



FLOTTE  
OCÉANOGRAPHIQUE  
FRANÇAISE  
PAR L'IFREMER

## *Ifremer Fleet updates*

17 october 2023

[www.flotteoceanographique.fr](http://www.flotteoceanographique.fr)

La Flotte océanographique française,  
une très grande infrastructure de recherche opérée par l'Ifremer

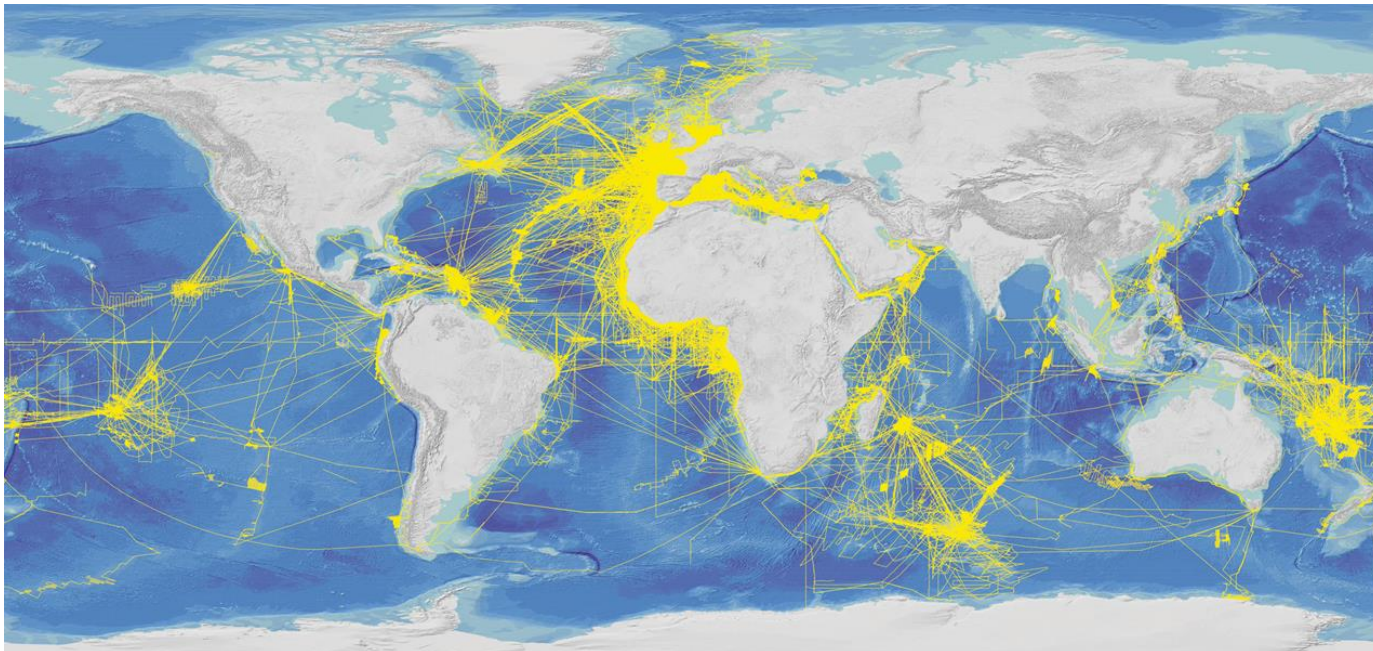


# French oceanographic fleet updates

1. The French oceanographic fleet, in less than 2 minutes ...
2. New Atlantic regional Vessel (see following presentation)
3. Modernisation of the *Pourquoi pas?*
4. A new vessel for the Western Pacific
5. Surface drones : ongoing experiments and prospects
6. A large-scale foresight project to define the oceanographic fleet of the future: horizon 2035



## Some key figures



# Modernising the *Pourquoi pas?*

Carrying out major upgrades and maintenance work to enable the ship to continue its missions for another twenty years or so:

- Dealing with obsolescence (numerous items of equipment reaching the end of their service life).
- Install new scientific equipment to meet user requirements.

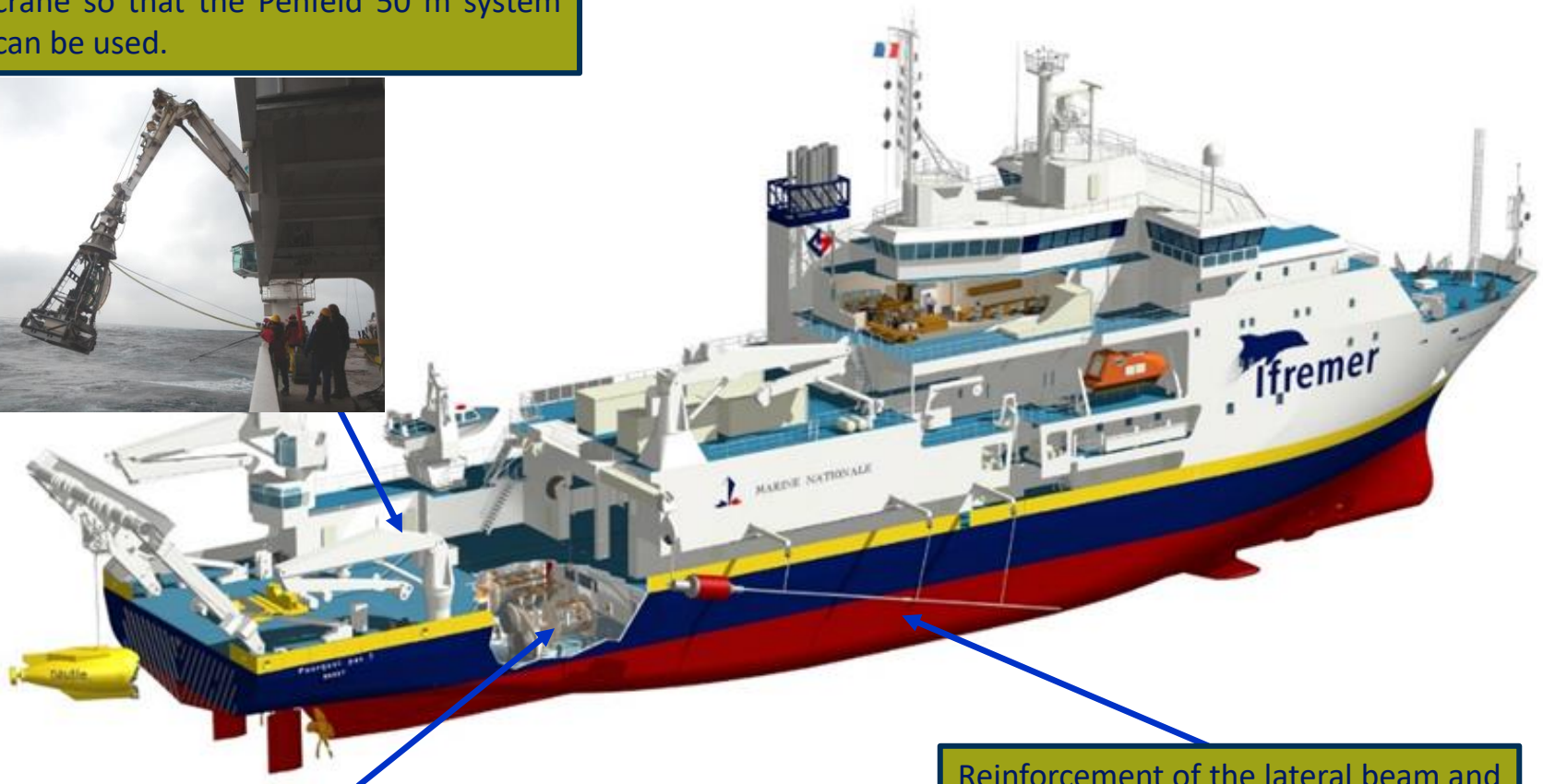
Project investment budget: €25m, of which 45% are subsidised by the French Navy.

Works schedule: November 2024 to June 2025



# Modernising the Pourquoi pas?

Replacement of the oceanographic crane so that the Penfeld 50 m system can be used.

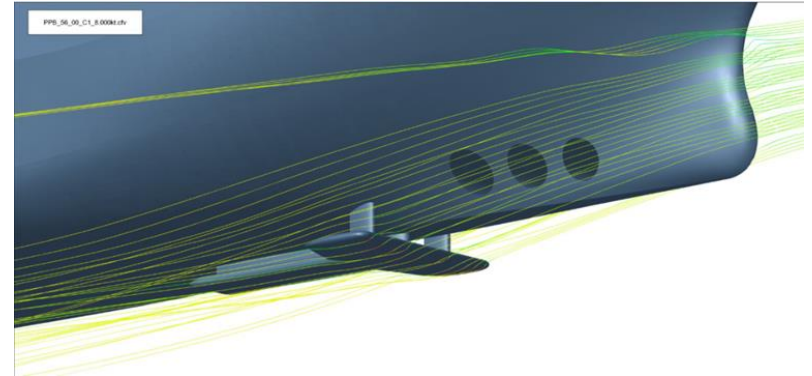


Replacement of the deepwater winch: 2 new 15-tonne capstans combined with 4 new 8,000-metre cable storage units (Dynema, steel, opto-electroporteur).

Reinforcement of the lateral beam and upgrade to a 30-tonne pull-out capacity for routine operation of a 36-metre corer, with an option to extend to 50 metres.

# Modernising the Pourquoi pas?

- New gondola with new / updated acoustic echosounders:
  - Multibeam: EM 124, EM 712
  - Splitbeam: EK 80 (18, 38, 70, 120, 200, 333 kHz).
  - ADCP: RDI OS 38, OS 75 + Kongsberg EC 150.
  - SBP IXBLUE Echoes 3500
  - Other equipment: Phins, Posidonia, GPS, gravimeters...



- IT and communication equipment upgrade.
- New installations for meteorological measurement.
- Physical measurement: Ferrybox.
- Scientific control room rearrangement.
- Laboratories and sounder room refit.



# Modernising the Pourquoi pas?

## Maintenance work.

- Replacement of the electric motors control systems and the Energy Control System.
- Replacement of the dynamic positioning system.
- Upgrading of navigation equipment.
- Conventional maintenance work: mechanical, hydraulic, electrical, piping, sheet metal work, painting.



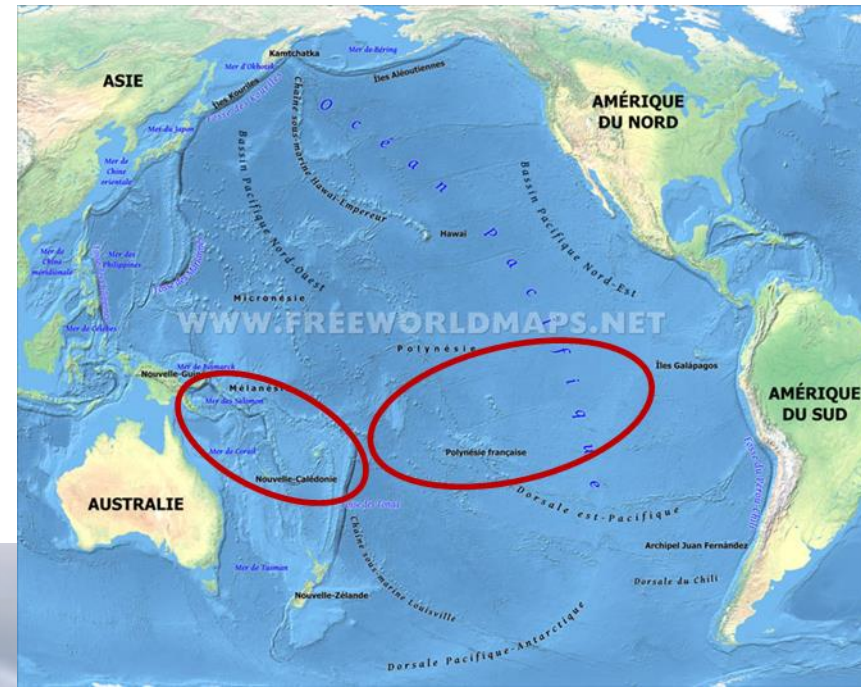
## On the environmental front:

- Certification of diesel alternators to switch to B30 diesel,
- Preparation of an earthed power supply system (to be installed in 2027),
- Replacement of the air conditioning management system,
- Overhaul of the waste treatment system.

# Arrival of Antéa in New Caledonia

**Antéa (35)** arrived in December 2022 from France to replace **Alis (30m)** as a permanent mid-shore vessel in the Western Pacific

Based in Nouméa, New Caledonia, it operates in the south-western Pacific Ocean, from French Polynesia to Papua New Guinea. It conducts campaigns in the fields of geology, physics, chemistry and biology.

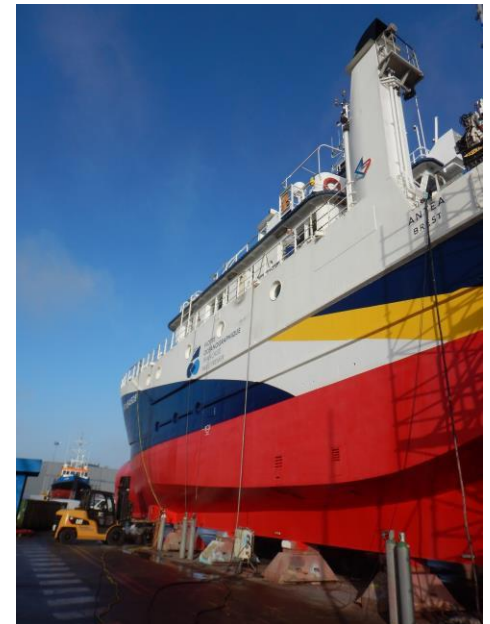




*Antea* is a 35-metre aluminium catamaran delivered in 1995, which has sailed mainly in the equatorial Atlantic, the Mediterranean and the Indian Ocean.

In order to make her fit to sail another 5 to 10 years in the Western Pacific, major work was carried out before she left France, to adapt her to her new missions:

- Replacement of all the scientific equipment.
- Adapting the ship to be able to operate the Ariane HROV and the Ulyx AUV.
- Modernisation of interior fittings and air conditioning.
- Modernisation of the air conditioning system.
- Reducing the environmental footprint



## Integration of broadband single-beam echosounders & ADCP



Access hatches



- EK80 - 18, 38, 70, 120 & 200kHz
- ADCP 75 & 600 kHz



Structure for EM712 1°x2°  
or EM2040 multibeam  
echosounder



Port blister - ¾ bottom view - EM 712 version



Port blister - ¾ bottom view - Version EM 2040

## Reducing the environmental footprint: towards Kite auxiliary propulsion?



Structural integration for 50m<sup>2</sup> kite effort.



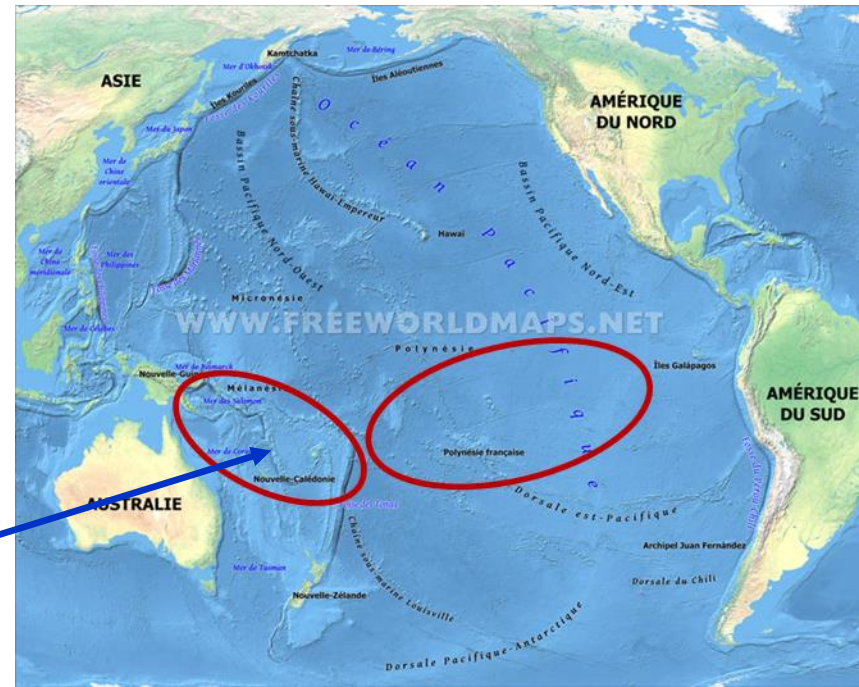
More to come ....

# A new vessel to replace *Antéa* in 2028?

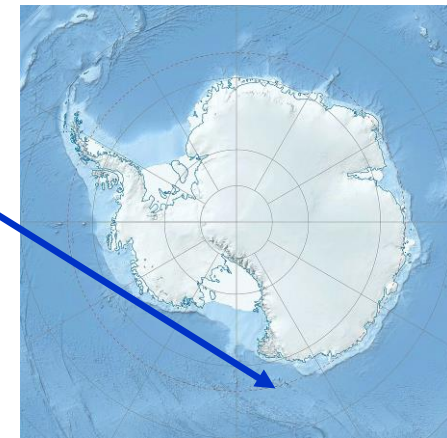
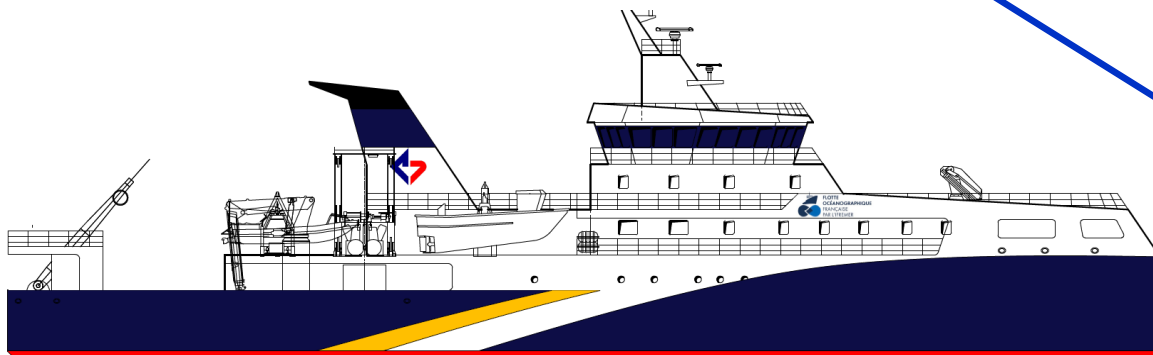
In July 2023, the decision was taken to replace the *Antéa* from 2028 with a larger vessel better suited to the seas encountered.

Two options are still open:

- **Option 1.** A 50-metre vessel for central and western Pacific, carrying around 15 scientists and capable of deploying a full range of underwater equipment and devices at depths of up to 4,000 meters.
- **Option 2.** A 65-metre PC 6 vessel carrying around 20 scientists that would work in the Central and Western Pacific from March to November, and in the Urville Sea (from Hobart) from December to February.



Decision expected before the end of 2023



# Ifremer surface drone trials (2022 - 2023)

## Medium-term outlook for France

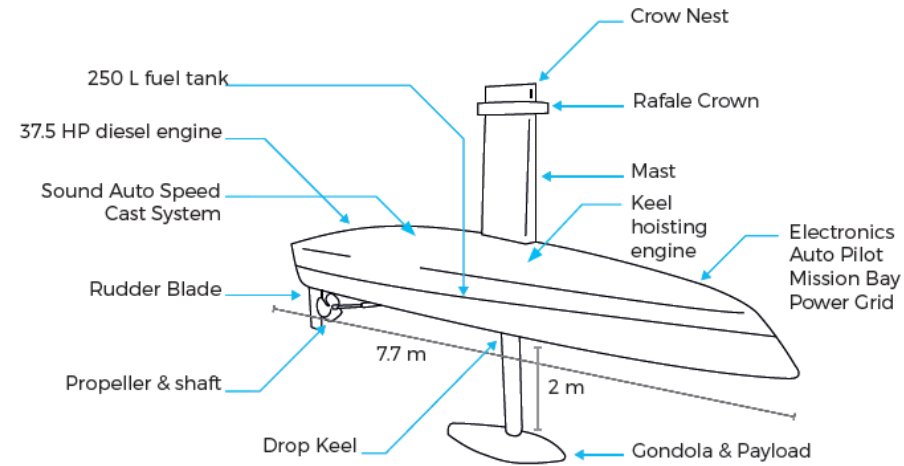
## Pre-selection of a coastal USV's

- **DriX (EXAIL) - Streamline shape**
  - Focussed on behavior at sea (data quality)
  - Matching 65 % of requirements
  - Successful experiments
  - Easily transportable and mobilisable on ships
  - SHOM and NOAA cooperation
  
- **Mariner X (Maritime Robotic) - Mini-supply**
  - Focussed on operationability and cargo capacities
  - Difficult to mobilized on ships
  - Use cases to clarify
  - Scientific evaluation in 2024 with VLIZ
  
- **Souder (Kongsberg) - Standard boat design**
  - Intermediary design
  - Scientific evaluation in 2023 with IMR



## DriX characteristics

- Length : 7.71m
- Width : 0.82m
- Weight : 1.38T
- Draft : 2m
- Speed : 14 knts
- Propulsion : 38cv
- Autonomy : >3 days
- Retractable keel
- >20 units sold



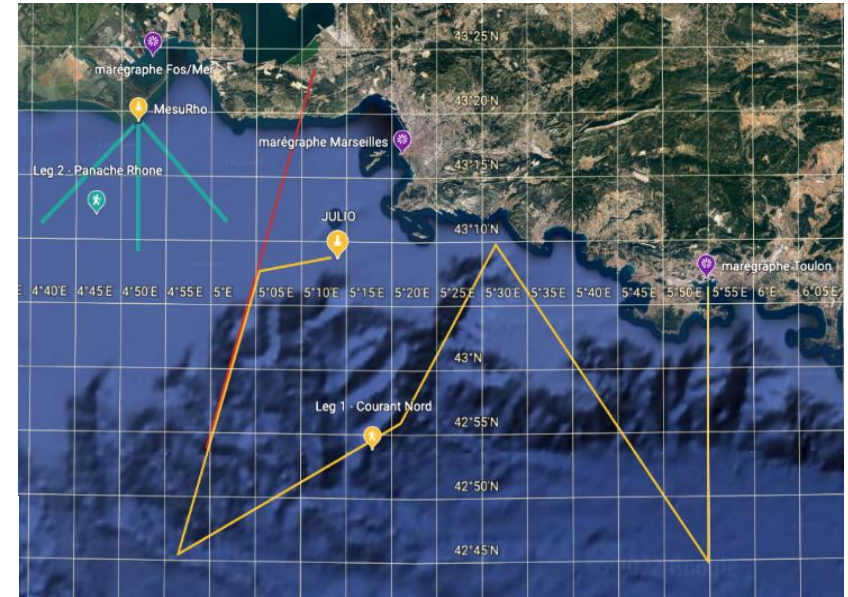
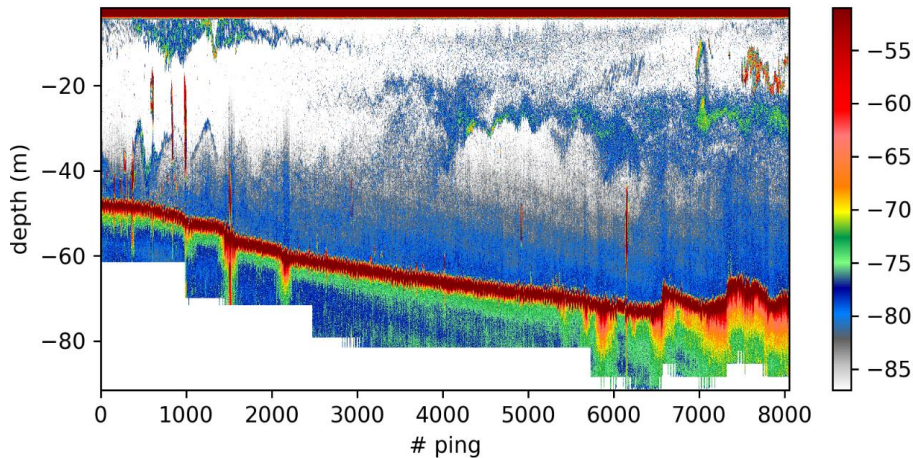


# September 21-25, 2022 - 5 days in Mediterranean sea October 7-9, 2022 - 2.5 days south of Belle Ile – SOLIBOB cruise

## Equipment on DriX

- ADCP 300 kHz
- EK80 70 and 200 kHz
- CTD at the front and at the rear
- Turbidimeter
- CTD on winch
- Meteo station

Sv pulse compressed (dB)  
2022-10-07 16:10:20 to 16:57:30



## Scientific areas

- Physical & optical properties of water
- Currents
- Sea level
- Backscatter
- Meteo

# DELMOGES-Co-occurrence of small pelagic fishes and dolphins to explain accidental capture – February 2023 – 13 days at sea

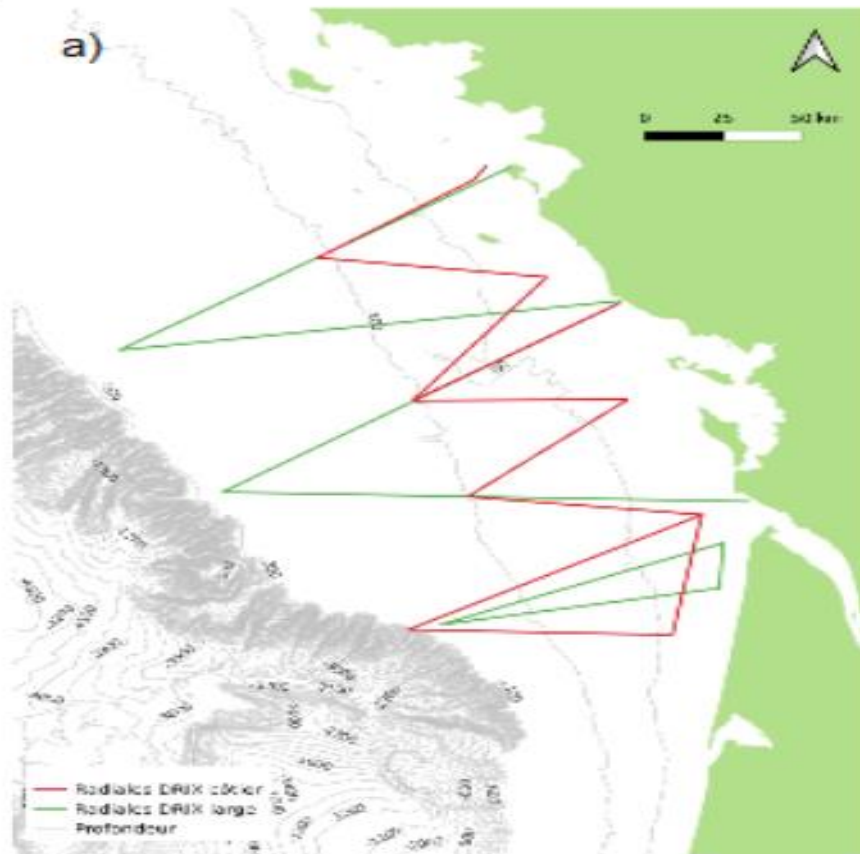
- Air plane for dolphins detection
- Drix survey for fish detection



## Scientific team conclusions

"Without claiming to be able to match the acquisition capacities of an oceanographic vessel, the use of the Drix has made it possible, in addition to other data sources (trawlers, fishing effort data, preliminary knowledge of the area's ecosystems), to provide scientific data relevant to the study in question". M.Doray

- Acoustic acquisition by Drix
- 2 days fishing by a ship of opportunity



- Golf of Bisquay
- 3 days meteo standby
- 1100 NM at 7-9 knts

## Drix equipment

- SBES EK80 70 kHz
- SBE EK80 200 kHz
- Hydrophones
- CTD
- Turbidimeter

# C-SWOT cruise 17-22 April 2023 - Mediterranean sea

## Scientific objectives

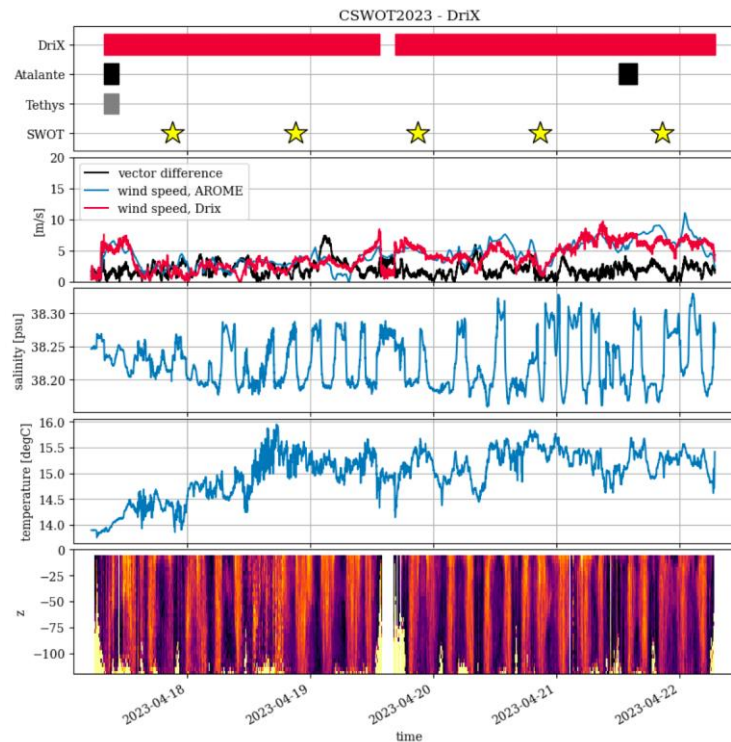
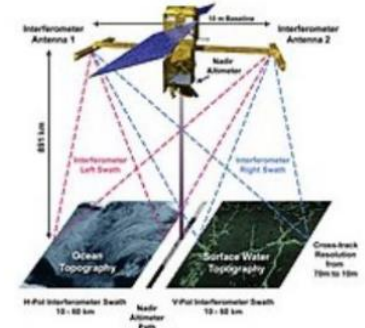
- Calibration of SWOT satellite
- North current variability data

## Complementing 2 R/V with DriX

- ADCP measures
- Underway CTD
- Meteorological observations
- Underway sea level data

## Scientific team conclusions

"The use of a surface drone as part of the CSWOT2023 campaign and the launch of the SWOT satellite mission has been a success from an operational point of view and a very substantial addition from a scientific point of view that will certainly be exploited in the coming year". A. Ponte



## General conclusions

### ➤ **Successful cruises with DriX**

- High scientific data quality comparable with vessels
- Operable in open water by sea state 4/5 : comparable with coastal vessels
- Operable from port to port
- At sea behavior remarkable and fully operational

### ➤ **DriX cruises validation**

- Optimisation of ship time (DELMOGES)
- Data densification (SOLIBOB and SWOT)

### ➤ **Shared experiments to come**

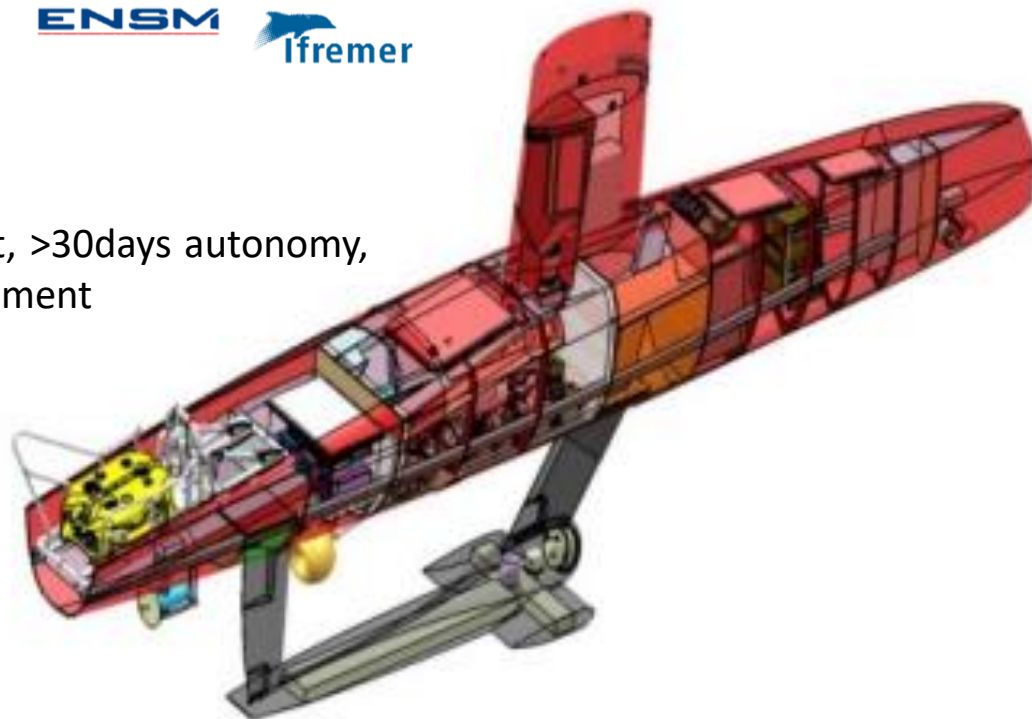
- Mariner X (Maritime Robotic) in 2024 with VLIZ
- Sounder (Kongsberg) with IMR, end 2023

# Perspective for oceanic drone : SEMNA project and France 2030

## SEMNA Project signed – Collaborative work with EXAIL Leader



- Collaborative project 2022-2024
- Development of **DriX Ocean** : 15m, >5t, >30days autonomy, deep water payload, small ROV deployment



## France 2030 (if accepted, 2024 – 2027)



- 2 Drix Ocean
- Exploration of abyssal plains + surveys of high volcano-seismic risks areas
- Bathymetric survey, water column survey, currents, physical properties of water, e-DNA,...
- Launching of a small AUV for precise survey

# Drone project : A whole

## Carriers

**Shore Infrastructure** : Control room for multi-facilities cruise coordination(vessels and USV)

## Protocols, procedures and software tools

- General mission management – supervision
- Checking the drone's scientific equipment
- Monitoring scientific data acquisition
- Managing data flows from the ship or drone to archiving

## New cruises strategies and new way of thinking



**“Imagine the French oceanographic fleet in 2035”**

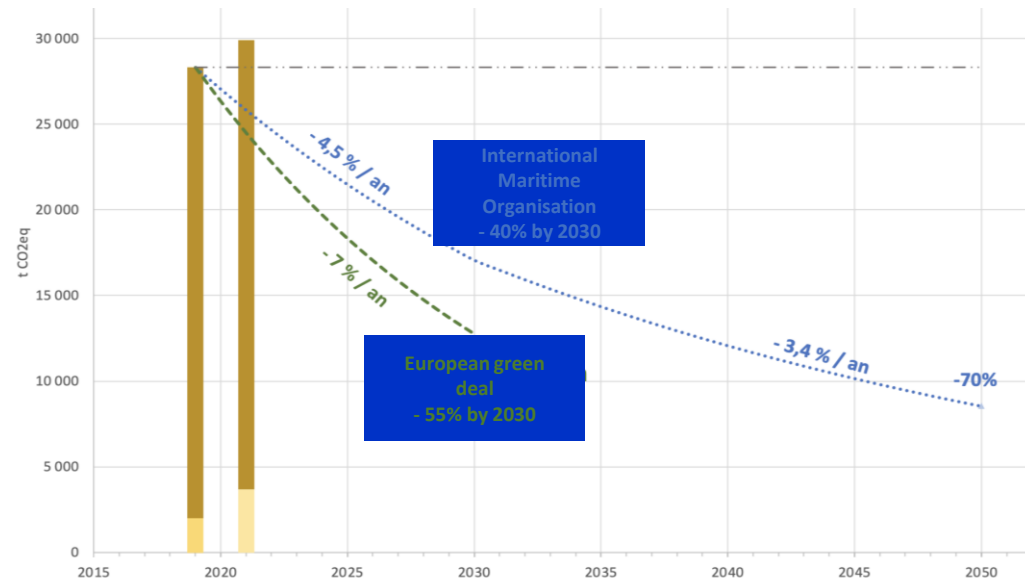
# Global foresight exercise : “Imagine the oceanographic fleet in 2035”

## Why ?

- Growing awareness in the research community of the need to take account of the environmental impact of scientific activities
- Rising energy prices, shortages and a general increase in costs.

## Objective by June 2024

- A renewal plan for the French oceanographic fleet that will enable us to decarbonise our activities while maintaining a high level of service.



Total GHG emissions from ships are at least 30 000 teqCO<sub>2</sub>, of which :

- 25 000 t for 4 global class ships
- 5 000 t. for 6 regional/coastal ships



# Global foresight exercise : “Imagine the oceanographic fleet in 2035”

***An inventory shared with users of possible solutions to change the way oceanographic campaigns are conducted***

***Improving the assesment of the CO2 footprint***

- Including as many emission items as possible in the GHG balance sheet : waste, freight, travel, data storage, ...
- Making data available to scientists
- A simulation tool for GHG emissions from a campaign

***WP 1 - Identifying future scientific needs***

- Physical ocean and biogeochemistry
- Paleoclimatology
- Marine geosciences
- Marine biology
- Fisheries science
- Teaching

***WP 2 – Future technologies and ships***

- State of the art in ship decarbonisation technologies
- Thinking and designing next global class research ship
- Working group on sailing ship for oceanography
- Unmanned surface vehicle (USV)
- Telepresence
- Underwater systems

***WP 3 - Updating our partnership strategy***

- at national level
- at European level by continuing to build strong European cooperation
- at international level, with a global analysis of the deployment of oceanographic fleets in the Indian, Pacific and polar regions

# Global foresight exercise : "Imagine the oceanographic fleet in 2035"

