BOUSSOLE Monthly Cruise Report

Cruise 170
April 13-16, 2016

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Vessel: R/V Téthys II
(Captain: Joël Perrot)

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Recovery of the glider operated by the *Technical Division of the Institut National des Sciences de l'Univers - CNRS (DT-INSU)* between the Port of Nice and the BOUSSOLE site.

BOUSSOLE project

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

April 27, 2016

Foreword

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

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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 first day, the DACNet (Data Acquisition and Control Network) was removed from the buoy by the divers for its maintenance because the buoy was not working. The last day, the 3X1M-004 fluorimeter sensor installed on the buoy at 9 m in December 2015 cruise was recovered in order to download the data and to change the battery. The CTD at 3 m depth was replaced by another one that had been previously serviced and calibrated.

The last day, a sea glider operated by the Technical Division of the INSU (CNRS) on the transect between Nice and Calvi was recovered during the way back from the BOUSSOLE site.

Cruise Summary

The first day was used for the diving operations, a Secchi disk, optical profiles, CIMEL measurements and CTD casts with water sampling. The second day, bad weather prevented the departure from the Nice harbour. The last day was used for optical profiles, CTD casts with water sampling and a Secchi disk at the BOUSSOLE site. This day was also used for the recovery of the sea glider during the way back from the BOUSSOLE site.

Wednesday 13 April 2016

The sea state was slight with a gentle breeze. The sky was blue and the visibility was good. When arrived at the BOUSSOLE site, divers went at sea to remove the DACNet from the buoy for its repair and maintenance on board. Then, the 3X1M-004 fluorimeter at 9 m was recovered and reinstalled during a second dive the same day after changing the battery and downloading the data. They also replaced the CTD located at 3 m depth and cleaned the sensors. The DACNet could not be reinstalled during the second dive because the microdrive had to be changed. The microdrive that we had on board was not functioning. So, the DACNet will be reinstalled after changing the microdrive in the lab. Surface sensors and solar panels were cleaned on the top of the buoy. A broken solar panel was replaced by a new one.
1 Secchi disk, 3 C-OPS profiles and 2 CTD casts with water sampling were performed this day at the BOUSSOLE site. The first CTD cast was performed with a 0.2 µm filter on the a-Sphere absorption meter and a cap on the HS-6 backscattering meter for dark measurements.

Tuesday 14 April 2016

Bad weather prevented departure from the Nice harbour.

Friday 15 April 2016

The sea state was slight with a moderate breeze. The sky was blue in the morning and cloudy in the afternoon. Firstly, 3 C-OPS profiles were performed at the BOUSSOLE site. Then a CTD cast was attempted but cancelled because the O_2 sensor was not functioning. So, the CTD was taken on board. Different tests were performed after cleaning the connectors and the cable between the CTD and the sensor. Then it appeared that the cable was faulty. So it was changed, and then the O_2 sensor was tested again. The O_2 sensor worked correctly and the two CTD casts with water sampling were performed successively (the first one with the 0.2 µm filter on the a-Sphere absorption meter). Then a Secchi disk was performed at the BOUSSOLE site. The sea glider was recovered at 43°32.633'N 7°26.773'E during the way back from BOUSSOLE.

Saturday 16 April 2016

This day was programmed for MOOSE DYFAMED operations but it was also used to re-install the DACNet on the buoy after changing the microdrive in the lab. The DACNet was reinstalled during the morning before the DYFAMED operations. Then, the battery and the junction box of the buoy were switched on and the ARGOS connector at the top of the buoy was cleaned.

Pictures taken during this cruise can be found at:
https://picasaweb.google.com/114686870380724925974/2016_04_boussole170

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

Cruise Report

Wednesday 13 April 2016 (UTC)

People on board: Jean De Vaugelas, Emilie Diamond, Melek Golbol, David Luquet, Judicaël Rivier, Eduardo Soto Garcia and Vincenzo Vellucci.

0630 Departure from the Nice harbour.
0915 Arrival at the BOUSSOLE site.
0930 Diving operations: recovery of DACNet, fluorimeter and CTD, cleaning of sensors, taking pictures.
1000 Cleaning of surface sensors and replacement of the broken solar panel.
1200 Secchi 01, 13 m.
1235 C-OPS 01, 02, 03.
1245 CIMEL 01, 02, 03.
1320 Diving operations: installation of the CTD and fluorimeter, taking pictures.
1415 CTD 01, 400 m with water sampling at 10 and 5 m for TSM (with 0.2 µm filter on a-Sphere and cap on HS-6)
1450 CTD 02, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p and CDOM.
1230 Secchi 01, 14 m.
1540 Departure to the Nice harbour.
1900 Arrival at the Nice harbour.

Tuesday 14 April 2016

Bad weather prevented departure from the Nice harbour.

Friday 15 April 2016 (UTC)

People on board: Quentin D'Alexis, Emilie Diamond, Melek Golbol, Eduardo Soto Garcia and Phuong Tam Tran N'Guyen.

0610 Departure from the Nice harbour.
0920 Arrival at the BOUSSOLE site.
0935 C-OPS 04, 05, 06.
1025 Attempt of CTD cast: failed
1055 CTD 03, 400 m with water sampling at 10 and 5 m for TSM, TA/TC and O_2 (with 0.2 µm filter on a-Sphere).
1205 CTD 04, 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.
1245 Secchi 02, 12 m.
1250 Departure to the site of recovery of the sea glider.
1410 Recovery of the sea glider.
1420 Departure to the Nice harbour.
1700 Arrival at the Nice harbour.

Saturday 16 April 2016 (UTC)

People on board: Jean De Vaugelas, Emilie Diamond, Bastien Gaucher, David Luquet and Eduardo Soto Garcia.

0515 Departure from the Nice harbour.
0830 Arrival at the BOUSSOLE site.
0835 Diving operations: re-installation of the DACNet.
0900 Cleaning of the ARGOS connector.
0950 Departure to the DYFAMED site.
1045 Arrival at the DYFAMED site.
1100 DYFAMED operations.
1355 Departure to the Nice harbour.
1700 Arrival at the Nice harbour.

Problems identified during the cruise

- CTD 01 and CTD 02: Problems appeared on the O_2 data. It appeared that the cable was faulty. The problem was solved the next day by changing the cable between the O_2 sensor and the CTD.

- The DACNet was removed for maintenance because it was not functioning. The microdrive had to be changed. Unfortunately the microdrive that we had on board were not functioning. So, it was changed in the lab and the DACNet was re-installed three days later, during the MOOSE DYFAMED cruise.

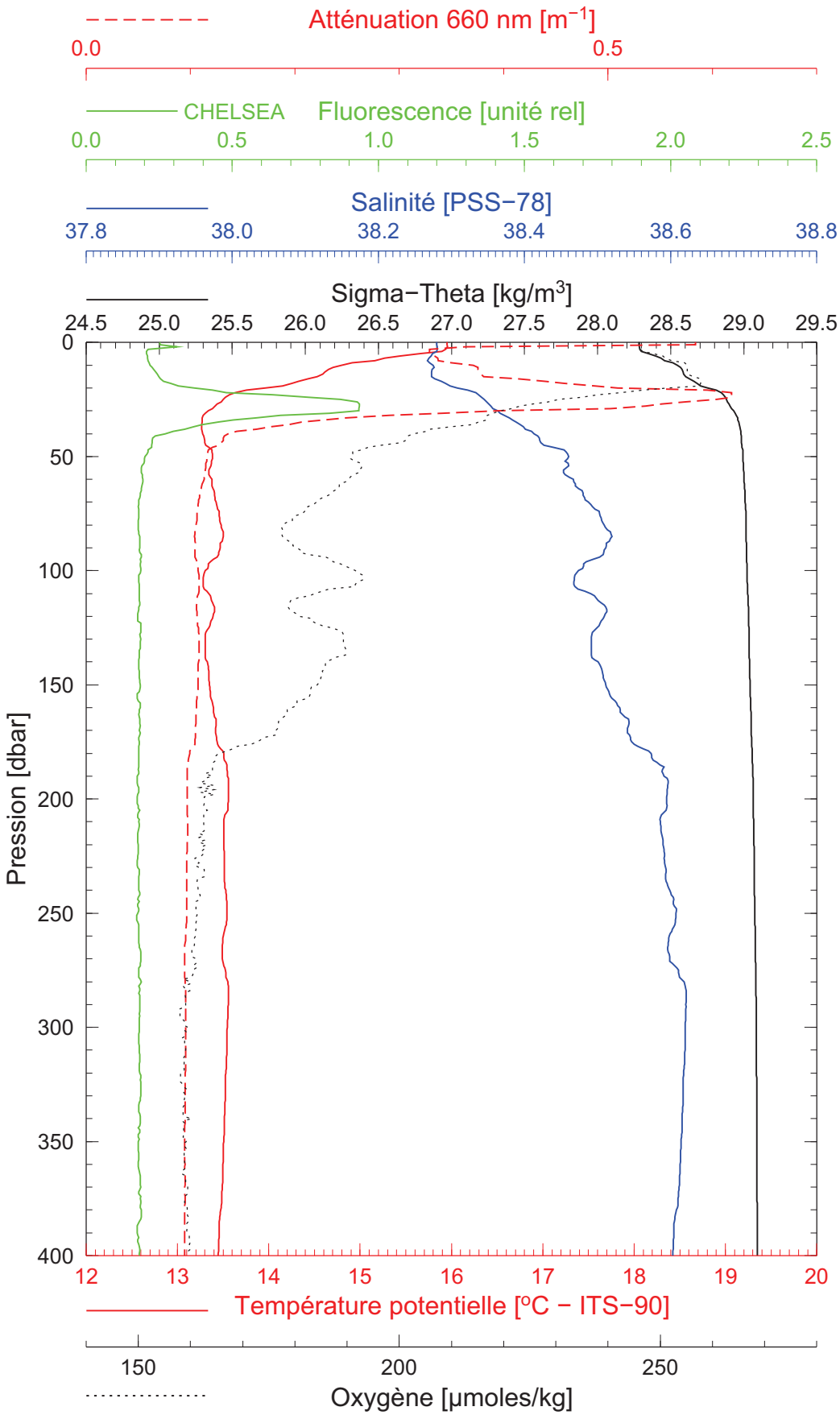
Appendices

Cruise Summary Table for Boussole 170

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
13/04/16				Secchi01	12:00	4:00	13	43	22.000	7	54.000	blue		3					good			calm			
		bou_c-ops_160413_11219_001_data.csv			12:34	3:48	97	43	22.134	7	54.104	blue	Cu	3	10	227	1010.8	82	good	15.7		calm	0.5		no
		bou_c-ops_160413_11219_002_data.csv			12:46	4:11	111	43	22.359	7	53.868	blue	Cu	3	10	227	1010.8	82	good	15.7		calm	0.5		no
		bou_c-ops_160413_11219_003_data.csv			12:57	4:22	118	43	22.503	7	53.637	blue	Cu	3	10	227	1010.8	82	good	15.7		calm	0.5		no
				CIMEL01	12:49	7:00		43	22.000	7	54.000	blue		1			1010.6								
				CIMEL02	13:03	7:00		43	22.000	7	54.000	blue		1			1010.5								
				CIMEL03	13:25	7:00		43	22.000	7	54.000	blue		0			1010.3								
			CTDBOUS001	TSM	14:11	29:00	400	43	22.189	7	54.240	blue		1	12	113	1009.6	83		15.7	15.93	calm			
			CTDBOUS002	HPLC, Ap & CDOM	14:58	32:00	400	43	22.228	7	54.272	blue		1	20	114	1009.1	84		15.8	15.87	calm			
14/04/16	Bad weather																								
15/04/16		bou_c-ops_160415_0925_001_data.csv			09:34	4:17	114	43	22.209	7	53.903	blue	None	0	14	190	1015.2	91	good	15.3		calm	0.9		yes
		bou_c-ops_160415_0925_002_data.csv			09:45	4:08	112	43	22.257	7	53.624	blue	None	0	14	190	1015.2	91	good	15.3		calm	0.9		yes
		bou_c-ops_160415_0925_003_data.csv			09:55	4:20	119	43	22.309	7	53.392	blue	None	0	14	190	1015.2	91	good	15.3		calm	0.9		yes
			CTDBOUS003	O2 & TA/TC & TSM	10:54	32:00	400	43	22.380	7	54.090	cloudy		4	15	208	1014.9	90		15.3	15.31	calm			
			CTDBOUS004	HPLC & Ap	12:05	36:00	400	43	22.282	7	54.215	cloudy		4	17	117	1014.5	87		15.7	15.4	calm			
				Secchi02	12:45	4:00	12	43	22	7	54	cloudy		4					good			calm			

BOUSSOLE 170 **13/04/2016** **BOUS160413_01**

BOUS001

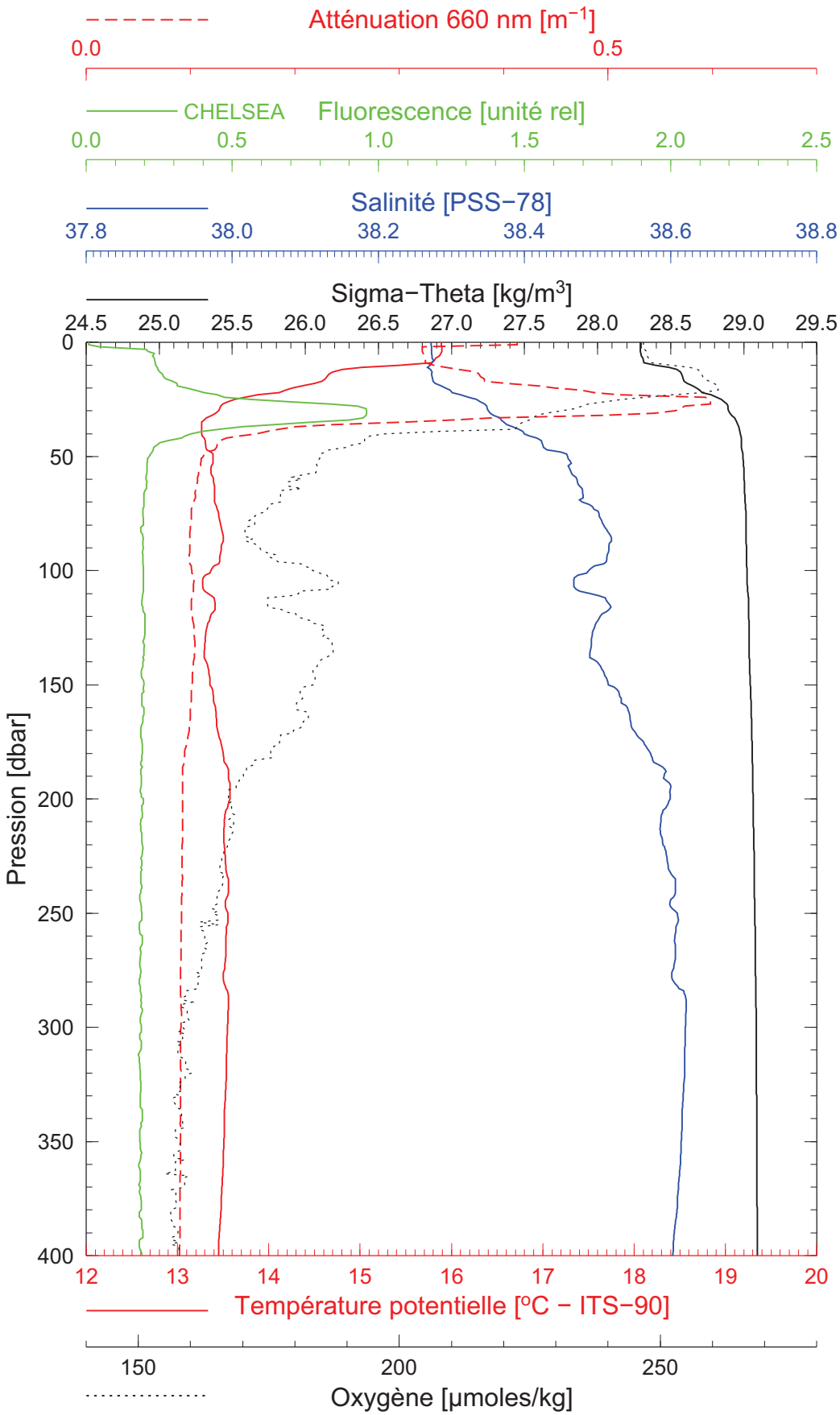


Date *13/04/2016* *Latitude* *43°22.189 N*

Heure déb *14h 11min [TU]* *Longitude* *07°54.240 E*

BOUSSOLE 170 **13/04/2016** **BOUS160413_02**

BOUS002

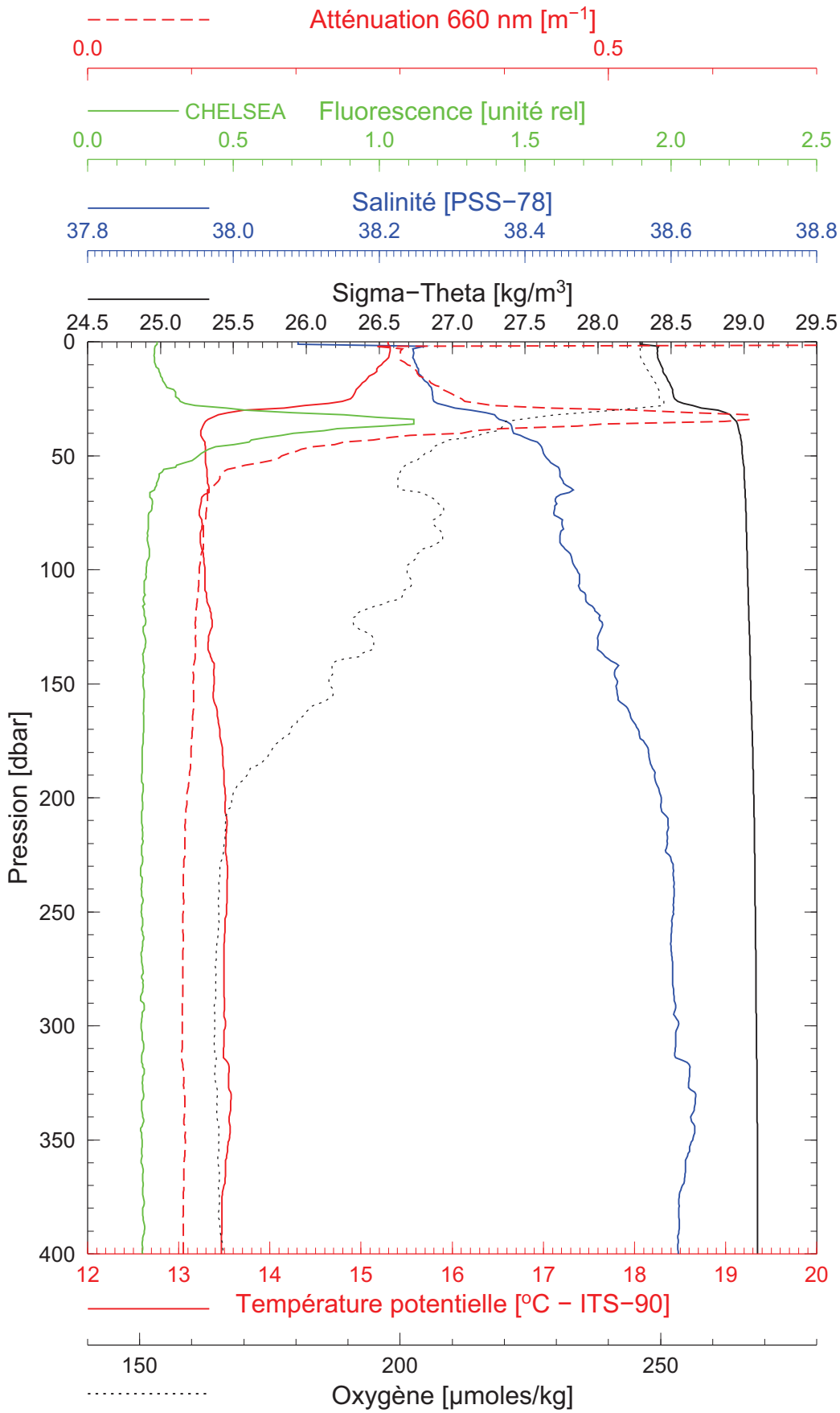


Date *13/04/2016* *Latitude* *43°22.228 N*

Heure déb *14h 58min [TU]* *Longitude* *07°54.272 E*

BOUSSOLE 170 **15/04/2016** **BOUS160415_01**

BOUS003

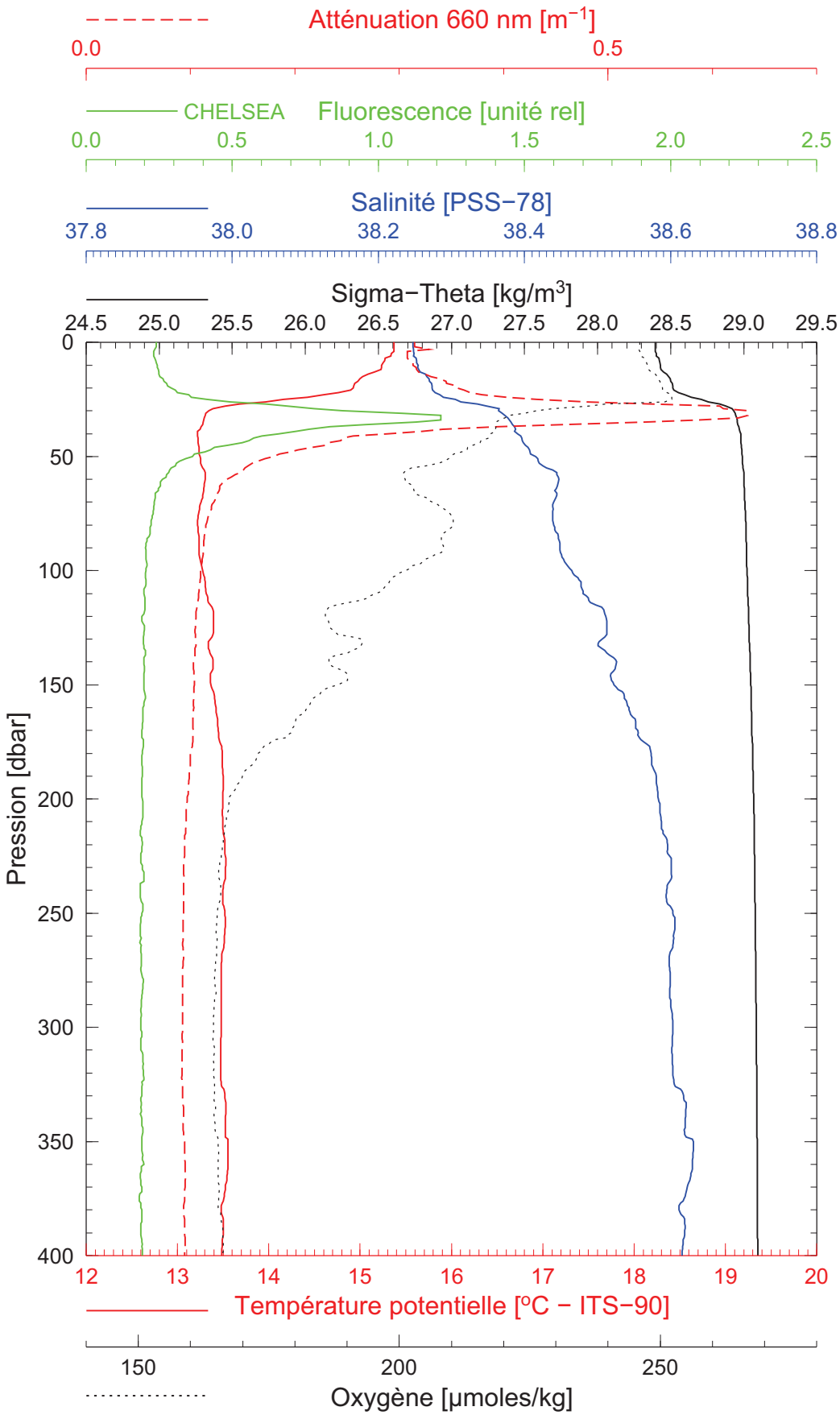


Date *15/04/2016* *Latitude* *43°22.380 N*

Heure déb *10h 54min [TU]* *Longitude* *07°54.090 E*

BOUSSOLE 170 **15/04/2016** **BOUS160415_02**

BOUS004



Date *15/04/2016* *Latitude* *43°22.282 N*

Heure déb *12h 05min [TU]* *Longitude* *07°54.215 E*