BOUSSOLE Monthly Cruise Report

Cruise 256
July 12, 2023

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Vessel: R/V Sagitta III
(Captain: Jean-Yves Carval)

Science Personnel: Emilie Diamond Riquier, Melek Golbol and Paco Stil

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Deployment of the CTD Rosette at the BOUSSOLE site from the deck of the R/V *Sagitta III*

BOUSSOLE project

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

July 28, 2023

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

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Sorbonne Université, 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. 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, the DO and pH sensors 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

A Underwater Video Profiler (UVP) cast and two zooplankton nets were performed at the BOUSSOLE site for the MOOSE program.

Cruise Summary

The BOUSSOLE cruise took place on the R/V *Sagitta III* due to the unavailability of both the R/V *Téthys II* and R/V *L'Europe*. Only one day was allocated both to BOUSSOLE and MOOSE-DYFAMED operations. This included optical profiles, a UVP cast, a CTD cast with water sampling, a Niskin bottle deployment, IOP casts, a Secchi disk and zooplankton nets at the BOUSSOLE site.

Wednesday 12 July 2023

The sea state was smooth with a light air in the morning and a light breeze in the afternoon. The sky was blue and the visibility was good. Firstly, three C-OPS profiles were performed and then the UVP was deployed for the MOOSE program at the BOUSSOLE site. Then a CTD cast with water sampling was deployed, for use by both the BOUSSOLE and MOOSE programs. The carousel water sampler installed on the rosette-CTD for this cruise

was smaller than the one commonly used on the BOUSSOLE cruises. Therefore, a Niskin bottle of 12 L was deployed at 5 m for TSM sampling, in addition to the Niskins of the rosette. After this sampling was completed, a Secchi disk and two IOP casts were performed. For the second cast, a cap was put on the backscattering meter for dark measurements and was deployed down to 50 m depth. The IOP package could not be affixed as usually on the main rosette-CTD for the deployment because it would have been too heavy for the gantry of the R/V *Sagitta III*. Finally, two zooplankton nets were performed at the BOUSSOLE site for the MOOSE program before returning to the Villefranche-sur-Mer harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/rBYqHcrtAcpZx8fV6

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 12 July 2023 (UTC)

People on board: Emilie Diamond Riquier, Melek Golbol and Paco Stil

0550 Departure from the Villefranche-sur-Mer harbour.
0900 Arrival at the BOUSSOLE site.
0905 C-OPS 01, 02, 03.
1000 UVP cast (MOOSE program).
1035 CTD 01, 500 m with water sampling at 500, 205, 150, 120, 80, 70, 53, 40, 30, 20, 10 and 5 m for HPLC, a_p, DO, TA/TC, pH, nutrients (MOOSE program) and cytometry (MOOSE program).
1110 Niskin 01, 5 m for TSM.
1115 IOP 01, 400 m.
1130 Secchi 01, 28 m.
1140 IOP 02, 50 m (with cap on the HS6).
1145 Zooplankton nets x2 (100 and 200 m)
1210 Departure to the Villefranche-sur-Mer harbour.
1500 Arrival at the Villefranche-sur-Mer harbour.

Problems identified during the cruise

- This cruise took on the *R/V Sagitta III* because of the unavailability of both the R/V *Téthys II* and R/V *L'Europe* and only one day was allocated for BOUSSOLE and MOOSE operations, so the operations were reduced:

  - the carousel water sampler installed on the rosette-CTD for this cruise was smaller than the one commonly used on the BOUSSOLE cruises. Therefore, a Niskin bottle was deployed at 5 m for TSM sampling, in addition to the Niskins of the rosette.

  - The IOP package could not be affixed as usually on the main rosette-CTD for the deployment because it would have been too heavy for the gantry of the R/V *Sagitta III*.

  - the time available for operations was reduced according to the working time of the crew.

  So, it was not possible to perform an IOP cast with a 0.2 µm filter installed on the inlet tube of the a-Sphere because of the lack of time.

- During the last cruise, C-OPS profiles could not be performed because of a technical problem. It appeared that the sea cable was faulty. So, another cable was used during this cruise but it appeared that the cable was tangled at its end. So, the C-OPS profiles had to be stopped between 60 and 80 meters depth.

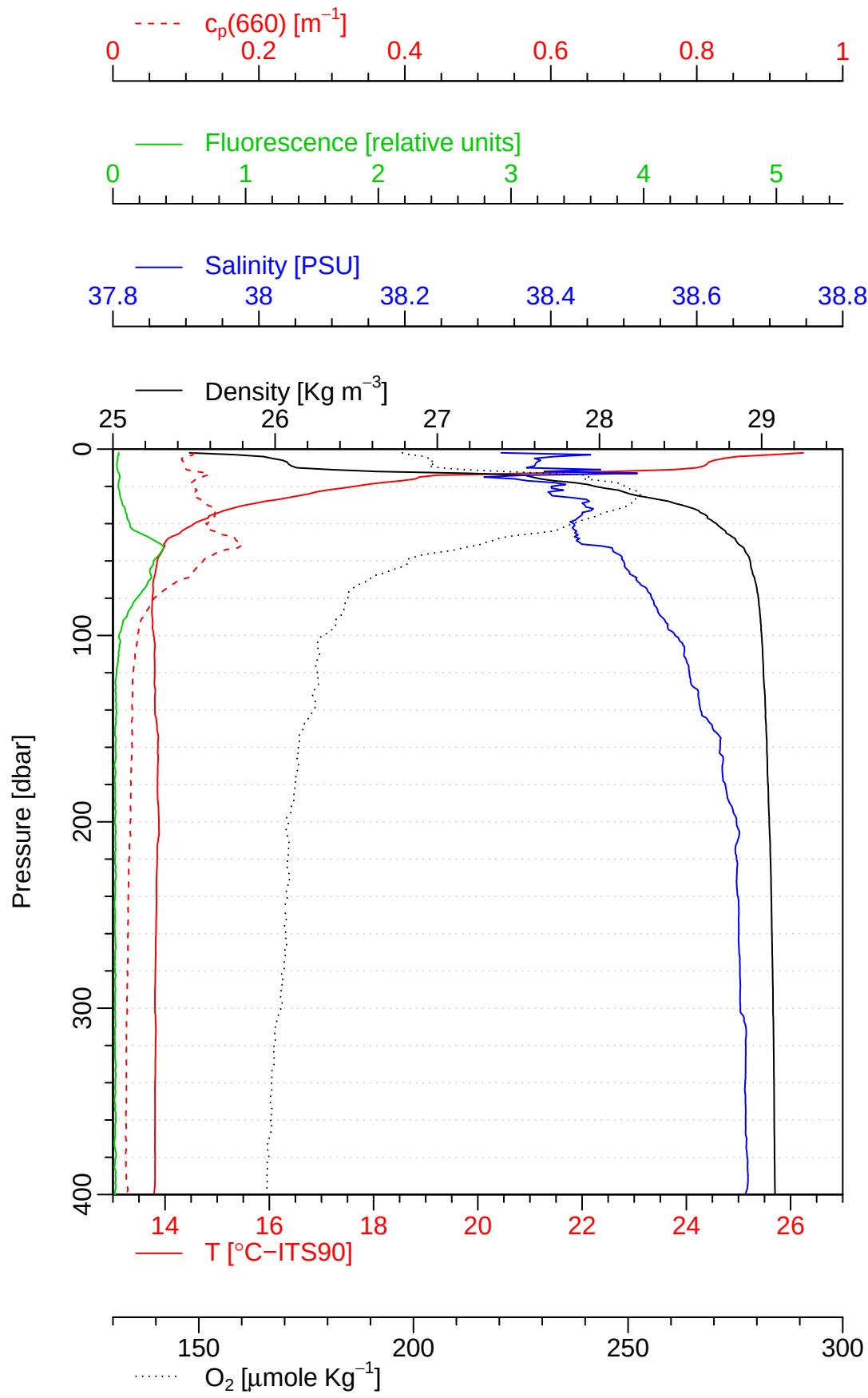
Appendices

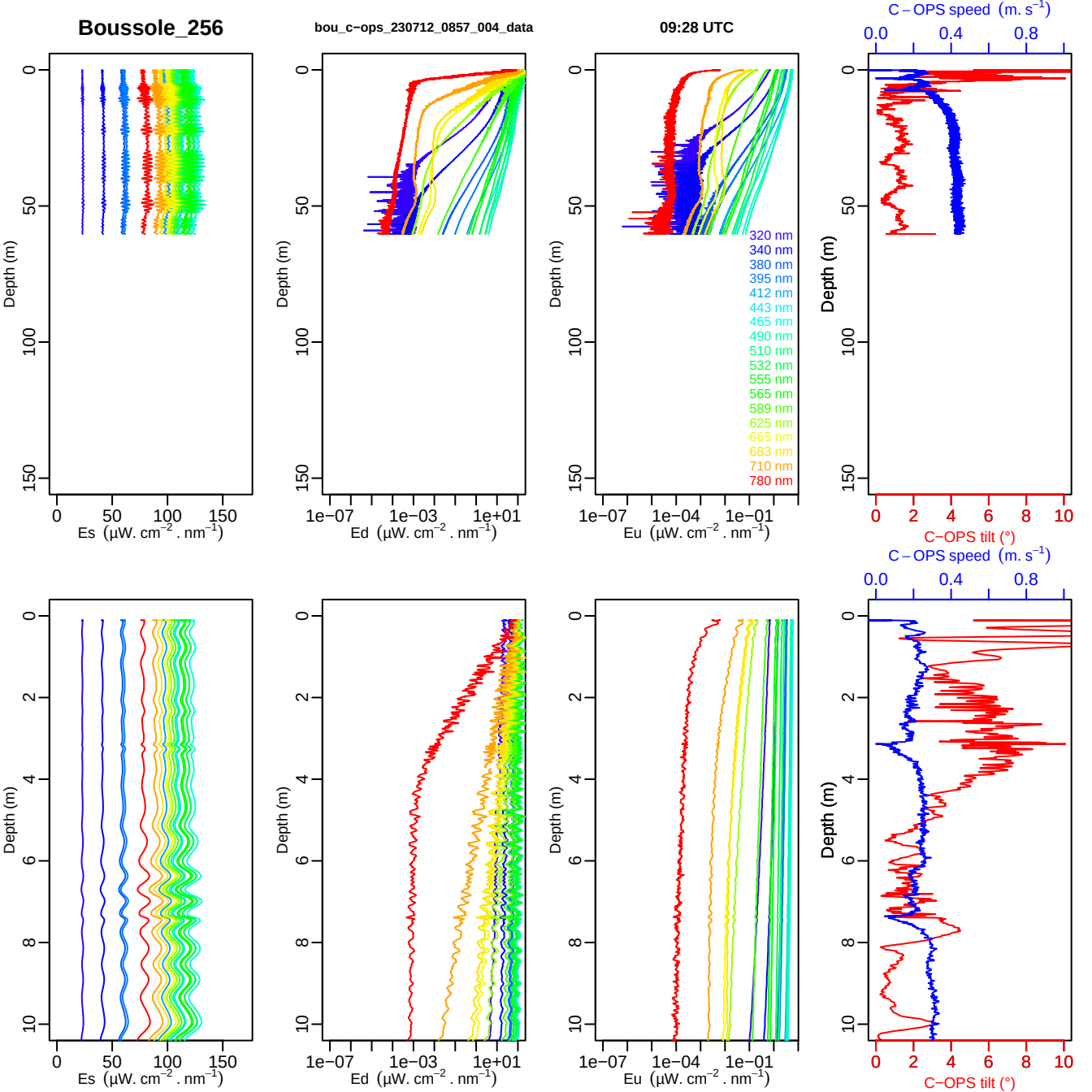
Cruise Summary Table for Boussole 256

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
12/07/23		bou_c-ops_230712_0857_004_data.csv			9:28	0:02:51	60	43	22.48	7	52.939	blue	None	0	0.6	277	1014	NA	good	25.7		smooth	0.4		no
		bou_c-ops_230712_0857_005_data.csv			9:36	0:02:54	68	43	22.543	7	52.811	blue	None	0	0.6	277	1014	NA	good	25.7		smooth	0.4		no
		bou_c-ops_230712_0857_006_data.csv			9:44	0:03:23	81	43	22.525	7	52.676	blue	None	0	0.6	277	1014	NA	good	25.7		smooth	0.4		no
			BOUS256_01	HPLC, ap, TA/TC, DO, pH, cyto (MOOSE) & nutrients (MOOSE)	10:36	0:30:00	500	43	22.137	7	53.572	blue		3	0.5	303	1014	NA		25.6	26.3	smooth			
				Niskin for TSM	11:13	0:05:00	5	43	22	7	54	blue		3			1014	NA				smooth			
				IOP01	11:15	0:21:00	400	43	22.206	7	53.161	blue		2	0.2	271	1014	NA		25.6	NA	smooth			
				Secchi 01	11:30	0:04:00	32	43	22	7	54	blue							good			smooth			
				IOP02 (Dark HS6)	11:37	0:05:00	50	43	22	7	54	blue										smooth			

bous256_01

Date = 12/07/2023
Heure debut [TU] = 10:36
Longitude = 007 53.572 E
Latitude = 43 22.137 N

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C – OPS speed (m. s^{-1})
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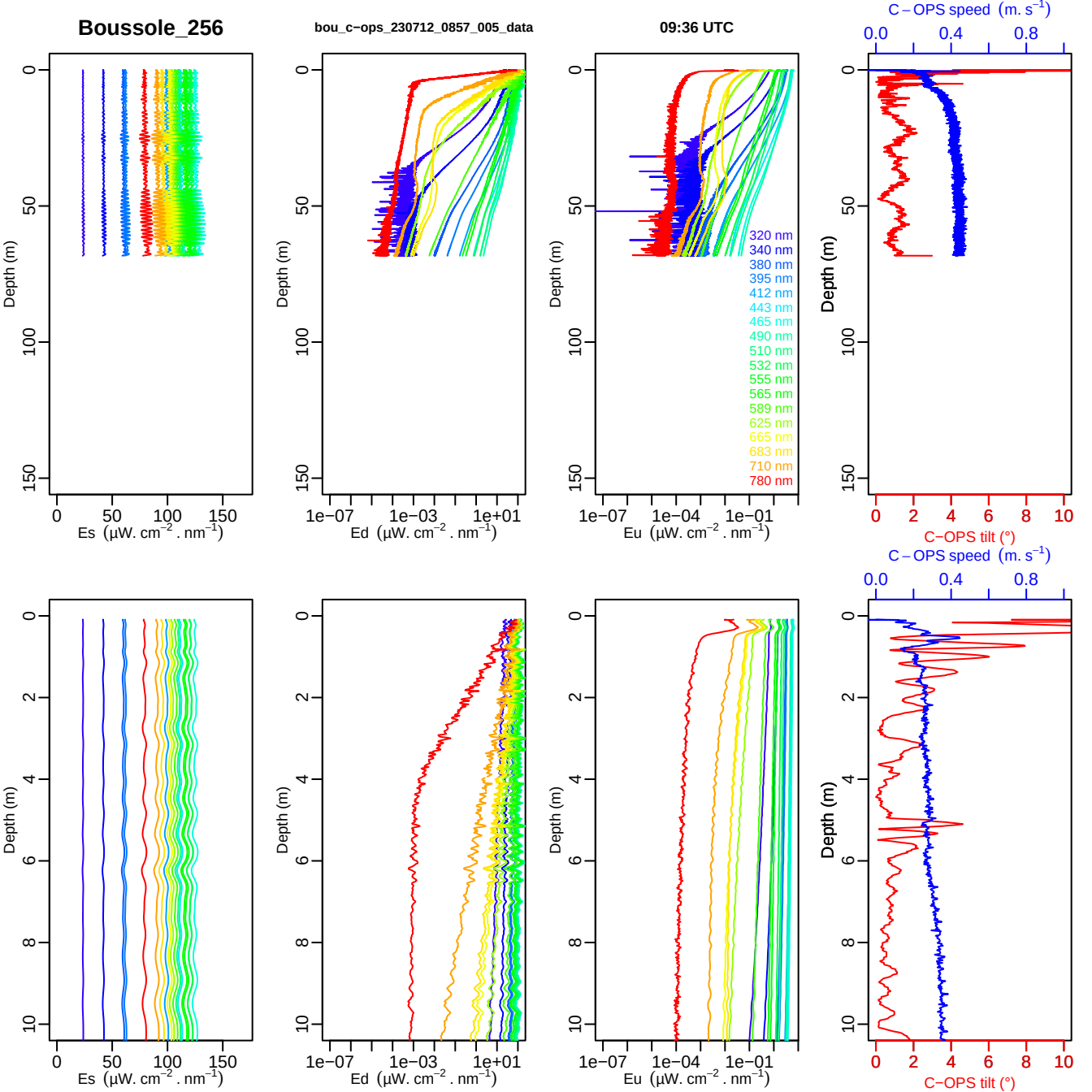
0.4
0.8
Depth (m)
0
50
100
150
0
50
100
150
Es (µW. cm^{-2}. nm^{-1})
1e−07
1e−03
1e+01
Ed (µW. cm^{-2}. nm^{-1})
1e−07
1e−04
1e−01
Eu (µW. cm^{-2}. nm^{-1})
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm
0
2
4
6
8
10
C−OPS tilt (°)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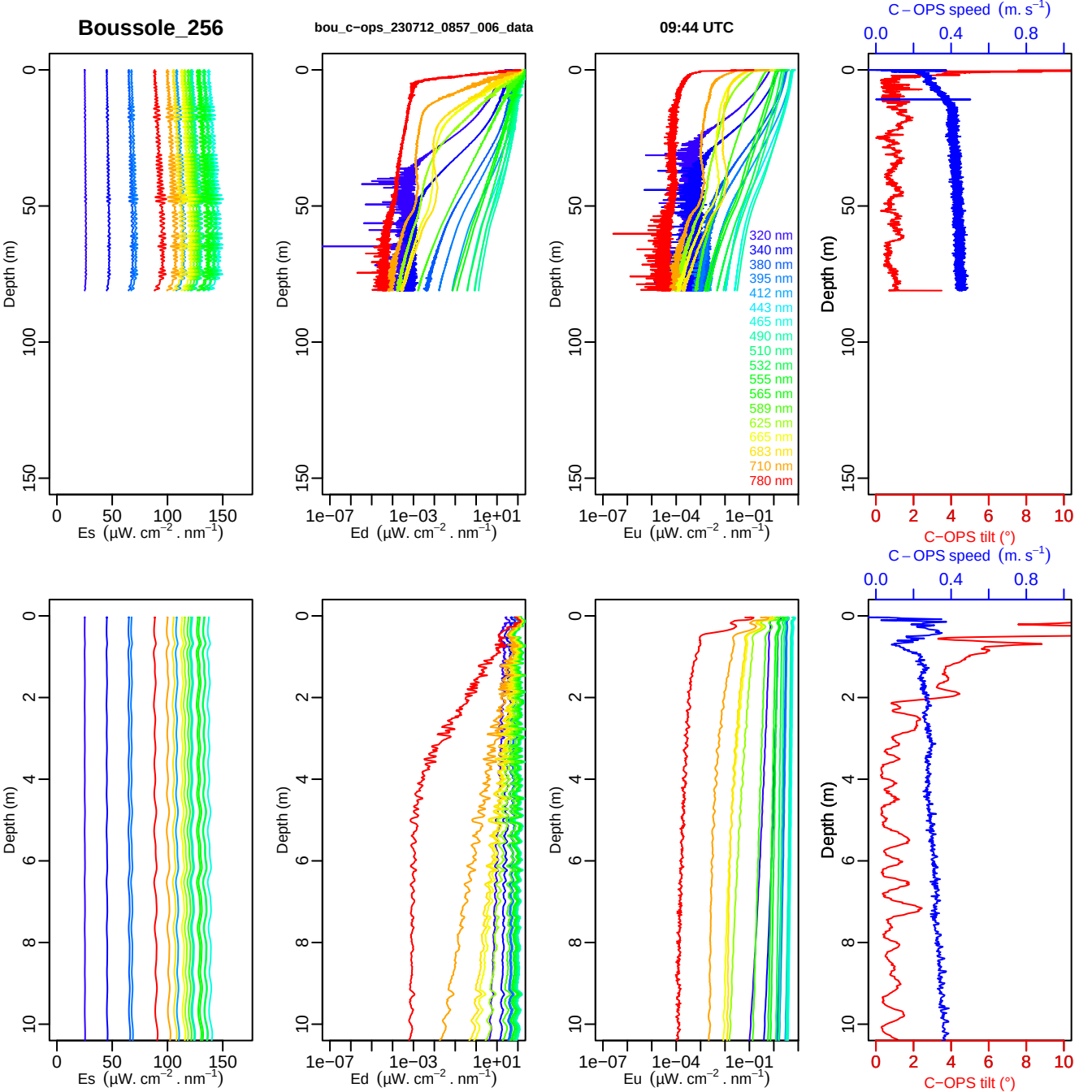
bou_c-ops_230712_0857_005_data
09:36 UTC
C – OPS speed (m. s^{-1})
0.0
0.4
0.8
Depth (m)
0
50
100
150
Es (µW. cm^{-2}. nm^{-1})
Ed (µW. cm^{-2}. nm^{-1})
Eu (µW. cm^{-2}. nm^{-1})
1e−07
1e−03
1e+01
1e−04
1e−01
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm
0
2
4
6
8
10
C−OPS tilt (°)


Boussole_256
bou_c-ops_230712_0857_006_data
09:44 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