



# ProVal



## A new Argo profiler dedicated to the validation of ocean color remote sensing data

E. Leymarie<sup>1,2</sup>, C. Penkerch<sup>1,2</sup>, H. Claustre<sup>1,2</sup>, D. Antoine<sup>1,2,3</sup>, G. Obolensky<sup>1,2</sup>, A. Poteau<sup>1,2</sup>

<sup>1</sup> Sorbonne Universités, UPMC Univ Paris 06, UMR 7093, LOV, Observatoire océanologique, F-06230, Villefranche/mer, France

<sup>2</sup> CNRS, UMR 7093, LOV, Observatoire océanologique, F-06230, Villefranche/mer, France

<sup>3</sup> Department of Imaging and Applied Physics, Remote Sensing and Satellite Research Group, Curtin University, Perth WA 6845, Australia

Email: leymarie@obs-vlfr.fr

E. Leymarie will not be present at the meeting. For any questions regarding the poster, please refer to Hervé Claustre



### Summary:

In the late 1990's the physical community designed and implemented the Argo program, the aim of which being to develop an array of vertically profiling floats that measure temperature and salinity throughout the world's ocean upper 2000m. After a decade of operation, this program has succeeded in attaining its initial objective of 3000 floats actively profiling (once every 10 days) and providing data with improved accuracy. These data are used by a large array of agencies and researchers and are assimilated into global circulation models. With more than 100,000 Temperature-Salinity profiles during 2008 alone, the Argo array accounts for ~ 95% of the vertical profiles ever measured. The aim of the **ProVal** project is to take advantage of the dynamics surrounding Argo floats to develop a profiler dedicated to Ocean Color data validation. This kind of instrument does not have the accuracy of permanent installations (like the Moby or Boussole moorings) but is strongly recommended by the Bio-Argo group of the International Ocean Color Coordinating Group (IOCCG 2011, Report N°11). The ProVal float is specifically designed to provide daily high accuracy radiometric data. It will be useful to cover poorly sampled ocean areas in order to extend Ocean Color validation exercises.

### Usual Cal/Val coverage:

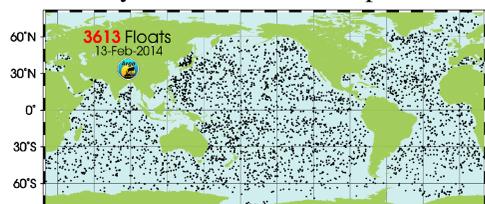
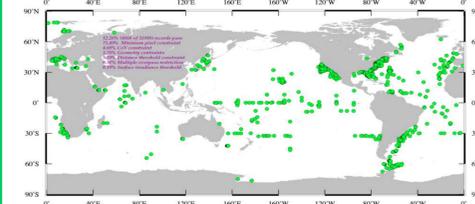
#### Oceanographic cruise

- ✓ Good data quality (Cal-Val)
- ✗ Expensive spatial coverage
- ✗ Limited temporal coverage

#### Instrumented buoy or costal station

- ✓ Good data quality (Cal-Val)
- ✗ Very limited spatial coverage (Boussole, Moby, Areonet-OC, ...)
- ✓ Excellent temporal coverage

Argo floats could be an efficient solution to provide enhanced spatial and temporal coverage in order to increase the number and diversity of satellite match-ups.



SeaWiFS match-ups in SeaBass-NASA data base (22Aug08)

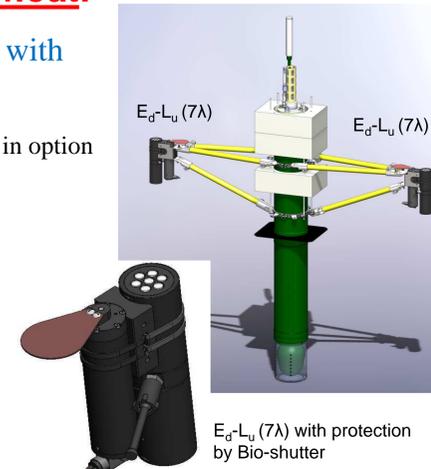
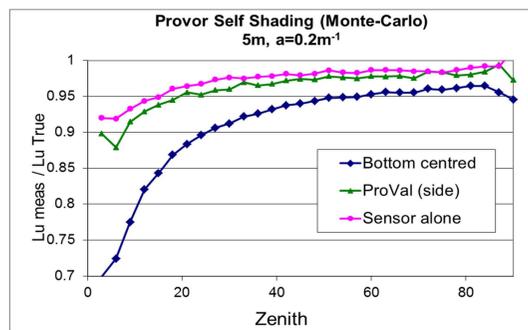
#### ProVal float

- ✓ Affordable spatial coverage
- ✓ Very good temporal coverage
- ? Data quality and durability to be studied in this this project

### The ProVal float:

#### ProVal is a PROVOR CTS5 instrumented with

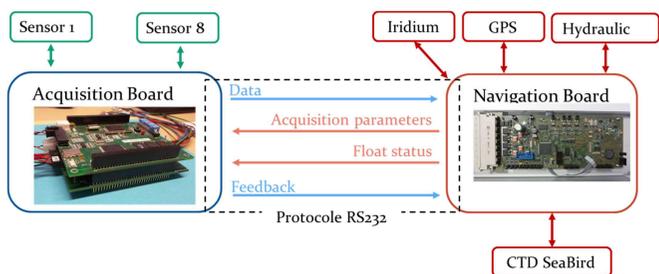
- ✓ 2  $E_d-L_u$  7 $\lambda$  (400, 412, 443, 490, 510, 560, 665 nm)
- ✓ Compass and tilt
- ✓ Fluorimeter (Chla and CDOM) and backscattering in option



The ProVal float is specifically instrumented with two identical  $E_d-L_u$  combos deported on the side of the float. This configuration will minimize the self-shading and allows data inter-comparison between both sensors for long terms deployments. These characteristics should improve the data quality.

### The New PROVOR Multi-Application:

The ProVal float is based on the new PROVOR CTS5 (from NKE) equipped with a new and powerful acquisition board developed by the LOV and OSEAN Company.



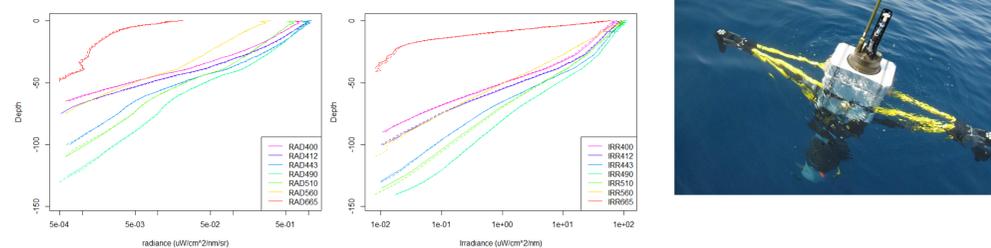
New PROVOR CTS5 provides many advantages:

- ✓ High speed RUDICS telemetry
- ✓ Self ballasting, high weight capacity
- ✓ Highly flexible script based mission
- ✓ Allow feedback commands

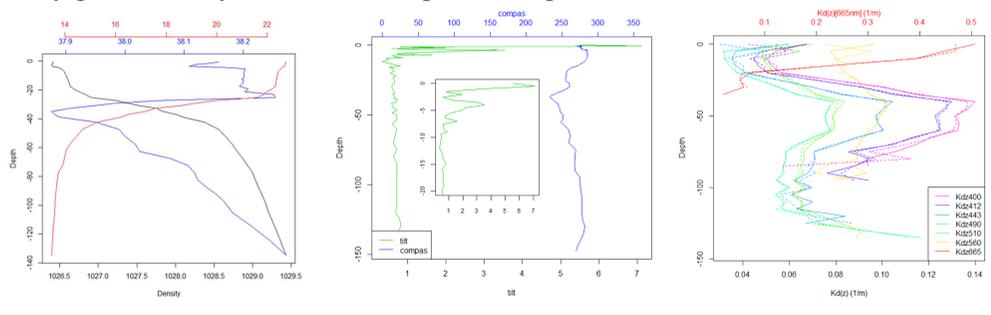
As well as the new LOV acquisition board:

- ✓ up to 8 sensors
- ✓ easy implementation of new sensor
- ✓ low power high CPU capacity
- ✓ data processing fully controlled by LOV
- ✓ send retroactive commands to float
- ✓ future acoustic capacities

### First deployment



The first test deployments were conducted out of Nice in September 2013. They show high quality radiometric profiles. In all plots, solid and dashed lines refer to left and right sensors.  $K_d$  profile could be derived from the irradiance profile. The float shows a very good stability with a tilt <3° up to 2m depth (and 7° at surface).



### Feedback of science onto float navigation:

The dialog between acquisition and navigations boards, and new capacities of the PROVOR CTS5, allow controlling the navigation of the float based on data measured by the acquisition board. This feedback will be used by ProVal float to profile, and then use energy, only when weather conditions are good enough for high quality satellite match-ups.

Examples of possible feedbacks are:

- During float ascent, a non monotonic variation of  $E_d$  versus depth is a sign of clouds. The feedback will cancel the current ascent.
- At surface, a too important fluctuation of float tilt or  $E_d$  values could be used to estimate sea state. Also, too weak values of  $E_d$  could be used to detect overcast sky. In poor condition, replicates profiles will be canceled.
- In future, weather conditions estimated from parking depth by using passive acoustic will be used to postpone profiles.

