iFADO
INNOVATION IN THE FRAMEWORK OF THE ATLANTIC DEEP OCEAN

Final Workshop
Instituto Superior Técnico, Lisboa, Portugal
1st June 2023

OSPAR ICG-EMO activities on the Atlantic Area

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CoLAB +ATLANTIC

Interreg Atlantic Area
European Regional Development Fund

EUROPEAN UNION

This project has received funding from the European Union's Interreg Atlantic Area programme under the grant EAPA_165/2016

Main Objective

Atlantic Area to catch up with ongoing coordinated work on eutrophication at OSPAR ICG-EMO

MSFD Regional and international cooperation

One of the key objectives of the Marine Directive is to contribute to fulfilling international commitments made by the EU and its Member States on marine environmental protection. Many of the concepts and approaches used by the Directive for the EU's marine waters, such as the ecosystem and integrated approach, originated from international fora and agreements.

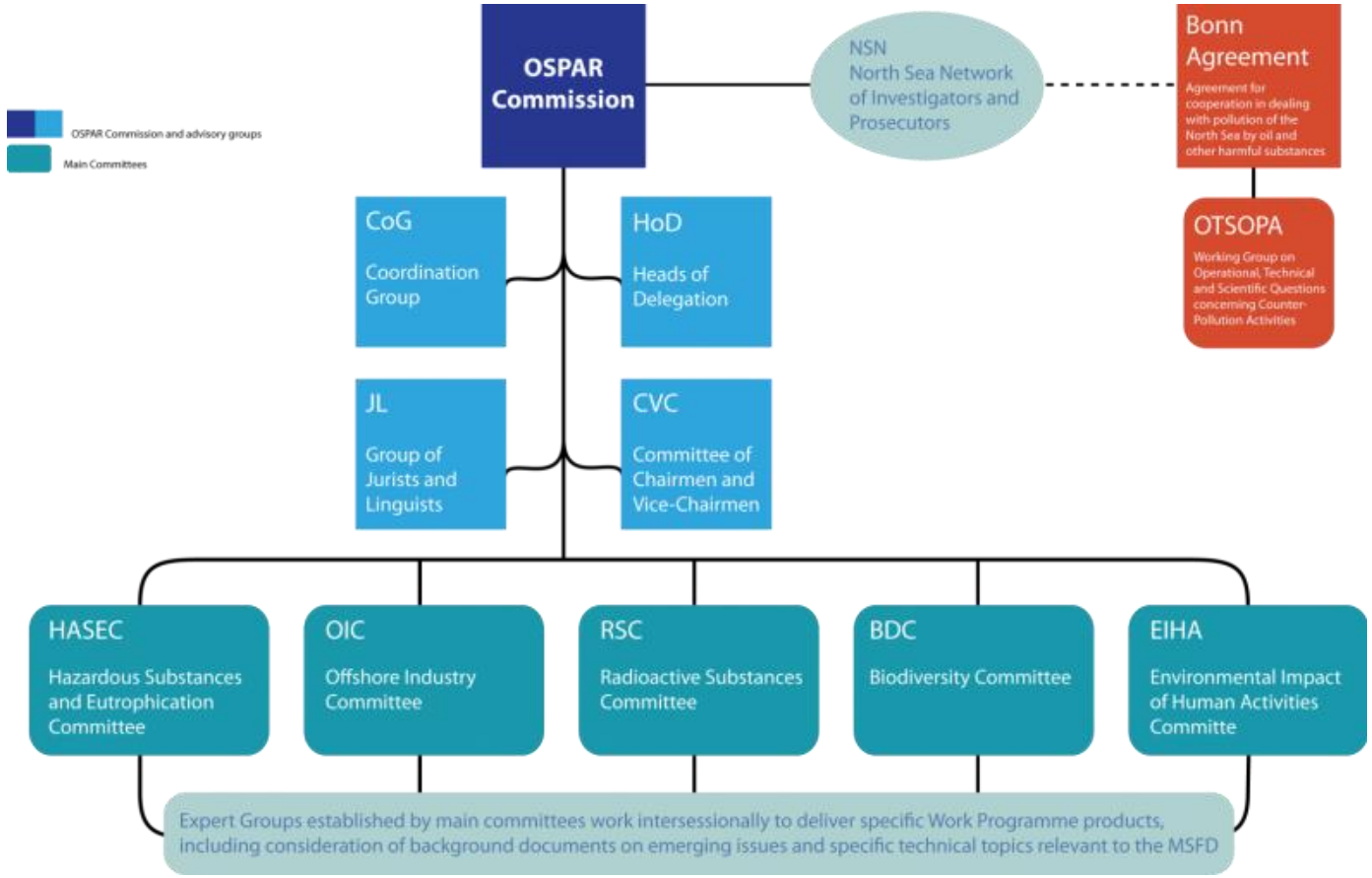
Regional sea conventions

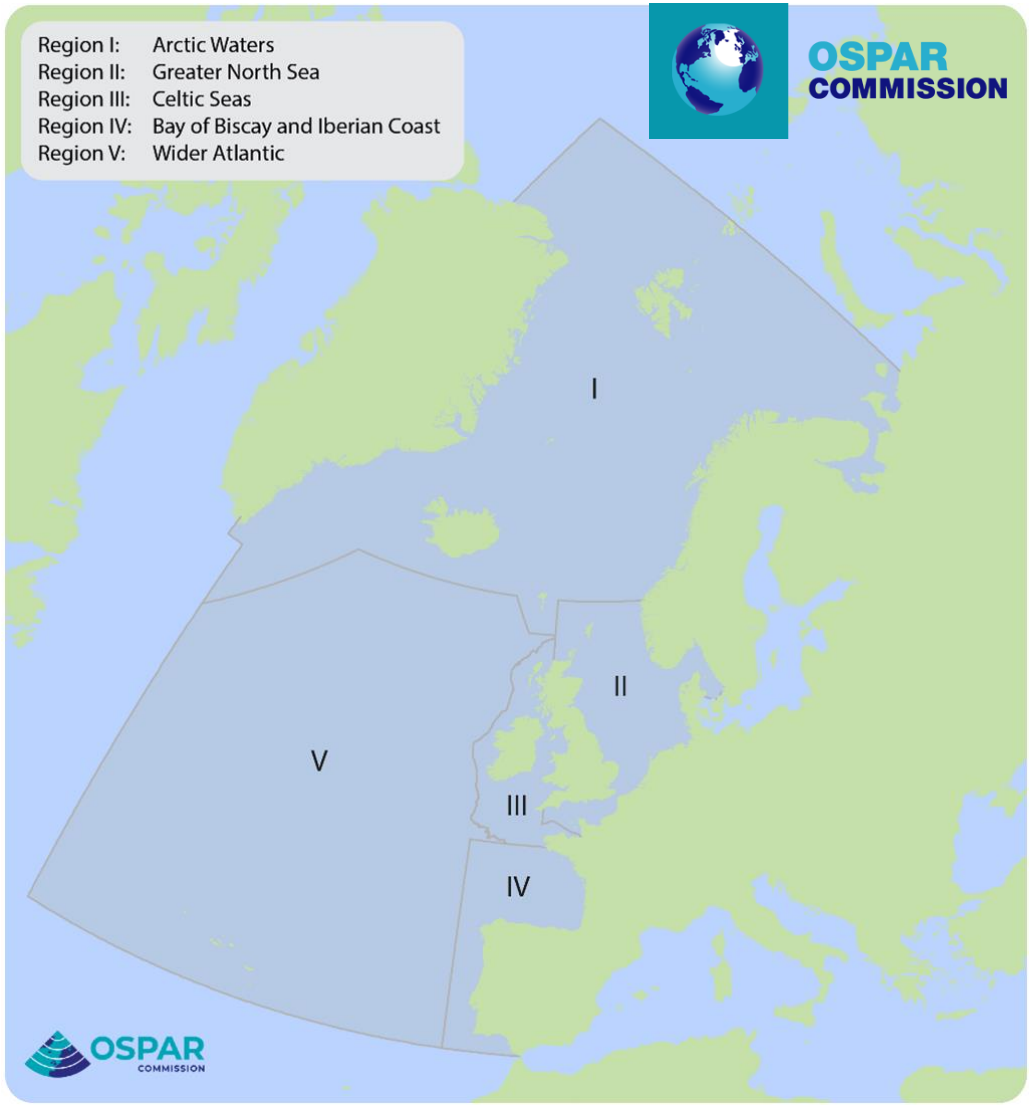
When developing their marine strategies, Member States are required to coordinate with each other and third countries though existing regional cooperation structures. In Europe, there are four Regional Sea Conventions which aim to protect the marine environment and bring together Member States and neighbouring countries that share marine waters.

OSPAR (Oslo-Paris Convention)

The OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic was adopted in 1992. It is the legal instrument guiding international cooperation for the protection of the marine environment of the North-East Atlantic.

OSPAR structure and area





ICG-EMO A long history

Journal of Marine Systems 81 (2010) 148–170

2010

Contents lists available at ScienceDirect

Journal of Marine Systems

journal homepage: www.elsevier.com/locate/jmarsys

Predicting the consequences of nutrient reduction on the eutrophication status of the North Sea

Hermann-J. Lenhart [a,*], David K. Mills [b], Hanneke Baretta-Bekker [c], Sonja M. van Leeuwen [b], Johan van der Molen [b], Job W. Baretta [d], Meinte Blaas [e], Xavier Desmit [e], Wilfried Kühn [a], Geneviève Lacroix [f], Hans J. Los [e], Alain Ménesguen [g], Ramiro Neves [h], Roger Proctor [i], Piet Ruardij [j], Morten D. Skogen [k], Alice Vanhoutte-Brunier [g], Monique T. Villars [e], Sarah L. Wakelin [i]

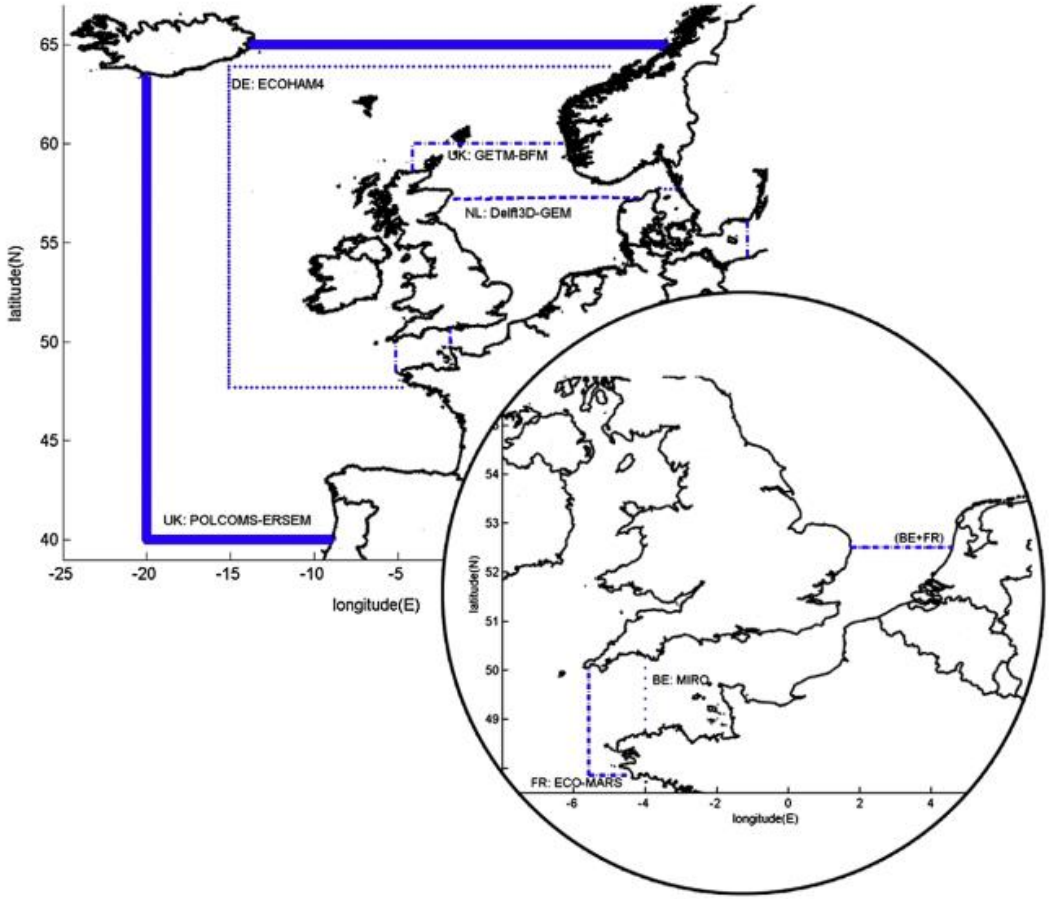


Fig. 2. Overview on the six model domains of the ecosystem models that run the reduction scenarios.

And continuous

frontiers | Frontiers in Marine Science

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Check for updates

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Deriving pre-eutrophic conditions from an ensemble model approach for the North-West European seas

Sonja M. van Leeuwen[1*], Hermann-J. Lenhart[2], Theo C. Prins[3], Anouk Blauw[3], Xavier Desmit[4], Liam Fernand[5], Rene Friedland[6,7], Onur Kerimoglu[8], Genevieve Lacroix[4], Annelotte van der Linden[3], Alain Lefebvre[9], Johan van der Molen[1], Martin Plus[9], Itzel Ruvalcaba Baroni[10], Tiago Silva[5], Christoph Stegert[11,12], Tineke A. Troost[3] and Lauriane Vilmin[3]

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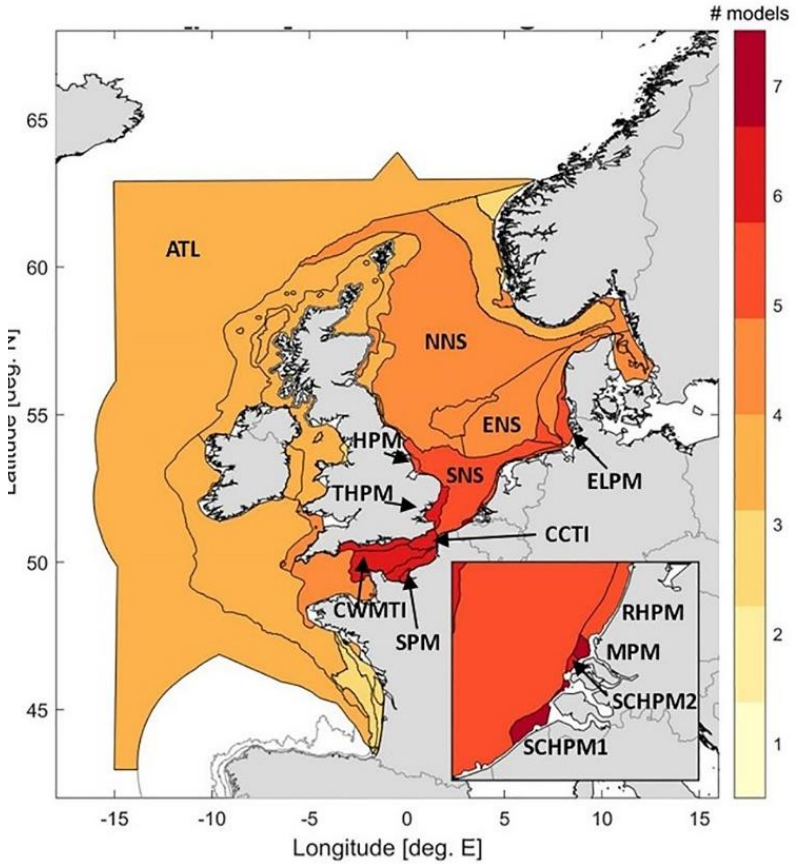
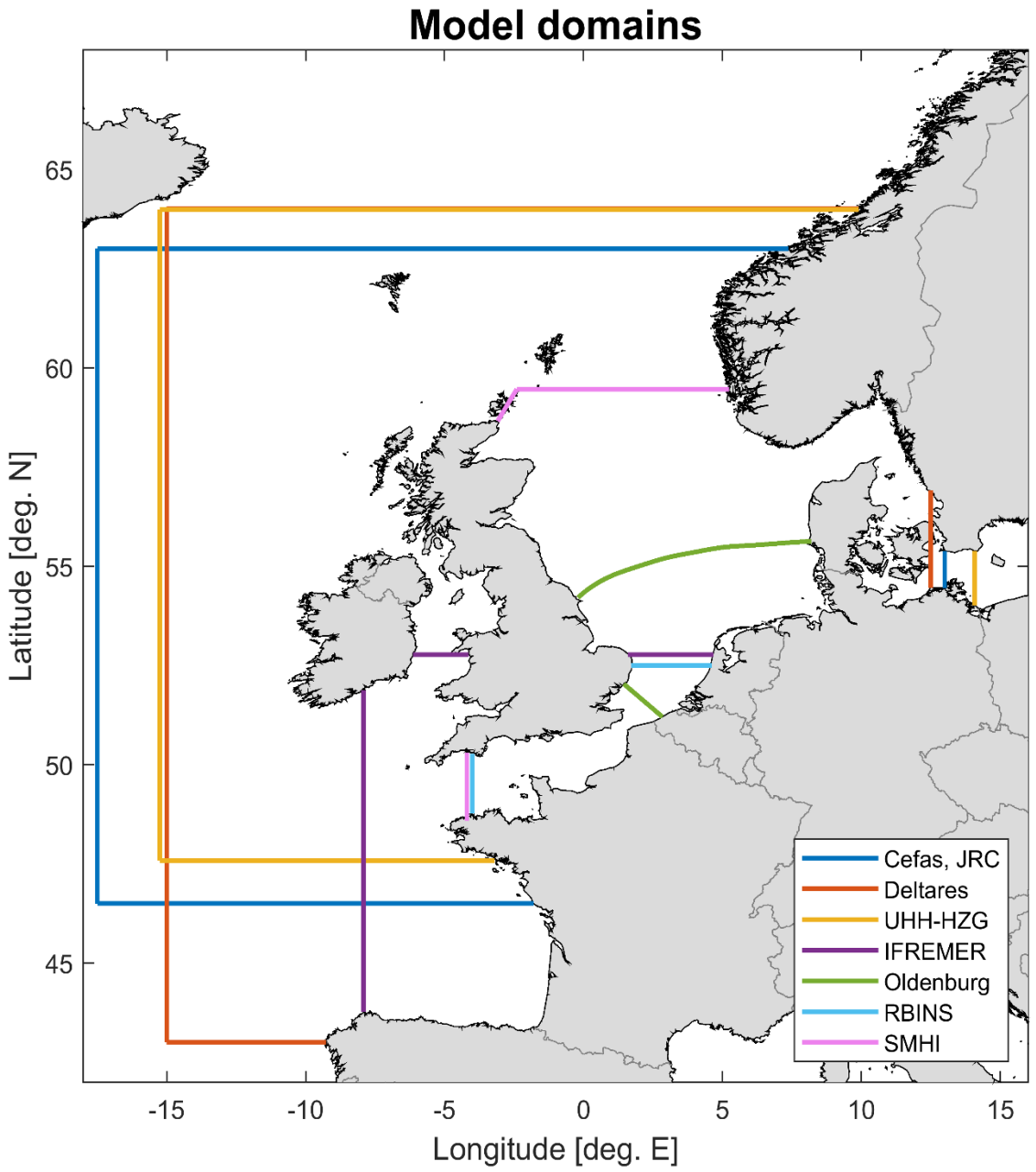


ATL: Atlantic
CCTI: Channel Coastal Shelf Tidally Influenced
CWMTI: Channel Well Mixed Tidally Influenced
ELPM: Elbe Plume
ENS: Eastern North Sea
HPM: Humber plume
MPM: Meuse Plume
NNS: Northern North Sea
RHPM: Rhine Plume
SCHPM1: Scheldt Plume 1
SCHPM2: Scheldt Plume 2
SNS: Southern North Sea
SPM: Seine Plume
THPM: Thames plume

What we found

Institute	years	Current state	Historic Scenario 1
Cefas (UK)	2006-2014	DIN, DIP, Chla	
Deltares (NL)		All variables	All variables
IFREMER (FR)		S, DIN, DIP, TotalN, TotalP, N:P, Chla, Chla90th, O2, O2sat, Kd, netPP	S, DIN, DIP, TotalN, TotalP, N:P, Chla, Chla90th, O2, O2sat, Kd, netPP
JRC (EU)		All variables	All variables
Oldenburg (DE)		All variables	All variables
RBINS (BE)		S, DIN, DIP, Chla, Chla90th	S, DIN, DIP, Chla, Chla90th
SMHI (SE)		S, DIN, DIP, TotalN, TotalP, N:P, Chla, Chla90th, O2, O2sat, netPP	S, DIP, TotalN, TotalP, Chla, Chla90th, O2, O2sat, netPP – NOT USED
UHH-HZG (DE)		S, DIN, DIP, Chla, Chla90th, netPP	S, DIN, DIP, Chla, Chla90th, netPP

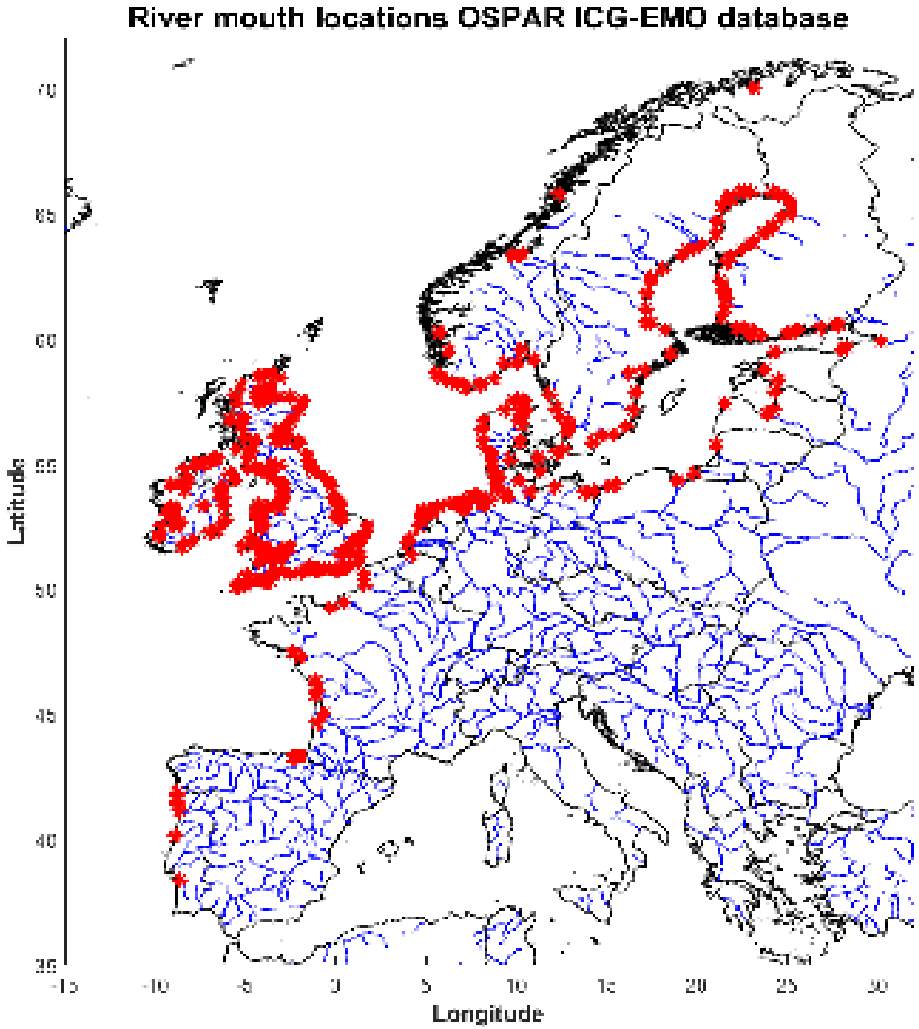


ICG-EMO Exercise

- Period simulated 2009-2014 (2006-2009 for BGQ model warming up)
- Rivers already agreed by all the partners and provided by the ICG-EMO
- The exercise includes Nitrogen fluxes from the atmosphere
- Portugal and Spain to participate in the exercise and to use same boundary conditions for comparison. Need to agree on the nutrients concentration for each river.
- Portugal and Spain will only simulate the current status scenario and one reduction scenario.
- Evaluating Winter Nutrients (Nov-Feb) and Chl *a* (Mar-Oct)
- Outputs are daily timeseries (daily or daily averaged) according to the model
- Meteorological forcing decided by the model forcing
- Salinity value can be decided by the modeller
- Downscalling from CMEMS_Phy and BGQ reanalysis

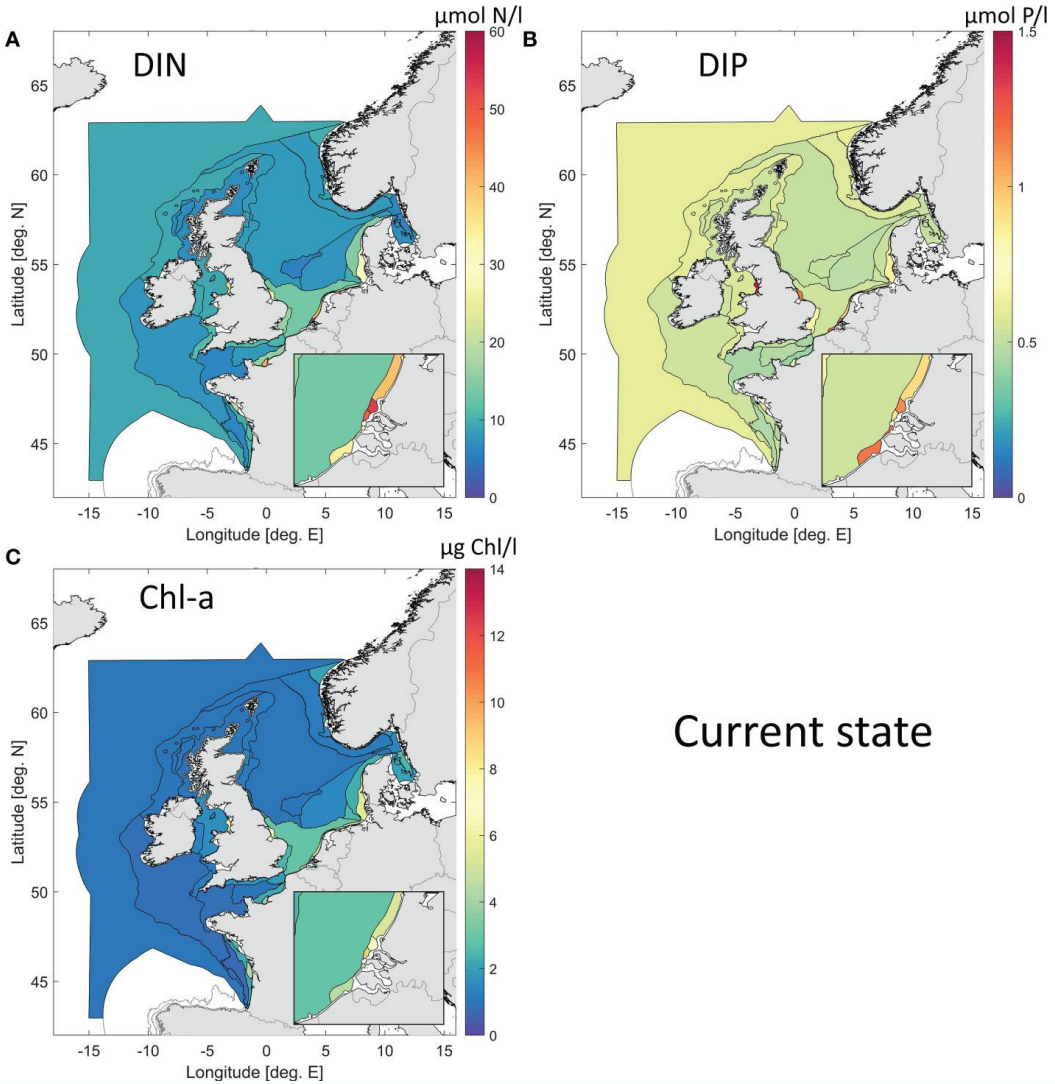
What we improved so far

- Out-of-date river database for Portuguese Rivers
- Mistakes on Irish rivers
- Missing data for Spanish rivers



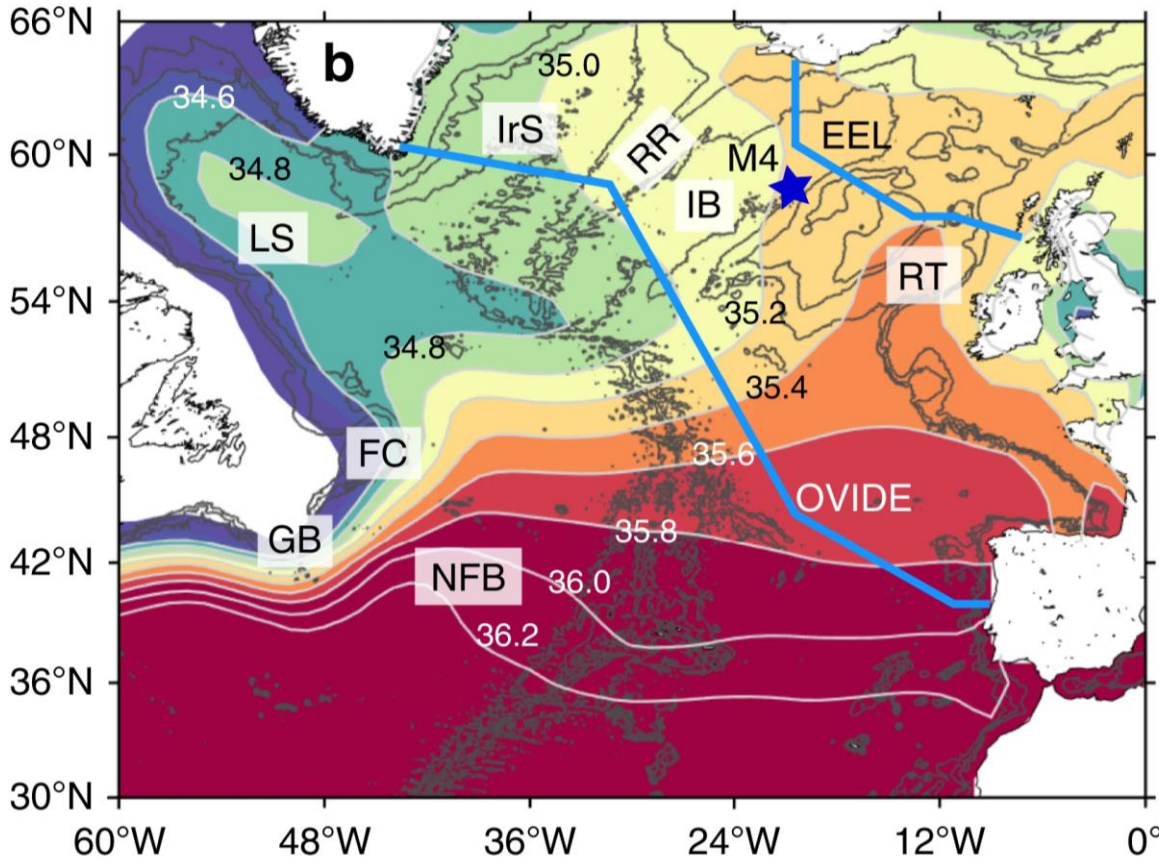
van Leeuwen, Sonja; Lenhart, Hermann, 2021, "OSPAR ICG-EMO riverine database 2020-05-01 used in 2020 workshop", https://doi.org/10.25850/nioz/7b.b.vc, NIOZ, V1

Curren state results from ICG-EMO

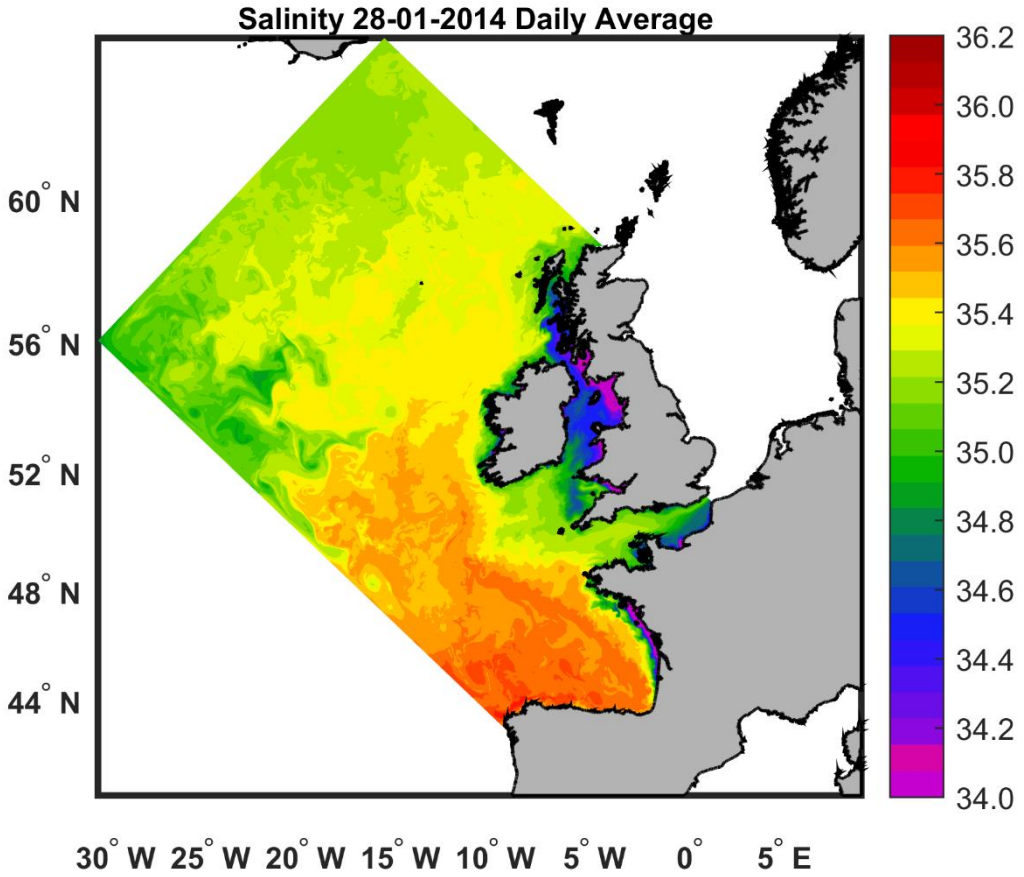


Current state

Holiday et al.2020

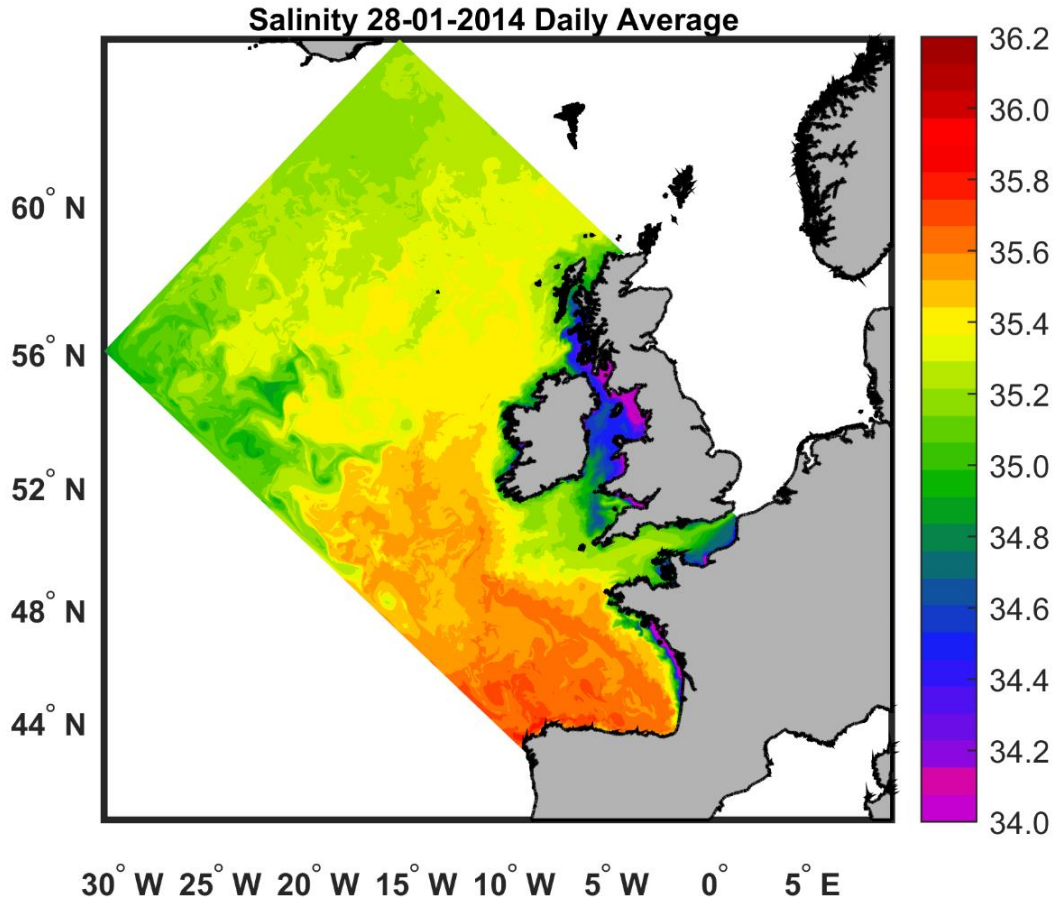


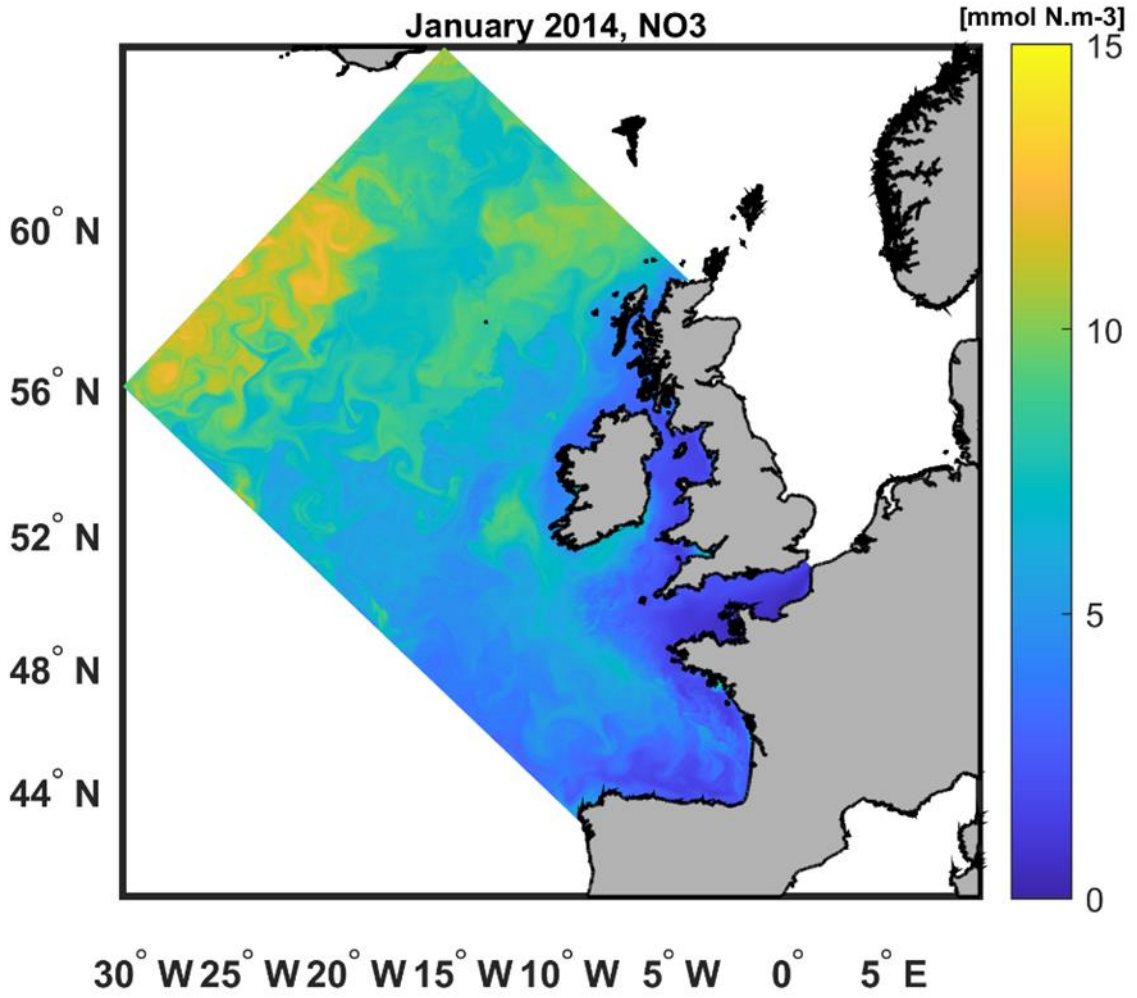
CROCO Model OSPAR-Simulations 2006-2014



0-200 m (2005-2016) EN4 dataset

Ireland Model Setup





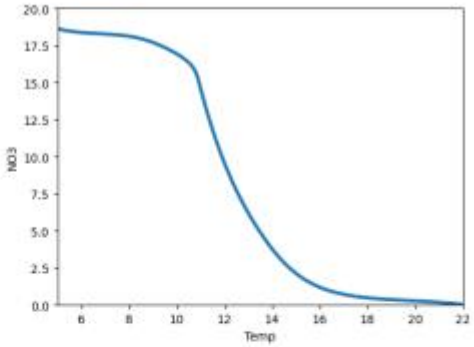
CROCO Model OSPAR-Simulations 2006-2014

Spain Model Setup

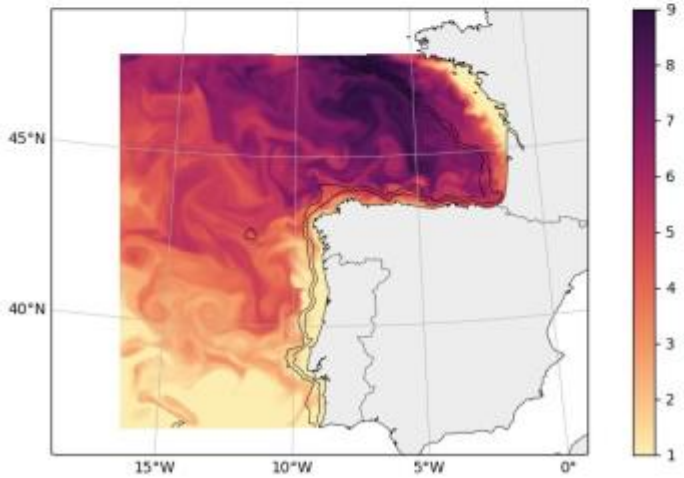
Biogeochemistry

Forcing (initial, boundaries, nudging):

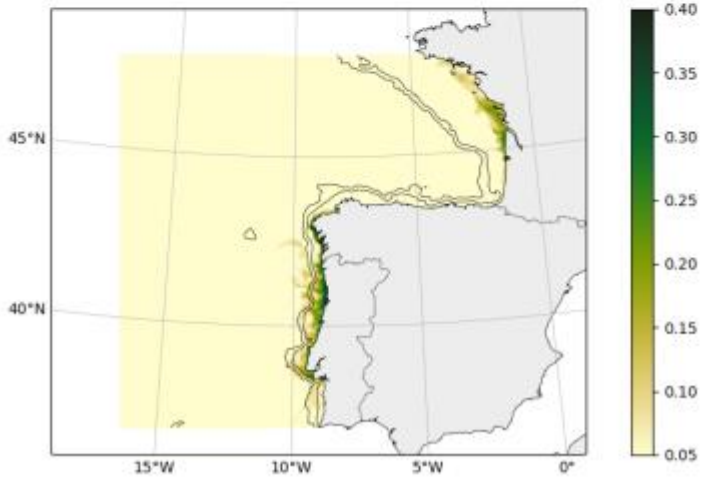
1) Mercator-Ocean biogeochemical hindcast
2) Temp vs NO3 analytical relationship



NO3 after 1 year (31-dec)

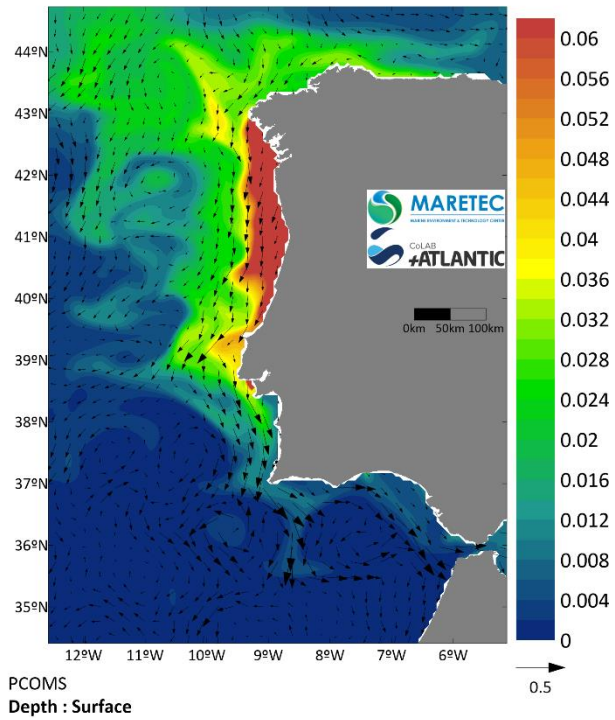


Zooplankton



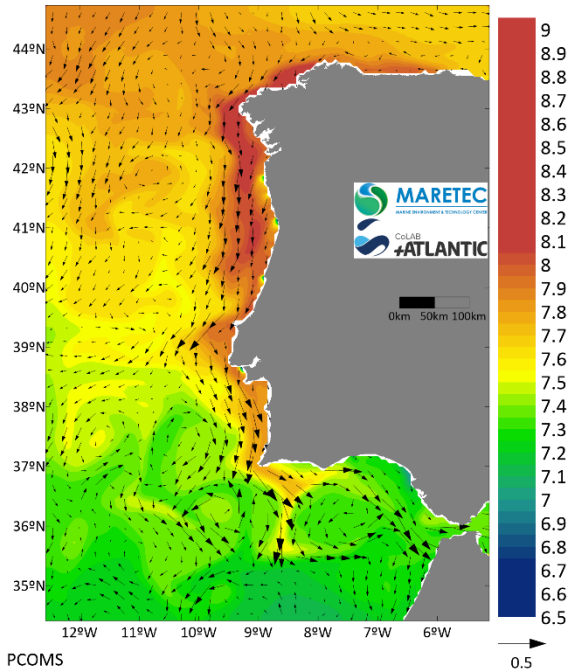
Portugal Model Setup

nitrate (mg/l) and Velocity direction (m/s) Average period: 20060704_20060705



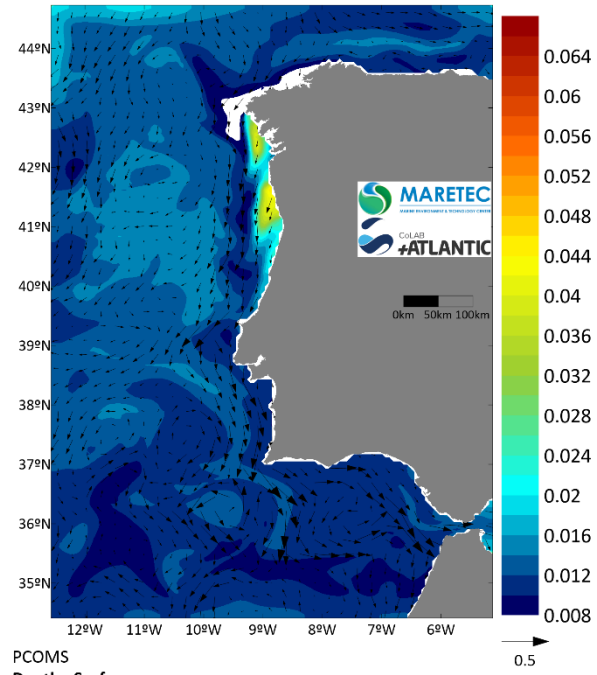
PCOMS
Depth : Surface

oxygen (mg/l) and Velocity direction (m/s) Average period: 20060704_20060705



PCOMS
Depth : Surface

phytoplankton (mg/l) and Velocity direction (m/s) Average period: 20060704_20060705

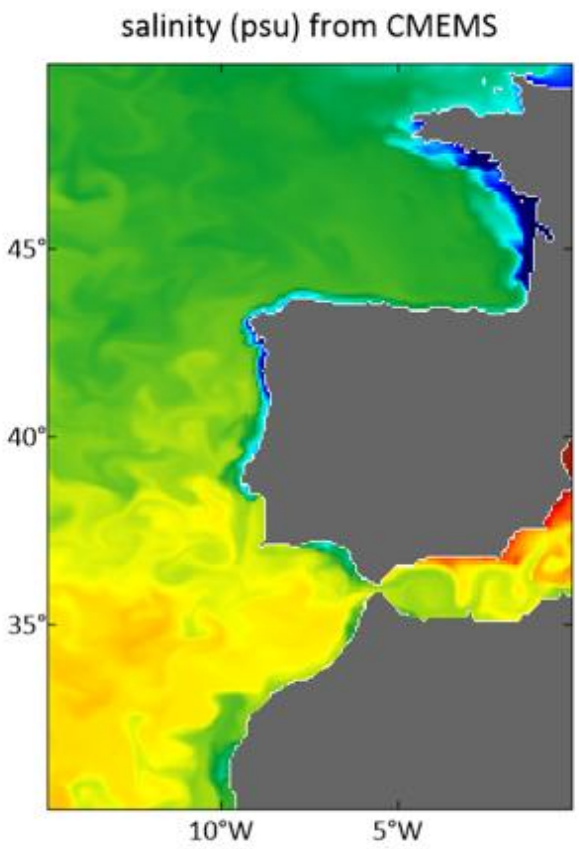


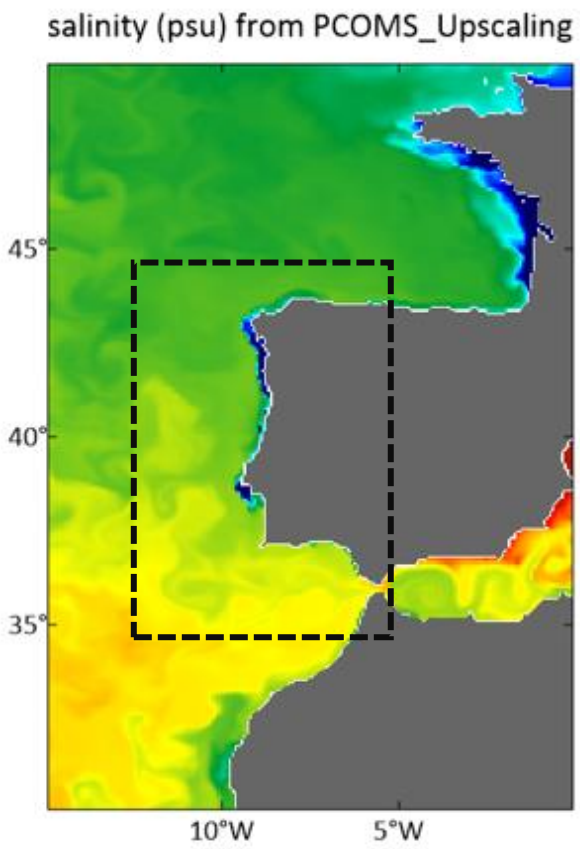
PCOMS
Depth : Surface

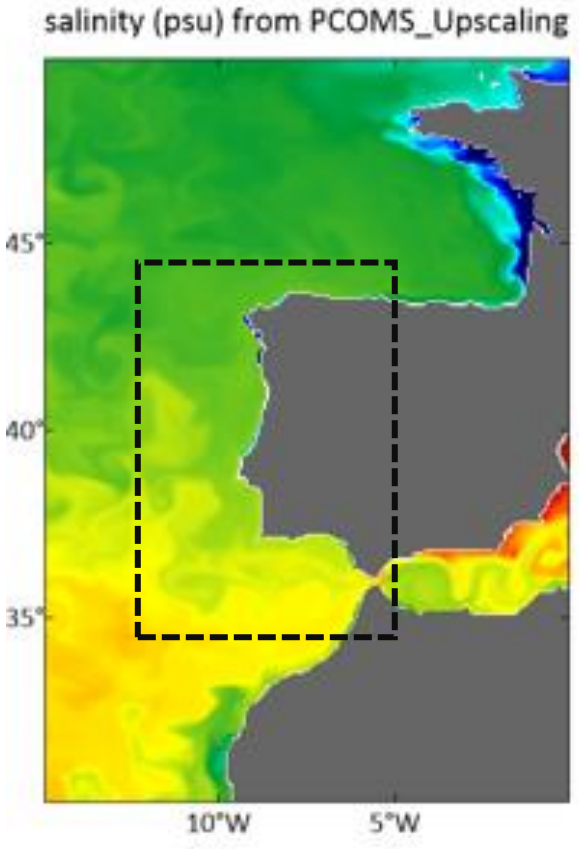
Surface Salinity patching

River direct discharge

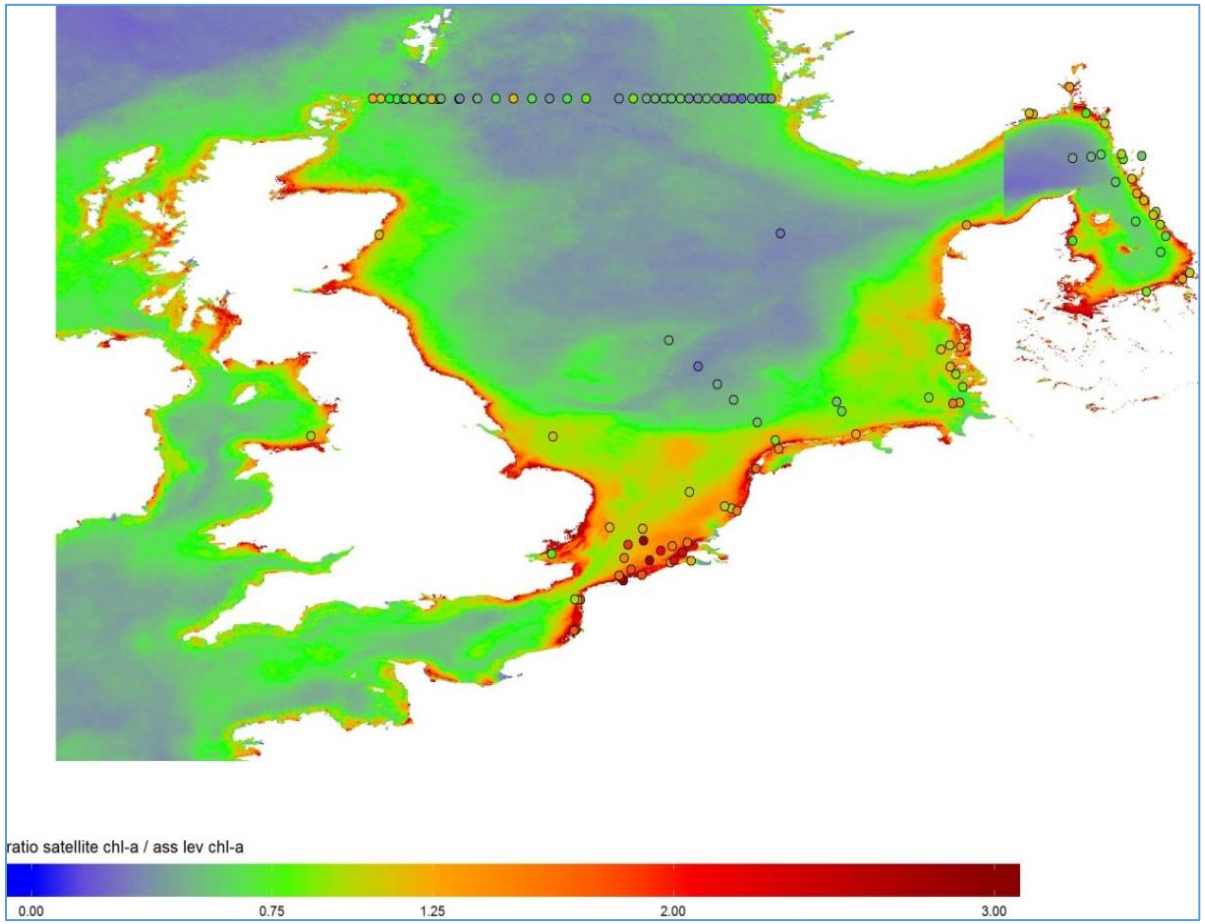
Estuarine discharge







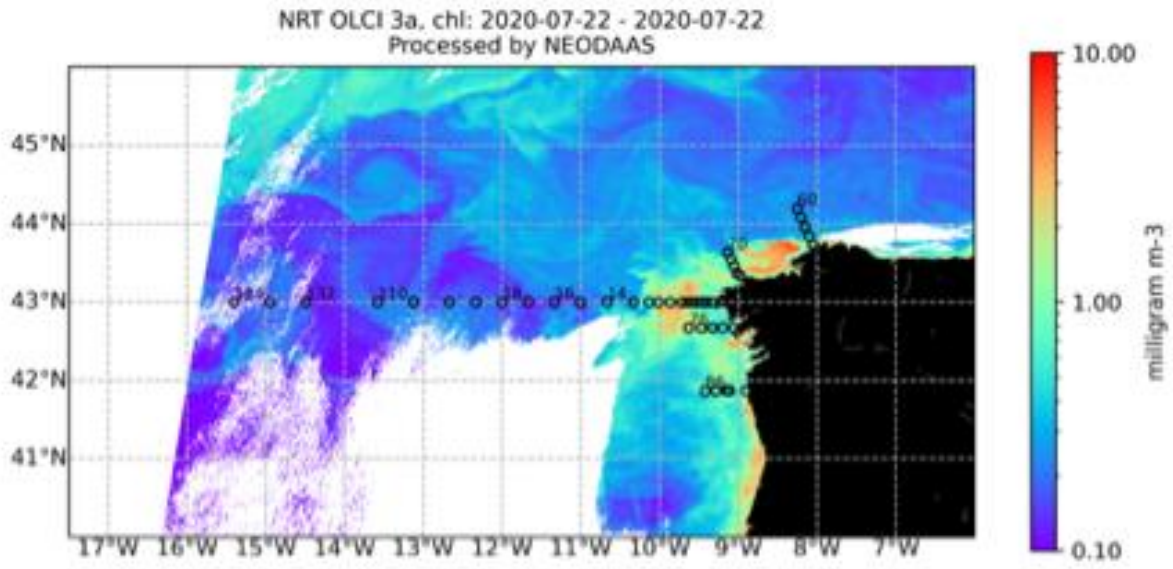
Chlorophyll assessment
2. Traditional and innovative monitoring

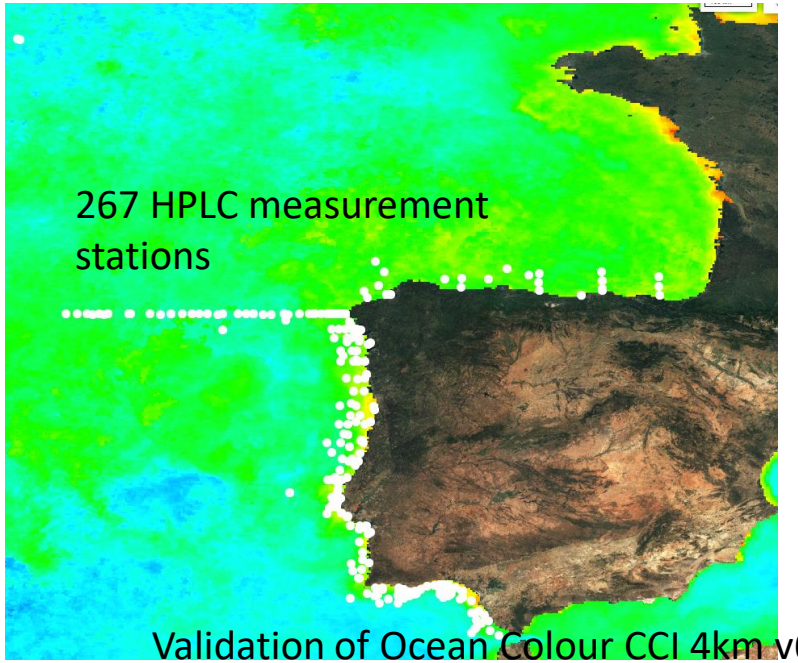


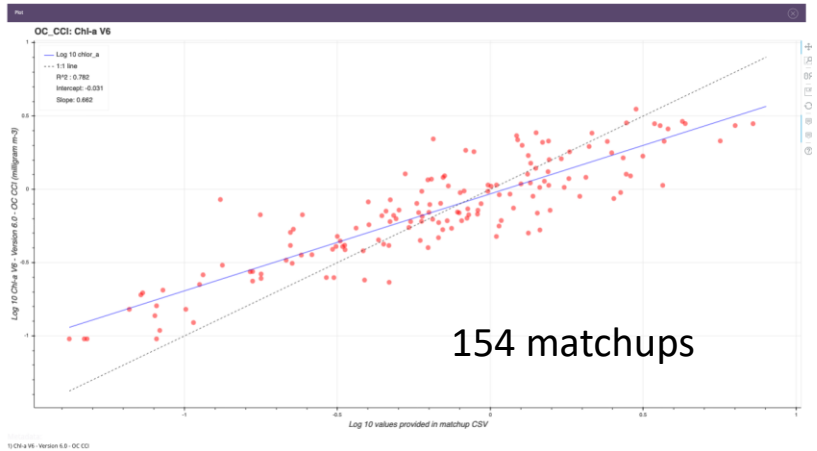
Chl-a satellite/ chl-a assessment level

iFADO Remote Sensing Benchmark

- Cruises in WP4 supported with near-real time data
- Chl-a data from 12 cruises used for satellite validation

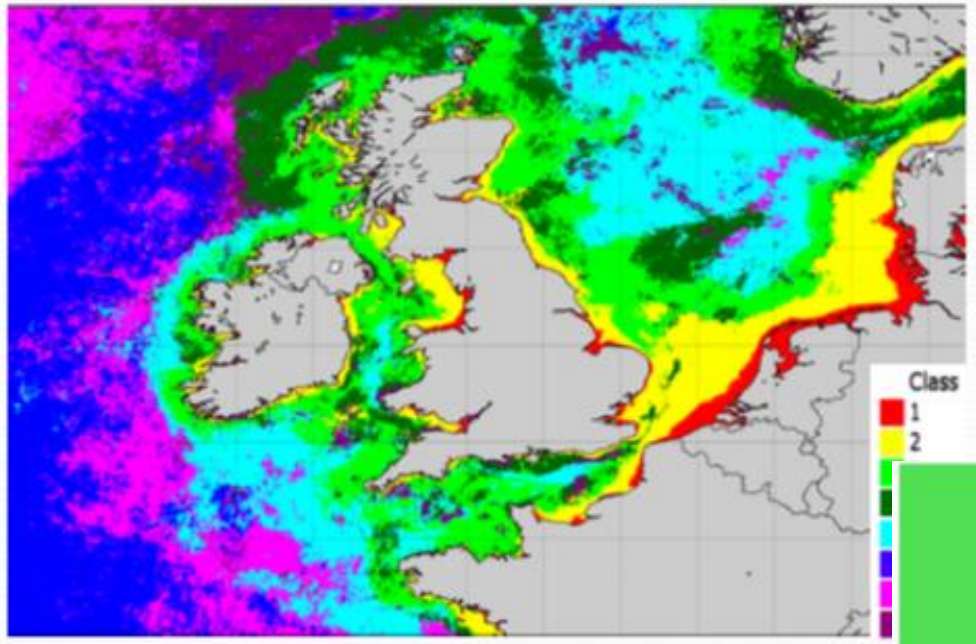


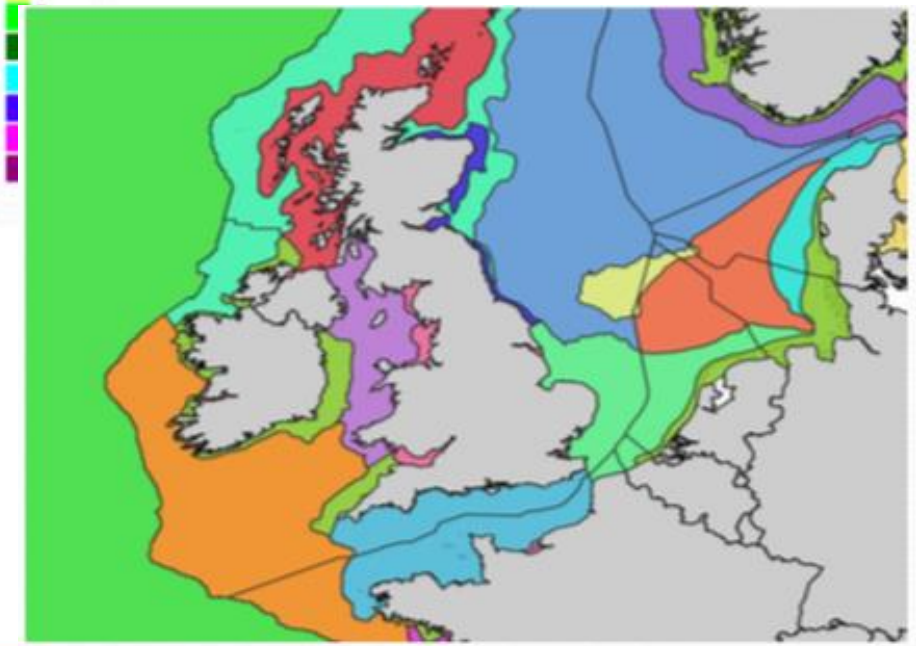




Validation of Ocean Colour CCI 4km v6 data with iFADO HPLC

New assessment areas & types of water

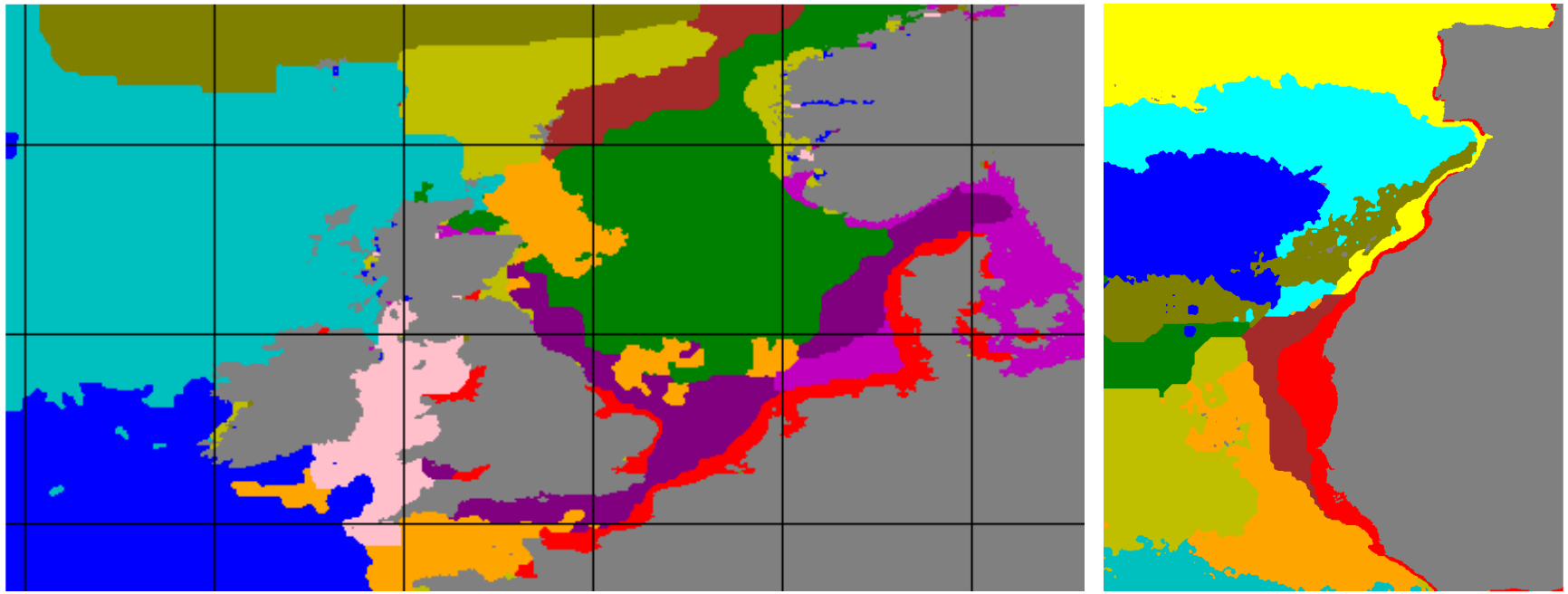




Primary production in the Atlantic

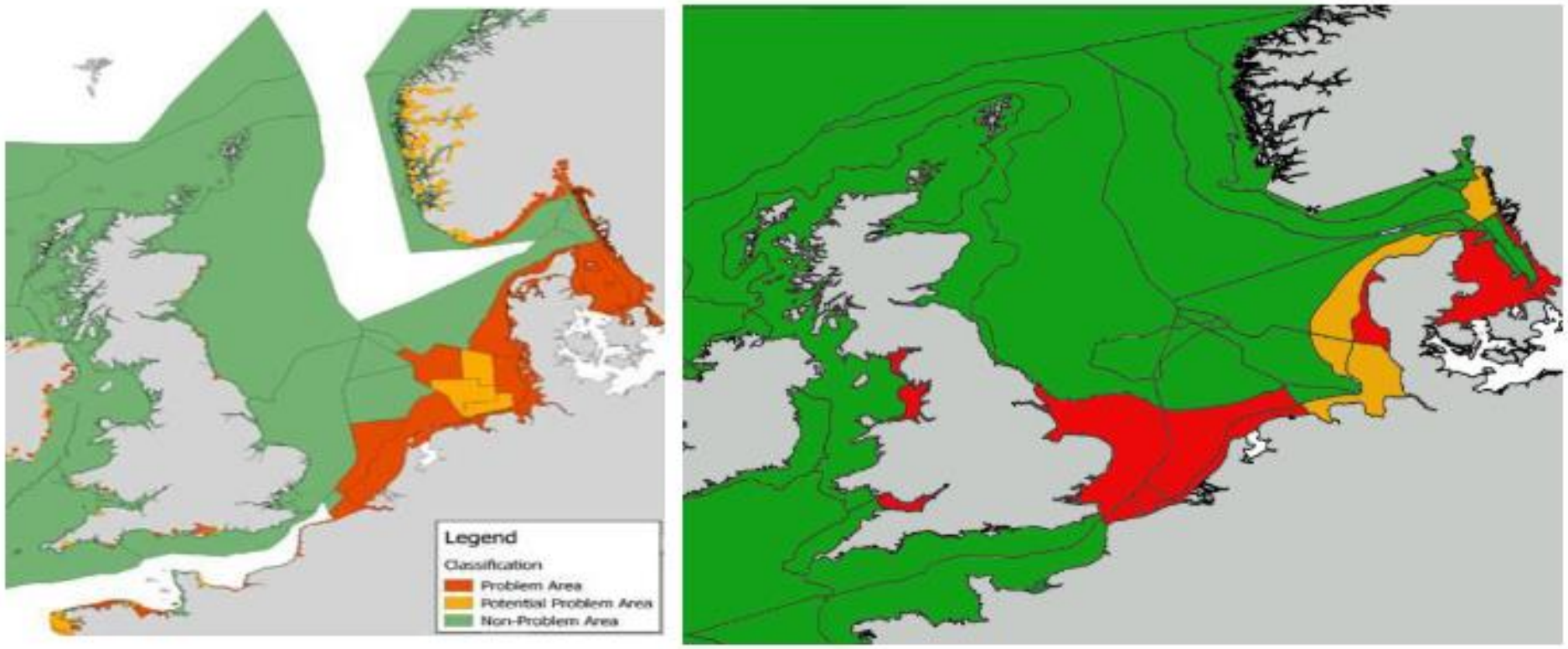
- Part of work was to classify Atlantic waters into regions of similar peak, timing, location and annual primary production

- Identified using k-means cluster analysis for the north-east Atlantic, Iberian peninsula and Mauritania.

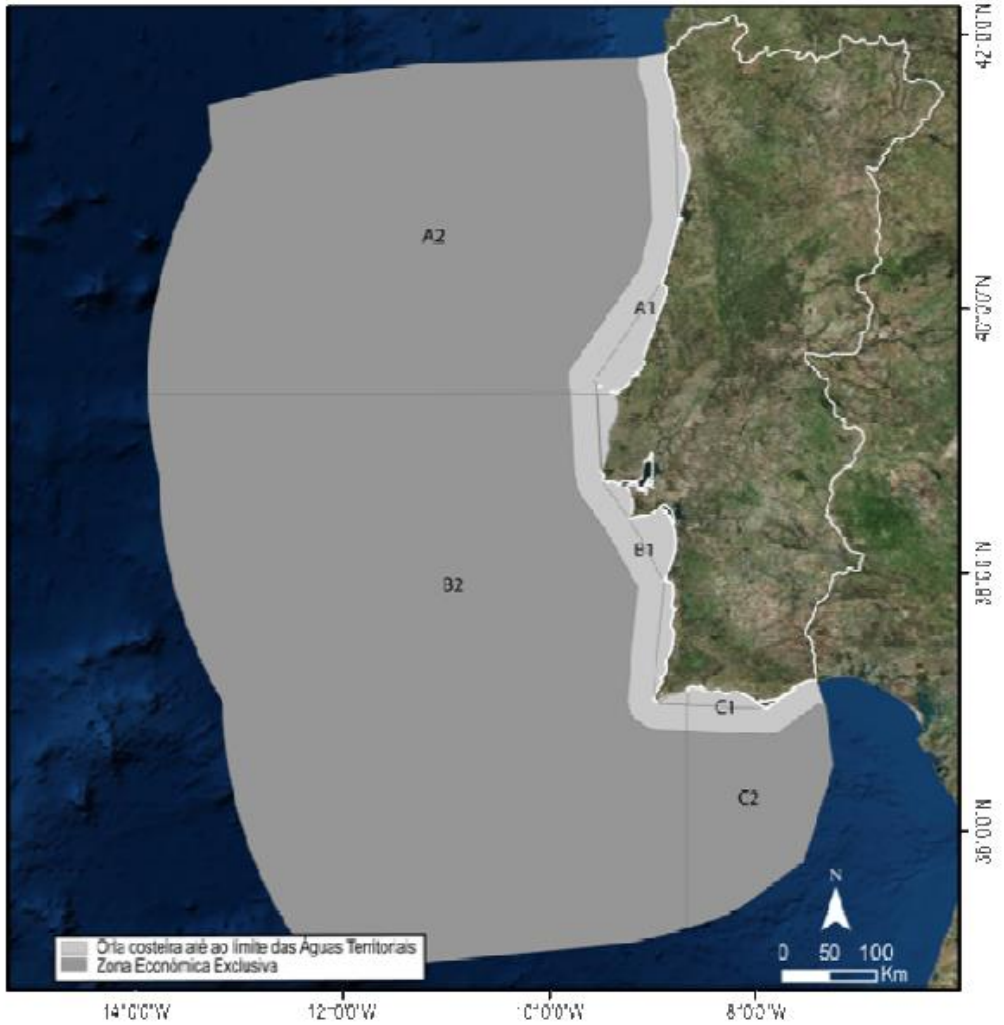


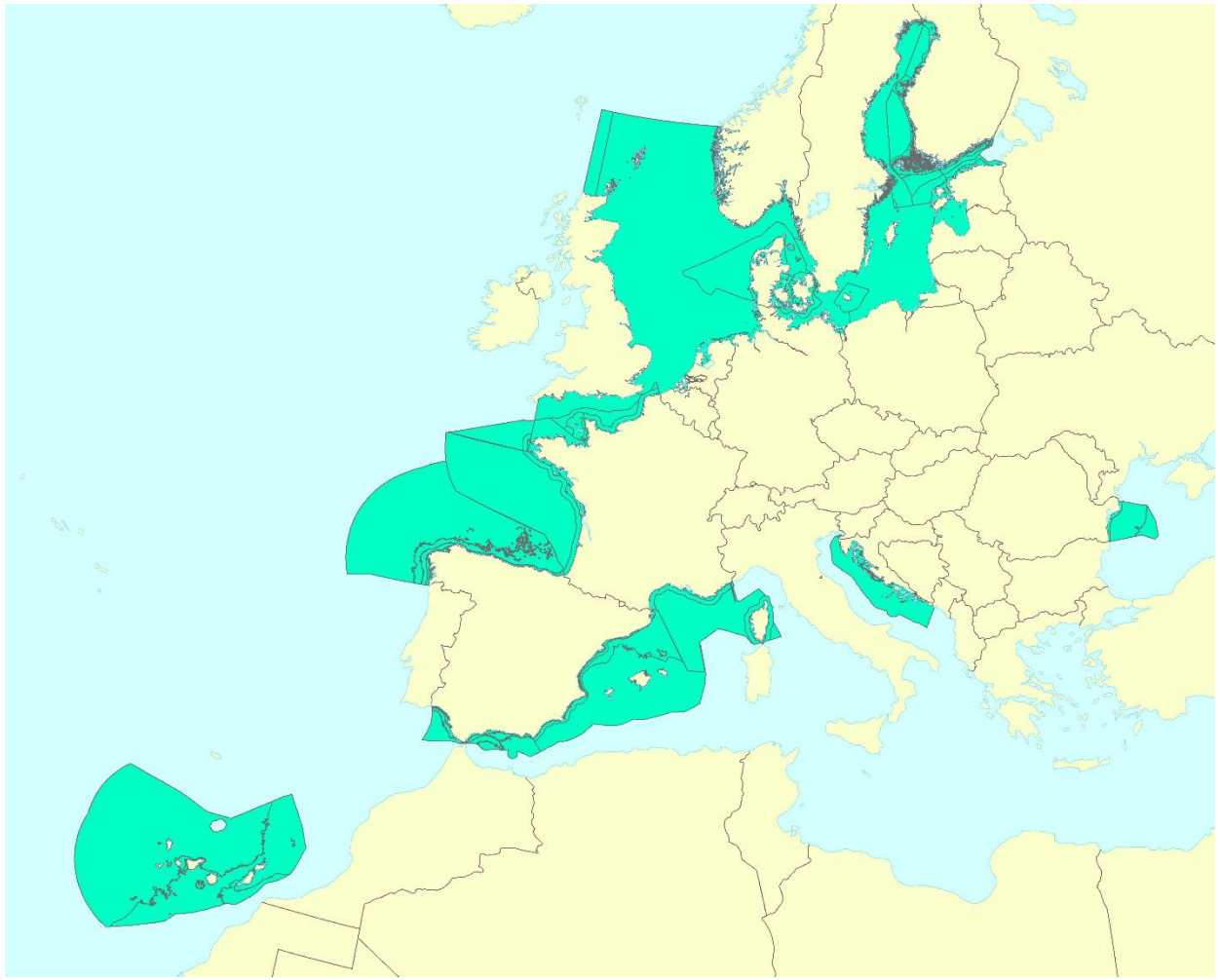
Regions of similar peak, timing, location and annual primary production identified using k-means cluster analysis for the north-east Atlantic, Iberian peninsula and Mauritania.

New MRUs
Example from the North Sea



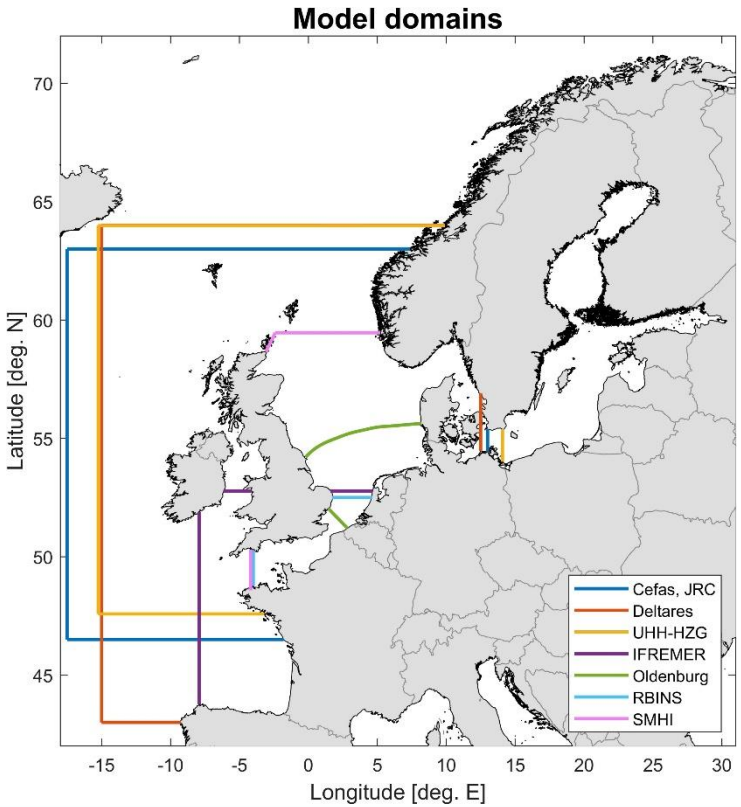
MRUS EEA June 2020

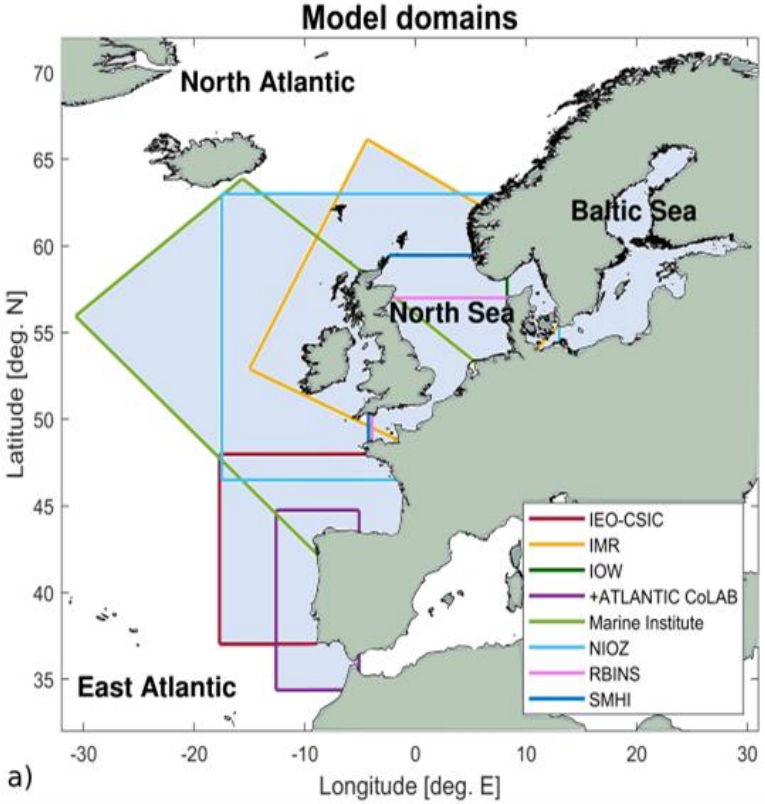




Follow-up activities

- Continue to collaborate with the ICG-EMO
- Continue contribution for river data
- Analyse the modelling results and try to complete the OSPAR picture
- Suggest MRUs based on the project results





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Thank you for your attention!

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