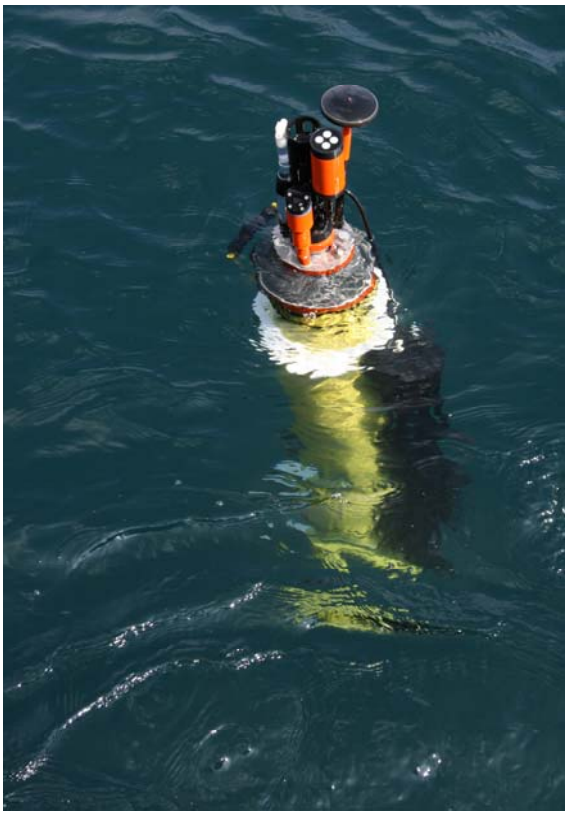
BOUSSOLE Monthly Cruise Report

Cruise 109
March 25 - 29, 2011

Duty Chief: Emilie Diamond (diamond@obs-vlfr.fr)
Vessel: R/V Téthys II
(Captain: Joël Perrot)

Science Personnel: Emilie Diamond, Gregory Gerbi, Malika Kheireddine, Yves Lamblard, Grigor Obolensky, Emmanuel and Pierre (divers).

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



The deployment of the bio-optical profiling float of Emmanuel Boss from the University of Maine, USA.

The beginning of a CTD cast with water sampling in the vicinity of the BOUSSOLE buoy.

BOUSSOLE project

ESA/ESRIN contract N° 13226/10/I-NB

April 18, 2011

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

National Aeronautics and Space Administration, USA

Centre National de la Recherche Scientifique, France

Université Pierre & Marie Curie, France

Observatoire Océanologique de Villefranche/mer, France

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Cruise Objectives

Routine operations

Multiple SPMR (SeaWiFS Profiling Multichannel Radiometer) profiles are to occur within about 3 hours of satellite overhead passes (of MERIS in particular) around solar noon, under optimal conditions: clear blue skies and flat, calm sea surface. Since April 2010, these radiometry profiles are performed with a Biospherical's C-OPS (Compact Optical Profiling System) on 0-200 m at the BOUSSOLE site. This instrument will eventually replace the SPMR/SMSR system. 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 SPMR or 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. A floating platform is to be used to support the SPMR Eu sensor approximately 20cm below the surface for up to 3 minutes of stable light field before a release mechanism triggers the release of the profiler to start a descent as normal. Multiple descents ideally will be started in this way and the data will be used to assess near-surface Eu extrapolation model calculations (this deployment mode has been used until 2007). CTD deployments are required at the start and end of the SPMR profiling day and around noon in the longer summer days or when there is a high possibility of a satellite matchup. In addition to the depth profile from the CTD, CDOM fluorometer, Chl fluorometer, AC9 (from July 2002) and Eco-BB3 (from June 2003), seawater samples are to be collected, filtered and stored in N_2 for HPLC pigment and particle absorption spectrophotometric filter analysis in the lab. Three replicates samples are to be collected at surface for total suspended matter (TSM) weighting in the lab. A gimbled PAR sensor positioned on the foredeck and operated from the CTD computer serves as a light field stability indicator during SPMR profiling (until summer of 2007).

For one day of each cruise, at the end of the optics measurements on site, there will be one CTD transect between the BOUSSOLE site and the Port of Nice. This transect consists of six fixed locations on-route from BOUSSOLE (see map in appendix). The time of day of this transect should be similar for each cruise, if possible to minimise influence of diurnal variability.

For one day of each cruise, three divers will check the underwater state of the buoy structure and instrumentation, take some pictures for archiving, clean the sensor optical surface, and then take again some pictures after cleaning. Divers will also put a neoprene cap on the HS4 and on the transmissometers for acquiring three dark measurements (started in 2009).

Further details about these operations and the 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

Gregory Gerbi, a postdoctoral researcher at the University of Maine in USA, was on board during this cruise to deploy and recover a bio-optical profiling float. The first day, two Plankton Net 0-100 m profiles were performed at the BOUSSOLE site to complete the MOOSE program. During the diving day, the LISST-100X (a multi-parameter system for in-situ observations of particle size distribution) was put back on the buoy.

Cruise Summary

All cruise days were used. The first cruise day was initially planned for MOOSE program but because of the absence of the MOOSE duty chief, this cruise day was shared with BOUSSOLE program. This day was used for cleaning the buoy head connectors, for deploying a float in the vicinity of the BOUSSOLE buoy, for optical profiles, plankton net sampling and buoy data retrieval. During the first CTD cast, the connection with the CTD cable of the *Téthys II* ship stopped. The cable was out of order and nobody from DT-INSU (Division Technique de l'Institut National des Sciences de l'Univers) could come from Toulon to repair it during the week-end so Philippe, the *Téthys II* chief engineer, and Grigor Obolensky finally repaired it. The second day was only used for recovering the float and the third day for diving operations on the buoy and repairing the CTD cable. The last days were used for optical profiles, CTD casts with water sampling and the float deployment at the BOUSSOLE site and for completing the CTD transect.

Friday 25 March 2011

The first day, the sea was smooth with a gentle breeze and the sky was overcast with a good visibility. When arrived at the BOUSSOLE site, Emilie Diamond climbed on the head of the buoy to clean ARGOS and CISCO connectors, optical sensors and solar panels. Then the bio-optical float-profiler of Emmanuel Boss and Gregory Gerbi was deployed. Then two attempts of CTD cast failed. Fuses of the CTD deck-unit blown and there was no connection with the Niskin carrousel. We immediately called DT-INSU engineers who asked us to perform several tests. In parallel, 1 Secchi disk, 2 plankton nets, 3 C-OPS and 3 SPMR profiles were performed. Only the first SPMR profile gave normal pressure data. 2 attempts of CISCO connection with the buoy failed and the third one permitted to retrieve a part of buoy data.

Saturday 26 March 2011

The second day, we went to the Station 06 to test the CTD cable with the MOOSE CTD but it still did not work. Waiting for news of people from the DT-INSU, we went further the BOUSSOLE site to recover the bio-optical float which was not profiling well. Finally nobody from the DT-INSU could come from Toulon during the week-end to repair the sea cable so we came back to Nice harbour and Philippe, the chief engineer of the *Téthys II*, and Grigor Obolensky repaired the splicing connection. But there was still a problem with the slip ring and the head engineer of the DT-INSU did not allow them to change it.

Sunday 27 March 2011

The third day, the captain decided to allowed Philippe and Grigor to repair the slip ring after the diving operations. This day, the sea was smooth with a gentle breeze, a blue sky and a good visibility. Some attempts of GSM connection on the way and in the vinicity of the buoy failed. When arrived at the BOUSSOLE site, divers went at sea to put back the LISST-100X on the buoy and to clean buoy instruments. They also put neoprene caps on the HS4 and on the transmissometers for acquiring dark measurements. Then 3 Niskin water sampling and 1 Secchi disk were performed. When arrived at the Nice harbour, the slip ring was replaced and the connection with the CTD worked well.

Monday 28 March 2011

The fourth day, we went to the Station 06 to test the CTD cable and this time the CTD worked. When arrived at the BOUSSOLE site, the sea was slightly roughened with a gentle breeze and the sky was overcast with a medium visibility. 3 C-OPS profiles and 1 CTD cast with water sampling were performed. Then the profiling float was deployed and immediately recovered because it did not sink as expected. We had to come back earlier this day because of a raging toothache of a member of the crew.

Tuesday 29 March 2011

The last day, the sea was smooth with a gentle breeze, a blue sky and a good visibility. When on site, the profiling float was deployed. Then, 1 CTD cast with water sampling, 3 C-OPS and 3 SPMR profiles, 2 sets of CIMEL measurements and the CTD transect were performed.

Cruise Report

Friday 25 March 2011 (UTC)

People on board: Emilie Diamond, Gregory Gerbi and Grigor Obolensky.

0605 Departure from the Nice harbour.
0920 Arrival at the BOUSSOLE site.
0930 Cleaning of solar panels, sensors and ARGOS and CISCO connectors on the head of the buoy.
0935 Bio-optical profiling float deployment.
0945 CTD did not work.
1010 CTD tests: unsuccessful.
1020 C-OPS 01, 02, 03.
1130 SPMR 01.
1215 CISCO connection with the buoy: unsuccessful.
1250 Secchi disk 01 (6 m).
1315 CISCO connection with the buoy: unsuccessful.

1320 2 x Plankton net, 0-100 m.
1415 CISCO connection with the buoy but incomplete data retrieval
1420 Departure to the Nice harbour.
1725 Arrival at the Nice harbour.

Saturday 26 March 2011 (UTC)

People on board: Emilie Diamond, Gregory Gerbi and Grigor Obolensky.
0700 Departure from the Nice harbour.
0730 Test with the MOOSE CTD at the station 06: unsuccessful.
0745 Departure to the last bio-optical profiling float position.
1110 Arrival at the float site.
1120 Recovery of the float.
1130 Departure to the Nice harbour.
1500 Arrival at the Nice harbour.
1600 New splicing connection of the CTD cable done over.
1800 CTD connection test on the deck: unsuccessful. Checkout of the slip ring: seemed damaged.

Sunday 27 March 2011 (UTC)

People on board: Emilie Diamond, Malika Kheireddine and 3 divers.
0510 Departure from the Nice harbour.
0825 Arrival at the BOUSSOLE site.
0830 Diving on the buoy for installing the LISST-100X and cleaning instruments. Dark HS4 and transmissometers measurements at 08:45, 09:00 and 09:15.
0845 GSM connection tests near the buoy.
0850 Niskin bottle for water sampling at 20, 10 and 5 m for HPLC, Ap and TSM.
0920 Secchi disk 02 (12 m).
0945 Departure to the Nice harbour.
1255 Arrival at the Nice harbour.
1500 Repair of the CTD cable slip ring.
1730 CTD connection test on the deck: OK.

Monday 28 March 2011 (UTC)

People on board: Emilie Diamond, Gregory Gerbi and Grigor Obolensky.
0505 Departure from the Nice harbour.
0535 Test CTD, 100m, Station 06: OK.
0845 Arrival at the BOUSSOLE site.
0850 C-OPS 04, 05, 06.
0945 CTD 01, 400 m with water sampling at 200, 150, 80, 70, 50, 40, 30, 10 and 5 m for HPLC, a_p, TSM and CDOM.
1025 Bio-optical profiling float deployment and recovery: did not work.
1050 Departure to the Nice harbour.
1350 Arrival at the Nice harbour.

Tuesday 29 March 2011 (UTC)

People on board: Emilie Diamond, Gregory Gerbi and Grigor Obolensky.
0500 Departure from the Nice harbour.
0820 Arrival at the BOUSSOLE site.
0825 Bio-optical profiling float deployment: OK.
0830 CTD 02, 400 m with water sampling at 200, 150, 80, 70, 60, 50, 40, 30, 20, 10 and 5 m for HPLC, a_p and TSM.
0845 CIMEL 01: incomplete.
0915 C-OPS 07, 08, 09.
0955 SPMR 04, 05, 06.
1035 CIMEL 02, 03.
1100 Departure to the first transect station.
1130 CTD 03, 400 m, station 01 (43°25’N 07°48’E).
1220 CTD 04, 400 m, station 02 (43°28’N 07°42’E).

1315 CTD 05, 400 m, station 03 (43°31'N 07°37'E).
1405 CTD 06, 400 m, station 04 (43°34'N 07°31'E).
1505 CTD 07, 400 m, station 05 (43°37'N 07°25'E).
1555 CTD 08, 400 m, station 06 (43°39'N 07°21'E).
1625 Departure to the Nice harbour.
1650 Arrival at the Nice harbour.

Problems identified during the cruise

- At the beginning of the cruise, the CTD cable of *Téthys II* was out of order and was repaired by stages. Two afternoons were lost for repairing firstly the splicing connection and secondly the slip ring.
- We came back earlier to the Nice harbor: the 25th for testing the CTD;
  the 26th for repairing the splicing connection;
  the 27th for repairing the slip ring;
  the 28th because of a raging toothache of a member of the crew.
- The ARGOS beacon on the head of the buoy stopped to transmit data from the 7th of March so its connector has been cleaned the first day of the cruise
- The buoy data retrieval was incomplete because of a corrupted file.
- The first day, only the first SPMR profile gave normal pressure data.
- Between Saturday 26th and Sunday 27th, we changed over to Daylight Saving Time but the AC9 stay at the winter time. So there is a different of one hour between the CTD and the AC9 files.

Calculated Swath paths for the MERIS Sensor (Esov NG Software)

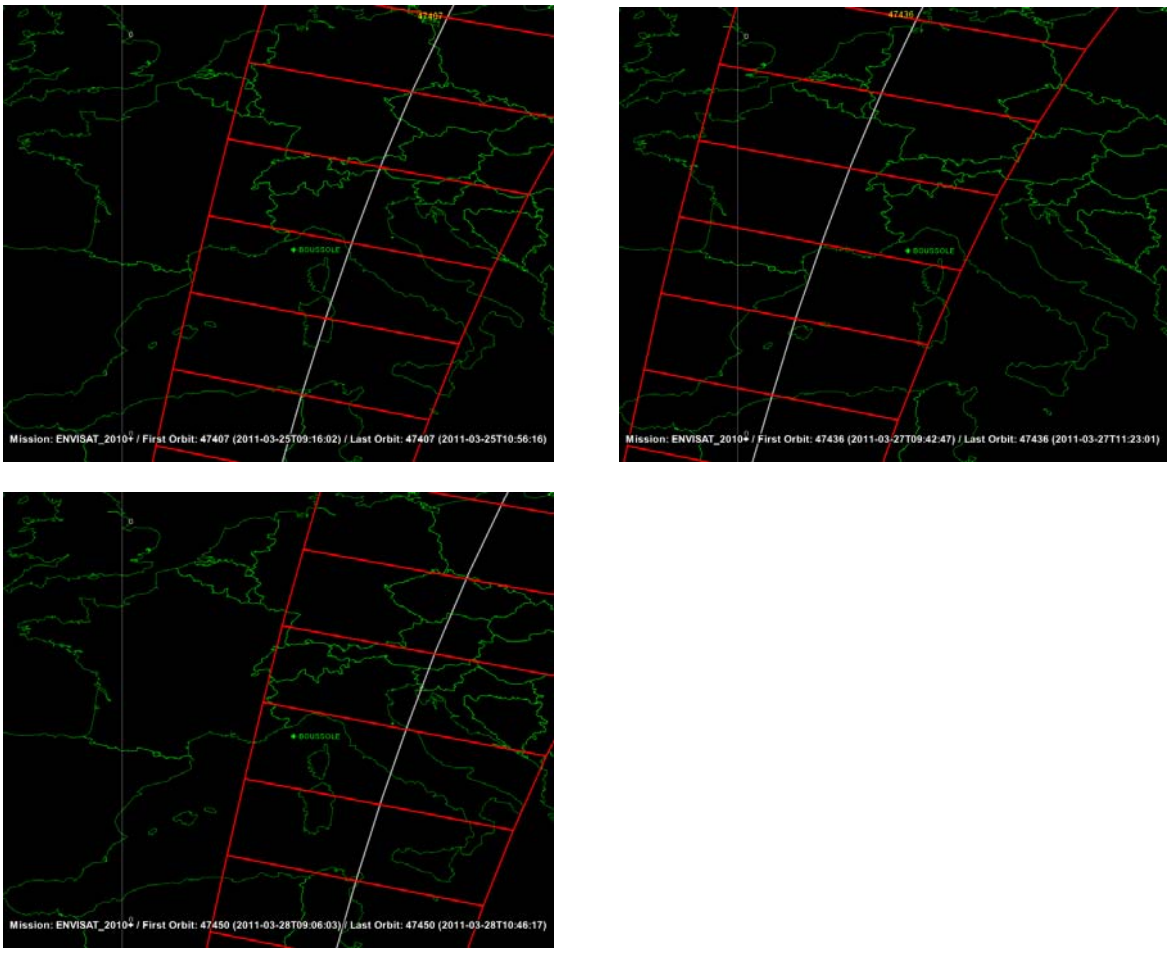
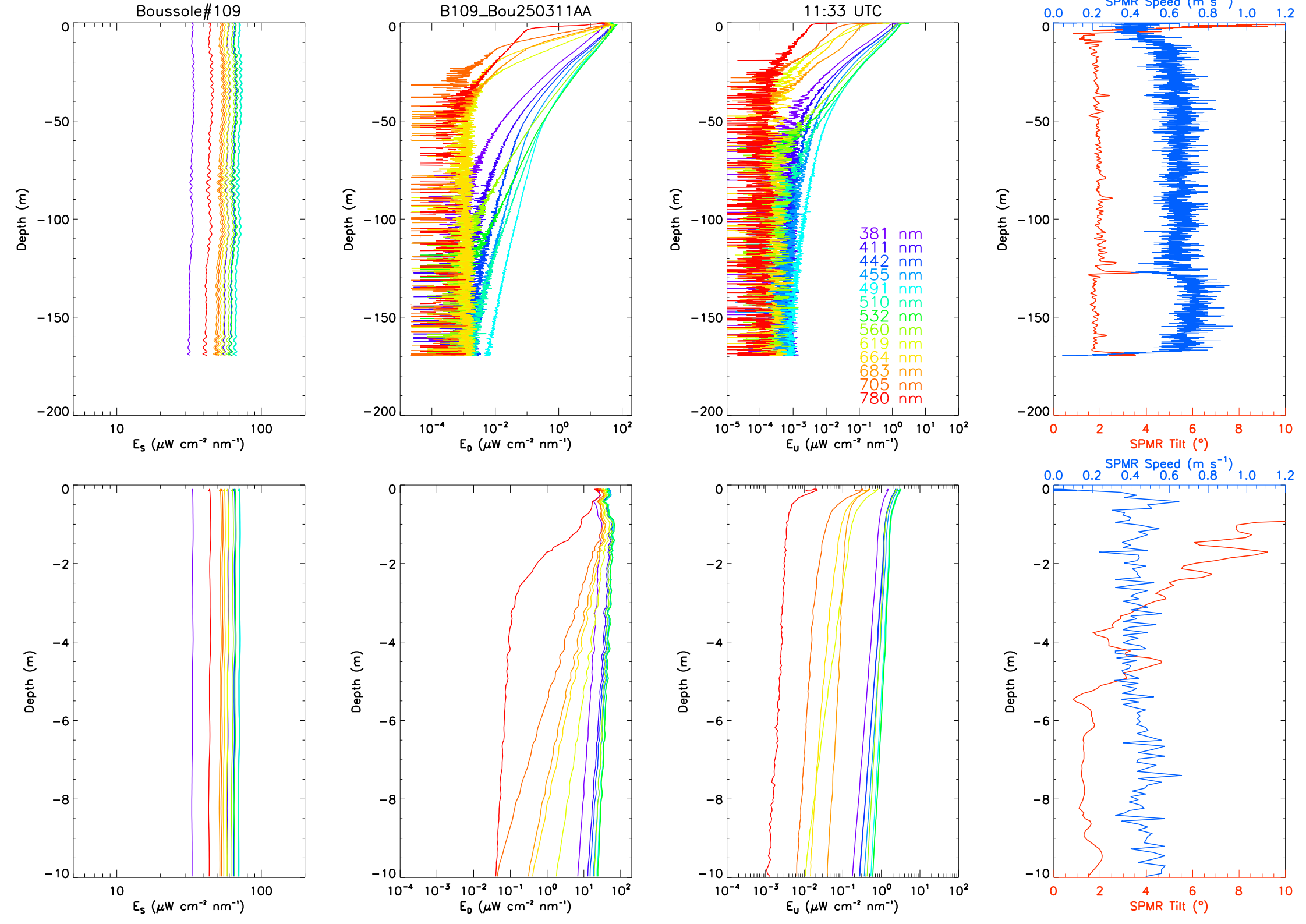


Figure 1. Calculated swath paths for MERIS (Esov NG software) above the BOUSSOLE site for the 25th, 27th and 28th of March 2011.

Appendices

Cruise Summary Table for Boussole 109

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")	satellite overpass		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
	bou_c-ops_110325_1029_001_data				10:30	1:20																			
		bou_c-ops_110325_1029_002_data			10:39	3:08	54.7	43	22.189	7	53.850	overcast	As&Cu	6	10	257	1025.5	83	good	12.9		calm	0.5		no
		bou_c-ops_110325_1029_004_data			10:59	3:58	70	43	22.413	7	53.761	overcast	As&Cu	6	10	257	1025.5	83	good	12.9		calm	0.5		no
		bou_c-ops_110325_1029_005_data			11:12	3:20	59.2	43	22.478	7	53.626	overcast	As&Cu	6	10	257	1025.5	83	good	12.9		calm	0.5		no
25/03/11	bou_c-ops_110325_1029_009_data				12:09	2:14																			
	Bou250311black1				10:25	3:00																			
		Bou250311AA			11:33	4:32	169.5	43	22.216	7	53.887	overcast	As&Cu	7	13	262	1025.1	84	good	13.0		calm	0.5		no
	Bou250311black2				12:11	2:00																			
				Secchi01	12:50	3:00	6	43	22	7	54	overcast		7					good			calm			no
26/03/11	Emmanuel Boss' float recovery																								
27/03/11			Niskin01	HPLC, Ap & TSM	08:50	20:00	20	43	22	7	54	overcast		5			1017.2	89	good	12.8	13.3	calm			no
				Secchi02	09:20	3:00	12	43	22	7	54	blue		4					good			calm			no
	bou_c-ops_110328_0830_001_data.csv				08:50	1:29																			
		bou_c-ops_110328_0830_002_data.csv			08:59	5:19	101.8	43	21.857	7	53.725	overcast	Cb&St	8	5	262	1011.6	82	medium	12.7		calm	0.8		no
28/03/11		bou_c-ops_110328_0830_003_data.csv			09:10	4:33	85.6	43	21.695	7	53.514	overcast	Cb&St	8	5	262	1011.6	82	medium	12.7		calm	0.8		no
		bou_c-ops_110328_0830_005_data.csv			09:31	3:31	62.9	43	21.470	7	53.206	overcast	Cb&St	8	5	262	1011.6	82	medium	12.7		calm	0.8		no
	bou_c-ops_110328_0830_006_data.csv				10:00	1:43																			
			CTDBOUS001	HPLC, Ap, TSM & CDOM	09:48	32:00	400	43	21.420	7	52.976	overcast		8	9	30	1011.6	82		13.1	13.4	calm			no
			CTDBOUS002	HPLC, Ap & TSM	08:34	35:00	400	43	21.771	7	53.535	blue		1	7	68	1016.1	90		14.0	13.7	calm			no
				CIMEL01	08:47	7:00		43	21.753	7	53.422	blue		3			1016.3		good						
		bou_c-ops_110329_0836_002_data			09:21	4:18	80	43	21.889	7	53.315	blue	None	0	4	275	1016.5	83	good	14.2		calm	0.5		no
		bou_c-ops_110329_0836_003_data			09:30	3:52	69.9	43	21.784	7	53.078	blue	None	0	4	275	1016.5	83	good	14.2		calm	0.5		no
		bou_c-ops_110329_0836_004_data			09:39	3:49	70.5	43	21.666	7	52.823	blue	None	0	4	275	1016.5	83	good	14.2		calm	0.5		no
	bou_c-ops_110329_0836_008_data				10:23	1:20																			
	Bou290311black1				08:37	3:00																			
		Bou290311AA			10:00	3:42	111.5	43	21.847	7	53.318	blue	None	0	7	266	1016.7	84	good	14.0		calm	0.3		no
		Bou290311AB			10:09	3:40	120.7	43	21.801	7	53.074	blue	None	0	7	266	1016.7	84	good	14.0		calm	0.3		no
29/03/11		Bou290311AC			10:18	3:33	120.6	43	21.780	7	52.905	blue	None	0	7	266	1016.7	84	good	14.0		calm	0.3		no
	Bou290311black2				11:01	3:00																			
				CIMEL02	10:37	9:00		43	21.941	7	53.798	blue		1			1016.8		good						
				CIMEL03	10:47	9:00		43	21.935	7	53.644	blue		0			1016.8		good						
			CTDBOUS003		11:32	20:00	400	43	25.018	7	47.876	blue		1	9	30	1016.7	83		14.1	14.2	calm			no
			CTDBOUS004		12:23	25:00	400	43	28.007	7	41.856	blue		1	11	70	1016.3	83		14.2	14.6	calm			no
			CTDBOUS005		13:17	24:00	400	43	30.956	7	36.850	blue		1	4	50	1016.1	82		14.2	14.7	calm			no
			CTDBOUS006		14:11	25:00	400	43	33.950	7	31.097	blue		2	2	60	1015.8	83		14.3	14.3	calm			no
			CTDBOUS007		15:08	26:00	400	43	37.087	7	24.915	blue		3	2	30	1015.7	79		14.5	14.5	calm			no
			CTDBOUS008		15:56	25:00	400	43	39.039	7	20.905	blue		3	1	63	1015.5	81		14.5	14.1	calm			no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E_D (μW cm⁻² nm⁻¹)
E_U (μW cm⁻² nm⁻¹)
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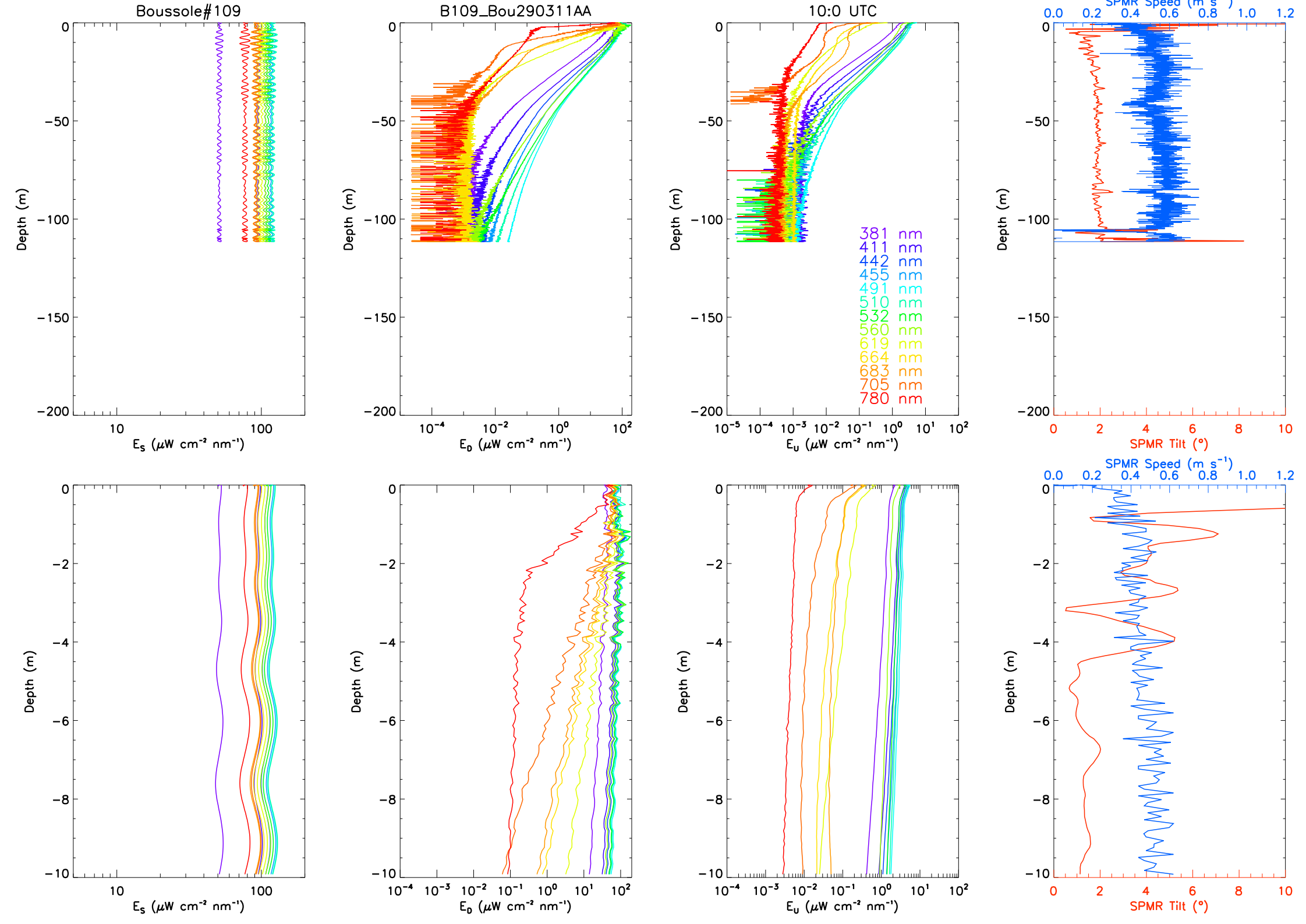
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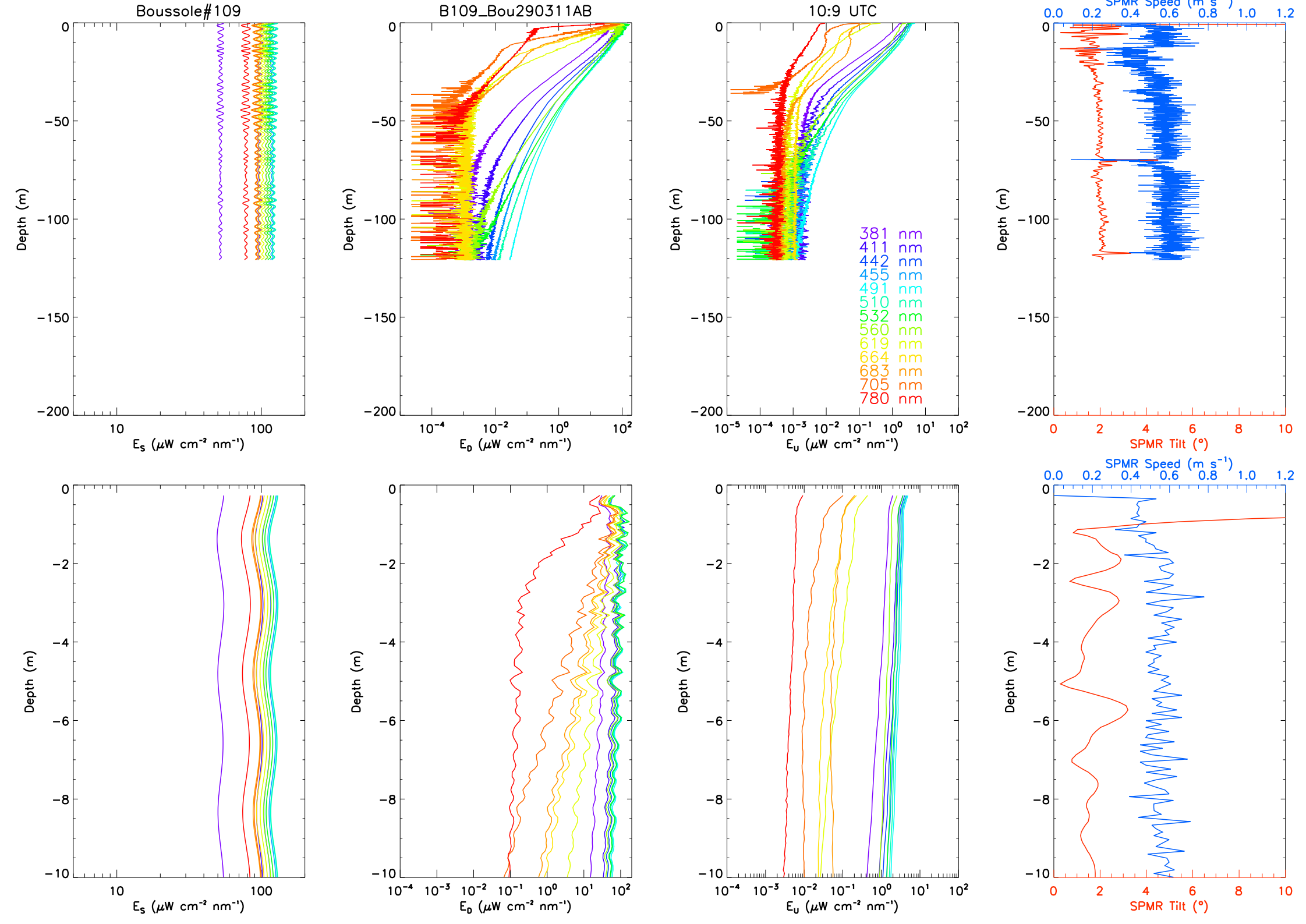
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E_S (μW cm^{-2} nm^{-1})
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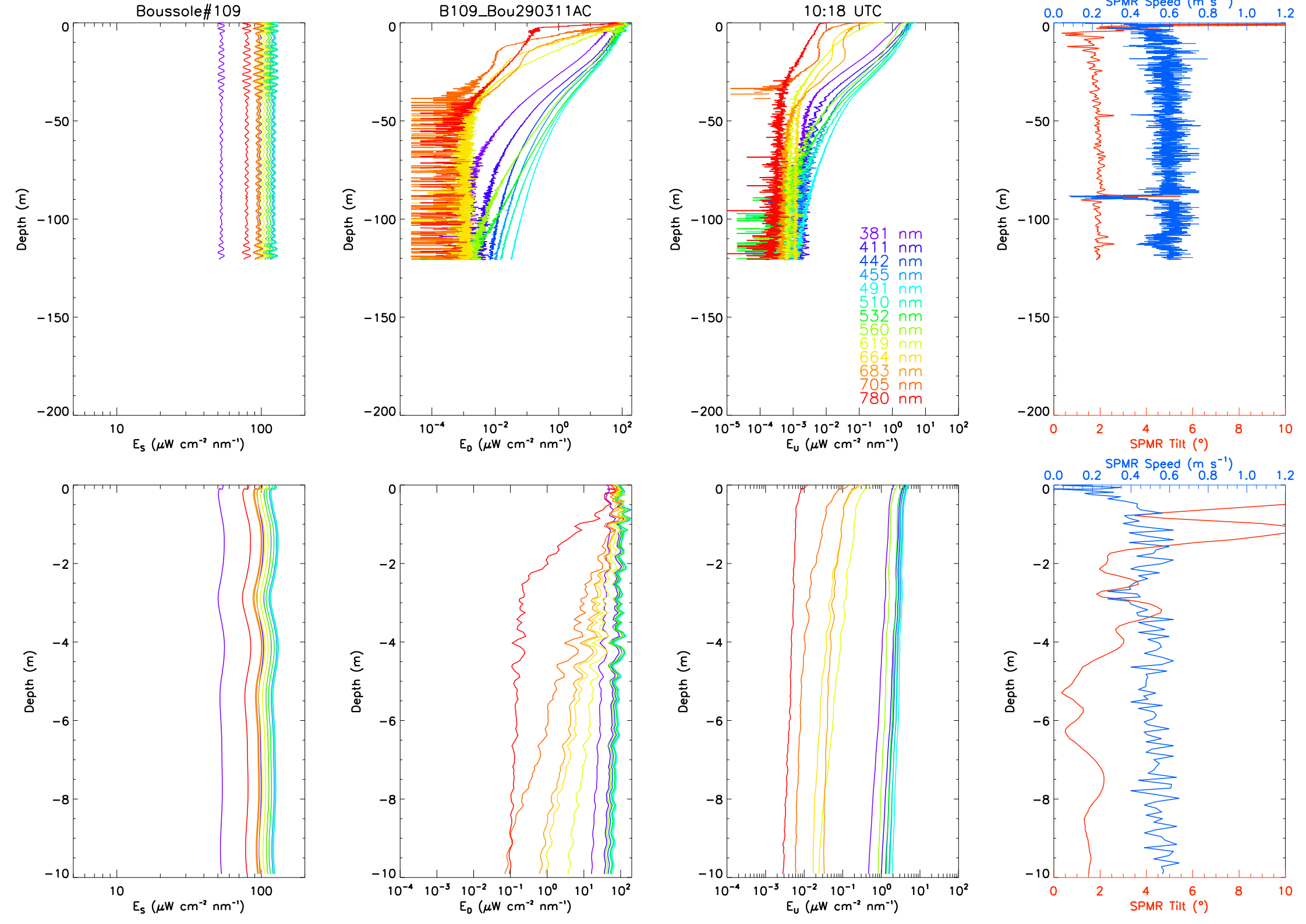
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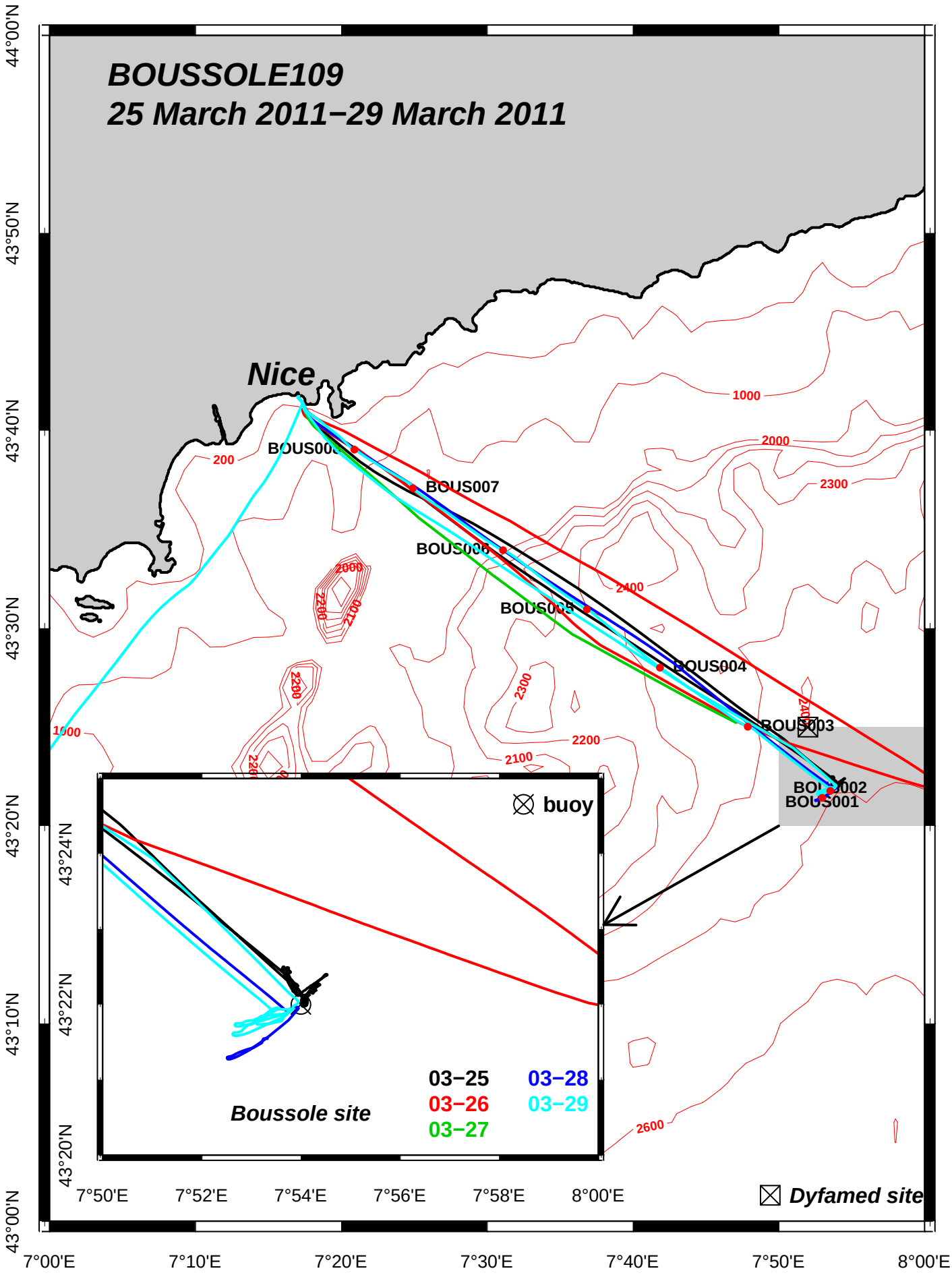
780 nm
SPMR Speed (m s^{-1})
SPMR Tilt (°)


BOUSSOLE109
25 March 2011−29 March 2011
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BOUS005
BOUS004
BOUS003
BOUS002
BOUS001
200
1000
2000
2100
2200
2300
2400
2600
buoy
Boussole site
03−25
03−26
03−27
03−28
03−29
Dyfamed site
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43°20'N
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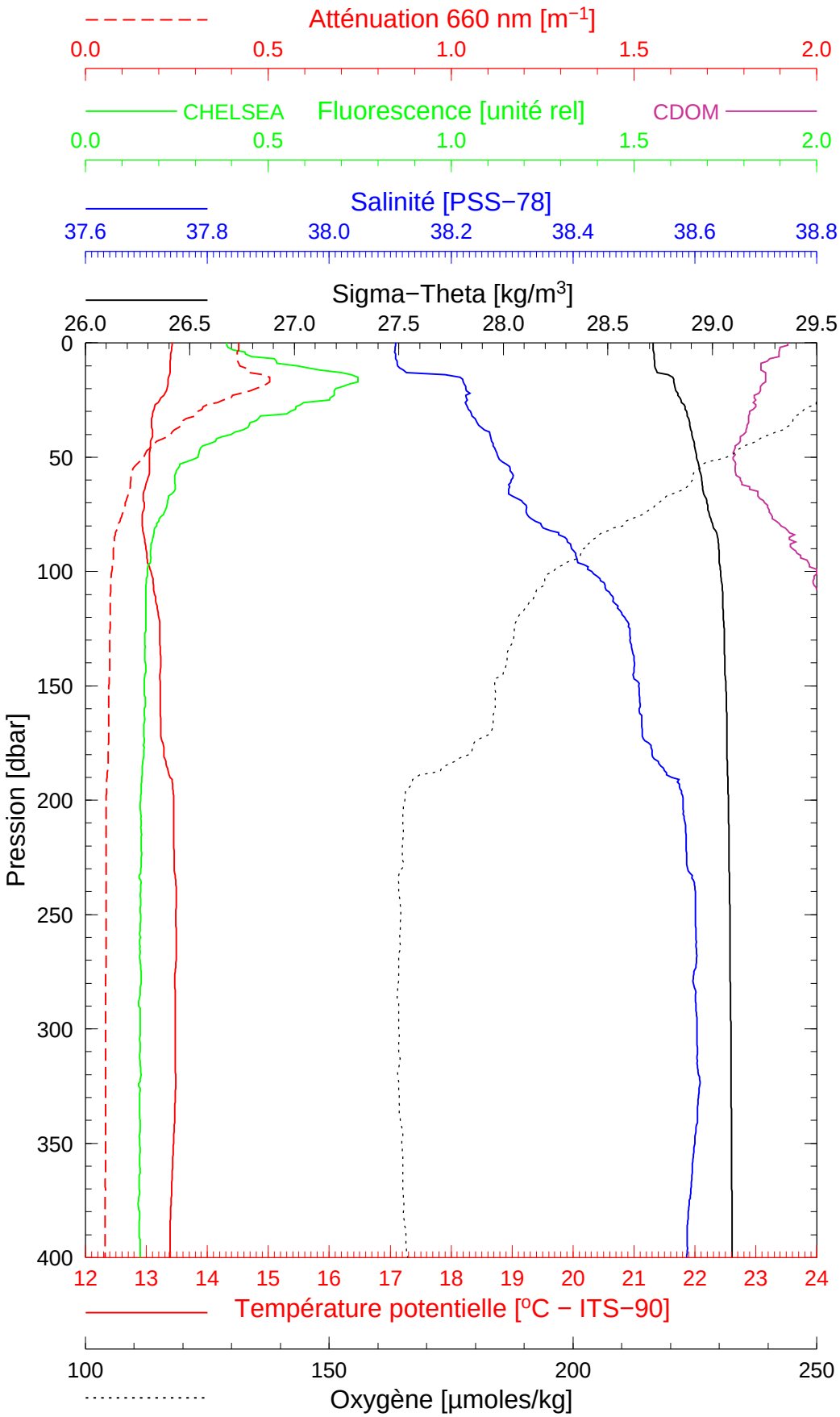
BOUSSOLE 109 **28/03/2011** **BOUS110328_01**

BOUS001



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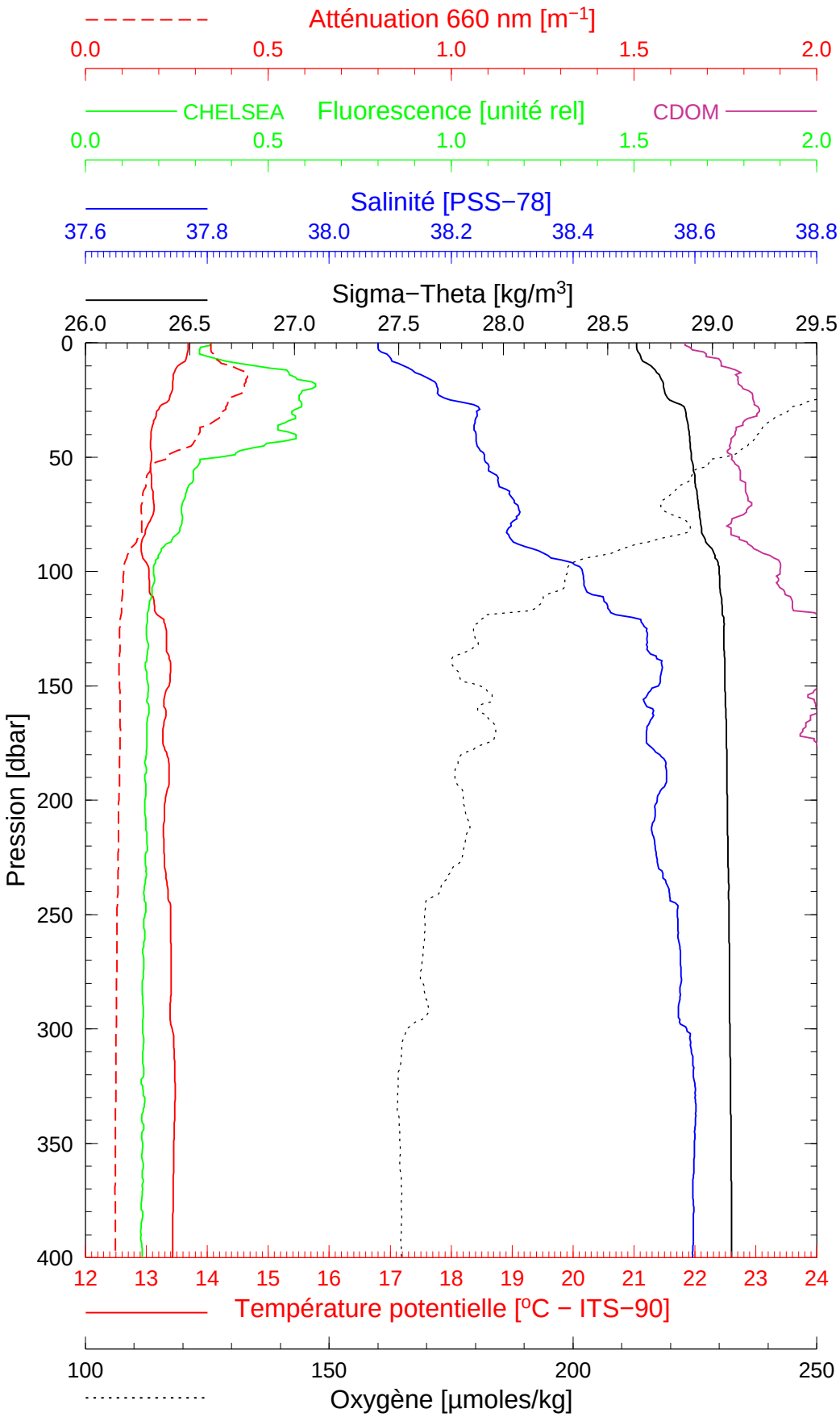
BOUS002



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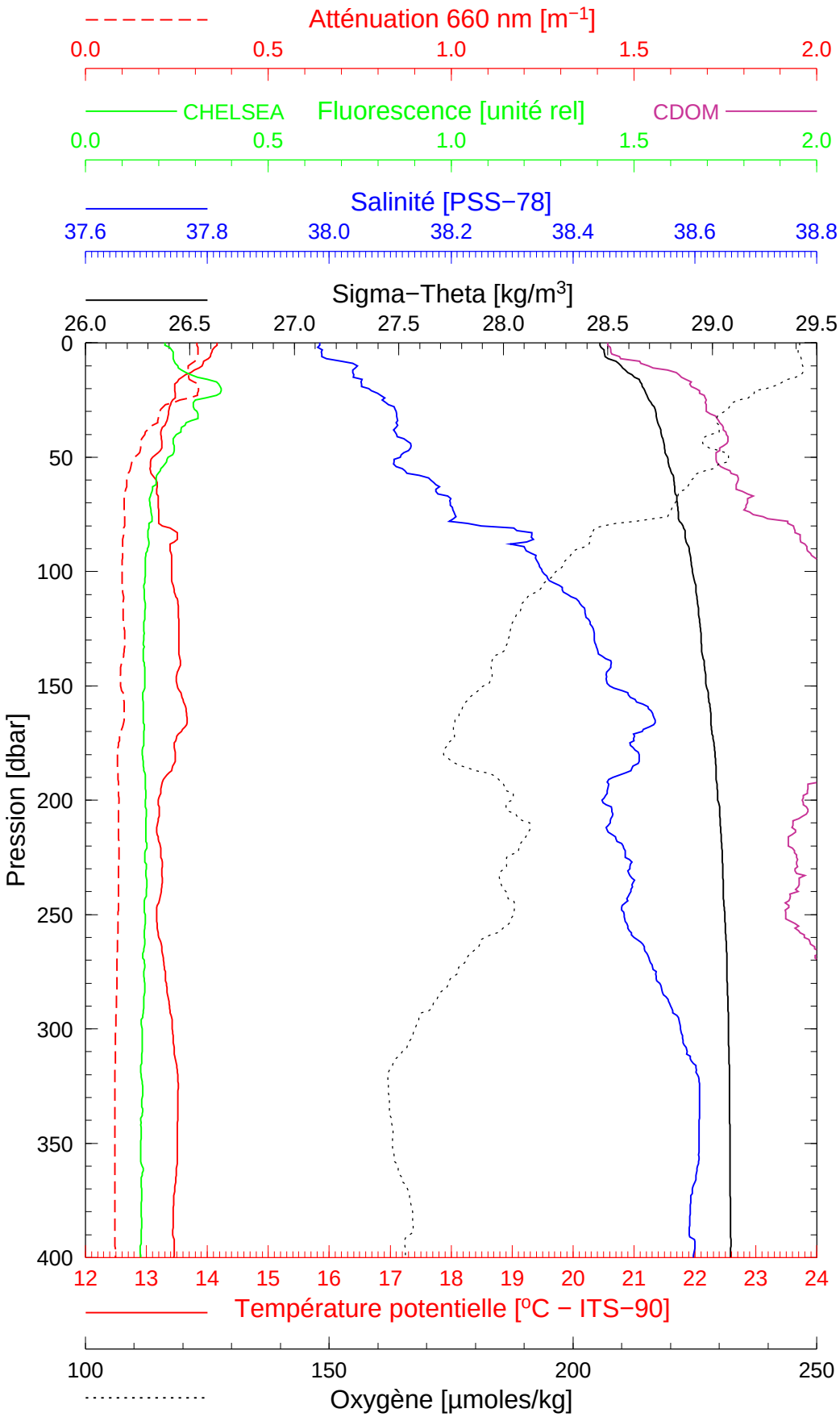
Heure déb *08h 34min [TU]* *Longitude* *07°53.535 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_02**

BOUS003

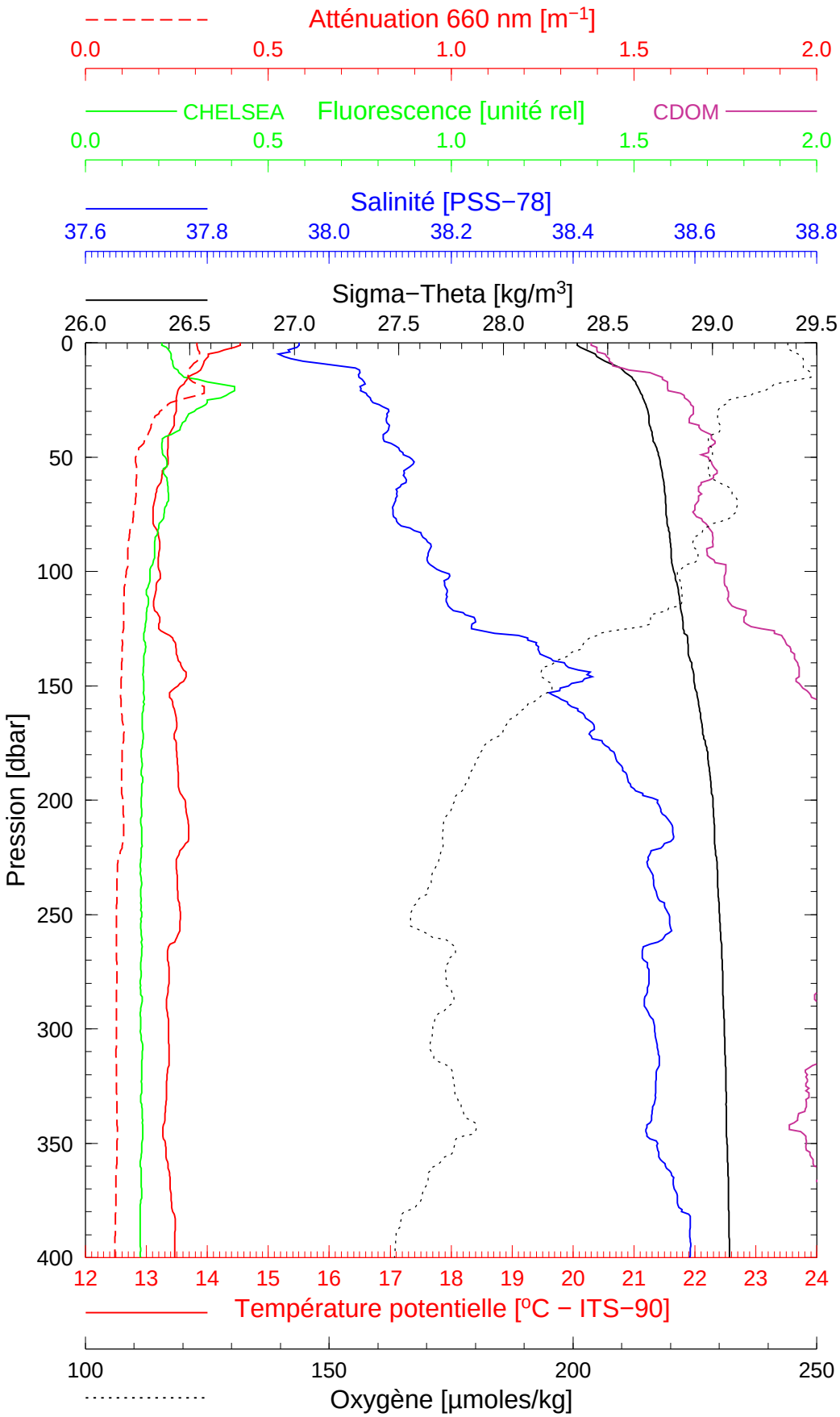


Date *29/03/2011* *Latitude* *43°25.018 N*

Heure déb *11h 32min [TU]* *Longitude* *07°47.876 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_03**

BOUS004

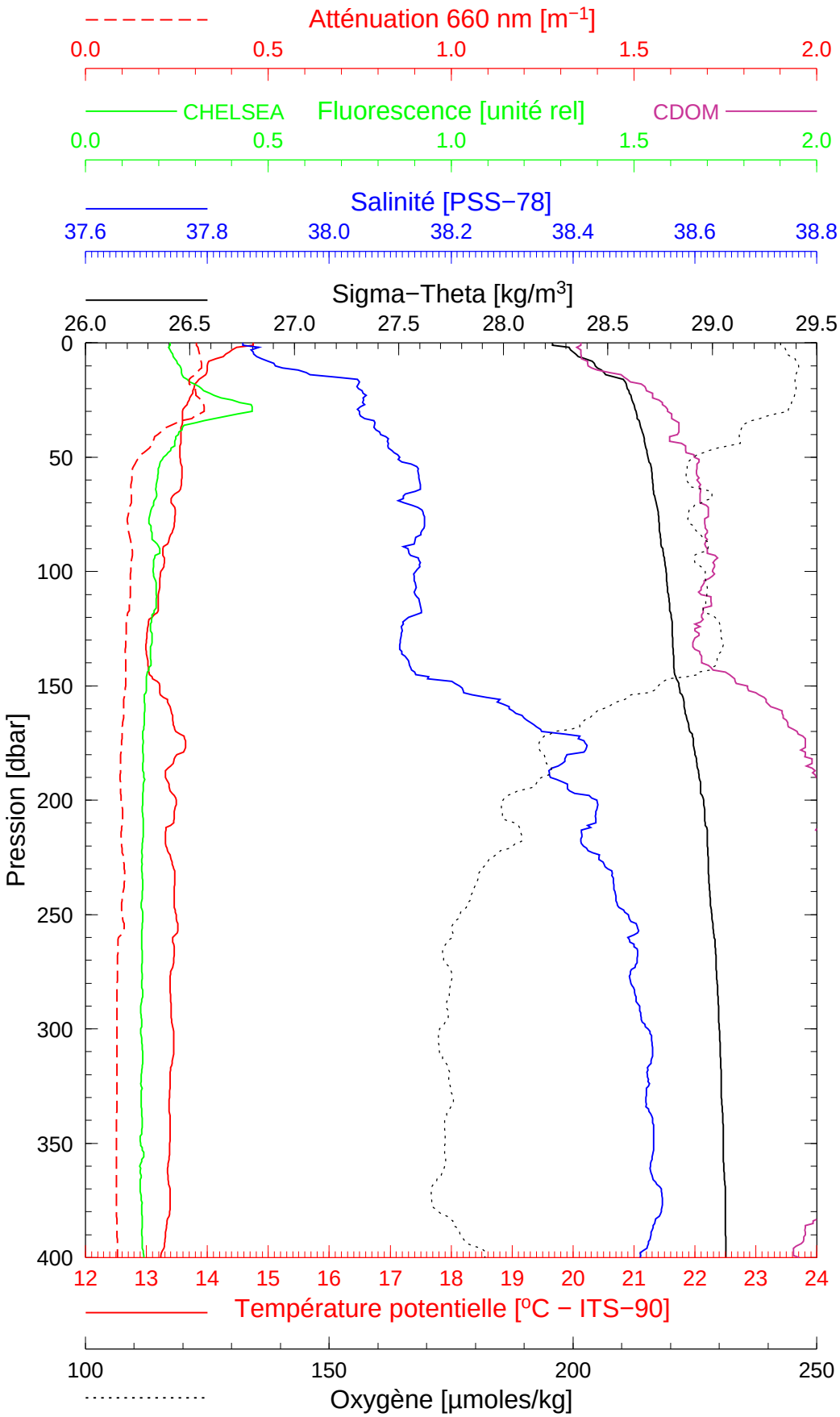


Date *29/03/2011* *Latitude* *43°28.007 N*

Heure déb *12h 23min [TU]* *Longitude* *07°41.856 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_04**

BOUS005

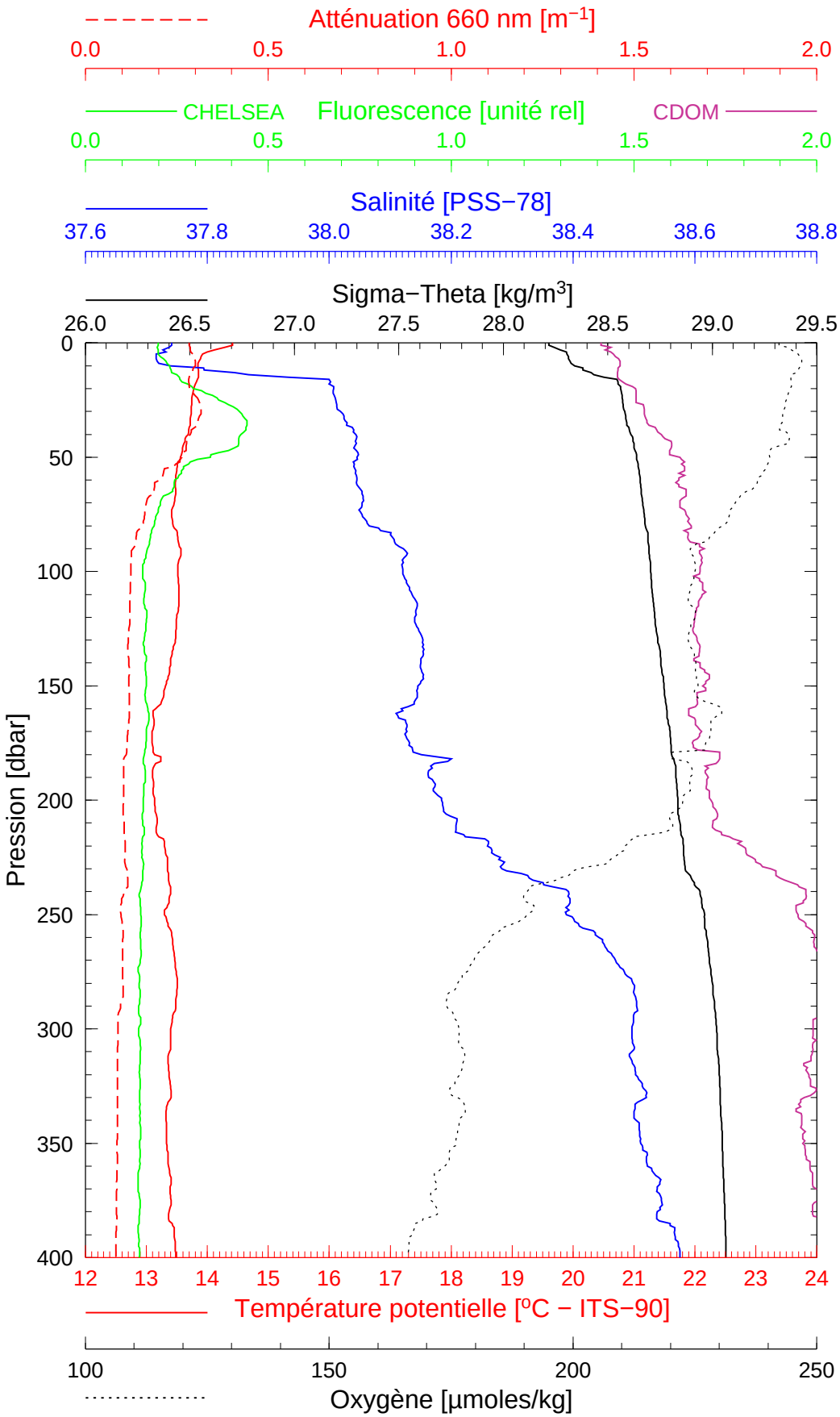


Date *29/03/2011* *Latitude* *43°30.956 N*

Heure déb *13h 17min [TU]* *Longitude* *07°36.850 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_05**

BOUS006

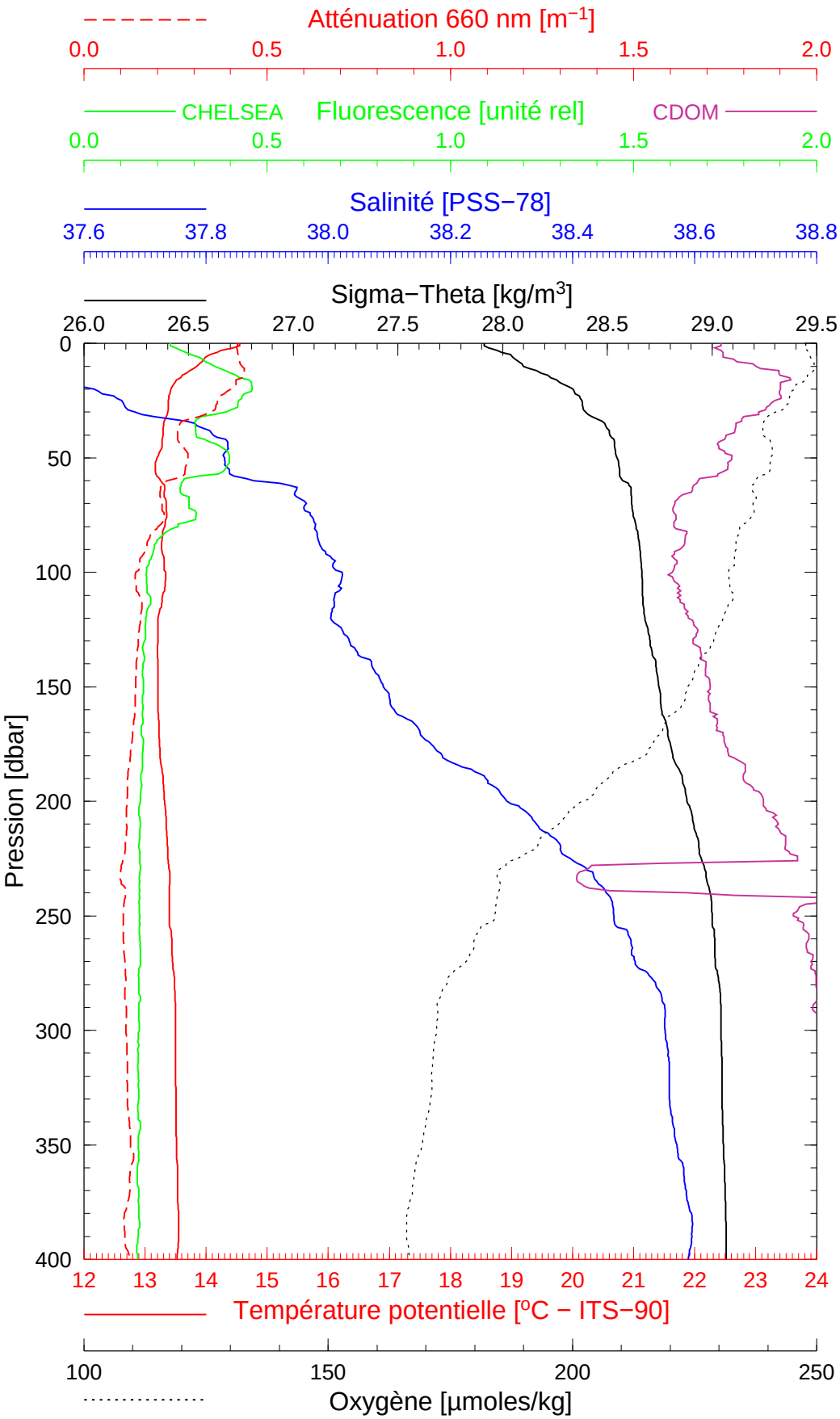


Date *29/03/2011* *Latitude* *43°33.950 N*

Heure déb *14h 11min [TU]* *Longitude* *07°31.097 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_06**

BOUS007

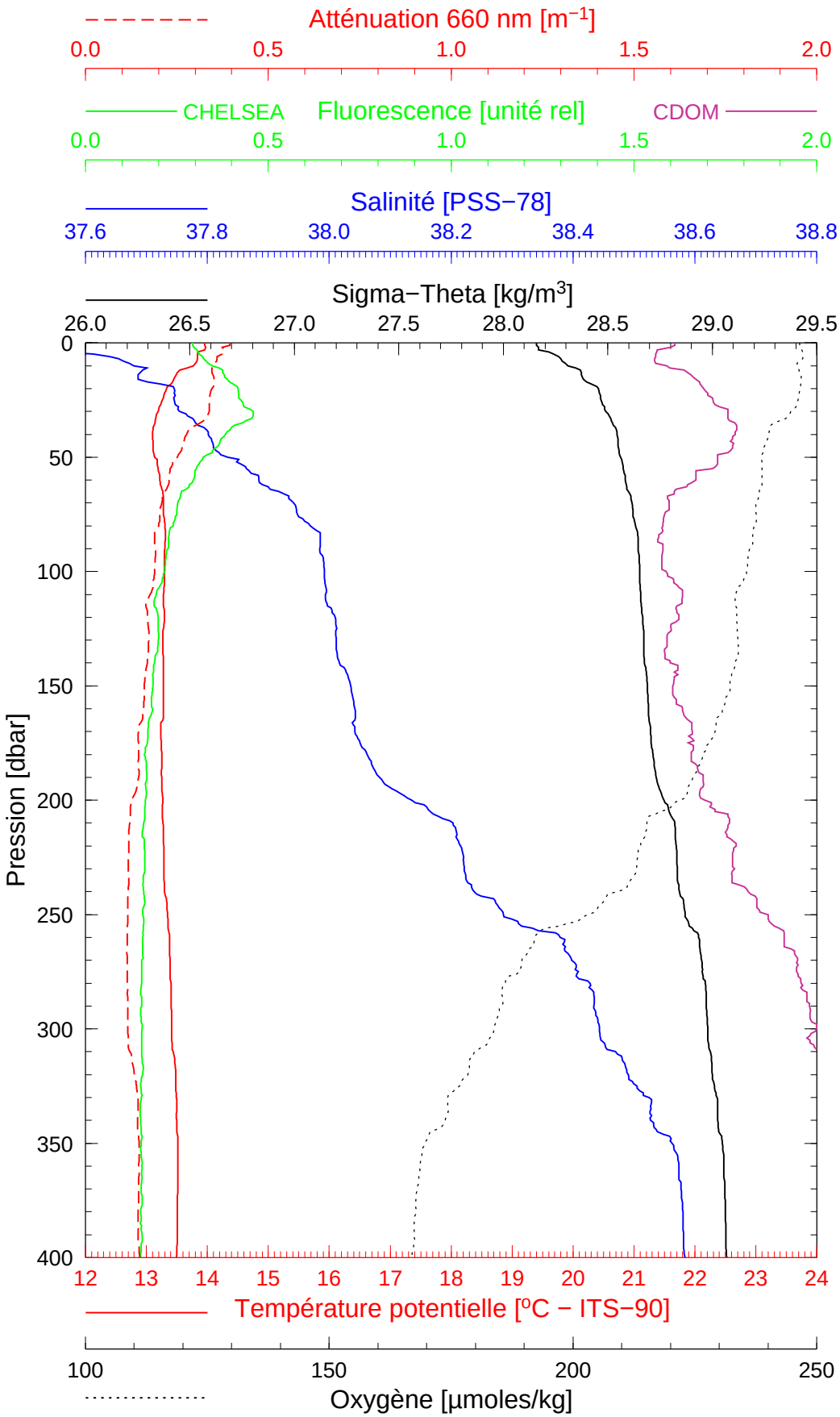


Date *29/03/2011* *Latitude* *43°37.087 N*

Heure déb *15h 08min [TU]* *Longitude* *07°24.915 E*

BOUSSOLE 109 **29/03/2011** **BOUS110329_07**

BOUS008



Date *29/03/2011* *Latitude* *43°39.039 N*

Heure déb *15h 56min [TU]* *Longitude* *07°20.905 E*