Glider observations across the scales of ocean dynamics during BioSWOT-Med cruise

Journées Nationales Glider

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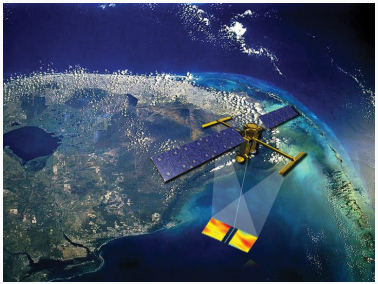
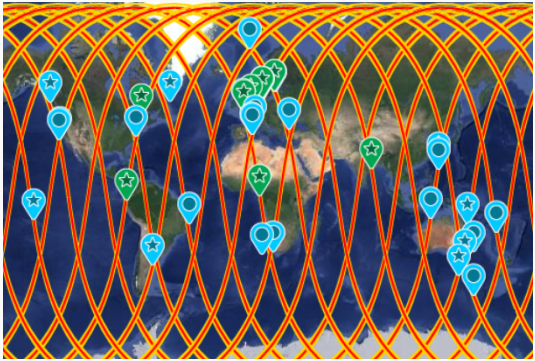
Marseille, 7–8 December 2023

General Context : SWOT AdAC Consortium

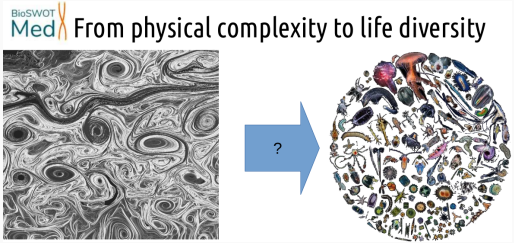




→ SWOT satellite launched in December 2022
  ↪ **CalVal (”fast sampling” every 24h) from April-July 2023**

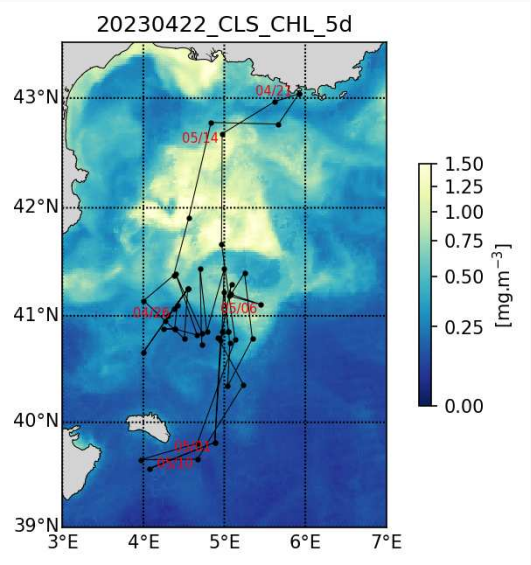
→ **”Adopt A Crossover”** : a CLIVAR-endorsed action to support CalVal ocean experiments (+30 worldwide, incl. **BioSWOT-Med**)
  ↪ Satellite data, NRT KaRIn images, Lagrangian analysis, communication

BioSWOT-Med cruise (21 April – 15 May 2023, PI: A. Doglioli, G. Gregori, F. D'Ovidio)



→ Multi-disciplinary cruise to study physics/biology coupling at ocean fronts
↪ towed CTD (MVP), flow cytometry, CTD/ADCPs/VMP (turbulence), chemistry, biology (omics), ...

→ ... including autonomous **gliders**



BioSWOT-Med : stations map

BioSWOT-Med : synergy with MOOSE glider observatory

MOOSE's glider T02 line

+ 4 Gliders deployed/recovered

→ 2 Seaexplorer prep/piloting MIO

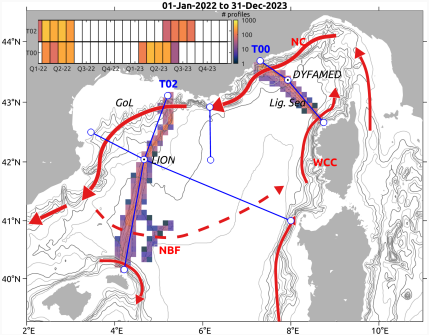
→ 1 Slocum with microstructure turbulence
prep/piloting Université de Bergen I. Fer

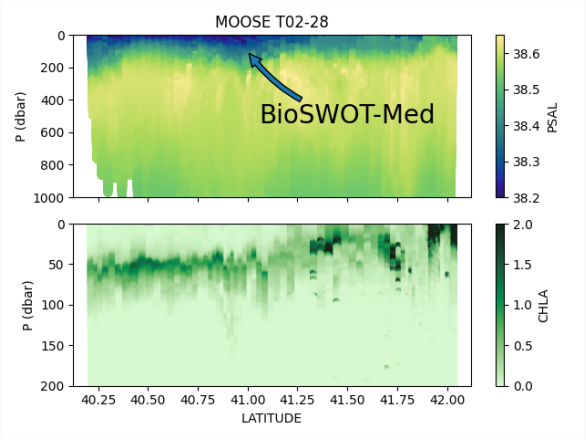
→ 1 Zooglider with echosounder + zoocam
prep/piloting SCRIPPS M. Ohman

MOOSE T02 endurance line : Marseille/Minorque

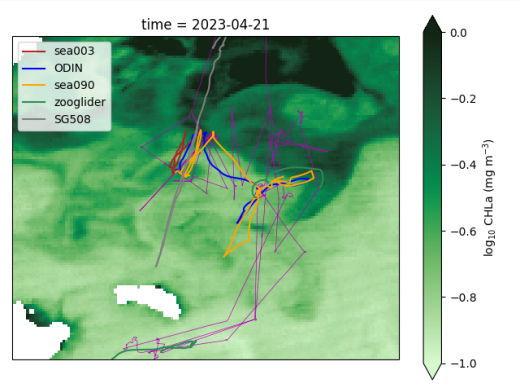
MOOSE: ”Mediterranean Ocean Observing System for the Environment”

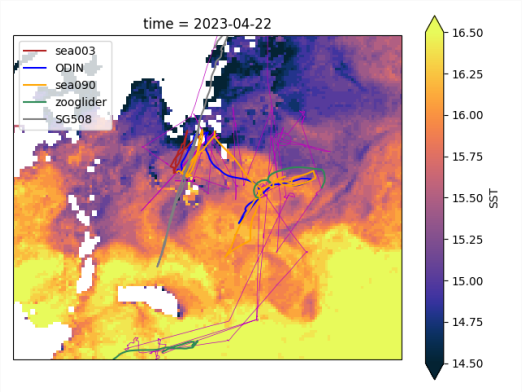
Multi-platform integrated Ocean Observing System dedicated to the long-term monitoring of the NW Mediterranean since 2010.





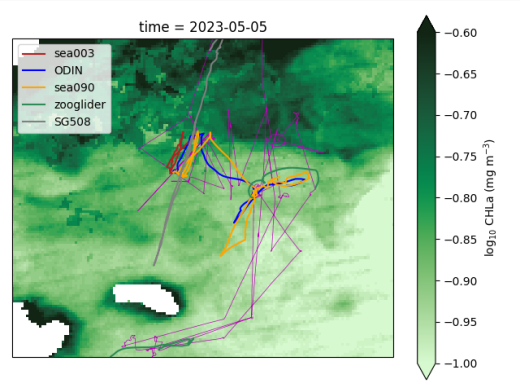
The BioWOT-Med gliders

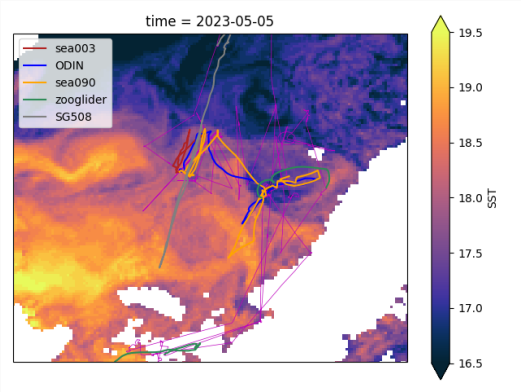




→ Initial plan : target a front and go back and forth
↪ The gliders discovered an eddy and could cross in and out
(SEA003 leaked; SEA090+Odin and then Zooglider)

The BioWOT-Med gliders





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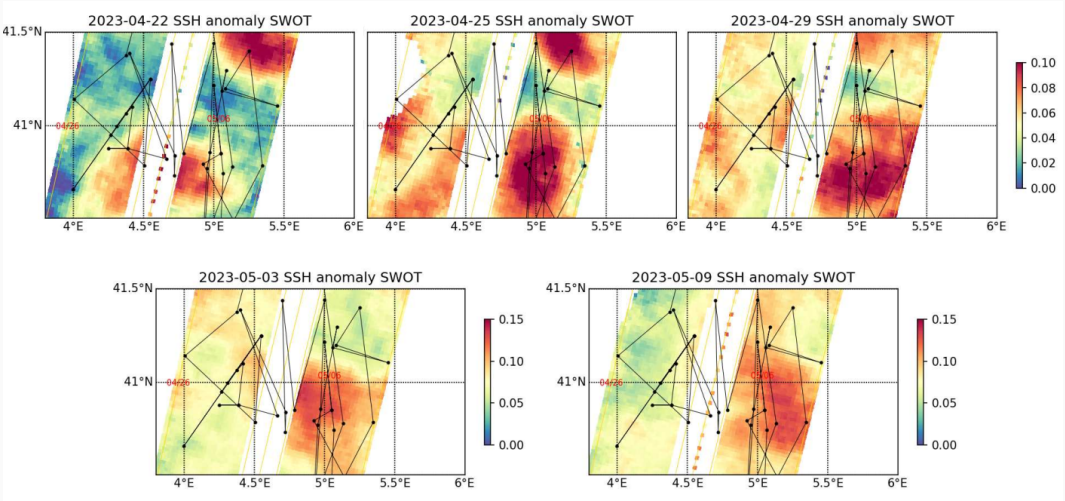
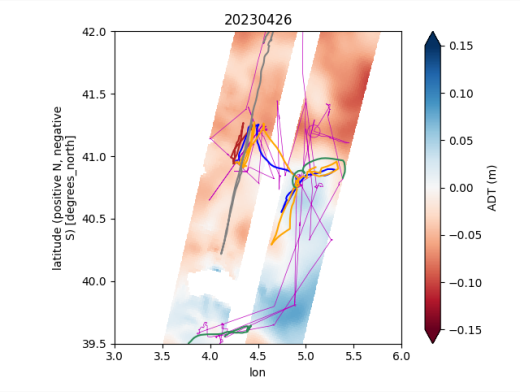
→ **Coherent structure** during the whole cruise!

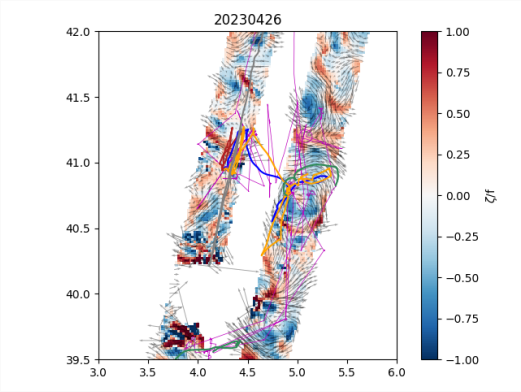
First results from SWOT!



→ SWOT = Unprecedented maps of ADT @ **2km resolution**

First results from SWOT!





→ **Rich dynamics O(5–10km)** in currents and vorticity (cyclo-geostrophic balance)

→ Gliders will allow comparison with their geostrophic currents

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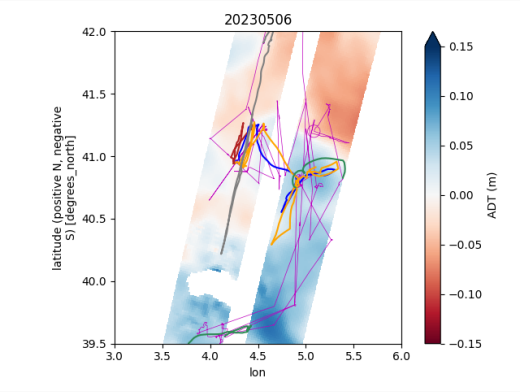

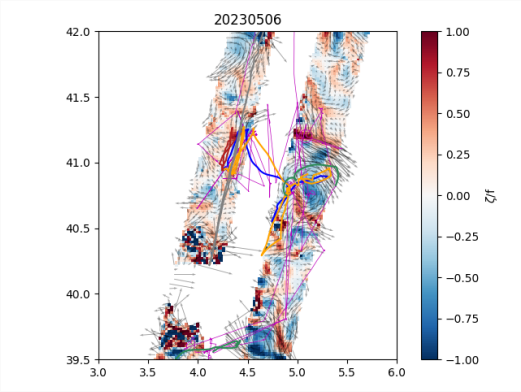

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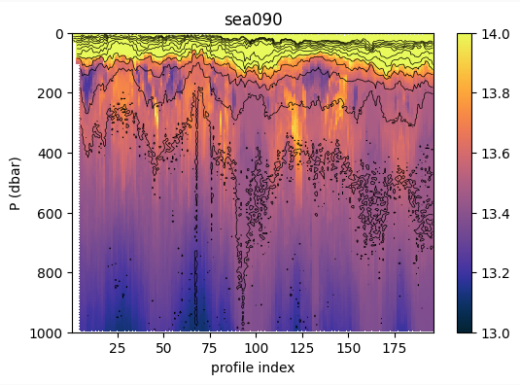
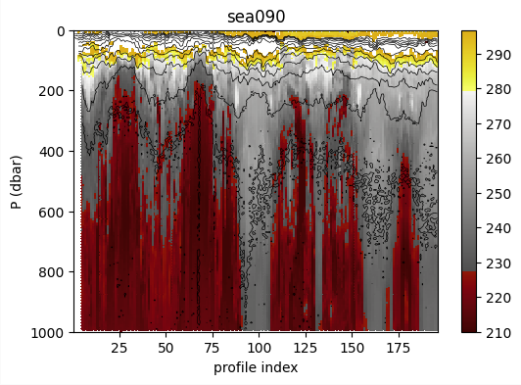
SEA090 : eddy characterisation

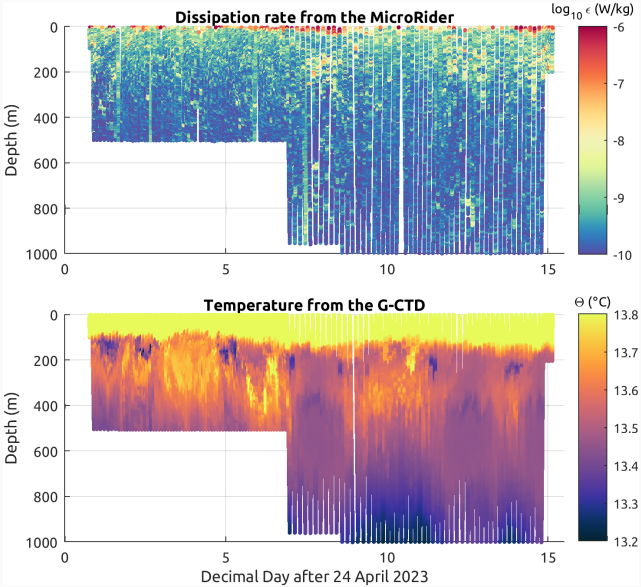




→ Core of a deep anticlonic eddy (high O2, low T)
↪ extension down to 1500m

→ Eddy sampled with SEA090 (T,S,Chla,O2) and **Odin (T,S,turbulence)**

First results from microstructure glider I. Fer (UIB)



→ signal of turbulence enhancement in the eddy core at about 200m

↪ trapping of NIW generated by winds

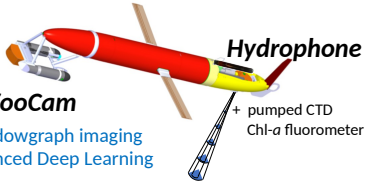
→ Anticyclonic eddy = **hotspot of turbulent mixing**

→ Impact on vertical fluxes (nutrients, carbon, ...)

→ Impact on biology (grazer/plankton interaction)?

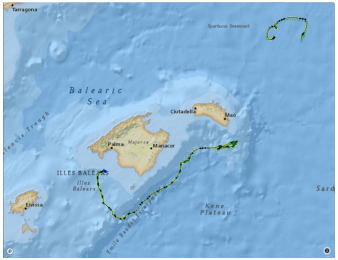
Zooglider

BioSWOT Med



Shadowgraph imaging
Advanced Deep Learning

200 & 1000 kHz



Deployment thanks to colleagues at SOCIB & IMEDEA

Mark Ohman
Sven Gastauer
Jeff Ellen

SIO
Thünen Institute
NWIC

Designed and built by the
Instrument Development Group

SCRIPPS INSTITUTION OF OCEANOGRAPHY
UC San Diego

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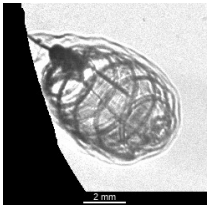

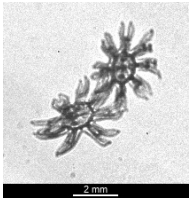

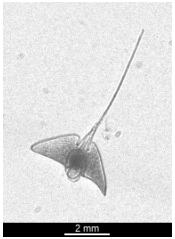

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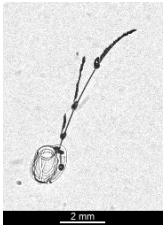

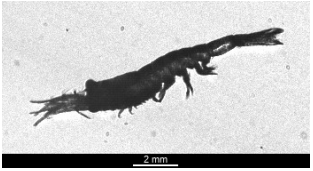

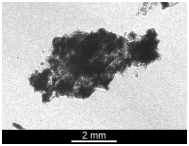

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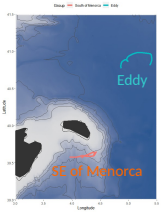
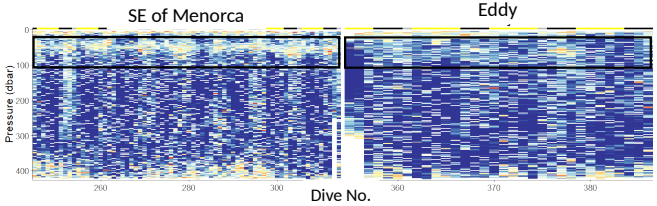
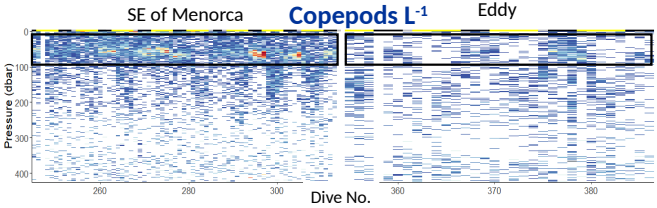


Volume backscatter ($Sv_{200\ kHz}$)



'disappearance' of $Sv_{200\ kHz}$ layer in center of eddy

Copepods L^{-1}



Reduction of copepod layer in center of eddy

preliminary analyses

Merci pour votre attention!

Questions?