



FUMSECK (et un peu plus)

Résultats - Valorisation

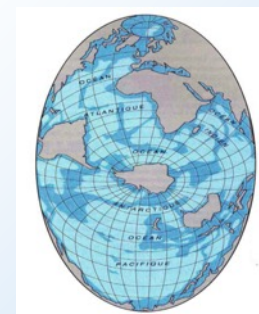
Perspectives

Visite CNES, MIO, 03/03/2023

Stéphanie Barrillon, Anne Petrenko, Jean-Luc Fuda, Caroline Comby, Andrea Doglioli,
Anthony Bosse, Roxane Tzortzis (OPLC)

Robin Fuchs, Christophe Yohia, Nagib Bhairy, Melilotus Thyssen, Gérald Grégori (MIO)

Patrice Le Gal, Patrick Marsaleix, Claude Estournel, Caroline Ulses, Frédéric Cyr, Francesco d'Ovidio

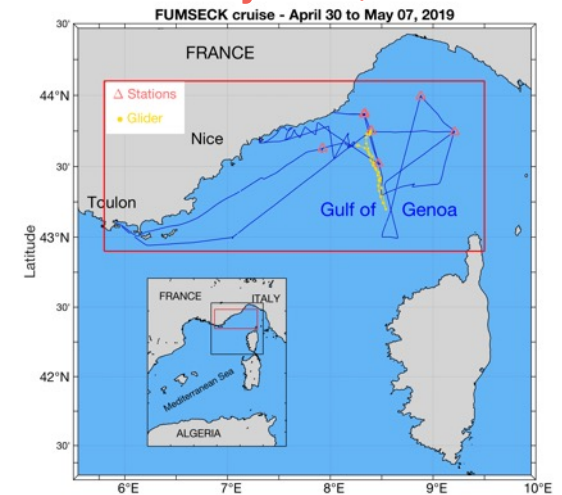
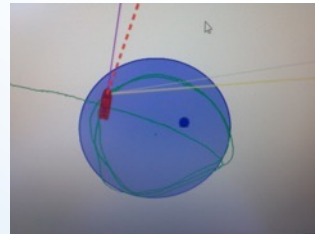
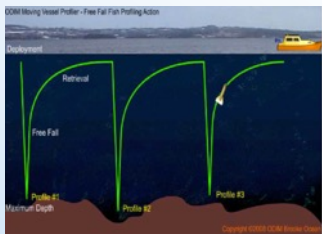
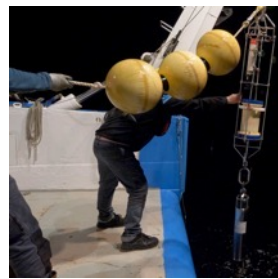
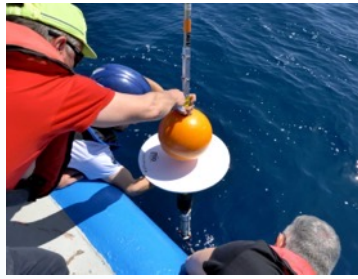


🚢 **FUMSECK** (*Facilities for Updating the Mediterranean Submesoscale - Ecosystem Coupling Knowledge*), 30 avr - 07 mai 2019, mer Ligure. R/V Téthys II (S. Barrillon)

💬 Préparation SWOT. Mesures couplées phys/bio

💬 Résultats :

- Vitesses verticales
- Effet tempête phys-bio

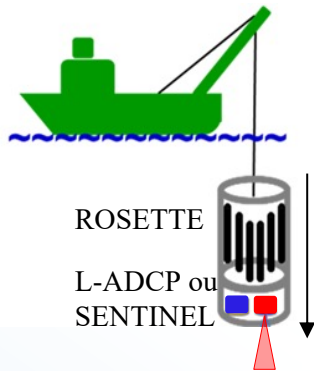


💬 Stratégie lagrangienne avec SPASSO

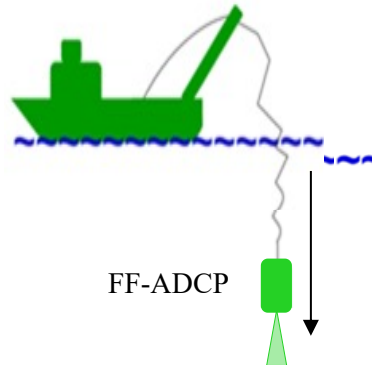
Mesures Vitesses verticales

Directes *in situ* (ADCP)

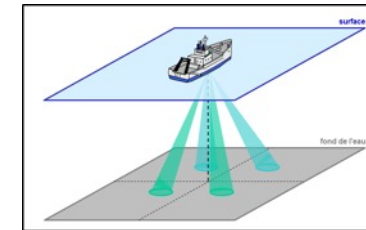
CTD



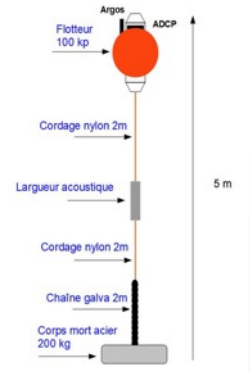
Free-Fall



Coque



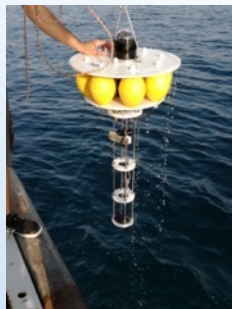
Mouillage



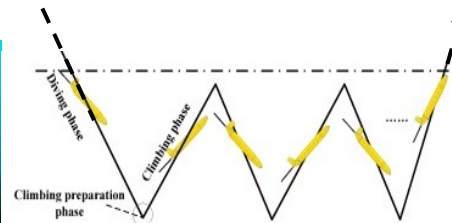
Directes *in situ* avec modèle de vol

VVP

(Vertical Velocity Profiler)



Glider



Indirectes :

Équation ω

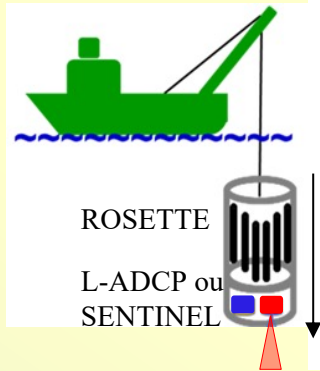
- + *in situ* density/ currents
- + satellite

+ Modélisation
(hydrostatique)

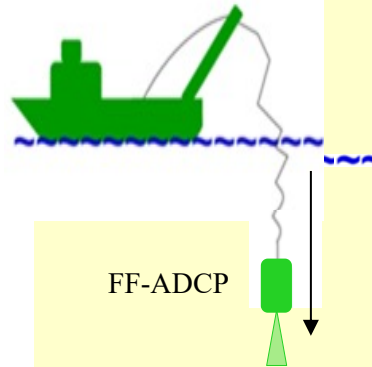
Mesures Vitesses verticales

Directes *in situ* (ADCP)

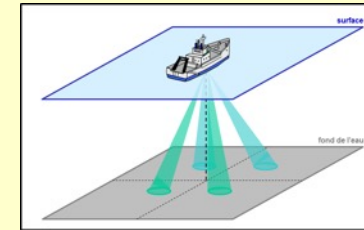
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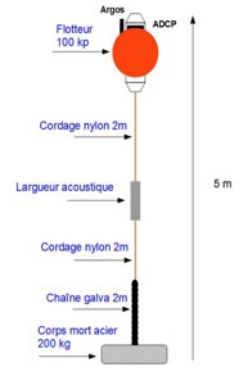
Free-Fall



Coque



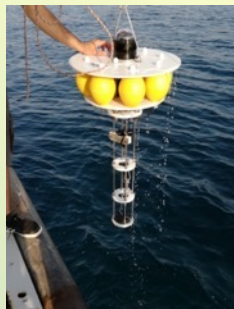
Mouillage



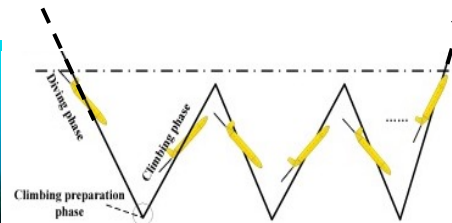
Directes *in situ* avec modèle de vol

VVP

(Vertical Velocity Profiler)



Glider

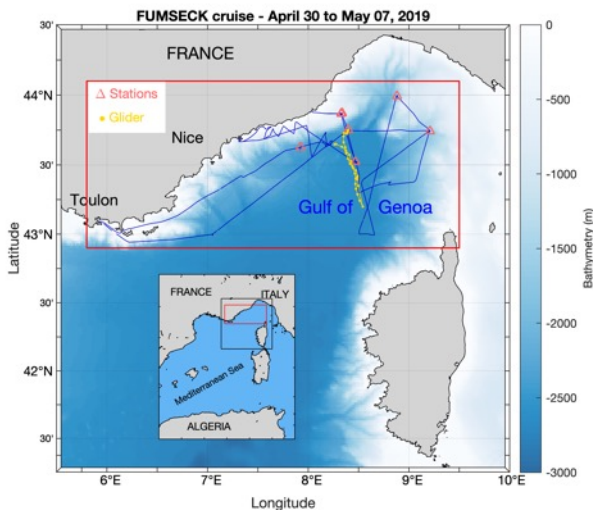


Indirectes :

Équation w

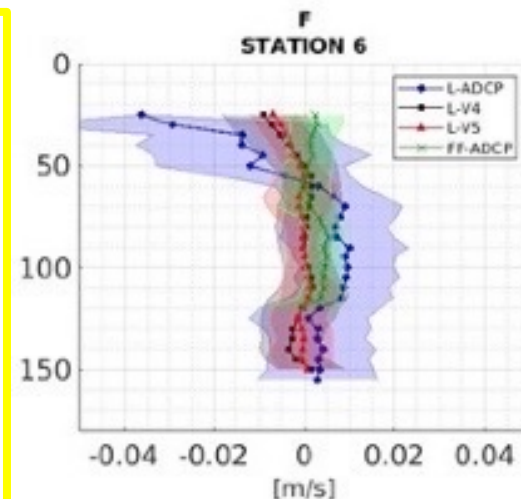
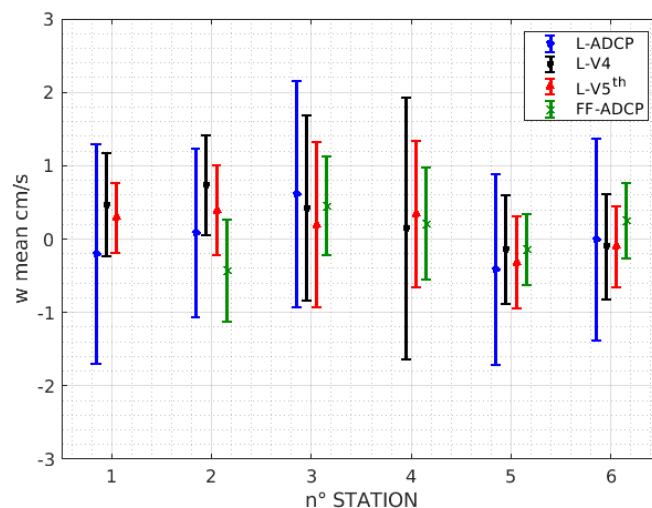
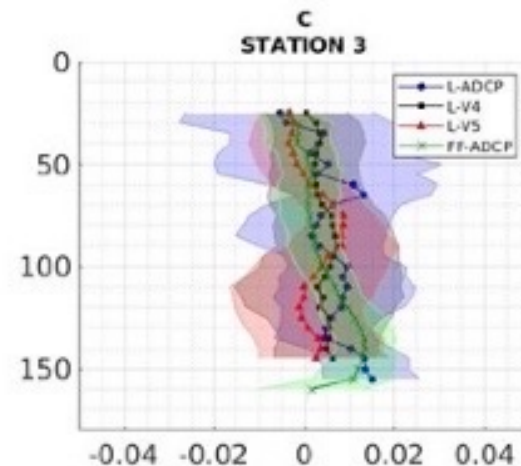
- + *in situ* density/ currents
- + satellite

+ Modélisation
(hydrostatique)



Comby *et al.* (2022)

- FUMSECK
- 6 stations
- 4 methodes
 - Lowered-ADCP
 - Lowered-Sentinel
 - 4 beams + 5th vert.
 - FreeFall-ADCP



Résultats

Downcasts data 0 – 150 m

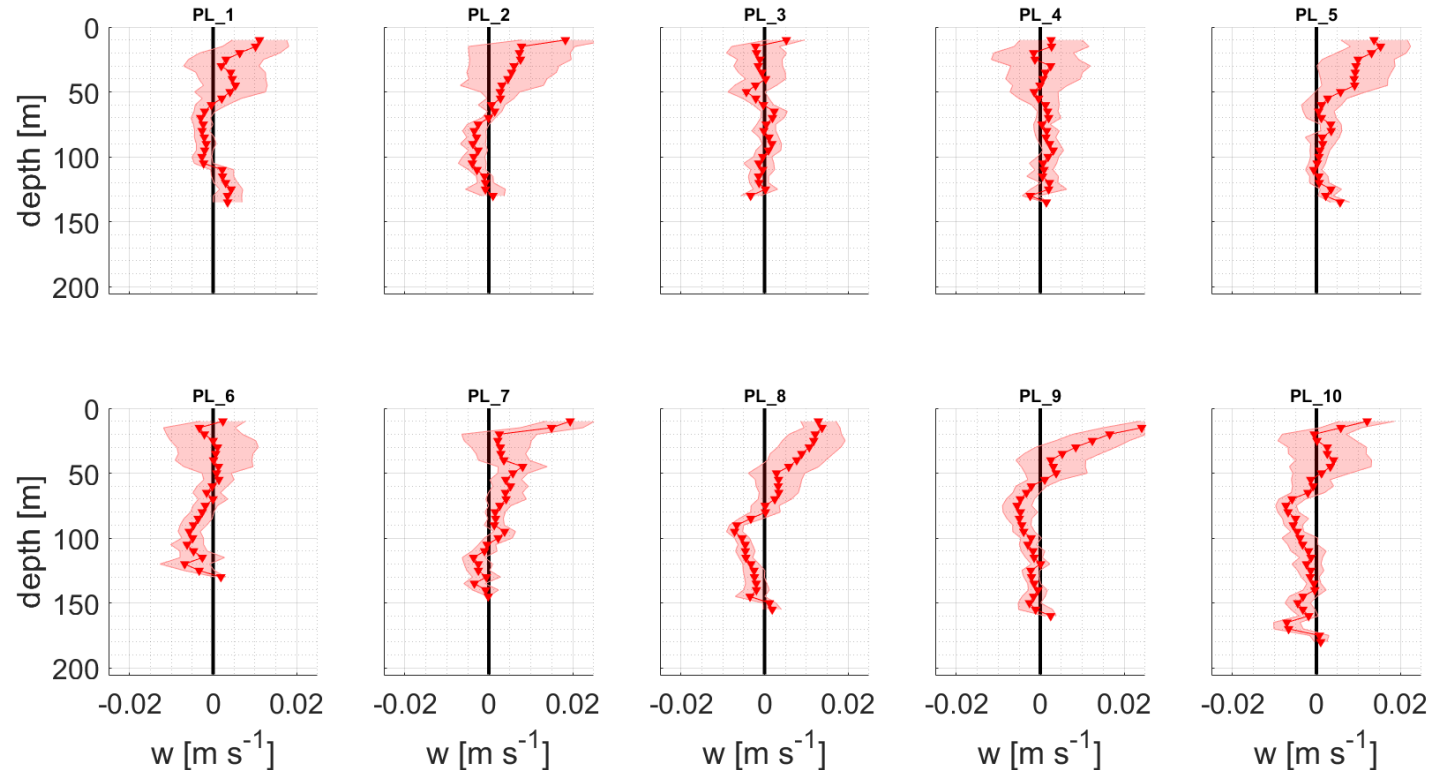
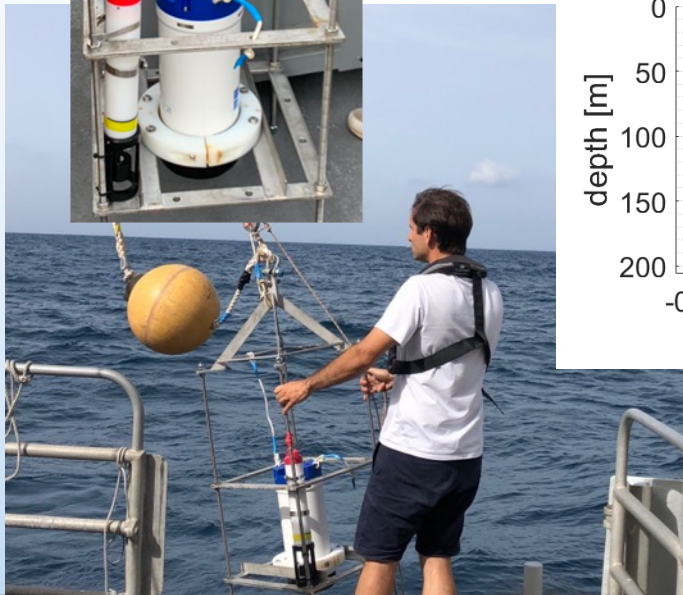
$\mu \sim \text{mm/s}$
 0.02 0.26 0.14 0.6 cm/s

$\sigma \sim \text{cm/s}$
 1.3 1.0 0.7 0.6 cm/s
 L-ADCP > L-V4 > L-V5 > FF-ADCP

➔ best FF-Sentinel

FF-ADCP avec Sentinel

⚓ VVPTest 2022 (Med)



$$\sigma \approx 3 \text{ mm/s}$$

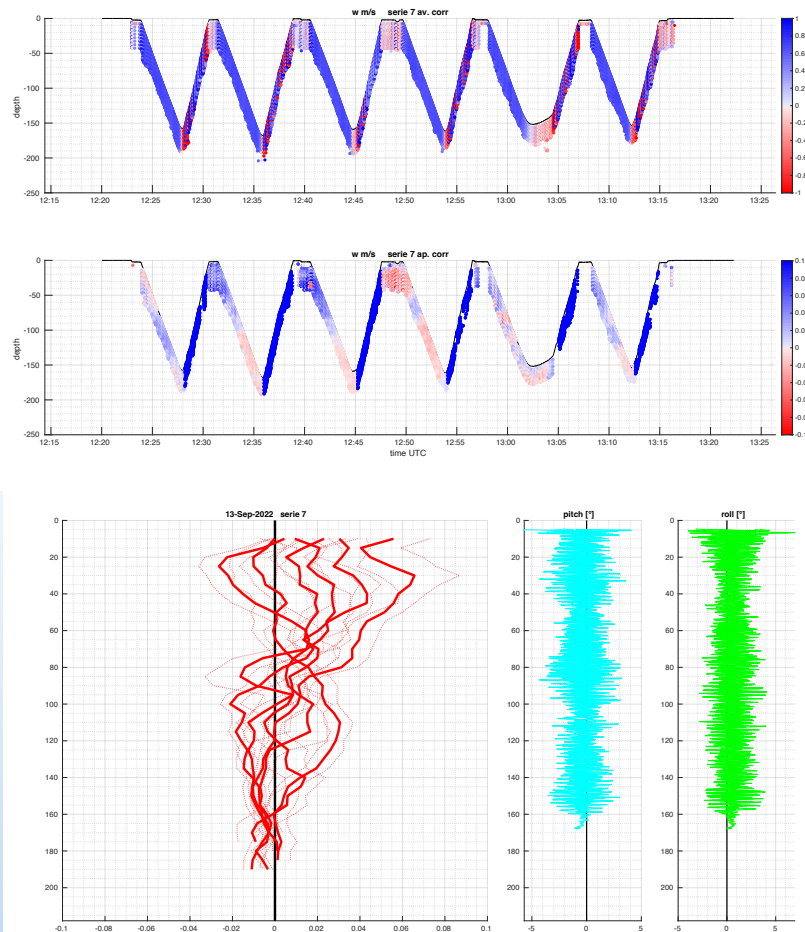
Caroline Comby

FF-ADCP avec Sentinel

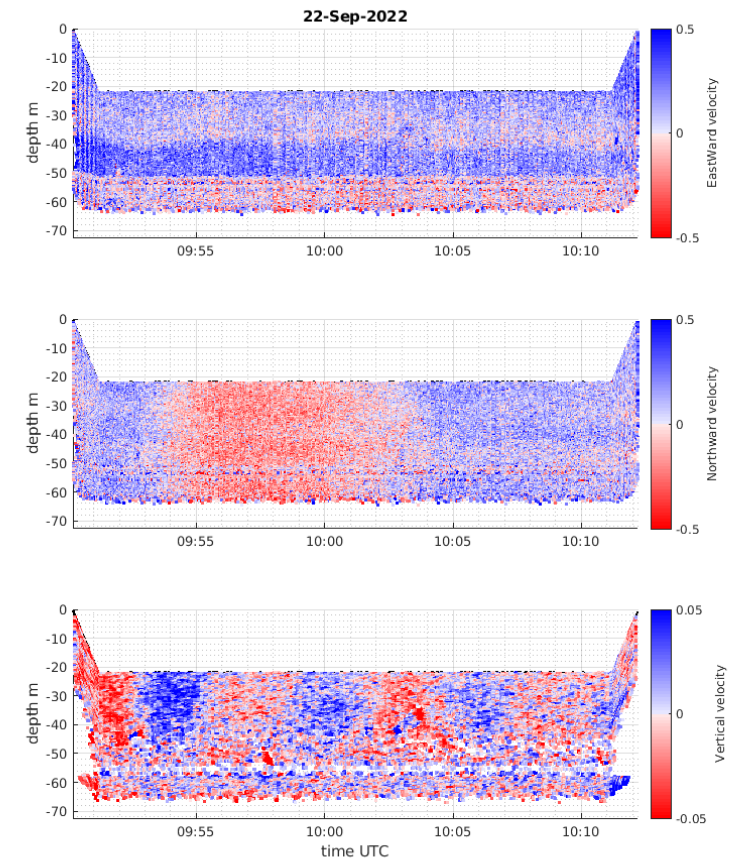
Caroline Comby

🚢 Gascogne 2022, ondes internes

Profils



Profondeur fixe



→ Oscillations vitesses verticales $\neq$ horizontales

FF-ADCP avec Sentinel

⚓ En préparation pour BioSWOT-Med

💬 Nouveau : ajout d'un largeur

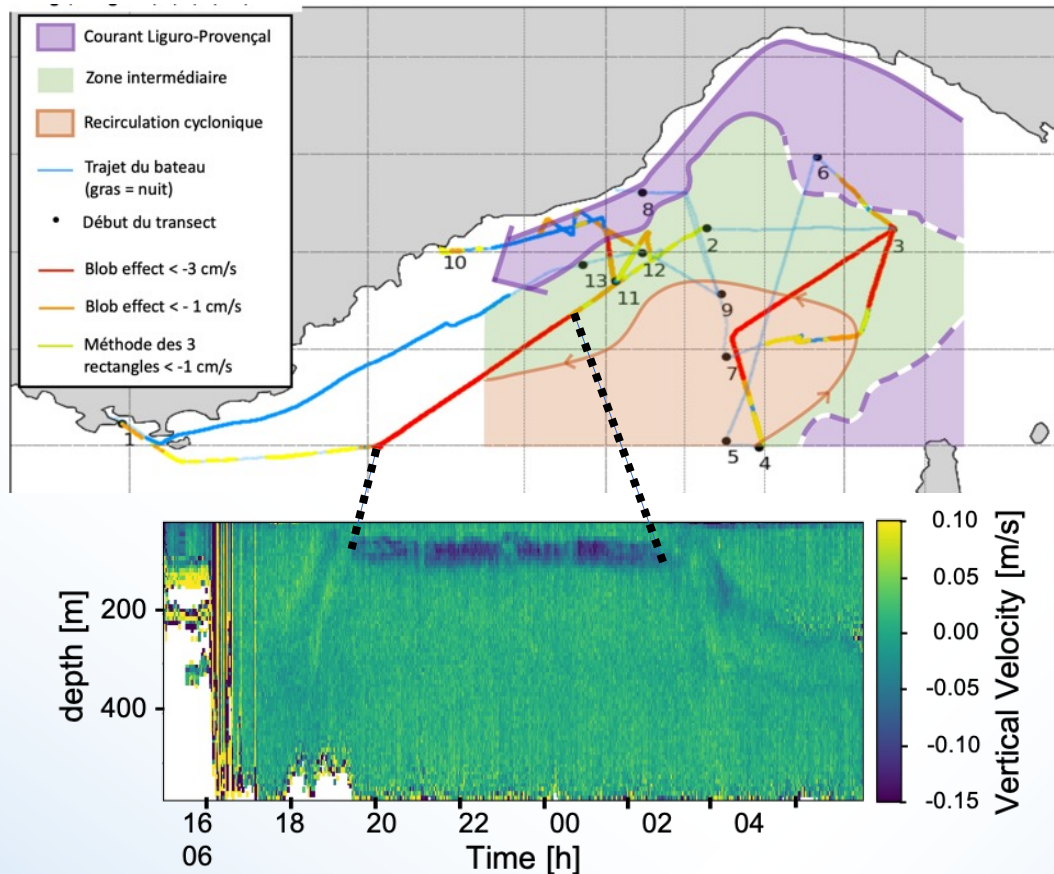


ADCP de coque

Charlotte Cunci

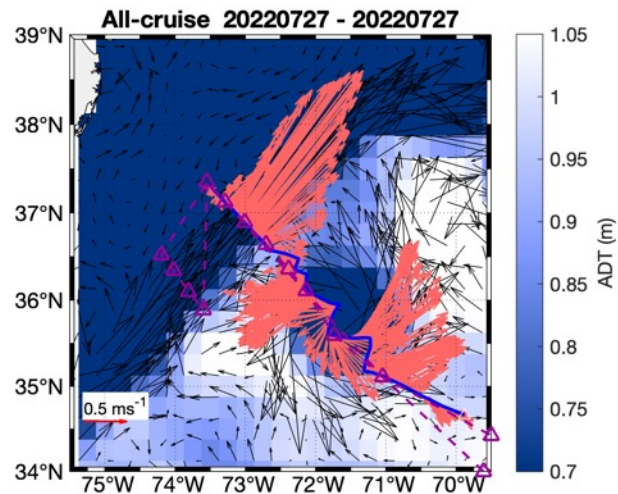
Vitesses verticales

- Soustraction du mouvement vertical du bateau
- FUMSECK: anomalies négatives la nuit → migration nyctémérale du krill

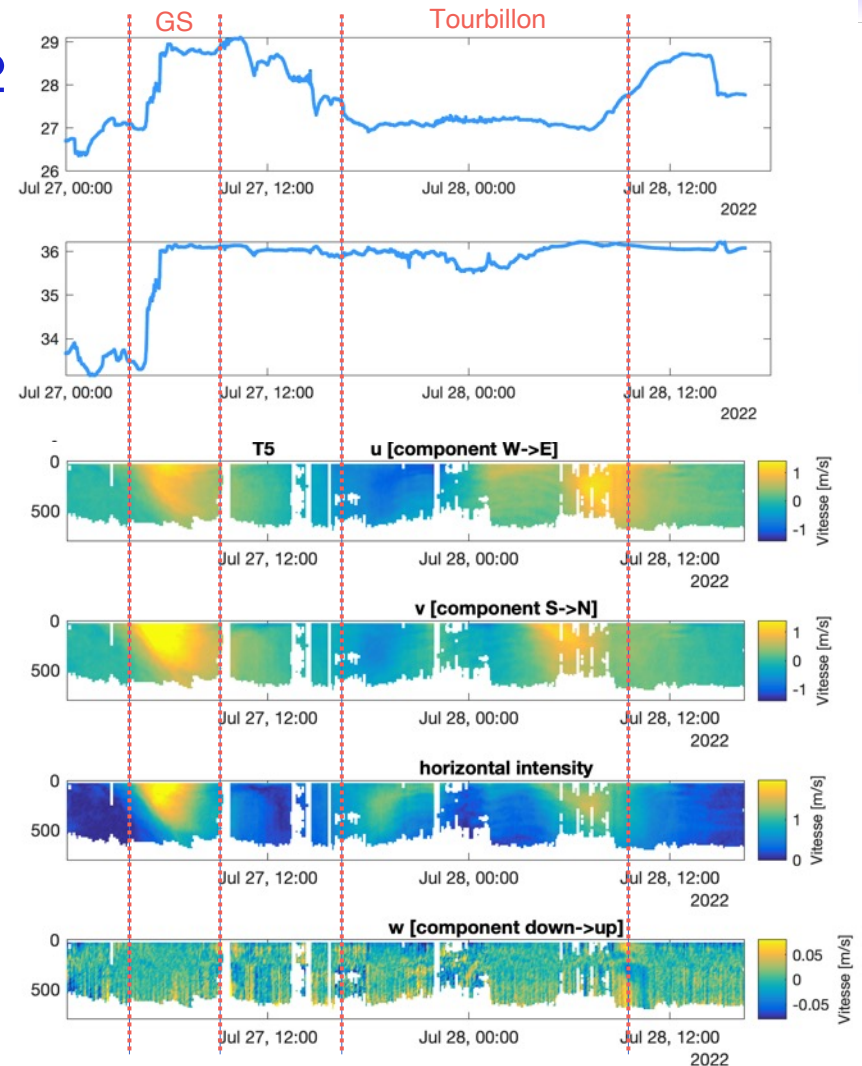
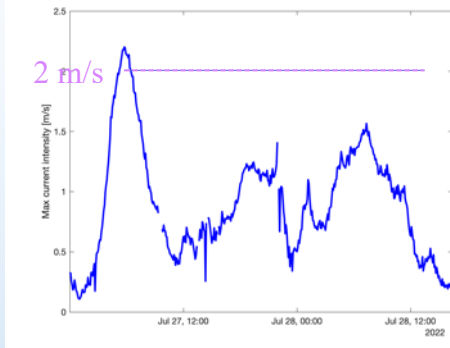


ADCP de coque

FIGURE (M. Benavides) Gulf Stream 2022



Current intensity (m/s)



Structures de vitesses verticales fronts

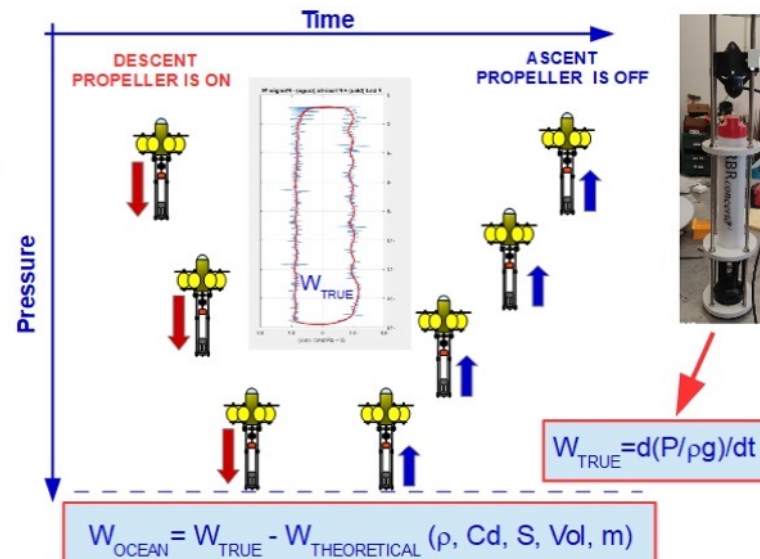
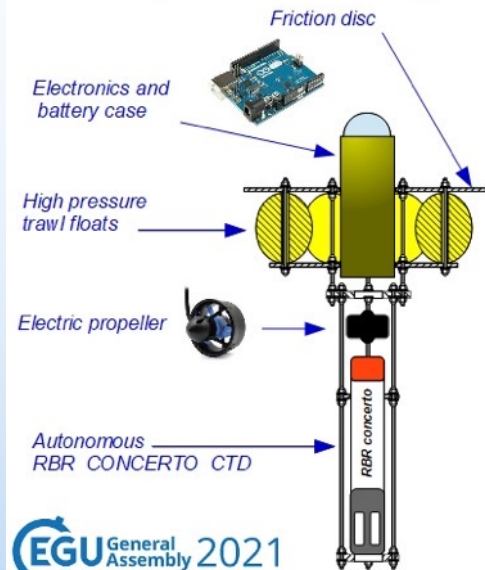
Vertical Velocity Profiler (VVP)

⚓ VVP (Fuda *et al.*, EGU 2021): profiler autonome

A new approach for measuring ocean vertical velocities

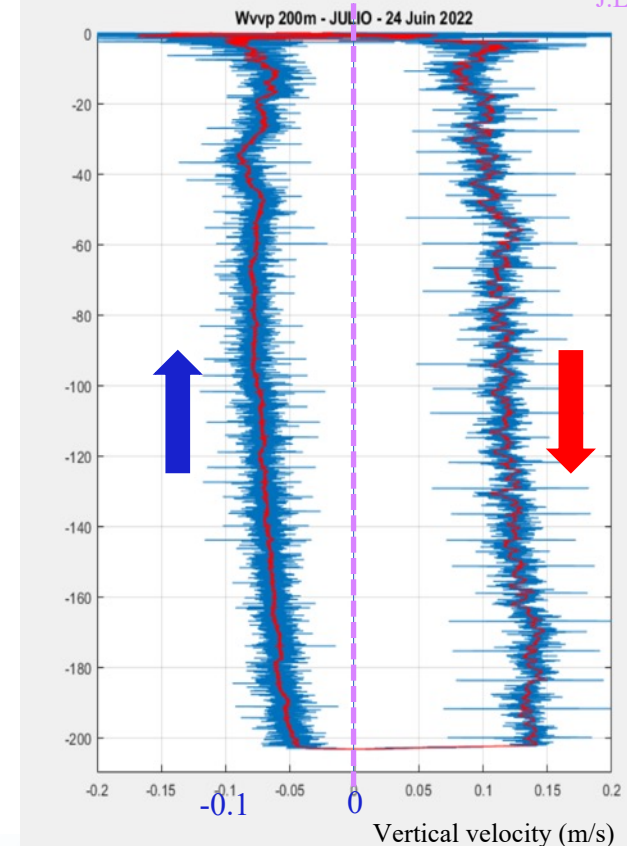


Fuda, J.-L.^{*1}, Barrillon, S.¹, Doglioli, A.², Petrenko, A.², Gregori, G.¹, Tzortzis, R.², Comby, C.², Thyssen, M.¹, Lafont, M.², Bhairy, N.¹, Malengros, D.¹, Guillemain, D.¹, and Grenz, C.¹



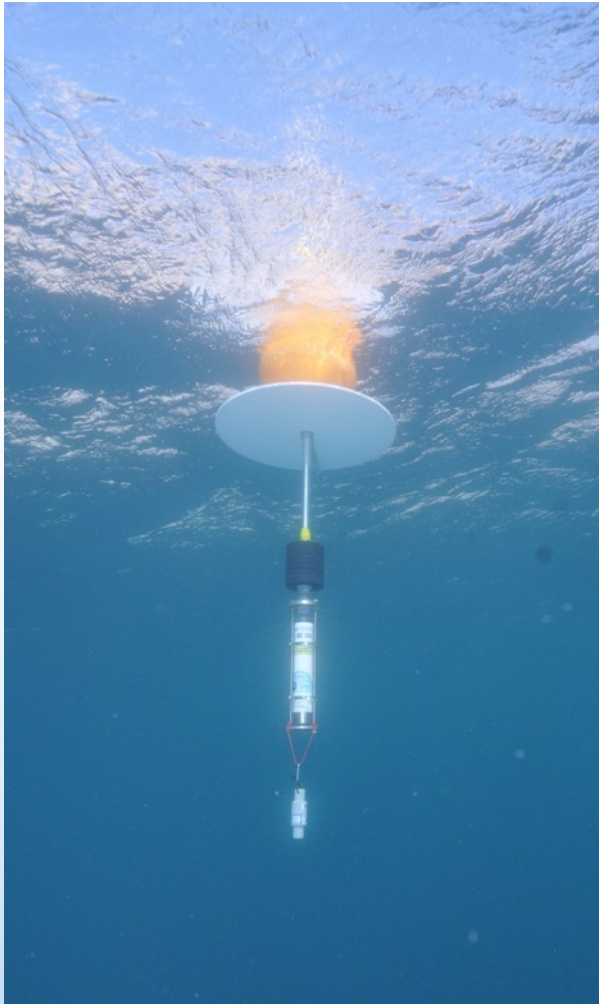
Premier 200 m profil (2022)

J.L. Fuda



Vertical Velocity Profiler (VVP)

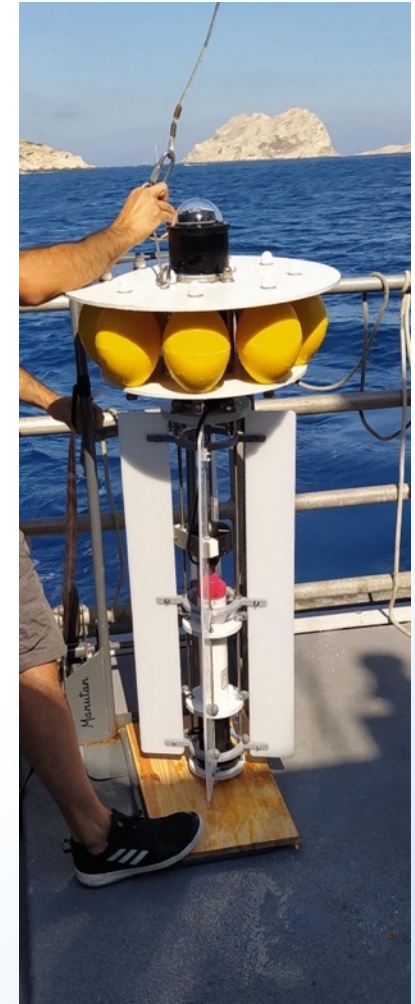
2019



2021



2022

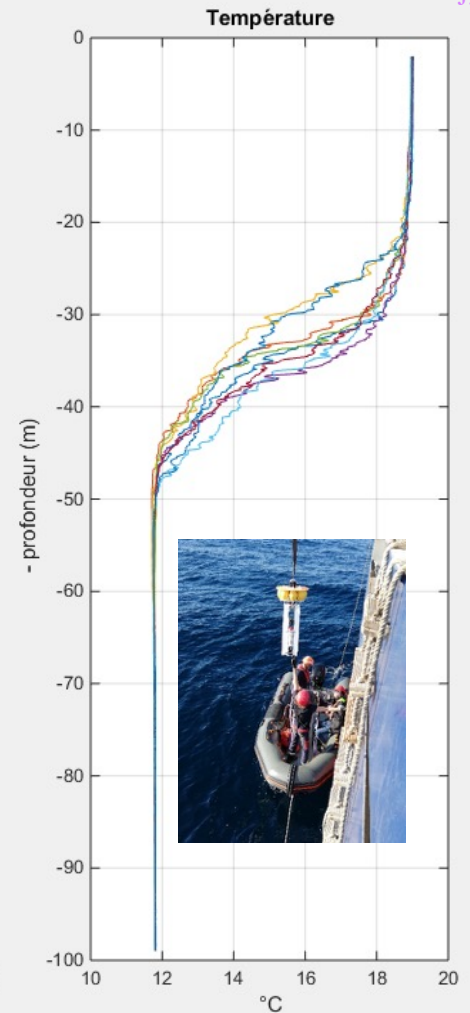
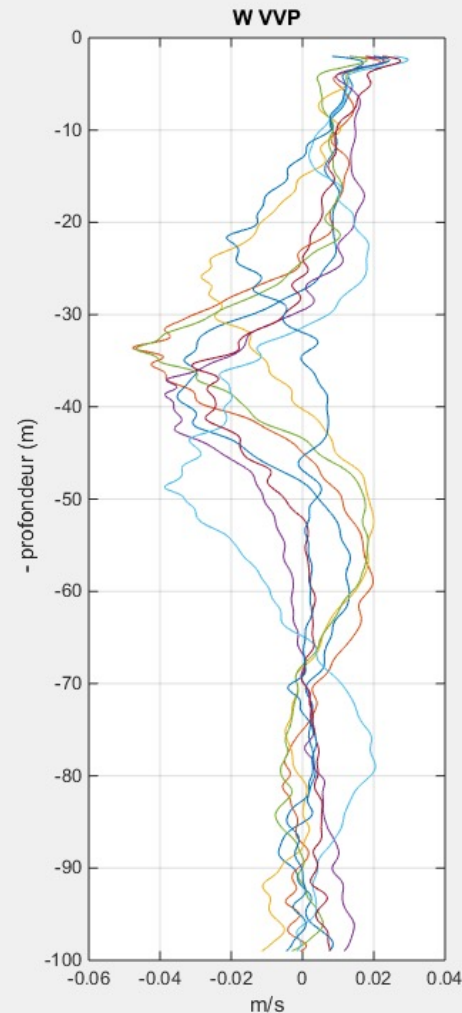
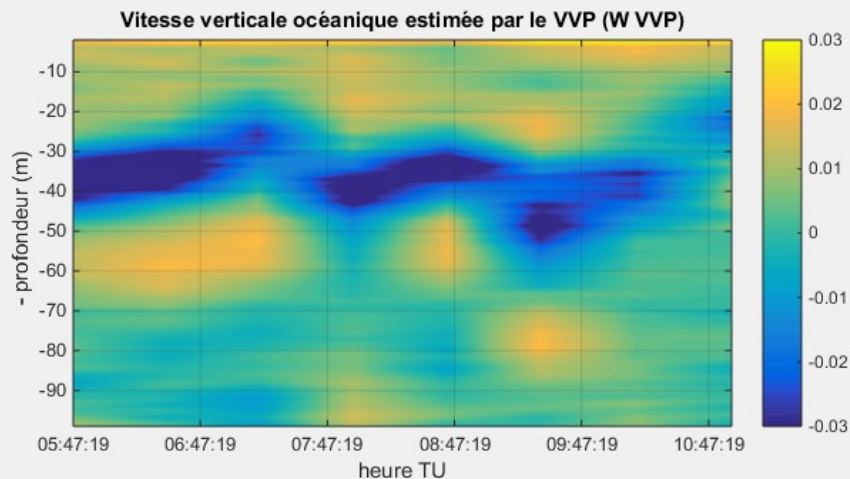
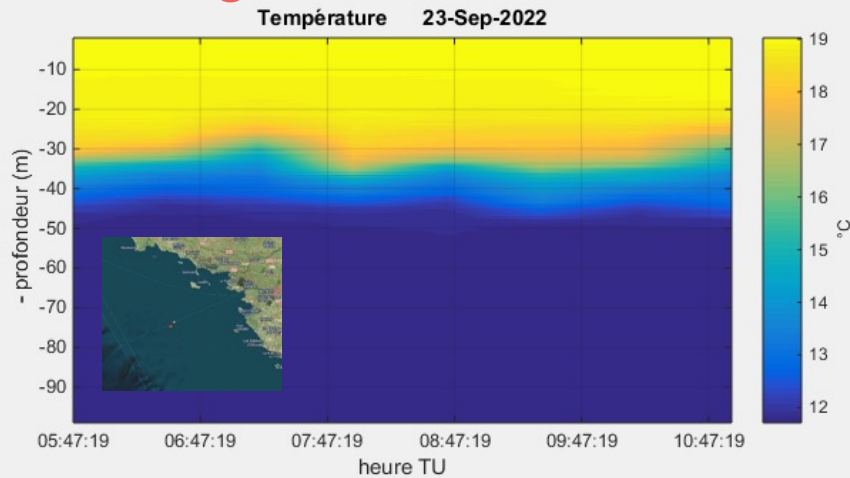


Vertical Velocity Profiler (VVP)



Gascogne 2022, ondes internes

J.L Fuda

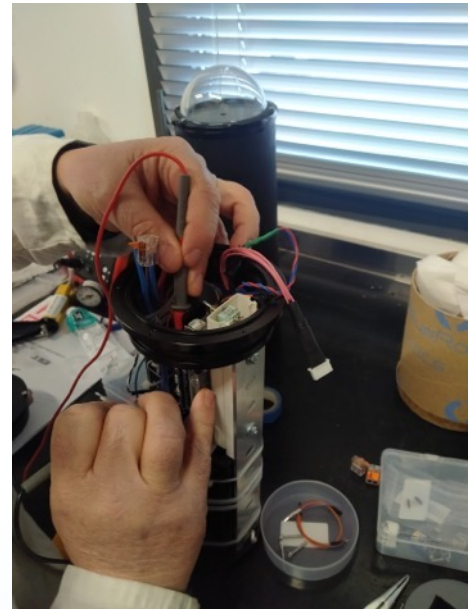
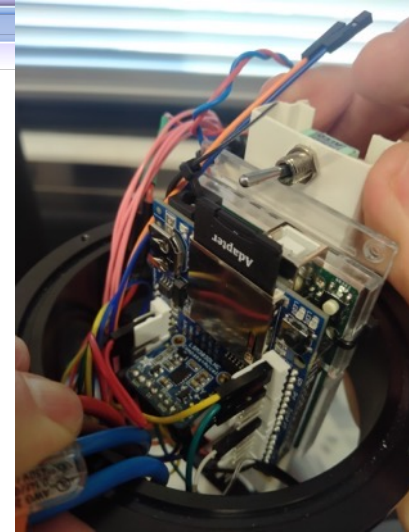
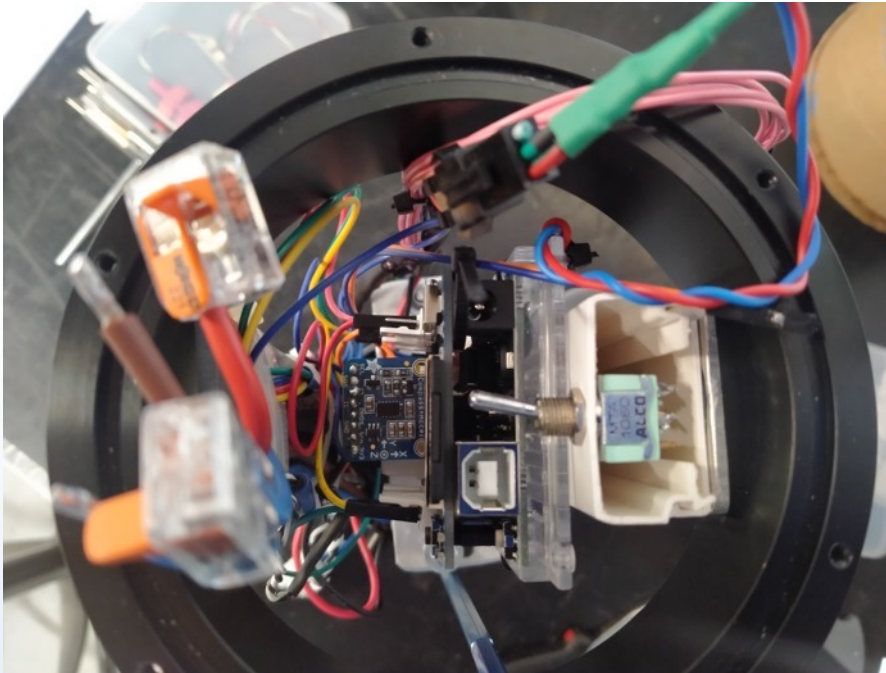


Vertical Velocity Profiler (VVP)



En préparation pour BioSWOT-Med

- Nouveau : conception système électronique
- Deuxième VVP

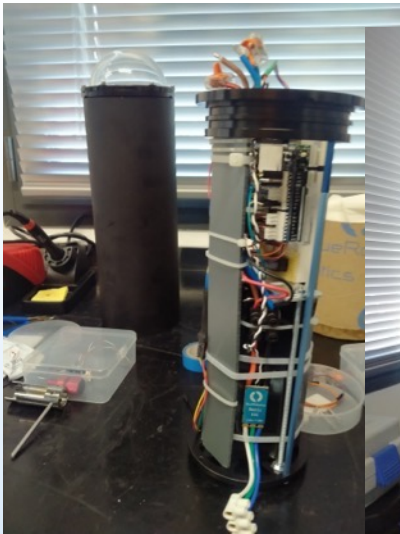


Vertical Velocity Profiler (VVP)



En préparation pour BioSWOT-Med

- Nouveau : conception système électronique
- Deuxième VVP



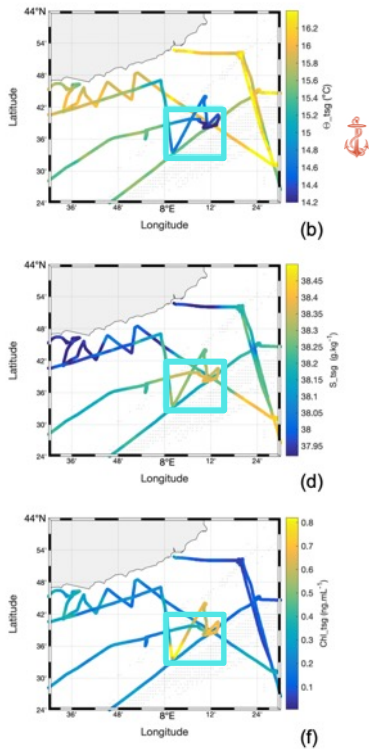
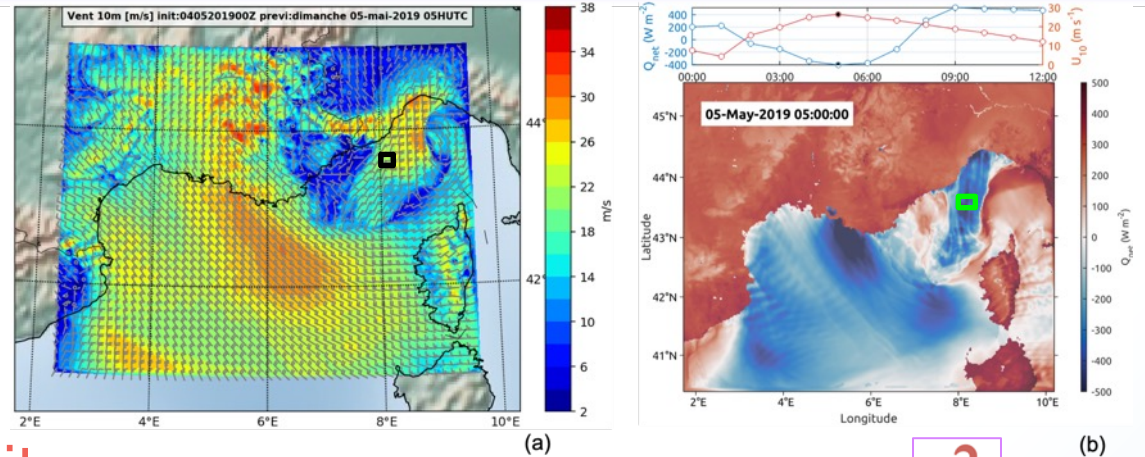
Test 01/03/2023

Tempête FUMSECK

Barrillon et al., 2023

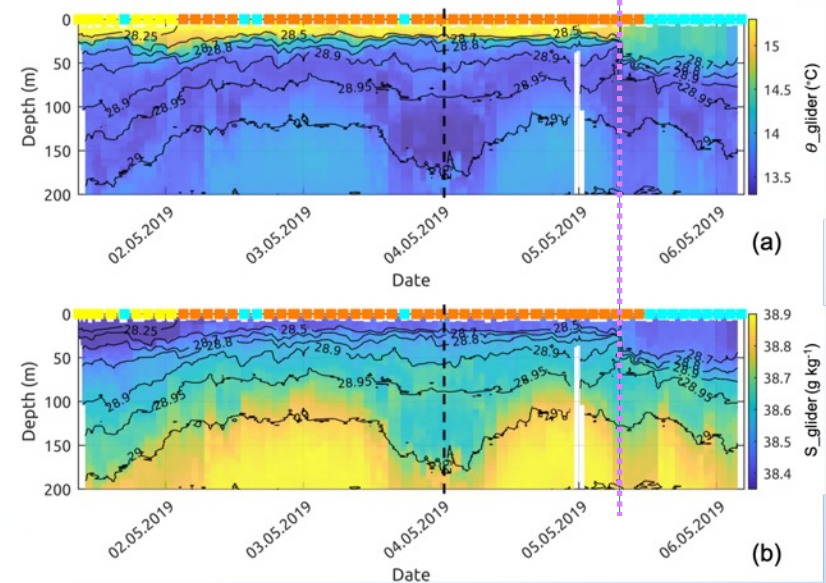
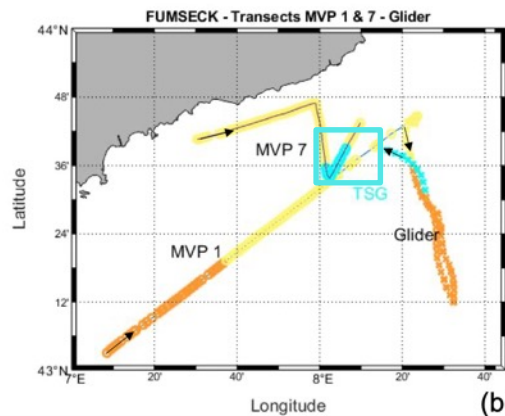
Tempête intense

- Vents atteignant 130 km/h
- @Toulon : 1 / 2 ans
mais 1 / 30 ans en mai



Mesures in situ

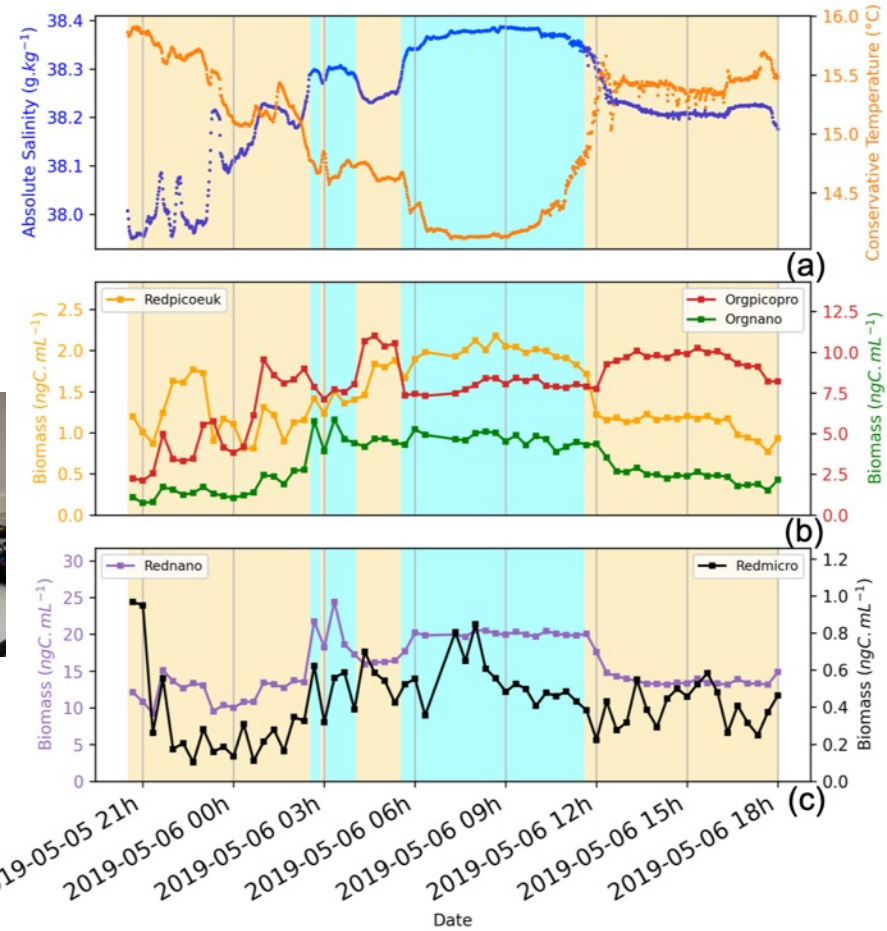
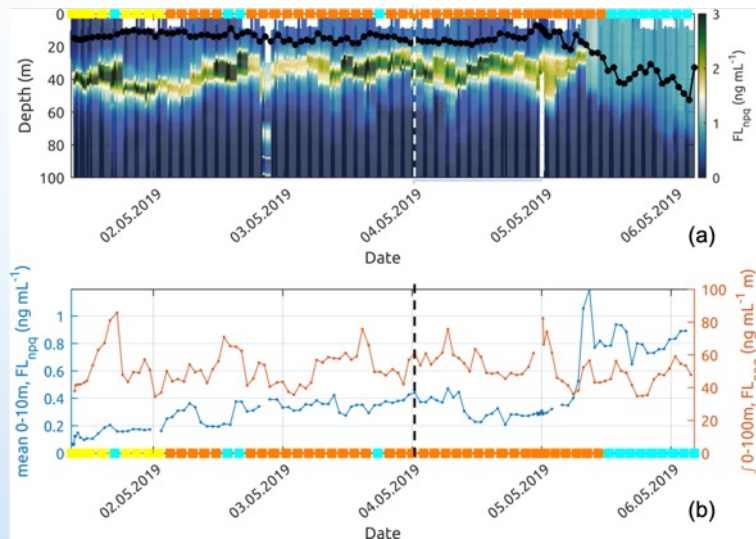
- masse d'eau froide vue par TSG et Glider



Tempête FUMSECK

⚓ Mesures couplées phys/bio

- Masse d'eau provenant de 60m
- Approfondissement couche mélange
- Dilution DCM par mélange
- ↗ Chla et nutriments surface
- ↗ biomasse (sauf orgpicopro)

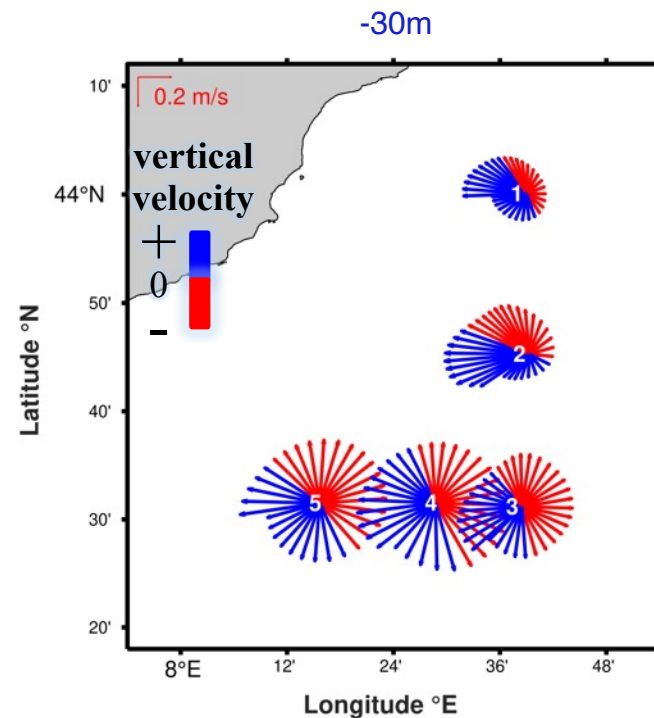
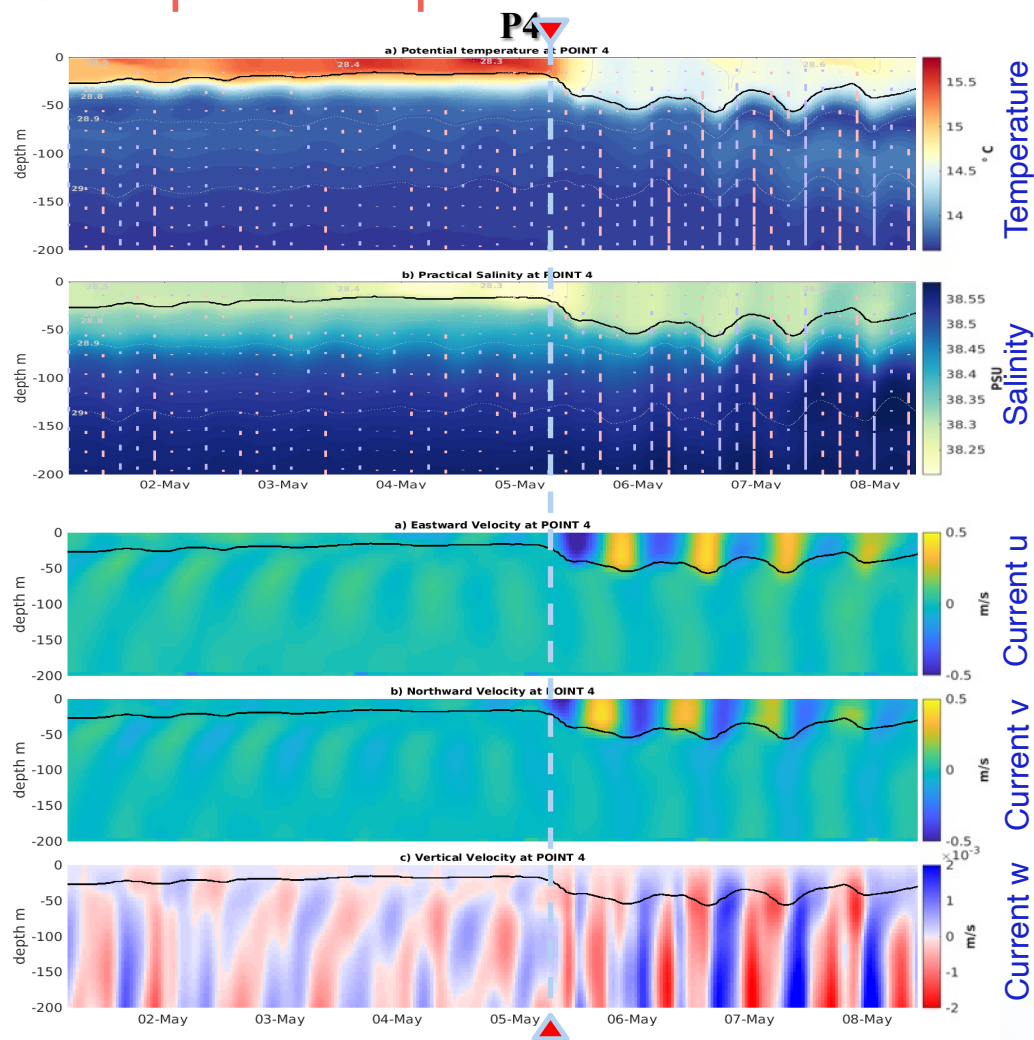




Impact tempête FUMSECK

Comby et al., en préparation

Caroline Comby

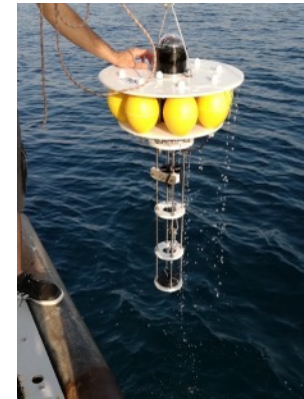
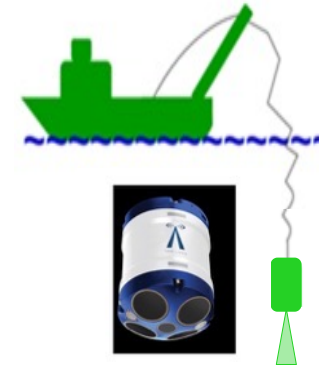


- Approfondissement couche mélange
- Intensification courant (horizontal et vertical)
- Ondes quasi-inertielles

Conclusions et perspectives

⚓ Totalité des données FUMSECK exploitées

- 🗨 Vitesses verticales → Comby et al. 2022
- 🗨 Couplage phys/bio → Barrillon et al. 2023
- 🗨 Modélisation → Comby et al. en préparation
- 🗨 Conférences, réseaux sociaux, médias ...



⚓ Vitesses verticales

- 🗨 Projet LEFE FUMSECK-vv 2021-2023 (*S. Barrillon, A. Petrenko*)
→ instruments vitesses verticales
- 🗨 Campagne BioSWOT-Med (*A. Doglioli, G. Grégori*)
→ vitesses verticales et fines échelles
- 🗨 Projet SeaLab AMIDEX 2023 - 2026 (*P. Le Gal*) → labo / in situ
- 🗨 Projet HOPE-vv AMIDEX (*A. Petrenko*, en attente)
→ vitesses verticales et pompe à carbone
- 🗨 Projet ANR PRME VV-MIMOSA (*S. Barrillon*, à resoumettre)
→ multi-plateforme