#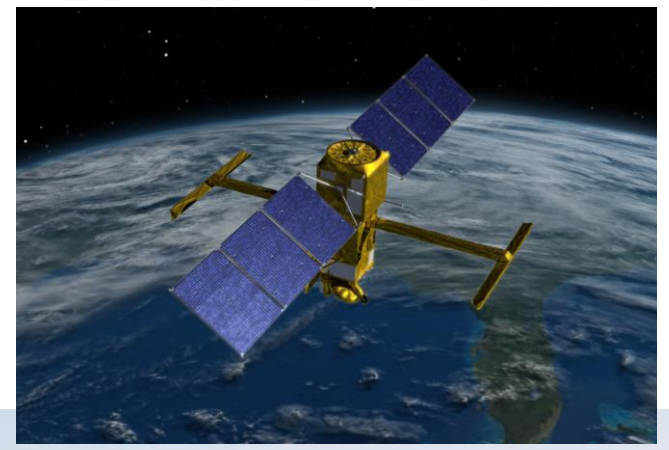 FaSt-SWOT field campaigns combining high-resolution observations and modelling for SWOT validation in the Western Mediterranean Sea
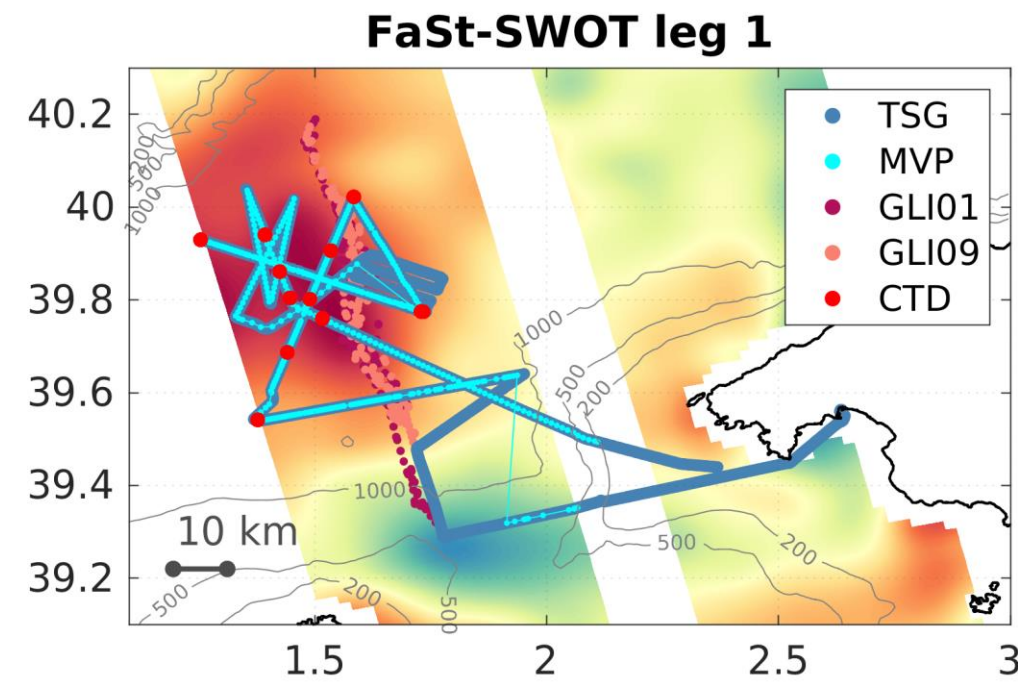
Baptiste Mourre[1,2] (bmourre@imedea.uib-csic.es), Elisabet Verger-Miralles[1], Laura Gómez-Navarro[1], Bàrbara Barceló-Llull[1], Benjamín Casas[2], Vincent Combes[1], Eugenio Cutolo[1,3], Lara Díaz-Barroso[2], Máximo García-Jove[2], Irene Lizarán[2], Emma Reyes[2], Daniel R. Tarry[1,4], Nikolaos Zarokanellos[2] and Ananda Pascual[1]
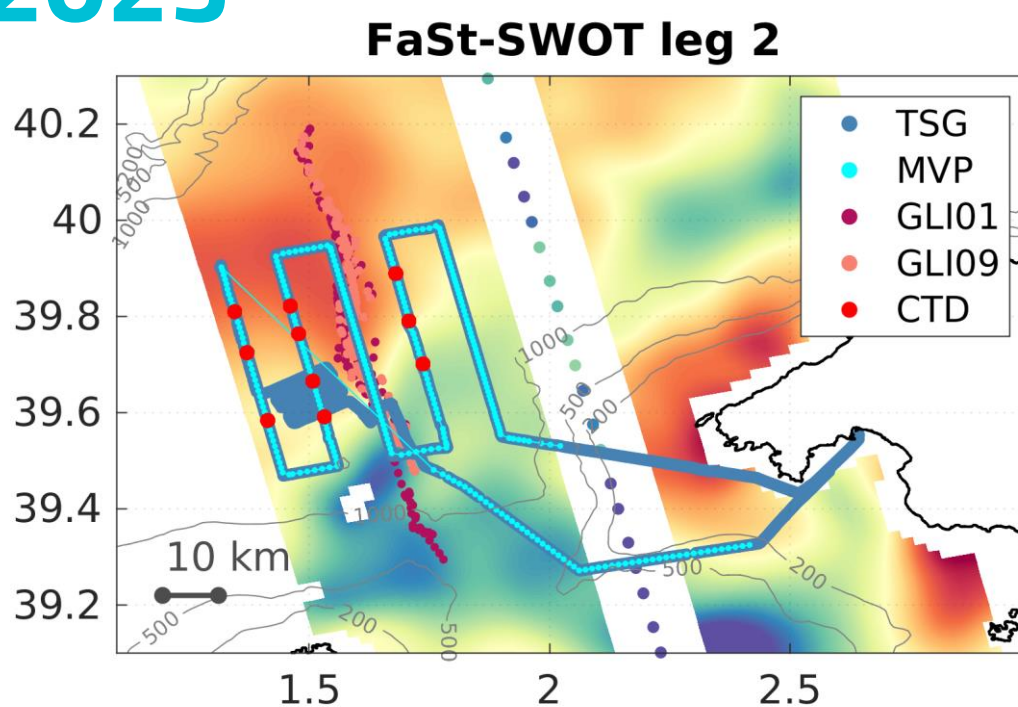
[1]IMEDEA, CSIC-UIB, Esporles, Spain; [2]SOCIB, Balearic Islands Coastal Observing and Forecasting System, Palma, Spain; [3]IMT-Atlantique, Brest, France; [4]University of Washington, Seattle, USA

R/V SOCIB

The FaSt-SWOT sea trial experiments, conducted in the Balearic Sea between 25-28 April and 7-10 May 2023, aimed at collecting multi-platform in-situ observations of fine-scale ocean structures in the area covered by SWOT during its initial fast-sampling phase. The general objectives of the FaSt-SWOT project are twofold: 1) participate with these data to the satellite cal/val activities, and 2) improve the characterization and understanding of these fine-scale structures by combining in-situ multi-platform and satellite data with high-resolution numerical models and machine-learning computational techniques.
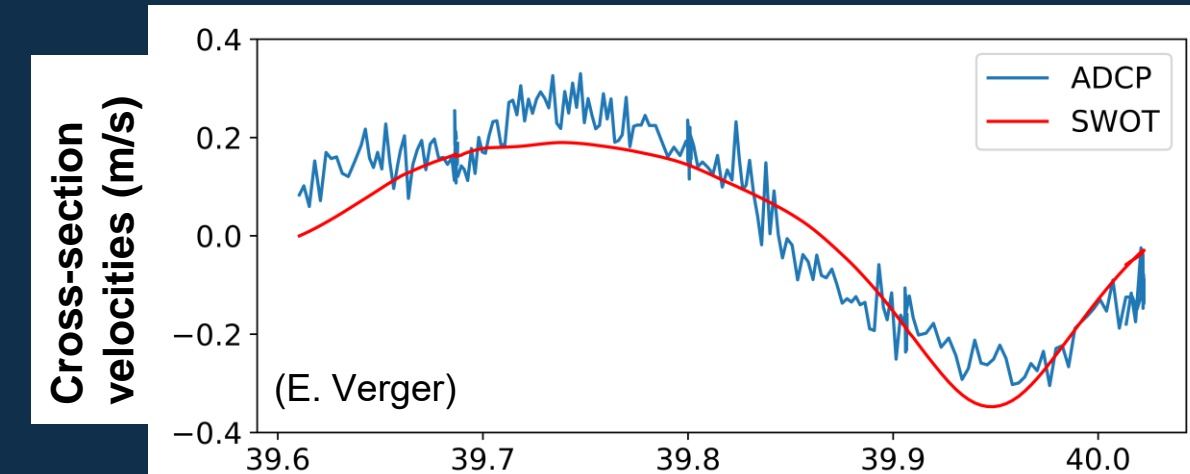

Sampling area

Leg 1: 25-28 April 2023

FaSt-SWOT leg 1
TSG, MVP, GLI01, GLI09, CTD
10 km

Leg 2: 7-10 May 2023

FaSt-SWOT leg 2
TSG, MVP, GLI01, GLI09, CTD
10 km

→ Monitoring of water column T-S and horizontal velocities
→ Sampling repeated after 10 days to track the evolution

SWOT vs Dynamic height

(E. Verger)
CTD 90 m, CTD 507 m, MVP 90 m, SWOT 20230426 int. MVP, SWOT 20230426 int. CTD

SWOT sea level gradients are larger than DH gradients derived from MVP and CTD profiles.
Deep extension of the eddy.

SWOT vs SST and drifter

SST (color) + SWOT L3 SLA contours (cm) [25-Apr-2023] (°C)
25 Apr
SVP035 drifter trajectory [22-Apr 12:00 to 27-Apr 00:00]

[26-Apr-2023] (°C)
26 Apr
SVP035 drifter trajectory [22-Apr 12:00 to 27-Apr 00:00]

Eddy well represented on 26 Apr

SWOT vs conv. altimetry and drifter

Conventional altimetry [rep] L3/L4 SLA [25-Apr-2023] (cm)
SWOT L3 noiseless SLA [25-Apr-2023] (cm)
25 Apr

Conventional altimetry [rep] L3/L4 SLA [26-Apr-2023] (cm)
SWOT L3 noiseless SLA [26-Apr-2023] (cm)
26 Apr
Sea level anomaly (SLA)

Positive SLA signal intensified in SWOT data, with smaller-scale features

Significant daily SLA variability

Modelling

High-resolution data-assimilative simulations:
- WMOP (2km res.) with daily data assimilation (SLA, SST, Argo T/S, HFR)
- BSOP (650m res.) over the study area

SWOT data

SWOT data analysed in this poster are L3 noiseless sea level anomalies from: AVISO/DUACS, 2023. SWOT Level-3 SSH Expert (v0.3) [Data set]. CNES. https://doi.org/10.24400/527896/A01-2023.018

Next steps

→ In-depth in-situ data analysis
→ Data integration and dynamical reconstruction
→ SWOT and in-situ data assimilation

Surface vorticity / f BSOP-650m [25-Apr-2023]

SSH (cm) BSOP-650m [26-Apr-2023]

WMOP Cross-section velocity (m/s) 24-Apr-2023 12:00

Instrumentation

Thermosalinograph
CTDs [0-700m]
Moving Vessel Profiler [0-200m]
ADCP (Vessel Mounted)
2 Slocum gliders [0-700m]
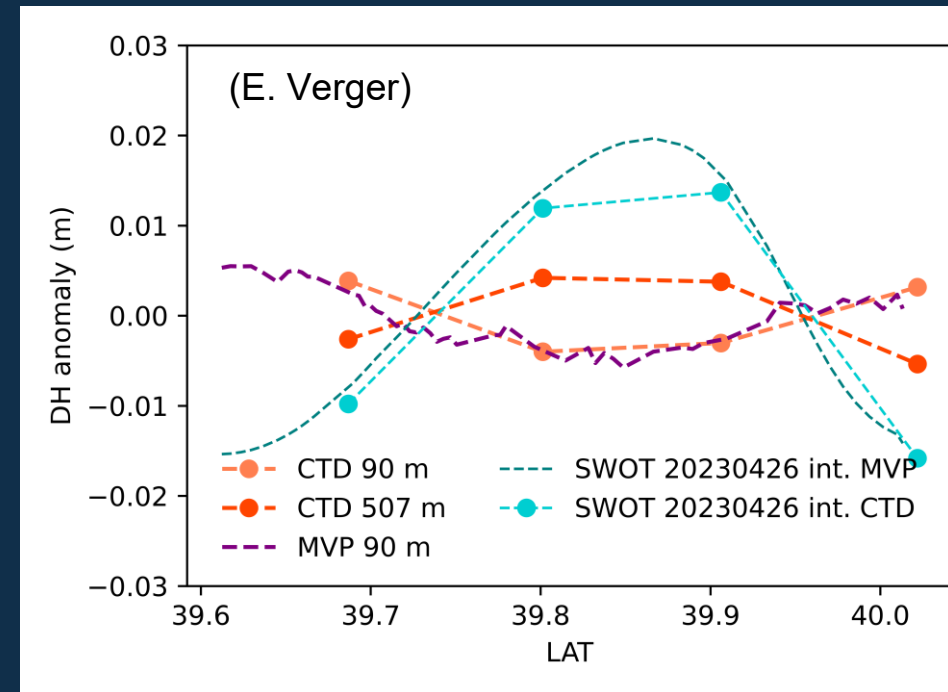45 surface drifters
Meteorological station
GoPros action cameras

SWOT vs ADCP

SWOT-derived geostrophic velocities versus ship-ADCP velocities at 100m along a section crossing the eddy
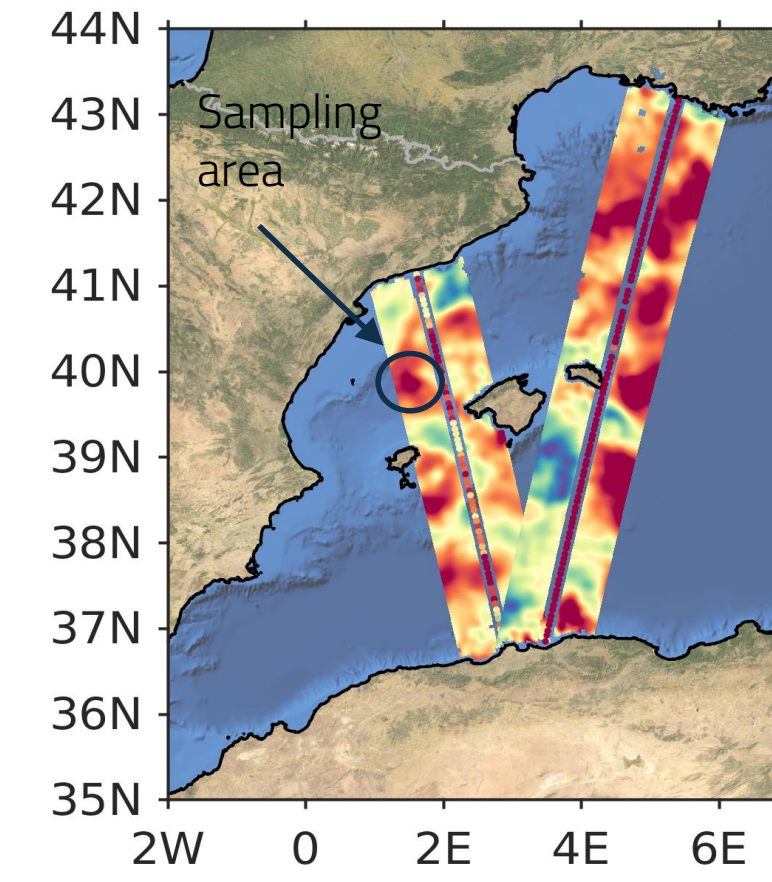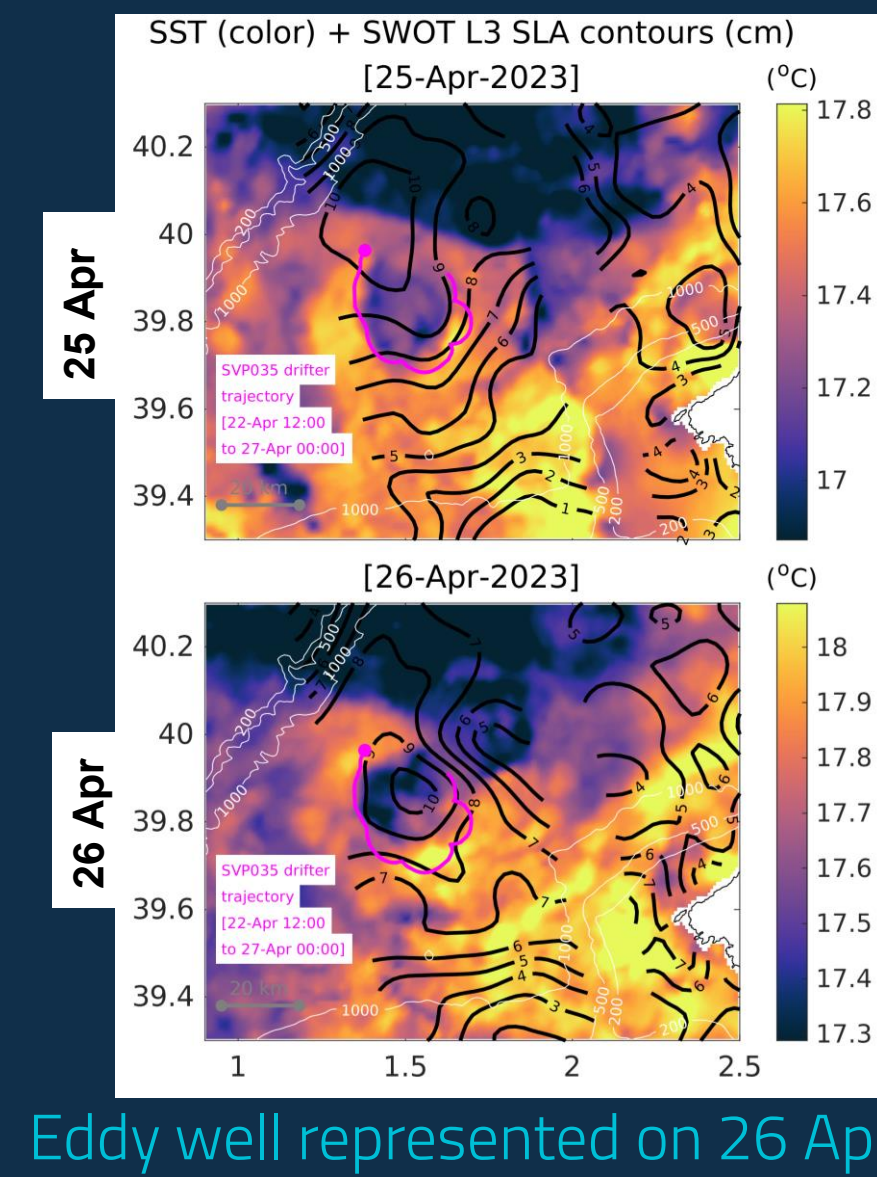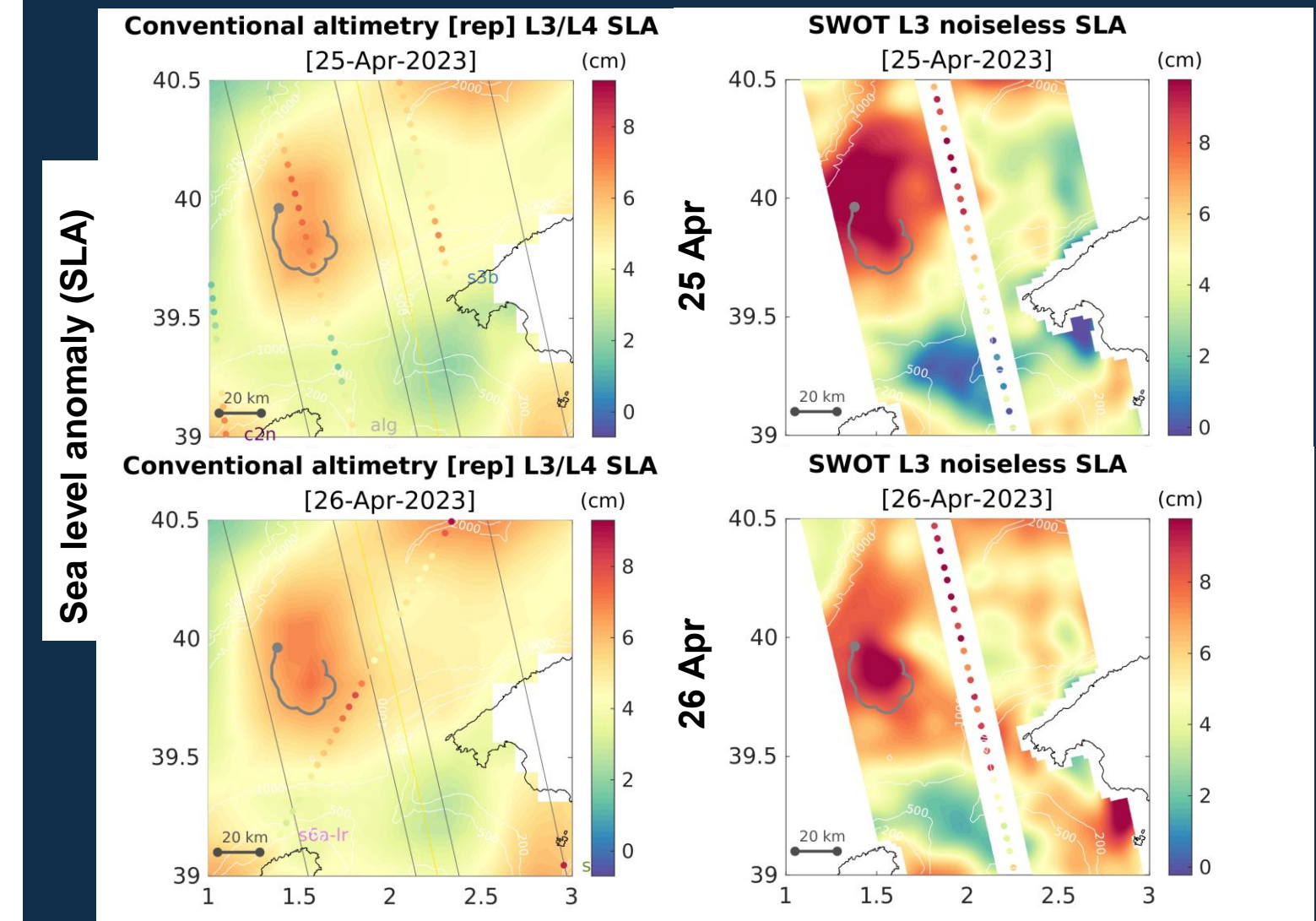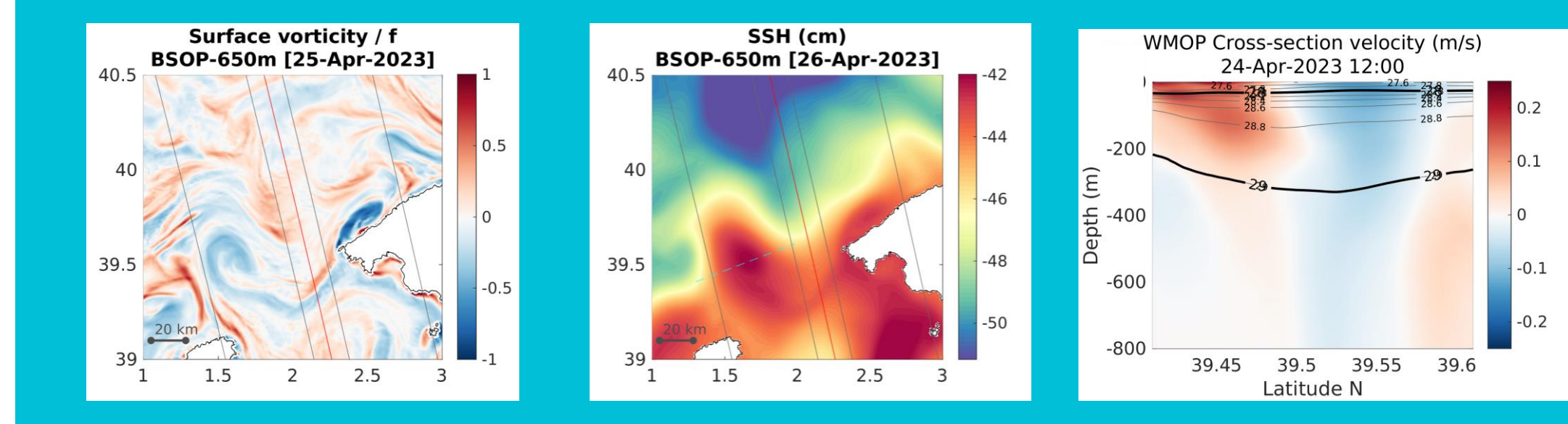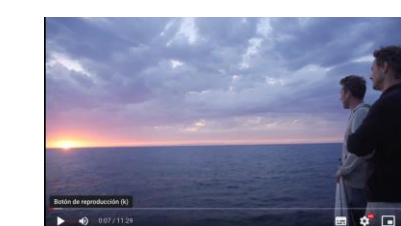

ADCP, SWOT
(E. Verger)

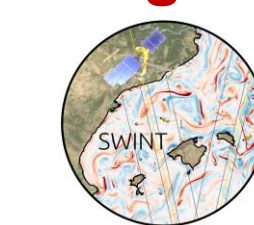The anticyclonic velocities of the eddy are very well represented by SWOT data.

Short documentory

Youtube IMEDEA
Youtube SOCIB

Interested in joining us? We are hiring a postdoc for 1.5 years

Cruise report

See also E. Verger's presentation EGU24-17643