

BELGICA CRUISE REPORT ST0709

Subscribers

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GEOLOGY - Cruise 07/09

Period: 16-20/04/2007

1. Belgica cruise details
2. List of Participants
3. Objectives of the campaign
4. Localisation and measurements; trackplot
5. Operational course
6. Instruments used
7. Remarks on measurement instruments and campaign

1. BELGICA CRUISE ST2007-09

1.	Cruise number	2007-09
2.	Date / hour	Zeebrugge ETD: 16/10, 19h35 Zeebrugge T&G: 17/10, 19h00 Zeebrugge ETA: 20/10, 13h30
3.	Responsible scientist	Dr. Vera VAN LANCKER with Isabelle DU FOUR as assistant chief scientist
	Participating institutions	UG-RCMG
4.	Area of interest	Flemish Banks, Sierra Ventana region
5.	Number of scientists	9 (16/04); 8 (17-20/04)

2. PARTICIPANTS

		April 16	April 17-20
UG-RCMG	Vera VAN LANCKER ¹	X	X
	Mieke MATHYS	X	X
	Isabelle DU FOUR	X	X
	Wim VERSTEEG	X	X
	Koen DE RYCKER	X	X
	Katrien Heirman	X	X
	Dries BOONE	X	X
	Els VERFAILLIE	X	X
MUMM	Daniel Saudemont	X	
TOTAL		9	8

¹ chief scientist

3. PROGRAM OBJECTIVES

RESOURCE-3D (UG-RCMG)

A Belspo funded 'Action in support of the Federal Authority's strategic priorities' and relates to the studies of the Fund for Sand Extraction (FPS Economy, SMEs, Self-employed and Energy).

A methodological and strategic approach will be developed to image/quantify the internal structure of sandbanks in very-high resolution. Several source/receiver configurations will be tested and the optimal approach used to interpret the sandbank architecture in terms of its sedimentological and lithological composition. The results will be integrated with former knowledge databases related to the Quaternary evolution of the Belgian shelf.

For this project, additional seismic source/receiver configurations are being tested. In particular, the C-Boom of Magelas and the X-star chirp profiler of TNO Built Environment and Geosciences (NL).

QUEST4D: QUantification of Erosion/Sedimentation patterns to Trace the natural versus anthropogenic sediment dynamics (UG-RCMG, MUMM, WLH, KUL, UG-MARBIO)

QUEST4D, a Belspo funded project, focuses on the quantification of erosion and sedimentation processes along the Belgian shelf. As such, the sediment state and dynamics will be studied in the space, depth and time domain (4D). The research is timely as indications of a longer-term and broader-scale physical degradation of the seafloor exist and it is unclear whether this is solely due to the increasing anthropogenic influence or to a combination with the natural evolution of the seafloor itself, including the effect of climate change. The latter processes need to be disentangled as their impact needs to be balanced against the industry-related activities.

STUDY OF THE GEOLOGICAL EVOLUTION OF THE BELGIAN CONTINENTAL SHELF (RCMG-MM)

Within the framework of a PhD investigation regarding the development of a genetic model of the geological Quaternary evolution of the Belgium Continental Shelf, additional seismic data are required.

Two areas will be covered during this campaign:

Area A: In the region of the Ostend palaeo-valley itself, some extra seismic lines have to be recorded to obtain a more detailed insight in the palaeo-valley system (Fig.1).

Area B: continuation of cruise B2006-20a, situated near the Oostdyck and Buiten Ratel. This zone is the western equivalent of the Vlakte van de Raan (investigated during cruises B2005-04, B2005-17, B2005-23). Both zones are situated on either side of the Ostend palaeo-valley, which is scoured in the Top-Tertiary surface (Fig.2).

MESH (Development of a framework for Mapping European Seabed Habitats) (RCMG)

MESH is an EU Interreg IIIb-funded international marine habitat mapping programme aiming at the development of international standards and protocols for seabed mapping. Partnership: Joint Nature Conservation Committee (JNCC, coordination) (UK); Ghent University (B); IFREMER (FR); Marine Institute (IRL); Alterra-Texel (NL); TNO Built Environment and Geosciences (NL); Centre for Environment, Fisheries and Aquaculture Science (CEFAS) (UK); Department for Agriculture and Rural Development, Northern Ireland (DARD) (UK); English Nature (UK); Envision Mapping Ltd (UK); National Museums and Galleries of Wales (NMGW) (UK); Natural Environment Research Council (British Geological Survey) (BGS) (UK).

Programme MUMM-Patrick Roose

The project is part of the continuous surveillance and evaluation of the quality of the marine environment in the region of the Belgian continental shelf (BCP) and the Western Scheldt estuary in the framework of international (the Joint Assessment and Monitoring Programme (JAMP) and the Nutrient Monitoring Programme (NMP) of the OSPAR commission) and national programmes (e.g. impact of sand extraction and dredging activities).

MUMM determines nutrients, salinity, suspended matter, dissolved Oxygen, TOC and POC, chlorophyll a, phaeophytine and optical parameters in the water column. Phytoplankton biomass and species composition as well as benthos species composition and biomass are also determined as part of the

monitoring programme. The other determinants (e.g. heavy metals and organic contaminants) in sediment and biota are determined in collaboration with the Sea Fisheries department of the Centre for Agricultural Research.

Quality assurance and quality control during sampling and in the laboratory receive a high priority within the project.

4. MEASUREMENTS, LOCALISATION AND RESULTS

Seismic measurements

Areas

I. Kwinte Bank (Resource 3D, UG-RCMG)

Seismic recordings are planned using different sources (Seistec; the sparkers Centipede and SIG and the C-boom of Magelas).

Strategy

Several seismic source/receiver configurations have been tested. Test lines were sailed in the upper, middle and south part of the study area with per source, 2 test lines in each part. Those parts were chosen because of the difference in their sediment distribution. The north part is coarser grained; the middle part is known to be very rich in shells and the south part is characterised with medium grained sand. The best source was used for the mapping of the complete study area.

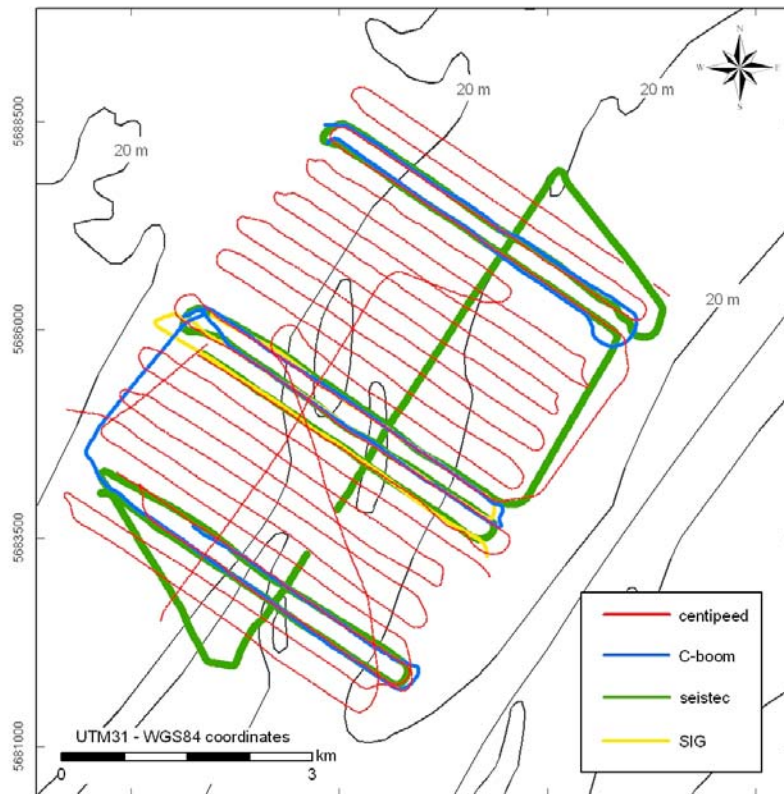


Fig. 1 Location of the seismic lines on the Kwinte Bank.

2. Sierra Ventana region (QUEST4D/MESH, UG-RCMG)

Seismic lines have been sailed in support of vibrocores that have been taken in the framework of the MESH project in November 2006 (Fig. 2).

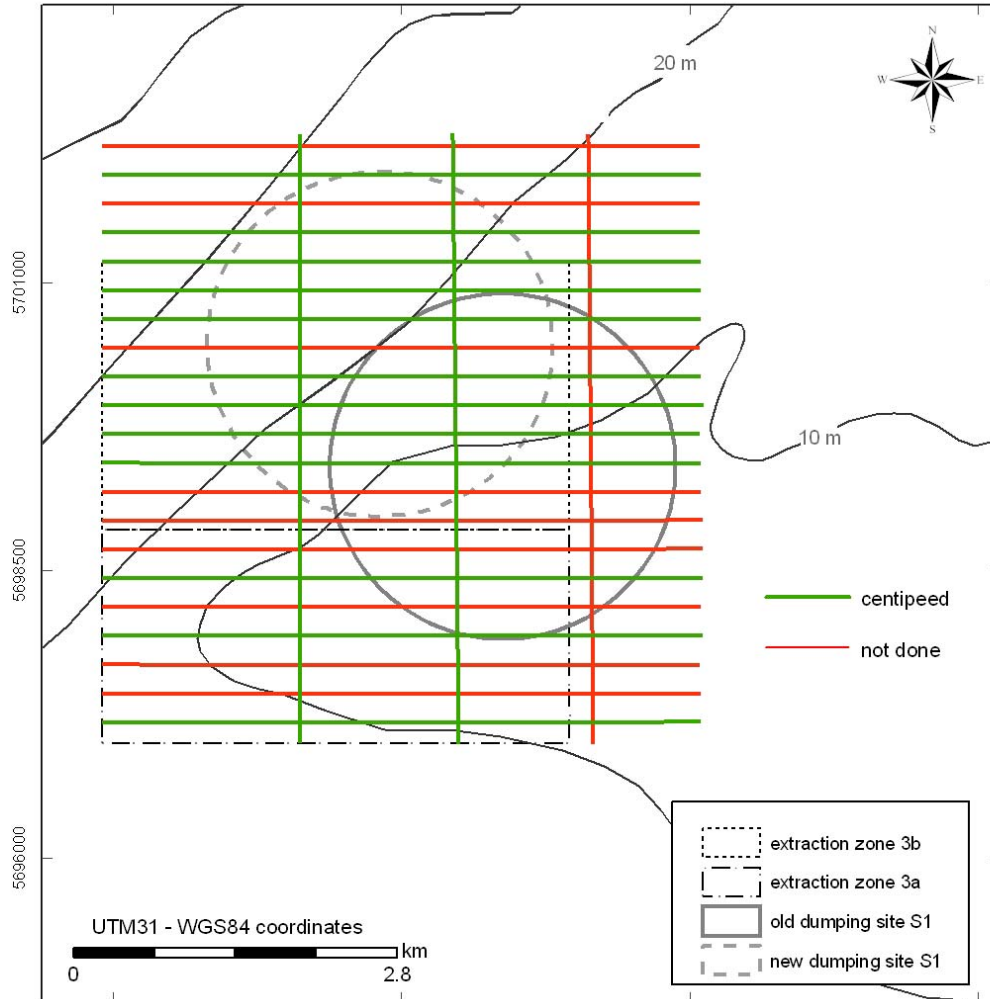


Fig. 2 Location of the seismic lines in the Sierra Ventana region.

Seismic equipment

Boomer (Seistec) (UG-RCMG):

- Until 3 Beaufort
- 1000-5000Hz (main frequency of 2500Hz)
- frame: 257*73*65cm; 100kg
- 75m cables: 1 signal, 2 high-voltage
- 30m towrope
- SPA-3 receiver unit + lunchbox-pc
- HV-power supply: 220V-16A
- winch + A-frame**

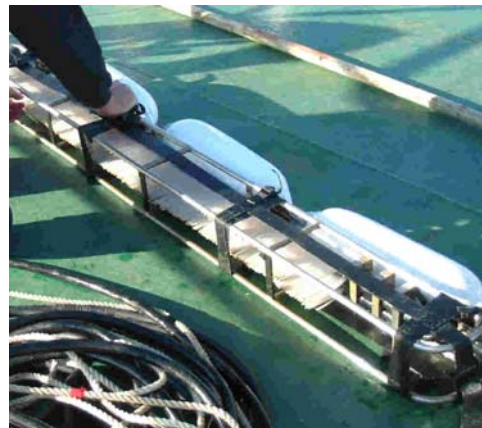
foreseen during campaign ST0615



Sparker (Centipede) (UG-RCMG):

- Until 3-4 Beaufort
- 1100-1200Hz
- frame: 195*20*20cm; 25kg
- 50m cable
- 30m towrope
- HV-power supply: 220V-16A
- streamer (5m + 75m cable); receiver-unit/band-passfilter/lunchbox-PC

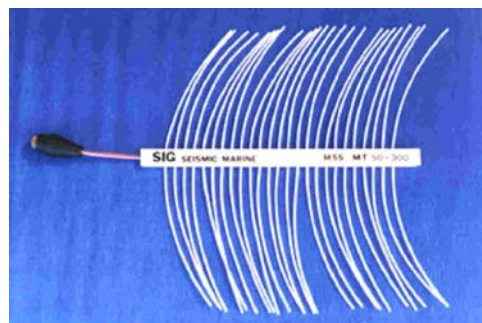
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Sparker (SIG) (UG-RCMG):

- Until 4-5 Beaufort
- 800-900Hz
- frame: 40*100cm; 1,25kg
- 50m or 75m cable
- 30m towrope
- HV-power supply: 220V-16A
- streamer (5m + 75m cable); receiver-unit/band-passfilter/lunchbox-PC

foreseen during campaign ST0615



Other seismic source that is used in the framework of the Resource-3D project

C-boom low voltage boomer (Magelas):



Energy Output: 100 joules (Equivalent to 3000v system. Acoustic output comparison)
Firing rate: Up to 6 / sec
Working Voltage: 600v dc
Supply Voltage: Mains 110 / 220 volts ac
Dimensions: PSU – Standard 4u 19" rackmount 0.4 x 0.48 x 0.19
Cable – standard 60m
Transducer – assembled with floats 0.9m x 1m
Weights: PSU – 18 kg, Kevlar Cable – 10 kg, Transducer – 30kg
Connections: 1 EC Euro Main connector
Sound Source Details: In house built transducer. Disc Diameter 360mm
Capacitance Not applicable – see "energy output"
Operational Power
Consumption: 800W ~ 1kW
Power source: 1.5KVA generator
Resolution: 30cm or better.
Environmental: Safe portable equipment
Connections: Input power – mains cord, input trigger - bnc
Dominant Frequency: 1760Hz – measured from pulse signature
Catamaran Details: Lightweight stainless steel tubular frame work.
Hydrophone: TBC

3. Area covering the Oostende Bank and the Oostdyck, Buiten Ratel (UG-MATHYS, RCMG)

Research area: Area covering the Oostende Bank (Fig.1, area A) and the Oostdyck, Buiten Ratel (Fig.2, area B).

Measurements: Seismic recordings were planned using two different sparker sources (Centipede and SIG, see above), depending on the weather circumstances (Table 1). Because of the fair weather the Centipede sparker could be used the entire week.

Results:

About 134km of the planned 137km could be completed, using the Centiped sparker. Due to the perfect weather circumstances the seismic data are of high quality.

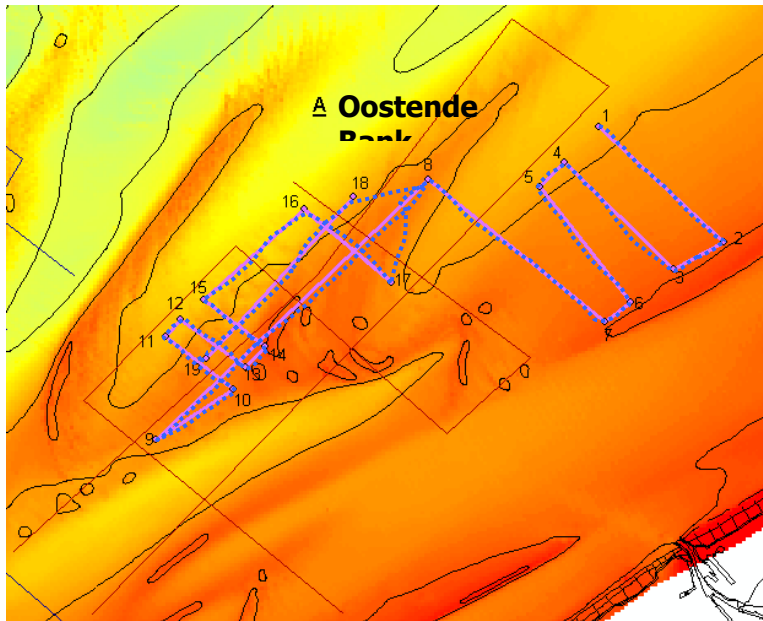


Figure 1: Sailed seismic lines in area A (blue dashed). Order of lines was adjusted onboard depending on the tide.

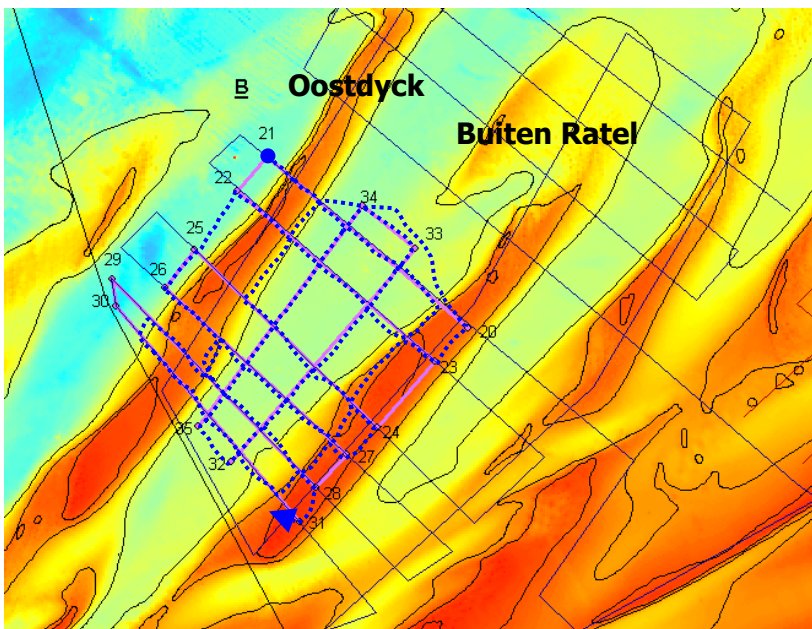


Figure 2: Covered seismic lines in area B (blue dashed). Order and length of lines was adjusted onboard depending on the water depth.

Multibeam measurements (UG-RCMG)

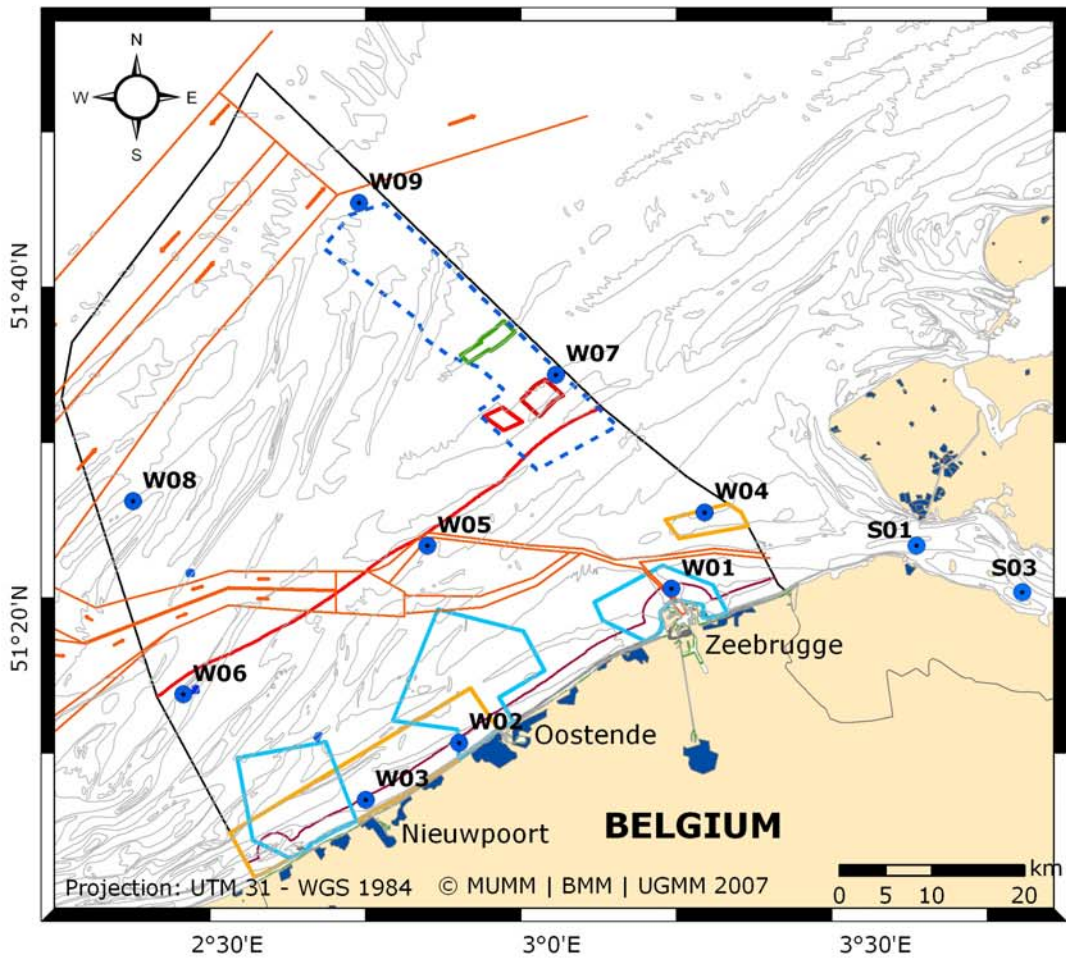
During the seismic recordings on the Kwinte Bank and Sierra Ventana, multibeam recordings have been made.

Sampling operations (MUMM-PR)

MUMM sampling stations are indicated on the map below. For this campaign only the sites S01 and S03 need to be sampled. At each station 2 10l Niskin bottles need to be taken as well as a depth profile with the Seacat. Also, some time should be provided for oxygen measurement. **+WO4**

Station Name	In situ measurements		Water Niskin - GoFlo		
	D.O. YSI-52	CTD Sea-cat	Salinity	pH	Nutrients ¹ Chlorophyl
S01	X	X	X	X	X
S03	X	X	X	X	X

¹ NO_x – NO₂ – PO₄ – NH₄ – Si – Total N + P, DON, DOP, PON, POC, SPM



5. OPERATIONS

All times are given in local time.

Monday, April 16th

The campaign is postponed because of generator test.

13h30 Embarkment of UG-RCMG personnel

16h Embarkation of instruments and installation of power supply in the work container and recording equipment on the bridge

Testing of generator until 16h30

Installation of seismic equipment

19h35 Sail off from Zeebrugge

Transit to Sierra Ventana region for seismic recordings

21h30 Multibeam calibration and sound velocity profile
Seismic source in water

22h35 Start simultaneous recording of multibeam and seismic recordings (source: Centipede sparker).
Electrical propulsion.

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate:
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

Tuesday, April 17th

03h *Technical problems with thermosalinograph – no sound velocity values are obtained*

10h50 *Technical problems with A400: programme is halted*

Contact with Joan Backers from MUMM to discuss problems.

12h08 End of simultaneous recording of multibeam and seismic recordings

Transit to the sampling points of the MUMM-Roose programme

13h Joan Backers is brought to the RV Belgica with a military Alouette

Xx Sampling of W04

15h30 Sampling of S01

16h39 Sampling of S03

Transit to Zeebrugge for the disembarkation of Joan Backers and Daniel Saudemont

19h03 Disembarkment of Joan Backers and Daniel Saudemont with zodiac

19h51 Zodiac back to RV Belgica

Transit to the Oostende Bank for seismic recordings programme UGent-Mathys

21h01 Start seismic recordings (source: Centipede sparker)

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate: 2-3 Bf N
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

Wednesday, April 18th

06h29 End

Transit to Kwinte Bank for seismic recordings programme Resource-3D

06h29 Start simultaneous recording of multibeam and seismic recordings (source: Centipede sparker) (north part of the study area)

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate: 2-3 Bf N
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

7h23 Change of sparker electrode chain (middle to black electrode chain)

10h41 End

11h16 Start simultaneous recording of multibeam and seismic recordings (source: C-Boom) (test lines in the middle and south part of the study area)

Parameter settings	
Source: C-Boom	Wind/Seastate: 2-3 Bf
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 700 Hz-7000 Hz 500 Hz-7000 Hz (11h32) 600 Hz-7000 Hz (15h00) Gain : 10 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

shotnr 2000: energy tests from 600 to 500 and 300 J

shotnr 4900: no analogue filter applied

shotnr 5000: tests with the Delph system

15h14 End

15h25 Start simultaneous recording of multibeam and seismic recordings (source: Centipede sparker) (middle part of the study area)

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate: 1-2 Bf Offset source vessel: 20 m
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 (400 ms: 16h) Delay: 0 ms Master: SPA 3

16h47 End

17h12 Start simultaneous recording of multibeam and seismic recordings (source: Seistec boomer) (test lines in the north, middle and south part of the study area)

Source: Seistec boomer (CSP600 power supply)	Wind/Seastate: 1-2 Bf Offset source vessel: 20 m
Receiver: Seistec (ch2)/SIG-single channel streamer (ch1)	
Acquisition: Rockland 751A Analogue bandpass filter: 800 Hz-1200 Hz Calibratie : 1500 -> 600 nV	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

Thursday, April 19th

00h08 End

Transit to the Buiten Ratel – Oostdijck area for seismic recordings programme UG-Mathys

01h46 Start seismic recordings (source: Centipede sparker)

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate: 4-3 Bf (~7h42)
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

15h58: change of sparker electrode chain

17h04 End

Transit to Kwinte Bank for seismic recordings programme Resource-3D

18h09 Start simultaneous recording of multibeam and seismic recordings (source: Centipede sparker)

Parameter settings	
Source: Centipede 300 J (CSP600 power supply)	Wind/Seastate: 2-3 Bf Offset source vessel: 20 m
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

21h27 End

21h33 Start simultaneous recording of multibeam and seismic recordings (source: SIG sparker) (3 test lines in the middle part of the study area)

Parameter settings	
Source: SIG sparker 300 J (CSP600 power supply)	Wind/Seastate: 4-5 Bf
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 100 Hz-3000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 400 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

23h15 End

Friday, April 20th

01h04 Start simultaneous recording of multibeam and seismic recordings (source: C-Boom) (2 test lines in the upper part of the study area)

Parameter settings	
Source: C-Boom	Wind/Seastate:
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: no analogue filter applied	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 200 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

01h36 End

Transit to south part of the study area

02h10 Start simultaneous recording of multibeam and seismic recordings (source: Centipede sparker)

Parameter settings	
Source: Centipede 200 J (CSP600 power supply)	Wind/Seastate: 5 Bf Offset source vessel: 20 m
Receiver: SIG-single channel streamer	
Acquisition: Rockland 751A Analogue bandpass filter: 200 Hz-6000 Hz Gain : 0 dB	ELICS: Sampl. freq.: 20 kHz Shooting interval: 500 ms Rec. length: 400 ms Nr. of channels: 1 Delay: 0 ms Master: SPA 3

10h35 End

Transit to Zeebrugge

13h30 Arrival at Zeebrugge
Disembarkment of equipment and personnel

- End of campaign ST0709 -

6. INFRASTRUCTURE AND INSTRUMENTATION USED

Continuous measurements
- Thermosalinograph SCTD-SBE21
- Turner fluorometer
- Sea water pump

Navigation / Meteorology / Bathymetry
- Friedrichs meteo
- DGPS Thales Aquarius
- Atlas Deso 20
- Tss 320B heave compensator
- RoxAnn bottom discriminator
- Kongsberg-Simrad EM1002S multibeam
- Sound velocity probe (side-winch needed)

Seismic recordings (UG-RCMG)
-Boomer (Seistec)
-Sparker (Centipede, SIG)
-Streamer

Seismic recordings (Magelas)
-C-boom

Navigation/Meteorology
- Standard meteorological instruments (wind, atmospheric pressure, PAR)

BMM-Monitoring
Water sampling and in-water instruments (from side gantry and davit)
- Oceanographic cable
- SeaCAT system (SCTD-SBE19, OBS, PAR) with 10 litre and 5 litre Niskin (MUMM)
Storage of samples: deepfreezer and refrigerator in the wet lab, deepfreezer and refrigerator deck
Milli RiOS/ Milli Q system

7. REMARKS ON THE MEASUREMENT INSTRUMENTS AND ON THE OPERATIONAL COURSE OF THE CAMPAIGN

Problems were encountered with A400 workstation.
There were repeated problems with the thermosalinograph.
The problems were solved and were reported.

The officers and crew of the RV Belgica are greatly acknowledged for their cooperation and skilful navigation, notwithstanding the difficulties in this shallow area.