# The CMEMS Sea Level Component
# &
# MedSUB Service Evolution Project

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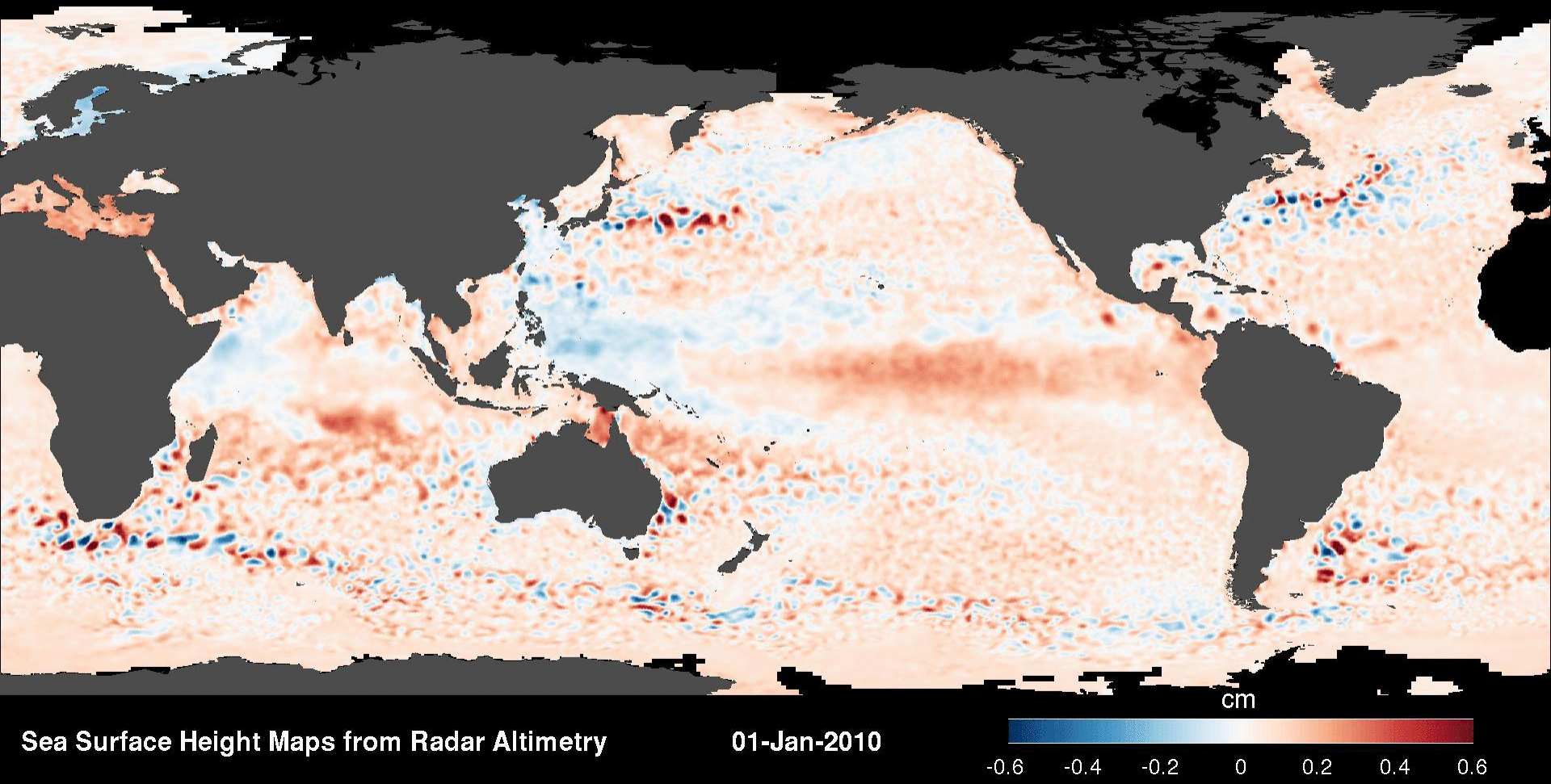
Copernicus Marine for Spain
Madrid, 28 March 2019

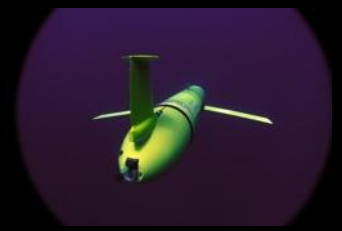
# Outline

1. **Motivation**
2. **Objectives**
3. **The Sea Level Component**
4. **MedSUB SE project**
5. **Future prospects**

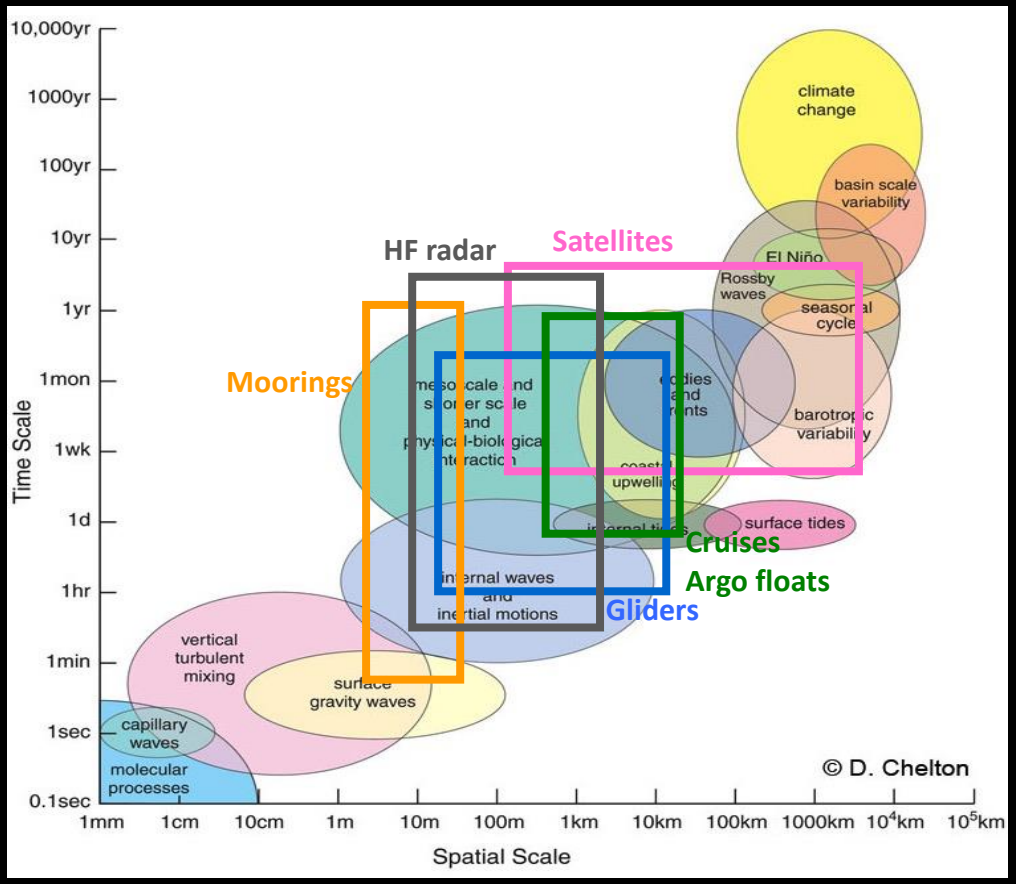
# Satellite altimetry has revolutionized our view of ocean circulation



# Need of integrated ocean observations

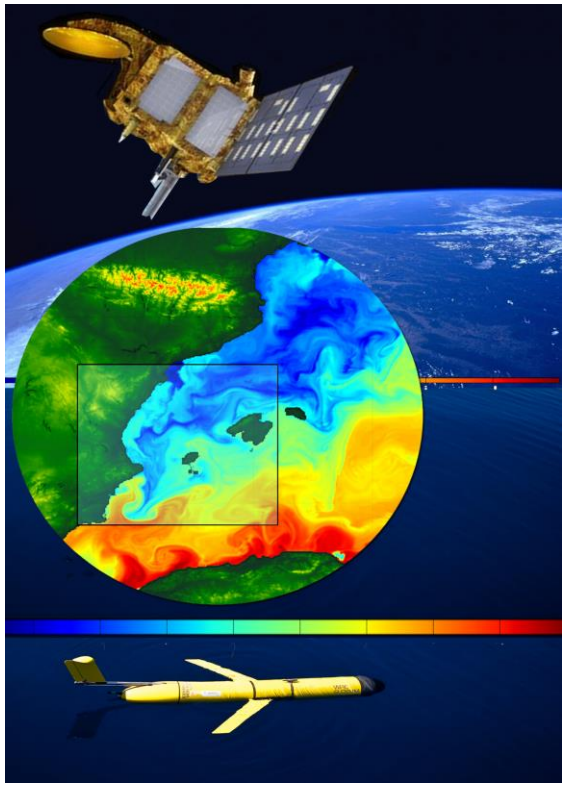


…to resolve a wide range of spatial and temporal scales that characterize ocean processes




Artificial Intelligence

# Objectives



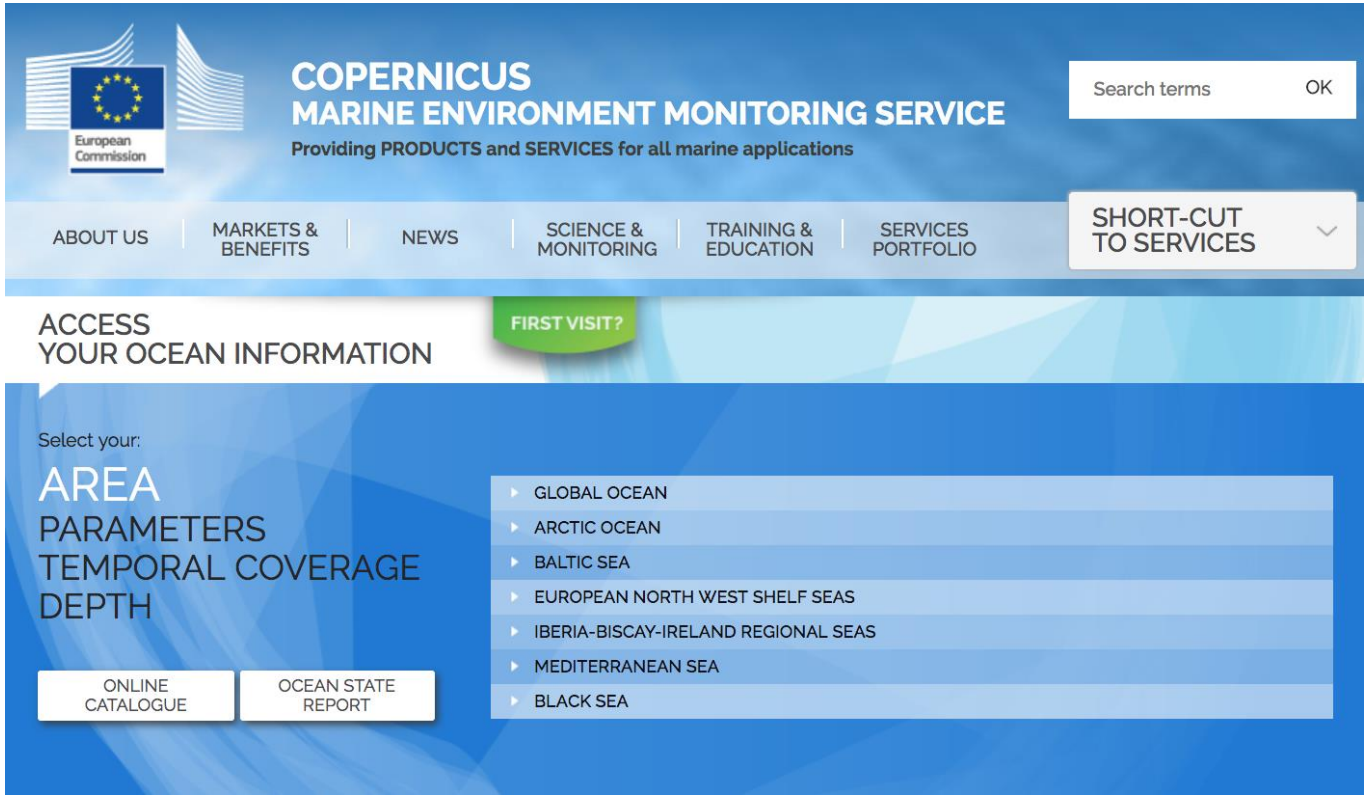
**Science:** To characterize, understand and predict ocean processes (from coast to open ocean) that interact at a wide range of spatial and temporal scales

FOCUS: Meso- and submesoscale

**Technical:** Cal/Val, assessment

FOCUS: Altimetry vs in situ & model

# Research for operational oceanography




http://marine.copernicus.eu/

# The Sea Level component:
# Data quality assessment of altimetry products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# 10 years of altimetry assessment

**SEA LEVEL**
**THEMATIC ASSEMBLY CENTER**

**2009-2012**

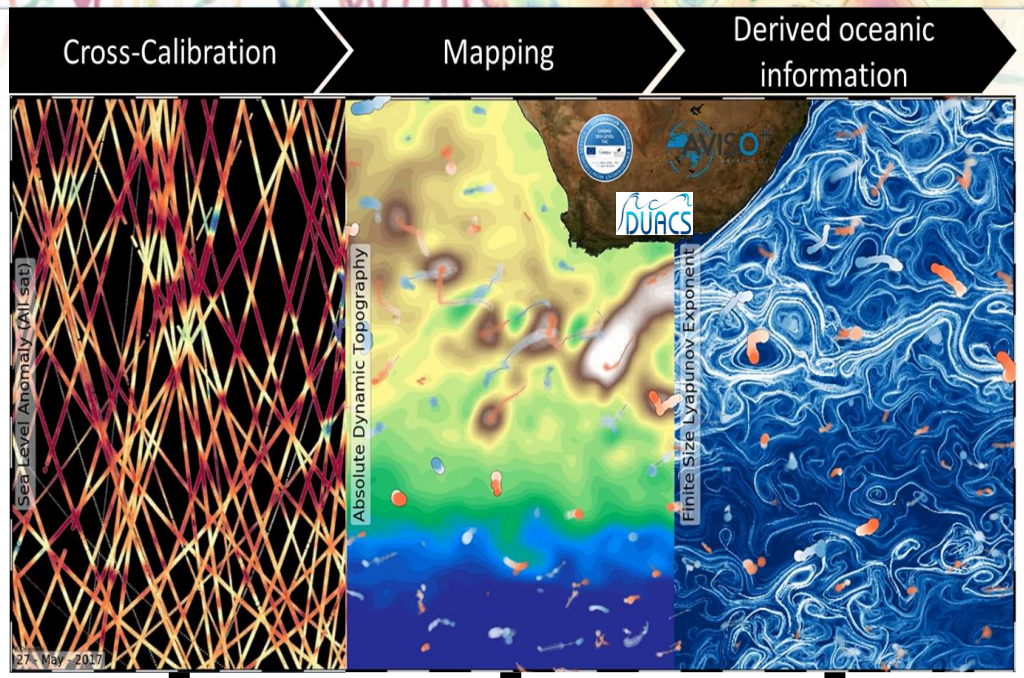
**2012-2014**

**2014-2015**

**2015-2018**

**2018-2021**

# Data Unification and Altimeter Combination System



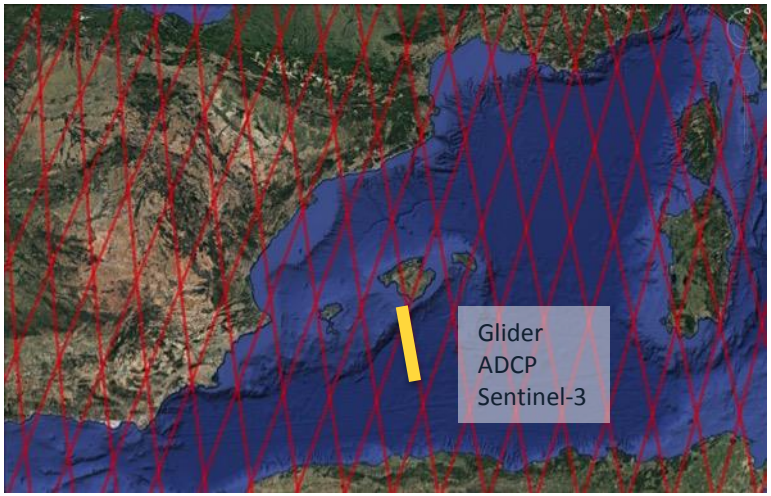

Sea Level & Geostrophic current Anomaly
Absolute Dynamic Topography & Geostrophic current
Mean Dynamic Topography & Geostrophic current
Associated errors

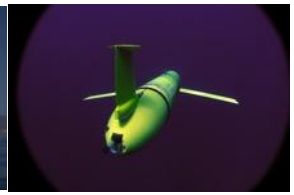
Finite Size Lyapounov Exponent
Mesoscale Eddy Atlas
Trajectory
Ocean Monitoring Index

- NRT and offline production lines.
- Operational L3/L4 products available on CMEMS
- L3 product ingested in Global (Mercator) as well and regional model (European seas)
- R&D Demonstration products and L4p available on Aviso
- In collaboration with

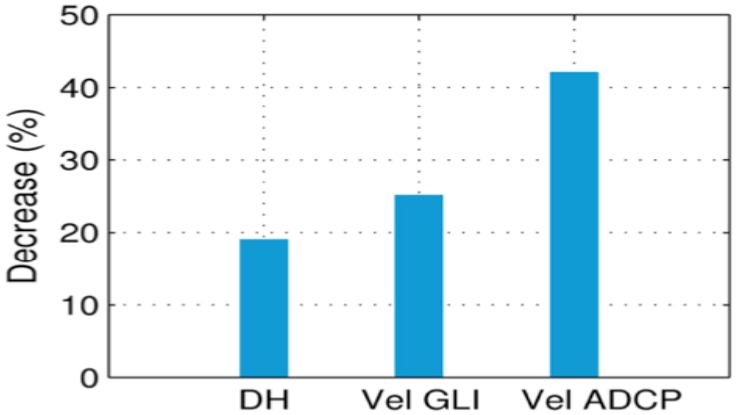
- More info on www.duacs.cls.fr

# CMEMS altimetry assessment



Example: multi-platform experiment (ship, glider) during **commisioning phase - Sentinel-3A (ESA)**.




Decrease in percentage error between SARM and P-LRM product.
Heslop et al. GRL (2017)

- **More than 50 publications on altimetry**
- **Including comparison vs HF radar, SST, OC, numerical models**

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SOCIB Balearic Islands Coastal Observing and Forecasting System

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# Innovative ocean observations to validate satellite derived surface currents

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

## Rafting behaviour of seabirds as a proxy to describe surface ocean currents in the Balearic Sea

Received: 7 June 2018
Accepted: 28 November 2018
Published online: 10 January 2019

A. Sánchez-Román[1], L. Gómez-Navarro[1,2], R. Fablet[3], D. Oro[1], E. Mason[4,1], J. M. Arcos[5], S. Ruiz[1] & A. Pascual[1]

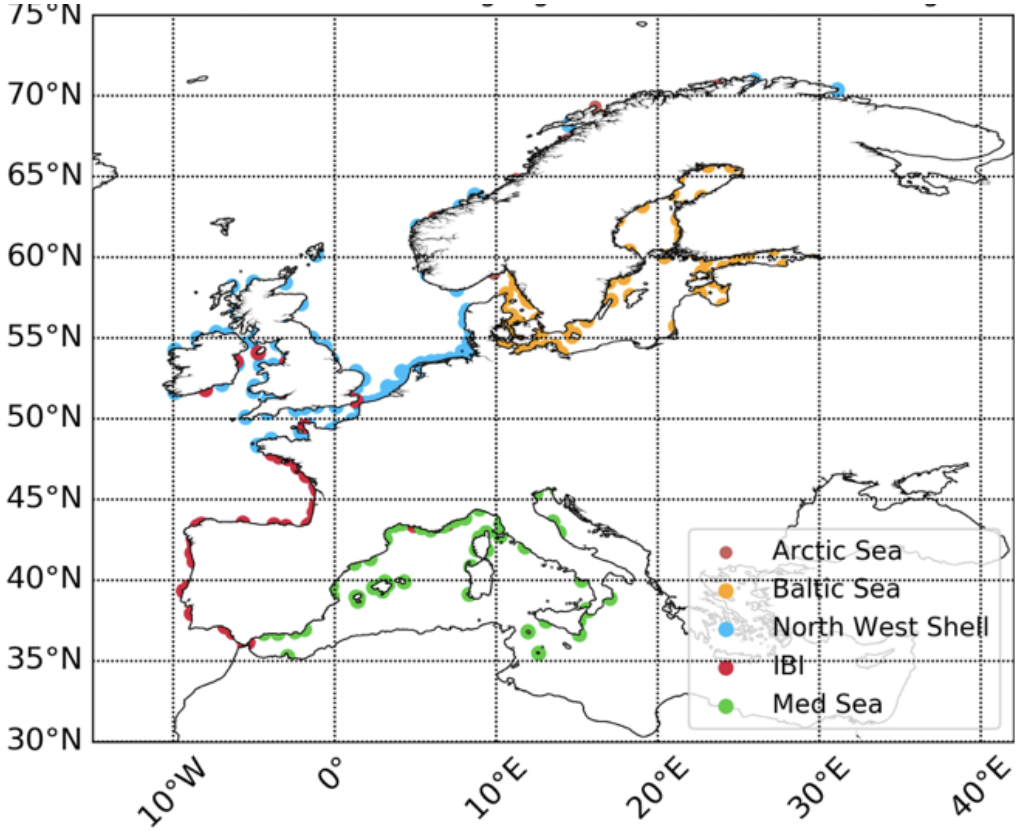
# CMEMS altimetry assessment (tide gauges)

- CMEMS tide gauge database preparation
- Implementation of specific metrics for the comparison of in situ tide gauge data and altimetric measurements

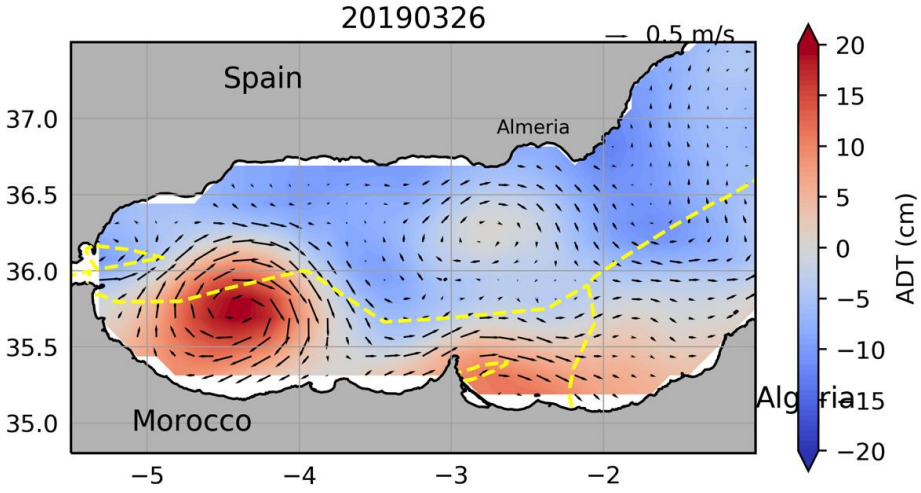
CMEMS NRT TIDE GAUGE products from:

[www.marineinsitu.eu](http://www.marineinsitu.eu)

**ONGOING WORK**



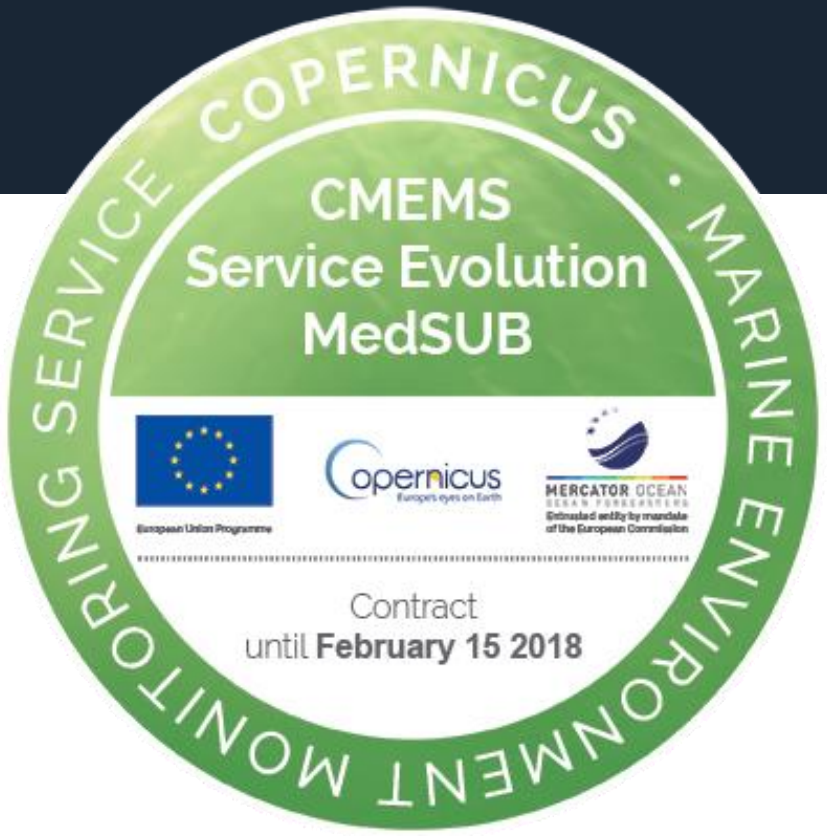
# Application: Cruise planning support





Sea surface height and surface currents derived from altimetry in the Alboran Sea in support of Calypso (onboard Pourquoi Pas?) cruise planning.

# Understanding meso and submesoscale ocean interactions to improve Mediterranean CMEMS products (SE project MedSUB)

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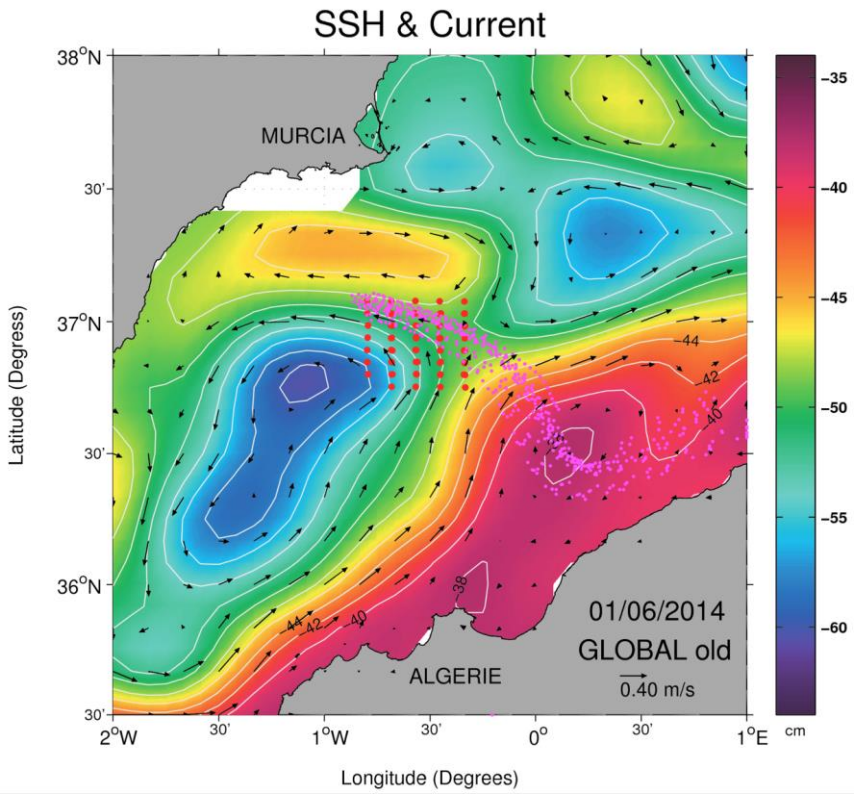
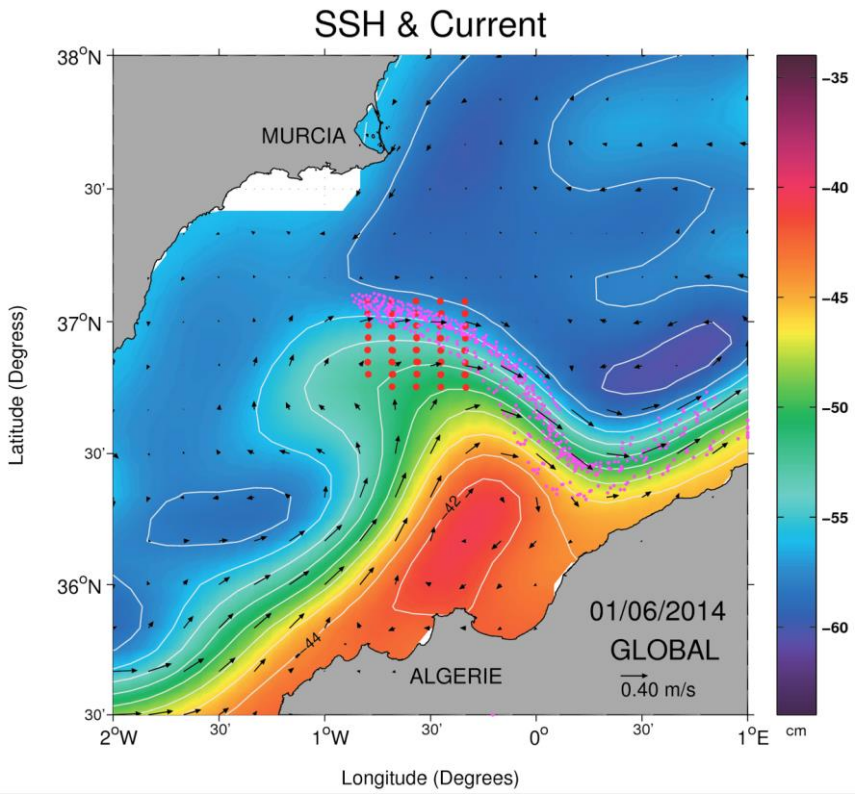
# Assessing CMEMS models with in situ data (drifters)



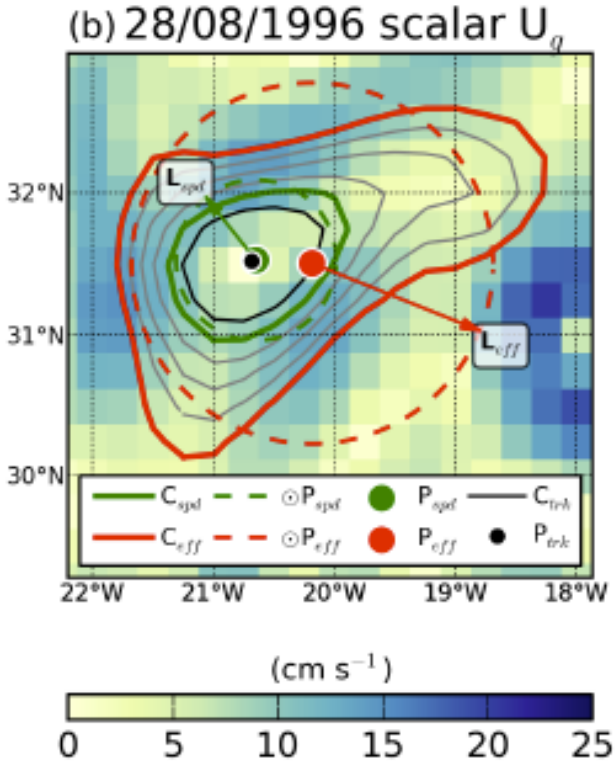

GLOBAL-MFC feedback:

New GLOBAL system (October 2016) - impact of assimilation of new MDT

Drifters trajectories from AlborEx experiment (Pascual et al. 2017)

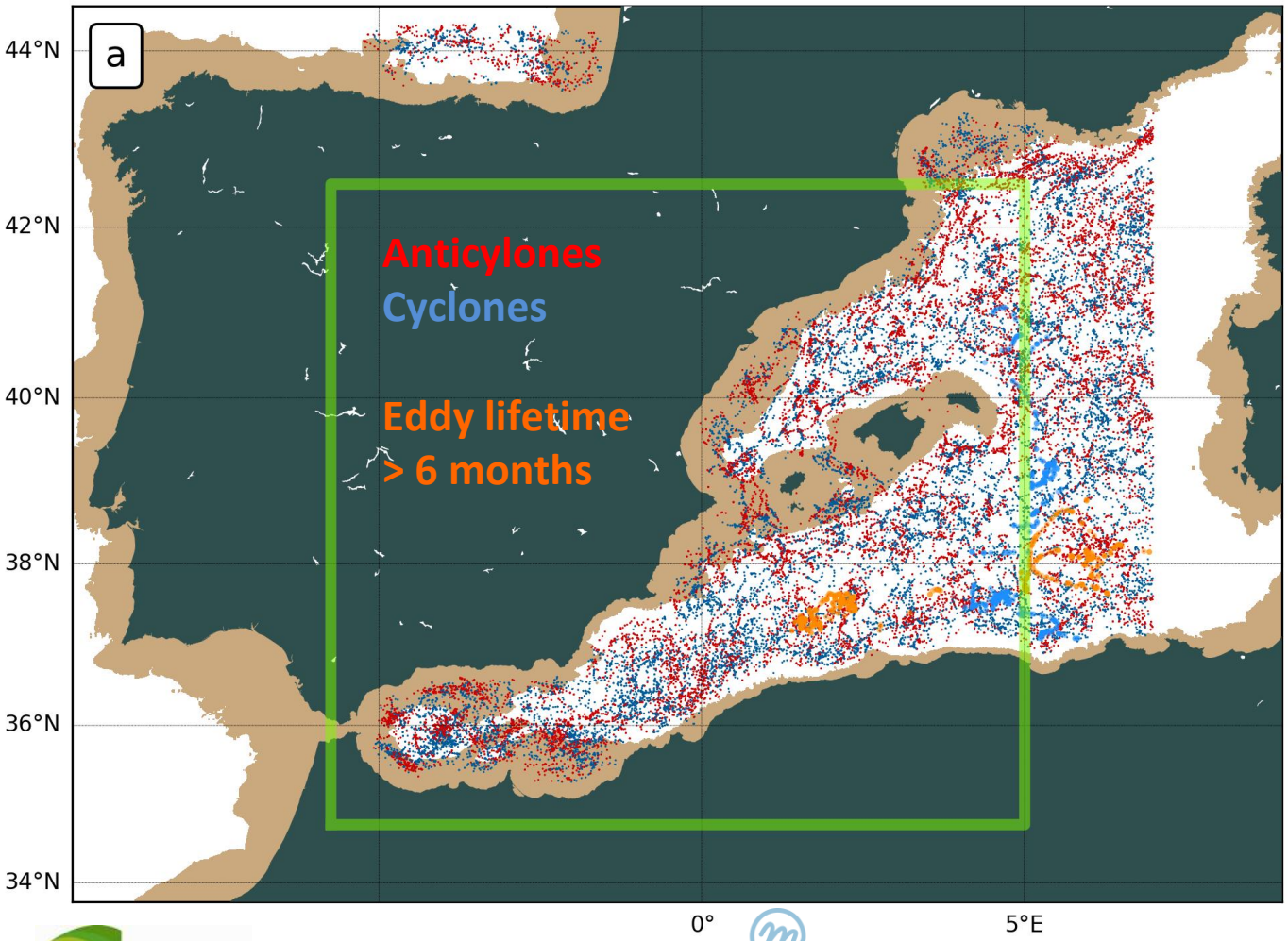
# A new approach to assess the mesoscale content of CMEMS model

New approach to characterize and assess the mesoscale content of the models based on a automated **eddy tracker tool*.**




*Mason, E., A. Pascual, and J. McWilliams, 2014: A New Sea Surface Height Based Code for Oceanic Mesoscale Eddy Tracking. J. Atmos. Oceanic Technol., doi:10.1175/JTECH-D-14-00019.1

# Py-eddy-tracker and 3D composites using CMEMS (GLO, MFS, IBI) models




**R&D transfer to CMEMS:**

https://bitbucket.org/emason/py-eddy-tracker

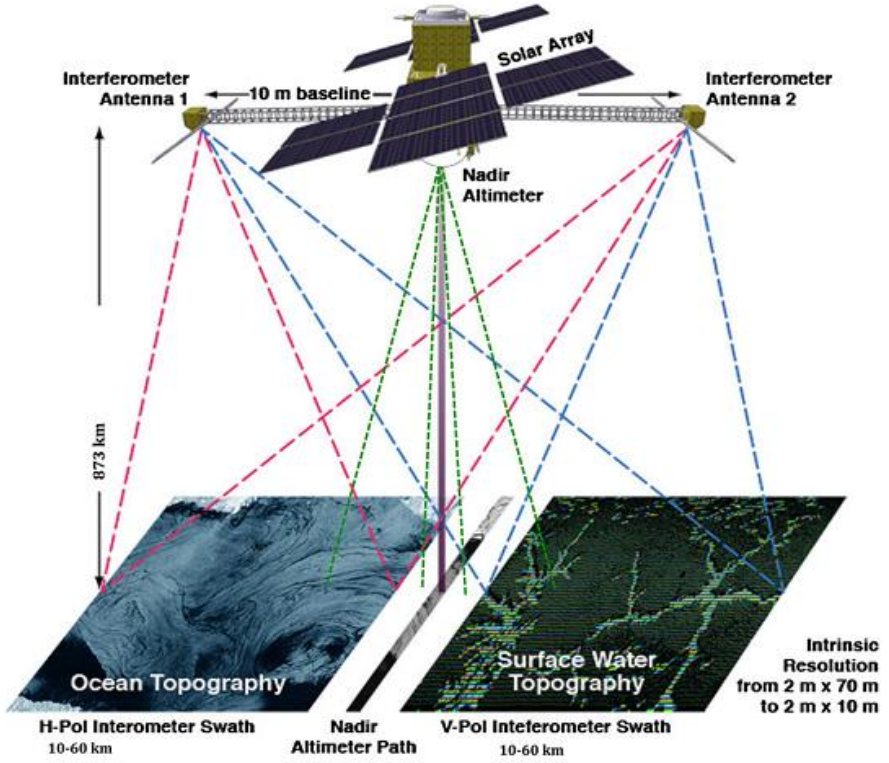
Mason et al. 2019 (submitted)

# Future prospects

## Surface Water Ocean Topography mission

## SWOT

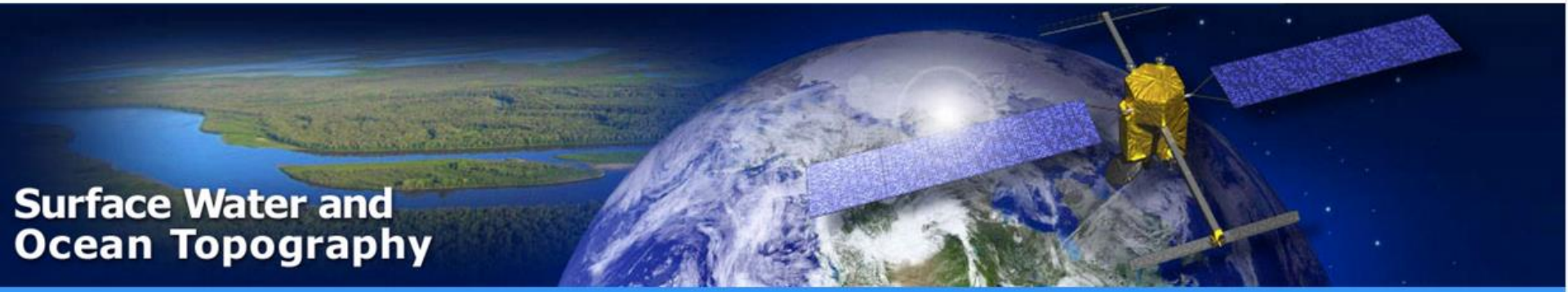
- **Wide-swath** altimeter
- Launch: 2021
- Provide **water elevation** maps
  - Oceanography
  - Hydrology




(Fu and Ubelmann, 2013)

National Aeronautics and Space Administration

Search




HOME SCIENCE MEETINGS

## SWOT Science Team

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

NASA

# MULTI-SUB: Mesoscale and sub-mesoscale vertical exchanges from multi-platform experiments and modeling simulations: anticipating SWOT launch

PI: Ananda Pascual
Co-Is: S. Ruiz, E. Mason, A. Orfila, C. Troupin, B. Mourre, B. Casas, R. Escudier, M. Juza, M. Torner, J. Tintoré

# Future prospects

Big data, cloud computing (e.g. DIAS), artificial intelligence, data-driven and machine and deep learning.