

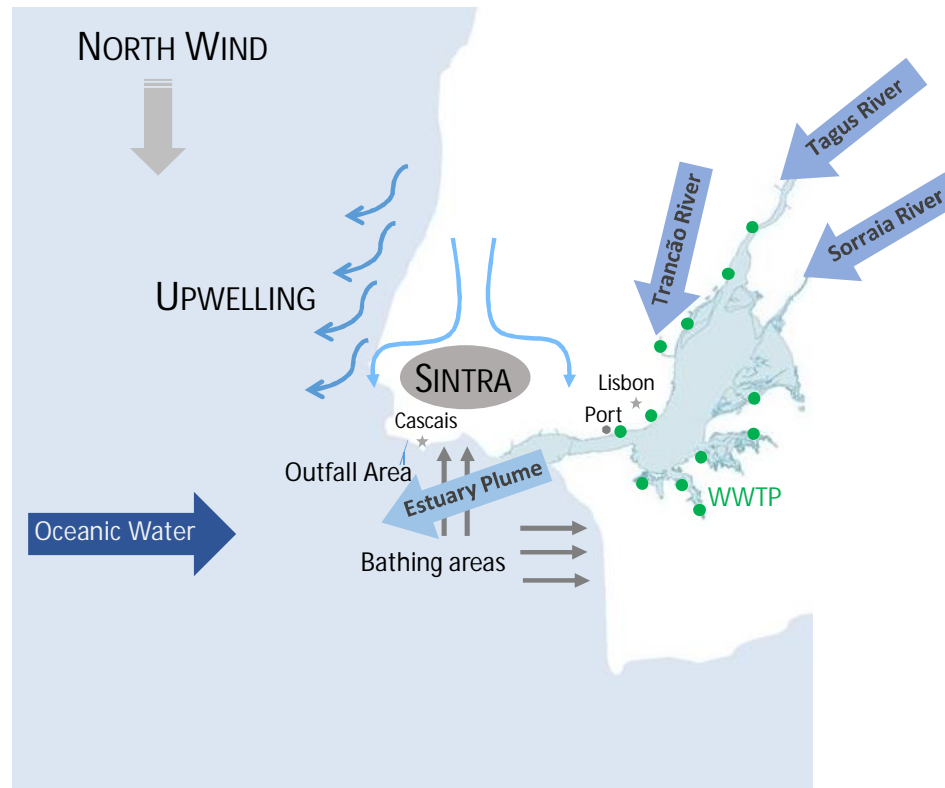
Assessment of estuarine plume in a coastal area using high-resolution model: The Tagus mouth case.

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Goal of this presentation:

Present a methodology to quantify nutrient budget in a coastal area, between an estuary and the ocean, subject to different hydrodynamic regimes

Study Area - Conceptual Model

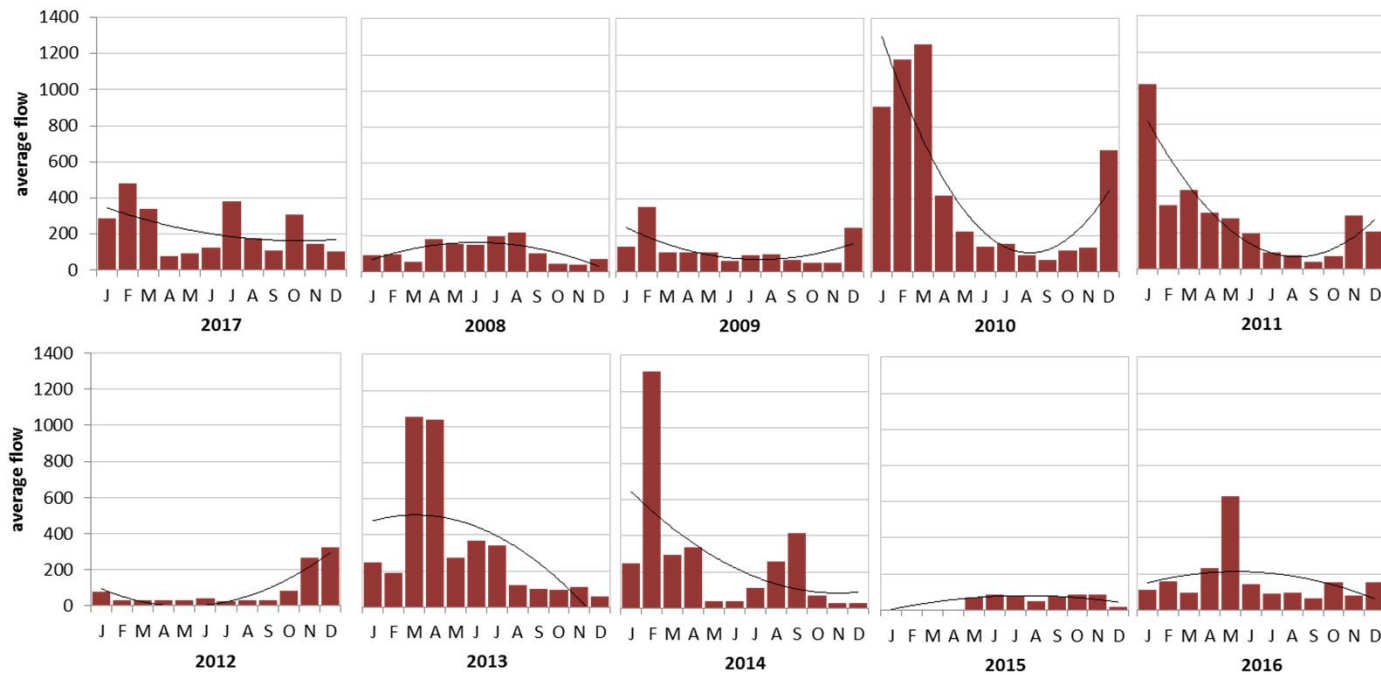


What parameters and how to choose them?

- Fresh Water Discharges – (loads)Seasonality?



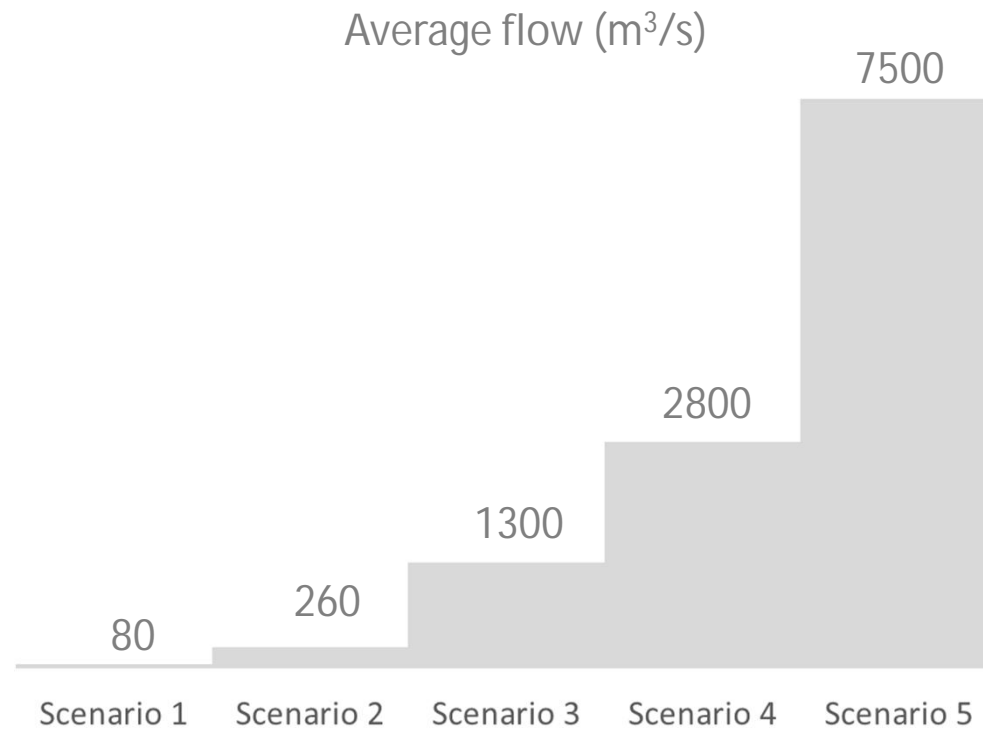
○ Fresh Water Discharges - Seasonality?



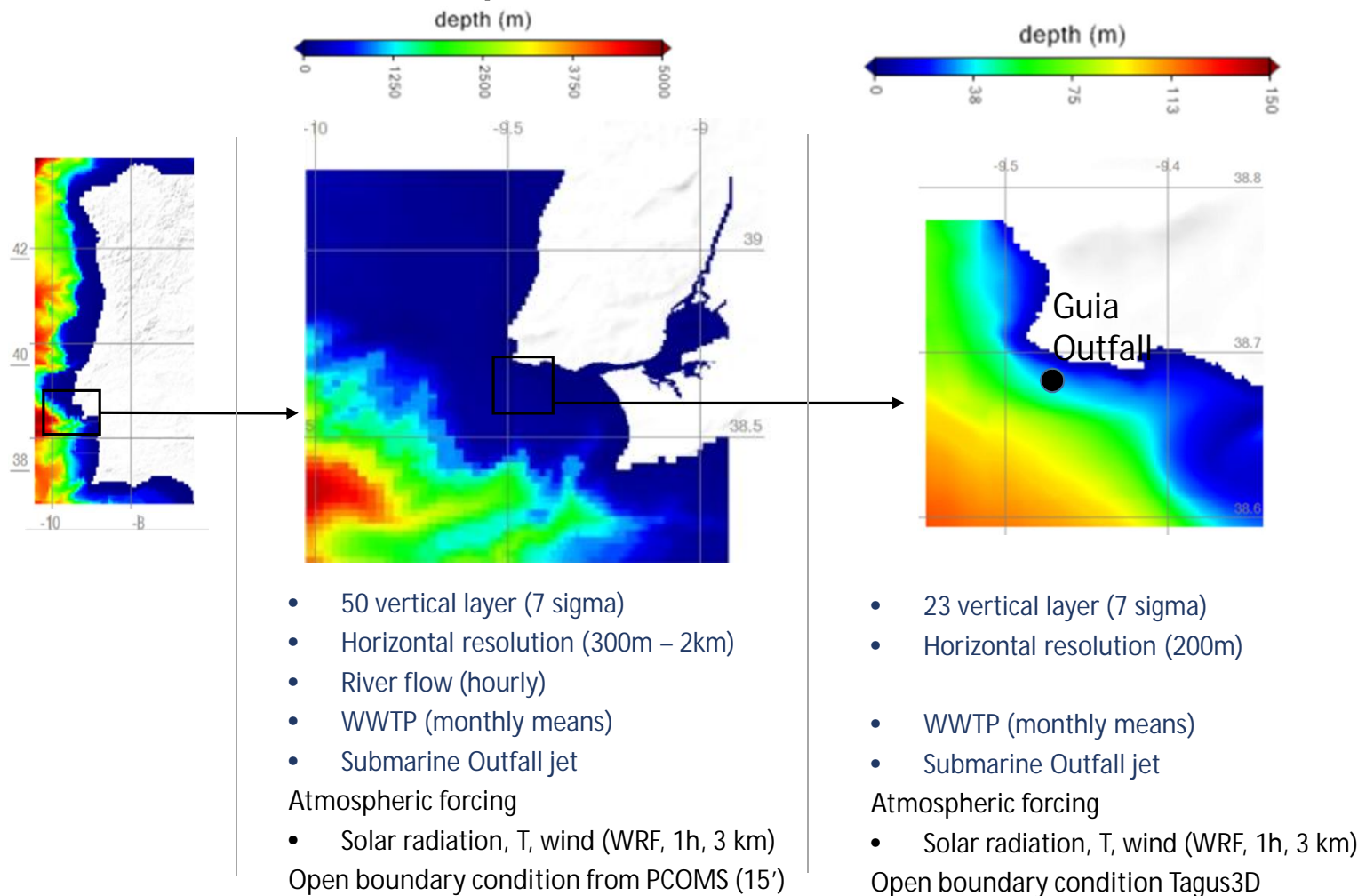
- Capitals (madrid and lisbon)
- Highly artificialized river
- Presence of dams
- Agriculture, industry ...
- does not follow the typical seasonal rainfall regime



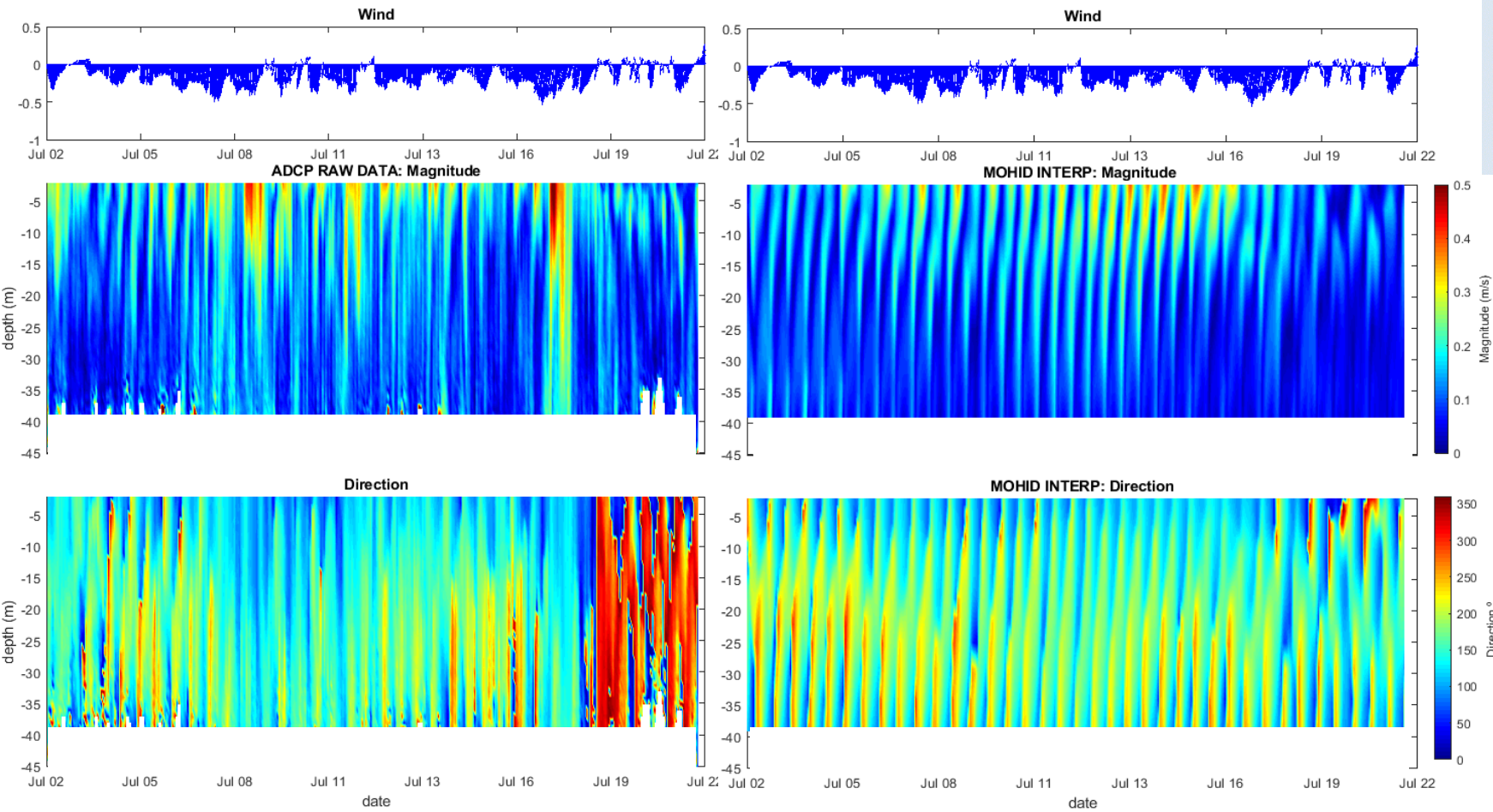
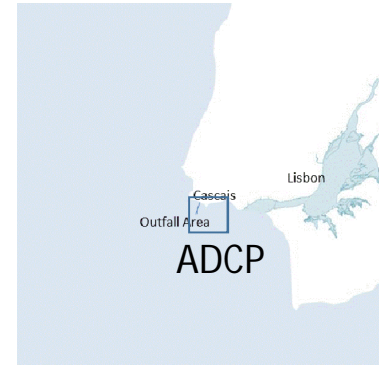
5 Flow classes – 5 scenarios to study



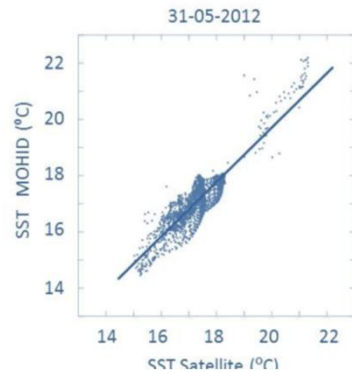
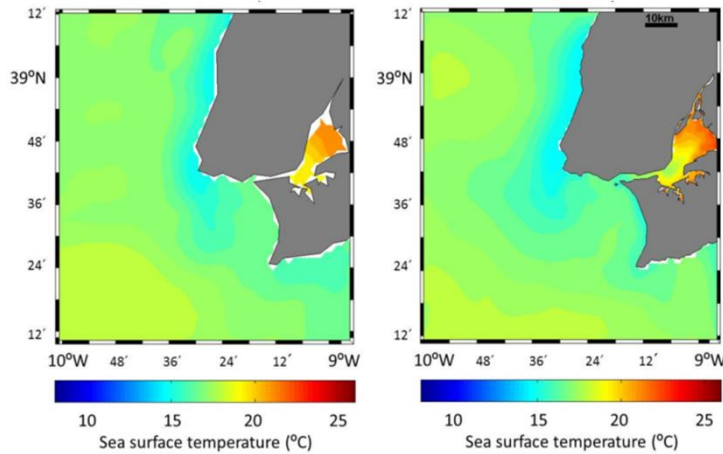
MOHID model Implementation



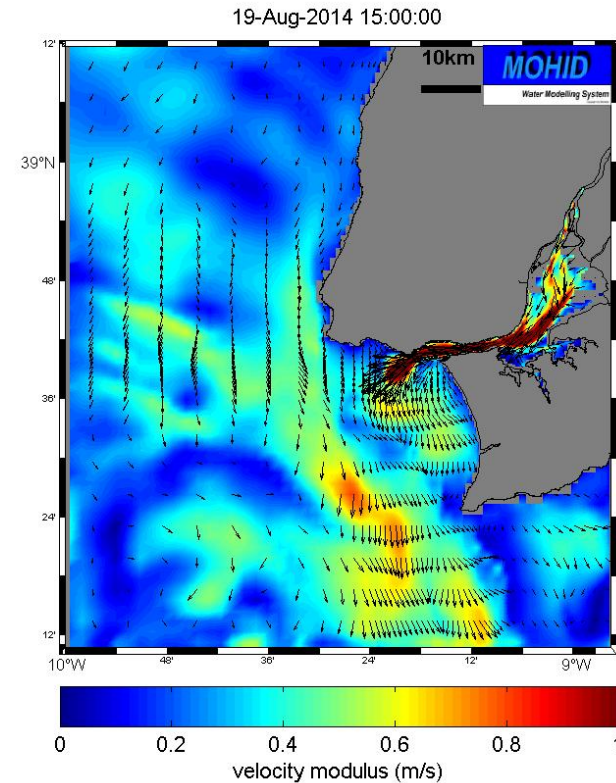
Hydrodynamic Results Validation



Surface solution



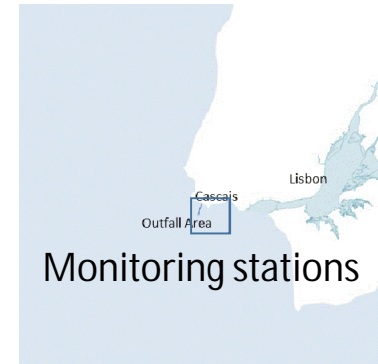
Linear Fit $y = 0.339 + 0.968x$
 Number of data points used = 2095
 Average model data = 17.112 (°C)
 Average obser data = 17.31 (°C)
 Correlation (Pearson): $R = 0.899$
 Correlation (Pearson): $R^2 = 0.809$
 Bias = -0.199 (°C)
 RMSA = 0.475 (°C)



Upwelling -> Surface Transport off the coast

Strong Hydrodynamics -> Strong mixing and low residence time

Biogeochemical Results Validation



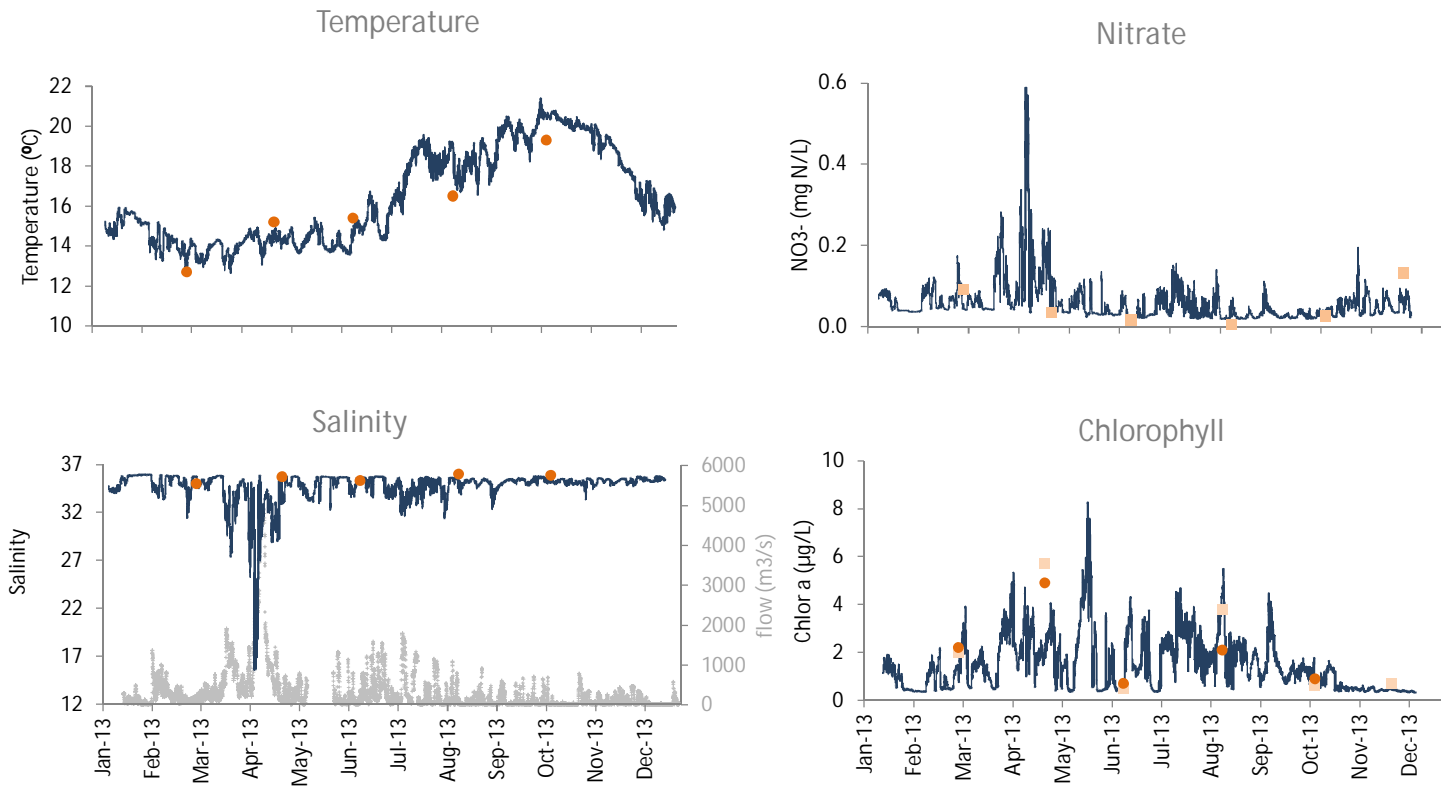
Monitoring stations

Monitoring Stations

- bi-monthly
- Surface, middle and bottom of water column

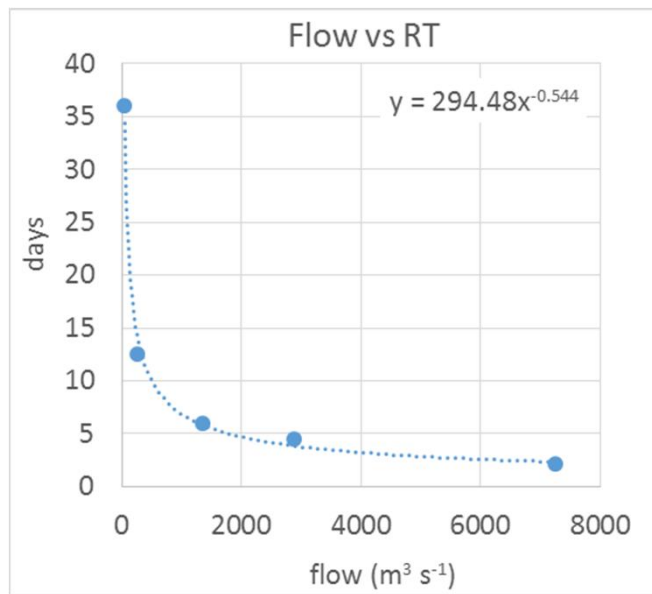
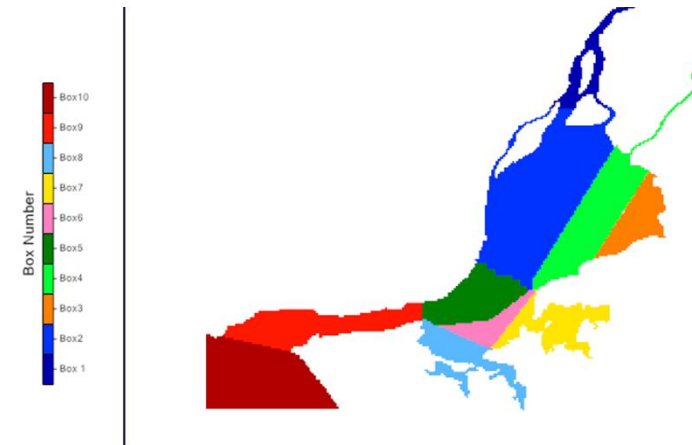
Outfall – Monitoring Station

■ Lab ● Probe — Model



How to determine the simulation time for the 5 flow scenarios?

- Calculate the residence time with each flow
- Lagrangian module and Boxes Methodology

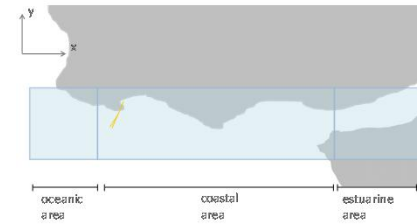
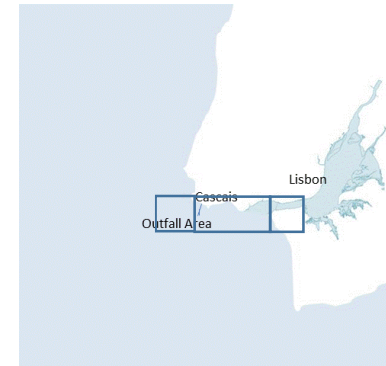
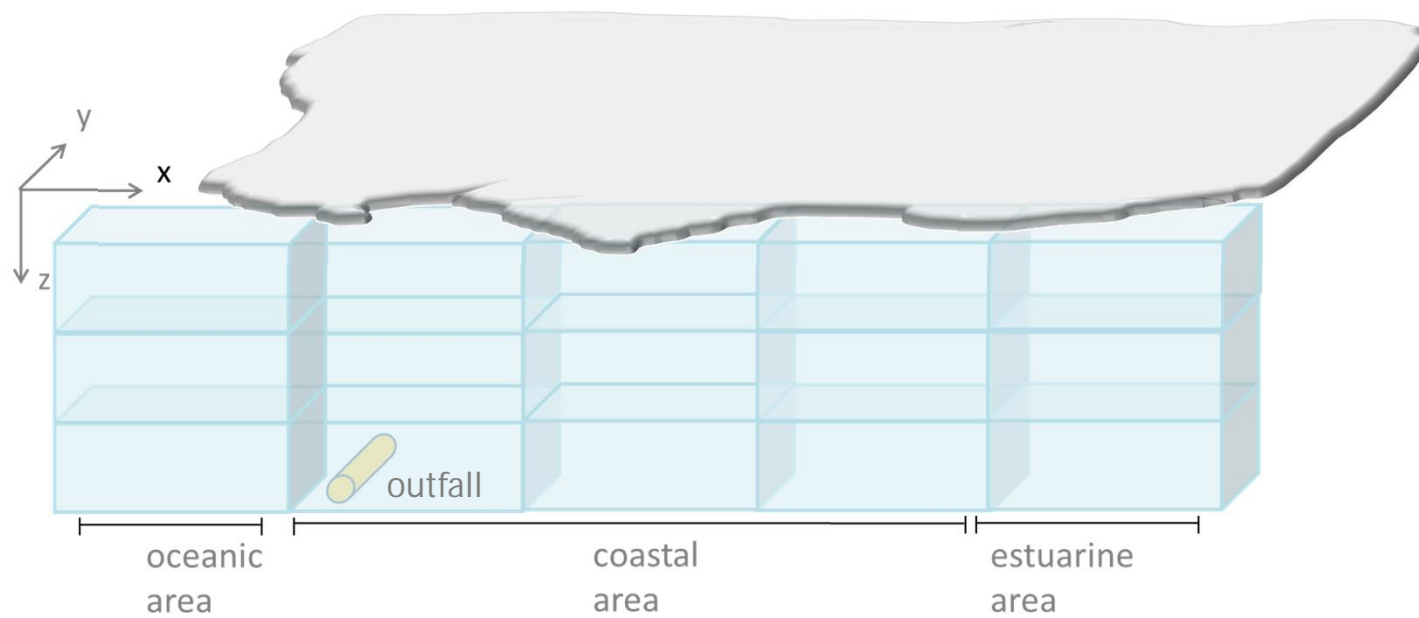


Scenarios	Average flow (m³/s)	Estuary Residence time (days)
S1	80	36
S2	26	12.5
S3	1300	6
S4	2800	4.5
S5	7500	2.1

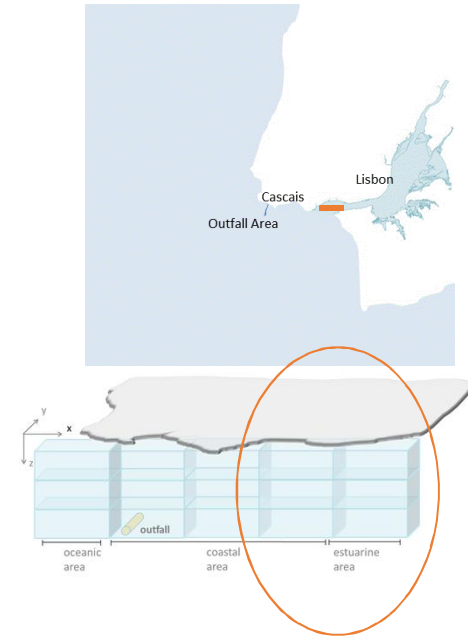
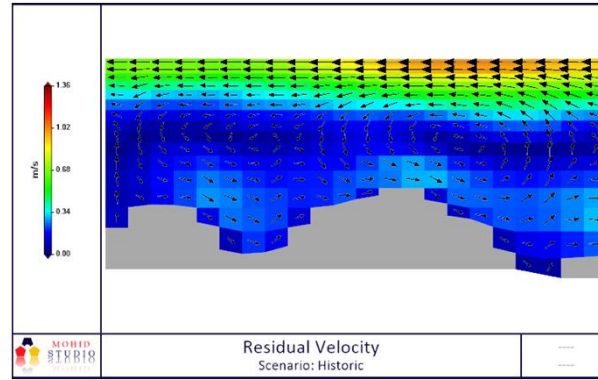
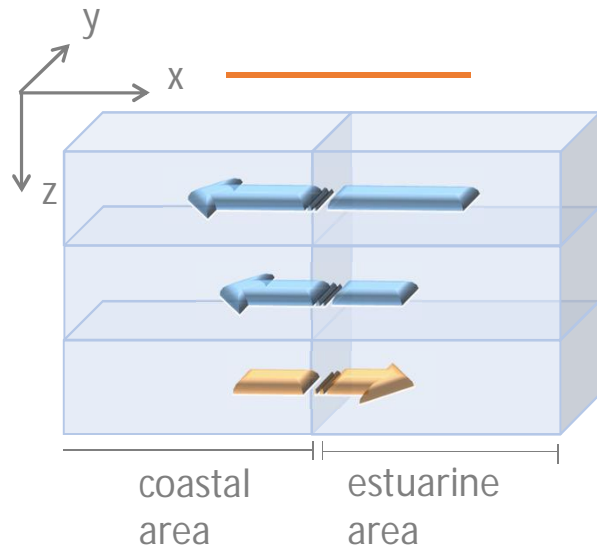
Simulation time for each scenario



Horizontal and Vertical Fluxes Boxes

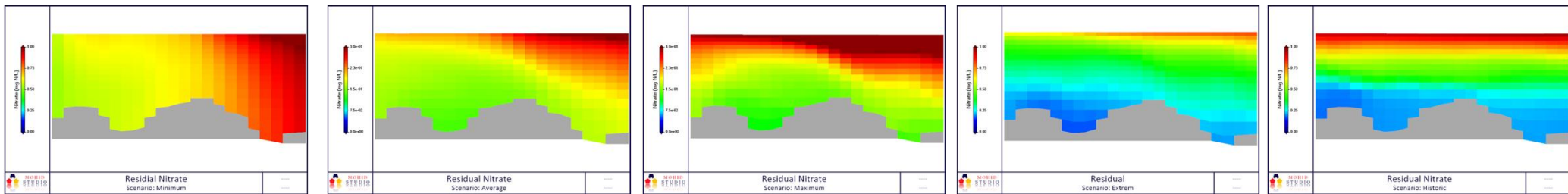
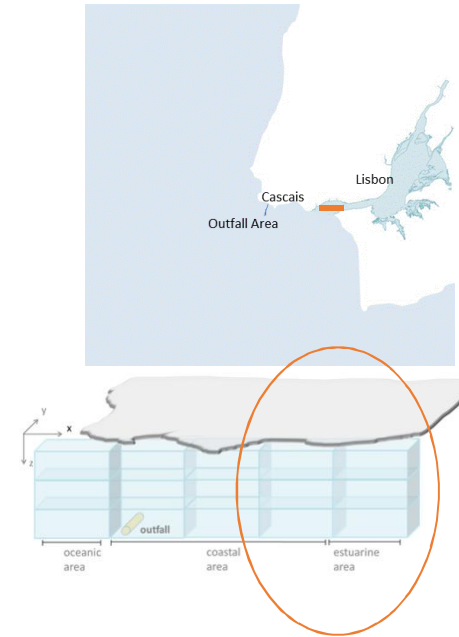
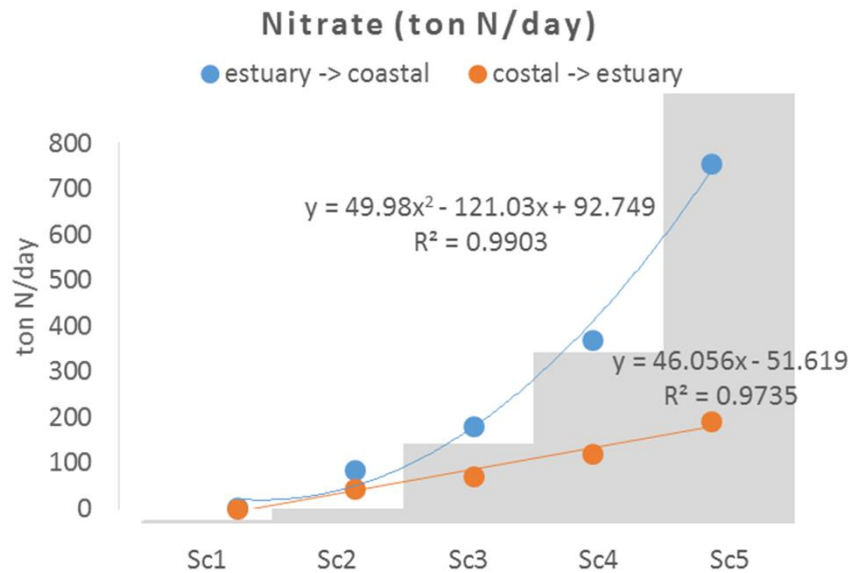


Coastal area ↔ Estuarine area

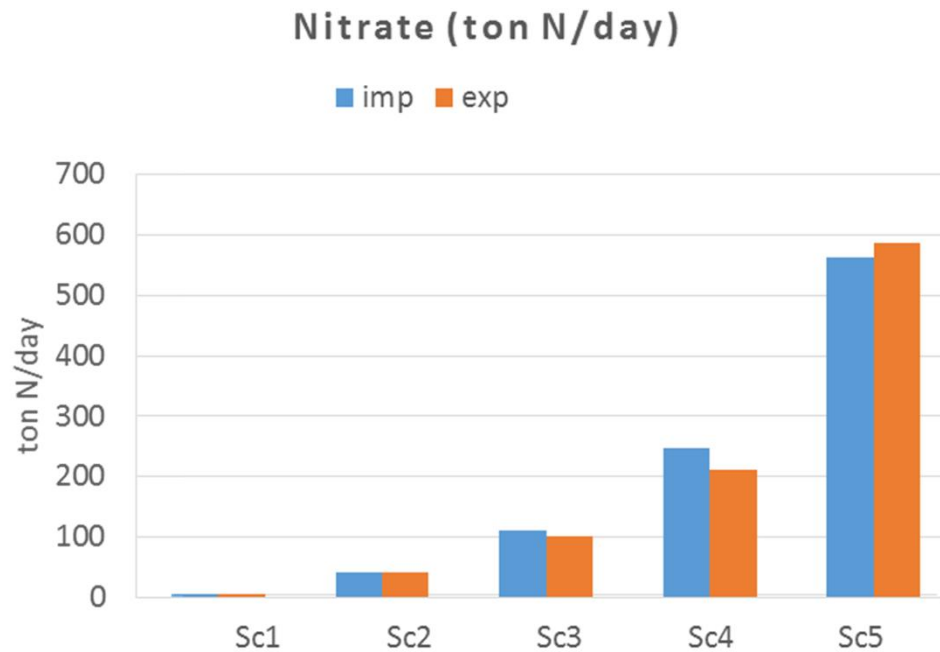
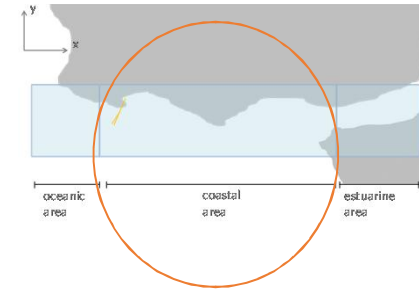


Residual horizontal circulation in the interface of coastal and estuarine areas

Export ● and import ● of nitrate



Coastal area? Sink or source?



- Sc1 - Sink
- Sc2 - Sink
- Sc3 - Sink
- Sc4 - Sink
- Sc5 - Source

- Methodology applicable to any study area and parameter
- More frequent extreme flow (high and low) events due to climate change.
- Account for the nutrient uptake from phytoplankton inside the estuary, and import/export of organic matter.
- Intense hydrodynamics generates strong mixing and low residence time.
- Nutrients discharged by the Guia submarine outfall contribute with about 1% of total budget.
 - Wastewater disposal at sea is suitable.
- Can be used to test different management scenarios, as well as the behaviour of the system under different sets of conditions - support to coastal management policies.

grazie mille!
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