



GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA, INNOVACIÓN
Y UNIVERSIDADES



CONSEJO
ESPANOL DE
INVESTIGACIONES CIENTIFICAS

The PRE-SWOT experiment



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Institut
Pierre
Simon
Laplace



Med SWOT experiment – May 2018

A synergy among three programs:

1. BIOSWOT (SWOT-ST; A. Doglioli, G. Gregori, F. d'Ovidio: MIO, LOCEAN-IPSL; F. Cyr NAFC, St John's)
2. PROTEVS_SWOT (F. Dumas, P. Garreau SHOM)
3. PRE-SWOT (A. Pascual: SWOT-ST, IMEDEA, SOCIB)

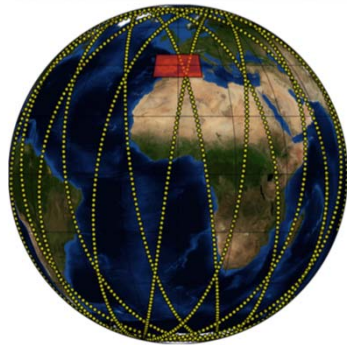


BIOSWOT



One common objective..

Evaluate the interest of the west Med SWOT crossover



Gain experience in multi-platform, multi-lateral campaign coordination

Explore the dynamics of the region

Platforms and instruments

R/V García del Cid
(CSIC, Spain)



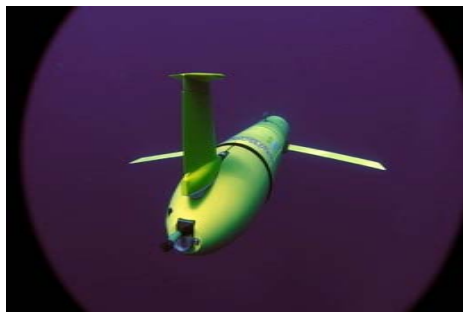
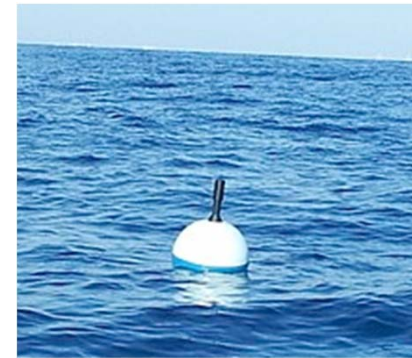
5-16 May 2018

BHO Beautemps-Beaupré
(SHOM France)



28 April – 14 May 2018

Drifters
(CSIC, SOCIB, SHOM)



Slocum glider
(SOCIB, Spain)

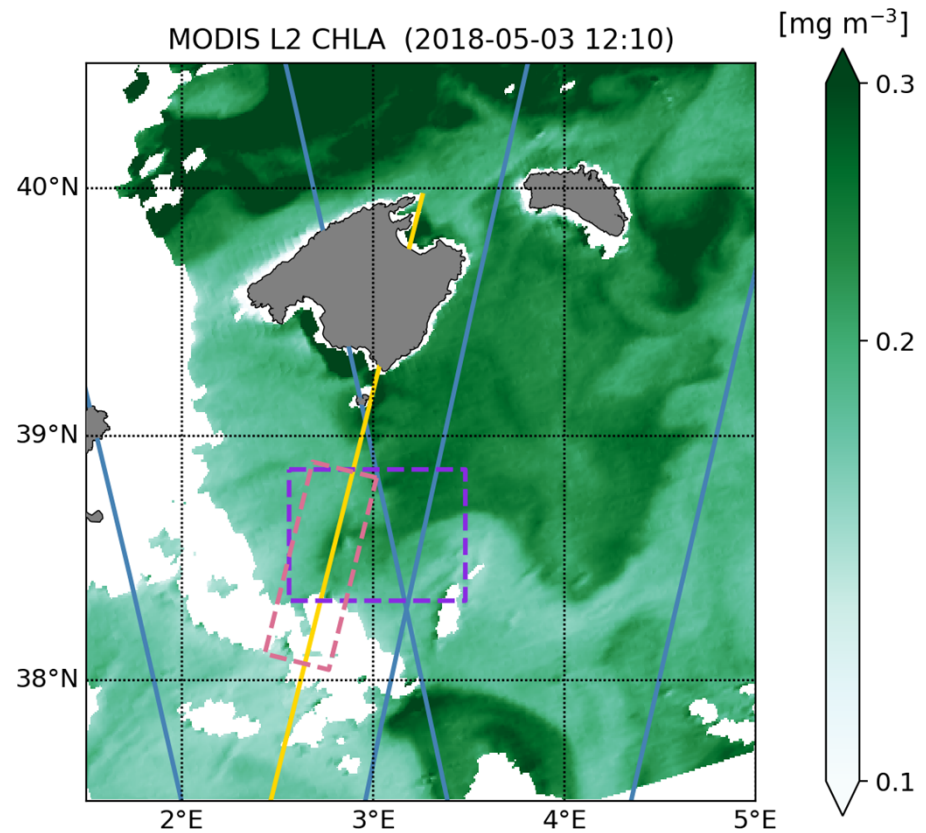


SeaExplorer glider
(MIO, France)

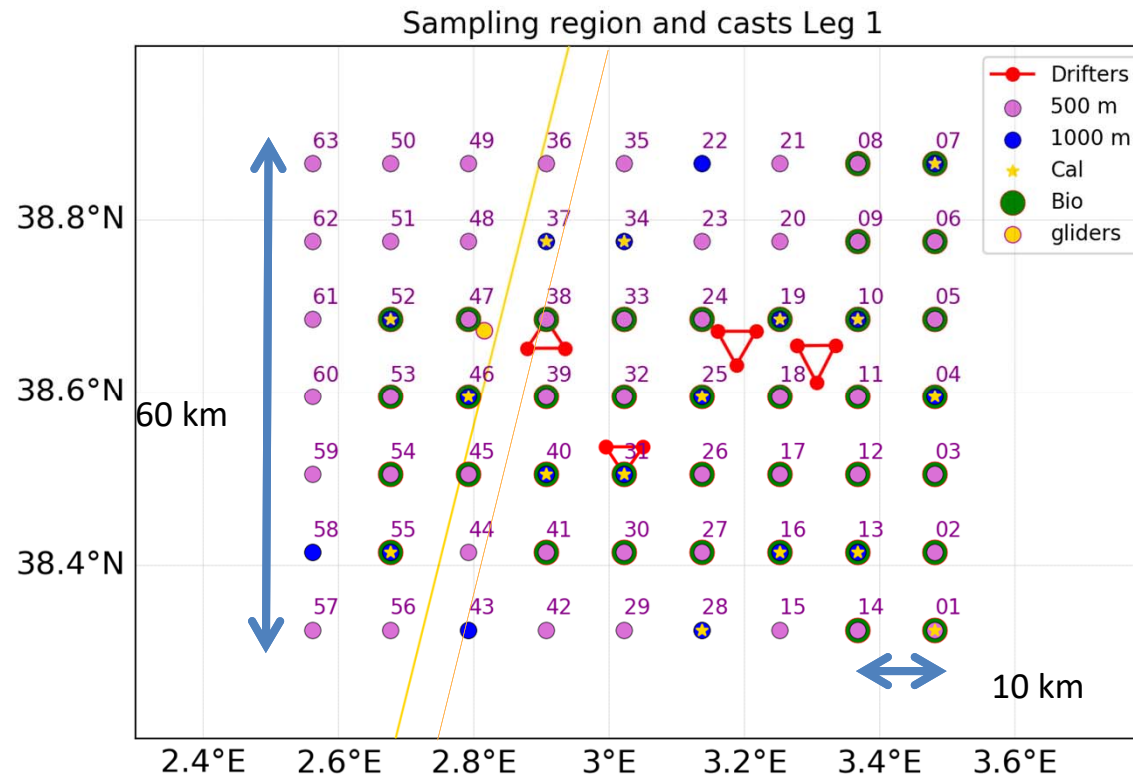
Determining the area of study from satellite data



-  Leg-1
-  Leg-2
-  SWOT swaths
-  Sentinel-3 244 Track

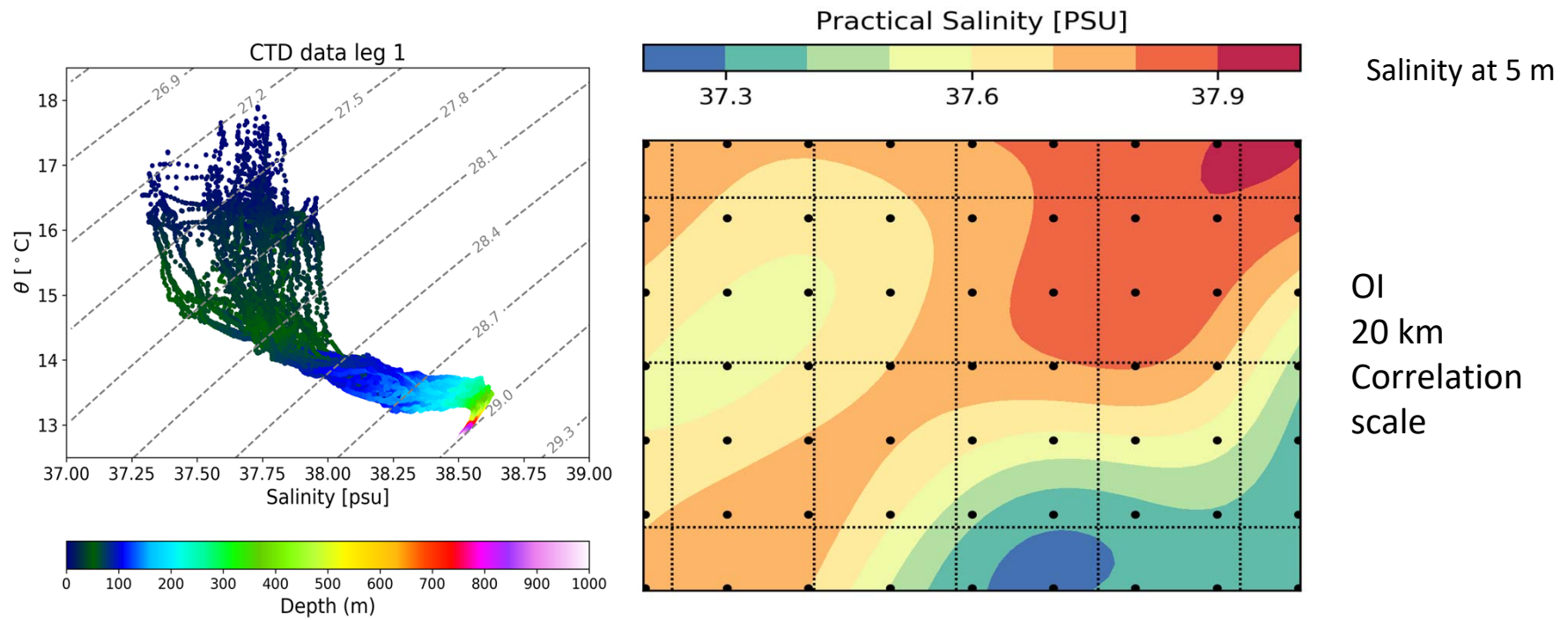


PRE-SWOT sampling design (Leg-1)

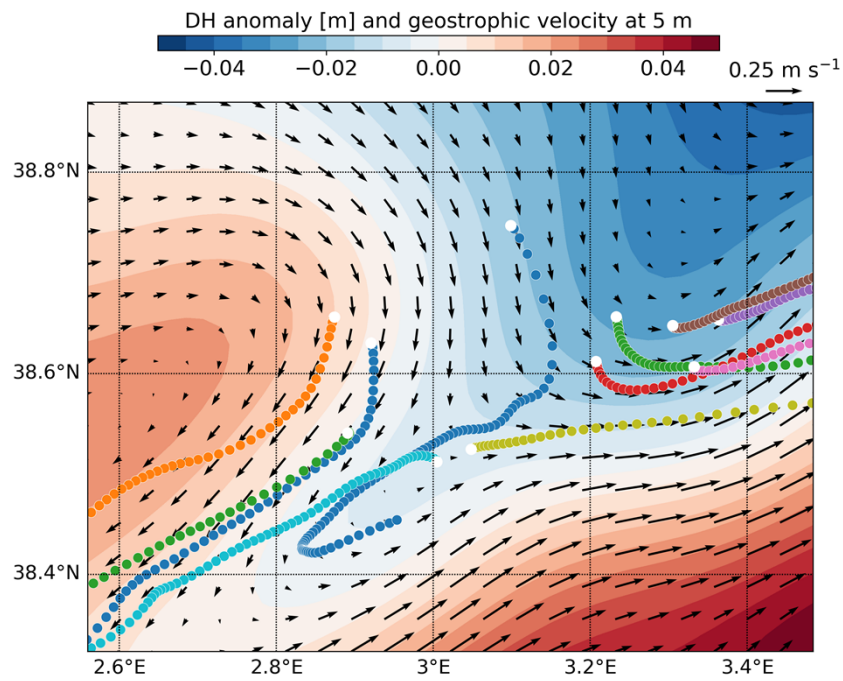


- Mimic SWOT swath width and resolved scales
- Radiator grid covered 100 % in 4.5 days
- All data QC and public (DOI)
- Cruise report (DOI)

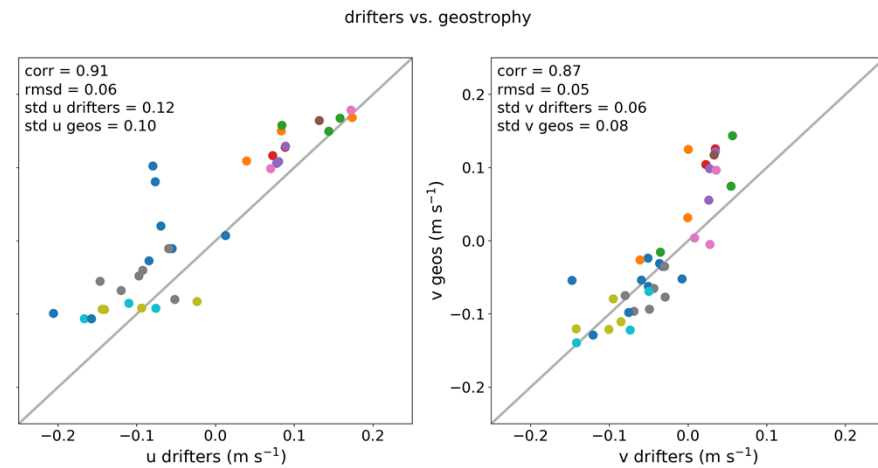
Water masses - salinity front



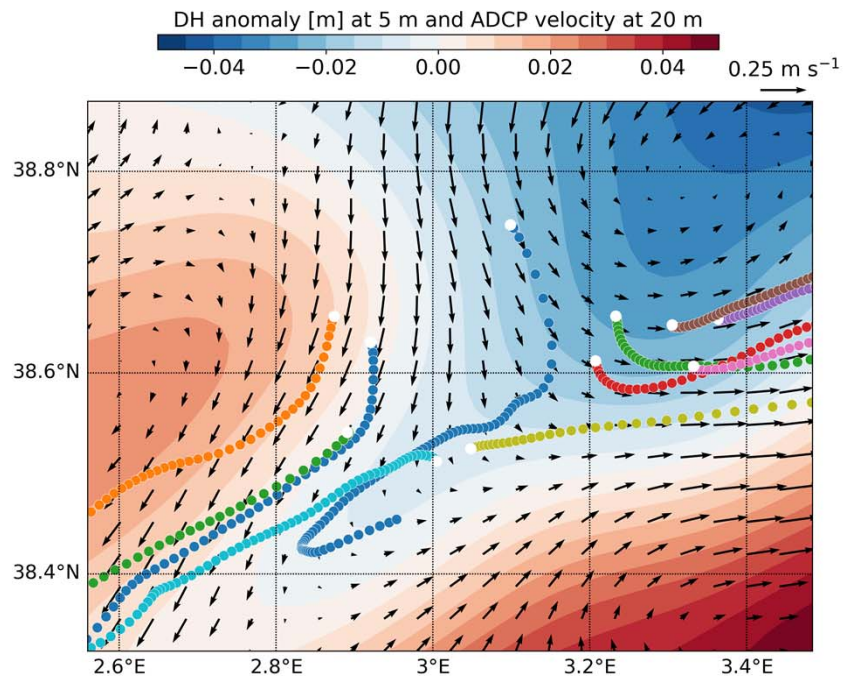
Dynamic Height – Geostrophic Velocity



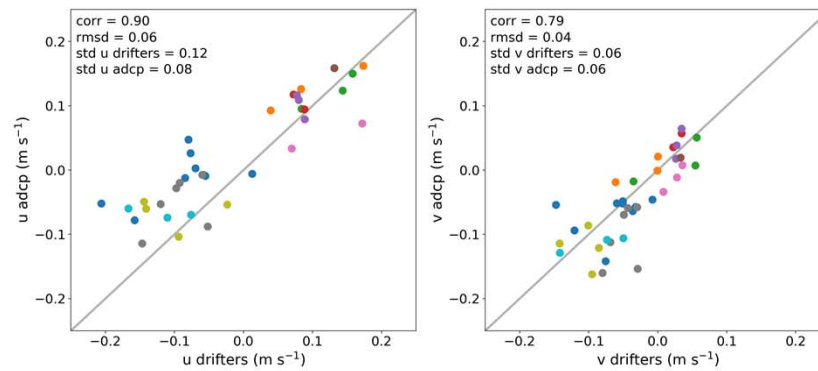
$\gamma = \frac{1}{\rho_0} \frac{d\rho}{dz}$



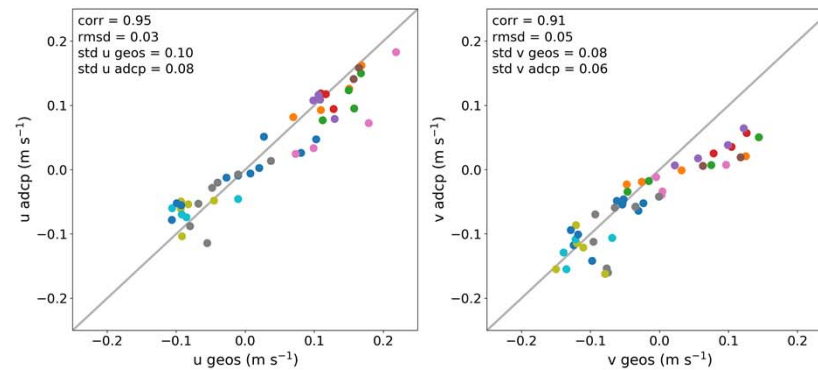
Dynamic Height – ADCP



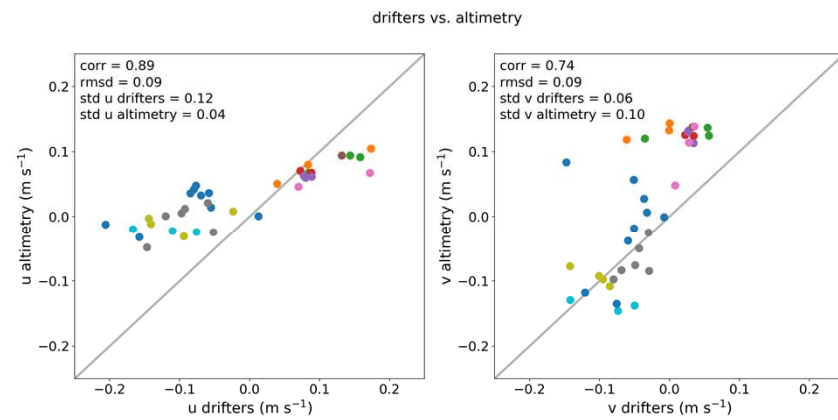
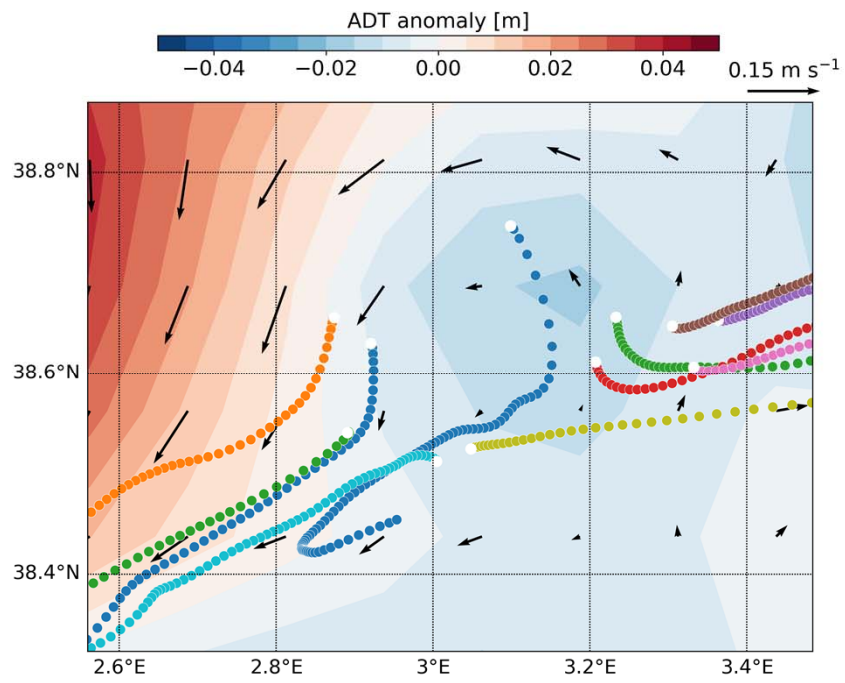
drifters vs. ADCP



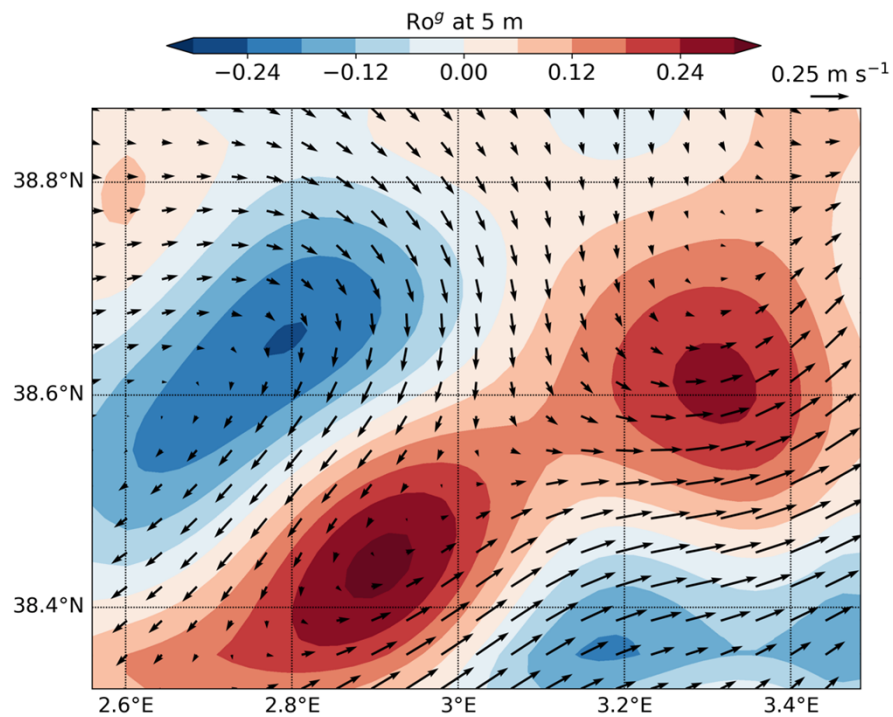
geostrophy vs. ADCP



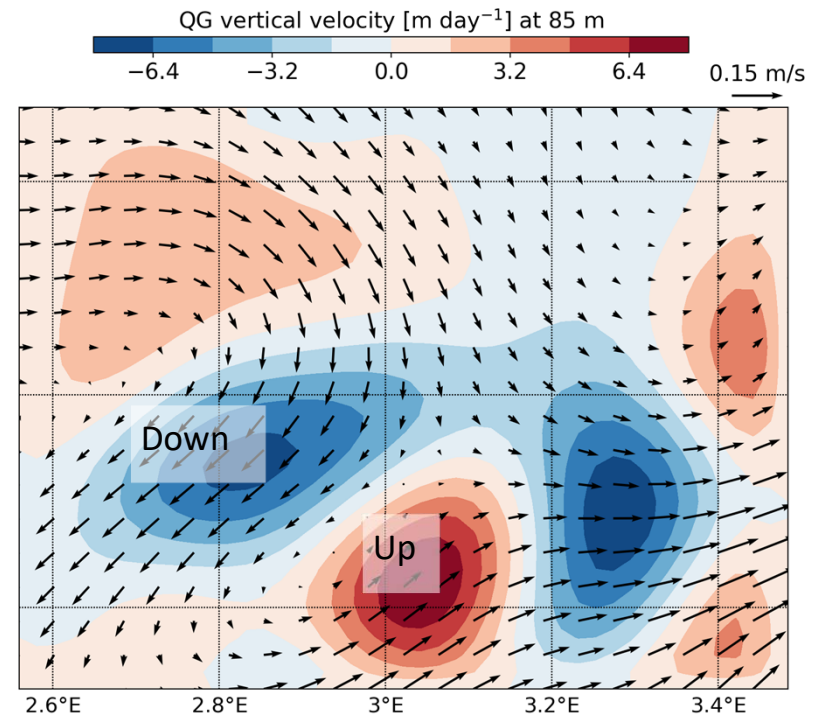
DUACS gridded altimetry



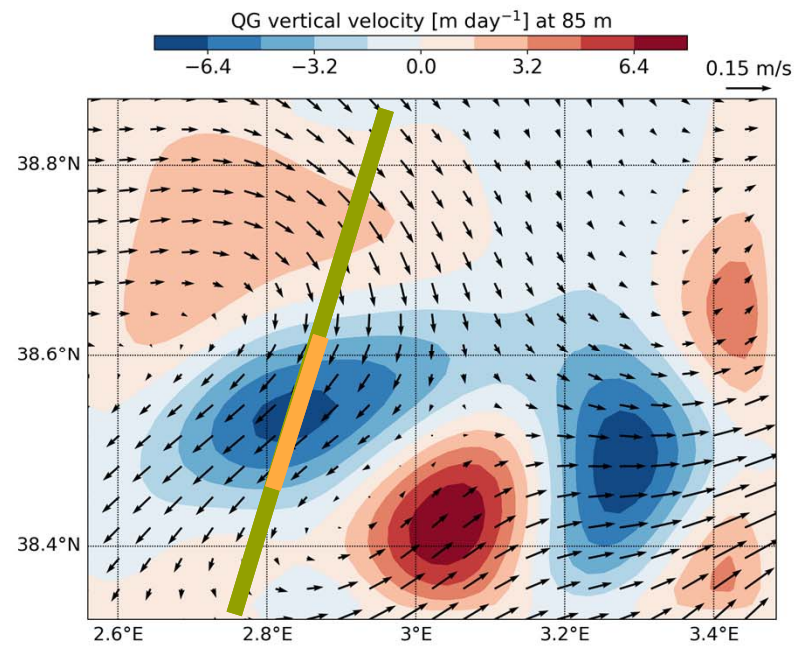
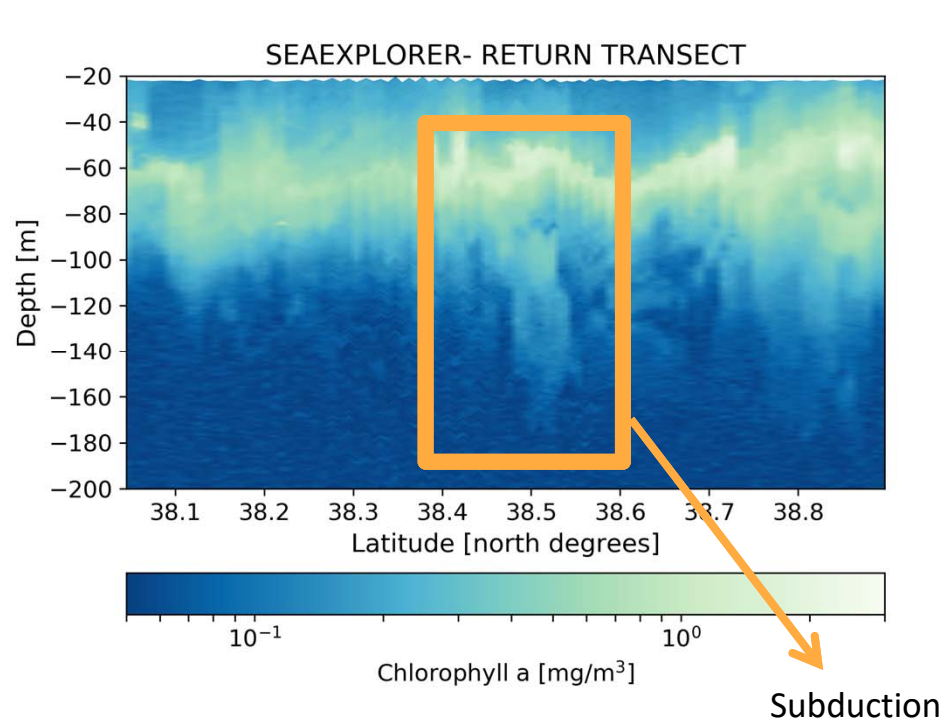
Relative vorticity



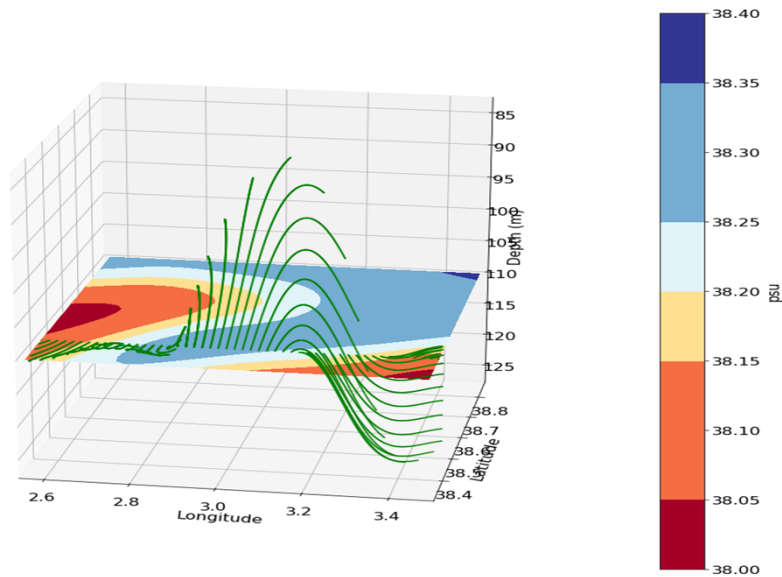
QG-vertical velocity



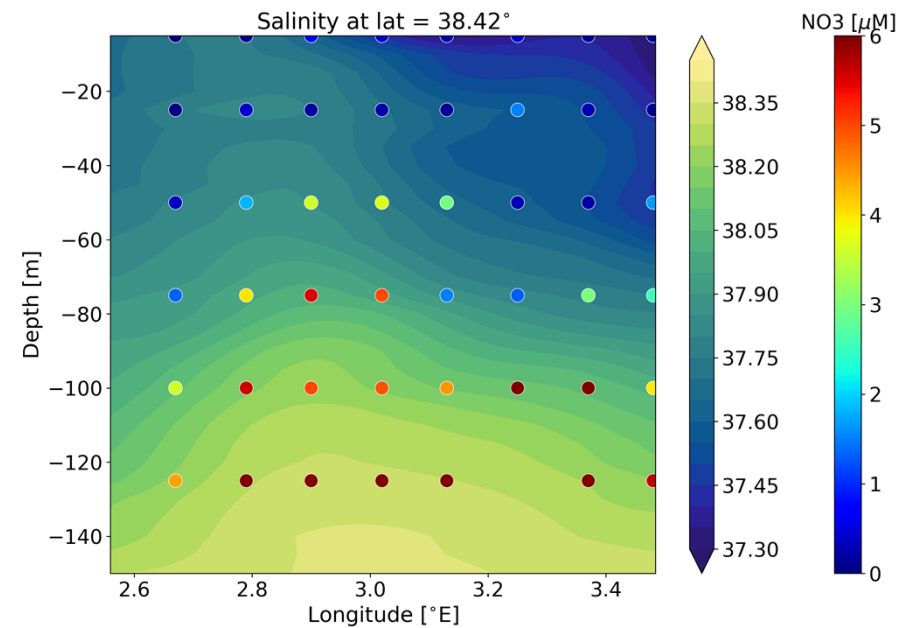
Chl subduction - glider



Particle trajectories and nutrient distributions



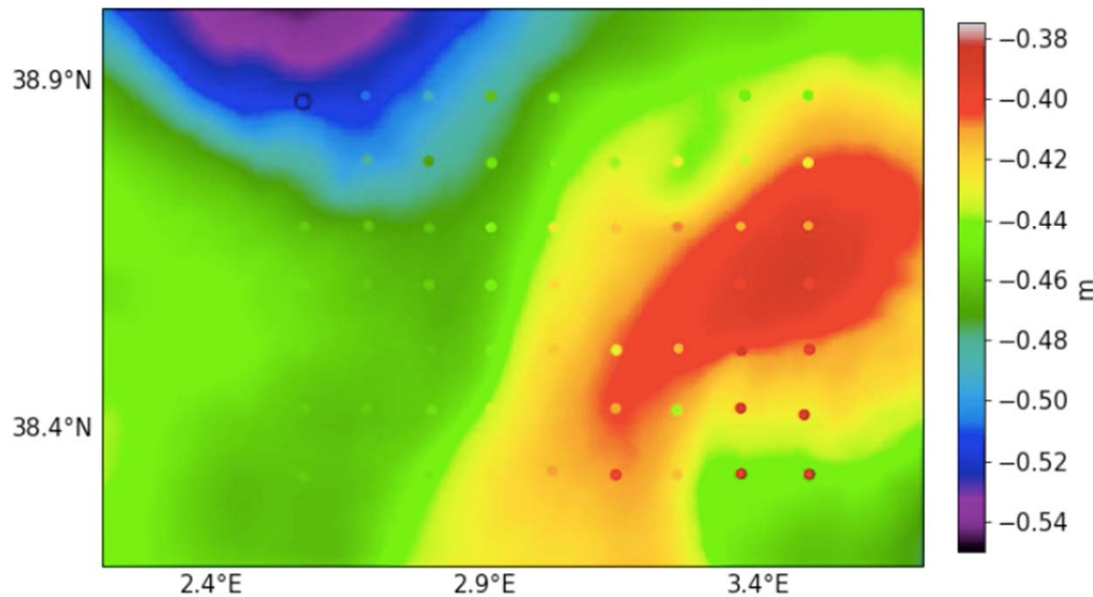
3D trajectories using PARCELS. Particles have been advected with geostrophic and QG-w velocities. Parcels trajectories after 120 hours.



Nutrient and salinity vertical distribution

Synopticity – temporal scales

SSH from WMOP v3.0 (res=400m) at 2018-05-17T15:00:00.000000000



Observing System
Simulation Experiment
(OSSE) – work in progress

SSH
nested ROMS-WMOP

SSH, SST assimilation

JGR Oceans

RESEARCH ARTICLE

10.1029/2018JC014636

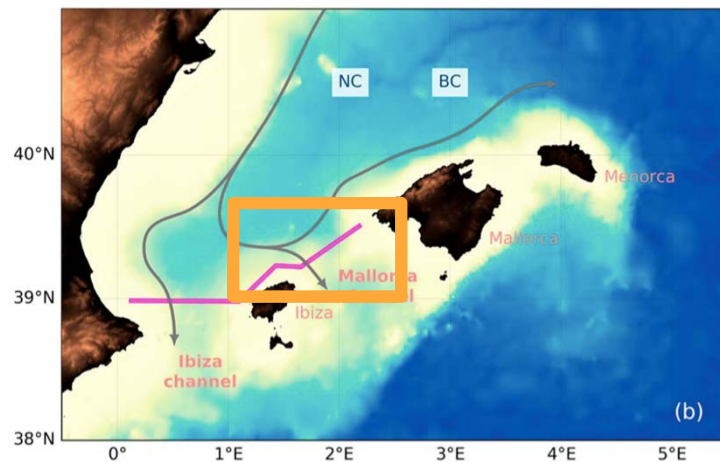
Key Points:

- High-frequency variability dominates the circulation and transport across the channel
- The characteristic horizontal dimension of mesoscale instabilities in this region is 6.0 km

Temporal and Spatial Hydrodynamic Variability in the Mallorca Channel (Western Mediterranean Sea) From 8 Years of Underwater Glider Data

Bàrbara Barceló-Llull¹, Ananda Pascual¹, Simón Ruiz¹, Romain Escudier², Marc Torner³, and Joaquín Tintoré^{1,3}

¹IMEDEA (UIB-CSIC), Esporles, Spain, ²CMCC, Bologna, Italy, ³SOCIB, Palma de Mallorca, Spain



Analysis of historical glider data in Mallorca Channel (covered by SWOT fast sampling orbit)

- Characteristic horizontal scale (Rossby radius of deformation) of 6 km
- Eddies radius ranging from 5 to 18 km
- Temporal variability of circulation and transport over timescales of weeks stronger than seasonal changes

Barceló-Llull et al. JGR 2019

Summary

- Need of integrated multi-platform and interdisciplinary approach for understanding fine-scale processes.
- Small scale processes in the west Med.
- Integration with modeling (see also poster by Laura Gómez-Navarro et al. on denoising techniques and SWOT simulator applied to NATL60, HYCOM, MITgcm).

Future plans

- Contribute to SWOT Science Team and Adopt-A-Crossover initiative: multi-platform experiment in Western Mediterranean Crossover
 - Similar strategy as in PRE-SWOT, in coordination with French team (probably better if both ships were at the same location to reduce synopticity issues).
 - Include moorings - ideally 3 with CTDs and currentmeters, separated ~10 km (collaboration with U. Send, Scripps).
 - Synergies with CALYPSO or other programs ? Lagrangian floats, AUVs, gliders, drifters,...
 - Which funding ??
- Collaboration in other crossovers (e.g. California, Antarctica,...)
- Open questions



Next Spanish Call
for Proposals
Autumn 2019