Improving and Integrating European Ocean Observing and Forecasting Systems for sustainable use of the Oceans

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862626.
Research and innovation towards a user-focused, truly interdisciplinary, and responsive European ocean observing and forecasting system, that delivers the essential information needed for human wellbeing and safety, sustainable development and blue economy in a changing world.
Goals

- Improve the European ocean observing system
- Deliver ocean observations & forecasts
- Demonstrate the importance of the ocean
- Integration into global context
- Knowledge about ocean climate, marine ecosystems & their vulnerability to human impacts
- Significance for an economically viable & healthy society
Mission

Use a **co-design approach** to significantly improve European ocean observing and forecasting **services and products** by building the **community** needed for a system that delivers services and products on the ocean, **ocean climate**, **marine ecosystems** and their **vulnerability** to human impacts.
1. Strengthen European ocean observing and forecast as an integrated entity within a global context

2. Improve the design for an integrated European ocean observing and forecasting system for the European seas and the Atlantic, including the deep sea

3. Improve and enhance the readiness and integration of ocean observing networks
Enable FAIR data, support integration of ocean data into Copernicus Marine Service, EMODnet and SeaDataNet portfolios
Objectives

5 Deliver improved forecasts and new information synthesis products by better use of data in models

6 Develop novel services, demonstrate the value of the ocean observing system to users

7 Support of an integrated, sustainable and fit-for-purpose ocean observing system by engaging with a range of end-users and other stakeholders
Governance Structure

- European Commission
- Project Coordination Unit
  - General Assembly
  - Executive Board (EB)
- Steering Committee (WP leaders)
- International Scientific and Technical Advisory Board (ISTAB)
- Innovation and Stakeholder Committee (ISC)
- Gender and Diversity Board (GDB)
- Task Leaders
- Steer Committee (WP leaders)
“Without inclusion, diversity initiatives may not be enough” (Purity et al, Science 2017)
Coordination and Governance

1. Priorities
2. Best Practices
3. Legal Frameworks

Ocean Observing & Forecasting Systems

Coordination & Governance
Coordination and Governance

- Strengthen EOOS & connection to national ocean observing priorities
- Connect observing & modelling communities
- Develop marine debris observing network
- Strengthen EU biological networks
- Extend ocean best practice
- Visualise observing system performance
- Insight on legal issues
- Orientation for the future

1.1 Observing and forecasting system coordination
1.2 System monitoring
1.3 Foresight: Technology and sustainability
1.4 Legal frameworks

EOOS / GOOS
BioEco networks
Marine Plastics
Best practices
Modelling
Ocean Observing System Design
Ocean Observing System Design

Societal benefits of Ocean Observing → Requirements towards EuroSea → Strategy for sustained EOV monitoring

European Blue Growth strategy → Identification of requirements in existing observing networks → Support of demonstrators (WP5, 6, 7)

? → Improve existing elements

! → Accurate estimates for indicators

? → Implementation of new Ocean Observing components

Societal challenges
Network Integration and Improvement
Network Integration and Improvement

- Make European observing networks fit for global integration
- Ensure that European observing efforts are visible and accessible at a global level
- Ensure **seamless flow of data** with know quality from observations to data centres
- Incorporate augmented/OMICS observations into the European ocean observing network landscape
- Develop **multidisciplinary and multiplatform observing strategies** and guidelines

<table>
<thead>
<tr>
<th>European networks</th>
<th>Global networks</th>
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<tbody>
<tr>
<td>HF Radar</td>
<td>HFRadar/EuReGoOS Task Team</td>
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<tr>
<td>Glider</td>
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<tr>
<td>Fixed platforms</td>
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<td>Surface vehicle</td>
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<td>Profiling floats</td>
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<td>Research ships</td>
<td>in progress…</td>
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<td>Commercial ships</td>
<td>in progress…</td>
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<tr>
<td>Tide gauges</td>
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Data Integration, Assimilation & Forecasting
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- Data assimilation
- Copernicus Marine global and regional monitoring and forecasting systems
- Copernicus Climate seasonal forecasts
- Quality assessment
- Long term validation of satellite observations
- Improving the use of in-situ observations
- Synthesis product development based on ship-based in situ biogeochemical data
- Model development and validation
- Improved forecasting

Sea Water Salinity

Time

Forecast Uncertainty
Coastal Resilience and Operational Services

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COASTAL RESILIENCE & OPERATIONAL SERVICES

AFFORDABLE SEA LEVEL DATA QUALITY

Puertos del Estado

UNIVERSITY OF CAMBRIDGE

Laboratori d'Enginyeria Marítima
UPC - BARCELONATECH

ARUP
Coastal Resilience and Operational Services

Demonstration end-to-end connection

New measuring instruments → Observations → Novel decision making tools

3 case studies
- Barcelona
- Alexandria
- Taranto

Sea level → Pollution

Operational Services → Cities → Ports

Environmental management

Sea level rise impact: uncertainty visualisation

Sea level rise assumptions:
- No rise
- RCP-4.5
- RCP-8.5

Risk distribution

Risks
Ocean Health

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Regional & Local Level

Ocean Health

Shared Understanding of Water Management

AANDERAA
a xylem brand

Danmarks Meteorologiske Institut

CSIC

Marine Institute

SOCIB

Baleric Islands Coastal Observing and Forecasting System

TALTECH
Ocean Health

6.1 Extreme Marine Events & 6.4 System Operation

6.2 Connecting CMEMS and Small Pelagics
- Early Warning
- Mitigation Strategies
- Forcings on Fish Life-Cycles

6.3 Integrating BOOS and HELCOM
- Observational Networks
- Reduce Uncertainty of Eutrophication Assessment
- Adapt and Manage
- Total Allowable Catch
- Stock Assessment Models with Oceanographic Forcing
Ocean Climate Indicators

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7 OCEAN CLIMATE INDICATORS

FEEDBACK LOOPS

QUANTIFY ECONOMIC VALUE

ECMWF
MERCATOR OCEAN INTERNATIONAL
Optimizing the observing system to monitor long-term changes in ocean carbon

Upscale spatio-temporal coverage

Reduce key uncertainties & quantify natural variability

Impact assessment of observational uncertainties & natural variability on the economic value of ocean carbon uptake

7.1 Carbon in deep convection regions & 7.3 tropical carbon fluxes

Tropical Atlantic → Gulf of Lion → Labrador Sea

Records of EOVs from OO systems, CMEMS and ESA-CCI to verify forecast

Stakeholder engagement

Create user driven forecasting indicators and products

Observable and user-relevant ocean climate and forecasting indicators

7.2 Societal benefit of Ocean Monitoring
Communication: Engagement, Dissemination, Exploitation & Legacy
### Communication: Engagement, Dissemination, Exploitation & Legacy

#### Messages
- Need for sustained information **Forecasts**
- Economic value of ocean observing **Products & Services**
- Knowledge **Information & Best practices**
- European Ocean Observing as part of Global Ocean Observing **Integration**

#### How
- Promotion of work and results
- Engagement and Co-design
- Sharing
- Expanding capacities
- Raise awareness for importance of ocean observing

#### Stakeholders
- Policy
- Industry
- Society
- Science
Project Coordination, Management and strategic ocean observing alliance
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- Day-to-day management
- Monitoring of planning and progress
- Coordination of reporting
- Proposals for corrective and preventive actions
- Financial monitoring
- Facilitation of internal communication
- Building interfaces to other projects
User-friendly ocean information products will serve communities and citizens in Europe after the project.

Improved ocean observing and forecasting

Ocean information becomes a public utility
Thank you

For more information
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