BOUSSOLE Monthly Cruise Report

Cruise 214
November 12-14, 2019

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

Science Personnel: Emilie Diamond, Melek Golbol, Franck Petit and Eduardo Soto Garcia.

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

A view of the deck of the *Téthys II* showing bad weather on the way back to the Nice harbour.

BOUSSOLE project

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

November 30, 2019

Foreword

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

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European Space Agency

Centre National d'Etudes Spatiales, France

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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 from Sea-Bird Scientific Company "BBFL2 ECO V2 - B00128" was tested by the *Marine optics and remote sensing group* of the *Laboratoire d'Océanographie de Villefranche* (LOV) 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.

The MOOSE DYFAMED cruise of 15th November was cancelled because of a bad weather forecast, so their operations were performed during the last day of the BOUSSOLE cruise (14th November).

Cruise Summary

The first and second day of the cruise were canceled because of bad weather. The last day of the cruise was used for optical profiles, for CTD casts with water sampling and for a Secchi disk at the BOUSSOLE site. This day was

also used for the deep CTD cast at the DYFAMED site in the frame of the MOOSE program. Rough weather did not allow for diving operations.

Tuesday 12 November 2019

Bad weather prevented departure from the Nice harbour.

Wednesday 13 November 2019

Bad weather prevented departure from the Nice harbour.

Thursday 14 November 2019

The sea state was slight with a gentle breeze in the morning and a moderate breeze in the afternoon. The sky was overcast in the morning and cloudy in the afternoon and the visibility was medium. Firstly a CTD cast was attempted but failed. Then 3 C-OPS profiles were performed at the BOUSSOLE site. In the meantime, the cables and the connections of the CTD Rosette were checked and cleaned. The CTD problem was solved: there was a bad contact between connections of the deck unit and the computer, so the communication with the CTD failed. The cables and connections were cleaned and the communication with the CTD restored. Then a Secchi disk and 3 CTD casts were performed. For the first cast (CTD01), a cap was put on the Hydroscat-6 for dark measurements. The second cast (CTD 02) was deployed only at 10 m depth in order to sample water for TSM analyses. The third cast was a deep cast performed on the DYFAMED site (MOOSE program). We had to stop the work at DYFAMED after the CTD cast because of weather quickly degrading. Conditions were so rough that we were unable to sample water from the Rosette during the way back to the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/Dp3J76Kc1J5QPkAR8

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 12 November 2019

Bad weather prevented departure from the Nice harbour.

Wednesday 13 November 2019

Bad weather prevented departure from the Nice harbour.

Thursday 14 November 2019 (UTC)

People on board: Emilie Diamond, Melek Golbol, Franck Petit and Eduardo Soto Garcia.

0500 Departure from the Nice harbour.
0820 Arrival at the BOUSSOLE site.
0830 CTD attempt: failed.
0855 C-OPS 01, 02, 03.
0940 CTD 01, 400 m (with cap on the HS6).
0950 CTD 02, 10 m with water sampling for TSM.
1000 Secchi disk 01, 16 m.
1020 CTD 03, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, O_2 and TA/TC.
1045 Departure to the DYFAMED site.
1120 Arrival to the DYFAMED site.
1125 CTD MOOSE 136 with water sampling (MOOSE program).
1255 Departure to the Nice harbour.
1550 Arrival to the Nice harbour.

Problems identified during the cruise

- There were problems of communication with the CTD. It was due to a bad contact between connections of the deck unit and the computer, so the communication with the CTD failed. The cables and connections were cleaned and the communication with the CTD restored.

- Bad weather limited the time available for work, so that the CTD cast including a 0.2 µm filter on the inlet tube of the a-Sphere for the dissolved matter absorption measurements could not be performed during this cruise.

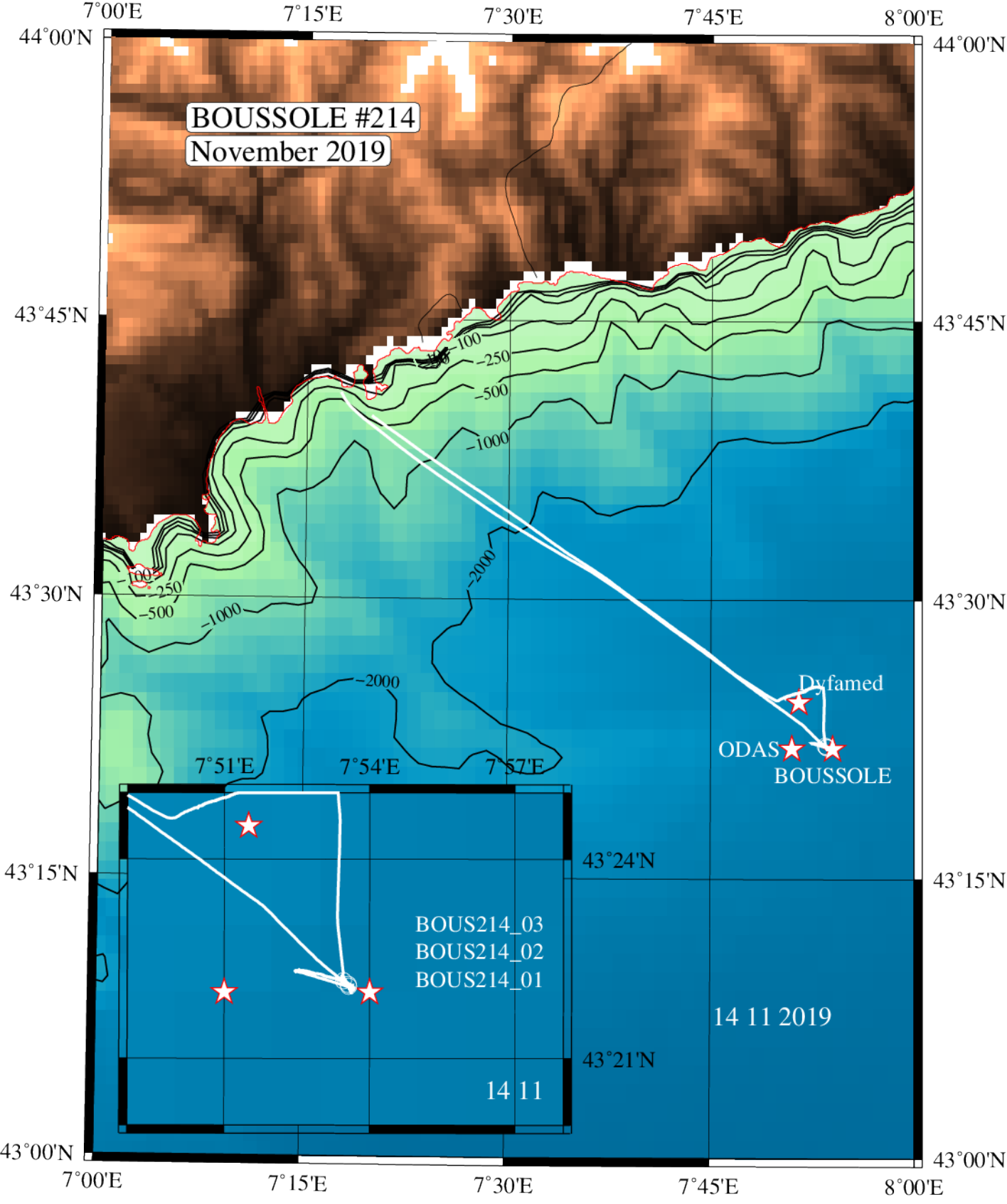
- The GPS of the C-OPS system did not work. It was subsequently sent to Biospherical for repair.

- The weather station of the *Téthys* II did not function correctly. There were missing parameters (air temperature and hygrometry).

Appendices

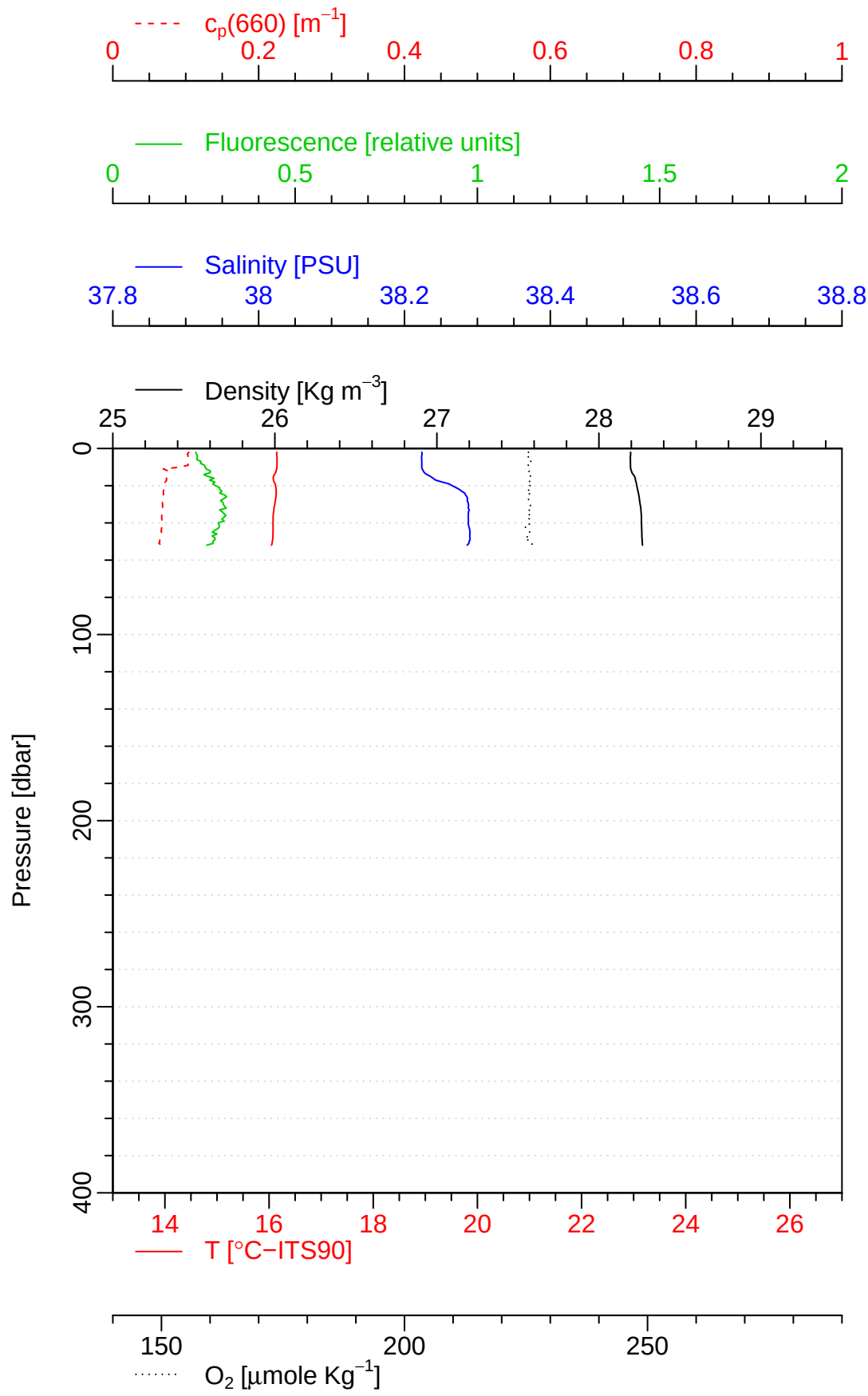
Cruise Summary Table for Boussole 214

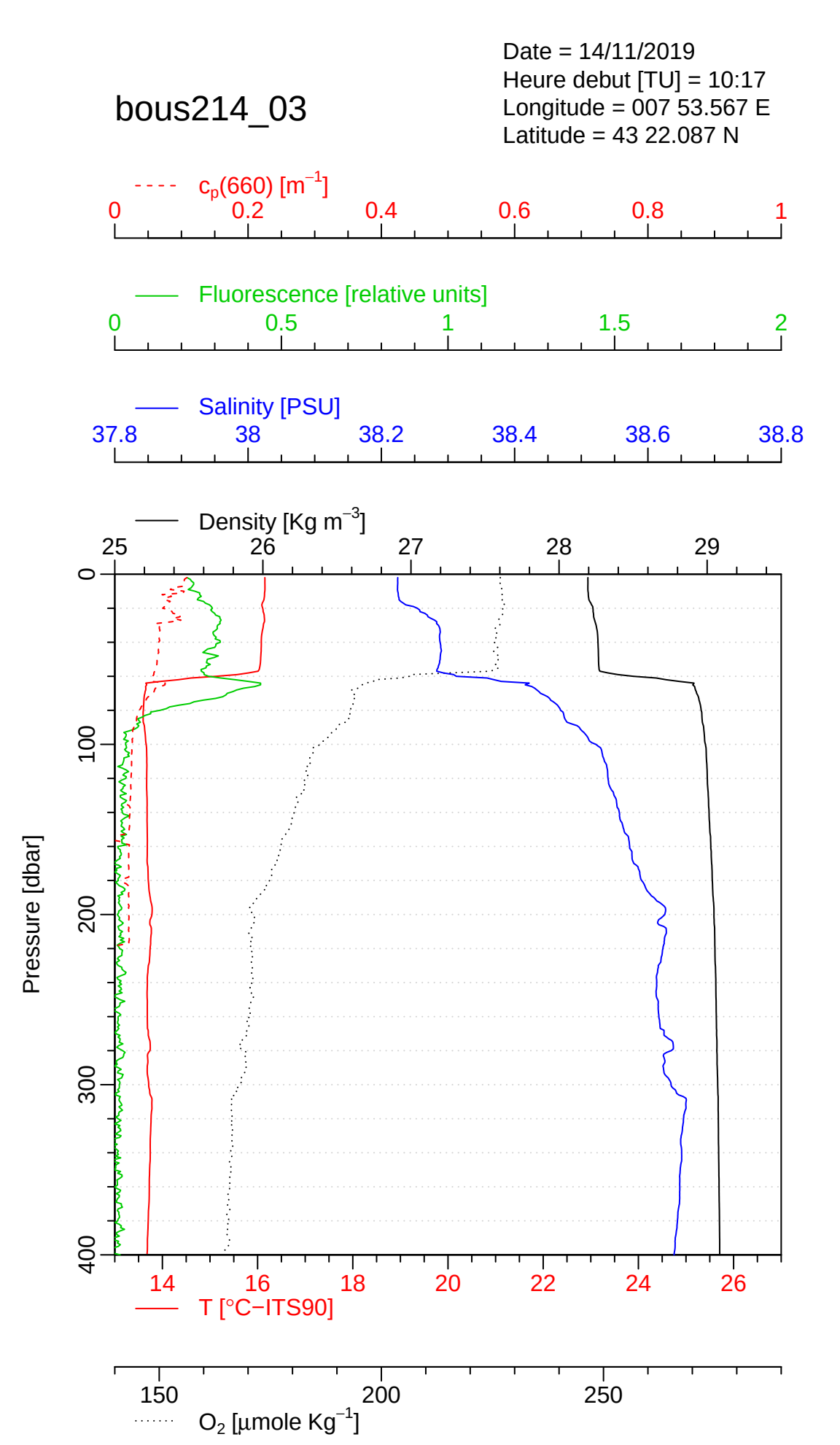
Date	Black names	Profile names	CTD notées	Other sensors	Start Time	Duration	Depth max	Latitude (N)		longitude					Weather							Sea		
	(file ext: ".raw")	(file extension: ".raw")			GMT (hour.min)	(min.sec)	(meter)	(Degree)	(Minute)	(Degree)	(Minute)	Sky	Clouds	Quantity (#/8)	Wind sp. (kn)	Wind dir.	Atm. Pressure (hPa)	Humidity (%)	Visibility	T air	T water	Sea	Swell H (m)	Swell dir.	Whitecaps
12/11/19	Bad weather																							
13/11/19	Bad weather																							
14/11/19		bou_c-ops_191114_0835_001_data.csv			08:55	4:14	106	43	22.163	7	53.451	overcast	St	8	7	160	1006.3	56	medium	14.3		slight	0.8		No
		bou_c-ops_191114_0835_002_data.csv			09:06	4:23	106	43	22.240	7	53.082	overcast	St	8	7	160	1006.3	56	medium	14.3		slight	0.8		No
		bou_c-ops_191114_0835_003_data.csv			09:16	4:04	103	43	22.285	7	52.833	overcast	St	8	7	160	1006.3	56	medium	14.3		slight	0.8		No
			BOUS214_01	no sampling	09:41	7:00	50	43	22.114	7	53.561	cloudy		6	10	143	1005.5	57		14.6	16.15	slight			
			BOUS214_02	TSM	09:52	2:00	10	43	22.170	7	53.460	cloudy		6	10	143	1005.2	57		14.6	16.15	slight			
				Secchi01	10:00	4:00	16	43	22	7	54	cloudy		6					medium			slight			
			BOUS214_03	HPLC, ap O_2 & TA/TC	10:20	24:00	400	43	22.087	7	53.567	cloudy		6	13	120	1006.1	57		14.6	16.15	slight			


BOUSSOLE #214
November 2019
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
BOUS214_03
BOUS214_02
BOUS214_01
14 11 2019
14 11

bous214_01

Date = 14/11/2019
Heure debut [TU] = 09:41
Longitude = 007 53.561 E
Latitude = 43 22.114 N




bous214_03
Date = 14/11/2019
Heure debut [TU] = 10:17
Longitude = 007 53.567 E
Latitude = 43 22.087 N
cp(660) [m−1]
0
0.2
0.4
0.6
0.8
1
Fluorescence [relative units]
0
0.5
1
1.5
2
Salinity [PSU]
37.8
38
38.2
38.4
38.6
38.8
Density [Kg m−3]
25
26
27
28
29
Pressure [dbar]
0
100
200
300
400
14
16
18
20
22
24
26
T [°C−ITS90]
150
200
250
O2 [µmole Kg−1]