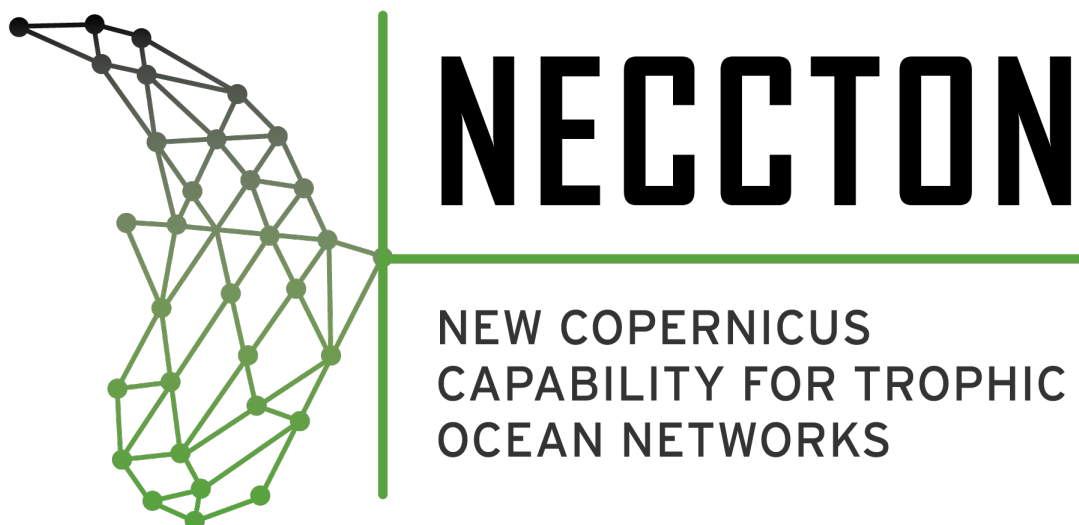


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1. Executive Summary

NECCTON is a project that aims to enable the Copernicus Marine Service to deliver products that inform marine biodiversity conservation and food resources management, by fusing innovative ocean ecosystem models and new data.

In order to maximise the dissemination, exploitation and communication of the results, an interactive Viewer (i.e. a “datacube exploratory viewer”), implemented as a customised instance of Copernicus Marine Service data viewer (MyOcean Viewer), is being developed and configured to visualize and distribute NECCTON products.

Indeed, visualization of the NECCTON outcomes is a crucial component of the communication strategy and this interactive application aims to ensure the exploration and visualization of NECCTON’s products supporting user needs. Datacubes are based on innovative cloud-based technologies and use a serverless architecture that allows direct connection to files rather to a server. This viewer guarantees high-availability, visual analysis, flexible data dissemination, and enables the monitoring (across all dimensions: lon, lat, depth, time) of which products and datasets are more frequently downloaded by investigators and stakeholders. This datacube exploratory viewer:

- promotes free and open data dissemination;
- allows the sub-setting and analysis of diverse datasets independently of existing HTTP interfaces such as the Web Map Service (WMS) protocol;
- is compatible with the current MyOcean Viewer used by the Marine Service. This will facilitate the eventual transfer of the tool to Copernicus Marine Service.

Future deployment and evolution of this application will help to engage stakeholders into dialogues around changing ecosystems, climate impacts and policy options, and to publicly disseminate project outputs with clear messages.

2. Scope

The purpose of this document is to report the main functionalities and information of the NECCTON Data Viewer, including reference to further resources and future developments.

This report corresponds to deliverable D2.2 of Project “*NECCTON – New Copernicus Capability for Trophic Ocean Networks*”.

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3. Procedures

The NECCTON Data Viewer Portal is designed to visualize and navigate NECCTON datasets in an interactive and open web portal.

3.1 Access to the NECCTON Viewer

The NECCTON Viewer is available in the web page: <https://data.neccton.eu>

Visualisation of NECCTON data and exploration of layers, including the creation and exportation of graphics are free for all users.

Data download is also free and available to all Copernicus Marine users. A free account can be created in the Copernicus Marine web page, if needed: <https://data.marine.copernicus.eu/register>

3.2 Further resources

The video recording of a live-demo of the NECCTON viewer, which took place on November 12th, 2024, can be found in the following link:

https://us02web.zoom.us/rec/play/ZUX0Zo-erGf_EoM_2uS_ZF-cw6ASsFNoPP-Fkgh3JS1U_yLmvVsus8dzV9y4p2alF539SrHAtYCAkJ.kl8wPly0Z5c0HgWP?canPlayFromShare=true&from=share_recording_detail&continueMode=true&componentName=rec-play&originRequestUrl=https%3A%2F%2Fus02web.zoom.us/j/91875532331?pwd=OWp0aUJkdzV9Yy4pMjZlbnR5bWVsc0Z5c0HgwP?canPlayFromShare=true

3.3 Future developments

Some developments will be implemented within the next versions of the Viewer, to adapt and facilitate the usage of the Viewer and the user's experience.

Catalogue

Thumbnails giving a snapshot of the data provided by the datasets will be homogenized. They will be related to product content and with the goal of ensuring consistency between data, but allowing to distinguish them from one another too, keeping a professional-looking catalogue that will help the ease of use.

Product's main categories, such as "New datasets", "Favourites", etc., will be reorganized, with the aim to help the exploration of the datasets available and a better organisation.

Filters will be adjusted and updated based on the products. This will facilitate the research of datasets matching the parameters needed. New filters may also be added.

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Data Exploration

If necessary, improvements will be made to support possible in-situ observation data that can also be downloaded via the Viewer's graphical interface. This will facilitate the exploration and comparison of satellite and in-situ observations with marine models, simultaneously.

In addition, videos of immersive visualizations of case studies will be produced to improve the communication and engage stakeholders into dialogues around changing ecosystems, climate impacts, and policy options.

Data Download

The download process will also be updated and will offer both the subsetting option and the Web Portal access to the original data. Figure 1 represents a first mock-up of the download window for the original files.

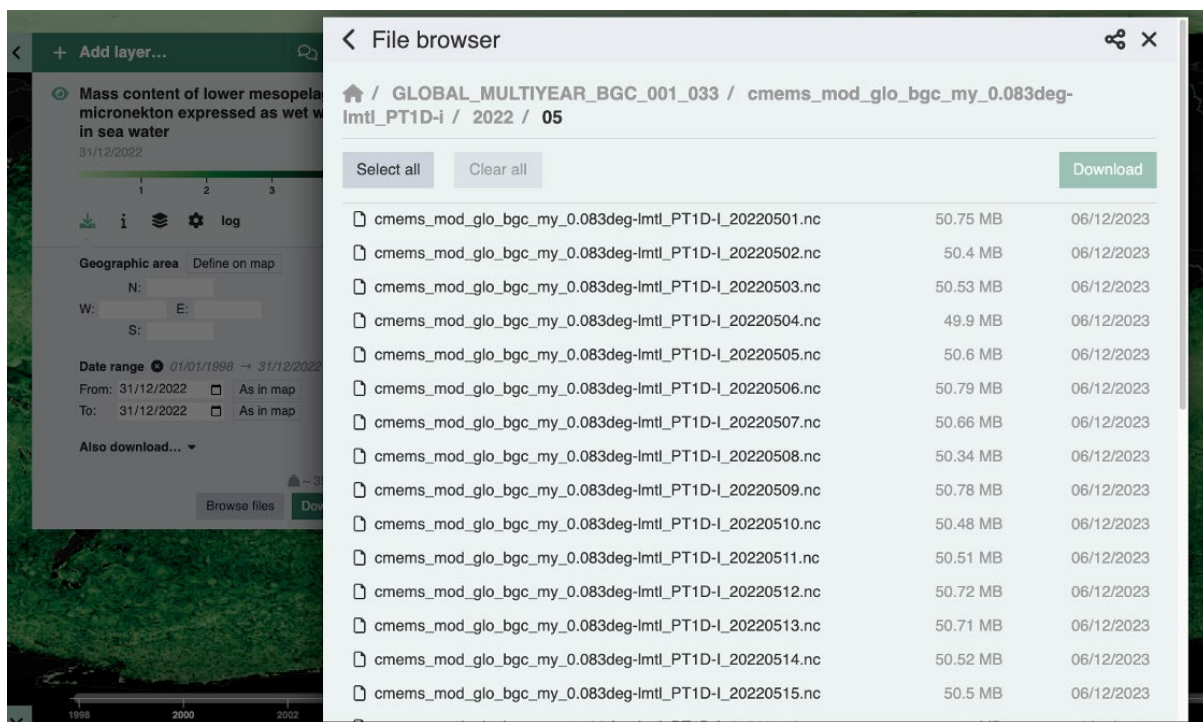


Figure 1: Mock-up of the download option for the original files.

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3.4 Feedback from the demonstration session

This section lists the main points of the feedback received during the viewer demonstration session. In addition to the future improvements of the viewer listed in the previous section, these suggestions made by the attendees of the session will be considered when designing the roadmap of viewer evolutions.

Visualisation of uncertainty

It was suggested for the viewer to provide means to visualise the uncertainty of models, when it is provided as a variable. In maps, regions above a certain value of uncertainty could be visually highlighted (see Figure 2 for an example of viewer displaying uncertainties on the map).

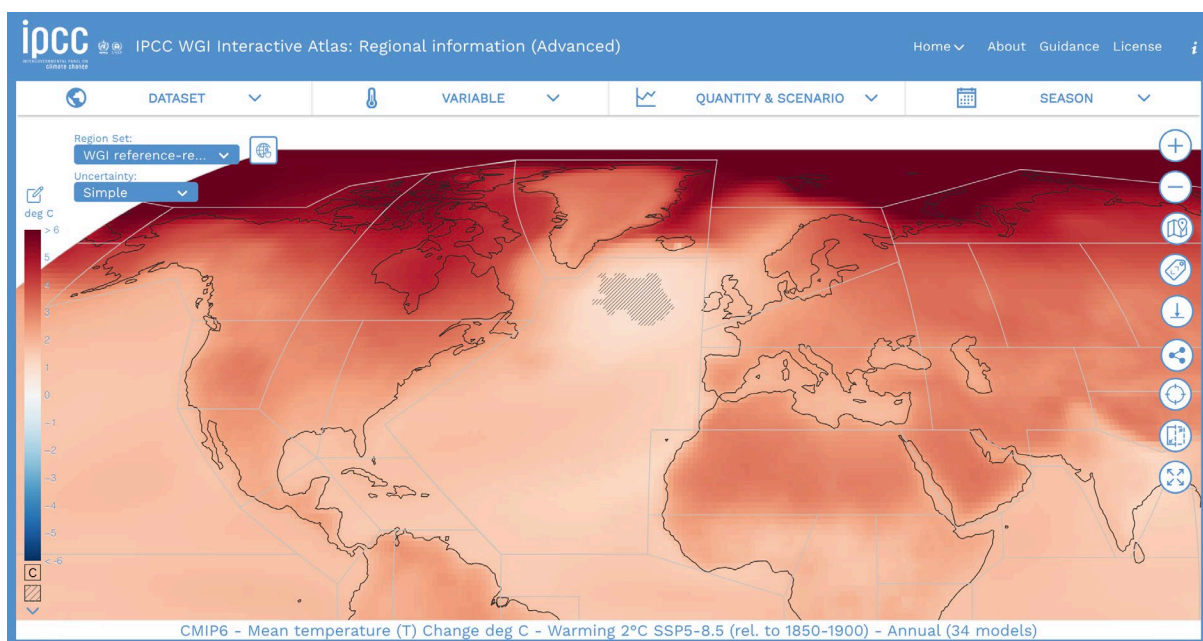


Figure 2: IPCC Atlas showing uncertainty as hatched areas on the map

Additionally, uncertainty could be displayed in the time series as a shaded area around the variable value.

Time aggregations

There was also a suggestion to offer time aggregations when retrieving the data (in the subsetting form). Given that the data subset (the generation of the downloadable NetCDF) is done client-side, an additional option could be added to the subsetting form to let users chose between different time aggregations, or none at all.

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Annex: User manual of the NECCTON Data Viewer

1 Introduction

The purpose of this document is to introduce the first version of the NECCTON Data Viewer Portal, including a user manual for the main functionalities.

Fully compliant with the Copernicus Marine Viewer (MyOcean Viewer), the innovative visualisation of the NECCTON outcomes is a crucial component of the communication strategy to stakeholders and scientific community and it is configured to explore and distribute NECCTON products supporting user needs. Based on the innovative cloud-based technology and on a serverless architecture that allows to connect directly to files and rather than to a server, the NECCTON Viewer guarantees high-availability, visual analysis and flexible data dissemination, across all their dimensions: lon, lat, depth, time.

This “datacube exploratory viewer”:

- Promotes free and open data dissemination;
- allows the sub-setting and analysis of diverse datasets independently of existing HTTP interfaces such as the Web Map Service (WMS) protocol;
- is compatible with the current MyOcean Viewer used by Marine Service. This will facilitate the eventual transfer of the tool to Copernicus Marine Service.

2 User Manual

The NECCTON Data Viewer Portal is designed to guarantee the visualization and dissemination of NECCTON products in an interactive and open web portal.

The NECCTON Data Viewer has an intuitive, detailed, easy-to-use interface, allowing the exploration of satellite observations and model data.

2.1 Data Catalogue

In the Catalogue window, the list of products and datasets available for the NECCTON project are listed and available.

Data Search

Products can be browsed in the list of products available by clicking on Add layer. The search for a product can be done by using keywords in the “Free-text search” bar and/or by using one or several of possible filters.

Thumbnails

Each product has a specific thumbnail related to product content and which allows to distinguish products from one another and ease of use, but always ensuring the consistency and making the catalogue more professional-looking.

To aim this, thumbnails make use of several visual elements:

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- **Geographic domain:** thumbnails accurately reflect the region covered by each product.
- **Basemaps:** default basemaps are assigned based on the product type. A dark basemap is used for near-real-time (NRT) products; a light basemap identifies multiyear (MY) product.
- **Colour map:** the colour map used in the thumbnails corresponds to the variables present in the data.
- **Tags:** tags have been introduced for select products to aid in distinguishing or grouping similar items, or to emphasize specific aspect. This additional feature improves the categorization and identification of products within the catalogue.

2.2 Map Customisation

Once a layer is added to the viewer, the default settings are used for basic visualisation, but maps can also be fully customised, via the Layer Options panel (Figure 3).

Colour map

Recognising the central role of colours in data visualisation several colour maps available (including new cyclic, sequential, and diverging palettes). In addition, an invert button allows to invert the colour map, along with a staircase button that allows the use of discrete colour maps based on user-defined intervals of values and stops. Indeed, range values can be set by hand or automatically adapted to the visualized portion of data (“Auto”).

Toponyms

To improve the context of data visualisations, toponyms, or place names, are introduced for rivers, lakes and marine areas. This addition to the map provides valuable geographical context to a data visualisation.

Auto-zoom on geographic domain

When adding a layer to the map, users are now automatically zoomed in on the geographic domain of the dataset. Similarly, clicking on the title of a layer will automatically zoom in on the same area.

Layer disambiguation

To avoid confusion when viewing several maps with similar colours or overlapping layers, the domain and time resolution of each layer are now directly displayed below the layer’s title.

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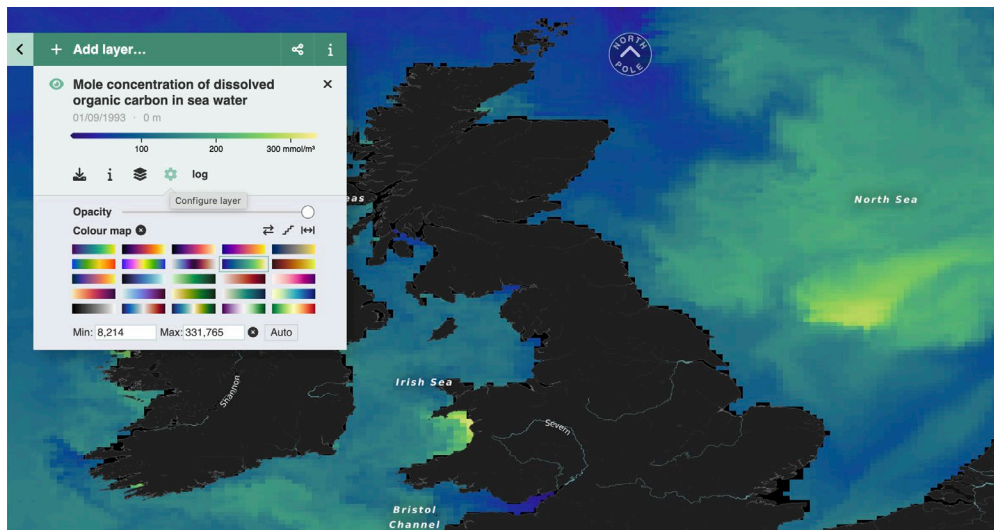


Figure 3: NECCTON viewer and Layer Options panel.

2.3 Data Viewer

Timeline and depth levels

Once in the Viewer, it is possible to change the time step via the timeline bar on the bottom of the window and, when available, the depth level.

Objects and graphics

It is also possible to add objects on the map that allows a deeper and more detailed exploration of the data available, thanks to the graphics that are automatically generated:

- **Points:** this opens a timeseries, a depth profile and a timeseries as function of depth, when this dimension is available.
- **Lines:** this generates the timeseries computed over the line and a transect as a function of depth (when available) and geographic area.
- **Areas:** this generates a timeseries for the selected polygon and an histogram.

Clicking on the “Import” tool opens the *Import geometries* modal, which allows the user to add geometries to the map without having to draw them. Multiple options are possible (Figure 4):

- **Preset geometry collections:** curated geometries that are useful to marine users, grouped in collections.
- **Recent:** geometries imported or drawn by the user in the past.
- **WKT/GeoJSON/Shapefile:** geometries uploaded by the user in various formats.

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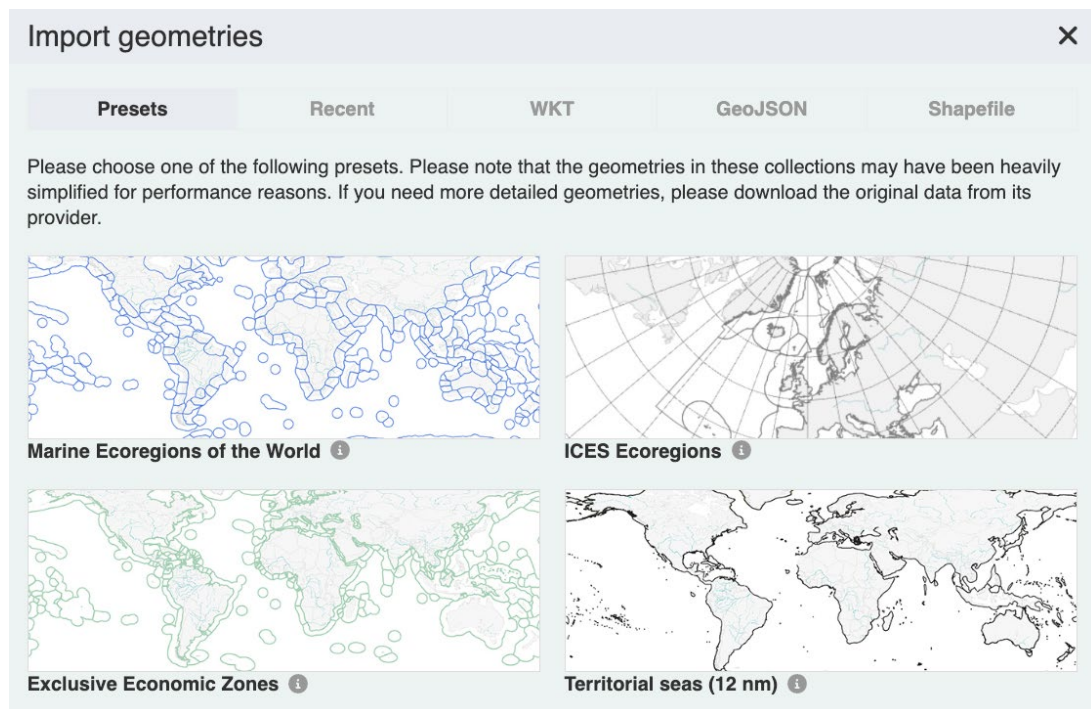


Figure 4: import geometries options

Focusing on the graphics, it is possible to:

- Expand all graphs
- Adjust axes
- Export to netCDF, CSV or SVG
- Delete graph(s)
- Add new graph

2.4 Settings

General settings

It is also possible to change the general settings of the map by clicking on the gear next to the timeline bar (or above the depth axis, if available) (Figure 5). This allows to:

- Login/logout to your Copernicus Marine account
- Change the map and the projection settings
- Select the basemap
- Change the object units

A reset map option is also available. This functionality resets all the map-adjustments, except for the colour-blind mode.

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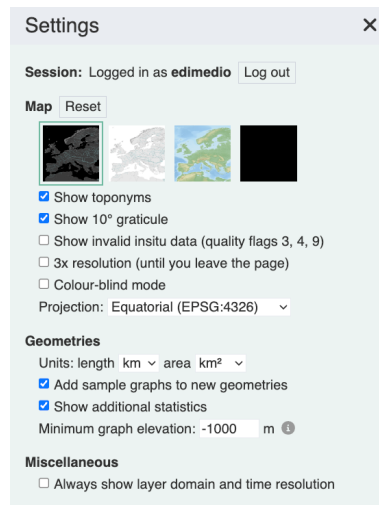


Figure 5: General settings of the NECCTON Data Viewer

Shortcuts

Several new and improve shortcuts have been implemented, aiming to facilitating the user experience, in any conditions.

2.5 Data Download

All data in the catalogue are available to download, via the subset option or accessing the original files (called “native”) as they have been produced.

Subset

With the objects or imported polygons it is possible to automatically define the geographical coordinates of the area of interest, in the tab of the layer Download icon (Figure 6). Select the other parameters such as date range, variables and depth range if available and click on “Download”. The netCDF is then automatically stored on the machine’s local folder.

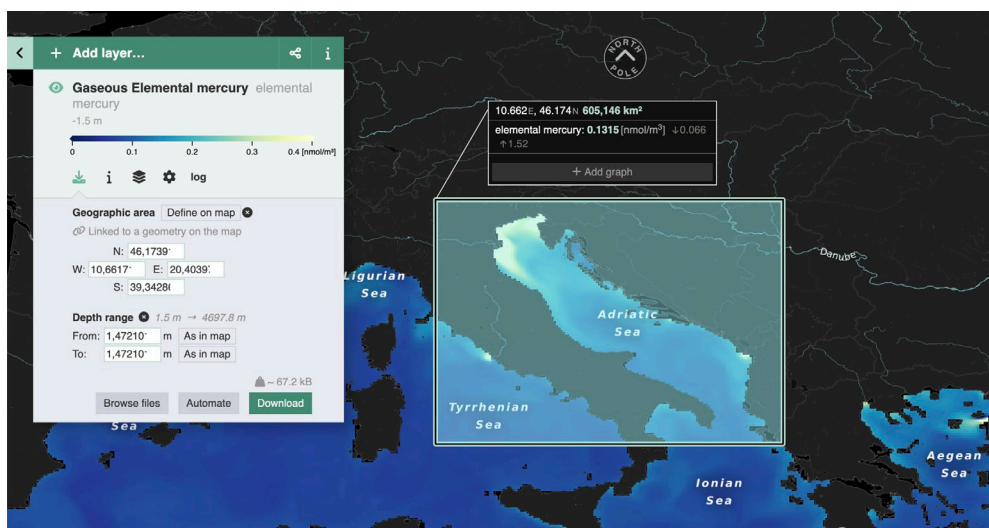


Figure 6: subset option

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File Browser

The File Browser provides direct and intuitive access to browse and download locally original files, to all users (Figure 7). *Note: This feature is still not available in the current NECCTON viewer, but will be present when the final NECCTON products are ingested.*

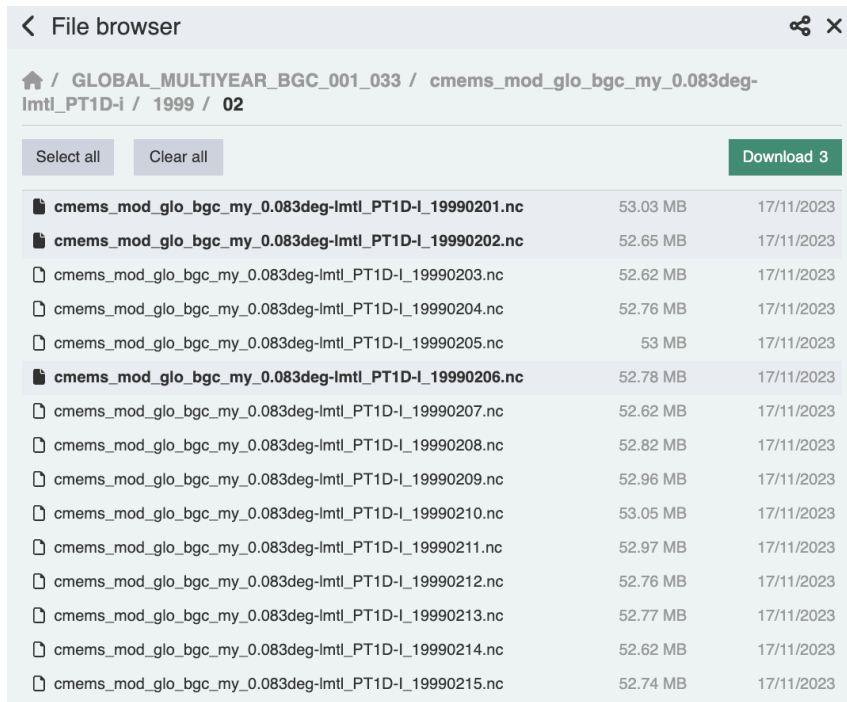


Figure 7: File Browser

2.6 Data Sharing

Finally, all the data opened on the interface can be exported as animations, images and embedded links, clicking on the Share icon, where it is possible to (Figure 8):

- Share the link redirecting to the same configuration of the map (same layer, colour map, graphics and objects)
- Save the image
- Create a video or GIF, defining the time interval, the step and the duration
- Share the embed link

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Share
X

Link
Image
Video
Embed

Start 31/12/2022 00:00 Stop 07/01/2023 00:00 Step 1 day

Format ☒ MP4 (smaller, memory-hungry) ☐ GIF (higher quality) Duration 4 s

Overlay ☒ legend ☒ t/z caption

Generate video

Figure 8: Share and export animations, images and embedded links.

2.7 Contact

If you have any problems or questions, please consult the NECCTON contact page: <https://neccton.eu/contact/> or contact the NECCTON team directly at neccton@mercator-ocean.eu.