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Benthic O_2 fluxes in a coastal upwelling system (Ría de Vigo, NW Iberia) measured with the Aquatic Eddy Covariance technique

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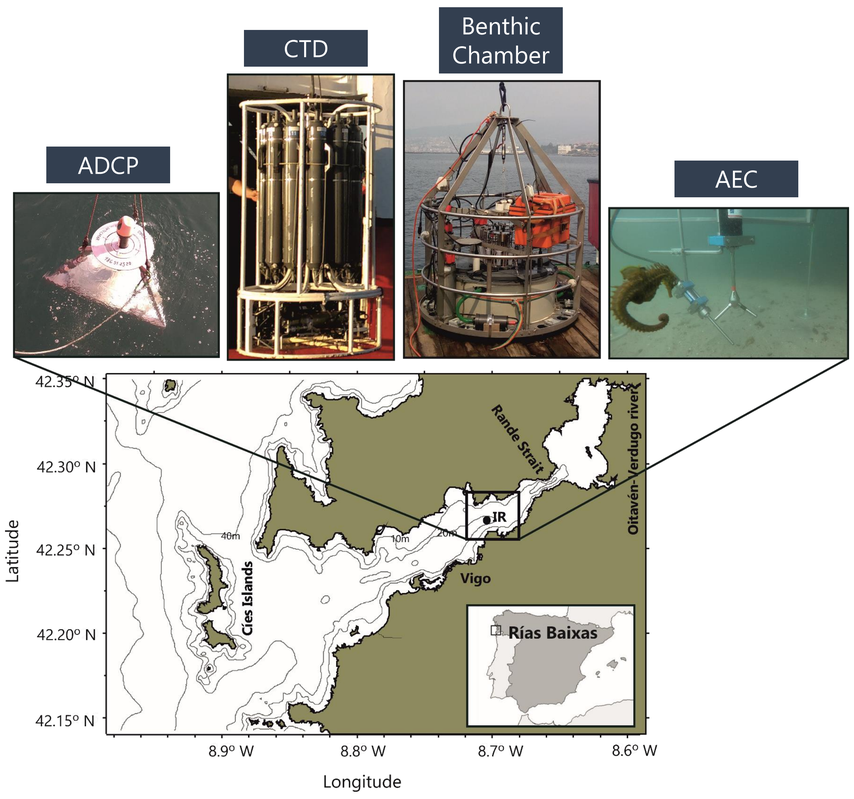
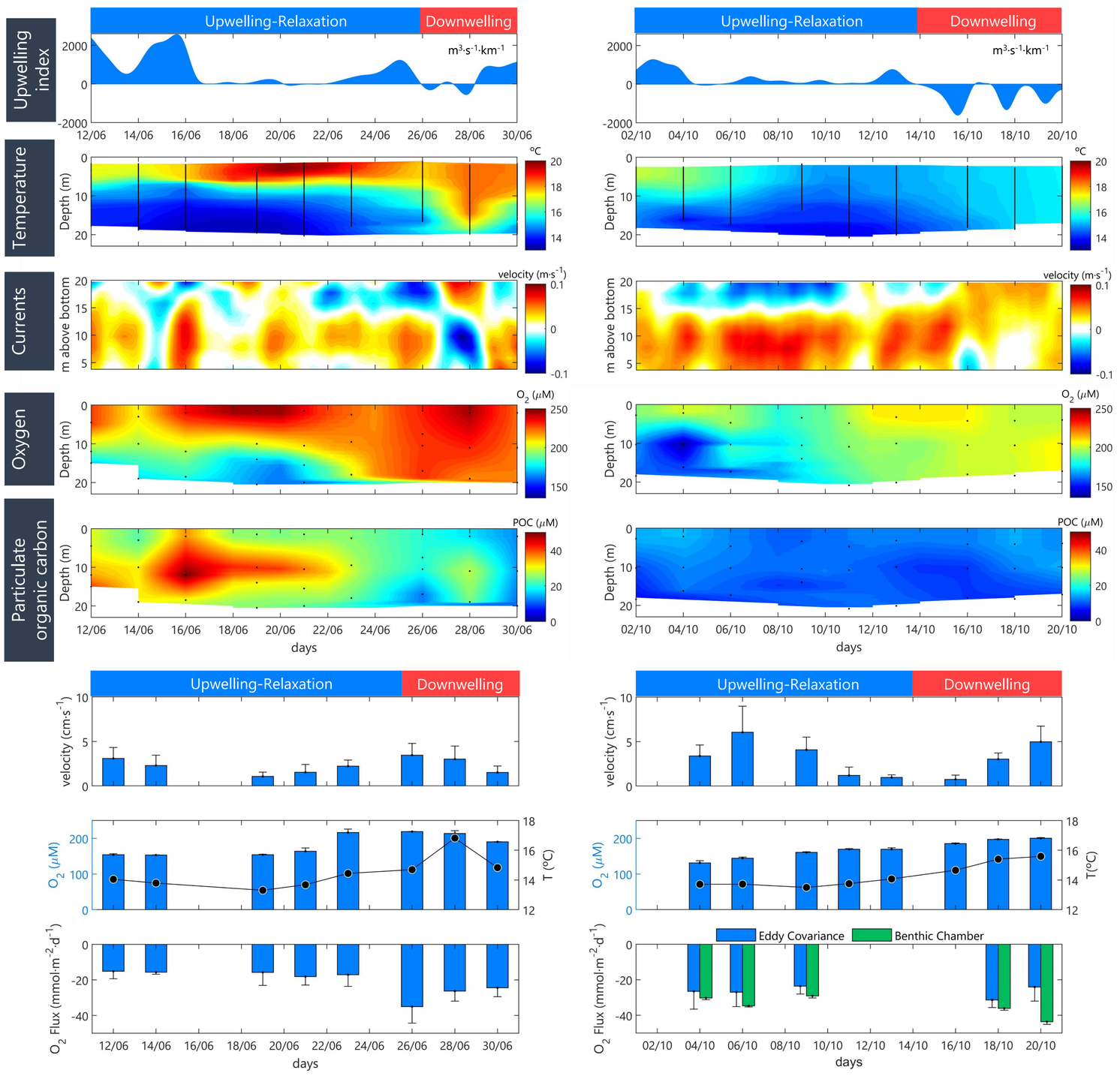
1.-Objective

Organic carbon mineralization and nutrient cycling are critical for the biogeochemical functioning of coastal regions. Benthic O_2 uptake is the most common proxy used to quantify the benthic mineralization rate of organic carbon (Glud 2008). Our objectives were to determine benthic O_2 fluxes in the Ría de Vigo using the Aquatic Eddy Covariance (AEC) technique (Berg et al. 2003) under different hydrodynamic conditions (June and October 2017) and identify the main forcing factors involved.

2.- Study Site & Data Collection



3.-Results

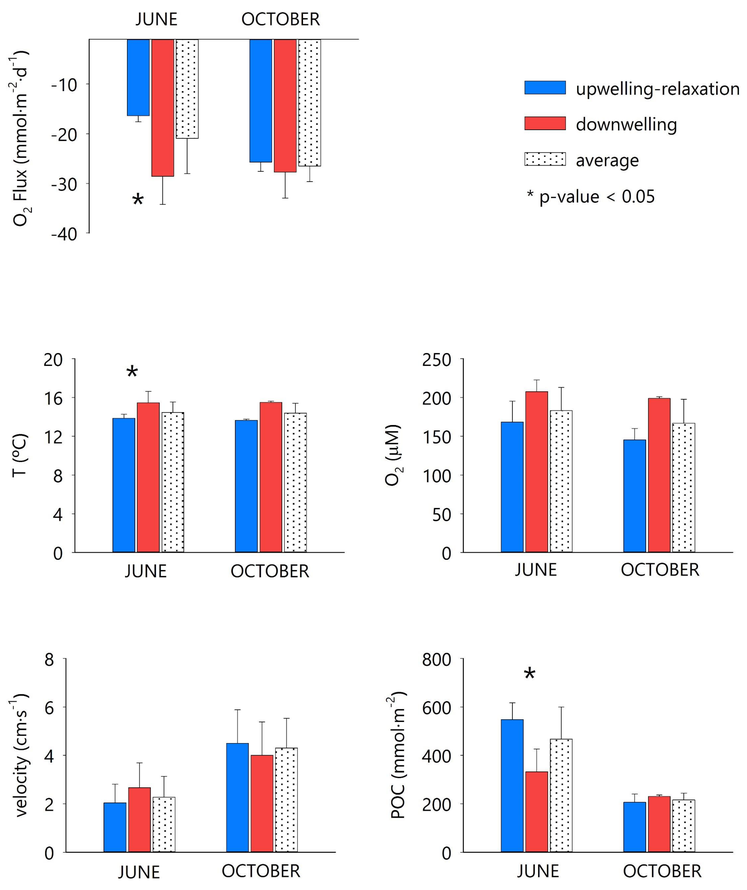


Pelagic conditions

Thermal stratification & Passive sinking of labile organic matter	Thermal homogenization & Ventilation of the water column	Slightly stratified water column & Positive circulation	Oceanic waters advected by Ophelia extratropical cyclone
⬇ Benthic O_2 Fluxes	⬆ Benthic O_2 Fluxes	Upwelling-relaxation Benthic O_2 Fluxes	≈ Downwelling Benthic O_2 Fluxes

Bottom conditions

4.-Discussion



The highest benthic O_2 fluxes were measured during the summer-downwelling period, even though bottom velocities were relatively low. These high summer fluxes were due to mineralization of labile organic matter that sank during the previous wind relaxation. The October measurements had comparable bottom temperatures and O_2 concentrations, but they had much lower POC concentrations. October had similar benthic O_2 flux compared to June, which was probably enhanced by the stronger bottom velocities.

5.-Conclusion

There was acceptable agreement between the AEC and benthic chamber O_2 fluxes. In the June campaign, benthic O_2 fluxes were modulated by the supply of organic matter, but bottom velocity was the principal forcing factor for the October campaign.

7.- References

Berg, P., Røy, H., Janssen, F., Meyer, V., Jørgensen, B. B., Huettel, M., & de Beer, D. (2003). Oxygen uptake by aquatic sediments measured with a novel non-invasive eddy-correlation technique. Marine Ecology Progress Series, 261, 75-83.

Glud, R. N. (2008). Oxygen dynamics of marine sediments. Marine Biology Research, 4(4), 243-289.

6- Acknowledgments

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