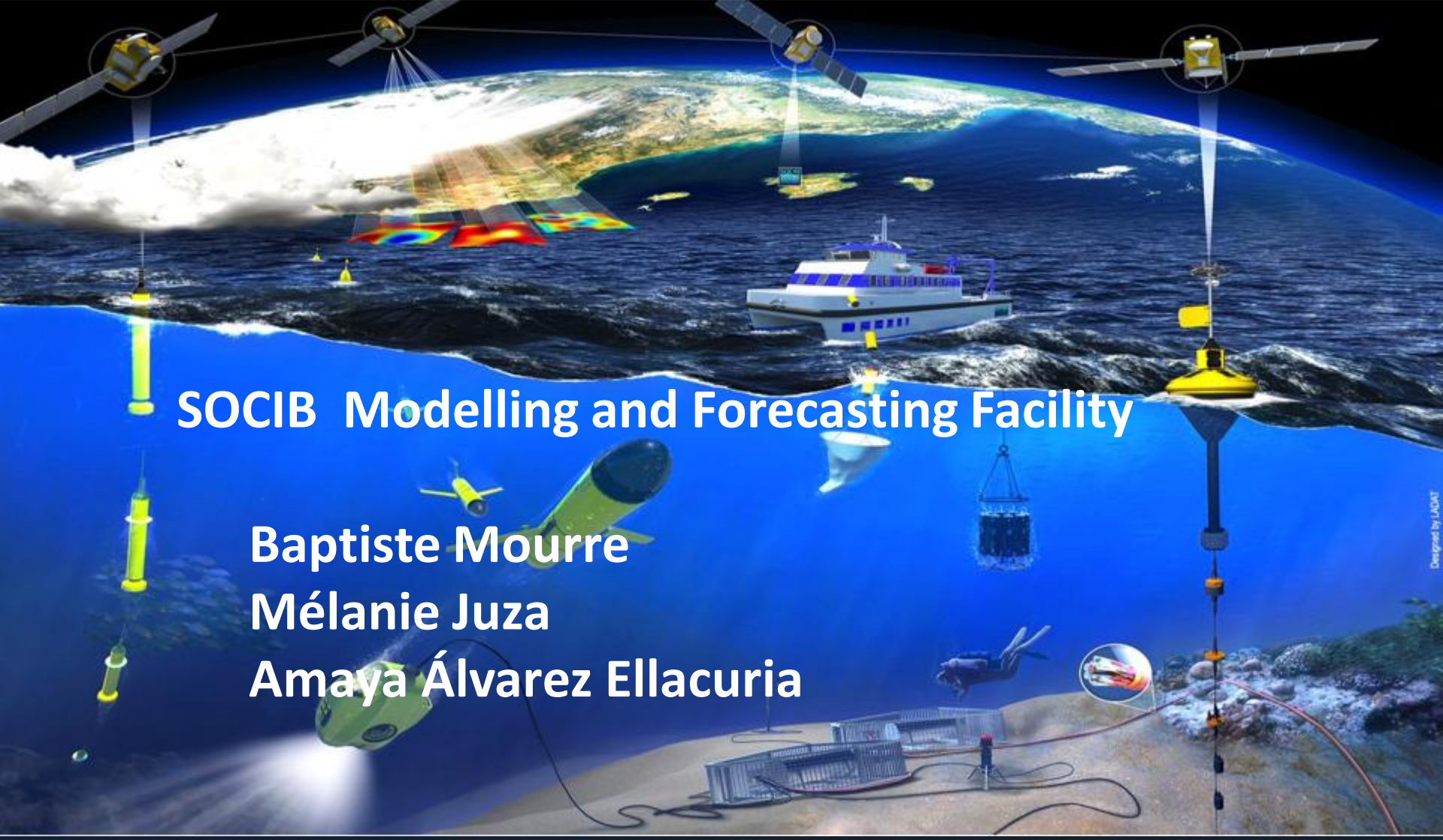


SOCIB Modelling and Forecasting Facility

Baptiste Mourre
Mélanie Juza
Amaya Álvarez Ellacuria

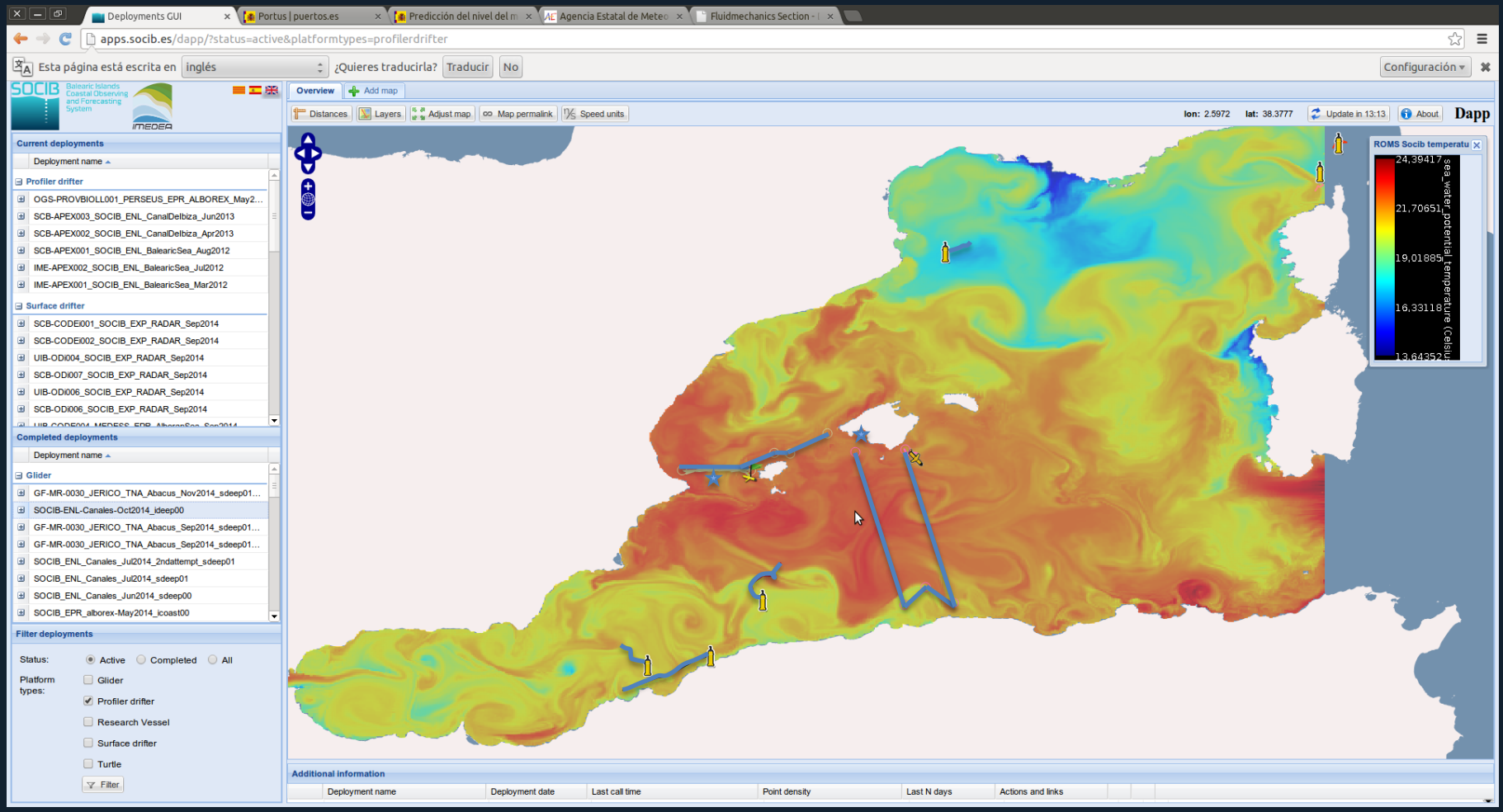
TEAM WORK TO guarantee Scientific Excellence & Technology Development

with… Impact on Society

www.socib.es

WHY ARE MODELS SO ESSENTIAL TO SOCIB ?

Ocean observations are inevitably limited in space and time !



WHY ARE MODELS SO ESSENTIAL TO SOCIB ?

Models have the capacity to represent the full ocean state (all physical oceanic variables) from surface to bottom everywhere in the domain, as well as its evolution in time.

- Essential to understand what we are able to detect in the observations.
- Essential to predict future states.

SOCIB Balearic Islands Coastal Observing and Forecasting System

- Essential to integrate all available information from multi-platform observations into a unified picture.
  → *data assimilation*
- Essential to objectively design the observation sampling requirements
  → *Observing System Simulation Experiments*

MODELLING AND FORECASTING FACILITY OBJECTIVES

Develop, implement and operate several ocean prediction systems aiming at responding to society needs in the Balearic Islands and Western Mediterranean Sea.

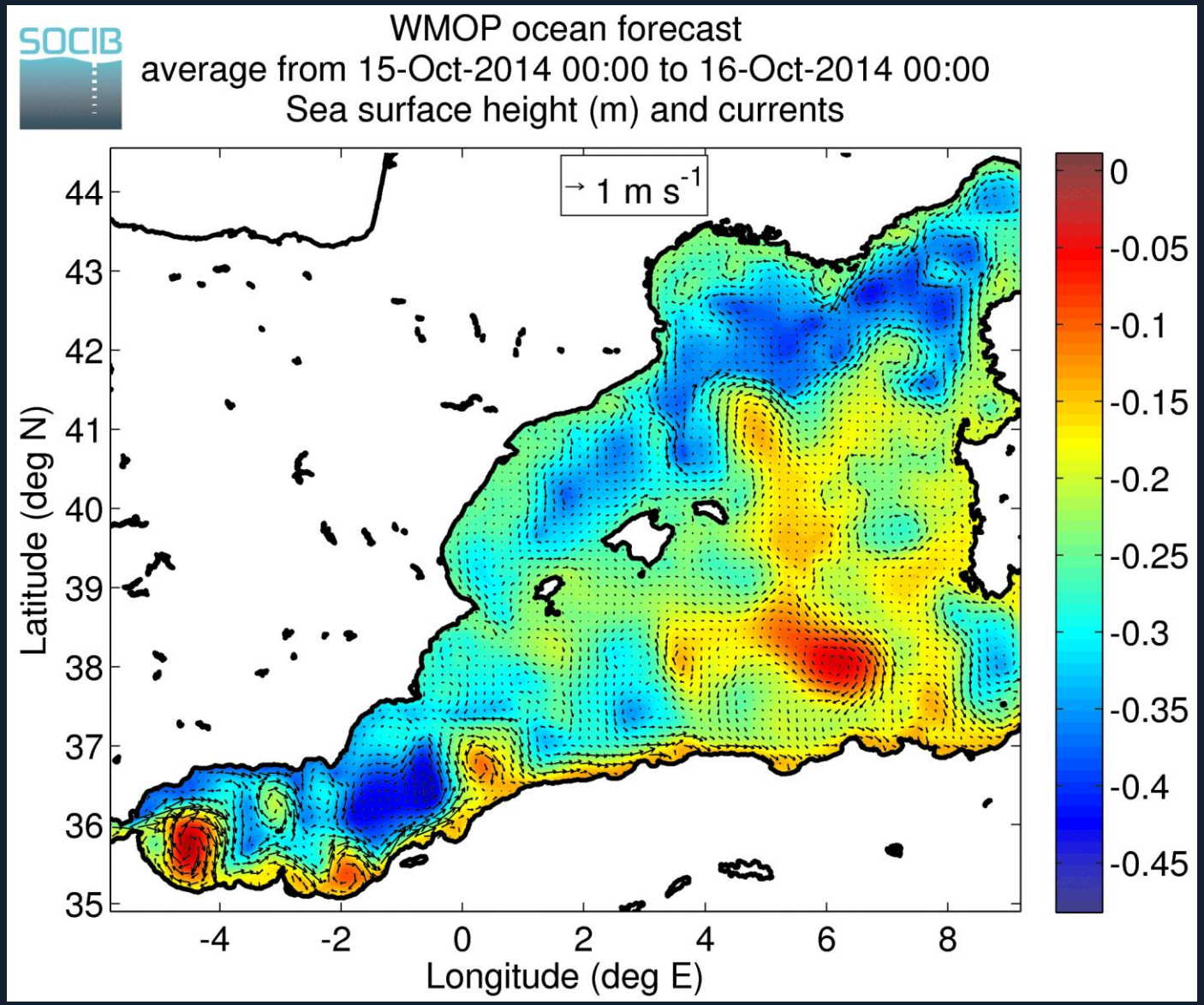
Conduct scientific research to continuously improve the model forecasting skills and develop new systems.

1. **WMOP**: Western Mediterranean hydrodynamic model
   → 3-day predictions of ocean currents, sea level, temperature and salinity

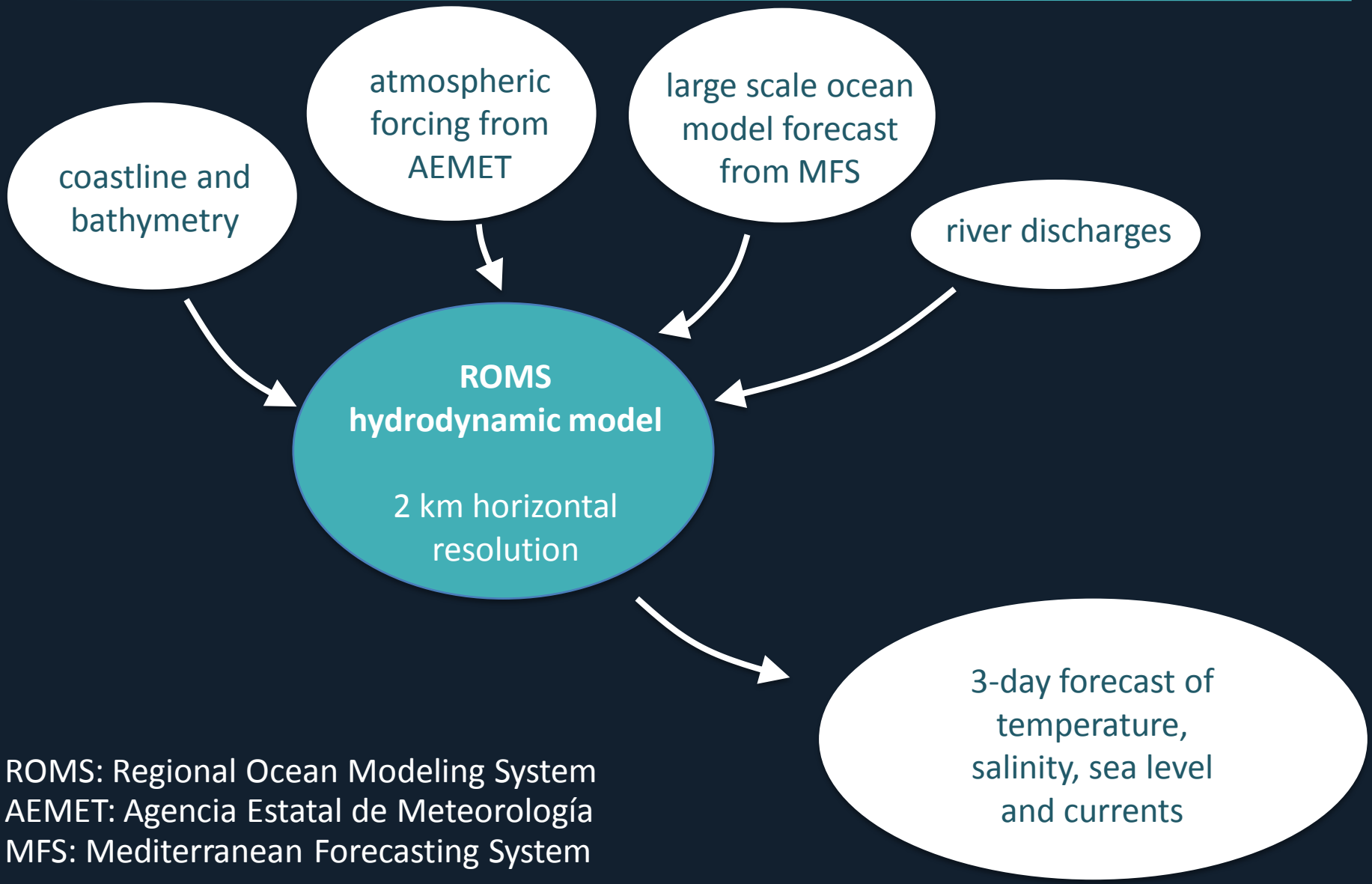
2. **SAPO**: Balearic Islands wave model
   → 3-day predictions of wave height, period and direction

3. **BRIFS**: Ciutadella harbour rissaga prediction model
   → 2-day predictions of atmospheric pressure and sea level oscillations

1 WMOP: Western Mediterranean OPerational Model

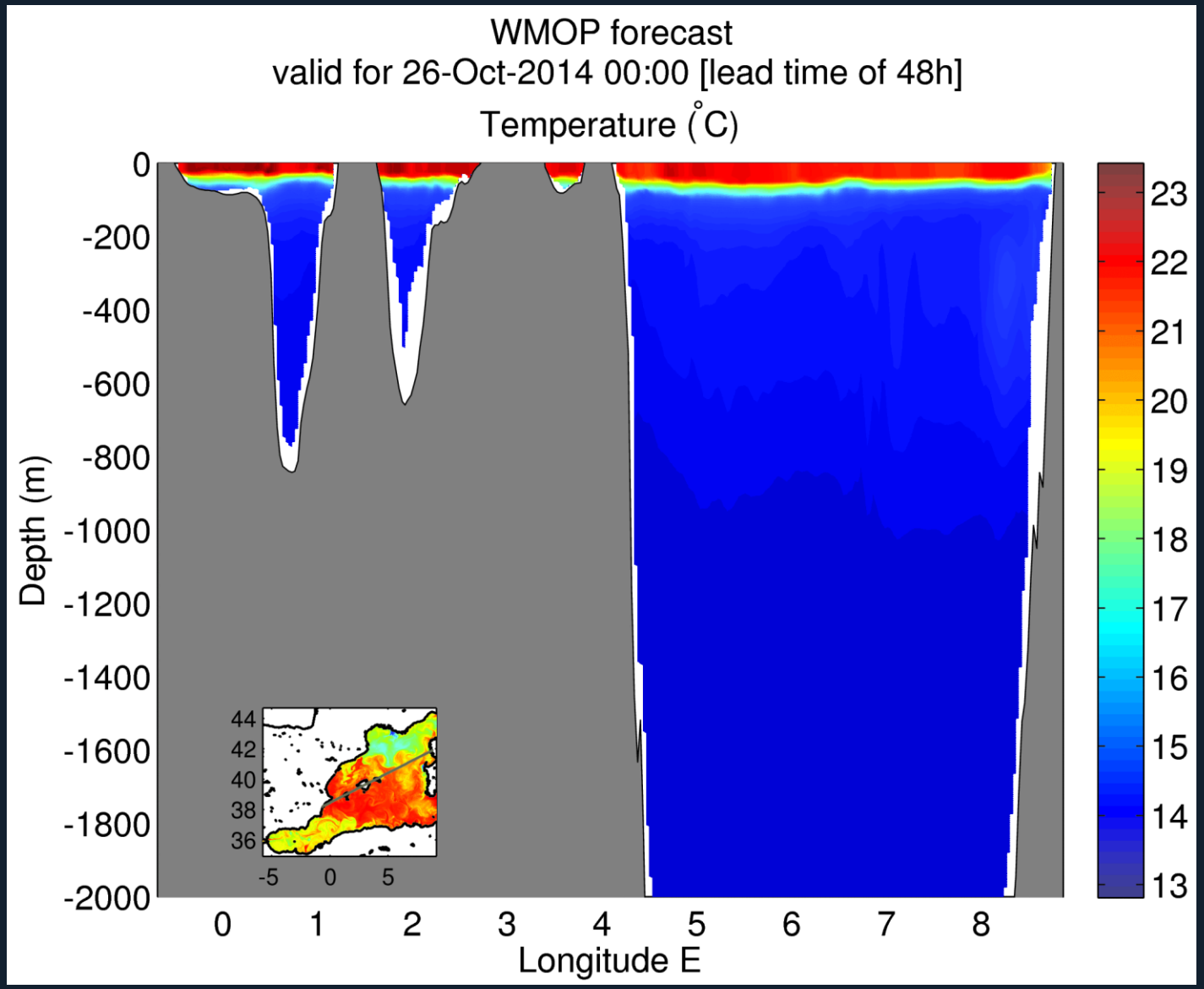


1 WMOP: Western Mediterranean OPerational Model



ROMS: Regional Ocean Modeling System
AEMET: Agencia Estatal de Meteorología
MFS: Mediterranean Forecasting System

1 WMOP: Western Mediterranean OPerational Model



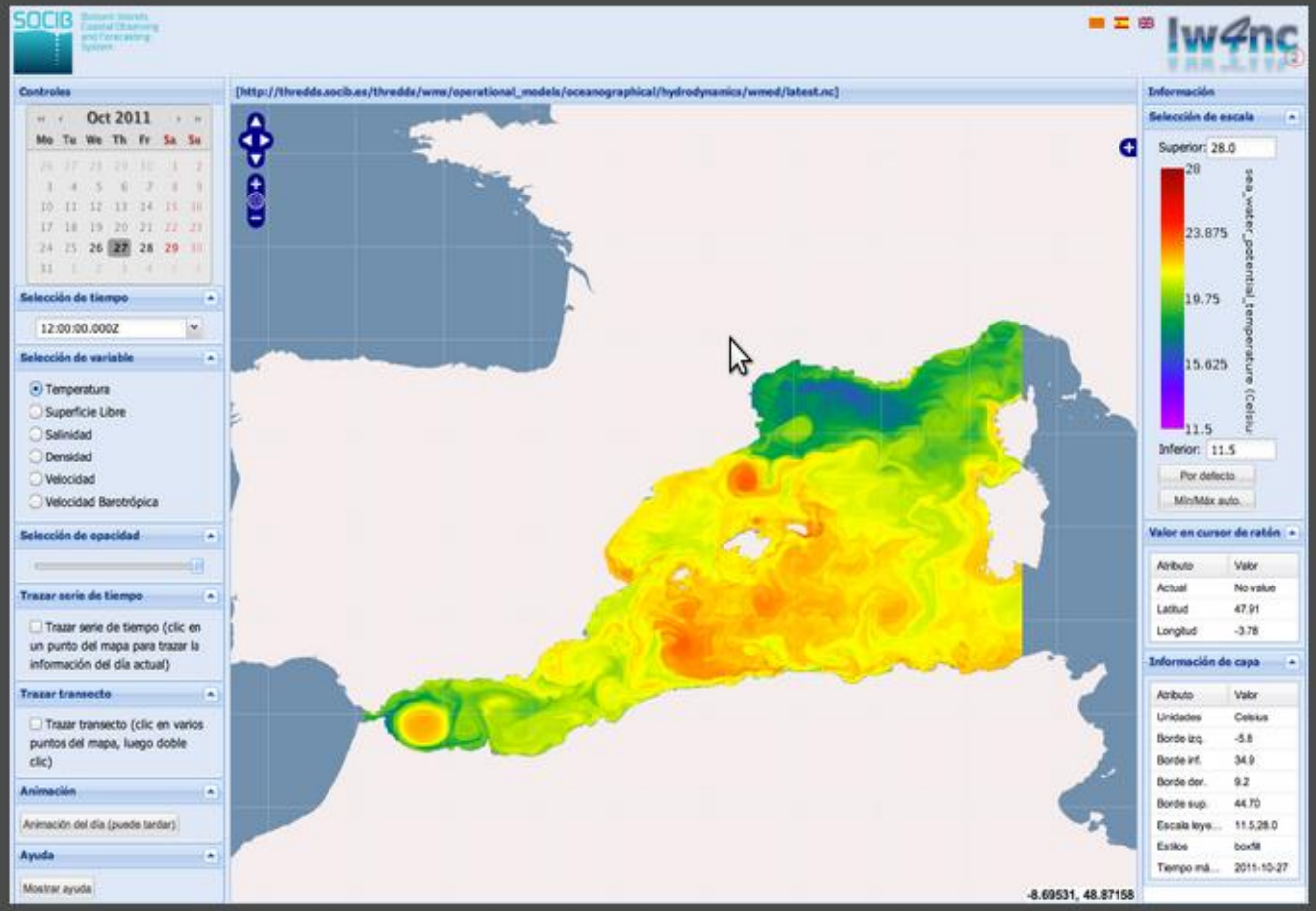
1 WMOP: Western Mediterranean OPerational Model

MODELLING AND FORECASTING FACILITY

- Overview
- Ocean forecasting system
  - System description
  - Ocean forecast
  - Operational validation
  - Ocean indicators
  - Data access
- Rissaga forecast
- Wave forecast
- Oil spill forecast
- Publications
- Links
- Acknowledgements

Interactive visualization

The application lw4nc provides an interactive system to visualize the model outputs selecting variables (temperature, salinity, currents, free surface, barotropic velocity) and visualization types (snapshots, animations, maps, time series, regional zoom, sections, fixed positions, etc...).



1 WMOP systematic evaluation

Delayed mode

Near real-time

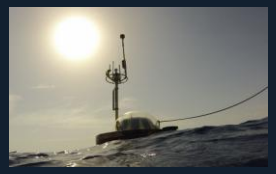
Satellite

Gliders

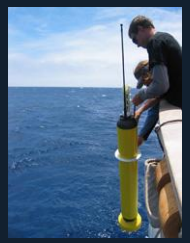
Ship-based CTDs

WMOP ocean forecasts

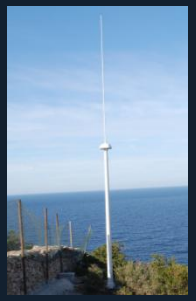
Moorings



Argo floats



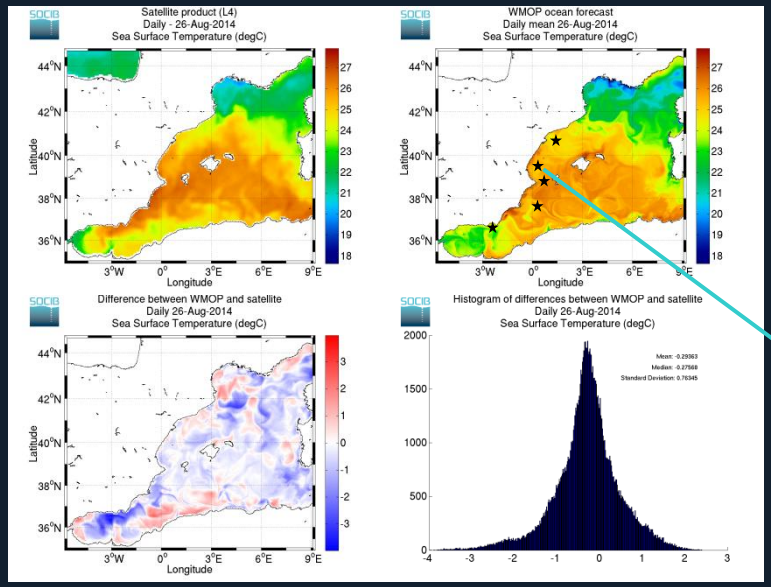
HF radar



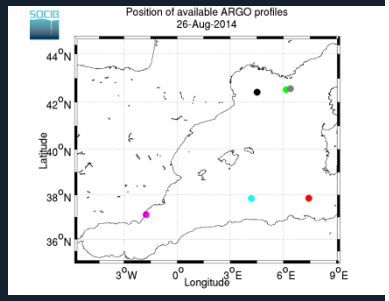
Surface drifters

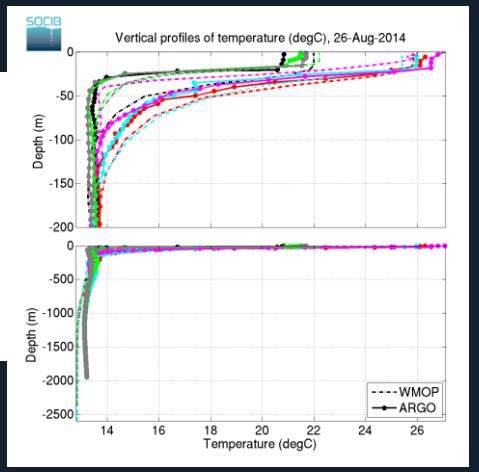
1 WMOP systematic evaluation (near real-time)

Sea Surface Temperature
Satellite products (1/16º) [*www.myocean.eu*]

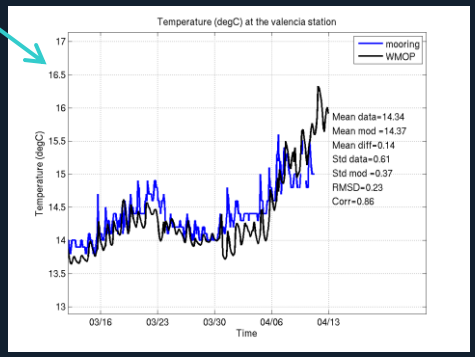


Temperature/Salinity profiles
Argo floats [*www.ifremer.fr*]

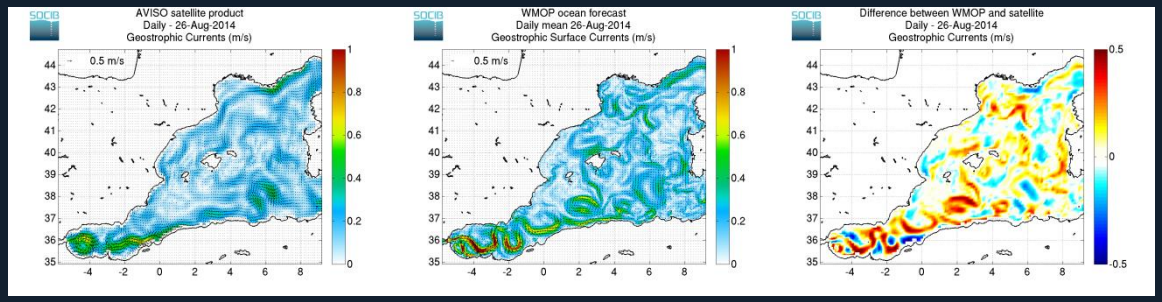




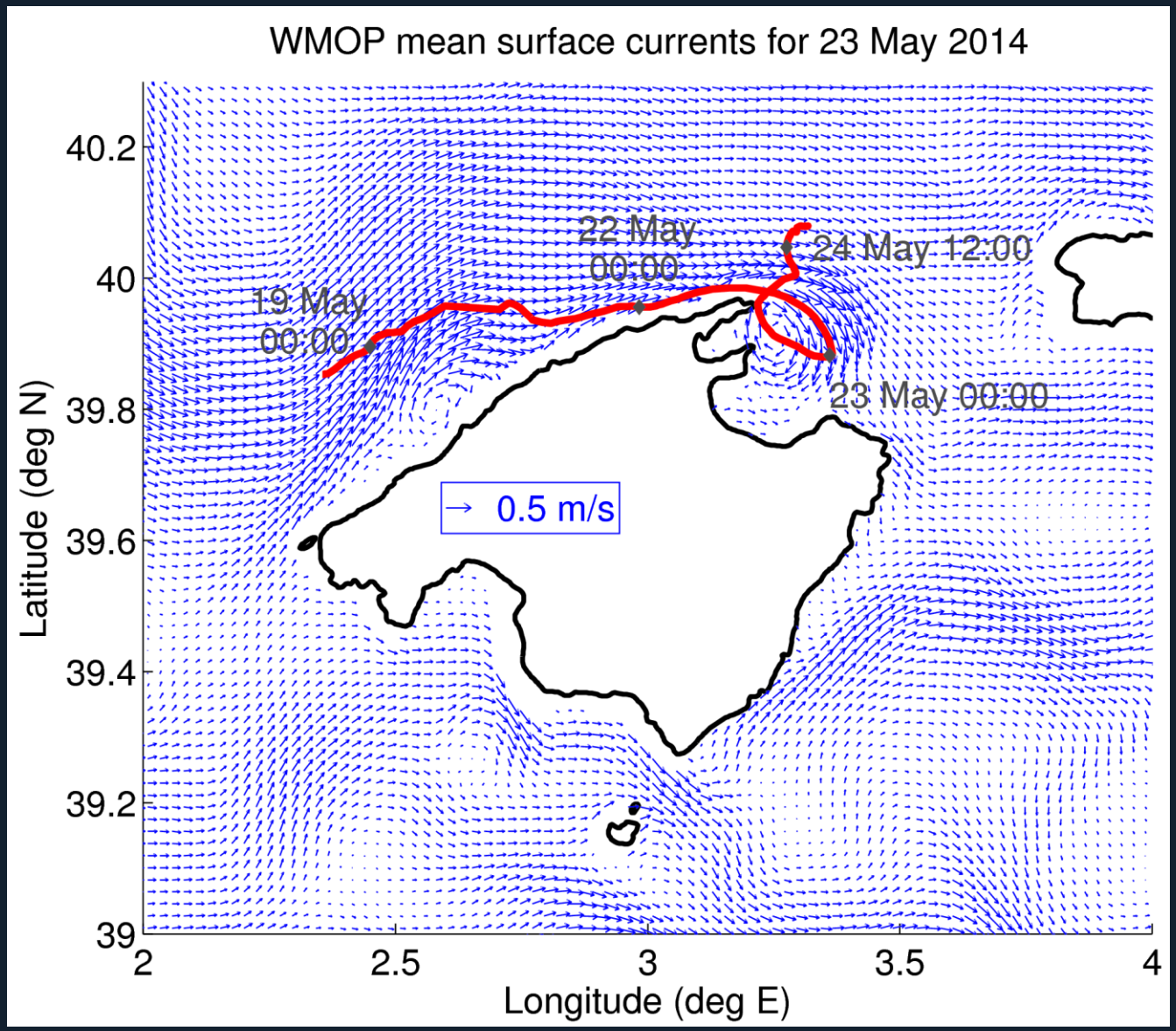
Temperature, Salinity, Currents
Fixed moorings [*www.puertos.es, www.socib.es*]



Geostrophic Current
Altimetry products (1/8º) [*www.aviso.oceanobs.com*]



1 WMOP systematic validation (delayed time)



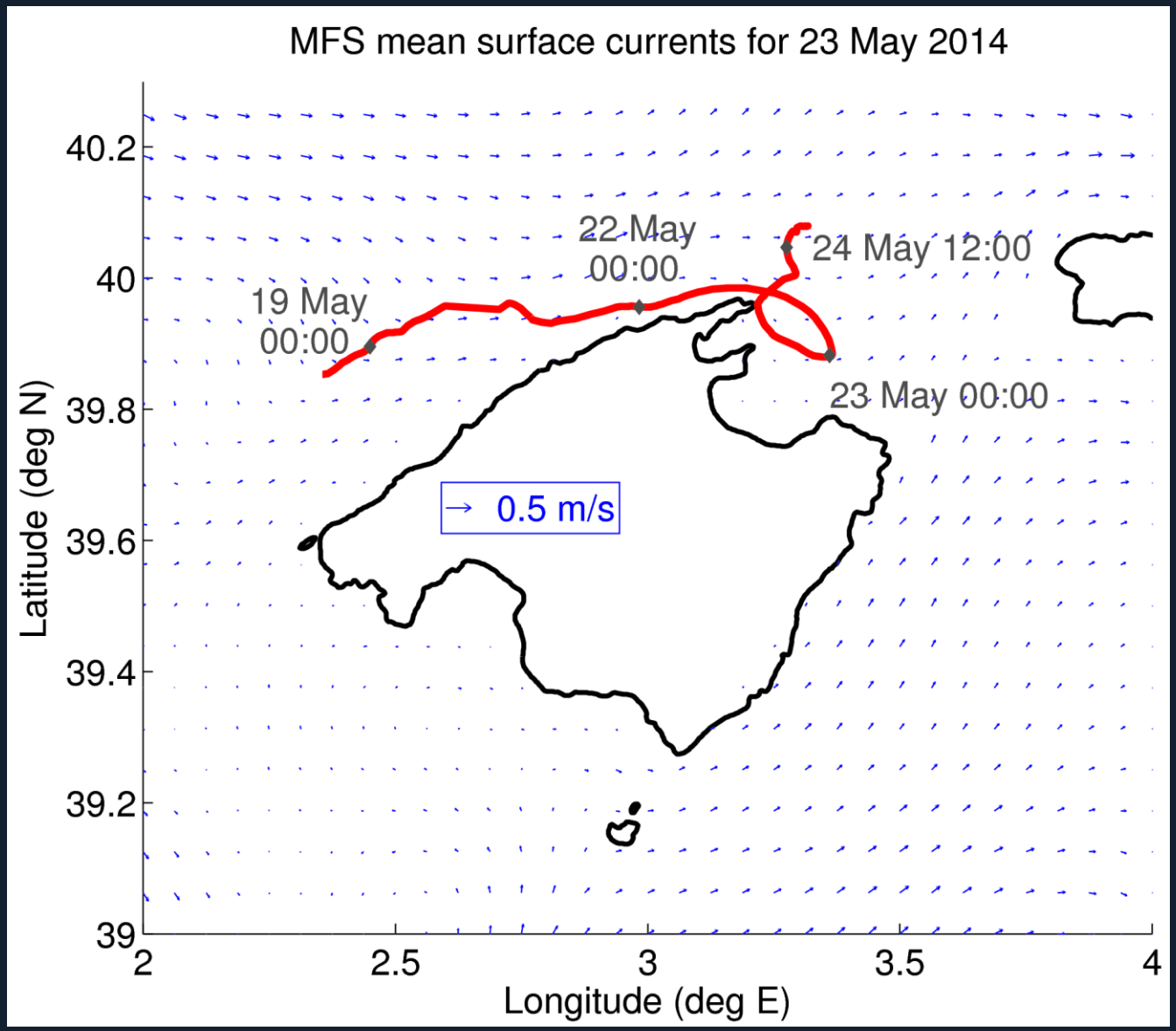
Mean velocity along the drifter trajectory:

drifter → 0.30 m/s

MFS → 0.10 m/s

WMOP → 0.36 m/s

1 WMOP systematic validation



Mean velocity along the drifter trajectory:

drifter → 0.30 m/s

MFS → 0.10 m/s

WMOP → 0.36 m/s

1 WMOP improvements: challenges and future work

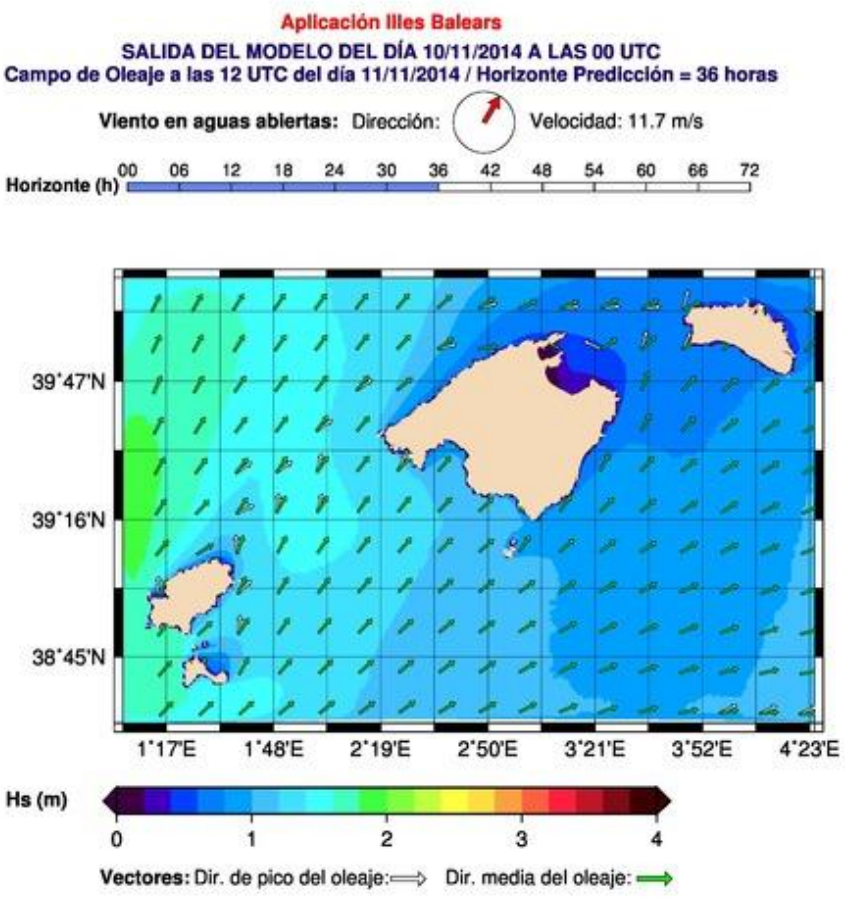
- Robust model reformulation to allow for future improvements.
- Inclusion of gliders, HF radar and surface drifter observations in the near real-time model validation.
- Data assimilation in the model.

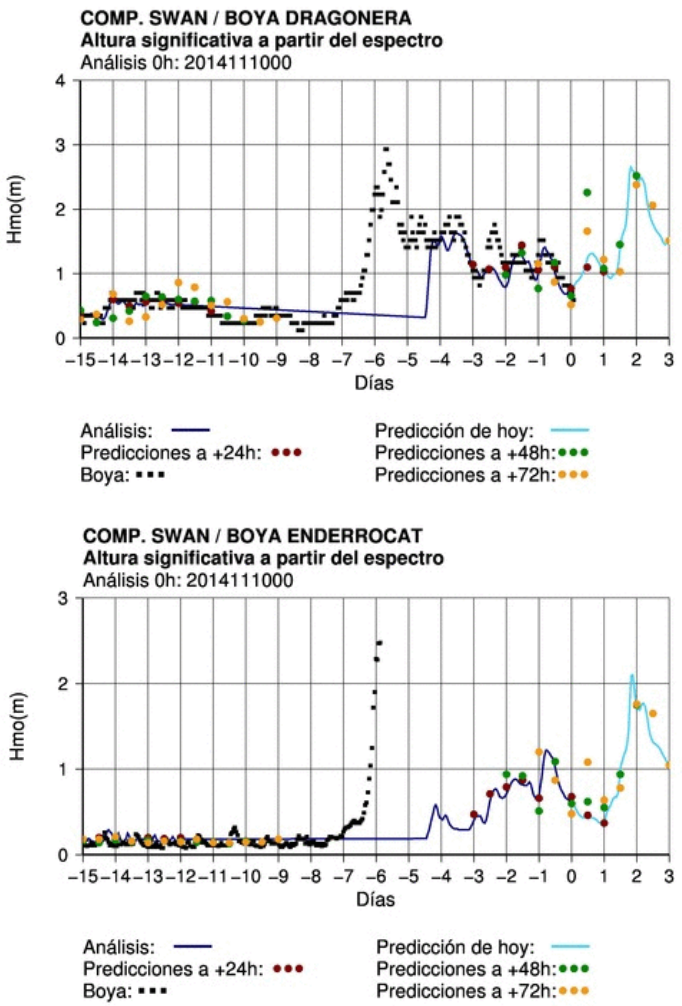
Some underlying scientific questions to be investigated through historical simulations ("hindcast"):

Interactions between ocean eddies and the mean circulation ?
Predictability of ocean mesoscale and submesoscale processes ?
Water masses formation and spreading ?
Model interannual variability ?
…

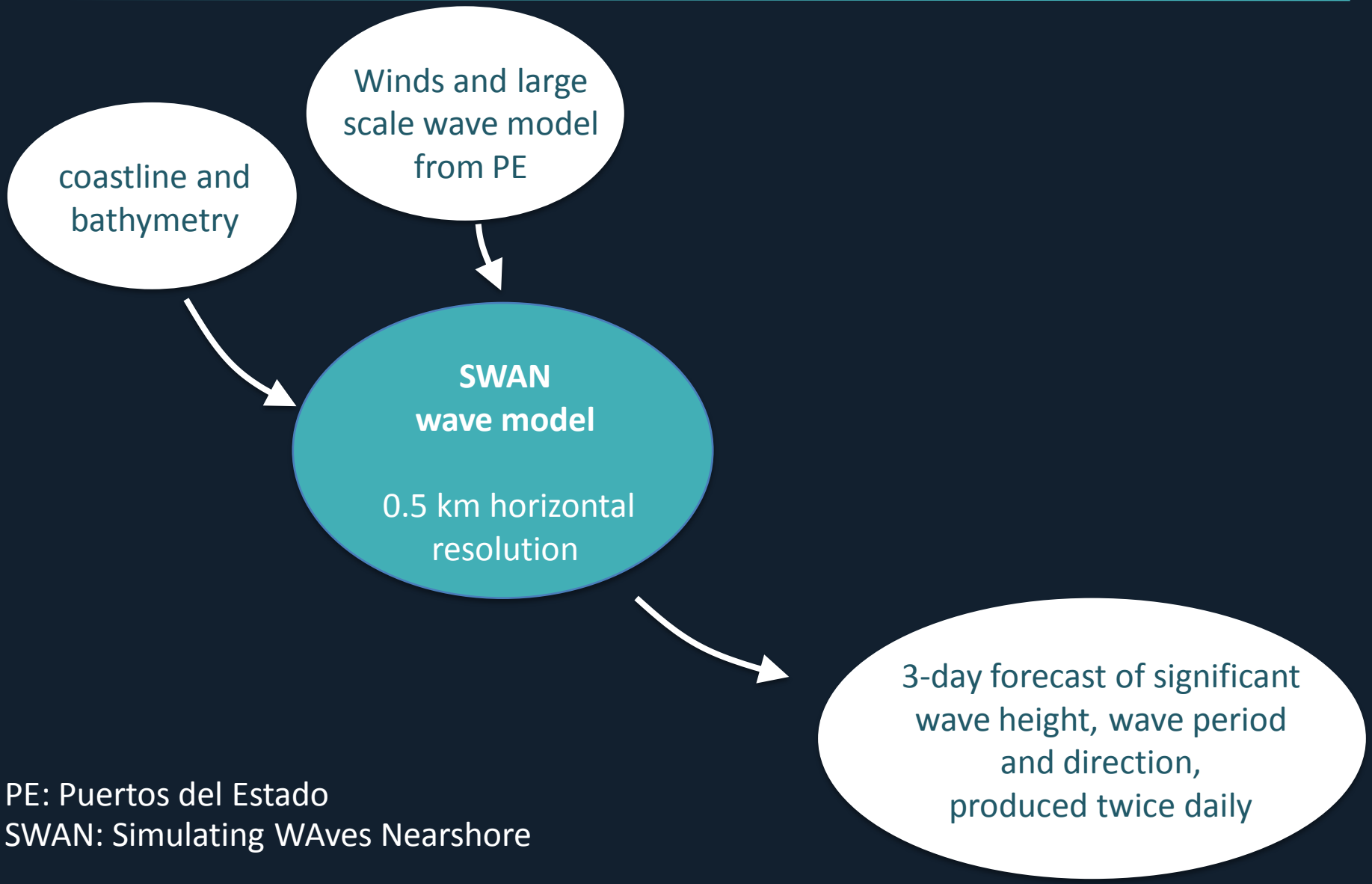
2 SAPO: Balearic Islands Operational Wave Model

Local Wave Forecasting System at the Port Authorities (SAPO).
In collaboration with Puertos del Estado.





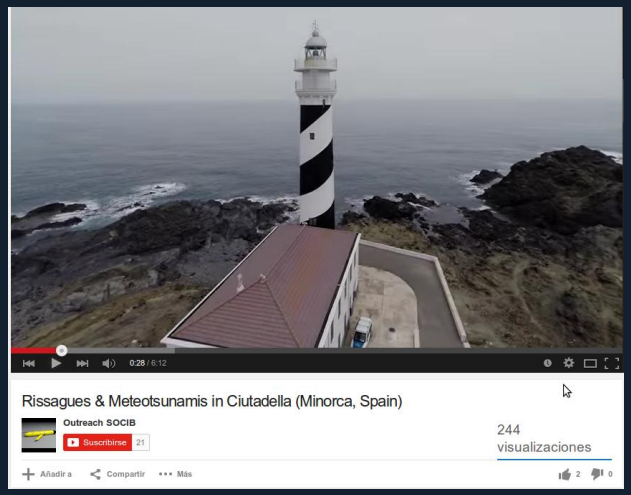
2 SAPO: Balearic Islands Operational Wave Model

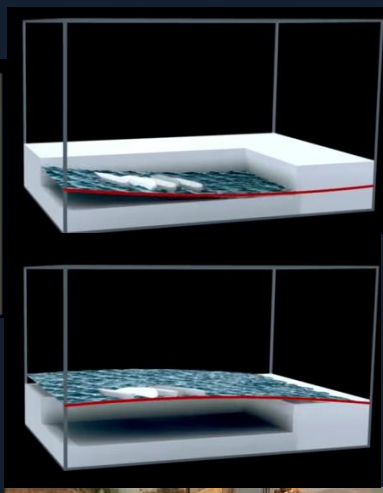


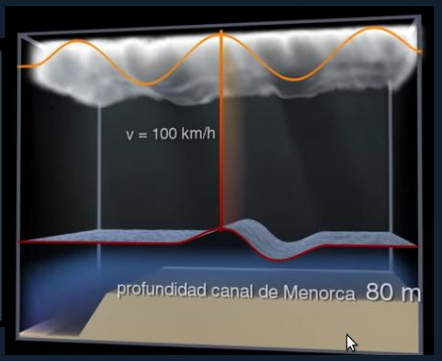
PE: Puertos del Estado
SWAN: Simulating WAves Nearshore

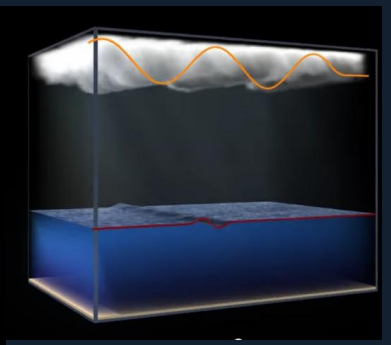
3 BRIFS: Balearic RIssaga Forecasting System

Rissaga: meteotsunami leading to dramatic sea level oscillations in Ciutadella harbour.



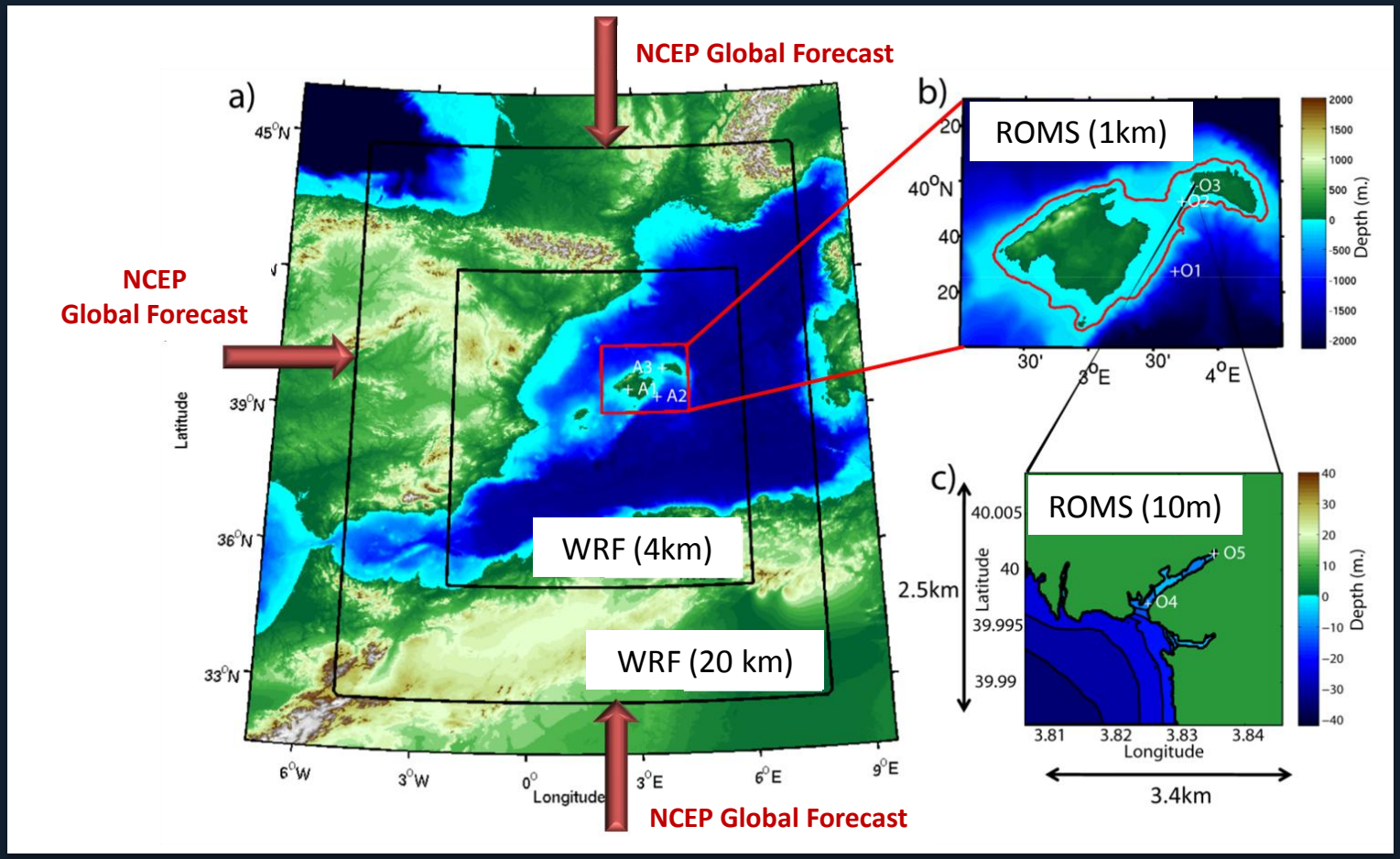






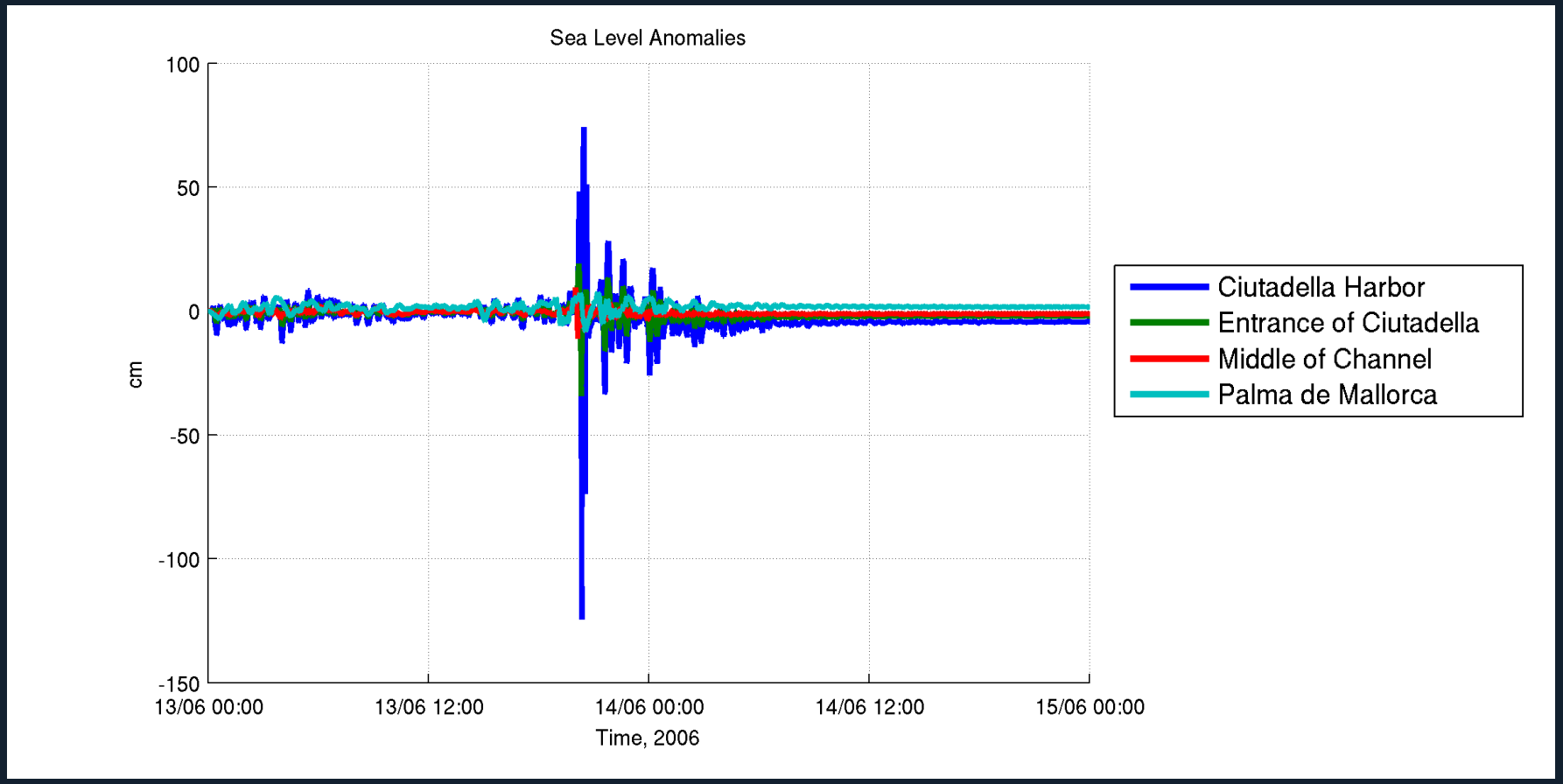
3 BRIFS: Balearic RIssaga Forecasting System

Coupled ocean-atmosphere prediction system



WRF: Weather Research and Forecasting Model
ROMS: Regional Ocean Modeling System
NCEP: National Centers for Environmental Prediction

3 BRIFS: Balearic RIssaga Forecasting System



1 BRIFS improvements: challenges and future work

- Robust model reformulation to allow for (i) full operationality, (ii) retrospective simulations and (iii) future improvements.

- Careful analysis of model predictions during past events to better evaluate the model capability to represent rissagues.

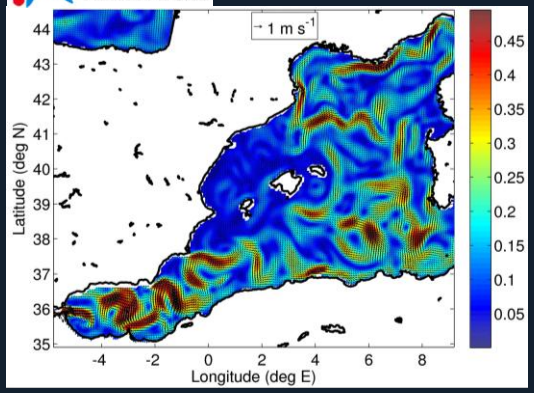
M&FF projects and collaborations

BlueFin tuna project

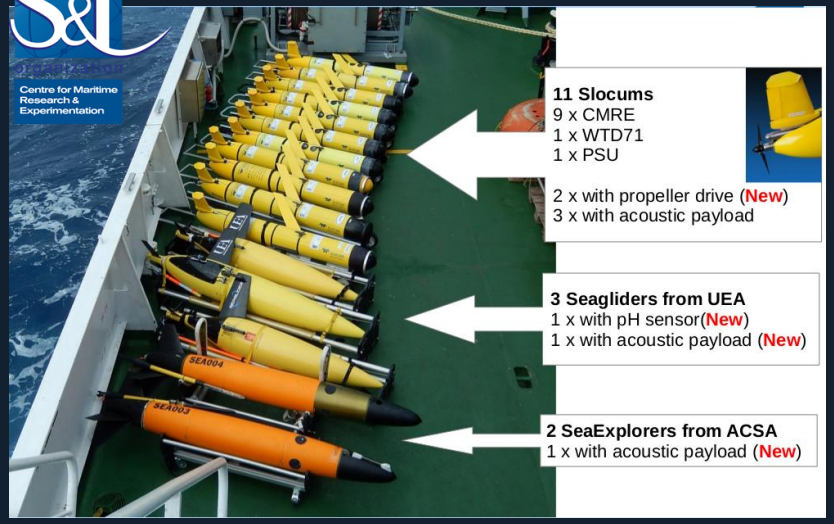
Jellyfish

Turtles

MEDCLIC



REP14 – West Sardinia



MEDESS4MS

JERICO-NEXT

SUMMARY

- Both models and observations are essential to SOCIB !

- M&FF activities strongly rely on Computing Facility, Data Center, ETD and Observing Facilities.

- M&FF has a very active role to play in the interactions between facilities.

- Limited personel for a wide range of activities…
Incorporation of Romain Escudier 1st Feb 2015 (MEDCLIC project).

Gracias !