

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

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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.

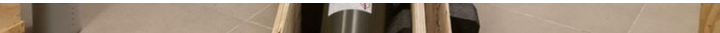
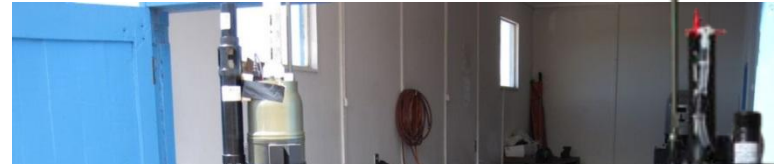
Development of the CTS4 profiler

Collaboration LOV - IFREMER - NKE

Nice results:

- More than 200 floats
- First float “Full BGC” deployed
- Highly flexible BGC Argo float

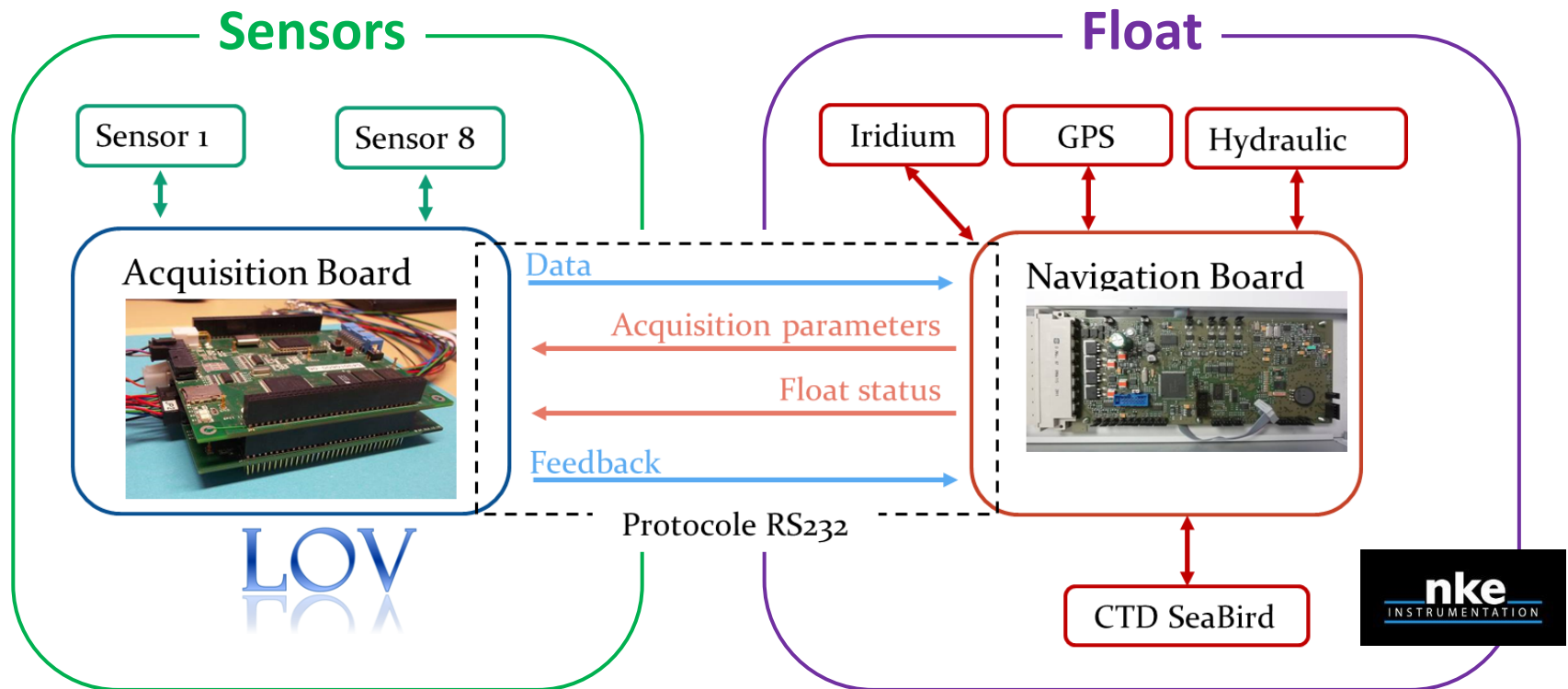
➔ But not easy to explore new applications



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

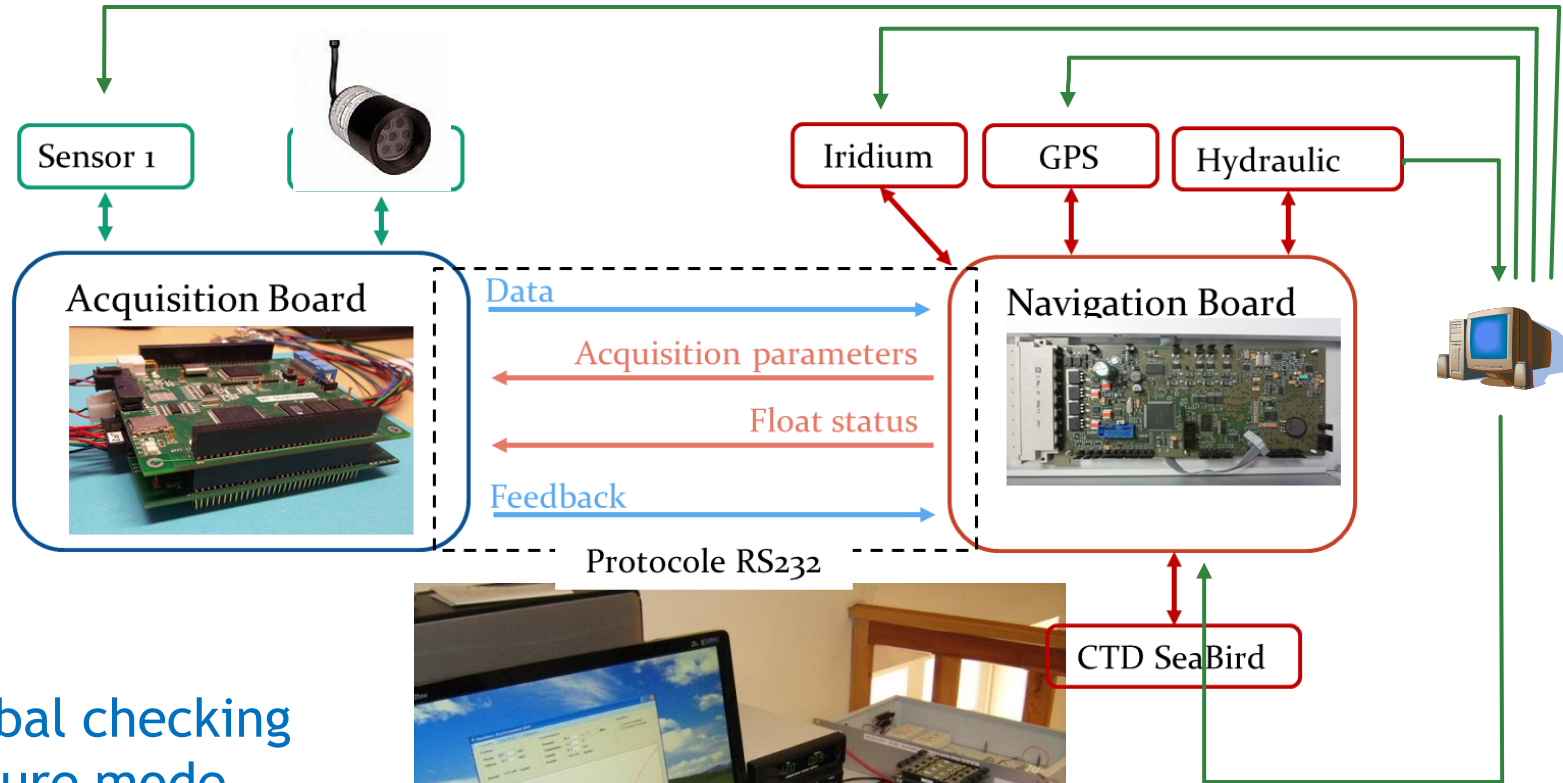
Stable = Security

Collaboration LOV - NKE

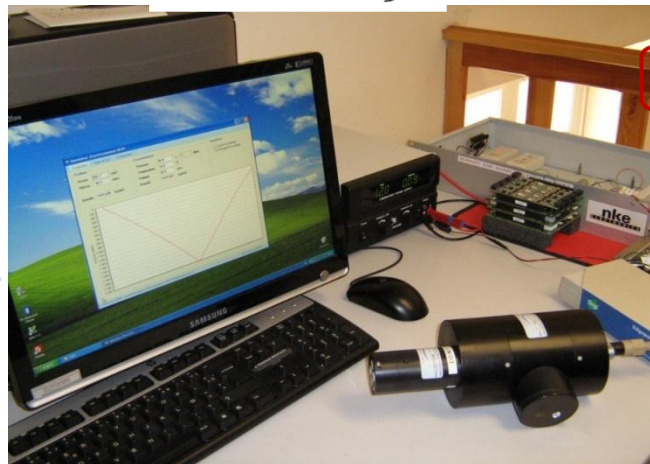
Development of the CTS5 profiler

How to test our development ?

1- Hardware Bench Simulator



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

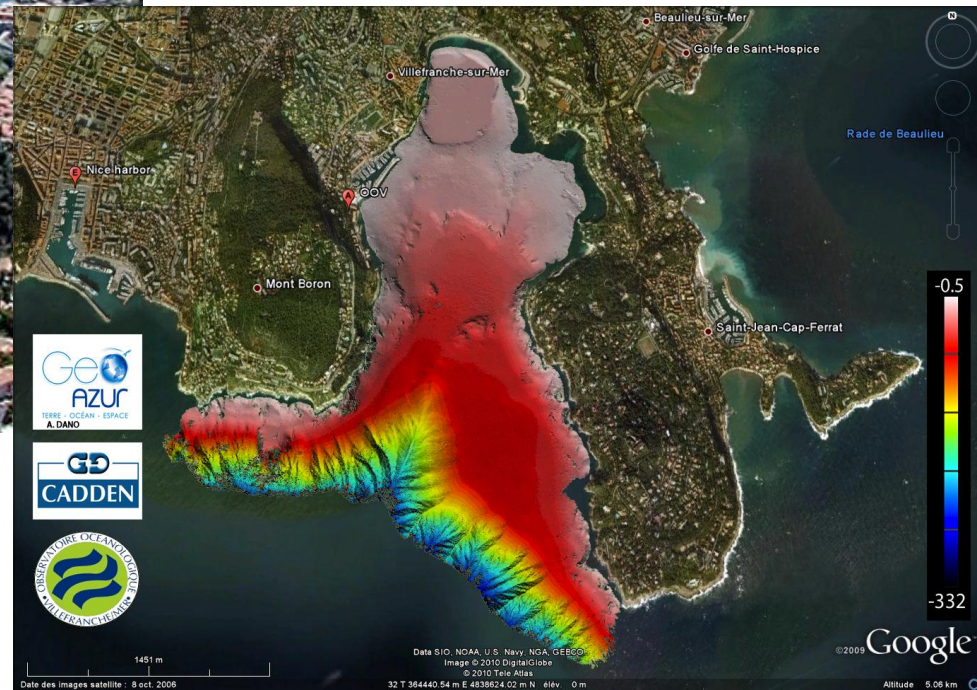


Development of the CTS5 profiler

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

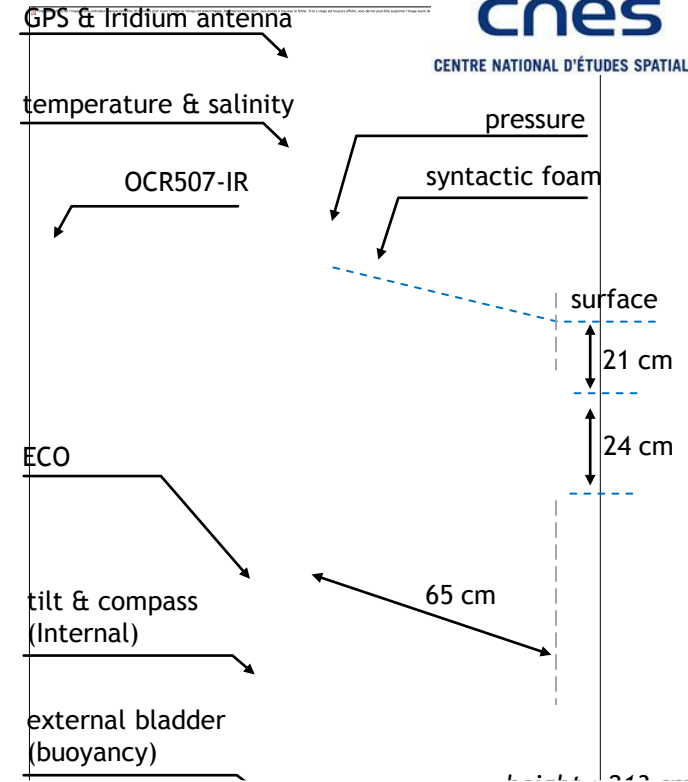
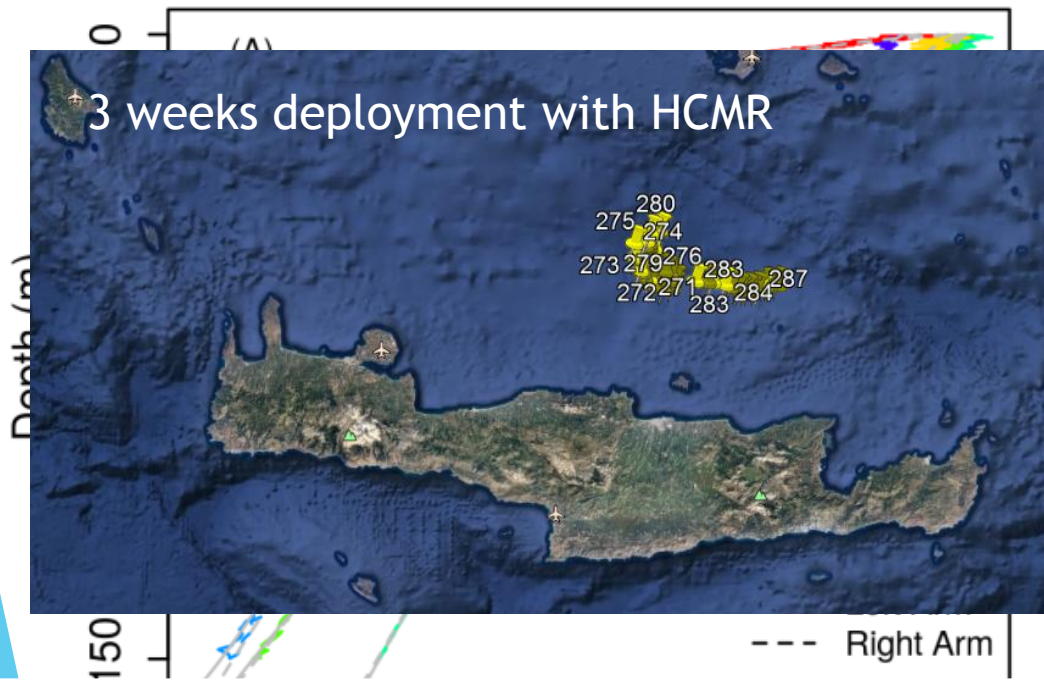
1. ProVal float
2. ProIce float
3. UVP6 sensor
4. Passive acoustic

ProVal: A new float for radiometric measurements

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



CENTRE NATIONAL D'ÉTUDES SPATIALES



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

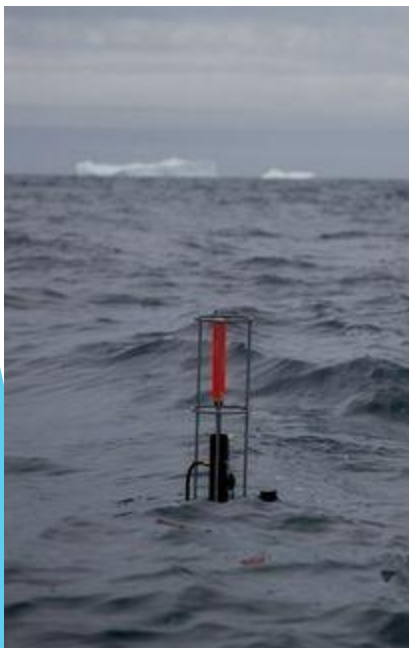
Irradiance ($\mu\text{W}\cdot\text{cm}^{-2}\cdot\text{nm}^{-1}$)

Already 3 floats and more than 600 profiles. *Frontiers in mar. Sc.*

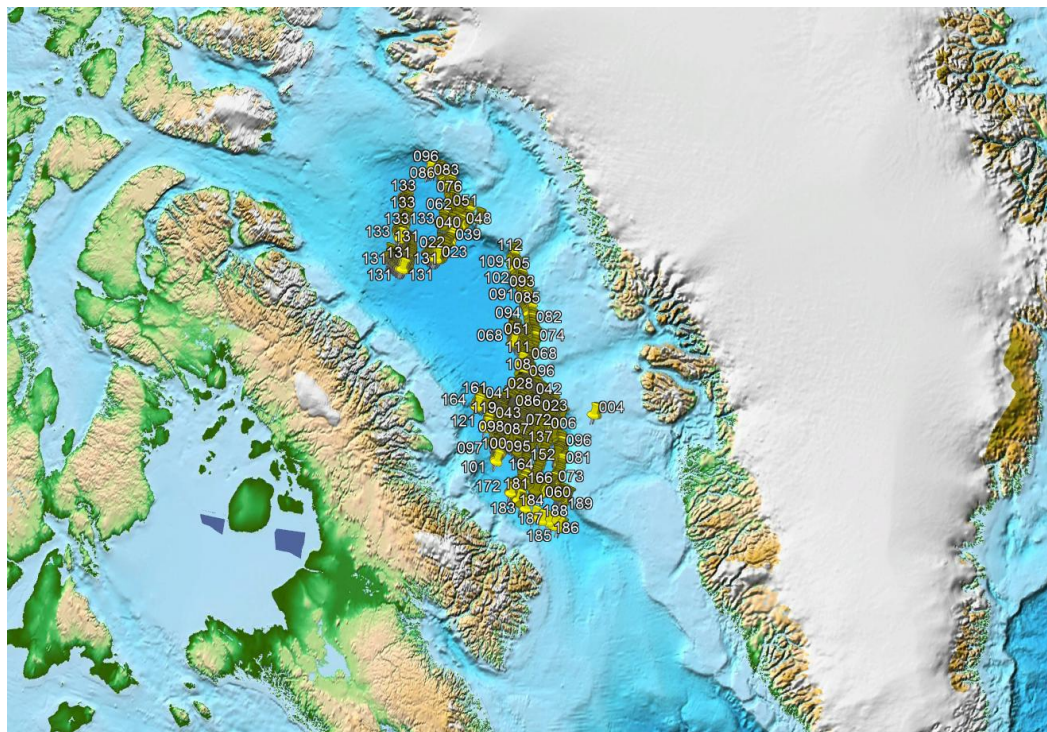
<https://www.frontiersin.org/articles/10.3389/fmars.2018.00437/full>

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

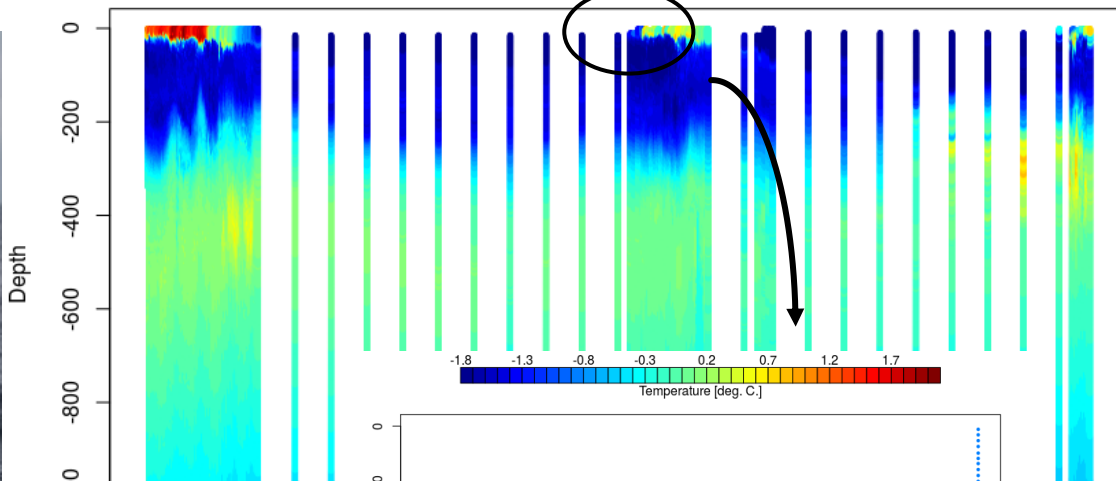
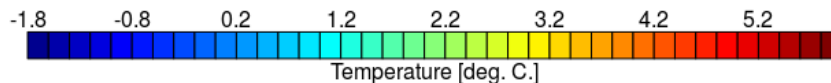


Joint work with C. Marec, J. Lagunas, E. Rehm and M. Babin from Takuvik

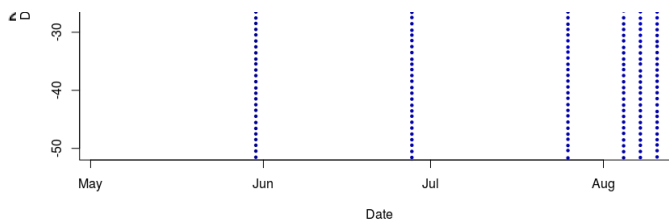
- ✓ Ice avoidance : ISA adapted to Baffin Bay, Altimeter and date criteria programmed on the LOV acquisition board
- ✓ Change of configuration under-ice (script based - date criteria)



Crédit P. Bourguain



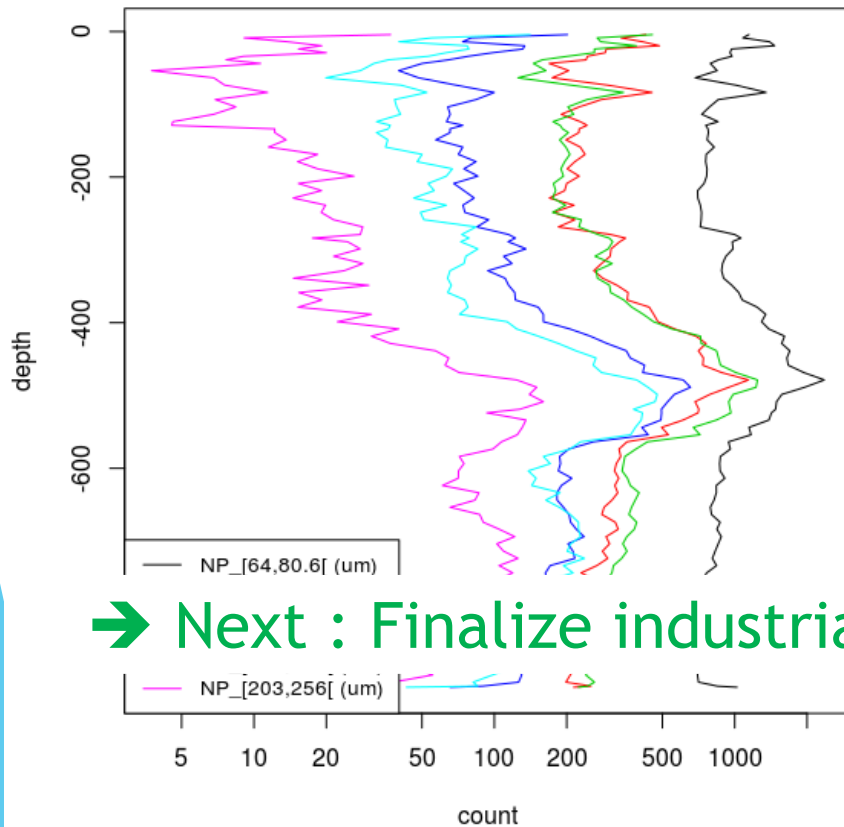
➔ Next : Move to a more industrialized version.



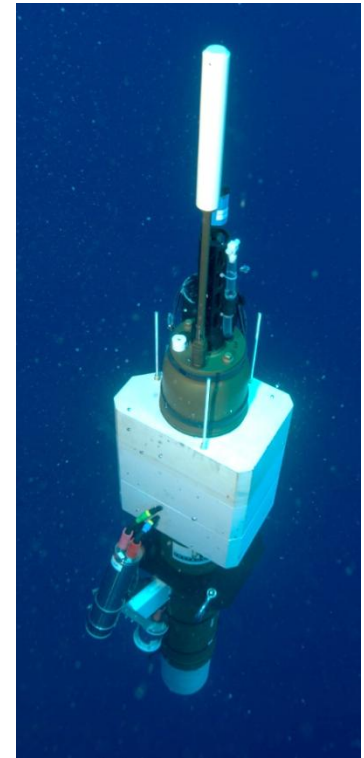
UVP6-LP : Miniaturized Under Vision Profiler

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

Octopus NPart_Class1-6



➔ Next : Finalize industrialized version.



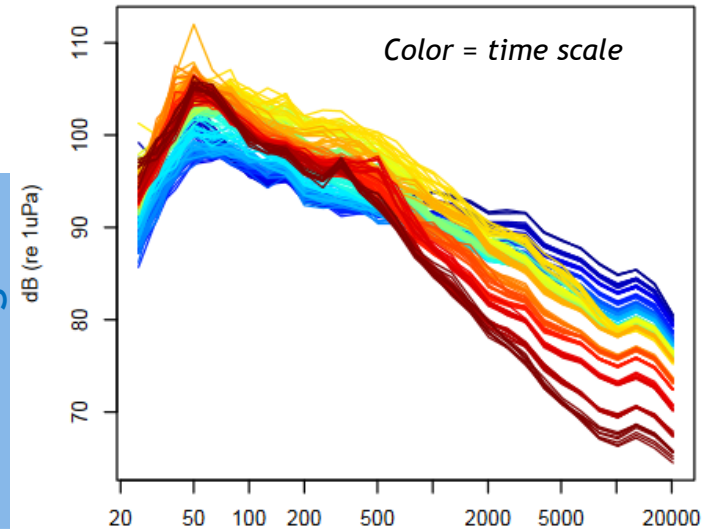
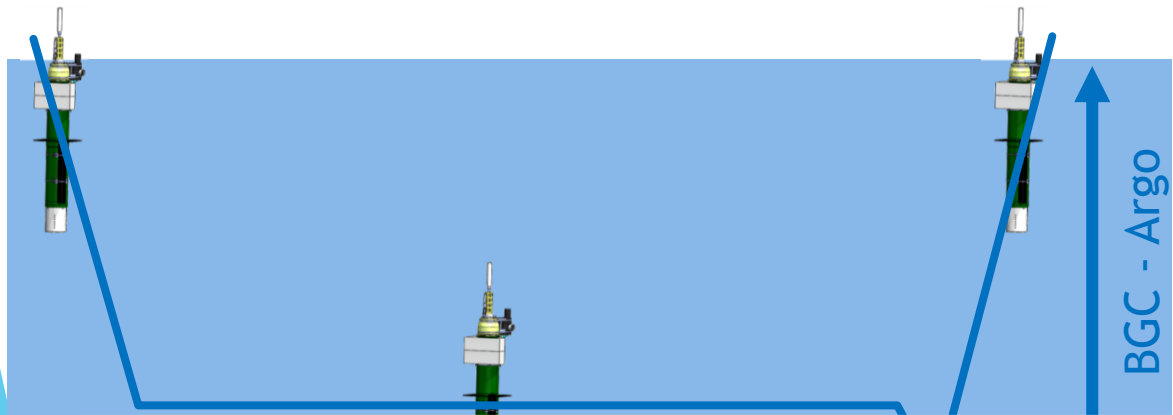
Projet GOPPI



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



anthropic



cetacean



Wind



Rain



Ice

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

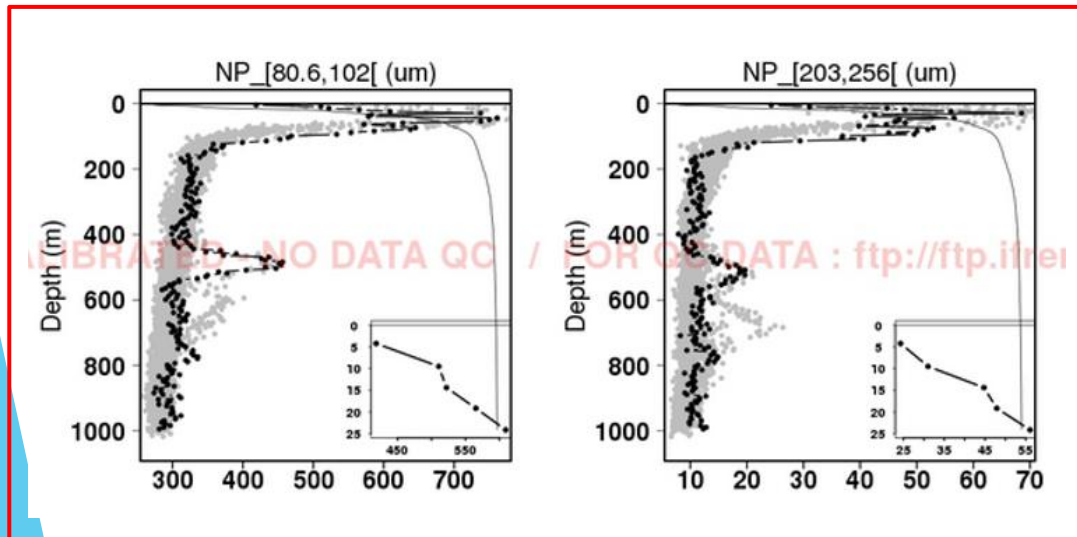
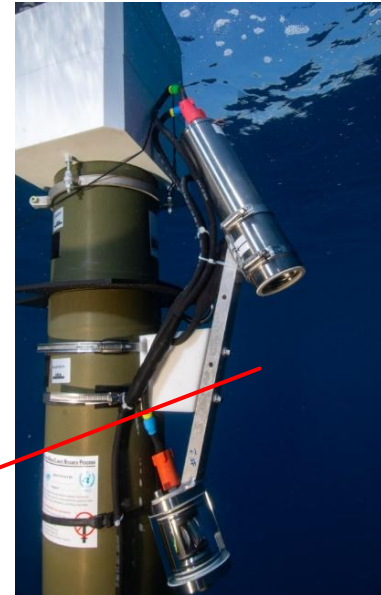
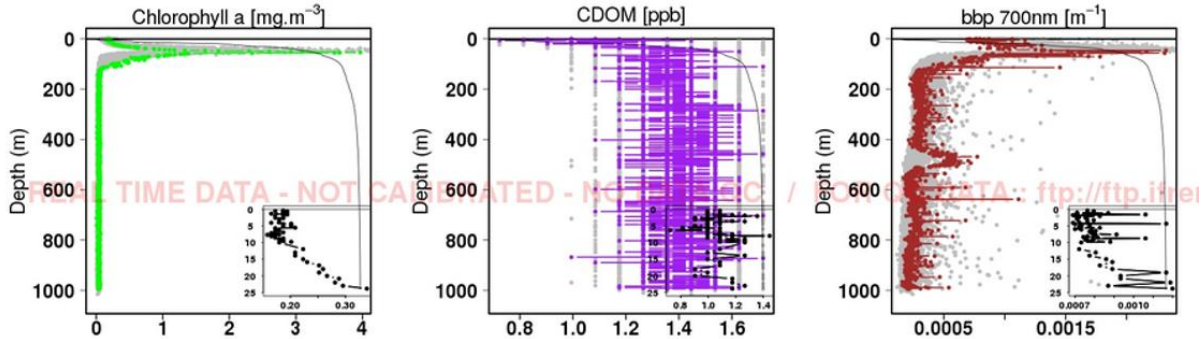
➔ New Development with NKE : CTS5 - USEA

- 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



CTS5 - USEA : First Results

Integration of the UVP6 sensor as commercial product

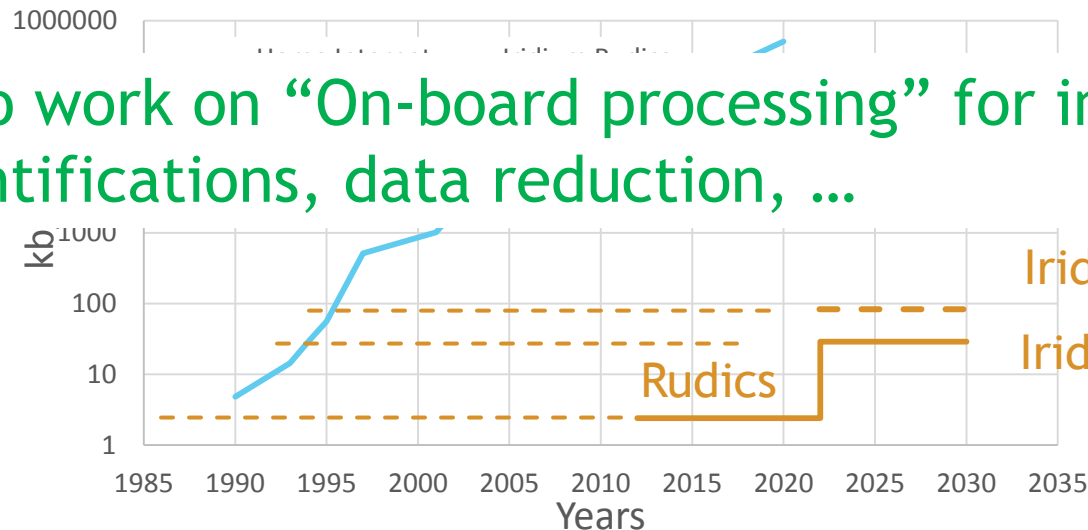


Thanks to C. Schmechtig, JP Rannou and T. Carval for data handling

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

