



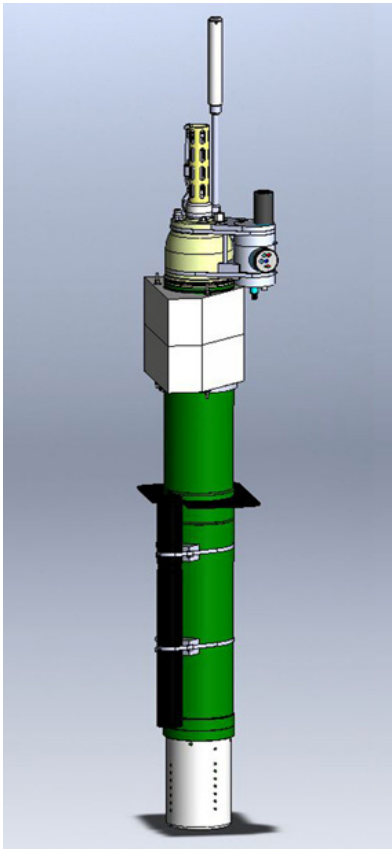
SOUTHERN OCEAN AND CLIMATE
FIELD STUDIES WITH INNOVATIVE TOOLS

Outils pour SOCLIM: Les flotteurs profileurs bio- géochimique et bio-optique multi-instrumentés

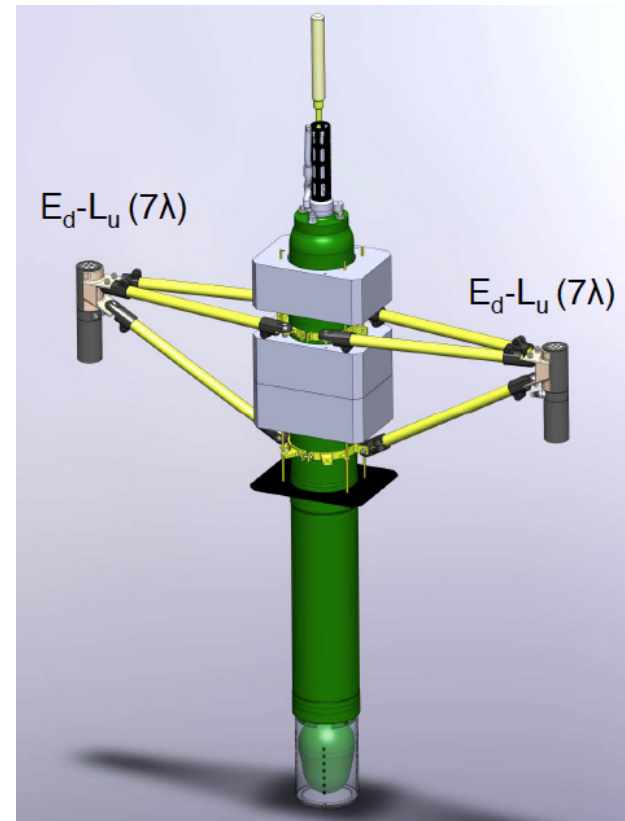
Hervé Claustre – 30.10.2014

Deux types de flotteurs

- Bio-Argo



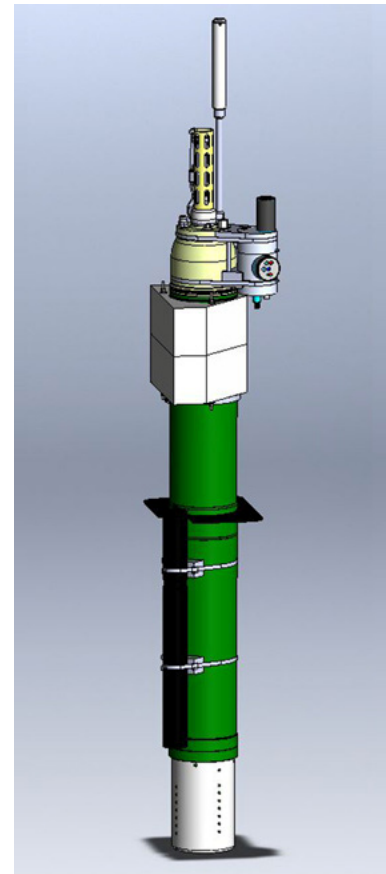
- PROVAL



Le flotteurs Bio-Argo : PROVOR CTS4 (NKE)

- Température, Salinité
- Chla fluorescence
- CDOM fluorescence
- bb(700)
- Cp(660)
- PAR
- Ed(380), Ed(412), Ed(490)
- O₂
- NO₃
- pH?

Iridium two-way transmission

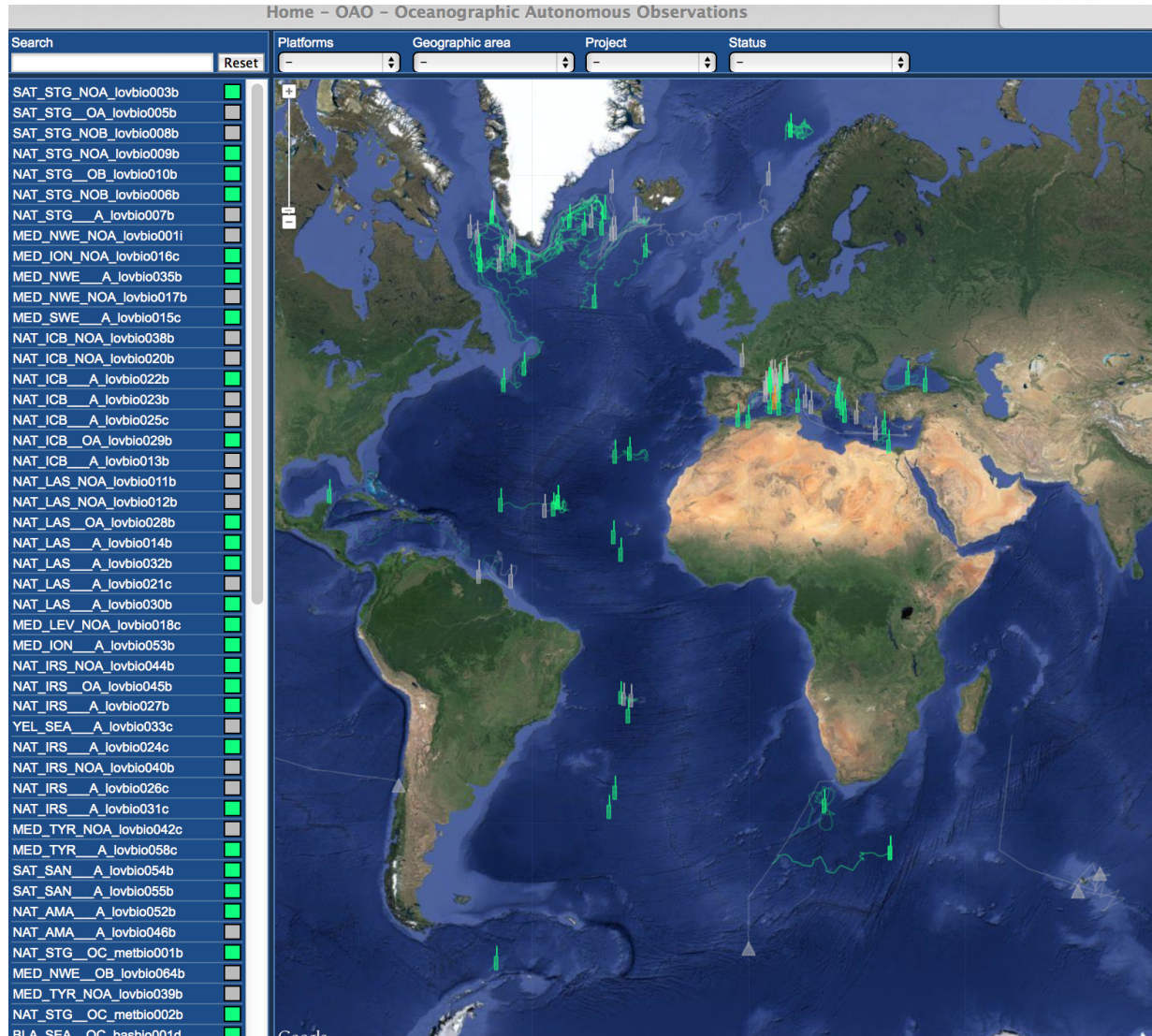


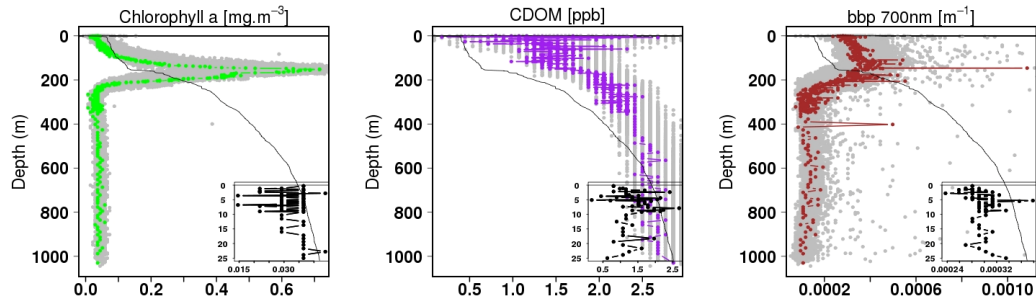
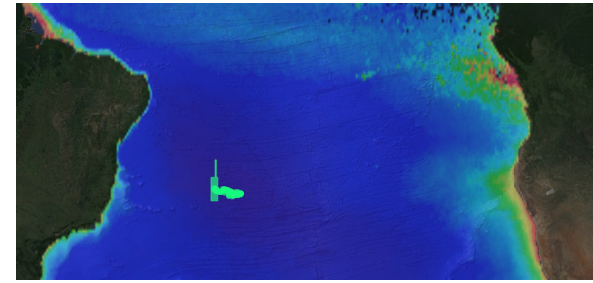
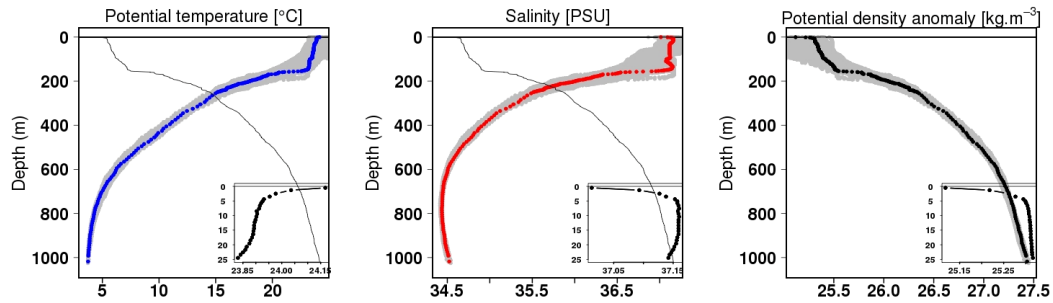
Le flotteur Bio-Argo pour faire quoi?

- Profils verticaux et time-series de ces profils
 - Cycles saisonniers, variabilité interannuelle, tendance climatique....
 - réponse biogéochimique aux forçages physique
 - budget (C, N, O)
- Cycle diurne et production
- Sédimentation de particules, flux
- Migration de zooplancton?

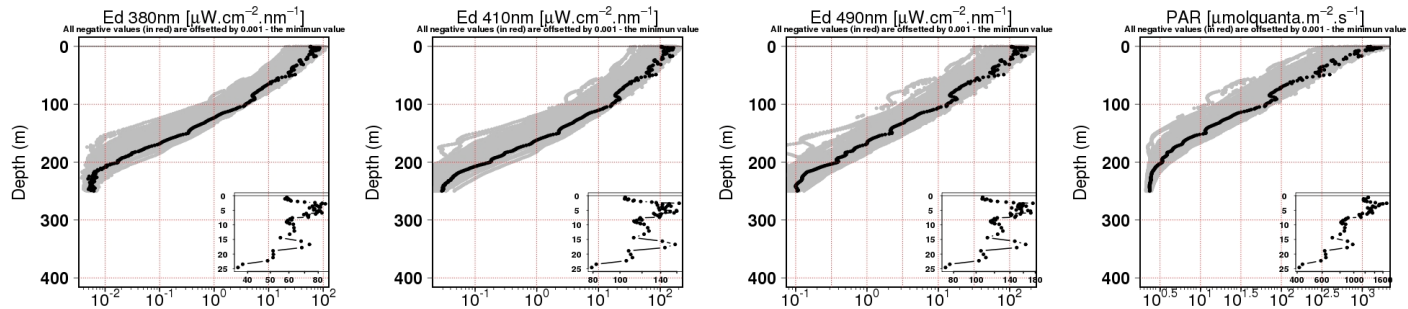
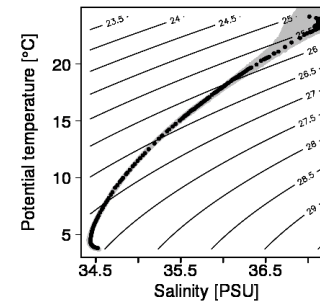
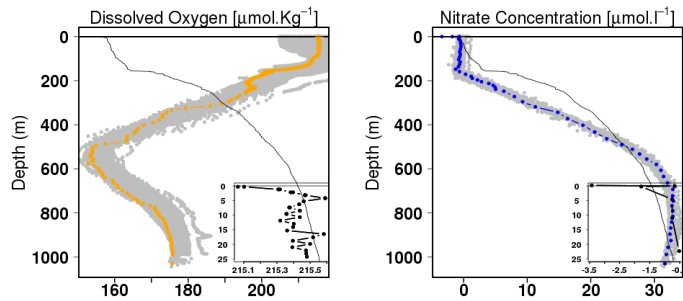
Voir flotte en temps réel à :

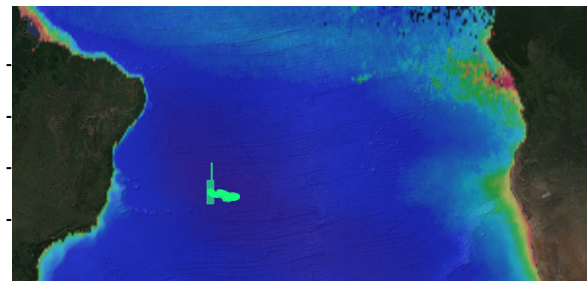
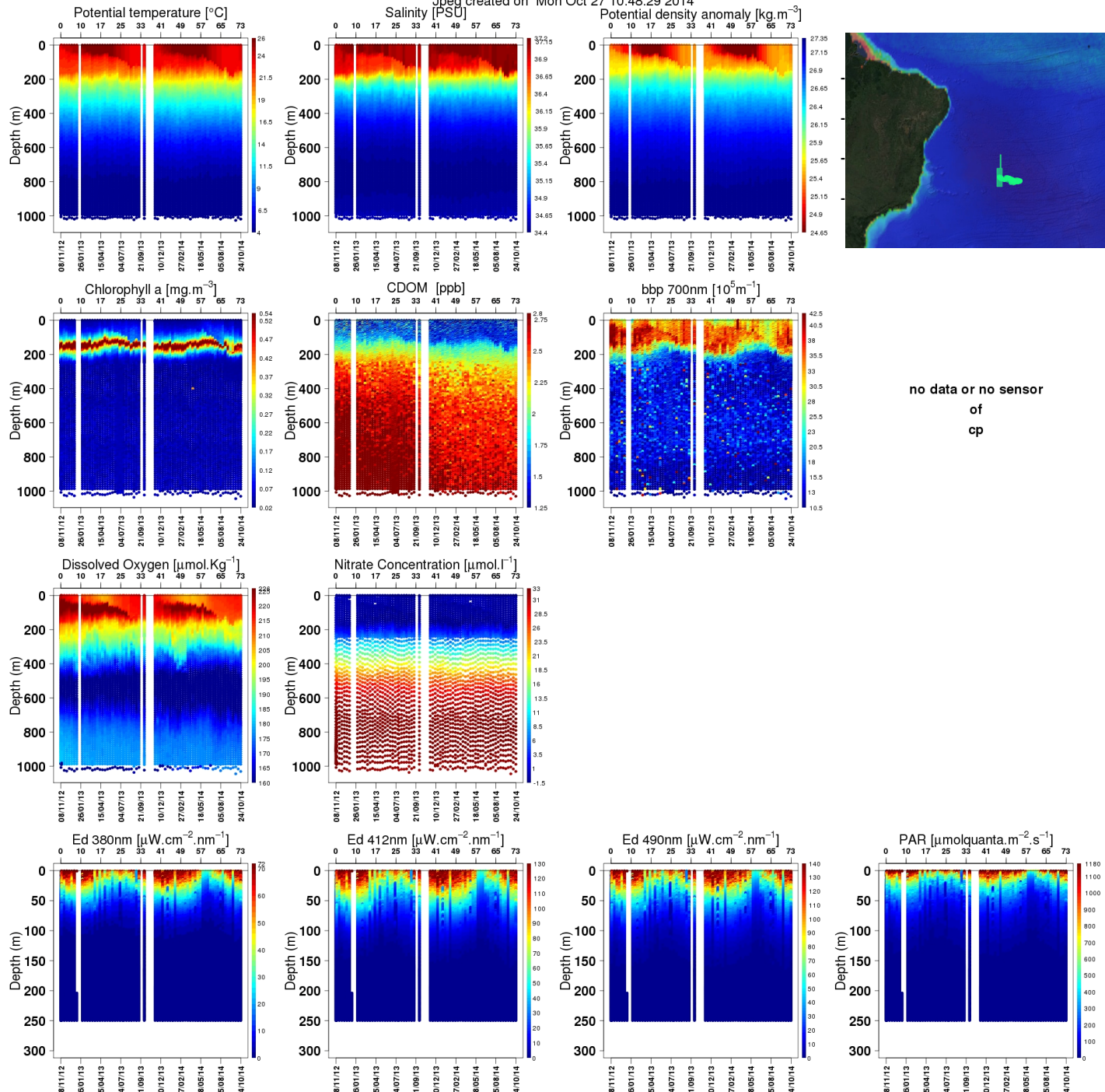
<http://www.oao.obs-vlfr.fr/maps/en/>



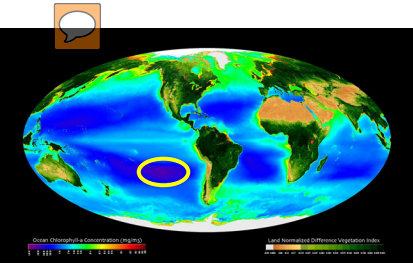


no data or no sensor
of
cp

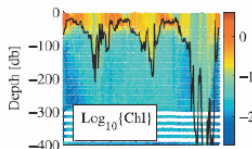
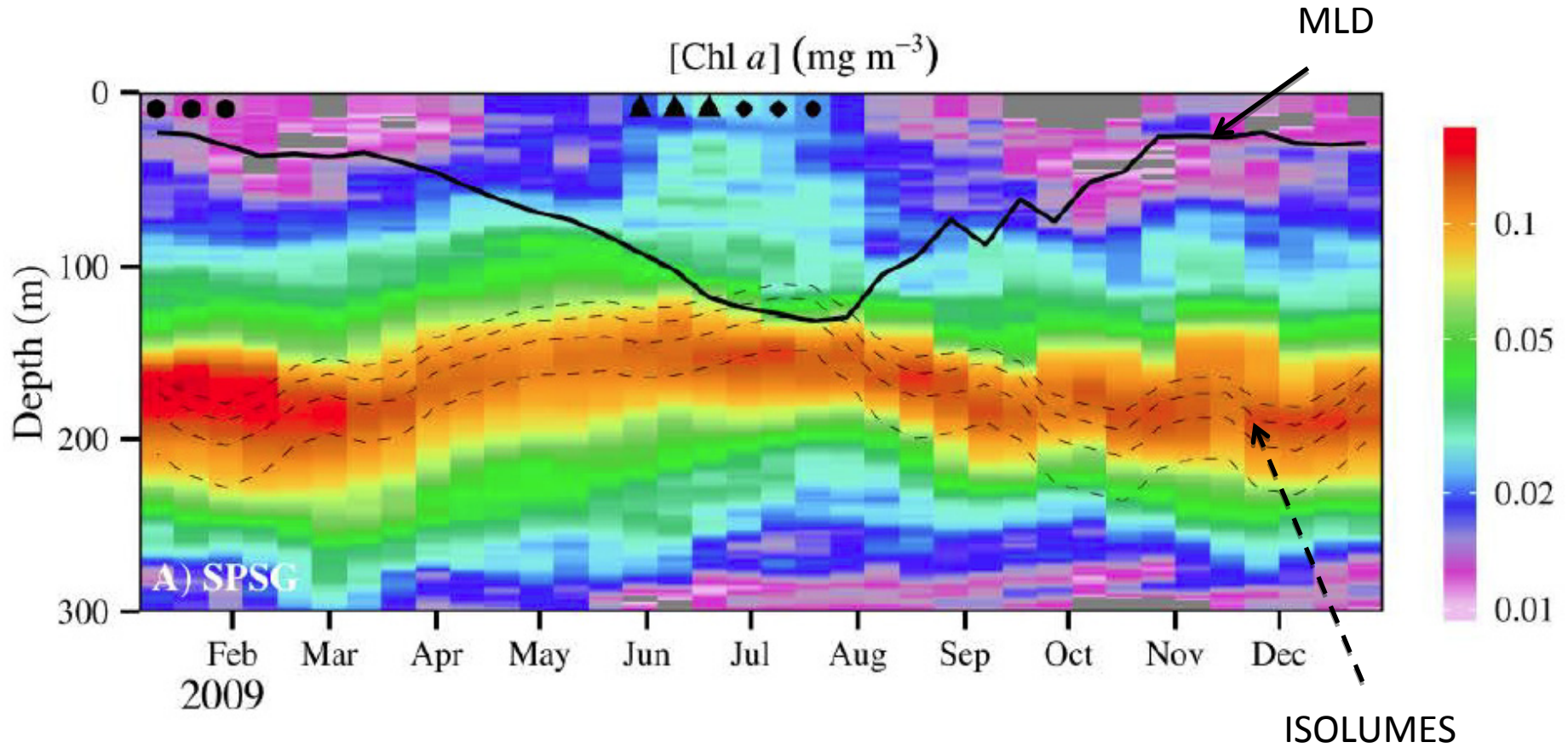




no data or no sensor
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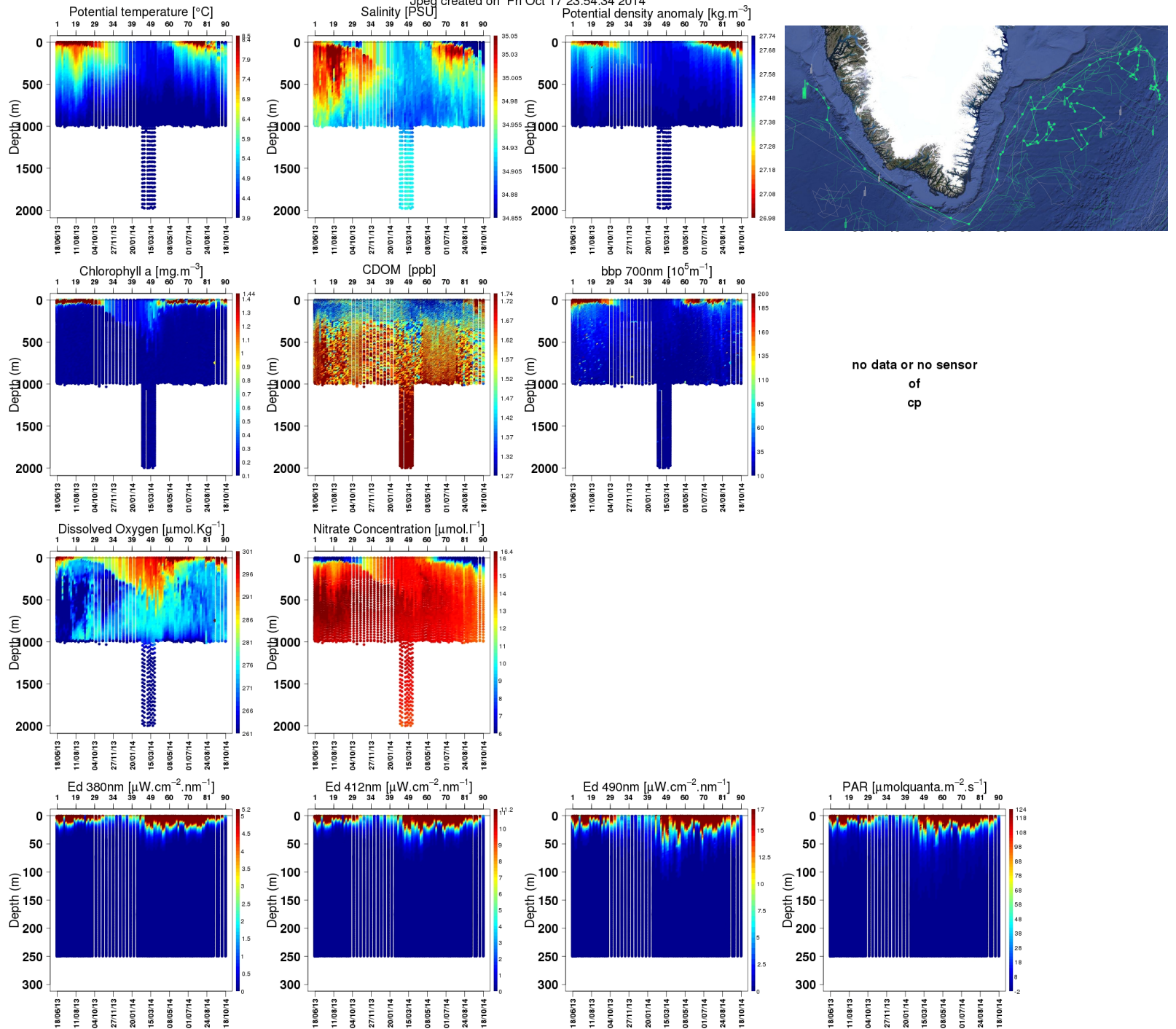


DCM light-related dynamics Here the South Pacific Gyre

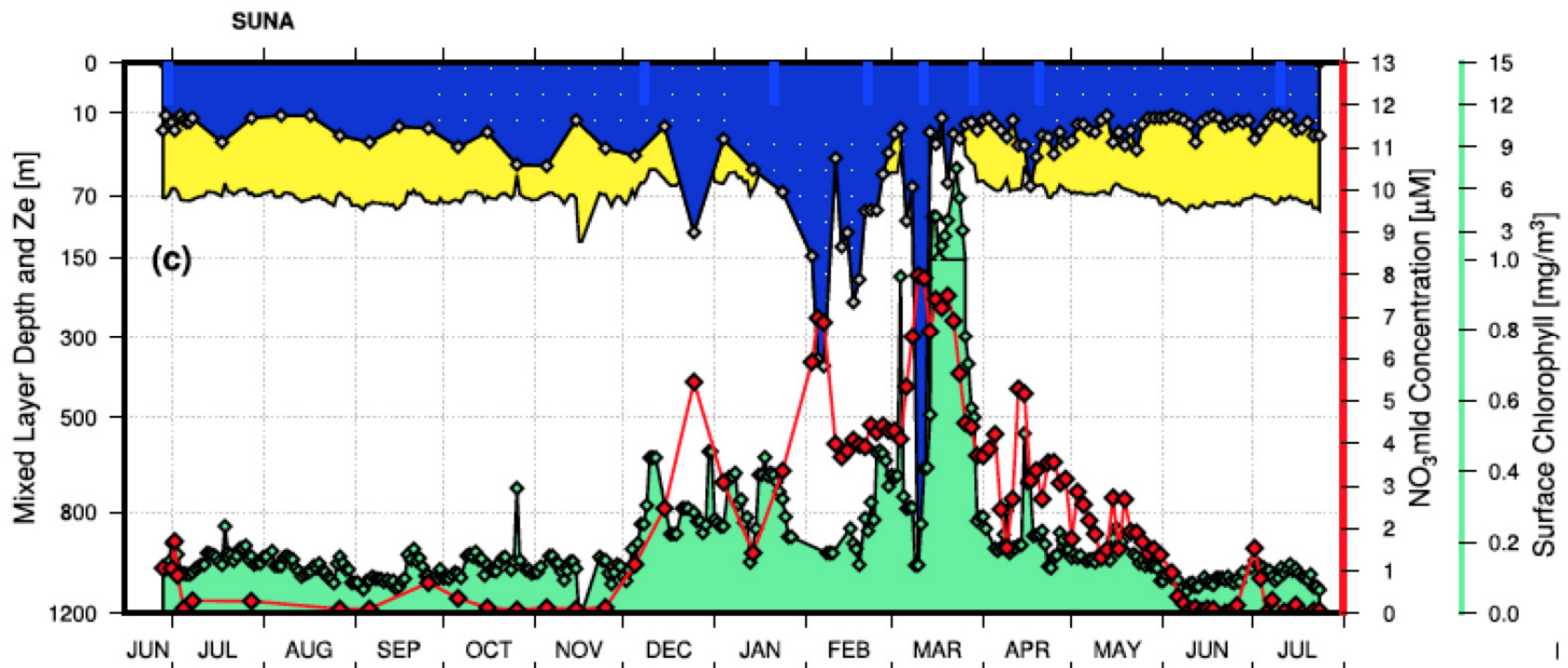


BioArgo
Global Biogeochemistry

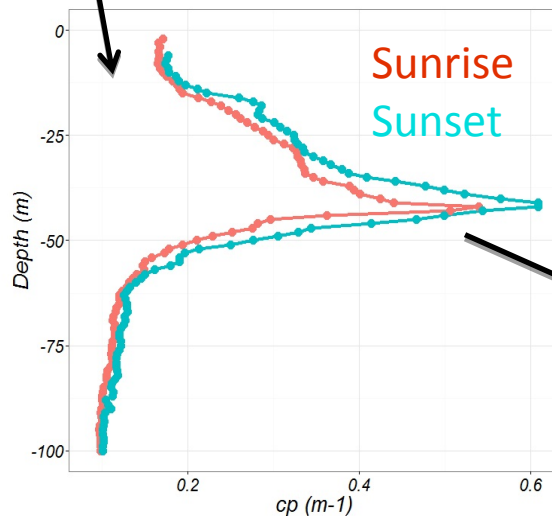
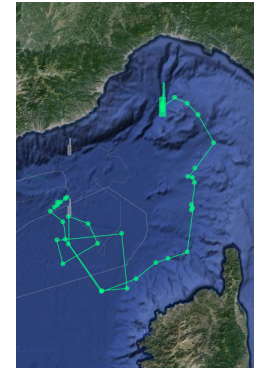
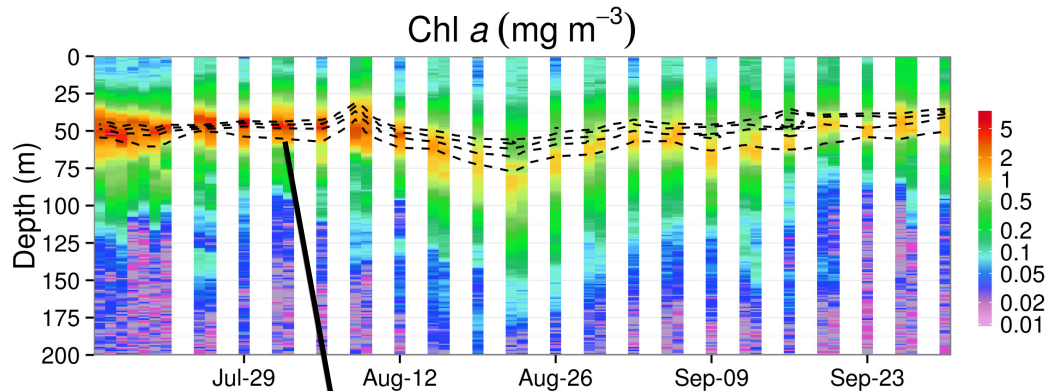
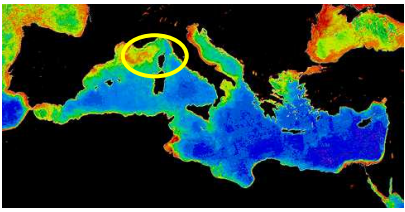
Mignot et al., GBC 2014



Serie temporelle nitrate-flotteur et Chla-satellite en Méditerranée Nord Occidentale

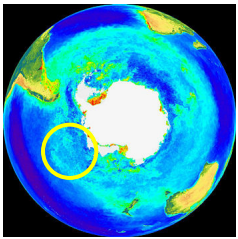


Cycles diurnes

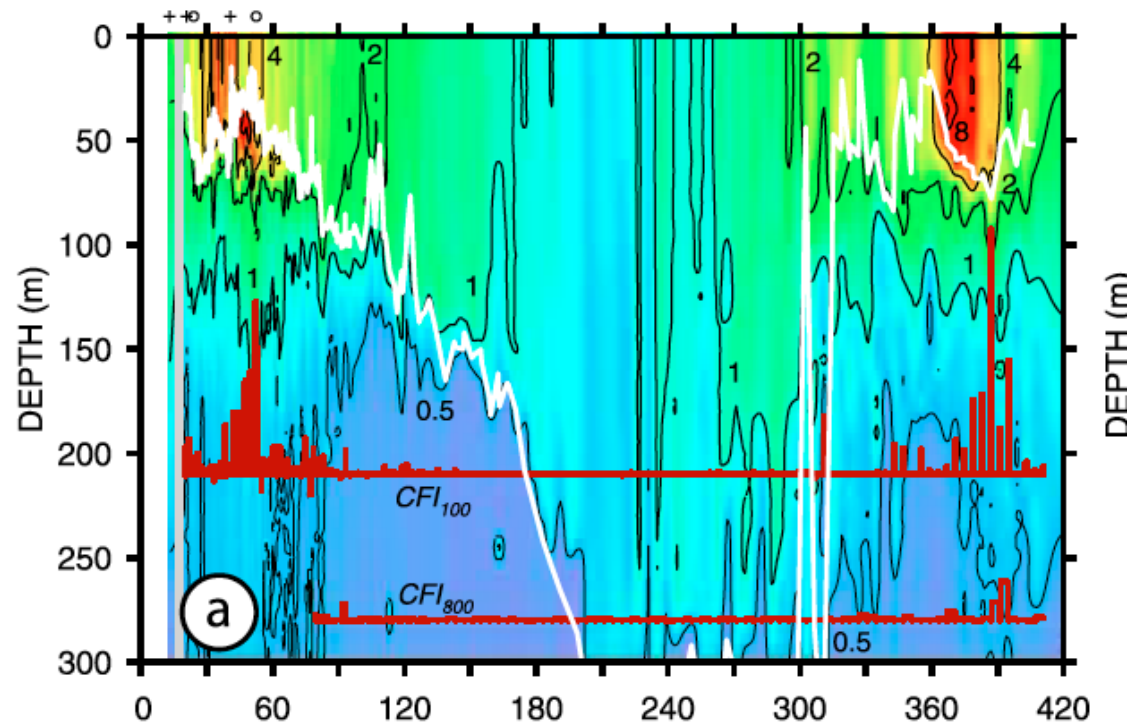
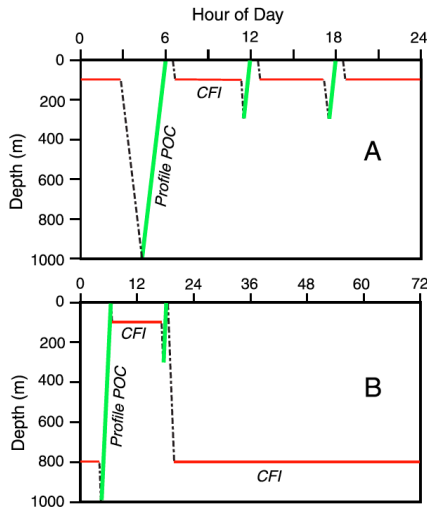
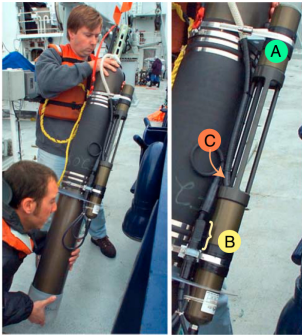


- Adapting the temporal sampling resolution
- The diel cycle in c_p converts into $\sim 1 \text{ g C m}^{-2} \text{ d}^{-1}$
- 75% of the production in the 30-60 m layer

*The float sees what the satellite does not see...:
« deep blooming » in the NW Med Sea in
summer*

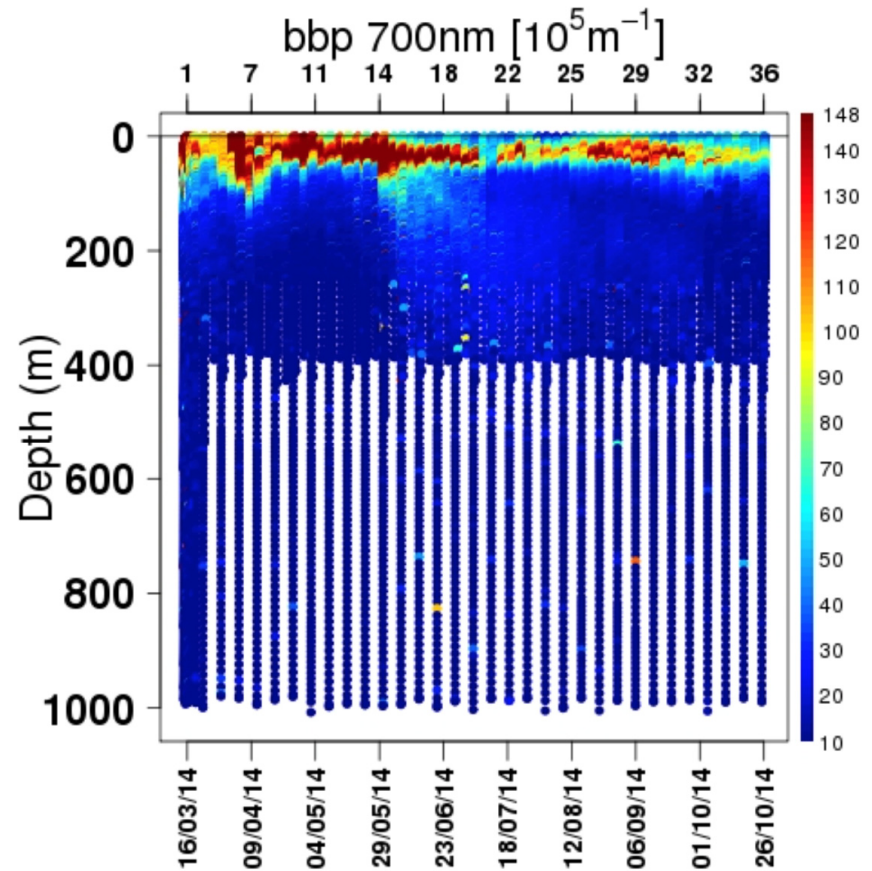
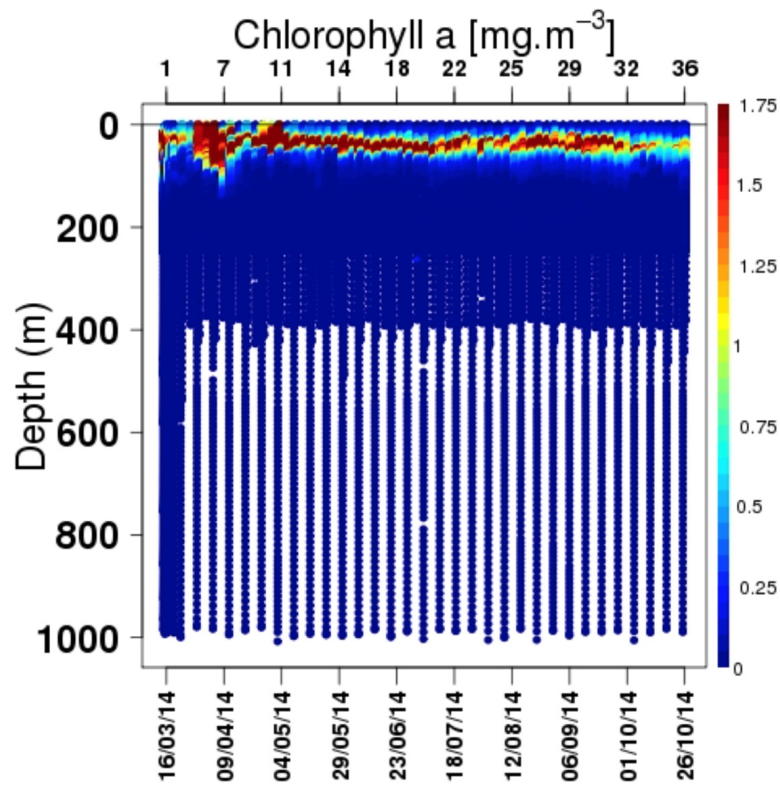
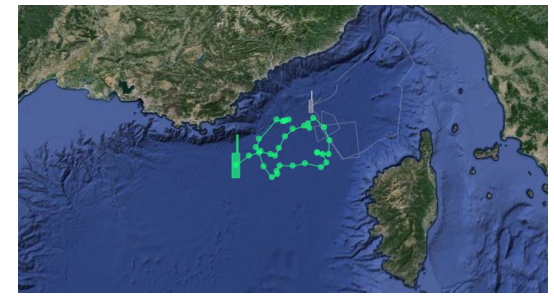


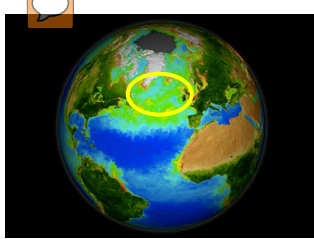
Particulate sinking fluxes. Example from the Southern Ocean



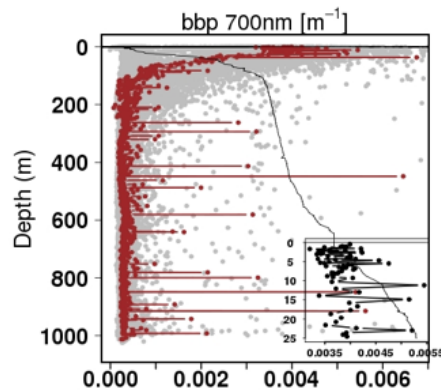
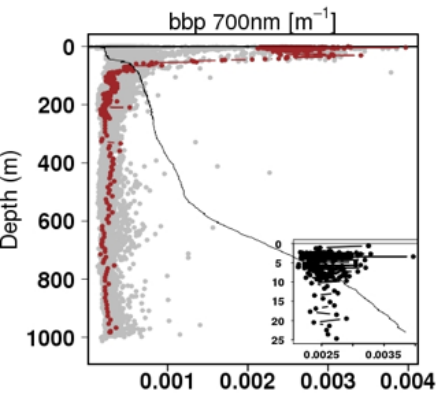
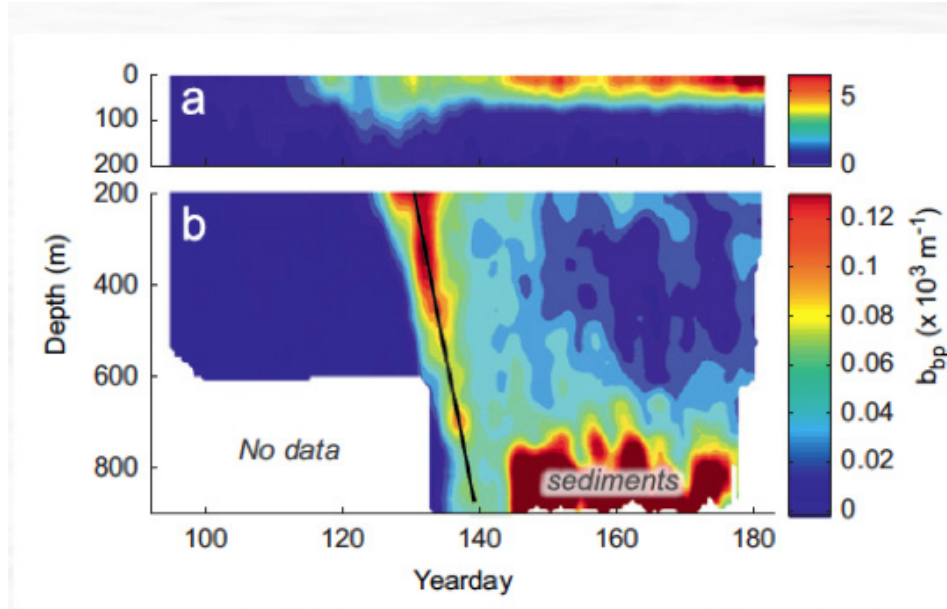
Adapting float parking depth for the measurement of particulate flux attenuation.





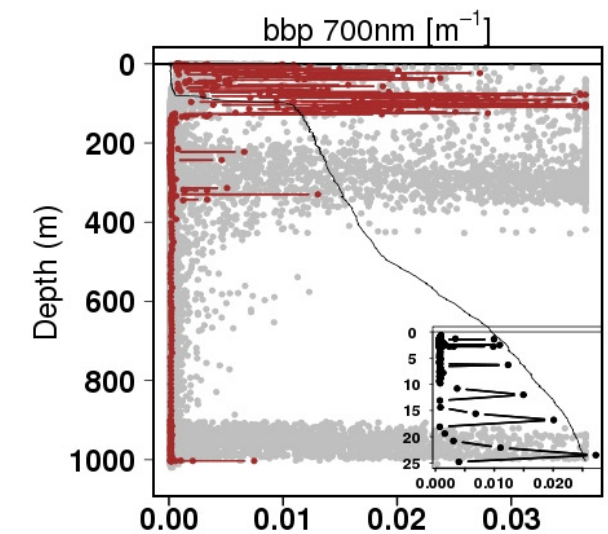
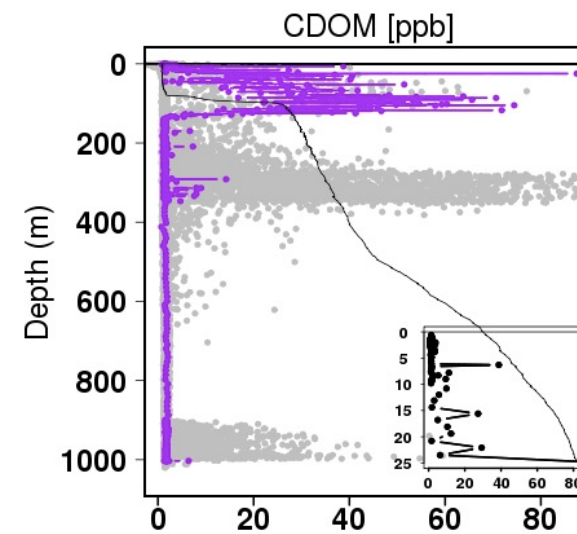
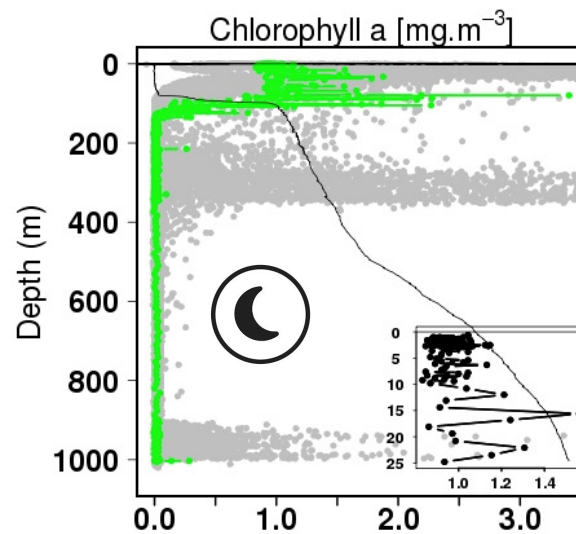
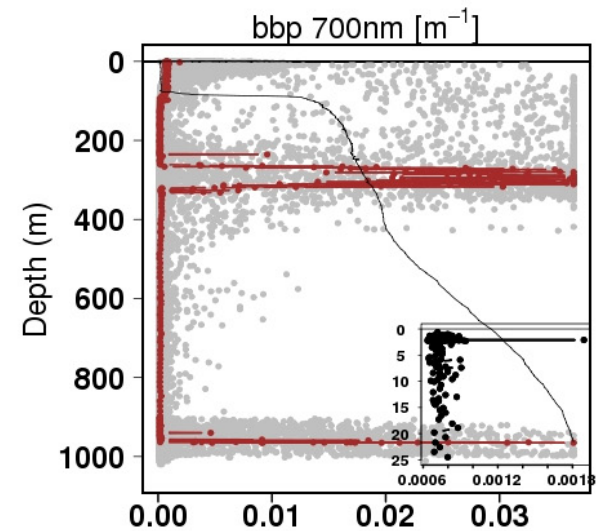
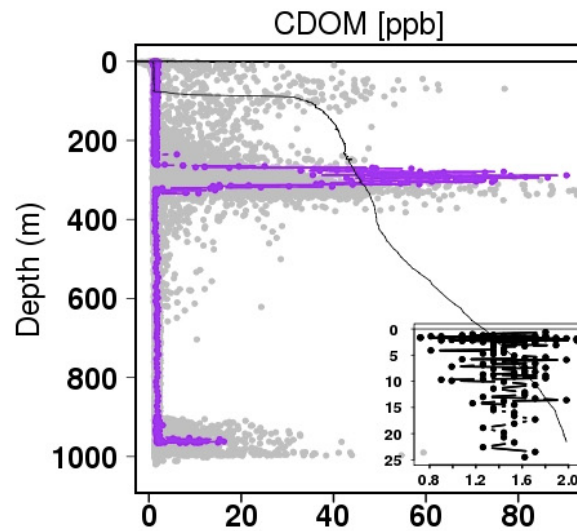
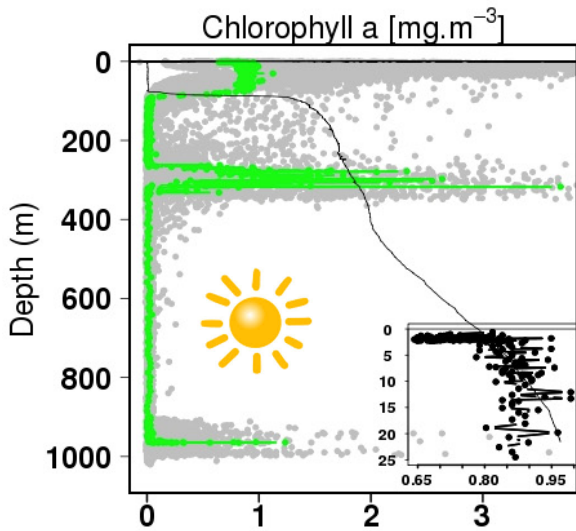
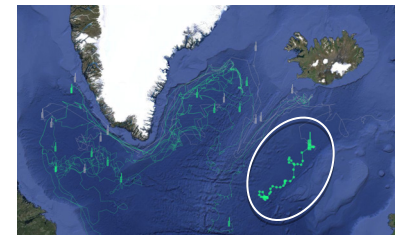


Particulate sinking fluxes: Example from the North Atlantic

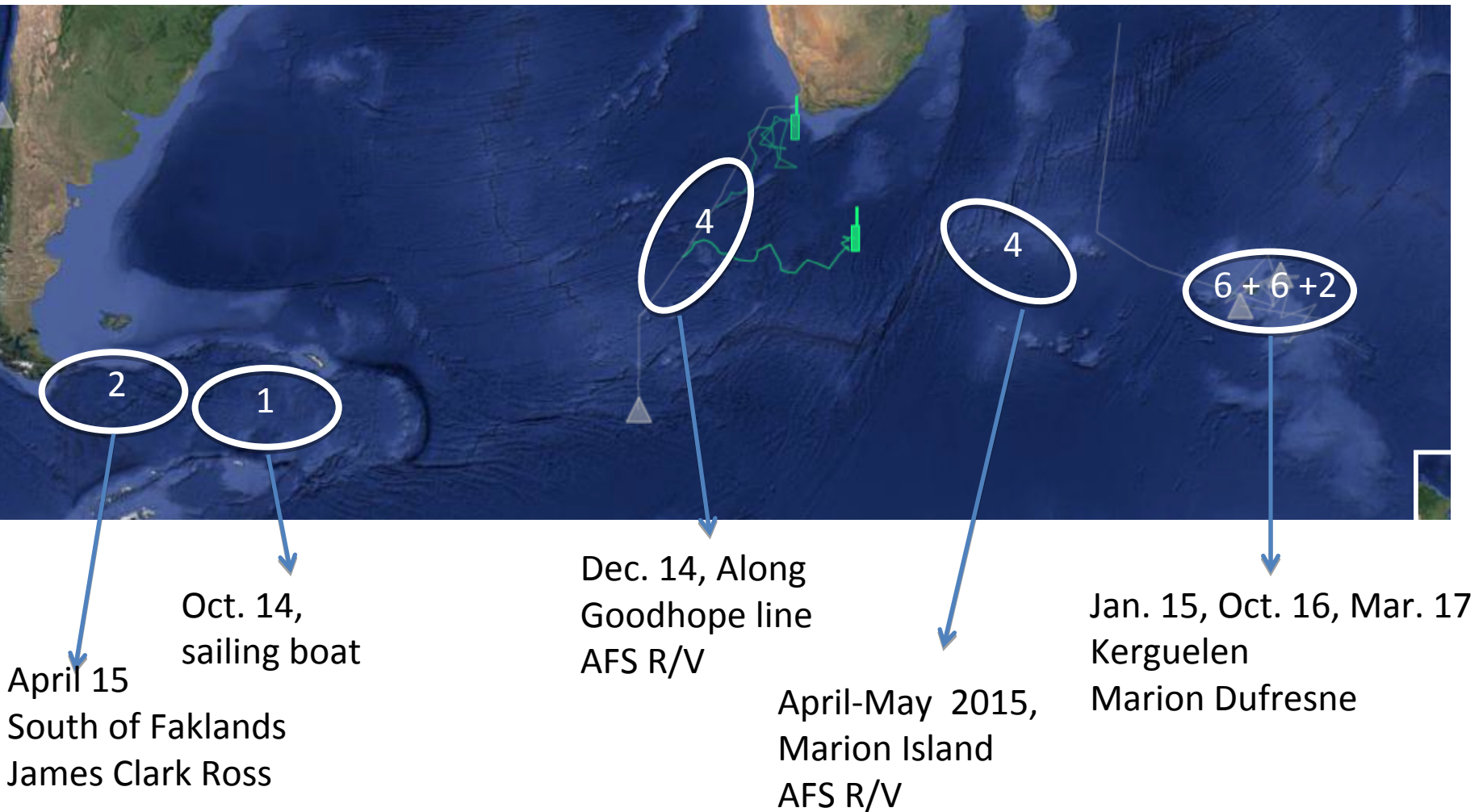


**Spiky data have a scientific value !
Adapting vertical sampling
resolution to catch the bloom
export**

Zooplankton migration?



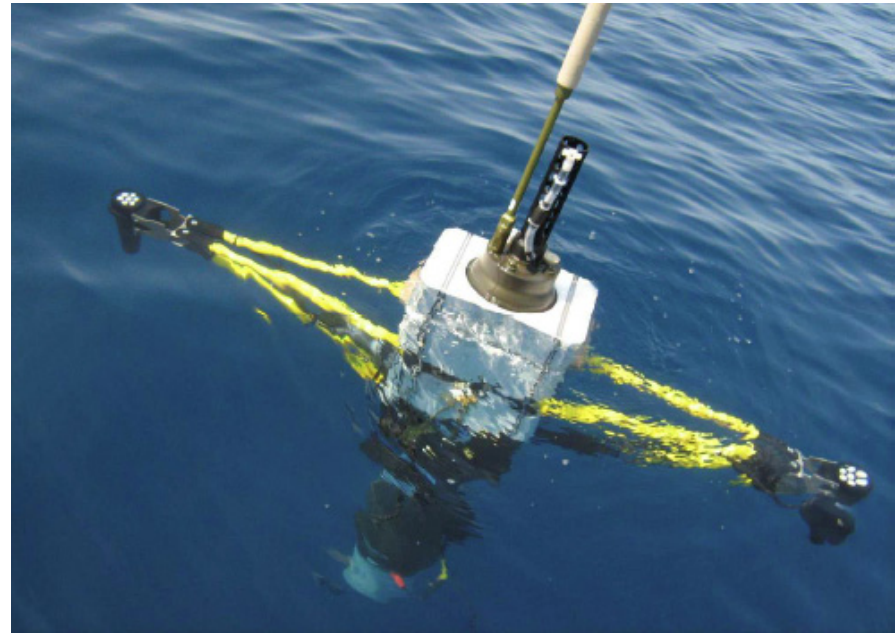
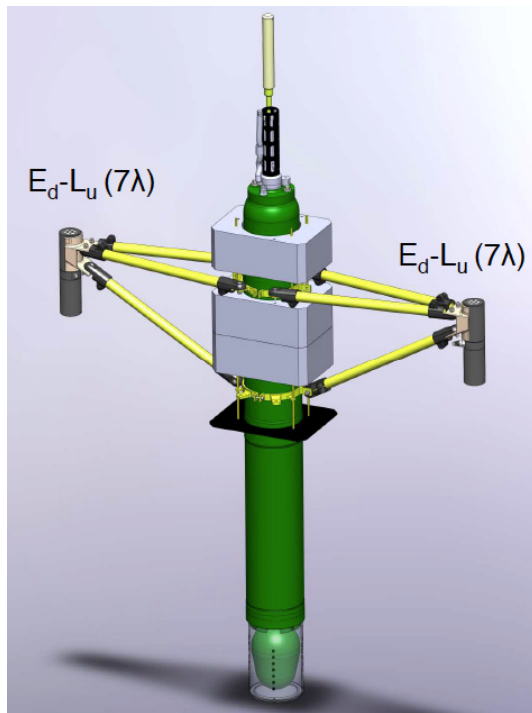
French plans for float deployments in the Southern Ocean



Some LOV references related to BIO-Argo floats

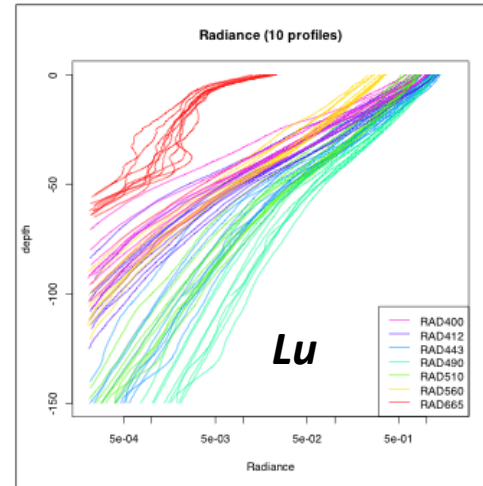
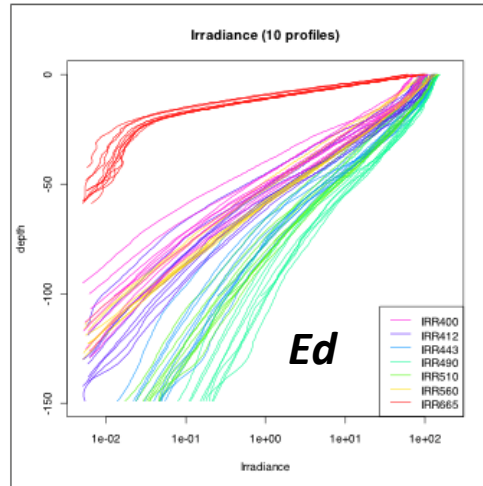
- D'Ortenzio F., H. Lavigne, F. Besson, H. Claustre, L. Coppola, N. Garcia, A. Laës-Huon, S. Le Reste, D. Malardé, C. Migon, P. Morin, L. Mortier, A. Poteau, L. Prieur, P. Raimbault and P. Testor (2014). Observing mixed layer depth, nitrates and chlorophyll concentrations in the North Western Mediterranean: a combined satellite and NO₃ profiling floats experiment, *Geophysical Research Letters*, 41, 6443–6451, doi:10.1002/2014GL061020.
- Mignot, A., Claustre, H., Uitz, J., Poteau, A., D'Ortenzio, F. and X. Xing (2014) Understanding the seasonal dynamics of phytoplankton biomass and DCM in oligotrophic environments: a Bio-Argo float investigation. *Global Biogeochemical Cycles*, DOI: 10.1002/2013GB004781
- Xing, X., Claustre, H., Uitz, J., Mignot, A., Poteau, A. and H. Wang (2014). Seasonal Evolutions of Bio-optical Properties and Their Inter-relationships Observed by Bio-Argo Floats in the Sub-polar North Atlantic, *Journal of Geophysical Research*, 119, doi:10.1002/2014JC010189.
- Xing, X., Morel, A., Claustre, H., D'Ortenzio, F., and A. Poteau (2012). Combined processing and mutual interpretation of radiometry and fluorometry from autonomous profiling Bio-Argo floats: 2. Colored dissolved organic matter absorption retrieval. *Journal of Geophysical Research*, Vol. 117, No. C4, C04022, <http://dx.doi.org/10.1029/2011JC007632>.
- Xing, X., Morel, A., Claustre, H., Antoine, D., D'Ortenzio, F., Poteau, A., Mignot, A. (2011). Combined processing and mutual interpretation of radiometry and fluorimetry from autonomous profiling Bio-Argo Floats. The retrieval of Chlorophyll a, *Journal of Geophysical Research*, 116, C06020, doi:10.1029/2010JC006899.

PROVAL: a float dedicated to validation of Ocean Color Radiometry

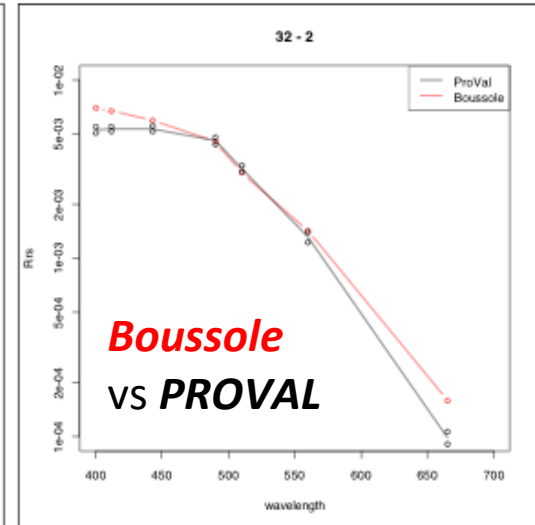
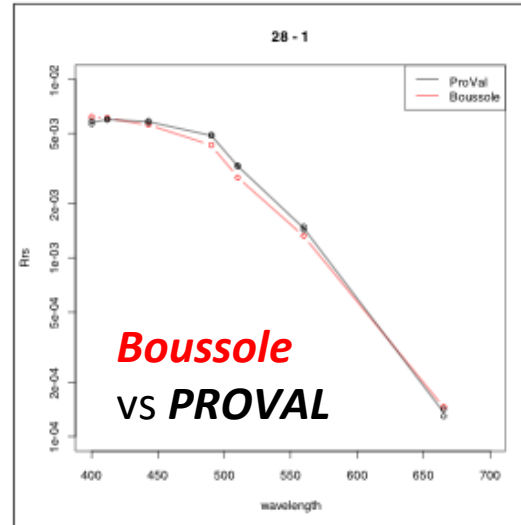
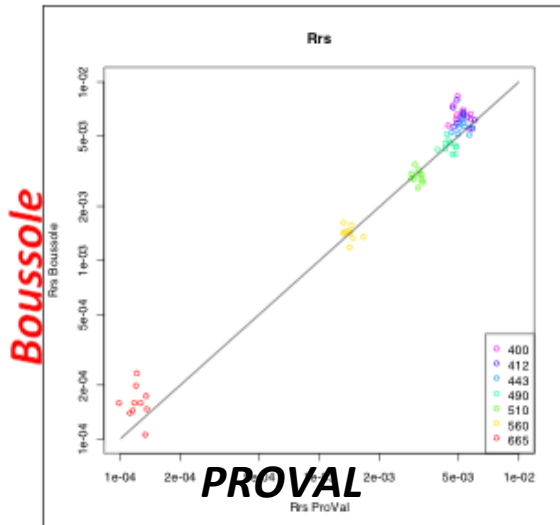


First results in the Med Sea

Radiometric profiles



Remote sensing reflectance



Bio-optical anomalies in the Austral Ocean

- OC Satellite under-estimates the retrieval of Chla content in Austral waters
- Data required:
 - To document the underlying bio-optical anomalies
 - To develop consistent bio-optical data base to be compared to other areas (e.g. Med, where there is an overestimation)
 - To identify key locations for future dedicated « bio-optical » cruises
- PROVALs will be key tools in addressing these objectives
- 2 PROVALS will be acquired and deployed as part of SOCLIM

More information at : <http://www.oao.obs-vlfr.fr>

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Oceanographic Autonomous Observations

OAO represents a kind of a virtual platform and also stands for :

REAL-TIME DATA

The remote acquisition of real-time data in the Ocean interior by undersea robots, together with the use of satellite data of the Ocean upper layer

MORE

UNDERSEA ROBOTS

Specific instruments used for oceanographic observations namely undersea robots (gliders and profiling floats) equipped with miniaturized sensors dedicated to the measurement of biogeochemical properties

TEAM OF SCIENTISTS

A multi-disciplinary team of scientists and scientific engineers controlling the technological advancements as well as the data collection and analysis.

MORE