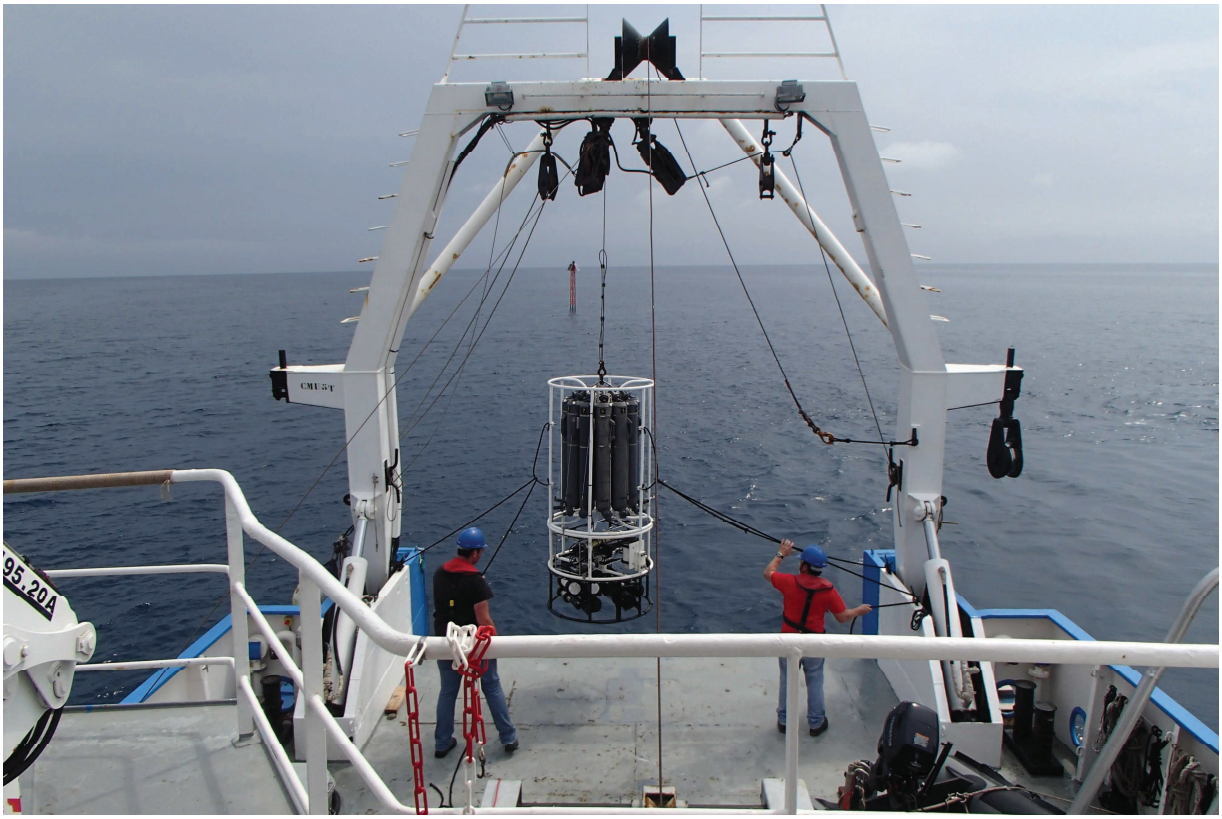
BOUSSOLE Monthly Cruise Report

Cruise 146
April 11 – 14, 2014

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

Science Personnel: Marie Barbieux, Melek Golbol, Roger Jullien, Yves Lamblard, David Luquet, Didier Robin, Vincent Taillandier and Vincenzo Vellucci.

Laboratoire d'Océanographique de Villefranche (LOV), 06238 Villefranche sur mer cedex, France



Deployment of the CTD Rosette at the BOUSSOLE site from the deck of the R/V *Téthys II* and the BOUSSOLE buoy on the background.

BOUSSOLE project

ESA/ESRIN contract N° 13226/10/I-NB

May 19, 2014

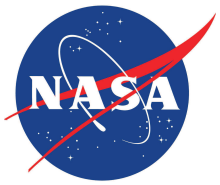
Foreword

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



National Aeronautics and Space Administration, USA

Centre National de la Recherche Scientifique, France

Université Pierre & Marie Curie, France

Observatoire Océanologique de Villefranche/mer, France

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 depth (5m and 10m) for total alkalinity (AT) and total inorganic carbon (CT) 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 samples will 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

Divers recovered the two CTD plus optode located at 3m and 10m and the pCO_2 CARIOCA sensor at 10 m. Data of the two CTD were downloaded on board and the two optodes were replaced. During a second dive, these two CTD were reinstalled with their new optode at 3m and 10m. The pCO_2 sensor was replaced by a new one, which was installed at the same location. The telemetry cable of the pCO_2 sensor at 10m was brought to the surface and attached to the top of the buoy.

An emergency operation was performed the second day, on the way back from the BOUSSOLE site to the Nice harbour. Yann Hello from the "Geoazur" lab contacted us: he wanted to use the winch of the Téthys in order to recover urgently a mooring installed in the bay of Villefranche-sur-mer. The Lagrangian profiling float installed on this mooring for testing was faulty and at risk.

The last day a deep CTD cast was performed for the MOOSE DYFAMED program, which had to cancel its operations the next day because of bad meteorological forecasts. This cast was performed at the BOUSSOLE site with water sampling so that it can be used by the BOUSSOLE program.

Cruise Summary

The first day was used for CTD casts at the BOUSSOLE site and for the CTD transect. The second day was used for diving operations and maintenance of the buoy, a Secchi disk and a CTD cast with water sampling. Buoy data were retrieved using the wireless radio connection. C-OPS balance tests were performed in order to check and adjust it during the descent phase of the profiles. On the way back to the Nice harbor, a mooring with a profiling float was recovered in the bay of Villefranche-sur-mer. The third day was used for maintenance on the head of the buoy with data retrieval from the pCO2 sensors, C-OPS balance tests, optical profiles, CTD casts with water sampling and a Secchi disk. The last day was used for optical profiles, a Secchi disk and CTD casts with water sampling at the BOUSSOLE site.

Friday 11 April 2014

The first day, the sea state was smooth with a light air. The sky was overcast. Before arriving at the BOUSSOLE site, the batteries of the IOP package were plugged to the HydroDAS (Data and Handling System Controller of the IOP package). The HydroDAS was switched on in order to warm up the instruments. But the IOP package did not work. So, when arrived at BOUSSOLE, 1 CTD cast with water sampling was performed without IOP profiles. After solving the problem of the HydroDAS, another CTD cast could be performed with the IOP profiles. Finally, the CTD transect was performed.

Saturday 12 April 2014

The second day, the sea state was smooth with a light breeze. The sky was blue and the visibility was good. When arrived at the BOUSSOLE site, divers went at sea to clean the buoy sensors and to perform the dark measurements (backscattering meter and transmissometers). They recovered the two CTD plus optode (3m and 10m) and the pCO_2 sensor located at 10m. The telemetry cable of the pCO2 sensor at 10m was brought to the surface. Data from the CTD at 3m and 10m were downloaded on board. Then during a second dive, the two CTD were reinstalled at the same location after replacing the two optode. The pCO2 sensor was replaced and the new sensor was installed at 10m. Then, 1 Secchi disk and 1 CTD cast with water sampling were performed. Buoy data were retrieved using the wireless radio connection. C-OPS balance tests were performed and 2 C-OPS profiles were performed after these tests. On the way back to the Nice harbor, we stopped in the bay of Villefranche-sur-mer in order to recover a profiling float installed on a mooring. The mooring cable with the profiling float was recovered successfully.

Sunday 13 April 2014

The third day, the sea state was smooth with a light breeze. The sky was overcast and hazy, the visibility was medium. The third day, the ARGOS connection and the solar panels were cleaned. The telemetry cable of the pCO2 sensor at 10m was attached to the head of the buoy. Data from the pCO_2 sensor at 3m were downloaded using the telemetry cable. Nevertheless, data from the pCO_2 sensor at 10m could not be downloaded. The C-OPS was tested again to optimize the descent phase of the profiles. 3 C-OPS profiles, 2 CTD casts with water sampling and 1 Secchi disk were performed at the BOUSSOLE site.

Monday 14 April 2014

The last day, the sea state was smooth with a light breeze on the morning and the sea state was slight with a moderate breeze in the afternoon. The sky was slightly overcast on the morning and blue on the afternoon. The visibility was good. 4 C-OPS profiles, 1 Secchi disk and 2 CTD casts with water sampling including a deep cast were performed at the BOUSSOLE site.

Pictures taken during this cruise can be found at:
https://plus.google.com/photos/114686870380724925974/albums/6005424634912134849?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

Friday 11 April 2014 (UTC)

People on board: Melek Golbol, Roger Jullien and Vincent Taillandier.

0530 Departure from the Nice harbour.
0900 Arrival at the BOUSSOLE site.
0910 CTD 01, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p and TSM.
1000 Lunch.
1115 CTD 02, 400 m.
1145 Departure to the first transect station
1215 CTD 03, 400m, station 01 (43°25'N 07°48'E).
1310 CTD 04, 400m, station 02 (43°28'N 07°42'E).
1405 CTD 05, 400 m, station 03 (43°31'N 07°37'E).
1505 CTD 06, 400 m, station 04 (43°34'N 07°31'E).
1600 CTD 07, 400 m, station 05 (43°37'N 07°25'E).
1650 CTD 08, 400 m, station 06 (43°39'N 07°21'E).
1715 Departure from the station 06.
1740 Arrival at the Nice harbour.

Saturday 12 April 2014 (UTC)

People on board: Melek Golbol, Roger Jullien, Yves Lamblard, David Luquet, Didier Robin, Vincent Taillandier and Vincenzo Vellucci.

0500 Departure from the Nice harbour.
0820 Arrival at the BOUSSOLE site.
0830 Diving on the buoy for cleaning sensors, performing dark measurements and recovering of the two CTD plus optode (3m and 10m) and the pCO_2 CARIOCA sensor at 10m.
0835 Secchi disk 01 (13,5m).
0915 Downloading of the two CTD data and replacing of the two optodes on board
0915 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 and TSM.
1035 Diving on the buoy for installing the two CTD plus optode (3m and 10m) and the new pCO_2 CARIOCA sensor at 10m.
1100 Wireless radio connection with the buoy and data retrieval.
1130 C-OPS balance tests.
1305 C-OPS 01, 02.
1240 Departure to the bay of Villefranche-sur-mer.
1530 Recovering of the mooring with profiling float in the bay of Villefranche-sur-mer.
1610 Departure to the Nice harbour.
1625 Arrival at the Nice harbour.

Sunday 13 April 2014 (UTC)

People on board: Marie Barbieux, Melek Golbol, Vincent Taillandier and Vincenzo Vellucci.

0600 Departure from the Nice harbour.
0915 Arrival at the BOUSSOLE site.
0920 Cleaning of the solar panels, ARGOS and CISCO connectors, sensors on the top of the buoy.
Connection with the pCO2 sensors at 3m and 10 m and data retrieval of the pCO2 sensor at 3m.
0930 C-OPS balance tests.
C-OPS 03, 04.
1015 Lunch.
1115 C-OPS balance tests
1140 CTD 10, 400 m with water sampling 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p and TSM.
1235 C-OPS 05.

1305 CTD 11, 400 m with water sampling 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, CDOM and TA/TC.
1310 Secchi disk 02 (15m).
1340 Departure to the Nice harbour.
1650 Arrival at the Nice harbour.

Monday 14 April (UTC)

People on board: Melek Golbol, Joséphine Ras, Raphaëlle Sauzède and Vincent Taillandier.

0505 Departure from the Nice harbour.
0825 Arrival at the BOUSSOLE site.
0830 CTD 12, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p TSM.
0930 C-OPS 06, 07.
1000 Dark Hydroscat-6 profile, 50m.
1030 Secchi disk 03 (13m).
1050 CTD 13, 2470 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p TSM.
1235 C-OPS 08, 09.
1300 Departure to the Nice harbour.
1630 Arrival at the Nice harbour.

Problems identified during the cruise

- The first day, the IOP package did not work. In fact, a file named "CAST.HDS" was deleted by mistake in the HydroDAS. This important file controls the ignition of the instruments. This problem was solved by reinstalling this file in the HydroDAS.

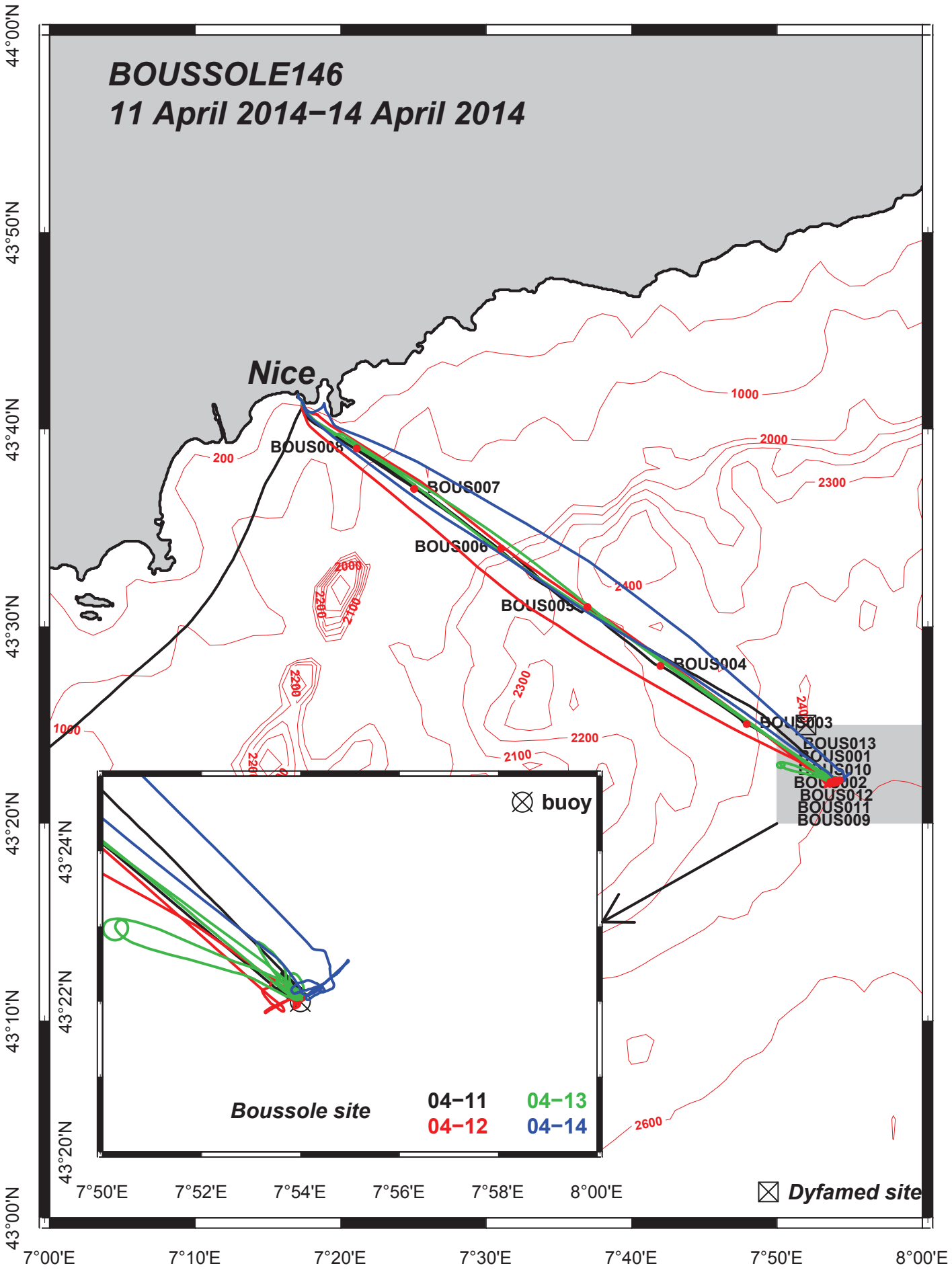
- In order to perform the dark measurement, a dark adhesive tape was put on the hobilabs Hydroscat-6 instead of the neoprene cap (which was lost during the previous mission). Unfortunately, the adhesive tape was not removed fully. Therefore the acquired data are correct only for the wavelength of 620nm, for CTD 002 and CTD 003.

- Data from the pCO_2 sensor at 10m could not be downloaded, only data from the pCO_2 sensor at 3m could be downloaded via the telemetry cable.

Appendices

Cruise Summary Table for Boussole 146

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
11/04/14			CTDBOUS001	HPLC, Ap & TSM	09:10	23:00	400	43	22.186	7	53.998	overcast		7	2	108	1018.0	65		15.7	14.97	calm			
			CTDBOUS002		11:16	23:00	400	43	22.106	7	53.684	overcast		6	2	82	1017.0	70		15.9	15.06	calm			
			CTDBOUS003		12:15	26:00	400	43	25.050	7	47.922	overcast		8	1.6	113	1017.5	72		15.0	15.26	calm			
			CTDBOUS004		13:14	24:00	400	43	27.998	7	41.990	overcast		6	0.2	96	1017.3	71		15.3	15.71	calm			
			CTDBOUS005		14:08	24:00	400	43	30.984	7	36.976	overcast		8	4.5	43	1016.7	68		15.5	16.33	calm			
			CTDBOUS006		15:05	22:00	400	43	33.956	7	31.044	overcast		6	3	26	1016.4	68		15.5	16.00	calm			
			CTDBOUS007		16:00	25:00	400	43	36.977	7	25.057	overcast		6	2.8	116	1016.0	69		15.7	16.33	calm			
			CTDBOUS008		16:50	24:00	400	43	39.035	7	21.120	overcast		6	3	143	1016.1	70		15.2	16.27	calm			
12/04/14				Secchi01	8:35	4:00	13.5	43	22	7	54	blue		1					good			calm			
			CTDBOUS009	HPLC, Ap &TSM	9:20	35:00	400	43	22.073	7	53.923	blue		1	7.7	49	1017.4	71		15.4	15.41	calm			
	bou_c-ops_140412_1127_001_data.csv				11:29	1:21																		
		bou_c-ops_140412_1127_005_data.csv			12:25	1:48	46.0	43	22.078	7	53.279	blue	Ci&Cs	1	6.5	48	1016.7	71	good	15.9		calm	0.3		no
		bou_c-ops_140412_1127_006_data.csv			12:31	2:34	67.6	43	21.980	7	53.401	blue	Ci&Cs	1	6.5	48	1016.7	71	good	15.9		calm	0.3		no
13/04/14	bou_c-ops_140413_0918_001_data.csv				09:21	1:21																		
		bou_c-ops_140413_0918_002_data.csv			09:30	2:49	71.7	43	22.120	7	53.865	hazy	Cs&Sc	8	3.3	43	1017.7	82	medium	15.2		calm	0.2		no
		bou_c-ops_140413_0918_003_data.csv			09:51	1:19	32.7	43	22.172	7	53.909	hazy	Cs&Sc	8	3.3	43	1017.7	82	medium	15.2		calm	0.2		no
	bou_c-ops_130413_0918_005_data.csv				11:15	2:05																		
		bou_c-ops_130413_0918_006_data.csv			11:20	0:59	24.2	43	22.135	7	54.063	hazy	Cs&Cc	7	4.7	87	1017.3	82	medium	16.1		calm	0.2		no
	bou_c-ops_130413_0918_009_data.csv				12:54	1:26																		
			CTDBOUS010	HPLC, Ap & TSM	11:42	35:00	400	43	22.110	7	53.988	hazy		8	6.7	80	1017.0	84		15.5	16.02	calm			
			CTDBOUS011	HPLC, Ap, CDOM &TA/TC	13:04	32:00	400	43	22.082	7	53.946	overcast		6	2.8	65	1017.2	81		15.7	15.00	calm			
				Secchi02	13:10	4:00	15	43	22	7	54	overcast		6					medium			calm			
14/04/14			CTDBOUS012	HPLC, Ap & TSM	08:29	36:00	400	43	22.094	7	54.088	coudy		5	9.3	229	1018.0	86		15.3	15.43	calm			
	bou_c-ops_140414_0848_001_data.csv				08:53	1:51																		
		bou_c-ops_140414_0848_003_data.csv			09:29	2:32	65.0	43	22.222	7	54.368	slightly hazy	Cu	1	10.6	228	1017.6	84	good	15.3		calm	0.6		few
		bou_c-ops_140414_0848_004_data.csv			09:39	2:05	52.5	43	22.283	7	54.155	slightly hazy	Cu	1	10.6	228	1017.6	84	good	15.3		calm	0.6		few
				Secchi03	10:30	4:00	14	43	22	7	54	cloudy		4					good			calm			
			CTDBOUS013	HPLC & Ap	10:50	93:00	2470	43	22.193	7	54.314	cloudy		4	8.9	239	1017.3	82		15.7	15.8	calm			
	bou_c-ops_140414_0848_007_data.csv				12:01	1:21																		
		bou_c-ops_140414_0848_008_data.csv			12:33	2:34	65.6	43	22.091	7	54.322	blue	none	0	15.1	212	1015.8	84	good	15.2		calm	0.8		few
		bou_c-ops_140414_0848_010_data.csv			12:52	2:34	67.1	43	22.460	7	54.601	blue	none	0	15.1	212	1015.8	84	good	15.2		calm	0.8		few
	bou_c-ops_140414_0848_011_data.csv				13:06	1:30																		


BOUSSOLE146
11 April 2014−14 April 2014
Nice
BOUS008
BOUS007
BOUS006
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BOUS004
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BOUS013
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BOUS010
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BOUS012
BOUS011
BOUS009
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1000
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2300
2400
2200
2100
2600
buoy
Boussole site
04−11
04−12
04−13
04−14
Dyfamed site
44°00'N
43°50'N
43°40'N
43°30'N
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43°00'N
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43°24'N
43°22'N
43°20'N
7°50'E
7°52'E
7°54'E
7°56'E
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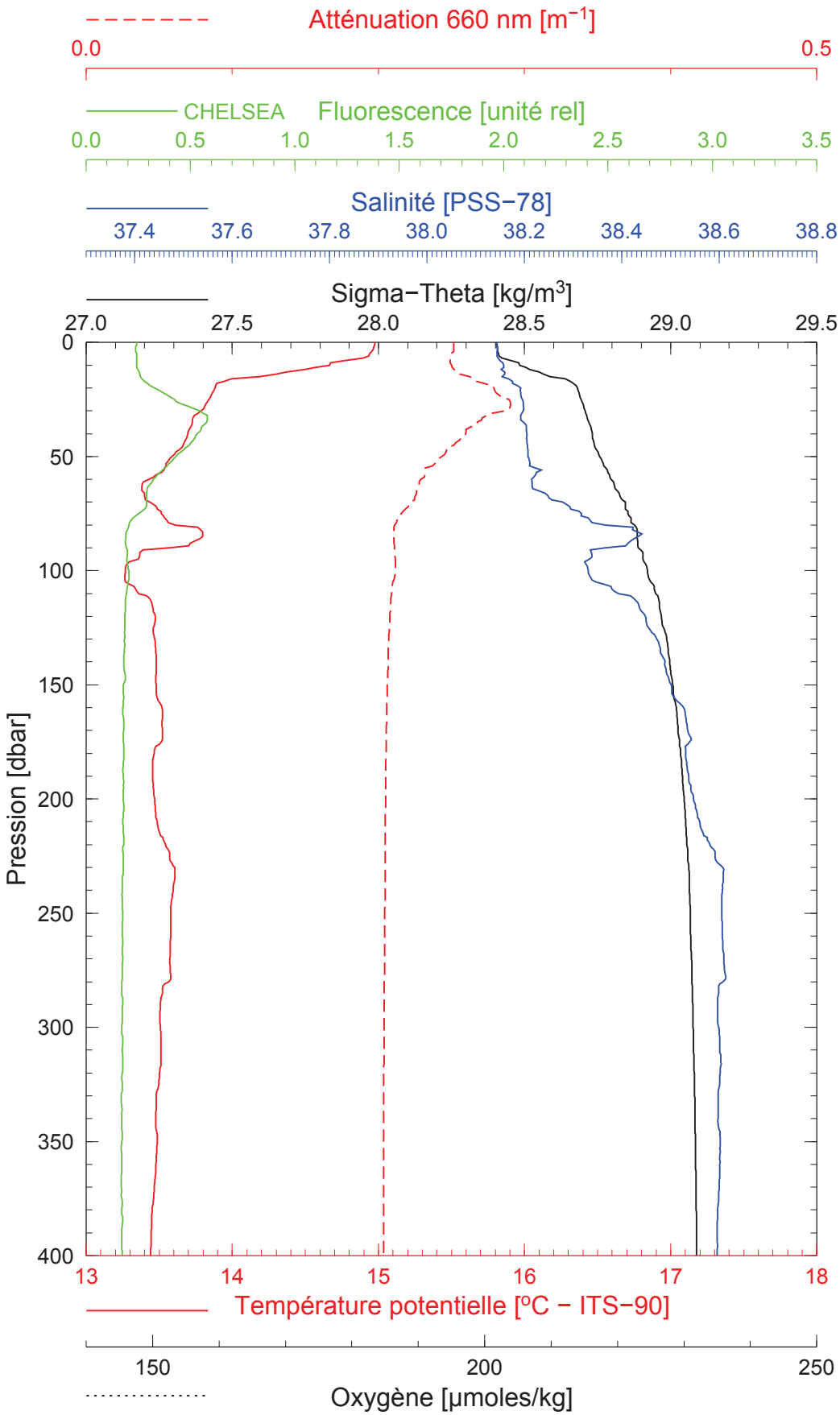
8°00'E

BOUSSOLE 146 **11/04/2014** **BOUS140411_01**

BOUS001

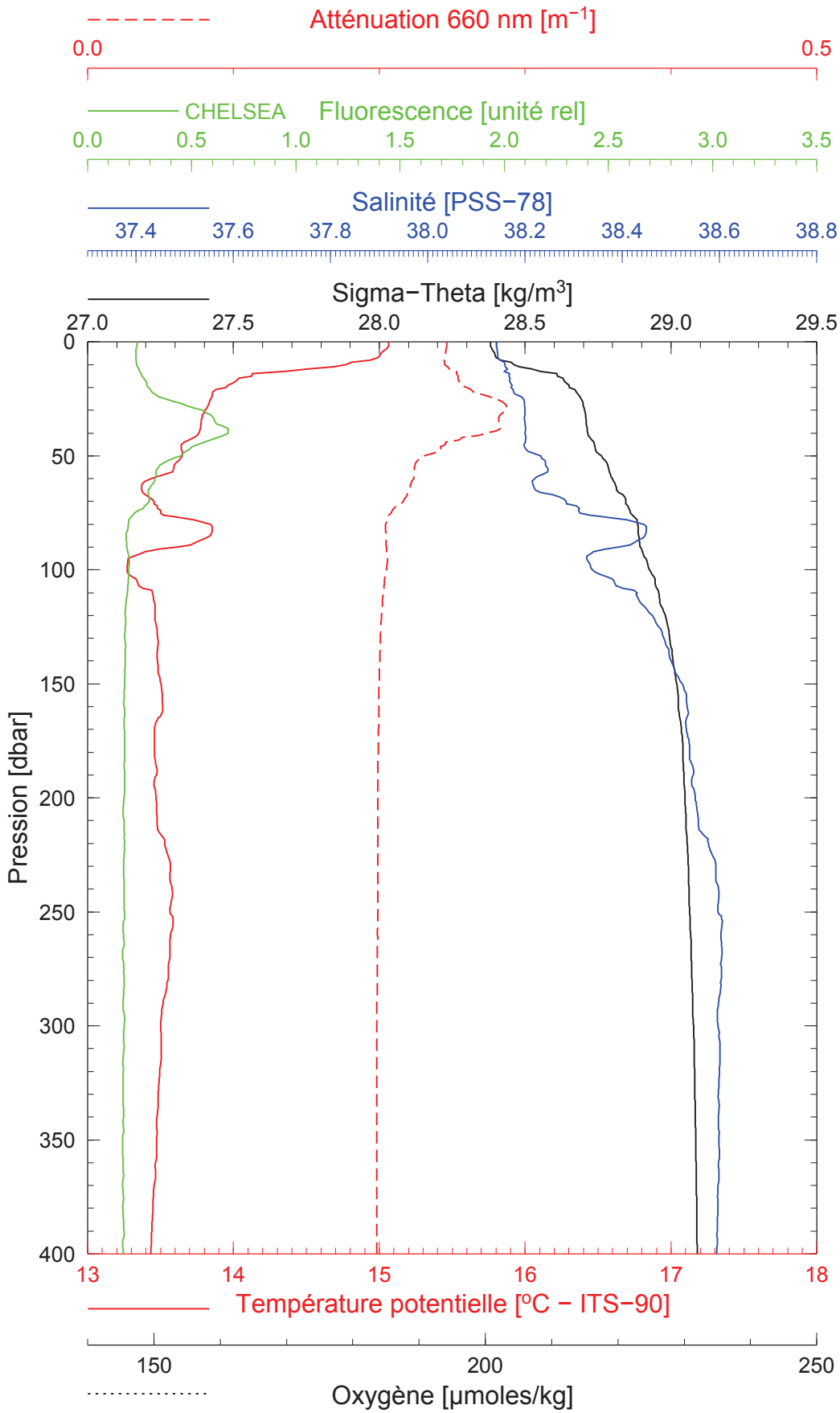


Date *11/04/2014* *Latitude* *43°22.186 N*

Heure déb *09h 10min [TU]* *Longitude* *07°53.998 E*

BOUSSOLE 146 **11/04/2014** **BOUS140411_02**

BOUS002

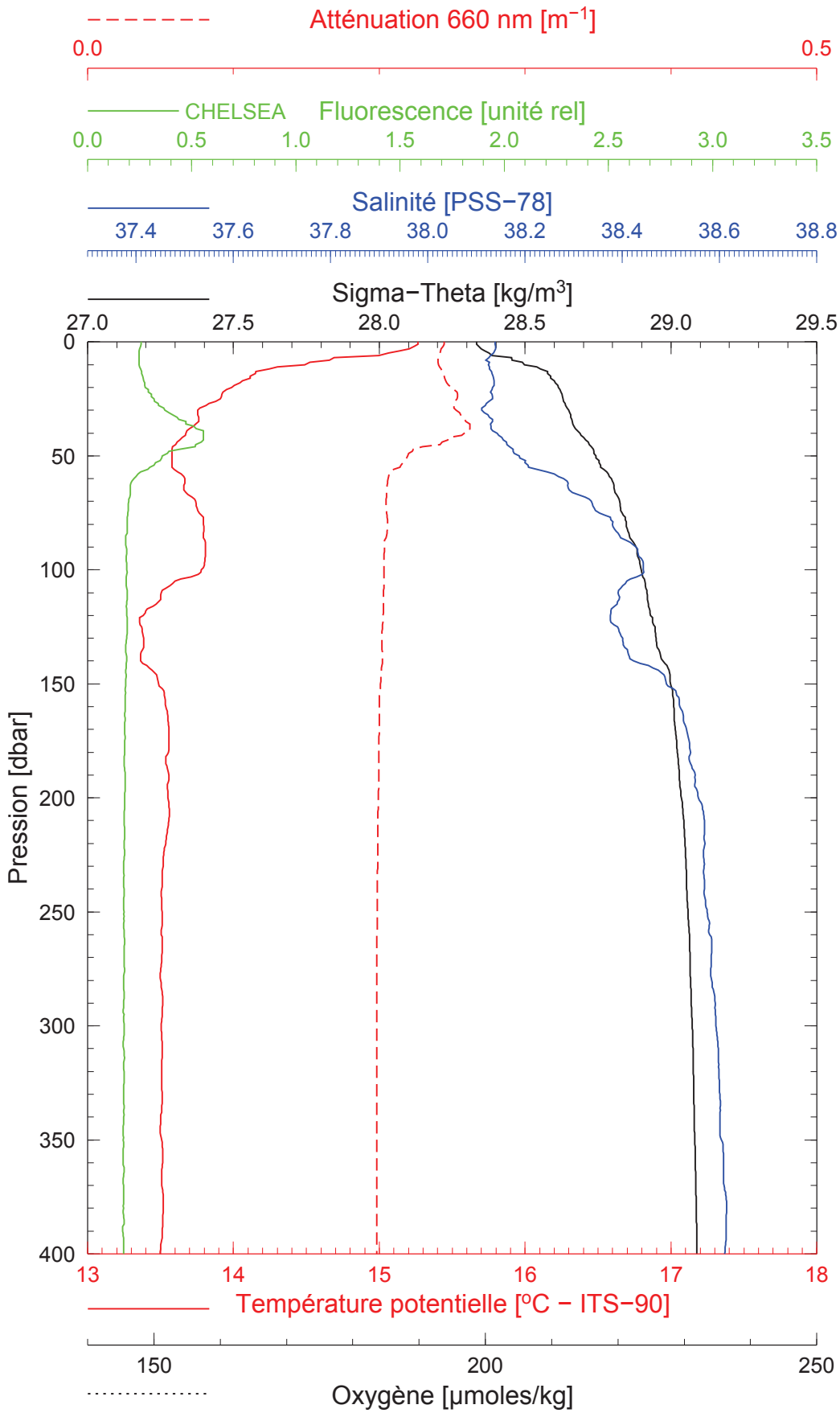


Date *11/04/2014* *Latitude* *43°22.106 N*

Heure déb *11h 16min [TU]* *Longitude* *07°53.684 E*

BOUSSOLE 146 **11/04/2014** **BOUS140411_03**

BOUS003



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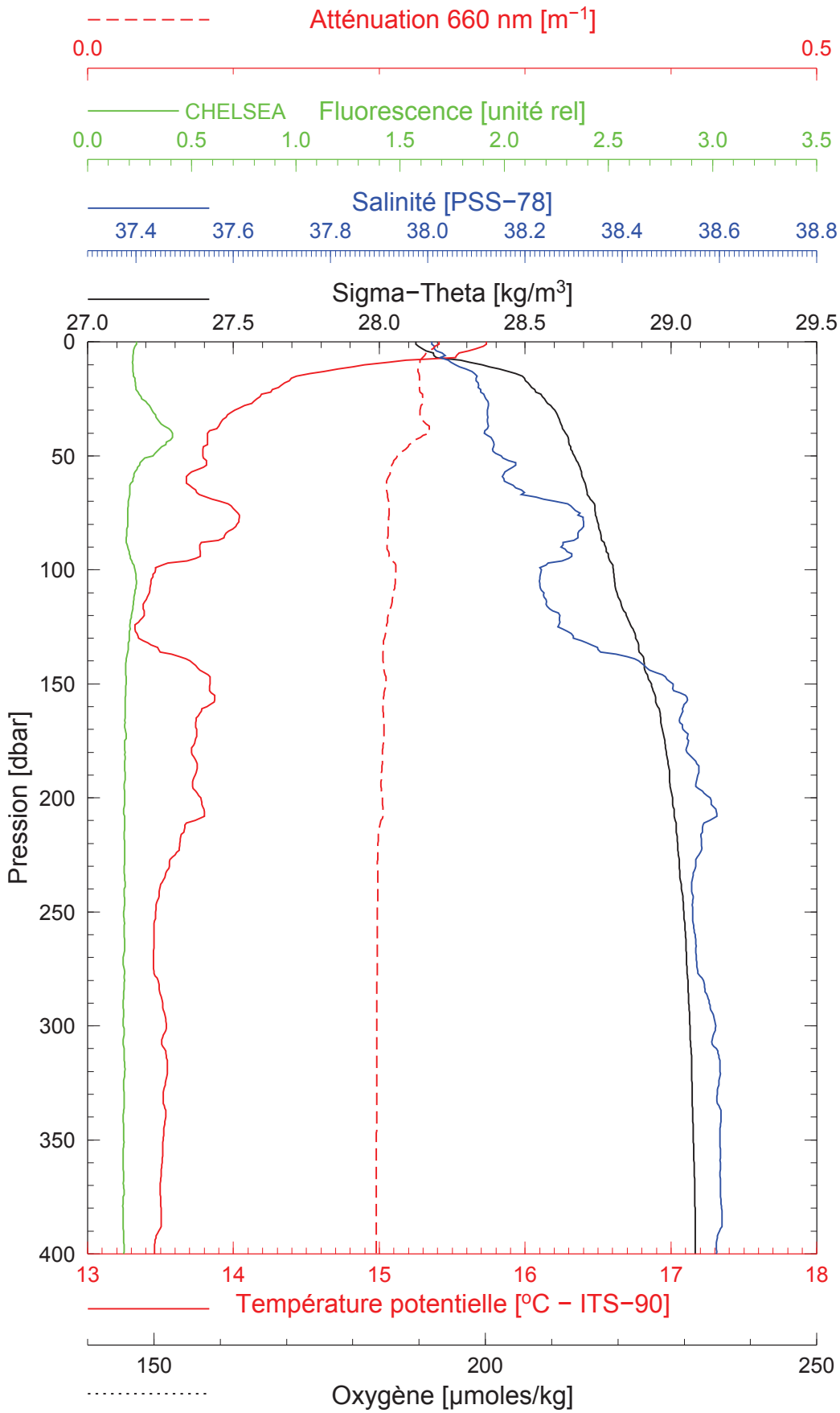
BOUSSOLE 146 **11/04/2014** **BOUS140411_04**

BOUS004



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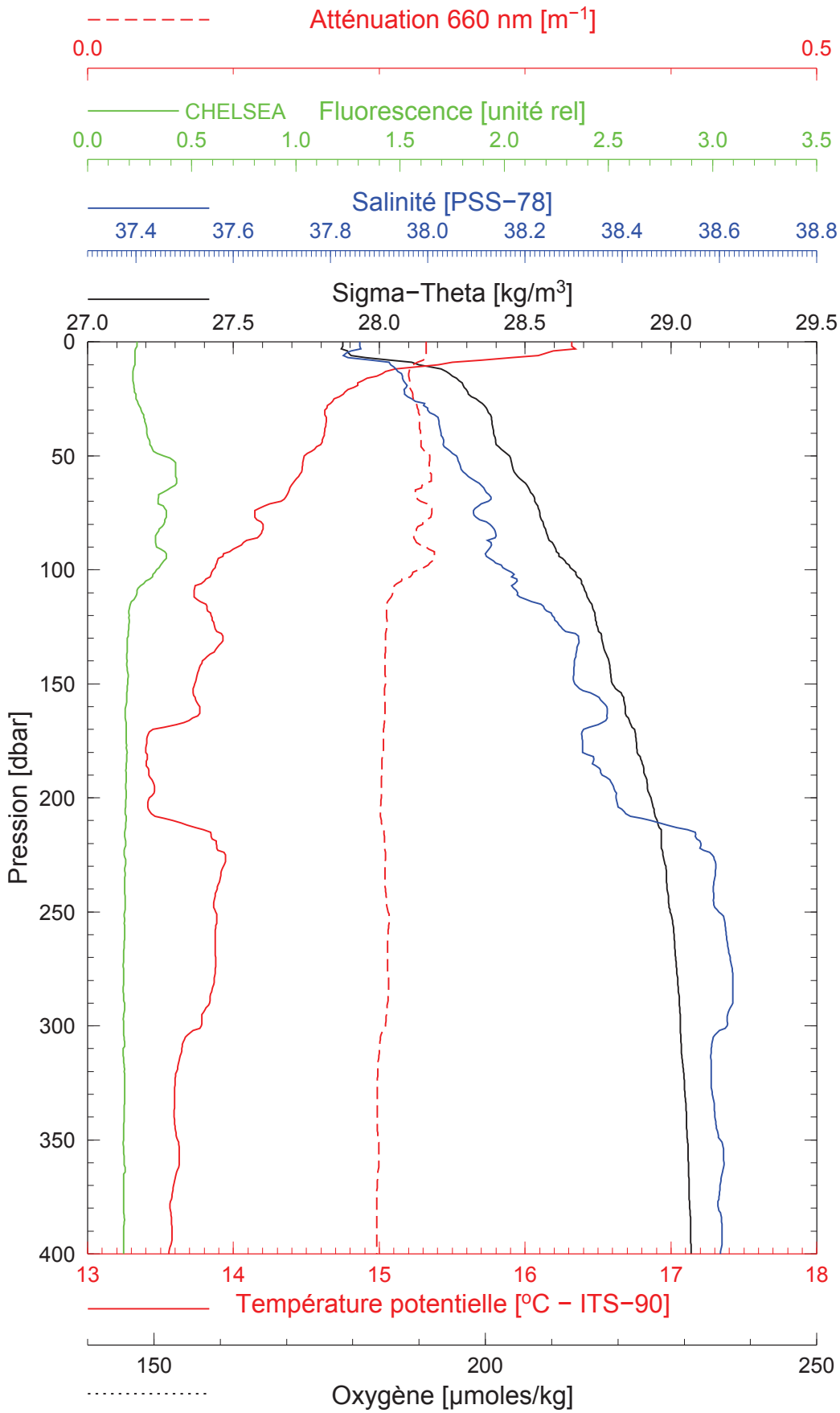
BOUSSOLE 146 **11/04/2014** **BOUS140411_05**

BOUS005



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BOUSSOLE 146 **11/04/2014** **BOUS140411_06**

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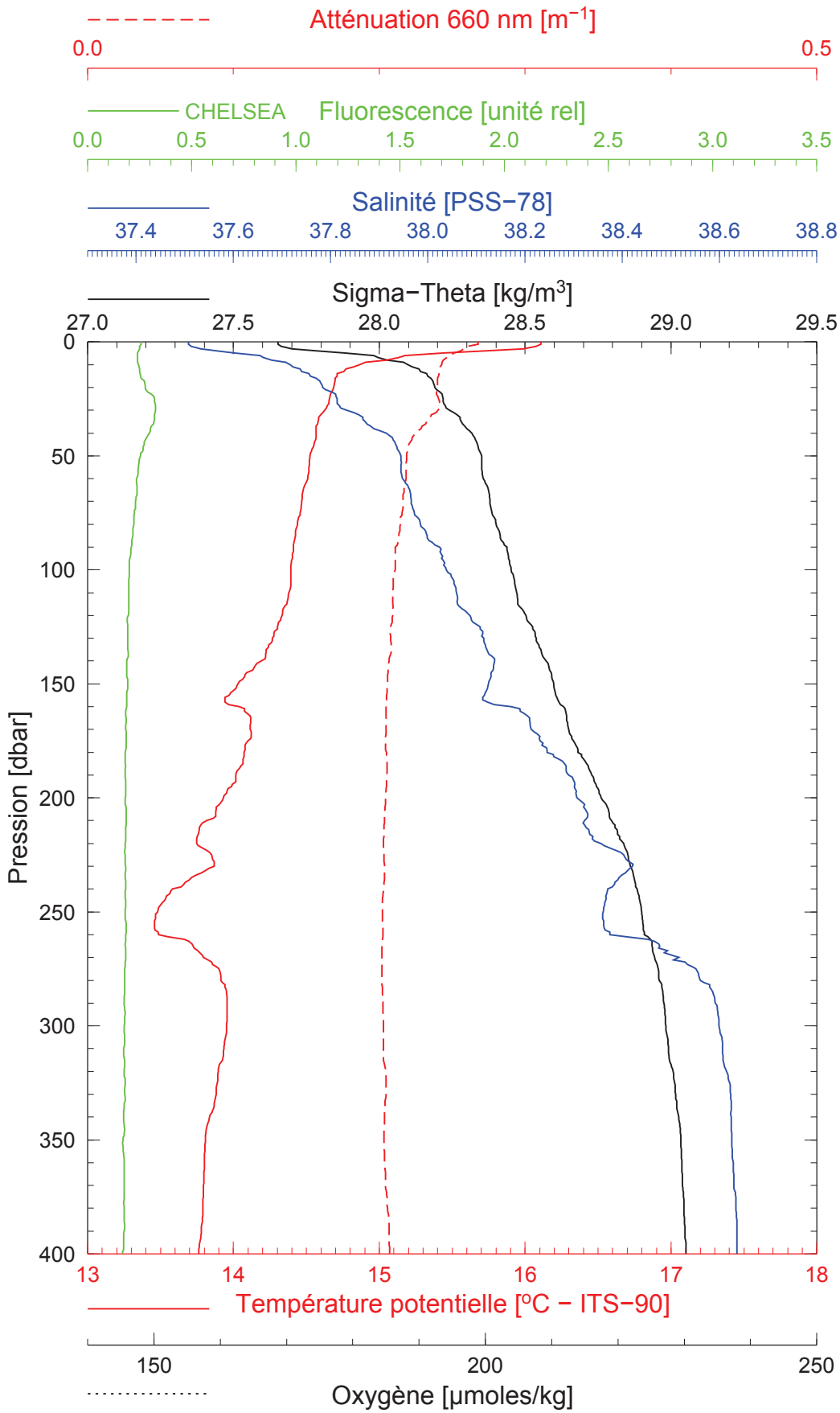

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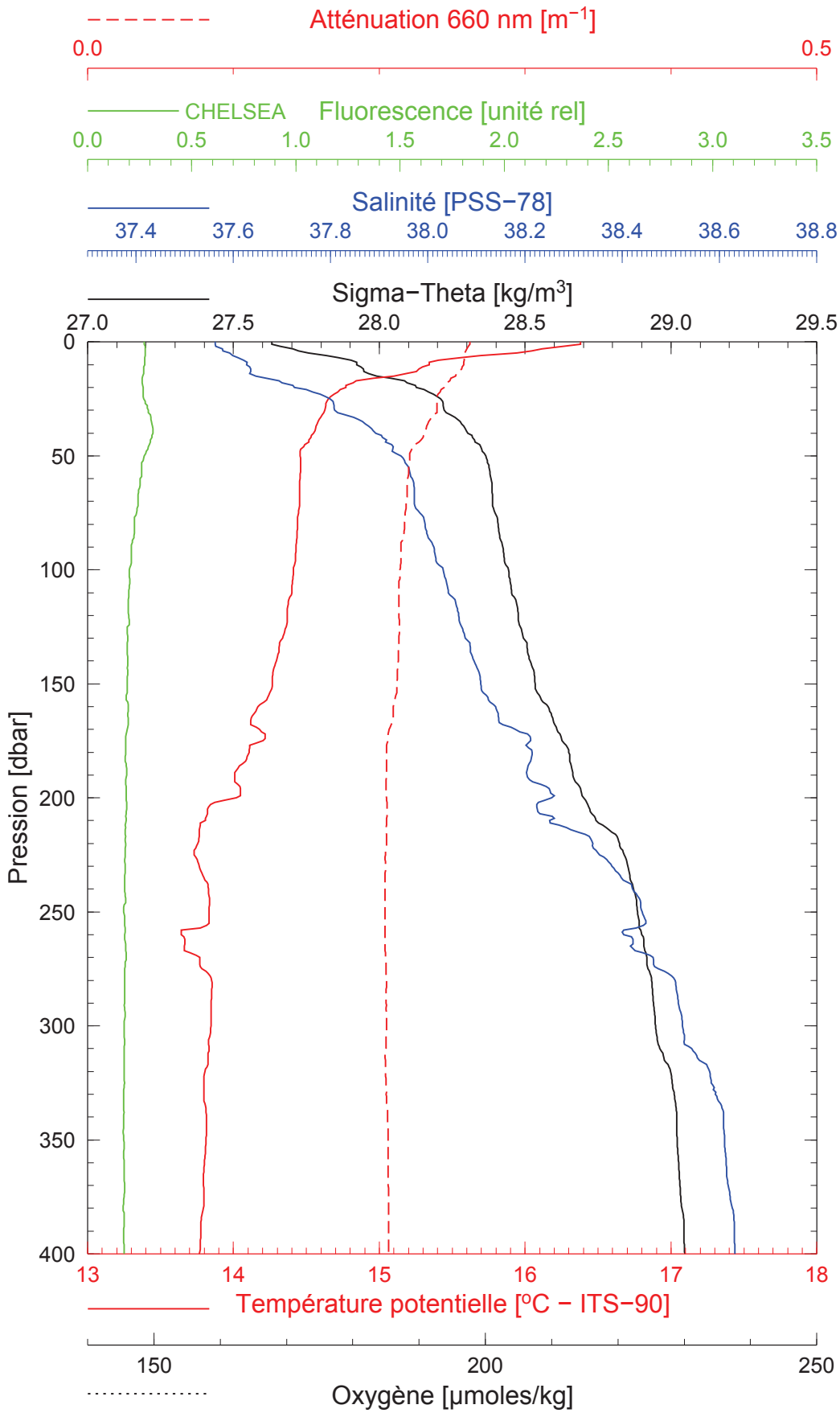
BOUSSOLE 146 **11/04/2014** **BOUS140411_07**

BOUS007



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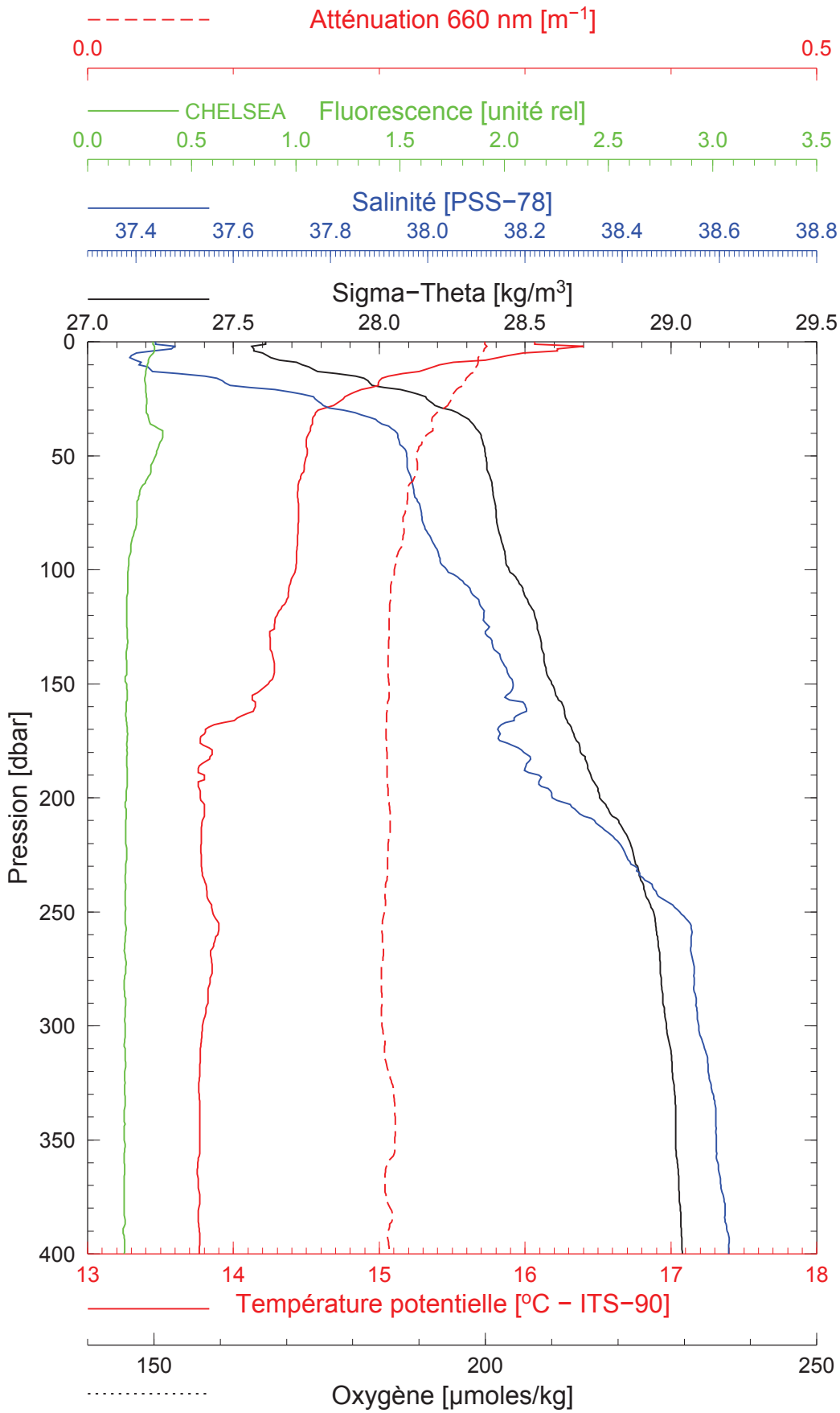
BOUSSOLE 146 **11/04/2014** **BOUS140411_08**

BOUS008

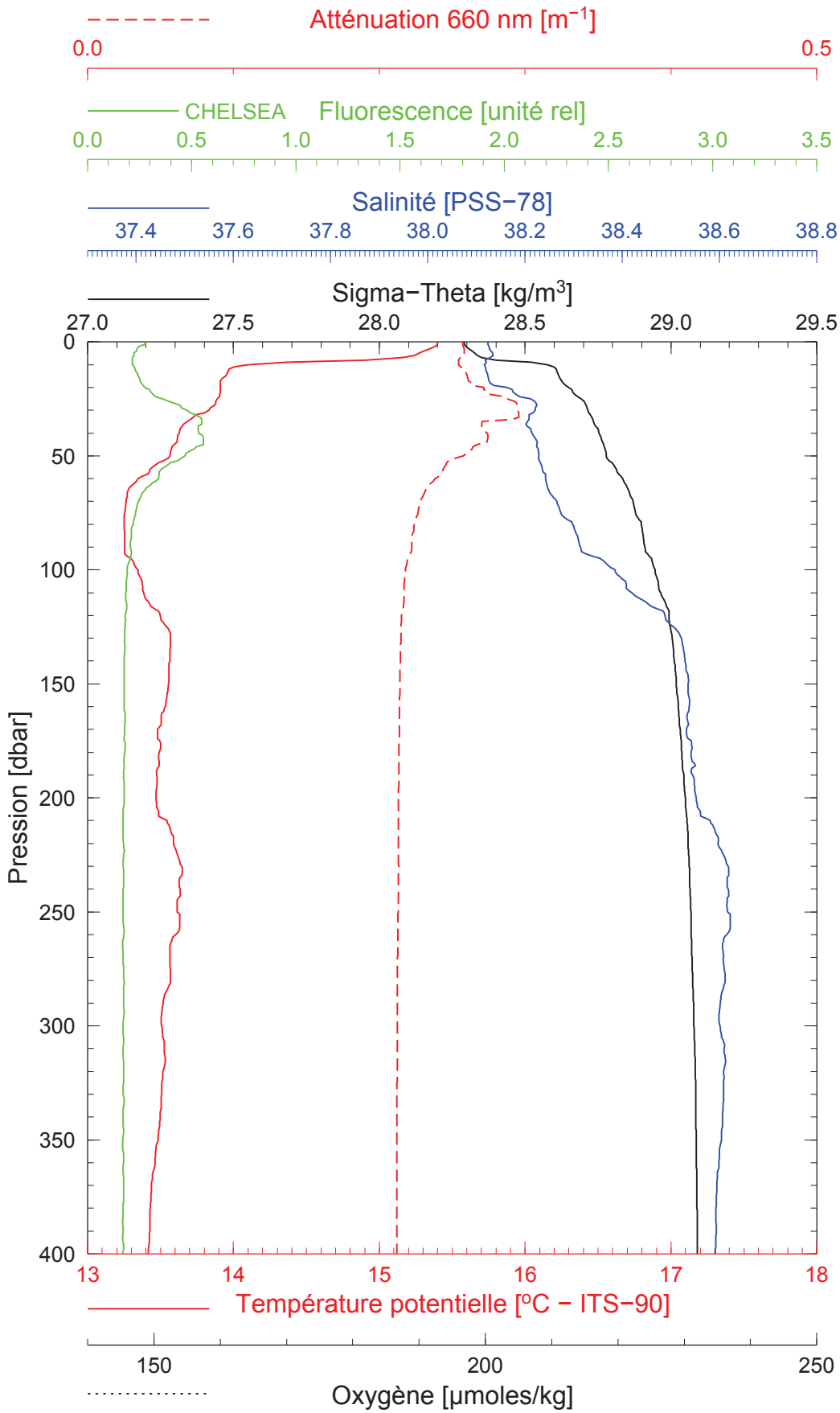


Date *11/04/2014* *Latitude* *43°39.035 N*

Heure déb *16h 50min [TU]* *Longitude* *07°21.120 E*

BOUSSOLE 146 **12/04/2014** **BOUS140412_01**

BOUS009

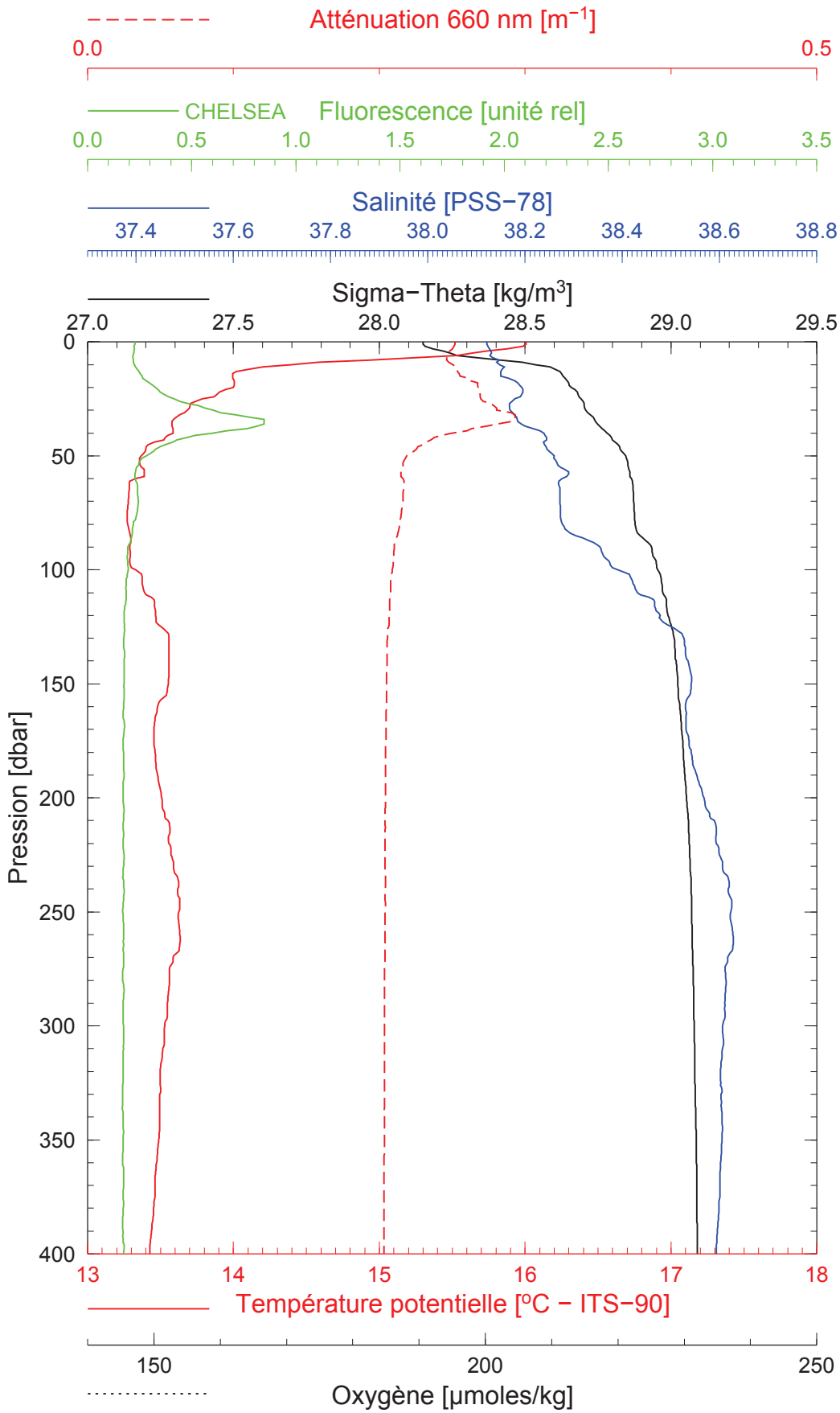


Date *12/04/2014* *Latitude* *43°22.073 N*

Heure déb *09h 20min [TU]* *Longitude* *07°53.923 E*

BOUSSOLE 146 **13/04/2014** **BOUS140413_01**

BOUS010

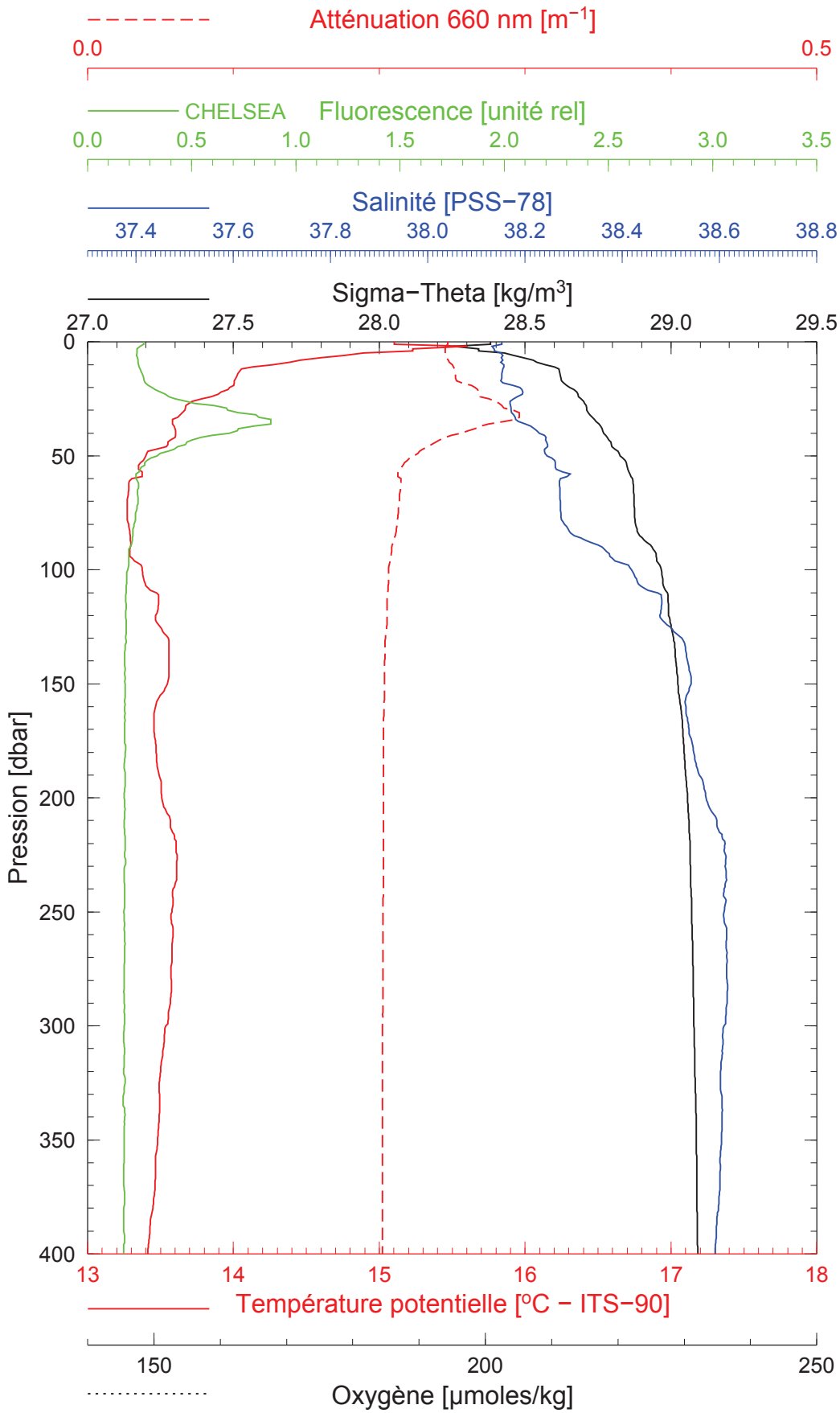


Date *13/04/2014* *Latitude* *43°22.110 N*

Heure déb *11h 42min [TU]* *Longitude* *07°53.988 E*

BOUSSOLE 146 **13/04/2014** **BOUS140413_02**

BOUS011

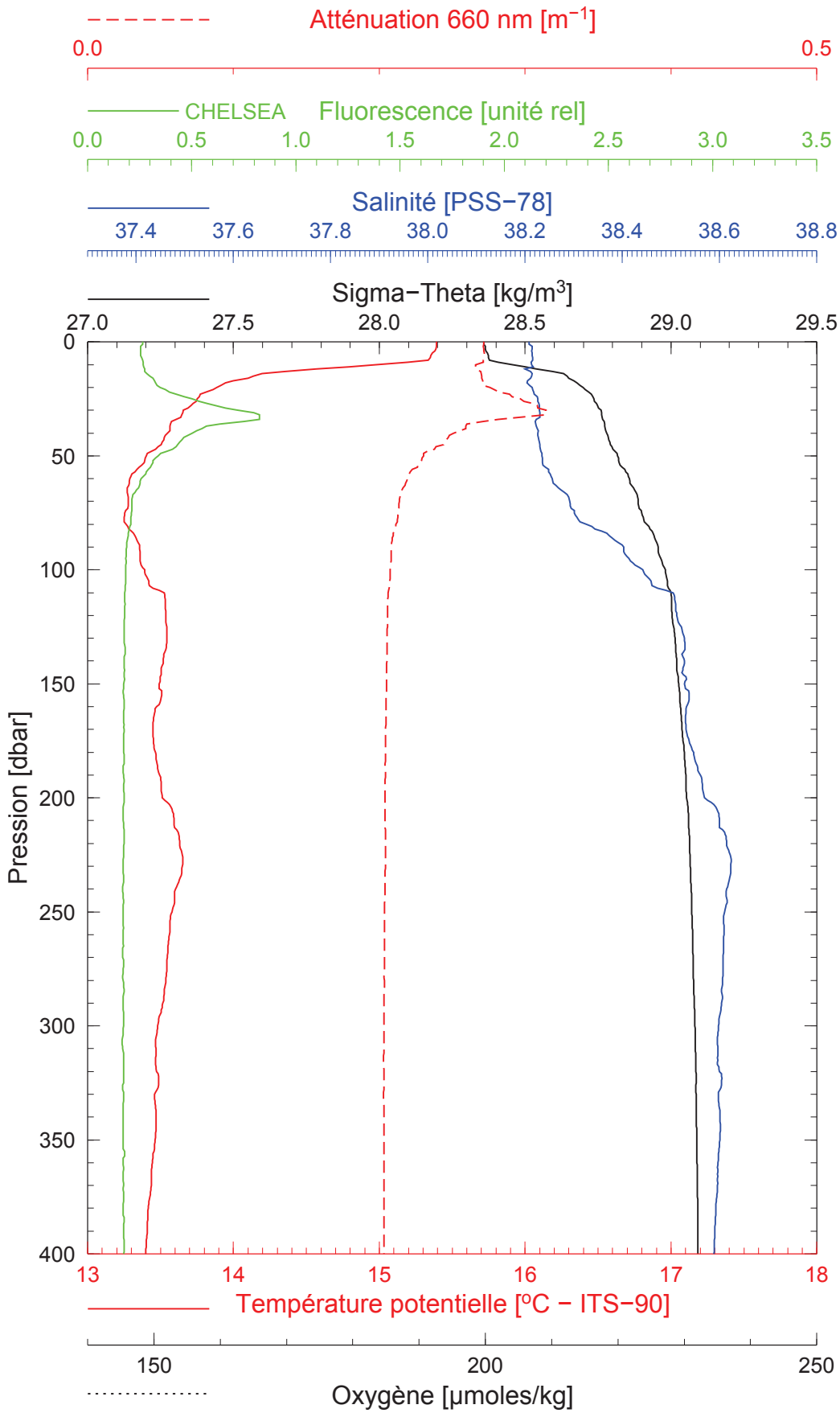


Date *13/04/2014* *Latitude* *43°22.082 N*

Heure déb *13h 04min [TU]* *Longitude* *07°53.946 E*

BOUSSOLE 146 **14/04/2014** **BOUS140414_01**

BOUS012

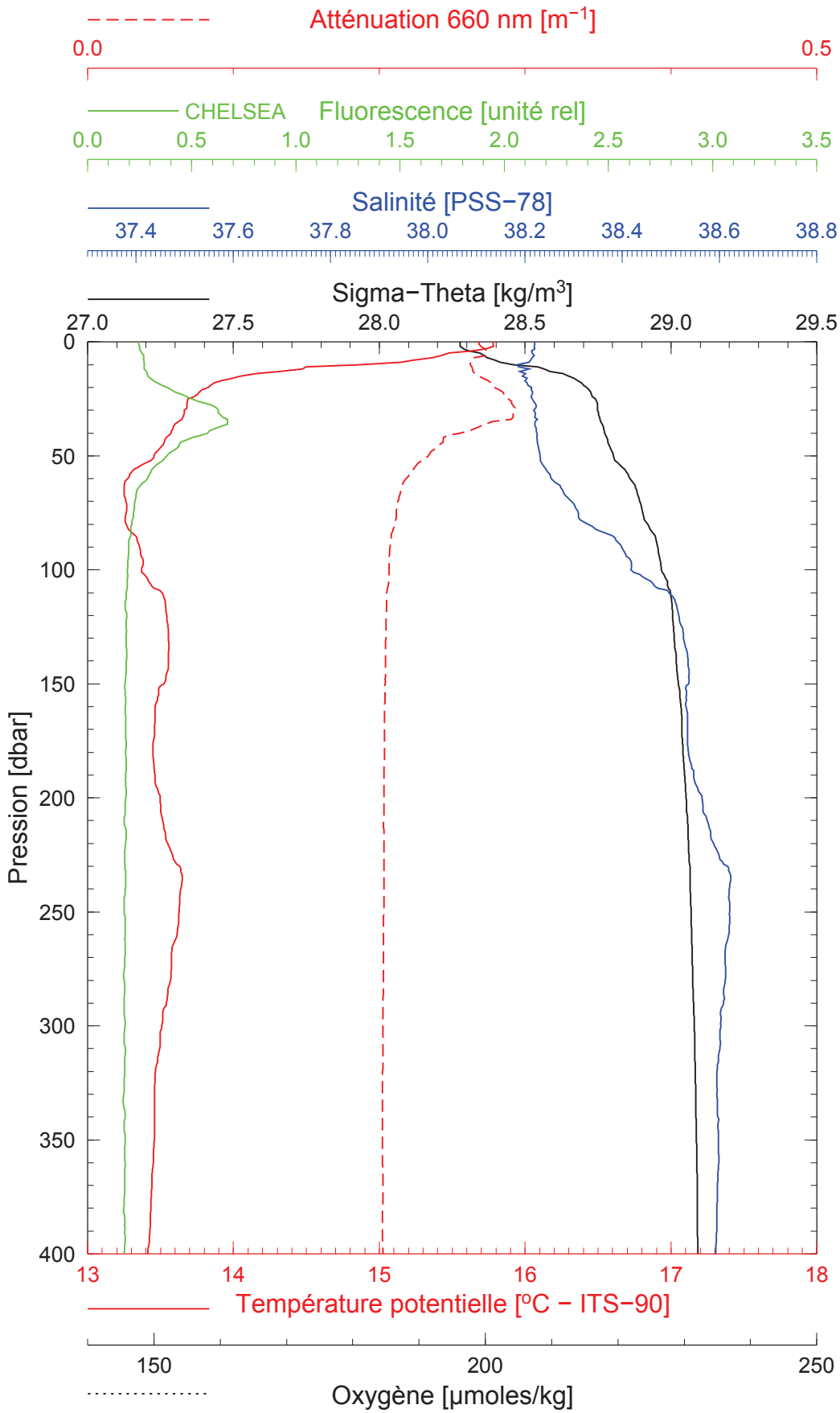


Date *14/04/2014* *Latitude* *43°22.094 N*

Heure déb *08h 29min [TU]* *Longitude* *07°54.088 E*

BOUSSOLE 146 **14/04/2014** **BOUS140414_02**

BOUS013



Date *14/04/2014* *Latitude* *43°22.193 N*

Heure déb *10h 50min [TU]* *Longitude* *07°54.314 E*