



# VERTICAL EXPORT OF PARTICULATE ORGANIC CARBON IN THE RÍA DE VIGO (NE ATLANTIC UPWELLING SYSTEM): THE ROLE OF PHYSICAL FORCING AND PHYTOPLANKTON COMMUNITY STRUCTURE

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EGU meeting  
Vienna, 3-8 April 2011

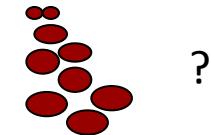


# Objectives



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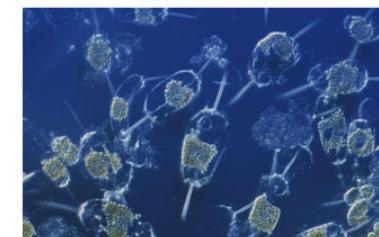
- To understand the **efficiency** of an upwelling **ecosystem** (Ría de Vigo; NW Iberian Peninsula) in the **vertical export of organic matter** from the photic zone on a seasonal basis.



- To describe how **hydrodynamic forces** are controlling the **vertical organic carbon fluxes** in the region.



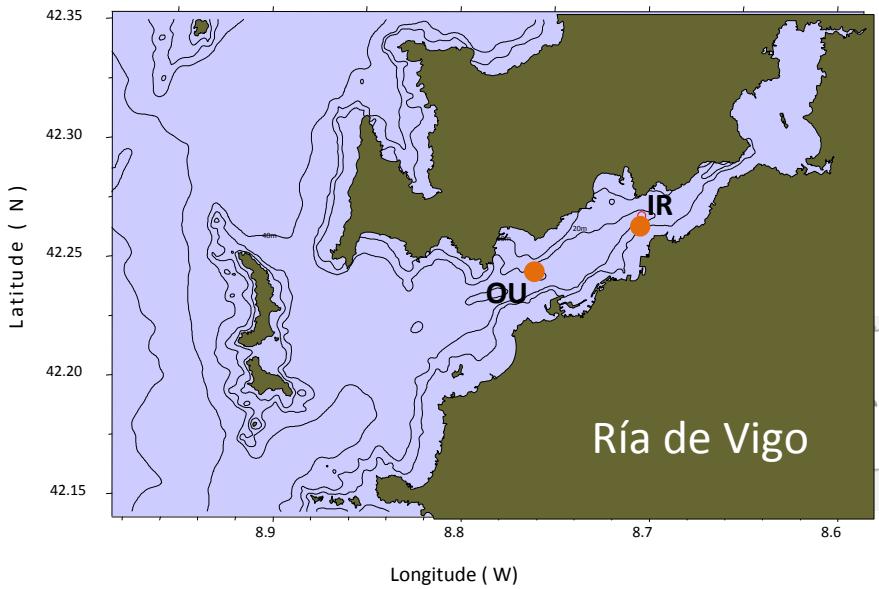
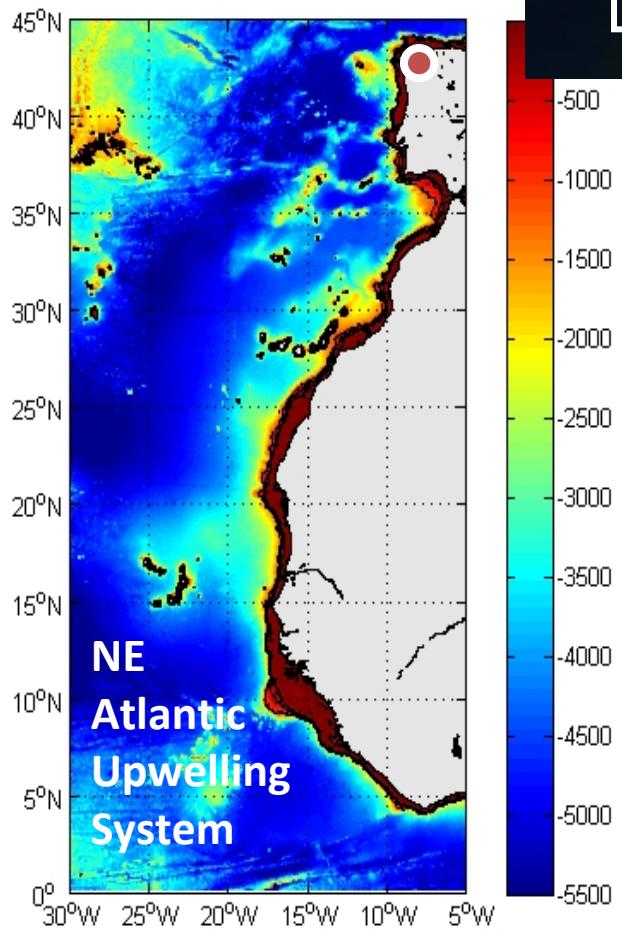
- To study the contribution of **living phytoplankton carbon** to vertical fluxes as a key piece to understand the **coupling** between **primary production** and the **vertical export** of the organic material from the photic zone.



# Study area

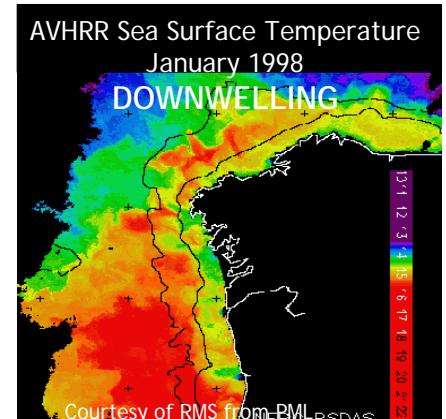
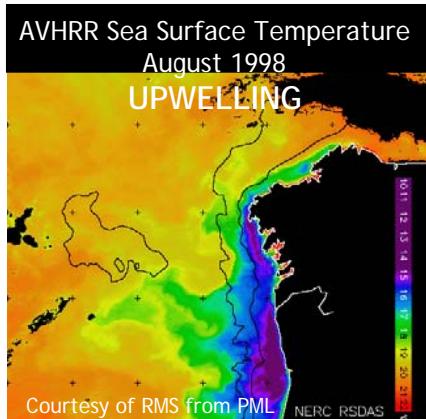


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**May- October UPWELLING (positive circulation)**

**November- April DOWNWELLING (negative circulation)**

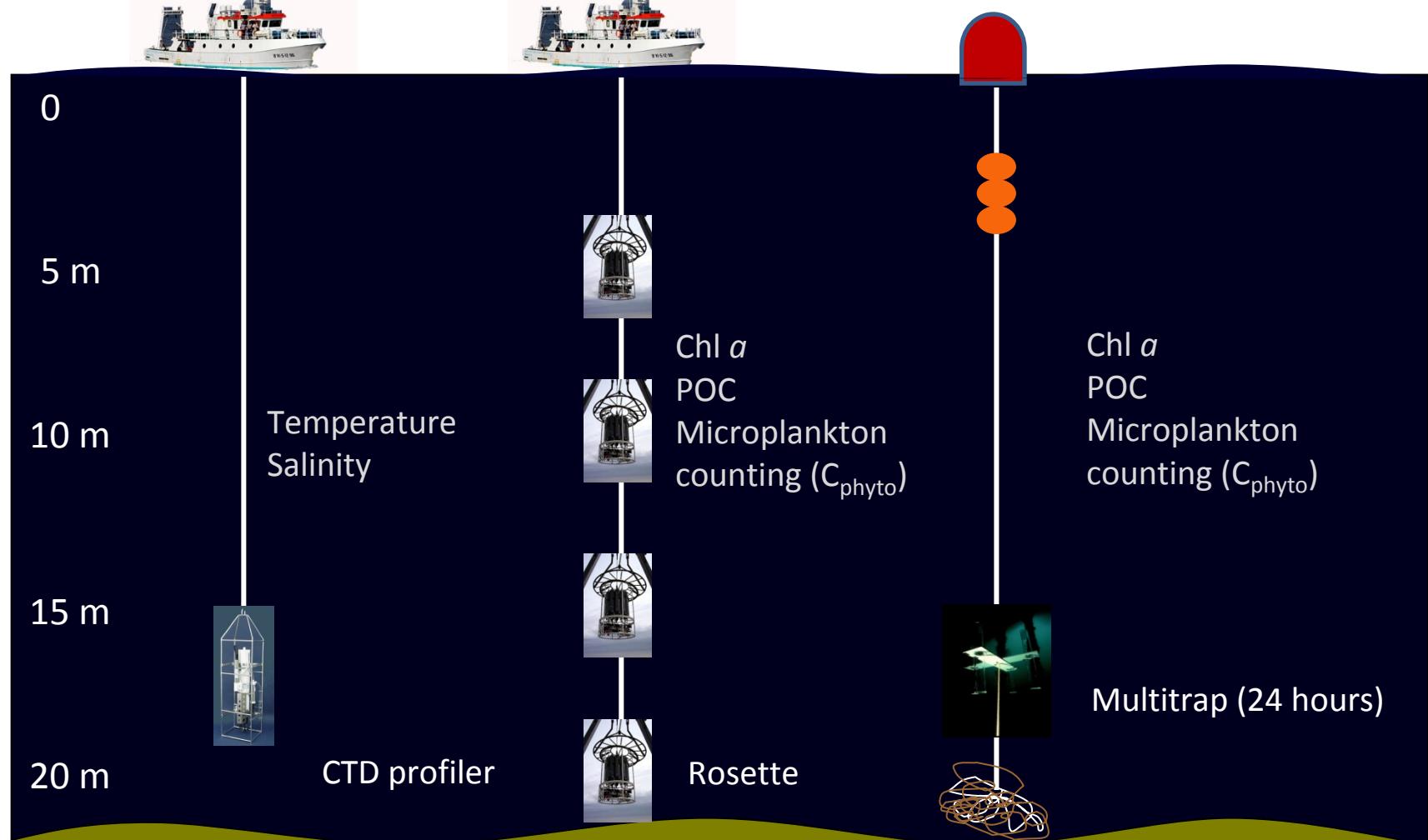


# Methods



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Twice a week for two weeks  
(40 oceanographic cruises)

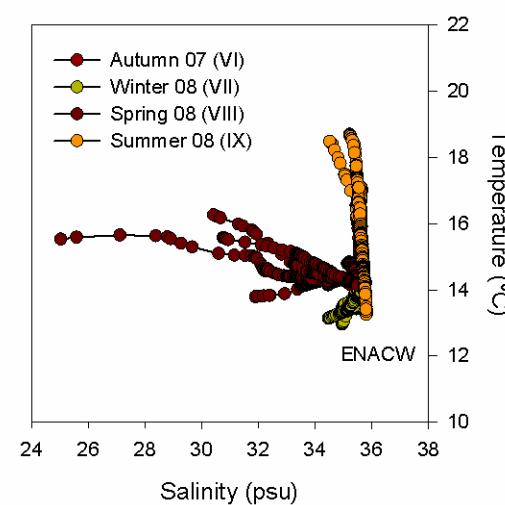
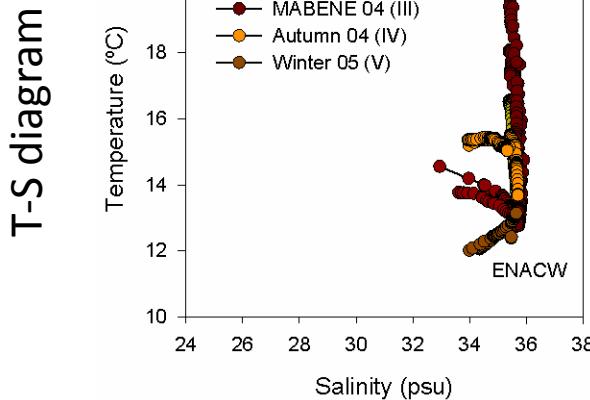
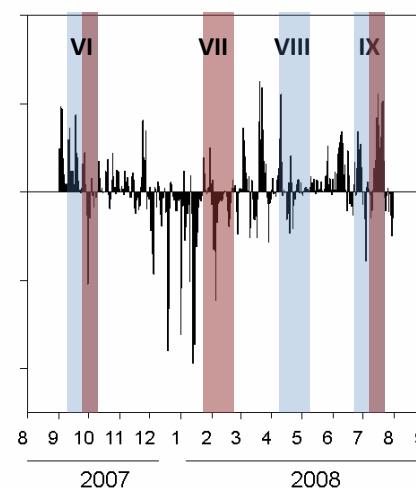
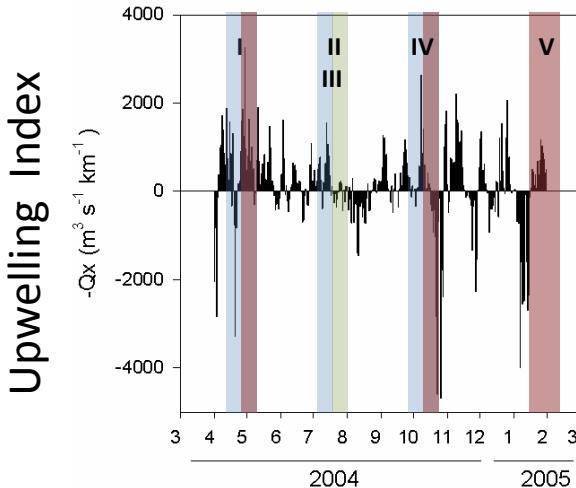


# Results and discussion



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## Hydrographic conditions



**UPWELLING**  
Periods I, II, IV, VI, VIII, IX

**STRATIFICATION**  
Periods III

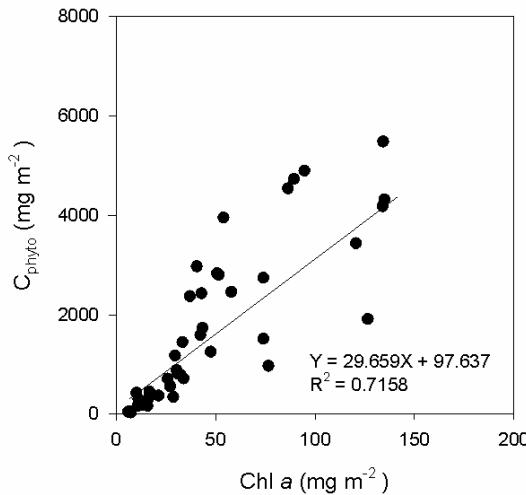
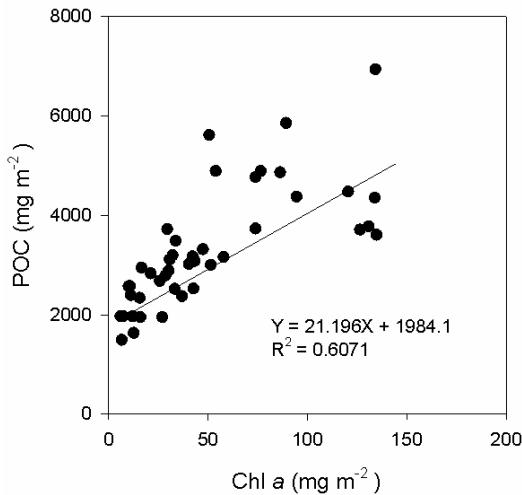
**DOWNWELLING/MIXING**  
Periods I, IV, V, VI, VII, IX

# Results and discussion



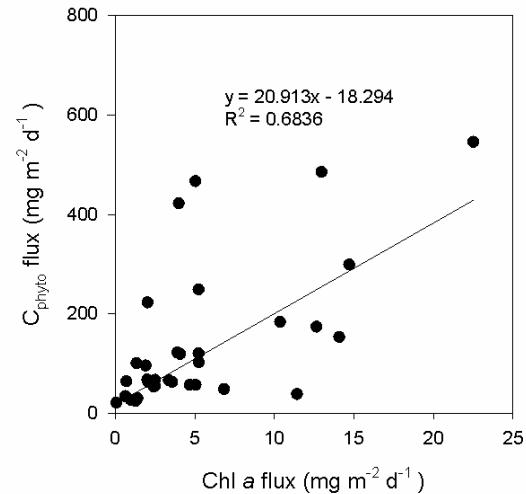
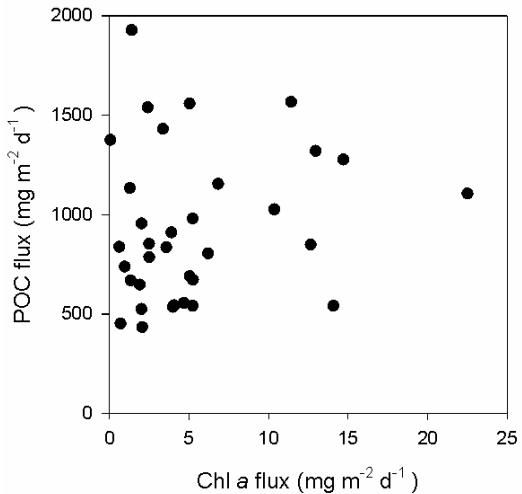
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## Water column



**Particulate organic carbon is predominantly from a pelagic origin**

## Sediment traps



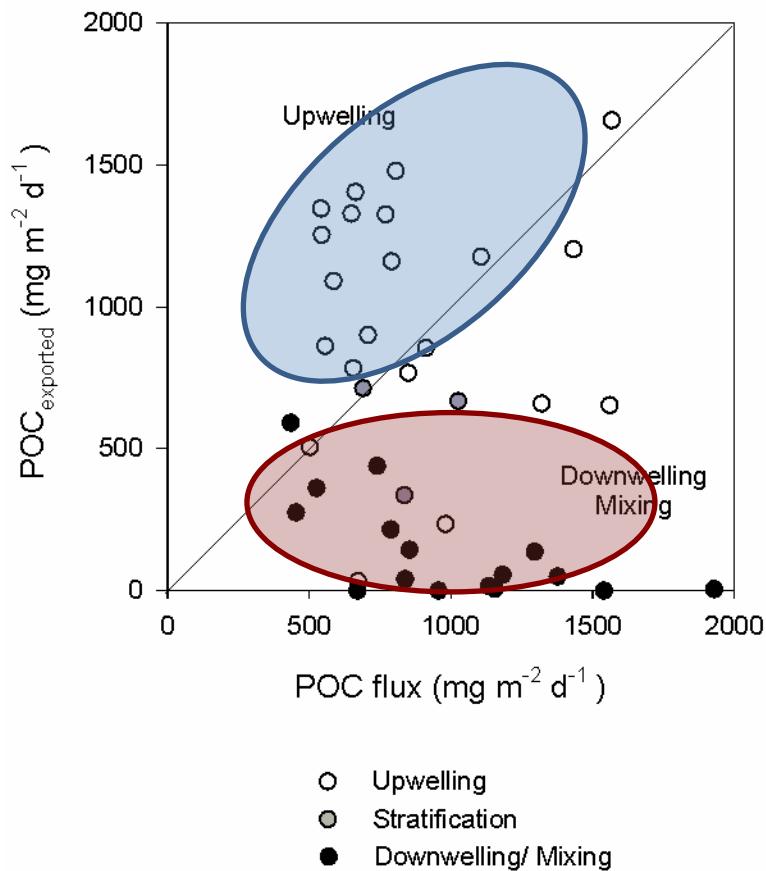
**Particulate organic carbon is NOT only related with phytoplankton biomass sinking below the photic zone**

# Results and discussion



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## Hydrographic control



$$\text{POC}_{\text{exported}} = \text{f-ratio} * \text{PP}_{\text{photic zone}}$$

**POC flux** = Real POC flux (recorded by the sediment traps)

### UPWELLING

$$\text{POC}_{\text{exported}} > \text{POC flux}$$

Export out of the Ría  
(up to 60%)

### DOWNWELLING / MIXING

$$\text{POC}_{\text{exported}} < \text{POC flux}$$

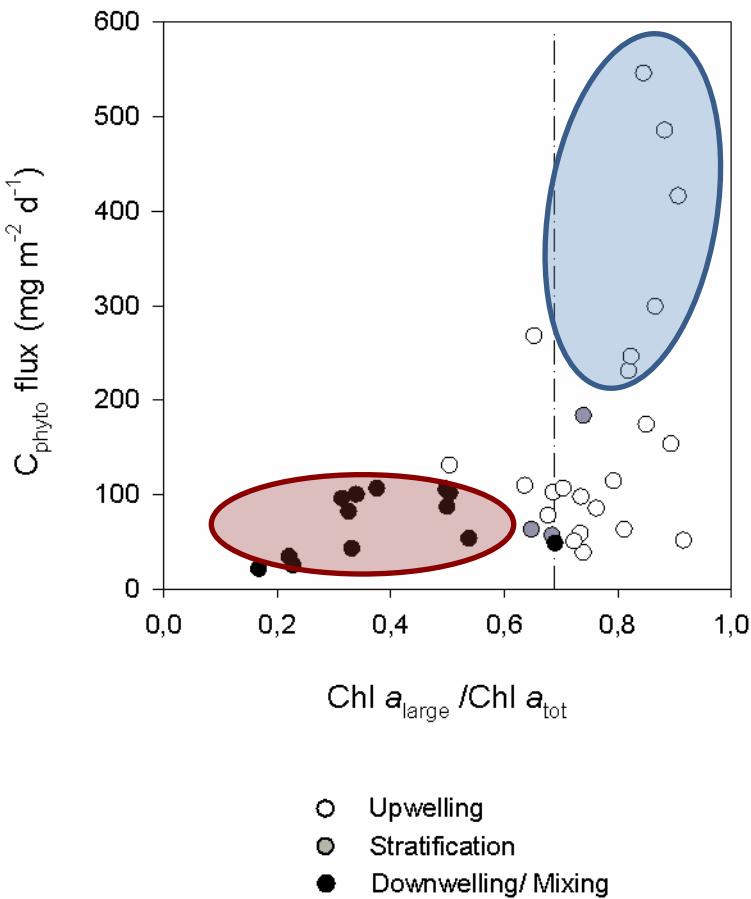
Other allochthonous  
sources

# Results and discussion



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## Biological control



$\text{Chl } a_{\text{large}} / \text{Chl } a_{\text{tot}}$  increase ( $\text{Chl } a_{\text{large}} = > 20 \mu\text{m}$ )

Phytoplankton carbon flux at the bottom layer increase

### UPWELLING

$\text{Chl } a_{\text{large}} / \text{Chl } a_{\text{tot}} > 0.7$  (70%)

Phyto flux HIGH

CHAIN FORMING DIATOMS

### DOWNWELLING/ MIXING

$\text{Chl } a_{\text{large}} / \text{Chl } a_{\text{tot}}$  LOW

Cells remain in suspension in the water column

SMALL SOLITARY CELLS

# Conclusions



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Instead of its regional importance our results could be interesting for people modelizing **ocean organic carbon cycle**. Some important aspects are:

- The **export of organic carbon** out of the photic zone in the Ría de Vigo is very high and is clearly affected by seasonal processes. Our results point to the importance of **coastal zones**, specially those affected by upwelling processes, as key regions in the **biological CO<sub>2</sub> pump**.
- The **HYDROGRAPHIC CONDITIONS** in the Ría clearly controlled the vertical fluxes of particulate organic carbon being susceptible to be **vertically transferred** out of the photic zone or **horizontally exported out** of the Ría.
- The **PHYTOPLANKTON COMMUNITY STRUCTURE** varies seasonally. When dominance of **large phytoplankton cells**, there is an enhancement of **vertical carbon export** from the photic zone.



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A photograph of a large cable-stayed bridge spanning a body of water under a cloudy sky. In the bottom right foreground, the white superstructure of a ship or boat is visible, showing some equipment and a lifebuoy. Overlaid on the left side of the image is the text 'Thanks for your attention' in a large, bold, white sans-serif font.

Thanks  
for your attention

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