

Bordeaux, June 17-20, 2019

# SWOT

Science Team Meeting  
& Calval Workshop



## SW Mediterranean 2018: the PROTEVS-BIOSWOT campaign

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F.Dumas (SHOM), P.Garreau (IFREMER), A.Pascual (IMEDEA, Spain), F.Cyr (DFO, Canada)*



# SWOT and fine scale biophysical processes

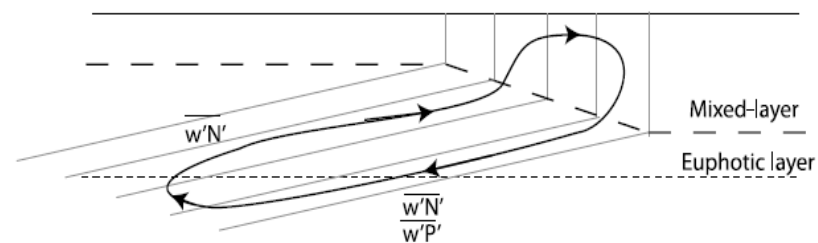
Fine scale circulation :

- impacts the carbon pump  
*advecting nutrients upward and organic matter downward*

- controls the mixing  
*influencing primary production, grazing and predation*

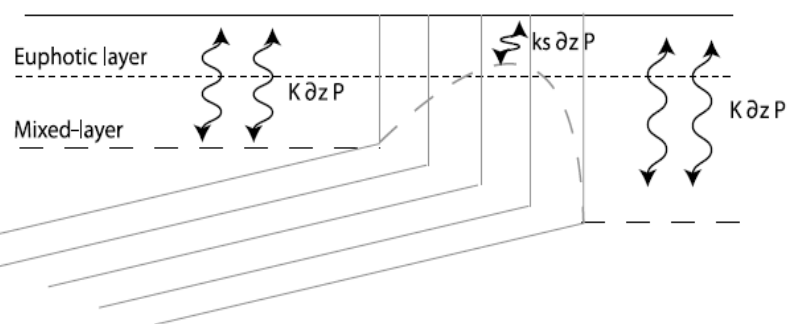
- drives the biodiversity  
*creating “fluid-dynamical niches”*

a) Transport at a submesoscale front

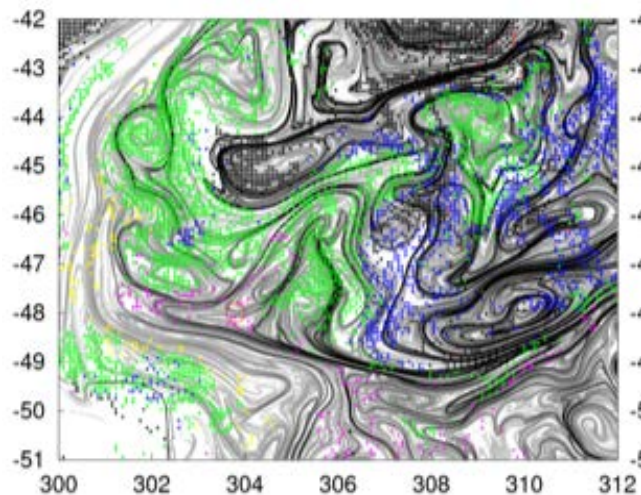


[Lévy, 2012]

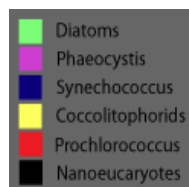
b) Vertical mixing at a submesoscale front



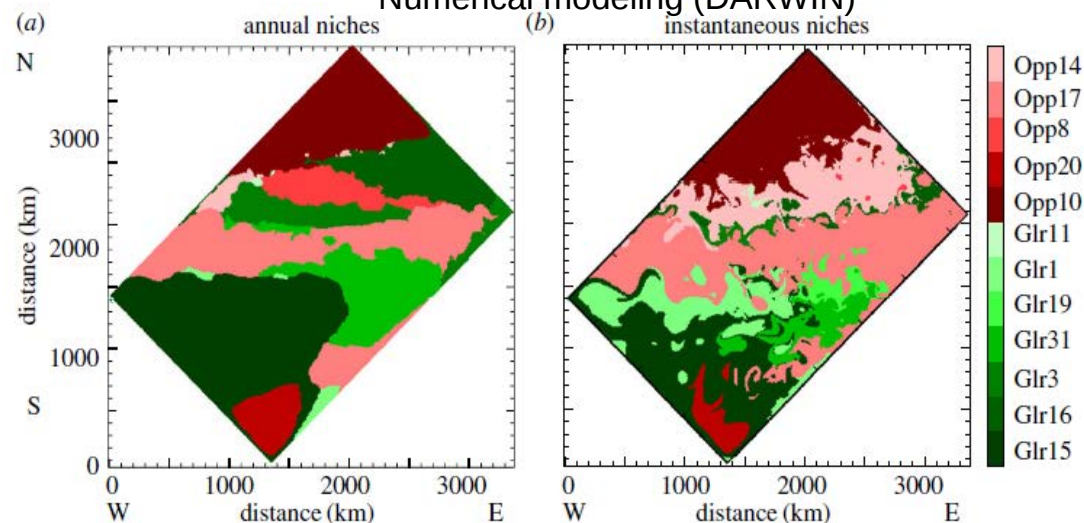
Satellite data (FSLE & Physat)



[d'Ovidio et al., 2010]

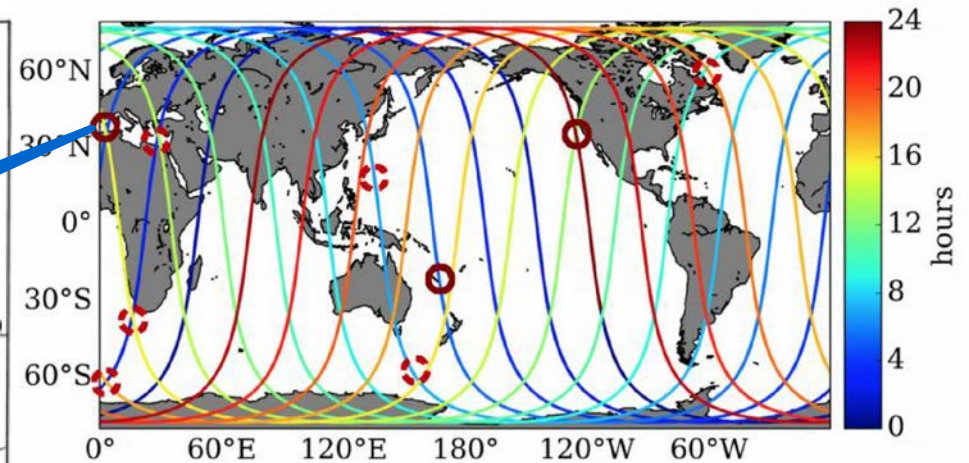
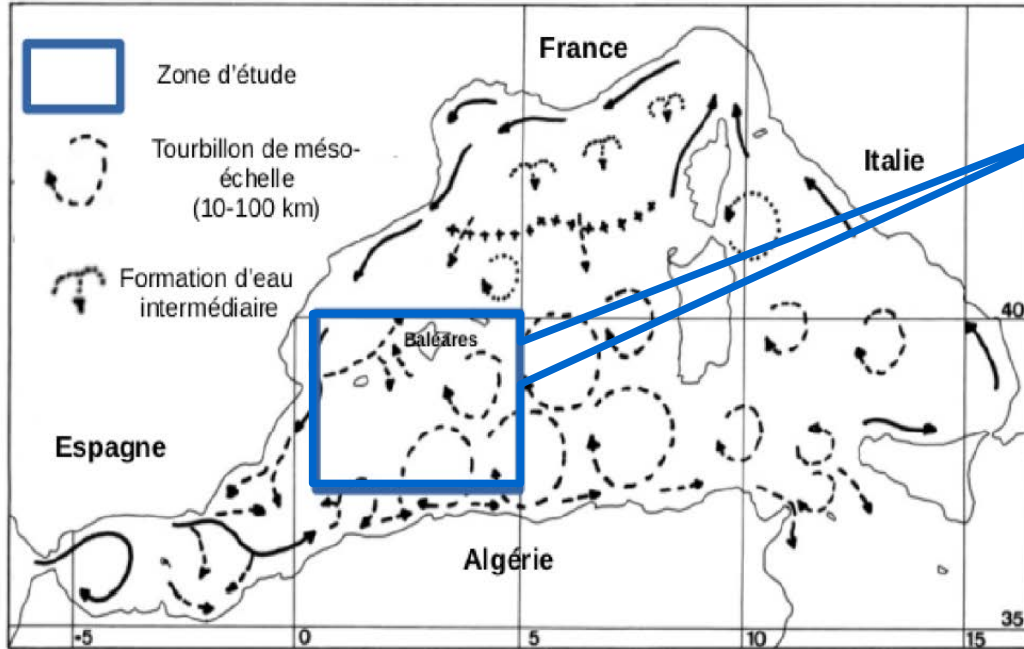


Numerical modeling (DARWIN)



[Lévy et al. 2015]

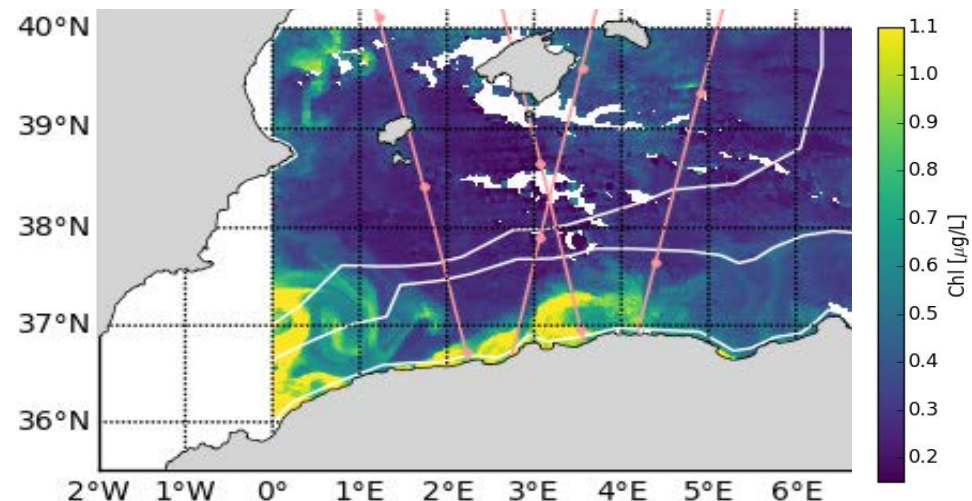
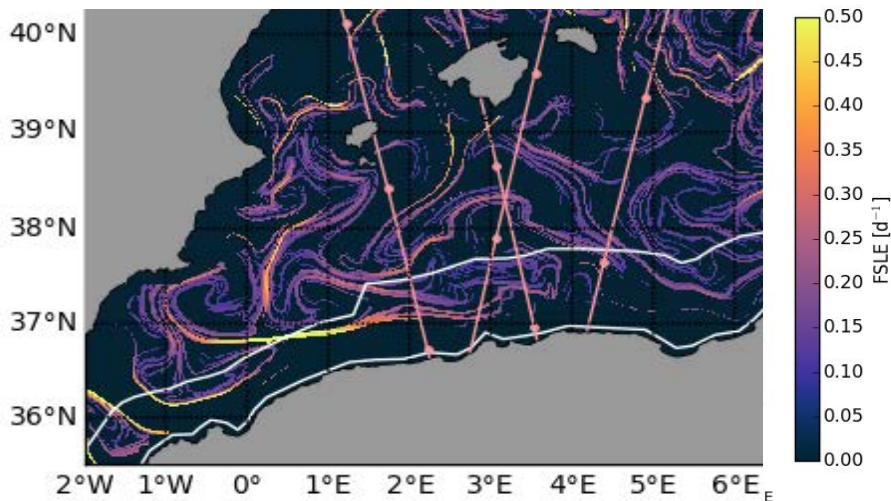
# The SW Mediterranean cross-over



◯ Formally adopted (CalVal plan)    ◻ Proposed adoption  
 ↑ d'Ovidio et al [2019]

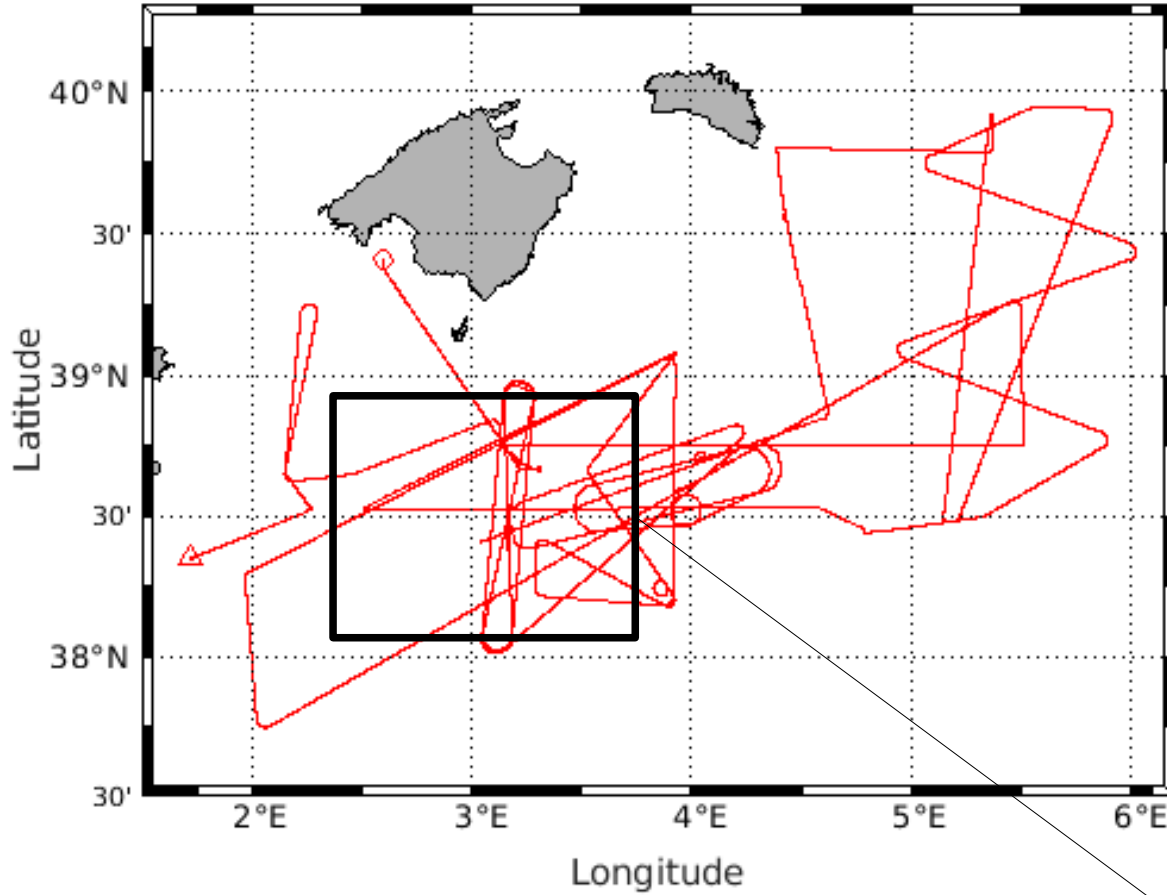
← Millot [1999]

**Intense mesoscale field with the meanders and the eddies of the Algerian current  
 Nice contrasts in hydrological properties and biology**

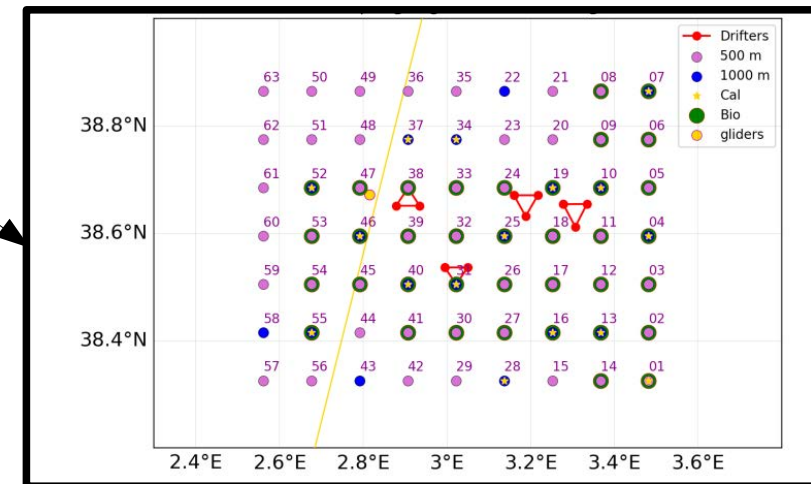


# The 2018 campaign

BHO Beatemps-Beaupré from 30 April to 14 May  
 R/V Garcia del Cid from 5 May to 17 May



and 2 gliders  
 along a  
 Sentinel 3 track



# Onboard of the BHO Beautemps-Beaupré



**ADCP 150 & 38 kHz, TSG,  
SeaSoar (SHOM)**  
~3 km resolution & 300 m depth

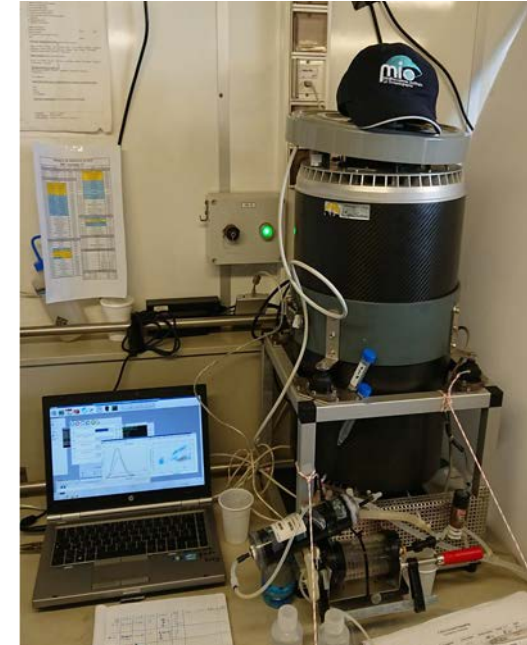


**Flow Cytometer (MIO)**

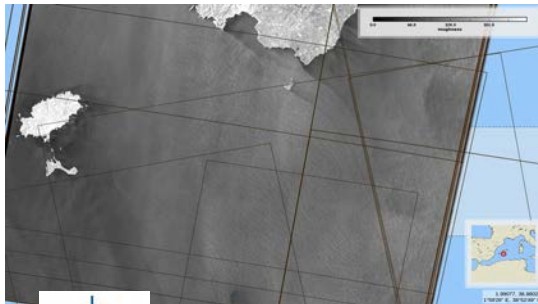
Identification of  
microbes from size,  
color, and shape.

One point every 20'

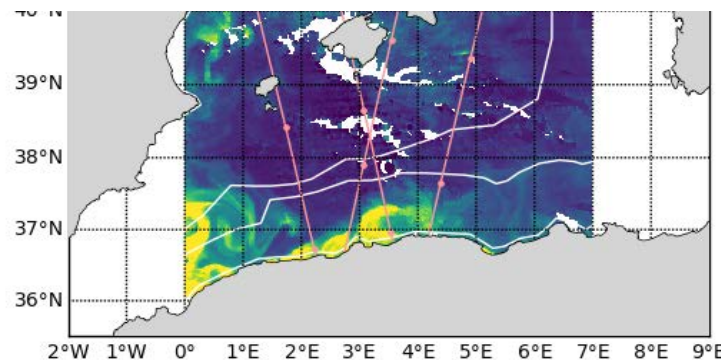
@ 9 Knot  $\approx$  5.5 km



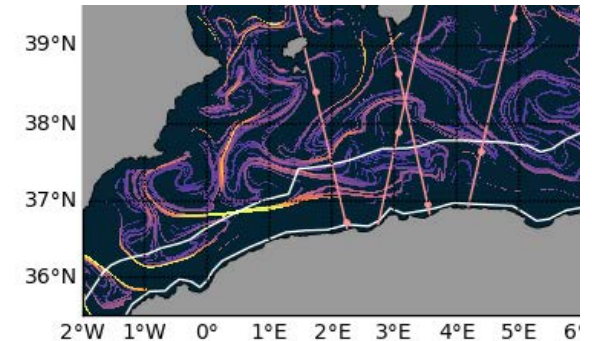
## On land : multisatellite support



**SAR**



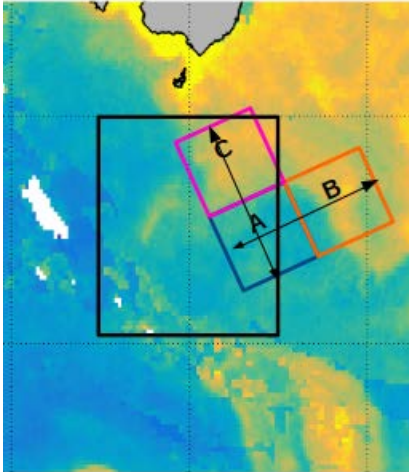
CLS data of SST and SCHL + Lagrangian analyses by  
SPASSO <http://spasso.mio.univ-amu.fr>



# Sampling strategy

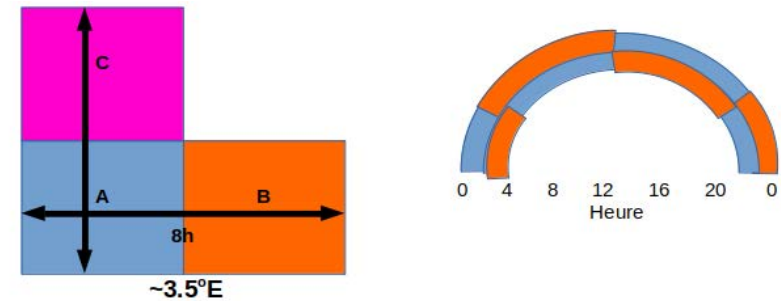
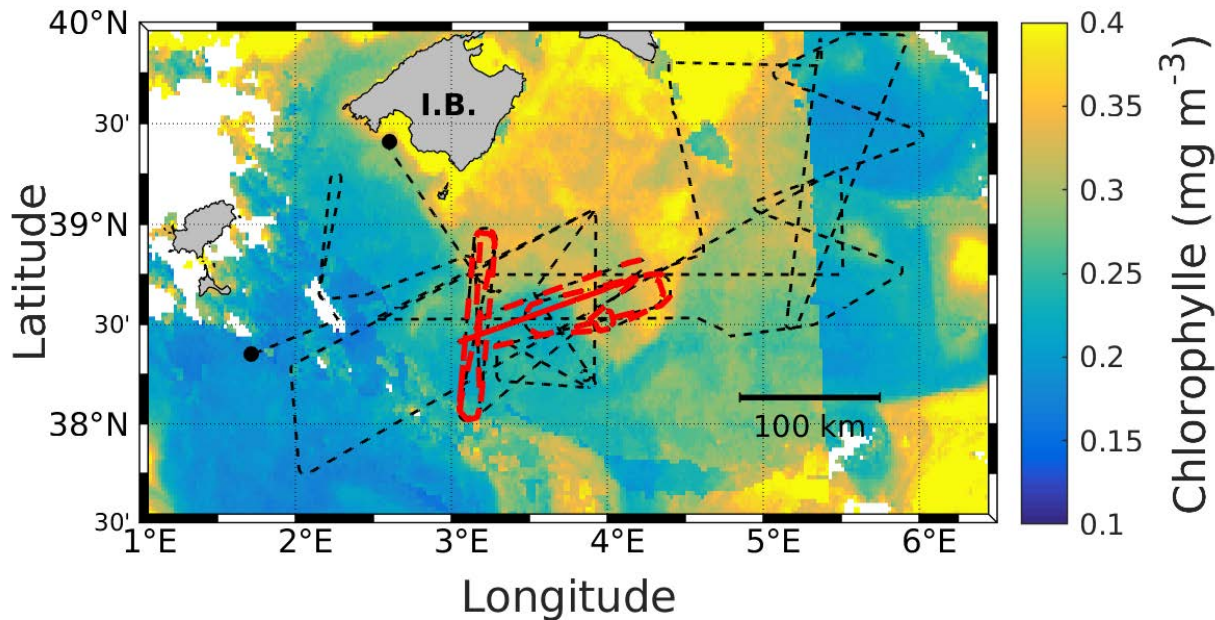


## *Adaptive & Lagrangian*



NRT satellite images used to identify areas of interest (fronts, contrasted water masses)

Vessel route designed to spend 4 hours in each of the 3 areas in order to reconstruct the daily cell cycle



# Preliminary results

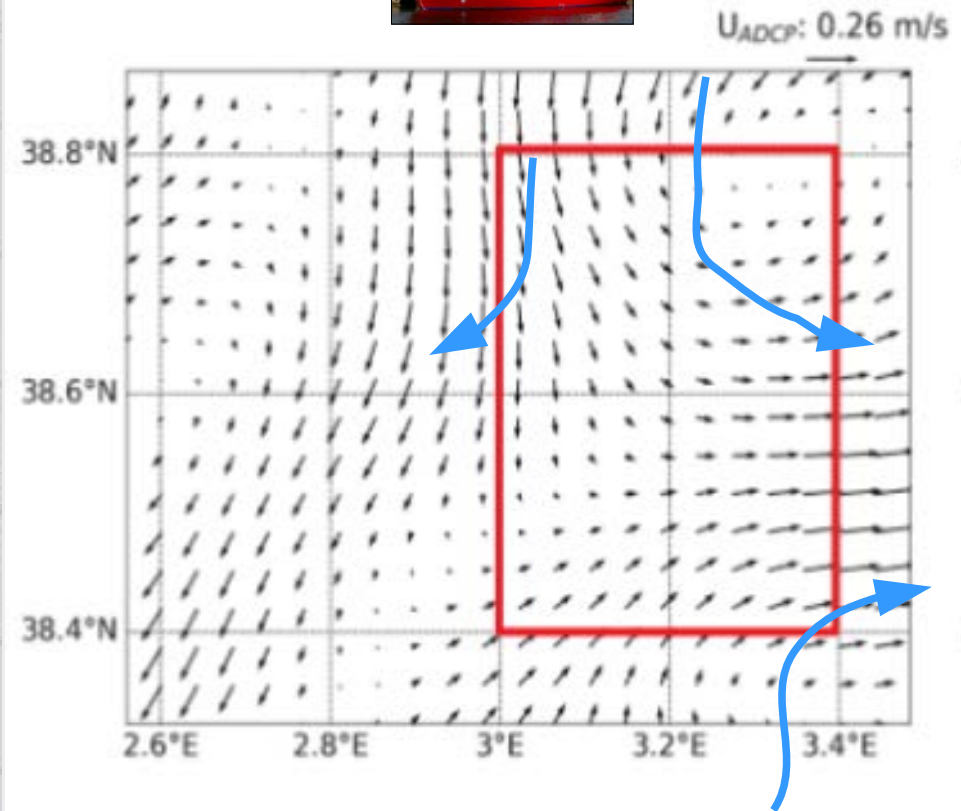
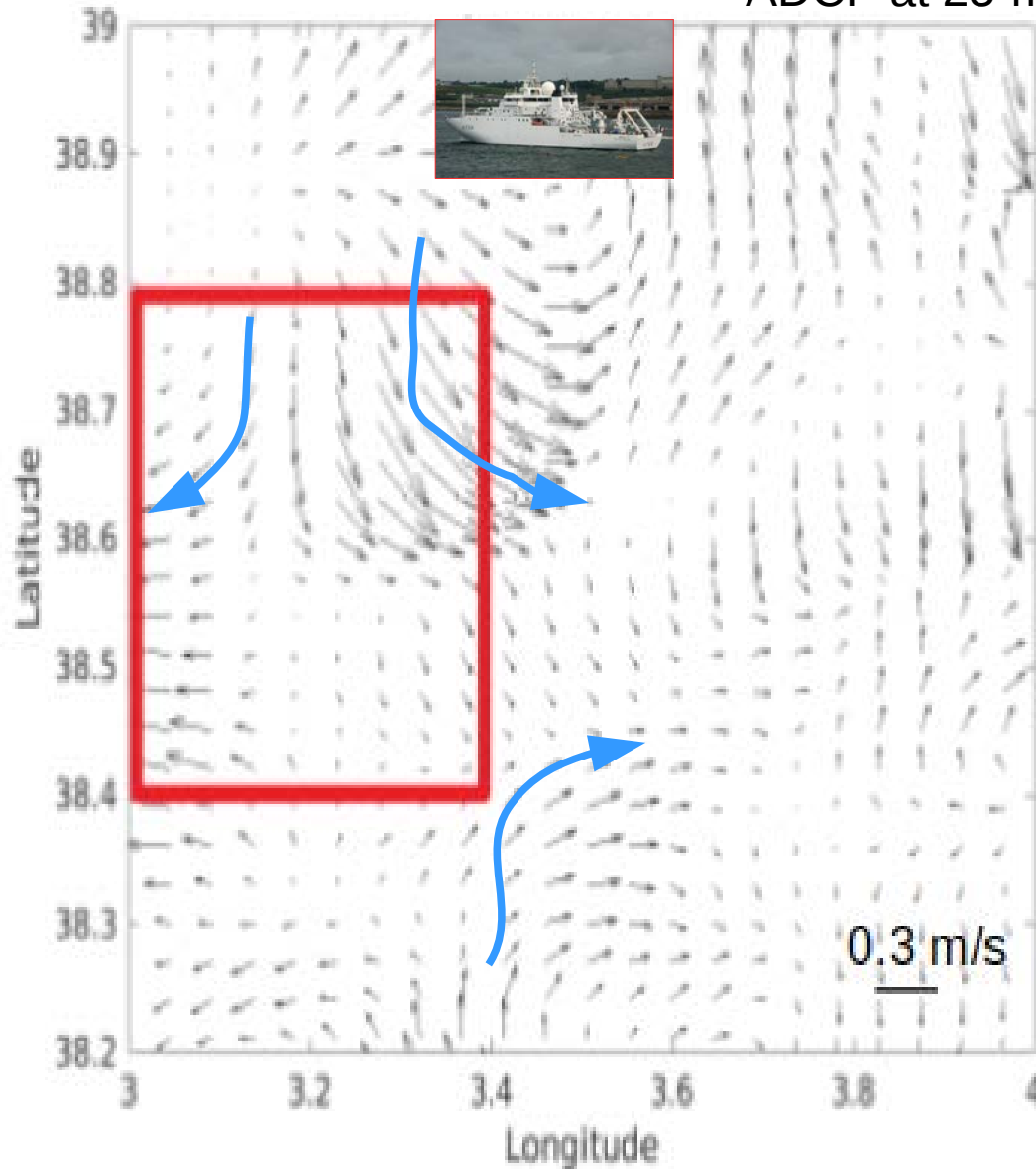
*R.Tzortzis and L.Izard*  
*Master studentships @ MIO*

*B.Barcelò-Lull*  
*post-doc @ IMEDEA*

# Preliminary results

## *Horizontal-velocities objective mapping*

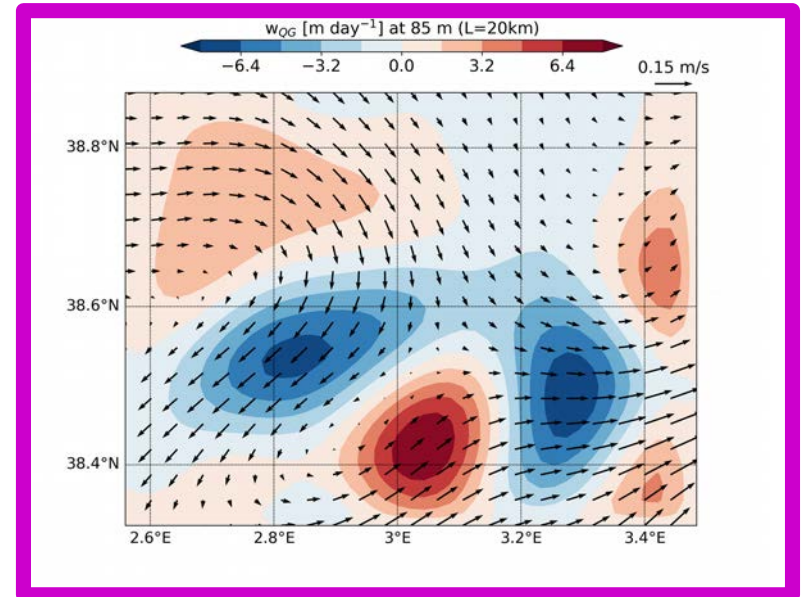
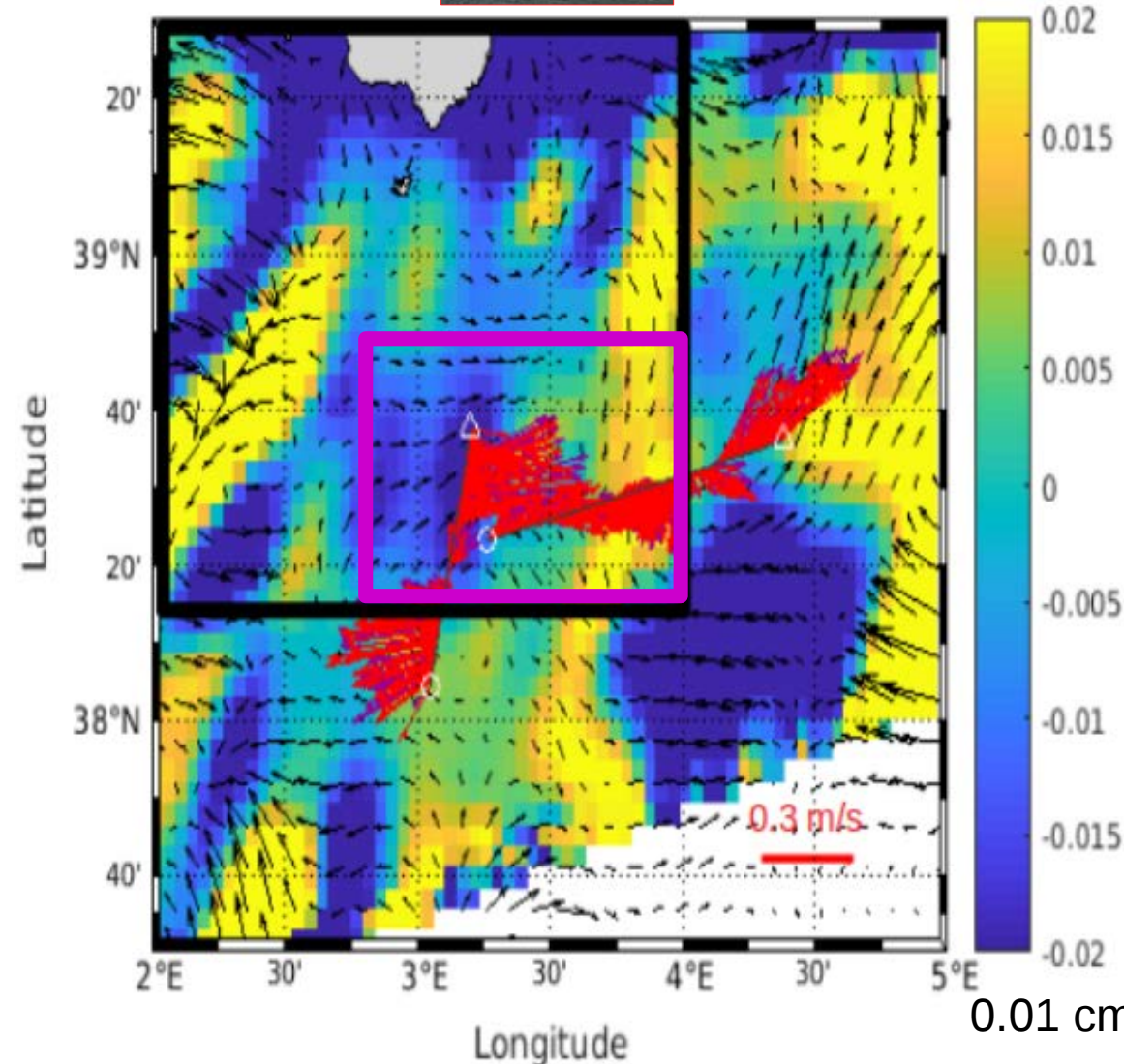
ADCP at 25-m depth





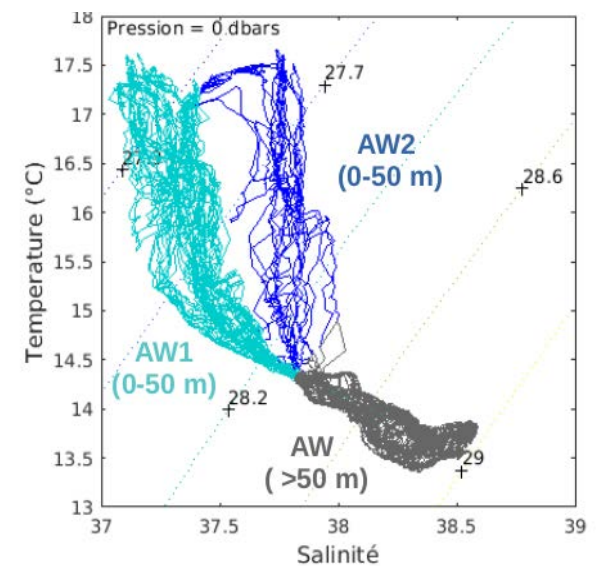
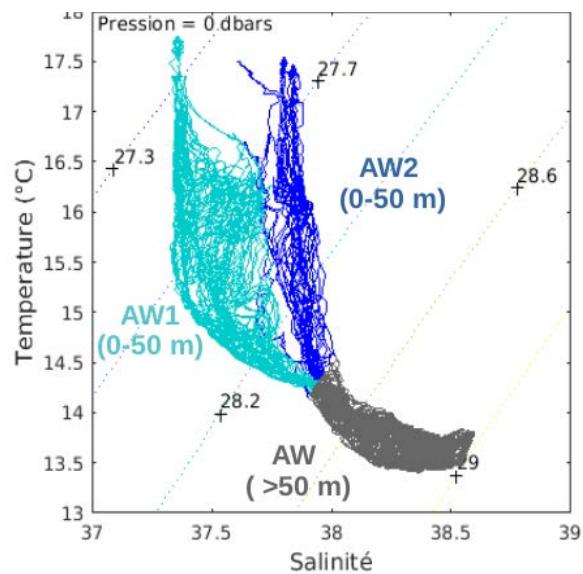
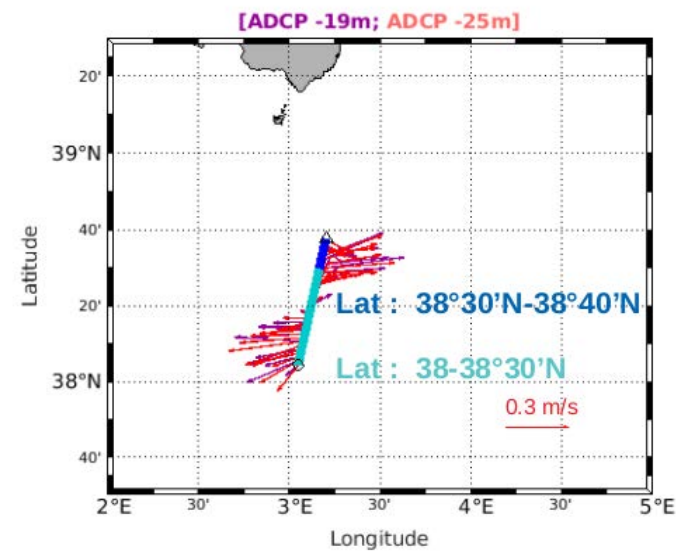
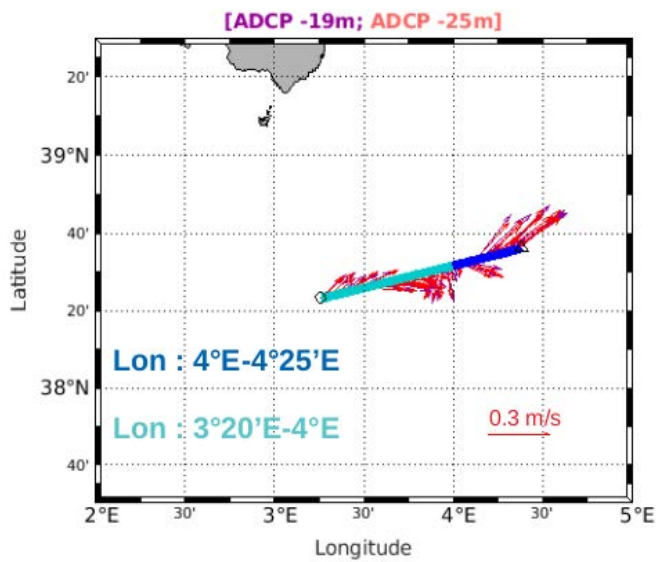
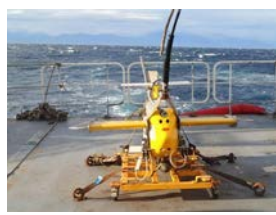
# Preliminary results

## *QG vertical velocities estimation*



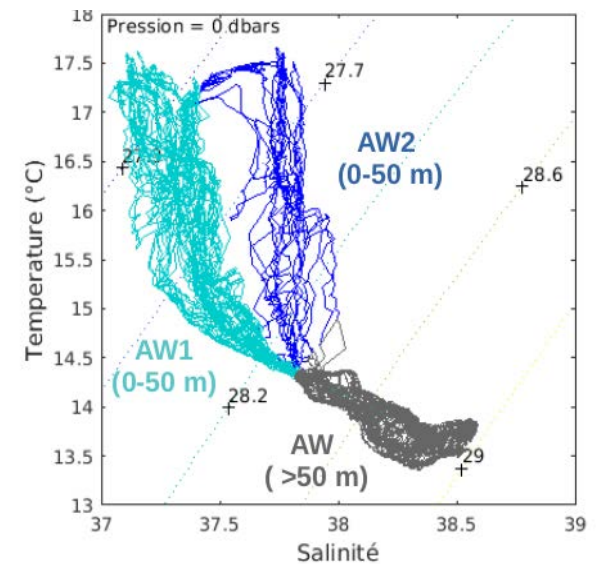
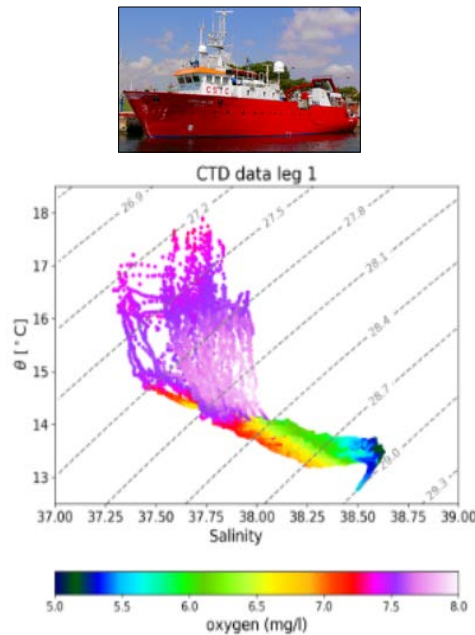
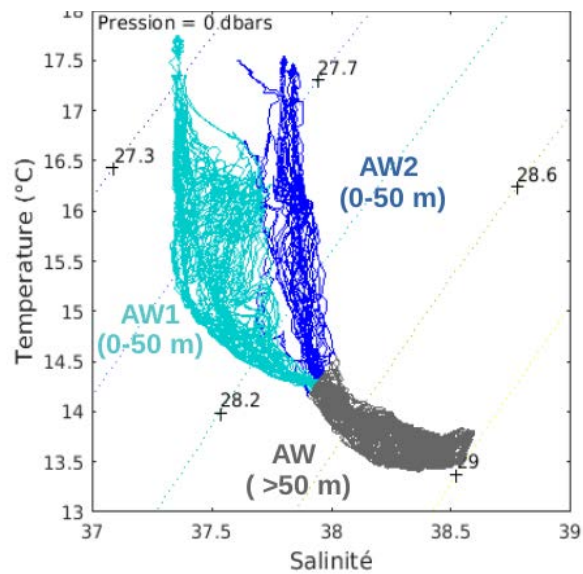
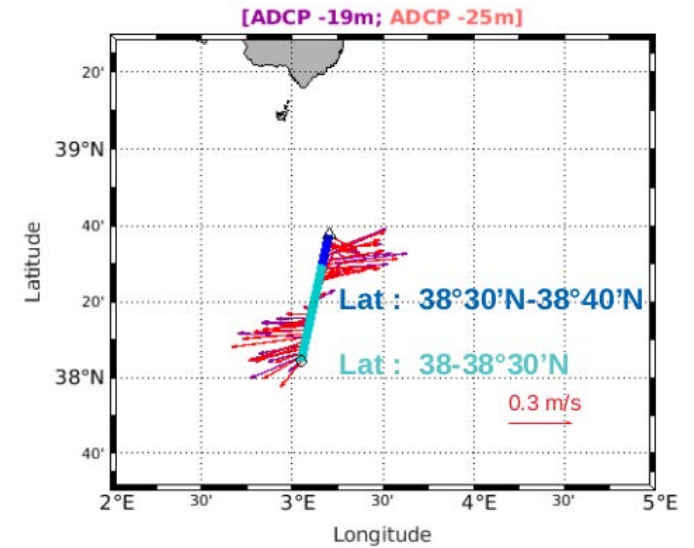
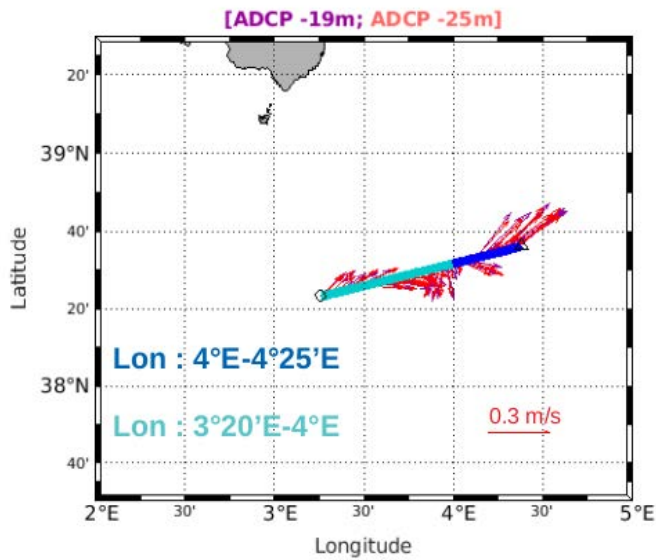
# Preliminary results

## High resolution hydrology



# Preliminary results

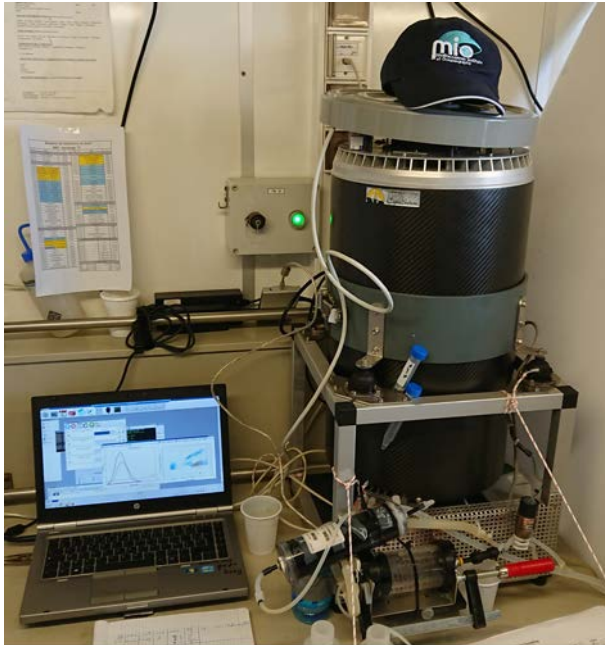
## High resolution hydrology



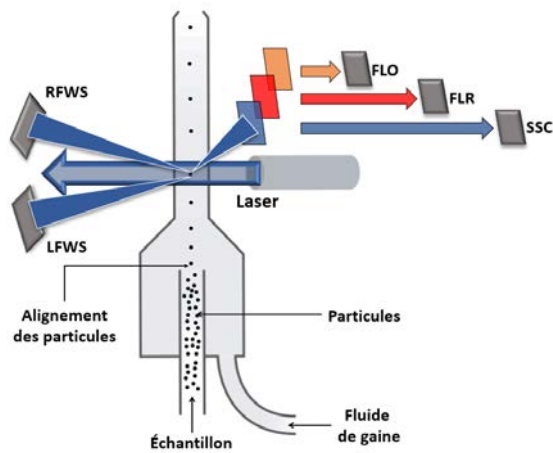
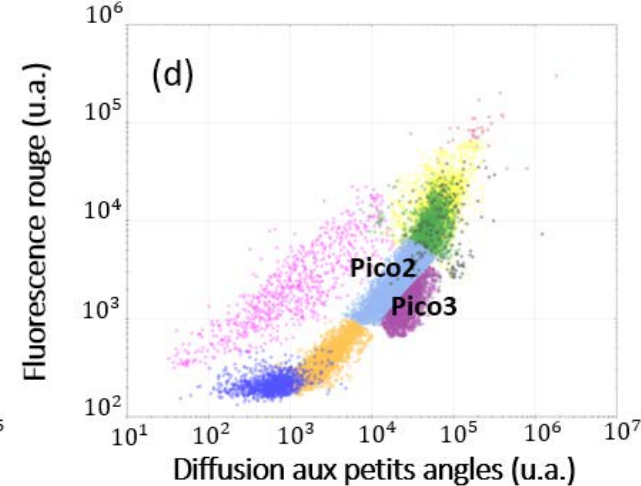
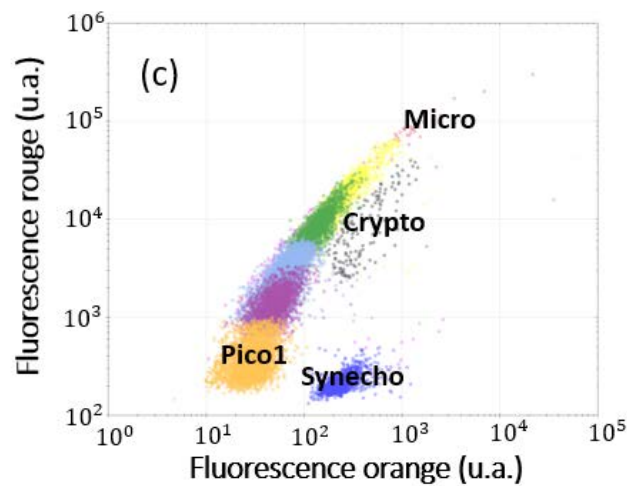
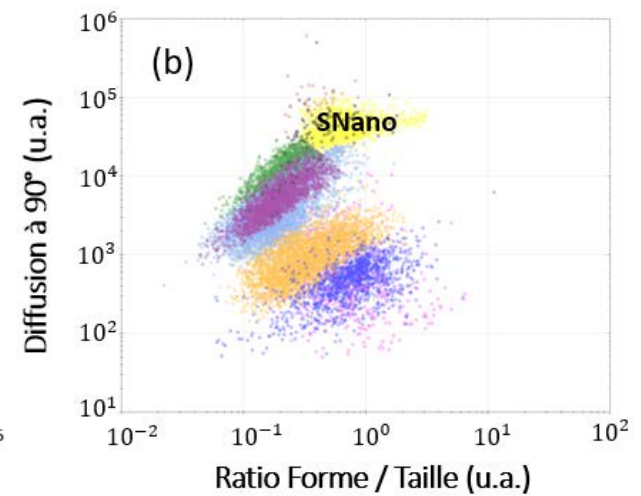
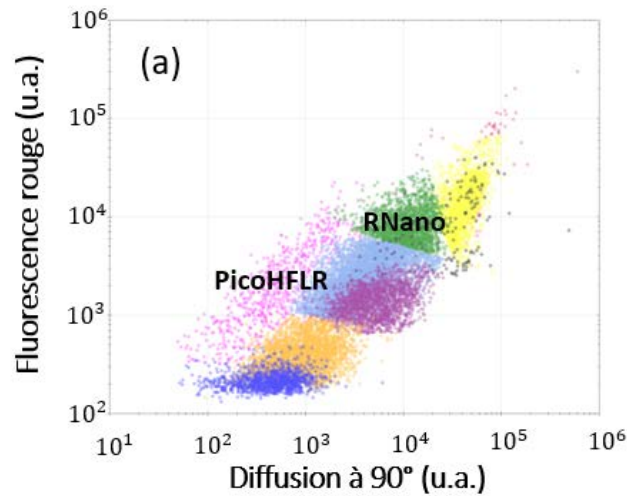
# Preliminary results

## Cytometry

16 millions of particles  
9 functional groups & 3 size classes  
(pico-, nano- and micro- phytoplankton)



Crédit photo : Gérald Grégori



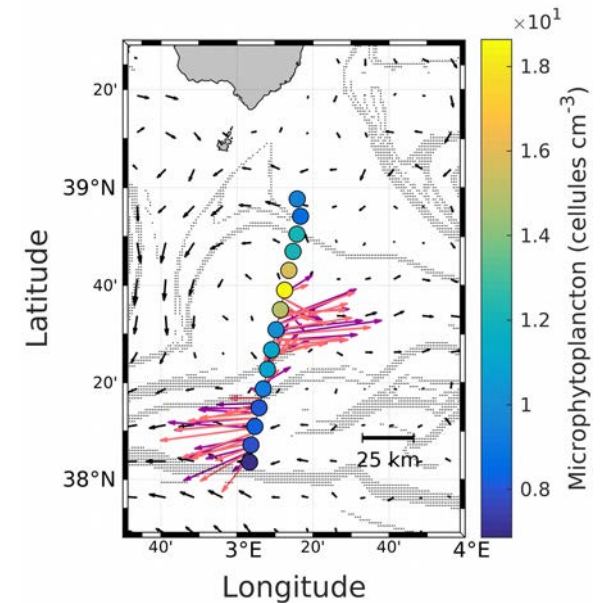
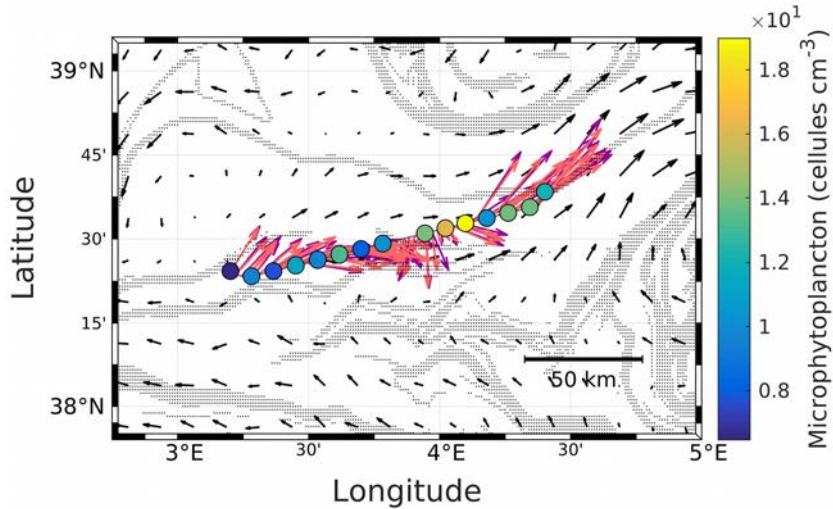
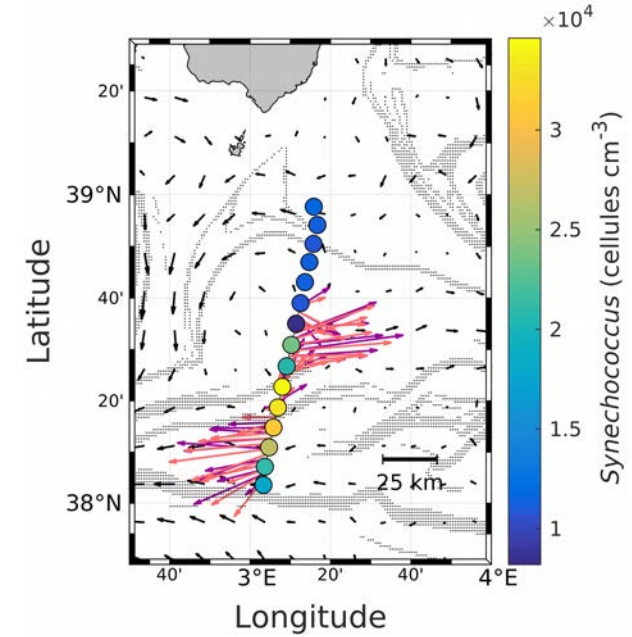
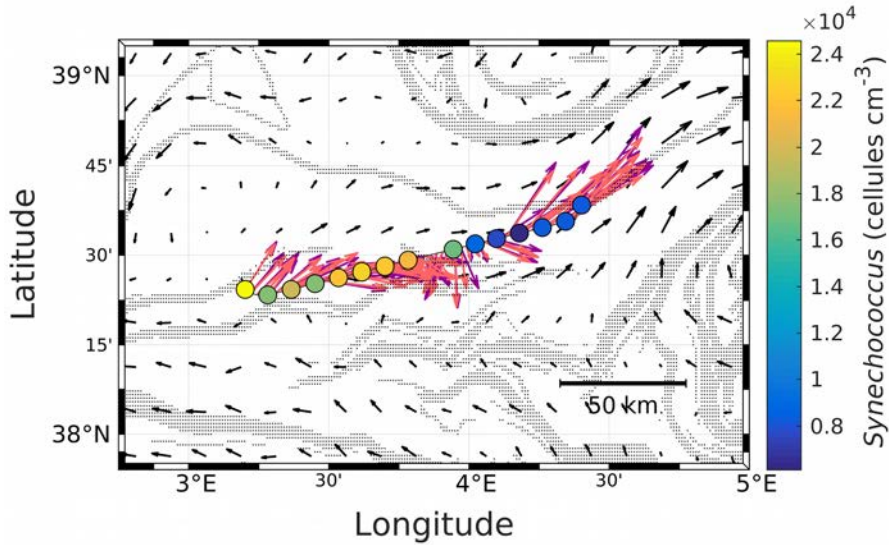
# Preliminary results

## Cytometry

**Synechococcus**

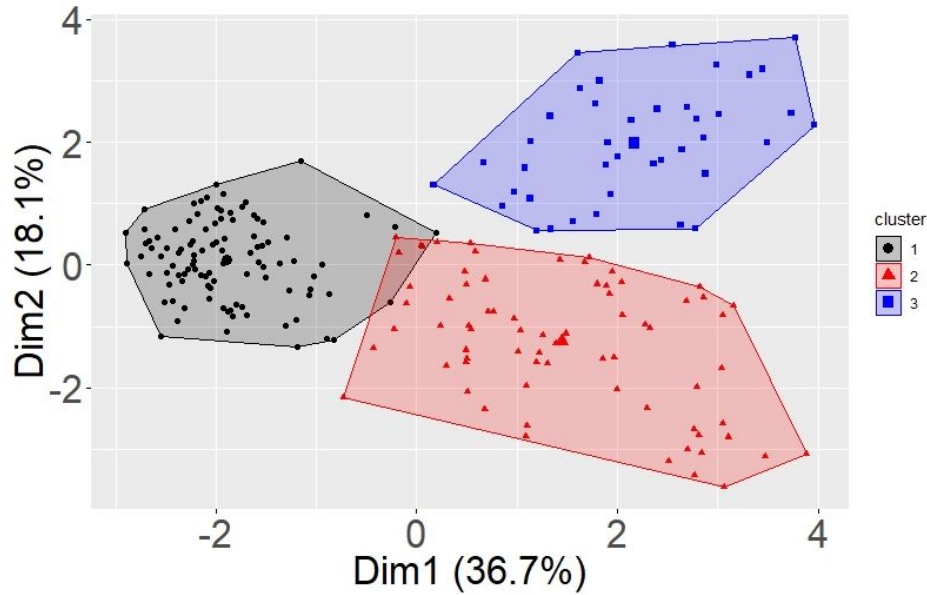
**Contrasted abundances across the front**

**Microphytoplankton**



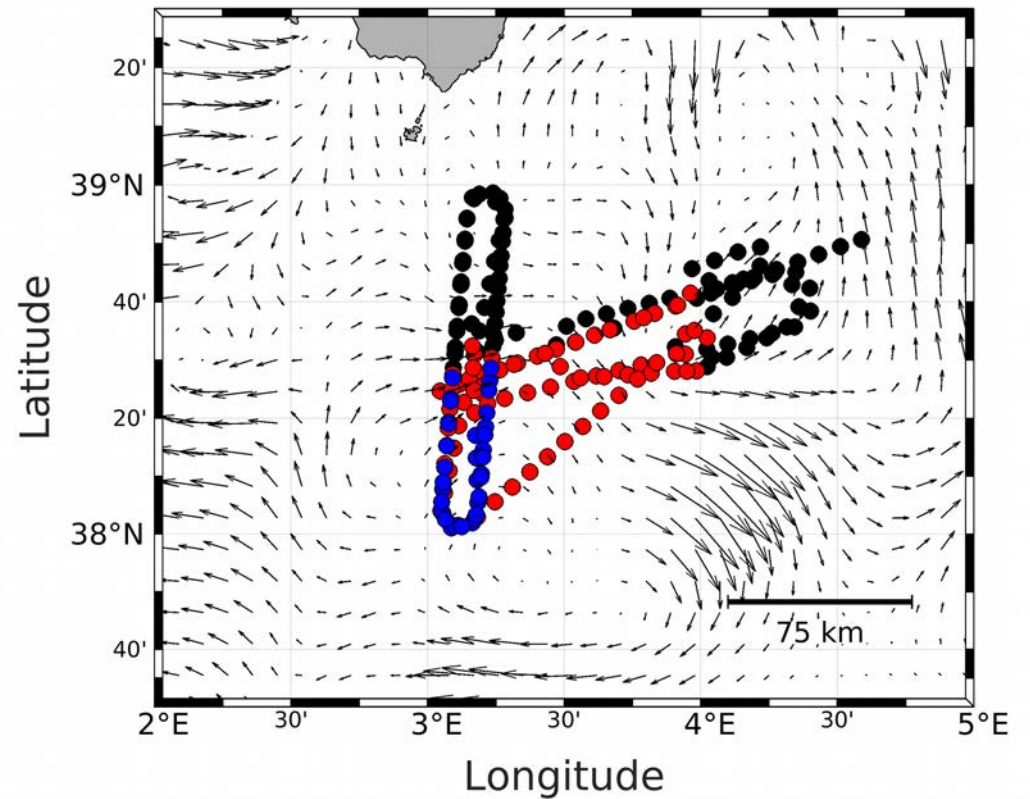
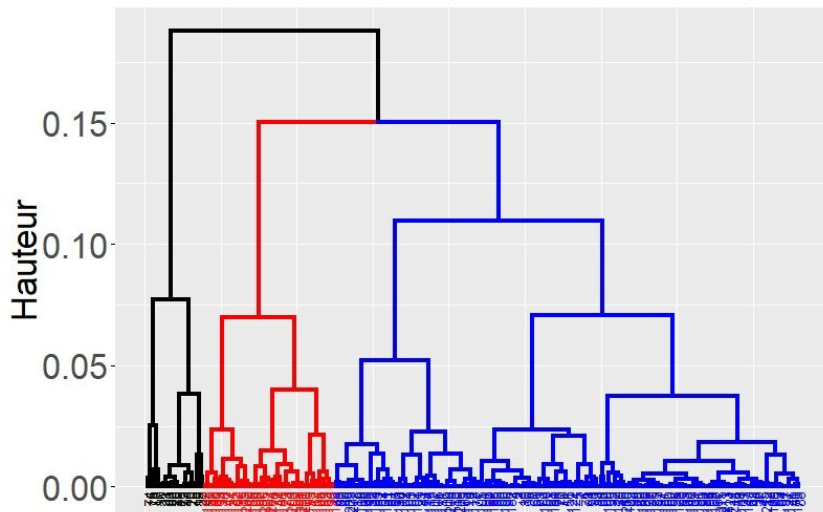
# Preliminary results

## Cytometry



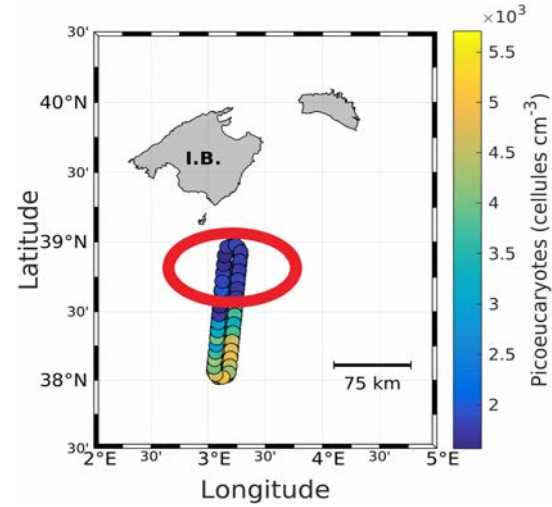
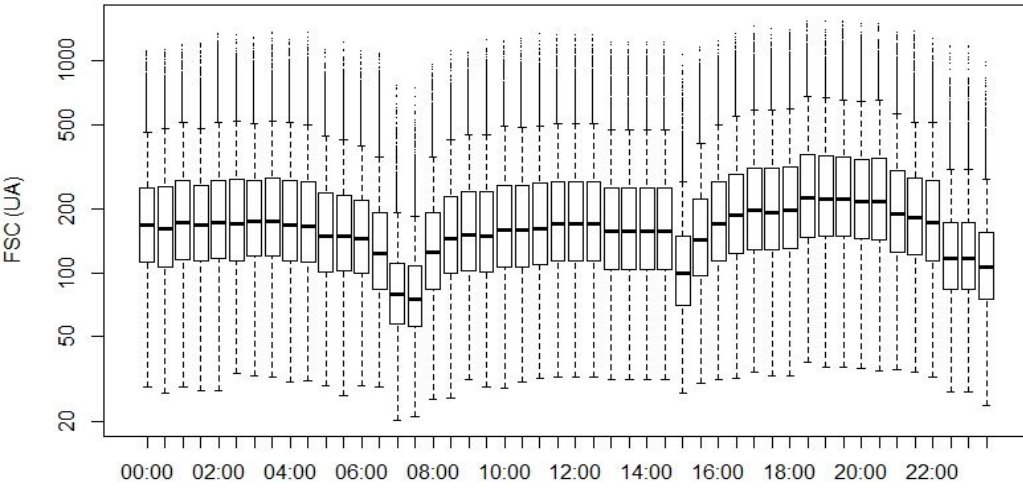
Statistical analysis on  
11 variables (9 groups+T+S)

**The spatial organization of the groups  
is driven by currents**

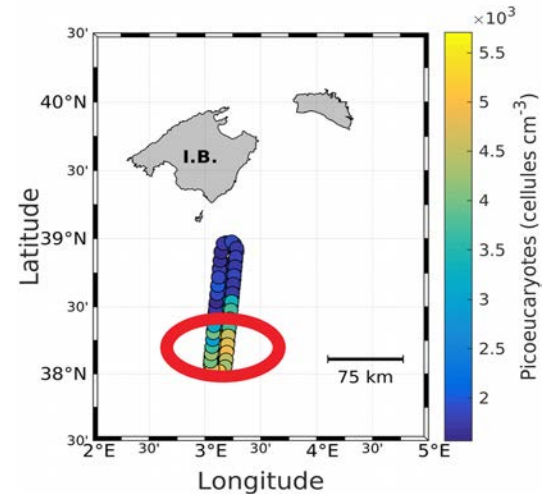
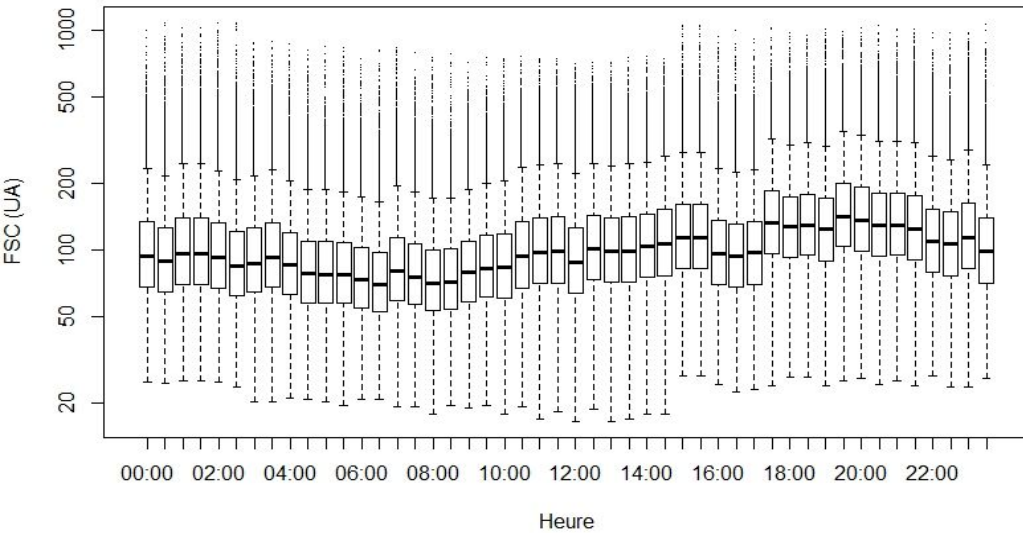


# Preliminary results

## *Growing rate estimation*

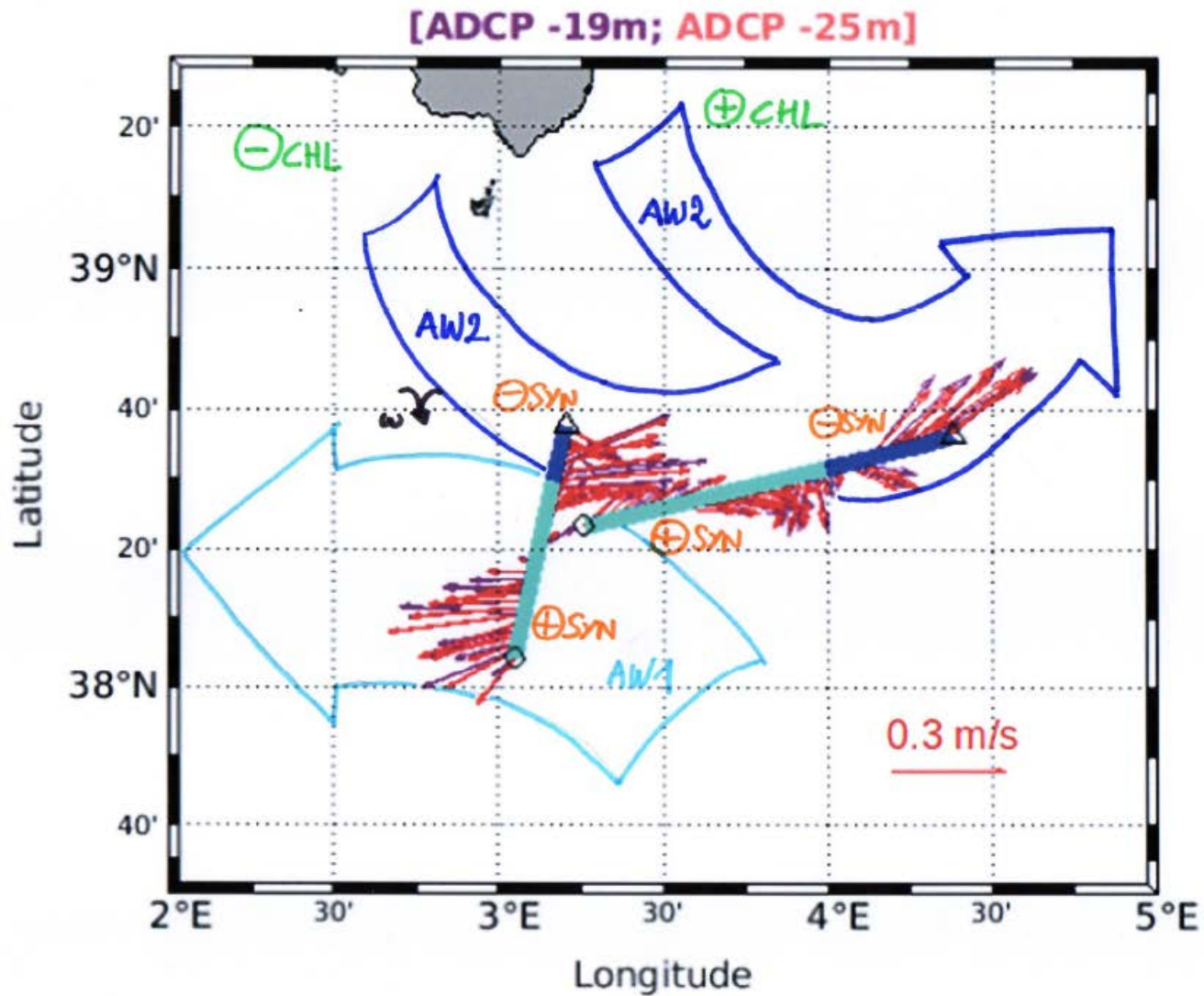


**Contrasted rates associated with the different communities**



# Preliminary results

*Summarizing...*





## Conclusions & Perspectives

*The SW Mediterranean SWOT crossover presents nice contrasts of water masses giving rise to an interesting fine-scale activity for both physics and biology.*

*Development of high resolution multidisciplinary measurements is successfully on-going.*

Needs of

- direct measurements of vertical velocities and
- deeper biological sampling (e.g. @ DCM !)
- knowledge of higher levels of the trophic web (e.g. grazers)



*Thank you  
for your attention !*

