



Validated downstream services for water quality In coastal and inland waters






CoastObs





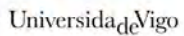


COMMERCIAL SERVICE
PLATFORM FOR USER-RELEVANT
COASTAL WATER MONITORING
SERVICES BASED ON EARTH
OBSERVATION







<https://coastobs.eu/>


EOMORES 


Earth Observation based services for
Monitoring and Reporting of
Ecological Status

<https://eomores-h2020.eu/>














The users in the driver's seat

CoastObs and EOMORES have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements n° 776348 and n° 730066




Common objectives of our downstream projects




- Develop user relevant water quality information products for clients
- Operationalise the production of water quality information products
- Build value chains with with local/regional renown R&D institutes and clients
- Work according to iterative principles:

Technology push




Requirements
Development
Demonstration
Fine-tuning

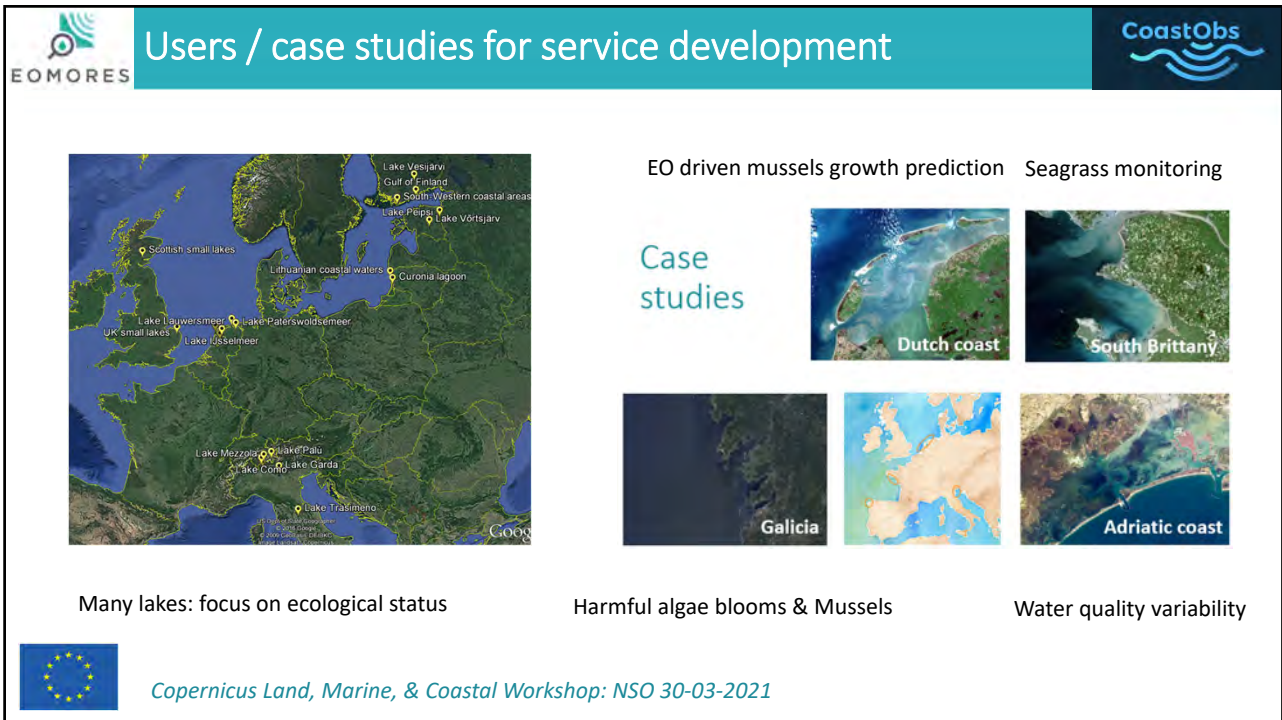
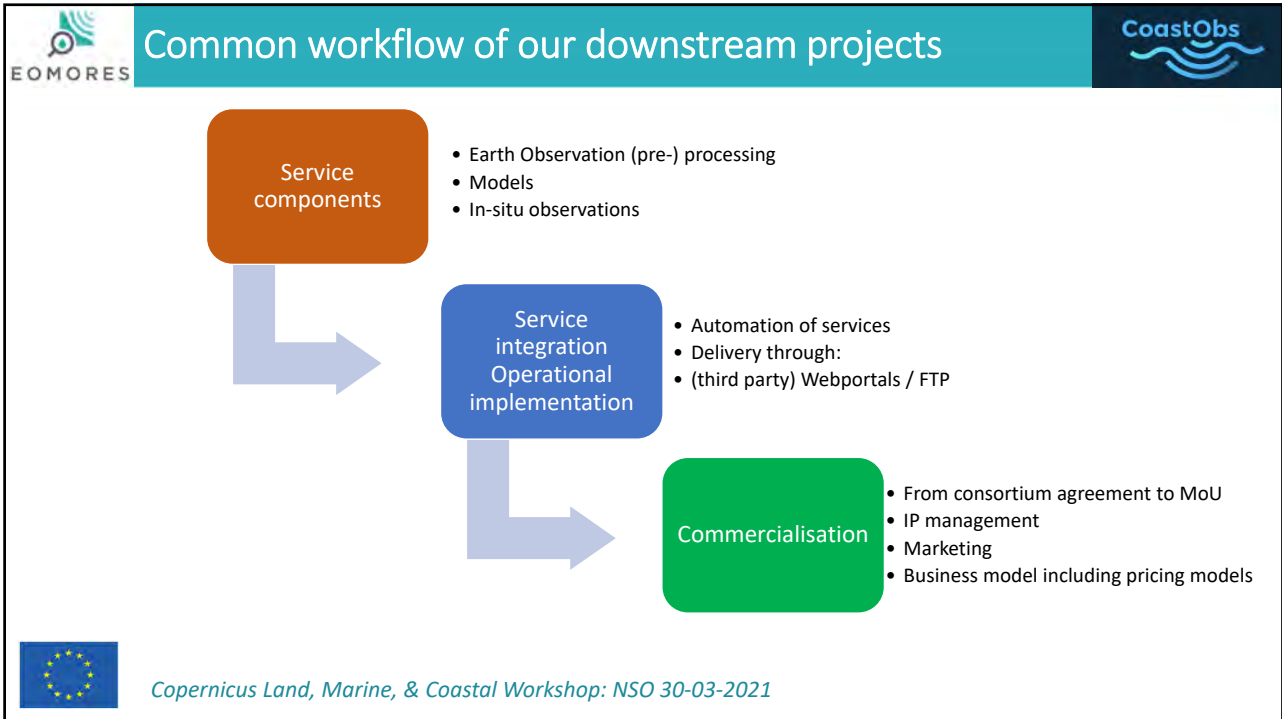


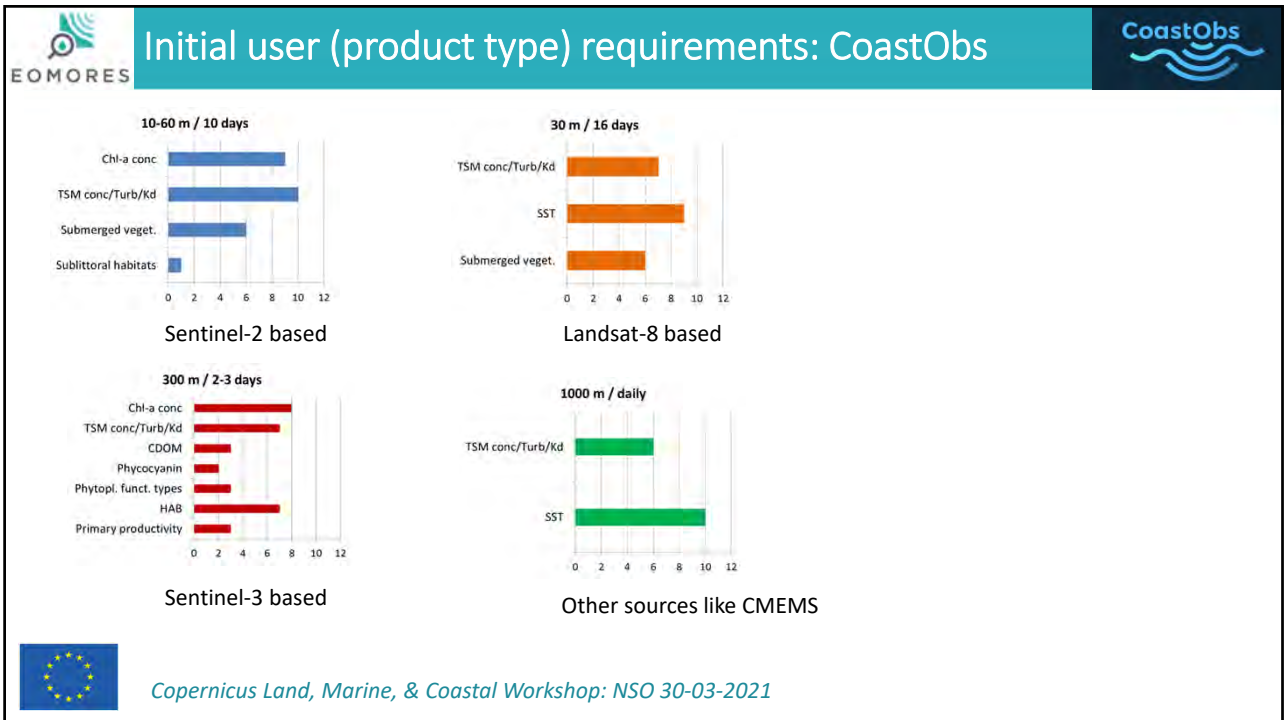
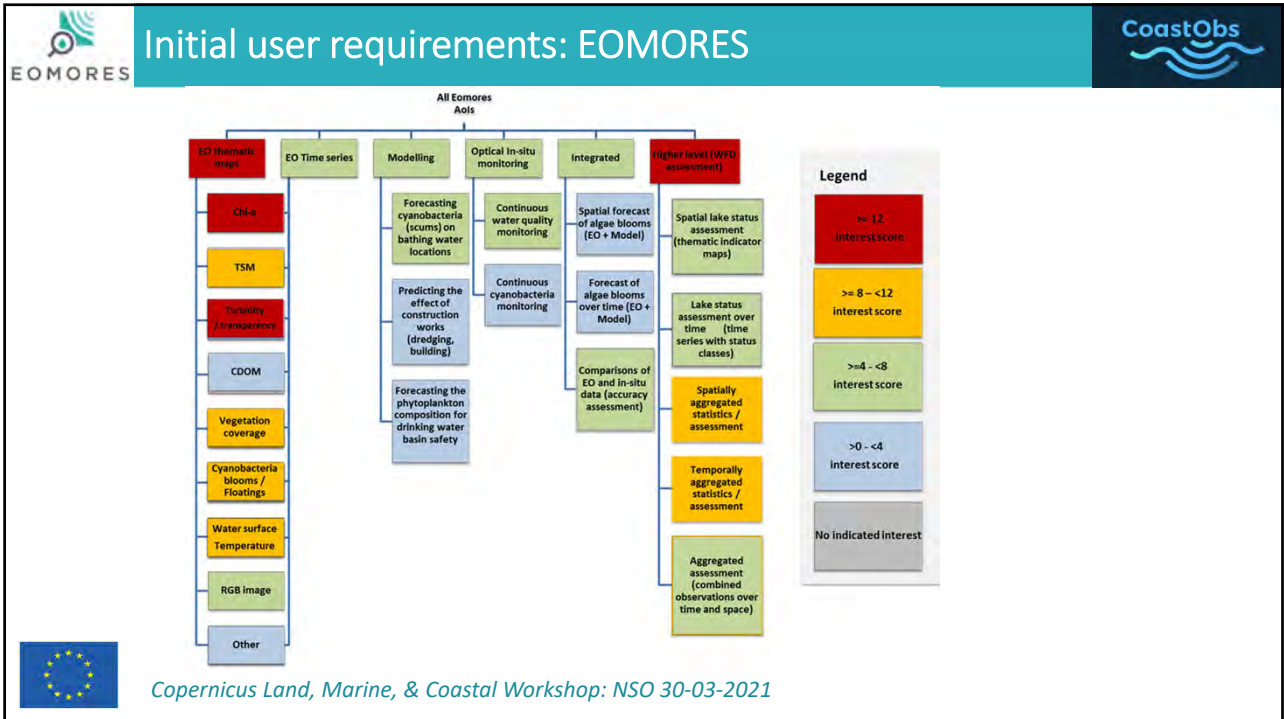
User pull

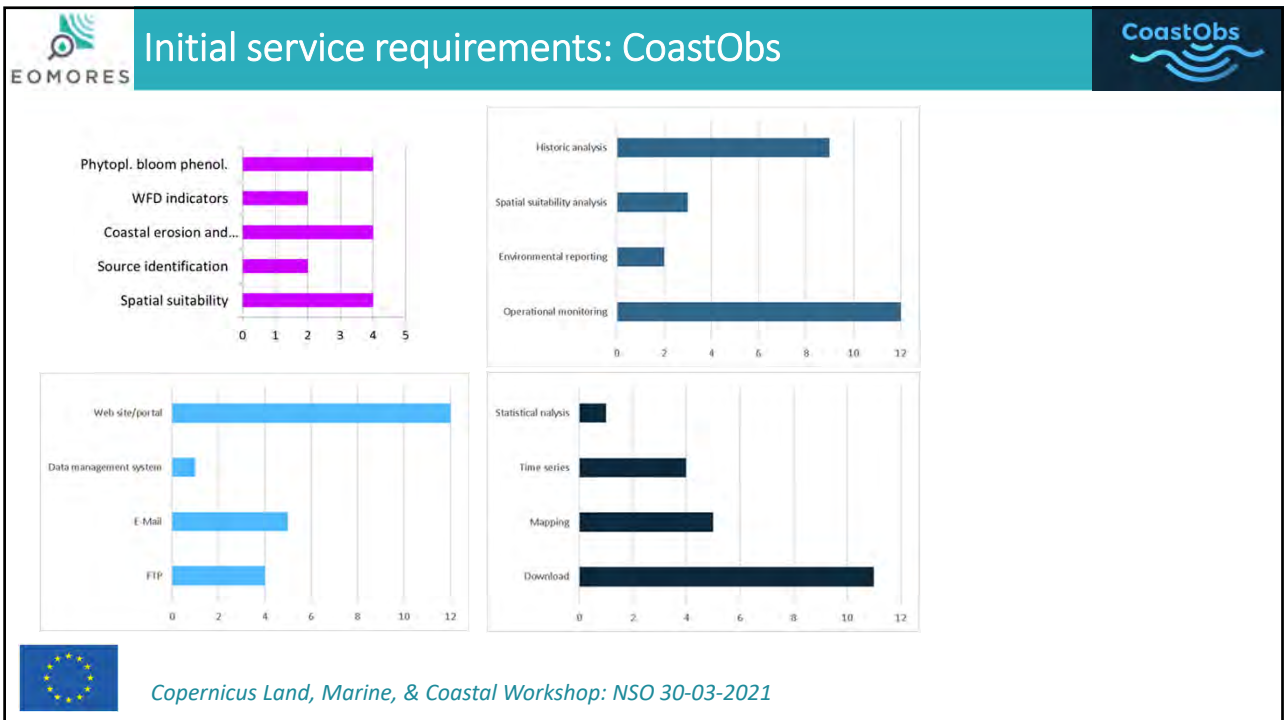
- Implement operational services and ensure user uptake (matching user requirements and product and system development)
- Commercial service provision (lower cost of production by automated production and target users with overlapping requirements)



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EOMORES Service portfolio example (EO, In-situ, Model)

ALGAE

What is the problem?
Due to human impact and climate change, water quality is on the decline resulting in, amongst other things, excessive algae growth and increased concentrations of phytoplankton.

How does EOMORES address it?
The EOMORES system provides timely, accurate and timely geospatial information as a result of combining satellite mapping, high frequency in situ measurements and forecasting models of chlorophyll a (Chl a) and phytoplankton concentrations, and algal blooms.

EOMORES in action: Identifying locations sensitive to phytoplankton dynamics in order to optimize Chl a sampling in Lake Trazemuse (Italy)

SEMI-CONTINUOUS WATER QUALITY MEASUREMENTS

Target user: Water management authorities, tourist industry, wastewater industry, emergency planning, drinking water companies.

Application: Continuous water quality monitoring.

Applicable range:
- 100 - 1000 km²
- 100 - 1000 m²
- 1000 - 10000 m²

Accuracy:
- 10% - 20% (RMSE) and 0.1

Limitations:
- No measurements possible at water surface turbidity.
- Only water quality parameters.

HARMFUL ALGAL BLOOM FORECASTS

Target user: Water management authorities, tourist industry.

Application: Forecast of algal blooms over time.

Worldwide bathing waters are subject to harmful algal blooms that produce toxins and therefore pose a threat to recreationalists. Predicting these blooms may help water managers to take the appropriate measures in time to take necessary actions and thus keep bathing water locations open to the public. EOMORES offers a forecasting model called the AlgalBloomer, which has been demonstrated in Lake Trazemuse, in the northeast Italian lakes.

The top image shows the occurrence of algal blooms, when the model is fed meteorological data only (weather forecasts). The lower panel shows the results after "bathosm filtering", a process in which daily in situ chlorophyll a measurements are used to adjust the model.

Applicable range:
- Deep blue sea (open ocean).

Resolution (X):
- 1000 m (approx.)

Maximum frequency:
- Every 15 minutes (approx.)

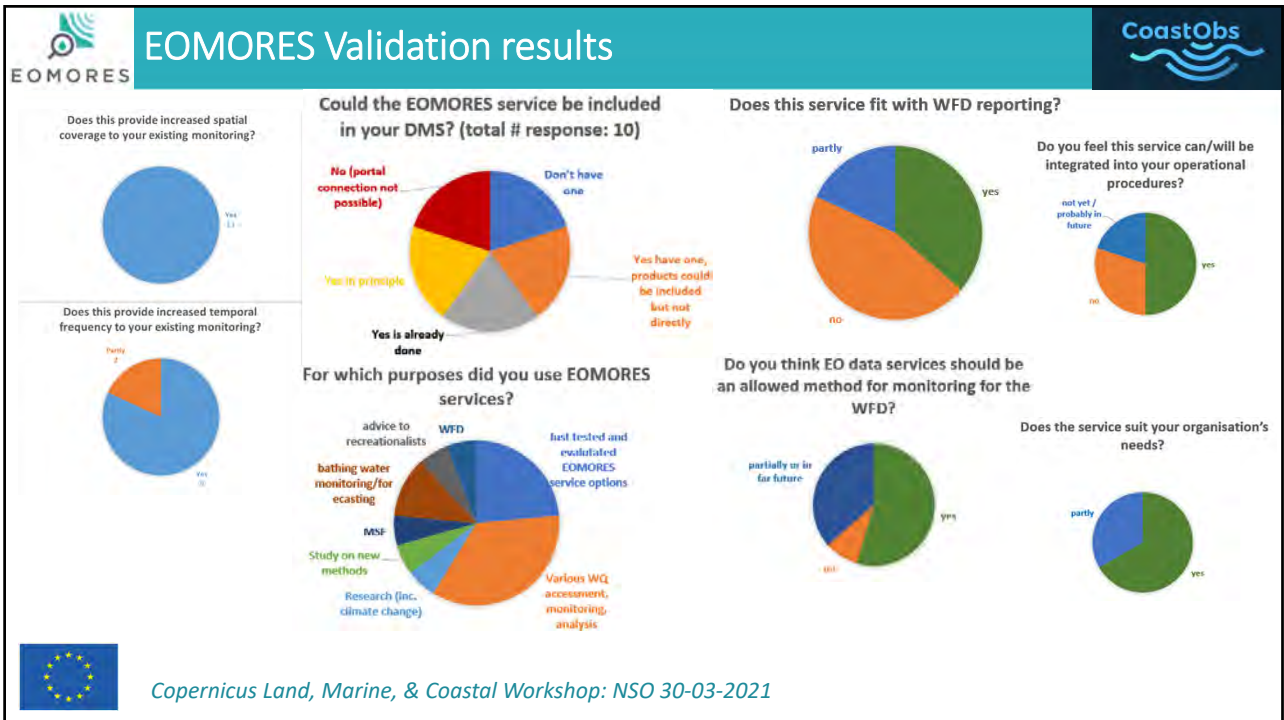
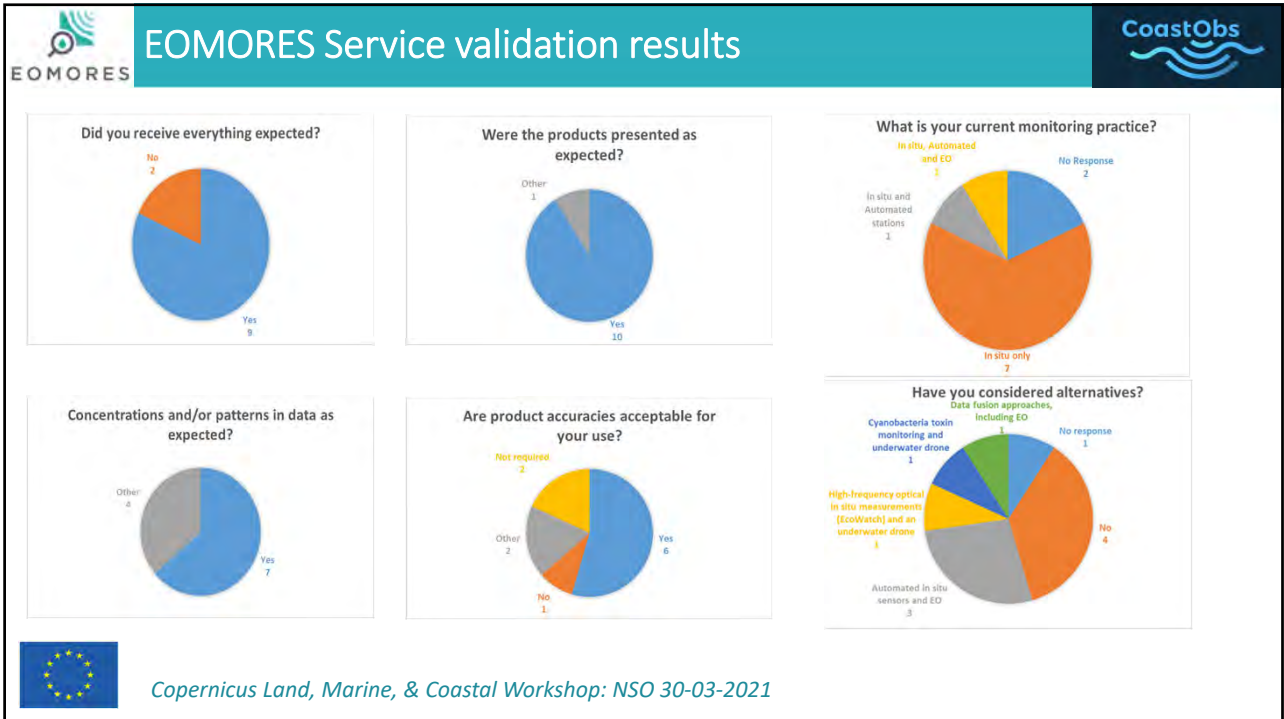
Accuracy:
- Depends on weather forecasts and frequency of in situ measurements.
- Lake depth, bathosm filtering and use of in situ data are important factors that affect accuracy.


Limitations:
- The model is not applicable in low light conditions.
- The sudden appearance of events is not currently predicted.

Delivery methods & service options:
- Reports
- Information factory through CoastObs ERS


https://eomores.eu/wp-content/uploads/2020/01/2020_01_13_Product_portfolio_small.pdf

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EOMORES and CoastObs: response to policy makers




Satellite-assisted monitoring of water quality to support the implementation of the Water Framework Directive


To promote and support the use of satellite-based water quality metrics in WFD national and statutory monitoring and reporting activities, we make the following recommendations, particularly in light of the ongoing revision of the WFD:

- ◆ Recognition of satellite observation as an assessment method in the context of the revision of the Water Framework Directive.
- ◆ Create a satellite observation expert group to harmonise metrics across countries and advise member states on best practises.
- ◆ Reference the use of satellite-based Earth observation metrics in the Reporting Guidance (Annex 5) of the revised Water Framework Directive.
- ◆ Convene a conference for EC, Member States, WFD authorities to agree on recommendations of common practices and reporting standards when using satellite-based water quality metrics to support the Water Framework Directive.


Papathanaopoulou, E., Simis, S. *et al.* 2019. Satellite-assisted monitoring of water quality to support the implementation of the Water Framework Directive. *EOMORES white paper*. 28pp. doi: [10.5281/zenodo.3463050](https://doi.org/10.5281/zenodo.3463050)



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Coastobs service examples South Brittany




Intertidal seagrass mapping

- Seagrass percent cover (SPC) in *Z. noltei* dominated meadows
- Based on NDVI
- Applied to S2 images (10 m pixel)



Summer peak - 2018




Summer peak - 2019

Legend

Bathymetric lines (m)	SPC (%)	Flooded areas
— 0	0	
— 1	25	
— 2	50	
— 3	75	
	100	

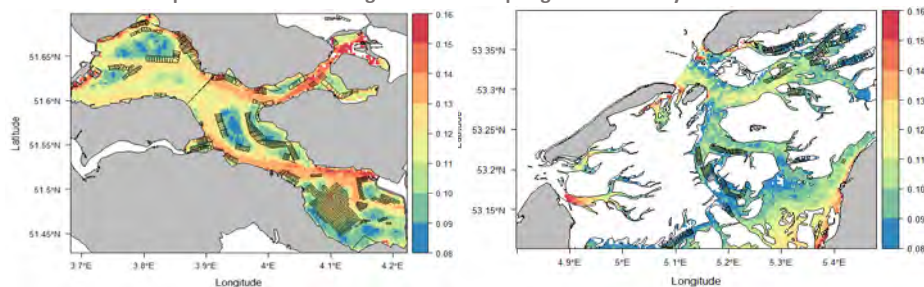
Intertidal areas without seagrass



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Mussels Growth potential: EO + model

based on main predictors for mussel growth rate in spring for each study area:



Study area	Main predictor	Parameter estimate	R ²	p-value
Oosterschelde	log Total Suspended Matter	-0.02	0.24	0.009
	log Food Quality	0.03	0.17	0.025
Wadden Sea	log Food Quality	0.12	0.31	0.013

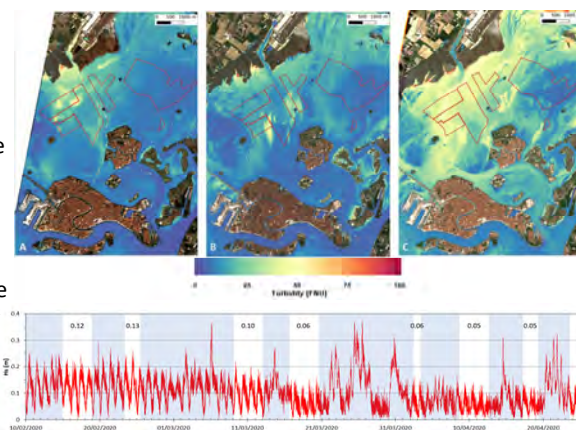


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COVID-19 lockdown measures reveal human impact on water transparency in the Venice Lagoon

Investigate the seasonal evolution of water transparency in the Venice Lagoon under reduced anthropic pressures.

In situ observations acquired at monitoring stations, specifically designed field activities and the use of modelling tools to quantitatively describe the processes affecting water transparency.

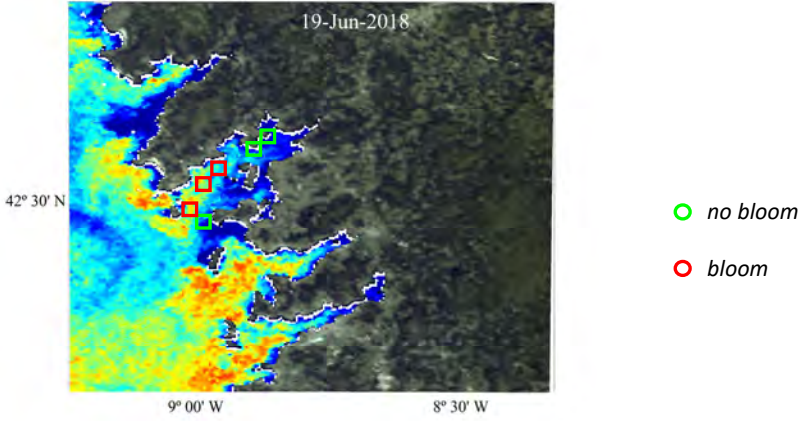


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EOMORES **Coastobs service examples: Galicia** CoastObs

Validation results

Pseudo-nitzschia spp. species indicator




19-Jun-2018

42° 30' N

9° 00' W 8° 30' W

○ no bloom
○ bloom

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EOMORES **Web portals (based on Lizard by Neelen & Schuurmans)** CoastObs



<https://coastobs.lizard.net>

<https://eomores.lizard.net>

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Take home messages



- EOMORES produced a number of viable and validated services based on EO (mainly Sentinels), continuous in-situ data (WISPstation) and model (Algae radar)
- CoastObs also produced a very user relevant service portfolio based on EO and models and user requests and requirements
- On the technical side it was noted that local services (both inland and coastal) still need quite some fine-tuning in atmospheric correction and algorithm development per location : no one size fits all solution
- WFD applications will establish a real value for water managers but first embedding of EO-based monitoring in the directive itself is required
- Coastal applications show a large commercial promise



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