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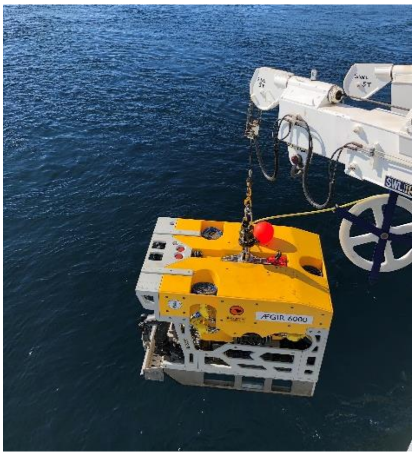

**Key words**: Middle Norwegian Margin, cold seeps, methane, ROV Ægir6000
**With contributions by:** Sunil Vadakkepuliyambatta; Arunima Sen, Sten-Andreas Grundvåg, Tobias Himmler, Julie Velle Heggdal, Matteus Lindgren, Sondre Krogh Johansen.

# 1. Introduction and Scientific Objectives

The cruise to the Atlantic-Arctic gateway region is organized and funded through the Geological Survey of Norway (NGU) and Spirit Energy Norway AS and focuses on studies of methane leakage at the seafloor on the Mid-Norwegian shelf and continental margin. Cruise 2020108 in June 2020 was directed to two areas to study ongoing seepage of hydrocarbons and their controlling factors (Fig. 1). Along the Lofoten margin we investigated the outcropping bedrock structures in two canyons inspected during a pilot cruise with G.O. Sars in 2017 (Fig. 2a). The bedrock is currently releasing freshwater, which stimulates the formation of chemosysnthetic organisms at the seafloor. On the Mid-Norwegian shelf, we inspected recently discovered seep sites in Vestbrona Volcanic Province (PL998 license) (Fig. 2b) close to outcropping volcanic structures. From previous cruise we have identified the exact sampling locations for the ROV Ægir 6000.

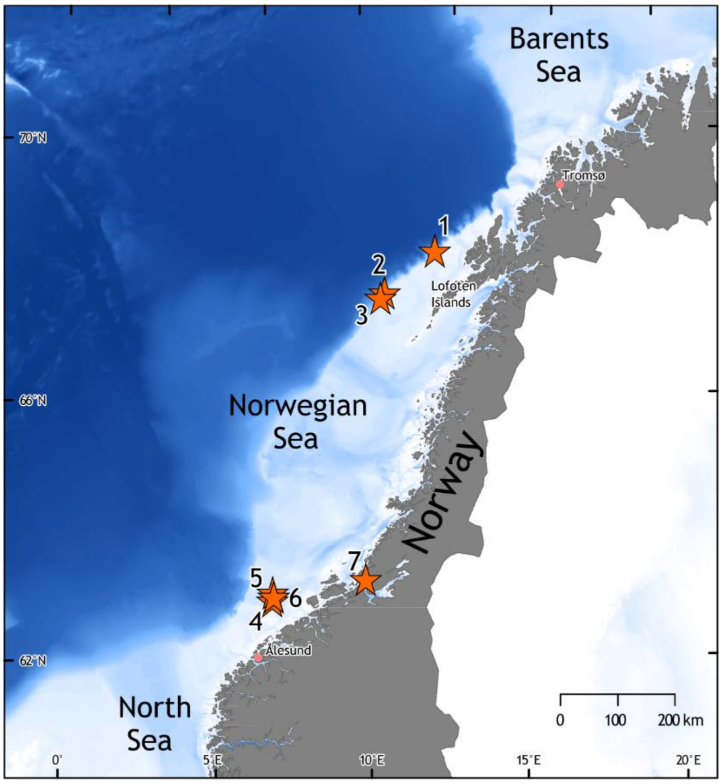


**Figure 1.** Study areas: (1) Canyon 8, (2-3) Canyon North and South, (4-6) Vestbrona Volcanic Province, (7) Stjørnfjorden, outer Trondheimsfjorden.

The cruise was dedicated to the use of the remotely operating vehicle (ROV) Ægir 6000. It has been supplemented by gravity-coring equipment and multibeam echosounding surveys. A detailed sampling program of the outcropping bedrock with the help of ROV Ægir has been conducted. In addition, new push cores from highly active seep sites have been sampled. Highest priority on the Mid-Norwegian shelf are the active seep sites, where free gas has been sampled with ROV Ægir 6000. In addition, we sampled the outcropping volcanic structures for their ages, composition, and origin.

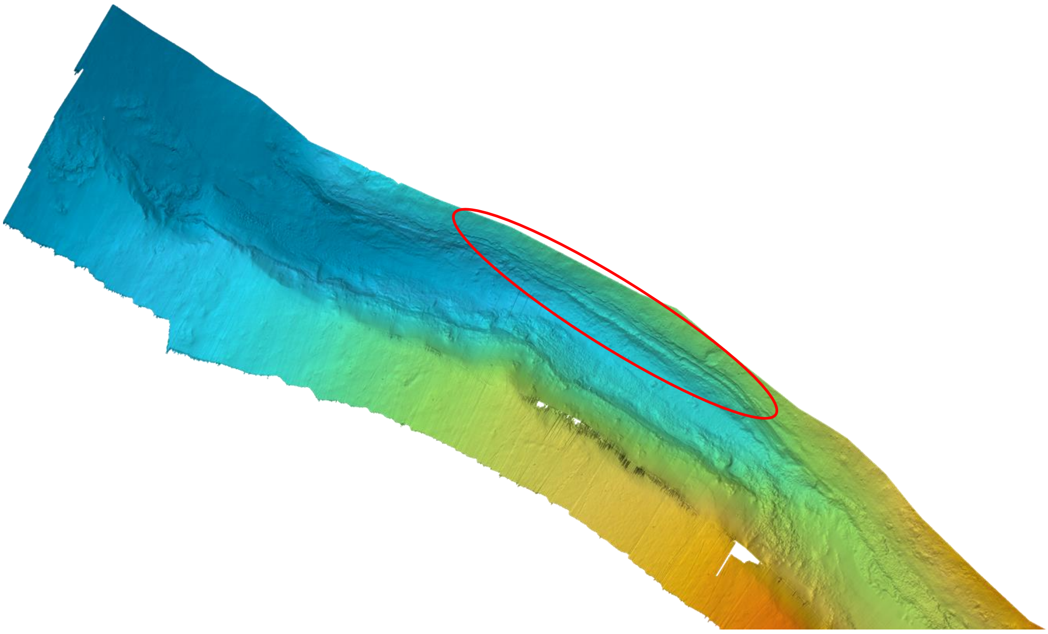

**Figure 2a.** Outcropping bedrock in Lofoten Canyon South (in red). Pilot studies indicate an Eocene age for the highly porous sandstones.

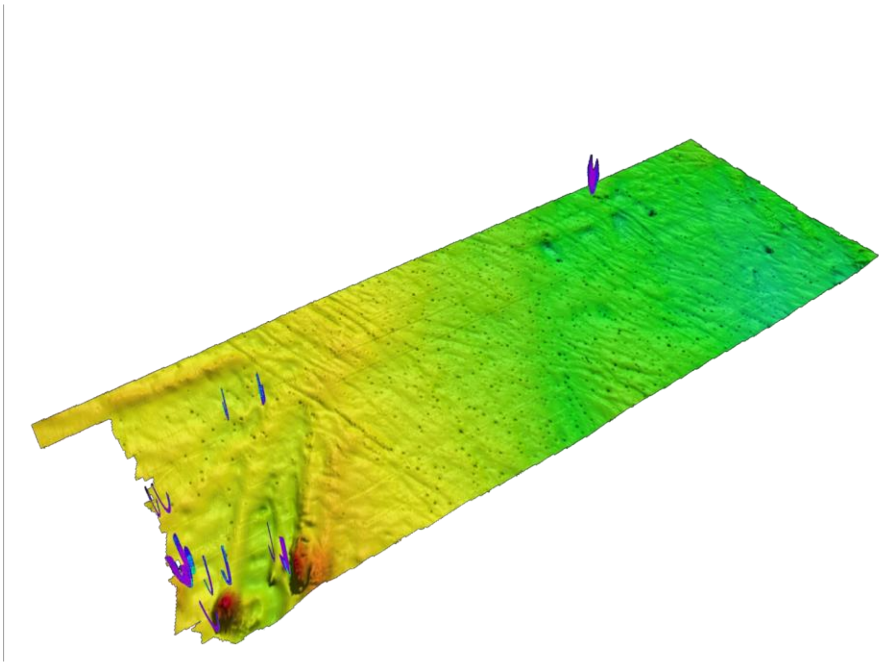

**Figure 2b.** Bathymetry and mapped gas flares in the Vestbrona Volcanic Province (PL998 license) on the mid Norwegian margin. Outcropping volcanic rocks in red.

**Scientific Party**

| | |
|---|---|
| Jochen Knies | Researcher, NGU/CAGE-UiT (Cruise Leader) |
| Sunil Vadakkepuliyambatta | Researcher, CAGE-UiT (Leader Acoustics) |
| Egil Frøyen | Engineer, IMR (Leader Instruments) |
| Jørn Patrick Meyer | Engineer, IMR |
| Sten-Andreas Grundvåg | Professor, UiT |
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| Tobias Himmler | Researcher, NTNU |
| Julie Velle Heggdal | Researcher, NGU |
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| Eyvind Ernstsen | Engineer, IMR |
| William Skjold | Consultant |
| Jonas Broberg | Consultant |
| Estee Ashbridge | Consultant |

# 2. Equipment and Methods used on board

## 2.1 Seabird 911 plus CTD

The CTD used on the cruise is the Seabird 911 plus from Seabird Scientific (Fig. 3). The CTD has been used for general oceanography on each station, and also to produce sound velocity profiles to the EK80 single-beam echosounder, as well as the EM302 multibeam echosounder for bathymetric mapping. The CTD system consists of the Seabird SBE 11 plus deck unit connected to the subsea SBE 9plus CTD. On the CTD we have a 12 bottle SBE32 carousel for water sampling, but on this cruise most of the stations are without any water sampling.
The CTD is equipped with the following sensors: 2 x SBE3 Temperature sensors, 2 x SBE4 Conductivity sensors, 2 x SBE43 oxygen sensors, 1x PSA916 Altimeter, 1 x Wet Labs C-Star beam transmissometer, 1x Wet Labs ECO-AFL/FL Fluorometer, and 1 x Biospherical PAR sensor with Surface PAR added. The CTD measures all these parameters at a rate of 44Hz and stores it on the top-side computer. Datalogging has been done with The Seasave v. 7.26.7, and for postprocessing we have used SBE Data processing v. 7.26.7 (Fig. 4). Both these software packages are from Seabird.

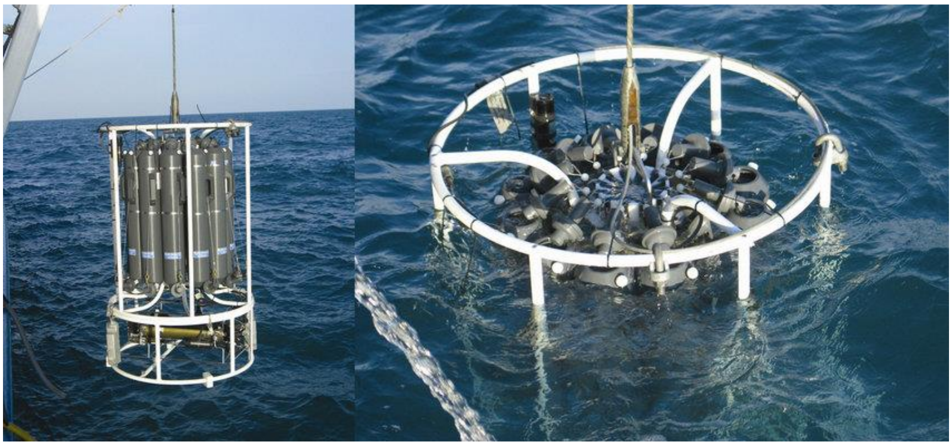

**Figure 3.** CTD deployment

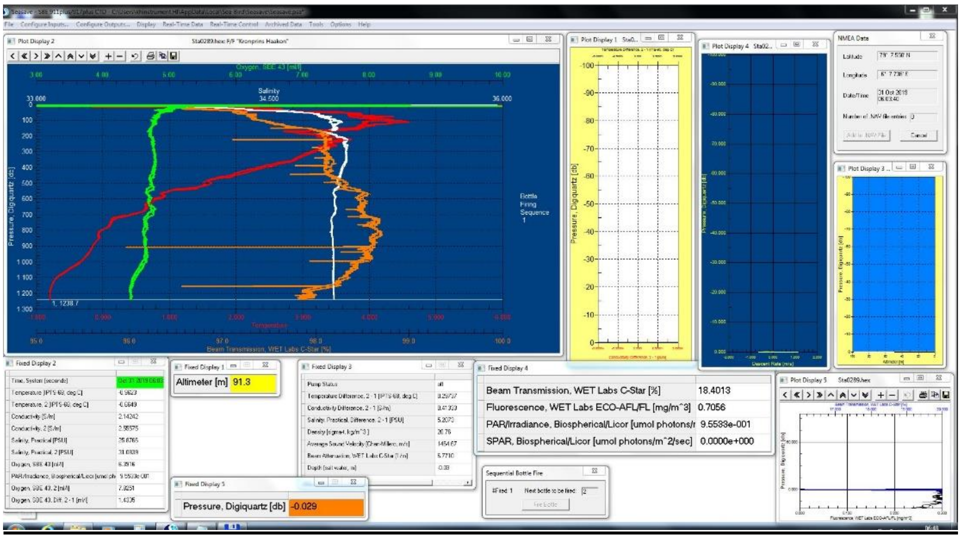


**Figure 4.** Logging of CTD data using Seasave software

## 2.2 EM302 Multibeam sonar data

Surveying of the sea bottom and water column is done using EM302 system by Kongsberg. Its operating frequency is 30 Khz and it generates swaths of data covering the width up to 5,5 times the water depth. The output for each line consists of two files:

- File with extension *all contains datapoints corresponding to seabottom
- File with extension *wcd stores all the information recorded for the watercolumn

Processing of the data is performed using QPS software: Qimera and FMMidwater.

### Bathymetry

The data is loaded line by line to the project in Qimera. Each part of the line is visually inspected in 3D view and all the data points that deviate from the general trend are being removed. They correspond to part of recordings affected by noise and majority of them are located at the edges of the profile. When the manual cleaning process is done, automatic spline-based filter with varying degree of intensity is applied to segments of each line, with intensity chosen based on the quality of data in the given area of seafloor. Final lines are then converted into surfaces that can be exported as a datapoints for mapping and interpretation.

### Water column

Processing of water column information is done in FM Midwater. After import and conversion to internal format all the information from beams is stacked to produced single beam of data for a given position. All of these beams are then displayed next to each other to produce side view of the water column and the sea bottom, which makes it easier to distinguish signal noise and potential gas flares sightings. In this view, all lines are inspected, position by position, with simultaneous check of data recorded for each beam. High-pass frequency filter is also applied individually for each line in order to alleviate parts of the noise present in the data. Each spotted flare is marked and extracted using stacked view, with filtering out beams and depth ranges that do not contain valuable data. This process leads to generation of datapoints with amplitude information of the flare, that can be exported outside software as an ASCII points file. Each point has geographical coordinates, depth and amplitude values assigned. Further clearing of data to bring out flare shape can be done using other tools i.e. Petrel. Finally, generated shape can be overlaid on bathymetry data to correlate seafloor features with gas expulsions.

## 2.3 Sediment Coring

A gravity corer (GC) with a total weight of ~1000 kg was used, which consists of a 6 m long steel barrel with an inner diameter of 11 cm, a steel-mantled led weight at the top, and a core head with a core catcher at the bottom.
For each deployment, a 5.95 m gray plastic liner (pipe) with an outer diameter of 11 cm and inner diameter of 10 cm was inserted into the steel barrel and the core head and catcher was mounted. The gravity core was lifted horizontally by two slings attached to a crane while hooked up to the traction winch rope (see section on Calypso corer). The weight was transferred from the crane slings to the traction winch rope and the corer was rotated to its vertical orientation, and was released from the crane slings. The gravity core was lowered through the water column at 1m/s and further through the sediments by its own weight. After retrieval, the plastic liner was manually cut into sections of up to 100 cm length, while taking care of the plastic sawdust. The section ends were secured with plastic caps and the sections were labelled. All sections were stored in a cooling container at +4ºC.

## 2.4 Remotely Operately Vehicle (ROV) Ægir6000

The ROV Ægir6000 is a work-class ROV 150 Hp specially equipped for science with samplers and sensors, sufficiently powered to operate seafloor drilling systems and to install and maintain seafloor observatories, designed for operation from both RVs "G.O. Sars" and "Kronprins Haakon". It has the capacity, deployed together with a 750 m+ tether management system (TMS). Its manipulators consist of pincers, able to collect precise samples through its 7 cameras, enabling the technicians to grab targeted objects once on the seafloor. The taken samples are then put into the bio drawer, where they await analysis once the unit is brought back onboard in seawater. ROV Ægir 6000 is also equipped with coring devices, gas and water samplers, oceanographic and geochemical sensors as well as a multibeam system, in order to image the seafloor on a more precise scale.


**Figure 5.** Remotely Operating Vehicle (ROV) Ægir 6000

# 3. Station Description

See the exact location of each superstation including all push cores, bedrock and gas samples in the log files (Chapter 4). Below, we briefly describe the different stations and applied equipment and samples.  CTD data are not reported here. The data can be downloaded at Norwegian Maritime Data Center and CAGE-UiT on request (Fabio.sarti@uit.no).

## 3.1 Superstation CAGE 20-0-GS-001

Site location: Canyon 8

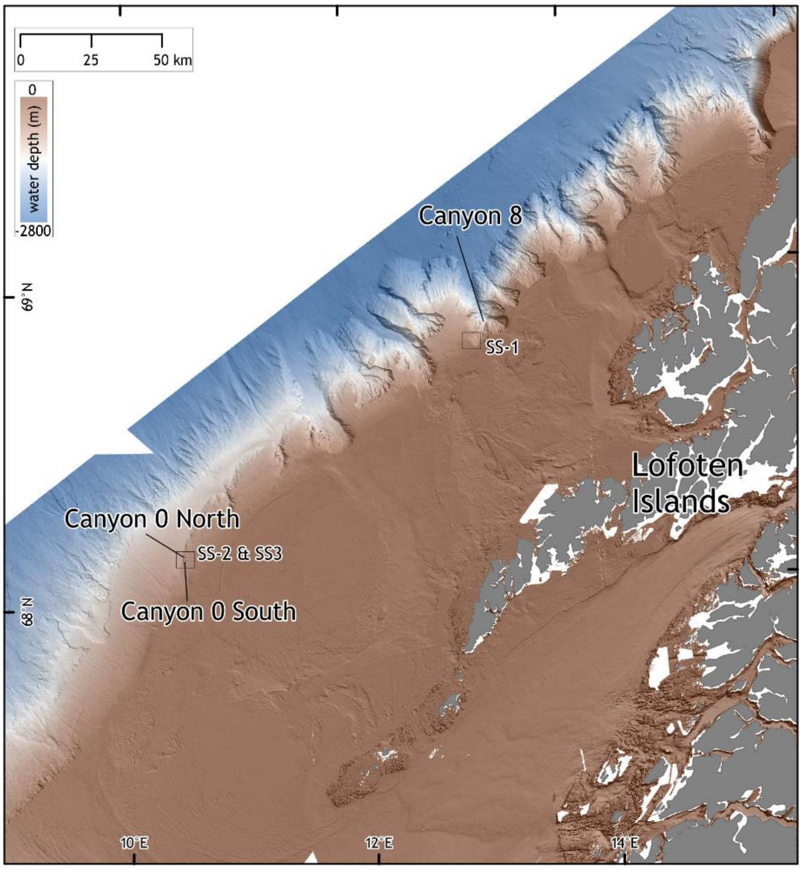


**Figure 6.** Study areas on the Lofoten continental margin. Investigated canyons are indicated.

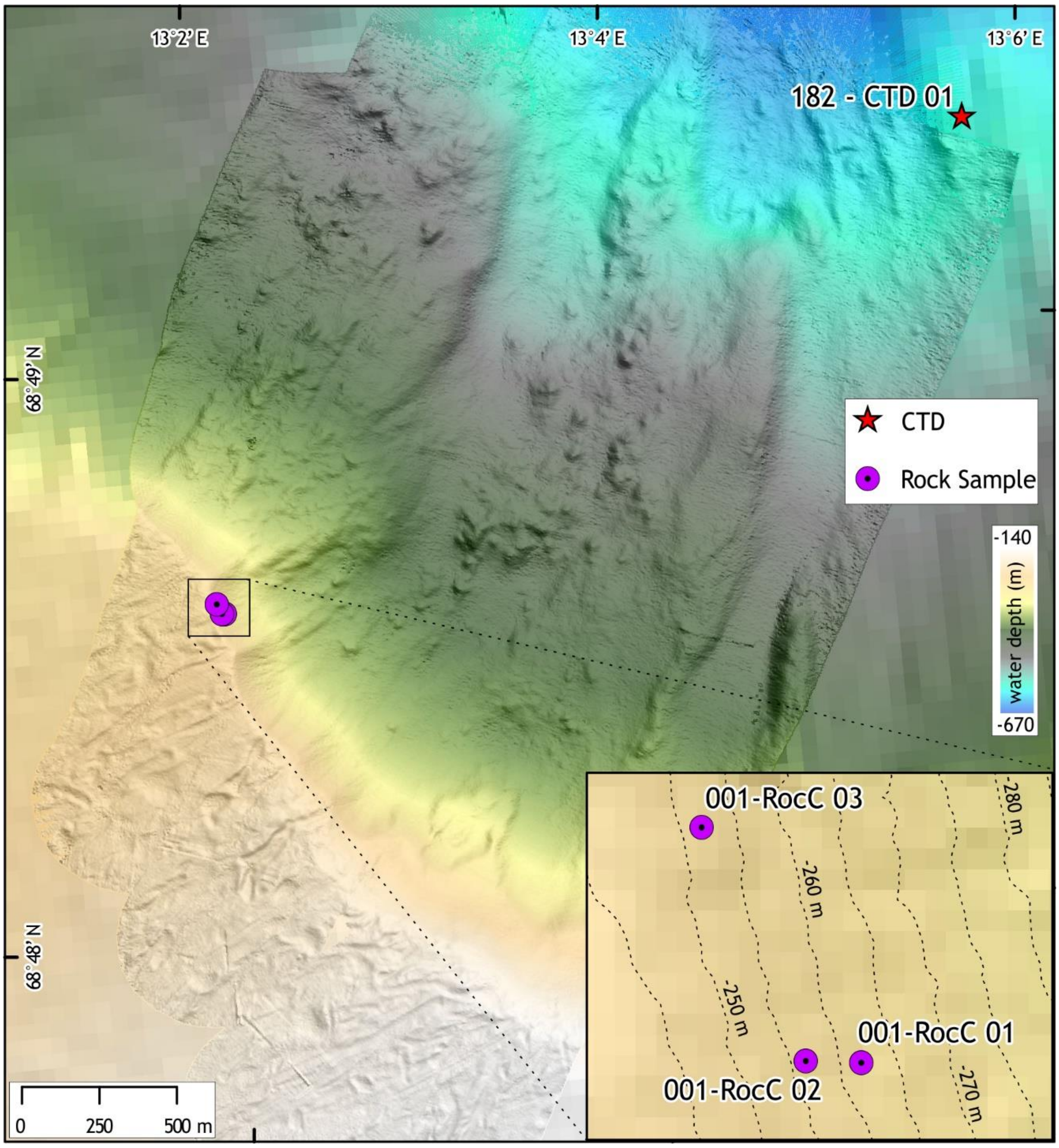


**Figure 7.** Detailed multibeam bathymetry with locations of rock samples and CTD

**ROV sampling**

- **3 Bedrock samples in chronological order (bottom-up)**
  - **CAGE20-GS-001-RocC01:** water depth of 258.58 m
  - **CAGE20-GS-001-RocC02:** water depth of 255.2 m
  - **CAGE20-GS-001-RocC03:** water depth of 249.4 m

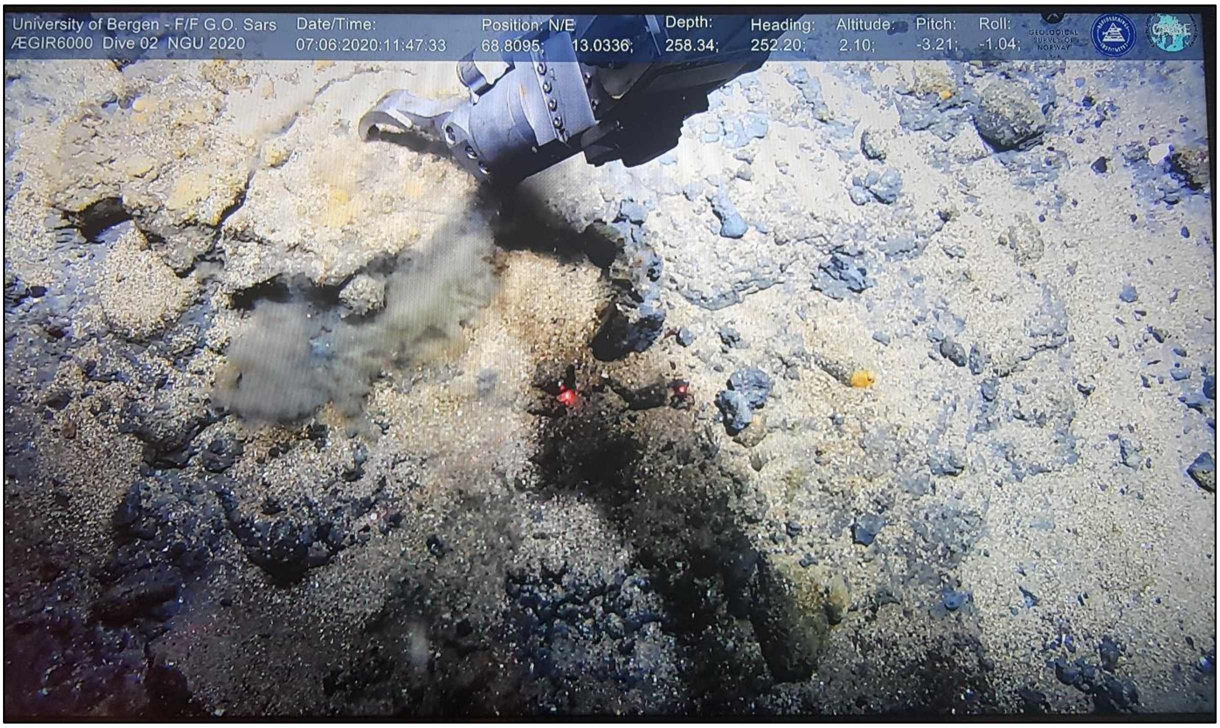


**Figure 8.** ROV bedrock sample at Superstation 1

**ROV Bedrock**

- **Sample CAGE20-GS-001-RocC01:** Six pieces plus some smaller crumbles. Dark grey, poorly sorted and poorly consolidated diamicton. Some layering is visible. Up to 2-3 cm long, partly rounded quartzite pebbles occur abundantly.
- **Sample CAGE20-GS-001-RocC02:** Four larger pieces plus some smaller crumbles. Dark-grey colored, poorly sorted and poorly consolidated diamicton rich in pebbles.
- **Sample CAGE20-GS-001-RocC3:** Two larger pieces plus some smaller crumbles. Dark-grey colored, poorly sorted and poorly consolidated diamicton rich in pebbles (partly rounded to equant).


**Figure 9.** ROV bedrock samples

### 3.2 Superstation CAGE 20-0-GS-002

Site location: Canyon North

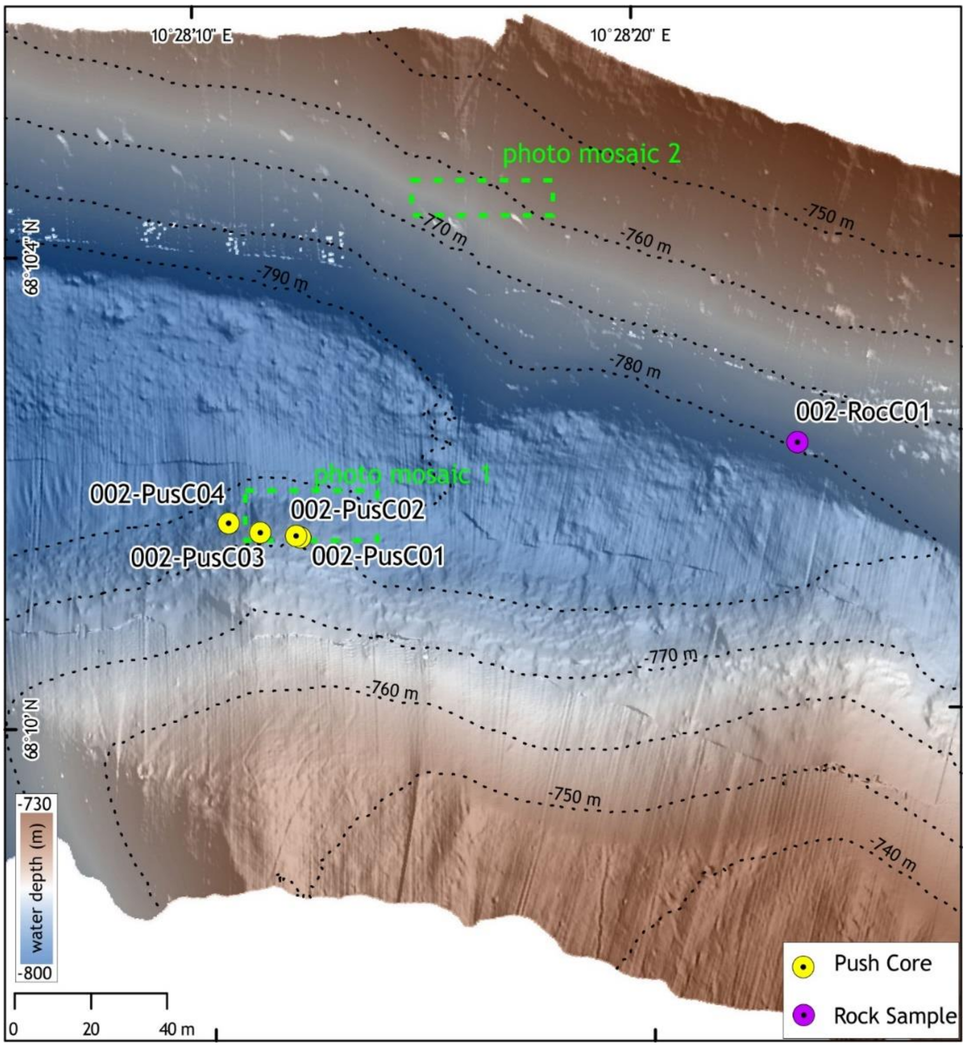


**Figure 10.** ROV microbathymetry with locations for push cores (yellow, rock samples (purple), and video mosaics (green).

**Video mosaics:**

An HD camera was placed on the bottom of the ROV in a downward facing position and we used this to take overlapping video transects. Images were extracted from the videos and stitched together to make composite, georeferenced images of the seafloor (mosaics).

**Mosaic1:**
Mosaic 1 was taken at Super Station 2 (the north canyon of the two Lofoten canyons visited in 2017). Seep and chemosynthesis based communities were targeted on the southern flank

of the canyon, where push cores were taken in 2017. Preliminary inspection of the mosaic suggests very low species diversity in this area.

**Mosaic 2:**

Mosaic 2 was also made at Super Station 2, however, in this case, the peripheral benthic community adjacent to visible seepage and chemosynthesis based communities was targeted. We covered the northern, steep flank of the canyon. Though barely a few meters away from the seep communities, the peripheral community as seen in the mosaic appears to be completely different. It is dominated by sponges and cnidarians, and no chemosynthesis based animals or bacterial mats were seen in this area.

**ROV sampling**


**Figure 11.** ROV bedrock sampling in Canyon North ores (yellow) and rock samples (purple).

**ROV bedrock samples (**more sample photos can be found in the superstation folder)

- **Sample CAGE20-GS-002-RocC01:** Poorly sorted, organic-rich, dark grey-colored carbonate crust. Abundant crust-forming worm tubes. Sulphur odor.


**Figure 12.** ROV bedrock sample (authigenic carbonate crust) .

**ROV Push cores**

A total of four push-cores were sampled, two for pore water (PusC01 & PusC03) and two for headspace analyses (PusC02 & PusC04), respectively. Core penetration on the seafloor was problematic due to low sediment cover and abundant authigenic crusts. Material of PusC02 was sucked out of the liner during recovery on board and could not be sampled. Bottom water and porewater from cores PusC01 and PusC03 using rhizons; bottom water was sampled at ~1 cm above sediment-water interface. Three headspace samples of 5 ml sediment were taken, one from PusC01 at ~24 cm depth after ~2 hr on deck, and two samples from PusC04 at 3 cm (only 3 ml sediment) and 5 cm depth immediately after recovery on deck


**Figure 13.** ROV push core.

### 3.3 Superstation CAGE 20-0-GS-003

Site location: Canyon South

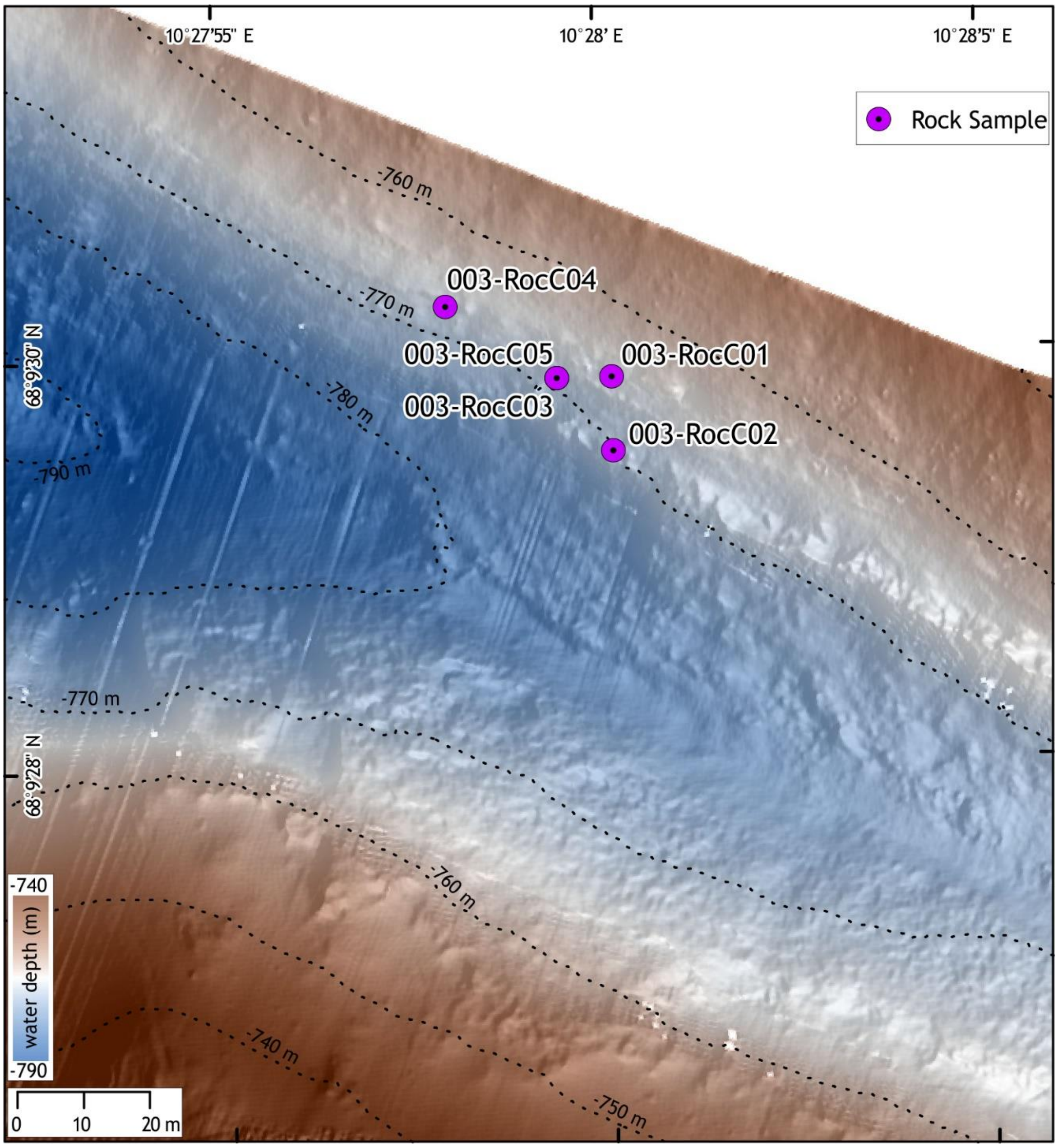


**Figure 14:** Bathymetry in Canyon South and location of bedrock samples.

## ROV Sampling

### Bedrock Samples

**Figure 15:** ROV bedrock samples in Canyon South.

- **Sample CAGE20-GS-003-RocC01:** Large slab consisting of dark grey, moderately sorted, fine- to medium-grained, faintly laminated sandstone. Granules occur in places. Beige oxidation color. Poorly consolidated.
- **Sample CAGE20-GS-003-RocC02:** Dark grey, moderately sorted, fine-to medium-grained sandstone with scattered granules. Rusty color appearance (due to oxidation). Poorly consolidated.
- **Sample CAGE20-GS-003-RocC03:** Moderately sorted and poorly consolidated, medium-grained, dark grey-colored sandstone. Fine grained matrix is present and granules occur in places.
- **Sample CAGE20-GS-003-RocC04:** Relatively large slab consisting of fine-grained, well to moderately sorted, light grey to beige-colored, carbonate cemented sandstone. Karst-like features occur on the top surface of the slab.
- **Sample CAGE20-GS-003-RocC05:** Poorly- to moderately-sorted, poorly consolidated, dark-grey colored sandstone. Small single sample.

**Figure 16:** ROV bedrock samples in Canyon South.



**Figure 17:** ROV bedrock samples in Canyon South.


**Figure 18:** ROV bedrock sample in Canyon South.

### 3.4 Superstation CAGE 20-0-GS-004

Site location: Vestbrona Volcanic Province (PL998 license)

The Vestbrona Volcanic Province (PL998) was inspected for the occurrence of gas flares by a multibeam survey, but the initial occurrence of gas flares (Fig. 2a) could not be confirmed. We could not identify traces of gas seepage, neither by carbonate crusts nor bacterial mats. We decided not to take any push cores in the area but focused instead on the bedrock sampling of the volcanic plugs/sills identified by the bathymetry (Fig. 19).

However, one major discovery with active gas flaring and plenty of methane-derived carbonate crusts and bacterial mats have been made in the “Vestbrona Carbonate Field” (Superstation 5) (Fig. 19).

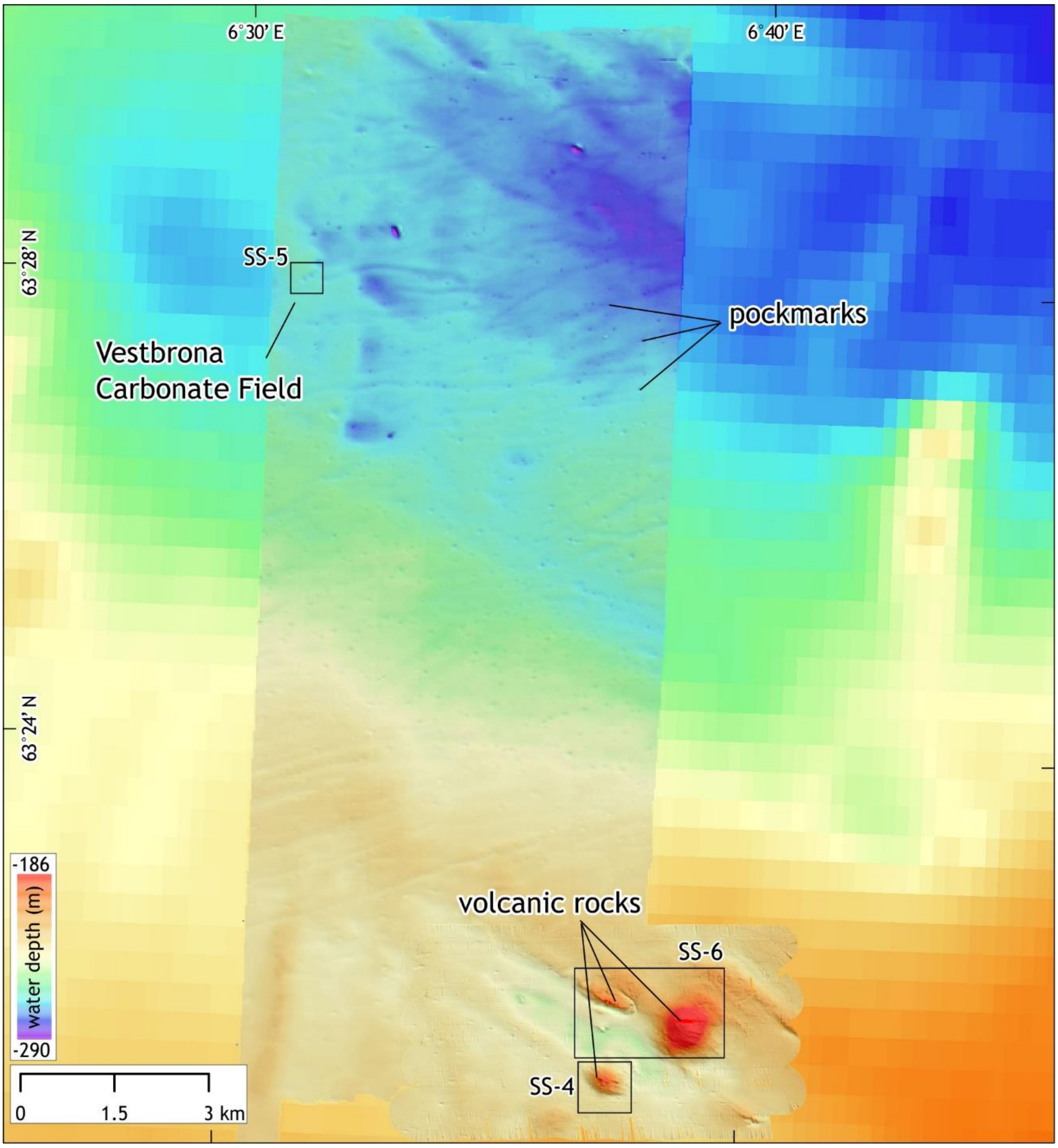


**Figure 19:** Bathymetry from Vestbrona Volcanic Province.

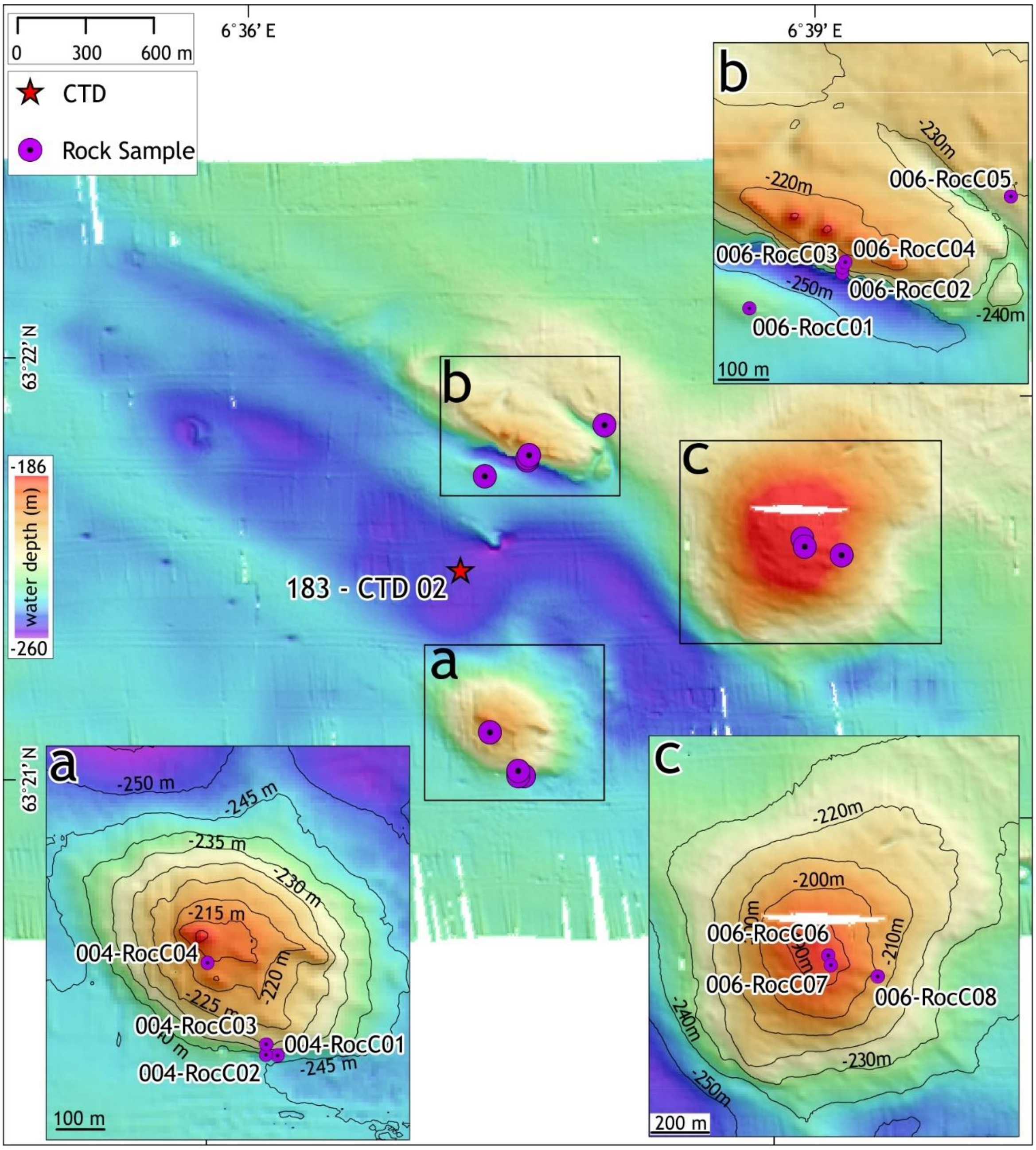


**Figure 20:** Detailed bathymetry with all rock samples from the Vestbrona Volcanic Province. No gas flares previously mapped (Fig. 2b) could be confirmed in this area.

**ROV Sampling**

**Bedrock Samples**

- **Sample CAGE20-GS-004-RocC01:** Water depth of 239.96 m. Two samples from the same location (packed separately and labelled A and B). These samples were two loose blocks picked up by the manipulator arm; not in situ. Samples consisting of well cemented/lithified volcanoclastics. Both samples collected at the base of the volcano cliff.
-


**Figure 21:** ROV bedrock sample from Vestbrona Volcanic Province.

- **Sample CAGE20-GS-004-RocC02:** Water depth of 239.47 m. Three samples from the same location (packed seperately and labelled A, B and C). Samples A, B and C consisting of well cemented/lithified volcanoclastics. Uncertain if sample A is in-situ. Samples B and C were cut with the chain saw. Some cm-scale tuff clasts occur in sample C.


**Figure 22:** ROV bedrock sample from Vestbrona Volcanic Province.

- **Sample CAGE20-GS-004-RocC03:** Water depth of 228 m. Three samples from the same location (packed separately and labelled A, B and C). Samples A, B and C consisting of well cemented/lithified volcanoclastics. All samples in-situ (A grabbed with claw, B and C cut with chain saw). Sample C contain some cemented veins (most likely calcite cement).
-


**Figure 23:** ROV bedrock sample from Vestbrona Volcanic Province.

- **Sample CAGE20-GS-004-RocC04:** Water depth of 213.21 m. One large boulder. Partly rounded (possibly due to glacial abrasion). The origin of the sample is uncertain (either gneisses or glacial abraded volcanoclastic).

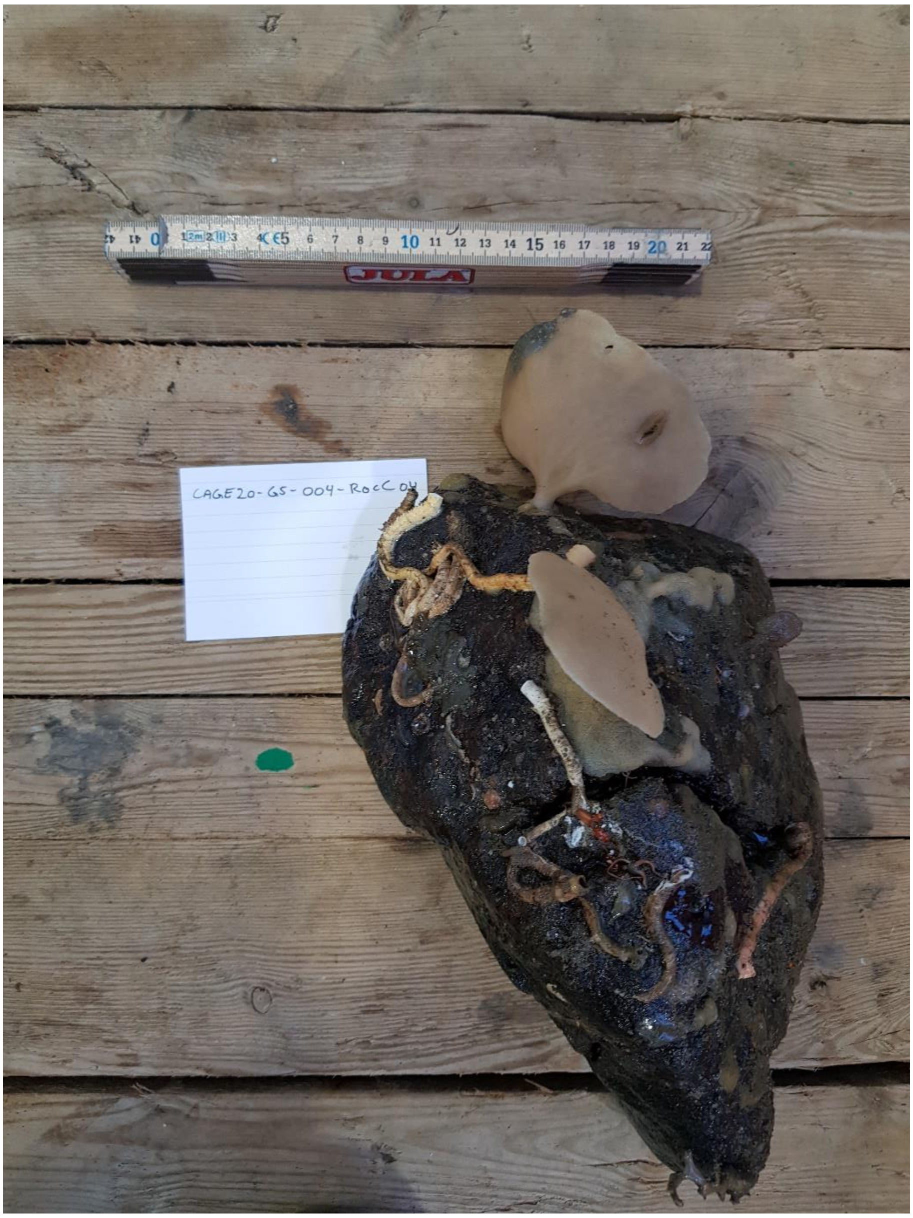


**Figure 24:** ROV bedrock sample from Vestbrona Volcanic Province.

## 3.5 Superstation CAGE 20-0-GS-005

Site location: Carbonate Field Area

**Gas flare mapping and sampling**

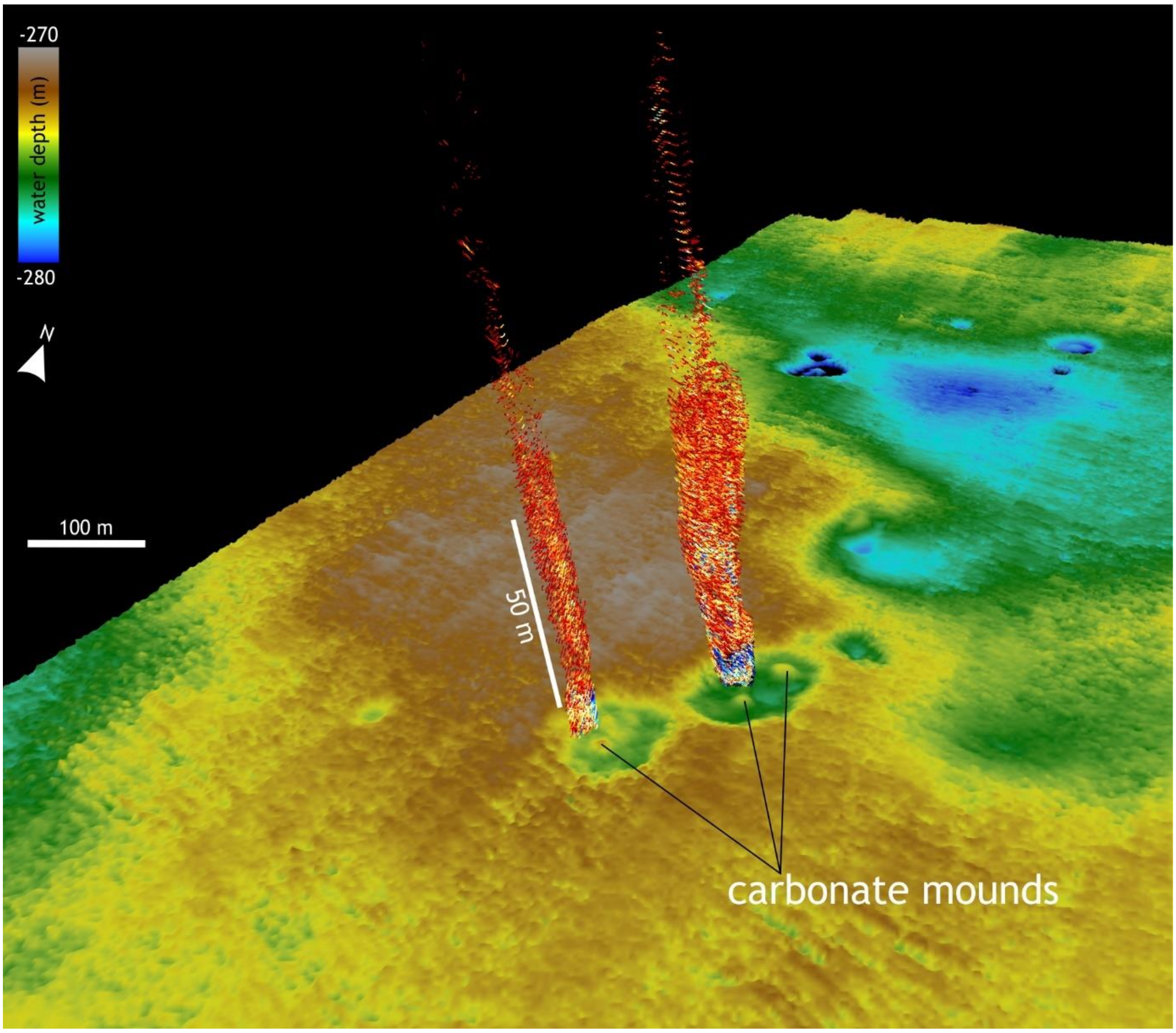


**Figure 25:** Gas flares in the Carbonate Field Area.

**CAGE20-GS-005-GasS01**: Free gas were sampled on two locations (pockmarks) where we mapped two distinct gas flares in the multibeam survey (Fig. 25). Cylinder 1 and 2 were filled with the collected gas (Fig. 26).

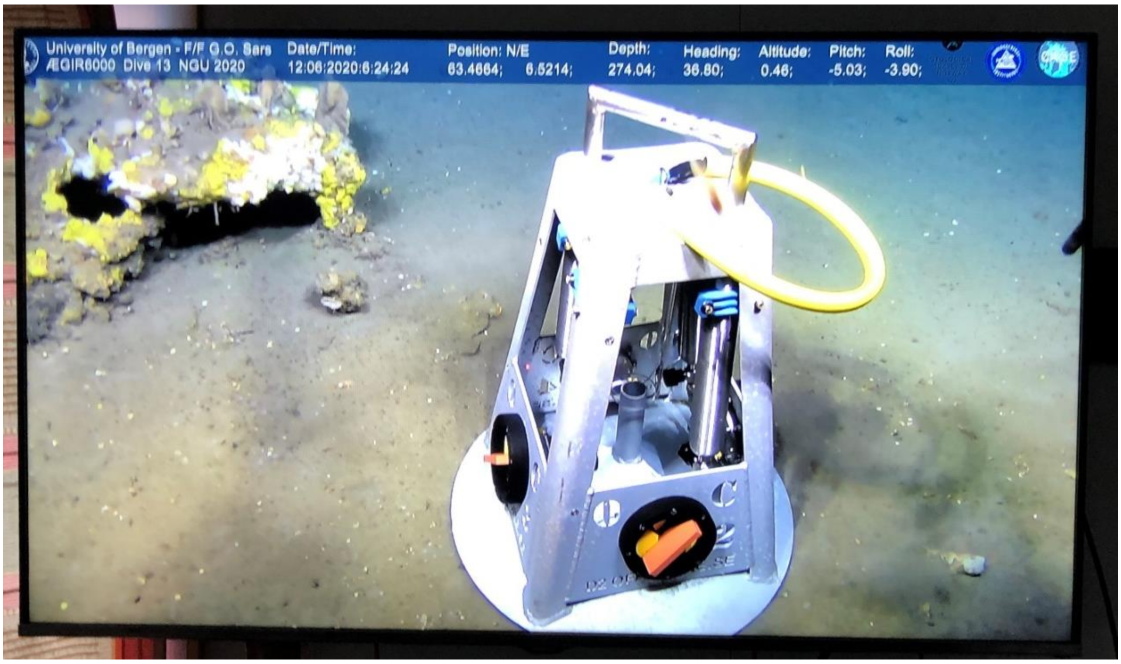


**Figure 26:** Sampling of the gas flares in the Carbonate Field Area.

**Sampling of methane-derived authigenic carbonates (MDAC)**

**MDAC: 2 samples**

- **CAGE20-GS-005-CarC01**: Ca. 10 cm thick 13 x 13 cm wide carbonate crust; sampled from a c 2 m wide flat carbonate slab; relatively few rounded glaciogenic debris in grey micritic matrix.

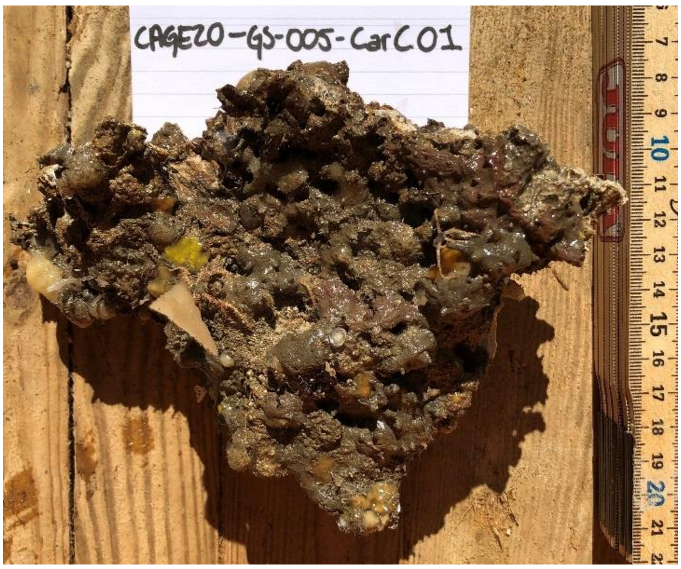

**Figure 27:** MDAC from the Carbonate Field Area.

- **CAGE20-GS-005-CarC02 A&B**: Ca. 10 to 15 cm thick flat carbonate crust, ca 0.5 x 0.5 m wide; sampled at the lower part of a layered ca. 0.5 high carbonate build-up; abundant rounded cm-sized glaciogenic clasts in grey matrix; abundant mm-wide aragonite cement crusts; abundant pores and vugs; subsample A (elongated, ca. 20 x 10 cm) broke off the lower right corner of subsample B during recovery with the ROV.


**Figure 28:** MDAC from the Carbonate Field Area.

**Push cores: 2 push cores**

- **CAGE20-GS-005-PusC01&02** were sampled right next to each other in between ca. 1 m high carbonate build-ups; PusC1 was sampled for bottom water and porewater at 2 cm depth resolution using rhizons at 4° C (+1 to -39 cm depth); liner with sediment stored at -20°C. PusC2 was sampled immediately after recovery on deck for headspace gas samples at 3-cm-depth resolution; overall good sediment recovery (PusC01 ~40 cm, PusC02 ~25 cm); PusC02 was placed in the ROV drawer for recovery and therefore has a slightly disturbed sediment surface; sediment was discarded after sampling.

**Figure 29:** Push core from the Carbonate Field Area

**Video Mosaic**

**Mosaic 3:**
Mosaic 3 was taken at Superstation 5, the Vestbrona carbonate field where large carbonate crusts were seen. The crusts were covered in very large sponges and corals, meaning that they could be very old (hundred+ years). Fishing lines and nets were also seen among the crusts.

**Mosaic 4:**
Mosaic 4 was also taken at Superstation 5 at the Vestbrona carbonate field, but a little distance away from Mosaic 3. This area was targeted since a bacterial mat emitting gas bubbles was seen. Similar to the area covered in mosaic 3, the area covered in mosaic 4 was full of large carbonate crusts and large sponges and corals. An additional gas flare was seen during the mosaicking process: bubbles were seen escaping from a ‘hole’ in a large carbonate crust covered in a very large, pink Gorgonian coral.

It is worth noting that no chemosynthesis based animals were seen in the Vestbrona carbonate field. Bacterial mats were also very scarce, and very small. Since bubbles were seen, and porewater smelled strongly of sulfide, understanding why chemosynthesis based animals and large fields of bacterial mats are missing is worth investigating.

### 3.6 Superstation CAGE 20-0-GS-006

Site location: Vestbrona Volcanic Province

**ROV Bedrock Sampling**

**Bedrock Sampling**

- **Sample CAGE20-GS-006-RocC01:** Water depth of 213.21 m. Water depth of 213.21 m. Five samples retrieved with the manipulator arm from the ridge crest. All samples consisting of well cemented/lithified volcanoclastics. These samples were all packed and labelled as one.


**Figure 30:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC02:** Water depth of 249.66 m. Two samples, cut by saw on the southern side and lower part of the prominent cliff.


**Figure 31:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC03:** Water depth of 229.12 m. One large sample collected with the claw from a loose/fractured flake. The sample were collected at the southern side and middle part of the prominent cliff. Loose and poorly consolidated clast-supported diamictite or volcanoclastic rock.


**Figure 32:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC04:** Water depth of 221.69 m. Two small samples collected with the claw from the top plateau of the prominent cliff. Volcanoclastic rock with some tuff/bentonite clasts.


**Figure 33:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC05:** Water depth of 241.12 m. One sample collected with the claw from the NE corner of the cliff.

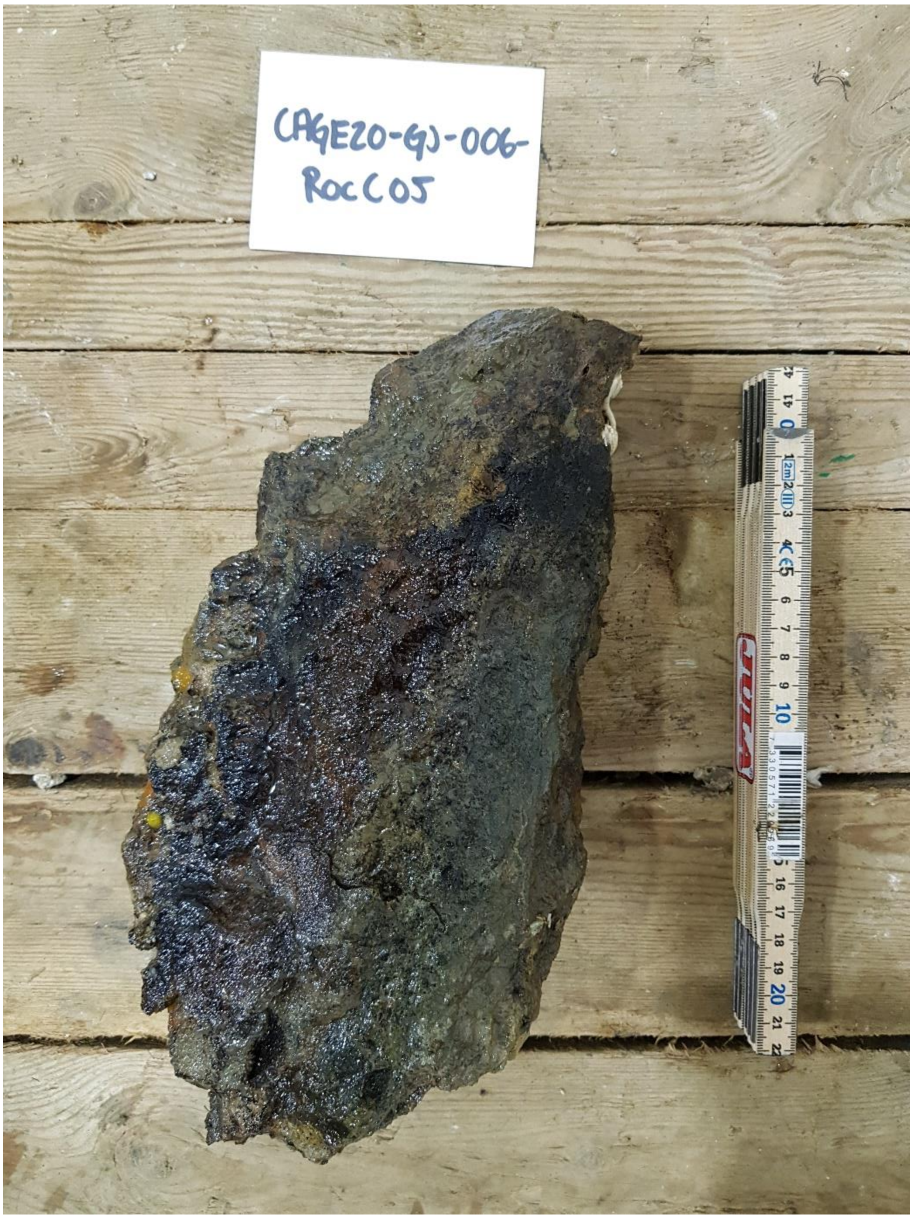


**Figure 34:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC06:** Water depth of 184.82 m**:** Sample grabbed with the claw from top of the large potential sea mount east of the cliff.

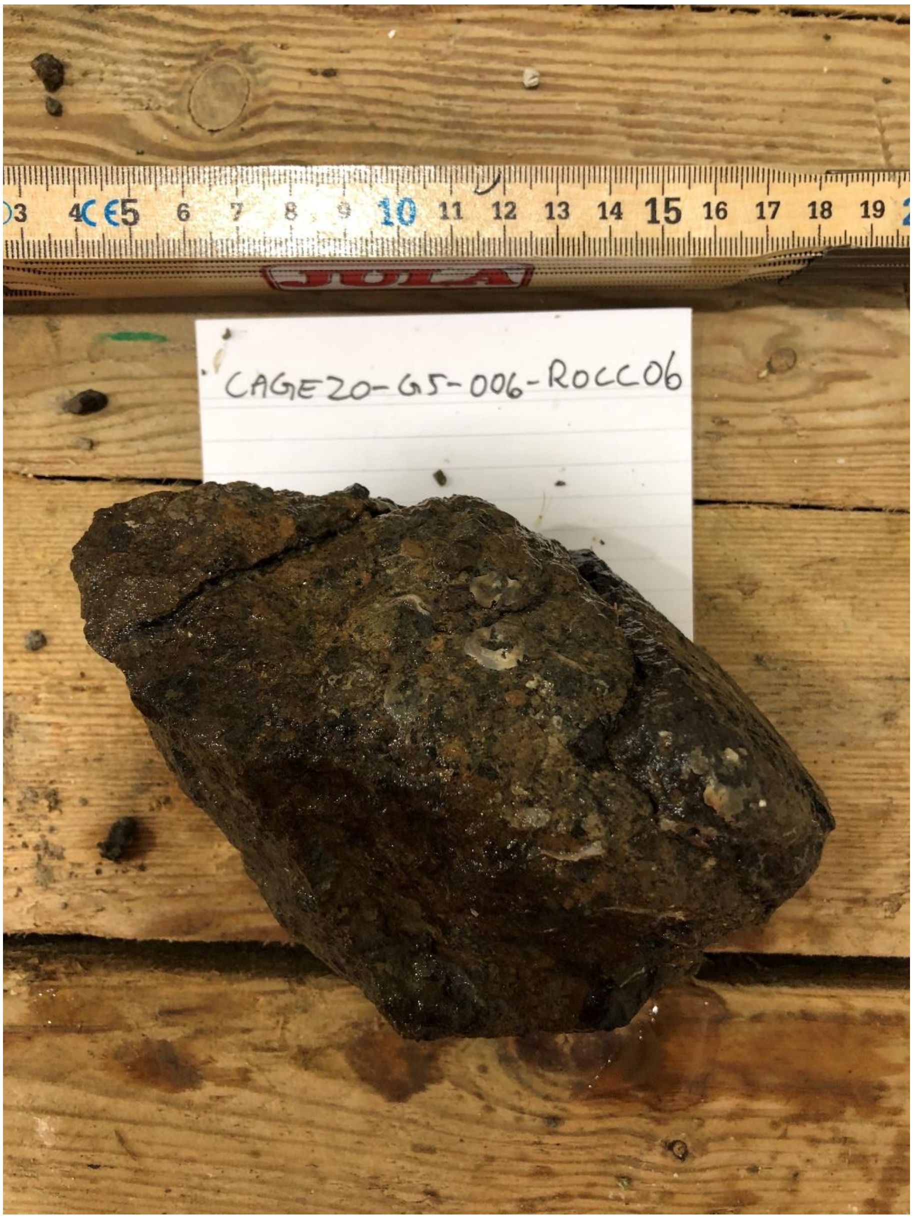


**Figure 35:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC07:** Water depth of 185.19 m. 2 dark-colored samples grabbed with the claw from top of the large potential sea mount east of the cliff. Collected to check if they were Paleocene shales described from previous dredge samples. Turned out to be two igneous (mafic) rocks of basement origin.


**Figure 36:** ROV bedrock sample, Vestbrona Volcanic Province

- **Sample CAGE20-GS-006-RocC08:** Water depth of 200.84 m. 1 large sample grabbed with the claw from a small, but laterally persistent SSE-dipping ledge on the S side of the sea mount.

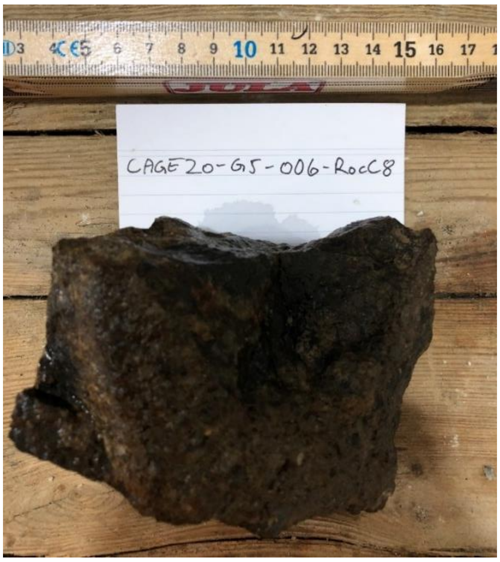


**Figure 37:** ROV bedrock sample, Vestbrona Volcanic Province

### 3.7 Superstation CAGE 20-0-GS-007

Site location: Stjørnfjorden, Trøndelag

**CAGE 20 – GS-007 – Gravity Coring, Stjørnfjorden, Trøndelag.**

**Figure 38:** Gravity Coring in Stjørnfjorden, Trøndelag

Gravity Core:
CAGE 20 – GS-007-GC01
Latitude: 63.7102 N
Longitude: 9.8545 E
Water Depth: 220 m
Recovery: 330 cm

| Section | Depth | Comm |
|---|---|---|
| D | 0-30 | Top of Core |
| C | 30-130 cm | |
| B | 130-230 cm | |
| A | 230-330 cm | Base of Core |

Gravity Core:
CAGE20-GS-007-GC 02
Latitude: 63.7102 N
Longitude: 9.8624 E
Water Depth: 225.8 m
Recovery: 400 cm

| Section | Depth | Comment |
|---|---|---|
| D | 0-100 cm | Top of Core |
| C | 100-200 cm | |
| B | 200-300 cm | |
| A | 300-400 cm | Base of Core |

Gravity Core:
CAGE 20 – GS-007-GC03
Latitude: 63.7102 N
Longitude: 9.8545 E
Water Depth: 220 m
Recovery: 330 cm

| Section | Depth | Comment |
|---|---|---|
| D | 0-30 | Top of Core |
| C | 30-130 cm | |
| B | 130-230 cm | |
| A | 230-330 cm | Base of Core |

**Topas/Shallow seismics**

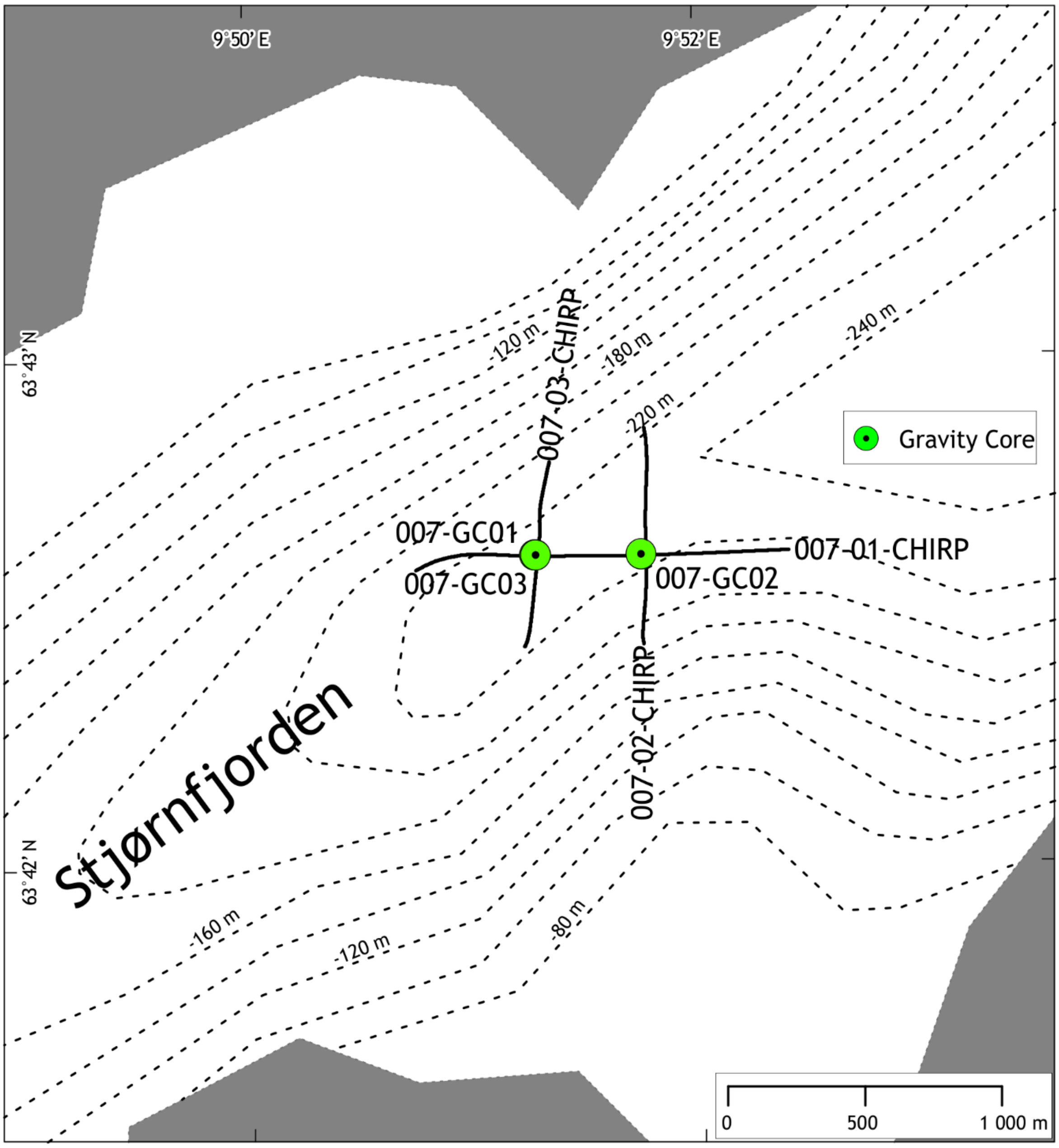


**Figure 39:** Gravity core locations and chirp profiles in Stjørnfjorden, Trøndelag.

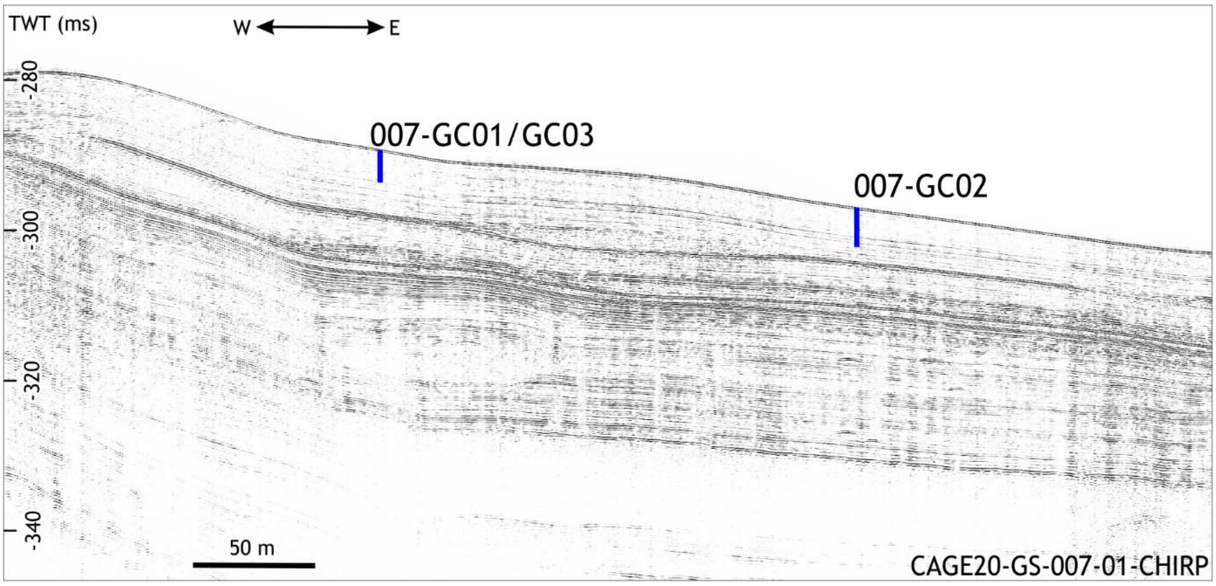


**Figure 40:** Chirp profile with location and recovery of gravity cores.

# 4. Log files

**Table 1:** Metadata

| Location | Activity | Station Id | Map ID | Date (UTC) | Time (UTC) | Latitude | Longitude | Water Depth | Penetration |
|---|---|---|---|---|---|---|---|---|---|
| Lofoten Canyon 8 | CTD | GS-182-CTD01 | 20-GS-182-01 | 07/06 | 04:46 | 68.82247 | 13.09502 | 586 | not utilized |
| Lofoten Canyon 8 | ROV Rock Collection | GS-001-RocC01 | 20-GS-001-01 | 07/06 | 11:42 | 68.8095 | 13.0336 | 258.58 | Surface sample |
| Lofoten Canyon 8 | ROV Rock Collection | GS-001-RocC02 | 20-GS-001-02 | 07/06 | 12:02 | 68.8095 | 13.0334 | 255.2 | Surface sample |
| Lofoten Canyon 8 | ROV Rock Collection | GS-001-RocC03 | 20-GS-001-03 | 07/06 | 12:09 | 68.8098 | 13.033 | 249.4 | Surface sample |
| Lofoten Canyon 0 (northern) | ROV Rock Collection | GS-002-RocC01 | 20-GS-002-01 | 08/06 | 11:51 | 68.1673 | 10.4732 | 779.8 | Surface sample |
| Lofoten Canyon 0 (northern) | ROV Push Core | GS-002-PusC01 | 20-GS-002-01 | 08/06 | 15:21 | 68.167104 | 10.47004 | 771.8 | ~30 cm |
| Lofoten Canyon 0 (northern) | ROV Push Core | GS-002-PusC02 | 20-GS-002-02 | 08/06 | 15:24 | 68.167108 | 10.470012 | 772.2 | ~30 cm |
| Lofoten Canyon 0 (northern) | ROV Push Core | GS-002-PusC03 | 20-GS-002-03 | 08/06 | 15:35 | 68.167117 | 10.469786 | 771.98 | ~20 cm |
| Lofoten Canyon 0 (northern) | ROV Push Core | GS-002-PusC04 | 20-GS-002-04 | 08/06 | 16:09 | 68.167141 | 10.469589 | 772.82 | ~15 cm |
| Lofoten Canyon 0 (southern) | ROV Rock Collection | GS-003-RocC01 | 20-GS-003-01 | 08/06 | 20:48 | 68.1583 | 10.4667 | 760.73 | Surface sample |
| Lofoten Canyon 0 (southern) | ROV Rock Collection | GS-003-RocC02 | 20-GS-003-02 | 08/06 | 20:56 | 68.1582 | 10.4667 | 764.3 | Surface sample |
| Lofoten Canyon 0 (southern) | ROV Rock Collection | GS-003-RocC03 | 20-GS-003-03 | 08/06 | 21:16 | 68.1583 | 10.4665 | 763.47 | Surface sample |
| Lofoten Canyon 0 (southern) | ROV Rock Collection | GS-003-RocC04 | 20-GS-003-04 | 08/06 | 21:38 | 68.1584 | 10.4661 | 761.79 | Surface sample |
| Lofoten Canyon 0 (southern) | ROV Rock Collection | GS-003-RocC05 | 20-GS-003-05 | 08/06 | 21:52 | 68.1583 | 10.4665 | 763.89 | Surface sample |
| Vestbrona Volcanic Province | CTD | GS-183-CTD02 | 20-GS-183-02 | 10/06 | 07:06 | 63.35897 | 6.62077 | 254 | |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-004-RocC01 | 20-GS-004-01 | 10/06 | 18:28 | 63.3509 | 6.627 | 239.96 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-004-RocC02 | 20-GS-004-02 | 10/06 | 18:36 | 63.3509 | 6.6265 | 239.47 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-004-RocC03 | 20-GS-004-03 | 10/06 | 18:53 | 63.3511 | 6.6265 | 228 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-004-RocC04 | 20-GS-004-04 | 10/06 | 19:31 | 63.3526 | 6.6239 | 213.21 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC01 | 20-GS-006-01 | 11/06 | 02:04 | 63.3627 | 6.6226 | 213.21 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC01 | 20-GS-005-01 | 11/06 | 08:12 | 63.4668 | 6.5215 | 269.15 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC02 | 20-GS-005-02 | 11/06 | 08:27 | 63.4659 | 6.5194 | 272.52 | Surface sample |
| Vestbrona Carbonate Field | ROV Push Core | GS-005-PusC01 | 20-GS-005-01 | 11/06 | 08:46 | 63.466 | 6.519 | 272.24 | ~45 cm |
| Vestbrona Carbonate Field | ROV Push Core | GS-005-PusC02 | 20-GS-005-02 | 11/06 | 08:27 | 63.466 | 6.519 | 272.24 | ~30 cm |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC02 | 20-GS-006-02 | 11/06 | 16:58 | 63.3634 | 6.6263 | 249.66 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC03 | 20-GS-006-03 | 11/06 | 17:09 | 63.3635 | 6.6263 | 229.12 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC04 | 20-GS-006-04 | 11/06 | 17:15 | 63.3636 | 6.6264 | 221.69 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC05 | 20-GS-006-05 | 11/06 | 18:11 | 63.3649 | 6.633 | 241.12 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC06 | 20-GS-006-06 | 11/06 | 19:27 | 63.3607 | 6.6508 | 184.82 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC07 | 20-GS-006-07 | 11/06 | 19:33 | 63.3604 | 6.651 | 185.19 | Surface sample |
| Vestbrona Volcanic Province | ROV Rock Collection | GS-006-RocC08 | 20-GS-006-08 | 11/06 | 19:51 | 63.3601 | 6.6543 | 200.84 | Surface sample |
| Vestbrona Carbonate Field | ROV Gas Sampling | GS-005-GasS01 | 20-GS-005-01 | 12/06 | 06:24 | 63.4664 | 6.5214 | 274.04 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC03 | 20-GS-005-03 | 12/06 | 05:02 | 63.466 | 6.519 | 271.83 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC04 | 20-GS-005-04 | 12/06 | 05:07 | 63.466 | 6.519 | 271.83 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC05 | 20-GS-005-05 | 12/06 | 05:14 | 63.4662 | 6.5191 | 271.98 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC06 | 20-GS-005-06 | 12/06 | 05:16 | 63.4662 | 6.5191 | 271.98 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC07 | 20-GS-005-07 | 12/06 | 05:50 | 63.466 | 6.5192 | 284.83 | Surface sample |
| Vestbrona Carbonate Field | ROV Carbonate Crust Collection | GS-005-CarC08 | 20-GS-005-08 | 12/06 | 06:52 | 63.466 | 6.5214 | 274.01 | Surface sample |
| Vestbrona Carbonate Field | ROV Push Core | GS-005-PusC03 | 20-GS-005-03 | 12/06 | 06:44 | 63.466 | 6.5214 | 274.01 | ~30 cm |
| Vestbrona Carbonate Field | ROV Push Core | GS-005-PusC04 | 20-GS-005-04 | 12/06 | 06:48 | 63.466 | 6.5215 | 274.01 | ~80 cm |
| Stjørnfjorden | Gravity Core | GS-007-GC01 | 20-GS-007-01 | 12/06 | 20:14 | 63.7102 | 9.8545 | 220 | 330 cm |
| Stjørnfjorden | Gravity Core | GS-007-GC02 | 20-GS-007-02 | 12/06 | 20:55 | 63.7102 | 9.8624 | 225.8 | 400 cm |
| Stjørnfjorden | Gravity Core | GS-007-GC03 | 20-GS-007-03 | 12/06 | 22:10 | 63.7102 | 9.8546 | 220 | 330 cm |