



Using Copernicus Marine Service spatial data into EwE Modelling approach

7 June 2024, 9-17 CEST

Select, visualize and download datasets through the MyOcean online Copernicus tool

Gianpiero Cossarini



Summary:

- Marine Copernicus Catalogue and selection of products
- Spatial-temporal scales of products
- MyOcean online visualization
- How to access data and download

How to access and visualize the products: the Marine Data Store

Implemented by Mercator Ocean International as part of the Copernicus Programme

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Services Opportunities Access Data Use Cases User Corner About

Copernicus Marine Service

Providing free and open marine data and services to enable marine policy implementation, support Blue growth and scientific innovation.

Access Data >

DATA

OCEAN PRODUCTS

A robust ocean data catalogue, to download or visualise data including hindcasts, nowcasts and forecasts.

EXPERTISE

OCEAN STATE REPORT

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

TRENDS

OCEAN MONITORING INDICATORS

Essential variables monitoring the health of the ocean over the past quarter of a century.

EXPLORATION

OCEAN VISUALISATION

Dive into our 4D digital oceans through our 3 visualisation tools for beginner, intermediate and advanced users

How to access and visualize the products: the Marine Data Store

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MAIN VARIABLES

- Carbonate system 19
- Mixed layer thickness 17
- Nekton 1
- Nutrients 16
- Optics 41
- Organic carbon 2
- Oxygen 26
- Plankton 75
- Salinity 38
- Sea ice 37
- Sea surface height 50
- Surface density 2
- Temperature 90
- Velocity 54
- Wave 38
- Wind 6

AREA

- Global Ocean 102
- Antarctic Ocean 4
- Arctic Ocean 50
- Atlantic: Iberia-Biscay-Ireland 42
- Atlantic: NW European Shelf 34
- Atlantic: North 60
- Baltic Sea 57
- Black Sea 41
- Europe 4
- Mediterranean Sea 46

INDICATORS & TRENDS

FEATURE TYPE

Copernicus Marine Data Store

Home > Marine Data Store

Filters

FREE-TEXT SEARCH

FAVOURITES 0

TIME RANGE

WITH DEPTH 37

DEPTH RANGE

UNIVERSE

- Blue Ocean 191
- White Ocean 40
- Green Ocean 78

Products 277

MOST POPULAR

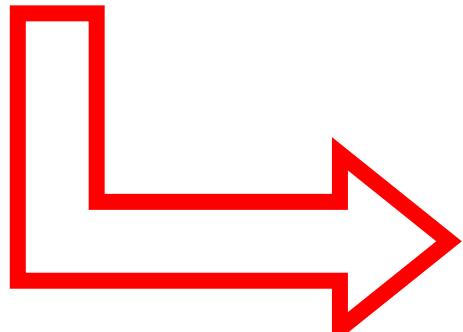
- Global Ocean Physics Analysis and Forecast
- Global Ocean Biogeochemistry Analysis and Forecast
- Global Ocean Physics Reanalysis
- Global Ocean and Forecast

RECENTLY VIEWED

- Mediterranean Sea, Bio-Geo-Chemical, L3, daily observation
- Global Ocean Physics Reanalysis
- Baltic Sea Physics Reanalysis
- Mediterranean Analysis

NEW IN COPERNICUS MARINE

- GlobCurrent
- Wind
- Wind
- MEDSEA_A



How to access and visualize the products: the Marine Data Store



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Filters

FREE-TEXT SEARCH
Free text

FAVOURITES ★ 0

TIME RANGE ▾
gg/mm/aaaa - gg/mm/aaaa
Covering full interval

WITH DEPTH 37

DEPTH RANGE ▾

UNIVERSE ▾
Blue Ocean 191
White Ocean 40
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Global Ocean and Forecast

RECENTLY VIEWED

Mediterranean Sea, Bio-Geo-Chemical, L3, daily observation

Global Ocean

NEW IN COPERNICUS MARINE

GlobCurrent

Wind

Input variables for EwE:

Chlorophyll

Carbon biomass of phytoplankton

Primary Production

Carbon biomass of zooplankton

Oxygen

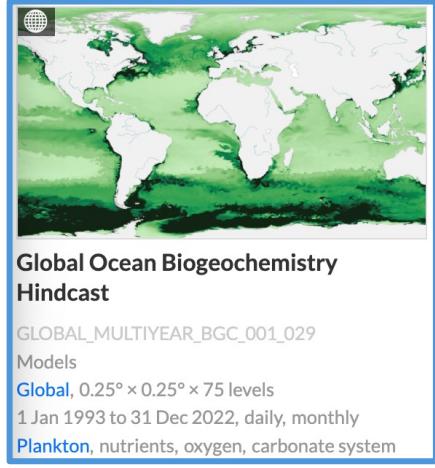
Temperature

Salinity

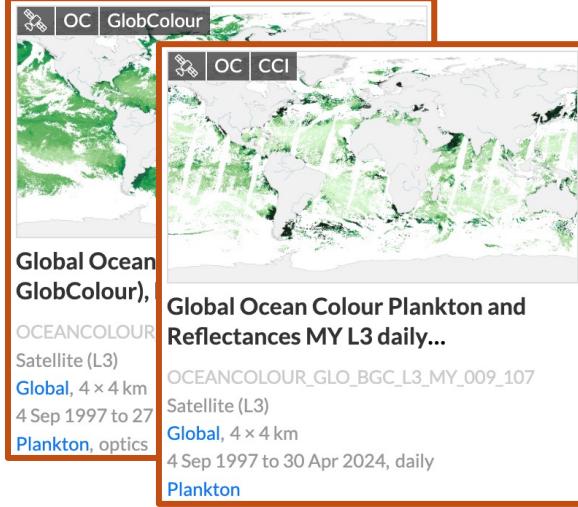
Currents

how many products for chlorophyll for a particular region (e.g. Mediterranean Sea)?

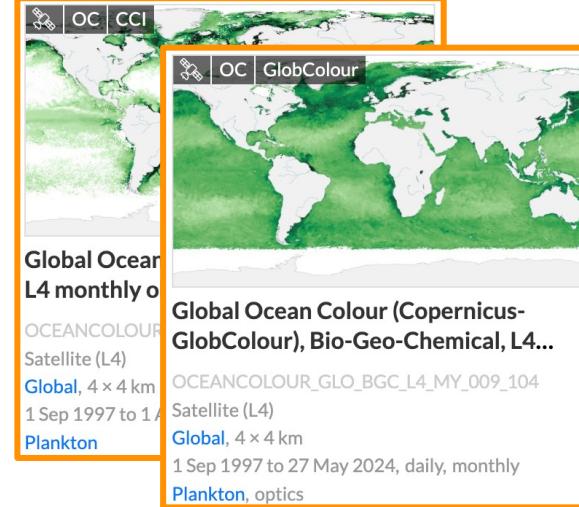
models



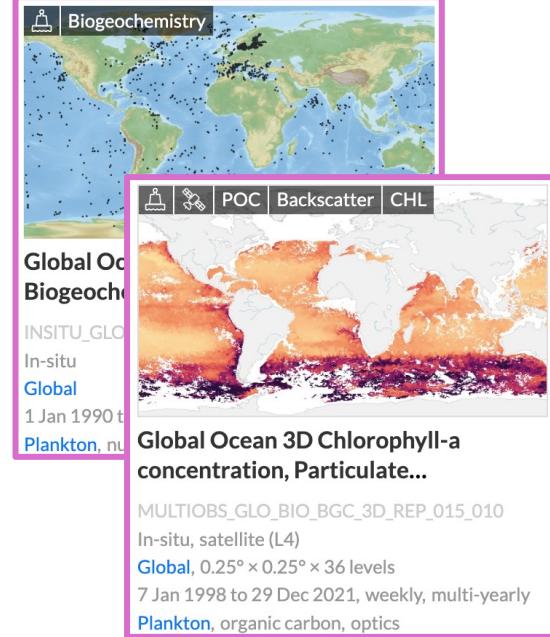
satellite L3



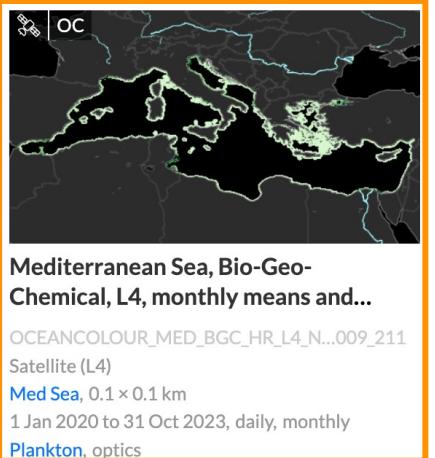
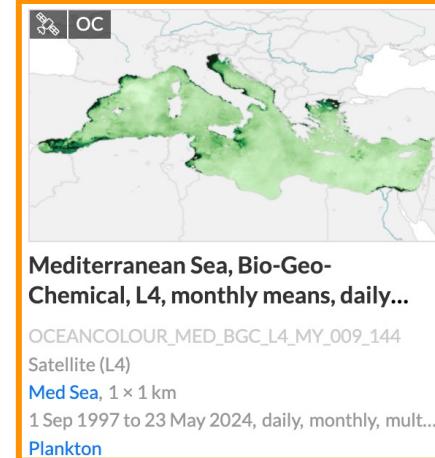
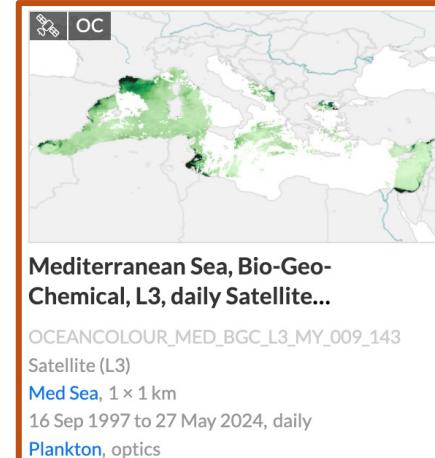
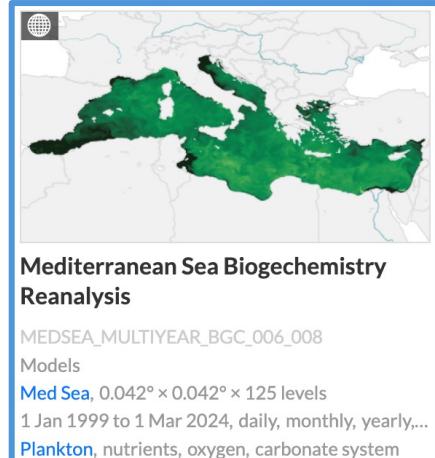
satellite L4



insitu and data driven models



regional products



In landscape ecology scale is defined as “resolution (grain) and extent” of phenomena, observations/sampling and analysis

Dungan et al., 2002

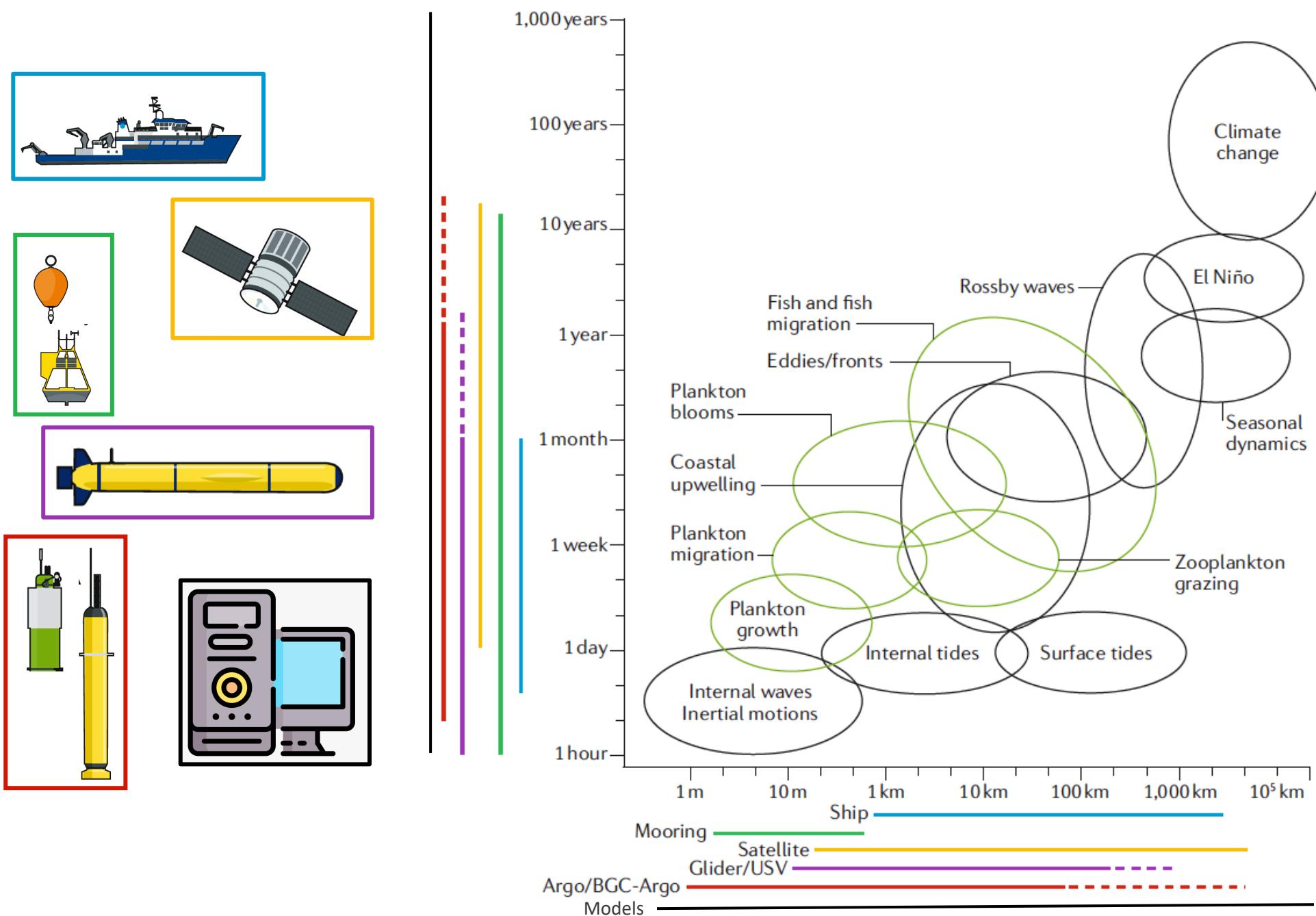
resolution refers to the size of the smallest possible feature (sampling unit or grain size) that can be detected

remote sensing images and model are composed of a matrix of picture elements (pixels), which are the smallest units of an image. Image pixels are normally square and represent a certain area on an image

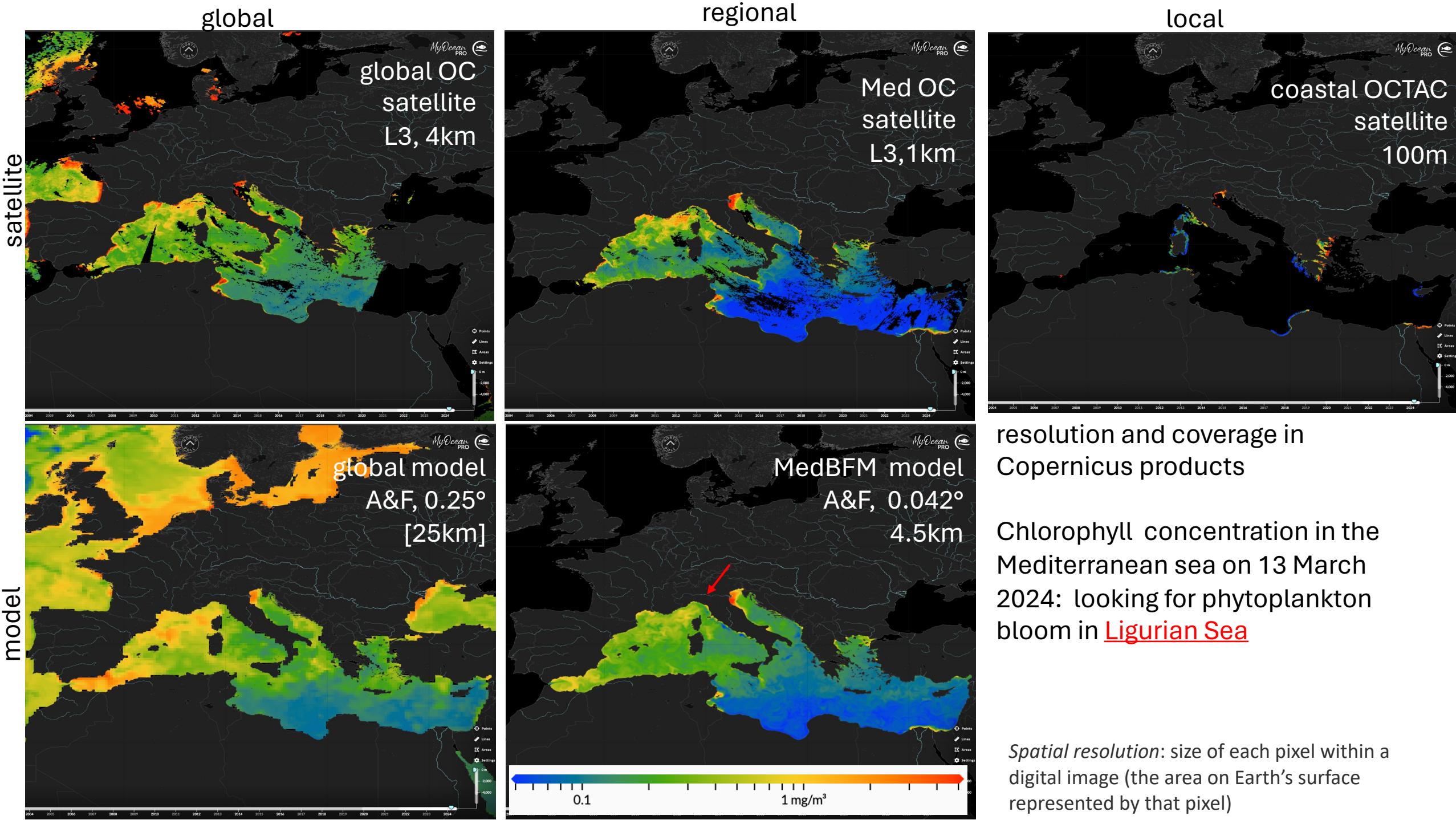
extent refers to the area/volume/period of time included in the phenomena or observed/analysed by sensors/dataset/model

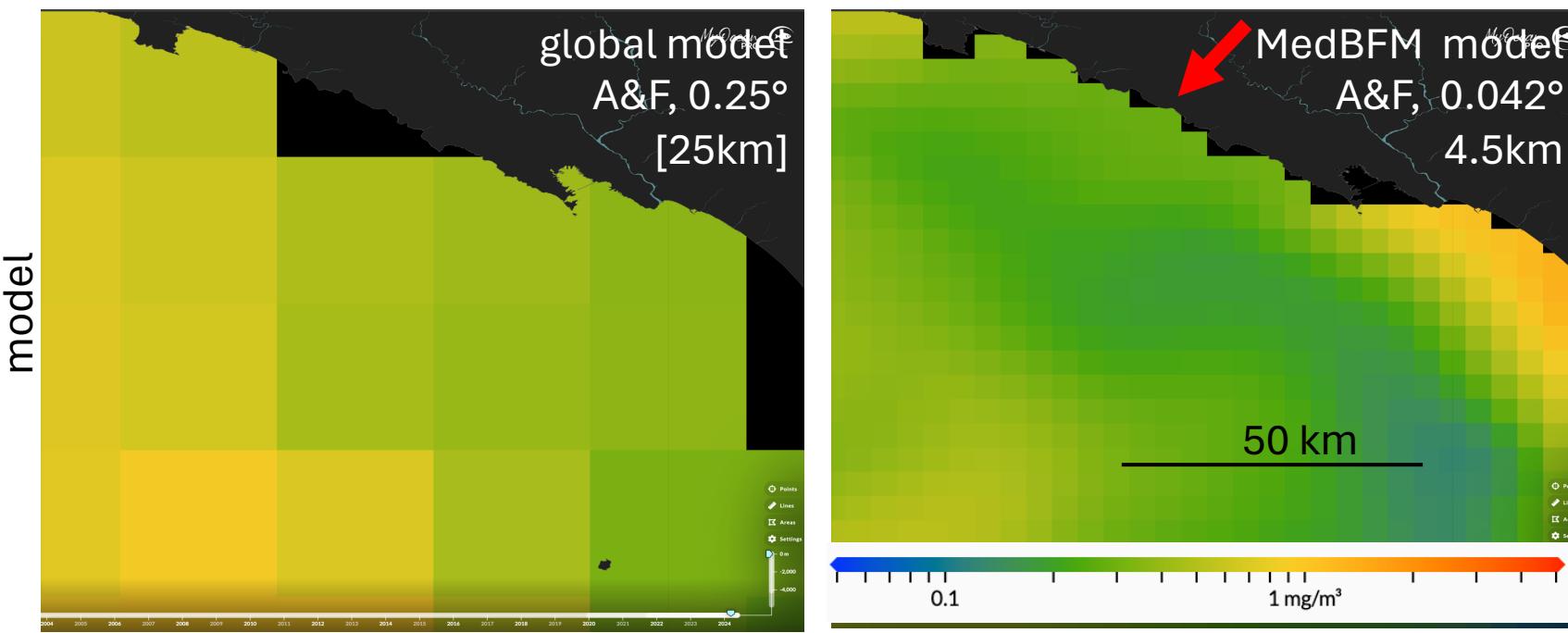
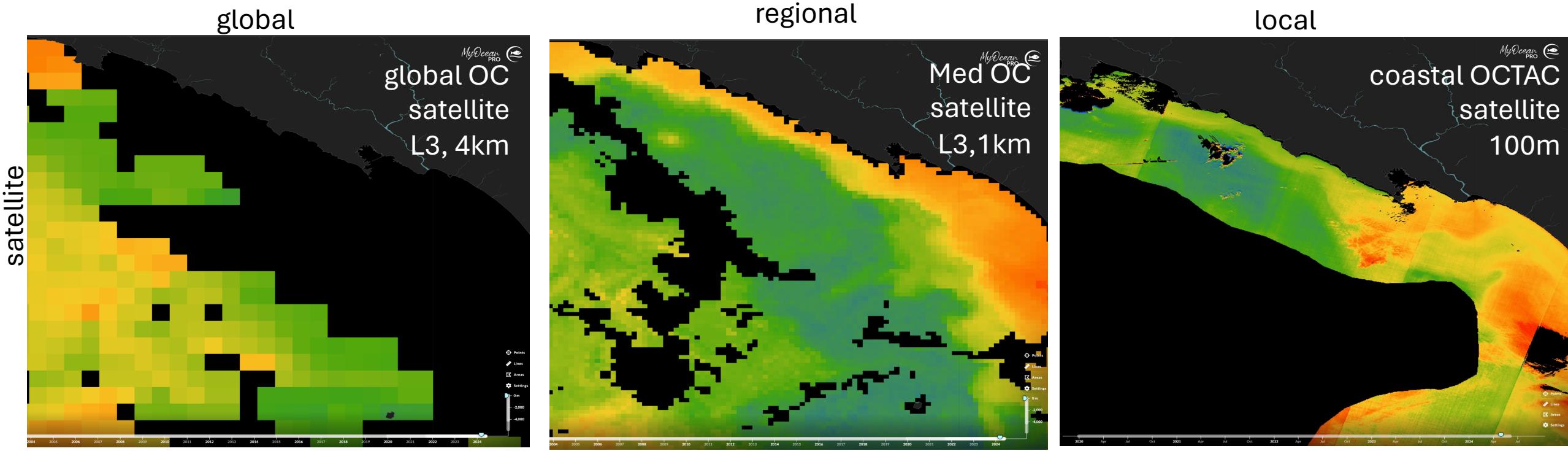
*area or period of time encompassing a phenomena
model domain
composite of satellite images*

spatial and temporal scales of ocean processes and coverage of the different platforms



physical processes
biological processes





resolution and coverage in Copernicus products

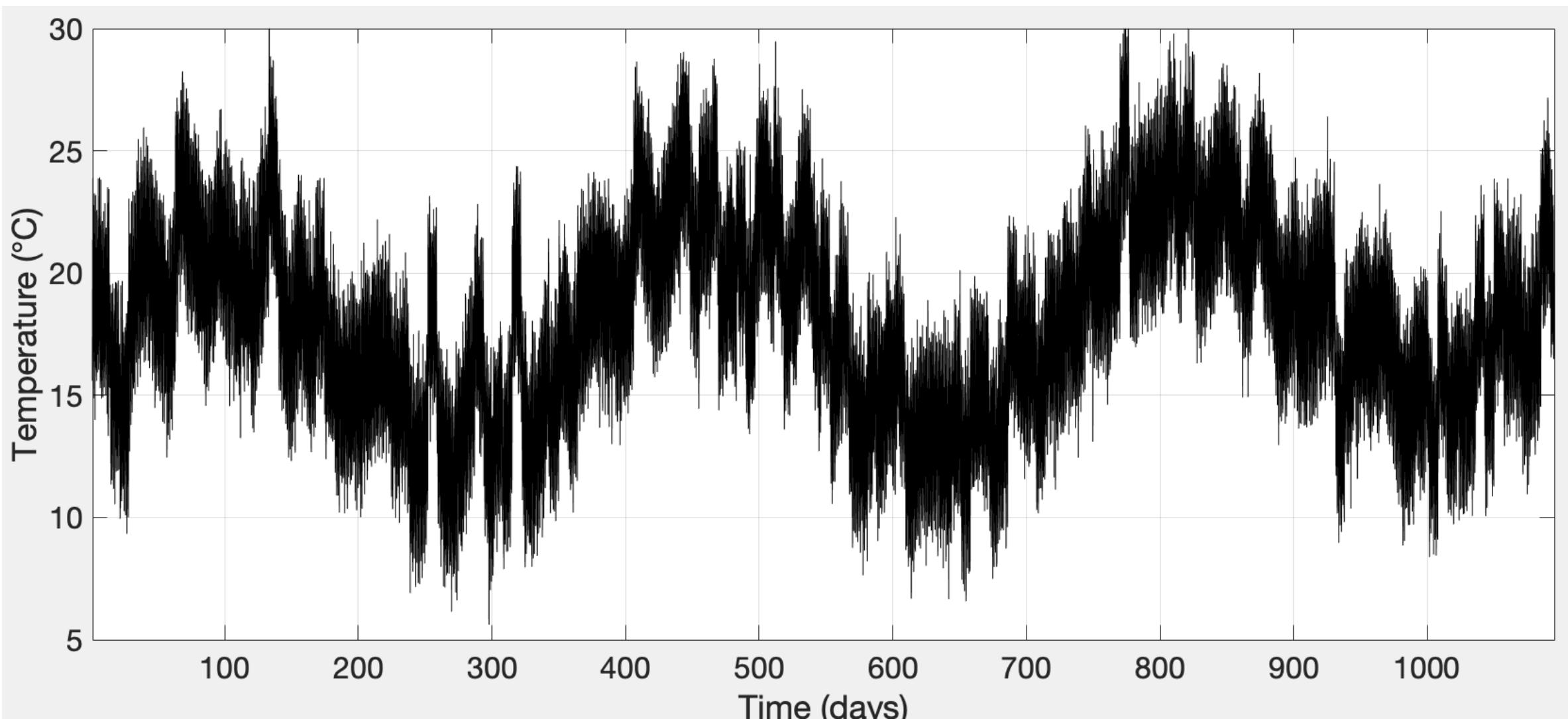
Chlorophyll concentration in the Mediterranean sea on 13 March 2024: looking for phytoplankton bloom in [Ligurian Sea](#)

Spatial resolution: size of each pixel within a digital image (the area on Earth's surface represented by that pixel)

Temporal resolution is time two subsequent data for the exact same location

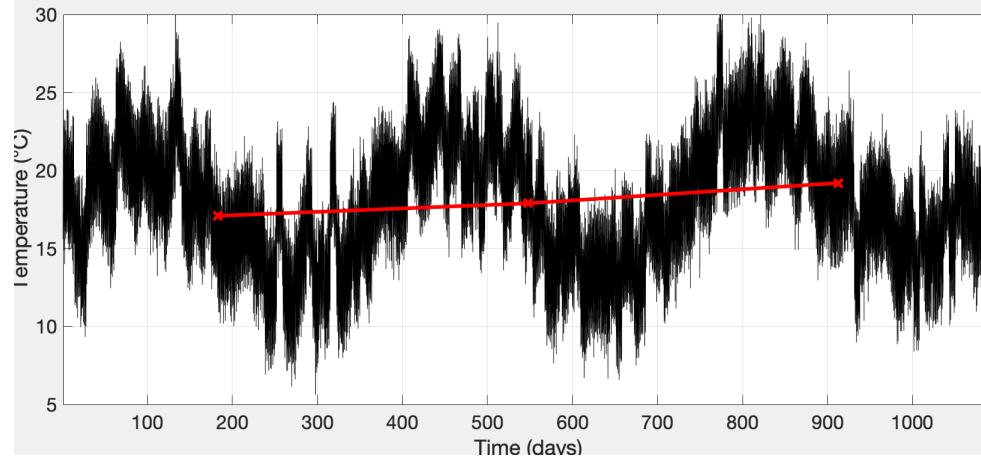
time series data represent a mixture of variation at different time scales

Example of hourly temperature with multiannual trend, seasonal cycle, monthly/weekly signals, daily cycle and random noise

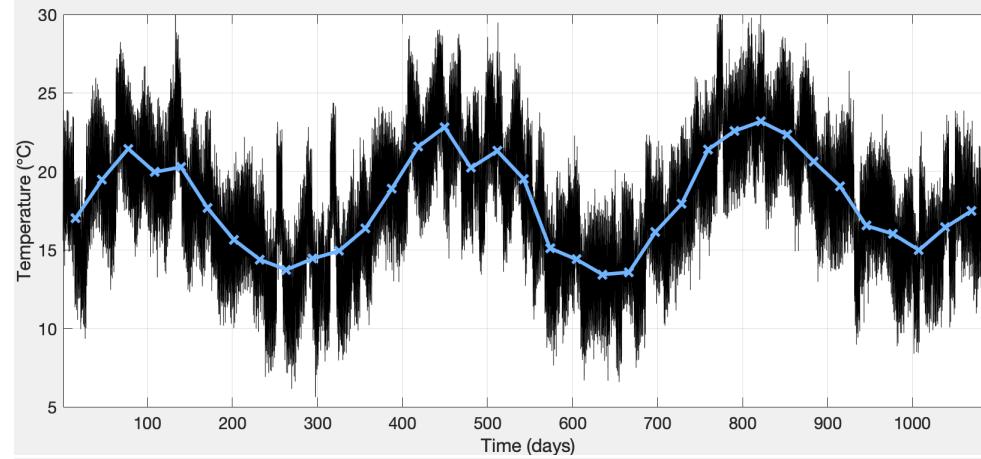


Temporal resolution: averaging and instantaneously sampling at different frequencies

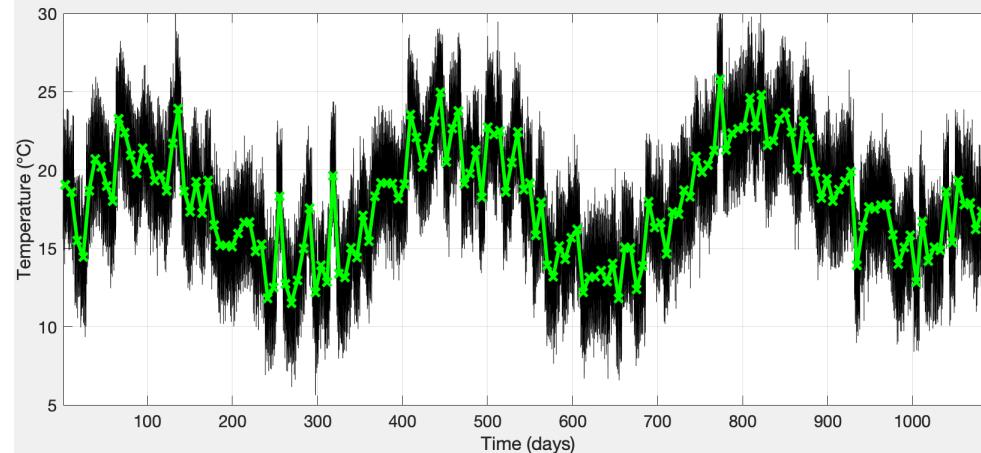
annual means



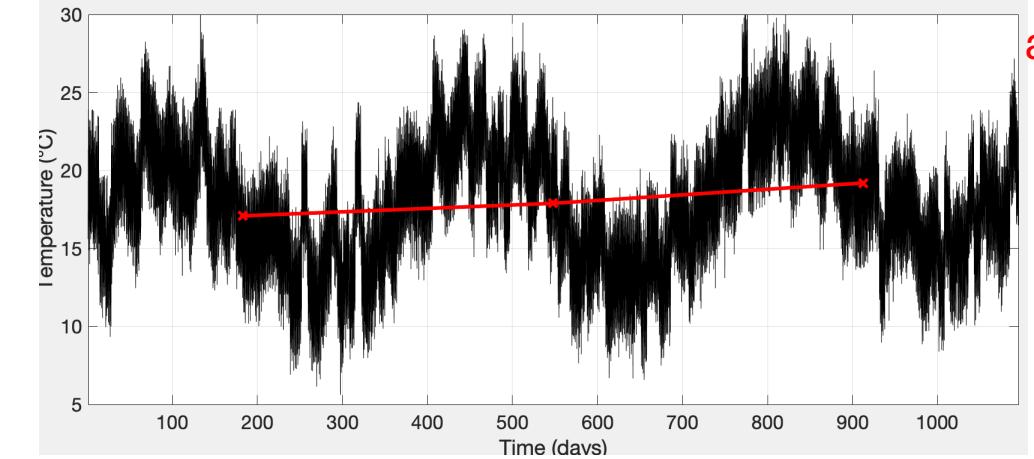
monthly means



weekly means

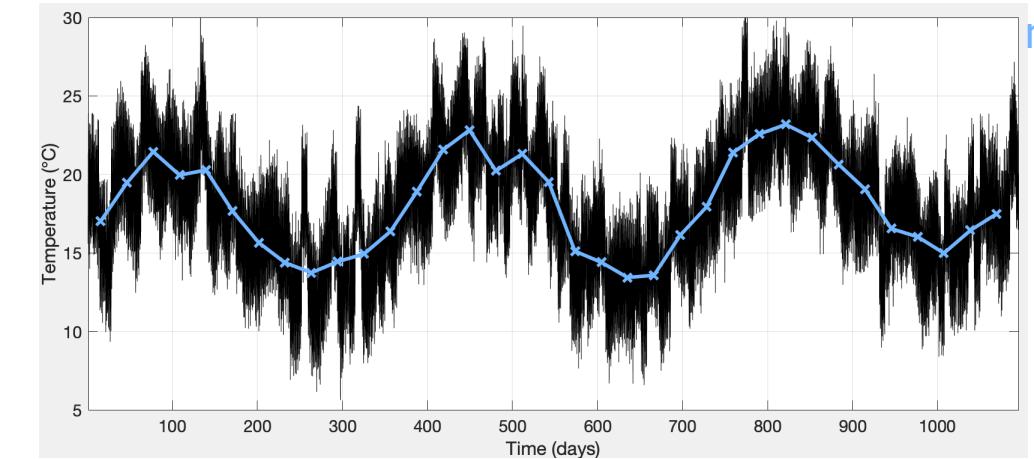


Temporal resolution: averaging and instantaneously sampling at different frequencies



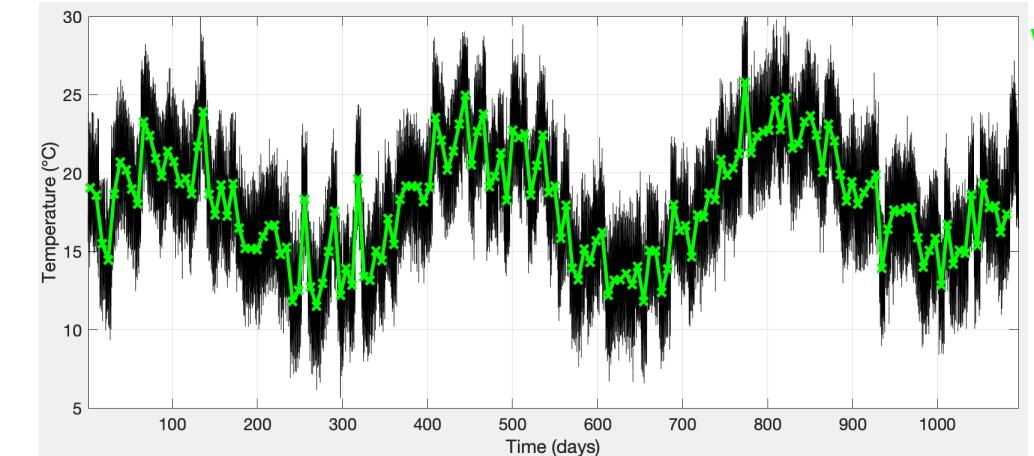
annual means

annual sampling



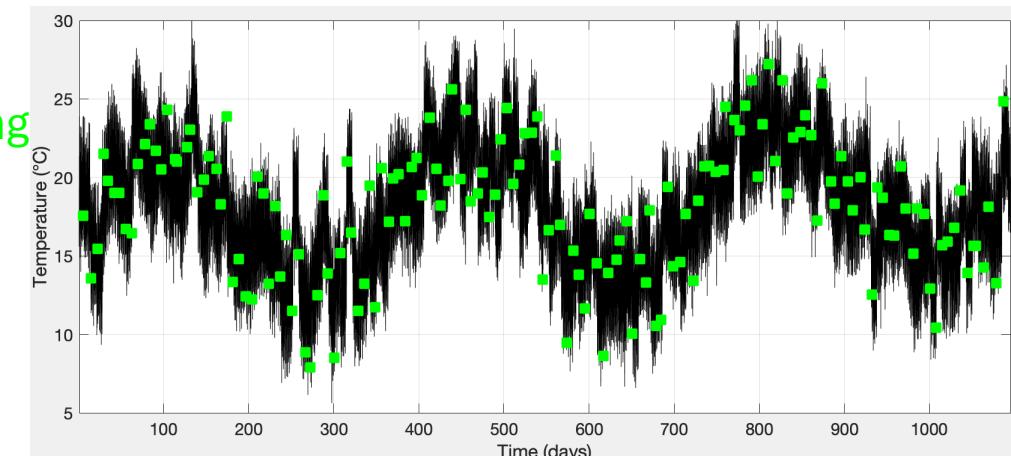
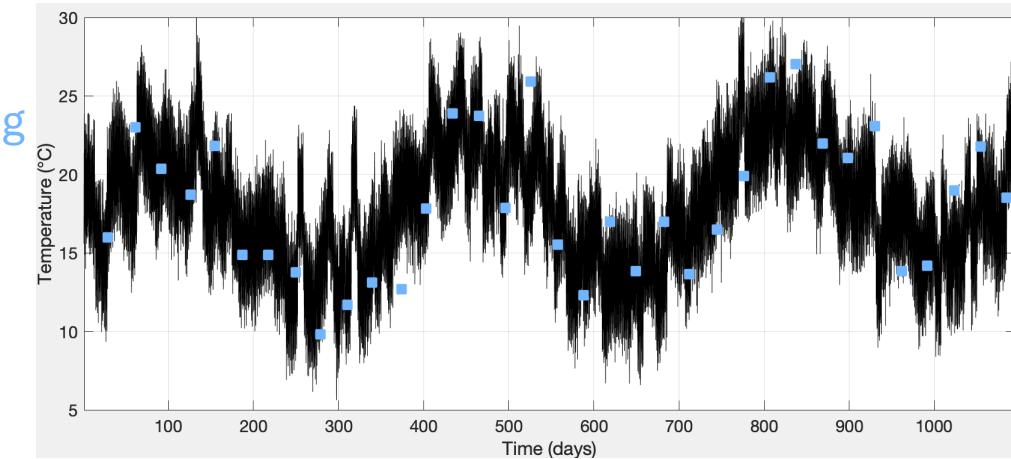
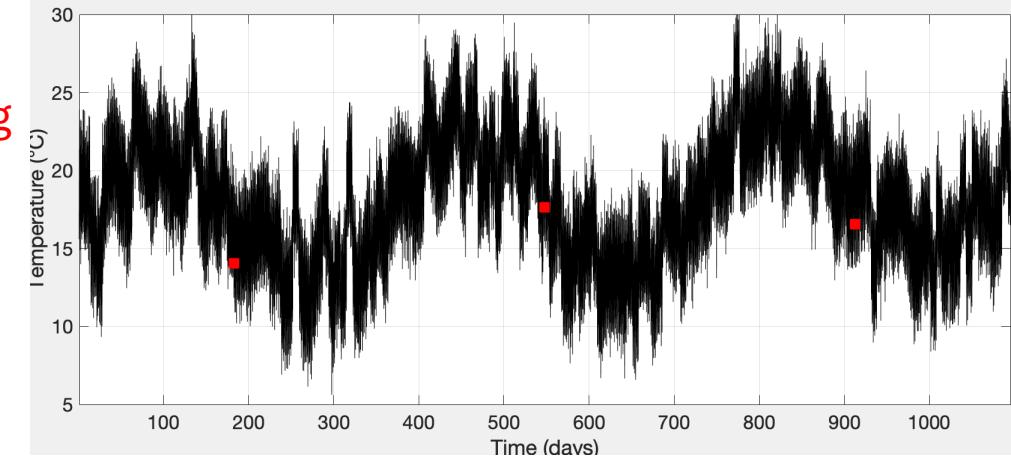
monthly means

monthly sampling



weekly means

weekly sampling



How to access and dive into products and variables: Myocean viewer

The screenshot shows the Copernicus Marine Service website. At the top, there's a navigation bar with links for Resources, News, Events, Contact, a Register button, a search icon, and a language selection for English. Below the navigation is the Copernicus Marine Service logo and a banner for the MyOcean service.

MyOcean Viewer Interface: On the left, a map of the Mediterranean Sea displays chlorophyll concentration (chl) and sea water potential temperature (thetao) data. Three specific locations are highlighted with callouts: 36.081N, 10.165E; 37.477N, 17.990E; and 39.398N, 14.717E. Each location has its own detailed plot window showing time series data for chl and thetao over a period of about a year (2020-2021).

Ocean Visualisation Box: A red-bordered box on the right contains the following text:

OCEAN VISUALISATION
Dive into our 4D digital oceans through our 3 visualisation tools for beginner, intermediate and advanced users

MyOcean Viewer: 3 tools of online visualization
What will we see? how to select a product and a dataset; how to plot a variable; how to customize a plot; how to subset a region and download data
What do you need?
A connection to the web and nothing more ... maybe curiosity

Credits: <https://vimeo.com/891402984>

Step by step

1. data search and select product

Chlorophyll (1) in the Mediterranean Sea (2) in the filter menu'

2. select the product (e.g., reanalysis of the Mediterranean Sea (3))

data.marine.copernicus.eu/products?facets=colors~Green+Ocean--mainVariables~Plankton--areas~Mediterranean+Sea

 Copernicus Europe's eyes on Earth 

Services Opportunities Access Data Use Cases User Corner About

Copernicus Marine Data Store

Home > Marine Data Store

Filters 

FREE-TEXT SEARCH
Free text

FAVOURITES  0

TIME RANGE  dd/mm/yyyy  dd/mm/yyyy 
Covering full interval

WITH DEPTH 2

DEPTH RANGE  

UNIVERSE  Blue Ocean 1  Green Ocean 12

MAIN VARIABLES  Carbonate system 2
Nutrients 2
Optics 6
Oxygen 3
Plankton 12
Salinity 1
Sea surface height 1
Temperature 1
Velocity 1
Wave 1

AREA  Atlantic: Iberia-Biscay-Ireland 1
Atlantic: North 1
Baltic Sea 1
 Mediterranean Sea 12

INDICATORS & TRENDS

FEATURE TYPE

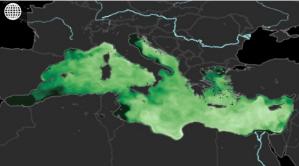
TEMPORAL RESOLUTION  Instantaneous 1
Daily 8
Monthly 5
Yearly 1
Multi-yearly 2

SOURCE  Numerical models 2
In-situ observations 1
Satellite observations 9

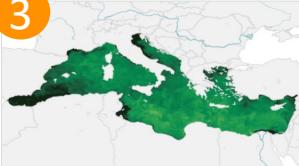
PROCESSING LEVEL

EU DIRECTIVE

Products 12

  Mediterranean Sea Biogeochemistry Analysis and Forecast

MEDSEA_ANALYSISFORECAST_BGC_006_014
Models
Med Sea, 0.042° × 0.042° × 125 levels
1 Jan 2020 to 18 May 2024, daily, monthly
Carbonate system, nutrients, optics, oxygen, plankton

 Mediterranean Sea Biogeochemistry Reanalysis

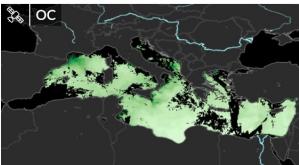
MEDSEA_MULTIYEAR_BGC_006_008
Models
Med Sea, 0.042° × 0.042° × 125 levels
1 Jan 1999 to 1 Mar 2024, daily, monthly, yearly,...
Carbonate system, nutrients, oxygen, plankton

 Mediterranean Sea, Bio-Geo-Chemical, L3, daily observation

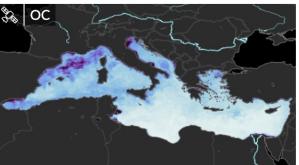
OCEANCLOUD_MED_BGC_HR_L3_N...009_205
Satellite (L3)
Med Sea, 0.1 × 0.1 km
1 Jan 2020 to 8 May 2024, daily
Optics, plankton

 Mediterranean Sea, Bio-Geo-Chemical, L4, monthly means and...

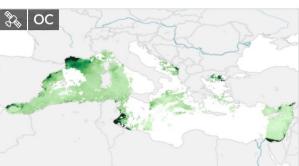
OCEANCLOUD_MED_BGC_HR_L4_N...009_211
Satellite (L4)
Med Sea, 0.1 × 0.1 km
1 Jan 2020 to 31 Oct 2023, daily, monthly
Optics, plankton

 Mediterranean Sea, Bio-Geo-Chemical, L3, daily Satellite...

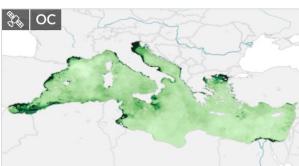
OCEANCLOUD_MED_BGC_L3_NRT_009_141
Satellite (L3)
Med Sea, 1 × 1 km
29 Apr 2023 to 9 May 2024, daily
Optics, plankton

 Mediterranean Sea, Bio-Geo-Chemical, L4, monthly means, daily...

OCEANCLOUD_MED_BGC_L4_NRT_009_142
Satellite (L4)
Med Sea, 1 × 1 km
1 Jan 2022 to 9 May 2024, daily, monthly
Optics, plankton

 Mediterranean Sea, Bio-Geo-Chemical, L3, daily Satellite...

OCEANCLOUD_MED_BGC_L3_MY_009_143
Satellite (L3)
Med Sea, 1 × 1 km

 Mediterranean Sea, Bio-Geo-Chemical, L4, monthly means, daily...

OCEANCLOUD_MED_BGC_L4_MY_009_144
Satellite (L4)
Med Sea, 1 × 1 km

 Mediterranean Sea- In-Situ Near Real Time Observations

INSITU_MED_PHYBGCWAV_DISCRET...013_035
In-situ
Med Sea

3. access to the product information

Analysis and Forecast biogeochemical model product

(1) documentations: User Manual, Quality Information Documents, Synthesis Quality Overview ...
DOI

In the **Notifications** tab (2), you have access to all the maintenances, incidents and news about the product.

The **Data access** tab (3) displays all the datasets of the product and the different data access mechanisms available (**Subset, Files and Maps**)

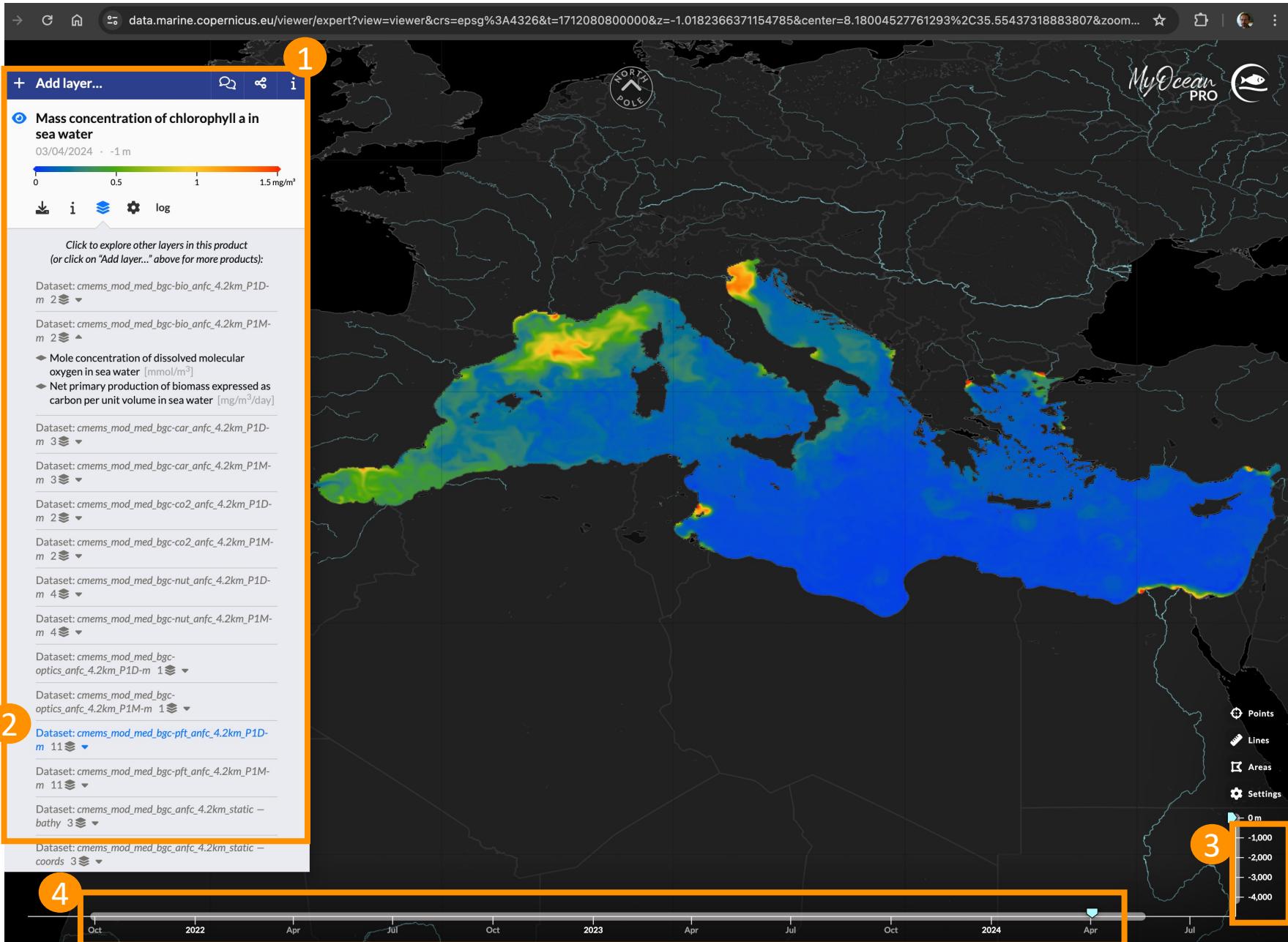
use **MyOcean viewer** (4) to plot variables

The screenshot shows the product page for the "Mediterranean Sea Biogeochemistry Analysis and Forecast". The top navigation bar includes links for Resources, News, Events, Contact, Log out (gcossarini1), a search bar, and a star icon. The main header features the Copernicus logo and the text "Copernicus Europe's eyes on Earth" and "Copernicus Marine Service". Below the header, there are links for Services, Opportunities, Access Data, Use Cases, User Corner, and About. The main title "Mediterranean Sea Biogeochemistry Analysis and Forecast" is prominently displayed, along with icons for sharing, favoriting, and viewing. A breadcrumb navigation shows Home > Marine Data Store > Product. On the left, a sidebar menu lists: Description (1), Notifications (2), Data access (3, updated), Contact, DOCUMENTATION (User Manual, Quality Information Document, Synthesis Quality Overview, Licence, How to cite), and DOI (10.25423/cmcc/medsea_analysisforecast_bgc_006_014_medbfm 4). The main content area, titled "Overview", describes the biogeochemical analysis and forecasts for the Mediterranean Sea at 1/24° resolution, mentioning the MedBFM4 model system, OASIM, OGSTM_BIOPTIMOD v4.3, and BFM v5. It also details the 3D variational data assimilation scheme 3DVAR-BIO v3.3 and the assimilation of surface chlorophyll (CMEMS-OCTAC NRT product) and vertical profiles of chlorophyll, nitrate, and oxygen (BGC-Argo floats provided by CORIOLIS DAC). The text notes that the biogeochemical MedBFM system, forced by the NEMO-OceanVar model (MEDSEA_ANALYSIS_FORECAST_PHY_006_013 product run by CMCC), produces one day of hindcast and ten days of forecast (every day) and seven days of analysis (weekly on Tuesday). A reference is given to a paper by Salon et al. (2019). A "Read more" link is present. To the right, a map of the Mediterranean Sea shows biogeochemical data with a color scale from purple to red, indicating chlorophyll concentration. The map includes a legend for depth (0 m to -4,000 m), a north arrow, and a "Settings" button. A timeline at the bottom of the map shows years from 2020 to 2024. At the bottom right, a call-to-action button says "Explore in MyOcean Pro".

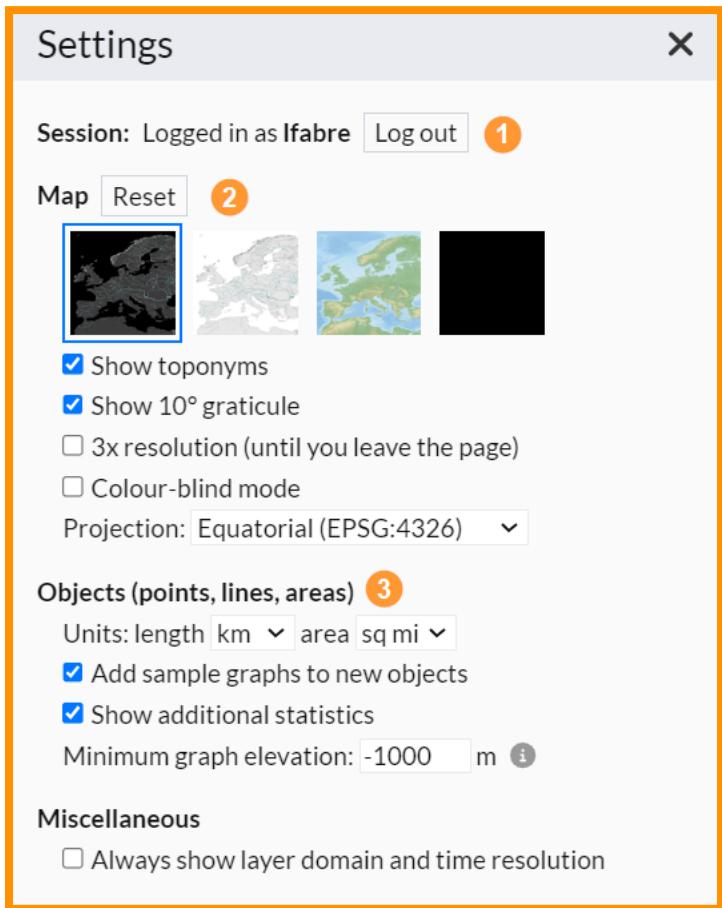
4. access to the list of all the datasets and variables you want to add on the map from the **layer panel**

the **layer menu** allows to select data and modify the appearance (1):

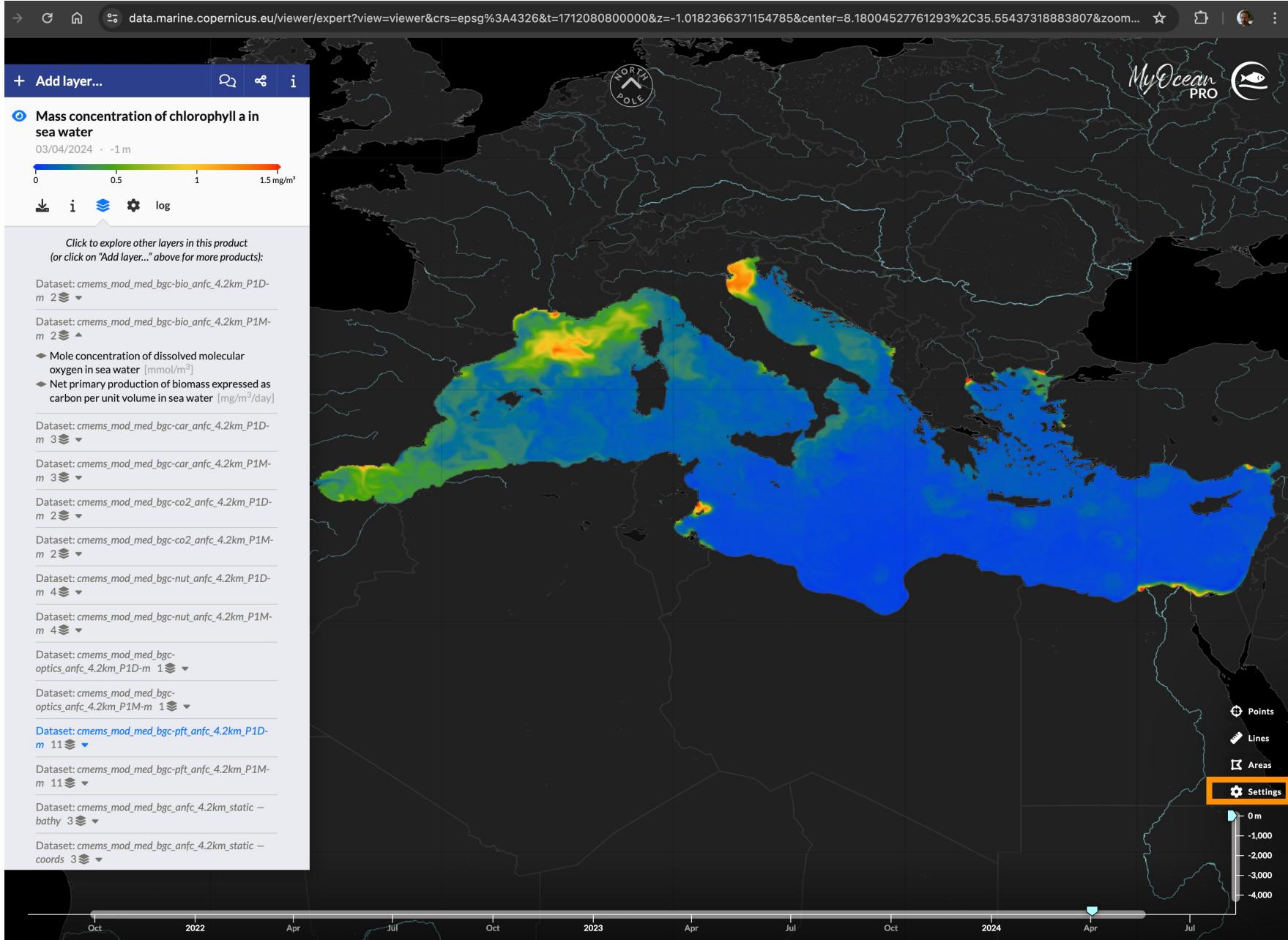
selecting **chlorophyll daily data** (2) and visualize the data according to a depth (3) and a date (4):



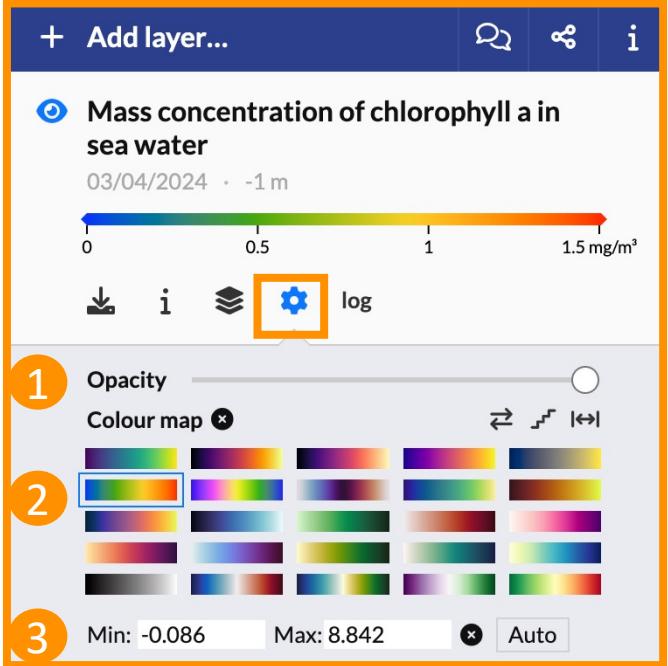
5. change setting of the map



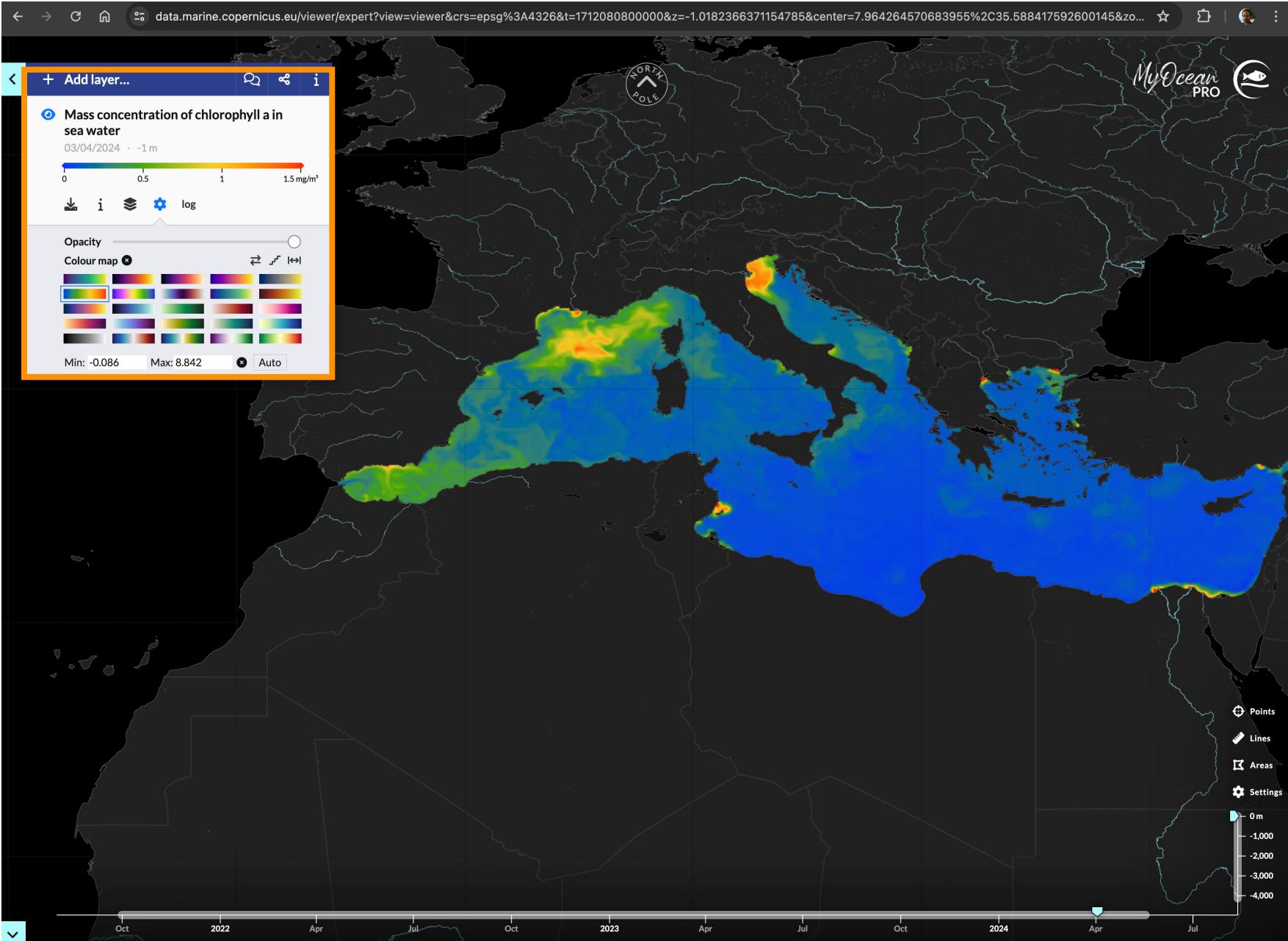
- login/logout to your Copernicus Marine account **(1)**
- change the map and projection settings **(2)**
- change object units **(3)**



6. in the layers panel, you can open the **layer configurations** by clicking on the gear icon



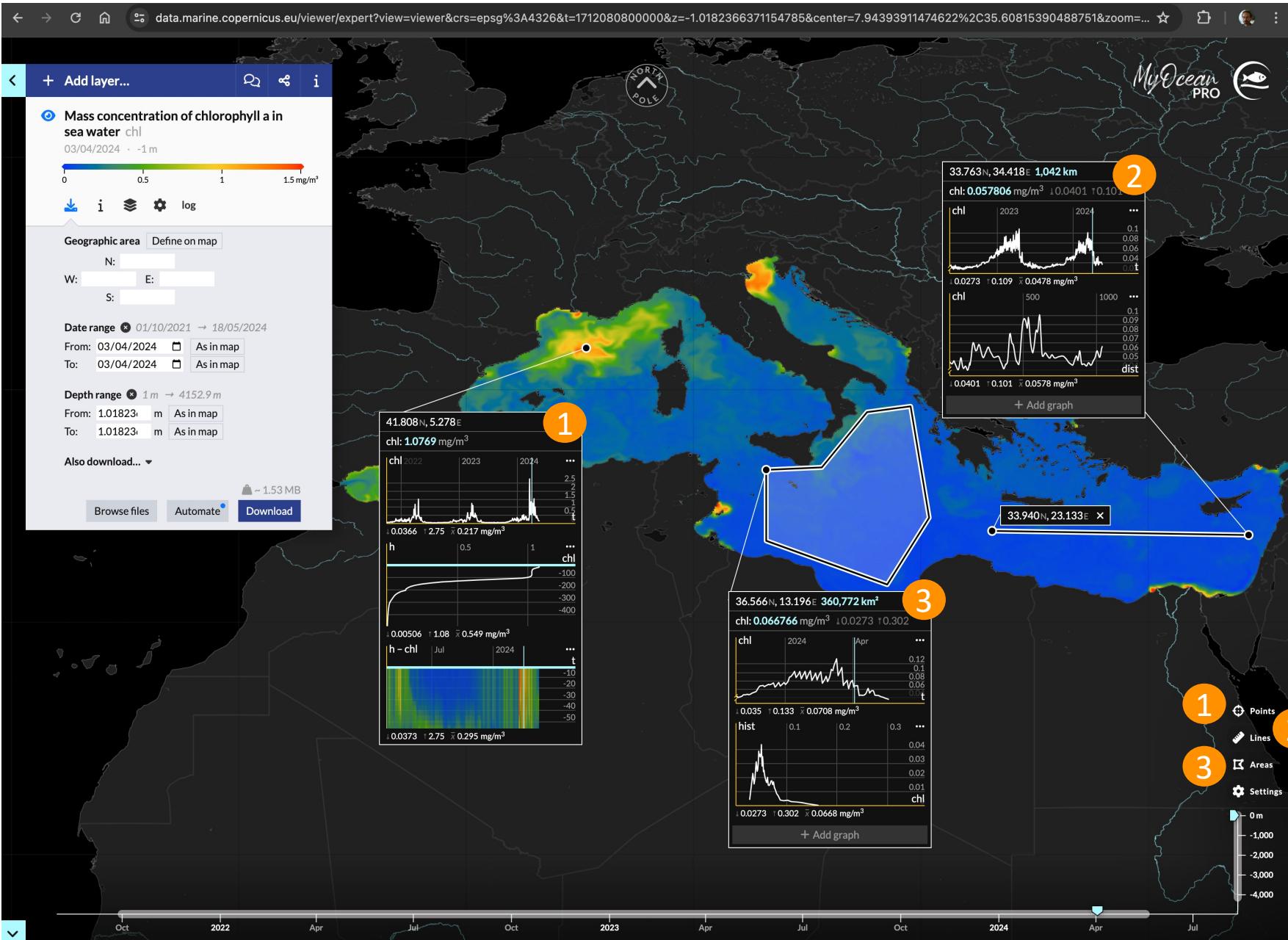
and change the **opacity (1)** of the layer, the **color map (2)** and the **minimum and maximum values** to consider (3)



7. Data exploration

add objects on the map:

- create time evolution, profile and ZT plots for a given **point (1)** in the map
- create time evolution and line plots for a transect using the **line object (2)**
- create a time evolution plot and a histogram of data frequency for a **geographic area of interest (3)**



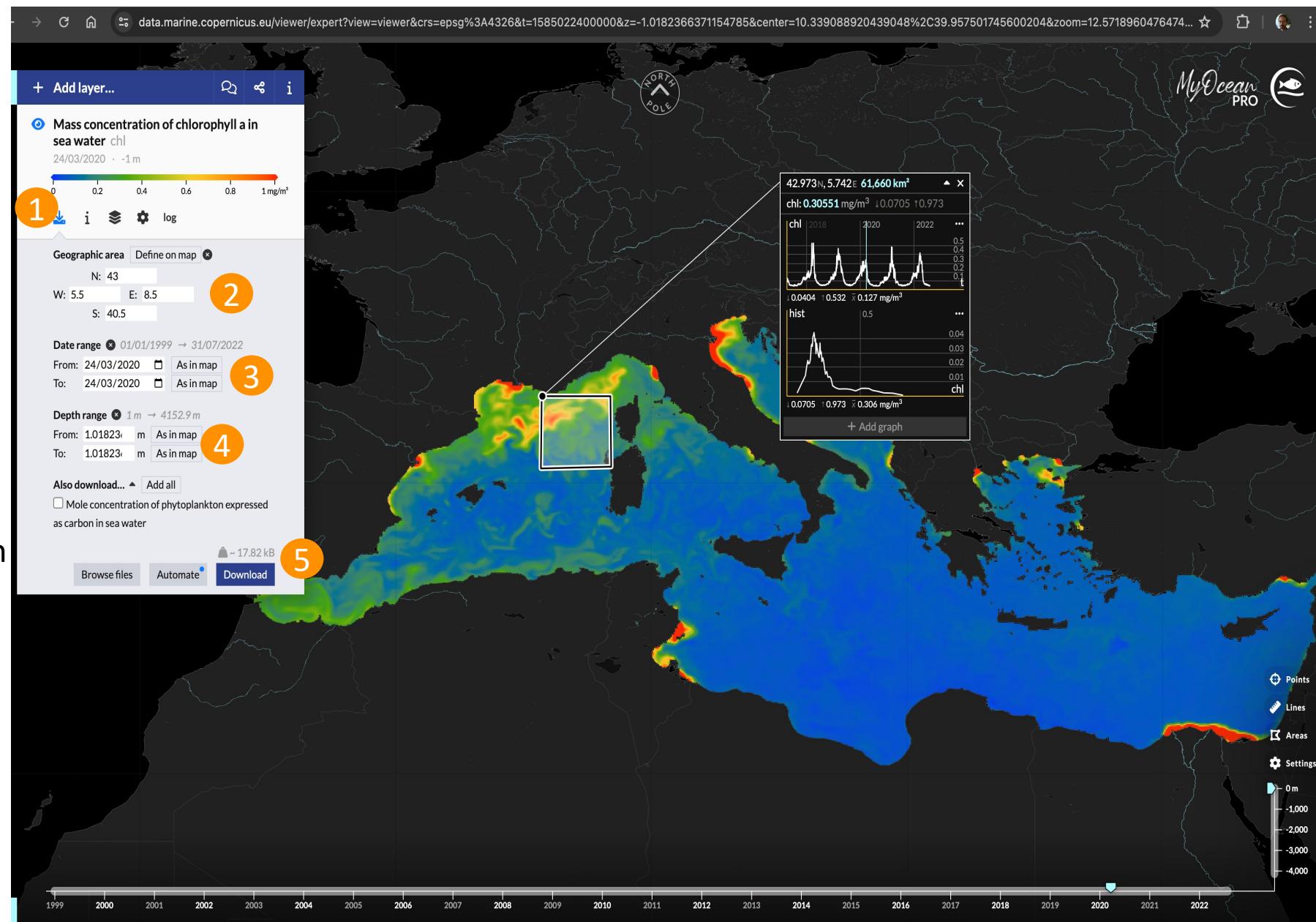
8. download data from the viewer

The **download icon (1)** allows you to define the request parameters in order to download a subset:

- geographic area **(2)**: it can be selected manually or through “define on map”
- temporal range **(3)**
- depth range **(4)**

Three download options:

- download the selected data **(5)** with indication of its size (limit 1Gb)



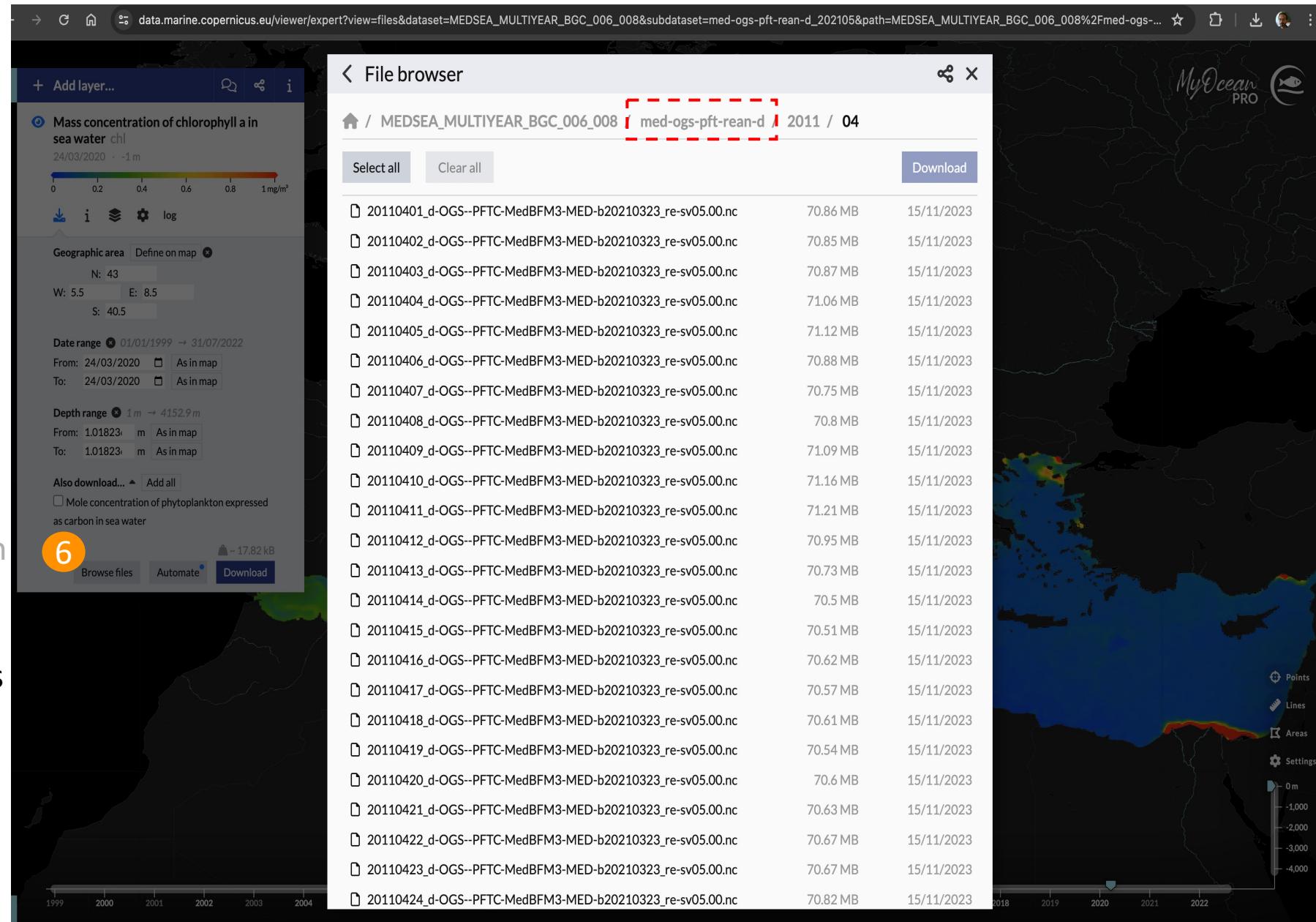
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- temporal range (3)
- depth range (4)

Three download options:

- download the selected data (5) with indication of its size (limit 1Gb)
- download the full-size files of the dataset (6), browsing folders, names in User Manual



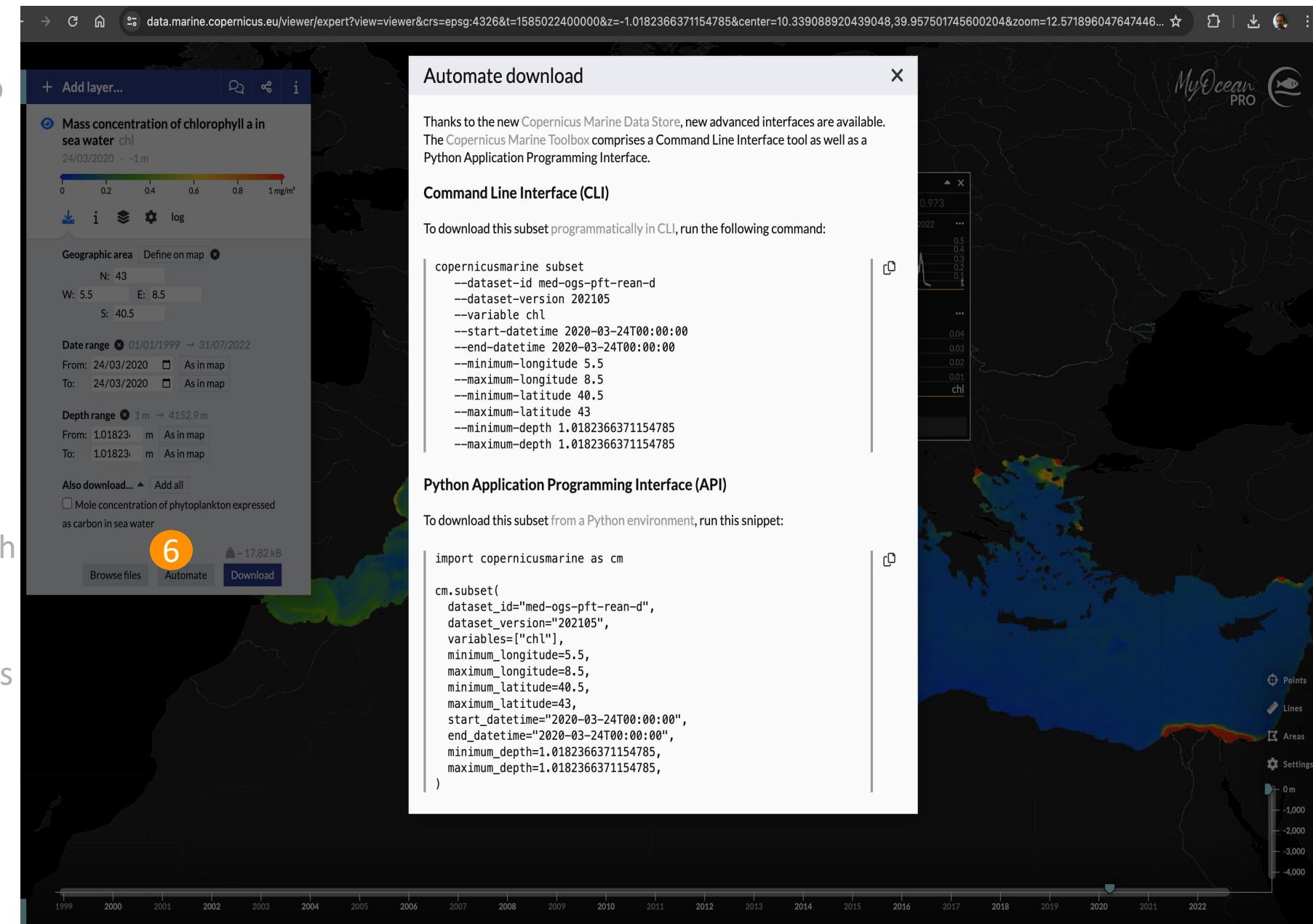
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Three download options:

- download the selected data (5) with indication of its size (limit 1Gb)
- download the full-size files of the dataset (6), browsing folders, names in User Manual
- by clicking on Automate (7), you can display the CLI and Python command lines of the Copernicus Marine Toolbox request [next lecture]





Take home messages:

- interchangeable products in the Marine Copernicus catalogue
- fit-for-purpose of products
- myocean viewer as an exploratory tool to dive into products
- documentation in an essential part for an informed and effective use of free and open data

thank you

