

BOUSSOLE Monthly Cruise Report

Cruise 184

June 06-07 & 09, 2017

Duty Chief: Melek Golbol (golbol@obs-vlfr.fr)

Vessel: R/V *Téthys II*

(Captain: Dany Deneuve then Joël Perrot)

Science Personnel: Theo Audemard (student), Jean De Vaugelas, Emilie Diamond, Melek Golbol, David Luquet, Didier Robin and Eduardo Soto Garcia and Vincenzo Vellucci.

Laboratoire d'Océanographie de Villefranche (LOV), 06238 Villefranche sur mer cedex, France



A ProVal profiling float, which is dedicated to the validation of satellite ocean color remote sensing data, was deployed at the BOUSSOLE site, from the deck of the R/V *Téthys II*.

BOUSSOLE project

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

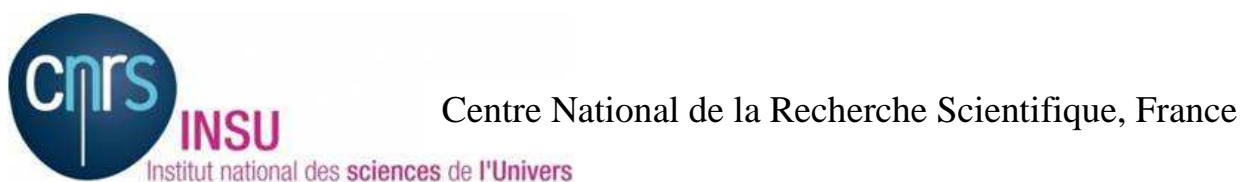
June 19, 2017



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



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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). Two CTD casts are to be performed at each data acquisition at the BOUSSOLE site: one cast with, and one cast without, a 0.2 μ m 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 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

Two 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 ProVal float was deployed at the BOUSSOLE site during this cruise. This float was developed by the marine optics and remote sensing group of the Laboratoire d'Océanographie de Villefranche. It is based on a two-arm design that allows sensor redundancy and shading reduction. The float is equipped with radiometers measuring downward irradiance and upwelling radiance at seven wavelengths. It also measures the downward PAR, the fluorescence of Chl_a and CDOM and the backscattering coefficient at 700nm.

Divers installed a newly calibrated pCO₂ CARIOCA sensor at 10 m depth in replacement of the sensor recovered in April 7, 2017 during BOUSSOLE cruise #182. Moreover, a CONTROS HydroC CO₂ sensor was installed on the buoy at 20 m depth, for dissolved CO₂ measurements, in the frame of the MOOSE program.

Cruise Summary

The first day, bad weather prevented the work at the BOUSSOLE site. So, we took advantage of this day to test the C-OPS and the IOP package, next to the Nice harbour, where the weather was better. The second day was used for optical profiles, for CTD casts with water sampling, for CIMEL measurements and for a Secchi disk at the BOUSSOLE site. The diving operations were performed the third day, during the MOOSE DYFAMED cruise, because the weather did not allow us to do this operation during the BOUSSOLE cruise. The third day was also used to deploy the profiling float after finishing the work at the BOUSSOLE site. Then, a manta net was deployed on the way to DYFAMED, a deep CTD cast and zooplankton nets were performed at the DYFAMED site for the MOOSE DYFAMED program.

Tuesday 06 June 2017

The weather did not allowed us to work at the BOUSSOLE site. Therefore we worked next to the Nice harbour to perform the C-OPS balance tests, in order to check and adjust it during the descent phase of the profiles. Then, the IOP package was deployed at 5 m depth, to check the tightness after the replacement of the faulty connector on the hydroDAS (see BOUSSOLE Cruise Report #183). The data logger worked correctly. Then, a second IOP cast was performed at 50 m depth with a neoprene cap on the Hydrocat-6 in order to perform dark measurements.

Wednesday 07 June 2017

The sea state was moderate with a gentle breeze. The sky was blue and the visibility was good. This day, 4 C-OPS profiles, 3 CTD casts with water sampling, 3 CIMEL measurements and 1 Secchi disk were performed at the BOUSSOLE site. The second and third CTD casts were performed with a 0.2 µm filter on the a-Sphere absorption meter.

Thursday 08 June 2017

Rotation of the R/V *Téthys II* crew.

Friday 09 June 2017

The sea state was smooth with a light breeze. The sky was overcast. Firstly, the buoy was checked because the buoy did not transmit any data since rotation of the upper superstructure on 2nd June, 2017. It appeared that the buoy was actually working. Divers went at sea to clean the underwater sensors, to perform dark measurements of the transmissometer and the backscattering meter and to take pictures. They also installed the pCO₂ CARIOCA sensor at 10 m depth and the HydroC CO₂ sensor at 20 m depth.

In the meantime, buoy data were downloaded using the cable available at the top of the buoy, surface sensors and solar panels were cleaned. Then, a CTD cast with water sampling was performed at the BOUSSOLE site. The ProVal float was deployed before the departure to the DYFAMED site. Then a manta net was deployed on the way to DYFAMED. Finally 3 zooplankton nets and a deep CTD cast were performed at the DYFAMED site to complete the MOOSE DYFAMED program.

Pictures taken during this cruise can be found at:

<https://get.google.com/albumarchive/114686870380724925974/album/AF1QipOZyV3YjfSbnLSlbnzk4JxcUpO OYcFCmIvIES5q>

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 06 June 2017 (UTC)

People on board: Melek Golbol and Eduardo Soto Garcia.

0715 Departure from the Nice harbour.

0730 Arrival at the test station (43°38'N; 7°21'E).

0800 C-OPS balance tests.
0810 IOP package test, 5 m.
0900 IOP profile, dark Hydrosat-6, 50 m.
0910 C-OPS balance tests.
0945 Departure to the Nice harbour.
1015 Arrival to the Nice harbour.

Wednesday 07 June 2017 (UTC)

People on board: Melek Golbol and Eduardo Soto Garcia.

0735 Departure from the Nice harbour.
1130 Arrival at the BOUSSOLE site.
1145 C-OPS 01, 02, 03, 04.
1300 CTD 01, 400 m with water sampling at 400, 200, 150, 70, 60, 50, 40, 30, 10 and 5 m for HPLC, a_p and cytometry.
1310 CIMEL 01, 02, 03.
1415 CTD 02, 80 m with water sampling at 80, 20 and 5 m for HPLC, a_p and TSM.
1440 CTD 03, 400m with 0.2 μ m filter on a-Sphere.
1505 Secchi 01, 19 m.
1510 Departure to the Nice harbour.
1830 Arrival at the Nice harbour.

Thursday 08 June 2017

Rotation of the R/V *Téthys II* crew.

Friday 09 June 2017 (UTC)

People on board: Theo Audemard, Jean De Vaugelas, Emilie Diamond, David Luquet, Didier Robin and Eduardo Soto Garcia and Vincenzo Vellucci.

0515 Departure from the Nice harbour.
0830 Arrival at the BOUSSOLE site.
0840 Diving operations: cleaning, dark measurements, pictures, installation of the HydroC CO₂ sensor at 20 m and the PCO₂ CARIOCA sensor at 10 m.
0900 Connection with the buoy and data retrieval.
Cleaning of surface sensors and solar panels.
0900 CTD 04, 50 m with water sampling at 10 and 5 m for TA/TC and O₂.
1000 Profiling float deployment.
1050 Departure to the DYFAMED site.
1100 Manta net.
1140 Arrival at the DYFAMED site.
1145 Zooplankton nets x 3 for MOOSE DYFAMED program.
1215 Deep CTD cast, MOOSE 109, 2350 m with water sampling for MOOSE DYFAMED program.
1345 Departure to the Nice harbour.
1645 Arrival at the Nice harbour.

Problems identified during the cruise

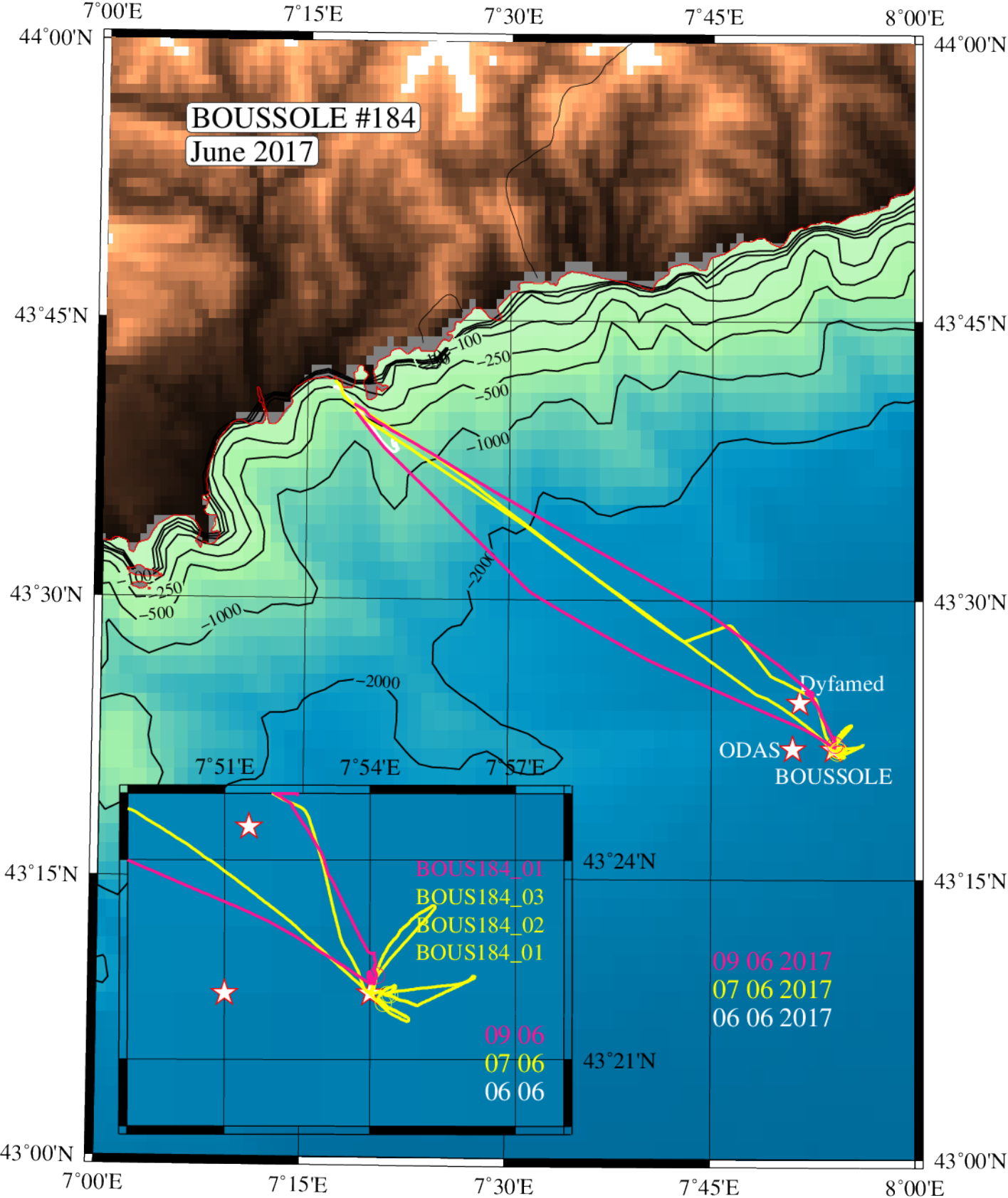
- The HydroDAS on the IOP package worked correctly but, unfortunately, there was no data from the Hydrosat-6 recorded on the hydroDAS. The Hydrosat-6 went to sleep because of a low voltage of its internal battery. The internal battery discharged quickly and seems to be faulty. After the cruise, it was decided to send the IOP package to the manufacturer for calibration and repair.
- For the CTD 01 cast, two Niskin bottles were closed incorrectly twice at the same depth (150 m and 70 m depth). And seawater was not sampled at 80 m and 20 m depth. So, it was decided to sample at these two depths during the CTD 02 cast.

- The buoy was checked because the buoy did not transmit any data since rotation of the upper superstructure on 2nd June 2017. It appeared that the buoy was actually working correctly since the day of its launch. The problem seems to originate from the ARGOS beacon. It will be replaced at the next cruise.

Appendices

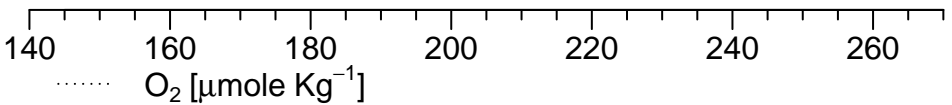
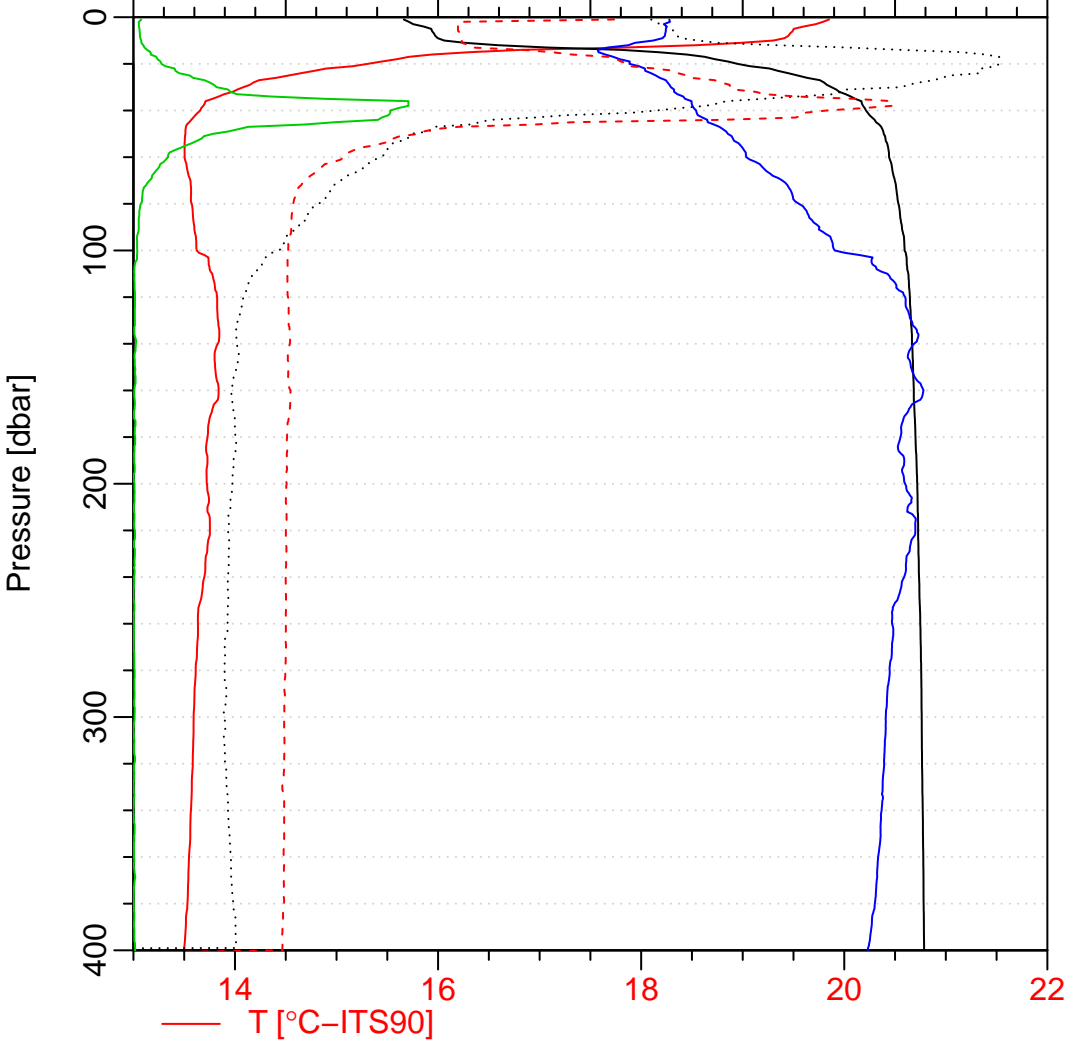
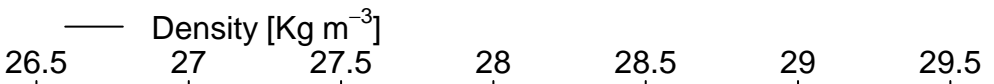
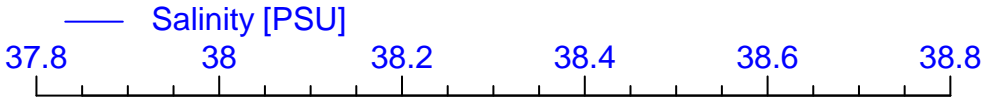
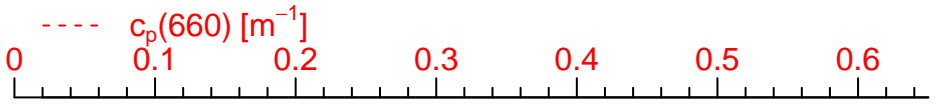
Cruise Summary Table for Boussole 184

| Date | Black names (file ext: ".raw") | Profile names (file extension: ".raw") | CTD notes | Other sensors | Start Time GMT (hour.min) | Duration (min.sec) | Depth max (meter) | Latitude (N) (Degree) (Minute) | Longitude (Degree) (Minute) | Sky | Clouds | Quantity (#/8) | Weather Wind sp. (kn) | Wind dir. | Atm. Pressure (hPa) | Humidity (%) | Visibility | T air | T water | Sea | Sea Swell H (m) Swell dir. | Whitecaps | | | |
|----------|-----------------------------------|---|-----------|------------------------|------------------------------|-----------------------|----------------------|-------------------------------------|----------------------------------|-----|--------|----------------|--------------------------|-----------|---------------------|--------------|------------|-------|---------|-------|---------------------------------|-----------|-----|--|-----|
| 06/06/17 | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 07/06/17 | | bou c-ops 170607 1126 001 data.csv | | | 11:44 | 1:55 | 44 | 43 | 22.531 | 7 | 54.261 | blue | None | 0 | 10 | 279 | 1014.6 | 63 | good | 19.9 | | moved | 1.3 | | few |
| | | bou c-ops 170607 1126 002 data.csv | | | 11:50 | 4:02 | 94 | 43 | 22.671 | 7 | 54.363 | blue | None | 0 | 10 | 279 | 1014.6 | 63 | good | 19.9 | | moved | 1.3 | | few |
| | | bou c-ops 170607 1126 003 data.csv | | | 12:02 | 3:49 | 92 | 43 | 22.905 | 7 | 54.604 | blue | None | 0 | 10 | 279 | 1014.6 | 63 | good | 19.9 | | moved | 1.3 | | few |
| | | bou c-ops 170607 1126 004 data.csv | | | 12:12 | 3:47 | 92 | 43 | 22.091 | 7 | 54.850 | blue | None | 0 | 10 | 279 | 1014.6 | 63 | good | 19.9 | | moved | 1.3 | | few |
| | | BOUS184_01 | | HPLC, Ap & Cyto | 12:58 | 26:00 | 400 | 43 | 21.976 | 7 | 54.356 | blue | 1 | 9 | 280 | 1014.7 | 66 | | 20.4 | 19.50 | moved | | | | |
| | | | | CIMEL01 | 13:08 | 6:00 | | 43 | 21.812 | 7 | 55.008 | blue | 0 | | | 1014.7 | | | | | | | | | |
| | | | | CIMEL02 | 13:27 | 4:00 | | 43 | 21.812 | 7 | 55.008 | blue | 0 | | | 1014.6 | | | | | | | | | |
| | | | | CIMEL03 | 13:32 | 5:00 | | 43 | 21.812 | 7 | 55.008 | blue | 1 | | | 1014.4 | | | | | | | | | |
| | | BOUS184_02 | | HPLC, Ap & TSM | 13:33 | 4:00 | 80 | 43 | 21.972 | 7 | 54.408 | blue | 1 | 8 | NA | 1014.7 | 69 | | 20.6 | 19.30 | moved | | | | |
| | | BOUS184_03 | | | 14:42 | 18:00 | 400 | 43 | 21.845 | 7 | 54.280 | blue | 1 | 7 | 253 | 1014.7 | 70 | | 20.6 | 19.40 | moved | | | | |
| | | | | Secchi01 | 15:05 | 4:00 | 19 | 43 | 22 | 7 | 54 | blue | 1 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 08/06/17 | | BOUS184_04 | | O ₂ & TA/TC | 10:03 | 6:00 | 50 | 43 | 22.261 | 7 | 54.136 | overcast | | 7 | 5 | 260 | 1016.9 | 71 | | 21.2 | 20.30 | calm | | | |



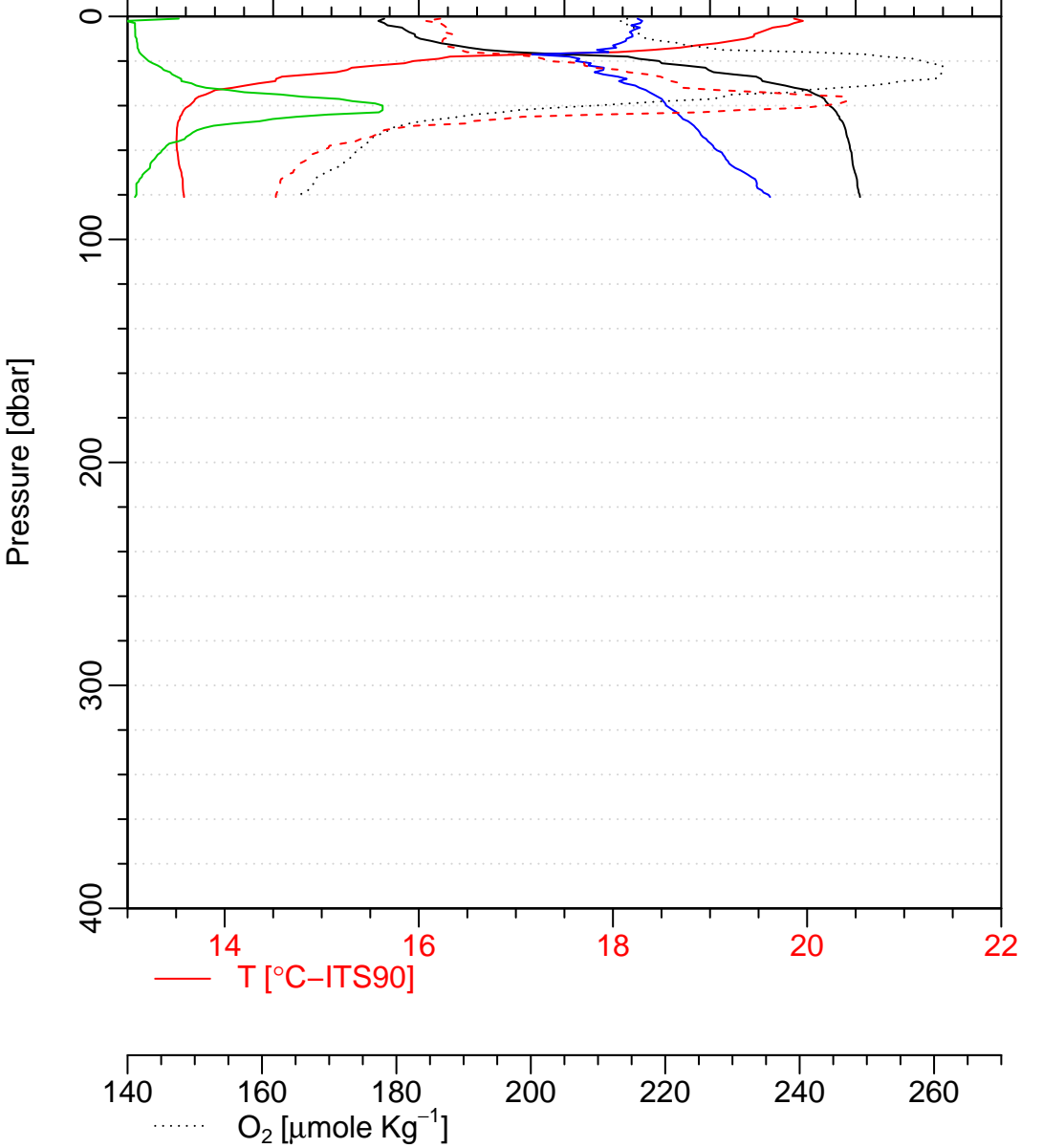
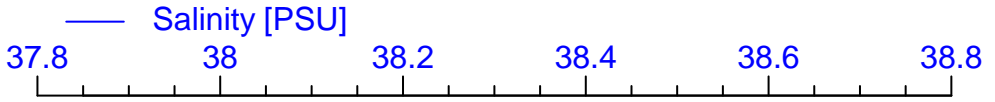
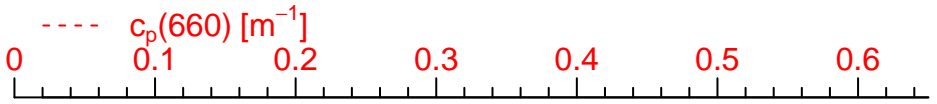
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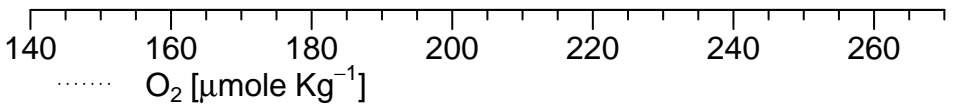
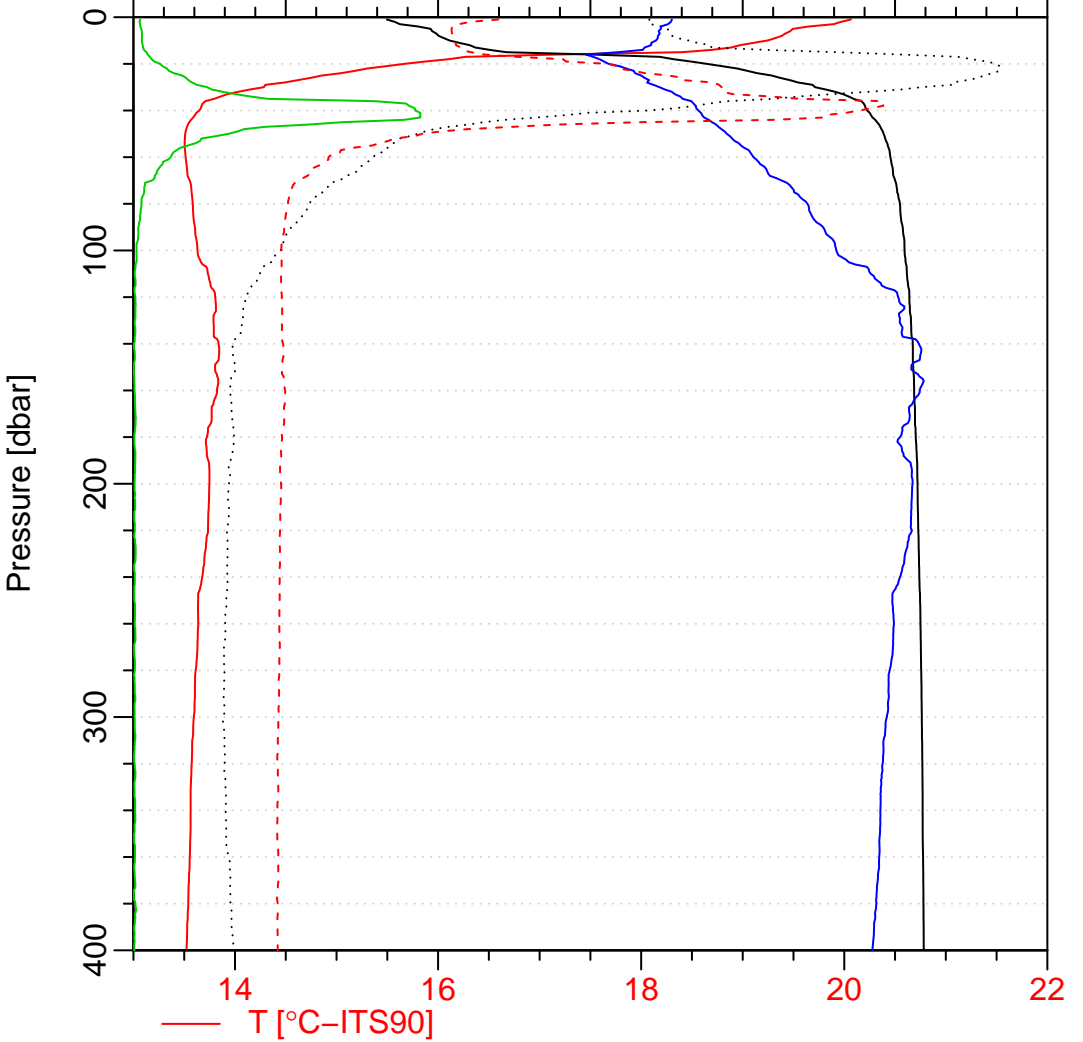
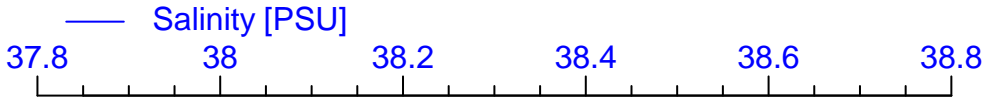
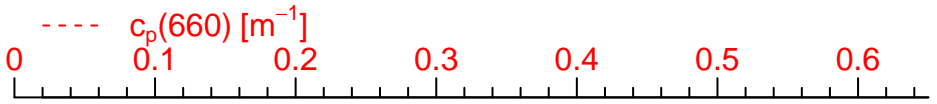
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Latitude = 43 21.972 N



bous184_03

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Longitude = 007 54.280 E
Latitude = 43 21.845 N



bous184_04

Date = 09/06/2017
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Latitude = 43 22.261 N

