BOUSSOLE Monthly Cruise Report

Cruise 239
February 08-11, 2022

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

Science Personnel: Céline Dimier, Solène Motreuil, Melek Golbol, Emilie Riquier Diamond and Paco Stil.

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

A view of the aft deck of the R/V *Téthys II* in a rough sea.

BOUSSOLE project

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

February 28, 2022

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

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. 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 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 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

The BOUSSOLE cruise was cancelled because of bad weather during the first and the second day and because of the strike of sailor officers during the third day. Nevertheless, some of BOUSSOLE operations were anticipated and performed during the DYFAMED cruise planned on February 8th.
This day was used for Secchi disk and a CTD cast with water sampling at the BOUSSOLE site and for MOOSE operations (deep CTD cast, zooplankton and Manta nets).

Tuesday 08 February 2022

The sea state was slight with a light air. The sky was blue. Firstly, a Secchi disk and then a CTD cast with water sampling were performed at the BOUSSOLE site. Then a Manta net, two zooplankton nets and a deep CTD cast were performed at the DYFAMED site for the MOOSE program before returning to the Nice harbour.

Wednesday 09 February 2022

Bad weather prevented departure from the Nice harbour.

Thursday 10 February 2022

Bad weather prevented departure from the Nice harbour.

Friday 11 February 2022

A sailor officers strike prevented departure from the Nice harbour

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/13XYAojdWTmayE699

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 08 February 2022 (UTC)

People on bord: Solène Motreuil, Emilie Riquier Diamond and Paco Stil.

0645 Departure to the BOUSSOLE site.
1000 Arrival at the BOUSSOLE site.
1010 Secchi disk, 16 m.
1015 CTD 01, 400 m with water sampling at 400, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p, TA/TC, O_2, pH, TSM, nutrients and cytometry.
1050 Departure to the DYFAMED site.
1110 Arrival at the DYFAMED site.
Manta net (MOOSE program)
1200 Zooplankton nets x2, 100 m and 200 m (MOOSE program).
1245 Deep CTD cast, MOOSE 160 (MOOSE program)
1435 Departure to the Nice harbour.
1730 Arrival to the Nice harbour.

Wednesday 09 February 2022

Bad weather prevented departure from the Nice harbour.

Thursday 10 February 2022

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A sailor officers strike prevented departure from the Nice harbour

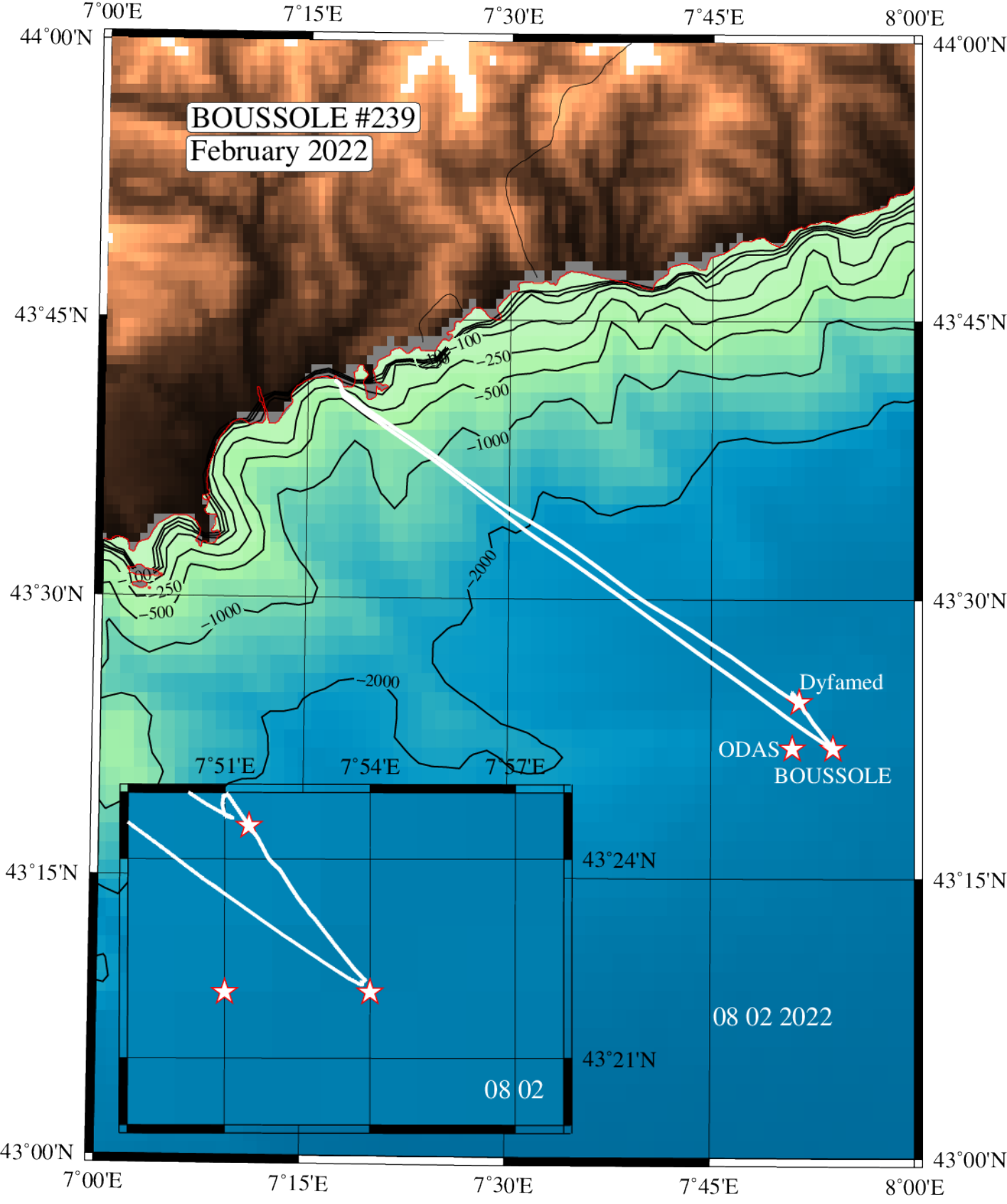
Problems identified during the cruise

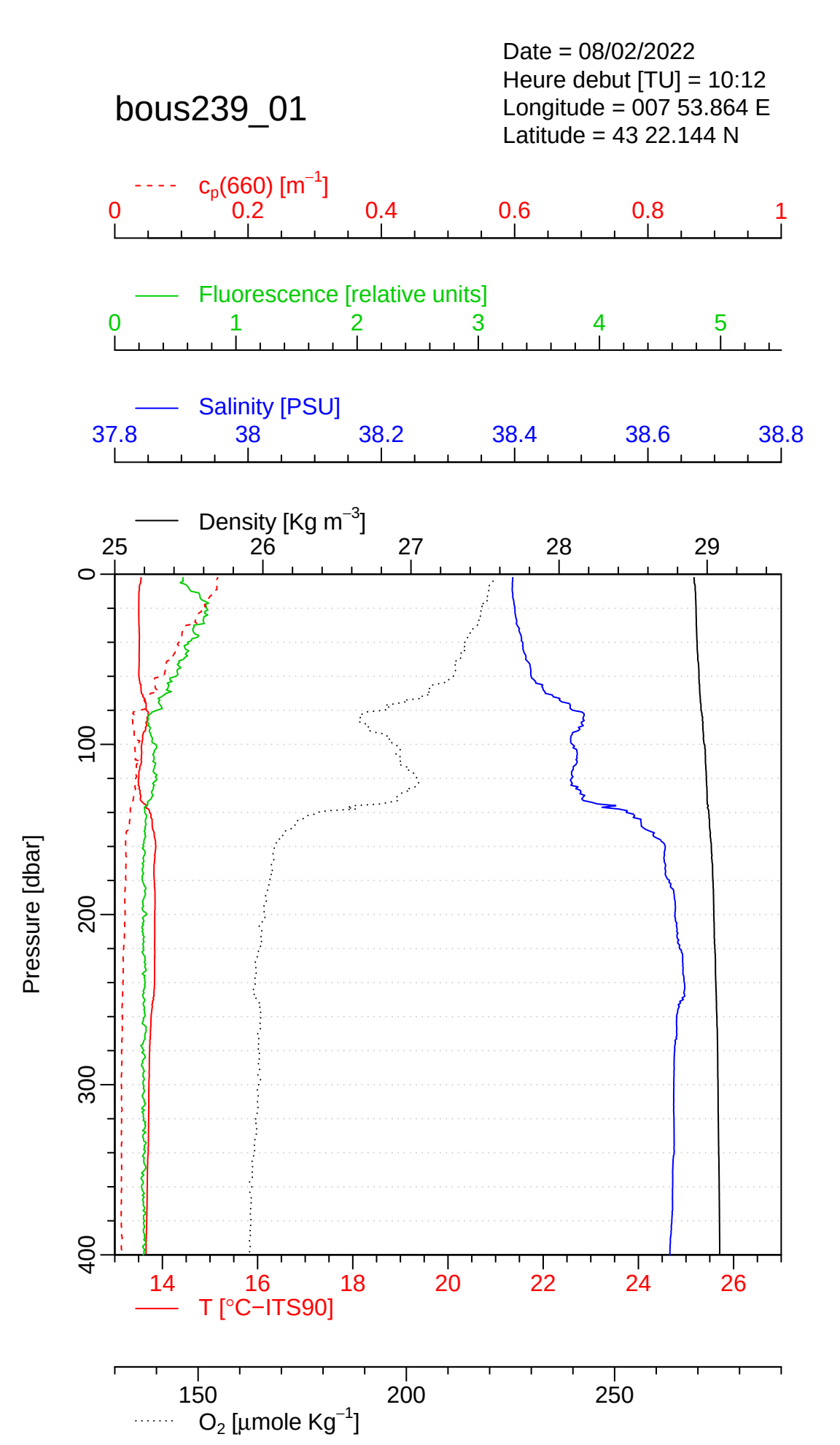
- The IOP package was not available for this cruise. The instruments were still under calibration at Hobi Instruments Service.
- C-OPS profiles could not be performed during this cruise because the instruments were still under calibration at Biospherical Instruments Inc.
- The metagenomic sampling for EFFICACY ANR project was not performed because of the cancellation of BOUSSOLE cruise.
- CTD 01: The upcast file was used for the data processing instead of the downcast file because of an acquisition problem during the first meters of the downcast (0 -7 m).

Appendices

Cruise Summary Table for Boussole 239

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
08/02/22				Secchi 01	10:10	0:04:00	16	43	22	7	54	blue		0								slight			
			BOUS239_01	HPLC, ap, TSM, Cyto, TA/TC, O_2, Nutrients & pH	10:12	0:33:00	400	43	22.144	7	53.864	blue		0	0.1	119	1031	58		13.3	13.56	slight			
09/02/22	Bad weather																								
10/02/22	Bad weather																								
11/02/22	Strike of sailor officers																								


BOUSSOLE #239
February 2022
7°00'E
7°15'E
7°30'E
7°45'E
8°00'E
44°00'N
43°45'N
43°30'N
43°15'N
43°00'N
-100
-250
-500
-1000
-2000
Dyfamed
ODAS
BOUSSOLE
7°51'E
7°54'E
7°57'E
43°24'N
43°21'N
08 02
08 02 2022


bous239_01
Date = 08/02/2022
Heure debut [TU] = 10:12
Longitude = 007 53.864 E
Latitude = 43 22.144 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
O2 [µmole Kg−1]