# BOUSSOLE Monthly Cruise Report

## Cruise 172
## June 07-08, 2016

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

Science Personnel: Emmanuel Boss, Guillaume De Liège, Anna Derkacheva, Melek Golbol, David Luquet and Eduardo Soto Garcia.

*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*.

**BOUSSOLE project**

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

*June 28, 2016*

# 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

Observatoire Océanologique de Villefranche/mer, France

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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 3X1M-004 fluorimeter sensor at 9 m which was removed by the divers during the previous cruise in order to download the data was reinstalled the first day of this cruise.
The divers also removed one of the ARGOS beacon located next to the sphere at 20 m depth. The battery of the beacon will be replaced and the beacon will be reinstalled on the lower superstructure of the buoy during the next

deployment of the mooring. The divers replaced the optode at 10 m with another one previously calibrated. They also installed the optode at 3 m which was removed from the old upper superstructure the day before in the lab.

# Cruise Summary

The first day was used for the diving operations, CTD casts with water sampling, a Secchi disk and optical profiles at the BOUSSOLE site. The last day was used for optical profiles, CTD casts with water sampling and a Secchi disk at the BOUSSOLE site.

## Tuesday 07 June 2016

The sea state was smooth with a light breeze. The sky was blue and cloudy the visibility was medium. The deployment of the upper section of the buoy occurred during this cruise. The GG9 vessel was already on site when arrived at BOUSOLE, ready for the deployment of the new upper section of the buoy. When the GG9 team finished the work and left the BOUSSOLE site, divers went at sea to perform dark measurements of the transmissiometers and backscattering meter and to take pictures. They removed the emergency ARGOS beacon located next to the sphere at 20 m depth. The battery of the beacon will be replaced. The beacon will be reinstalled on the lower superstructure of the buoy during the next deployment of the mooring. They also replaced the optode at 10 m with another one previously calibrated, and they installed the optode at 3 m. This optode was removed from the old upper superstructure the day before in the lab. Then, they installed the 3X1M-004 fluorimeter at 9 m. Then 2 CTD casts with water sampling were performed at the BOUSSOLE site. The first CTD cast was performed with a 0.2µm filter on the a-Sphere absorption meter and a cap on the HS-6 backscattering meter for dark measurements. Then, 1 Secchi disk and 1 C-OPS profile were performed at the BOUSSOLE site.

## Wednesday 08 June 2016

The sea state was smooth with a light breeze. The sky was overcast and the visibility was medium. 3 C-OPS profiles and 2 CTD casts were performed with water sampling at the BOUSSOLE site, the second one was performed with 0.2 µm filter on the a-Sphere absorption meter. Finally, a Secchi disk was performed before returning back to the Nice harbour.

Pictures taken during this cruise can be found at:
https://picasaweb.google.com/114686870380724925974/6301230720185109553

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

# Cruise Report

## Tuesday 07 June 2016 (UTC)

People on board: Emmanuel Boss, Guillaume De Liège, Anna Derkacheva, Melek Golbol, David Luquet and Eduardo Soto Garcia.

0600 Departure from the Nice harbour.
0910 Arrival at the BOUSSOLE site.
0930 Diving operations: dark measurements, pictures, remove of the ARGOS beacon, replacement of the optodes, installation of the fluorimeter.
1115 CTD 01, 400 m with water sampling at 10 and 5 for TSM (with 0.2 µm filter on a-Sphere and cap on HS-6).
1200 Secchi 01, 15 m.
1215 CTD 02, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and $a_p$.
1315 C-OPS 01.
1330 Departure to the Nice harbour.
1700 Arrival at the Nice harbour.

## Wednesday 08 June 2016 (UTC)

People on board: Anna Derkacheva, Melek Golbol and Eduardo Soto Garcia.

0600 Departure from the Nice harbour.
0930 Arrival at the BOUSSOLE site.
0935 C-OPS 02, 03, 04.
1025 CTD 03, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and $a_p$.
1100 Lunch.
1225 CTD 04, 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).
1300 Secchi 02, 16 m.
1305 Departure to the Nice harbour.
1810 Arrival at the Nice harbour.

# Problems identified during the cruise

- The first day, only 1 C-OPS profile was performed because the sky conditions were not optimal (many clouds and unstable sky).

- CTD 03: the Niskin bottle # 6 was leaking.

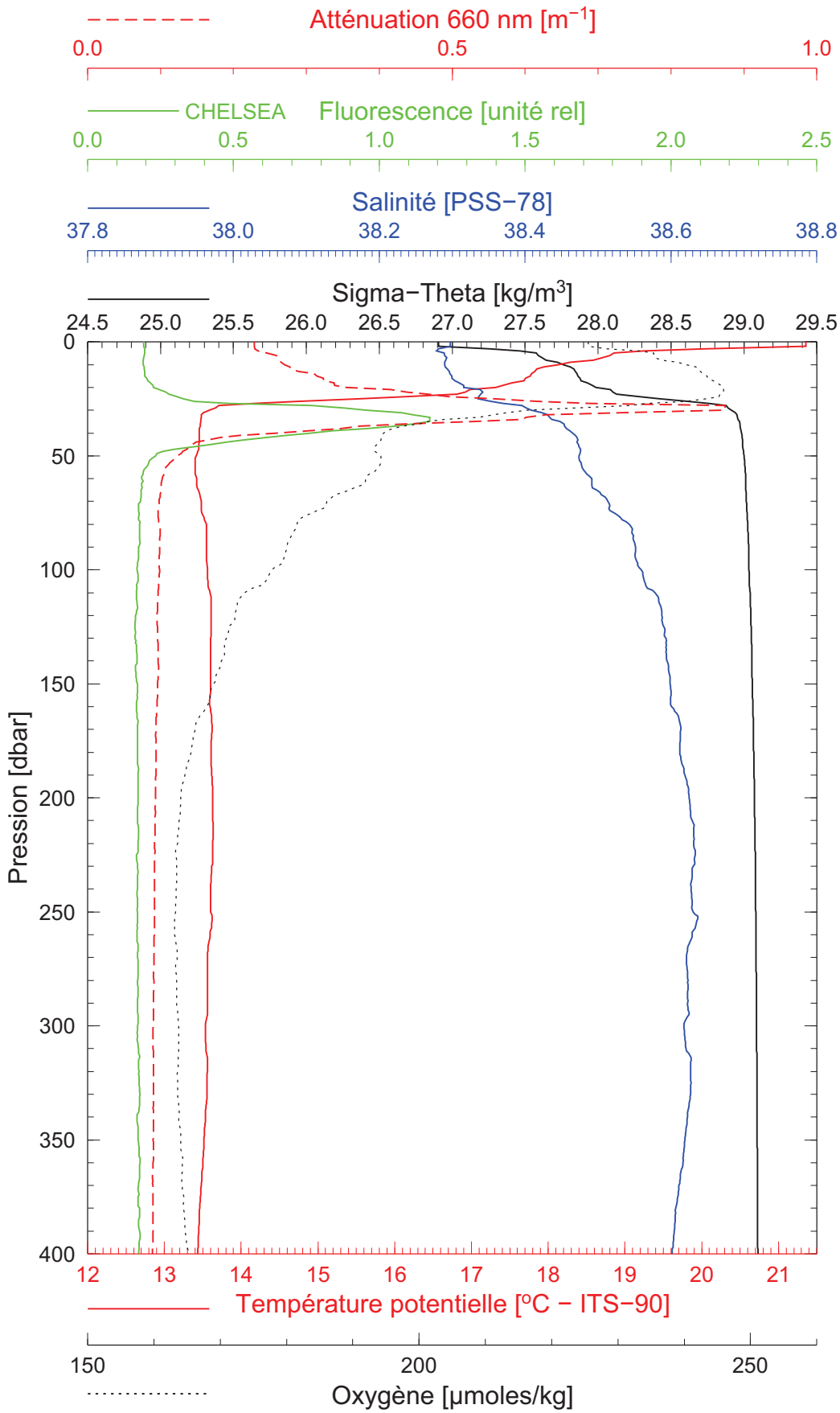
# Appendices

Cruise Summary Table for Boussole 172

| 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 |
| 07/06/16 | | | CTDBOUS001 | TSM | 11:16 | 22:00 | 400 | 43 | 22.270 | 7 | 54.200 | blue | | 2 | 4 | 171 | 1021.3 | 81 | | 21.4 | 21.80 | calm | | | |
| | | | | Secchi01 | 12:00 | 4:00 | 15 | 43 | 22 | 7 | 54 | blue | | 2 | | | | | medium | | | calm | | | |
| | | | CTDBOUS002 | HPLC & Ap | 12:12 | 31:00 | 400 | 43 | 22.240 | 7 | 54.258 | blue | | 2 | 4 | 185 | 1021.1 | 82 | | 21.4 | 21.70 | calm | | | |
| | | bou_c-ops_160607_1249_001_data.csv | | | 13:12 | 4:05 | 105 | 43 | 22.259 | 7 | 54.258 | cloudy | Ci | 4 | 6 | 280 | 1021.0 | 77 | medium | 22.6 | | calm | 0.2 | | no |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 08/06/16 | | bou_c-ops_160608_0839_001_data.csv | | | 09:36 | 4:09 | 109 | 43 | 22.174 | 7 | 53.775 | overcast | Cu | 7 | 5 | 286 | 1018.3 | 86 | medium | 20.2 | | calm | 0.3 | | no |
| | | bou_c-ops_160608_0839_002_data.csv | | | 09:48 | 2:41 | 71 | 43 | 22.332 | 7 | 53.417 | overcast | Cu | 7 | 5 | 286 | 1018.3 | 86 | medium | 20.2 | | calm | 0.3 | | no |
| | | bou_c-ops_160608_0839_003_data.csv | | | 10:00 | 4:14 | 109 | 43 | 22.458 | 7 | 53.120 | overcast | Cu | 7 | 5 | 286 | 1018.3 | 86 | medium | 20.2 | | calm | 0.3 | | no |
| | | | CTDBOUS003 | HPLC & Ap | 10:25 | 24:00 | 400 | 43 | 22.183 | 7 | 54.000 | cloudy | | 6 | 6 | 192 | 1018.0 | 88 | | 20.4 | 20.36 | calm | | | |
| | | | CTDBOUS004 | TSM, TA/TC & $O_2$ | 12:26 | 25:00 | 400 | 43 | 22.212 | 7 | 54.094 | cloudy | | 6 | 8 | 186 | 1017 | 88 | | 20.9 | 20.7 | calm | | | |
| | | | | Secchi02 | 13:00 | 4:00 | 16 | 43 | 22 | 7 | 54 | cloudy | | 6 | | | | | medium | | | calm | | | |

**BOUSSOLE 172** **07/06/2016** **BOUS160607_01**

*BOUS001*

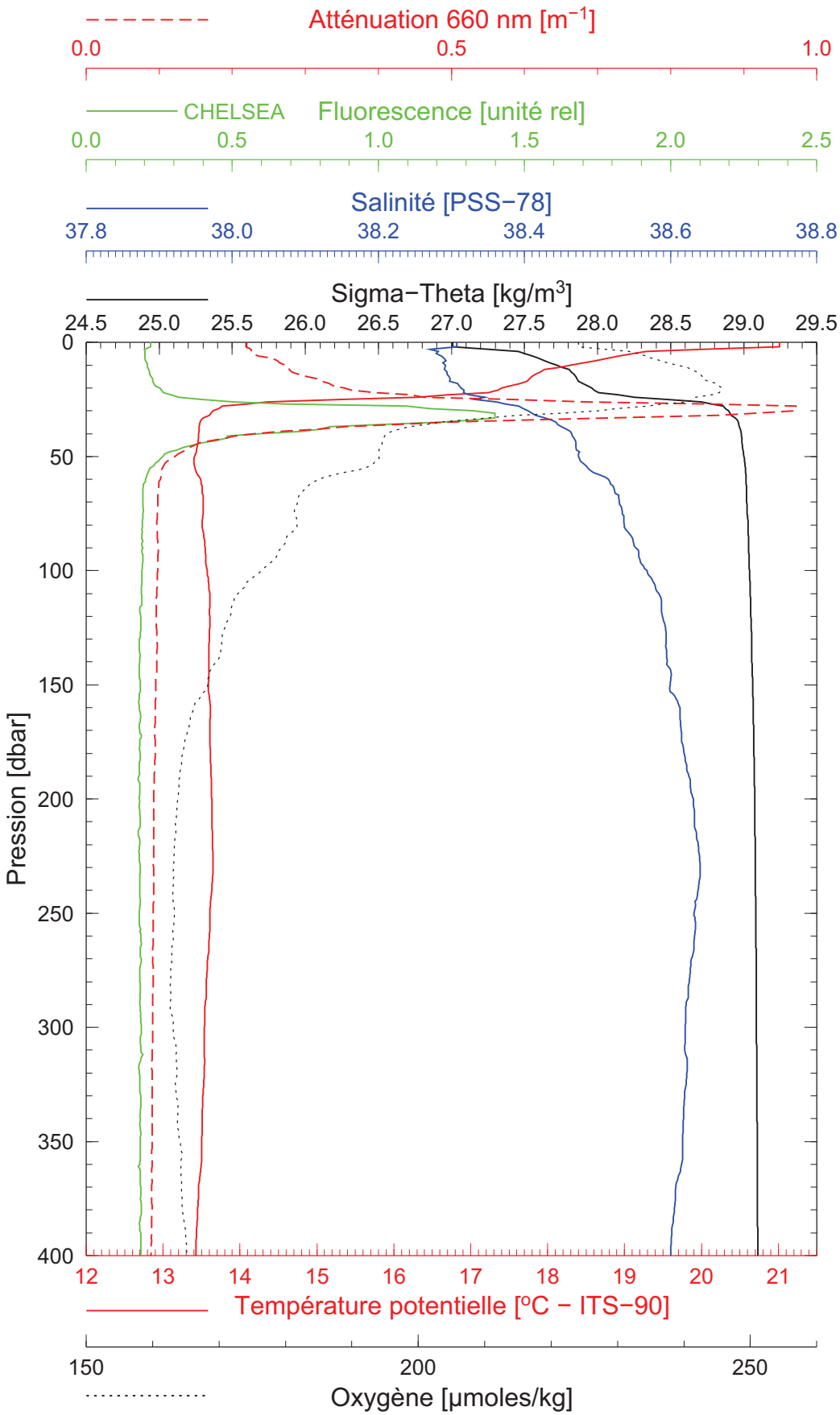



*Date* *07/06/2016* *Latitude* *43°22.270 N*

*Heure déb* *11h 16min [TU]* *Longitude* *07°54.200 E*

**BOUSSOLE 172** **07/06/2016** **BOUS160607_02**

*BOUS002*

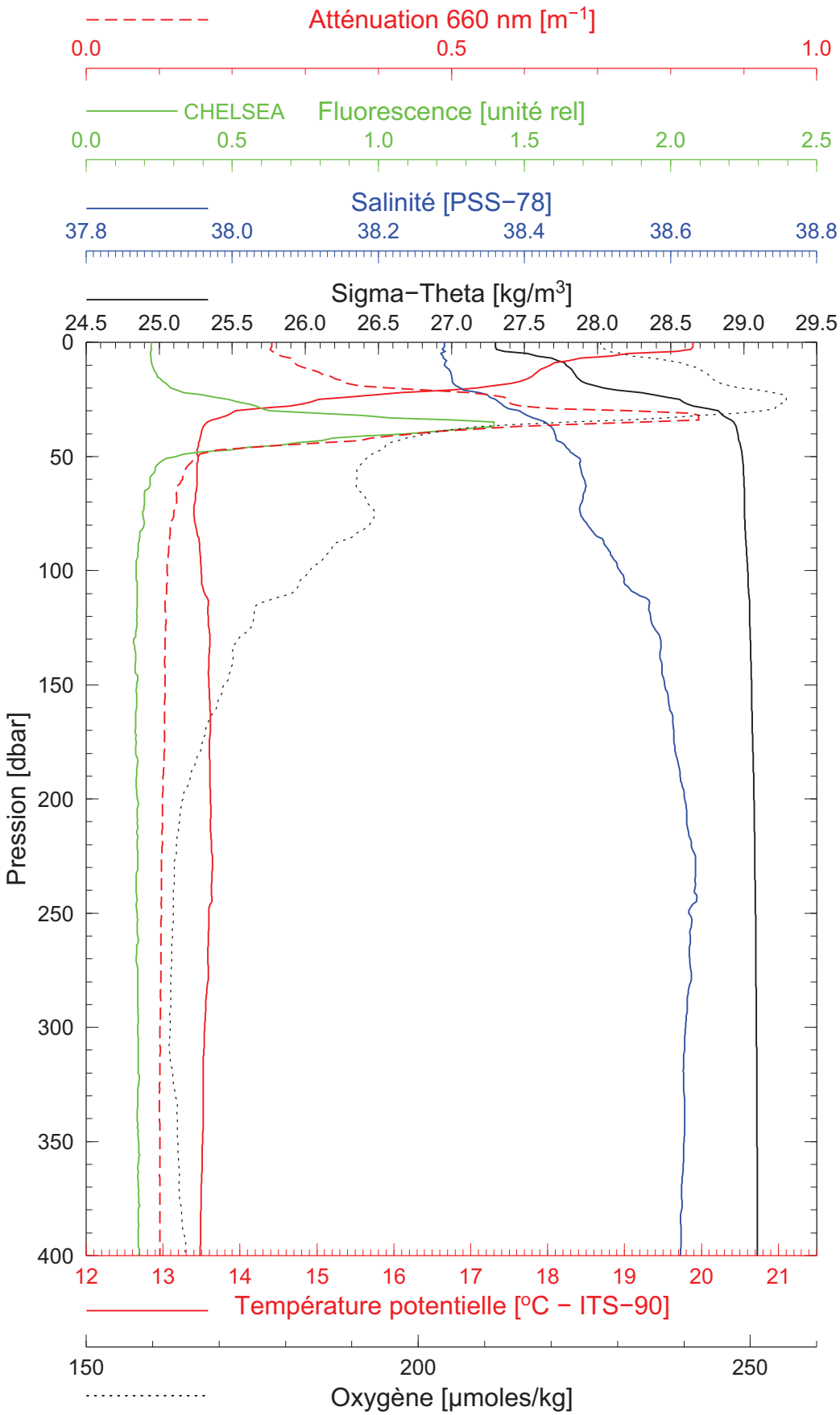



*Date* *07/06/2016* *Latitude* *43°22.240 N*

*Heure déb* *12h 12min [TU]* *Longitude* *07°54.258 E*

**BOUSSOLE 172** **08/06/2016** **BOUS160608_01**

*BOUS003*

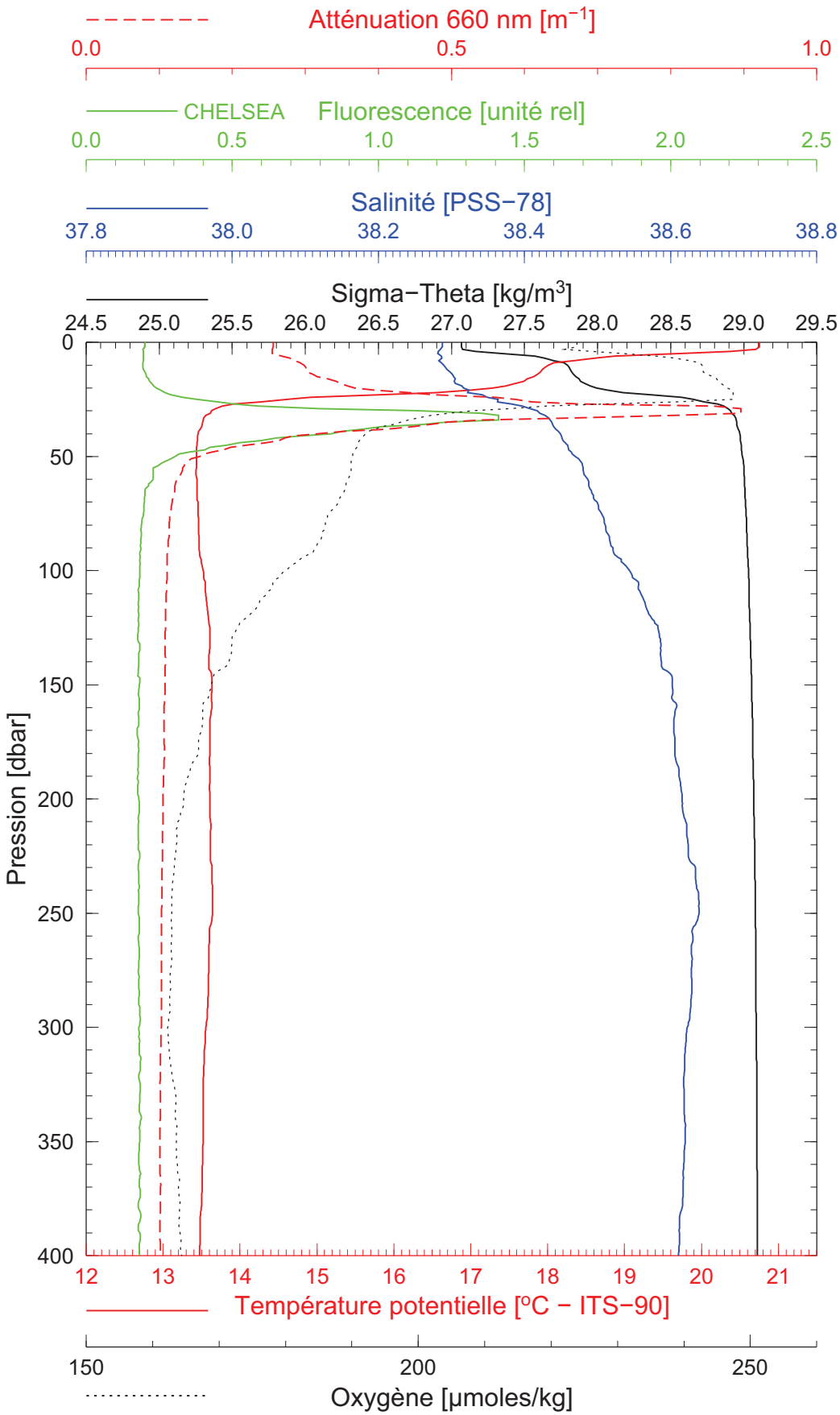



*Date* *08/06/2016* *Latitude* *43°22.183 N*

*Heure déb* *10h 25min [TU]* *Longitude* *07°54.000 E*

**BOUSSOLE 172** **08/06/2016** **BOUS160608_02**

*BOUS004*




*Date* *08/06/2016* *Latitude* *43°22.212 N*

*Heure déb* *12h 26min [TU]* *Longitude* *07°54.094 E*