
DATA
FEST
2019

A Look Into the Copernicus Marine Environment Monitoring Service.

Initiation in the In Situ TAC Network & Data

Paz Rotllan Garcia

Encarni Medina Lopez

Day 1 - 12th March

Target: beginners
Lecture: introduction to Copernicus Marine Services. Focus on the In Situ TAC
Hands-on: interactive interfaces
Time: Half a day starting at 9am, finishing at 1pm

Location: Alexander Graham Bell Building, Edinburgh University
Requirements: laptop

Organization

9-10 CMEMS lecture

10-10.30 In Situ TAC lecture

———————— Break 15'

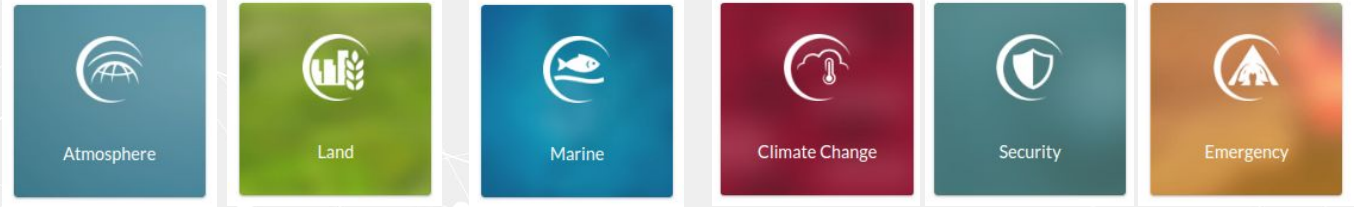
10.45-11.45 hands-on 1

———————— Break 15'

12-13 hands-on2

COPERNICUS MARINE SERVICES (CMEMS)

DATA FRINGE



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The European Earth Observation Programme

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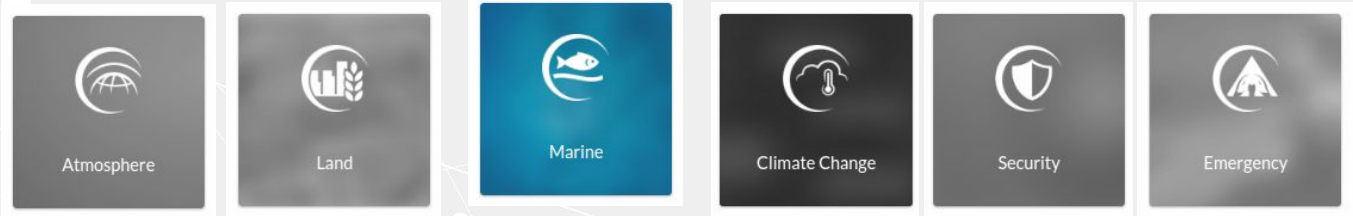
DATA FEST

DATA FRINGE

MFCs - Monitoring and Forecasting Centers (forecast)

TACs - Thematic Data Assembly Centers (Observations)

http://marine.copernicus.eu/



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The European Earth Observation Programme

DATA FRINGE

Regional approach

MFCs - Monitoring and Forecasting Centers (**forecast**)

TACs - Thematic Data Assembly Centers (Observations)

http://marine.copernicus.eu/

Atmosphere | Land | Marine | Climate Change | Security | Emergency

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DATA FRINGE

Regional approach

Remote observations (satellites)

On-site observations (in situ)

MFCs - Monitoring and Forecasting Centers (forecast)

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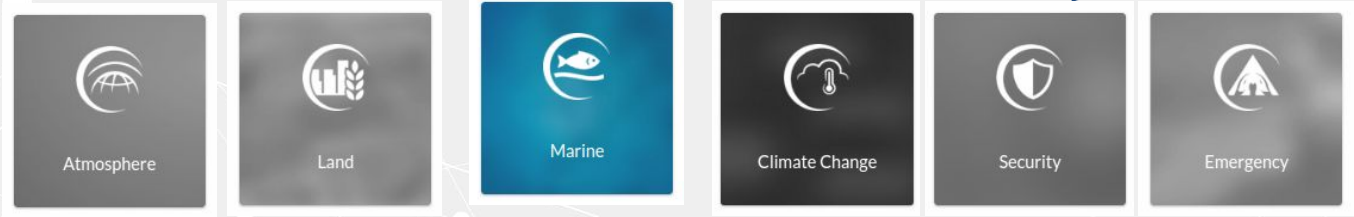

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DATA FEST


MFCs - Monitoring and Forecasting Centers (forecast)
- Thematic Data Assembly Centers (Observations)
http://marine.copernicus.eu/

DATA FRINGE

X-day **forecasts of physical and biogeochemical parameters** that include sea levels, ice, currents, waves, temperature and salinity, as well as chlorophyll, oxygen, nitrate and phosphate.

Reanalysis products of the physical and biogeochemical parameters.

MFCs - Monitoring and Forecasting Centers (forecast)

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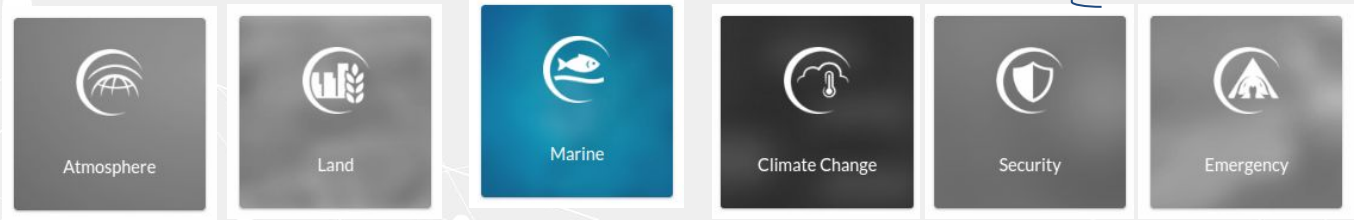
http://marine.copernicus.eu/

Data acquired from satellite ground segment in real-time (today) and **reprocessed** (20 years historic) products.

Remote observations (satellites)

Data acquired from In Situ platforms in real-time (today) and **reprocessed** (20 years historic) products.

On-site observations (in situ)



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DATA FRINGE

Data produced by MFCs and TACs is freely and openly accessible for users at CMEMS FTP servers:

ftp://nrt.cmems-du.eu

ftp://my.cmems-du.eu/

SECURED FTP servers

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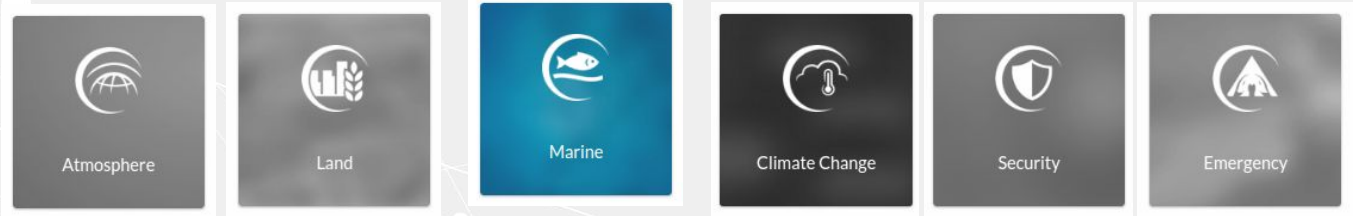

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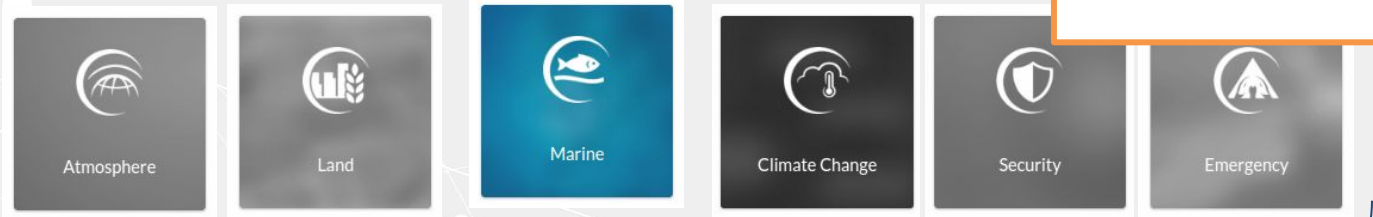
TACs - Thematic Data Assembly Centers (Observations)

http://marine.copernicus.eu/

You won't be granted access unless you request user credentials at: http://marine.copernicus.eu/services-portfolio/register-now/



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SECURED FTP servers

- ftp://nrt.cmems-du.eu – **TOWARDS SPEED**
  - Near Real Time data from MFCs and TACs - ***at least today's data***
    - **MFCs:** {*region*}_ANALYSIS_FORECAST
    - **TACs:** {*TAC*}_NRT
  - netcdf files - *daily outputs of automate processes.*

- ftp://my.cmems-du.eu/ – **TOWARDS QUALITY**
  - Multiyear data from MFCs and TACs - ***delayed mode data***
    - **MFCs:** {region}_ REANALYSIS
    - **TACs:** {*TAC*}_REP
  - netcdf files - *enriched with assimilation, more comprehensive quality checks, derived variables..*

INSITU_NWS_NRT_OBSERVATIONS_013_036/
OCEANCOLOUR_ATL_OPTICS_L3_NRT_OBSERVATIONS_009_034/
GLOBAL_ANALYSIS_FORECAST_BIO_001_014/

INSITU_NWS_TS_REP_OBSERVATIONS_013_043/
OCEANCOLOUR_ATL_OPTICS_L3_REP_OBSERVATIONS_009_066/
GLOBAL_REANALYSIS_BIO_001_029/

DATA FRINGE

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ftp://nrt.cmems-du.eu

ftp://my.cmems-du.eu/

SECURED FTP servers

On such ftps there are several products (collection of netCDFs) listed but…

How do you know which one is attractive to you?

You can get a quick view of each product by passing its name (id) to the following url:

http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&view=details&product_id=PRODUCT_NAME

i.e:
http://marine.copernicus.eu/services-portfolio/access-to-products/?option=com_csw&view=details&product_id=GLOBAL_ANALYSIS_FORECAST_PHY_001_024

DATA FRINGE

Data produced by MFCs and TACs is freely and openly accessible for users at CMEMS FTP servers:

ftp://nrt.cmems-du.eu

ftp://my.cmems-du.eu/

SECURED FTP servers

There are a number of ways to access such servers:

- **Interactively**:
  - Directly: ftp://nrt.cmems-du.eu & ftp://my.cmems-du.eu/
  - Interfaced:
    - *CMEMS* Catalogue: http://marine.copernicus.eu/services-portfolio/access-to-products/
    - *Others*: FTP clients (i.e filezilla): https://filezilla-project.org/
- **Programmatically/scripting:**
  - *CMEMS* Motu-client (only for satellite & model data)
  - *Others*: python, matlab etc modules/toolkits/libraries able to interact with ftp servers.

DATA FRINGE

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ftp://nrt.cmems-du.eu

ftp://my.cmems-du.eu/

SECURED FTP servers

There are a number of ways to explore data in netCDF format:

- **Interactively**:
  - *CMEMS* Catalogue: visualization services
  - *Others*: Panoply: https://www.giss.nasa.gov/tools/panoply/
- **Programmatically/scripting:**
  - Python, matlab etc netCDF modules/toolkits/libraries to interact with available services to access/download netcdf format (wms, opendap, ftp…)

COPERNICUS IN SITU TAC (IN SITU TAC)

DATA FRINGE

Regional approach

Remote observations (satellites)

On-site observations (in situ)

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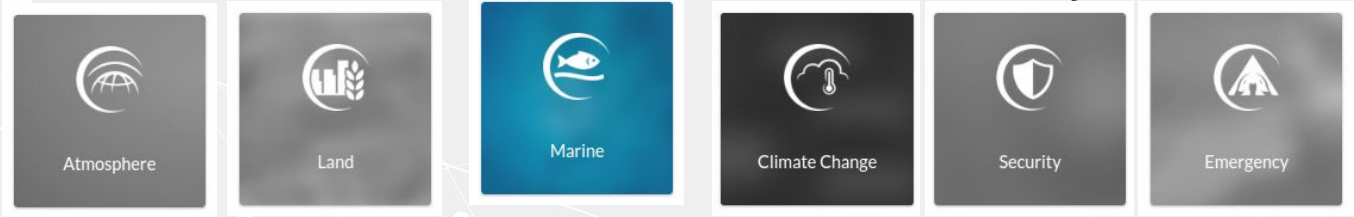

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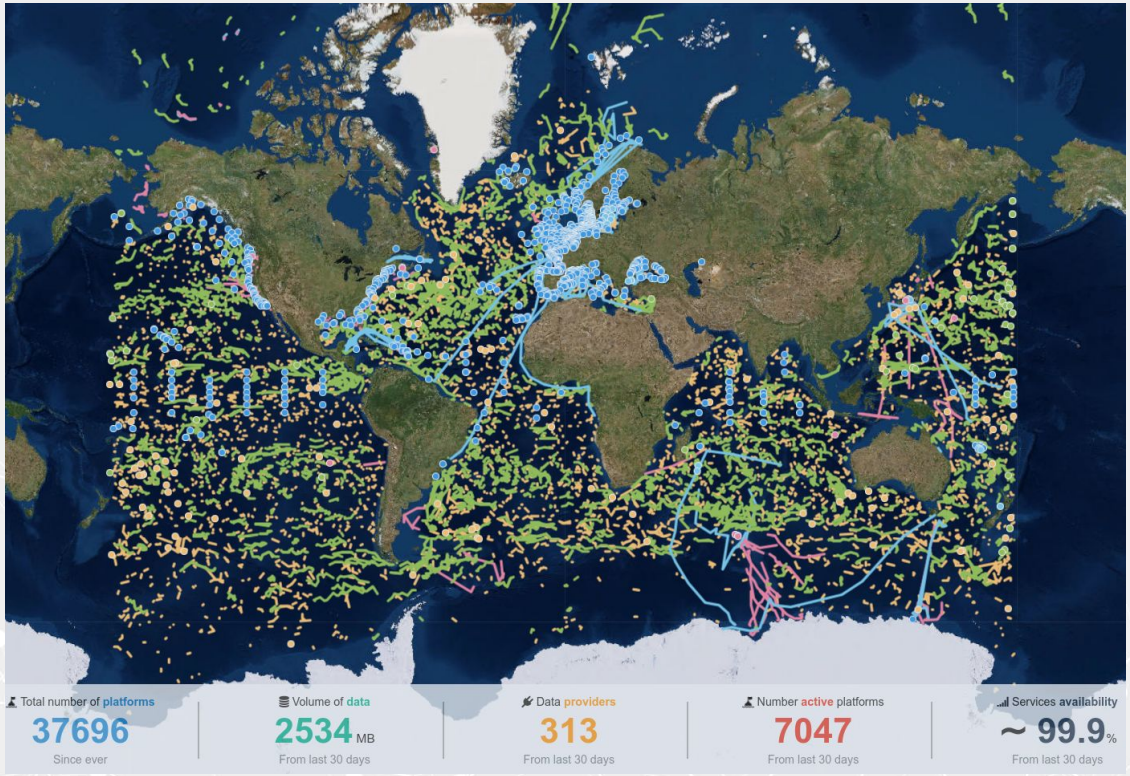
DATA FRINGE

In Situ TAC integrates thousand of local data from on-site sensors on board of a wide range of platforms



COPERNICUS · MARINE ENVIRONMENT MONITORING SERVICE
CMEMS IN SITU OCEAN TAC
Contract 82-CMEMS TAC INSITU
Until 31 March 2021

DATA FEST

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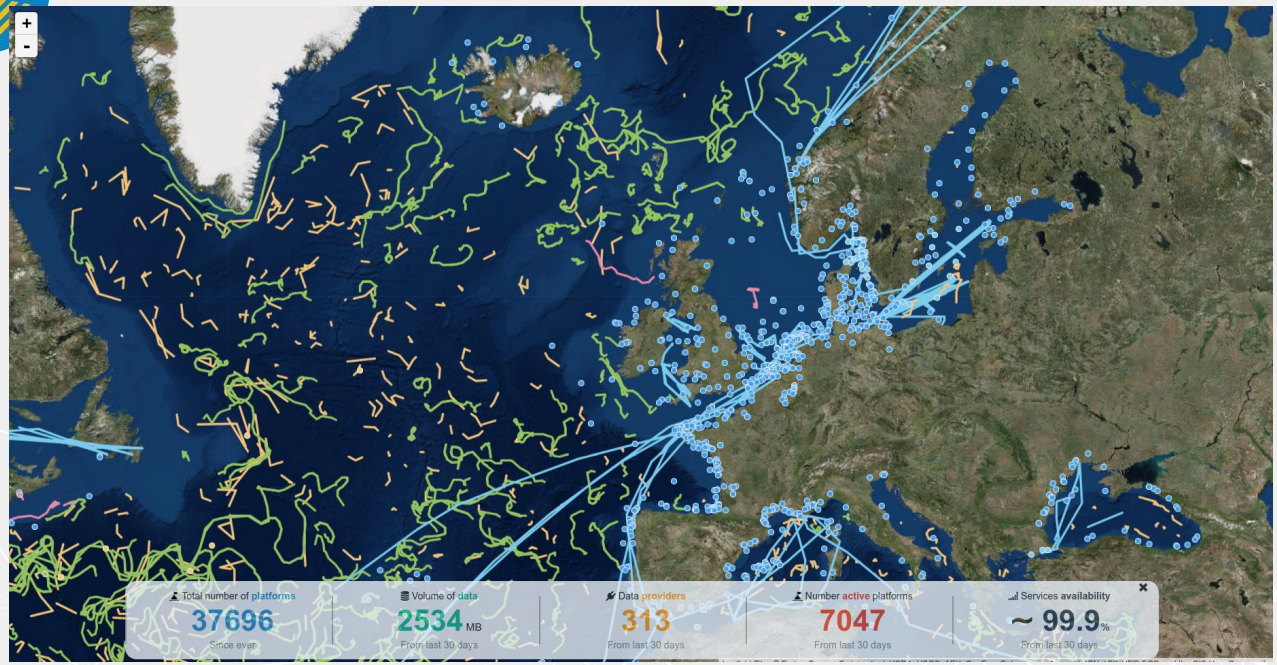

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CMEMS IN SITU OCEAN TAC
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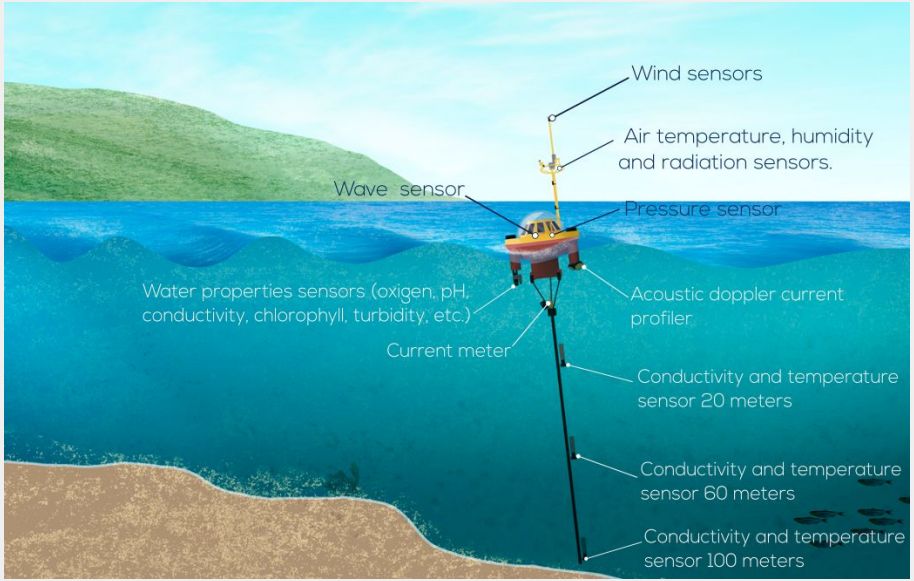
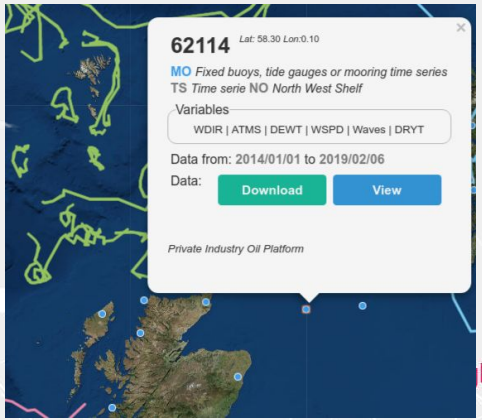
DATA FRINGE

Moorings
Oceanographic buoys
River Flows
Tide gauges

So-called 'fixed-stations'





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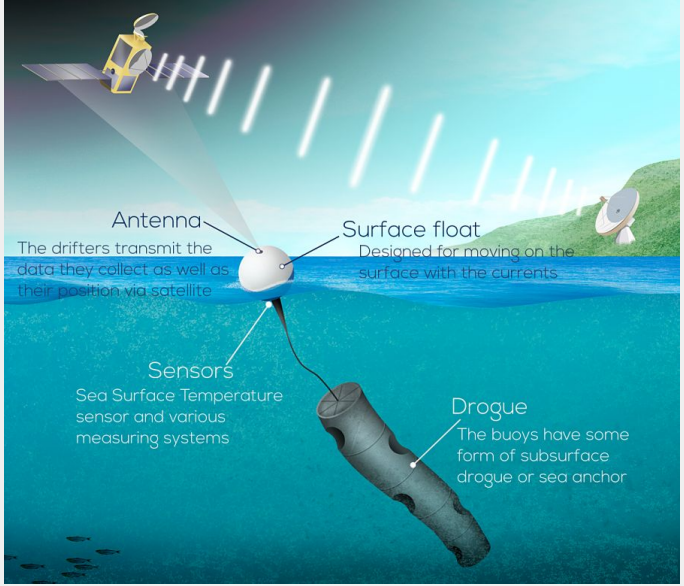
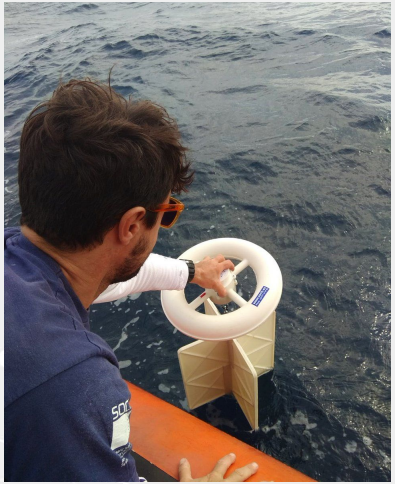
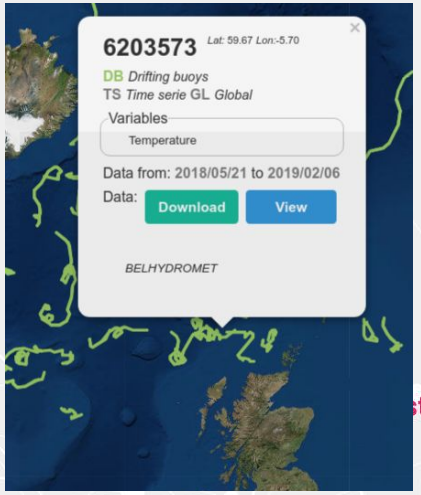
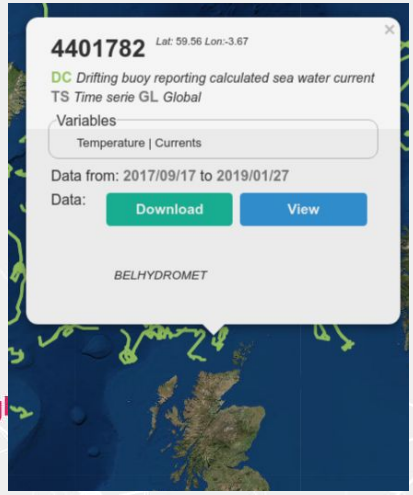


Drifters
Drifting buoys
Drifting buoys reporting currents

Surface **drifters** are autonomous observing **platforms** that provide a lagrangian trajectory from which ocean currents can be inferred

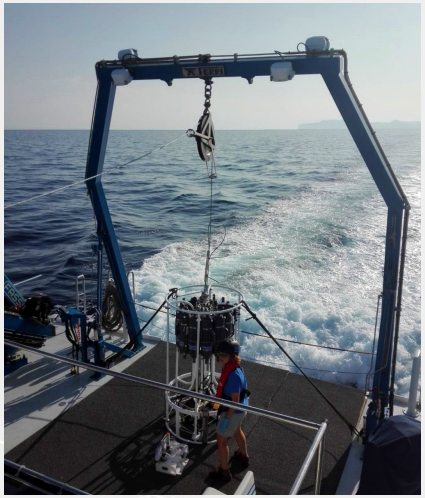


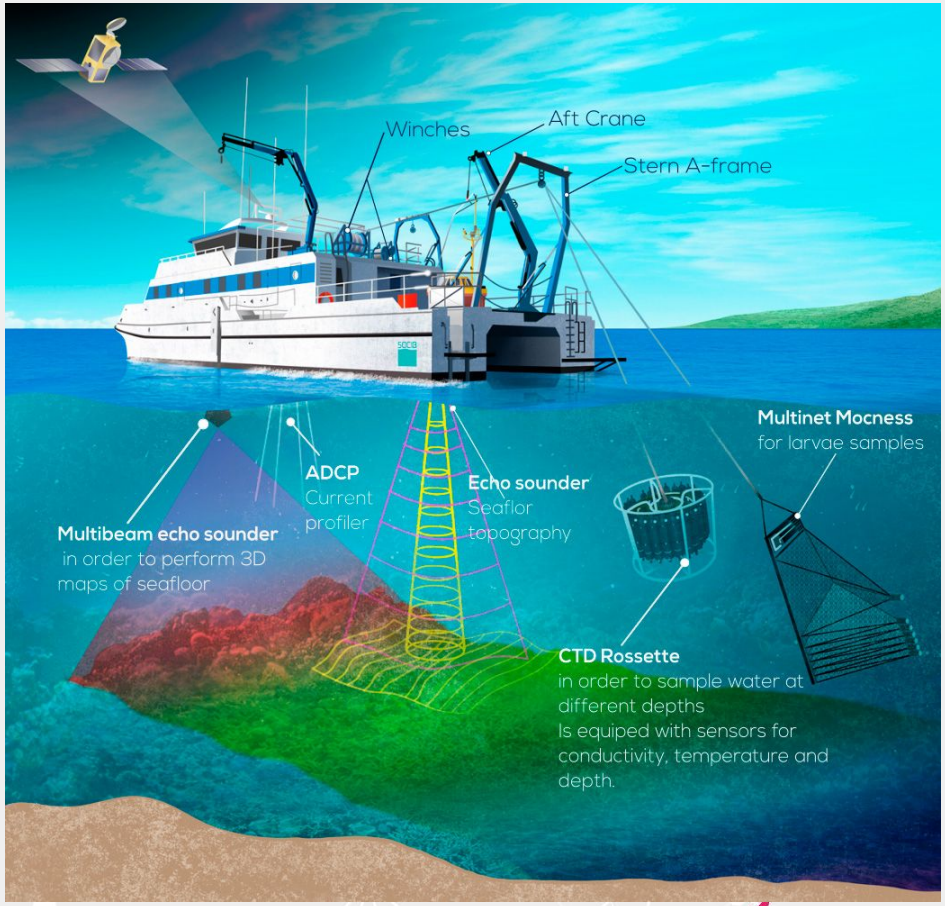




DATA FRINGE

Vessels
Ferribox
XBTs
CTDs
Bottles
Towed CTDs
Miniloggers
Thermosalinograph
...





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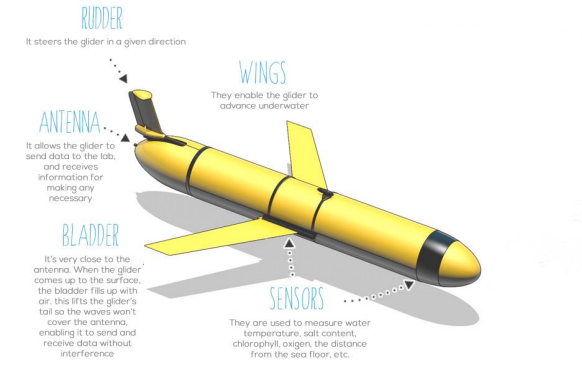
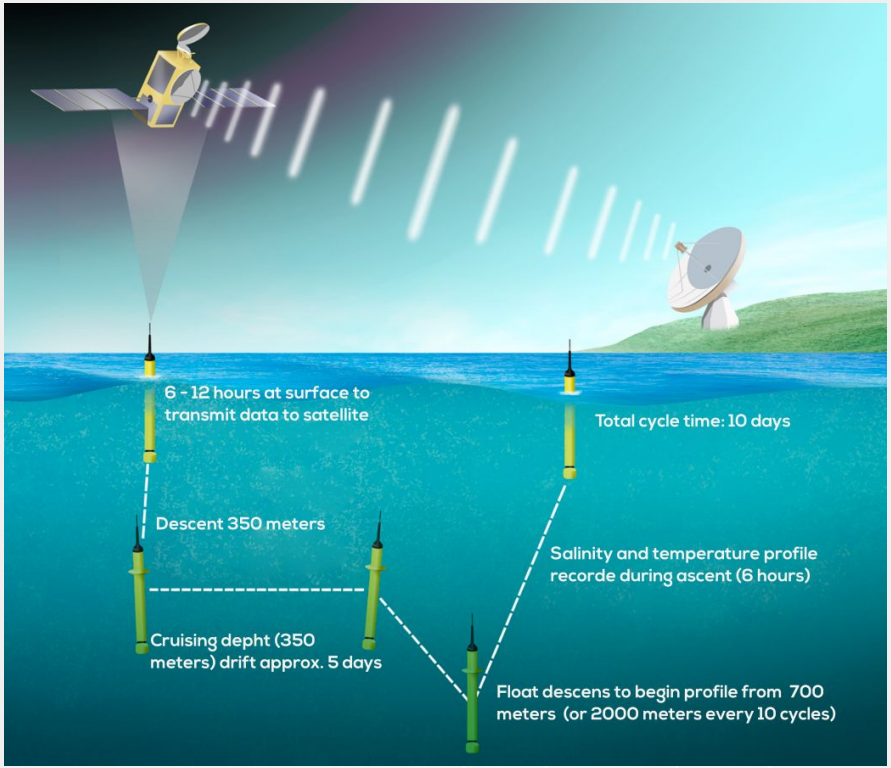


Profilers-gliders
Profilers
Gliders



DATA FRINGE

Others
Sea mammals
Not yet identified

Since 2004, several hundred seals have been equipped with conductivity-temperature-depth (CTD) sensors in the Southern Ocean for both biological and physical oceanographic studies.

Why do we say that the In Situ TAC **integrates** data?

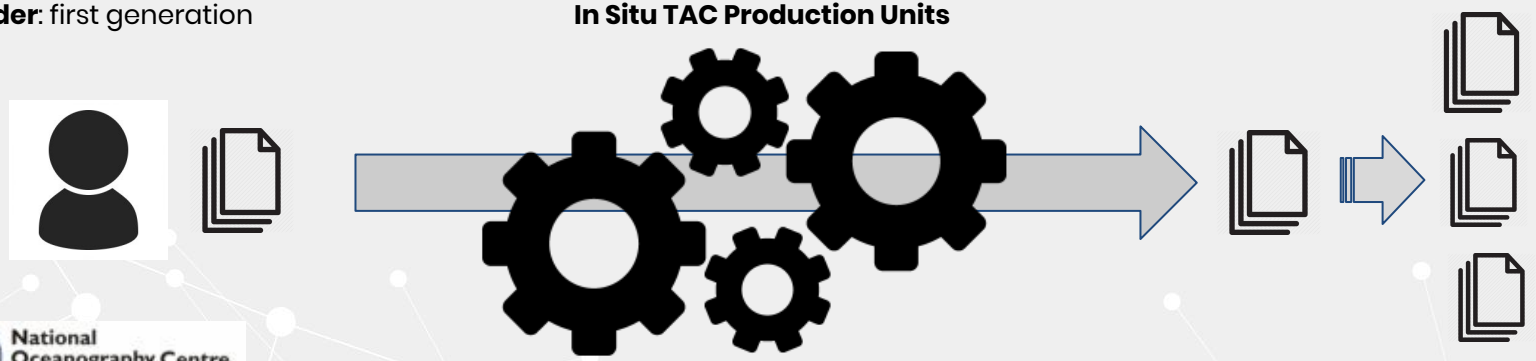
The In Situ TAC data providers collect data and the In Situ TAC:

- Formatt it to be fully compliant with European standards
- Performs a ‘quality check’ over the variables
  - Other operations to procure added value products.

=> ENRICHED DATA!

Provider: first generation

In Situ TAC Production Units



National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

Met Office

DATA FRINGE

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=> **ENRICHED DATA**!

In Situ data is stored in netCDFs, format used by up to 1300 institutions for creating, accessing and sharing array-oriented scientific data.

The data files format is an implementation of NetCDF OceanSITES format.

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IN SITU DATA RELIABILITY:
QUALITY FLAGS

The In Situ TAC performs a 'quality check' over the variables to provide the user not only the data *perse* but also an **indicator of reliability**:

- <*PARAM*> variables
- <*PARAM_QC*> variables

code	meaning	comment
0	No QC performed	-
1	Good data	All real-time QC tests passed
2	Probably good data	-
3	Banda data potentially correctable	These data are not to be used without scientific correction
4	Bad data	Data have failed one or more of the tests
5	Value changed	Data may be recovered after transmission error
6	Not used	-
7	Nominal value	-
8	Interpolated value	Missing data may be interpolated from neighbouring data in space or time
9	Missing value	-

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=> ENRICHED DATA!

- Derived variables - *currents from bare drifter trajectories (DB → DC)*
- Gridded data - *from discrete to gridded products (Objective Analysis) thanks to the wide spatial coverage*
- Scientific assessment (quality check round 2) - *experts revisit data in order to complement the automated quality tests (NRT → REP)*

.....

DATA FRINGE

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ftp://nrt.cmems-du.eu

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SECURED FTP servers

- ftp://nrt.cmems-du.eu - TOWARDS SPEED
  - Near Real Time data
    - **In Situ TAC: INSITU_NRT**

    Data reported by the In Situ network of platforms (driters, moorings, profilers, gliders etc) is:
    - formatted (netCDF)
    - quality checked

    by **automated procedures** to ensure a Near Real Time data distribution.

- ftp://my.cmems-du.eu/ - TOWARDS QUALITY
  - Variable-specific reprocessed data
    - **In Situ TAC: INSITU_REP**

    The Near Real Time data reported by the In Situ network of platforms is revisited to:
    - compute derived variables
    - improve quality check
    - improve spatial resolution

    by **time consuming procedures** to ensure a delayed mode products (netCDFs).

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- ftp://nrt.cmems-du.eu - **TOWARDS SPEED**
  - Near Real Time data
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INSITU_**GLO**_NRT_OBSERVATIONS_013_030
INSITU_**ARC**_NRT_OBSERVATIONS_013_031
INSITU_**BAL**_NRT_OBSERVATIONS_013_032
INSITU_**BS**_NRT_OBSERVATIONS_013_034
INSITU_**IBI**_NRT_OBSERVATIONS_013_033
INSITU_**MED**_NRT_OBSERVATIONS_013_035
INSITU_**NWS**_NRT_OBSERVATIONS_013_036

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SECURED FTP servers

- ftp://my.cmems-du.eu/ - TOWARDS QUALITY
  - Variable-specific reprocessed data
    - **In Situ TAC: INSIU_REP**

The Near Real Time data reported by the In Situ network of platforms is revisited to:

- compute derived variables
- improve quality check
- improve spatial resolution

by **time consuming procedures** to ensure a delayed mode products (netCDFs).

INSITU_GLO_**TS**_REP_OBSERVATIONS_013_001_b
INSITU_GLO_**WAVE**_REP_OBSERVATIONS_013_045
INSITU_GLO_**UV**_L2_REP_OBSERVATIONS_013_044
INSITU_GLO_**TS_OA**_REP_OBSERVATIONS_013_002_b
INSITU_GLO_**TS_OA**_NRT_OBSERVATIONS_013_002_a

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SECURED FTP servers

Available files:

- history files → one file per platform
- monthly files → one file per platform per month (last 5 years)
- latest files → one file per platform per day (last 30 days)

Self describing names:

{*PU*}_{*data type*}_{*platform type*}_{*code*}.nc + *timestamp (YYYYMM or YYYYMMDD)*

- GL_TS_MO_61417.nc
- IR_TS_MO_Malaga-coast-buy.nc
- NO_TS_DB_5401562.nc

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Self describing names: http://cmems-resources.cls.fr/documents/PUM/CMEMS-INS-PUM-013.pdf

{*PU*}_{*data type*}_{*platform type*}_{*code*}.nc + *timestamp (YYYYMM or YYYYMMDD)*

- GL_TS_MO_61417.nc
- IR_TS_MO_Malaga-coast-buy.nc
- NO_TS_DB_5401562.nc
  - *coming in April: GL_TV_HF_stirlign.nc*

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SECURED FTP servers

Grouping strategies:

- platform category (history and monthly files)::
  - moorings
    - MO, TG, RF
  - profilers-gliders:
    - GL, PF
  - drifters
    - DB, DC
  - vessels
    - CT, TS, BO…
  - others
    - SM; SF

- platform category (monthly and latest files):
  - YYYYMM
  - YYYYMMDD

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SECURED FTP servers

Tips for In Situ TAC data products:

- **Interactively**:
  - Directly: ftp://nrt.cmems-du.eu & ftp://my.cmems-du.eu/
    - **Products with *INSITU* on its name**
  - Interfaced:
    - *CMEMS* Catalogue: ***filter by DEPTH***
      http://marine.copernicus.eu/services-portfolio/access-to-products/
    - *Others*: FTP clients (i.e filezilla): https://filezilla-project.org/

- **Programmatically/scripting:**
  - ~~*CMEMS* Motu-client (only for satellite & model data)~~
  - *Others*: python, matlab etc modules/toolkits/libraries able to interact with ftp servers.
    Python examples: http://www.marineinsitu.eu/material/

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SECURED FTP servers

Tips to explore In Situ TAC data in netCDF format:

- **Interactively**:
  - *CMEMS* Catalogue: visualization services
    - **In Situ TAC Dashboard: http://www.marineinsitu.eu/dashboard/**
  - *Others*: Panoply: https://www.giss.nasa.gov/tools/panoply/
- **Programmatically/scripting:**
  - Python, matlab etc netCDF modules/toolkits/libraries to interact with available services to access/download netcdf format (wms, opendap, ftp…)
    - **Python examples: http://www.marineinsitu.eu/material/**

HANDS-ON 1:
MODELS/SATELLITES (1h)

CODE-LESS

DATA FRINGE

DOWNLOAD

- **CMEMS catalog 10’** http://marine.copernicus.eu/services-portfolio/access-to-products/
- ***Filezilla* 20’*** https://filezilla-project.org

DATA ACCESS

- **CMEMS visualization services 10’** http://marine.copernicus.eu/services-portfolio/access-to-products/
- ***Panoply* 20’*** https://www.giss.nasa.gov/tools/panoply/

**software installation required*

HANDS-ON 2: INSITU (1h)

CODE-LESS

DATA FRINGE

DOWNLOAD

- **CMEMS catalog 5':** http://marine.copernicus.eu/services-portfolio/access-to-products/
  - **In Situ TAC Dashboard 10':** http://www.marineinsitu.eu/dashboard/
- ***Filezilla 5' ****** https://filezilla-project.org

DATA ACCESS

- **CMEMS visualization services 5':** http://marine.copernicus.eu/services-portfolio/access-to-products/
  - **In Situ TAC Dashboard 5':** http://www.marineinsitu.eu/dashboard/
- ***Panoply* 30'*** https://www.giss.nasa.gov/tools/panoply/
  - *Profiles: glider, profilers, CTDs...*
  - *Time Series: moorings, river flows….*
  - *Trajectories: drifters, thermosalinograph..*

**software installation required*