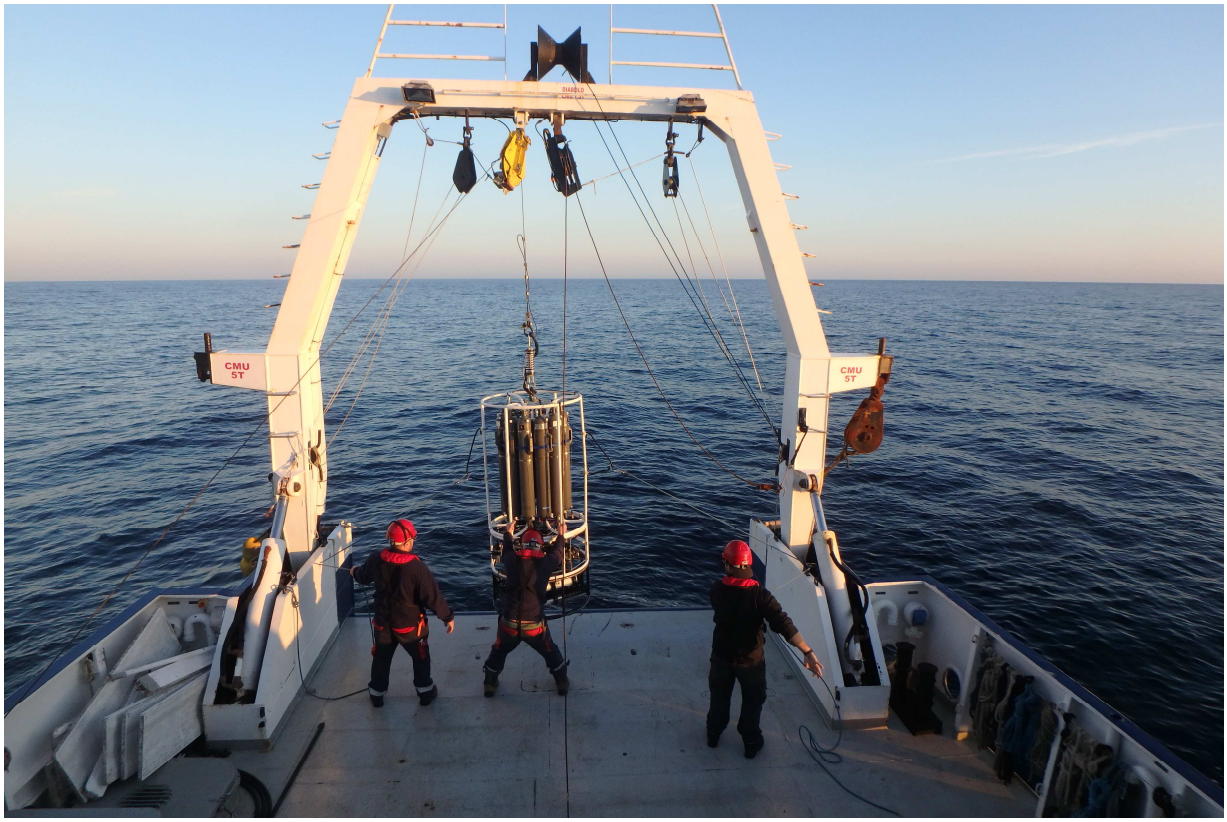
BOUSSOLE Monthly Cruise Report

Cruise 236
November 17-19, 2021

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

Science Personnel: Ewen Ancel, Céline Dimier and Melek Golbol.

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



Recovery of the CTD Rosette on the deck of the R/V *Téthys II* after its deployment at the BOUSSOLE site.

BOUSSOLE project

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

November 29, 2021

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), handheld CIMEL sun photometer measurements are to be performed consecutively where possible with C-OPS profiles. If sea conditions are poor but sky is good, handheld 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 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 and on the transmissometers 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 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 two pCO_2 CARIOCA sensors, the two optodes and the pH sensor installed on the buoy at 3 m.
Water samples are to be collected at four depths for metagenomic analyses of different types of Synechococcus, cytometry and nutrients (from March 2020). Additional samples for cytometry analyses are to be collected at ten depths during the BOUSSOLE CTD sampling (from November 2021). These operations are part of the EFFICACY ANR 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.

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

No additional operations.

Cruise Summary

All operations were performed the second day of the cruise because of bad weather during the first day. The third day was given to the MOOSE program because the DYFAMED cruise planned initially on November 15th was

cancelled due to bad weather. 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. Diving and maintenance operations on the buoy were not performed during this cruise because the buoy is currently not working.

Wednesday 17 November 2021

Bad weather prevented departure from the Nice harbour.

Thursday 18 November 2021

The sea state was slight with a gentle breeze. The sky was blue and the visibility was excellent. Firstly, four C-OPS profiles and two CTD casts with water sampling were performed at the BOUSOLE site. For the second CTD cast (CTD #02), a 0.2µm filter was put on the a-Sphere absorption meter for the dissolved matter absorption measurements and a cap was put on the backscattering meter for dark measurements. The cast was stopped at 10 depths during the ascent of the CTD. In the meantime, 3 CIMEL measurements and a Secchi disk were performed at the BOUSSOLE site.

Friday 19 November 2021

This day was given to the MOOSE DYFAMED program, which had their cruise cancelled on Monday 15 November because of bad weather.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/FbgS9yTca68PoGFn8

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

Cruise Report

Wednesday 17 November 2021

Bad weather prevented departure from the Nice harbour.

Thursday 18 November 2021 (UTC)

People on bord: Ewen Ancel (engineer at IMEV), Céline Dimier and Melek Golbol.

0730 Departure to the BOUSSOLE site.
1100 Arrival at the BOUSSOLE site.
1115 C-OPS 01, 02, 03, 04.
1240 CTD 01, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, TA/TC, O_2, pH and cytometry.
1250 CIMEL 01, 02, 03.
1415 CTD 02, 400 m with water sampling at 80, 50, 20 and 5 m for TSM, metagenomic, cytometry and nutrients analyses (with a 0.2 µm filter on a-Sphere and with 2 minutes stop at 400, 150 m and 7 minutes stop at 80, 60, 50, 40, 30, 20, 10 and 5 m) (with cap on the HS6)
1540 Departure to the Nice harbour.
1900 Arrival to the Nice harbour.

Friday 19 November 2021

MOOSE DYFAMED operations.

Problems identified during the cruise

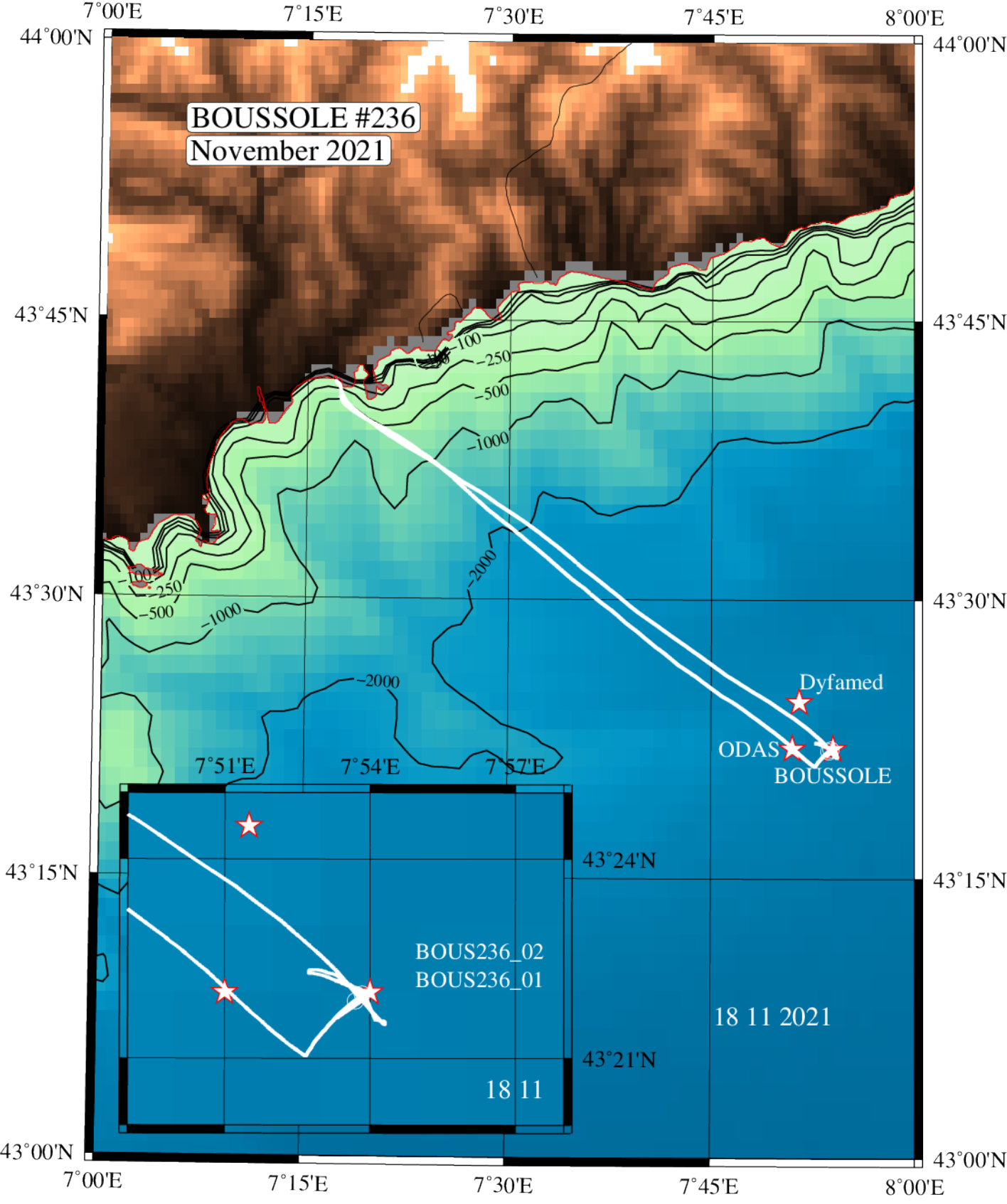
- The first C-OPS profile (COPS #01) was deployed only down to 25 m because shadows appeared on the surface radiometer, probably because of an incorrect orientation of the ship with respect to the sun. However, three other good-quality C-OPS profiles were performed at the BOUSSOLE site.

- A Secchi disk was performed at the BOUSSOLE site but the information was lost because we had forgotten to report the measurement on the logbook.

Appendices

Cruise Summary Table for Boussole 236

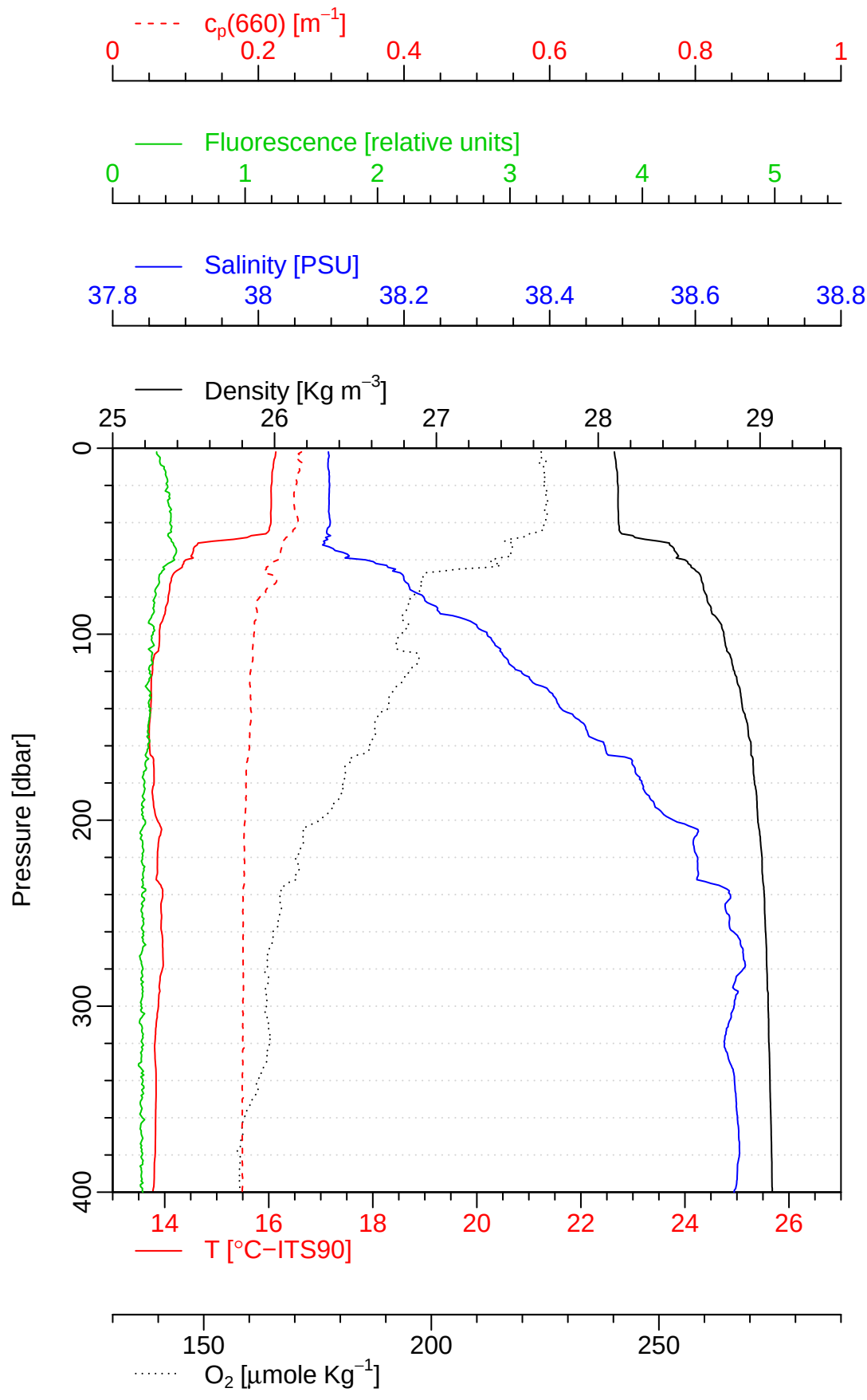
Date	Black names	Profile names	CTD notées	Other sensors	Start Time	Duration	Depth max	Latitude (N)		longitude					Weather							Sea		
	(file ext: ".raw")	(file extension: ".raw")			GMT (hour.min)	(hour.min.sec)	(meter)	(Degree)	(Minute)	(Degree)	(Minute)	Sky	Clouds	Quantity (#/8)	Wind sp. (kn)	Wind dir.	Atm. Pressure (hPa)	Humidity (%)	Visibility	T air	T water	Sea	Swell H (m)	Swell dir.	Whitecaps
17/11/21	Bad weather																								
18/11/21		bou_c-ops_211118_1053_002_data.csv			11:23	0:01:18	25	43	22.077	7	53.624	blue	None	0	8.9	64	1023.7	76.9	excellent	16		slight	0.7		few
		bou_c-ops_211118_1144_001_data.csv			11:48	0:03:06	85	43	22.024	7	53.714	blue	None	0	8.9	64	1023.7	76.9	excellent	16		slight	0.7		few
		bou_c-ops_211118_1144_002_data.csv			12:00	0:04:16	111	43	22.169	7	53.459	blue	None	0	8.9	64	1023.7	76.9	excellent	16		slight	0.7		few
		bou_c-ops_211118_1144_003_data.csv			12:11	0:04:47	96	43	22.284	7	53.139	blue	None	0	8.9	64	1023.7	76.9	excellent	16		slight	0.7		few
			BOUS236_01	HPLC, ap, Cyto, TA/TC, O_2 & pH	12:39	0:26:00	400	43	21.966	7	53.844	blue		1	8.1	51	1023.5	76		16.5	16.13	slight			
				CIMEL01	12:52	0:03:00		43	21.865	7	53.686	blue		0			1023.4								
				CIMEL02	12:56	0:03:00		43	21.972	7	53.834	blue		0			1023.4								
				CIMEL03	13:00	0:05:00		43	21.972	7	53.834	blue		0			1023.4								
			BOUS236_02	TSM, Metagenomics, Cyto & Nutrients	14:13	1:27:00	400	43	21.862	7	53.700	blue		1	9.9	42	1023.3	74.5		16.8	16.14	slight			
19/10/21	Bad weather																								



GMT 2022 Jan 18 17:51:43

bous236_01

Date = 18/11/2021
Heure debut [TU] = 12:39
Longitude = 007 53.844 E
Latitude = 43 21.966 N



bous236_02

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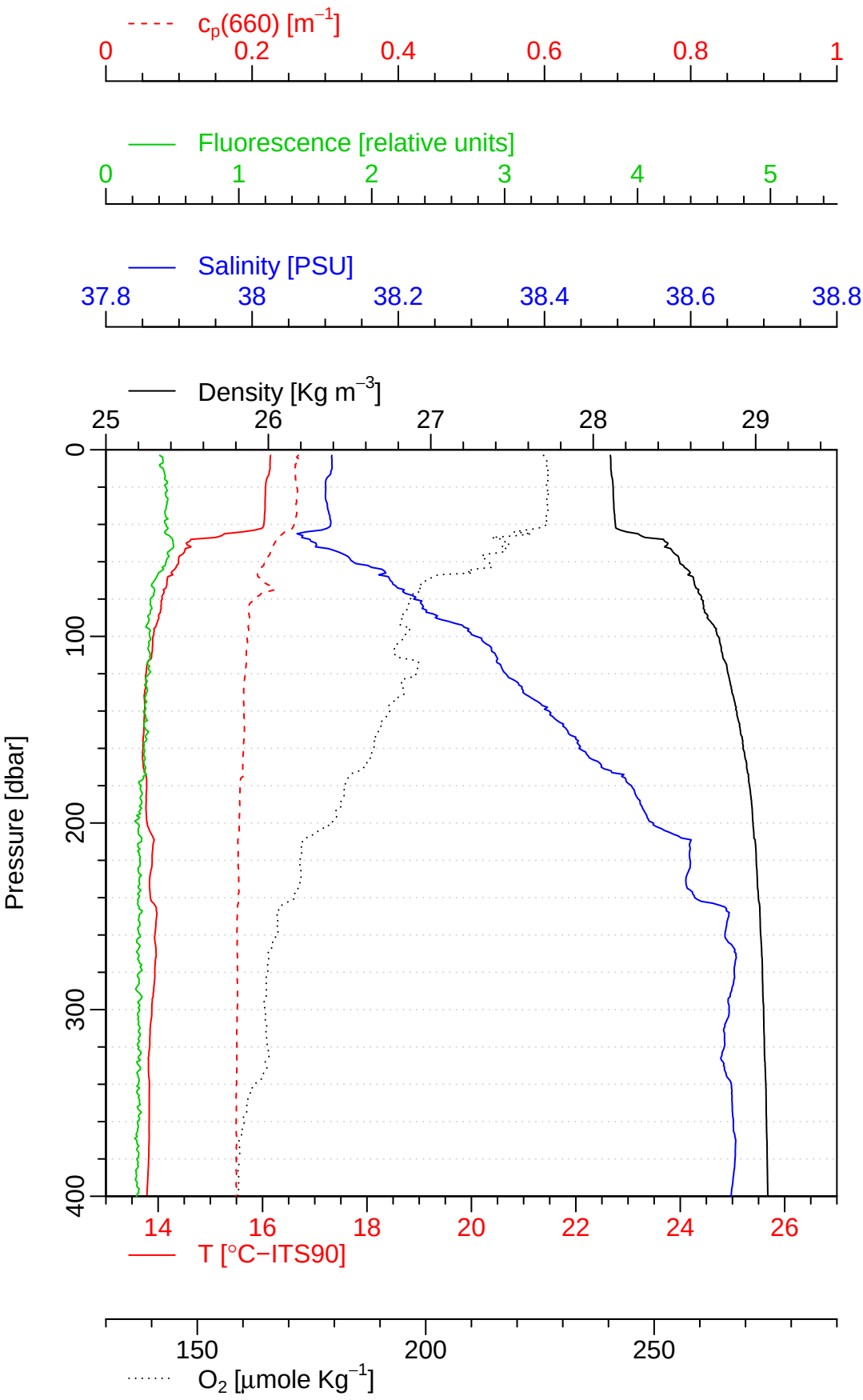
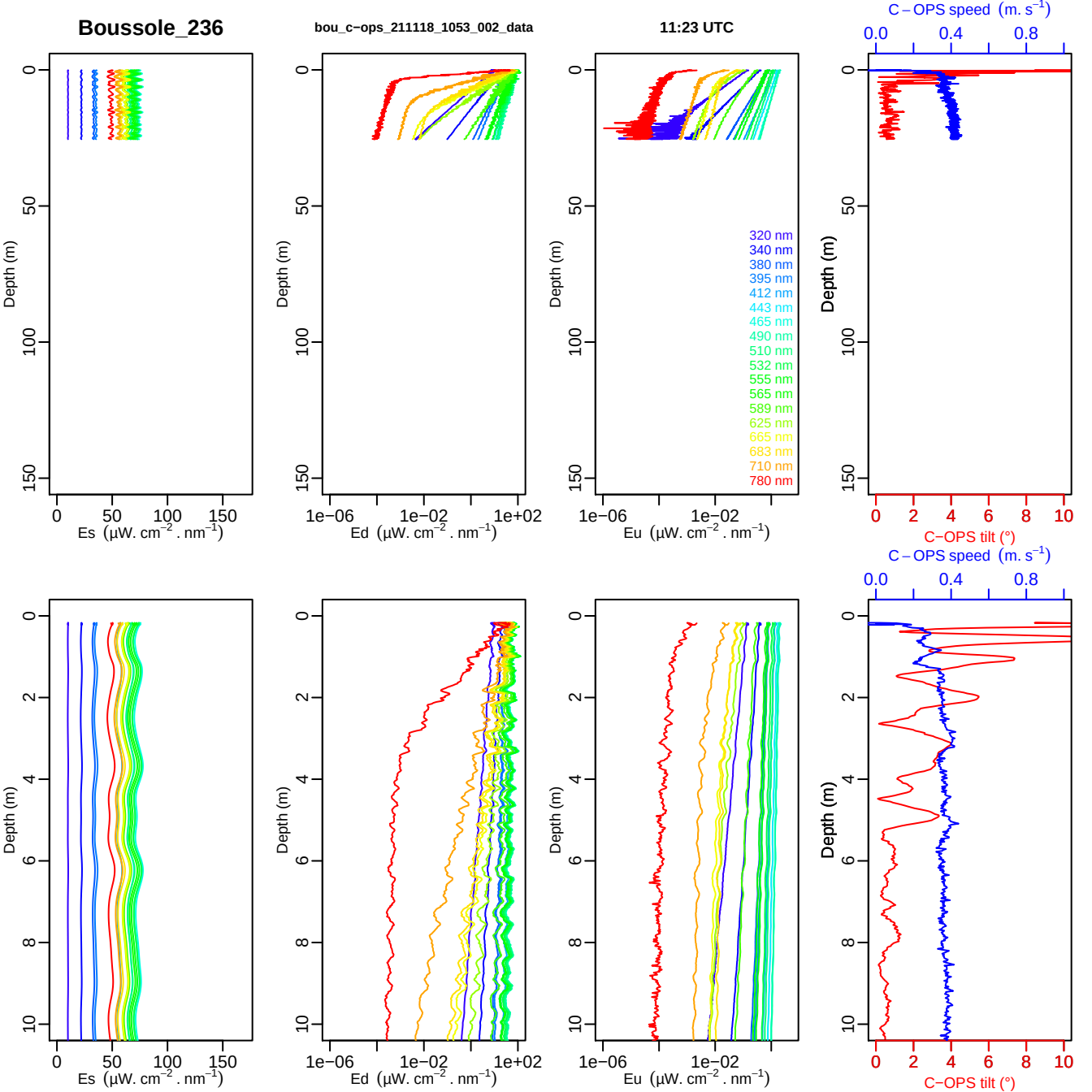
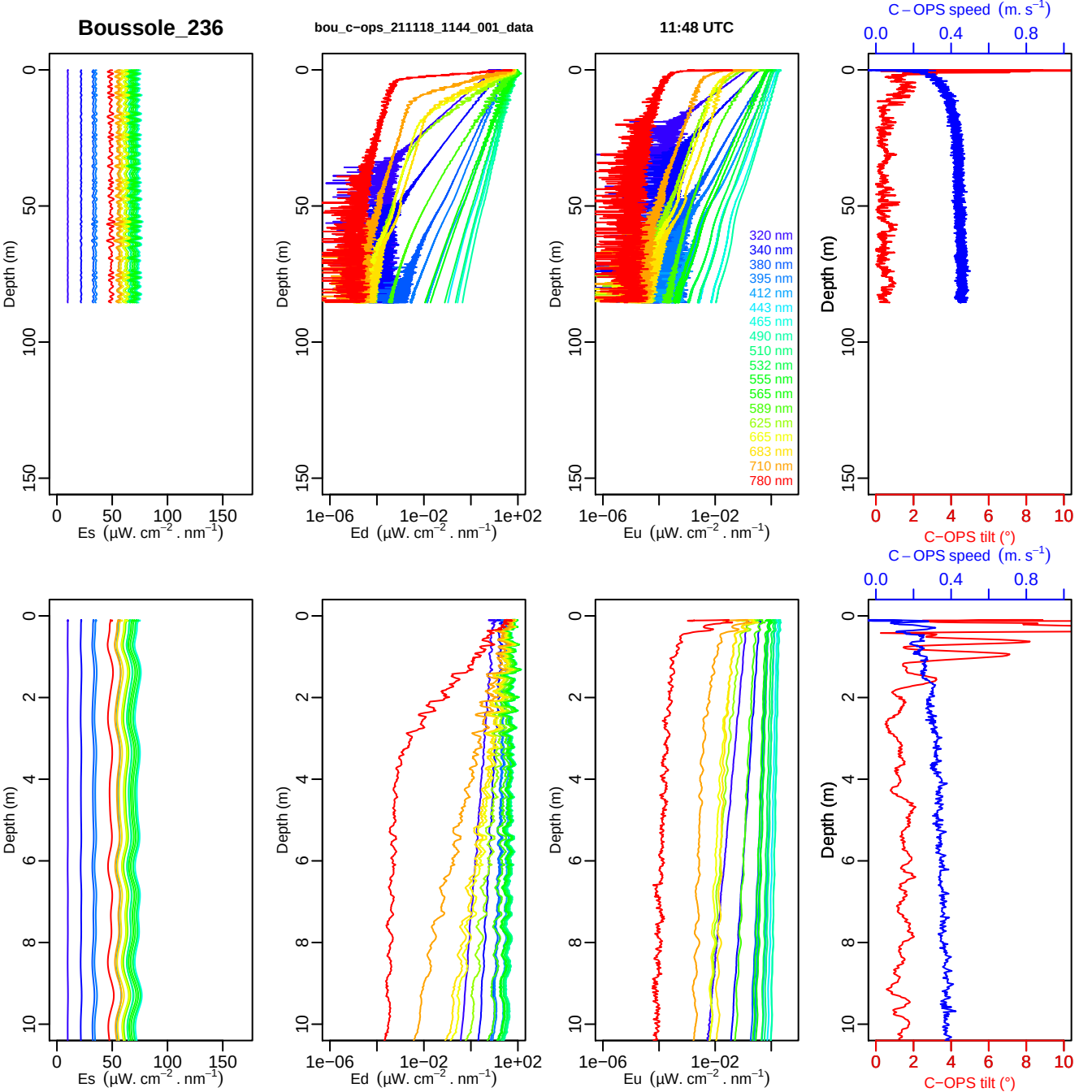
Heure debut [TU] = 14:13
Longitude = 007 53.700 E
Latitude = 43 21.862 N




Boussole_236
bou_c−ops_211118_1053_002_data
11:23 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−06
1e−02
1e+02
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
0
2
4
6
8
10
C−OPS tilt (°)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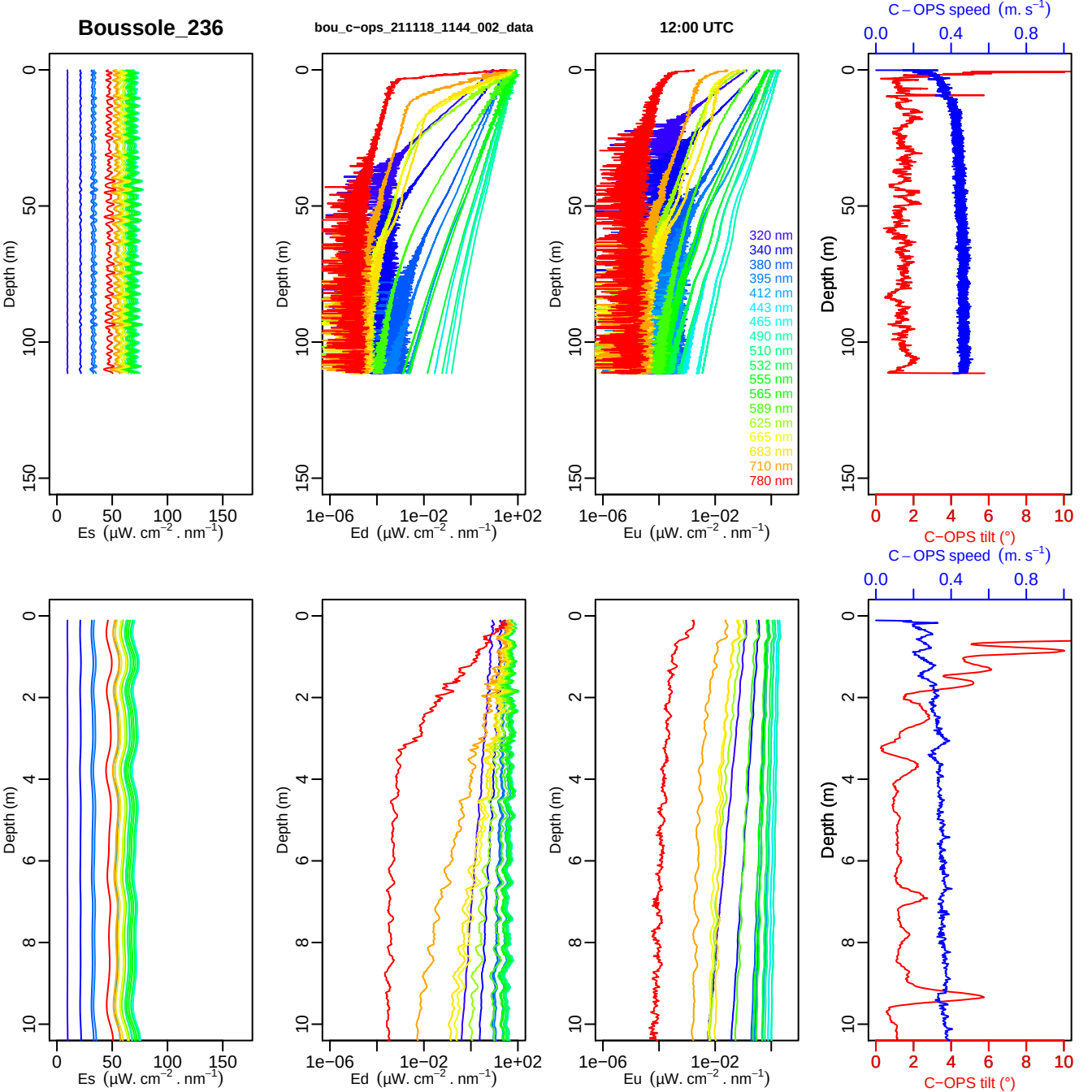
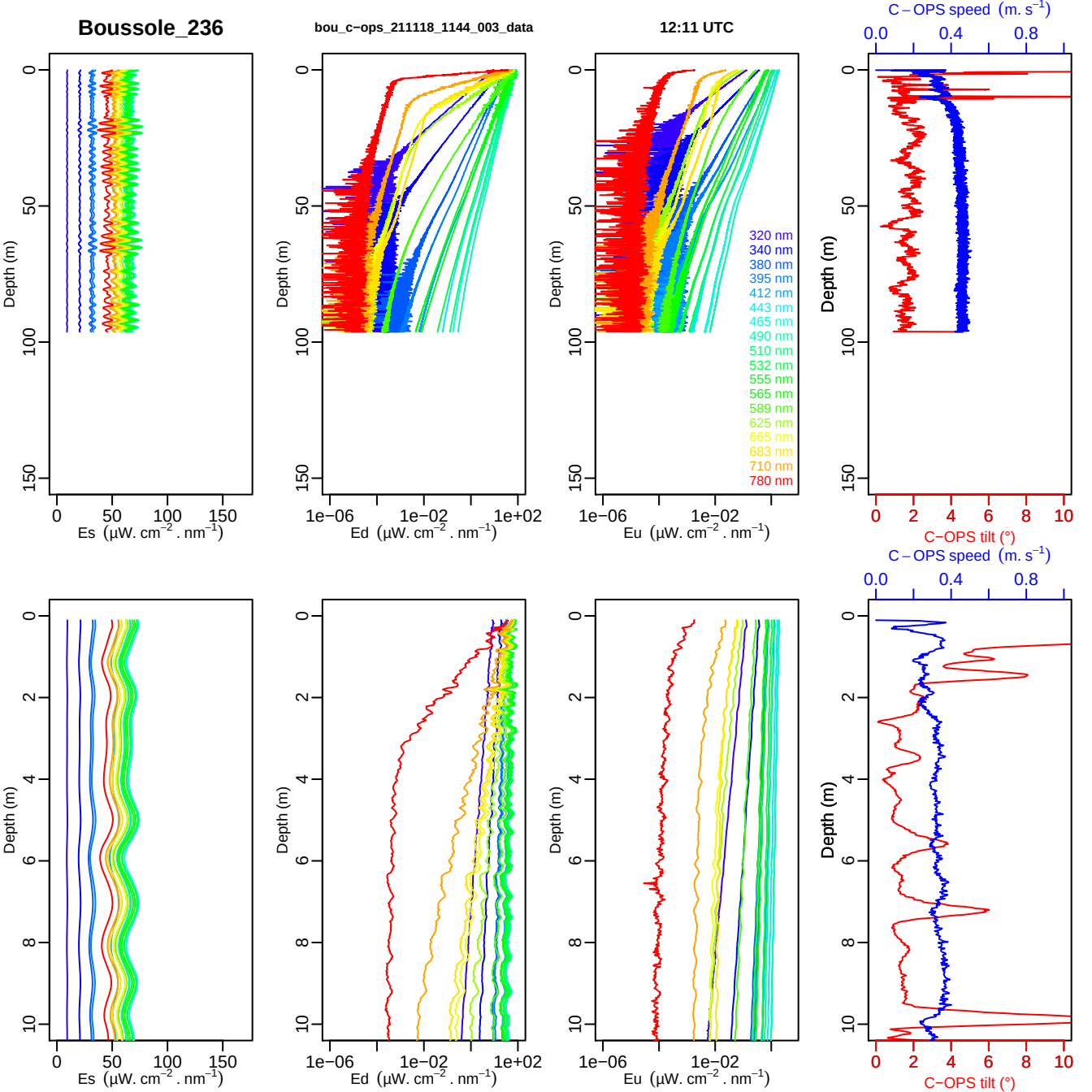
bou_c-ops_211118_1144_001_data
11:48 UTC
C – OPS speed (m. s^{-1})
0.0
0.4
0.8
Depth (m)
0
50
100
150
0
50
100
150
Es (µW. cm^{-2}. nm^{-1})
1e−06
1e−02
1e+02
Ed (µW. cm^{-2}. nm^{-1})
Eu (µW. cm^{-2}. nm^{-1})
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm
0
2
4
6
8
10
C−OPS tilt (°)


Boussole_236
bou_c-ops_211118_1144_002_data
12:00 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_236
bou_c-ops_211118_1144_003_data
12:11 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