BOUSSOLE Monthly Cruise Report

Cruise 175
September 14-16, 2016

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

Science Personnel: Agnieszka Bialek, Laure Cailloce (journalist), Guillaume De Liège, Emilie Diamond, Melek Golbol, David Luquet, Didier Robin and Eduardo Soto Garcia.

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The BOUSSOLE buoy hyperspectral radiometer measuring *Lu* at 4 m depth, during the diving operations.

BOUSSOLE project

ESA/ESRIN contract N° 4000111801/14/I-NB

September 28, 2016

Foreword

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

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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). 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 (5m and 10m) 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 pCO2 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 was collected at 10 m depth, in the frame of a collaboration with Collin Roesler (Bowdoin College, Maine, USA) concerning the installation of an ECO 3X1M fluorimeter on the BOUSSOLE buoy at 9 m depth.
This fluorimeter sensor was recovered by the divers in order to download the data. It was then reinstalled at the same location.
The divers installed the ARGOS beacon on the new lower superstructure of the buoy, at 20 m depth next to the sphere. It was removed from the buoy structure during the June cruise in order to change the battery and to reinstall it on the new structure after the rotation of the mooring, which occurred at the end of August.
The light beacon located at the top of the buoy, which signals the buoy at night, was flooded. It was replaced with a new one during the surface maintenance operations.

Cruise Summary

The first day programmed for the MOOSE DYFAMED cruise was also used for BOUSSOLE diving operations because the weather forecasts were not favorable for the next days. This day was also used to perform maintenance

operations on the top of the buoy. The second day, bad weather prevented departure from the Nice harbour. The last day was used to perform optical profile and CTD casts with water sampling at the BOUSSOLE site.

Wednesday 14 September 2016

The sea state was smooth with a light breeze. The sky was cloudy and the visibility was medium. When arrived at the BOUSSOLE site, divers went at sea to reinstall the emergency ARGOS beacon located next to the sphere at 20 m depth. The 3X1M-004 fluorimeter located at 9 m depth was removed and brought on board of the dinghy by the divers. Then, it was reinstalled at the same location after downloading the data. The divers also cleaned the sensors and performed dark measurements of the transmissiometers and backscattering meter and took pictures. In the meantime, the light beacon located at the top of the buoy was replaced. Then data were retrieved directly using the cable available on the top of the buoy and with the AK connector.
A Secchi disk was performed before the departure to the DYFAMED site in order to complete the MOOSE program with a deep CTD cast and zooplankton nets.

Thursday 15 September 2016

Bad weather prevented departure from the Nice harbour.

Friday 16 September 2016

The sea state smooth with a light breeze. The sky was blue and cloudy and the visibility was good. Firstly 1 C-OPS profile was performed at the BOUSSOLE site. The C-OPS profile had to be stopped at 50 m because clouds appeared on the sky and the irradiance became unstable. Thereafter, it was not possible to do other profiles. Then 2 CTD casts were performed with water sampling at the BOUSSOLE site, the second one was performed with a 0.2 µm filter on the a-Sphere absorption meter and with a cap on the backscattering meter.

Pictures taken during this cruise can be found at:
https://get.google.com/albumarchive/114686870380724925974/album/AF1QipM3GoJk-rL1M1YE4ZykSs0Nf8u0cRnXSExaKR7Q

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

Cruise Report

Wednesday 14 September 2016 (UTC)

People on board: Laure Cailloce, Guillaume De Liège, Emilie Diamond, Melek Golbol, David Luquet, Didier Robin and Eduardo Soto Garcia.

0610	Departure from the Nice harbour.
0915	Arrival at the BOUSSOLE site.
0925	Diving operations: installation of the ARGOS beacon, remove of the fluorimeter, cleaning, dark measurements, pictures. Fluorimeter data retrieval and reinstallation of the fluorimeter on the buoy. Connection with the buoy (AK connector) and data retrieval.
0945	Secchi 01, 18m.
1050	End of diving operations.
1100	Departure to the DYFAMED site.
1200	Deep CTD cast (MOOSE), 2350m.
1355	Zooplancton nets (MOOSE).
1430	Departure to the Nice harbour.
1730	Arrival at the Nice harbour.

Thursday 15 September 2016 (UTC)

Bad weather prevented departure from the Nice harbour.

Friday 16 September 2016 (UTC)

People on board: Agnieszka Bialek, Melek Golbol and Eduardo Soto Garcia.

0500 Departure from the Nice harbour.
0815 Arrival at the BOUSSOLE site.
0825 C-OPS 01.
0855 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.
1010 CTD 02, 400 m with water sampling at 10 and 5 m for TSM, TA/TC, O_2 and cytometry (with 0.2 µm filter on a-Sphere and cap on HS-6).
1100 Departure to the Nice harbour.
1415 Arrival at the Nice harbour.

Problems identified during the cruise

- The last day, only 1 C-OPS profile was performed because the sky conditions were not optimal (many clouds and unstable sky). This profile was stopped at 50 m because clouds appeared during the profile and the irradiance became unstable.

- The last day, during the CTD 02 cast, the IOP data were not recorded because the data logger was not switched on before deployment.

- The filtration of HPLC, a_p took a long time. It was probably due to a leak on the filtration system. The system will be checked on the lab.

- The Thermosalinograph of the R/V *Téthys II* was not operational for this cruise.

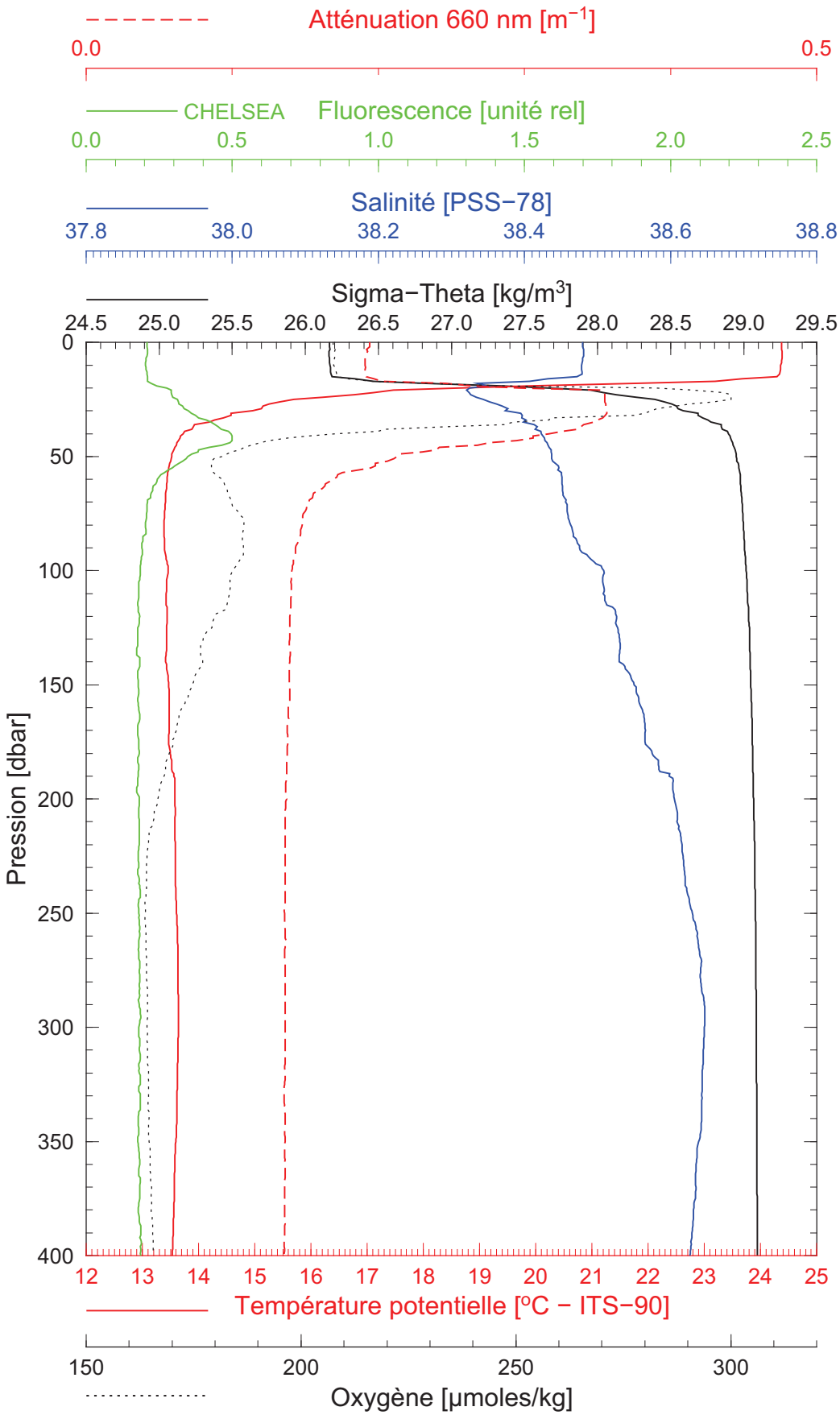
Appendices

Cruise Summary Table for Boussole 175

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
14/09/16				Secchi01	09:45	4:00	18	43	22	7	54	cloudy		4					good			calm			
15/09/16	Bad weather																								
16/09/16		bou_c-ops_160916_0801_001_data.csv			08:25	3:45	40	43	22.123	7	53.815	cloudy	Sc/Cu	4	6	28	1014.4	64	good	23.5		calm	0.5		no
			CTDBOUS001	HPLC & Ap	08:55	26:00	400	43	22.079	7	53.861	cloudy		4	NA	NA	1014.7	65		23.1	24.40	calm			
			CTDBOUS002	TSM, TA/TC, O_2 & Cyto	10:10	20:00	400	43	22.253	7	53.962	cloudy		4	NA	NA	1014.6	63		22.9	24.30	calm			

BOUSSOLE 175 **16/09/2016** **BOUS160916_01**

BOUS001

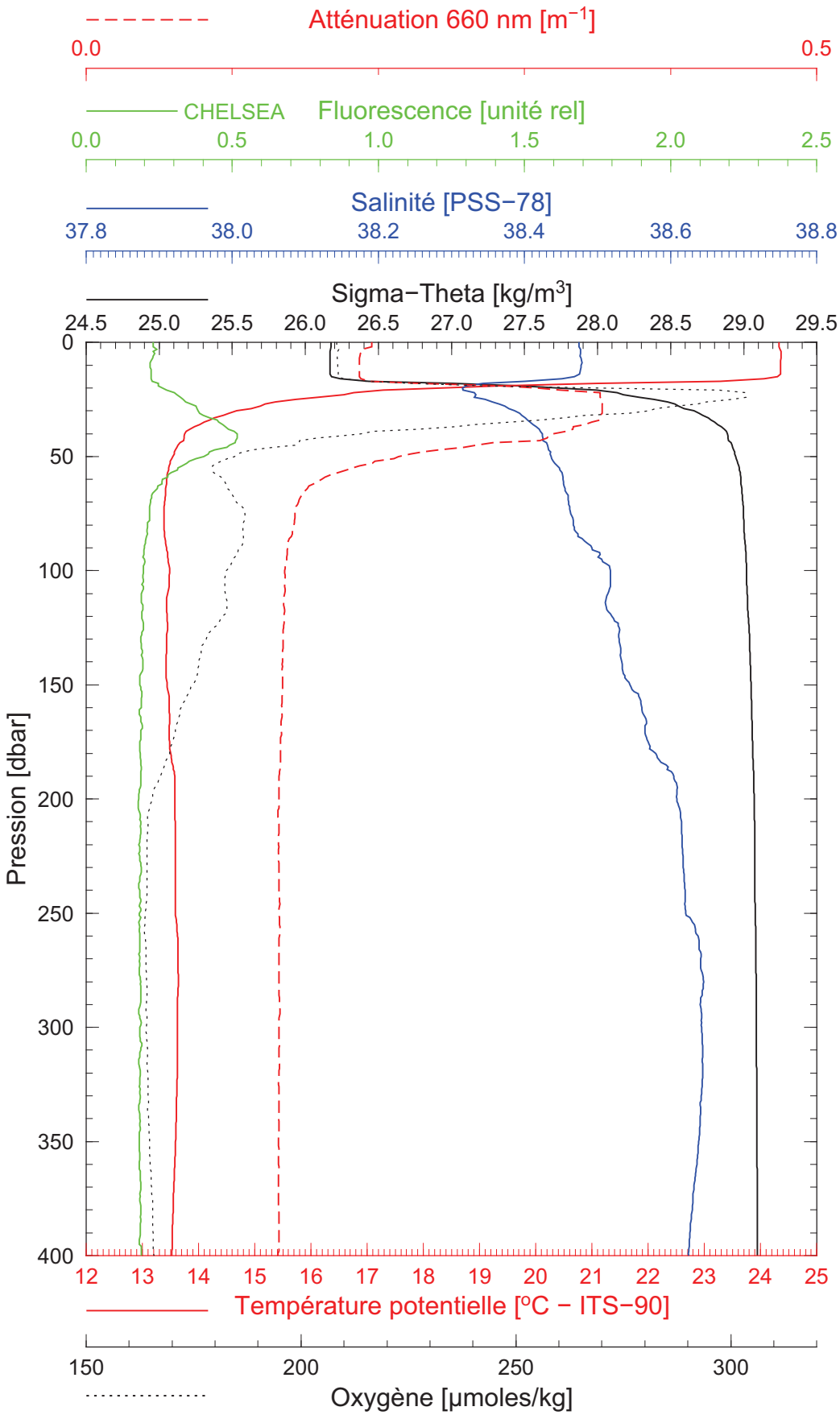


Date *16/09/2016* *Latitude* *43°22.079 N*

Heure déb *08h 55min [TU]* *Longitude* *07°53.861 E*

BOUSSOLE 175 **16/09/2016** **BOUS160916_02**

BOUS002



Date *16/09/2016* *Latitude* *43°22.253 N*

Heure déb *10h 10min [TU]* *Longitude* *07°53.962 E*