BOUSSOLE Monthly Cruise Report

Cruise 250
January 10-12, 2023

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

Science Personnel: Lou Andres, Cyril Debost, Emilie Diamond-Riquier, Céline Dimier, Melek Golbol, Elsa Simon and Paco Stil

Institut de la Mer de Villefranche (IMEV), 06230 Villefranche-sur-Mer, France

Cleaning of the BOUSSOLE buoy sensors by the divers.

BOUSSOLE project

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

January 20, 2023

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

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. 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 replicate 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 for acquiring dark measurements (started in April 2009).

Projects-specific operations

In addition, water samples are to be collected at 5 m depth for dissolved oxygen (DO), total alkalinity (TA) and total inorganic carbon (TC) analysis (from March 2014) and pH analysis (from October 2021). The TA/TC samples will be processed by the National service for such analyses (SNAPOCO – LOCEAN in Paris). The DO and pH samples will be analysed in the *Institut de la Mer de Villefranche* by the MOOSE team. The results will allow checking the data collected by the pCO_2 CARIOCA sensors, the optode and the pH sensor installed on the buoy at 3 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 "MOOSE DYFAMED" cruise scheduled on 13th January was cancelled because of bad weather forecasts, so their operations were performed during the BOUSSOLE cruise.

The last day was given to the SEAMER cruise for the deployment of the drifting mooring line (project of the *Laboratoire de Villefranche-sur-Mer)* because of the bad weather forecasts during their schedule's dates.

Cruise Summary

The first day was cancelled because of bad weather. The second day was used for BOUSSOLE operations including diving operations, Secchi disk, CTD casts with water sampling and C-OPS profiles at the BOUSSOLE site. It was also used for MOOSE operations including a deep CTD cast, zooplankton vertical nets and a Manta horizontal net at the DYFAMED site. The last day was used for SEAMER operations.

Tuesday 10 January 2023

Bad weather prevented departure from the Nice harbour.

Wednesday 11 January 2023

The sea state was slight with a light to gentle breeze. The sky was overcast and the visibility was excellent. Firstly, divers went at sea to clean the buoy instruments, took pictures and put caps on the backscattering meter for dark measurements. They switched the battery off and on, and the surface DL3 on the top of the buoy was switched off and on two times to restart the system in order to have three series of dark measurements. The functioning of the buoy was checked on the top of the buoy, the surface sensor was heard working and the underwater instruments were seen working (opening of the fluorometers shutters during the measurements). The files recorded on the surface DL3 and the battery voltage were checked with a WIFI connection. It appeared that only two files were created this day. So, the surface DL3 on the top of the buoy was switched off and on a third time. The solar panels and the surface sensor were cleaned. In the meantime, a Secchi disk was deployed from the ship. Then, two CTD casts with water sampling and four C-OPS profiles were performed. The second C-OPS profiles was stopped at 45 m depth because of the unstable surface irradiance. Then, a deep CTD cast, two vertical zooplankton nets and a horizontal Manta net were performed at the DYFAMED site for the MOOSE program.

Thursday 12 January 2023

This day was used for SEAMER operations.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/mmCkiqaUuPAocsXR9

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 10 January 2023

Bad weather prevented departure from the Nice harbour.

Wednesday 11 January 2023 (UTC)

People on board: Lou Andres, Cyril Debost, Emilie Diamond-Riquier, Céline Dimier, Melek Golbol, Elsa Simon and Paco Stil.

0530	Departure from the Nice harbour.
0855	Arrival at the BOUSSOLE site.
0900	Diving operations: cleaning, dark measurements, pictures. Maintenance on the top of the buoy: functional checking, solar panels cleaning.
0945	Secchi 01, 20 m.
1025	CTD 01, 15 m with water sampling at 5 m for TSM, TA/TC, DO and pH.
1055	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.
1135	C-OPS 01, 02, 03, 04.
1230	Departure to DYFAMED site.
1250	Arrival at the DYFAMED site.
1255	Deep CTD cast (MOOSE program).
1430	Zooplankton nets x 2, 100 and 200 m (MOOSE program).
1455	Manta horizontal net (MOOSE Program).
1530	Departure to the Nice harbour.
1830	Arrival at the Nice harbour.

Tuesday 12 January 2023

SEAMER operations.

Problems identified during the cruise

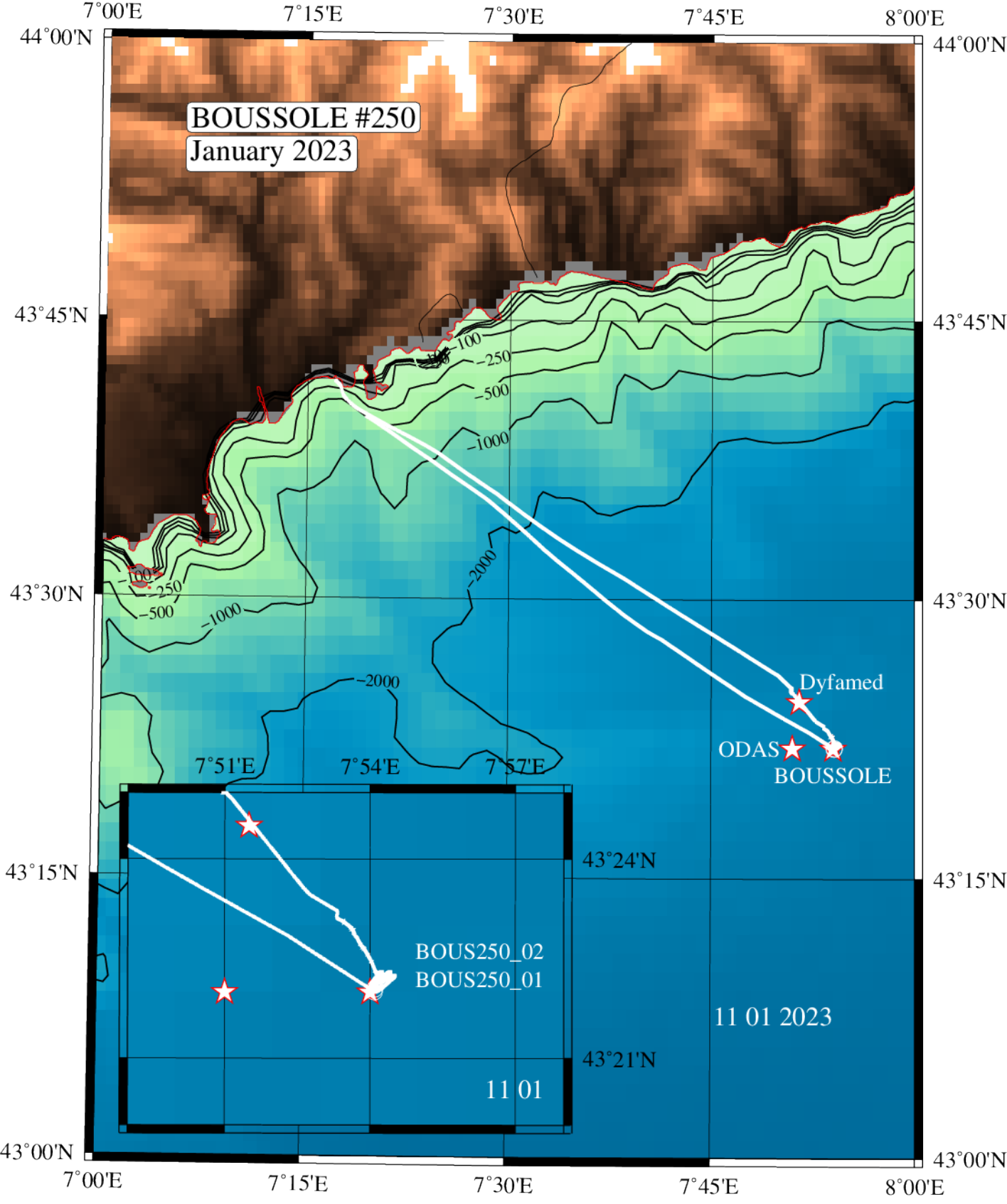
- The IOP package was not available for this cruise. The instruments were still under calibration at Hobi Instruments Service.

- The second C-OPS profile was stopped at 45 m depth because of an unstable surface irradiance.

Appendices

Cruise Summary Table for Boussole 250

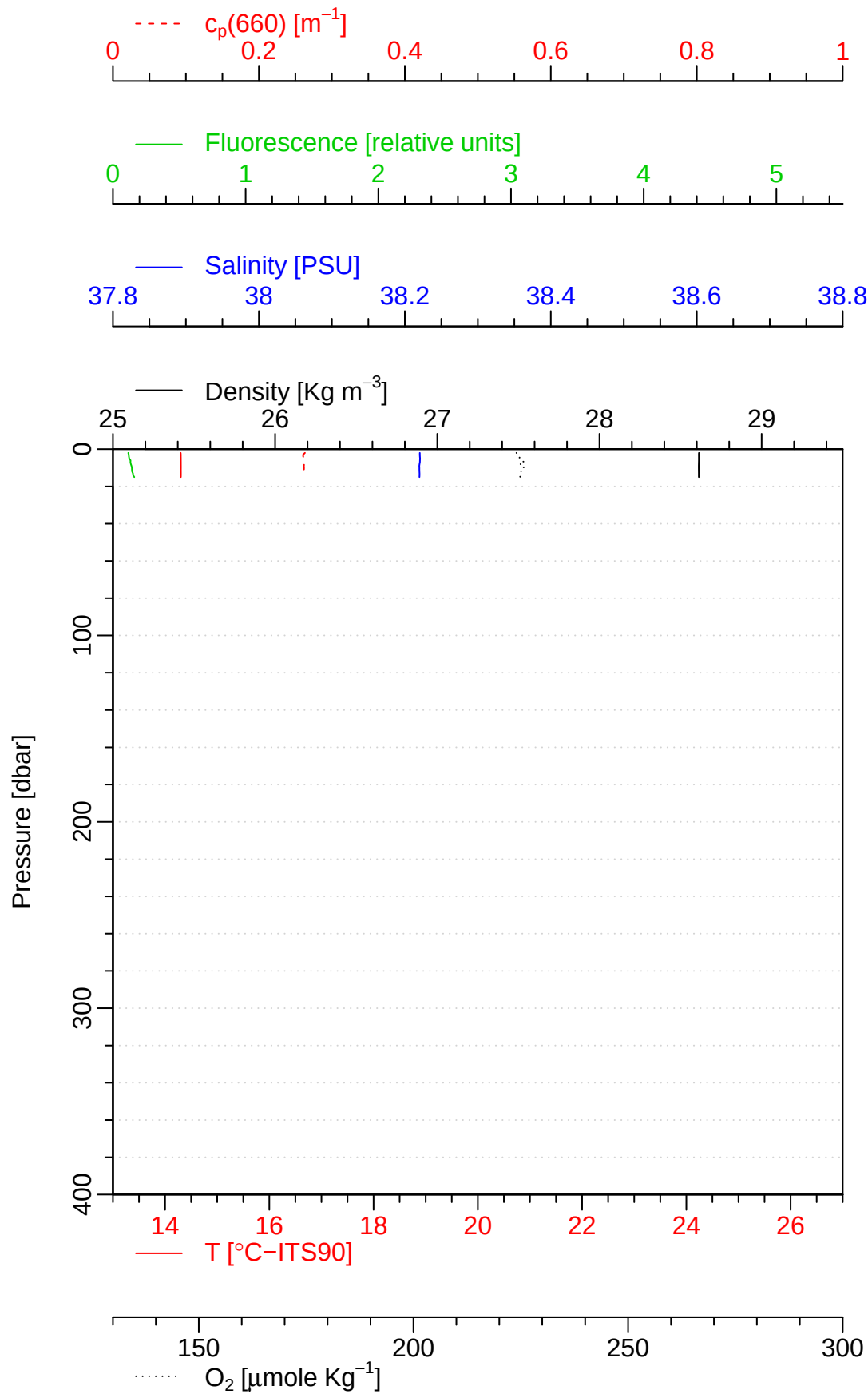
Date	Black names	Profile names	CTD notées	Other sensors	Start Time	Duration	Depth max	Latitude (N)		longitude					Weather							Sea		
	(file ext: ".raw")	(file extension: ".raw")			GMT (hour.min)	(hour.min.sec)	(meter)	(Degree)	(Minute)	(Degree)	(Minute)	Sky	Clouds	Quantity (#/8)	Wind sp. (kn)	Wind dir.	Atm. Pressure (hPa)	Humidity (%)	Visibility	T air	T water	Sea	Swell H (m)	Swell dir.	Whitecaps
10/01/23	Bad weather																								
11/01/23				Secchi 01	9:45	0:04:00	20	43	22	7	54	overcast		6					excellent			slight			
			BOUS250_01	TSM, TA/TC, O2 & pH	10:25	0:03:00	15	43	22.004	7	54.089	overcast		6	10	270	1020	60		13.8	14.8	slight			
			BOUS250_02	HPLC & ap	10:57	0:26:00	400	43	22.042	7	54.094	overcast		6	10.9	260	1020	61		13.6	14.9	slight			
		bou_c-ops_230111_1129_001_data.csv			11:36	0:05:08	126	43	22.239	7	54.149	overcast	As, Cs	7	5	260	1020	67	excellent	13.7		slight	1		no
		bou_c-ops_230111_1129_002_data.csv			11:54	0:01:55	44	43	22.556	7	53.955	overcast	As, Cs	7	5	260	1020	67	excellent	13.7		slight	1		no
		bou_c-ops_230111_1129_003_data.csv			12:00	0:05:21	136	43	22.543	7	53.883	overcast	As, Cs	7	5	260	1020	67	excellent	13.7		slight	1		no
		bou_c-ops_230111_1129_004_data.csv			12:15	0:06:30	154	43	22.886	7	53.673	overcast	As, Cs	7	5	260	1020	67	excellent	13.7		slight	1		no
12/01/23	SEAMER operations																								

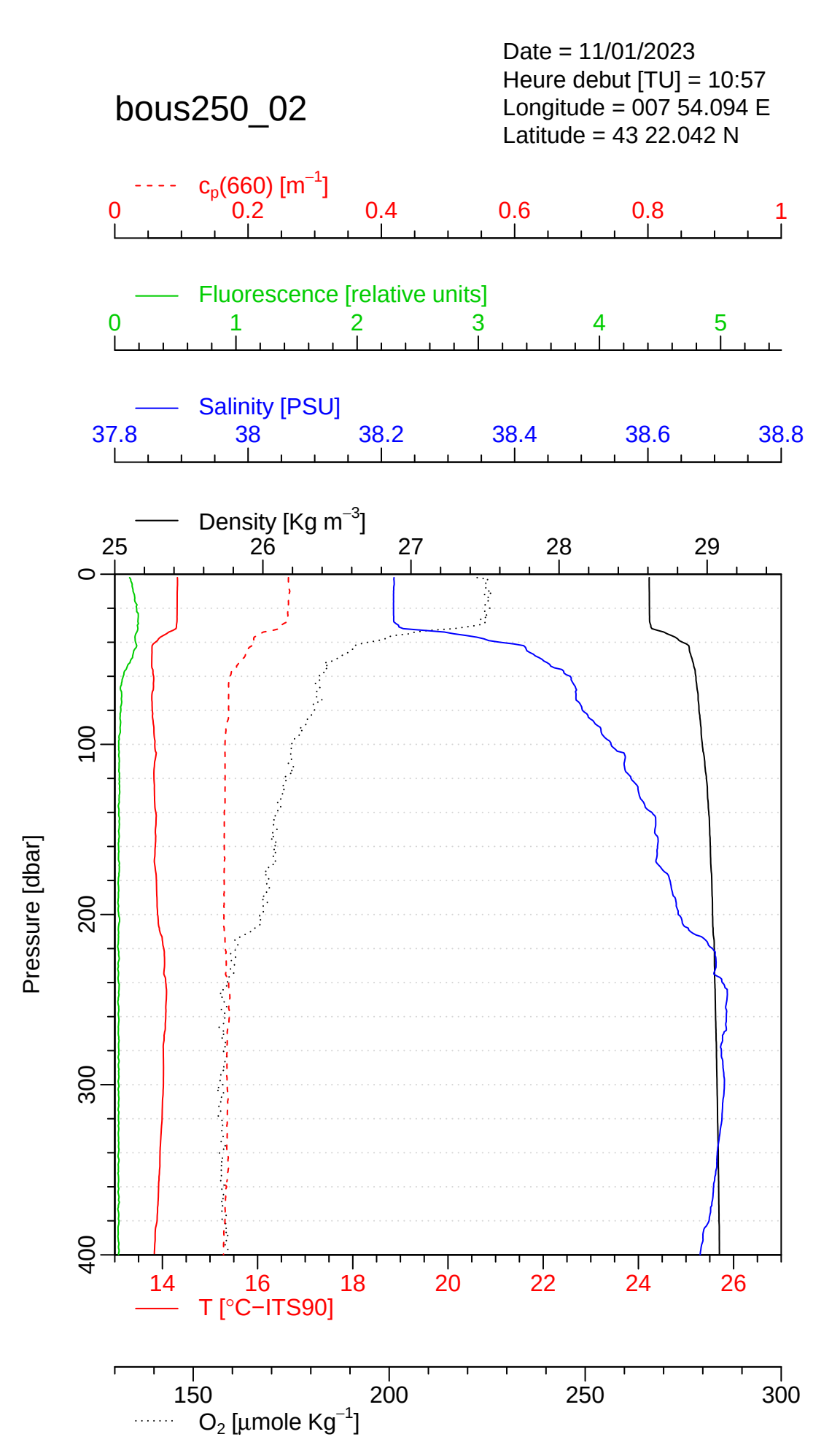


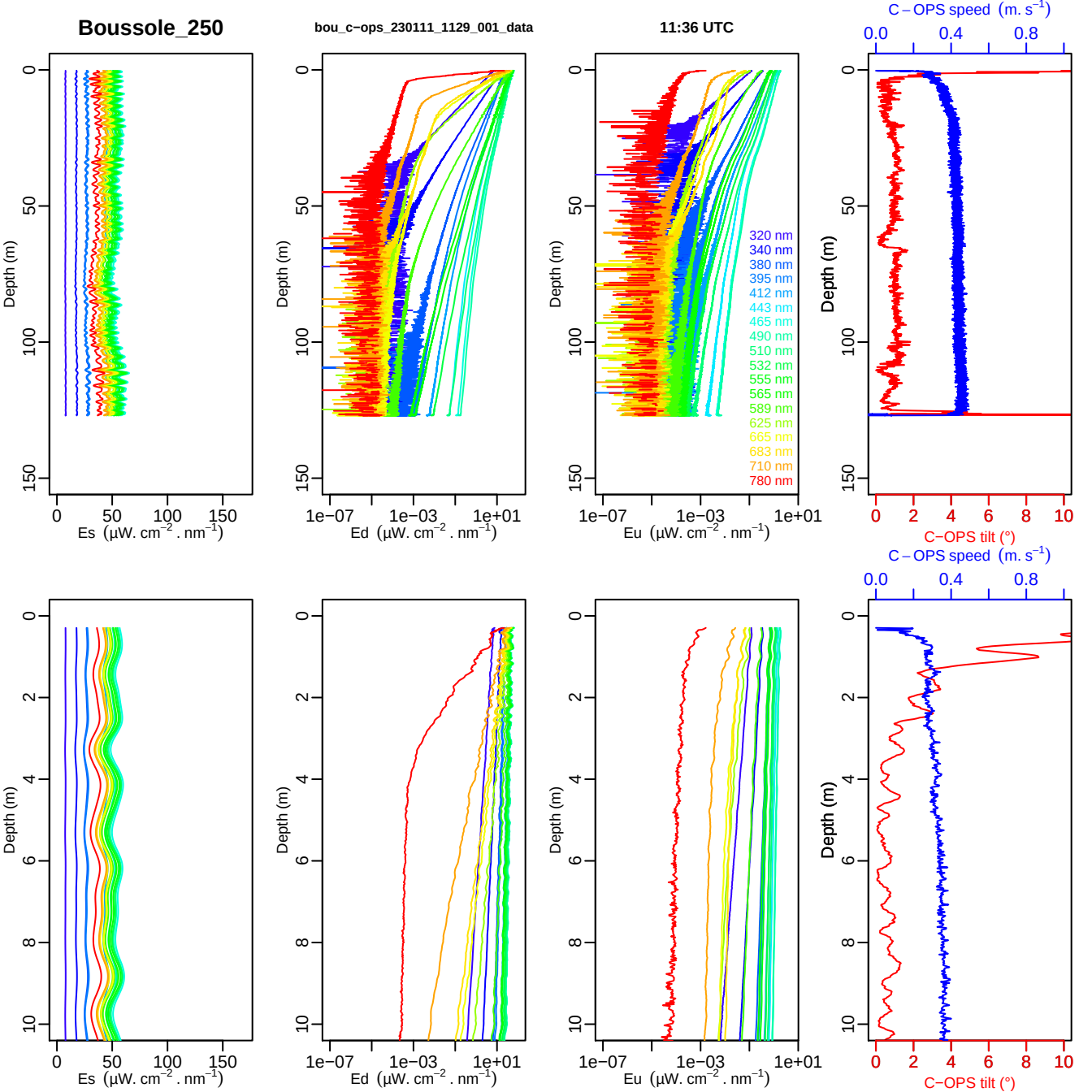
GMT 2023 Feb 22 12:34:40

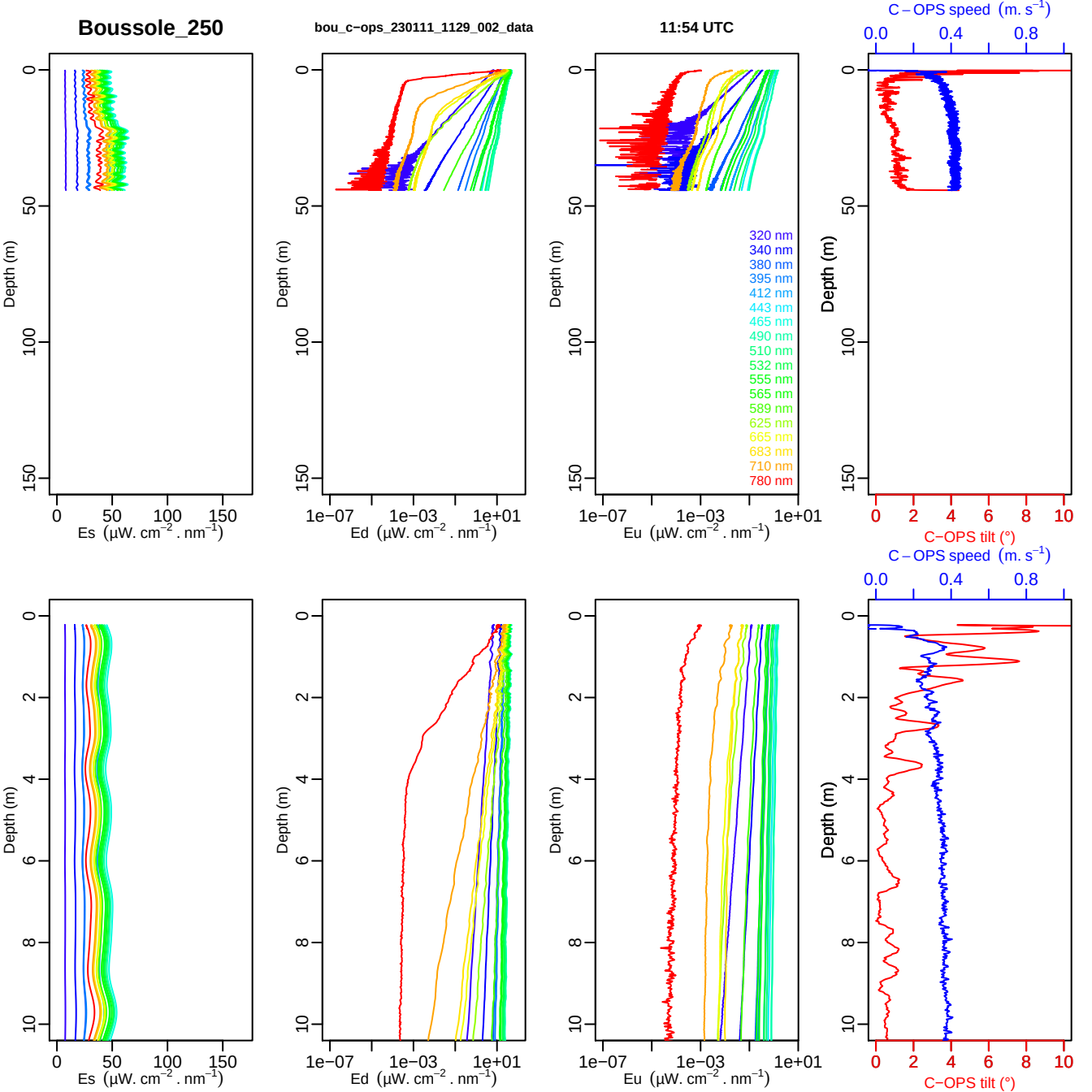
bous250_01

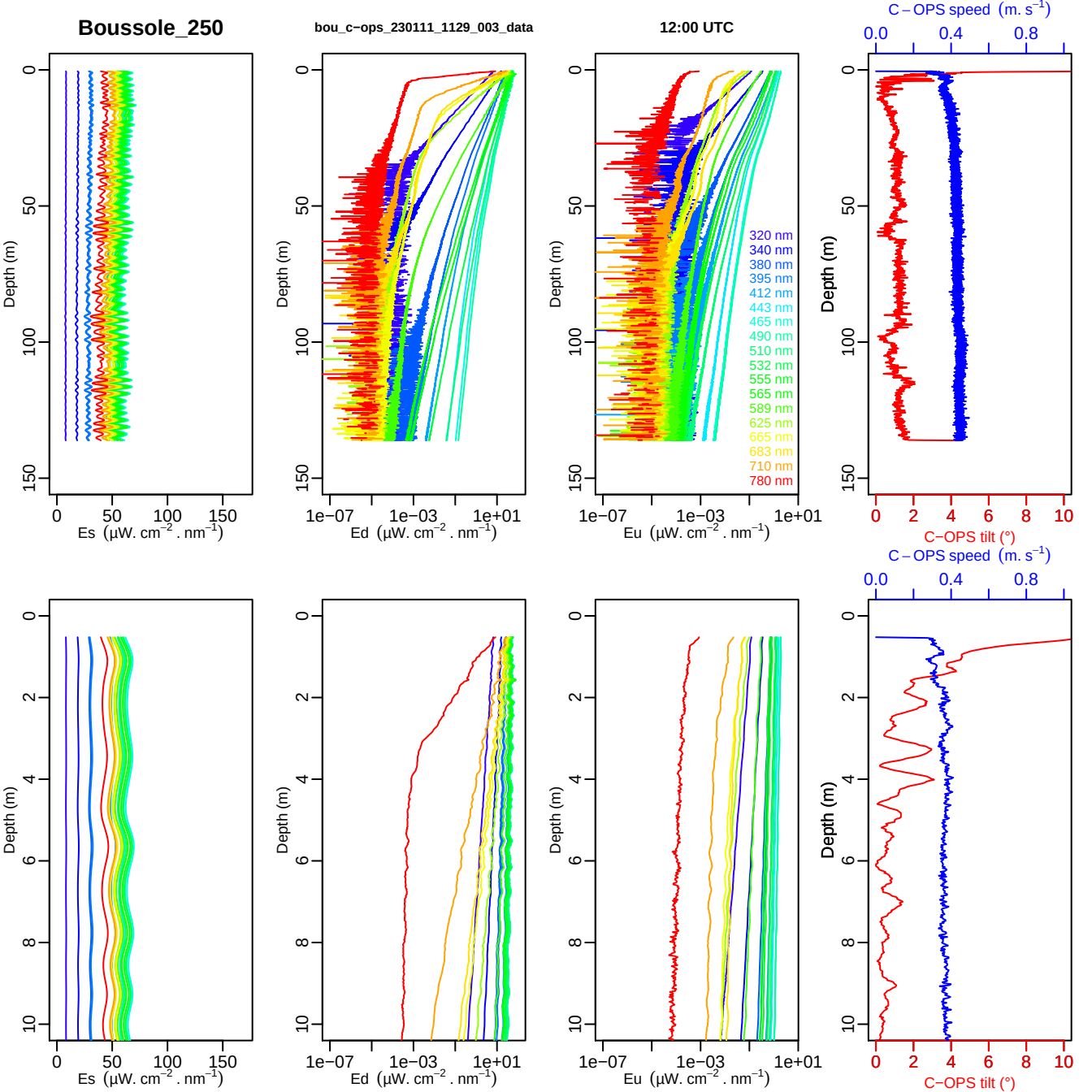
Date = 11/01/2023
Heure debut [TU] = 10:25
Longitude = 007 54.089 E
Latitude = 43 22.004 N

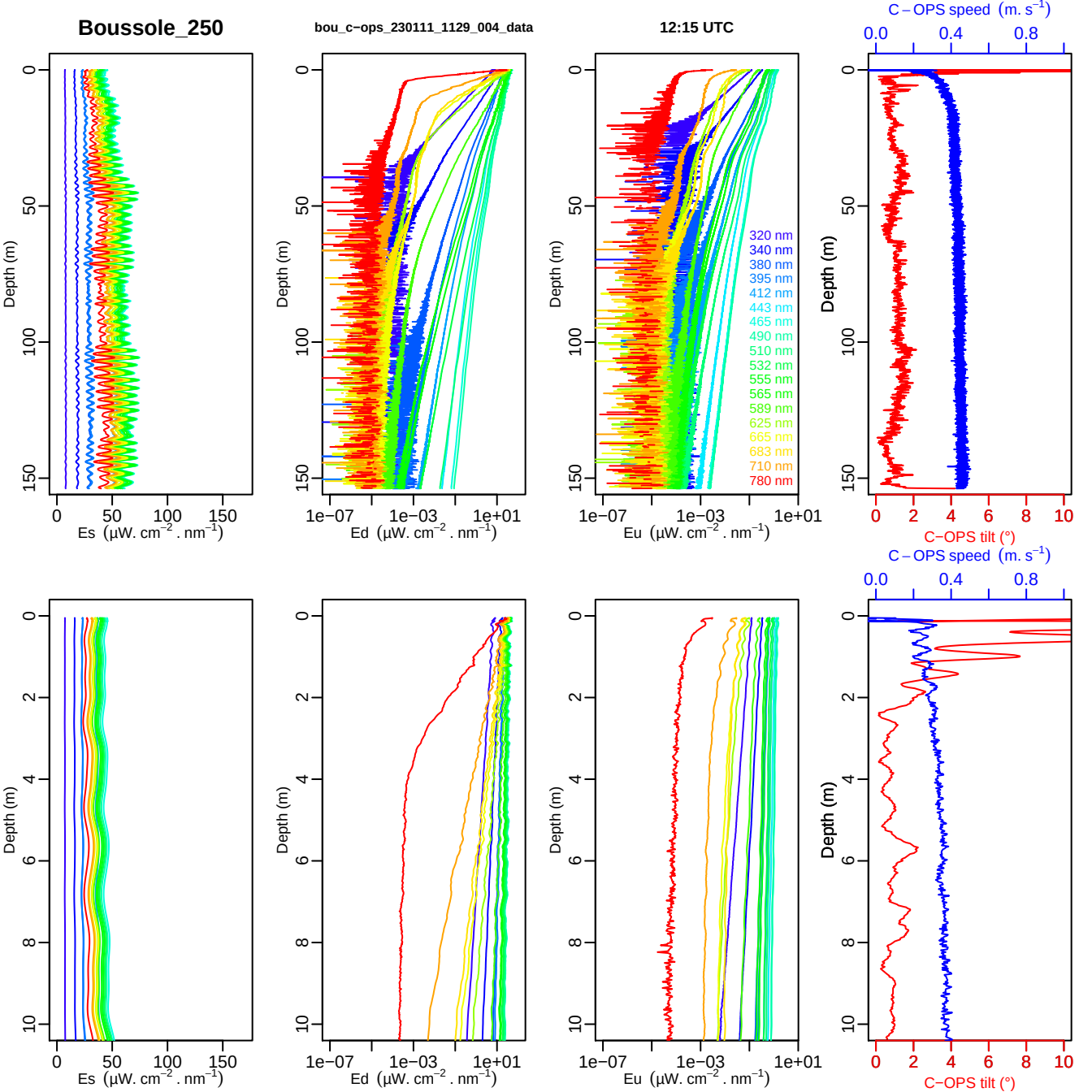



bous250_02
Date = 11/01/2023
Heure debut [TU] = 10:57
Longitude = 007 54.094 E
Latitude = 43 22.042 N
cp(660) [m−1]
0
0.2
0.4
0.6
0.8
1
Fluorescence [relative units]
0
1
2
3
4
5
Salinity [PSU]
37.8
38
38.2
38.4
38.6
38.8
Density [Kg m−3]
25
26
27
28
29
Pressure [dbar]
0
100
200
300
400
14
16
18
20
22
24
26
T [°C−ITS90]
150
200
250
300
O2 [µmole Kg−1]


Boussole_250
bou_c-ops_230111_1129_001_data
11:36 UTC
Depth (m)
Es (µW. cm⁻². nm⁻¹)
Ed (µW. cm⁻². nm⁻¹)
Eu (µW. cm⁻². nm⁻¹)
C-OPS speed (m. s⁻¹)
C-OPS tilt (°)
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm


Boussole_250
bou_c-ops_230111_1129_002_data
11:54 UTC
Depth (m)
Es (µW. cm^{-2}. nm^{-1})
Ed (µW. cm^{-2}. nm^{-1})
Eu (µW. cm^{-2}. nm^{-1})
C – OPS speed (m. s^{-1})
C–OPS tilt (°)
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm


Boussole_250
bou_c-ops_230111_1129_003_data
12:00 UTC
C – OPS speed (m. s^{-1})
0.0
0.4
0.8
Depth (m)
0
50
100
150
Es (µW. cm^{-2}. nm^{-1})
Ed (µW. cm^{-2}. nm^{-1})
Eu (µW. cm^{-2}. nm^{-1})
1e−07
1e−03
1e+01
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm
C−OPS tilt (°)
0
2
4
6
8
10


Boussole_250
bou_c-ops_230111_1129_004_data
12:15 UTC
C – OPS speed (m. s^{-1})
0.0
0.4
0.8
Depth (m)
0
50
100
150
Es (µW. cm^{-2}. nm^{-1})
Ed (µW. cm^{-2}. nm^{-1})
Eu (µW. cm^{-2}. nm^{-1})
1e−07
1e−03
1e+01
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm
C−OPS tilt (°)
0
2
4
6
8
10