

# COPERNICUS MARINE SERVICE TRAINING WORKSHOP

for Iberia-Biscay-Ireland  
Region

# In Situ Products

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Estado (Spain)

*noLogin / Puertos del*



#CMEMSTrain

May 14-15  
2019  
Lisbon



“

*Without sufficient **observations**, useful prediction will likely never be possible. Models will evolve and improve, but, without data, will be untestable, and observations not taken today are lost forever*

C. Wunsch et al. (2010) PNAS

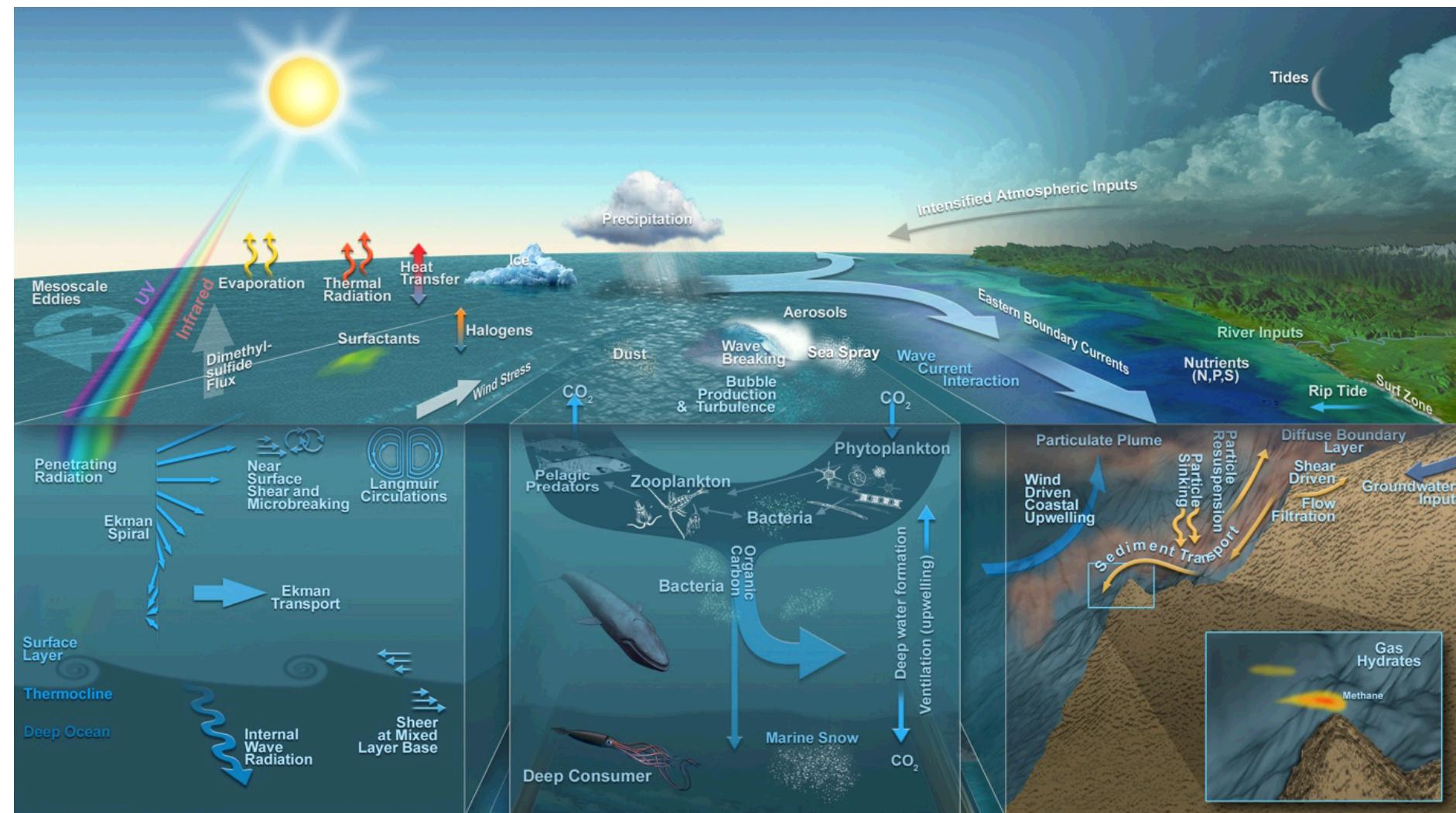


In Situ  
Products  
ocean  
is  
complex...

...many  
processes  
are  
involved.

## In Situ

# 1. In Situ Observations



# In Situ Products

## 1. In Situ Observations

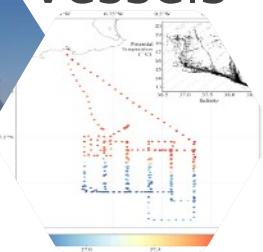
A multi-platform approach is essential !



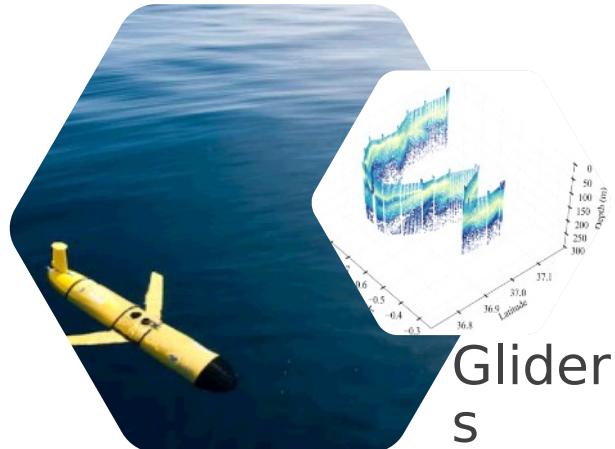
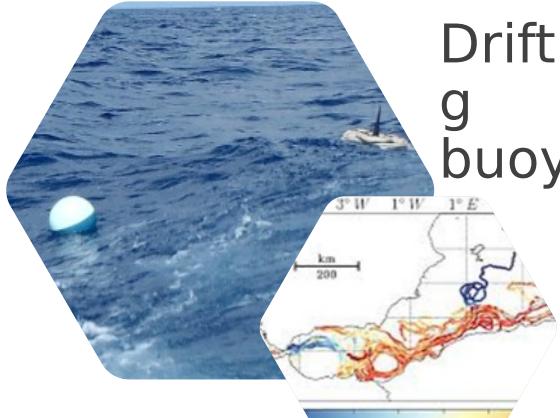
# In Situ Products

## 1. In Situ Observations

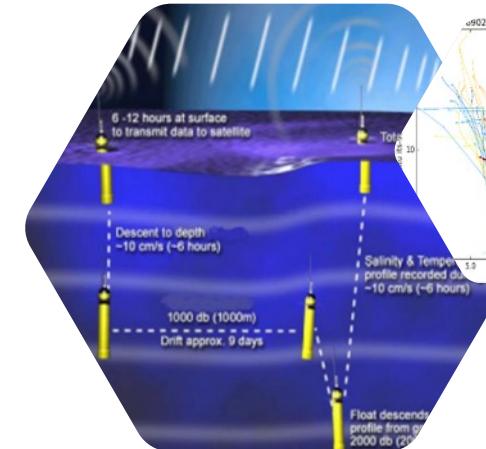
Researc  
h  
vessels



Driftin  
g buoys



Glider  
S

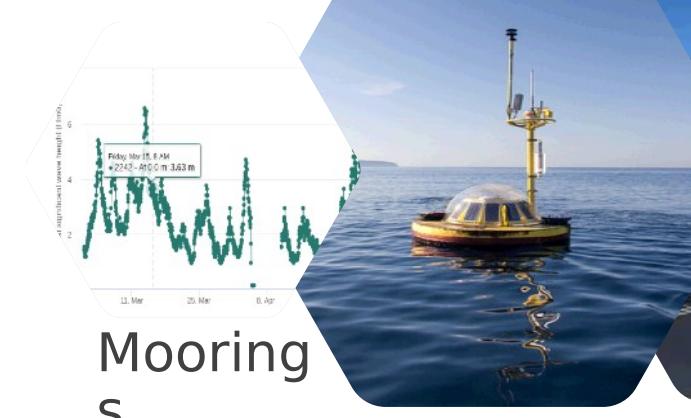


ARGO floats



HF  
radars

Mooring  
S



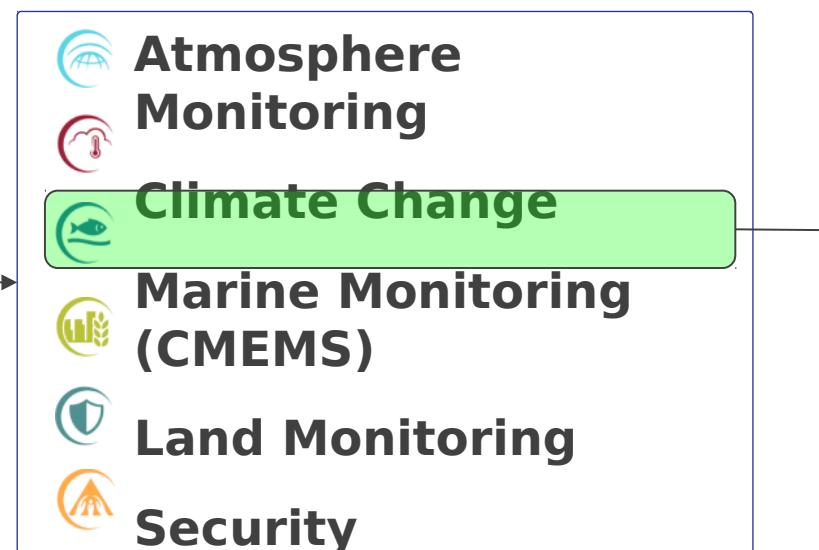
# In Situ Products

## 2. CMEMS In Situ TAC



<http://copernicus.eu>

- 3 components**
- 
- **Space**
- **In situ**
- Services



Copernicus  
Emergency  
Management  
<http://marine.copernicus.eu>

**Data producers**  
**7 MFCs (Models)**  
**GLO MFC**  
**ARC MFC**  
**BAL MFC**  
**NWS MFC**  
**IBI MFC**  
**MED MFC**  
**BS MFC**

**8 TACs (Observations)**  
**In Situ TAC**  
**6 Space TACs:**  
**OCTAC,**  
**SLTAC, ...**  
**1 Multi Obs**

The component of the CMEMS which ensures a consistent and reliable access to a range of in situ data for the purpose of service production and validation.



## In Situ Products

### 2. CMEMS In Situ TAC Objectives

Two main objectives:

- 1. To collect multi-source, multi-platform, heterogenous data, perform consistent quality control and distribute it in a common format (NetCDF) and in near-real-time (within 24 hours) to the CMEMS Marine Forecasting Centres (MFC), for assimilation into their numerical ocean models.**
- 2. To supply the MFCs and downstream users with re-processed 25-50-year products in delayed mode.** In addition to the near-real-time products, these delayed-mode products are useful for model validation or assimilation in ocean reanalysis and climate studies.

# In Situ Products



## 2. CMEMS In Situ TAC Organization

**Management & Operations**  
7 Regions

**Scientific Expertise**  
Cross Cutting

**System Evolution**

**Global:** Ifremer / France  
**Arctic:** IMR / Norway  
**Baltic:** SMHI / Sweden  
**NWS:** BSH / Germany  
**IBI:** Puertos del Estado / Spain  
**MED:** HCMR / Greece  
**Black Sea:** IOBAS / Bulgaria

**Product Quality:** Oceanscope-PdE-IMR  
**Multi Year:** SOCIB-OceanScope-PdE  
**BGC assim.:** IMR

**HF Radar:** AZTI-CNR-SOCIB  
**Carbon Data:** UIB  
**BGC assessment:** IMR-HCMR-SYKE  
**Monitoring:** SOCIB-PdE-HCMR



## In Situ

### Products

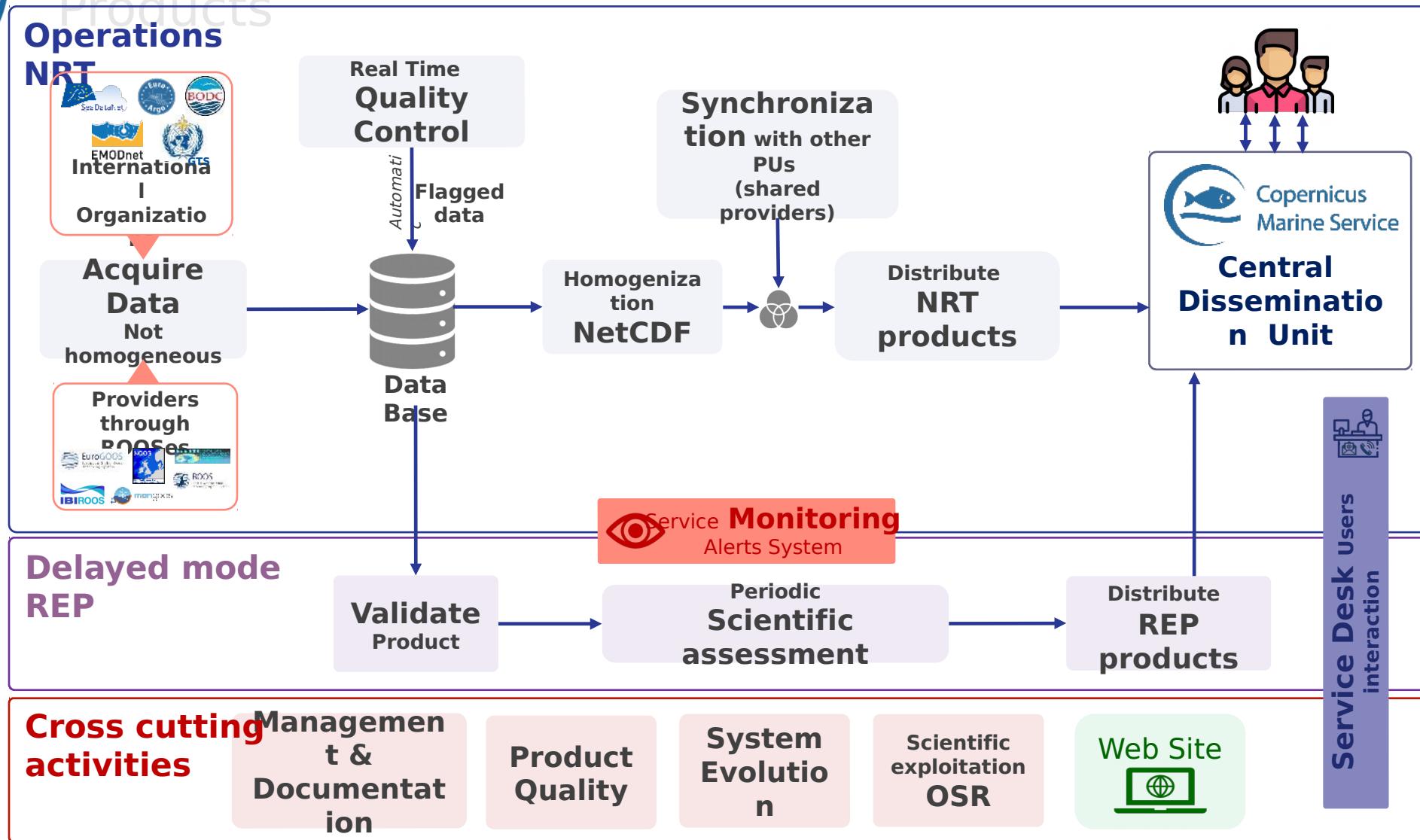
## 2. CMEMS In Situ TAC General Description

**Fully operational service** since April 2015

- **Unique data access** to all the available data: CMEMS catalogue (registration)
- **Open and free** data policy
- **Strong collaboration** with EuroGOOS, SeaDataNet and EMODnet
- **7 Components:** Global + 6 regions (Arctic, Baltic, NWS, IBI, MED and Black Sea)
- **Same data format** (NetCDF - OceanSites 1.2)
- **Same FTP structure** in all the regions
- **Homogenization** of variable names, units, attributes
- **Same RTQC** & quality flagging convention
- **NRT** (Near Real Time) and **REP** (REProcessed) products

# In Situ

## 2. CMEMS In Situ TAC Data Flow





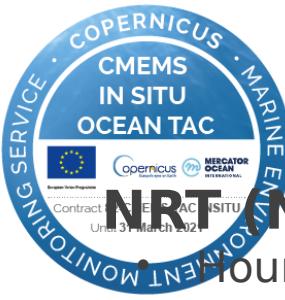
## In Situ Products

### 2. CMEMS In Situ TAC Numbers

**+7000 platforms active in Real Time**

**+37000 platforms integrated**

**+300 providers**



## In Situ

## 2. CMEMS In Situ TAC Products

### NRT (Near Real Time) products (automatic RTQC):

Hourly updates

- Distributed in Global & Regional
- All variables: T&S, Wave, UV(Currents), BGC, Sea level
- HF Radar and Carbon data **in April 2019**

### REProcessed products (validated & assessed):

- Twice a year update
- Global
- Variables:  
~~T&S since 2015~~  
- UV (currents) from Drifters since 2016  
- Waves since 2018  
- BGC (O2 and Chla) since 2018

- Carbon data **new in 2019**
- HF Radar **planned for 2020**



**Documents**  
associated  
with  
each product:





# In Situ Products

## 2. CMEMS In Situ TAC Access



<http://marine.copernicus.eu>

### Índice de /Core/INSITU\_IBI\_NRT\_OBSERVATIONS\_013\_033

[directorio principal]

Nombre	Tamaño	Fecha de modificación
DNT/		7/5/19 17:01:00
INS_PUERTOS_SWS_NRT_OBS_POINTSERIES_LATEST/		15/3/18 1:00:00
INS_PUERTOS_SWS_NRT_OBS_PROFILE_LATEST/		15/3/18 1:00:00
INS_PUERTOS_SWS_NRT_OBS_TRAJECTORIES_LATEST/		15/3/18 1:00:00
history/		23/3/18 1:00:00
index_history.txt	5.5 MB	3/5/19 18:42:00
index_latest.txt	5.2 MB	7/5/19 17:01:00
index_monthly.txt	18.3 MB	7/5/19 15:25:00
latest/		7/5/19 3:09:00
monthly/		23/3/18 1:00:00
myo_index_platform.txt	2.0 MB	7/5/19 17:01:00

#### USER REGISTRATION FORM

The screenshot shows a user registration form with several fields highlighted:

- MY CART**: Shows a cart icon with a value of 1.
- ATA DOWNLOAD**: A button labeled "ATA DOWNLOAD" is highlighted with a red box and an arrow pointing to it.
- CLOSE**: A "CLOSE" button is highlighted with a red box and an arrow pointing to it.
- IBI**: A thumbnail image of a map with a color scale from 8 to 22 is labeled "IBI".
- an account**: A field labeled "an account" is highlighted with a red box and an arrow pointing to it.
- Me**: A "Me" button is highlighted with a red box and an arrow pointing to it.
- LOGIN**: A "LOGIN" button is highlighted with a red box and an arrow pointing to it.
- SELECTION**: A "SELECTION" field is highlighted with a red box and an arrow pointing to it.
- DELAYED MODE**: A "DELAYED MODE" field is highlighted with a red box and an arrow pointing to it.
- FTP ACCESS**: A "FTP ACCESS" button is highlighted with a red box and an arrow pointing to it.

Below the form, a note states: "Filtering is not applicable for "FTP Access" (no criteria taken into account). You can connect to the FTP server with your Copernicus Marine Service credentials to select dataset files."



## In Situ Products

### 3. CMEMS In Situ TAC IBI region Responsibilities

#### Roles & responsibilities:

- Puertos del Estado:** Coordination. NRT production and validation (assigned providers). Waves REP development and assessment.
- Ifremer:** Contribution to the NRT production and validation for French providers and Lagrangian and underway platforms.
- Oceanscope:** T&S REP product validation and assessment.

Institute	Coordination	Production Unit PU	Synchronization PUs	Product Quality NRT Assessment	Product Quality multi-year Assessment (REP)
Puertos del Estado	IBI	IBI	GLO, IBI, MED, NWS	IBI	IBI (WAVES)
Ifremer			IBI	IBI	
Oceanscope					IBI (T&S)

- River flow stations



## In Situ

Spain: Puertos del Estado, IEO, Euskalmet,  
Xunta Galicia, SOCIB

## 3. CMEMS In Situ TAC IBI region

## Providers

Portugal: Instituto Hidrografico,  
University of Azores, DGT

France: SHOM, Meteofrance, Ifremer,  
CETMEF, CEREMA

Ireland: Marine Institute (buoys & tidegauges)

UK: UKMO, EA (UK tide gauges), CEFAS

## Lagrangian and underway stations

- Profilers-gliders:
- ARGO, CTD, Gliders, XBT and other profiles

# In Situ Products

## 3. CMEMS In Situ TAC IBI region The IBI

### Coord. Team



Fernando  
Manzano

**Operation  
s &  
System  
Evolution**



Marta de  
Alfonso

**Management  
& Product  
Quality &  
OSR-OMI**



Alex  
Gallardo

**Operation  
s &  
Developm  
ent**

## In Situ Products

## 4. Products Description



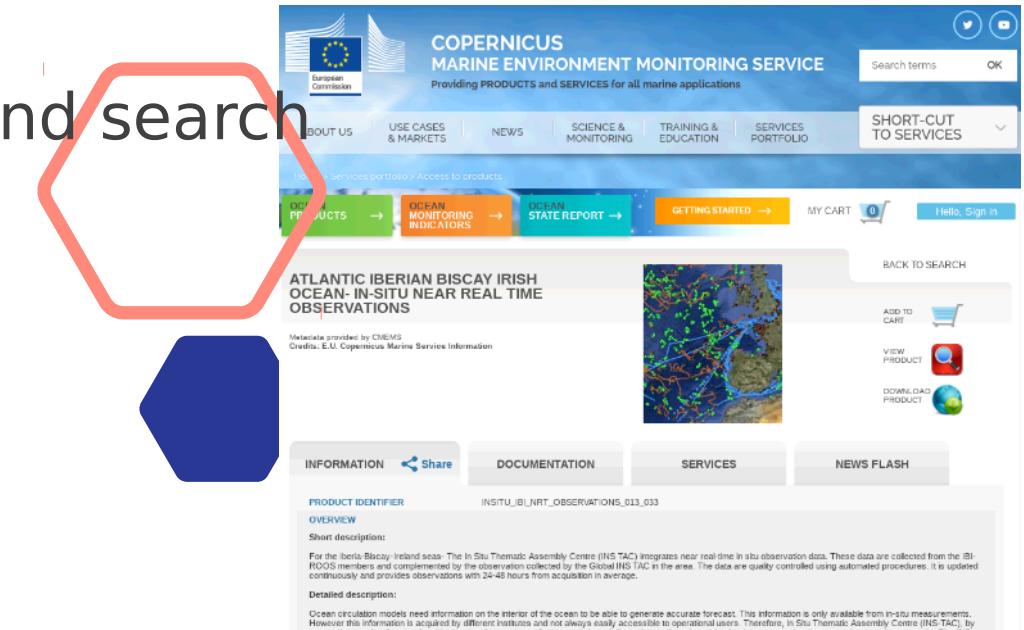
# Changes are coming!

Transition to NetCDF4  
New structure and file naming  
...

- May 2019** NetCDF3 - NetCDF4 files consistency
- Jun 2019** Start NetCDF4 distribution
- Sep 2019** Stop NRT NetCDF3

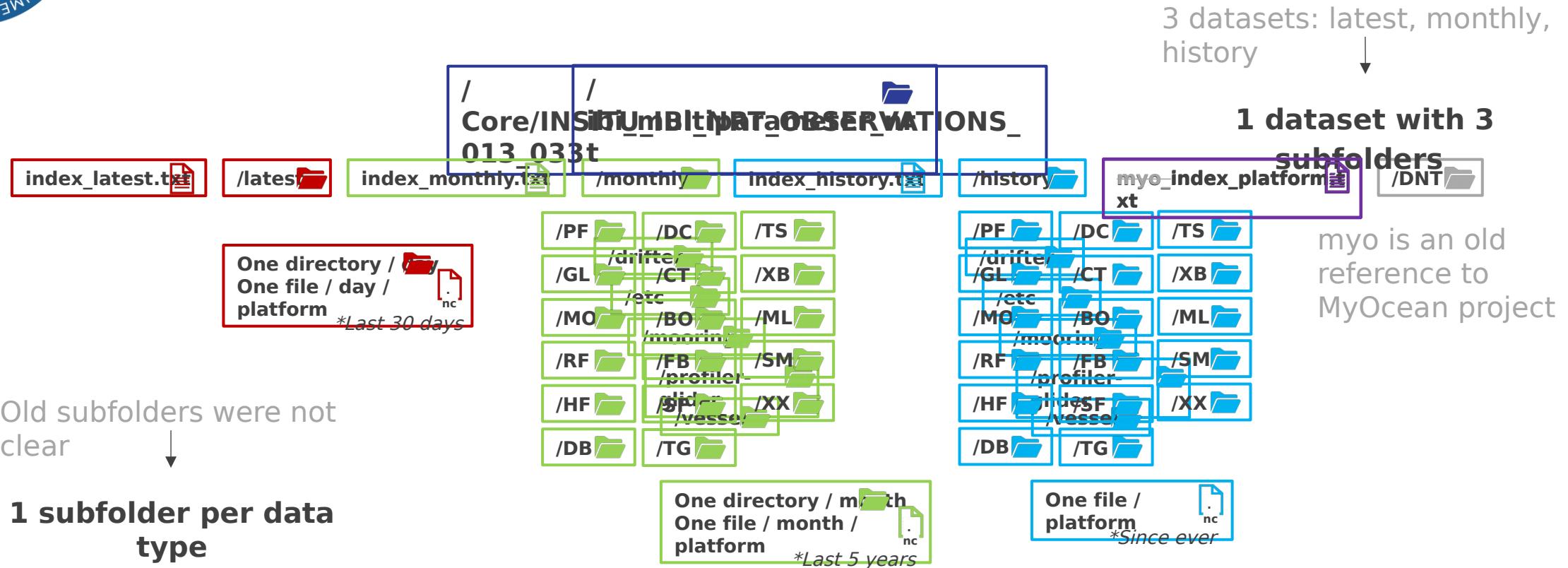
**Jul 2019 to Sep 2019**  
NetCDF3 and NetCDF4 datasets are produced in parallel

- NetCDF files are accessed from <http://marine.copernicus.eu> but at the end it's only **an FTP access**:
  - NRT: [ftp://nrt.cmems-du.eu/Core/INSITU\\_IBI\\_NRT\\_OBSERVATIONS\\_013\\_033](ftp://nrt.cmems-du.eu/Core/INSITU_IBI_NRT_OBSERVATIONS_013_033)
  - REP: [ftp://my.cmems-du.eu/Core/INSITU\\_IBI\\_TS REP OBSERVATIONS\\_013\\_040/](ftp://my.cmems-du.eu/Core/INSITU_IBI_TS REP OBSERVATIONS_013_040/)
- Index files** to smooth the navigation and search
- Files organized** based on periods:
  - Latest: Last 30 days of data
  - Monthly: Last 5 years of data
  - History: Since ever, whole datasets



# In Situ Products

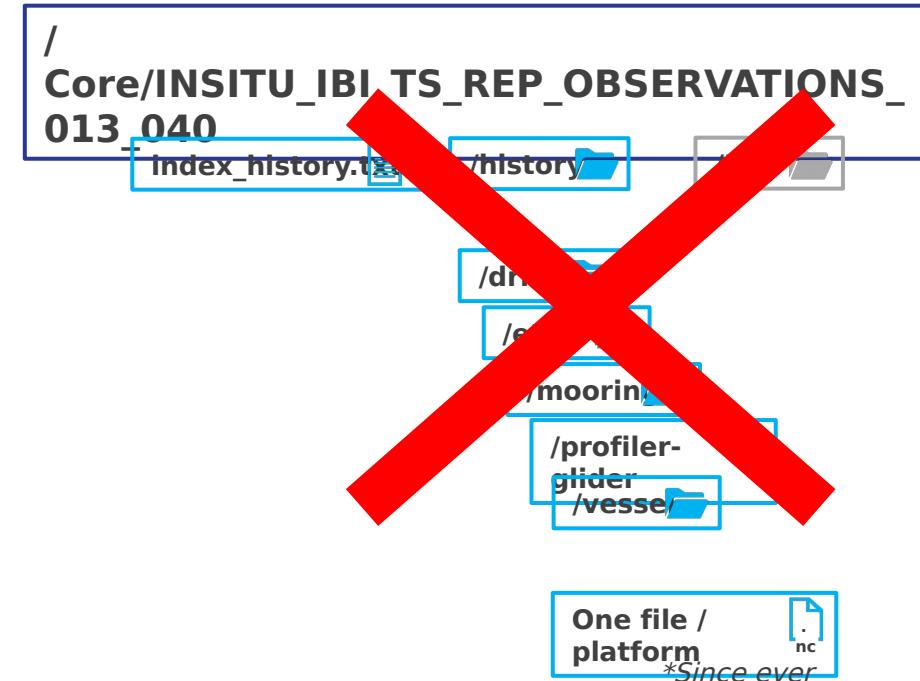
## 4. Products Description Folders structure



New NRT product structure, implemented from July 2019

# In Situ Products

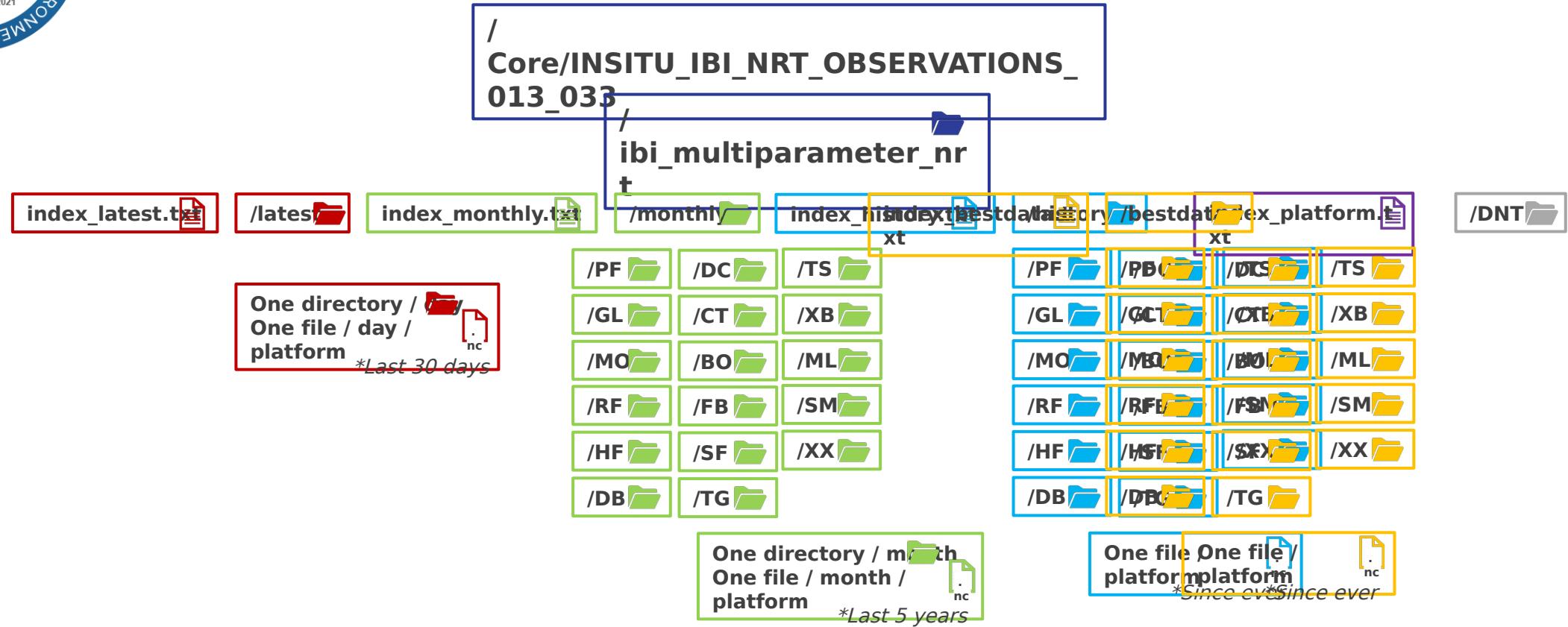
## 4. Products Description Folders structure



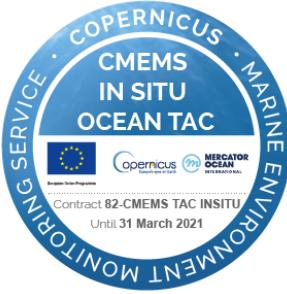
Regional TS REP products will  
disappear...

# In Situ Products

## 4. Products Description Folders structure



New NRT product structure, implemented from July 2019



# In Situ Products

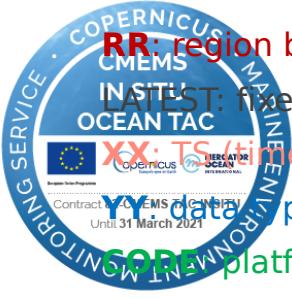
## 4. Products Description Index files

### index\_latest.txt

```
# Title : in-situ observations catalog
# Description : catalog of available IBI in-situ observations per platform.
# Project : Copernicus (generated by Puertos del Estado-SPAIN).
# Format version : 1.1.
# Date of update : 20190508093503
# product_id,file_name,geospatial_lat_min,geospatial_lat_max,geospatial_lon_min,geospatial_lon_max,time_coverage_start,time_coverage_end,provider,date_update,data_mode,parameters
COP-IR-01,ftp://arcas.puertos.es/Core/INSITU_IBI_NRT_OBSERVATIONS_013_033/ibi_multiparameter_nrt/latest/20190408/IR_TS_MO_13130_20190408.nc,28.187,28.1987,-15.8032,-15.7977,2019-04-08T00:00:00Z,2019-04-08T23:00:00Z,Puertos del Estado (Spain),2019-04-23T09:33:34Z,R,DEPH TEMP VTM02 VTPK PSAL ATMS VMDR HCSP VHMO WSPD VPED DRYT HCDT
COP-IR-01,ftp://arcas.puertos.es/Core/INSITU_IBI_N15.8014,2019-04-09T00:00:00Z/RT_OBSERVATIONS_013_033/ibi_multiparameter_nrt/latest/20190409/IR_TS_MO_13130_20190409.nc,28.1856,28.1943,-15.805,-,2019-04-09T23:00:00Z,Puertos del Estado (Spain),2019-04-23T09:33:34Z,R,DEPH TEMP VTM02 VTPK PSAL ATMS VMDR HCSP VHMO WSPD VPED DRYT HCDT
COP-IR-01,ftp://arcas.puertos.es/Core/INSITU_IBI_NRT_OBSERVATIONS_013_033/ibi_multiparameter_nrt/latest/20190410/IR_TS_MO_13130_20190410.nc,28.1856,28.1914,-15.805,-15.8014,2019-04-10T00:00:00Z,2019-04-10T23:00:00Z,Puertos del Estado (Spain),2019-04-23T09:33:34Z,R,DEPH TEMP VTM02 VTPK PSAL ATMS VMDR HCSP VHMO WSPD VPED DRYT HCDT
COP-IR-01,ftp://arcas.puertos.es/Core/INSITU_IBI_NRT_OBSERVATIONS_013_033/ibi_multiparameter_nrt/latest/20190411/IR_TS_MO_13130_20190411.nc,28.1856,28.1929,-15.805,-15.7996,2019-04-11T00:00:00Z,2019-04-11T23:00:00Z,Puertos del Estado (Spain),2019-04-23T09:33:34Z,R,DEPH TEMP VTM02 VTPK PSAL ATMS VMDR HCSP VHMO WSPD VPED DRYT HCDT
COP-IR-01,ftp://arcas.puertos.es/Core/INSITU_IBI_NRT_OBSERVATIONS_013_033/ibi_multiparameter_nrt/latest/20190412/IR_TS_MO_13130_20190412.nc,28.187,28.1973,-15.805,-15.7996,2019-04-12T00:00:00Z,2019-04-12T23:00:00Z,Puertos del Estado (Spain),2019-04-23T09:33:34Z,R,DEPH TEMP VTM02 VTPK PSAL ATMS VMDR HCSP VHMO WSPD VPED DRYT HCDT
```

### index\_platform.txt

```
# Title : in-situ platforms catalog
# Description : catalog of available IBI in-situ platforms.
# Project : Copernicus (generated by Puertos del Estado-SPAIN).
# Format version : 1.0.
# Date of update : 20190508093508
# platform_code,creation_date,update_date,wmo_platform_code,data_source,institution,institution_edmo_code,parameter,last_latitude_observation,last_longitude_observation,last_date_observation
13130,2019-05-08T09:35:07Z,2019-05-08T09:33:52Z,13130,IR_LATEST_MO_13130_13130_IRXXXXXX_MO_13130_13130,Puertos del Estado (Spain),2751,DEPH VHMO VTPK VTM02 VMDR VPED ATMS DRYT WSPD HCSP HCDT TEMP PSAL,28.187,-15.805,2019-05-08T09:00:00Z
13131,2019-05-08T09:35:07Z,2019-05-08T09:33:52Z,13131,IR_LATEST_MO_13131_13131_IRXXXXXX_MO_13131_13131,Puertos del Estado (Spain),2751,DEPH VHMO VZMX VTPK VTM02 VMDR VPED ATMS WSPD WDIR HCSP HCDT TEMP PSAL,27.9981,-16.5942,2019-05-08T08:00:00Z
61196,2019-05-08T09:35:07Z,2019-05-08T09:33:52Z,61196,IR_LATEST_MO_61196_61196_IRXXXXXX_MO_61196_61196,Puertos del Estado (Spain),2751,DEPH VHMO VZMX VTPK VTM02 VMDR VPED ATMS WSPD WDIR,41.8994,3.6517,2019-05-08T09:00:00Z
61197,2019-05-08T09:35:07Z,2019-05-08T09:33:52Z,61197,IR_LATEST_MO_61197_61197_IRXXXXXX_MO_61197_61197,Puertos del Estado (Spain),2751,DEPH VHMO VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR,39.7124,4.4281,2019-05-08T09:00:00Z
```



**RR:** region bigram

**LATEST:** fixed name

**XX:** TS (timeserie) or PR (profile)

**YY:** data type

**SOPE:** platform code

## In Situ Products

YYYYMMDD: year month day of observations

YYYYMM : year month of observations

777 : To split files (per year, time sampling ...)

## 4. Products Description File naming conventions

IR\_LATEST\_TS\_MO\_62082\_20190409.nc ☾

IR\_TS\_MO\_62082\_20190409.nc

IR\_201904\_TS\_MO\_MahonTG.nc ☾

IR\_TS\_TG\_MahonTG\_201904.nc

IR\_TS\_MO\_Bilbao-coast-buoy.nc

☽ IR\_TS\_MO\_Bilbao-

• TOE tide gauge station

- TS thermosalinograph data

☽ TOI history



## Products

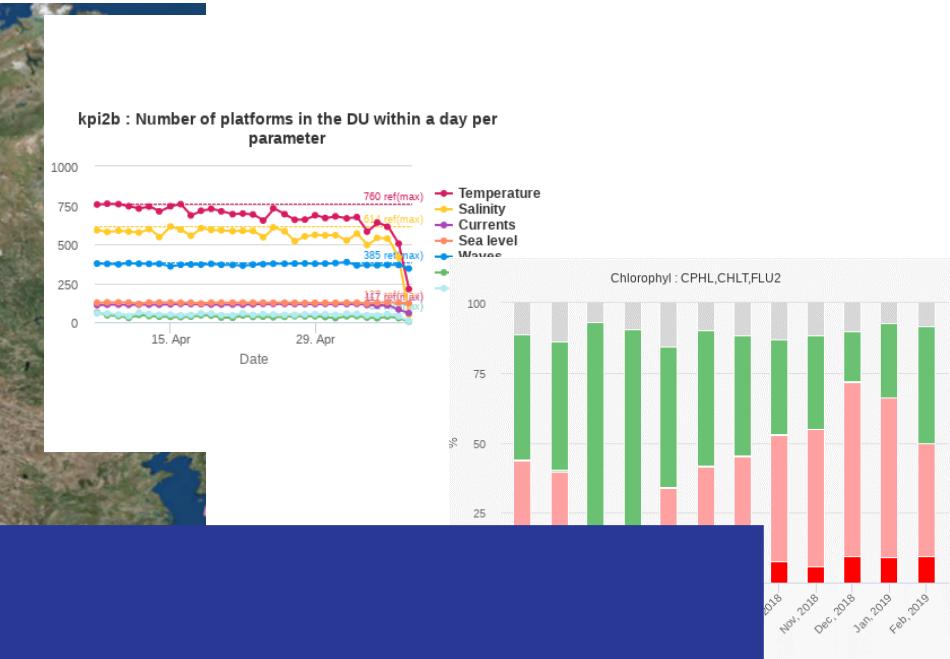
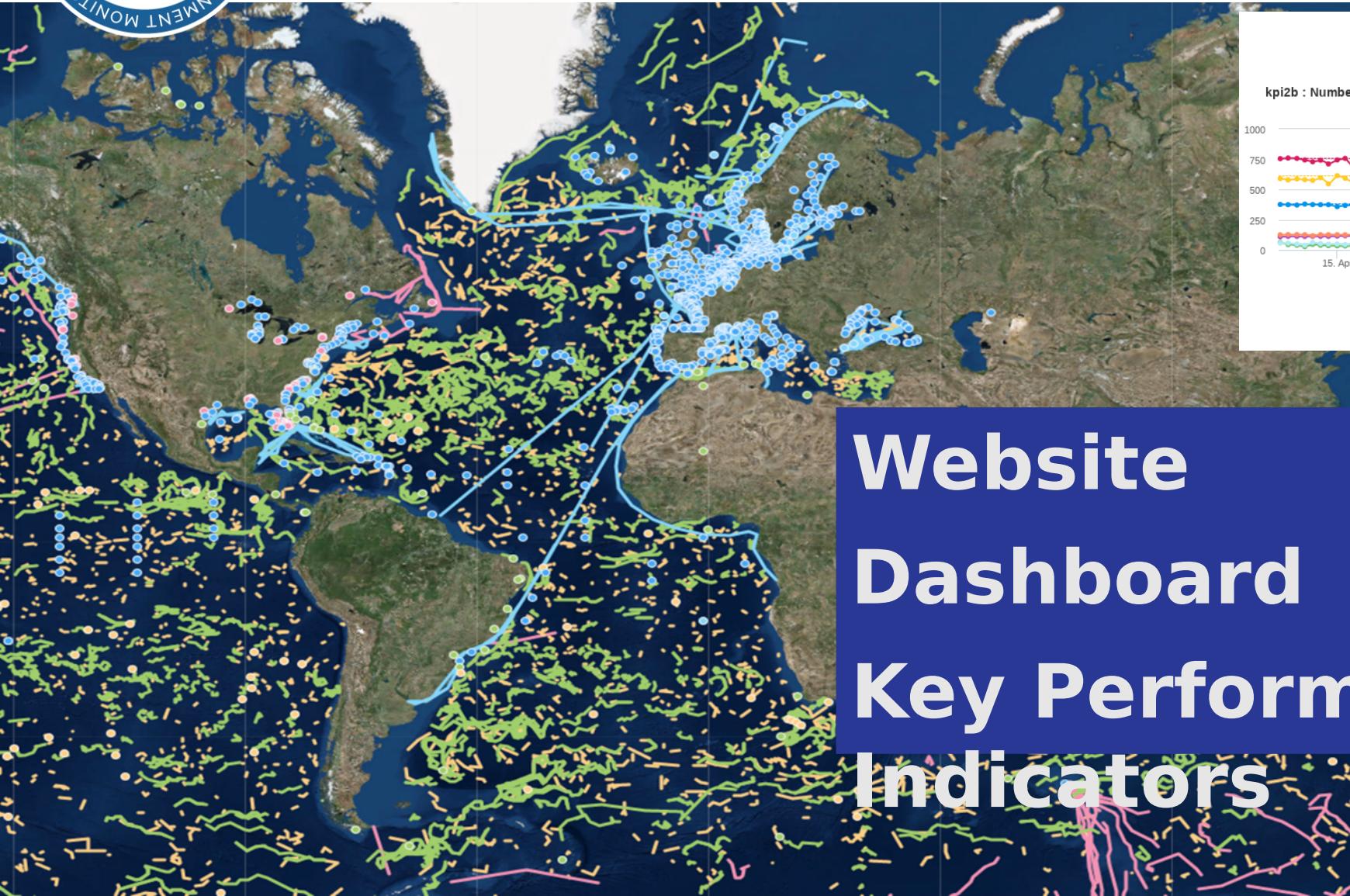
Transition to **NetCDF4** classic format

- Use of data packaging method based on **scale factor** and **offset**
- **File naming** harmonization
- Reshape of directories **structure**:
  - Only one dataset in NRT product
  - Regional REP products are now in NRT
  - New subfolders based on data types
- **\_FillValue** attribute set to default value of the variable type NetCDF4
- **Homogenization** of variable names, descriptions and units

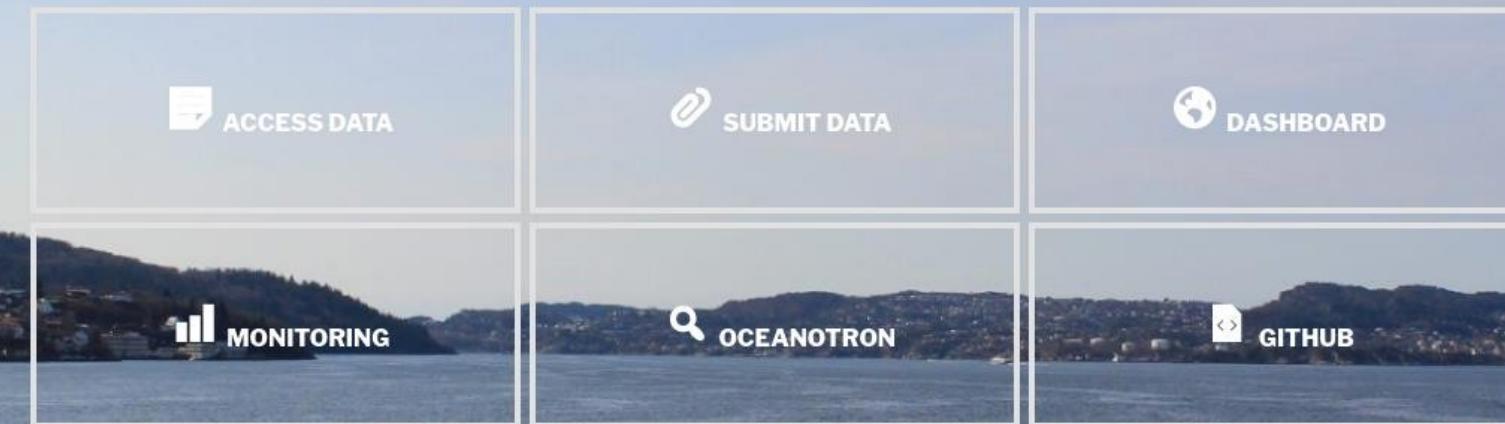


# In Situ Products

## 5. CMEMS In Situ TAC Improvements



Website  
Dashboard  
Key Performance  
Indicators



# CMEMS In Situ TAC

Copernicus Marine Environment Monitoring Service In Situ Thematic Assembly Centre

<http://www.marineinsitu.eu/documentation/>

## Documentation

- SRD – System Requirement Document
- PUM – Products User Manual
- OceanSITES NetCDF Format Reference
- Parameters List
- Quality Control procedures
- Some useful code

## 5. CMEMS In Situ TAC Improvements

Website

### DOCUMENTATION

Main documentation

- SRD – System Requirement Document
- PUM – Products User Manual
- PUM – Global ocean delayed mode currents from drifting buoys, Product User Manual
- OceanSITES NetCDF format reference manual
- Regions definition
- Parameter List



Real time quality control procedures

- Recommendations for in-situ data Near Real Time Quality Control
- Copernicus In Situ TAC, Real Time Quality Control for WAVES
- Real Time Quality Control of biogeochemical measurements
- BGC data : recommendations for Production Units and Data Providers

Useful code:

- In situ TAC file format checker
- Example of script to select and download data files: INDEX Script example
- Copernicus NetCDF file format checker

# In Situ Products

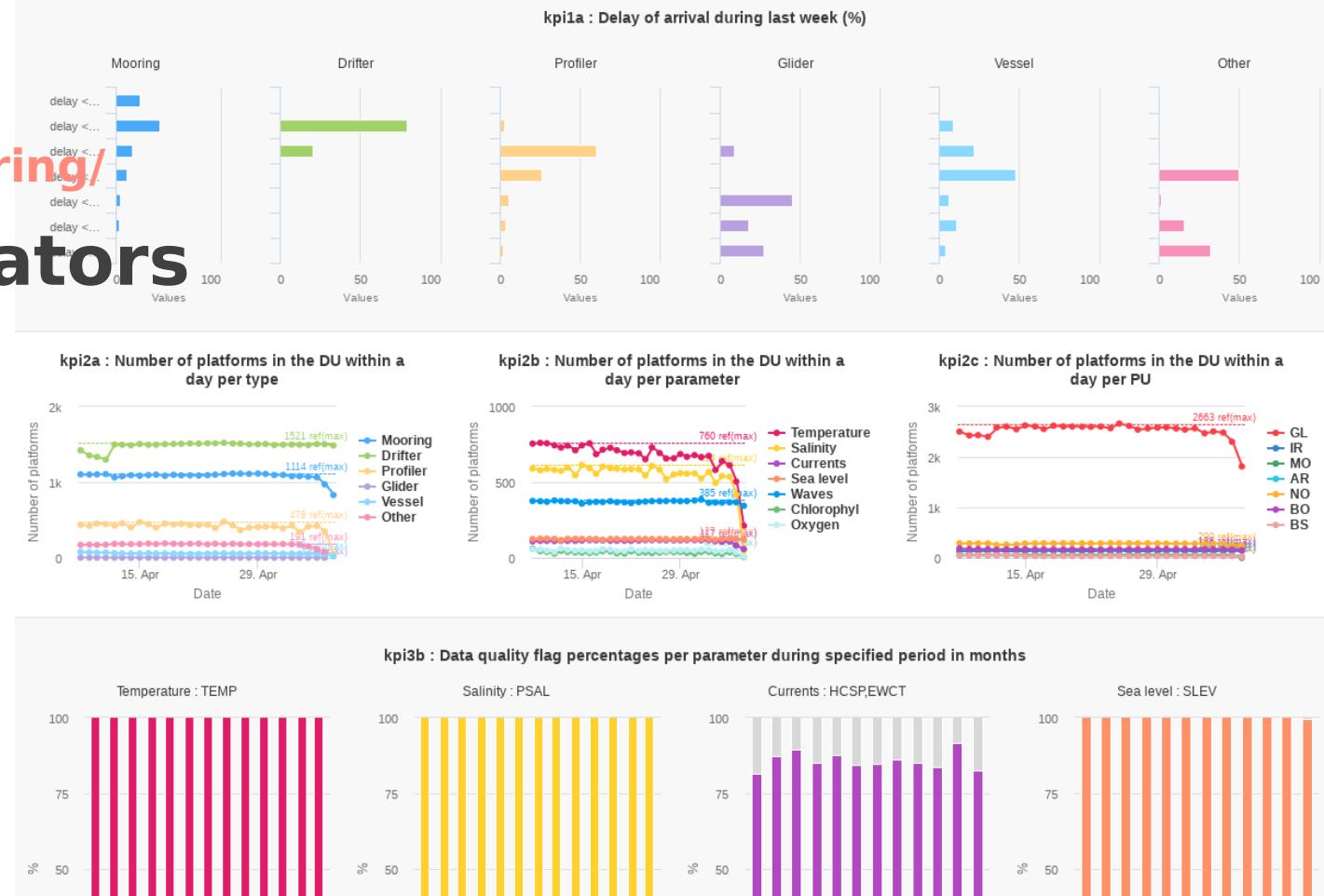
## 5. CMEMS In Situ TAC Improvements KPIs

> Services > Monitoring

<http://www.marineinsitu.eu/monitoring/>

### Key Performance Indicators

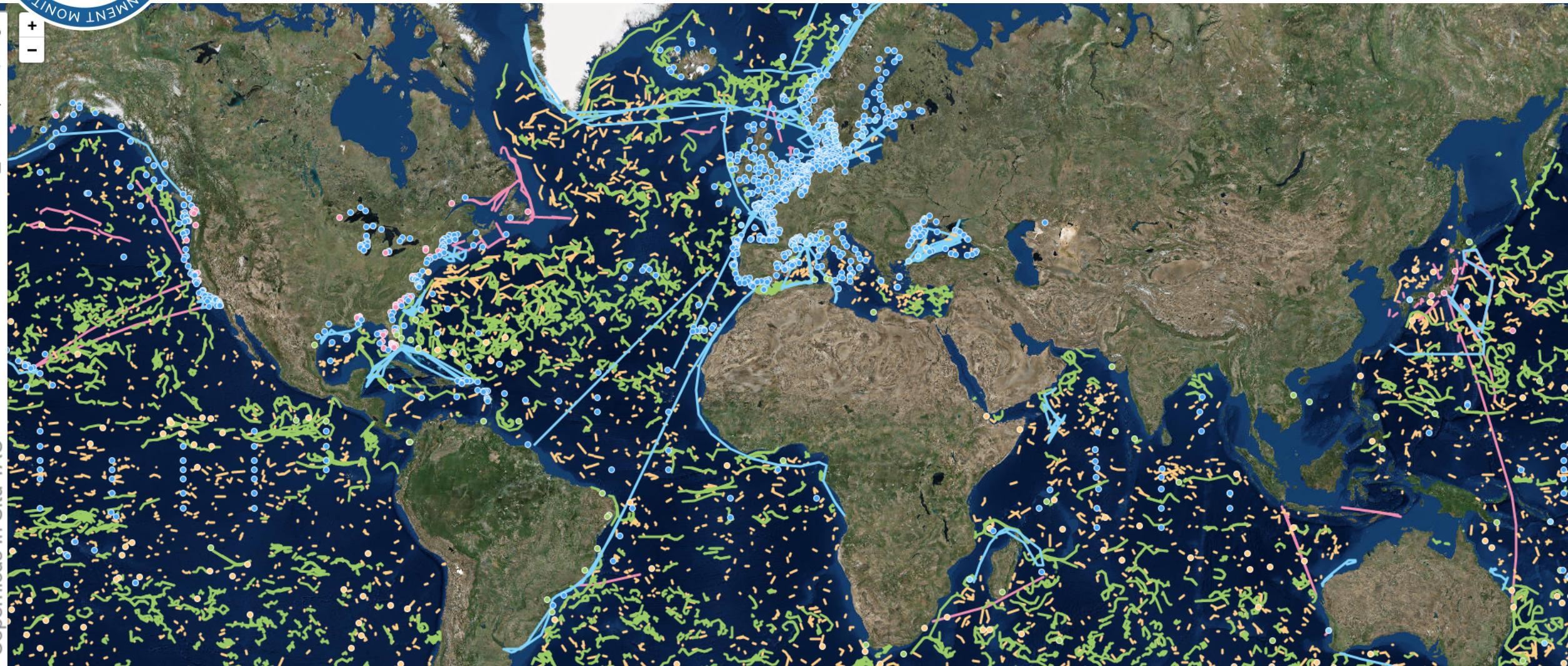
- KPI1 – Delay of Arrival
- KPI2 – Number of Platforms
- KPI3 – Data Quality
- KPI4 – Usage (deprecated)
- KPI5 – Data Providers Soon
- KPI6 – Data Files Soon



## In Situ

Products > Services > Dashboard <http://www.marineinsitu.eu/dashboard/>

## 5. CMEMS In Situ TAC Improvements





# In Situ

> Services > Dashboard <http://www.marineinsitu.eu/dashboard/>

## 5. CMEMS In Situ TAC Improvements

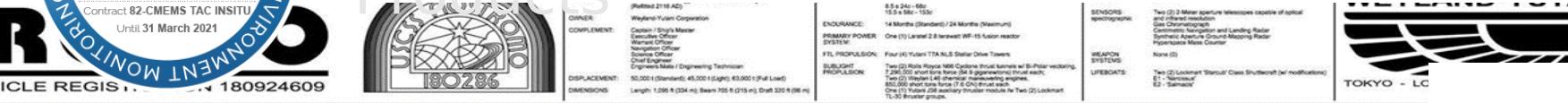
The dashboard interface includes the following sections:

- Regions:** INSTAC comprehends 7 regions of data collection. More info at: [Copernicus in situ TAC - CMEMS regions definition.](#) Regions shown: Global, Mediterranean, Iberia-Biscay-Ireland, North West Shelf, Baltic, Arctic, Black Sea.
- Platforms:** Filter by data type: High Frequency Radars, Moorings, River Flows, Drifters (DB), Drifters (DC), Profilers, Gliders.
- Parameters:** Find here an abstraction of INSTAC list of parameters ie: PSAL and CNDC as 'Salinity'. More info at: [Copernicus in situ TAC - Parameter List.](#) Parameters shown: Salinity, Temperature, Currents, Sea Level, Waves, Chlorophyl, Oxygen.
- Data Collection:** A callout for station 62082 (Lat: 44.14 Lon: -7.67) shows TS Time serie IR Iberia-Biscay-Ireland. Variables: Temperature, WDIR, ATMS, WSPD, Waves, DRYT, Salinity, Currents. Data from 1996/07/19 to 2019/05/08. Buttons for Download and View are highlighted with red boxes and arrows pointing to them.
- Parameter Selection:** Click the param to display charts from 62082 station. Options: WDIR, TEMP, VPED. TEMP is highlighted with a red box and an arrow pointing to it.
- Time Series Chart:** sea temperature in TIME from 2019/03/10 to 2019/05/09. The chart shows temperature in degrees Celsius over time (8 Apr to 6 May) for Depth 3. The chart area is highlighted with a red box and an arrow pointing to it.
- Map:** A map of the North Atlantic and Europe showing data collection points marked with blue dots. A specific location in the Bay of Biscay is highlighted with a red box and an arrow pointing to it.

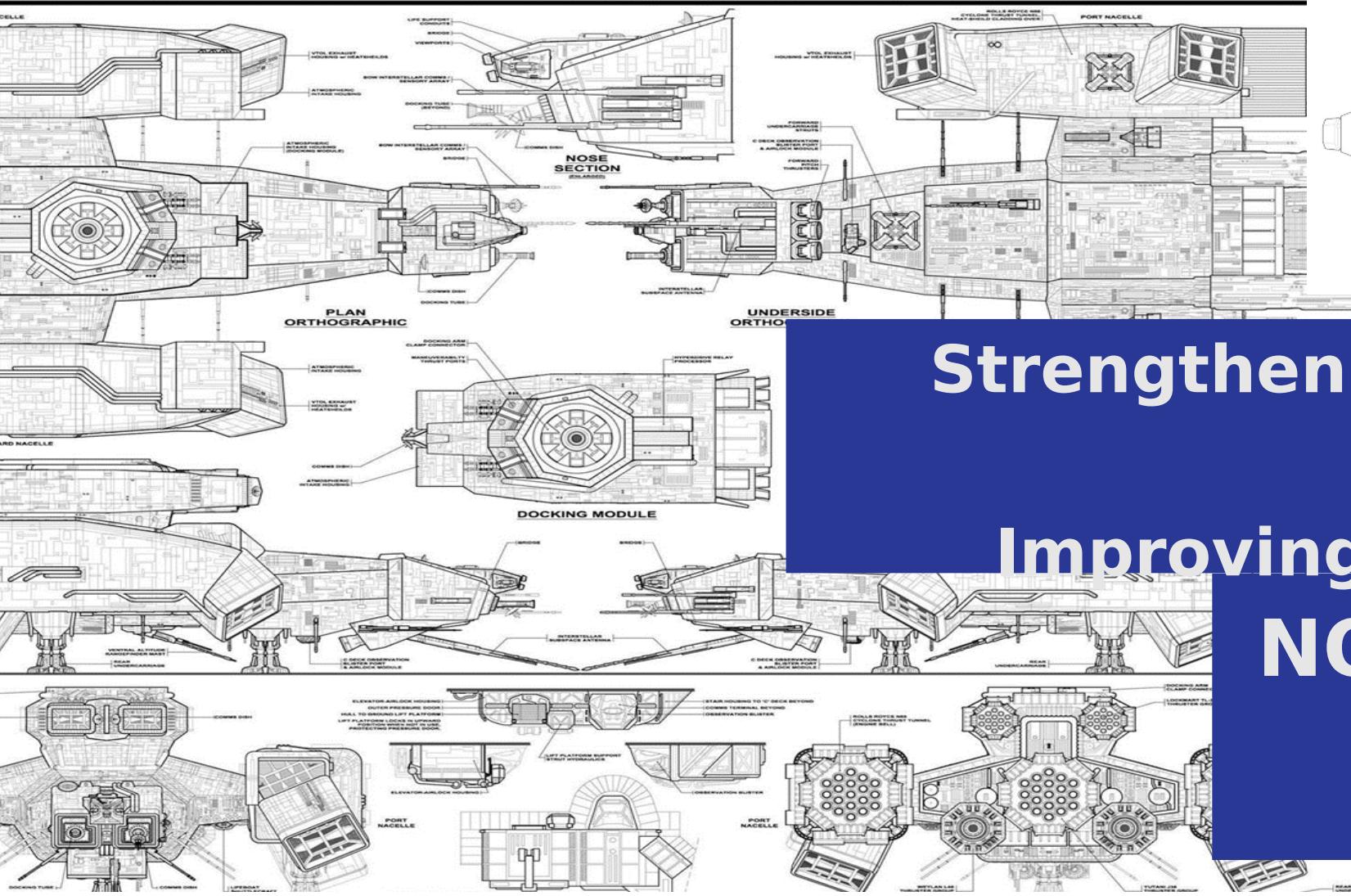


# In Situ

## Products



## 6. Upgrades, better products

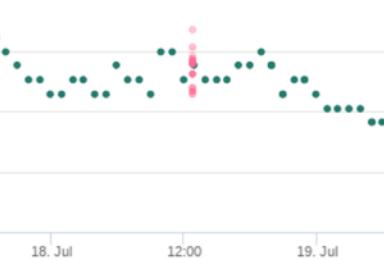


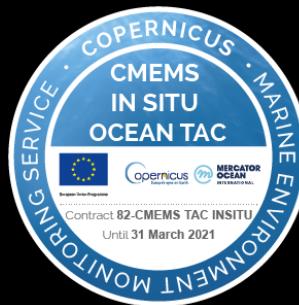
Strengthening of the  
operative

Improving the data

NOSTROMO

IBISVAL





## In Situ Products

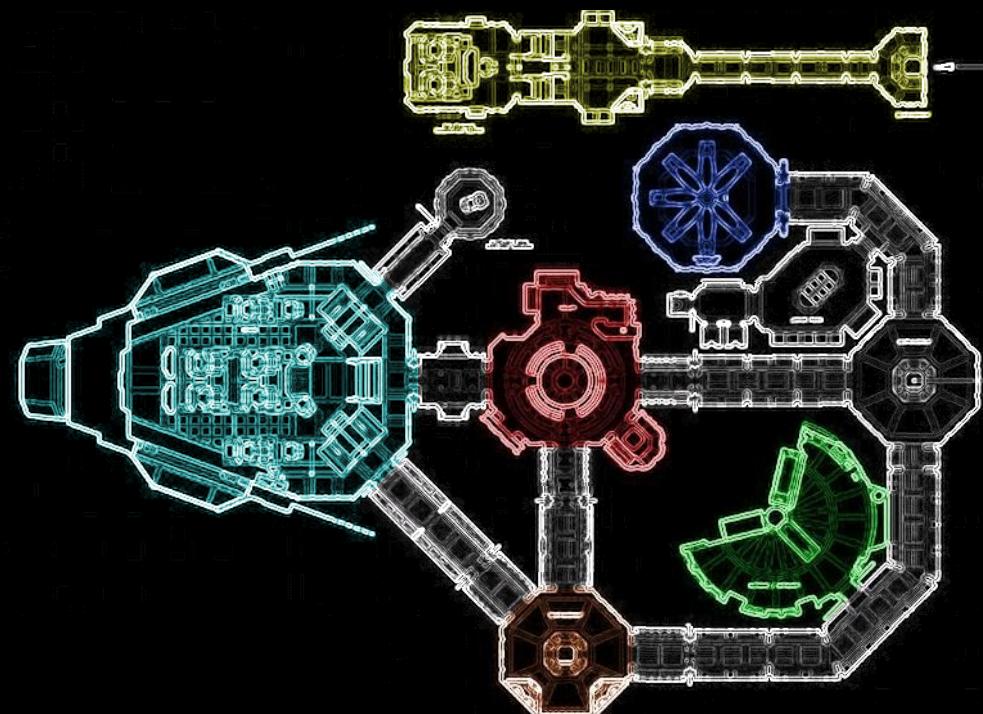
# 6. Upgrades, better products **NOSTROMO**

New Operative System, Tools and Resources for Ocean Monitoring and Observations control

N O S T R O M O

*For internal use only*

**NOSTROMO:** Integrated system to monitor and control de IBI CMEMS In Situ TAC operative.



# In Situ Products

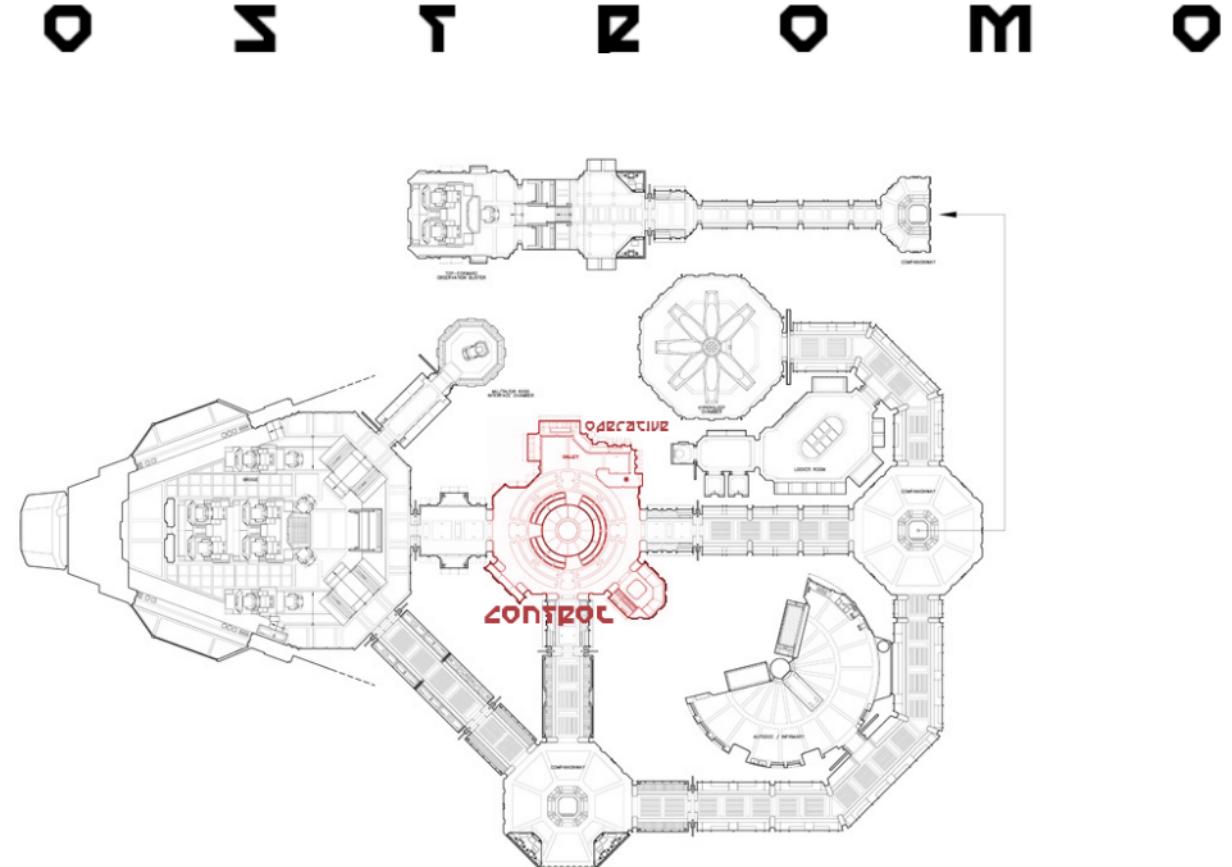
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**CONTROL:** Manual and customized launching of the procedures.

The screenshot shows a software interface with several tabs and sections:

- SYNCHRONIZATION:** A large white area with a progress bar at the top.
- GENERATE NETWORK:** Contains fields for "Dataset:" (Latest), "Days to gen:" (1), "Provider:" (Euskalnet-Euskalmet), and "Network:" (All). Buttons include "Edit", "Reset", and "Launch".
- CHECK QUALITY:** Contains fields for "Provider:" (Euskalnet-Euskalmet), "Network:" (All), "Record:" (Data Base or CSV), and date range "From" and "To". Buttons include "Edit", "Reset", and "Launch".
- GET DATA:** Contains fields for "Provider:" (Euskalnet-Euskalmet), "Network:" (All), "Record:" (Data Base or CSV), and date range "From" and "To". Buttons include "Edit", "Reset", and "Launch". Below this is a terminal window showing log output for a script named "getdataEuskalnet.sh".

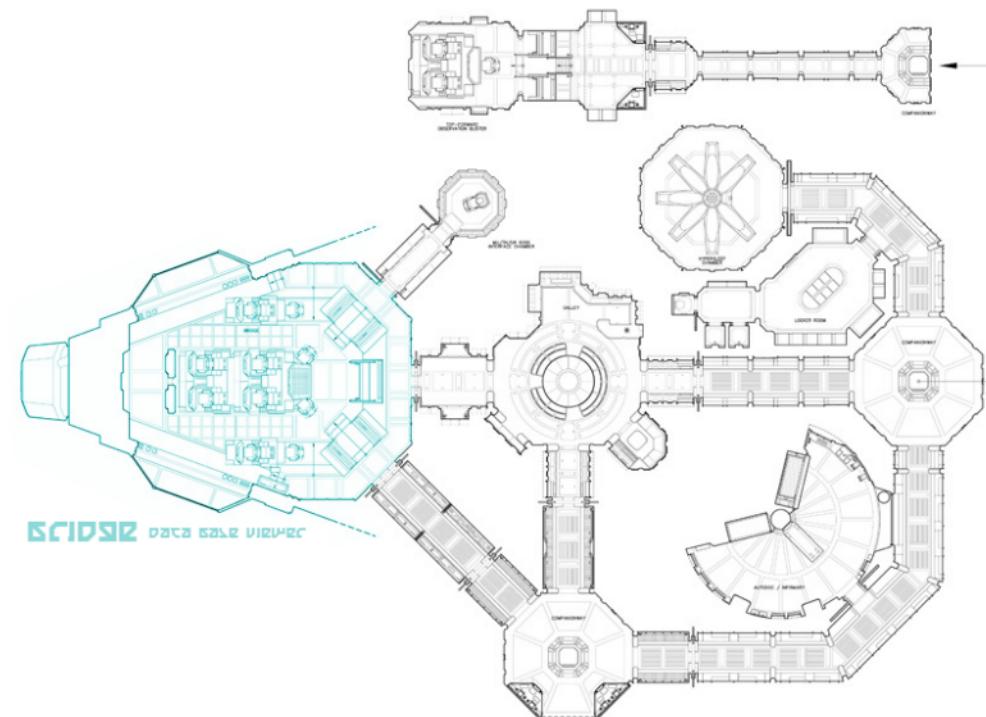


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**DATA BASE VIEWER:**  
Visualization of data series.  
It allows to modify flags in  
the database



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**CENTRAL DU:** Checks the status of the files in the Central DU.

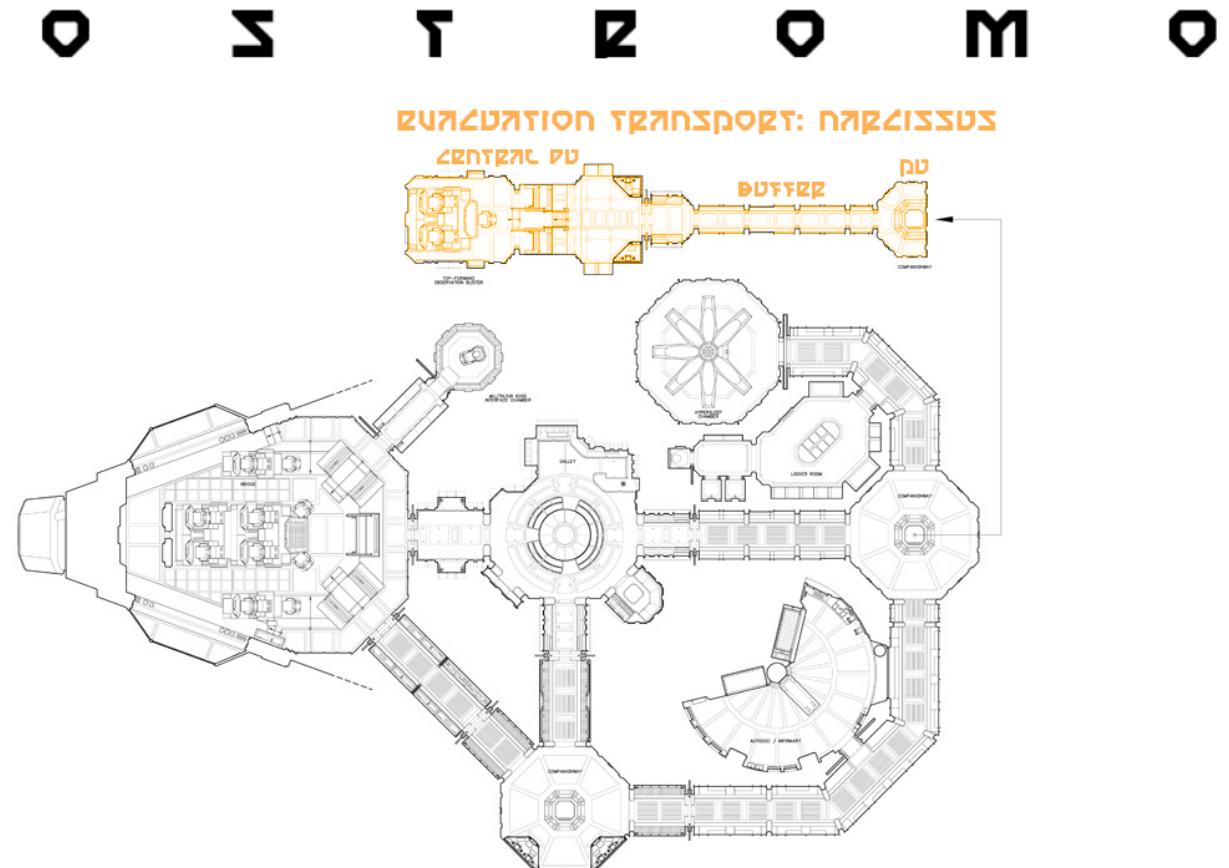
The screenshot shows a dashboard with several tabs at the top: F, T, P, s, S, C, A, U, D, I, N, G. Below the tabs, there are three main sections of text output from file checks:

- IBI - (IBI) - INSTITU\_M2\_M2\_OBSERVATIONS\_NOM\_OBN - latest**

```
Number of days included in latest directory: 31      * Value expected 31 is 30
Total number of files included in latest directory: 8      * Value expected 8 is 8
...  
DU file INSTITU_IBI_M2_M2_OBSERVATIONS_013_013_P20180402T125956Z_resource.xml updated on 2018-04-02 13:09:18
...  
Repetition process result True
...  
DU file INSTITU_IBI_M2_M2_OBSERVATIONS_013_013_P20180402T13091342Z_resource.xml updated on 2018-04-02 13:09:18
...  
Repetition process result True
...  
Last subdirectory included: 20180402      * Value expected 20180402 is 20
Check subdirectories detailed info +
```
- IBI - M2D - INSTITU\_IBI\_M2\_M2\_OBSERVATIONS\_013\_013 - monthly**

```
Total number of files included in monthly directory: 1873      * Value expected 1873 is 20
Number of lines in index file index.txt coincides with number of files in directory index
Index monthly file (index_monthly.txt) updated on 2018-04-02 09:26:00      * Check if Not updated in last 10 days
...  
mooring
```
- IBI - M2H - INSTITU\_IBI\_M2\_M2\_OBSERVATIONS\_013\_013 - history**

```
Number of files (excluding) included in history directory: 72
updated from 2018-03-01 00:00:00 to 2018-03-01 00:00:00
Average size of history files: 200B
Number of lines in index file index coincides with number of files in directory /2
Index history file (index_history.txt) updated on 2018-03-03 12:17:00      * Check if Not updated in last 3 months
...  
mooring
```

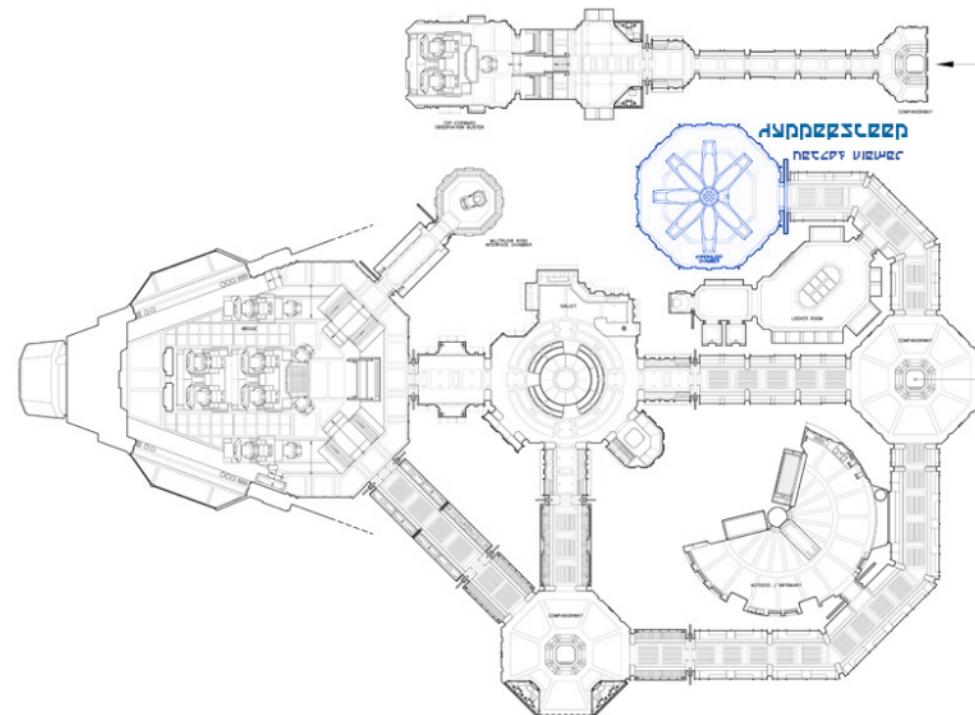
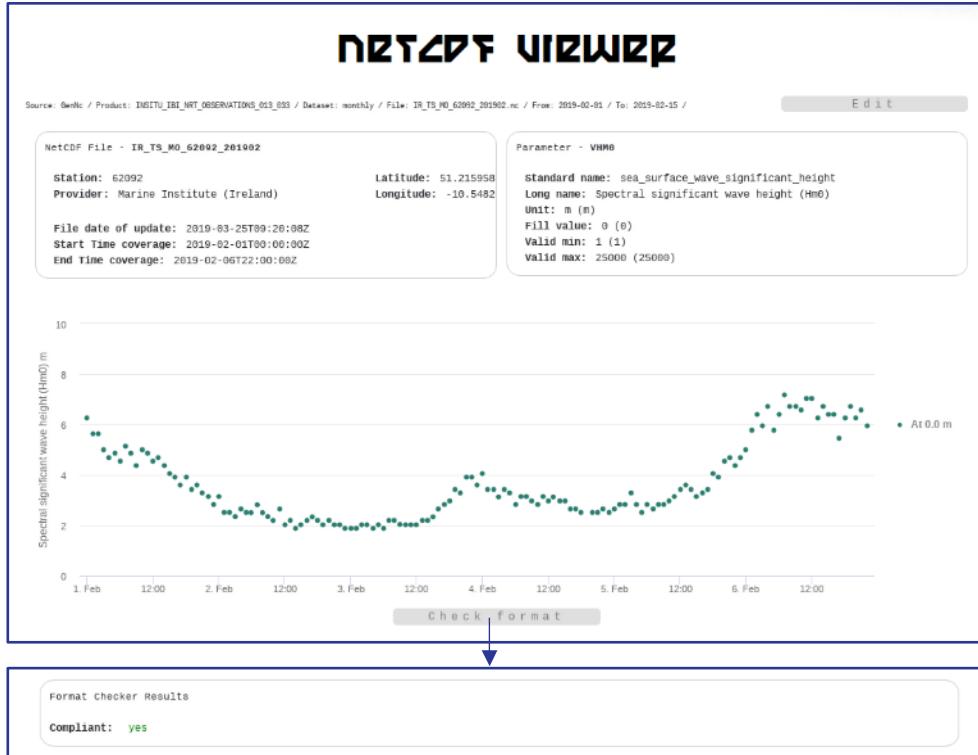


New Operative System, Tools and Resources for Ocean Monitoring and Observations control



### NETCDF VIEWER:

Visualization of data series from the NetCDF files.

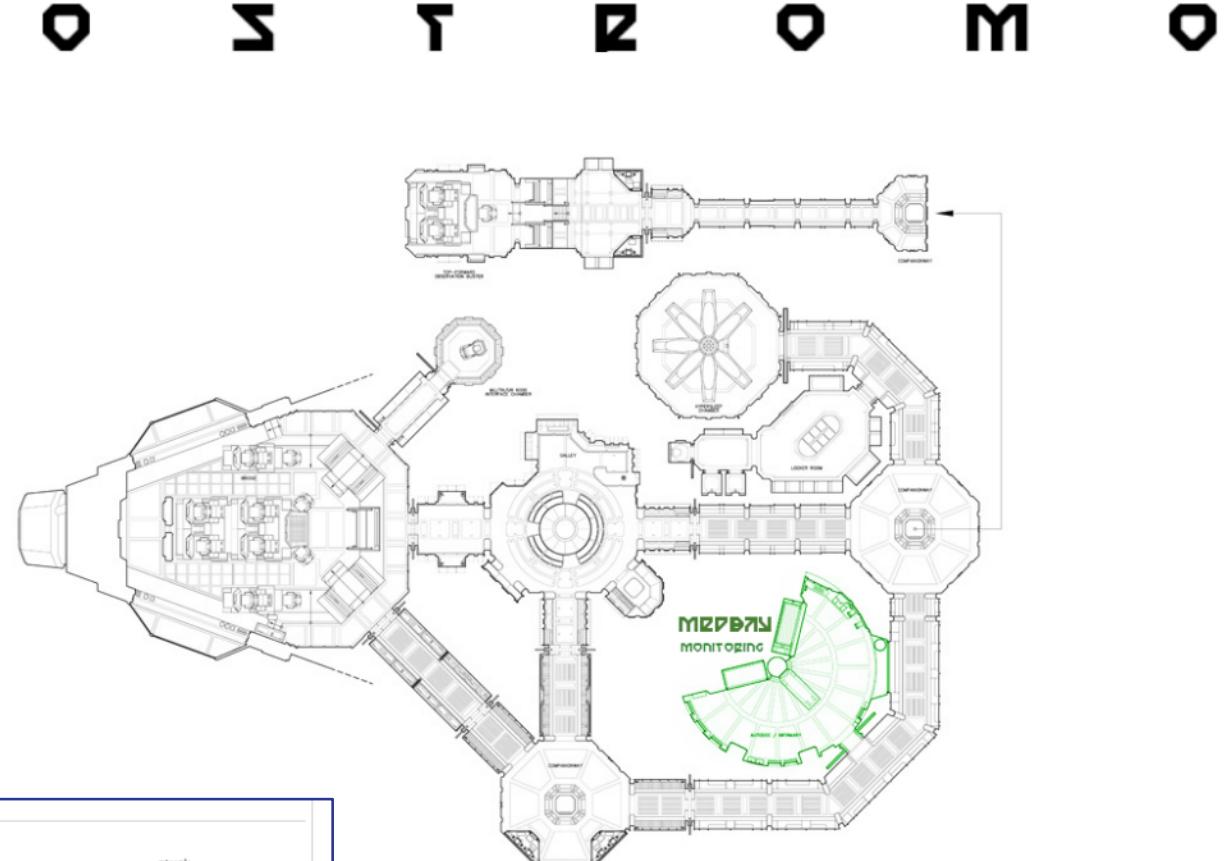
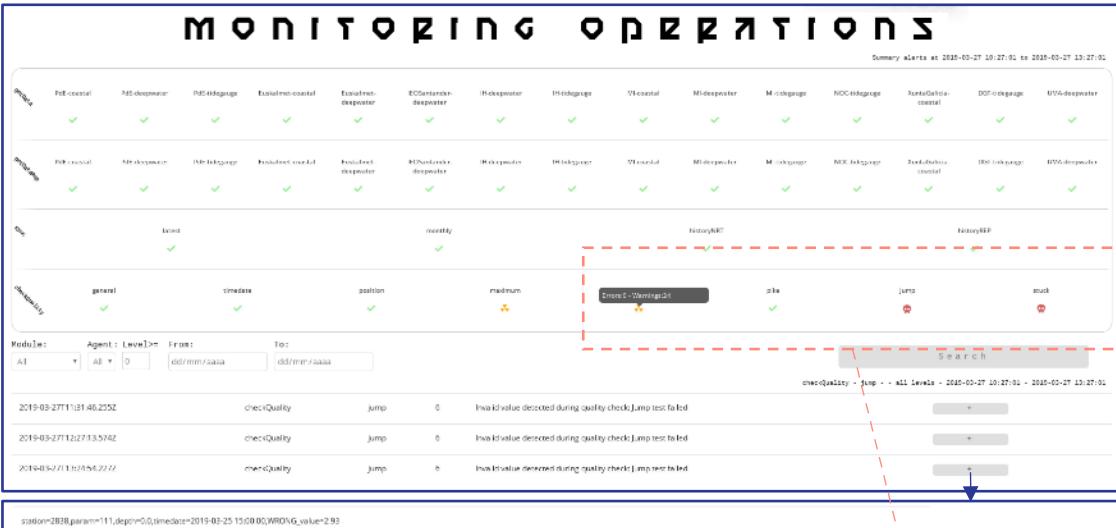


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**MONITORING:** Errors and alerts visualization system.



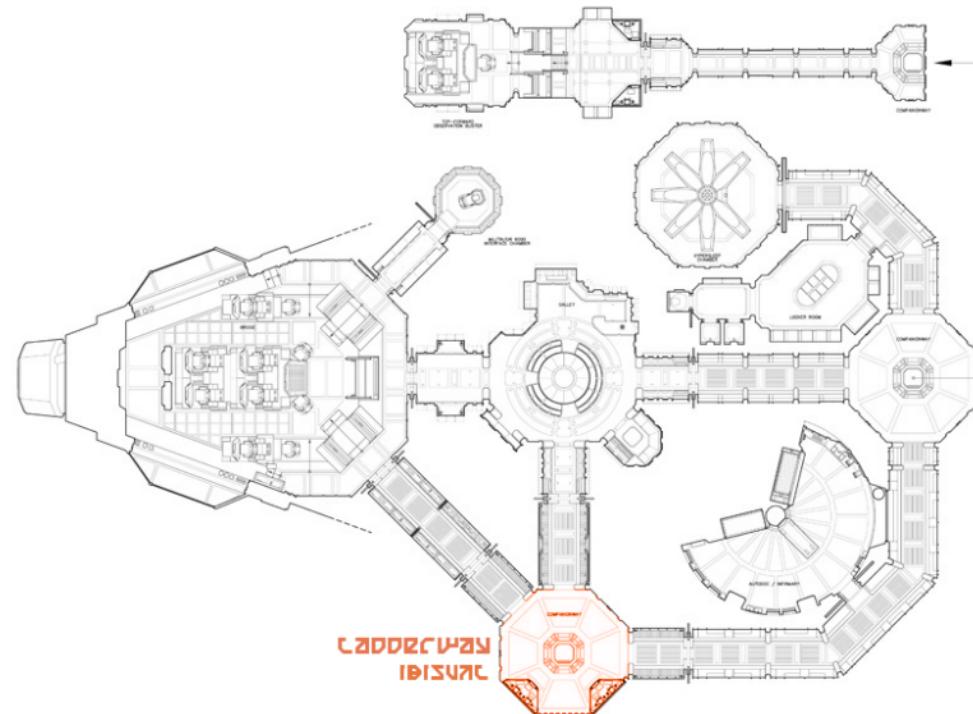
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U Q S T E O M Q

**IBISVAL**: IBI Software for Validation.

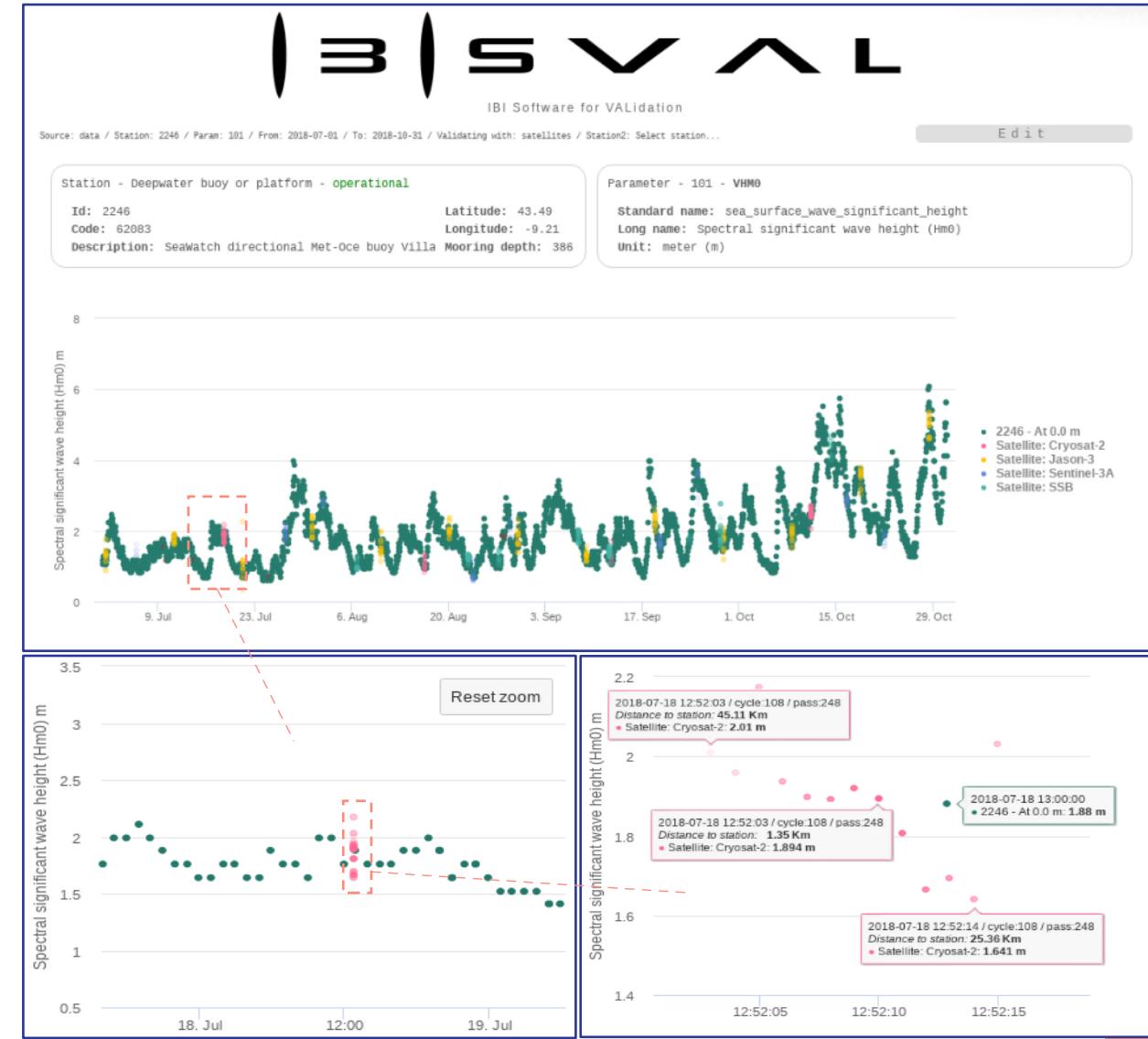
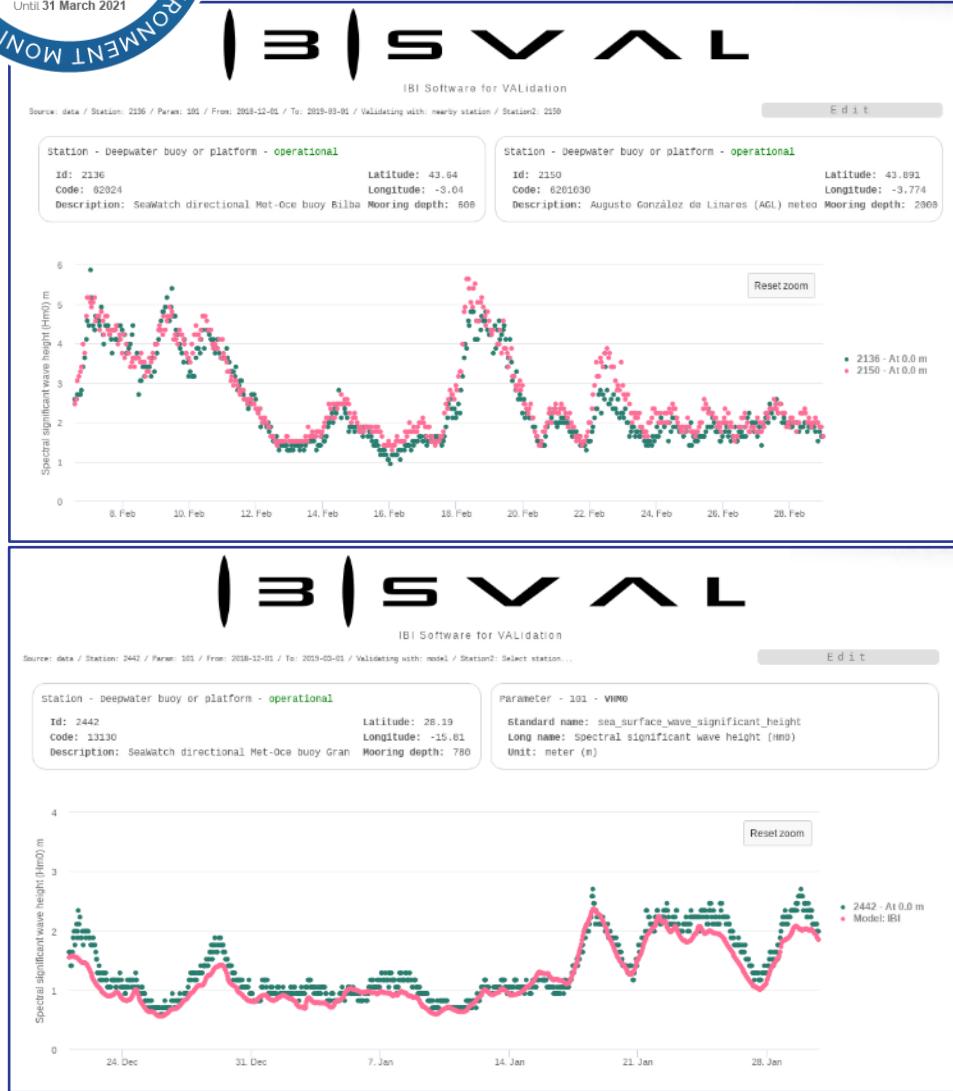


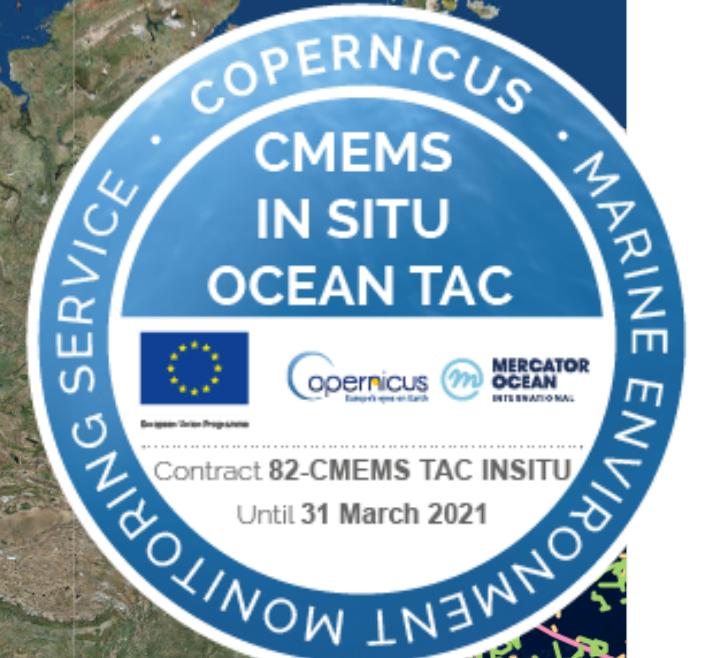
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## 6. Upgrades, better products IBISVAL

### NEARBY STATIONS

### HINDCAST





# Thank you!

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