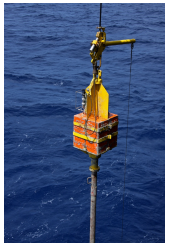
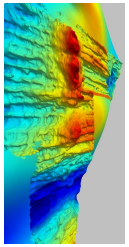
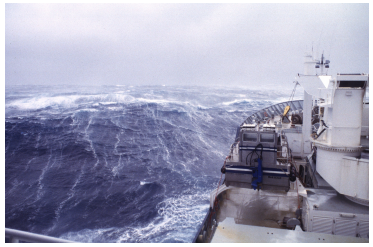
R/V *Marion Dufresne* long core quality

Hélène LEAU – French Polar Institute IPEV


R/V Marion Dufresne

Chartered by IPEV, jointly with TAAF,

IPEV 217 days / year

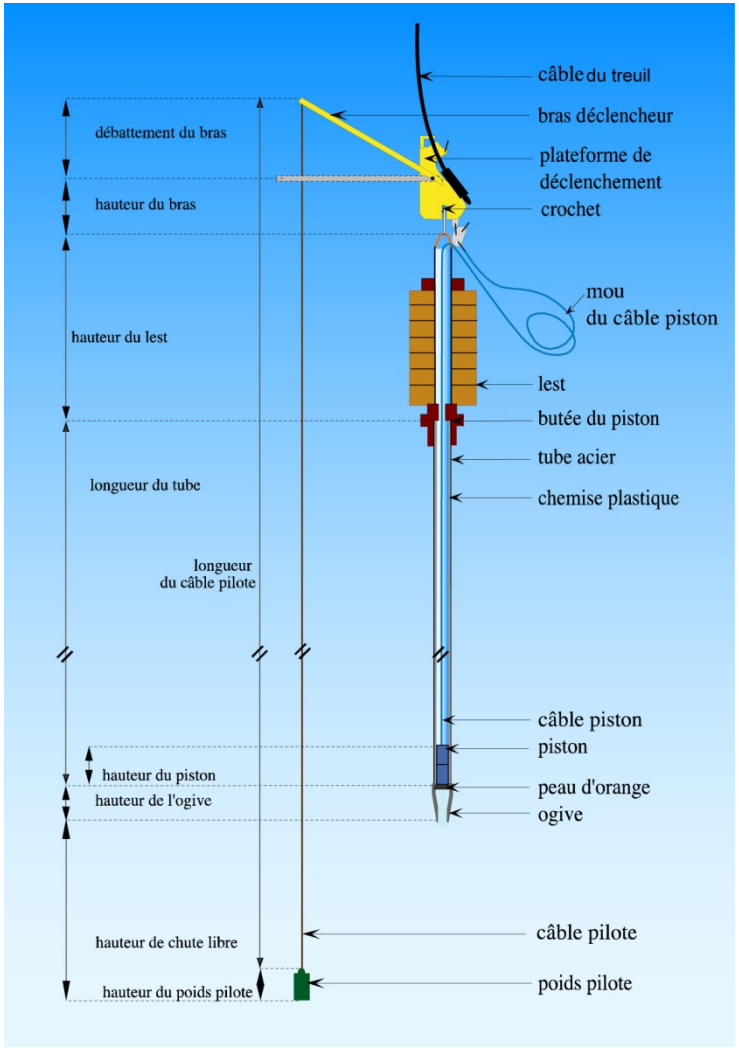
Scientific research

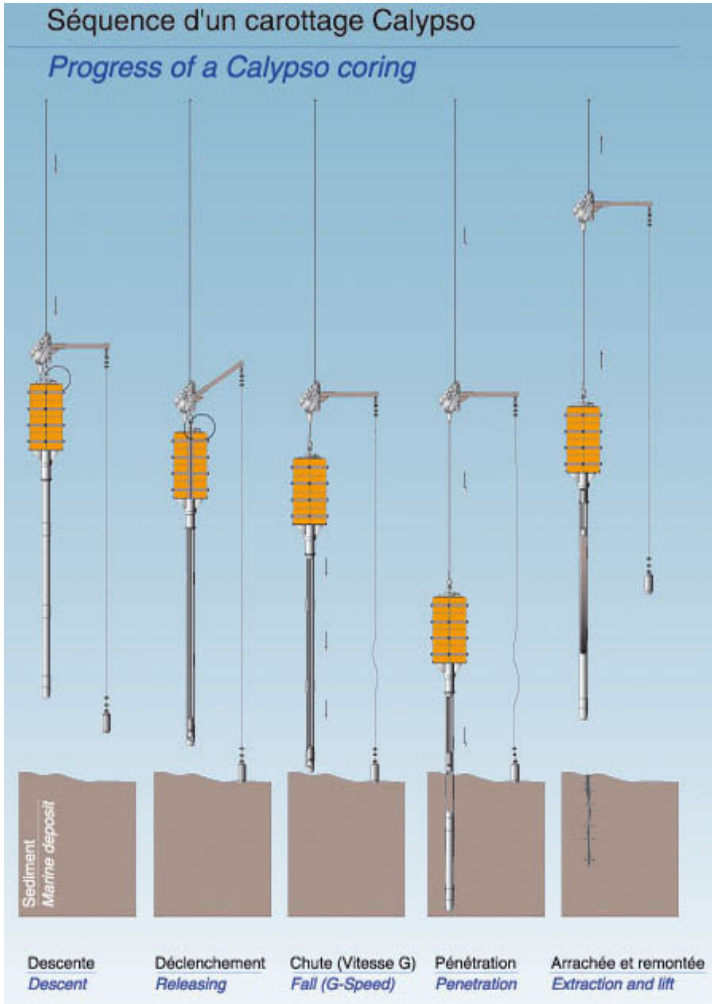
TAAF 120 d/y

French sub-antarctic islands supply

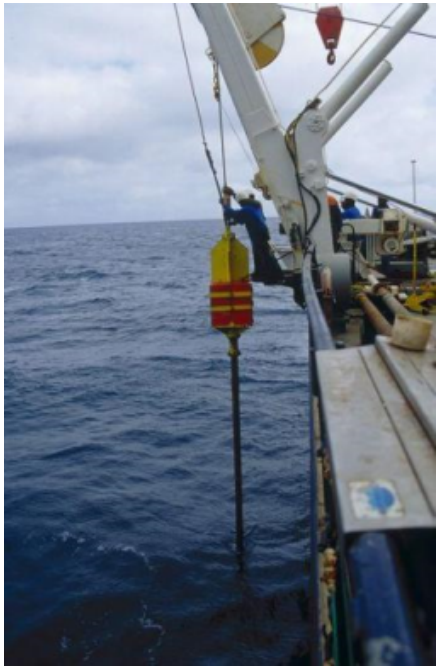
Length 120 m, breadth 20 m
Crew 48, Passengers up to 110
Cruising speed 13 knts

CALYPSO Core System





CALYPSO Core System



In the past

-Quality of sediment cores varied: core settings, water depths

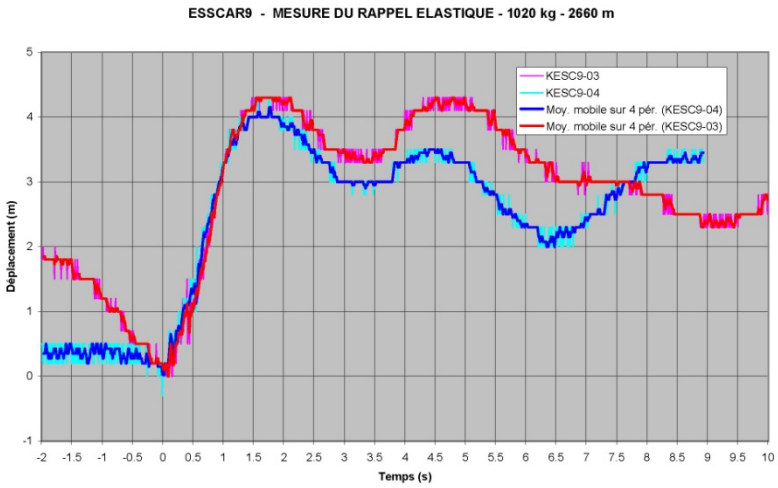
-Recovery success uneven

-No detailed knowledge of coring processes

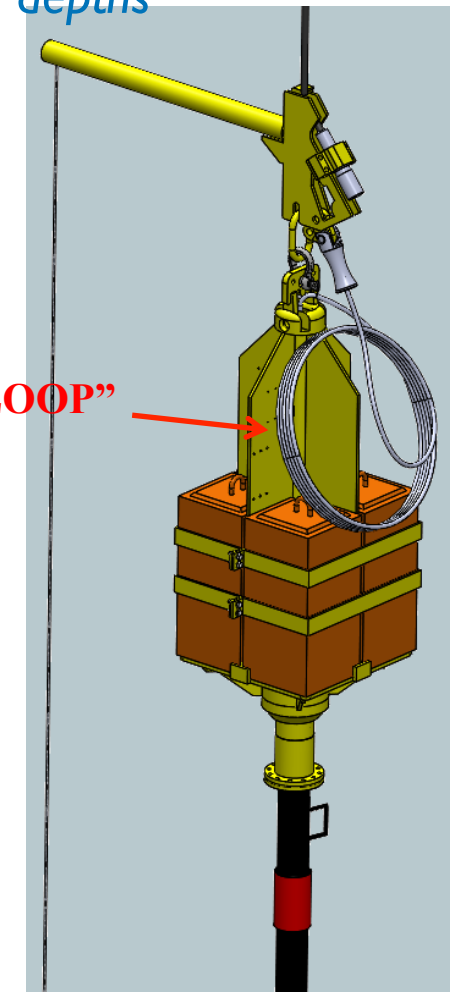
→ **Cinema Project:** *Ifremer, IPEV, CNRS-INSU*

Eliminating cores' stretching

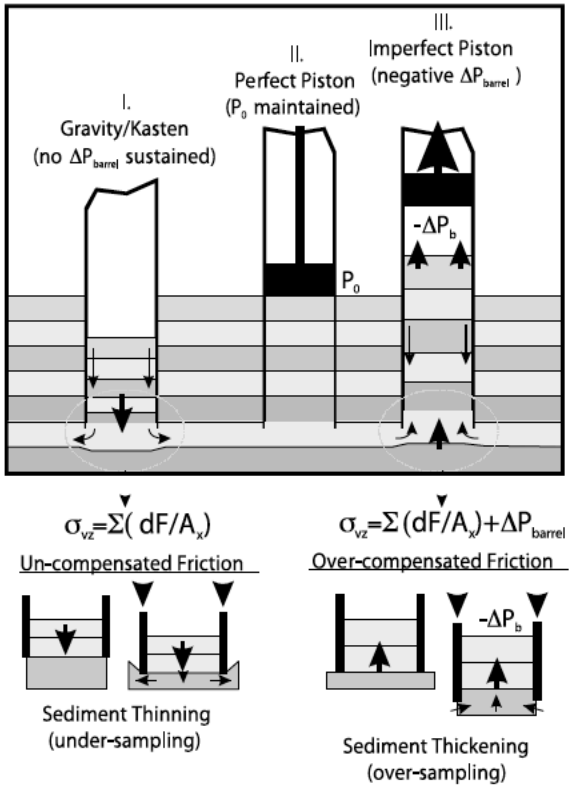
Animation



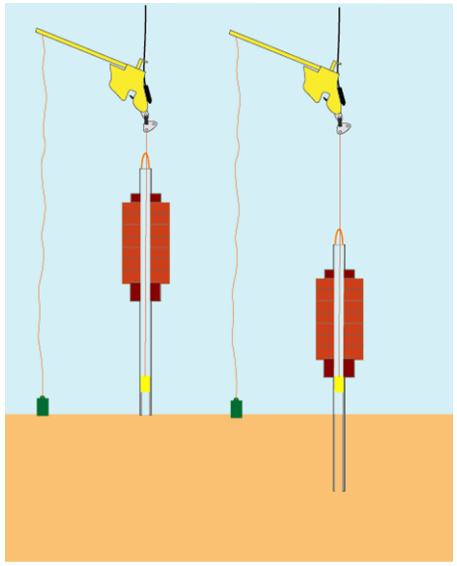
"LOOP"



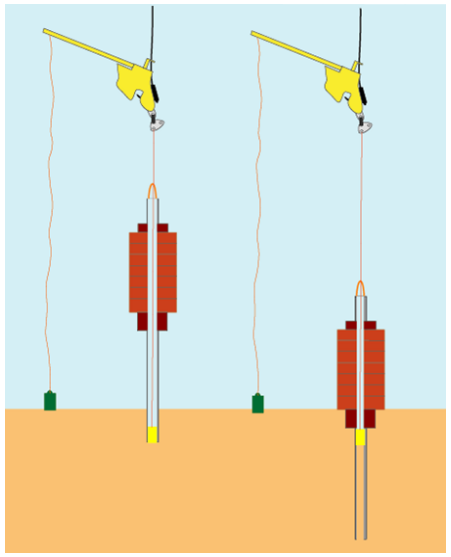
- Under/over sampling



(Skinner et McCave, 2003)

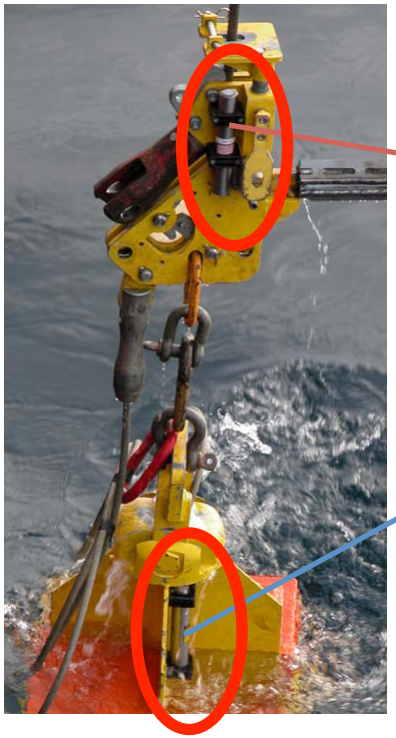


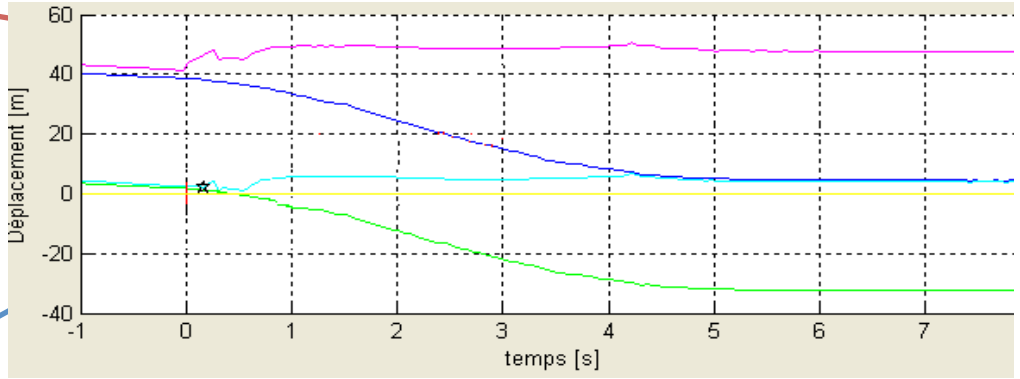
- *Too shot loop*
  - *Water sampling*
  - *Sampling ends during the penetration*
  - *Shorter corer*

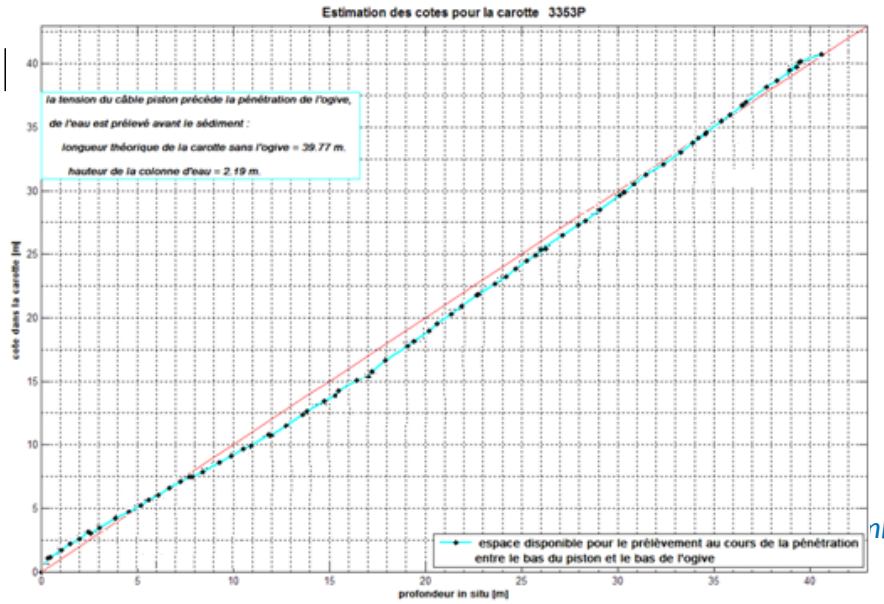


- *Too long loop:*
  - *Seabed not sampled*
  - *Weights enters the sediment*

Instrumentation of cores with pressure & acceleration sensors

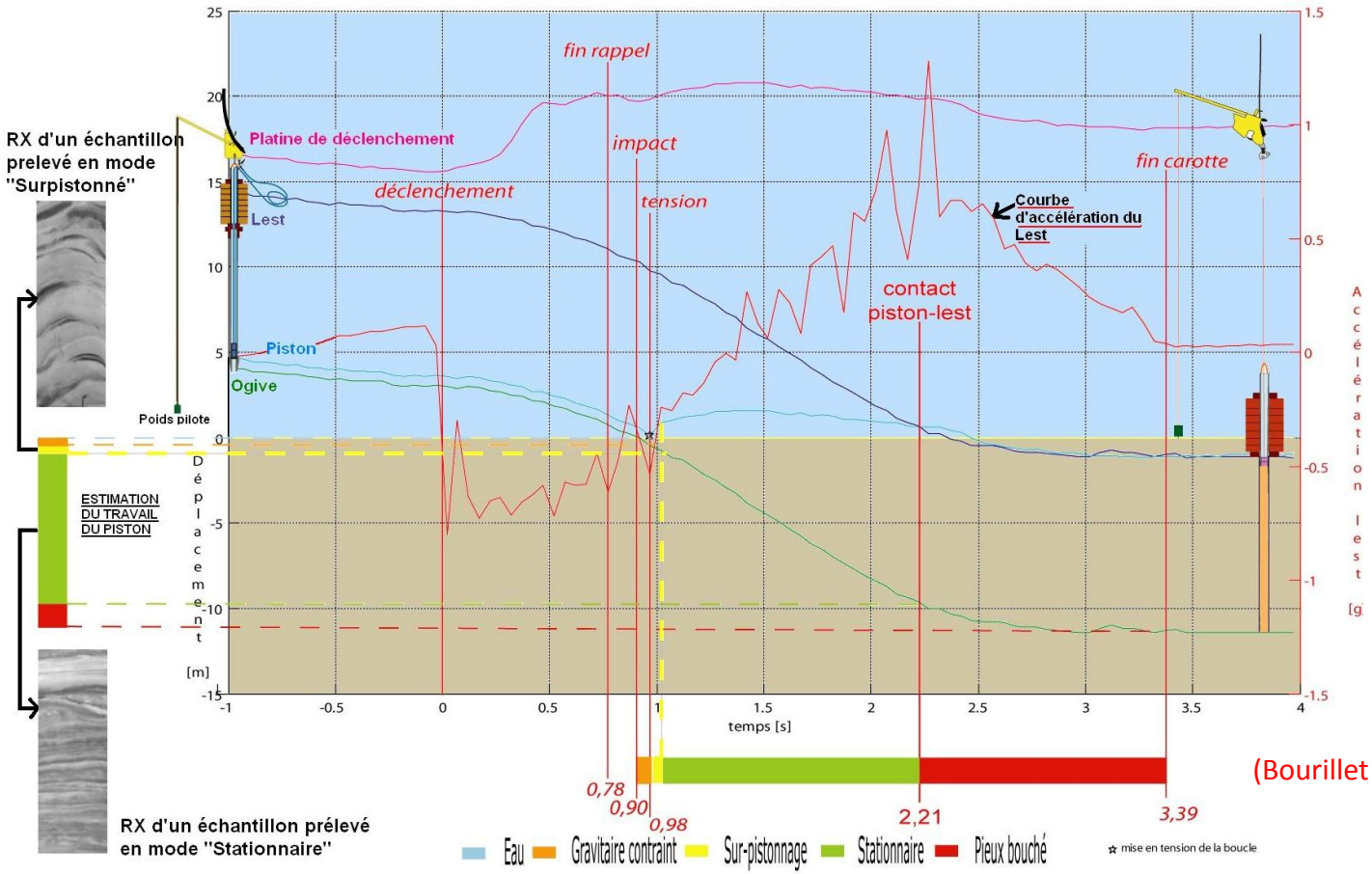






Quality of recovery during a core

Action of piston is defined from the chronology of the peaks



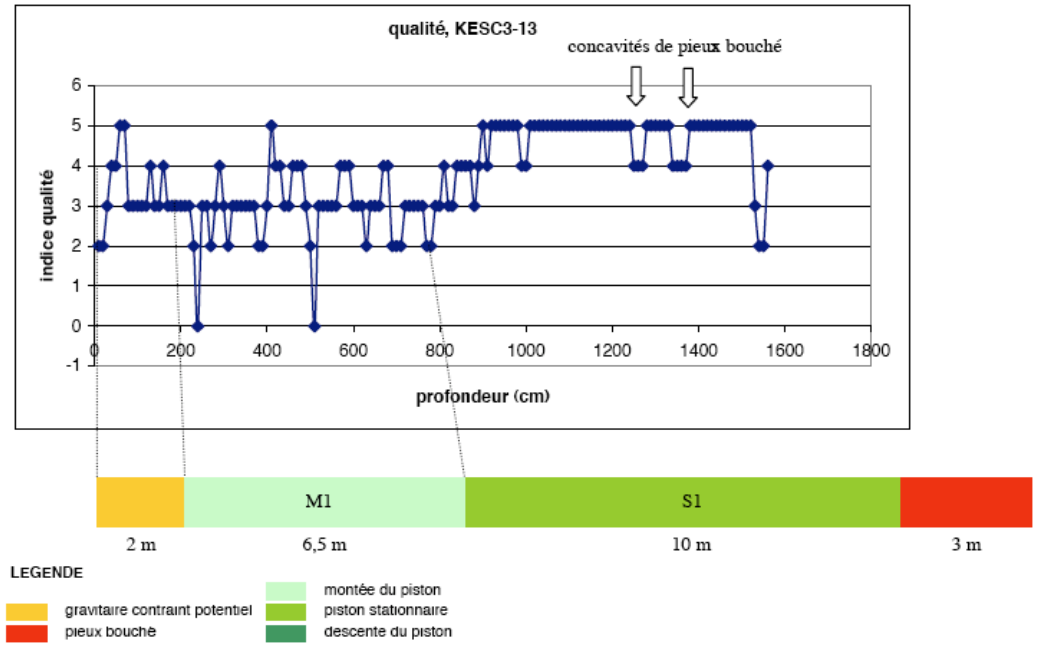
Action of piston versus time

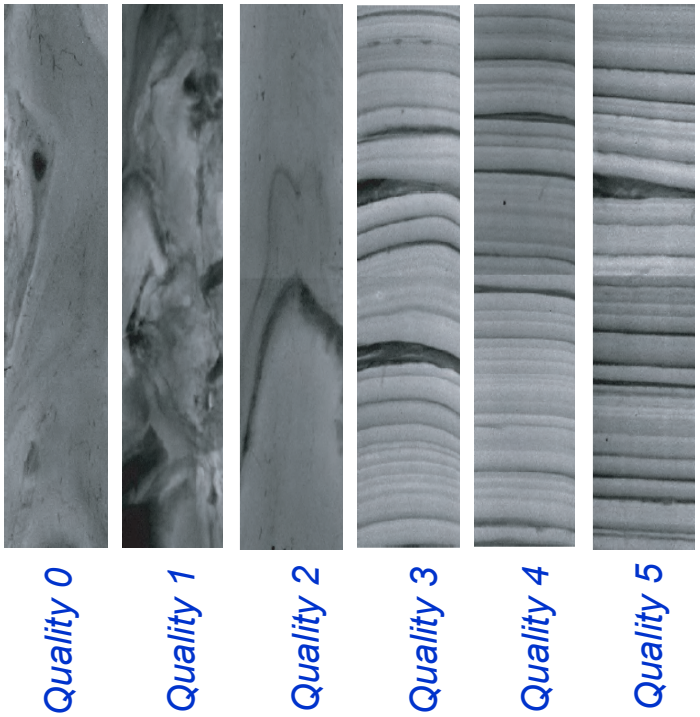
Action of piston versus depth

(Bourillet & Woerther , 2008)

Colours show action of the piston (water sampling, soughing, stationary, under sampling or pill up effect)

Core quality depends on piston action





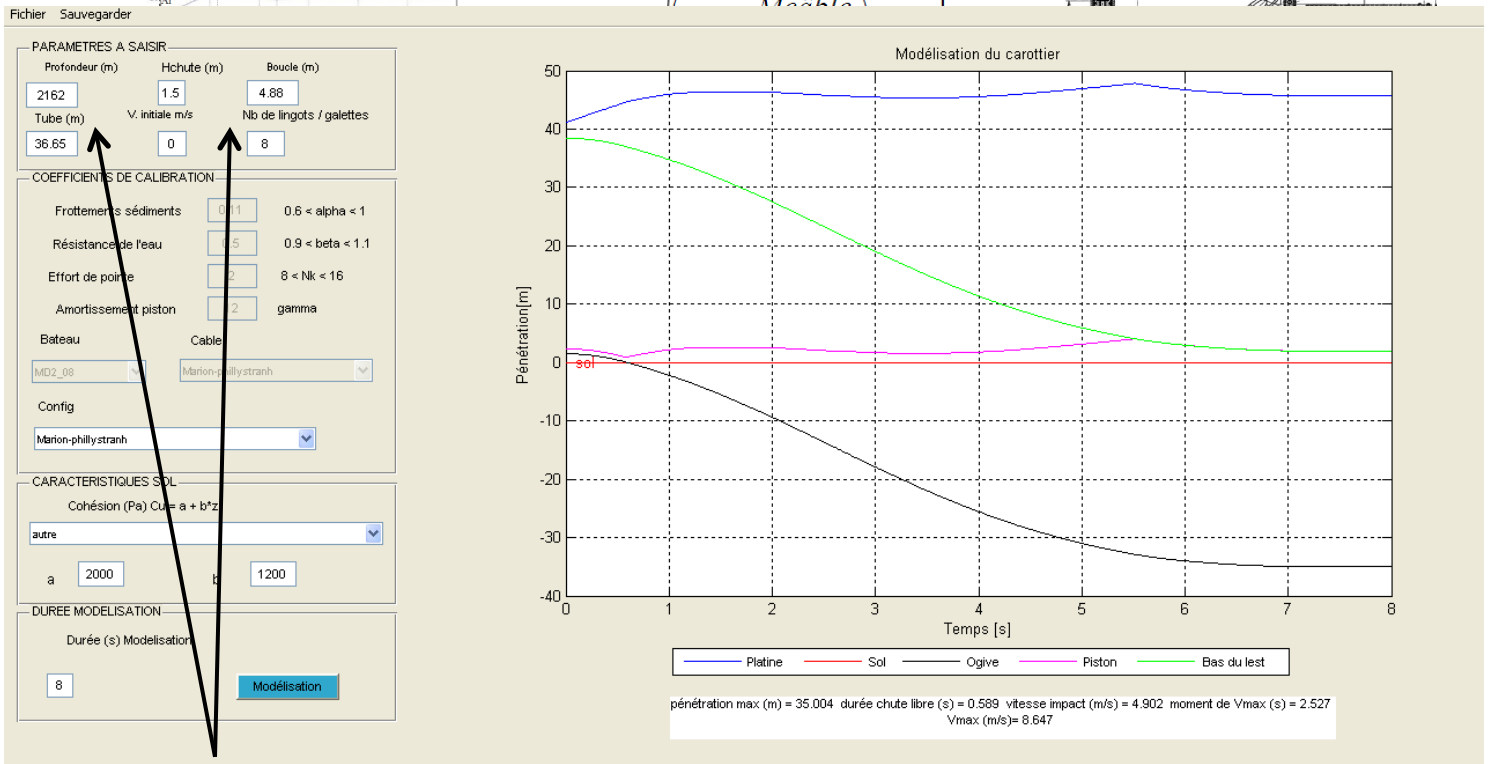
Quality 0 *Quality 1* *Quality 2* *Quality 3* *Quality 4* *Quality 5*

Piston action (water sampling, soughing, stationary, under sampling or pill up effect)

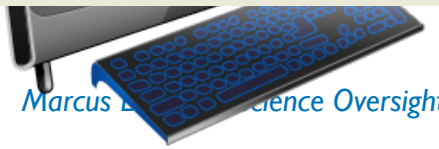
Patrice WOERTHER Ifremer and Coll. INMARTECH 2012

"CINEMA" software : modeling the operation

Field studies **Mechnical laws** **Corer geometry**



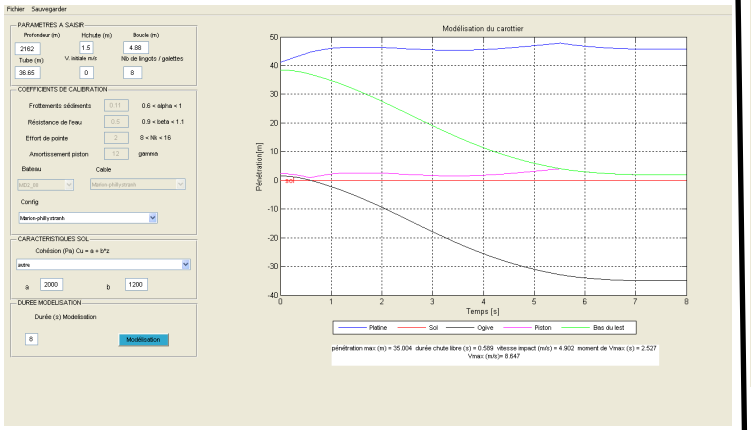
Tuning of the parameters to get the best quality



Routine coring procedure o/b Marion Dufresne

Before coring :

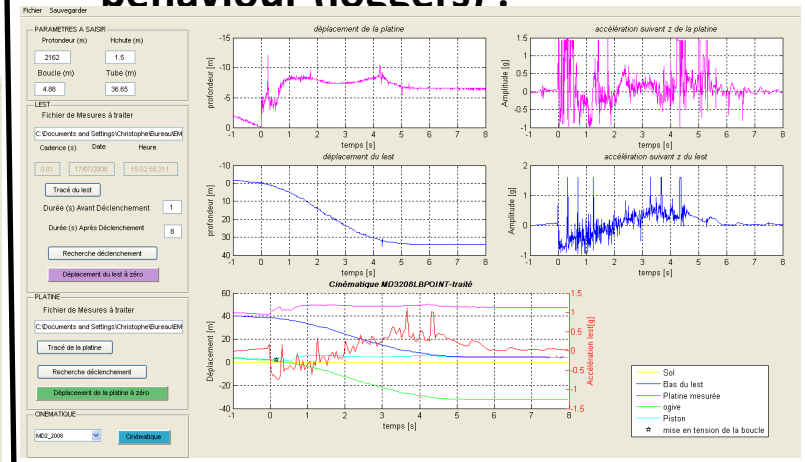
- **Calculation of the core settings: length of loop, free fall height**



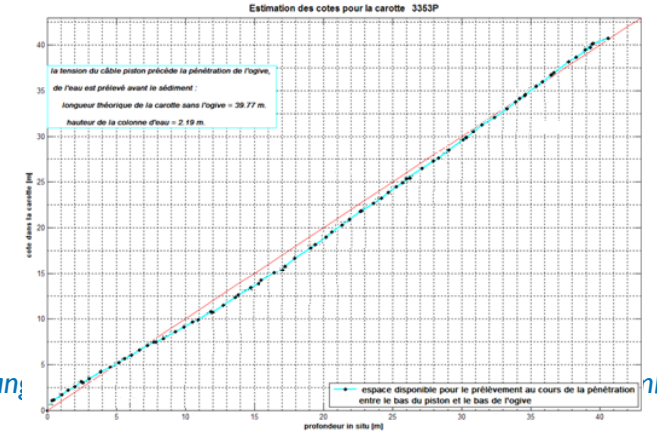
- **Preparation of the corer : cables length's, weights,...**

After coring :

- **Verification of the piston's behaviour (loggers) :**



- **Diagnostic of the core :**

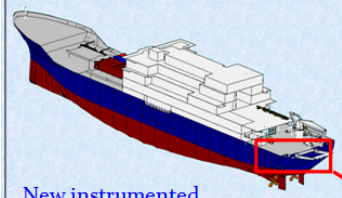


Year	Cruise	Location	PI	Other PIs
2009	MD173/RETRO2	Brazil	C. Waelbroeck, LSCE	T. Dokken, BCCR, Norway
2010	MD178/TAIWAN	Taïwan	Y. Wang, Central Geol. Survey	
2010	MD179/Japan Sea Gas Hydrates	Japan	R. Matsumoto, Univ. Tokyo Japan	
2011	MD184/ERODER4	Réunion	N. Babonneau IUEM S. Jorry, IFREMER	
2011 2012	MD185/INDIENSUD MD189/INDIENSUD2	Kerguelen	A. Mazeau, LSCE	E. Michel, LSCE JL Turon, EPOC
2011 2013	MD186/CONEGAS MD195/CONEGAS2	Brazil	M. Ketzer, PUCRS, Brazil	D. Miller, PETROBRAS
2011	MD187/PROERG	Brazil	K. Souza, CPRM, Brazil	
2012	MD191/MONOPOL	Bay of Bengal	F. Bassinot, LSCE	L. Beaufort, CEREGE T. De Garidel, CEREGE
2012	MD190/CIRCEA	South China Sea	C. Kissel, LSCE	
2013	MD194/EuroFLEETS-MD	Mediterran. Bay of Biscay	D. Van ROOIJ, U-Gent, Belgium S. Nave, LGE Portugal	

CLIMCOR - Ocean Project 2012-2019

Improvement of quality and size of the sediment cores.
2 main changes : the **coring cable** and the **winch** that drives it.

Siamois Coring Winch Improvment

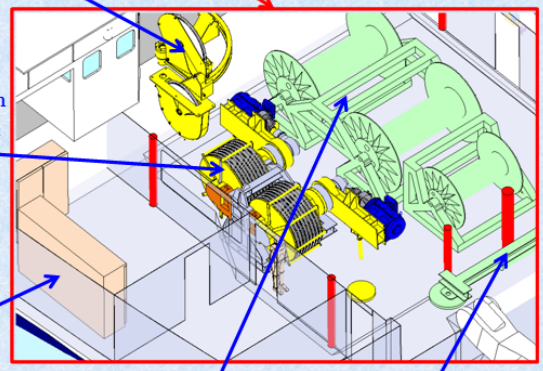


The coring winch will be upgraded in order to be more efficient and reliable for any operations. Equipped with the last technologies and a stronger capstan, it will be able to beat new records of coring length and producitvity.

New instrumented blocks

Winch Capstan replacement : from 30 tons to **45 tons capacity.** Double drum technology.

New electrical power system



New spooling system

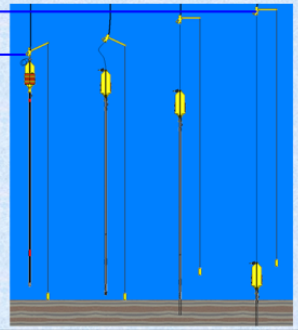
New hydraulic regulation systems

New Calypso coring cable

A new 7000 metres oceanographic cable will be designed to fit with the new requirements of « perfect » long coring : it has to be both extremely strong – to bear 45 tons extraction strenght of giant pipes - and very stiff. New fibers and braidings are studied.

Elastic stretching to prevent and/or minimize :

It lifts the piston up and creates over suction of the sediment, thus destroying the sample.
A cable with a very high stiffness prevent this stretching, to get the best sample's quality.



45 tons winch → 75 m cores

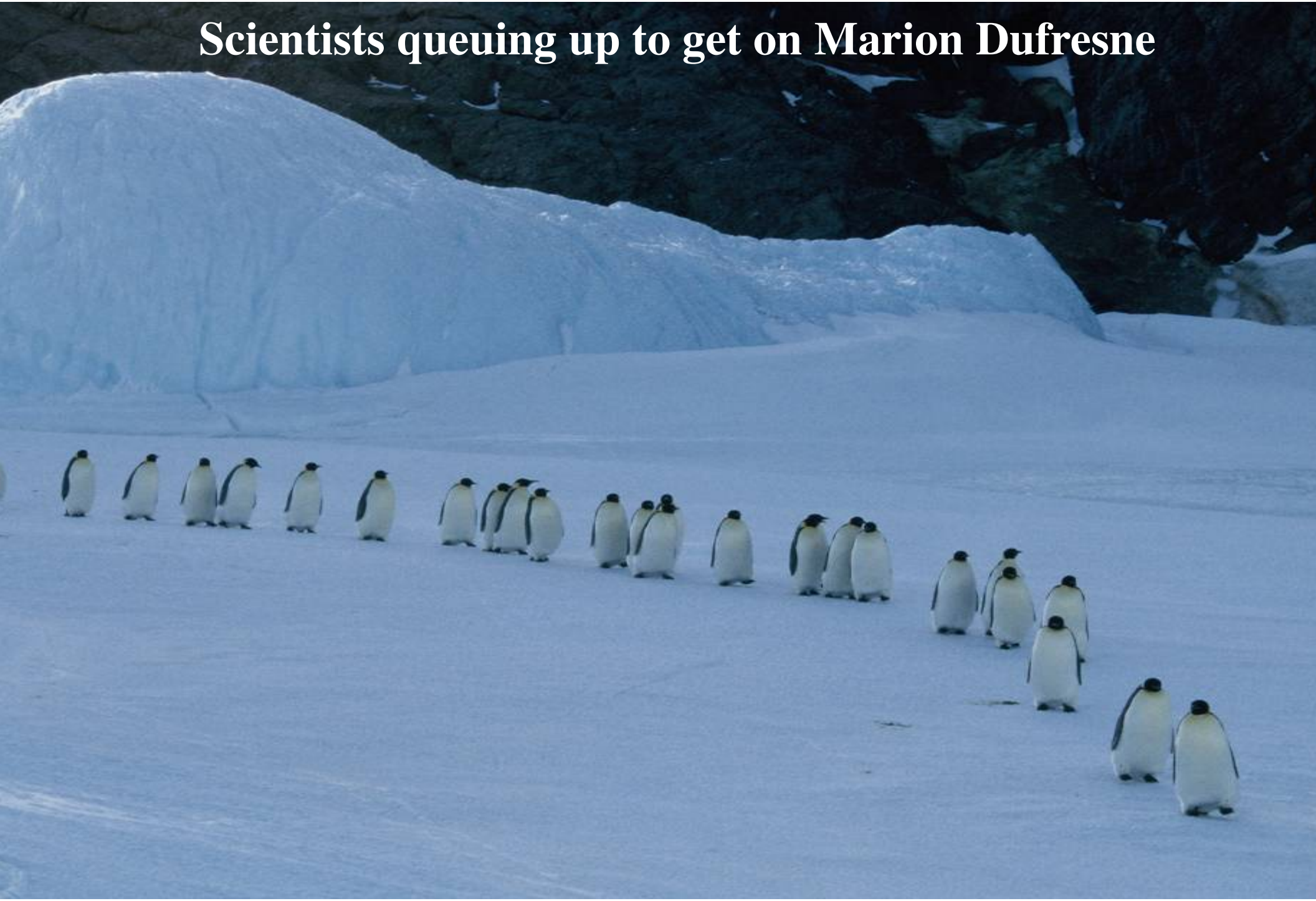
5000 m out, 10 tons corer → 15 m cable stretch max

More R&D activities about long core are on going

More information:

Hélène LEAU : hleau@ipev.fr
Yvan REAUD: yréaud@ipev.fr
www.institut-polaire.fr

Scientists queuing up to get on Marion Dufresne



R&D Activities

Calypso IV :

Calypso IV

Security Jaw

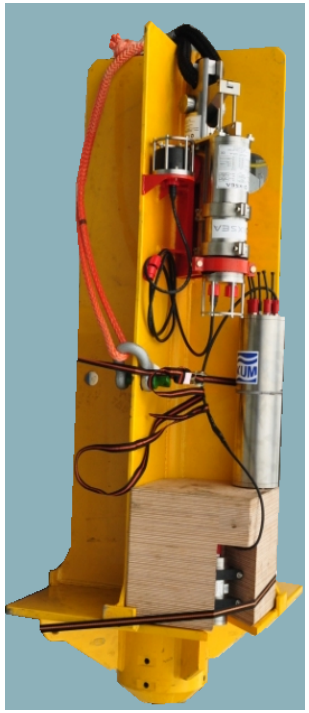
Instrumentation

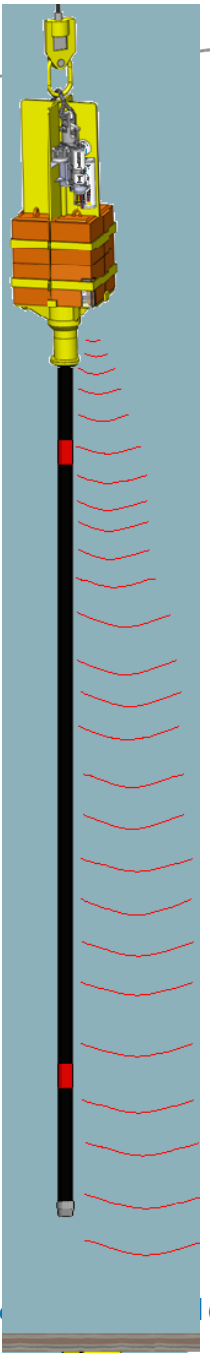
Cables & Ropes

Sampling & Log

Acoustic altimetry triggering
Under development : sea trials in 2014

- **Best Free Fall height control and feedback**
- **Linked with Cinema : levels correction**
- **Faster and more secured handling**
- **etc.**





R&D Activities

Security Jaw :

Calypso IV

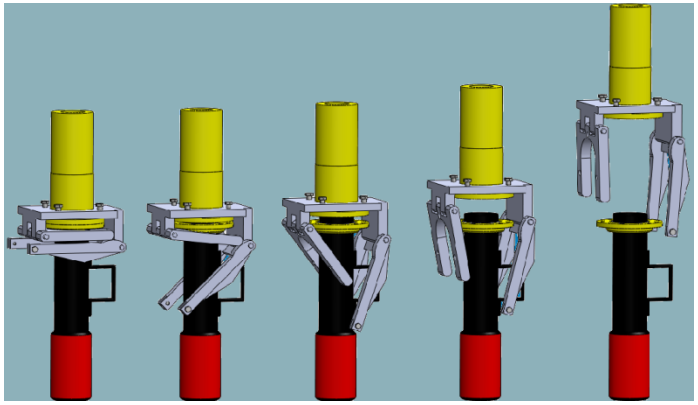
Security Jaw

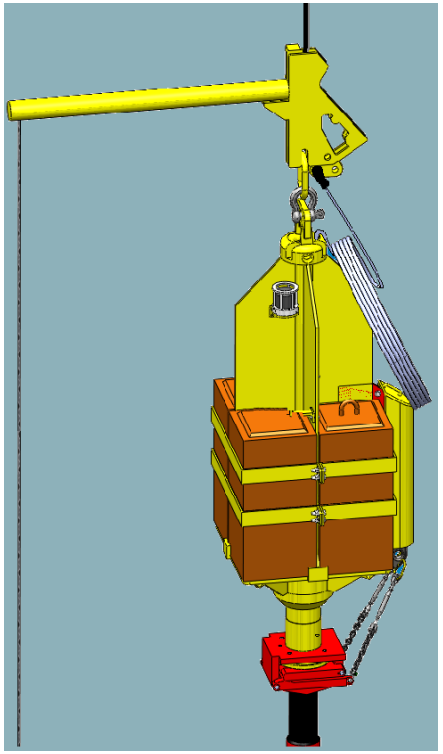
Instrumentation

Cables & Ropes

Sampling & Log

Acoustically remoted pipes link :
- Prevents the pipes from being stuck in the sediment, threatening to lose the corer (& instrumentation)
- Faster and more secured handling





R&D Activities

Instrumentation :

Calypso IV

Security Jaw

Instrumentation

Cables & Ropes

Sampling & Log

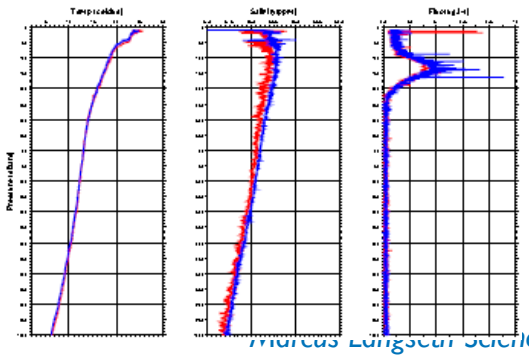
Integration of sensors and samplers on the corers :

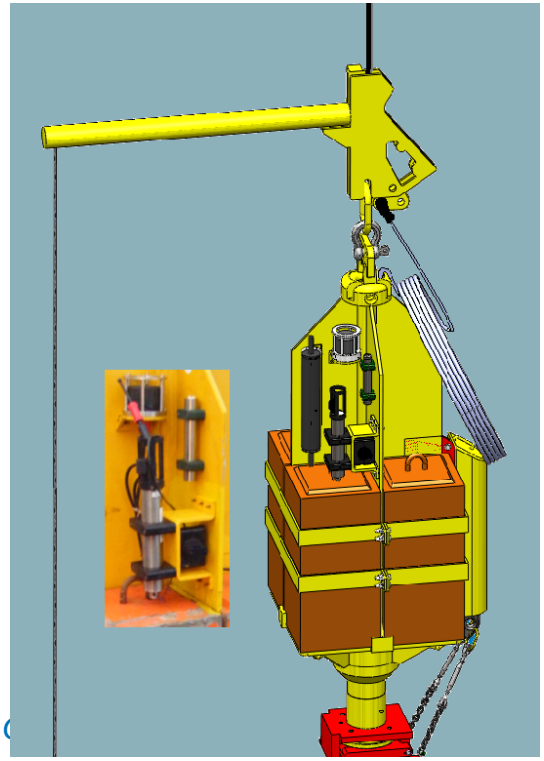
- **CTD sensors and fluorometry**
- **1,7 L Niskin bottle : interface water sample**

To come :

- **Additional sensors : Dissolved oxygen**
- **USBL Positionning**
- **Additional / Bigger Niskin bottles**

Save a precious “shiptime” by performing several operations in one





R&D Activities

Ropes and cables studies

Calypso IV

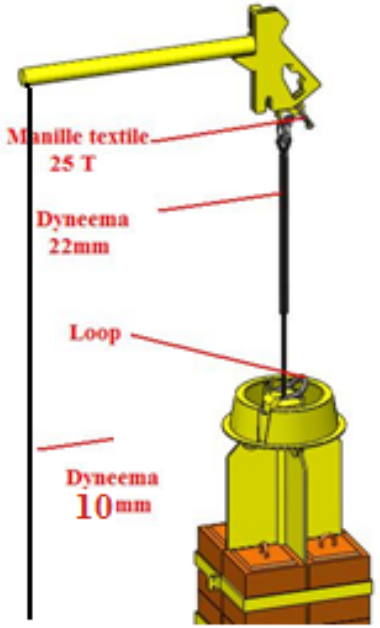
Security Jaw

Instrumentation

Cables & Ropes

Sampling & Log

Switching from steel cables to textile technology



R&D Activities

MSCL and Laboratory equipment

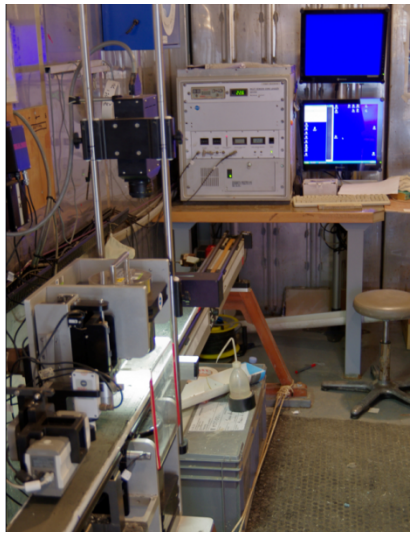
Calypso IV

Security Jaw

Instrumentation

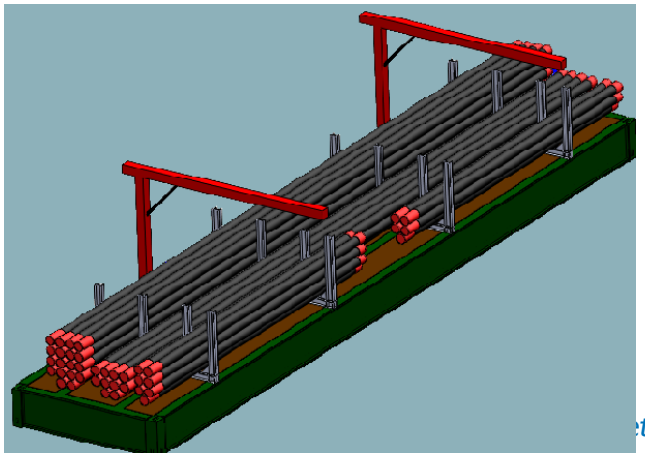
Cables & Ropes

Sampling & Log



Sampling tools and facilities

Logistic and deck handling tools



C2FN Ocean Coring Tools

Coring tools

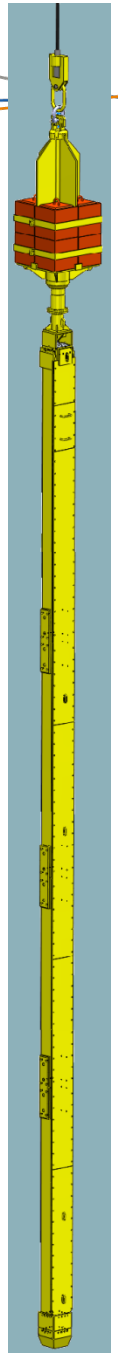
Calypso IV

Security Jaw

Instrumentation

Cables & Ropes

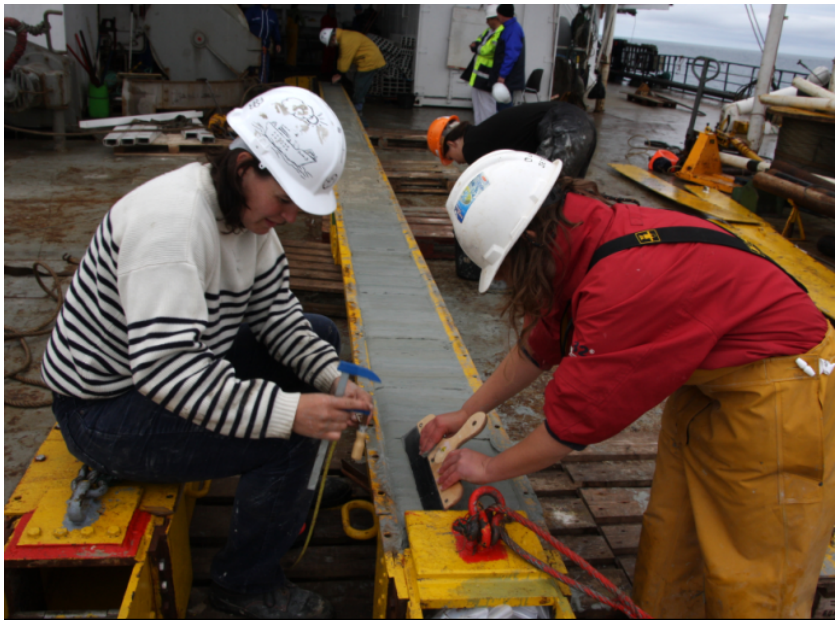
Sampling & Log



Gravity Core : CASQ

Gravity Core up to 12 m

Square Section 25 cm x 25 cm



C2FN Ocean Coring Tools

Interface Corers :

- KC Denmark 71000 D100

Under development :

- Acoustic triggering
- Video logging

Coring tools

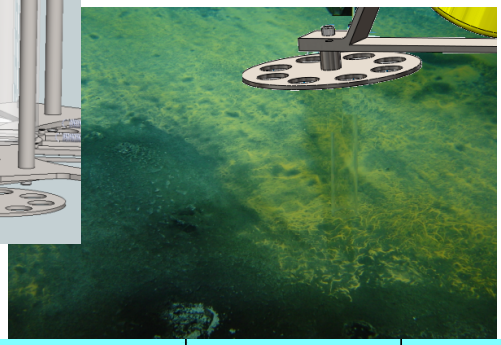
Calypso IV

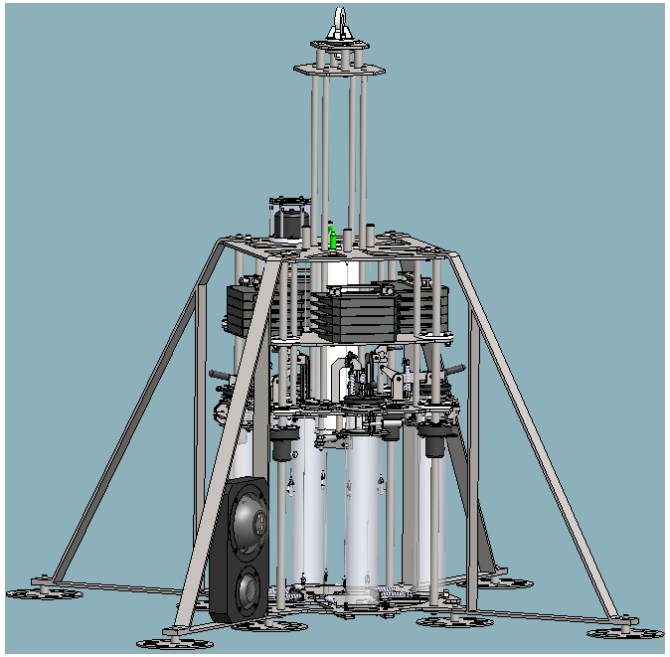
Security Jaw

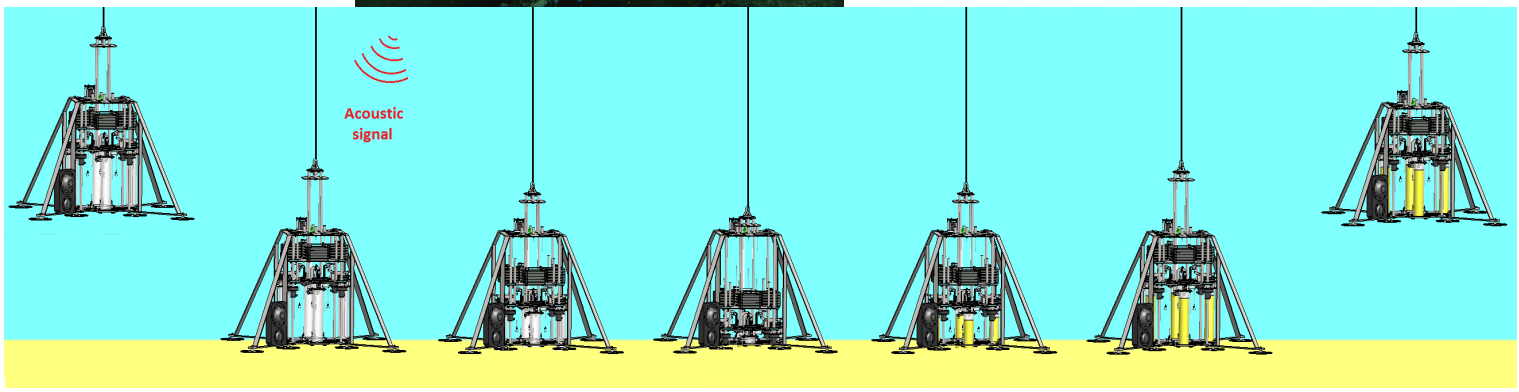
Instrumentation

Cables & Ropes

Sampling & Log







- … and a boxcore available