FrOOS

European Pavilion

Digital Ocean

Nice | France

2 - 13 JUNE 2025

Observing the Ocean

The role of France with the French Ocean Observing System

Inspire

How to monitor the Ocean?

French Ocean Observing System

Opening remarks

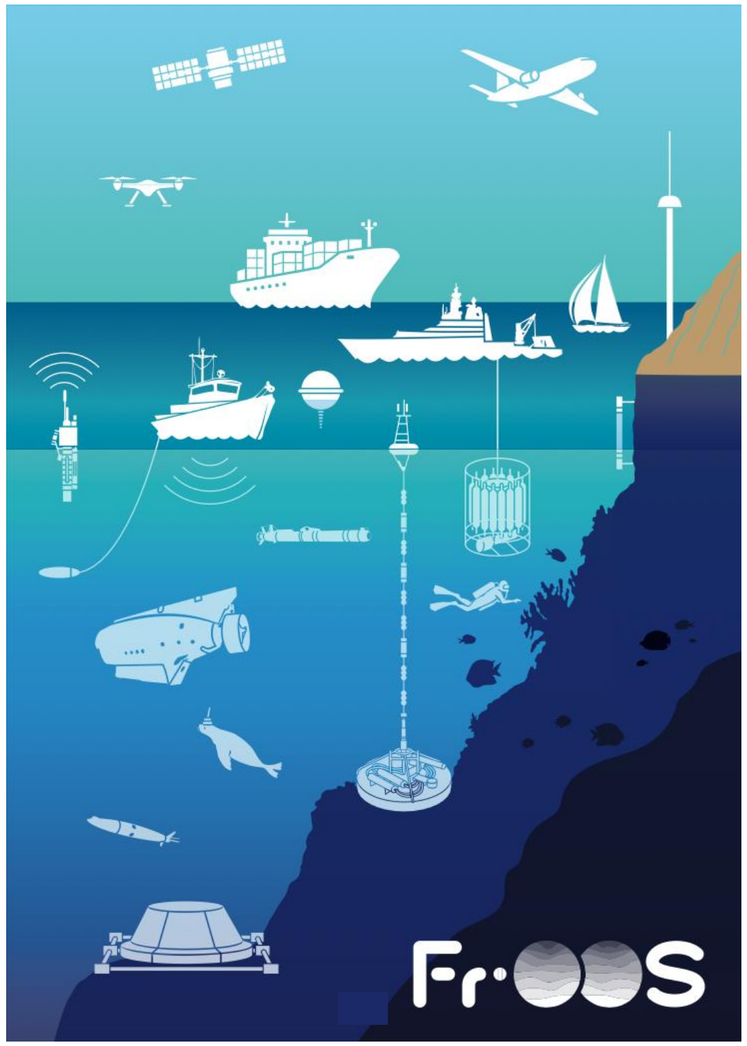
Fabrizio D’Ortenzio
CNRS INSU
Laboratoire d'Océanographie de Villefranche
Fr-OOS Executive Secretariat

Valérie Cariou
Shom

Pierre-Yves Le Traon
Ifremer

Lucie Cocquempot
Ifremer

Aurore Molé
CNRS



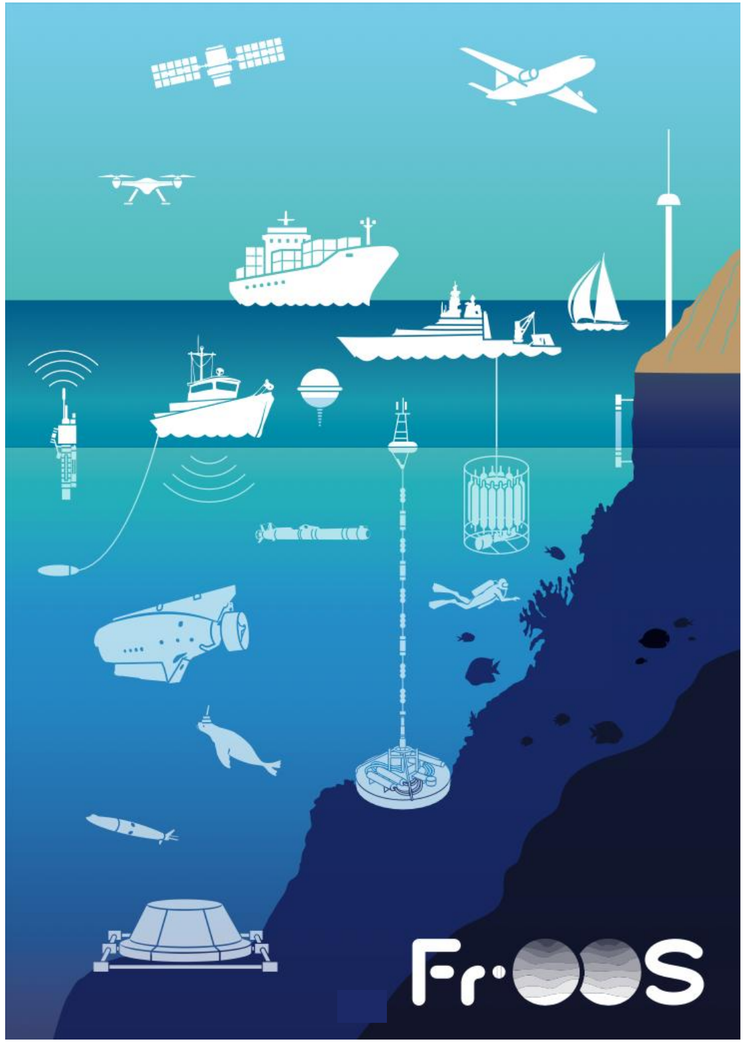
Opening remarks

Contexte

Historically, **ocean observation** has been a **core activity** of the French oceanographic research community.

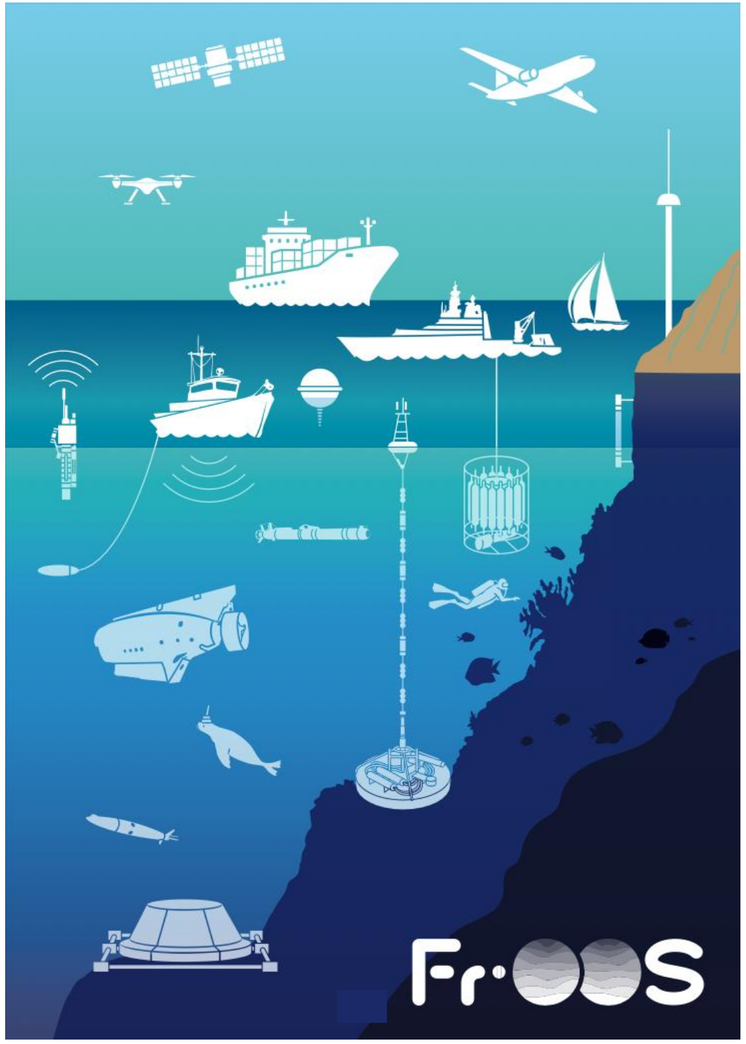
French oceanographers have been — and continue to be — strongly engaged in:

- the **collection** of in situ data, its long-term storage in high-quality **databases**, and its subsequent valorization and **scientific exploitation**;
- building synergies and scientific collaboration with the **remote sensing** and **modelling** communities;
- the establishment and consolidation of **European Research Infrastructures** for marine sciences;
- the participation to the **international** and **global structures of coordination**



Opening remarks

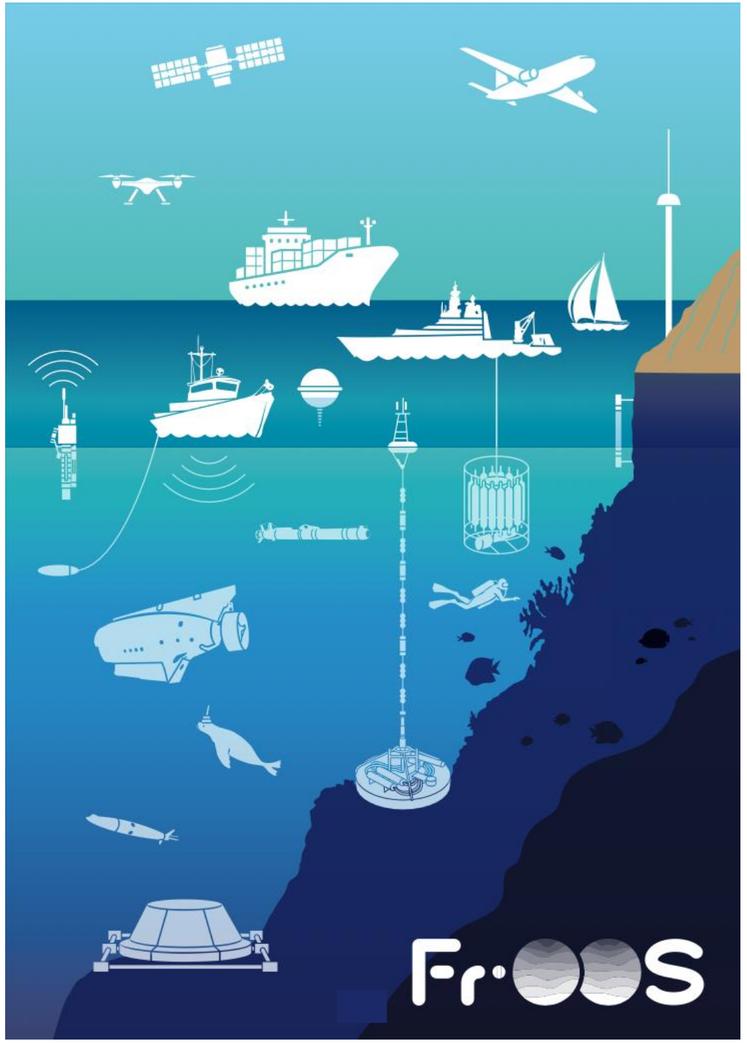
The **French Ocean Observing System** was established in 2023 to **support** this dynamic, strengthen **individual components**, and promote **cross-component interactions**



Opening remarks

Fr-OOS objectives

- **Strengthen long-term ocean observation**
- **Harmonize activities** promote resource pooling and align/simplify associated governance bodies.
- **Organize the interfaces** between the national marine observation research infrastructures Argo-France (IR* EURO-ARGO), EMSO-France, ILICO, a future open sea infrastructure (OHIS), observation networks not organized as research infrastructures (monitoring, fishery)
- **Develop transverse activities** : interfaces with the Research Vessel fleet infrastructure, data centers, satellite observations and ocean, weather and climate modeling centers.
- **Insert the Fr-OOS into the international** (**GOOS**, GCOS, POGO, GEO, UN Decade) and **European** (**EOOS**, ESFRI, EMODnet, Copernicus, Digital Twin Ocean, SBEP) landscapes.



Opening remarks

Focus on its components

Components Committee

composed of representatives from all Fr-OOS components, along with representatives of the ODATIS Research Infrastructure

RESEARCH INFRASTRUCTURES (RI)

ARGO France

French node of the Euro-Argo ERIC and Argo international program

EMSO France

French node of ERIC EMSO

ILICO

Coastal and littoral research infrastructure

OHIS

Open ocean in-situ

(RI in construction)

NETWORKS NOT STRUCTURED AS RI

CEREMA

Candhis network. National coastal observatory for *in situ* sea states

Météo France

Meteorologicals buoys network

Shom

Tide gauge network: sea level observations

Ifremer

Environmental and biological resources monitoring networks

Session outline

Introduction by Supervisory Authorities

Nicolas Arnaud
Director of the National Institute for Earth Sciences and Astronomy (INSU), CNRS

Jean-Marc Daniel
Director of the Department of Oceanographic Observation and Data, Ifremer

Session outline

The Challenges of Long-Term Ocean Observation in the European and International Context

Emma Heslop
Global Ocean Observing System Specialist (GOOS), IOC-UNESCO

Global Ocean Observing System

Sheila Heymans
Co-Chair of the EOOS Steering Group, European Marine Board

EOOS

Session outline

Components & Dashboard Presentation: Current Status and Perspectives

- **Introduction – Data Terra RI / ODATIS :**
  Frédéric Huynh *(Data Terra)* / Erwann Quimbert *(ODATIS – Data Terra)*

- **Coastal Ocean Observations – ILICO :** Alain Lefebvre *(Ifremer)* / Annaïg Le Guen *(CNRS)*

- **Open Ocean – OHIS :** Sabrina Speich *(CNRS - Institut Pierre-Simon Laplace)*

- **Argo France :** Nicolas Kolodziejczyk *(University of Brest)*

- **Deep Ocean – EMSO France :** Dominique Lefèvre *(CNRS – MIO)*

- **Oceanographic Buoys**
  Lotfi Aouf *(Météo-France)*
  Matthieu Suire *(Cerema)*

- **Sea Level :** Marie Dauguet *(Shom)*

Session plan

Closing remarks

MINISTÈRE
DE L'ENSEIGNEMENT
SUPÉRIEUR
ET DE LA RECHERCHE

Liberté
Égalité
Fraternité

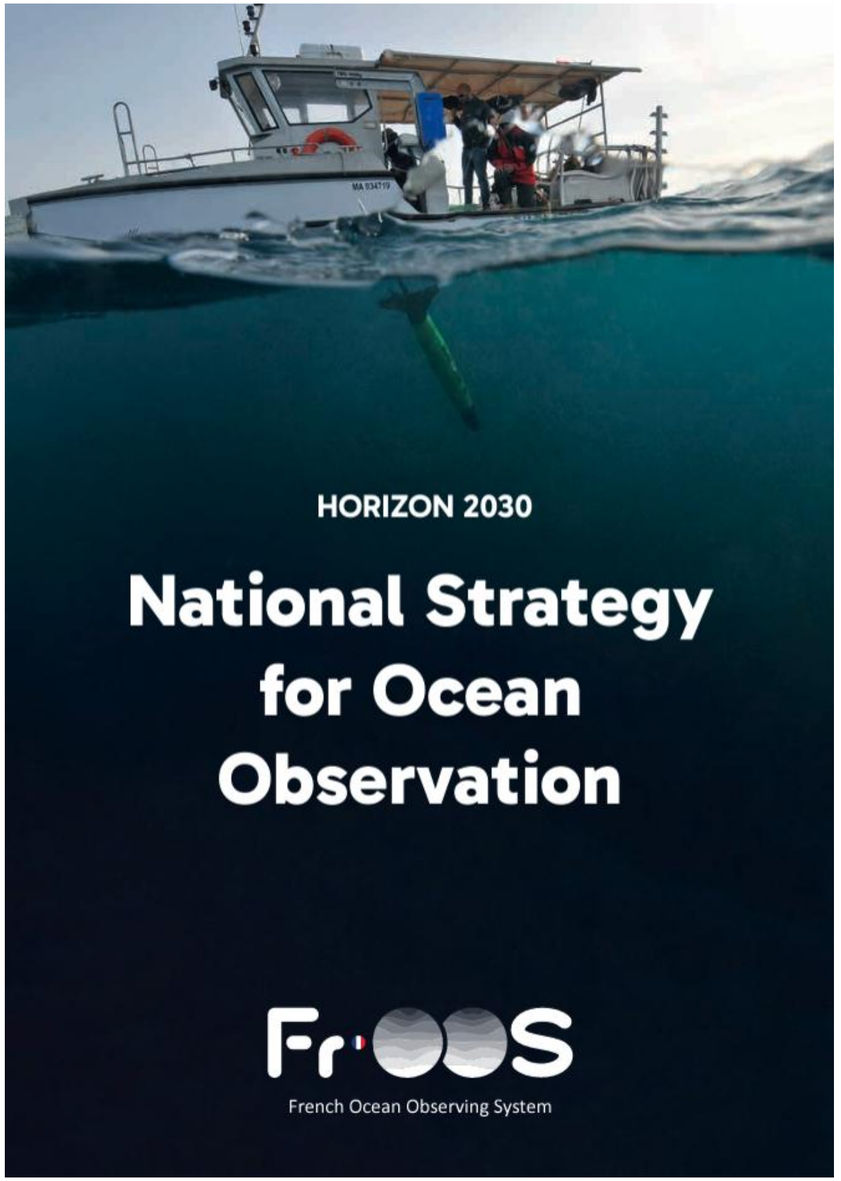
MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE

Liberté
Égalité
Fraternité

National Strategy for Ocean Observation

In collaboration with all Fr-OOS components and scientific experts

Important 2025 deliverable Fr-OOS



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How to monitor the Ocean?

Introduction by Supervisory Authorities

Nicolas ARNAUD

Director of INSU
National Institute for Earth
and Universe Sciences,
CNRS

Jean-Marc DANIEL

Deputy Director-General for Strategy,
Ifremer

Copernicus
Europe's eyes on Earth

EU MISSIONS
RESTORE OUR OCEAN & WATERS

Copernicus
Marine Service

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MERCATOR OCEAN
INTERNATIONAL

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How to monitor the Ocean?

Challenges of long-term Ocean observing internationally and in Europe

Sheila Heyman

EOOS (European Ocean Observing System) Steering group
European Marine Board

Joanna Post

GOOS (Global Ocean Observing System) Directo
Intergovernmental Oceanographic Commission

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How to monitor the Ocean?

Global Ocean Observing System

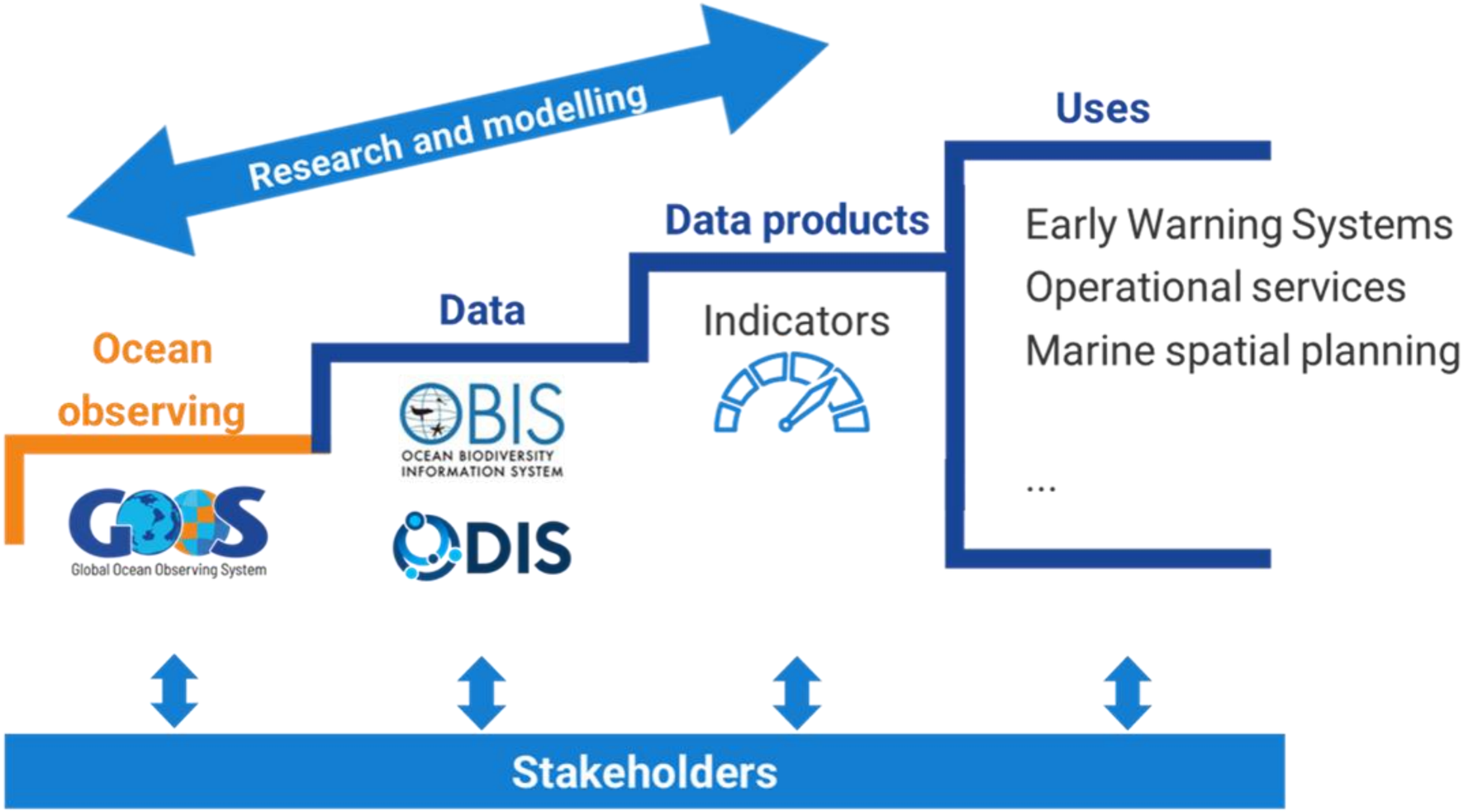
Joanna Post

IOC GOOS

The Global Ocean Observing System (GOOS)

Leading and supporting a community of international, regional and national ocean observing programmes, governments, UN agencies, research organisations and individual scientists.

A critical infrastructure for ocean observations - for science and society



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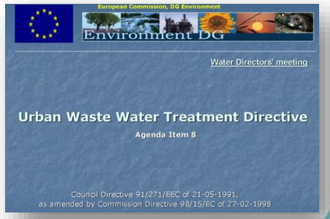
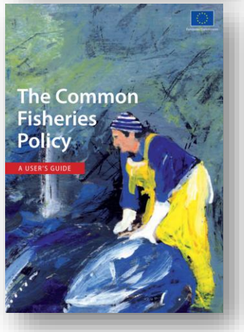
How to monitor the Ocean?

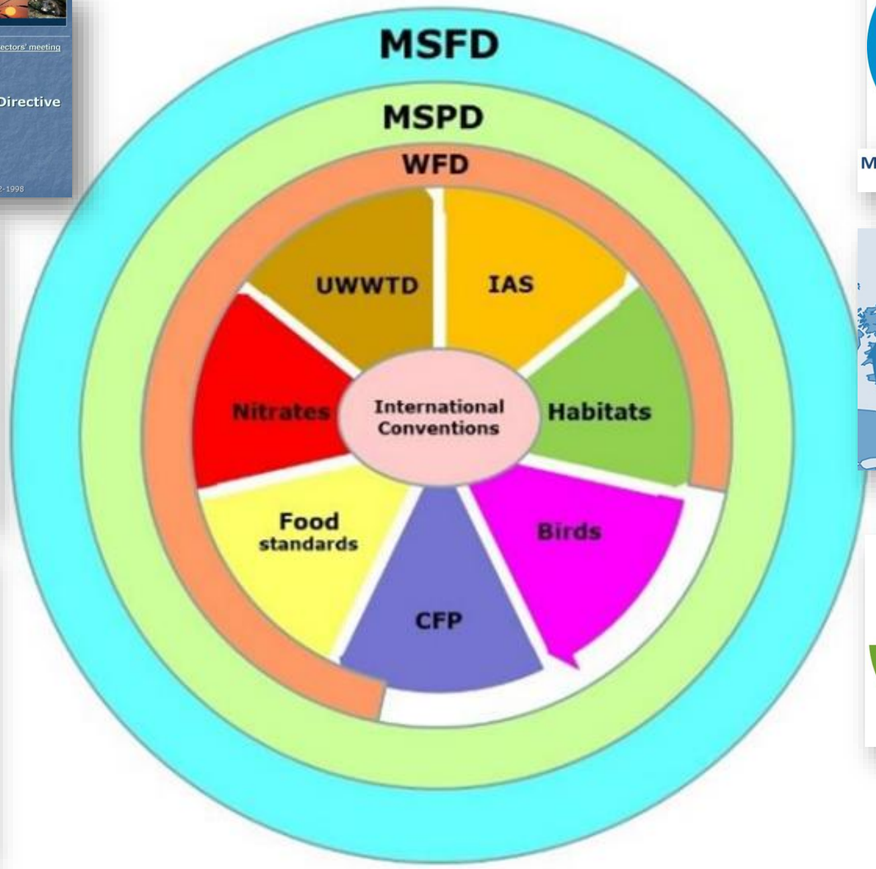
Sheila JJ Heymans

European Marine Board and EOOS

European Ocean Observing







- In Europe Ocean observing (including monitoring) is done to address many different legal requirements.
- It is done on a case by case basis, with very little coordination between different legal drivers at European level, as these monitoring for these legal instruments are National competency.

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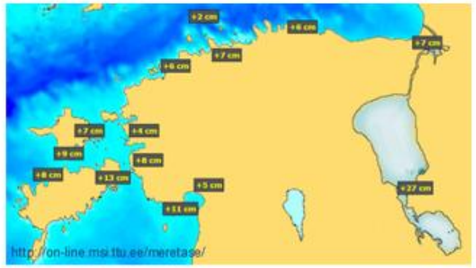
European Ocean Observing

National level	Trigger	Information/Assessment
Environmental Agencies	National priorities	Public
Research Institutes	European Policies	Private
Universities	Research interests	Academia
Local environment centres	Private sector needs	Local Governments
NGOs	International commitments	Decisionmakers
Private sector		
Citizens		





- **Ocean observing (including monitoring) is based on national requirements and research interest.**
- **There is no mandated coordination of these observations at a European Scale or Nationally (in most cases).**

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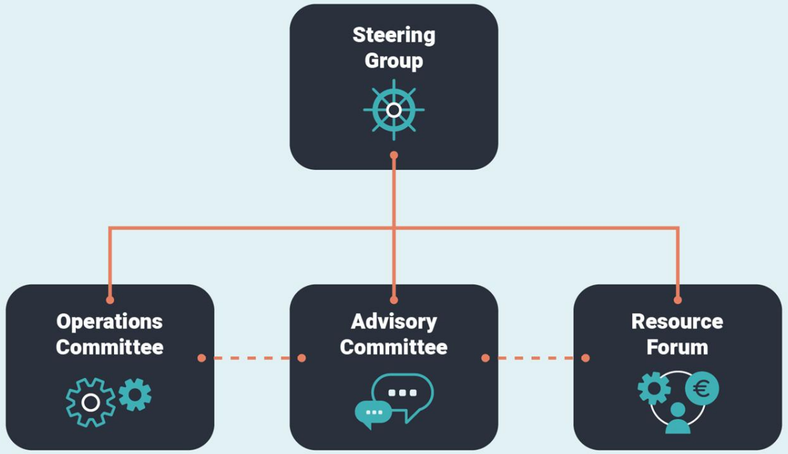
European Ocean Observing System Framework



- In Europe Ocean observers have self-organised into EOOS, to ensure effective Ocean observing in Europe
- With 2 cycles of Strategy and Implementation (2018-2022; 2013-2027)
- The organisation is working with nations to understand what Ocean observations are being done, and where the information goes

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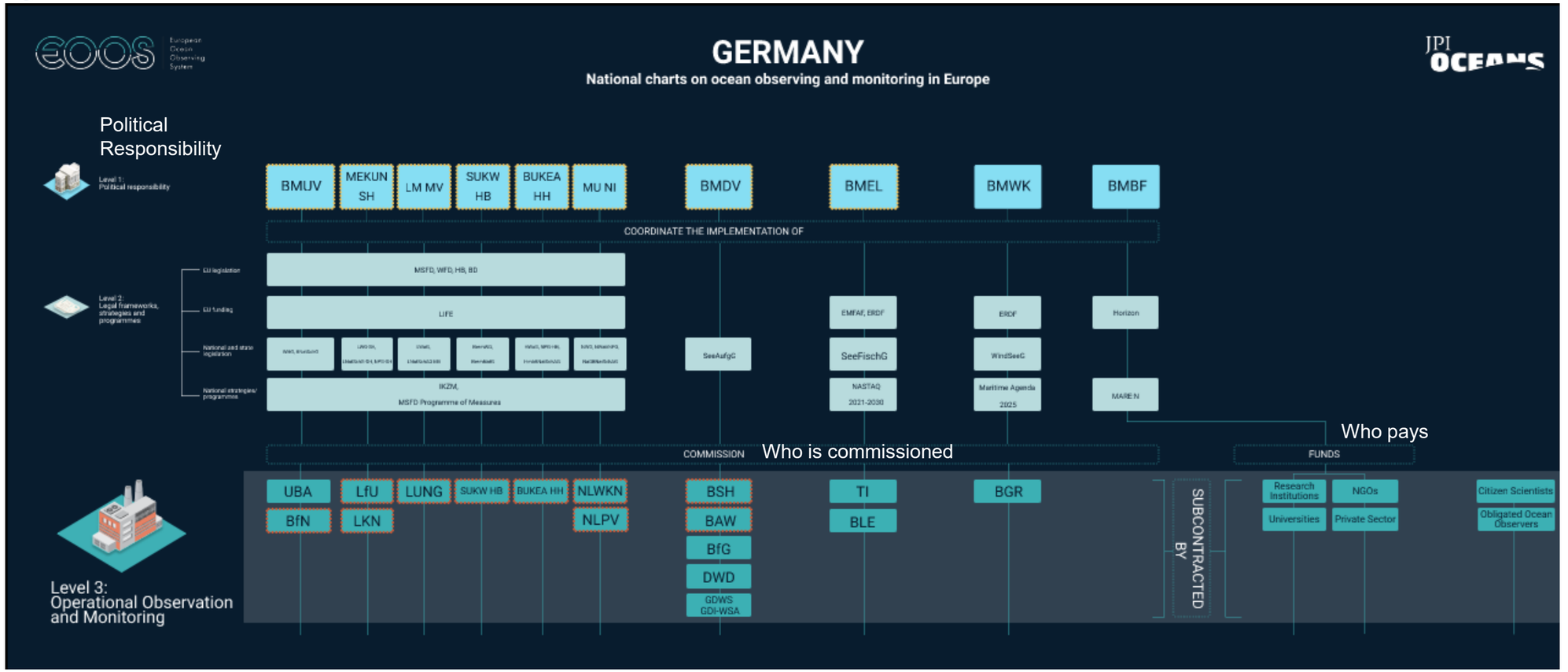
European Ocean Observing System Framework



- **EOOS has created National Charts for Germany and Greece to elucidate coordination including who is politically responsible, who is commissioned to take the observations, and who the funders are, among others levels …**

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- EOOS has worked with the EC to see if we can formalise this coordination but this require National mandates
- Nations such as Germany, Greece and France has taken up the challenge
- France created FrOOS to ensure that ocean observations are well coordinated in country.

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Fr-OOS Components & Dashboard presentation

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Data Terra,
An e-Research Infrastructure to access, process and combine data related to Earth System Sciences

Frédéric Huynh, IRD

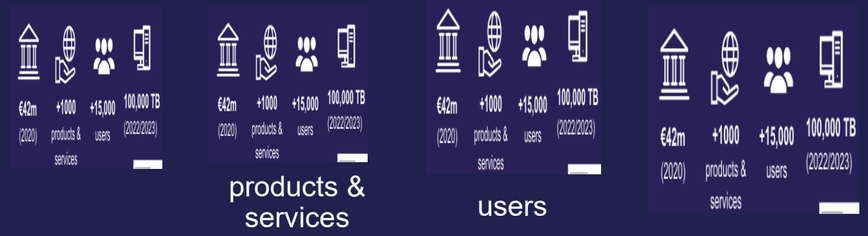
Data Terra Research Infrastructure director

Erwann Quimbert, Ifremer

ODATIS, Ocean data hub director

e-Infrastructure for Earth and Environment System Research

Develop a global system for accessing and processing multi-source data and developing services to observe, understand and predict the functioning and evolution of the Earth system in an integrated manner

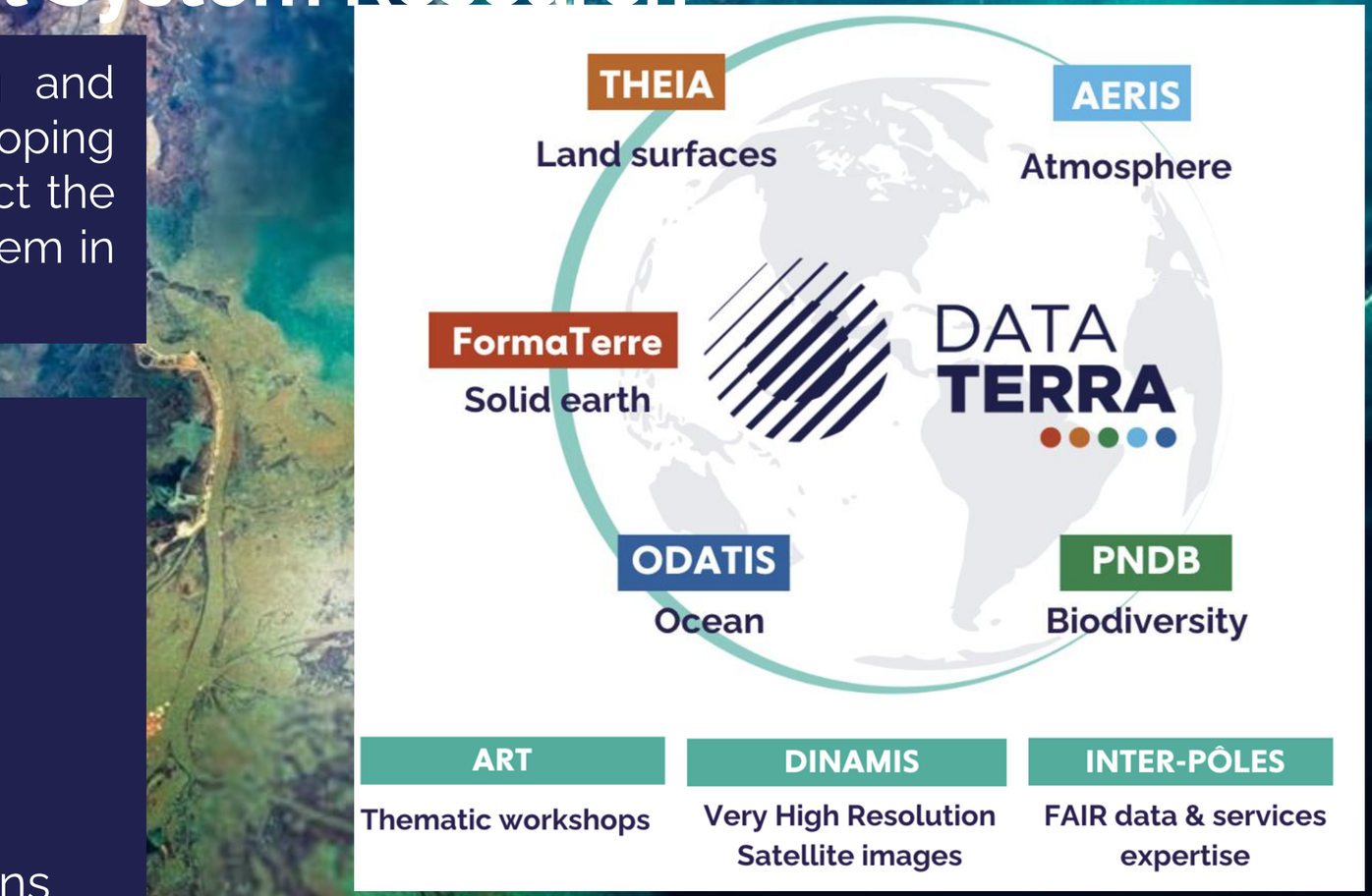


products & services

users

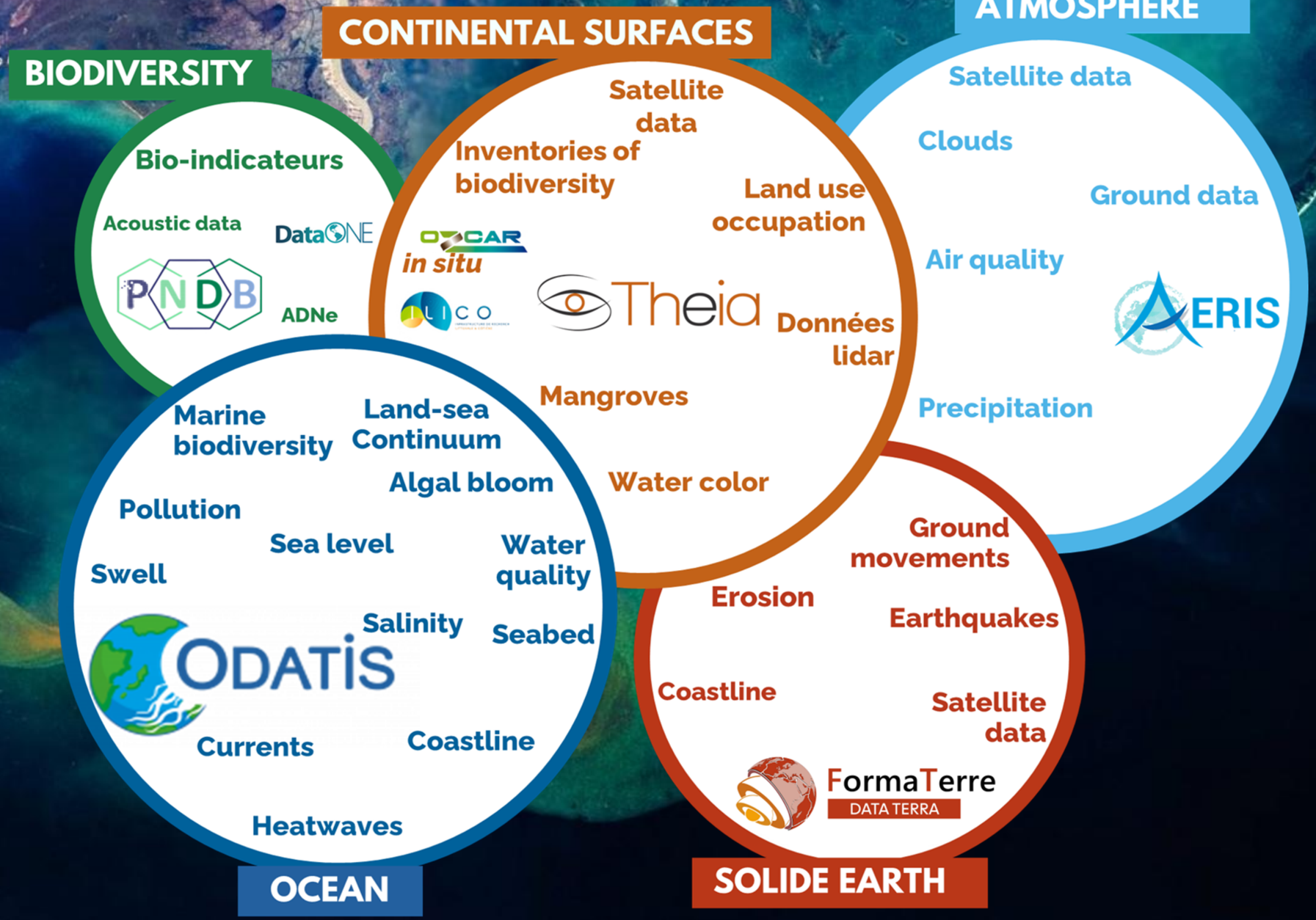
- 34 Partner organizations
- 27 Data and service centers
- 32 Scientific expertise consortia
- 450 scientists, engineers and technicians

Data Terra offers services with Earth System Observation Data interoperable & interdisciplinary



DATA TERRA

Five multidisciplanry data hubs



ODATIS

The French ocean data and service cluster

Understanding, sharing and reusing marine data

Annual budget: €16 million
FTE: 64

Promoting and facilitating the use of observations made in the ocean or at its interface with other environments

Satellite, in situ, laboratory and modeling data

From the coast to the open sea, from the surface to the ocean floor

Physics, chemistry, biology in the different compartments :

Data

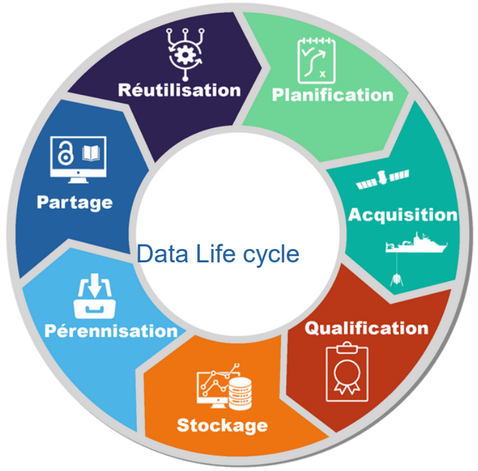
Marine data management applying the FAIR principles: “Findable - Accessible - Interoprable, - Reusable”.

Scientific Expertise

Innovative processing methods and products for all ocean data and its interfaces

Services and tools

Training workshops, Services for publishing, host, catalog, combine, analyze, process data.



cnrs · cnes CENTRE NATIONAL D'ÉTUDES SPATIALES · Ifremer · IRD Institut de Recherche pour le Développement FRANCE · SHOM · UNIVERSITÉS MARINES · Cerema CLIMAT & TERRITOIRES DE DEMAIN · METEO FRANCE À VOS CÔTÉS, DANS UN CLIMAT QUI CHANGE

ODATIS Data and Service Centres (DSCs)

- SISMER – Ifremer – Brest
- Coriolis – multi-tutelles – Brest
- SHOM – Shom – Brest
- STAMAR – OSU – Roscoff, Banuyls, Villefranche
- OMP – OSU – Toulouse
- OSU – Bordeaux
- ERSAT – Ifremer – Brest
- AVISO+ – CNES – Toulouse

in situ data

Biogeochemistry

Dissolved oxygen, carbonate system - CO_2 Marine pH, nutrients, pigments, CDOM, metals, chemical elements and contaminants, isotopes, marine waste, ...

Marine biology

phytoplankton, zooplankton, benthic habitats, macroalgae, dissolved organic matter, biotoxins, bioinformatics , pathogenic organisms

Ocean Physics

Salinity, temperature, sea surface height, tides, waves, currents, ice, heat content, optical parameters, turbidity, ...

Geology

Geomorphology, coastline, bathymetry, sediment flows, sediment cores, mineral resources, etc.

Meteorology

Surface pressure and wind, radiative flux, ...

A DSC assembles, harmonizes, maintains and makes accessible the data sets for the perimeter for which it is responsible.

- Data Management
- Storage
- Metadata
- Quality control
- Online access services
- Preservation

CORE TRUST SEAL

Findable Accessible Interoperable Reusable

A full range of services

Storage

ODATIS' IT infrastructure is based on 2 HPC data and computing centres, combining computing resources and storage dedicated to hosting and processing massive amounts of data.

Warehouse

The SEANOE marine data warehouse and the ODATIS CDS data warehouse enable datasets to be deposited, described, stored, searched and disseminated.

Catalogue

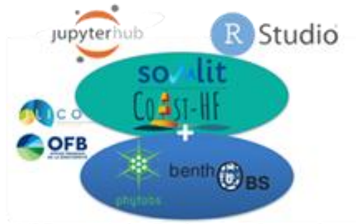
The ODATIS catalogue harvests several existing catalogues in the CDS, OSU, projects and SEANOE with multidisciplinary data in oceanography, with application of the FAIR principles on metadata.

Visualization

The ODATIS catalogue on the Sextant interface enables the creation of interoperable display services and interactive thematic maps.

VRE

Access to virtual research environments with multidisciplinary data and toolboxes for manipulating and exploring multidisciplinary data



VRE pour Niche Ecologique Optimale

Support and guidance

For data producers and users: organisational and technical support (DMP), support for enriching metadata, harmonising formats, publishing data, FAIRising data, etc.

CESSDA Data Archiving Guide

Workshops

Technical and thematic workshops for training in good data management practice, getting to grips with tools, sharing feedback, ...

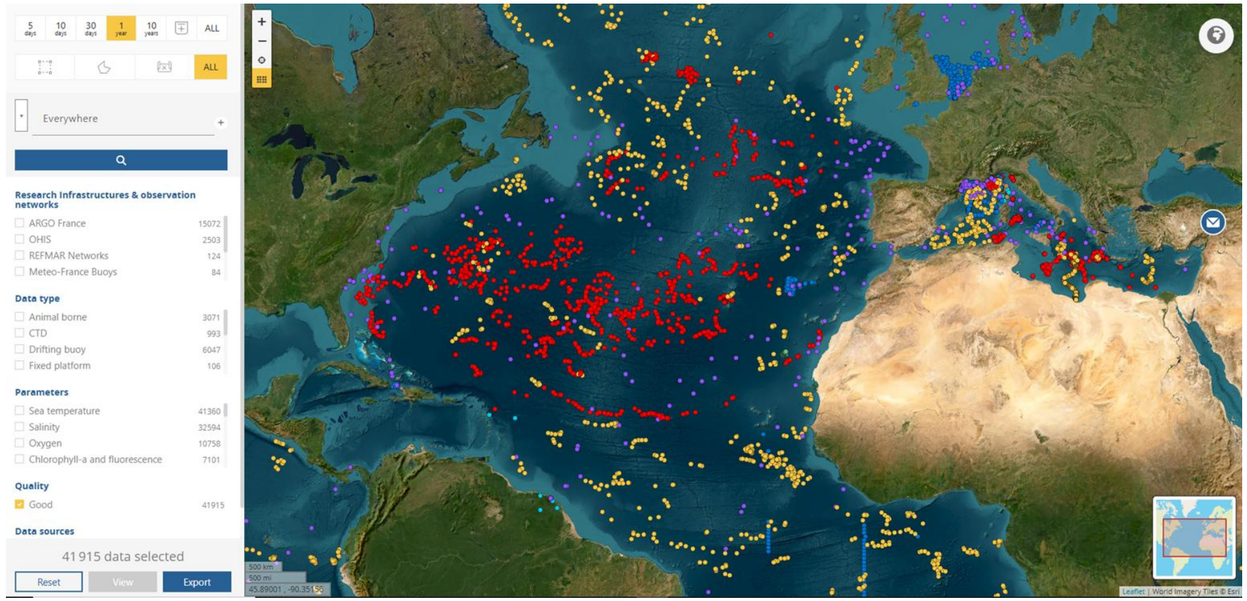
Webinar

Webinars to promote the activities of the CDS, to share feedback on the use of data and to present useful tools and services to the scientific community.

FrOOS-ODATIS dashboard on French observation systems

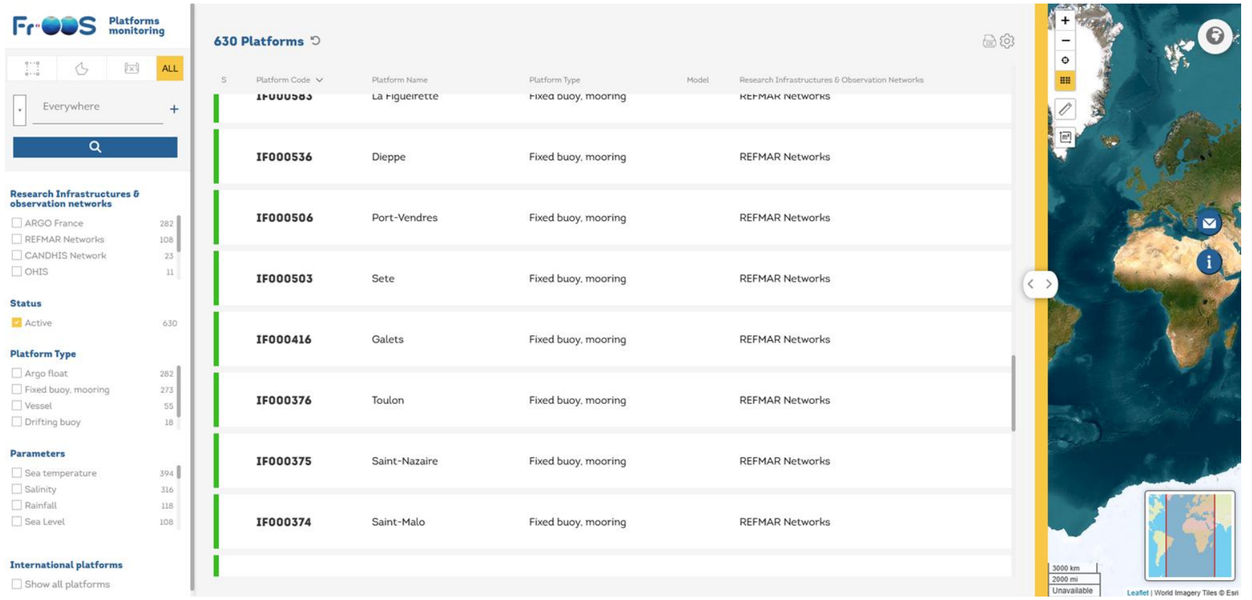
Objective - To set up a dashboard of the French observation systems, showing the various IRs and observation networks (observation points, parameters measured, access to data) and development plans.

Data selection



https://data-selection.odatis-ocean.fr/froos

Platform catalogue



https://platform.odatis-ocean.fr/froos

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Join us at
https://www.data-terra.org/
https://www.odatis-ocean.fr/

Contact us at contact@odatis-ocean.fr

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Coastal and Littoral Environmental Observation in France: Towards an Integrated System Led by national research infrastructure ILICO.

Lefebvre A.[1], Le Guen A.[2]

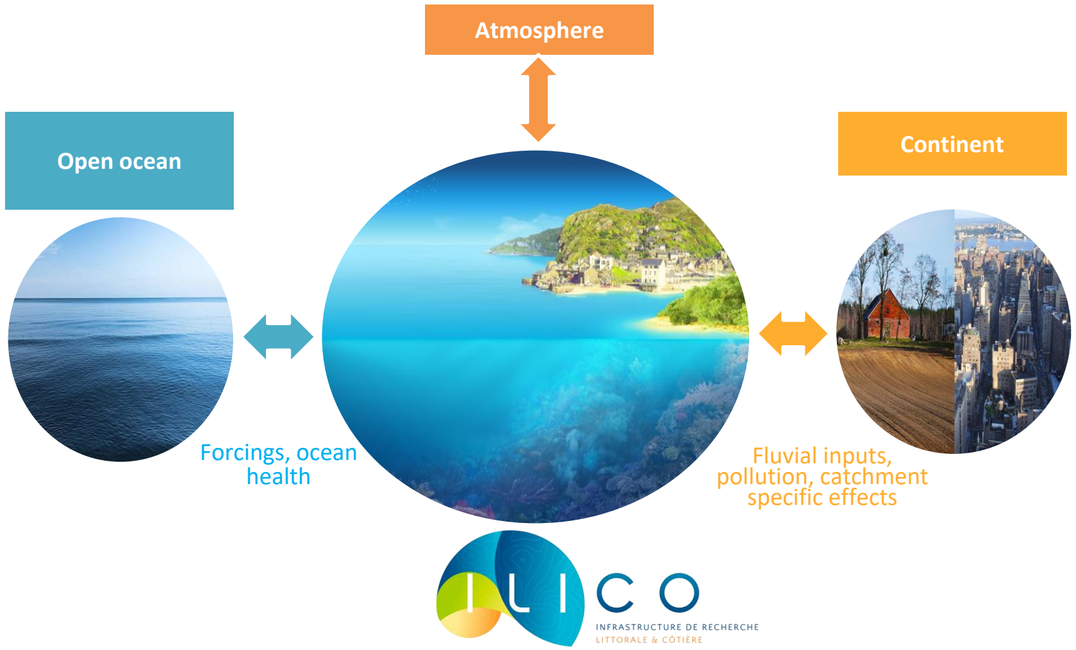
And colleagues from the direction team, accredited National Observing Services, Community Codes and Instrumented Platform

1 - Ifremer, COAST, Laboratoire Environnement et Ressources, Boulogne sur mer

2 – IUEM UAR 3113, UBO, CNRS, IRD, F-29280 Plouzané

Coastal Research Infrastructure

A Research Infrastructure of multiple interfaces



Multiple complementary data acquisition technologies

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The visible face of eutrophication

Green tide (macro-algae) in Brittany

Red Tide (phytoplankton)

Foam of *Phaeocystis globosa* (phytoplankton)
In the Eastern English Channel

Focus on Eutrophication

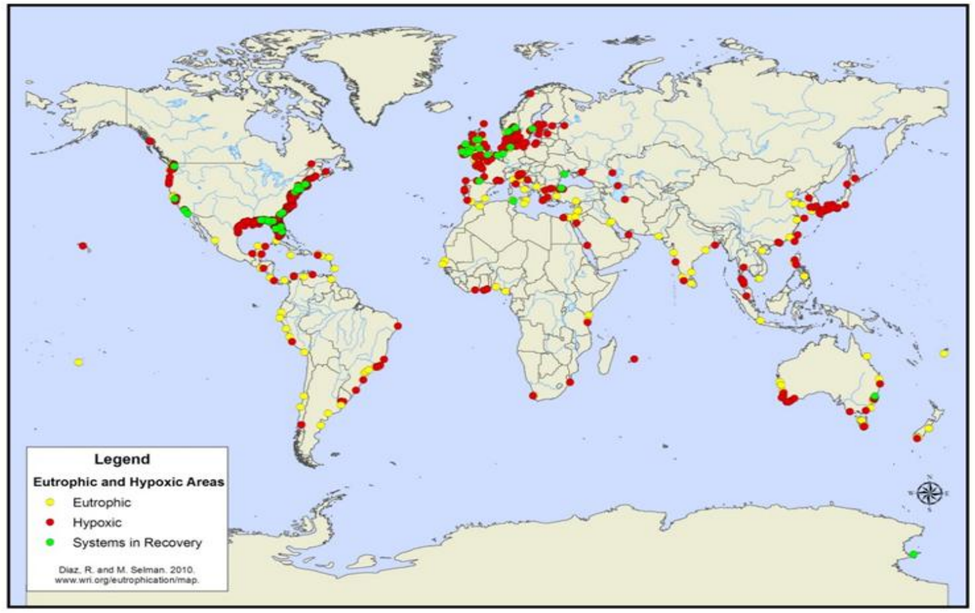
One case Study from SNOs

And the « invisible » face of Eutrophication

Ex. Modification of Energy transfer within the trophic network => impact on **Biodiversity**

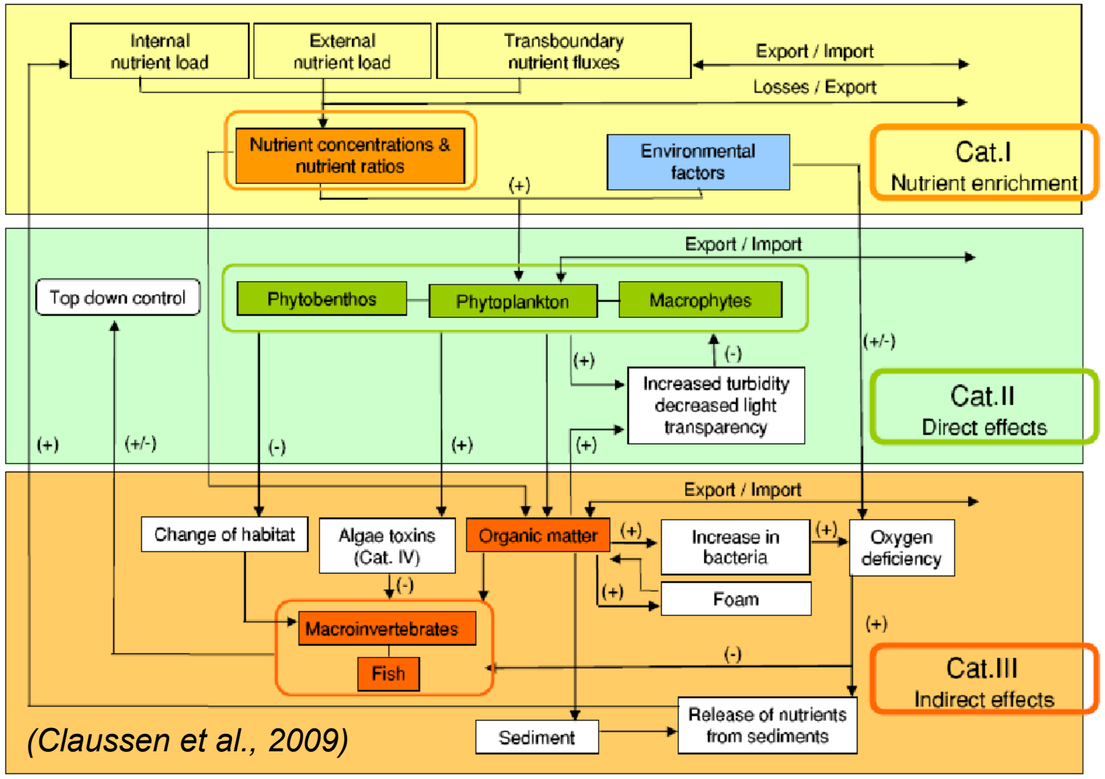
Other ex. **Oxygen** depletion, fish **mortality**

(Van Beusekom *et al.*, 2009)



Eutrophication is a worlwide and highly complex process

Eutrophication: Syndrome of an aquatic ecosystem associated with the overproduction of organic matter induced by anthropogenic inputs of phosphorus and nitrogen.

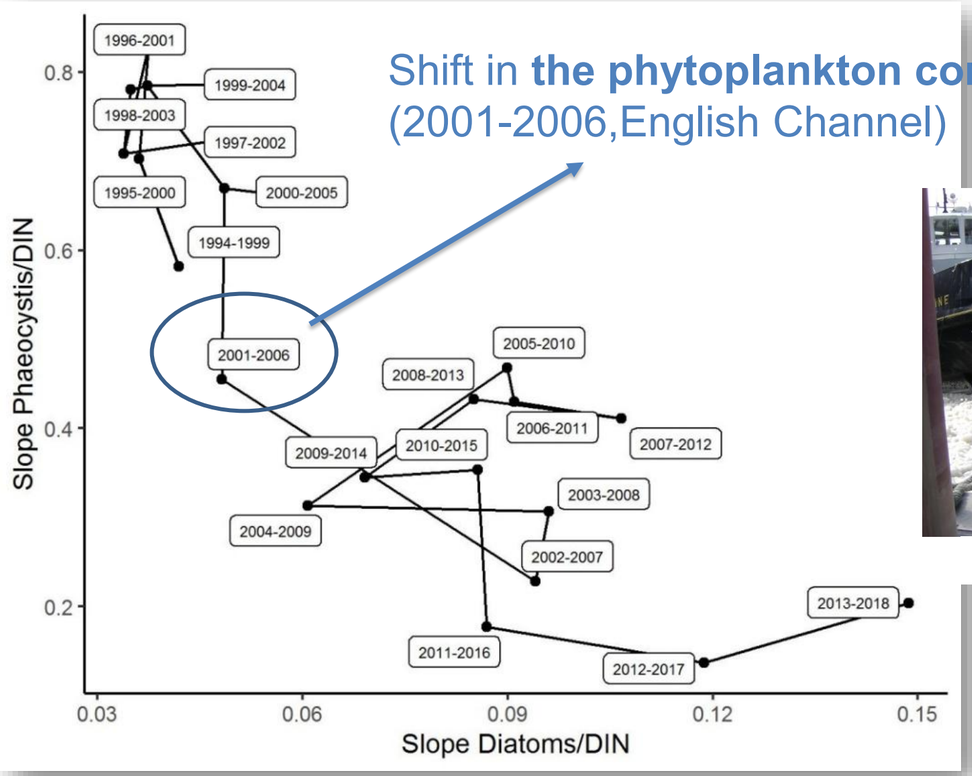


(Claussen et al., 2009)

A well-suited selection of sites and variables are needed to track and study direct and indirect effects of eutrophication

Our observations show:

Shift in **the phytoplankton community** (2001-2006,English Channel)



Bloom of Phaeocystis globosa

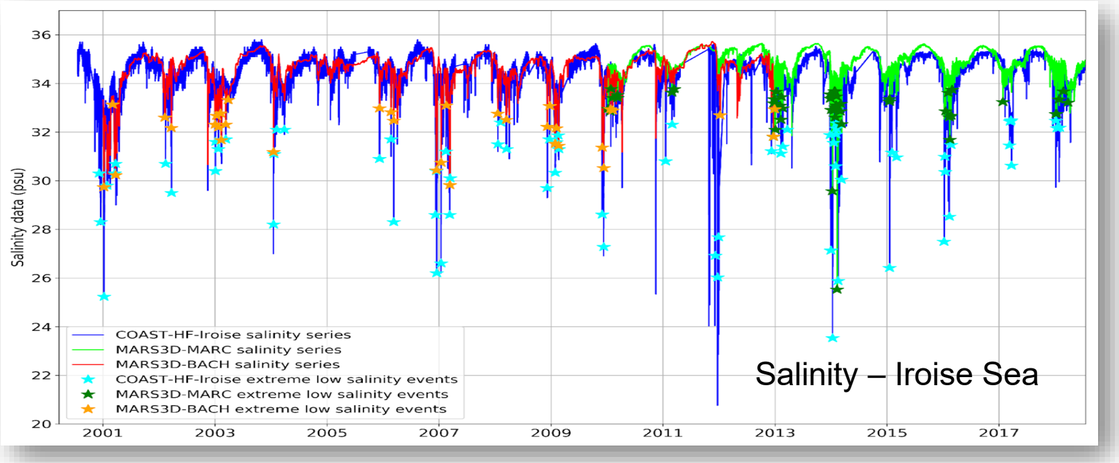
Accredited National Observation Service

phytobs-network

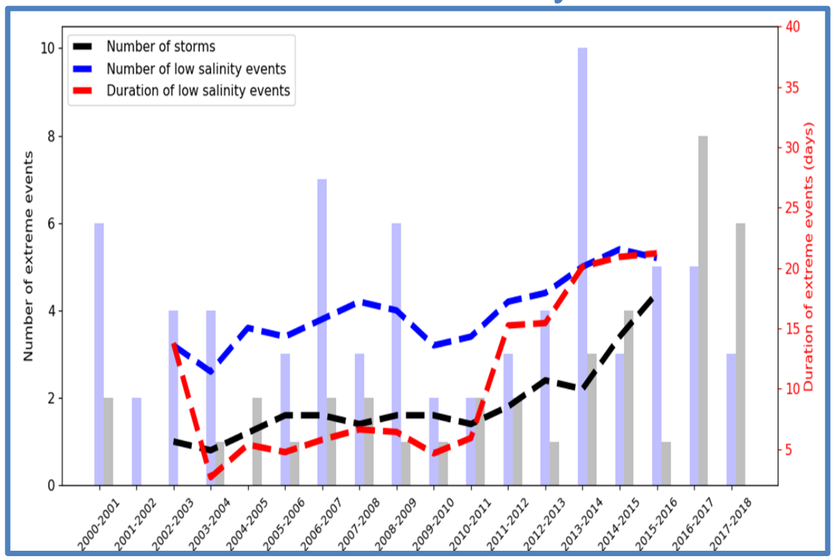
somlit

COAST-HF

Local increase of number and duration of hydrological **extreme events**



Increase of **continental water influence** on the marine ecosystem



Overall **decreasing <u>nutrient concentrations (=pressure on the ecosystem)</u>**

Both **climatic changes and human activities** drive nutrient concentrations

Ecosystems with trajectories based on their **continental influence**

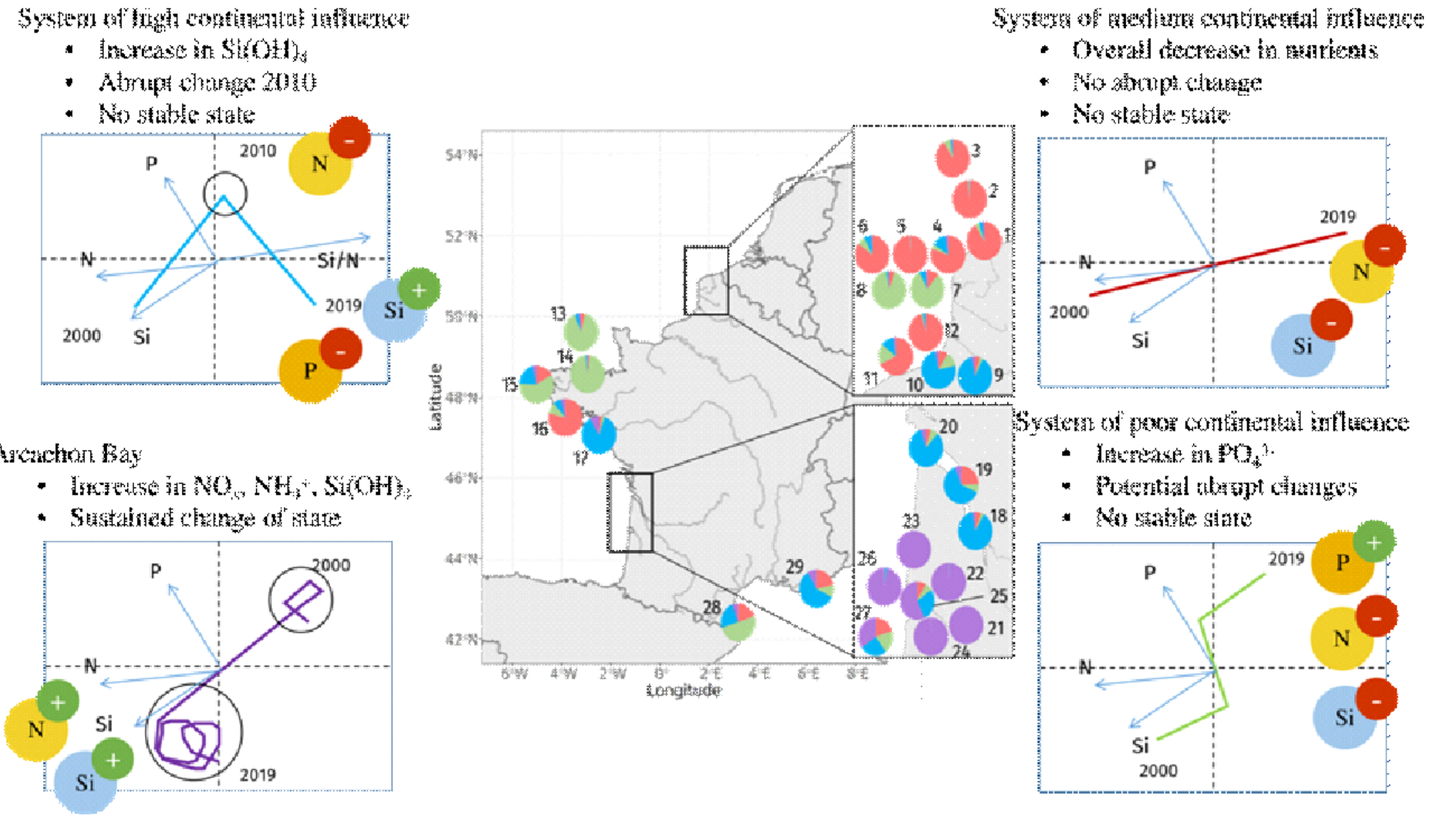
Our observations show:

Accredited National Observation Service

phytobs-network

somlit

COAST-HF



With <u>long-term</u> coastal observations:

- Ability to detect and prevent Harmful Algal Blooms
- Ability to deconvoluate global and local changes

Including changes from low to high trophic levels

=> towards an ecosystemic approach

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General Assembly RI ILICO, 28 octobre 2025, Boulogne sur Mer (France)

International Conference “Long term coastal in situ observation from automated platforms of small temporal and spatial scales’”, 29 - 31 octobre 2025, Boulogne sur Mer (France)

https://www.ir-ilico.fr/?ColloqueHauteFredequenceEtHauteResolution

Organisation: Alain Lefebvre (Ifremer), François Schmitt (UMR LOG / CNRS), Guillaume Charria (Ifremer)

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OHIS – Open Ocean In Situ

OHIS

OPEN OCEAN IN SITU

Sabrina Speich
Professor in Ocean, Atmosphere and Climate Sciences

Institut Pierre-Simon Laplace

OHIS

OPEN OCEAN IN SITU

- **Centered around long-term observing of the Open Ocean**
- **Connects and supports 5 observation systems around an integrated strategy**
- **Covers poorly-documented areas**

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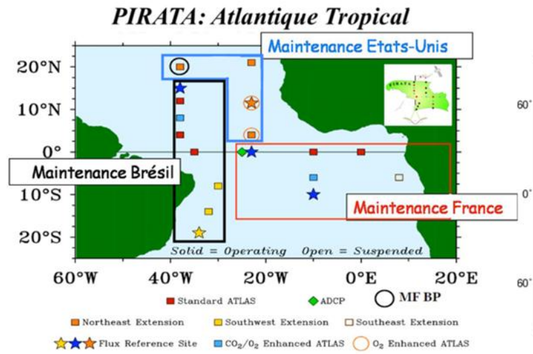
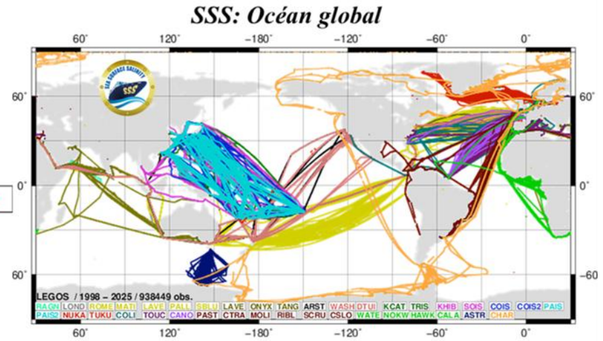
Assembling the open-ocean French national observing system under one strategic umbrella

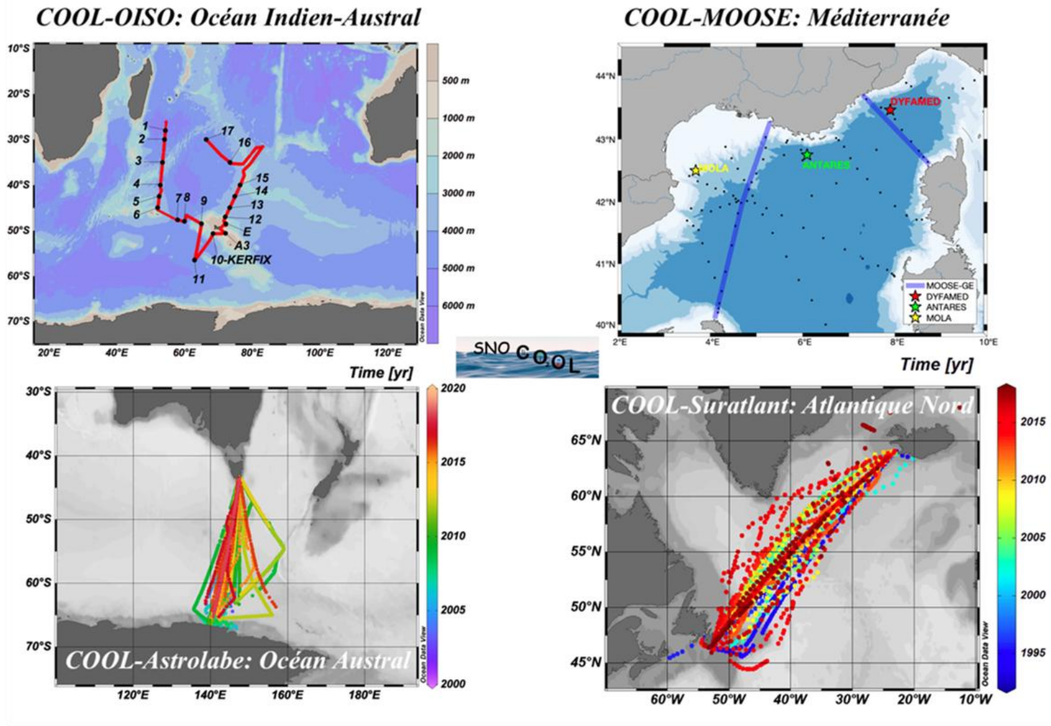
→ **SNO-PIRATA**



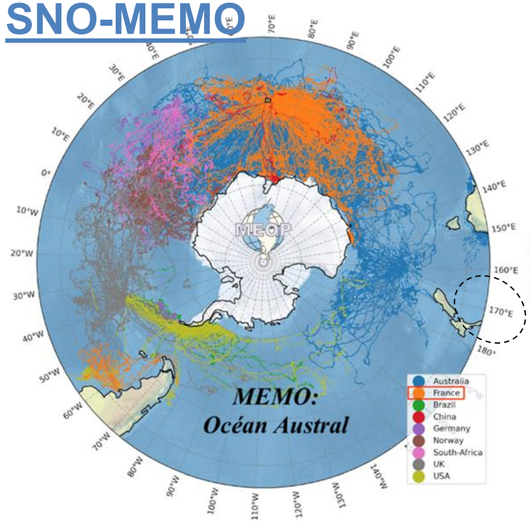
→ **SNO-SSS**



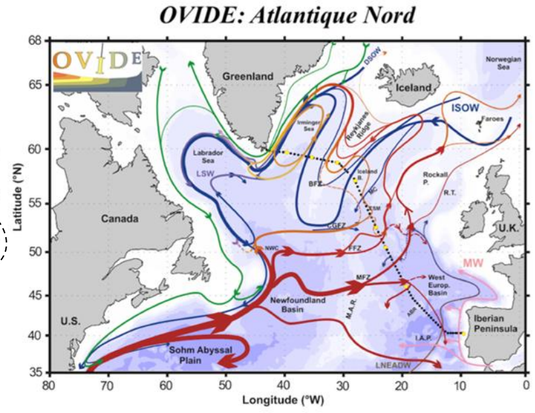
→ **SNO COOL**



→ **SNO-MEMO**



→ **OVIDE**



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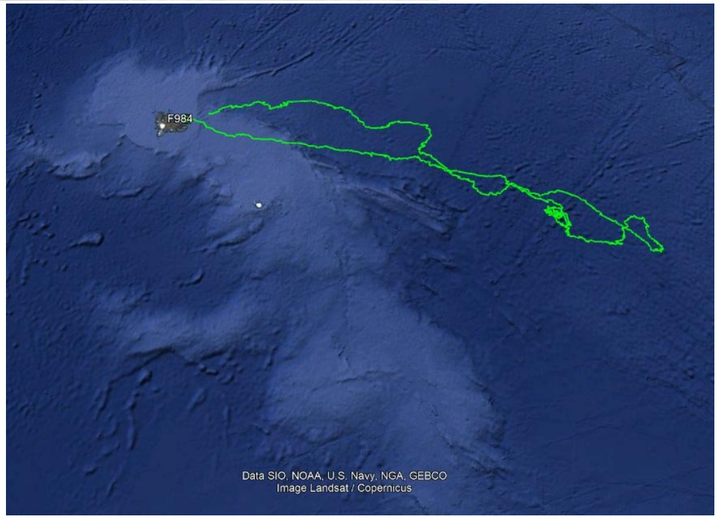
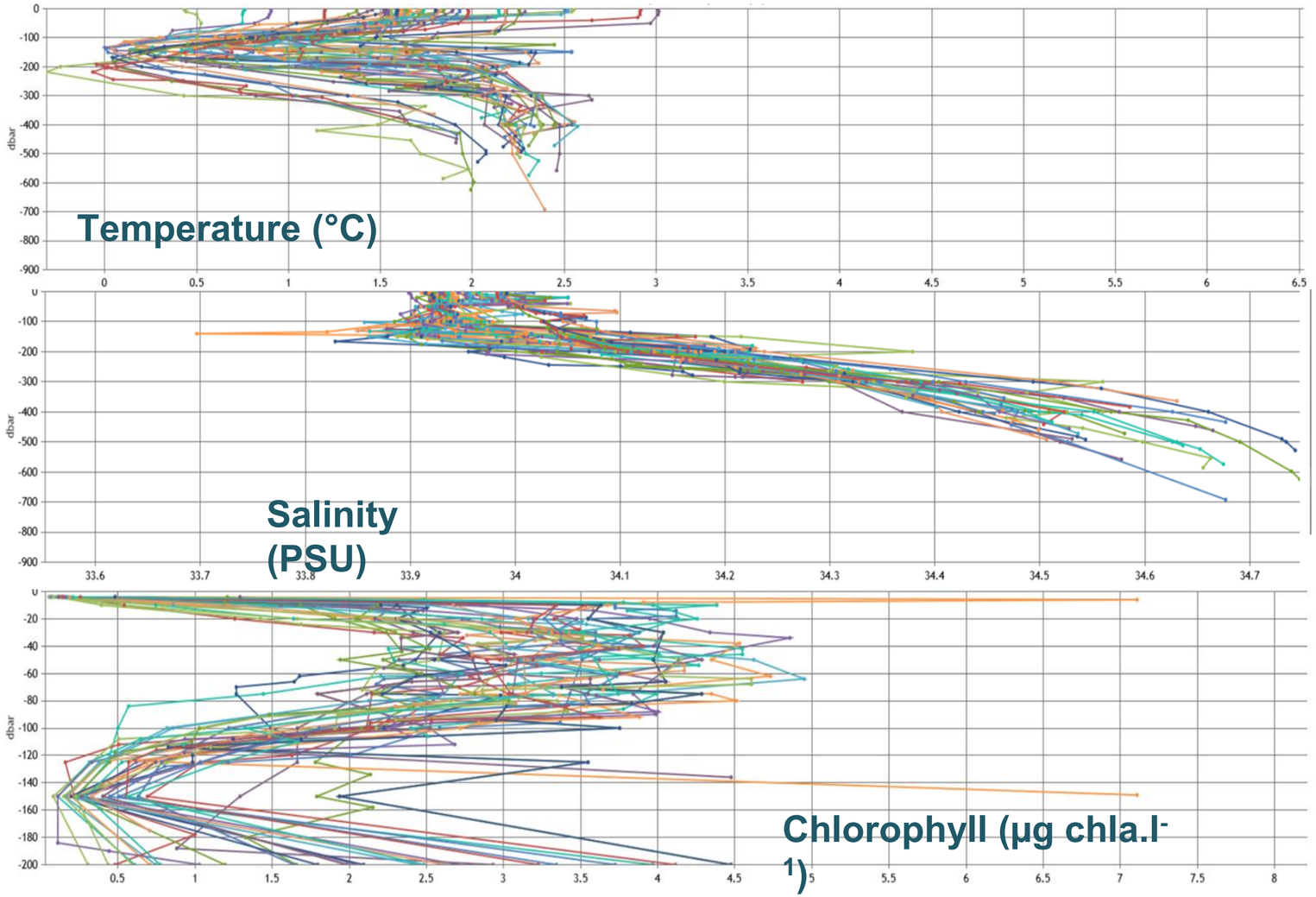
How to monitor the Ocean?

Juvenile male equipped at Kerguelen Island

- On the 8th January 2025- Currently foraging in Antarctica



Real time Transmitted Data 16th-23rd of November 2024



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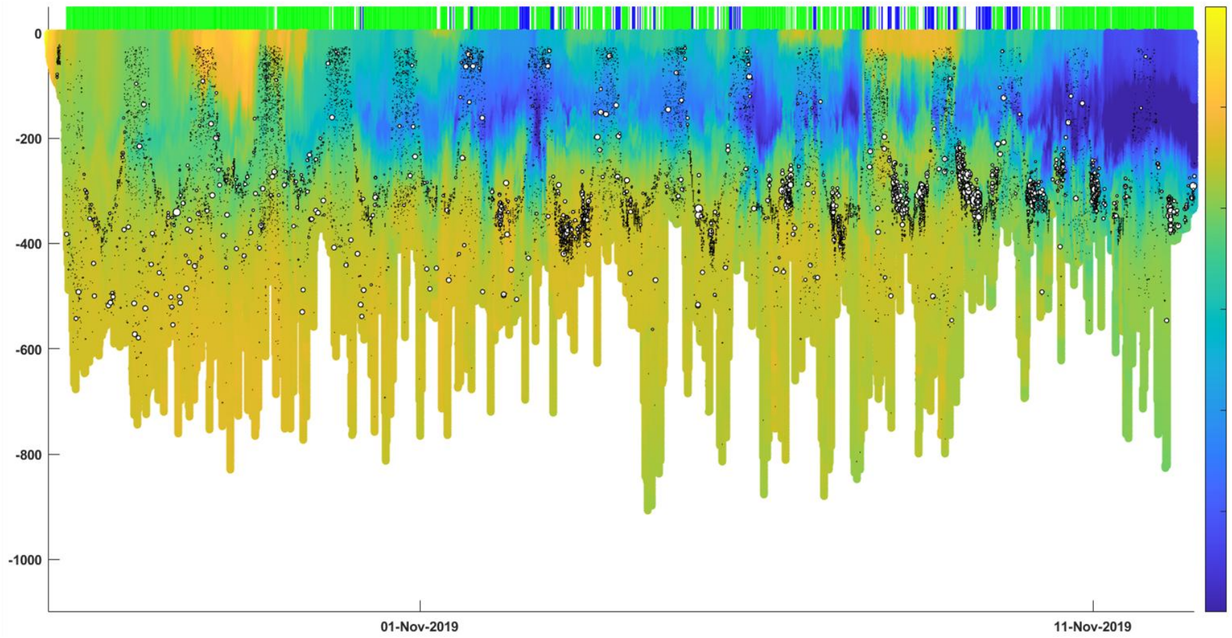
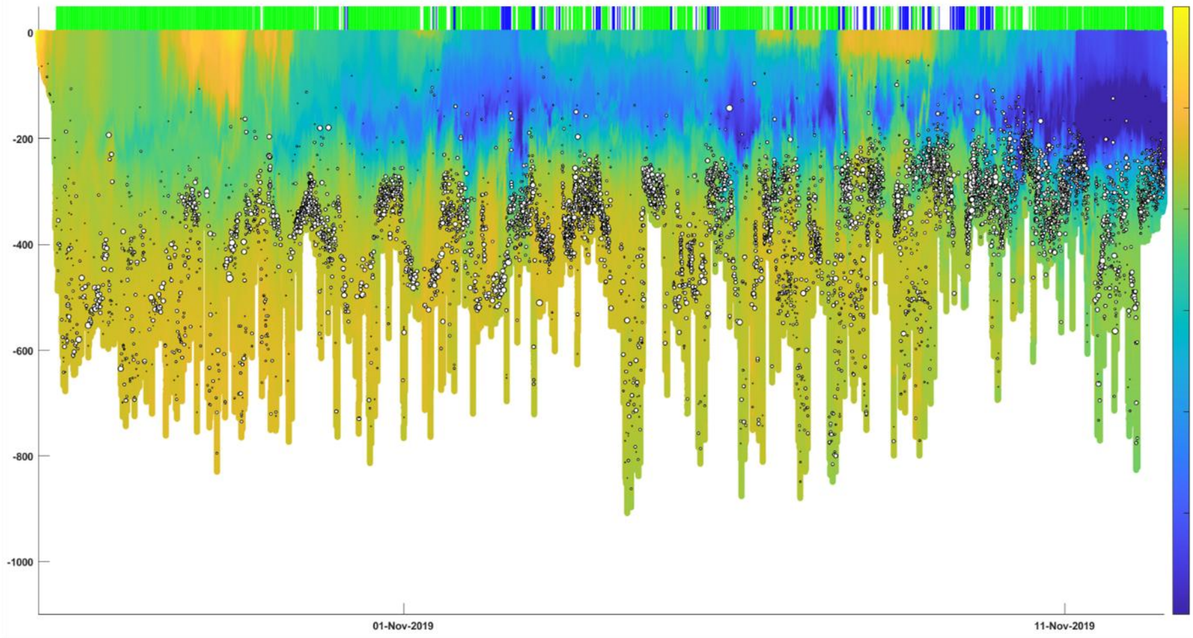
- Delayed mode – high-frequency profile example



Bioluminescence Flashes



Prey Capture Attempts

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Thanks to all the members of the OHIS network, for their continued contributions and work.

Special thanks to Christophe Guinet and Baptiste Picard for kindly providing the figures and data for the seal case study !

Copernicus
Europe's eyes on Earth

EU MISSIONS
RESTORE OUR OCEAN & WATERS

Copernicus
Marine Service

PAVILION IMPLEMENTED BY
MERCATOR OCEAN
INTERNATIONAL

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Argo France

Nicolas Kolodziejczyk
Physical Oceanographer

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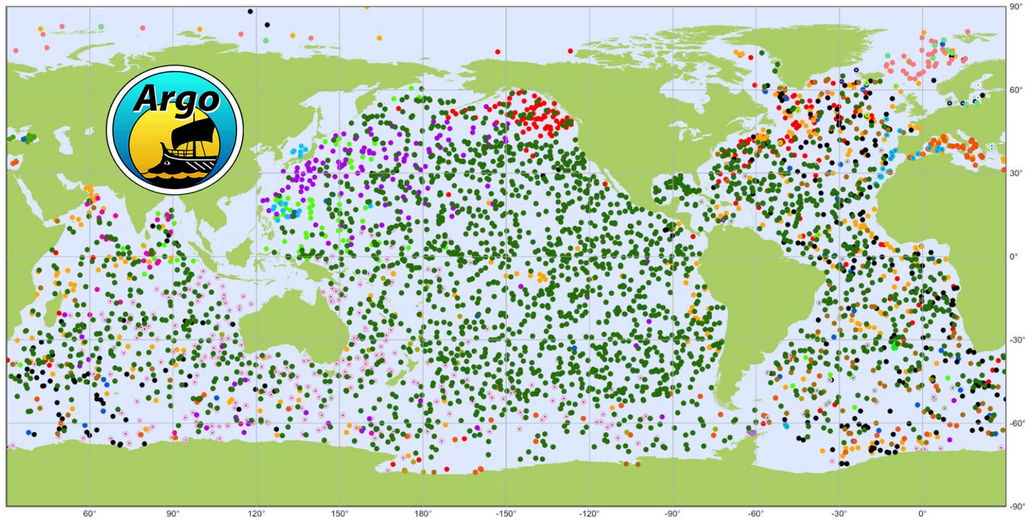
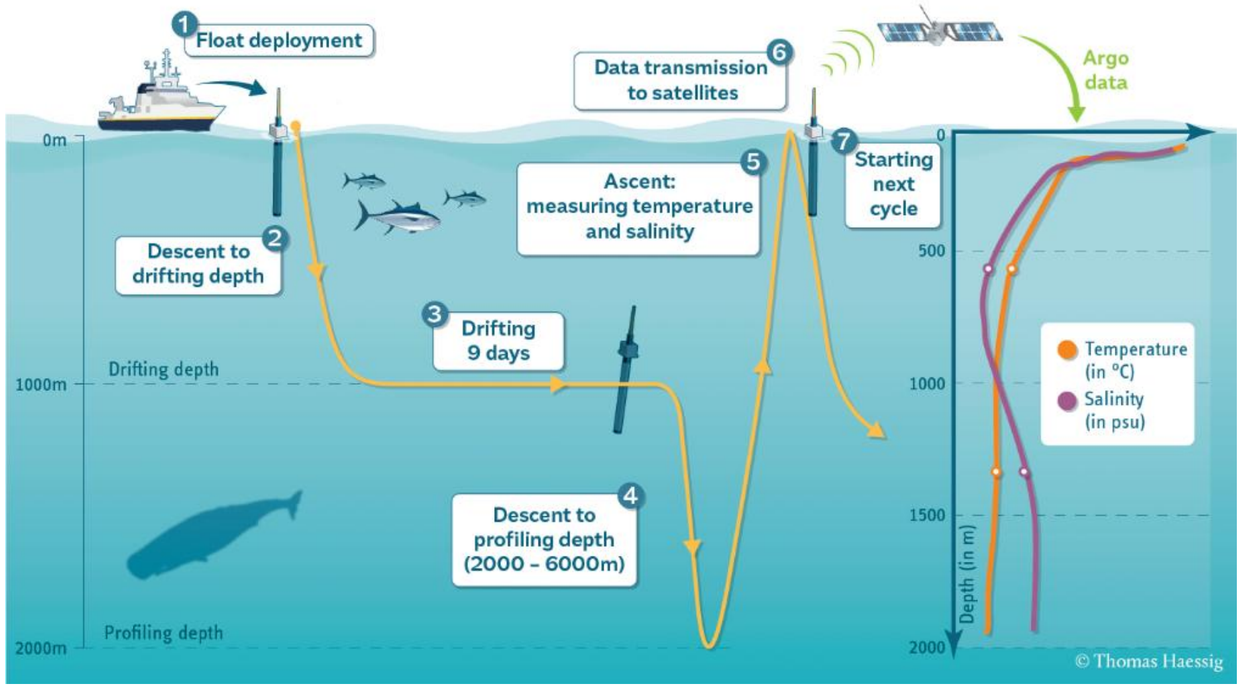
How to monitor the Ocean?

OneArgo : A global, multidisciplinary surface-bottom ocean observation network pillar of the global ocean observing system

- 4700 Profiling floats
- 2500 Core floats
- 1000 BGC floats
- 1200 Deep floats





Monitoring ocean warming, freshwater change, and ocean health, pole to pole

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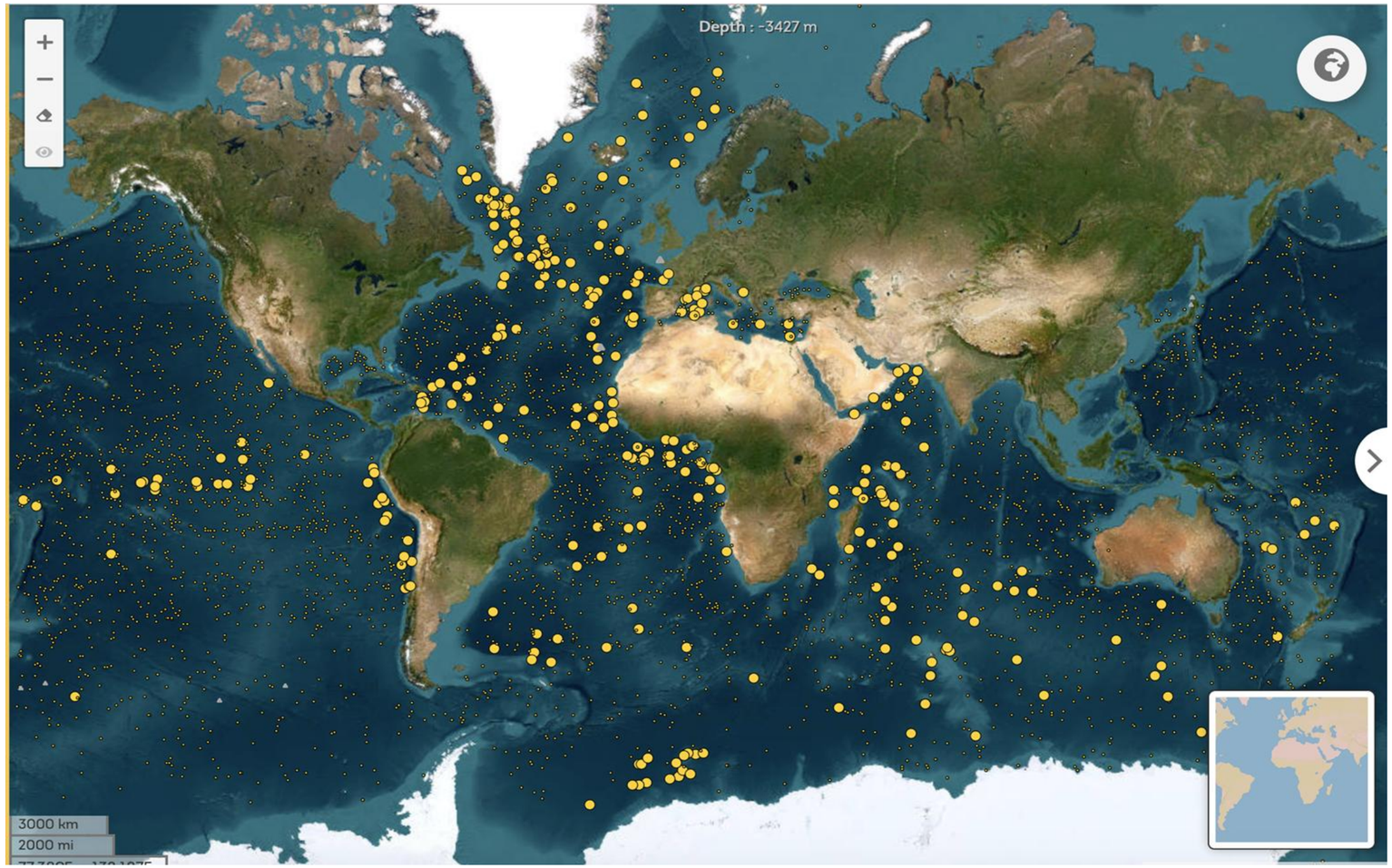
How to monitor the Ocean?

Major player in the Argo program (1998) and ERIC Euro-Argo (2014)
IR* Euro-Argo-France since 2014, SNO accredited since 2011

- 293 French floats
- 30% European
- 8% global effort



ARGO France
Observer l'océan global

Euro Argo

Argo

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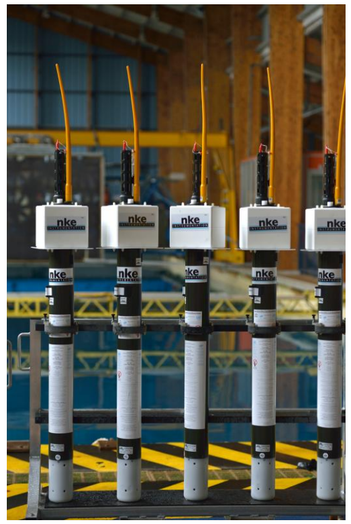
30 core/years
P/T/S 0-2000 m



20 core-O2 /years
P/T/S/O2 0-2000 m

15 BGC /years
P/T/S + 6 BGC variables

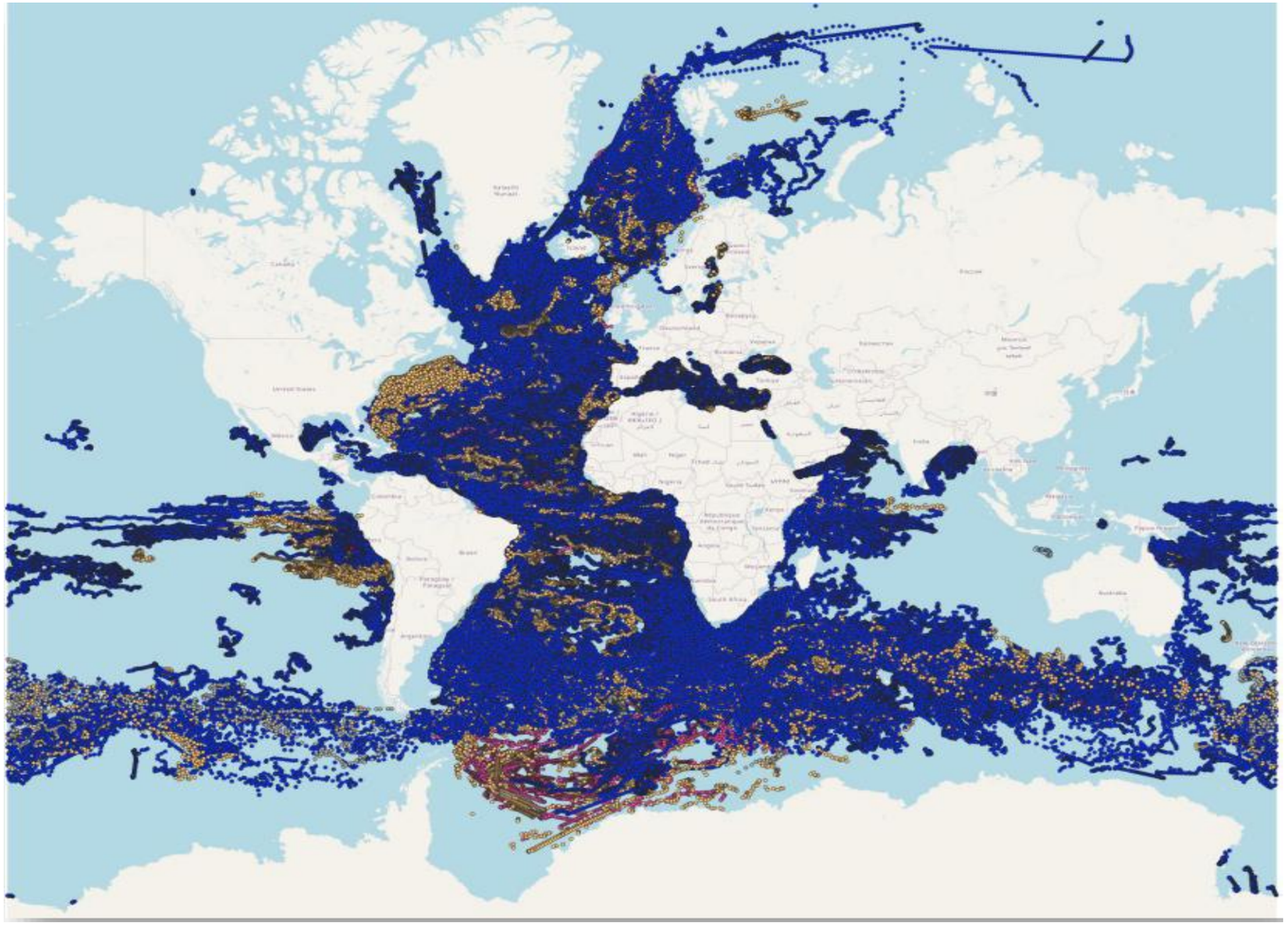
15 Deep /years
P/T/S/O2 0-4000 m

ARGO France
Observer l'océan global

Coriolis Data Center

DAC (Data Assembly Center) for Argo France and European countries

- 3601 floats
- 700 586 data profiles



ARGO France
Observer l'océan global

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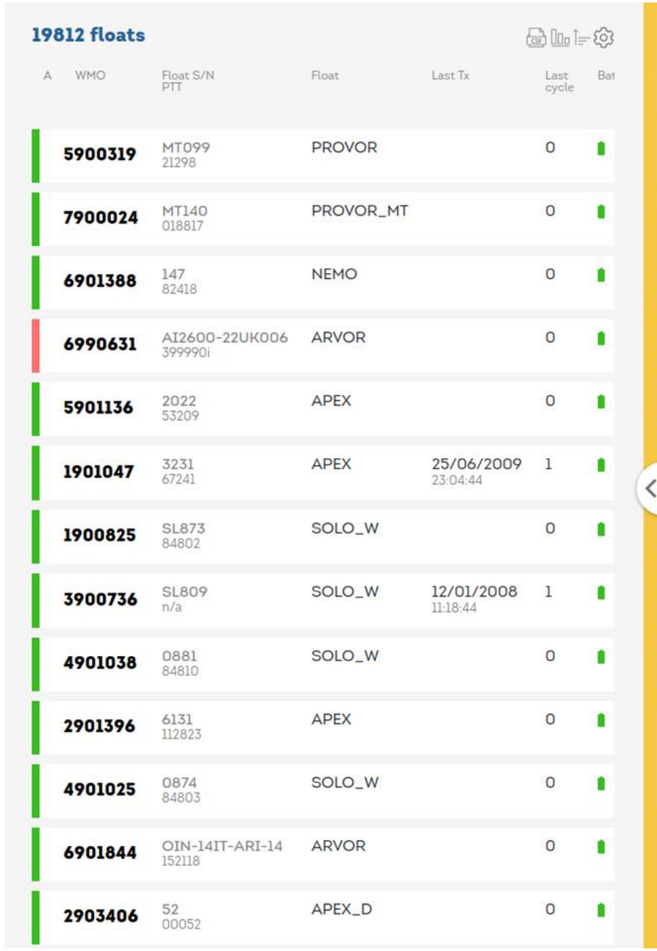
Coriolis Data Center

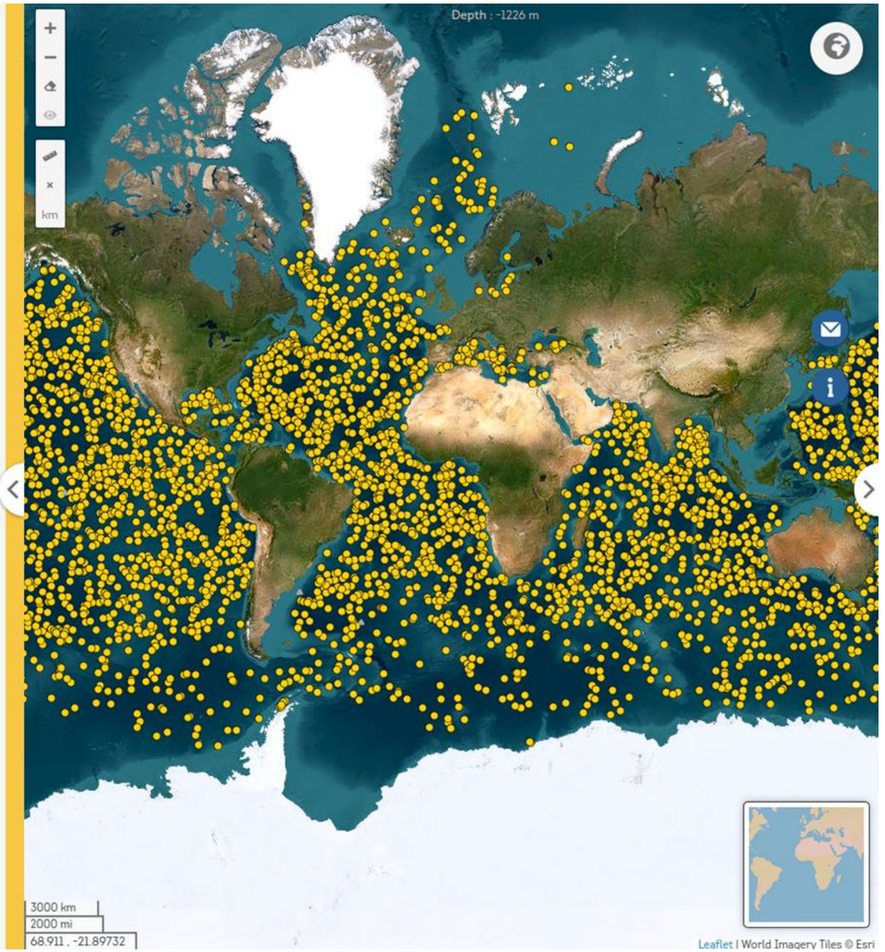
GDAC (Global Data Argo Center) for OneArgo

- 19812 floats
- More than 3 million profiles



19812 floats

A	WMO	Float S/N PTT	Float	Last Tx	Last cycle	Bat
	5900319	MT099 21298	PROVOR		0	
	7900024	MT140 018817	PROVOR_MT		0	
	6901388	147 82418	NEMO		0	
	6990631	AI2600-22UK006 399990i	ARVOR		0	
	5901136	2022 53209	APEX		0	
	1901047	3231 67241	APEX	25/06/2009 23:04:44	1	
	1900825	SL873 84802	SOLO_W		0	
	3900736	SL809 n/a	SOLO_W	12/01/2008 11:18:44	1	
	4901038	0881 84810	SOLO_W		0	
	2901396	6131 112823	APEX		0	
	4901025	0874 84803	SOLO_W		0	
	6901844	OIN-14IT-ARI-14 152118	ARVOR		0	
	2903406	52 00052	APEX_D		0	



ARGO France

Observer l'océan global

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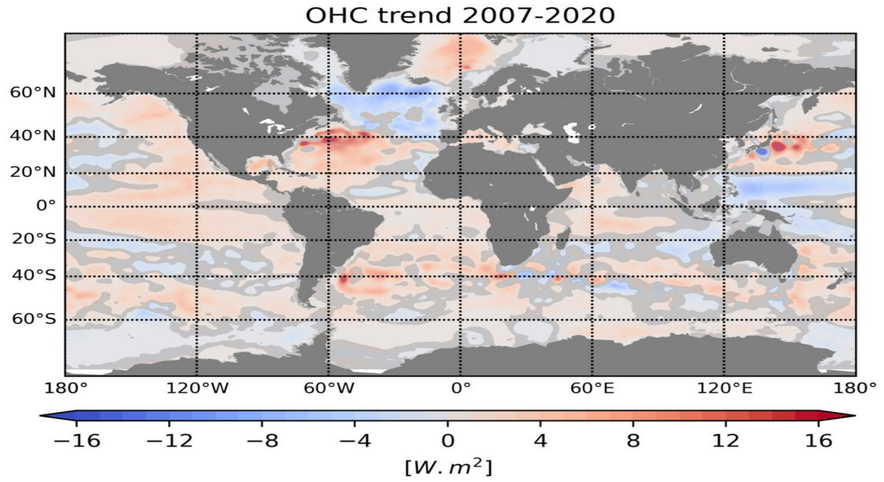
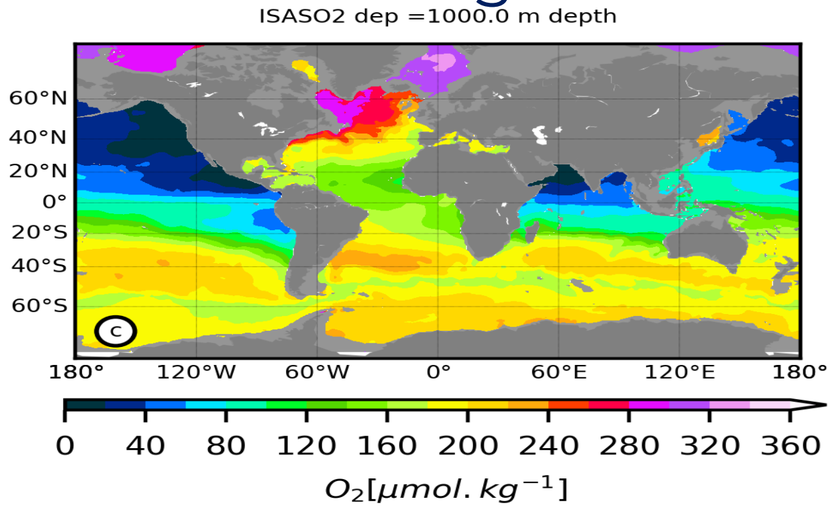
Data products

for ocean science and monitoring

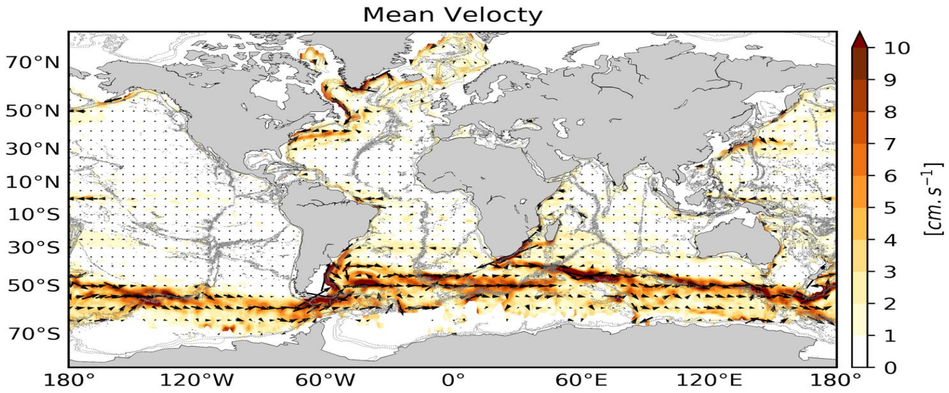
Ocean Heat Content Change

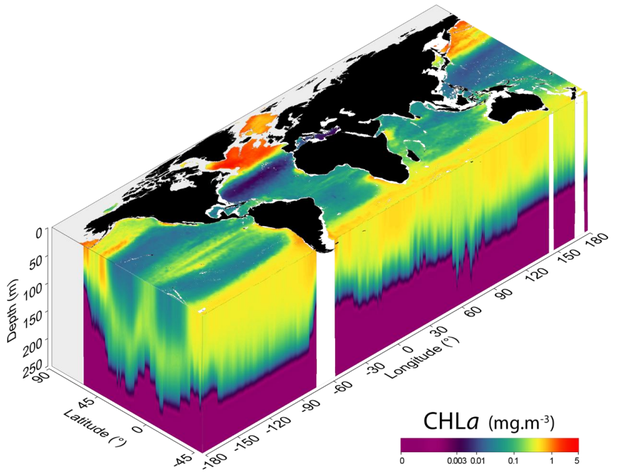




Dissolved Oxygen

Ocean Deep Currents





Chlorophyll-a

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emso

EMSO-France

Nadine Lanteri, Ifremer
Dominique Lefevre, CNRS

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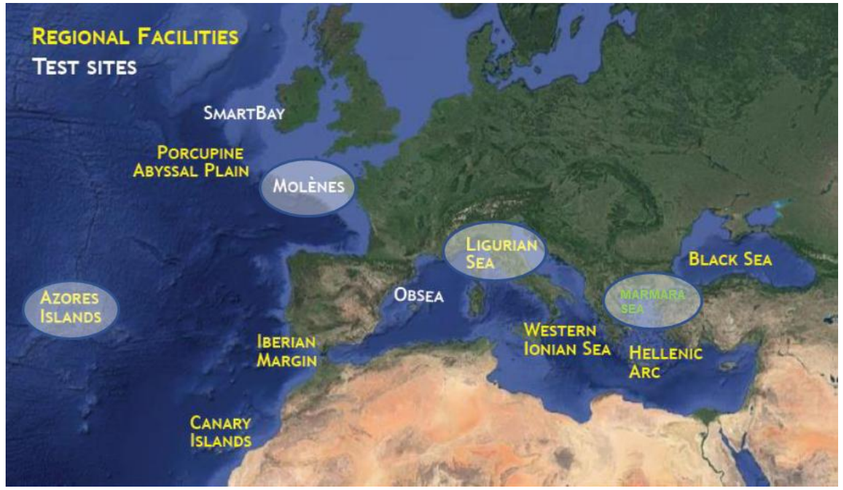


EMSO France, Research infrastructure of the national roadmap in charge of :

Developing and maintaining seabed observatories: Long-term, fixed-point, multidisciplinary observation systems

Long-term, fixed-point, multidisciplinary observation systems on the ocean floor and in the water column

Coordinating the French contribution to ERIC EMSO

Scientific objectives :

Observation of environmental processes linked to interactions between the geosphere, biosphere

and hydrosphere, acquisition of long time series and high frequency, to describe slow

→ describe slow changes (climate, biodiversity, human impact, etc.)

→ capture exceptional events

Instrumented sites :

EMSO-Açores: an untethered observatory (bottom stations, buoys and moorings) dedicated to the integrated study of the processes at work in the Mid-Atlantic Ridge.

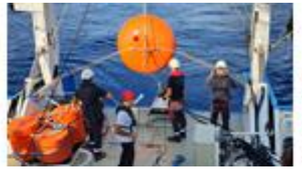
EMSO-Ligure: the geophysical and oceanographic observatories EMSO Nice, Dyfamed, Lion, EMSO Ligure-Ouest (cabled and autonomous systems, moorings) are designed to study slope stability and seismic risks, deep convection, water mass properties and carbon export.

Cabled test sites: shallow water, IROISE, initially on Molène, currently being relocated to Brest harbour, and deep water with EMSO Ligure Ouest and the BJS.

Marmara: development site for seismic measurement methods







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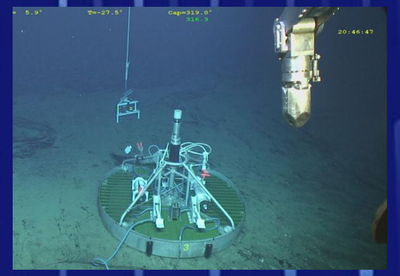
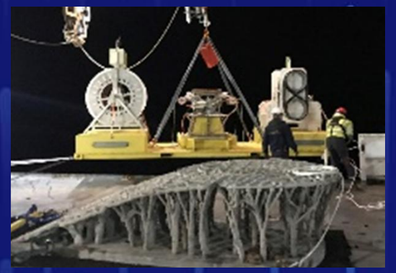
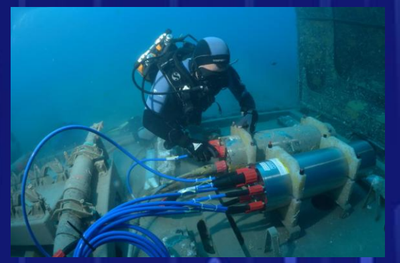
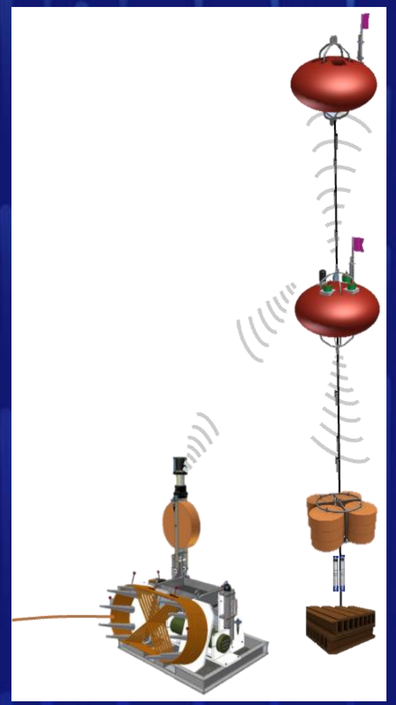
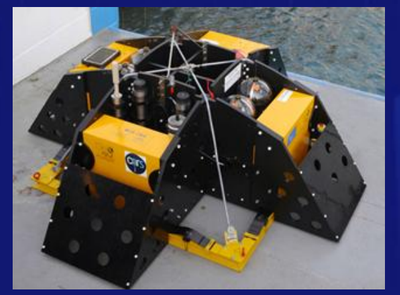
How to monitor the Ocean?

EMSO France, Expertise & Technology to serve Science

- **Design** of deep-sea observation systems (pressure, corrosion, etc.)
- **Design**, testing and operation of various platforms
  - instrumented mooring
  - cabled systems
  - Autonomous systems
  - **Development** of original tools to answer specific questions (hot fluid sampling, temperature chains, OBS, etc.)
- Long-term maintenance of these observing systems (ageing equipment, obsolescence, etc.)



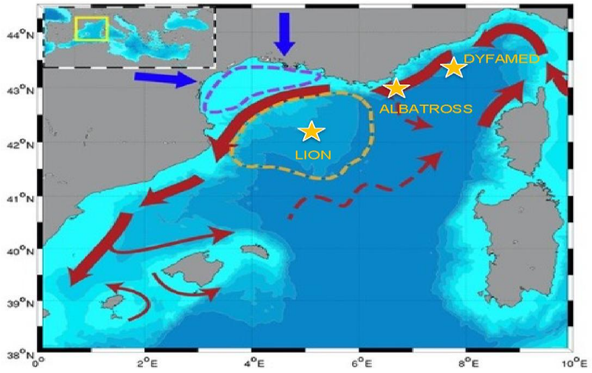




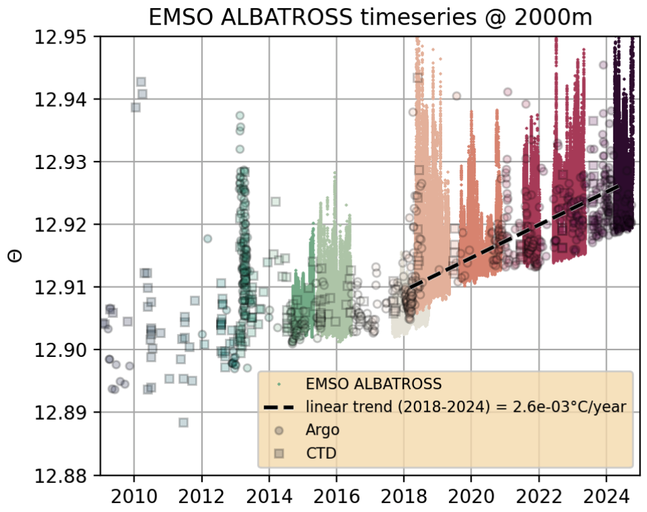



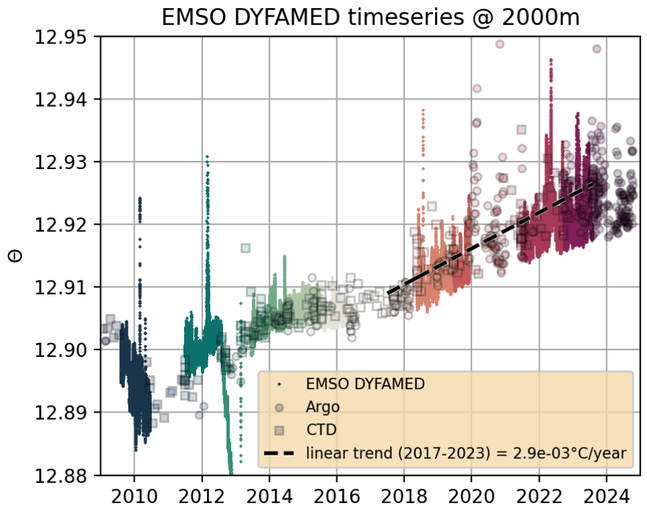
What we can see with long-term observations

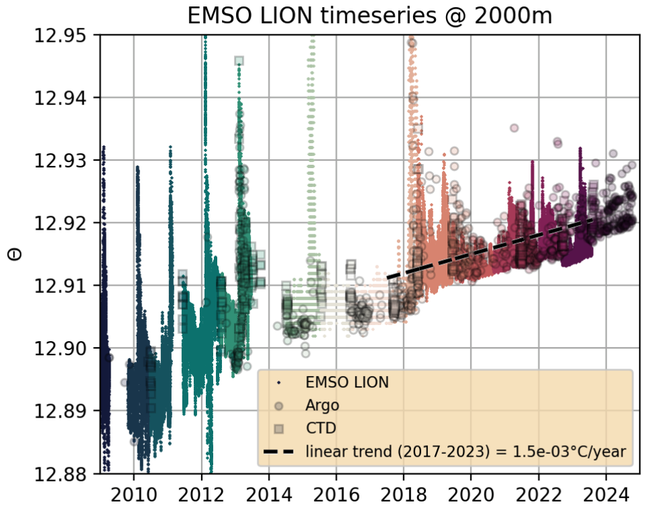
A warming trends in EMSO Ligure

The NW Mediterranean Sea is an area of deep convection crucial for the ventilation of deep and intermediate waters, and characterized by an intense spring phytoplankton bloom These processes show an important variability, hence this oceanic region sensitive to climate change.









Warming trends at 2000 m on EMSO's deep moorings

O(0.001–0.003)˘rC/year since 2018 in absence of deep convection!

Mayot et al., JGR 2017; Testor et al., JGR 2018

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How to monitor the Ocean?

What we can see with long-term observations

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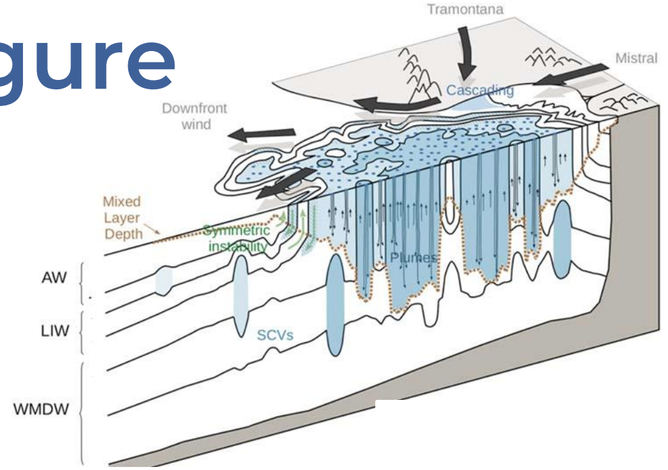

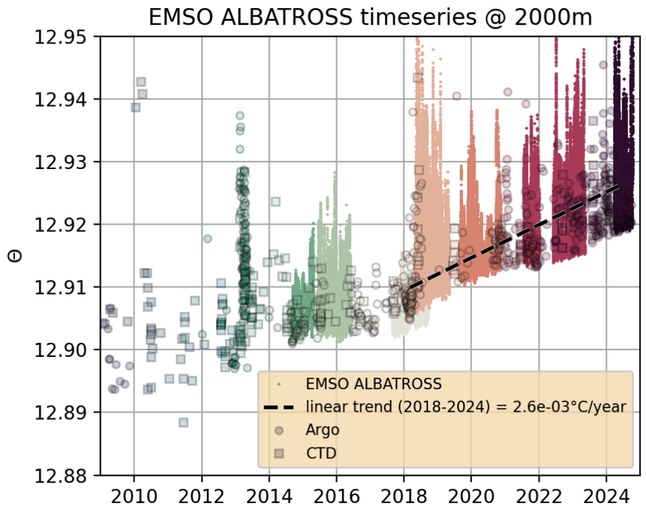

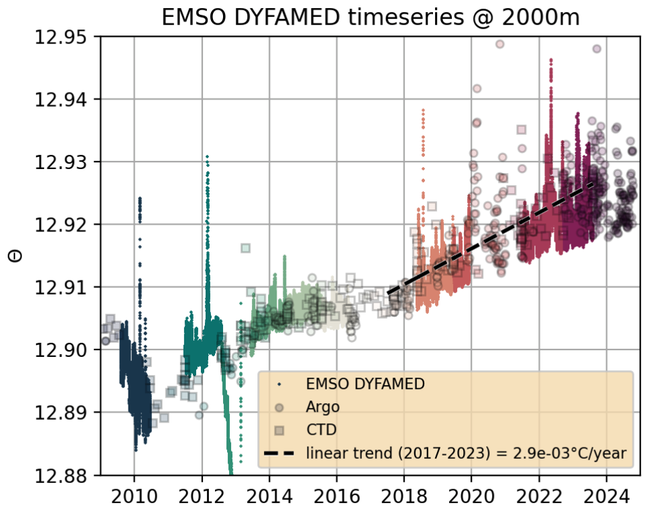

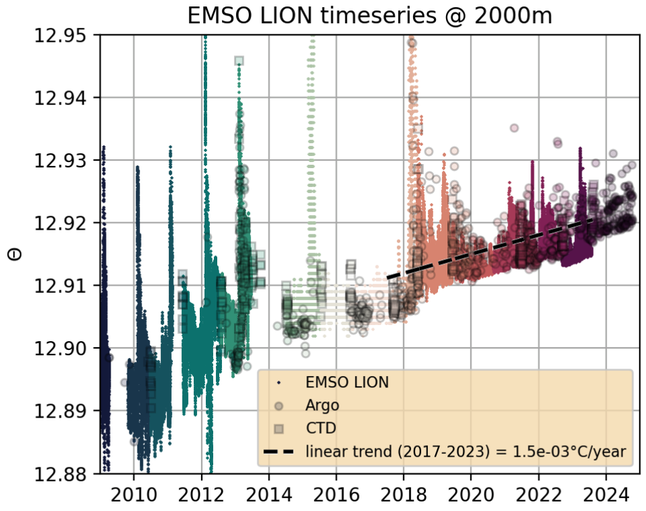

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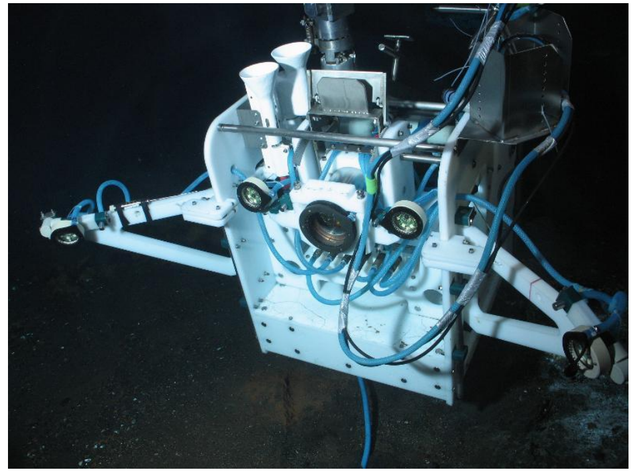
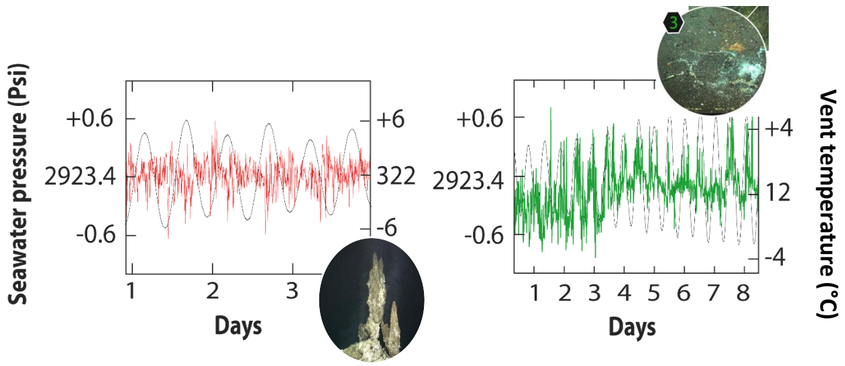
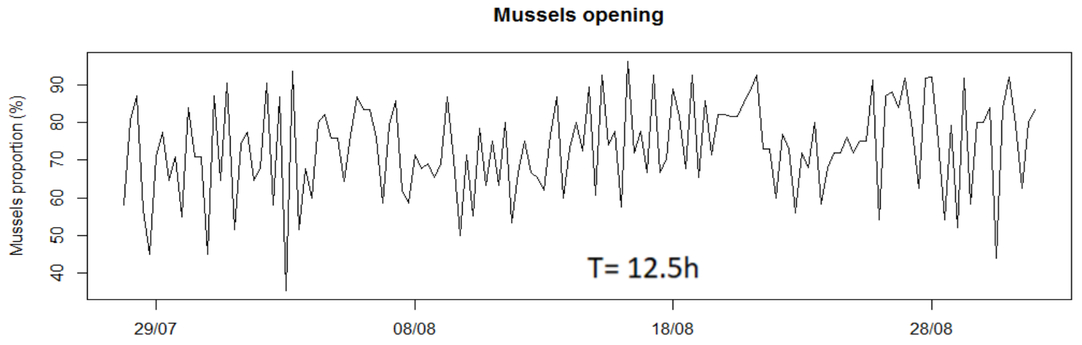
What we can see with long-term observations

The rhythm of the tide, internal clock of hydrothermal system on EMSO Azores

All the fluid outflows bear witness to the impact of the tides that induce an overpressure at the seafloor every 12 hours, modifying the permeability of the bedrock. The tides also impact near-seafloor currents, inducing changes in current direction and velocity.
These effects modify the local hydrology above and below the seafloor and induce variations in the effluents' temperature and chemistry that in turn affect species behaviour and physiology as suggested by the occurrence of biological rhythm in *Bathymodiolus azoricus*.
Functional clock? Related to feeding or symbiosis?







At the rhythm of the tide, internal clock of hydrothermal system
B. Wheeler, M. Cannat, F. Fontaine, V. Chavagnac - A. Mat, M. Matabos, J. Sarrazin, C. Fabioux, A. Huvet

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METEO FRANCE

Lofti Aouf

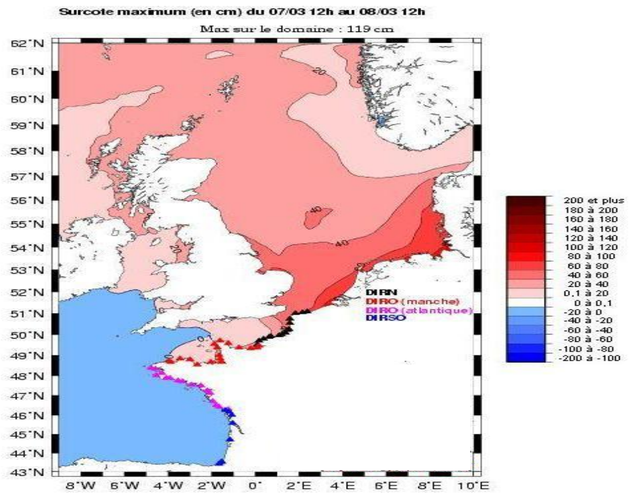
Senior Scientist

In situ ocean observations are essential for Numerical Weather Prediction and ocean forecasting

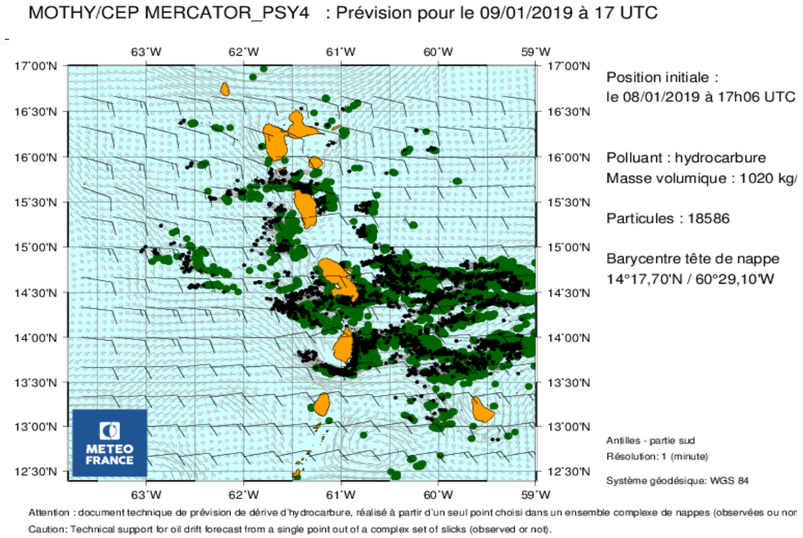
- Sea surface parameters in NWP (sea level pressure, SST, fluxes corrections,…)
- Verification of operational wave and surge forecasting, in open and coastal ocean : vigilance vagues submersion
- Calibration/validation of satellite ocean observations (SWOT, CFOSAT, altimetry,…)
- Understanding of coupled processes and implementation of cupled earth system.

- Ensuring maritime safety
- Accurate coastal flooding warning
- Emergency response at sea

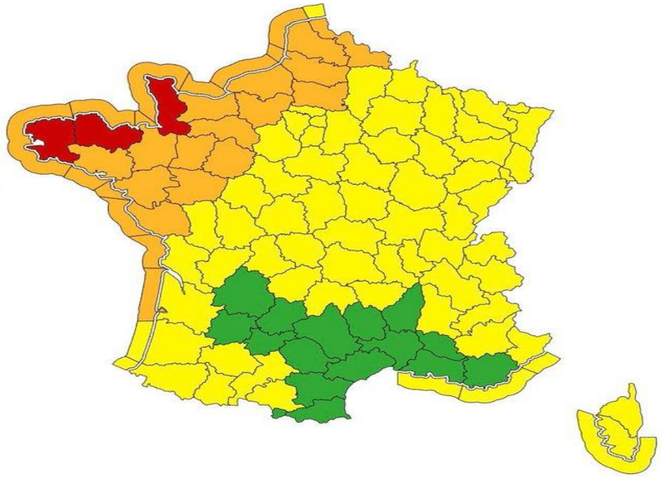
surge



Sargassum drifting



Vigilance map



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Activities in the frame of EUMETNET (IOC/WMO) : E-surfmar

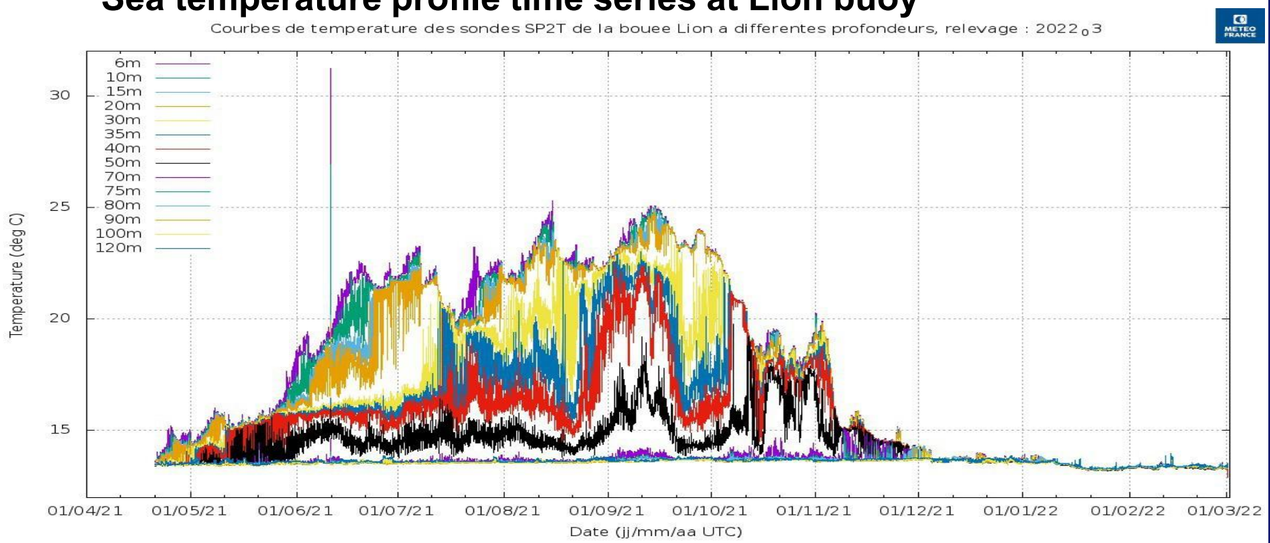
- **Marine observations Monitoring :**
  Mooring and drifting buoys, Ship, Wave coastal buoys, coastal buoys

- **Quality control tools :**
air temperature, SST, wind speed and direction, pressure, key wave parameters

- **Blacklisting of corrupted data. Statistics of comparisons with models outputs established by different meteorological centres**

- **Maintenance of moorings network and deployment of new buoys**

Sea temperature profile time series at Lion buoy



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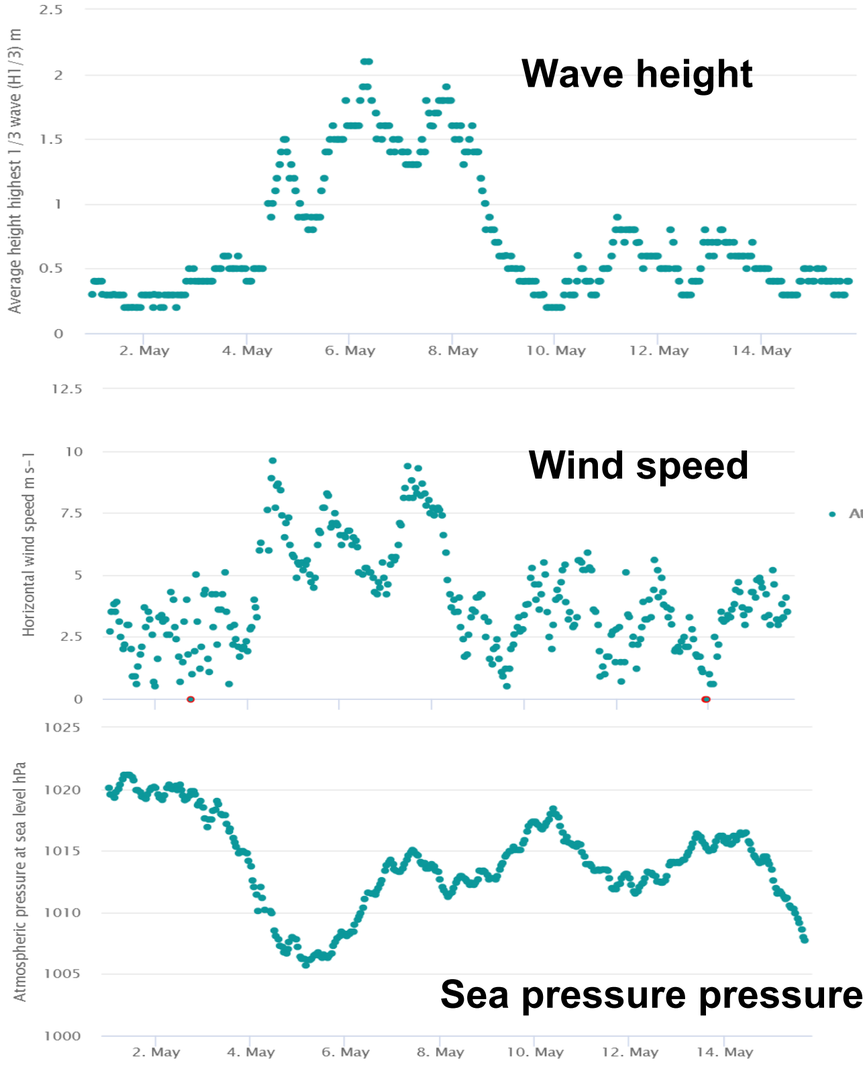
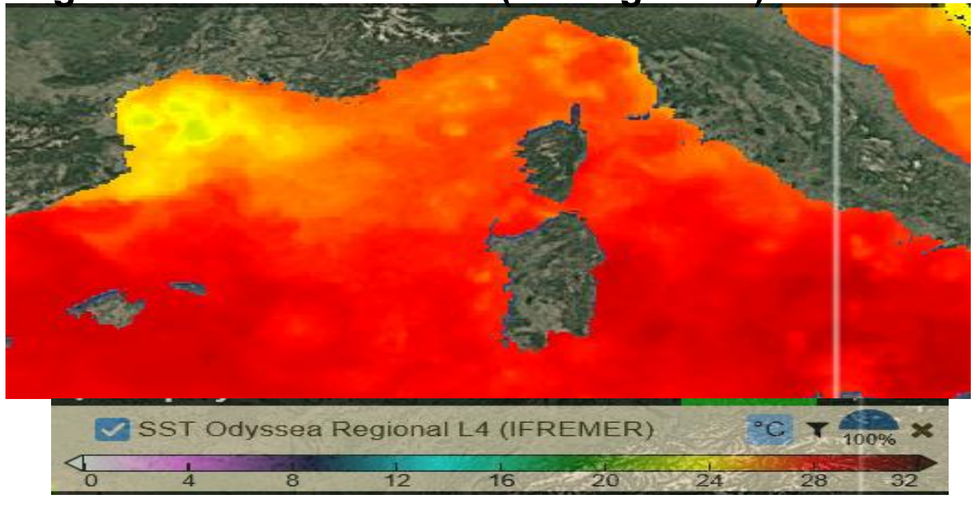
Monitoring essential variables for NWPand ocean sea state prediction

- Verification at real time
- Analysis and characterization of meteorological events
- Model validation and assimilation
- Preventing and understanding extreme events
- calibration/validation of satellite data and new measurements concepts

New buoys deployed recently



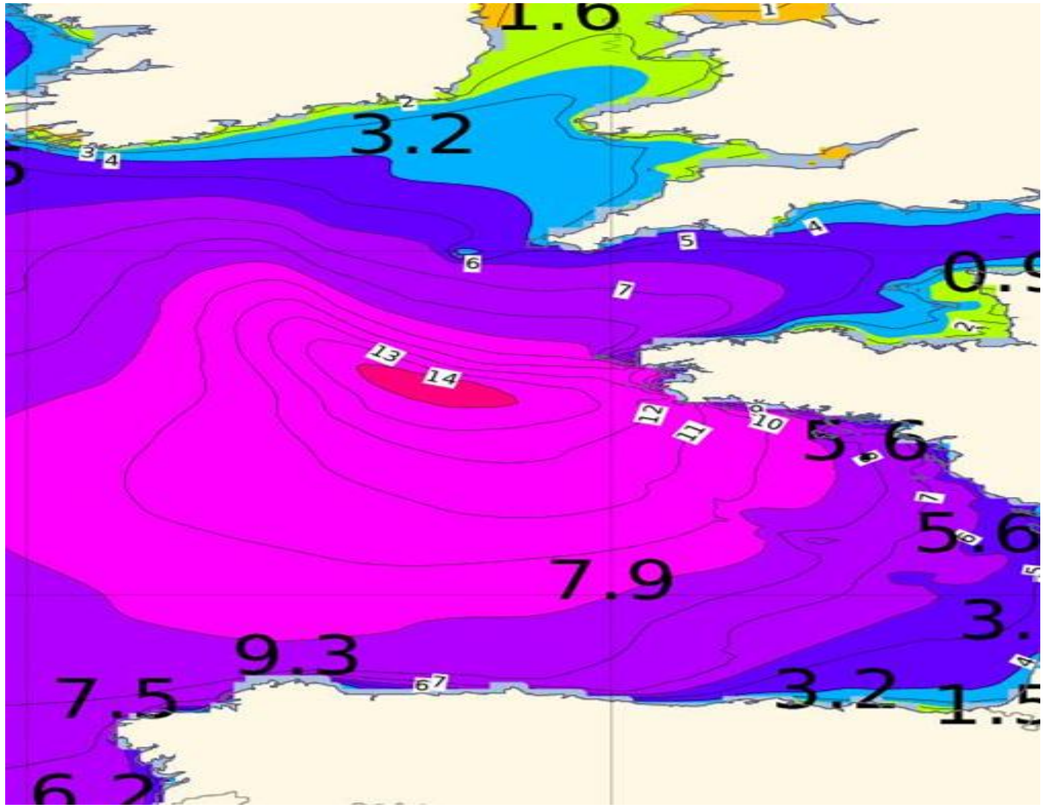
Sea surface temperature from satellite during fast storm in summer (18 Aug. 2022)



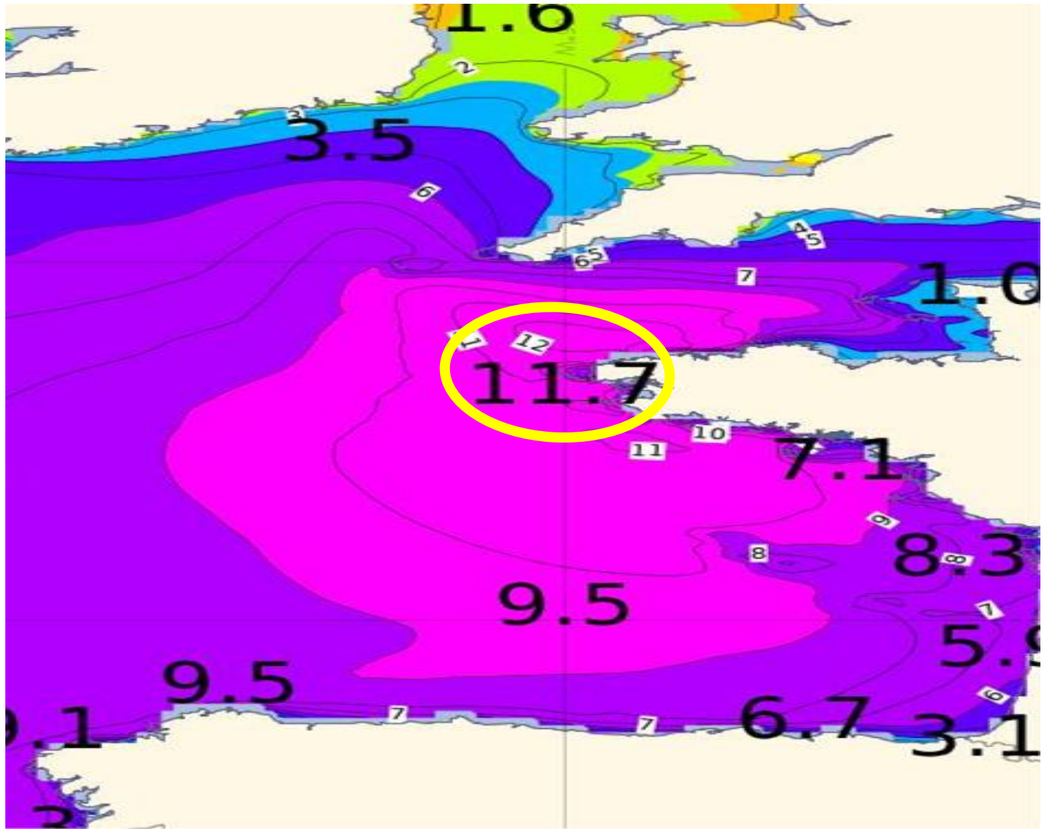
Accounting of sea warming in coupled regional system (atmosphere/wave/ocean : future AROBASE)

Assisting marine forecasters to critical warning event CIARAN 2023

MFWAM SWH 02/11/23 at 1h UTC
Obs in black



MFWAM SWH 02/11/23 at 5h UTC
Obs in black

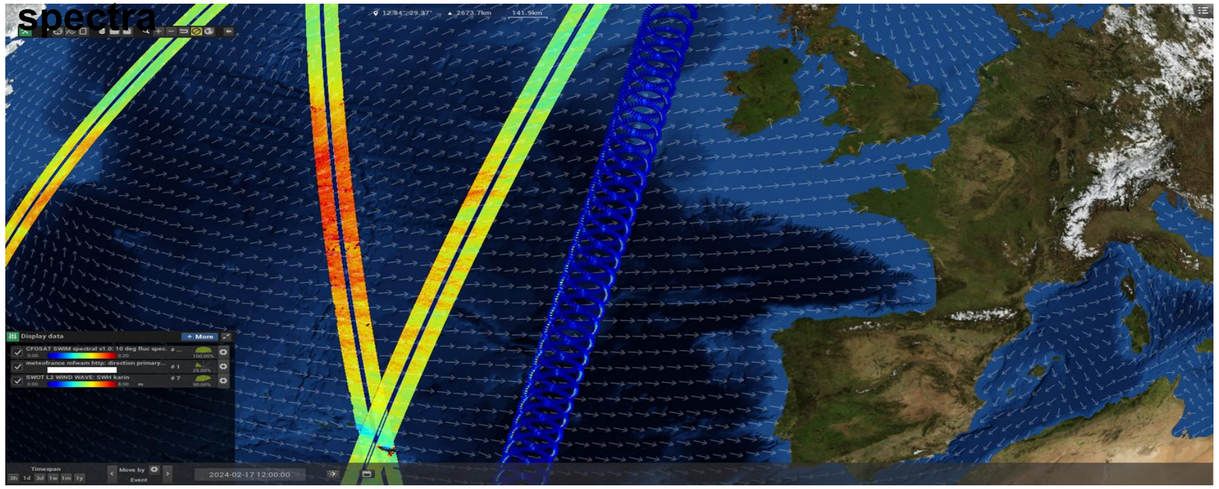


During Ciaran storm, missing observations near the coast on the storm track for 4 hours (transmitting problem). Marine forecasters delivered

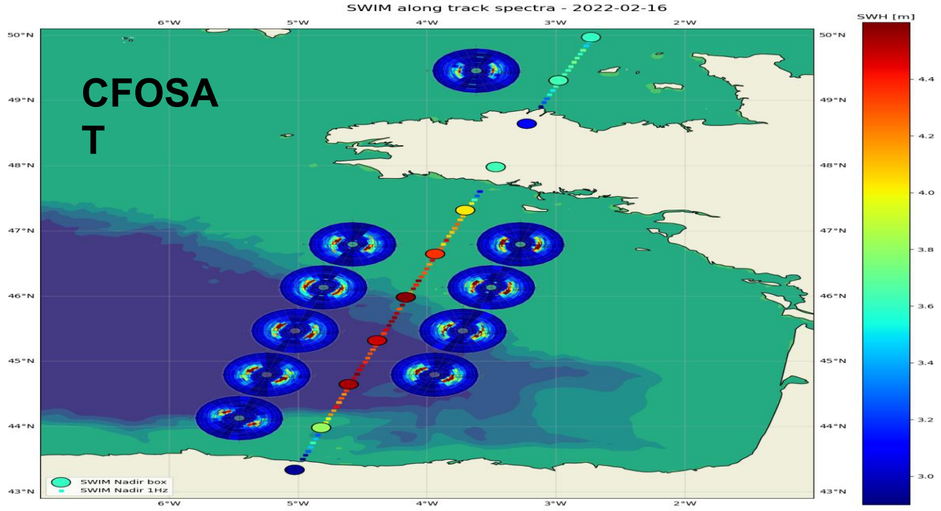
Key process of calibration/validation of satellite data with in situ observations

Preparation of satellite data to the assimilation in operational models

Wave height on swath and SWIM wave spectra



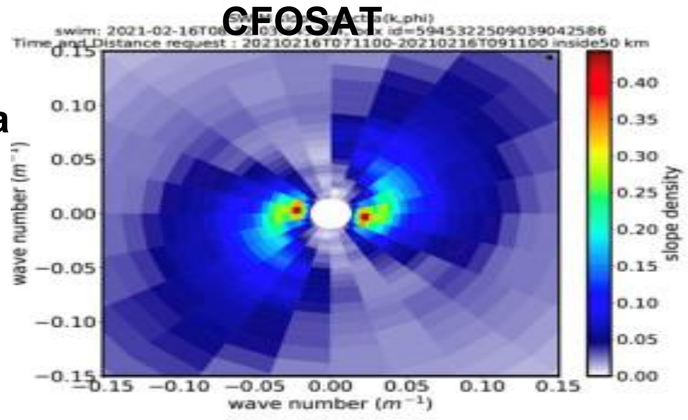
SWIM and SWOT during storm in North Atlantic : 17 February 2024

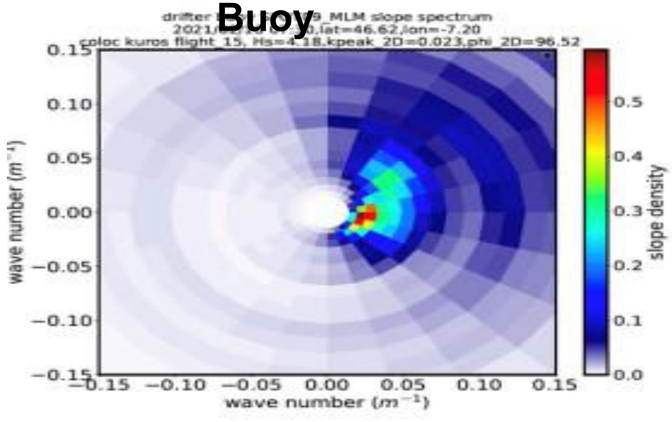


SWIM-CFOSAT

wave Buoy

Wave spectra (2D energy)





Sea state analysis and qualification of remarkable events compared to climatology

Use of observations	**Request to natural hazards certificate, judicial request, medias. Climatology and RETEX on extreme events**
constraints	**- Long time series (> 5 years) without data loss. - fast delivery under request. - Quality of measurements.**
needs	**- improve the data coverage off-shore and on the coastal areas (including overseas). - Maintaining long time series (> 10 ans) - automatic control for removal of corrupted data. - availaibility of additional parameters : wave spectrum, Hmax,...etc**

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How to monitor the Ocean?

Cerema

Matthieu Suire

Head of the Sea and Coastal Group at Cerema

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CANDHIS

The national coastal observatory for in situ sea state measurements

Observing the Ocean : The role of France with the French Ocean Observing System (Fr-OOS)

Jun 4, 2025 — 04:30 pm - 6:00 PM

Candhis

The national coastal observatory for in situ sea state measurements

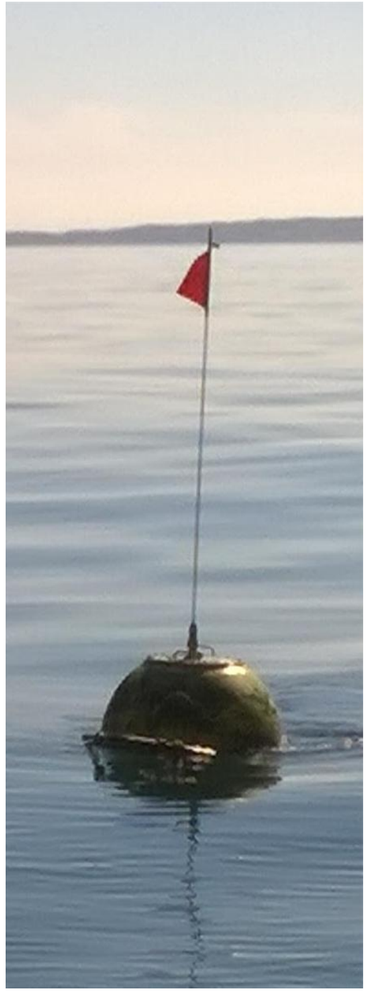
- A measurement network
  - 41 measurement buoy (mainland and overseas)
  - Around 20 partners
  - Coordination led by Cerema
- An information system
  - Managed by Cerema
  - For data centralization, processing, control, archiving, and dissemination
  - https://candhis.cerema.fr/
- Gouvernance
  - Cerema (leader), Shom, Météo-France, Ministry of Ecology

Candhis

The national coastal observatory for in situ sea state measurements.

- For public policies and research:
  - Coastal risks
  - Coastal morphodynamics and shoreline monitoring
  - Design of port and coastal structures
  - Navigation safety
  - Marine renewable energies
  - Study of climate change and its impact on the coastline

- Towards a single portal for in situ sea state measurement
  - IGEDD 2022 recommendations
  - Cerema, national reference for in situ sea state measurement
  - https://candhis.cerema.fr/

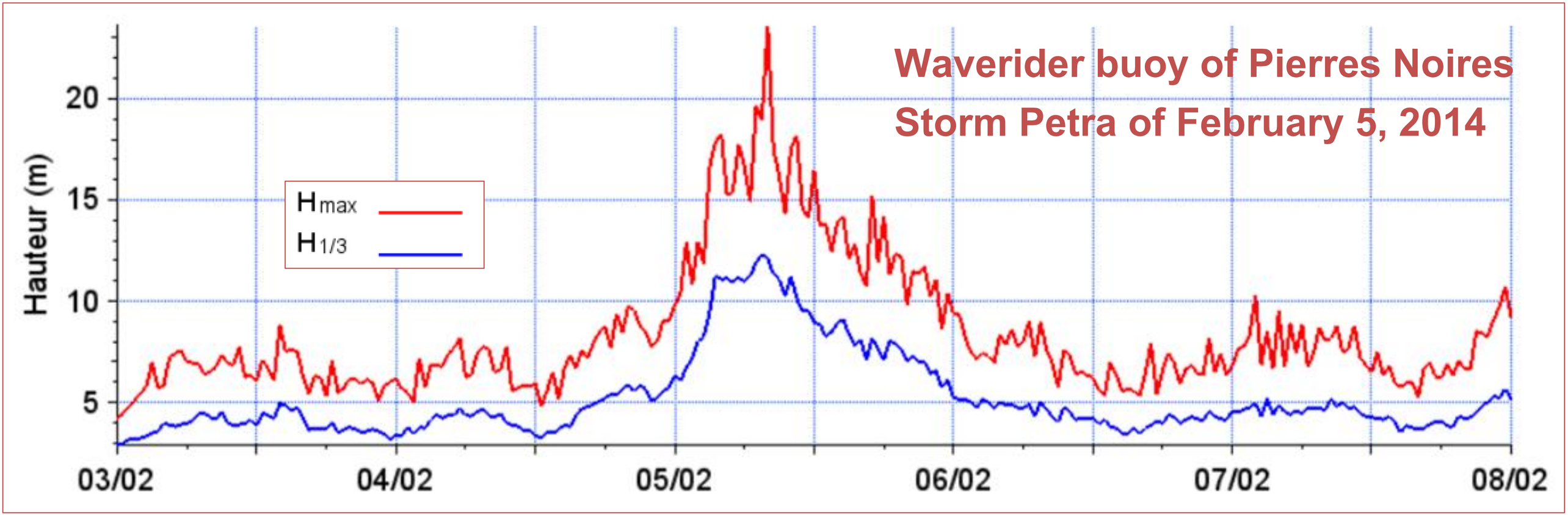


Candhis

The national coastal observatory for in situ sea state measurements

- Measurements since the early 1980s

  and **a record with a wave height of 23.6 meters**



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L'océan en référence

Marie Dauguet

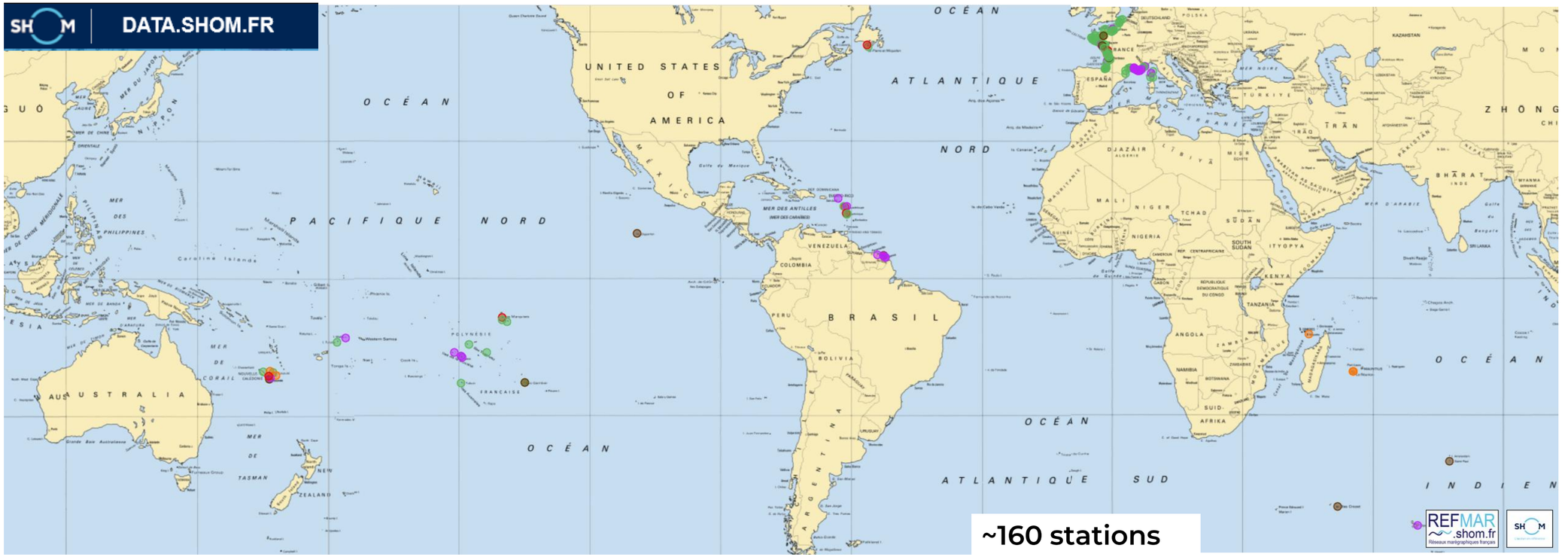
Sea level - Shom

REFMAR coordination

L'océan en référence

- National coordination in the collection and dissemination of public data under acronym REFMAR (SGMer - 2010):
  - Partners Tide Gauges Networks : 110 stations
  - RONIM : 50 stations
- Promotion of international recommendations (IOC, GLOSS, IHO)
- Support and training for tide gauge implementation

REFMAR .shom.fr



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.shom.fr

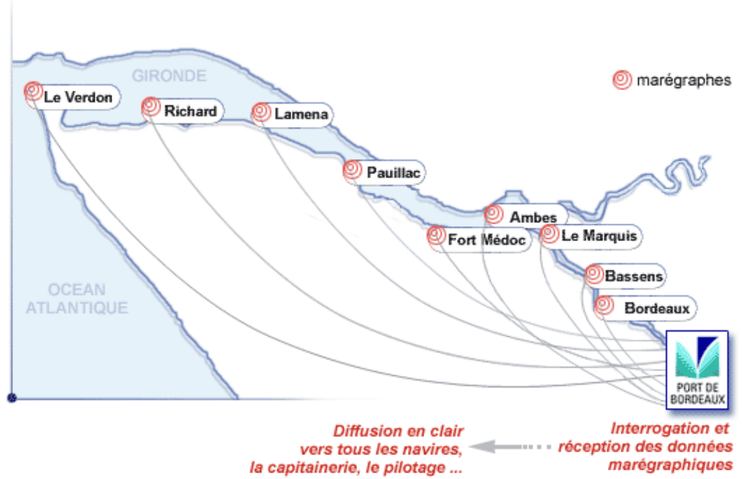
~ 20 Partners tide gauges networks

- Autonomous Ports (Bordeaux, Nantes, HAROPA)
- Local Authorities and Intercommunal Structures
- Academic Partners & Public Research Organizations
- National public agency supporting flood forecasting

ROSAME

LEGOS cnrs

VIGICRUES



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RONIM network

- 50+ tide gauges
- Radar-only technology (1Hz)
  Real-time transmission (Internet+Satellite)
  « Coupled » with permanent GNSS stations
- Remote monitoring of real time network status
- Major equipment modernization (2021–2023)

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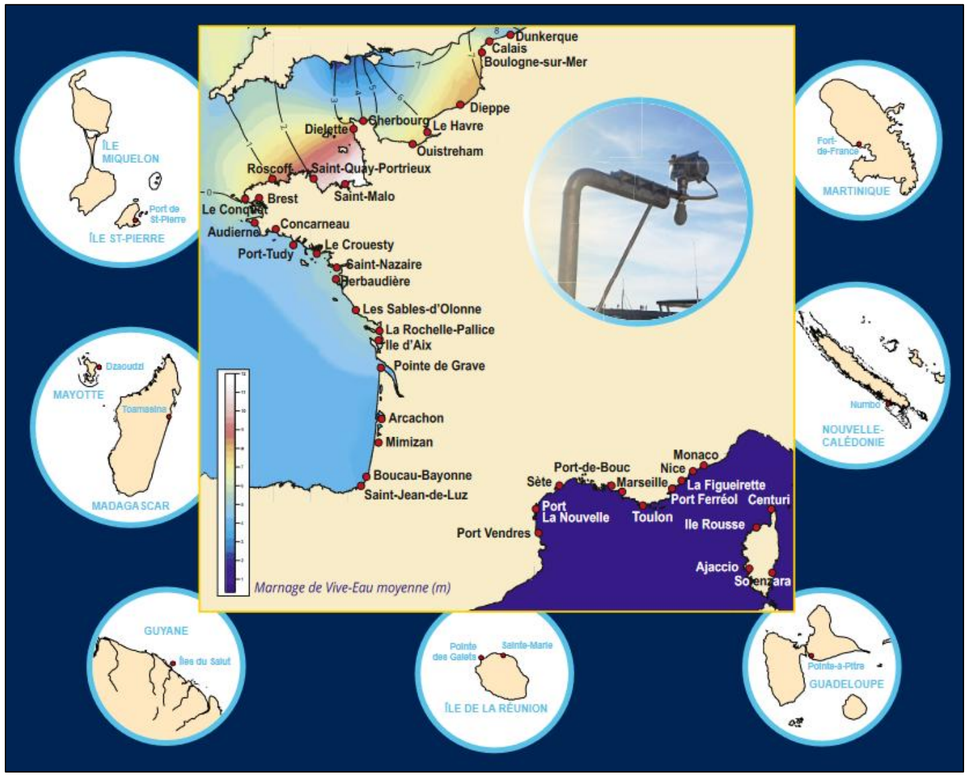
L'océan en référence



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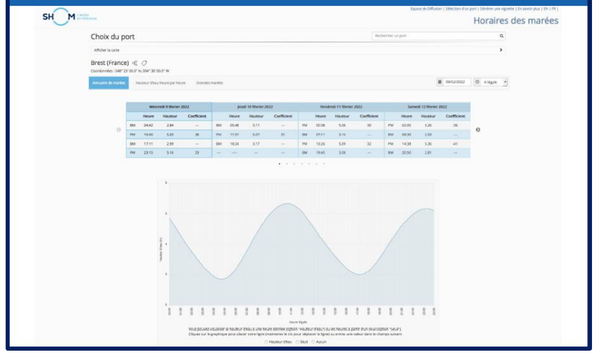
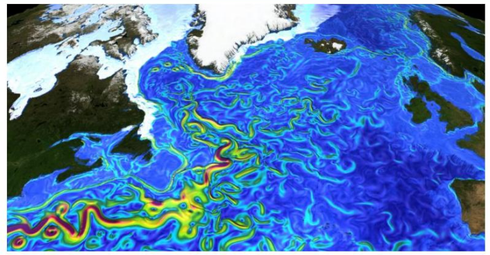
TIDE PREDICTIONS

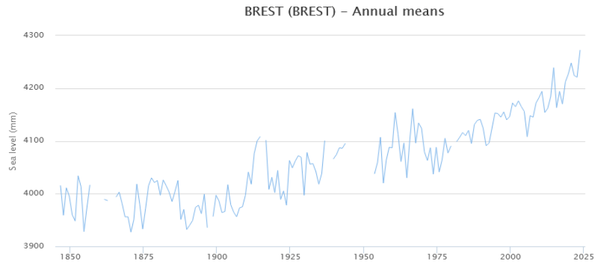


MODELLING



unesco · GOOS The Global Ocean Observing System · WORLD METEOROLOGICAL ORGANIZATION · MERCATOR OCEAN INTERNATIONAL · ARGO France · Copernicus

AVERAGE LEVEL MONITORING



SONEL · PSMSL

Data source: REFMAR

NAVIGATION SAFETY

STORM SURGES MODELING

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

SHOM · METEO FRANCE

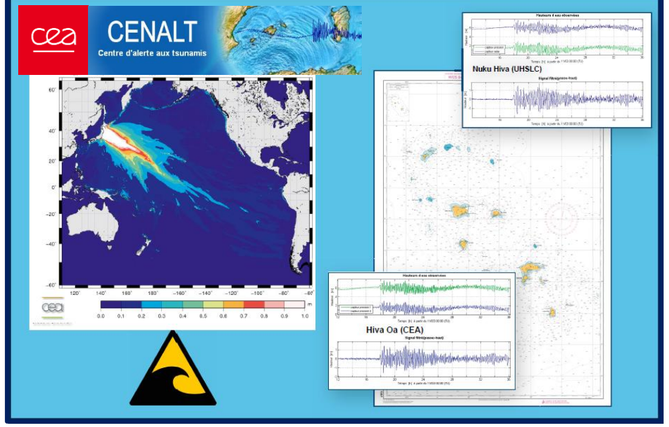
Depuis octobre 2011.

«SIMULATION»

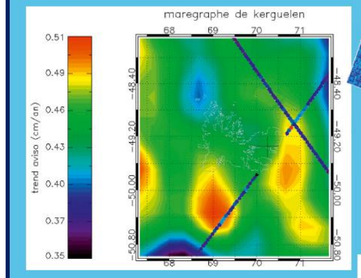
© Port du Conquet - Shom 2014

TSUNAMI DETECTION

cea CENALT
Centre d'alerte aux tsunamis



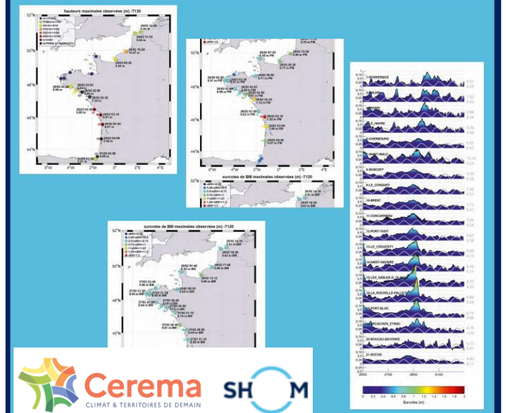
SATELLITE CALIBRATION AND DATA VALIDATION



cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

Source : OST-ST
Altimer 2008-2011
(LF605)

EXTREME EVENTS STATISTICS



Cerema CLIMAT & TERRITOIRES DE DEMAIN · SHOM

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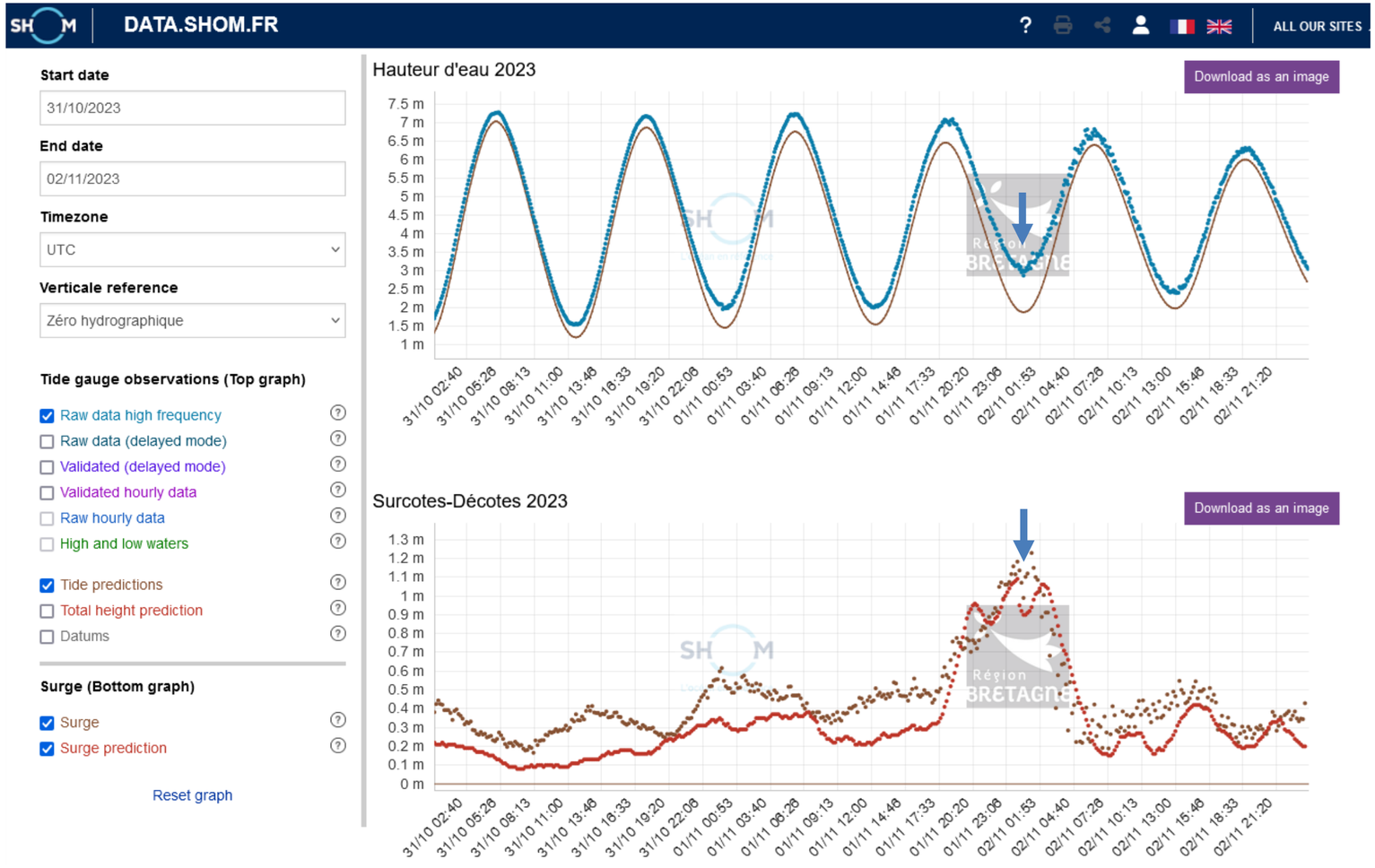
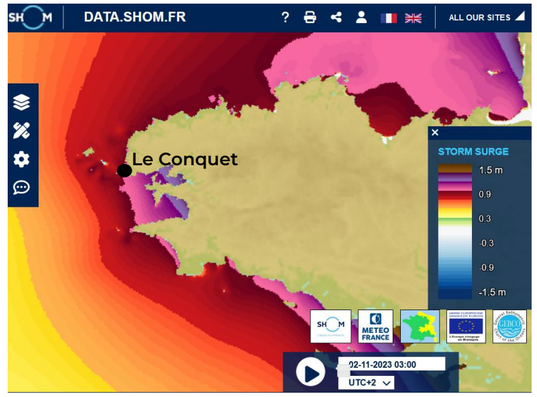
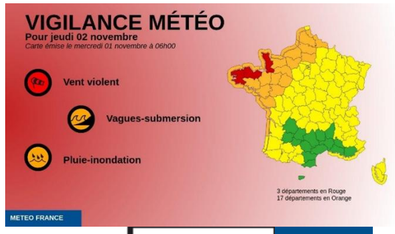


CIARAN Storm at Le Conquet – 01-02 Nov. 2023

- Open data dissemination https://data.shom.fr
- Tide gauges real time vizualisation Automatic download
- Modelling and forecasting capabilities



Surge from Hycom 2D model (02 Nov. 2023 – 01:00)



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Closing Remarks

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