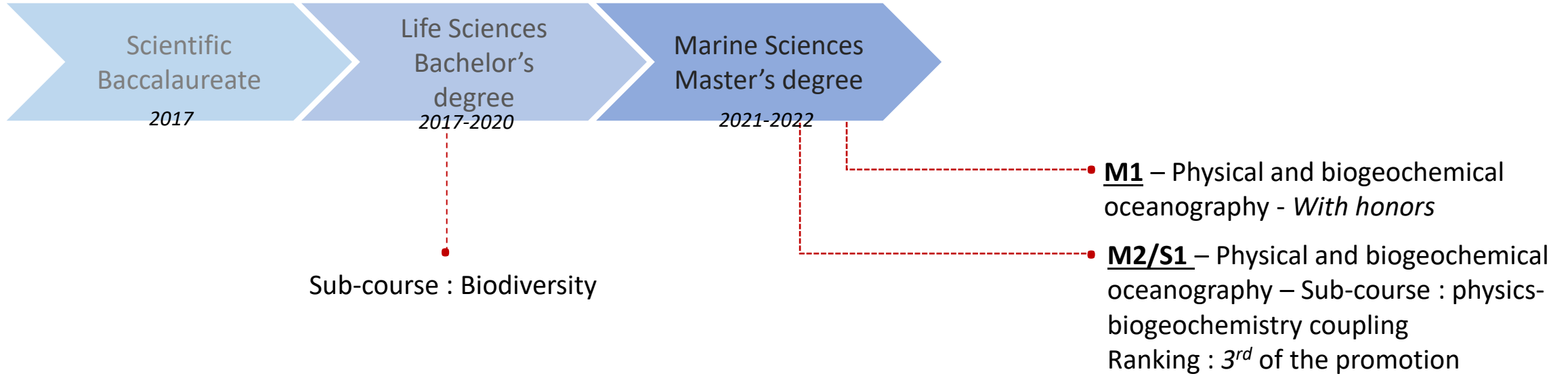


Interview PhD : Lagrangian study of small-scale physical-biological coupling

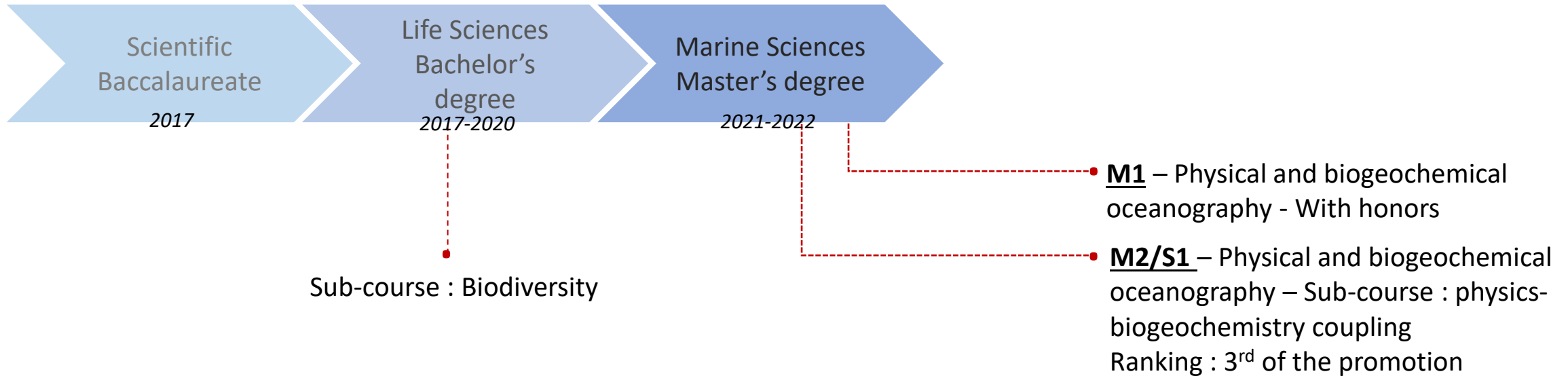
Laurina Oms

June 2, 2022

❖ Academic background



❖ Academic background



❖ Now

M2/S2 – Internship (M.I.O) :

Study of the physical-biological coupling at fine scales

Supervisors: G. Grégori and A. Doglioli

❖ Other activities

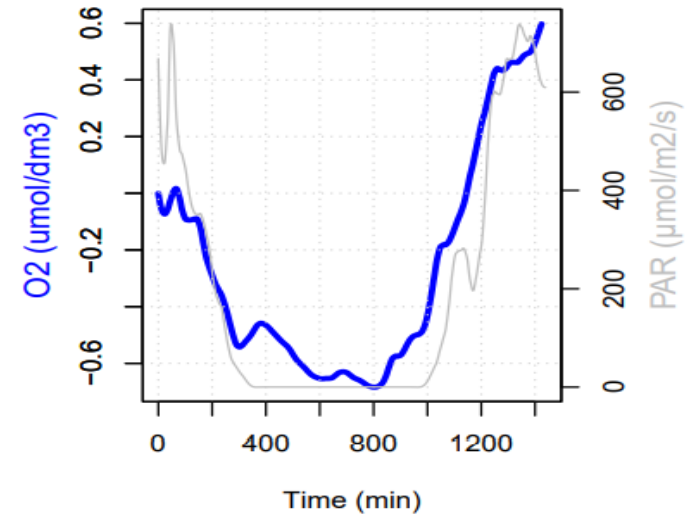
Animator in leisure center for children
Volunteering in few associations

Research activities

❖ Voluntary internship – May to June 2021

Parametrization of oxygen dynamics

Supervisor : D.Lefevre

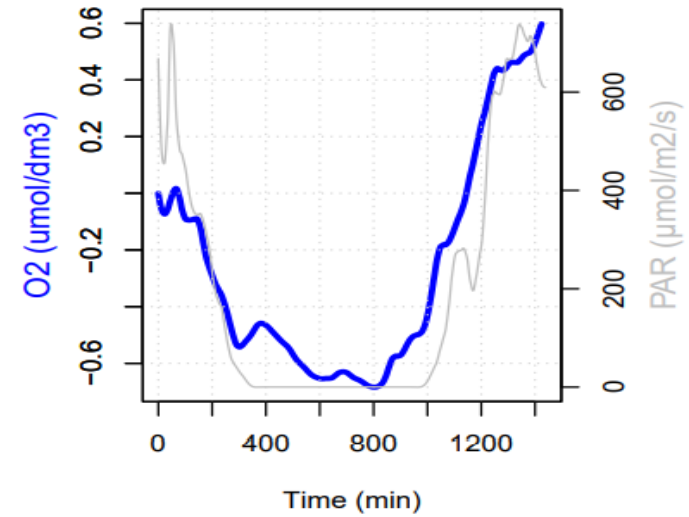


Research activities

❖ Voluntary internship – May to June 2021

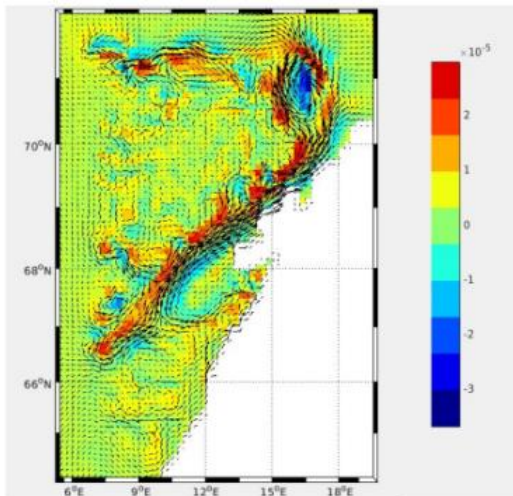
Parametrization of oxygen dynamics

Supervisor : D.Lefevre

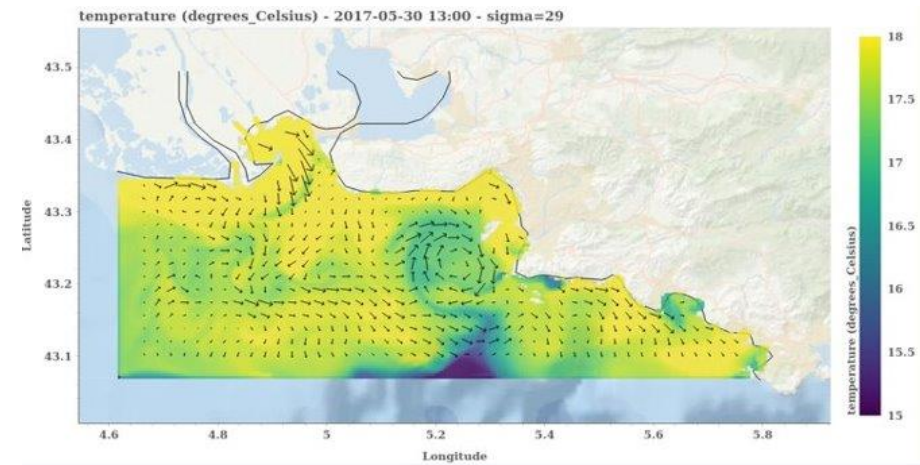


❖ Modeling projects

✓ M1 (2021) : Modeling of water circulation along the Norwegian west coast with the CROCO model



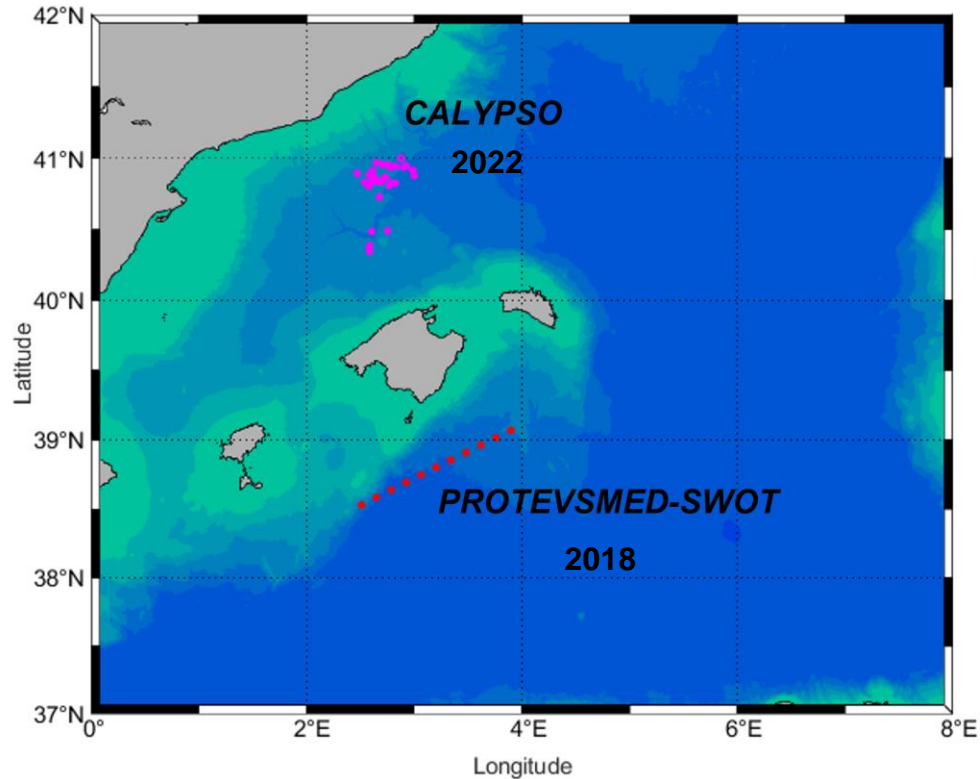
✓ M2 (2021) : Study of the biological dynamics in the Marseilles eddy with coupled model (physics/biogeochemistry)



Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?



CALYPSO

PI : A. Mahadevan - Woods Hole
Oceanographic Institution
PI : E. d'Asaro – University of
Washington

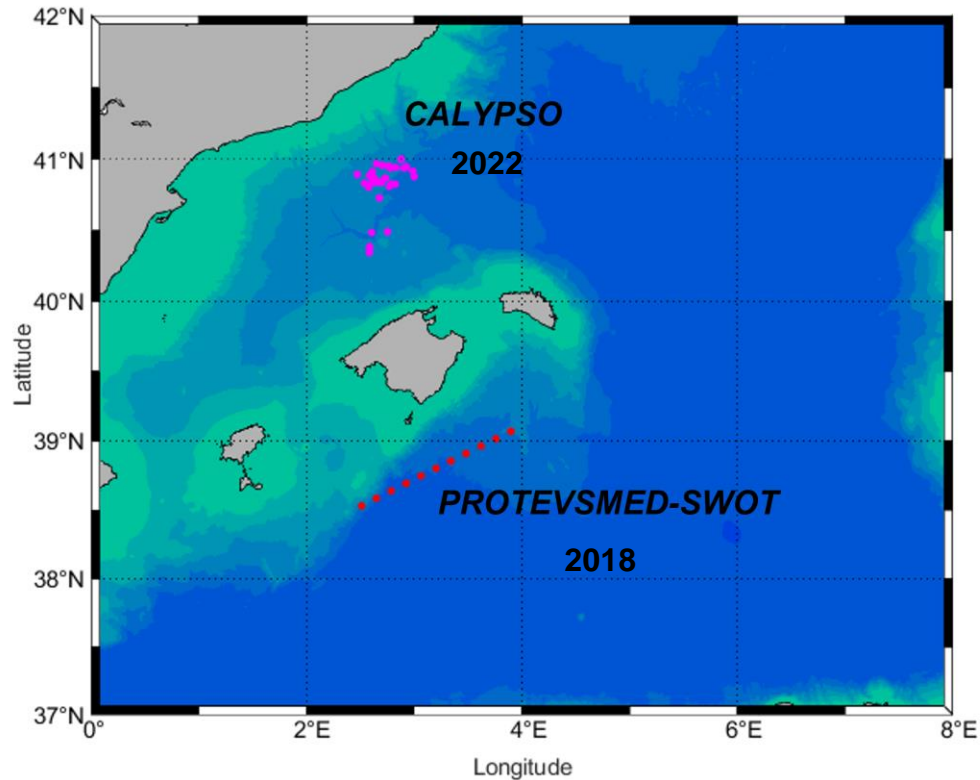
PROTEVSMED-SWOT

PI : F. Dumas - SHOM

Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?

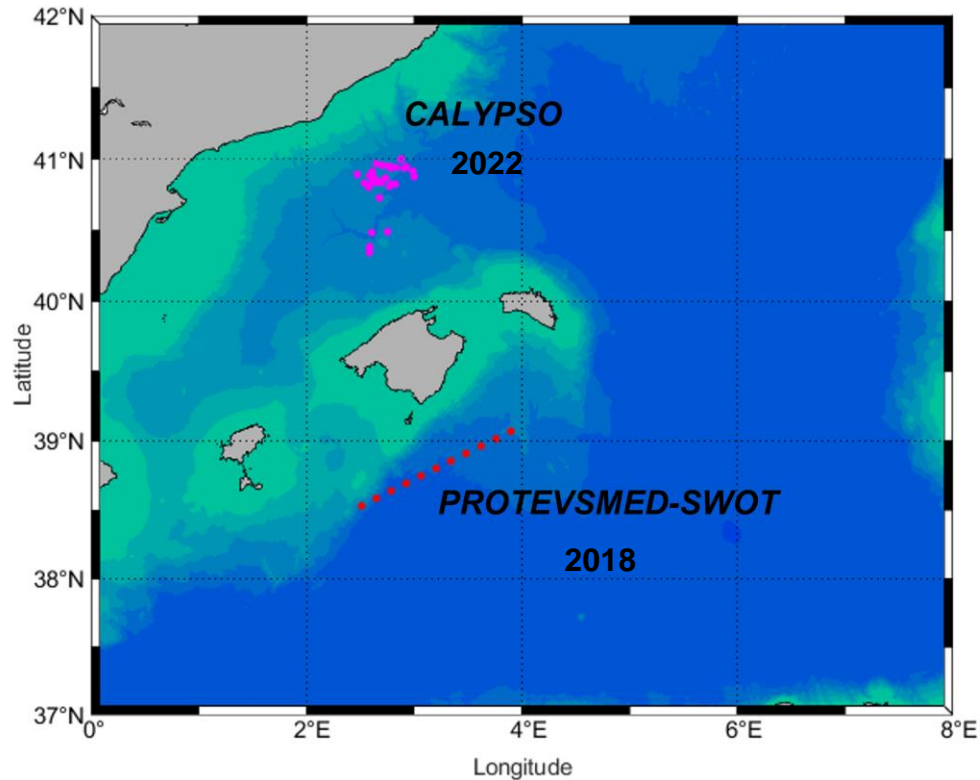


- **Adaptative Lagrangian strategy**

Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?

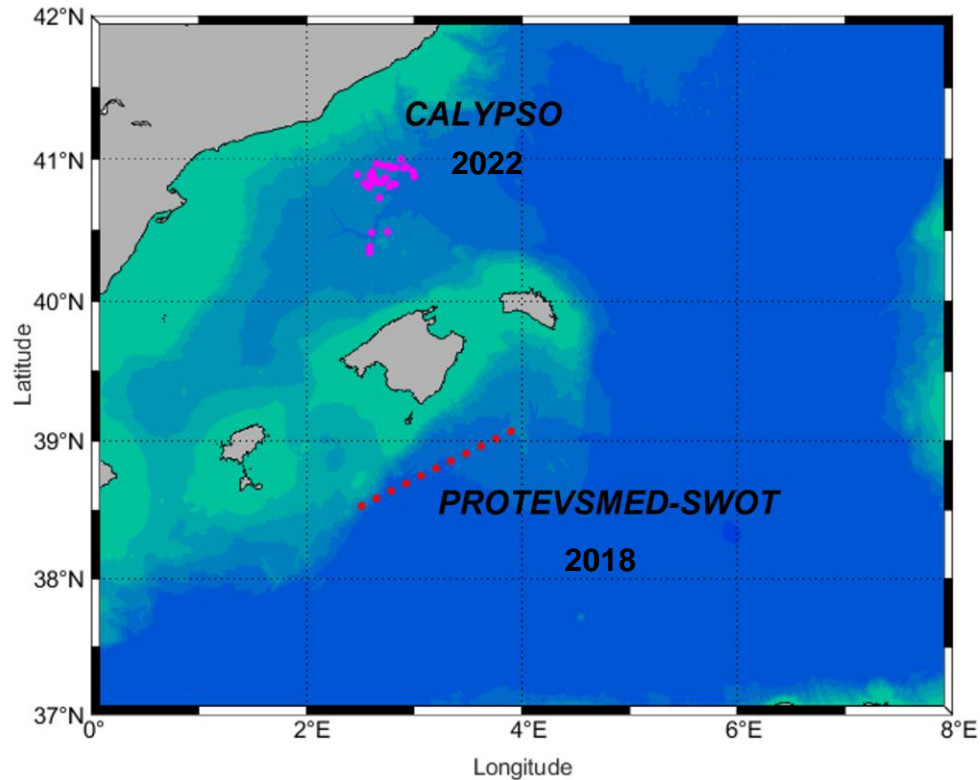


- **Adaptative Lagrangian strategy**
- **Cytometric analysis**

Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?

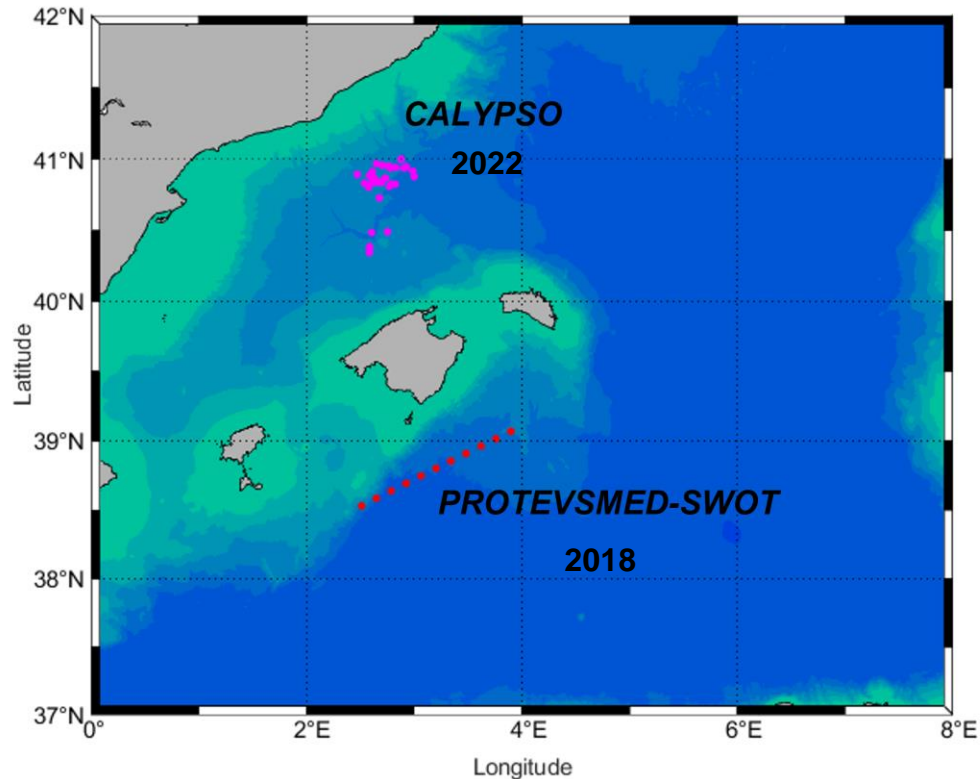


- **Adaptative Lagrangian strategy**
- **Cytometric analysis**
- **Surface and depth view**

Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?

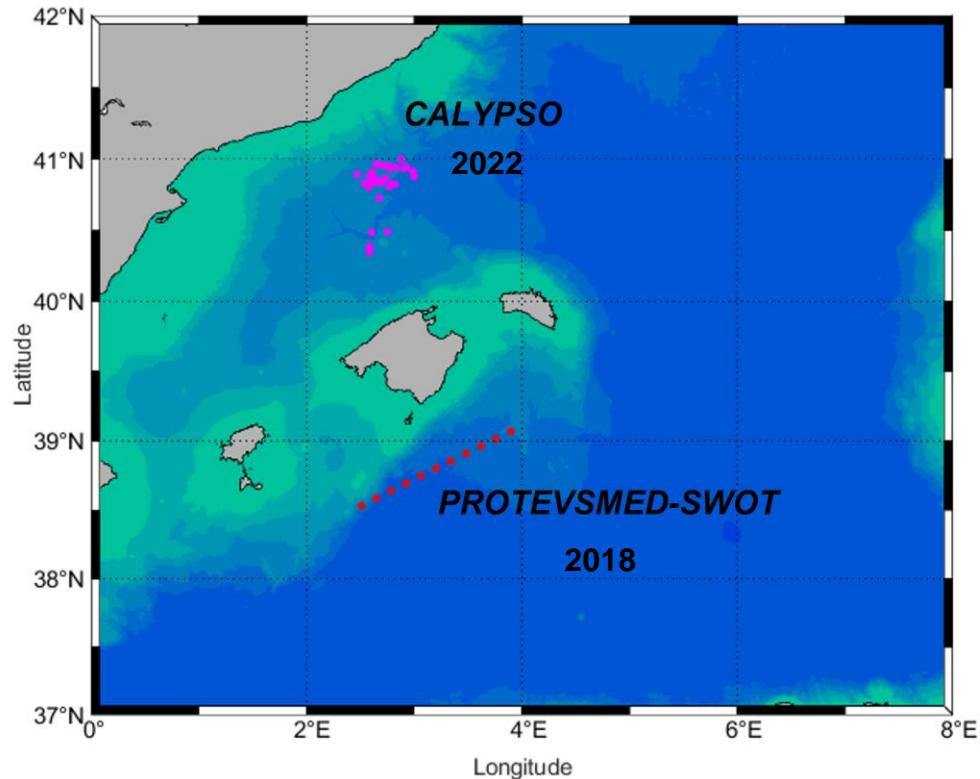


- **Adaptative Lagrangian strategy**
- **Cytometric analysis**
- **Surface and depth view**
- **Frontal region VS swirling region**

Research activities

❖ Master 2 Internship – January to June 2022

How do phytoplankton organisms organize themselves on the scale of physical processes such as fronts and eddies?



- **Adaptative Lagrangian strategy**
- **Cytometric analysis**
- **Surface and depth view**
- **Frontal region VS swirling region**

International
collaborations

Fondation
taraocéan
explorer et partager



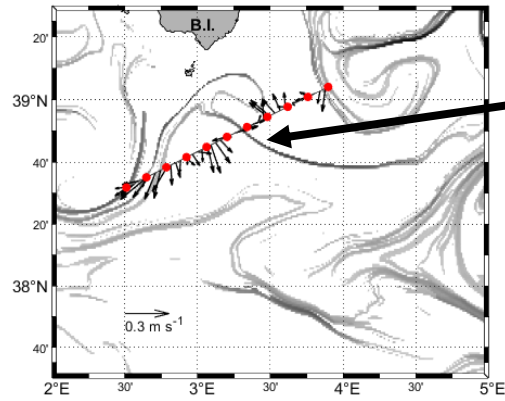
- CALYPSO team : futur article in view on biophysical coupling
- Fondation TARA OCEAN : investment in the South Atlantic 2022 mission follow-up

Research activities

❖ Master 2 Intership – January to June 2022

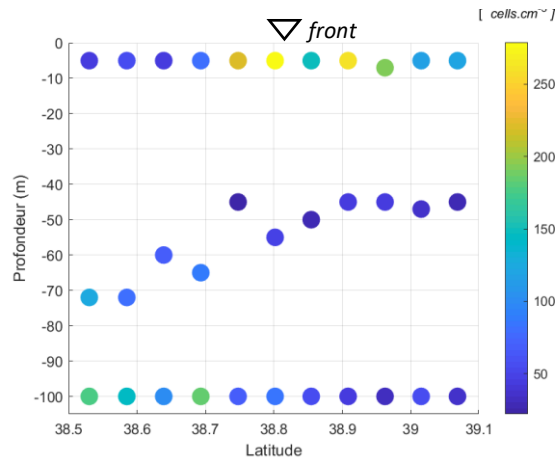
Results

Southern Balearic Island (PROTEVSMED-SWOT)



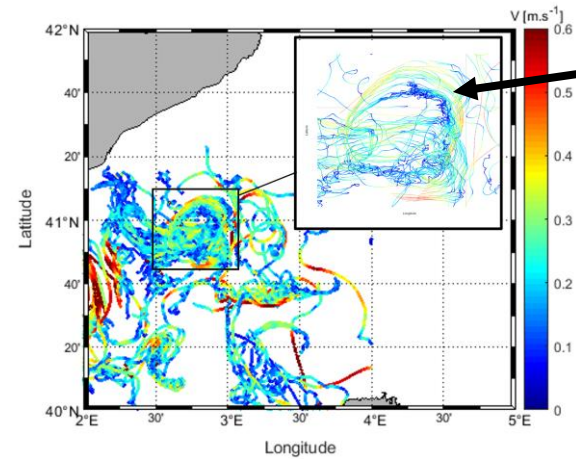
Physical frontal area

Microphytoplankton



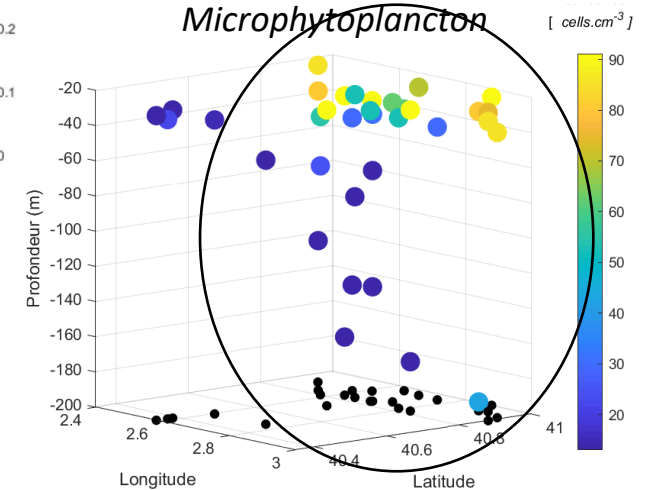
Front separating 2 water masses and so phytoP groups and abundances down to -100m

Northern Balearic Island (CALYPSO)



Cyclone from an energy cascade

Microphytoplankton



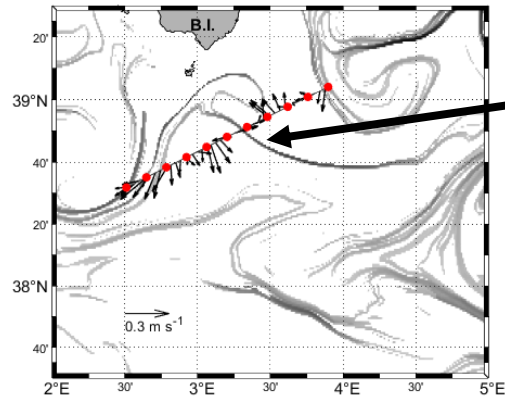
Constrasted abundance inside the eddy with high value to -195m

Research activities

❖ Master 2 Internship – January to June 2022

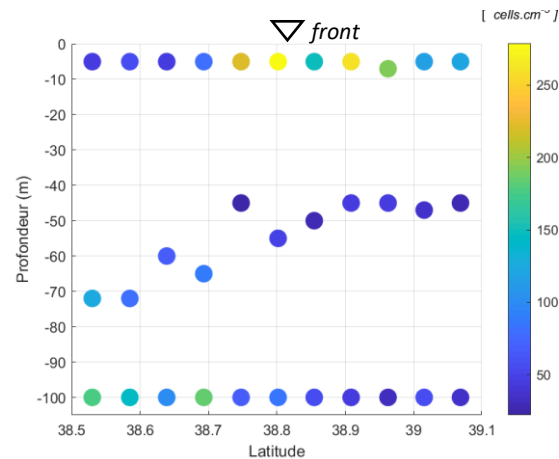
Results

Southern Balearic Island (PROTEVSMED-SWOT)



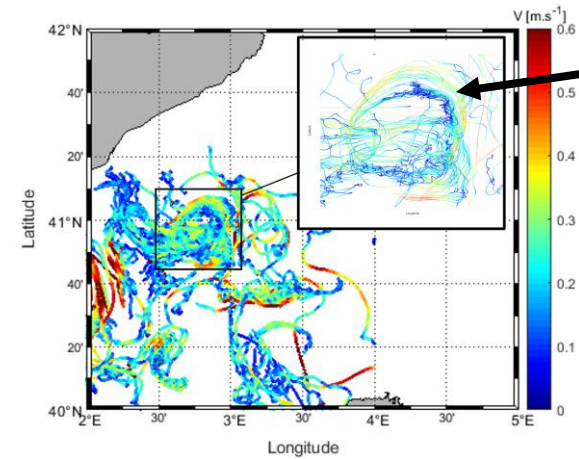
Physical frontal area

Microphytoplankton



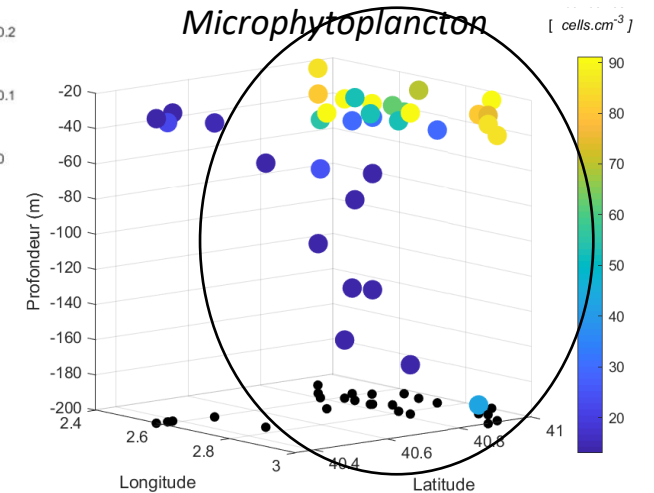
Front separating 2 water masses and so phytoP groups and abundances down to -100m

Northern Balearic Island (CALYPSO)



Cyclone from an energy cascade

Microphytoplankton



Constrasted abundance inside the eddy with high value to -195m

Take home message :

My work shows that fine scale coupling acts also in the water column according to the type of physical structure

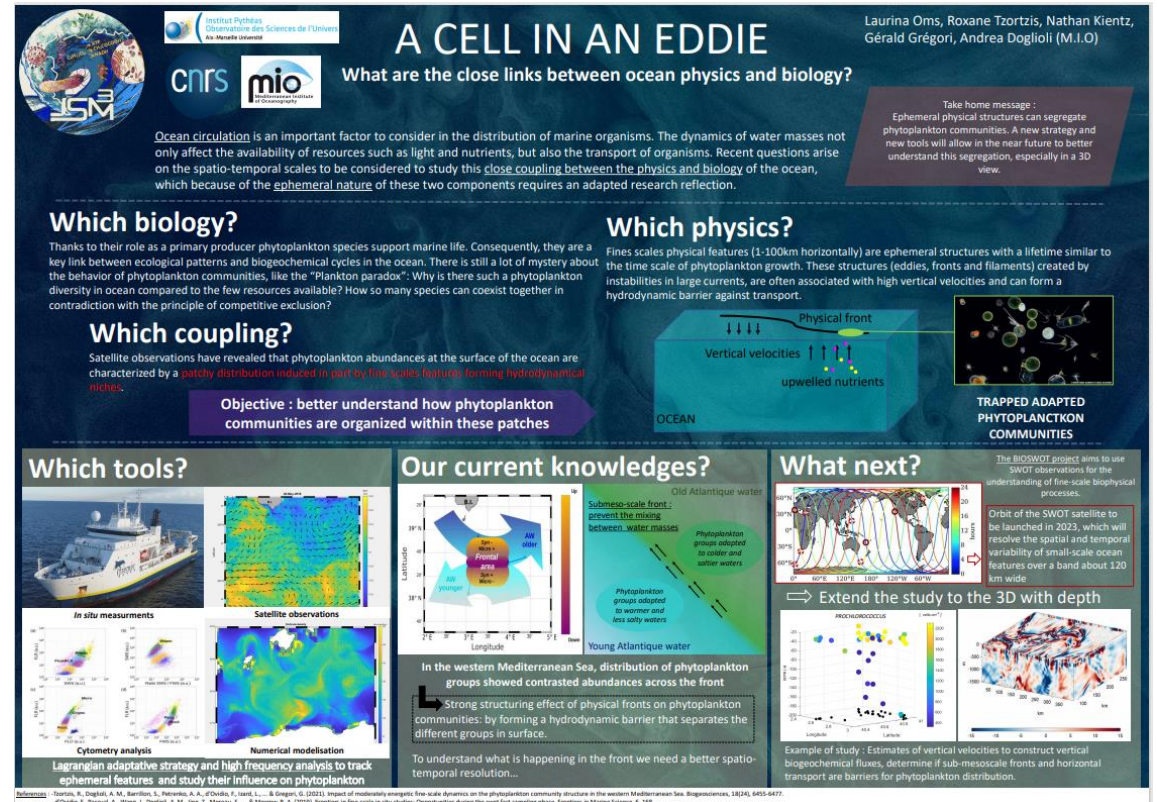
Research activities

❖ Master 2 Internship – January to June 2022

Congress

Presentation of my subject in JSM3 (*Junior Scientists Microbiology Meeting of Marseille*) 2022 international congress through a poster

1st prize of the best poster



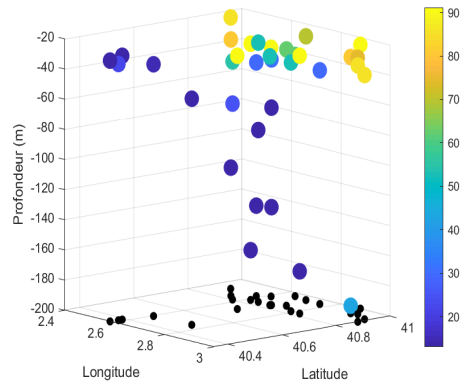
What next ?

❖ PhD interest application

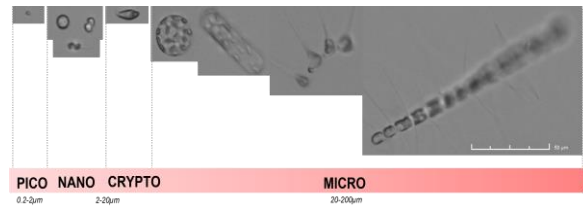
BIOSWOT

- Learn more about my questions on vertical phytoplankton distribution and communities at fine scale thanks to higher resolution and frequency data from a **Lagrangian approach**

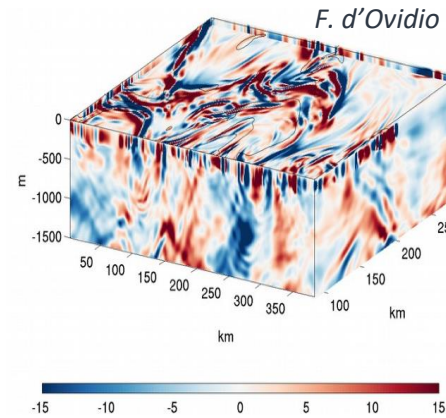
3D structures of phytoplankton abundances



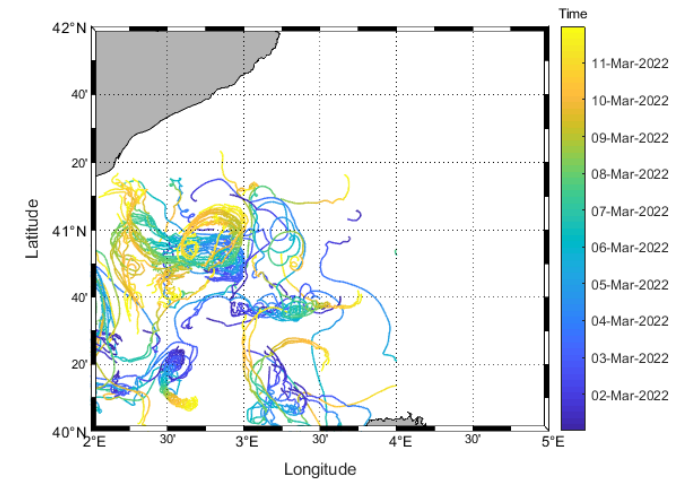
Phytoplankton diversity



Vertical velocities



Lagrangian trajectories



Objectives :

- ✓ Estimates of vertical velocities to **construct vertical fluxes** : determine how sub-mesoscale fronts and 3D transport drive the phytoplankton distribution
- ✓ Determine **phytoplankton diversity on a 3D view** in sub-mesoscale features
- ✓ Use **numerical modeling** to understand phytoplankton 3D patterns at fine scales

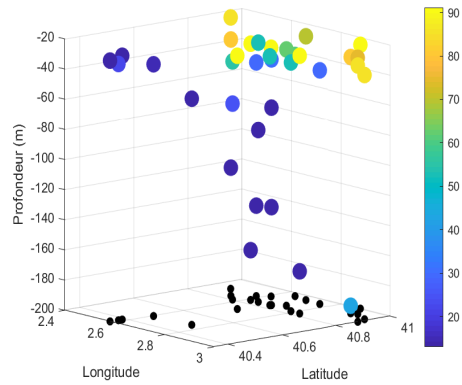
What next ?

❖ PhD interest application

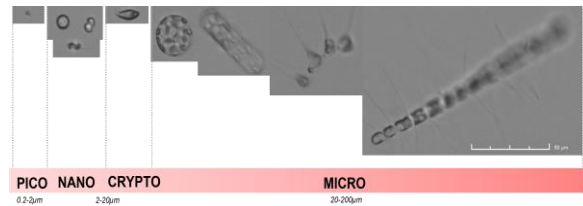
BIOSWOT

- Learn more about my questions on vertical phytoplankton distribution and communities at fine scale thanks to higher resolution and frequency data from a **Lagrangian approach**

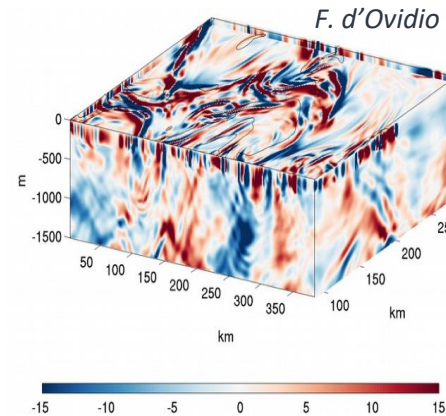
3D structures of phytoplankton abundances



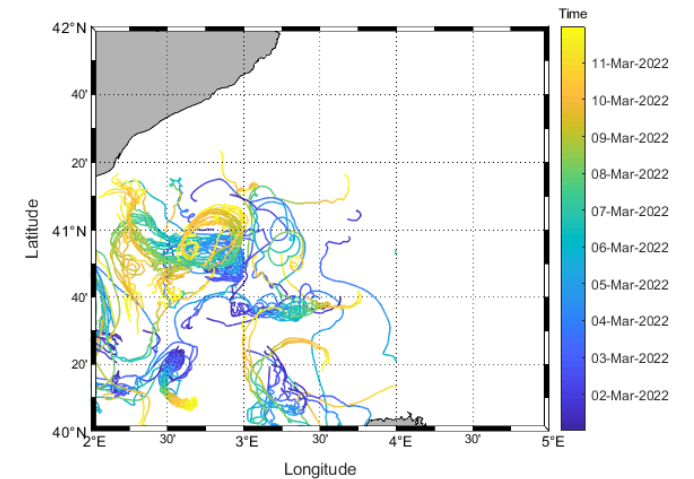
Phytoplankton diversity



Vertical velocities



Lagrangian trajectories



Objectives :

- ✓ Estimates of vertical velocities to **construct vertical fluxes** : determine how sub-mesoscale fronts and 3D transport drive the phytoplankton distribution
- ✓ Determine **phytoplankton diversity on a 3D view** in sub-mesoscale features
- ✓ Use **numerical modeling** to understand phytoplankton 3D patterns at fine scales

And...

- Participate to the scientific vulgarization and communication

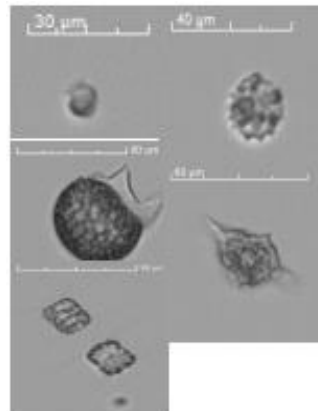
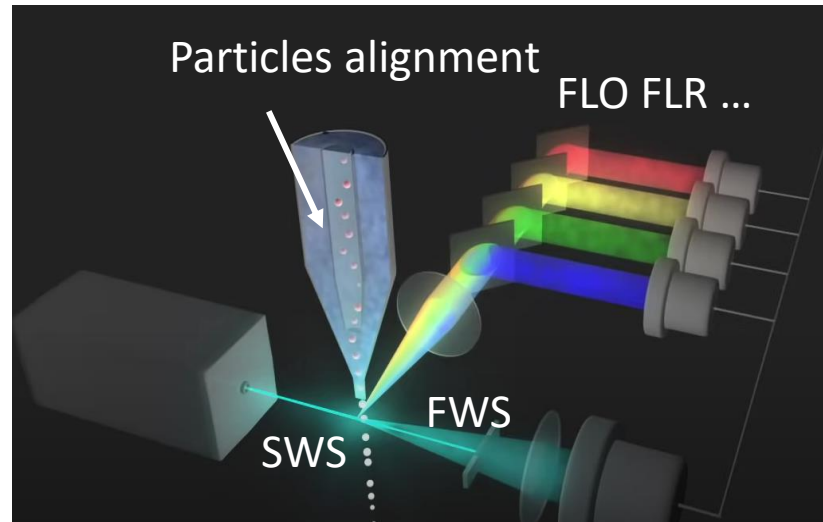
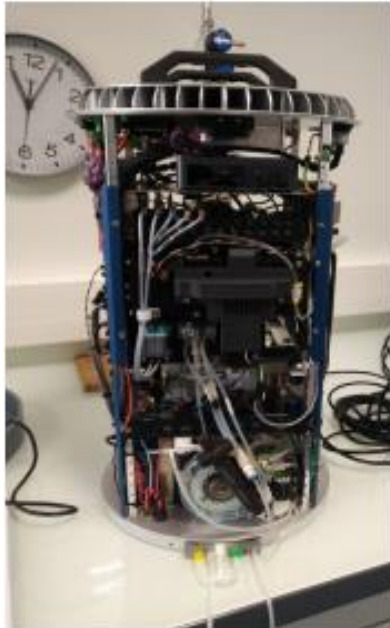
Thank you for listening !

Questions ?

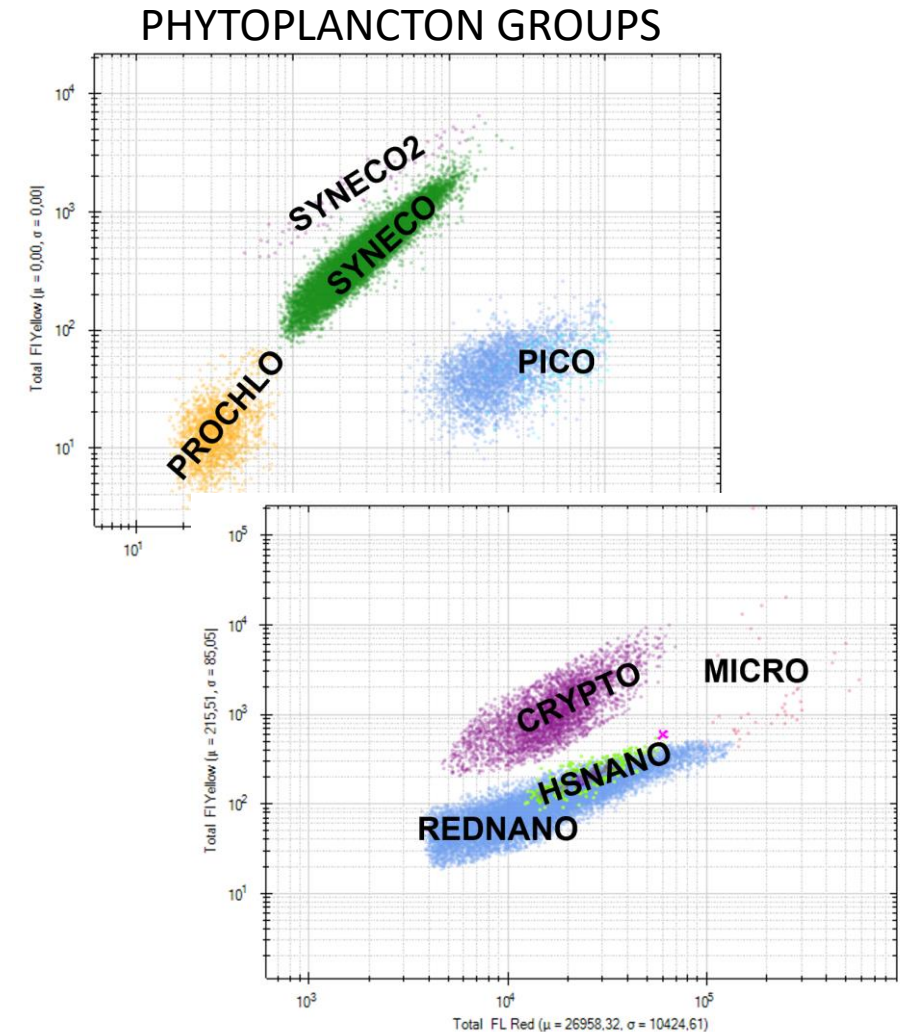


Fluxes cytometry

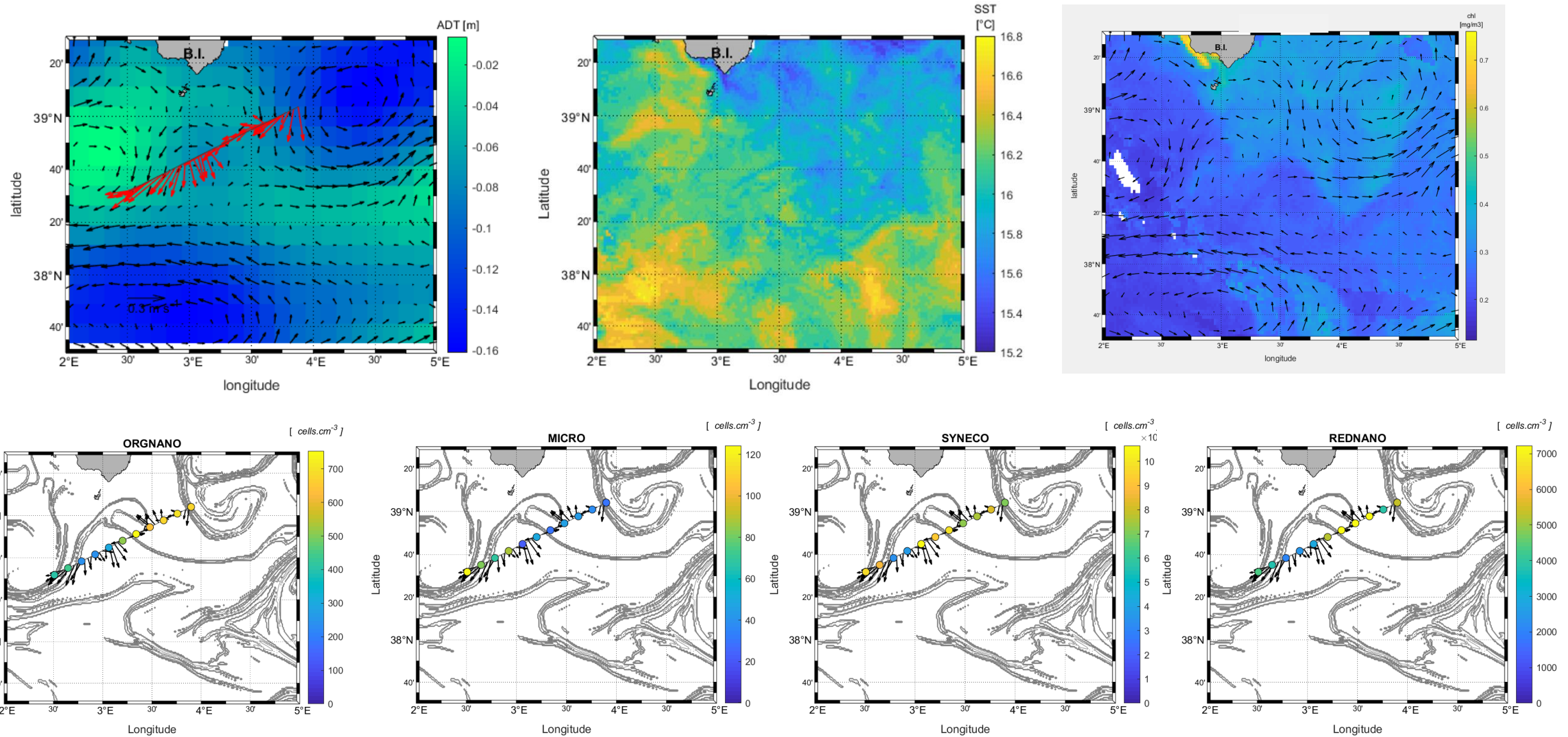
Automatic system able to perform high frequency analysis of seawater in order to identify several types of phytoplankton according to their size and optical properties



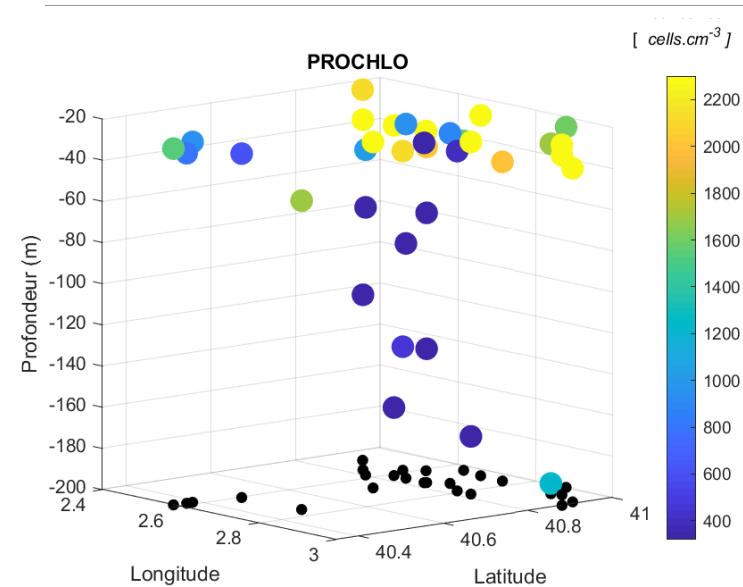
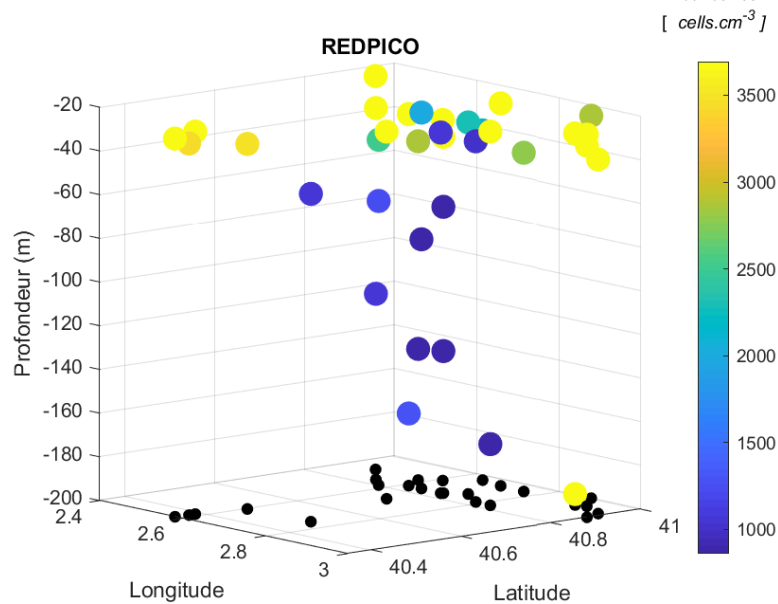
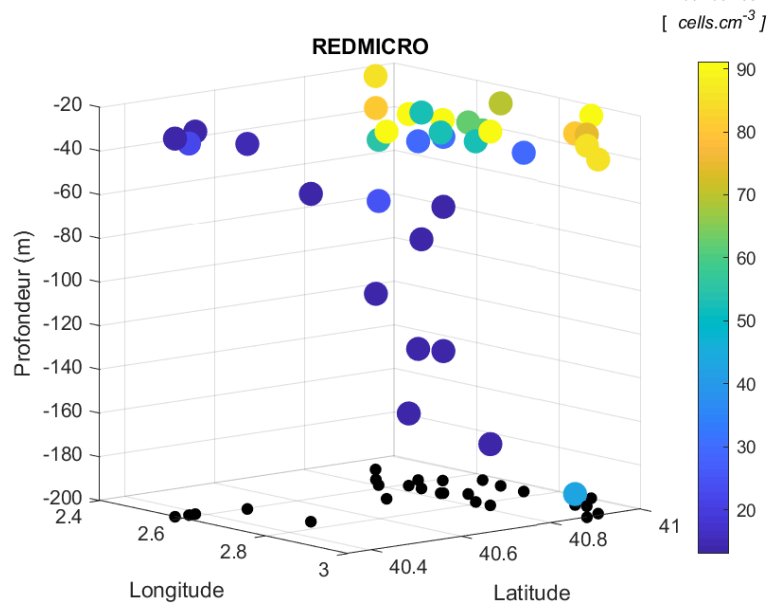
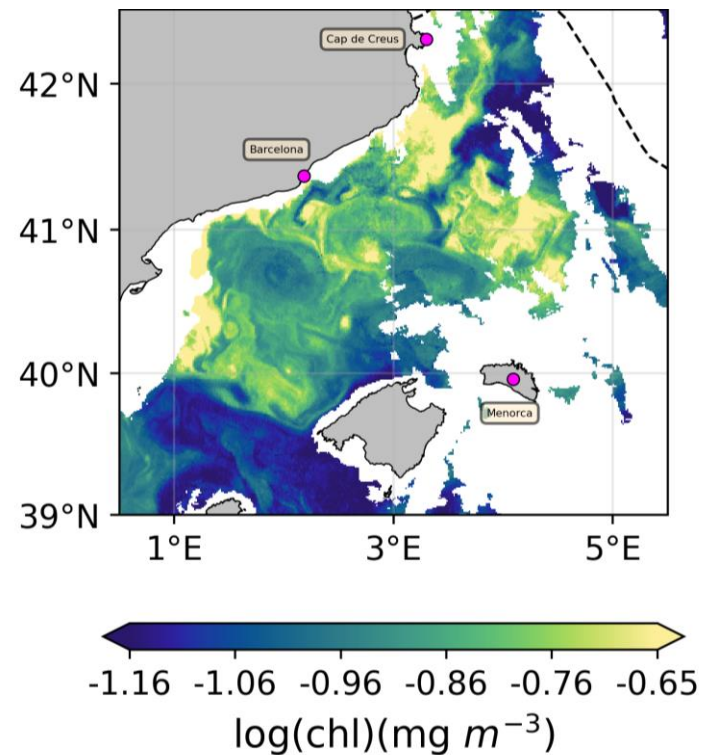
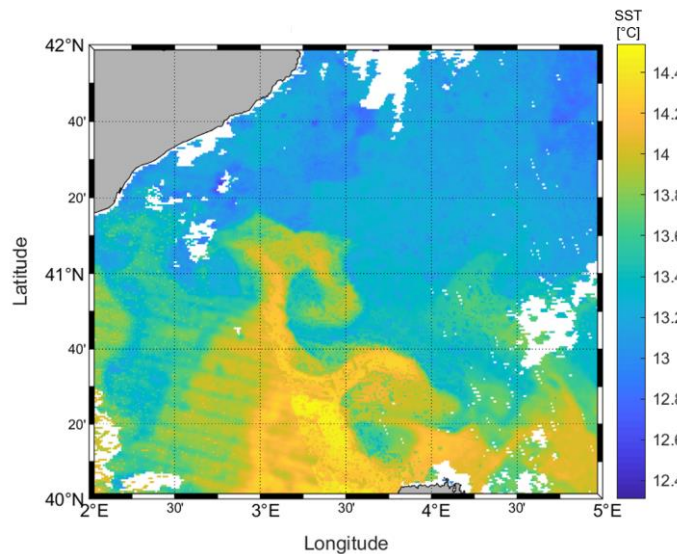
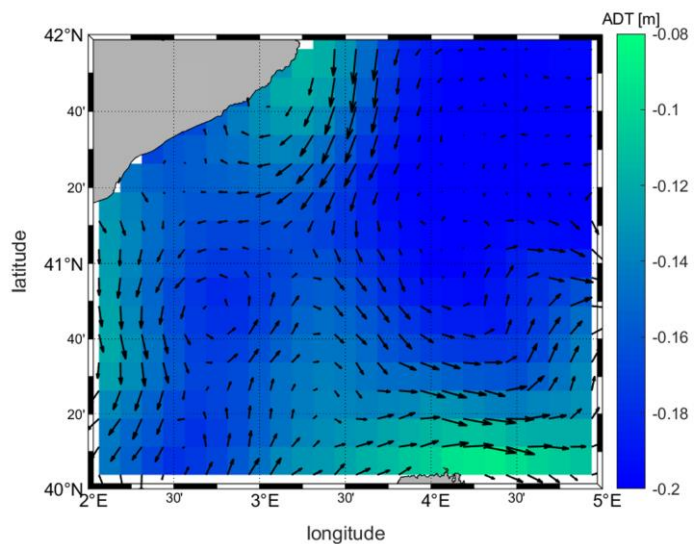
FWS : Forward angle light scatter
SWS : Sideward angle scatter
FLO : Orange fluorescence
FLR : Red fluorescence



South Balearic front



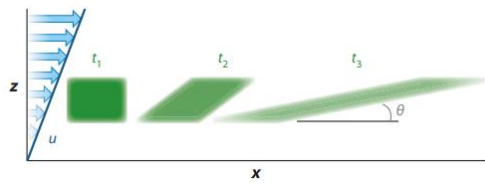
North Balearic eddy



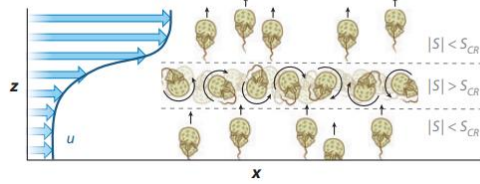
Deep phytoplankton layers

Hypothesis

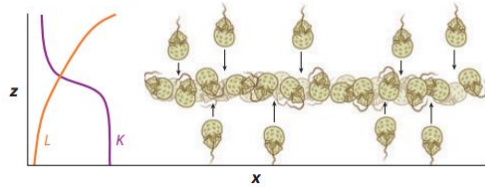
a Straining



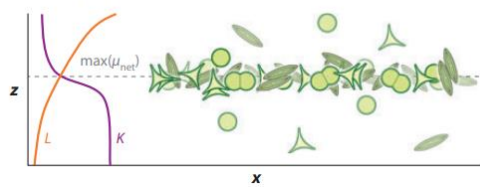
d Gyrotactic trapping



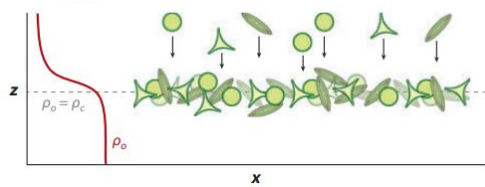
b Convergent swimming



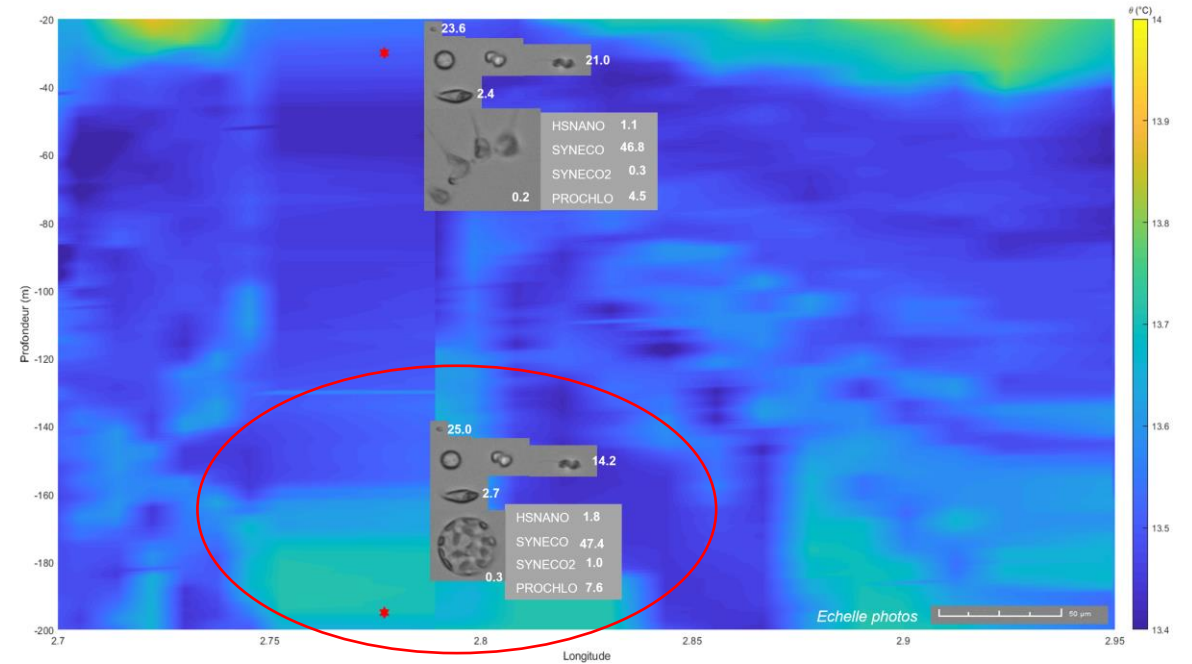
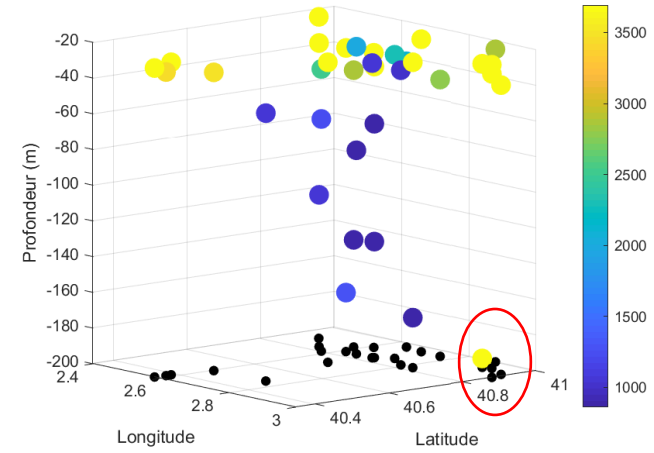
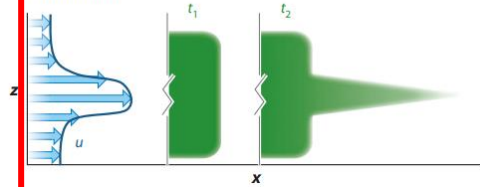
e In situ growth



c Buoyancy



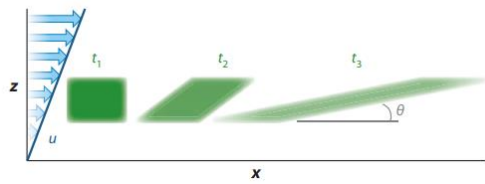
f Intrusion



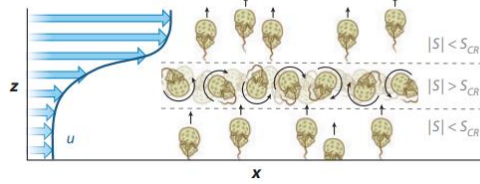
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Hypothesis

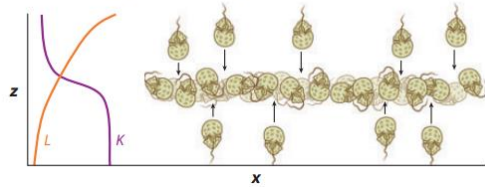
a Straining



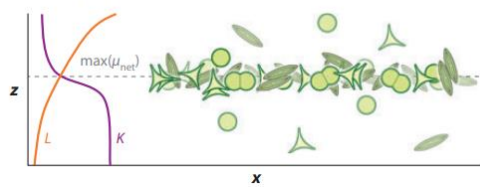
d Gyrotactic trapping



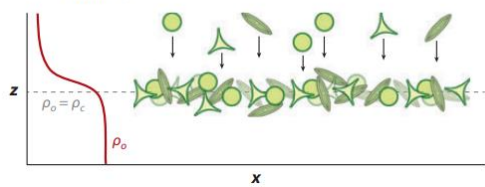
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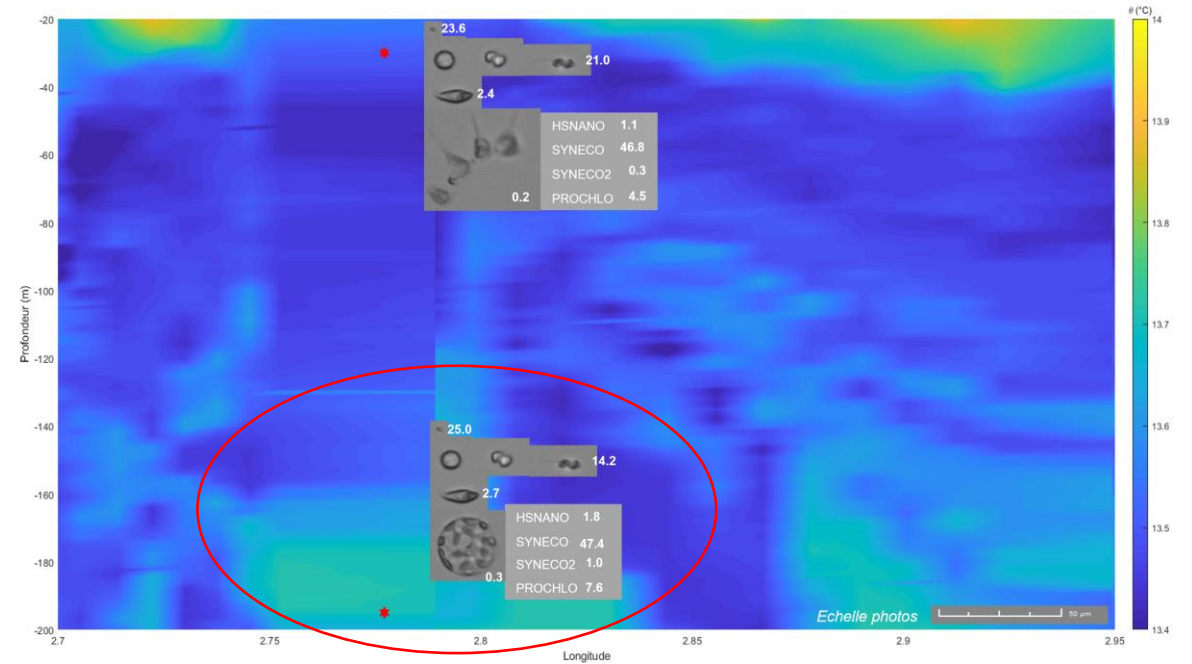
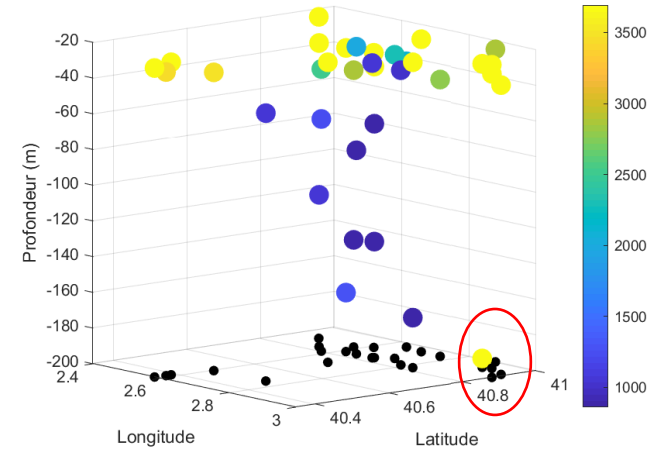
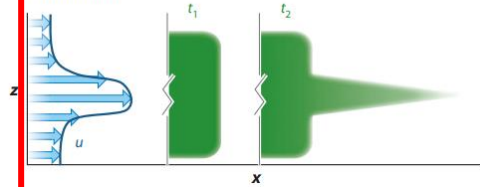
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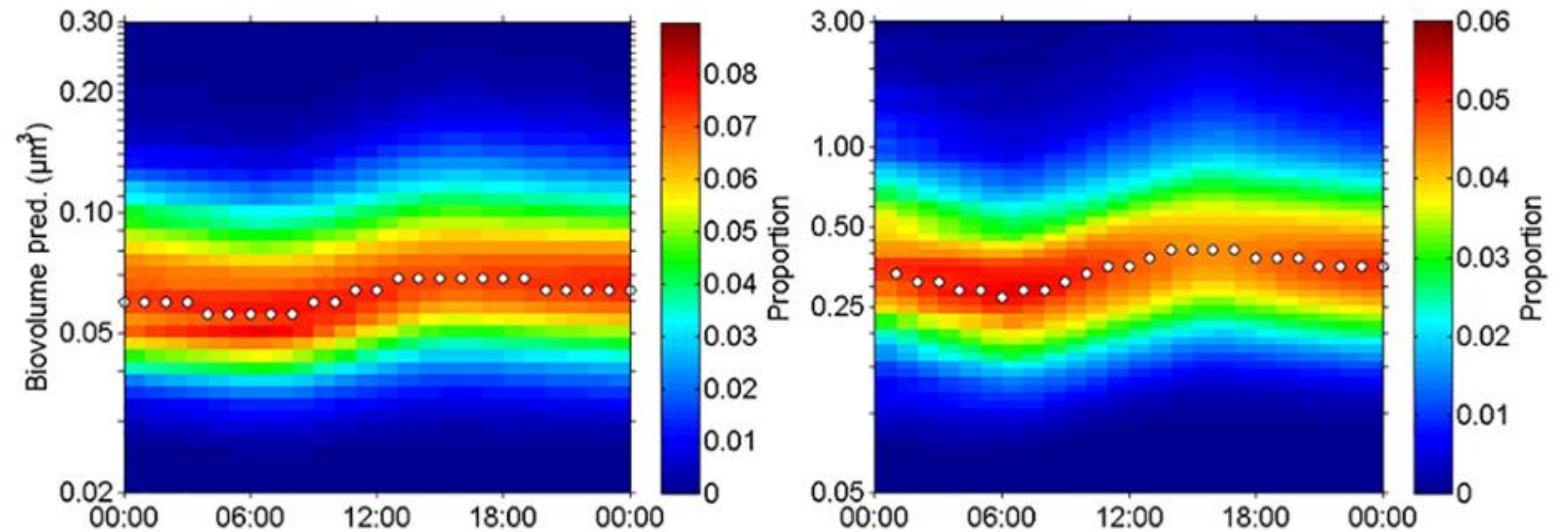


Phytoplankton cellular cycle

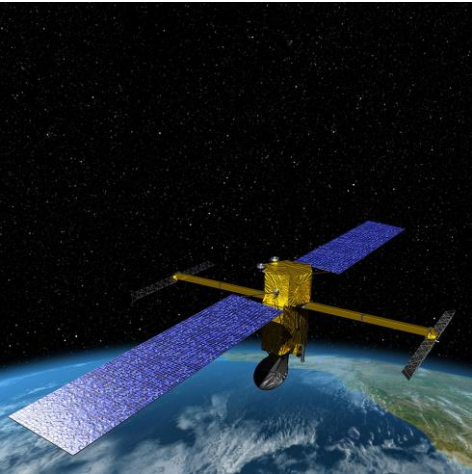
Modèle « Size Structured Population » (Suite)

Sosik et al (2003)
Dugenne et al (2017)

Marrec et al (2018)



SWOT



PROTEUSWOT (2018)
BIOSWOT (2023)

