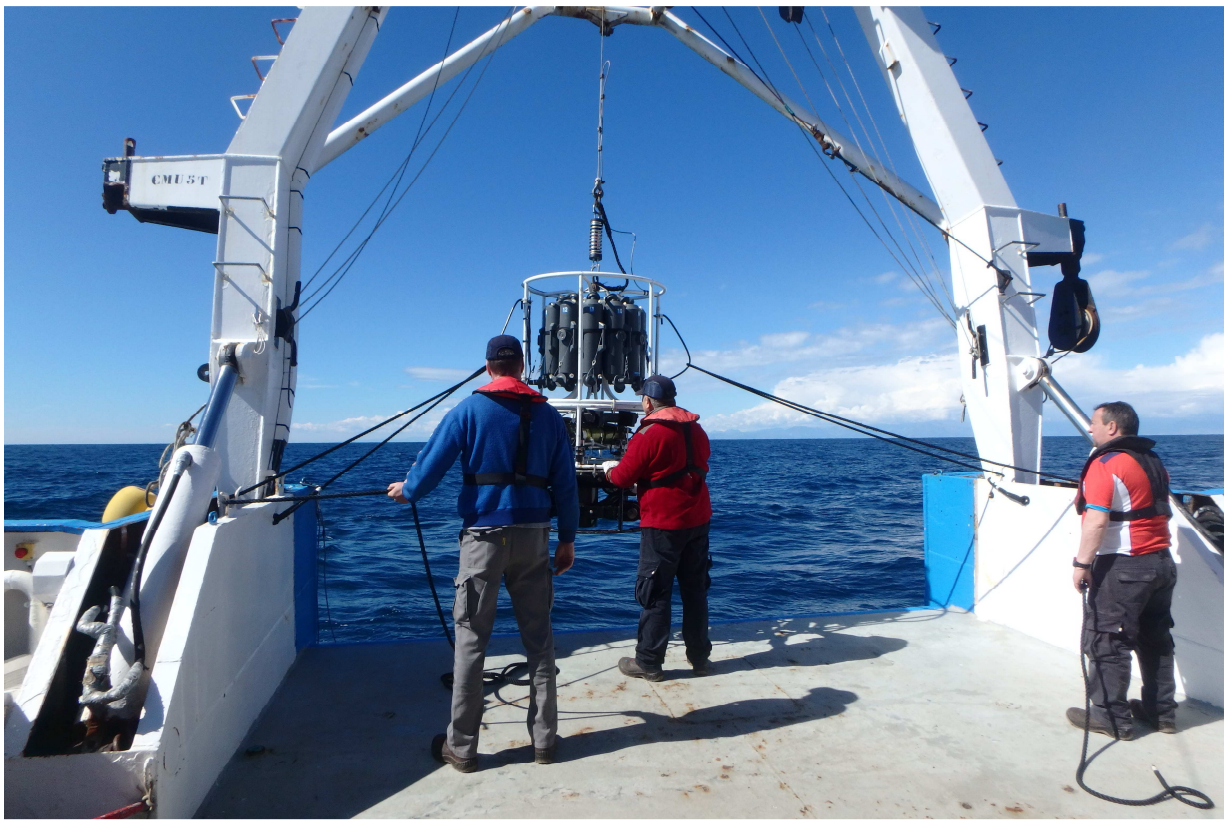
# BOUSSOLE Monthly Cruise Report

## Cruise 193
## March 19-21, 2018

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

Science Personnel: Melek Golbol and Eduardo Soto Garcia.

*Laboratoire d'Océanographie de Villefranche (LOV), 06230 Villefranche-sur-Mer, France*




Deployment of the CTD Rosette from the deck of the R/V *Téthys II*.

**BOUSSOLE project**

**ESA/ESRIN contract N° 4000119096/17/I-BG**

*March 29, 2018*

# Foreword

This report is part of the technical report series that is being established by the BOUSSOLE project.

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Centre National d'Etudes Spatiales, France

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# 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). Two 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.

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 (5 m and 10 m) 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 $pCO_2$ 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

Water samples for cytometry analysis were collected at 10 m depth in the frame of a collaboration with Collin Roesler (Bowdoin College, Maine, USA), about the installation of an ECO 3X1M multi-channel fluorimeter on the BOUSSOLE buoy at 9 m depth.

A deep (1000m) CTD cast was performed at the DYFAMED site in order to anticipate MOOSE operations planned two days after the BOUSSOLE cruise, because bad weather was announced for the next few days.

# Cruise Summary

The first day was used for optical profiles, for a Secchi disk, for CIMEL measurements at the BOUSSOLE site and for CTD casts with water sampling at the BOUSSOLE and DYFAMED sites. The second day and the last day, bad weather prevented the departure from the Nice harbour. During the cruise, the buoy was almost entirely under water because of strong currents (a situation that typically occurs a few days every year, as seen from the full record of the buoy pressure sensor). The diving and maintenance operations could not be carried out because the weather forecasts announced high waves and strong currents for the entire cruise duration.

## Monday 19 March 2018

The sea state was slight with a light breeze. The sky was blue and the visibility was excellent. The buoy was almost entirely under water because of strong currents. Only the top of the buoy including solar panels, surface sensors and ARGOS beacon were seen from the ship at the surface.
Firstly, 2 C-OPS profiles were performed but a problem appeared with the connection between the deck unit of the C-OPS and the sensors, with communication with the sensors being often lost. So it was not possible to perform a third profile. Then, 2 CTD casts with water sampling and a Secchi disk were performed at the BOUSSOLE site. For the second CTD cast, a cap was put on the Hydroscat-6 for dark measurements and a 0.2 µm filter on the a-Sphere absorption meter for the dissolved matter absorption measurements. Then, we went to the DYFAMED site to perform a CTD cast with water sampling at 1000 m depth for the MOOSE program. In the meantime, CIMEL measurements were performed before returning to the Nice harbour.

## Tuesday 20 March 2018

Bad weather prevented departure from the Nice harbour.

## Wednesday 21 March 2018

Bad weather prevented departure from the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/YCAo6u3W8ZiFWANK2

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

# Cruise Report

## Monday 19 March 2018 (UTC)

People on board: Melek Golbol and Eduardo Soto Garcia.

0745 Departure from the Nice harbour.
1105 Arrival at the BOUSSOLE site.
1130 C-OPS 01, 02.
1225 CTD 01, 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 cytometry.
1355 CTD 01, 400 m with water sampling at 10 and 5 m for $O_2$, TA/TC and TSM (with 0.2 µm filter on a-Sphere and cap on HS-6).
1425 Secchi disk 01, 17 m.
1430 Departure to the DYFAMED site.
1445 Arrival at the DYFAMED site.
1515 CTD MOOSE 116, 1000 m with water sampling at 1000, 500, 200 m depth for $O_2$.
1515 CIMEL 01, 02, 03.
1605 Departure to the Nice harbour.
1900 Arrival at the Nice harbour.

## Tuesday 20 March 2018

Bad weather prevented departure from the Nice harbour.

## Wednesday 21 March 2018

Bad weather prevented departure from the Nice harbour.

## Problems identified during the cruise

- The diving and maintenance operations could not be carried out because the weather forecasts announced high waves and strong currents for the entire cruise duration.

- A problem appeared with the connection between the deck unit of the C-OPS and the sensors, with the communication with sensors being often lost. The connectors were checked and cleaned on board but the problem reappeared. It was not possible to perform the third C-OPS profile. This problem was probably due to a faulty cable. The cables and connectors will be examined and tested in the lab before the next cruise.

- There was a problem with $O_2$ data in the first CTD cast: spikes appeared between 0 and 80 m depth. The problem appeared also in the CTD cast performed at the DYFAMED site after 600 m depth. It was probably due to a faulty cable. It will be replaced in the lab.

- The instrumentation of the R/V *Téthys II* was faulty, so the thermosalinograph was not functioning and the navigation and meteorological files were not available.

# Appendices

Cruise Summary Table for Boussole 193

| 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 |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19/03/18 | | bou_c-ops_180319_1028_002_data.csv | | | 11:30 | 5:45 | 143 | 43 | 22.105 | 7 | 54.084 | blue | Ci, St | 3 | 6 | 200 | 999.6 | 57 | excellent | 11.3 | | slight | 0.8 | | few |
| | | bou_c-ops_180319_1147_001_data.csv | | | 11:51 | 5:44 | 140 | 43 | 22.274 | 7 | 54.102 | blue | Ci, St | 3 | 6 | 200 | 999.6 | 57 | excellent | 11.3 | | slight | 0.8 | | few |
| | | | BOUS193_01 | HPLC, Ap & Cyto | 12:24 | 32:00 | 400 | 43 | 22.299 | 7 | 54.898 | blue | | 1 | 3 | 190 | 999.6 | 56 | | 11.5 | 13.50 | slight | | | |
| | | | BOUS193_02 | TA/TC, $O_2$ & TSM | 13:55 | 22:00 | 400 | 43 | 22.241 | 7 | 54.312 | blue | | 1 | 3 | 80 | 999.8 | 56 | | 11.6 | 13.87 | slight | | | |
| | | | | Secchi01 | 14:15 | 4:00 | 17 | 43 | 22 | 7 | 54 | blue | | 1 | | | | | excellent | | | slight | | | |
| | | | | CIMEL01 | 15:18 | 4:00 | | 43 | 22 | 7 | 54 | blue | | 1 | | | 999.8 | | | | | | | | |
| | | | | CIMEL02 | 15:24 | 4:00 | | 43 | 22 | 7 | 54 | blue | | 1 | | | 999.8 | | | | | | | | |
| | | | | CIMEL03 | 15:30 | 3:00 | | 43 | 22 | 7 | 54 | blue | | 1 | | | 999.8 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20/03/18 | Bad weather | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21/03/18 | Bad weather | | | | | | | | | | | | | | | | | | | | | | | | |

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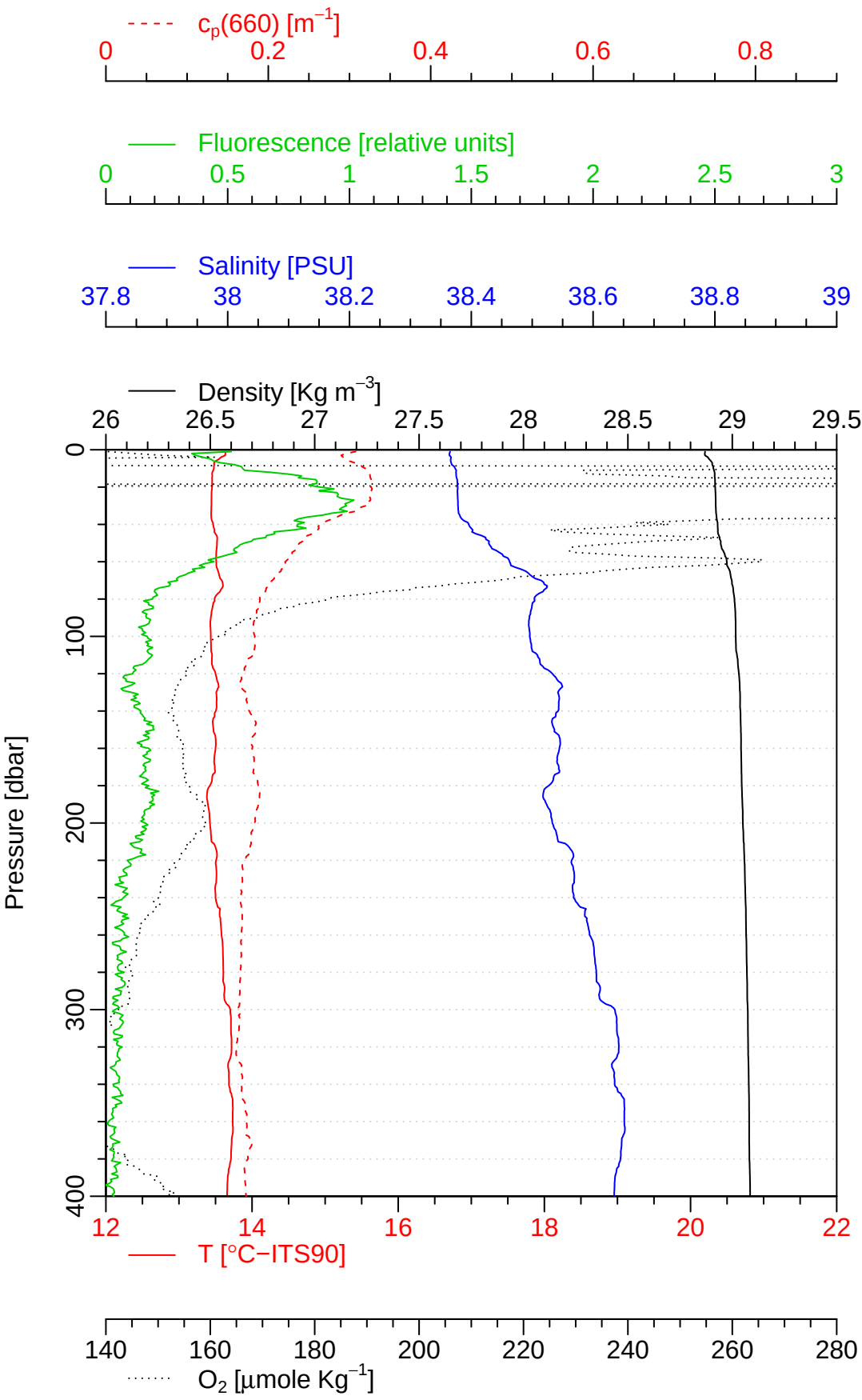
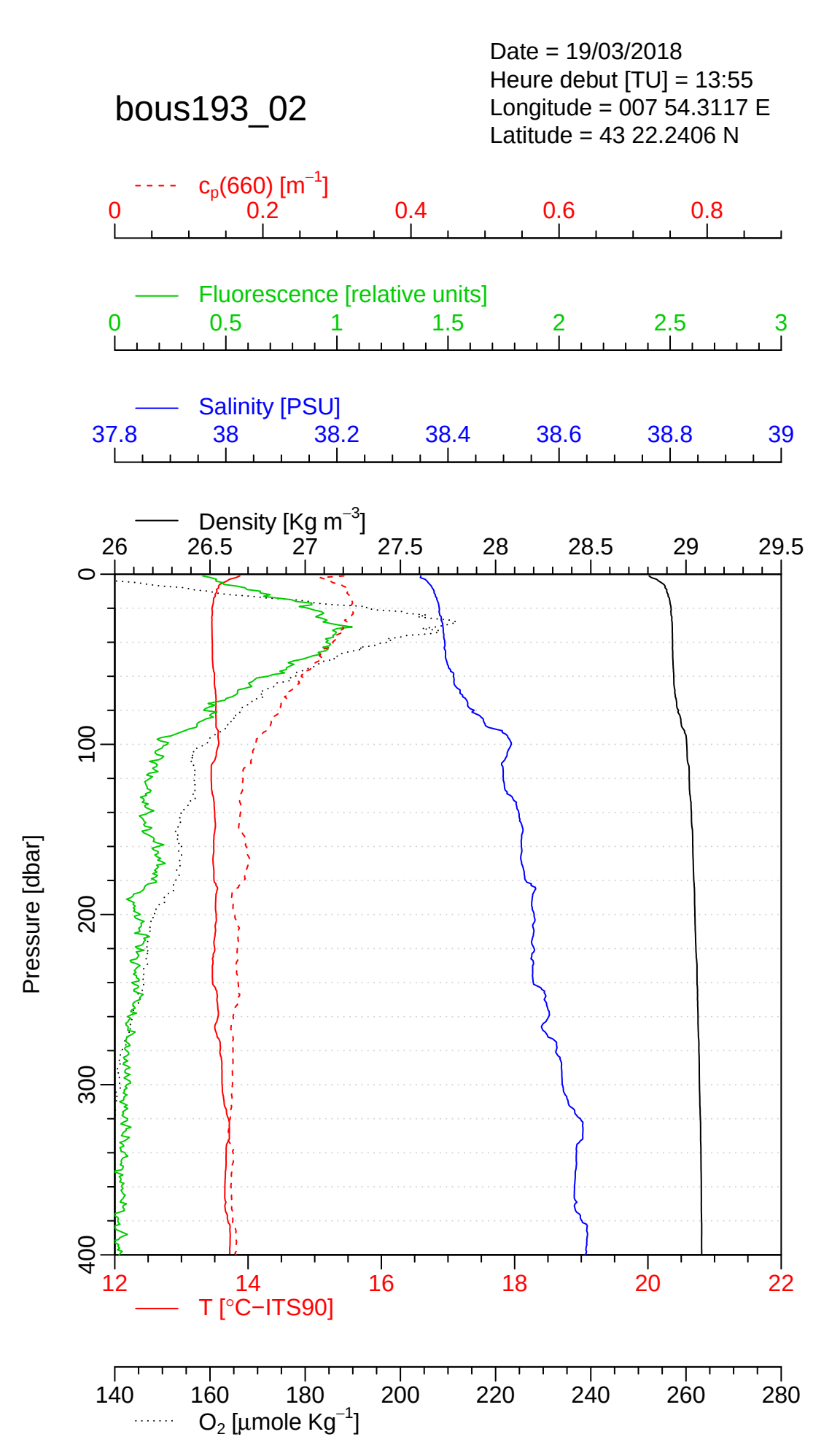
Latitude = 43 22.299 N




bous193_02
Date = 19/03/2018
Heure debut [TU] = 13:55
Longitude = 007 54.3117 E
Latitude = 43 22.2406 N
cp(660) [m−1]
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0.4
0.6
0.8
Fluorescence [relative units]
0
0.5
1
1.5
2
2.5
3
Salinity [PSU]
37.8
38
38.2
38.4
38.6
38.8
39
Density [Kg m−3]
26
26.5
27
27.5
28
28.5
29
29.5
Pressure [dbar]
0
100
200
300
400
12
14
16
18
20
22
T [°C−ITS90]
140
160
180
200
220
240
260
280
O2 [µmole Kg−1]