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Use of Copernicus products for Tailored Coastal Information Services

Copernicus Land, Marine, & Coastal Workshop

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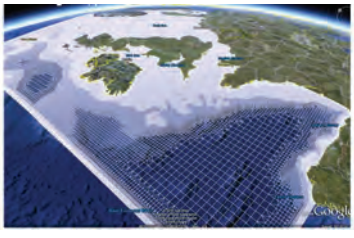
Special interest in Coastal Information Systems

Coastal Systems

- Coasts are constantly under threat → **competing interests**
- Detailed information is needed to describe **fine scale processes** and provide scientific based optimized solutions
- Earth Observation (EO) and coastal models increasingly **complement in-situ monitoring**
- Information provision in the form of added value services should be **tailored to specific user needs**.



One of our core businesses

- Answer societal questions through information provision in **deltas and coasts**

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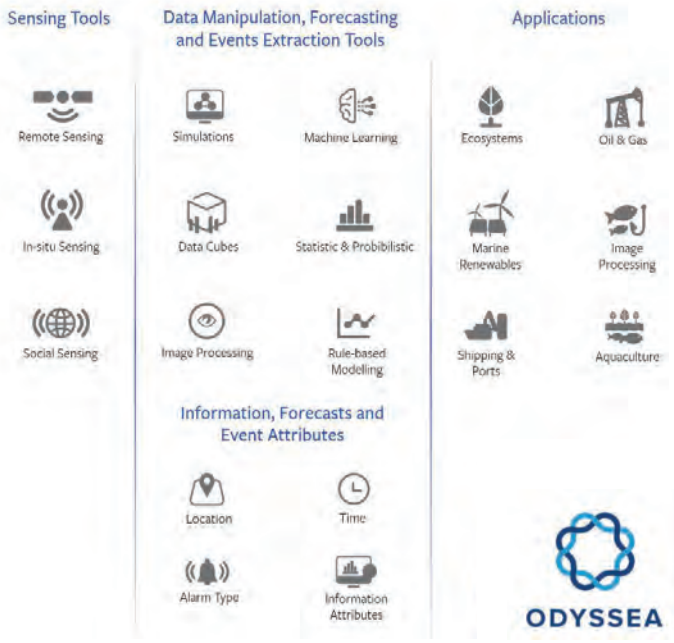
Tailored coastal information services
(High resolution services)



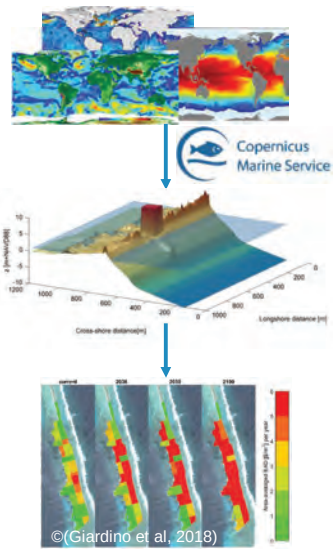
Why do we need higher resolution?

Reducing uncertainties in socio-economic scenarios

(uncertainties in forcing data)

(uncertainties in model setup)

(uncertainties in socio-economic scenarios)



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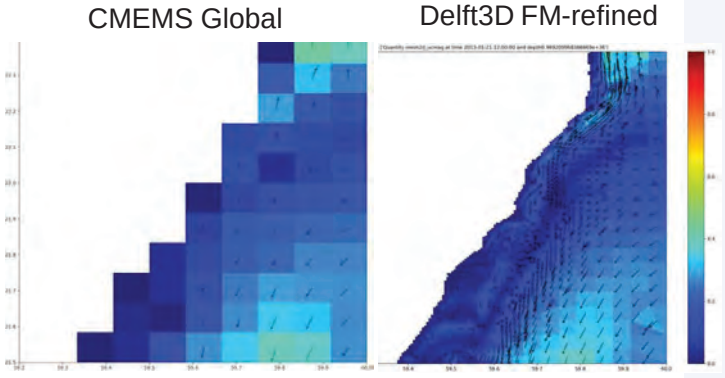
Better characterization of fine scale processes



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Tailoring Copernicus products…

esa

EMODnet

…

general public

industry

policy

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For different communities / user sectors

- Wide user community
- Industries (aquaculture, ports, fisheries)
- Policy

For different regions

- Mediterranean Sea
- Black Sea
- Wadden Sea
- North Atlantic

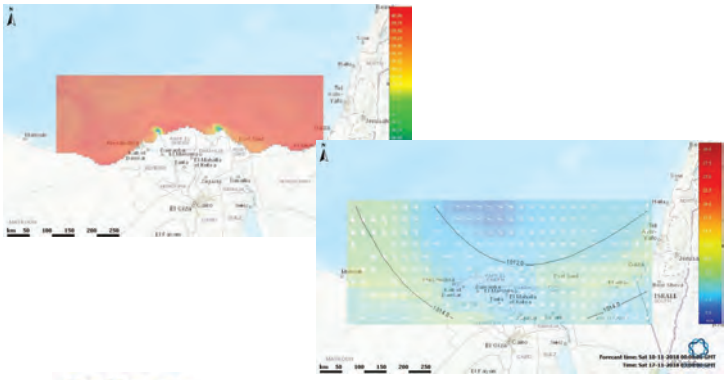
Using different transformations

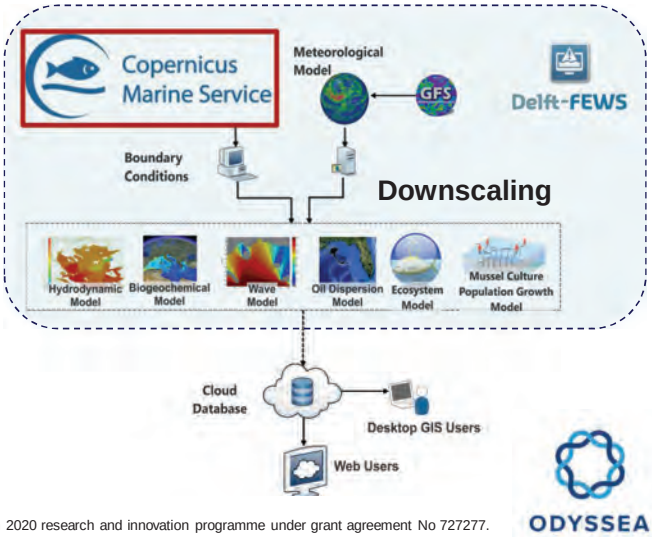
- Dynamical & Statistical downscaling
- Data science algorithms
- Data-driven coastal forecasts
- Classification
- Data analysis

Operational downstream coastal services using CMEMS

- **Community / sector:** Wider user community (industry, academia, policy)
- **Region:** 9 coastal observatories, Mediterranean Sea
- **Transformation:** Dynamic downscaling - From Copernicus Marine Service to local (high resolution) operational metocean and water quality simulation

- **Benefit:** CMEMS provides us with global sustainable entrance for forecasting services to a wider community





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ODYSSEA

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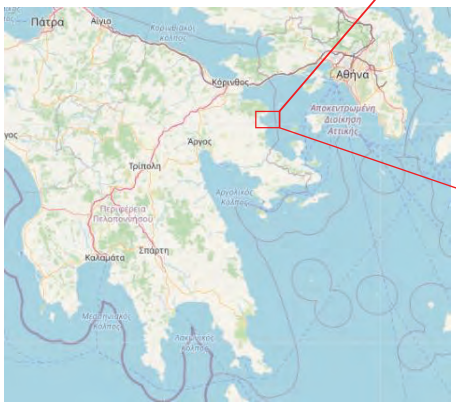
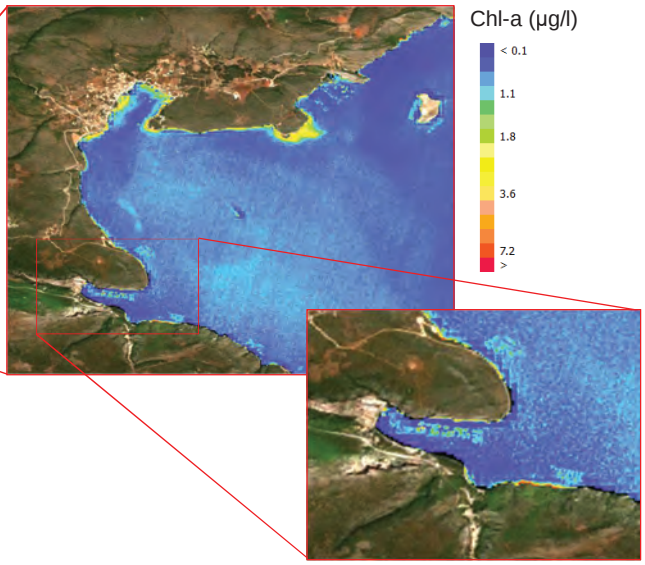
High resolution services for aquaculture operations

- **Community / sector:** aquaculture
- **Region:** Greece, Mediterranean Sea
- **Transformation:** optical remote sensing algorithm

- **Benefit:** Data service provision. Mapping chlorophyll-a content using Sentinel 2 data with 10 m spatial resolution





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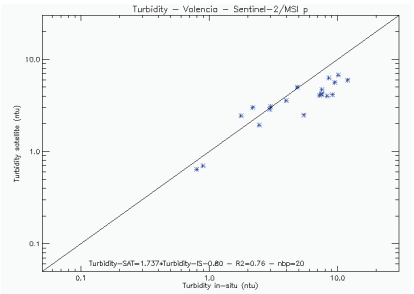
High resolution services for port operations

- **Community / sector:** port authorities
- **Region:** spain, Mediterranean Sea
- **Transformation:** Data integration

- **Benefit:** Added value data provision. Mapping turbidity using Sentinel 2 data with 10 m spatial resolution



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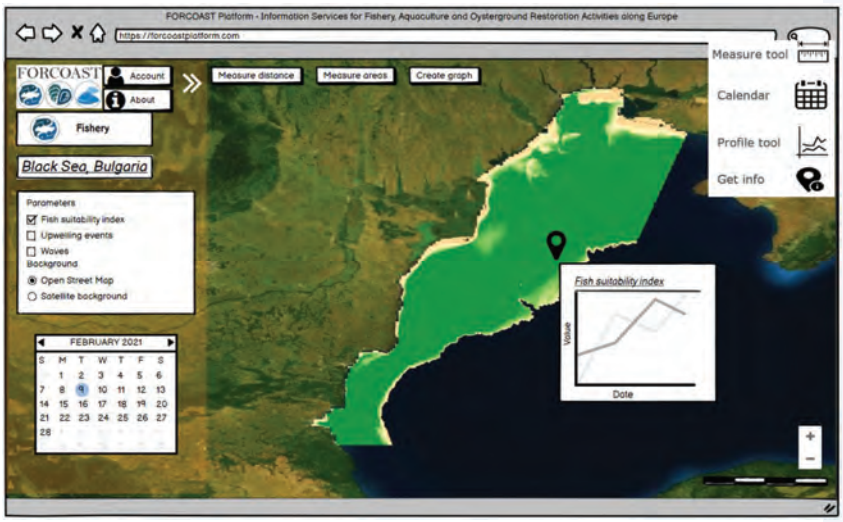
Suitable Fishing Areas

- **Community / sector:** Fisheries, individual fisherman to mid-size and industrial fishing companies
- **Region:** north-western Black Sea
- **Transformation:** Provision of indicators

- **Benefits:** Provision of decision support tools
- Derive a Fishing Suitability Index (FSI), waves and upwelling events
- Decision support tool to identify the most favourable fishing areas
- Sustainable exploitation of marine resources
- Maximize the economic efficiency of fishing activities



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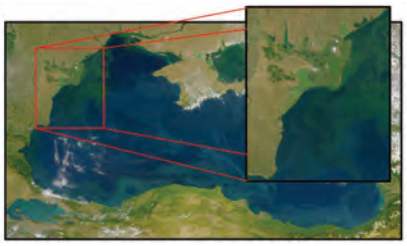
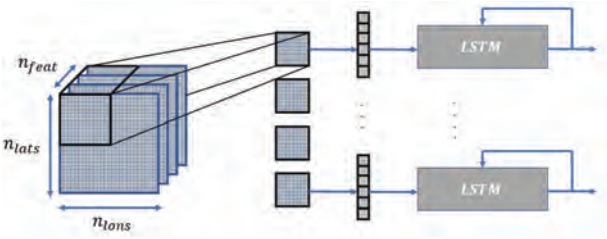
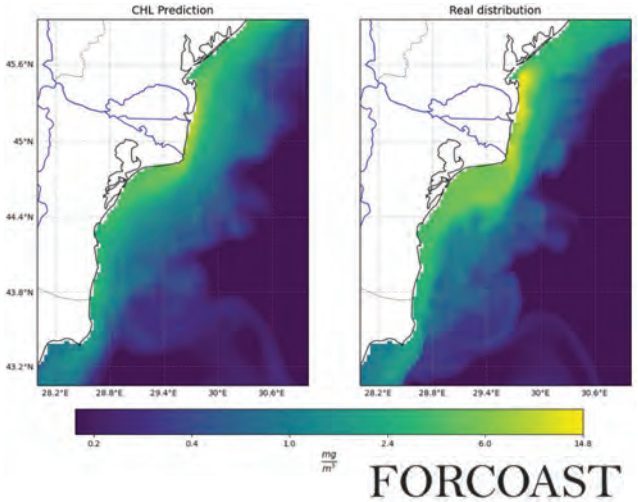
Forecasting with Machine learning



- **Community / sector:** Fisheries
- **Region:** Danube delta, Black Sea
- **Transformation:** Data driven forecast

- **Benefit:** Short-term chloropyll-a prediction (4-5 days) based on: CHL, nutrients, O2 and Sea Surface Temperature (SST)
- Convolutional Recurrent Neural Network





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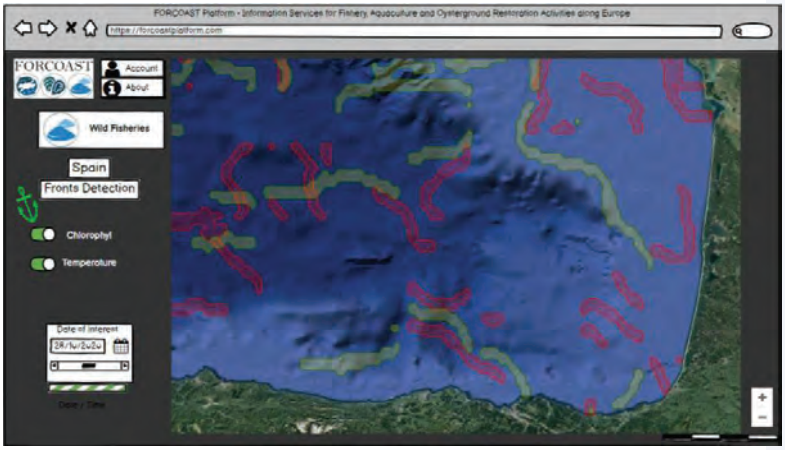
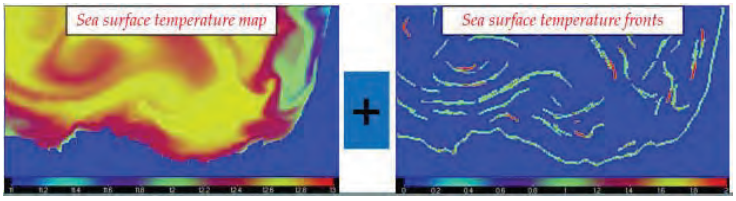
Fronts detection for fisheries

- **Community / sector:** Fisheries
- **Region:** Bay of Biscay, North Atlantic
- **Transformation:** classification

- **Benefit:** Ocean fronts (temperature, chlorophyll-a, etc.) detection service contributing to a more efficient activity
- Distribution / abundance of commercial fished is related to ocean fronts





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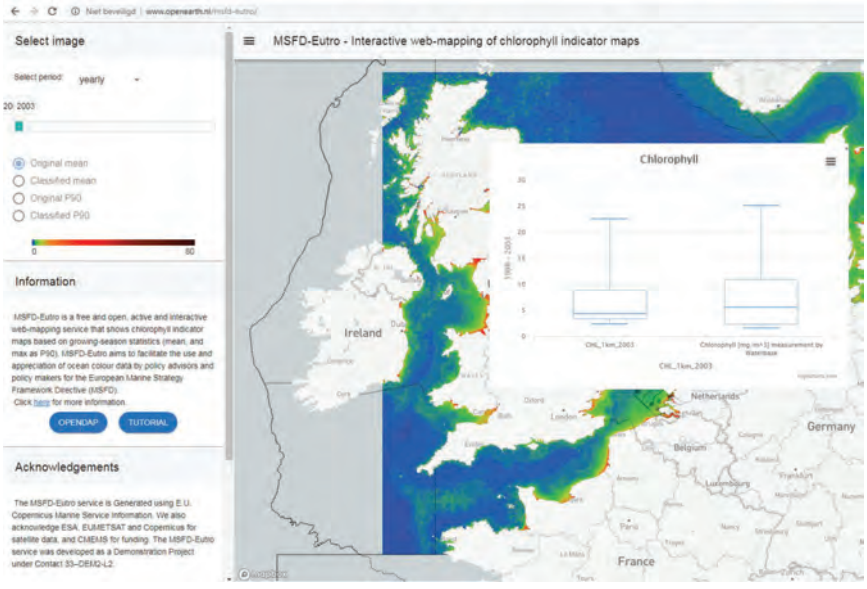
FORCOAST

MSFD-Eutro: Satellite-based demonstration service for assessment of Environmental Status

- **Community / sector:** MSFD (policy)
- **Region:** North Sea
- **Transformation:** Data analysis

- Environmental indicators: Analyse trends and capture maps and statistics.
- Evaluate the spatial impact of assessment levels interactively
- Supporting the Marine Strategy Framework Directive



COPERNICUS · MARINE ENVIRONMENT MONITORING SERVICE
CMEMS DEMONSTRATION MSFD
MSFD-EUTRO

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Satellite derived bathymetry (potential link to biodiversity)

- **Community / sector:** Wider community
- **Region:** Wadden Sea
- **Transformation:** Remote sensing algorithms

Reconstructed inverse-depth bathymetry

Live Demo: https://gena.users.earthengine.app/view/rws-bathymetry

Potential application for biodiversity

e.g. classifying habitats

For more information:
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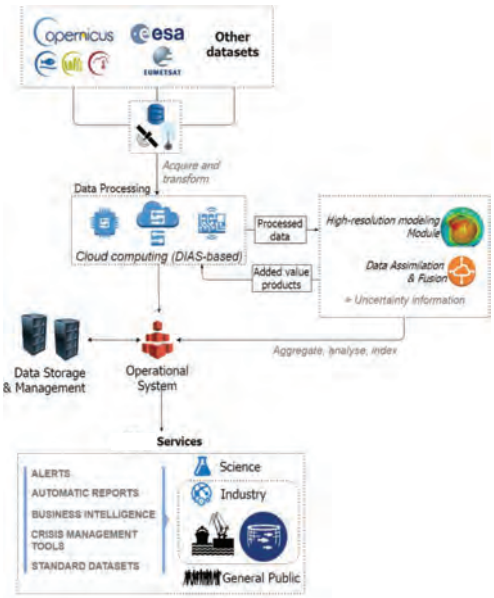
Conclusions

- **Copernicus Services can provide the solutions for:**
  - Different Communities (wider user, industries, policy)
  - Different Sectors (aquaculture, ports, fisheries, etc.)
  - Different Regions (North Sea, Mediterranean Sea, Black Sea, North Atlantic)
- **Tailored coastal information services:**
  - System knowledge, data integration, and addressing the user requirements
  - High resolution information into the processing chain of different users
  - Sustainable downstream services



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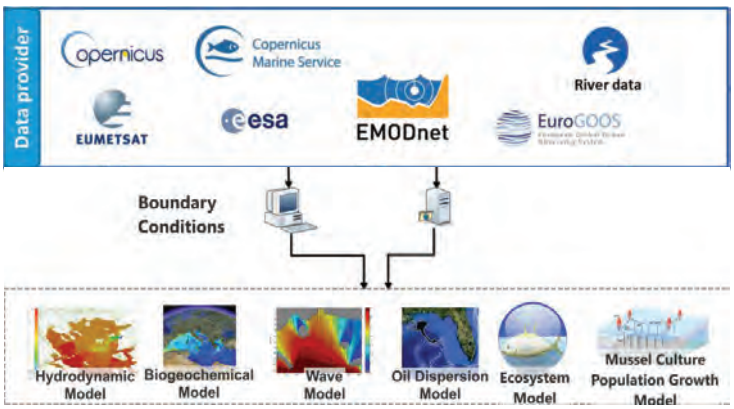
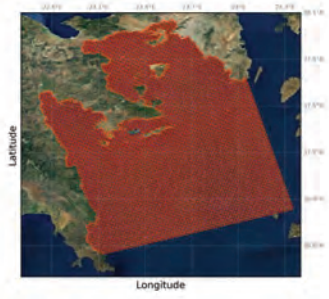
Readiness of external data for coastal services

- **FREE and accurate atmospheric forecast needed**
- **Improved coastal bathymetry**
- **River data**
- **Biogeochemistry (limitations)**





Mapping of state variables

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```

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