LAMDBA

LAnd-Marine Boundary Development and Analysis

Framework for improving land boundary conditions in CMEMS regional products

MOHIDing Meeting 7th-8th June 2018

opernicus
Europe's eyes on Earth

Main Objective

to improve the CMEMS MFCs thermohaline circulation in coastal areas by a better characterisation of the land-marine boundary conditions

The LAMBDA project will:

- generate freshwater products flows and associated water properties;
- enhance satellite salinity products development;
- Evaluate the capacity of hydrological models;
- integrate the different time scales of river outflow by flexible interfaces;
- benefit from local and regional knowledge.

The LAMBDA project rely on three pillars:

- A wide consortium with excellence on their respective area;
- Model, software and EO products developers connected with local experts and CMEMS MFCs operators;
- Communication activities to enhance partner interaction.

Consortium: Full partners

- MARETEC-IST
- Bentley Systems
- Barcelona Expert Centre
- ETT

Consortium: Associated Partners

- Met Office
- Puertos del Estado
- Marine Institute
- HZG

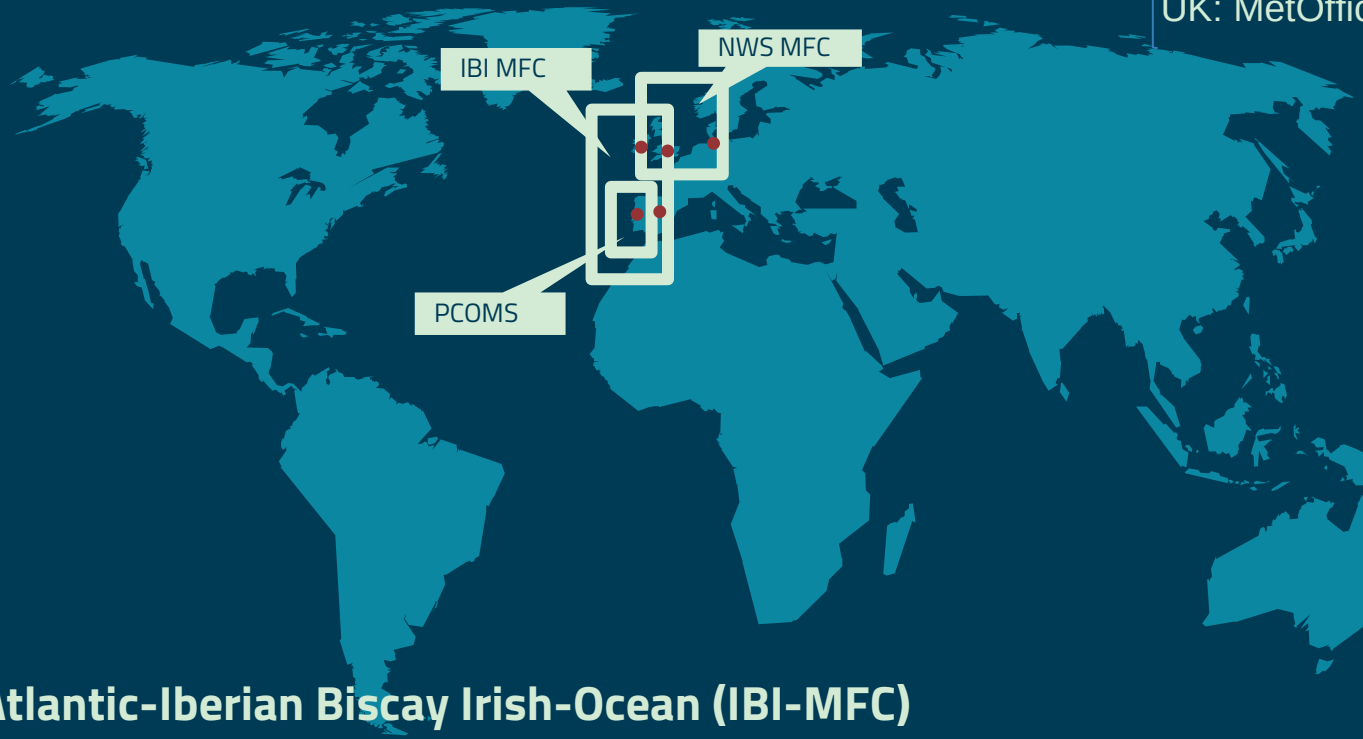
LAMBDA project activities:

1. Fresh water modelling development (Lead: IST)
2. Fresh water data validation, adaptation and distribution (Lead: Bentley)
3. Land-marine boundary ocean model scenarios testing (Lead: IST)
4. EO validation and development of novel EO salinity products (Lead: BEC-ICM)
5. Local expertise evaluation (Lead: IST)
6. Project Communication (Lead: ETT)
7. Project Coordination and Management (Lead: IST)

Study Areas

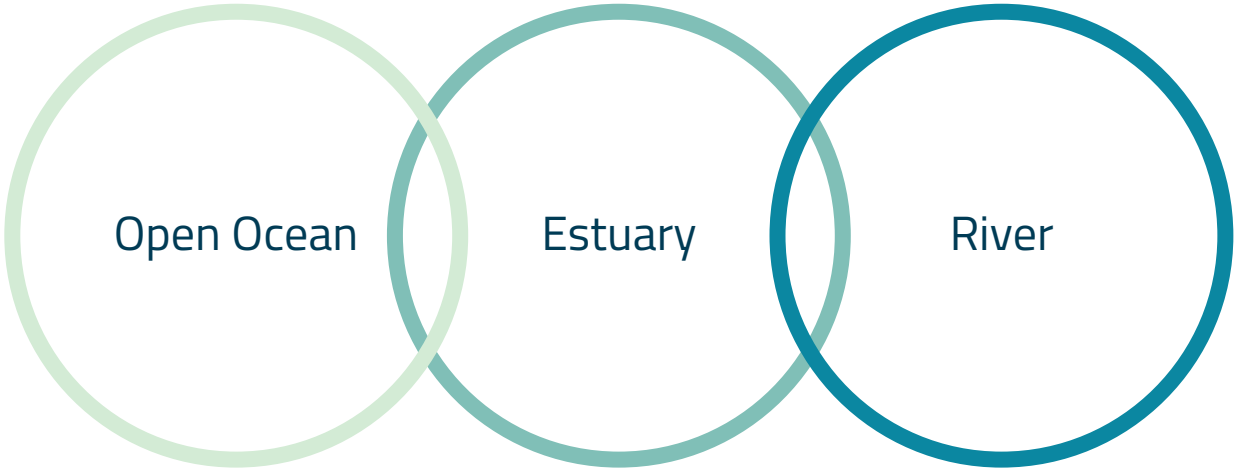
Local Experts

Germany: HGZ
Ireland: MI
Portugal: MARETEC-IST
Spain: Puertos del Estado
UK: MetOffice



Atlantic-Iberian Biscay Irish-Ocean (IBI-MFC)
Atlantic-European North West Shelf (NWS-MFC)
Portuguese Coast Operational Modelling System (PCOMS)

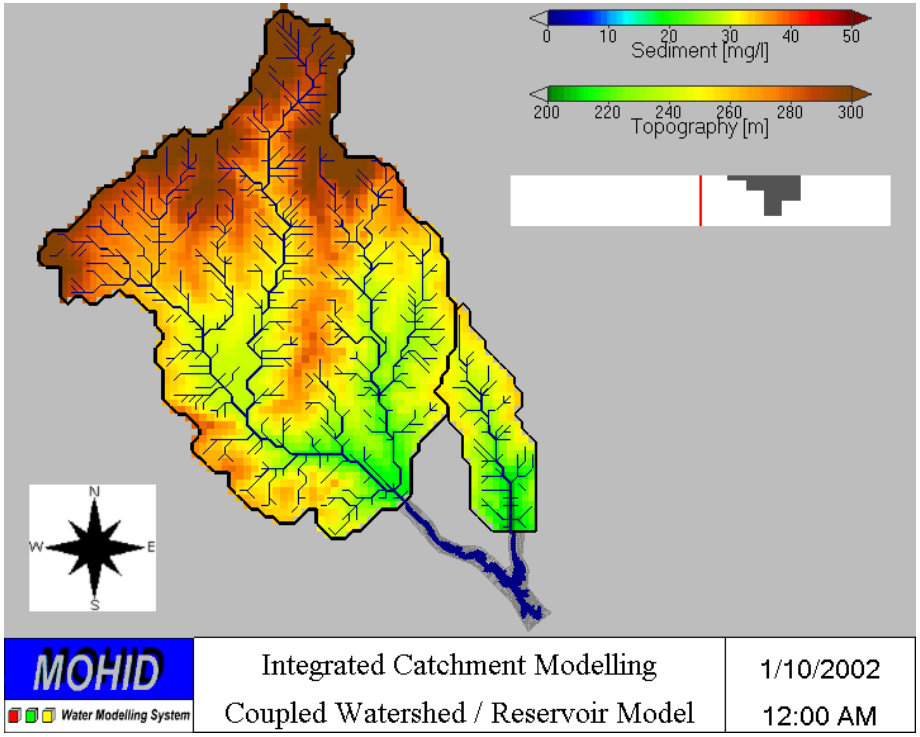
LAMBDA project conceptual dyagram: Coping with Water continuum interfaces



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.

MOHID Watershed modelling

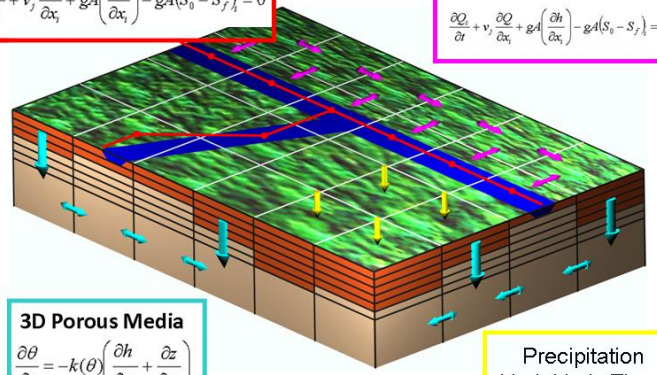


1D Drainage Network

$$\frac{\partial Q_i}{\partial t} + v_j \frac{\partial Q}{\partial x_i} + gA\left(\frac{\partial h}{\partial x_i}\right) - gA\left(S_0 - S_{f_i}\right) = 0$$

2D Overland Flow

$$\frac{\partial Q_i}{\partial t} + v_j \frac{\partial Q}{\partial x_i} + gA\left(\frac{\partial h}{\partial x_i}\right) - gA\left(S_0 - S_{f_i}\right) = 0$$



3D Porous Media

$$\frac{\partial \theta}{\partial t} = -k(\theta)\left(\frac{\partial h}{\partial x_i} + \frac{\partial z}{\partial x_i}\right)$$

Precipitation
Variable in Time
& Space

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

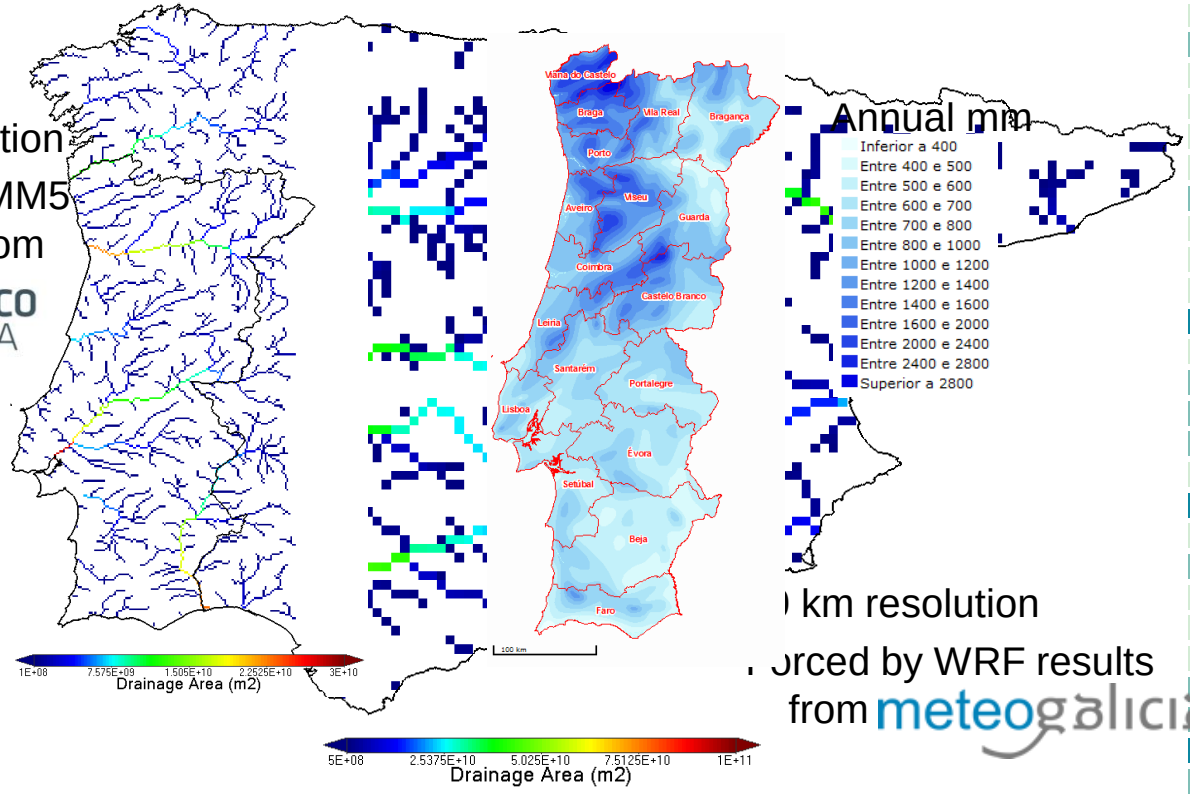
Integrating operational watershed and coastal models for the Iberian Coast: Watershed model implementation – A first approach

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

2 km resolution

Forced by MM5 results from

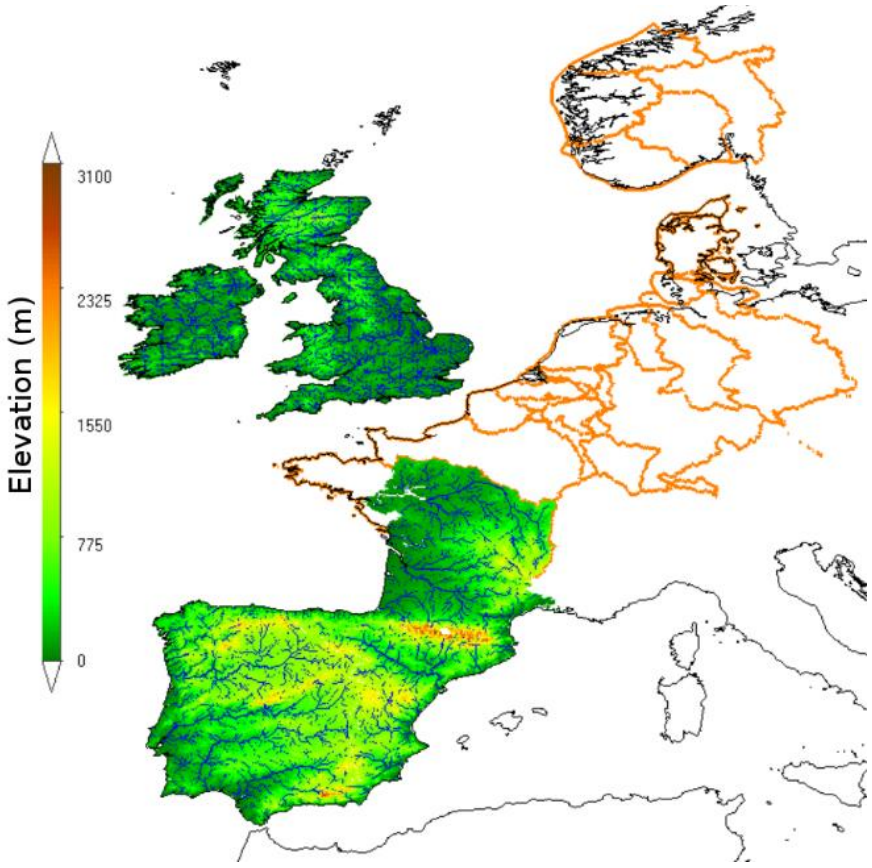
TÉCNICO LISBOA



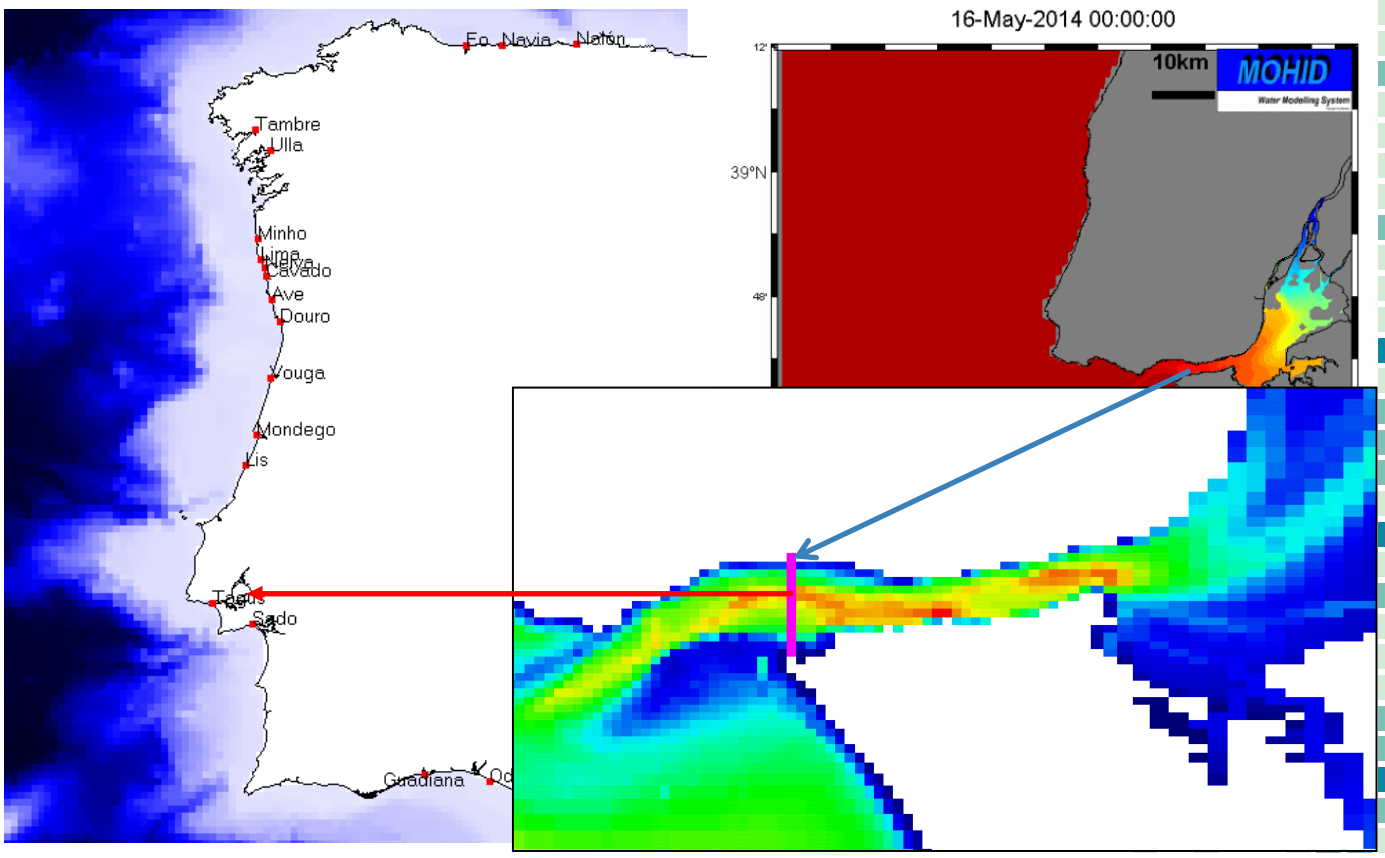
km resolution

orced by WRF results from meteogalicia

Watershed LAMBDA Coverage

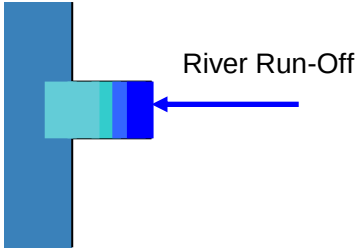


RIVER-ESTUARY-OCEAN COUPLING



Estuarine proxy

A proxy for estuarine mixing will be generated based on the river discharge along estuaries characteristics such as tidal prim and tidal harmonics obtained from global tidal models such as FES2012

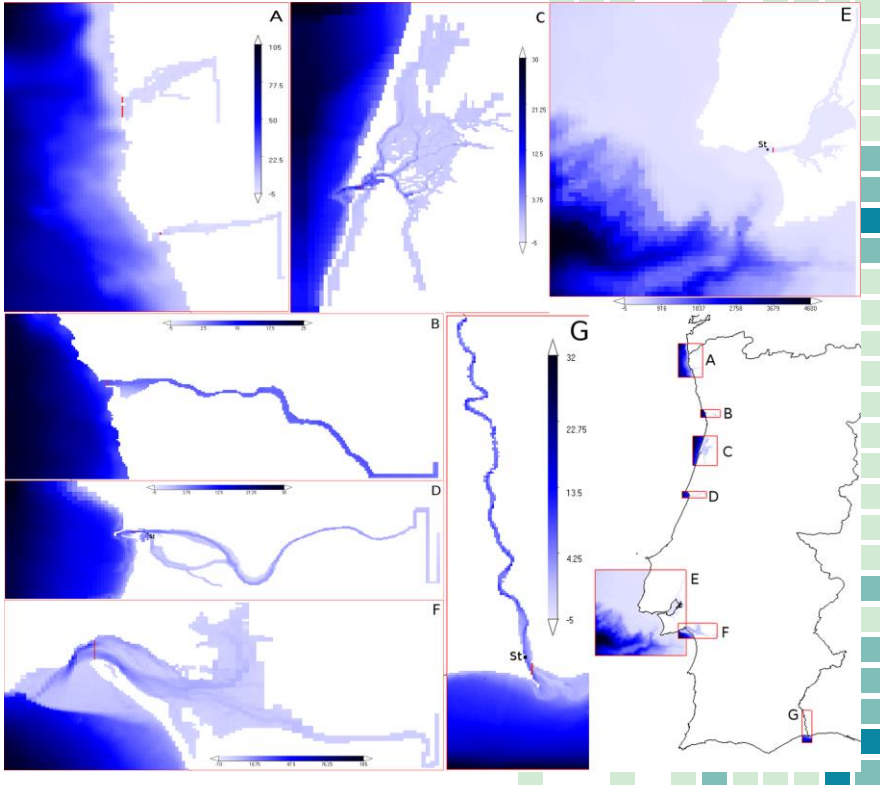


Estuary implementation

River flow forcing:

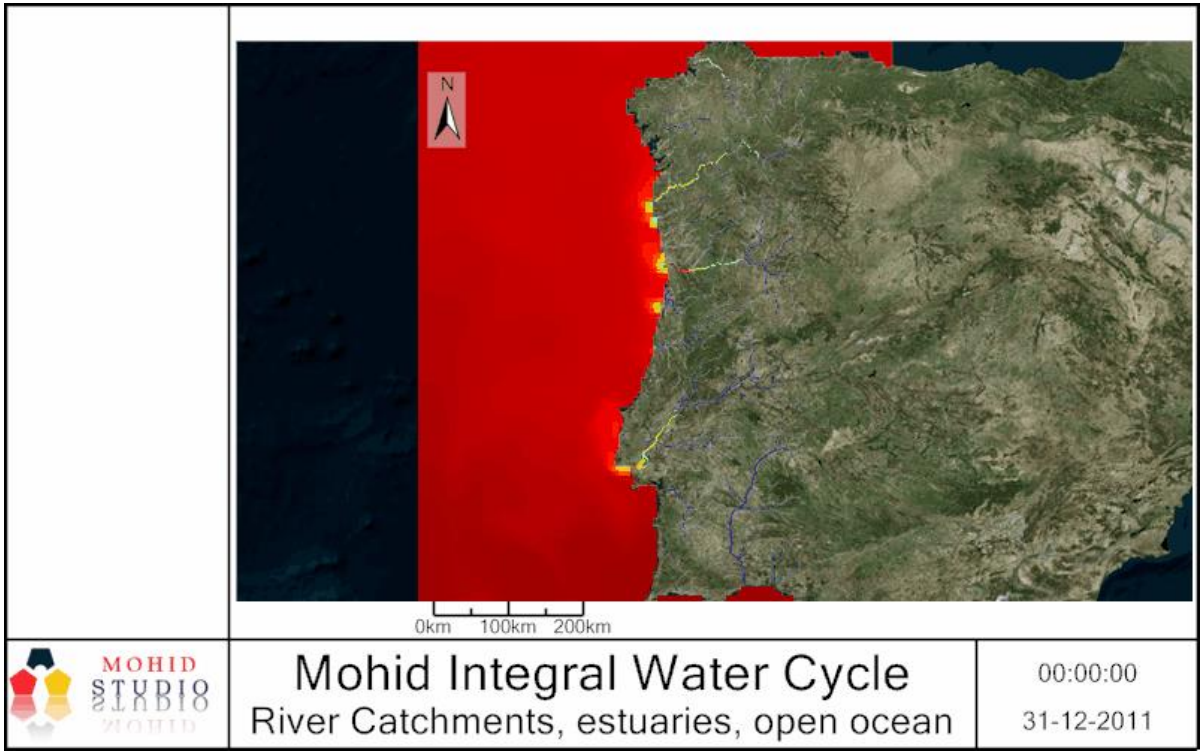
A (top): Minho (MOHID Land WI)
A (bottom): Lima (MOHID Land WI)
B: Douro (SNIRH/APA)
C: Aveiro (MOHID Land WI)
D: Mondego (SNIRH/APA)
E: Tagus (SNIRH/APA)
F: Sado (MOHID Land WI)
G: Guadiana (SNIRH/APA)

River temperature provided in all cases by MOHID Land WI.



Campuzano FJ, Juliano M, Sobrinho J, de Pablo H, Brito D, Fernandes R, Neves R (2018). Coupling Watersheds, Estuaries and Regional Oceanography through Numerical Modelling in the Western Iberia: Thermohaline Flux Variability at the Ocean-Estuary Interface. In: Estuary. W. Froneman (Ed), InTech, Rijeka, Croatia. DOI: 10.5772/intechopen.72162.

Integrated Water Cycle



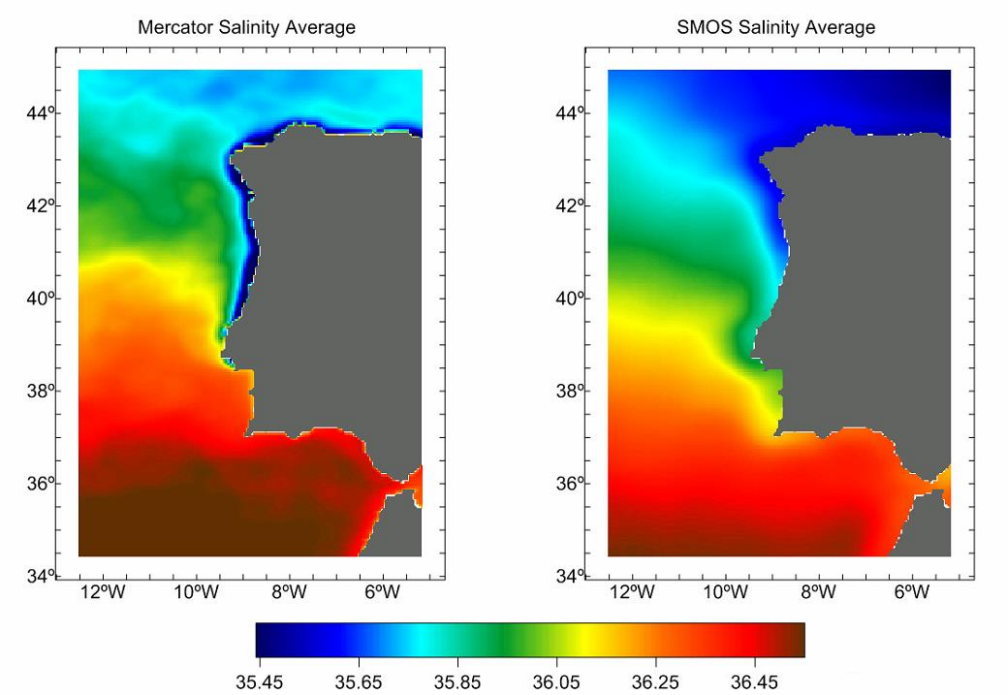
LAMBDA project scenarios:

- Climatology: pure river climatologies;
- Reference: NWS and IBI CMEMS MFCs current land-marine boundary conditions;
- MOHID Land modelling results:
  - Natural flows (LAMBDA river flows V0)
  - Natural flows modified by the estuary proxy (LAMBDA river flows V0-M)
  - Biogeochemical discharge scenario (LAMBDA BGQ V0)
  - River dam controlled flows (LAMBDA river flows V1-M)

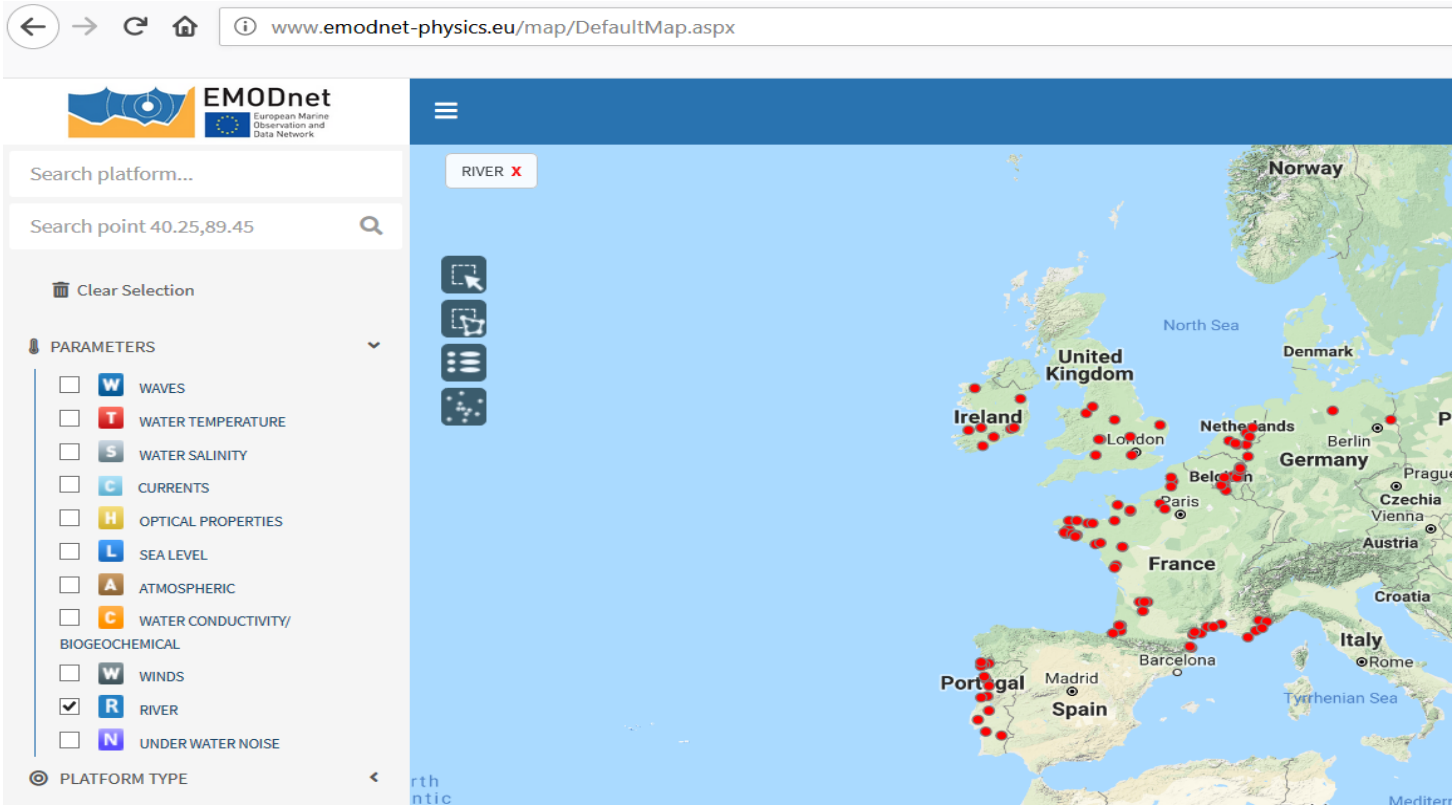
LAMBDA scenario testing rationale

- The LAMBDA boundary products will be implemented first as proof of concept (PoC) in the Portuguese Coast Operational Modelling System (hereafter referred as PCOMS, Mateus et al., 2012) for a minimum simulation period of two years before application in the CMEMS IBI and NWS MFCs
- CMEMS MFCs model sensitivity tests for specific relevant time periods of interest
- The water quality scenario will only be tested in the PCOMS model domain and guidance will be produced for future MFCs implementation

Validation with novel SSS EO products and by local experts



EMODNET RIVERS INITIATIVE - CURRENT STATUS



Assembly centers:

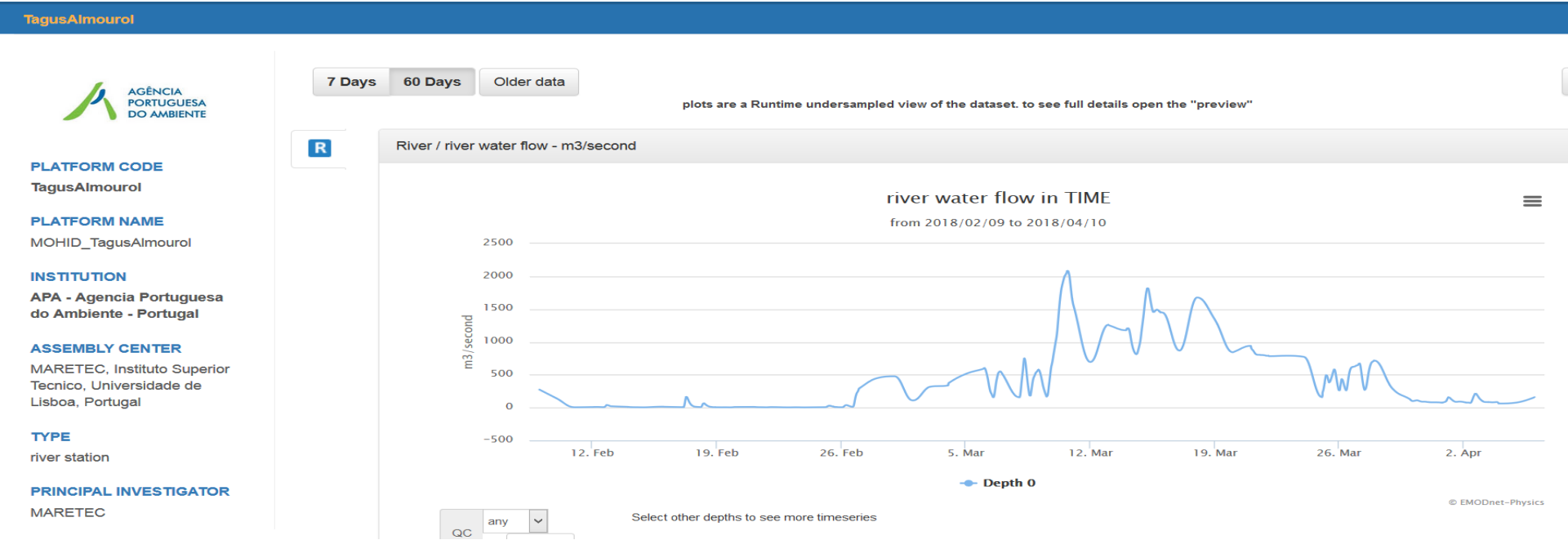
TÉCNICO LISBOA

Coriolis OPERATIONAL OCEANOGRAPHY

NOOS

North West European Shelf Operational Oceanographic System

ACKNOWLEDGING THE SOURCES



CONCLUSIONS:

- Harmonised database of relevant and reliable river flow and water properties;
- One stop shop for river data at the European level;
- Standarised common data formats;
- Observations completed by modelling results in terms of properties;
- River forecasts to be included in the next future;
- Looking for contributions/contributors. Can you help?

Communication Plan

- Splinter meeting/focused session in one European scientific event on river/coastal coupling (e.g. EGU, or GODAE COSS-TT workshop, or Hymex conference)
- Project Webpage
- Leaflets and video

THANKS!

Any questions?

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