BOUSSOLE Monthly Cruise Report

Cruise 209
July 06-07, 2019

Duty Chief: Melek Golbol (golbol@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captain: Joël Le Guennec)

Science Personnel: Nour Alem, Alexandra Aymard, Alexandre Corrizzi, Céline Dimier, Melek Golbol and Eduardo Soto Garcia.

Laboratoire d'Océanographie de Villefranche (LOV), 06230 Villefranche-sur-Mer, France

Retrieving of the *Biospherical* C-OPS (Compact-Optical Profiling System) after its deployment at the BOUSSOLE site

BOUSSOLE project

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

July 19, 2019

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), hand held CIMEL sun photometer measurements are to be performed consecutively where possible with C-OPS profiles. If sea conditions are poor but sky is good, hand held 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 replicates 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).

In addition, water samples are to be collected at two depths (5 m and 10 m) for dissolved oxygen (DO), total alkalinity (TA) and total inorganic carbon (TC) analysis (from March 2014). This operation is part of the BIOCAREX ANR project, in collaboration with the LOCEAN in Paris (J. Boutin and collaborators). The TA/TC samples will be processed by the National service for such analyses (SNAPOCO – LOCEAN in Paris). The results will allow checking the data collected by the two pCO_2 CARIOCA sensors and the two optodes installed on the buoy at 3 m and 10 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 first day, Céline Dimier, working for the *Service d'Analyse de Pigments par HPLC* (SAPIGH) of the *Institut de la Mer de Villefranche* (IMEV) was onboard to sample additional water for HPLC analyses. These samples will be used for an international intercomparison study on the protocols involving other labs.

A square grid survey was performed with the *R/V Téthys II* in order to characterize the spatial variability of the surface chlorophyll concentration in the vicinity of the BOUSSOLE buoy. Data were acquired by the underway fluorimeter installed on the ship. This operation will be performed once per cruise until the end of 2019 in the frame of the ROSACE project (Radiometry for Ocean Colour SAtellites Calibration & Community Engagement). This project aims to propose a preliminary design of the new European infrastructure dedicated to the System Vicarious Calibration (SVC) for the European Copernicus Ocean Colour missions.

Cruise Summary

The first day was used for optical profiles, for CTD casts with water sampling, for surface chlorophyll measurements (square grid survey) and for a Secchi disk at the BOUSSOLE site. Diving operations were not planned during this cruise because they were anticipated and performed two days before the cruise due to the uncertainty of the weather forecasts. The second day, bad weather prevented the departure from the Nice Harbour.

Saturday 6 July 2019

The sea state was slight with a moderate breeze. The sky was blue and the visibility was good. Firstly, 3 C-OPS profiles and a CTD cast with water sampling was performed at the BOUSSOLE site. During lunchtime, the sea surface chlorophyll measurements grid was performed, centered on the BOUSSOLE site. Then a second CTD cast with water sampling was performed at the BOUSSOLE site. A cap was put on the Hydroscat-6 for dark measurements and a 0.2 µm filter was put on the a-Sphere absorption meter for the dissolved matter absorption measurements. This CTD cast was stopped at 10 depths during the ascent of the CTD.
Finally, a Secchi disk was performed at the BOUSSOLE site before returning to the Nice harbour.

Sunday 7 July 2019

Bad weather prevented departure from the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/VVcpt1x4i7Qo7ekaA

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

Cruise Report

Saturday 6 July 2019 (UTC)

People on board: Nour Alem, Alexandra Aymard, Alexandre Corrizzi, Céline Dimier, Melek Golbol and Eduardo Soto Garcia.

0545 Departure from the Nice harbour.
0900 Arrival at the BOUSSOLE site.
0905 C-OPS 01, 02, 03.
1005 CTD 01, 400 m with water sampling at 400, 200, 150, 80, 70, 60, 50, 40, 30, 20 and 10 m for HPLC and a_p.
1050 Surface chlorophyll fluorescence grid.
1200 Secchi disk 01, 18 m.
1220 CTD 02, 400 m with water sampling at 40 m for HPLC (intercomparison study), 10 and 5 m for HPLC, a_p, O_2, TA/TC and TSM (with cap on the HS6 and a 0.2 µm filter on a-Sphere and with 2 minutes stop at 400 and 150 m and 7 minutes stop at 80, 60, 50, 40, 30, 20, 10 and 5 m).
1400 Departure to the Nice harbour.
1700 Arrival at the Nice harbour.

Sunday 6 July 2019

Bad weather prevented departure from the Nice harbour.

Problems identified during the cruise

- Diving operations were not planned during this cruise because they were anticipated and performed two days before the cruise due to the uncertainty of the weather forecasts.

- CTD 01: During the ascent of the CTD, the pump functioned incorrectly between 400 and 250 m.

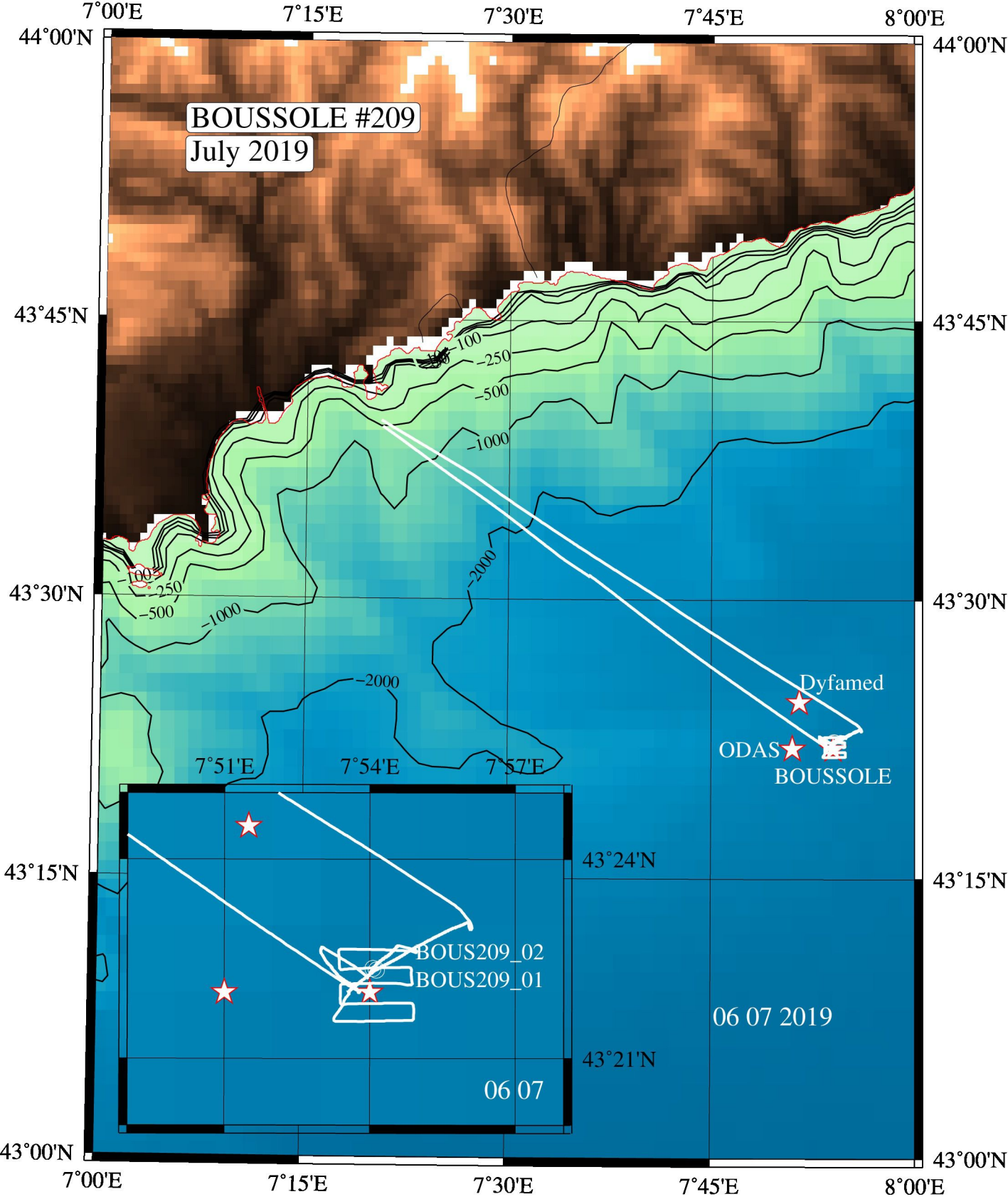
- CTD 01: 2 Niskin bottles were inadvertently closed at 30 m, so there was not enough Niskin to sample at 5 m depth. Nevertheless, water sample at 5 m depth was collected during CTD 02.

- The C-Star transmissometer of the CTD package was not available because the instrument was sent to *Seabird – WET Labs* for calibration. The instrument was not returned in time for this cruise.

Appendices

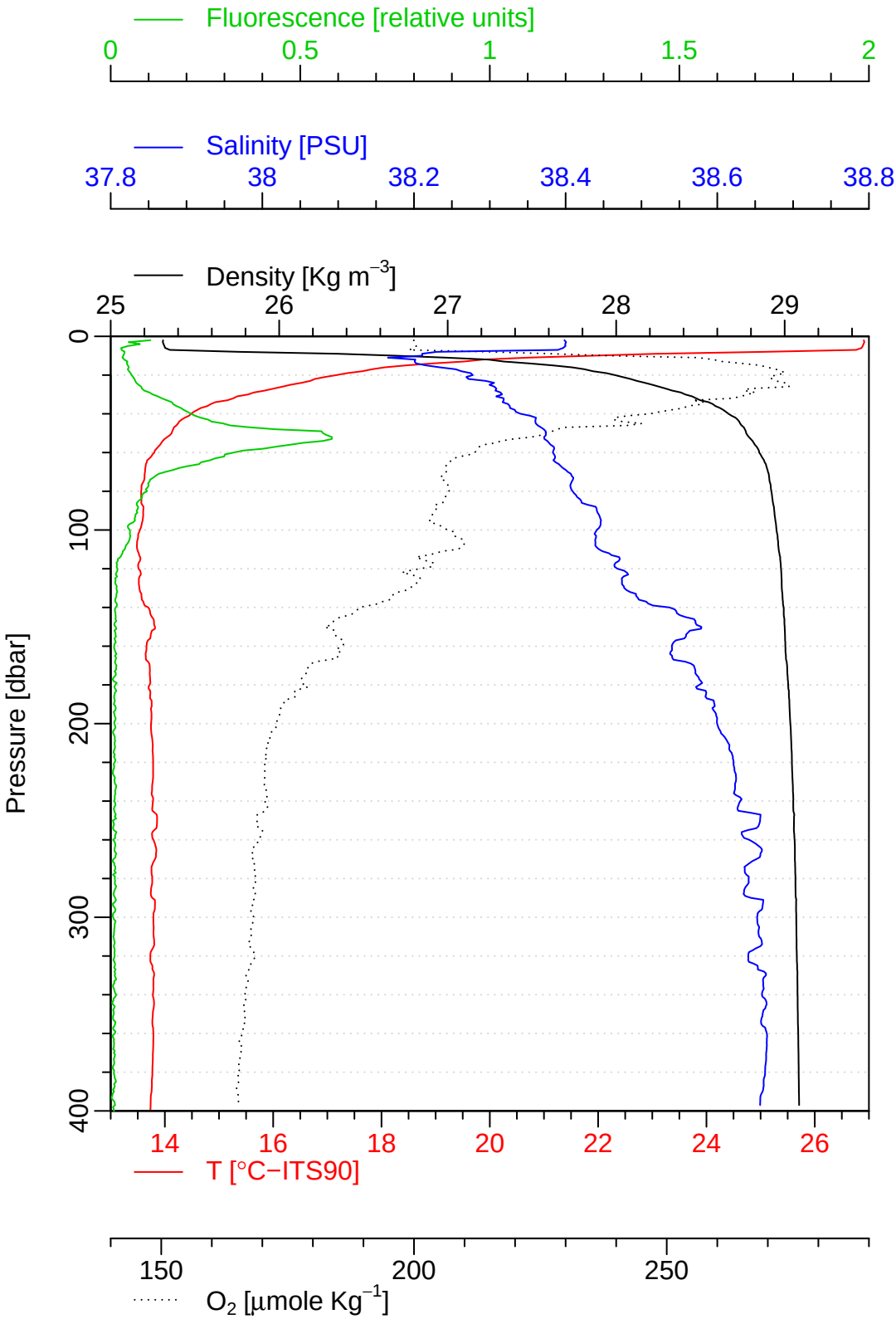
Cruise Summary Table for Boussole 209

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)	(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
06/07/19		bou_c-ops_190706_0857_001_data.csv			09:07	4:36	113	43	22.087	7	53.644	blue	None	0	14	237	1013.6	75	good	25.9		slight	0.8		Yes
		bou_c-ops_190706_0857_002_data.csv			09:17	3:53	96	43	22.217	7	53.390	blue	None	0	14	237	1013.6	75	good	25.9		slight	0.8		Yes
		bou_c-ops_190706_0857_003_data.csv			09:29	3:58	94	43	22.399	7	53.173	blue	None	0	14	237	1013.6	75	good	25.9		slight	0.8		Yes
			BOUS209_01	HPLC & Ap	10:07	29:00	400	43	22.357	7	54.007	blue		1	14	247	1013.9	75		26.3	26.91	slight			
				Secchi01	12:00	4:00	18	43	22	7	54	blue			13	242	1013.8	76	good	26.8		slight			
			BOUS209_02	TA/TC, O_2 and TSM	12:21	1:27:00	400	43	22.333	7	54.138	blue		2	13	238	1013.7	77		26.9	26.98	slight			
07/07/19	Bad weather																							


BOUSSOLE #209
July 2019
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
BOUS209_02
BOUS209_01
06 07 2019
06 07

bous209_01

Date = 06/07/2019
Heure debut [TU] = 10:07
Longitude = 007 54.067 E
Latitude = 43 22.357 N



bous209_02

Date = 06/07/2019
Heure debut [TU] = 12:21
Longitude = 007 54.138 E
Latitude = 43 22.333 N