Inspire
the EU and policies

Copernicus
Marine Service

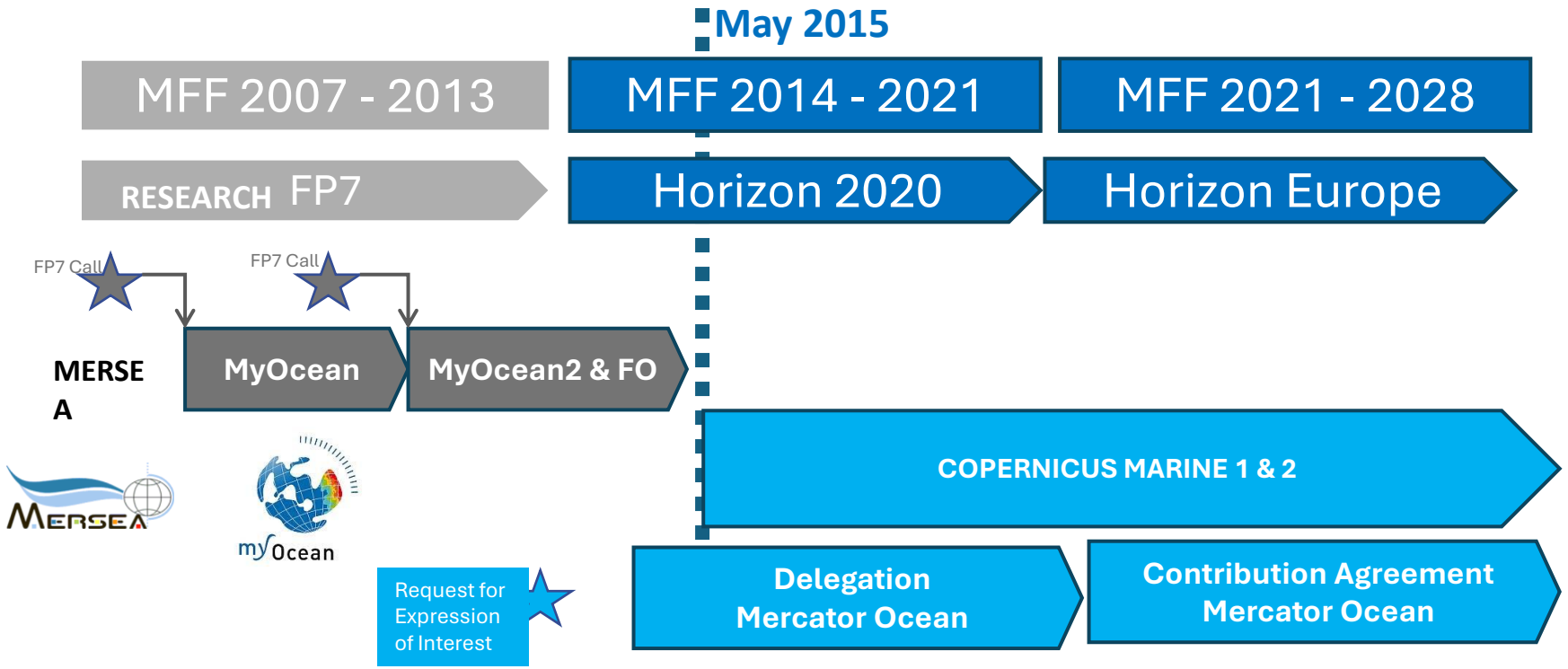
COPERNICUS MARINE ACHIEVEMENTS: A WORLD LEADING EU MARINE SERVICE

Pierre-Yves Le TRAON

SCIENTIFIC DIRECTOR

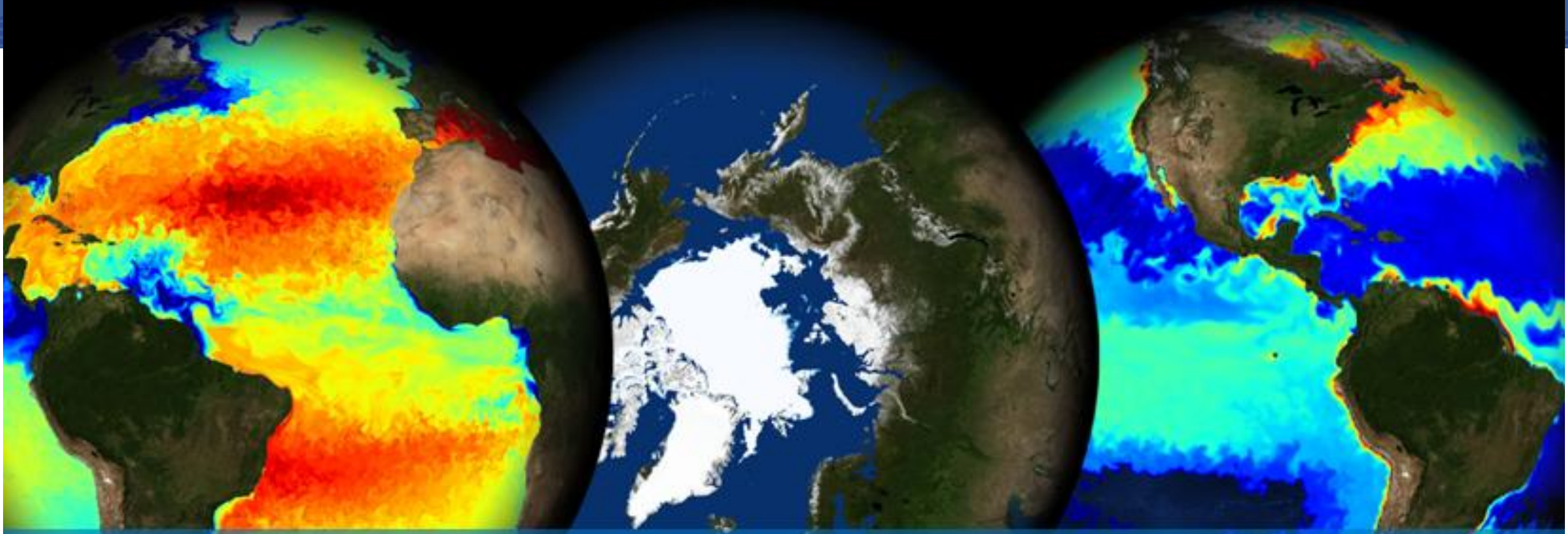
Mercator Ocean International

10 years ago … end of R&D precursor projects, start of a new operational journey



11 November 2014, Signature of the Mercator Ocean / Copernicus Marine delegation agreement

« The Ocean », according to marine.copernicus.eu



Satellite, in situ observations and models for Essential Ocean Variables, translated by experts into verified products and forecasts, indicators, reports, seen by 500,000 users worldwide/year, integrated as regular information by more than 100,000 subscribers.

PROGRAMME OF THE EUROPEAN UNION

Copernicus

implemented by MERCATOR OCEAN INTERNATIONAL

Copernicus Marine Service

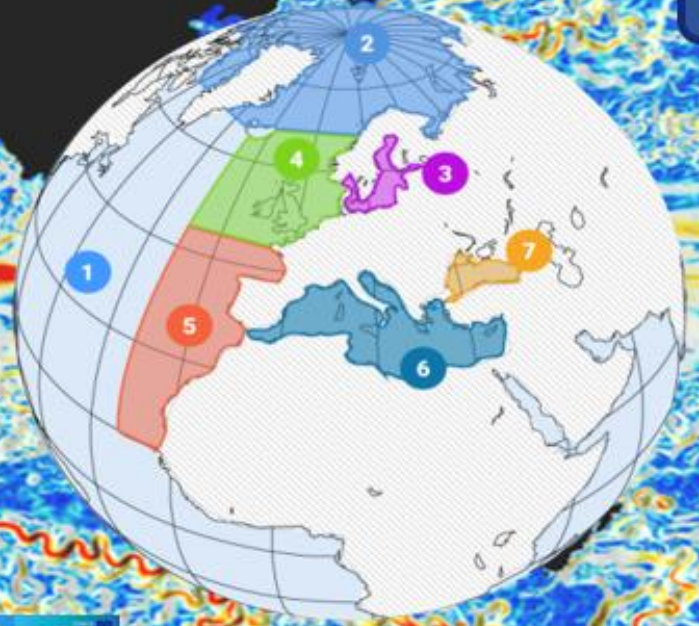
The EU Copernicus Marine Service

Global & Regional Ocean Monitoring and Forecasting

MULTI-YEAR
10 to 45 years

REAL-TIME
Daily, hourly

FORECAST
2 to 10 days



ESSENTIAL OCEAN VARIABLES

BLUE OCEAN	WHITE OCEAN	GREEN OCEAN
Physics	Sea Ice	Biogeochemistry

OBSERVATIONS
In-situ & Satellites

NUMERICAL MODELS
& data assimilation

1 Global
2 Arctic
3 Baltic
4 NWS
5 IBI
6 Med Sea
7 Black Sea

marine.copernicus.eu

Free and Open

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A pan-European network of Production Centres, feeding our central Copernicus Information System and Marine Data Store

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Copernicus Marine supports all sectors of the blue economy

User Uptake: > 100,000 subscribers, Web: 1,500,000 visitors/year

Environment

1 POLAR ENVIRONMENT MONITORING
The Copernicus Marine Service provides key data products for the Polar Environment Monitoring sector to assess environmental impacts at both poles.

2 CLIMATE & ADAPTATION
The Copernicus Marine Service provides scientists with ocean data and information to conduct their environmental, climate and oceanographic research to support climate adaptation.

3 OCEAN HEALTH
The Copernicus Marine Service provides important inputs to monitor the ocean's state and vital health signs, essential for the well-being of life on Earth.

4 MARINE CONSERVATION & BIODIVERSITY
The Copernicus Marine Service provides key data to monitor marine biodiversity and to protect Marine Protected Areas, preserving at-risk ecosystems.

Society

5 SCIENCE & INNOVATION
The Copernicus Marine Service provides scientists and businesses with ocean data, allowing them to innovate their practices and build new applications and services for intermediate and final users.

6 POLICIES & OCEAN GOVERNANCE & MITIGATION
The Copernicus Marine Service provides key data to support European Member States in the implementation of European Directives. It also collaborates with international institutions to support Ocean Governance.

7 EDUCATION, PUBLIC HEALTH & RECREATION
The Copernicus Marine Service supports businesses and non-profit organizations to develop public health, ocean literacy and educational tools to raise awareness on the many challenges facing the ocean.

8 EXTREMES, HAZARDS & SAFETY
The Copernicus Marine Service supports safety at sea and pollution response by providing oceanic parameters for extreme situations at sea and pollutant drift forecasts.

Economy

9 MARINE FOOD
The Copernicus Marine Service supports the management of aquaculture farms and the sustainable exploitation of ocean's living resources.

10 COSTAL SERVICES
The Copernicus Marine Service provides key data that can be used to develop high-resolution coastal models to manage and monitor coastal areas.

11 TRADE & MARINE NAVIGATION
The Copernicus Marine Service provides key ocean parameters contributing to safer and more ecological marine navigation.

12 NATURAL RESOURCES & ENERGY
The Copernicus Marine Service provides key data products for the oil & gas, deep sea mining and marine renewable energy sectors.

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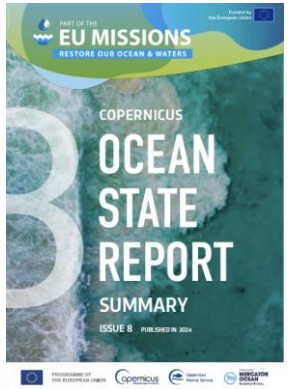
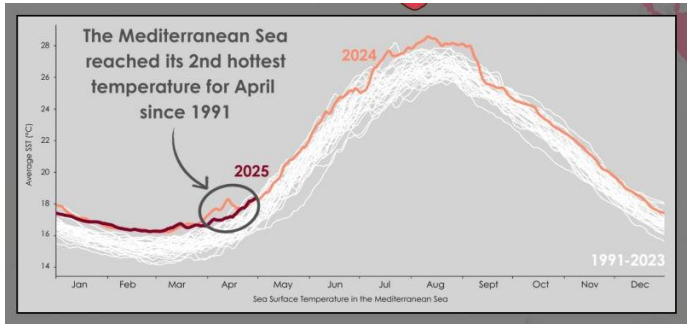
The Copernicus Ocean State Report

ISSUE 9: under review
ISSUE 10: Call for Contributions

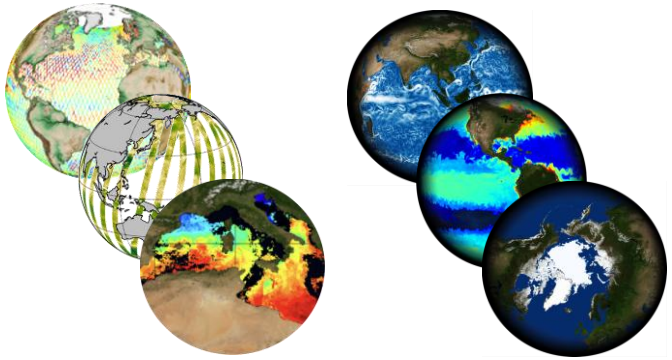
http://marine.copernicus.eu/science-learning/ocean-state-report/

- Provides a state-of-the-art reference for the variability, changes, and state of the ocean
- Provides key inputs that support major EU and international policies & initiatives
- Collaboration of more than 150 scientific experts from more than 25 European institutions
- Building on the Copernicus Marine Ocean Monitoring Indicators (OMIs) framework.

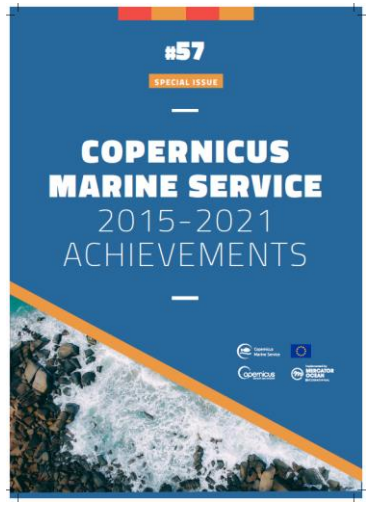


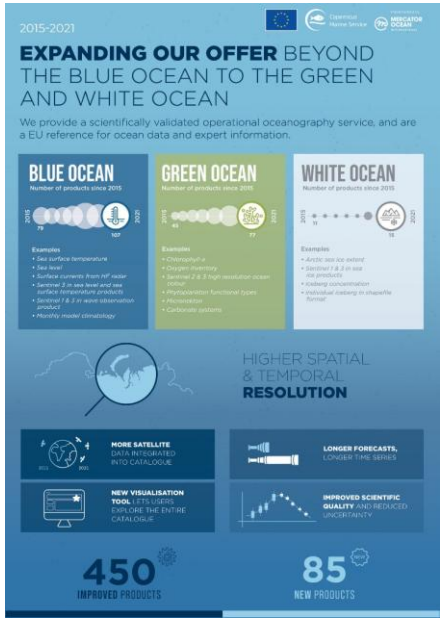


Achievements



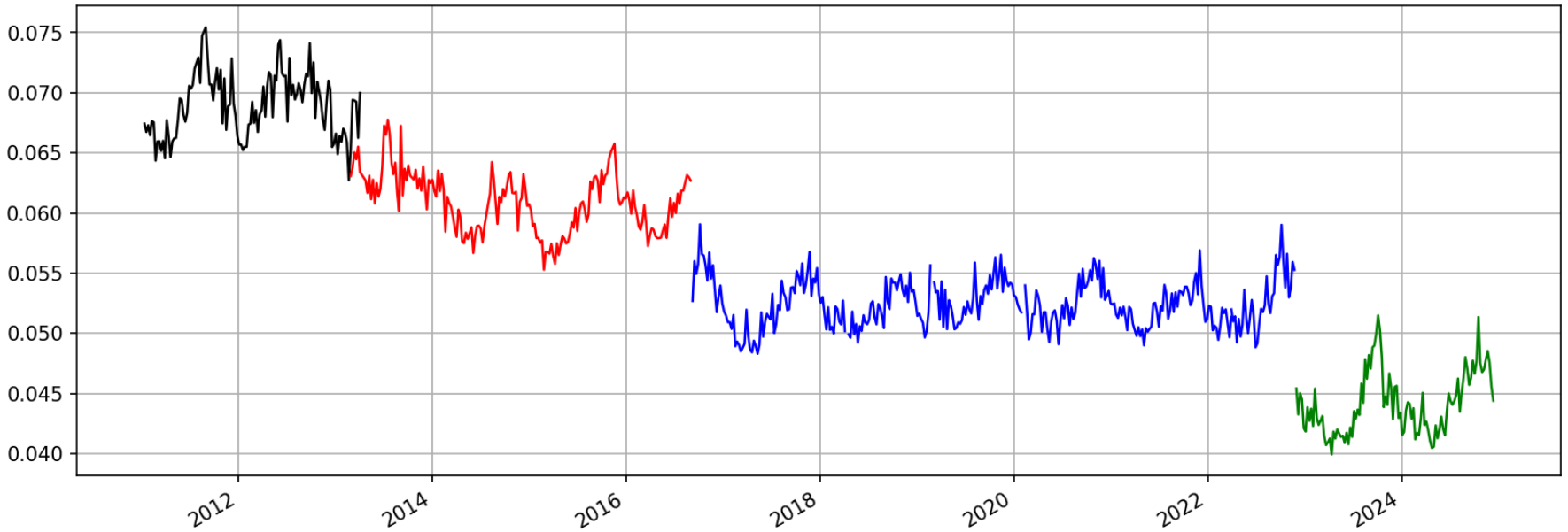
- **User uptake and user engagement**
- New **marine data store**
- **Visualization** tools (MyOcean)
- Integrate **new missions (esp. Sentinels)**
- **Improved or new observation products** (e.g. pan Arctic)
- **Improved model products** based on upgraded systems (e.g. assimilation, resolution, improved forcings)
- **Improved homogeneity** between model products
- **Product quality** monitoring and improvements
- **Interfaces** Copernicus Marine and coastal systems
- **“Interim” reanalyses**
- **Extended multi-year products** in the past
- **Ocean State Report** and high-level summary
- …





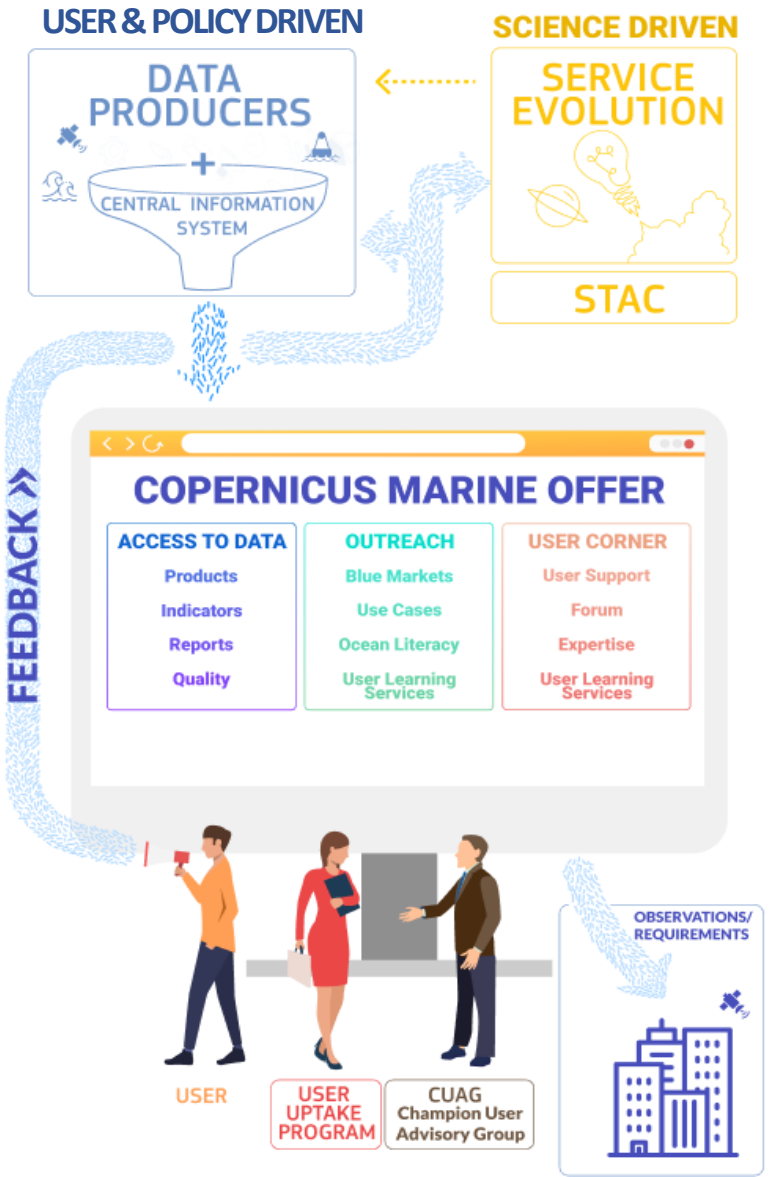
Evolution of performances

Evolution of the SSH forecast error of the global Mercator Ocean 1/12° system (from Pinardi et al. 2024). Colours indicate different versions of the system.



MERCATOR OCEAN INTERNATIONAL

Service Evolution Strategy



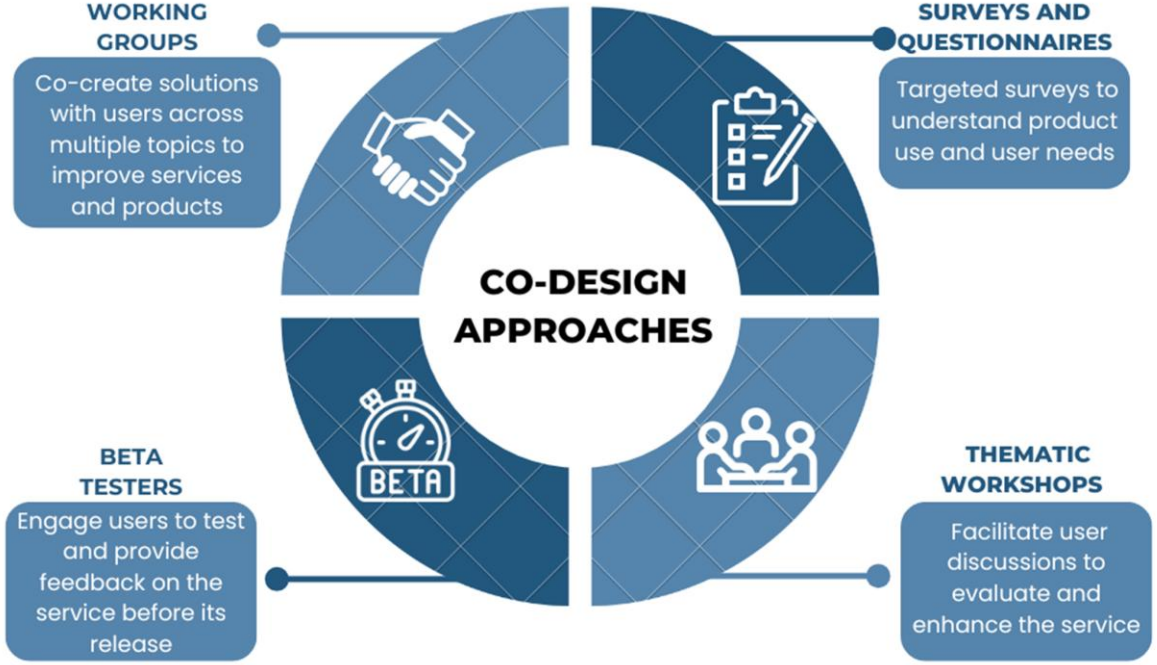
A user, policy, science driven, continuously evolving service to remain leading state-of-the-art service for Copernicus

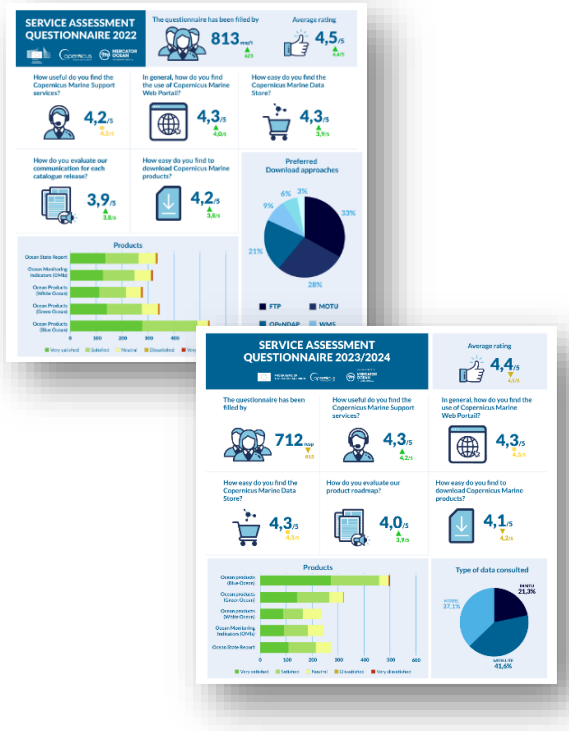
- The **continuous improvement approach is applicable to all Copernicus Marine Service elements**: production centers, marine data store, web & service

- **User & policy driven:** user feedbacks & policy needs are monitored and translated into service/products evolution objectives. **Guidance** from our **Champion User Advisory Group (CUAG)**

- **Science driven: Scientific** (observations, modelling, assimilation, AI) and **technological** (e.g. cloud and computing capabilities) **advances** are fully taken into account. **Guidance** from our international, independent experts from the **Scientific and Technical Advisory Committee (STAC)**

A user and policy driven service

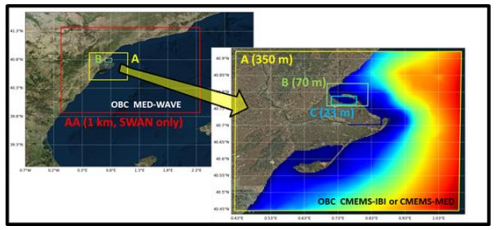




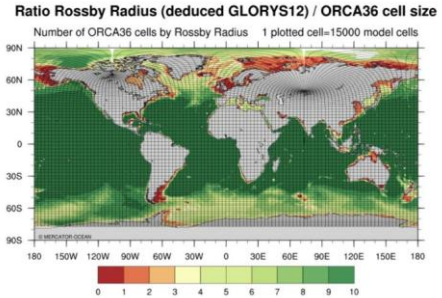
Collecting User Needs

Innovation

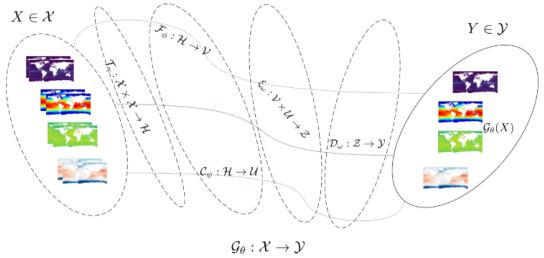
Themes of research and innovation for state-of-the-art systems responsive to evolving user needs: observation, modelling, assimilation, artificial intelligence, cloud & HPC, product quality, visualization, user services…



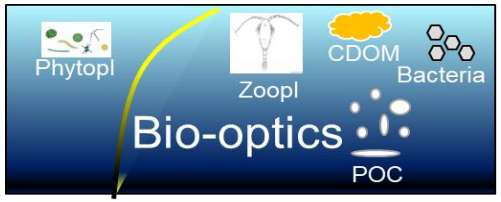
Coastal ocean
Coupling with open ocean & hydrology

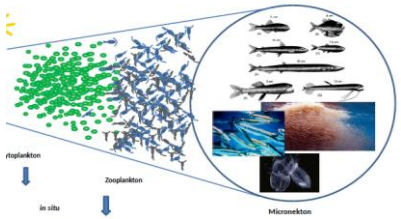


New generation of ocean models, HPC infrastructure



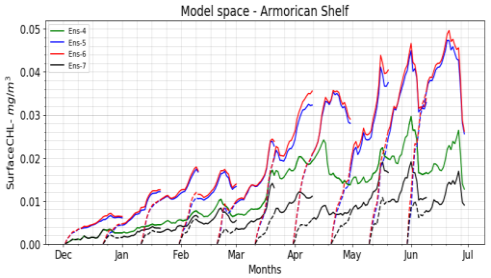
Artificial Intelligence





Improved BGC modelling & assimilation capabilities, high trophic levels

Ocean/Wave/Atmosphere interactions & coupling

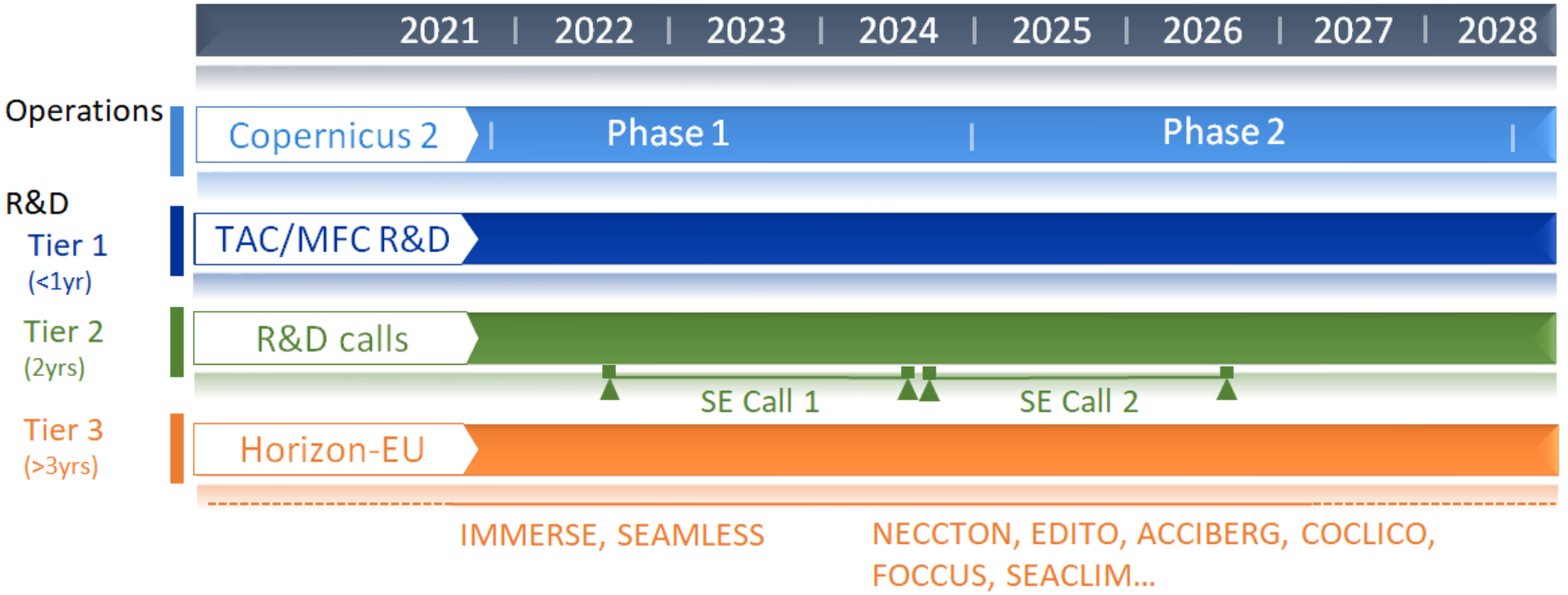


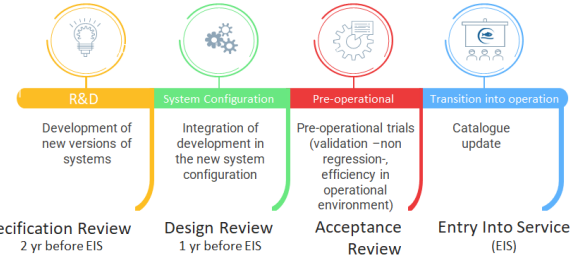
Ensemble data assimilation and forecasting

Service Evolution

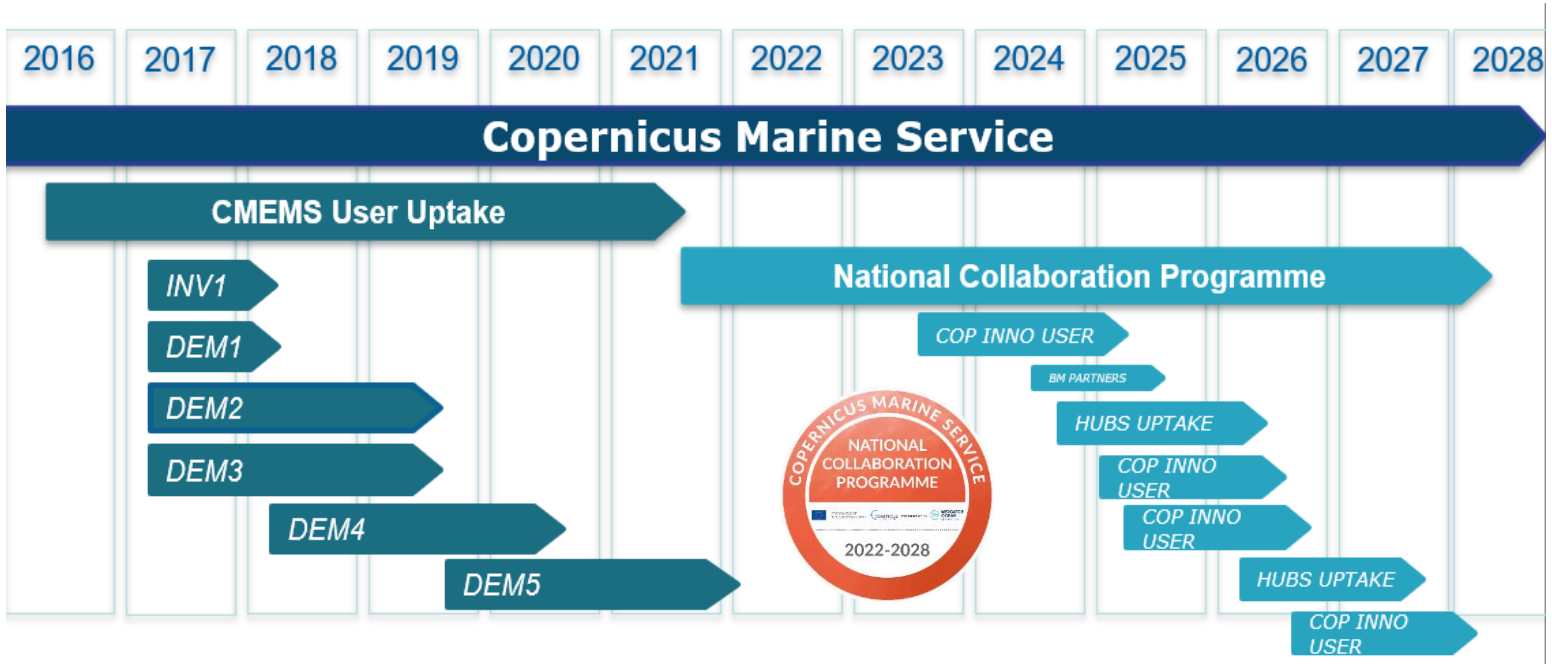
Management of service evolution activities

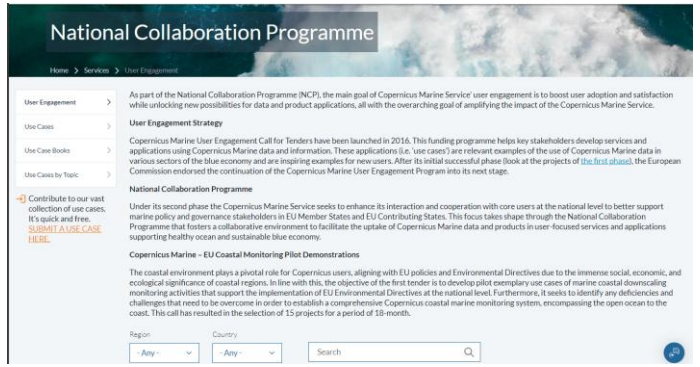
- 3 Streams defined to support Copernicus Marine R&D activities, with different time horizons, players and objectives
- Overall objective: integrate R&D advances in the operational systems

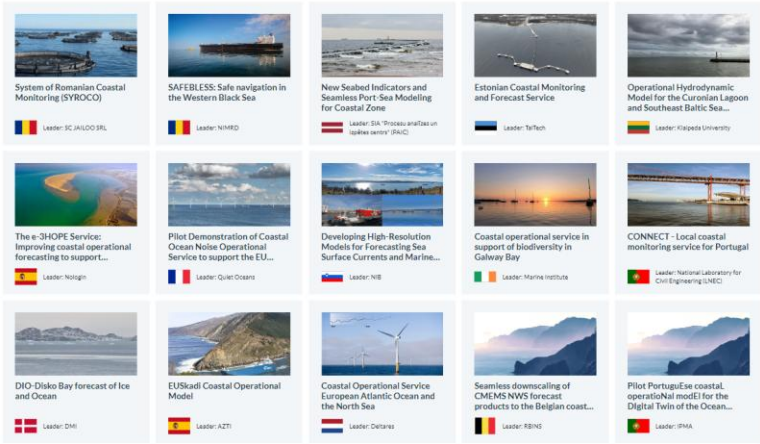




Working with & for member states: our National Collaboration Programme







EU COASTAL MONITORING PILOT DEMONSTRATIONS

Inspire
the EU and policies

Working with the space and in-situ components

The Copernicus Marine Service is highly dependent on satellite (Sentinels) and in-situ observing capabilities.

Requirements, impact assessment and advocacy.

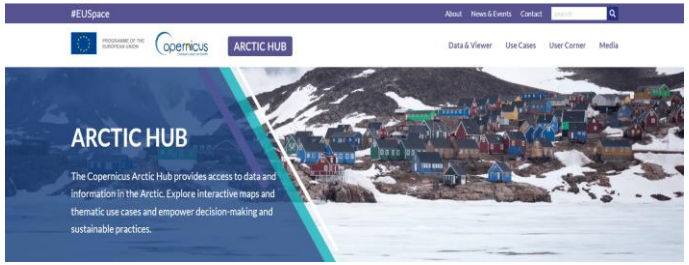
Integration of Jason-3, S1, 2, 3 A & B in Copernicus 1, S6A in Copernicus 2 and future integration of S6B, S1, 2, 3 C&D. Preparing for expansion missions (in particular Arctic Ocean).

Support the EC for Sentinel NG mission design.

Working with EEA, EuroGOOS & EOOS to strengthen development of the global in-situ observing system.

Working with the other EEs

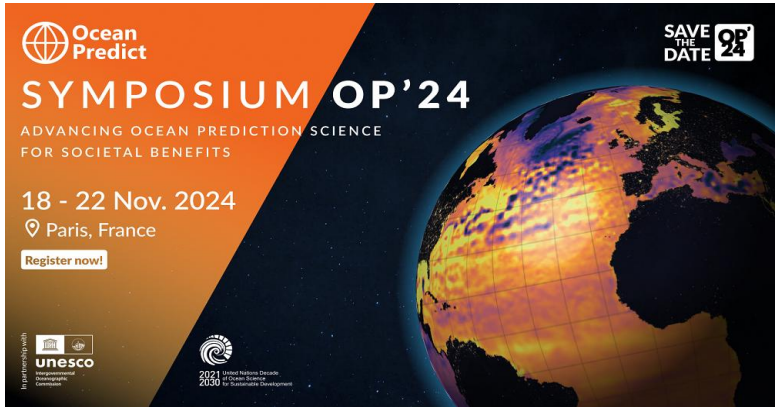
WEkEO



Thematic Hubs and WEkEO

- **Land Service**: Coastal Zone (Coastal Roadmap)
- **Climate Service**: Copernicus Marine ocean&climate monitoring, indicators and Ocean State Reports. Reprocessing of ocean ECVs for C3S.
- **Emergency Management Service** coastal flooding. Hydrology modelling (EFAS, GLOFAS)
- **Atmospheric Service** : Dust inputs and atmospheric CO2 and support to CO2MVS (air/sea fluxes of CO2)
- **Security Services (EMSA, Frontex)**: use of Copernicus Marine products (currents, waves, sea ice temperature).

International Collaboration and Impact



OceanPredict
Advancing the science of ocean prediction

Ocean Prediction Capacity of the Future
ForeSea

The Global Ocean Observing System

GOOS | CoastPredict
with The Global Ocean Observing System

GEO BLUE PLANET

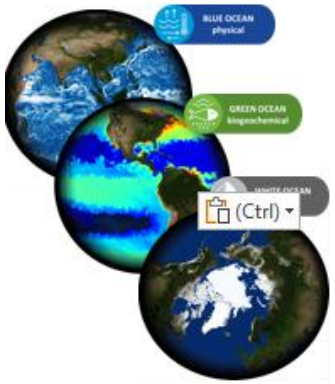
Ocean Prediction
UN DECADE COLLABORATIVE CENTRE

Call for action

« International mobilization to advance ocean prediction capabilities for the benefit of society»

UN OCEAN CONFERENCE NICE 2025 FRANCE

Copernicus Marine in 2025 …



- A world leading EU marine service responsive to user and policy needs to sustainably manage the ocean, better protect marine biodiversity and support climate policies
- A pan European network
- Innovation - Service Evolution Strategy
- Links with EU member states / National Collaboration Programme
- Integration in the Copernicus ecosystem
- International impact and collaboration
- En route to Copernicus 3 & new challenges : biology, coastal, climate, AI, Sentinel Expansion, in-situ observing system, towards an integrated platform and service line between Copernicus Marine and the EU DTO

PROGRAMME OF THE EUROPEAN UNION

opernicus Europe's eyes on Earth

implemented by MERCATOR OCEAN INTERNATIONAL

Inspire the EU and policies

Inspire

the EU and policies

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EU MISSIONS
RESTORE OUR OCEAN & WATERS

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PAVILION IMPLEMENTED BY
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INTERNATIONAL