Ferrybox data from ship to your Desktop

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GOSUD - IODE Program Leader

16/09/2024

IOC. (2003). Resolution XXII-6: IOC Oceanographic Data Exchange Policy. Intergovernmental Oceanographic Commission, UNESCO

The timely, free and unrestricted international exchange of oceanographic data is essential for the efficient acquisition, integration and use of ocean observations gathered by the countries of the world for a wide variety of purposes including the prediction of weather and climate, the operational forecasting of the marine environment, the preservation of life, the mitigation of human-induced changes in the marine and coastal environment, as well as for the advancement of scientific understanding that makes this possible

https://unesdoc.unesco.org/ark:/48223/pf0000372654

Topics to be Covered

- **In Situ TAC Organisation and Ferrybox dataflow**
- Some examples
- Marine Data Store & use of copernicusmarine toolbox
- Some features that will come soon
- Acquisition in EEZ

In Situ TAC Organisation

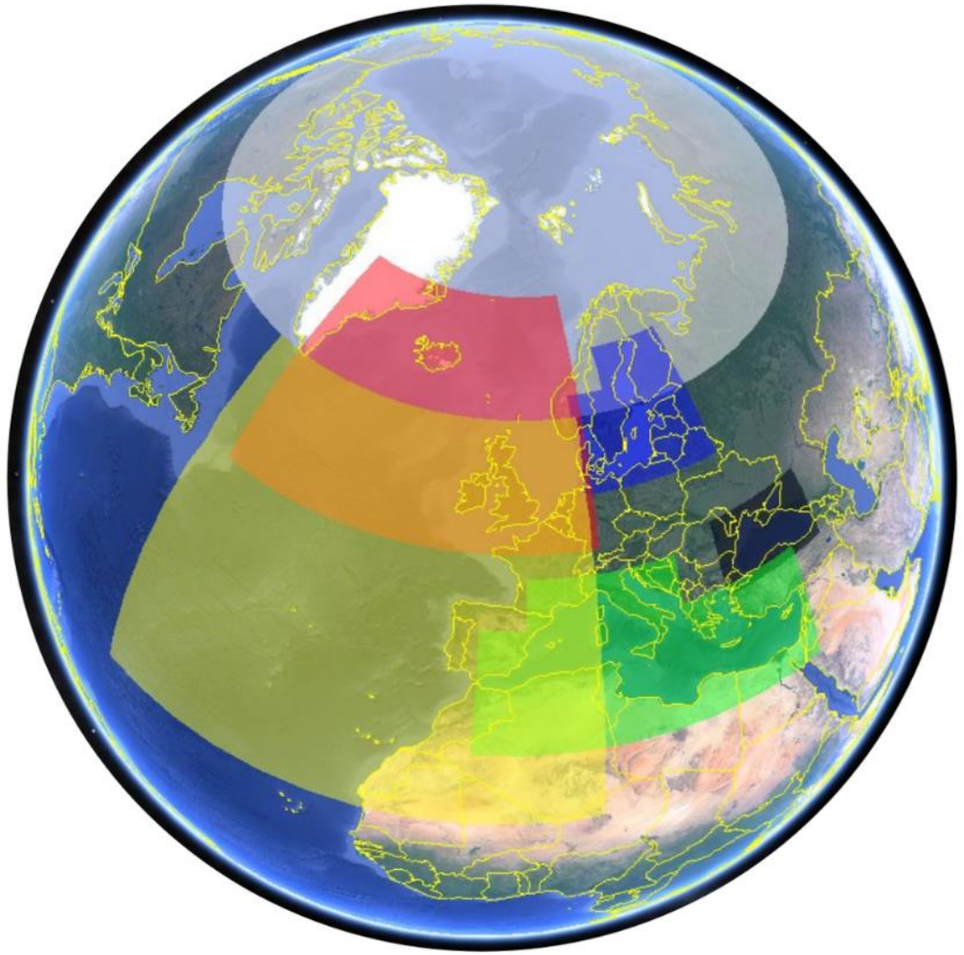
Copernicus Marine Service In Situ TAC portfolio

NRT products

Global: Ifremer-Pokapok
Arctic Ocean: IMR
Baltic Sea: SMHI
North West Shelf: BSH
Iberia-Biscay-Ireland: PdE-Nologin
Mediterranean Sea: HCMR
Black Sea: IOBAS
T & S: OceanScope
Currents (UV): CLS-AZTI-Ifremer-CNR

Multi Year products

T & S: OceanScope
Currents (UV): CLS-AZTI-Ifremer-CNR-SOCIB
Waves: PdE-Nologin
BGC: IMR-Pokapok-HCMR-SYKE
Sea level: PdE-Nologin
Carbon: IMR
OMI: PdE-Nologin



In Situ TAC Organisation - Global Product INSITU_GLO_PHYBGCWAV_DISCRETE_MYNRT_013_030

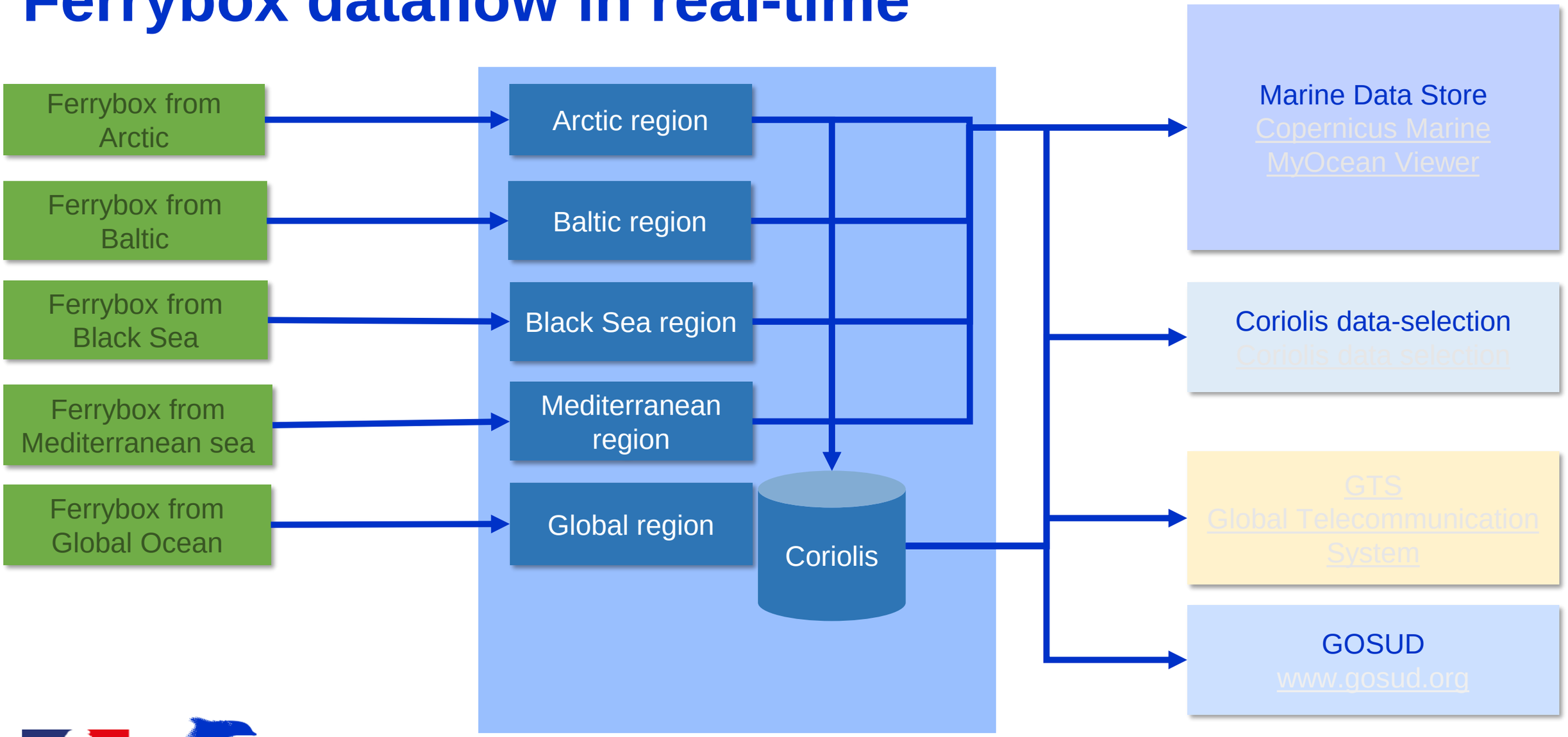
- The global region : all the world's oceans and seas.

  It is hourly synchronised with regional products (Arctic, Baltic, Black Sea, North West Shelf, Mediterranee, Iberian-Biscay-Ireland)

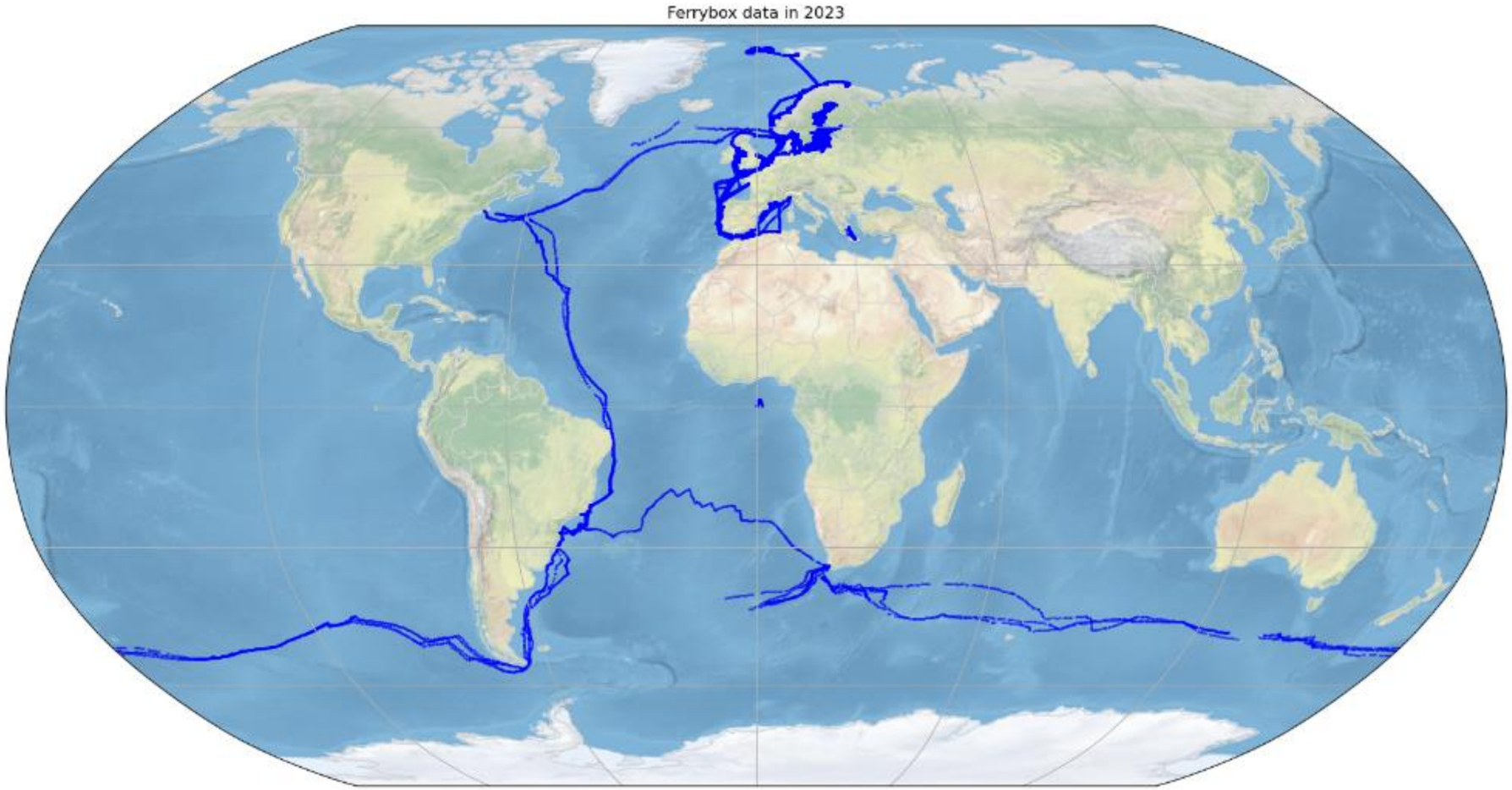
- The data from other regions feeds Coriolis database (the French In situ database for operational oceanography)
- Data are made accessible through Coriolis data selection

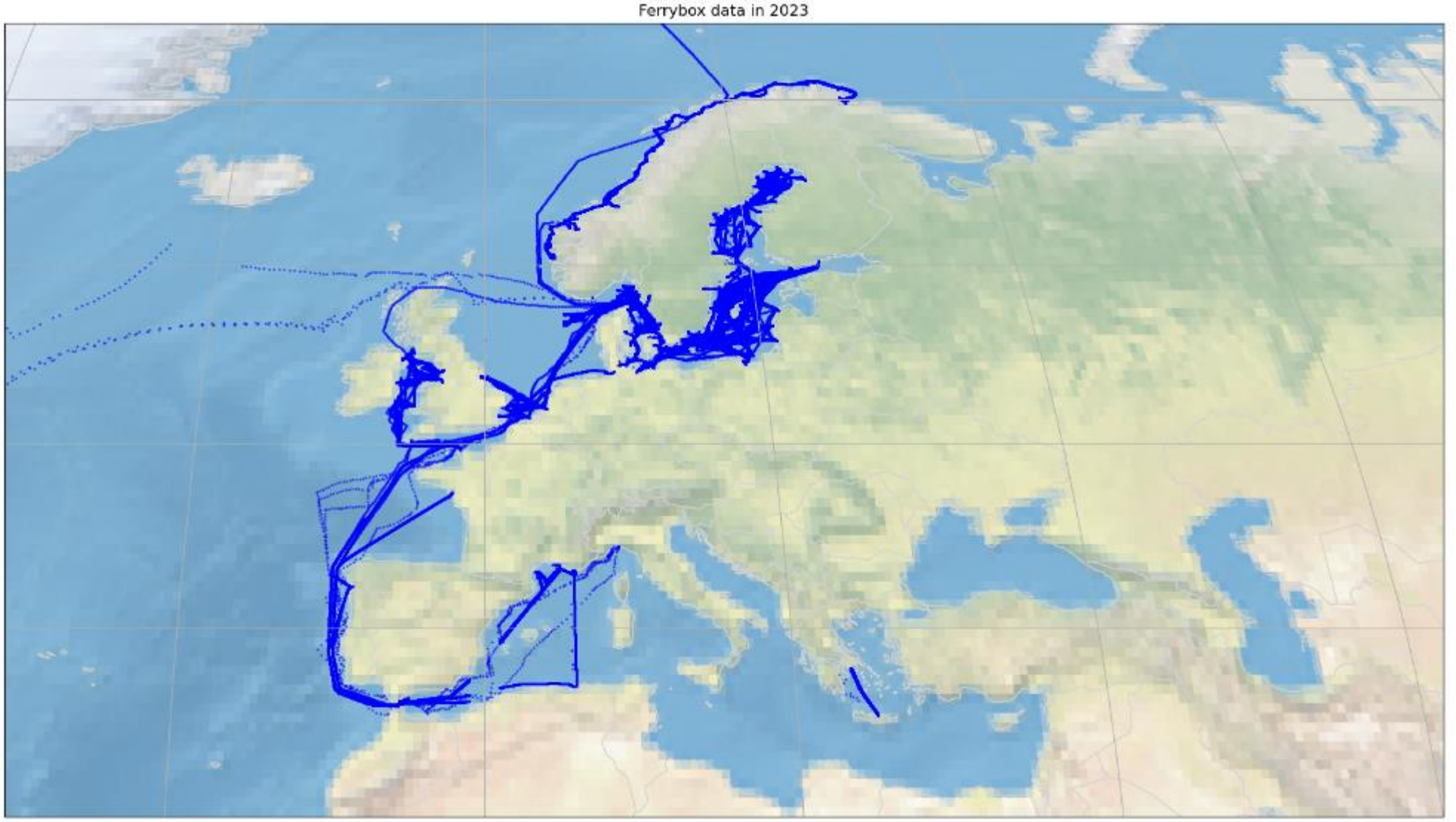
- Data sent to Marine Data Store are accessible Global Ocean- In-Situ Near-Real-Time Observations | Copernicus Marine Service

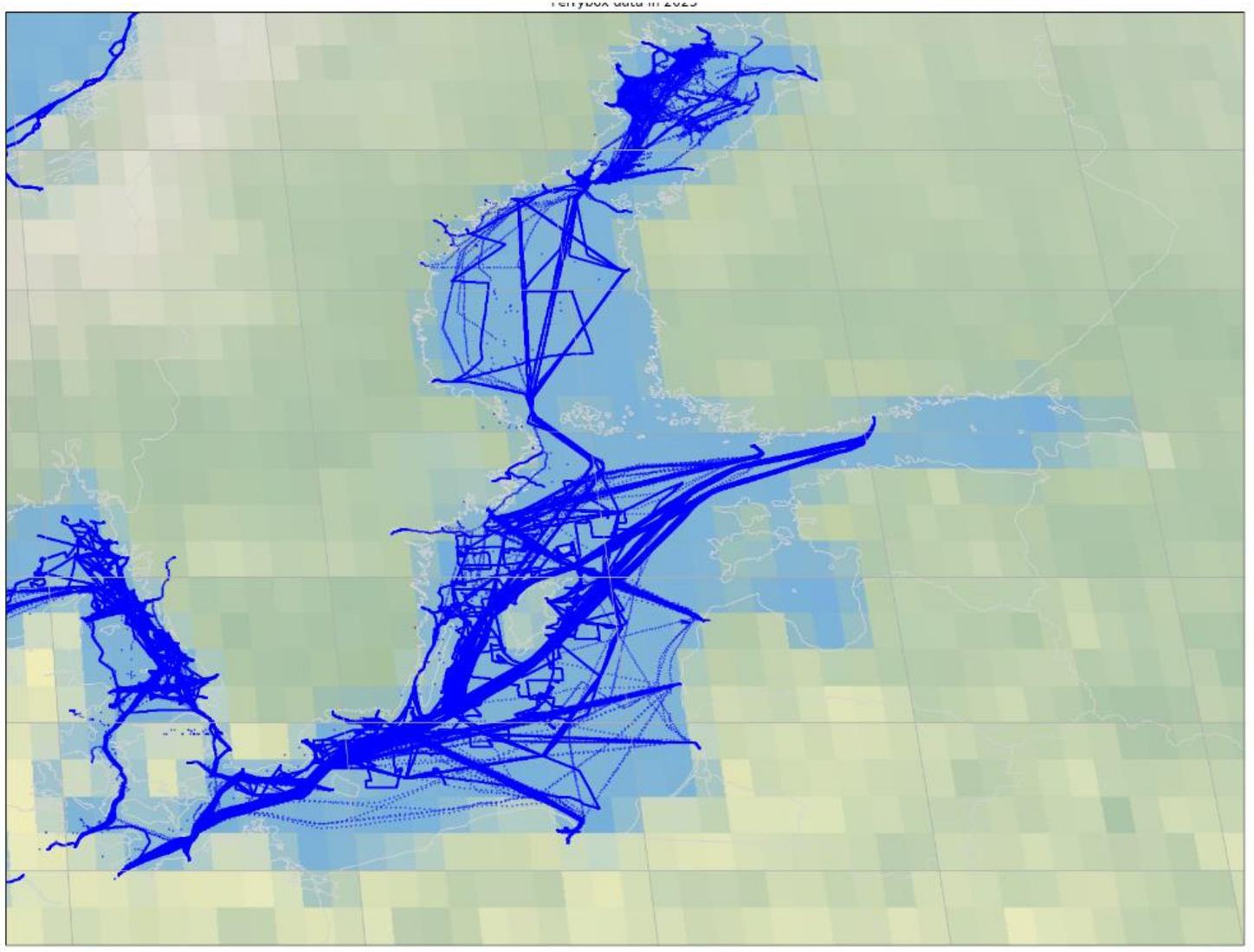
Ferrybox dataflow in real-time



Ferrybox data in Coriolis in 2023




Ferrybox data in 2023



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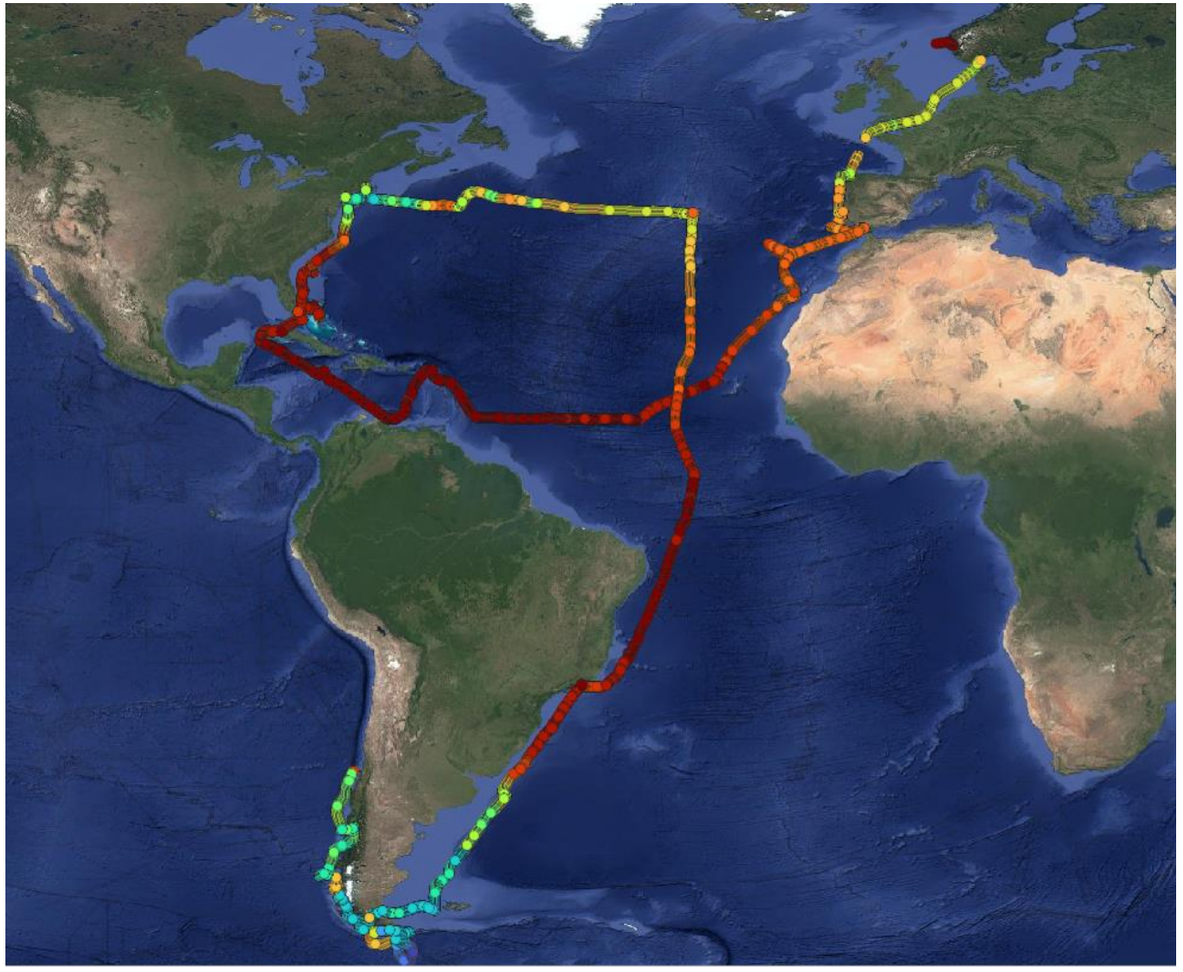
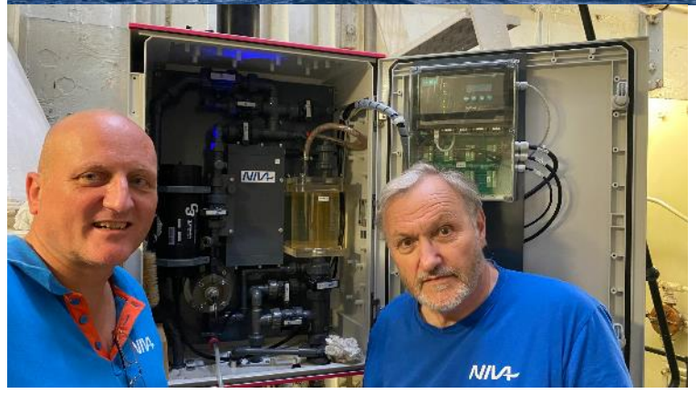
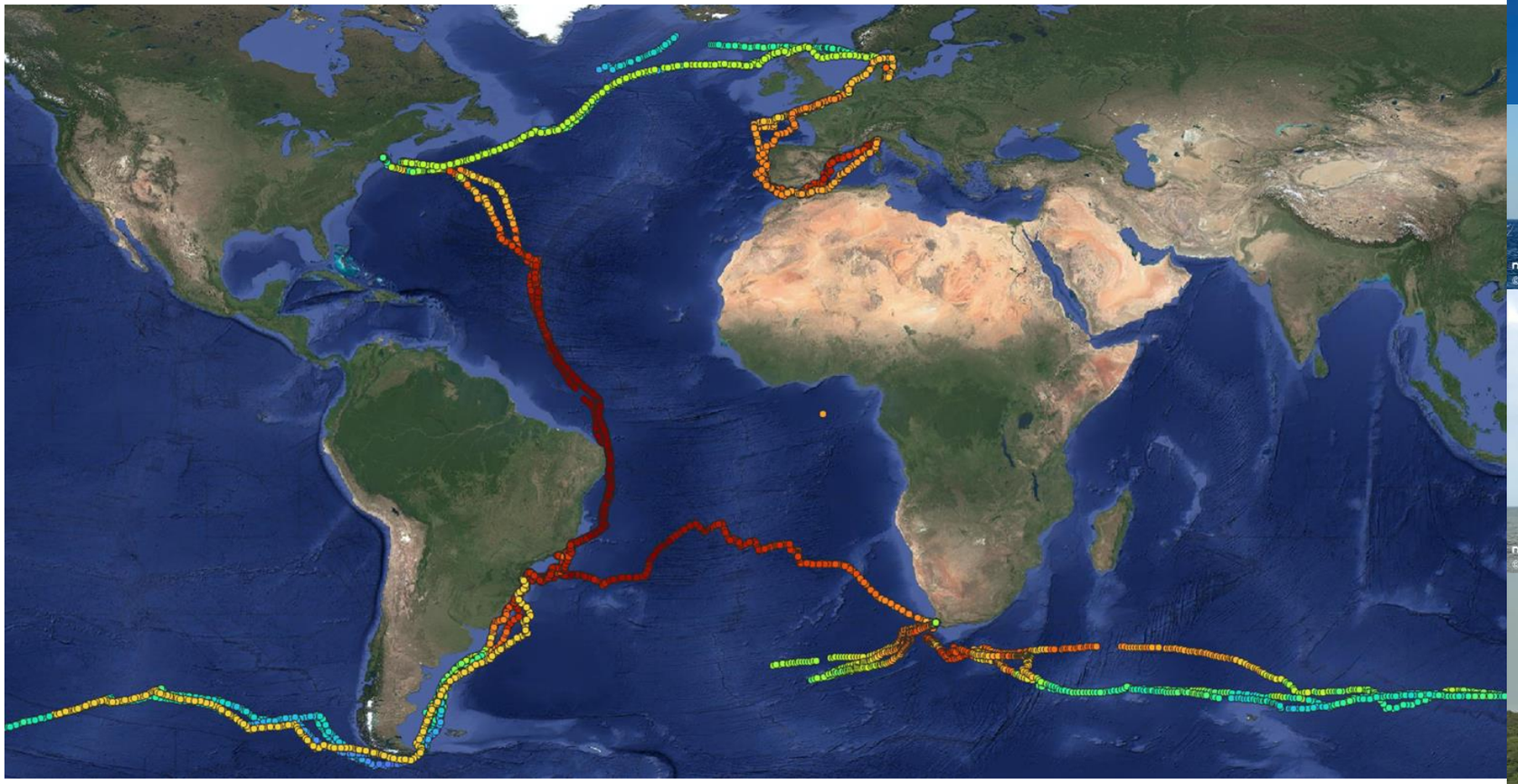
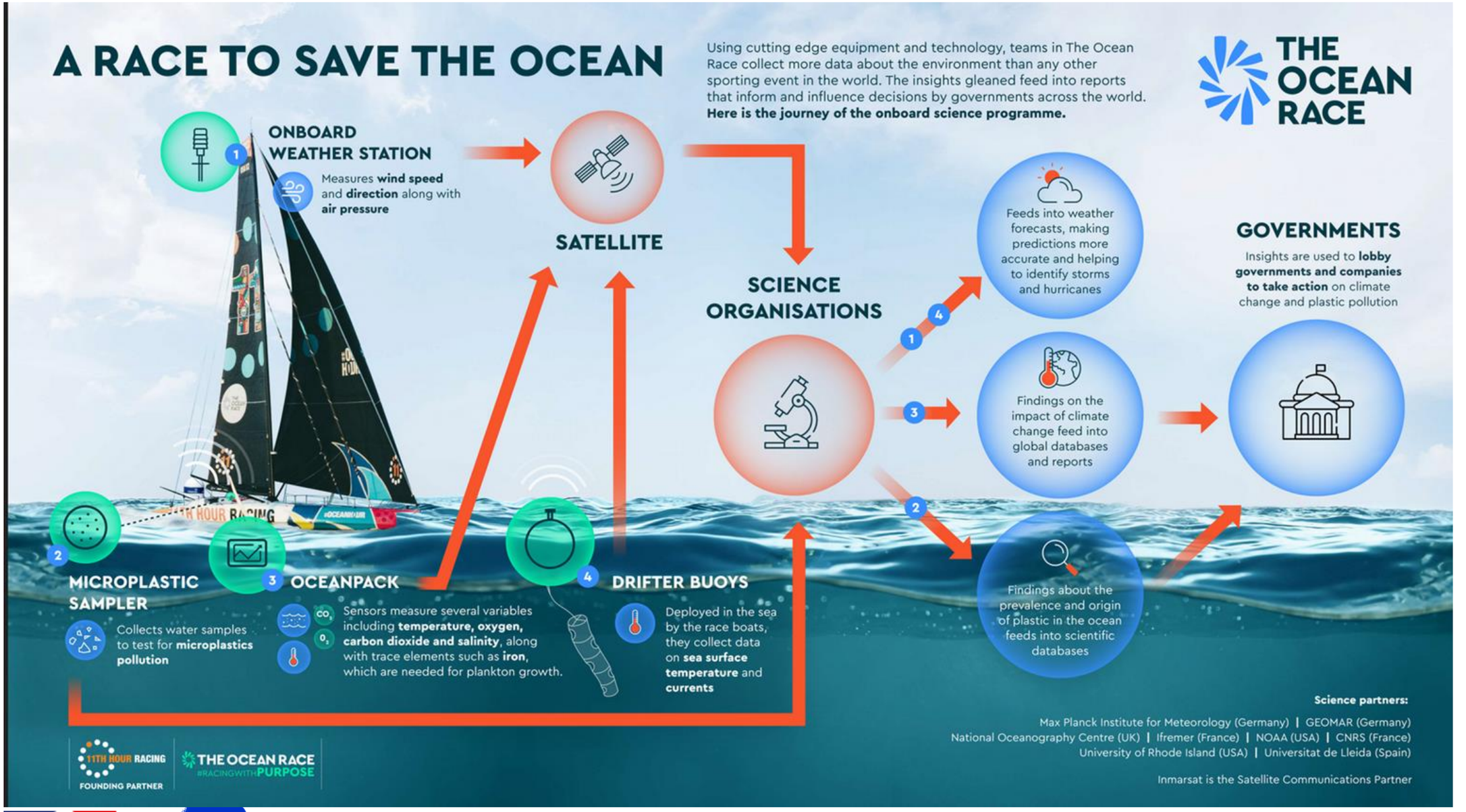
Statsraad lehmkuhl 2021-2022





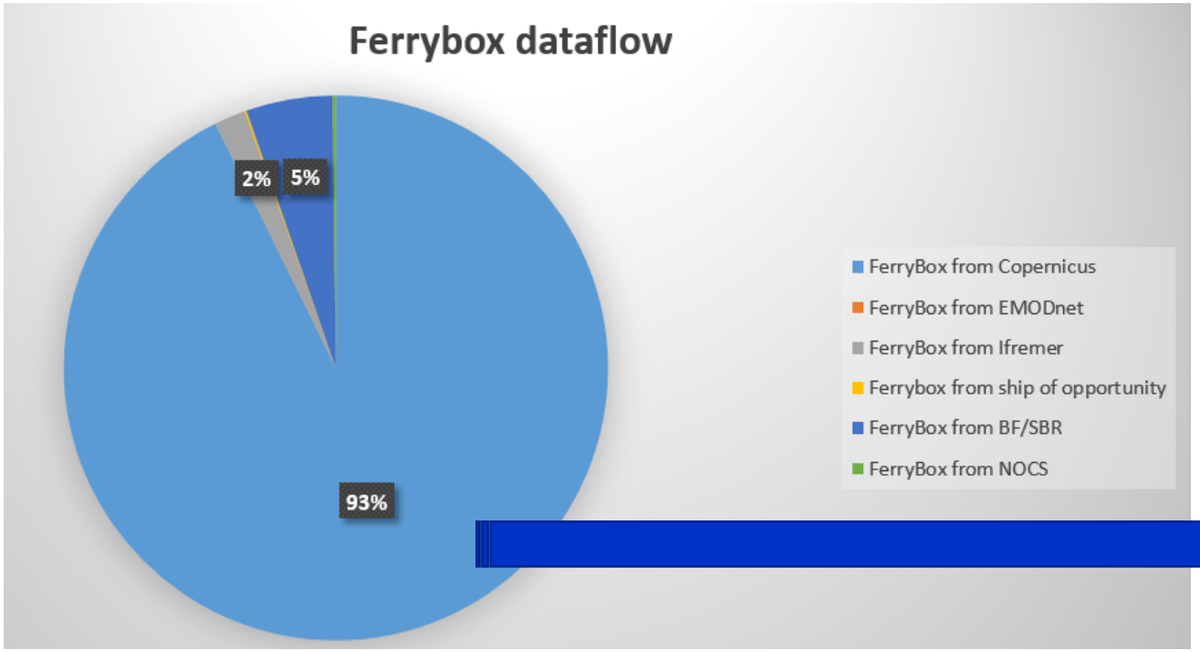
The Ocean Race

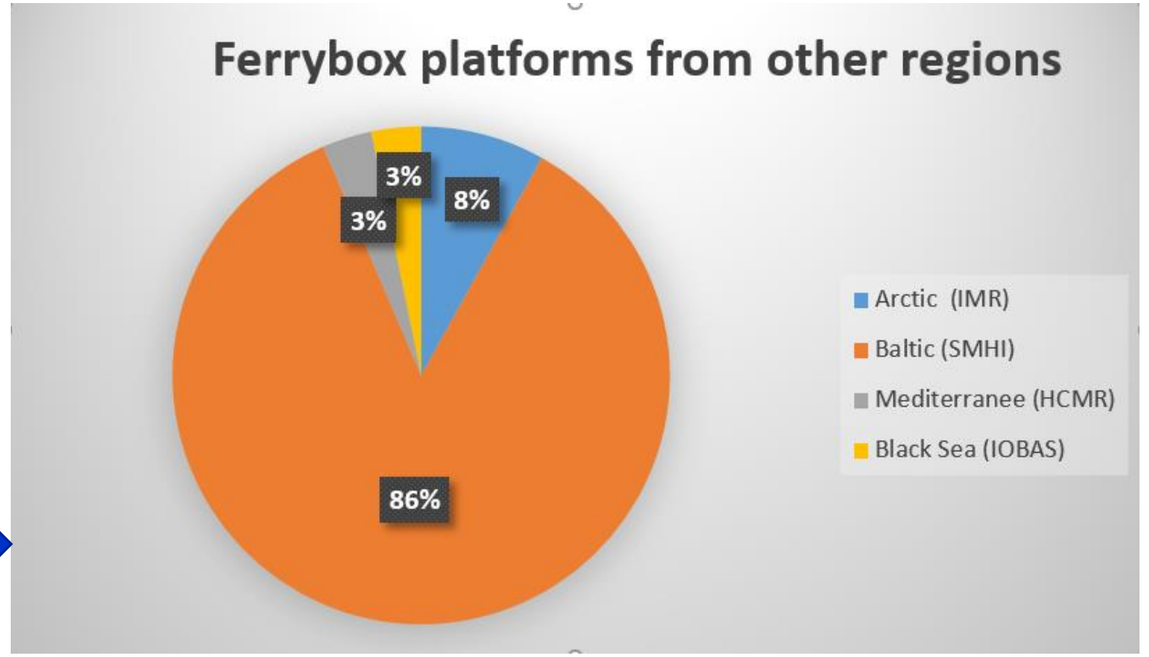



A RACE TO SAVE THE OCEAN
Using cutting edge equipment and technology, teams in The Ocean Race collect more data about the environment than any other sporting event in the world. The insights gleaned feed into reports that inform and influence decisions by governments across the world. Here is the journey of the onboard science programme.
THE OCEAN RACE
1 ONBOARD WEATHER STATION
Measures wind speed and direction along with air pressure
SATELLITE
SCIENCE ORGANISATIONS
Feeds into weather forecasts, making predictions more accurate and helping to identify storms and hurricanes
GOVERNMENTS
Insights are used to lobby governments and companies to take action on climate change and plastic pollution
Findings on the impact of climate change feed into global databases and reports
2 MICROPLASTIC SAMPLER
Collects water samples to test for microplastics pollution
3 OCEANPACK
Sensors measure several variables including temperature, oxygen, carbon dioxide and salinity, along with trace elements such as iron, which are needed for plankton growth.
4 DRIFTER BUOYS
Deployed in the sea by the race boats, they collect data on sea surface temperature and currents
Findings about the prevalence and origin of plastic in the ocean feeds into scientific databases
11TH HOUR RACING
FOUNDING PARTNER
THE OCEAN RACE
#RACINGWITHPURPOSE
Science partners:
Max Planck Institute for Meteorology (Germany) | GEOMAR (Germany)
National Oceanography Centre (UK) | Ifremer (France) | NOAA (USA) | CNRS (France)
University of Rhode Island (USA) | Universitat de Lleida (Spain)
Inmarsat is the Satellite Communications Partner

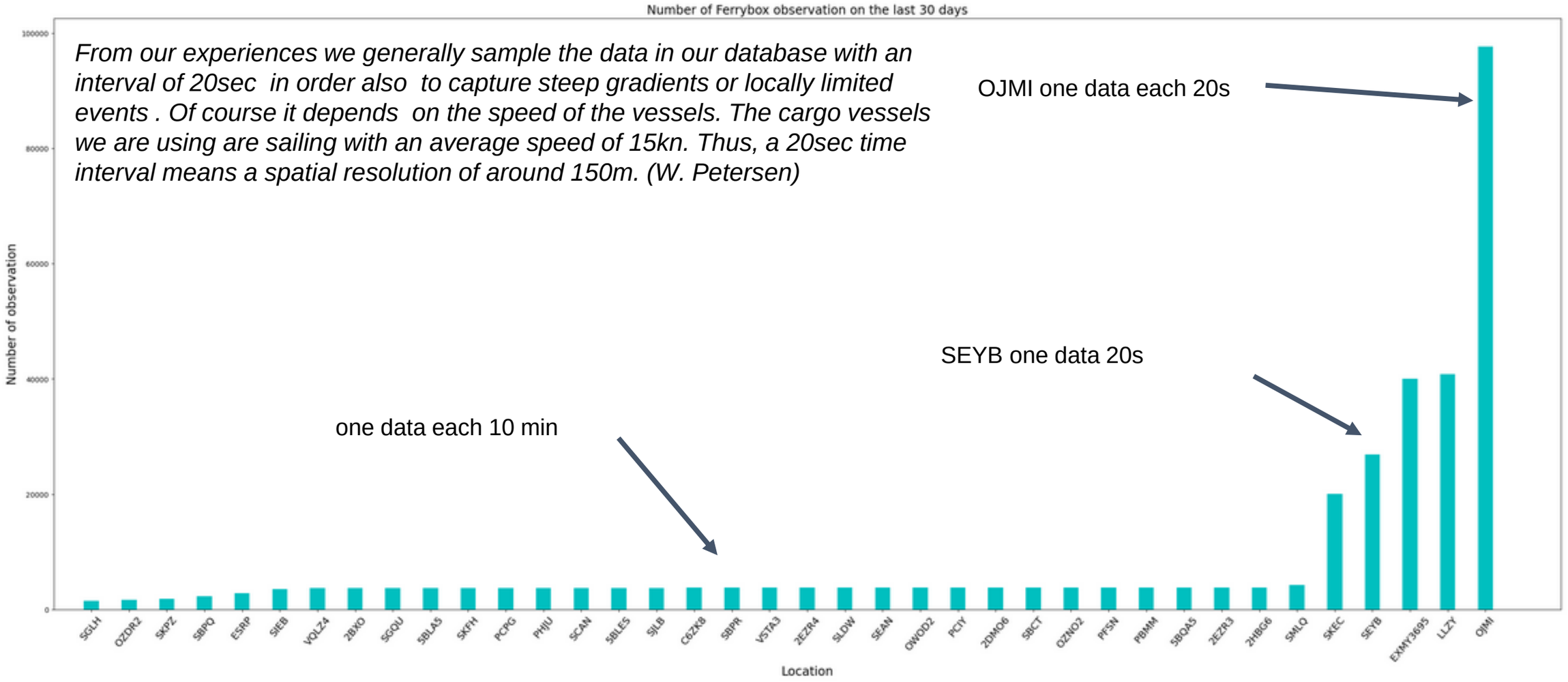
Ifremer

Ferrybox data since ever

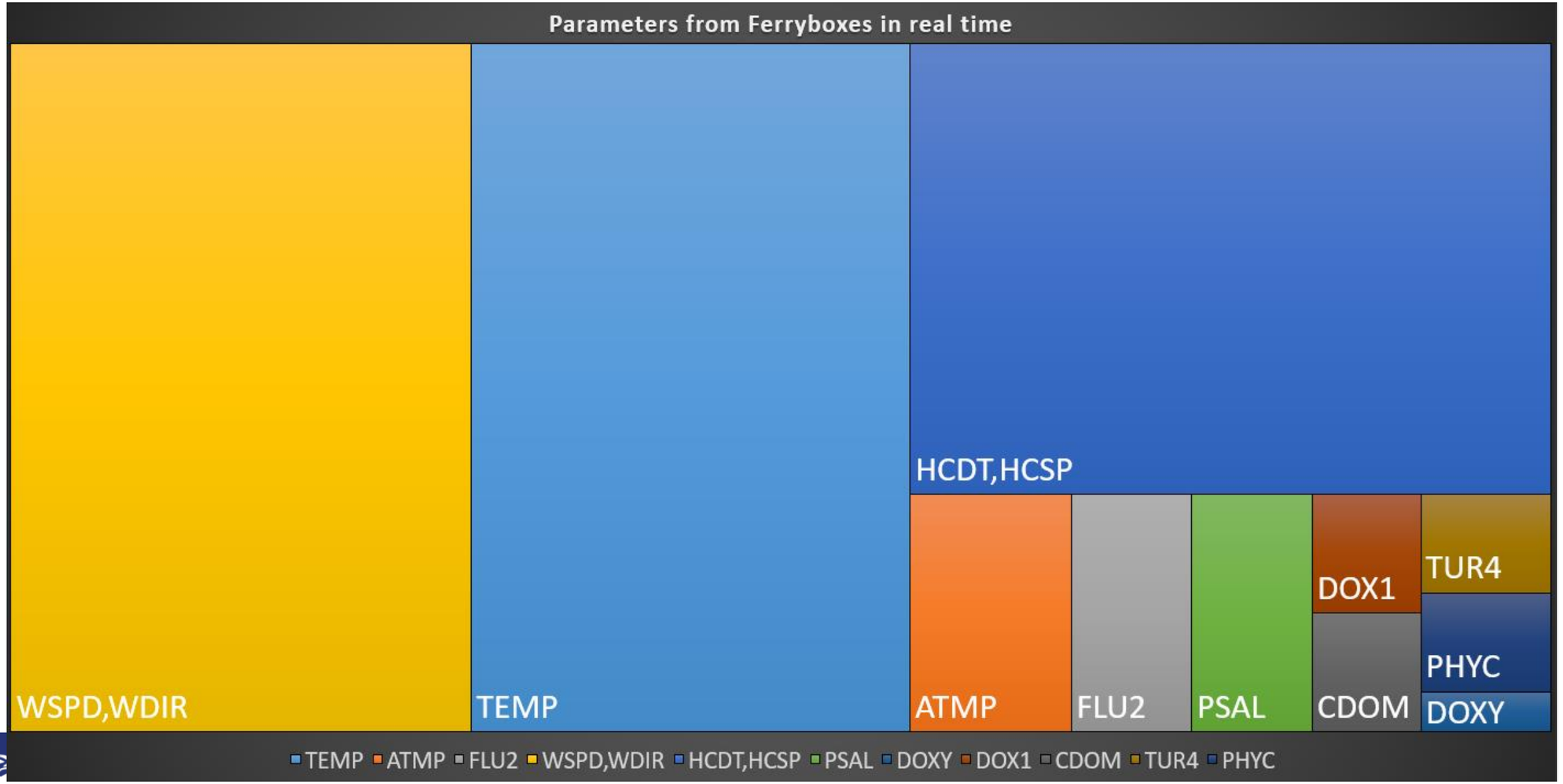




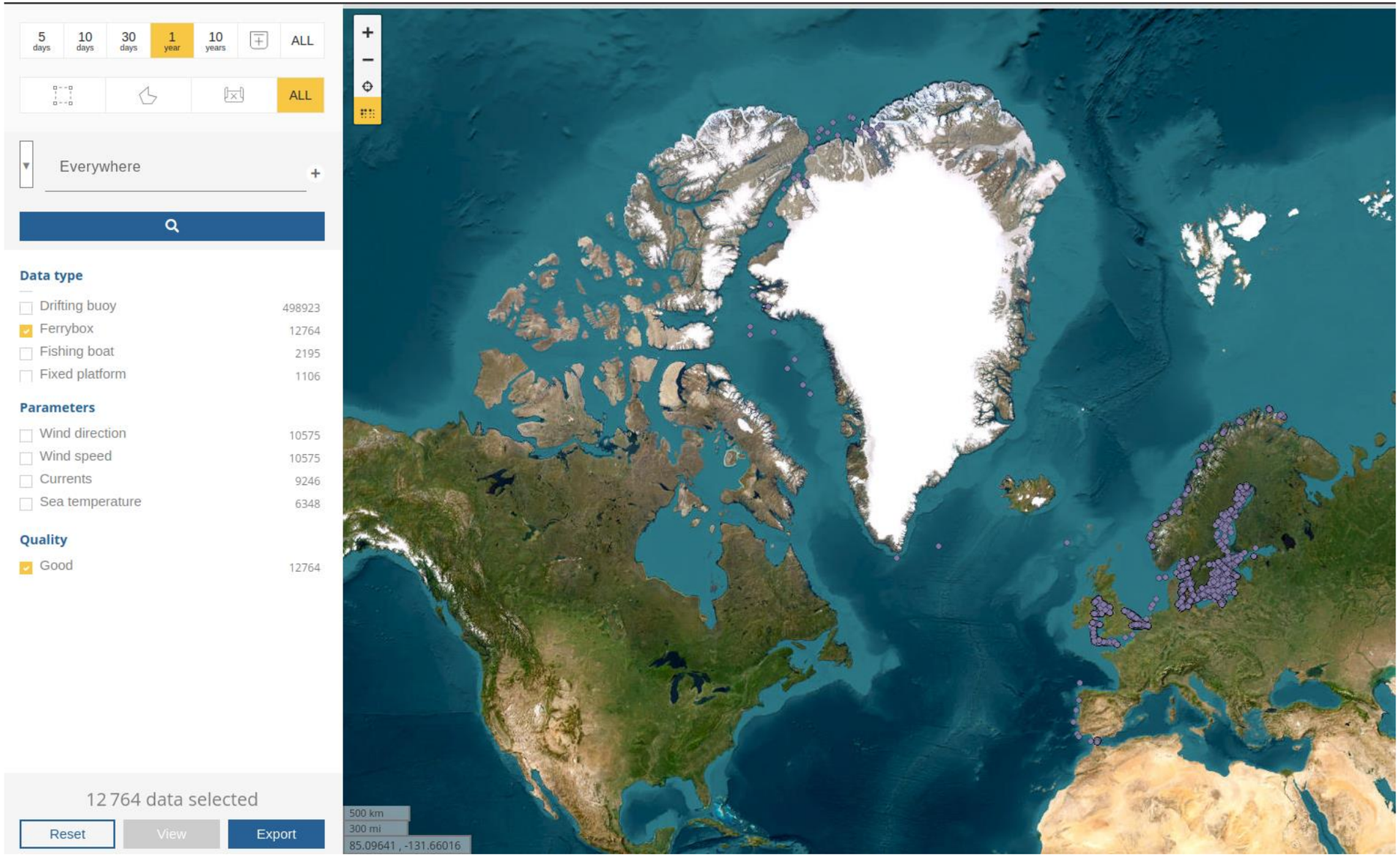
Ferrybox observations over the last 30 days



Parameters from Ferryboxes



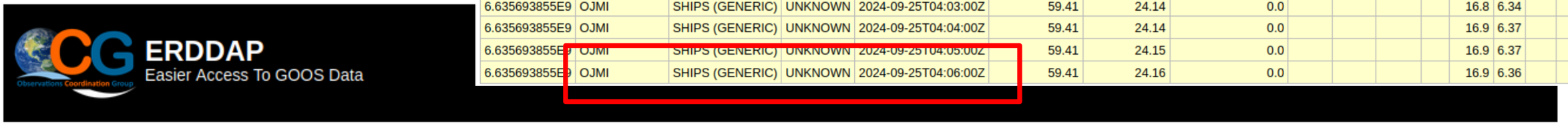
Ferrybox data in data selection



GTS data: Example with FinMaid (OJMI)

Extraction date: 2024-09-26 17:30:00

last date of observation in OSMC ERDDAP: 2024-09-25T04:06:00



platform_id	platform_code	platform_type	country	time	latitude	longitude	observation_depth	sst	atmp	precip	sss	ztmp	zsal	slp	windspd	winddir
				UTC	degrees_north	degrees_east		Deg C	Deg C	mm	1	Deg C		hPa	m/s	Deg true
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:00:00Z	59.02	21.46	0.0					17.5	6.63			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:01:00Z	59.03	21.46	0.0					17.5	6.62			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:02:00Z	59.03	21.47	0.0					17.5	6.62			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:03:00Z	59.03	21.47	0.0					17.4	6.62			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:04:00Z	59.03	21.48	0.0					17.4	6.62			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:05:00Z	59.04	21.48	0.0					17.3	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:06:00Z	59.04	21.48	0.0					17.3	6.63			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:07:00Z	59.04	21.49	0.0					17.3	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:08:00Z	59.05	21.49	0.0					17.3	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:09:00Z	59.05	21.5	0.0					17.2	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:10:00Z	59.05	21.5	0.0					17.2	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:11:00Z	59.05	21.51	0.0					17.1	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T00:12:00Z	59.05	21.51	0.0					17.1	6.64			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T04:03:00Z	59.41	24.14	0.0					16.8	6.34			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T04:04:00Z	59.41	24.14	0.0					16.9	6.37			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T04:05:00Z	59.41	24.15	0.0					16.9	6.37			
6.635693855E9	OJMI	SHIPS (GENERIC)	UNKNOWN	2024-09-25T04:06:00Z	59.41	24.16	0.0					16.9	6.36			

GTS: Some topics to follow

There is no metadata in OceanOPS regarding Ferrybox

- OceanOPS need to create a program group (related to SOOP ?)
- Discussion should be tackle at Bologna (SOOP-DATAMEQ)

The use of SOTID should be generalised instead of the CALLSIGN.

- A SOTID is related to an instrument contrary to the call-sign

Topics to be Covered

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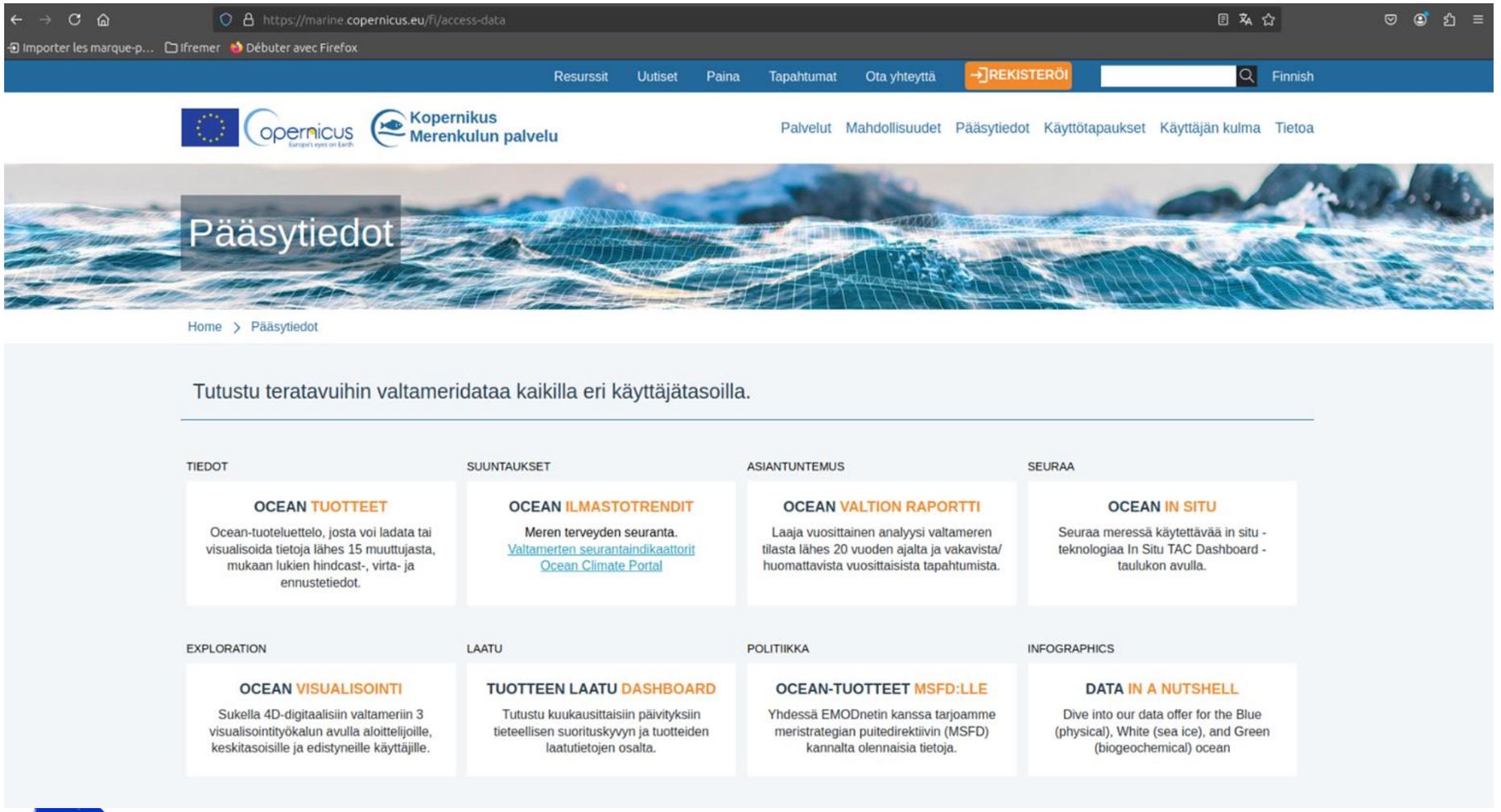
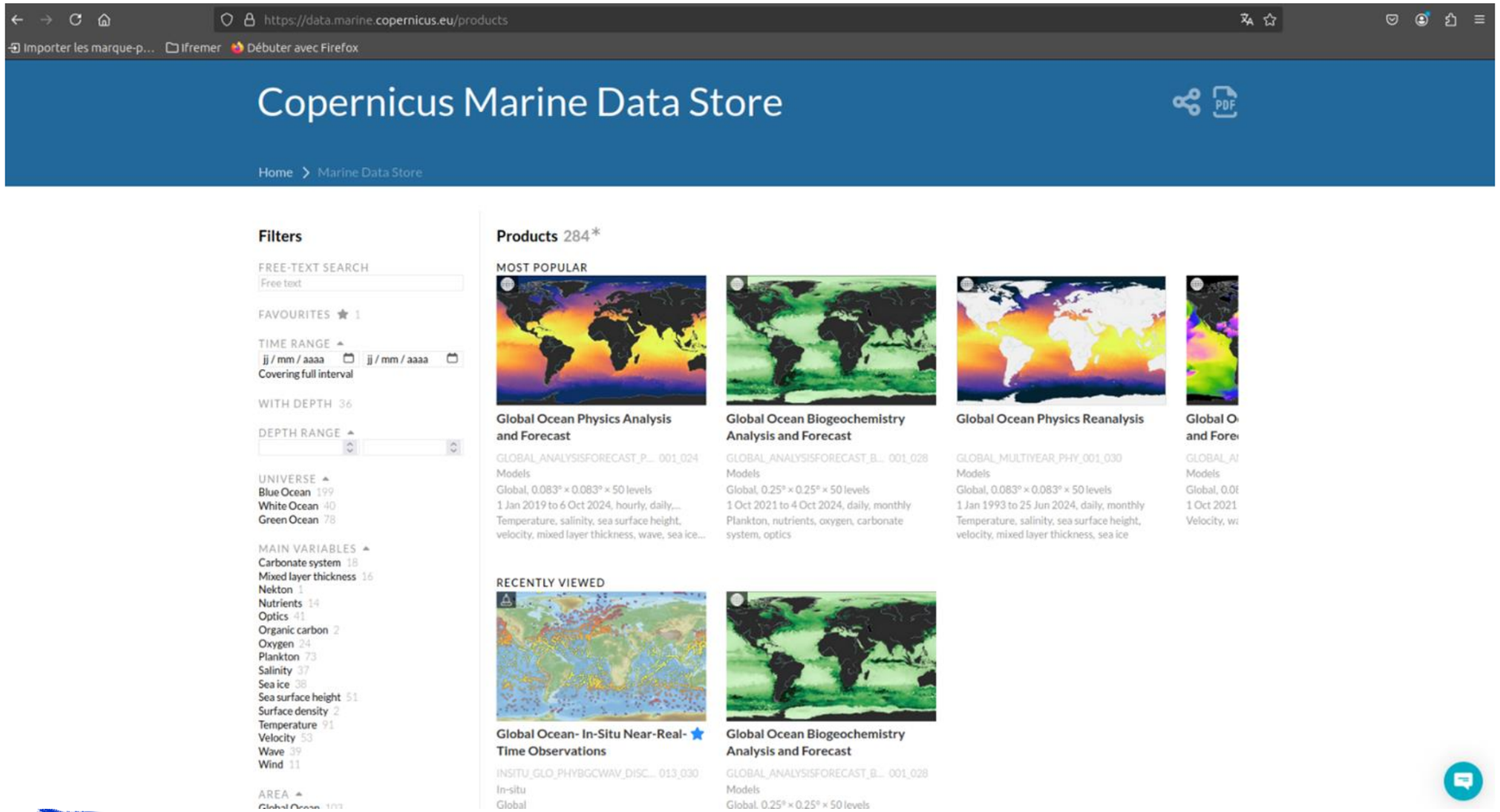
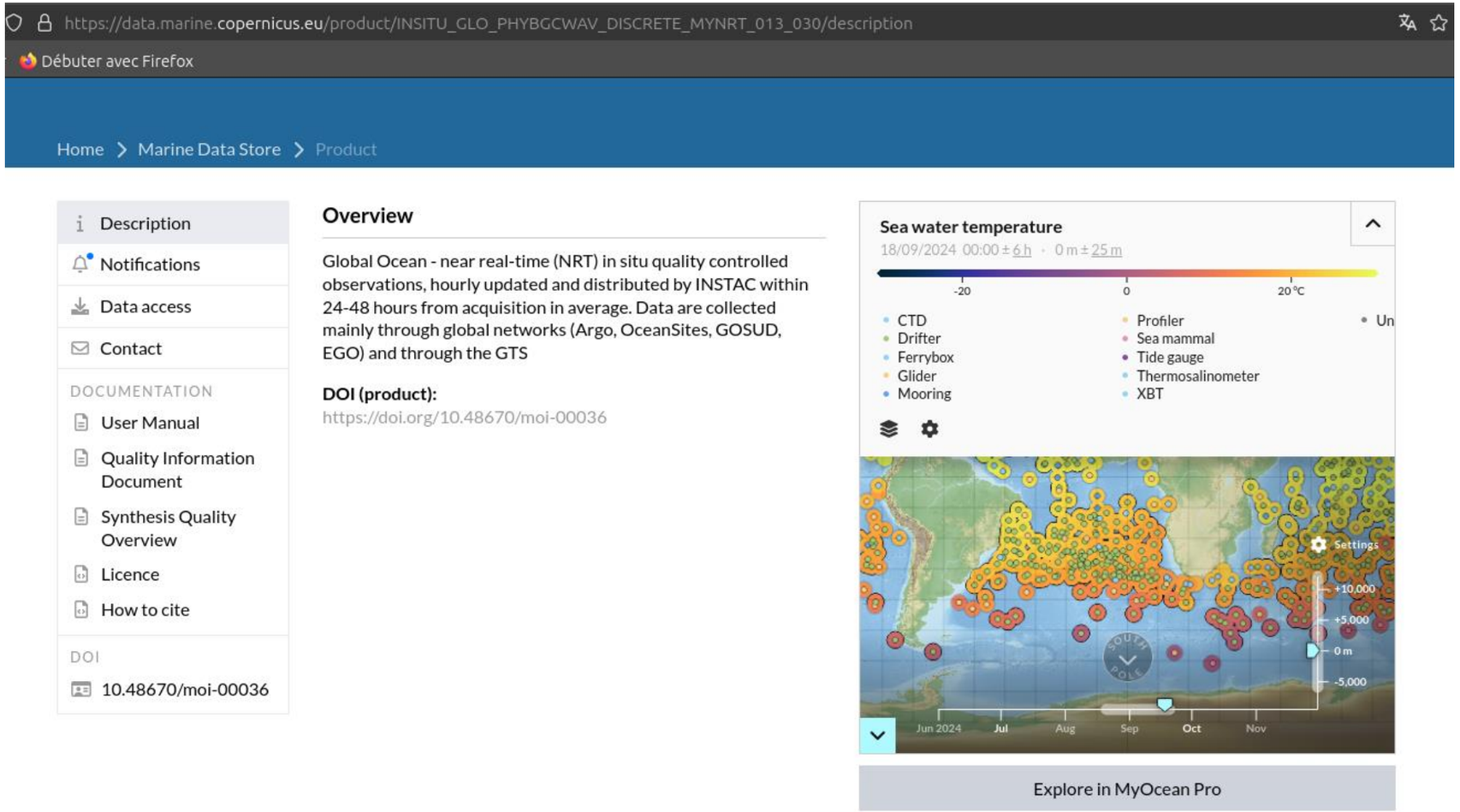
Copernicus Marine In Situ TAC



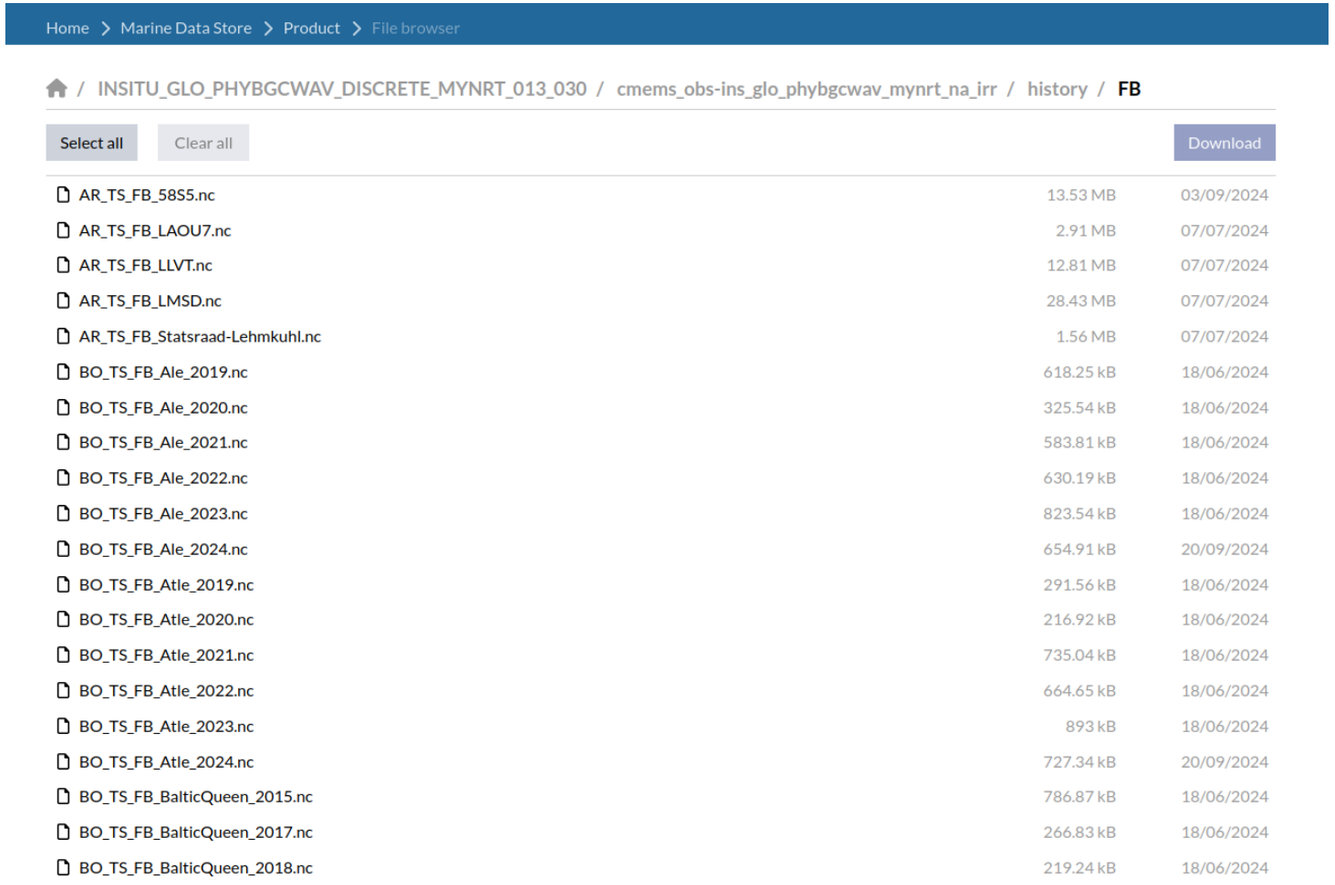
Access to In Situ TAC products



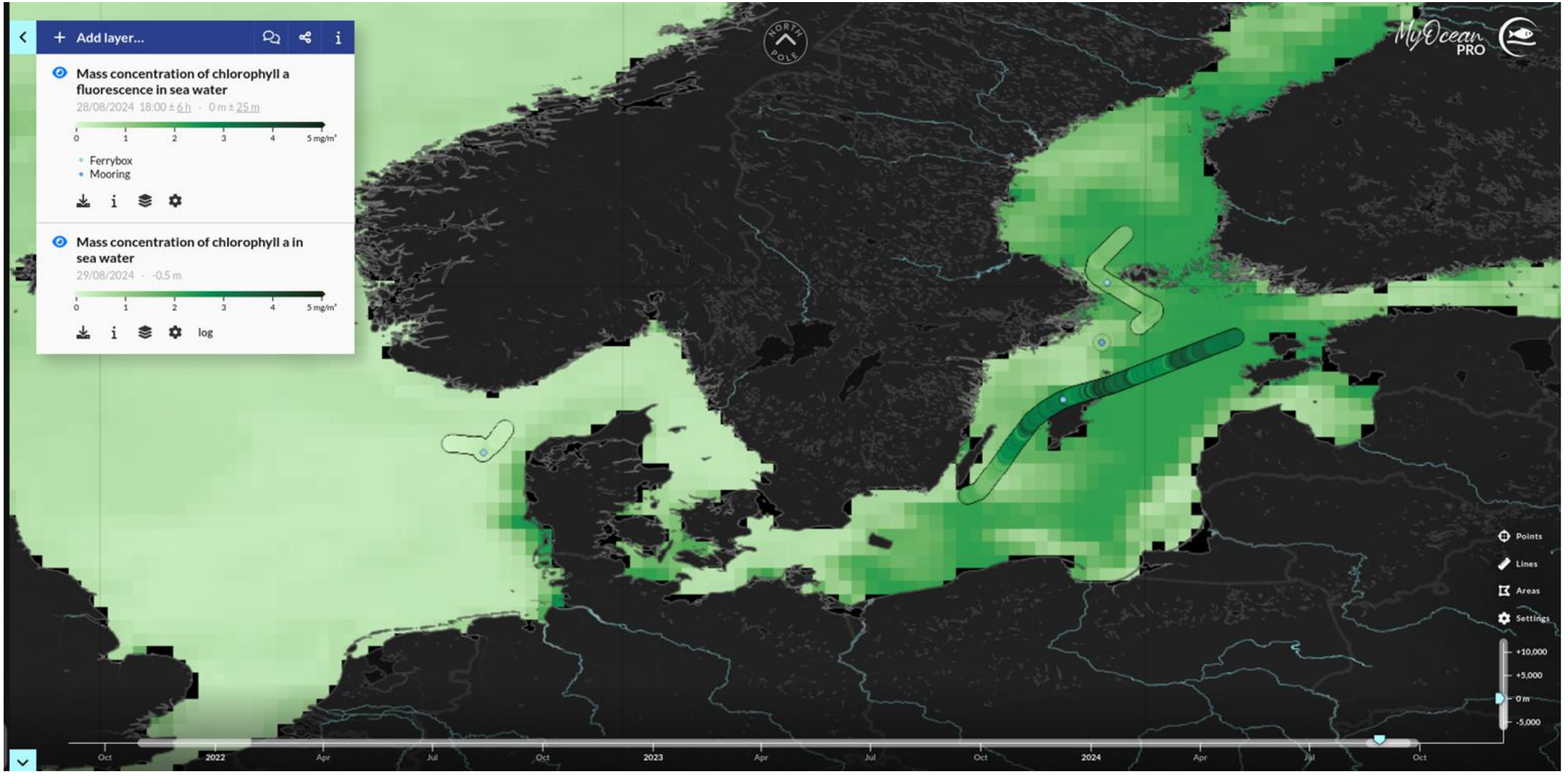
Access to the Marine Data Store



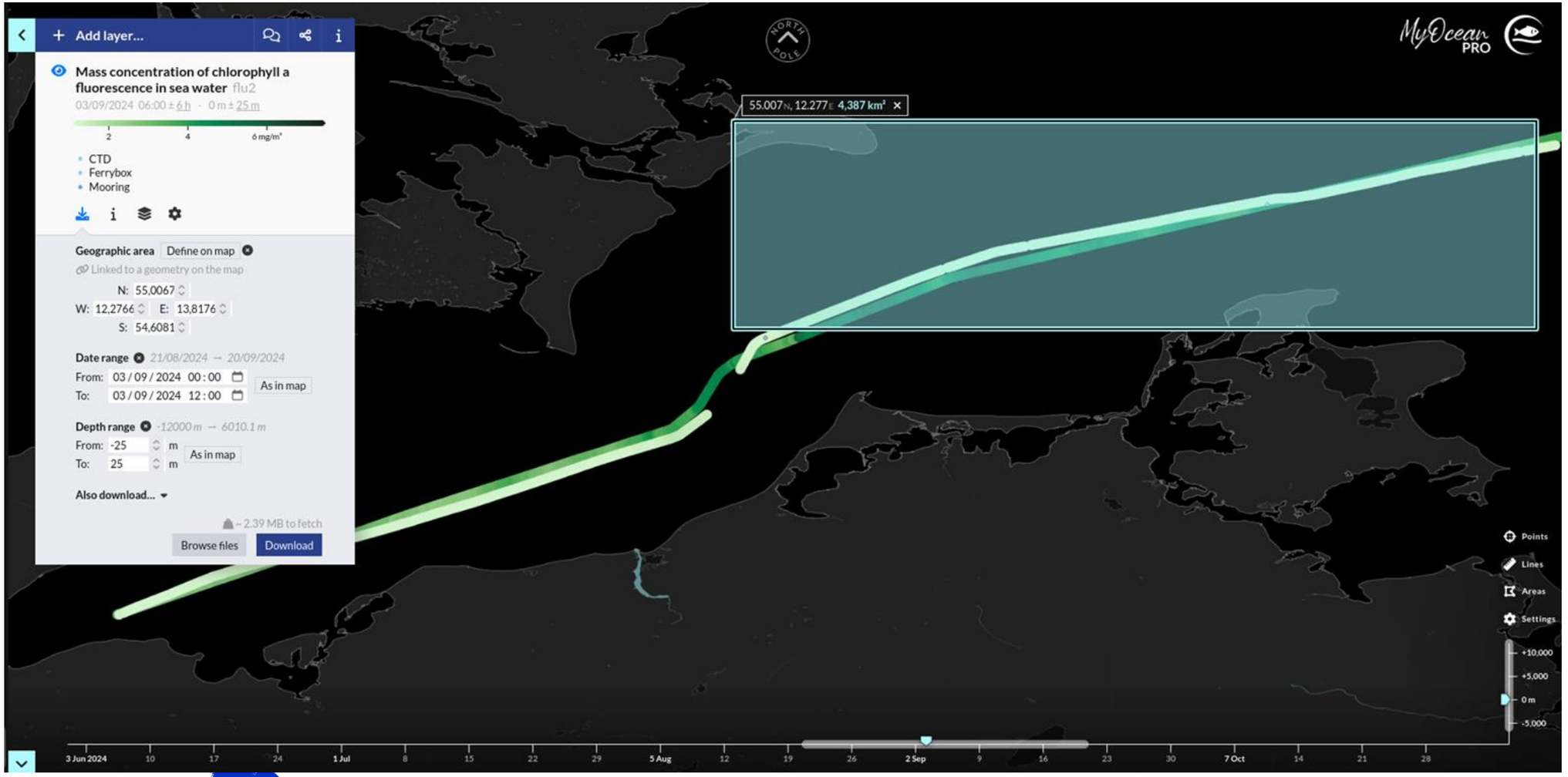
Browse Ferrybox files



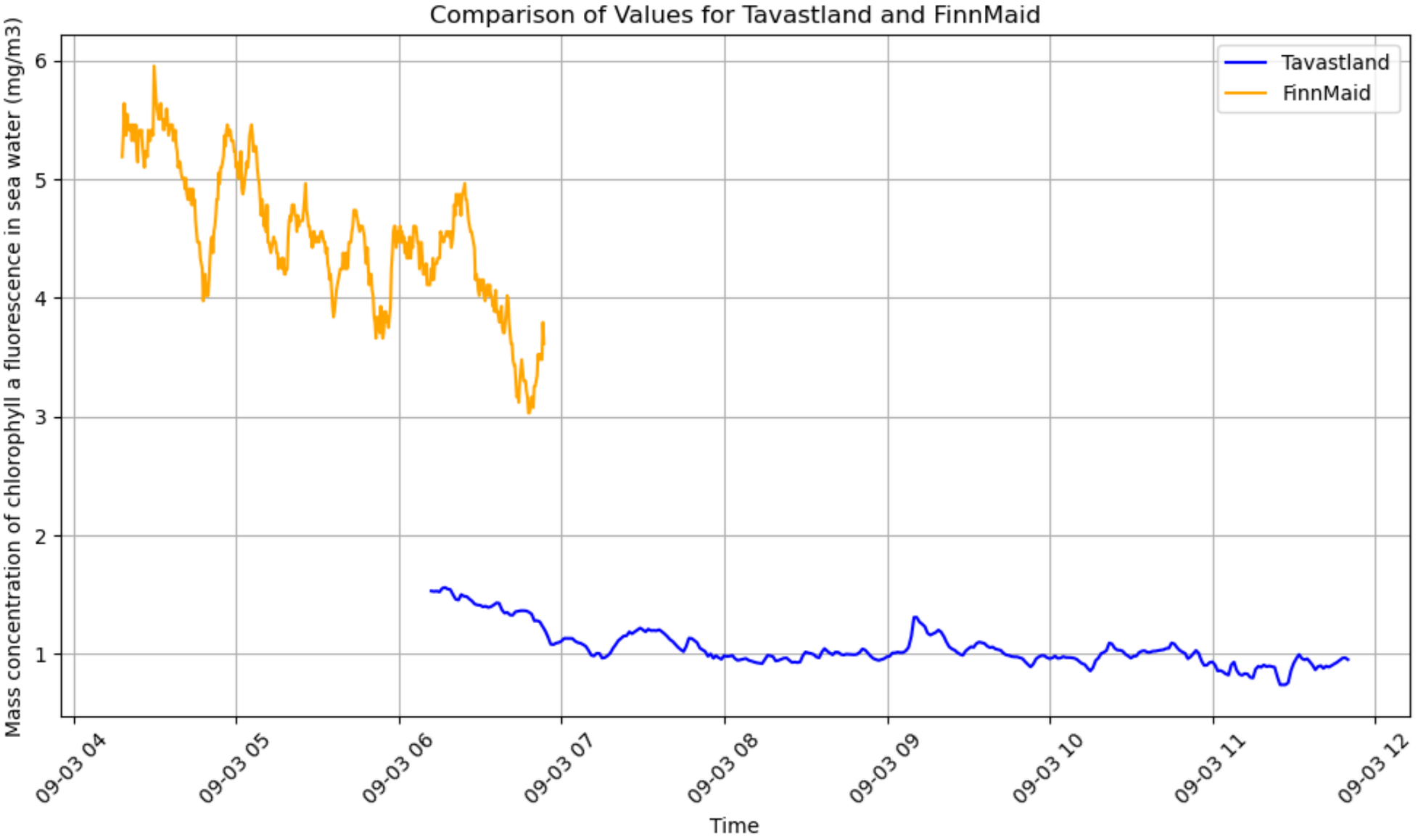
View data in the MyOcean Viewer



Download and compare data



Download and compare data



Download data using copernicus toolbox

```
copernicusmarine get --request-file request-ferrybox.json
```


```
{
    "dataset_id": "cmems_obs-ins_glo_phybgcwav_mynrt_na_irr",
    "dataset_version": null,
    "dataset_part": "latest",
    "no_directories": false,
    "filter": "*TS_FB_*",
    "regex": null,
    "output_directory": "copernicusmarine_data",
    "show_outputnames": true,
    "service": "files",
    "force_download": false,
    "file_list": null,
    "sync": false,
    "sync_delete": false,
    "index_parts": false,
    "disable_progress_bar": false,
    "overwrite_output_data": false,
    "overwrite_metadata_cache": false,
    "no_metadata_cache": false,
    "log_level": "INFO"
}
```


Request only Ferrybox files of the last 30 days

Download data using copernicus toolbox

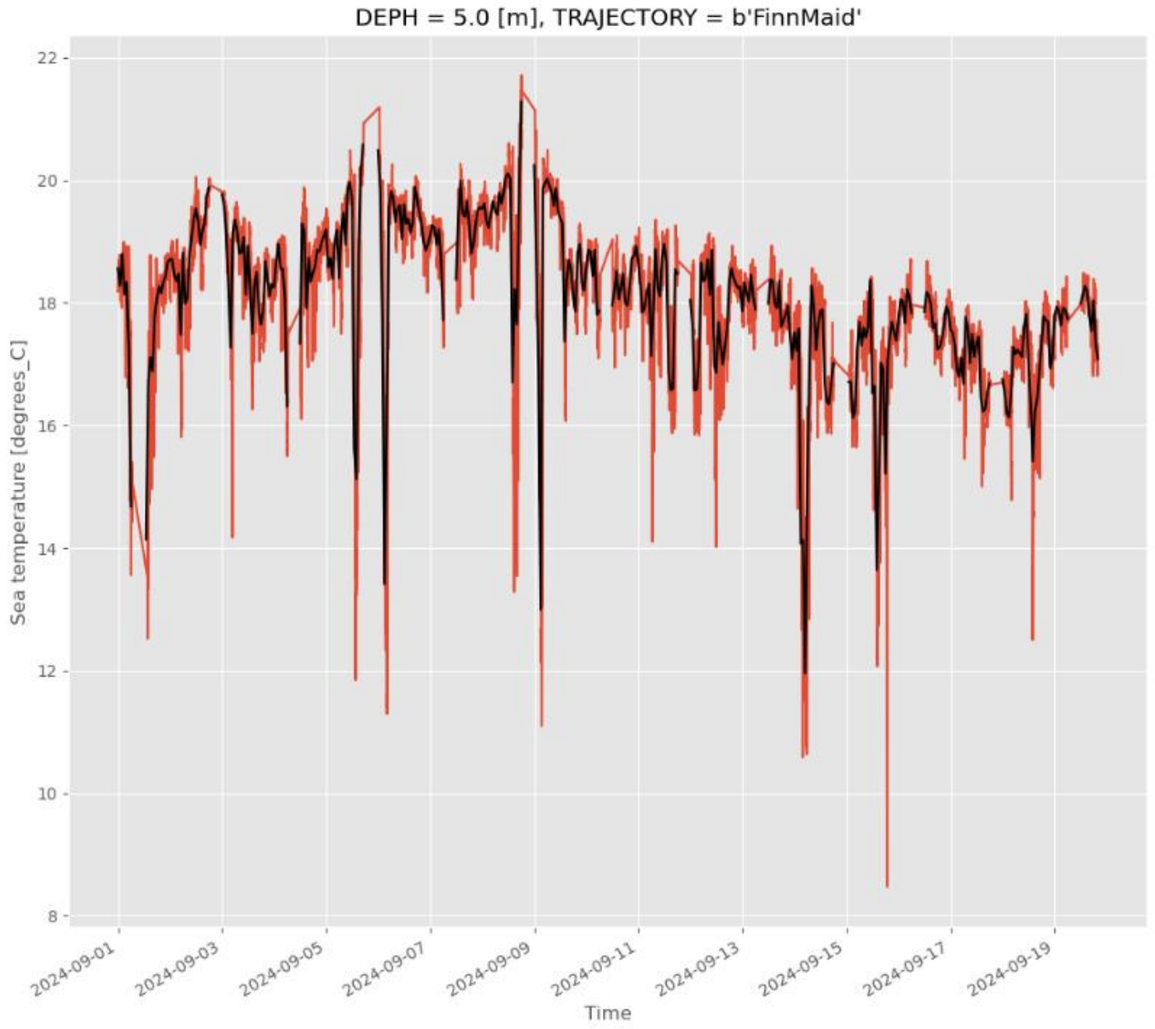
```
copernicusmarine get --request-file request-ferrybox.json
```

```
{
    "dataset_id": "cmems_obs-ins_glo_phybgcwav_mynrt_na_irr",
    "dataset_version": null,
    "dataset_part": "history",
    "no_directories": false,
    "filter": "*TS_FB_FinnMaid_**",
    "regex": null,
    "output_directory": "copernicusmarine_data",
    "show_outputnames": true,
    "service": "files",
    "force_download": false,
    "file_list": null,
    "sync": false,
    "sync_delete": false,
    "index_parts": false,
    "disable_progress_bar": false,
    "overwrite_output_data": false,
    "overwrite_metadata_cache": false,
    "no_metadata_cache": false,
    "log_level": "INFO"
}
```

Request all Ferrybox files for FinnMaid ferry

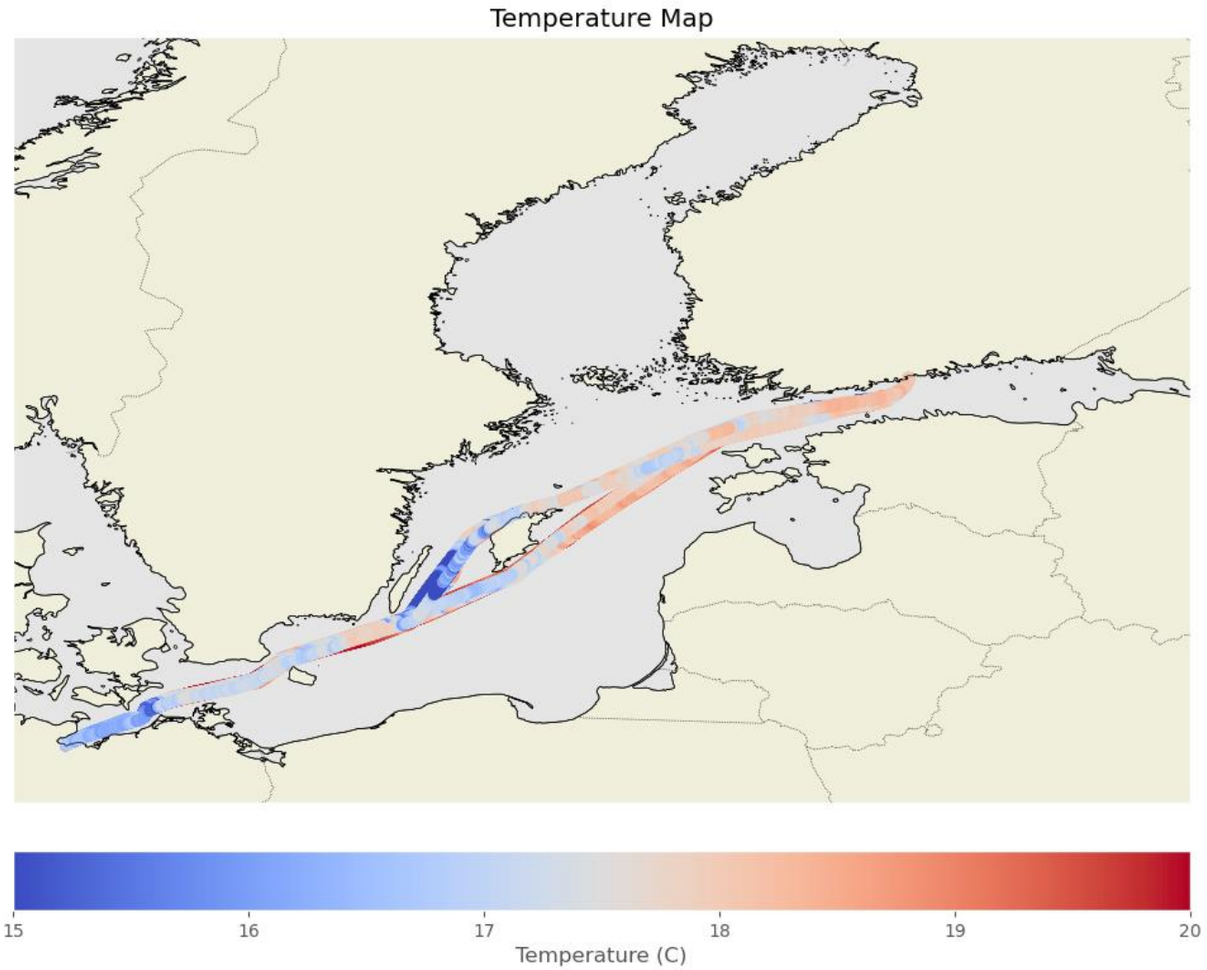
Plot Sea Water Temperature

```python
import xarray as xr
import matplotlib.pyplot as plt

plt.style.use('ggplot')
plt.close()
# Create a figure and axis
plt.figure(figsize=(12, 10))

# Path to the NetCDF files
file_pattern = '/home/ldrouine/Data/Ferrybox/BO_TS_FB_FinnMaid_*.nc'

# Open multiple NetCDF files as a single dataset
ds = xr.open_mfdataset(file_pattern, combine='by_coords', chunks=None)

temp = ds['TEMP']

temp_filtered = temp.sel(TIME=slice('2024-09-01', '2024-09-22'))

# Plot TEMP over TIME
#temp.plot()
temp_filtered.plot()
# Calculate and plot the mean temperature over the time range
# Resample the data by hour and compute the mean for each hour
temp_hourly_mean = temp_filtered.resample(TIME='1H').mean()

temp_hourly_std = temp_filtered.resample(TIME='1H').std()


# Plot the hourly mean temperature
plt.plot(temp_hourly_mean['TIME'], temp_hourly_mean, color='black',
         label='Hourly Mean Temperature')

# Show the plot
plt.show()
```



Plot Sea Water Temperature value on a map

```python
import cartopy.crs as ccrs
import cartopy.feature as cfeature

# Select the temperature variable (TEMP) and the coordinates
temp = ds['TEMP']
lat = ds['LATITUDE']
lon = ds['LONGITUDE']


# Filter data between 2024-09-01 and 2024-09-22
start_date = '2024-09-01'
end_date = '2024-09-22'
temp_filtered = temp.sel(TIME=slice(start_date, end_date))
lat_filtered = lat.sel(TIME=slice(start_date, end_date))
lon_filtered = lon.sel(TIME=slice(start_date, end_date))


# Create a figure and axis
fig, ax = plt.subplots(figsize=(12, 10),
                       subplot_kw={'projection': ccrs.PlateCarree()})

# Scatter plot the temperature data on the map, using lat/lon as coordinates
sc = ax.scatter(lon_filtered, lat_filtered, c=temp_filtered, cmap='coolwarm',
                transform=ccrs.PlateCarree(),  vmin=15, vmax=20)

# Add coastlines and other map features
ax.coastlines()
ax.add_feature(cfeature.BORDERS, linestyle=':')
ax.add_feature(cfeature.LAND, edgecolor='black')
ax.set_extent([10, 30, 53, 66], crs=ccrs.PlateCarree())

# Add a colorbar
cbar = plt.colorbar(sc, ax=ax, orientation='horizontal', pad=0.05)
cbar.set_label('Temperature (C)')


# Show plot
plt.title('Mean Temperature Map')
plt.show()
```



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What is coming next ?

- Subsetting in time and geographic area
- part history (which contains the full time series)
- Possibility to select by platform type, geographical area, provider,...

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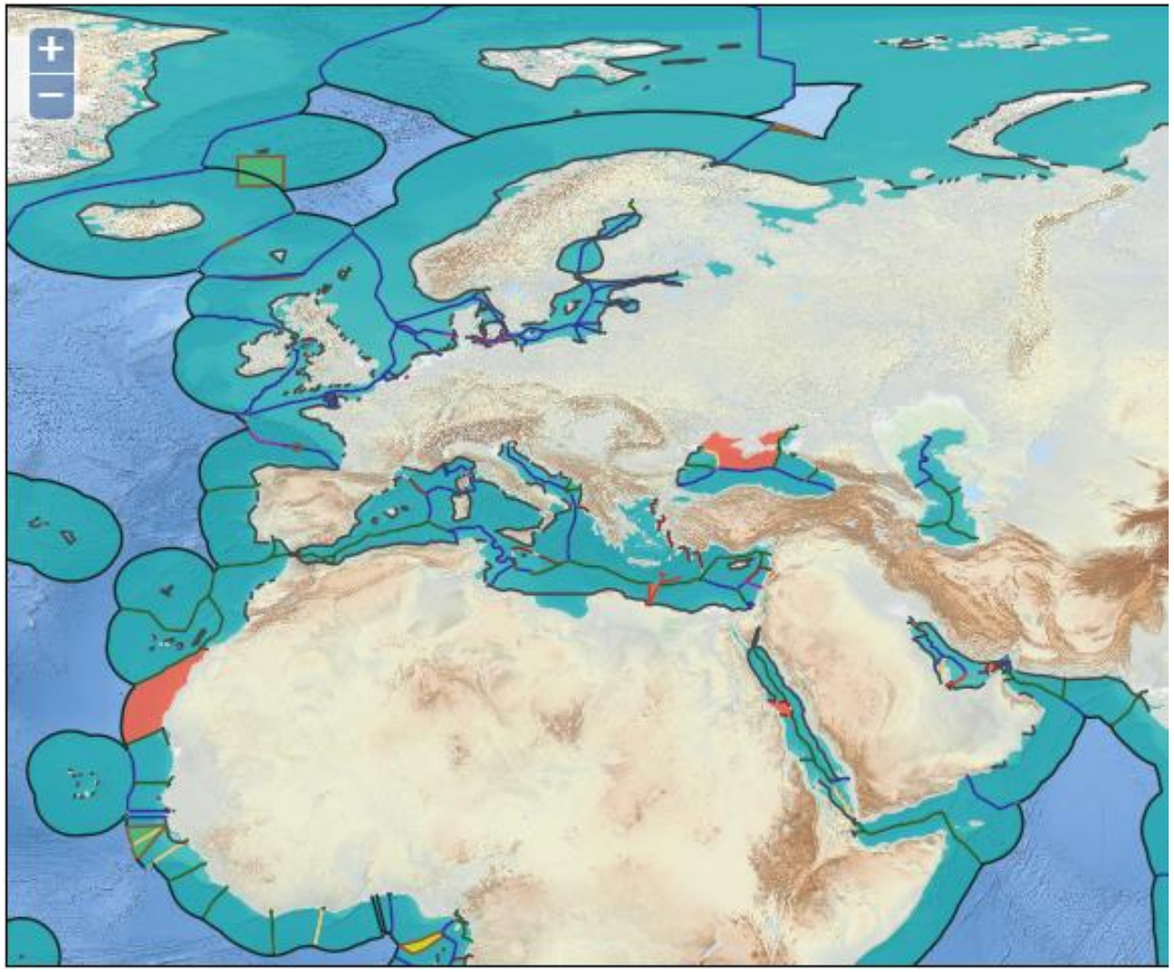
Acquisition in EEZ



French research vessels decide to stop acquisition of underway data during transits in EEZ

Extra slide: Issue with acquisition in EEZ

The topic of taking observations in EEZs is being discussed under the Working Group on ocean observations in national juridiction under the IOC – which will make a report to Assembly next year (2025)

EC57 Progress

https://oceanexpert.org/document/30476

https://oceanexpert.org/downloadFile/56422