



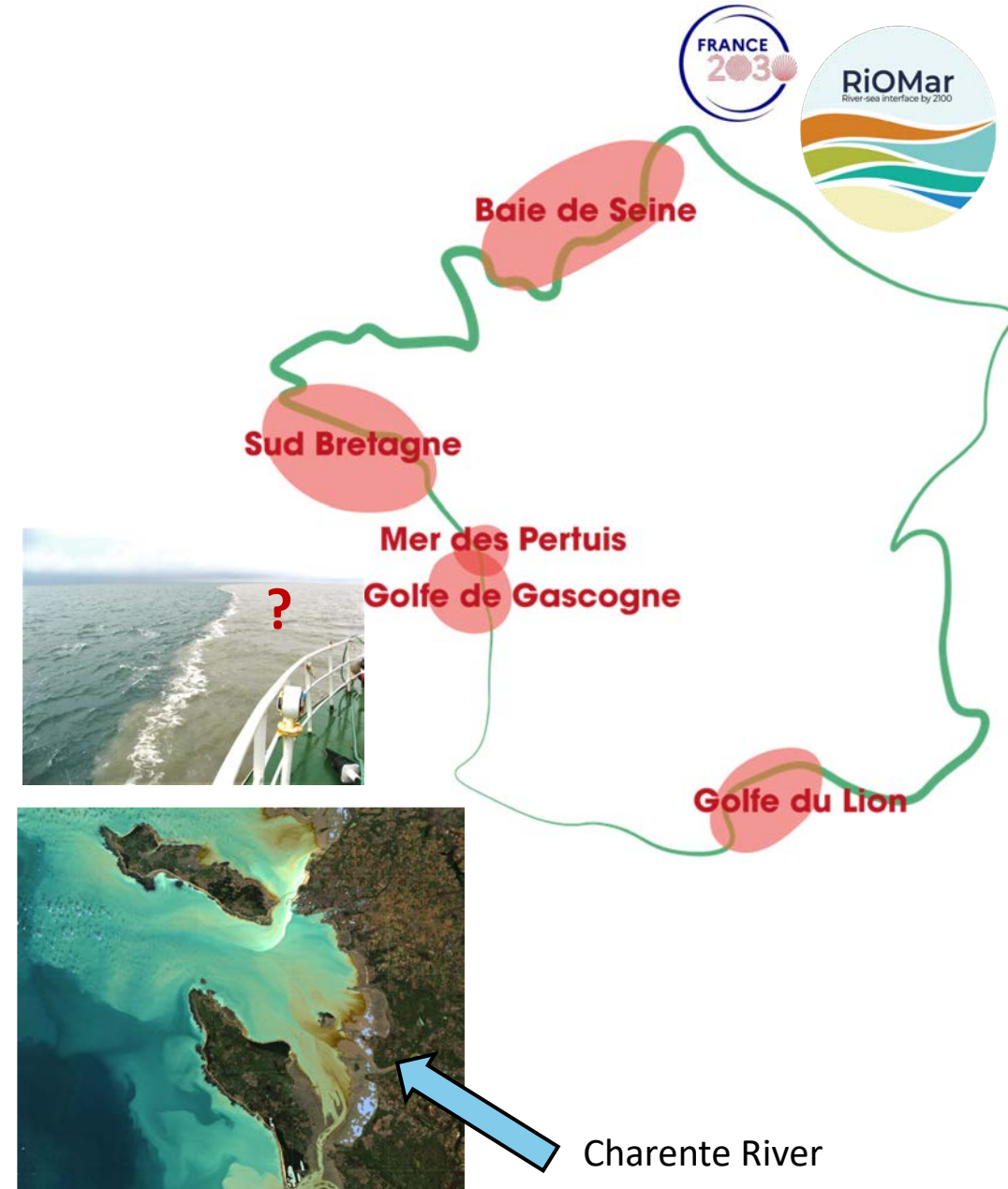
# Integrated Observations from the RiOMar Project in the Pertuis Charentais (PPR Océan & Climat)

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IFREMER

# The RiOMar project (2023-2028)

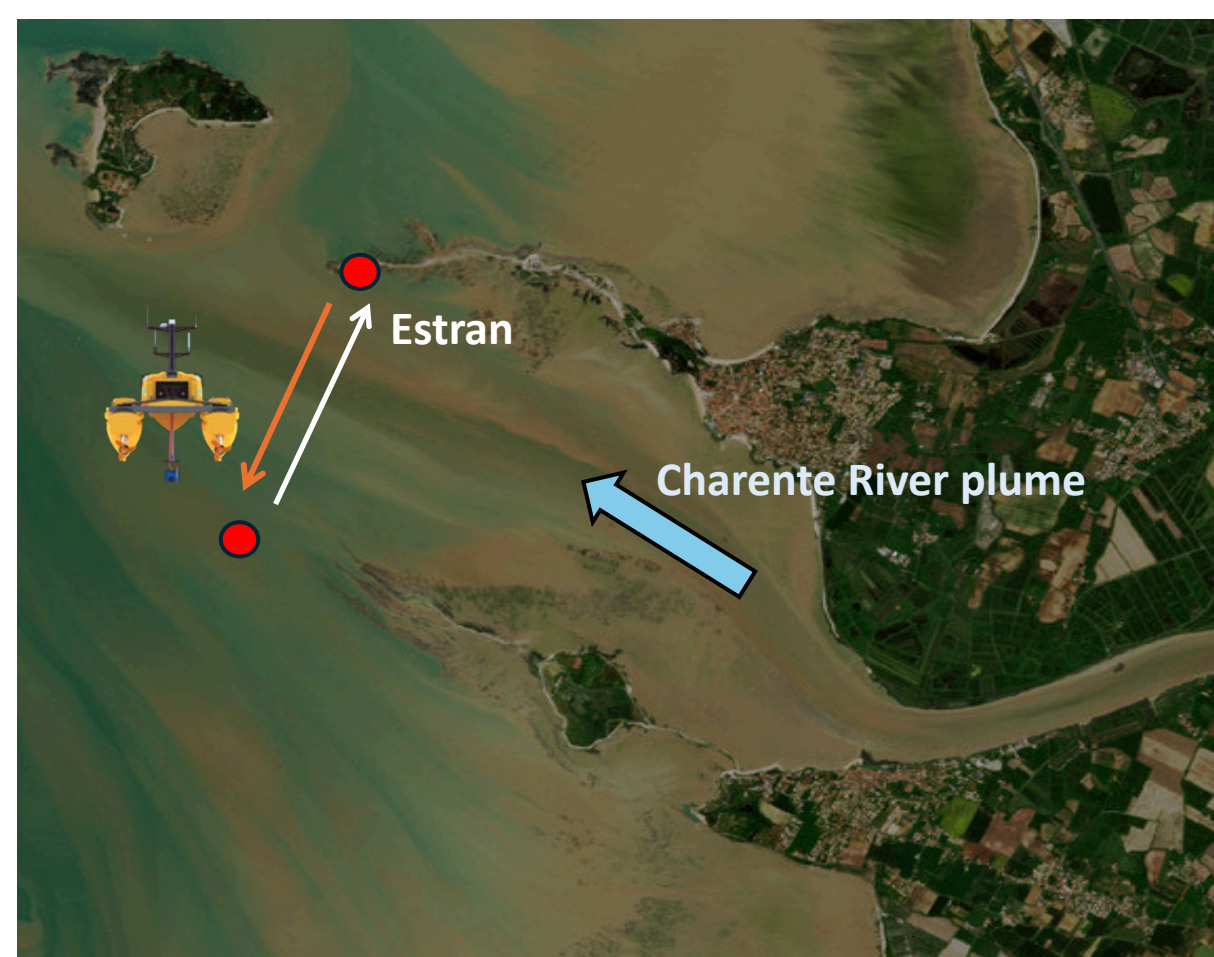
Observe and anticipate the evolution of French coastal zones under the influence of rivers in the 21st century

- 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)



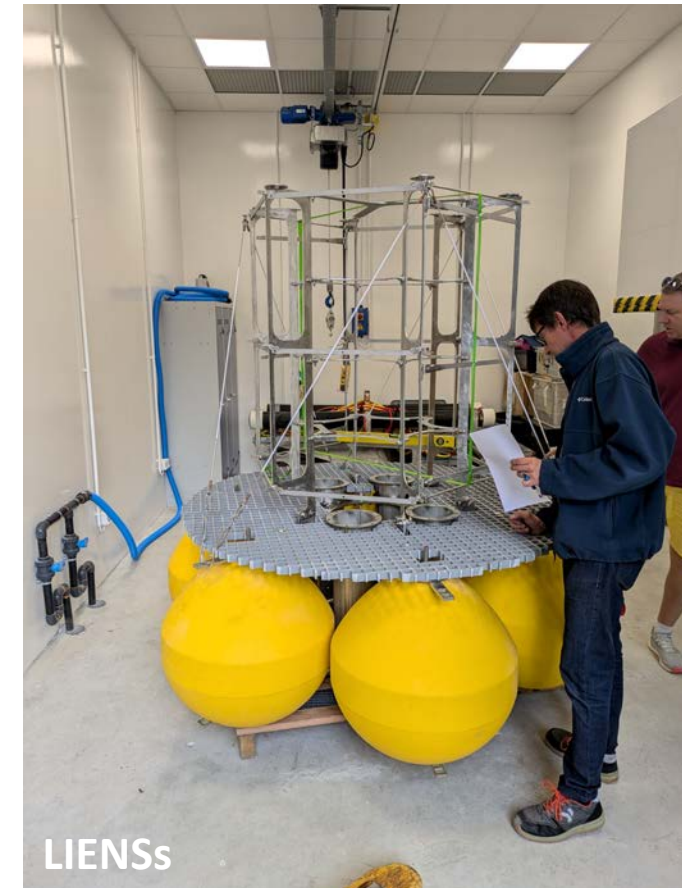
# How and what

- PAMELi **U.A.V.**
- **Ship** Estran
- Multi-parametric **probes** (T, S, pH, O<sub>2</sub>, pCO<sub>2</sub>, turbidity, fluorescence)
- Surface **water samples** taken by PAMELi (Chl  $\alpha$ , nutrients, DOC, TALK) at edges of the transects and midway
- At edges, two moorings (T, S, turbidity) ●



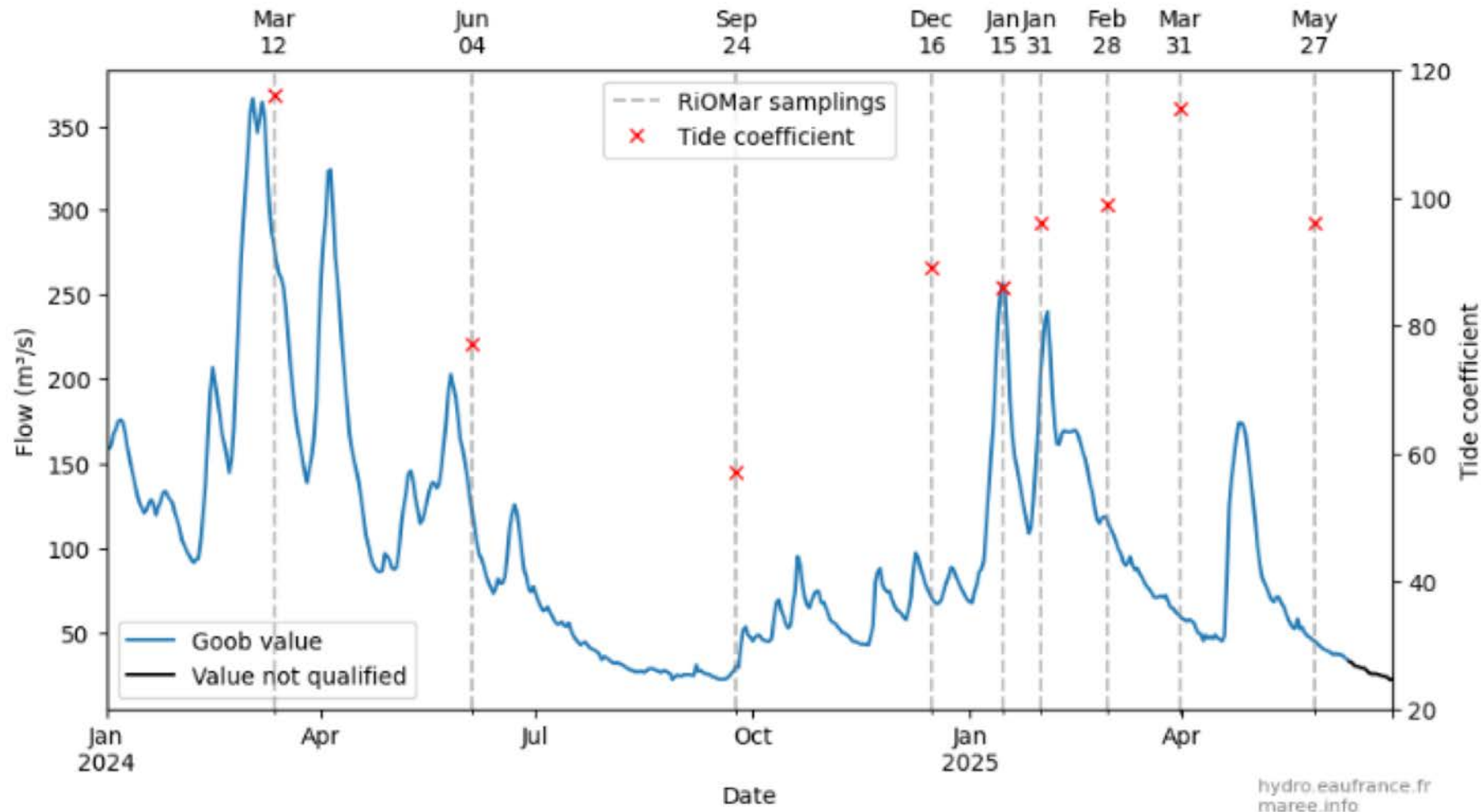


Bouée-Li (to come soon)



January, 2025 (Landsat)

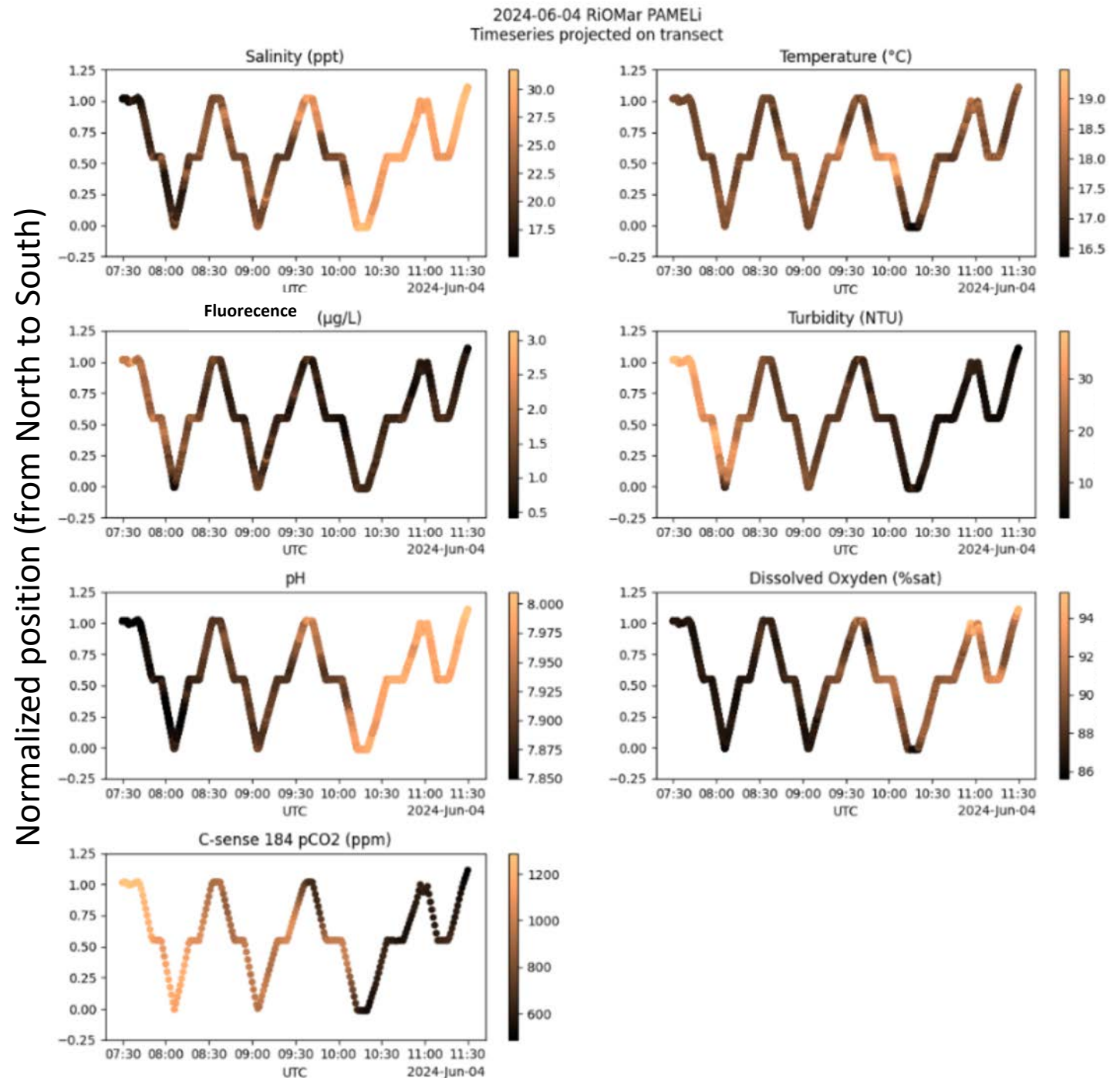
Charente River's **discharge** (full line) with samplings dates (dashed line) and respective **tidal coefficients**



Sampling at **ebb tide**

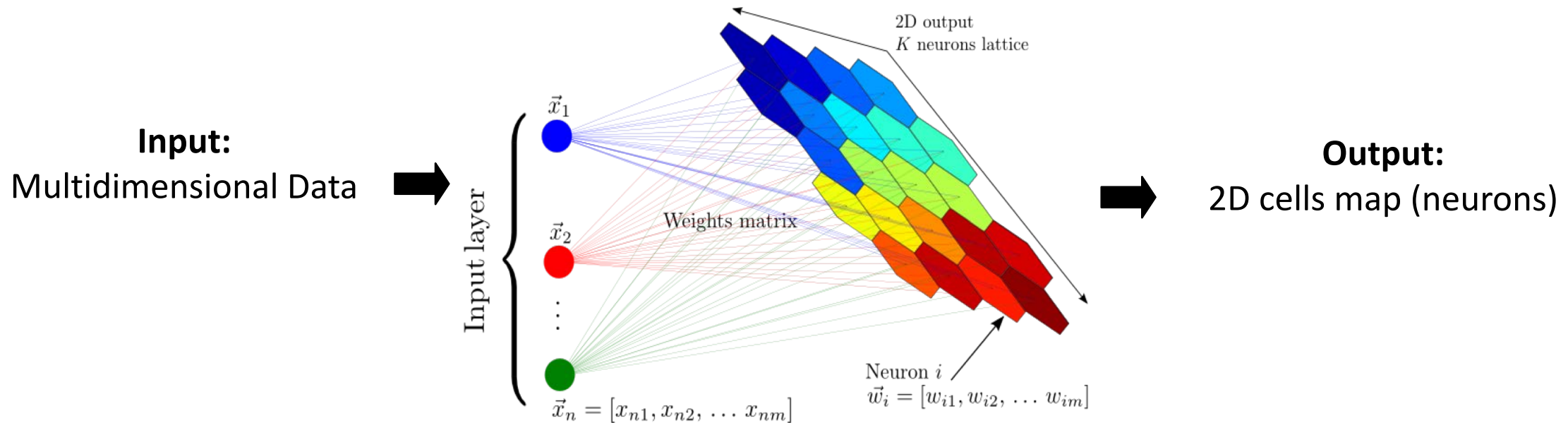
More than **10 cruises**, **14 parameters** evolving across **space** and **time**

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)

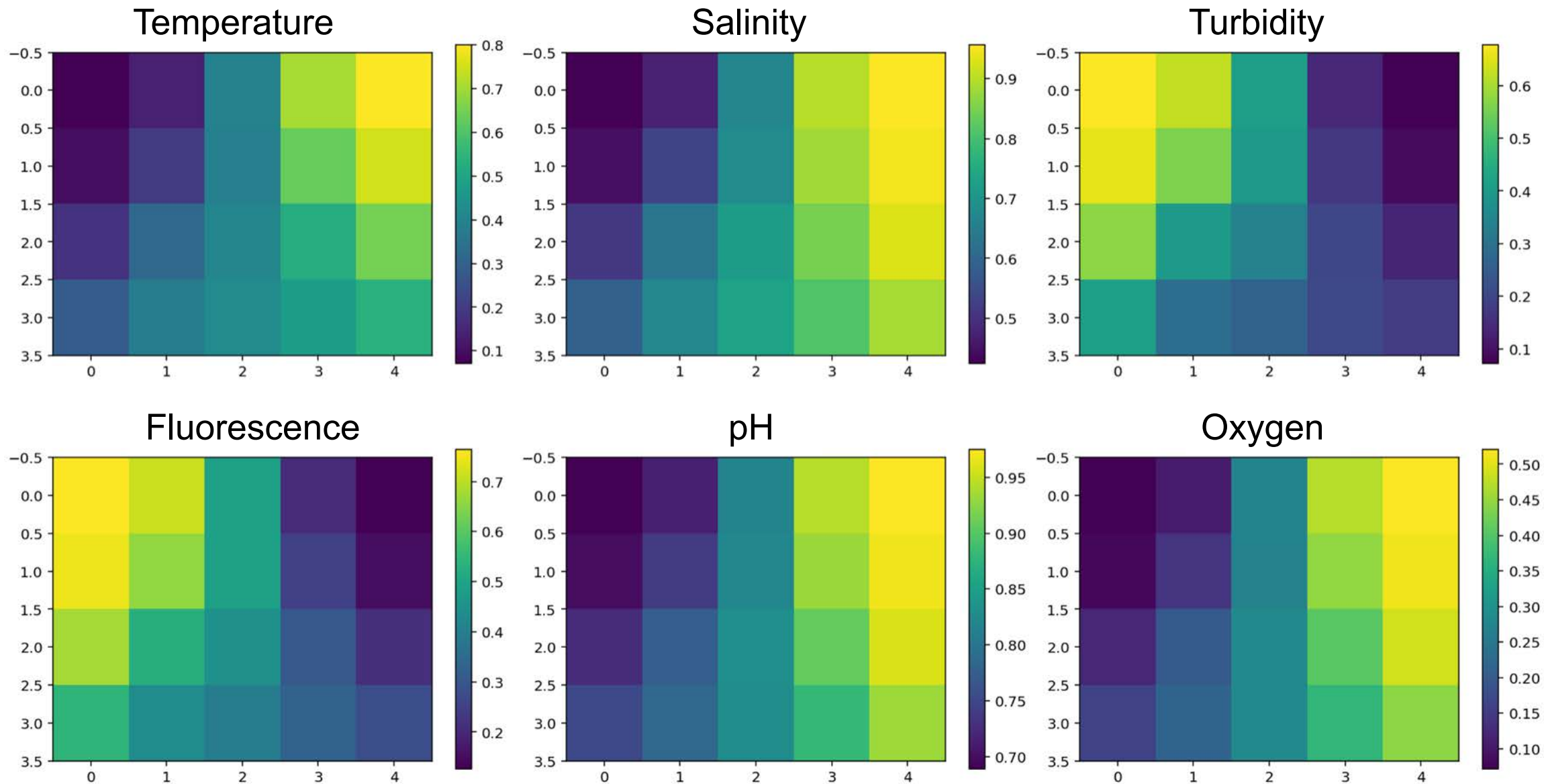


Generates maps that preserve data topology (relationships between data points)

Neighboring cells in the map represent similar conditions

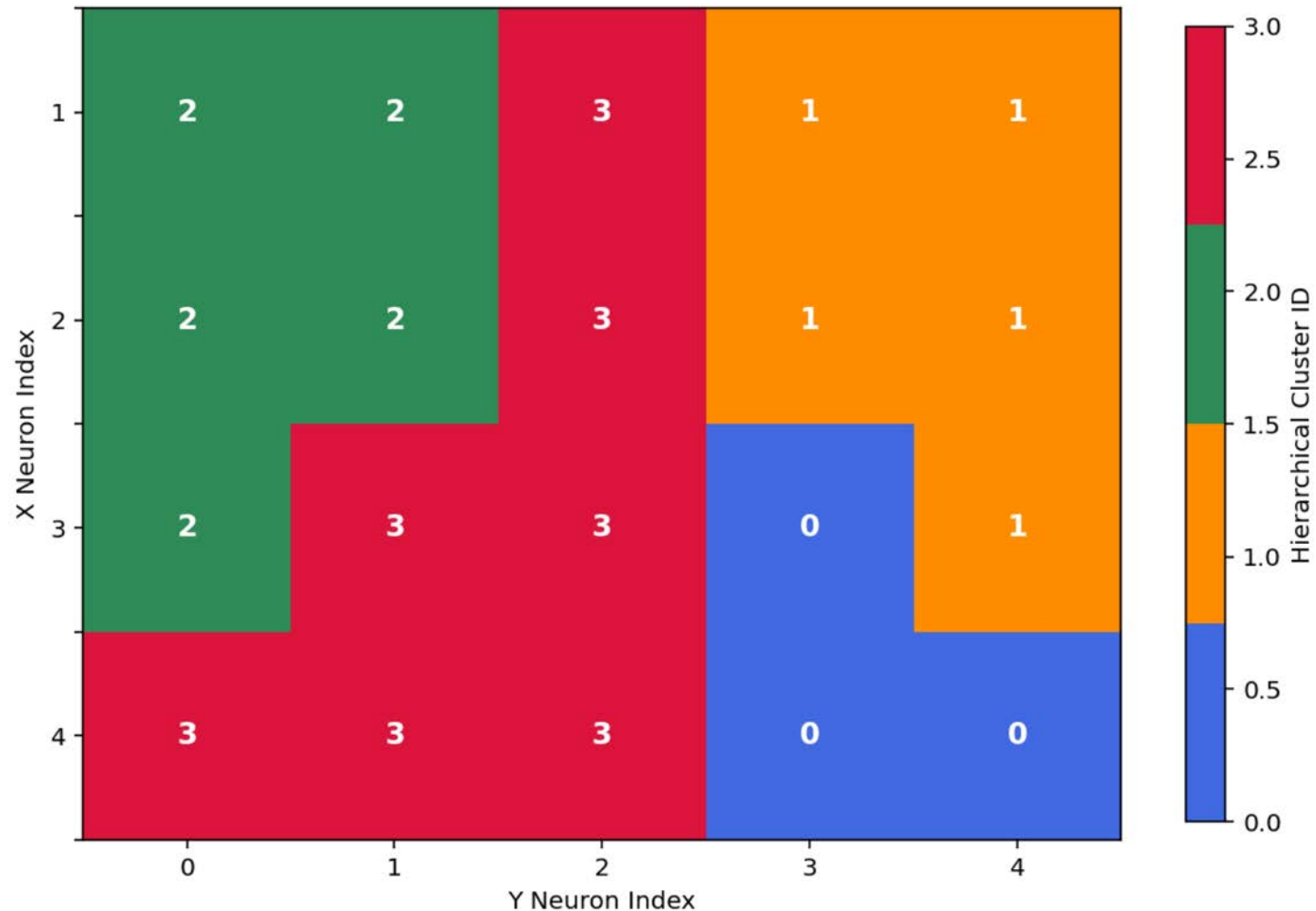
Clusters: groups of neurons that describe regimes in the data

# Self Organizing Map (SOM)

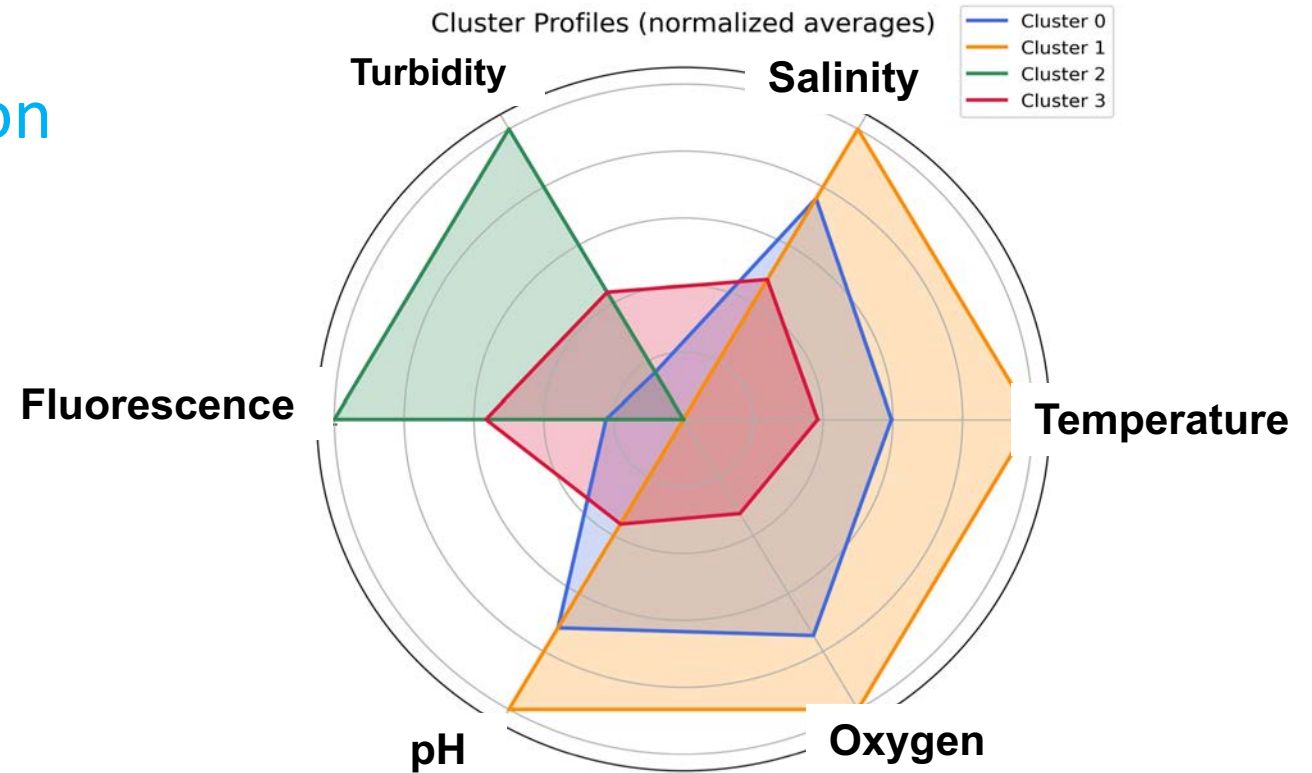


# Hierarchical clustering of neurons

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



# Hierarchical clusters - Interpretation



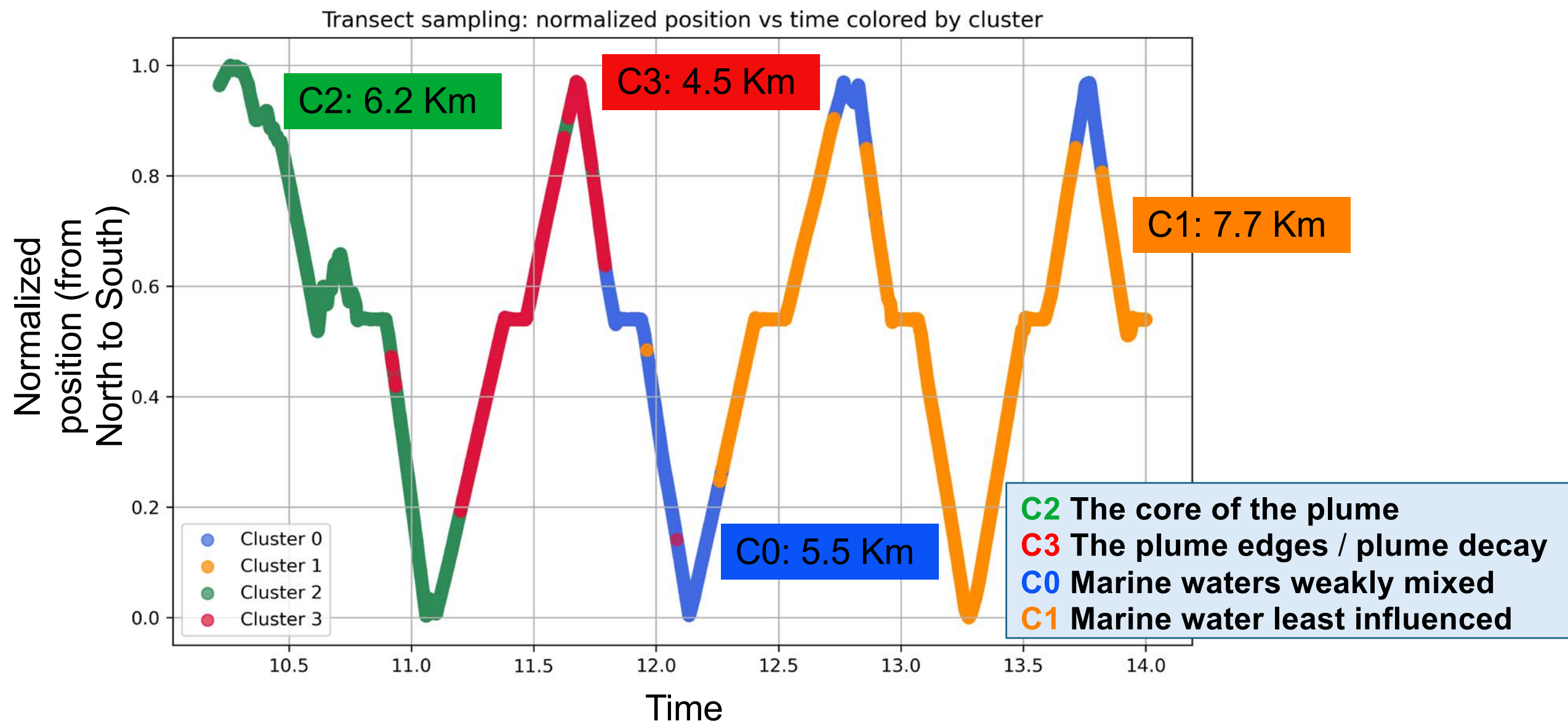
**Cluster 2** (**Low**: salinity, temperature, oxygen, pH. **High** turbidity, fluo): **The core of the plume**

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

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

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

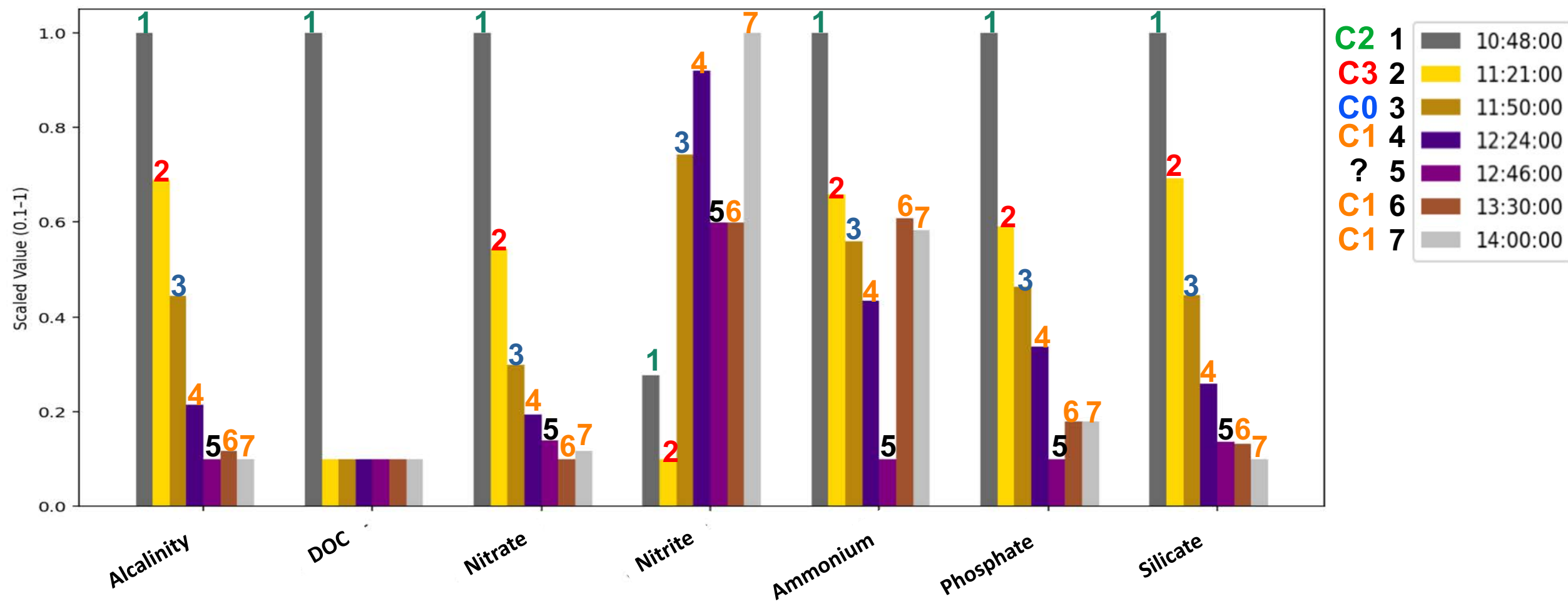
# Hierarchical clusters - Back projection



Transect sampling: normalized position vs time colored by cluster



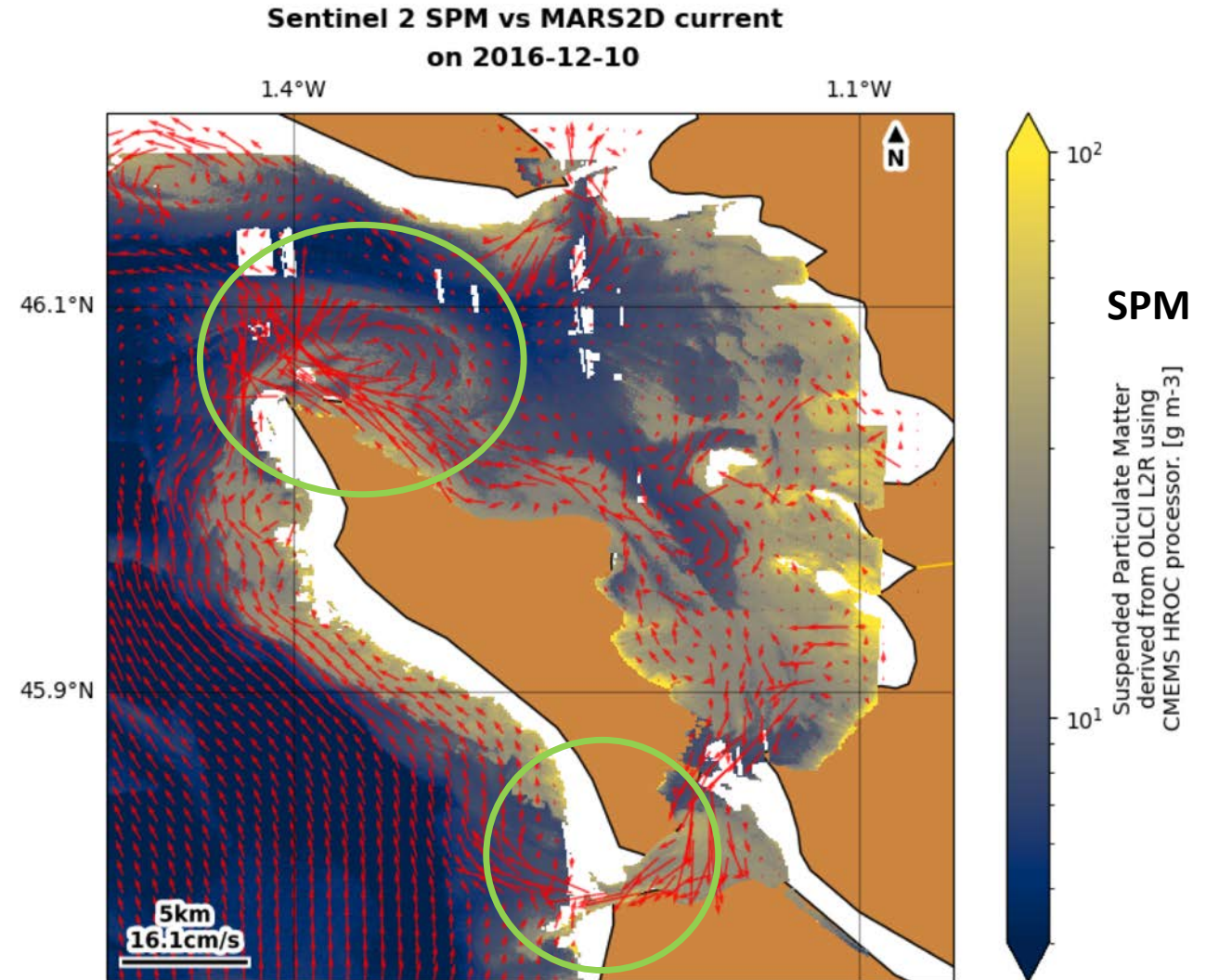
- C2** The core of the plume
- C3** The plume edges / plume decay
- C0** Marine waters weakly mixed
- C1** Marine water least influenced



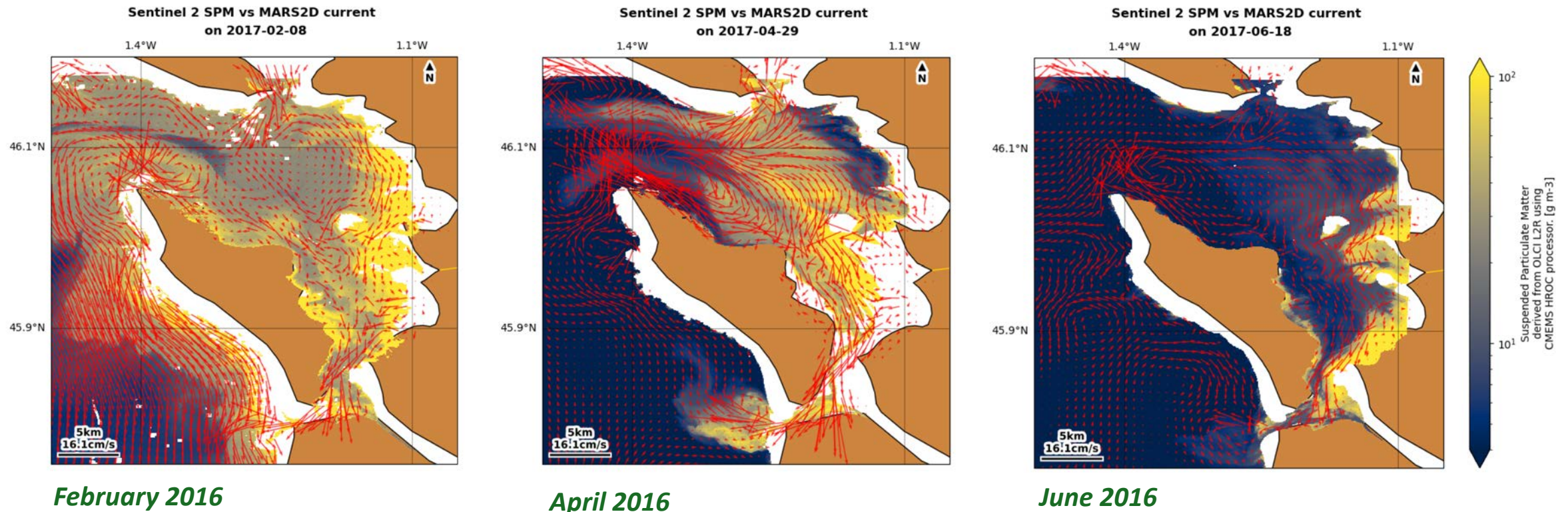
# The plume downstream: insights from space remote sensing and models

December 2016

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



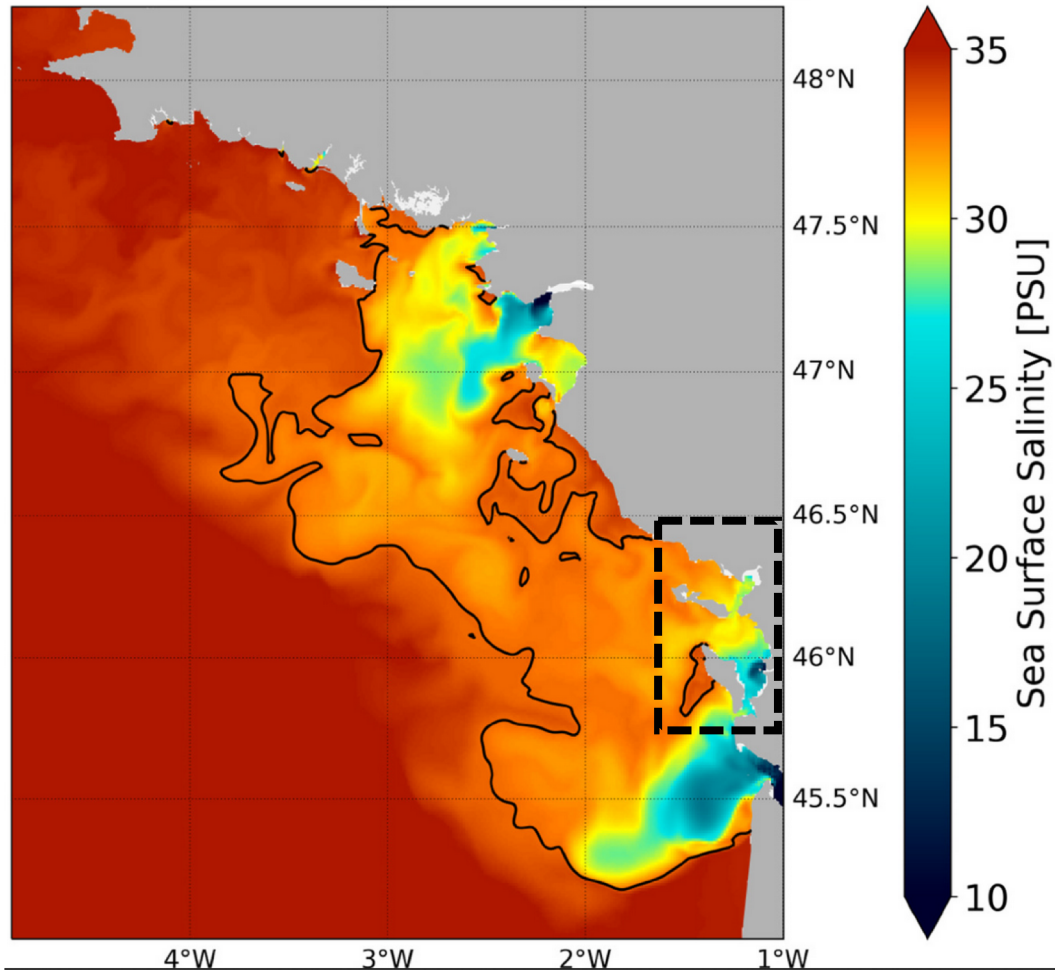
# The plume downstream: insights from space remote sensing and models



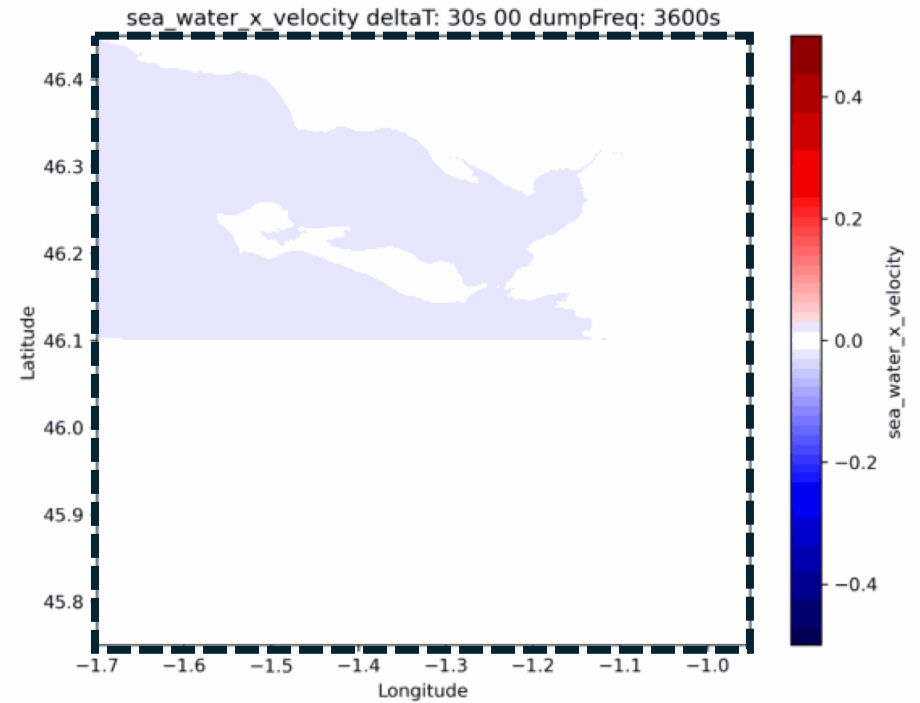
Some features seem **recurrent across the seasons**:

- **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)