BOUSSOLE Monthly Cruise Report

Cruise 205
February 17-19, 2019

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

Science Personnel: Céline Dimier, Melek Golbol, Juliette Maury and Eduardo Soto Garcia.

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The upper superstructure of the BOUSSOLE buoy which was deployed the day before the cruise, with the R/V *Téthys II* in the background.

BOUSSOLE project

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

February 25, 2019

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

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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

The first day, a pressure test was performed for the a-Sphere absorption meter. A drift of the sensor was observed when the pressure is increasing. It was decided to test this effect by filling the cavity of the a-Sphere with pure water and unplugging the pump.

On that same day, a Manta net was deployed at the DYFAMED site because this operation could not be performed during the MOOSE cruise that took place the day before.

The last day, 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) before its commercialization. The LOV is interested to acquire this sensor. It measures Chla and CDOM fluorescence and the backscattering coefficient b_b at 700 nm.

Cruise Summary

The first day of the cruise was used for CTD casts with water sampling, for optical profiles, for CIMEL measurements and for a Secchi disk at the BOUSSOLE site. This day was also used to deploy a Manta net at the DYFAMED site. The pressure effect on the a-Sphere absorption measurements was tested. The second day was used for downloading data from the buoy, for a Secchi disk, for optical profiles and for CTD casts with water sampling at the BOUSSOLE site. The last day of the cruise was used for CTD casts with water sampling, for CIMEL measurements, for optical profiles and for a Secchi disk at the BOUSSOLE site.

Sunday 17 February 2019

The sea state was smooth with a light breeze. The sky was overcast in the morning and clear in the afternoon, the visibility was good. Firstly, 2 CTD casts with water sampling were performed at the BOUSSOLE site. For the first cast, the cavity of the a-Sphere was completely filled with pure water in order to test the pressure effect on the measurements. A cap was put on the Hydroscat-6 for dark measurements. Then, 3 C-OPS profiles, 3 CIMEL measurements and a Secchi disk were performed at the BOUSSOLE site. Finally, a Manta net was deployed at the DYFAMED site before returning to the Nice harbour.

Monday 18 February 2019

The sea state was smooth with a light air. The sky was blue and the visibility was good. Firstly, data were downloaded from the buoy. In the meantime, a Secchi disk was performed at the BOUSSOLE site. Then, 3 C-OPS profiles and 2 CTD casts were performed at the BOUSSOLE site. For the last CTD cast (CTD 05), a 0.2 µm filter was put on the a-Sphere absorption meter for the dissolved matter absorption measurements. This CTD cast was stopped at 10 depths (400 and 150 m during 2 minutes and 80, 60, 50, 40, 30, 20, 10 and 5 m during 7 minutes) during the ascent of the CTD.

Tuesday 19 February 2019

The sea state was smooth with a light breeze. The sky was cloudy in the morning and blue in the afternoon and the visibility was good. Firstly, 2 CTD casts with water sampling were performed at the BOUSSOLE site. The Sea-Bird prototype sensor "BBFL2 ECO V2 - B00128" was affixed on the rosette for testing. Then, 3 CIMEL measurements were performed at the BOUSSOLE site. C-OPS balance tests were performed in order to check and adjust it during the descent phase of the profiles. Finally, 3 C-OPS profiles were performed at the BOUSSOLE site before returning to the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/Do2Ygk3CBUgCpfGD8

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

Cruise Report

Sunday 17 February 2019 (UTC)

People on board: Melek Golbol, Juliette Maury (LOV) and Eduardo Soto Garcia.

0715 Departure from the Nice harbour.
1045 Arrival at the BOUSSOLE site.
1050 CTD 01, 400 m with water sampling at 5 m for TSM and a-Sphere pressure effect testing.
1135 CTD 02, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and a_p.
1315 C-OPS 01, 02, 03.
1410 CTD 03, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and a_p.
1420 CIMEL 01, 02, 03.
1440 Secchi disk 01, 15 m.

1450 Departure to DYFAMED site.
1510 Arrival to DYFAMED site.
1515 Manta net.
1550 Departure to the Nice harbour.
1900 Arrival at the Nice harbour.

Monday 18 February 2019 (UTC)

People on board: Céline Dimier, Melek Golbol and Eduardo Soto Garcia.

0715 Departure from the Nice harbour.
1030 Arrival at the BOUSSOLE site.
1050 Secchi 02, 13.5 m.
1100 Connection with the buoy and data retrieval.
1130 C-OPS 04, 05, 06.
1240 CTD 04, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and a_p.
1355 CTD 05, 400 m with water sampling at 10 and 5 m for TSM, TA/TC and O_2.
1525 Departure to the Nice harbour.
1900 Arrival to the Nice harbour.

Tuesday 19 February 2019 (UTC)

People on board: Melek Golbol and Eduardo Soto Garcia.

0815 Departure from the Nice harbour.
1130 Arrival at the BOUSSOLE site.
1155 CTD 06, 50 m with water sampling at 5 m for TSM (with BBFL2 ECO V2 sensor testing).
1220 CTD 07, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and a_p (with BBFL2 ECO V2 sensor testing).
1250 CIMEL 04, 05, 06.
1310 C-OPS balance tests.
1340 C-OPS 07, 08, 09.
1510 Secchi 03, 10 m.
1520 Departure to the Nice harbour.
1730 Arrival to the Nice harbour.

Problems identified during the cruise

- The first day, during the CTD 02 cast, the IOP package was unfortunately not turned on. So, it was decided to perform a third CTD cast with water sampling by ensuring that the IOP package is turned on.

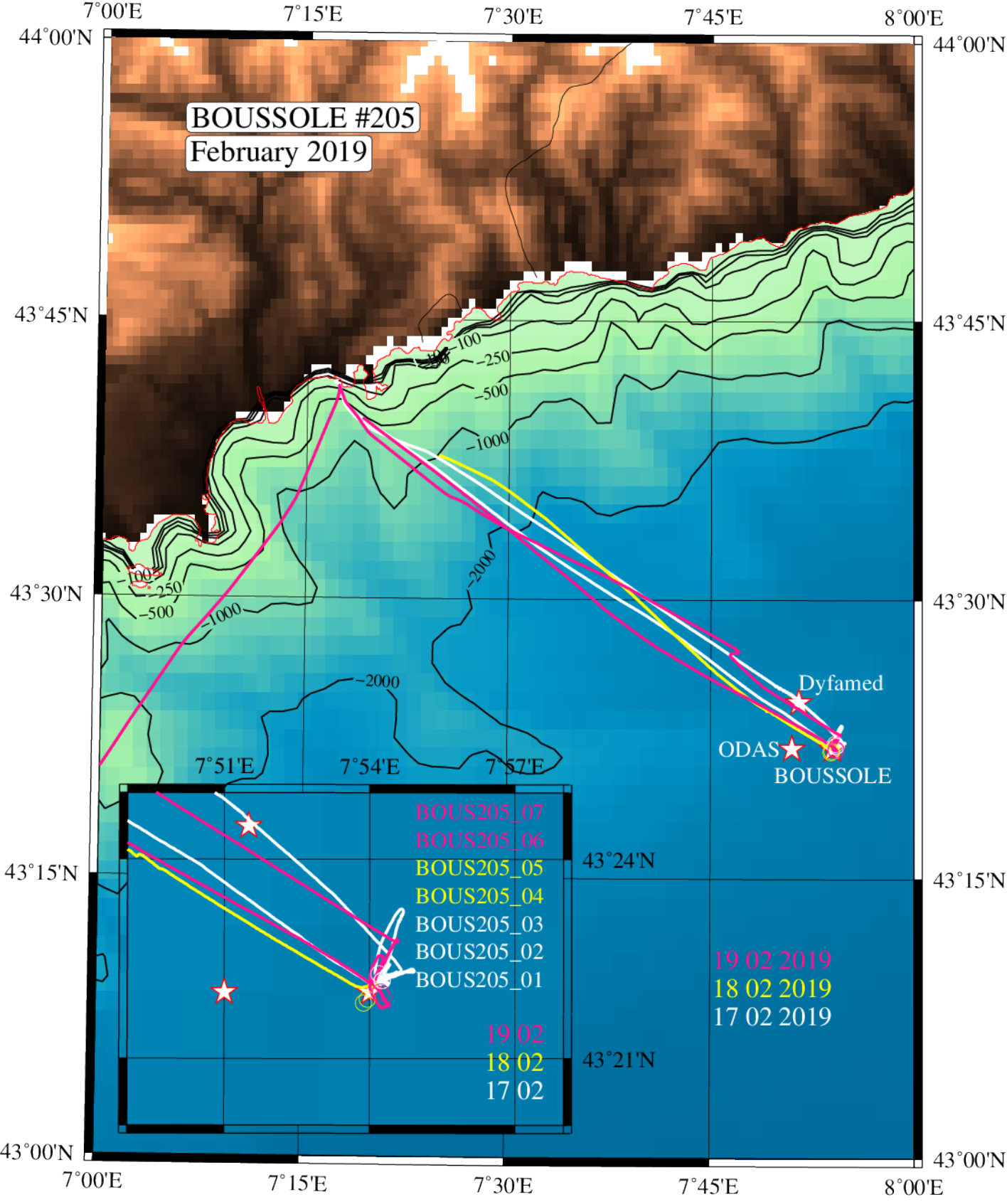
- The rotation of the upper superstructure of the buoy took place the day before the cruise. So, the functioning of the buoy was checked and data were downloaded. It appeared that the CTD at 9 m depth on the buoy was not functioning. It was possibly due to a configuration issue. The CTD will be replaced during the next cruise and will be tested in the lab. However, there is a second CTD at 3 m depth which functioned correctly and its data will be used for the processing of the buoy data.

- Diving and maintenance operations of the buoy were not carried out because the rotation of the upper superstructure of the buoy took the day before. So it was not necessary to clean the instruments.

Appendices

Cruise Summary Table for Boussole 205

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
17/02/19			BOUS205_01	TSM	10:50	24:00	400	43	22.270	7	54.194	overcast		7	5	222	1030.0	79		12.9	13.57	smooth			
			BOUS205_02	HPLC & Ap	11:36	35:00	400	43	22.168	7	54.256	overcast		7	6	246	1030.0	79		13.0	13.58	smooth			
		bou_c-ops_190217_1302_001_data.csv			13:13	3:46	91	43	22.270	7	54.296	blue	Cu	1	6	253	1028.5	77	good	13.0		smooth	0.3		no
		bou_c-ops_190217_1302_002_data.csv			13:25	3:42	91	43	22.542	7	54.416	blue	Cu	1	6	253	1028.5	77	good	13.0		smooth	0.3		no
		bou_c-ops_190217_1302_003_data.csv			13:39	3:55	97	43	22.940	7	54.552	blue	Cu	1	6	253	1028.5	77	good	13.0		smooth	0.3		no
			BOUS205_03	HPLC & Ap	14:12	31:00	400	43	22.174	7	54.266	blue		2	7	228	1028.2	76		13.1	13.75	smooth			
				CIMEL01	14:18	4:00		43	22.173	7	54.263	blue		1			1028.2								
				CIMEL02	14:24	5:00		43	22.173	7	54.263	blue		0			1028.2								
				CIMEL03	14:30	4:00		43	22.173	7	54.263	blue		0			1028.2								
				Secchi01	14:40	4:00	15	43	22	7	54	blue		4					good			smooth			
18/02/19				Secchi02	10:50	4:00	13.5	43	22	7	54	blue		1					good			smooth			
		bou_c-ops_190218_1127_001_data.csv			11:32	3:55	97	43	22.296	7	54.071	blue	Cu	1	3	255	1026.3	61	good	12.8		smooth	0.2		no
		bou_c-ops_190218_1127_002_data.csv			11:43	3:46	95	43	22.441	7	53.896	blue	Cu	1	3	255	1026.3	61	good	12.8		smooth	0.2		no
		bou_c-ops_190218_1127_003_data.csv			11:54	4:06	104	43	22.612	7	53.762	blue	Cu	1	3	255	1026.3	61	good	12.8		smooth	0.2		no
			BOUS205_04	HPLC & Ap	12:40	31:00	400	43	21.893	7	53.957	blue		3	1	242	1025.5	61		12.8	13.60	smooth			
			BOUS205_05	TA/TC, O2 and TSM	13:53	1:28:00	400	43	21.832	7	53.874	blue		3	1	188	1024.8	64		12.4	13.64	smooth			
19/02/19			BOUS205_06	TSM	11:54	5:00	50	43	22.002	7	54.228	cloudy		5	3	345	1023.8	58		12.8	14.30	smooth			
			BOUS205_07	HPLC & Ap	12:19	33:00	400	43	21.922	7	54.278	cloudy		4	3	320	1023.6	59		12.3	13.66	smooth			
				CIMEL04	12:48	2:00		43	21.834	7	54.366	blue		0			1023.2								
				CIMEL05	12:51	3:00		43	21.834	7	54.366	blue		0			1023.2								
				CIMEL06	12:55	3:00		43	21.834	7	54.366	blue		0			1023.2								
		bou_c-ops_190219_1302_002_data.csv			13:34	4:16	107	43	22.269	7	54.159	blue	None	0	6	298	1022.9	63	excellent	12.3		smooth	0.3		no
		bou_c-ops_190219_1302_003_data.csv			13:46	4:38	117	43	22.417	7	54.283	blue	None	0	6	298	1022.9	63	excellent	12.3		smooth	0.3		no
		bou_c-ops_190219_1302_004_data.csv			13:57	4:37	116	43	22.602	7	54.407	blue	None	0	6	298	1022.9	63	excellent	12.3		smooth	0.3		no
				Secchi03	15:10	4:00	10	43	22	7	54	blue		0					excellent			smooth			



GMT 2019 Apr 11 03:47:28

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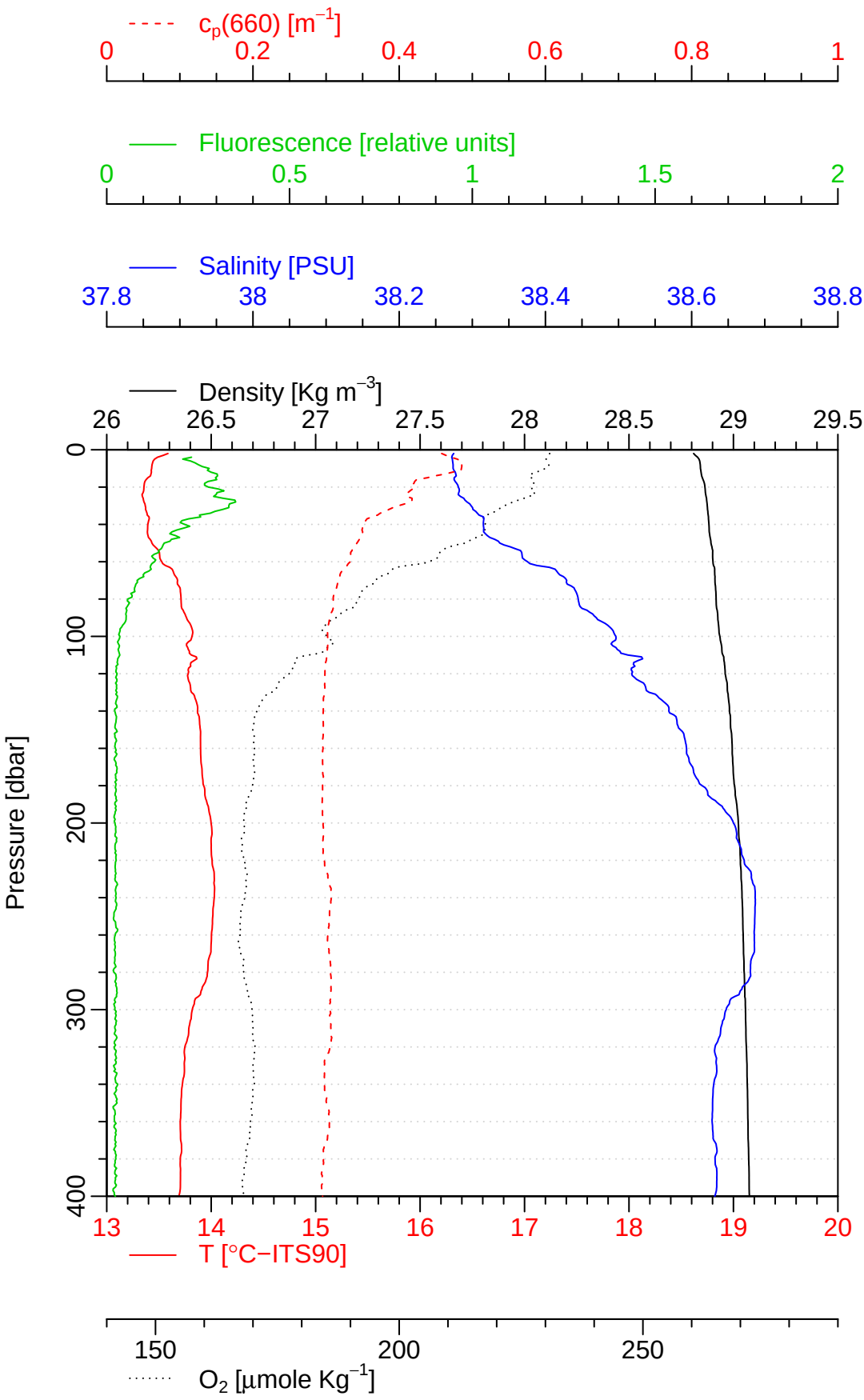
Latitude = 43 22.270 N



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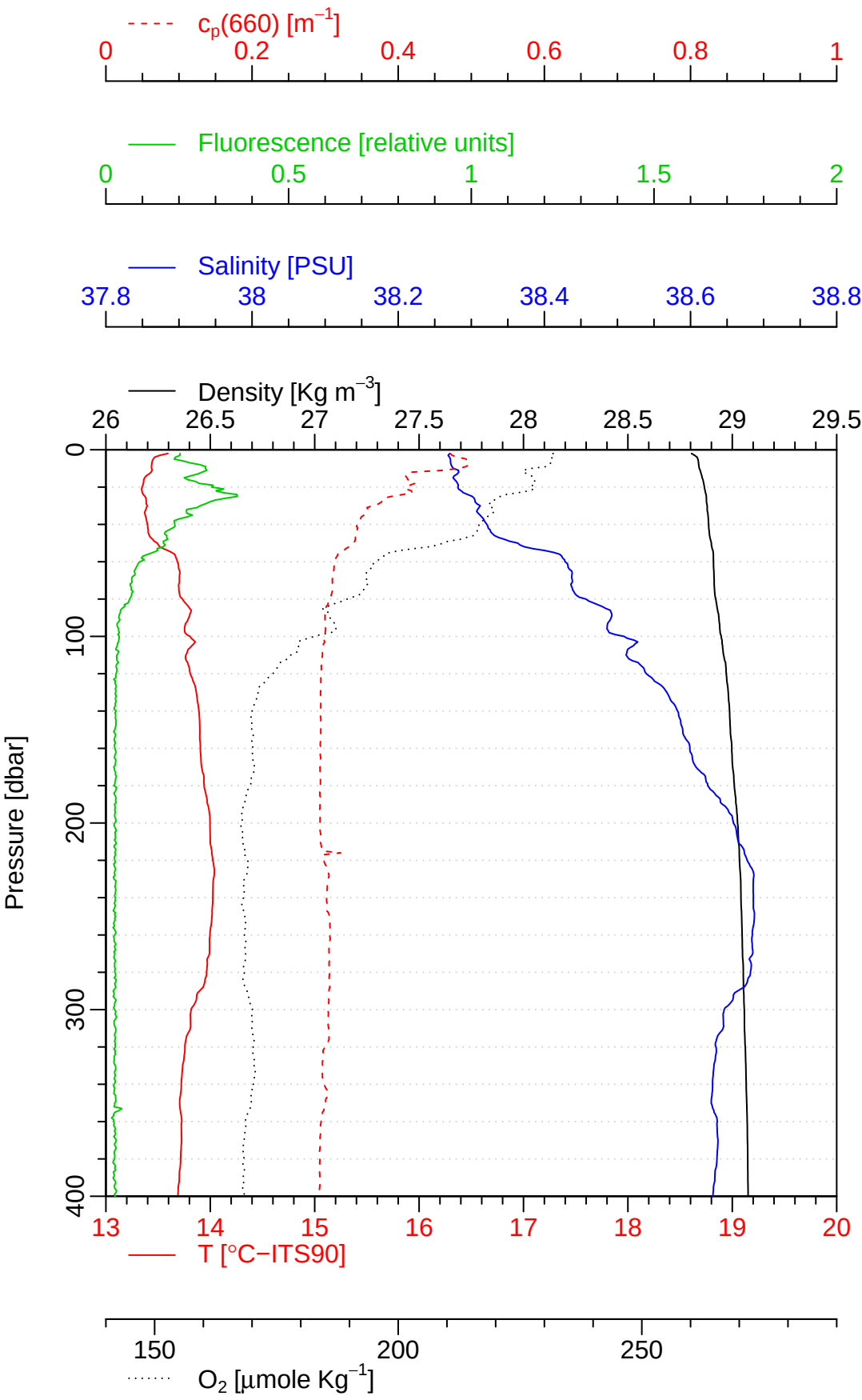

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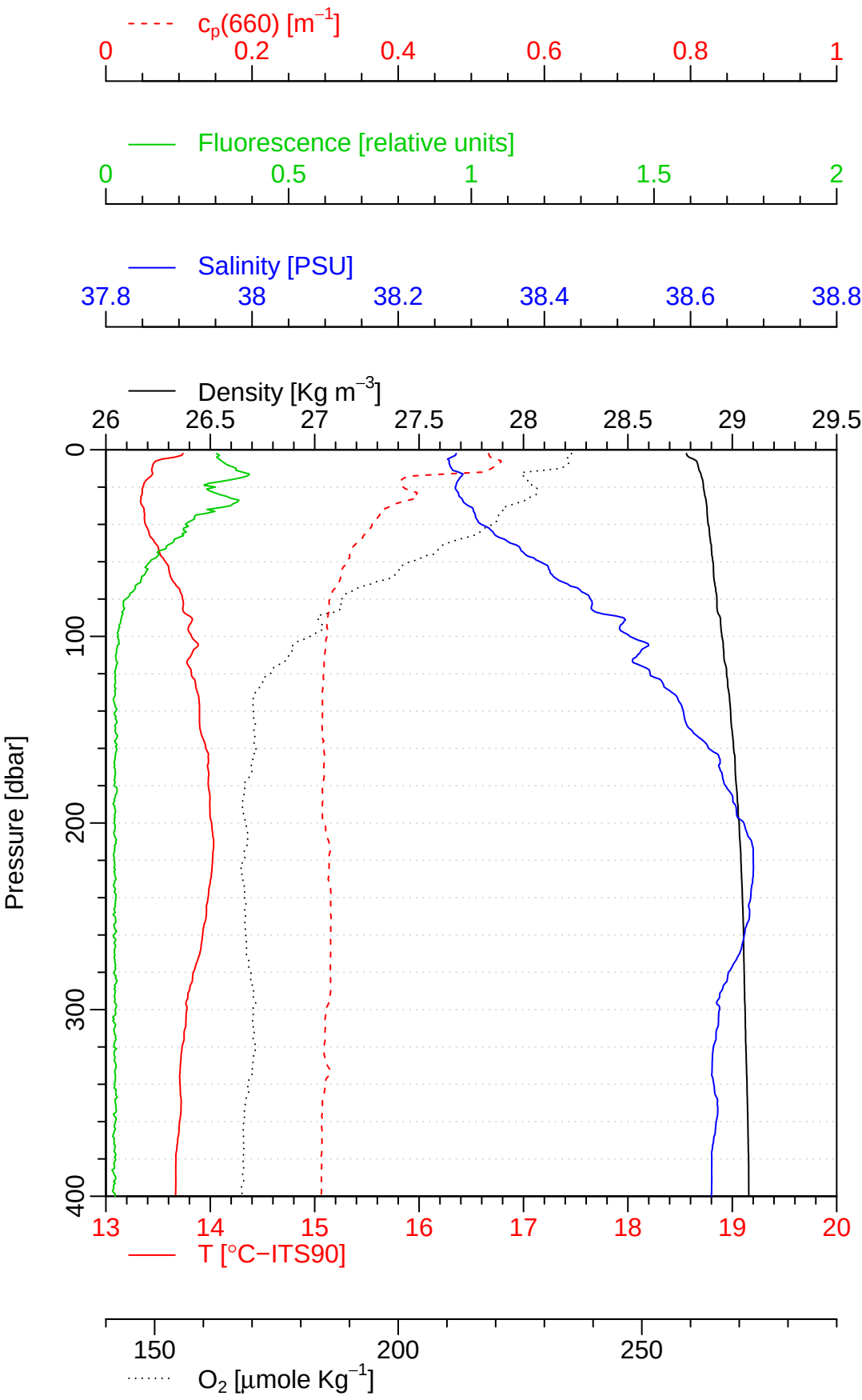

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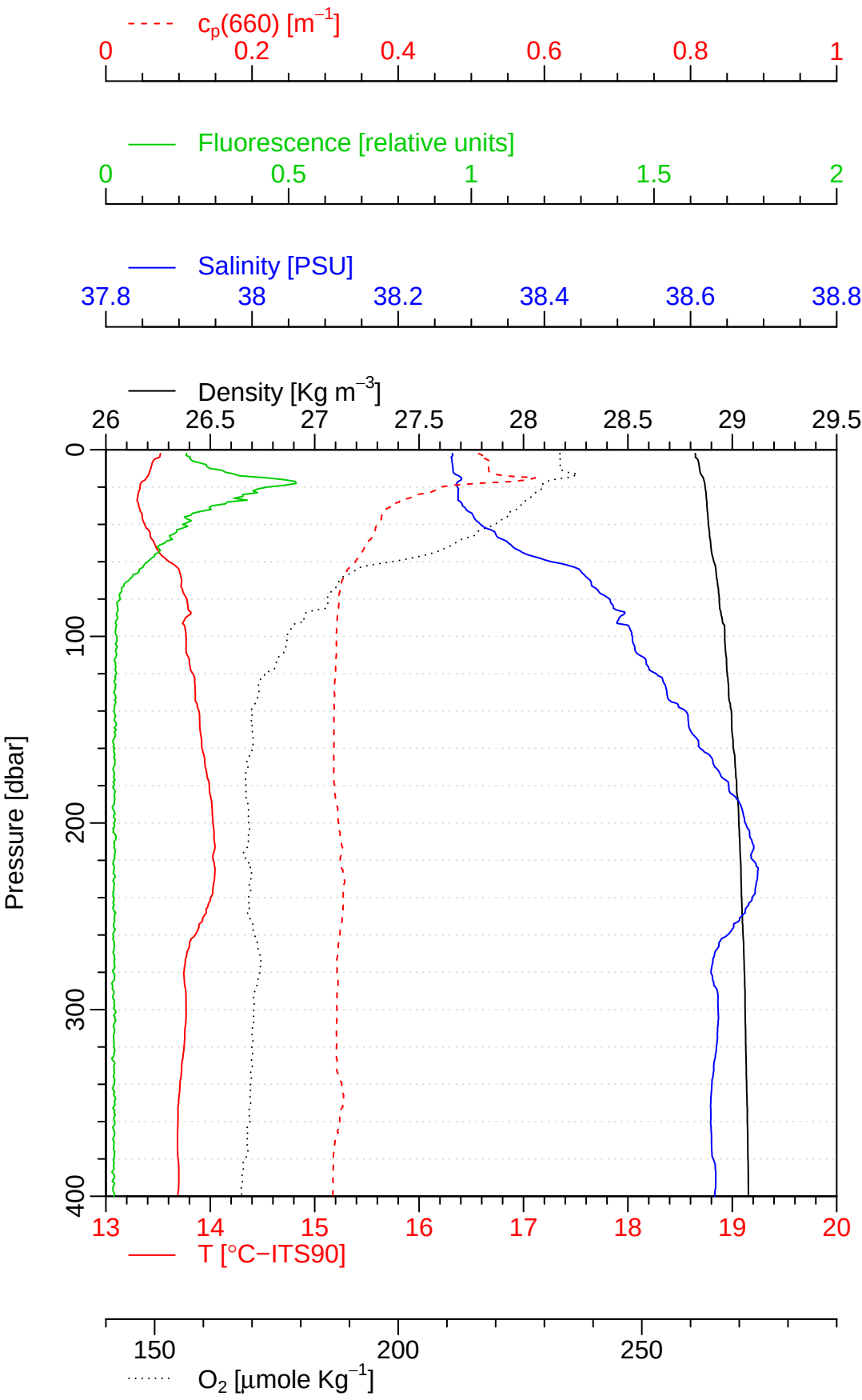

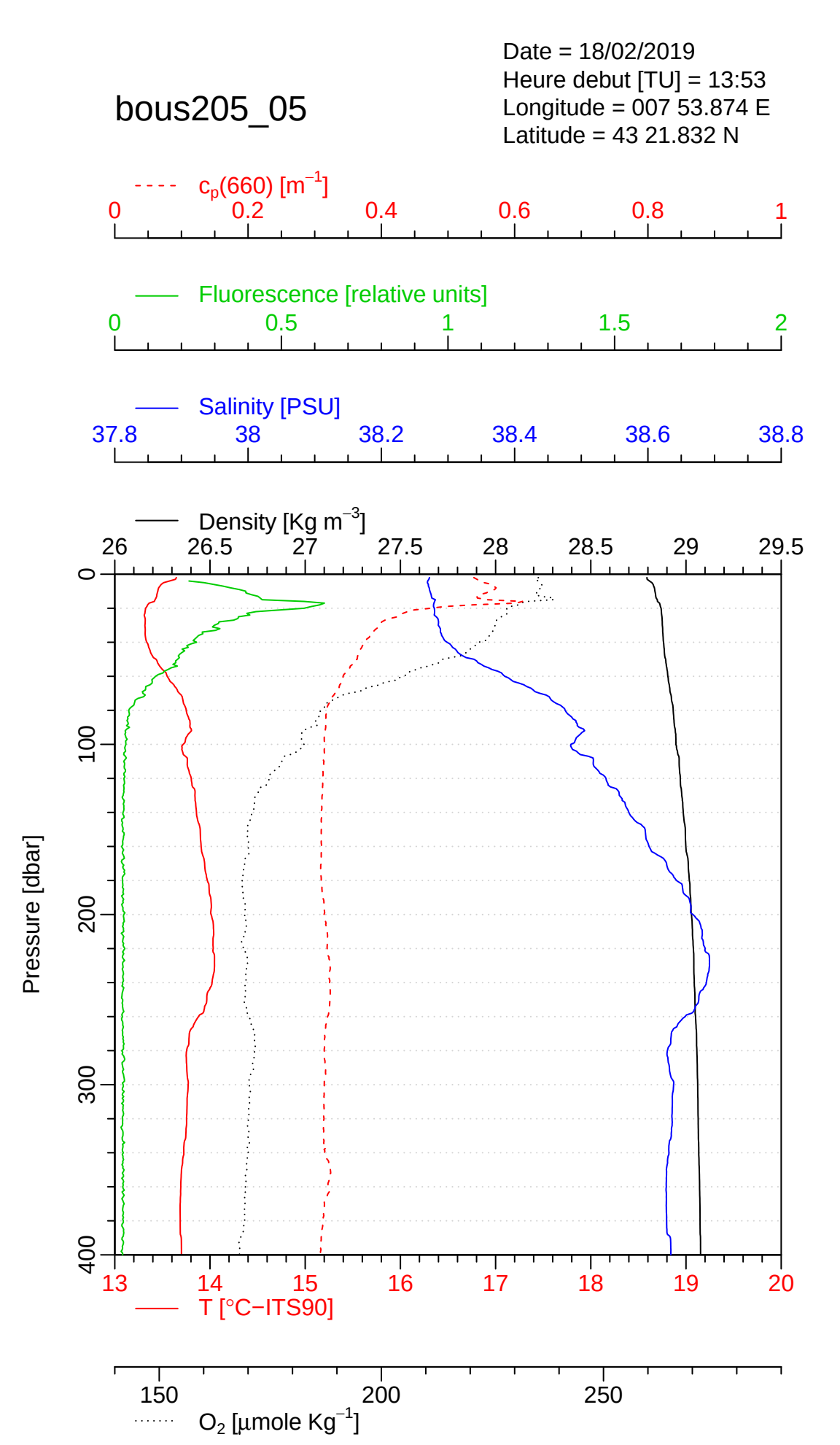
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0
0.2
0.4
0.6
0.8
1
Fluorescence [relative units]
0
0.5
1
1.5
2
Salinity [PSU]
37.8
38
38.2
38.4
38.6
38.8
Density [Kg m−3]
26
26.5
27
27.5
28
28.5
29
29.5
Pressure [dbar]
0
100
200
300
400
13
14
15
16
17
18
19
20
T [°C−ITS90]
150
200
250
O2 [µmole Kg−1]

bous205_06

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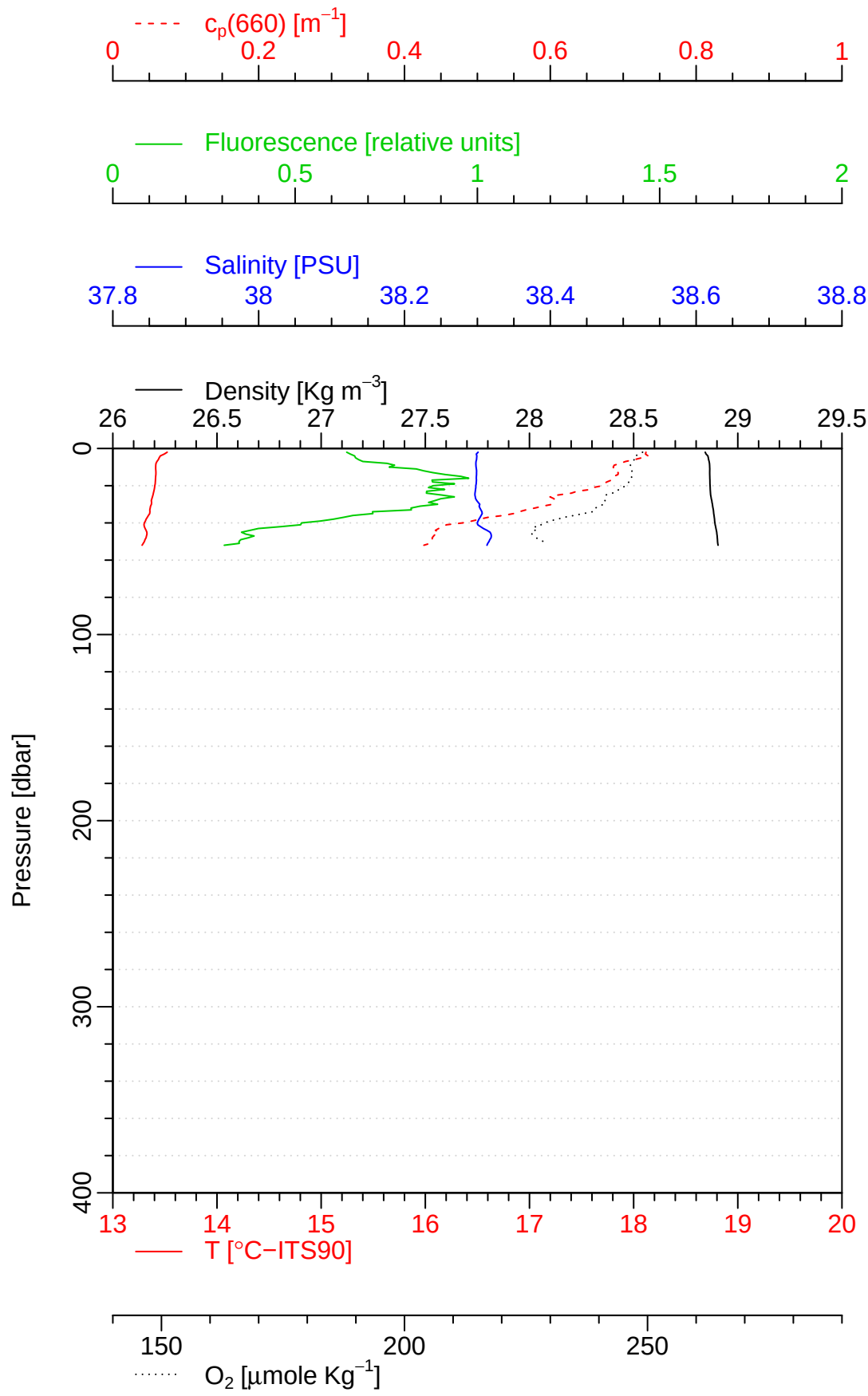

bous205_07

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