BOUSSOLE Monthly Cruise Report

Cruise 208
May 27-29, 2019

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

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Filtering for total suspended matter with the new filtration manifold that was installed in the wet lab of the *R/V Téthys II*.

BOUSSOLE project

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

May 31, 2019

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

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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 MOOSE DYFAMED cruise of 27^{h} May was cancelled because of bad weather, so their operations were performed during the first day of the BOUSSOLE cruise (28th May).

A BGC-Argo profiling float (LOVAPMO15B) was deployed by the *Marine optics and remote sensing group* of the *Laboratoire d'Océanographie de Villefranche* (LOV) at the DYFAMED site. This float is equipped with the following biogeochemical and bio-optical sensors: UVP (Underwater Vision Profiler and remA pack).

The prototype sensor from Sea-Bird Scientific Company "BBFL2 ECO V2 - B00128" was tested by the *Marine optics and remote sensing group* of the *Laboratoire d'Océanographie de Villefranche* (LOV) in order to check its functioning during a deep CTD profile (MOOSE Dyfamed cast). It measures Chla and CDOM fluorescence and the backscattering coefficient b_b at 700 nm.

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 SVC (Copernicus Ocean Colour Vicarious Calibration).

Cruise Summary

The MOOSE DYFAMED cruise planned the day before BOUSSOLE cruise was cancelled because of the bad weather. For the first day of the BOUSOLE cruise, bad weather was predicted in the afternoon. So it was decided to embark the evening of 27th May in order to start the operations early on the 28th May and to achieve all BOUSSOLE and DYFAMED operations. This day was used for the deep CTD cast and zooplankton nets at the DYFAMED site (MOOSE program), for the deployment of the profiling float, for optical profiles, for CTD casts with water sampling, for surface chlorophyll measurement transect and for a Secchi disk at the BOUSSOLE site.

Monday 27 May 2019

This day was planned for the DYFAMED cruise but the cruise was cancelled because of the bad weather. The weather became better in the end of afternoon. So the departure took place in the evening in order to start the operations the day after early in the morning, because bad weather was announced in the afternoon of 28th May.

Tuesday 28 May 2019

The sea state was slight with a gentle breeze. The sky was cloudy and the visibility was good. Firstly, a deep CTD cast and 2 zooplankton nets were performed at the DYFAMED site. Secondly, we went to the BOUSSOLE site to deploy the profiling float. Then surface sensors of the buoy, solar panels and the ARGOS connector were cleaned. A connexion with the buoy was attempted but failed: the buoy was not functioning. Then, 1 C-OPS profile and 1 CTD cast with water sampling were performed at the BOUSSOLE site. It was not possible to perform other C-OPS profiles because of the instability of irradiance due to the cloudy sky (broken clouds). During the lunchtime, the sea surface chlorophyll measurements grid was performed, centered on the BOUSSOLE site. Then optical profiles were attempted and only 1 other C-OPS profile was performed because of the instability of irradiance. Finally, a Secchi disk and a second CTD cast with water sampling were 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.

Wednesday 29 May 2019

Bad weather prevented departure from the Nice harbour.

Pictures taken during this cruise can be found at:
https://photos.app.goo.gl/bY1VLBuKRik2hNgX6

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 27 May 2019 (UTC)

People on board: Melek Golbol, Alice Pierret and Eduardo Soto Garcia.

1800 Departure from the Nice harbour.
2200 Arrival at the DYFAMED site.

Tuesday 28 May 2019 (UTC)

People on board: Melek Golbol, Alice Pierret and Eduardo Soto Garcia.

0430 CTD MOOSE 131, 2350 m with water sampling.
0625 Zooplankton nets x 2, 100 and 200 m.
0650 Departure to the BOUSSOLE site.
0710 Arrival at the BOUSSOLE site.
0725 Deployment of the profiling float: 43°22.188'N, 07°54.763'E.
0750 Cleaning of surface sensors, solar panels and ARGOS connector.
0800 Attempt of connexion with the buoy: failed.
0835 C-OPS 01.
0920 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.
1000 Lunch and surface chlorophyll fluorescence transect.
1130 C-OPS 02.
1205 CTD 02, 400 m with water sampling at 5 m for TSM, TA/TC and O_2 (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).
1210 Secchi disk 01, 13 m.
1330 Departure to the Nice harbour.
1645 Arrival to the Nice harbour.

Wednesday 29 May 2019

Bad weather prevented departure from the Nice harbour.

Problems identified during the cruise

- C-OPS measurements were not optimal for this cruise because of the bad sky conditions during the acquisition: the sky was cloudy with unstable irradiance. The first C-OPS profiles had to be stopped early during the acquisition.

- The BioGPS of the C-OPS system was not functioning after the first cast. It was decided to remove it before the second cast. Then, it will be tested in the lab. Latitudes and longitudes were taken from the GPS of the ship before each profile.

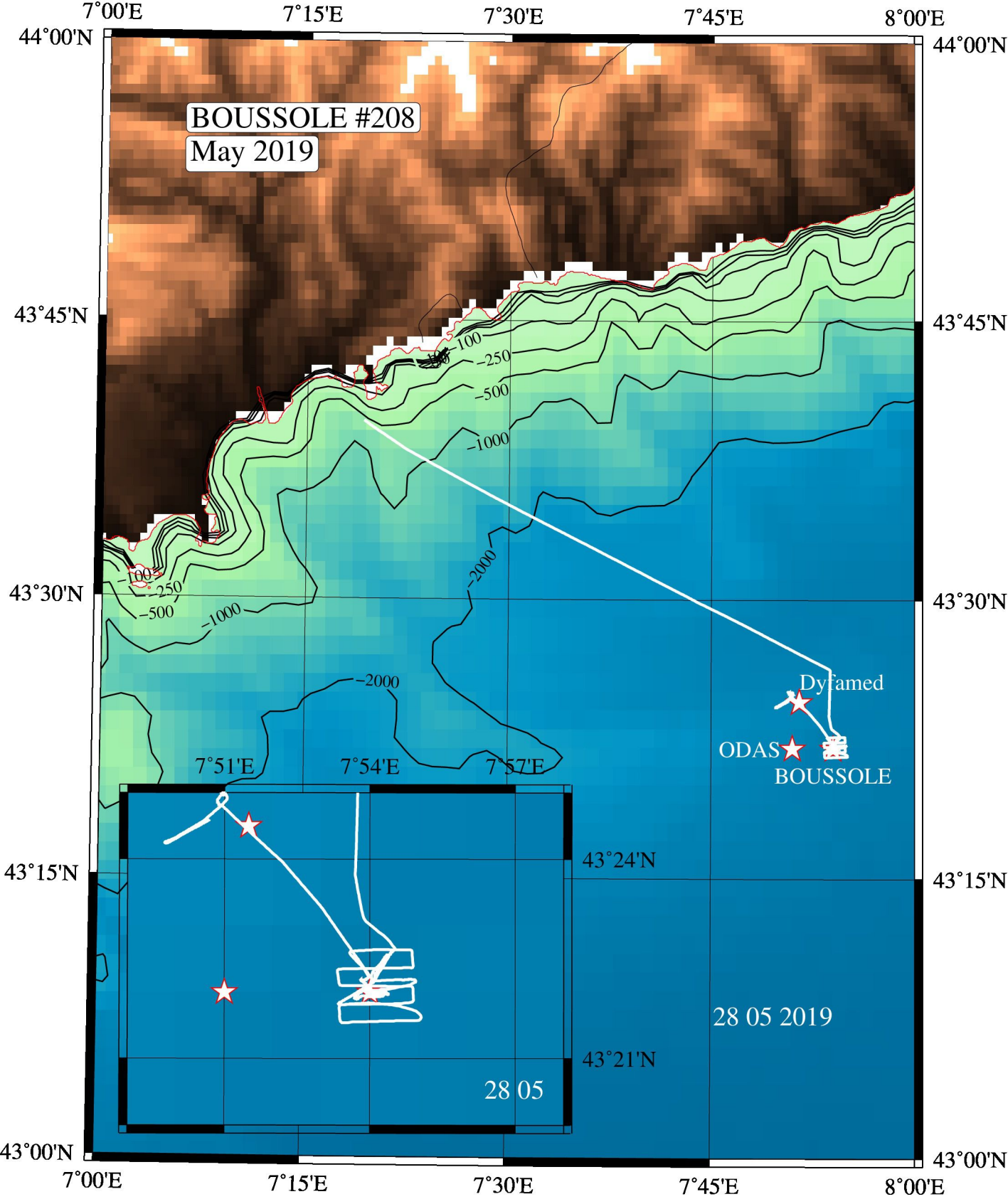
- Diving operations were not programmed during this cruise because of the bad weather forecasts.

- A connection with the buoy in order to download data was attempted but failed: the buoy was not functioning. A fault with the Microdrive of the DACNet (Data Aquisition and Control Network) was suspected. An intermediate cruise for diving operations including maintenance of the DACNet will be organized.

Appendices

Cruise Summary Table for Boussole 208

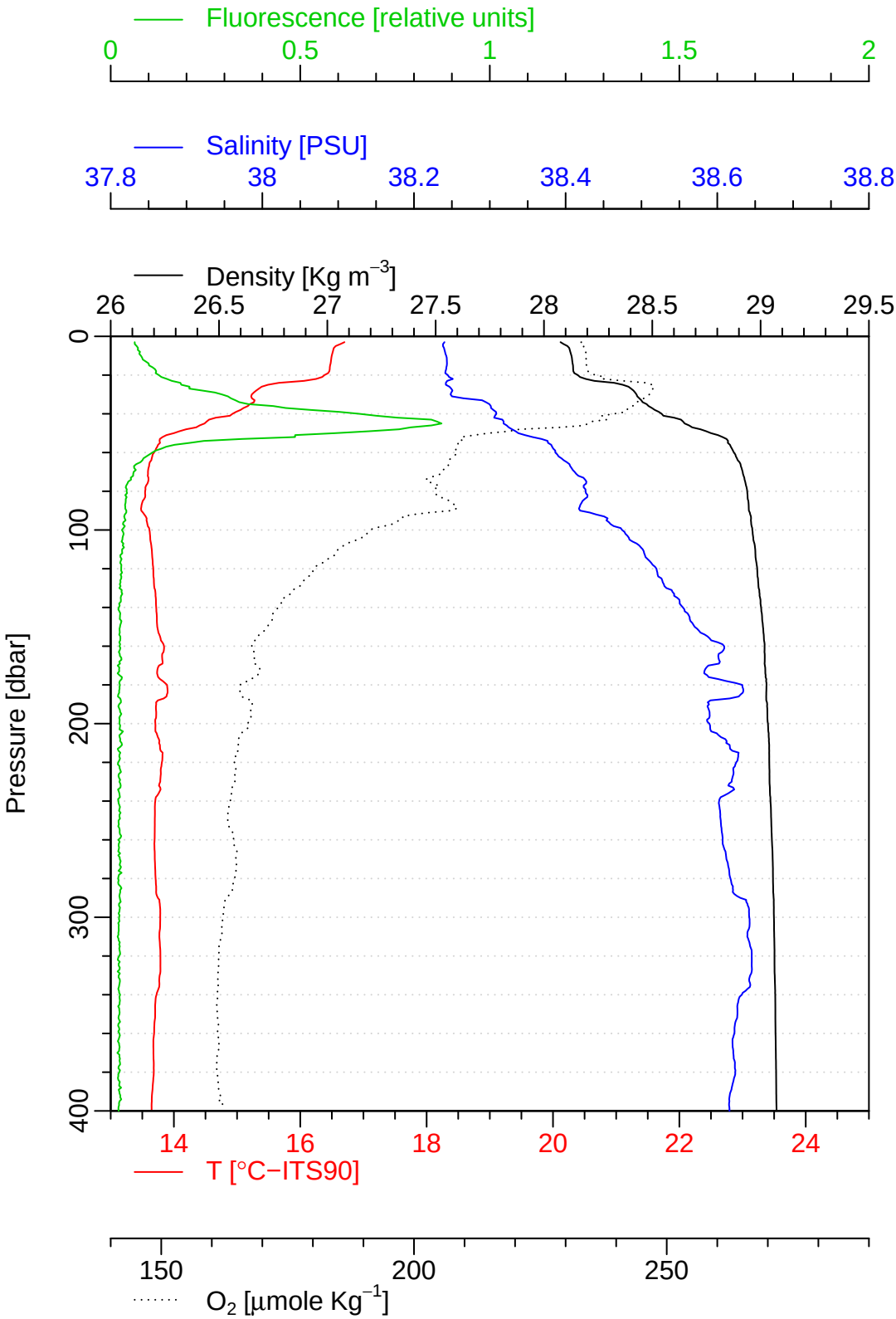
Date	Black names	Profile names	CTD notées	Other sensors	Start Time	Duration	Depth max	Latitude (N)		longitude					Weather							Sea		
	(file ext: ".raw")	(file extension: ".raw")			GMT (hour.min)	(min.sec)	(meter)	(Degree)	(Minute)	(Degree)	(Minute)	Sky	Clouds	Quantity (#/8)	Wind sp. (kn)	Wind dir.	Atm. Pressure (hPa)	Humidity (%)	Visibility	T air	T water	Sea	Swell H (m)	Swell dir.	Whitecaps
28/05/19		bou_c-ops_190528_0818_007_data.csv			08:37	1:42	40	43	21.929	7	53.998	cloudy	Cs	4	8	259	1005.4	86	good	16.5		slight	0.8		no
			BOUS208_01	HPLC & Ap	09:20	32:00	400	43	22.062	7	53.918	cloudy		6	9	238	1005.3	85		16.7	16.73	slight			
		bou_c-ops_190528_1128_001_data.csv			11:33	3:05	71	43	22.361	7	54.134	cloudy	Cs	5	11	187	1004.7	84	good	17.2		slight	1.2		few
			BOUS208_02	TA/TC, O_2 and TSM	12:03	23:00	400	43	22.177	7	54.092	cloudy		6	10	194	1004.6	85		17.3	17.10	slight			
				Secchi01	12:10	4:00	13	43	22	7	54	cloudy		6					good			slight			
29/05/19	Bad weather																							



GMT 2019 Jun 23 08:21:52

bous208_01

Date = 28/05/2019
Heure debut [TU] = 09:20
Longitude = 007 53.918 E
Latitude = 43 22.062 N



bous208_02

Date = 28/05/2019
Heure debut [TU] = 12:03
Longitude = 007 54.092 E
Latitude = 43 22.177 N