BOUSSOLE Monthly Cruise Report

Cruise 180
February 06-08, 2017

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

Science Personnel: Gaetan Dalla Vedova, Emilie Diamond, Bastien Gaucher (diver), Melek Golbol, David Luquet, Juliette Maury and Didier Robin.

Laboratoire d'Océanographique de Villefranche (LOV), 06238 Villefranche sur mer cedex, France

Buoy surface sensors including multispectral and hyperspectral radiometers and PAR sensor, on the top of the BOUSSOLE buoy.

BOUSSOLE project

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

February 17, 2017

Foreword

This report is part of the technical report series that is being established by the BOUSSOLE project.

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Contents

1. Cruise Objectives
2. Cruise Summary
3. Cruise Report
4. Problems identified during the cruise

Appendices

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). Two CTD casts are to be performed at each data acquisition at the BOUSSOLE site: one cast with, and one cast without, a 0.2µm filter added on the a-sphere for the dissolved matter absorption measurements.

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 installed on the buoy at 3m and 10m.

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

Two water samples for cytometry analysis were collected at 10 m depth in the frame of a collaboration with Collin Roesler (Bowdoin College, Maine, USA), about the installation of an ECO 3X1M multi-channel fluorimeter on the BOUSSOLE buoy at 9 m depth.

This fluorimeter sensor was recovered by the divers in order to download the data and to change the batteries. It was then reinstalled at the same location.

The MOOSE DYFAMED operations were performed the second day of the BOUSSOLE cruise because bad weather was announced for the next days.

Cruise Summary

The first and last days of the cruise, bad weather prevented the departure from the Nice harbour. So, only the second day was used for BOUSSOLE and DYFAMED operations, which included a deep CTD cast and

zooplankton nets at the DYFAMED site, diving operations on the BOUSSOLE buoy, downloading of buoy data and fluorimeter data, optical profiles, a CTD cast with water sampling and a Secchi disk at the BOUSSOLE site.

Monday 6 February 2017

Bad weather prevented departure from the Nice harbour.

Tuesday 07 February 2017

The sea state was slight with a gentle breeze. The sky was overcast and the visibility was good. It was decided to perform the MOOSE program first because the weather forecasts were better in the afternoon than in the morning, and the diving operations at BOUSSOLE required good conditions of weather. Firstly, 1 deep CTD cast and 3 zooplankton profiles were performed at the DYFAMED site. When arrived at the BOUSSOLE site on the afternoon, divers went at sea to remove the fluorimeter, to clean the sensors, to perform dark measurements of the transmissometers and backscattering meter, and to take pictures. In the meantime, surface sensors of the buoy, solar panels and the ARGOS connector were cleaned. One of the solar panel was broken and the acquisition system of the buoy was stopped because of a lack of energy. So the system was rebooted with the AK connector and data were retrieved using the cable available on the top of the buoy. The fluorimeter was brought on board of the *Téthys II*, the data were downloaded on board and the batteries were changed. It was then reinstalled on the buoy at the same location (9 m depth) during a second dive. Then, 3 C-OPS profiles, 1 CTD cast with water sampling and a Secchi disk were performed at the BOUSSOLE site before returning to the Nice harbour.

Wednesday 08 February 2017

Bad weather prevented departure from the Nice harbour.

Pictures taken during this cruise can be found at:
https://get.google.com/albumarchive/114686870380724925974/album/AF1QipOQxlNN8-QahE3rDU3q8UZTefbtCBCTs5CkmQ4U

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 2017 (UTC)

Bad weather prevented departure from the Nice harbour.

Tuesday 07 February 2017 (UTC)

People on board: Gaetan Dalla Vedova, Emilie Diamond, Bastien Gaucher (diver), Melek Golbol, David Luquet, Juliette Maury and Didier Robin.

0600 Departure from the Nice harbour.
0855 Arrival at the DYFAMED site.
0900 Deep CTD cast (MOOSE).
1050 Zooplankton nets x 3 (MOOSE).
1120 Departure from the DYFAMED site.
1200 Arrival at the BOUSSOLE site.
Lunch and water sampling for DYFAMED program.
1310 Diving operations: remove of the fluorimeter, cleaning, dark measurements, pictures.
1340 Cleaning, data downloading and battery changing of the fluorimeter.
1345 Cleaning of surface sensors, solar panels and ARGOS connector.
1405 Connection with the buoy and data retrieval (with AK connector).
1530 Diving operation: reinstallation of the fluorimeter at 9m depth (switch ON at 15:00).
1555 COPS 01, 02, 03.

1640 CTD 01, 400 m with water sampling at 200, 150, 80, 70, 50, 40, 30, 20, 10 and 5 m for HPLC and a_p, TSM, TA/TC, O_2 and cytometry.
1650 Secchi 01, 11 m.
1710 Departure to the Nice harbour.
2015 Arrival at the Nice harbour.

Wednesday 08 February 2017 (UTC)

Bad weather prevented departure from the Nice harbour.

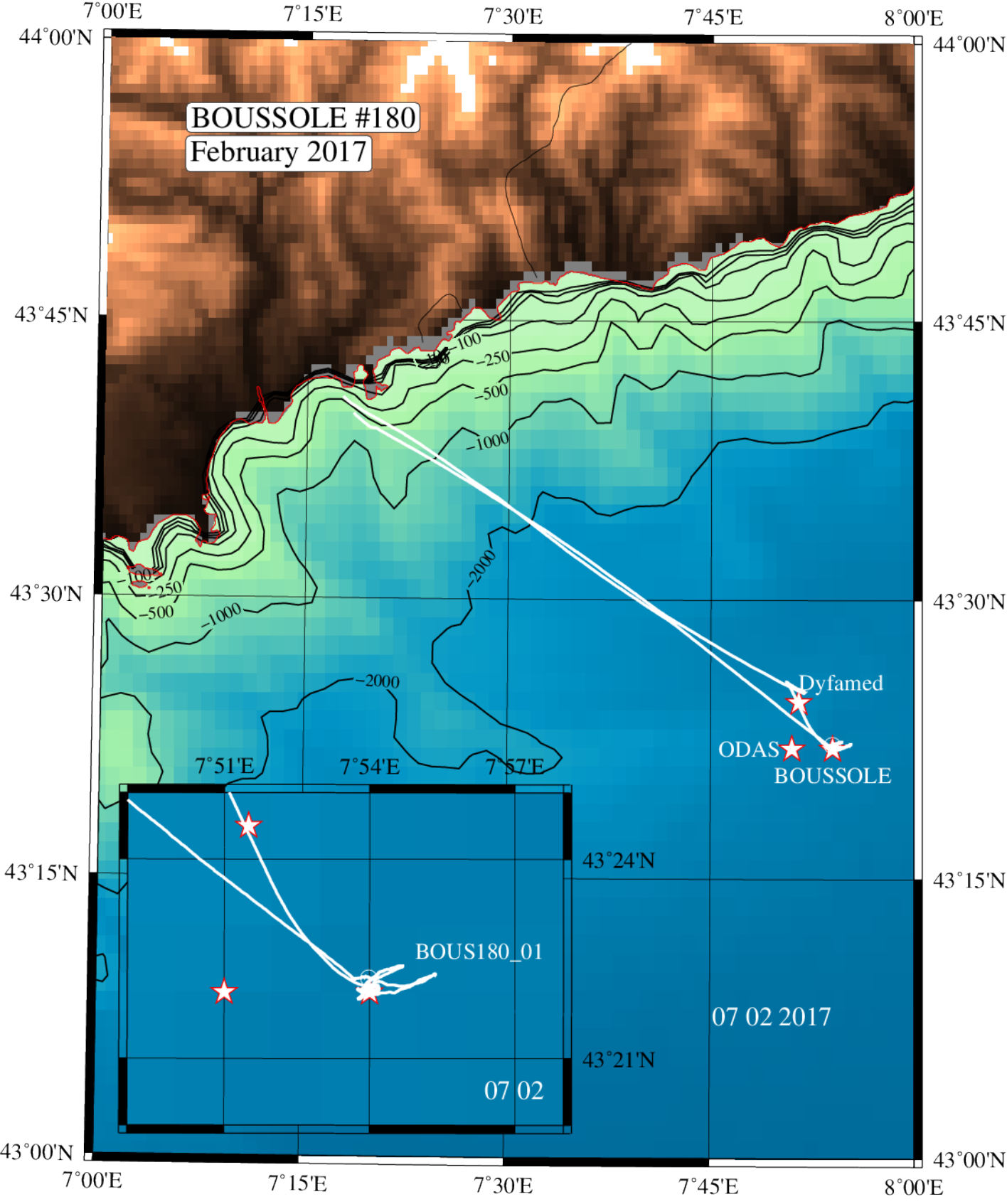
Problems identified during the cruise

- The IOP package was not available for this cruise.
- One of the solar panels of the buoy was broken.
- The C-OPS commonly used on the BOUSSOLE missions was still under calibration at *Biospherical*. The C-OPS used for this cruise was the one shared among the marine optics and remote sensing group at LOV. The instrument is similar to the BOUSSOLE one, yet has a L_u sensor instead of a E_u one**.**
- Changing the batteries of the fluorimeter took a long time because the nylon wire that seals the sensor was twisted, and it was difficult to reinsert it in the sensor.
- Because of a lack of time, only 1 CTD cast was performed with water sampling at 10 depths unlike the usual 12 depths. The C-OPS profiles and the Secchi disk were performed late during the afternoon when the sun was low in the sky.

Appendices

Cruise Summary Table for Boussole 180

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
06/02/17	Bad weather																								
07/02/17		bou_c-ops_170207_1530_001_data.csv			15:52	3:55	94	43	22.185	7	54.042	overcast	Sc	7	7	154	1013.0	74	good	13.3		moved	1		no
		bou_c-ops_170207_1530_002_data.csv			16:03	3:51	95	43	22.290	7	54.194	overcast	Sc	7	7	154	1013.0	74	good	13.3		moved	1		no
		bou_c-ops_170207_1530_003_data.csv			16:13	3:31	92	43	22.344	7	54.413	overcast	Sc	7	7	154	1013.0	74	good	13.3		moved	1		no
			BOUS180_01	HPLC & Ap , TSM, TA/TC, O2 & Cyto	16:37	31:00	400	43	22.220	7	53.977	cloudy		6	8	208	1013.1	68		15.5	13.45	moved			no
				Secchi01	16:50	4:00	11	43	22	7	54	cloudy		6					good			moved			
08/02/17	Bad weather																								



GMT 2017 Jun 02 12:17:07

bous180_01

Date = 07/02/2017
Heure debut [TU] = 16:37
Longitude = 007 53.98 E
Latitude = 43 22.21 N