BOUSSOLE Monthly Cruise Report

Cruise 153
November 12– 15, 2014

Duty Chief: Melek Golbol (golbol@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captain: Dany Deneuve)

Science Personnel: Laurent Coppola, Guillaume De Liège, Maia Durozier, Melek Golbol, David Luquet, Didier Robin and Vincent Taillandier.

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A diver is cleaning the hyperspectral sensors (measuring *Ed* and *Lu*) on the BOUSSOLE buoy.

BOUSSOLE project

ESA/ESRIN contract N° 13226/10/I-NB

December 19, 2014

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

Université Pierre & Marie Curie, 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). 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.

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 (see map in appendix). 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, 2 water samples were also collected for dissolved oxygen (DO) analysis by Winkler Method in order to calibrate the optode's measurement at 3m and 9m. This operation is part of the BIOCAREX ANR project, in collaboration with the LOCEAN in Paris (J. Boutin and collaborators).
During the diving day, 2 anodes were installed on the buoy.

Cruise Summary

The first day was used to perform two CTD casts with water sampling, optical profiles, a Secchi disk at the BOUSSOLE site and the CTD transect. The second day, we started lately because the weather forecast was bad in the morning and better in the afternoon. This day was used for a CTD cast with water sampling, optical profiles and a Secchi disk at the BOUSSOLE site. The third day was used for the diving operations and a CTD cast with water sampling at the BOUSSOLE site. This day was also used to perform a deep CTD cast and plankton nets at

DYFAMED site because the weather forecast was bad for the day of the DYFAMED cruise. The last day, bad weather prevented departure from the Nice harbour.

Wednesday 12 November 2014

The sea state was slight with a gentle breeze. The sky was overcast and rainy with a medium visibility. When arriving at the BOUSSOLE site, the buoy was not visible and was completely underwater because of strong currents.
2 CTD casts with water sampling, a Secchi disk and 2 C-OPS profiles were performed at the BOUSSOLE site. Optical profiles were not optimal because of the sky conditions (clouds). The buoy eventually reappeared at the surface. Finally, the CTD transect was totally completed.

Thursday 13 November 2014

The sea state was slight with a gentle breeze. The sky was blue with an excellent visibility. Only the afternoon was used to work at the BOUSSOLE site because there was bad weather during the morning and the weather became better on the afternoon. So we used this day to perform 3 C-OPS profiles and 1 CTD cast with water sampling on the afternoon.

Friday 14 November 2014

The sea was slight with a gentle breeze. The sky was overcast and rainy. When arriving at the BOUSSOLE site, divers went at sea to clean the buoy sensors, to take pictures and to perform dark measurements of the backscattering meter and transmissometers. They also affixed 2 anodes on the buoy structure. Then, 1 CTD cast with water sampling and plankton nets for the DYFAMED program were performed at the BOUSSOLE site. After finishing the work at BOUSSOLE, a CTD cast was performed at the DYFAMED site for the DYFAMED program.

Saturday 15 November 2014

Bad weather prevented departure from the Nice harbour.

Pictures taken during this cruise can be found at:
https://plus.google.com/photos/114686870380724925974/albums/6088622075118170049?banner=pwa

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 12 November 2014 (UTC)

People on board: Melek Golbol and Vincent Taillandier.

0715 Departure from the Nice harbour.
1030 Arrival at the BOUSSOLE site: buoy completely underwater
1045 CTD 01, 400m with water sampling at 200, 150, 80, 70, 50, 40, 30, 20, 10 and 5 m for HPLC, $a_{p,}$ and TSM.
1115 Lunch.
1200 Buoy visible at surface.
1215 Finishing installing the C-OPS system.
1250 C-OPS 01, 02.
1330 CTD 02, 400m with water sampling at 400, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, $a_{p,}$ and CDOM.
1405 Secchi 01, 19m.
1410 Departure to the first transect station.

1445 CTD 03, 400m, station 01 (43°25'N 07°48'E).
1545 CTD 04, 400m, station 02 (43°28'N 07°42'E).
1645 CTD 05, 400m, station 03 (43°31'N 07°37'E).
1745 CTD 06, 400m, station 04 (43°34'N 07°31'E).
1840 CTD 07, 400 m, station 05 (43°37'N 07°25'E).
1930 CTD 08, 400 m, station 06 (43°39'N 07°21'E).
1955 Departure to the Nice harbour.
2035 Arrival at the Nice harbour.

Thurday 13 November 2014 (UTC)

People on board: Melek Golbol and Vincent Taillandier.

0830 Departure from the Nice harbour.
1200 Arrival at the BOUSSOLE site.
1205 C-OPS 03, 04, 05.
1315 CTD 09, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, TSM, DO and TA/TC.
1400 Attempts of CISCO connection with the buoy: failed.
1410 Secchi 02, 21m.
1415 Departure to the Nice harbour.
1840 Arrival at the Nice harbour.

Friday 14 November 2014 (UTC)

People on board: Laurent Coppola, Guillaume De Liège, Maia Durozier, Melek Golbol, David Luquet, Didier Robin and Vincent Taillandier.

0610 Departure from the Nice harbour.
0930 Arrival at the BOUSSOLE site.
0945 Diving on the BOUSSOLE buoy for cleaning sensors, performing dark measurements, taking pictures, installing anodes.
0945 Plankton nets for the DYFAMED program.
1105 CTD 10, 400m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, and TSM.
1115 Secchi 03, 20m.
1145 Departure to the DYFAMED site.
1225 CTD MOOSE 80, 2350m (DYFAMED program).
1500 Departure to the Nice harbour.
1730 Arrival at the Nice harbour.

Saturday 15 November 2014

Bad weather prevented departure from the Nice harbour.

Problems identified during the cruise

- CTD 01: Niskin bottle #5 did not close, so there was no sampling at 60m. CTD #02: There was no sampling at 200m because the bottle #5 is lacking. The clamp that permits the close of the bottle was broken. This clamp was changed with another one the second day.

- CTD 08: Problems appeared during the descent of the CTD at station 06 of the transect. The cast visualization on *SeaSave* software stopped but data acquisition continued. During the ascent, there was no problems, the profile was visualized on *SeaSave* software. But the data were checked after the cast: there was problems with the data during the descent but not during the ascent. The ascent profile (*soub008*) would be used for data exploitation instead of the descent profile (*bous008*).

- The water pump was damaged: during the HPLC filtrations, the pump became noisy, there was too much pressure and some of the filters were torn. The sampling for these filters (70m, 10m and 5m) were performed

another time but later than the other depths. For the last day, another water pump was used and there was no problem with the filtrations.

- An incorrect date was recorded on the HydroDAS (data logger of the IOP package). Therefore, the dates on the IOP data files had to be corrected after the data processing.

- The « Daufin » system managing the acquisition, storage and provision of navigation, meteorological, thermosalinometer and fluorimeter data from the sensors installed on the *Tethys II* was unavailable during this cruise. It will be replaced in February 2015 by a new system. Therefore the corresponding data are not available for this cruise.

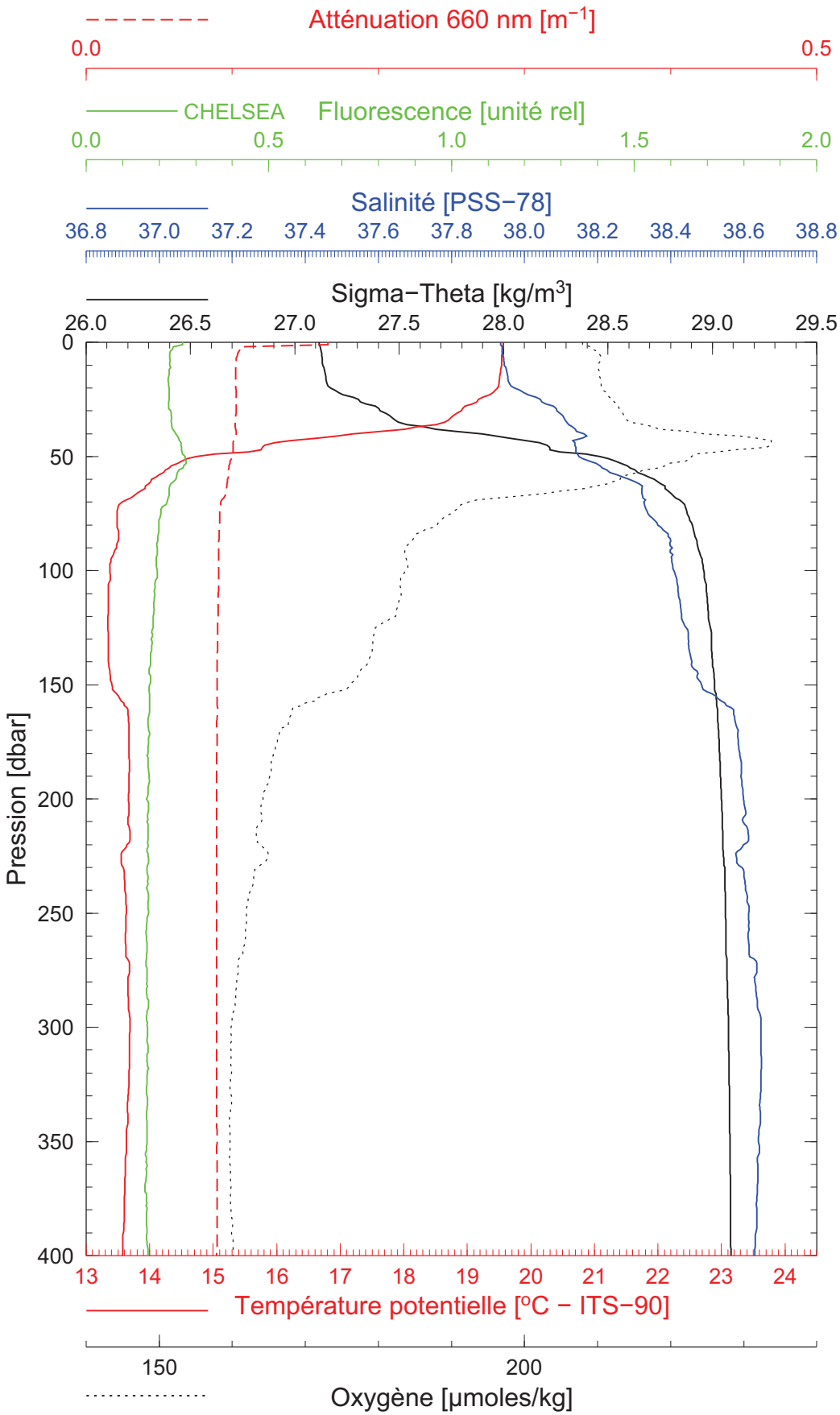
Appendices

Cruise Summary Table for Boussole 153

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
12/11/14			CTDBOUS001	HPLC, Ap & TSM	10:45	35:00	400	43	22.915	7	52.725	overcast		8	9	95	1003.0	78		17.1	19.56	calm			
	bou_c-ops_141112_1236_001_data.csv				12:38	1:22																		
		bou_c-ops_141112_1236_002_data.csv			12:51	3:21	87.2	43	22.107	7	53.639	overcast&rainy	Sc	7	7	38	1002.5	83	medium	16.3		calm	0.9		no
		bou_c-ops_141112_1236_003_data.csv			13:04	3:12	80.6	43	22.227	7	53.040	overcast&rainy	Sc	7	7	38	1002.5	83	medium	16.3		calm	0.9		no
	bou_c-ops_141112_1236_004_data.csv				13:23	1:22																		
			CTDBOUS002	HPLC, Ap & CDOM	13:31	31:00	400	43	22.044	7	53.847	overcast&rainy		8	9	20	1002.2	82		16.4	19.74	moved			
				Secchi01	14:05	4:00	19	43	22	7	54	overcast&rainy		8					medium			moved			
			CTDBOUS003		14:44	26:00	400	43	25.047	7	47.982	overcast&rainy		8	10	41	1002.4	78		16.3	19.60	moved			
			CTDBOUS004		15:49	23:00	400	43	28.002	7	41.854	overcast&rainy		8	8	23	1002.8	82		15.6	19.03	calm			
			CTDBOUS005		16:43	25:00	400	43	30.992	7	36.919	night		8	9	341	1003.0	78		15.7	19.38	calm			
			CTDBOUS006		17:45	22:00	400	43	34.083	7	31.046	night		8	10	315	1003.4	80		14.8	19.69	calm			
			CTDBOUS007		18:42	24:00	400	43	37.070	7	24.948	night		8	7	285	1003.5	73		15.6	19.65	calm			
			CTDBOUS008		19:29	27:00	400	43	38.882	7	20.803	night		8	9	275	1003.5	75		15.6	19.93	calm			
13/11/14	bou_c-ops_141113_1155_001_data.csv				11:57	1:27																		
		bou_c-ops_141113_1155_002_data.csv			12:09	2:25	60	43	22.067	7	54.295	blue		0	6	244	1009.1	66	excellent	18.8		moved	1.2		no
		bou_c-ops_141113_1155_003_data.csv			12:21	3:14	85.4	43	22.172	7	54.531	blue		0	6	244	1009.1	66	excellent	18.8		moved	1.2		no
		bou_c-ops_141113_1155_005_data.csv			12:41	3:00	78.8	43	22.289	7	55.010	blue		0	6	244	1009.1	66	excellent	18.8		moved	1.2		no
	bou_c-ops_141113_1155_006_data.csv				12:57	1:29																		
			CTDBOUS009	HPLC, Ap, TA/TC, O_2 & TSM	13:16	28:00	400	43	21.967	7	54.253	blue		0	7	216	1009.1	67		17.9	19.64	moved			
				Secchi02	14:10	4:00	21	43	22	7	54	blue		0					excellent			moved			
14/11/14			CTDBOUS010	HPLC, Ap & TSM	11:07	35:00	400	43	22.191	7	53.408	overcast		8	8	79	1012.4	72		17.8	18.90	calm			
				Secchi03	11:15	4:00	20	43	22	7	54	overcast		8					medium			calm			
15/11/14	Bad weather																							

BOUSSOLE 153 **12/11/2014** **BOUS141112_01**

BOUS001

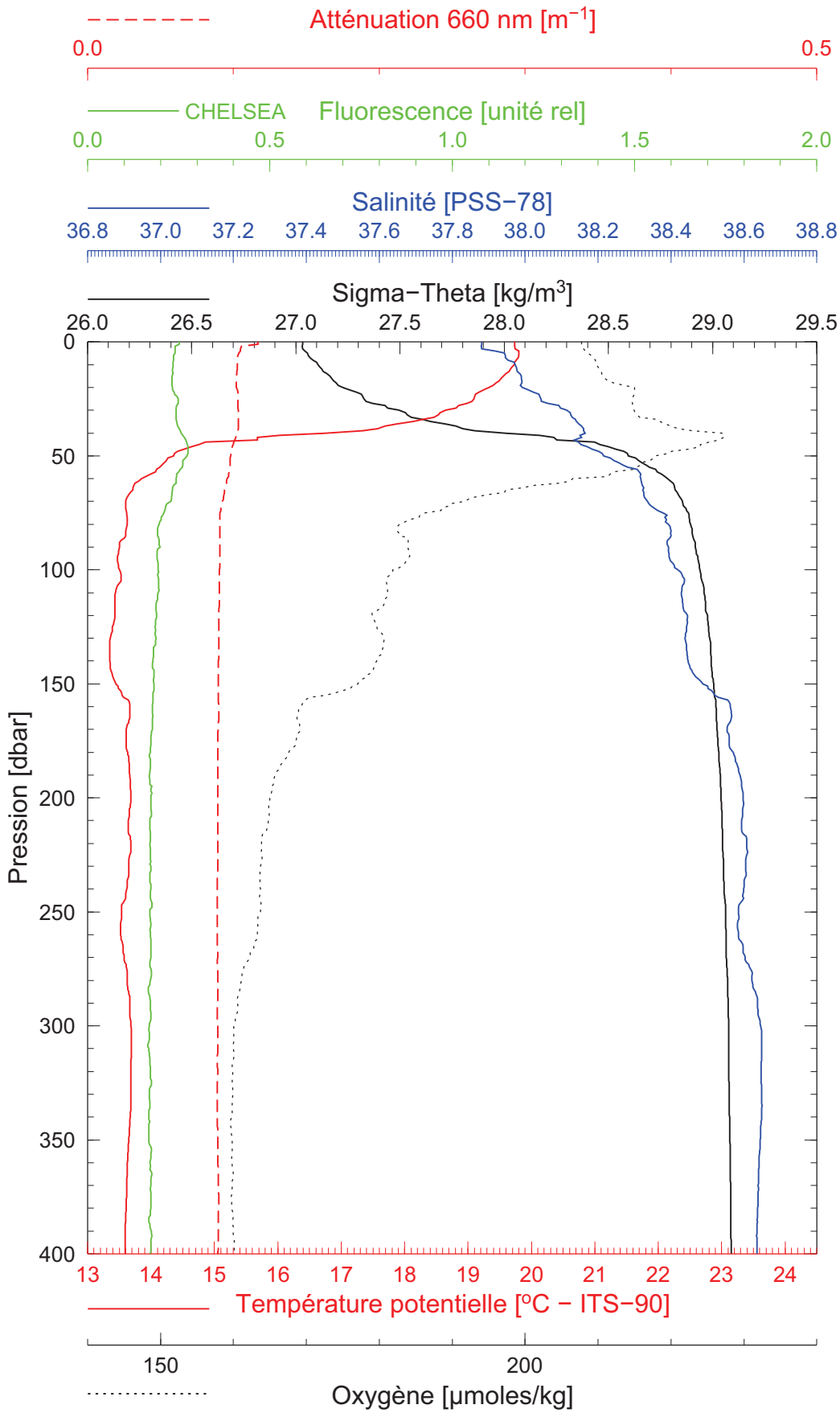


Date *12/11/2014* *Latitude* *43°22.915 N*

Heure déb *10h 45min [TU]* *Longitude* *07°52.725 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_02**

BOUS002

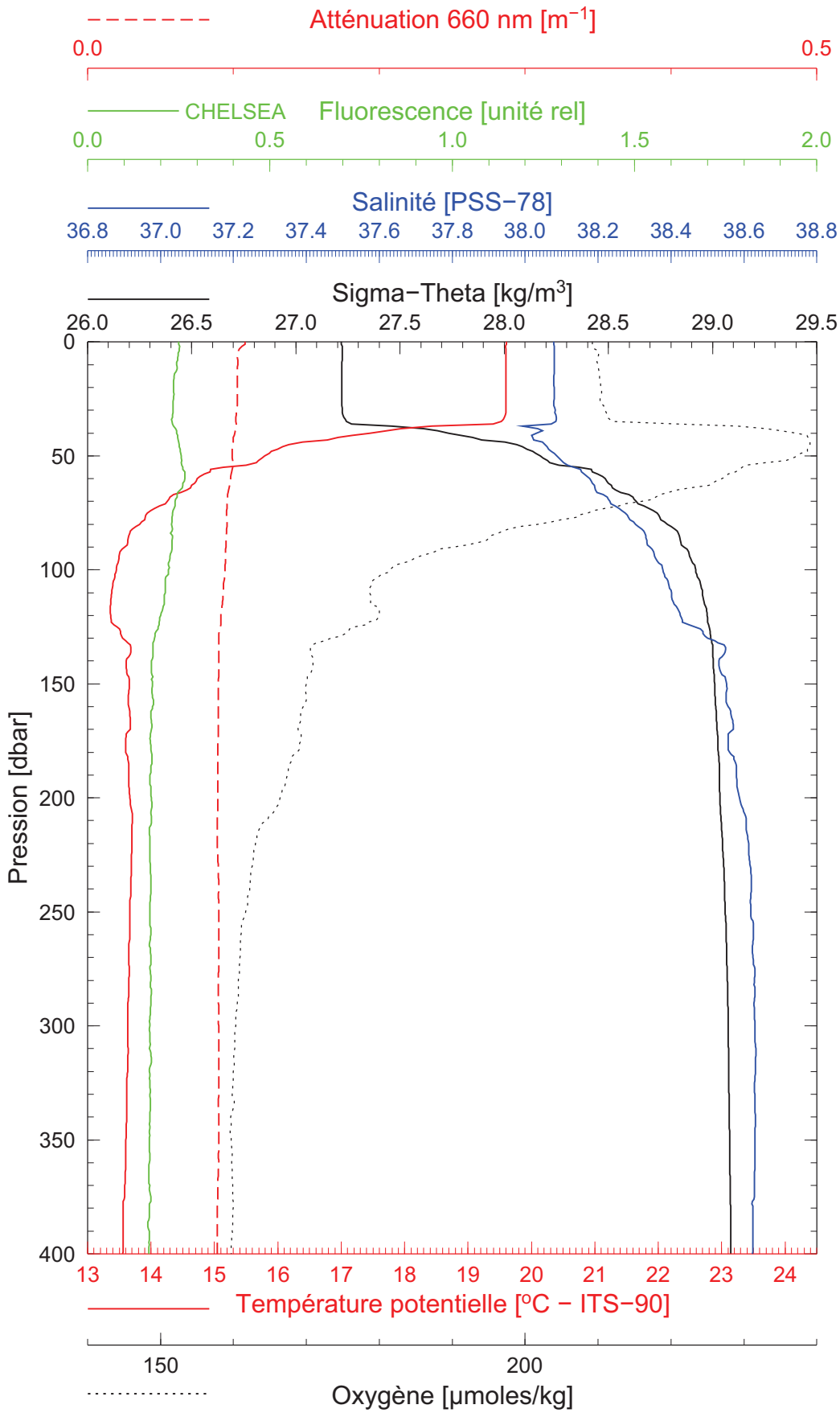


Date *12/11/2014* *Latitude* *43°22.044 N*

Heure déb *13h 31min [TU]* *Longitude* *07°53.847 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_03**

BOUS003

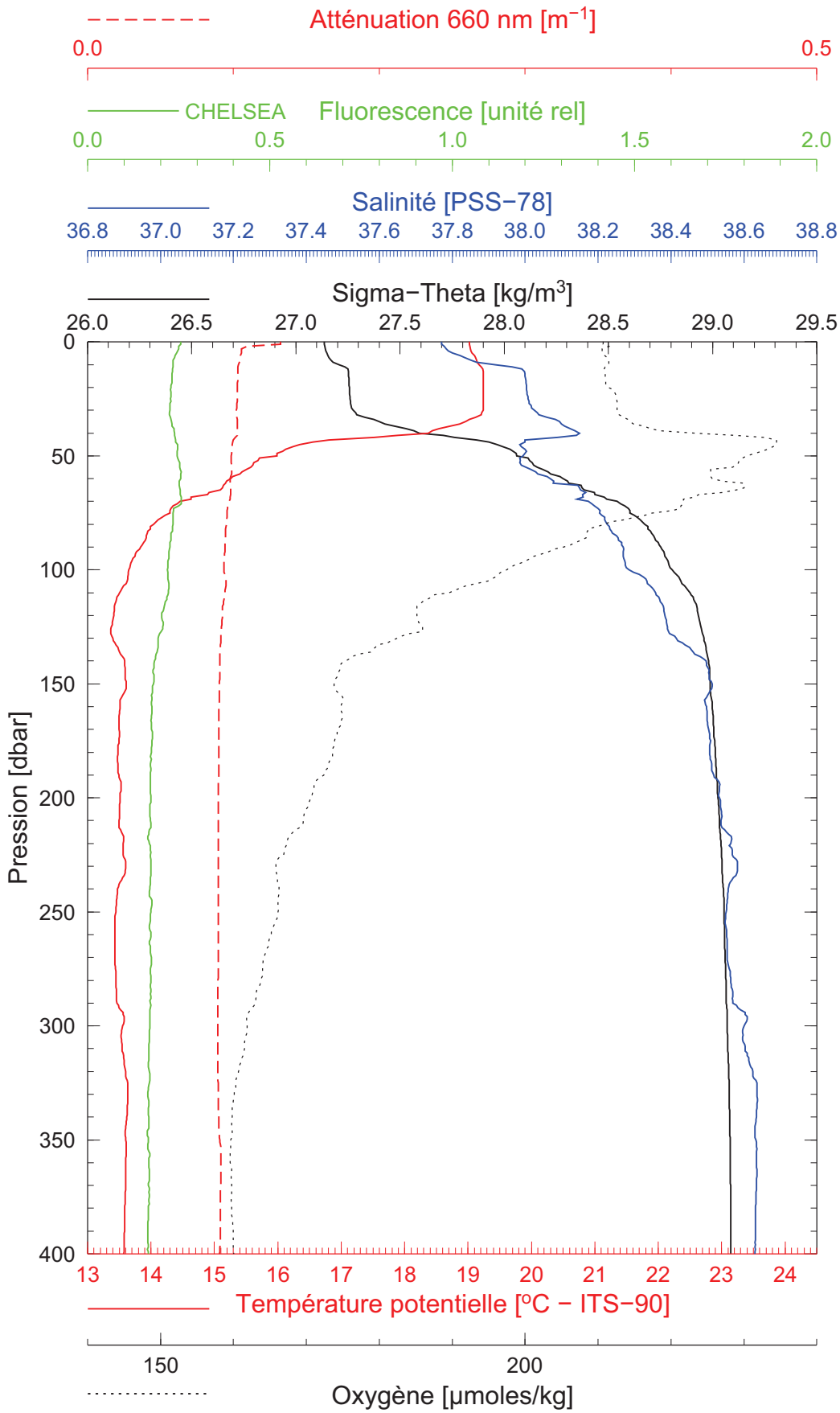


Date *12/11/2014* *Latitude* *43°25.047 N*

Heure déb *14h 44min [TU]* *Longitude* *07°47.982 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_04**

BOUS004

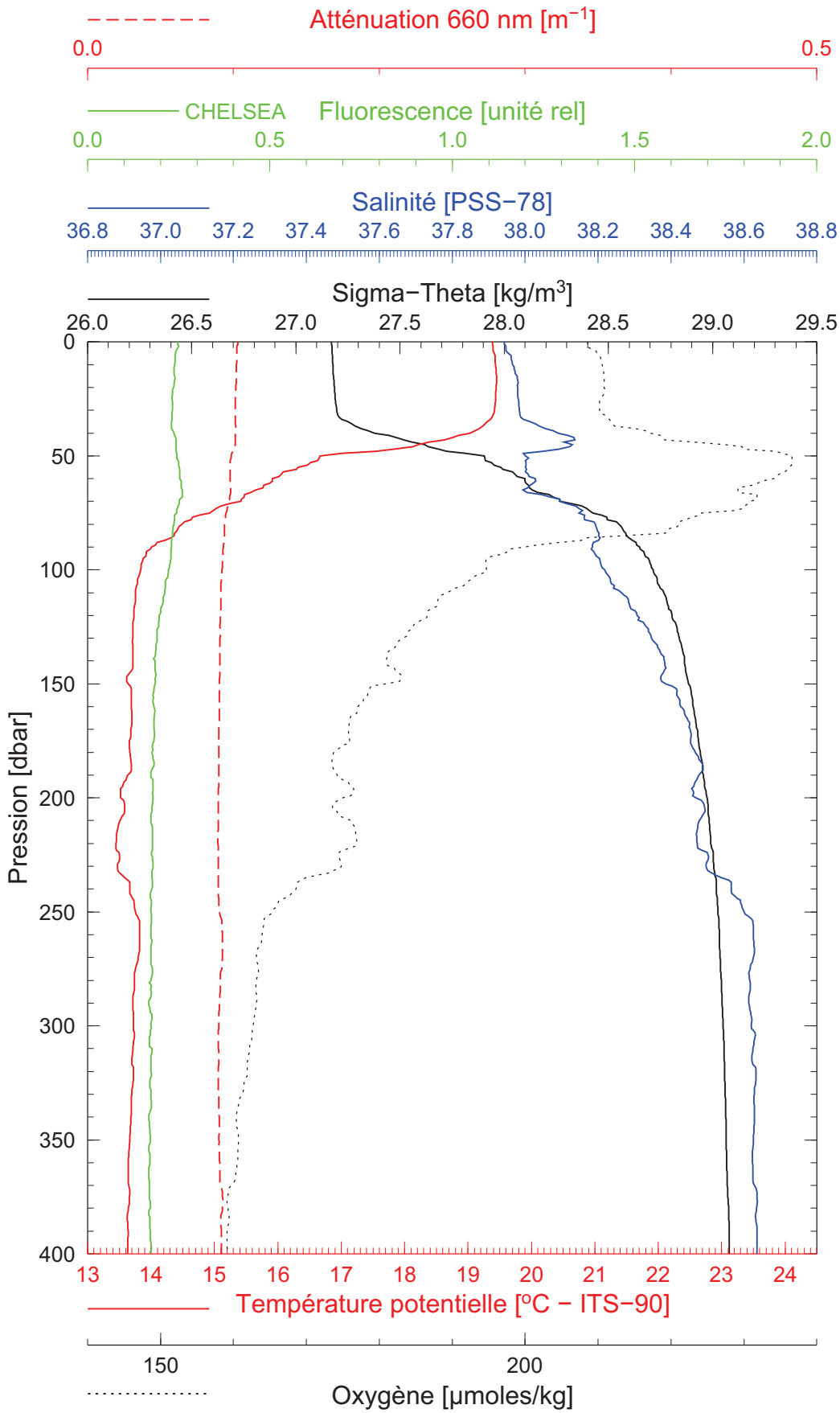


Date *12/11/2014* *Latitude* *43°28.002 N*

Heure déb *15h 49min [TU]* *Longitude* *07°41.854 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_05**

BOUS005

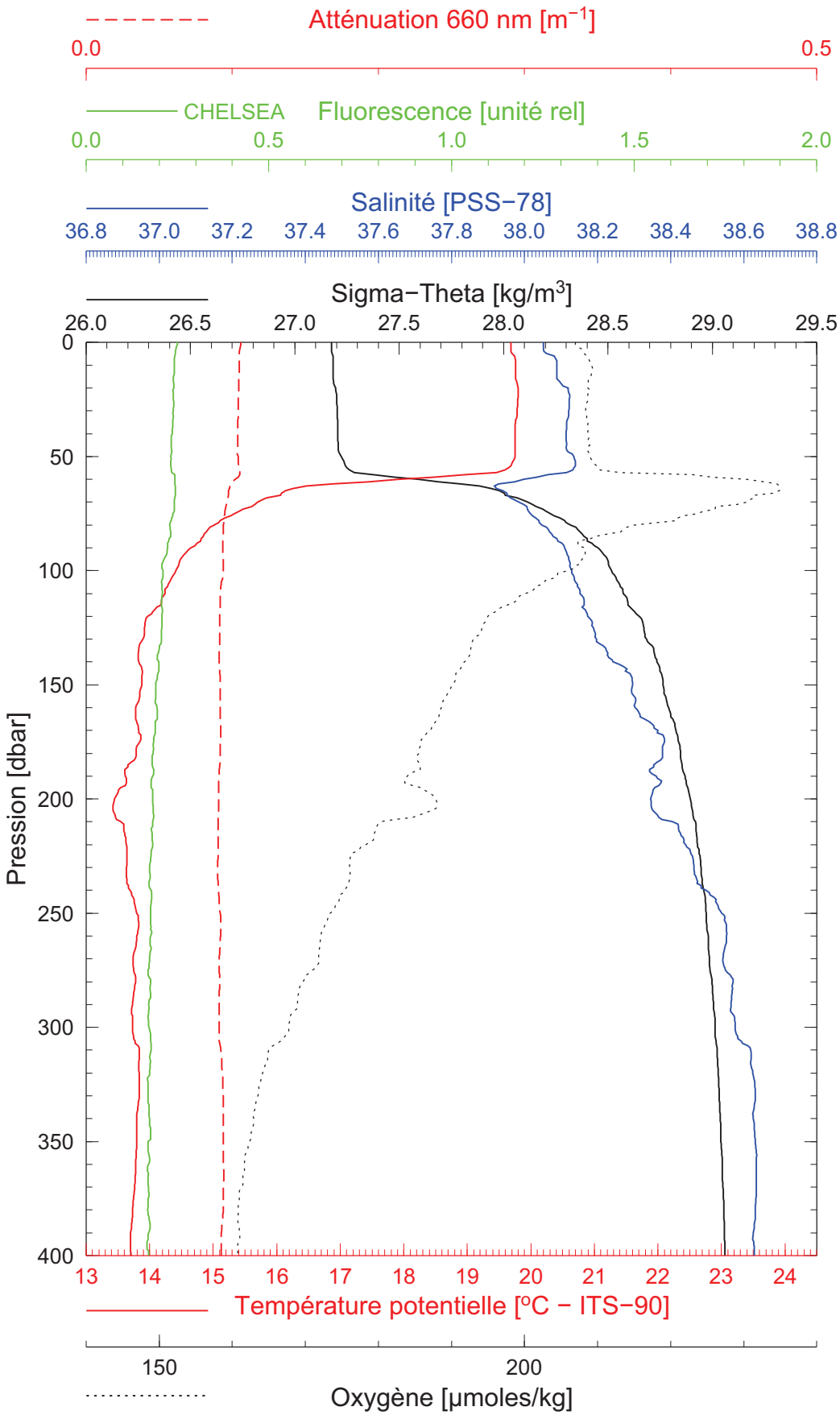


Date *12/11/2014* *Latitude* *43°30.992 N*

Heure déb *16h 43min [TU]* *Longitude* *07°36.919 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_06**

BOUS006

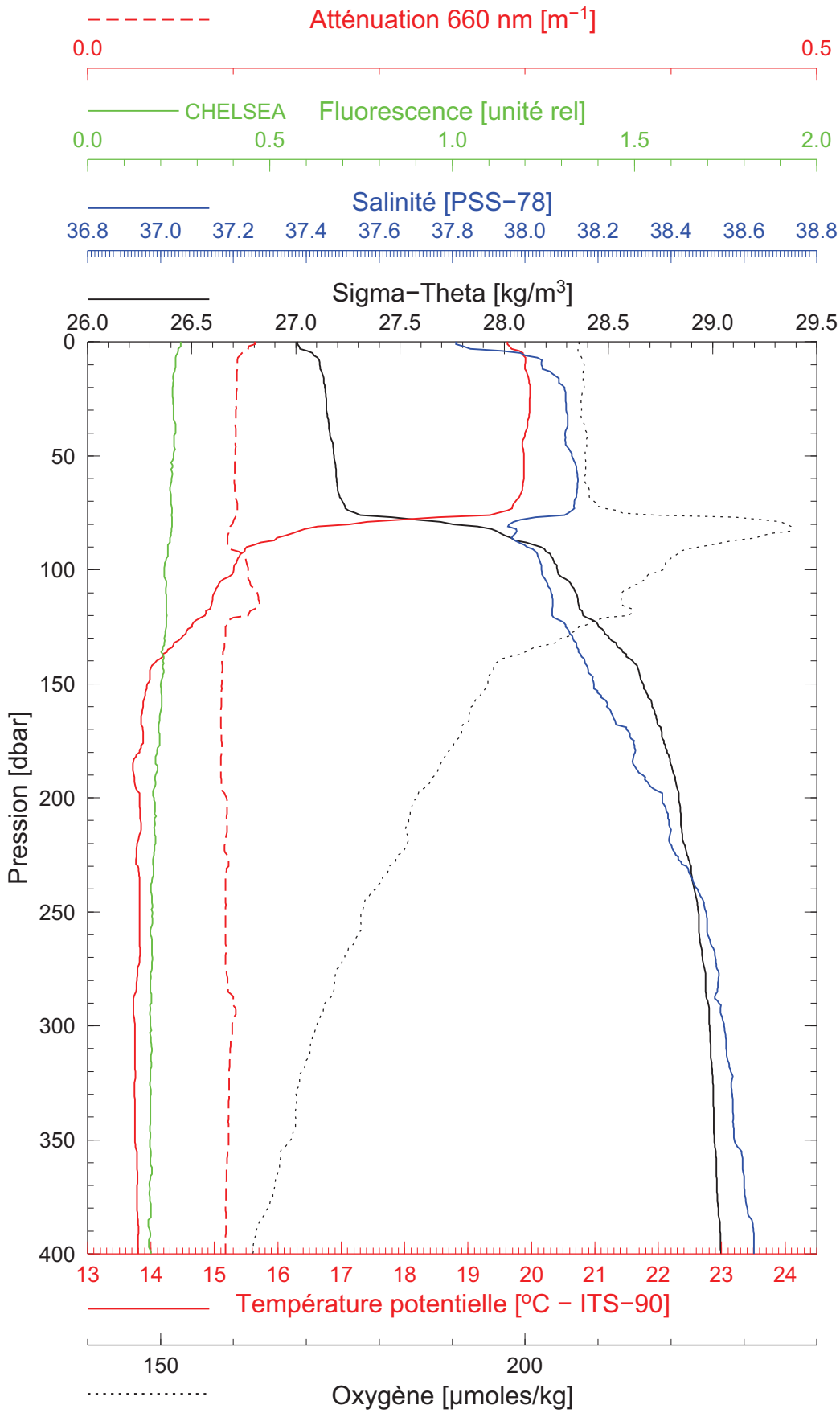


Date *12/11/2014* *Latitude* *43°34.083 N*

Heure déb *17h 45min [TU]* *Longitude* *07°31.046 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_07**

BOUS007

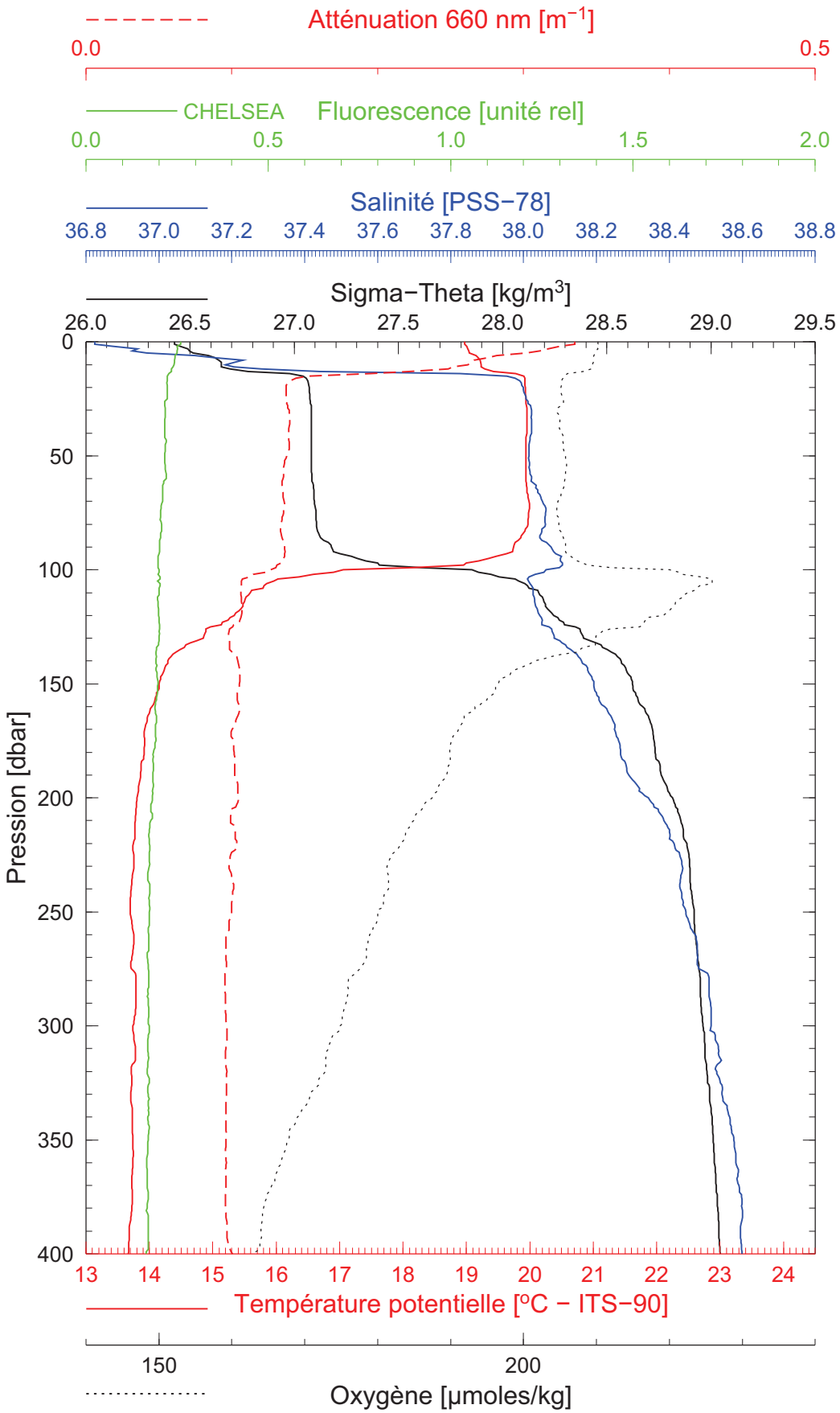


Date *12/11/2014* *Latitude* *43°37.070 N*

Heure déb *18h 42min [TU]* *Longitude* *07°24.948 E*

BOUSSOLE 153 **12/11/2014** **BOUS141112_08**

SOUB008

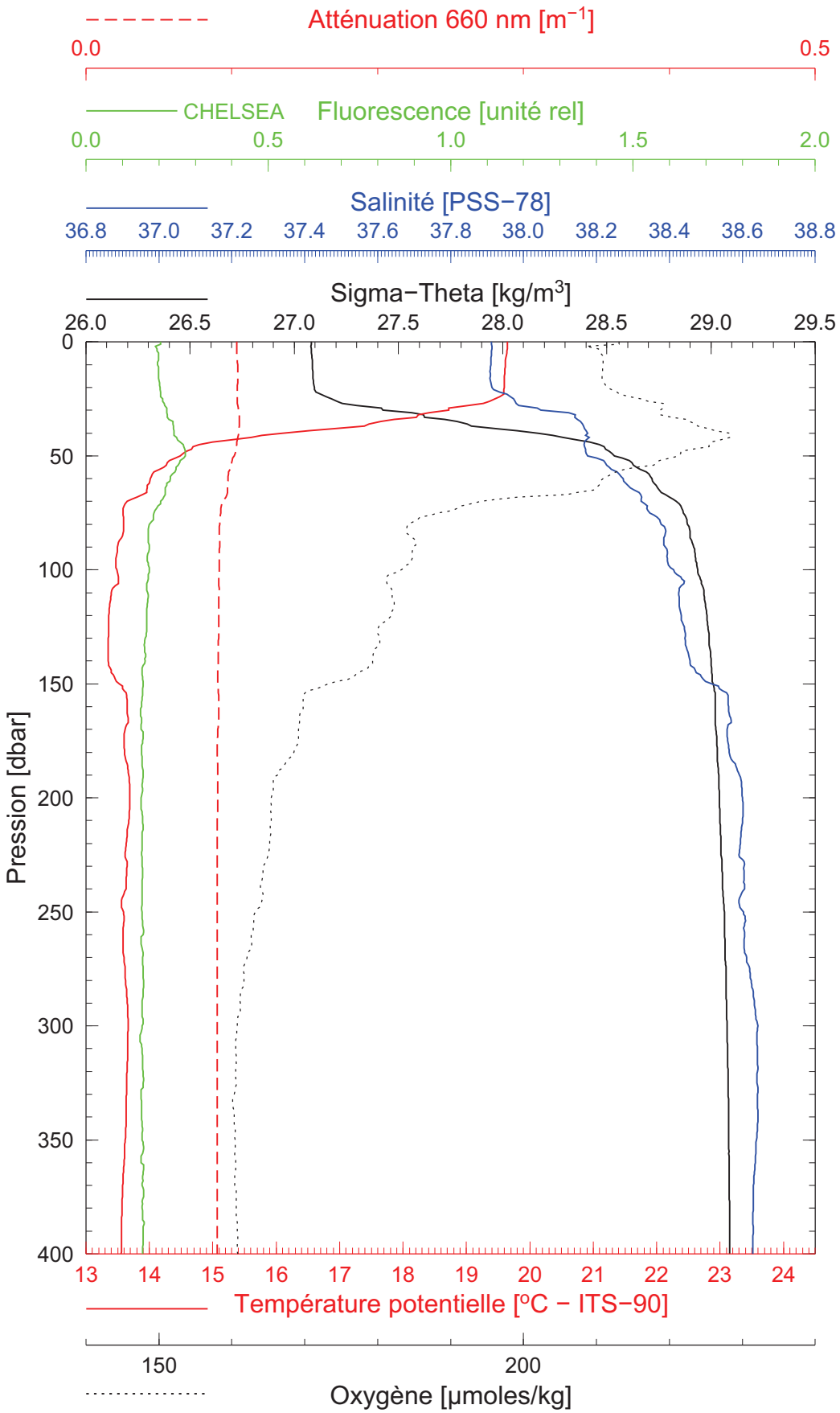


Date *12/11/2014* *Latitude* *43°38.882 N*

Heure déb *19h 42min [TU]* *Longitude* *07°20.803 E*

BOUSSOLE 153 **13/11/2014** **BOUS141113_01**

BOUS009

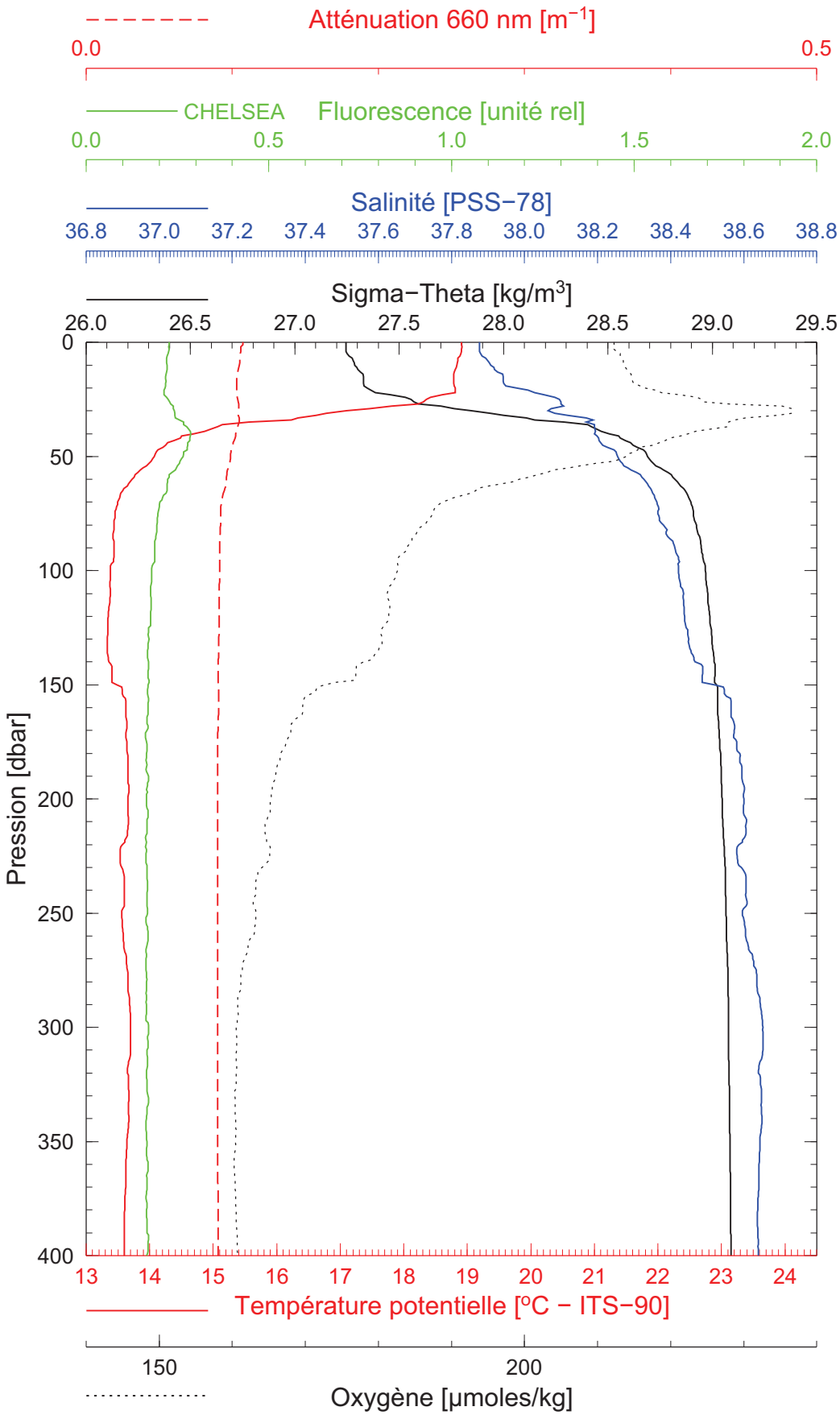


Date *13/11/2014* *Latitude* *43°21.967 N*

Heure déb *13h 16min [TU]* *Longitude* *07°54.253 E*

BOUSSOLE 153 **14/11/2014** **BOUS141114_01**

BOUS010



Date *14/11/2014* *Latitude* *43°22.191 N*

Heure déb *11h 07min [TU]* *Longitude* *07°53.408 E*