



IMPLEMENTATION OF
AUTOMATIC UNDERWAY
MEASUREMENT SYSTEM
(« **FERRYBOX** » ON
RESEARCH VESSELS

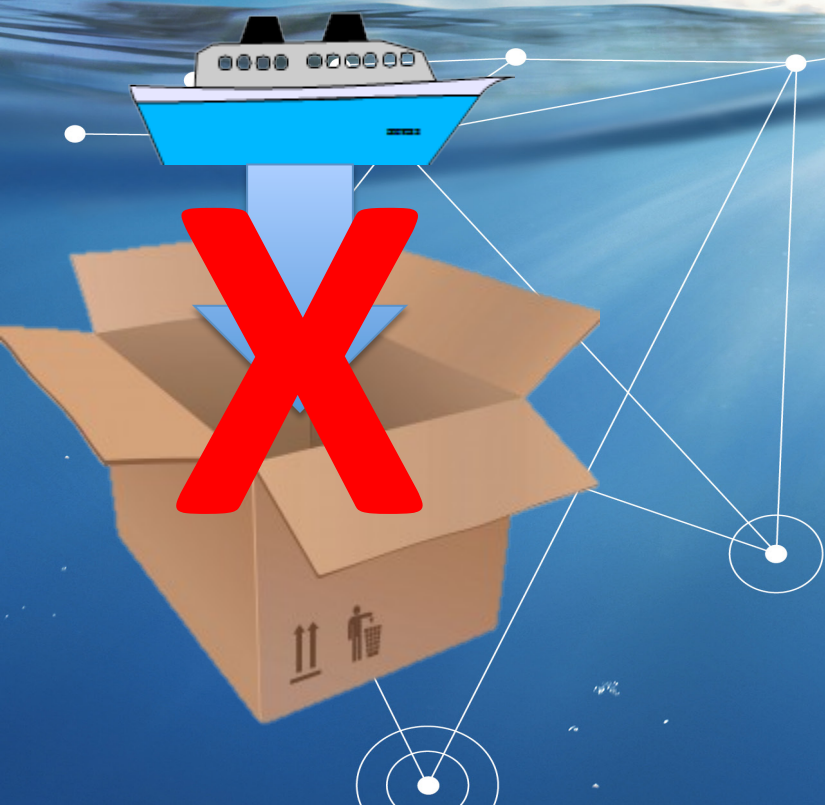


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SPEAKER: BRIEUC CRÉNAN BRIEUC.CRENAN@IFREMER.FR

FERRY...WHAT ?



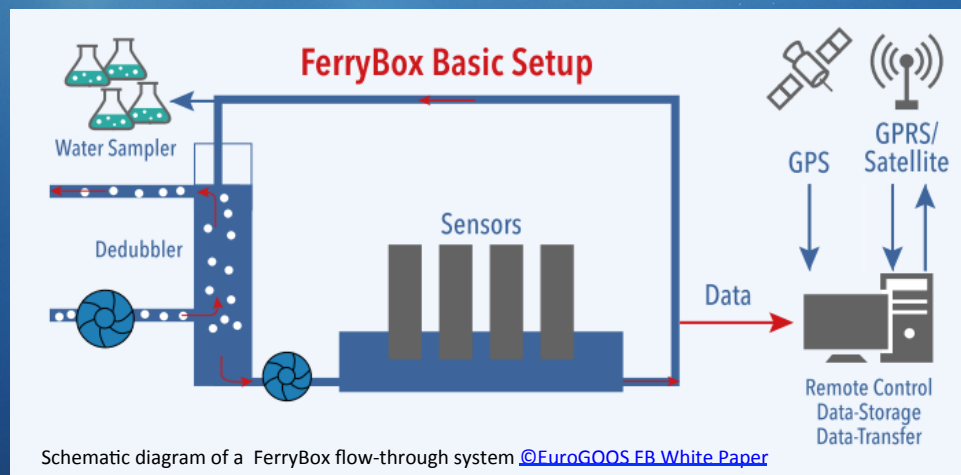
A FERRYBOX is :



An automatic underway measurement system .

FerryBox technology allows taking automated measurements aboard ships. The core ocean parameters measured are temperature, salinity, turbidity, and chlorophyll-a fluorescence. In addition, non-standard sensors provide data on currents and sediment transport, pH, oxygen, nutrients, and algal species.

First designs were for ship of opportunity (ferries, Cargo..)



<https://www.ferrybox.com/FERRYBOX Whitepaper>



Schematic diagram of a FerryBox flow-through system @EuroGOOS FB White Paper

History

~2002: First Ferrybox released (GKSS/HZG - Germany)

...

...

2010: IFREMER + CNRS install a Ferrybox on MV *Armorique* (English channel)

2011: CNRS install a 2nd Ferrybox on MV *Pont Aven* (english Channel + bay of Biscay)

...

2015 : Ifremer's Scientists requires more underway measurement on RV

2015-2016 : Workgroup on underway measurement system

2017: Installation of a Ferrybox on RV *Thalassa*

2018: Installation of a PocketFerrybox on RV *Europe*

2019: *To be continued...*



MV *Pont Aven* – 184m



RV *Thalassa* – 74m

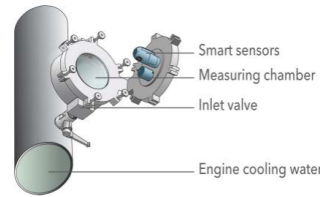


RV *l'Europe* – 30m

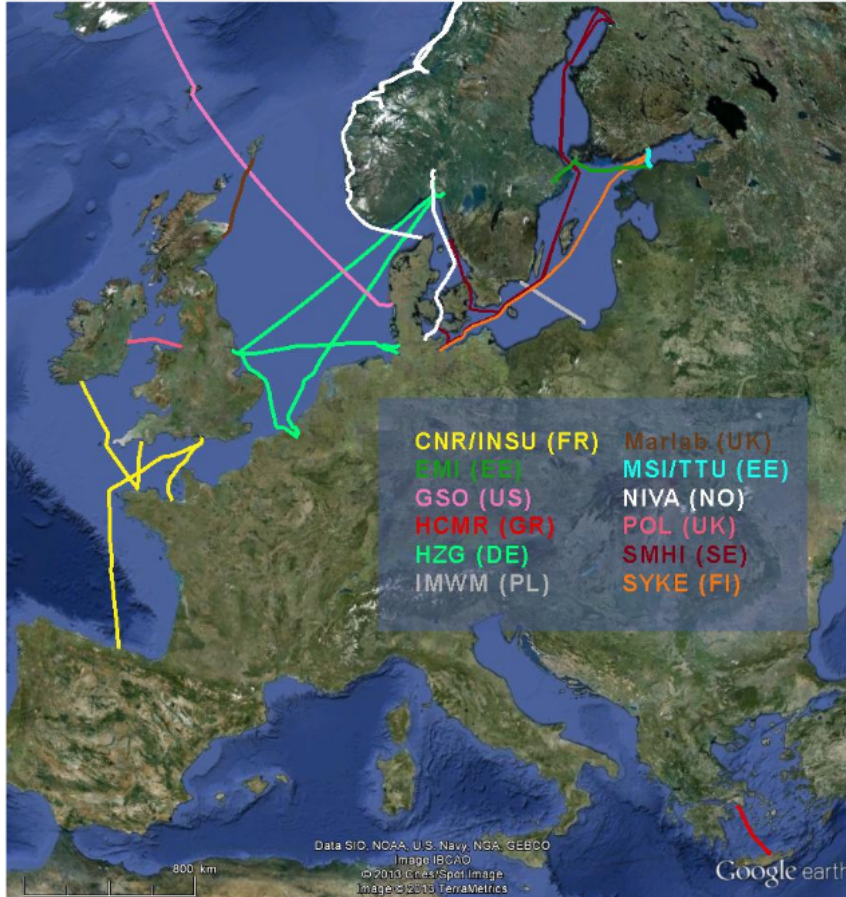
How does it look like ?

Different manufacturers for different needs

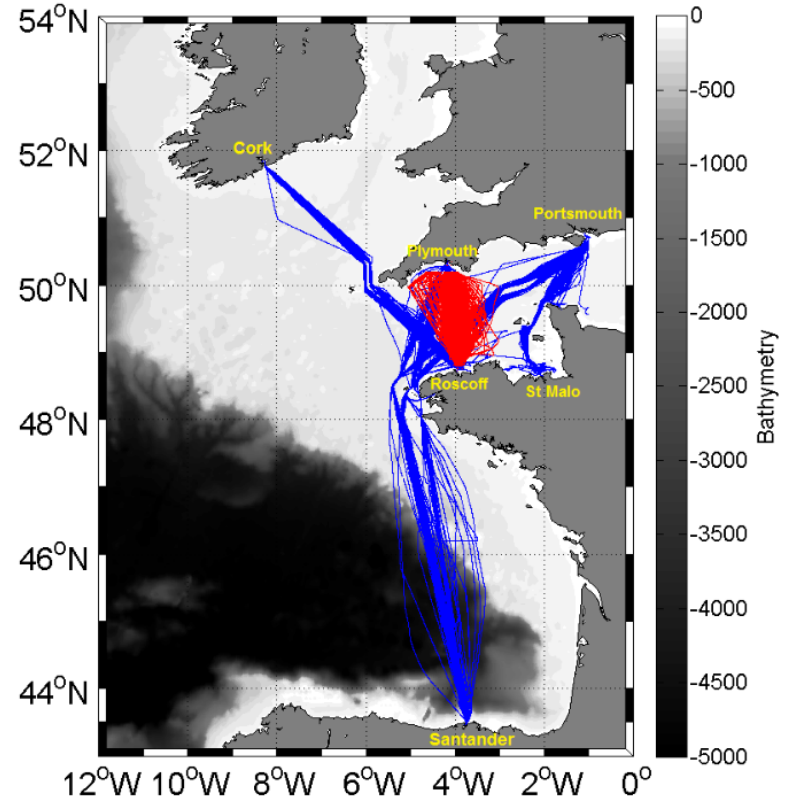
accurate Computer cleaning
 turbidity temperature Analysis
 Chlorophyll GPS Pipes
 pump Data **Ferrybox**
 diatoms Fluorescence
 research reliable salinity
 automatic Ferries
 continuous Chl-a debubbler acid
 underway Oxygen



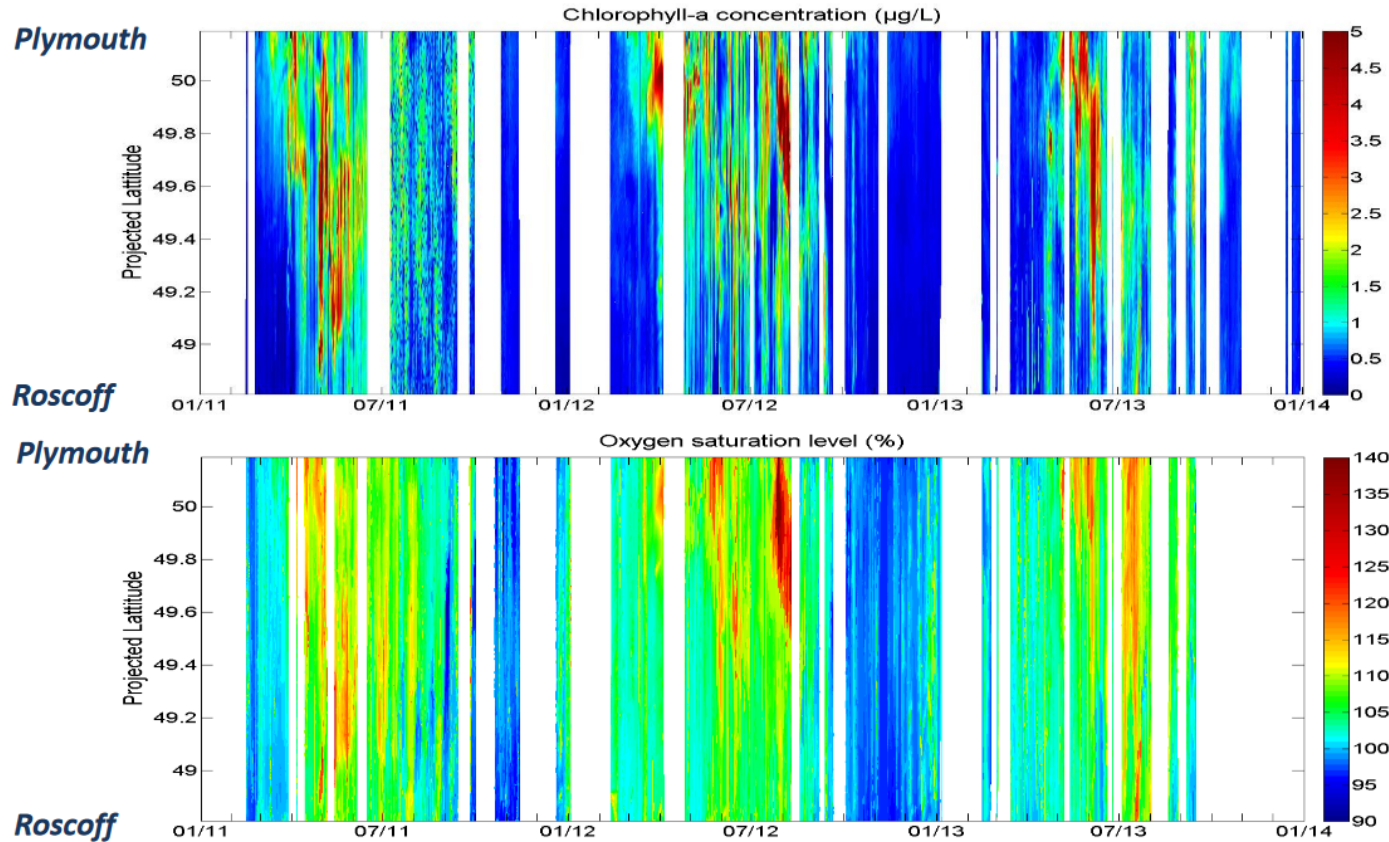
Ferrybox routes examples



Routes of MV *Armorique* & *Pont Aven* from 2011-2013

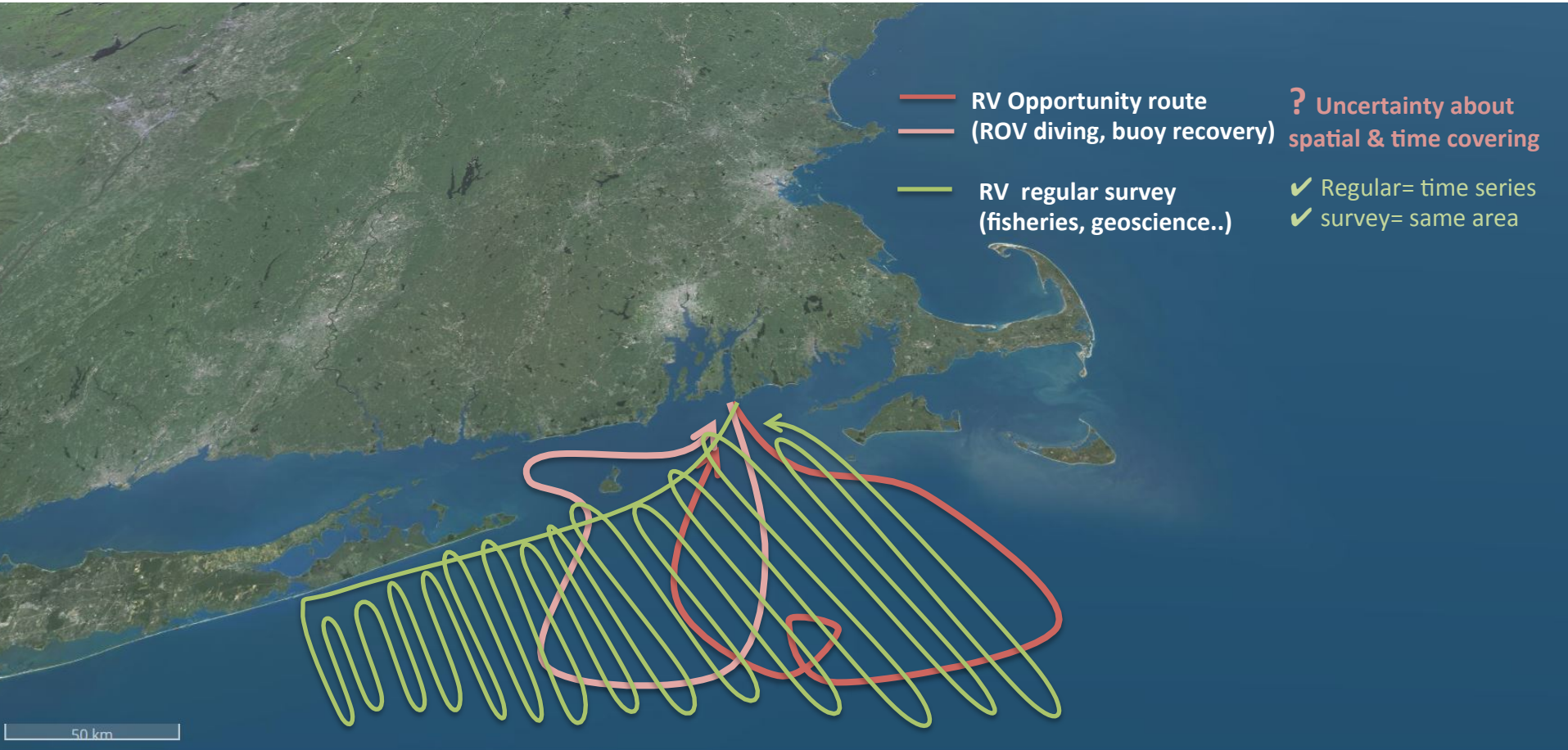


Example of time series over English channel

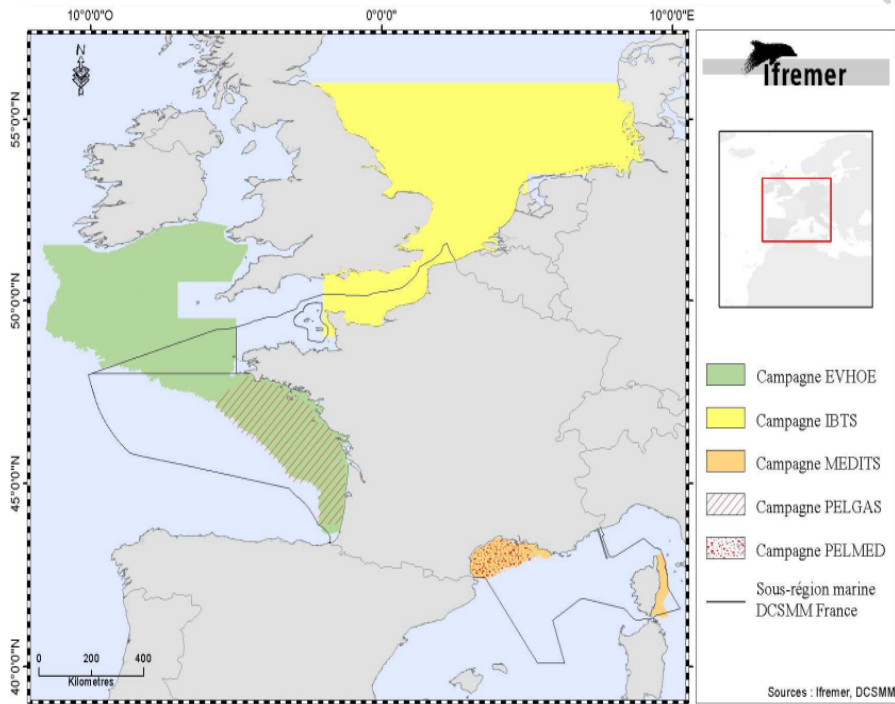


Pierre Marrec et al. – SB Roscoff

Simulated Research vessels route



Current cruises on Ifremer



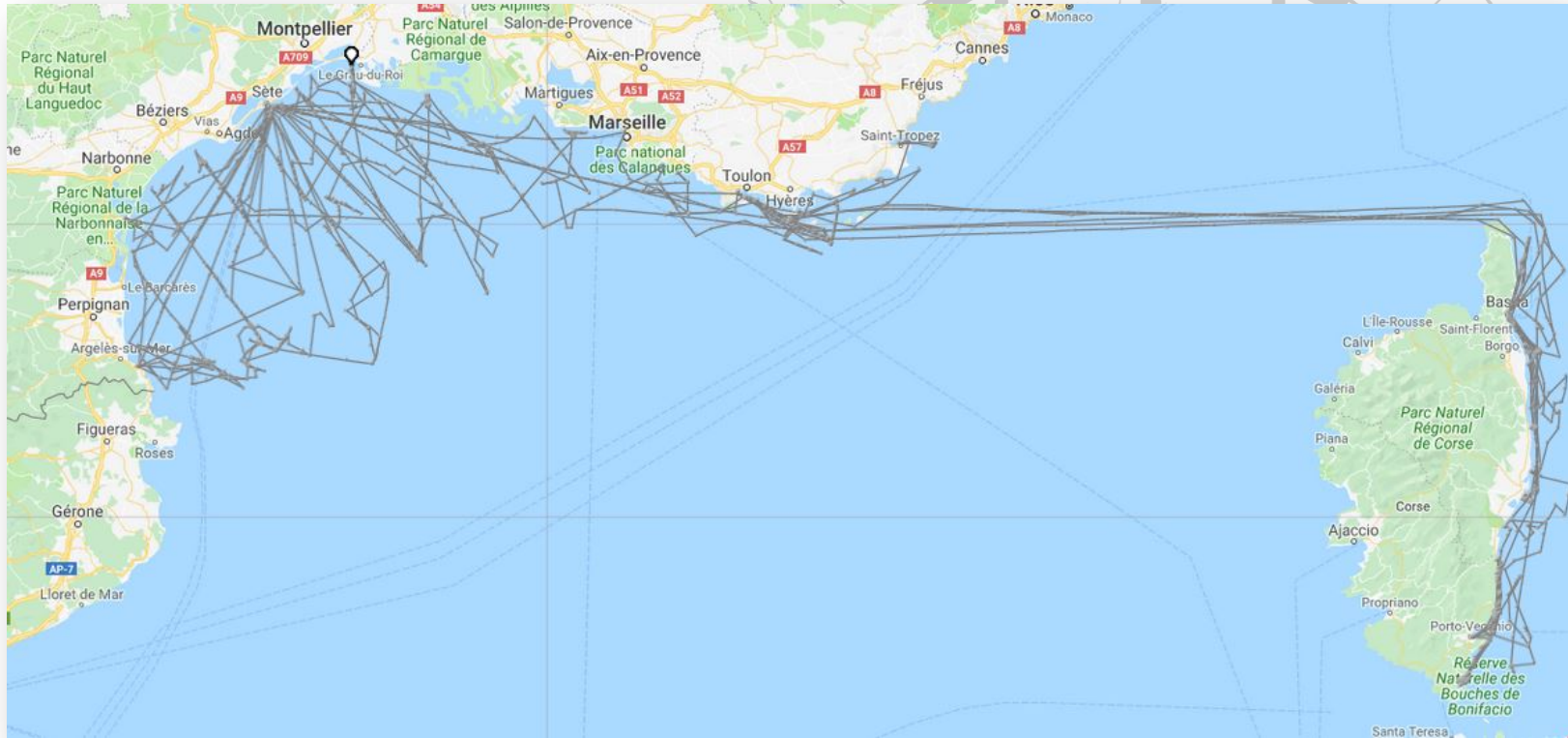
RV *Thalassa* – 74m – Bay of Biscay, Irish Sea, english Channel, North Sea



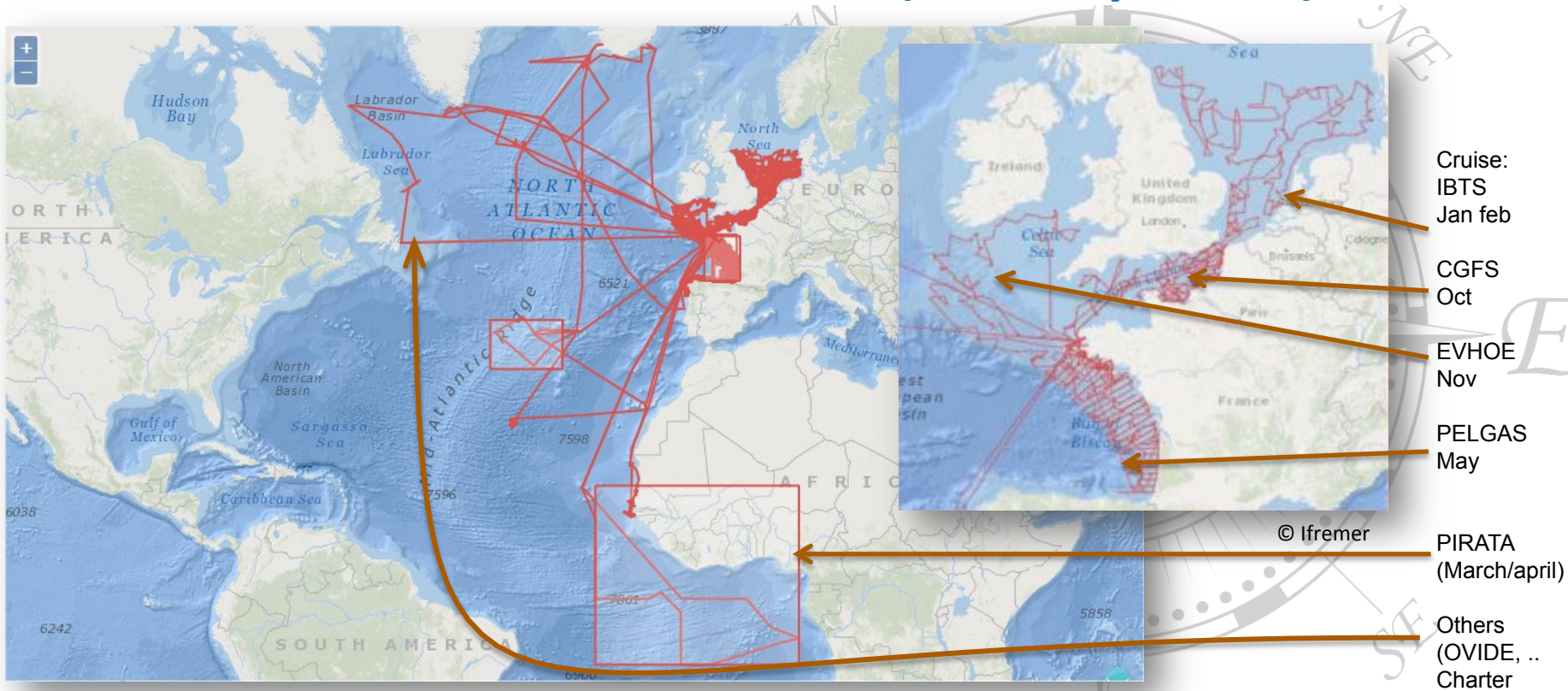
RV *l'Europe* – 30m
Mediterranean sea

Figure 7 : zones couvertes par les campagnes DCF - réalisation P. Sorin, Ifremer, Dyneco-Vigies

L'Europe cruises (May-Sept 2018)

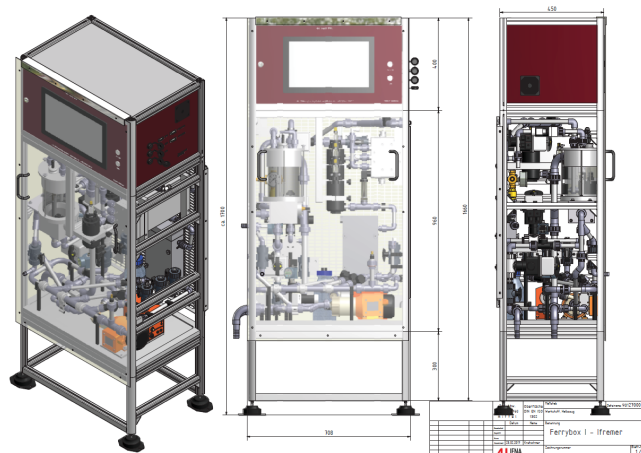


Thalassa cruises (on 5 years)



IFREMER's FB configuration

Thalassa



Ferrybox:

Manufacturer : **-4H-Jena, "Ferrybox I"**

Thermosalinograph SBE45

Oxygen: Anderaa 4835

Turbidity Seapoint

Fluorescence BBE-AOA

pH: Meinberg MV3010

(pH for acid control and not a scientific sensor !)

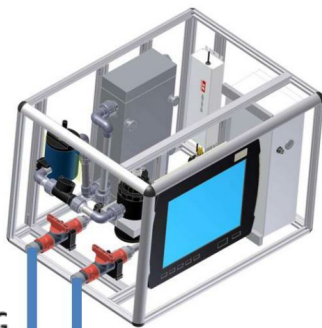
Air temp: PT100

Debubbler, auto-cleaning system, more space for future sensors

+ Thermosalinograph SBE21

L'Europe

4 JENA
ENGINEERING



[Link \(c\) -4H-Jena Ferrybox Description](#)

[Link : \(c\) -4H-Jena PocketFerrybox Description](#)

pocketFerrybox:

Manufacturer : **-4H-Jena, "PocketFerrybox"**

Thermosalinograph SBE45

Oxygen: Anderaa 4835

Turbidity Seapoint

Fluorescence BBE-AOA

pH: Meinberg MV3010

(pH for acid control and not a scientific sensor !)

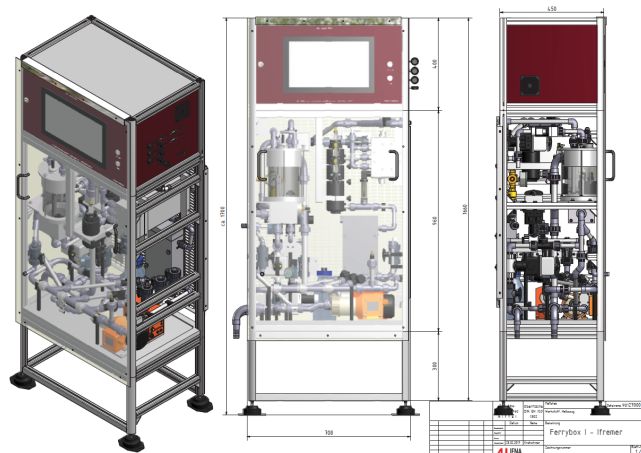
Air temp: PT100

No debubbler, no auto-cleaning system, no space left !

+ Thermosalinograph SBE21

IFREMER's FB configuration

Thalassa



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Manufacturer : -4H-Jena, "Ferrybox I"

Thermosalinograph **SBE45**

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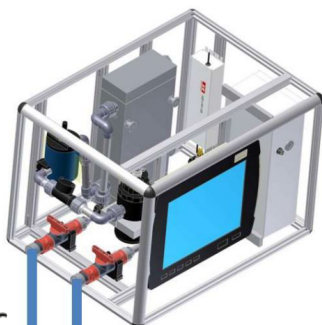
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Debubbler, auto-cleaning system, more space for future sensors

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L'Europe

4 JENA
ENGINEERING



pocketFerrybox:

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Air temp: **PT100**

No debubbler, no auto-cleaning system, no space left !

+ **Thermosalinograph SBE21**

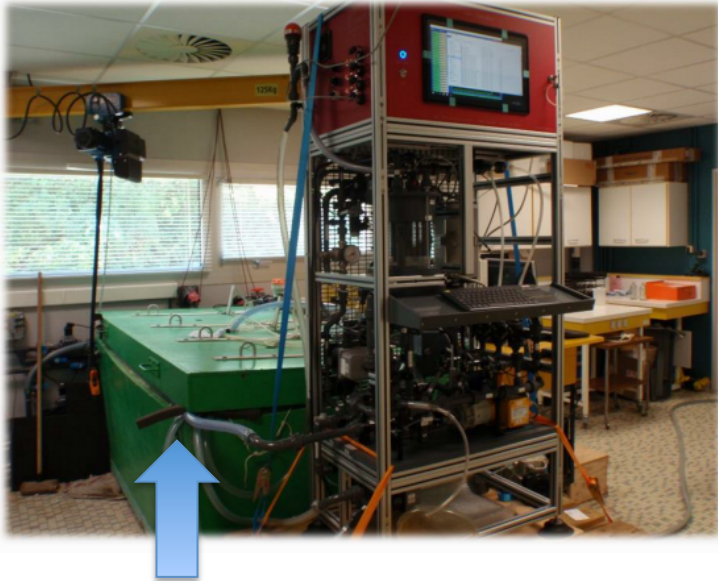
[Link \(c\) -4H-Jena Ferrybox Description](#)

[Link : \(c\) -4H-Jena PocketFerrybox Description](#)

Ifremer's Metrology lab



- Habilitated by COFRAC (french regulations)
- I assume : the 1st Ferrybox ever installed in a metrology lab (open to discussions !)



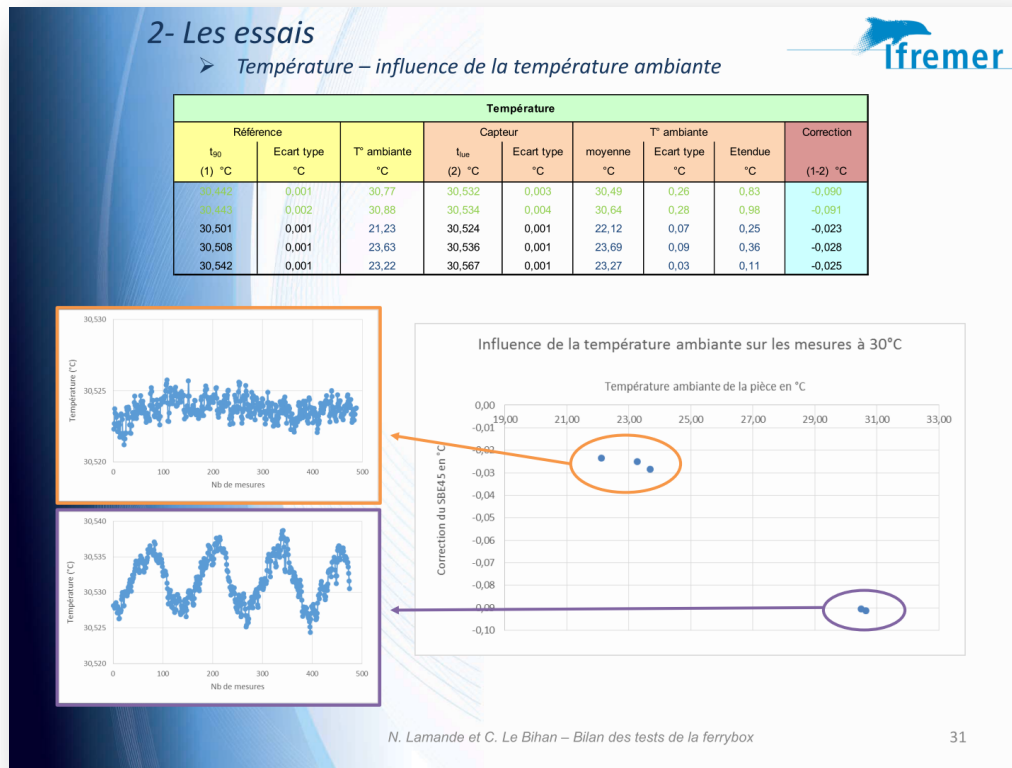
Sea Water tank
800L
Adjustable temp 0-30°C
Adjustable salinity 24-34 PSU

Ferrybox scientific sensors	SBE45
	Aanderaa Optode
	Seapoint Turbidity
	BBE AOA

Optode Calibration : another tank (60L)

Details on SBE21/45 comparison

Test in a metrology lab : **yes** there is an impact on SBE45's Temp sensor



SBE21:

- ✓ Tough
- ✓ reliable
- ✓ historical sensor

X manual cleaning each X weeks

X needs 60L/min

X takes a lot of space for coastal RV

SBE45:

- ✓ smaller
- ✓ needs less flow in ~2L/min
- ✓ in the automatic cleaning of FB (2*day)

? Impact from ambient temperature ?

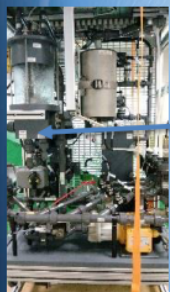
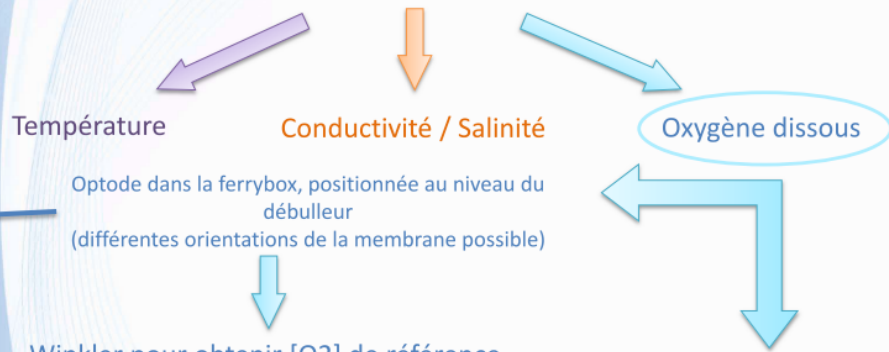
Tests on the vessel ? And final impact on measurement of salinity ? To be continued

Ifremer's Metrology lab

2- Les essais

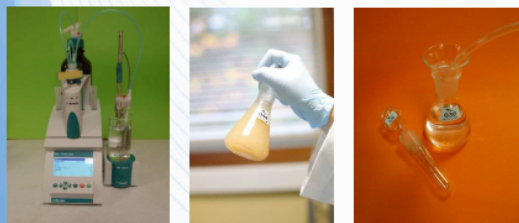


Paramètres travaillés :

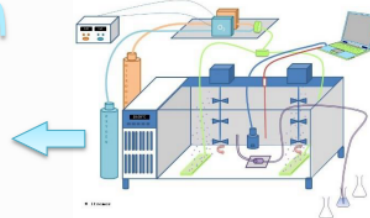


Optode dans la ferrybox, positionnée au niveau du débulleur
(différentes orientations de la membrane possible)

Winkler pour obtenir [O₂] de référence



Optode dans banc d'O₂ du labo



Remarque : Pas de compensation de salinité sur l'optode

N. Lamande et C. Le Bihan – Bilan des tests de la ferrybox

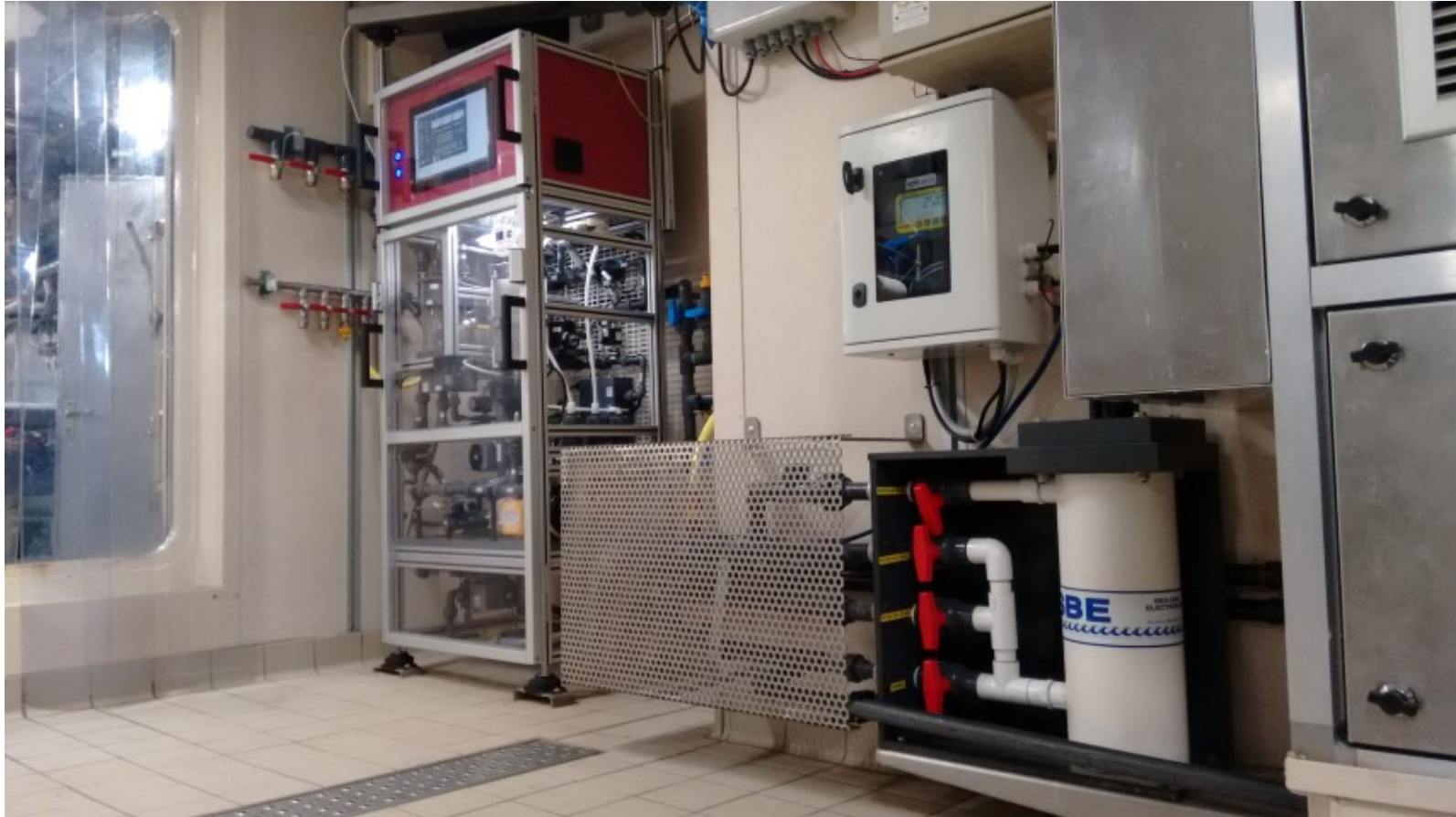
58

More results ?
Let's talk after presentation !

Questions regarding metrology ?
[Testing Facilities at Ifremer](http://www.ifremer.fr/testing-facilities)

Ifremer metrology office contact:
brest.metrologie@ifremer.fr

Thalassa Installation

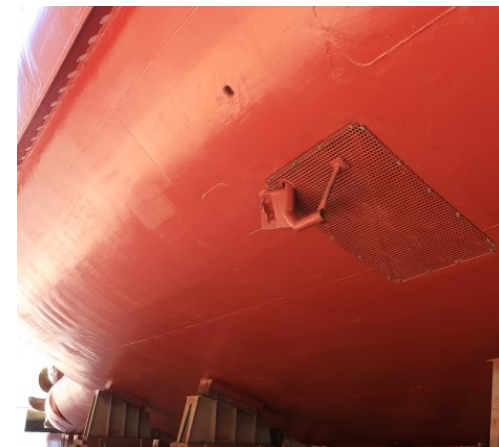
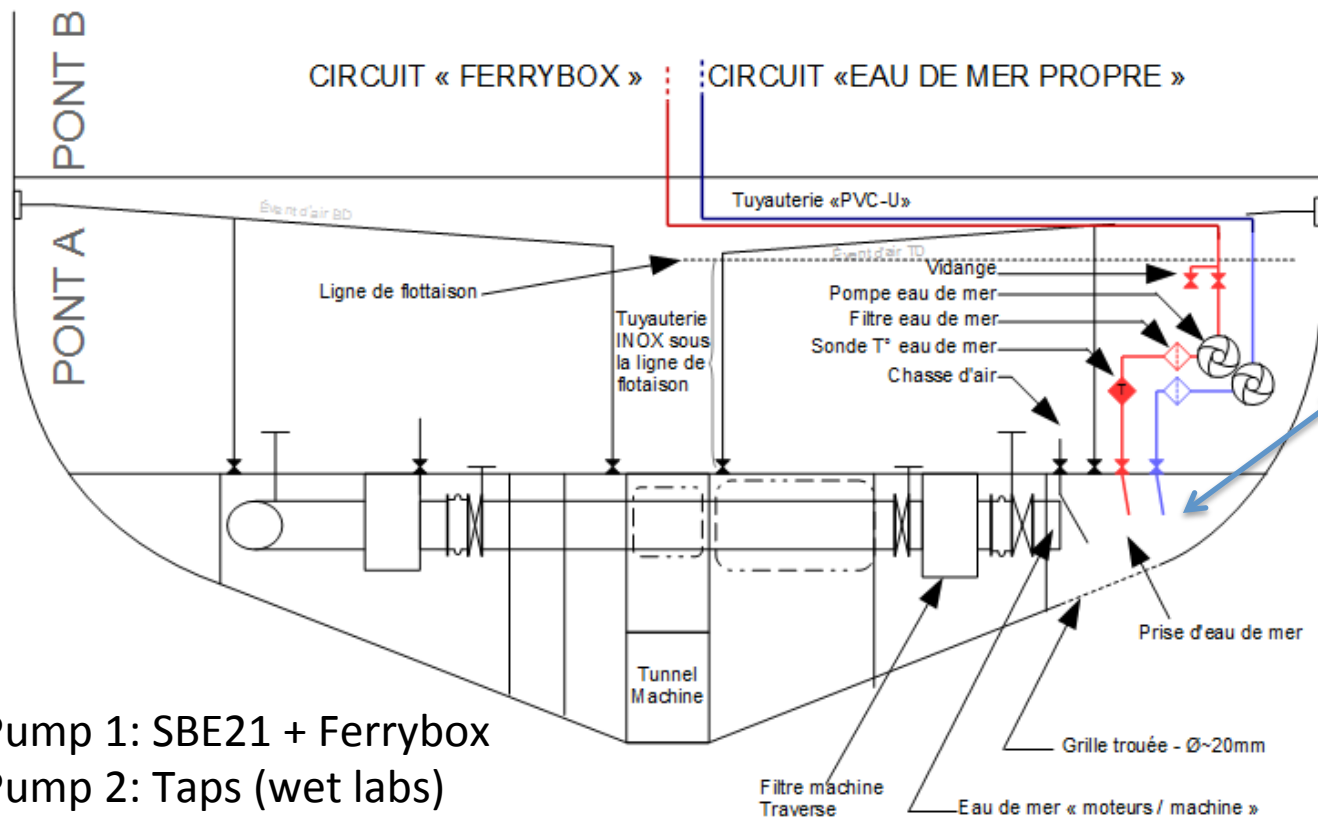


October 16th 2018

Thalassa Installation

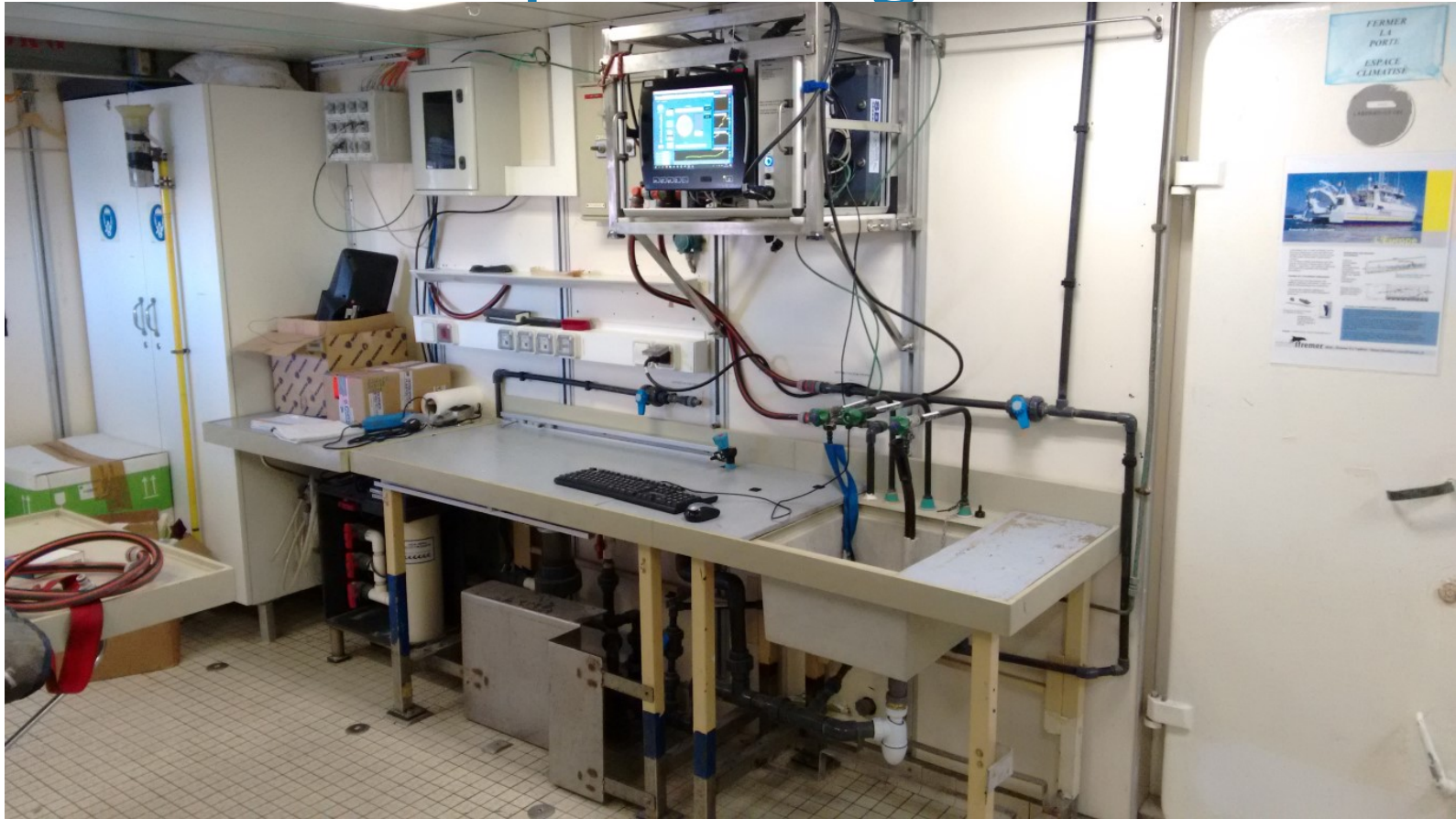
C57 BD

C59 TD



Pump 1: SBE21 + Ferrybox
 Pump 2: Taps (wet labs)

L'Europe configuration



How to validate those “new” sensors ?

Lot of knowledge on Temperature & Salinity quality control, calibration, sensor

What about :

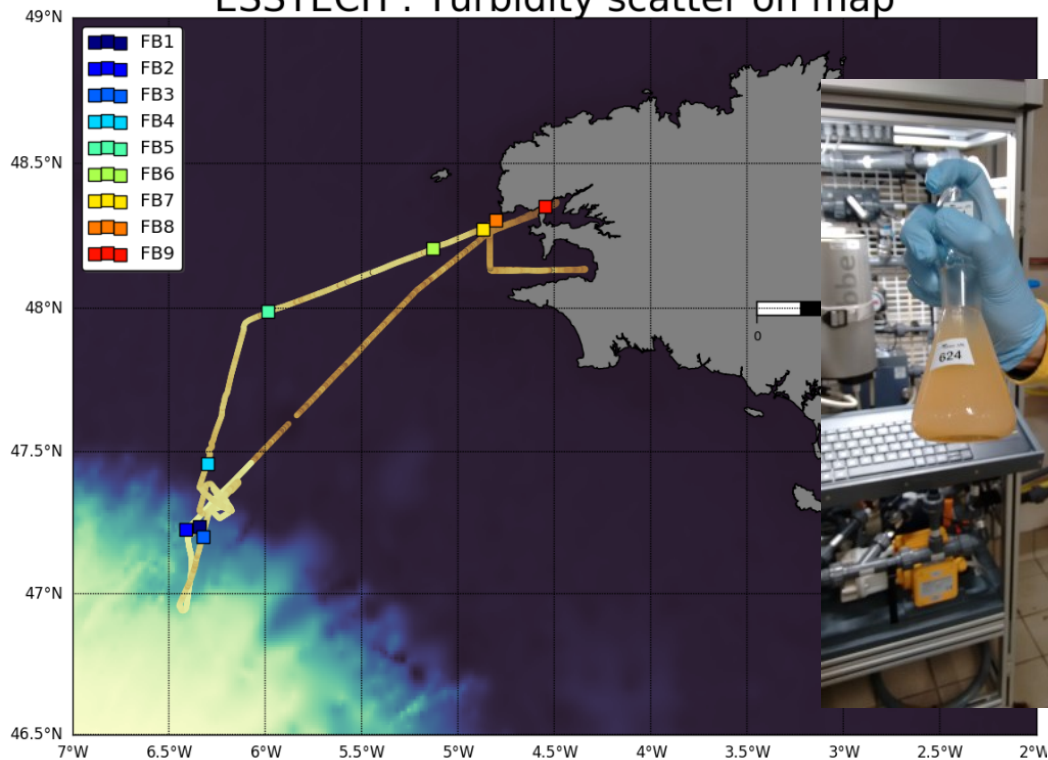
- Oxygen measurement ? → Yes on ARGO float
- Turbidity ? → some on on coastal observatory, CTDs
- Fluorimetry ? → “*measurement of biology is really complicated*”

Let’s try to find a good protocol to validate and to control those sensors !

Cruise trials

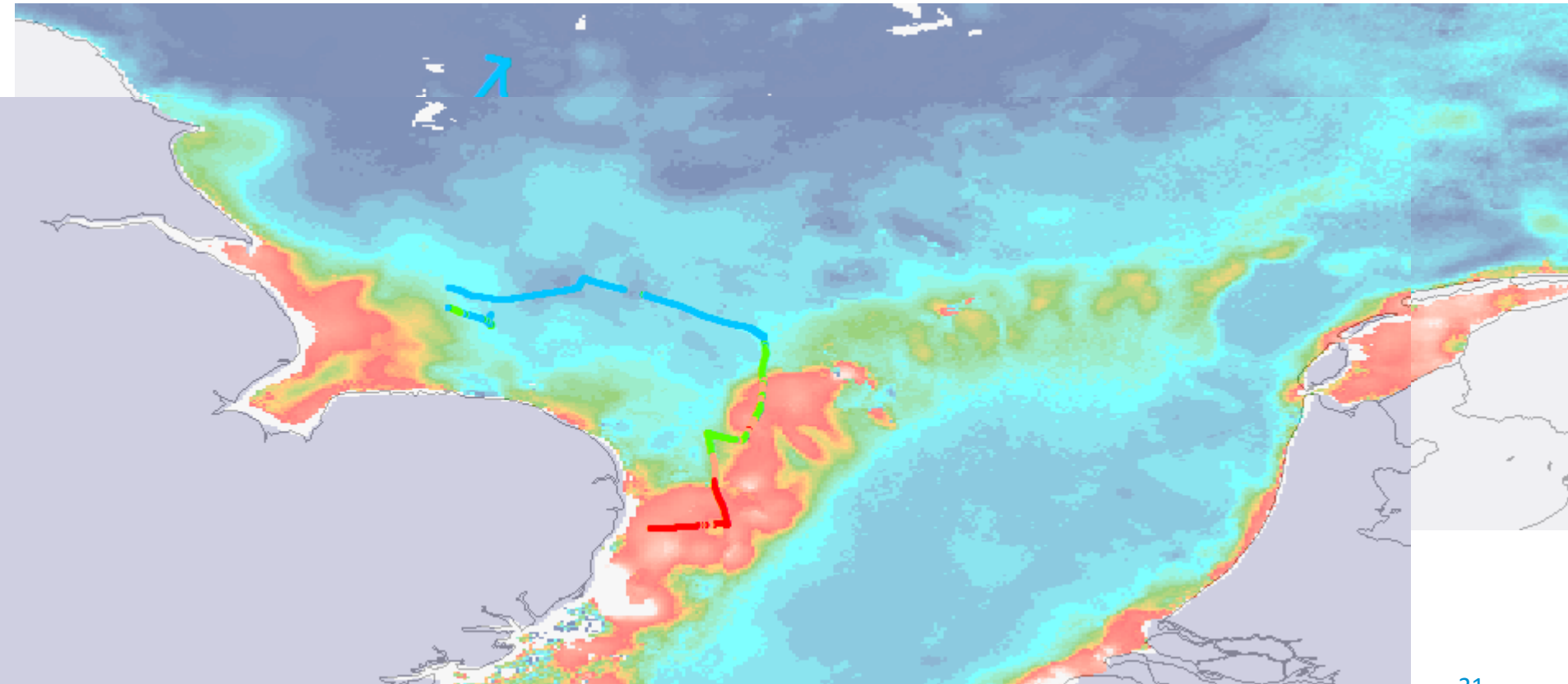
Salinity, Oxygen, Turbidity, Fluorescence ...
 Cross-comparison Ferrybox + PocketFerrybox ...

ESSTECH : Turbidity scatter on map

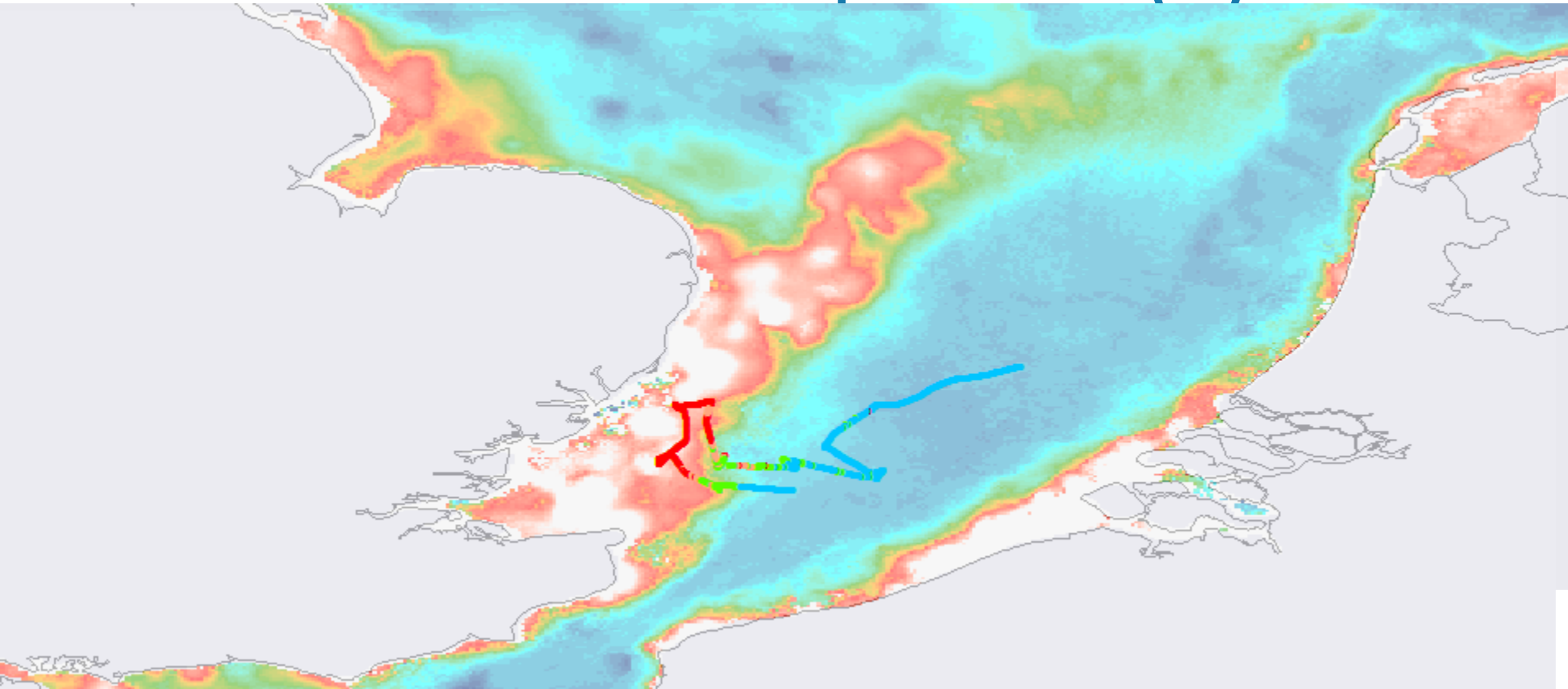


October 16th 2018

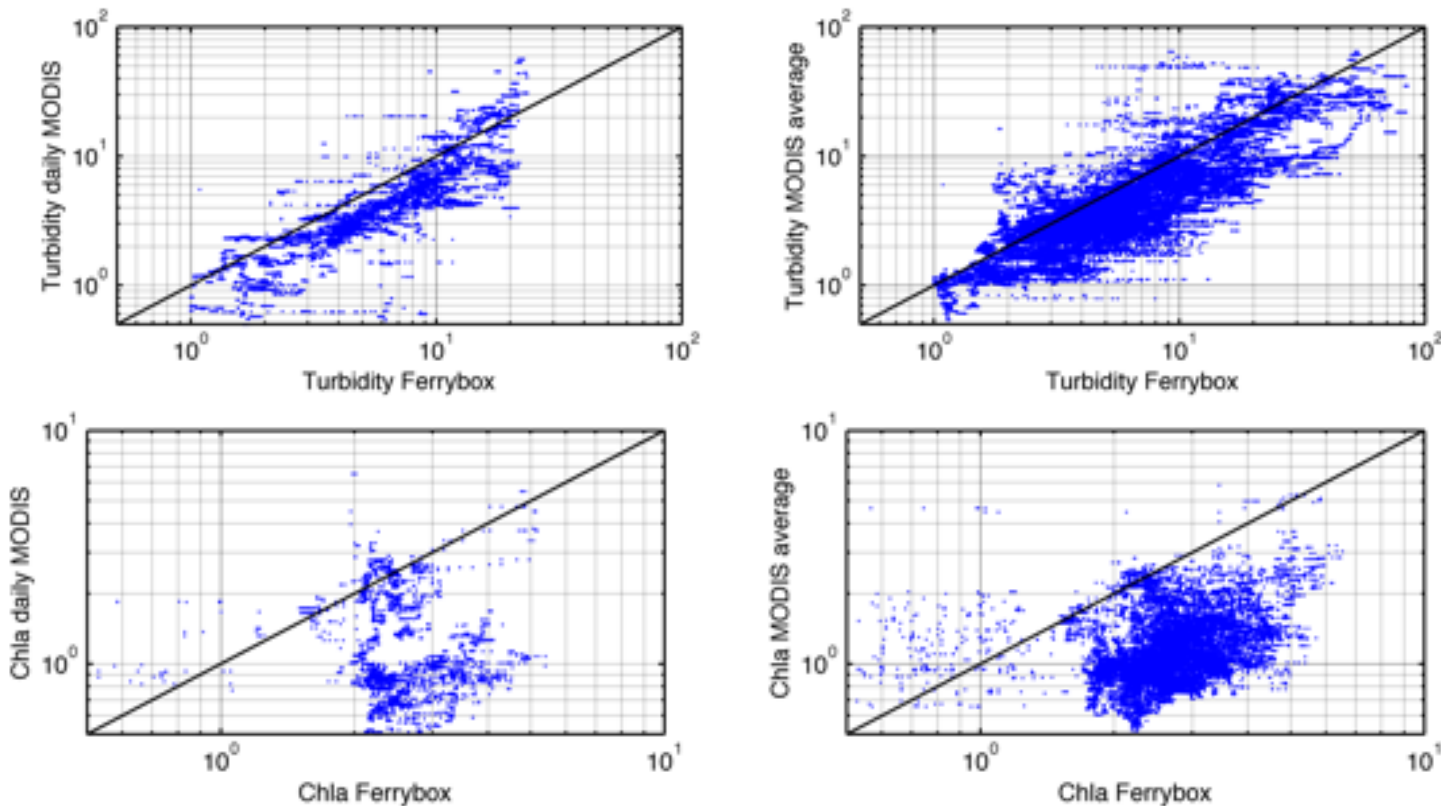
Satellite comparison (1)



Satellite comparison (2)



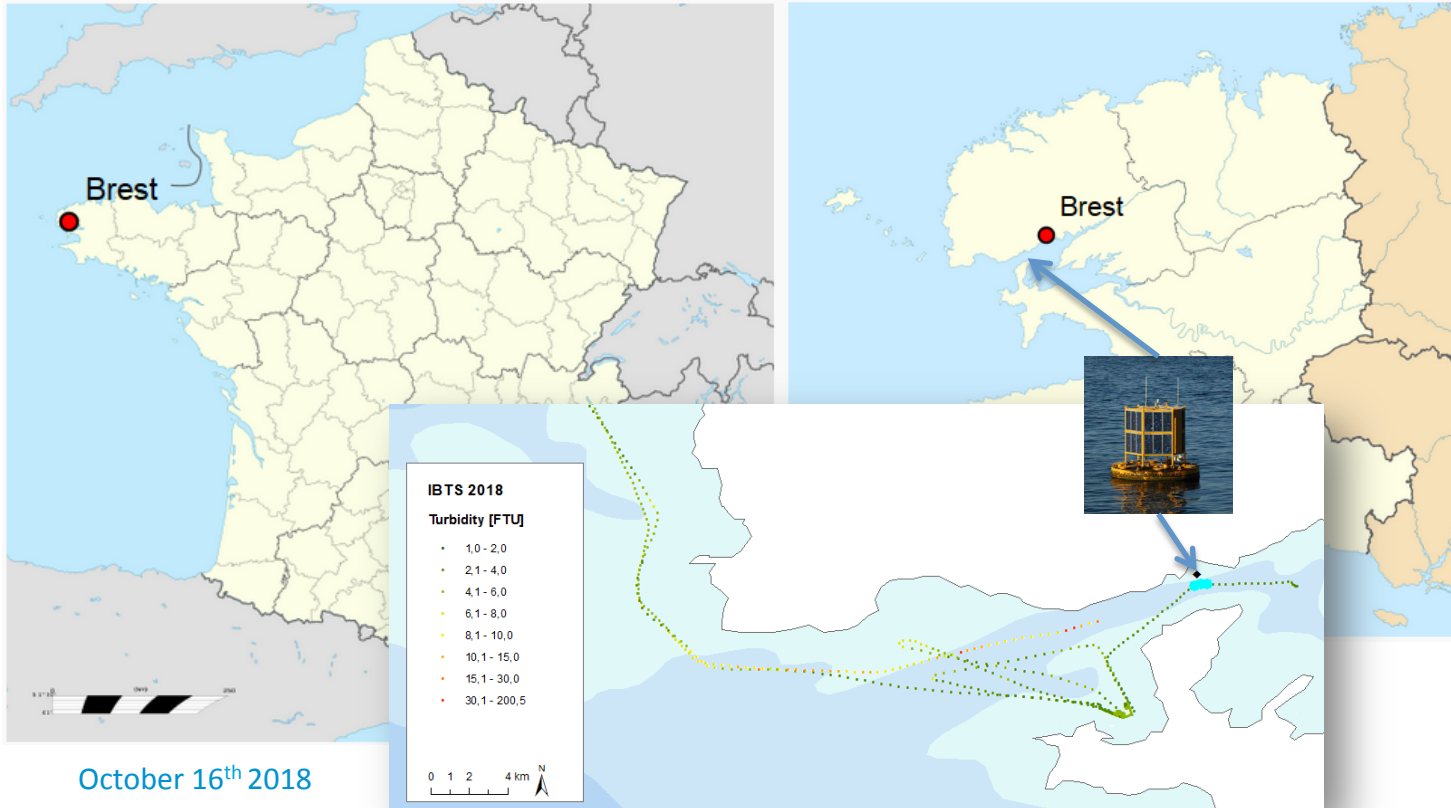
Sattelite comparison(3)



Comparison to a buoy

Thalassa comes back to Brest harbour each 6 weeks

On the way of *Thalassa* [MAREL Buoy](#) (High frequency monitoring of a coastal marine environment), acquires the same parameters as *Thalassa's*



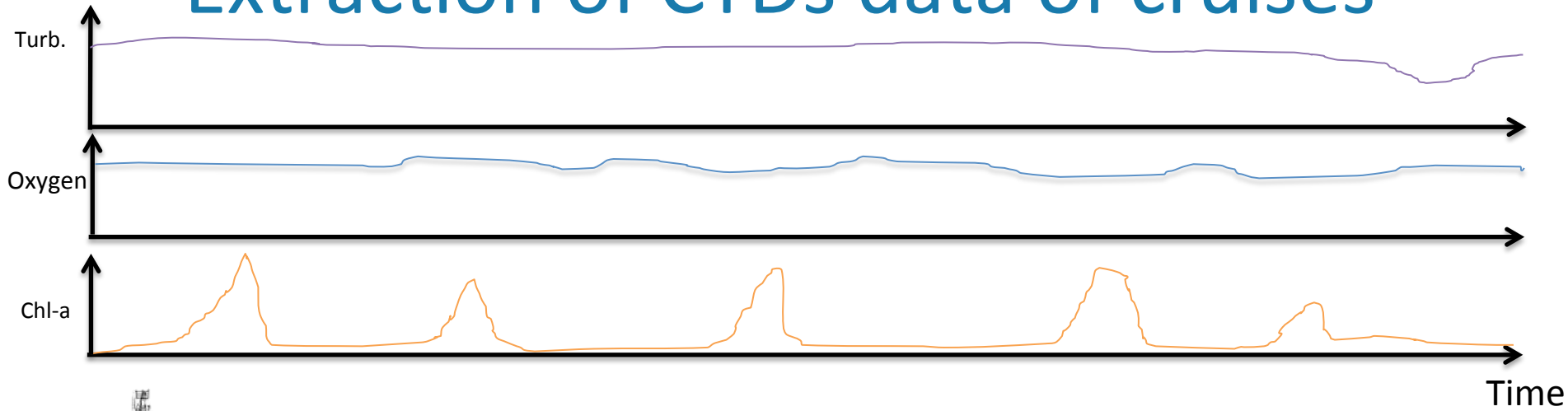
Objective: compare *Thalassa*/MAREL data when *Thalassa* is in front of the buoy to check health of sensors.

Problem identified : Marel data are delayed
Impact of tide

Initiated by A.Ritzmann (NLWKN)

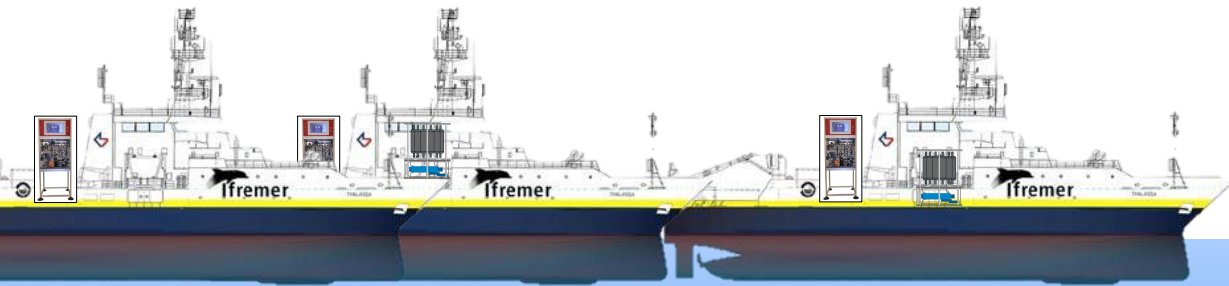
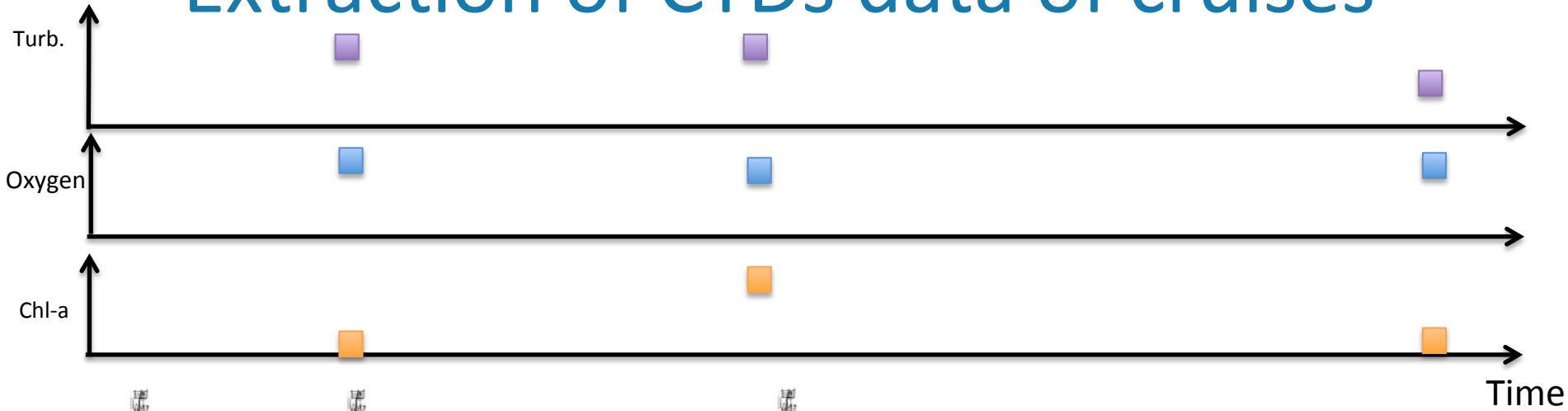
Status: *in progress* (waiting for several time series)

Extraction of CTDs data of cruises



Ferrybox “underway”

Extraction of CTDs data of cruises



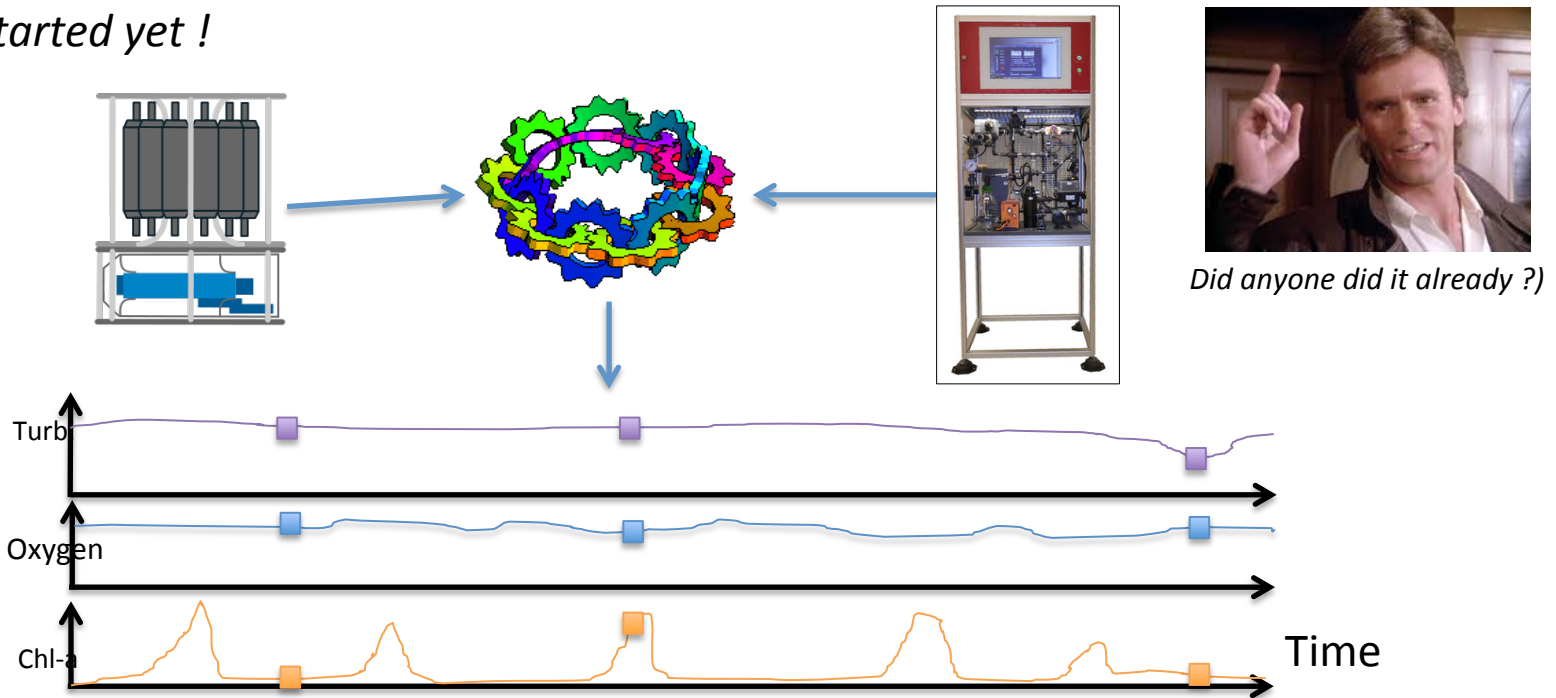
CTD "at stations"

Extraction of CTDs data of cruises

Objective: create a "simple" routine to extract Turb, Oxygen, Fluo and all data of CTD at -5m, from all *Thalassa* Cruises

Output: a time serie file (netcdf) and be able to compare those CTD data to the ferrybox

Status: *not started yet !*





THANK YOU

