



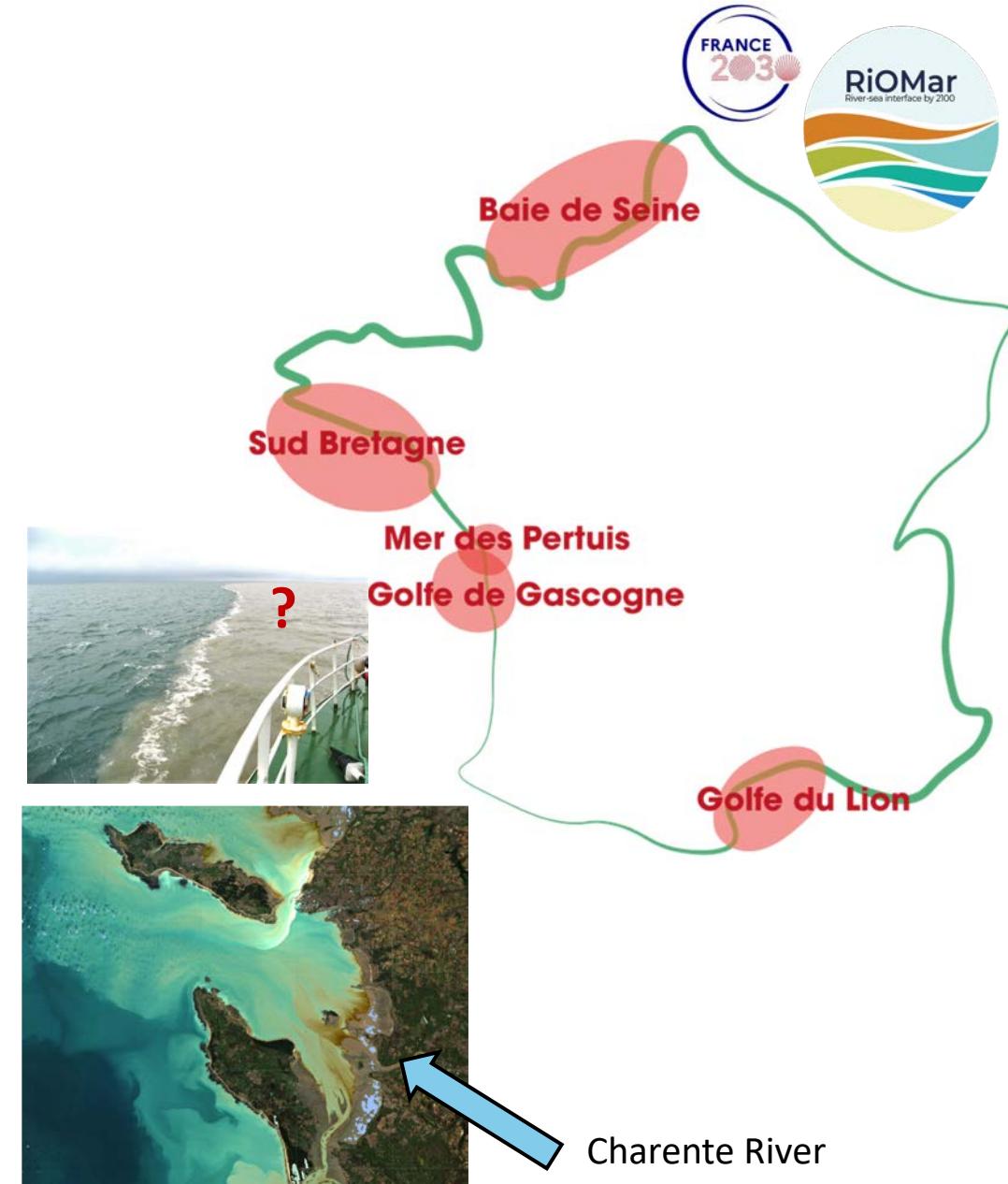
Integrated Observations from the RiOMar Project in the Pertuis Charentais (PPR Océan & Climat)

Littoral ENvironnement et Sociétés (LIENSS)
Laboratoire d'Océanographie de Villefranche (LOV)
IFREMER

The RiOMar project (2023-2028)

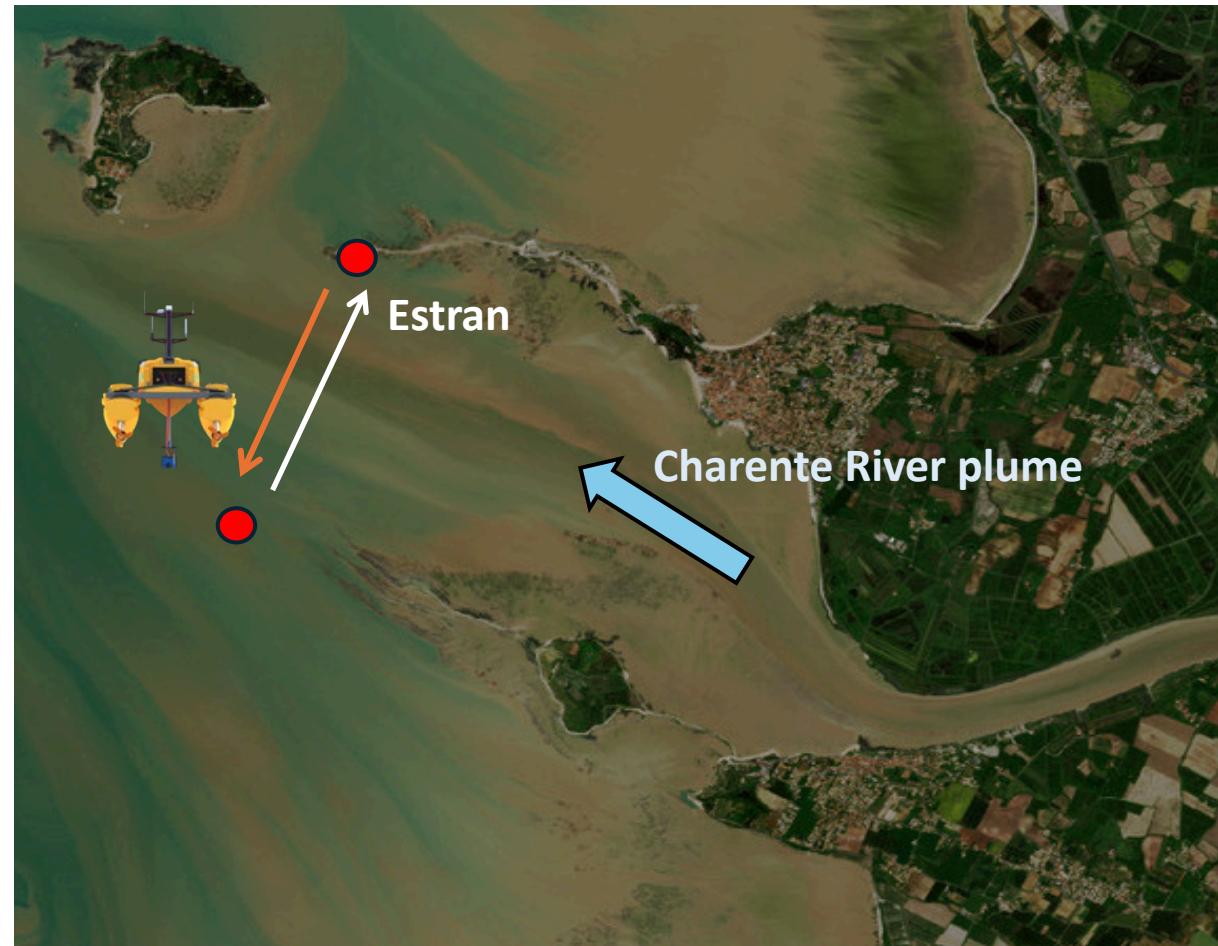
Observe and anticipate the evolution of French coastal zones under the influence of rivers in the 21st century

- The **Pertuis Sea**
 - Shallow (<60 m)
 - Macrotidal (up to 6 m tidal range)
- Objectives:
 - Find the **Charente River plume** biogeochemical signature(s)
 - Link with the socio-ecosystems (oyster farming, nurseries)



How and what

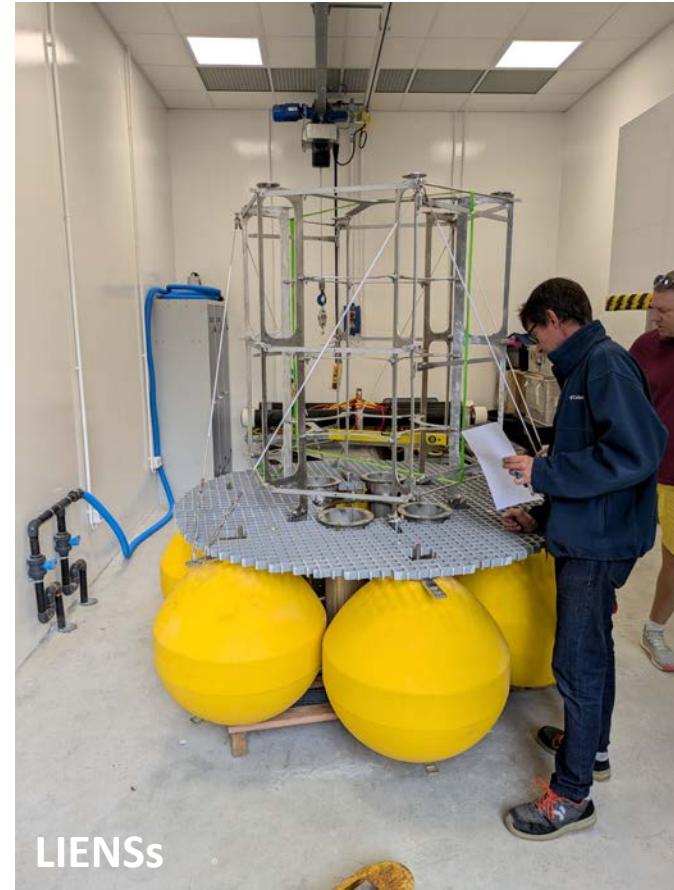
- PAMELi **U.A.V.**
- **Ship** Estran
- Multi-parametric **probes** (T, S, pH, O₂, pCO₂, turbidity, fluorescence)
- Surface **water samples** taken by PAMELi (Chl *a*, nutrients, DOC, TALK) at edges of the transects and midway
- At edges, two moorings (T, S, turbidity) ●





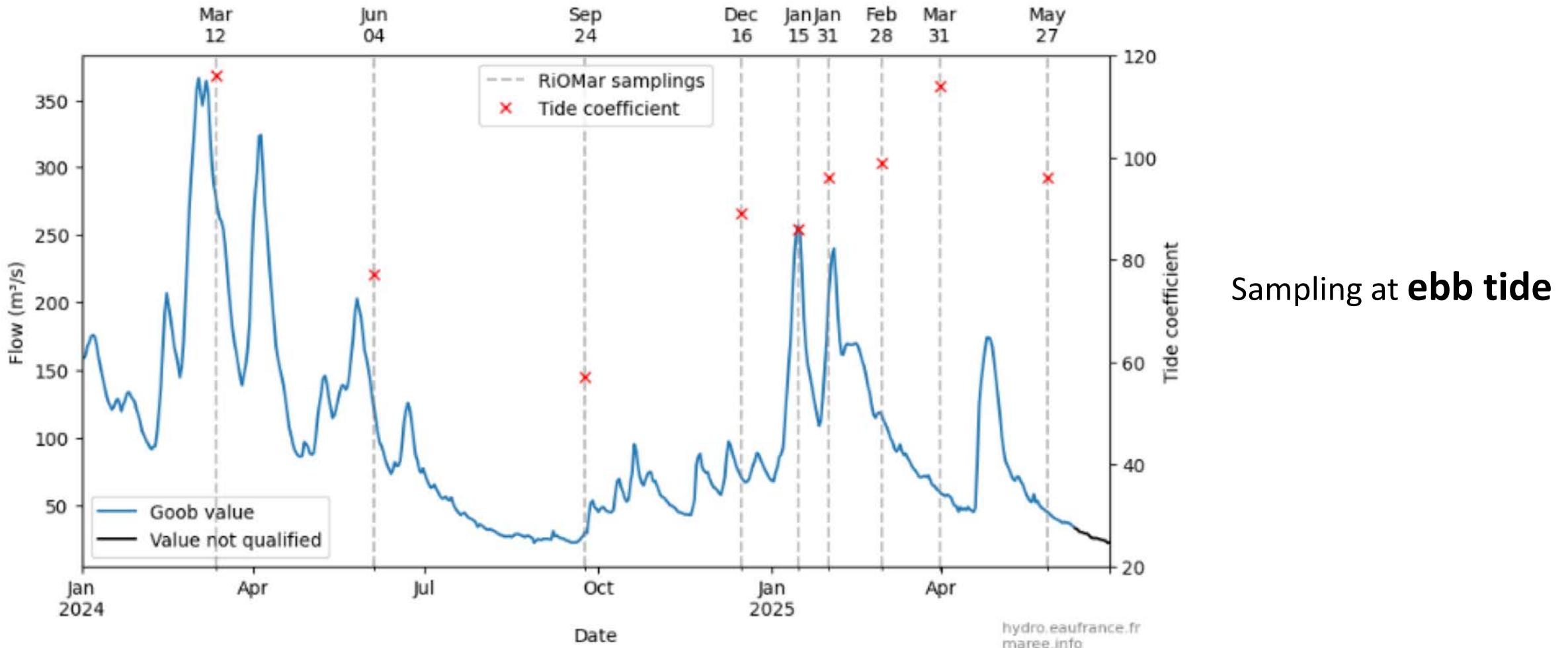
January, 2025 (Landsat)

Bouée-Li (to come soon)



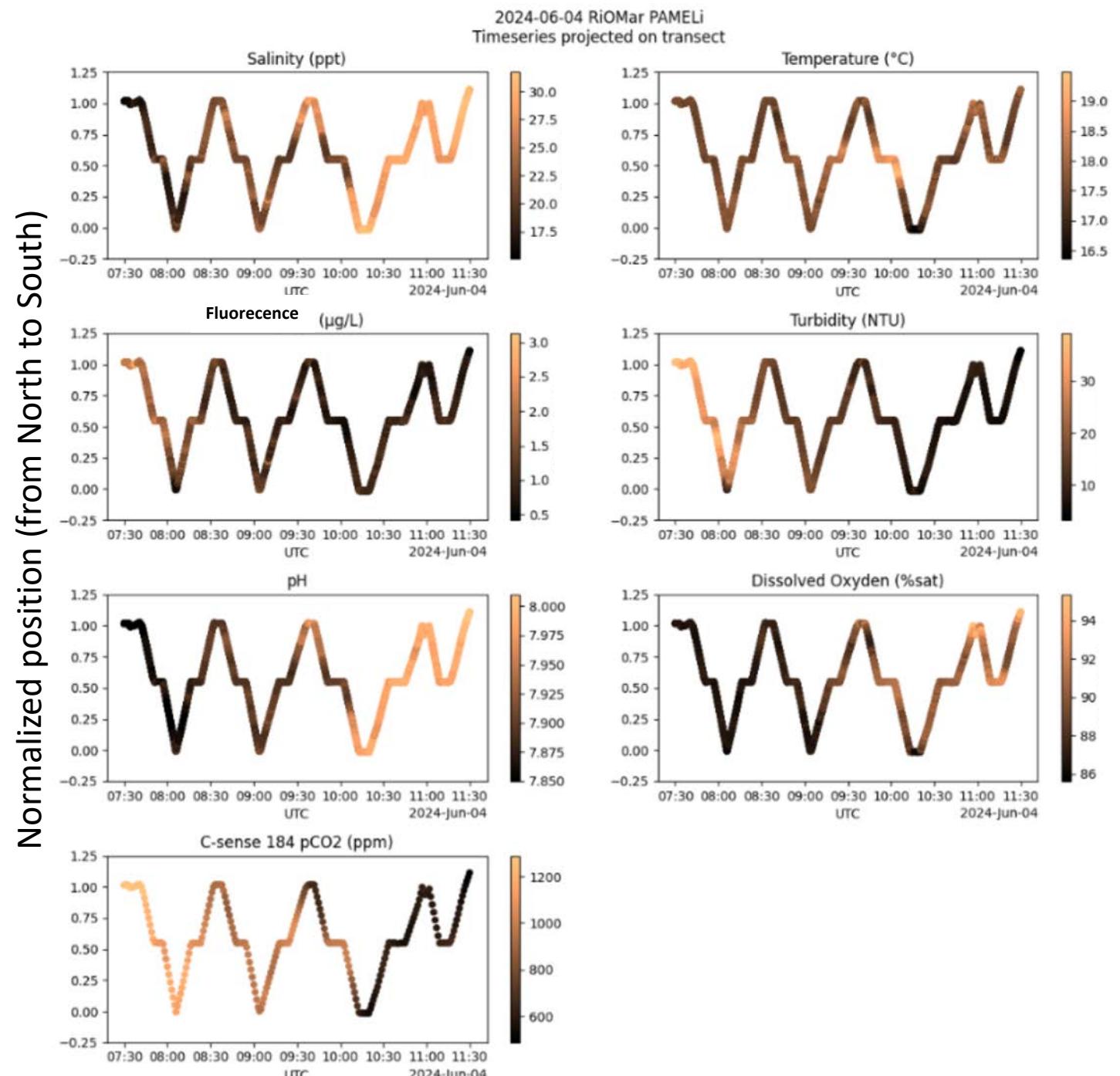
LIENSs

Charente River's **discharge** (full line) with samplings dates (dashed line) and respective **tidal coefficients**



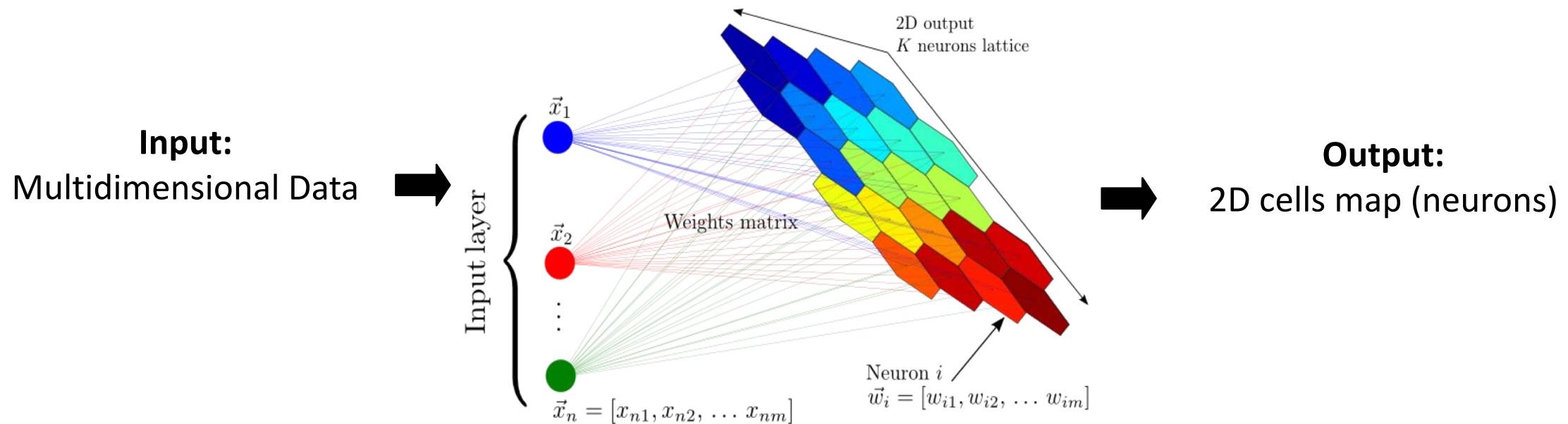
More than **10 cruises**, **14 parameters** evolving across space and time

Deciphering the complexity of these datasets remains a major scientific challenge!



Self Organizing Map (SOM; cartes topologiques auto-adaptatives)

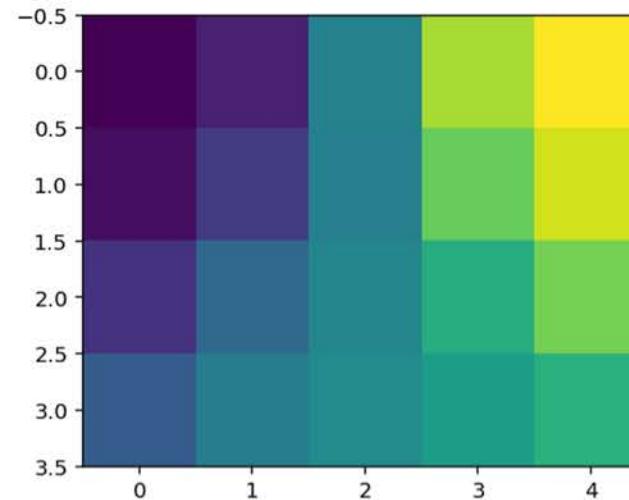
- Machine Learning technique
- Artificial Neural Network
- Unsupervised clustering (no prior labels)



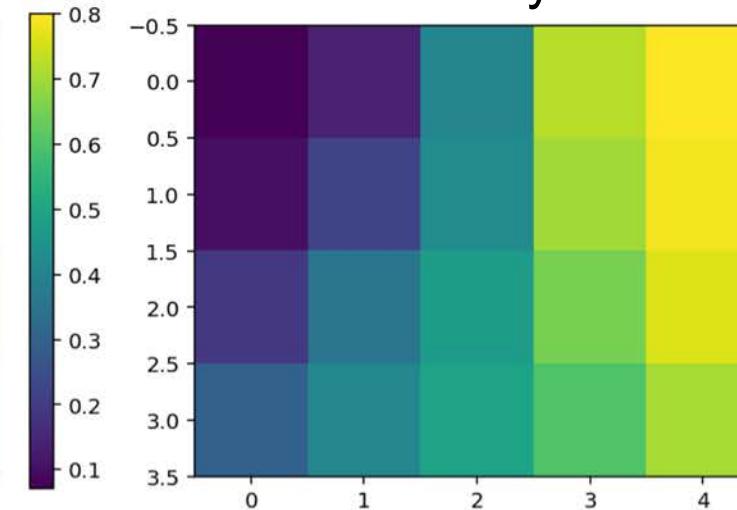
Generates maps that preserve data topology (relationships between data points)
Neighboring cells in the map represent similar conditions
Clusters: groups of neurons that describe regimes in the data

Self Organizing Map (SOM)

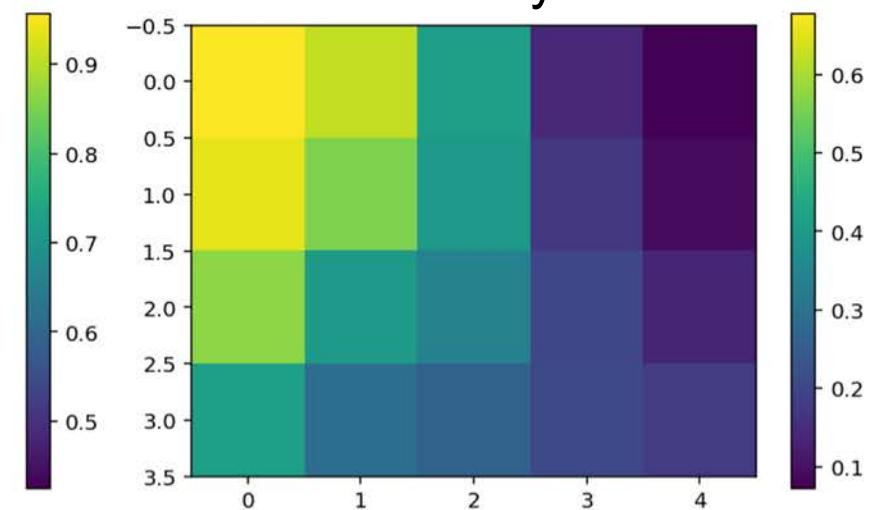
Temperature



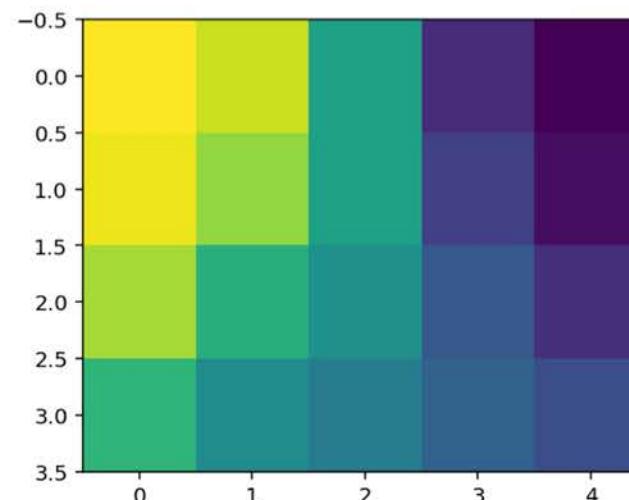
Salinity



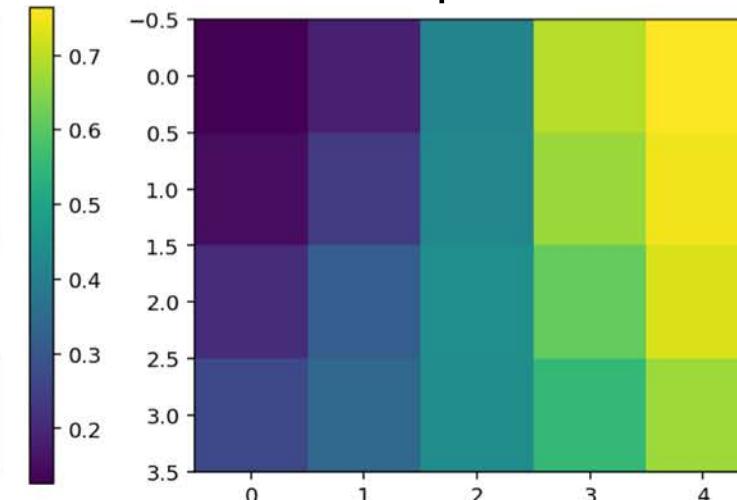
Turbidity



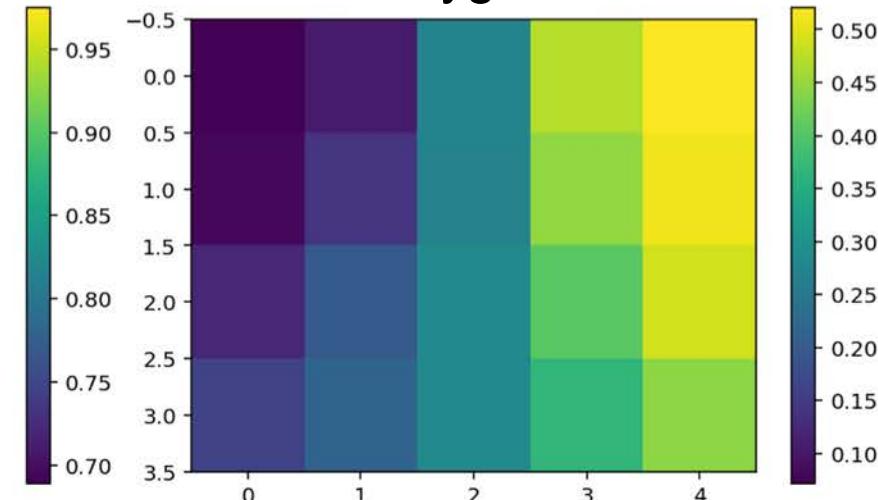
Fluorescence



pH

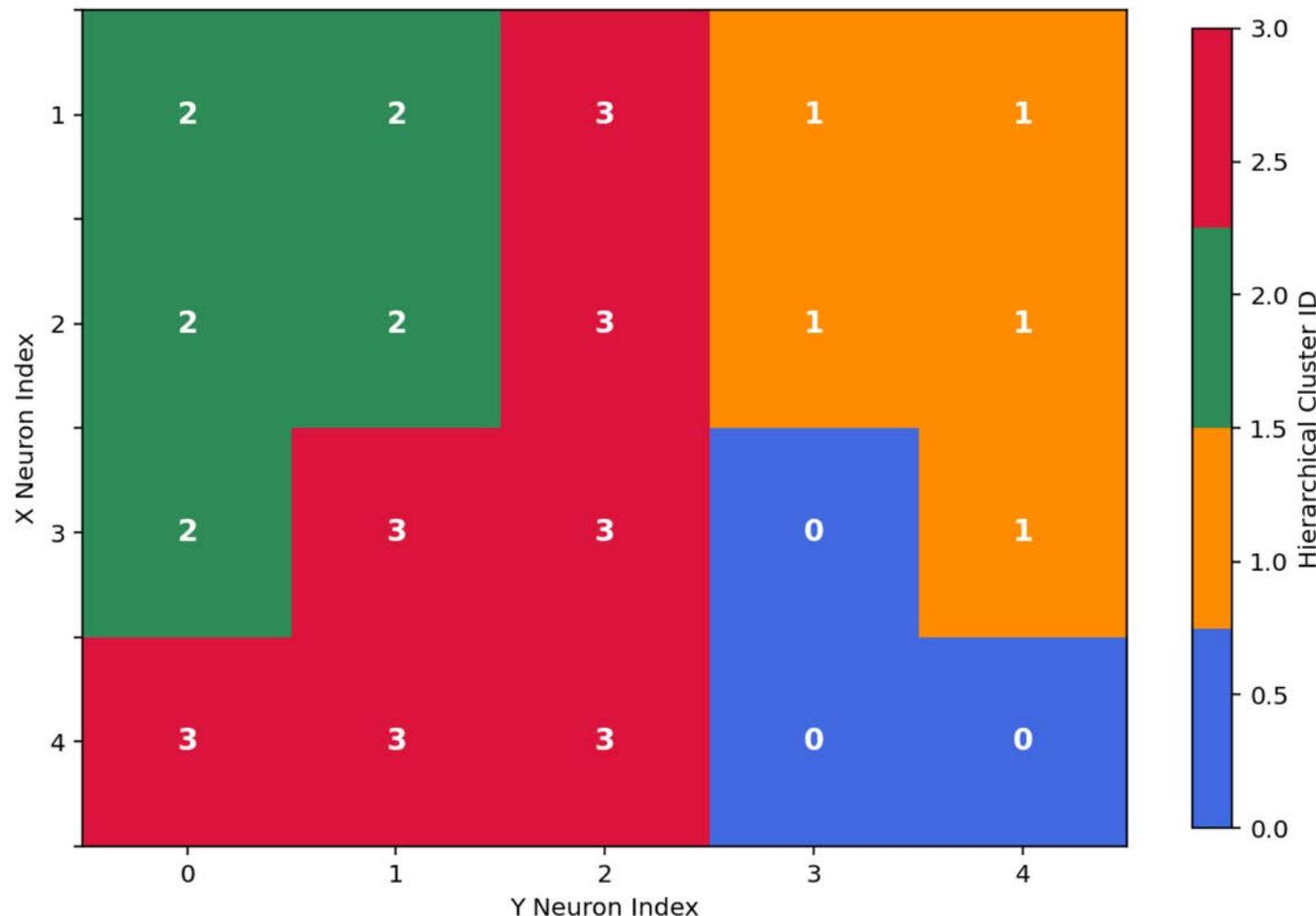


Oxygen

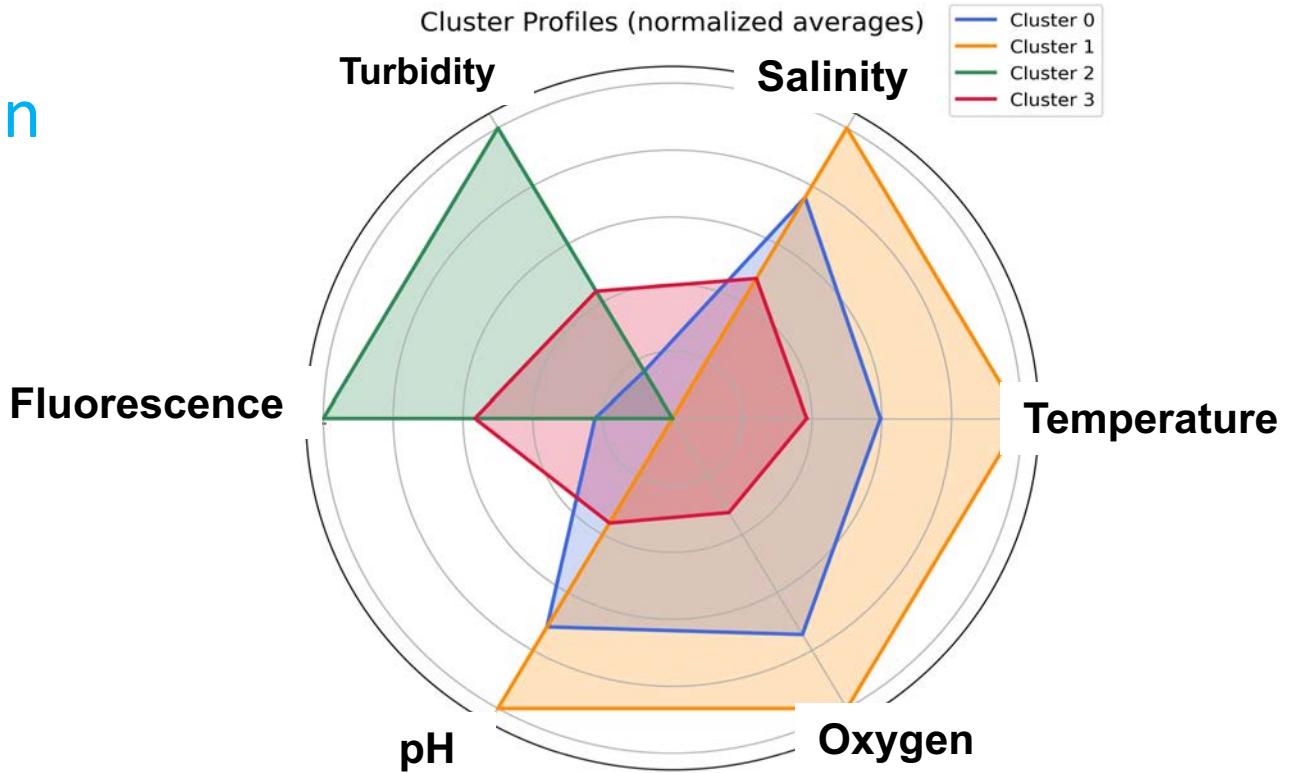


Hierarchical clustering of neurons

Hierarchical clustering takes SOM neurons and groups them into a smaller number of meaningful clusters



Hierarchical clusters - Interpretation



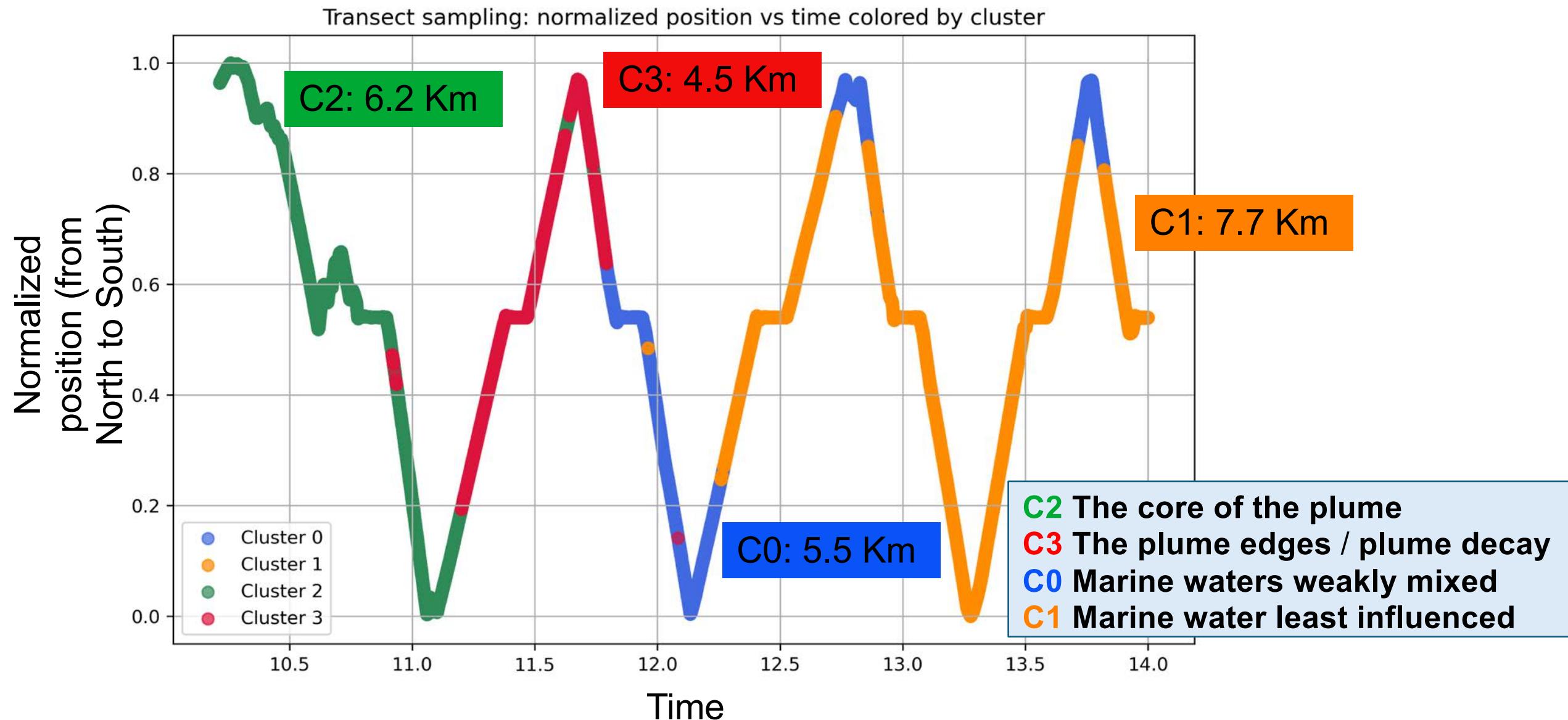
Cluster 2 (Low: salinity, temperature, oxygen, pH. High turbidity, fluo): **The core of the plume**

Cluster 3 (intermediate salinity, moderate turbidity/flu): **The plume edges / plume decay**
plume water interacts laterally with surrounding marine waters or efect of the plume fades.

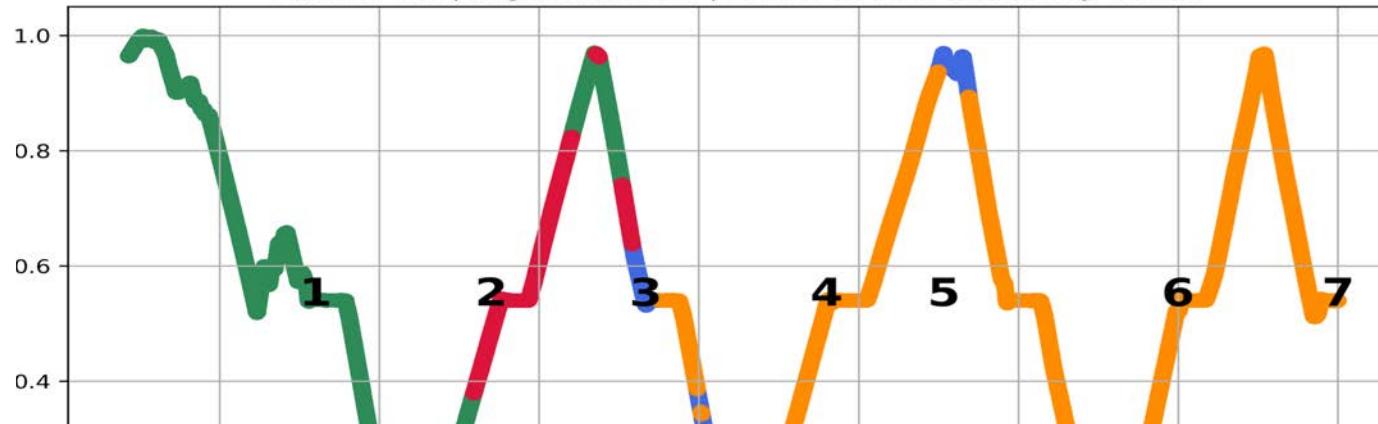
Cluster 0 (higher salinity, moderate fluo): **Marine waters weakly mixed with the plume margin.**

Cluster 1 (highest salinity, lowest turbidity/flu): **Marine water least influenced by the plume.**

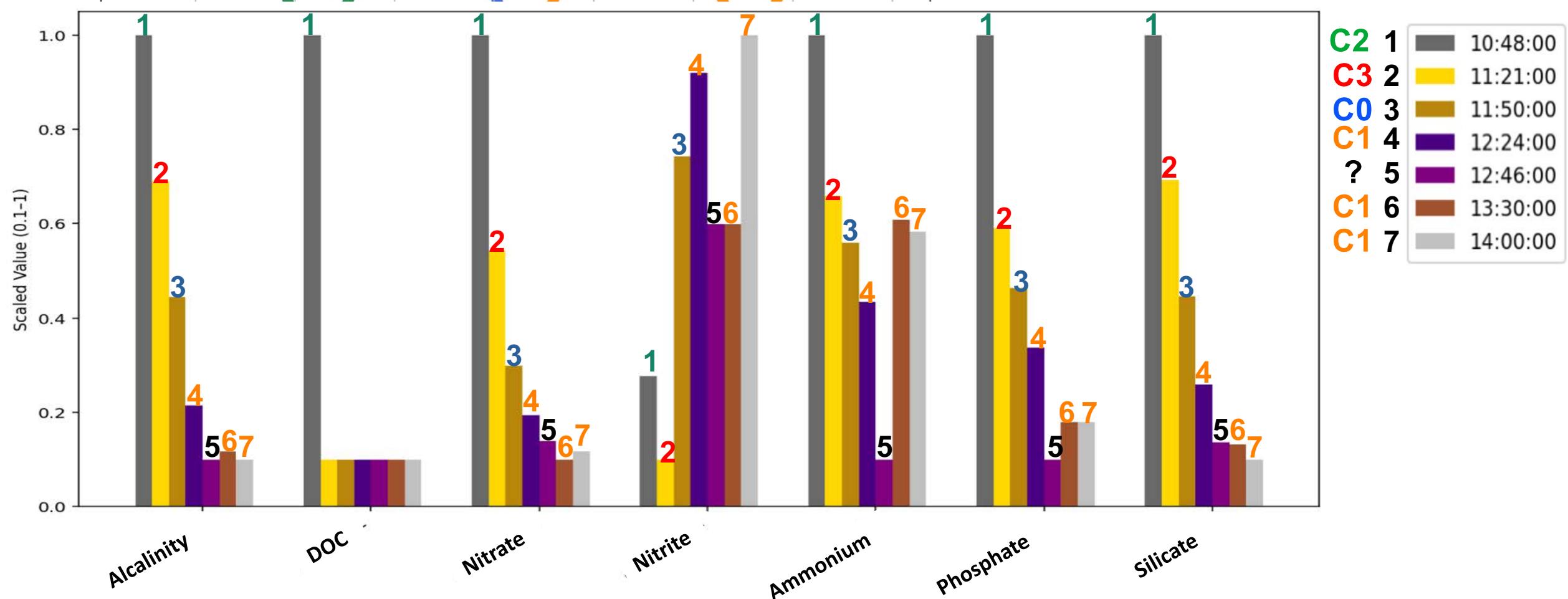
Hierarchical clusters - Back projection



Transect sampling: normalized position vs time colored by cluster



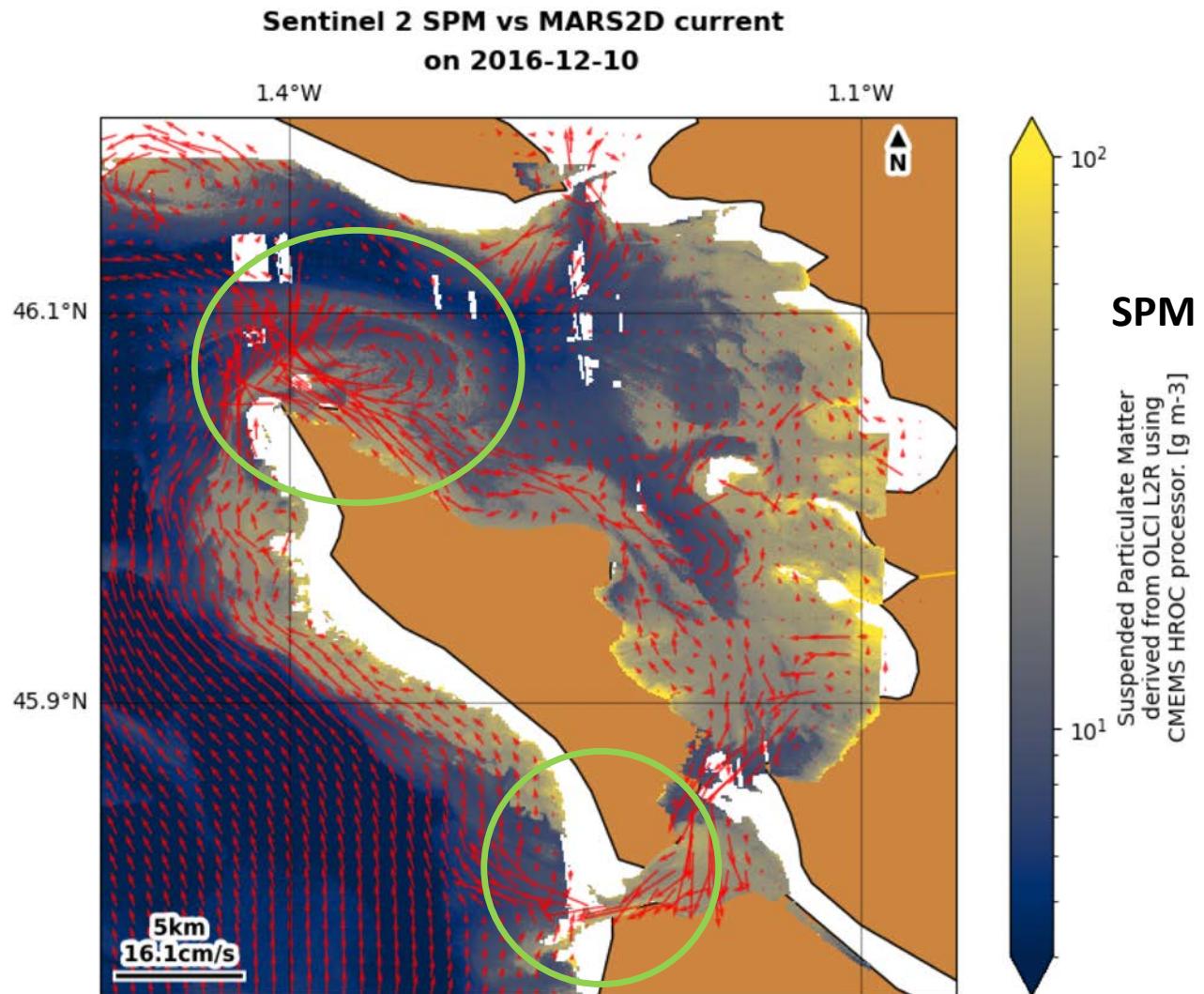
C2 The core of the plume
C3 The plume edges / plume decay
C0 Marine waters weakly mixed
C1 Marine water least influenced



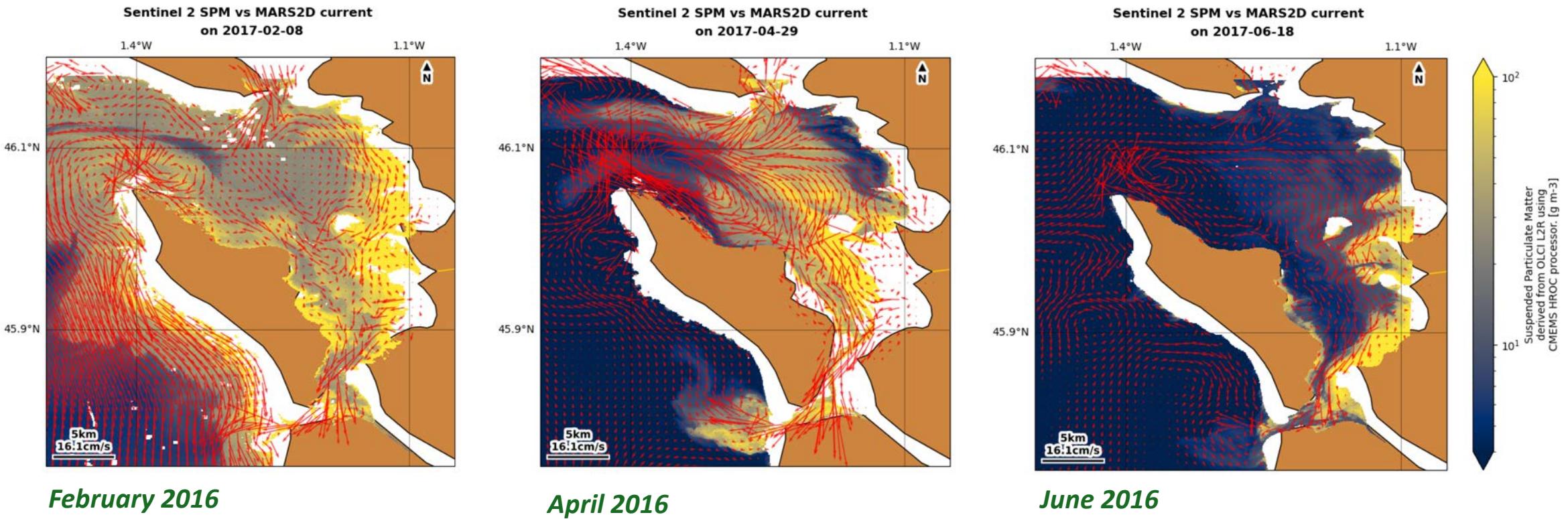
The plume downstream: insights from space remote sensing and models

December 2016

- ❖ 2 main **outflow paths** spotted, North and South
- ❖ Correlates with **high suspended particulate matter (SPM)** concentrations



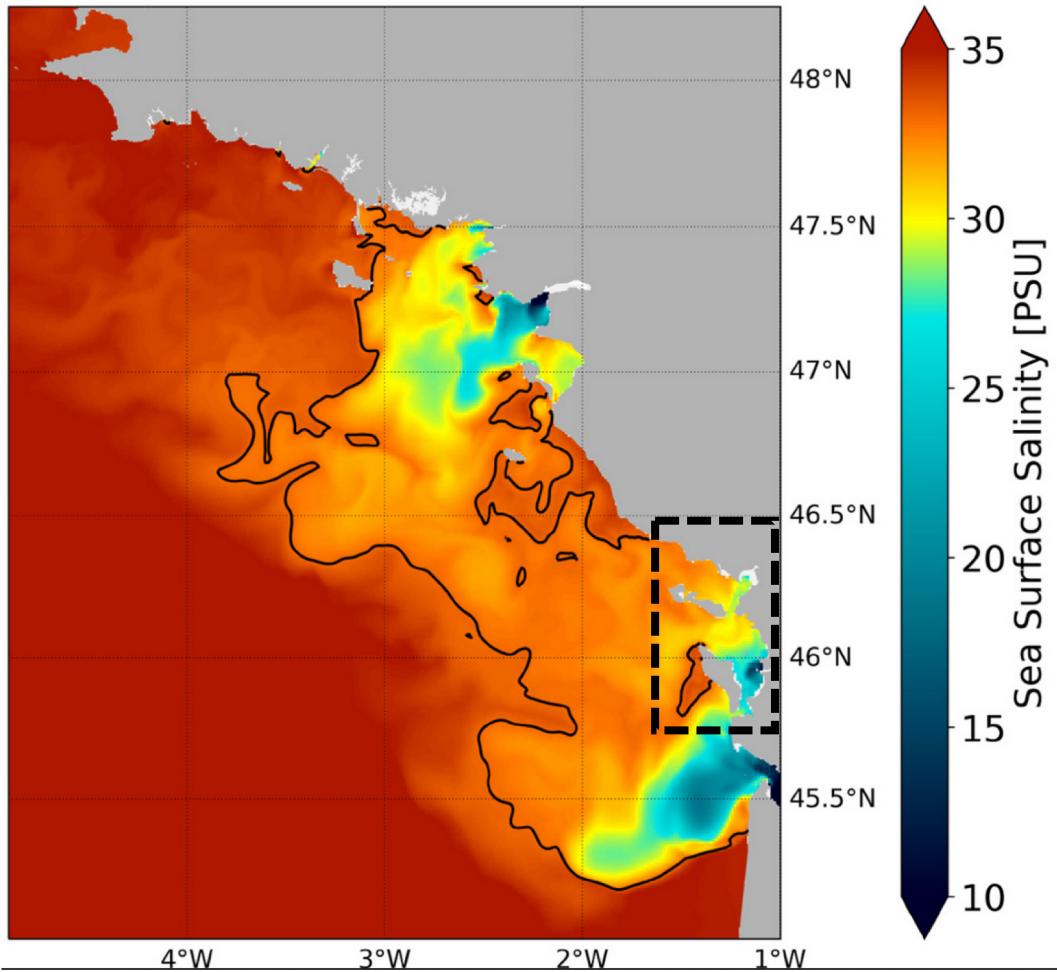
The plume downstream: insights from space remote sensing and models



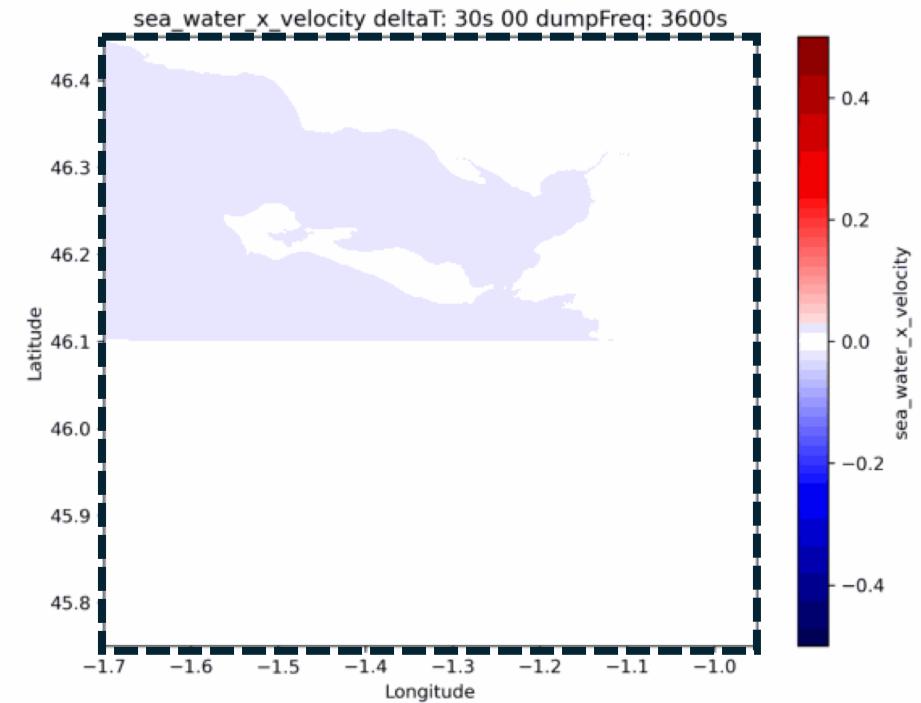
Some features seem **recurrent across the seasons**:

- **Eddies** varying in intensity and **shaping high and low SPM** concentration patterns
- **SPM flushed out** North or South of the Pertuis, and then **recirculated in or out**

The modeling activity in RiOMar and LRTZC



RiOMar, Ifremer CROCO, 1 km (Martinez Almoyna et al., 2025)



LRTZC, ECCO-Darwin, 80 m (Mattei, Le Fouest, Menemenlis)