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RV Sanna 2019 Cruise Report

Fjeldskred project: Marine fieldwork within Vaigat and SW Uummannaq fjord

Matthew Owen, Tove Nielsen, Lars-Georg Rödel,
John Boserup, Anders Dahlin & Anna Sofie B. Nielsen

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND
DANISH MINISTRY OF CLIMATE, ENERGY AND UTILITIES

G E U S

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Report of RV Sanna cruise
17.- 30. september 2019
Ilulissat - Vaigat - Uummannaq fjord - Ilulissat

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Appendix C – Cores acquired during the Fjeldskred 2019 marine fieldwork.

1. Summary

Following the Karrat Fjord tsunami of June 2017 (Paris et al., 2019) the Geological Survey of Denmark and Greenland have been tasked with assessing the landslide risk faced by Greenland. Initial assessments have shown that the Nuussuaq basin area, and Vaigat in particular are a 'hotspot' for landslide activity in the area, with previous events having occurred in 1952 and 2000 (Dahl-Jensen et al., 2004; Svennevig, 2019). As such, the marine fieldwork is focused on this area, in order to gather data to constrain tsunami models and to gather evidence relating to former landslide activity.

The Fjeldskred project marine survey aboard RV Sanna took place from 18th of September to the 30th of September 2019. Work included bathymetric and geophysical survey as well as sediment coring in selected locations. The cruise track and core locations are shown in Figure 1. The work was carried out without any adverse incidents in good weather conditions. Though the presence of icebergs in the eastern Vaigat limited the amount of work that could be undertaken near the settlements of Saqqaq and Qeqertaq.

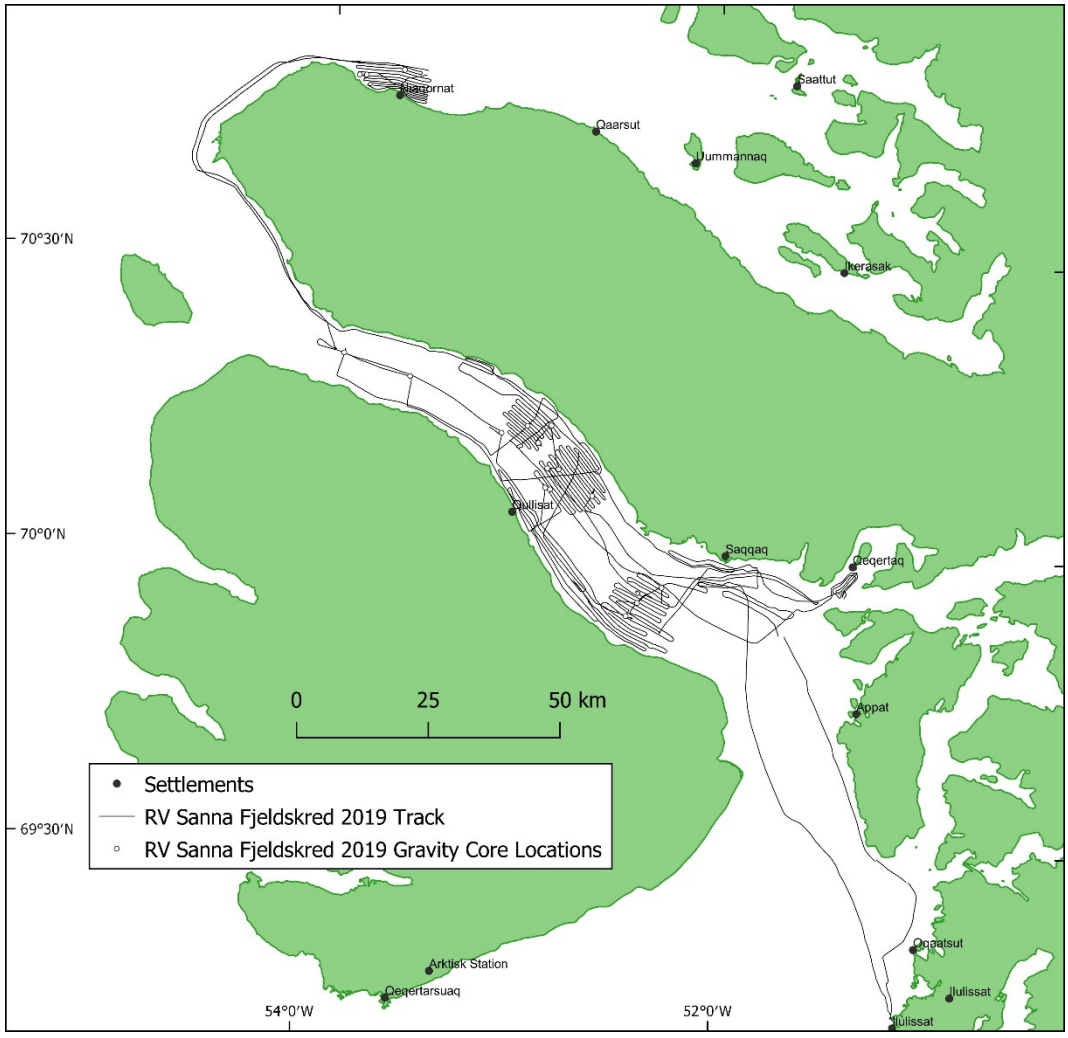

Figure 1. RV Sanna cruise track in September 2019 during the Fjeldskred project marine fieldwork.

1.1 Objectives

The Fjeldskred marine fieldwork had four primary objectives:

i. To collect bathymetry data near settlements to better constrain tsunami models.
ii. Filling of general gaps in high resolution bathymetry coverage to constrain tsunami models and identify any addition sources of risk.
iii. Investigation of known mass transport complexes, to determine their nature: in particular with regard to frequency and magnitude of events.
iv. To acquire sediment cores to enable age constraint of mass movement events.

The geographical focus area of the cruise was Vaigat and southwestern Uummannaq fjord, in the vicinity of the settlement at Niaqornat (**Figure 1**). Within this area there are four main settlements of interest, namely: Saqqaq, Qeqertaq, Niaqornat and Quillisat (abandoned, but of interest due to the recorded runups from the 1952 and 2000 CE tsunami events).

1.2 Funding

The cruise was funded by the governments of Denmark and Greenland, within the project "Study of the risk for serious landslides in Greenland 2019 – 2022".

2. Summary Narrative

In general, the cruise preceded to plan without any major mishap. Mobilisation took a little over 24 hours with the vessel departing Ilulissat shortly after lunchtime on the 19th, following a wet test the vessel transited to the work site in the east of Vaigat.

The initial priority was to collect additional bathymetry near the settlements at Saqqaq and Qeqertaq and this was attempted after some initial work in less high-risk areas, where the survey team and marine crew had been able to get used to survey procedure. Working near Saqqaq on the 21st, significant amounts of ice were encountered and the Innomar pole was recovered to avoid damage. It was not possible to work near to the coastline at Saqqaq. Ice conditions were better at Qerqertaq and the area was surveyed with the multibeam system (sparker and Innomar not deployed due to the near shore environment) later the same day.

Following this, survey work resumed in the main Vaigat channel in good weather. This weather led to an earlier than planned transit around the Nuussuaq peninsula to map the nearshore area at Niaqornat, which was found to be largely ice free.

Following a transit back to Vaigat survey work resumed on the southern Nuussuaq coastline where the sites of the 1952 and 2000 CE landslides were investigated. From the 25th to the 29th both survey and coring operations were undertaken. Survey operations focused on filling gaps in the bathymetry data coverage, with work around the Disko and Nuussuaq coasts, including additional visits to the Saqqaq area as well as investigating the landslide complexes at Giesecke Monument and Ujarasussuk. During daylight hours, cores were taken near and within the landslide complexes.

Work completed in the morning of the 29th, with more bathymetry mapping near Saqqaq, after which point Sanna returned to Ilulissat for demobilisation.

Table 1. Overview of fieldwork activities aboard RV Sanna (refer to Figure 2 for location of settlements and mass transport complexes).

Date	Work area	Notes
18.09.2019	Alongside in Ilulissat	Mobilisation of vessel commences
19.09.2019	Ilulissat to eastern Vaigat	Completed mobilisation 13:00, conduct wet test and transit to start geophysical survey in eastern Vaigat.
20.09.2019	Eastern Vaigat	Surveying in eastern Vaigat from the deeper water offshore Saqqaq, through the Ujarasussuk slide complex and along the Disko coast.
21.09.2019	Eastern Vaigat (Saqqaq and Qeqertaq)	Surveying along the Southern Nuussuaq coast, and around Saqqaq (where ice density forced a change of plan) and Qeqertaq. Innomar pole and sparker recovered to deck to avoid damage. Settlement areas surveyed with multibeam only.

22.09.2019	Vaigat Thalweg and Niaqornat transit	Redeployment of sparker and Innomar and survey of Vaigat thalweg. On advice from the captain we continue to Niaqornat to take advantage of the good weather.
23.09.2019	Niaqornat	Geophysical and bathymetry survey at Niaqornat. Absence of ice allows full coverage of area of interest. Coring operations at Niaqornat from 3 pm UTC. Three sites successfully cored.
24.09.2019	Niaqornat to the Nuussuaq Vaigat coastline	Transit back to Vaigat at 7.5 knots, with no sparker. Sparker redeployed on arrival in Vaigat. Working on the southern Nuussuaq coast, in areas of interest identified by the terrestrial team including 1952 slide.
25.09.2019	Manniup Kua (Paatuut) and western Vaigat	Geophysical and bathymetric survey of the large landslide complex, which includes the year 2000 event at Paatuut. Survey on the northern Disko coast (Quillisat), before coring two sites in western Vaigat.
26.09.2019	Central Vaigat and Giesecke Monument	Survey on northern Disko coast before geophysical and bathymetric survey of landslide complex at Giesecke Monument.
27.09.2019	Central Vaigat (Paatuut, Giesecke) and eastern Vaigat (Saqqaq)	Daylight coring operations at Paatuut and Giesecke Monument before night bathymetry infill operations in eastern Vaigat and Saqqaq. Ice still a problem.
28.09.2019	Central and eastern Vaigat.	Daylight coring operations at Giesecke Monument and Ujarasussuk complexes before night bathymetry and geophysical survey at Ujarasussuk.
29.09.2019	Eastern Vaigat to Ilulissat	Completed further bathymetry infill near Saqqaq before transit to Ilulissat inorder to claim berth on departure of ferry. Alongside in Ilulissat 17:00.
30.09.2019	Alongside in Ilulissat	Completed demobilisation, equipment and core samples packed in container for shipping to Denmark.

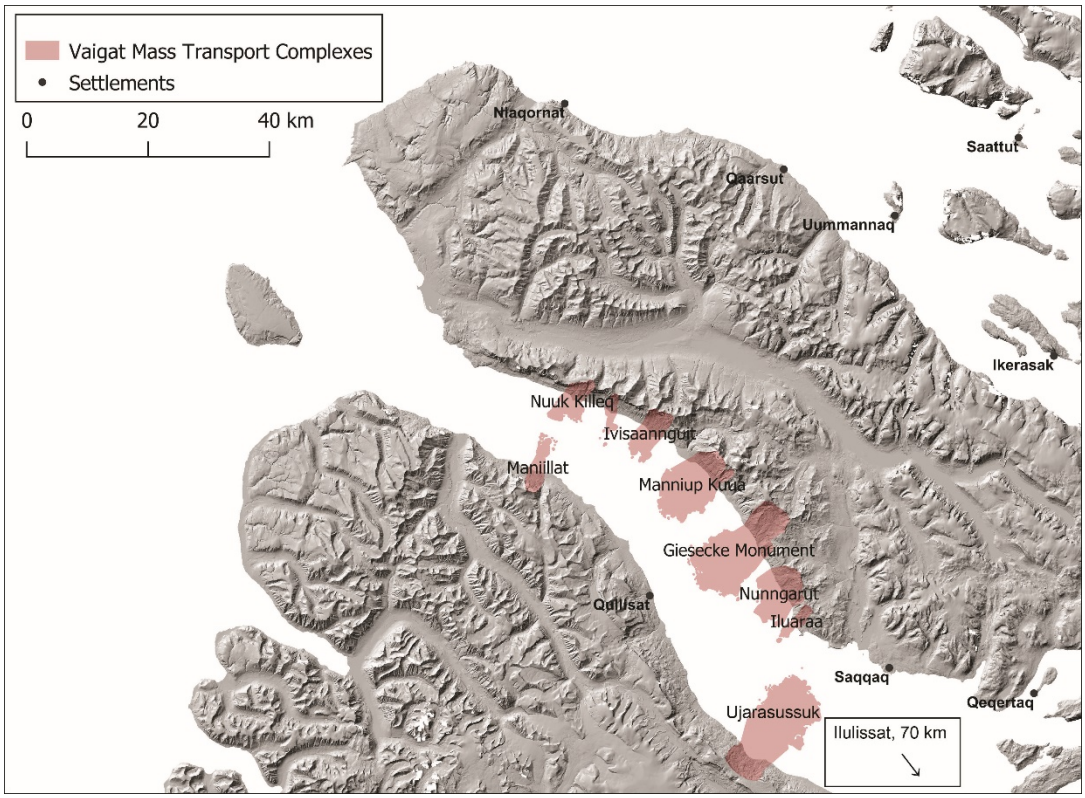

Figure 2. Overview of settlements and know mass transport complexes in the Vaigat and Uummannaq fjord area.

3. Personnel

Marine Crew

Niels Nielsen – Captain

Sivert Olsen – Chief Engineer

Tønnes Hard – First mate

Klaus Nielsen – Mate/ Seaman

Peter Berthelsen – Mate/ Seaman

Hans Lars Siegstad – Helmsman

Sørene Poulsen – Cook

Scientific party

Matthew Owen – Party Chief - GEUS

Tove Nielsen – Co-Party Chief - GEUS

Lars-Georg Rödel - GEUS

John Boserup - GEUS

Anders Dahlin - GEUS

Anna Sofie Bang Nielsen – GEUS / KU

Diana Krawczyk - Greenland Institute of Natural Resources (GINR) / GEUS

The Scientific party was split into two main watches, 12 midday to 12 midnight (Owen, Boserup and Krawczyk) and 12 midnight to 12 midday (T. Nielsen, Rödel and Dahlin). Anna Bang Nielsen worked a shift from 8 am to 8 pm.

4. Equipment reports

4.1 RV Sanna – vessel

RV Sanna performed well during the survey and was found to be a modern, well-equipped vessel that is suited to this work.

One mechanical issue that did affect the vessel was a problem with a hydraulic pump in the gearbox. This could have required a transit to Ilulissat to replace the part, however, the engineer was able to maintain the part onboard.

Figure 3. RV Sanna, departing Ilulissat harbour on the 30th of September. Photo credit. M. J. Owen.

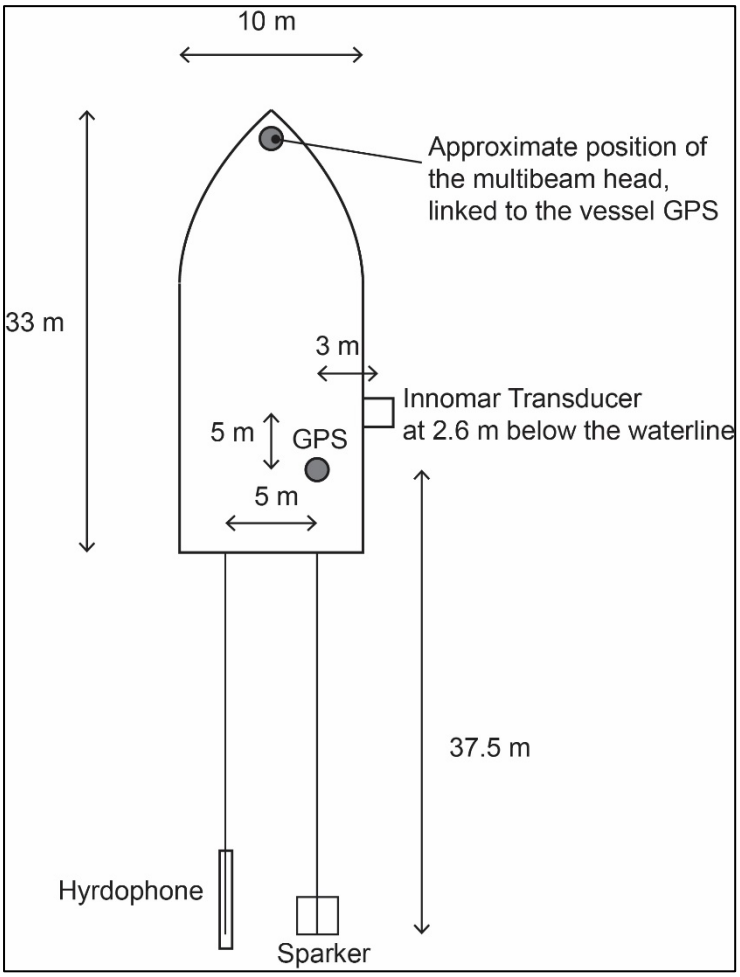

Figure 4. Geophysical survey equipment offsets aboard Sanna

4.2 Reson T50 Multibeam echosounder

RV Sanna is equipped with a permanently installed, hull-mounted, Reson T50 Extended Range multibeam echosounder. The system is theoretically capable of working to depths of 900 m, has 512 beams and operates at selected frequencies between 150 and 400 kHz. The settings used in this survey are outlined in Table 2.

Table 2. Reson T50 settings

Data type	Sensor data, snippets
Power	Full (226 dB)
Pulse length	10000 µs
Gain	10-80 dB
Max rate (ping)	50 p/s
Beam mode	Equi-distant
Pulse type	FM (frequency modulating); FM sweep 1 kHz

Frequency	180 kHz
Absorption	35 dB/km-1
Spreading	30 dB

The vessel's multibeam performed well, though it did struggle with the deeper water areas. For example, the swath width had to be reduced to minimise noise and achieve good results in the deeper water. This meant that line spacing had to be reduced in deeper water and in general a maximum swath width of 900 to 1000 m was achieved. The software crashed on two occasions necessitating infill.

4.3 Geo-Resources 1 kJ Sparker

The sparker was deployed aft, alongside a Geo-Sense 8-element single channel hydrophone streamer with a Geo-Spark power supply. Data was recorded using Geo-Suite Acquistion.

Table 3. Hardware settings for the Sparker system

Power Supply	Geo-Spark 1000
Power output	800 J
Tow frame	Geo-Source 400
Streamer	Geo-Sense 8 element single channel
Firing interval	1.0 to 1.3 seconds (changed to remove the pulse from the Innomar data)
Layback	37.5 m

The sparker worked very well during the survey, assisted by the excellent weather conditions encountered. Maximum penetration was about 200 ms TWT and in general the data was not adversely affected by noise.

No penetration was achieved over parts of the landslide complexes. It is hypothesised that this was either because the material here was heavily compacted or because there was igneous rock at the seabed (basalt and other volcanic blocks displaced on the seabed).

4.4 Innomar Medium sub-bottom profiler

An Innomar Medium sub-bottom profiler was deployed on a swivelled pole-mount on the starboard aft quarter of the vessel. The Innomar was triggered externally from the sparker, firing twice per sparker pulse.

Table 4. Settings for the Innomar system

Primary frequency	8 kHz
Recording range	150 m
Firing interval	Triggered externally from the sparker pulse
Position offset	5 m forward and 3 m starboard.

The Innomar system performed at an acceptable level during the survey, though it was affected by noise from the sparker. However, the Innomar did not cause noise in the multibeam data, which was a concern prior to the survey.

In areas of soft sediments the system achieved penetration of approximately 25 m, no penetration was achieved in areas with a harder seabed.

During coring operations the Innomar system was set to internal trigger (with the sparker not deployed) and during these occasions much higher data quality was achieved.

4.5 Coring operations

Coring operations were undertaken on 23/09 (at Niaqornat), 25/09 (in western Vaigat), 27/09 and 28/09 (at the landslide complexes) and after some initial difficulties with moving the gravity corer on deck the activities proceeded well and without incident.

A table of core locations is provided in Appendix C.

4.5.1 Gravity corer

The 6 m gravity corer was deployed, with a mass of 1000 kg, on 19 occasions in water depths of up to 670 m. There were four failures and thus 15 successful cores. Recovered sediments ranged in length from approximately 0.3 m to 5.5 m. The corer was found to struggle when sampling coarser material such as gravel.

4.5.2 Rumohr Lot corer

The Rumohr corer, with a 75 kg weight, was deployed on 11 occasions with four failures. On all occasions the top 2 cm were removed for subsequent analysis for DNA (which was not part of the Fjeldskred project).

4.5.3 Box corer

The box corer was deployed once in a location that was viewed as too hard a seabed for the gravity core. In this instance a sample was successfully recovered and two cores were taken as samples from the box.

4.6 Naming conventions for cores and survey lines

4.6.1 Cores

Core names all share the same prefix: 'SANNA2019', identifying the cruise.

Gravity cores are then numbered sequentially from 01.

Rumohr-lot cores are numbered sequentially from 101.

Box cores are numbered sequentially from 201.

Failures are included in this list.

Cores were cut into 1 m sections aboard vessel with the lowest section labelled '1', increasing in number as the core neared the seabed so that the highest number for a given core represents the seabed.

Appendix C provides a list of all cores acquired.

4.6.2 Survey lines

Sparker lines were divided between different areas:

Area	**Abbreviation**
Eastern Vaigat	EVAI
Western Vaigat	WVAI
Central Vaigat	CVAI
Northern Vaigat	NVAI
Southern Vaigat	SVAI
Niaqornat	NIAQ
Paatuut	PAAT
Giesecke Monument	GIES
Ujarasussuk	UJ

Lines were then numbered increasing from 01. When a line was restarted due to an equipment failure the suffix ‘a’ was added e.g. EVAI-01a.segy.

Innomar lines were named automatically by the Innomar system, with the suffix Vaigat added to the normal Innomar timestamp naming system e.g. Vaigat_27092019_091630.raw.

Appendix B provides a list of the geophysical lines acquired within the survey log.

5. Incidents

No accidents or near misses occurred during the survey operations.

6. Survey Field Report

6.1 Eastern Vaigat – Saqqaq and Qerqertaq

Survey activities were undertaken in the vicinity of Saqqaq and Qerqertaq on the 21st and 27th and 29th of September. Ice, including grounded icebergs, were a significant problem near Saqqaq (see Figure 4 and iceberg outlines in Figure 3) and it was not possible to come nearer that approximately 500 to 600 m from the coastline. The minimum water depth encountered was 55 m.

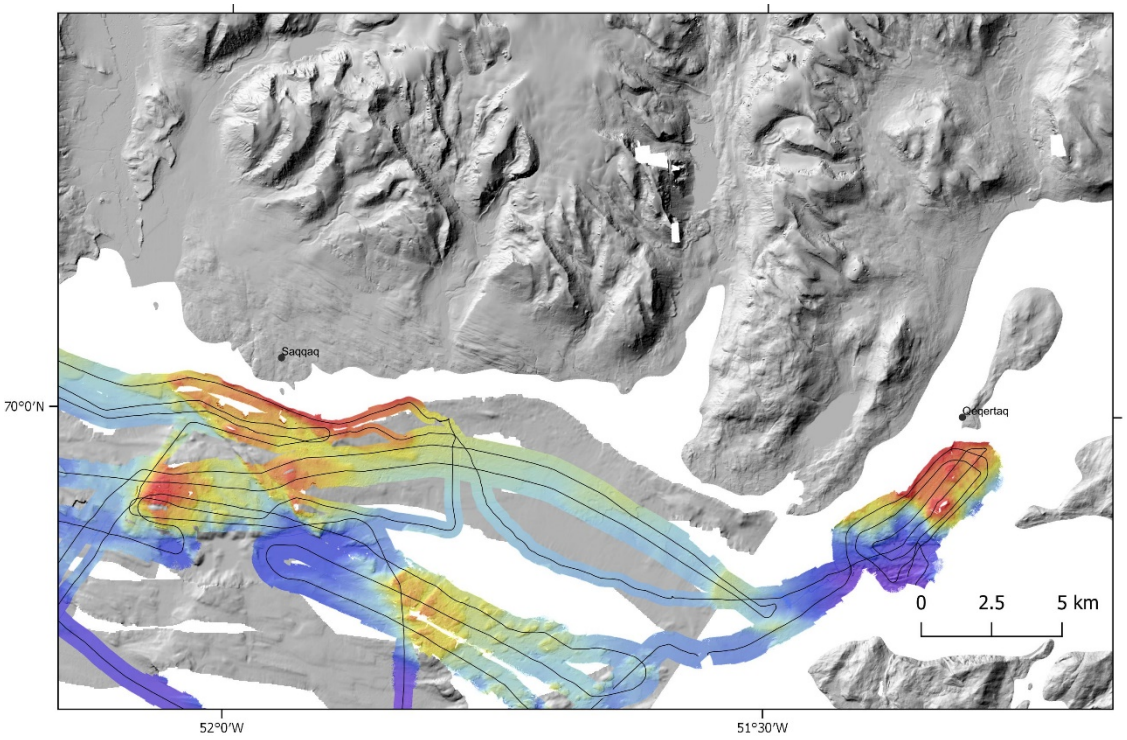

Figure 5. Track and bathymetry data acquired near Saqqaq and Qerqetaq.

Figure 6. Saqqaq and nearby ice on the 21st of September. Photo credit. M.J. Owen.

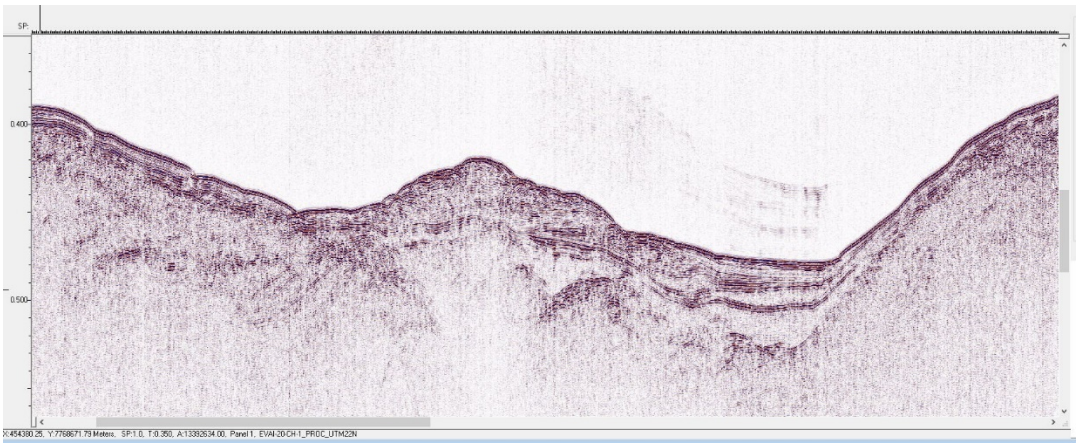

Figure 7. Sparker example west of Saqqaq, showing fan deposits.

Sparker data shows a rocky seabed near to Saqqaq, with sediments infilling small basins that are present. To the west of Saqqaq a delta, extending from the Nuussuaq coast is visible (Figure 4), though is was not possible to collect much data here due to the ice conditions.

Survey was also undertaken near the settlement at Qeqertaq, where ice was present near the settlement but it was not as adverse as near to Saqqaq (Figure 6). A minimum water depth of 28 m was mapped near Qeqertaq and multibeam data reached just under 500 m from the settlement. Rocks to the west and ice to the north meant it was not possible to further extend the multibeam coverage closer to Qeqertaq and the Nuussuaq coast. A shelf of between 100 and 250 m water depth extends offshore some 4 km from Qeqertaq, before the depths increase rapidly to 700 m.

Figure 8. Qeqertaq, as viewed on the 21st of September 2019. Photo credit. A.S. Bang Nielsen.

6.2 Vaigat landslide complexes

The centre of Vaigat was surveyed over a range of days during the cruise. This filled large bathymetry gaps, in particular on the Disko coast, identified the marine deposits from the 1952 landslide and provided high resolution data for the three large landslide complexes.

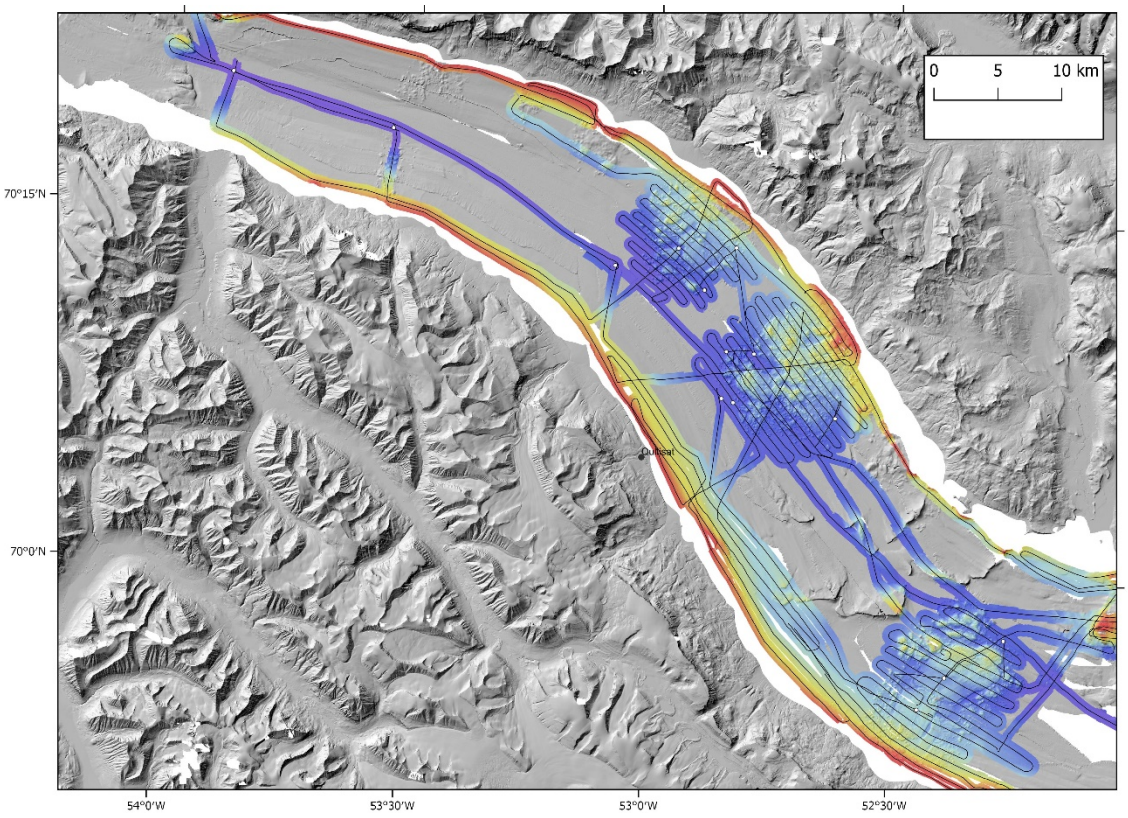

Figure 9. Track and bathymetry data acquired in the central Vaigat.

Figure 10. Onshore deposit from the 1952 (?) landslide the Nuussuaq Vaigat coast, Mollards visible in the foreground. Photo credit. A.S. Bang Nielsen.

New bathymetry data near the abandoned settlement at Qullisat shows a smooth, sloping seabed that we have imaged to within 300 m of the coastline, where water depths of 80 m were encountered.

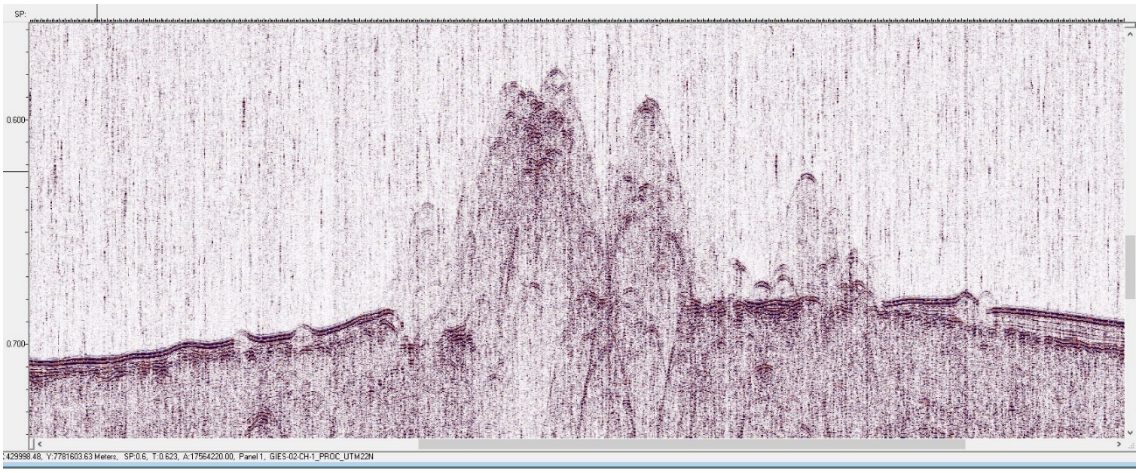

Figure 11. Sparker example from the foot of the Giesecke monument slide complex.

Data from the landslide complexes shows the features in more detail than was previously available. In some cases, the slide deposits appear buried by up to 25 m of the deglacial to Holocene sequence, in others the landslide deposits are at or near the surface (e.g. Figure 8). We are aware of the potential role of bottom currents in controlling sedimentation rates in these locations.

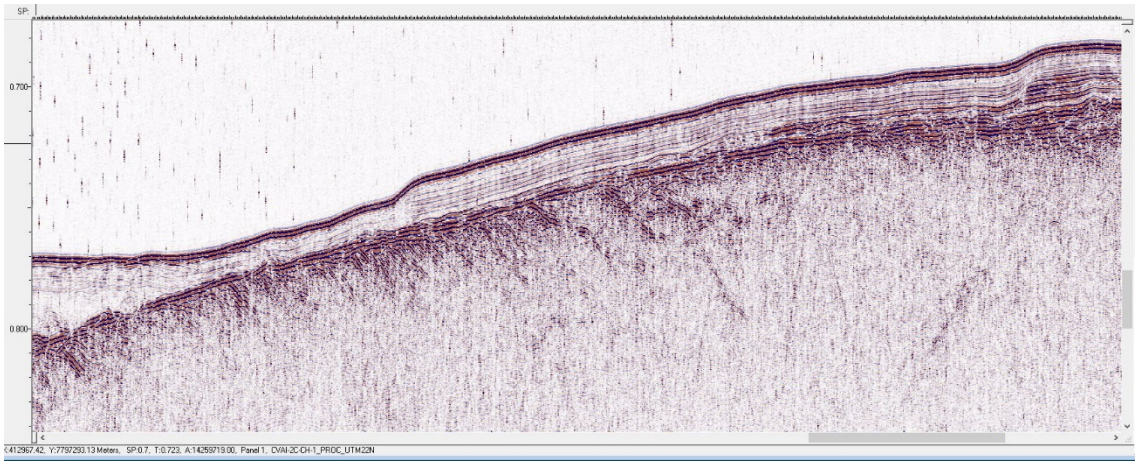

Figure 12. Sparker example showing marine failure scarps in the deglacial to Holocene sequence, water depth approximately 550 m.

In addition to the, already recognised, subaerial to marine complexes we have also identified some wholly marine failures. For example, Figure 9, shows truncated reflectors in the deglacial to Holocene sequence in the centre of Vaigat that indicate a submarine failure scarp (Canals et al., 2004).

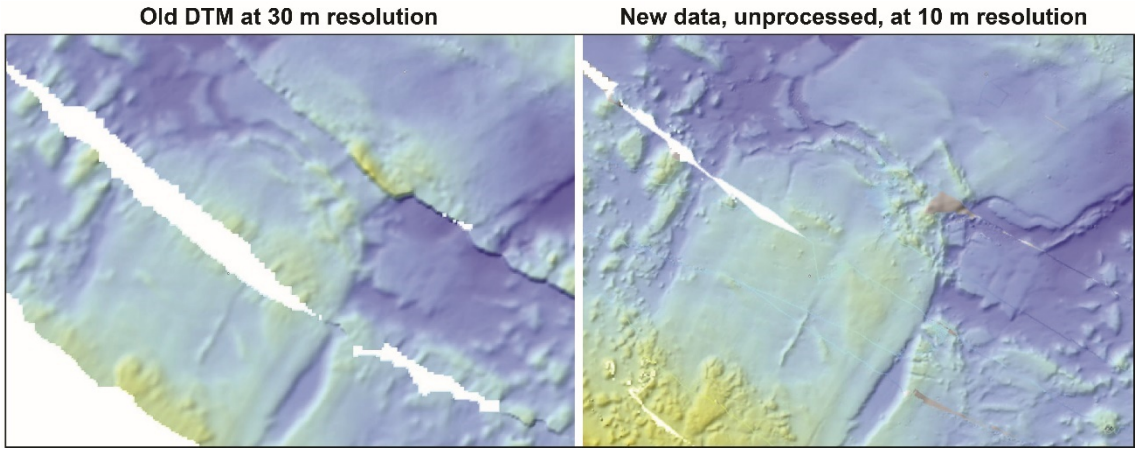

Figure 13. Comparison of existing DTM at 30 m resolution, with large artefacts and the new data, shown unprocessed at 10 m resolution.

New bathymetry data has also revealed far more diagnostic features within the landslide complexes, even where there was some data previously. For example ***Figure 10*** shows a part of the Ujarassusk landslide complex. Previously, there was some uncertainty (and depth disagreement) concerning the origin of the morphology, we can now clearly see the displaced blocks and faulted and deformed structures alongslide the avalanche deposits.

Once the data from all the complexes is analysed it should be possible to identify some of the individual events: a process that will be vital when it comes to assessing the tsunami hazard.

6.3 Niaqornat

The vicinity around the settlement at Niaqornat was surveyed from the 23rd to the 24th of September.

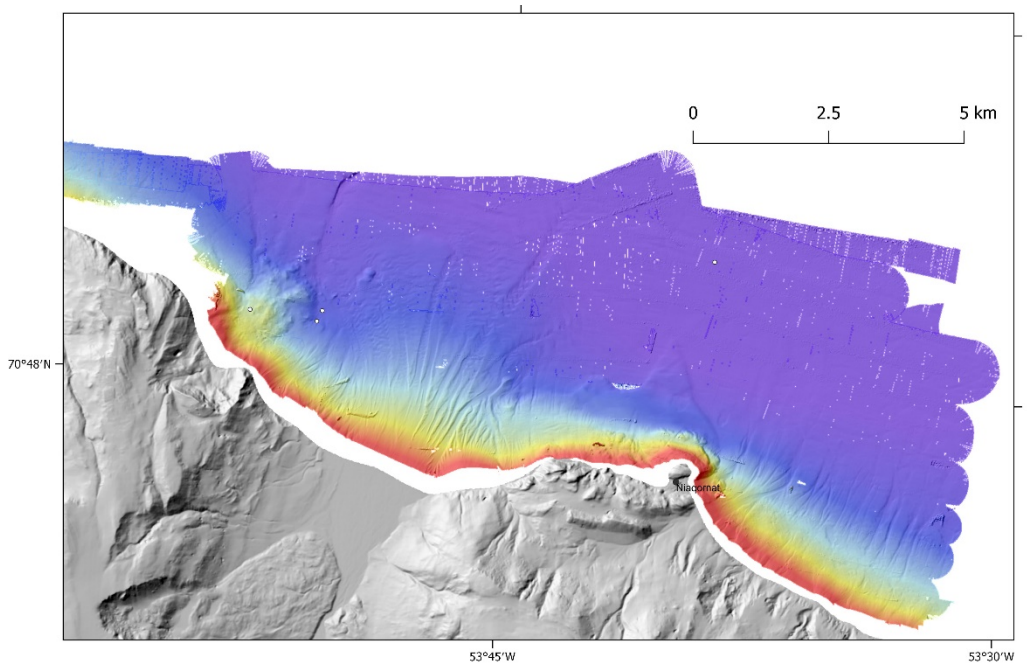

Figure 14. Track and bathymetry data acquired near Niaqornat.

Figure 15. The settlement at Niaqornat. Photo credit. A.S. Bang Nielsen.

The absence of significant ice meant it was possible to achieve nearly full data coverage of the area, collected data reaches to within 100 m of the shoreline with depths of 30 m encountered. This allows us to investigate a potential risk site identified by the terrestrial team to the east of the settlement as well as to gather bathymetry data for tsunami modelling (see ***Figure 13***).

We did not find evidence of landslide deposits in the locations identified by the terrestrial team, we did however map a landslide deposit of some 2 km^2 and 70 m relief to the west of Niaqornat (***Figure 13***). Although we did not see large scale landslide deposits on the seabed east of Niaqornat, sparker data does show what appears to be a mass transport deposit with a

lateral extent of several kilometres towards the base of deglacial to Holocene sequence (***Figure 13***).

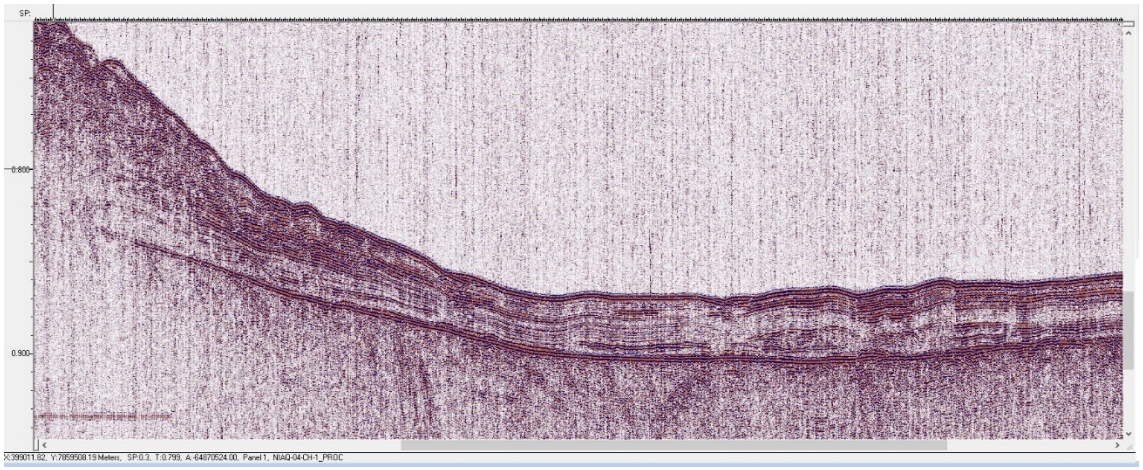

Figure 16. Sparker data offshore from Niaqornat.

7. Summary

The 2019 Fjeldskred marine fieldwork campaign took place aboard the *RV Sanna* between the 18th and 30th of September 2019. The survey collected geophysical data (multibeam echo-sounder, Innomar and Sparker) and sediment core samples (gravity, Rumohr and box corers) in Vaigat and in the vicinity of Niaqornat.

The vessel and survey equipment performed well with no significant breakdowns. Nearly 2050 km of geophysical survey lines were run and 23 core samples recovered. There were no incidents during the fieldwork.

Weather conditions were excellent during the survey though ice was a significant impediment near Saqqaq and limited the amount of work that was possible in this location.

The data is yet to be analysed to any significant degree, but initial impressions are that it is of high quality and will provide a means to further understand landslide and tsunami risk in Vaigat. The cruise met the survey objectives and has filled numerous bathymetric gaps and the new data in coastal areas should provide significant inputs to tsunami models. This is particularly true at Niaqornat and Qullisat. In this second instance it is hoped that the data will assist with modelling of the 2000 landslide and tsunami at Paatuut, where inundation data is available at Qullisat. The new data on the landslide complexes should also allow identification of individual events within the landslide complexes.

8. Acknowledgements

We are very grateful for the captain and crew of RV Sanna, without whose help the cruise would not have been anywhere near as successful as it was. We would also like to thank many of our colleagues who helped with logistical preparations for the fieldwork.

9. References

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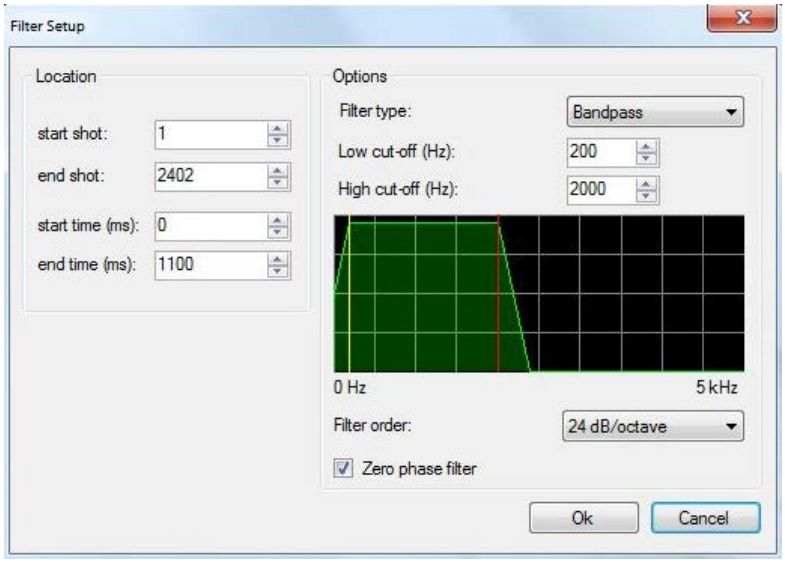
Appendix A – Processing workflow for Sparker data

Processing sequence of sparker data Vaigat cruise 2019

A six-step processing sequence was employed for the processing of single-channel seismic sparker data from the Vaigat cruise, September 2019. After importing the SegY-files each individual line was processed using the following processing sequence. Other processing modules were attempted but didn't have the wanted effects, this six-step sequence gave the most coherent results.

Step 1: IIR filter

The IIR filter module was used to remove undesired frequency content of the signal spectrum such as electrical low frequency noise and ship propeller noise. The employed filter had the settings shown on the picture below.



Step 2: Normalization

The normalize module scales each tract with the inverse of its RMS mean level.

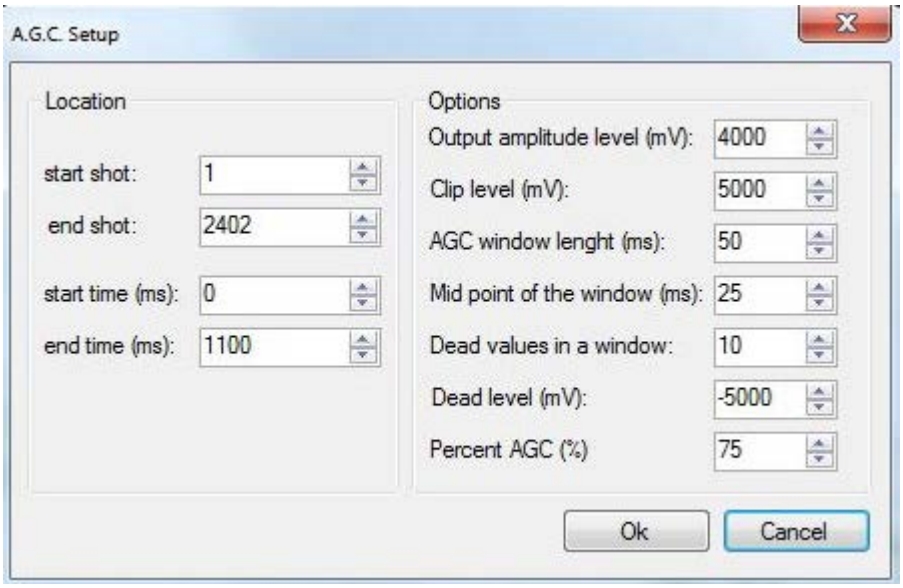
$$rms = \sqrt{\frac{1}{n}\sum_{i=0}^{n} s(i)} \quad ; \qquad s_{out}(i) = \frac{s(i)}{rms} \qquad i = 0,1 \dots n$$

Step 3: A.G.C (Automatic Gain Control)

Automatic gain control compensates the signal attenuation by scaling the data such that the average absolute value of the amplitudes within a specified window will be a certain value. (Output amplitude level).

With the employed AGC routine it is possible to control the way near zero values can affect the computation of the scaling factor. If the window contains too many near zero values, the previous scaling factor is used, to prevent the P-breaks to be over scaled (and thus, clipped). To control this the two parameters *Dead values in a window* and *Dead level (mV)* are used.

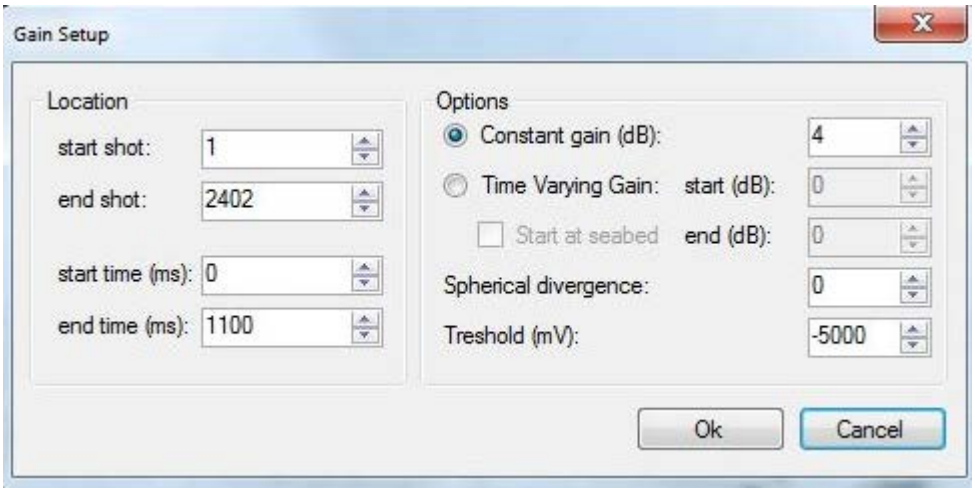
- *Dead values in a window*: indicates the maximum number of near zero samples that can be found in a window before using the previous scaling factor.
- *Dead level (mV)*: indicates the near zero threshold level (e.g. value of 100 mV means that every sample whose absolute value is less than 100 mV is considered a near zero value.)



The *Percent AGC* parameter is used to soften the effect of the AGC operator: 100% means that the signal will be scaled completely using the AGC scaling factor; values less than 100% will reduce the scaling factor.

Step 4: Gain (Constant)

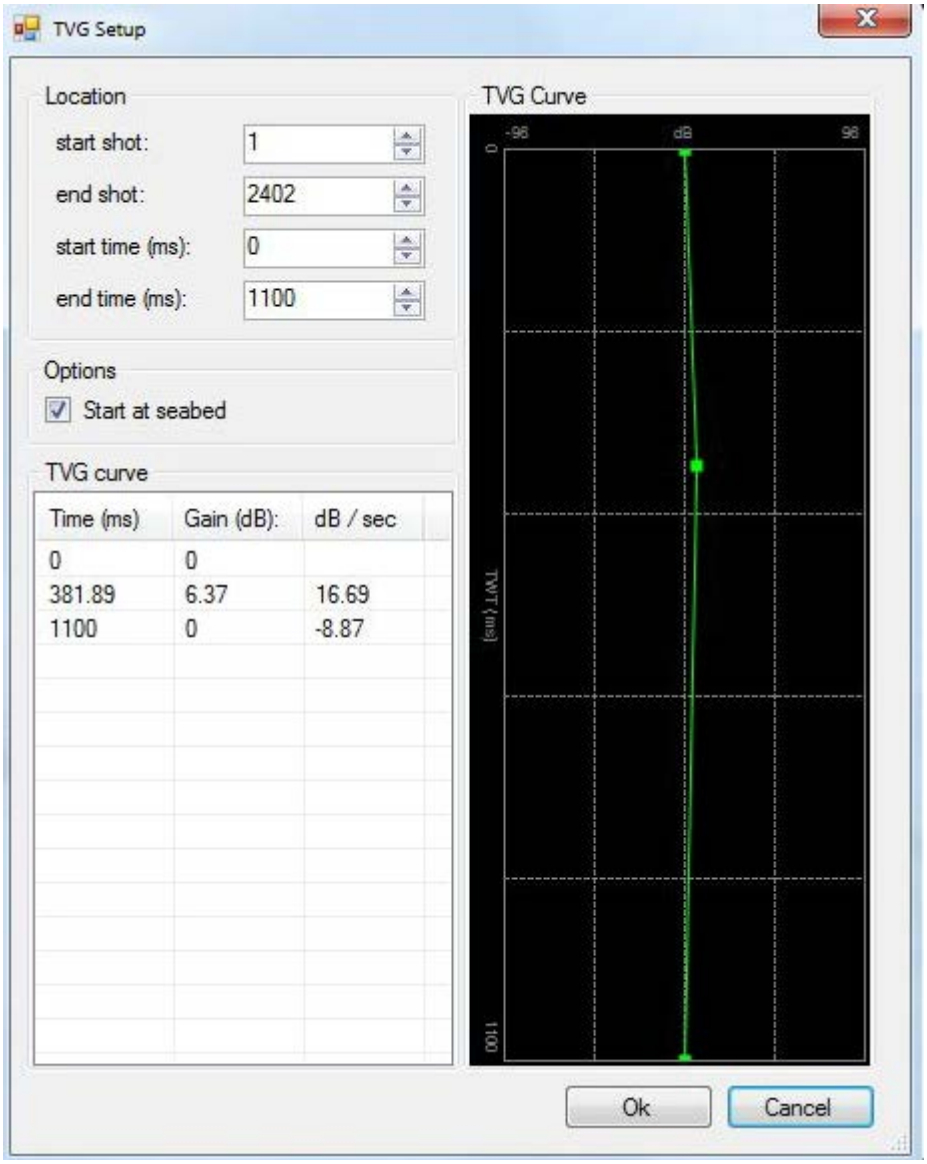
The Gain module was used to apply a small constant gain to the entire profile, since the survey area is on quite deep water (50-600 m).



Step 5: TVG (time-varying-gain with editable curve)

This operator was used to apply a full controllable gain curve to the data. The gain curve will be applied to the portion of the profile defined in the **Location** pane in terms of depth and shots.

For this operator the **Start at seabed** option (at [1]) was used to shift the TVG curve tract by trace so that 0 ms in the TVG curve will correspond to the seabed position.



Step 6: Median filter

The last module in the processing sequence, the median filter, was used to increase horizontal coherency across traces while filtering out undesired data such as spikes or bursts in the water column. This filter makes it easier to track the seabed in case of a noisy water column.

Appendix B – Survey log for RV Sanna

initialer	Survey Log for Fjeldskred Sanna 2019 cruise Date dd-mm-yyyy	start UTC hh:mm:ss	end UTC hh:mm:ss	line name	Client: GEUS RAW	heading	Innomar2000/ Sparker SES_2000	Sparker	sea state m/s	wind m/s	WGS84 Zone 22N Survey skib: Sanna comments and (Mammals observation)
MOW	**18/09/2019**	09:00:00									Mobilising alongside in Ilulissat
MOW	**19/09/2019**	09:30:00									Continue mobilisation
MOW	**19/09/2019**	13:00:00									Depart Ilulissat
											Wet test and refasten Innomar Pole
MOW	19/09/2019	21:48:00	22:20:00	SVP-1							At site take SVP
MOW	19/09/2019	22:38:00	00:15:00	EVAI-01		NW	Vaigat_19092019_223818.raw	EVAI1_01-CH-1.segy			Sparker 800 kJ, shotrate 1s, rec length 900 s, delay=0;
						NW	Vaigat_19092019_231538.raw				Innomar HF 8kh; LF 2kk, pingrate 1s, rec 100ms, delay variable
						NW	Vaigat_19092019_233712.raw				
							Vaigat_20092019_000000.raw				
MOW	20/09/2019	00:17:00	02:07:00	EVAI-02		SE	Vaigat_20092019_001400.raw	EVAI1_02-CH-1.segy			
							Vaigat_20092019_005318.raw				Settings = do; increasing ice
							Vaigat_20092019_012713.raw				
		04:54:28									
MOW	20/09/2019		02:10:00	EVAI-03		NW	Vaigat_20092019_020361	EVAI1_03-CH-1.segy			Innomar rec length 150 ms; Remaining settings = doA lot of ice towards land, Very large iceberg 0.15 nm to starboard
							Vaigat_20092019_024618				Large icberg c 0.15 nm to board side at c.69d58.34'N, 052d04.37'W
		02:11:00		EVAI-04		Variable at start + NW	Vaigat_20092019_043819	EVAI_04-CH-1.segy	25-30 kn/t	170d	Settings = do; Start of line =S-form (transit from line -03 to -04)
			06:09:12				Vaigat_20092019-045315				On line 69d57.34'N; 052d04.20'W
											Settings=do
				EVAI-05		SW	Vaigat_20092019_060714	EVAI_05-CH-1.segy			OBS- diviation from strait run line cause seismic artifact on the Sparker (look like uo-doming)
											Several large icebergs at EOL
				EVAI-06		SE	Vaigat_20192019_073042	EVAI_06-CH-1.segy		120	Settings=do; Increasing wind and wavers (0.5->1m)
				EVAI-07		NW	Vaigat_20092019_084550	EVAI_07-CH-1.segy			Settings =do
							Vaigat_20092019_104158				
				EVAI-08			Vaigat_20092019_104702	EVAI_08-CH-1.segy			Settings =do
							_115923				Speed increased from c 4.5 kn to 6 kn at c. 69d54N, 052d30W
							_120107				Speed decreased to 5.5 kn; Sparker short rate shifted to 1.2 s c. 1/3 from the end of line
							__120251				Adjusting various parametre on Innomar
			14:38:00	EVAI-09			Vaigat_20092019_122857	EVAI_09-CH-1.segy			Large iceberg close to line c.12:45
		16:28:00		EVAI-10		SE	Vaigat_20092019_162615	EVAI_10-CH-1.segy			
							Vaigat_20092019_163230				
							Vaigat_20092019_163735				
							Vaigat_20092019_164020				Testing synchronisation with sparker to reduce interference from sparker pulse.
							Vaigat_20092019_164125				
							Vaigat_20092019_164334				
							Vaigat_20092019_164457				
							Vaigat_20092019_165441				
							Vaigat_20092019_172539				
MOW		15:55:00		EVAI-11		NW	Vaigat_20092019_175515	EVAI_11-CH-1.segy			
							Vaigat_20092019_183827				
							Vaigat_20092019_202535				
							Vaigat_20092019_210914				
							Vaigat_20092019_210955				
			22:02:00				Vaigat_20092019_211033				
MOW		22:02:00		EVAI-12		SE	Vaigat_20092019_220219	EVAI_12-CH-1.segy			
							Vaigat_20092019_232210				
							Vaigat_21092019_000000				
			00:26:00								
MOW		00:26:00		EVAI-13		NW	Vaigat_21092019_002312	EVAI_13-CH-1.segy			
		03:36:00		EVAI-14			Vaigat_21092019_033634	EVAI_14-CH-1.segy			
			05:20:00								
				EVAI-15			Vaigat_21092019_051951	EVAI_15-CH-1.segy			reduce speed to 4,5 knots after turn, sailing towards saqqaq not on a line. Failure in recording, sparker not receiving navigation, restart system
		05:36:00		EVAI-15b			Vaigat_21092019_053637	EVAI_15b-CH-1.segy			restart recording, shooting sparker once pr. second
		06:03:00					Vaigat_21092019_060309				stop recording shortly to reset shot interval on innomar
			07:13:00								
		07:13:00		EVAI-16			Vaigat_21092019_071302	EVAI_16-CH-1.segy			
			08:48:00								reduced speed to 4 kn (rocky area); Innomar LF change to 3 kh

initialer	Survey Log for Fjeldskred Sanna 2019 cruise Date dd-mm-yyyy	start UTC hh:mm:ss	end UTC hh:mm:ss	line name	Client: GEUS RAW	heading	Innomar2000/ Sparker SES_2000	Sparker	sea state m/s	wind m/s	WGS84 Zone 22N Survey skib: Sanna comments and (Mammals observation)
		08:49:00		EVAI-17			Vaigat_21092019_084937				icy water, sparker moved behind the ship to avoid it getting hit by ice
			09:15:00								Innomar lifted out of the water due to risk of hitting ice in the water, temporarily stop the sparker recording
		09:41:00		EVAI-18		W-E					Speed 3-4 kn; very icy water with large icebergs and beginning sea ice formation
				EVAI-19		E-W	No Innomar				ice blocks create difractions on random times on the sparker record
			12:04:00								end of line EVAI-19, stop sparker and trigger during turn
		12:15:00		EAVI-20		W-E	do	EVAI_20-CH-1.segy			Speed 4.5 kn
			14:00:00								Stop recording. Due to ice. Plan on MBE only approach to Qerqertaq.
MOW		14:50:00	15:55:00								SVP and depart for Qerqertaq approach
MOW		15:57:00	18:25:00	EVAI-21		East	No Innomar	No Sparker			Qerqertaq approach - bathy only due to ice conditions
MOW		18:30:00	19:30:00								Core to check Ruhmor set up (corer did not trigger - failure) then SVP.
		19:30:00	22:40:00	EVAI-22			No Innomar	No Sparker			Continue nearshore work at Qerqertaq
		22:40:00	23:43:00								Redeploy Innomar pole and sparker
		23:43:00		CVAI-01		NW	Vaigat_21092019_234351	CVAI-01-CH-1.segy			Survey recommences with full spread
MOW	22/09/2019		00:27:00				Vaigat_22092019_000001				
		00:27:58	00:34:00	CVAI-02		NW	Vaigat_22092019_002758	CVAI-02-CH-1.segy			Sparker sweep increased to 1100 ms due to increased depth
		00:34:00		CVAI-02b		NW	Vaigat_22092019_003434	CVAI-02b-CH-1.segy			Firing interval reduced to 1250 to remove pulse from record
							Vaigat_22092019_051947				changed frequency and number of pulses on innomar, trying to get more defined pulse.
	07:12										multibeam system chrashed, motion sensor failed, restarting and circling around to cover the gap in the multibeam coverage
			07:24:00								stop recording innomar and sparker while turning, speed 2,3 knots
ANDA		07:50:00		CVAI-02c		NW	Vaigat_22092019_074937	CVAI-02c-CH-1.segy			Stopped at EOL; Sparker retrived + SVP
			11:42:21								SVT to 550 m depths, end c 10:47
TNI		13:05:22		NVAI-01		W-NW	Vaigat_22092019_130522	NVAI-01-CH1.segy			SOL around Nuussuaq, heading for Nioganat. Sparker trigger 1250ms, rec length 1.1 s. Speed 6-6.5 kn
							Vaigat_22092019_142252	NVAI-01-CH1.part.01.segy			
							Vaigat_22092019_153348	NVAI-01-CH1.part.02.segy			
							Vaigat_22092019_164819				
							Vaigat_22092019_180445				
			20:52:00				Vaigat_22092019_194917				Arrive at Niaqornat for SVP
MOW		21:58:30	22:10:00	NIAQ-01		E	Vaigat_22092019_215830	NIAQ-01-CH-1.segy			No navigation - Nav PC unresponsive
MOW		22:15:00	23:14:00	NIAQ-01a		E	Vaigat_22092019_221523	NIAQ-01a-CH1.segy			PC fixed (unsure on the actual fault) line continues
MOW		23:14:00		NIAQ-2		W	Vaigat_22092019_231129	NIAQ-02-CH1.segy			
			00:30:00				Vaigat_23092019_000000				
MOW	23/09/2019	00:30:26	01:59:00	NIAQ-3		E	Vaigat_23092019_003026	NIAQ-03-CH1.segy			
MOW	23/09/2019	01:59:00		NIAQ-04		W	Vaigat_23092019_0015826	NIAQ-04-CH1.segy			
TNI		03:26:04		NIAQ-05		E	Vaigat_23092019_032604	NIAQ-05-CH1.segy			
ANDA		04:55:31		NIAQ-06		W	Vaigat_23092019_0425531	NIAQ-06-CH1.segy			
			06:15:00								
ANDA		06:15:50		NIAQ-07		E	Vaigat_23092019_061555	NIAQ-07-CH1.segy			
			07:35:00								
ANDA		07:36:00		NIAQ-08		W	Vaigat_23092019_073344	NIAQ-08-CH1.segy			
ANDA		08:49:14		NIAQ-09		E	Vaigat_23092019_084914	NIAQ-09-CH1.segy			
			10:02:43								
ANDA		10:02:43		NIAQ-10		W	Vaigat_23092019_100243	NIAQ-10-CH-1.segy			
			10:32:14								
ASBN		10:32:14		NIAQ-11		E	Vaigat_23092019_103214	NIAQ-11-CH-1.segy			
			11:01:00								
ANDA		11:01:21		NIAQ-12		W	Vaigat_23092019_110121	NIAQ-12-CH-1.segy			
TNI		11:30:50		NIAQ-13		E	Vaigat_23092019_113050	NIAQ-13-CH-1.segy			
			11:55:00								
ANDA		11:55:00		NIAQ-14		W	Vaigat_23092019_115519	NIAQ-14-CH-1.segy			
		13:20:16	14:50:00	NIAQ-15		NNE		NIAQ-15-CH-1.segy			
				Core site 1				No sparker			
				Core site 2							
				Core site 3							
MOW	23/09/2019	23:25:00		NIAQ-17		N	Vaigat_23092019_232255	NIAQ-17-CH-1.segy			Complete coring operations and recommence geophysical survey. Sparker 800 J
			23:39:00				Vaigat_23092019_232534				
MOW	23/09/2019	23:39:00		NIAQ-18		SE	Vaigat_23092019_233943	NIAQ-18-CH-1.segy			
			00:42:00				Vaigat_24092019_000000				
MOW	24/09/2019	00:42:05	01:11:00	NIAQ-19		NE	Vaigat_24092019_004205	NIAQ-19-CH-1.segy			
MOW	24/09/2019	01:54:00		NVAI-02		W+SW	Vaigat_24092019_015336	No sparker			Transit back to Vaigat 7.5 kts

initialer	Survey Log for Fjeldskred Sanna 2019 cruise Date dd-mm-yyyy	start UTC hh:mm:ss	end UTC hh:mm:ss	line name	Client: GEUS RAW	heading	Innomar2000/ Sparker SES_2000	Sparker	sea state m/s	wind m/s	WGS84 Zone 22N Survey skib: Sanna comments and (Mammals observation)
							No Innomar	do			Innomar turned off to fix the navigation
lagr	24/09/2019	04:41:00				SW	Vaigat_24092019_043927	do			
			06:24:00			S	Vaigat_24092019_055135	do			innomar now with easting/northing on SIS pos 7 and 8 in navigation
TNI	24/09/2019	06:36:54				SE	Vaigat_24092019_063654	NVAI2_01			Sparker deployed after soft start 300j, final output 800J
	24/09/2019	10:43:16				E	Vaigat_24092019_104316	NVAI2_02			
	24/09/2019	12:58:06				E	Vaigat_24092019_125806	NVAI2_03			
						E	Vaigat_24092019_140919				
			16:37:00			E	Vaigat_24092019_152443				
MOW	24/09/2019	16:37:00				W	Vaigat_24092019_163726	NVAI3-CH-1.segy			
			20:08:00				Vaigat_24092019_174831				
MOW	24/09/2019	20:10:00		NVAI-04		E	Vaigat_24092019_185937	No sparker			Bathy infill close to 1952 slide
						E	Vaigat_24092019_203714				No sparker - Innomar on internal trigger
						E	Vaigat_24092019_210413				No sparker - Innomar on internal trigger
						W	Vaigat_24092019_211311				No sparker - Innomar on internal trigger
			22:30:00			W	Vaigat_24092019_222002				No sparker - Innomar on internal trigger
MOW	24/09/2019	22:35:00	23:54:00	NVAI-05		E	Vaigat_24092019_223541	NVAI-5-CH-1.segy			Sparker redeployed. 800 j. Innomar on external trigger
											Sparker interval changed to 1200 ms to remove noise from Innomar
MOW	24/09/2019	23:54:00		PAAT-01		E	Vaigat_24092019_235258	PAAT-01-CH-1.segy			
			01:07:00				Vaigat_25092019_000000				Some noise in sparker, think due to increased wind
MOW	25/09/2019	01:08:00		PAAT-02		W	Vaigat_25092019_010802	PAAT-02-CH-1.segy			
ANDA			02:12:00								
ANDA		02:12:41		PAAT-03		E	Vaigat_25092019_021241	PAAT-03-CH-1.segy			Sparker: 800J, shotrate 1300ms
TNI		03:18:06		PAAT-04		W	Vaigat_25092019_031806	PAAT-04-CH-1.segy			geometry changed bc noise. Layback increased w 4 m(maximum possible). Placed 2 m closer to the source.
		04:16:53		PAAT-05							
			05:05:00								
ANDA		05:05:22		PAAT-06		W	Vaigat_25092019_050522	PAAT-06-CH-1.segy			
			06:00:00								
ANDA		06:00:09		PAAT-07		E	Vaigat_25092019_060009	PAAT-07-CH-1.segy			
TNI		06:56:26		PAAT-08		W	Vaigat_25092019_065626	PAAT-08-CH-1.segy			
			07:55:00								
ANDA		07:55:02		PAAT-09		E	Vaigat_25092019_075502	PAAT-09-CH-1.segy			
			08:56:00								
ANDA		08:56:56		PAAT-10		W	Vaigat_25092019_085656	PAAT-10-CH-1.segy			
			09:44:00								
ANDA		09:44:53		PAAT-11		E	Vaigat_25092019_094453	PAAT-11-CH-1.segy			
			10:27:24								
ASBN		10:27:24		PAAT-12		W	Vaigat_25092019_102724	PAAT-12-CH-1.segy			
			11:02:22								
ASBN		11:02:22		PAAT-13		E	Vaigat_25092019_110222	PAAT-13-CH-1.segy			
			11:33:32								
ASBN		11:33:32		PAAT-14		W	Vaigat_25092019_113332	PAAT-14-CH-1.segy			
			12:40:00								
ANDA		12:40:04		PAAT-15		E	Vaigat_25092019_124004	PAAT-15-CH-1.segy			
			13:07:00								
MOW		13:07:00		PAAT-16		S	Vaigat_25092019_130527	PAAT-16-CH-1.segy			
			14:38:00								
MOW		14:38:00		SVAI-01		W	Vaigat_25092019_143716	SVAI-01-CH-1.segy			
			17:41:00				Vaigat_25092019_155112				Speed increased to 6 knots to get to core locations in good time. Sea state 1
MOW		17:42:00	18:10:00	SVAI-02		N	Vaigat_25092019_174150	SVAI-02-CH-1.segy			
MOW		18:21:00	23:20:00								Sparker recovered to deck. Coring operations Gravity core 05 and ruhmor core 104
MOW		23:18:36		SVAI-03		E	Vaigat_25092019_231836	SVAI-03-CH-1.segy			Sparker depolyed on route to eastern Vaigat....
TNI	26/09/2019	03:25:56		SVAI-04		NE	Vaigat_26092019_032556	SVAI-04-CH-1.segy			
		04:10:28		GIES-01		NW	Vaigat_26092019_041028	GIES-01-CH-1.sgy			Speed 5.5-6 kn
		05:01:06		GIES-02		SE	Vaigat_26092019_050106	GIES-02-CH-1.sgy			
		06:10:26		GIES-03		NW	Vaigat_26092019_061026	GIES-03-CH-1.sgy			Speed 5 kn
		07:31:36		GIES-04		SE	Vaigat_26092019_073136	GIES-04-CH-1.sgy			Speed 5.5 kn
			08:46:00								
ANDA		08:46:57		GIES-05		NW	Vaigat_26092019_084656	GIES-05-CH-1.segy			

initialer	Survey Log for Fjeldskred Sanna 2019 cruise Date dd-mm-yyyy	start UTC hh:mm:ss	end UTC hh:mm:ss	line name	Client: GEUS RAW	heading	Innomar2000/ Sparker SES_2000	Sparker	sea state m/s	wind m/s	WGS84 Zone 22N Survey skib: Sanna comments and (Mammals observation)
LaGR		11:10:33		GIES-08		NV	Vaigat_260919_111033	GIES-08-CH-1.segy			so far we continue and wait for hundested propel verdict on the hydraulics pump
TNI		12:32:37		GIES-09		SE	Vaigat_260919_123237	GIES-09-CH-1.segy			
			13:51:10								
ASBN		13:51:10		GIES-10		NW	Vaigat_260919_135110	GIES-10-CH-1.segy			Sparker interval changed to 1300 ms to avoid interference on Innomar
			15:07:00								
MOW		15:08:00		GIES-11		SE	Vaigat_260919_150833	GIES-11-CH-1.segy			
			16:32:00								
MOW		16:33:00		GIES-12		NW	Vaigat_260919_163348	GIES-12-CH-1.segy			
			17:54:00								
MOW		17:54:00		GIES-13		SE	Vaigat_260919_175431	GIES-13-CH-1.segy			
			19:18:00								
MOW		19:18:00		GIES-14		NW	Vaigat_260919_191832	GIES-14-CH-1.segy			
			20:34:00								
MOW		20:34:00		GIES-15		SE	Vaigat_260919_203455	GIES-15-CH-1.segy			
			21:45:00								
MOW		21:45:00		GIES-16		NW	Vaigat_260919_214544	GIES-16-CH-1.segy			
			22:49:00								
MOW		22:49:00		GIES-17		SE	Vaigat_260919_224952	GIES-17-CH-1.segy			
			22:31:00								
MOW		23:31:00		GIES-18		NW	Vaigat_260919_233142	GIES-18-CH-1.segy			
			00:15:00				Vaigat_260919_000000				
MOW	27/09/2019	00:15:00		GIES-19		WSW	Vaigat_270919_001511				
			00:15:00								
TNI		03:45:52		SWVAI-01							Very small line with wrong name
			03:48:47								
		03:48:47		SEVAI-01		SE	Vaigat_270919_034847	SEVAI-01-CH-1.sgy			Correct line name
			04:38:59								
		04:38:59		SEVAI-02		NW	Vaigat_270919_043859	SEVAI-02-CH-1.sgy			
			05:31:27								
		05:31:27		SEVAI-03		NW	Vaigat_270919_053127	SEVAI-03-CH-1.sgy			
			07:46:00								
ANDA		07:46:03		SW_INFILL-01		NW	Vaigat_270919_074603	SW_INFILL-01-CH-1.sgy			
			09:16:30								
		09:16:30		PAAT-17		N	Vaigat_270919_091630	PAAT-17-CH-1.sgy			
			09:52:00								
TNI		10:12:47		on core site		drift WNW	Vaigat_27092019_101247	no sparker			Innomar on core location Manniur_01
		11:07:22		drift		drift WNW	Vaigat_27092019_110722	do			Drift during lowering of (failed) RH coring
		11:43:25		transit		E	Vaigat_27092019_1143425	do			Transit to core site Manniup_02
		12:23:45		on core site			Vaigat_27092019_122345	do			On core location Manniup_02; drifting towards MTD = GR core on the slope ? No RH
			12:52:00								
		13:21:10		on core site			Vaigat_27092019_132110	do			On core location Manniup_03; GR core emty. No RH
			13:47:00								
		14:00:52		on core site				do			New attempt on site Manniup_03 - failed. Move to Manniup_04
				On core site							Gravity core attempted at location. Failed - firm to stiff clayey gravel on core barrel. Try box core.
			17:06:00	On core site							Leaving location Manniup_04 - sample in box core
MOW		17:50:00		On core site							Head to location Giesecke_02
			18:13:00				Vaigat_27092019_174835	no sparker			core on deck - looks like full recovery
							Vaigat_27092019_183328				Deploy ruhmor
MOW		19:40:00		On core site							Giesecke_03
											Coring completed, recommence geophysical survey
MOW		21:34:00		CVAI-03		E	Vaigat_27092019_213451	CVAI-03-CH-1.segy			
							Vaigat_27092019_214036				
							Vaigat_27092019_235259				
			03:25:00				Vaigat_28092019_000001				
ANDA			03:30:00				Vaigat_28092019_033147				sparker out of the water due to ice conditions, sailing back to vaigat on a line north of previous line CVAI-03 due to ice, CVAI line without sparker.
							Vaigat_28092019_062529				samme linje
LaGR											MB topunit crash, logging out from 06:55 > 07:12
anda		07:37:59		CVAI-04		W	Vaigat_28092019_073759	CVAI-04-CH-1.segy			sparker in the water again, less ice in the water
			09:25:17				Vaigat_28092019_074638				innomar triggering of sparker

initialer	Survey Log for Fjeldskred Sanna 2019 cruise Date dd-mm-yyyy	start UTC hh:mm:ss	end UTC hh:mm:ss	line name	Client: GEUS RAW	heading	Innomar2000/ Sparker SES_2000	Sparker	sea state m/s	wind m/s	WGS84 Zone 22N Survey skib: Sanna comments and (Mammals observation)
TNI		09:25:17		GIES-20		N	Vaigat_28092019_092517	GIES-20-CH-1.sgy			No MB- area already mapped
			09:47:56								
		10:13:39		On core site Giescke_04			Vaigat_28092019_101339	no sparker			Site Gieske_04: GR=70 06.850' N, 52 37.243 W. Wd 473 m; RH = 70 06.975 N , 52 37.737 W. wd 466 m
		11:57:43	12:12:00	On core site Giescke_05			Vaigat_28092019_115743	do			Site Giescke _05. Only GR
		12:54:09	13:05:00	On core site Giescke_01			Vaigat_28092019_125409	do			Site Giescke _01. Only GR
			16:29:00	Transit			Vaigat_28092019_132914	do			Speed 6 kn
Mow		16:30:00	16:38:00	Core site UJ-01			Vaigat_28092019_163008	No sparker			On location at UJ-01
		17:03:00	18:30:00	Transit and core site UJ-03			Vaigat_28092019_170346	No sparker			UJ-03
MOW		18:31:00	20:!5	Transit and core site UJ-02			Vaigat_28092019_183131	No sparker			
MOW		20:27:00		UJ-01			Vaigat_28092019_202752	UJ-01-CH-1.segy			
			20:43:00								
		20:43:00		UJ-02			Vaigat_28092019_204347	UJ-02-CH-1.segy			
			21:25:00								
MOW		21:25:00		UJ-03			Vaigat_28092019_212552	UJ-03-CH-1.segy			
			22:17:00								
ASBN		22:17:23		UJ-04			Vaigat_28092019_221723	UJ-04-CH-1.segy			
			23:19:00								
MOW		23:20:00		UJ-05			Vaigat_28092019_232045	UJ-05-CH-1.segy			
	29/08/2019		00:03:00				Vaigat_29092019_000000				
MOW		00:05:00		UJ-05a			Vaigat_29092019_000500	UJ-05a-CH-1.segy			MBE PC crashed. Loop back around. Gap in data due to repositioning of sparker behind vessel
			00:42:00								
MOW		00:43:00		UJ-06			Vaigat_29092019_004335	UJ-06-CH-1.segy			
			01:54:00								
MOW		01:54:00		UJ-07			Vaigat_29092019_015540	UJ-07-CH-1.segy			
			02:59:00								
TNI		02:59:19		UJ-08			Vaigat_29092019_025919	UJ-08-CH-1.segy			Sparker trigger rate1300 ms. Lot of icebergs - speed 3.5 kn
			04:24:00								
ANDA		04:24:12		UJ-09			Vaigat_29092019_042412	UJ-09-CH-1.segy			Speed 5.5 kn
			05:28:00								
TNI		05:28:46		UJ-10			Vaigat_29092019_052846	UJ-10-CH-1.segy			Sparker and Innomar out of the water. Survey continued with MB only (due to the iceberg situation)
			06:45:00								
			11:00:00	MBE infill							Survey completed. Begin tranist back to Ilulissat

Appendix C – Cores acquired during the Fjeldskred 2019 marine fieldwork.

Core site locations **Sanna 2019**

				Planned position						Actual position							
Name	Type	Name	Depth	X	Y	Lat	Lon	Lat_DD	Long_DD	Date	Time	Water depth (m)	Core length (cm)	Weather	Spid/Core catcher sample taken	Comments	Mag Sus
SANNA2019-01	Gravity core	Niaq_01	653	403010	7860169	70 49.59' N	53 38.80' W	70.82678	-53.6469	23/09/2019	14:30	673	458	Sun	SANNA2019-01 Spids	Shell fragments collected from the core catcher	x
SANNA2019-04	Gravity core	Niaq_02	280	394475	7859251	70 48.89' N	53 52.68' W	70.8155	-53.8793	23/09/2019	19:45	299	145	Dark and a litle rain	SANNA2019-04 Spids	Tubes collected from surface.	x
SANNA2019-02	Gravity core	Niaq_03	490	395653	7859146	70 48.86' N	53 50.75' W	70.81408	-53.8456	23/09/2019	16:45	483	33	Sun	SANNA2019-02 Spids		x
SANNA2019-03	Gravity core	Niaq_03						70.81587	-53.843	23/09/2019	18:00	516	-	Sun		Failure. Gravel collected from core catcher (basalt and quartz?)	
SANNA2019-05	Gravity core	WVAI_01	593	391483	7806620	70 20.53' N	53 53.48' W	70.34245	-53.8916	25/09/2019	16:50	607	51	Sun		Several shells collected from the bottom of the core.	x
SANNA2019-06	Gravity core	WVAI_02	584	404374	7801900	70 18.31'N	53 32.58' W	70.3075	-53.5538	25/09/2019	19:30	591	514	Dark	SANNA2019-06 Spids		x
SANNA2019-07	Gravity core	Manniup_01	560	421419	7791225	70 12.92' N	53 04.83'W	70.217	-53.0837	27/09/2019	08:30	562	489		SANNA2019-07 Spids	Tubes collected from surface.	
SANNA2019-08	Gravity core	Manniup_02	490	426360	7792792	70 13.85' N	52 57.06' W	70.23033	-52.9533	27/09/2019	10:30	499	91	Sun	SANNA2019-08 Spids	Large rocks removed from the bottom part of the core. Rocks were overlain by shells which were collected. A shell from the surface was also collected.	
SANNA2019-09	Gravity core	Manniup_03	505	428115	7789520	70 12.12' N	52 54.11' W	70.20183	-52.8967	27/09/2019	11:35	519	-	Sun	SANNA2019-09 Spids	Fail, but sediment retrived from core catcher.	
SANNA2019-10	Gravity core	Manniup_03						70.20163	-52.8974	27/09/2019	13:00	519	-	Sun	SANNA2019-02 Spids	Fail, but sediment retrived from core catcher.	
SANNA2019-11	Gravity core	Manniup_04	370	430810	7792770	70 13.91' N	52 49.99' W	70.23195	-52.8338	27/09/2019	14:00	382	-	Sun	SANNA2019-11 Spids	Fail, but sediment retrived from core catcher.	
SANNA2019-12	Gravity core	Giescke_02	510	431951	7784729	70 09.60 'N	52 47.80' W	70.15785	-52.7912	27/09/2019	16:05	528	463	Sun	SANNA2019-12 Spids		
SANNA2019-13	Gravity core	Giescke_03	504	429950	7784654	70 09.53' N	52 50.97'W	70.15902	-52.8485	27/09/2019	18:00	525	525	Sun	SANNA2019-13 Spids		
SANNA2019-14	Gravity core	Giescke_04	450	438385	7779465	70 06.87' N	52 37.39' W	70.11417	-52.6203	28/09/2019	08:20	473	296	Sun	SANNA2019-14 Spids	Surface sediment retrived in bag.	
SANNA2019-15	Gravity core	Giescke_05	504	430515	7780810	70 07.47' N	52 49.89' W	70.1235	-52.8317	28/09/2019	10:00	523	251	Sun	SANNA2019-15 Spids	Surface sediment retrived in bag.	
SANNA2019-16	Gravity core	Giescke_01	520	429536	7781123	70 07.63' N	52 51.45' W	70.12617	-52.8558	28/09/2019	11:00	538	95	Sun	SANNA2019-16 Spids	Surface sediment retrived in bag.	
SANNA2019-17	Gravity core	UJ-01	340	444750	7756700	69 54.71' N	52 26.49'W	69.91168	-52.4391	28/09/2019	14:30	354	342	Sun	SANNA2019-17 Spids	Bottom part of core retrived in bag.	
SANNA2019-18	Gravity core	UJ-03	400	446939	7759120	69 56.04'N	52 23.15'W	69.93438	-52.3841	28/09/2019	15:45	413	177	Sun	SANNA2019-18 Spids		
SANNA2019-19	Gravity core	UJ-02	477	451767	7762060	69 57.68 'N	52 15.68' W	69.96103	-52.2647	28/09/2019	17:20	491	428	Sun	SANNA2019-19 Spids	Material from outsite the spids/core catcher were also retrived. Shell fregmetns retrived from core catcher.	
SANNA2019-101	Rumohr-lot core	NIAQ_01	653	403010	7860169	70 49.59' N	53 38.80' W	70.82608	-53.6392	23/09/2019	15:15	677	100	Sun		Top 2 cm removed. Tubes collected from surface.	
SANNA2019-102	Rumohr-lot core	NIAQ_03	490	395653	7859146	70 48.86' N	53 50.75' W	70.81343	-53.8414	23/09/2019	17:15	482	-			Failure	
SANNA2019-103	Rumohr-lot core	NIAQ-02						70.81567	-53.8787	23/09/2019	20:30	302	74	Dark, a litle rain		Top 2 cm removed	
SANNA2019-104	Rumohr-lot core	WVAI-01	593	391483	7806620	70 20.53' N	53 53.48' W	70.34268	-53.8922	25/09/2019	17:25	607	8	Sun		Little materiel, therefore transferred to sample back. Top 2 cm removed	
SANNA2019-105	Rumohr-lot core	WVAI-02	584	404374	7801900	70 18.31'N	53 32.58' W	70.306	-53.544	25/09/2019	20:00	593	-	Sun		Failure, retried with same name	
SANNA2019-105	Rumohr-lot core	WVAI-02	584	404374	7801900	70 18.31'N	53 32.58' W	70.30833	-53.5503	25/09/2019	20:50	591	-	Sun		Failure	
SANNA2019-106	Rumohr-lot core	Manniup_01	560	421419	7791225	70 12.92' N	53 04.83'W	70.215	-53.0783	27/09/2019	09:10	562	-	Sun		Failed due to drifting	
SANNA2019-107	Rumohr-lot core	Giescke_02	510	431951	7784729	70 09.60 'N	52 47.80' W	70.15887	-52.7969	27/09/2019	16:35	529	85	Sun		Top 2 cm removed	
SANNA2019-108	Rumohr-lot core	Giescke_03	504	429950	7784654	70 09.53' N	52 50.97'W	70.15875	-52.847	27/09/2019	18:25	520	87	Sun		Top 2 cm removed	
SANNA2019-109	Rumohr-lot core	Giescke_04	450	438385	7779465	70 06.87' N	52 37.39' W	70.1155	-52.626	28/09/2019	08:45	476	21	Sun		Top 2 cm removed	
SANNA2019-110	Rumohr-lot core	UJ-03	400	446939	7759120	69 56.04'N	52 23.15'W	69.93327	-52.4173	28/09/2019	16:15	412	98	Sun		Top 2 cm removed	
SANNA2019-111	Rumohr-lot core	UJ-02	477	451767	7762060	69 57.68 'N	52 15.68' W	69.96255	-53.5975	28/09/2019	17:50	435	55	Sun		Top 2 cm removed	
SANNA2019-201	Box core	Manniup_04						70.23137	-52.8346	27/09/2019	14:41	377	15	Sun		Two cores and sample of the upperpart (mud) and of the lower part (gravel). Ekstra mixed material also retrived.	