SYMPOSIUM OP'24

Ocean Predict

In partnership with unesco Intergovernmental Oceanographic Commission

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

FOCCUS coastal applications in support of EU Member State requirements

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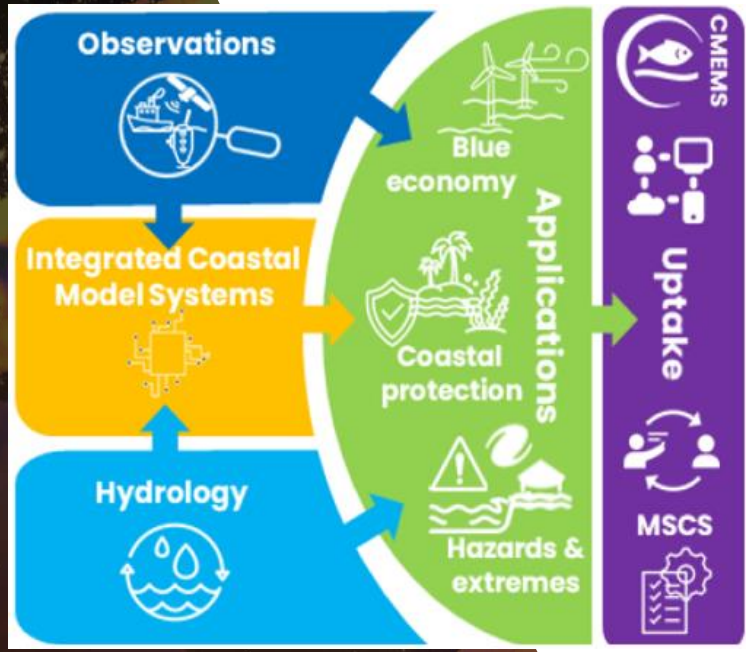
What is FOCCUS?

'Forecasting and observing the open-to-coastal ocean for Copernicus users'



- Improve EU Copernicus Marine Service (in coasts) and EU Member State Coastal Systems (MSCSs)
  - + in situ and satellite ***coastal observations***
  - + pan-European ***hydrology*** and land-ocean inputs
  - + refining ***model interfaces*** between ocean and coastal models
- Coastal Applications ***demonstrate*** these advancements in three Environmental and Societal Challenges (ECS's).

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Policy Directives and Coverage

European Union Directives

Maritime Spatial Planning Directive
the coexistence of coastal activities

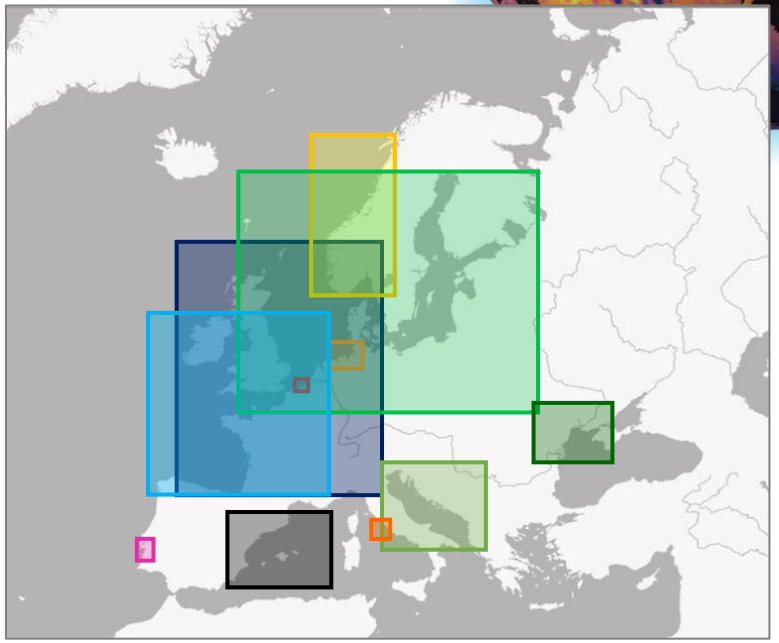
Marine Strategy Framework Directive
monitoring and assessment of marine GES

Water Framework Directive
monitoring and assessment of surface water GES

Common Fisheries Policy
conservation and management of marine biological resources

UN 2030

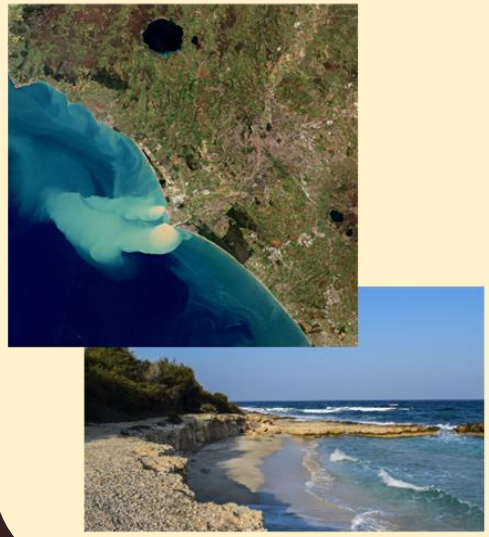
Sustainable Development Goals
2 on guaranteeing food security
14.1 on reducing marine pollution of all kinds by 2025



Utilize Member State Coastal Systems
- **Mature observing and modelling systems**
- **Major ESCs to be addressed**

Applications and ECS

ESC 1
Management and protection of coastal area



ESC 2
Enhance blue economy and multi-use operations

ESC 3
Building coastal resilience to climate change

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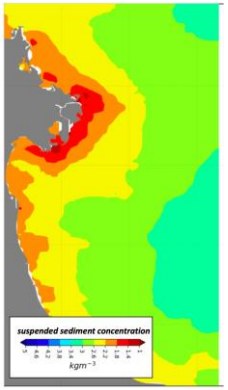
Coastal erosion mapping

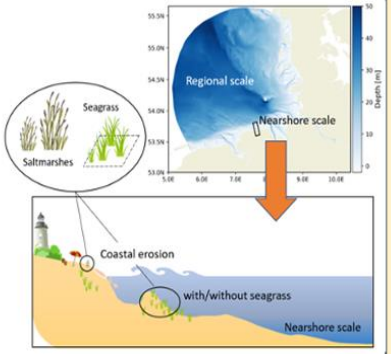
CMCC / CNR

Circulation-waves-sediment
Erosion risk assessment
Validation with remote sensing



HEREON

- coupled models
- erosion risk assessment
- Nature Based Solution



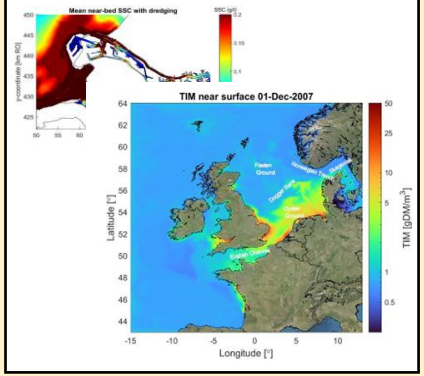
Pollution hazard/risk mapping

RBINS

Sediment plumes resuspended by human activities as a pressure for marine protected areas

DELTARES

far-field impacts of human activities (e.g. land-based pollution)



ESC 1: Management and protection of coastal area

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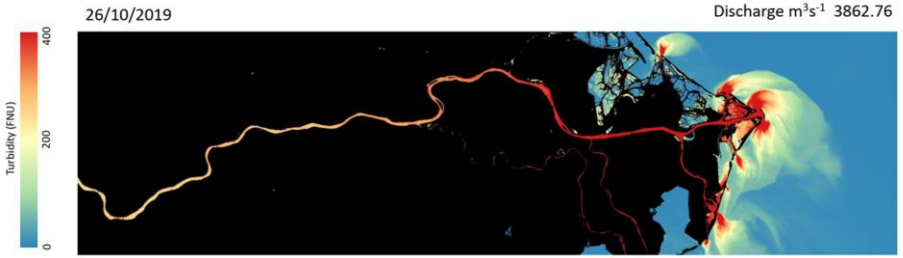
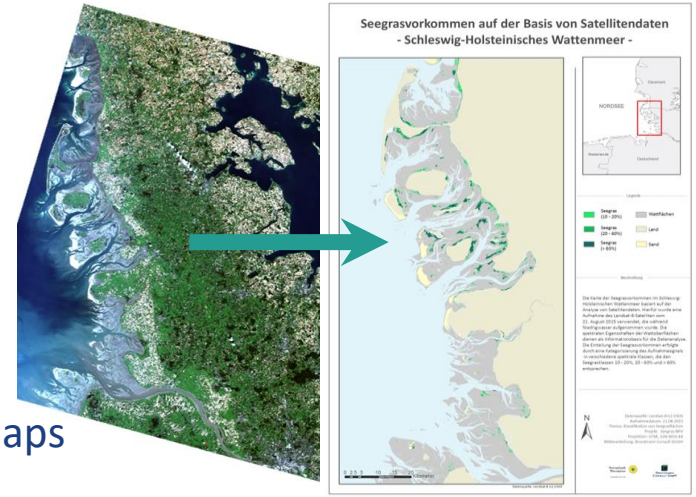
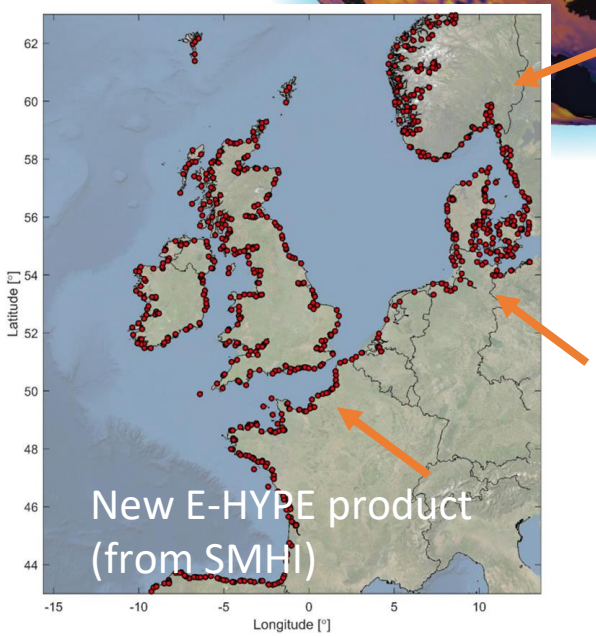


Inland-marine water connectivity product (from CNR)



Satellite derived seagrass maps (from Brockmann Consult)



New E-HYPE product (from SMHI)

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ESC 1: Example use of new coastal products

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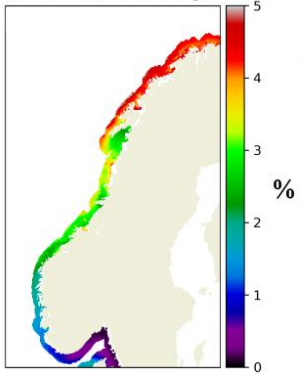
Support to multi-use of coastal and offshore operations

MET.NO and NERSC

Risk of Harmful Algae Bloom

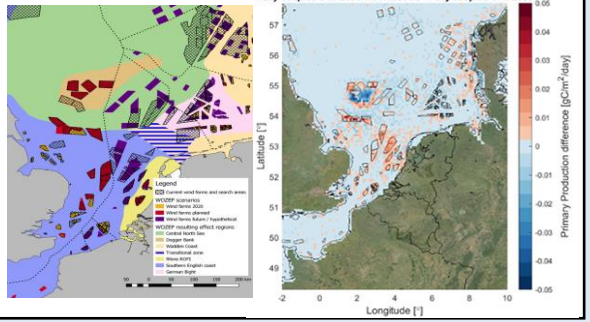


Aquaculture/fisheries /energy sector
- Transport of parasites/viral agents, HABs
- offshore operations
- Land-ocean coupling.

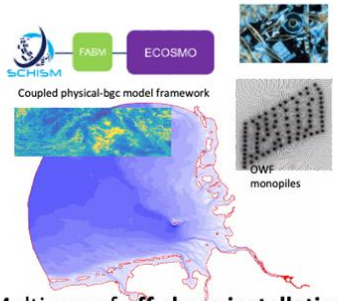
HABs Presentation Right after!

DELTARES

Environmental effects of large-scale implementation of multi-use offshore wind farms, taking into account NS connectivity.



HEREON



- Multi-use of **off-shore installations**
- Cascading **physical-biological** impacts
- Seasonal scale vs. extreme events

ESC 2: Enhance blue economy and multi-use operations

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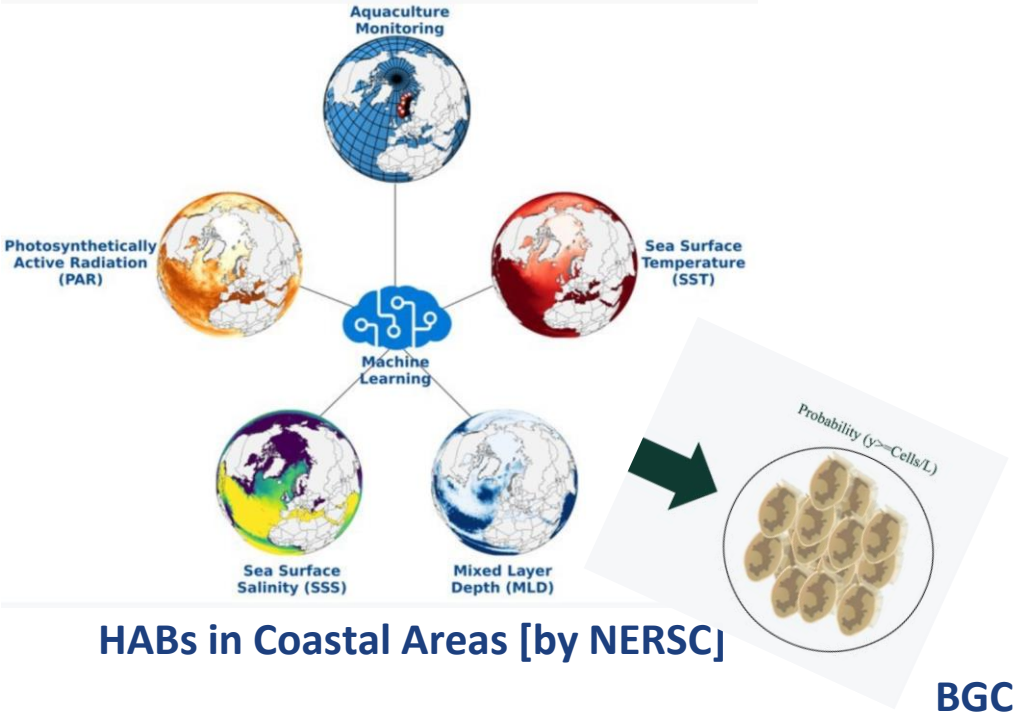

HABs in Coastal Areas [by NERSC]

CMEMS MSCS

Model state variable	Conversion from CMEMS data (CMEMS variables in µmol/L)
OXY	CMEMS_OXY × 32/1000
NH4	0.
NO3	CMEMS_NO3 × 14/1000
PO4	CMEMS_PO4 × 31/1000
Si	CMEMS_Si × 28/1000
Opal	CMEMS_PHYC × (28/12) × 0.5 × 0.13 [a]
POC	CMEMS_PHYC × 2 × 12/1000 [b]
PON	POC × (14/12) / 106 [c]
POP	POC × (31/12) / 106 [c]
DIAT_X, DINO_X, FLAG_X, Phae_X (X=E, N, P)	0.

BGC parameter mapping (ocean vs coastal models)

ESC 2: Example use of new coastal products

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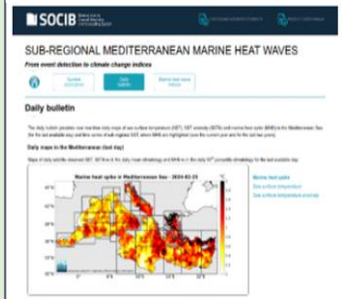
Combating degrading of ecosystems

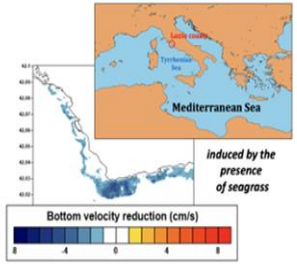
SOCIB and CMCC

Tracking Mediterranean MHWs



CMCC

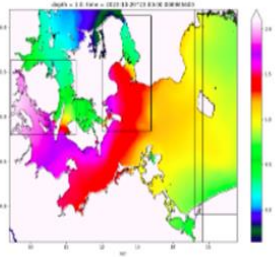
Circulation, waves and biogeo Planning **ecosystem restoration** in the Lazio coastal area (Med).



Natural hazards and extreme events

DMI

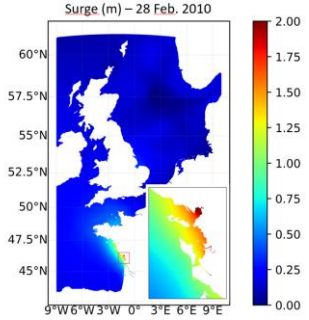
Storm surge forecast in west Baltic Danish coast with **ocean-wave interaction**



Sea level in storm Babet, 20 Oct. 2023

SHOM / MOi

Storm surges and water levels forecasts French Atlantic coasts



+ATLANTIC

Integrate **observation** and **modelling** systems in support of the Lisbon port using **wave and circulation models**

ESC 3: Building coastal resilience to climate change

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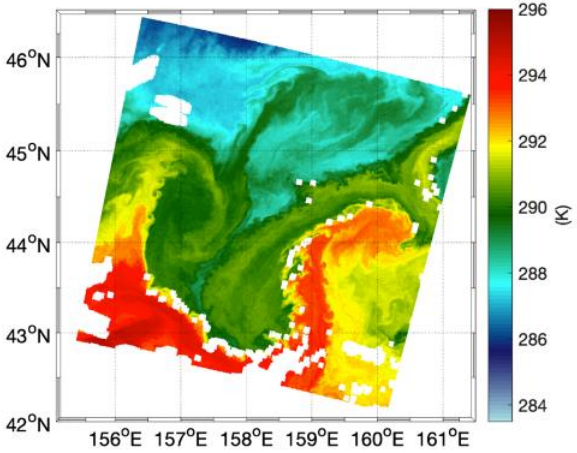
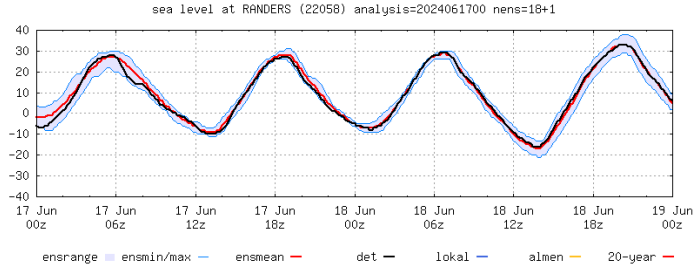
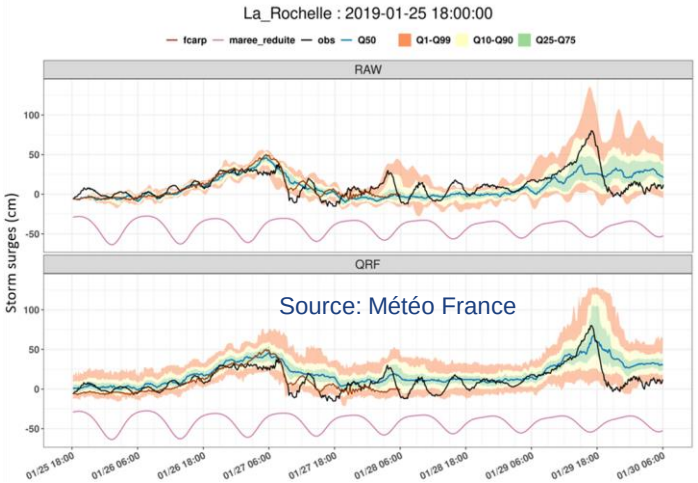


from Ciani et al. 2023 ***https://doi.org/10.3390/rs15041163***

High-Resolution (~1 km) Multi-Sensor SST products by CNR



Ensemble prediction by aggregating CMEMS and national forecasts by DMI



Corrective post-treatment of water level forecasts via filtering and ML by SHOM

ESC 3: Example use of new coastal products

To Conclude

- Focus on ***endorsed EU Member State Coastal Systems***, not specific downstream services

- ***Demonstrate accuracy enhancements*** in coastal applications:
  - Take the state-of-the-art operational coastal systems
  - Assess accuracy improvements compared to the benchmark

- If successful, new coastal observations, hydrology products and enhanced modelling methodologies should contribute to the ***long term evolution of the Copernicus Marine Service***

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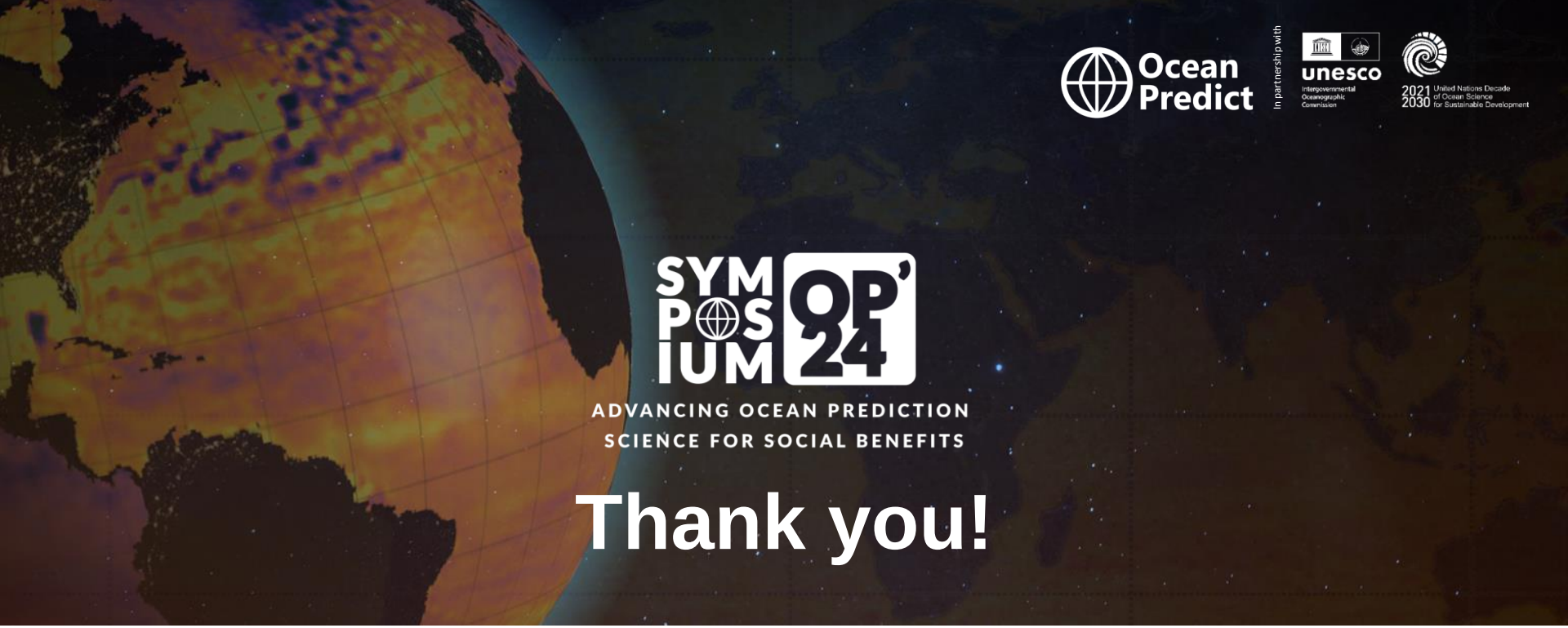

European Commission

Copernicus Marine Service

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