FLOTTE
OCÉANOGRAPHIQUE
FRANÇAISE
PAR L'IFREMER

FRENCH OCEANOGRAPHIC FLEET
MAIN PROJECTS UPDATES

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25 september 2024

Agenda

1 – Mid-life refit of RV Pourquoi Pas?

2 – New Atlantic & English Channel regional vessel – Anita Conti

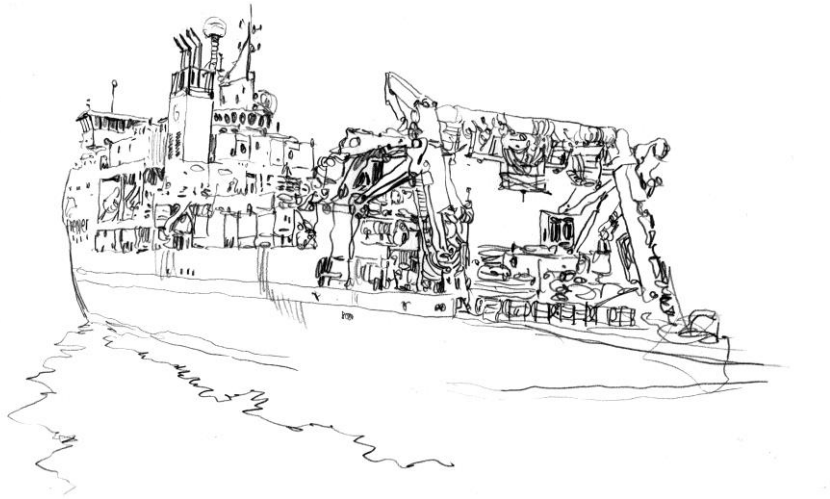
3 – Integration of USV in the fleet

4 – New Pacific & Antarctic regional vessel

5 – Underwater technologies update

1

MID-LIFE REFIT OF RV POURQUOI PAS?



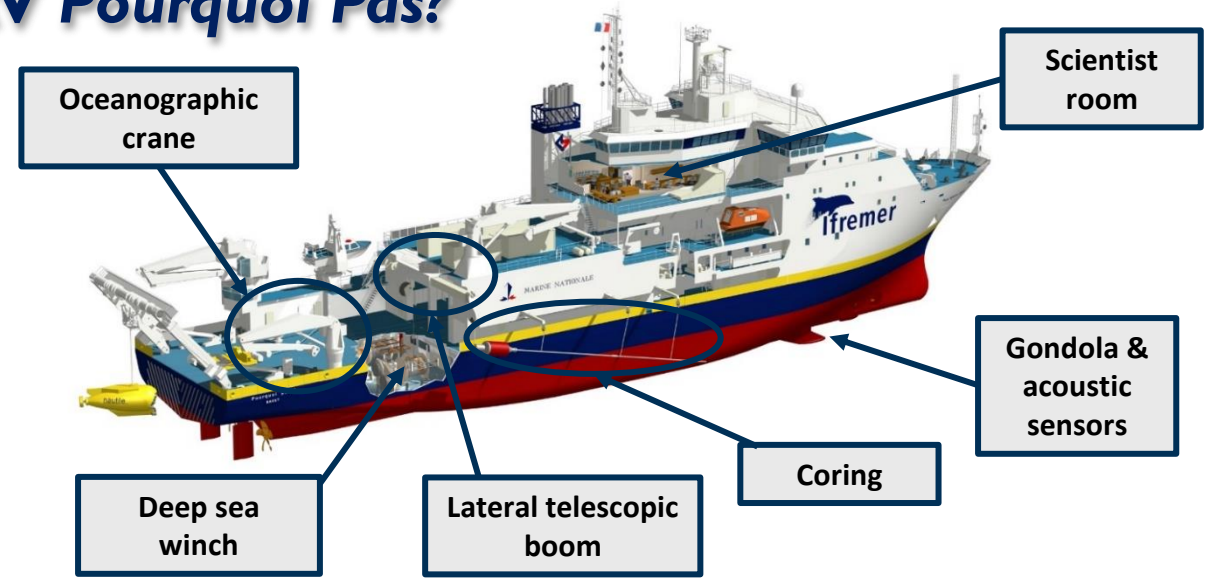
Mid-life refit of RV *Pourquoi Pas?*

General overview:

- **Objectives :** Mid life maintenance and evolutions to allow the vessel to perform its missions during the 20 coming years
- **Shipyard:** Remontowa (Poland).

Maintenance works:

- Replacement of Wärtsilä diesel engine Power Management System.
- Control command system modernization and maintenance of the electrical propulsion motors.
- Dynamic positionning system replacement.
- Navigation equipment upgrade.
- Waste management system upgrade with an objective of no sea or atmosphere release.
- Usual maintenance : mechanic, hydraulics, electrical, piping, steel replacement, painting.



Modernisation works:

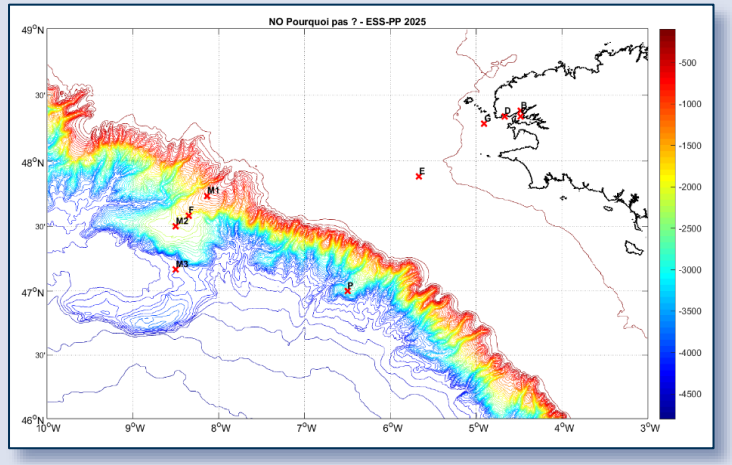
- Lifting appliances evolution:
  - Deep sea 4 drums winch replacement,
  - Oceanographic crane replacement,
  - Lateral telescopic boom evolution,
  - 36 m coring capacity reliability works.
- New boiler, heater & heat exchanger
- New gondola and acoustic sensors (Kongsberg EM 124, EM 712, EK 80, EC 150, ADCP OS38 & 75…).
- Upgrade of different sensors & ancillaries: MRU & satcom.
- Scientist room renewal, laboratories maintenance and upgrade.

Mid-life refit of RV *Pourquoi Pas?*

Planning :

- **Pre-yard works : → up to October 2024**
  - Shipyard engineering follow-up.
  - External suppliers follow up (Kongsberg, Kleyfrance, Wärtsilä, GE, Barillec).
  - Vessel setup : vessel alongside in Brest during October 2024.

- **Shipyard works : November 2024 – April 2025** (Remontowa, Gdansk, Poland)
  - Nov-Dec 2024 : maintenance & accommodation works.
  - Jan-Feb 2025 : dry-dock, new gondola and acoustic equipment fitting, new equipment installation.
  - March 2025 : new equipment installation, control command system upgrade, diesel engine & propulsion motor start-up.
  - April 2025 : shipyard quay and sea trial.



- **Operational trials : Mai – June 2025** (Brest & Bay of Biscay)
  - May-June 2025: operational sea trials for scientific equipment (coring, crane, LARS, etc.) acoustic equipment calibration

- **Back at work**: summer 2025

- **Warranty works period : November 2025**
  - 3 weeks alongside for the shipyard and suppliers to close warranty claims if required

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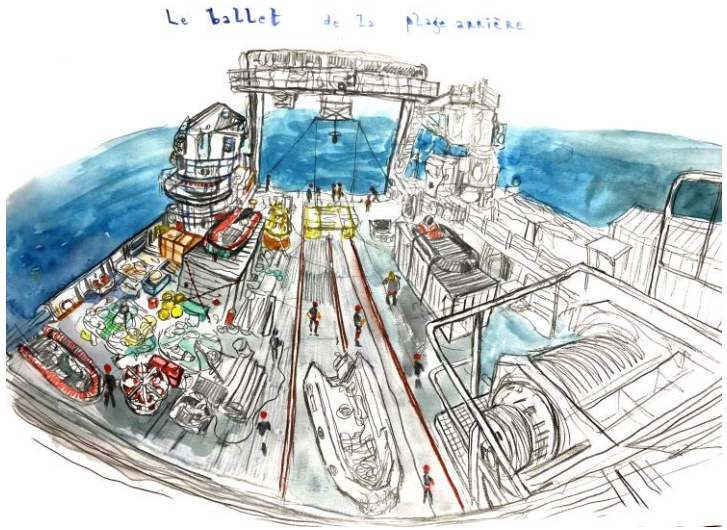
NEW ATLANTIC & ENGLISH CHANNEL REGIONAL VESSEL *ANITA CONTI*

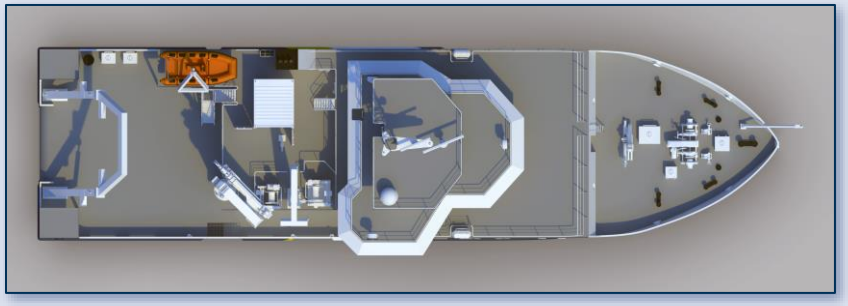


New Atlantic & English Channel regional vessel – *Anita Conti*

Remplacement of RV *Thalia* :

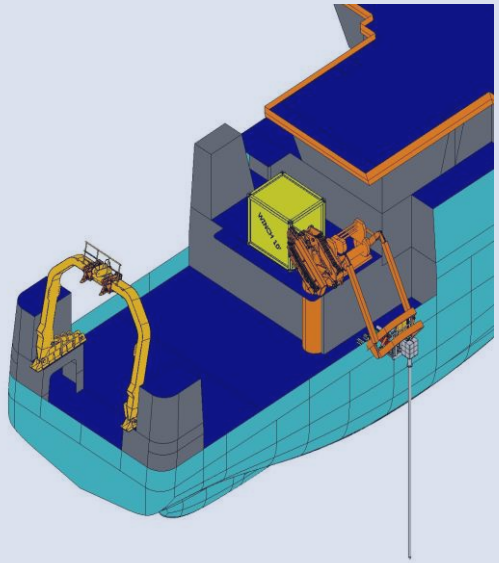
- **Scientific missions**
  - Physics and biogeochemistry
  - Biology and ecology of ecosystems
  - Sub marine research
  - Fisheries ecosystems and technologies
  - Geosciences and paleoclimate/paleo-environment

- **General characteristics**
  - Length 45m
  - Beam 11,5m
  - Pax 22 people (12 crew / 10 scientific)
  - 19 days of autonomy
  - Carbon footprint reduction of 30%
  - Low consumption and silent vessel

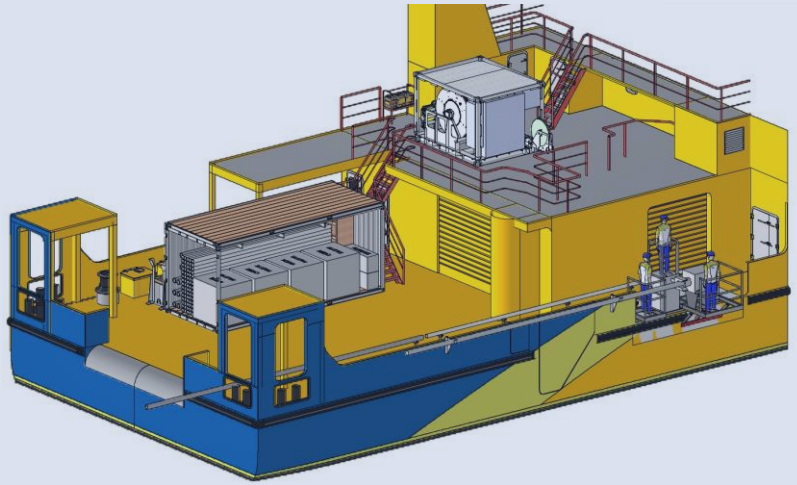


New Atlantic & English Channel regional vessel – *Anita Conti*

- **Equipment on keel or gondola**
  - Kongsberg EK80 Sounders — 18, 38, 70, 120, 200 & 333 kHz
  - Multi beam echo sounders — EM712 0,5° x 1°
  - Sub bottom profiler — IxBlue T3
  - ADCP — 75, 300 & 600 kHz
  - Fishery trawl and net monitoring device — Marport equipment
  - Ultra short baseline (USBL) positioning device — GAPS (mobile equipment)



- **Deployment capability**
  - Underwater equipment
    - Ifremer 3000 m & 6000 m rated AUVs
    - Ifremer 2500 m rated Hybrid ROV
  - Light Ifremer seismic equipment
  - Coring
    - 10m piston coring
    - Vibrocorer
  - Fishing gear



New Atlantic & English Channel regional vessel – *Anita Conti*

- **Planning**
  - First steel cut 24 April 2024
  - First block laid 12 July 2024
  - Currently, 4 blocs on the slipway for assembly
  - Next 4 blocks under construction
  - Launch in February 2025
  - Vessel delivery end of 2025
  - Active service admission mid-2026

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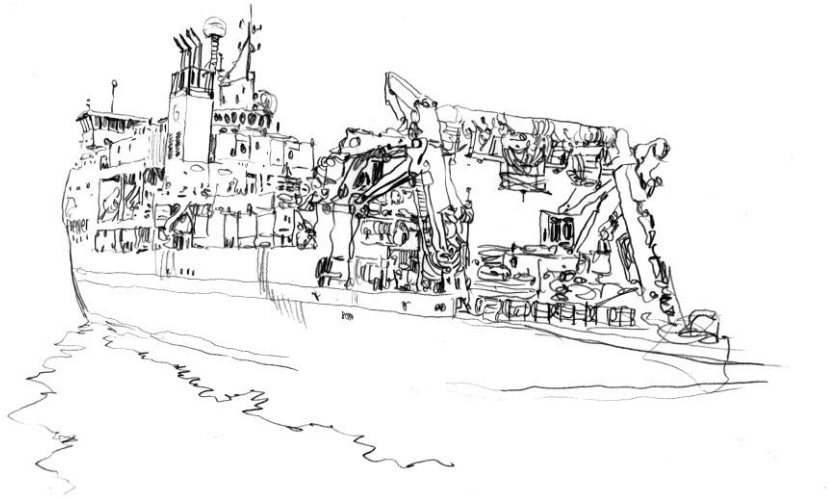
INTEGRATION OF USV IN THE FRENCH FLEET



Integration of USV in the French fleet

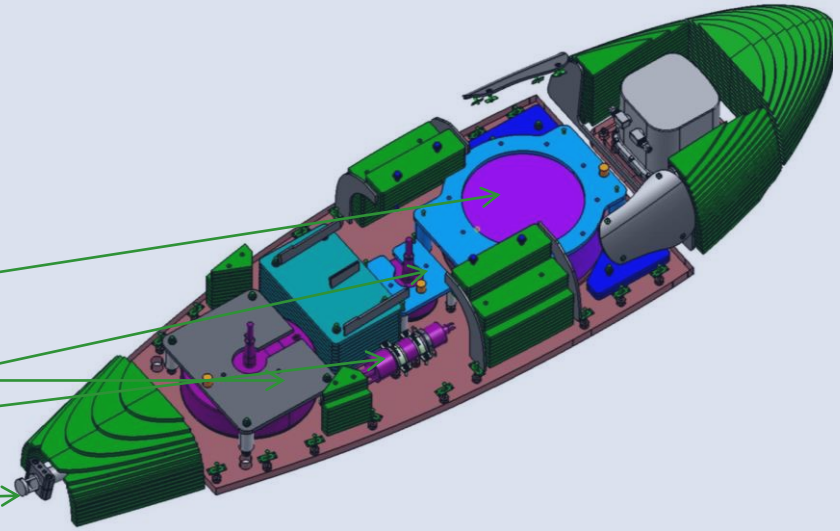
- Since 2022, new approach to evaluate the opportunity and benefit of USVs in the French Oceanographic Fleet
- Benchmark of medium & large USVs
- Regulation surveillance
- Scientific teams approach to increase awareness
- Demonstration missions with Exail DriX

Integration of USV in the French fleet

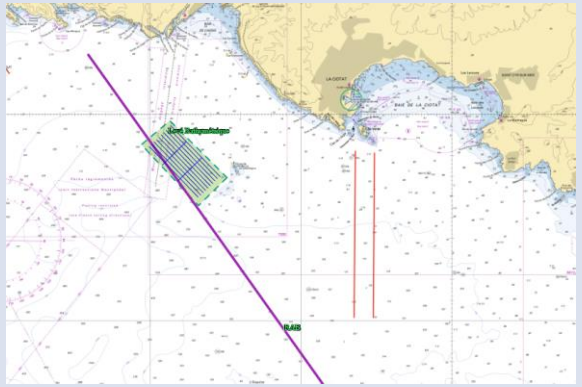
- **Mission ESSDriX « Fish stock assessment » 11-15 November 2021 in Mediterranean sea**

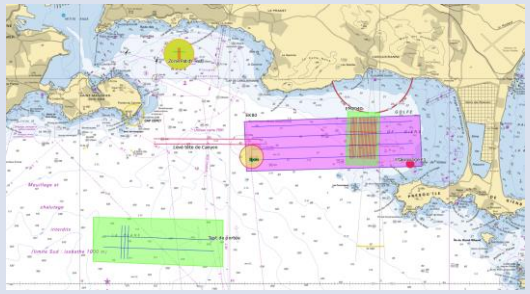
Inter comparison DriX – R/V L'Europe

Equipment on DriX



- MBES EM2040C Kongsberg.
- EK80 70 and 200 kHz with WBT Mini
- Hydrophone IcListen HF
- Mini SVS

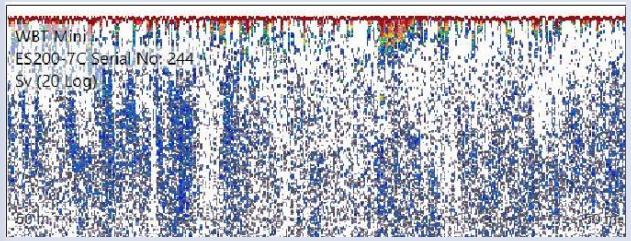


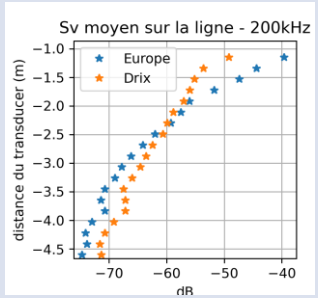


Integration of USV in the French fleet

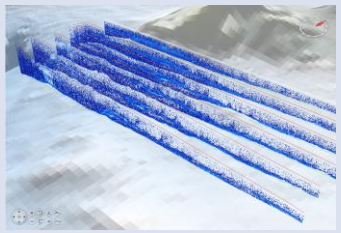
Bubbles sweep down

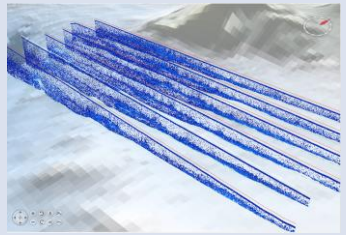
Bubbles : % of false pings : *L'Europe* 17%, DriX 18% - Similar results

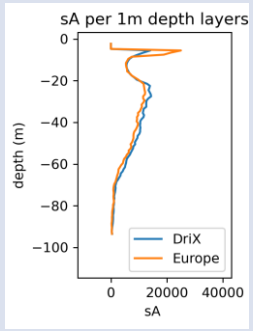




Plancton quantity – EK 80 70kHz



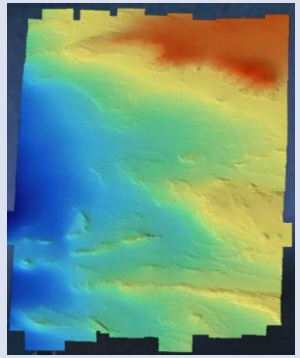




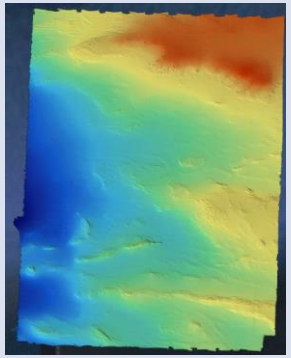
EM 2040 bathymetric survey

Similar quality
Higher speed with DriX

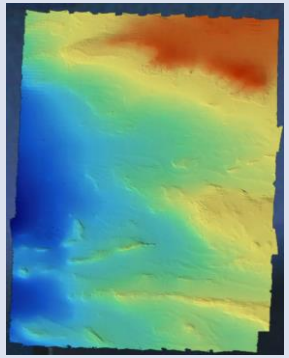
***L'Europe* 8 knots**



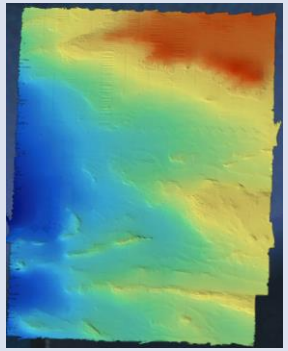
DriX 8 knots



DriX 10 knots



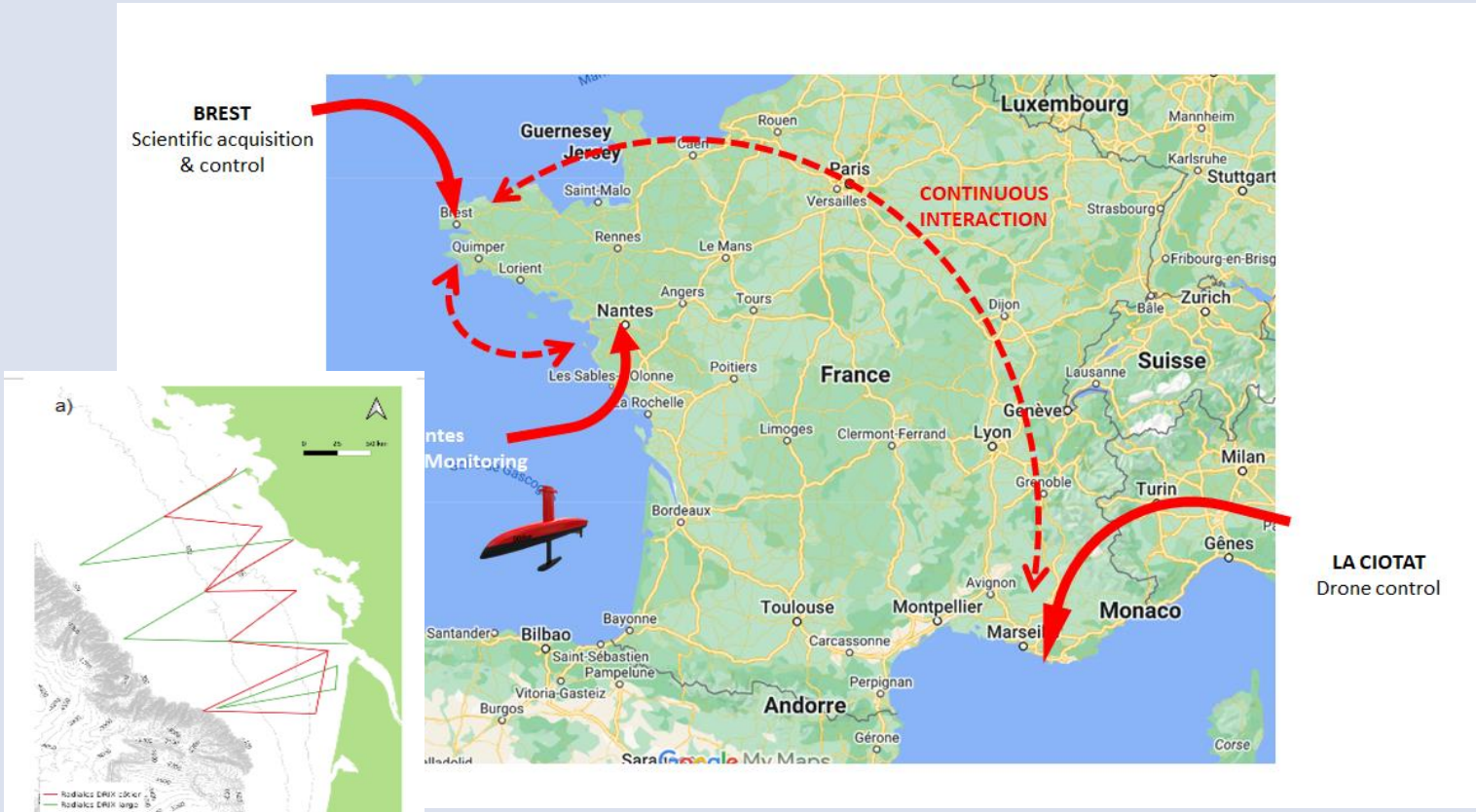
DriX 12 knots



Integration of USV in the French fleet

DELMOGES-Co-occurrence of small pelagic fishes and dolphins to explain accidental capture

- Air plane for dolphins detection
- Drix survey for fish detection
- Acoustic acquisition by DriX
- Golf of Bisquay
- February 2023
- 13 days at sea
- 3 days meteo standby
- 1100 NM at 7-9 knts
- 2 days fishing by a ship of opportunity



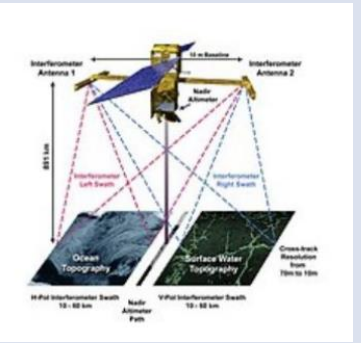
DriX equipment

- EK80 70 kHz & 200 kHz, Hydrophones, CTD, turbidimeter

Integration of USV in the French fleet

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

- Scientific objectives
  - Calibration of SWOT satellite
  - North current variability data
- Joint mission between RV L'Atalante (85m), RV Tethys (25m) & DriX
- Complementing R/V with DriX
  - ADCP measures
  - Underway CTD
  - Meteorogical observations
  - Underway sea level data



Integration of USV in the French fleet

- **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 behaviour remarkable and fully operational

- **DriX cruises validation**

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

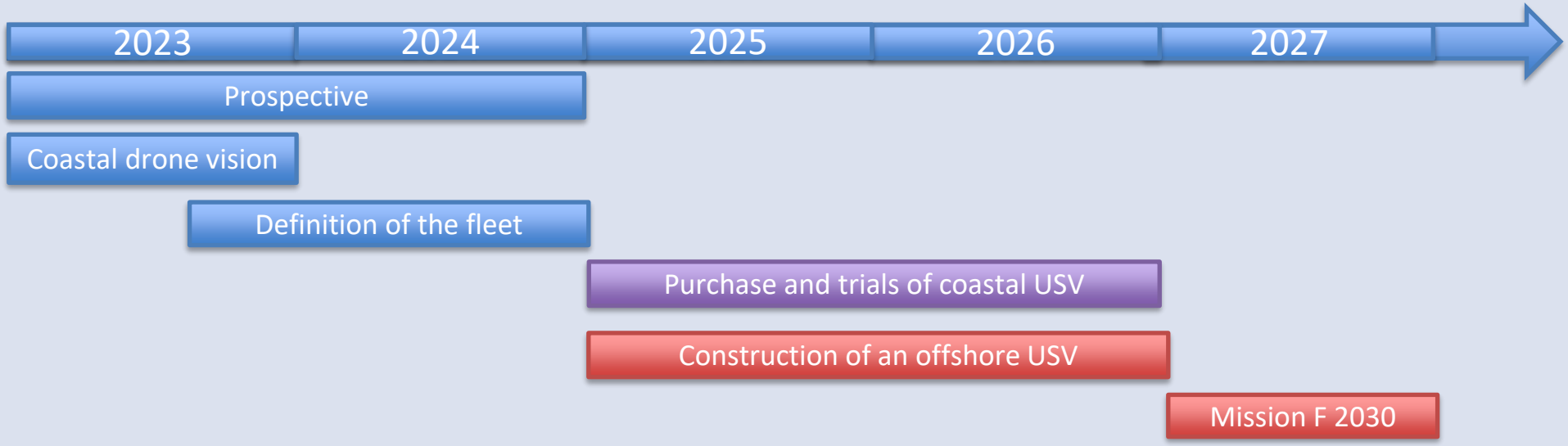
Integration of USV in the French fleet

- **National scientific survey conducted in 2022-2023**

- **70 use cases collected :** ultra near shore, near shore, offshore applications - Standalone or with a RV
  - 70 % without R/V, 20 % with R/V, 10 % unknown
  - 15 % ultra near shore, 65 % near shore, 20 % offshore

- Various thematic
  - Fish ressources
  - Physical oceanography : dynamics of the ocean, sea level measurement, geoide mesurement, satellite cal/val, ..
  - Marine geosciences : tectonics, CH4 monitoring, volcano/seismic hazards, bathymetry, geodesy,..
  - Marine biology – environnement : Habitat mapping, protected areas monitoring,…metallic and organic contamination, …
  - Technical assistance : AUV escort , Argo floats launch and recovery, data collection

Integration of USV in the French fleet



- First mission for the offshore USV planned in 2027:
  - Transoceanic cruise France to the Caribbean sea
  - 7 days survey in the middle of the Atlantic ocean

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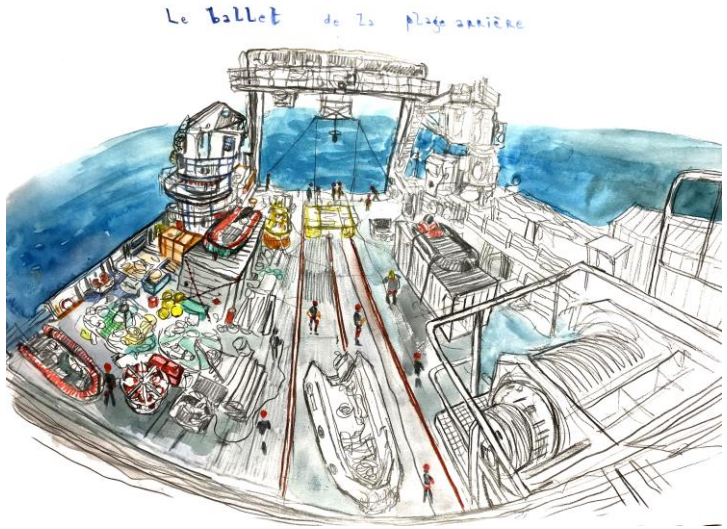
NEW PACIFIC & ANTARCTIC REGIONAL VESSEL



New Regional Vessel Pacific-Antarctic

General preliminary characteristics

- **Navigation zone**
  - Vessel based in Nouméa (New-Caledonia)
  - West Pacific ~ 9 months/year (March to November)
  - East Antarctic ~ 3 month/year (December to February)
  - Resupply stops in Hobart on the way and back from Antarctic
  - Possible stops in Dumont d'Urville (French Antarctic Station)
- **Preliminary characteristics**
  - Length : 65 à 70 m
  - Beam : ~ 14 m
  - Ice capacity to be confirmed
  - Pax : 15 crew, 21 scientist

New Regional Vessel Pacific-Antarctic

Project outline

- **Oceanographic research vessel**, no supply capacity

- **Regional** Vessel :
  - Capacity to work from coastal zones to approx 4000m depth
  - Ifremer 3000 m & 6000 m rated AUVs
  - Ifremer 2500 m rated Hybrid ROV
  - Will not deploy deep sea ROV Victor or Nautile

- Vessel will be operated by **Genavir**

- Ways of reducing the environmental footprint of the vessel under investigation

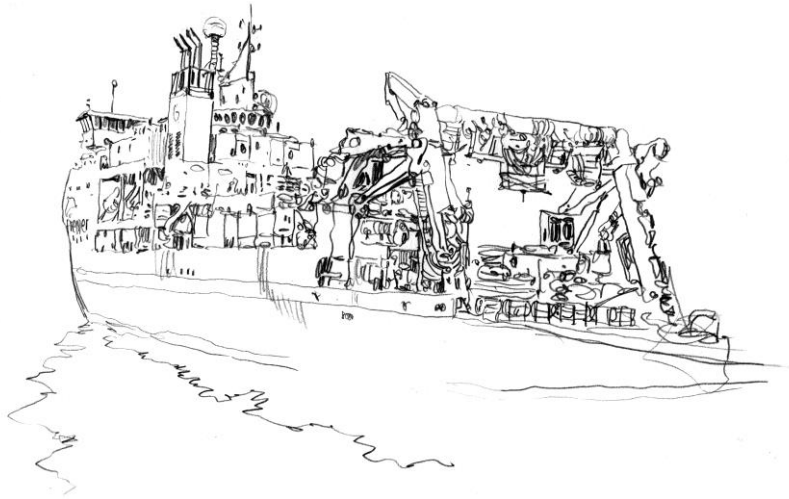
New Regional Vessel Pacific-Antarctic

General tentative planning

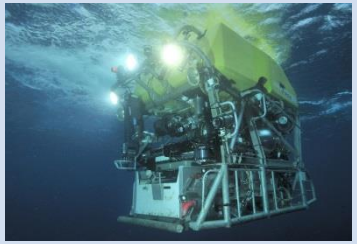
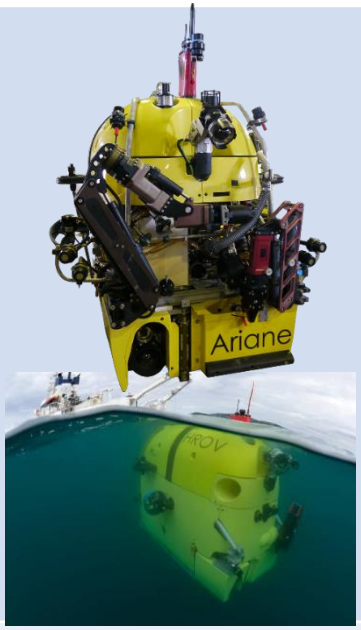
- **Q2 2024:** Project start
- **Q2 to end of 2024:** Scientific needs collection through workshops with the scientific community
- **2025:** Vessel definition and tender package preparation
- **2026:** Tender process for shipyard selection
- **2027-2028:** Construction
- **First half 2029:** Operational trials

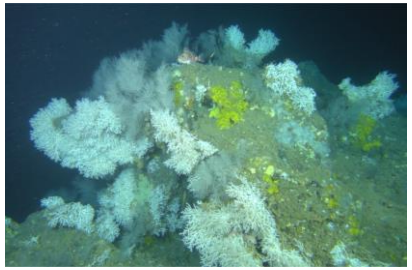
5

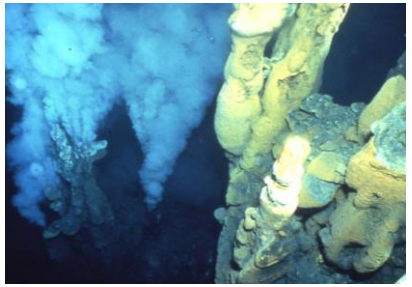
UNDERWATER TECHNOLOGIES UPDATES

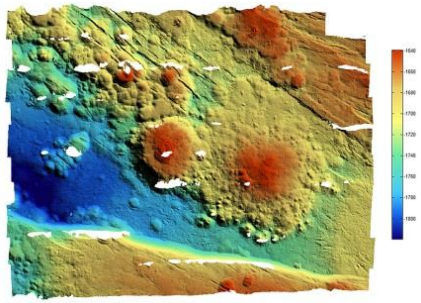


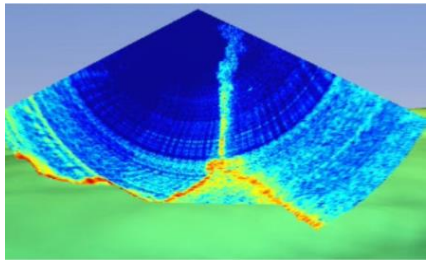
UW Systems in the French Oceanographic fleet

Nautile	*Victor6000*	*UlyX*	*Ariane*	*Aster^{X} & Idef^{X}*
 	 			 
Manned Submarine	ROV	AUV	Hybrid ROV	AUV
6000m	**6000m**	**6000m**	2500m	3000m
Since 1984	Since 1997	Objective 2020	Since 2017	Since 2005
Upgrade project to be decided (may 2024) for 10 year period	Upgrade project ongoing, implementation on Victor in 2025-26	Development completed, transfer to operating unit in 2024	Continued use	Continued use , upgrade project necessary 2027







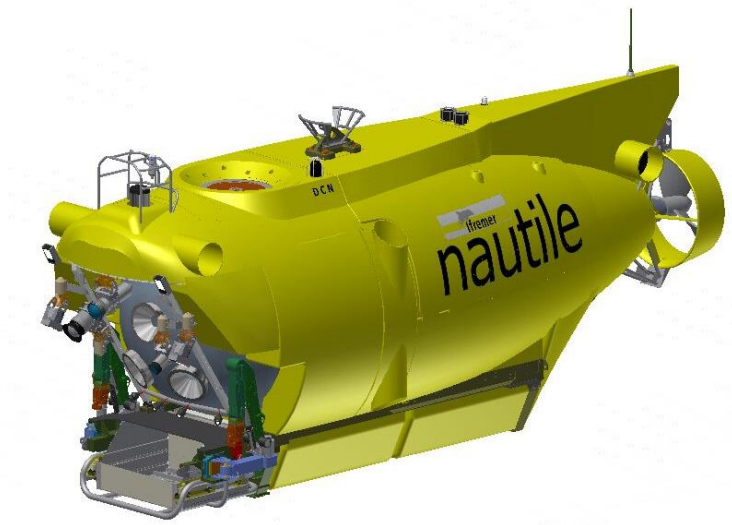


HOV NAUTILE

As there is no limit of life, upgrading for the next 2025-2035 life cycle is valuable

Objectives discussed

- Payload capacity
- Improving single pilot mode
- 7h bottom time
- Comfort & ergonomics
- Manipulation efficiency
- Reduce impact
- Data quality next level
- Safety of operations (surface)



Engineering actions

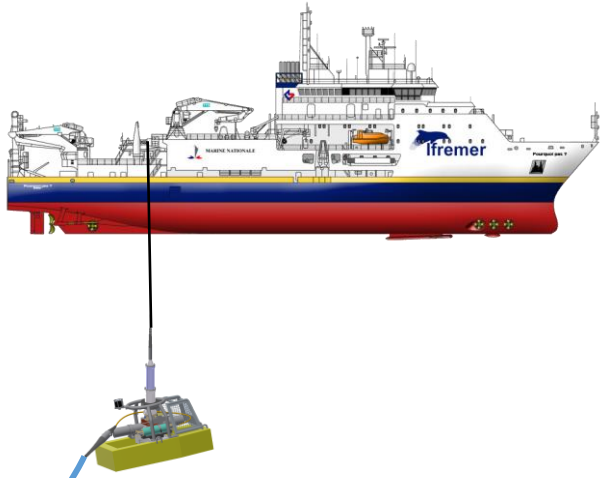
- Buoyancy replacement
- Sphere & living space design
- Data & IT system
- Computer vision & perception
- Front face upgrade
- Manipulator replacement
- Power system upgrade & optimisation
- Weighing system review
- Dwarf ROV…

Whatever developments are decided,
the fundamentals which made the Nautile design
and its synergy with the support ships
so successful will remain unchanged

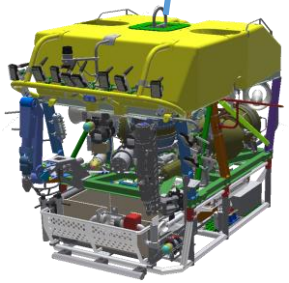
It's sea-proven, don't change it (an other robust principle…)

ROV Victor-6000

- Effective start mid-2022 after approbation of requirements by scientist work group
- Global overhaul with redesign of the vehicle in unchanged system architecture:
  - power system, perception, manipulation, hydraulics, science toolsled, buoyancy
  - performance increase : payload, sampling capacity, available power, 2-arm manipulation
- Mutualized developments with ROV+
  - software (shared ergonomics & workflow), sensors, perception & robotics
- Planning : design studies …2021-22, development 2022-2024, integration 2025-26



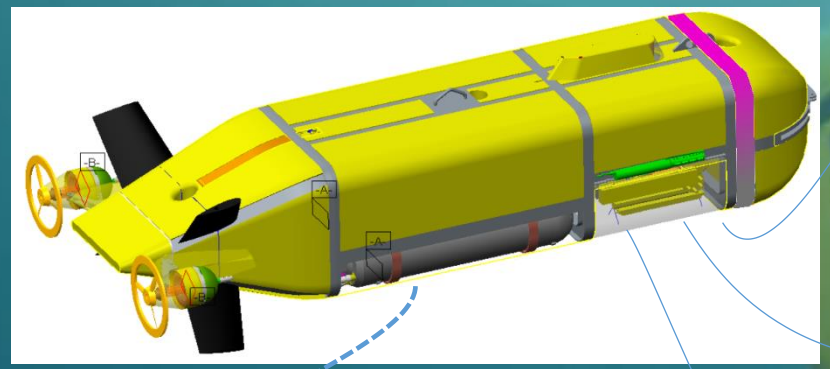
- Redesign of **power system**, gain 10%
  +3KW electrical, + 2KW hydraulics
- Increase of **payload & sampling capacity**
  500(+130)daN/air; 200(+90)daN/water
- Secondary **7-function manipulator**
  Schilling - Orion



- Redesign of the **vision system**
  - 2 x 4K video on pan & tilt
  - oriented high-res still photo, 70° view
  - full LED lighting
  - vertical HD video or still photo
- Single **scientific module** with new *generation tools (incl MBES)*
- New generation **software suite**
  on-board RT & surface applications

ULYX

scientific equipement & multi-sensor configurations



Subbottom profiler
Echoes 5000

+ RAMAN spectrometer
or ADCP 300 kHz
or Water sampler
or Optical data link
or Rangemeter LBL

Sidescan+SBP
Edgetech

+ RAMAN spectrometer
or Water sampler
or Optical data link

RAMAN spectrometer

+ Water sampler
or Optical data link

Permanent equipment

Optical HR imaging
Multibeam sonar
CTD
multi-sensor hub

ULYX

- weight 2,7T
- length 4,5m
- 28KWh, 36h – 48h
- 3kt cruise speed
- Zero velocity
- active water ballast
- hovering @ ‘optical’ altitude
- 200kg payload (water)

Thank you for your attention !