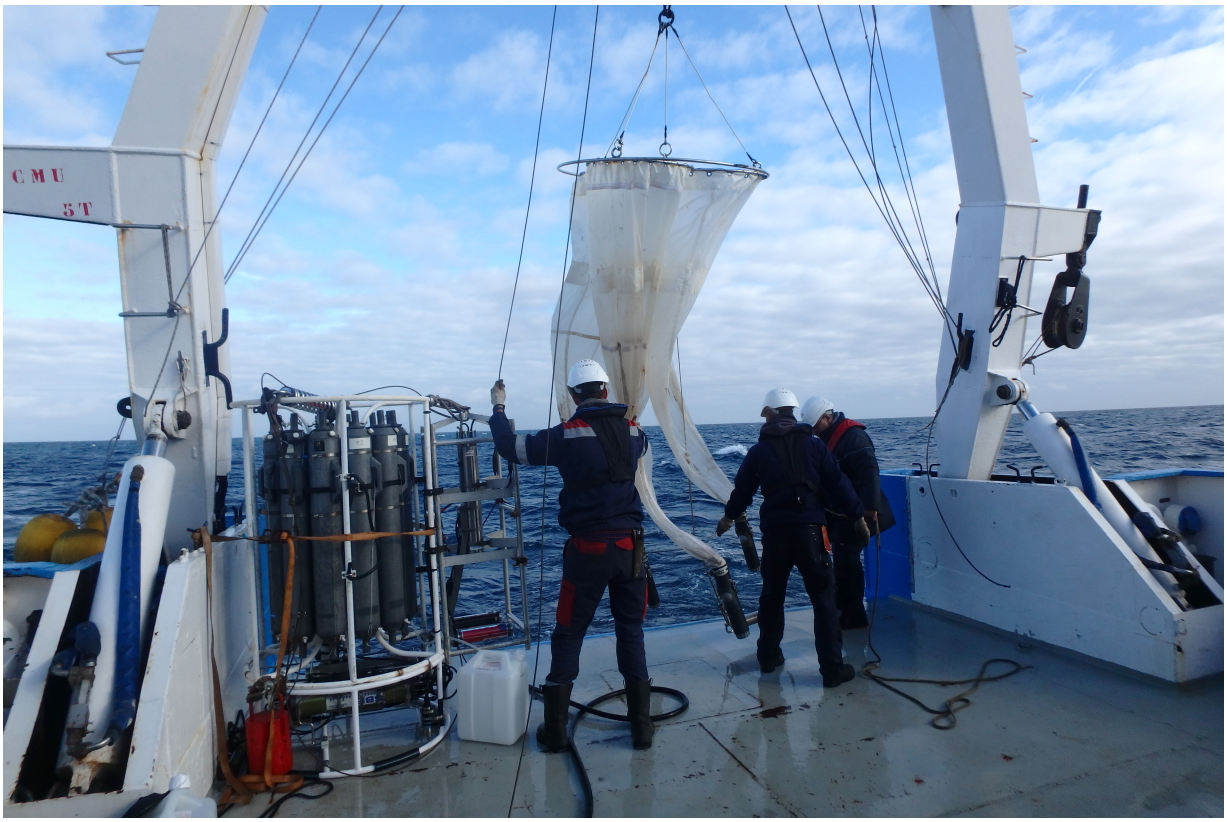
BOUSSOLE Monthly Cruise Report

Cruise 217
February 11-13, 2020

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

Science Personnel: Emilie Diamond-Riquier, Louison Dufour, Melek Golbol, Flavien Petit and Eduardo Soto Garcia.

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



A working day on the deck of the R/V *Téthys II:* deployment of a WP2 triple zooplankton net for the MOOSE program. The CTD Rosette to which an Underwater Video Profiler (UVP) is affixed is waiting for subsequent deployment (starboard side).

BOUSSOLE project

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

February 27, 2020

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

Sorbonne Université, France

Institut de la Mer de Villefranche, 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). A CTD cast including a 0.2 µm filter installed on the inlet tube of the a-Sphere is to be performed once per cruise at the BOUSSOLE site for the dissolved matter absorption measurements. This cast will be stopped at ten depths during 2 or 7 min depending on the depths in order to ensure that the integrating cavity of the a-Sphere be completely filled at each of these depths during the ascent of the CTD.

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 and the two optodes installed on the buoy at 3 m and 10 m.

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

A prototype sensor "BBFL2 ECO V2 - B00128" from the Sea-Bird Scientific Company was tested by the *Marine optics and remote sensing group* of the *Laboratoire d'Océanographie de Villefranche* (LOV-OMTAB) in order to check its functioning. It measures Chla and CDOM fluorescence and the backscattering coefficient b_b at 700 nm. It was installed on the CTD Rosette for comparison with the BOUSSOLE main CTD. Data acquired by this sensor will be also compared to data acquired with a remA pack (CDOM and Chla fluorometers, backscattering meter and PAR sensor), which was also installed on the CTD Rosette.

A PROVOR NOSS CTS4 profiling float was also deployed by LOV-OMTAB at the BOUSSOLE site for testing in the frame of the Novel Argo Ocean Observing System (NAOS) project.

The MOOSE DYFAMED cruise scheduled on 14th February was cancelled because of a bad weather forecast, so their operations were performed during the last day of the BOUSSOLE cruise (13th February).

During this cruise, new monthly operations were set up: seawater was sampled at 4 depths for cytometry and metagenomic analyses of different types of Synechococcus. This operation is part of the EFFICACY (*Ecological Fitness of light Colour Acclimation in Marine Cyanobacteria*) ANR (*Agence Nationale de la Recherche*) project in collaboration with the *Roscoff Biological Station.* The aim is to study the distribution of different types of Synechococcus populations characterized by distinct pigmentation and adaptation to the colour of light. It includes two years of cytometry and metagenomic sampling at the BOUSSOLE site.

Cruise Summary

The first and second days of the cruise were canceled because of bad weather. The last day of the cruise was used for CTD casts with water sampling, for optical profiles, for profiling float deployment and for a Secchi disk at the BOUSSOLE site and a zooplankton net for the MOOSE DYFAMED program. The first CTD cast deployed at 2400 m depth was jointly performed to BOUSSOLE and MOOSE programs in order to save time before arrival of bad weather. Diving operations for buoy maintenance were not carried out because the buoy currently does not function. Data acquisition will not resume until replacement of the data acquisition system is possible.

Tuesday 11 February 2020

Bad weather prevented departure from the Nice harbour.

Wednesday 12 February 2020

Bad weather prevented departure from the Nice harbour.

Thursday 13 February 2020

The sea state was slight with a light breeze in the morning and a moderate breeze in the afternoon. The sky was overcast and the visibility was good. Firstly a CTD deployment was attempted but failed: the temperature sensor was not functioning. It appeared that the cable that connects the temperature sensor to the CTD was faulty. It was replaced and then the CTD functioned correctly. We had to perform the operations quickly because bad weather was forecast for the afternoon. So a single cast (2400m depth) was performed with water sampling at the BOUSSOLE site for BOUSSOLE and MOOSE programs. Then, three C-OPS profiles and a Secchi disk were performed and seawater was sampled at surface directly from a bucket. A second CTD cast at 200 m depth with water sampling and two zooplankton nets were performed. Finally the profiling float was deployed at the BOUSSOLE site before returning to the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/qit2XuNcaCjPnp9d7

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 11 February 2020

Bad weather prevented departure from the Nice harbour.

Wednesday 12 February 2020

Bad weather prevented departure from the Nice harbour.

Thursday 13 February 2020 (UTC)

People on board: Emilie Diamond-Riquier, Louison Dufour (Station Biologique de Roscoff), Melek Golbol, Flavien Petit and Eduardo Soto Garcia.

0500 Departure from the Nice harbour.
0820 Arrival at the BOUSSOLE site.
0845 CTD 01, 400 m with water sampling at 2400, 2000, 1000, 500, 200, 120, 80, 60, 40, 20, 10 and 5 m for BOUSSOLE and MOOSE program (only 200 to 5 m depths were sampled for HPLC, a_p, TA/TC and O_2).
1050 C-OPS 01, 02, 03.
1135 Secchi disk 01, 16 m.
1145 Bucket for TSM sampling.
1020 Sampling from Rosette and filtrations.
1325 CTD 02, 400 m with water sampling at 75, 50, 25 and 5 m for metagonomic, cytometry and at 5 m for HPLC and a_p.
1350 Zooplankton net, 96 m (MOOSE program).
1445 Deployment of profiling float: 43°22' N, 07°53' E.
1450 Departure to the Nice harbour.
1815 Arrival to the Nice harbour.

Problems identified during the cruise

- During the installation of the CTD, there was a problem in the connection with the carousel water sampler. The problem was due to a faulty RS 232 card connection. The card was replaced with a RS232 to USB adapter cable. Then, the first CTD deployment failed because the temperature sensor was not functioning. It appeared that the cable that connects the temperature sensor to the CTD was faulty. It was replaced and the CTD functioned correctly.

- Because of a lack of time due to an unusually loaded program (BOUSSOLE and DYFAMED operations combined the same day) and arrival of bad weather during the afternoon, the first CTD cast was performed jointly between BOUSSOLE and DYFAMED programs. Therefore, there were not enough bottles to sample all the usual depths. Only 200, 120, 80, 60, 40, 20, 10 and 5 m depths were sampled for HPLC, a_p, TA/TC and O_2. The Niskin bottle #12 (5 m) was half filled, so that there was not enough water for HPLC and a_p sampling. This depth was therefore sampled again during CTD cast #02.

- The ECO V2 sensor was not switched on during the CTD cast #02.

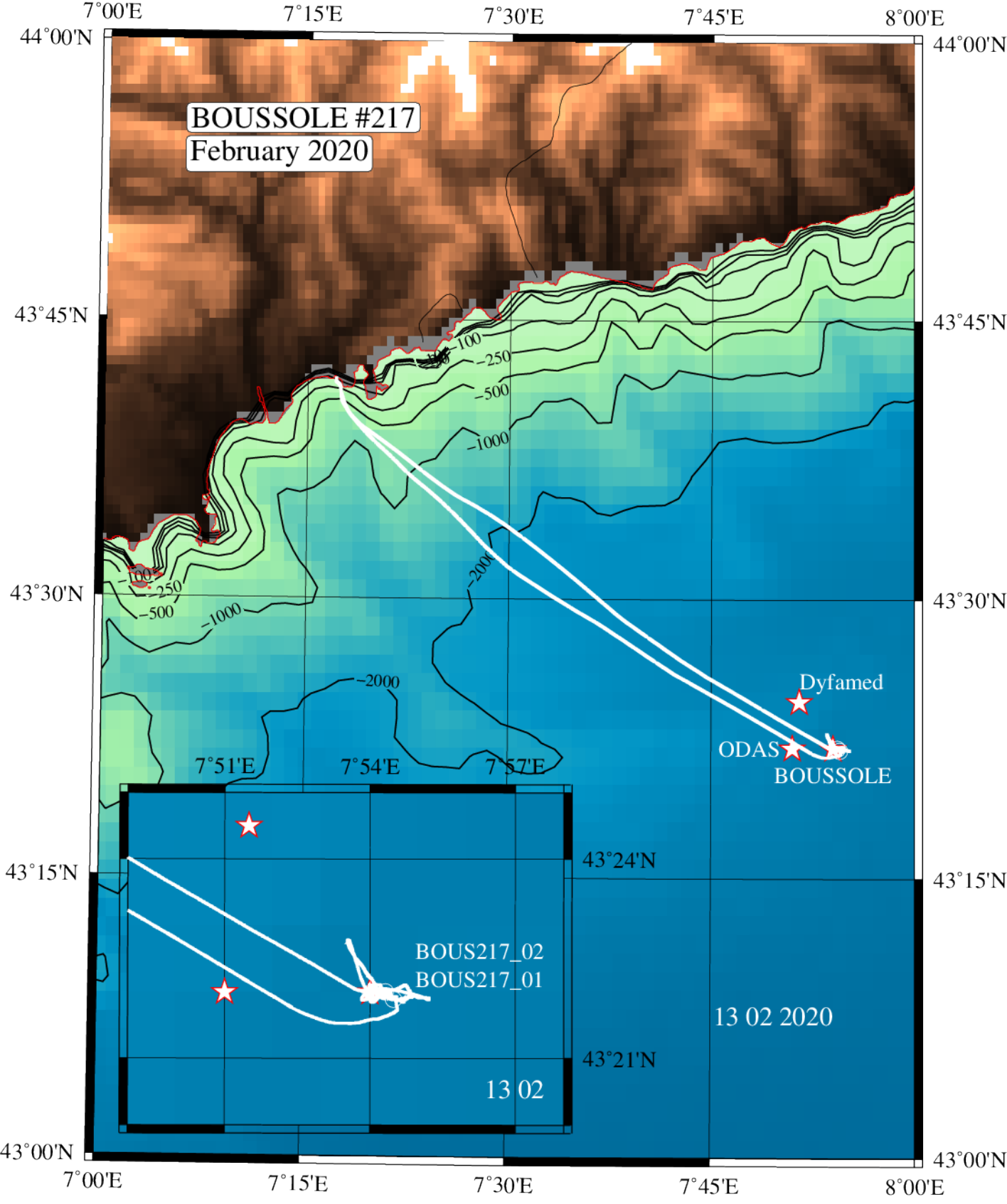
- The IOP package was not available for this cruise. The instruments were still under calibration at *Hobi Instruments Service.*

- There were problems during metagenomic filtrations: there were too many bubbles in the tubes. It appeared that the system including peristaltic pump, filtration plates and tubes was not optimally installed in the *Téthys II* lab. Therefore the samples were lost. Another installation of the filtration system will be tried during the next cruise. Only 2 depths were sampled for cytometry because not enough water remained in the Niskin bottles after testing metagenomic filtrations.

Appendices

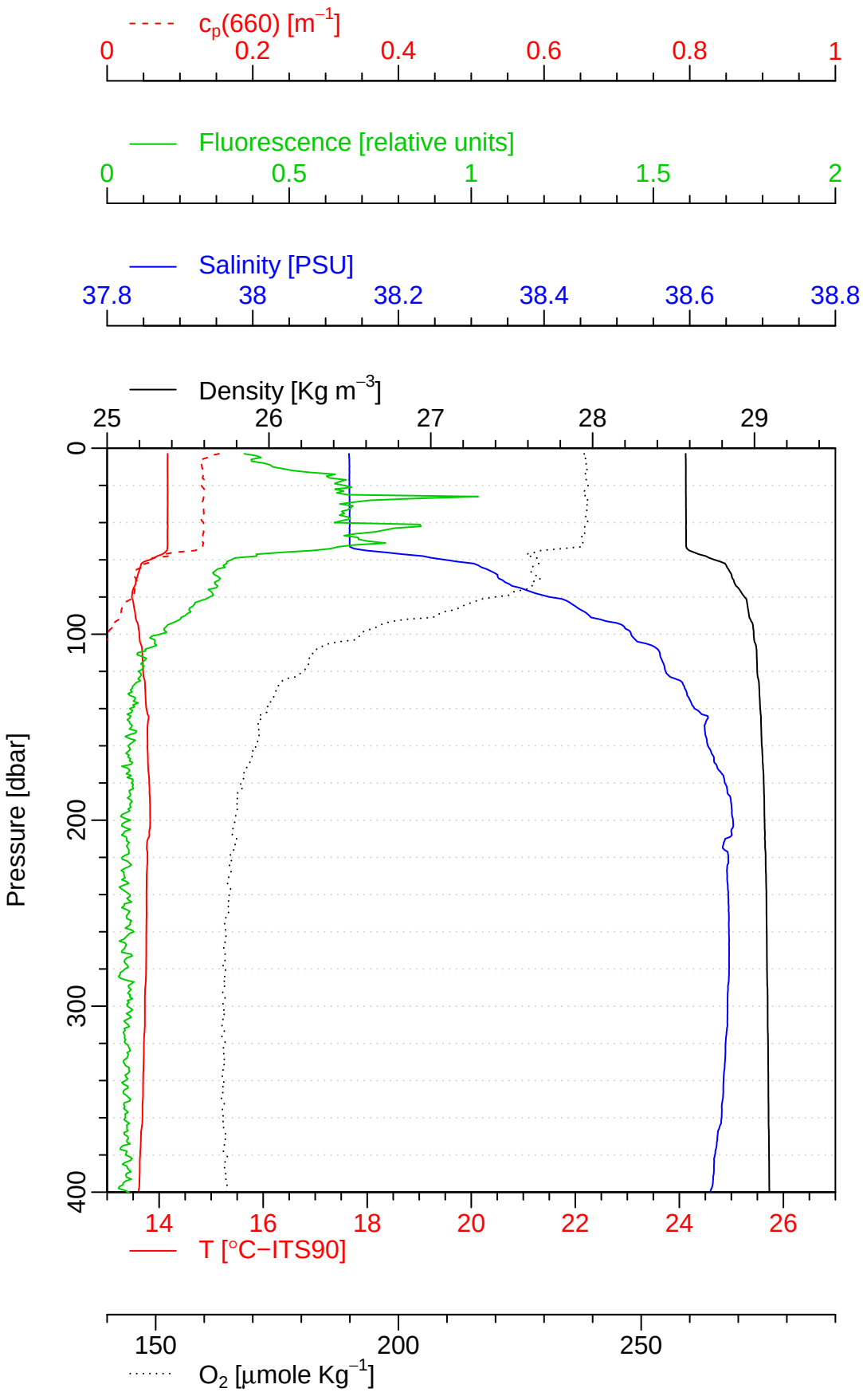
Cruise Summary Table for Boussole 217

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
11/02/20	Bad weather																							
12/02/20	Bad weather																							
13/02/20			BOUS217_01	HPLC, ap, O_2 & TA/TC	08:52	1:39:00	2400	43	21.889	7	54.486	blue		1	4	246	1021.0	46		13.1	14.1	slight	1		
		bou_c-ops_200213_1036_001_data.csv			10:50	3:45	93	43	22.141	7	54.054	blue	None	0	13	249	1021.4	68	good	12.6	14.7	slight	0.9		Yes
		bou_c-ops_200213_1036_002_data.csv			10:57	3:15	83	43	22.294	7	53.913	blue	None	0	13	249	1021.4	68	good	12.6	14.7	slight	0.9		Yes
		bou_c-ops_200213_1036_003_data.csv			11:10	3:15	83	43	22.501	7	53.701	blue	None	0	13	249	1021.4	68	good	12.6	14.7	slight	0.9		Yes
				Secchi01	11:35	4:00	16	43	22	7	54	blue							good			slight			
				Bucket TSM	11:45	2:00	0	43	21.926	7	54.475	blue	None		15	272	1020.6	64	good		14.7	slight			
			BOUS217_02	Metagenomics & Cyto	13:26	14:00	200	43	22.001	7	54.320	overcast		7	21	249	1019.7	76		13.1	14.23	moderate			


BOUSSOLE #217
February 2020
7°00'E
7°15'E
7°30'E
7°45'E
8°00'E
44°00'N
43°45'N
43°30'N
43°15'N
43°00'N
-100
-250
-500
-1000
-2000
Dyfamed
ODAS
BOUSSOLE
7°51'E
7°54'E
7°57'E
43°24'N
43°21'N
BOUS217_02
BOUS217_01
13 02 2020
13 02

bous217_01

Date = 13/02/2020
Heure debut [TU] = 08:52
Longitude = 007 54.486 E
Latitude = 43 21.889 N



bous217_02

Date = 13/02/2020
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Latitude = 43 22.001 N