

# COPERNICUS MARINE SERVICE



Marine Monitoring



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Marine  
Monitoring

<http://www.marine.copernicus.eu>

The screenshot shows the homepage of the Copernicus Marine Environment Monitoring Service. At the top, there's a header with the European Commission logo and the service name. Below this is a navigation bar with links like 'ABOUT US', 'MARKETS & BENEFITS', 'NEWS', 'SCIENCE & MONITORING', 'TRAINING & EDUCATION', and 'SERVICES PORTFOLIO'. The main content area features a large banner with the text 'ACCESS YOUR OCEAN INFORMATION' and a 'GETTING STARTED' button. Below the banner are three main sections: 'OCEAN PRODUCTS' (with a 'DATA' button), 'OCEAN MONITORING INDICATORS' (with a 'TRENDS' button), and 'OCEAN STATE REPORT' (with an 'EXPERTISE' button). On the right side, there's a 'SHORT-CUT TO SERVICES' sidebar with links to 'REGISTER NOW!', 'SCIENTIFIC QUALITY', 'ONLINE TUTORIALS', and 'COLLABORATIVE FORUM'. Below this is a 'LATEST NEWS FLASH' section with a date '2018 22 MAR' and a link to 'ALL NEWS FLASH'. At the bottom, there's a section titled 'COPERNICUS MARINE SERVICE AND OCEAN ENERGY EUROPE PARTNERSHIP KICK-OFF IN BRUSSELS' with a 'READ MORE' button. To the right of this section is a 'SAVE THE DATE' graphic for the 'Copernicus Marine Service and Ocean Energy Europe Partnership Kick-Off in Brussels' on April 23, 2018. The bottom left corner has a sidebar with links for 'EVENTS AGENDA', 'PARTNERS AND STAKEHOLDERS', 'FOCUS ON', and 'TRAINING'.

- One Single Portal
- MARINE PRODUCTS
- **OPEN&FREE**



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# Ocean Data & Information

## OCEAN PRODUCTS

Ocean product catalogue, to download or visualize data across more than 10 variables, including historic, current and forecasted data.

DATA



## OCEAN MONITORING INDICATORS

Essential variables monitoring the health of the ocean

TRENDS



## OCEAN STATE REPORT

Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events

EXPERTISE



ONLINE CATALOGUE

YOUR SEARCH

Found 151 ocean products matching your criteria.

REGIONAL DOMAIN

PARAMETERS

TEMPORAL COVERAGE

PRODUCT WITH DEPTH LEVEL

GLOBAL\_ANALYSIS\_FORECAST\_PHY\_001\_024

GLOBAL OCEAN 1/2° PHYSICS ANALYSIS AND FORECAST UPDATED DAILY

MODEL

T bottomT S SSH UN MLD SIC SIT SILV

0.003 degree x 0.003 degree (50 depth levels)

From 2005-12-27 to Present

monthly-mean, daily-mean, hourly-mean

GLOBAL\_ANALYSIS\_FORECAST\_BIO\_001\_014

GLOBAL OCEAN BIOGEOCHEMISTRY ANALYSIS AND WEEKLY FORECAST

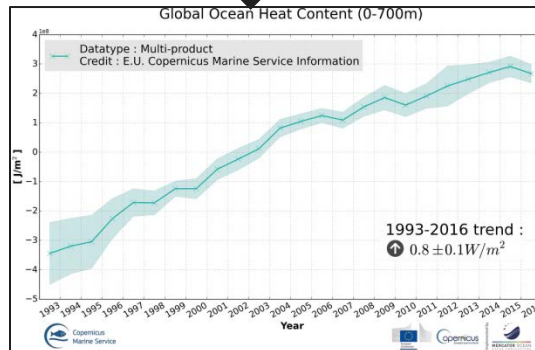
MODEL

CHL PHYC O2 NO3 PO4 SI FE PP

0.5 degree x 0.5 degree (50 depth levels)

From 2012-01-01 to Present

weekly-mean



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# OCEAN STATE REPORT FINDINGS IN THE BLACK SEA

## Decline of the Black Sea oxygen inventory

The Black Sea is entirely anoxic except for a thin ventilated surface layer, about 10 % of its volume. During the past 60 years, following a trend recently intensified by atmospheric warming, the vertical extent of this oxygenated layer has narrowed from 140m to 90m. The three Argo profilers active for 2016, although hardly representative for a basin average, suggest an ongoing deoxygenation trend and reach an average oxygen penetration depth of 72m.

*Typical summer profiles of (a) temperature, (b) practical salinity, (c) Brunt-Väisälä frequency, (d) potential density anomaly and (e) oxygen concentration illustrating the vertical structure of the central Black Sea.*



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# OCEAN DATA, A PUBLIC GOOD

**REANALYSES**  
~25 years



**REAL-TIME**  
Daily, hourly



**FORECAST**  
5 to 10 days

**ESSENTIAL  
OCEAN  
VARIABLES**



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



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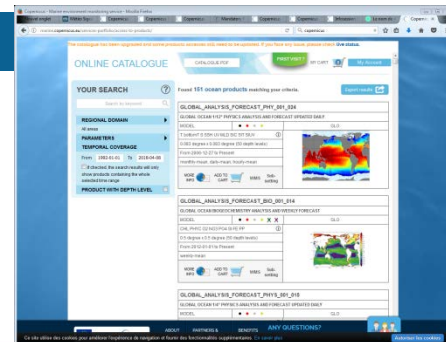


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# Marine.copernicus.eu

## ACCESS TO DATA & INFORMATION

Free and open access  
to worldwide Ocean information  
[marine.copernicus.eu](https://marine.copernicus.eu)



• SEARCH  
& BROWSE



• DISCOVER  
& VISUALISE



• REGISTER



• DOWNLOAD



• COMPUTE



• JOIN UP



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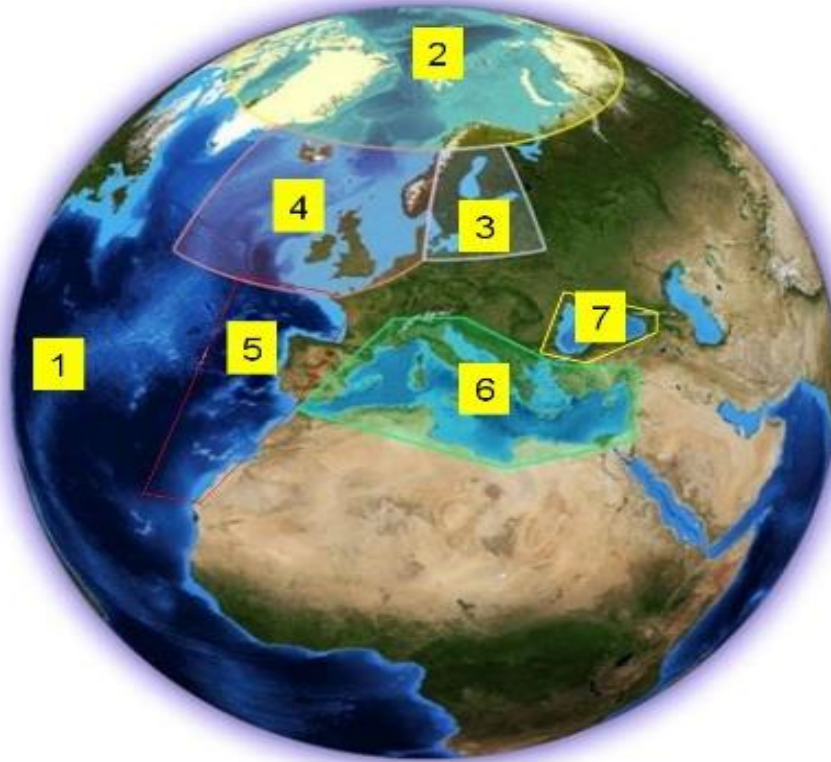
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# GLOBAL OCEAN AND EUROPEAN REGIONAL SEAS



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



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# OUR USER' APPLICATIONS ARE ABOUT:

MARITIME  
SAFETY



Copernicus Marine Service supports safety at sea and pollution response

COASTAL  
& MARINE  
ENVIRONMENT



Copernicus Marine Service contributes to coastal management and environmental impact assessment

MARINE  
RESOURCES



Copernicus Marine Service contributes to the sustainable management of marine resources

WEATHER,  
CLIMATE  
& SEASONAL  
FORECASTING



The Copernicus Marine Service synthesizes the

**POLICY-MAKERS**

**SCIENCE**

**NGOs**

**GENERAL PUBLIC**

**BUSINESS**

**PUBLIC SERVICES**

**> 12 000 subscribers  
worldwide – 2/3 are active  
users**





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## EXAMPLES OF USE IN THE BLACK SEA

- Ship Routing
- Support to MSFD Directive
- Water Quality Monitoring



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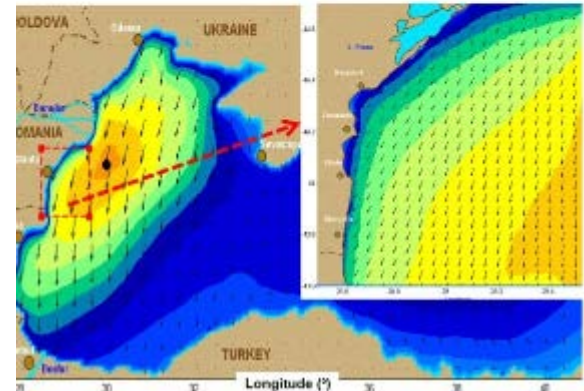
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# SHIP ROUTING IN THE BLACK SEA

## SUPPORTING SHIP ROUTING IN THE BLACK SEA



- One of the key factors in the maritime navigation is the knowledge of the areas that are the most affected by extreme events.
- DAMWAVE project helps identifying areas where storms are the most frequently encountered in order to better choose maritime routes.
- <http://marine.copernicus.eu/wp-content/uploads/use-cases/supporting-ship-routing-black-sea.pdf>



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## SUPPORTING MSFD IN THE BLACK SEA

# SUPPORTING THE MSFD DIRECTIVE IN THE BLACK SEA



- The Black Sea has suffered from severe ecological degradation since the 1970s due to concurrent effects of intense eutrophication, overfishing, outburst of gelatinous carnivores and natural climatic variations.
- **Marine modelling** at the Joint Research Centre, Directorate General (JRC) support a variety of EU policies including the **Marine Strategy Framework Directive**.
- <http://marine.copernicus.eu/wp-content/uploads/use-cases/supporting-msfd-directive-black-sea-1.0.pdf>



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# WATER QUALITY IN THE BLACK SEA

## ISWIM: BATHING WATER QUALITY MONITORING IN THE BLACK SEA



- Mamaia along the Black Sea coast is the largest touristic seaside resort of Romania. Mamaia beach is one of the most famous beaches of the Romanian Black Sea.
- Monitoring potential impact on its environment require mitigation measures: local and regional water quality changes due to direct physical, chemical and biological disturbances need to be monitored.
- iSWIM is focused on the Bay of Mamaia and is based on an operational system (since April 2016) implemented by NIMRD/ACTION MODULERS.
- <http://marine.copernicus.eu/wp-content/uploads/use-cases/iswim-bathing-water-quality-monitoring-black-sea-1.0.pdf>



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# (USE CASES) SHOWCASING USERS AND USAGES

## SHOWCASING USE CASES ONLINE (marine.copernicus.eu)



### USE CASES

See examples of how CMEMS data is used. You can also download all use cases.

Geographical Area

Area of benefit

User typology

Product in use

All

All

Business

All

deimos  
ENGENHARIA

TELESPAZIO  
a LEONARDO and THALES company

ISQ

CGG  
Passion for Geoscience

great  
CIRCLE



DHI

NAVTOR  
e-navigation made easy

ScanNav

Les éoliennes  
flottantes du golfe  
du Lion

Blue Ltd.

Polar View  
Earth Observation for Polar Monitoring

# SUBMIT YOUR USE CASE

<http://marine.copernicus.eu/markets/submit-your-use-case/>



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Data in the Black Sea

# Which Data in the Black Sea



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# DATA PROVIDERS

- 40+ data providers throughout Europe
- State-of-the-art scientific knowledge





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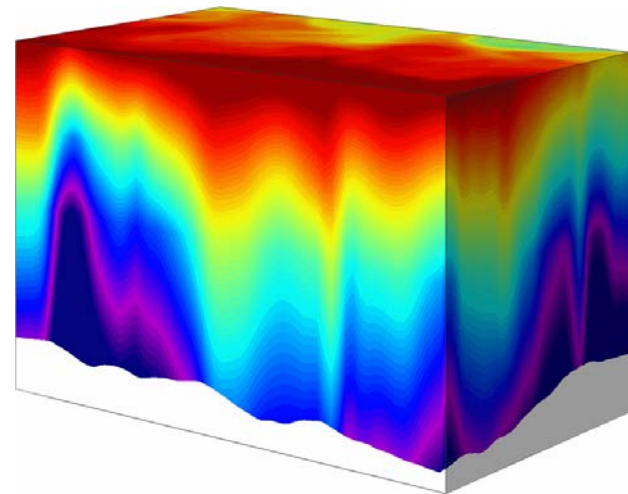
# PORTFOLIO GATHERS DATA FROM 3 SOURCES



**SATELLITE  
OBSERVATION**



**IN SITU  
OBSERVATION**



**OCEAN MODEL  
COMPUTATION**



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# Spatial and temporal characteristics

## ✓ Insitu Observations

- ✓ from surface to 2000 meters depth
- ✓ Covers long time series (25 years in the past), real time products (today)
- ✓ 3D non gridded product (available where the measure is done)

## ✓ Satellite Observations

- ✓ At the surface only
- ✓ Covers long time series (25 years in the past), real time products (today)
- ✓ 2D surface gridded product

## ✓ Ocean Models

- ✓ from surface to bottom
- ✓ Covers long time series (25 years in the past), real time products (today)  
& 5 to 10-day forecast
- ✓ 3D gridded product



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# IN-SITU DATA PROVIDERS IN THE BLACK SEA

**COPERNICUS · MARINE ENVIRONMENT MONITORING SERVICE ·**

**CMEMS IN SITU OCEAN TAC**

Contract **82-CMEMS TAC INSITU**  
Until **March 31 2021**

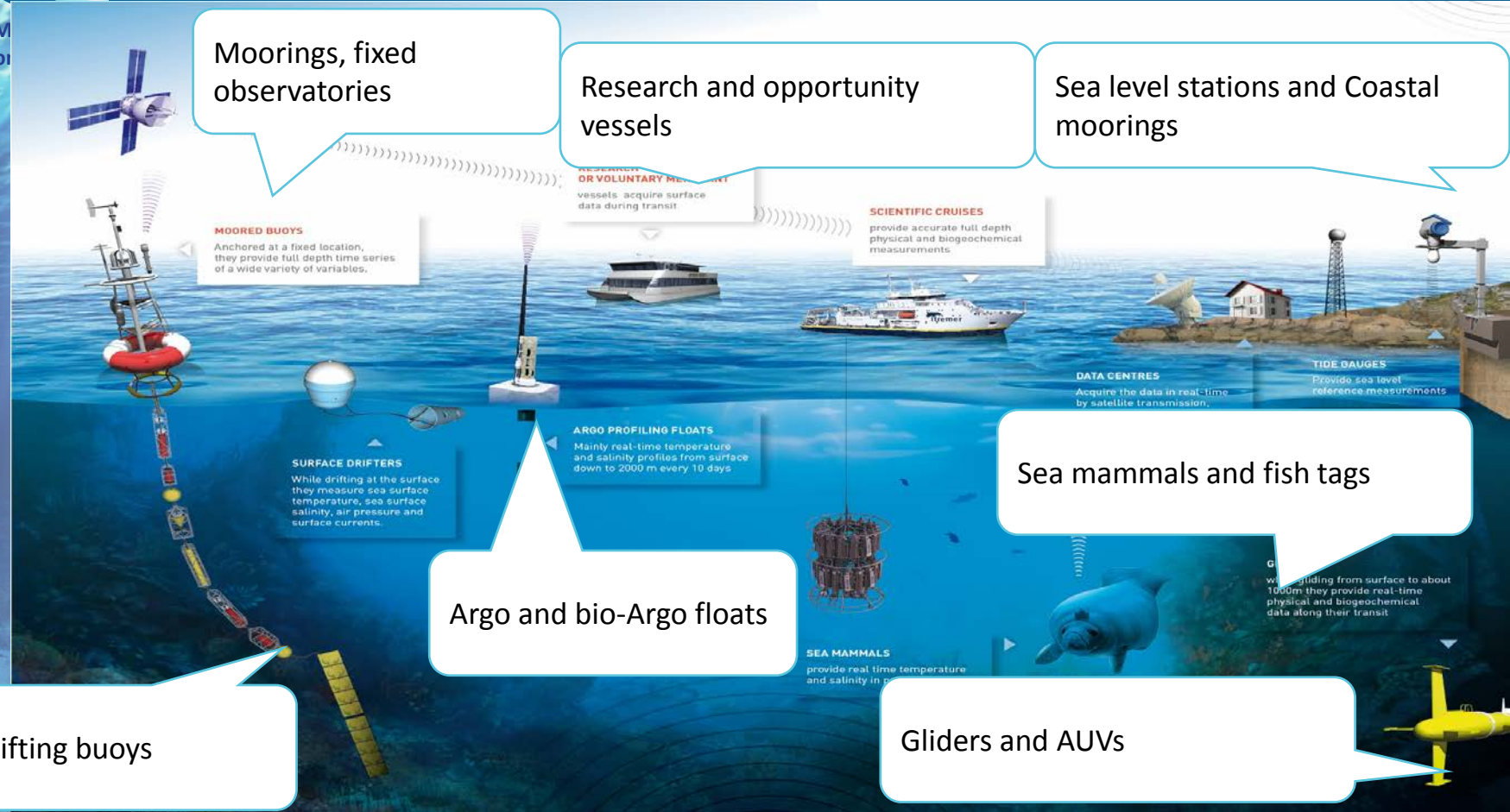








# IN SITU MULTI PLATFORM APPROACH







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# IN SITU DATA IN THE BLACK SEA for the last 60 days

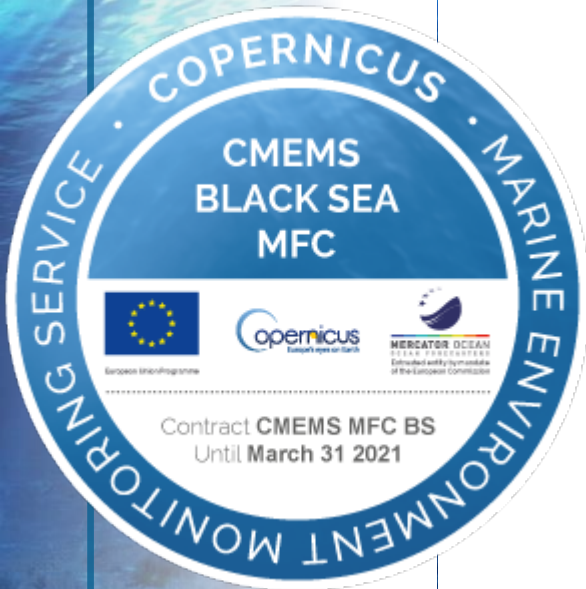






# BLACK SEA MODEL DATA PROVIDER

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**Mesoscale Ocean Circulation Models** predict Properties of seawater as it moves and evolves through the ocean basin.

Such models have sufficient resolution to **analyse and forecast** processes like eddy formation.

**Ocean Models simulate sea water properties in 3D with 5 to 10-Day forecast** when satellite data only provide with 2D coverage without any forecast.



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## BLACK SEA MODEL

Ocean Model use **Data Assimilation Techniques** to incorporate Satellite and In-situ Observations into Models. It allows to correct the ocean model to be closer to observed conditions.

Data assimilation techniques also allow to improve **forecast skills**.



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## BLACK SEA MODEL

Ocean Models simulate several properties from the Surface to the Sea Floor:

**Physical** parameters:

- Temperature, salinity, currents, elevation or sea surface height (SSH), sea ice, etc...

**Bio**geochemical parameters:

- Chlorophyll-a, Primary Production, Dissolved Oxygen, etc...

**Wave** parameters:

- Significant Wave Height, ....



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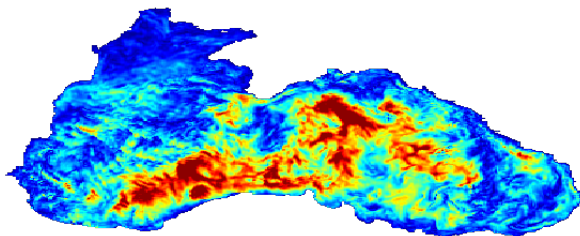




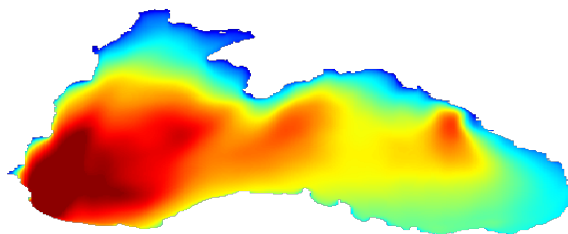


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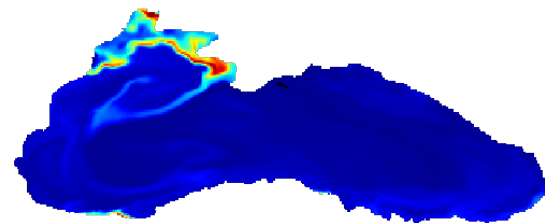
# BLACK SEA MODEL PRODUCTS



2018-03-06T00:30:00.000Z



2015-12-31T12:00:00.000Z



2017-04-01T00:00:00.000Z

## OCEAN CURRENTS

## WAVES

## CHLOROPHYLL



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# SATELLITE DATA PROVIDERS

- SEA LEVEL
- WAVE
- OCEAN COLOUR
- SEA SURFACE TEMPERATURE



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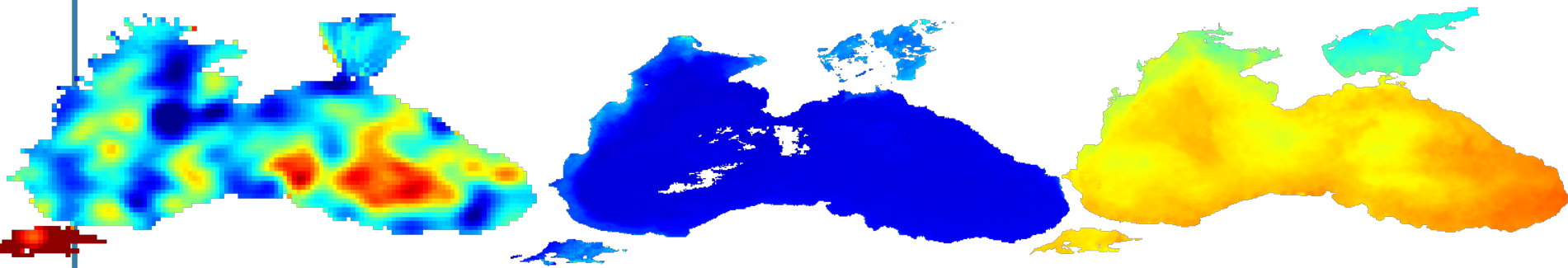
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# BLACK SEA SATELLITE PRODUCTS



2018-03-16T00:00:00.000Z

17-01-01T00:00:00.000Z

11-01T00:00:00.000Z

SEA LEVEL

OCEAN COLOUR

SEA SURFACE  
TEMPERATURE



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# CONTACT US

## JOIN THE COPERNICUS MARINE SERVICE COMMUNITY



### Web portal

[marine.copernicus.eu](http://marine.copernicus.eu)

### Service Desk's email

[servicedesk.cmems@mercator-ocean.eu](mailto:servicedesk.cmems@mercator-ocean.eu)

### Collaborative Forum

<http://forum.marine.copernicus.eu/>



### Mercator Océan

@MercatorOcean

### Copernicus EU

@CMEMS\_EU



### MercatorOcean



### Linkedin CMEMS partnership Meeting place

<https://www.linkedin.com/groups/8243515>



### Tutorials on CMEMS YouTube channel

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