BOUSSOLE Monthly Cruise Report

Cruise 168
February 04-06, 2016

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Vessel: R/V Téthys II
(Captain: Dany Deneuve)

Science Personnel: Marin Cornec, Emilie Diamond, Melek Golbol, Lucie Laporte, David Luquet, Judicaël Rivier, Didier Robin and Vincenzo Vellucci.

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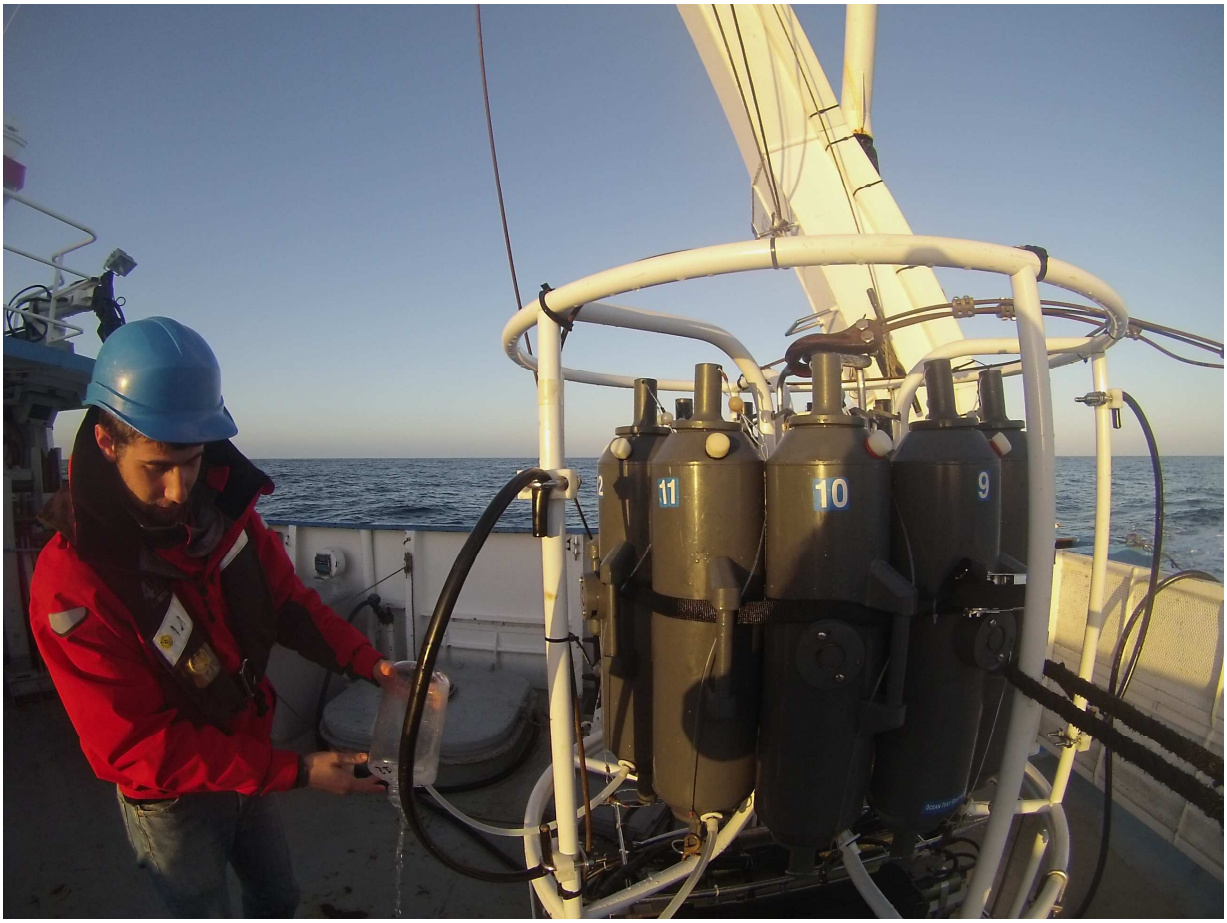

Marin Cornec, a Master's degree student is sampling water from the CTD Rosette for HPLC and a_p analysis.

BOUSSOLE project

ESA/ESRIN contract N° 4000111801/14/I-NB

February 19, 2016

Foreword

This report is part of the technical report series that is being established by the BOUSSOLE project.

BOUSSOLE is funded and supported by the following Agencies and Institutions

European Space Agency

Centre National d'Etudes Spatiales, France

Centre National de la Recherche Scientifique, France

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Contents

Cruise Objectives

Routine operations

Multiple Biospherical's C-OPS (Compact Optical Profiling System) radiometric profiles are performed at the BOUSSOLE site around solar noon, under optimal conditions: clear blue skies and flat, calm sea surface. If the sky is clear and sea conditions are reasonably calm (no whitecaps or large swell), hand held CIMEL sun photometer measurements are to be performed consecutively where possible with C-OPS profiles. If sea conditions are poor but sky is good, hand held CIMEL sun photometer measurements can be made at intervals throughout the day to measure atmospheric optical thickness. CTD deployments are required at the start and the end of the C-OPS profiling day and around noon in the longer summer days or when there is a high possibility of a satellite matchup. The CTD package also includes a Chl fluorometer. Additional instrumentation for measurement of inherent optical properties has been added from December 2011. The package includes a hyperspectral absorption meter (Hobilabs a-sphere), a multispectral backscattering meter (Hobilabs Hydroscat-6) and a multispectral beam transmissometer (Hobilabs Gamma-4). 2 CTD casts are to be performed at each data acquisition at the BOUSSOLE site: one cast with, and one cast without, a 0.2µm filter added on the a-sphere for the dissolved matter absorption measurements.

Seawater samples are to be collected, filtered and stored into liquid nitrogen for subsequent HPLC pigment and particle absorption spectrophotometric filter analysis in the lab. Three replicates samples are to be collected at surface for total suspended matter weighting in the lab.

A new sensor ("Master REM A") was added to the IOP package and connected to the CTD. This sensor is identical to the ones installed on the Bio-Argo floats, and is planned to be used as a "gold standard" to inter-calibrate sensors among the Bio-Argo fleet. This sensor measures fluorescence of Chla, fluorescence of Coloured Dissolved Organic Matter (CDOM), and backscattering at 700nm. The objective is to evaluate what this instrument provides in terms of Chl and CDOM fluorescence, by comparing its measurements to those from the BOUSSOLE Chl and CDOM fluorometers (the ones installed on the BOUSSOLE IOP package), to the chlorophyll concentrations from the HPLC analyses, and to the CDOM absorption measurements from the CDOM analyses.

Operations that have to be performed in each cruise include:
- Collection and filtration of seawater samples for colored dissolved organic matter (from June 2005).

- One CTD transect is performed between the BOUSSOLE site and the Port of Nice. This transect consists of six fixed stations on-route from BOUSSOLE. Whenever feasible, this transect should be performed at a similar time for each cruise, in order to minimise the influence of possible diurnal variability.

- Divers check the underwater state of the buoy structure and instrumentation, take pictures for archiving, clean the sensor optical surfaces, and then take again some pictures after cleaning. Divers also put a neoprene cap on the backscattering meter and on the transmissometers for acquiring dark measurements (started in April 2009).

In addition, water samples are to be collected at two depths (5m and 10m) for dissolved oxygen (DO), total alkalinity (TA) and total inorganic carbon (TC) analysis (from March 2014). This operation is part of the BIOCAREX ANR project, in collaboration with the LOCEAN in Paris (J. Boutin and collaborators). The TA/TC samples will be processed by the National service for such analyses (SNAPOCO – LOCEAN in Paris). The results will allow checking the data collected by the two pCO2 CARIOCA sensors installed on the buoy at 3m and 10m.

Further details about these operations and the data collection and processing protocols are to be found in:
Antoine, D. M. Chami, H. Claustre, F. D'Ortenzio, A. Morel, G. Bécu, B. Gentili, F. Louis, J. Ras, E. Roussier, A.J. Scott, D. Tailliez, S. B. Hooker, P. Guevel, J.-F. Desté, C. Dempsey and D. Adams. 2006, BOUSSOLE: a joint CNRS-INSU, ESA, CNES and NASA Ocean Color Calibration And Validation Activity. NASA Technical memorandum N° 2006 - 214147, 61 pp.
(http://www.obs-vlfr.fr/Boussole/html/publications/pubs/BOUSSOLE_TM_214147.pdf)

Additional operations

The second day of this cruise was used for DYFAMED operations (deep CTD cast and zooplankton net) because the DYFAMED cruise was cancelled two days before due to bad weather.

The last day, the 3X1M-004 fluorometer sensor installed on the buoy at 9m by the divers during the December cruise was recovered in order to download the data and to change the battery. The two PCO_2 CARIOCA sensors were replaced by two sensors that had been previously serviced and calibrated by the DT-INSU group. The pCO_2 sensor at 3m depth was recovered with its telemetry cable (on the top of the buoy). The telemetry cable of the pCO_2 sensor at 10m was recovered from the top of the buoy. This cable was connected to the new PCO_2 sensor at 10 m. Then the cable was winded and fixed with its sensor under the upper section of the buoy.

Cruise Summary

The first day was cancelled because of bad weather. The second day was used for the DYFAMED operations, for optical profiles, for a Secchi disk and for CTD casts with water sampling at the BOUSSOLE site.
The last day was used for diving operations, for a Secchi disk and for CTD cast with water sampling at the BOUSSOLE site.

Thursday 04 February 2016

Bad weather prevented departure from the Nice harbour.

Friday 05 February 2016

The sea state was slight with a light breeze. The sky was blue and cloudy. The visibility was medium. Firstly, a deep CTD cast with water sampling was performed at the DYFAMED site for the MOOSE DYFAMED program. Then, we went to the BOUSSOLE site. C-OPS balance tests were performed in order to check and adjust it during the descent phase of the profiles. Then 1 C-OPS profile and a Secchi disk were performed at the BOUSSOLE site. 2 CTD casts were attempted but failed. Then, the problem was solved and 2 CTD casts with water sampling could be performed. These 2 CTD casts included 1 cast with 0.2µm filters on the a-Sphere absorption meter and a cap on the HS-6 backscattering meter for dark measurements. Finally a zooplankton net was performed for the MOOSE DYFAMED program before returning to the Nice harbour.

Saturday 06 February 2016

The sea state was slight with a moderate breeze. The sky was overcast. The visibility was medium. When arrived at BOUSSOLE, divers went at sea to recover the fluorometer at 9 m, the 2 PCO_2 sensors at 3 m and 10 m. The 2 PCO_2 sensors were replaced with new ones. The pCO_2 sensor at 3 m was removed with its telemetry cable (on the top of the buoy). The telemetry cable of the pCO_2 sensor located at 10 m was recovered with the sensor. Then it was connected to the new PCO_2 sensor. The divers winded and fixed this cable under the upper section of the buoy. They also cleaned the instruments, took pictures and perform dark measurements by putting caps on the backscattering meter and the transmissometers. In the meantime, data were retrieved directly using the cable available on the top of the buoy and with the AK connector. Solar panels, surface sensors and ARGOS connectors were cleaned. Then 2 CTD casts with water sampling were performed at the BOUSSOLE site including 1 cast with 0.2µm filters on the a-Sphere absorption meter.

Pictures taken during this cruise can be found at:
https://picasaweb.google.com/114686870380724925974/2016_02_boussole168

Data from the BOUSSOLE cruises and buoy are available at:
http://www.obs-vlfr.fr/Boussole/html/boussole_data/login_form.php

Cruise Report

Thursday 04 February 2016

Bad weather prevented departure from the Nice harbour

Friday 05 February 2016 (UTC)

People on board: Marin Cornec, Emilie Diamond, Melek Golbol and Lucie Laporte.

0630 Departure from the Nice harbour.
0940 Arrival at the DYFAMED site.
0950 CTD MOOSE 94, 2300m (MOOSE DYFAMED program).
1120 Departure to the BOUSSOLE site.
1150 Arrival at the BOUSSOLE site.
1235 C-OPS balance tests.
1240 C-OPS 01.
1315 Secchi 01, 16m.
1340 Attempt of CTD cast: failed. CTD testing.
1425 CTD 01, 400 m with water sampling at 5 m for TSM (with 0.2 µm filter on a-Sphere and cap on HS-6).
1520 CTD 02, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and $a_{p.}$
1605 Zooplankton net, 100m (MOOSE DYFAMED program).
1615 Departure to the Nice harbour.
1915 Arrival at the Nice harbour.

Saturday 06 February 2016

People on board: Marin Cornec, Melek Golbol and Vincenzo Vellucci.

0610 Departure from the Nice harbour.
0930 Arrival at the BOUSSOLE site.
0945 Diving operations: replacement of the 2 pCO_2 sensors, removal of the fluorometer at 9m, dark measurements, cleaning of sensors and taking pictures.
1000 Secchi 02, 17m.
1120 Direct connection with the buoy using AK connector and data retrieval.
Cleaning of solar panels, surface sensors and ARGOS connectors.
1325 CTD 03, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 20, 10 and 5 m for HPLC, a_p and CDOM.
1440 CTD 04, 400 m with water sampling at 30, 10 and 5 m for TSM, TA/TC and O_2.
1515 Departure to the Nice harbour.
1900 Arrival at the Nice harbour.

Problems identified during the cruise

- The second day, 2 CTD casts were attempted and failed. In fact, that was due to the connection between the CTD and the electrocarrier cable. Fuses had blown two times successively and a burning smell was detected on the extension cable between the CTD and the electrocarrier cable. The problem was solved by changing the fuse and removing the extension cable that was faulty.

- The last day, the 3X1M-004 fluorometer sensor installed on the buoy at 9 m by the divers during the December cruise was recovered in order to download the data and to change the battery. The data were not downloaded on board, however, because we had not all the instructions for this operation. So it was decided to download the data in the lab after having got all instructions from Collin Roesler. This fluorometer will be re-installed during the next cruise.

- CTD 03: Niskin bottle #9 did not close, so there was no sampling at 30m. However the HPLC, a_p and CDOM were sampled the same day at 30 m during the CTD 04 cast in order to complete the discrete sampling.

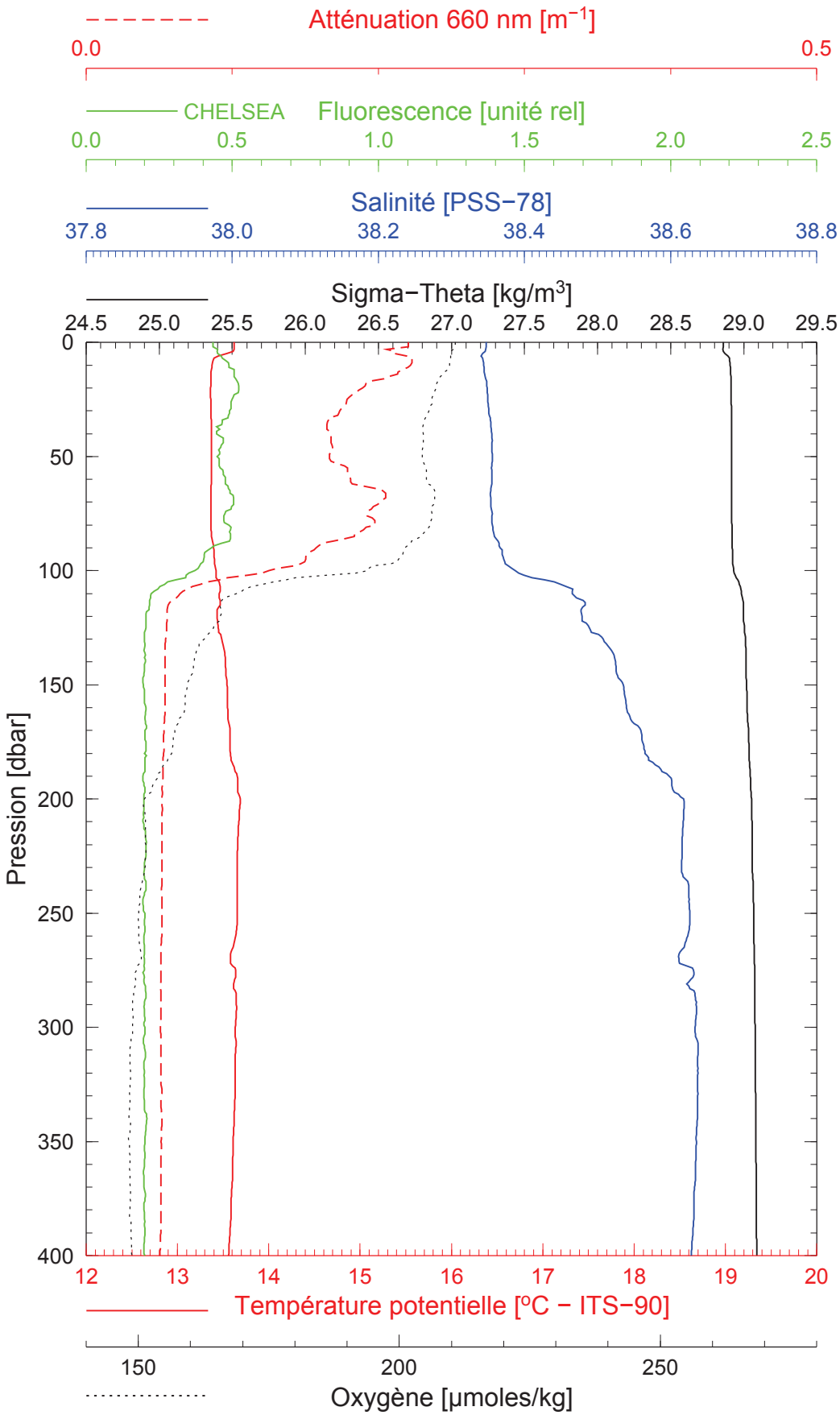
Appendices

Cruise Summary Table for Boussole 168

Date	Black names	Profile names	CTD notées	Other sensors	Start Time	Duration	Depth max	Latitude (N)		longitude					Weather							Sea		
	(file ext: ".raw")	(file extension: ".raw")			GMT (hour.min)	(min.sec)	(meter)	(Degree)	(Minute)	(Degree)	(Minute)	Sky	Clouds	Quantity (#/8)	Wind sp. (kn)	Wind dir.	Atm. Pressure (hPa)	Humidity (%)	Visibility	T air	T water	Sea	Swell H (m)	Swell dir.	Whitecaps
04/02/16	Bad weather																							
05/02/16		bou_c-ops_160205_1148_002_data.csv			12:41	2:43	70	43	22.316	7	53.899	cloudy	Cu	6	5	215	1025.8	73	medium	15.2		calm	0.8		no
				Secchi01	13:15	4:00	16	43	22	7	54	cloudy		6					medium			calm			
			CTDBOUS001	TSM	14:31	26:00	400	43	22.416	7	53.869	blue		1	6	171	1025.8	77		14.3	13.68	calm			
			CTDBOUS002	HPLC & Ap	15:21	31:00	400	43	22.182	7	54.016	blue		0	6	178	1026.1	77		13.6	14.00	calm			
06/02/16				Secchi02	14:00	4:00	35	43	22	7	54	overcast		8								calm			
			CTDBOUS003	HPLC, Ap & CDOM	13:31	24:00	400	43	22.186	7	53.862	overcast		7	10	107	1026.0	83		13.4	14.00	calm			
			CTDBOUS004	TSM, TA/TC & O_2 (HPLC, Ap and CDOM at 30m)	14:42	22:00	400	43	22.170	7	53.965	cloudy		6	11	108	1025.2	83		13.2	13.90	calm			

BOUSSOLE 168 **05/02/2016** **BOUS160205_01**

BOUS001

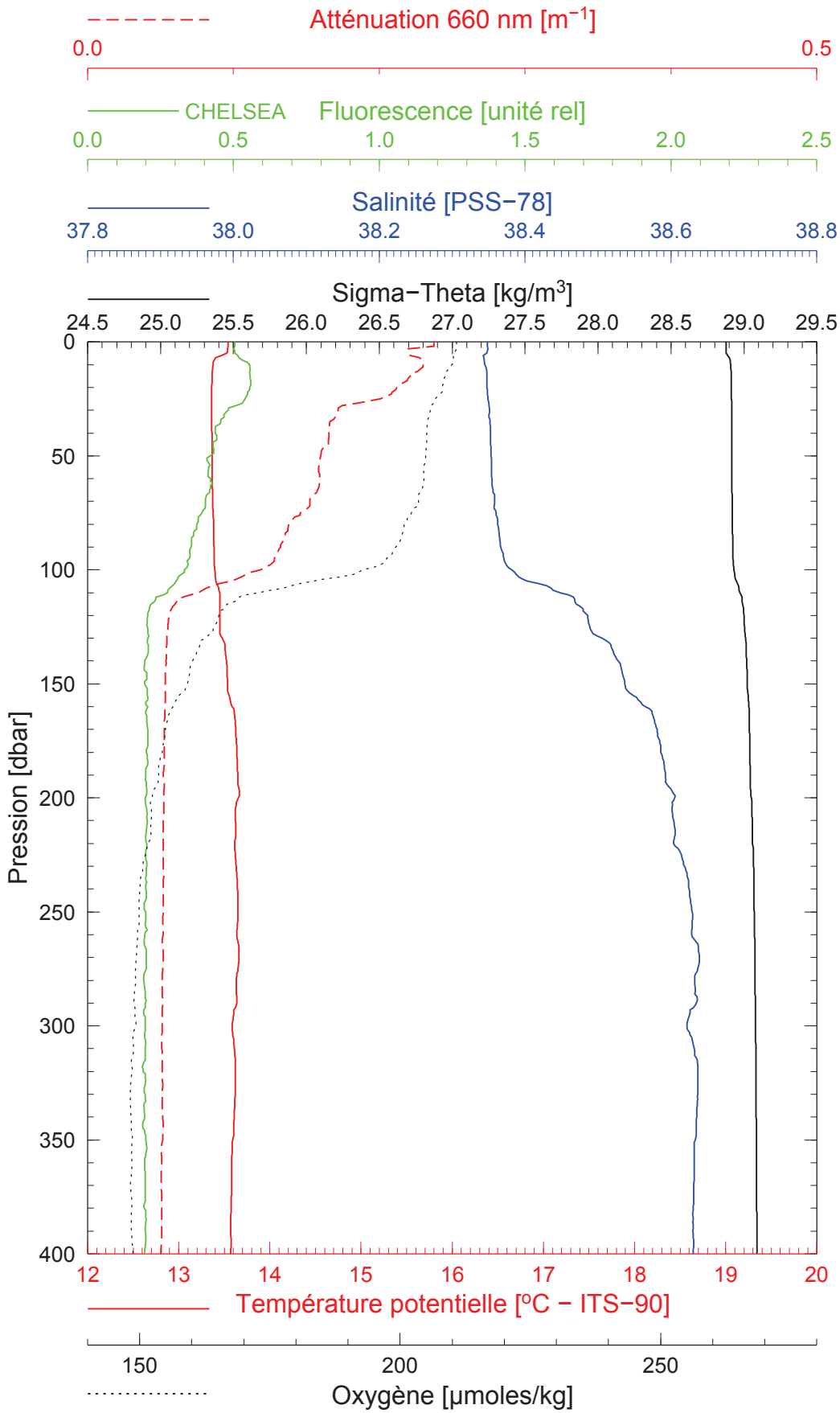


Date *05/02/2016* *Latitude* *43°22.416 N*

Heure déb *14h 31min [TU]* *Longitude* *07°53.869 E*

BOUSSOLE 168 **05/02/2016** **BOUS160205_02**

BOUS002

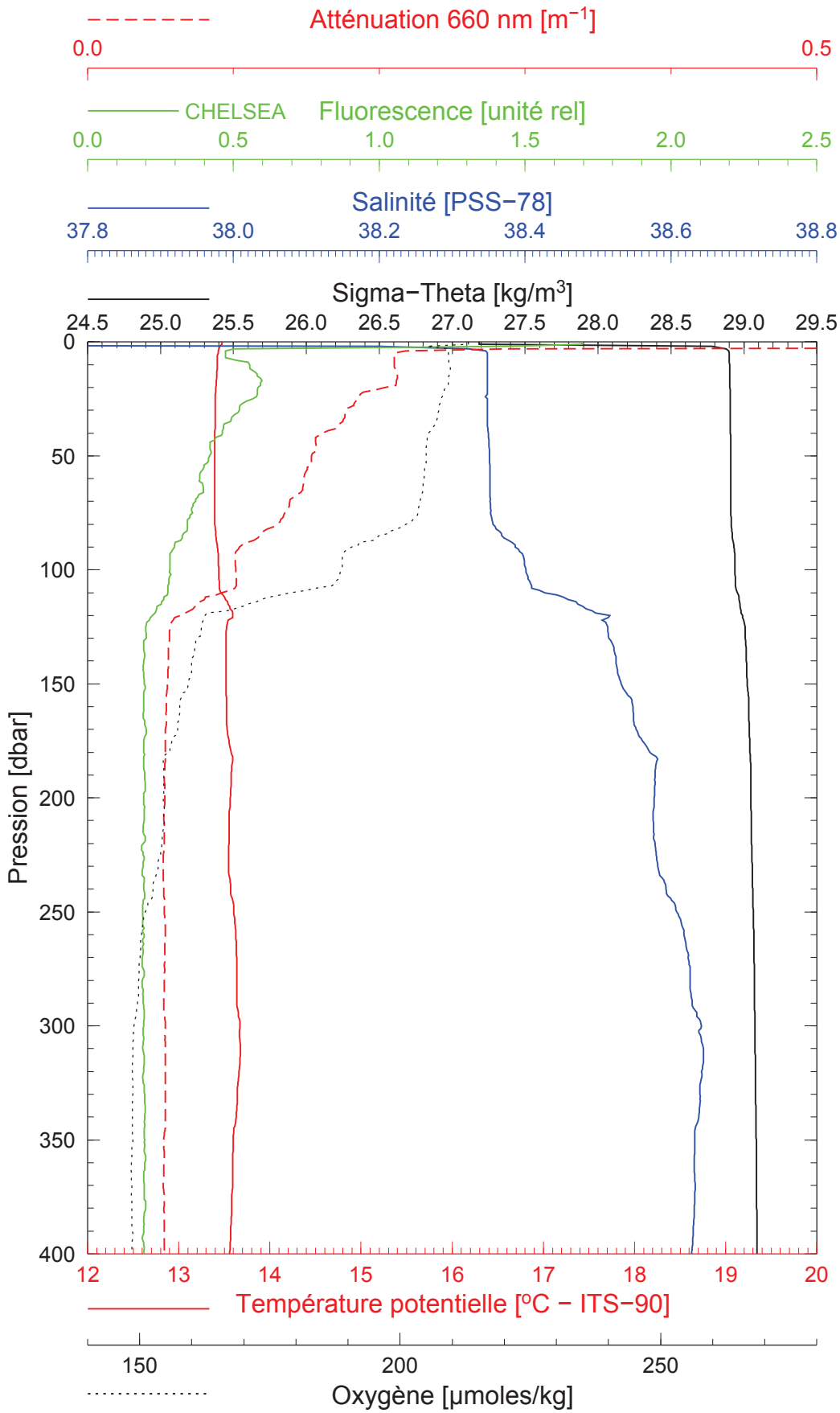


Date *05/02/2016* *Latitude* *43°22.182 N*

Heure déb *15h 21min [TU]* *Longitude* *07°54.016 E*

BOUSSOLE 168 **06/02/2016** **BOUS160206_01**

BOUS003

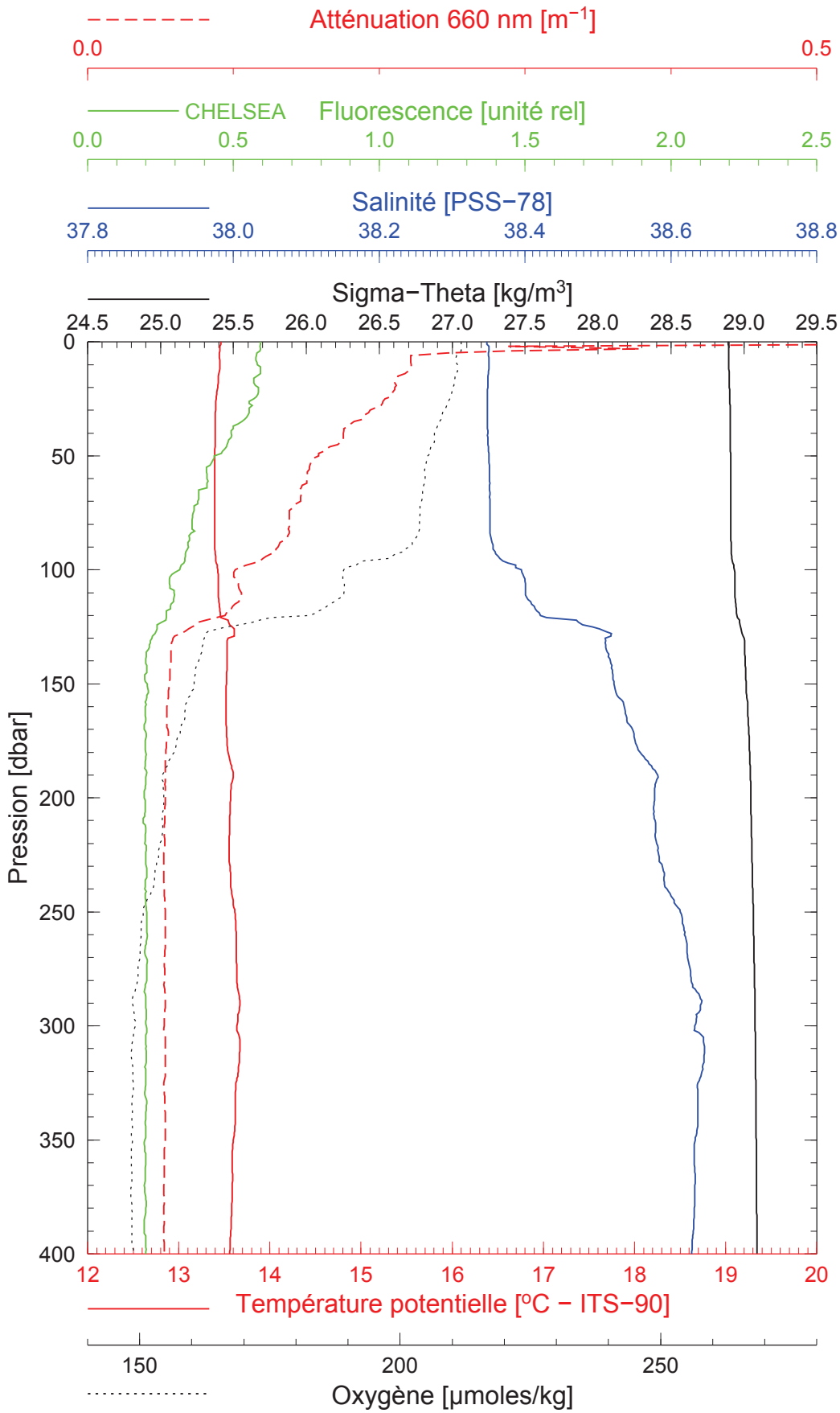


Date *06/02/2016* *Latitude* *43°22.186 N*

Heure déb *13h 31min [TU]* *Longitude* *07°53.862 E*

BOUSSOLE 168 **06/02/2016** **BOUS160206_02**

BOUS004



Date *06/02/2016* *Latitude* *43°22.170 N*

Heure déb *14h 42min [TU]* *Longitude* *07°53.965 E*