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CRUISE REPORT

Marine Geological Cruise to Storfjordrenna and Bjørnøyrenna

R/V Helmer Hanssen 7th July – 21st July, 2014

Centre for Gas Hydrate, Environment and Climate (CAGE)

UiT – The Arctic University of Norway

N-9037 Tromsø, Norway

1. Introduction and scientific objectives

The cruise was a part of the Centre of Excellence for Gas Hydrate, Environment and Climate (CAGE) at UiT - The Arctic University of Norway.
The cruise aimed at investigating areas with gas venting from the seabed in outer Storfjordrenna and central Bjørnøyrenna (Fig. 1.1). More specific objectives were:

- Sampling benthic seabed fauna in areas of gas venting to investigate the biological responses to natural gas seeping.
- Mapping seafloor geomorphology and subseabed structures relations to gas venting
- Mapping seafloor imprints of deglaciation

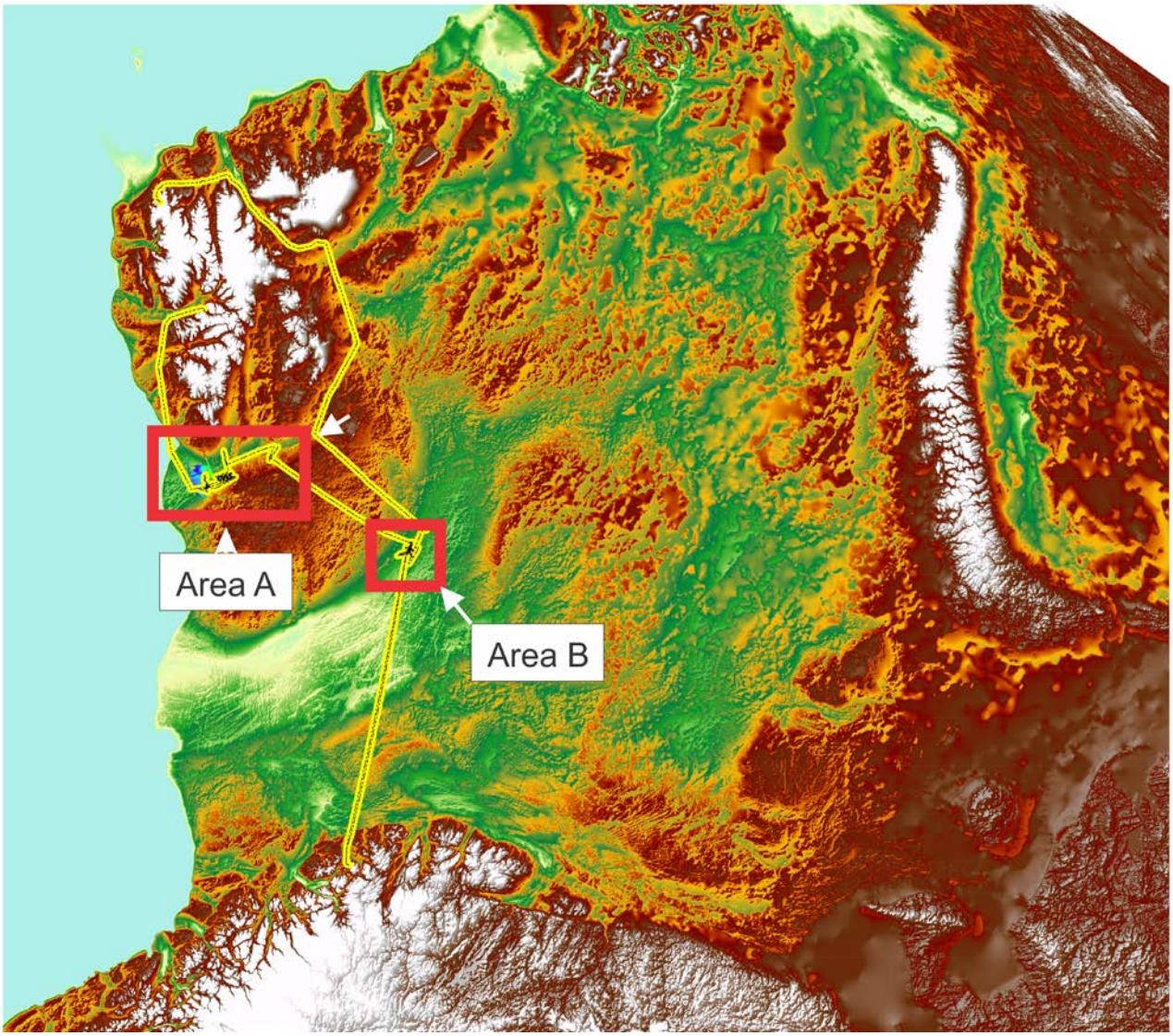

Figure 1.1. Overview of cruise track lines and investigated areas in Storfjordrenna and central Bjørnøyrenna.

2. Cruise participants

Karin Andreassen, Prof. University of Tromsø (Cruise leader; Sh1)
Michael Carroll, Scientist CAGE (open)
Will Ambrose, Prof. Bates College USA (open)
Anoop Mohanan Nair, Engineer University of Tromso (Sh1/open)
Andreia Plaza Faverola, PostDoc University of Tromsø (Sh1)
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Soma Baranwal, PostDoc, NGU Trondheim (Sh2)
Emmelie Åström, PhD University of Tromsø (open)
Eythor Gudlaugsson, PhD Student University of Tromsø (Sh1)
Mariana S. R. Esteves, PhD Student University of Tromsø (Sh2)
Emilia Piasecka, PhD Student University of Tromsø (Sh1; 7-13 July)
Andrea Schneider, PhD Student University of Tromsø (open)
Calvin Schackleton, PhD Student University of Tromsø (Sh2)
Ingvild Myrvang, Master Student University of Tromsø (Sh2)
Kirsti Bjørnøy, Master Student University of Tromsø (Sh1)
Olga Aganova, Master Student University of Tromsø (Sh1; 7-13 July)

Shifts
Sh1 = Shift 1: working 08:00-14:00 and 20:00-02:00
Sh2 = Shift 2: working 14:00-20:00 and 02:00-08:00

3. Equipment

3.1 Subbottom Profiler (Chirp)

A X-STAR Full Spectrum Sonar is a versatile wideband FM sub-bottom profiler that generates cross-sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges. X-STAR transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called “chirp pulse”).

The chirp system comprises of a hull-mounted 4 x 4 transducer array operated at an energy level of 4 kW and at a shot rate of 1 s. The signal lasts 40 ms, starts at 1.5 kHz and end at 9 kHz. The system can operate in up to 8000 m of water. The penetration depth depends on the sediment type/thickness, it can be up to 80 m in soft clay.

During this cruise, we image the morphology of the ocean floor and its shallow sub-bottom sedimentary layers and structures using the subbottom profiler. This can be used for deciding the location from where to extract the gravity cores.

3.2 Multibeam Echosounder

In the hull of R/V Helmer Hansen has been installed a Kongsberg Simrad EM 300 multi-beam echo sounder. The multi-beam system measures the two-way travel time that a sound wave initiated by a transmitter needs to reach the sea floor and come back. These waves have a frequency of 30 kHz, which is too high to penetrate the seafloor sediments, but gives a high resolution for a bathymetric map.

A number of piezo-electric transmitters, mounted in the hull, transmit 135 beams producing a fan arc, perpendicular to the ship track. Each beam has a width as narrow as one vertical degree by one horizontal degree.

The swath width, dependent on seabed sediments, in shallow water (<500 m) is typically 4 times the water depth. Down to 2000 m, a swath width of 4-5 km is common. The maximum width is 5000 m. The swath width, dependent on seabed sediments, in shallow water (<500 m) is typically 4 times the water depth. Down to 2000 m, a swath width of 4-5 km is common. The maximum width is 5000 m. The multibeam system has been used to map the seafloor morphology and its acoustic backscatter.

We have to take into account that the amplitudes recorded are slightly attenuated (~6 dB) because of protective housing installed around the hardware to avoid damage of ice contact. The outer beams of the EM300 swath can be of low quality, due to speed and signal reception errors because of the great travel distance, large propagation angle and low angle of reflection. That is why we usually have an overlap of 7-25% between the connecting lines. Ship turns also produce unevenly spaced swaths and so, data logging is normally paused during turns.

Once data have been acquired, we used programs such as, Neptune, Fledermaus and ArcGIS to visualize, clean, filter and process them.

3.3 CTD

CTD (Conductivity, Temperature, Depth) sensors measure or evaluate the physical properties of seawater. In addition to measuring the conductivity, temperature and pressure (from which depth is calculated), the CTD sensors can measure or calculate salinity of seawater, density, P-wave velocity, turbidity, fluorescence/chlorophyll, and oxygen content. Furthermore, it is possible to collect water samples from any depth of choice.

R/V Helmer Hanssen uses SBE 9plus CTD for producing vertical profiles of seawater properties (Fig. 3.3.1). A winch is used to lower the CTD system into the water. The SBE 9plus CTD can measure physical properties of the seawater from up to eight auxiliary sensors, in marine or fresh-water environments at depths up to 6000 meters. However, the winch wire length limits CTD measurements to approximately 3200 meters. The CTD sensors record data at a rate of 24 samples per second. The 9plus system uses the modular SBE 3plus temperature sensor, SBE 4C conductivity sensor, SBE 5T submersible pump, and TC duct. The submersible pump pumps water along the sensor to measure the conductivity. The TC duct makes sure that temperature and conductivity are measured on the same parcel of water. If required, 12 water bottles can be attached to the CTD instrument set up to collect the water samples from any depth. A single conductor cable supplies the power to the system and transmits data from and to the CTD system real time.

During this cruise, we used the sound velocity profiles from different CTD stations to calibrate depth calculations in the swath bathymetry data.

3.4 2D Reflection Seismic

3.4.1 Survey parameters

The 2D reflection seismic method is widely used to study deeper subsurface which cannot be easily studied by other methods. It uses the acoustic energy reflected by various lithological interfaces to obtain an image of the subsurface geology, which can then be interpreted. A reflection seismic survey typically involves generating seismic events or shots, using various methods, at different locations and recording the reflected waves using sensors or receivers. The sensors convert the ground motion, resulting from the seismic event, to electric voltage which is then recorded.

The major components of a 2D marine reflection survey are the seismic source and the streamer, which houses the receivers/sensors.

Source: During this cruise we used two **mini GI (Generator-Injector) air guns** as the seismic source. It is especially suited for high resolution surveys. The air gun generates seismic waves by releasing compressed air in to the water. The total volume of the gun is 30 in^3 and is operated in the harmonic mode (e.g., Marine Sources, Sercel), i.e., 15 in^3 each for generator and injector. This generates a high frequency signal which is suited to studying shallow subsurface in detail, which is the region of interest in our studies. A compressor is used to supply air at high pressure (maximum of 210 bars) to the air gun. Shooting rate was 5 s and sampling rate 0.25 ms.

In addition we recorded seismic lines using the **sparker** as a source. The sparker was towed at 30 m from the starboard edge of the ship. Data were recorded using the same streamer configuration as for the GI-gun data (see below). Shooting rate was 2 s and sampling rate 0.25 ms.

Streamer: In marine surveys, the seismic receivers or hydrophones are enclosed in oil –filled tube known as the streamer. The streamer used during this cruise is 100 m long with 32 channels separated 3.125 m. The streamer is conformed by 4 25 m long P-Cable sections.
Operation: The streamer is towed at a distance of 80 meters from an arm at ~13 m from the center of the boat. The mini-GI gun is towed at a distance of 33 meters behind the ship, at a depth of 2 meters below mean sea level. See figure 3.4.1.1 for geometry of the survey.

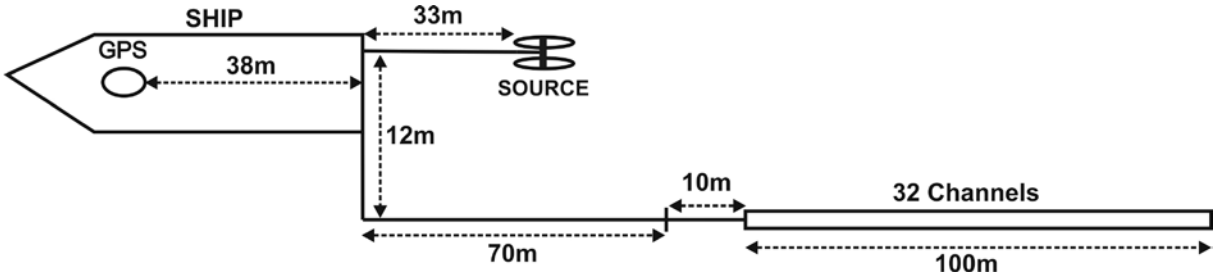


Figure 3.4.1.1: Geometry of the P-Cable seismic survey configured for 2D acquisition. The active section of the streamer consists of 4 25-m long streamers with a total of 32 channels.

3.4.2 On board processing

Two seismic lines were acquired using the airguns in the Storfjordrenna site: CAGE14_KA_HR2D_001 and CAGE14_KA_HR2D_002 (shot folders from Geoeel are named 002 and 004 respectively because 001 and 003 are testing shot files). A total of 5 air-gun seismic lines were acquired in the crater area (Bjørnøyrenna). Lines are named CAGE14_KA_HR2D_03, 04, 05, 06 and 12. In addition 5 lines were shot with the sparker (lines 999 (07), 08, 09, 10 and 11). The sparker lines have a shooting rate of 2 seconds and a sampling rate of 0.25 ms.

Data were processed on board using Radex Pro for data quality control. Segy files were imported in a Petrel project for composite display of seismic, bathymetry and acoustic flares locations. On board processing included:

1- *Navigation processing*. Seatrack GPS positioning from the gun raft and the stern of the boat was used when available. Ship navigation recorded by Geoeel was used when seatrack data were not available due to software crashing or GPS failures.
2- Shot files reading (SegD format)
3- Single channel display for quality control of recorded seismic
4- Geometry insertion, offset calculation.
5- CDP binning at 3.125 m bin size
6- Band pass filtering using 20-40-400-600 Hz for the air gun lines and 100-200-800-900 Hz for the sparker. The sparker data have a central frequency of 460 Hz while for the air gun data the central frequency is 110 Hz (figure 3.4.2.1)
7- Amplitude correction for spherical spreading.
8- NMO correction and stacking using constant velocity of 1500 m/s
9- Stolt migration using a constant Vp of 1500-2000 m/s (1500 m/s was not enough to migrate energy diffracted from hard ground).
10- *Deghosting.* Deghosting was applied over a Delph profile from a previous cruise. It was also applied on line CAGE14_KA_HR2D_002. Line CAGE14_KA_HR2D_001 appears less affected by ghosts. Line CAGE_KA_HR2D_12 also got improved after deghosting.
11- A F-K filter was applied on sparker lines after stack to get rid of coherent noise.
12- Segy output

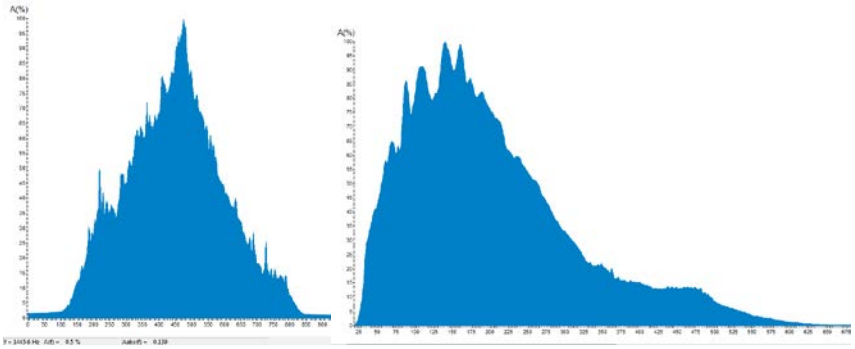


Figure 3.4.2.1: Frequency spectrums after band pass filtering: sparker (above); mini-GI (below).

All the data is stored in an external drive provided by KA. The folder with the cruise data is named CAGE_14_KA.

The sparker lines show a penetration generally not deeper than 50 ms. However, line 999 (shot during testing of the sparker source outside the crater area) shows deeper penetration and stratified layers pinching out at the seafloor (figure 3.4.2.2). Penetration of both, air-gun and sparker signals, were limited due to hard bedrock outcropping at the seafloor. Very little sedimentation characterizes the crater study area. However, acquired lines document dipping bedrock layers pinching out at the seafloor and lateral gas migration indicators. In the crater area the mini-GI gun lines reveal faults and layering of the upper 100 msbsf, while the sparker images the upper 30-40 msbsf (figure 3.4.2.3).

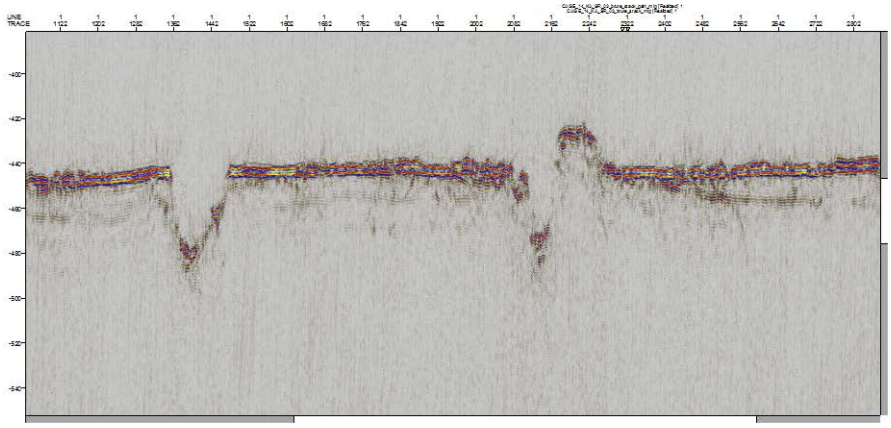
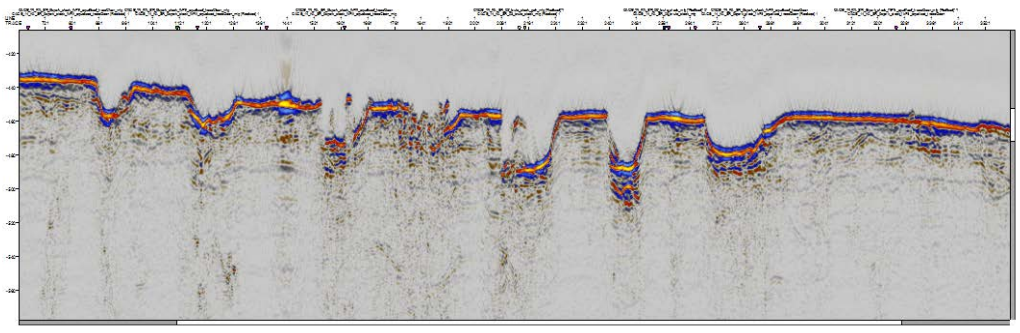


Figure 3.4.2.2: Example of sparker data along the crater area. The line crosses over one of the northernmost craters with a mound like feature associated with it. It is possible to recognize layering through the mound feature. P-wave velocity differences from e.g., 1500 m/s in the water column to 2200 m/s in the bed rock can cause a velocity pull down or pull up effect of approximately 10 ms with respect to the flat layering in craters or mound-like features ~30 m high.



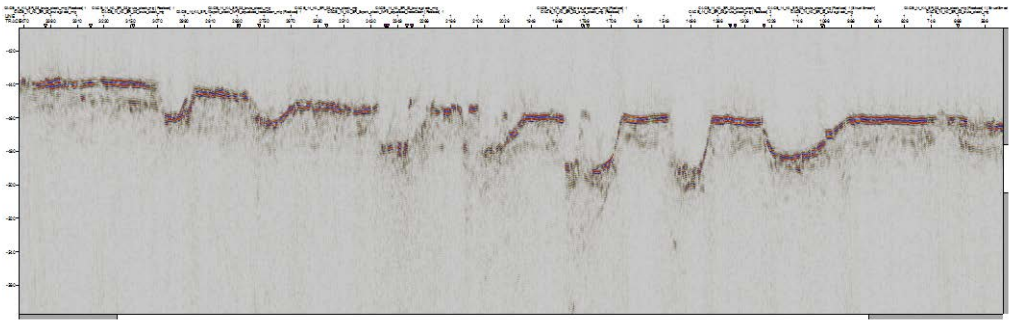


Figure 3.4.2.3: comparison between sparker (below) and mini-GI gun (above) data along the same line. See overview map for location of seismic lines.

3.5 Sediment coring

Sediment coring is the primary tool for ground truthing, studying sediment types, paleontology, and paleo-climate. R/V Helmer Hanssen has a piston corer, box corer, multi corer and a gravity corer. During our cruise we used the multi corer and gravity corer for sampling sediments.

The **gravity corer** onboard Helmer Hanssen consists of a 6m long iron barrel with iron weights attached on top of it. The whole apparatus weigh close to 2 tons. The gravity corer has an inner diameter of 11cm. A plastic liner with outer diameter of 11cm and inner diameter of 10.2 cm is inserted in to the iron barrel. During the coring operation, a core catcher and core cutter is attached to the lower end of the gravity corer. Core catcher keeps the sediments from falling out of the core, whereas core cutter helps the penetration of the core in to the sediments.

The gravity corer lies on a rail, which, during operation, is lifted vertically and the gravity corer is lowered to around 20m away from the seabed using a winch. When at the chosen core location the gravity corer is then dropped. The winch has a wire length of 2900 meters. When the gravity corer is lifted from the seabed and is brought to deck, the core catcher and core cutter are sampled first, if there are sediments present in them. Then, the plastic liner is taken out, cleaned, cut to 1 meter sections, labeled and stored in a cold room.

The **multi corer** can recover six parallel 70 cm long tubes with a diameter of 10 cm from the same spot at the seafloor. It is suitable for soft bottom conditions only. The core tubes are loaded with open upper and lower ends. When the multi corer lands on the seafloor, the tubes are pushed into the soft sediment by lead weights, and closed on both ends. Up to 60 cm of sediment and the immediate overlying water can be sampled. Once on board, the core tubes filled with water end sediment were carefully taken out of the sampling device, the ends are sealed, and the cores are stored in an upright position. They were labelled and subsampled immediately. These samples can be used for various types of sedimentological analyses as well as age determination of the material.

3.6 Single Beam Echo sounder

Single beam echo sounders are common among all types of ships. Their primary purpose is to estimate the depth of the seafloor. In a single beam echo sounder, the transducer projects a sound pulse through water in a controlled direction and the reflected wave is received. The depth is calculated from the travel time of the sound pulse. R/V Helmer Hanssen has a keel-mounted Simrad EK 60 single beam echo sounder with transducers at three different frequencies, 18 KHz, 38 KHz and 120 KHz. The 18 KHz transducer can be used for depths up to 10 km whereas 38 KHz and 120 KHz can only be used for depths up to 2 km and 500m respectively.

The single beam echo sounder can also be used for detecting gas leakages from the seafloor using 18KHz and 38KHz transducers.

3.7 Gas Sampling

Gas from sediments at different depths was collected for further determination of molecular and isotopic composition of hydrocarbon (HC) gases (methane, ethane, propane, buthane), using "head-space" technique. 5 ml of sediment was taken from each 30 cm of the gravity core and each 6 cm from the multicore, using a syringe. The sediment was put into vials (30 ml), filled with NaOH (6 ml) and 2 glass beads per vial. Thus, approximately 19 ml of each bottle was left for free gas from the sediment. By shaking the bottles, the sediment was mechanically broken down to obtain equilibrium in the system "sediment-water-gas". NaOH solution in the bottles prevents further bacterial activity in sampled sediments. Collected samples were stored in upturned vials at temperature 2°C for further analyses in the laboratory on shore (GEOMAR, Kiel, Germany).

Gas from seawater at different depths was collected for further determination of molecular composition of methane, using headspace technique. Seawater was sampled from Niskin bottles into 60 ml syringes avoiding air bubbles. To prepare samples for analysis, excess water was dispensed from syringes until mark 55 ml. 5 ml of headspace gas (nitrogen) was introduced into each syringe and samples were shaken for 2 minutes for methane to equilibrate with the headspace. 500 µl of headspace gas was injected into the gas chromatograph, peak area was measured and methane concentration was calculated.

3.8 Benthic faunal sampling

The main objective of the benthic faunal sampling was to qulitatively and quantitatively characterize the organisms inhabiting surface sediments. In the present cruise, sampling was done primarily with respect to methane eminating from the seafloor. We used a variety of sampling methods, described below, to collect benthic invertebrates (benthos) from the seafloor. We sampled within identified methane seep areas in both Storfjordrenna and Bjørnøyrenna, in craters from the latter; each paired with a control site so that we can compare the impact that methane seeps and craters have on faunal composition.

Van Veen grab

The van Veen grab is a quantitative tool for benthic sampling. It samples an area 0.1 m^2 to 20cm depth in the sediment. Six replicate grabs were taken at each station, the replication providing a measure of intra-site variability necessary for inter-site statistical comparisons. The samples from the grabs were washed with seawater on board through a 0.5 mm sieve, which retained all organisms greater than this size. Washed samples were preserved in buffered formalin, stained with rose bengal, and stored in sample buckets for further processing on land. In the laboratory (Akvaplan-niva), each individual organism will be sorted and identified to species, counted and weighed. This will result in species abundances and biomasses per sample, which will then be used to characterize community composition.

Triangle Scrape

The triangle scrape is a benthic trawl that moves across the seafloor surface towed by the ship (2kts). It measures 1x1x1m and trails a net. This dredge is designed for mass collection of larger seafloor organisms in a non-quantifiable manner. In this cruise, we used this technique for collection of benthic fauna for tissue stable isotope analyses, wherein food sources and trophic level can be resolved through isotopes of Carbon and Nitrogen, respectively. We ran triangle scrapes in both methane seep and non-seep areas in order to determine if we can detect whether methane based carbon is a detectible component of the marine food web in seep areas. Organisms were separated from the bottom sediments, identified to lowest taxonomic unit and frozen for further analyses in the laboratory on land.

4. Cruise narrative

Monday 7th July
Departure from Longyearbyen around 15:30 and begin transit to first study area in Storfjordrenna. Wind speed approximately 5 m/s, waveheight <1 m, temp~5 degrees. Start multibeam and chirp transit from Longyearbyen to Storfjordrenna.

Tuesday 8th July
End of multibeam and chirp transit from Longyearbyen in outer Storfjordrenna. Start of multibeam and chirp transit from Storfjordrenna towards the shelf break. CTD station 419 at the beginning of transit and CTD station 420 at the end of the transit. Acquisition of multibeam and chirp data at the Storfjordrenna shelf break. Echosounder transect along the shelf break in order to detect areas of flares. Chirp and multibeam survey running simultaneously.

Wednesday 9th July
Air temperature around 7 degrees, wind speed 4.5-6 m/s. Continue surveying in Storfjordrenna with the multibeam and chirp lines, as well as the single beam echo sounder.
Started acquisition of 2D seismic line, along the shelf break (zone of mapped flares) towards inner Storfjordrenna (MSGL's area). Ship speed 4.5-5 kn, gun system at 1.75 m water depth, 33 m behind the ship, shooting pressure 160-170 bar. Survey ended at 09:26 UTM. Continuation of multibeam and chirp surveys, CTD 424 at water depth 350.8 m. 6 grabs collected in the area of flares at the depth of 353 m. One multicore collected in the flare area at the depth of 351 m from which 3 liners were filled with 20-25 cm of sediment.

Thursday 10th July
Two gravity cores were recovered, 686-GC was approximately 5 m long, 687-GC was 2.9 m long. The first core (686-GC) was used to collect samples for methane analysis at 7 depths (15, 45, 75, 105, 135, 165, 195 cm). Triangle scrape (688-TC) was taken from the area of flares. Chirp and multibeam run simultaneously. Afterwards we went to reference station north from the flare area, at the Storfjordrenna shelf break, where the sampling was repeated. Water sampling for CTD was performed, 6 grabs were collected at water depth of ~353 m together with one multicore, two gravity cores (692-GC and 693-GC) and triangle scrape.
After we finished sampling, we went to the area NE from from the shelf break to perform multibeam survey. Air temperature 5.2 degrees, wind speed 6.5-9 m/s. In the afternoon we went to the middle shelf break area in Storfjordrenna to complete the bathymetry survey, continuing farther north.

Friday 11th July
Continuation of bathymetry survey further NE on shelf, in the area of MSGL's. Windspeed 10-16 m/s, air temperature 6.5°C. Average depth 260 m. Bathymetry survey in Storfjordrenna completed. In the afternoon we began a multibeam and chirp transect upstream Storfjordrenna. Windspeed approx. 7-9 m/s, air temperature ~7°C.
Start of 2D seismic transect in inner Storfjordrenna at 18:00 UTM. Recording of line 02 started at the possible core location 76°18.432 N, 20°18.165 E at 18:41 UTM. Ship speed 4-4.5 kn, wind speed 9,6-11 m/s, air temperature ~7°C, water depth approximately 250 m. 2D seismic transect ended at 20:09:49 UTM. After completion of 2D seismic survey, we went back to the grounding zone wedge in Storfjordrenna. A 2.96 m gravity core GC-5 was recovered at the station 694, from the water depth of 264 m. Wind speed increased, reaching 14-17 m/s, air temperature ~6°C. Next gravity core, GC-6, 2.68 m long was acquired from a basin at water depth of 239,1 m. Sediments from both cores have similar characteristics – grey, sticky, stiff, consolidated silty clay.
Started transect to Bjørnøyrenna, running multibeam, echosounder and chirp.

Saturday 12th July

Continuation of transect from Storfjordrenna to Bjørnøyrenna crater area. Ship speed 10.4 kn, water depth ~320,5 m, windspeed about 11-13 m/s. 12:25:30 UTM – start of multibeam survey in crater area in Bjørnøyrenna. Echosounder record revealed large number of flares associated with crater features. 15:42:40 UTM – started a transect to Hammerfest, speed 11.5 kn, windspeed ~11-12 m/s, air temperature 5°C.

Sunday 13th July

Continuation of transect to Hammerfest. Multibeam, echosounder and chirp record on. Ship speed 11.5 kn, windspeed ~3.5-4 m/s, air temperature 6.5-7°C. Depth ~400-250m. Left Hammerfest at around 18:00 UTM and started transect to Bjørnøyrenna.

Monday 14th July

Continuation of transect to Bjørnøyrenna crater area. Start of multibeam survey (where we left it on Saturday 12th July) at 17:58:59 UTM. Several multibeam and chirp lines were undertaken. Sampling station for benthic sampling chosen; a crater with a visibly clear flare inside of it (Core station 696). Water depth ~345m, windspeed ~1.3m/s, air temp ~5-6°C. Ship speed approx. 6-10kn.

Tuesday 15th July

Sampling at first crater area station (696) initiated. Seven grab samples, instead of six were taken as one grab sample failed and had to be retaken. One multicore taken as sediments were sufficiently soft to penetrate. Two gravity cores taken; the first for methane and the second for sedimentological analyses. Started on seismic lines at crater area. Water depth ~320-350m, windspeed varying from ~1.1-6.18 m/s, air temp ~4-5°C.

Wednesday 16th July

Finished the seismic lines at crater area. CTD station 430 with water samples. Sampling at crater area station (702) initiated. In total, nine grab samples were taken instead of six because 3 grab samples returned empty as the grab failed to close (station 702). Due to bad weather, multicore and gravity core were delayed. Finished CTD transect with water samples (10 stations). At station 703, 6 grab samples were taken. . Water depth ~330-355m, windspeed varying from ~6-16 m/s, air temp ~3.6-6°C.

Thursday 17th July

Waited for weather to improve enough to begin gravity cores at crater site. Four gravity cores were attempted at the crater site when the weather cleared up; all were unsuccessful with no sediment recovery due to the hard sea bottom. Triangle scrape was then undertaken before the final two attempts to gain gravity cores. Weather began to deteriorate and so, we started to take more multibeam and seismic lines of the crater area. Water depth ~330-355m, windspeed varying from ~6-16 m/s, air temp ~3.6-6°C.

Friday 18th July

Seismic line at the crater area was completed and another long multibeam line towards the 'control' sampling station was completed. CTD station 442 at water depth 335.6 m. At the control station for the benthic sampling, we undertook nine grab samples, instead of six as 3 grab samples failed to close and had to be retaken. One multicore were collected, were 4 out of 5 liners were filled with sediments. Three gravity cores (714-GC, 715-GC, and 716-GC) were attempted, two returned empty due to hard sea bottom and the final gravity core returned with 108cm. Transect to the upper

section of Storfjordrenna was completed and a new multibeam and chirp line was initiated to cover the three grounding zone wedges in the area. Water depth ranging from ~100-355m, windspeed varying from ~6-9 m/s, air temp ~4-6°C.

Saturday 19th July
Multibeam and chirp data collection over the upper Storfjordrenna grounding zone wedges was completed in the early morning. Transect to Longyearbyen via the Hinlopenstretet was initiated, keeping multibeam and chirp recording. Visit to Austfonna en-route. Water depth ranging from ~50-200m, windspeed varying from ~6-9 m/s, air temp ~5-8°C.

Sunday 20th July
Continuation of transect line towards Longyearbyen, stopping by Moffen and then Bjørnfjorden. Water depth ranging from ~30-200m, windspeed varying from ~6-9 m/s, air temp ~5-8°C.

Monday 21st July
Helmer Hanssen arrived at Longyearbyen in the early morning, marking the end of the CAGE_3_KA2014 cruise.

5. Ship tracks and study areas

Area A1: Storfjordrenna

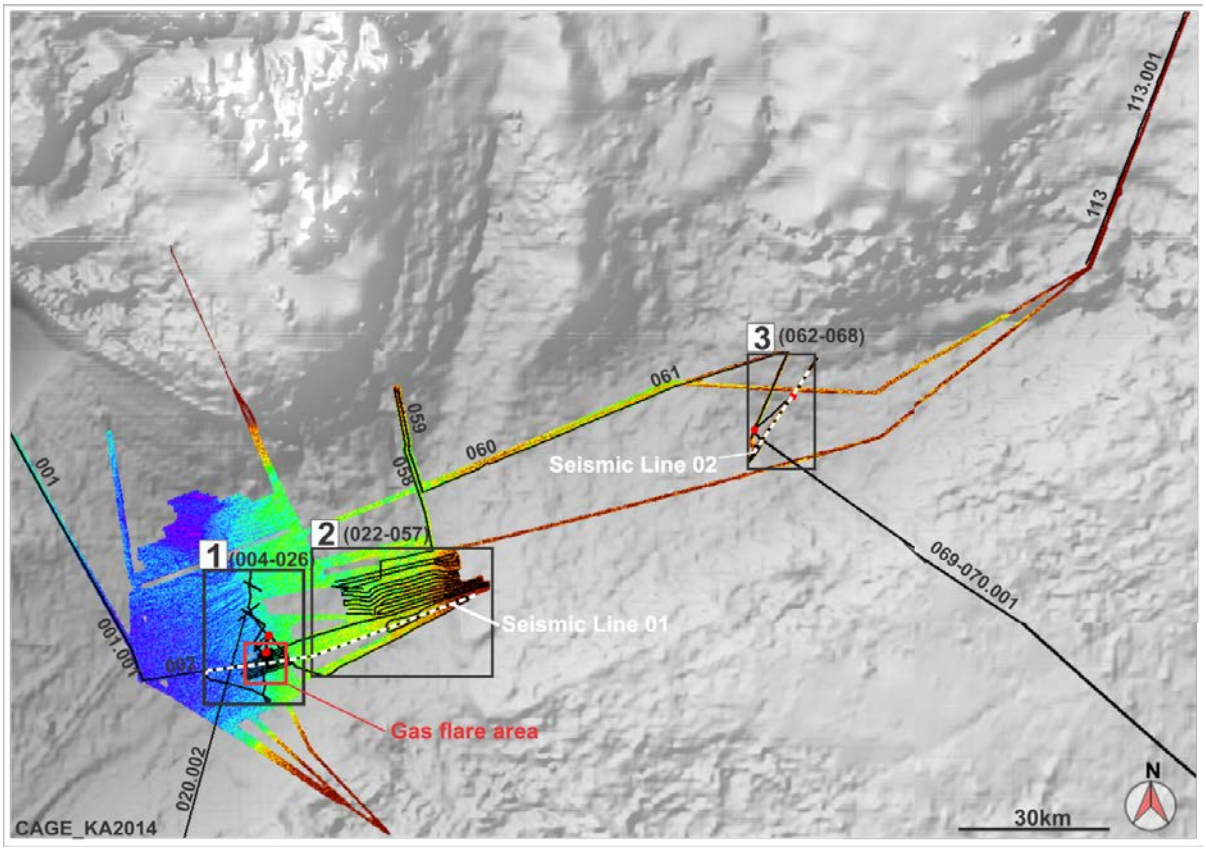


Fig. 5.1. Locations Stordjordrenna

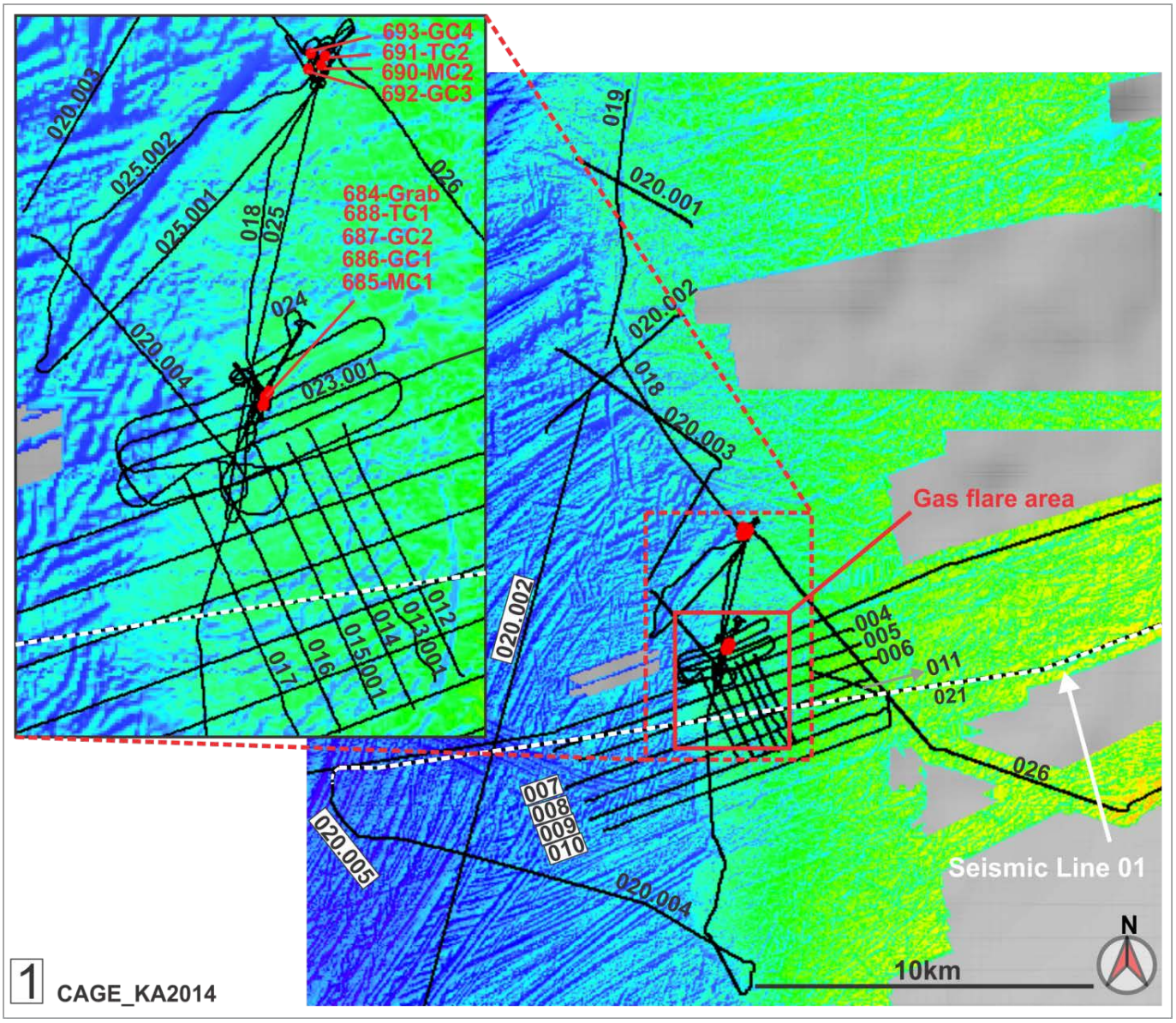


Fig. 5.2. Samples and lines in outer Storfjordrenna, mapping and sampling gas flares

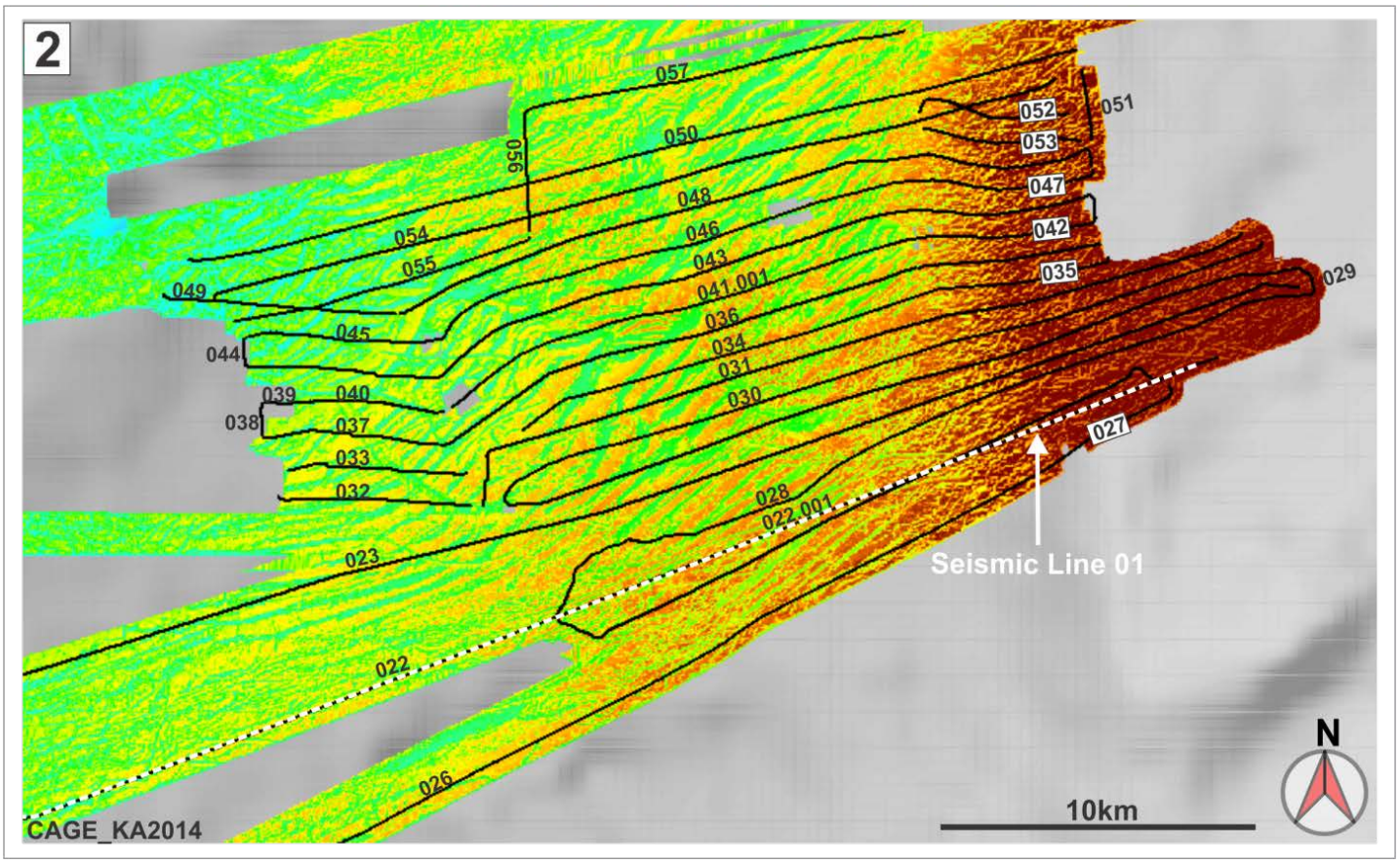


Figure 5.3. Multibeam, chirp and seismic lines in Storfjordrenna, filling in map from 2013 (below) of glacial features

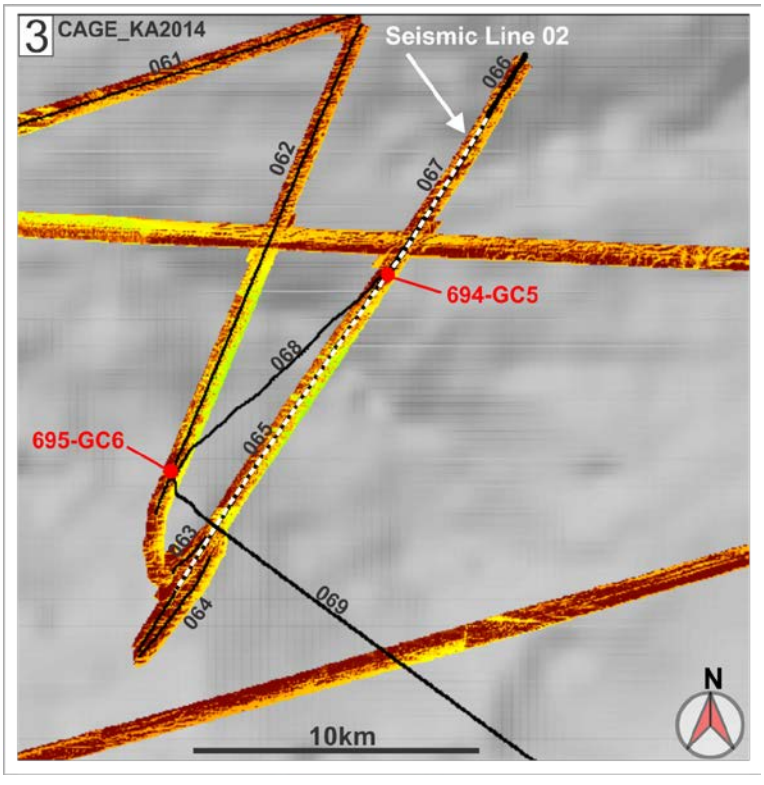


Figure 5.4. Lines and samples in central Storfjordrenna (see Fig. 5.1 for location)

Area B: Bjørnøyrenna

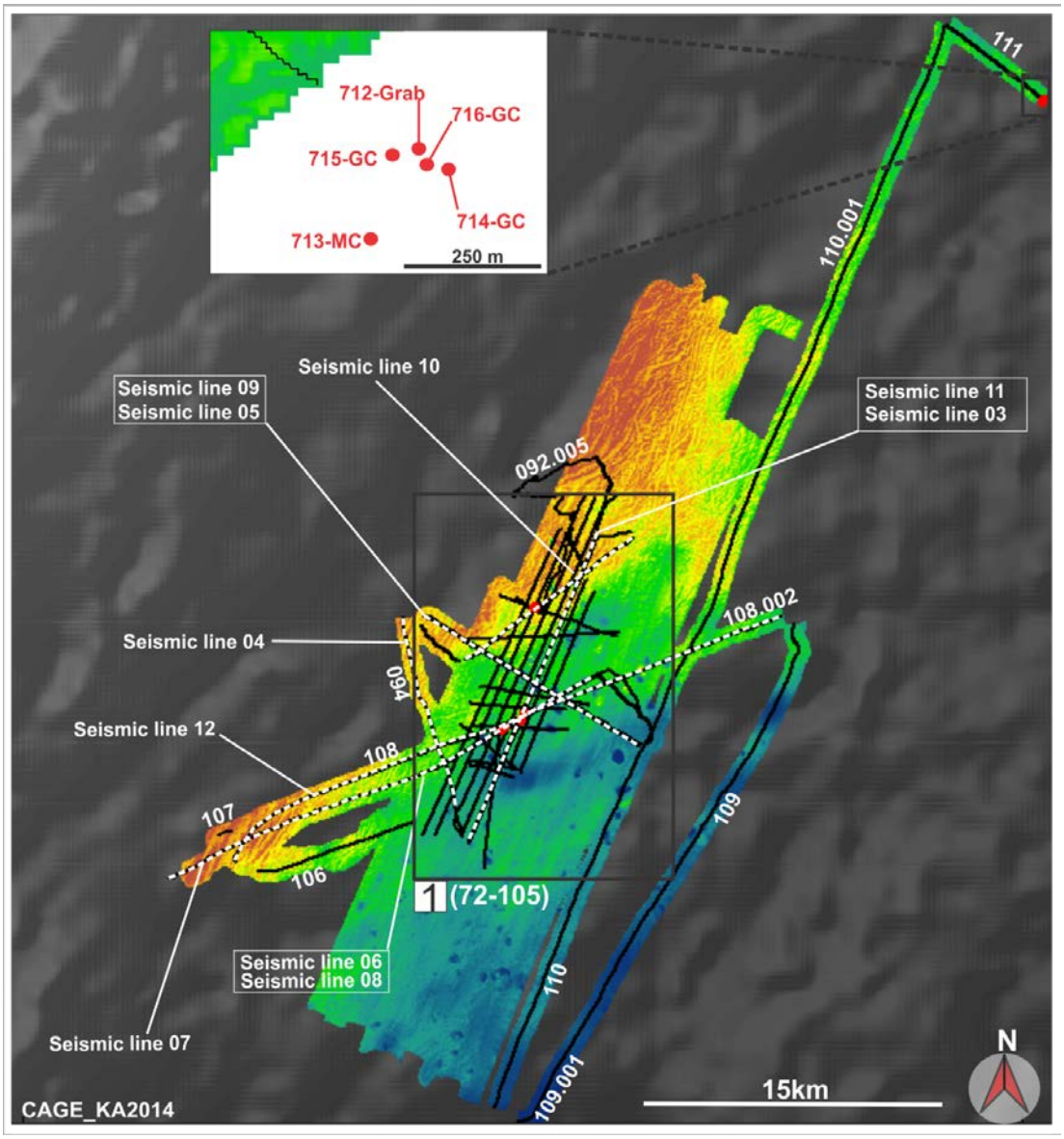


Figure 5.5. Overview of lines and samples in central Bjørnøyrenna Crater area (see Fig. 1.1 for location)

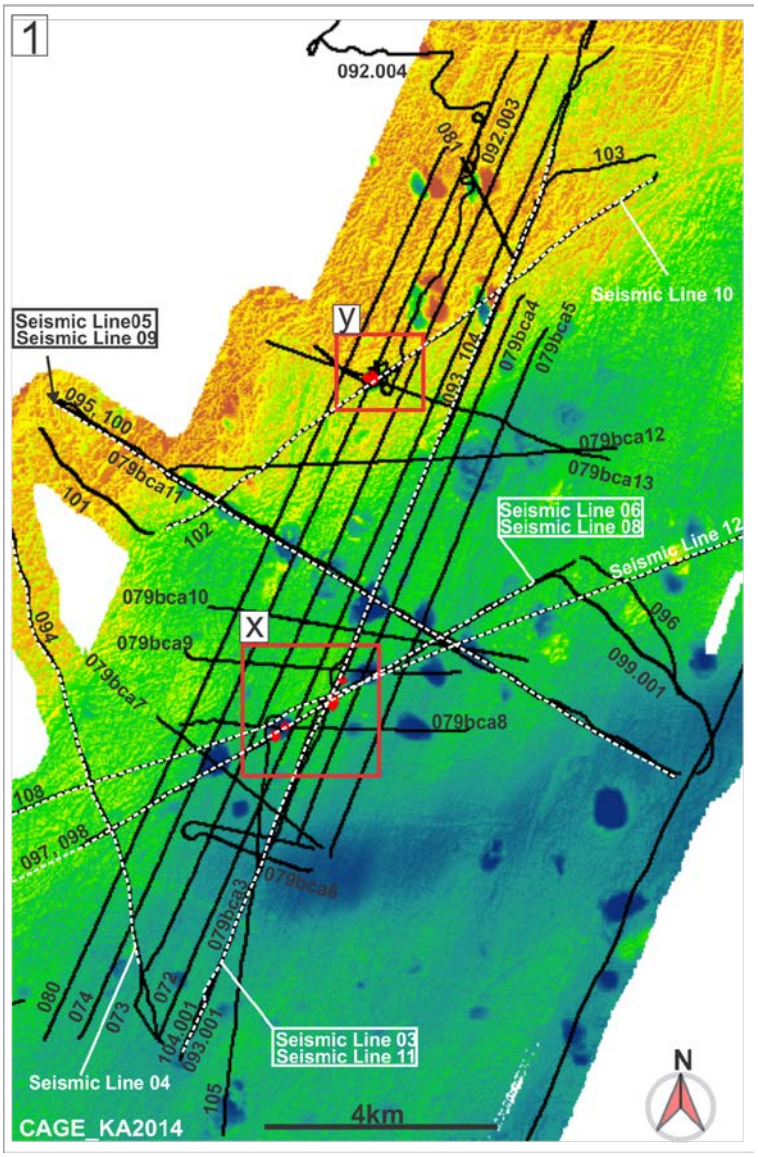


Figure 5.6. Stations in Bjørnøyrenna Crater area

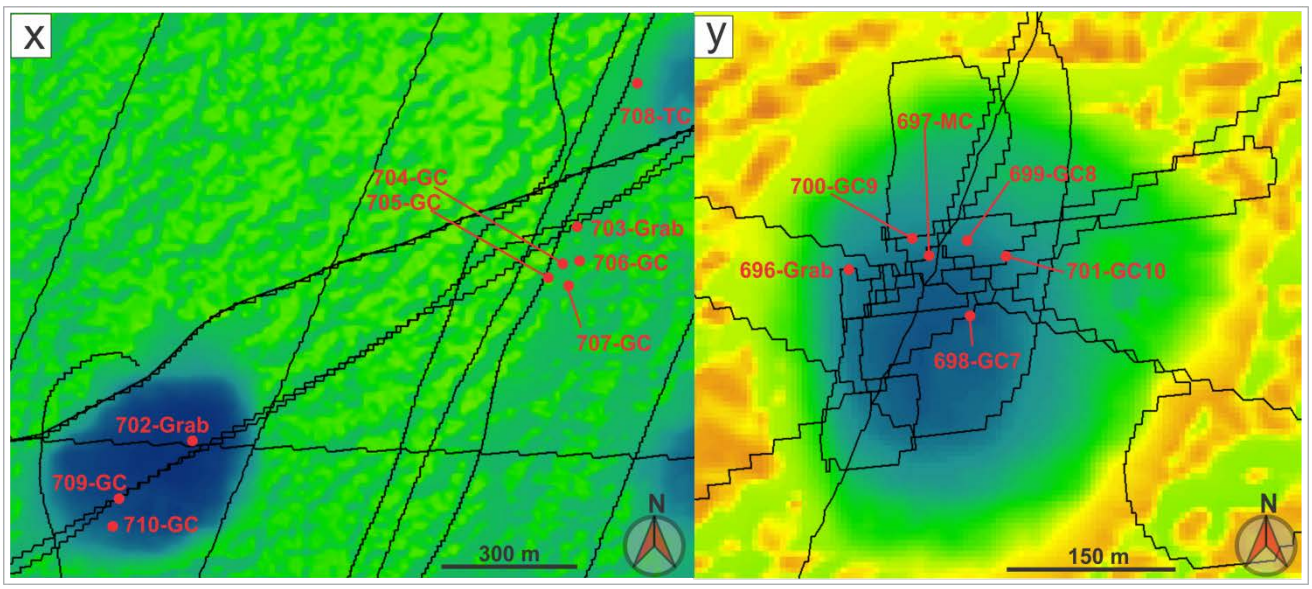


Figure 5.7. Details from stations in Bjjørnøyrenna Crater area

6. Logs, cores and preliminary results of the bottom sampling

6.1. Eventlog on RV Helmer Hanssen 7-21 July 2014 Storfjordrenna, Bjørnøyrenna

Core location numbering starting on Cage_KA2014_682, following the numbering on the bridge of 'other stations' and CTD station numbering starts at 419, following the CTD numbering on the bridge. Use UTC time (2 hrs after local time)

Date	UTC	Position	Event
07/7	Ca 15:30		Departure from Longyearbyen. Wind ca 5 m/s, waveheights <1 m, temp ca 5 degrees
07/7			Start transit multibeam from Longyearbyen to study area Storfjorden
08/7			End multibeam transit line in outer Storfjordrenna
08/7	Ca. 07:10	76°15.801 N 14°42.353E	CTD station 419 at Storfjordrenna shelf break (water depth 637 m)
08/7	07:23	76°15.638 N 14°42.579 E	Multibeam transit 0027-0038 Storfjordrenna towards the shelf break
08/7	07:23	76°15.638 N 14°42.579 E	Start Chirp line Cage_KA_2014_001
08/7	10:31	75°49.850 N 15°39.164 E	Chirp line Cage_KA_2014_001 - change of the course from 146° to 155°
08/7	10:55:08	75°46.458 N 15°45.845 E	CTD Station 420 at Storfjordrenna shelf break (water depth 383.5 m)
08/7	10:56	75°46.459 N 15°45.586 E	End Chirp line Cage_KA_2014_001, end multibeam 0027-0038
08/7	11:44	75°46.488 N 15°45.343 E	Start Chirp line Cage_KA_2014_002, start multibeam line 0037-0041
08/7	12:48	75°48.945 N 16°26.804 E	End Chirp line Cage_KA_2014_002, end multibeam line 0041
08/7	12:49	75°48.987 N 16°27.262 E	Start Chirp line Cage_KA_2014_003, start multibeam line 0041 - 0045
08/7	13:10:31	75°49.098 N 16°28.094 E	CTD Station 421 at Storfjordrenna (Water depth 365.80m)
08/7	13:25:59	75°48.910 N 16°25.638 E	End Chirp line Cage_KA_2014_003, end multibeam line 0045
08/7	13:30:12	75°48.993 N 16°27.045 E	Start Chirp line Cage_KA_2014_004, start multibeam line 0046-0048

08/7	14:01:27	75°50.929 N 16°45.375 E	End Chirp line Cage_KA_2014_004, end multibeam line 0048
08/7	14:06:13	75°50.745 N 16°46.451 E	Start Chirp line Cage_KA_2014_005, start multibeam line 0049-0051
08/7	14:37:59	75°48.693 N 16°27.080 E	End Chirp line Cage_KA_2014_005, end multibeam line 0051
08/7	14:41:58	75°48.485 N 16°28.988 E	Start Chirp line Cage_KA_2014_006, start multibeam line 0052-0054
08/7	15:16:15	75°50.481 N 16°46.839 E	End Chirp line Cage_KA_2014_006, end multibeam line 0054
08/7	15:19:53	75°50.223 N 16°47.476 E	Start Chirp line Cage_KA_2014_007, start multibeam line 0055-0057
08/7	15:53:19	75°48.134 N 16°28.267 E	End Chirp line Cage_KA_2014_007, end multibeam line 0057
08/7	15:57:34	75°47.876 N 16°28.861 E	Start Chirp line Cage_KA_2014_008, start multibeam line 0057-0060
08/7	16:32:20	75°49.979 N 16°47.765 E	End Chirp line Cage_KA_2014_008, end multibeam line 000060
08/7	16:36:39	75°49.767 N 16°48.371 E	Start Chirp line Cage_KA_2014_009, start multibeam line 0060-0063
08/7	17:09:30	75°47.624 N 16°29.772 E	End Chirp line Cage_KA_2014_009, end multibeam line 0063
08/7	17:14:51	75°47.426 N 16°30,263 E	Start Chirp line Cage_KA_2014_010, start multibeam line 0063-0066
08/7	17:51:24	75°49.904 N 16°48.200 E	End Chirp line Cage_KA_2014_010, end multibeam line 0066
08/7	17:52:02	75°49.956 N 16°47.930 E	Start Chirp line Cage_KA_2014_011, start multibeam line 0067-0068
08/7	18:02:44	75°50.362 N 16°42.988 E	End Chirp line Cage_KA_2014_011, end multibeam line 0068
08/7	18:23:44	75°50.289 N 16°40.788 E	Start Chirp line Cage_KA_2014_012, start multibeam line 0069
08/7	18:34:39	75°49.098 N 16°42.473 E	End Chirp line Cage_KA_2014_012, end multibeam line 0069
08/7	18:38:39	75°49.033 N 16°41.916 E	Start Chirp line Cage_KA_2014_013, start multibeam line 0070
08/7	18:50:00	75°49.033 N 16°14.916 E	End Chirp line Cage_KA_2014_013, end multibeam line 0070
08/7	18:55:20	75°50.323 N 16°38.185 E	Start Chirp line Cage_KA_2014_014, start multibeam line 0071
08/7	19:06:00	75°48.948 N 16°41.365 E	End Chirp line Cage_KA_2014_014, end multibeam line 0071

08/7	19:11:33	75°48.870 N 16°40.654 E	Start Chirp line Cage_KA_2014_015, start multibeam line 0072
08/7	19:21:40	75°50.262 N 16°45.550 E	End Chirp line Cage_KA_2014_015, end multibeam line 0072
08/7	19:28:34	75°50.172 N 16°36.745 E	Start Chirp line Cage_KA_2014_016, start multibeam line 0073
08/7	19:38:40	75°48.801 N 16°39.791 E	End Chirp line Cage_KA_2014_016, end multibeam line 0073
08/7	19:46:01	75°45.702 N 16°38.992 E	Start Chirp line Cage_KA_2014_017, start multibeam line 0074
08/7	19:56:40	75°50.086 N 16°35.983 E	End Chirp line Cage_KA_2014_017, end multibeam line 0074
08/7	20:10:30	75°50.182 N 16°37.611 E	Start echosounder transect Storfjordrenna – flares
08/7	20:10:45	75°50.262 N 16°37.550 E	Start Chirp line Cage_KA_2014_018, start multibeam line 0075
08/7	20:55:33	75°55.334 N 16°28.702 E	End Chirp line Cage_KA_2014_018, end multibeam line 0075-0077
08/7	20:55:33	75°55.334 N 16°28.702 E	End echosounder transect Storfjordrenna shelf break – for flares
08/7	21:08:43	75°55.174 N 16°28.424 E	Start echosounder transect along Storfjordrenna shelf break – for flares – continuation
08/7	21:07:47	75°55.305 N 16°28.453 E	Start Chirp line Cage_KA_2014_019, start multibeam line 0078
08/7	21:34:30	75°59.269 N 16°28.466E	End Chirp line Cage_KA_2014_019, end multibeam line 0078-0079
08/7	21:33:36	75°59.248 N 16°28.444 E	CTD station 422, water depth 346.3 m
08/7	21:59:48	75°59.325 N 16°28.294 E	Start Chirp line Cage_KA_2014_020, start multibeam line 0080-0090
08/7	21:59:55	75°59.324 N 16°28.308 E	Start echosounder transect along Storfjordrenna shelf break – crosscut
09/7	02:42:50	75°48,310 N 16°18,206 E	End Chirp line Cage_KA_2014_020, end multibeam line 0090
09/7	02:43:29	75°48,322 N 16°18,405 E	Start Chirp line Cage_KA_2014_021, start multibeam line 0091
09/7	05:05:28	75°50.519 N 16°58.187 E	End Chirp line Cage_KA_2014_021, end multibeam line 0091-0096
09/7	05:06:38	75°50.552 N 16°58,484 E	Sea Track (Gun coordinates) coordinates stopped recording (Time and co-ord are approximate)
09/7	05:06:42	75°50.552 N 16°58,484 E	Start Chirp line Cage_KA_2014_022, start multibeam line 0097

09/7	07:26:22	75°58.673 N 16°58,175 E	Sea Track (Gun coordinates) are now recording and fails again.
09/7	09:26:51	75°58.184 N 18°07.057 E	Sea Track ended. Shot point numbers 2-5072.
09/7	09:27:50	75°58.184 N 18°07.057 E	End Chirp line Cage_KA_2014_022, end multibeam line 0097-00105
09/7	10:00:30	75°59.264 N 18°11.670 E	Start Chirp line Cage_KA_2014_023, start multibeam line 00108
09/7	11:12:00	75°51.635 N 16°48.149 E	End Chirp line Cage_KA_2014_023, end multibeam line 00108-112
09/7	14:25:00	75°50.338 N 16°37.309 E	CTD 424, water depth 350.8 m
09/7	15:17:00	75°50.502 N 16°37.597 E	Start of grab sampling, station 684, water depth 353 m
09/7	15:53:00	75°50.501 N 16°37.550 E	Grab sample 1
09/7	16:32:00	75°50.495 N 16°37.591 E	Grab sample 2
09/7	17:08:00	75°50.500 N 16°37.633 E	Grab sample 3
09/7	17:35:00	75°50.492 N 16°37.581 E	Grab sample 4
09/7	18:41:00	75°50.494 N 16°37.617 E	Grab sample 5
09/7	19:02:00	75°50.497 N 16°37.628 E	Grab sample 6
09/7	19:54:32	75°50.488 N 16°37.643 E	Multicorer, Cage_KA2014_685(000)-MC, water depth 351 m
09/7	20:20:40	75°50.552 N 16°37.375 E	Start Chirp line Cage_KA2014_024, start multibeam line 00121
09/7	20:57:10	75°50.479 N 16°37.630 E	Gravity core Cage_KA2014_686(000)-GC - samples for methane
09/7	21:45:45	75°50.532 N 16°37.663 E	Gravity core Cage_KA2014_687(001)-GC
09/7	22:44:37	75°50.560 N 16°37.751 E	Triangle scrape (trekantskrape TC) Cage_KA2014_688-TC
09/7	22:59:30	75°50.189 N 16°37.324 E	End Chirp line Cage_KA2014_024, end multibeam line 00121-00127
09/7	22:59:30	75°50.189 N 16°37.324 E	Start Chirp line Cage_KA2014_025, start multibeam line 00128
09/7	23:30:38	75°52.356 N 16°38.378 E	Change of location – control station

09/7	23:50:37	75°52.469 N 16°38.069 E	CTD 425 –water sampling
10/7	00:02:05	75°52.249 N 16°38.189 E	Grab sampling at the station 689 – 6 grabs collected. Water depth 353 m
10/7	02:41:06	75°52.341 N 16°38.362	Multicore – 690. Water depth 352.4 m
10/7	02:52:33	75°52.388 N 16°38.430 E	Scrape – 691. Water depth 351.4 m
10/7	04:35:49	75°52.314 N 16°38.071 E	Gravity core Cage_KA2014_692_GC
10/7	06:18:04	75°52.397 N 16°38.122 E	Gravity core Cage_KA2014_693_GC
10/7	06:33:20	75°52.358 N 16°38.814 E	End Chirp line Cage_KA2014_025, end multibeam line 00128-00143
10/7	06:34:30	75°53.573 N 16°33.421 E	Start Chirp line Cage_KA2014_026, start multibeam survey line 00144
10/7	09:04:00	75°56.716 N 17°58.579 E	End Chirp line Cage_KA2014_026, end multibeam line 00144-00149
10/7	09:05:30	75°56.716 N 17°59.709 E	Start Chirp line Cage_KA2014_027, start multibeam survey line 00150
10/7	09:13:58	75°57.575 N 18°04.186 E	End Chirp line Cage_KA2014_027, continue multibeam 00150
10/7	09:14:50	75°57.836 N 18°03.199 E	Start Chirp line Cage_KA2014_28, continue multibeam 00150-00153 – filling in line
10/7	11:30:34	75°59.014 N 18°08.960 E	End Chirp line Cage_KA2014_28, end multibeam 00153-154
10/7	11:32:20	75°59.072 N 18°09.805 E	Start Chirp line Cage_KA2014_29, start multibeam 00155
10/7	11:38:30	75°59.343 N 18°12.507 E	End multibeam line 00155, start multibeam line 00156
10/7	11:40:23	75°57.759 N 18°10.928 E	Ship turn, continue multibeam line 00156
10/7	11:44:20	75°59.412 N 18°08.901 E	End Chirp line Cage_KA2014_29, end multibeam 00156
10/7	11:44:30	75°59.412 N 18°08.901 E	Start Chirp line Cage_KA2014_30, start multibeam 00157
10/7	12:57:30	75°55.695 N 17°29.861 E	Ship turn, End multibeam line 00157- 00160
10/7	13:02:33	75°55.814 N 17°25.421 E	Start multibeam line 00161
10/7	14:11:57	75°59.788 N 18°09.106 E	End Chirp line Cage_KA2014_30, end multibeam 0157-0164

10/7	14:14:58	76°00.045 N 18°09.335 E	Start Chirp line Cage_KA2014_31, start multibeam 0165
10/7	15:36:43	75°55.489 N 17°29.667 E	End Chirp line Cage_KA2014_31, end multibeam 0165-0171
10/7	15:37:56	75°00.045 N 17°23.093 E	Start Chirp line Cage_KA2014_32, start multibeam 0172-0173
10/7	15:56:13	75°55.349 N 17°11.793 E	End Chirp line Cage_KA2014_32, end multibeam 0173
10/7	16:00:08	75°55.753 N 17°11.469 E	Start Chirp line Cage_KA2014_33, start multibeam 0174-0175
10/7	16:16:48	75°55.880 N 17°22.279 E	End Chirp line Cage_KA2014_33, end multibeam 0175
10/7	16:22:34	75°56.454 N 17°25.095 E	Start Chirp line Cage_KA2014_34, start multibeam 0176-0177
10/7	16:28:23	75°57.048 N 17°27.999 E	Ship turn, End multibeam line 0176-0177
10/7	16:28:23	75°57.048 N 17°27.999 E	Start Multibeam line 0178
10/7	17:20:01	75°59.493 N 18°00.102 E	End Chirp line Cage_KA2014_34, end multibeam 00178-00180
10/7	17:22:41	75°59.755 N 17°59.832 E	Start Chirp line Cage_KA2014_35, start multibeam 00181
10/7	17:39:48	75°59.287 N 17°49.065 E	End Chirp line Cage_KA2014_35, end multibeam 00181
10/7	17:40:24	75°59.257 N 17°48.712 E	Start Chirp line Cage_KA2014_36, start multibeam 00182
10/7	18:28:27	75°56.293 N 17°21.072 E	End Chirp line Cage_KA2014_36, end multibeam 00182-00183
10/7	18:28:27	75°56.293 N 17°21.072 E	Start Chirp line Cage_KA2014_37, start multibeam 00183-00184
10/7	18:44:30	75°56.334N 17°08.166 E	End Chirp line Cage_KA2014_37, end multibeam 00184
10/7	18:44:45	75°56.232 N 17°10.066 E	Start Chirp line Cage_KA2014_38, start multibeam 00185
10/7	18:49:30	75°56.723 N 17°10.077 E	End Chirp line Cage_KA2014_38, end multibeam 00185
10/7	18:49:35	75°56.723 N 17°10.077 E	Start Chirp line Cage_KA2014_39, start multibeam 00186
10/7	18:52:00	75°56.753 N 17°11.752 E	End Chirp line Cage_KA2014_39, end multibeam 00186
10/7	18:52:00	75°56.753 N 17°11.752 E	Start Chirp line Cage_KA2014_40, start multibeam 00187

10/7	19:06:43	75°56.781 N 17°21.023 E	End Chirp line Cage_KA2014_40, end multibeam 00186-00187
10/7	19:07:24	75°56.842 N 17°21.349 E	Start Chirp line Cage_KA2014_41, start multibeam 00188
10/7	19:44:00	75°59,656 N 17°48,062 E	End Chirp line Cage_KA2014_41, end multibeam 00188-00192
10/7	19:44:45	75°59,675 N 17°48,436 E	Start Chirp line Cage_KA2014_42, start multibeam 00193
10/7	20:12:00	76°00,035 N17°59,150 E	End Chirp line Cage_KA2014_42, end multibeam 00193-00194
10/7	20:12:42	76°00,120 N 17°59,229 E	Start Chirp line Cage_KA2014_43, start multibeam 00195
10/7	21:41:00	75°57,686 N 17°8,897 E	End Chirp line Cage_KA2014_43, end multibeam 00195-00199
10/7	21:42:10	75°238 N 17°9,205 E	Start Chirp line Cage_KA2014_44, multibeam line 00199
10/7	21:44:00	75°57,686 N 17°8,897 E	End Chirp line Cage_KA2014_44, end multibeam 00199-00200
10/7	21:44:00	75°57,686 N 17°8,987 E	Start Chirp line Cage_KA2014_45, multibeam line 00200
10/7	22:03:55	75°57.910 N 17°20.747 E	End Chirp line Cage_KA2014_45, end multibeam 00200-00202
10/7	22:04:20	75°57.910 N 17°20.747 E	Start Chirp line Cage_KA2014_46, start multibeam line 00202
10/7	22:57:50	76°00.452 N 17°53.358 E	End Chirp line Cage_KA2014_46, end multibeam line 00202-00207
10/7	22:59:20	76°00.469 N 17°53.878 E	Start Chirp line Cage_KA2014_47, start multibeam line 00208
10/7	23:07:31	76°00.729 N 17°58.843 E	End Chirp line Cage_KA2014_47, end multibeam line 00208-00209
10/7	23:08:45	76°00.983 N 17°58.830 E	Start Chirp line Cage_KA2014_48, start multibeam line 00210
11/7	00:33:35	75°58,166 N 17°18,158 E	End Chirp line Cage_KA2014_48, end multibeam line 00210-00217
11/7	00:35:02	75°58,150 N 17°17,480 E	Start Chirp line Cage_KA2014_49, start multibeam line 00217
11/7	01:02:27	75°58.463 N 17°06.735 E	End Chirp line Cage_KA2014_49, end multibeam line 00210-00217
11/7	01:08:18	75°58.742 N 17°04.589 E	Start Chirp line Cage_KA2014_50, start multibeam line 00218
11/7	02:28:39	76°02.523 N 17°57.349 E	End Chirp line Cage_KA2014_50, end multibeam line 00218-00222

11/7	02:30:51	76°58.742 N 17°04.589 E	Start Chirp line Cage_KA2014_51, start multibeam line 00223
11/7	02:37:28	76°01.329 N 17°58.839 E	End Chirp line Cage_KA2014_51, end multibeam line 00223-224
11/7	02:38:56	76°01.222 N 17°58.450 E	Start Chirp line Cage_KA2014_52, start multibeam line 00225
11/7	03:00:58	76°01.609 N 17°48.498 E	Multibeam stopped logging, End Chirp line Cage_KA2014_52, end multibeam line 00225-00226
11/7	03:05:06	76°01.660 N 17°50.606 E	Start Chirp line Cage_KA2014_53, start multibeam line 00226
11/7	03:15:12	76°01.596 N 17°57.105 E	End Chirp line Cage_KA2014_53, end multibeam line 00226-00227
11/7	03:20:52	76°02.107 N 17°57.105 E	Start Chirp line Cage_KA2014_54, start multibeam line 00228
11/7	04:55:07	75°58.185 N 17°06.778 E	End Chirp line Cage_KA2014_54, end multibeam line 00228-0232
11/7	04:57:53	75°57.875 N 17°07.184 E	Start Chirp line Cage_KA2014_55, start multibeam line 00233
11/7	05:26:04	75°59.342 N 17°07.184 E	End Chirp line Cage_KA2014_55, end multibeam line 0233-0234
11/7	05:26:39	75°59.412 N 17°25.454 E	Start Chirp line Cage_KA2014_56, start multibeam line 0235
11/7	05:37:58	76°01.089 N 17°24.719 E	End Chirp line Cage_KA2014_56, end multibeam line 0235-0236
11/7	05:41:03	76°01.323 N 17°25.973 E	Start Chirp line Cage_KA2014_57, start multibeam line 0237
11/7	06:13:03	76°02.685 N 17°47.161 E	End Chirp line Cage_KA2014_57, end multibeam line 0237-0239
11/7	06:17:00	76°03.190 N 17°46.765 E	Start Chirp line Cage_KA2014_58, start multibeam line 0240
11/7	08:06:40	76°20.040 N 17°26.165 E	End Chirp line Cage_KA2014_58, end multibeam line 0240-243
11/7	08:10:09	76°20.044 N 17°27.695 E	Start Chirp line Cage_KA2014_59, start multibeam line 0244
11/7	09:26:15	76°09.022 N 17°41.271 E	End Chirp line Cage_KA2014_59, end multibeam line 0244-247
11/7	09:27:47	76°09.032 N 17°42.049 E	Start Chirp line Cage_KA2014_60, start multibeam line 0248
11/7	11:19:46	76°16.539 N 18°47.242 E	End Chirp line Cage_KA2014_60, end multibeam line 0248-253
11/7	11:32:21	76°16.539 N 18°47.242 E	CTD 426 – vel.correction f. multibeam. Mismatch in multibeam

11/7	11:52:33	76°16.630 N 18°47.688 E	Start Chirp line Cage_KA2014_61, start multibeam line 0255
11/7	14:16:32	76°25.602 N 20°22.087 E	End Chirp line Cage_KA2014_61, end multibeam line 0255-0260
11/7	14:18:14	76°25.455 N 20°22.554 E	Start Chirp line Cage_KA2014_62, start multibeam line 0261
11/7	15:28:04	76°16.142 N 20°06.664 E	End Chirp line Cage_KA2014_62, end multibeam line 0261-264
11/7	15:59:35	76°14.983 N 20°07.958 E	Start Chirp line Cage_KA2014_63, start multibeam line 0266
11/7	16:13:40	76°15.677 N 20°10.558 E	End Chirp line Cage_KA2014_63, end multibeam line 0266-0266
11/7	16:24:36	75°15.379 N 20°11.106 E	Start Chirp line Cage_KA2014_64, start multibeam line 0267
11/7	17:31:44	76°13.445 N 20°05.416 E	End Chirp line Cage_KA2014_64, end multibeam line 0267-0270
11/7	17:34:02	76°13.531 N 20°05.397 E	Start Chirp line Cage_KA2014_65, start multibeam line 0271
11/7	18:00:00	76°13.445 N 20°05.416 E	Start of 2D seismic survey, test
11/7	18:41:35	76°18.237 N 20°17.744 E	Start recording 2D seismic survey, starting file 921.
11/7	20:06:16	76°23.374 N 20°32.023 E	End Chirp line Cage_KA2014_65, end multibeam line 0271-0276
11/7	20:07:30	76°23.437 N 20°32.186 E	Start Chirp line Cage_KA2014_66, start multibeam line 0277
11/7	20:09:49	76°23.437 N 20°32.186 E	End recording 2D seismic survey, ending file 1975.
11/7	20:40:30	76°24.894 N 20°35.651 E	End Chirp line Cage_KA2014_66, end multibeam line 0277-0280
11/7	20:42:40	76°24.881 N 20°35.623 E	Start Chirp line Cage_KA2014_67, start multibeam line 0281
11/7	21:14:32	76°20.736 N 20°24.963 E	End Chirp line Cage_KA2014_67, end multibeam line 00281-00283
11/7	21:29:35	76°20.695 N 20°24.885 E	Gravity coring – Cage_KA2014_694-GC5 – Storfjordrenna GZW
11/7	21:30:12	76°20.697 N 20°24.858 E	Start Chirp line Cage_KA2014_68, start multibeam line 0284
11/7	22:33:20	76°16.947 N 20°08.358 E	End Chirp line Cage_KA2014_68, end multibeam line 00284-00286
11/7	22:44:41	76°16.951 N 20°07.953 E	Gravity coring – Cage_KA2014_695-GC6 – Storfjordrenna basin

11/7	22:52:43	76°16.885 N 20°08.268 E	Start Chirp line Cage_KA2014_69, start multibeam line 0287
12/7	06:36:07	75°26.268 N 24°45.298 E	End Chirp line Cage_KA2014_69, end multibeam line 00287-00303
12/7	06:37:02	75°25.952 N 24°50.526 E	Start Chirp line Cage_KA2014_70, start multibeam line 00304
12/7	11:51:20	75°00.088 N 27°42.500 E	End Chirp line Cage_KA2014_70, end multibeam line 00304-00313
12/7	11:57:40	74°00.146 N 27°45.484 E	Start Chirp line Cage_KA2014_71, start multibeam line 00314
12/7	12:03:33	74°59.862 N 27°44.980 E	End Chirp line Cage_KA2014_71, end multibeam line 00314-00315
12/7	12:13:11	74°59.887 N 27°44.931 E	CTD station 427, water depth 324.34 m – calibration of multibeam, survey off
12/7	12:20:40	74°59.864 N 27°45,943 E	Start Chirp line Cage_KA2014_72, start multibeam line 00316
12/7	12:25:30	74°59.562 N 27°44.240 E	Start of a multibeam survey in Bjørnøyrenna crater area – line 00317
12/7	13:31:16	74°51.219 N 27°25.967 E	End Chirp line Cage_KA2014_72, end multibeam line 00316-00320
12/7	13:35:00	74°51.461 N 27°25.096 E	Start Chirp line Cage_KA2014_73, start multibeam line 00321
12/7	14:36:03	74°59.822 N 27°43.514 E	End Chirp line Cage_KA2014_73, end multibeam line 0321-0324
12/7	14:39:07	74°59.968 N 27°42.649 E	Start Chirp line Cage_KA2014_74, start multibeam line 00325
12/7	15:41:02	74°51.294 N 27°22.897 E	End Chirp line Cage_KA2014_74, end multibeam line 00325-0328
12/7	15:42:40	74°51.224 N 27°22.372 E	Start Chirp line Cage_KA2014_75Hammerfest_transect, start multibeam line 0329
12/7	18:11:01	74°25.219 N 26°55.493 E	End Chirp line Cage_KA2014_75Hammerfest_transect, end multibeam line 0329-0333
12/7	18:11:30	74°25.099 N 26°55.372 E	Start Chirp line Cage_KA2014_76Hammerfest_transect, start multibeam line 0334
12/7	06:21:52	72°13.672 N 24°48.795 E	End Chirp line Cage_KA2014_76Hammerfest_transect, end multibeam line 0334-358
13/7	06:22:32	72°13.555 N 24°48.718 E	Start Chirp line Cage_KA2014_77Hammerfest_transect, start multibeam line 0359
13/7	13:18:42	70°57.791 N 23°39.422 E	End Chirp line Cage_KA2014_77Hammerfest_transect, end multibeam line 0359-0372
13/7	13:20:19	70°57.569 N 23°39.160 E	Start Chirp line Cage_KA2014_78Hammerfest_transect, start multibeam line 0373

13/7	13:30:24	70°39.898 N 23°40.890 E	End Chirp line Cage_KA2014_78Hammerfest_transect, end multibeam line 0373-378
13/7		70°39.898 N 23°40.890 E	Start Chirp line Cage_KA2014_79
			Hammerfest_transect, start multibeam line 0379
14/7	17:50:09	74°51.104 N 27°21.781 E	CTD station 428, water depth 340.70 m – multibeam survey off
14/7	17:58:59	74°51.141 N 27°21.579 E	Start Chirp line Cage_KA2014_80, start multibeam line 0429
14/7	19:22:17	74°59.068 N 27°34.457 E	End Chirp line Cage_KA2014_80, end multibeam line 0429-0432
14/7	19:23:59	74°59.021 N 27°40.093 E	Start Chirp line Cage_KA2014_81, start multibeam line 0433
14/7	19:30:48	74°58.010 N 27°41.529 E	End Chirp line Cage_KA2014_81, end multibeam line 0433-0434
14/7	19:32:08	74°57.838 N 27°41.277 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_3, start multibeam line 0435
14/7	20:07:31	74°52.930 N 27°30.675 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_3, end multibeam line 0435-0437
14/7	20:10:06	74°52.839 N 27°31.590 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_4, start multibeam line 0438
14/7	20:46:00	74°57.633 N 27°41.581 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_4, end multibeam line 0438-0440
14/7	20:49:26	74°57.363 N 27°42.549 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_5, start multibeam line 0441
14/7	21:22:12	74°52.740 N 27°32.741 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_5, end multibeam line 0441-0443
14/7	21:31:55	74°52.773 N 27°32.370 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_6, start multibeam line 0444
14/7	21:48:10	74°52,600 N 27°31,711 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_6, end multibeam line 0444-0445
14/7	21:52:07	74°52,770 N 27°32,558 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_7, start multibeam line 0446
14/7	22:04:10	74°54.085 N 27°27.421 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_7, end multibeam line 0446-0447
14/7	22:09:59	74°54.080 N 27°27.734 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_8, start multibeam line 0448
14/7	22:28:00	74°53.717 N 27°37.855 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_8, end multibeam line 0448-0449
14/7	22:09:59	74°54.080 N 27°27.734 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_9, start multibeam line 0450

14/7	22:48:56	74°54.674 N 27°28.533 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_9, end multibeam line 0450-0451
14/7	22:53:59	74°55.136 N 27°29.211 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_10, start multibeam line 0452
14/7	23:13:48	74°54.316 N 27°40.283 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_10, end multibeam line 0452-0453
14/7	23:17:18	74°54.211 N 27°39.433 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_11, start multibeam line 0454
14/7	23:39:58	74°56.374 N 27°28.427 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_11, end multibeam line 0454-0455
14/7	23:46:32	74°56.414 N 27°28.151 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_12, start multibeam line 0456
15/7	00:15:37	74°56.170 N 27°44.241 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_12, end multibeam line 0456-0457
15/7	00:17:36	74°56.053 N 27°44.164 E	Start Chirp line Cage_KA2014_Byornoyrenna_crater_area_13, start multibeam line 0458
15/7	00:40:04	74°57.480 N 27°32.631 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_13, end multibeam line 0458-0459
15/7	00:46:51	74°57.390 N 27°34.239 E	Start Chirp line Cage_KA2014_092, start multibeam line 0460. Station 696 sampling
15/7	00:52:46	74°57.000 N 27°35.893 E	CTD station 429. Water depth 339.39m
15/7	01:14:15	74°57.059 N 27°35.895 E	Start of grab sampling, station 696, water depth 341.42m. Seven grab samples taken.
15/7	01:22:32	74°57.054 N 27°36.001 E	696-Grabb-1. Grab sample 1
15/7	01:47:08	74°57.079 N 27°36.089 E	696-Grabb-2. Grab sample 2
15/7	02:03:29	74°57.053 N 27°35.957 E	696-Grabb-3. Grab sample 3. Failed grab
15/7	02:16:59	74°57.056 N 27°36.132 E	696-Grabb-4. Grab sample 4
15/7	02:31:25	74°57.065 N 27°36.170 E	696-Grabb-5 Grab sample 5
15/7	02:50:15	74°57.027 N 27°36.217 E	696-Grabb-6 Grab sample 6
15/7	03:08:49	74°57.077 N 27°36.112 E	696-Grabb-7 Grab sample 7
15/7	03:34:51	74°57.062 N 27°36.047 E	697-MC in same crater/flare location as grab sampler station 696. Water depth 346.22m
15/7	04:22:38	74°57.031 N 27°36.110 E	698-GC Gravity core GC7 taken at station 698 recovered for Methane sampling

15/7	05:32:14	74°57.067 N 27°36.121 E	699-GC Gravity core GC8 taken at site 699 - EMPTY
15/7	05:48:26	74°57.071 N 27°36.019 E	700-GC Gravity core GC9 taken at site 700 - EMPTY
15/7	06:16:11	74°57.057 N 27°36.188 E	701-GC Gravity core GC10 taken at site 701 - EMPTY
15/7	09:35:51	74°00,501 N 27°37,386 E	Autopilot stopped working
15/7	10:35:45	74°58,614 N 27°42,779 E	End Chirp line Cage_KA2014_Byornoyrenna_crater_area_92, end multibeam line 0460-0480
15/7	10:37:03	74°58.529 N 27°42.498 E	Start Chirp line Cage_KA2014_093, start multibeam line 0481. Start seismic line 03
15/7	12:50:13	74°50.989 N 27°26.687 E	End Chirp line Cage_KA2014_093, end multibeam line 0481-0486. End seismic line 03
15/7	13:04:19	74°51.108 N 27°26.195 E	Start Chirp line Cage_KA2014_094, start multibeam line 0487.
15/7	13:12	74°51.761 N 27°25.672 E	Start seismic line 04
15/7	14:16	74°57.257 N 27°22.466 E	End seismic line 04
15/7	14:16:11	74°57.182 N 27°22.330 E	End Chirp line Cage_KA2014_094, end multibeam line 0487-0490.
15/7	14:24:25	74°57.211 N 27°24.421 E	Start Chirp line Cage_KA2014_095, start multibeam line 0492.
15/7	14:25	74°57.154 N 27°24.770 E	Start seismic line 05
15/7	16:08:8	74°53.321 N 27°47.019 E	End Chirp line Cage_KA2014_095, end multibeam line 0492-0496.
15/7	16:07	74°53.113 N 27°45.139 E	End seismic line 05
15/7	16:17:52	74°53.785 N 27°45.622 E	Start Chirp line Cage_KA2014_096, start multibeam line 0496.
15/7	16:38:53	74°55.184 N 27°42.738 E	End Chirp line Cage_KA2014_096, end multibeam line 0496-0498
15/7	16:39:30	74°55.172 N 27°42.576 E	Start Chirp line Cage_KA2014_097, start multibeam line 0499
15/7	16:43	74°55.067 N 27°41.422 E	Start seismic line 06
15/7	17:58:02	74°53.045 N 27°24.003 E	End Chirp line Cage_KA2014_097, end multibeam line 0499-0502
15/7	17:59:00	74°52.987 N 27°23.544 E	End seismic line 06

15/7	19:56:00	74°58.667 N 27°42.874 E	Start Seismic line 07 Test Line
15/7	22:41:12	74°53.058 N 27°24.132 E	Start Chirp line Cage_KA2014_098, start multibeam line 0512
15/7	22:41:00	74°53.048 N 27°24.029 E	Start seismic line 08 (sparker)
16/7	00:01	74°55.053 N 27°41.610 E	End seismic line 08
16/7	00:03:53	74°54.978 N 27°42.116 E	End Chirp line Cage_KA2014_098, end multibeam line 0512-0513
16/7	00:05:14	74°54.904 N 27°42.286 E	Start Chirp line Cage_KA2014_099, start multibeam line 0514
16/7	00:40:17	74°53.093 N 27°46.034 E	End Chirp line Cage_KA2014_099, end multibeam line 0514-0517
16/7	00:44:08	74°53.062 N 27°45.180 E	Start Chirp line Cage_KA2014_100, start multibeam line 0518
16/7	00:49:53	74°53.314 N 27°44.195 E	Start seismic line 09 (sparker)
16/7	02:25:12	74°57.163 N 27°24.953 E	End Chirp line Cage_KA2014_100, end multibeam line 0518-522
16/7	02:26	74°57.177 N 27°24.699 E	End seismic line 09
16/7	02:32:23	74°56.956 N 27°24.111 E	Start Chirp line Cage_KA2014_101, start multibeam line 0523
16/7	03:02:07	74°55.853 N 27°27.599 E	End Chirp line Cage_KA2014_101, end multibeam line 0523-0524
16/7	03:04:17	74°55.863 N 27°28.025 E	Start Chirp line Cage_KA2014_102, start multibeam line 0525
16/7	03:06:33	74°55.915 N 27°28.481 E	Start seismic line 10 (sparker)
16/7	04:28:21	74°58.623 N 27°46.926 E	End Chirp line Cage_KA2014_102, end multibeam line 0525-0528
16/7	04:29:07	74°58.669 N 27°47.038 E	End Seismic line 10
16/7	04:30:10	74°58.742 N 27°47.067 E	Start Chirp line Cage_KA2014_103, start multibeam line 0529
16/7	04:49:37	74°58.647 N 27°42.975 E	End Chirp line Cage_KA2014_103, end multibeam line 0529-0530
16/7	04:50:04	74°58.626 N 27°42.930 E	Start Chirp line Cage_KA2014_104, start multibeam line 0531
16/7	04:51:05	74°58.579 N 27°42.830 E	Start seismic line 11

16/7	07:19:13	74°51.028 N 27°26.730 E	End Chirp line Cage_KA2014_104, end multibeam line 0531-0536
16/7	07:19:43	74°51.002 N 27°26.686 E	End seismic line 11
16/7	07:50:34	74°50.216 N 27°27.836 E	Start Chirp line Cage_KA2014_105, start multibeam line 0537
16/7	08:17:46	74°54.045 N 27°31.376 E	End Chirp line Cage_KA2014_105, end multibeam line 0537-0539
16/7	08:19:47	74°53.982 N 27°31.589 E	CTD station 430. Water depth 357.98m.
16/7	08:26:01	74°53.955 N 27°31.679 E	Stopped logging multibeam
16/7	08:38:53	74°53.940 N 27°31.616 E	702-Grabb-1 EMPTY, grab did not close.
16/7			702-Grabb-1 EMPTY, grab did not close.
16/7			702-Grabb-1 EMPTY, grab did not close.
16/7	10:37:00	74°53.954 N 27°31.358 E	702-Grabb-1
16/7	11:00:00	74°53.950 N 27°31.557 E	702-Grabb-2
16/7	11:15:00	74°53.935 N 27°31.528 E	702-Grabb-3
16/7	11:36:11	74°53.935 N 27°31.559 E	702-Grabb-4
16/7	11:51:00	74°53.947 N 27°31.528 E	702-Grabb-5 sediment samples
16/7	12:07:52	74°53.978 N 27°31.538 E	702-Grabb-6 fauna
16/7	12:53:40	74°54.554 N 27°27.347 E	CTD transect start, station 431, water depth; 333.14m, multibeam and chirp survey off
16/7	13:07:20	74°54.511 N 27°27.535 E	CTD transect stop, station 431, water depth; 334.19m, multibeam and chirp survey off
16/7	13:52:39	74°54.476 N 27°29.452 E	CTD transect start, station 432, water depth; 333.55m, multibeam and chirp survey off
16/7	14:02:51	74°54.490 N 27°29.533 E	CTD transect stop, station 432, water depth; 332.75m, multibeam and chirp survey off
16/7	14:52:10	74°54.427 N 27°31.146 E	CTD transect start, station 433, water depth; 336.82m, multibeam and chirp survey off
16/7	14:58:13	74°54.387 N 27°31.143 E	CTD transect stop, station 433, water depth; 336.75m, multibeam and chirp survey off

16/7	15:35:28	74°54.256 N 27°32.894 E	CTD transect start, station 434, water depth; 336.91m, multibeam and chirp survey off
16/7	15:42:27	74°54.223 N 27°32.957 E	CTD transect stop, station 434, water depth; 335.42m, multibeam and chirp survey off
16/7	16:06:45	74°54.162 N 27°34.712 E	CTD transect start, station 435, water depth; 338.23m, multibeam and chirp survey off; failed attempt
16/7	16:19:53	74°54.094 N 27°35.043 E	CTD transect stop, station 435, water depth; 339.60m, multibeam and chirp survey off; failed attempt
16/7	16:40:26	74°54.159 N 27°34.693 E	CTD transect start, station 436, water depth; 340.64m, multibeam and chirp survey off
16/7	16:52:18	74°54.151 N 27°34.847 E	CTD transect stop, station 436, water depth; 339.54m, multibeam and chirp survey off
16/7	17:25:00	74°54.052 N 27°36.412 E	CTD transect start, station 437, water depth; 341.98m, multibeam and chirp survey off
16/7	17:39:47	74°54.048 N 27°36.647 E	CTD transect stop, station 437, water depth; 341.87m, multibeam and chirp survey off
16/7	18:15:24	74°53.904 N 27°38.380 E	CTD transect start, station 438, water depth; 340.38 m, multibeam and chirp survey off
16/7	18:34:56	74°53.889 N 27° 38.474 E	CTD transect stop, station 438, water depth; 339.90m, multibeam and chirp survey off
16/7	19:10:03	74°53.834 N 27° 40.215 E	CTD transect start, station 439, water depth; 337.47 m, multibeam and chirp survey off
16/7	19:20?	74°53.841 N 27° 40.245 E	CTD transect stop, station 439, water depth; 338.59 m, multibeam and chirp survey off
16/7	19:56:11	74°53.726 N 27°41.992 E	CTD transect start, station 440, water depth; 342.60. m, multibeam and chirp survey off
16/7	20:11:30	74°53.684 N 27°41.976 E	CTD transect stop, station 440, water depth; 342.93m, multibeam and chirp survey off
16/7	20:37:32	74°53.594 N 27°43.816 E	CTD transect start, station 441, water depth; 354.99 m, multibeam and chirp survey off
16/7	20:54:52	74°53.596 N 27°43.943 E	CTD transect stop, station 441, water depth; 350.44m, multibeam and chirp survey off
16/7	21:37:21	74°54.141 N 27°33.461 E	703-Grabb-1 fauna
16/7	22:02:32	74°54.093 N 27°33.360 E	703-Grabb-2
16/7	22:21:03	74°54.101 N 27°33.381 E	703-Grabb-3
16/7	22:34:15	74°54.098 N 27°33.349 E	703-Grabb-4
16/7	22:48:16	74°54.090 N 27°33.433 E	703-Grabb-5

16/7	23:01:25	74°54.085 N 27°33.349 E	703-Grabb-6
16/7	23:01:25	74°54.085 N 27°33.349 E	Waiting for weather to improve
17/7	12:12:22	74°54.009 N 27°33.381 E	704-GC Gravity core; no recovery, empty
17/7	12:41:17	74°54.085 N 27°33.311 E	705-GC Gravity core; no recovery, empty
17/7	13:03:48	74°54.101 N 27°33.457 E	706-GC Gravity core; no recovery, empty
17/7	13:36:43	74°54.073 N 27°33.391 E	707-GC Gravity core; no recovery, empty
17/7	14:08:14	74°54.302 N 27°33.805 E	708-Triangle scrape (trekantskrape TC) Cage_KA2014_708-TC
17/7	17:03:31	74°54.880 N 27°31.257 E	709-GC Gravity core; 10 cm in plastic bag
17/7	17:28:33	74°53.849 N 27°31.216 E	710 -GC Gravity core
17/7	18:08:15	74°51.711 N 27°21.743 E	Start Chirp line Cage_KA2014_106, start multibeam line 0540
17/7	18:37:28	74°50.806 N 27°04.921 E	End Chirp line Cage_KA2014_106, end multibeam line 0540-0542
17/7	18:55:29	74°51.865 N 27°00.605 E	Start Chirp line Cage_KA2014_107, start multibeam line 0543
17/7	19:08:14	74°51.970 N 27°02.456 E	End Chirp line Cage_KA2014_107, end multibeam line 0543-0547
17/7	20:55:36	74°52.510 N 27°09.033 E	Start Chirp line Cage_KA2014_108, start multibeam line 0548
17/7	20:58:36	74°52.510 N 27°09.033 E	Start of Seismic line 12
18/7	00:27:21	74°55.967 N 27°59.793 E	End of seismic line 12
18/7	00:34:25	74°56.072 N 28°01.273 E	End Chirp line Cage_KA2014_108, end multibeam line 0548-0556
18/7	00:46:03	74°55.872 N 28°02.467 E	Start Chirp line Cage_KA2014_109, start multibeam line 0557
18/7	02:34:25	74°43.380 N 27°28.548 E	End Chirp line Cage_KA2014_109, end multibeam line 0557-0561
18/7	02:40:26	74°43.774 N 27°26.185 E	Start Chirp line Cage_KA2014_110, start multibeam line 0562
18/7	05:59:39	75°11.295 N 28°25.877 E	End Chirp line Cage_KA2014_110, end multibeam line 0562-0569

18/7	05:59:39	75°11.295 N 28°25.877 E	Start Chirp line Cage_KA2014_111, start multibeam line 0570
18/7	06:24:00	75°09.066 N 28°34.716 E	End Chirp line Cage_KA2014_111, end multibeam line 0570-0572
18/7	06:24:29	75°09.066 N 28°34.719 E	CTD station 442, water depth 335.6 m. Control station. Multibeam and chirp survey off.
18/7	06:50:39	75°08.988 N 28°35.042 E	712-Grabb-1 control station.
18/7	07:17:53	75°08.977 N 28°35.355 E	712-Grabb-2
18/7	07:29:21	75°08.920 N 28°35.647 E	712-Grabb-3
18/7	07:42:22	75°08.960 N 28°35.329 E	712-Grabb-4 EMPTY, grab did not close.
18/7	07:54:17	75°08.894 N 28°35.869 E	712-Grabb-4 EMPTY, grab did not close.
18/7	08:04:17	75°08.888 N 28°35.815 E	712-Grabb-4
18/7	08:19:54	75°09.036 N 28°34.808 E	712-Grabb-5
18/7	08:30:15	75°09.053 N 28°35.309 E	712-Grabb-6 EMPTY, grab did not close.
18/7	08:40:22	75°09.062 N 28°35.818 E	712-Grabb-6
18/7	08:59:34	75°08.907 N 28°34.812 E	713-MC. Control station. Water depth 335.78 m. 4 out of 5 liners were recovered.
18/7	09:47:16	75°08.967 N 28°35.146 E	714-GC. Control station. Water depth 334.78 m. No recovery, empty.
18/7	10:24:35	75°08.988 N 28°34.940 E	715-GC Control station. Water depth 335.04m. No recovery, empty.
18/7	11:07:19	75°08.976 N 28°35.065 E	716-GC Control station. Water depth 333.64m. Recovery of 109cm sediment.
18/7	11:42:19	75°08.889 N 28°33.905 E	Start transit to upper Storfjordrenna.
18/7	11:42:19	75°08.889 N 28°33.905 E	Start Chirp line Cage_KA2014_112, start multibeam line 0573
18/7	23:28:34	76°35.691 N 22°44.953 E	End Chirp line Cage_KA2014_112, end multibeam line 0573-0599
18/7	23:28:06	76°35.677 N 22°45.094 E	CTD station 443, water depth 156m.
18/7	23:47:26	76°36.060 N 22°45.201 E	Start Chirp line Cage_KA2014_113, start multibeam line 0600. Location: Upper Storfjordrenna

19/7	02:50:32	77°04.670 N 23°37.222 E	End Chirp line Cage_KA2014_113, end multibeam line 0600-0607
19/7	02:50:32	77°04.670 N 23°37.222 E	Start Chirp line Cage_KA2014_114, start multibeam line 0608 – Transect to Longyearbyen via Hinlopenstretet
20/7	19:14:10	78°32.377 N 10°38.593 E	End Chirp line Cage_KA2014_114, end multibeam line 0608-

6.2. Core Stations on RV Helmer Hanssen 7-21 July 2014 in Storfjordrenna and Bjørnøyrenna.

Gravity cores (Cage_KA2014_686-GC1, Cage_KA2014_692-GC3) were subsampled for free "head-space" gas immediately after core retrieval by sampling through boreholes (predrilled in gravity corer liner and covered by extra strong tape prior to coring) at 30cm intervals. Subsequently the cores underwent same procedures as described above.

The remaining gravity cores were stored whole in cooling room and transported to the Geological Department, University of Tromsø for further analyses.

Station	Date	Location	Latitude (N)	Longitude (E)	Time (UTC)	Penetration (m)	Recovery (m for GC)	Water Depth (m)	Comment
Cage_KA2014_684-Grabs 1-6	09.07.14	Storfjordrenna	75°50,502000	16°37,597000	15:17-19:02			353	
Cage_KA2014_685(000)-MC1	09.07.14	Storfjordrenna	75°50,488000	16°37,643000	19:54:32			351,00	
Cage_KA2014_686(000)-GC1	09.07.14	Storfjordrenna	75°50,479700	16°37,630000	20:57:10	Full	2 m	351,70	CH4 sampling at depths 15-45-75-105-135-165-195. Sediments

									from core catcher collected. Strong smell of H2S. Sticky, thick dark grey mud.
Cage_KA2014_687(001)-GC2	09.07.14	Storfjordrenna	75°50,532000	16°37,663000	21:45:45	Full	2.9 m	352,19	Sediments from core catcher collected. Strong smell, sticky, thick dark mud. Core for NGU
Cage_KA2014_688-TC1	09.07.14	Storfjordrenna	75°50,560000	16°37,751000	22:44:37			351,61	
Cage_KA2014_690-MC2	10.07.14	Storfjordrenna	75°52,341000	16°38,362000	02:41:06			352,46	
Cage_KA2014_691-TC2	10.07.14	Storfjordrenna	75°52,388000	16°38,430000	02:52:33			351,43	
Cage_KA2014_692-GC3	10.07.14	Storfjordrenna	75°52,314000	16°38,071000	04:35:49	Full	3.89 m	353,75	No H2S smell. Stiff and consolidated sediments in the core catcher and cutter - sediments were not kept. CH4 sampling at depths 34-64-94-124-154-184-204-234-264-294-324-354
Cage_KA2014_693-GC4	10.07.14	Storfjordrenna	75°52,397000	16°38,122000	06:18:04	Full	3.69 m	353,48	

Cage_KA2014_694-GC5	11.07.14	Storfjordrenna (GWZ)	76°20,695 000	20°24,8850 00	21:29:35	Full	2.96 m	264,00	Recovered from grounding zone wedge. Grey, sticky, stiff, consolidated silty clay.
Cage_KA2014_695-GC6	12.07.14	Storfjordrenna (pockmarks)	76°16,951 000	20°07,9530 00	22:44:41	Full	2.68 m	239,10	Basin. Grey, sticky, stiff, consolidated silty clay.
Cage_KA2014_696 Grabsamples	15.07.14	Bjornoyrenna Crater	74°57,059 657	27°35,8956 45	01:14:15			341,42	Seven grab samples in the same station 696. Grab 3 failed so one more was taken.
Cage_KA2014_697-MC3	15.07.14	Bjornoyrenna Crater	74°57,062 165	27°36,0478 28	03:34:51			346,22	
Cage_KA2014_698-GC7	15.07.14	Bjornoyrenna Crater	74°57,031 115	27°36,1101 74	04:22:38		0.69m	349,37	Ch4 sampling: 12 – 42 – 69 cm, Porewater sampling: 12 – 22 – 32 – 42 – 53 – 63 cm. Material from core catcher collected. No smell
Cage_KA2014_699-GC8	15.07.14	Bjornoyrenna Crater	74°57,067 199	27°36,1211 45	05:32:14		empty	342,23	
Cage_KA2014_700-GC9	15.07.14	Bjornoyrenna Crater	74°57,071 084	27°36,0198 51	05:48:26		empty	345,75	
Cage_KA2014_701-	15.07.14	Bjornoyrenna	74°57,057	27°36,1881	06:16:11		empty	343,74	

GC10		Crater	407	84					
Cage_KA2014_702 Grab sample	16.07.14	Bjornoyrenna Crater	74°53,940 828	27°31,6164 10	08:38:53		6 recovered	357,63	Nine grab samples were taken instead of six because 3 grab samples returned empty as the grab failed to close.
Cage_KA2014_703 Grab sample	16.07.14	Bjornoyrenna flare	74°54,141 697	27°33,4619 60	21:37:21		6 recovered		
Cage_KA2014_704 GC11	17.07.14	Bjornoyrenna flare	74°54,099 842	27°33,3811 24	12:12:22		empty	337,71	
Cage_KA2014_705 GC12	17.07.14	Bjornoyrenna flare	74°54,085 814	27°33,3113 24	12:41:17		empty	336,49	
Cage_KA2014_706 GC13	17.07.14	Bjornoyrenna flare	74°54,101 705	27°33,4572 17	13:03:48		20 cm	336,27	
Cage_KA2014_707 GC14	17.07.14	Bjornoyrenna flare	74°54,073 416	27°33,3911 15	13:36:43		empty	336,72	
Cage_KA2014_708 TC	17.07.14	Bjornoyrenna flare	74°54,302 834	27°33,8058 44	14:08:14			337,20	
Cage_KA2014_709 GC14	17.07.14	Bjornoyrenna Crater	74°53,880 064	27°31,2579 15	17:03:31		10 cm in plastic bag	354,92	grey mud with angular pebbles
Cage_KA2014_710 GC15	17.07.14	Bjornoyrenna Crater	74°53,849 975	27°31,2160 57	17:28:33		45 cm	352,72	CH4 sampling: 18 cm, Porewater sampling: 17 – 27 – 37 cm
Cage_KA2014_712-Grab sample	18.07.14	Bjornoyrenna control station	75°08,988 711	28°35,0420 41	06:50:39		6 recovered	335,29	nine grab samples, instead of six as 3 grab samples failed to close and had to be retaken.

Cage_KA2014_713-MC4	18.07.14	Bjornoyrenna control station	75°08,907609	28°34,812903	08:59:34		4 recovered	335,78	4 out of 5 cores recovered (1 empty)
Cage_KA2014_714-GC16	18.07.14	Bjornoyrenna control station	75°08,967480	28°35,146033	09:47:16		empty	334,78	EMPTY
Cage_KA2014_715-GC17	18.07.14	Bjornoyrenna control station	75°08,988291	28°34,940390	10:24:35		empty	335,04	EMPTY
Cage_KA2014_716-GC18	18.07.14	Bjornoyrenna control station	75°08,976942	28°35,065039	11:07:19		1.09m	333,64	CH4 sampling: 18 - 48 - 80 cm. Material from core catcher and core cutter sampled.

6.3. Linelog on RV Helmer Hanssen 7th-21st uly 2014 Storfjordrenna, Bjørnøyrenna

Airgun: MiniGI (15/15 cu inch), ca 0.5 l, shotrate 3s, towed 35 meters behind vessel at 2m water depth

Subbottom profiler: Edgetech hullmount chirp 4x4 transducer array, freq.range 1.5-9kHz, 4kW, shot rate 1s.

Multibeam: Kongsberg EM300, 32 kHz.

Line name	Date	Location	Start (UTC)	Start Lat decdeg	Start Long decdeg	End (UTC)	End Lat decdeg	End Long decdeg	MB Line count	Shot rate	Pulse mode chirp	Ship's speed [km]	Comments
		Transit											
Cage_KA_2014_000	08.07.2014	Storfjordrenna	08:13:00	76,97267	14,23262	14:25:00	75,93103	15,6859	0001-	1	1.5-9khz,40	10	Alles gut

									0015		ms		
Cage_KA_2014_001	08.07.2014	Storfjordrenna	07:23:42	76,26063	14,70965	10:56:00	75,77432	15,75977	0027-0036	1	1.5-9khz,40ms	10	
Cage_KA_2014_002	08.07.2014	Storfjordrenna	11:44:40	75,7748	15,75572	12:47:44	75,81575	16,44673	0037-0041	1	1.5-9khz,40ms	10	
Cage_KA_2014_003	08.07.2014	Storfjordrenna	12:48:49	75,81645	16,45437	13:25:59	75,81517	16,4273	0041-0045	1	1.5-9khz,40ms	10	Chirp not stopped during CTD
Cage_KA_2014_004	08.07.2014	Storfjordrenna	13:30:12	75,81655	16,45075	14:01:27	75,84882	16,75625	0046-0048	1	1.5-9khz,40ms	10	
Cage_KA_2014_005	08.07.2014	Storfjordrenna	14:06:13	75,84575	16,77418	14:37:59	75,81155	16,45133	0049-0051	1	1.5-9khz,40ms	10	
Cage_KA_2014_006	08.07.2014	Storfjordrenna	14:41:58	75,80808	16,48313	15:16:15	75,84135	16,78065	0052-0054	1	1.5-9khz,40ms	10	
Cage_KA_2014_007	08.07.2014	Storfjordrenna	15:19:53	75,83705	16,79127	15:53:19	75,80223	16,47112	0055-0057	1	1.5-9khz,40ms	10	
Cage_KA_2014_008	08.07.2014	Storfjordrenna	15:57:34	75,79778	16,48102	16:32:20	75,83298	16,79608	0057-0060	1	1.5-9khz,40ms	10	
Cage_KA_2014_009	08.07.2014	Storfjordrenna	16:36:39	75,82945	16,80618	17:09:30	75,79373	16,4962	0060-0063	1	1.5-9khz,40ms	10	
Cage_KA_2014_010	08.07.2014	Storfjordrenna	17:14:51	75,79043	16,50438	17:51:24	75,83173	16,80343	0063-0066	1	1.5-9khz,40ms	10	
Cage_KA_2014_011	08.07.2014	Storfjordrenna	17:52:02	75,8326	16,79883	18:02:44	75,83937	16,71647	0067-0068	1	1.5-9khz,40ms	10	
Cage_KA_2014_012	08.07.2014	Storfjordrenna	18:23:44	75,83815	16,6798	18:34:39	75,8183	16,70788	0068-	1	1.5-9khz,40	10	multibeam count line

									0070		ms		started too late, line 0069 missed
Cage_KA_2014_013	08.07.2014	Storfjordrenna	18:38:39	75,81722	16,2486	18:50:00	75,83968	16,64383	0070-0071	1	1.5-9khz,40ms	10	transect off track
Cage_KA_2014_014	08.07.2014	Storfjordrenna	18:55:20	75,83872	16,63642	19:06:00	75,8158	16,68942	0071-0072	1	1.5-9khz,40ms	10	
Cage_KA_2014_015	08.07.2014	Storfjordrenna	19:11:33	75,8145	16,67757	19:21:40	75,8377	16,75917	0072-0073	1	1.5-9khz,40ms	10	
Cage_KA_2014_016	08.07.2014	Storfjordrenna	19:28:34	75,8362	16,61242	19:38:40	75,81335	16,66318	0073-00741	1	1.5-9khz,40ms	10	
Cage_KA_2014_017	08.07.2014	Storfjordrenna	19:46:01	75,7617	16,64987	19:56:40	75,83477	16,59972	0074-0075	1	1.5-9khz,40ms	10	
Cage_KA_2014_018	08.07.2014	Storfjordrenna	20:10:45	75,8377	16,62583	20:55:33	75,92223	16,47837	0075-0077	1	1.5-9khz,40ms	10	Chirp not stopped during transect planning
Cage_KA_2014_019	08.07.2014	Storfjordrenna	21:07:47	75,92175	16,47422	21:34:30	75,98782	16,47443	0078-0079	1	1.5-9khz,40ms	10	
Cage_KA_2014_020	08.07.2014	Storfjordrenna	21:59:48	75,98875	16,47157	02:42:50	75,80517	16,30338	0080-0090	1	1.5-9khz,40ms	10	Change course - SW to SE and SE to SW - crosscutting pattern of transect
Cage_KA_2014_021	09.07.2014	Storfjordrenna	02:43:29	75,80537	16,30675	05:05:28	75,84198	16,96978	0091-0096	1	1.5-9khz,40ms	10	
Cage_KA_2014_022	09.07.2	Storfjordrenna	05:06:	75,842	16,974	09:27:	75,969	18,117	0097	1	1.5-	10	

	014		38	53	73	50	73	62	-00105		9khz,40 ms		
Cage_KA_2014_023	09.07.2014	Storfjordrenna	10:00:30	75,98773	18,1945	11:12:00	75,86058	16,80248	00108-112	1	1.5-9khz,40 ms	10	00106-00107 - not included due to ship turning
Cage_KA_2014_024	09.07.2014	Storfjordrenna	20:20:40	75,84253	16,62292	22:59:30	75,83648	16,62207	00121-00127	1	1.5-9khz,40 ms	10	00113-00120 - sediment sampling - record off
Cage_KA_2014_025	09.07.2014	Storfjordrenna	22:59:30	75,83648	16,62207	06:33:20	75,87263	16,6469	00128-00143	1	1.5-9khz,40 ms	10	sediment sampling - chirp and multibeam on
Cage_KA_2014_026	10.07.2014	Storfjordrenna	06:34:30	75,89288	16,55702	09:04:00	75,94527	17,97632	00144-149	1	1.5-9khz,40 ms	10	
Cage_KA_2014_027	10.07.2014	Storfjordrenna	09:05:30	75,94527	17,99515	09:13:58	75,95958	18,06977	00149	1	1.5-9khz,40 ms	10	
Cage_KA_2014_028	10.07.2014	Storfjordrenna	09:14:50	75,96393	18,05332	11:30:34	75,98357	18,14933	00150-00154	1	1.5-9khz,40 ms	10	
Cage_KA_2014_029	10.07.2014	Storfjordrenna	11:32:20	75,98453	18,16342	11:44:20	75,96265	18,18213	00155-00156	1	1.5-9khz,40 ms	10	
Cage_KA_2014_030	10.07.2014	Storfjordrenna	11:44:30	75,9902	18,14835	14:11:57	75,99647	18,15177	00157-00164	1	1.5-9khz,40 ms	10	
Cage_KA_2014_031	10.07.2014	Storfjordrenna	14:14:58	76,00075	17,38488	15:36:43	75,92482	17,49445	0165-0170	1	1.5-9khz,40 ms	10	

Cage_KA_2014_032	10.07.2014	Storfjordrenna	15:37:56	75,00075	17,38488	15:56:13	75,92248	17,19655	0171-0173	1	1.5-9khz,40ms	10	
Cage_KA_2014_033	10.07.2014	Storfjordrenna	16:00:08	75,92922	17,19115	16:16:48	75,93133	17,37132	0174-0175	1	1.5-9khz,40ms	10	
Cage_KA_2014_034	10.07.2014	Storfjordrenna	16:22:34	75,9409	17,41825	17:20:01	75,99155	18,0017	0176-0180	1	1.5-9khz,40ms	10	
Cage_KA_2014_035	10.07.2014	Storfjordrenna	17:22:41	75,99592	17,9972	17:39:48	75,98812	17,81775	181	1	1.5-9khz,40ms	10	
Cage_KA_2014_036	10.07.2014	Storfjordrenna	17:40:24	75,98762	17,81187	18:28:27	75,93822	17,3512	0182-0183	1	1.5-9khz,40ms	10	
Cage_KA_2014_037	10.07.2014	Storfjordrenna	18:28:27	75,93822	17,3512	18:44:30	75,9389	17,1361	00183-00184	1	1.5-9khz,40ms	10	
Cage_KA_2014_038	10.07.2014	Storfjordrenna	18:44:45	75,93772	17,1777	18:49:30	75,94538	17,16795	00184-00185	1	1.5-9khz,40ms	10	
Cage_KA_2014_039	10.07.2014	Storfjordrenna	18:49:35	75,94538	17,16795	18:52:00	75,94588	17,19587	00186-00187	1	1.5-9khz,40ms	10	
Cage_KA_2014_040	10.07.2014	Storfjordrenna	18:52:00	75,94588	17,19587	19:06:43	75,94635	17,35038	187	1	1.5-9khz,40ms	10	
Cage_KA_2014_041	10.07.2014	Storfjordrenna	19:07:24	75,94737	17,35582	19:44:00	75,99427	17,80103	00188-00192	1	1.5-9khz,40ms	10	
Cage_KA_2014_042	10.07.2014	Storfjordrenna	19:44:45	75,99458	17,80727	20:12:00	76,00058	17,98583	00193-	1	1.5-9khz,40	10	

									00194		ms		
Cage_KA_2014_043	10.07.2014	Storfjordrenna	20:12:42	76,002	17,98715	21:41:20	75,95415	17,15018	00195-00199	1	1.5-9khz,40ms	10	
Cage_KA_2014_044	10.07.2014	Storfjordrenna	21:42:10	75,95397	17,15342	21:44:00	75,96143	17,14828	00199-00200	1	1.5-9khz,40ms	10	
Cage_KA_2014_045	10.07.2014	Storfjordrenna	21:44:00	75,96143	17,14828	22:03:55	75,96517	17,34578	00200-00202	1	1.5-9khz,40ms	10	
Cage_KA_2014_046	10.07.2014	Storfjordrenna	22:04:20	75,96517	17,34578	22:57:50	76,00753	17,8893	00202-00208	1	1.5-9khz,40ms	10	
Cage_KA_2014_047	10.07.2014	Storfjordrenna	22:59:20	76,00782	17,89797	23:07:31	76,01215	17,98072	00208-00209	1	1.5-9khz,40ms	10	
Cage_KA_2014_048	10.07.2014	Storfjordrenna	23:08:45	76,01638	17,9805	00:33:35	75,96943	17,30263	00209-00215	1	1.5-9khz,40ms	10	
Cage_KA_2014_049	11.07.2014	Storfjordrenna	00:35:02	75,96917	17,29133	01:02:27	75,97438	17,11225	00215-00219	1	1.5-9khz,40ms	10	
Cage_KA_2014_050	11.07.2014	Storfjordrenna	01:08:18	75,97903	17,07648	02:28:39	76,04205	17,95582	00218-0222	1	1.5-9khz,40ms	10	
Cage_KA_2014_051	11.07.2014	Storfjordrenna	02:30:51	76,0387	17,96637	02:37:28	76,02215	17,98065	00223-0225	1	1.5-9khz,40ms	10	
Cage_KA_2014_052	11.07.2	Storfjordrenna	02:38:	76,020	17,974	03:00:	76,026	17,808	0026	1	1.5-	10	

	014		56	37	17	58	82	3	-0027		9khz,40 ms		
Cage_KA_2014_053	11.07.2014	Storfjordrenna	03:05:05	76,02767	17,84343	03:15:12	76,0266	17,95175	0027-00228	1	1.5-9khz,40 ms	10	
Cage_KA_2014_054	11.07.2014	Storfjordrenna	03:20:52	76,03512	17,94128	04:55:07	75,96975	18,12967	0228-0232	1	1.5-9khz,40 ms	10	
Cage_KA_2014_055	11.07.2014	Storfjordrenna	04:57:53	75,96458	18,29733	05:26:04	75,98903	17,42252	0233-234	1	1.5-9khz,40 ms	10	
Cage_KA_2014_056	11.07.2014	Storfjordrenna	05:26:39	75,9902	17,42423	05:37:58	76,01815	17,41198	0235-236	1	1.5-9khz,40 ms	10	
Cage_KA_2014_057	11.07.2014	Storfjordrenna	05:41:03	76,02205	17,43288	06:13:00	76,04475	17,78602	0237-239	1	1.5-9khz,40 ms	10	
Cage_KA_2014_058	11.07.2014	Storfjordrenna	06:17:00	76,05317	17,77942	08:06:40	76,334	17,43608	240-243	1	1.5-9khz,40 ms	10	
Cage_KA_2014_059	11.07.2014	Storfjordrenna	08:10:09	76,33407	17,46158	09:26:15	76,15037	17,68785	244-247	1	1.5-9khz,40 ms	10	
Cage_KA_2014_060	11.07.2014	Storfjordrenna	09:27:49	76,15053	17,70082	11:19:46	76,27565	18,78737	248-253	1	1.5-9khz,40 ms	10	stopping multibeam f vel.correction/CTD
Cage_KA_2014_061	11.07.2014	Storfjordrenna	11:52:33	76,27717	18,7948	14:16:32	76,4267	20,36812	0255-0260	1	1.5-9khz,40 ms	10	
Cage_KA_2014_062	11.07.2014	Storfjordrenna	14:18:14	76,42425	20,3759	15:28:04	76,26903	20,11107	0261-0264	1	1.5-9khz,40 ms	10	
Cage_KA_2014_063	11.07.2014	Storfjordrenna	15:59:35	76,24972	20,13263	16:13:40	76,26128	20,17597	0266-266	1	1.5-9khz,40	10	

											ms		
Cage_KA_2014_064	11.07.2014	Storfjordrenna	16:24:36	75,25632	20,1851	17:31:44	76,22408	20,09027	0267-0270	1	1.5-9khz,40 ms	10	
Cage_KA_2014_065	11.07.2014	Storfjordrenna	17:34:02	76,22552	20,08995	20:06:00	76,38957	20,53372	0271-0276	1	1.5-9khz,40 ms	10	
Cage_KA_2014_066	11.07.2014	Storfjordrenna	20:07:30	76,39062	20,53643	20:40:30	76,4149	20,59418	0277-0280	1	1.5-9khz,40 ms	10	
Cage_KA_2014_067	11.07.2014	Storfjordrenna	20:42:40	76,41468	20,59372	21:14:32	76,3456	20,41605	00281-00283	1	1.5-9khz,40 ms	10	
Cage_KA_2014_068	11.07.2014	Storfjordrenna	21:30:12	76,34495	20,4143	22:30:20	76,28245	20,1393	00284-00286	1	1.5-9khz,40 ms	10	multibeam and chirp line stopped for gravity coring
Cage_KA_2014_069	11.07.2014	Storfjordrenna	22:52:43	76,28142	20,1378	06:36:07	75,4378	24,75497	00287-00303	1	1.5-9khz,40 ms	10	multibeam and chirp line stopped for gravity coring
Cage_KA_2014_070	12.07.2014	Storfjordrenna/Bjørnøyrenna	06:37:02	75,43253	24,8421	11:51:20	75,00147	27,70833	00303-00313	1	1.5-9khz,40 ms	10	
Cage_KA_2014_071	12.07.2014	Bjørnøyrenna crater area	11:57:40	75,00243	27,75807	12:03:33	74,9977	27,74967	00314-00316	1	1.5-9khz,40 ms	10	
Cage_KA_2014_072	12.07.2014	Bjørnøyrenna crater area	12:20:40	74,99773	27,76572	13:31:16	74,85365	27,43278	0317-0320	1	1.5-9khz,40 ms	10	Start of multibeam survey - Bjørnøyrenna crater area
Cage_KA_2014_073	12.07.2	Bjørnøyrenna crater	13:35:	74,857	27,418	14:36:	74,997	27,725	0321	1	1.5-	10	

	014	area	00	68	27	03	03	23	-0324		9khz,40 ms		
Cage_KA_2014_074	12.07.2014	Bjørnøyrenna crater area	14:39:07	74,99947	27,71082	15:41:02	74,8549	27,38162	0325-0328	1	1.5-9khz,40 ms	10	
Cage_KA_2014_075	12.07.2014	Hammerfest transect	15:42:40	74,85373	27,37287	18:11:01	74,41832	26,92287	0329-0333	1	1.5-9khz,40 ms	10	Hammerfest transect
Cage_KA_2014_076	12.07.2014	Hammerfest transect	18:11:30	74,41832	26,92287	06:21:52	72,22787	24,81325	0334-0358	1	1.5-9khz,40 ms	10	Hammerfest transect
Cage_KA_2014_077	13.07.2014	Hammerfest transect	06:22:32	72,22592	24,81197	13:18:42	70,95948	23,65267	0359-0372	1	1.5-9khz,40 ms	10	Hammerfest transect
Cage_KA_2014_078	13.07.2014	Hammerfest transect	13:20:19	70,95948	23,65267	17:58:59	74,85235	27,35965	0372-0428	1	1.5-9khz,40 ms	10	Byørnøyrenna crater area
Cage_KA_2014_080	14.07.2014	Bjørnøyrenna crater area	17:58:59	74,85235	27,35965	19:22:17	74,98447	27,57428	0428-0432	1	1.5-9khz,40 ms	10	Byørnøyrenna crater area
Cage_KA_2014_081	14.07.2014	Bjørnøyrenna crater area	19:23:59	74,98368	27,66822	19:30:48	74,96683	27,69215	0432-0434	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_3	14.07.2014	Bjørnøyrenna crater area	19:32:08	74,96397	27,68795	20:07:31	74,88217	27,51125	0435-0437	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_4	14.07.2014	Bjørnøyrenna crater area	20:10:06	74,88065	27,5265	20:46:00	74,96055	27,69302	0438-0440	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_5	14.07.2014	Bjørnøyrenna crater area	20:49:26	74,95605	27,70915	21:22:12	74,879	27,54568	0441-0443	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_6	14.07.2014	Bjørnøyrenna crater area	21:31:55	74,87955	27,5395	21:48:10	74,87667	27,52852	0444-0445	1	1.5-9khz,40 ms	10	Missed line so turned around to start again
Cage_KA_2014_079Byornoyrenna_cra	14.07.2	Bjørnøyrenna crater	21:52:	74,879	27,542	22:04:	74,901	27,457	0446	1	1.5-	10	

ter_area_7	014	area	07	5	63	10	42	02	-0447		9khz,40 ms		
Cage_KA_2014_079Byornoyrenna_crater_area_8	14.07.2014	Bjørnøyrenna crater area	22:09:59	74,90133	27,46223	22:28:00	74,89528	27,63092	0448-0449	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_9	14.07.2014	Bjørnøyrenna crater area	22:31:30	74,90275	27,64385	22:48:56	74,91123	27,47555	0450-0451	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_10	14.07.2014	Bjørnøyrenna crater area	22:53:59	74,91893	27,48685	23:13:48	74,90527	27,67138	0452-0453	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_11	14.07.2014	Bjørnøyrenna crater area	23:17:18	74,90352	27,65722	23:39:58	74,93957	27,47378	0454-0455	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_12	14.07.2014	Bjørnøyrenna crater area	23:46:32	74,94023	27,46918	00:15:37	74,93617	27,73735	0456-457	1	1.5-9khz,40 ms	10	
Cage_KA_2014_079Byornoyrenna_crater_area_13	15.07.2014	Bjørnøyrenna crater area	00:17:36	74,93422	27,73607	00:40:04	74,958	27,54385	0458-459	1	1.5-9khz,40 ms	10	
Cage_KA_2014_092	15.07.2014	Bjørnøyrenna crater area	00:46:51	74,9565	27,57065	10:33:45	74,9769	27,71298	0460-0480	1	1.5-9khz,40 ms	10	Line name changed back to normal numbering
Cage_KA_2014_093	15.07.2014	Bjørnøyrenna crater area	10:37:03	74,97548	27,7083	12:50:13	74,84982	27,44478	0481-0486	1	1.5-9khz,40 ms	10	Start and end seismic line 03
Cage_KA_2014_094	15.07.2014	Bjørnøyrenna crater area	13:04:19	74,8518	27,43658	14:16:11	74,95303	27,37217	0487-0490	1	1.5-9khz,40 ms	10	Start and end seismic line 04
Cage_KA_2014_095	15.07.2014	Bjørnøyrenna crater area	14:24:25	74,95352	27,40702	16:08:08	74,88868	27,78365	0492-0496	1	1.5-9khz,40 ms	10	Start and end seismic line 05
Cage_KA_2014_096	15.07.2014	Bjørnøyrenna crater area	16:17:52	74,89642	27,76037	16:38:53	74,91973	27,7123	0496-0498	1	1.5-9khz,40 ms	10	

Cage_KA_2014_097	15.07.2014	Bjørnøyrenna crater area	16:39:30	74,91953	27,7096	17:58:02	74,88408	27,40005	0499-0511	1	1.5-9khz,40ms	10	Start and end seismic line 06
Cage_KA_2014_098	15.07.2014	Bjørnøyrenna crater area	22:41:12	74,88475	27,4022	00:03:53	74,9163	27,70193	0512-0513	1	1.5-9khz,40ms	10	
Cage_KA_2014_099	16.07.2014	Bjørnøyrenna crater area	00:05:14	74,91507	27,70477	00:40:17	74,88488	27,76723	0514-0517	1	1.5-9khz,40ms	10	Start and end seismic line 9
Cage_KA_2014_100	16.07.2014	Bjørnøyrenna crater area	00:44:08	74,88437	27,753	02:25:12	74,95272	27,41588	0518-0522	1	1.5-9khz,40ms	10	Start and end seismic line 10
Cage_KA_2014_101	16.07.2014	Bjørnøyrenna crater area	02:32:23	74,94927	27,40185	03:02:07	74,93088	27,45998	0523-0524	1	1.5-9khz,40ms	10	
Cage_KA_2014_102	16.07.2014	Bjørnøyrenna crater area	03:04:17	74,93105	27,46708	04:28:21	74,97705	27,7821	0525-0528	1	1.5-9khz,40ms	10	Start and end seismic line 11
Cage_KA_2014_103	16.07.2014	Bjørnøyrenna crater area	04:30:10	74,97903	27,78445	04:49:37	74,97745	27,71625	0529-0530	1	1.5-9khz,40ms	10	
Cage_KA_2014_104	16.07.2014	Bjørnøyrenna crater area	04:50:04	74,9771	27,7155	07:19:13	74,85047	27,4455	0531-0536	1	1.5-9khz,40ms	10	Start and end seismic line 12
Cage_KA_2014_105	16.07.2014	Bjørnøyrenna crater area	07:50:34	74,83693	27,46393	08:17:46	74,90075	27,52293	0537-0539	1	1.5-9khz,40ms	10	Stopped logging multibeam
Cage_KA_2014_106	16.07.2014	Bjørnøyrenna crater area	18:08:15	74,86185	27,36238	18:37:28	74,84677	27,08202	0540-0542	1	1.5-9khz,40ms	10	
Cage_KA_2014_107	16.07.2014	Bjørnøyrenna crater area	18:55:29	74,86442	27,01008	19:08:14	74,86617	27,04093	0543-0544	1	1.5-9khz,40ms	10	
Cage_KA_2014_108	17.07.2014	Bjørnøyrenna crater area	20:55:36	74,87517	27,15055	00:34:25	74,93453	28,02122	0548-0556	1	1.5-9khz,40ms	10	Start and end of seismic line 13

Cage_KA_2014_109	18.07.2014	Bjørnøyrenna crater area	00:46:03	74,9312	28,04112	02:34:25	74,723	27,4758	0557 - 0561	1	1.5-9khz,40ms	10	
Cage_KA_2014_110	18.07.2014	Bjørnøyrenna crater area	02:40:26	74,72957	27,43642	05:59:39	75,18825	28,43128	0562 - 0569	1	1.5-9khz,40ms	10	
Cage_KA_2014_111	18.07.2014	Bjørnøyrenna crater area	05:59:39	75,18825	28,43128	06:28:00	75,151	28,5786	0570 - 0572	1	1.5-9khz,40ms	10	multibeam and chirp line stopped for coring at control station
Cage_KA_2014_112	18.07.2014	Transit to upper Storfjordrenna	11:42:19	75,14815	28,56508	23:28:34	76,59485	22,74922	0573 - 0599	1	1.5-9khz,40ms	10	
Cage_KA_2014_113	18.07.2014	Upper Storfjordrenna	23:47:26	76,59485	22,74922	02:50:32	77,07783	23,62037	0600 - 0607	1	1.5-9khz,40ms	10	New location: Upper Storfjordrenna
Cage_KA_2014_114	19.07.2014	Upper Storfjordrenna	02:50:32	77,07783	23,62037				0608 -	1	1.5-9khz,40ms	10	Transect line to Longyearbyen