BOUSSOLE Monthly Cruise Report
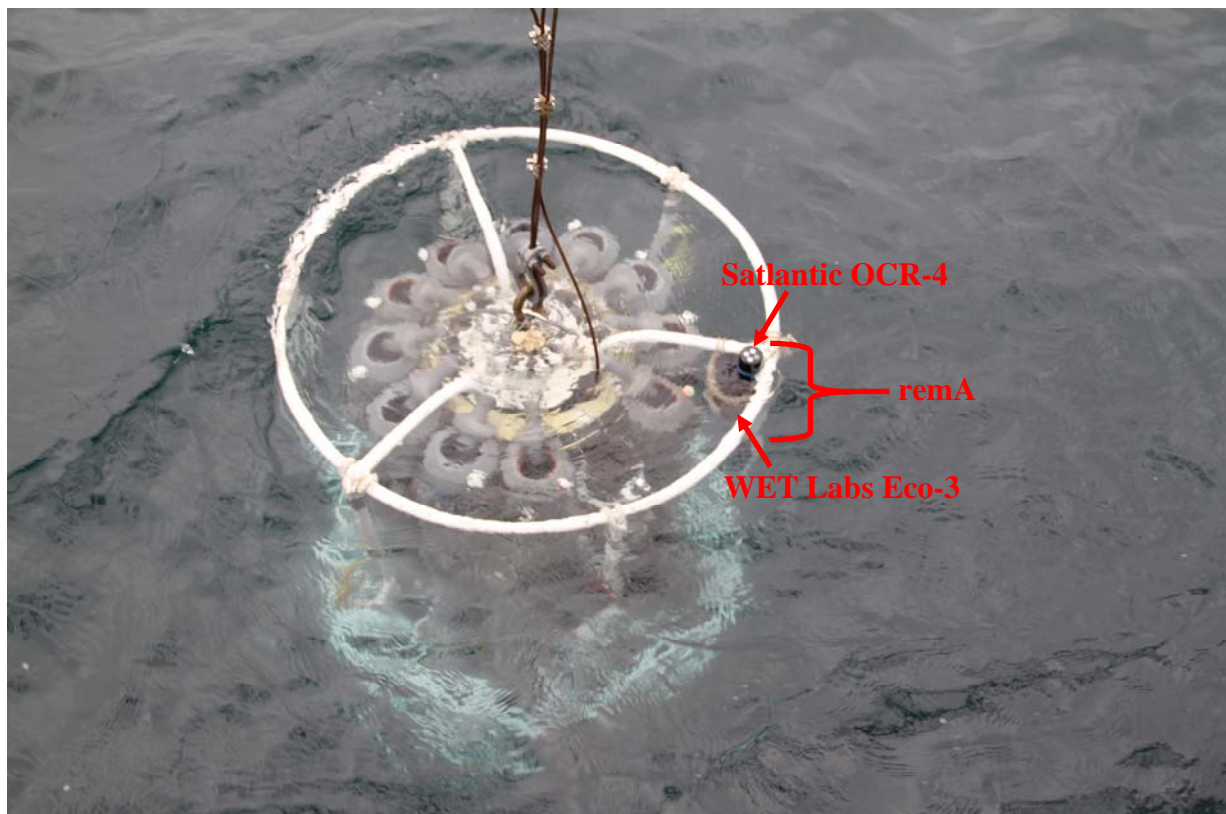
Cruise 122
April 04 - 07, 2012

Duty Chief: Emilie Diamond (diamond@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captain: Renaud Lebourhis)

Science Personnel: Emilie Diamond, Fayçal Kessouri, Yves Lamblard, Grigor Obolensky, Mustapha Ouhssain, Alice Webb and Pascal (diver).

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

The rosette onto which a remA sensor is installed in view of testing it. This kind of sensor is planned for being deployed on bio-optical profiling float for the remOcean project.

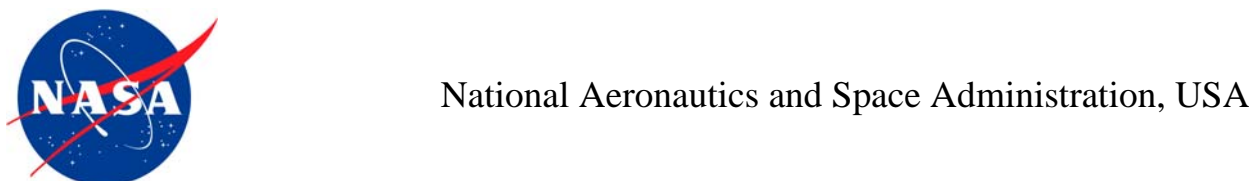## BOUSSOLE project

ESA/ESRIN contract N° 13226/10/I-NB

May 02, 2012

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 to occur on 0-150 m at the BOUSSOLE site within about 3 hours of satellite overhead passes (of MERIS in particular) 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. In addition to the depth profile from the CTD, CDOM fluorometer, Chl fluorometer, AC9 (from July 2002) and Eco-BB3 (from June 2003), seawater samples are to be collected, filtered and stored into liquid nitrogen for 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. From December 2011, hyperspectral absorption measurements are to be performed during the CTD deployments using a new "IOP package" including a Hobilabs hyperspectral absorption-meter (a-sphere), a backscattering meter (Hydroscat-6) and a spectral transmissometer (Gamma-4).

For one day of each cruise, in addition to a depth profile from the CTD, seawater samples are to be collected and filtered for colored dissolved organic matter (from June 2005) and particulate organic carbon (from October 2011) analysis in the lab. Small quantities of seawater are to be fixed with glutaraldehyde for cytometric analysis (from December 2011).

For one day of each cruise, at the end of the optics measurements on site, there will be one CTD transect between the BOUSSOLE site and the Port of Nice. This transect consists of six fixed locations on-route from BOUSSOLE (see map in appendix). The time of the day of this transect should be similar for each cruise, if possible to minimise the influence of diurnal variability.

For one day of each cruise, three divers will check the underwater state of the buoy structure and instrumentation, take some pictures for archiving, clean the sensor optical surfaces, and then take again some pictures after cleaning. Divers will also put a neoprene cap on the HS4 and on the transmissometers for acquiring three dark measurements (started in April 2009).

Further details about these operations and the 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

During this cruise, a remA sensor (including a Satlantic OCR-4 and a WET Labs Eco-3) was installed on the BOUSSOLE rosette and was connected to the Wet Labs DH-4 data logger to test it during the CTD casts. The second day, Mustapha Ouhssain was on board to compare different types of filtration for HPLC analyses.

Cruise Summary

The two first cruise days were used for optical profiles and CTD casts with water sampling at the BOUSSOLE site. The first day was also used for performing the CTD transect and the second day for diving operations. The third day, restrictions from the port authorities prevented departure from the Nice harbour and the last day, the bad weather prevented also the departure from the Nice harbour.

Wednesday 04 April 2012

The first day, the sea was smooth with a light air during the morning and slightly rough with a fresh breeze during the afternoon. The sky was overcast and rainy. When arrived at the BOUSSOLE site, 1 Secchi disk, 1 CTD cast with water sampling and 3 C-OPS profiles were performed. Then the CTD transect was performed.

Thursday 05 April 2012

The second day, the sea was smooth with a gentle breeze and the sky was blue or cloudy. When arrived at the BOUSSOLE site, 1 CTD cast with water sampling was performed. Then divers went at sea to clean buoy instruments. They also put neoprene caps on the HS4 and on the transmissometers at 4m for acquiring 1 set of dark measurements and they changed 3 locking sleeves of the buoy radiometers connectors. In parallel to diving operations, a direct connection with the buoy was established for data retrieval and solar panels, sensors and ARGOS and CISCO connectors on the top of the buoy were cleaned. Then 4 C-OPS profiles, 1 Secchi disk and 1 CTD cast with water sampling were performed.

Friday 06 April 2012

Restrictions from the port authorities prevented departure from the Nice harbour (Zonex 26 and 28 not allowed).

Saturday 07 April 2012

Bad weather prevented departure from the Nice harbour.

Cruise Report

Wednesday 04 April 2012 (UTC)

People on board: Emilie Diamond and Grigor Obolensky.
0545	Departure from the Nice harbour.
0900	Arrival at the BOUSSOLE site.
0930	Secchi disk 01 (7 m).
0935	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.
1100	C-OPS 01, 02, 03.
1200	Departure to the first transect station.
1245	CTD 02, 400 m, station 01 (43°25'N 07°48'E).
1350	CTD 03, 400 m, station 02 (43°28'N 07°42'E).
1445	CTD 04, 400 m, station 03 (43°31'N 07°37'E).
1550	CTD 05, 400 m, station 04 (43°34'N 07°31'E).
1650	CTD 06, 400 m, station 05 (43°37'N 07°25'E).
1745	CTD 07, 400 m, station 06 (43°39'N 07°21'E).
1810	Departure to the Nice harbour.
1835	Arrival at the Nice harbour.

Thursday 05 April 2012 (UTC)

People on board: Emilie Diamond and Grigor Obolensky.
0505	Departure from the Nice harbour.
0815	Arrival at the BOUSSOLE site.
0820	CTD 08, 200 m with water sampling at 10 and 5 m for HPLC tests.
0900	Direct connection with the buoy and data retrieval.
0905	Diving on the buoy for cleaning instruments. Substitution of 3 locking sleeves of the buoy radiometers connectors. Dark HS4 and 4m-transmissometer measurements at 09:15, 09:30 and 09:45.
0930	Cleaning of solar panels, sensors and ARGOS and CISCO connectors on the head of the buoy.
1045	C-OPS 04, 05.
1135	C-OPS 06, 07.
1155	Secchi disk 02 (9 m).
1215	CTD 09, 400 m with water sampling at 400, 200, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, POC, CDOM and cytometry.
1255	Bucket at surface for TSM.
1300	Departure to the Nice harbour.
1630	Arrival at the Nice harbour.

Friday 06 April 2012

Restrictions from the port authorities prevented departure from the Nice port. Zonex 26 and 28 were not allowed.

Saturday 07 April 2012

Bad weather prevented departure from the Nice harbour.

Problems identified during the cruise

- The third day, restrictions from the port authorities prevented departure from the Nice harbour (Zonex 26 and 28 not allowed) and the last day, bad weather prevented the departure from the Nice harbour.
- Data from the WET Labs CDOM fluorometer were still corrupted.
- In the CTD configuration files (.con), the SBE 43 Serial Number was #0587 instead of #0378. The files were corrected after the cruise and before data process.
- Oxygen data from the SBE 43 sensor SN #0378 were corrupted between 0 and 15 meters.

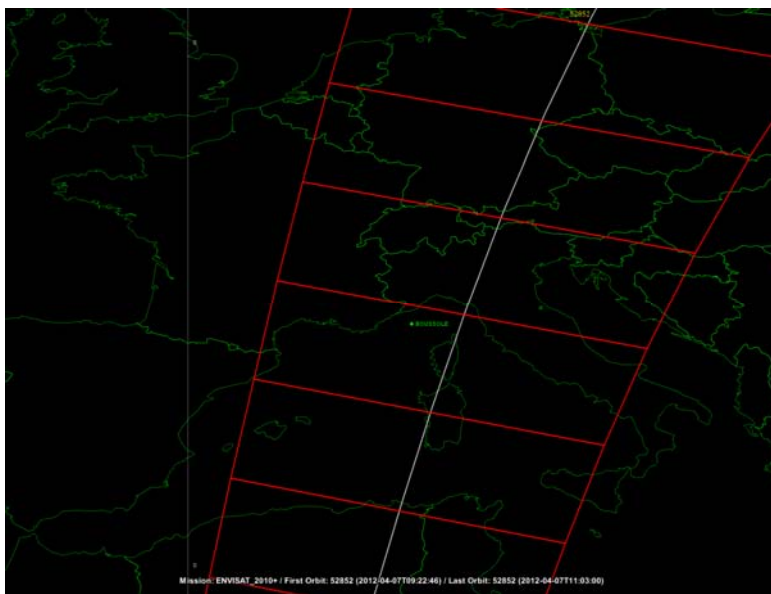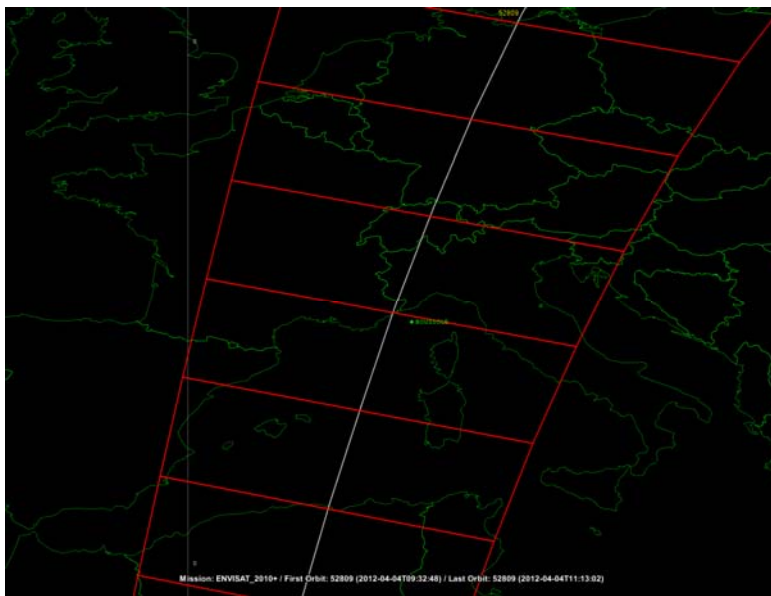## Calculated Swath paths for the MERIS Sensor (Esov NG Software)

Figure 1. Calculated swath path for MERIS (Esov NG software) above the BOUSSOLE site for the 04th and 07th of April 2012.
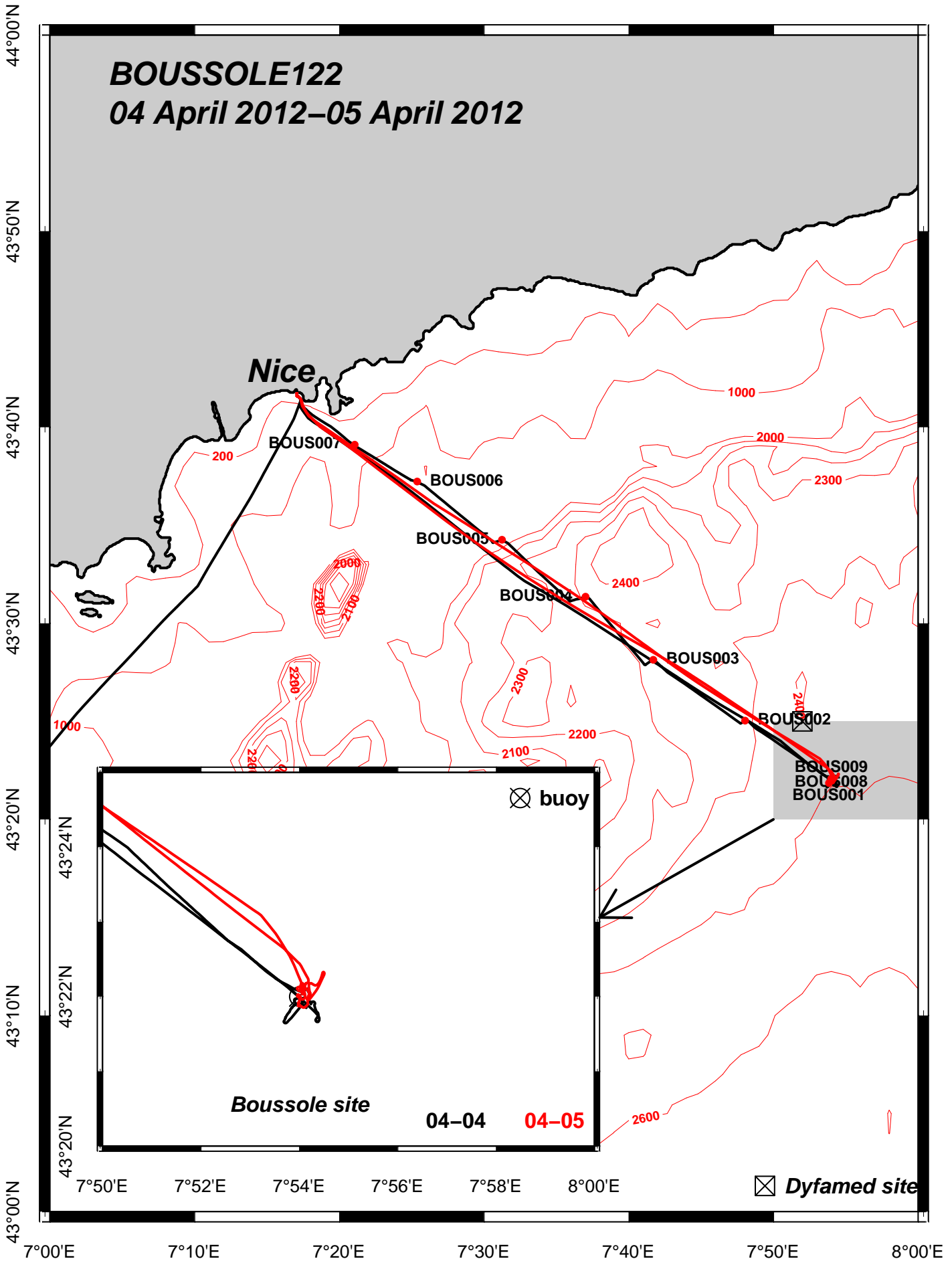
Appendices

Cruise Summary Table for Boussole 122

Date	Black names (file ext: ".raw")	Profile names (file extension: ".raw")	CTD notées / satellite overpass	Other sensors	Start Time GMT (hour.min)	Duration (min.sec)	Depth max (meter)	Latitude (N) (Degree)	(Minute)	longitude (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
				Secchi01	09:30	4:00	7	43	22	7	54	overcast		8					medium			calm			no
			CTDBOUS001	HPLC, Ap & TSM	09:41	37:00	400	43	21.856	7	53.841	overcast		8	7	277	1008	93		14.7	15.0	calm			no
	bou_c-ops_120404_1053_001_data.csv				10:54	1:11																			
		bou_c-ops_120404_1053_003_data.csv			11:09	4:21	105.8	43	21.931	7	54.220	overcast	Cb&Ns	8	5	99	1007.9	93	medium	14.9		calm	0.3		no
		bou_c-ops_120404_1053_004_data.csv			11:24	2:58	70.7	43	21.930	7	54.288	overcast	Cb&Ns	8	5	99	1007.9	93	medium	14.9		calm	0.3		no
		bou_c-ops_120404_1053_005_data.csv			11:35	3:12	72.2	43	21.795	7	54.358	overcast	Cb&Ns	8	5	99	1007.9	93	medium	14.9		calm	0.3		no
04/04/12	bou_c-ops_120404_1053_006_data.csv				11:47	1:17																			
			CTDBOUS002		12:51	25:00	400	43	25.038	7	48.044	overcast		8	9	120	1007	92		14.8	15.0	calm			no
			CTDBOUS003		13:52	25:00	400	43	28.139	7	41.702	overcast		8	8	260	1007	91		14.8	14.6	calm			no
			CTDBOUS004		14:55	28:00	400	43	31.359	7	37.019	rainy		8	17	50	1007	93		14.4	15.1	calm			yes
			CTDBOUS005		15:53	25:00	400	43	34.262	7	31.246	rainy		8	19	58	1006	89		13.6	14.8	moved			yes
			CTDBOUS006		16:50	29:00	400	43	37.233	7	25.386	rainy		8	15	104	1006	86		13.8	14.8	moved			few
			CTDBOUS007		17:45	26:00	400	43	39.111	7	21.068	rainy		8	8	101	1006	87		14.1	15.0	calm			no
			CTDBOUS008	HPLC	08:24	15:00	200	43	22.023	7	53.994	blue		2	5	86	1009	87		15.0	15.0	calm			no
	bou_c-ops_120405_1045_001_data.csv				10:47	1:14																			
		bou_c-ops_120405_1045_004_data.csv			11:01	3:24	81.4	43	22.058	7	54.218	blue	Cu	3	7	242	1009.3	80	good	15.0		calm	0.3		no
		bou_c-ops_120405_1045_005_data.csv			11:12	3:20	76	43	22.169	7	54.210	cloudy	Cu	5	7	242	1009.3	80	good	15.0		calm	0.3		no
05/04/12		bou_c-ops_120405_1045_006_data.csv			11:36	3:06	71.2	43	22.051	7	54.203	blue	Cu	3	7	242	1009.3	80	good	15.0		calm	0.3		no
		bou_c-ops_120405_1045_007_data.csv			11:46	3:08	72.9	43	22.138	7	54.097	blue	Cu	3	7	242	1009.3	80	good	15.0		calm	0.3		no
	bou_c-ops_120405_1045_008_data.csv				12:01	1:15																			
				Secchi02	11:55	4:00	9	43	22	7	54	cloudy		4					good			calm			no
			CTDBOUS009	HPLC, Ap, CDOM, POC & cyto	12:19	32:00	400	43	22.075	7	53.996	blue		2	7	93	1009	81		15.2	15.6	calm			no
				Bucket: TSM	12:55	2:00	surface	43	22	7	54	blue		2	7	93	1009	81		15.2		calm			no
06/04/12											Work on BOUSSOLE site not allowed														
07/04/12											Bad weather														

BOUSSOLE122
04 April 2012–05 April 2012

BOUSSOLE 122　　　**04/04/2012**　　　**BOUS120404_01**

BOUS001

Atténuation 660 nm [m^{-1}]

0.0　　　　　　　0.5　　　　　　　1.0

CHELSEA　Fluorescence [unité rel]　CDOM

0.0　　　0.5　　　1.0　　　1.5　　　2.0

Salinité [PSS−78]

37.8　　38.0　　38.2　　38.4　　38.6　　38.8

Sigma−Theta [kg/m^3]

28.5　　　　　　29.0

Pression [dbar]

0　50　100　150　200　250　300　350　400

13　　　14　　　15　　　16

Température potentielle [ºC − ITS−90]

100　　150　　200　　250　　300

Oxygène [µmoles/kg]
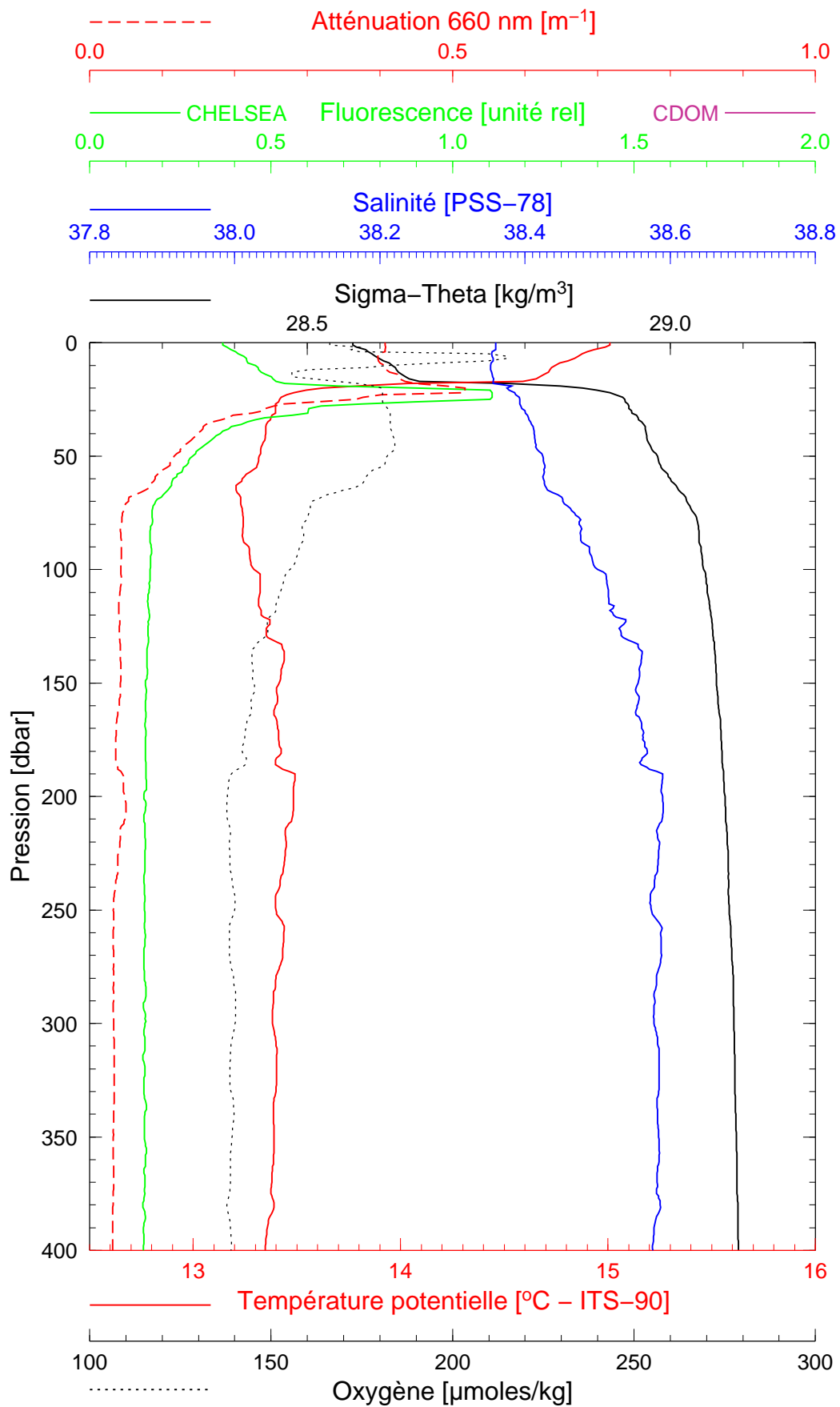
| Date | 04/04/2012 | Latitude | 43º21.856 N |
| Heure déb | 09h 41min [TU] | Longitude | 07º53.841 E |

BOUSSOLE 122   04/04/2012   BOUS120404_02

BOUS002

Atténuation 660 nm [m^{-1}]

| 0.0 | 0.5 | 1.0 |

CHELSEA   Fluorescence [unité rel]   CDOM

| 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |

Salinité [PSS–78]

| 37.8 | 38.0 | 38.2 | 38.4 | 38.6 | 38.8 |

Sigma–Theta [kg/m^3]

28.5   29.0

Pression [dbar]

13   14   15   16

Température potentielle [ºC – ITS–90]

100   150   200   250   300

Oxygène [µmoles/kg]
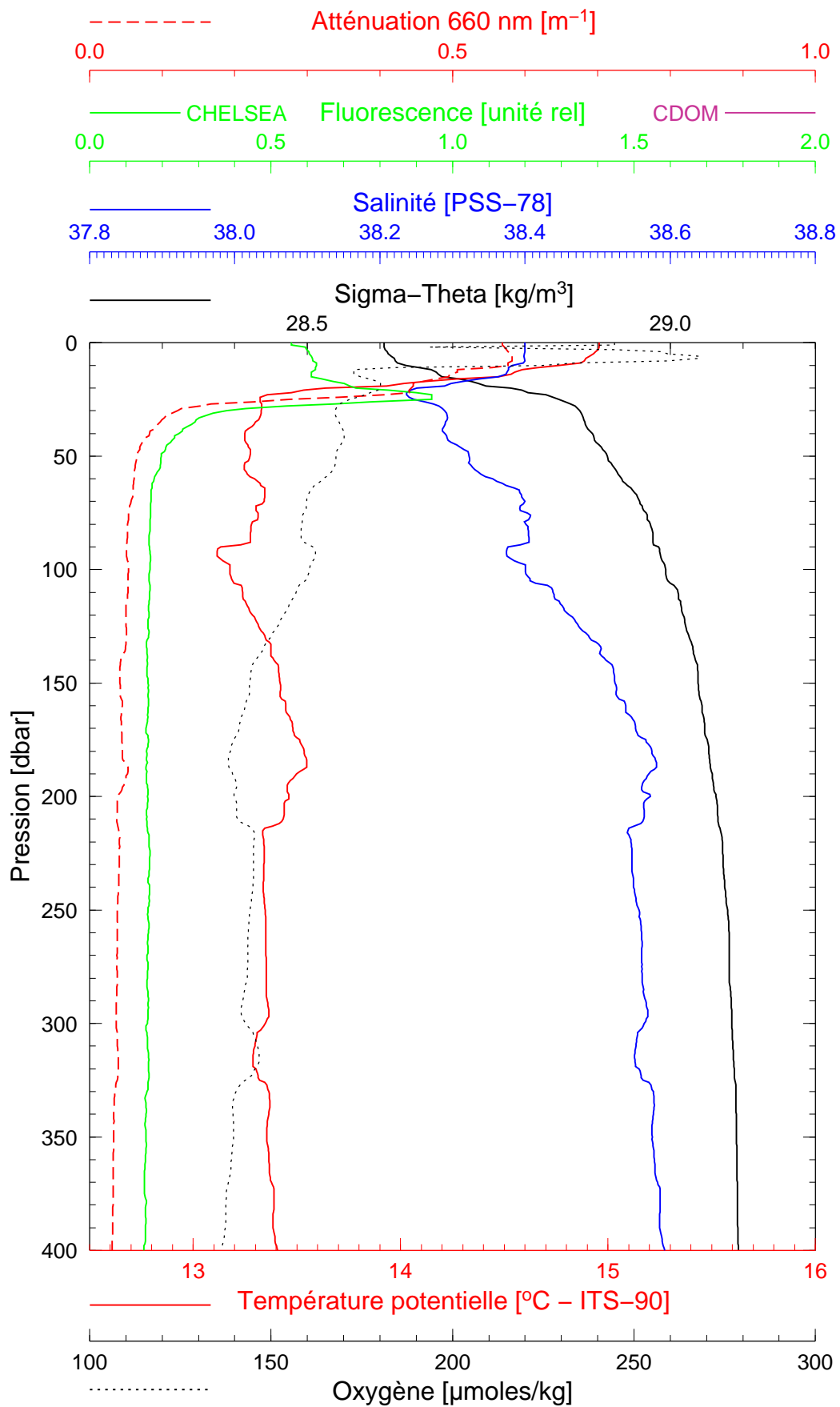
Date   04/04/2012   Latitude   43º25.038 N
Heure déb   12h 51min [TU]   Longitude   07º48.044 E

BOUSSOLE 122 **04/04/2012** **BOUS120404_03**

BOUS003

Atténuation 660 nm [m⁻¹]

CHELSEA Fluorescence [unité rel] CDOM

Salinité [PSS−78]

Sigma−Theta [kg/m³]

Pression [dbar]

Température potentielle [ºC − ITS−90]

Oxygène [µmoles/kg]
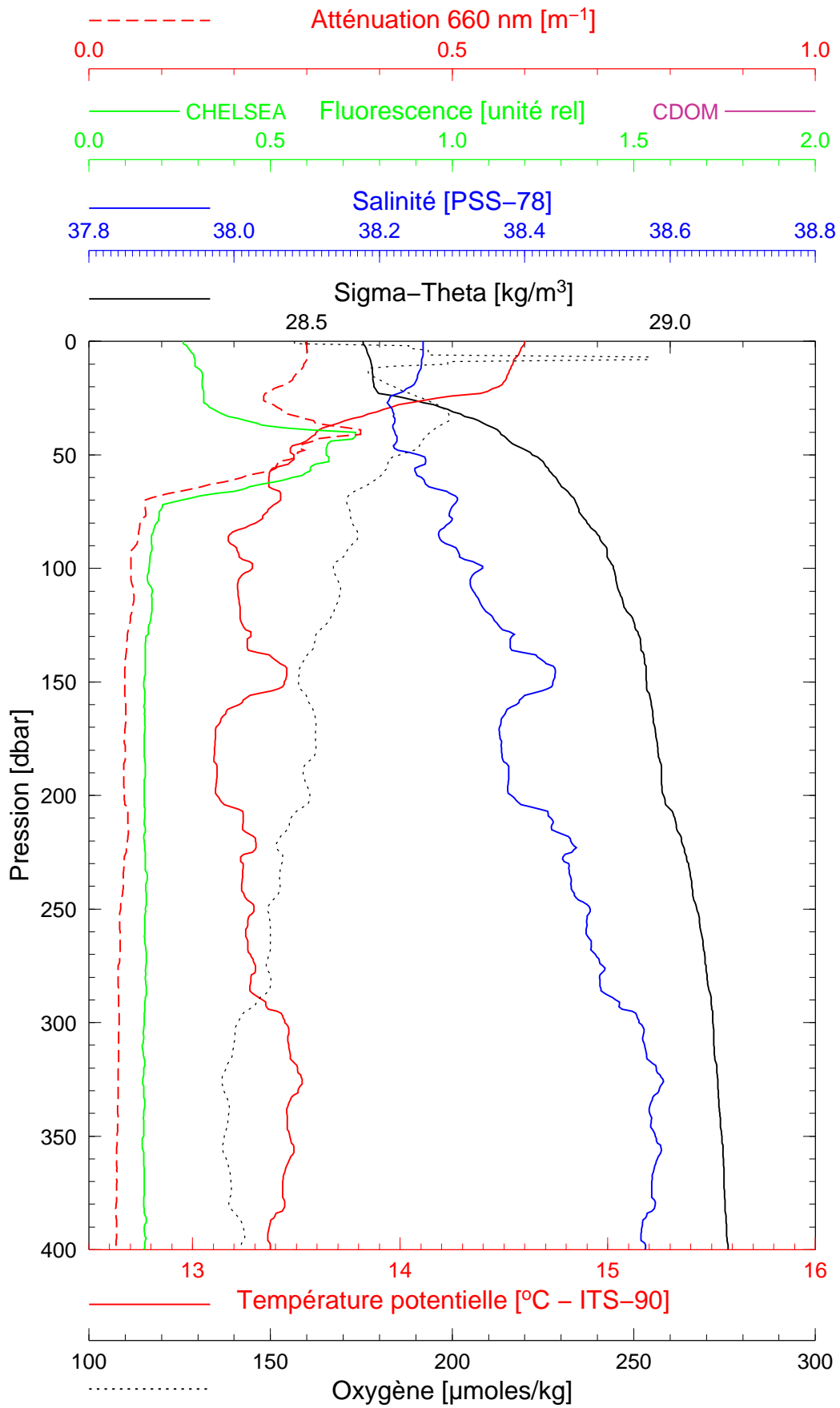
| Date | 04/04/2012 | Latitude | 43º28.1398 |
| Heure déb | 13h 52min [TU] | Longitude | 07º41.702 E |

BOUSSOLE 122   **04/04/2012**   **BOUS120404_04**
BOUS004

Atténuation 660 nm [m⁻¹]

0.0   0.5   1.0

CHELSEA   Fluorescence [unité rel]   CDOM

0.0   0.5   1.0   1.5   2.0

Salinité [PSS−78]

37.8   38.0   38.2   38.4   38.6   38.8

Sigma−Theta [kg/m³]

28.5   29.0

Pression [dbar]

0
50
100
150
200
250
300
350
400

13   14   15   16
Température potentielle [°C − ITS−90]

100   150   200   250   300
Oxygène [µmoles/kg]
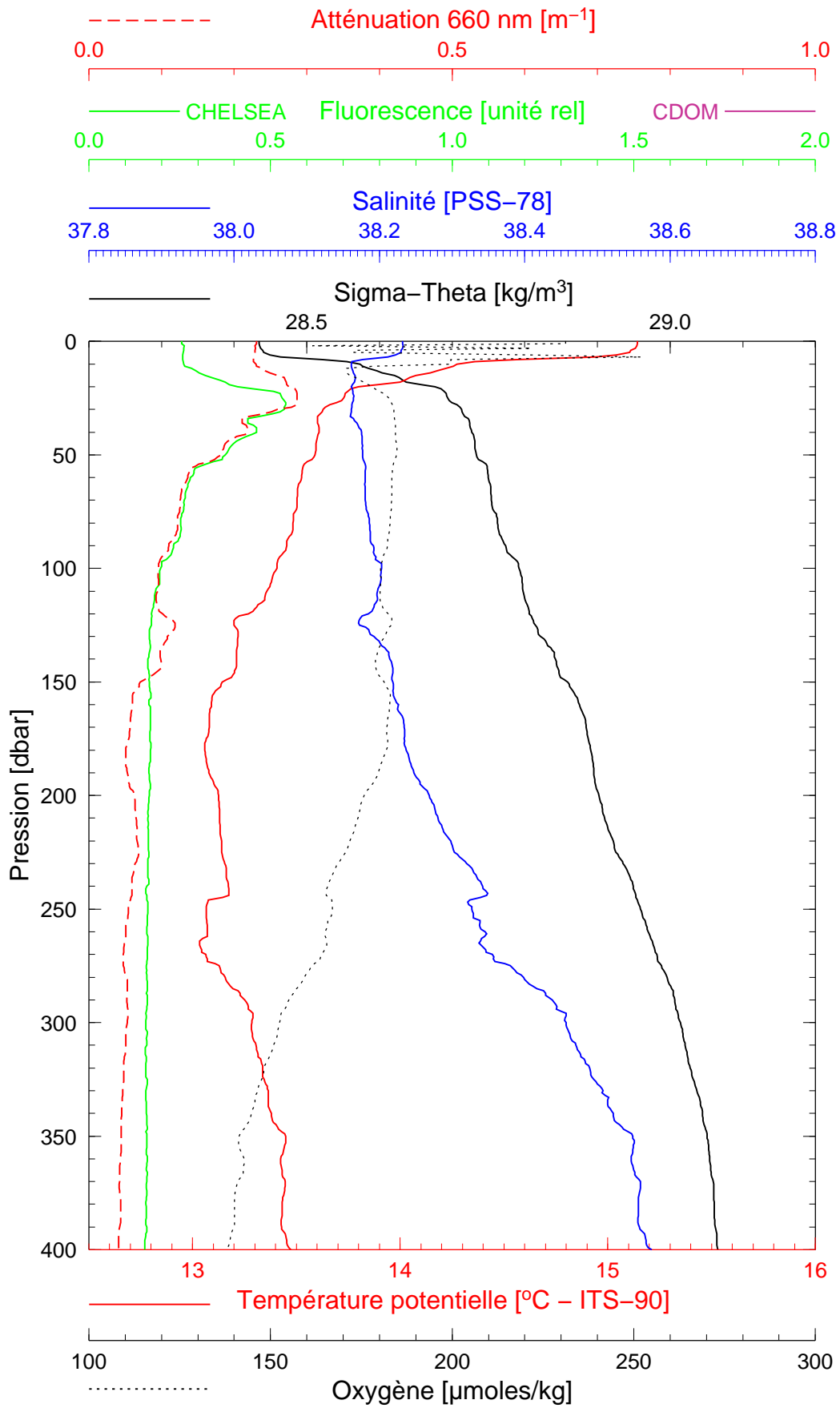
| Date | 04/04/2012 | Latitude | 43°31.359 N |
| Heure déb | 14h 55min [TU] | Longitude | 07°37.019 E |

BOUSSOLE 122   04/04/2012   BOUS120404_05

BOUS005

Atténuation 660 nm [m⁻¹]

CHELSEA   Fluorescence [unité rel]   CDOM

Salinité [PSS-78]

Sigma-Theta [kg/m³]

Température potentielle [°C – ITS-90]

Oxygène [µmoles/kg]
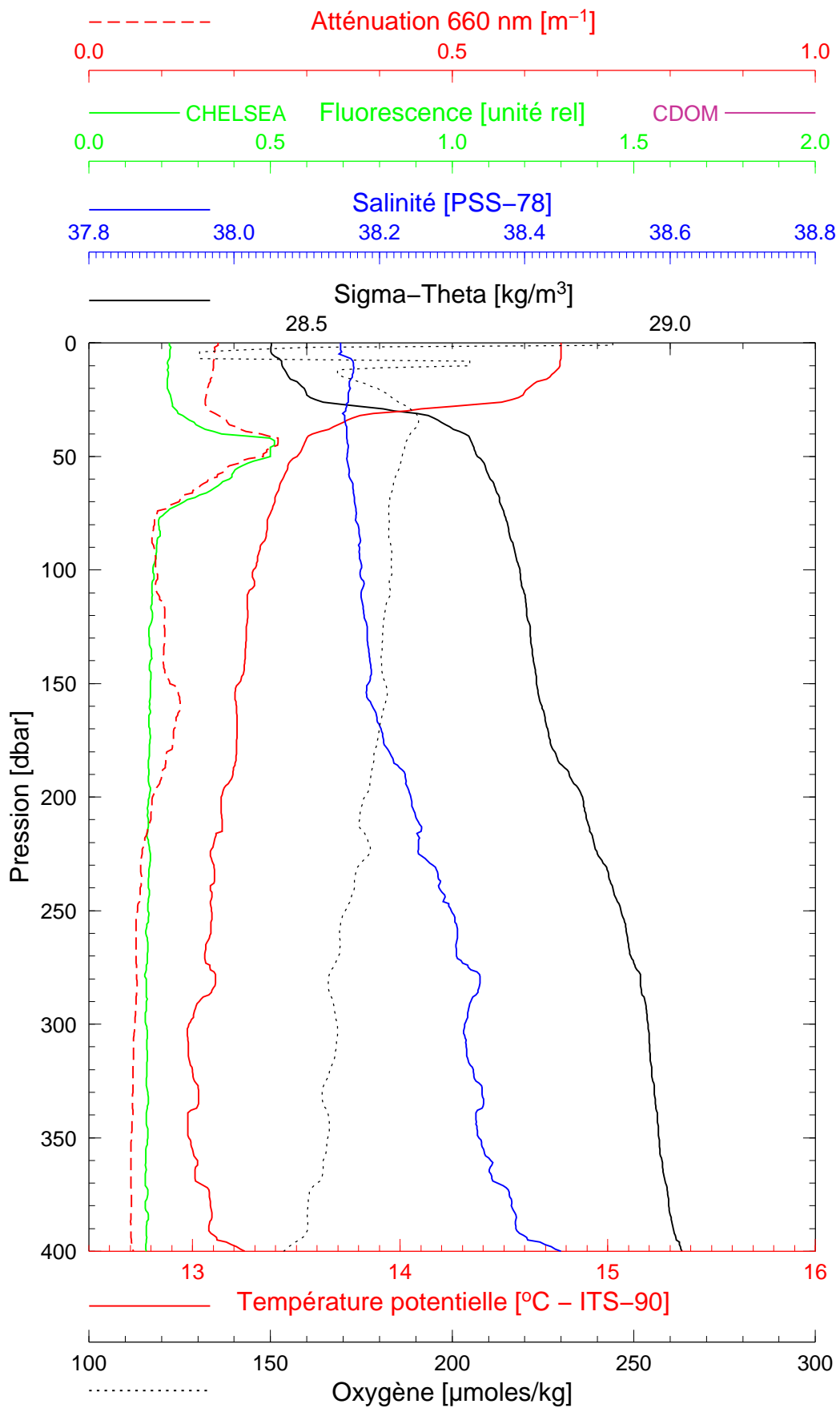
Date	*04/04/2012*	*Latitude*	*43°34.262 N*
Heure déb	*15h 53min [TU]*	*Longitude*	*07°31.246 E*

BOUSSOLE 122   04/04/2012   BOUS120404_06
BOUS006

Atténuation 660 nm [m⁻¹]

| 0.0 | 0.5 | 1.0 |

CHELSEA Fluorescence [unité rel]   CDOM

| 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |

Salinité [PSS–78]

| 37.8 | 38.0 | 38.2 | 38.4 | 38.6 | 38.8 |

Sigma–Theta [kg/m³]

Pression [dbar]

Température potentielle [°C – ITS–90]

Oxygène [µmoles/kg]
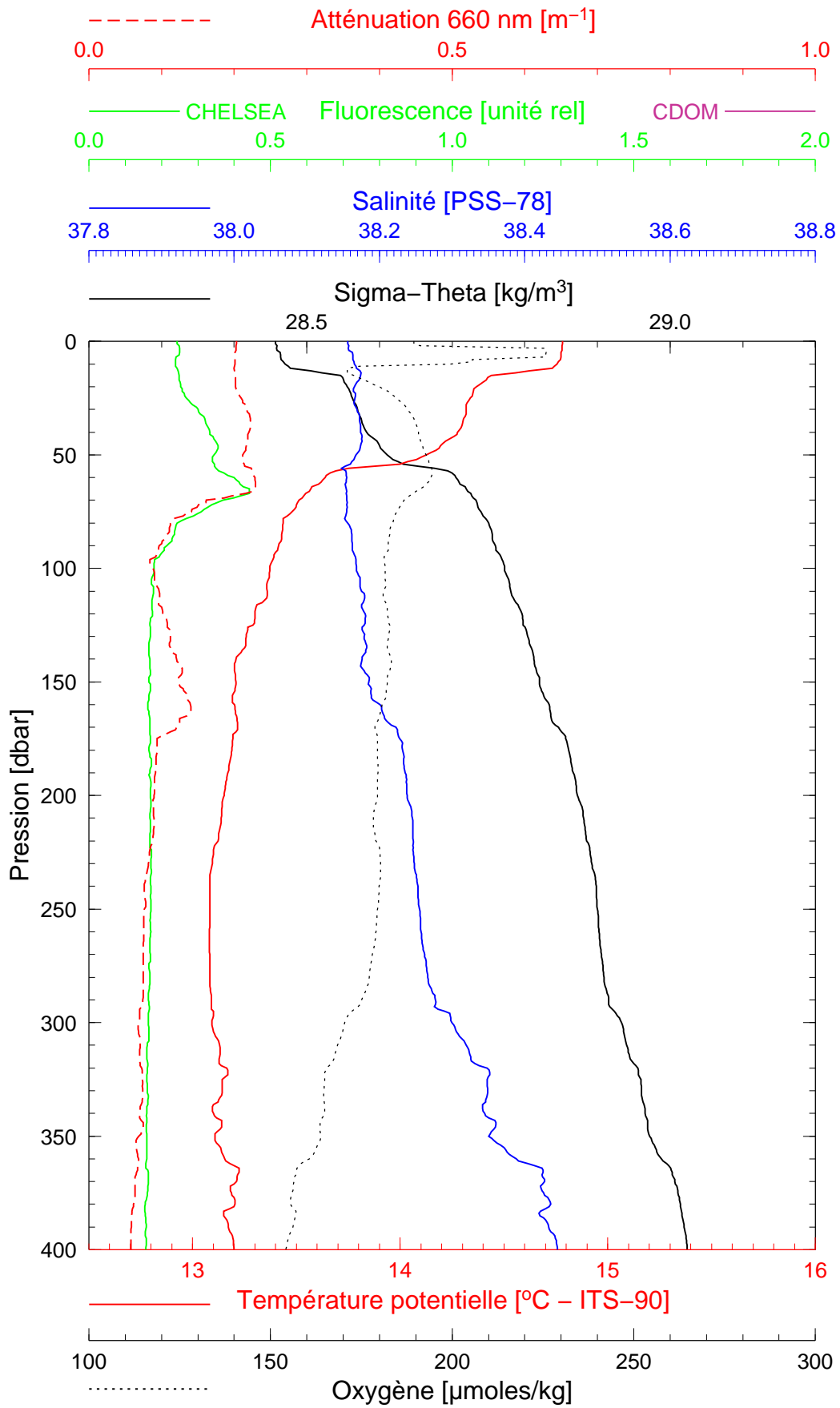
| Date | 04/04/2012 | Latitude | 43°37.233 N |
| Heure déb | 16h 50min [TU] | Longitude | 07°25.386 E |

BOUSSOLE 122　　　**04/04/2012**　　　**BOUS120404_07**
BOUS007

Atténuation 660 nm [m⁻¹]

| 0.0 | 0.5 | 1.0 |

CHELSEA　　Fluorescence [unité rel]　　CDOM

| 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |

Salinité [PSS−78]

| 37.8 | 38.0 | 38.2 | 38.4 | 38.6 | 38.8 |

Sigma−Theta [kg/m³]

| 28.5 | 29.0 |

Pression [dbar]

Température potentielle [°C − ITS−90]

| 13 | 14 | 15 | 16 |

Oxygène [µmoles/kg]
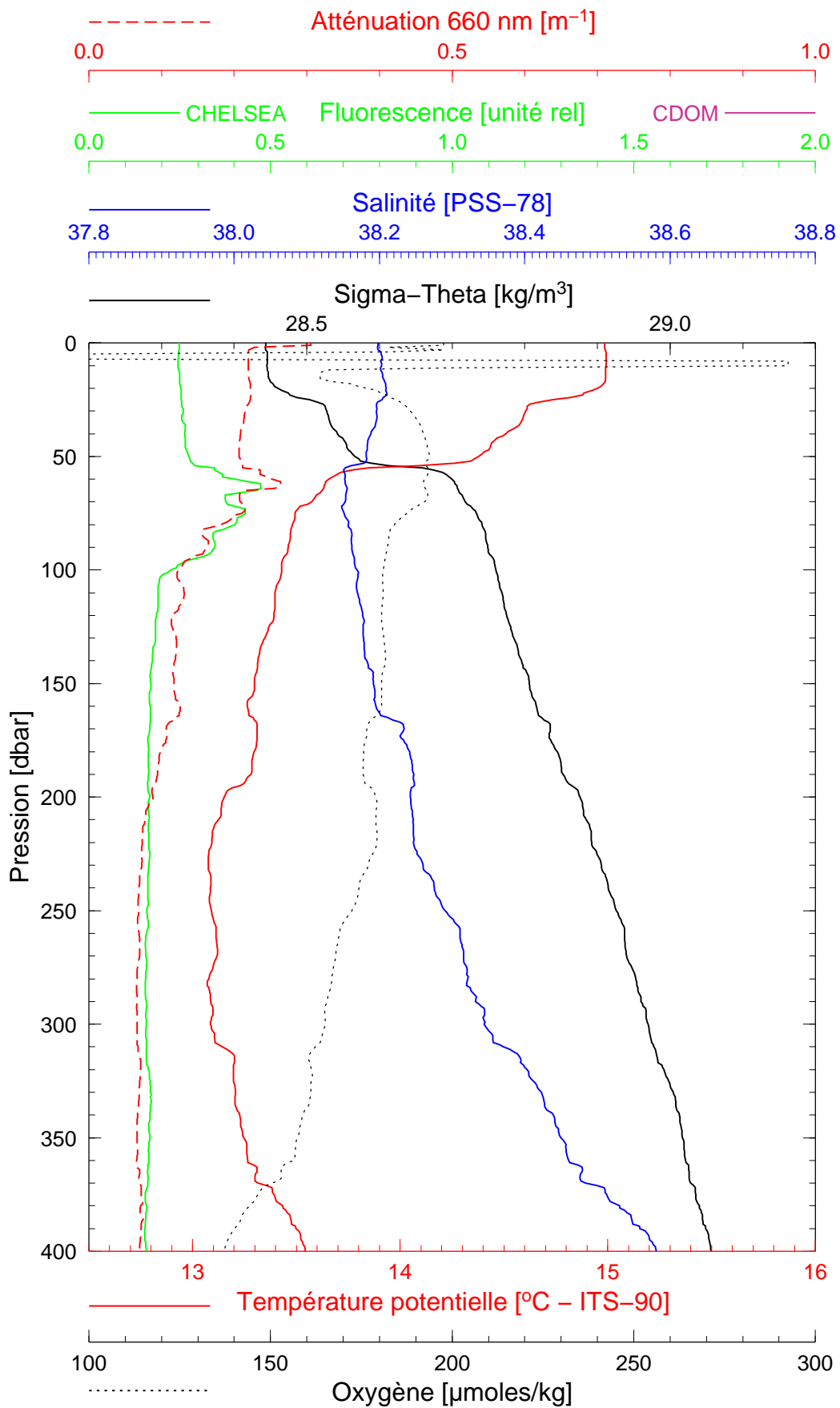
| 100 | 150 | 200 | 250 | 300 |

| Date | 04/04/2012 | Latitude | 43°39.111 N |
| Heure déb | 17h 45min [TU] | Longitude | 07°21.068 E |

BOUSSOLE 122   05/04/2012   BOUS120405_01
BOUS008

Atténuation 660 nm [m^{-1}]

CHELSEA   Fluorescence [unité rel]   CDOM

Salinité [PSS−78]

Sigma−Theta [kg/m^3]

Pression [dbar]

Température potentielle [°C − ITS−90]

Oxygène [µmoles/kg]
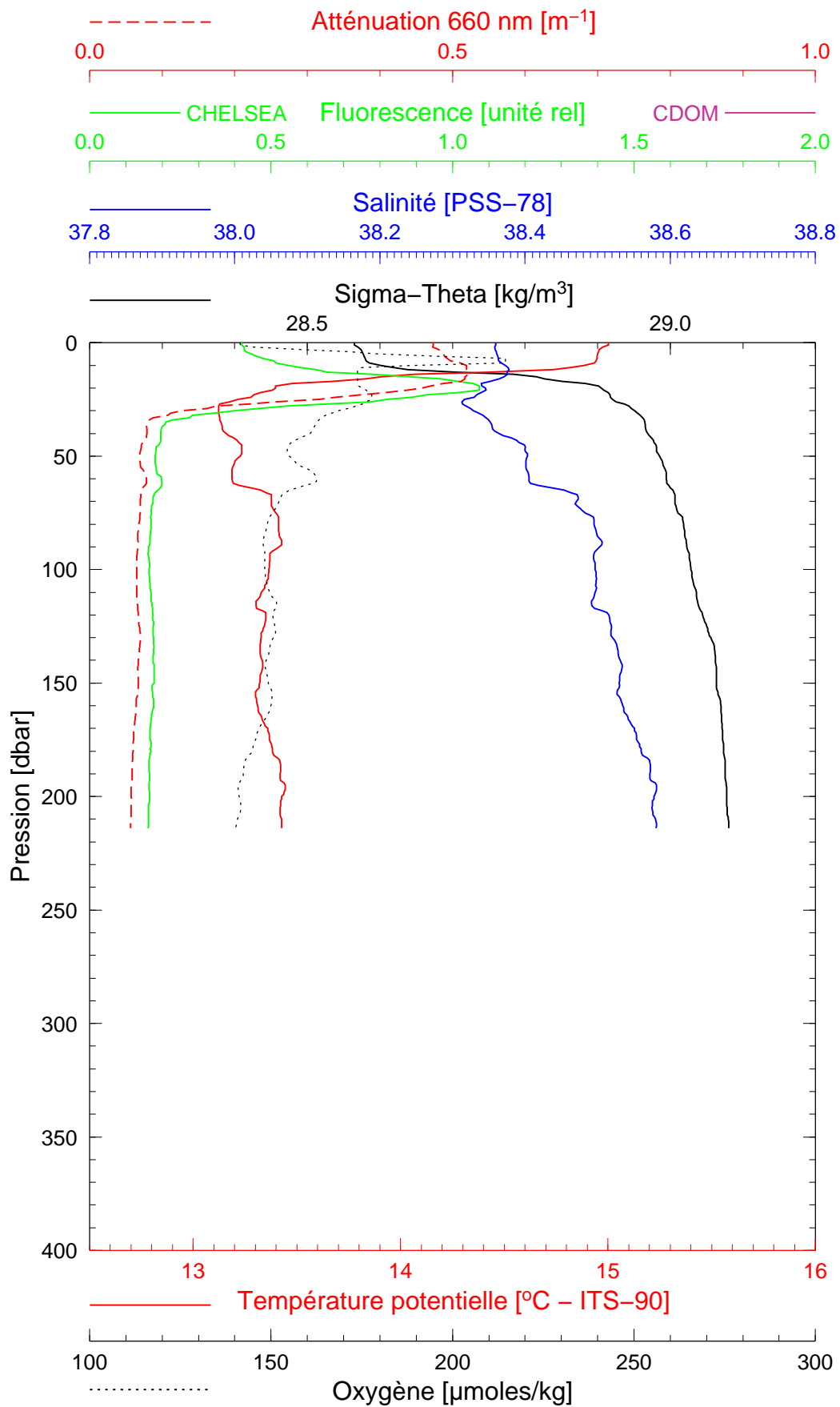
Date	05/04/2012	Latitude	43°22.023 N
Heure déb	08h 24min [TU]	Longitude	07°53.994 E

BOUSSOLE 122   **05/04/2012**   **BOUS120405_02**
BOUS009

Atténuation 660 nm [m⁻¹]

0.0   0.5   1.0

CHELSEA   Fluorescence [unité rel]   CDOM

0.0   0.5   1.0   1.5   2.0

Salinité [PSS−78]

37.8   38.0   38.2   38.4   38.6   38.8

Sigma−Theta [kg/m³]

28.5   29.0

Pression [dbar]

0
50
100
150
200
250
300
350
400

13   14   15   16

Température potentielle [ºC − ITS−90]

100   150   200   250   300

Oxygène [µmoles/kg]

| Date | 05/04/2012 | Latitude | 43º22.075 N |
| Heure déb | 12h 19min [TU] | Longitude | 07º53.996 E |