Using Copernicus Marine Service spatial data into EwE Modelling approach

7 June 2024, 9-17 CEST

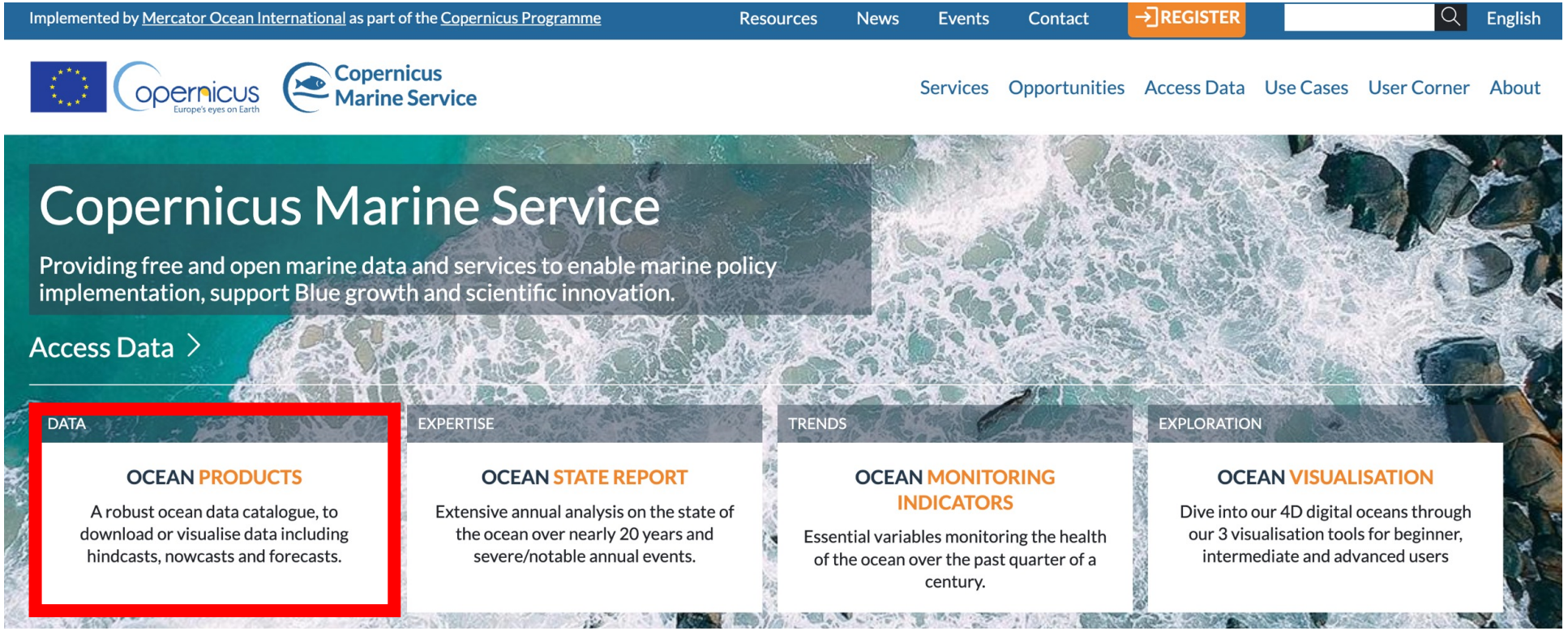
Select, visualize and download datasets through the MyOcean online Copernicus tool

Gianpiero Cossarini

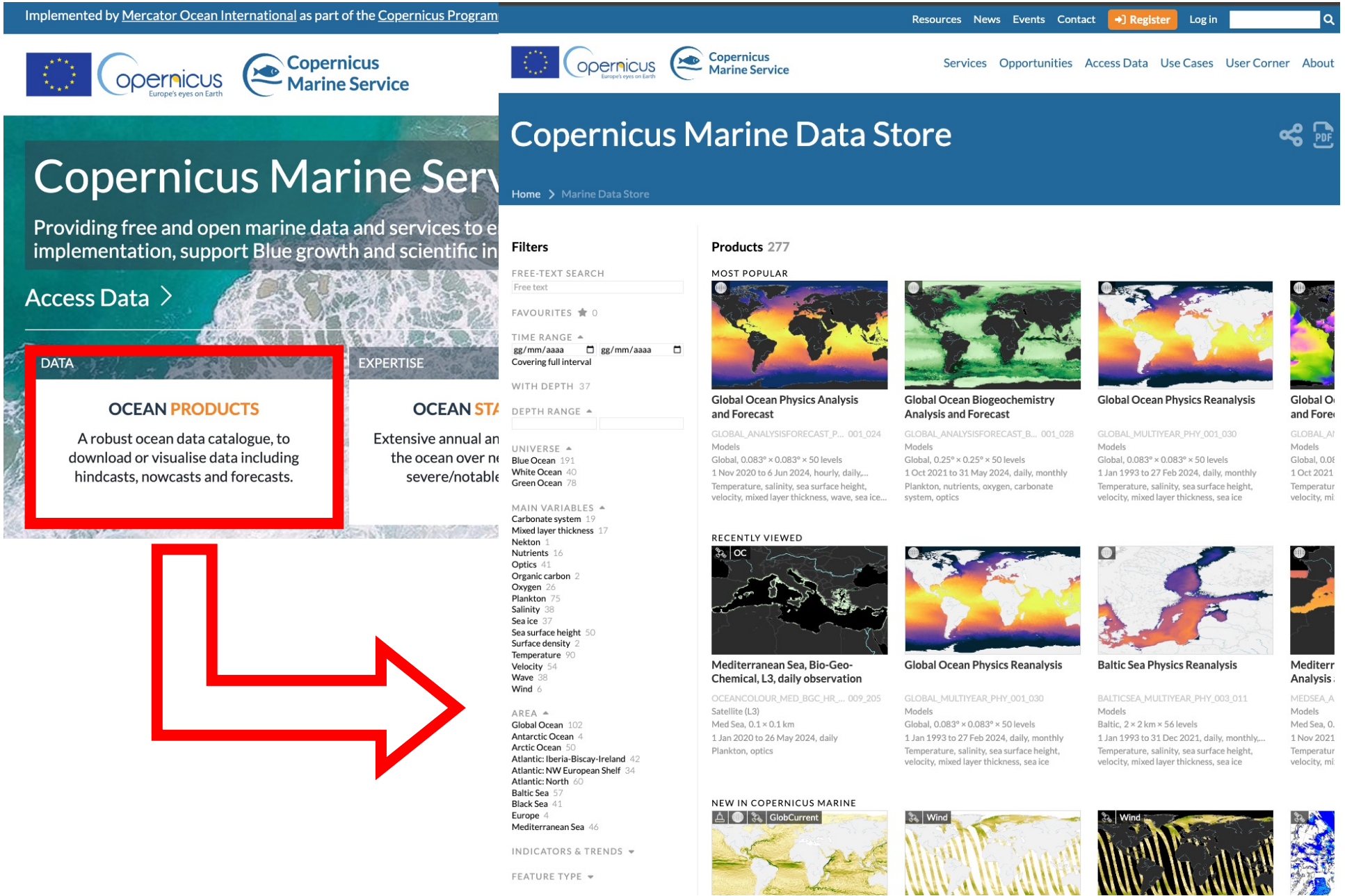
Summary:

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

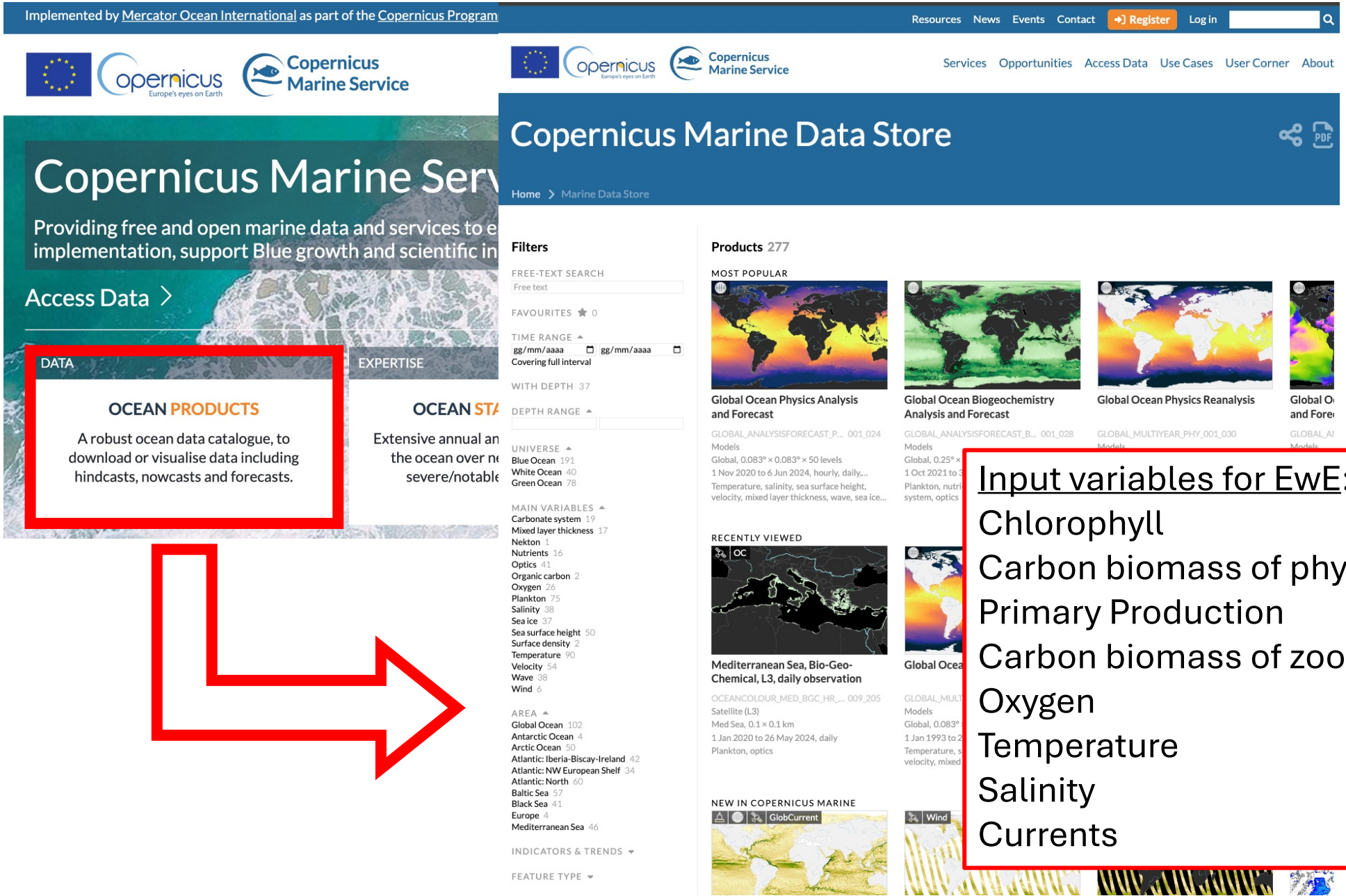
How to access and visualize the products: the Marine Data Store



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



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



Input variables for EwE:

Chlorophyll

Carbon biomass of phytoplankton

Primary Production

Carbon biomass of zooplankton

Oxygen

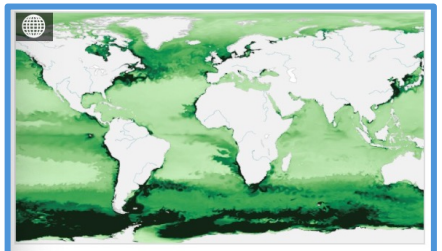
Temperature

Salinity

Currents

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

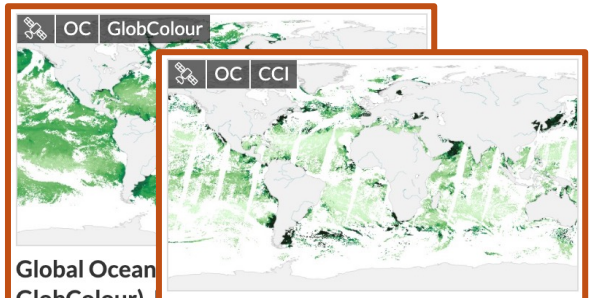
models



Global Ocean Biogeochemistry Hindcast

GLOBAL_MULTIYEAR_BGC_001_029
Models
Global, 0.25° × 0.25° × 75 levels
1 Jan 1993 to 31 Dec 2022, daily, monthly
Plankton, nutrients, oxygen, carbonate system

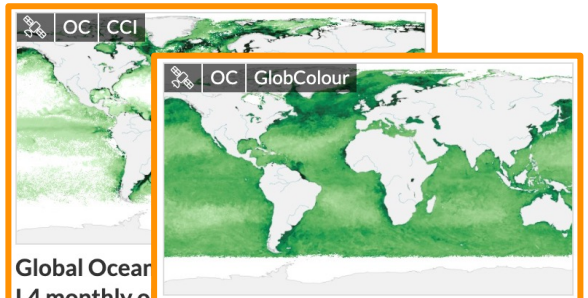
satellite L3



Global Ocean Colour Plankton and Reflectances MY L3 daily...

OCEANCOLOUR_GLO_BGC_L3_MY_009_107
Satellite (L3)
Global, 4 × 4 km
4 Sep 1997 to 30 Apr 2024, daily
Plankton

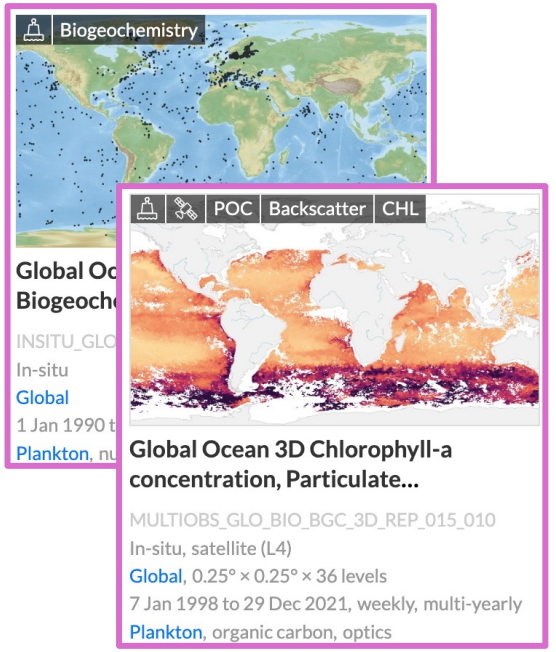
satellite L4



Global Ocean Colour (Copernicus-GlobColour), Bio-Geo-Chemical, L4...

OCEANCOLOUR_GLO_BGC_L4_MY_009_104
Satellite (L4)
Global, 4 × 4 km
1 Sep 1997 to 27 May 2024, daily, monthly
Plankton, optics

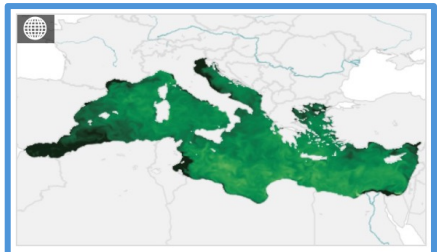
insitu and data driven models



Global Ocean 3D Chlorophyll-a concentration, Particulate...

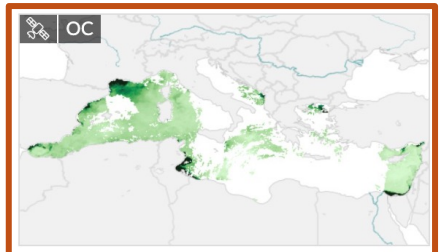
MULTIOBS_GLO_BIO_BGC_3D_REP_015_010
In-situ, satellite (L4)
Global, 0.25° × 0.25° × 36 levels
7 Jan 1998 to 29 Dec 2021, weekly, multi-yearly
Plankton, organic carbon, optics

regional products



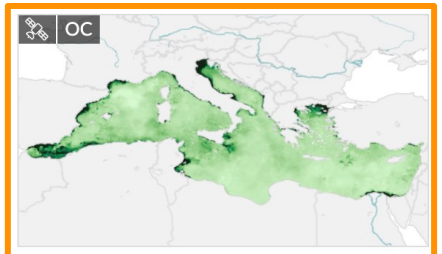
Mediterranean Sea Biogechemistry Reanalysis

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



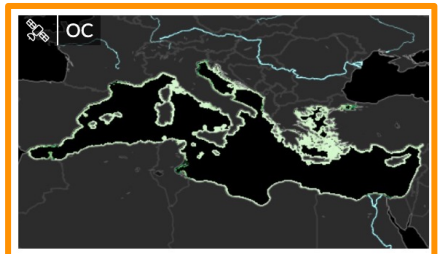
Mediterranean Sea, Bio-Geo-Chemical, L3, daily Satellite...

OCEANCOLOUR_MED_BGC_L3_MY_009_143
Satellite (L3)
Med Sea, 1 × 1 km
16 Sep 1997 to 27 May 2024, daily
Plankton, optics



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

OCEANCOLOUR_MED_BGC_L4_MY_009_144
Satellite (L4)
Med Sea, 1 × 1 km
1 Sep 1997 to 23 May 2024, daily, monthly, mult...
Plankton



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

OCEANCOLOUR_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
Plankton, optics

Mediterranean Sea- In-Situ Near Real Time Observations

INSITU_MED_PHYBGCWAV_DISCRET...013_035
In-situ
Med Sea
6 May 2024 to 5 Jun 2024, instantaneous
Temperature, salinity, sea surface height, velocity, wave, plankton, oxygen

global products

regional products

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

Dungan et al., 2002

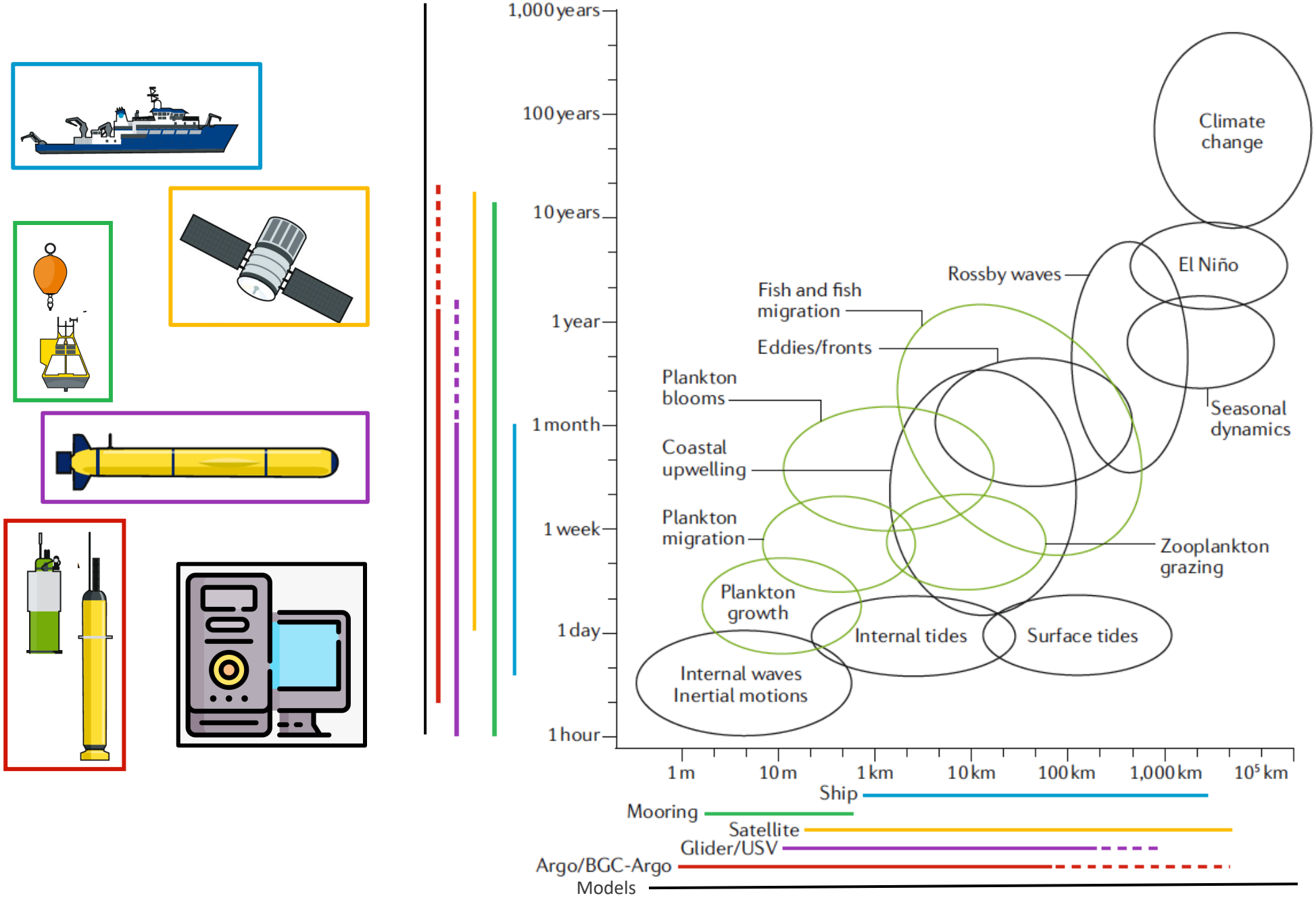
resolution refers to the size of the smallest possible feature (sampling unit or grain size) that can be detected

*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 phenoma 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

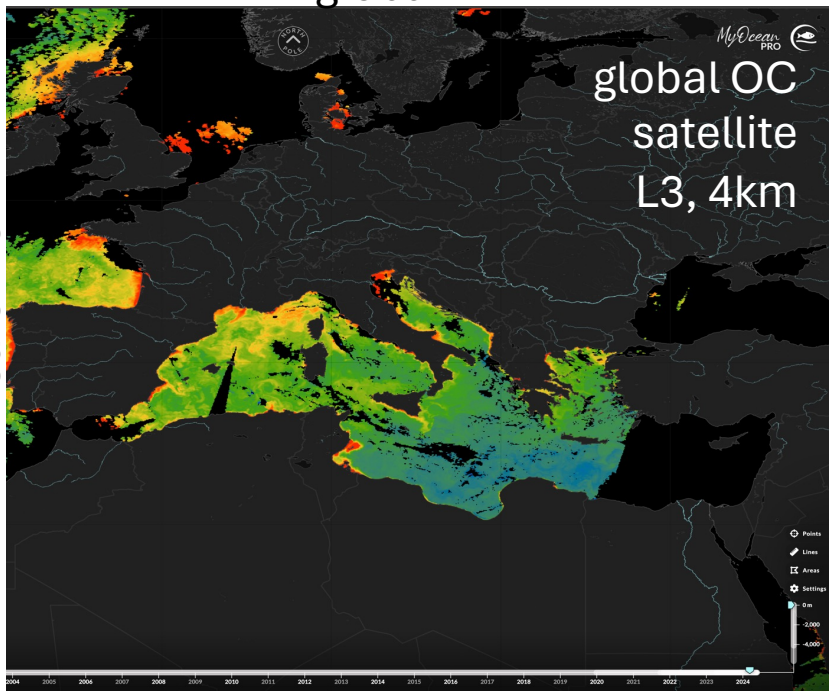
modified from Chai et al., 2020

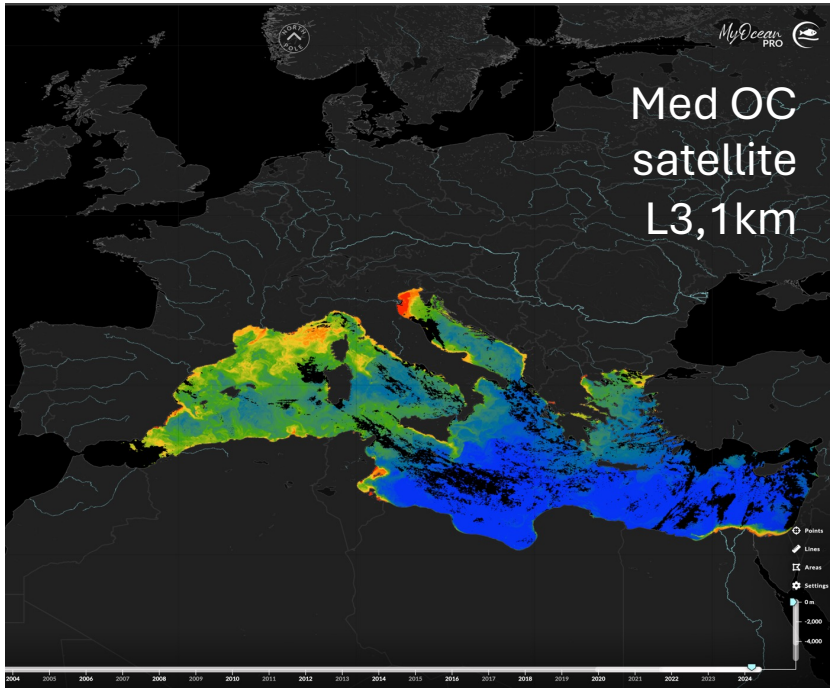
global

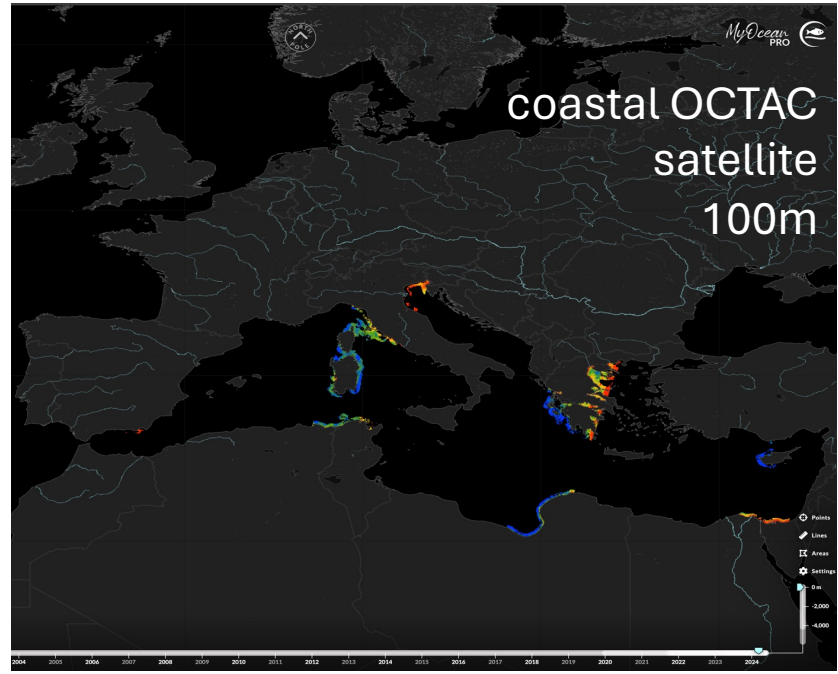
regional

local

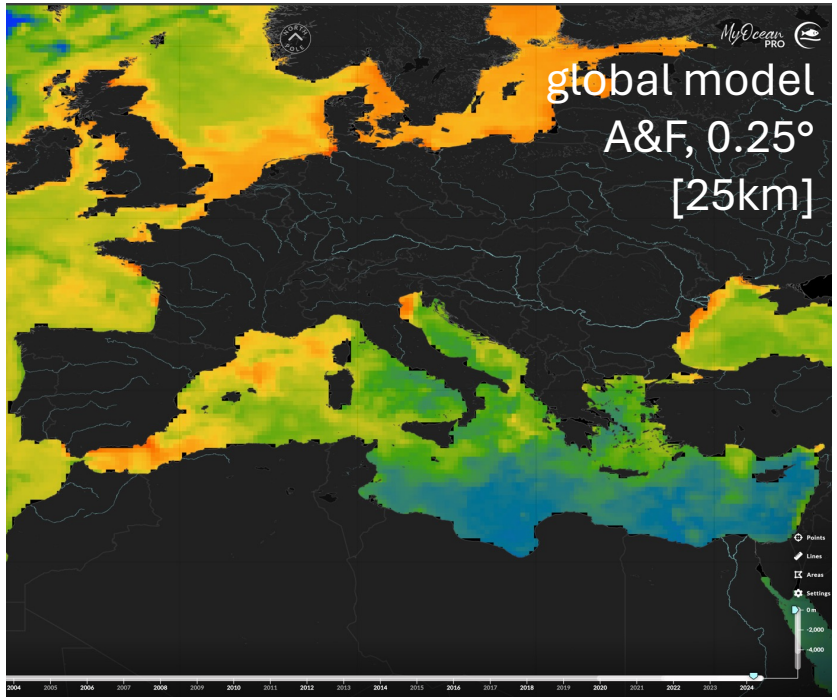
satellite

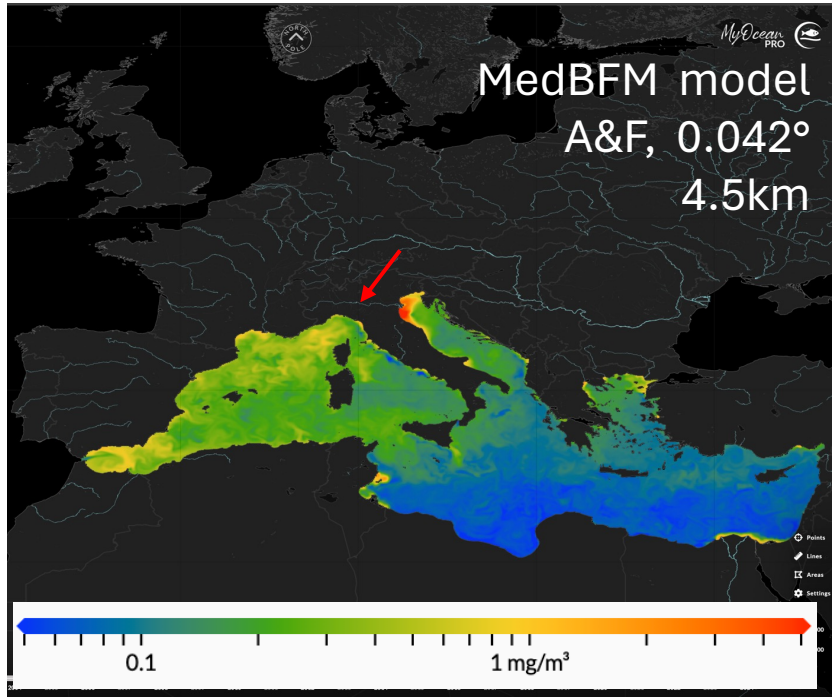






model





resolution and coverage in Copernicus products

Chlorophyll concentration in the Mediterranean sea on 13 March 2024: looking for phytoplankton bloom in Ligurian Sea

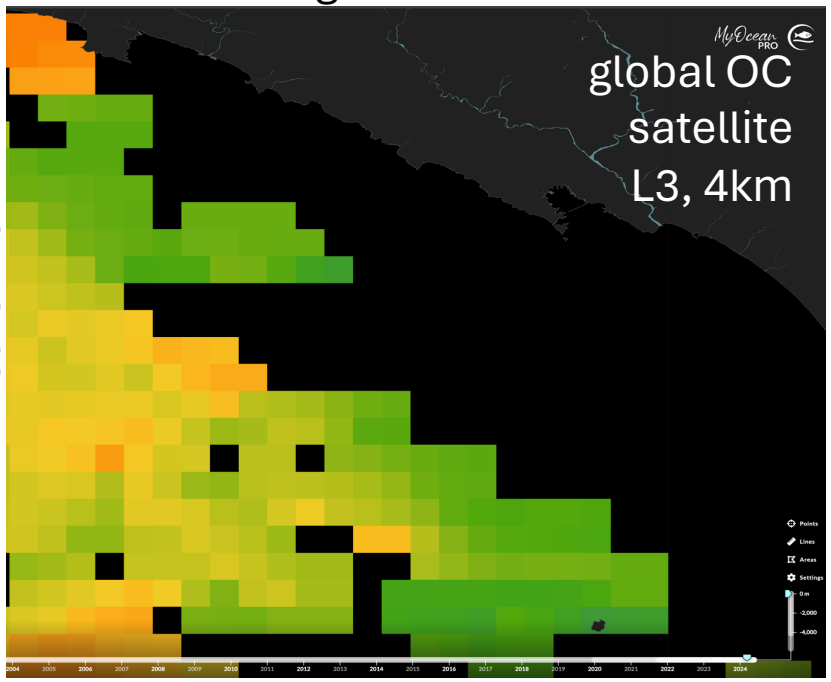
Spatial resolution: size of each pixel within a digital image (the area on Earth's surface represented by that pixel)

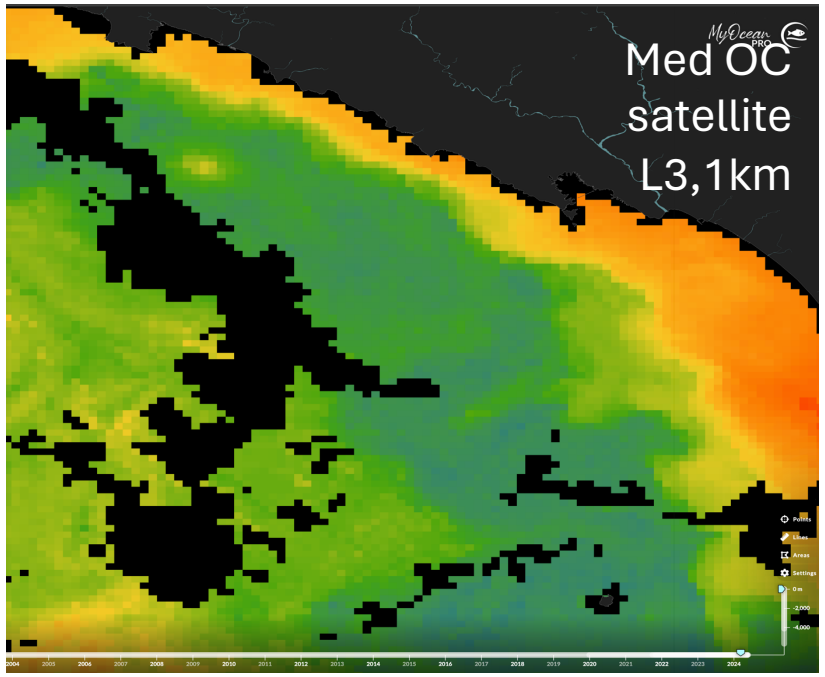
global

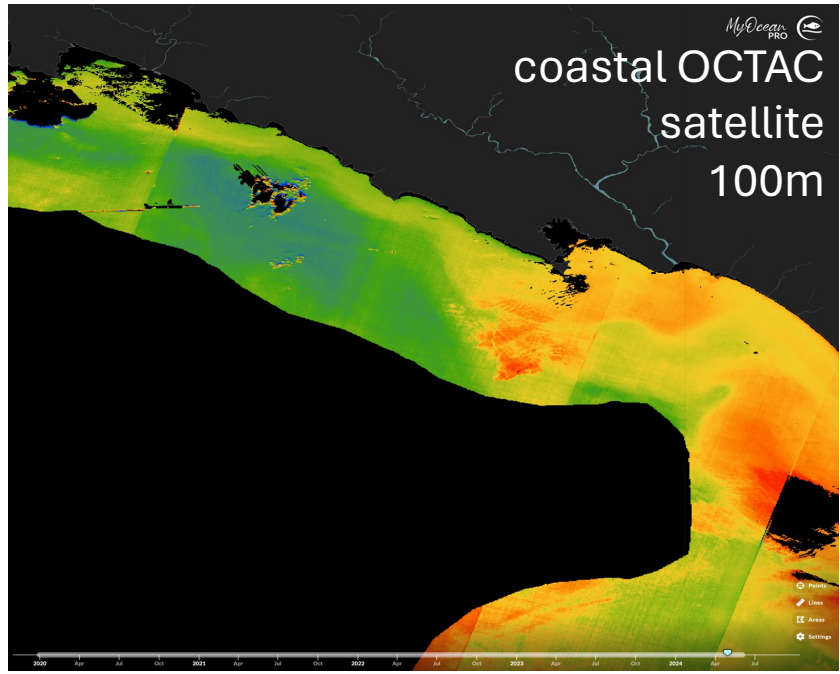
regional

local

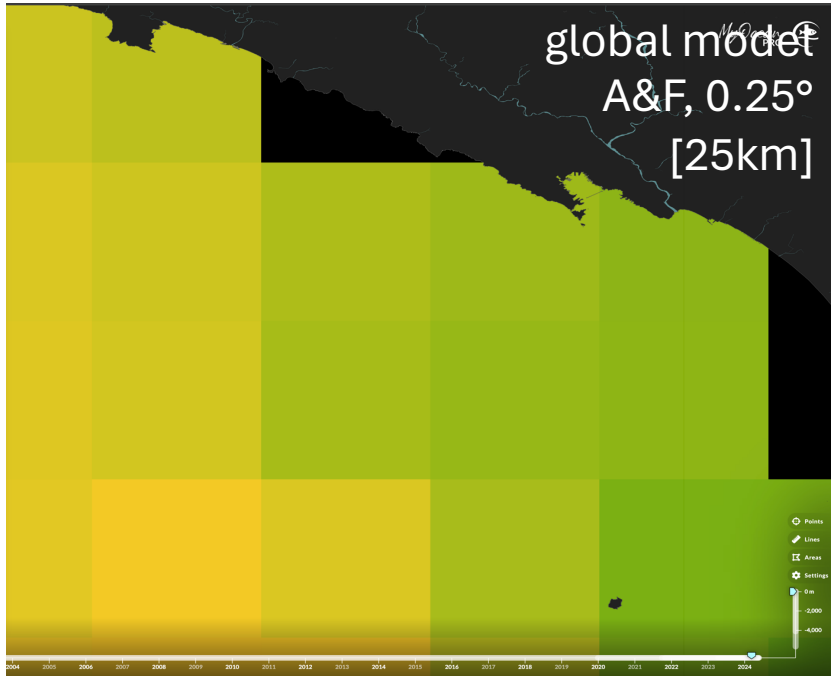
satellite

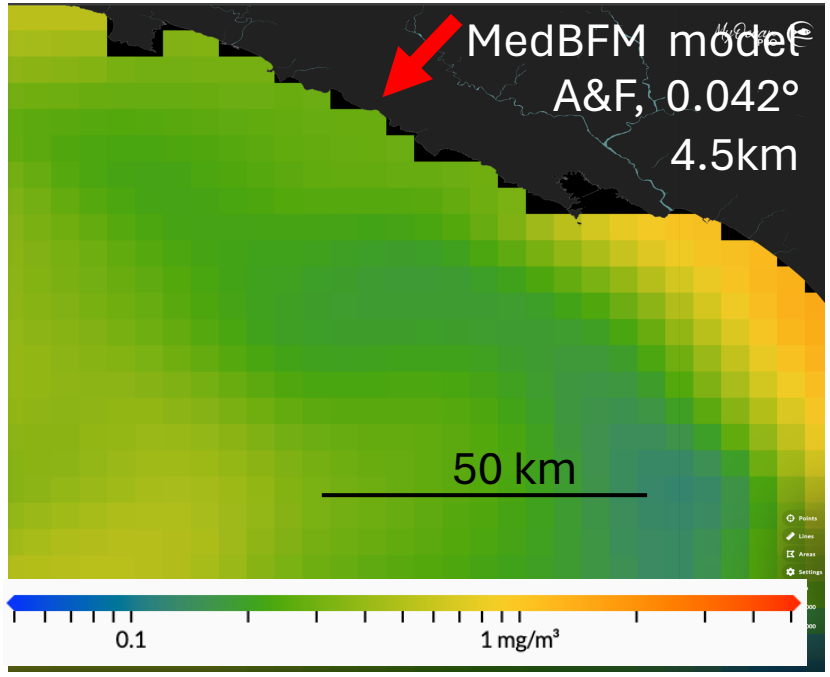






model



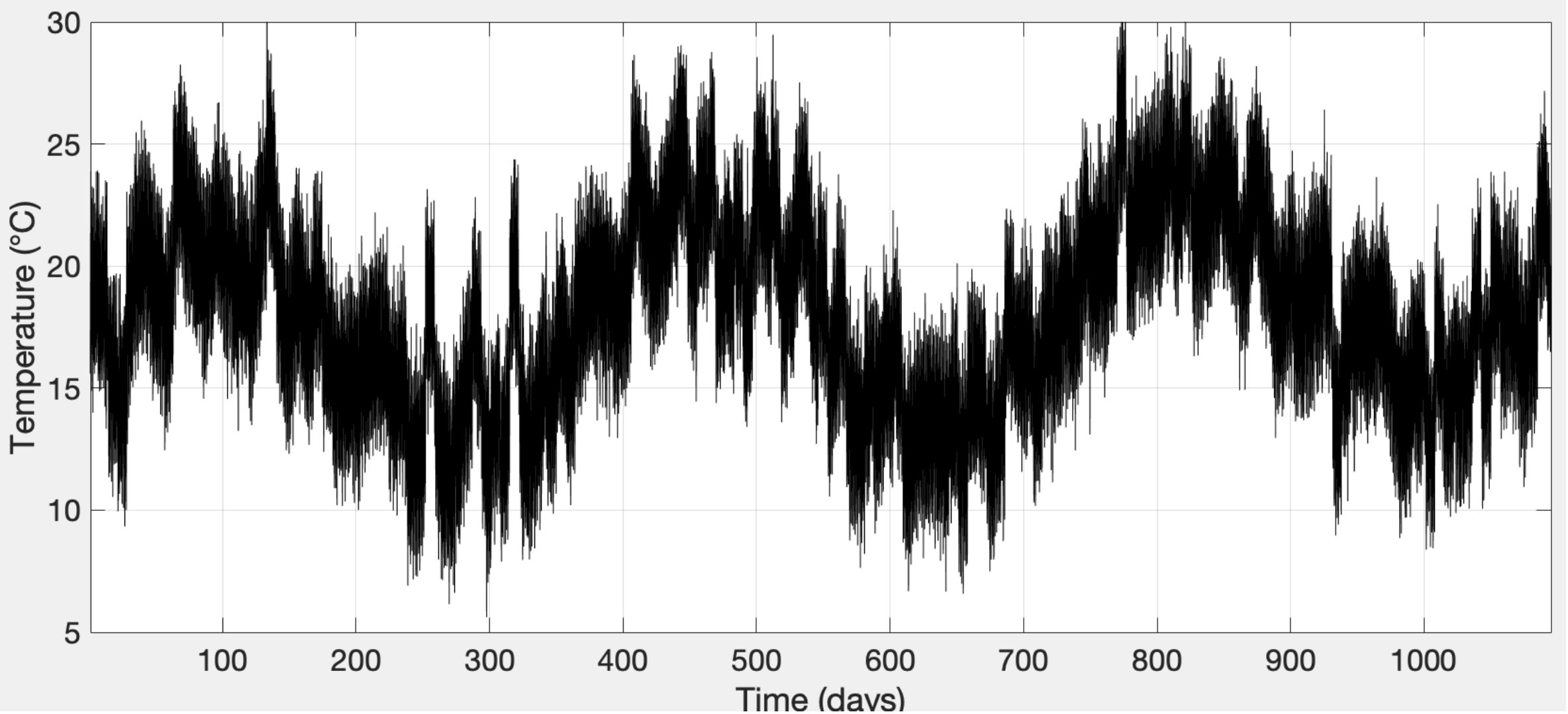


resolution and coverage in Copernicus products

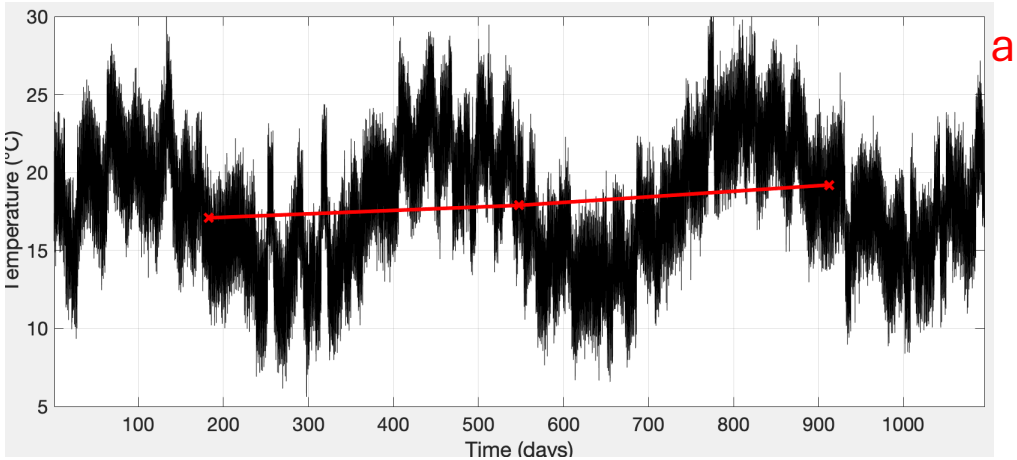
Chlorophyll concentration in the Mediterranean sea on 13 March 2024: looking for phytoplankton bloom in Ligurian Sea

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

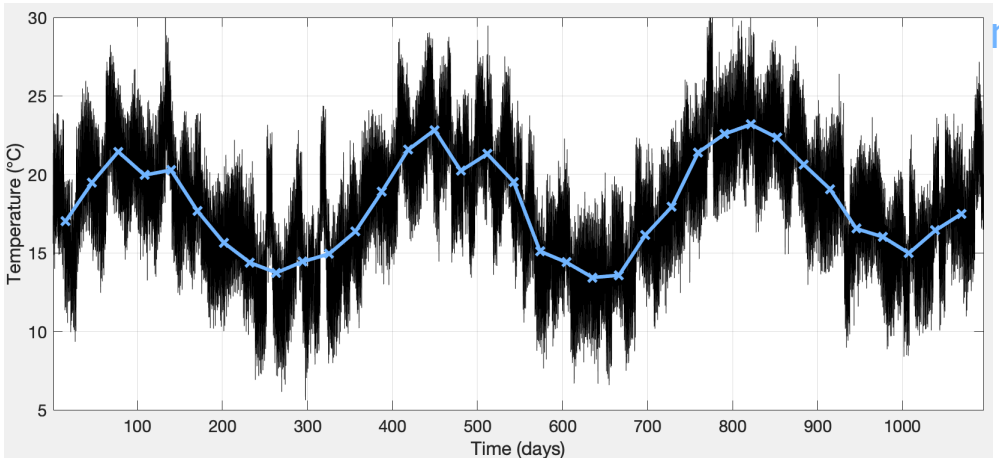
Temporal resolution is time two subsequent data for the exact same location
time series data represent a mixture of variation at different time scales
Example of hourly temperature with multiannual trend, seasonal cycle, monthly/weekly signals, daily cycle and random noise



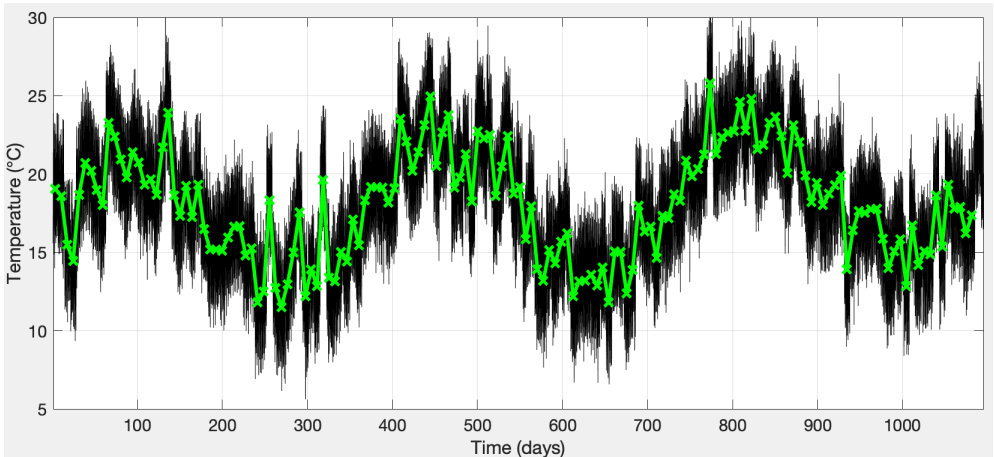
Temporal resolution: averaging and instantaneously sampling at different frequencies



annual means



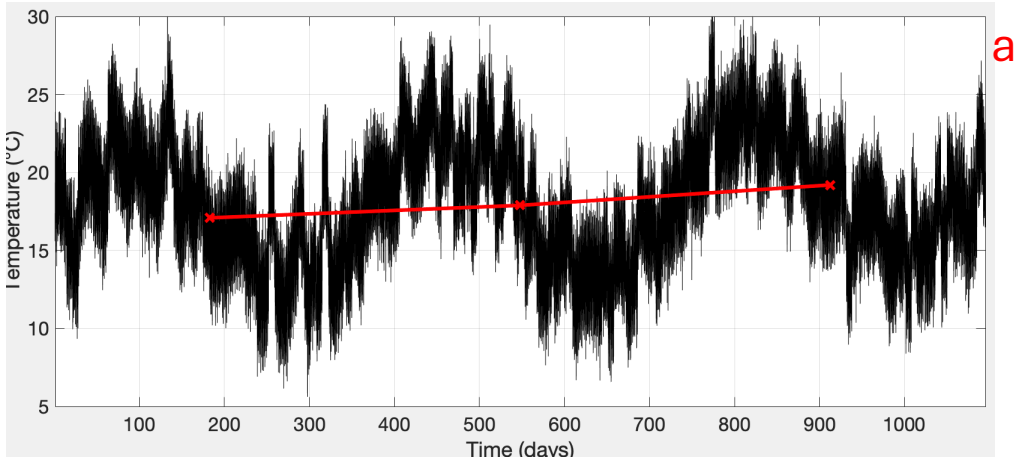
monthly means



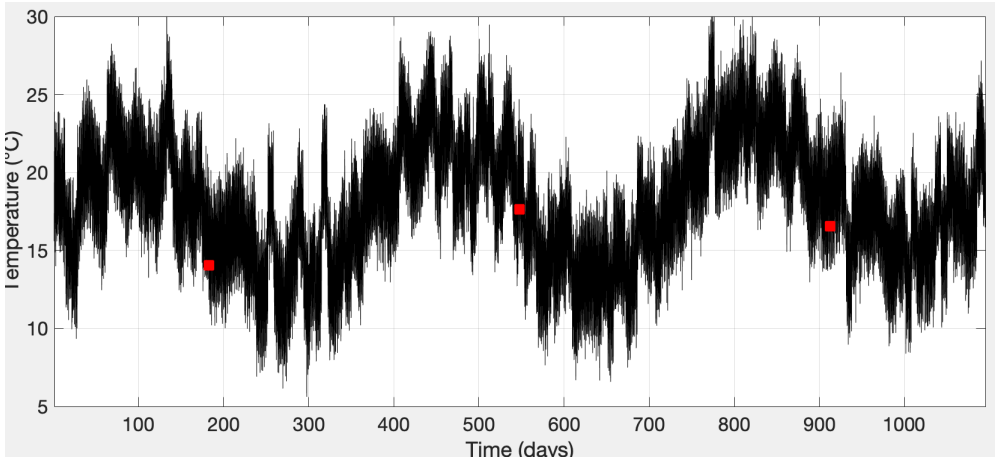
weekly means

Temporal resolution: averaging and instantaneously sampling at different frequencies

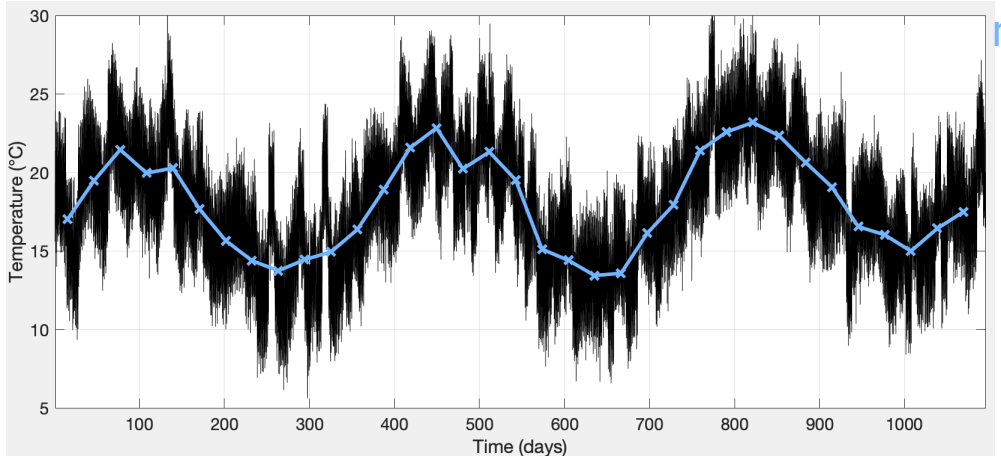
annual means



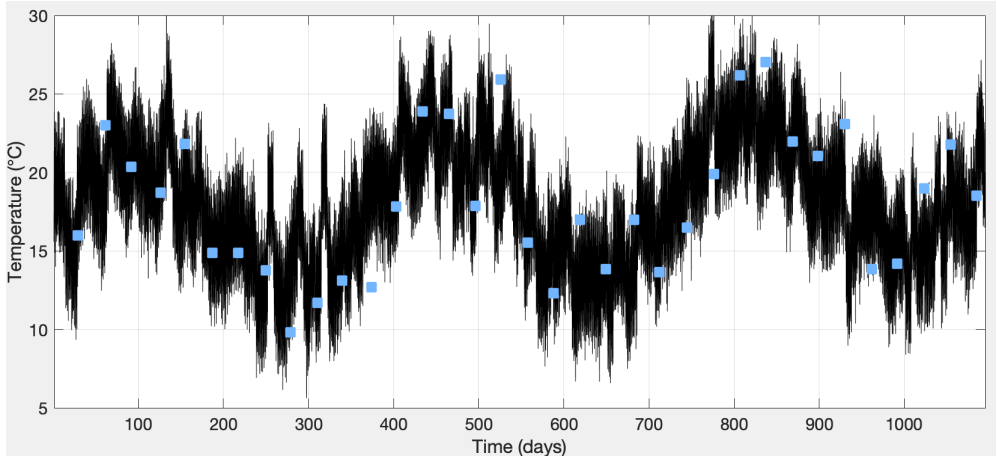
annual sampling



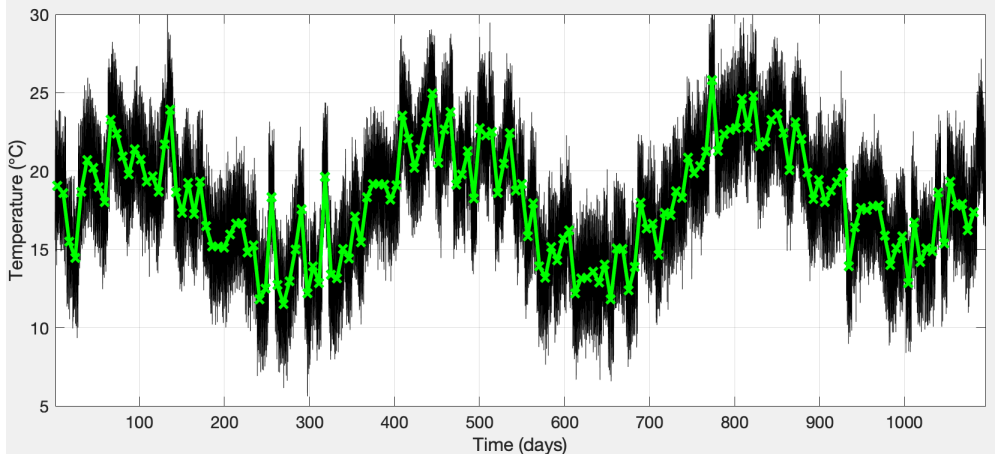
monthly means



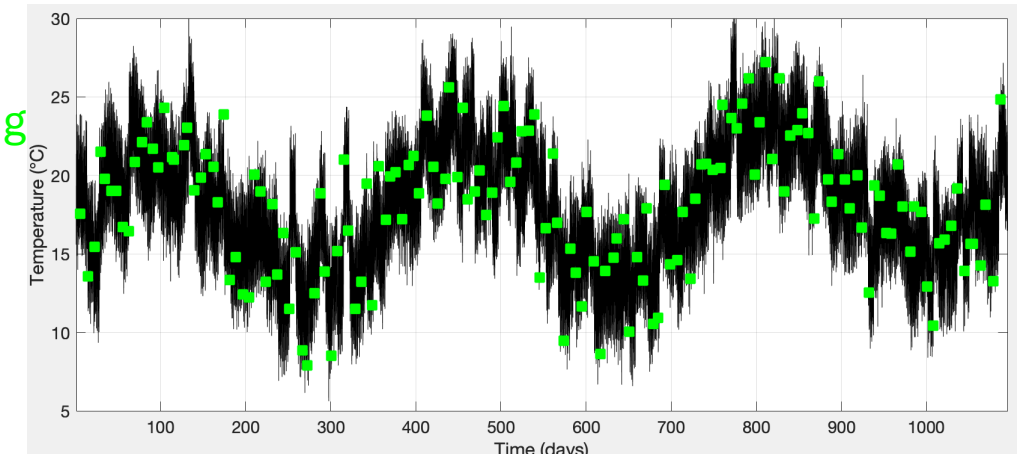
monthly sampling



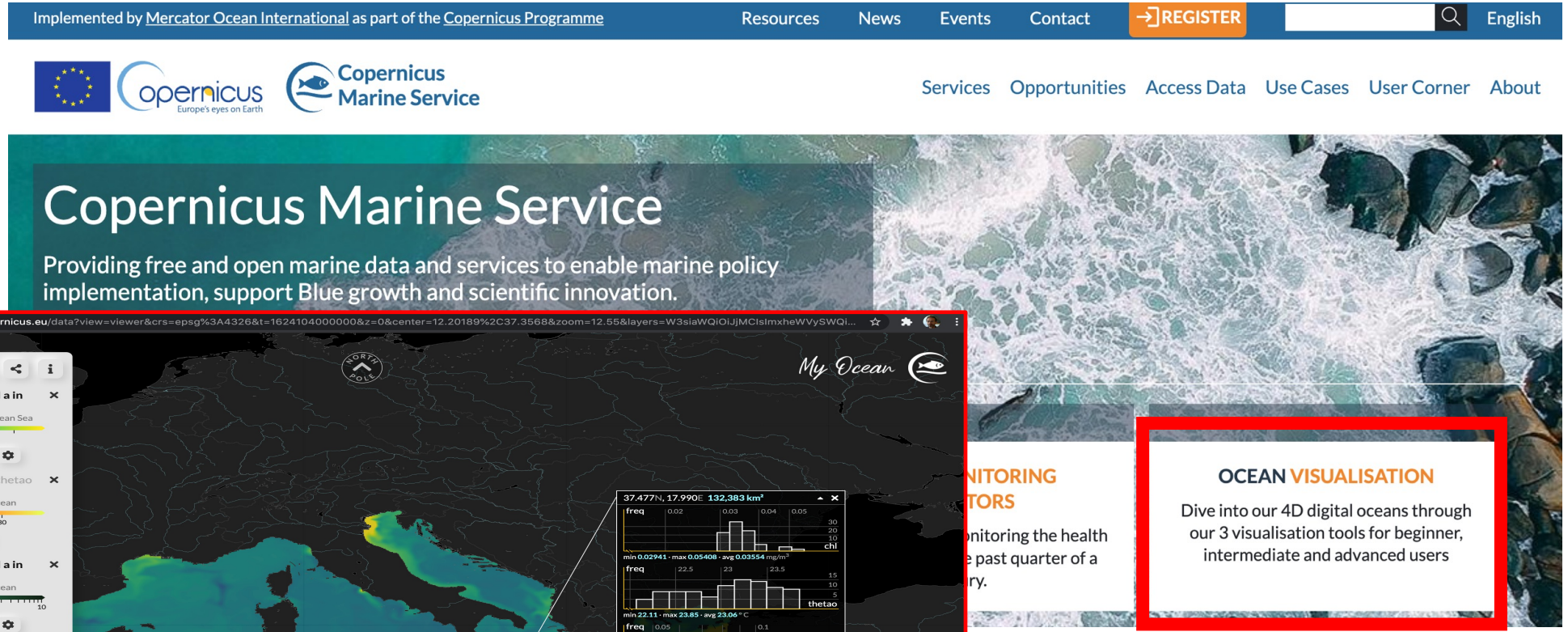
weekly means

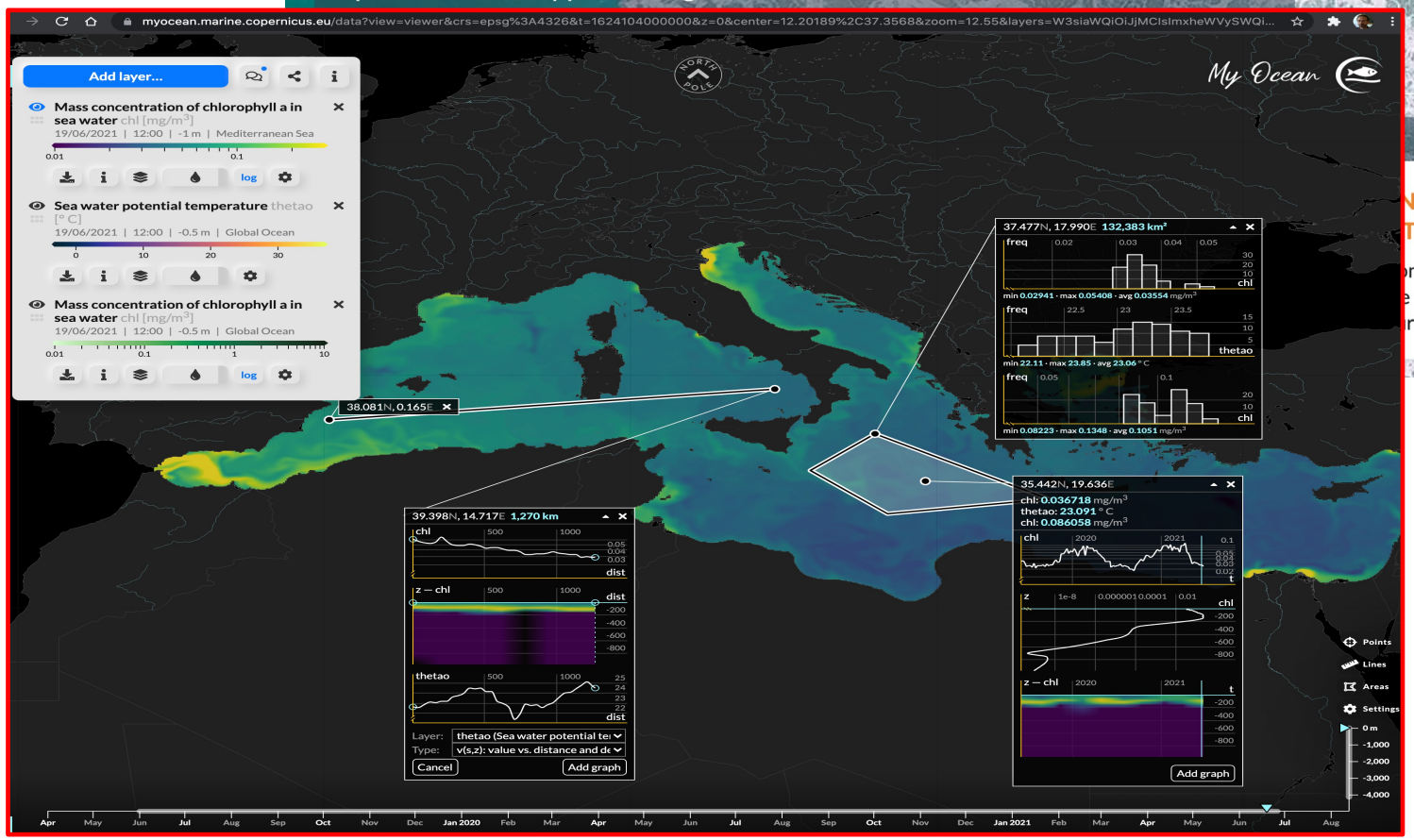


weekly sampling



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





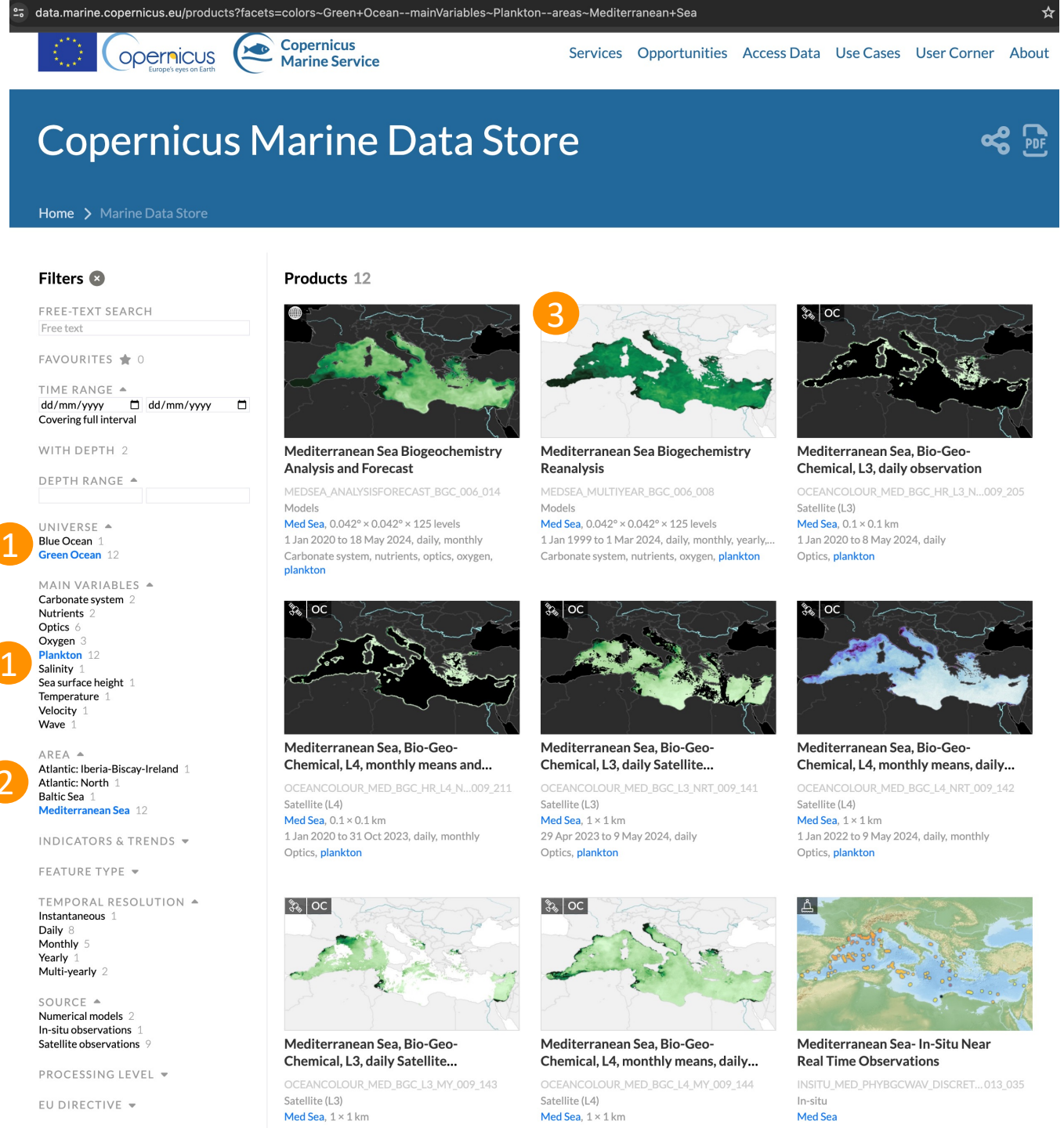
MyOcean Viewer: 3 tools of online visualization
What will we see? how to select a product and a dataset; how to plot a variable; how to customize a plot; how to subset a region and download data
What do you need?
A connection to the web and nothing more ... maybe curiosity
Credits: https://vimeo.com/891402984

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))



3. access to the product information

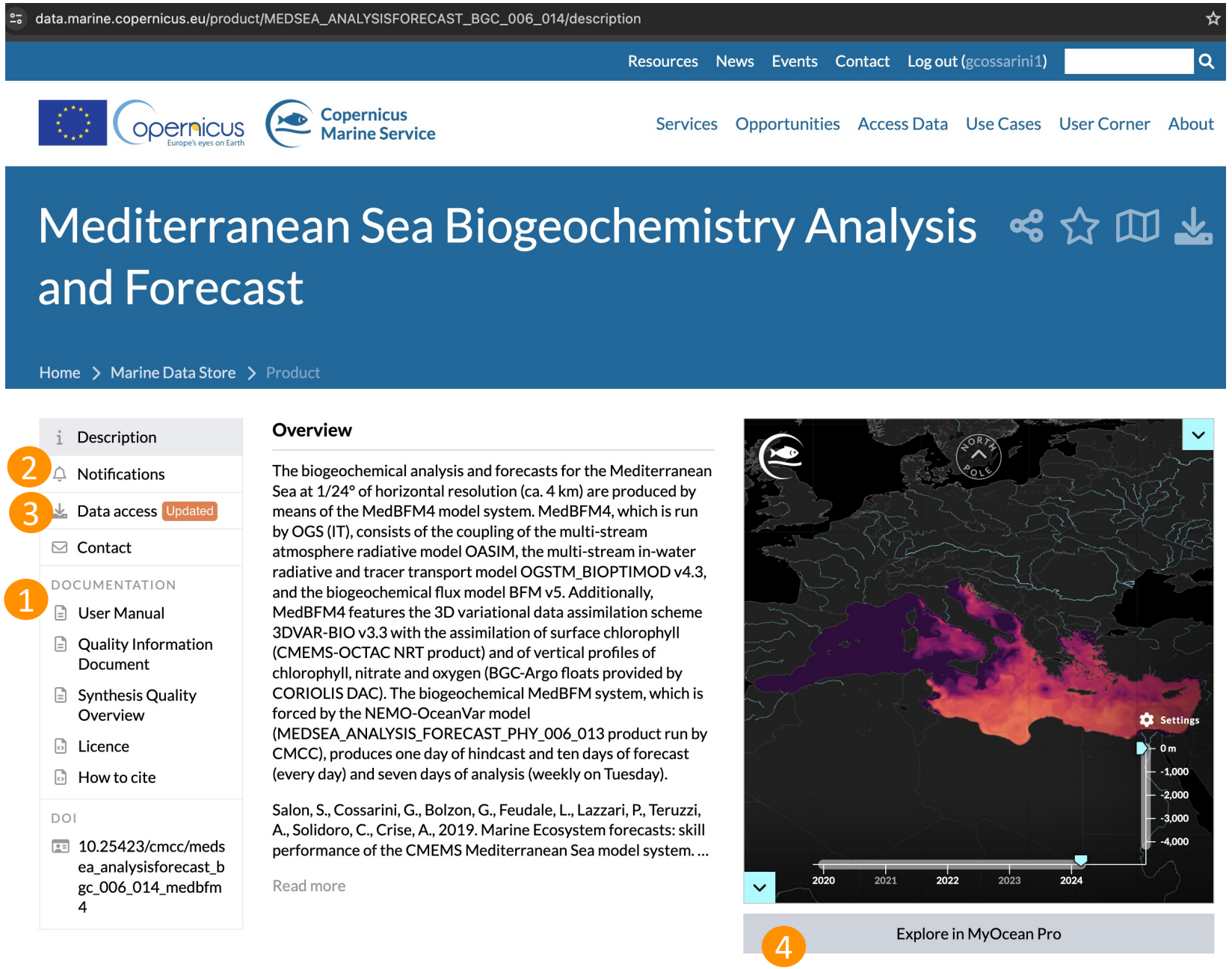
Analysis and Forecast biogeochemical model product

(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**)

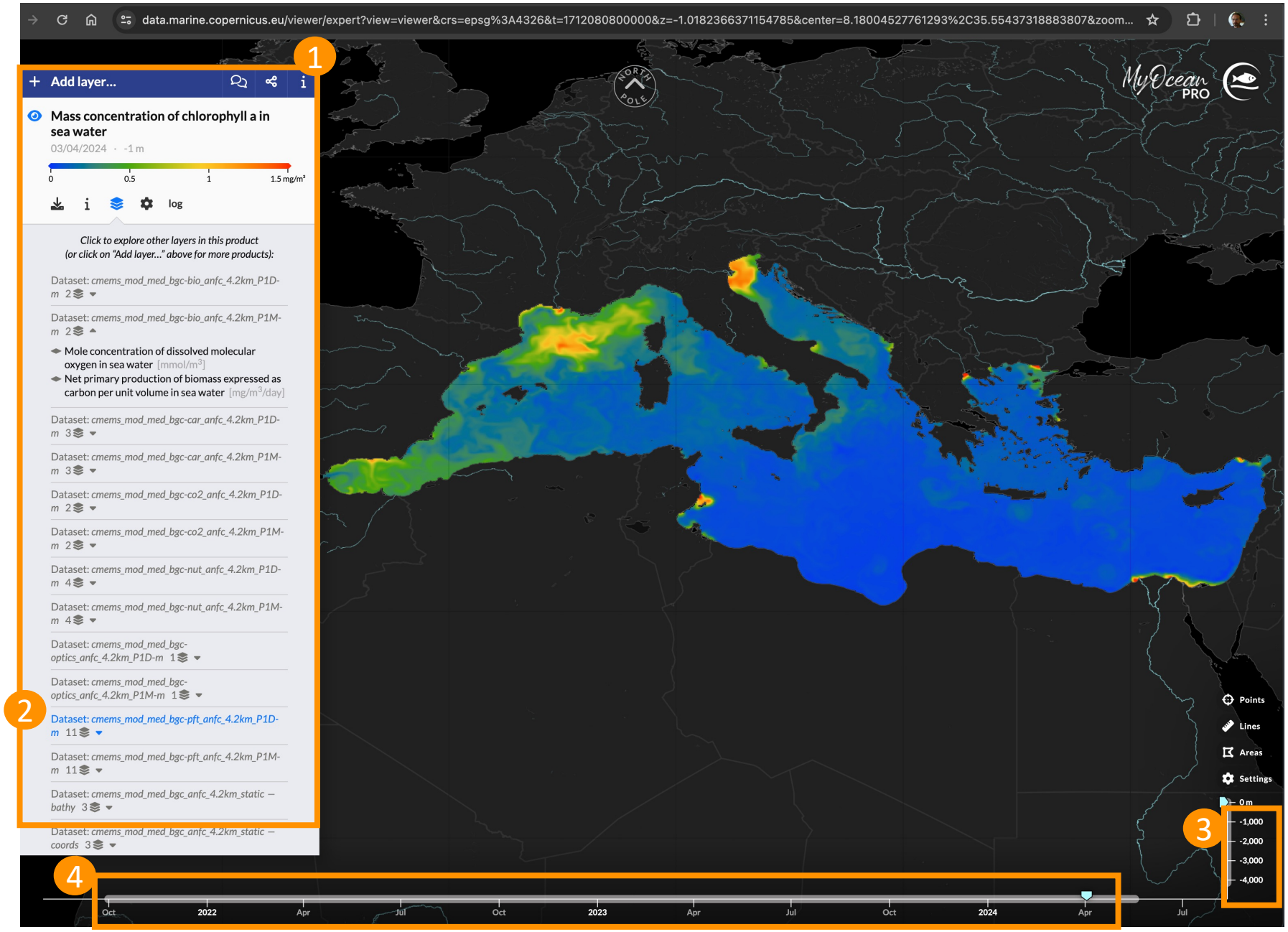
use **MyOcean viewer** (4) to plot variables



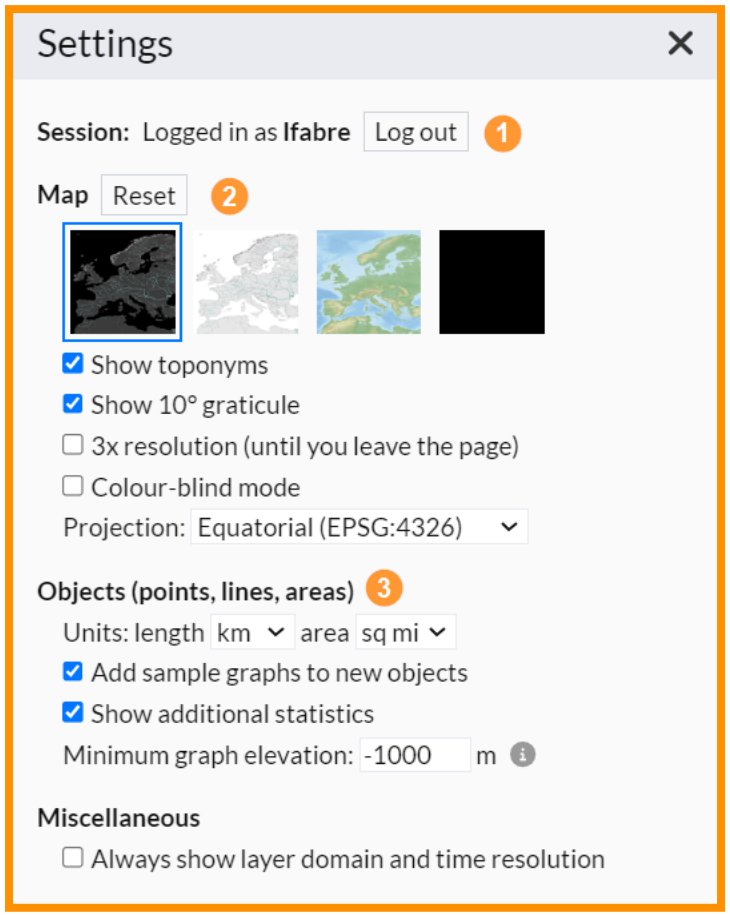
4. access to the list of all the datasets and variables you want to add on the map from the **layer panel**

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

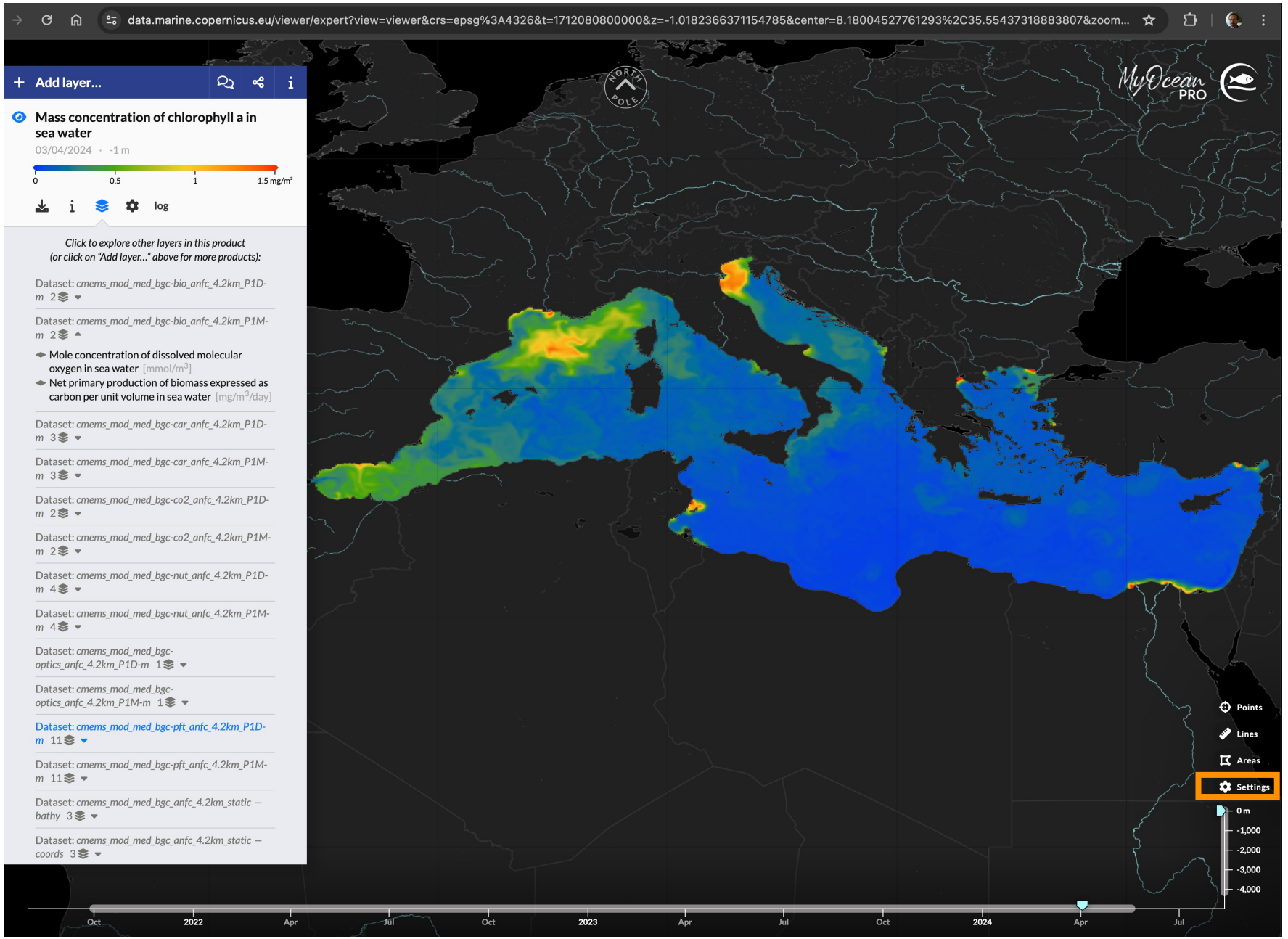
selecting chlorophyll daily data **(2)** and visualize the data according to a **depth (3)** and a **date (4)**:



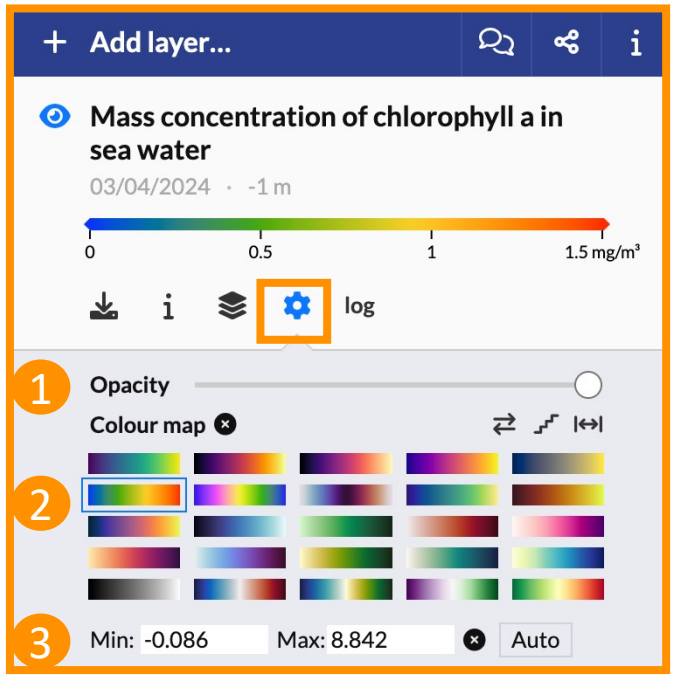
5. change setting of the map



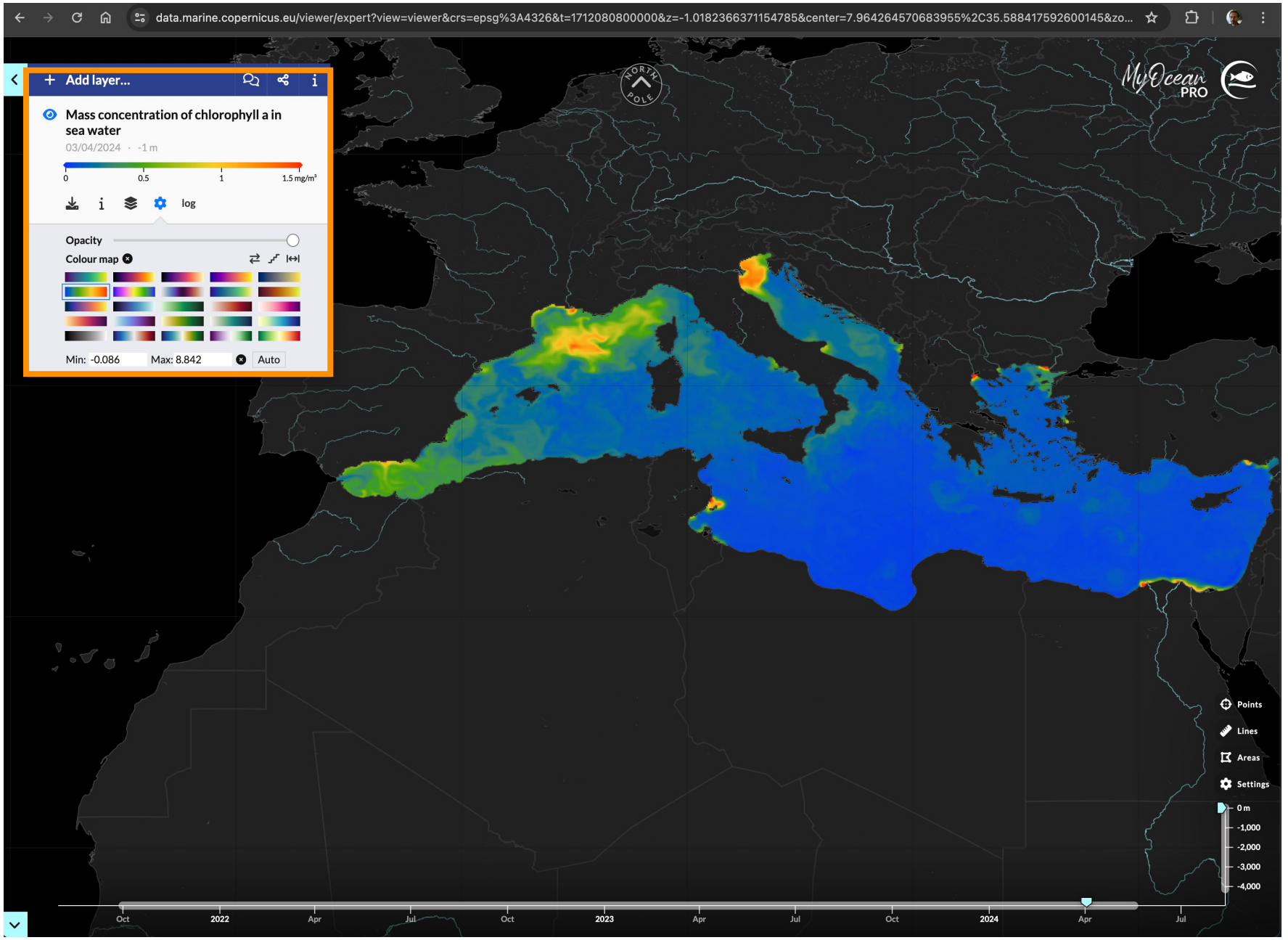
- login/logout to your Copernicus Marine account **(1)**
- change the map and projection settings **(2)**
- change object units **(3)**



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



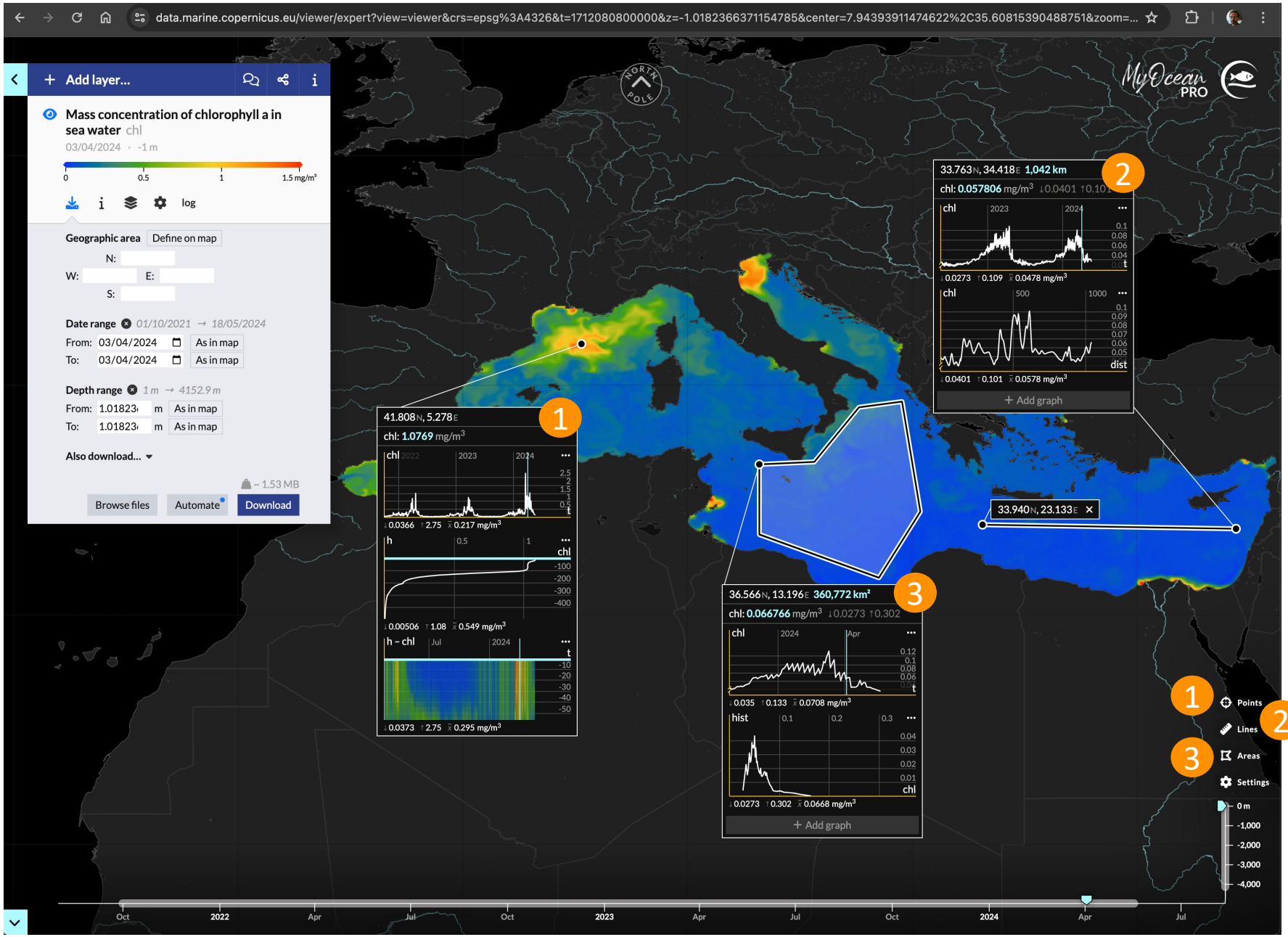
and change the **opacity** (1) of the layer, the **color map** (2) and the **minimum and maximum values** to consider (3)



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)



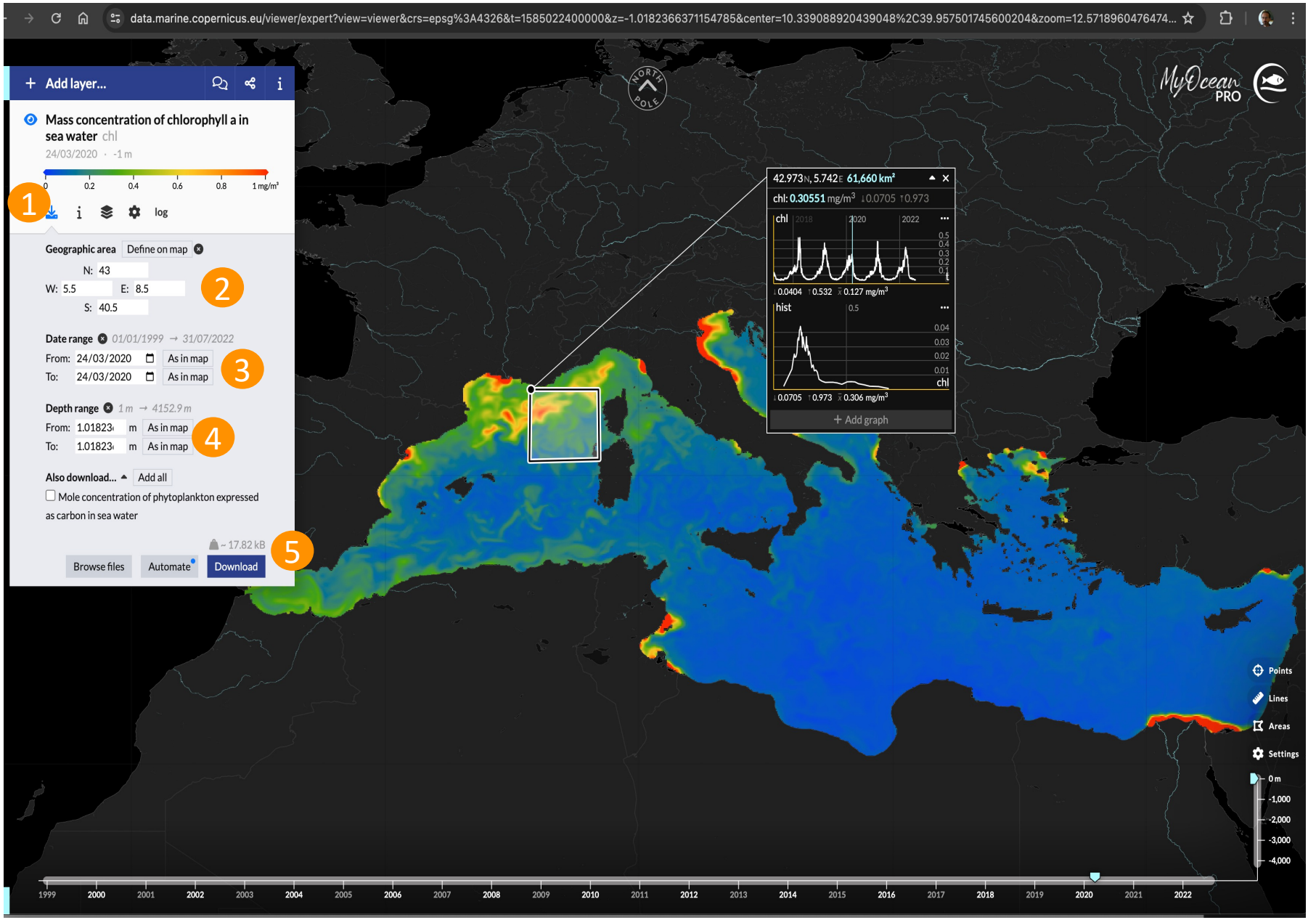
8. download data from the viewer

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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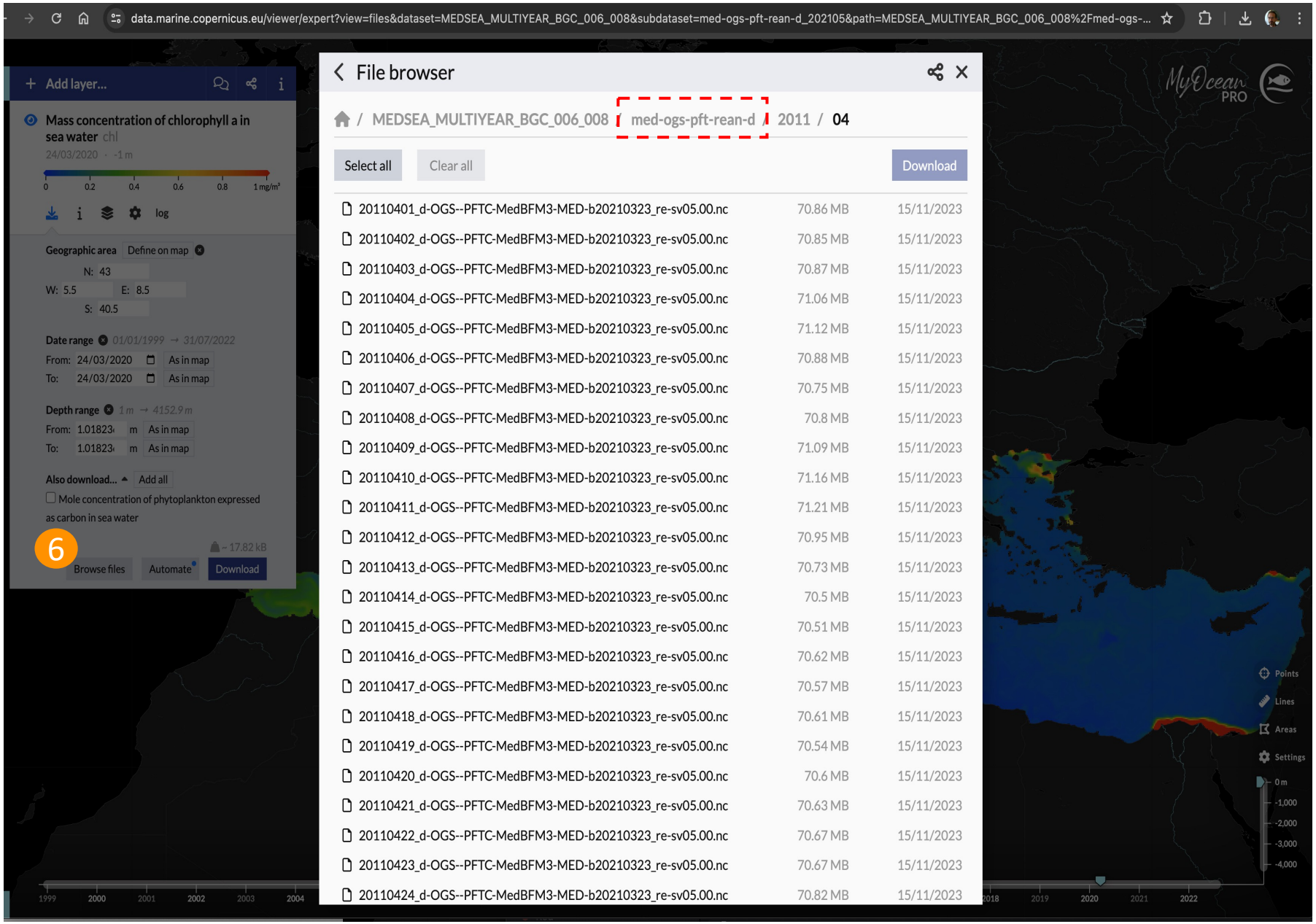
Three download options:

- 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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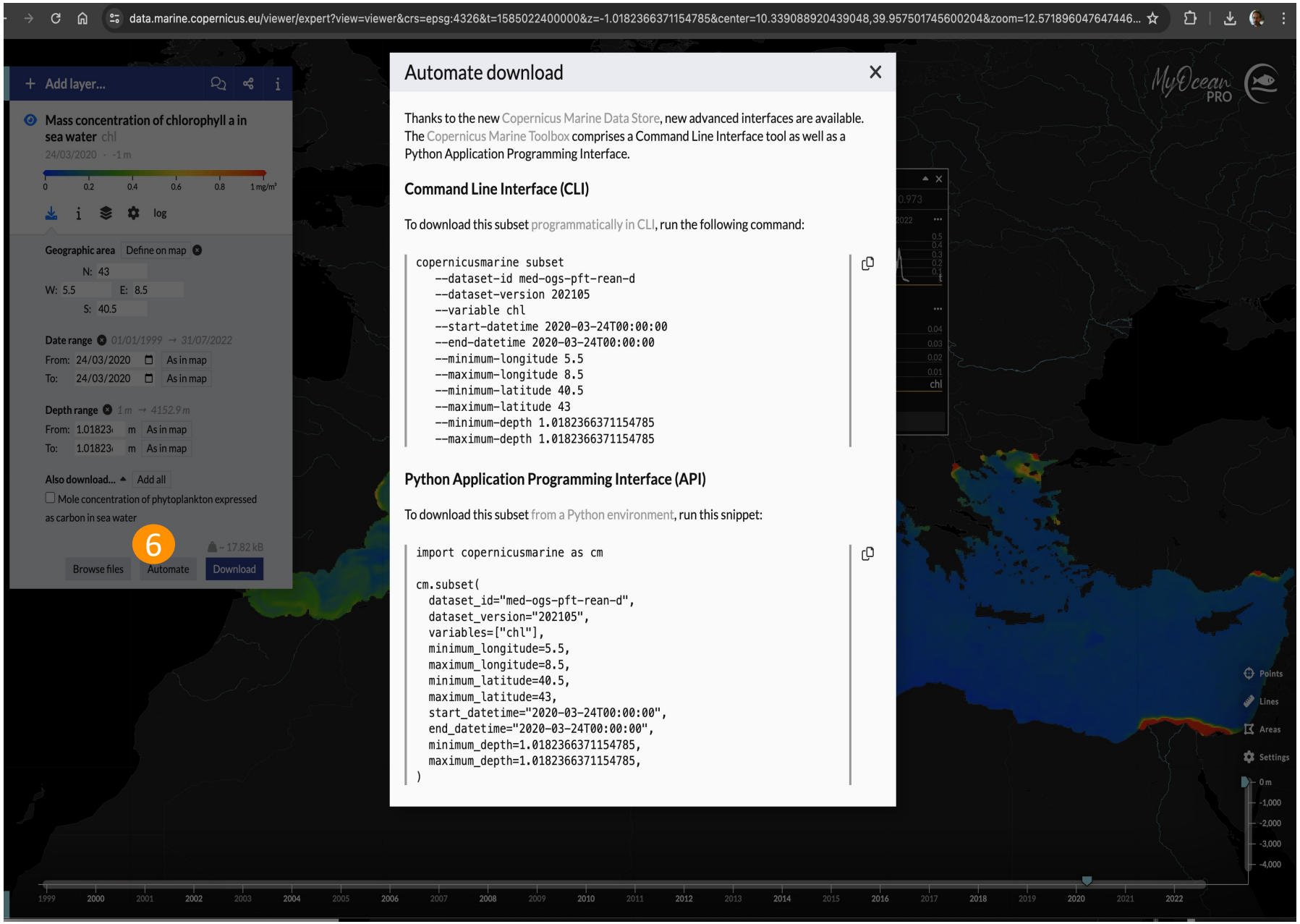
Three download options:

- 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