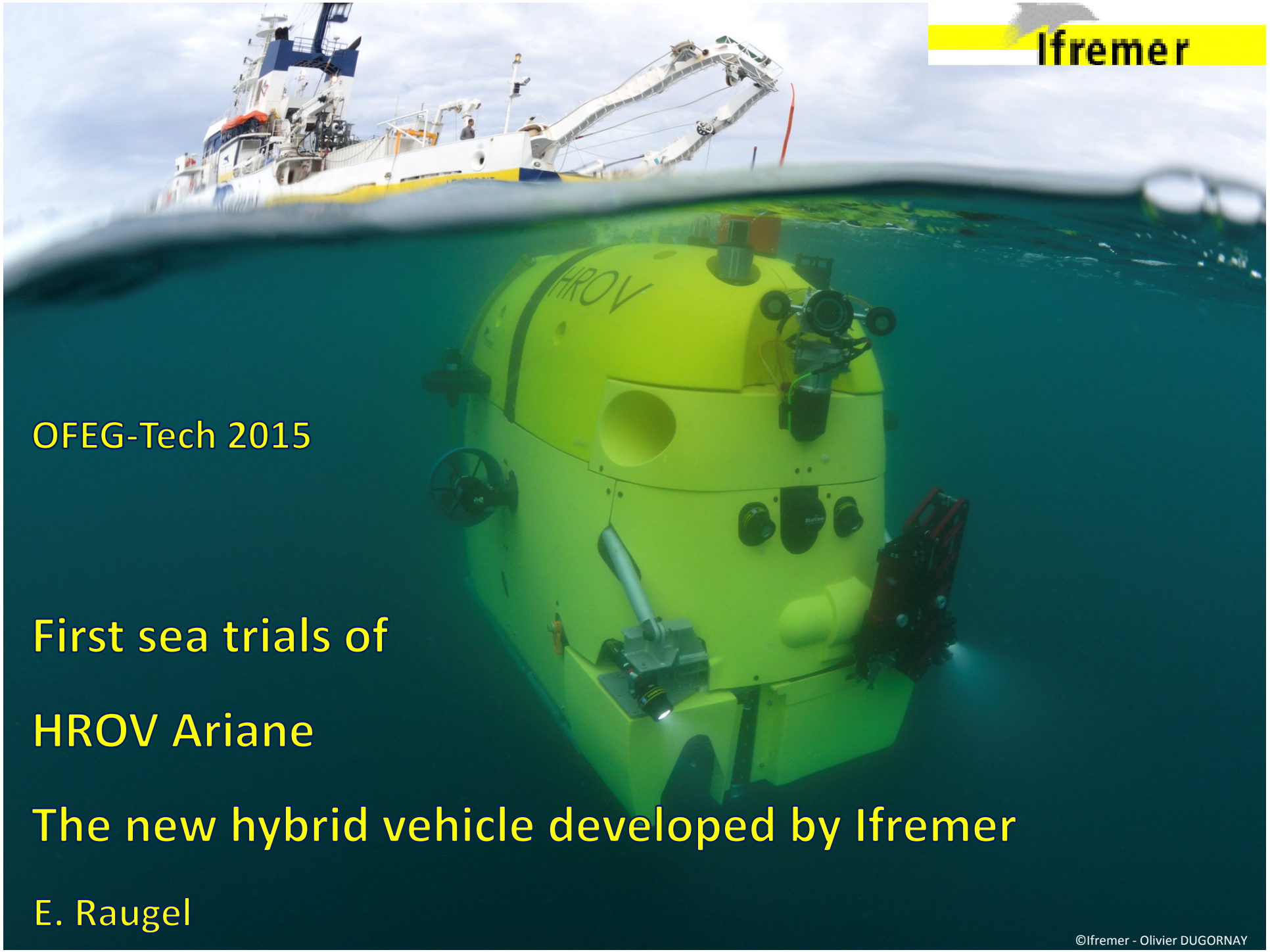


OFEG-Tech 2015

First sea trials of HROV Ariane

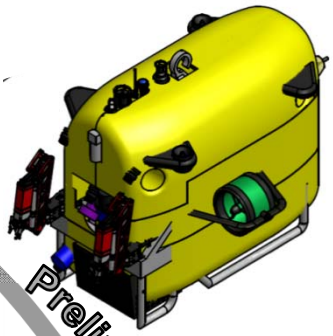
The new hybrid vehicle developed by Ifremer

E. Raugel

2010 : kickoff

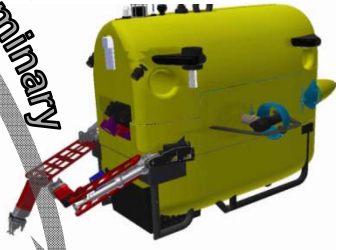
Concept study

Mid 2011

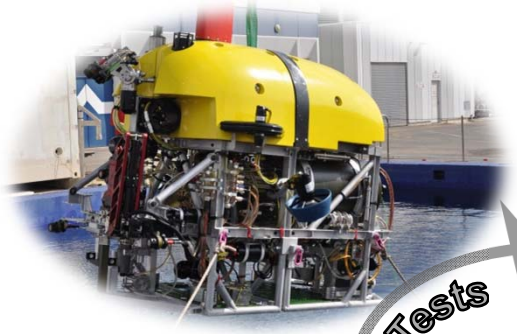


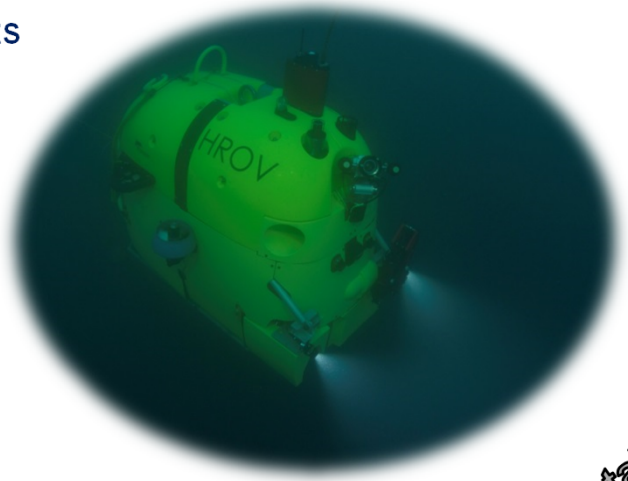
Preliminary

December2014 : 1st sea trial

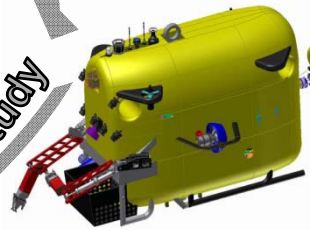


Sept-Nov 2014 : pool and harbour tests





Tests

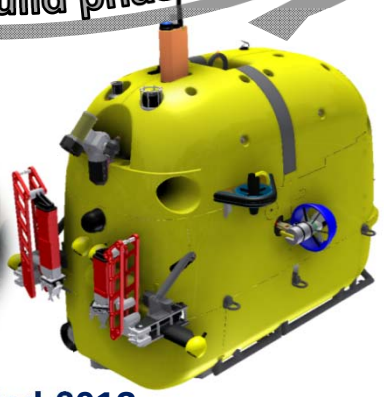


Detailed study

End 2012

Build phase

Integration

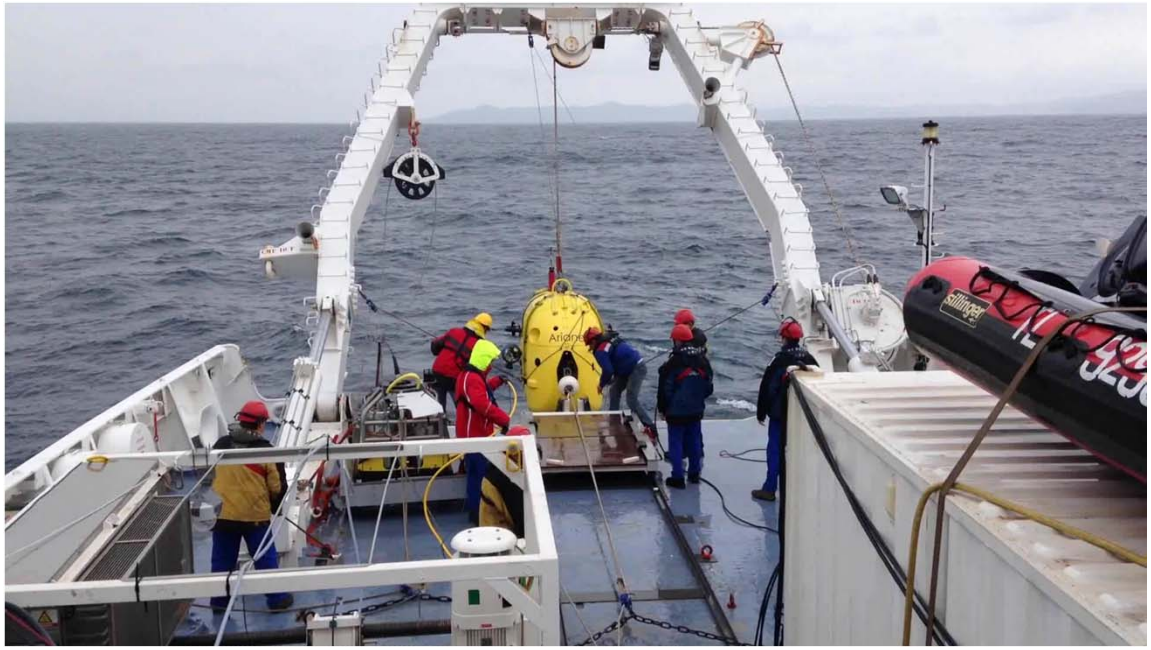


April2014

End 2013

HROV Ariane : 1st sea trials

Cruise	Date	Vessel	Results
ESSHROV1	December 2014	N/O Le Suroît	5 dives
ESSHROV2	March 2015	N/O Le Suroît	10 dives
ESSHROV3	May 2015	N/O L'Europe	7 dives

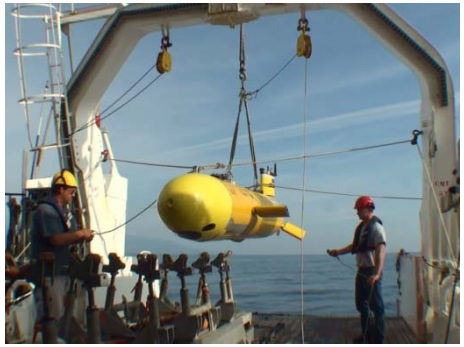


- ➔ **Validation of deployment, navigation, manoeuvrability**
- ➔ **22 Dives mainly in ROV mode**
- ➔ **Tests of first payloads (manipulators and camera)**

Hybrid ROV – a new concept of underwater vehicle

ROV : remote operation

- Cable : power supply & real time control
- Maneuverability constraints

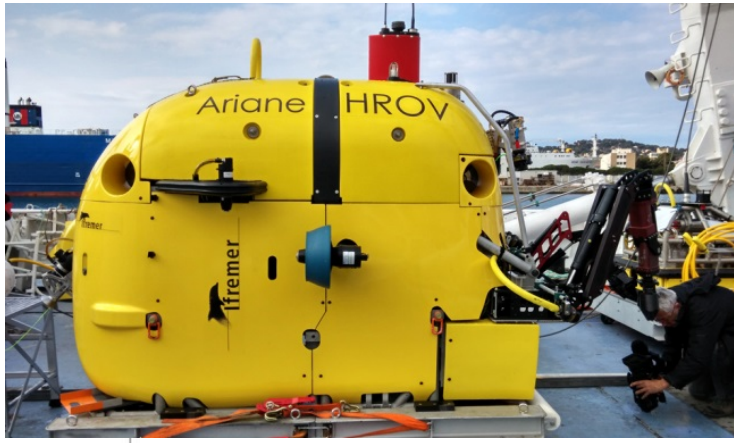


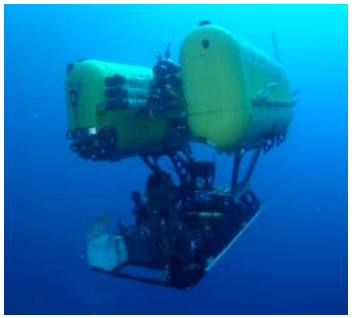
AUV : survey operation

- Untethered autonomous vehicle
- On-board power supply
- No real time control

Hybrid-ROV :
Self powered underwater vehicle

- fiber optic tether → ROV mode
- untethered → AUV mode





Hybrid ROV Ariane : overview

Most innovative feature : operated from light vessels

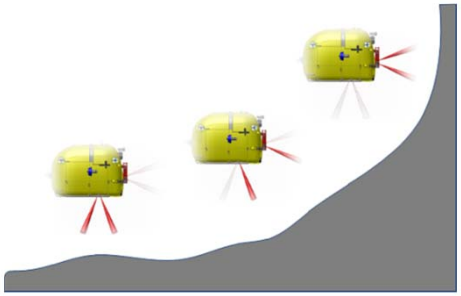
Non DP capable light vessel available

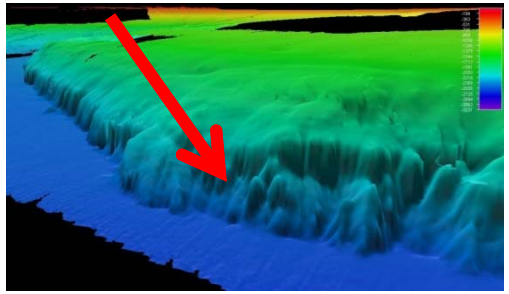
➔ Reduced operational cost

➔ Easy and cost-effective access to ship time (opportunity vessels)

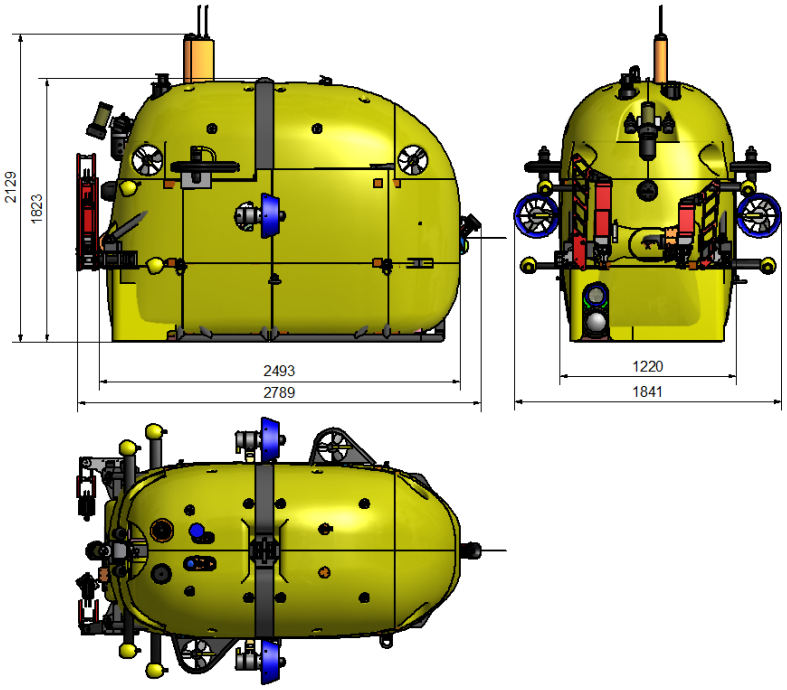
Ariane missions :

- Daily work cycle, mostly coastal, up to 2500m depth
- Close-up inspection, Sampling and light tools manipulating, optical imaging, acoustic mapping
- Perform tasks on all sorts of seabed morphology, emphasis on canyons, cliffs and steep inclines

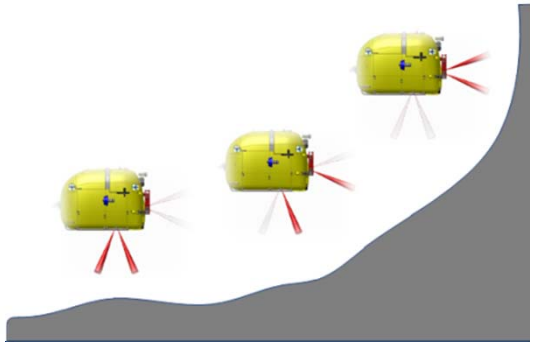




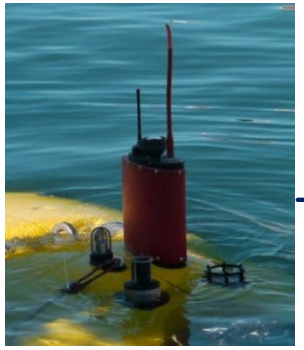
Hybrid ROV Ariane : vehicle



- **Mass** : between 1,6 and 1,8 tons depending on payload configuration
- **Payload :** up to 250kg (including manipulators and basket)
- **Power supply :** 2 Li-ion batteries in pressure housing
  - 14kWh battery dedicated to thrusters and lights
  - 6kWh battery dedicated to electronic and safety devices
- **Main actuators :**
  - Main propulsion : 2 tilting thrusters ➔ speed : 0-2 knots
  - 2 vertical and 2 lateral thrusters
  - 20 liter reversible ballast

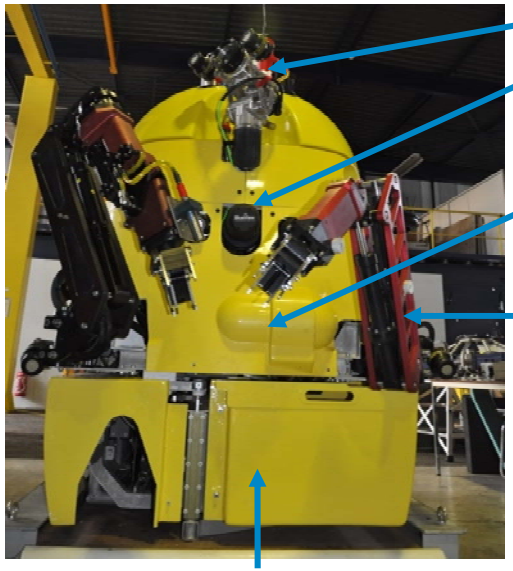


Hybrid ROV Ariane : vehicle

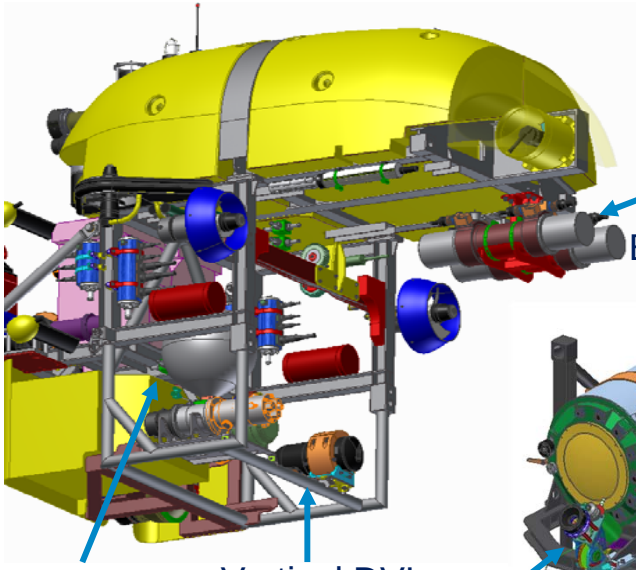


USBL beacon
Wifi, DGPS Gonio-beacon
Flasher
Acoustic modem

1.8 tons
2500 m max depth
4 to 10 hours endurance

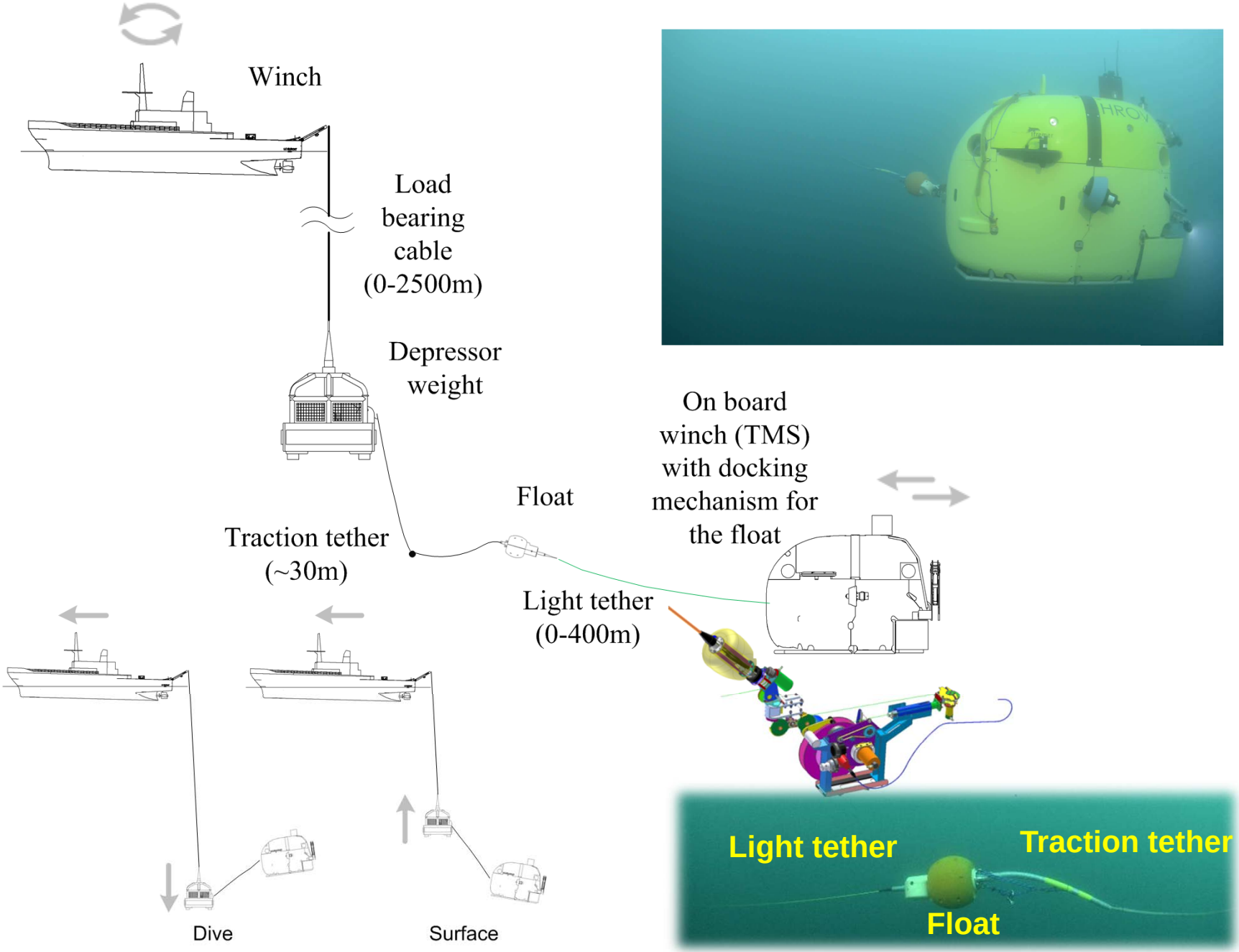


Main P&T HD cam
FWD looking sonar
Frontal DVL
5 and 7 function arms
Motorised payload tray
Tilting digital camera
Biological sampling tools



Thruster pods
Electronics pod
Battery pod
Ballast
Vertical DVL
Swivel joint
TMS
Drop weight

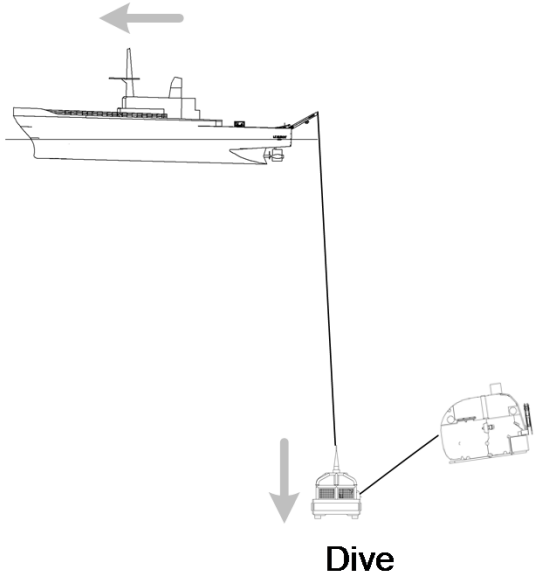
HROV Ariane's innovative deployment – ROV mode

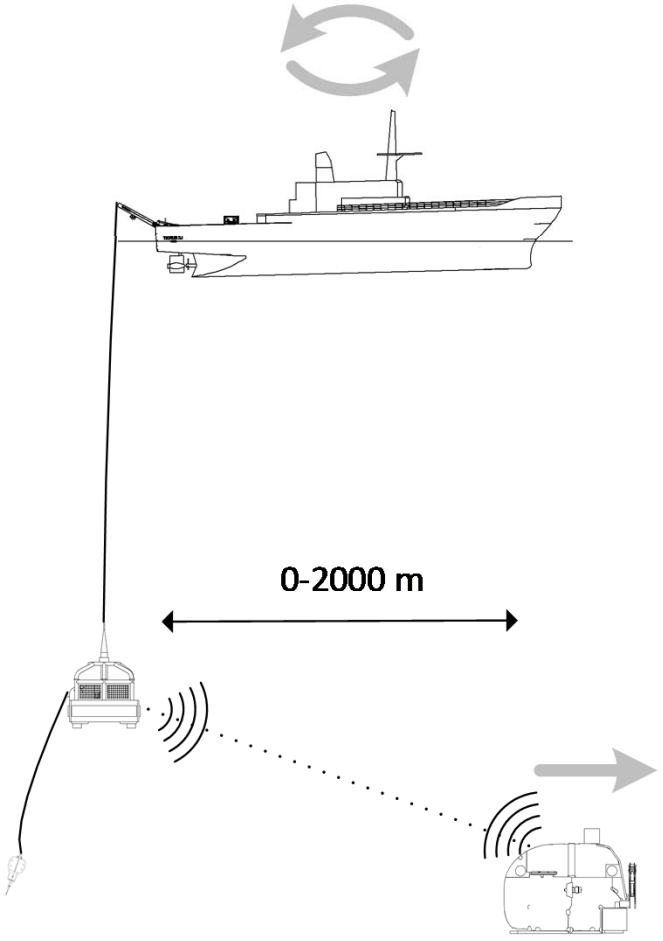


HROV – AUV mode

2 AUV modes :

- **Safety mode in case of ROV mode failure**
- **Nominal AUV mode (tested in 2016)**

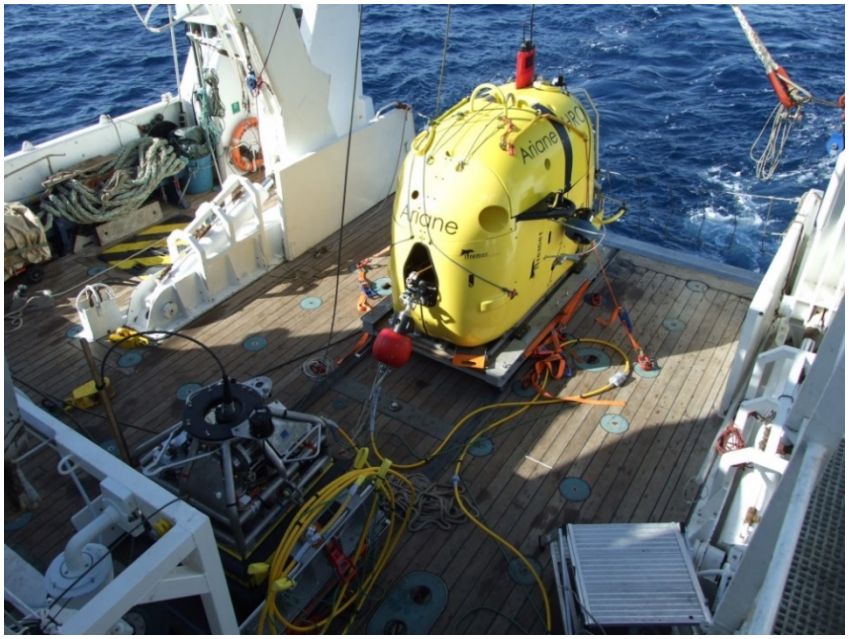


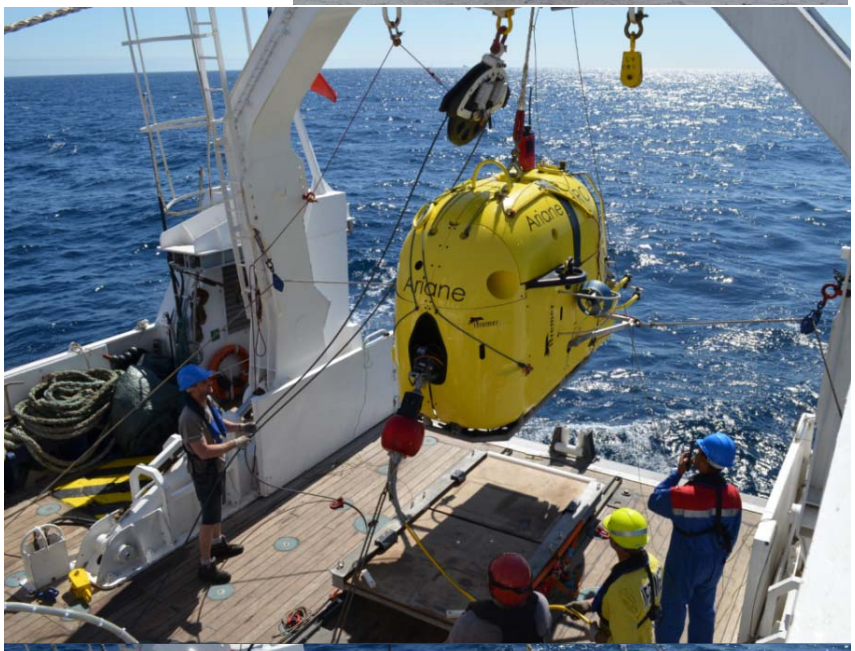


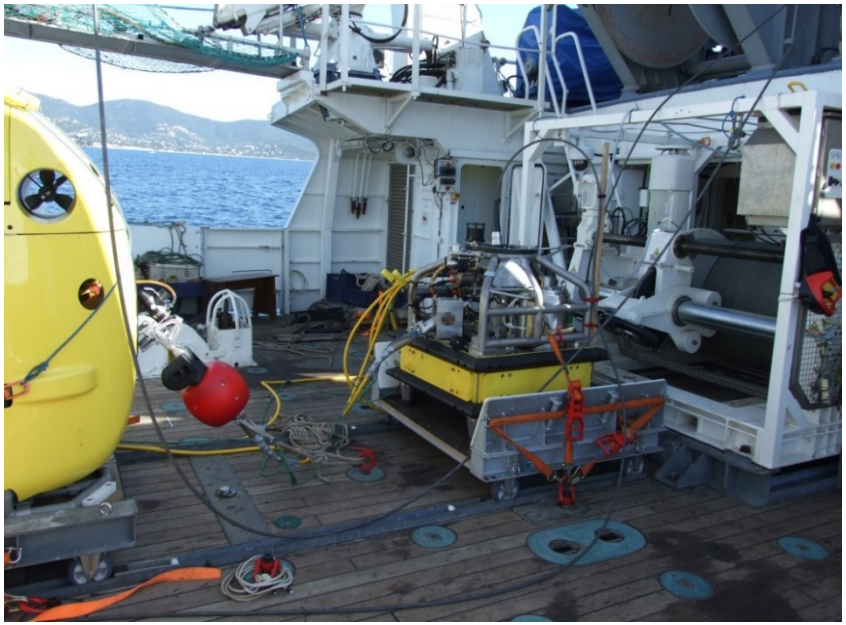
Acoustic modem on the depressor weight

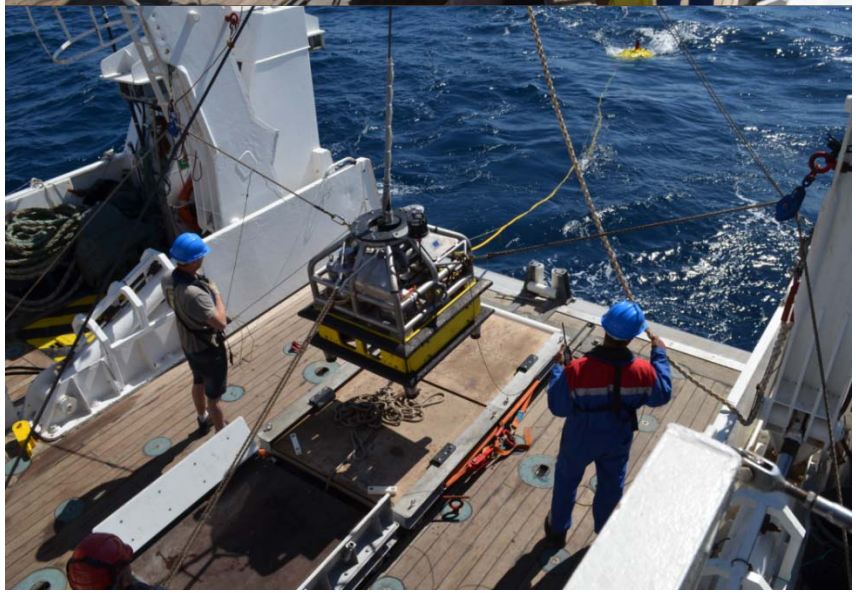
➔ Optimisation of the acoustic communication

Deployment from N/O L'Europe









Piloting Hybrid ROV Ariane

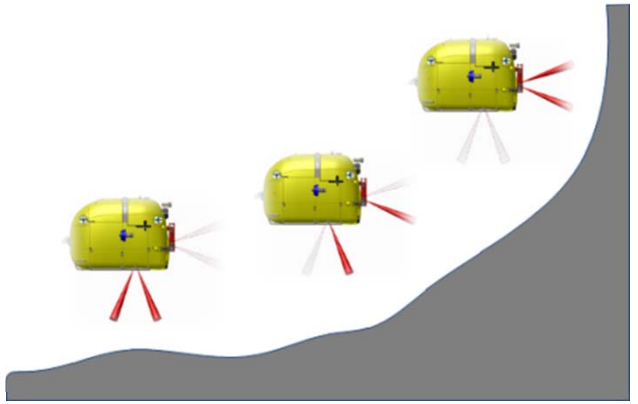
Compact cockpit

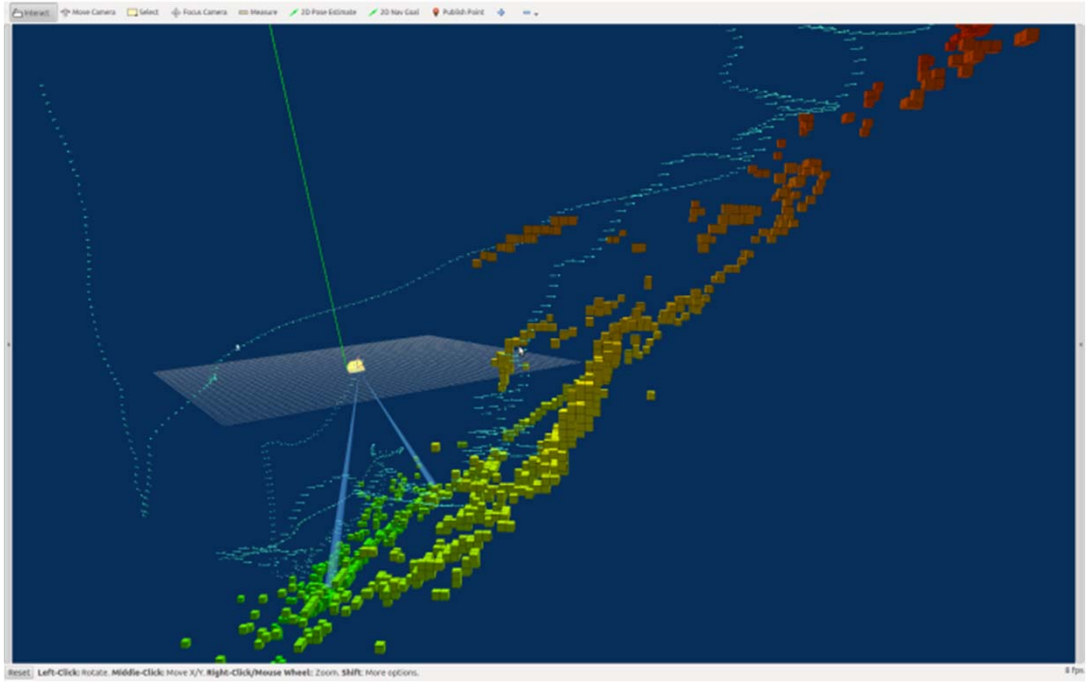
3 operators :

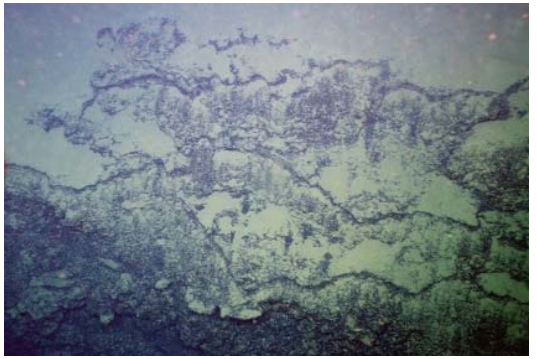
- Pilot
- Copilot
- Scientist

Navigation on steep slopes

- ✓ **4 dives on cliff or steep slope**
- ✓ **2 DVLs used for navigation**



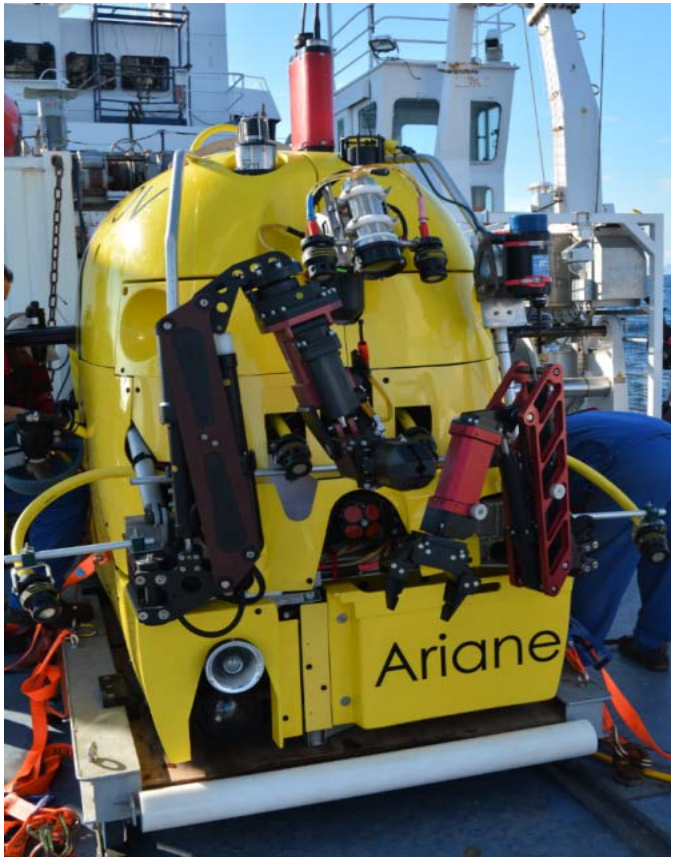


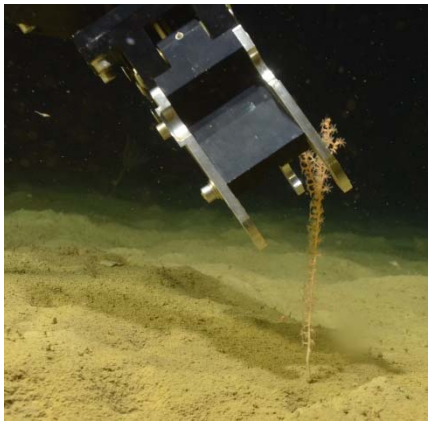


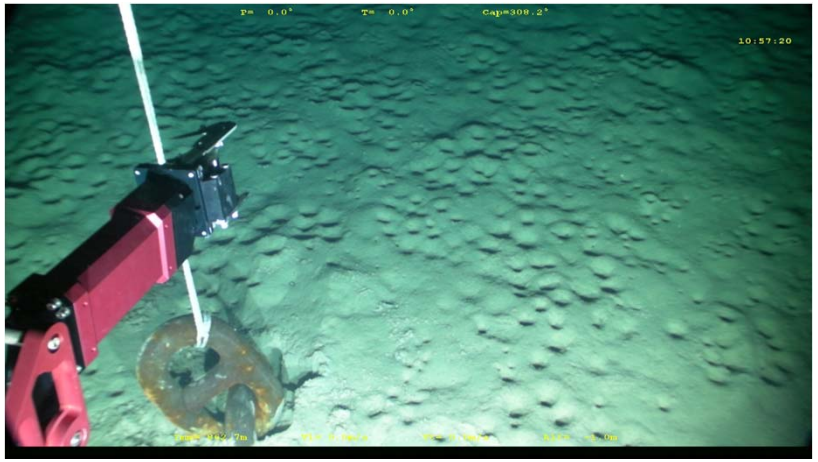
First tests of manipulators

- ✓ **Manipulators configuration:**
  - **7 function electric arm**
  - **5 function electric arm**

- ✓ **First tests done only with the 5 function arm**



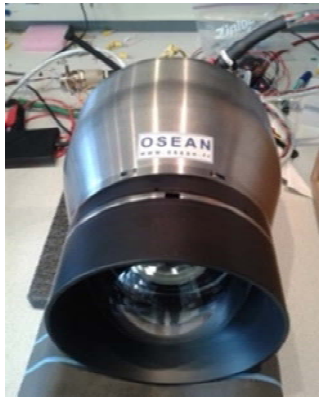




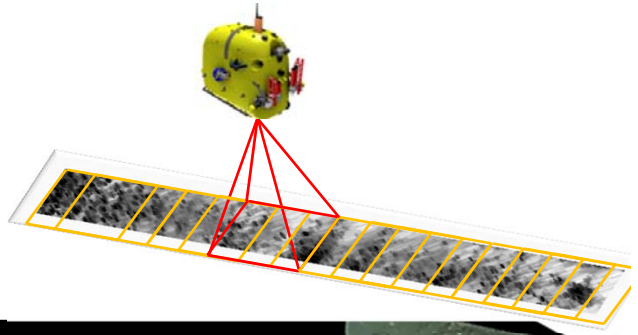
First test of digital camera

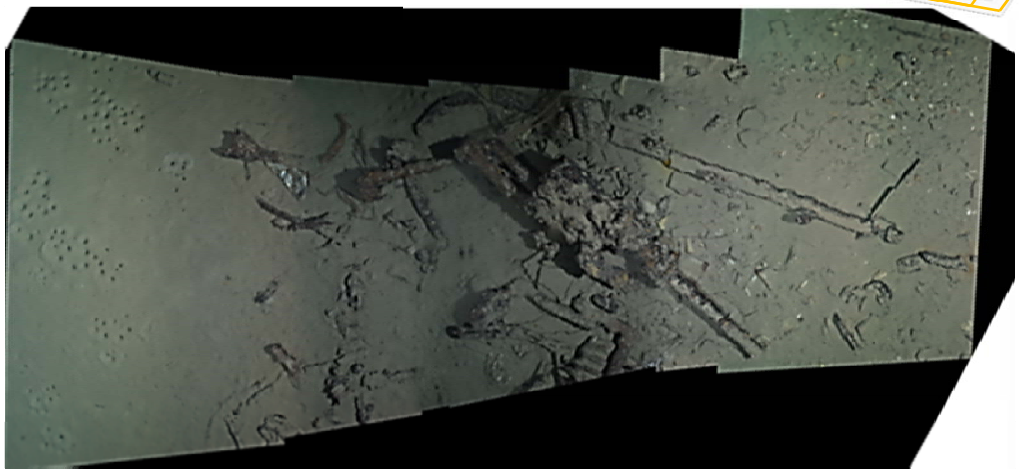
Digital tilt-camera

Tested without flash

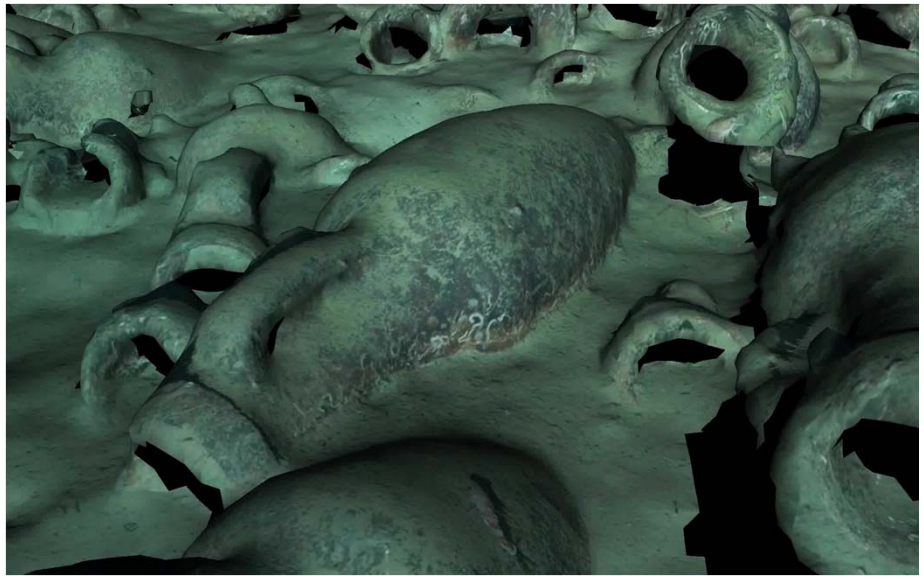


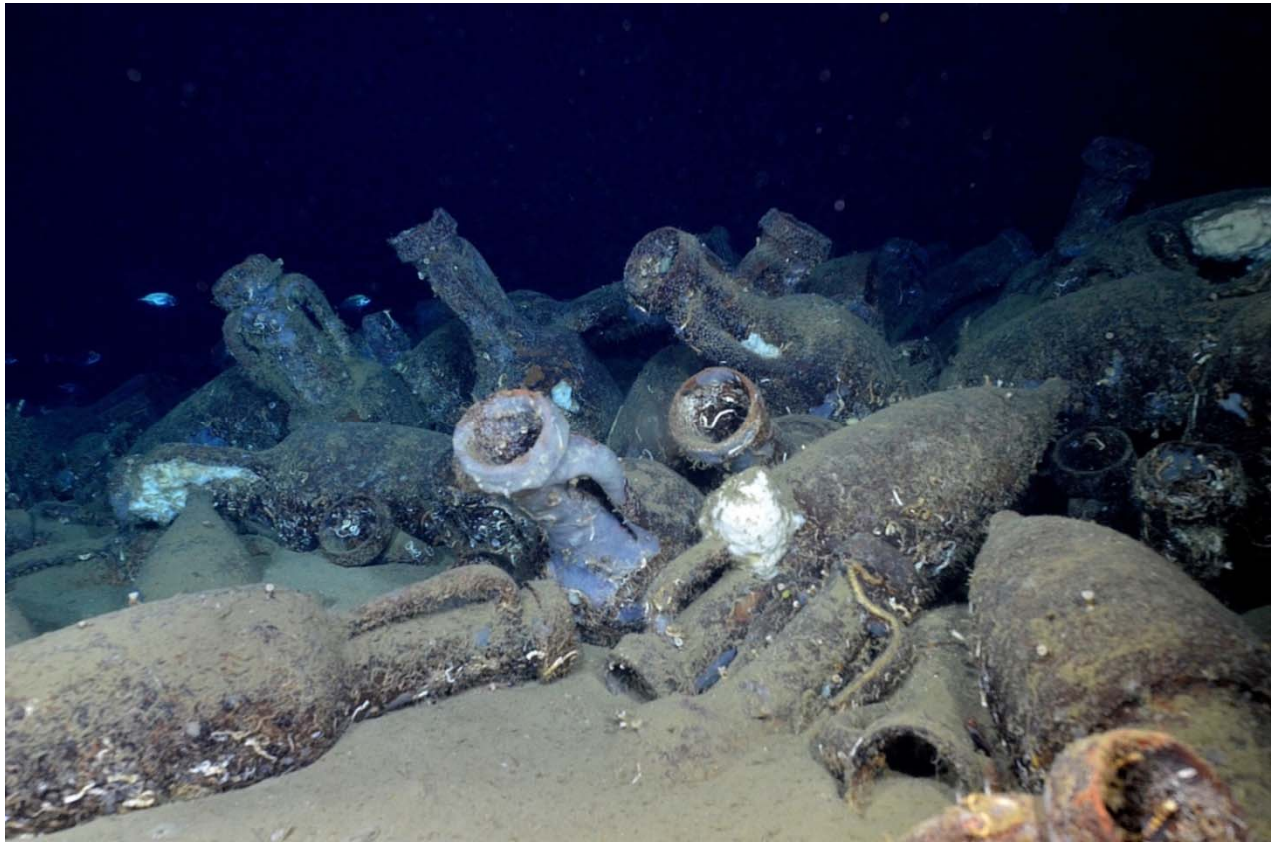
2D mosaïc :





Inspection and 3D mosaïc

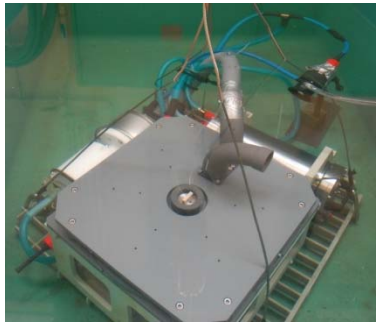




Next steps

➔ **2016 :**

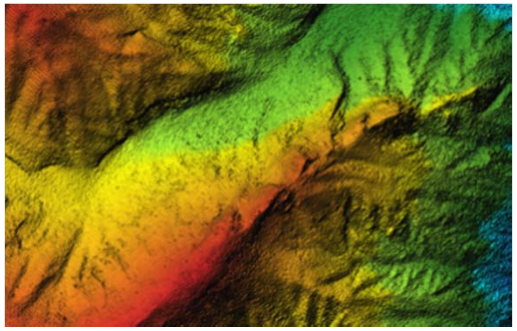
- ❑ HROV validation in intervention configuration (sampling payloads, manipulators, camera)

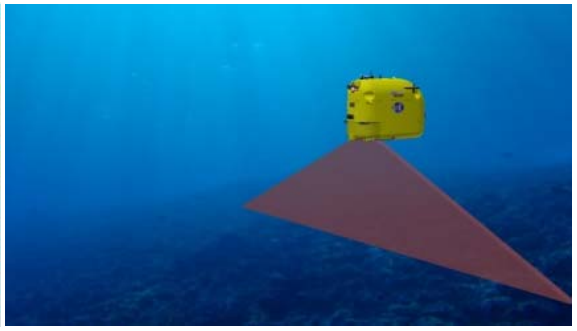


- ❑ AUV mode validation
- ❑ First scientific cruises

➔ **2017 :**

- ❑ HROV validation in cartography configuration for acoustic and optic survey (payloads : SMF EM2040 and digital camera)





Thank you