Past and new technological developments at LOV for core and new BGC applications

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LOV

Acknowledgements

Technological developments are always a team work !

- LOV : Antoine Poteau, Christophe Penkerc'h, A. Pierret, V. Taillandier, N. Alem, F. D'Ortenzio, H. Claustre

- Strong and good collaboration with Ifremer and NKE

Presentation Outline

Provor CTS4 : A float developed for the BGC core Argo mission

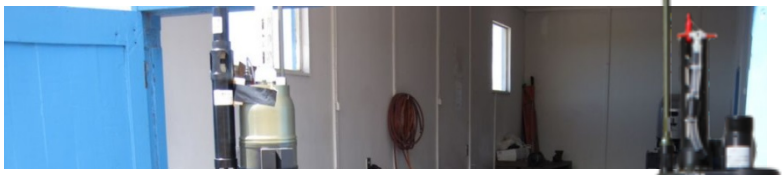
Provor CTS5 : A float developed for R&D and demanding application

- R&D facilities at LOV
- Past developments
- On going developments

Conclusion and perspectives.

Development of the CTS4 profiler

Collaboration LOV – IFREMER - NKE



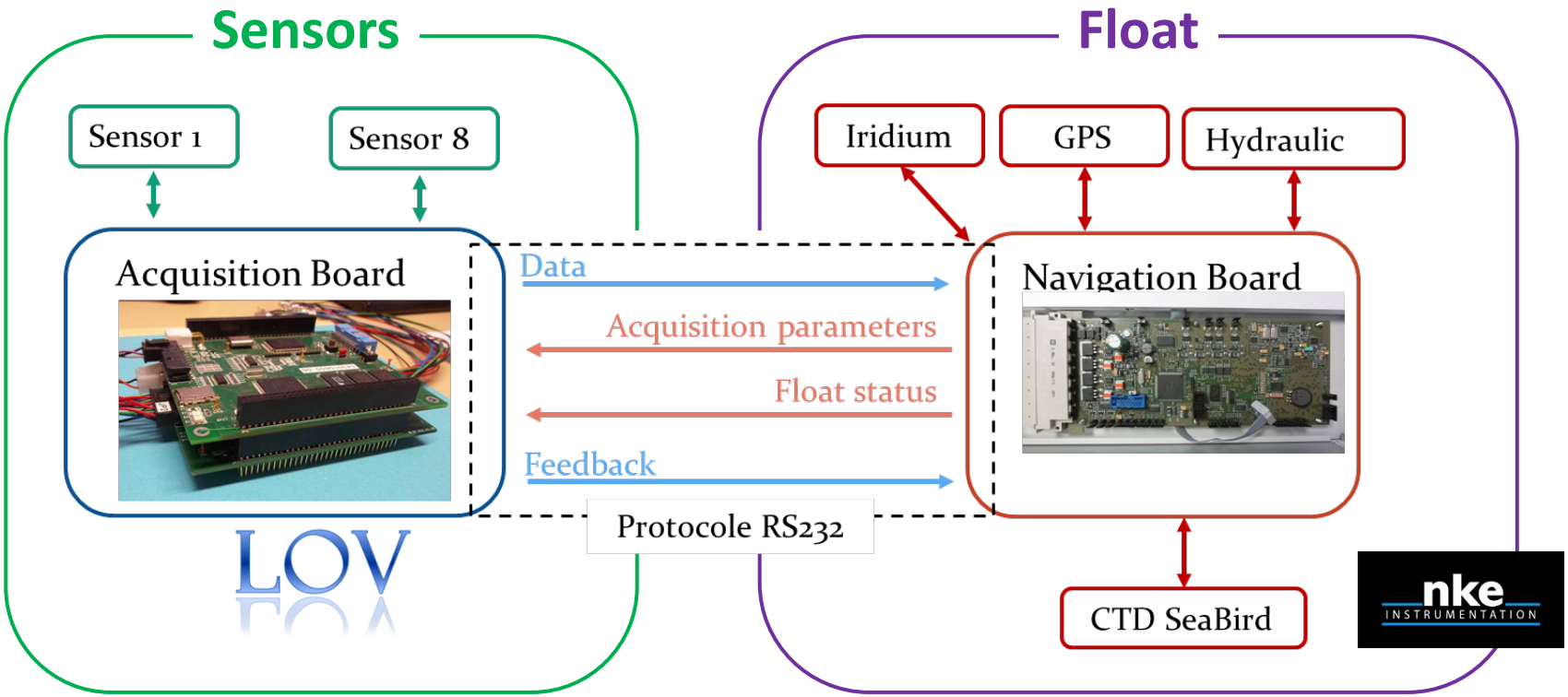
Nice results:

- **More than 200 floats**
- **First float "Full BGC" deployed**
- **Highly flexible BGC Argo float**

➔ But not easy to explore new applications

Development of the CTS5 profiler

How to integrate safely, at LOV, new applications ?
➔ dual board strategy. The CTS5 support a protocol to communicate with a user electronic board.



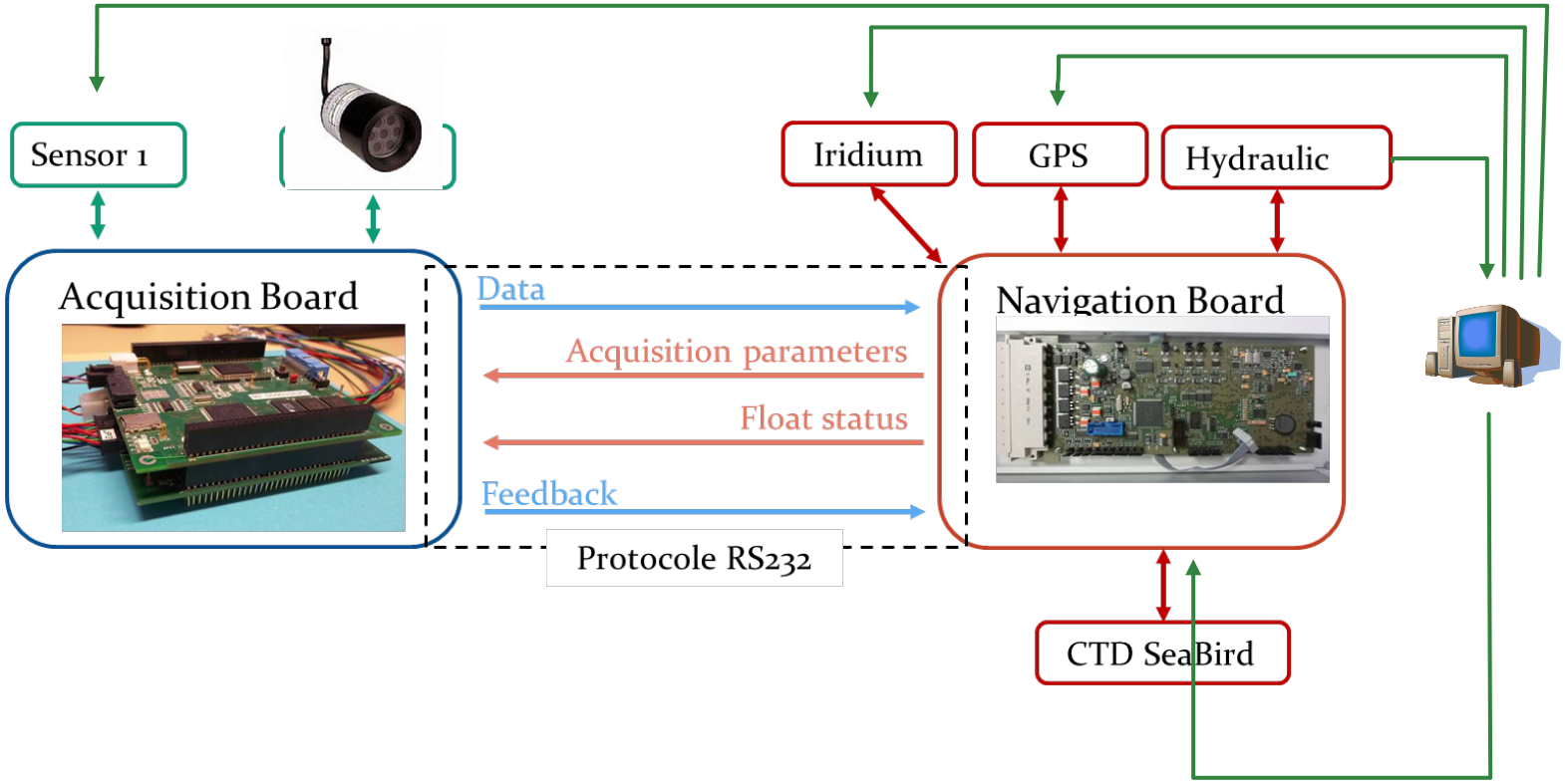
Modifiable at LOV = Flexibility

Stable = Security

Development of the CTS5 profiler

How to test our development ?

1- Hardware Bench Simulator



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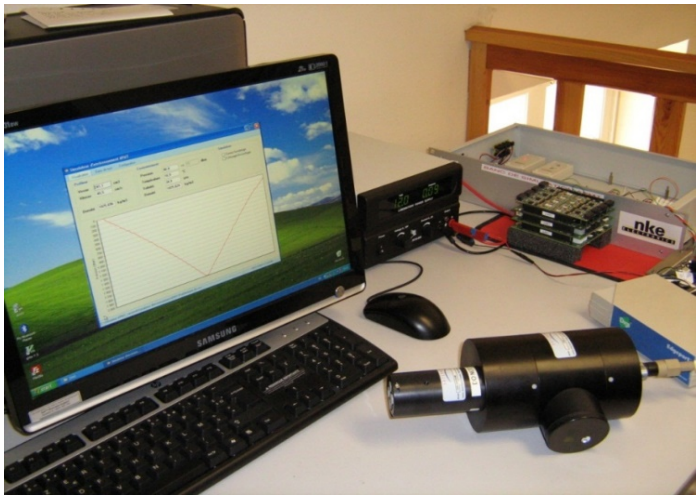
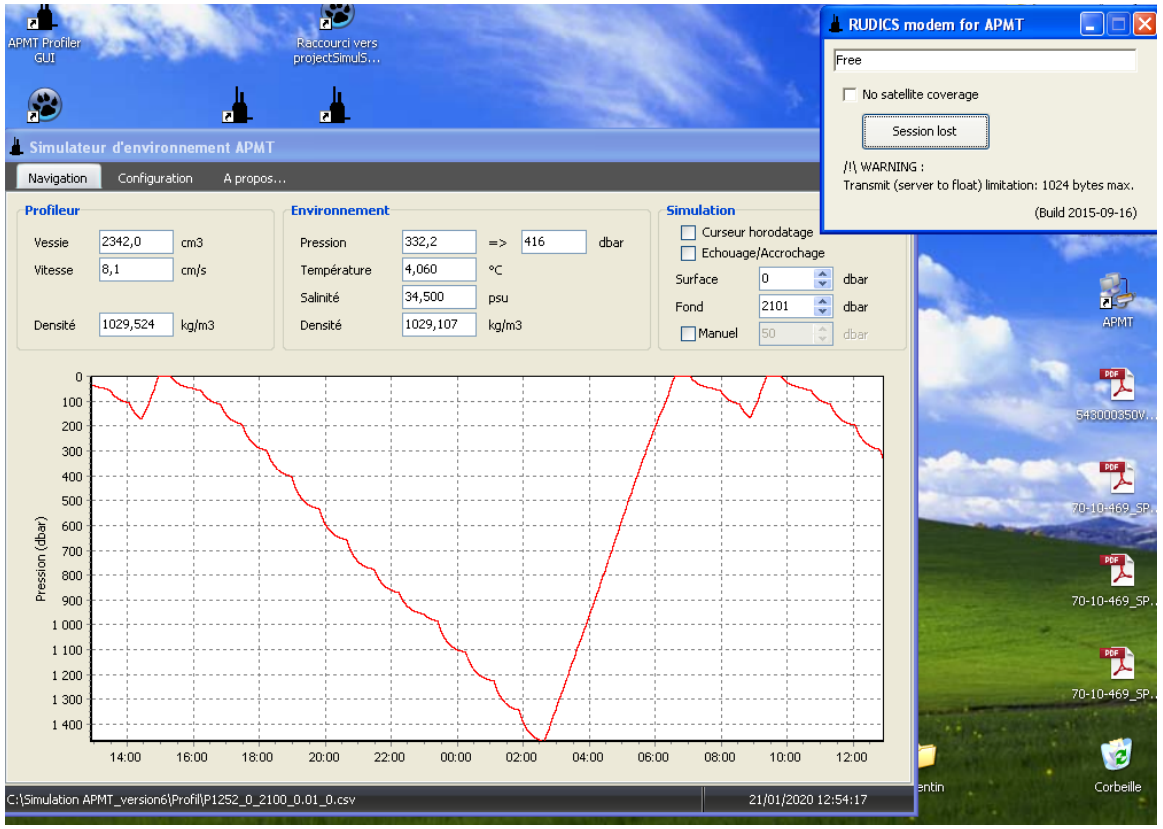




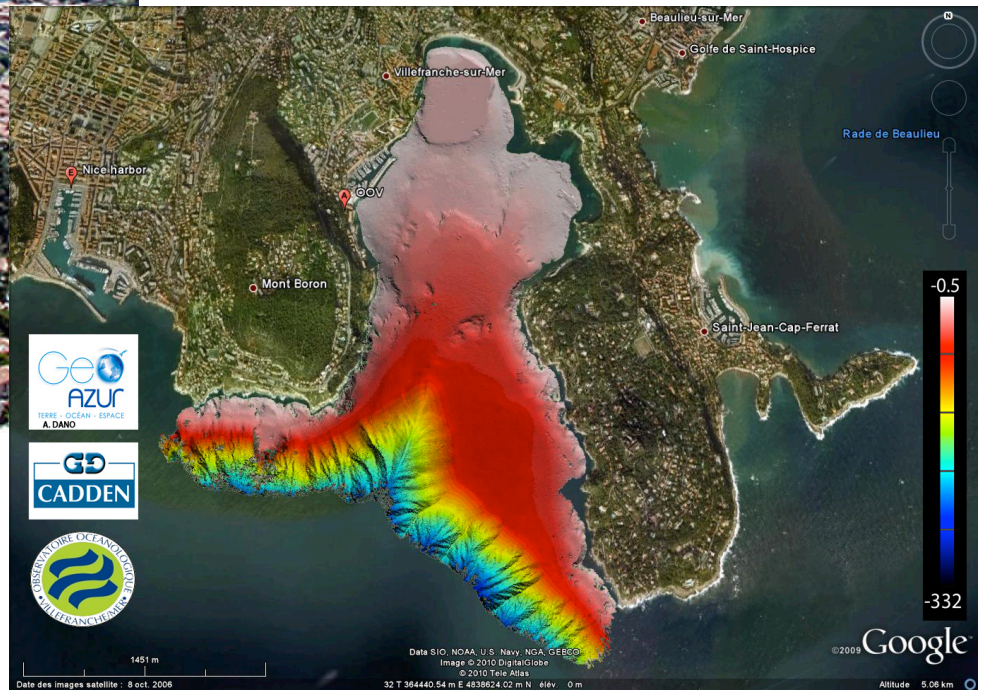
- ✓Global checking
- ✓Failure mode
- ✓Data acquisition bias

Development of the CTS5 profiler

How to test our development ?

2- In-situ testing at LOV

- ✓ 1 000 m depth at 4 nm
- ✓ 2000 m depth at 10 nm
- ✓ Good weather and predictable current for recovery

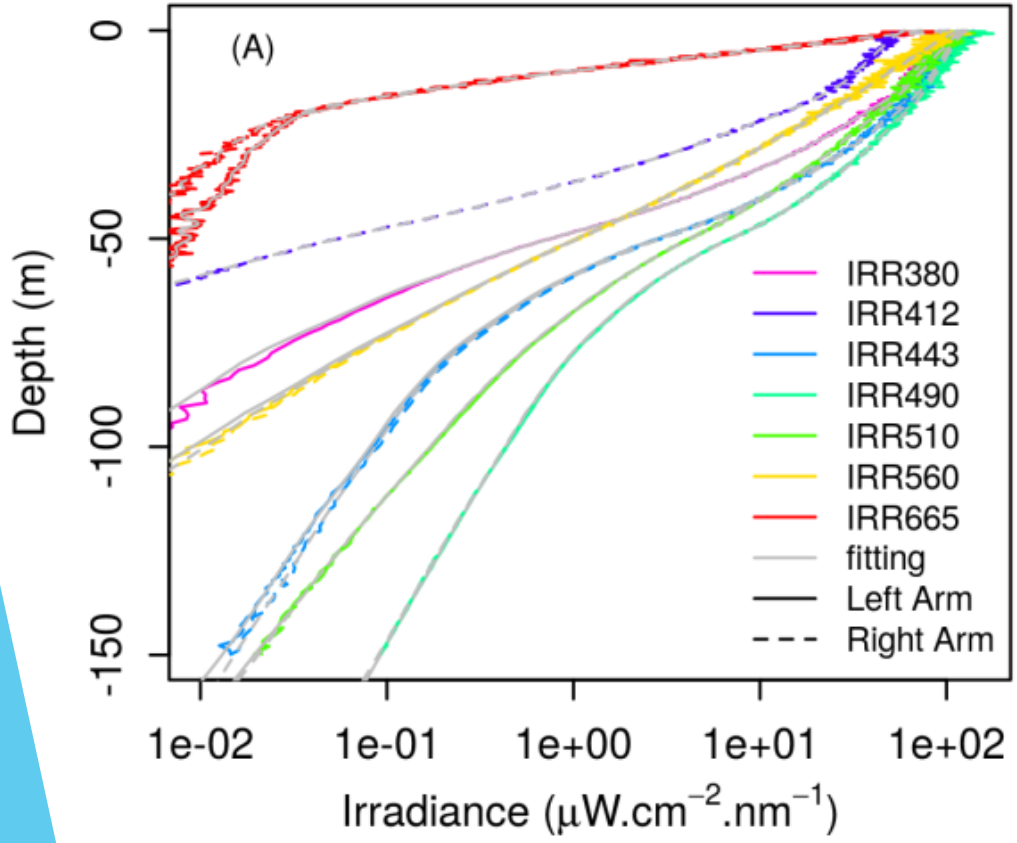


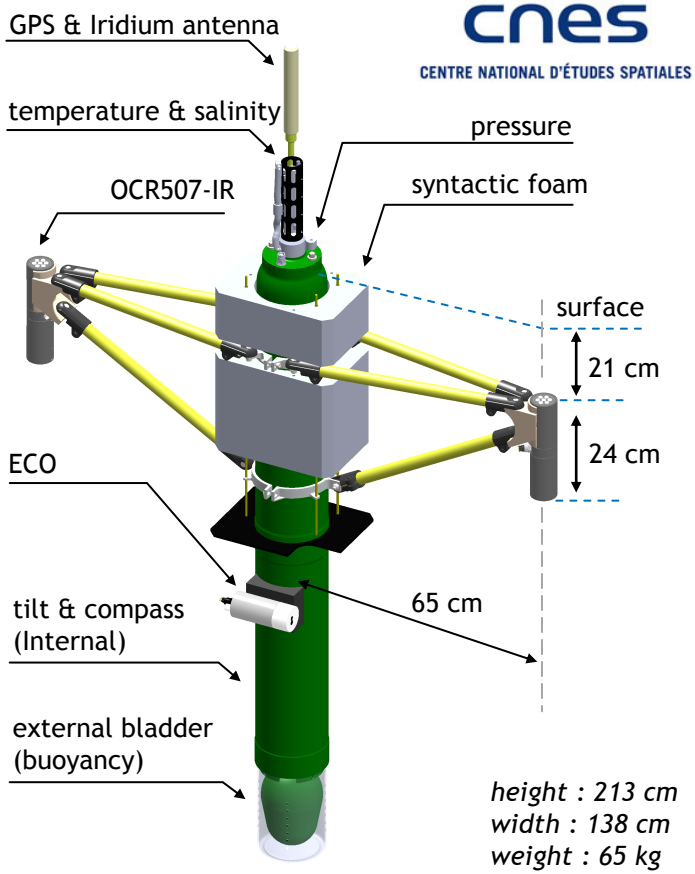
CTS5 profiler
Past and on-going developments

1. ProVal float
2. ProIce float
3. UVP6 sensor
4. Passive acoustic

ProVal: A new float for radiometric measurements

- ✓ Irradiance (Ed) and radiance (Lu) at 7 wavelength [380 - 665 nm]
- ✓ Tilt and compass sensors
- ✓ Chla, backscattering, CDOM, CTD

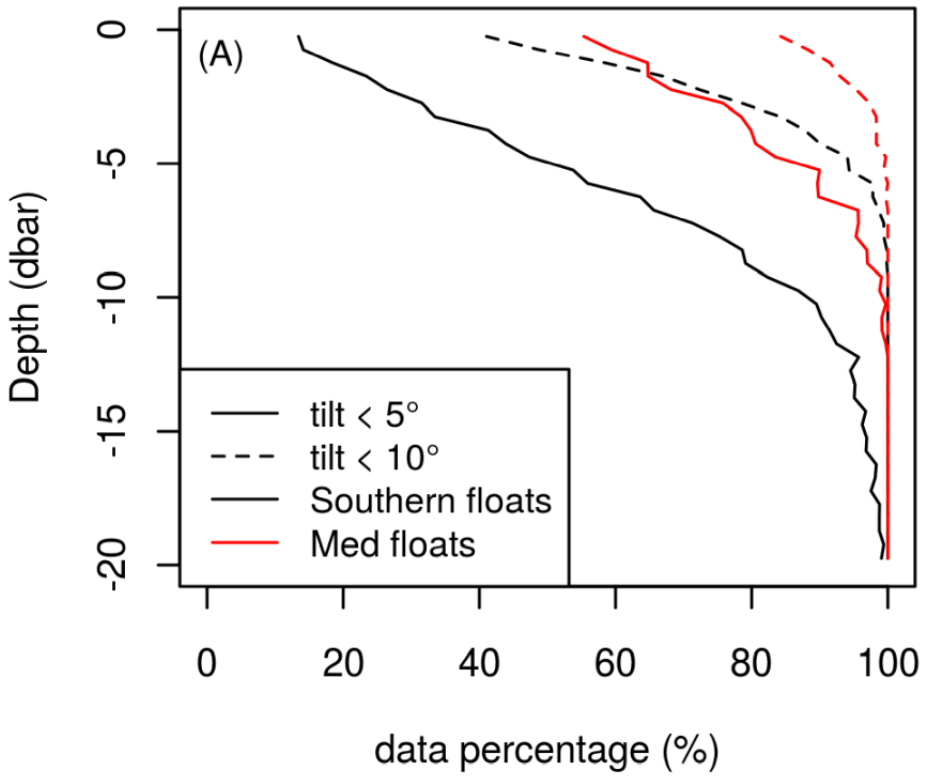


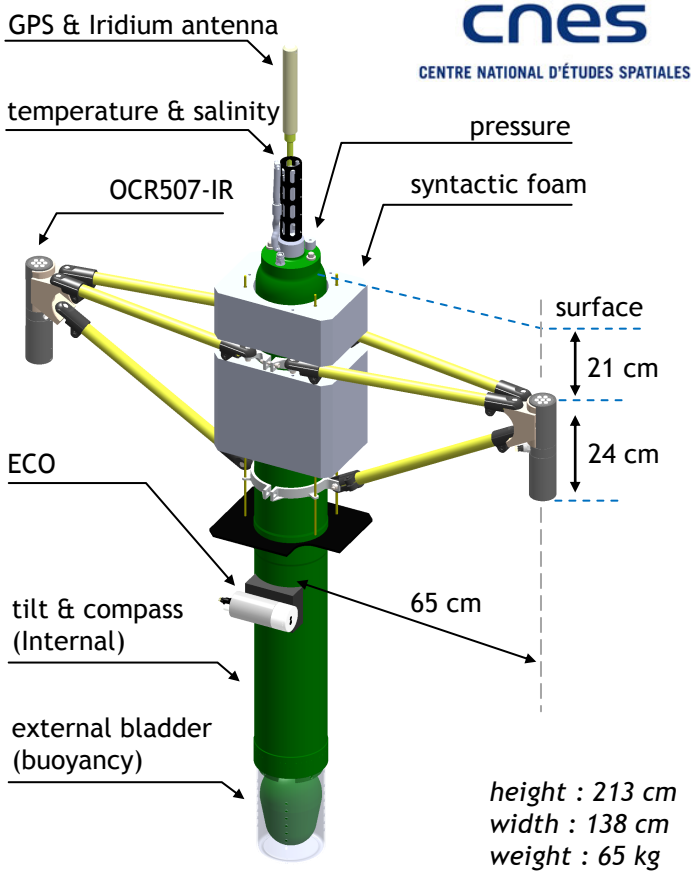


Already 3 floats and more than 600 profiles. *Frontiers in mar. Sc.*
https://www.frontiersin.org/articles/10.3389/fmars.2018.00437/full

ProVal: A new float for radiometric measurements

✓ Stability of the Provor float





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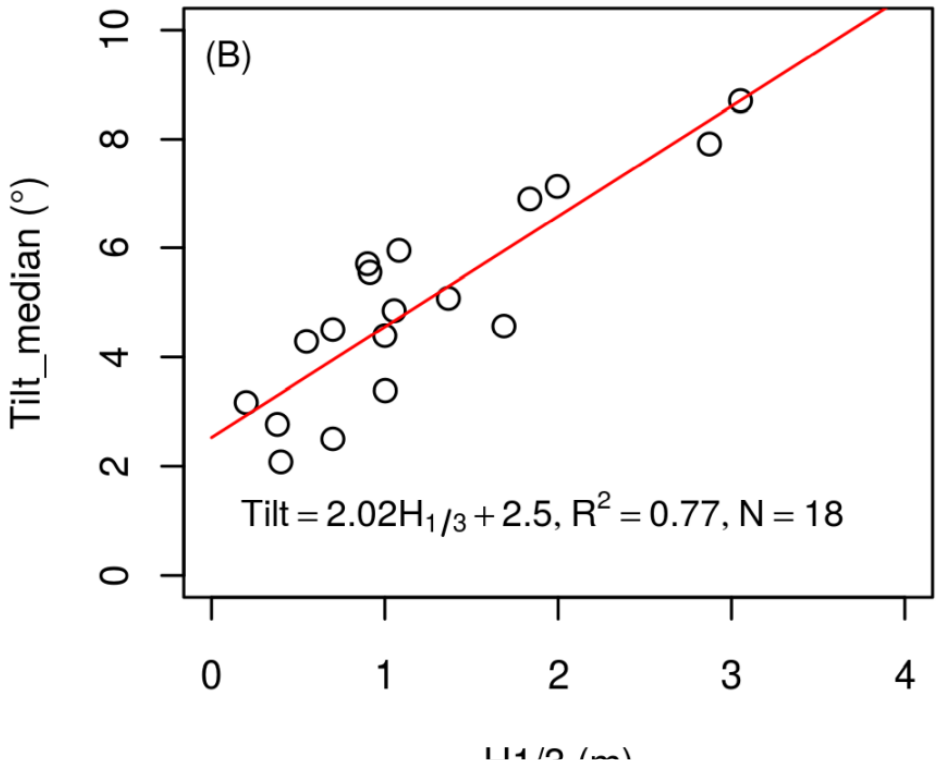
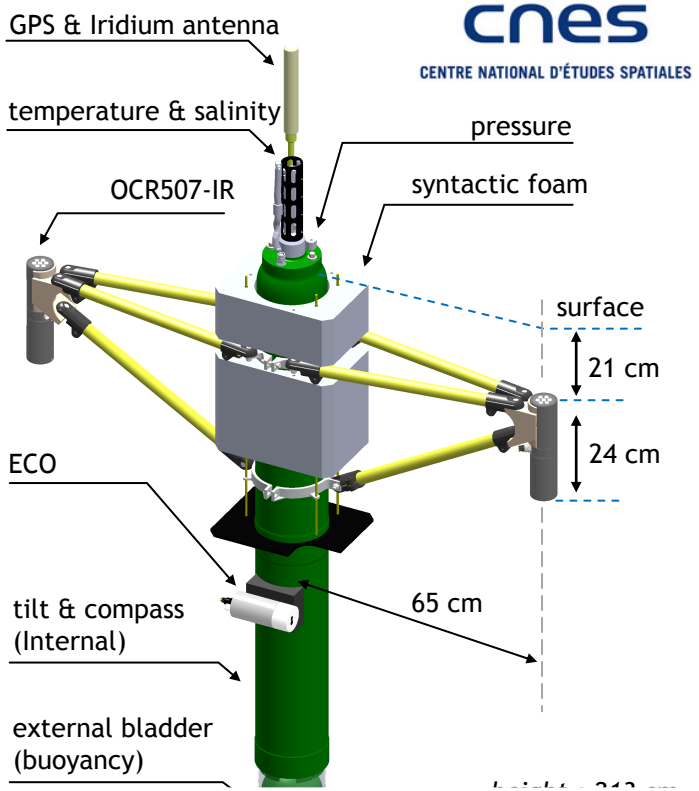




➔ Next : integration of Hyperspectral radiometer (EA-RISE)

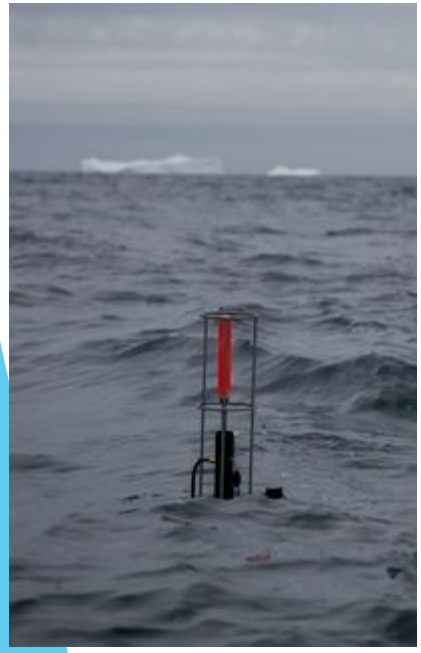
Already 3 floats and more than 600 profiles. *Frontiers in mar. Sc.*
https://www.frontiersin.org/articles/10.3389/fmars.2018.00437/full

ProIce: A BGC float for arctic condition

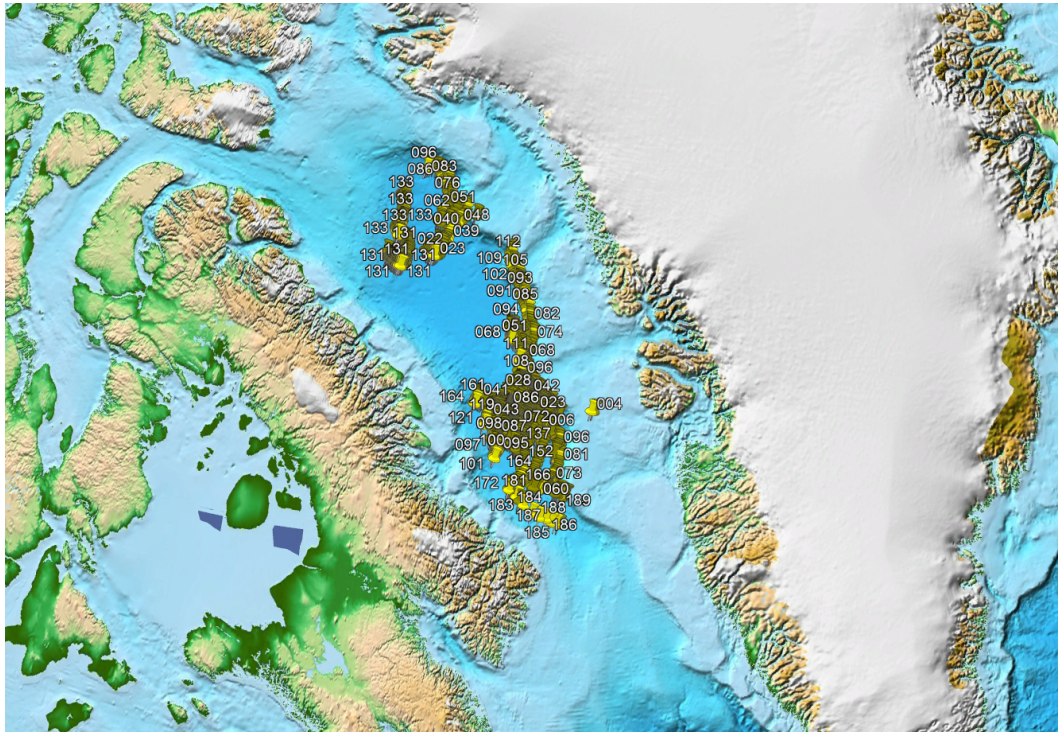
Joint work with C. Marec, J. Lagunas, E. Rehm and M. Babin from Takuvik

✓ Ice avoidance : ISA adapted to Baffin Bay, Altimeter and date criteria **programmed on the LOV acquisition board**

✓ Change of configuration under-ice (date criteria)



Crédit P. Bourguain



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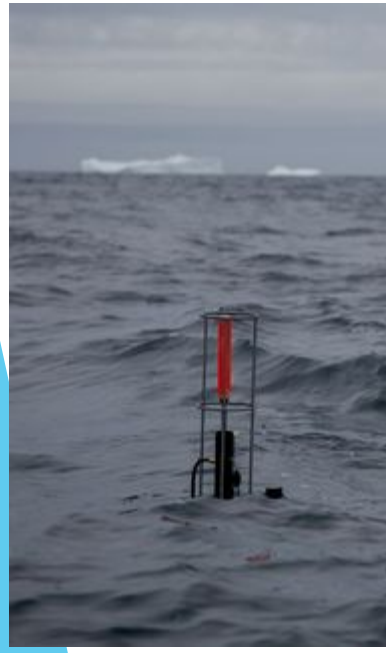

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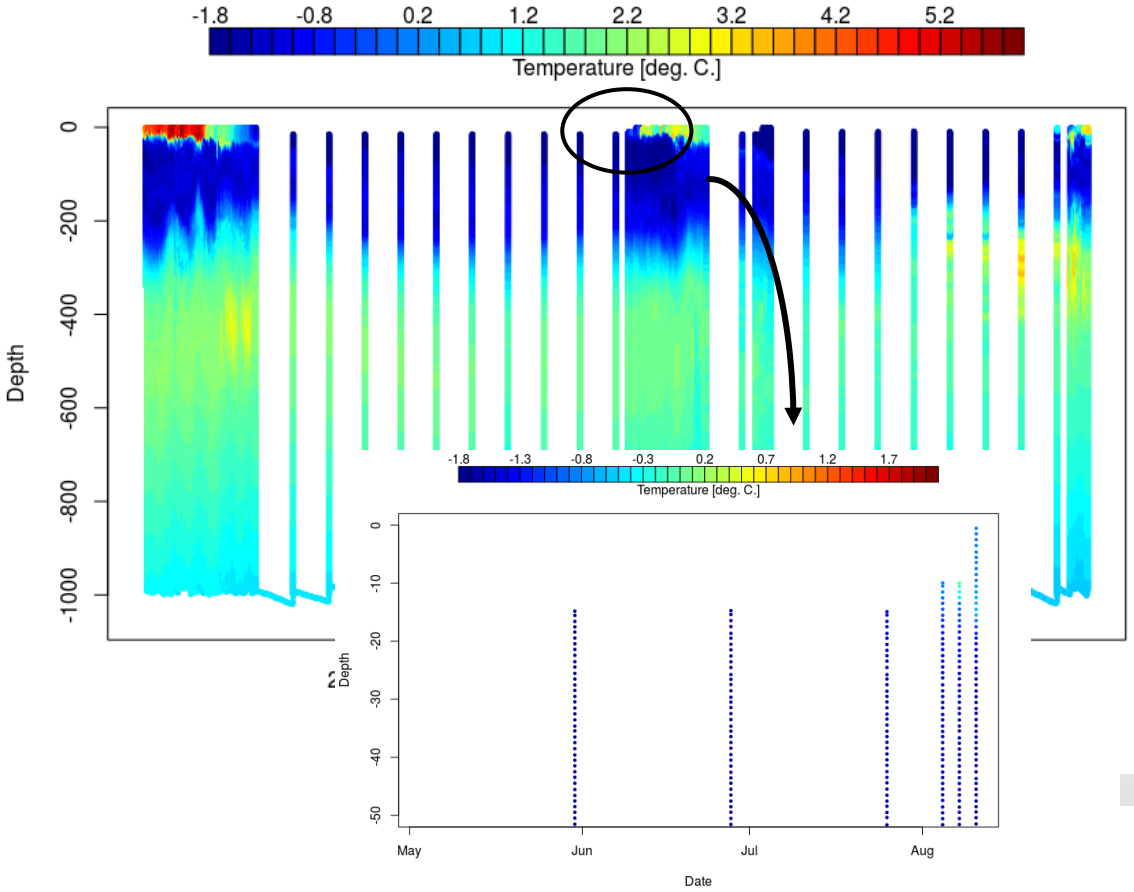

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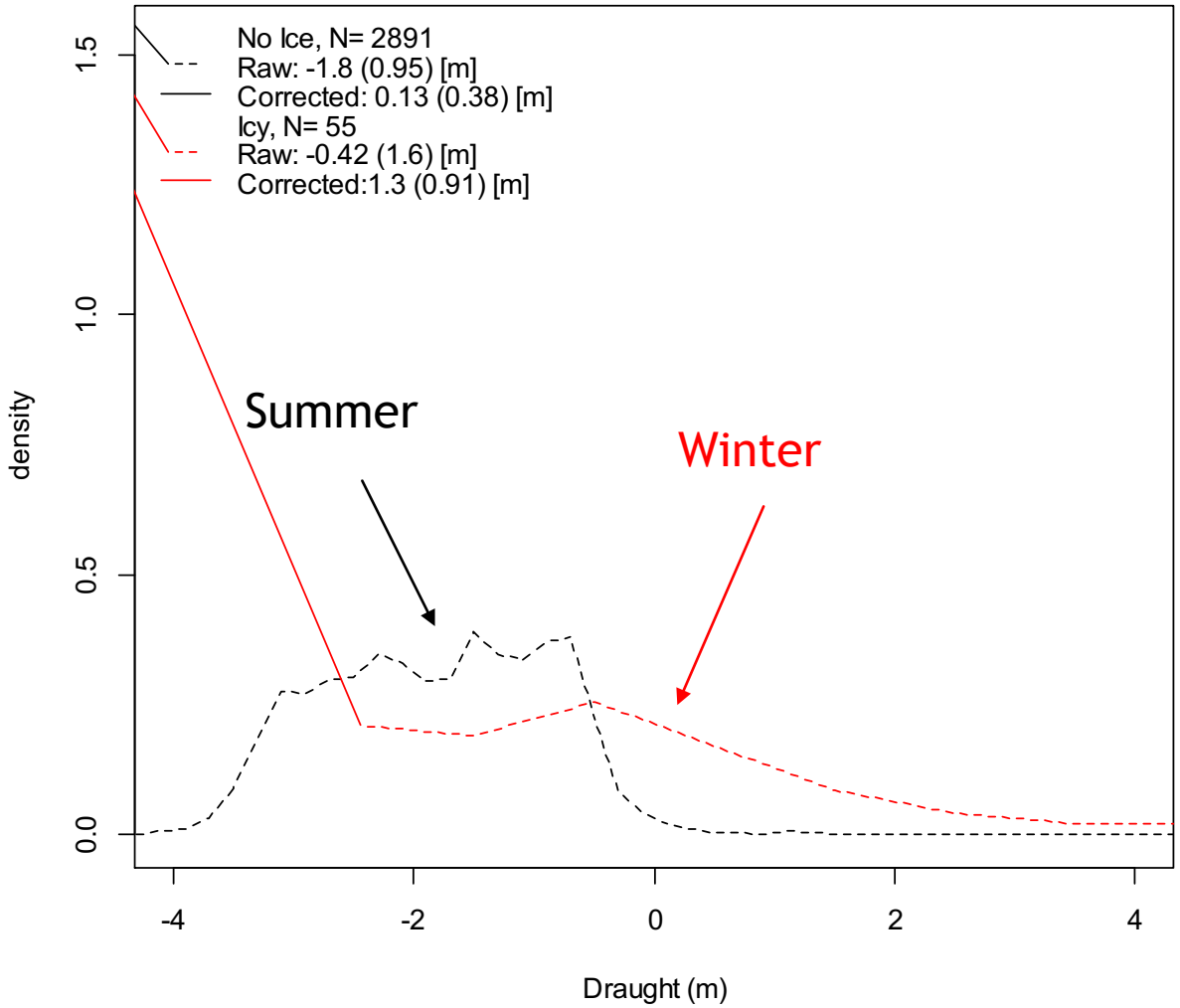
Review on Pinger data

Draught = Depth – Distance (m)



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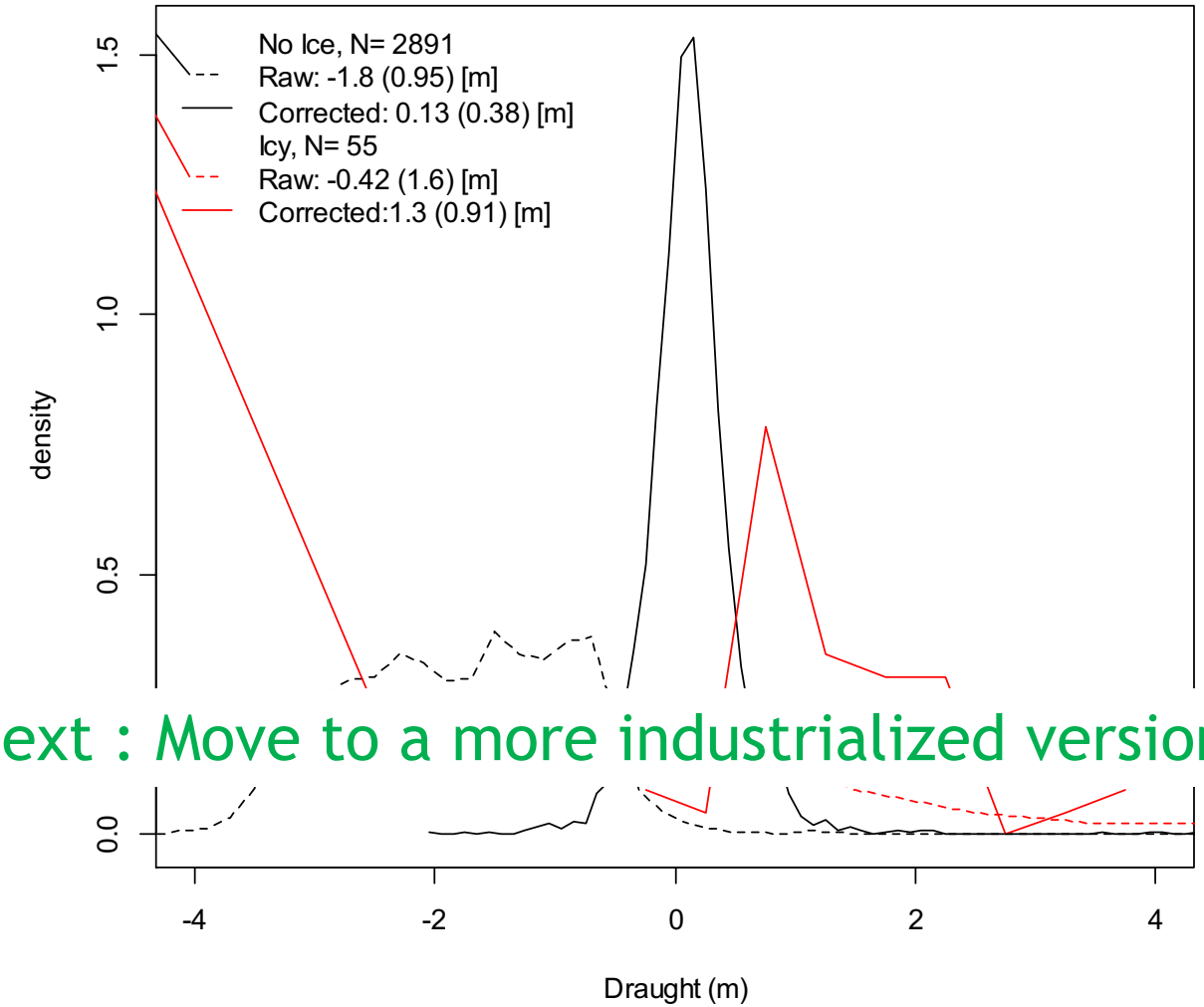
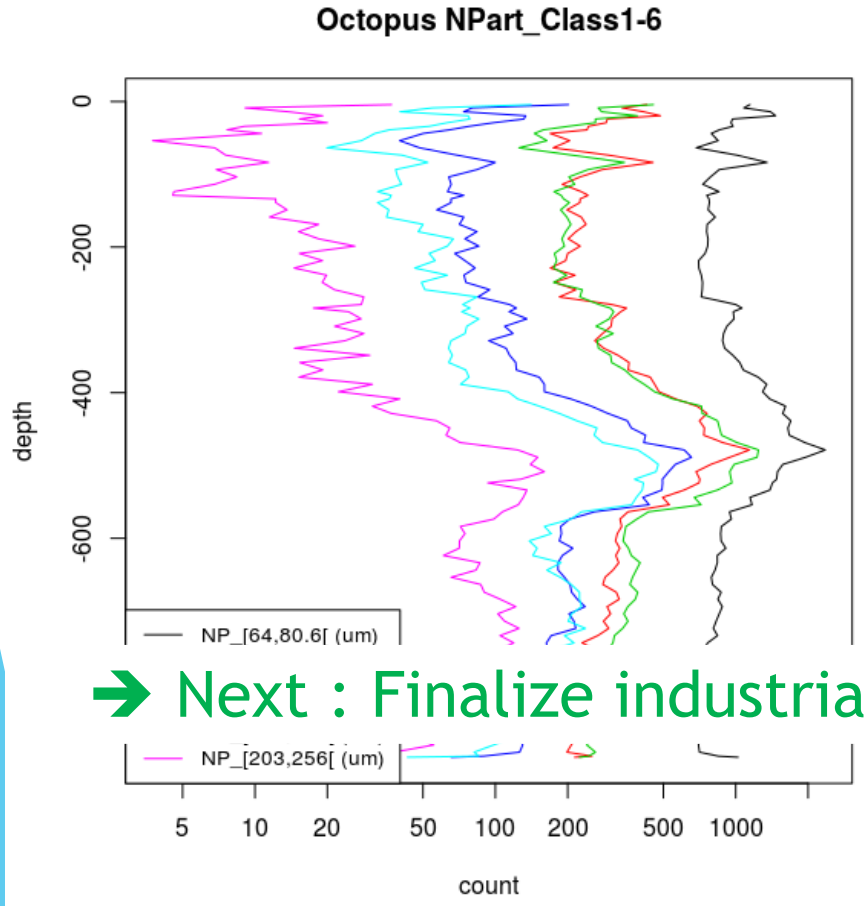
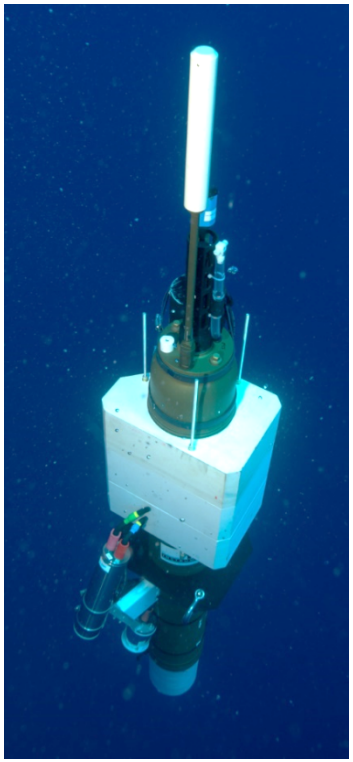


➔ Next : Move to a more industrialized version.

UVP6-LP : Miniaturized Under Vision Profiler

Low power, image based, particle size counter (18 size class, 64 to 4100 µm)
Sensor developed at LOV M. Picheral *et al*.





➔ Next : Finalize industrialized version.

BRIDGES
BRINGING TOGETHER RESEARCH AND INDUSTRY FOR THE DEVELOPMENT OF GLIDER ENVIRONMENTAL SERVICES

Projet GOPPI

HYDROPTIC

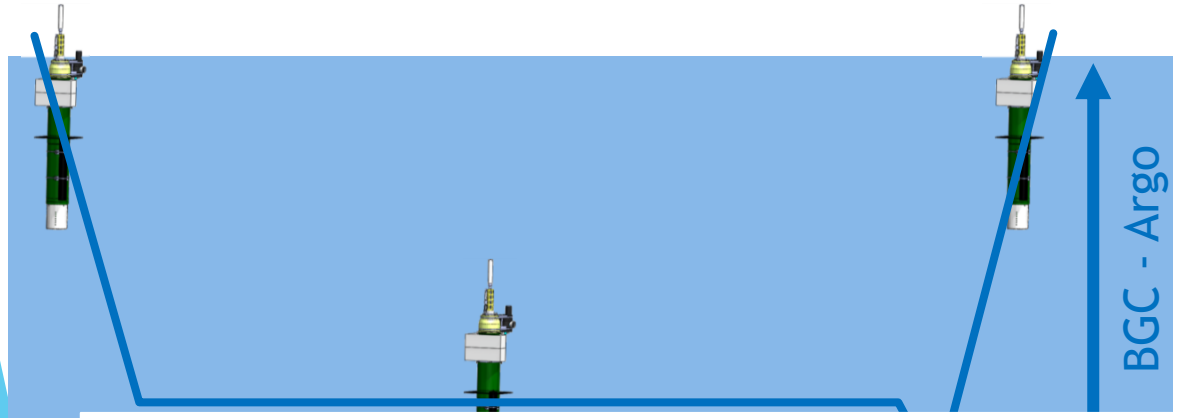
Passive Acoustic Monitoring

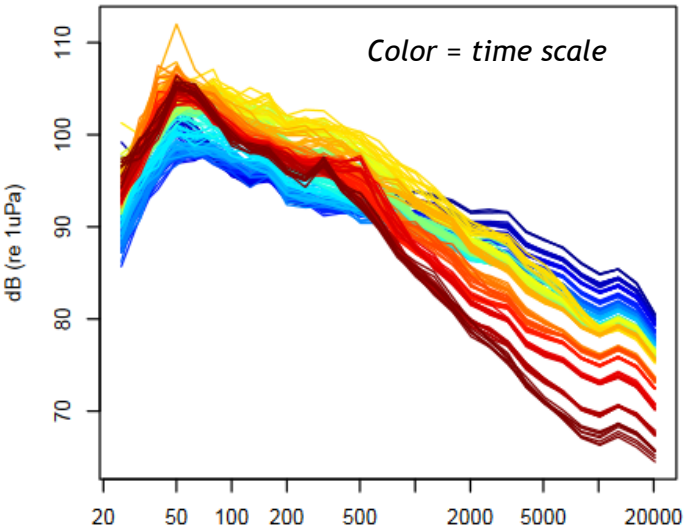
Joint work with J. Bonnel (Whoi) and D. Cazau (ENSTA)

➔ Estimate wind speed and rainfall from parking depth

✓ Passive acoustic recorder (RTSys) and transmission of 30 FFT bands (1/3 octave) per acquisition

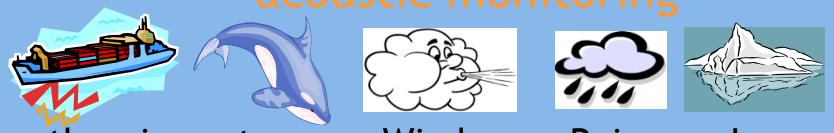
✓ Several short deployments (1 week)





➔ Next : achieve longer deployments (ERC – REFINE)

acoustic monitoring



Overview and future developments.

Conclusion on the acquisition board managed by LOV

- Created a lot of opportunities for testing new applications
- But difficulties when you want to industrialize these applications

➔ New Development with NKE : CTS5 - USEA

- Increased capabilities for BGC-Core Argo
  - ✓ Mission and sampling flexibilities
  - ✓ Increased Rudics speed
  - ✓ GUI configuration tools

- Room for new applications developed by LOV but with easier industrialization
  - ✓ New sensor
  - ✓ Advanced On-Board Processing

LOV

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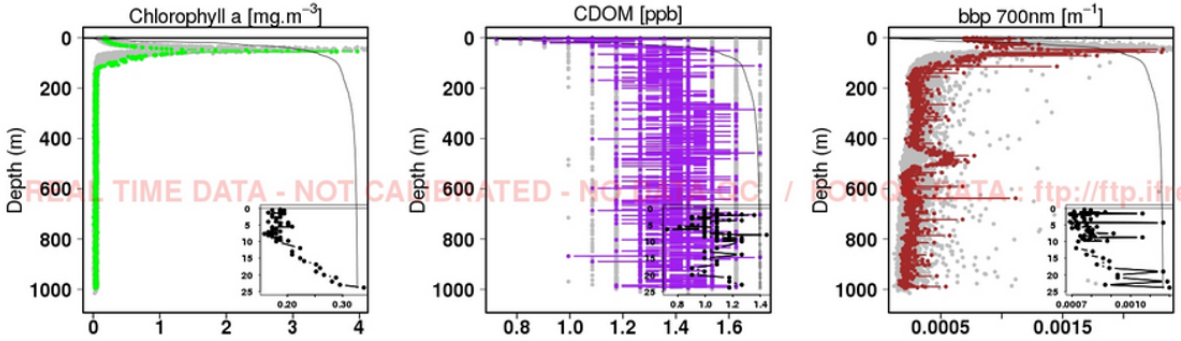
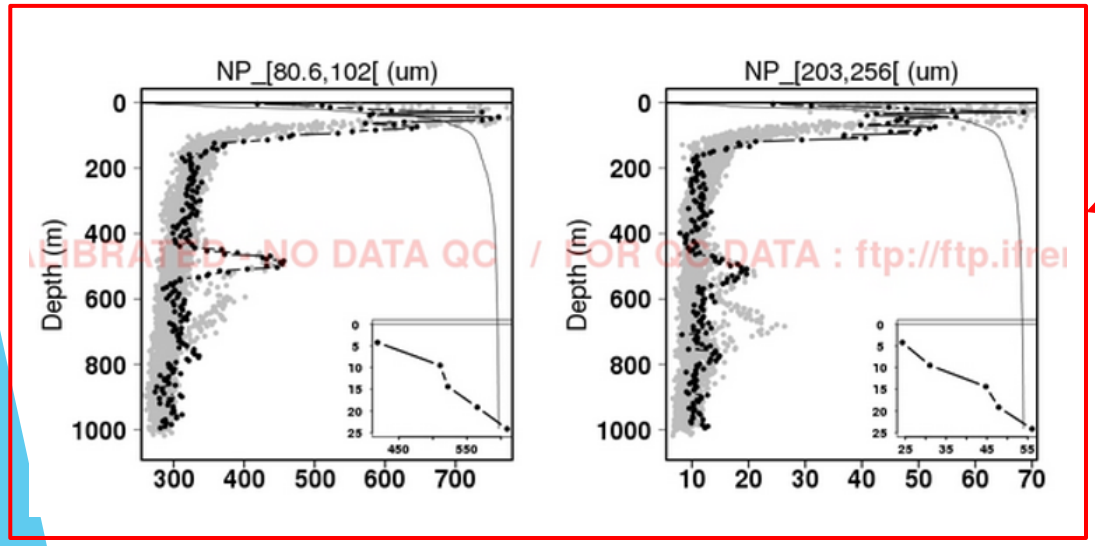
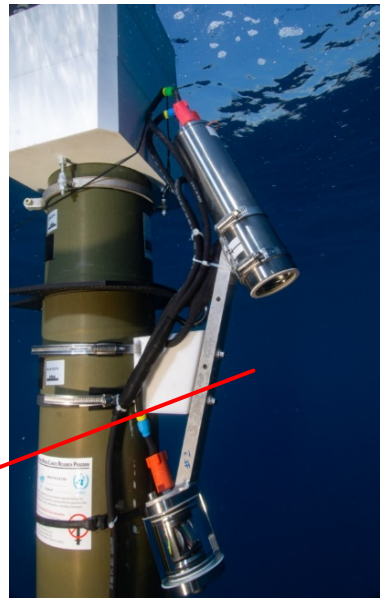
CTS5 - USEA : First Results

Integration of the UVP6 sensor as commercial product







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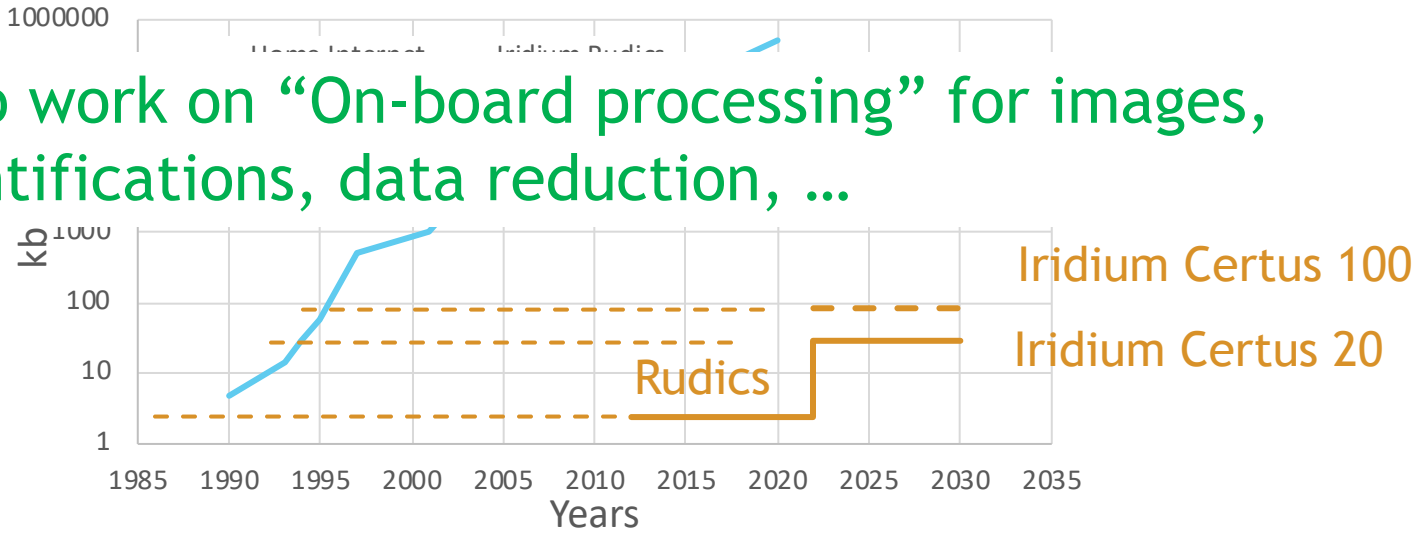
LOV

HYDROPTIC

Thanks to C. Schmechtig, JP Rannou and T. Carval for data handling

Perspectives

- A lot of new applications are waiting to be implemented on floats
- Very significant progress is being made to reduce sensor power consumption (ex. UVP ➔ 20 times less in 10 years) opening new applications for Argo floats
- The bottleneck for the next decade is the telemetry !



➔ Need to work on “On-board processing” for images, sound identifications, data reduction, …

Merci

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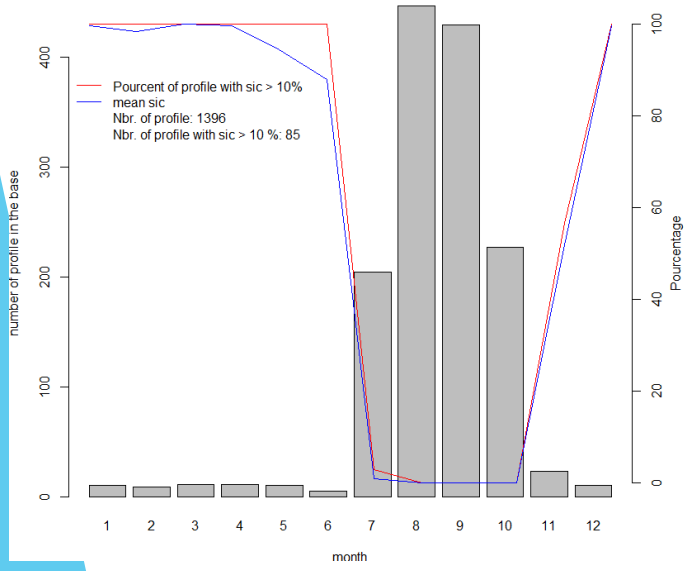
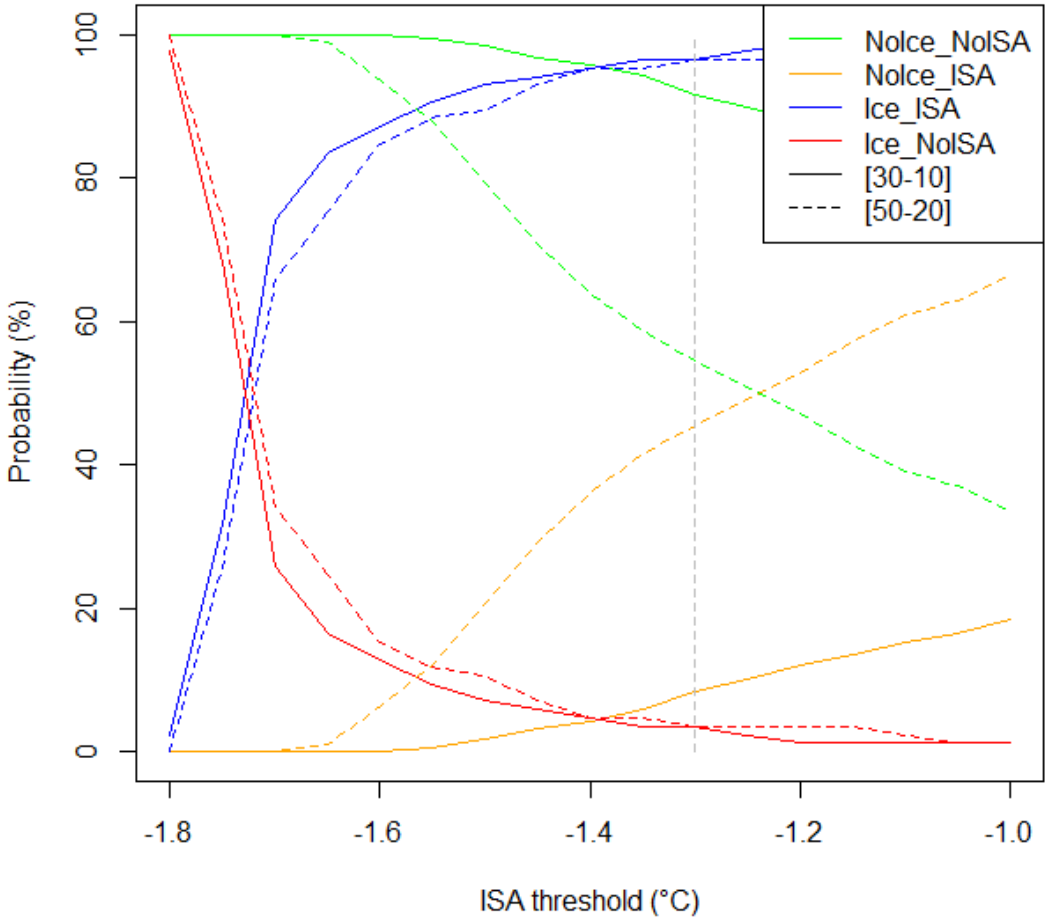
ISA in Baffin Bay





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Float breaking