# BOUSSOLE Monthly Cruise Report

## Cruise 37
## November 19 – 23 (+ December 16), 2004

Duty Chief: Guislain Bécu (guislain.becu@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captain: Rémy Lafond / Alain Stépahn)

Science Personnel: Guislain Bécu, David Antoine, Thibault Wagner, 3 divers (David Luquet, Yves Lamblart + colleague), 3 others divers (SAMAR, 16th December)

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

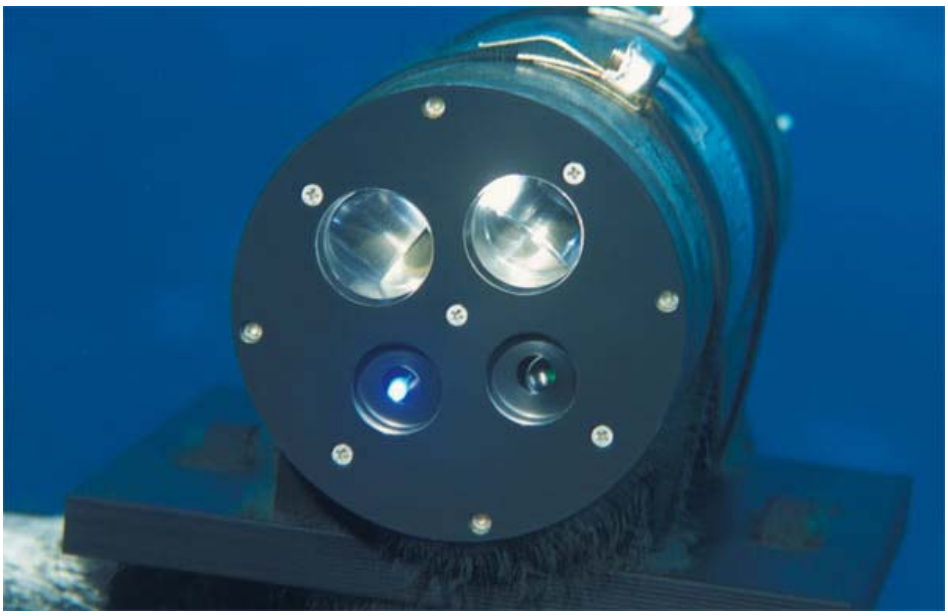


Fig 1. Buoy back-scattering meter (Hobi Labs HydroScatt-II) after cleaning.

**BOUSSOLE project**

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

**Deliverable from WP#400/200**

*December 2, 2005*

# 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 of the USA

Centre National de la Recherche Scientifique, France

Institut National des Sciences de l'Univers, France

Université Pierre & Marie Curie, France

Observatoire Océanologique de Villefranche sur mer, France

# Contents

## Cruise Objectives

Multiple SPMR profiles are to occur within 1 hour of satellite overhead passes of SeaWiFS and MERIS and 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 LN2 for HPLC pigment and particule absorption spectrophotometric filter analysis 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 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 four fixed locations on-route from Boussole and a final two station positions to be decided during the transect in order to sample on both sides of the main frontal structure between the coastal waters and Ligurian Sea. The time of day of this transect should be similar for each cruise, if possible to minimise influence of diurnal variability.

David Antoine and Thibault Wagner will be assisting Guislain Bécu with CTD operations; Vera Jones will be aboard to take 8x25 litres Sea Water.

One CNRS diver and Two independent divers will be aboard (on 22$^{nd}$ November) to check on the physical state of the buoy below the surface, providing underwater photographs and cleaning and exchanging the sensors. Three independent divers (SAMAR) will be aboard (on 16$^{th}$ December) also to check on the under surface buoy state, to take some sensors and buoy pictures, and to clean and exchange radiometers.

Other activities will also be performed on the buoy to download the data off the buoy and verify that everything is as expected above the waterline.

## Cruise Summary

LOV AC9+ was used on BIOSOPE mission at the same time, so that another one was borrowed (in emergency) at Collin Roesler (Bigelow Laboratory for Ocean Sciences, U.S.A.) (cf. BOUSSOLE #36 report). The AC9+ was finally successfully configured, so that the BOUSSOLE site – Nice Port transect was possible.

The new filtration unit (cf. BOUSSOLE #36 report) was again tested and successfully operated (a screw was tightened a little bit too much and was crushing a plastic tube).

The pressure sensor giving the SPMR depth was not repaired nor exchanged (cf. BOUSSOLE #36 report), so that depth is not known when realizing a profile, but a Sea Beard CTD SBE39 (hand held CTD) was fixed on the SPMR, synchronized with the SPMR connected Laptop. The SPMR depth can so be retrieved.

### Friday 19$^{th}$ November

The weather conditions were very bad; winds were about Beaufort force 5 or 6, with a lot of swell. The ship stayed at Nice

### Saturday 20$^{th}$ November

Weather conditions were too bad and prevented departure.

## Sunday 21st November

Winds reduced (Beaufort 2 – 3), swell also reduced, a site trip was possible. Buoy data were retrieved (again, it wasn't possible to retrieve the event log files). 2 CTD profiles, 5 BOUSSOLE site - Port of Nice transect CTD and 3 SPMR profiles were realized.

## Monday 22nd November

2 CTD profiles were realized, including one at 900 m depth (to test the electric cable that holds and powers the CTD, as Jacques Chiaverini had some doubts about it). No SPMR profiles were realized, as there were too many heterogeneous clouds. The divers cleaned up the buoy sensors, took some pictures.

## Tuesday 23rd November

2 CTD and 6 SPMR profiles were realized. For the last CTD profile, no water sample was collected, as the liquid nitrogen tank was full (just a small one – 10 l – was available for the cruise, as the others were on BIOSOPE and KEOPS mission). Buoy data were retrieved.

## Thursday 16th December

As the buoy strain sensor was indicating a weird value for few weeks, it was decided to try to measure it mechanically. This operation was tried on 16th December, as this was a crucial date to exchange the buoy radiometers, too. The only mechanical weighing hook that was available was far too big to be manipulated without hazard, especially with the large swell of that day. The operation was cancelled. The radiometers were nevertheless exchanged, and the data retrieved.

# Cruise Report

## 19th November, 2004 (Times UTC)

Staying in port of Nice, due to bad sea conditions

## 20th November, 2004

Staying in port of Nice, due to bad sea conditions

## 21st November, 2004

0530 Departure from Port of Nice
0850 Arrival at BOUSSOLE site
0900 Buoy data retrieval
0910 CTD profile 1 with sea water samples at 200, 100, 80, 70, 60, 60, 50, 40, 30, 20, 10 (triplicate) and 5 (triplicate) m. Filtration finished at 1210; little bit longer than expected because of a screw that was tightened too much (it was crushing a plastic tube in the vacuum circuit)
1215 SPMR profiles 1, 2 and3 with the SBE39 hand held CTD (fixed on the profiler) as the depth recorder
1325 CTD profile 2 with triplicate at 10 and 5 m
1425 CTD profile 3. Max 400m. Transect Station 1 (43°25'N 7°48'E)
1525 CTD profile 4. Max 400m. Transect Station 2 (43°28'N 7°42'E)
1620 CTD profile 5. Max 400m. Transect Station 3 (43°31'N 7°37'E)
1720 CTD profile 6. Max 400m. Transect Station 4 (43°34'N 7°31'E)
1820 CTD profile 7. Max 400m. Transect Station 5 (43°37'N 7°25'E)
1905 Arrival in port of Nice

## 22nd November, 2004 (except for diving, outside Zonex #28 by military order)

0530 Departure from port of Nice
0900 Arrival at BOUSSOLE Site; Vera Jones took 8x25 l sea water samples; divers took some pictures, cleaned up the buoy sensor, and did not exchange the radiometers ("b" rad set stayed at sea).
1105 CTD profile 8 with sea water samples at 200, 100, 80, 70, 60, 50, 40, 30, 20, 10 (triplicate) and 5 (triplicate) m.
1320 CTD profile 9 until 900 m, to test the electric cable.
1700 Arrival in port of Nice

## 23rd November, 2004

0530 Departure from port of Nice
0850 Arrival at BOUSSOLE Site
0900 Buoy data retrieval (event log files not retrieved)
0905 CTD profile 10 with sea water samples at 200, 100, 80, 70, 60, 50, 40, 30, 20, 10 (triplicate) and 5 (triplicate) m.
0950 SPMR profiles 4, 5 and 6 with SBE39 hand held CTD (synchronized with the SPMR connected Laptop) as a pressure sensor
1200 SPMR 7, 8 and 9 profiles with the SBE39 CTD as a pressure sensor
1245 CTD profile 11 without water sampling. Only the small (10 l) liquid nitrogen tank was available for the mission, others were on others missions (BIOSOPE, KEOPS)
1300 Buoy data retrieval
1640 Arrival in Port of Nice

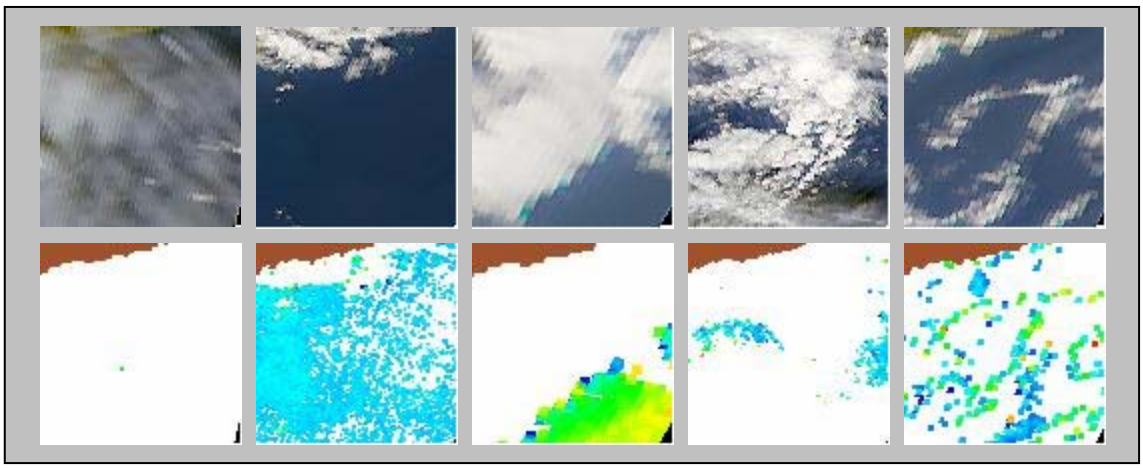
## 16th December, 2004 (Captain: Alain Stephan)

0630 Departure from port of Nice
0700 U-turn back to port of Nice: Cpt. A. Stephan doesn't want the divers of SAMAR to dive without CNRS/INSU-DT permission.
1400 Arrival at BOUSSOLE Site; buoy data retrieval.
1410 Divers checked the general state of the buoy and exchanged the radiometers without cleaning the previous (they just cleaned the Tx and Fl), as administrative problems delayed departure and large swell made the operation uncomfortable. Guislain Bécu exchanged the MVD. Radiometers # 030, 036, 037, 048, 050, 163 and 164 were installed ("s" rad set). The Zodiac boat was a little bit damaged when returning back on the boat rear deck, due to the swell (an attach point was broken).
1500 Buoy data retrieval
1510 Departure for port of Nice. Strain mechanical weighing not realized due to too large swell and due to the size of the weighing hook
1850 Arrival in port of Nice

# Ligurian Sea Boussole Site Satellite Images

http://seawifs.gsfc.nasa.gov/cgi/seawifs_region_extracts.pl

## SeaWiFS



19th Nov 04 20th Nov 04 21st Nov 04 22nd Nov 04 23rd Nov 04

Figure 2. SeaWiFS images Level 1 (upper) and Level 2 (lower) images of the french coastline and Boussole site. (http://seawifs.gsfc.nasa.gov/cgi/seawifs_region_extracts)

# Modis

Modis images not available at time of last edit

# Calculated Swath paths for MERIS Sensor (ESOV Software)

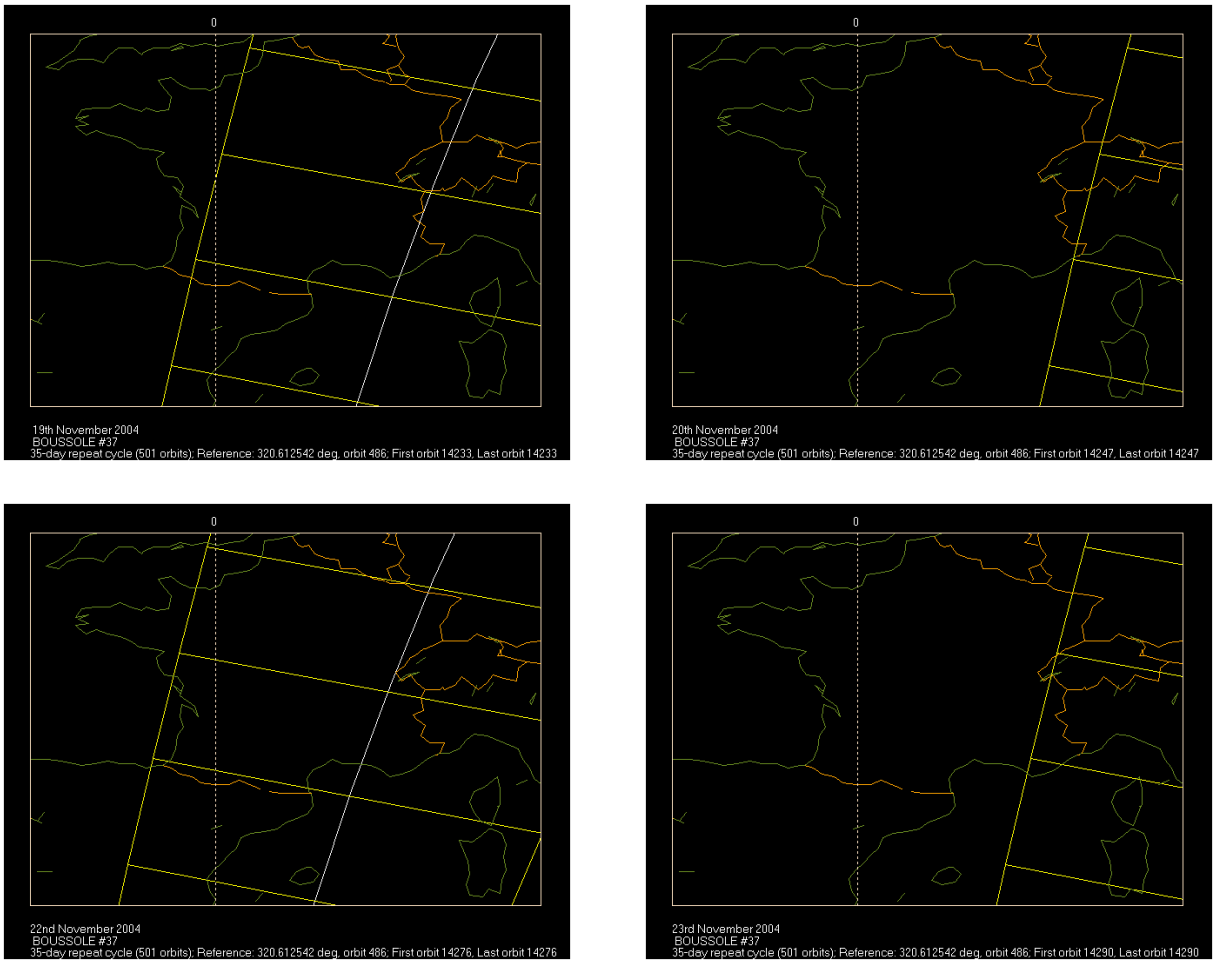
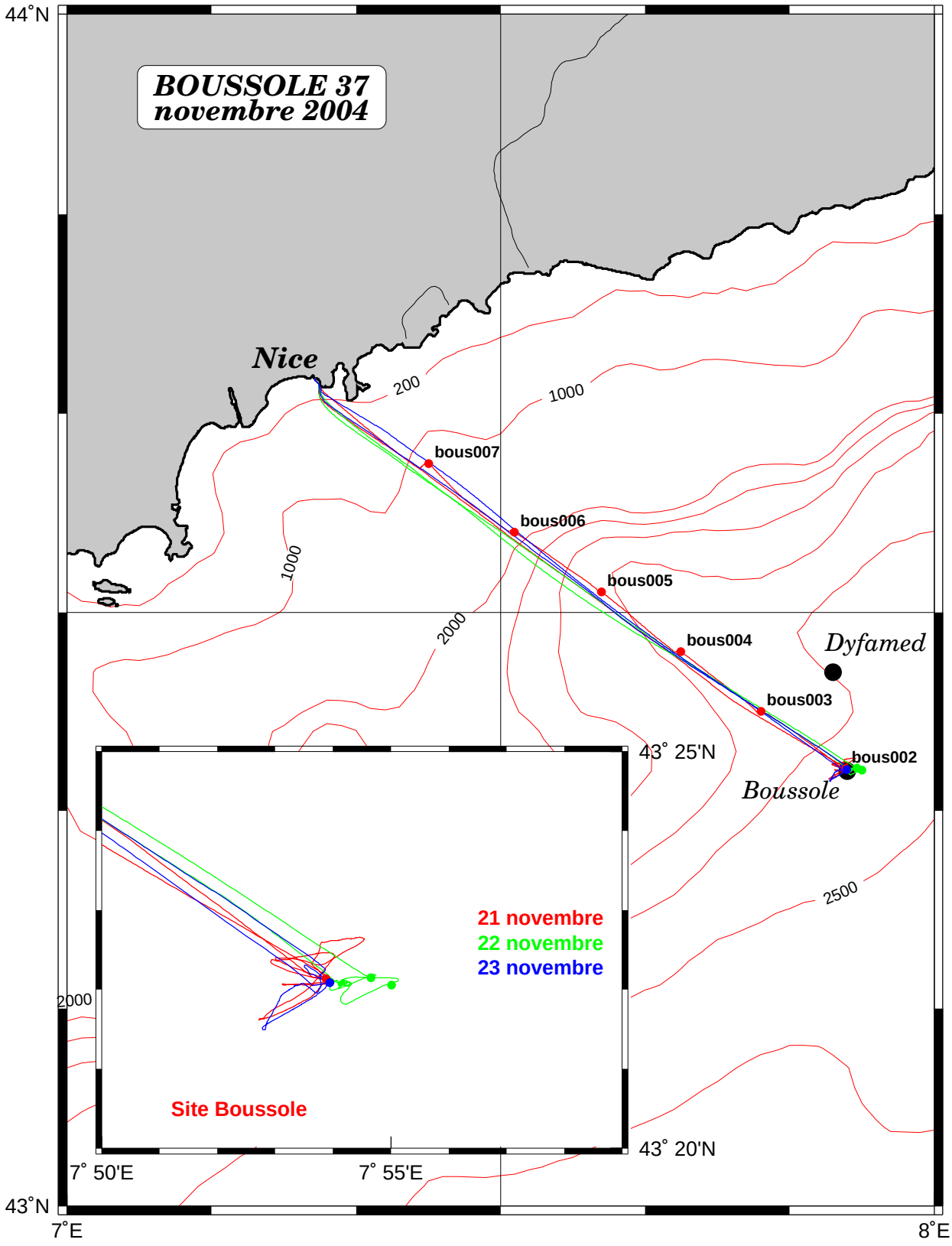



Figure 3. Calculated swath paths for MERIS (Esov software) above BOUSSOLE site for 19$^{th}$, 20$^{th}$, 22$^{nd}$ and 23$^{rd}$ October, 2004.

# Appendix

Cruise Summary Table for Boussole 37

| Date | Black names | Profile names | CTD notées / | Start Time | Duration | Depth max | Latitude (N) | | longitude | | Other sensors | Their cast | Start/Finish | | | | 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 speed | Wind dir. | Atm. Pressure | humidity | Visibility | T air | T water | Sea | Swell height | Swell dir. | White horses |
| ########## | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | F5-F6 | - | - | - | - | - | - | - | 1,8 m | - | yes |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ########## | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | F5-F6 | - | - | - | - | - | - | - | 1,5 m | - | yes |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | CTDBOUS001 | 09:09 | 67:00 | 400 | 43 | 21.824 | 7 | 53.430 | | | | rather clear | far | 3 | 10 kn | 270 | 1024.7 | 51 | very good | 14.0 | 15.8 | choppy | 1 m | | some |
| | bou211104black1 | | | 09:31 | 03:00 | | 43 | 21.420 | 7 | 53.040 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| | bou211104black2 | | | 12:14 | 03:00 | | 43 | 22.040 | 7 | 53.130 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| | | bou211104A | | 12:32 | 04:30 | 180 | 43 | 22.162 | 7 | 53.804 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| | | bou211104B | | 12:43 | 04:35 | 185 | 43 | 22.223 | 7 | 53.511 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| | | bou211104C | | 12:54 | 04:30 | 180 | 43 | 22.269 | 7 | 53.362 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| ########## | bou211104black3 | | | 13:09 | 03:00 | | 43 | 22.314 | 7 | 53.197 | | | | covered | gray Cu | 5 | 8 kn | 253 | 1024.9 | 57 | very good | 13.8 | | choppy - | 0,7 m | | rare |
| | | | CTDBOUS002 | 13:18 | 53:00 | 400 | 43 | 22.136 | 7 | 53.879 | | | | covered | gray Cu | 6 | 6 kn | 61 | 1025.0 | 49 | very good | 14.2 | 15.6 | calm | 0,5 m | | no |
| | | | CTDBOUS003 | 14:23 | 29:00 | 400 | 43 | 25.010 | 7 | 48.020 | | | | covered | gray Cu | 6 | 4 kn | 84 | 1025.0 | 48 | very good | 14.2 | 15.6 | calm | 0,5 m | | no |
| | | | CTDBOUS004 | 15:23 | 29:00 | 400 | 43 | 28.042 | 7 | 42.479 | | | | covered | gray Cu | 7 | 5 kn | 106 | 1025.3 | 47 | very good | 14.2 | 16.8 | calm | 0,5 m | | no |
| | | | CTDBOUS005 | 16:21 | 27:00 | 400 | 43 | 31.032 | 7 | 36.984 | | | | covered | gray Cu | 6 | 4 kn | 144 | 1025.5 | 52 | very good | 14.3 | 17.0 | calm | 0,5 m | | no |
| | | | CTDBOUS006 | 17:21 | 26:00 | 400 | 43 | 34.050 | 7 | 30.953 | | | | night | night | night | 2 kn | 135 | 1026.1 | 50 | very good | 14.3 | 17.2 | calm | 0,5 m | | no |
| | | | CTDBOUS007 | 18:20 | 27:00 | 400 | 43 | 37.491 | 7 | 25.018 | | | | night | night | night | 8 kn | 63 | 1026.6 | 63 | very good | 14.1 | 17.6 | flat | 0,3 m | | no |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ########## | | | CTDBOUS008 | 11:02 | 00:00 | 400 | 43 | 22.057 | 7 | 55.009 | | | | covered | heterogen. | 5 | 8 kn | 231 | 1026.6 | 68 | good | 15.0 | 15.5 | calm | 0,7 m | | no |
| | | | CTDBOUS009 | 13:20 | 00:00 | 900 | 43 | 22.150 | 7 | 54.655 | | | | covered | heterogen. | 7 | 5 kn | 214 | 1025.1 | 75 | good | 14.5 | 15.6 | calm | 0,7 m | | no |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | CTDBOUS010 | 09:06 | 27:00 | 400 | 43 | 22.059 | 7 | 53.790 | | | | far fog | far Cu | 2 | 7 kn | 25 | 1021.9 | 65 | good | 16.6 | 15.6 | calm | 0,8 m | | no |
| | bou231104black1 | | | 09:23 | 03:00 | | | | | | | | | | | | | | | | | | | | | | |
| | | bou231104A | | 09:52 | 04:30 | 180 | 43 | 22.054 | 7 | 53.523 | | | | far fog | far Cu | 2 | 7 kn | 25 | 1021.9 | 65 | fair | 16.6 | | calm | 0,8 m | | no |
| | | bou231104B | | 10:02 | 04:30 | 180 | 43 | 22.045 | 7 | 53.239 | | | | far fog | far Cu | 2 | 7 kn | 25 | 1021.9 | 65 | fair | 16.6 | | calm | 0,8 m | | no |
| | | bou231104C | | 10:13 | 04:30 | 180 | 43 | 21.976 | 7 | 53.198 | | | | far fog | far Cu | 2 | 7 kn | 25 | 1021.9 | 65 | fair | 16.6 | | calm | 0,8 m | | no |
| ########## | bou231104black2 | | | 10:38 | 03:00 | | | | | | | | | | | | | | | | | | | | | | |
| | bou231104black3 | | | 11:57 | 03:00 | | | | | | | | | | | | | | | | | | | | | | |
| | | bou231104D | | 12:08 | 03:57 | 140 | 43 | 22.105 | 7 | 53.855 | | | | milky | far Cu | 1 | 8 kn | 56 | 1021.2 | 67 | fair | 14.8 | | calm | 0,8 m | | no |
| | | bou231104E | | 12:17 | 04:30 | 180 | 43 | 22.150 | 7 | 53.773 | | | | milky | far Cu | 1 | 8 kn | 56 | 1021.2 | 67 | fair | 14.8 | | calm | 0,8 m | | no |
| | | bou231104F | | 12:27 | 04:30 | 180 | 43 | 22.194 | 7 | 53.659 | | | | milky | far Cu | 1 | 8 kn | 56 | 1021.2 | 67 | fair | 14.8 | | calm | 0,8 m | | no |
| | bou231104black4 | | | 12:56 | 03:00 | | | | | | | | | | | | | | | | | | | | | | |
| | | | CTDBOUS011 | 12:45 | 26:00 | 400 | 43 | 22.086 | 7 | 53.947 | | | | mily | far Cu | 1.5 | 8 kn | 82 | 1020.9 | 67 | fair | 15.7 | 15.6 | calm | 0,7 m | | no |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ########## | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

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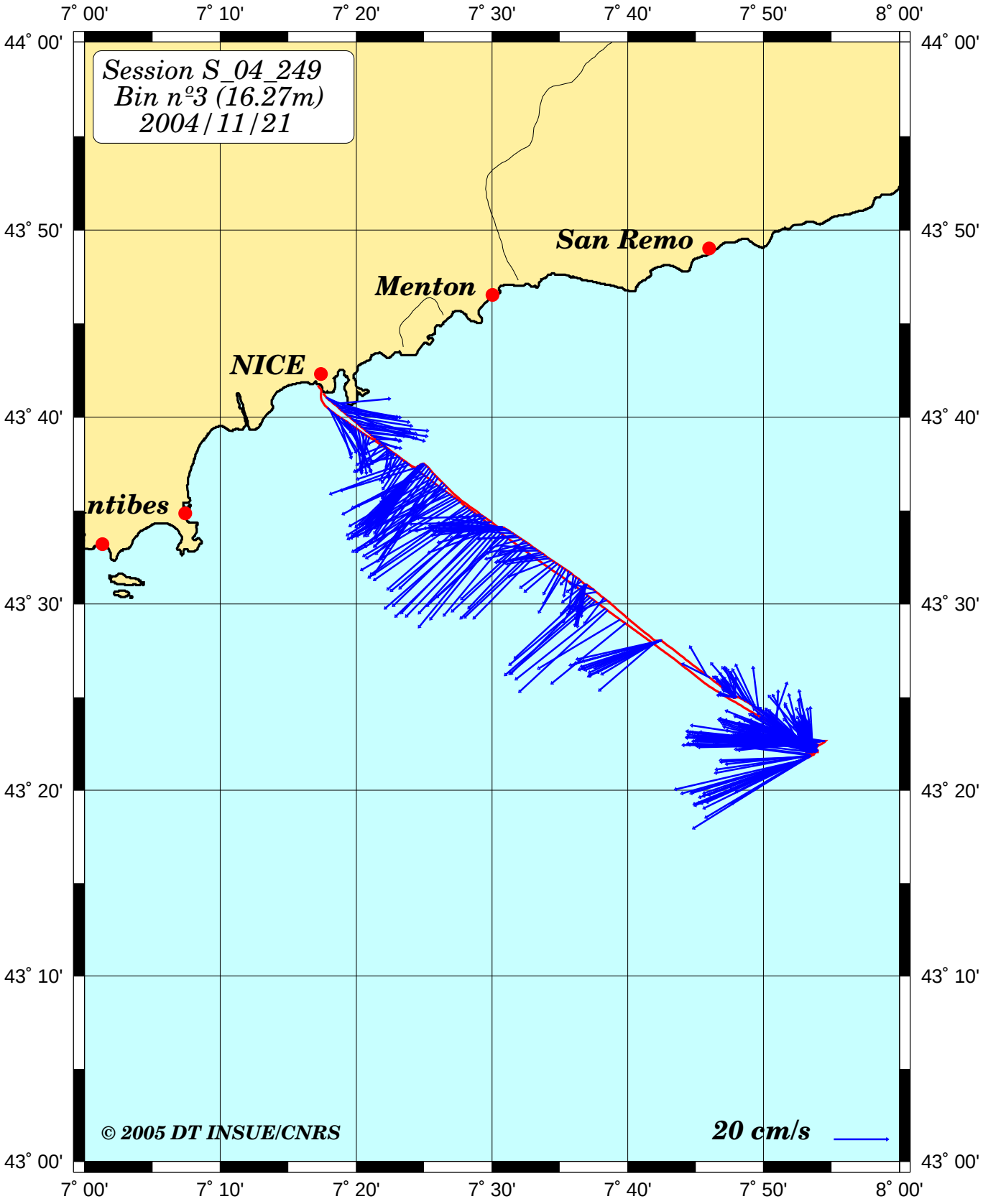


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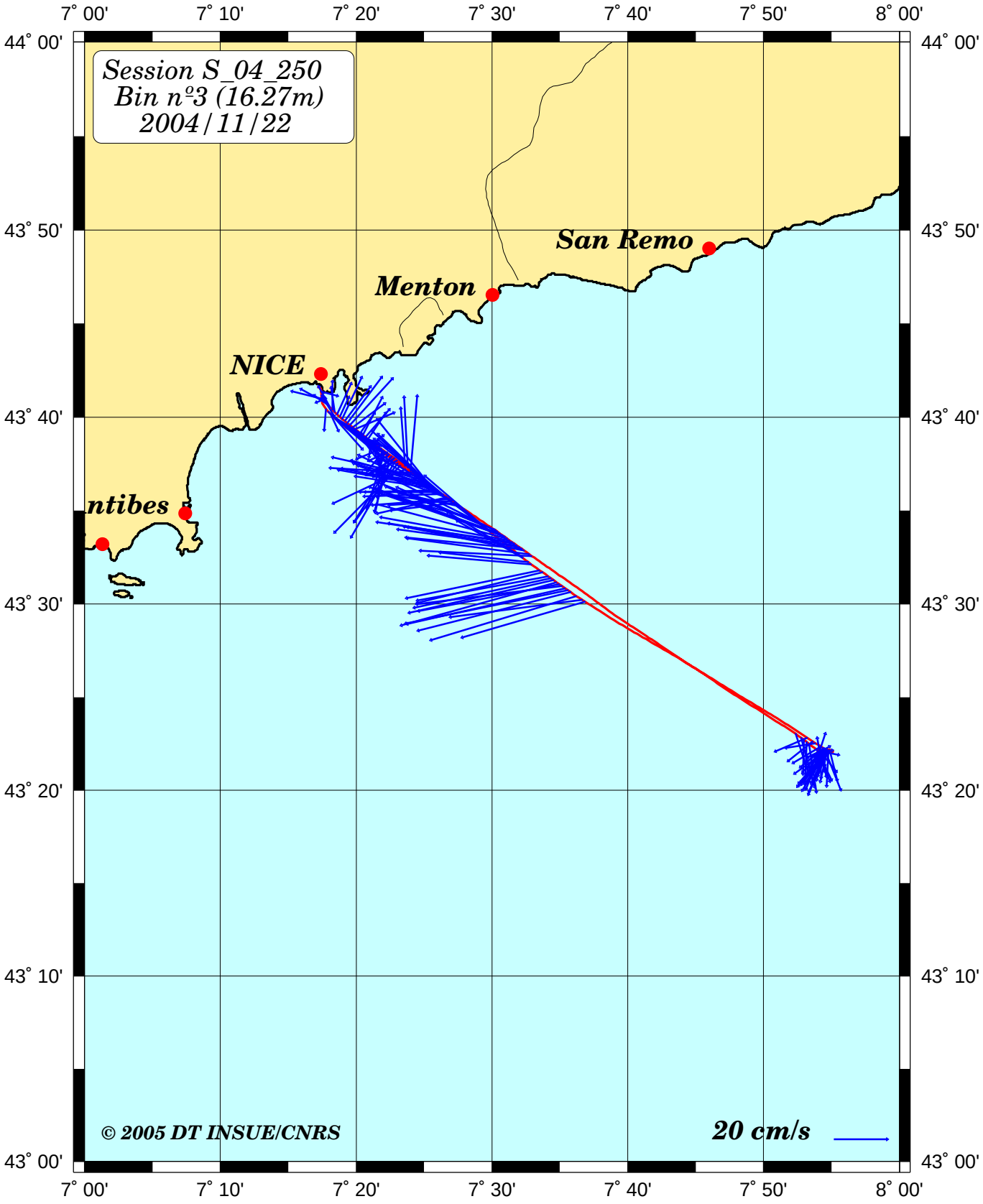


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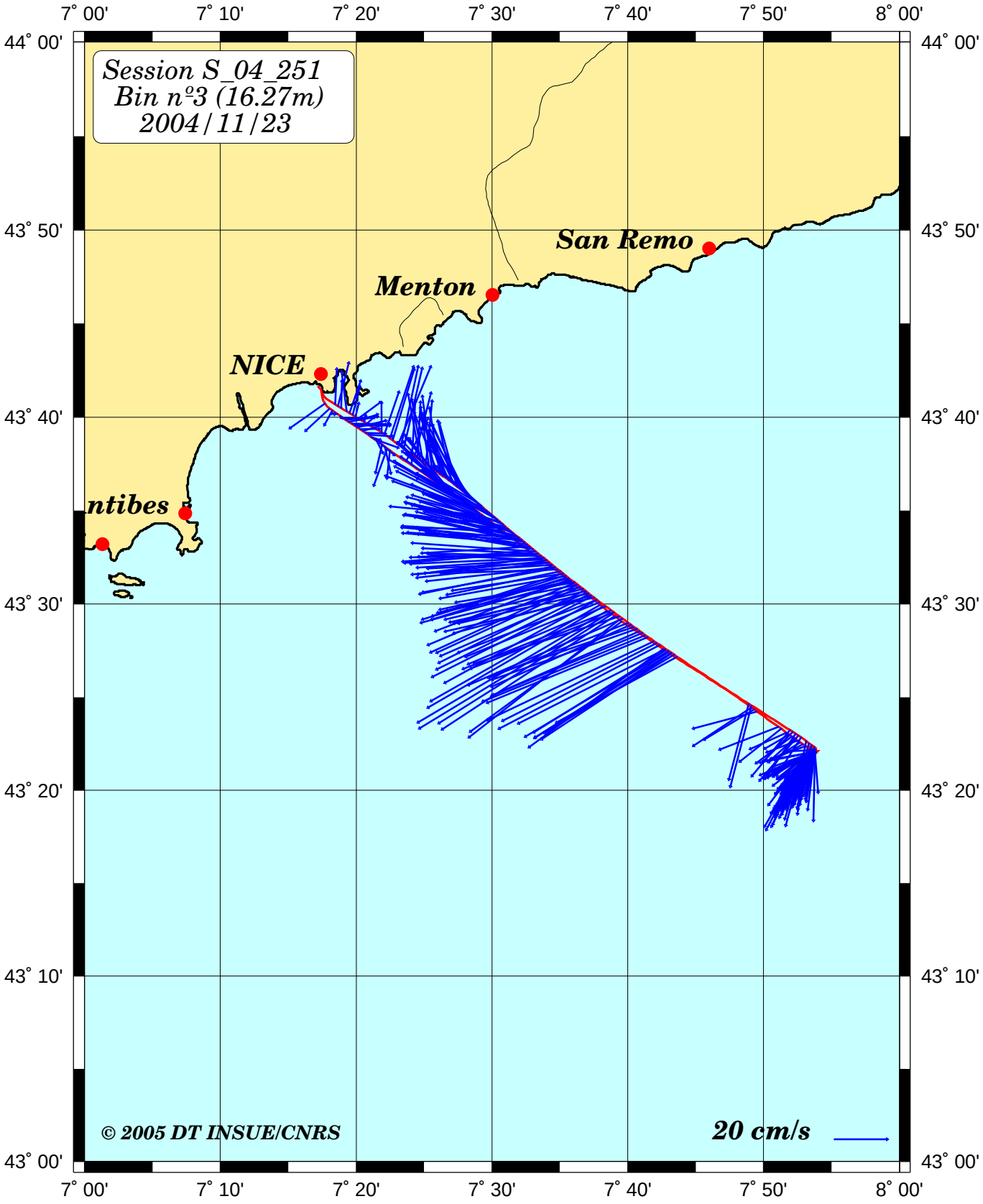


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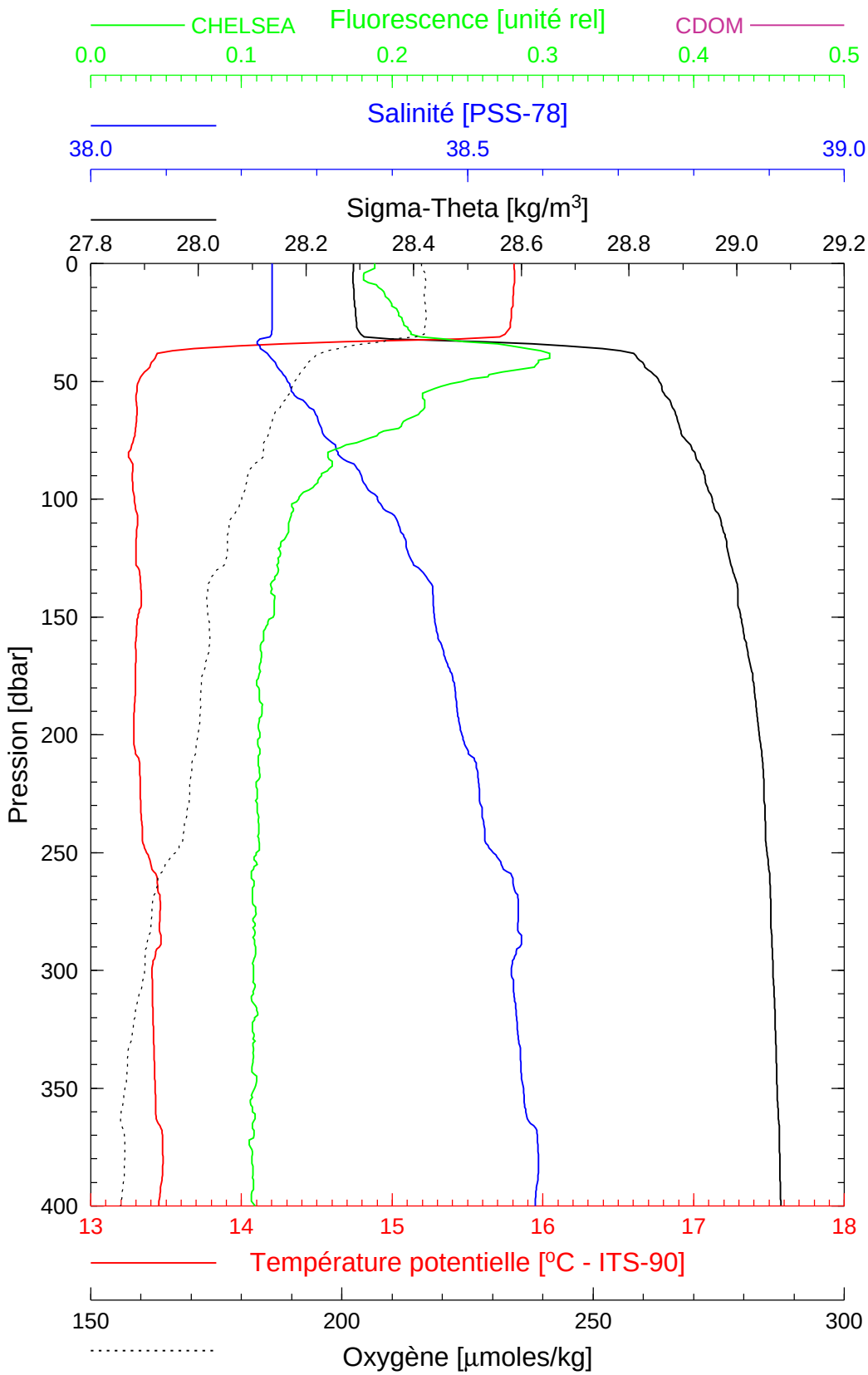
*BOUS001*

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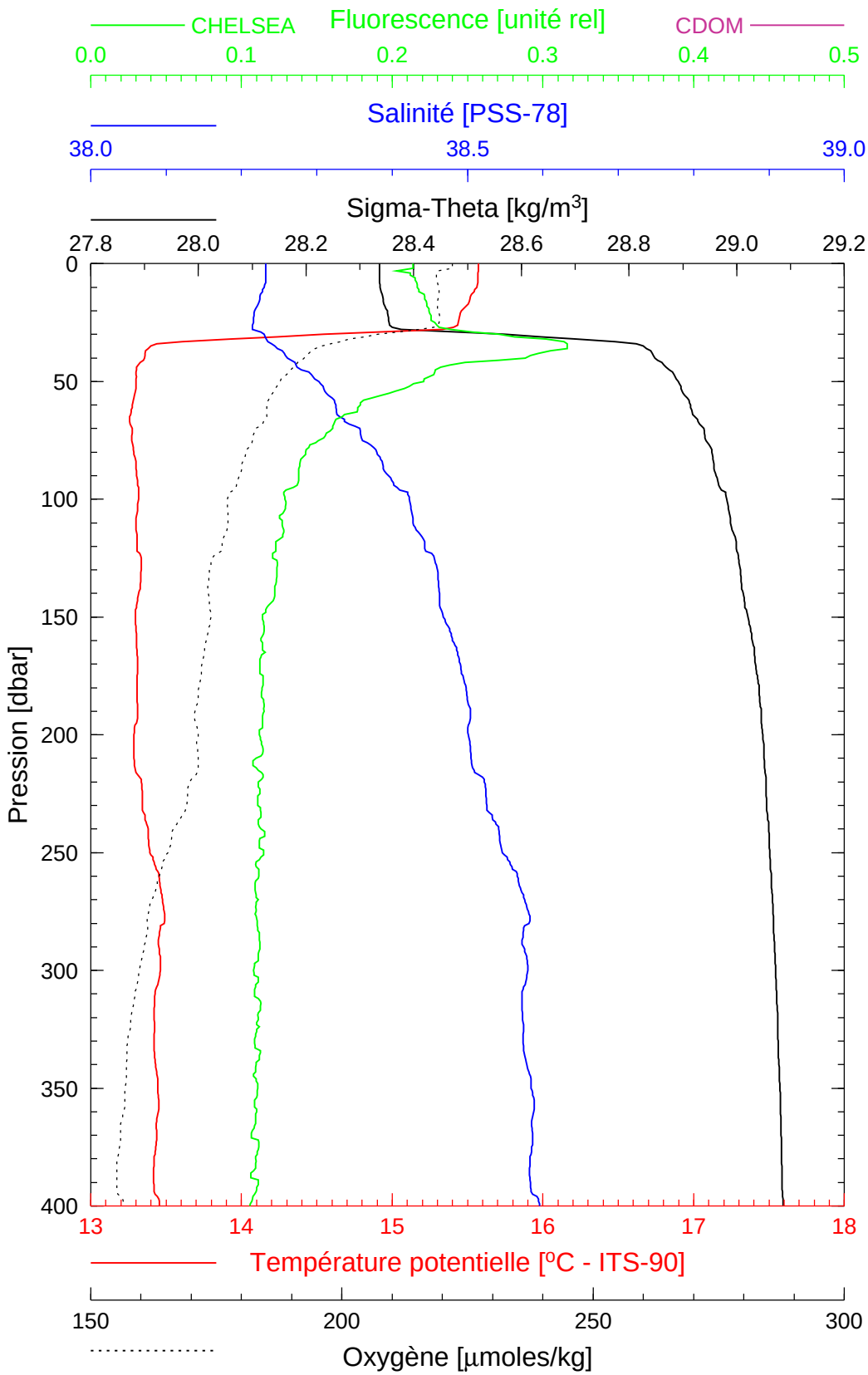
*BOUS002*

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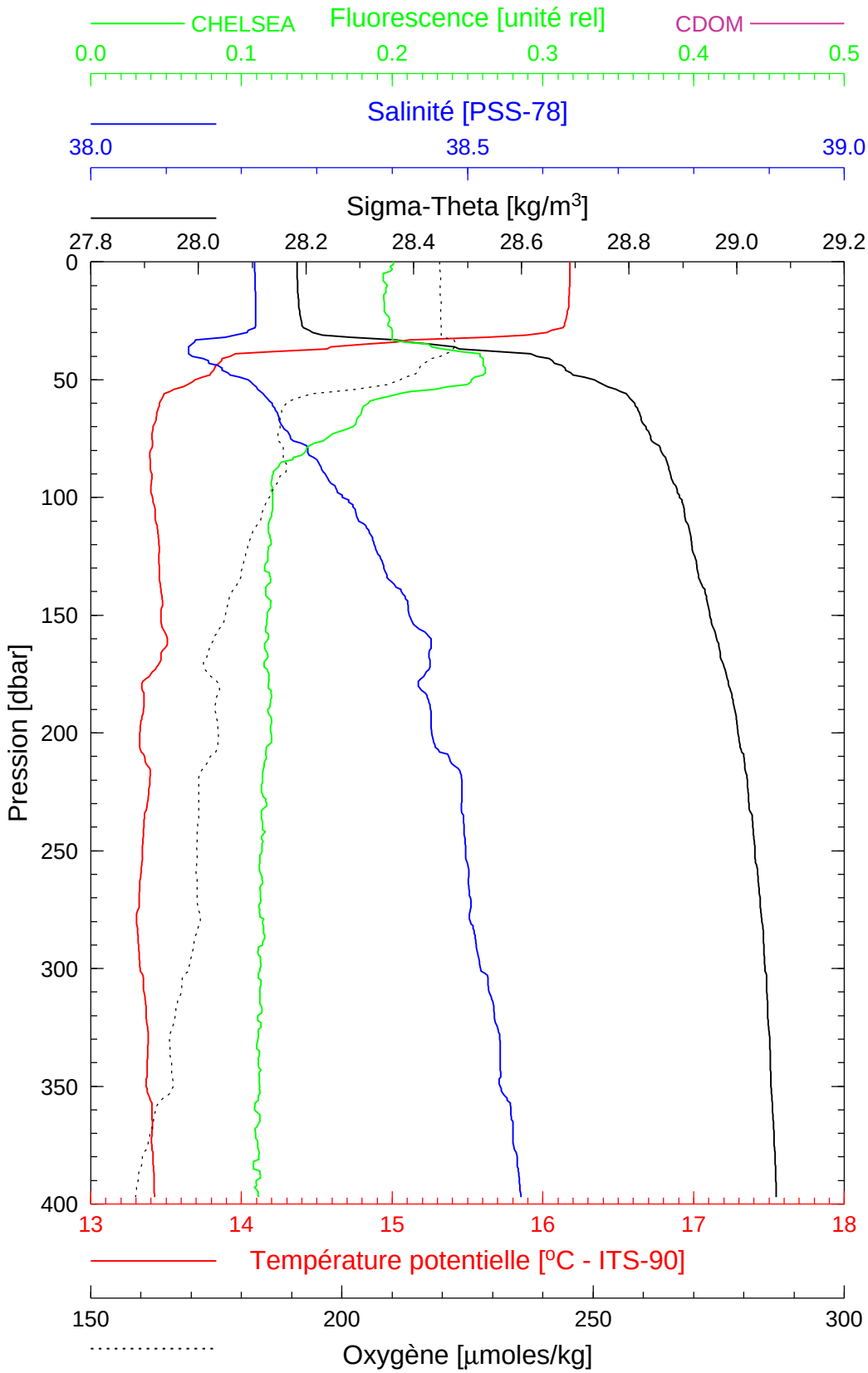
*BOUS003*

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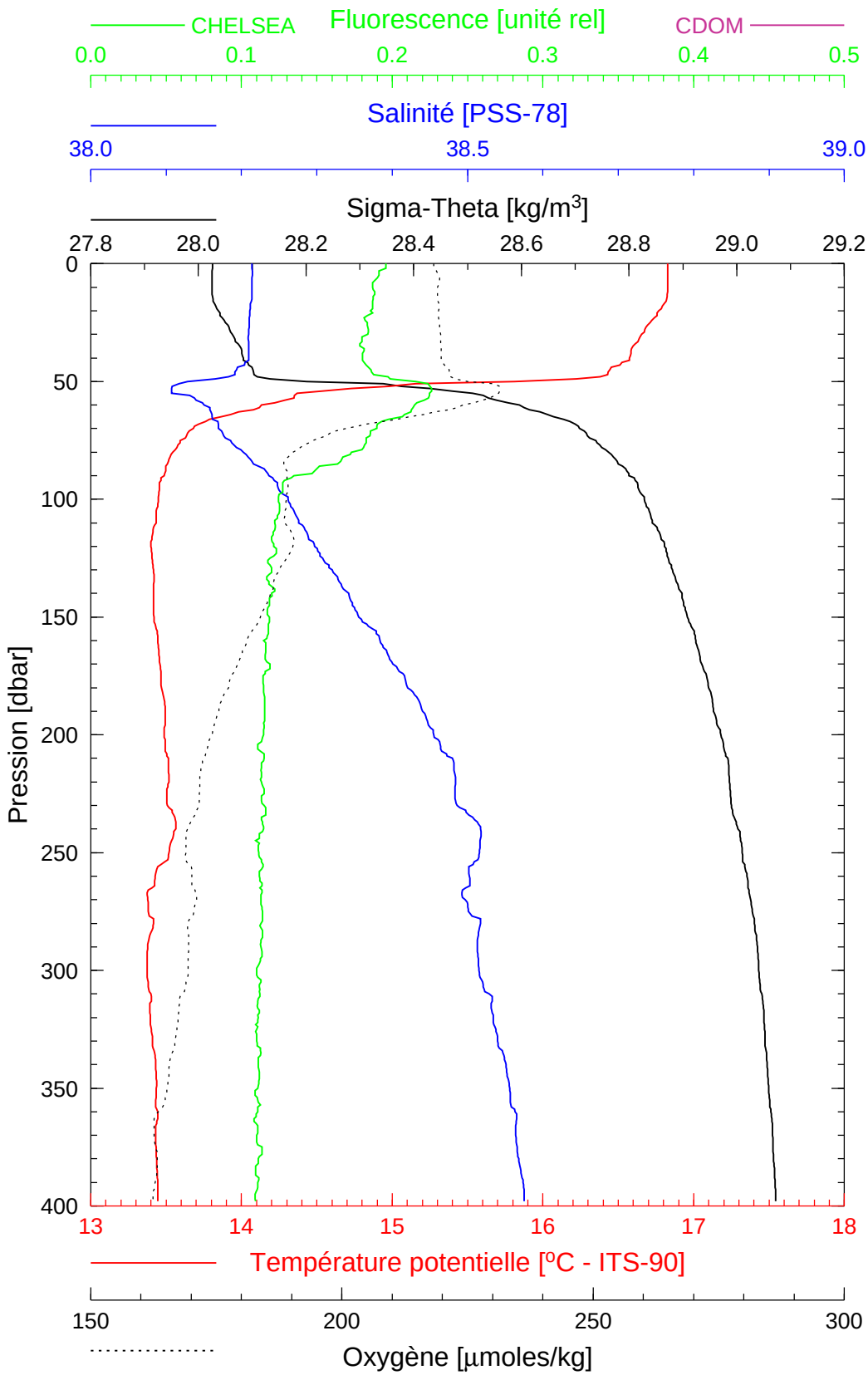


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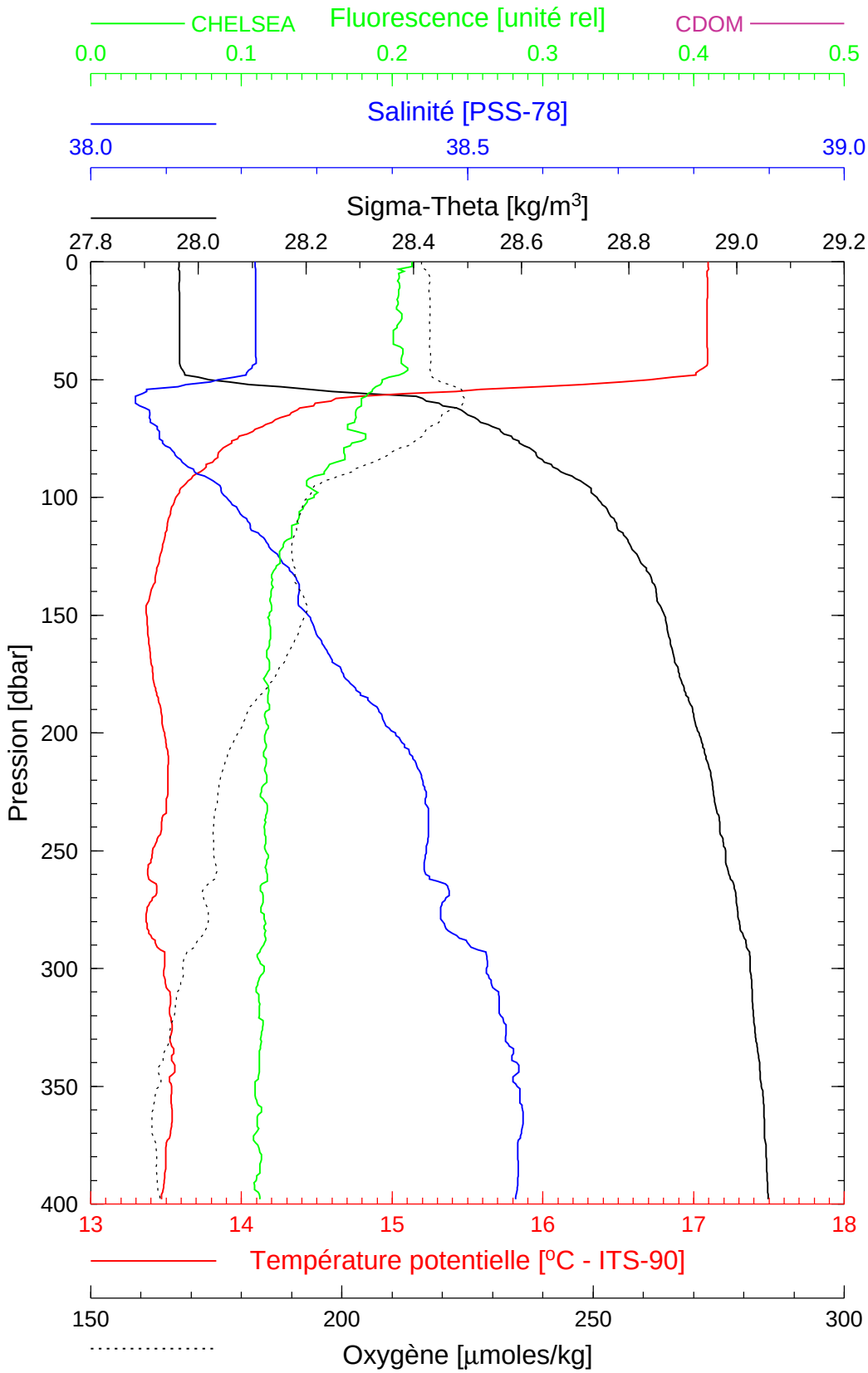
*BOUS005*

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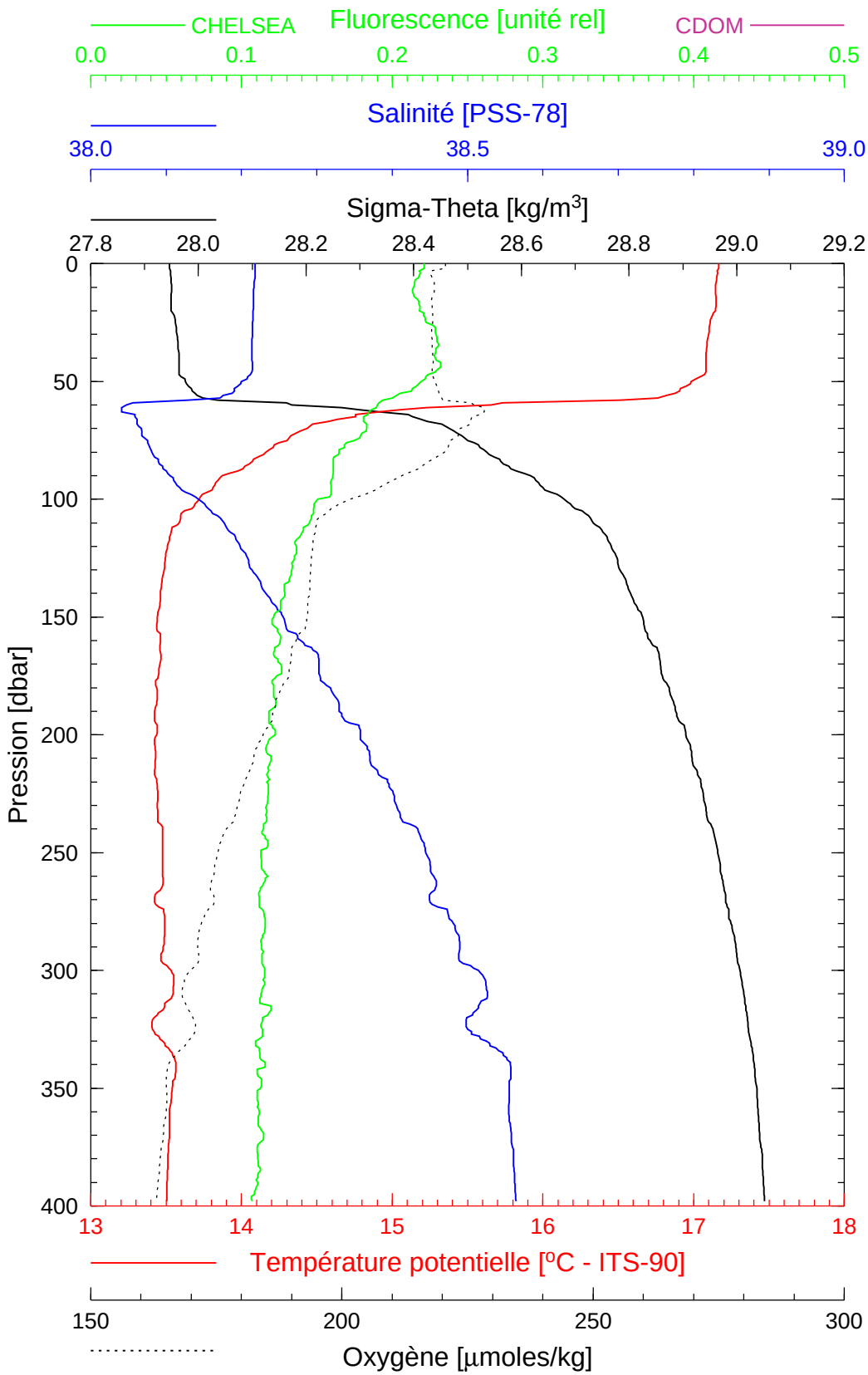
*BOUS006*

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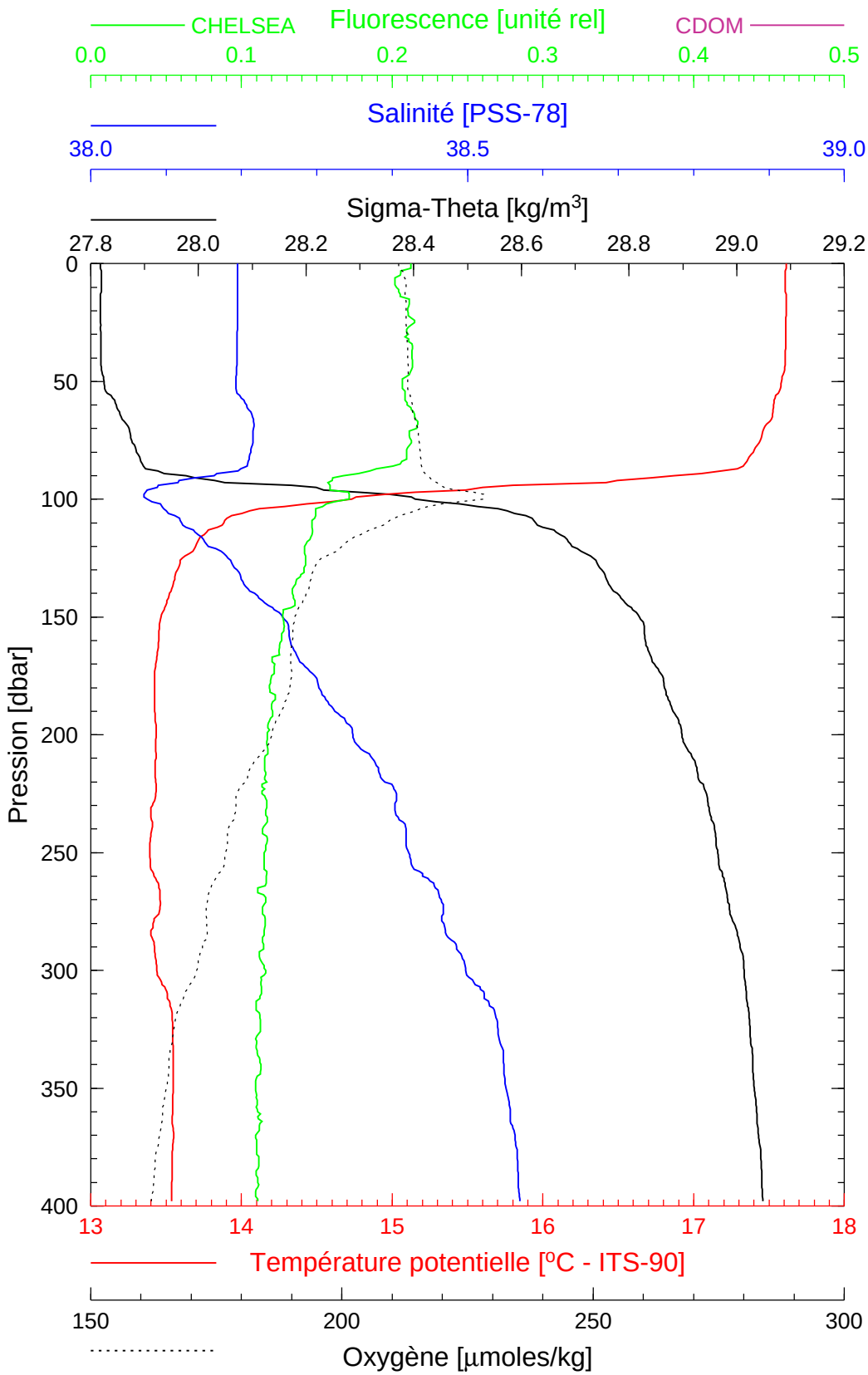
*BOUS007*

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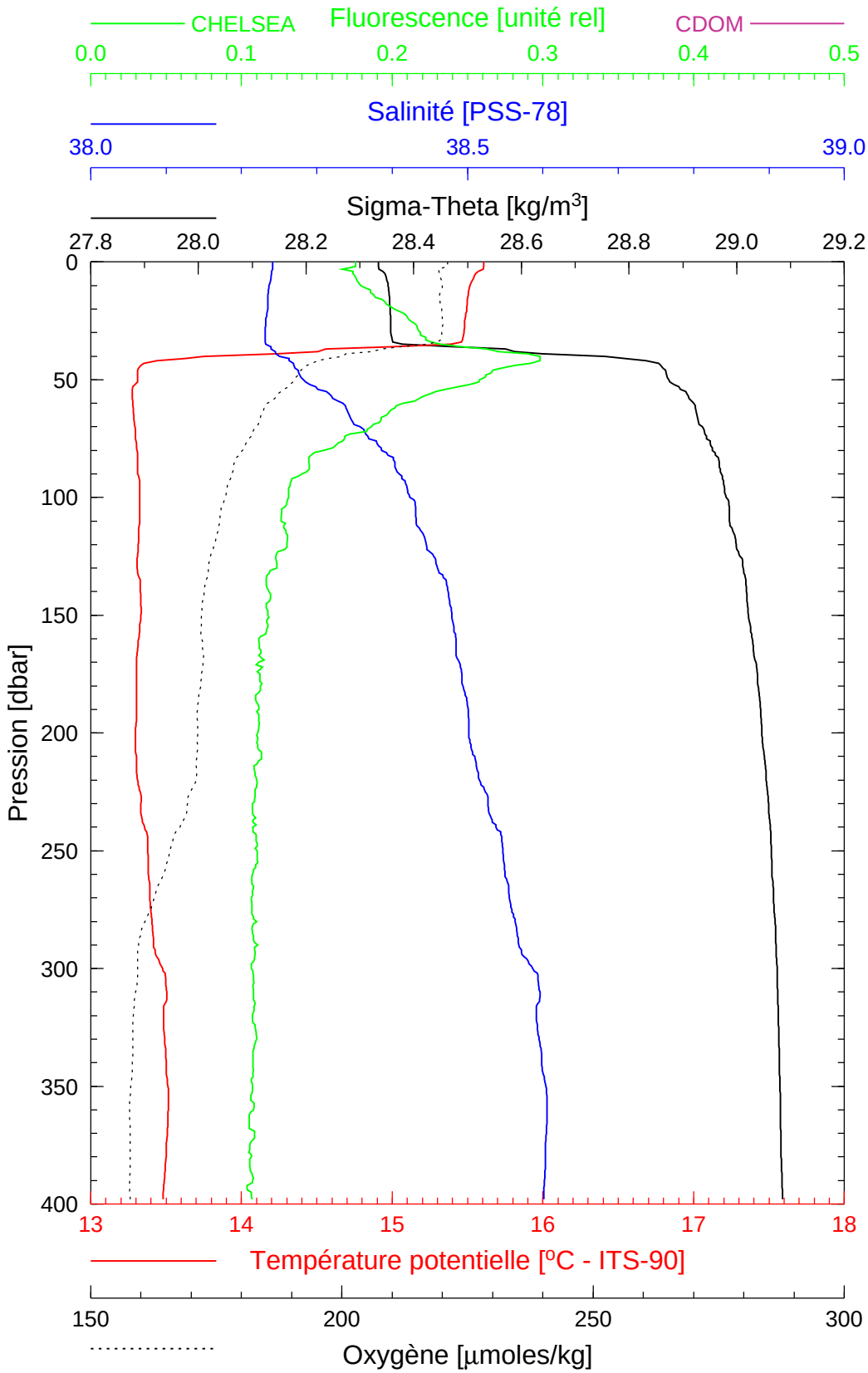
*BOUS008*

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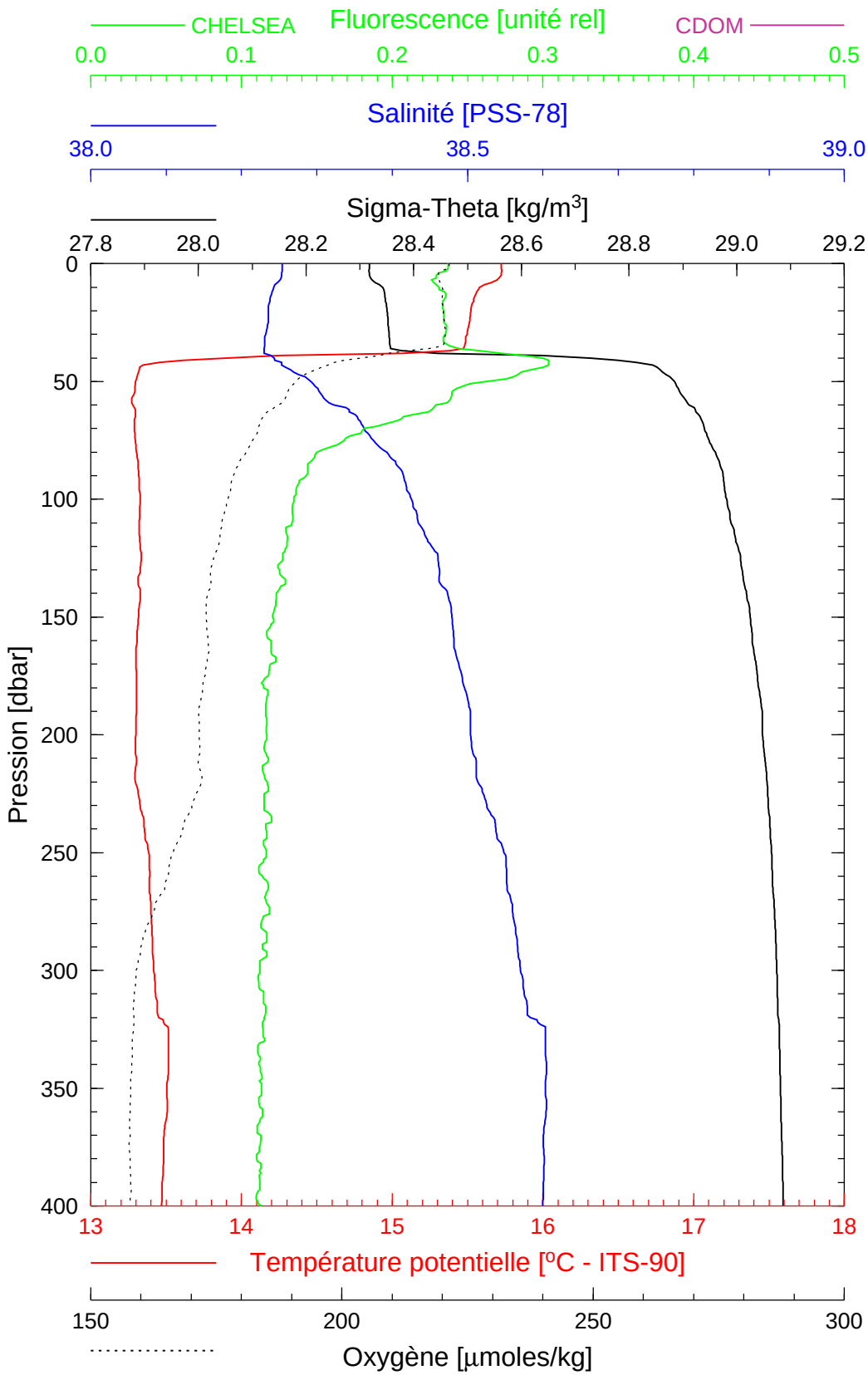
*BOUS009*

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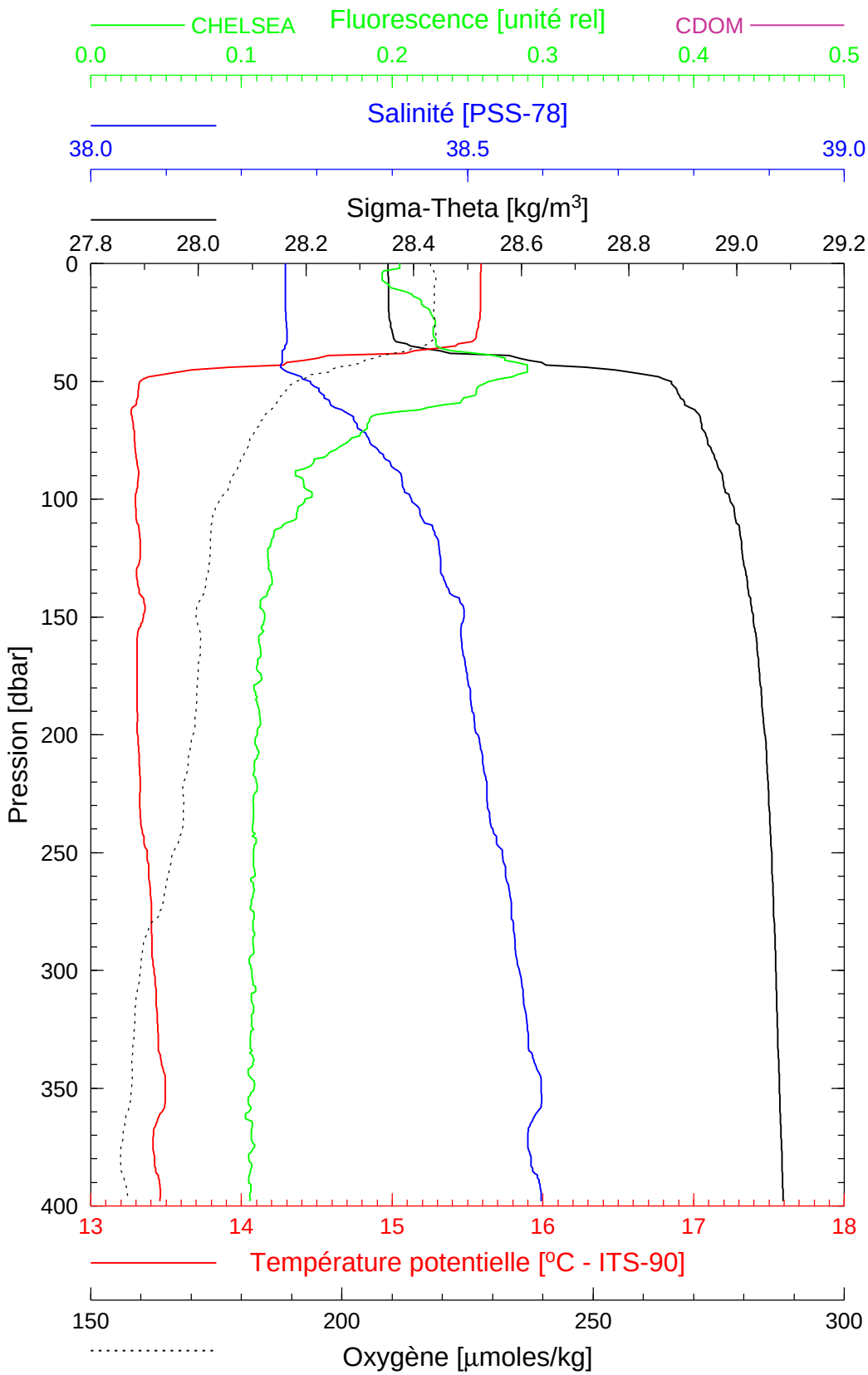
*Heure déb* *13h 17min [TU]* *Longitude* *07º54.655 E*

**Boussole 37** **23/11/2004** **BOUS041123_01**

*BOUS010*

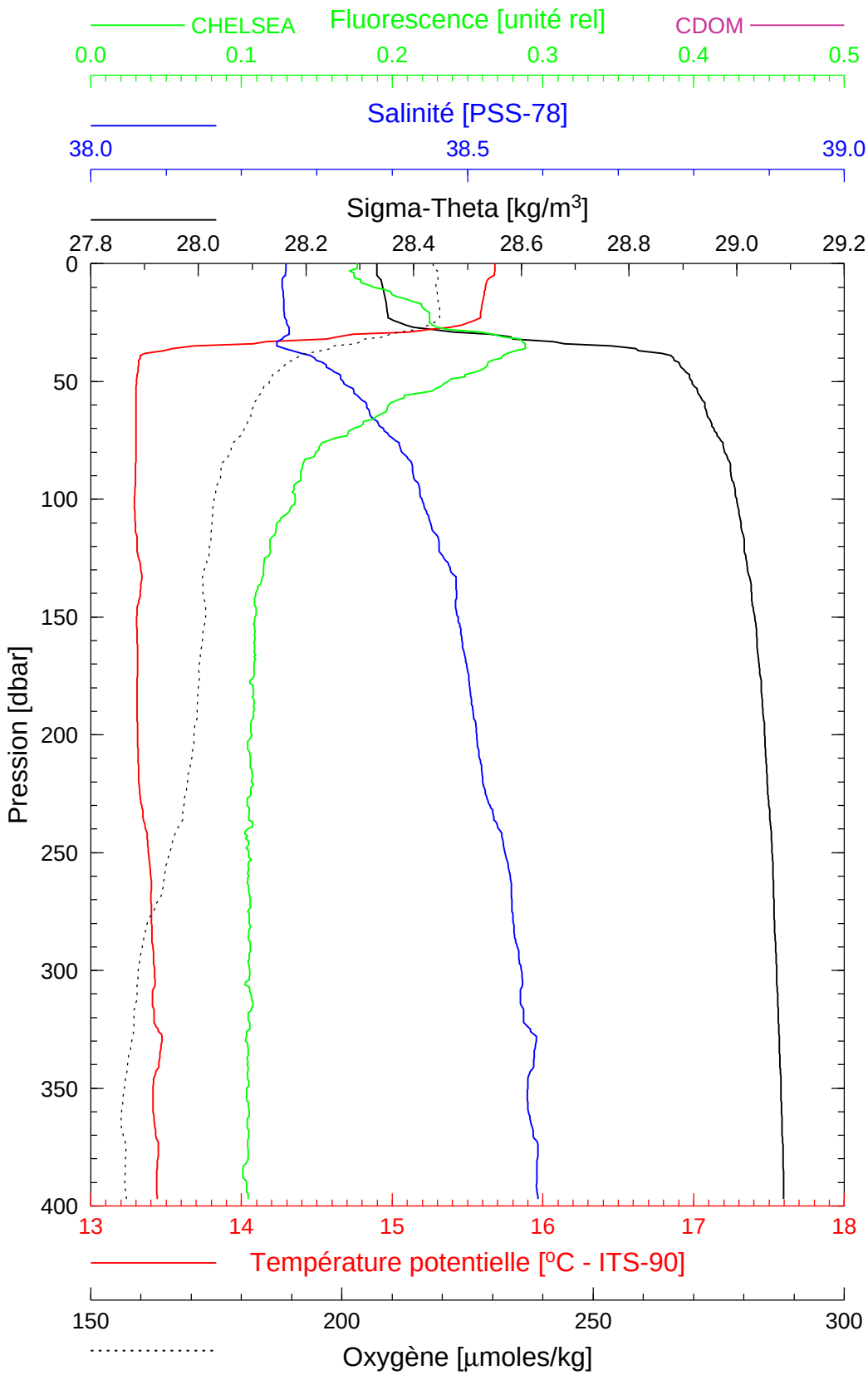



*Date* *23/11/2004* *Latitude* *43º22.059 N*

*Heure déb* *09h 10min [TU]* *Longitude* *07º53.790 E*

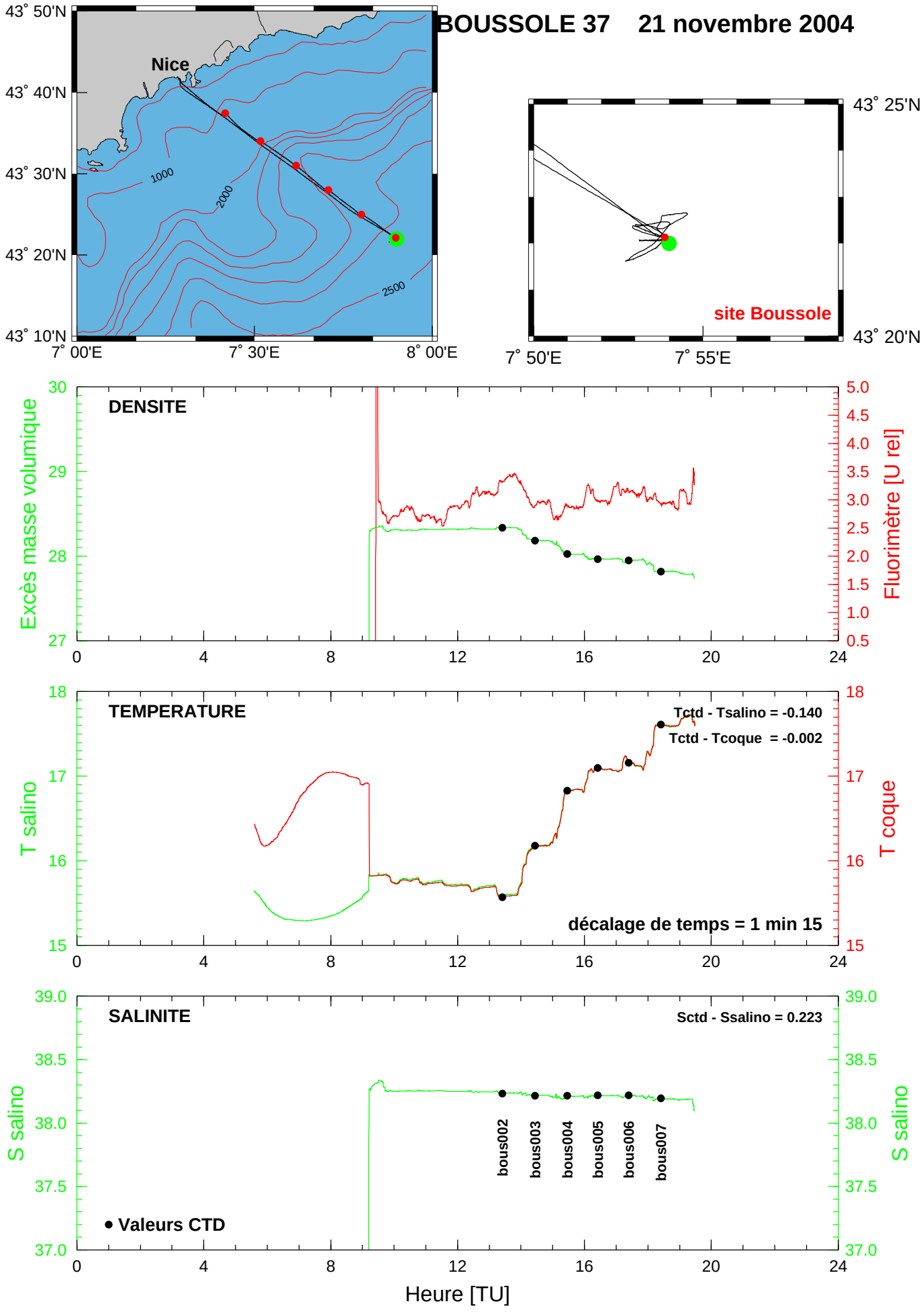
**Boussole 37** **23/11/2004** **BOUS041123_02**

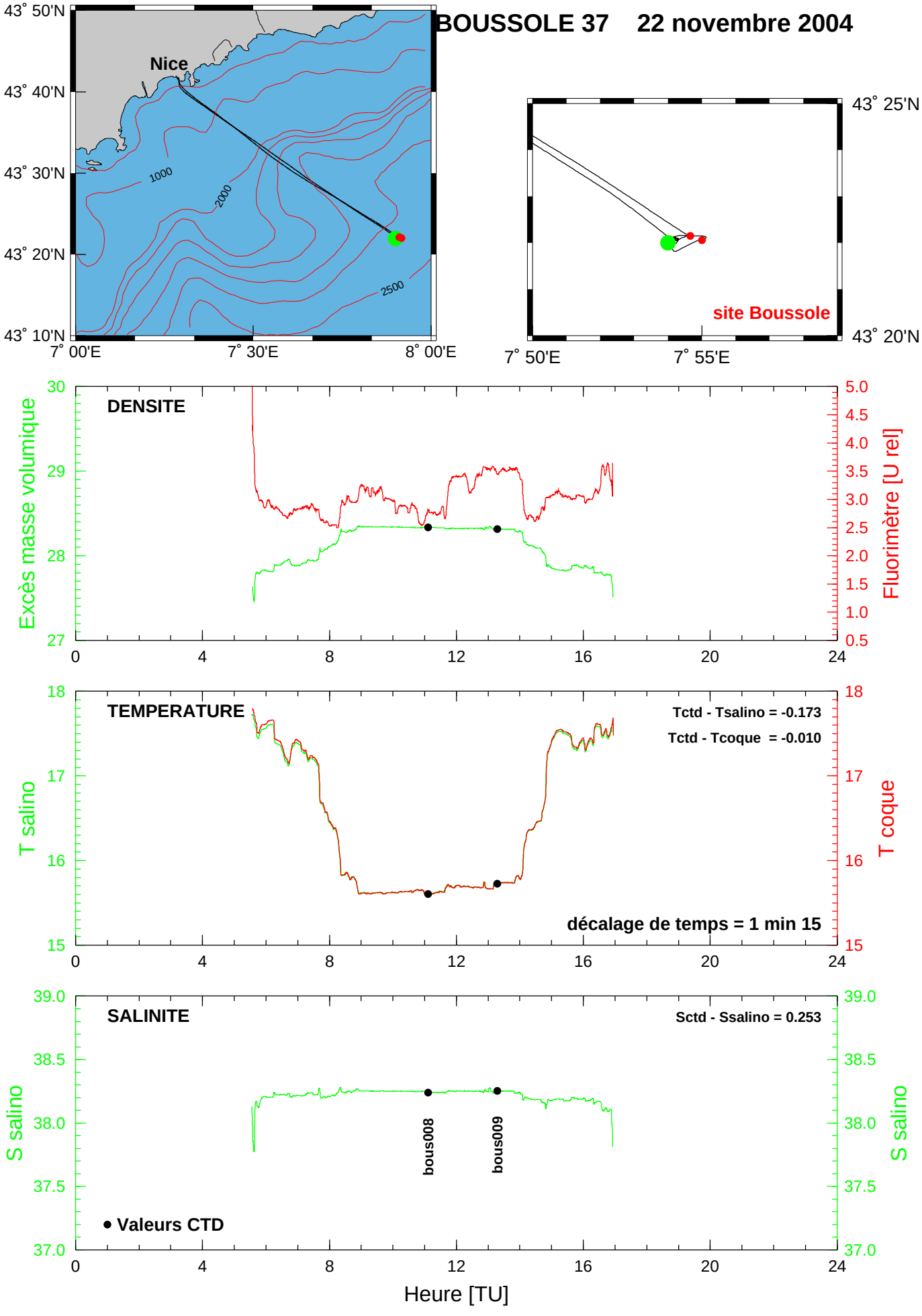
*BOUS011*

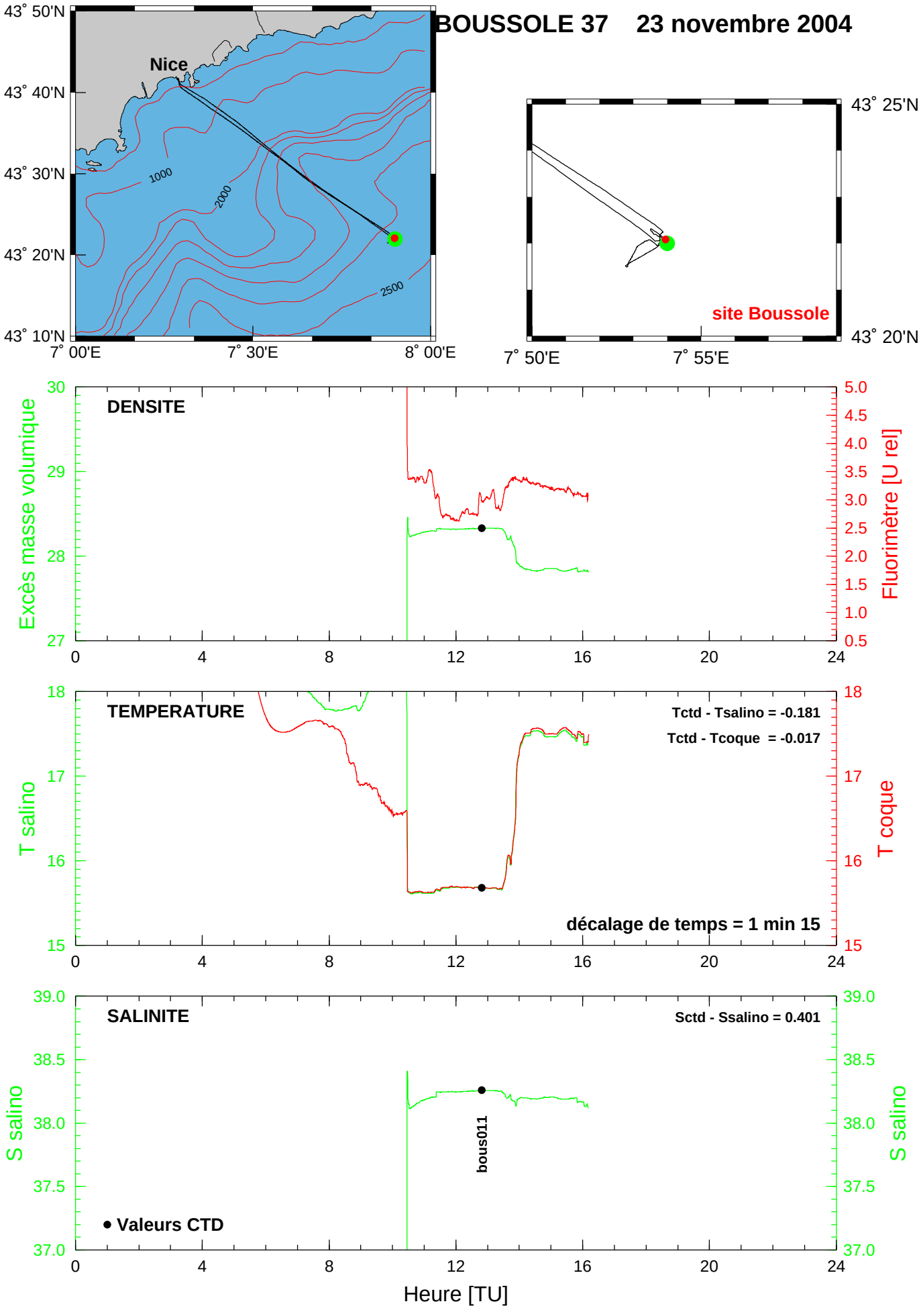



*Date* *23/11/2004* *Latitude* *43º22.086 N*

*Heure déb* *12h 49min [TU]* *Longitude* *07º53.947 E*


BOUSSOLE 37 21 novembre 2004
Nice
43° 50'N
43° 40'N
43° 30'N
43° 20'N
43° 10'N
7° 00'E
7° 30'E
8° 00'E
1000
2000
2500
43° 25'N
43° 20'N
7° 50'E
7° 55'E
site Boussole
DENSITE
Excès masse volumique
Fluorimètre [U rel]
TEMPERATURE
Tctd - Tsalino = -0.140
Tctd - Tcoque = -0.002
T salino
T coque
décalage de temps = 1 min 15
SALINITE
Sctd - Ssalino = 0.223
S salino
bous002
bous003
bous004
bous005
bous006
bous007
• Valeurs CTD
Heure [TU]


BOUSSOLE 37 22 novembre 2004
Nice
43° 50'N
43° 40'N
43° 30'N
43° 20'N
43° 10'N
7° 00'E
7° 30'E
8° 00'E
1000
2000
2500
43° 25'N
43° 20'N
7° 50'E
7° 55'E
site Boussole
DENSITE
Excès masse volumique
Fluorimètre [U rel]
TEMPERATURE
Tctd - Tsalino = -0.173
Tctd - Tcoque = -0.010
T salino
T coque
décalage de temps = 1 min 15
SALINITE
Sctd - Ssalino = 0.253
S salino
bous008
bous009
• Valeurs CTD
Heure [TU]


BOUSSOLE 37 23 novembre 2004
Nice
43° 50'N
43° 40'N
43° 30'N
43° 20'N
43° 10'N
7° 00'E
7° 30'E
8° 00'E
1000
2000
2500
43° 25'N
43° 20'N
7° 50'E
7° 55'E
site Boussole
DENSITE
Excès masse volumique
Fluorimètre [U rel]
TEMPERATURE
Tctd - Tsalino = -0.181
Tctd - Tcoque = -0.017
T salino
T coque
décalage de temps = 1 min 15
SALINITE
Sctd - Ssalino = 0.401
S salino
bous011
• Valeurs CTD
Heure [TU]