

## RV SIMON STEVIN 2019/570 – CRUISE REPORT

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### Geological/geophysical survey: 02/09/2019 - 13/09/2019

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## 1. CRUISE DETAILS

1.	Cruise number	2019/570
2.	Date/time (planned)	Oostende: 05/09/2019 at 08h00 Oostende: 12/09/2019 at 16h00
3.	Chief Scientists Participating institutes	Dr. Tine Missiaen VLIZ; Universiteit Gent (UGent); University of Bradford; University of Leeds; Warwick U
4.	Area of interest	British and Dutch continental shelf – southern North Sea

## 2. LIST OF PARTICIPANTS

INSTITUTE	NAME	08/09 – 12/09/2019
<b>VLIZ</b>	Tine MISSIAEN	x
<b>VLIZ</b>	Wim VERSTEEG	x
<b>VLIZ</b>	Dre CATTRIJSE	x
<b>VLIZ</b>	Jan VERMAUT	x
<b>Univ. Bradford</b>	Ben JENNINGS	x
<b>Univ. Leeds</b>	Victor CARTELLE ALVAREZ	x
<b>Univ. Warwick</b>	Rosie EVERETT	x
Total number of participants:		<b>7</b>

(\*) Chief Scientist

## 3. SCIENTIFIC OBJECTIVES

The survey takes place within the framework of the “Deep History” project aimed at a reconstruction of the late Quaternary palaeolandscape in the southern North Sea (palaeo-fluvial system, proglacial lake, Holocene drowning) and the relation to possible prehistoric human occupation. In April 2018 a first seismic reconnaissance survey was carried out in the larger Brown Bank area which resulted in a unique dataset of unprecedented quality. A follow-up seismic survey with RV Belgica was carried out in spring 2019 which a.o. focused on further detailed seismic investigations and dredging activities. The main aim of this 2019 Simon Stevin campaign is to take vibrocores and perform targeted dredging on a number of well-chosen locations (also based on the 2019 Belgica data). In view of the high accuracy and resolution of the seismic data dynamic positioning during coring is crucial. During the night additional seismic data (sparker, SES Quattro) is envisaged (if possible simultaneous with multibeam).

## 4. OPERATIONAL COURSE

*All times are given in local time. All coordinates in WGS84.*

**Wednesday 04/09/2019**

Installation of the equipment on board.

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**Thursday 05/09/2019 – Saturday 07/09/2019**

Due to extreme bad weather conditions in the entire southern North Sea (6-7 bft), it is decided not to sail out. Weather updates are discussed in detail several times per day to decide on the planning.

**Sunday 08/09/2019**

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- 08:00 Embarkation of scientific personnel.
- 14:00 Transit to the Brown Bank area. Safety briefing at ~15h00. Weather conditions are still quite bad (5-6 bft, wind from the NE). The transit progresses slowly due to strong current and wind.
- 23h30 Arrival in the study area. Too much wind (5-6 bft) to start the seismic. Stand-by during the night.

**Monday 09/09/2019**

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- 05:00 Deployment of the dredging equipment (beam trawl). Start dredging in area VC45 along profiles D1-D2-D3-D4-D5-D6. All dredge finds (peat, wood, flints etc) are stored in labelled plastic bags.
- 09h30 Stop dredging in area VC45. Transit to central network area.
- 10h50 Start dredging in central network area along profiles NS6t, BB16t, Bb13, BB16t, D2C, EW1.
- 20h30 Stop dredging operations. Beam trawl is taken back on board.
- 21h00 Transit to start of seismic lines in central network area. Problems with navigation and motion sensor.
- 22h30 Lowering of SES-Quattro into the water. Still too much wind (5 bft) for sparker source.
- 23h00 Start of seismic measurements (SES-Quattro and simultaneous multibeam) in central network area. EW lines every 200m.

**Tuesday 10/09/2018**

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- 08h00 Stop seismic data acquisition in central network area. Wind has fallen to 3 bft.
- 09h00 Start coring operations with vibrocore. Two cores per location. Consecutive locations D2C, BB16t-3, D2C, BB11, BB16t-1, NS6t, EW1, BB16A, BB16B, BB16C
- 12h00-13h00 Problems with the core cable. This causes 1 hour delay.
- 20h30 Stop coring. Vibrocore is put on deck.
- 21h00 Transit to area VC45.
- 21h30 Start of seismic measurements (with simultaneous multibeam) in area VC45. Wind 3 bft.

**Wednesday 11/09/2019**

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- 02h00 Stop recording seismic network VC45. Transit towards central network (continuous recording).
- 04h00 Arrival in central network area. Start with continuation of EW lines and consecutively NS lines. Weather conditions are slowly worsening (4-5 bft).
- 08h30 Stop seismic measurements due to bad weather (6 bft). All seismic equipment back on board.
- 09h00 Transit to dredge location south of the central network area.
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- 10h30 Arrival at dredging area. Lowering of the beam trawl in the water proves too dangerous. Wind is still picking up (6-7 bft).
- 10h45 Abandoning of all dredging activities. Start transit towards Oostende. Wind 7 bft from SW. Most of the crew and scientists are (very) sick.

#### Thursday 12/09/2019

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- 00h15 Arrival in Ostend.
- 08h00-14h00 Demob of all equipment.

- End of campaign 2019/570 -

## 5. MEASUREMENTS AND SAMPLING

### 5.1. DATA ACQUISITION

Due to the bad weather, only a limited part of the planned data acquisition could be carried out.

#### Seismic data acquisition

In total 48 seismic lines were recorded with the SES-2000 Quattro (single beam mode):

- Area VC45 (A): 8 NS lines and 11 EW lines (see Figure 2)
- Area central network (B): 6 NS lines and 22 EW lines (see Figure 3)
- Long transit line between the two areas

Simultaneously with the seismic data, also multibeam data were recorded.

#### Dredges

In total 19 different line transects were dredged (6 in area VC45 and 13 in the wider central area). Most lines were dredged in both directions. For location see Figures 1 -3. See Table 1 below for more details.

Dredge Name	Trend	Start		End	
		X	Y	X	Y
VC45-D1	N/S	504780	5814364	504780	5814864
VC45-D2	E/W	504780	5814653	505330	5814614
VC45-D3	N/S	505069	5814385	505069	5814885
VC45-D4	N/S	505033	5814388	505033	5814888
VC45-D5	N/S	504954	5814393	504954	5814893
VC45- D6(RESERVE)	N/S	504816	5814400	504816	5814900
EW1-D1	N/S	537323	5818098	537323	5819098
EW1-D2	E/W	537203	5818601	537571	5818597
NS6t-D1	NE/SW	526160	5818506	526760	5819106
NS6t-D2	NE/SW	526134	5818274	526734	5818874
BB16t-D2	N/S	526565	5821644	526565	5822144
BB16t - RESERVE	E/W	526391	5821615	526891	5821615
BB16t - RESERVE 2	E/W	526670	5820823	527170	5820823
BB13-D2	E/W	516682	5807632	517182	5807632
D2C-D1	N/S	527959	5822047	527959	5822547

D2C-D2	N/S	526287	5822038	526287	5822538
D2C-D3	N/S	526326	5822037	526326	5822537
D2C-D4	N/S	527959	5822297	527959	5822797
D2C-D5	E/W	527435	5822302	527857	5822296

Table 1 – overview of dredge transects

### **Vibrocores**

In total 17 vibrocores were taken at 10 different locations. Core length varied between 0.9 and 2.4 m. Two cores (a few meters apart) were taken at most stations. After two failed attempts a core location was abandoned in order to save time. For location see Figures 1 and 3. See Table 2 below for more coring details.

Name	X	Y	Length		Length	
			Core A	comment	Core B	comment
D2C -1	526268	5822289	2m	peat at bottom	2m40	sand at bottom
BB16t-3	526557	5821922	1m50		1m35	
D2C -3	527857	5822296	2m40	sand at bottom	2m15	
BB11-1	527605	5821982	1m70	several trials	2m	
BB16t-1	526921	5820830	2m20		1m90	reeds at bottom
NS6t-1	526305	5819202	2m		1m30	
EW1-1	537538	5818597	2m		1m90	
BB16-A	524754	5825908	90cm		no core	failed twice
BB16-C	518693	5825759	2m20		no core	failed twice
BB16-B	518421	5825736	2m10		no core	lack of time

Table 2 – overview of core locations

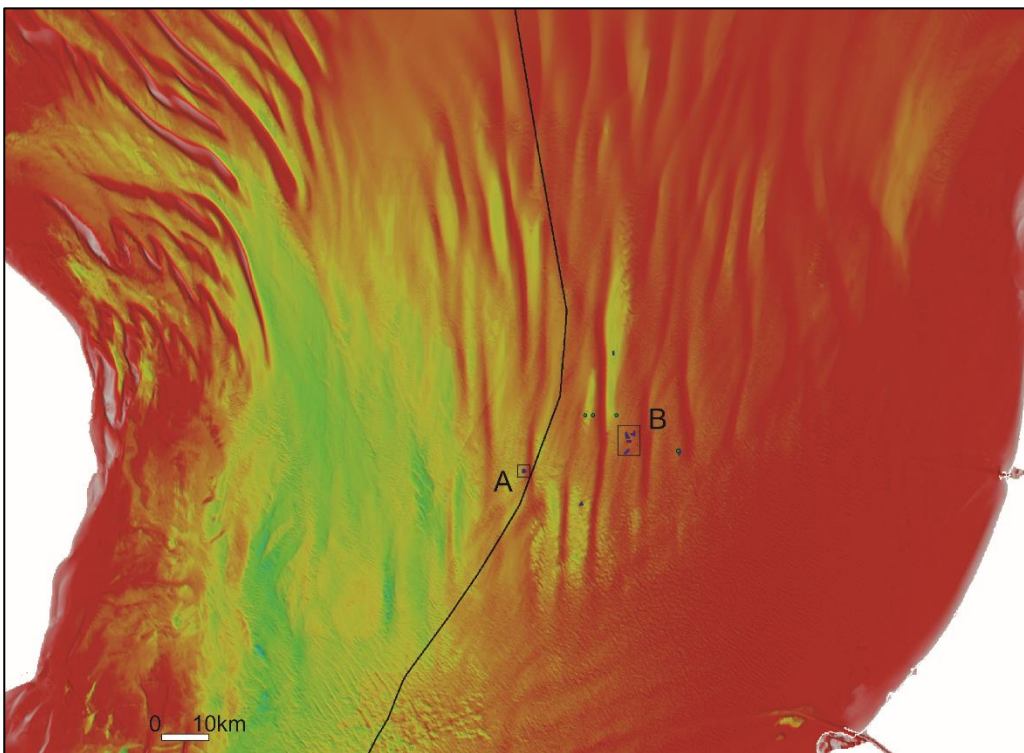


Figure 1 – Overall location of the survey area with indication of seismic network areas A (VC 45) and B (central network), dredge lines (blue) and cores (green).

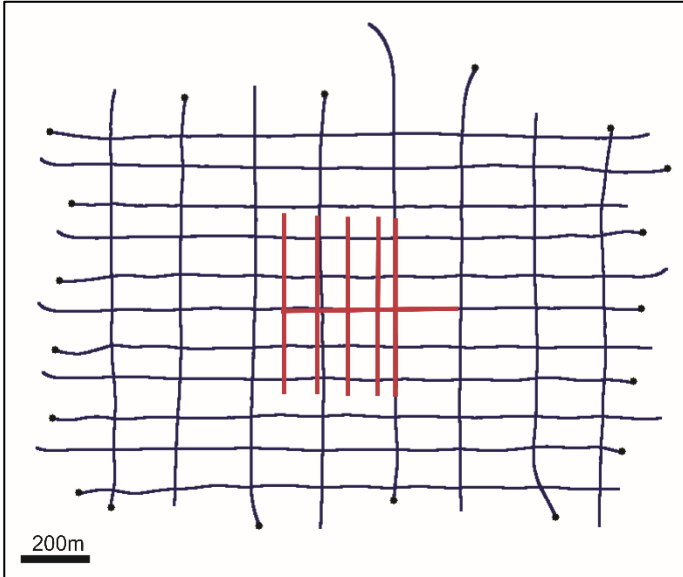


Figure 2 – Detailed map of seismic network in area VC 45 (A in Figure 1); dredge lines are indicated in red.

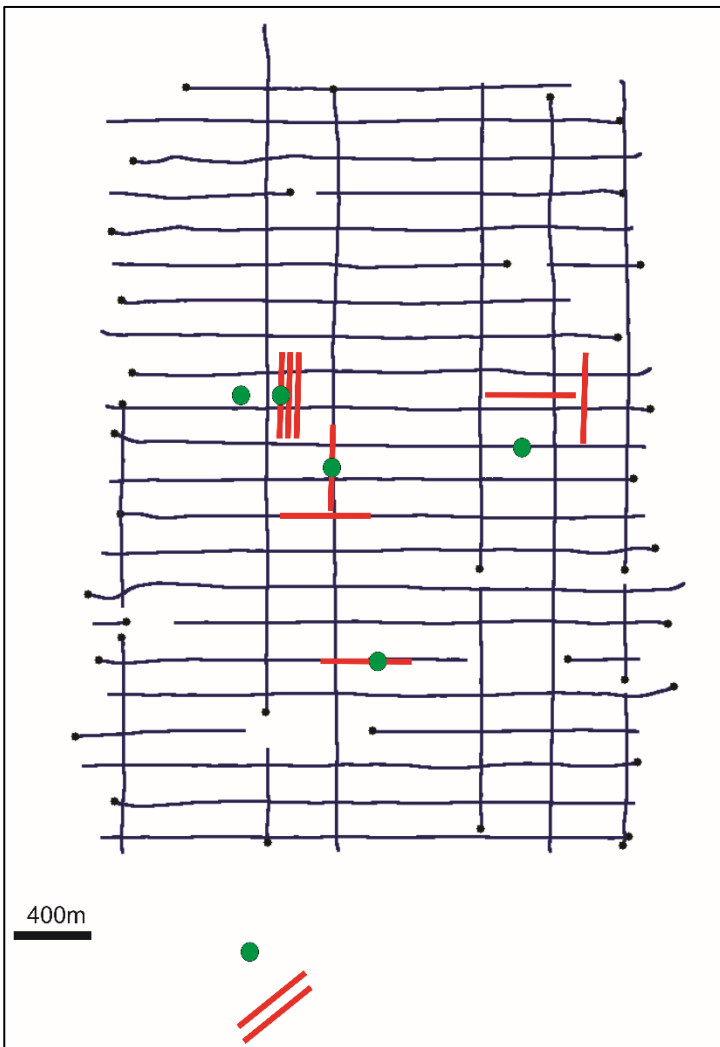


Figure 3 – Detailed map of seismic network in central area (B in Figure B); dredge lines and cores are indicated respectively in red and green.

## 5.2. FIRST RESULTS

### Seismics

The quality of the SES-2000 Quattro data was rather variable. Relatively good weather conditions prevailed during recording in area VC45 (Figure 4). Weather conditions worsened fast while recording in the central network area which is clearly observed in the data (Figure 5). Notwithstanding the bad weather the overall data quality was still better than expected.

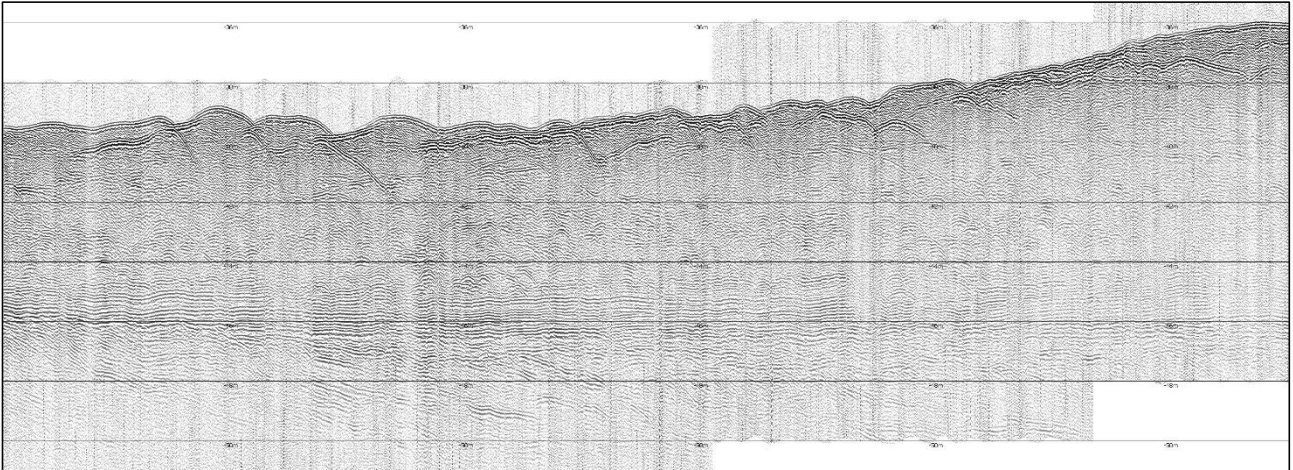


Figure 4 - Example of SES-Quattro profile from area VC45 (3 bft).

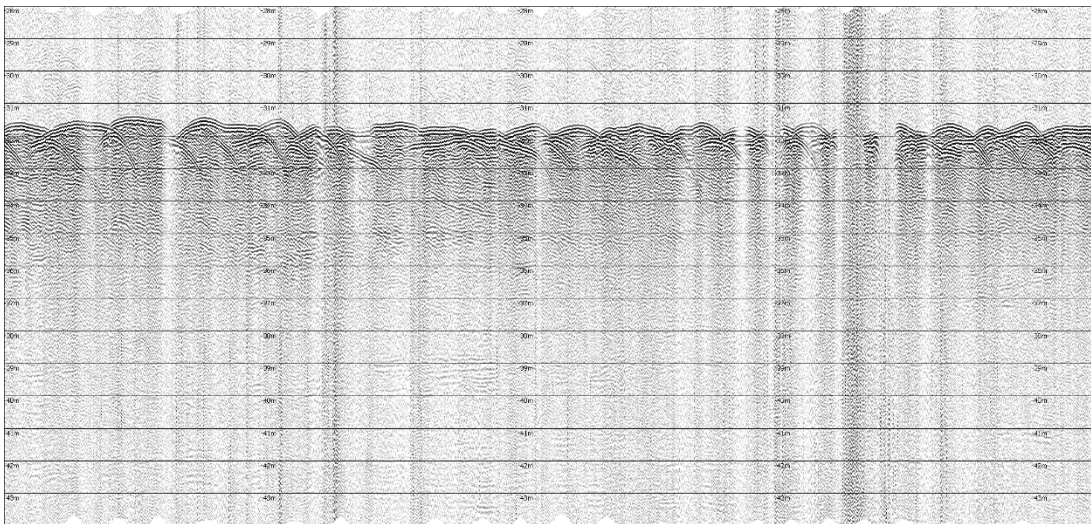


Figure 5 - Example of SES-Quattro profile from central network area VC45 (4-5 bft). Noise level has increased clearly, and absence of data is observed locally due to sharp pitch and roll movement of the transducer.

### Dredges

The following finds were obtained from the different dredge transects (A, B, C, etc. refer to different dredging directions of the same dredge line):

- VC45-D1 A (NS): wood, charcoal, concretion
- VC45-D1 A (NS): peat lumps
- VC45-D1 B (SN): wood, charcoal
- VC45-D2 A (EW): wood, charcoal, bone, concretion
- VC45-D2 A (EW): peat

VC45-D2 B (WE): no finds  
 VC45-D2 C (WE, 50 m to north): large peat lump with reeds/wood (see Figure 6)  
 VC45-D2 C (WE, 50 m to N): wood, flint  
 VC45-D2 D (EW, 50 m to S): wood  
 VC45-D3 A (NS): large wood piece  
 VC45-D3 A (NS): wood, flint  
 VC45-D3 B (SN): flint, small wood pieces  
 VC45-D4 A (NS): large peat lump  
 VC45-D4 A (NS): wood, flint  
 VC45-D4 B (SN): large & small wood pieces, charcoal  
 VC45-D5 A (NS): large charcoal, flint, wood  
 VC45-D5 B (SN): flint, wood  
 VC45-D6 (reserve): wood, concretion  
 VC45-D6 (reserve): large flints  
 EW1-D1 (NS): large flint  
 EW1-D1 (NS): large wood  
 EW1-D2 (EW): large wood, charcoal  
 EW1-D2 (EW): peat  
 NS6t-D1 A (NE-SW): peat  
 NS6t-D1 A (NE-SW): wood, concretion, charcoal?  
 NS6t-D2 A (NE-SW): peat, wood, bone charcoal  
 NS6t-D2 B (SW-NE): flint, wood, charcoal  
 NS6t-D2 B (SW-NE): large peat  
 NS6t-D2 B (SW-NE): large peat  
 NS6t-D2 B (SW-NE): wood, charcoal  
 BB16t-D2 A (SN): flint, charcoal (*remark: BB16t-D1 was not done*)  
 BB16t-D2 A (SN): peat, wood  
*BB16t-D2 B (NS): small finds, not kept*  
*BB16t-reserve: small finds, not kept*  
 BB16t-reserve 2 B (NS): wood chips, leather  
 BB16t-reserve 2 A (SN): wood, charcoal  
 D2C-D1+D3 (NS): large peat lump, large charcoal  
 D2C-D2 A (NS): wood chips  
 D2C-D2 A (NS): large peat lump with seeds (see Figure 6)  
 D2C-D2 B (SN): *small peat lumps, wood chips (no finds kept)*  
 D2C-D4 A (NS): *small peat lumps (no finds were kept)*  
 D2C-D4 B (SN): large wood piece  
 D2C-D5 A (EW): charcoal, iron object  
 D2C-D5 A (EW): wood, fish vertebrae  
 D2C-D5 B (WE): wood, peat, weeds  
 BB13-D2 A (EW): peat (*remark: BB13-D1 was not done*)  
 Bottom of core NS6t-1B (~1.9 m depth): reeds



Figure 6 – Left: large wood lump dredged up at D2C-D2A; Right: Wood and flint pieces dredged up at Vc45-D2C.



In some locations large amounts of seagrass were dredged up which hindered the search for archaeological and environmental finds (see Figure 7).

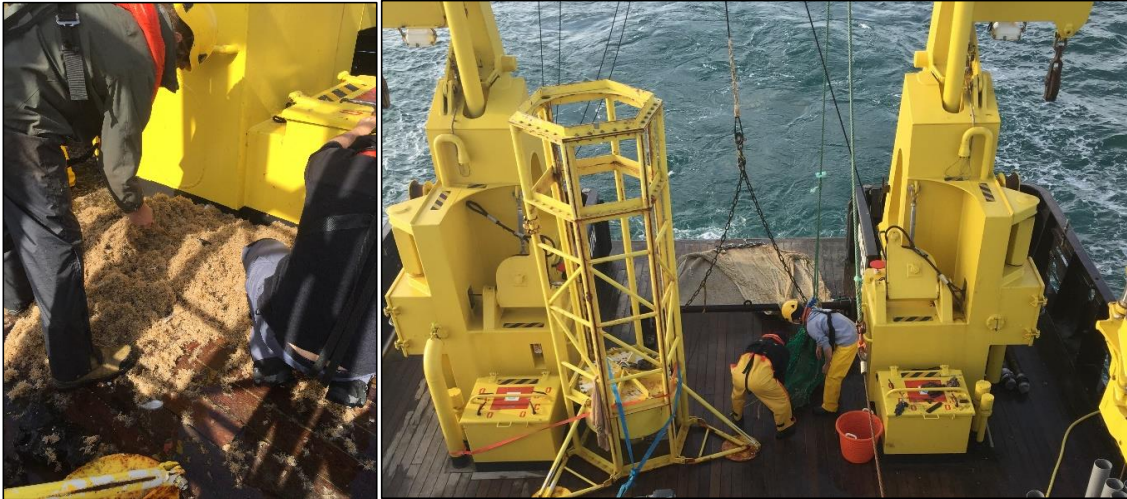


Figure 7 – Left: heaps of seagrass dredged up locally; Right: dredging operation on board RV Simon Stevin

### **Coring**

The cores were cut in pieces of ~1 m and stored on board for the duration of the survey.



Figure 8 – Recovering the core from the vibrocore on the deck of RV Simon Stevin

## **6. REMARKS**

We would like to thank the Simon Stevin captain and crew for their efforts and cooperation. Their skilfulness on-board contributed greatly to the success of this campaign, notwithstanding the adverse weather conditions.

## 8. DATA STORAGE

Seismic data were saved in SES-2000 Quattro echosounder format. Following the campaign, the data were archived in external hard drives. Copies of the data are stored at VLIZ. Vibrocores have been stored in the cold storage at VLIZ. The 'double' cores will be sent over to Bradford in December 2019. Dredge samples have been sent over to the UK (Bradford University) for environmental analysis.

### Contact people:

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