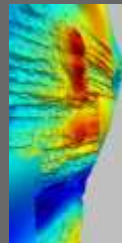
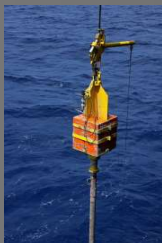


MAJOR REFIT OF R/V MARION DUFRESNE

HÉLÈNE LEAU
HEAD OF OCEANOGRAPHY DEPARTMENT
INSTITUT POLAIRE FRANÇAIS, PAUL-EMILE VICTOR - IPEV





IPEV FRENCH POLAR INSTITUTE & OCEANOGRAPHY DEPARTEMENT

The French Polar Institute

National support agency

For implementation of **research programs in** Arctic, Antarctic, Sub-Antarctic regions and **on board vessels.**

A PUBLIC agency

Gathering 9 organisms : MENESR, CNRS,

Employing 50 permanents, > 200 contracts in land bases

The Oceanography department:

10 persons (3 IR, 4 IE, 2 AI, 1 TCE)
40% of total budget (26 MM€)

Missions:

Préparation and implementation of scientific cruises on board R/V Marion Dufresne

R&D Sediment Coring

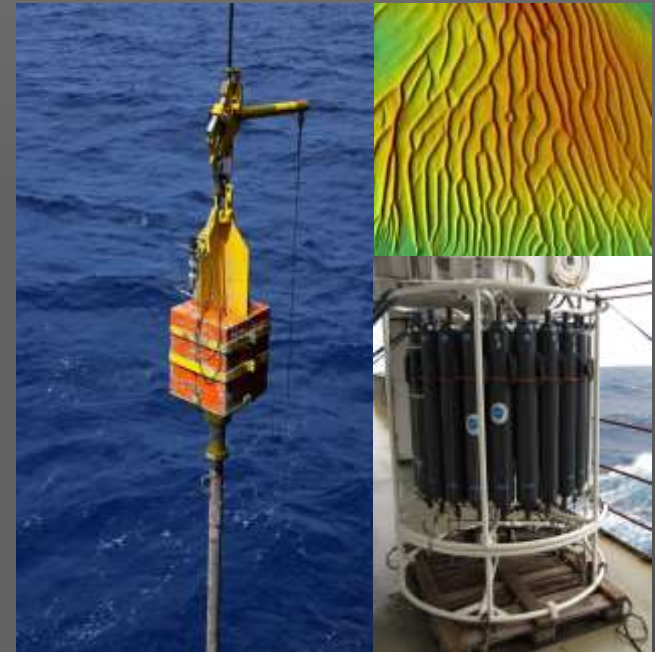
Worldwide Record of length of sediment core retrieved
→ Paléoclimatology

107 cruises since 1995

400 researchers, technicians and students per year

3700 publications from cruises data –

Feeding IPCC (Intergovernmental panel on climate change)





217 days / an
Scientific activity

120 days / an
Logistic activity

Operator
48 crew



THE R/V MARION DUFRESNE

Length: 120 m
Width 20.5 m
Draft: 7 m
Displacement: 10380 t
Passengers: 110



MARION DUFRESNE

MARSEILLE

MARC-JOSEPH MARION DU FRESNE (MARION-DUFRESNE)

French explorer : **22 mai 1724** (St Malo) – **12 juin 1772** (Baie des îles, NZ)

1972: During an exploration voyage to New-Zealand, he discovered

Marion and Prince Edward's islands (RSA) as well as **Crozet** archipelago (France)

12 juin 1772 – At anchor for repairs in « Baie des îles » NZ, kidnapped by Maoris and probably victim of cannibalism



MARION DUFRESNE SPECIFICITIES

One of the longest vessel of the European research fleet

Multisicplinary cruises

→ nb / type operations

→ nb scientists (large parties)

Fit for southern ocean navigation

Giant sediment corer CALYPSO

(International leadership)

Home port – La Réunion, Indian ocean

Education « Floating universities »

Unité Mixte de Service FOF:

IPEV, Ifremer, CNRS-INSU, IRD



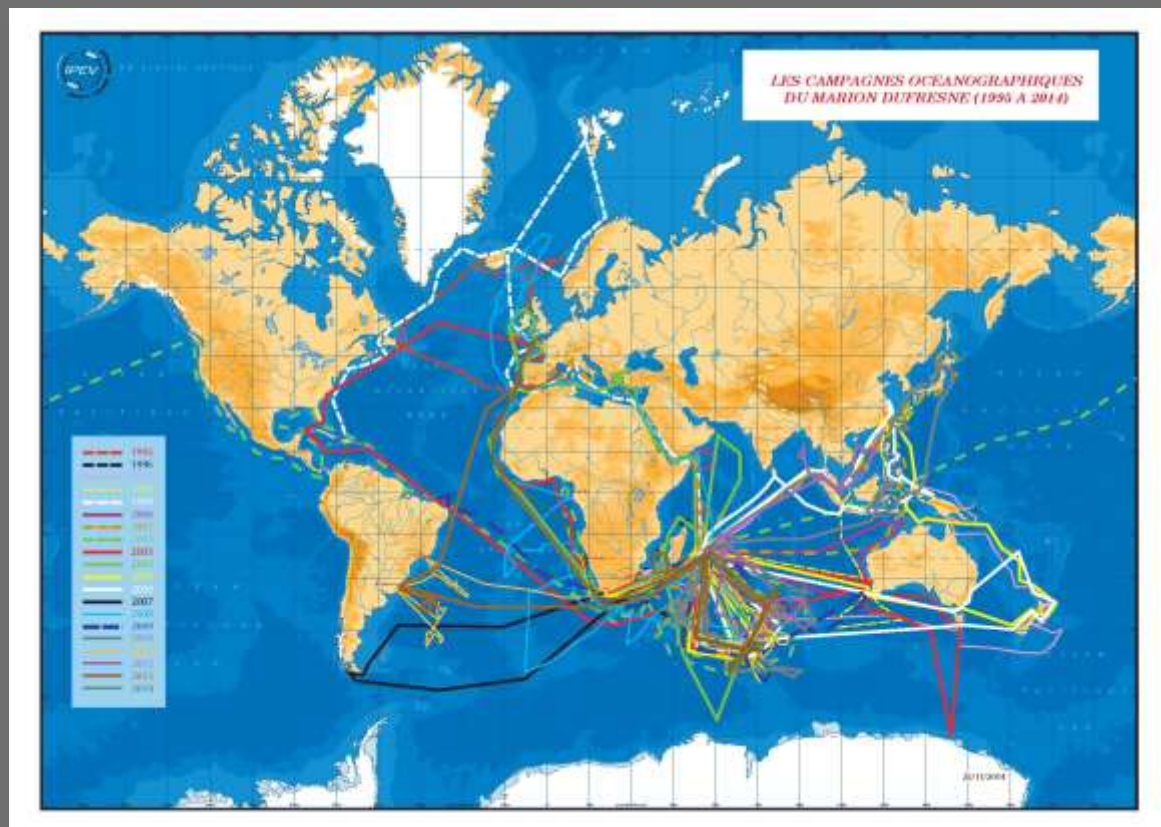
Cruises worldwide, but
ice covered ocean

Routes of cruises 1995 - 2014

All  cruises

« Mission Specific
Platform » (MSP) in

 program



MAJOR REFIT - 2015



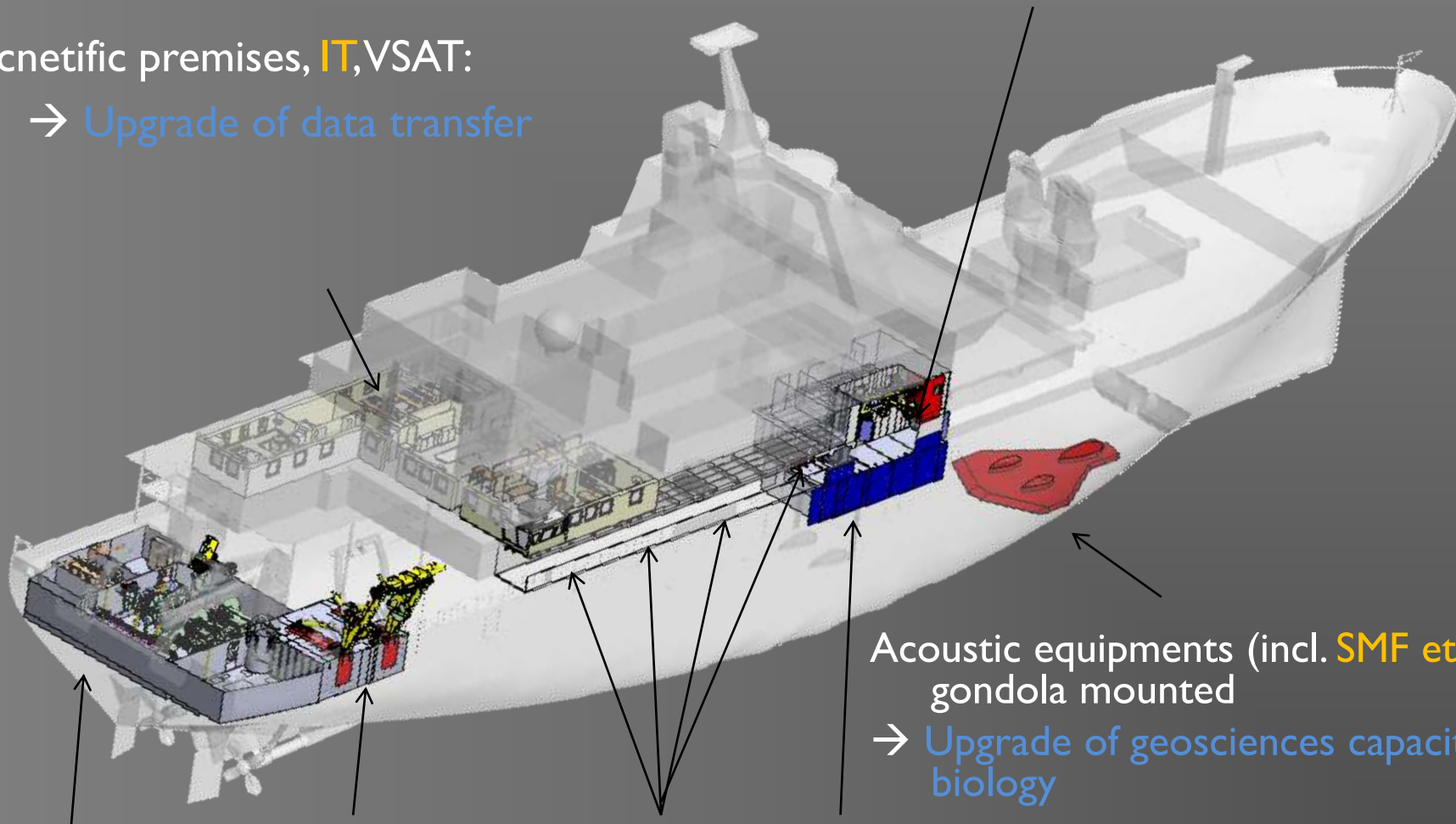
SYNTHESIS OF IPEV ACTIONS

Hydrologic system (winch, gantry, rooms)

→ « Clean » CTD capacity

Scientific premises, IT, VSAT:

→ Upgrade of data transfer



Acoustic equipments (incl. SMF et SBP) gondola mounted

→ Upgrade of geosciences capacity + biology

Coring winch, coring A frame, coring booms, bulkward

→ Upgrade of coring facilities, up to 75 m long cores

R/V MARION DUFRESNE REFIT PROJECT

EquipEX CLIMCOR: 2 M€ upgrade of deep tow winch (coring)

EquipEX CLIMCOR-Marion Dufresne: 13M€ upgrade / renew of all other scientific equipment



TAAF: 10 M€ non-scientific work:

Hull & Machinery, « public » premises, cabins, galley, etc.

Funding voted in november 2012, actually received in 2014 → 18 months project

SCHEDULE

February 2015: 1 month transit out (Réunion to Dunkerque) - Preparation

DAMEN *shiprepair* de Dunkerque **20 weeks**

Dry dock: **6 weeks**

Sea trials (mainly vessel): 2 weeks

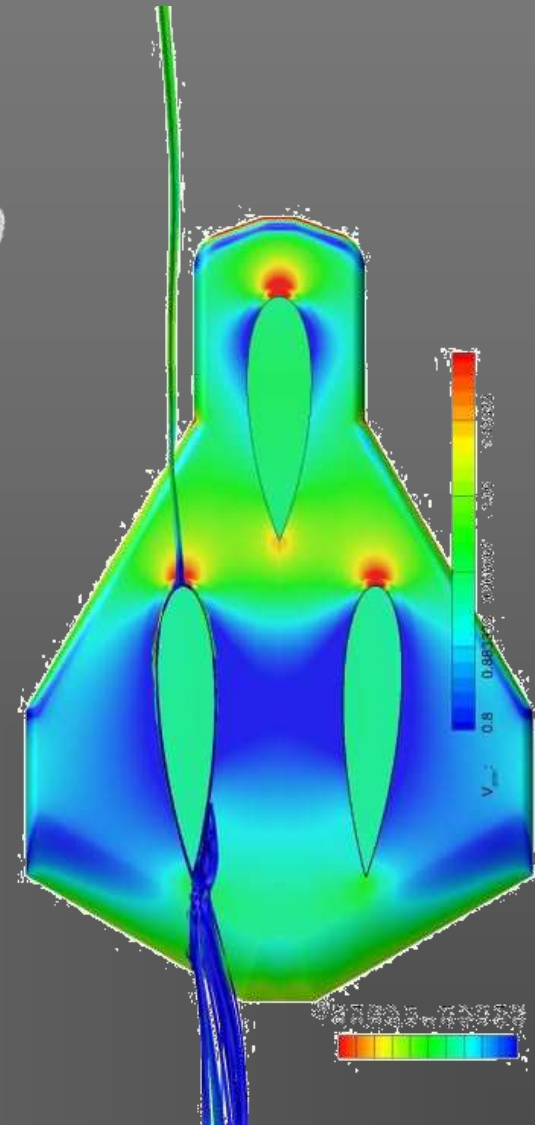
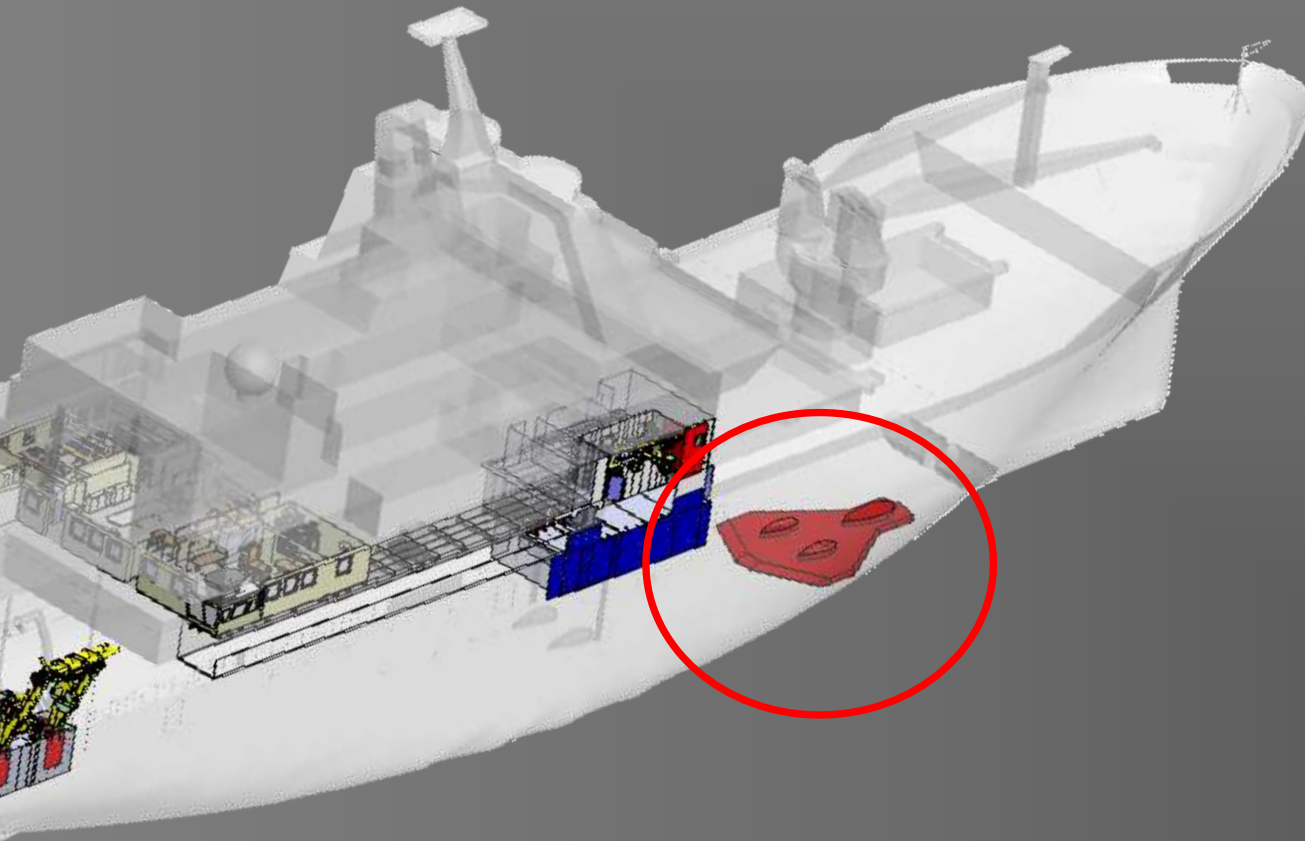
August 2015: 1 month transit home (Dunkerque to Réunion) incl. some scientific equipment SAT

TAAF OP2: 1 month operation (logistic supply french sub-antarctic islands) No supply of islands from Dec 2014 to August 2015

Scientific equipment SAT: **6 weeks**

1st January 2016: First IPEV cruise

NEW ACOUSTICS EQUIPMENT— FITTED ON GONDOLA

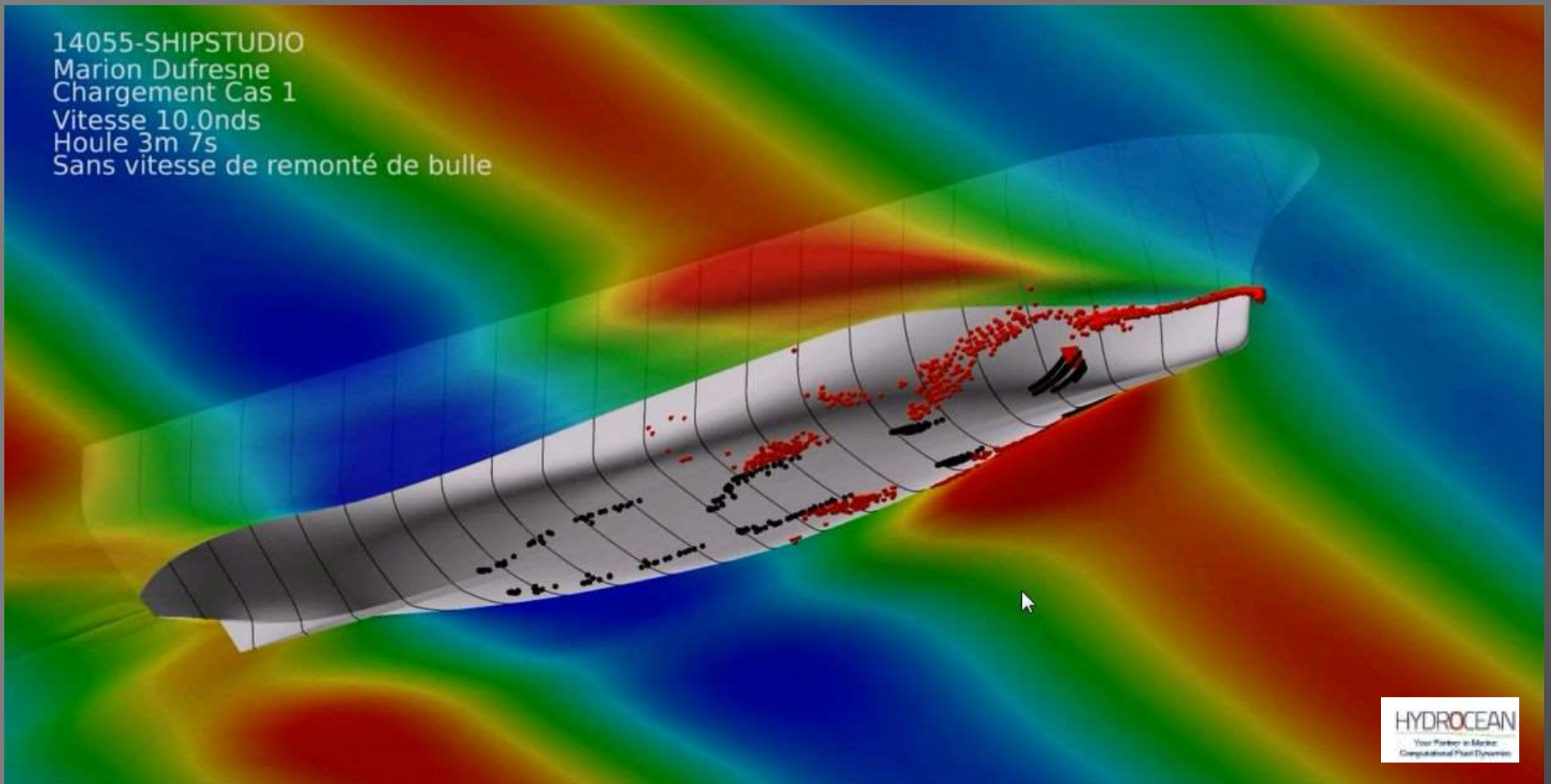


Gondola design

Step 1: Hydrodynamic simulation with various cases

(swell, speed, load) *Use of 1993 model results for validation the computations*

14055-SHIPSTUDIO
Marion Dufresne
Chargement Cas 1
Vitesse 10.0nds
Houle 3m 7s
Sans vitesse de remonté de bulle





Hull scientific equipment

Gondola mounted

- 2 multibeam echo-sounders
KONGSBERG: EM122 & EM710
- Sediment profiler KONGSBERG SBP120
- Fisheries echo-sounder KONGSBERG EK80 (5 freq: 18, 38, 70, 120 and 200 kHz)
- ADCP : RDI 38, 75 & 150 kHz

Naca profiles

- USBL IXBlue Posidonia
- Loch
- Acoustic transponder
- Underwater camera

On board scientific equipment

- *Surface continuous recorder* (thermosal, fluorimeter, Oxygen, etc.)
- 2 inertial navigation system (INS) IXBlue HYDRINS
- Synchronisation for MBES, SBP, ADCP, EK80 : KONGSBERG K-SYNC
- New weather station
- Upgrade of the gravimeter to MGS
- XRF in MSCL system

BUILDING THE GONDOLA IN WORKSHOP



LOWERING THE GONDOLA IN THE DOCK





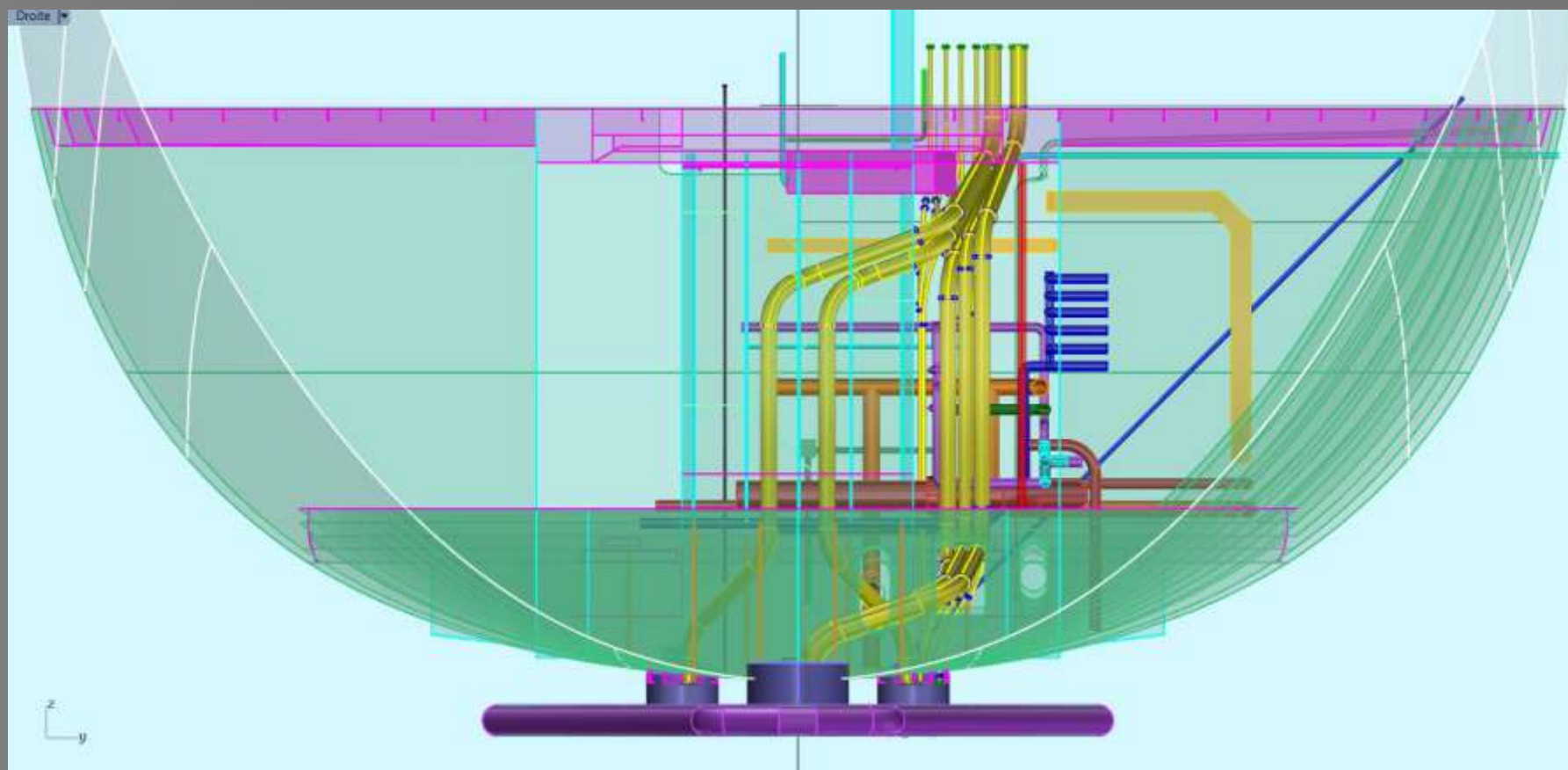
INSERTING THE ANTENNAS



GONDOLA FINISHED



GONDOLA CABLES ROUTE DESIGN



Cable pipes in yellow

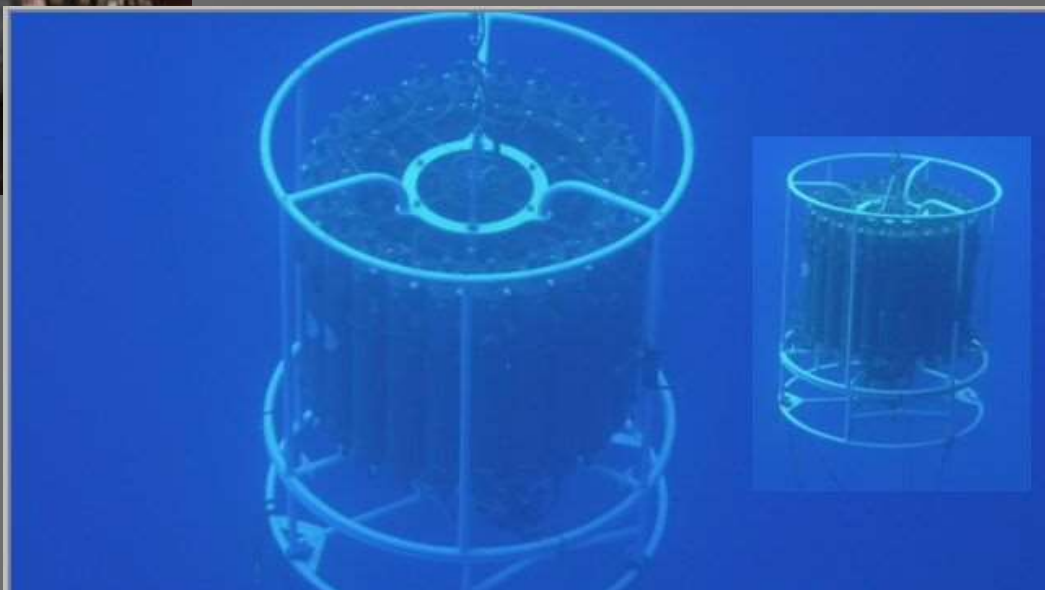
ELECTRONIC ROOM CREATED IN FORWARD HOLE I

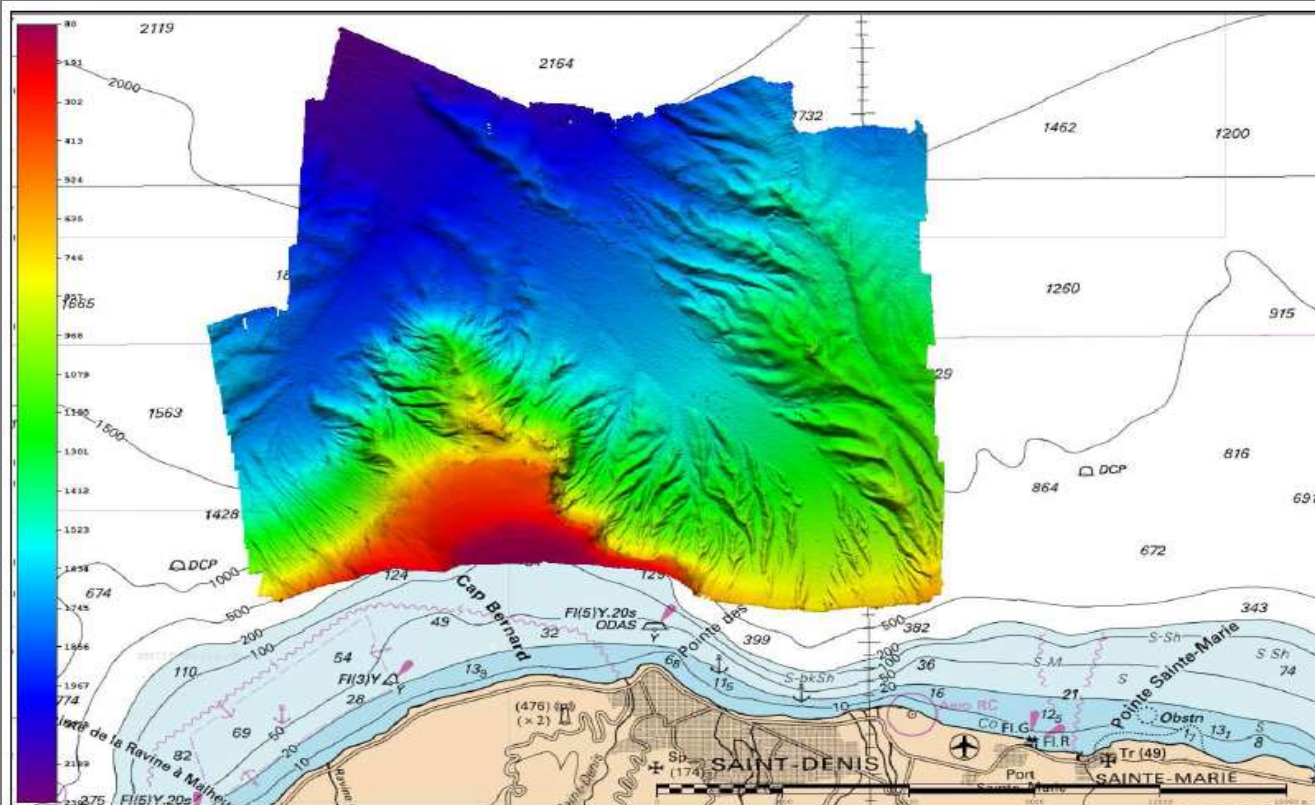


INSTRUMENTATION ON NACA PROFILES

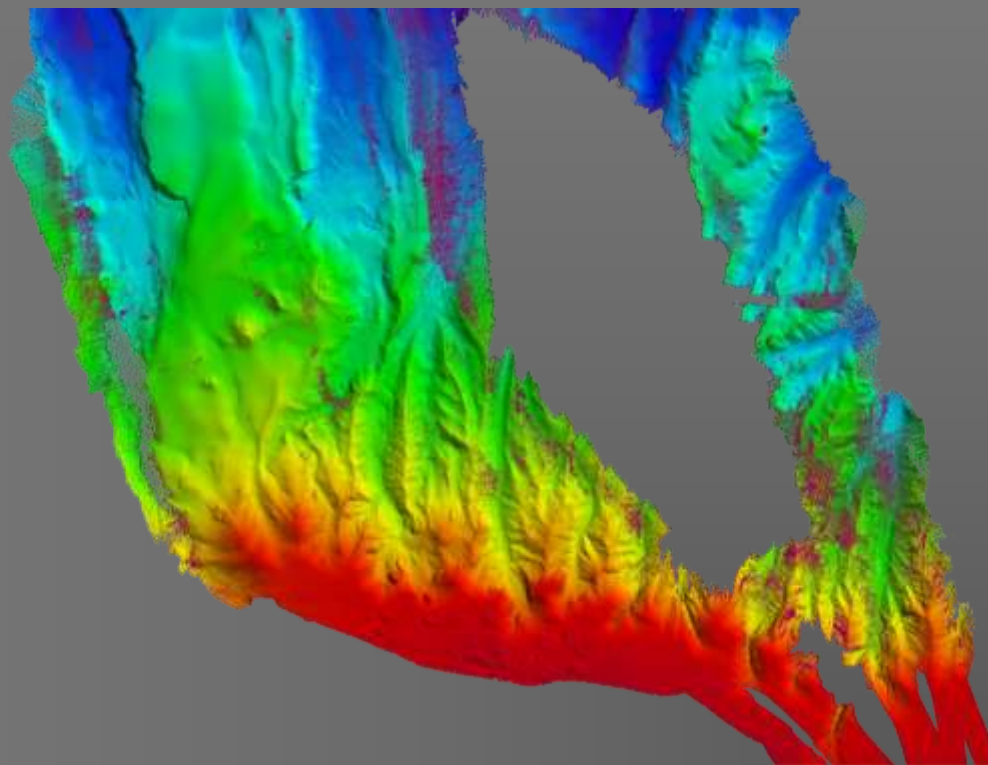


View of the CTD carousel from underwater camera set on portside Naca profile





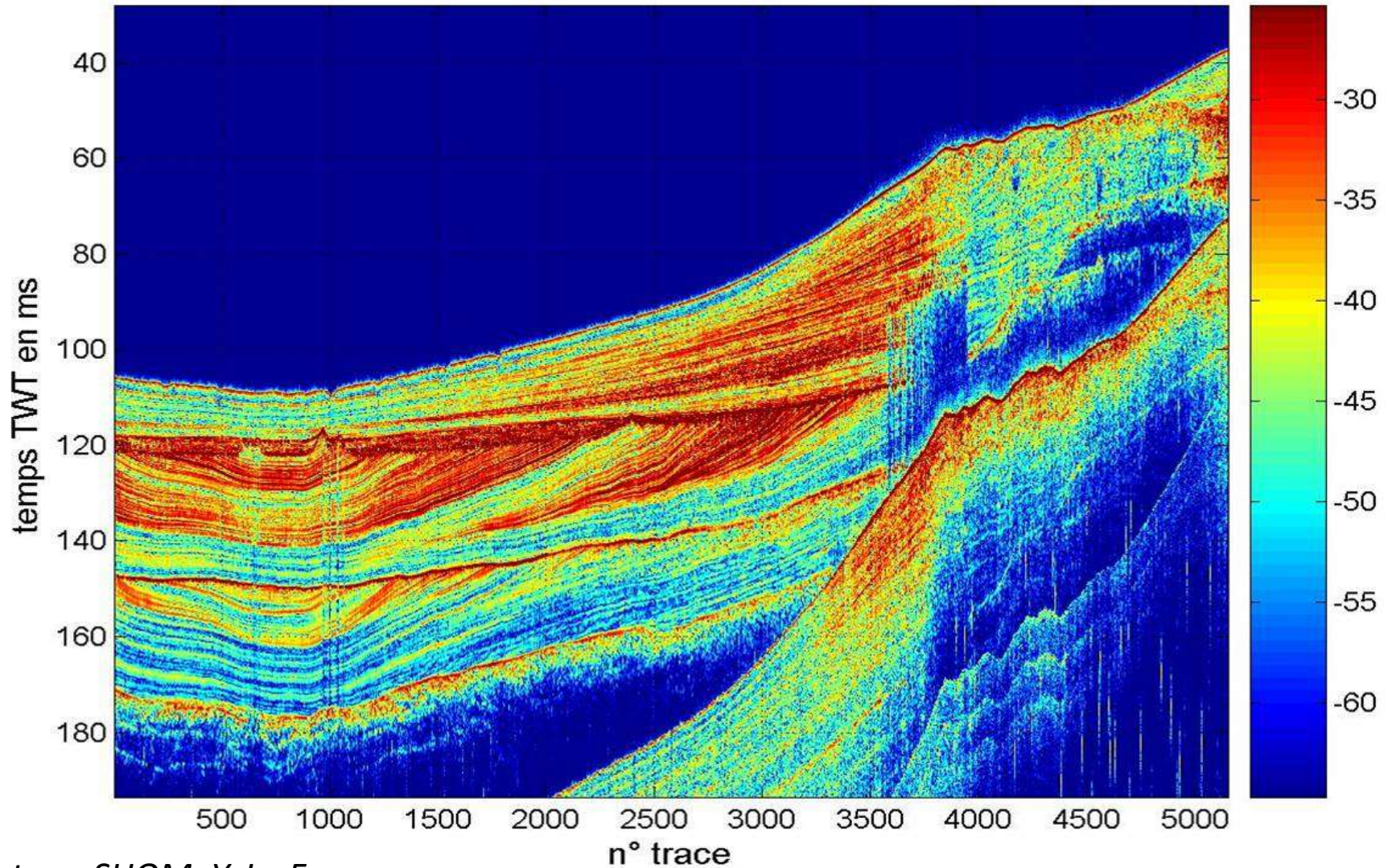
Résultat du levé de 12 heures - Modèle numérique de terrain au large de St Denis – SMF EM12 ρ et EM710 – maille à 10m – de 80m à 2300m – levé à $\pm 65^\circ$ - 7/8 noeuds



CARTE BATHYMETRIQUE ACQUISE PENDANT CAMPAGNE CTBTO

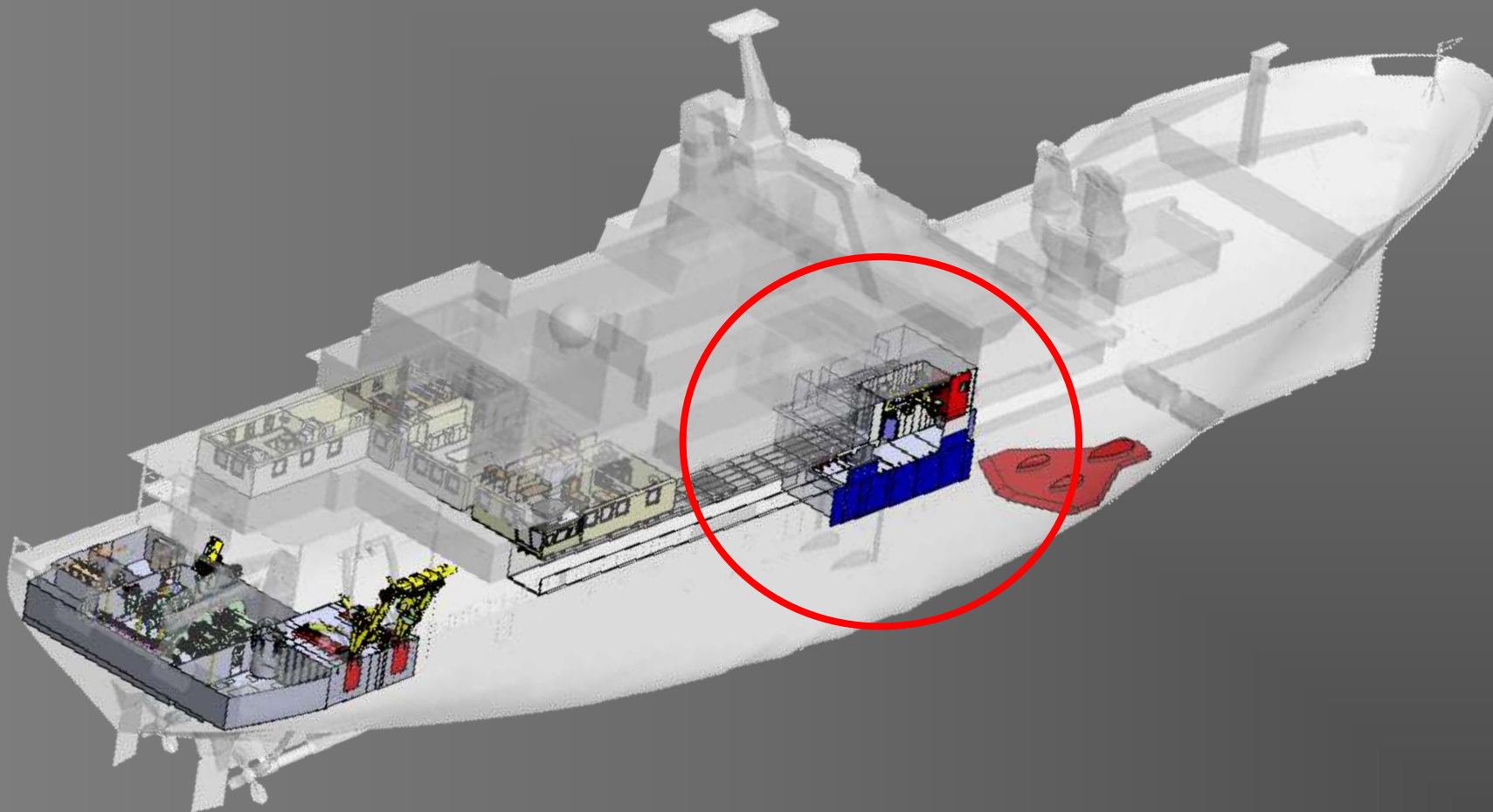
DATA EXAMPLE : SBP 120

SBP120 : AR2 (20040912231927.raw), acquisition SW - NE



Courtesy: SHOM, Y. Le Faou

NEW HYDROLOGY SYSTEM (ILOT)



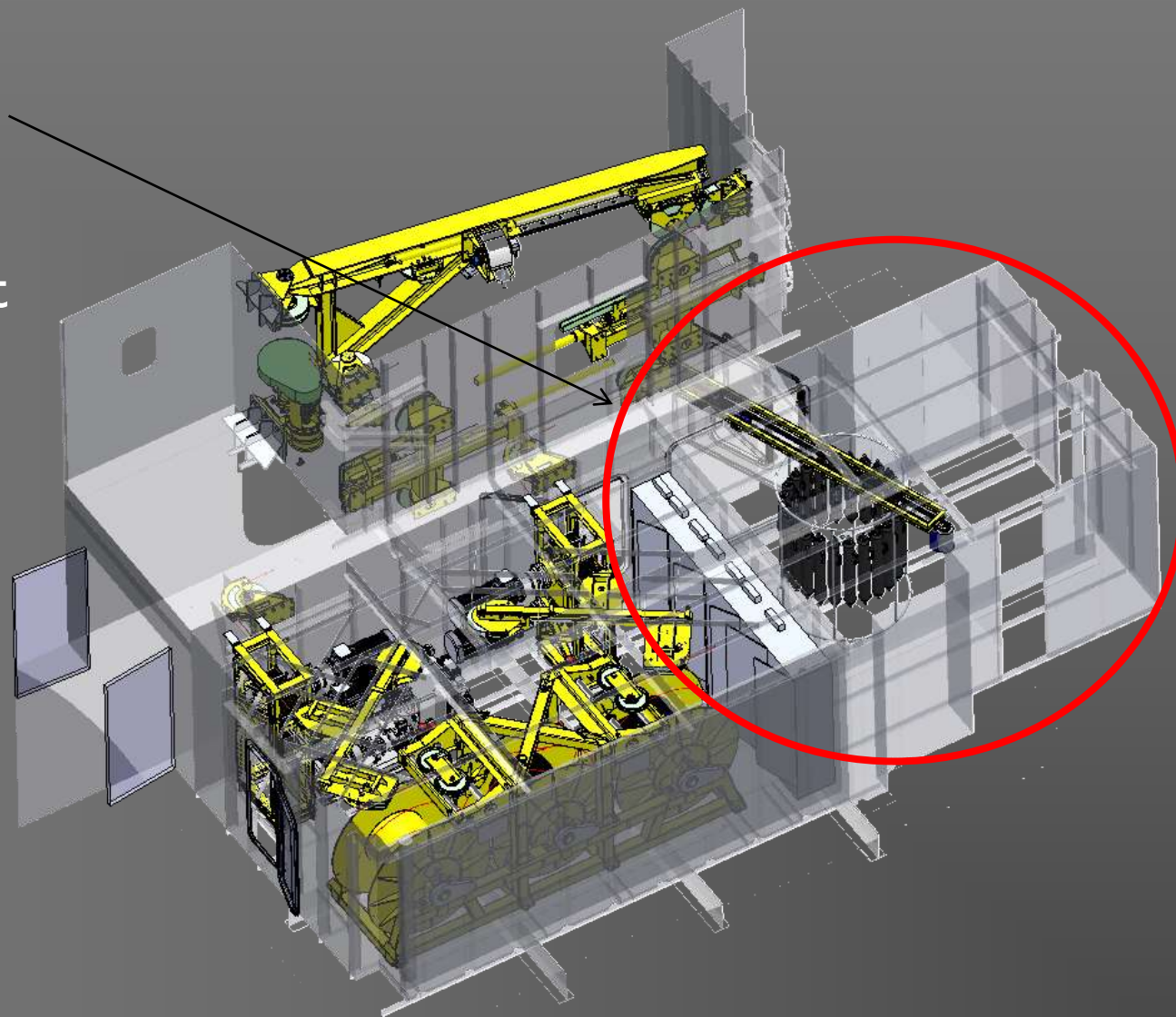
NEW HYDROLOGY SAMPLING SYSTEM

New **sheltered room**
for sampling

Gantry for deployment

Polymères pulleys and
synthetic cable for
« **clean** » CTD
operation

Dual capstan
technology for
special cable use



STRUCTURAL REINFORCEMENT



IMPACT ON 6 CABINS

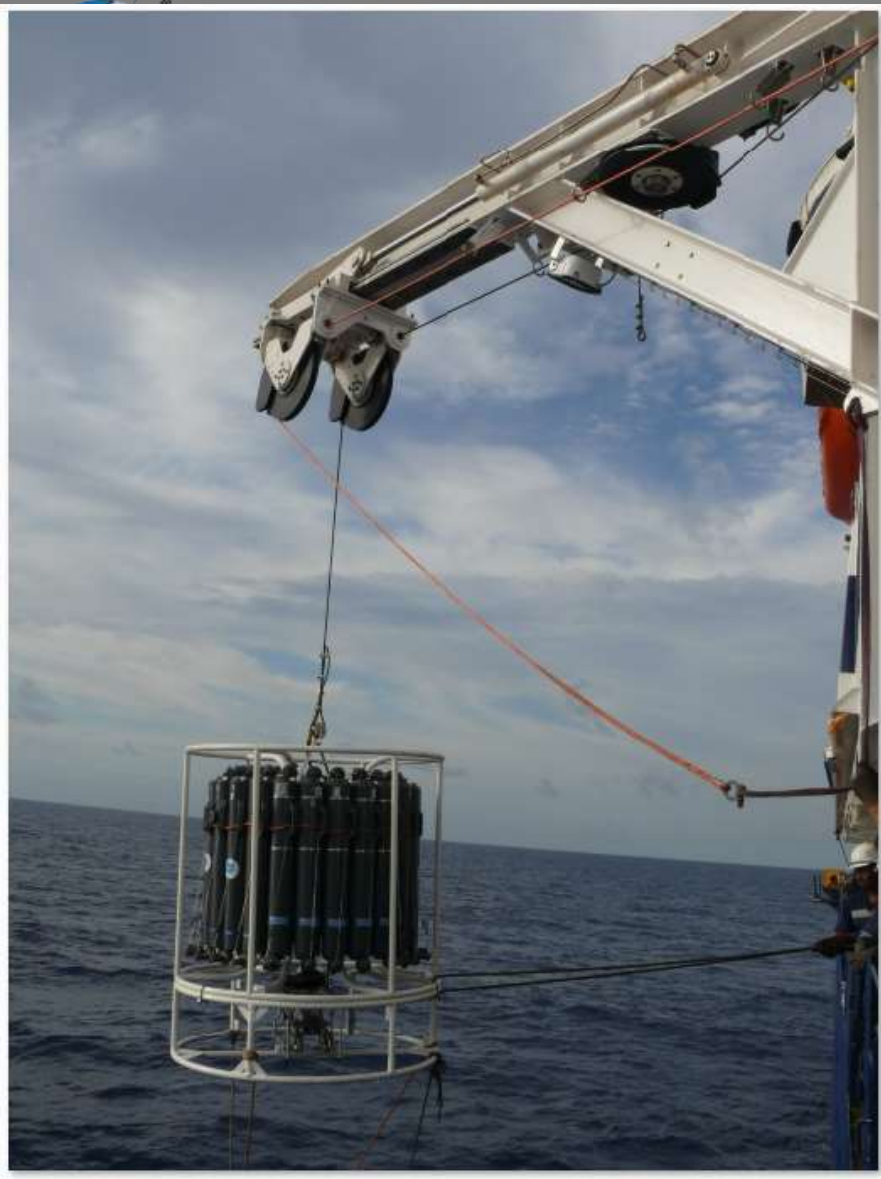
INSTALLATION NEW DRUMS



Designed in
« one go »
for easy integration



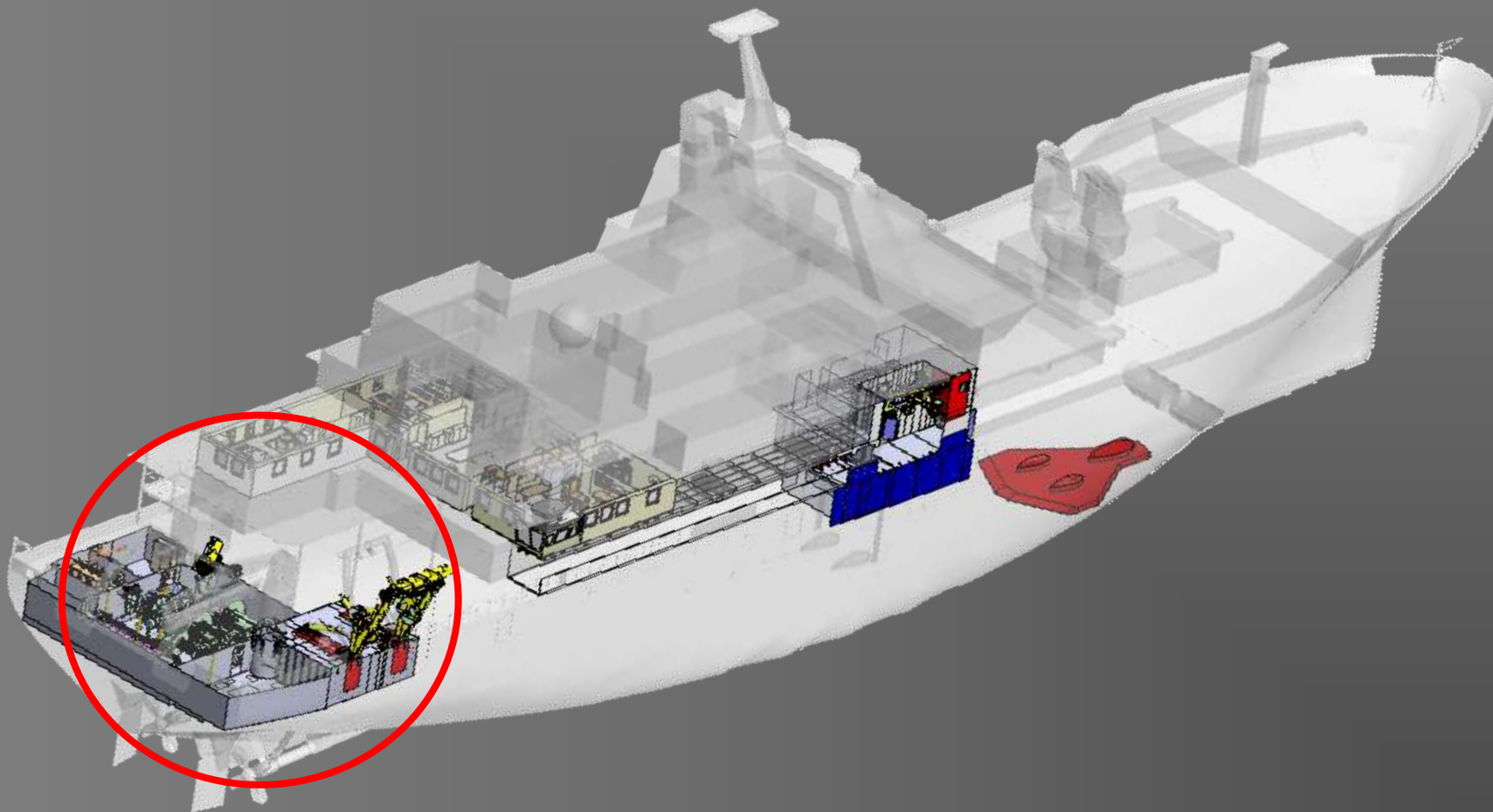
Inside view of ILOT: left, one of the bi-capstan



CTD and carousel deployment
(*right*: maintenance gallery)



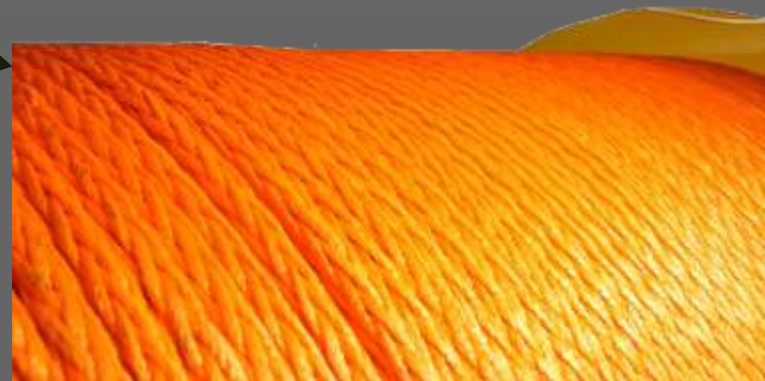
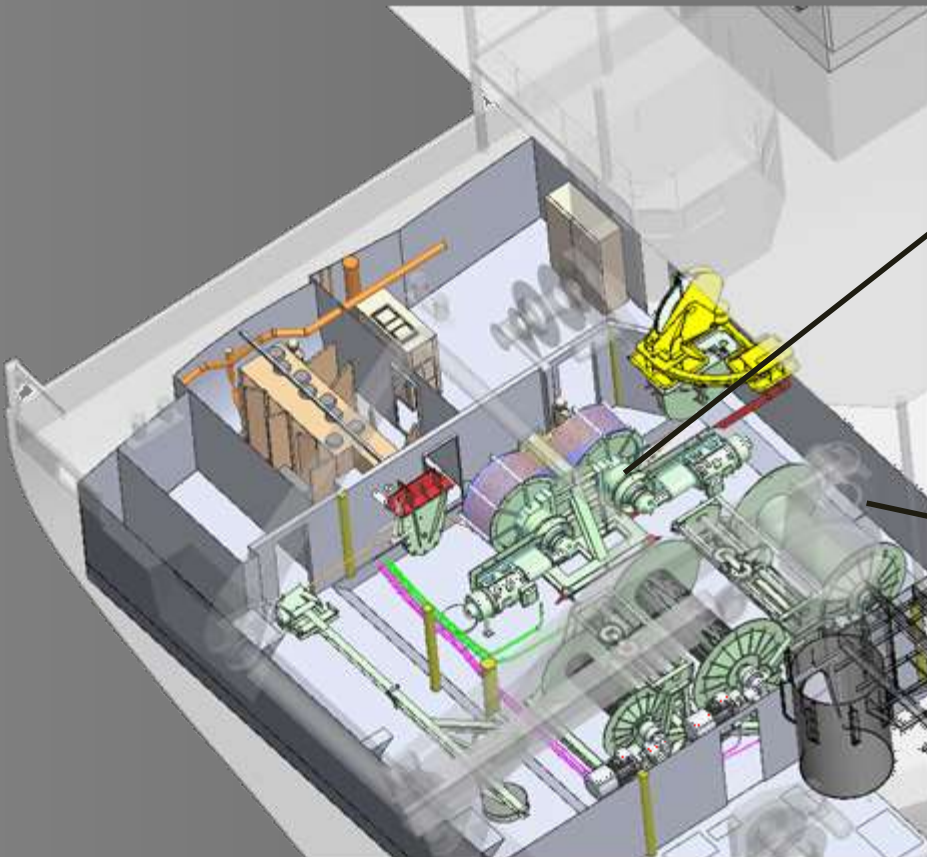
UPGRADE OF CORING SYSTEM



I- NEW DEEP SEA WINCH AND CORING CABLE



45 TONS PULLING STRENGTH WINCH
→ 75 METRES LONG CORES



7200 METRES HIGH STIFFNESS CORING CABLE
→ VERY HIGH QUALITY CORES



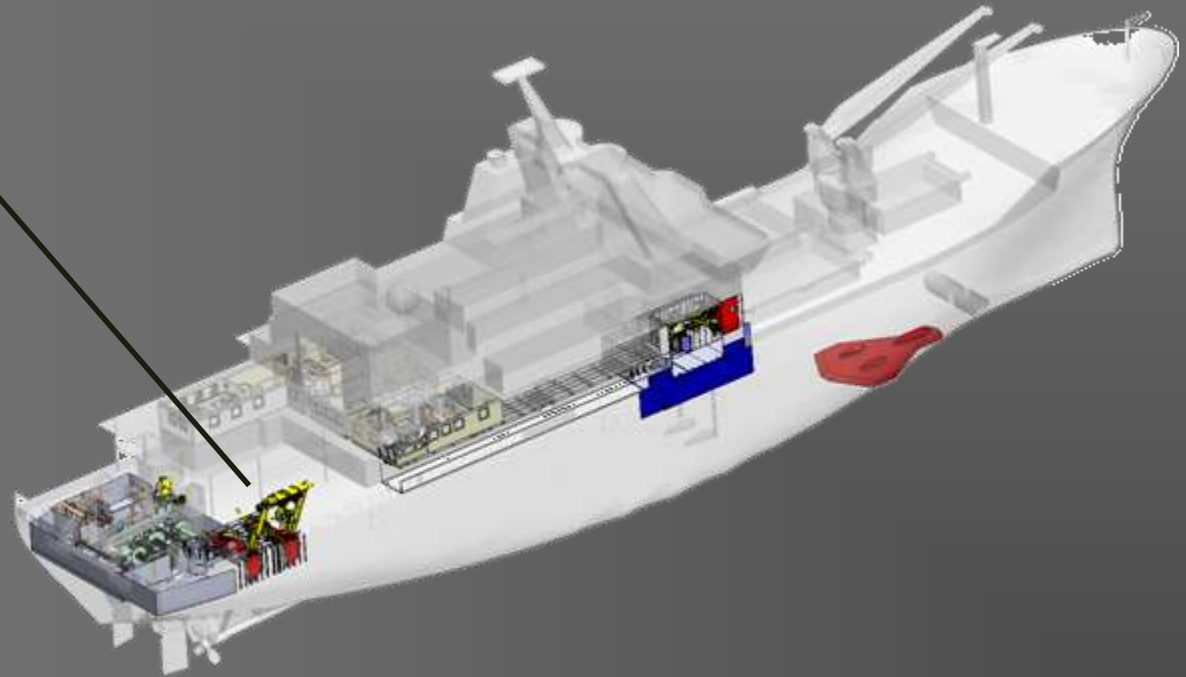
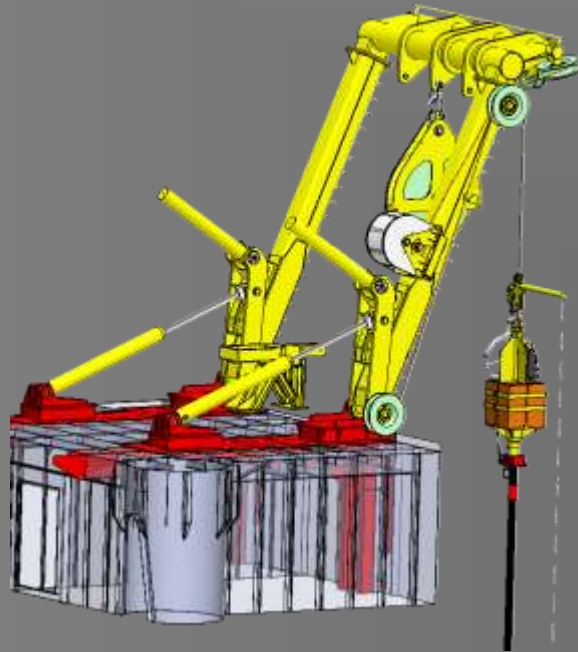
Deep sea winch SIAMOIS – 3 drums amongst them one quipped with textile cable
New bi-capstan 45 tons SWL



Special design of braiding of Dynalight cable $\varnothing 35\text{mm}$ – as stiff as possible

2- NEW CORING A FRAME

NEW CORING A-FRAME : 45 TONS SWL
INTEGRATED HANDLING WINCH NEW ERGONOMICS



INTEGRATION OF CORING A-FRAME





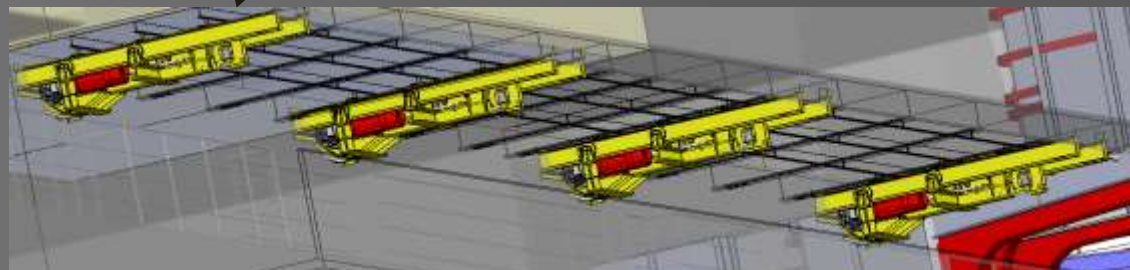
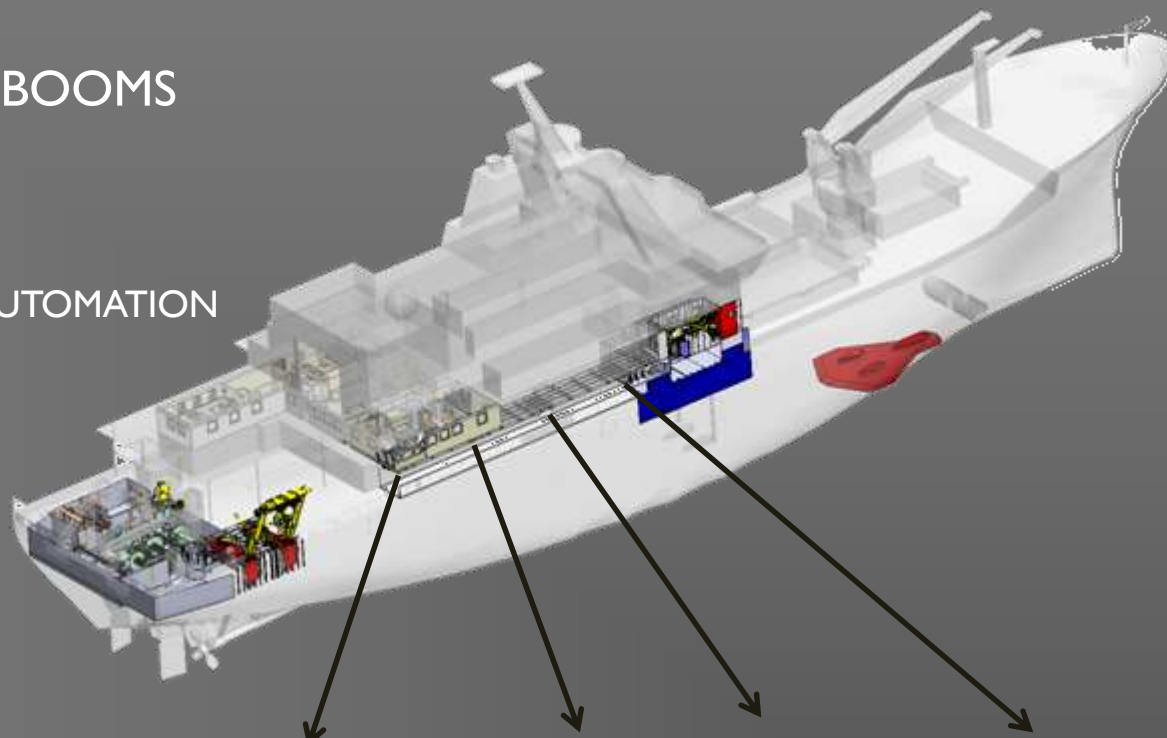
Coring A-frame : SWL 45T, top frame shifted, integrated handling winch

3- NEW HANDLING BOOMS

4 NEW TELESCOPIC BOOMS

2 TONS SWL

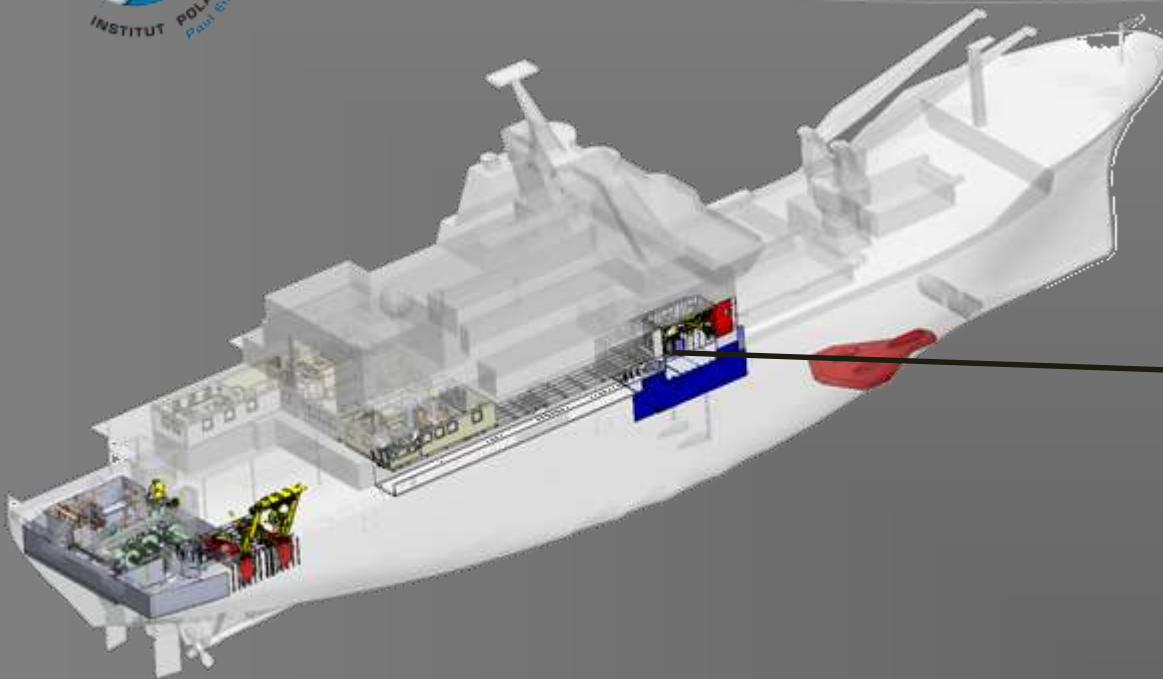
INTEGRATED SENSORS & AUTOMATION





Load tests for telescopic booms for long core handling

4- NEW SHIP DESIGN

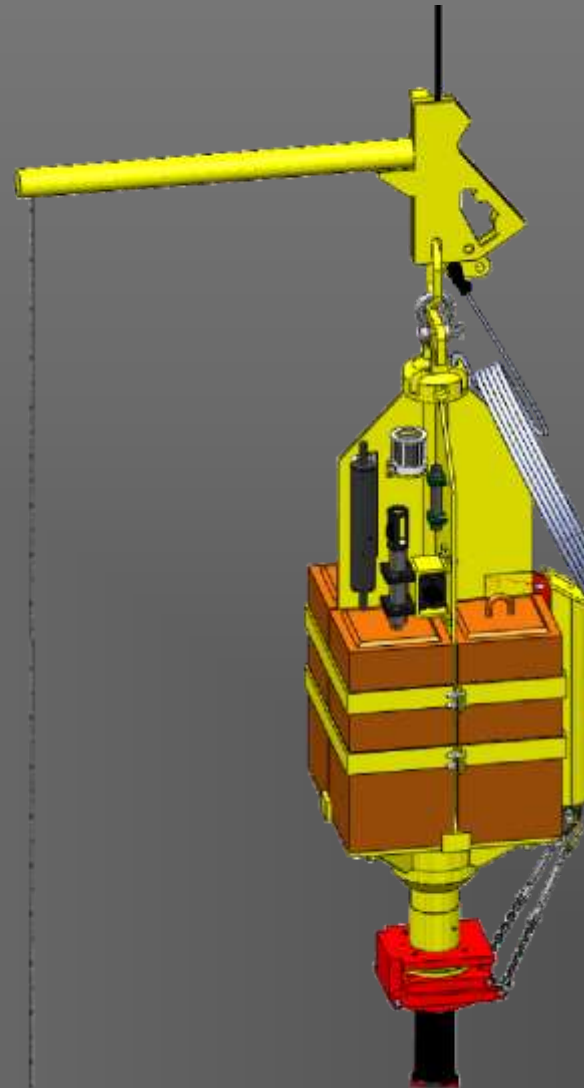


IMPROVE LONG CORE DEPLOYMENT :
CLEAR WAY FOR 50 METRES LONG PIPES

SEDIMENT CORERS

GIANT KULLEMBERG CORER CALYPSO

75 M LONG

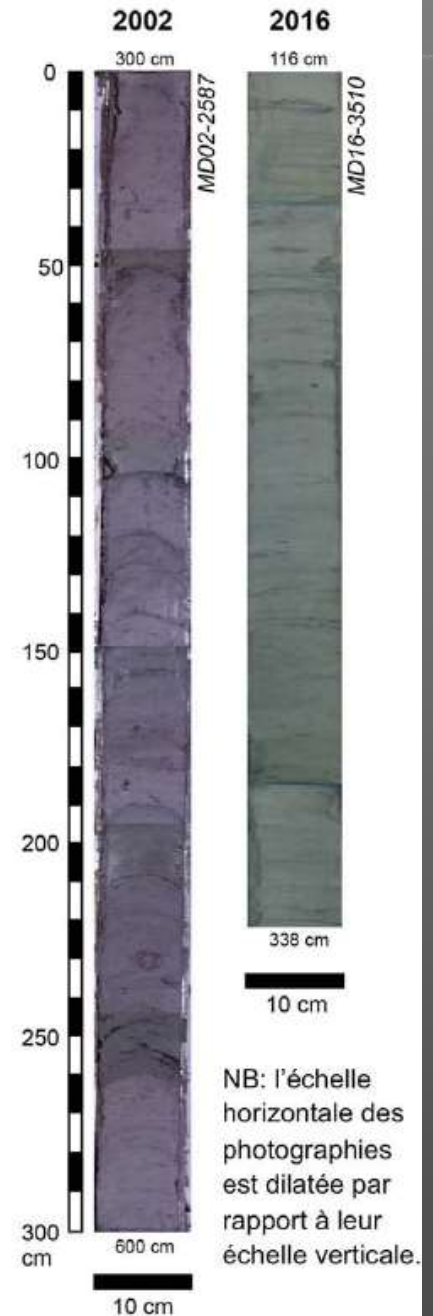




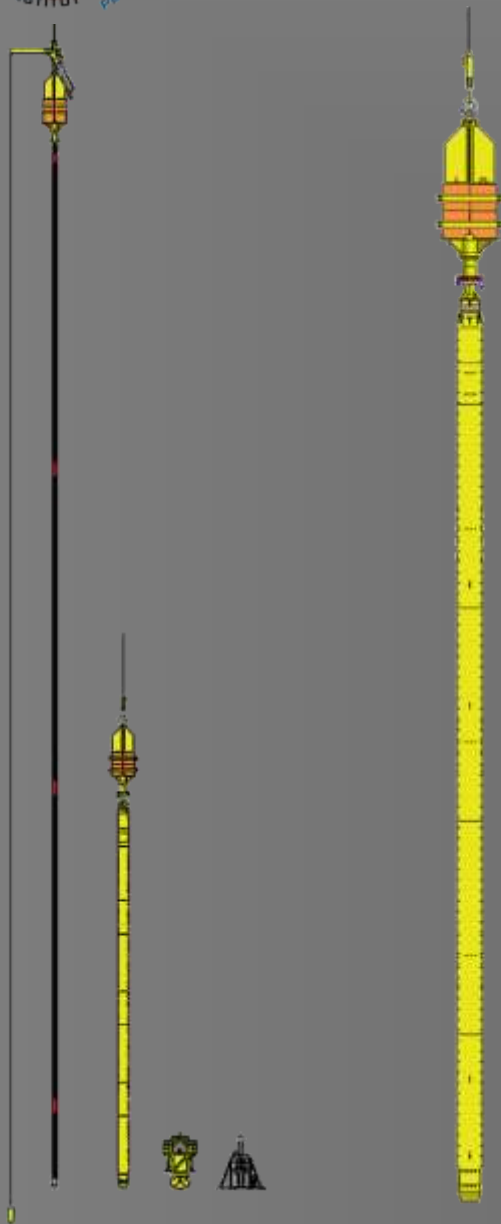
Les **nouveaux équipements de carottage** installés à bord du Marion Dufresne durant sa jouvence en 2015 ont permis de prélever des carottes géantes d'une **qualité exceptionnelle** à grande profondeur.

La carotte MD16-3510 prélevée au 1^{er} site de la campagne **MD203-ACCLIMATE**, situé à 4350 m de profondeur, a pu être comparée avec une carotte prélevée au même site par le Marion Dufresne en 2002.

Sur ces photographies, la même période de temps est couverte par 3 mètres de sédiment prélevé en 2002, et 2.2 mètres en 2016. Les couches individuelles noires sont aussi nettement courbées en 2002, et droites en 2002. Ces différences de prélèvement soulignent le fort étirement de la séquence sédimentaire lors du carottage en 2002, et l'**absence totale d'étirement et de déformations en 2016**.



OTHER TYPES OF AVAILABLE SEDIMENT CORERS



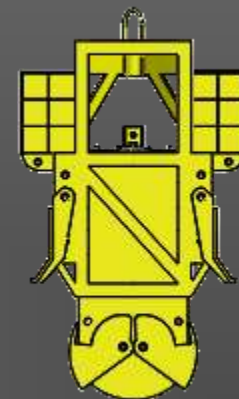
CASQ CALYSPO SQUARE (GRAVITY)

GRAVITY

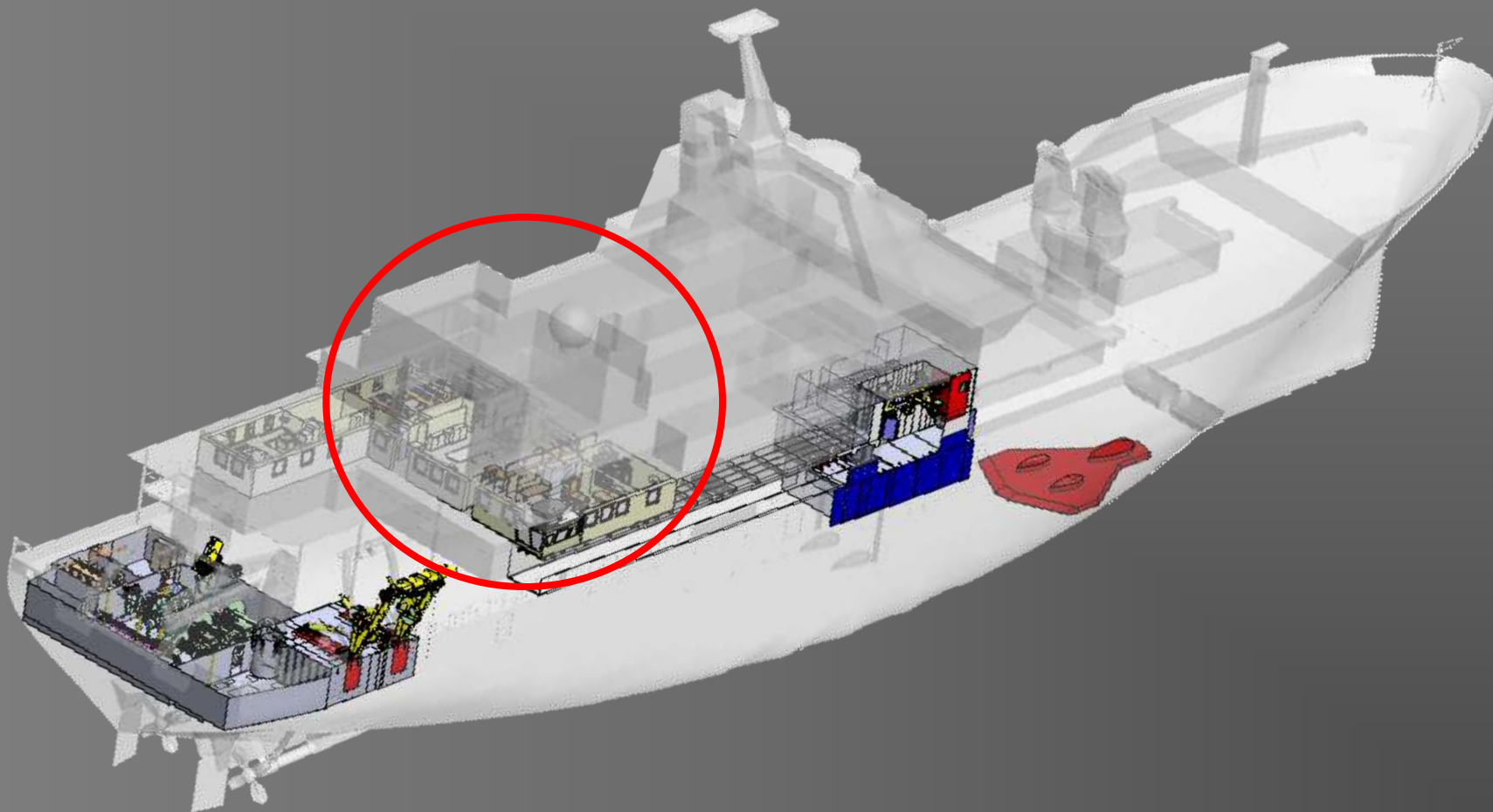
MULTITUBE & VIDEO (INTERFACE)



BOX CORE (INTERFACE)



IT AND SCIENTIFIC PREMISES REFURBISHMENT



REFIT OF SCIENCE ROOM



Artist view



Real life

REFIT OF LABORATORIES AND CABIN-LAB BAD « SURPRISES » IN WET LABS



REFITTED LABS



CREATION OF AN IT ROOM (CLOSED, AIR CONDITIONED)





TAAF PUBLIC PREMISES RENOVATED – CORRIDORS, COLD ROOMS



TAAF PUBLIC PREMISES RENOVATED – RESTAURANT AND FORUM



