Copernicus Marine Environment Monitoring Service

Mercator Ocean

March 2017





Implemented by



Entrusted to Mercator Ocean by the European Commission

MyOcean legacy (2009/2015)

Delegation agreement (2014/2021)

To implement and operate the Copernicus Marine Service.



- French non-profit company
- Owned by 5 national agencies
- Global Ocean Analysis and Forecasting center
- 20 years expertise in Operational Oceanography
 - **Producer (science-based)**
 - **Gervice provider**
 - □ International leadership and network







Networking ocean data producers



- A network of European data providers
- State-of-the-art scientific knowledge
- Unique products portfolio







The Copernicus Marine Service in a nutshell



- ★ An operational service.
- ★ Full OPEN and FREE service for any application related to Ocean & Seas.
- ★ A unique catalogue online.
- ★ A Worldwide & European coverage.
- ★ Data Download provided registration /CMEMS licence.
- ★ Products Information & Quality Information.
- ★ A service desk supported by a network of technical & marine experts.









CMEMS Subscribers typology







A user driven service



Feedback collection

- Sent to service desk
- From projects (GMES-Pure)
- Online questionnaires
- Meetings
- InfoDays and User workshops



Example:

★ Record

Over a 4 year period

×

900 feedback from 400 users

Request April 2015:

to provide sea bottom temperature (for MSFD use) → done CMEMS release April 2016



★ Analyse

Request September 2015:

3 analyses don∈ to better promote the marine service → first User Uptake calls on demonstrators, July 2016







A user driven service



A FORUM, for players engaged in creating sustainable value for our Oceans. AN OPEN DIALOGUE, with Policy makers, Industrials & Entrepreneurs, Regional Authorities & Stakeholders, Public Services and Scientists involved in Marine Environment and Blue Growth. A MAJOR EVENT, to take stock of the Copernicus Marine Service achievements and future prospects.

http://marine.copernicus.eu/save-date-copernicus-marine-weekseptember-25-29-2017/







Catalogue of products

- 1. Global 2. Arctic **Global ocean** 3. Baltic and the European 6. Med Sea 7. Black Sea basins







InSitu, Satellite Observations, 1 **Modelling products**

4. NWS 5. IBI



- **Physical & Biogeochemical** variables
 - ★ Long time series (25 years)
 - ★ Real time products



From Copernicus bytes to the marine catalogue



Essential Ocean Information / Variables





OPERPICUS Europe's eves on Earth





OSI TAC WITS :

Wind, Sea Ice and Temperature at the Sea Surface Service provides operational (Level 3 and 4) observational multi-mission data products derived rom upstream satellite earth observation (L2) data.

OC TAC:

Ocean colour thematic assembly centre provides worldwide global, pan-European and regional ocean colour products covering 7 defined CMEMS regions (e.g. Baltic Sea).







CMEMS OSI TAC WITS – SEA ICE PRODUCTS



- ice chart ice concentration grid (spatial resolution 1 km, daily)
- 100 · ice chart average ice thickness grid (1 km, daily)
 - 90
- 80 · SAR based ice thickness (4 hour after SAR acquisition, 500 m)
 70
- SAR based ice drift (for each overlapping SAR image pair within 2 days, produced twice daily, 800 m)
 - SAR based ice thickness mosaic, twice daily, 500 m
 - SENTINEL-1 (a and b) the major instrument for FMI, additionally somedata from other SAR instruments (RADARSAT-2/RADARSAT-C, Cosmo-SkyMED, TerraSAR-X/TanDEM-X).



40

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European Commission





The DMI Sea Surface Temperature analysis aims at providing daily gap-free maps of sea surface temperature, referred as L4 product, at 0.02deg. x 0.02deg. horizontal resolution, using satellite data from infra-red and microwave radiometers.

Uses SST nighttime satellite products from these sensors: NOAA AVHRR, Metop AVHRR, Terra MODIS, Aqua MODIS, Aqua AMSR-E, Envisat AATSR, MSG Seviri



See poster by Jacob Hoeyer: A Satellite-Based SST Climate Data Record for the Baltic Sea









Legacy, current and future OC sensors

The OC TAC relies on current and legacy OC sensors: MERIS from ESA, SeaWiFS and MODIS/Aqua from NASA, and VIIRS/NPP from NOAA.

In 2017, OLCI data will be ingested by CMEMS for NRT L3&L4 global and regional products for the European Seas.

The ESA OC-CCI "SeaWiFS-like" data set (1998-2016) is used to produce a consistently reprocessed time series for global products (4km) and regional products for the European Seas (1km).



Because of their spectral bandsets, SeaWiFS, Aqua and VIIRS are not suitable for optically complex conditions like those of the Baltic Sea:

- the ESA OC-CCI "SeaWiFS-like" data set is not suitable
- data gap (2012-2016) between the end of MERIS and OLCI





Algorithms and data availability for the Baltic Sea

- Current algorithms for Chlorophyll:
 - Current NRT product from MODIS data is based on Neural Network on $(R^2 = 0.2)$
 - Current REP product from ESA OC-CCI "SeaWiFS-like" is based on a Blue/Green Ratio data (R²=~0.4)
 - These uncertainties derive from the spectral bandset and the atmospheric correction
 - Accuracy is likely to improve for NRT OLCI products in 2017
- CMEMS OCTAC can implement and serve operationally community vetted algorithms:
 - Need for regionally (spatially/seasonally) tuned algorithms (for Chlorophyll, Cyanobacteria, CDOM, TSS, Secchi) to be applied to MERIS/OLCI for the Baltic to best serve the community needs
 - Need for a pooled set of all available Inherent and Apparent Optical properties for community algorithm development and validation
- Other (semi-)operational services are available for the Baltic Sea (IOP, SYKE, SMHI, BC):
 - How do we ensure that we all provide the same answers to the users?

•Ocean NRT

-HBM+ERGOM

-The Baltic Sea physical model product provides forecasts for the physical conditions in the Baltic Sea. The Baltic forecast is updated twice daily providing a 60 h forecast with hourly data for sea level variations, ice concentration and thickness at the surface, and temperature, salinity and horizontal velocities for the 3D field.

-The Baltic Sea biogeochemical model product provides forecasts for the biogeochemical conditions in the Baltic Sea, with hourly data for the parametres dissolved oxygen, nitrate, phosphate, chl-a. The product is produced by the biogeochemical model ERGOM (Neumann, 2000) one way coupled to the Baltic 3D ocean model

•RAN

-HIROMB 1989 -2014

-The reanalysis for the Baltic Sea was produced in 2014 at SMHI with the circulation model HIROMB (High-Resolution Operational Model for the Baltic). The data assimilation scheme used was a 3D Ensemble Variational data assimilation scheme. The product provides data on a 3 nautical miles grid (5.5 km) for the physical conditions

•Wave NRT (from April 2017)





For validation:

In pre-operational validadation HBM results are evaluated against, satellite based SST and ice products

We would like to use ocean colour products – better quality needed.

In future we'd like to use altimeter SWH products for validation of wave forecasts

For assimilation:

Presently used in reanalyses In future will be used in assimation of NRT forecasts





CMEMS Ocean State Report

Written by 80 European scientific experts from more than 25 institutions, this first Ocean State Report issue is a step forward into the development of regular annual reporting on the state and health of the Global Ocean and European Seas based on marine environment monitoring capabilities of the Copernicus Marine Environment Monitoring Service. Download the Ocean State Report 2016 from the Journal of Oceanography site: http://www.tandfonline.com/doi/full/10.1080/1 755876X.2016.1273446











FEEL LIKE JOINING THE COPERNICUS MARINE BLUE COMMUNITY ?

- ★ <u>http://marine.copernicus.eu/</u>
- ★ Contact <u>servicedesk.cmems@mercator-ocean.eu</u>
- ★ Share on <u>http://forum.marine.copernicus.eu/</u>
- ★ Join the Partnership Meeting Place <u>https://www.linkedin.com/groups/8243515</u>
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