BOUSSOLE Monthly Cruise Report

Cruise 145
March 12 – 15, 2014

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

Science Personnel: Marie Barbieux, Melek Golbol, Yves Lamblard, David Luquet, Grigor Obolensky and Didier Robin.

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

GG9 vessel at BOUSSOLE site for the deployment of the upper section of the buoy.

BOUSSOLE project

ESA/ESRIN contract N° 13226/10/I-NB

April 22, 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).

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 deployment of the upper section of the buoy occurred during this cruise. In order to prepare this deployment, the divers recovered the CTD plus optode and the pCO_2 CARIOCA sensor located at 3m. The CTD plus optode will be installed on the new buoy during the deployment at the same location. The pCO_2 sensor will be replaced by another sensor at the laboratory. The telemetry cable (fixed on the top of the buoy) of the pCO_2 CARIOCA sensor located at 10m was removed. The divers winded and fixed this cable under the upper section of the buoy.

The METEO FRANCE - COTE D'AZUR buoy (Latitude: 43.38, Longitude: 7.83) give us meteorological data in real time next to the BOUSSOLE Site. These data were useful for the BOUSSOLE cruises. The buoy did not work since December 2013, however. So we took advantage of the last day to do maintenance on this buoy. We rebooted the meteo buoy by disconnecting, cleaning and reconnecting the four solar panels.

The last day, water samples were also collected for total alkalinity (AT) and total inorganic carbon (CT) analysis. This operation is part of the BIOCAREX ANR project, in collaboration with the LOCEAN in Paris (J. Boutin and collaborators). The two pCO_2 CARIOCA sensors located at 3m and at 10m gave data with an unexpected difference. It is possible that one of the sensors doesn't work correctly. So, from this cruise, it was decided to start water sampling for AT/CT analysis, 1 time per cruise at two depths: 5m and 10m. The samples will be sent to the SNAPOCO – LOCEAN Paris for analysis. The results could help us checking the data collected by the two sensors.

Cruise Summary

The first day was used for 2 CTD casts with water sampling at the BOUSSOLE site, optical profiles and 1 Secchi disk. The second day was used for diving operations: cleaning of buoy sensors, performing dark measurements, recovering the CTD plus optode and the pCO_2 sensor located at 3m. The telemetry cable of the pCO2 sensor at 10m was removed and fixed under the upper structure of the buoy. This day, data were retrieved from a physical connection to the buoy computer, via the cable available on top of the buoy. Then, 1 CTD cast with water sampling, CIMEL measurements, optical profiles and 1 Secchi disk were performed at the BOUSSOLE site. The third day was used to perform 1 CTD cast with water sampling at the BOUSSOLE site, optical profiles and the CTD transect. This day was also the day of the deployment of the new upper section of the buoy.
The last day was used to perform maintenance on the METEO FRANCE - COTE D'AZUR buoy, 1 CTD cast with water sampling at the BOUSSOLE site, optical profiles and 1 Secchi disk. This day, data were also retrieved from physical connection to the buoy computer in order to check the acquired data after the deployment.

Wednesday 12 March 2014

The first day, the sea state was slight with a fresh to moderate breeze. The sky was blue and the visibility was excellent. During the way up to BOUSSOLE, the sea became choppy, so it was not possible to continue installing equipment on the deck of the Téthys. Then, 2 CTD casts with water sampling, 3 C-OPS profiles and 1 Secchi disk were performed at the BOUSSOLE site.

Thursday 13 March 2014

The second day, the sea state was smooth with a light breeze. The sky was blue and the visibility was excellent. When arrived at the BOUSSOLE site, divers went at sea to clean the buoy sensors and to perform dark measurements of the backscattering meter and the transmissometers. They recovered the CTD plus optode and the pCO_2 sensor located at 3m. They removed the telemetry cable of the pCO2 sensor at 10m and fixed it under the upper structure of the buoy. Data were retrieved from physical connection to the buoy computer. Then, 1 CTD cast with water sampling, CIMEL measurements, 3 C-OPS profiles and 1 Secchi disk were performed at the BOUSSOLE site.

Friday 14 March 2014

The third day, the sea state was smooth with a gentle breeze. The sky was cloudy and the visibility was medium. The GG9 vessel was at the BOUSSOLE site for the deployment of the new upper section of the buoy. 6 C-OPS profiles and 1 CTD cast with water sampling were performed at the BOUSSOLE site. Then, the CTD transect was performed.

Saturday 15 March 2014

The last day, the sea state was smooth with a light breeze. The sky was hazy on the morning and blue on the afternoon. The visibility was good.
Before arriving at the BOUSSOLE site, we stopped at the METEO FRANCE - COTE D'AZUR buoy to do maintenance on the buoy: the connections of the solar panels were disconnected, cleaned and the buoy was rebooted. Then, 1 CTD cast with water sampling, 1 Secchi disk and 3 C-OPS profiles were performed at the BOUSSOLE site. Data were retrieved via cable connection to the buoy computer in order to check the data acquired by the newly installed buoy.

Pictures taken during this cruise can be found at:
https://plus.google.com/photos/114686870380724925974/albums/6005147047678593041?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 March 2014 (UTC)

People on board: Marie Barbieux, Melek Golbol and Grigor Obolensky.

0730 Departure from the Nice harbour.
1050 Arrival at the BOUSSOLE site.
1100 C-OPS system installation at the deck of the Téthys.
1235 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.
1335 C-OPS 01, 02.
1425 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.
1500 Secchi 01 (13m).
1510 Departure to the Nice harbour.
1815 Arrival at the Nice harbour.

Thursday 13 March 2014 (UTC)

People on board: Melek Golbol, Yves Lamblard, Grigor Obolensky, David Luquet and Didier Robin.

0600 Departure from the Nice harbour.
0915 Arrival at the BOUSSOLE site.
0935 Diving on the buoy for cleaning sensors, performing dark measurements and recovering of the CTD plus optode and the pCO_2 CARIOCA sensor at 3m.
1000 Direct connection with the buoy and data retrieval.
1110 CTD 03, 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.
1235 CIMEL 01, 02, 03.
1305 C-OPS 03, 04.
1415 Secchi disk 02 (16m).
1430 Departure to the Nice harbour.
1725 Arrival at the Nice harbour.

Friday 14 March 2014 (UTC)

People on board: Melek Golbol and Grigor Obolensky.

0600 Departure from the Nice harbour.
0920 Arrival at the BOUSSOLE site.
1000 C-OPS 05, 06.
1025 CTD 04, 400 m with water sampling 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p and TSM.
1105 C-OPS 07, 08, 09.
1130 Departure to the first transect station.
1245 CTD 05, 400m, station 01 (43°25’N 07°48’E).
1345 CTD 06, 400m, station 02 (43°28’N 07°42’E).
1435 CTD 07, 400 m, station 03 (43°31’N 07°37’E).
1525 CTD 08, 400 m, station 04 (43°34’N 07°31’E).
1615 CTD 09, 400 m, station 05 (43°37’N 07°25’E).
1700 CTD 10, 400 m, station 06 (43°39’N 07°21’E).
1730 Departure to the Nice harbour.
1800 Arrival at the Nice harbour.

Saturday 15 March (UTC)

People on board: Melek Golbol and Grigor Obolensky.

0535 Departure from the Nice harbour.
0835 Arrival at the Buoy Cote d'Azur- Meteo France.
Maintenance on the buoy: cleaning connectors and rebooting of the system.
0915 Arrival at the BOUSSOLE site.
0925 CTD 11, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p TSM and TA/TC.
1000 Secchi disk 013 (14.25m).
1030 Direct connection with the buoy and data retrieval.
1135 C-OPS 10, 11, 12.
1210 Departure to the Nice harbour.
1510 Arrival at the Nice harbour.

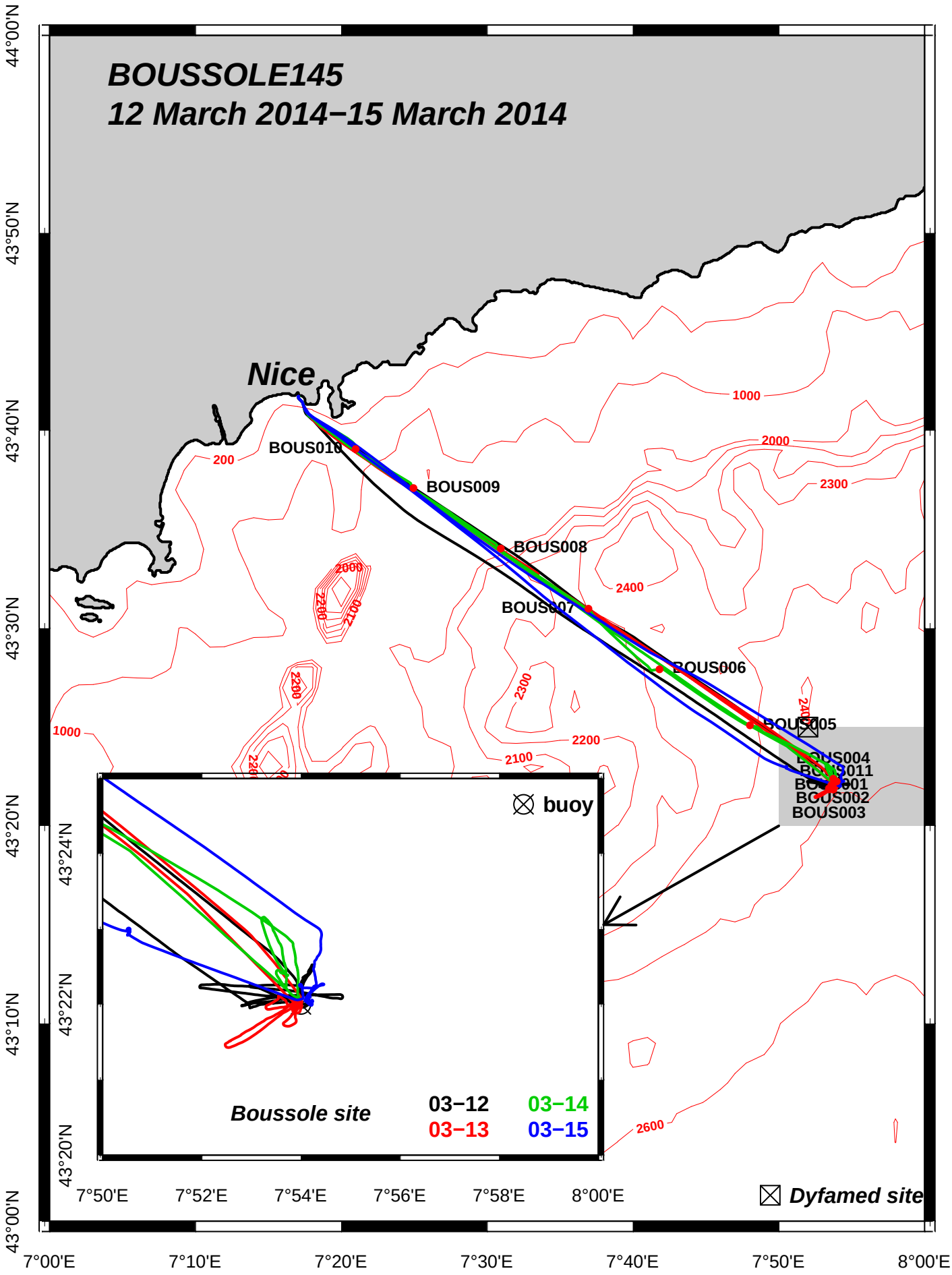
Problems identified during the cruise

- The C-OPS commonly used on the BOUSSOLE missions returned from calibration at *Biospherical* during the cruise. It was not possible to make the settings in the laboratory. So, the C-OPS used for this cruise was still the one shared among the marine optics and remote sensing group at LOV. The instrument is similar to the BOUSSOLE one, yet has a Lu sensor instead of a Eu one**.** The sea cable length is shorter than the one of the BOUSSOLE instrument. Therefore the optical profiles were shorter (between 25 and 40m depth). The longer BOUSSOLE cable was only used from the third day of the cruise.
- The Hobilabs Hydroscat-6 (HS-6) neoprene cap was inadvertently left on the sensor during the CTD profile 01. The cap fell during the ascent of the CTD and was consequently lost. The first IOP profile can be used as a dark record for the HS-6 measurements.
- The samples collected for the CTD 01 and CTD 02 were placed in the freezer at -20°C instead of the liquid nitrogen container, after it was realized that the container was not enough filled.

Appendices

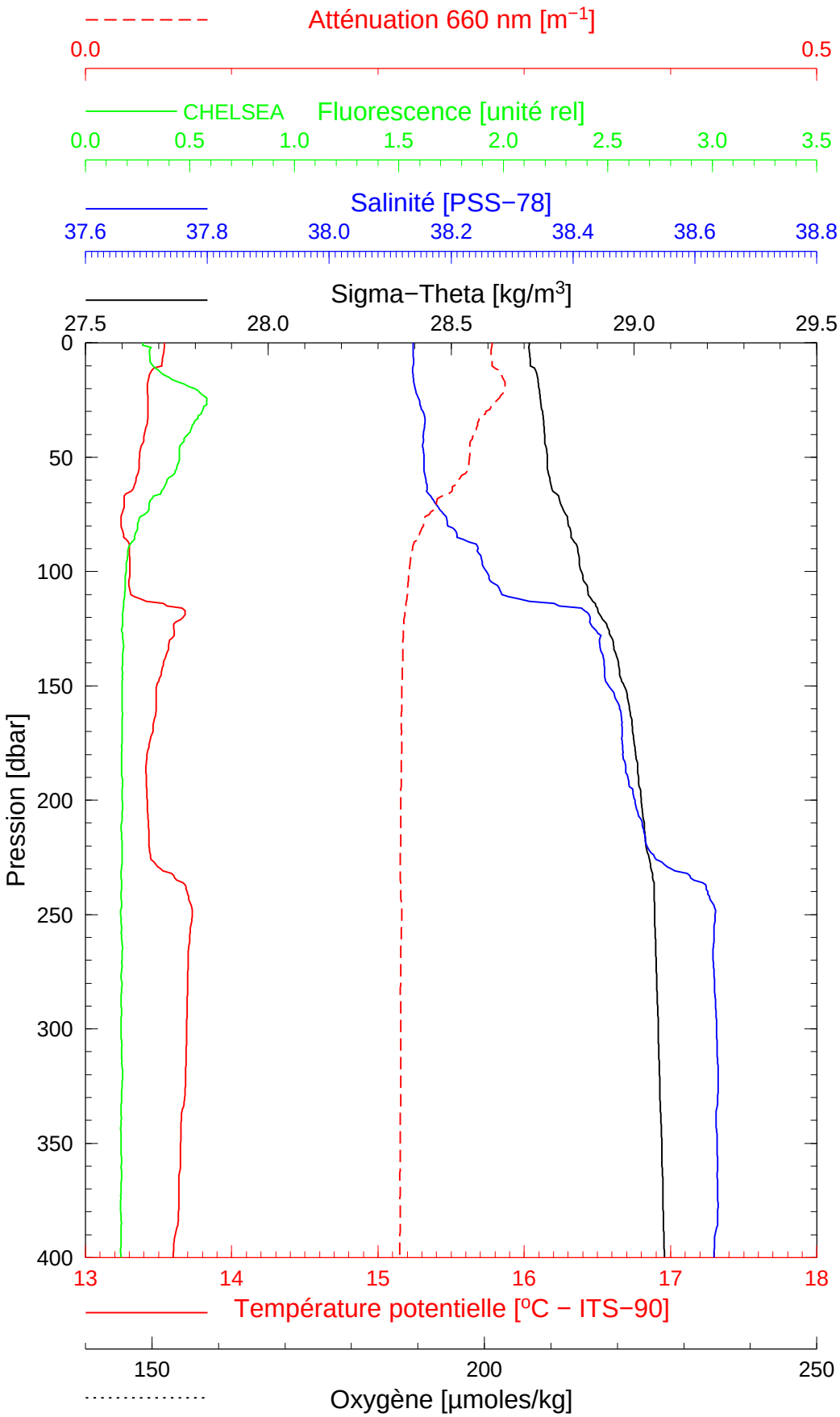
Cruise Summary Table for Boussole 145

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
			CTDBOUS001	HPLC, Ap, TSM	12:35	35:00	400	43	22.064	7	53.609	hazy		0	18	103	1028.8	54		13.7	13.5	calm			
	bou_c-ops_140312_1308_001_data.csv				13:16	1:21																		
		bou_c-ops_140312_1308_004_data.csv			13:49	2:24	56	43	22.328	7	54.044	blue	none	0	14.5	106	1028.2	55	excellent	13.4		calm	0.8		few
12/03/14		bou_c-ops_140312_1308_005_data.csv			13:56	2:04	50.3	43	22.412	7	54.156	blue	none	0	14.5	106	1028.2	55	excellent	13.4		calm	0.8		few
	bou_c-ops_140312_1308_006_data.csv				14:40	1:26																		
			CTDBOUS002	HPLC, Ap, CDOM	14:24	30:00	400	43	22.031	7	53.699	blue		0	19	94	1028.1	58		13.7	13.6	calm			
				Secchi01	15:00	4:00	13	43	22	7	54	blue		0					excellent			calm			
			CTDBOUS003	HPLC, Ap, TSM	11:11	32:00	400	43	21.846	7	53.442	blue		0	5	87	1027.9	58		14.7	13.9	calm			
				CIMEL01	12:38	6:00		43	21.923	7	53.885	blue		0					excellent						
				CIMEL02	12:45	5:00		43	21.923	7	53.885	blue		0					excellent						
				CIMEL03	12:51	4:00		43	21.923	7	53.885	blue		0					excellent						
13/03/14	bou_c-ops_130313_1210_001_data.csv				12:13	1:19																		
		bou_c-ops_130313_1210_002_data.csv			13:08	1:45	42	43	21.883	7	53.853	blue	none	0	2.1	43	1026.6	59	excellent	14.3		calm	0.3		no
		bou_c-ops_130313_1210_005_data.csv			13:24	1:33	37.2	43	22.056	7	53.678	blue	none	0	2.1	43	1026.6	59	excellent	14.3		calm	0.3		no
	bou_c-ops_130313_1210_006_data.csv				14:26	1:44																		
				Secchi02	14:15	4:00	16	43	22	7	54	blue		0					excellent			calm			
	bou_c-ops_130314_0818_001_data.csv				09:19	1:21																		
		bou_c-ops_130314_0818_003_data.csv			09:37	2:29	68.1	43	22.738	7	53.620	blue	Ci	2	9.2	80	1025.5	75	medium	13.8		calm	0.4		no
		bou_c-ops_130314_0818_004_data.csv			09:48	4:32	85.8	43	22.916	7	53.493	blue	Ci	2	9.2	80	1025.5	75	medium	13.8		calm	0.4		no
	bou_c-ops_130314_0818_006_data.csv				10:27	6:57																		
			CTDBOUS004	HPLC, Ap, TSM	10:24	29:00	400	43	22.386	7	53.738	blue		0	7	90	1025.4	72		14.1	13.7	calm			
	bou_c-ops_130314_1058_001_data.csv				10:59	1:22																		
		bou_c-ops_130314_1058_002_data.csv			11:06	3:18	79.9	43	22.294	7	53.944	cloudy	Ci&Cs	4	8.5	102	1025.1	73	medium	13.9		calm	0.4		no
		bou_c-ops_130314_1058_003_data.csv			11:17	3:04	74.2	43	22.467	7	53.930	cloudy	Ci&Cs	4	8.5	102	1025.1	73	medium	13.9		calm	0.4		no
14/03/14		bou_c-ops_130314_1058_004_data.csv			11:26	2:59	69.7	43	22.615	7	53.892	cloudy	Ci&Cs	4	8.5	102	1025.1	73	medium	13.9		calm	0.4		no
	bou_c-ops_130314_1058_005_data.csv				11:50	2:09																		
			CTDBOUS005		12:48	25:00	400	43	25.089	7	48.026	hazy		2	6.5	151	1024.5	79		14.1	13.8	calm			
			CTDBOUS006		13:45	24:00	400	43	27.924	7	41.824	hazy		2	2	333	1024.0	80		14.1	14.6	calm			
			CTDBOUS007		14:35	21:00	400	43	30.990	7	36.950	hazy		4	0		1023.7	63		14.6	14.7	calm			
			CTDBOUS008		15:25	19:00	400	43	34.033	7	30.942	hazy		7	4	132	1023.2	66		14.9	14.5	calm			
			CTDBOUS009		16:15	23:00	400	43	37.092	7	24.953	hazy		7	0		1022.9	60		15.1	14.4	calm			
			CTDBOUS010		17:00	25:00	400	43	39.066	7	20.985	hazy		7	4	262	1023.0	65		15.4	14.5	calm			
			CTDBOUS011	HPLC, Ap, TSM	09:24	29:00	400	43	22.249	7	53.973	hazy		6	5	266	1021.0	87		13.8	13.7	calm			
				Secchi03	10:00	4:00	14.25	43	22	7	54	blue		6					good			calm			
	bou_c-ops_130315_0923_001_data.csv				09:26	3:48																		
15/03/14		bou_c-ops_130315_0923_002_data.csv			11:37	2:54	68.6	43	22.456	7	54.258	blue	none	0	7.1	246	1019.7	72	good	14.1		calm	0.4		no
		bou_c-ops_130315_0923_003_data.csv			11:45	3:31	86.4	43	22.570	7	54.276	blue	none	0	7.1	246	1019.7	72	good	14.1		calm	0.4		no
		bou_c-ops_130315_0923_004_data.csv			11:57	2:49	66.5	43	22.715	7	54.401	blue	none	0	7.1	246	1019.7	72	good	14.1		calm	0.4		no
	bou_c-ops_130315_0923_005_data.csv				12:08	1:47																		


BOUSSOLE145
12 March 2014−15 March 2014
Nice
BOUS010
BOUS009
BOUS008
BOUS007
BOUS006
BOUS005
BOUS004
BOUS011
BOUS001
BOUS002
BOUS003
200
1000
2000
2300
2400
2100
2200
2600
buoy
Boussole site
03−12
03−13
03−14
03−15
Dyfamed site
44°00'N
43°50'N
43°40'N
43°30'N
43°20'N
43°10'N
43°00'N
7°00'E
7°10'E
7°20'E
7°30'E
7°40'E
7°50'E
8°00'E
43°24'N
43°22'N
43°20'N
7°50'E
7°52'E
7°54'E
7°56'E
7°58'E
8°00'E

BOUSSOLE 145 **12/03/2014** **BOUS140312_01**

BOUS001

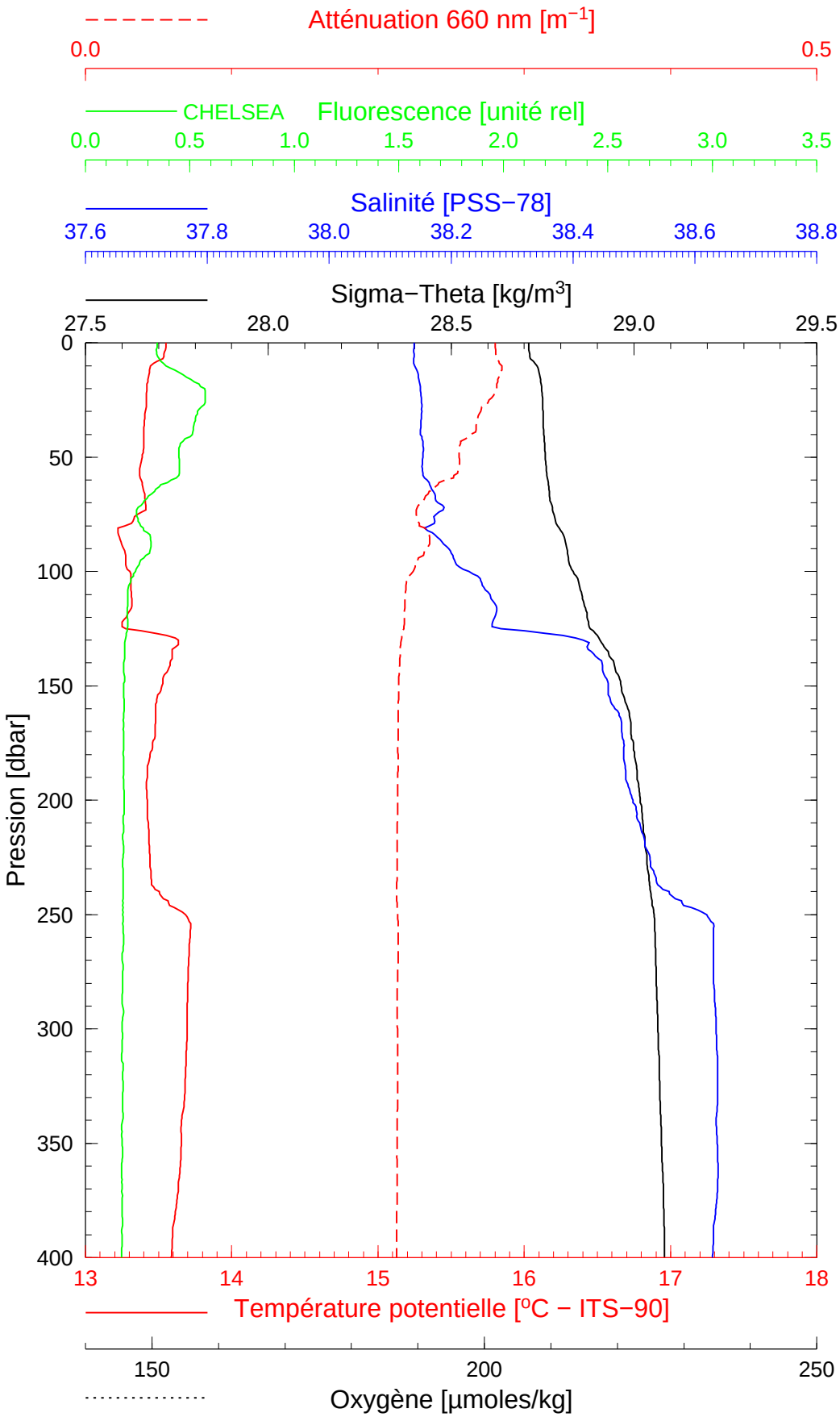


Date *12/03/2014* *Latitude* *43°22.064 N*

Heure déb *12h 35min [TU]* *Longitude* *07°53.609 E*

BOUSSOLE 145 **12/03/2014** **BOUS140312_02**

BOUS002

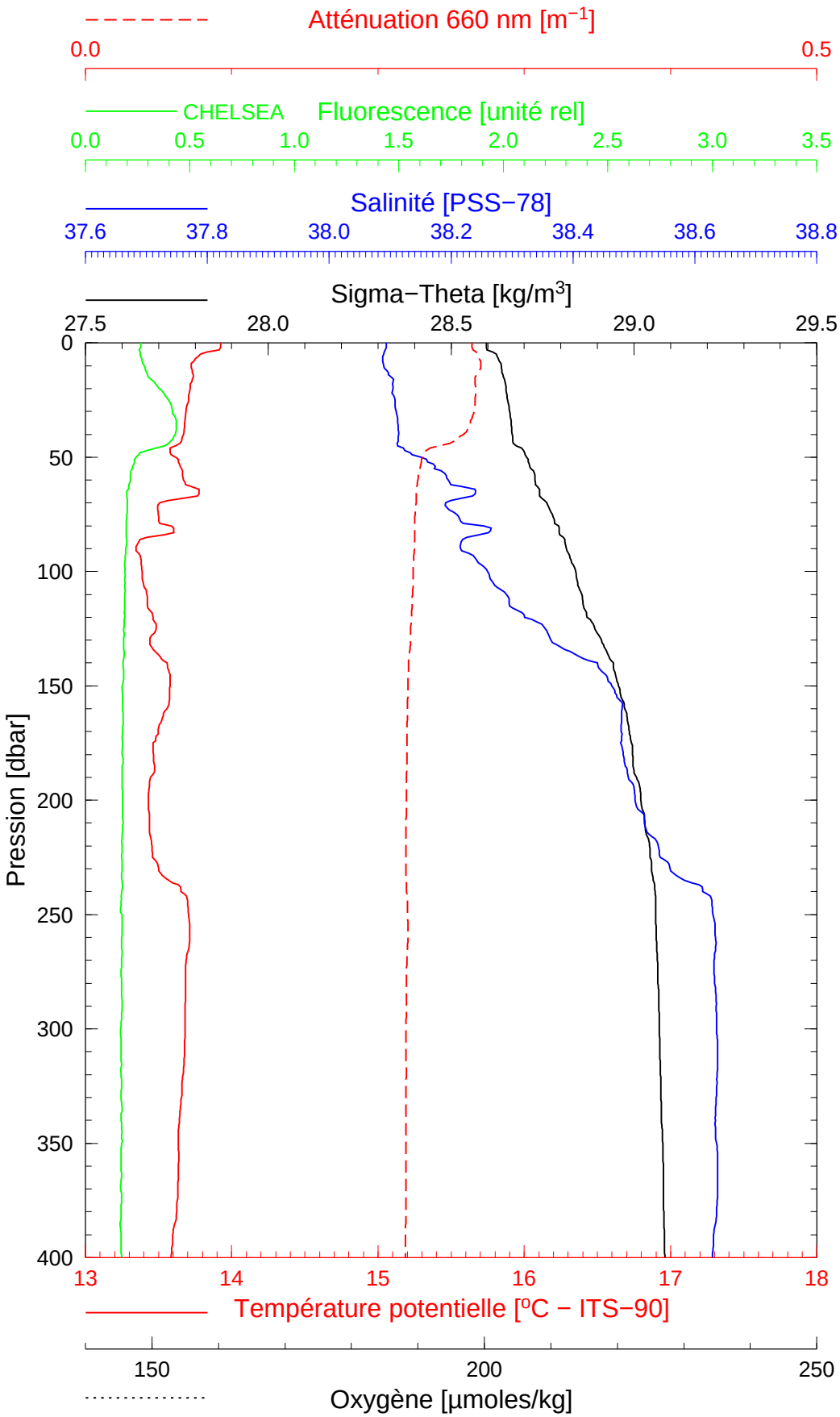


Date *12/03/2014* *Latitude* *43°22.031 N*

Heure déb *14h 24min [TU]* *Longitude* *07°53.699 E*

BOUSSOLE 145 **13/03/2014** **BOUS140313_01**

BOUS003

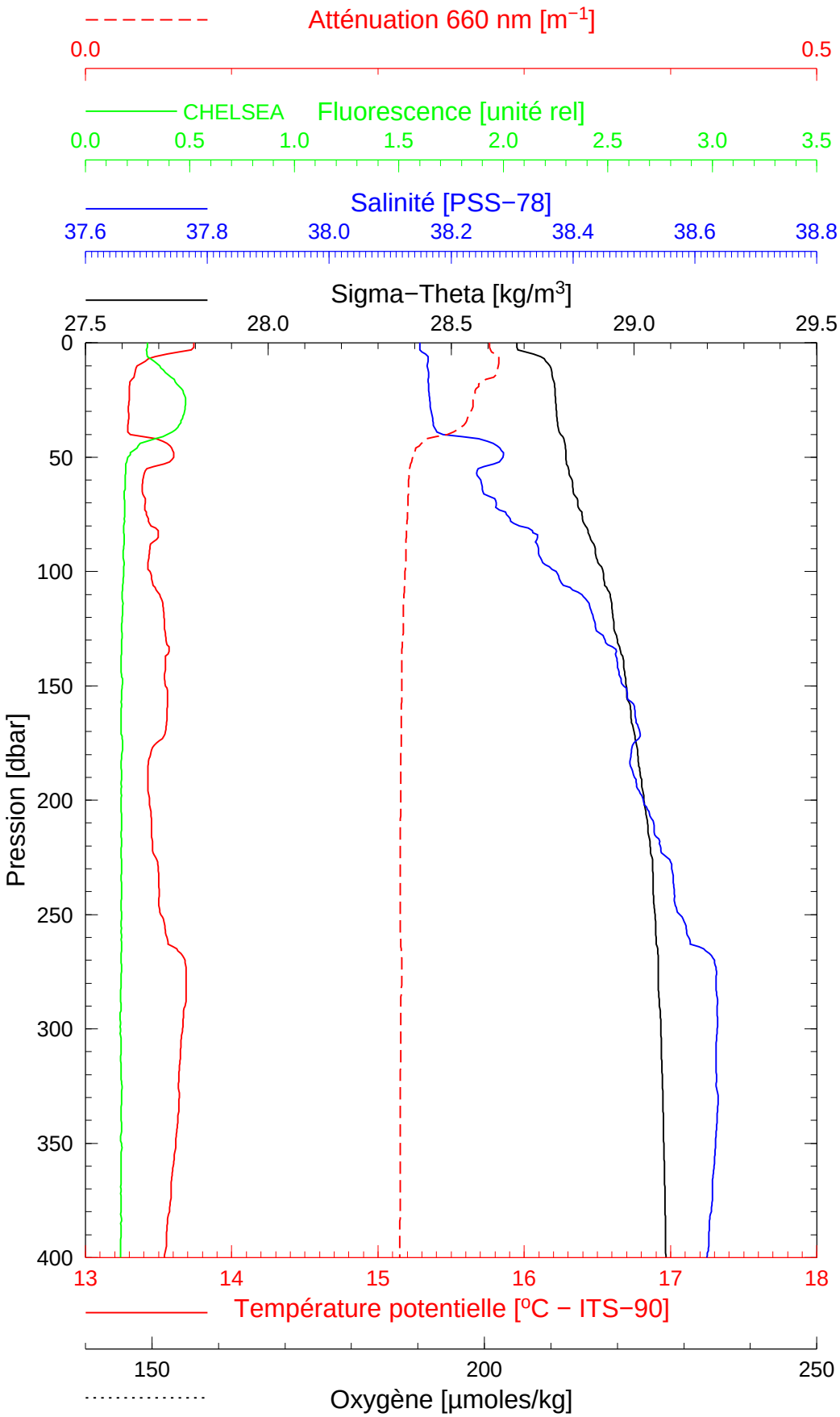


Date *13/03/2014* *Latitude* *43°21.846 N*

Heure déb *11h 11min [TU]* *Longitude* *07°53.442 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_01**

BOUS004

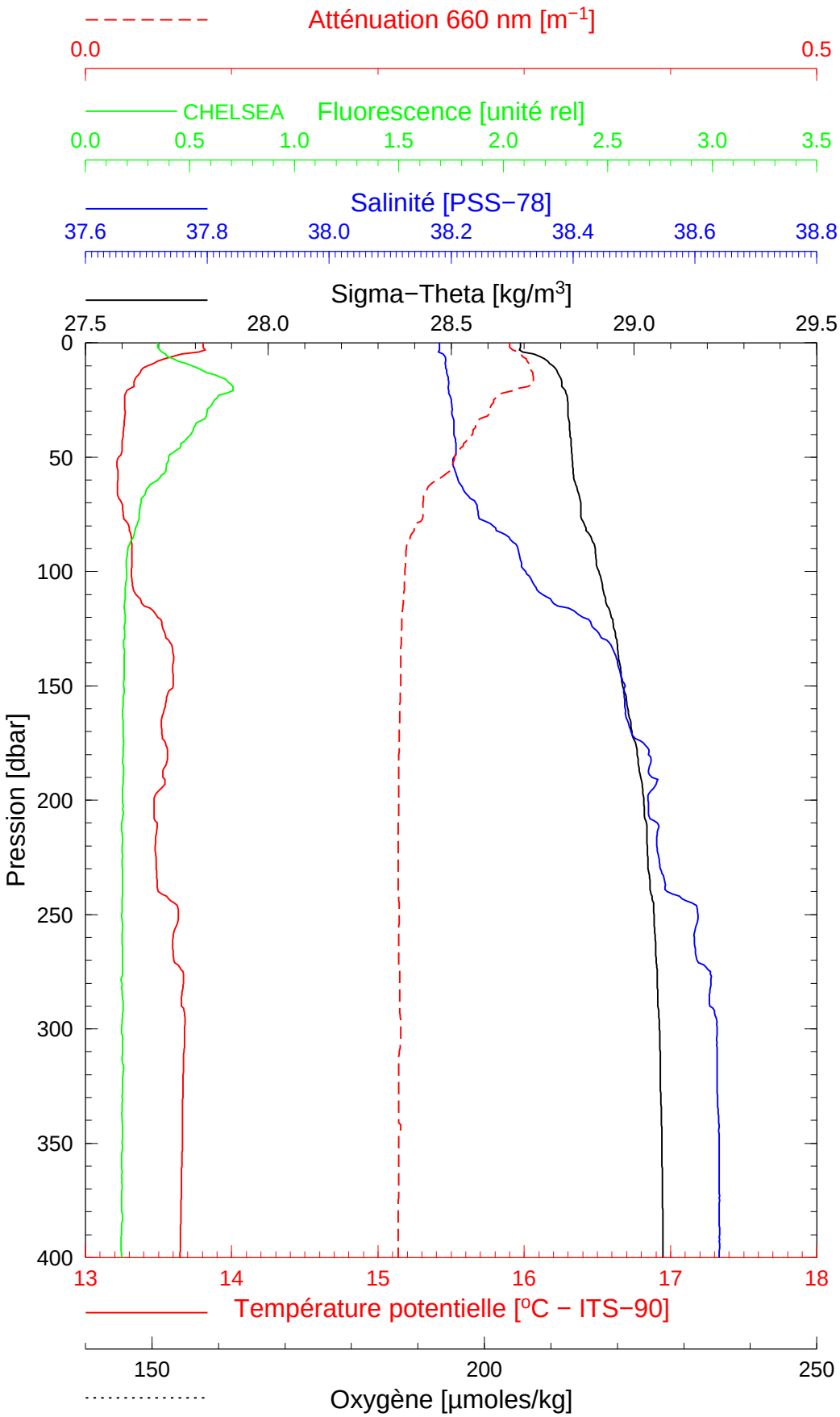


Date *14/03/2014* *Latitude* *43°22.386 N*

Heure déb *10h 24min [TU]* *Longitude* *07°53.738 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_02**

BOUS005



Date *14/03/2014* *Latitude* *43°25.089 N*

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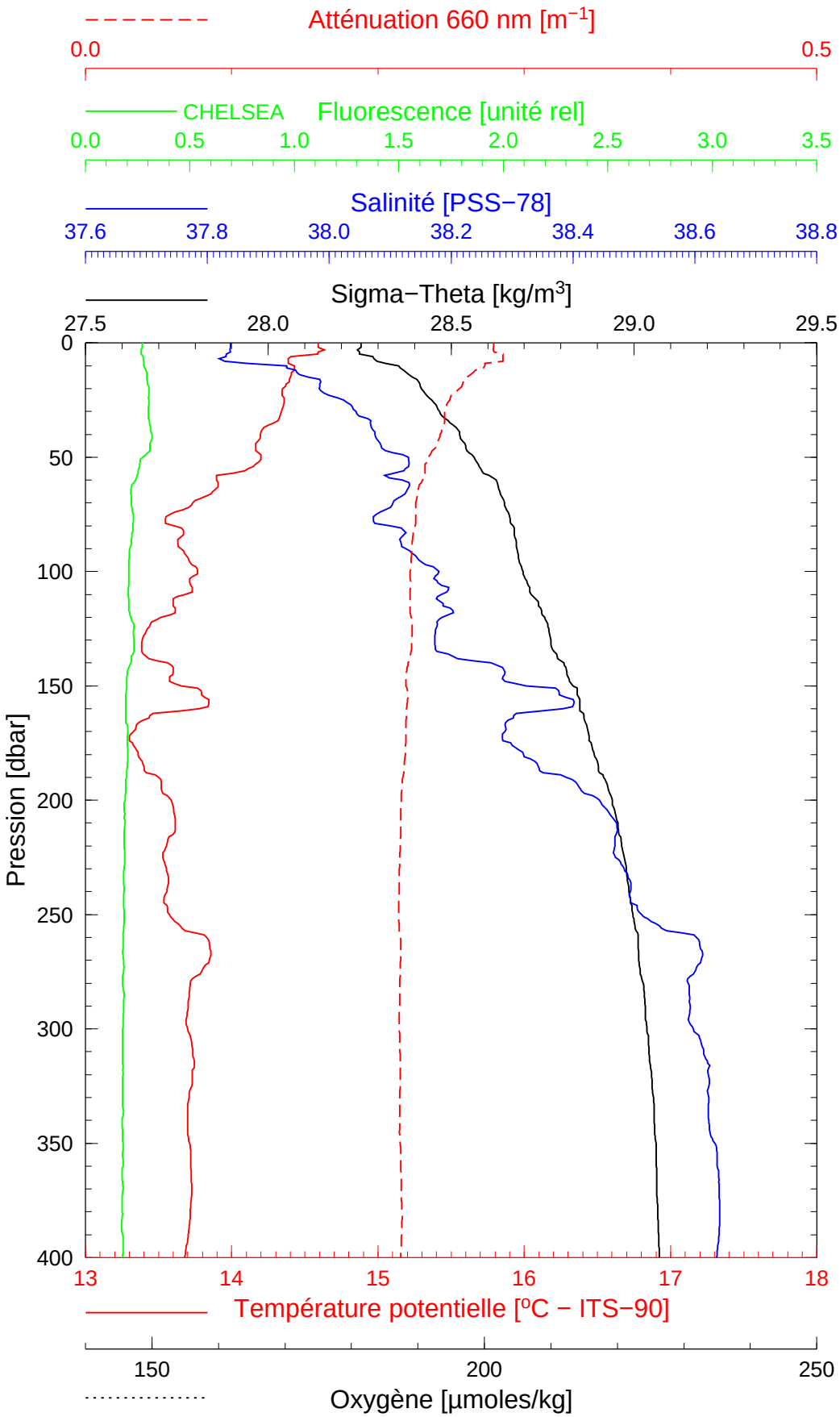
BOUSSOLE 145 **14/03/2014** **BOUS140314_03**

BOUS006



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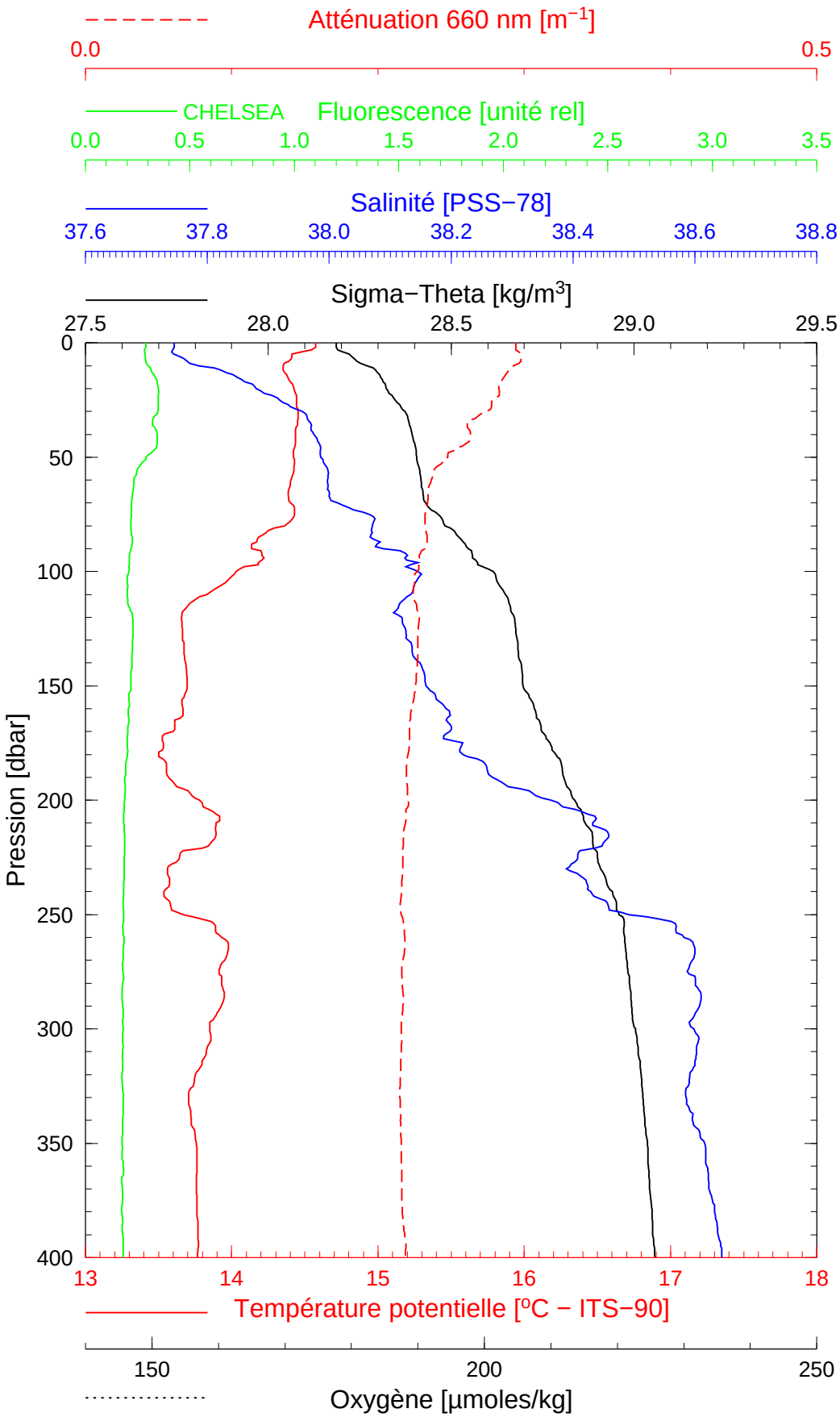
Heure déb *13h 45min [TU]* *Longitude* *07°41.824 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_04**

BOUS007



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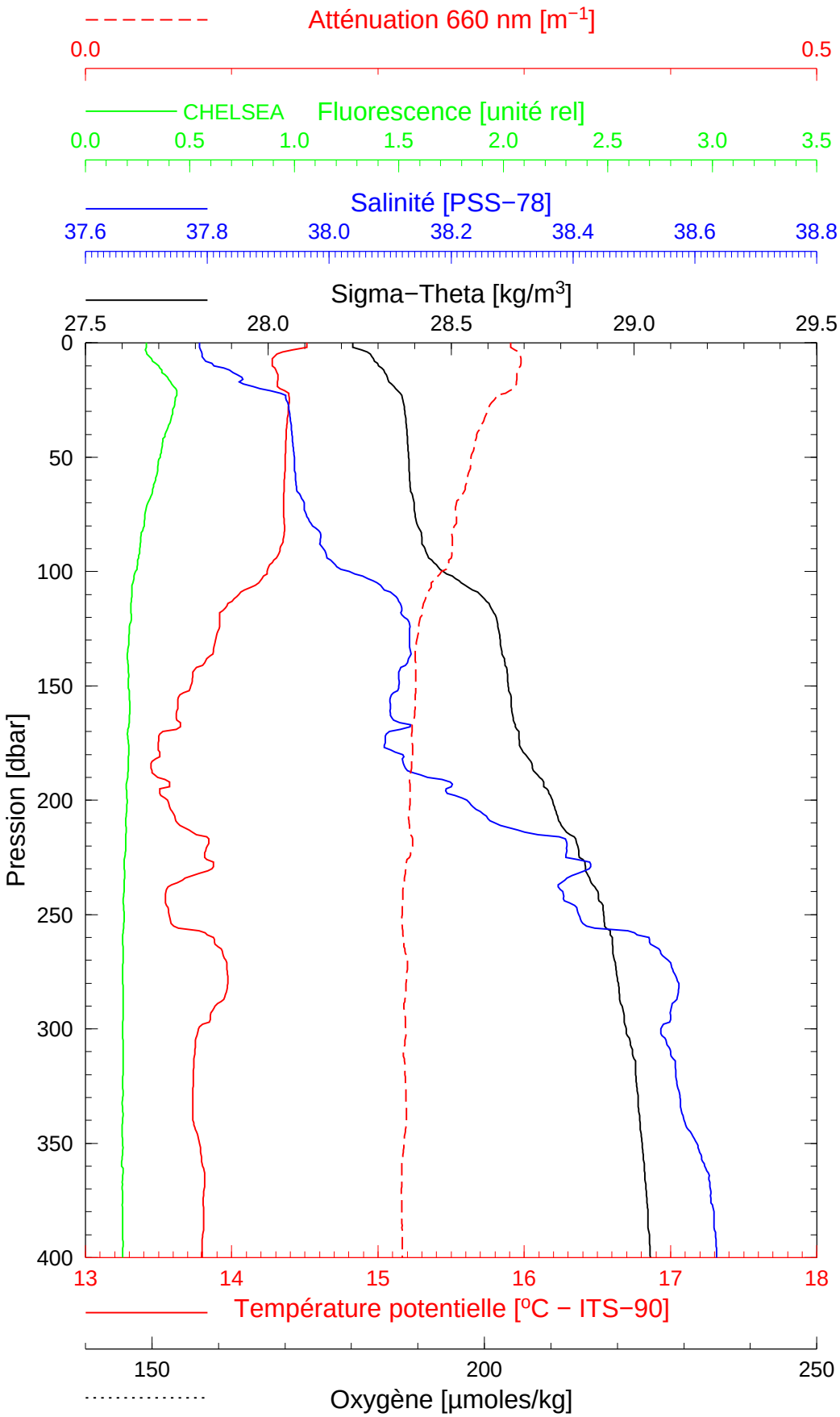
Heure déb *14h 35min [TU]* *Longitude* *07°36.950 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_05**

BOUS008

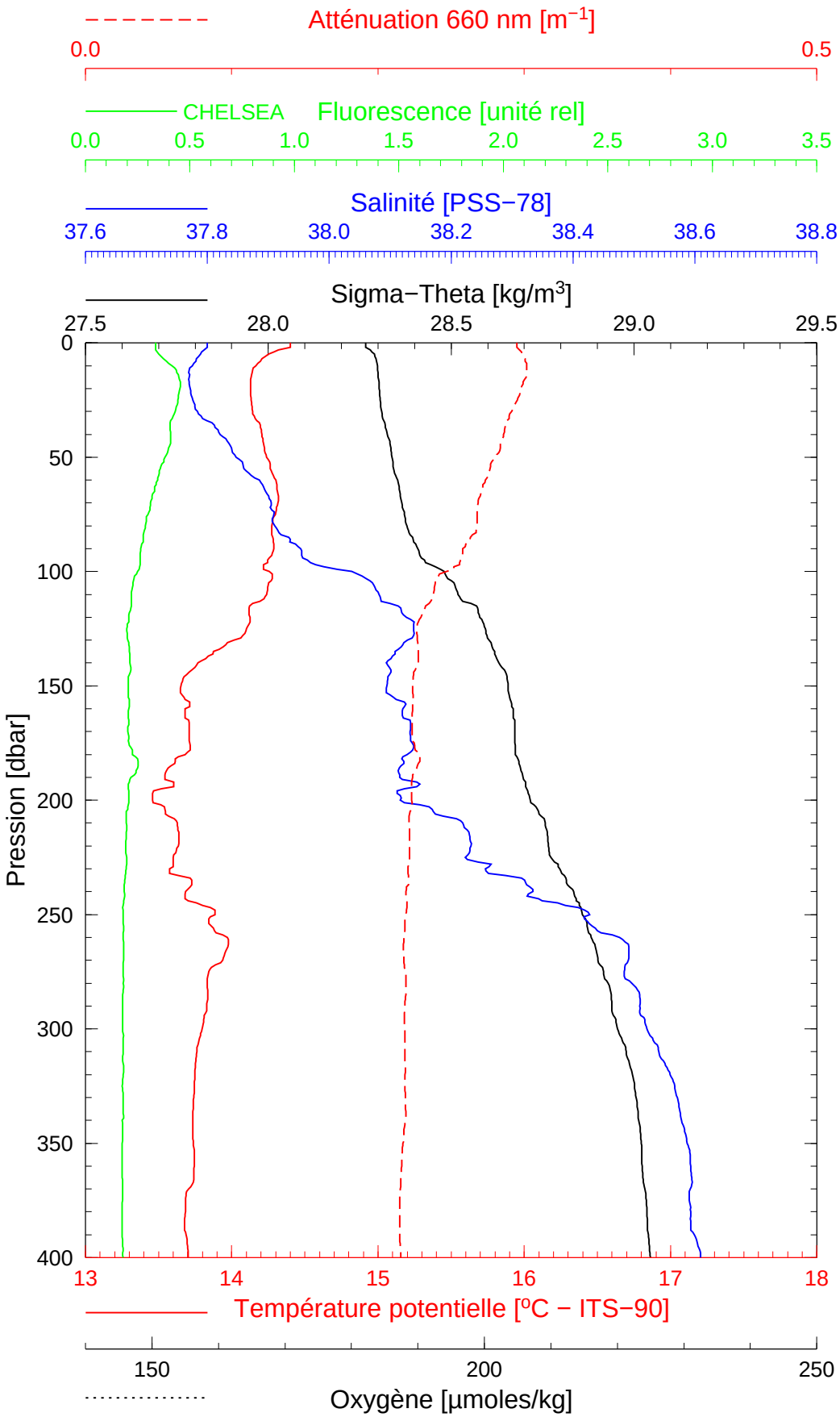


Date *14/03/2014* *Latitude* *43°34.033 N*

Heure déb *15h 25min [TU]* *Longitude* *07°30.942 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_06**

BOUS009

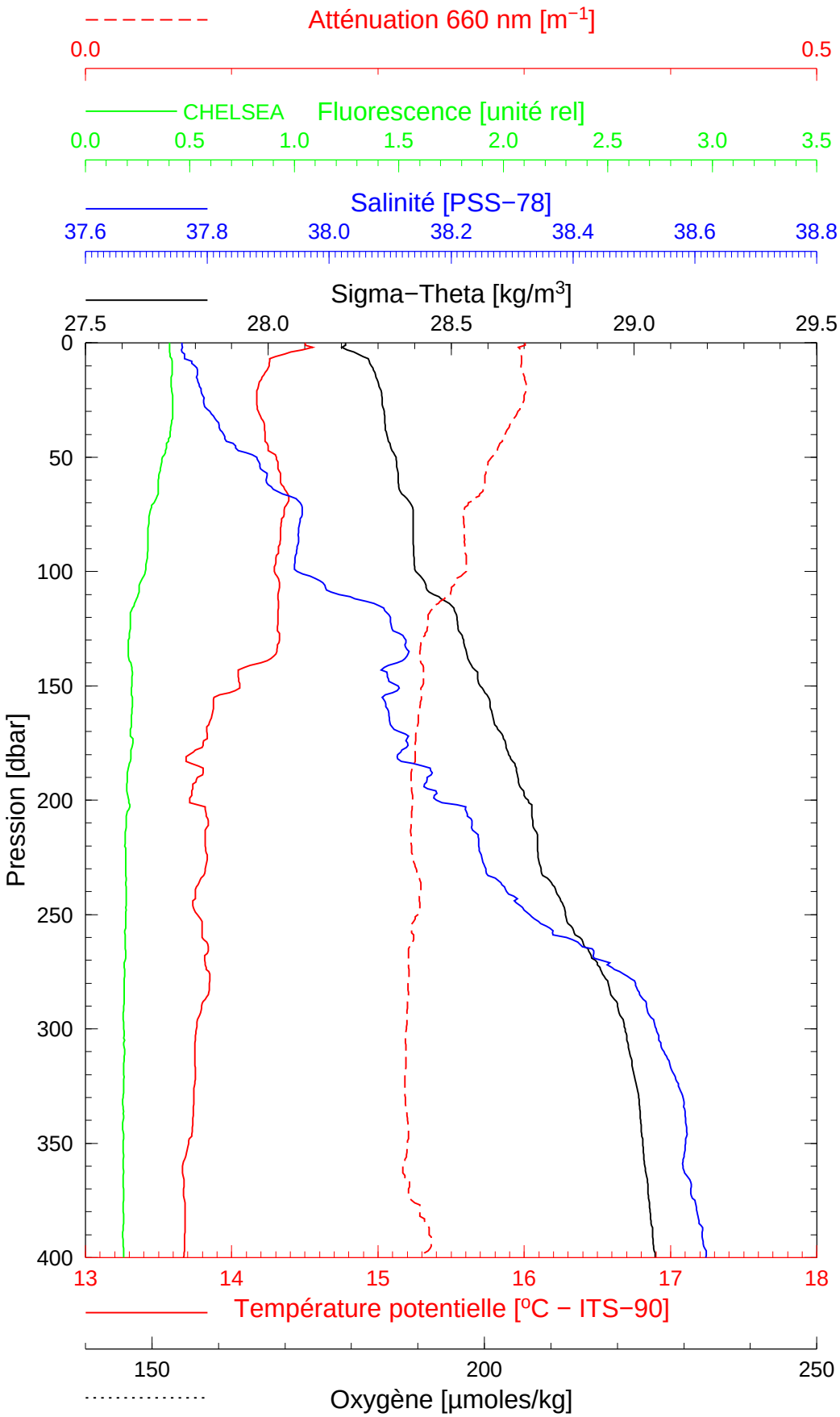


Date *14/03/2014* *Latitude* *43°37.092 N*

Heure déb *16h 15min [TU]* *Longitude* *07°24.953 E*

BOUSSOLE 145 **14/03/2014** **BOUS140314_07**

BOUS010

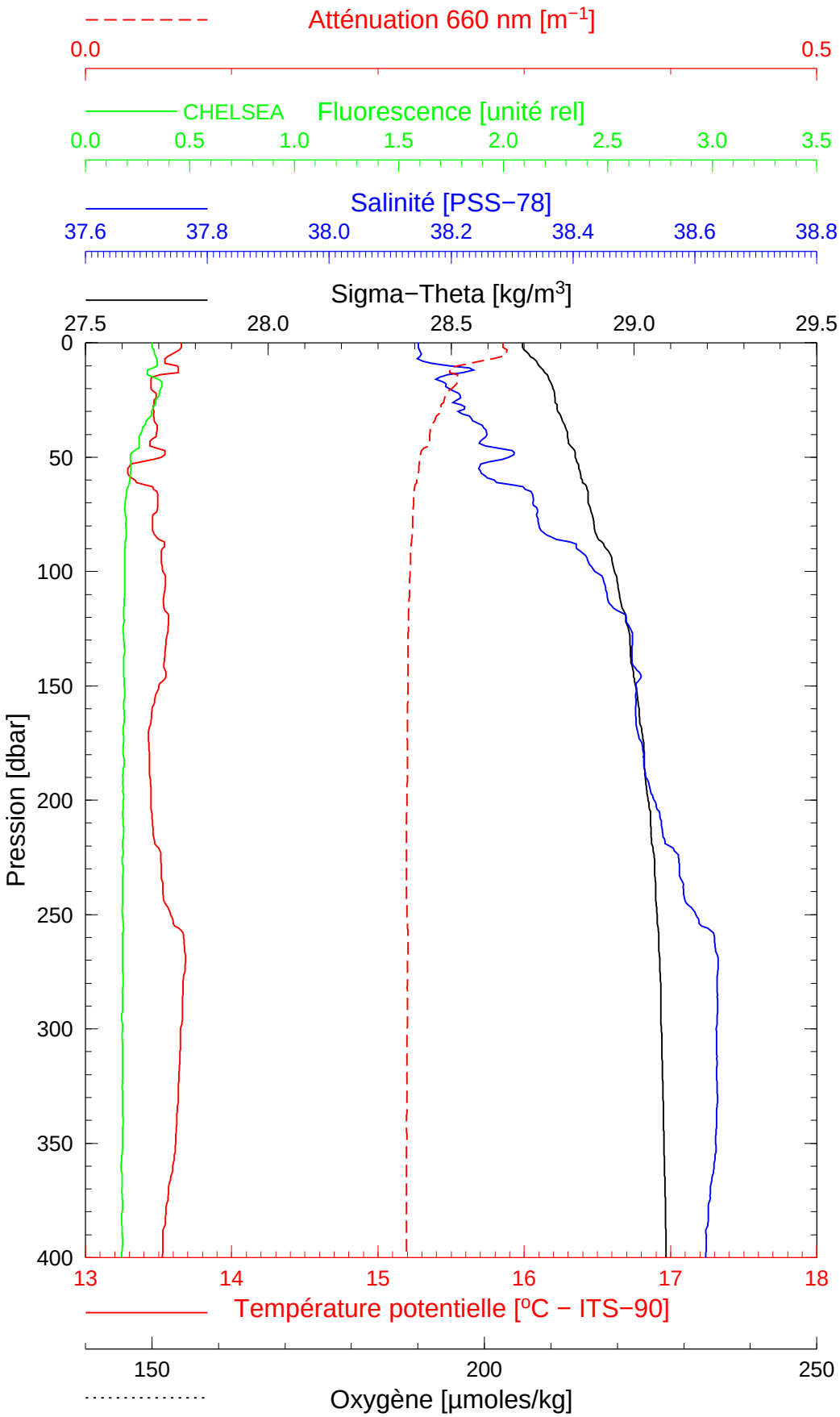


Date *14/03/2014* *Latitude* *43°39.066 N*

Heure déb *17h 00min [TU]* *Longitude* *07°20.985 E*

BOUSSOLE 145 **15/03/2014** **BOUS140315_01**

BOUS011



Date *15/03/2014* *Latitude* *43°22.249 N*

Heure déb *09h 24min [TU]* *Longitude* *07°53.973 E*