

RV Belgica Cruise 2011/24 Cruise Report

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12/09-15/09/2011

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Participants

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Sonia PAPILI	DGMR		X
Paul COPPENS	DGMR		X
Marnick LELONG	DGMR		X
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Alban BOUCHARD	DGMR-Guest		X
Laurent MATTIO	DGMR-Guest		X
Griet NEUKERMANS	MUMM	X	X
Jérôme HARLAY	ULg	X	X
	TOTAL	2	10

Scientific objectives

MUMM-KR: BELCOLOUR-2 by MUMM + ULg

The general objective of the BELSPO-funded BELCOLOUR-2 project is to improve the quality of existing optical remote sensing products for marine, coastal and inland waters based on new scientific knowledge and to develop new products (including partial pressure of CO₂ and primary production) for key applications such as aquaculture and air-sea CO₂ flux quantification. In addition to algorithm work and image processing BELCOLOUR-2 participates in seaborne cruises for the purposes of calibration of algorithms and for validation of the end products. The main objective of this campaign is making measurements of pCO₂ and relevant biogeochemical (SPM, Chl) variables in waters characterized by different/contrasted salinity and turbidity in order to develop algorithms to derive synoptic pCO₂ fields from remote sensed data. During the campaign *in-situ* measurements should be realized as much as possible simultaneous with satellite overpasses of MERIS (Medium Resolution Imaging Spectrometer) and MODIS (Moderate Resolution Imaging Spectrometer).

DGMR-SP: MRN07-09 by DGMR

MRN07 - Study of sand dynamics at small scale to evaluate the risk of mine burial.

MRN09 – Detection and classification of mines using high resolution SAS images.

The project MRN07 aims to evaluate the necessary time for partial or total burial of objects in shallow water (<50m depth) by studying the sand dynamics at a small scale on the BCS in both time and space domain. Several techniques will be used to reach this goal: time series of side scan sonar measurements will be performed, boxcores for validation of acoustic images will be taken and instrumented mines are deployed in strategic site to investigate small-scale variability of sand dynamics over long periods, 3 to 12 months each site. The areas of analysis will be chosen in the first instance by considering scientific criteria and then their economical and social value. In the range of areas with good scientific characteristics, it will be preferred to make measurements in sites densely populated by ships and fishermen. This choice is due to the fact that the research will be used for military and civil application regarding the safety of human life on the North Sea

The project MRN09 aims to determine the limits for the detection and classification of seabed objects. In the frame of the Long Term Critical Requirement 21 (Fast detection and neutralization of a minefield) and following the development of autonomous underwater vehicles (AUV), it is necessary to develop classification procedures. This work will focus on the study of synthetic aperture sonar (SAS) images to validate SAS image processing algorithms, which will be developed. Data (high-resolution SAS images) will be collected using the available equipment (modern mine hunters and sensors from the Mine Warfare Data Center) during the measurement campaigns that will be planned in collaboration with the MRN07 study.

Operational course

Planned operations

See cruise plan.

Implementation of planned operations

Due to bad weather conditions on Monday, transit to the TH stations was aborted and sampling was done in more sheltered waters, close to the Belgian coast. The weather improved steadily throughout the course of the cruise, but sampling in TH waters later during the cruise was not possible due to incompatibility with the rest of the cruise objectives. Sampling was planned to allow the SAT Tests to be done in the most optimal weather conditions, i.e. on Thursday. The teams successfully completed the following objectives:

- 13 out of 18 planned stations were sampled by MUMM+ULg (all, except TH1-TH5 stations)
- Thanks to cloudfree, sunny skies, 3 satellite match-ups were achieved (2 for MERIS and 1 for MODIS Aqua) at 3 additional stations (see Table 1).
- Filtration experiments in clear, moderately turbid and turbid waters were successfully conducted on board at stations CI, Mod and T, respectively.
- Multibeam calibration (MWDC) was performed
- SAT test for the Shadows (MWDC) was executed

Operational course

All times are given in local time (=UTC + 2 hours)

Monday 12th September

08:00 -10:30	Embarkation Zeebrugge
10:30	Departure Zeebrugge and transit to station TH5.
14:00	Abort transit to TH5 and return to the Belgian coastal zone, due to bad weather conditions
16:00	Sampling MUMM+ULg at station CH2
16:40	Sampling MUMM+ULg at station CH3
17:00	Sampling MUMM+ULg at station CH4
17:40	Sampling MUMM+ULg at station CH5 aborted due to high waves, return to Zeebrugge harbor to stay overnight

Tuesday 13th September

08:00-12:00	Mobilization MWDC system
14:00	Departure Zeebrugge
15:00	Sampling MUMM+ULg at station MOD-A-1124 for MODIS Aqua satellite overpass
15:45	Sampling MUMM+ULg at station CH6
17:00	Sampling MUMM+ULg at station CH45
17:50	Sampling MUMM+ULg at station CH5
18:40	Sampling MUMM+ULg at station CH7
19:20	Sampling MUMM+ULg at station CH8
21:00	Sampling MUMM+ULg at station CH10
22:15	Sampling MUMM+ULg at station S01
22:45	Sampling MUMM+ULg at station CH12

23:30 Sampling MUMM+ULg at station CH11

Overnight at MOW-1.

Wednesday 14th September

09:00 Van Veen Grab on the Wandelaar and sampling MUMM for turbid water filtration experiment (station T)

09:05-10:30 Turbid water filtration experiment

12:50 Sampling MUMM+ULg at station MER-A-1124 for MERIS satellite overpass

14:00 Multibeam calibration on Thorntonbank Sampling MUMM in clear waters for filtration experiment (station Cl)

14:10-17:00 Clear water filtration experiment

18:30 Shadows test on Thorntonbank

Overnight at MOW-1.

Thursday 15th September

07:00-14:00 SAT Tests (Shadows+ Multibeam) on Gootebank

12:10 Sampling MUMM+ULg at station MER-B-1124 for MERIS satellite overpass

12:20 Transit to Zeebrugge

13:20 Sampling MUMM at station MOD for filtration experiment

13:20-15:15 Filtration experiment

14:45 Arrival Zeebrugge

15:00 Disembarkation of BELCOLOUR-2 equipment

Sampling stations and operations

MUMM-KR: BELCOLOUR-2 by MUMM and ULg

MUMM and ULg sampled simultaneously at 13 stations. Due to cloudfree, sunny skies, 3 satellite match-ups were achieved (2 for MERIS and 1 for MODIS Aqua). A list of stations and parameters measured by BELCOLOUR-2 is given in Table 1. At these 16 stations, ULg has determined transparent exopolymer particles (TEP) concentration, total alkalinity (TA), oxygen saturation (O2%), concentrations of methane (CH4) and N2O in surface waters, in addition to the continuous pCO2 record. TEP, CH4, and N2O remain to be analysed in the ULg lab. MUMM carried out filtrations to determine the concentrations of phytoplankton pigments (chl a) and suspended particulate matter (SPM) and recorded water turbidity (T).

Filtration experiments in clear, moderately turbid and turbid waters were successfully conducted by MUMM on board at stations Cl, Mod and T, respectively, during the course of the cruise. Filtrations were carried out on-board immediately after sampling.

Table 1. Sampling stations and parameters measured by MUMM and Ulg for BELCOLOUR-2 during campaign B11-24. Stations in bold correspond to satellite match-ups.

station	date	time (h UTC)	lat	lon	MUMM			Ulg			
					chl a	SPM	T	O2	CH4	N2O	Alk
CH2	12/9/2011	14:00	51° 14.215' N	2° 42.269' E	x	x	x	x	x	x	x
CH3	12/9/2011	14:40	51° 15.429' N	2° 45.929' E	x	x	x	x	x	x	x
CH4	12/9/2011	15:00	51° 16.237' N	2° 48.406' E	x	x	x	x	x	x	x
MOD-A-1124	13/9/2011	12:59	51° 21.275' N	3° 03.698' E	x	x	x	x	x	x	x
CH6	13/9/2011	14:46	51° 19.354' N	2° 56.454' E	x	x	x	x	x	x	x
CH45	13/9/2011	14:52	51° 14.449' N	2° 54.089' E	x	x	x	x	x	x	x
CH5	13/9/2011	15:52	51° 18.413' N	2° 52.936' E	x	x	x	x	x	x	x
CH7	13/9/2011	16:42	51° 21.230' N	3° 01.294' E	x	x	x	x	x	x	x
CH8	13/9/2011	17:21	51° 21.979' N	3° 06.429' E	x	x	x	x	x	x	x
CH9	13/9/2011	18:21	51° 23.581' N	3° 14.582' E	x	x	x	x	x	x	x
CH10	13/9/2011	19:05	51° 23.538' N	3° 20.063' E	x	x	x	x	x	x	x
S01	13/9/2011	20:05	51° 24.986' N	3° 33.063' E	x	x	x	x	x	x	x
CH12	13/9/2011	20:45	51° 25.634' N	3° 31.384' E	x	x	x	x	x	x	x
CH11	13/9/2011	21:33	51° 24.855' N	3° 25.545' E	x	x	x	x	x	x	x
T	14/9/2011	7:00	51° 22.663' N	3° 02.194' E		x	x				
MER-A-1124	14/9/2011	10:50	51° 28.487' N	2° 49.418' E	x	x	x	x	x	x	x
CI	14/9/2011	12:05	51° 29.259' N	2° 50.490' E		x	x				
MER-B-1124	15/9/2011	10:13	51° 24.082' N	2° 44.609' E	x	x	x	x	x	x	x
MOD	15/9/2011	11:23	51° 20.781' N	2° 57.254' E		x	x				

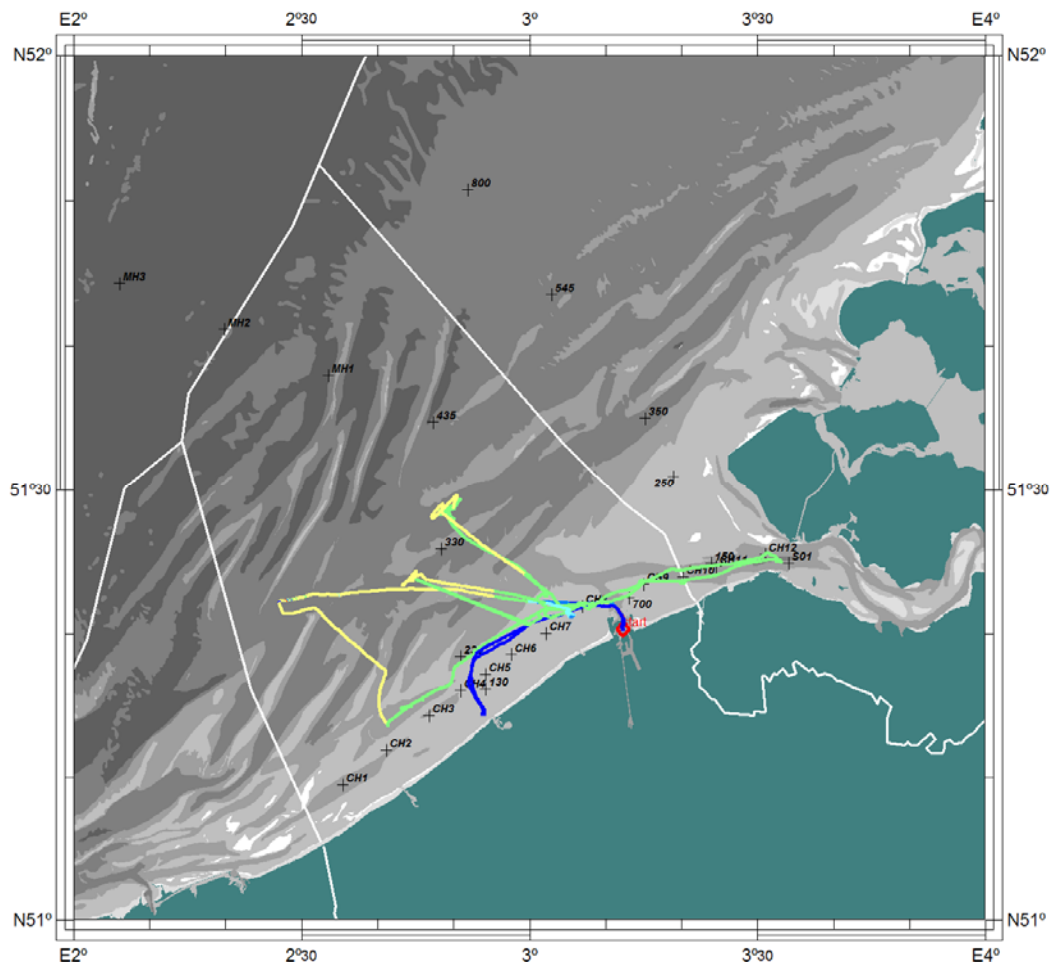


Figure 1. ODAS Track plot colour coded according to salinity during campaign B11-24, showing also the BELCOLOUR-2 sampling stations.

DGMR-SP: MRN07-09 by DGMR

Multibeam

Multibeam calibration was performed on Thortonbank.

6 lines were recorded with heading 071°/251°, length 1500m

Coordinates

Region	ID	Long (DM)	Lat (DM)
Thortonbank	1	2° 49,607'E	51° 28,634'N
	2	2° 48,377'E	51° 28,374'N

Calibration value:

H1: Roll= 0.2 ;Pitch: 2.6; Heading=0

H2: Roll= -1; pitch: 2.9; Heading=0

Van Veen Grab

4 samples on Wandelaar:

COORDINATES

Region	ID	Long (DM)	Lat (DM)	In situ Description
Wandelaar	A	3° 2,14'E	51° 22,69'N	Medium coarse sand with shell fragments
	B	3° 2,19'E	51° 22,67'N	Medium coarse sand with shells
	C	3° 2.14'E	51° 22,64'N	Medium sand with Shell fragments
	D	3° 2.10'E	51° 22,67'N	Medium coarse sand with few shell fragments

Shadows test

on Thorton bank: 3 lines were executed to test the functionality of the Shadows.

SAT TEST on Gootebank region in the proximity of Wreck 123/244: Shadows + Multibeam

12 lines were recorded for both the instruments with different heading

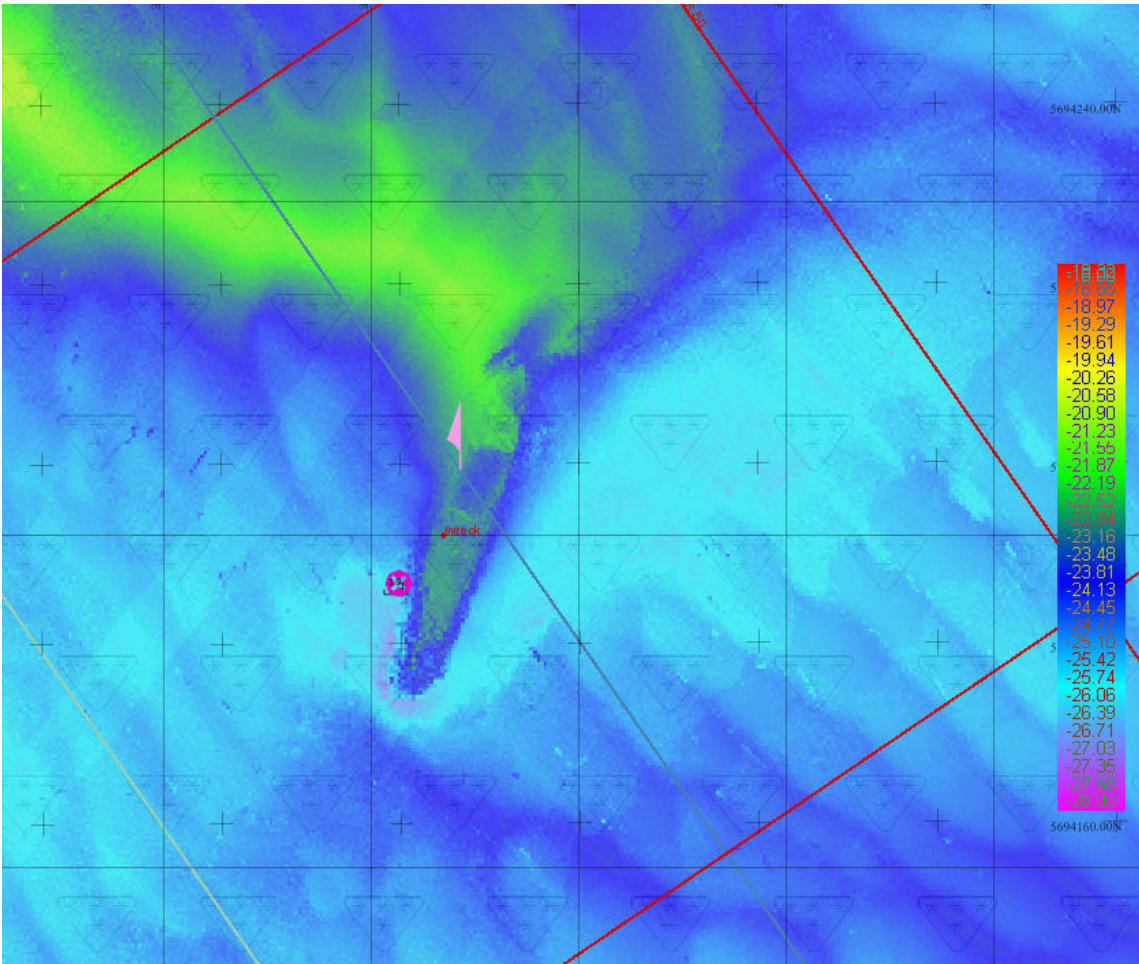


Figure 2: multibeam image recorded on the Gootebank: Wreck 123/244

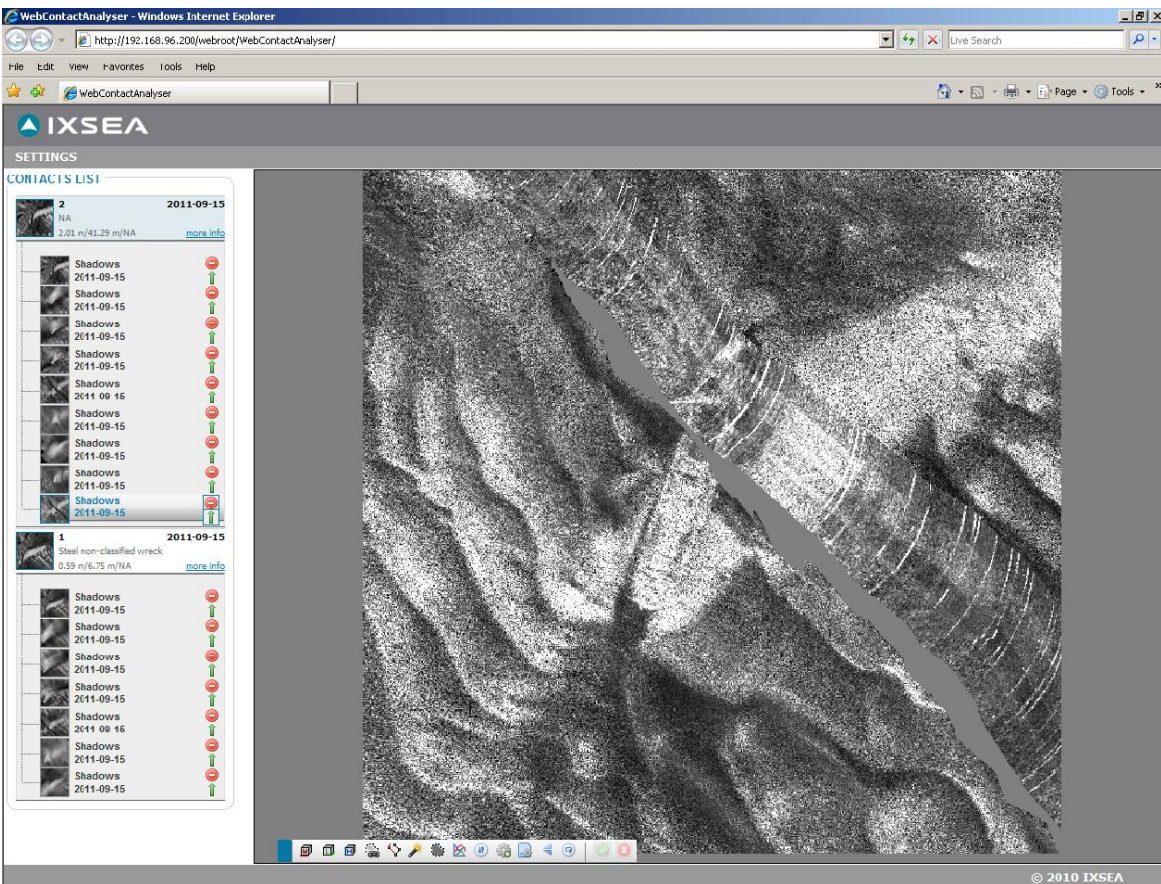


Figure 3: Shadows Image processed at 15cm resolution, on the Gootebank: Wreck 123/244

Acknowledgements

The scientific crew is very grateful to the captain and crew of the R.V. Belgica for their assistance and kind help. MUMM-REMSEM thanks MUMM-MARCHEM for providing laboratory equipment and sample analysis for TSM and pigment concentration.