Ocean Information for Marine Renewable Energy: Status and Perspectives

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OUTLINE

• WHICH OCEAN DATA OFFER FOR MARINE RENEWABLE ENERGY
• HOW OCEAN DATA ANSWER MARINE RENEWABLE ENERGY NEED
• HOW IS ORGANISED INDUSTRY REQUIREMENT FEEDBACK
• USE CASES
• WHAT’S NEXT?
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WHICH OCEAN DATA OFFER FOR RENEWABLE MARINE ENERGY

OCEAN DATA BASE
TARGETING ALL SECTORS

- Copernicus
- SeaDataNet
- EMODnet
- ECMWF
- podaac

And more...

OCEAN KNOWLEDGE AND DATA BASE
TARGETING MRE SECTOR

- TETHYS
- IRENA
- Global Atlas
- MaRINET2
- ETIPOCEAN

And more...
WHICH PRODUCTS?
+15 OCEAN PARAMETERS

Temperature
Salinity

Currents
Waves

Sea surface
elevation

Transparency
Turbidity

Sea ice
Surface Wind

Nutrients
Plankton

Bathymetry
Sea Bed Habitats
Geology

Human Activities

Primary production

Also
TRAINING WEBINARS
WHICH OCEAN DATA OFFER FOR RENEWABLE MARINE ENERGY

- marine.copernicus.eu
- Sustained in the long term
- Open and Free
- User-Driven
# COPERNICUS MARINE SERVICE
## HIGH QUALITY OCEAN DATA

<table>
<thead>
<tr>
<th>Wave Energy</th>
<th>Ocean Currents</th>
<th>OTEC SWAC</th>
<th>Salinity Gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Wave Energy Image" /></td>
<td><img src="image2.png" alt="Ocean Currents Image" /></td>
<td><img src="image3.png" alt="OTEC SWAC Image" /></td>
<td><img src="image4.png" alt="Salinity Gradient Image" /></td>
</tr>
</tbody>
</table>

**Hourly and daily surface ocean waves**
- GLO: 8km
- MED: 4km
- NWS: 7km

**Hourly and daily 3D ocean currents**
- GLO: 8km
- MED: 4km
- NWS: 7km

**Hourly and daily 3D ocean temperature**
- GLO: 8km
- MED: 4km
- NWS: 7km

**Hourly and daily 3D ocean salinity**
- GLO: 8km
- MED: 4km
- NWS: 7km
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RENEWABLE MARINE ENERGY
FARM LIFE CYCLE

PROSPECTING

-5

YEARS

PRE-FEASIBILITY

-1

DESING

0

OPERATION

+1

+25

Start of development

Start of Mesuring

Start of Construction

Start of Operation

End of Life-time
• Same thing for Insurance/accident recovery
• Prevention
• Preparedness
• Response
• Recovery
HOW OCEAN DATA ANSWER RENEWABLE MARINE ENERGY NEED

1. Evaluation of ocean energy resources (tidal, wave, heat, currents, salinity)

2. Performance validation and technology certification

3. Evaluation of met-ocean conditions for operations at sea

4. Evaluation of constraints applied on the sea-exposed machines

5. Environmental impact assessment of farm (before / after implementation)
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HOW IS ORGANISED
INDUSTRY REQUIREMENT FEEDBACK

OCEAN DATA SERVICE

INTERMEDIATE USER 1, 2, 3...

END USER
Ocean Energy Europe

A leader Trade Association for Renewable Marine Energy
https://www.oceanenergy-europe.eu

Mercator Ocean

Free Ocean Data Provider
https://marine.copernicus.eu
• Survey sent by OEE to its members to get feedbacks about Copernicus Marine Service data

• Information and Training session during annual OEE event.

• Webinar among OEE members
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Ocean Thermal Energy Conversion (OTEC) exploits the difference in temperature between warm surface and cooler deep waters (temperature difference of at least 20 °C).

Using the ocean database of Copernicus Marine Service, Bluerise in collaboration with TU Delft, has evaluated the year round and ten year average ocean characteristics in the Caribbean analyzing the ocean currents, density and temperature profiles over depth. Particular attention was spent on ocean upwelling and seasonal fluctuations. This enables a quick assessment of the feasibility of OTEC locations.
The Biscay Marine Energy Platform (BiMEP) is an open sea test site with grid connection for demonstrating and validating wave energy collectors and floating wind platforms. BiMEP provides manufacturers with ready-to-use facilities to test technical and economic feasibility of their prototype.

BiMEP and IH Cantabria have developed a Prediction System to forecast wind, wave, currents and sea level conditions to be considered in the planning of marine operations at BiMEP and feed the Decision Support System developed in TRL+ project. The Copernicus Marine Service physics and wave models are used as forcing conditions in a very high resolution model.

Example of CMEMS user
A harsh ocean environment with strong winds and waves over decades of use causes significant wear and tear on offshore structures. The angle from which waves hit a platform, and the wave height are important factors, but in addition the wave frequency is an important factor due to the resonance frequency of the structure itself.

AHPA, Asset Health and Probabilistic Analyses, focuses on probability analyses of fractures and strains on offshore structures. The Copernicus Marine Service wave height combined with period is used to predict the 3-dimensional motion of floating bodies.

Example of CMEMS USER

Wave Height Evolution during 5 days in October 2017
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WHAT’S NEXT?

• User-driven Copernicus Marine Service
  – Higher spatial and temporal resolution
  – Dedicated products, trainings and webinars for RME

• Copernicus DIAS service for environmental data
  – Transform data with cloud-based processing and tools
THANK YOU