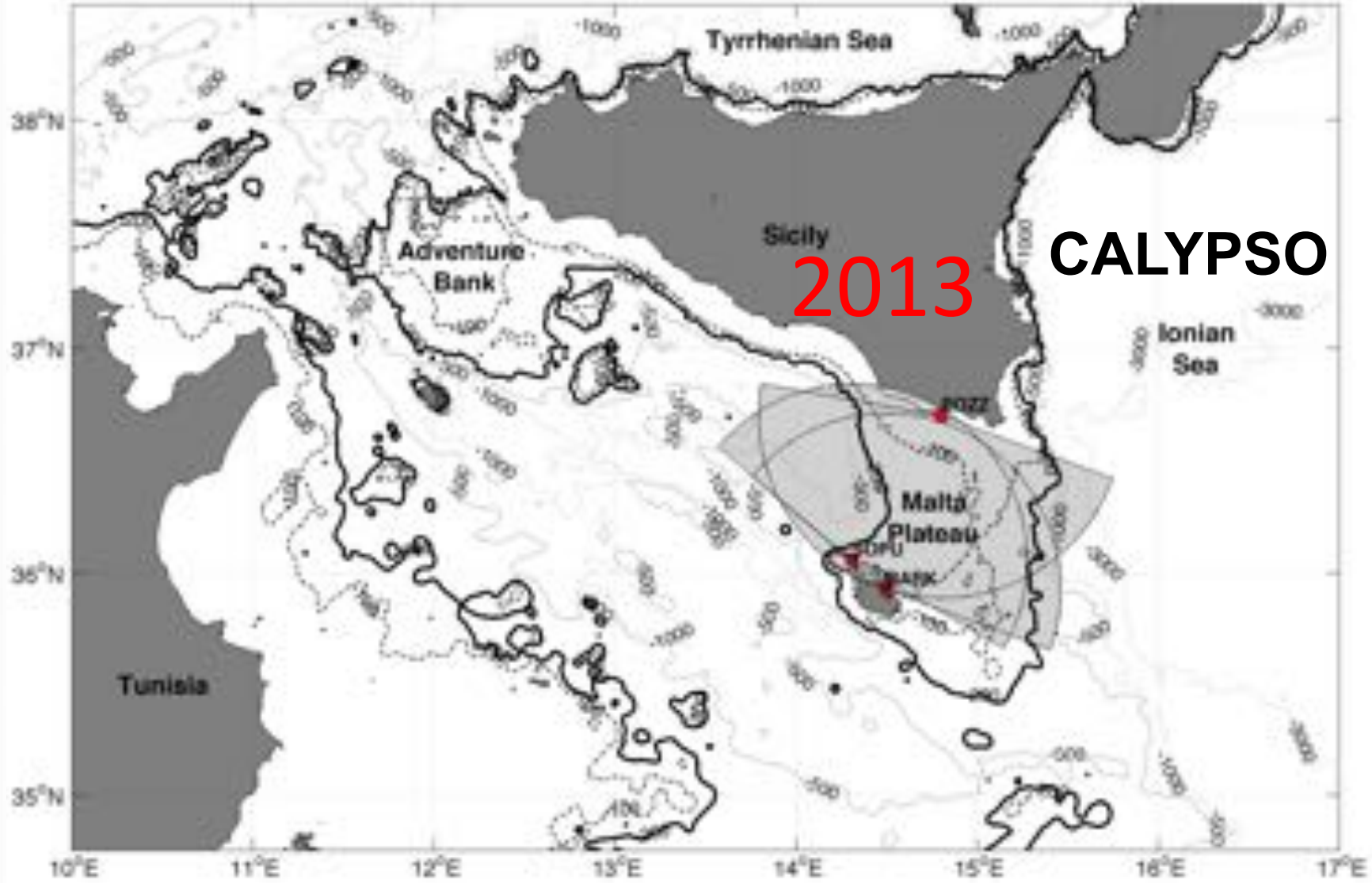

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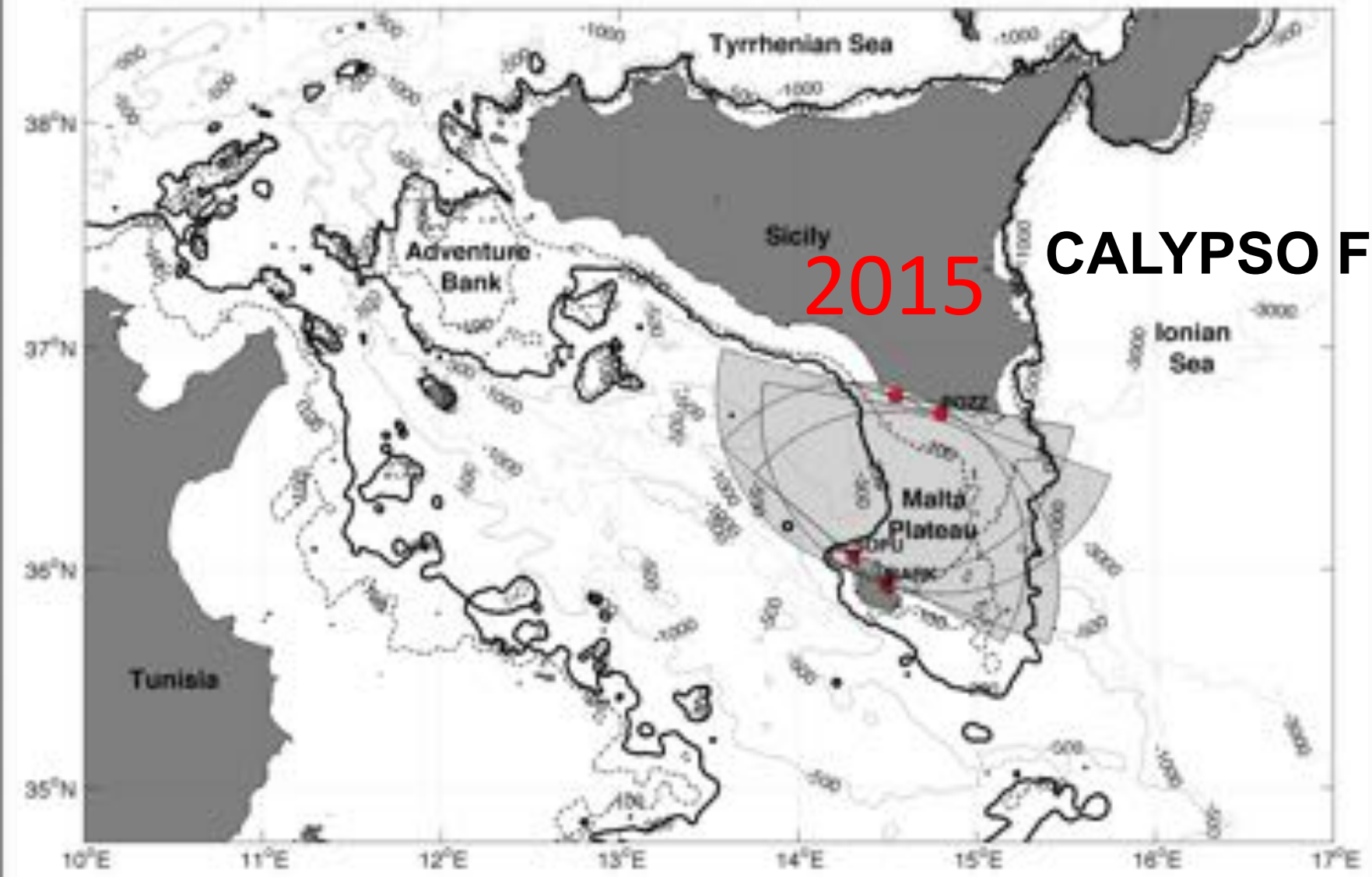

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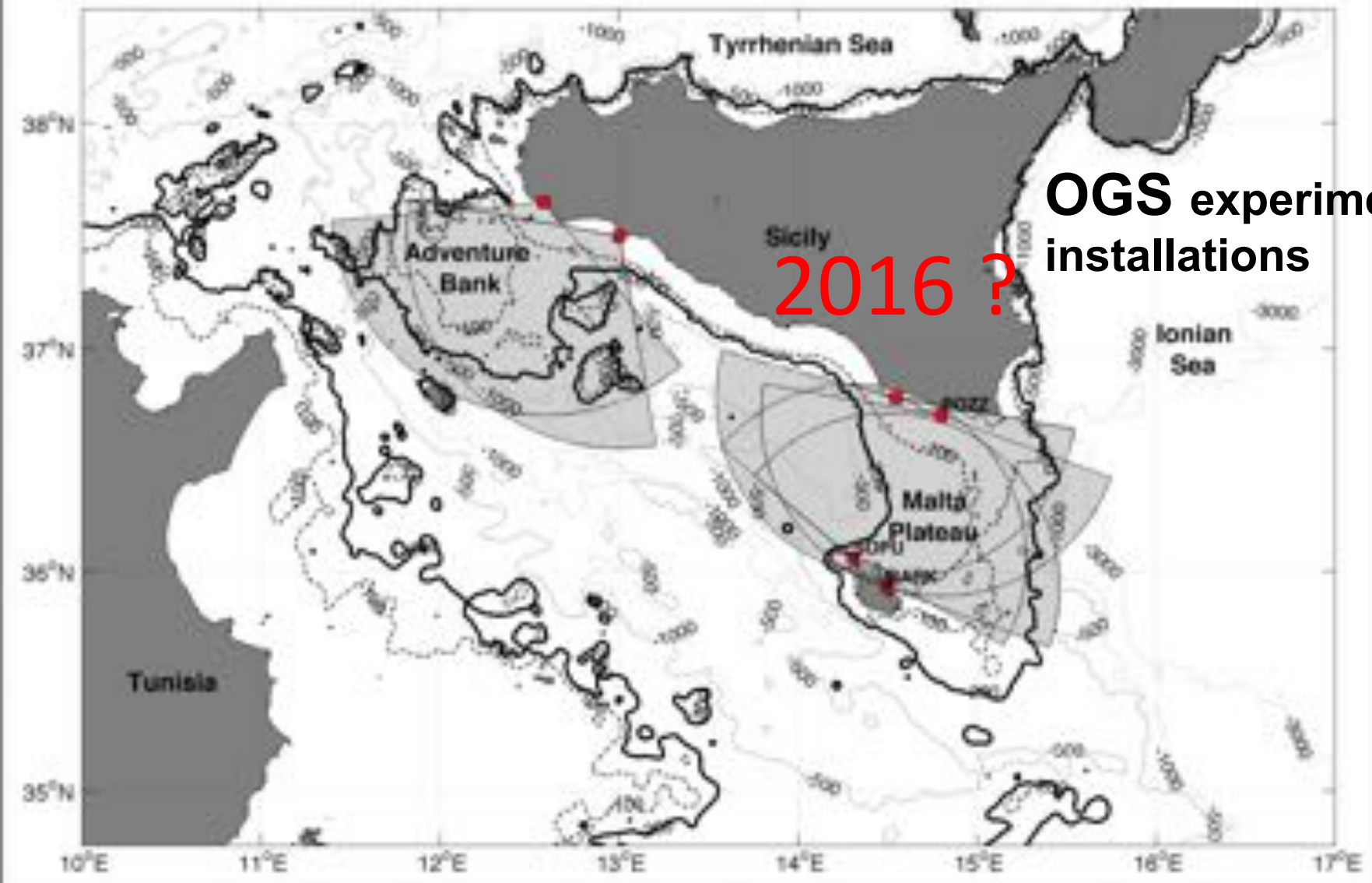

OGS experimental installations

2016 ?

Conclusions

- Mapping the surface currents and waves is **a crucial issue** for the Sicilian channel
- The oil spill is still an unsolved phenomenon in this area
- The performance of the HF Radar technology is proven
- The expansion of the network is on going
- The potentiality of this technology in the **Search And Rescue** activities is very high (need of further effort in this direction)

Acknowledgements

All the Calypso partners (both in Italy and Malta)

- **The UNIPA Staff (Fulvio Capodici and Alba Abbate)**
- **The IOM-Malta (Adam Gauci, Joel Azzopardi, Marija Attard)**
- **Italian Coast Guard Headquarter staff**
- **Qualitas Instruments staff**

Meeting a Ragusa
21 November 2011

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THANKS FOR LISTENING

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