# BOUSSOLE Monthly Cruise Report

## Cruise 251
## February 6-8 & 11, 2023

Duty Chief: Melek Golbol (melek.golbol@imev-mer.fr)
Vessel: R/V L'EUROPE
(Captain: Frédéric Rannou)

Science Personnel: Cyril Debost, Melek Golbol, Juliette Maury and Paco Stil

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Diving maintenance operations on the BOUSSOLE buoy

**BOUSSOLE project**

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

*February 21, 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

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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

No additional operations.

# Cruise Summary

The bad weather did not allow to work during the dates planned for BOUSSOLE cruises (February, 6-8). Nevertheless, the cruise was postponed and the BOUSSOLE operations could be performed on 11 February, which was used for diving operations, optical profiles, Secchi disk and CTD casts with water sampling at the BOUSSOLE site.

## Monday 6 February 2023

Bad weather prevented departure from the Nice harbour.

## Tuesday 7 February 2023

Bad weather prevented departure from the Nice harbour.

## Wednesday 8 February 2023

Bad weather prevented departure from the Nice harbour.

## Saturday 11 February 2023

The sea state was smooth with a light breeze. The sky was blue and the visibility was excellent. Firstly, divers went at sea to clean the instruments, to take pictures and to put a cap on the backscattering meter for dark measurements. It appeared that the buoy was not working. The functioning of the instrumentation was checked on the top of the buoy, the surface sensor was not heard working and the underwater instruments were not seen working (no opening of the fluorometers shutters during the measurements). The divers switched the battery off and on, to restart the system but it appeared that the buoy was not working even after repeating this operation twice. Then the DL3 at surface was switched off and on and the surface sensor was heard working. Then it was decided to restart the DL3 at 4 m and 9 m depths in the same way and the underwater instruments were seen working. The surface DL3 on the top of the buoy was switched again two times in order to have three series of dark measurements. Divers checked the shackles on the chain and the cable under the main buoy sphere at 20 m depth : nothing wrong or alarming was reported. The files recorded on the surface DL3 and the battery voltage were checked with a WIFI connection. The solar panels and the surface sensor were cleaned.
Then, three C-OPS profiles, a Secchi disk and two CTD casts with water sampling were performed at the BOUSSOLE site. For the second cast, a cap was put on the backscattering meter for dark measurements.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/a9xzv6HxBiojdn5p6

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

# Cruise Report

## Monday 6 February 2023

Bad weather prevented departure from the Nice harbour.

## Tuesday 7 February 2023

Bad weather prevented departure from the Nice harbour.

## Wednesday 8 February 2023

Bad weather prevented departure from the Nice harbour.

## Saturday 11 February 2023 (UTC)

People on board: Cyril Debost, Melek Golbol, Juliette Maury (diver) and Paco Stil.

0615 Departure from the Nice harbour.
1000 Arrival at the BOUSSOLE site.
1115 Diving operations: cleaning, dark measurements, pictures, functional and shackles checking.
Maintenance on the top of the buoy: functional checking, solar panels cleaning.
1155 End of diving operations.
1210 C-OPS 01, 02, 03.
1310 CTD 01, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC and $a_p$.
1340 Secchi 01, 24 m.
1435 CTD 02, 50 m with water sampling at 5 m for TSM, TA/TC, DO and pH (with cap on HS6).
1500 Departure to the Nice harbour.
1850 Arrival at the Nice harbour.

## Problems identified during the cruise

- The CTD of the IOP package could not be installed on the package with the other instruments because it was still under calibrations at SeaBird. Therefore, the data from the CTD of the Rosette will be used for the data processing.

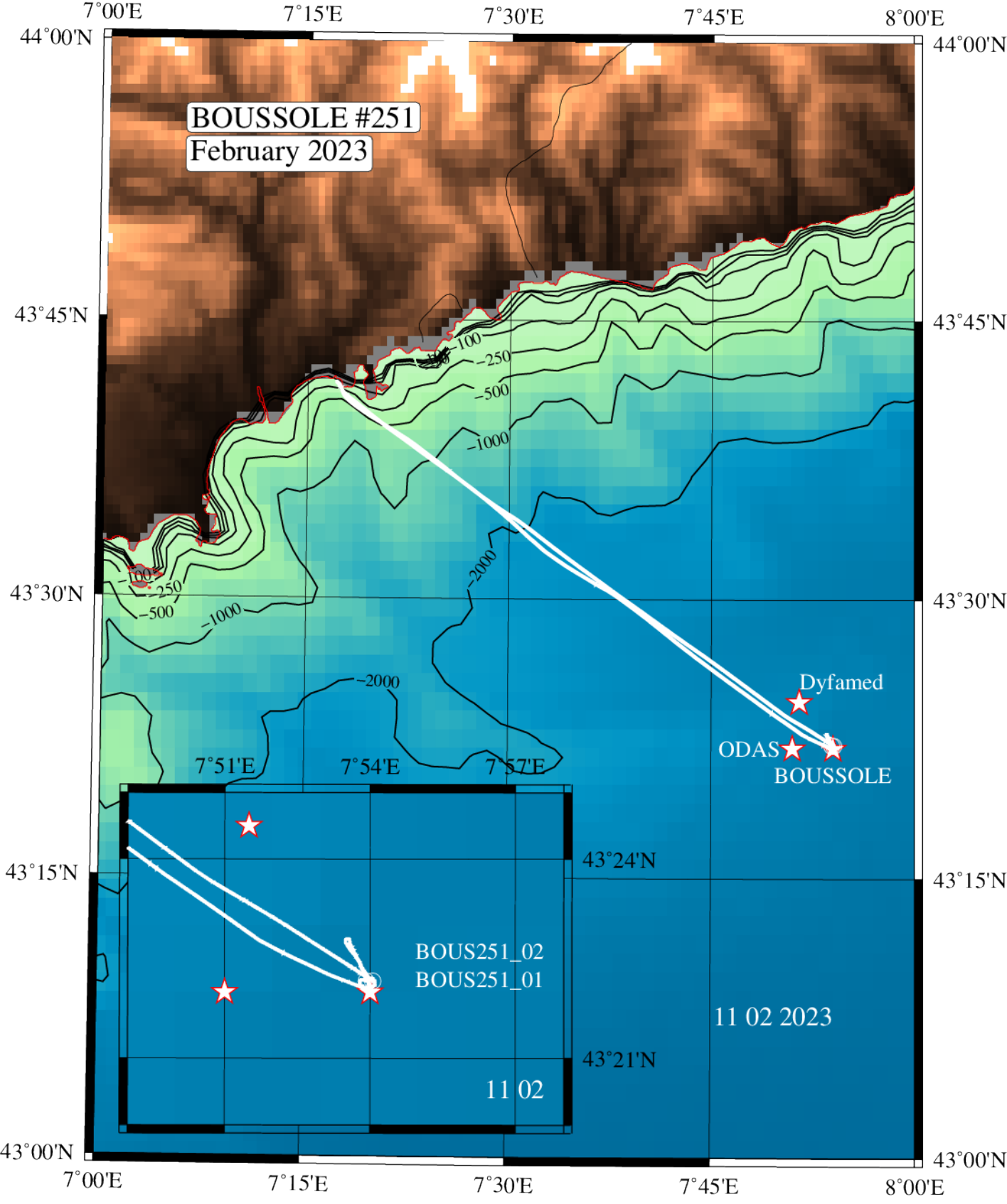
- During the diving operations, it appeared that the buoy was not functioning and switching off and on the battery was not enough to restart the system. It was necessary to switch off and on each DL3 (surface, 4 and 9 m depths) to restart operations.

- All operations were performed in a single day. The R/V *L'Europe* is slower than the R/V *Téthys II*, so the working time on station was shorter than usually. Therefore, it was not possible to perform the CTD cast including a 0.2 µm filter installed on the inlet tube of the a-Sphere for the dissolved matter absorption measurements because of the lack of time.

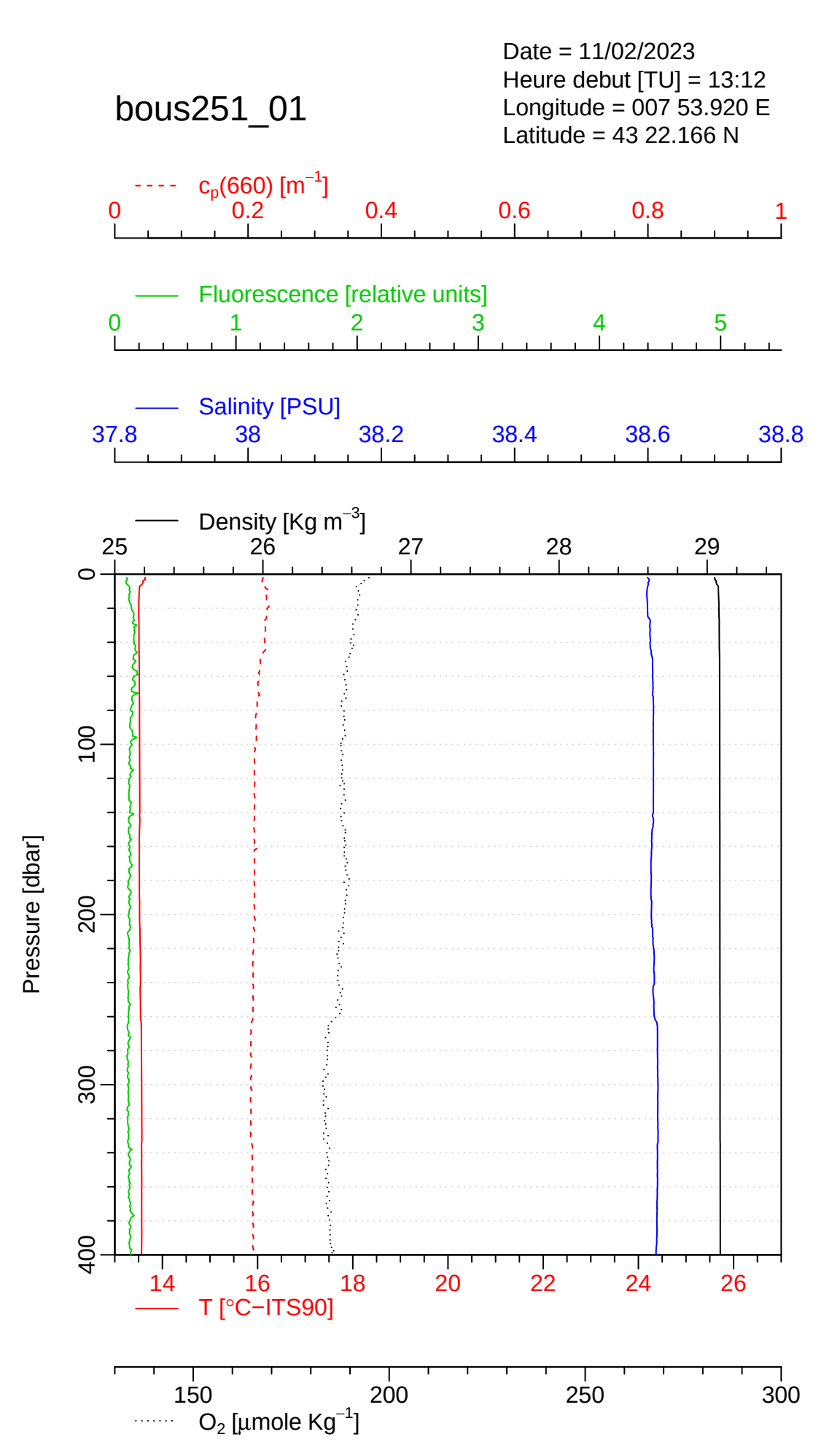
# Appendices

Cruise Summary Table for Boussole 251

| 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 |
| 06/02/23 | Bad weather | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07/02/23 | Bad weather | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 08/02/23 | Bad weather | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11/02/23 | | bou_c-ops_230211_1157_002_data.csv | | | 12:10 | 0:05:04 | 123 | 43 | 22.351 | 7 | 53.835 | blue | Ci | 2 | 6 | 277 | 1034 | 56.5 | excellent | 11.5 | | smooth | 0.2 | | no |
| | | bou_c-ops_230211_1157_003_data.csv | | | 11:54 | 0:01:55 | 44 | 43 | 22.556 | 7 | 53.955 | blue | Ci | 3 | 6 | 277 | 1034 | 56.5 | excellent | 11.5 | | smooth | 0.2 | | no |
| | | bou_c-ops_230211_1157_004_data.csv | | | 12:00 | 0:05:21 | 136 | 43 | 22.543 | 7 | 53.883 | blue | Ci | 3 | 6 | 277 | 1034 | 56.5 | excellent | 11.5 | | smooth | 0.2 | | no |
| | | | BOUS251_01 | HPLC & ap | 13:12 | 0:38:00 | 400 | 43 | 22.166 | 7 | 53.920 | blue | | 2 | 5.4 | 220 | 1039 | 54 | | 11.7 | 13.6 | smooth | | | |
| | | | | Secchi 01 | 13:40 | 0:04:00 | 24 | 43 | 22 | 7 | 54 | blue | | 2 | | | | | excellent | | | smooth | | | |
| | | | BOUS251_02 | TSM, TA/TC, $O_2$ & pH | 14:36 | 0:07:00 | 400 | 43 | 22.163 | 7 | 54.056 | blue | | 2 | 5.6 | 245 | 1033 | 66 | | 11.7 | 13.6 | smooth | | | |




GMT 2023 May 19 12:39:36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Latitude = 43 22.166 N
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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]

bous251_02

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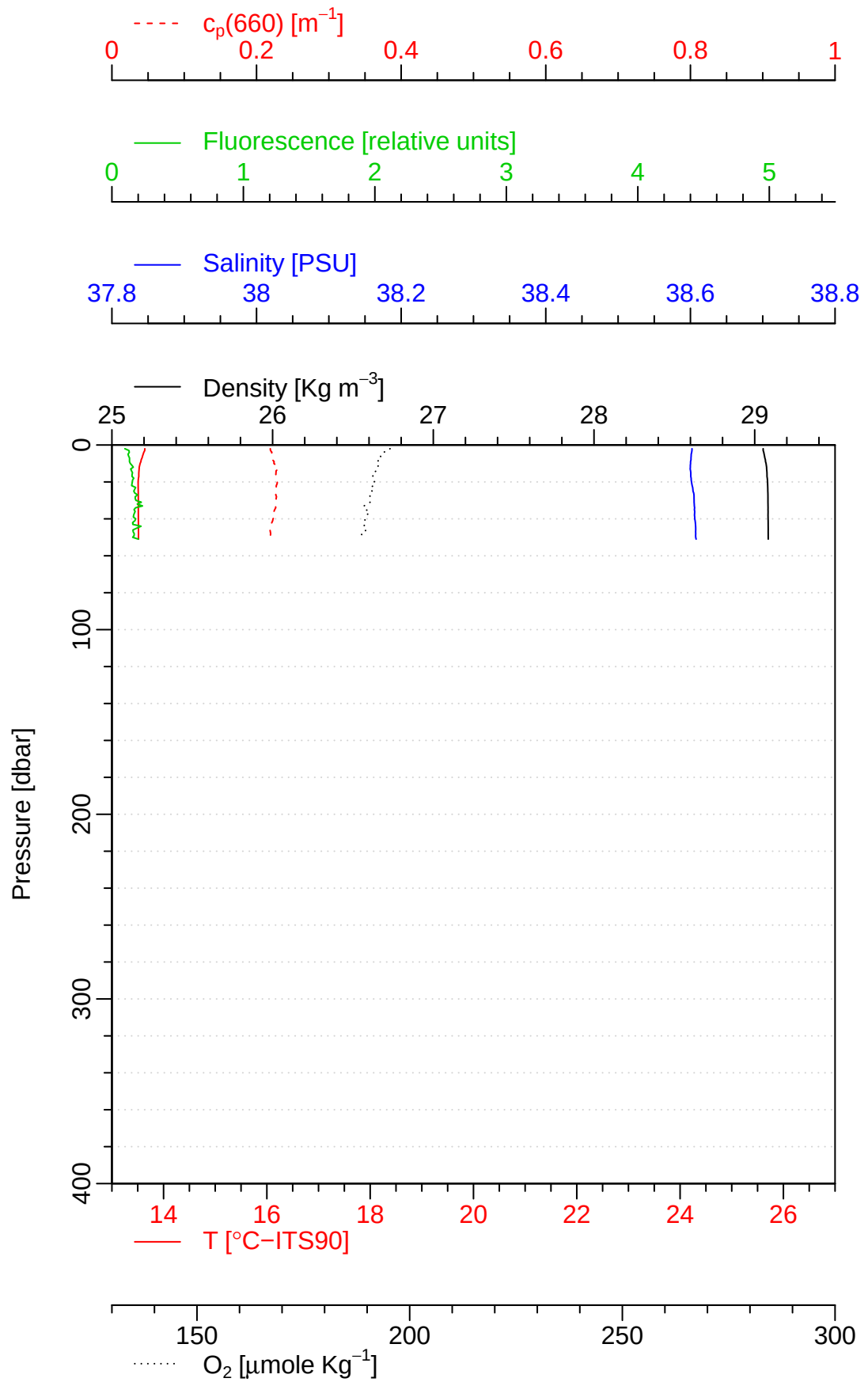

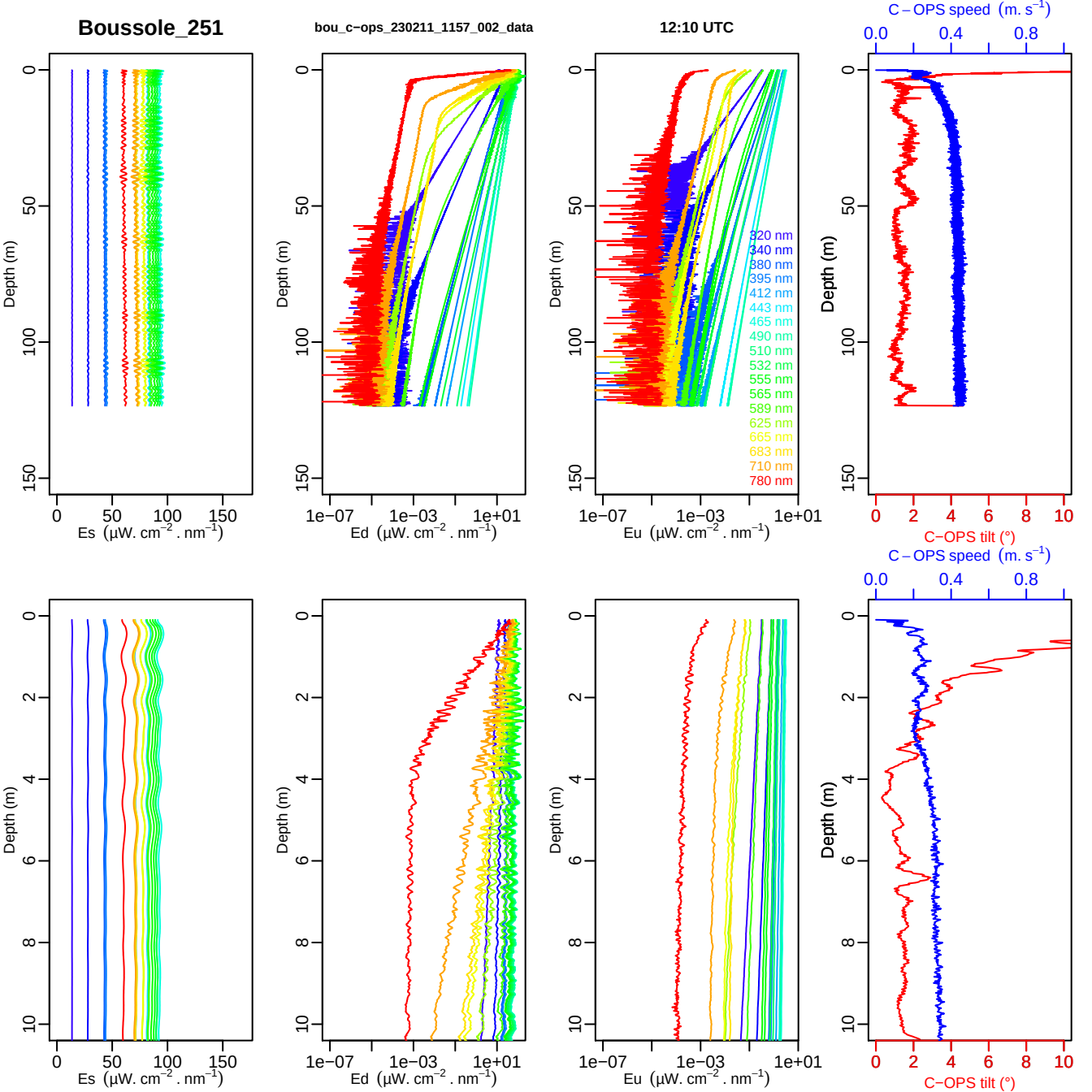
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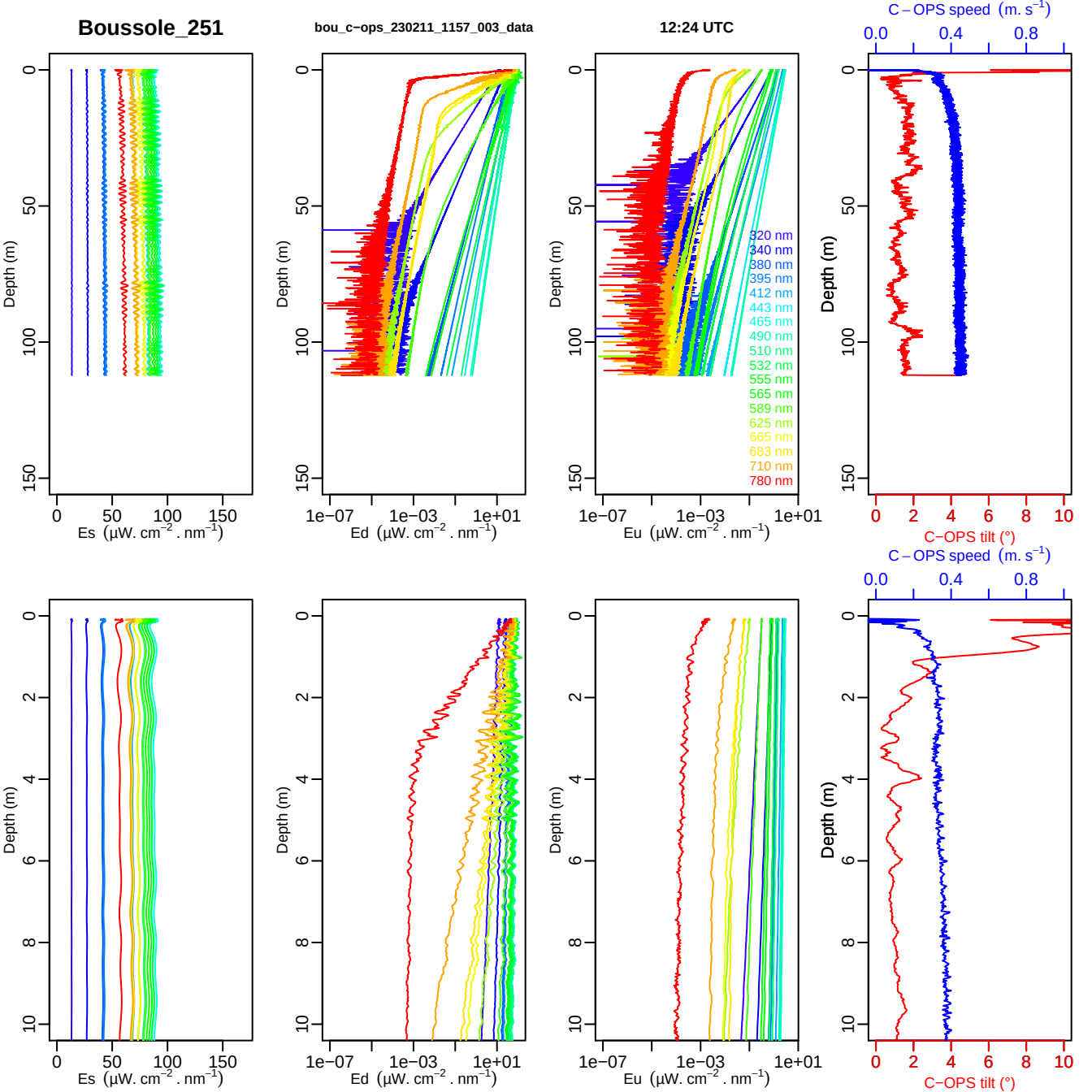
Depth (m)
Es (µW. cm⁻². nm⁻¹)
Ed (µW. cm⁻². nm⁻¹)
Eu (µW. cm⁻². nm⁻¹)
C-OPS speed (m. s⁻¹)
C-OPS tilt (°)
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm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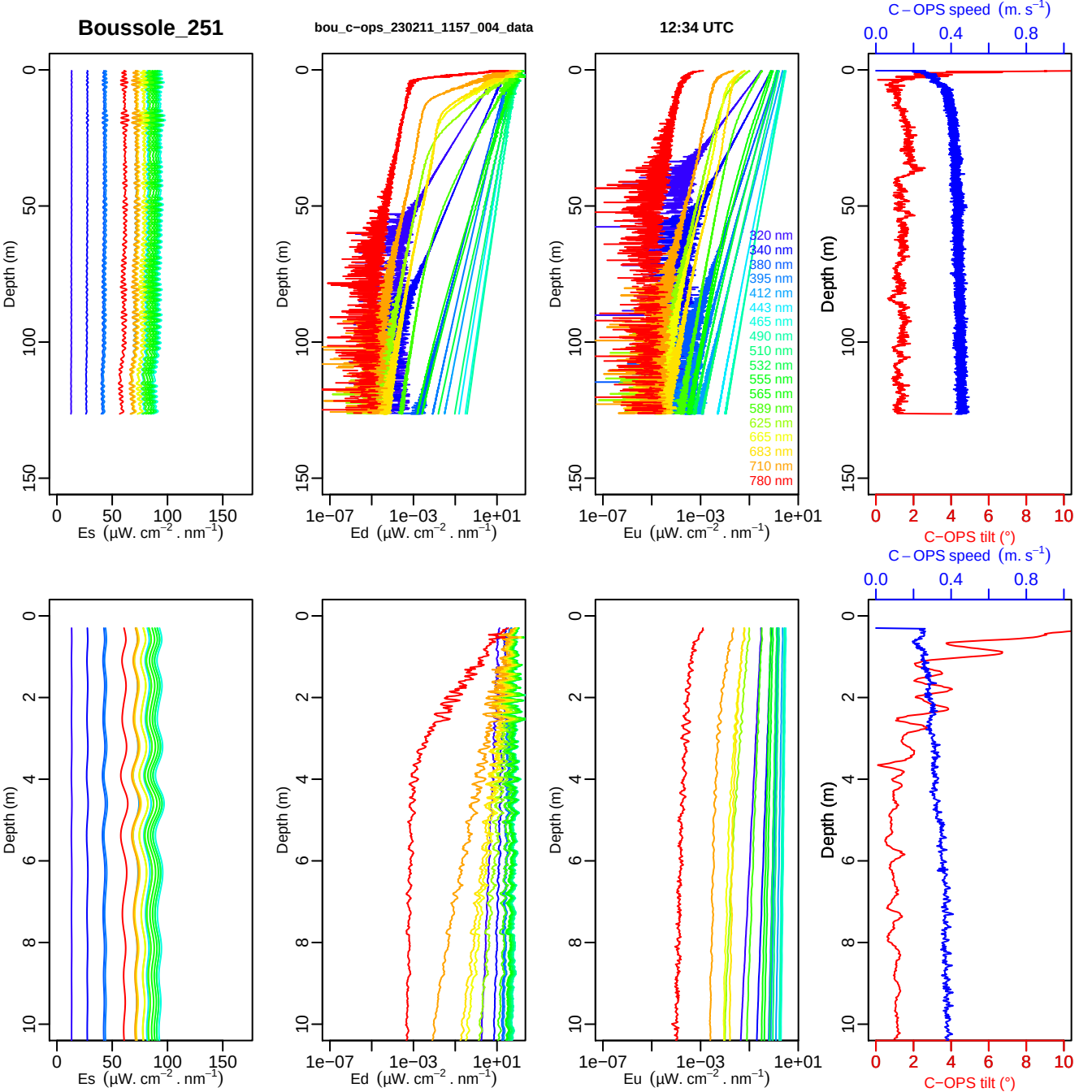
Ed (µW. cm⁻². nm⁻¹)
Eu (µW. cm⁻². nm⁻¹)
C-OPS speed (m. s⁻¹)
C-OPS tilt (°)
320 nm
340 nm
380 nm
395 nm
412 nm
443 nm
465 nm
490 nm
510 nm
532 nm
555 nm
565 nm
589 nm
625 nm
665 nm
683 nm
710 nm
780 nm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Ed (µW. cm⁻². nm⁻¹)
Eu (µW. cm⁻². nm⁻¹)
C-OPS speed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