# BOUSSOLE Monthly Cruise Report

## Cruise 77
## July 15 - 19, 2008

Duty Chiefs: Vincenzo Vellucci (enzo@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captains: Rémy Lafond, Alain Stephan)

Science Personnel: David Antoine, Stanford B. Hooker, Heloïse Lavigne, Edouard Lemarye, John H. Morrow, Grigor Obolensky, Vincenzo Vellucci and three divers.

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

Fig 1. Radiance camera deployment with the Boussole buoy, recently deployed, in the background.

**BOUSSOLE project**

**ESA/ESRIN contract N° 17286/03/I-OL**

**Deliverable from WP#400/200**

*July 25, 2008*

# Contents

# Cruise Objectives

## Routine operations

Multiple SPMR profiles are to occur within 1 hour of satellite overhead passes of MERIS 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 SPMR 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. A floating platform is to be used to support the SPMR Eu sensor approximately 20cm below the surface for up to 3 minutes of stable light field before a release mechanism triggers the release of the profiler to start a descent as normal. Multiple descents ideally will be started in this way and the data will be used to assess near-surface Eu extrapolation model calculations. CTD deployments are required at the start and end of the SPMR 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 and AC9, seawater samples are to be collected, filtered and stored in $N_2$ 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 (TSM) weighting in the lab. A gimbled PAR sensor positioned on the foredeck and operated from the CTD computer serves as a light field stability indicator during SPMR profiling.

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. The time of day of this transect should be similar for each cruise, if possible to minimise 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 surface, and then take again some pictures after cleaning.

For one day of each cruise, 250 ml of sea water will be sampled at 200, 150, 80, 70, 6, 50, 40, 30, 20, 10 and 5 meters depth. For each sample, 125 ml will be filtered through a 0.2 µm GF/F filter and both total and filtered water samples will be analysed with the UltraPath for CDOM absorption determination.

## Additional operations

Stan Hooker (NASA-GSFC) and John Morrow (Biospherical Inc.) will be on board during the entire cruise for performing optical profiles at the Boussole site with a Biospherical's BioOPS, and the new build COPS. Edouard Lemarye will be on board one day for performing radiance camera measurements (CAMLUM) at the BOUSSOLE site.

# Cruise Summary

During the cruise the weather was generally good, with some swell and clouds during the last two days. The first day the CTD was out of order so this day was spent for performing optical measurements, diving on the buoy, and downloading buoy data. The second day was used for optical and CTD casts at the BOUSSOLE site, the transect on the route to the Nice port was completed too. The third and fourth days, after crew exchange, were used for CTD sampling and optical measurements at the BOUSSOLE site.

## Tuesday 15 July 2008

This day the sea state was calm (H1/3 0.4 m) and the sky was blue with excellent visibility. The CTD was out of order and Grigor Obolensky had to work all day long to repair it and make it available for the following days. Divers found the buoy in perfect conditions after the deployment of June 28$^{th}$, though the flotation point is about 70 cm over the sea surface. Data was successfully retrieved from the buoy through CISCO antenna. 3 SPMR, 2 Secchi Disk, and 6 CIMEL were realized. Surface was sampled with a bucket for HPLC, $A_p$ and TSM. Several BioOPS and COPS profiles were also performed at the BOUSSOLE site.

## Wednesday 16 July 2008

The second cruise day the sea state was still good (H1/3 0.2 m) but the sky was half covered by cirrus. 3 CIMEL measurements were made on the route to the BOUSSOLE site; the internal battery started showing very fast

discharging problems and is operational only when plugged. 1 CTD cast, 3 SPMR and several BioOPS and COPS profiles were performed close to the buoy before leaving the site and completing the transect on the route to the port of Nice.

### Friday 18 July 2008

This day the sea state was not optimal because of a long wave (H1/3 1.0 m) due to Mistral blowing in the near Gulf of Lions, but the sky was with few clouds and the very low wind on site allowed sampling. 2 CTD casts, 6 SPMR profiles and 1 Secchi Disk were performed at BOUSSOLE, and samples for CDOM were also taken. Surface measurements with the CAMLUM radiance camera were collected near the buoy. Several BioOPS and COPS optical profiles were collected close to the buoy, SMSR data were collected during these casts. The CIMEL stopped working even when plugged.

### Saturday 19 July 2008

For the last cruise day the sea state was better (H1/3 5.0 m) the sky was blue with low wind. 1 CTD casts, 4 SPMR profiles and 1 Secchi Disk. Several BioOPS and COPS optical profiles were collected close to the buoy, SMSR data were collected during these casts. A connection with the buoy was attempted before leaving the site; the connection was not established probably because the crossover cable was not well brunched.

## Cruise Report

### Tuesday 15 July 2008 (UTC)

People on board: David Antoine, Stanford Hooker, John Morrow, Grigor Obolensky, Vincenzo Vellucci, Yves Lamblard and two other divers.

0640 Departure from the Nice port.
0940 Arrival at the BOUSSOLE site.
0950 Divers at sea: the buoy recently deployed is in optimal conditions.
1100 Secchi Disk 01 (16.5 m).
1115 Buoy data retrieval: successful.
1130 The CTD is not working. The problem will be solved only at the end of the day.
1210 BioOPS profiles.
1245 CIMEL 01, 02.
1310 SPMR 01, 02 and 03.
1350 CIMEL 03.
1410 COPS profiles.
1445 Secchi Disk 02 (15 m).
1450 CIMEL 04.
1530 Surface water sampling with a bucket for HPLC, Ap, and TSM.
1545 CIMEL 05, 06.
1600 Departure to the Nice port.
1915 Arrival at the Nice port.

### Wednesday 16 July 2008

People on board: David Antoine, Stanford Hooker, John Morrow, Grigor Obolensky, Vincenzo Vellucci.

0430 Departure from the Nice port.
0535 CIMEL 07.
0630 CIMEL 08.
0700 CIMEL 09.
0750 Arrival at the BOUSSOLE site.
0815 BioOPS profiles.
0845 SPMR 04, 05, 06.
0930 CTD 01, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 30, 20, 10 and 5 m for HPLC, Ap and TSM
1020 CTD cable unrolled to the bottom.
1140 BioOPS profiles.
1230 COPS Profiles.
1345 Departure to the Nice port
1425 CTD 02, 400 m, station 01 (43°25’N 07°48’E).
1530 CTD 03, 400 m, station 02 (43°28’N 07°42’E).

1630 CTD 04, 400 m, station 03 (43°31’N 07°37’E).
1730 CTD 05, 400 m, station 04 (43°34’N 07°31’E).
1830 CTD 06, 400 m, station 05 (43°37’N 07°25’E).
1920 CTD 07, 400 m, station 06 (43°39’N 07°21’E).
2015 Arrival at the Nice port

## Friday 18 May 2008

People on board: David Antoine, Stanford Hooker, Heloïse Lavigne, Edouard Lemarye, John Morrow, Grigor Obolensky, Vincenzo Vellucci.

0500 Departure from the Nice port.
0825 Arrival at the BOUSSOLE site.
0830 CTD 08, 400 m, with water sampling at 200, 150, 80, 70, 60, 50, 30, 20, 10 and 5 m for HPLC, Ap.
0910 BioOPS profiles.
1000 SPMR 07, 08 and 09.
1105 Secchi Disk 03 (13 m)
1105 Radiance Camera (CAMLUM) measurement at surface.
1205 BioOPS and COPS profiles.
1315 SPMR 10, 11, 12.
1355 BioOPS profiles.
1500 CTD 09, 400 m, with water sampling at 200, 150, 80, 70, 60, 50, 30, 20, 10 and 5 m for HPLC, Ap, CDOM and TSM.
1545 Departure to the Nice port.
1900 Arrival at the Nice port.

## Saturday 19 May 2008

People on board: David Antoine, Stanford Hooker, John Morrow, Grigor Obolensky, Vincenzo Vellucci.

0430 Departure from the Nice port.
0800 Arrival at the BOUSSOLE site.
0805 CTD 10, 400 m, with water sampling at 200, 150, 80, 70, 60, 50, 30, 20, 10 and 5 m for HPLC, Ap.
0850 BioOPS and COPS profiles.
0950 SPMR 13, 14, 15, 16.
1045 Secchi Disk 04 (11 m)
1155 BioOPS and COPS profiles.
1215 Attempted connection with the buoy: unsuccessful.
1220 CTD 11, 200 m, with water sampling at 10 and 5 m for HPLC, Ap and TSM.
1430 Departure to the Nice port.
1800 Arrival at the Nice port.

**Calculated Swath paths for the MERIS Sensor (ESOV Software)**

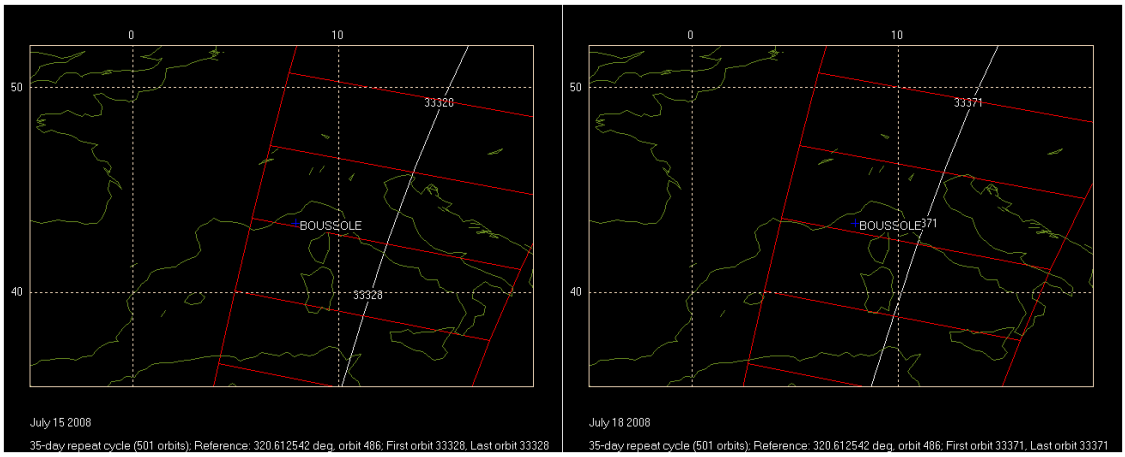



Figure 2. Calculated swath paths for MERIS (Esov software) above BOUSSOLE site for July 15 and 18 2008.

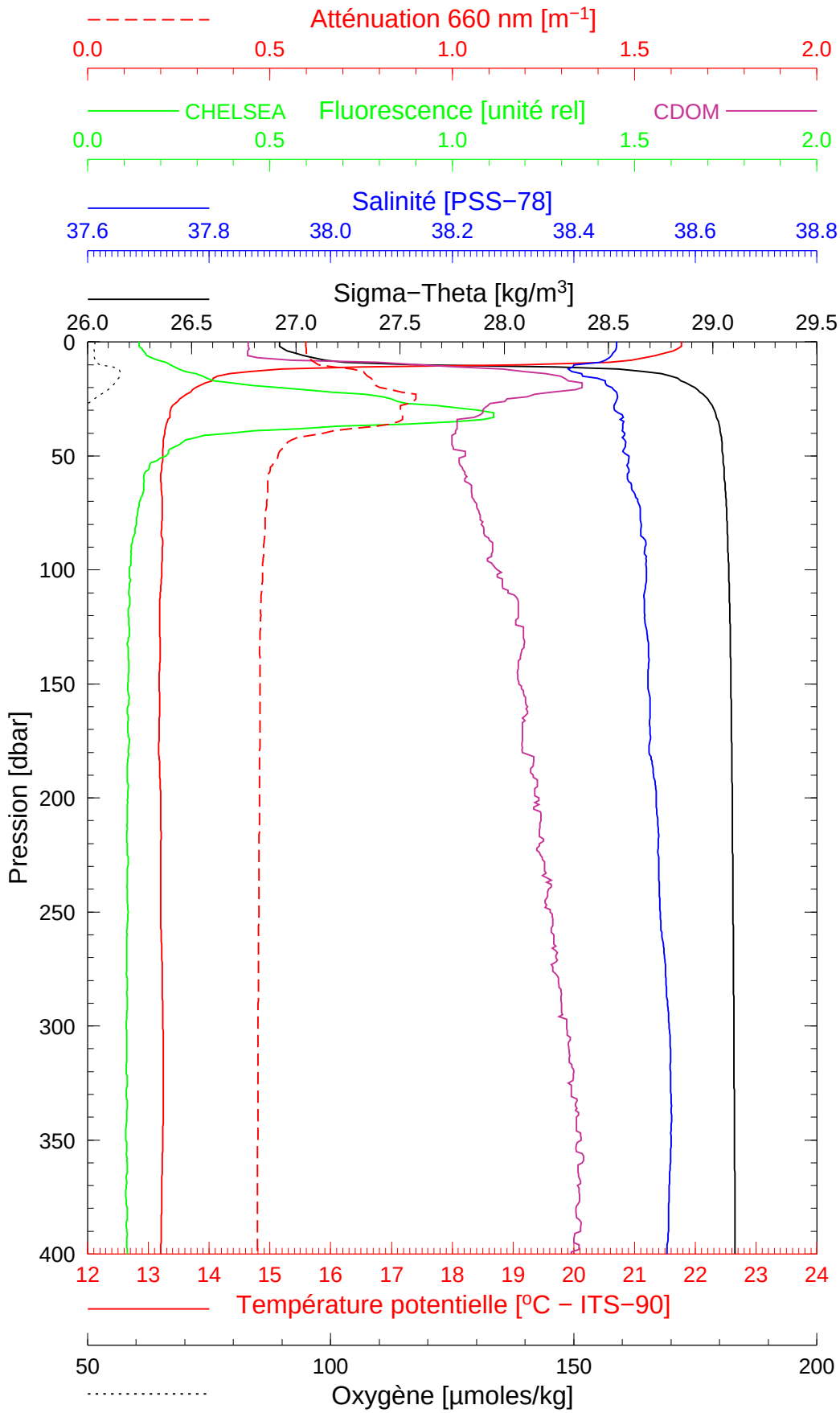
# Appendix

Cruise Summary Table for Boussole 77

| 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") | satellite overpass | | 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 |
| 15/07/08 | | | | Secchi Disk 01 | 11:00 | 3:00 | 16.5 | 43 | 22 | 7 | 54 | | | 0 | | | | | excellent | | | | | | |
| | | | | CIMEL01 | 12:48 | 2:00 | | 43 | 22 | 7 | 54 | | | | | | | | | | | | | | |
| | | | | CIMEL02 | 12:51 | 2:00 | | 43 | 22 | 7 | 54 | | | | | | | | | | | | | | |
| | Bou150708black1 | | | | 13:13 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | Bou150708AA | | | 13:30 | | 150 | 43 | 22.362 | 7 | 53.710 | blu | | 0 | 2 | 242 | 1024.7 | | excellent | 22.9 | | slightly moved | 0.4 | | no |
| | | Bou150708AB | | | 13:39 | 3:33 | 161 | 43 | 22.360 | 7 | 53.757 | blu | | 0 | 2 | 242 | 1024.7 | | excellent | 22.9 | | slightly moved | 0.4 | | no |
| | | Bou150708AC | | | 13:48 | 3:34 | 160 | 43 | 22.346 | 7 | 53.833 | blu | | 0 | 2 | 242 | 1024.7 | | excellent | 22.9 | | slightly moved | 0.4 | | no |
| | Bou150708black2 | | | | 14:01 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | | | CIMEL03 | 14:50 | 2:00 | | 43 | 22 | 7 | 54 | | | | | | | | | | | | | | |
| | | | | Secchi Disk 02 | 14:45 | 3:00 | 15 | 43 | 22 | 7 | 54 | | | 0 | | | | | excellent | | | | | | no |
| | | | | CIMEL04 | 13:53 | 3:00 | | 43 | 22 | 7 | 54 | | | | | | | | | | | | | | |
| | | | | bucket at surface | 15:30 | 2:00 | | 43 | 22 | 7 | 54 | | | | | | | | | | | | | | |
| | | | | CIMEL05 | 15:46 | 3:00 | | 43 | 24 | 7 | 50 | | | | | | | | | | | | | | |
| | | | | CIMEL06 | 15:50 | 2:00 | | 43 | 24 | 7 | 49 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16/07/08 | | | | CIMEL07 | 05:38 | 3:00 | | 43 | 36.10 | 7 | 26.93 | | | | | | 1020 | | | | | | | | |
| | | | | CIMEL08 | 06:30 | 4:00 | | 43 | 31.48 | 7 | 35.78 | | | | | | 1020 | | | | | | | | |
| | | | | CIMEL09 | 07:01 | 4:00 | | 43 | 27.94 | 7 | 42.54 | | | | | | | | | | | | | | |
| | Bou160708black1 | | | | 08:47 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | Bou160708AA | | | 08:53 | 3:50 | 155 | 43 | 22.145 | 7 | 54.165 | covered | Ci | 6 | 6 | 190 | 1021.7 | 85 | very good | 21.9 | | calm | 0.2 | | no |
| | | Bou160708AB | | | 09:03 | 3:59 | 160 | 43 | 22.245 | 7 | 54.342 | covered | Ci | 6 | 6 | 190 | 1021.7 | 85 | very good | 21.9 | | calm | 0.2 | | no |
| | | Bou160708AD | | | 09:13 | 3:58 | 148 | 43 | 22.334 | 7 | 54.561 | covered | Ci | 6 | 6 | 190 | 1021.7 | 85 | very good | 21.9 | | calm | 0.2 | | no |
| | Bou160708black2 | | | | | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | | CTDBOUS001 | wat. samp.TSM | 09:32 | 32:00 | 400 | 43 | 22.523 | 7 | 54.980 | | | 7 | 6 | 208 | 1021.0 | 86 | | 21.9 | 21.7 | calm | | | |
| | | | CTDBOUS002 | | 14:25 | 23:00 | 400 | 43 | 24.913 | 7 | 48.043 | | | 6 | 9 | 248 | 1019.5 | 85 | | 22.6 | 22.5 | slightly moved | | | |
| | | | CTDBOUS003 | | 15:33 | 24:00 | 400 | 43 | 27.969 | 7 | 41.969 | | | 5 | 6 | 248 | 1018.6 | 83 | | 22.8 | 23.2 | slightly moved | | | |
| | | | CTDBOUS004 | | 16:31 | 24:00 | 400 | 43 | 31.040 | 7 | 36.955 | | | 5 | 8 | 218 | 1118.2 | 77 | | 22.8 | 22.8 | slightly moved | | | |
| | | | CTDBOUS005 | | 17:31 | 25:00 | 400 | 43 | 34.001 | 7 | 30.971 | | | 6 | 6 | 225 | 1017.6 | 77 | | 22.5 | 22.8 | slightly moved | | | |
| | | | CTDBOUS006 | | 18:30 | 26:00 | 400 | 43 | 37.027 | 7 | 24.923 | | | 6 | 4 | 224 | 1017.1 | 79 | | 22.6 | 23.1 | slightly moved | | | |
| | | | CTDBOUS007 | | 19:21 | 22:00 | 400 | 43 | 38.976 | 7 | 20.847 | | | 9 | 3 | 45 | 1016.6 | 80 | | 22.1 | 22.8 | slightly moved | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18/07/08 | | | CTDBOUS008 | | 08:33 | | 400 | 43 | 22.402 | 7 | 53.781 | | | 4 | 5 | 354 | 1010.5 | 85 | | 22.5 | 21.8 | moved | | | |
| | Bou180708black1 | | | | 10:04 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | Bou180708AA | | | 10:25 | 4:00 | 170 | 43 | 22.287 | 7 | 53.869 | | Ci | 4 | 5 | 310 | 1011.1 | 83 | good | 22.7 | | moved | 1.0 | | no |
| | | Bou180708AC | | | 10:46 | 4:00 | 158 | 43 | 22.618 | 7 | 54.123 | | Ci | 4 | 5 | 310 | 1011.1 | 83 | good | 22.7 | | moved | 1.0 | | no |
| | | Bou180708AD | | | 10:56 | 4:00 | 165 | 43 | 22.744 | 7 | 54.289 | | Ci | 4 | 5 | 310 | 1011.1 | 83 | good | 22.7 | | moved | 1.0 | | no |
| | Bou180708black2 | | | | | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | | | Secchi Disk 03 | 11:05 | 2:00 | 13 | 43 | 22 | 7 | 54 | | Ci | 4 | | | | | good | | | | | | no |
| | Bou180708black4 | | | | 13:05 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | Bou180708AE | | | 13:16 | 3:45 | 140 | 43 | 22.015 | 7 | 54.396 | blu | Ci | 1 | 5 | 239 | 1001.5 | 76 | good | 23.6 | | slightly moved | 0.6 | | no |
| | | Bou180708AF | | | 13:26 | 3:42 | 155 | 43 | 22.089 | 7 | 54.699 | blu | Ci | 1 | 5 | 239 | 1011.5 | 76 | good | 23.6 | | slightly moved | 0.6 | | no |
| | | Bou180708AI | | | 13:35 | 4:00 | | 43 | 22.136 | 7 | 54.913 | blu | Ci | 1 | 5 | 239 | 1011.5 | 76 | good | 23.6 | | slightly moved | 0.6 | | no |
| | Bou180708black5 | | | | 13:50 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | | CTDBOUS009 | wat. samp.TSM & CDOM | 15:08 | 24:00 | 400 | 43 | 21.939 | 7 | 54.594 | | | 3 | 7 | 237 | 1011.7 | 73 | | 23.2 | 22.7 | slightly moved | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19/07/08 | | | CTDBOUS010 | | | | 400 | 43 | 21.998 | 7 | 53.794 | | | 1 | 5 | 107 | 1016.0 | 81 | | 22.4 | 22.7 | slightly moved | | | |
| | Bou190708black2 | | | | 09:55 | 1:54 | | | | | | | | | | | | | | | | | | | |
| | | Bou190708AA | | | 10:04 | 3:30 | 160 | 43 | 22.176 | 7 | 53.631 | blu | | 0 | 7 | 190 | 1016.8 | 84 | discreete | 22.5 | | slightly moved | 0.5 | | no |
| | | Bou190708AB | | | 10:14 | 3:28 | 170 | 43 | 22.194 | 7 | 53.676 | blu | | 0 | 7 | 190 | 1016.8 | 84 | discreete | 22.5 | | slightly moved | 0.5 | | no |
| | | Bou190708AC | | | 10:26 | 4:00 | 140 | 43 | 22.285 | 7 | 53.628 | blu | | 0 | 7 | 190 | 1016.8 | 84 | discreete | 22.5 | | slightly moved | 0.5 | | no |
| | | Bou190708AD | | | 10:35 | 4:00 | 160 | 43 | 22.333 | 7 | 53.467 | blu | | 0 | 7 | 190 | 1016.8 | 84 | discreete | 22.5 | | slightly moved | 0.5 | | no |
| | Bou180708black3 | | | | 10:52 | 3:00 | | | | | | | | | | | | | | | | | | | |
| | | | | Secchi Disk 04 | 10:45 | 2:00 | 11 | 43 | 22 | 7 | 54 | blu | | 0 | | | | | discreete | | | | | | no |
| | | | CTDBOUS011 | wat. samp.TSM | 12:28 | 4:00 | 10 | 43 | 22.140 | 7 | 53.799 | | | | | | | | | | 23.0 | | | | |

**Boussole** **16/07/2008** **BOUS080716_01**

*BOUS001*

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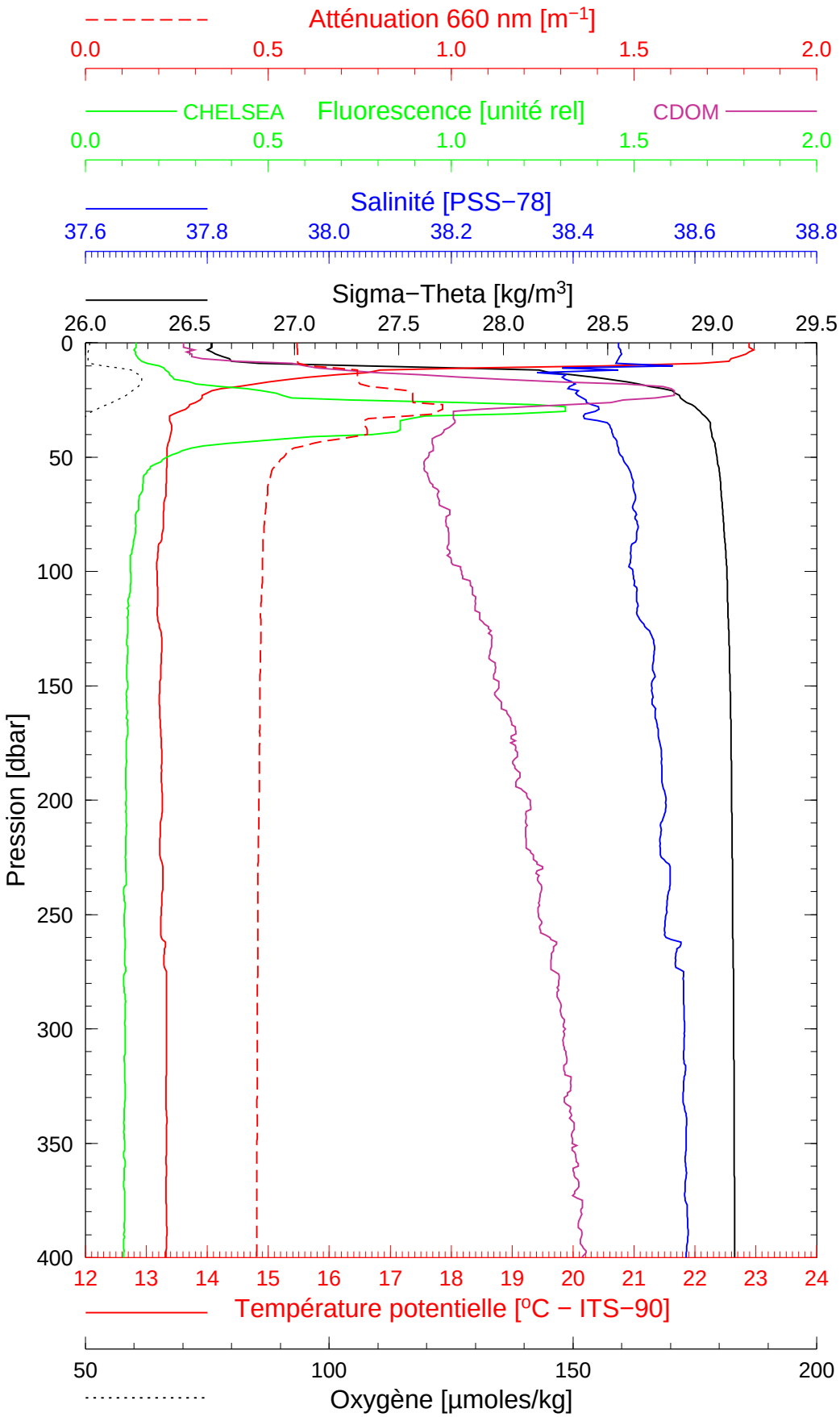
**Boussole** **16/07/2008** **BOUS080716_02**

*BOUS002*

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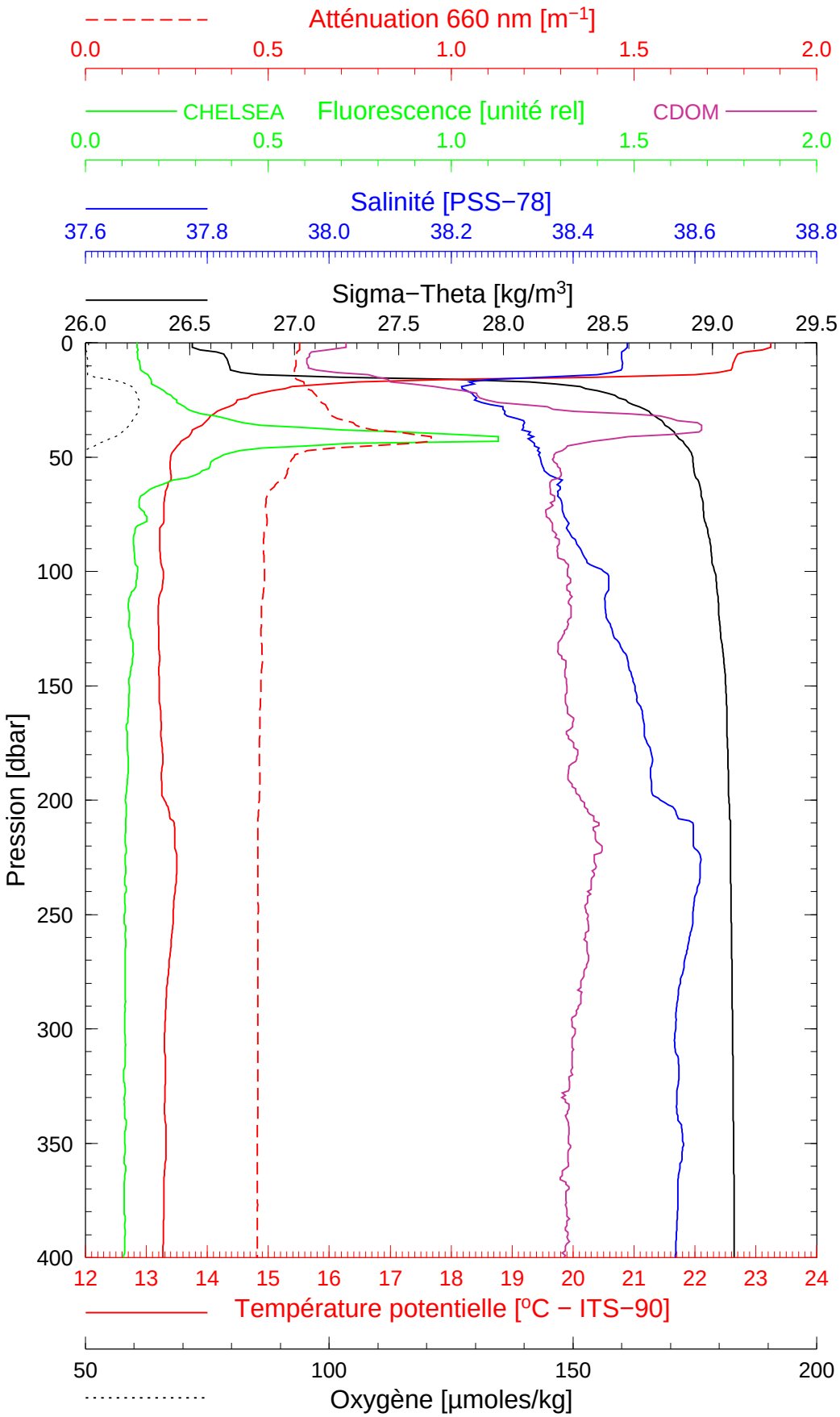
*BOUS003*

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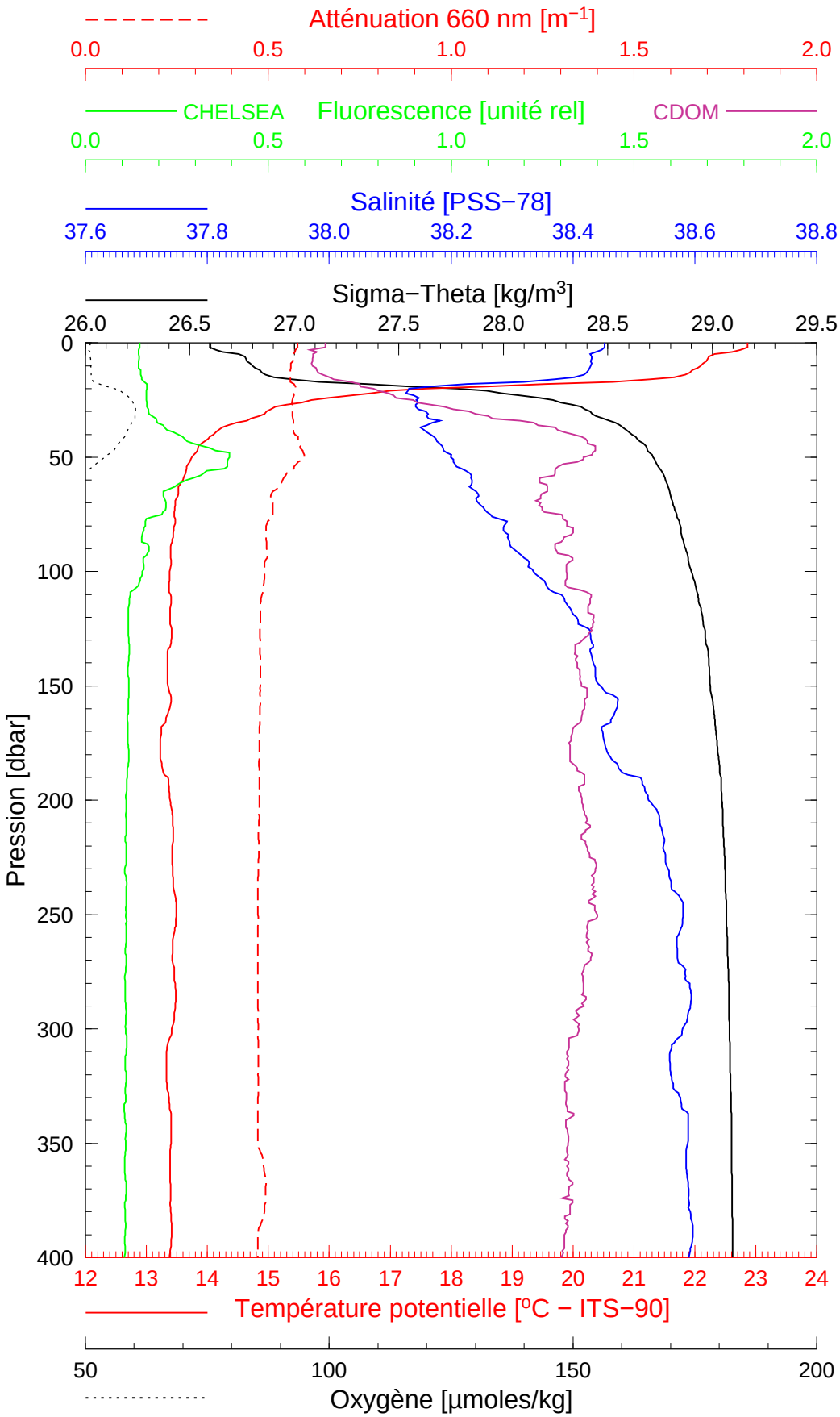
*BOUS004*

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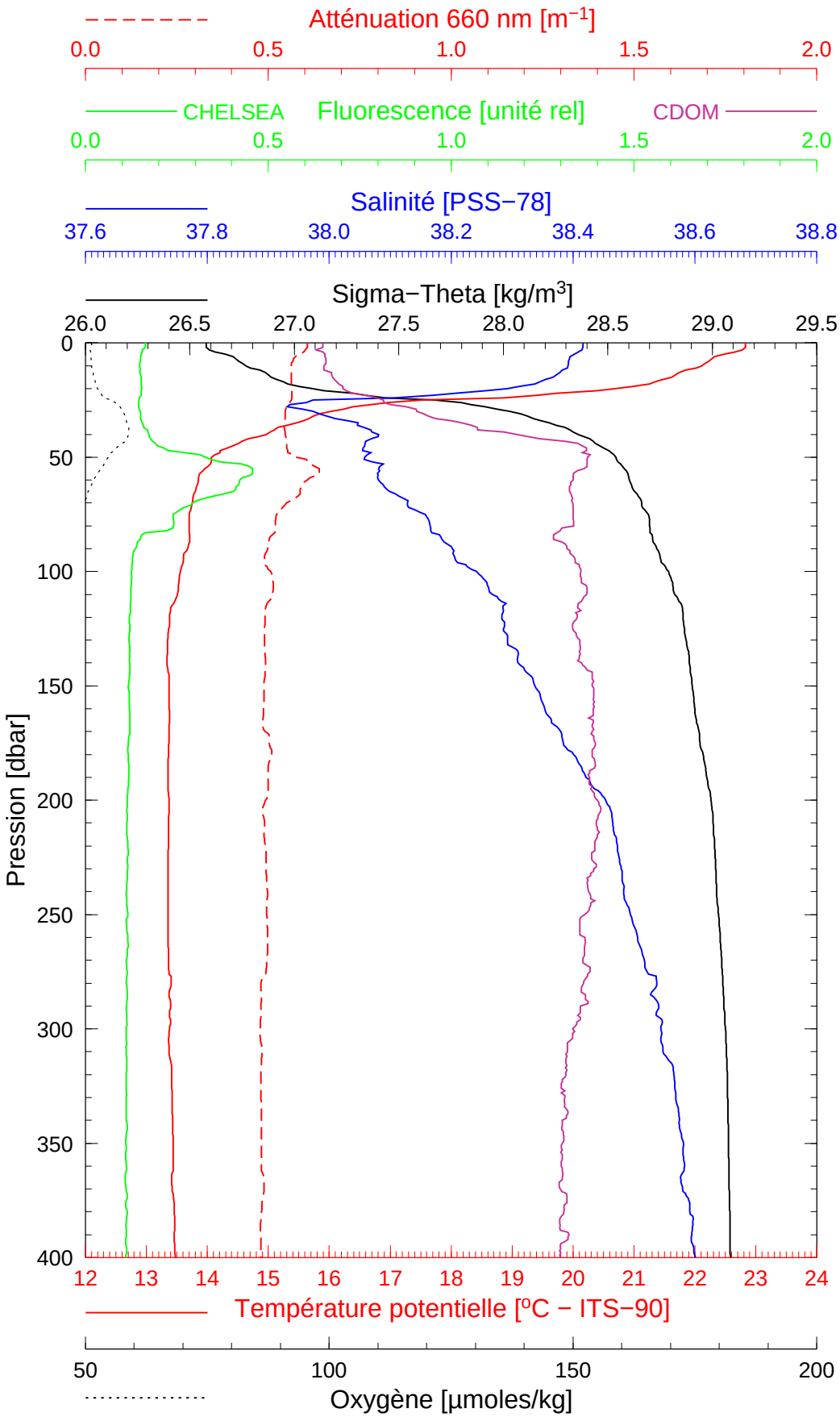
**Boussole** **16/07/2008** **BOUS080716_05**

*BOUS005*

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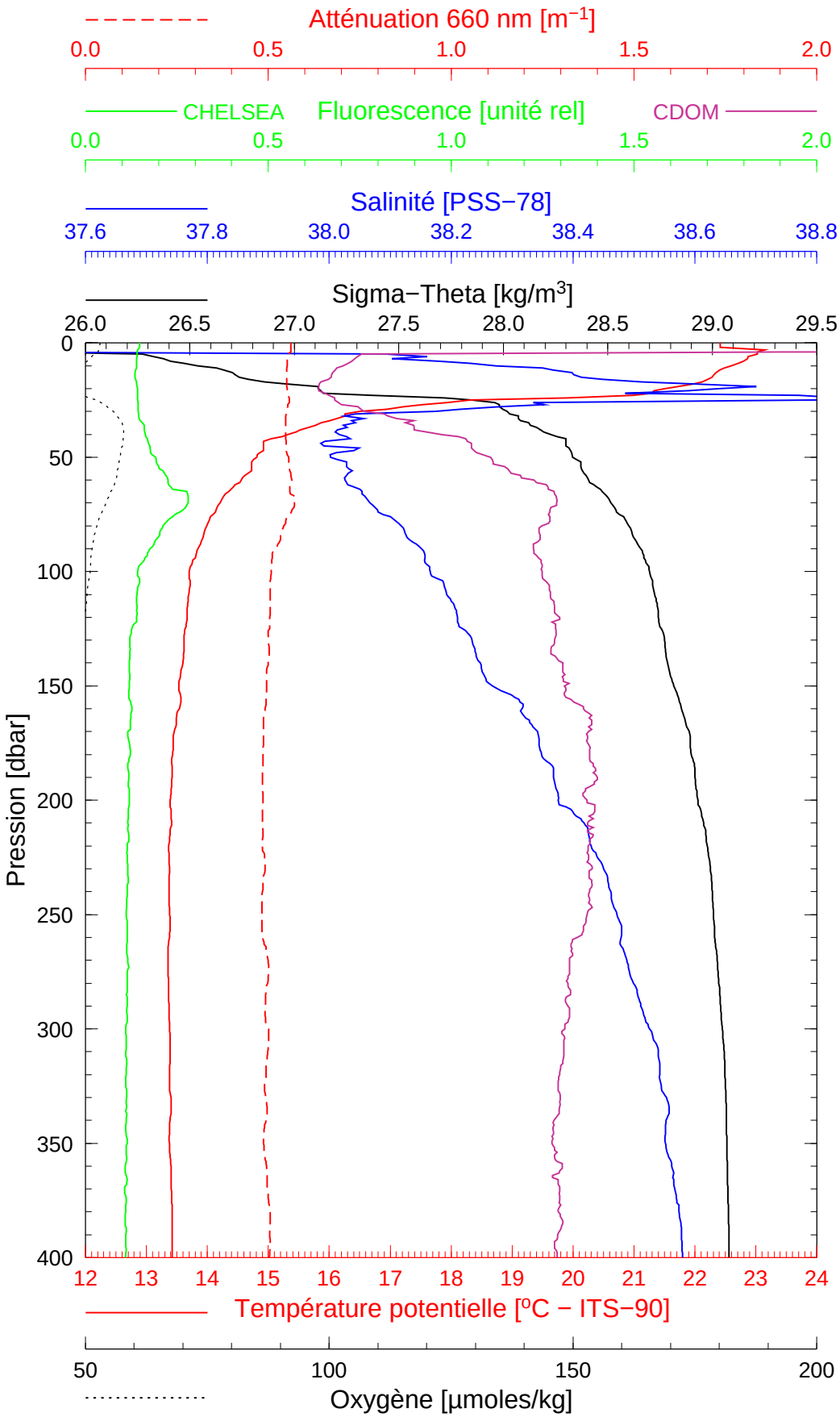
*BOUS006*

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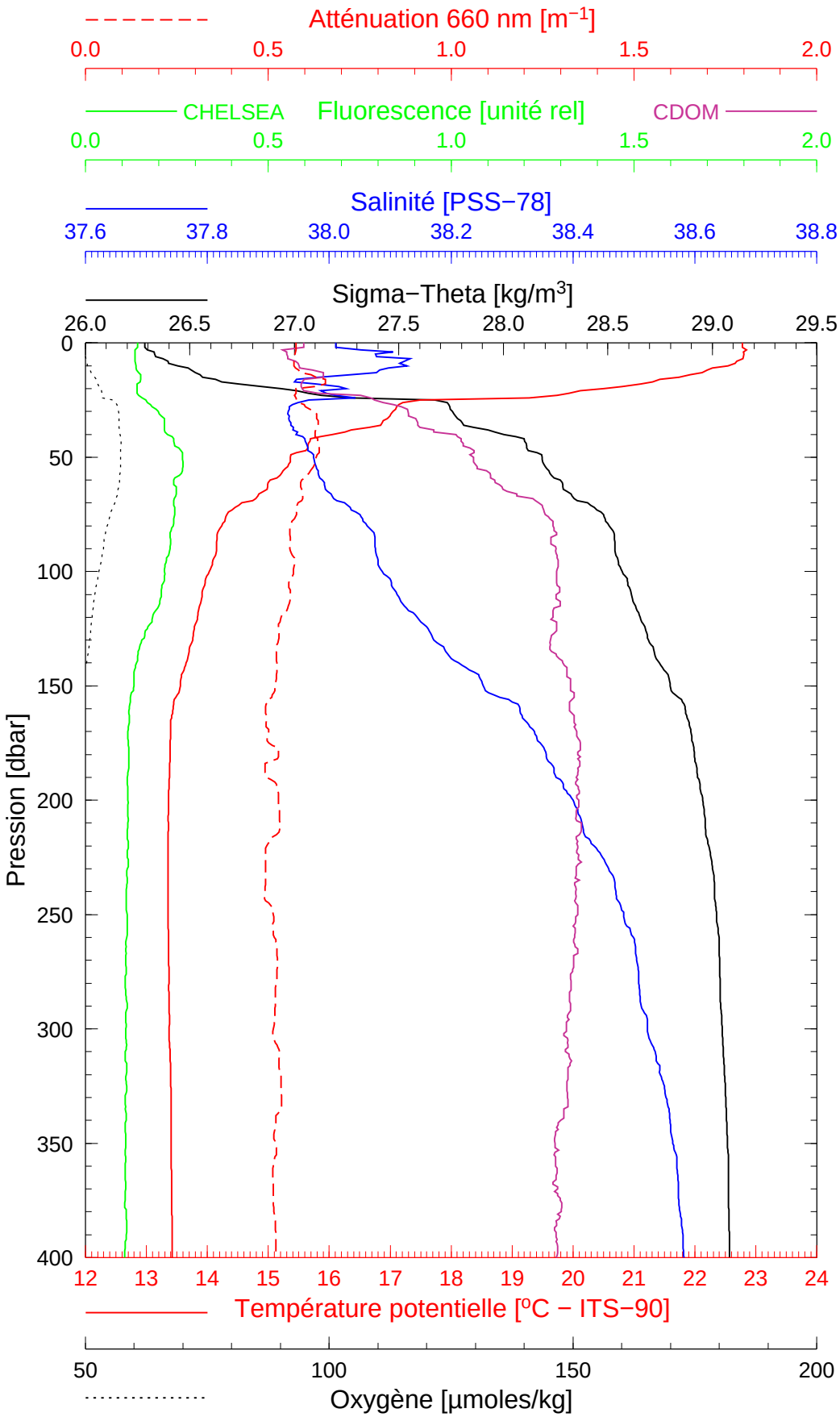
**Boussole** **16/07/2008** **BOUS080716_07**

*BOUS007*

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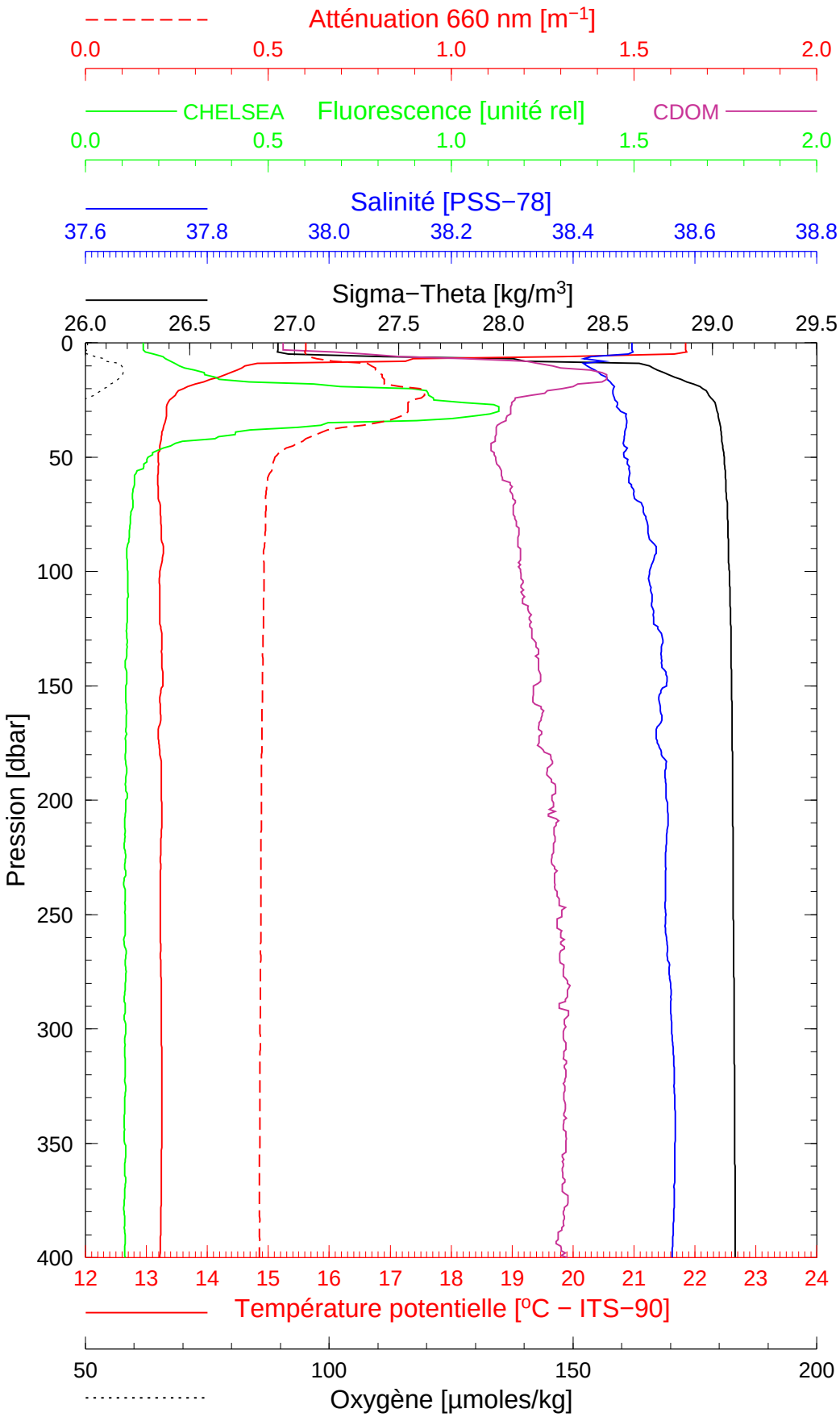
**Boussole** **18/07/2008** **BOUS080718_08**

*BOUS008*

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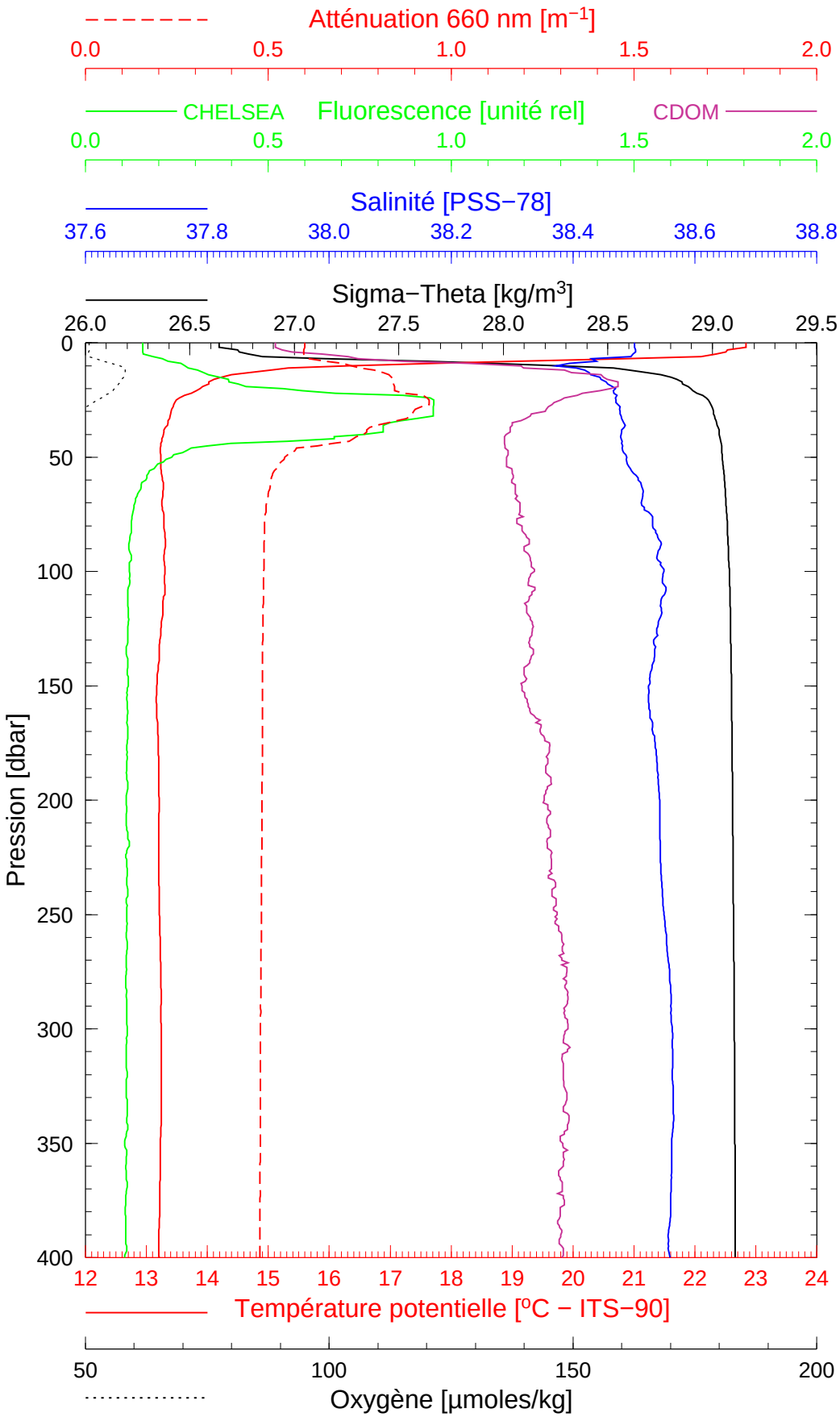
**Boussole** **18/07/2008** **BOUS080718_09**

*BOUS009*

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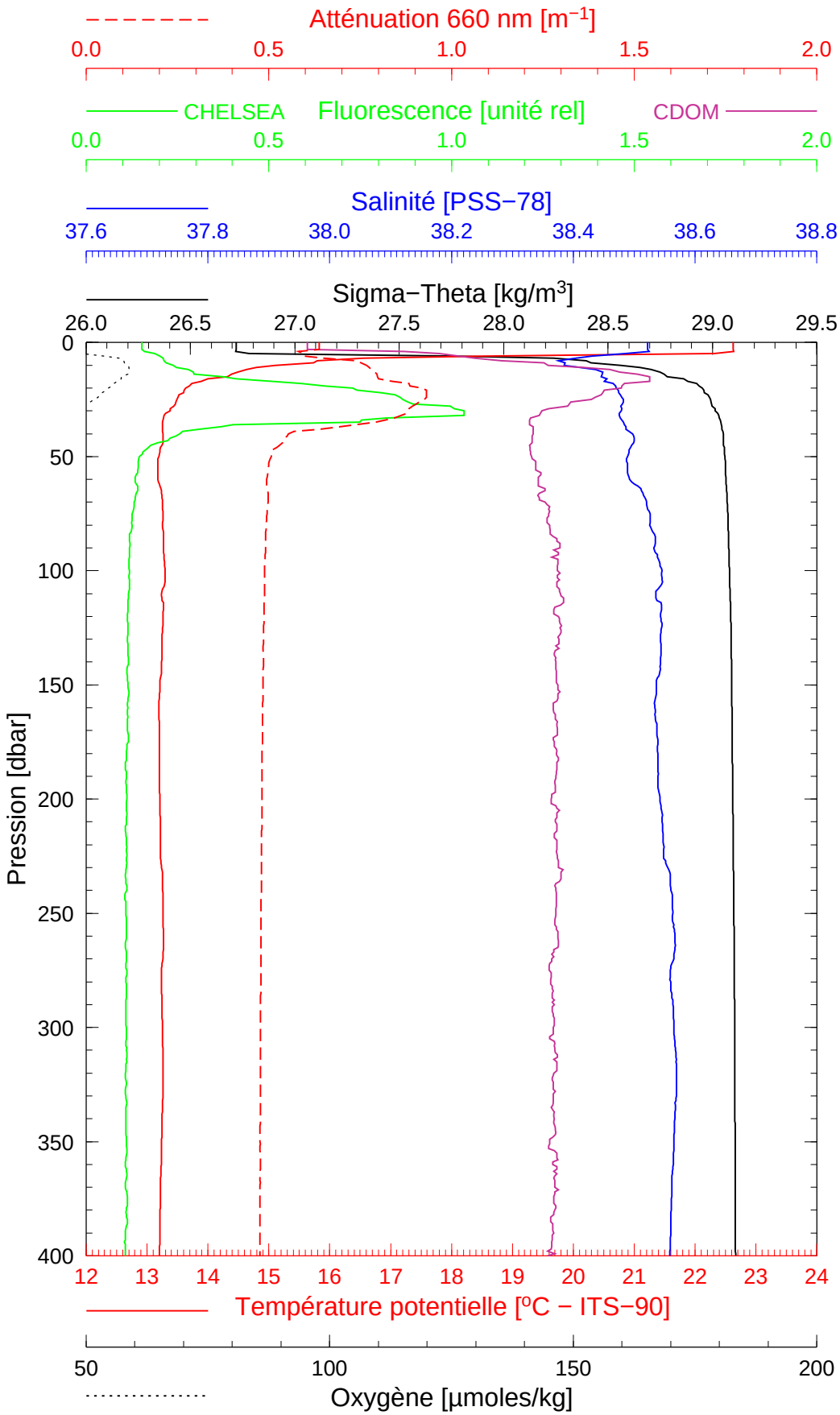
**Boussole** **19/07/2008** **BOUS080719_10**

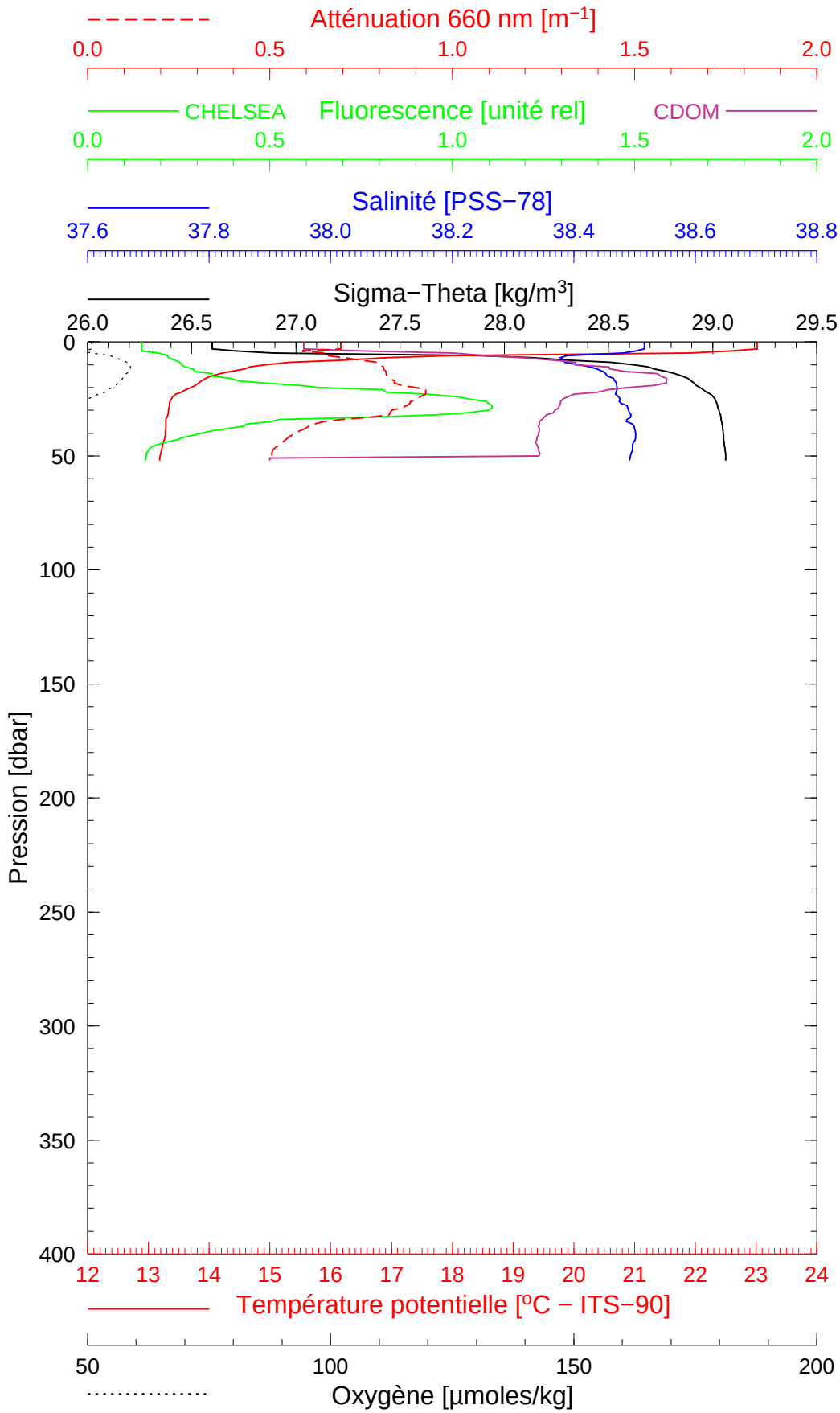
*BOUS010*




| | | | |
|---|---|---|---|
| *Date* | *19/07/2008* | *Latitude* | *43°21.998* |
| *Heure déb* | *08h 11min [TU]* | *Longitude* | *07°53.794* |

**Boussole** **19/07/2008** **BOUS080719_11**

*BOUS011*




| | | | |
|---|---|---|---|
| *Date* | *19/07/2008* | *Latitude* | *43°22.140* |
| *Heure déb* | *12h 28min [TU]* | *Longitude* | *07°53.799* |