EMODnet
River and ocean interface component

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EMODnet-Copernicus 22 September 2022

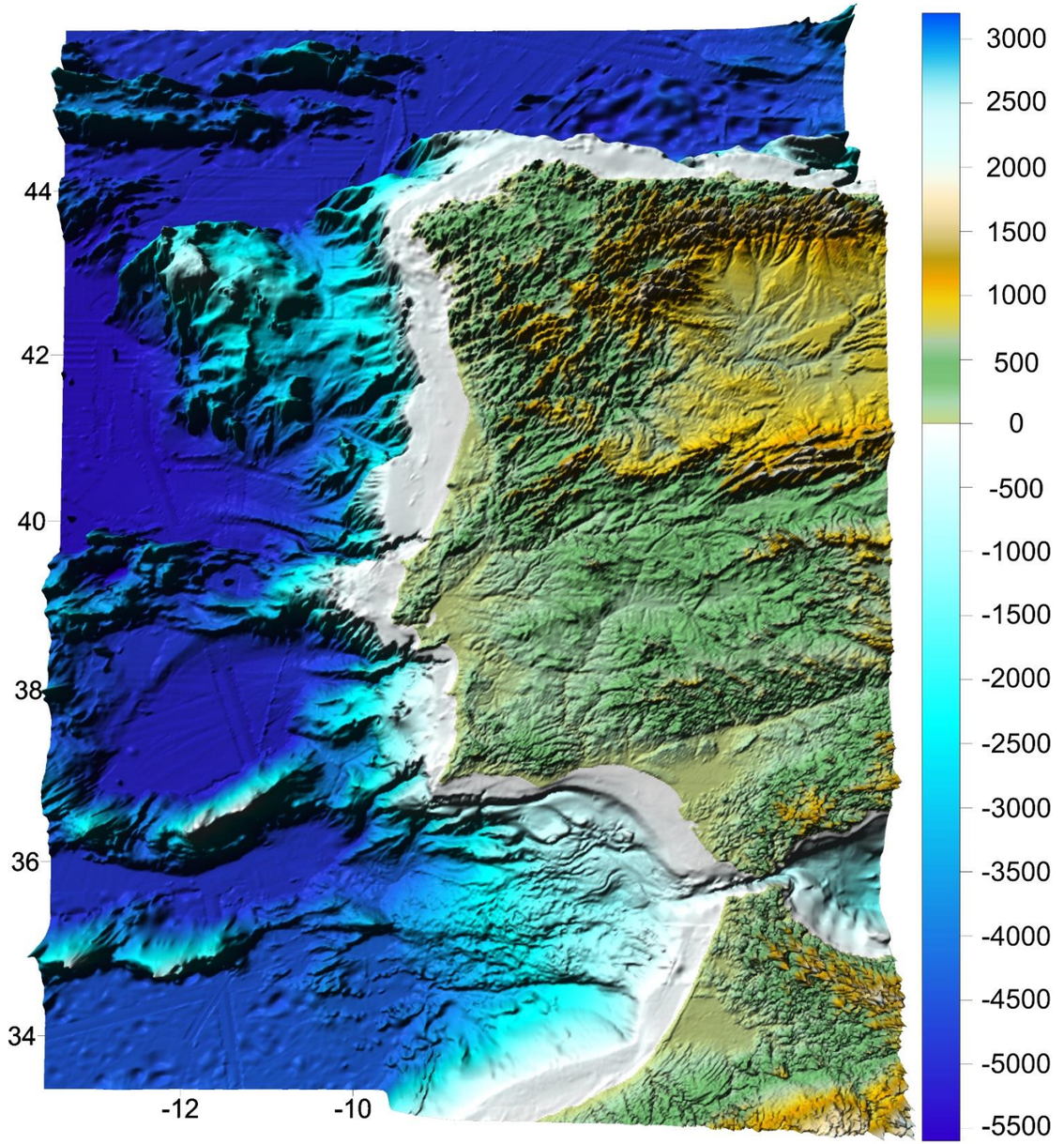
+ A paradigm shift

Integrated water cycle approach

The main objective of the present research was to **develop a methodology** and to explore the capacity to **improve** the thermohaline circulation in regional ocean model applications by a better characterisation of the **land-ocean boundary conditions** able to represent the salinity features described for the Western Iberia region.

Main Challenges:

- Obtain river data near its mouth;
- Imposing those inputs in regional ocean models;
- How to validate the results.

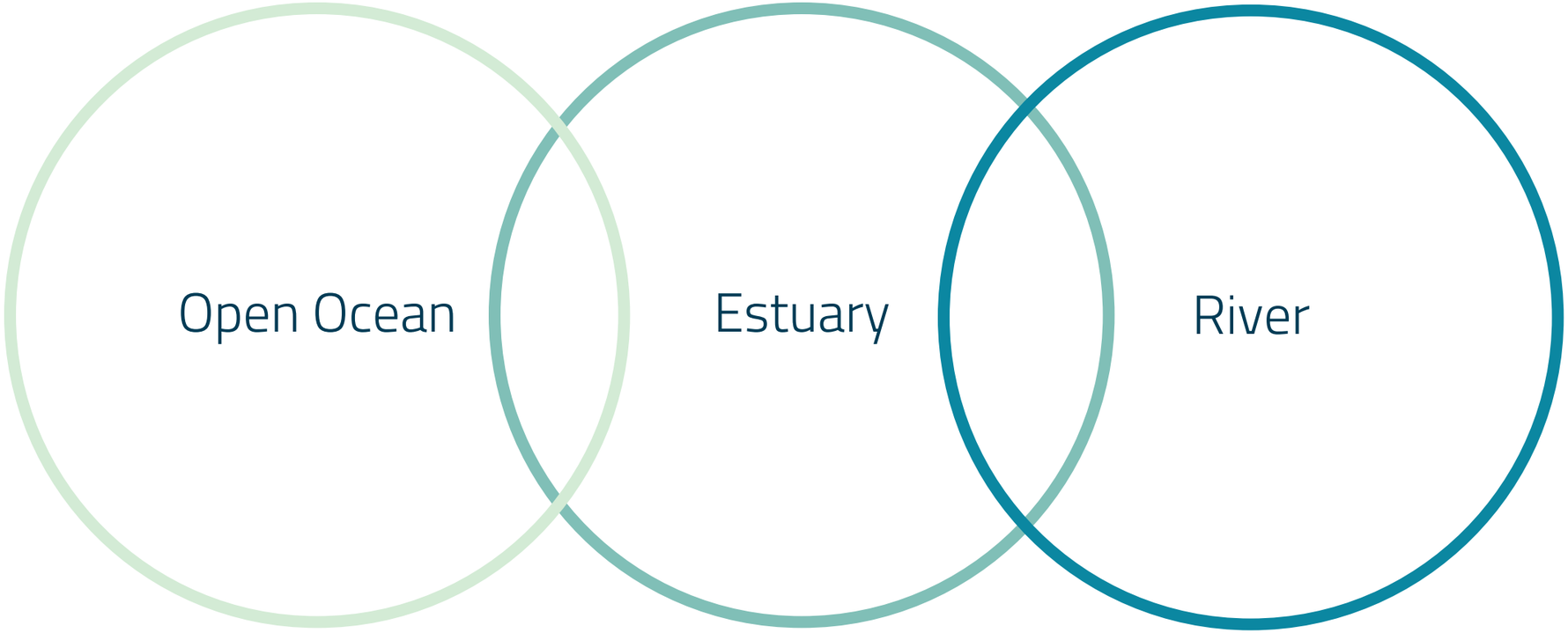


EMODnet
European Marine Observation and Data Network

CoLAB +ATLANTIC

+ WATER CONTINUUM conceptual diagram

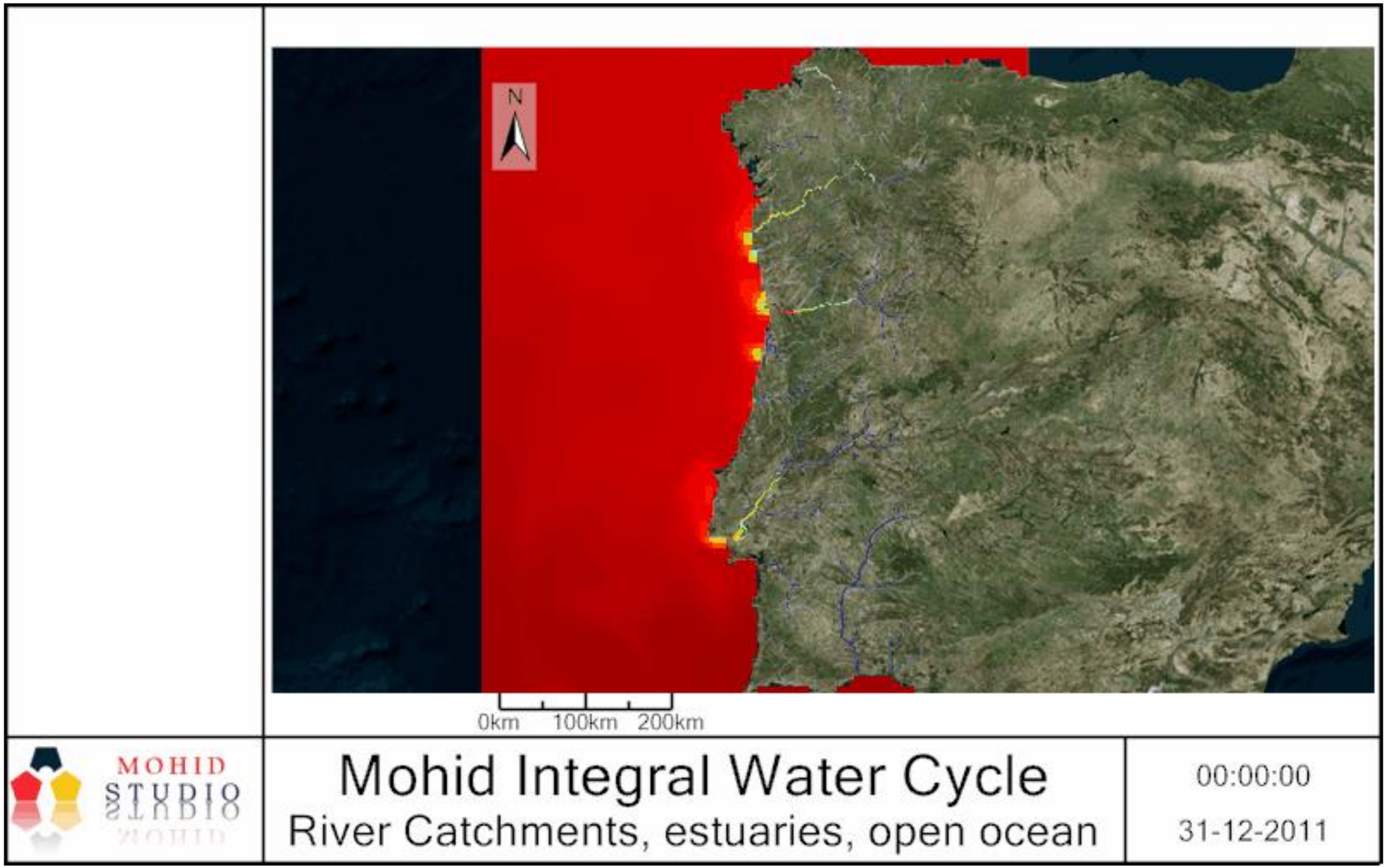
Coping with Water continuum interfaces



Complete description at:

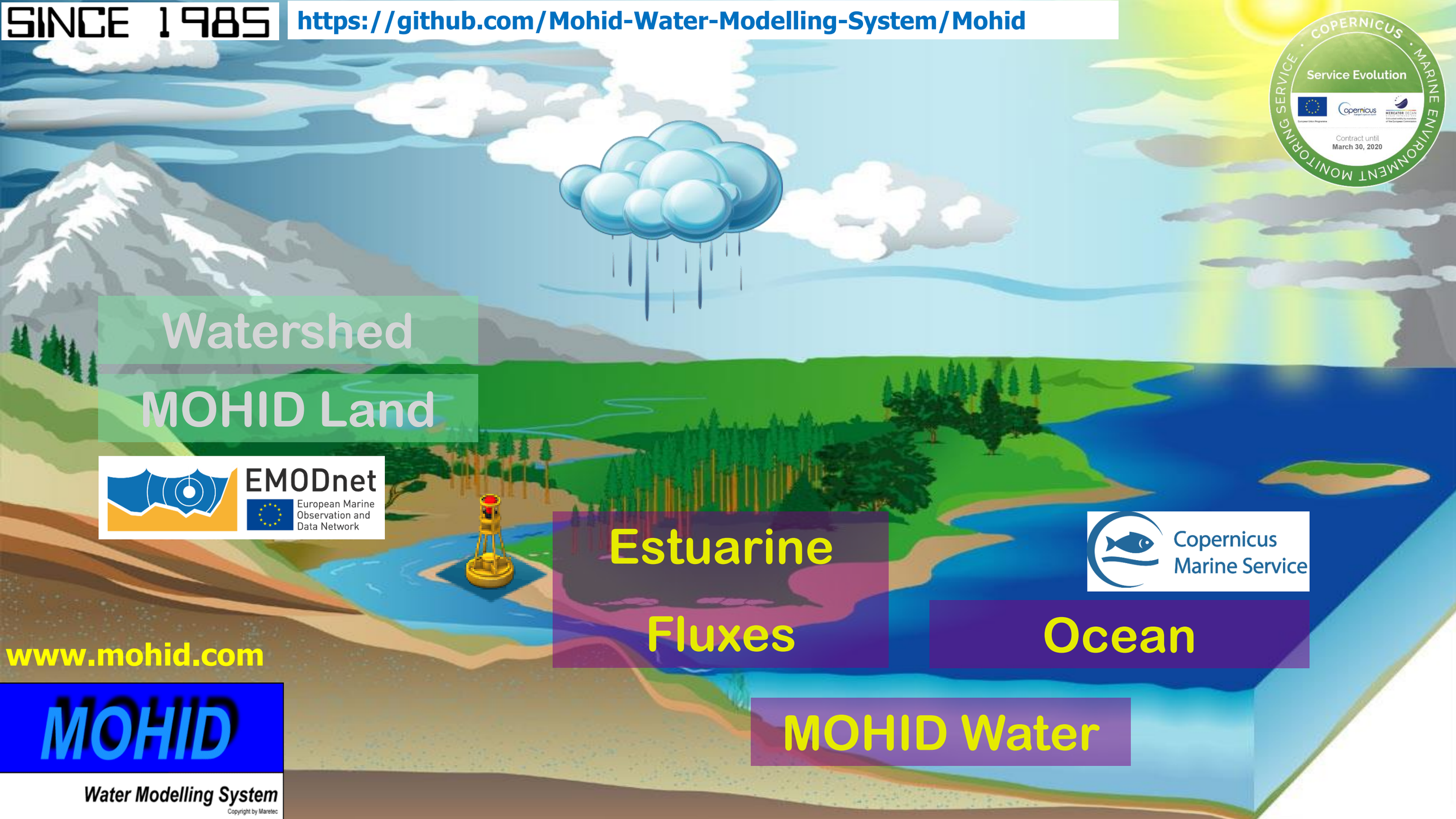
Campuzano F (2018). Coupling watersheds, estuaries and regional seas through numerical modelling for Western Iberia. PhD Thesis, Instituto Superior Técnico, Universidade de Lisboa, Portugal.

+ Integral Water Cycle in the Portuguese continental coast



SINCE 1985

https://github.com/Mohid-Water-Modelling-System/Mohid



www.mohid.com

MOHID

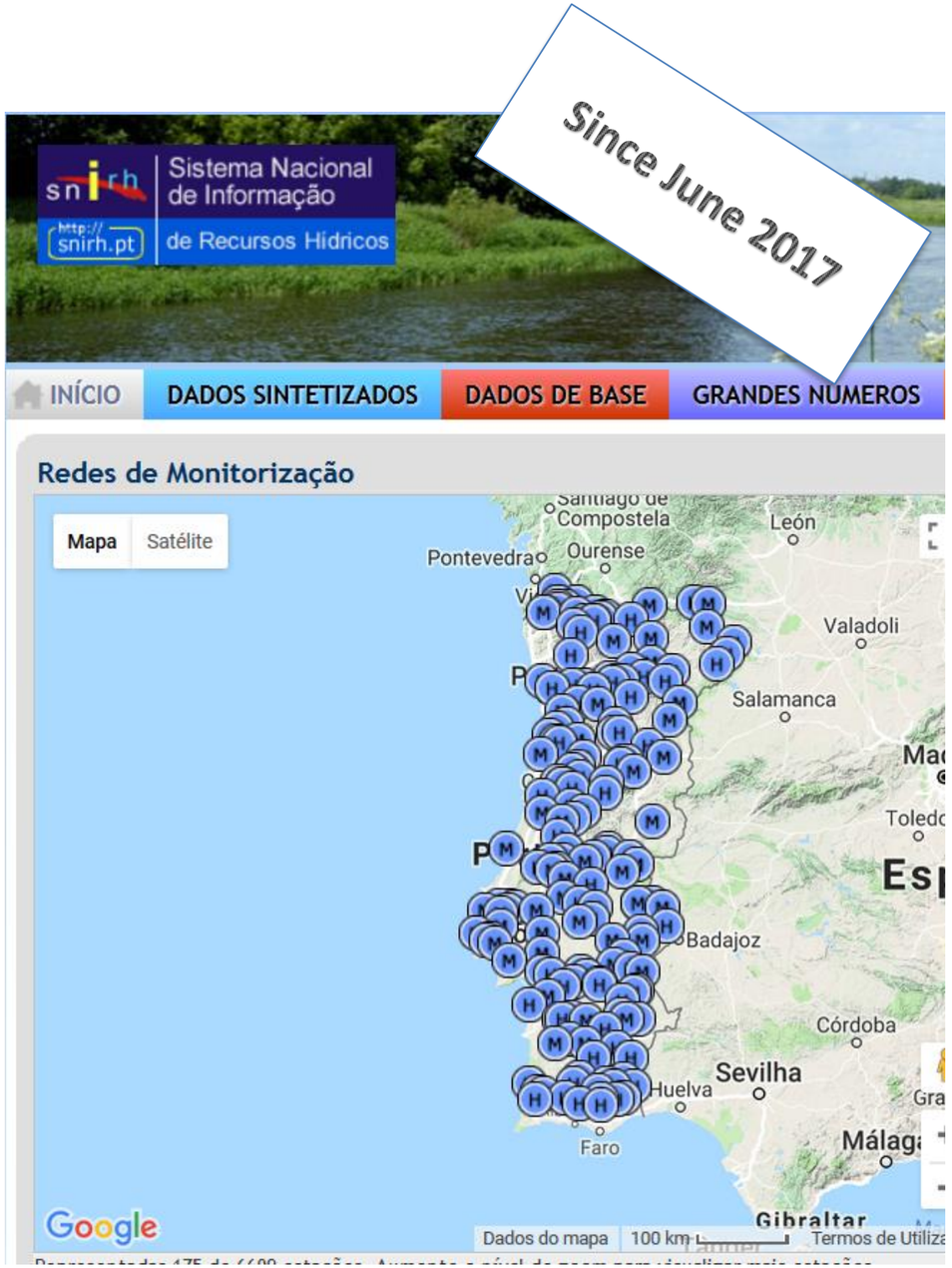
Water Modelling System

Operational River data constraints

- Sparse data in national/regional webpages sometimes only in local language;
- Multiple data sources with GIS portals that eventually may offer access to the actual data;
- Global databases that provide historic data flows but lack of near real time data;
- Water level data without flow curve for conversion into river flow;
- River runoff reaching the coastal area is unavailable or unmonitored for many rivers. This is an increasing problem in the current context of a global decline of the hydrometric networks (Mishra and Coulibaly, 2009).
- Numerical models complete NRT data spatial and temporal coverage. They can add other variables such as water temperature and nutrients and allows to produce forecasts.

EMODnet rivers objectives

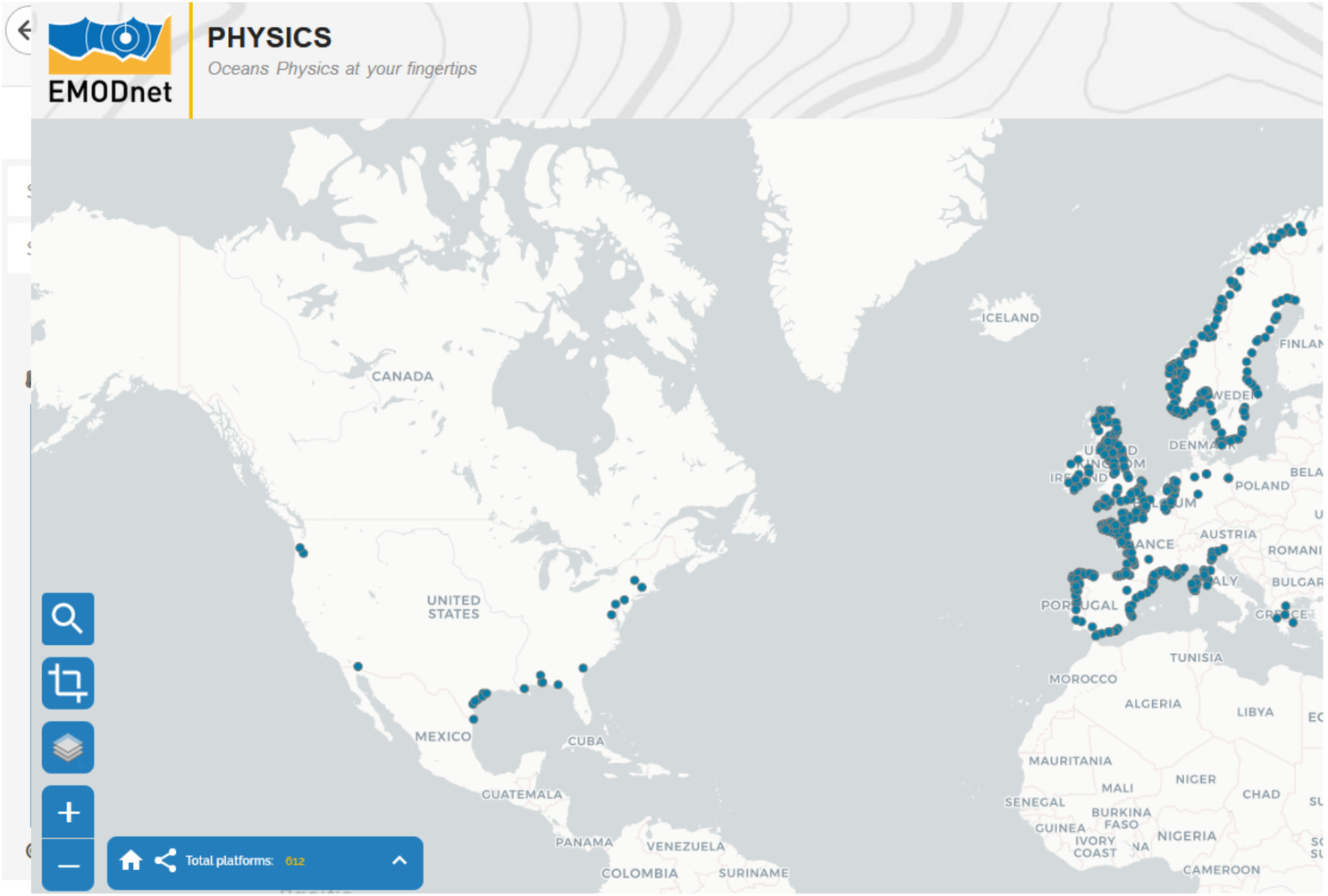
- Identify the main river inputs and the institutions responsible for setting up and maintaining the hydrological networks;
- Select the most reliable stations near the coastal area. Coastal/ocean local experts contribution is important;
- Provide the river observations in a one stop shop and with a common format and metadata information;
- River data is provided in a daily and monthly basis as commonly done in other *in situ* data services.
- Complete the observations with properties from watershed models and provide forecasts.



EMODnet NRT rivers initiative current status (612 stations approx.)

EMODnet

Since June 2017



- Data format
  netCDF-4, CF 1.6
- metadata structure
  - Mandatory: CF-1.6 and OceanSITES
  - Recommended: INSPIRE

Assembly centres:

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TÉCNICO LISBOA

U LISBOA UNIVERSIDADE DE LISBOA

Coriolis OPERATIONAL OCEANOGRAPHY

NOOS

North West European Shelf Operational Oceanographic System

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Acknowledging the sources

PLATFORM CODE

EbroTortosa

PLATFORM NAME

EbroTortosa

INSTITUTION

Confederacion Hidrografica del Ebro

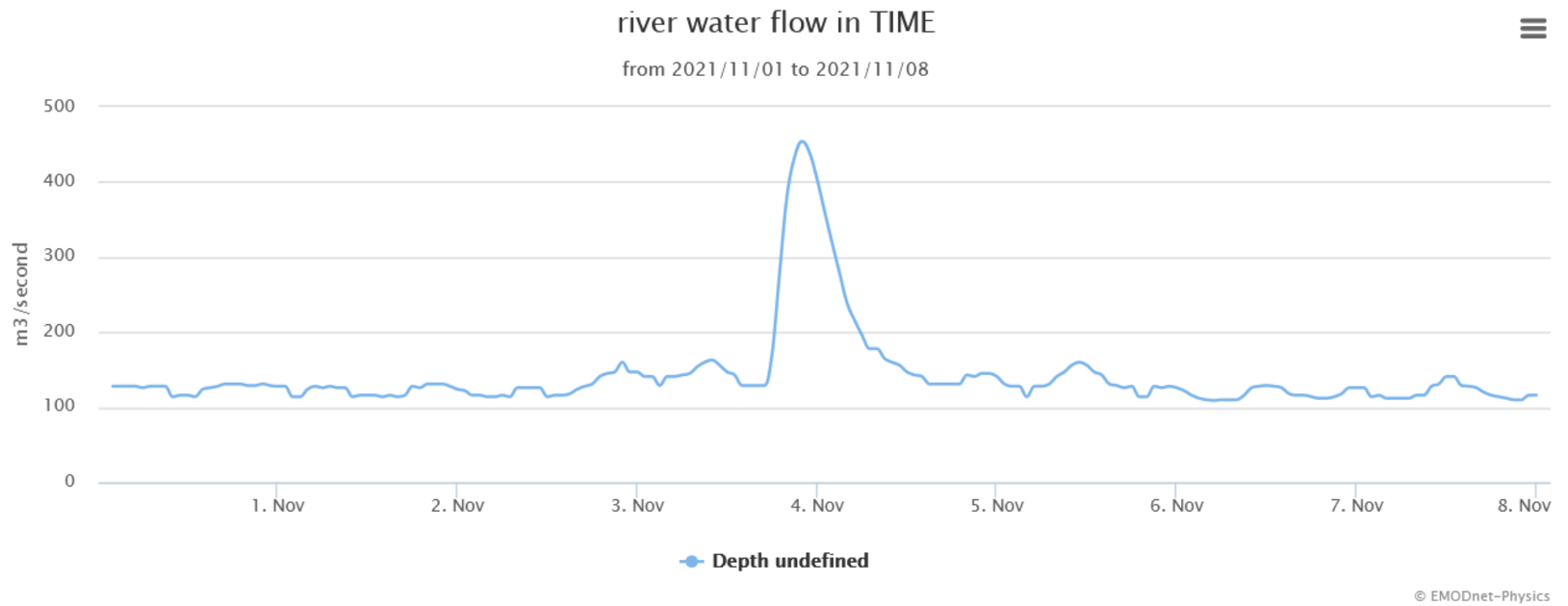
7 Days | 60 Days | Older data

quick download(60 days): select data format and go

NetCDF | CSV | Download | Preview

plots are a Runtime undersampled view of the dataset. to see full details open the "preview"

River / river water flow - m3/second



QC any

QC doc

Select other depths to see more timeseries

+Watershed Modelling Setup

Estuarine, Coastal and Shelf Science
Volume 167, Part A, 20 December 2015, Pages 138–146
Coastal systems under change: tuning assessment and management tools

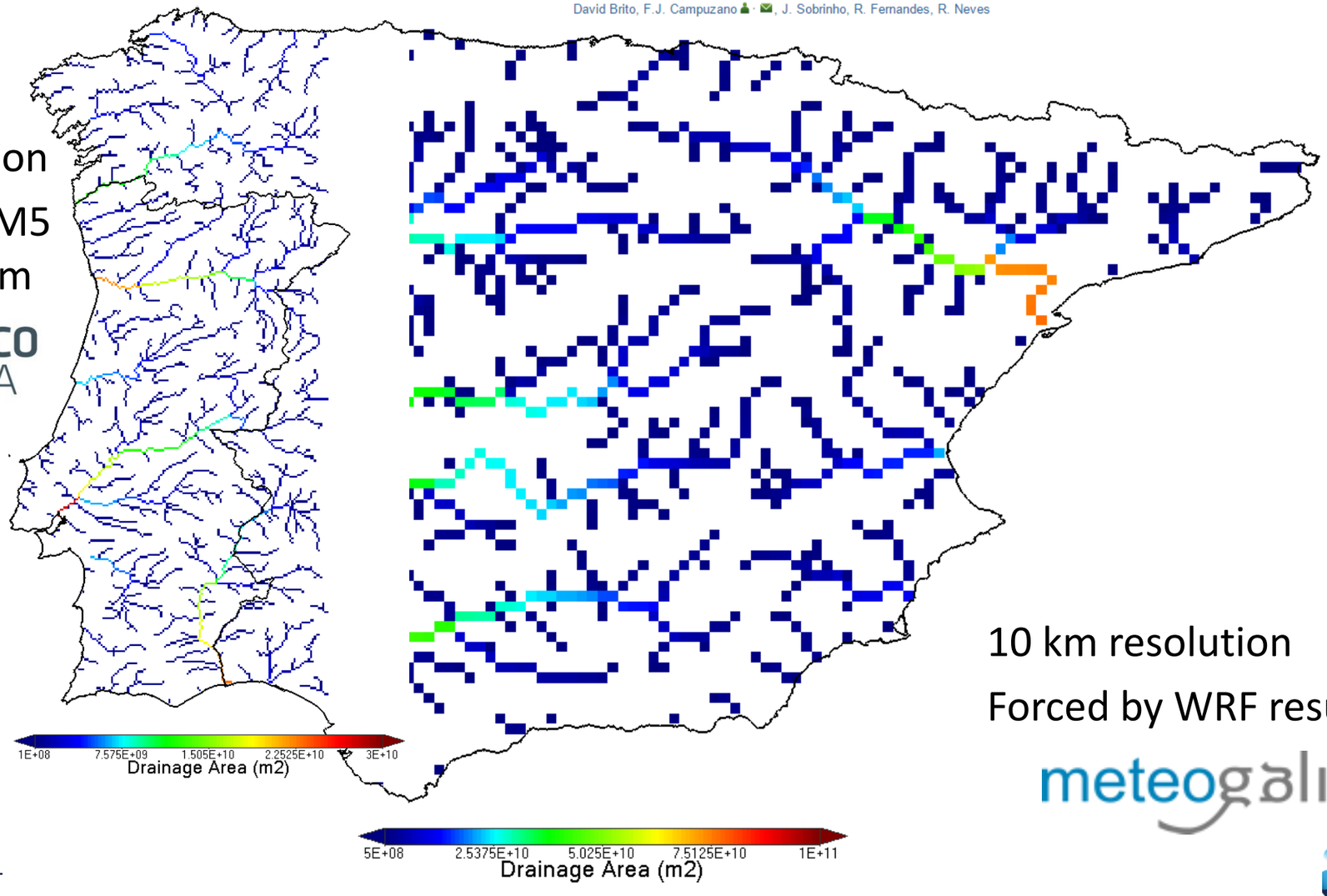
Integrating operational watershed and coastal models for the Iberian Coast: Watershed model implementation – A first approach

David Brito, F.J. Campuzano, J. Sobrinho, R. Fernandes, R. Neves

2 km resolution

Forced by MM5 results from

TÉCNICO LISBOA



10 km resolution

Forced by WRF results from

meteogalicia

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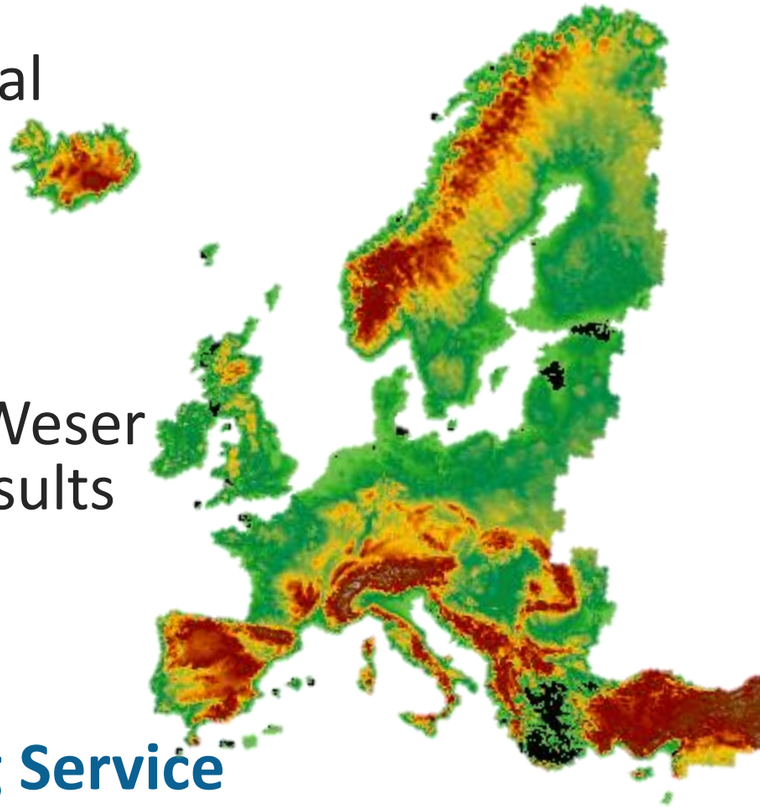
Watershed modelling details

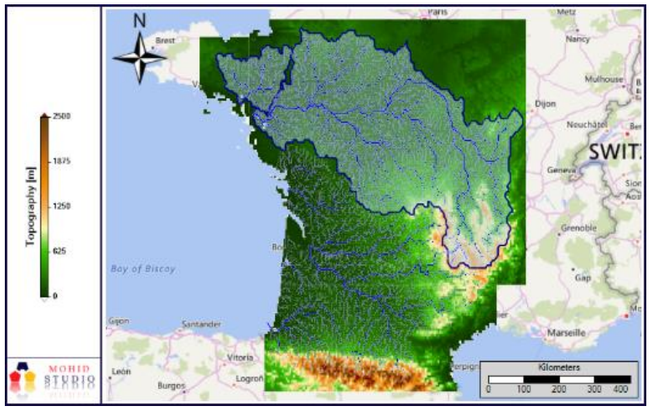
- The main goal was estimating the amount of freshwater entering the coastal areas of the North Sea/Atlantic Ocean.
- The LAMBDA project divided the study area into ten numerical modelling domains
- Simulated period: **01/01/2008 – 01/01/2019**
- **5 km x 5 km grid**, except for for Loire and Severn rivers
- **ERA5 meteorological model (ECMWF)** except for Ems and Weser watersheds were meteorological stations produced better results
- Digital Elevation Model **EU-DEM** (resolution: 30 m)
- River Cross Sections from Andreadis *et al*., 2013
- **2012 Corine Land Cover** from **Copernicus Land Monitoring Service**
- 3D soil hydraulic database (resolution: 250 m) from Tóth *et al*. 2017



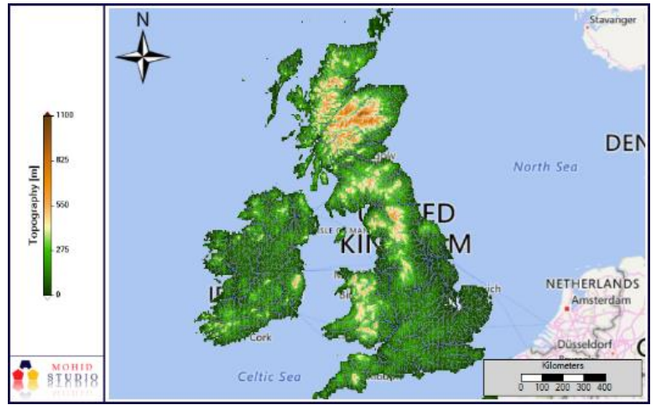
Watershed modelling domains

a) Western Iberian Peninsula

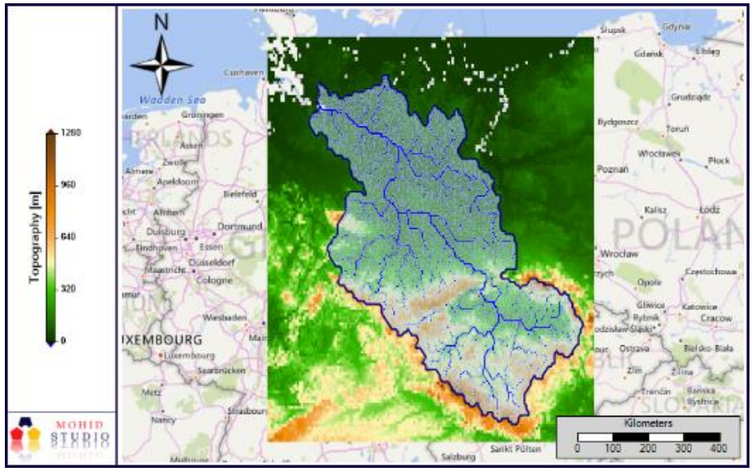
b) Western France



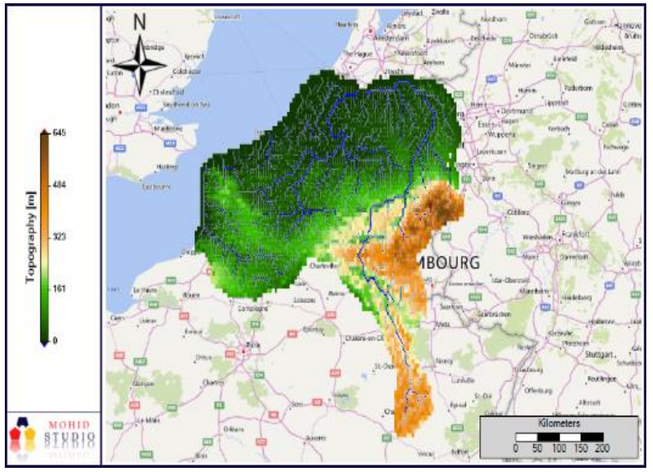
c) United Kingdom and Ireland



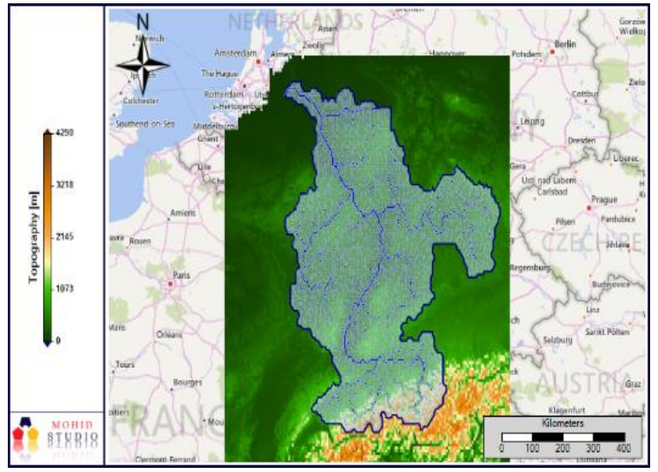
d) Elbe watershed



e) Somme, Escault and Meuse

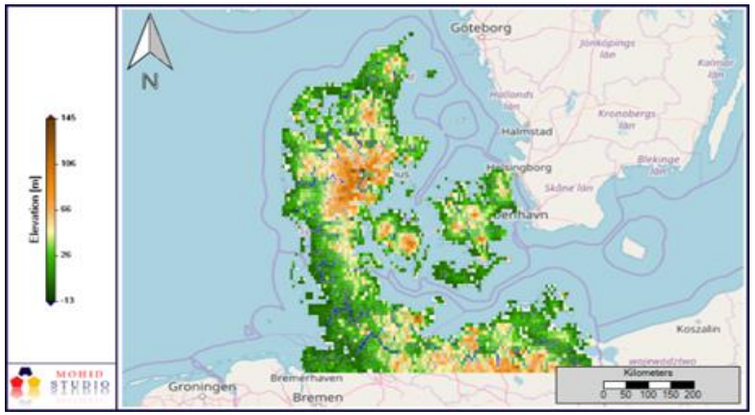


f) Rhine watershed

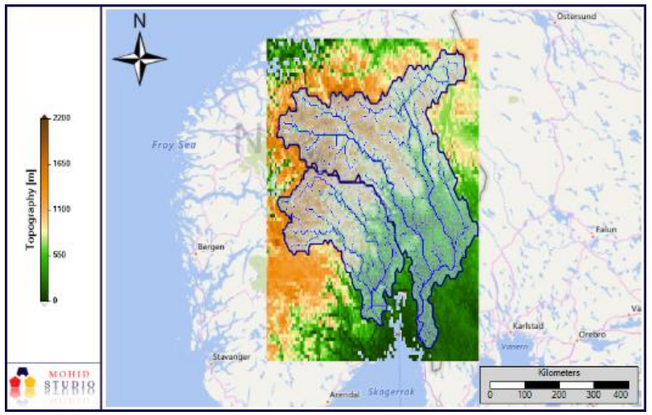


Watershed modelling domains

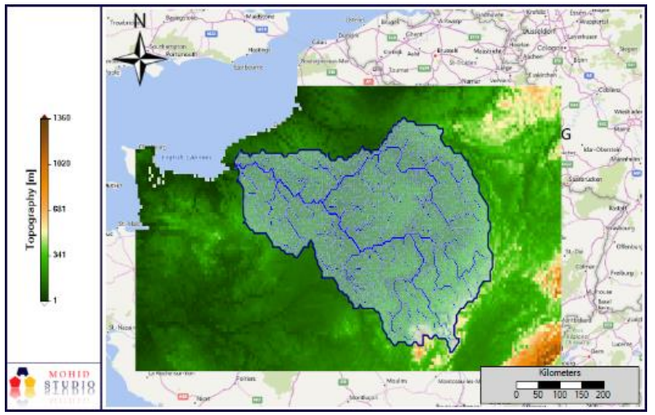
g) Denmark domain



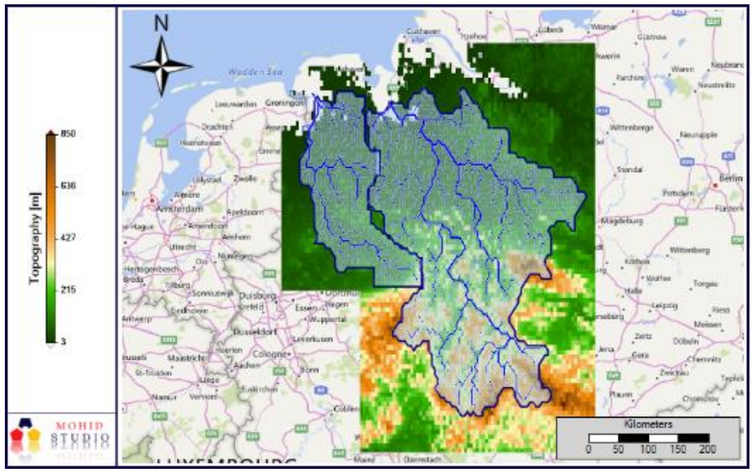
h) Glomma and Drammen



i) Seine watershed



j) Ems and Weser watersheds



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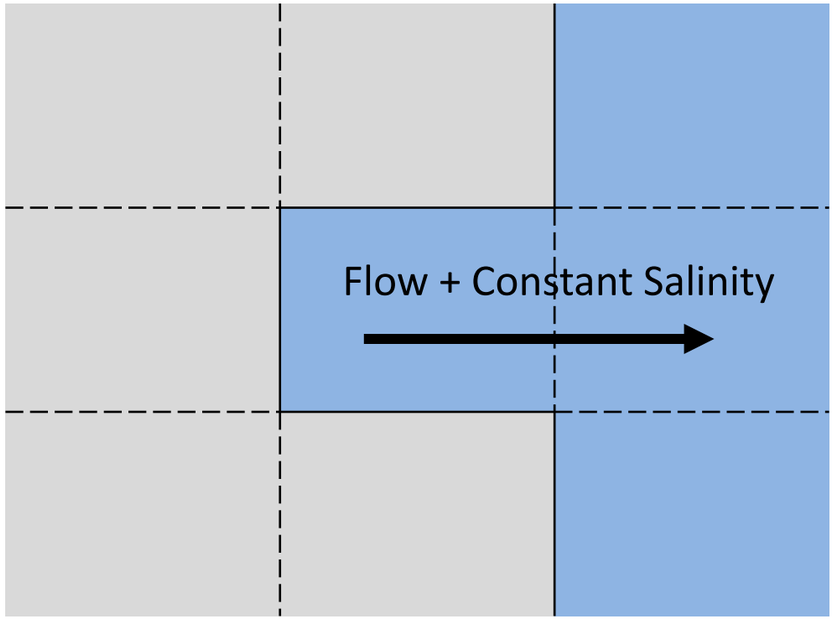
54 main Rivers*

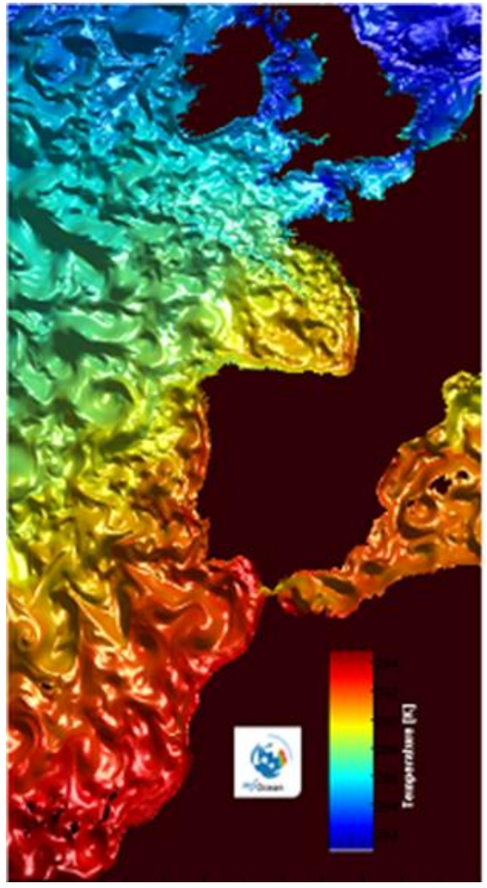
* 70 and 364 extra rivers were produced for Western Iberia and Ireland-UK domains respectively

River input in the coastal area methods

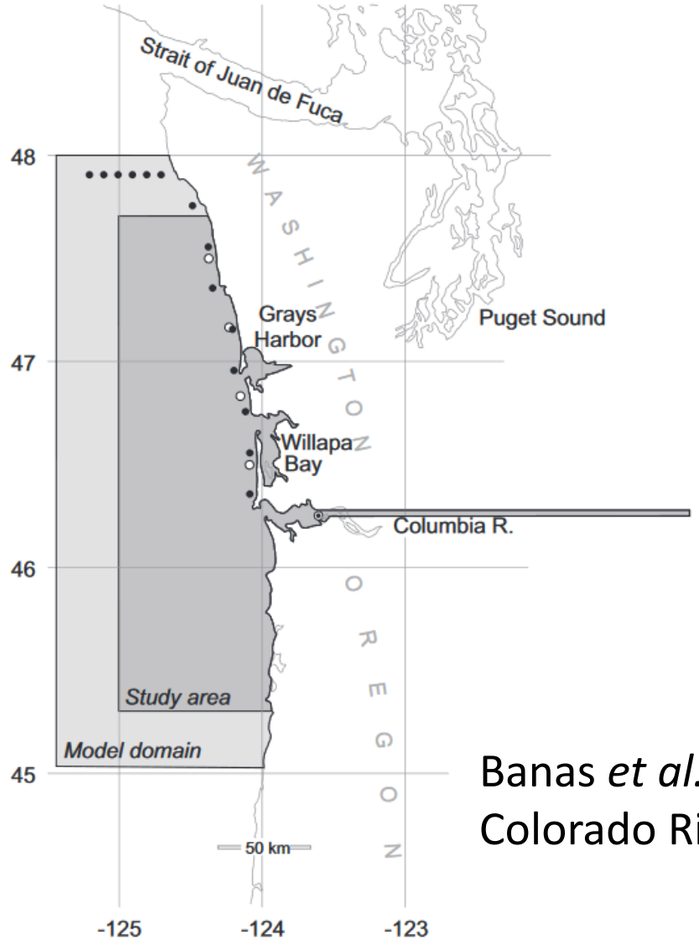
Direct Discharge (Flow + constant salinity)

Initial dilution through single inlet (Flow + constant salinity)
such as the Copernicus marine service for the IBI-Region





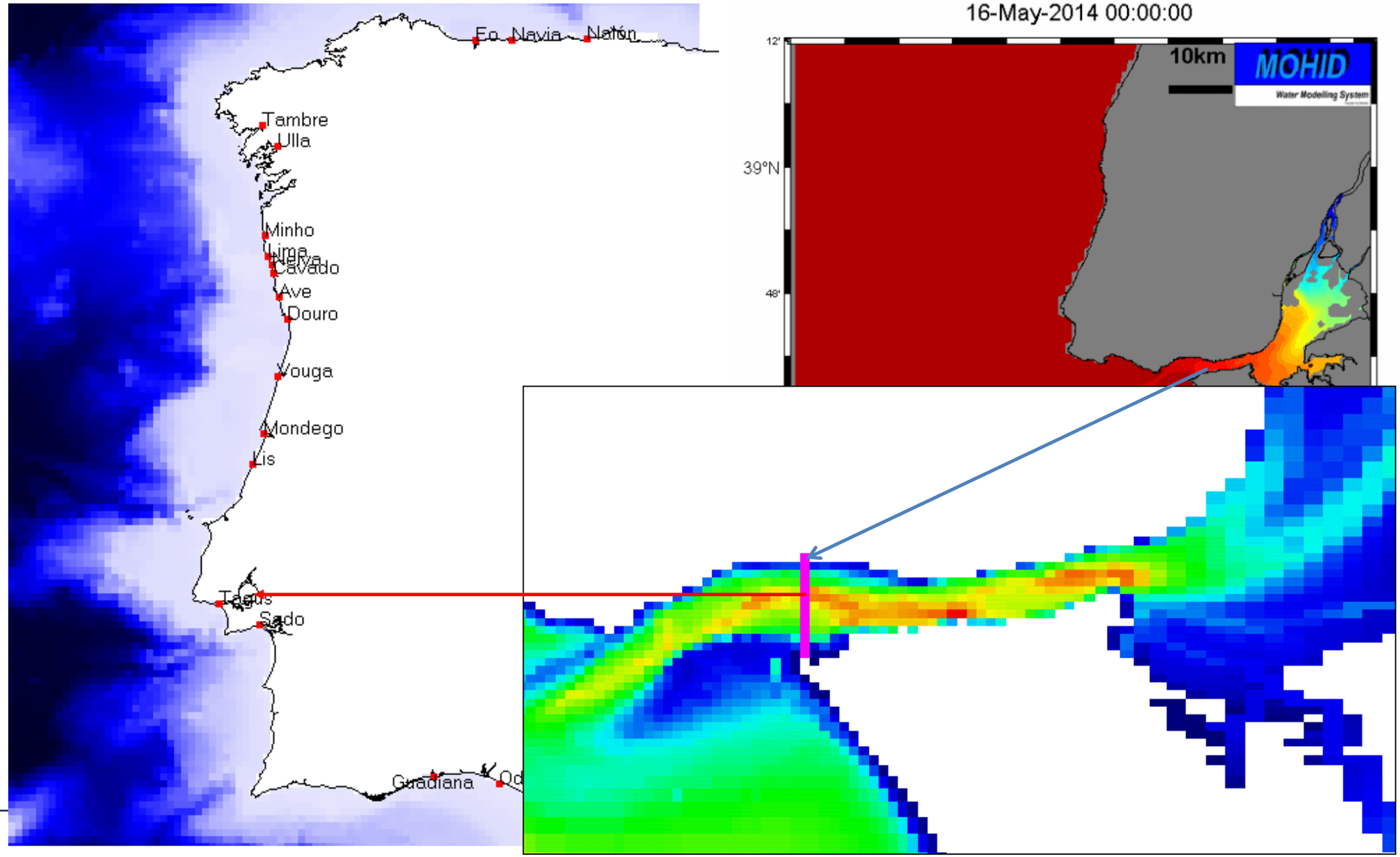
Integrating estuary in the model grid



Banas *et al.* 2009
Colorado River (USA)

+RIVER-ESTUARY-OCEAN COUPLING

Estuaries are very dynamic areas with influence from tides, river inputs and the open ocean conditions. Due to the tide, and their cycles, their discharges vary in time from ebb to flow and varying from spring to neap tides.



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MOHID Water

Estuarine Proxy

OCEAN INPUTS

Tides and ocean water properties

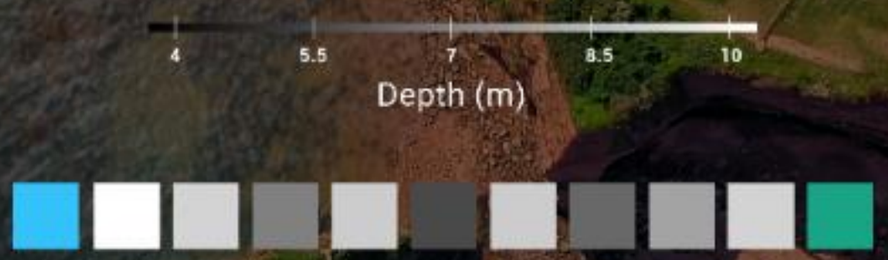
FES2014

Tides

PCOMS

Timeseries of ocean salinity and temperature

Copernicus Marine Service



Outer estuarine cell & outputs

- Water salinity
- Temperature
- Flow
- Velocity
- Oxygen
- Nutrients

LAND INPUTS

River flow and temperature

MOHID Land

Modelled flow +
Modelled Temperature +
Salinity constant 0.01

Observations

Observed flow +
Modelled Temperature +
Salinity constant 0.01

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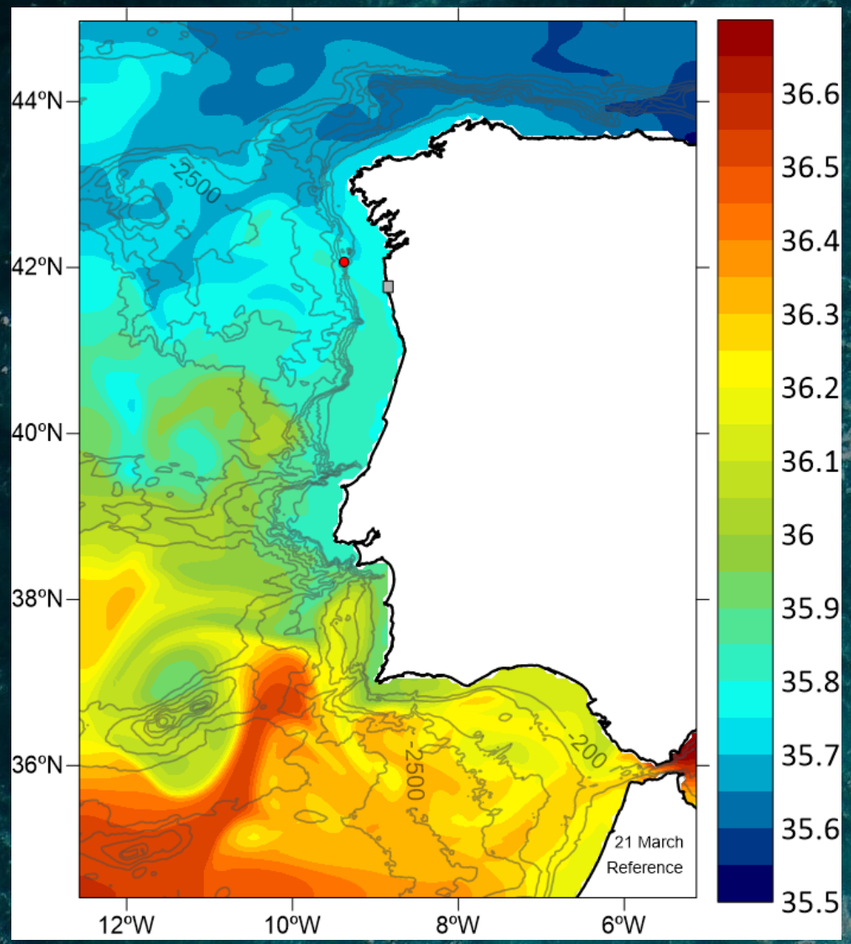
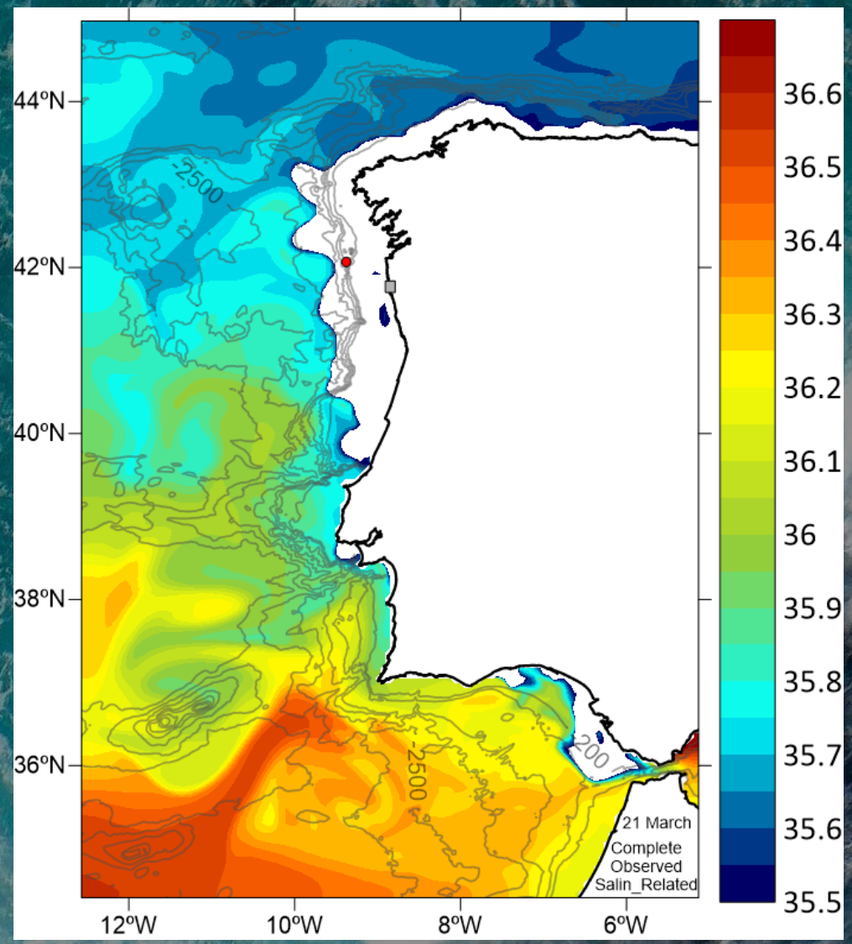
+ Fresh Water Influence

Large rain event in late March 2018





What’s new

The main deliverables and objectives for this new period are:

- keep adding new stations
- new variables (chemistry & meteorology)
- database of estuarine main characteristics
- river proxy (estuary): new variables river momentum and volume
- annual version of the product: climatology and river proxy
- made operational the CMEMS SE LAMBDA products
- explore links with OSPAR/EuroGOOS Coastal WG activities

Thank you so much for your attention!

Questions?

Stay in touch: francisco.campuzano@colabatlantic.com

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MARETEC – Marine, Environment & Technology Center

TÉCNICO LISBOA

Bentley – Advancing Infrastructure

BEC – Barcelona Expert Center (ICM, UPC, IEEC)

ETT – People and Technology

Associated Partners

Puertos del Estado

Met Office

Marine Institute – Foras na Mara

Helmholtz-Zentrum Geesthacht – Zentrum für Material- und Küstenforschung

More info at http://www.cmems-lambda.eu/

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Service Evolution

Contract until March 30, 2020