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Leg 2: Cold Seeps Extreme24 Expedition Report

Chief scientist: Giuliana Panieri

Capt. R/V: Hallgeir M. Johansen

Report prepared by: Panieri, G., Barrenechea Angeles, I., Argentino, C., Bednarek, G., Brickell, J., Caneva, A., Colson, B., Delpech, L.-M., Eilertsen, M. H., Farquhar, L., Garandel, O., Gjesdal, T., Guilhermic, C., Hemmateenejad, F., Hislop, L., Kalenitchenko, D., Kjær, M., Lunde, T.-A., Mattingsdal, R., O'Brien, M., Olsen, B. R., Øvstaas, J., Nyvoll, J. B., Pawlowski, J., Redaelli, C., Rodrigues, P. F. C., Rolley, L., Savini, A., Sørås, O., Vågenes, S., Vågenes, P., Wang, T., Wieman, S., Yan, Y. T.

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1 Participant list

1.1 Science party

	Name	Affiliation	Role	Discipline
1	Giuliana Panieri	UiT	Cruise leader	Chief Scientist, PI EXTREME24, micropaleontology
2	Alessandra Savini	Unimib	Scientist	Seafloor imaging and mapping
3	Arianna Caneva	Unimib, Erasmus	Student	Biology and oceanography
4	Beckett Colson	WHOI	Postdoc	Methane quantification
5	Bjorn Runar Olsen	UiT	Engineer	Cruise support and seafloor imaging
6	Carlotta Redaelli	Unimib, Erasmus	Student	Biology
7	Claudio Argentino	UiT	Researcher	Geochemistry, carbonates
8	Corentin Guilhermic	Université d'Angers	Postdoc	Geochemistry
9	Dimitri Kalenitchenko	UiT, La Rochelle Université	Researcher	Microbiology
10	Fereshteh Hemmateenejad	Unimib	PhD student	Seafloor imaging and habitat characterization
11	Gaelle Bednarek	Université de Poitiers	Student	Microbiology and amibs
12	Ines Barrenechea Angeles	UiT	Researcher	Micropaleontology and genetics
13	James Brickell	BBC	BBC producer	Media
14	Jan Pawlowski	IOPAN	Scientist	Molecular ecology
15	Jo Øvstaas	HUB Ocean	Researcher	Data management
16	Jørn B. Nyvoll	UiT	Expedition Communications	Media and communication
17	Lawrence Hislop	REV Ocean	Expedition Communications	Media and communication
18	Leighton Rolley	REV Ocean	Surveyor	Seafloor mapping and ROV operations
19	Lisa-Marie Delpech	La Rochelle Université	PhD student	Microbiology
20	Lorna Farquhar	Edinburgh University	Student	Marine biology and oceanography
21	Mari Heggernes Eilertsen	UiB	Researcher	Marine biology
22	Martina O'brien		Artist	Art
23	Michale Kjær	University of Copenhagen	Researcher	Art history

24	Oceane Garandel	Université d'Angers, Erasmus	Student	Micropaleontology
25	Olaf Sørås	UiB	Engineer	Data
26	Patrick Vågenes	Consultant	ROV Engineer	ROV operations
27	Pedro F.C. Rodrigues	BBC	BBC Videographer	Media
28	Rune Mattingsdal	NOD	Scientist	Geology
29	Scott Wieman	MIT-WHOI JP	PhD student	Marine geology, isotope geochemistry
30	Stig Vågenes	REV Ocean	ROV Engineer	ROV operations
31	Thea Gjesdal	UiT	Student	Marine geology
32	Tor-Arve Lunde	Consultant	ROV Engineer	ROV operations
33	Torstein Wang	UiT	Engineer	Cruise support
34	Yu Ting Yan	Nanyang Technological Uni	Researcher	Marine geology and micropaleontology

Participants Institution:

UiT The Arctic University of Norway (https://uit.no)

WHOI Woods Hole Oceanographic Institution, USA (https://www.whoi.edu)

IMR Institute of Marine Research, Norway (https://www.hi.no)

La Rochelle Université, France (https://www.univ-larochelle.fr)

Unimib Università degli Studi di Milano-Bicocca, Italy (https://www.unimib.it)

NOD, Norwegian Offshore Directorate (https://www.sodir.no)

REV Ocean, Norway (https://www.revocean.org)

Centre for Deep Sea Research, UiB, University of Bergen, Norway (https://www.uib.no/en/deepsea)

IO PAN The Institute of Oceanology of the Polish Academy of Sciences (https://www.iopan.pl)

Nanyang Technological University, Singapore (https://www.ntu.edu.sg)

The Massachusetts Institute of Technology (https://www.mit.edu)

MIT-WHOI Joint Program (https://mit.whoi.edu)

HUB Ocean (https://www.hubocean.earth)

The University of Edinburgh (https://www.ed.ac.uk)

University of Angers (https://www.univ-angers.fr/fr/index.html)

University of Copenhagen (https://www.ku.dk)

Université de Poitiers (https://www.univ-poitiers.fr/en/)

BBC (https://www.bbc.com)

1.2 Crew

Master: Hallgeir Magne Johansen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Chief Officer: Jon Harald Røttingen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

First Officer: Ida Louise Myking Fammestad, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Chief Engineer: Roy Karlsvik, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

First Engineer: Cato Sørsæther Fagervold, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Second Engineer: Andreas Buschmann Turøy, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Electrician: Bjarte Norheim, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Fishing Master: Frank Kjøndal Boska, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Fishing Net Man: Jan Erik Hansen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Able Seaman: Tobias Abrahamsen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Able Seaman: Pål-Thomas Johansen, Institute of Marine Research, Bergen, P.O. Box 1870

Nordnes, NO-5817 Bergen, Norway.

Able Seaman: Arve Helge Sulen Otterlei, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Able Seaman: Bjorn Erlend Strømmen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Chief Steward: Oscar Zahl Røksund, Institute of Marine Research, Bergen, P.O. Box 1870

Nordnes, NO-5817 Bergen, Norway.

Cook: Silje Beate Olsen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Stewardess: Hilde Marie Christensen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Stewardess: Rita Anette Mikkelsen, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

1.3 Science Support

Chief Instrument Engineer: Olaf Sørås, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Instrument Technician: Leif Johan Ohnstad, Institute of Marine Research, Bergen, P.O. Box 1870 Nordnes, NO-5817 Bergen, Norway.

Figure 1. Cruise participants.

2 Introduction and objectives

The Cold Seeps Extreme24 Expedition was the second leg of two expeditions, which form part of the University of Tromsø's Extreme 24 project.

The expedition focused on cold seeps sites characterised by methane emissions in several localities in the Barents Sea. The expedition is a research initiative (PI G. Panieri) hosted by the Department of Geosciences, part of the Faculty of Science and Technology at UiT The Arctic University of Norway, situated in Tromsø, and involved partners from different research institutes and universities around the world and used the REV Ocean Remotely Operated Vehicle (ROV) Aurora.

The expedition has been developed by leveraging the extensive knowledge gained from two significant projects funded by the Norwegian Research Council: CAGE (Centre for Arctic Gas Hydrate, Environment and Climate) and AKMA (Advancing Knowledge of Methane in the Arctic), both hosted at the Department of Geosciences at UiT. These projects have provided fundamental understandings to define the objectives and methodologies used during the EXTREME24 expedition, aiming to broaden our understanding of Arctic extreme environments.

3 Geological setting of the working areas

The western Barents Sea margin is the result of the continental break-up of Pangea and opening of the Norwegian-Greenland Sea. This process started in the Early Eocene ~55 Ma involving the epicontinental sea and was followed by seafloor spreading since Oligocene. Subsequent tectonic uplift and erosion of the continental shelf led to the deposition of a thick clastic wedge along the passive margin to the west. The clastic wedge can be subdivided into pre-glacial and glacial sediment deposits separated by a major unconformity, i.e. Base Glacial (BG) of Kuvaas and Kristoffersen (Kuvaas & Kristoffersen, 1996), R7 reflector of Faleide et al. (1996). Pre-glacial deposits are Paleocene to Early Pliocene in age (~65-2.7 Ma) (Fiedler & Faleide, 1996; Knies et al., 2009) and mainly consist of marine shales draping a thick sequence of Cretaceous sedimentary rocks. The overlying Plio-Pleistocene glaciogenic sediments can be further subdivided based on the identification of a shallow unconformity (0-1 km) which extends over most of the Barents Sea, known as Upper Regional Unconformity (URU). URU corresponds to reflector R1 (Faleide et al., 1996) with an age ranging from 0.2 to 0.7 Myr (Knies et al., 2009; Butt et al., 2000; Laberg et al., 2010). This erosive feature has been ascribed to the onset of larger, but less frequent, glaciations, with repeated advances of the ice sheet to the shelf edge. The sediments between URU and BG were deposited during smaller magnitude, but more frequent, glacial advances (pre-URU), which accumulated under consolidated material on the upper slope. This interval hosts extensive slope failures truncating the prograding glaciogenic sequences (Kuvaas & Kristoffersen, 1996). Among the pre-conditioning factors for slope failure, high sediment inputs inducing slope oversteepening and overpressures have been proposed (Kuvaas & Kristoffersen, 1996; Hjelstuen et al., 2007). Shallow gas and gas hydrate destabilization (Andreassen et al., 1990), or Late Pliocene volcanism (Kuvaas & Kristoffersen, 1996) are potential triggering mechanisms for the slides in this area. The distribution of the mud volcanoes discovered in this cruise strikingly matches the seafloor projection of a slide head scar visible in 2D seismics, thus implying a link between the two processes.

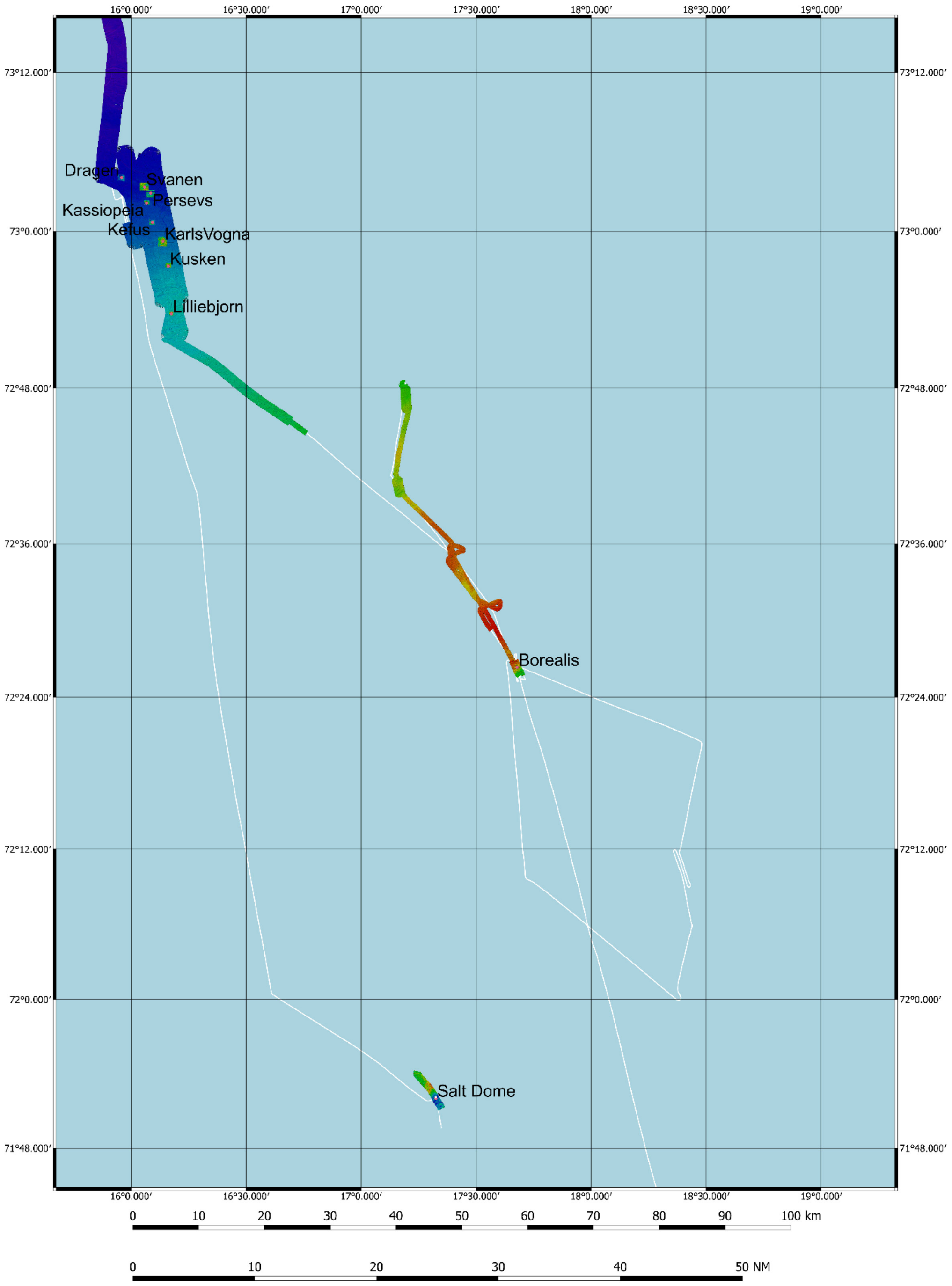


Figure 2. Study sites of the Leg 2: Cold Seeps Extreme24 Expedition Report.

4 Scientific Narrative of the Expedition

Note: Given times in the narrative are local time while the log sheets are in UTC.

Wednesday 22nd May DAY 1

At 07:00, we conducted a CTD cast to measure the conductivity, temperature, and depth of the water column, essential for assessing the physical properties of the seawater in the area where the mooring for the NorEMSO project, co-led by Benedicte Ferré, was supposed to be deployed. This was closely followed by a multibeam echosounder survey at 07:30, which provided detailed maps of the seafloor topography and evidenced methane flares.

At 08:30 we started the operations for deploying the mooring. The deployment ended successfully at 9:30. The mooring deployment is meant to study the transport of methane in the water column south of Svalbard, where an intense methane seepage was discovered in 2015. The recovery is planned for the summer of 2025. The instruments mounted on the mooring are indicated below, along with the depth:

- CTD Seabird: 110m
- Methane sensor (4h-Jena) with a CTD Seabird: 150m
- ADCP looking up: 240m
- Methane sensor (4h-Jena) with a CTD Seabird: 377m

After the mooring deployment, we steamed towards Tromsø and had the unique opportunity to stop at Bjørnøya at around 21:00. The visit was a chance to interact with the local research community and have a tour of the research station. We were warmly greeted by the Station Manager and his staff, who provided insights into their ongoing research and operations on the island. In a gesture of collaboration and goodwill, we welcomed the Station Manager and one of his personnel aboard KPH, fostering a spirit of scientific friendship. This brief interaction allowed for an exchange of ideas and potential avenues for future cooperation.

After visiting Bjørnøya, we resumed our journey back to Tromsø at around midnight.

Thursday 23rd May DAY 2

Today, we kept sailing towards Tromsø, and a significant part of the day was spent carefully packing all the collected samples and cleaning the laboratories used during the science work.

Friday 24th May DAY 3

06:00 - Arrival time in Tromsø.

14:00 - Participant Transition and Safety Briefing for Leg 2 participants.

18:00 - Science Meeting and Participant Presentations

The evening began with a scientific meeting at 18:00, where the new participants were introduced to the ongoing projects and objectives of the cruise. This session was an excellent opportunity for team members to present their planned research activities and discuss the scientific goals for Leg 2. The round of presentations created a collaborative atmosphere, setting a positive attitude for the upcoming activities.

20:00 - Safety Drill. Participation was mandatory for all on board, ensuring that both new and returning crew members were prepared for emergency response strategies.

20:30 - ROV Test Dive. The dive was a technical success. The BBC camera, mounted on the ROV for capturing high-quality underwater footage, worked perfectly.

22:00 - Heading towards Borealis Mud Volcano, Outer Bjørnøjrenna.

Saturday 25th May DAY 4

Steaming to Outer Bjørnøjrenna. The speed was slowed down by wavy weather, and we sailed at 7.5 knots.

16:00 - Arrived at Borealis and completed a CTD. Afterwards, we deployed the ROV equipped with the BBC camera, the MISO camera and SAGE methane sensor.

17:00 - Dive 22 on Borealis to do photomosaic. While descending, the pilots noted a ground fault where the water had contacted the electricity. After some inspections, it became clear that SAGE was causing the problem, so the ROV was recovered, and SAGE was removed. After that, we recommenced the dive at 18:00.

During the dive on the northern part of the crater, we observed two more little gryphons emitting intense methane bubbling and mud. The MISO camera recorded stunning video.

The gryphon inside Borealis, which we discovered last year, looks different from the video we recorded at that time. We ended the dive to be on deck by 20:00.

The night was spent surveying the area and obtaining a better multibeam bathymetry of the entire complex system of the Borealis MV.

Sunday 26th May DAY 5

The day commenced at 08:00 with the team preparing for Dive 24. During the early morning hours, we analysed the bathymetric data collected overnight. This analysis revealed an extensive carbonate formation, which was further corroborated by backscatter data. Additionally, more methane flares were observed and subsequently added to our navigational maps, enhancing our understanding of the site's geological activity.

Dive 24 began at 08:30, equipped with the BBC camera, the SAGE methane sensor, MISO camera system and carrying BBC Charlie, a lander outfitted with a GoPro and two lights. The ROV experienced several ground faults, leading to intermittent loss of the video feed from the BBC camera. Efforts to resolve these issues included disconnecting the CTD, initially suspected to be the source of the ground faults. However, disruptions with the BBC camera continued, resulting in recording gaps of approximately one minute each. The dive concluded at 10:30. Despite achieving some objectives, we faced technical challenges during the operation.

With the aim of continuing the BBC recording and seafloor observations, we initiated ROV Dive 25 at 13:00, using the same equipment configuration as Dive 24. At 15:00, we retrieved the ROV and changed the settings to 8 small push cores, 6 medium push cores, 2 big push cores, 2 blade corers, and the gas sampler.

At 16:30 we started the Dive 26. In the meantime, we did a short multibeam and EK80 survey that evidenced very strong flares (reaching the sea surface) a few hundred meters north of Borealis. The fisheries EK60 indicate a higher amount of biology around Borealis than in the nearby area. While opening the moonpool, the pilot realized that the handler of the gas samples was too big and did not allow the descent. We spent approximately 15 minutes removing it, after which we were able to begin the descent. We spent some time trying to collect methane using the Saga SubSea gas sampler, but it did not work. We think that the absence of methane bubbles in the water was due to high tide during the time of the dive. During the dive, we also tried to deploy the IG DropCam, but the bottom water was too muddy due to emissions from the active gryphons, and after spending nearly an hour, we aborted the plan as it was impossible to see the seafloor. The IG DropCam system was then brought on board.

We dedicated the rest of the ROV dive to collecting push cores from the gryphon we identified last year. We realised that sampling in this area is challenging due to very soft seafloor, which prevents the push cores from retaining the sediment. We ended the dive at 20:15.

After the dive, we did 2 gravity cores, north and south of Borealis. The rest of the evening and night were dedicated to surveying the area around Borealis.

Monday 27th May DAY 6

At 07:00 hrs and 12:00 hrs, WP2 180µm mesh plankton nets were deployed vertically to depths of 350m, 250m (x2), and 100m. The objective of the plankton net is to provide information on mesozooplankton variability in abundance, biomass, and species composition along a vertical gradient surrounding the Borealis mud volcano. Following the plankton net deployments, a CTD cast was performed to characterise the water masses surrounding the Borealis site. Water samples were collected at different depths to measure methane concentrations.

Two ROV dives, Dive 27 and Dive 28, were conducted at the Borealis mud volcano, successfully collecting samples for various research teams. Dive 27 focused on collecting gas samples using the Saga SubSea gas sampler and retrieving carbonate crusts, as well as samples for micropaleontology and macrofauna studies. The gas sampler was strategically placed and left to operate while the ROV explored areas rich in carbonate crusts and bacterial mats. Although the dive was largely successful, we encountered difficulties with one push core sample near a carbonate crust.

Dive 28 aimed to establish a reference site west of Borealis. A multicorer was deployed simultaneously to collect sediment cores. The cores were successfully retrieved near the gryphon, and methane levels were measured using the SAGE system.

The day concluded with a visit to two craters (named Tvillingene) north of the main Dive 28 site, observed during the previous night's dive. The northern crater, characterised by extensive carbonate crusts, bacterial mats, and active methane bubble trails, showed strong methane emissions. Notably, a redfish, possibly pregnant, was observed in this area, indicating a vibrant, albeit specialized, ecosystem. The southern crater, despite showing no evidence of methane flares in the multibeam survey, still featured extensive carbonate crusts and smaller patches of bacterial mats beneath them. Samples were collected for further analysis. Abundant redfish were also observed in this area, some appearing to be pregnant, further enhancing the biological interest of the site.

Tuesday 28th May DAY 7

The day started with a plankton net after a night of multibeam survey. The primary focus of today's research was the investigation of a seafloor mound, that we named Kassiopeia, which is part of a system of 7 other mounds. These mounds were initially identified through their distinctive seismic signatures, which revealed features resembling chimneys. The five southernmost mounds were further examined using 3D seismic techniques, which confirmed the presence of chimney-like structures. These seismic expressions bear a striking resemblance to those observed at the Håkon Mosby mud volcano, suggesting similar geological processes. While two additional mounds further north were surveyed during the night's multibeam operations, they were not explored in detail during this cruise. These mounds, along with the observed flare activities indicating potential methane and fluid emissions present a valuable target for future expeditions.

Our exploration today focused on Kassiopeia, a dome-shaped feature measuring approximately 700 meters in diameter and rising 7 meters above the seafloor. During the dive, we identified four mud pools within Kassiopeia. Fluid emissions from some of these pools were observed, creating mud flows that extended several meters across the seafloor. The vicinity of the mud pools was characterized by ecological hotspots, including clusters of tube worms and small patches of bacterial mats. Additionally, massive carbonate crusts, seemingly fixed in place, hosted a diverse array of epifauna, such as serpulids and anemones.

Wednesday 29th May DAY 8

Today's operations included a comprehensive ROV dive across multiple seafloor mounds that last night we decided to name as the constellation visible from the boreal hemisphere. We completed ROV Dive on the following mud volcanoes: Dragen, Persevs, Kefeus, and Karlsvogna. Each site was surveyed also using the SAGE system for methane measurements in the water and the MISO camera. Towards the end of the day, the winch broke, and we had to stop ROV deployment. However, we deployed the IG DropCam and filmed the seafloor of Kusken, and Lillebjørn.

During the day, gravity cores were taken from all mud volcanoes, including Dragen, Svanen, Persevs, Kefeus, Karlsvogna, Kusken, and Lillebjørn. Together with the gravity core collected yesterday from Kassiopeia, we were able to have a complete record of imagery, gravity cores, gas samples, and push cores from all the mud volcanoes and provided the base for the establishment of the first mud volcano province in the Barents Sea. Seismic data suggest that they are not deeply rooted, but rather very shallow, only a few hundred meters from the seafloor.

Thursday 30th May DAY 9

We arrived at the new site, Tromsøflaket Salt Dome, at 9:00 after a short survey that evidenced methane flares in the water column. This site is a salt dome in the subsurface, with faulted overburden showing signs of gas migrating vertically through the faults to the seafloor. Abundant gas flares were observed during a transit conducted in 2023 as part of the AKMA 3 expedition, a few hours before we discovered Borealis.

Friday 31st May DAY 10

We arrived in Tromsø early in the morning and started demobilization as well as the removal of samples and chemical waste from the laboratories. We also emptied the chemical storage. Police passport control at 9:15 am. Panieri and most of the scientists left the vessel, and Argentino took the lead of the cruise on Panieri's behalf. KPH left the harbour at around 13:00, refuelled the ship in Ramsfjord, and then stopped at the fuel station at 16:00. The transit was conducted without multibeam acquisition as it was within 12 nautical miles from the coast. At 22:30 BBC flew the drone.

Saturday 1st June DAY 11

An electric blackout occurred at 9:39 during testing of one of the engines, which was resolved at 11:00. They were testing an engine at 95%. At 16:50 we crossed 12 nm and started the multibeam line.

Sunday 2nd June DAY 12

At 3 am we passed over the potential shipwreck site with multibeam, but no seafloor expression was detected. We dove with the ROV at 4:04 (2:04 UTC). The seafloor was muddy and barren of macrofauna until we found some boulders colonised by cold water corals. In the same spot the sonar indicated the presence of something shallowly buried in the sediment, approximately 20 meters long and resembling the longitudinal section of a boat. The ROV manipulator arm penetrated the seafloor to see if we could reach the object detected by the sonar, but it was not reached. At 5:10 am (3:10 UTC) the ROV was back on deck. At 17:37 UTC we dove into another shipwreck, which was visible from the multibeam. We found it soon after landing on the seafloor, it was a boat made of wood and metal. We saw a propeller, a door passage and an external ladder. There were many fishes inside and around the boat, cold water corals colonized many spots. At 18:51, the ROV started its ascent.

Monday 3rd June DAY 13

Multibeam survey on abandoned wells during transit.

Tuesday 4th June DAY 14

We arrived in Stavanger at 8.30 am and started demobilization of ROV. Gas and sediment samples were delivered to the Norwegian Offshore Directorate.

5 Scientific Equipment

5.1 Hydroacoustic systems

The RV Kronprins Haakon is equipped with hydroacoustic systems that can be operated simultaneously. These systems are managed by dedicated software that intelligently coordinates transducer pings to prevent interference.

During the EXTREME24 cruise, the following hydroacoustic systems were extensively utilized:

- Simrad Kongsberg EA 600 – 12kHz single beam echosounder
- Kongsberg EM710 and EM 302 multibeam echosounder and SBP 300 Sub-Bottom Profiler

5.1.1 Kongsberg EA 600 –12kHz single beam echosounder

The single beam echosounder EA 600 can simultaneously operate up to four high power transceivers. Frequencies ranging from 12 to 710 kHz are available. A range of highly effective transducers is offered to meet all operational requirements from very shallow water to a depth of 11,000 meters. The primary purpose of this echosounder is to determine depth and locate highly reflective objects in the water column. During this expedition, we used the echosounder at 12 kHz as this frequency provided the best detection of the seafloor.

5.1.2 EM 710

The EM710 multibeam echosounder is a high to very high-resolution seabed mapping system which uses sonar frequencies in the 70-100 kHz range. It is installed on the port drop keel of the Kronprins Haakon and is well-suited for swath bathymetry surveys in water depths of up to 800 meters. The system emits 400 beams at angles of up to 70° on each side, with options to adjust the beam spacing to be equiangular or equidistant. It also has a high-density mode to achieve greater sounding density by reducing the acoustic footprint. During the EXTREME24 cruise, the system operated in high-density equidistant mode. Additionally, the EM710 can record water column backscatter data, which is helpful in identifying gas bubbles in the water column. This system was the primary multibeam system used during the expedition, and new CTD data were collected as needed to update the water velocity used by the EM710 system.

5.1.3 EM 302 and SBP 300

The multibeam echosounder EM 302 operates at a frequency of 30 kHz and is specifically designed for detailed and accurate seabed mapping at depths exceeding 7000 m. It utilizes beam focusing during both transmission and reception. Additionally, the EM 302 is equipped with a feature to minimize transmission power to avoid disturbing marine mammals nearby.

The system can produce up to 432 soundings per swath, with pointing angles automatically adjusted based on achievable coverage or user-defined limits. In dual swath mode, the system can generate up to 864 soundings, with the transmit fan duplicated and transmitted with a slight difference in a long-track tilt. The applied tilt is adjusted based on depth, coverage, and vessel speed to maintain a consistent sounding separation along the track. Furthermore, the transmit fan is divided into individual sectors with independent active steering to compensate for vessel movements such as yaw, pitch, and roll. Each transmit sector has its beam focusing.

When combined with a separate low frequency transmit transducer, the EM 302 can potentially provide sub-bottom profiling capabilities with a narrow beam width, known as the SBP 300 sub-bottom profiler. During this cruise, the sub-bottom profiler was consistently operated with a chirp pulse of 50 ms and a frequency bandwidth of 2.5 – 6.5 kHz.

The EM 302 (including the SBP 300) is installed in the ice window in the vessel's bottom hull. However, during ice breaking, the movement of ice beneath and alongside the ice window significantly impacts data acquisition, resulting in elevated noise levels and inaccurate measurements.

During the cruise, multibeam bathymetry data was processed and refined using QPS Qimera Software. Initial grid surfaces with a resolution ranging from 2 to 7.5 m were generated for the individual superstations. Certain data require further processing to enhance map quality.

5.2 Oceanographic systems

Physical and chemical measurements in the water column were measured from a CTD/rosette. The CTD model is a Seabird 911 plus mounted on a 12 or 24 10-litres Niskin bottles carousel and was brought close to the seafloor. The CTD is coupled with different types of equipment such as oxygen sensors, transmissometers, and fluorimeters.

5.3 Attributed Sensors

5.3.1 GPS/Navigation, Motion Reference Unit

An integrated global navigation satellite system (GNSS) is utilized, which employs signals from GPS, GLONASS, Galileo, or Beidou, along with inertial measurements, to deliver high-quality outcomes for various applications such as hydrographic surveying, dredging, oceanographic research, and seismic work. This Seapath system is equipped with a 5th-generation MRU motion sensor package that offers a roll and pitch accuracy of up to 0.008° RMS. The precision of this accuracy is attained using precise linear accelerometers and unique MEMS-type angular rate gyros. The MRU's processing unit encountered some issues in providing precise pitch and roll information, which significantly impacted USBL positioning and EM302 multibeam acquisition.

5.3.2 USBL HiPaP

ROV NUI, OFOBS, CTD, and some coring equipment were equipped with a HiPaP beacon for precise positioning on the seafloor. The HiPAP 501 system uses a transducer mounted on the hull that can be lowered a few meters below the vessel's hull. A transceiver unit, which includes a transmitter, preamplifiers, and beam-forming electronics, is mounted near the hull unit. This system has a spherical transducer with hundreds of elements covering the entire sphere under the vessel. It dynamically controls the beam to always point toward the transponder, even if the transponder is moving and the vessel's roll, pitch, and yaw affect its position. Roll and pitch data from sensors are used to compensate for the vessel's position.

The Super Short Base Line (SSBL) principle has the advantage of requiring only one hull-mounted transducer and one subsea transponder to establish the transponder's three-dimensional position. An SSBL system measures the horizontal and vertical angles along with the transponder's range. Any error in the angle measurement results in a position error that depends on the transponder's range. To achieve better position accuracy in deep water with an SSBL system, it is necessary to improve the angle measurement accuracy. The HiPaP 501 operates in the frequency band of 21 - 31 kHz with an operating range of 1 - 5000 m. The range detection accuracy is specified as 0.02 m under the assumption of unobstructed visibility between the transducer and transponder, minimal or no water column noise, and no errors from the heading/roll/pitch sensor. We observed interference between the HiPaP and multibeam EM 302 systems due to their use of similar frequency bands. During most seafloor operations, EM 302 acquisition was halted, resulting in a more stable positioning of the USBL transponder.

5.4 Sediment sampling

5.4.1 Gravity corer

Please refer to the Ocean Census Arctic Deep Expedition Report (Leg 1 Extreme24).

5.4.2 Box corer

Please refer to the Ocean Census Arctic Deep Expedition Report (Leg 1 Extreme24).

5.5 Biological sampling in the water column

5.5.1 Plankton net

The plankton net, with a 10 μm mesh size, is attached to a metallic frame on board R/V Kronprins Haakon. The crew will deploy the net using a winch and the sample will be collected at the agreed depth and speed on the way up.

5.6 REV Ocean ROV "Aurora Borealis"

Please refer to the Ocean Census Arctic Deep Expedition Report (Leg 1 Extreme24).

5.6.1 ROV exploration & sampling

During the EXTREME24 expedition, the ROV conducted 37 dives with various objectives. This included sampling sediment, meiofauna, macrofauna, and gas. Additionally, the ROV used Sagasubsea AS to measure methane levels in seawater at different depths and near the seabed using the SAGE sensor developed at WHOI. The ROV also captured video footage with a downward-facing 4k camera to visually represent different habitats and sedimentary facies at the explored sites. The precise locations for the ROV dives were chosen based on seafloor mapping and water column data analysis, as detailed in the Equipment section of this report.

5.6.2 Sampling equipment used by ROV Aurora

5.6.2.1 Gas sampling and flux measurements

We utilized a gas-sampling tool from Sagasubsea AS to collect gas and perform flux measurements (Figure 7). The ROV operated the gas sampler. The clear cylinder in the middle on top of the funnel enables precise (±20 ml) volume measurements that can be converted into fluxes by timing the gas accumulation in the cylinder. Gas that gathers in the clear cylinder is drawn into a steel cylinder by opening a valve because of the pressure contrast between the steel cylinder (atmospheric pressure) and subsea pressure. A total of 8 gas samples were obtained at 7 different superstations (please refer to the station log at the end of the report). Steel cylinders containing sampled gas were kept in the refrigeration room after retrieval. After the cruise, the samples will be examined for gas composition and isotopic signature.

Bubbles generally manifest as individual bubble streams emerging from small openings in the sandy and muddy sediments or through fissures in carbonate crusts. Bacterial mats often surround the source of the bubble stream. Seepage activity varied significantly across the study areas, as evidenced by the notably different numbers of total bubble streams and the visual intensity of the bubble stream.

Figure 3. Picture of the gas sampler used during the EXTREME24 cruise. The funnel at the bottom has a footprint of 0.5x0.5 m. Gas accumulates in the transparent cylinder atop the funnel, allowing gas volume measurement. A valve on the front can be turned and the accumulated gas will evacuate into one of the 4 steel cylinders on the back (photo by: Jørn B. Nyvoll).

Figure 4. Example of steel cylinders Picture of the gas sampler used during the EXTREME24 cruise (photo by: Jørn B. Nyvoll).

5.6.2.2 Scoop

A scoop was used to collect biota.

5.6.2.3 Blade corer

Blade corers were used to sample sediment. Due to their closing mechanism, they provide the possibility to obtain pristine sediment samples with sediment surfaces preserved. Their size is 320 x 100 x 250 mm.

5.6.2.4 Push cores

Push cores of different inner diameters were used to sample sediment. Eight of them with a diameter of 6cm and two of them with a diameter of 8cm. The tubes are transparent and have a holder to be manipulated by the ROV arm.

5.6.2.5 Niskin Bottles

Niskin bottles, operated with Aurora's articulated arm, were used.

Figure 5. Sampling tools arrangement on ROV Aurora during EXTREME24 (photo by: Jørn B. Nyvoll).

5.7 SAGE Methane Instrument

SAGE (Sensor for Aqueous Gases in the Environment) is a dissolved methane instrument developed by engineers at the Woods Hole Oceanographic Institution, led by Jason Kapit and Anna Michel. SAGE uses a membrane to extract dissolved gas from the water. Inside the instrument, the extracted gas fills a hollow core optical fiber. Tunable laser absorption spectroscopy measures the amount of methane in the optical fiber. Methane absorbs light at very specific wavelengths, and we use the amount of absorbed light to quantify the partial pressure of the methane. The extremely low gas volume inside the optical fiber allows SAGE to have a fast response time (on the order of minutes), which is critical for exploration of the seafloor. SAGE measures methane in terms of partial pressure. To convert to concentrations (e.g. nmol/L), Henry's Law can be used.

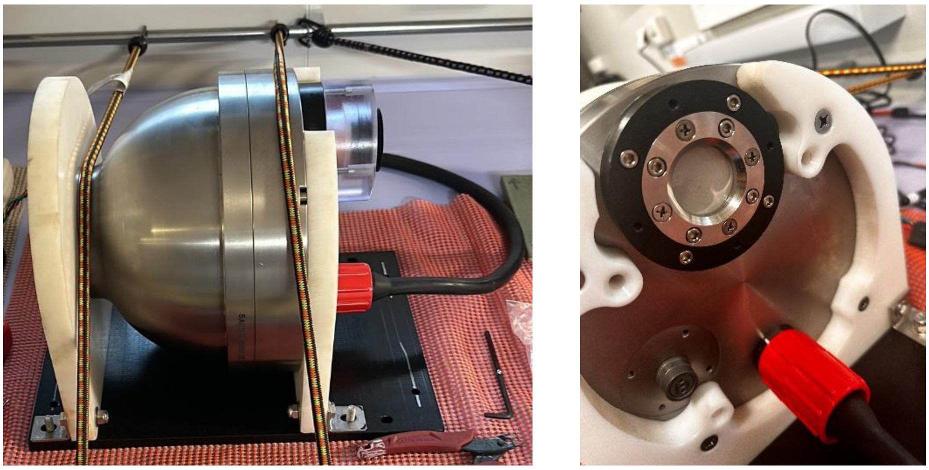


Figure 6 Left: SAGE on the bench aboard the R/V Kronprins Haakon. Right: The gas-permeable membrane on SAGE, which normally has a flow cap covering it.

SAGE powers a Seabird 5T pump to allow a continuous sample flow past the membrane. SAGE operates on 24VDC power and uses RS232 communications for data transfer to a topside computer. The user can use the topside computer to control settings like the pump state and heater temperature settings and monitor environmental variables critical to the health of the instrument (like internal humidity).

5.8 MISO camera

The MISO camera is a GoPro in a Deep Sea Power and Light housing designed specifically for taking high-quality deep-sea images, spearheaded by Daniel Fornari at Woods Hole Oceanographic Institution. The lens is set such that images have excellent depth of field, keeping subjects in focus whether they are close and far away. The camera is self-powered and self-logging and is mounted to the ROV just before the dive. The camera has enough battery life and data space to support approximately 20 hours of continuous filming.

5.9 IG TowCam system

The IG TowCam system camera system, utilized during the Extreme24 cruise, has a lighting system designed and assembled by Bjørn Runar Olsen at UiT. The system incorporates two high-performance Cree CXB3590-0000-000N0HCB50E LED modules. Each module can produce up to 12,000 lumens under optimal conditions, which are typically found at colder temperatures—a common scenario during the cruise. The LEDs emit a warm white light at 3000 Kelvin, creating a natural illumination that enhances the camera's visual capture capabilities. These modules are carefully managed by a robust LED driver circuit, which regulates the current to prevent overloading the LEDs and steps up the voltage from 24V to 72V DC, ensuring efficient power management. The colour rendering index (CRI) of the modules is rated at 80, providing good colour fidelity in the underwater images captured. The camera's housing is constructed from aluminium, which has been anodized to offer enhanced protection against corrosion—a necessary feature in the harsh marine environment. Additionally, the protective glass dome is crafted from high-quality BK7 glass, known for its optical clarity, ensuring that the camera delivers high-quality photographic results. The IG DropCam system is secured on the multicorer and deployed using KPH's crane, with a wire that powers the system and allows realm time images visualization.

5.10 Mooring

The mooring, deployed on 22/05/2024, is meant to study the transport of methane in the water column south of Svalbard, where an intense methane seepage was discovered in 2015. The recovery is planned in summer 2025. The deployment of the mooring is part of the NorEMSO project.

The instruments mounted on the mooring are indicated below, along with the depth:

- CTD Seabird: 110m
- Methane sensor (4h-Jena) with a CTD Seabird: 150m
- ADCP looking up: 240m
- Methane sensor (4h-Jena) with a CTD Seabird: 377m

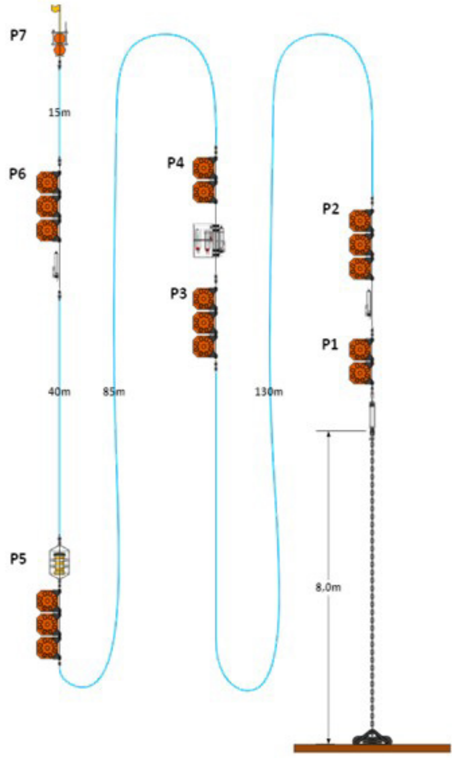


Figure 7. Drawing of the mooring. Between P1 and P2: CTD. Between P3 and P4: CTD and CH4 sensor. P5: ADCP. Below P6: CTD.

6 Methods

6.1 Multibeam echosounder Water Column Data (WCD)

Gas seep mapping was conducted using the QPS FMMidwater software. Gas seeps manifest as flares in the water column data due to backscatter from the gas bubble streams. Data from EM302 and EM710 in *.all and *.wcd formats were converted to the generic water column format (*.gwc) using FMMidwater. The *.gwc files were then visualized in fan view and stacked view. The locations of individual gas flares were identified manually by examining the data in fan view and extracting coordinates of the gas flare initiation points at the seafloor using the geo-picking tool. These flare locations were marked on the maps and utilized for ROV navigation during the dives to locate streams of gas bubbles.

6.2 Marine Geology

The Appendix contains a comprehensive list of all sediment samples gathered during the expedition. The "List of samples" table includes details about the sampling equipment used, such as push cores and blade corers operated by ROV AURORA, gravity-based methods, box corers and the multicorers. It also specifies the intended analyses for each sample.

6.2.1 Pore fluids samplings

Samples of porewater were obtained from blade cores at intervals of 2 cm and from push cores, multicores, and gravity cores at varying intervals based on the expected position of the sulphate-methane transition zone. Before deployment, push core and blade core liners were pre-drilled and sealed with tape. Porewater sampling took place in a cooled room (4 °C) after recovery. The methods used were in line with those detailed in Argentino et al. (2023) and are summarized as follows: 5 cm-long pre-wetted rhizons (0.15 μm mesh) were inserted into the pre-drilled holes, and water samples were obtained by applying suction with 10 mL syringes (Figure 15). The pore water samples were divided into different portions: 1) 1.5 mL subsamples were transferred into screw cap glass vials for dissolved inorganic carbon (DIC) analysis. We stored DIC samples at 4 °C without any fixative addition, as recent findings have indicated that it could affect the DIC geochemistry of cold seep samples (Argentino et al., 2023). 2) >0.5 mL was transferred into Eppendorf tubes and stored at -20 °C for sulphate analysis. 3) Samples for trace metals (> 1 mL) were treated with 10 μl of ultrapure 65% nitric acid (HNO3) to lower the pH to < 2 and stored at 4 °C.

In blade cores, bulk sediment samples (5 mL) were extracted at 5 cm and 10 cm depths using a cut-off syringe. These samples were then transferred into glass vials containing 5 mL of NaOH (1 M) to halt microbial activity (Figure 16). The vials were sealed with a rubber septum, sealed with aluminium crimp caps, and shaken, after which they were stored upside-down at 4 °C.

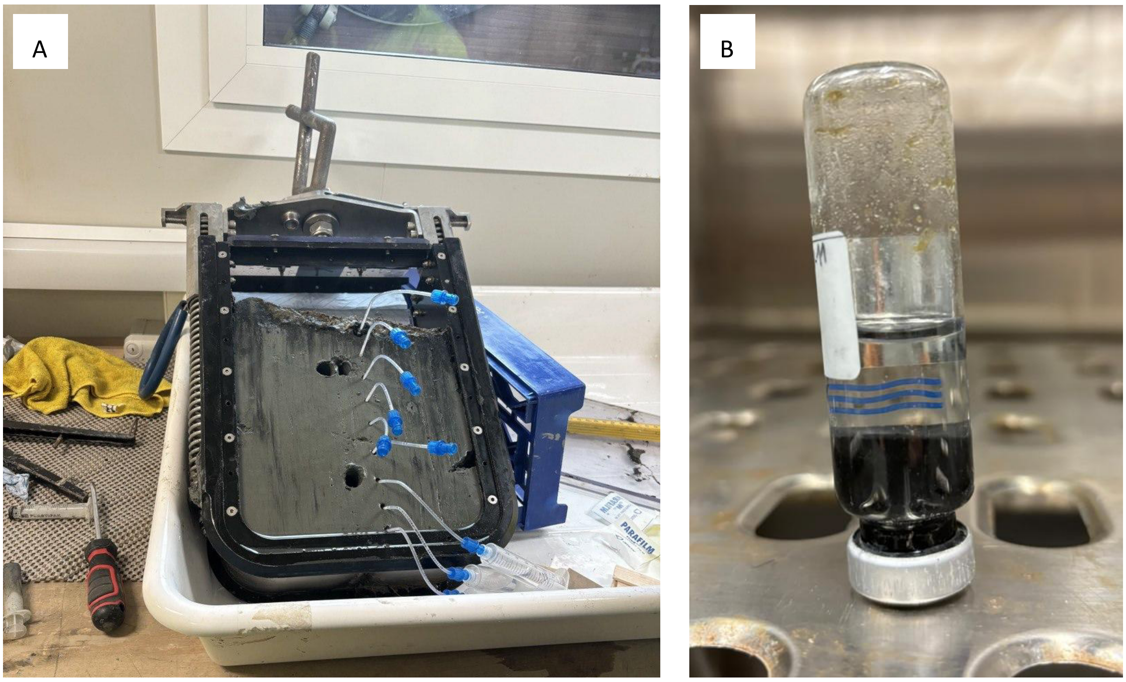
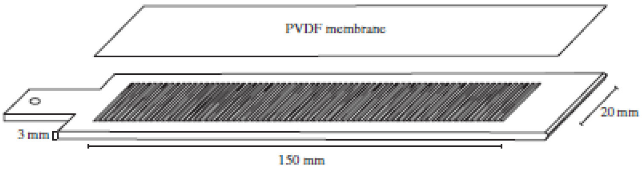


Figure 8. A) Pore water extraction from a blade core. B) Bulk sediment sample in a glass vial prepared with NaOH. The headspace will be analysed for gas composition.

6.2.2 Porewater biogeochemistry DET

6.2.2.1 DET 1D

A plastic probe containing 75 small agarose pieces (2mm vertical resolution) was inserted into sediment cores (push core and multicorer) and left to equilibrate with ambient porewaters for at least 8 hours (Diffusive equilibrium in thin films). After removal, all the small agarose pieces are removed and stored in 1.5 mL Eppendorf tubes until further handling (Metzger et al., 2013).



Further handling of the samples implies an elution of the agarose pieces with 5% nitric acid to release the previously equilibrated chemicals into solution. After a dilution of the eluted solution with 0.8% nitric acid, the liquid samples are processed through an ICP-AES to measure the concentration of several dissolved elements and molecules (Ca, Fe, K, Mg, Mn, Na, P, SO_4^{2-} , Si, Sr).

6.2.2.2 DET 2D

Probes presenting polyacrylamide gels on both sides (16*7.5 cm) are inserted into a sediment core (it must be a multicorer). At each station two probes are needed (two cores) to map the concentration of dissolved iron (Fe), phosphates (PO_4^{2-}) and nitrites (NO_2^-). First the probes need to be disposed in a way that the sediment-water interface is located the gel windows preferentially in the upper part. After an equilibration of the gels with the porewaters (at least 8h), revelation of the concentration of each element is carried out through colorimetric reaction involving the superposition of the gel probe onto a reagent gel previously equilibrated with a specific reagent corresponding to each chemistry. Dissolved iron mapping requires a reaction with a ferrozine and ascorbic acid solution revealing iron in pink/purple shades (Thibault de Chanvalon et al., 2017). Dissolved phosphates are revealed in blues shades as detailed by Cesbron et al. (2014). Finally, nitrites react with the Griess reagent in pink shades (Griess 1879; Metzger et al., 2016).

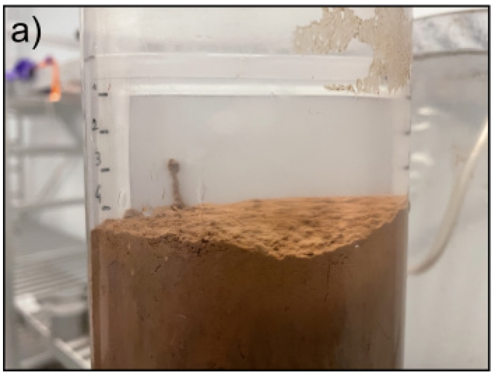


Figure 9. 2D probe deployed in a sediment core (Corentin Guilhermic, PhD thesis; Corentin Guilhermic. Effets des instabilités sédimentaires sur les microhabitats benthiques: cas du Kongsfjorden. Sciences de la Terre. Université d'Angers, 2023. Français. NNT : 2023ANGE0068).

After a reaction time of 20 minutes for each chemistry the probes are scanned using a desk scanner. The retrieved images need to be treated to assess further quantitative information.

Calibration process using similar reagents and known concentration standards give us a mathematical relation to convert greyscale values of pixel of the probe in concentration. With the use of ImageJ for image analysis and R software for the conversion the result is an image in false colours (usually from white 0 µmol L^{-1} and purple for max of each chemistry). Other uses of this method can be 2D flux modelling in identified structures and at the SWI, 1D vertical high resolution concentration profiles integrating horizontal variability.

6.2.3 Sedimentology

The seafloor sediment type was evaluated using high-resolution ROV images of the top layer and direct examination during push core and blade corer slicing. X-ray fluorescence (XRF) core-scanning, an efficient non-invasive method for quickly analysing elemental differences in grain size analyses, will be performed in the laboratory.

6.2.4 Rock sampling

Samples of rocks that caught the attention at the seafloor during the ROV Dives have been gathered using the manipulator arm of the ROV. The rocks were rinsed with freshwater to eliminate any salt deposits and then placed on the deck to air dry. At times, the biologist detached epiphytic organisms from the rocks.

6.3 Marine Biology

6.3.1 Microbiology

6.3.1.1 Amoebae

Sediment and water for amoebic cultures were collected using Push cores, Multicorer, Blade core and Niskin bottles. From these samples, we took surface sediments and water. Each sample has been cultured on Artificial Sea Water (ASW) agar with a salinity of 25 g/L (Instant Ocean artificial sea salts from Aquarium System) enriched with 100 µL of E. coli DO50, serving as a nutrient source. A 250 µL drop of sediment was placed on one edge. Then, the Petri dish was tilted, allowing the drop to form a line the width of the dish. The samples were then incubated under two different conditions: 8°C and 20°C. Each sample was processed in duplicate for each condition.

The amoeba-positive samples were then subcultured onto new E. coli-enriched ASW agar by removing a piece of agar containing the visible amoebae/amoebic migration front. They were then incubated at the same initial temperature.

Downstream analyses: The amoeba culture will be continued to isolate and identify the organisms collected during the sampling campaign. It is planned to analyse the eDNA to target the amoebae present at the Borealis sites using a genomic approach.

6.3.1.2 Prokaryotes

Sediment: Sediment slices (as detailed in the sample list) were anaerobically processed in a glove bag flushed and filled with nitrogen. From each slice, 2 ml were immediately frozen at -80°C for Total Nucleic Acid (TNA) analysis, and 2 ml were diluted in 2 mL ultrapure water and fixed with 2% final concentration glutaraldehyde for flow cytometry cell counting. The remaining sediment was anaerobically frozen at -20°C for porewater extraction and geochemical analyses.

Water: Water samples were collected within the crater using two Niskin bottles attached to the ROV arm. We filtered 500 mL of water through a Sterivex™ 0.2µm cartridge (Millipore). Concurrently, we collected 50 mL of sediment (after 2 hours of decantation) for TNA analyses. Water geochemistry samples were taken concomitantly according to the sampling list, for major ions analysis, elemental analysis, and H_2S and acid volatile sulphides.

6.3.2 Foraminifera diversity

Foraminiferal biodiversity was assessed in various habitats including bacterial mats, tubeworm patches, and reference sediments near the seep, and outside the seep. Sediment samples were recovered using either push cores (with diameters ranging from Ø 8cm to Ø 5cm) or Blade Cores (32x25x10cm) deployed with the ROV Aurora. Additional cores were taken using a multicorer and a boxcore for reference areas. The sediment cores were sliced into 5 sediment depth layers (0-1cm, 1-2cm, 2-3cm, 3-4cm, 4-5cm) and fixed in Rose Bengal diluted with formaldehyde (4%)/seawater solution.

Some cores were sampled every 1cm for sedimentological (e.g., grain size, TOC) and geochemical analysis (e.g., d13C and C:N).

Sediment samples were also collected for molecular analysis. The top sediments were collected using a clean spatula, making sure to avoid the edge of the core, and then kept at -20°C.

6.3.3 Macrofauna

The goal of the macrofauna sampling was to ensure comprehensive coverage of the biodiversity across the different microhabitats at each seep site. To accomplish this, macrofauna was obtained from samples gathered using ROV-operated Push cores (Ø 8 cm), Blade cores (32*25*10 cm), and Scoop. Additionally, fauna was collected from the surfaces of carbonate rocks. In each cold seep site, we focused on areas with bacterial mats, tubeworm fields, and rocky substrates to represent the various microhabitats. Reference samples from inactive sedimented areas were obtained using the multicorer.

All macrofauna samples were meticulously sieved through two stacked sieves with mesh sizes of 1 mm and 0.5 mm. Most of the material was preserved in 96% ethanol, while specific target taxa were separated using a Leica stereomicroscope and then frozen at -80 degrees for genomic studies. Some samples were also fixed in Glutaraldehyde for microscopy studies (SEM/TEM, FISH). Furthermore, representatives of all the common taxa at each site were frozen at -80 degrees for food web analyses using stable isotopes. Reference sediment samples from the same stations were also collected and frozen.

Figure 10. Various macrofauna were collected during the EXTREME24 cruise.

6.3.4 Zooplankton

6.3.4.1 Sampling

Plankton Net and Preservation Protocol

Plankton nets were deployed vertically to depths of 350m, 250m, and 100m using WP2 180µm mesh nets. Latitude, longitude, time of sampling, maximum depth, and net mesh size were recorded prior to sampling.

Nets are washed down with seawater to condense plankton into the codend. Samples must be treated with care throughout the entire process. Contents of the codend are collected into a sample bucket. Initial visualisation of samples can happen at this stage. After use, it is important to rinse the net and codend with fresh water after use to optimise the life and function.

Contents of the sample bucket are then sieved through a 120µm mesh to condense the sample. The sample is transferred from the sieve to 100-200ml sample jars, filled with seawater and sealed with a screw top lid. Samples are preserved in 95% ethanol. Ethanol can be topped up after 12 hours. Samples should be correctly labelled with readable IDs.

Sample Storage: Samples are stored in a dark and cool place.

Table I. Overview of zooplankton sampling during RV Kronprins Haakon from May 2024.

Gear	Size Group	Sample-type	Label	Depth	Mode of Sampling
WP2 180 µm	Mesozooplankton	Abundance/Biomass	MEB	350-0m	Vertical

Zooplankton and Biomass Acoustics EK80

Acoustic surveying during EXTREME24 on the RV Kronprins Haakon will be conducted using the six scientific Simrad EK80 echo sounders, all mounted on the drop keel, and simultaneously operated from a common computer. These are the 18kHz, 38kHz, 70kHz, 120kHz, 200kHz, 333kHz split beam systems. The EK80 was operated with no other acoustic systems and pinging at maximum ping rate.

6.3.4.2 Analysis protocol

Taxonomic identification and counting procedure

Initial microscopic analysis was conducted using Leica M125 C Encoded Stereo Microscopes. Magnification ranges from 8x to 100x. The aim was to examine morphological characteristics and determine the abundance of each species and sample. A basic marine zooplankton identification guide was used to confirm the identification of each species and define their characteristics. Once a specimen is identified to a broad taxonomic group, there are more detailed guides available to identify Arctic marine zooplankton to species level.

6.4 SAGE

6.4.1 ROV Integration

SAGE was installed in the rear basket of the ROV Aurora. SAGE was plumbed to pull water from the side of the ROV, beneath the thrusters. In this mounting position, SAGE measures methane further back from the main ‘action’ of the ROV at the front where sampling activities may take place (like collecting push cores). On this cruise, Beckett Colson and Scott Wieman operated the sensor. As the sensor is still under active development, and requires continuous supervision from the ROV control container, so Scott and Beckett took shifts monitoring it.

Figure 11. Left: Location of the rear basket on the ROV Aurora. Right: SAGE mounted in the basket.

6.4.2 ROV dives

SAGE was used on ROV dives 22, and 28 through 37. Upon diving during ROV 22, a ground fault was detected coming from SAGE. We disassembled SAGE and discovered that the laser inside SAGE was not properly isolated from the instrument chassis. We added the necessary electrical isolation and resolved the ground fault. After solving this issue, SAGE remained installed on the ROV for the remainder of the cruise.

Figure 12. Careful disassembly of SAGE at sea, using ratchet straps to keep the instrument steady.

6.5 MISO camera

6.5.1 ROV integration and dives

Several mounting configurations were used for the MISO camera to strike the best balance between mitigating the risk of bumping the camera with the ROV arms during sampling operations and acquiring the best images. The MISO camera was used on ROV dives 23-26, 30, 32-35, and 37.

For ROV dive 23, the imaging sled was used on the ROV and MISO camera could be mounted low on the vehicle. For all other dives, the MISO camera was mounted high on the vehicle to accommodate sampling activities with the arms. Overall, the best imagery quality was achieved on dive 23 where the camera was mounted low on the ROV and relatively far away from the lights.

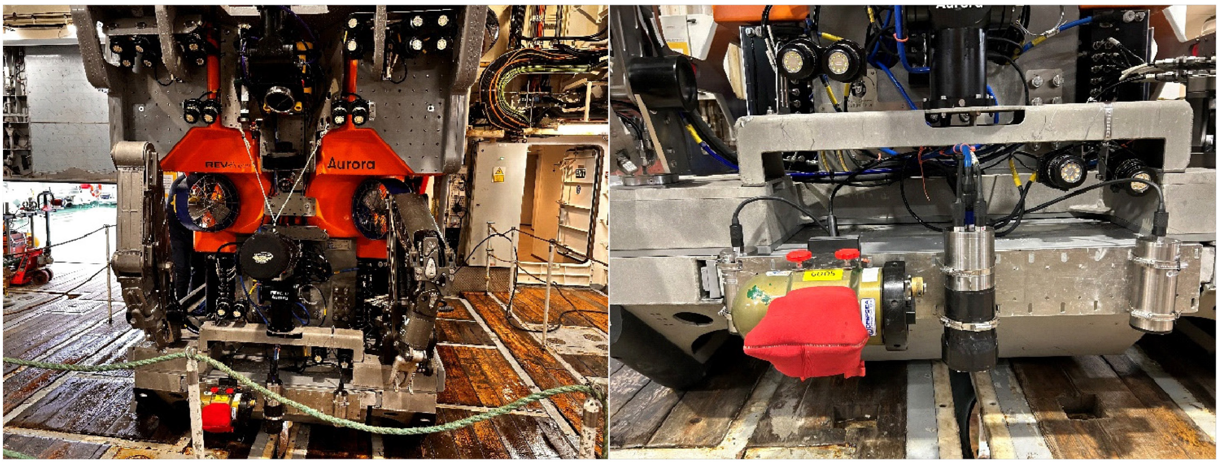


Figure 13. Left: Low MISO camera mounting position (only dive 23), showing the full vehicle. The MISO camera has a red lens cover on it and is located at the bottom of the vehicle. Right: Close-up of the MISO camera next to the ROV's camera and strobes.

Figure 14. Left: High MISO camera mounting position, showing the full vehicle. Right: MISO camera position, showing angling of the camera downwards to better capture the seafloor. The angle of tilt was adjusted throughout the deployment process to optimize the view of the seafloor.

7 Maps of the study site

7.1 SS13 (Outer Bjørnøyrenna (Borealis)) map

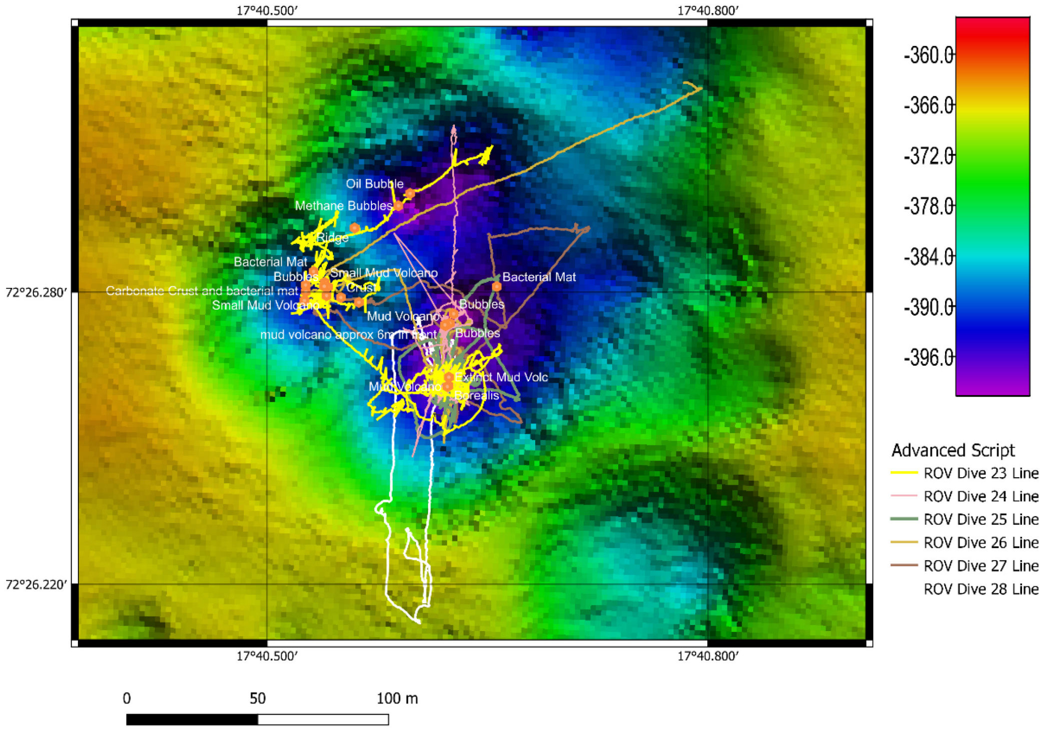


Figure 15. General map of SuperStation13 illustrating ROV23 to ROV28 survey area.

7.2 SS14 (Outer Bjørnøyrenna (Tvillingen)) map

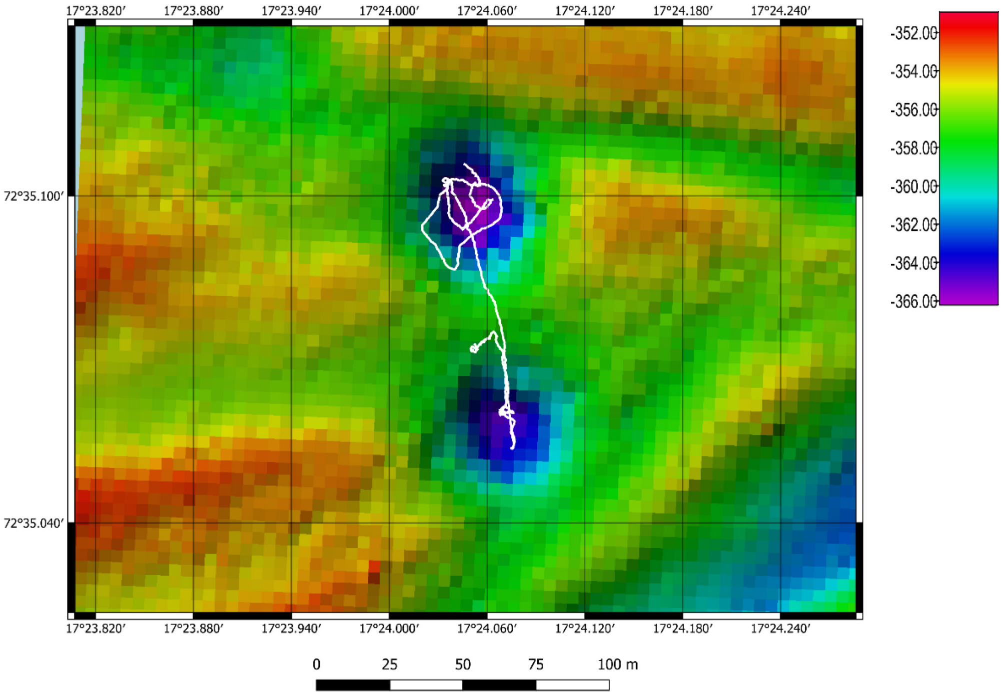


Figure 16. General map of SuperStation14 illustrating ROV29 survey area.

7.3 SS15 (Outer Bjørnøyrenna (Kassiopeia)) map

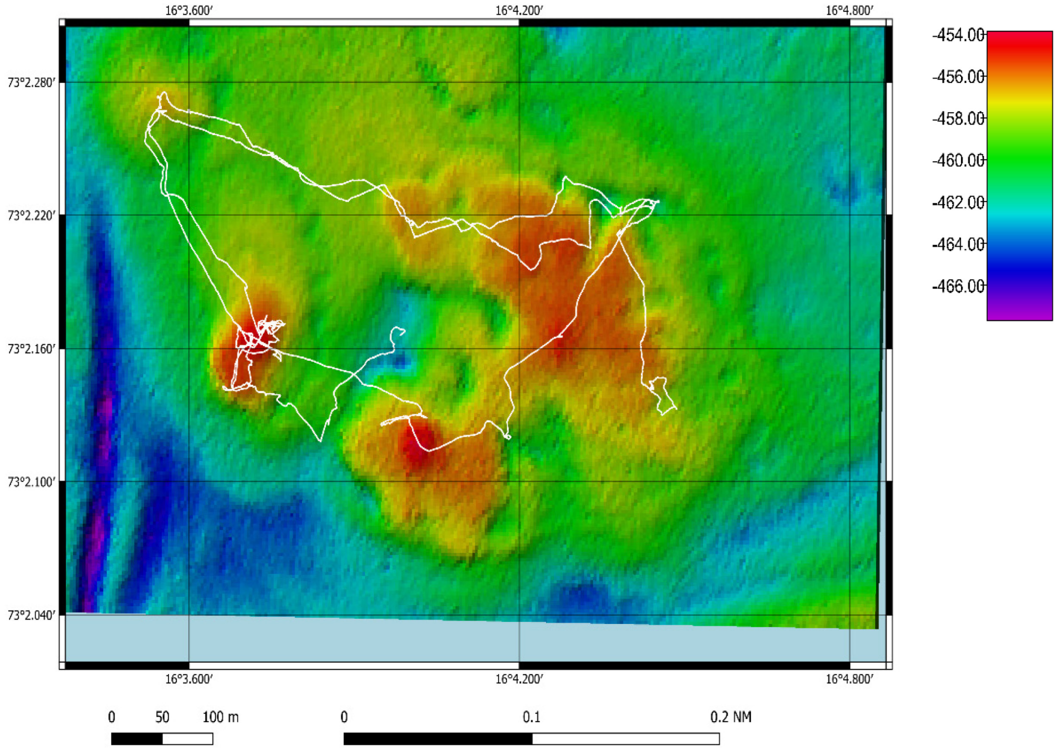


Figure 17. General map of SuperStation15 illustrating ROV30 survey area.

7.4 SS15-2 (Outer Bjørnøyrenna (Dragen)) map

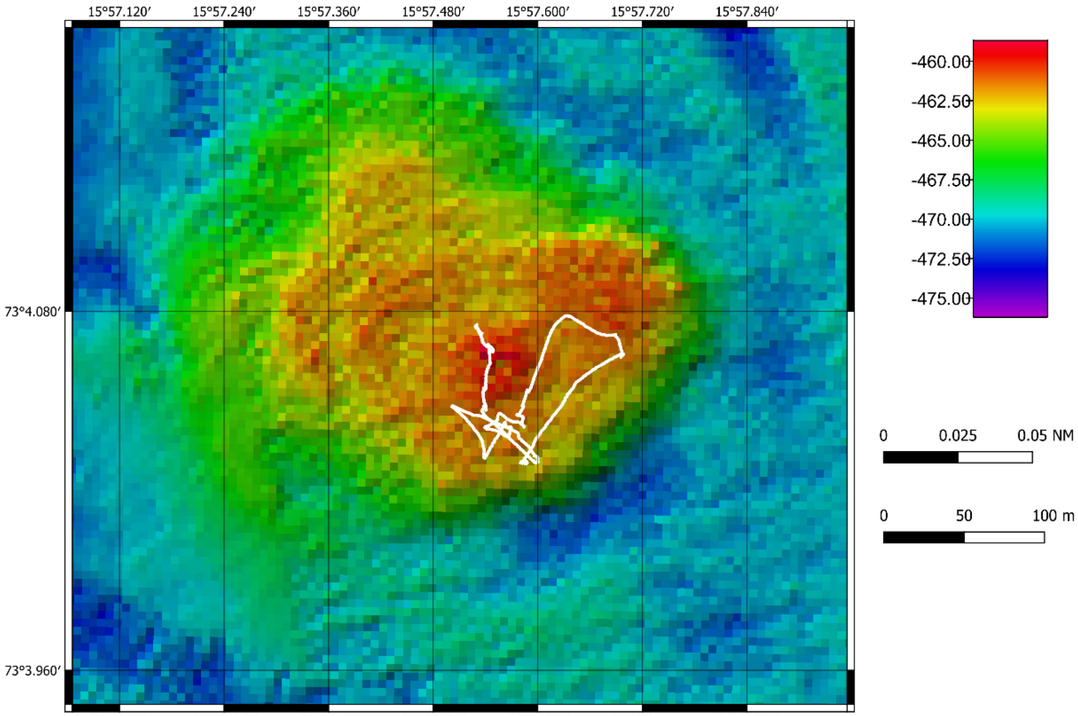


Figure 18. General map of SuperStation5-2 illustrating ROV31 survey area.

7.5 SS15-3 (Outer Bjørnøyrenna (Svanen)) map

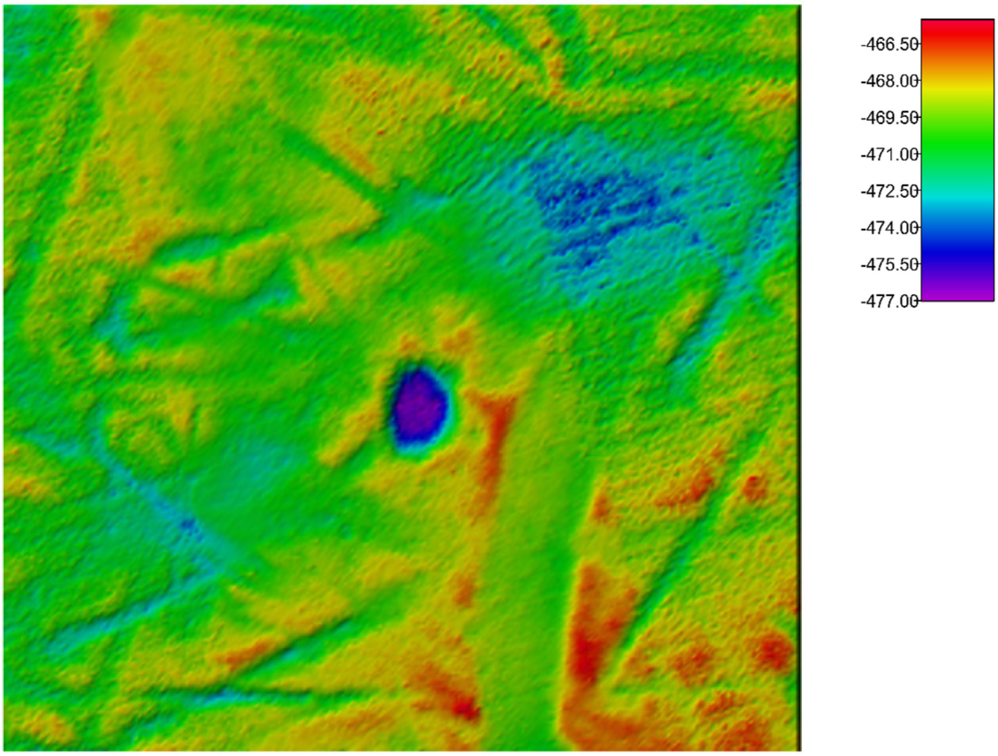


Figure 19. General map of SuperStation15-3.

7.6 SS15-4 (Outer Bjørnøyrenna (Persevs)) map

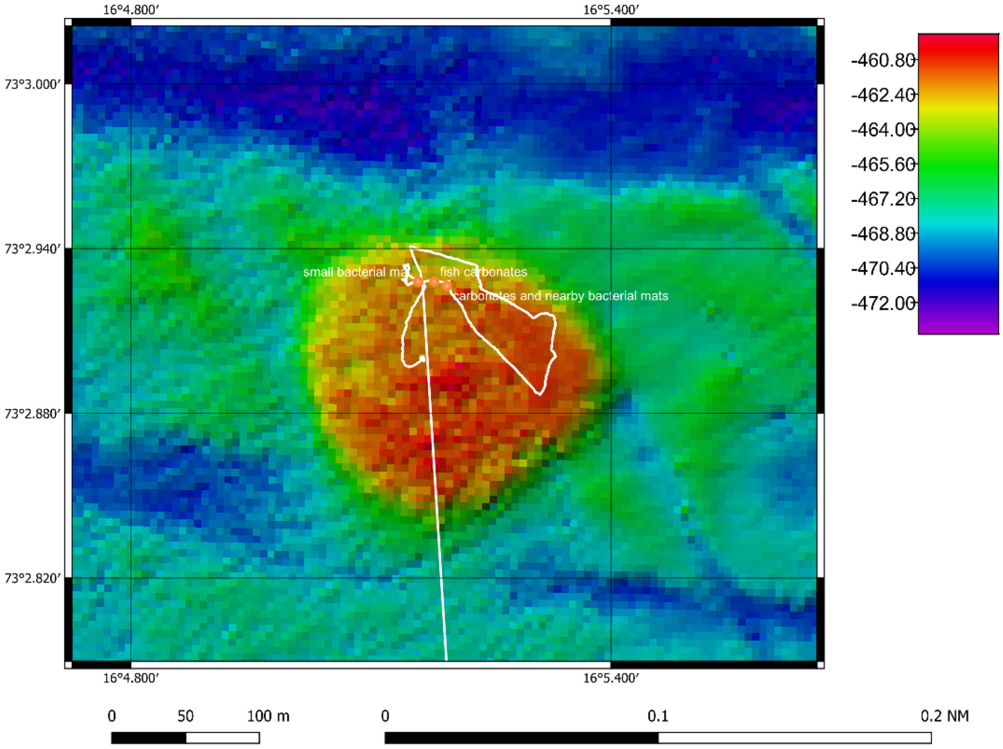


Figure 20. General map of SuperStation15-4 illustrating ROV32 survey area.

7.7 SS15-5 (Outer Bjørnøyrenna (Kefeus)) map

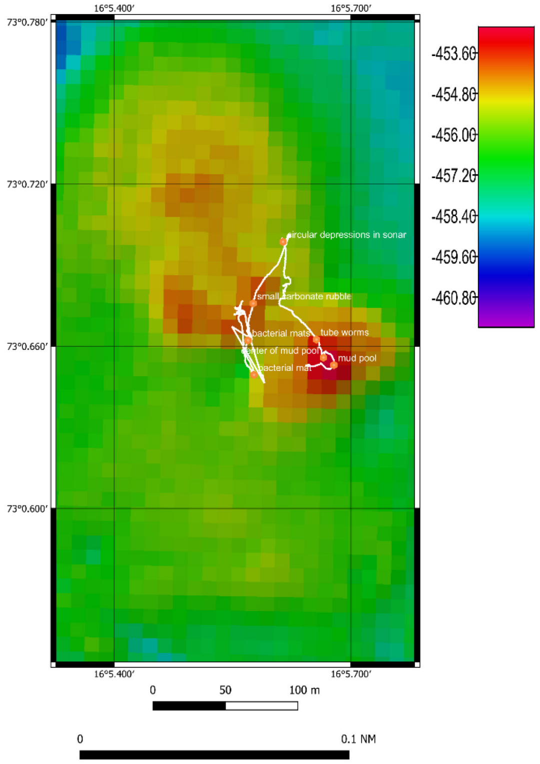


Figure 21. General map of SuperStation15-5 illustrating ROV33 survey area.

7.8 SS15-6 (Outer Bjørnøyrenna (Karlsvogna)) map

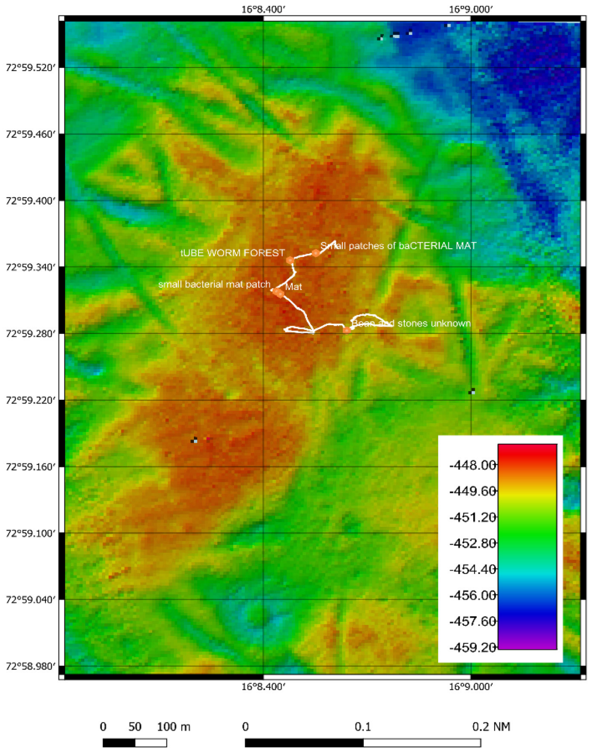


Figure 22. General map of SuperStation15-6 illustrating ROV34 survey area.

7.9 SS15-7 (Outer Bjørnøyrenna (Kusken)) map

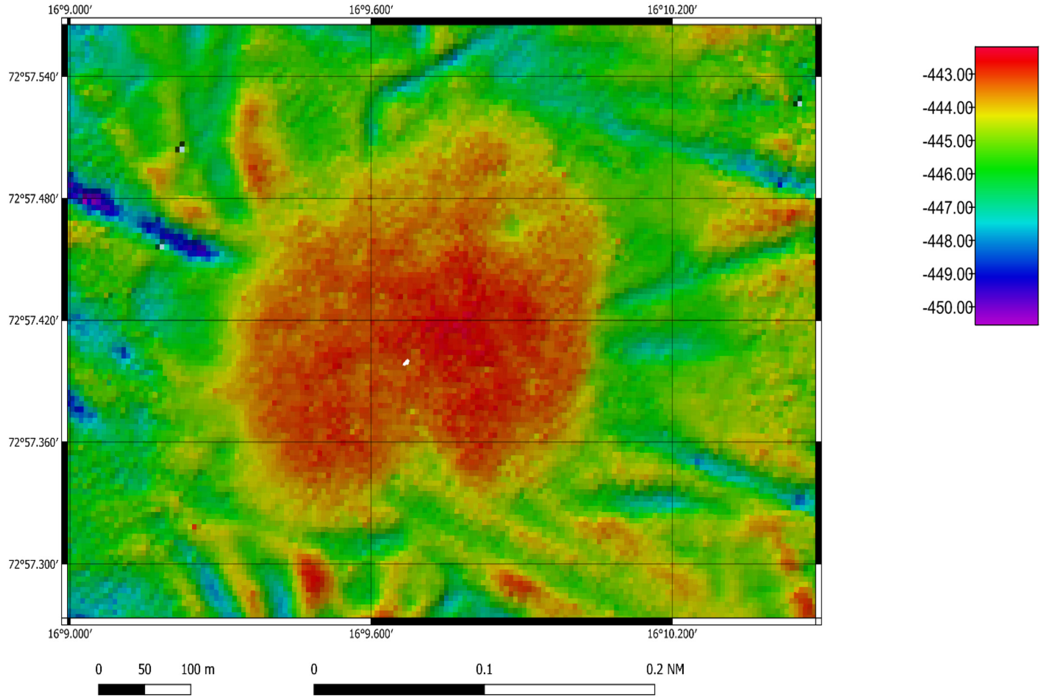


Figure 23. General map of SuperStation15-7.

7.10 SS15-8 (Outer Bjørnøyrenna (Lillebjørn)) map

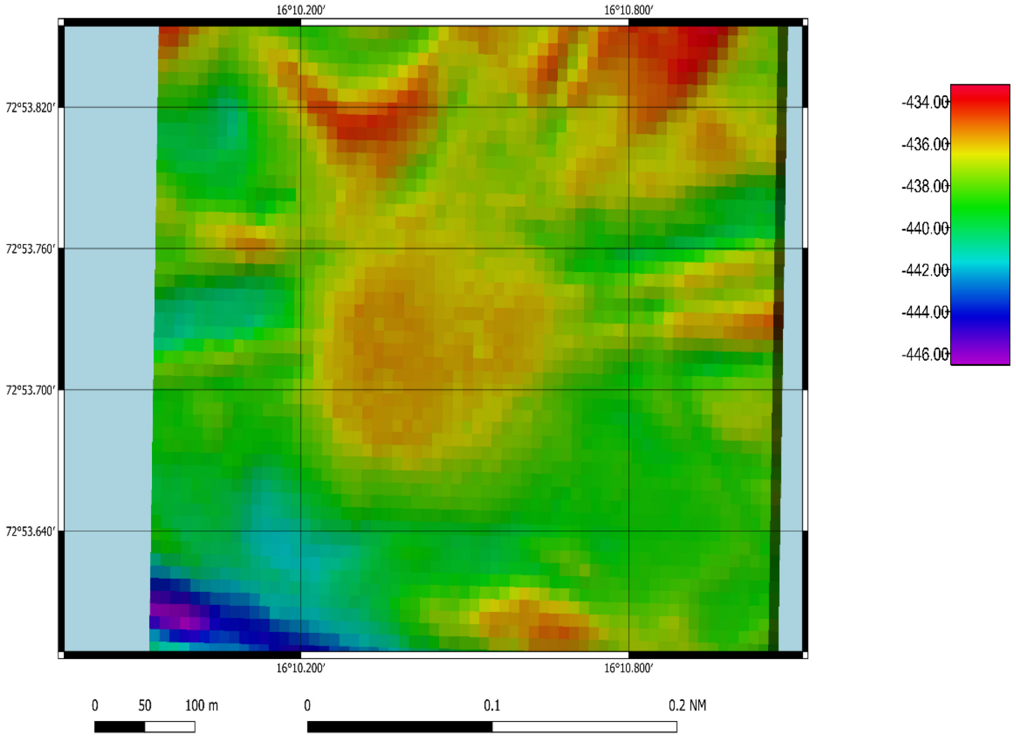


Figure 24. General map of SuperStation15-8.

7.11 SS16 (Salt Dome (Tromsøflaket)) map

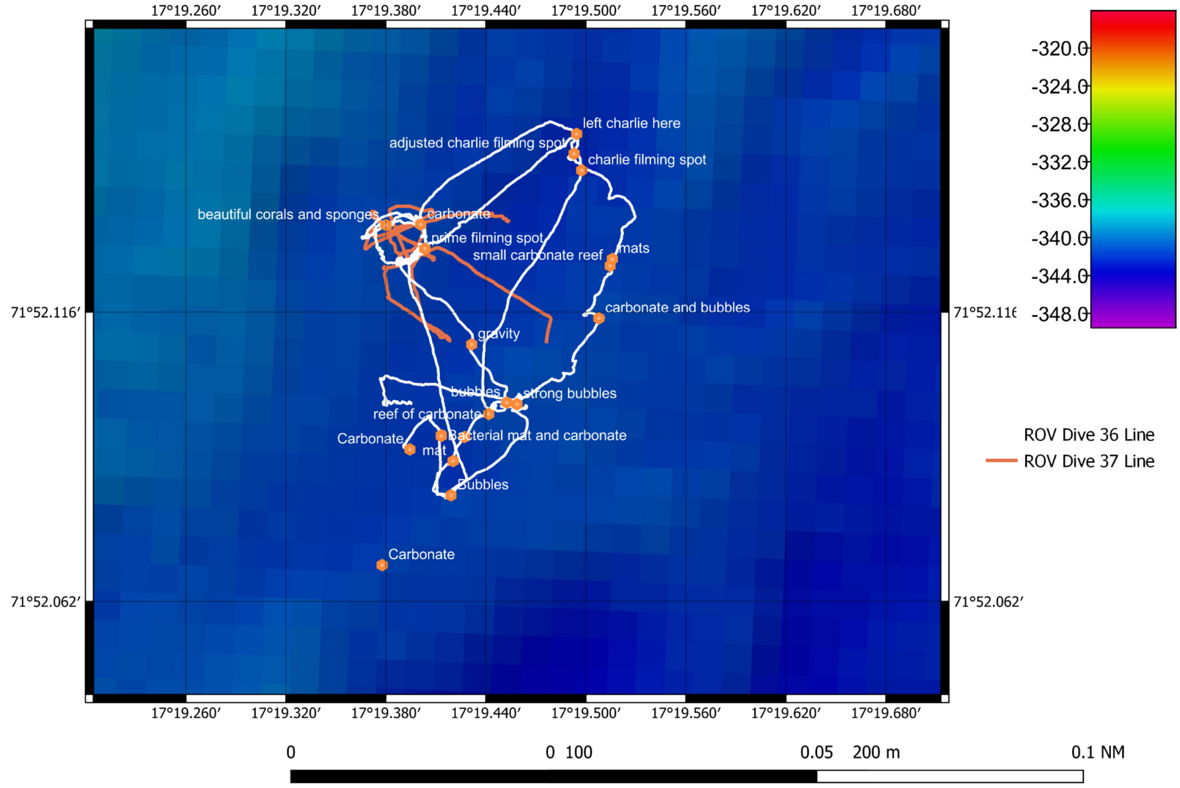


Figure 25. General map of SuperStation16 illustrating ROV36 and ROV37 survey area.

7.12 Examples of water column data interpretations done on board that guided the ROV dives.

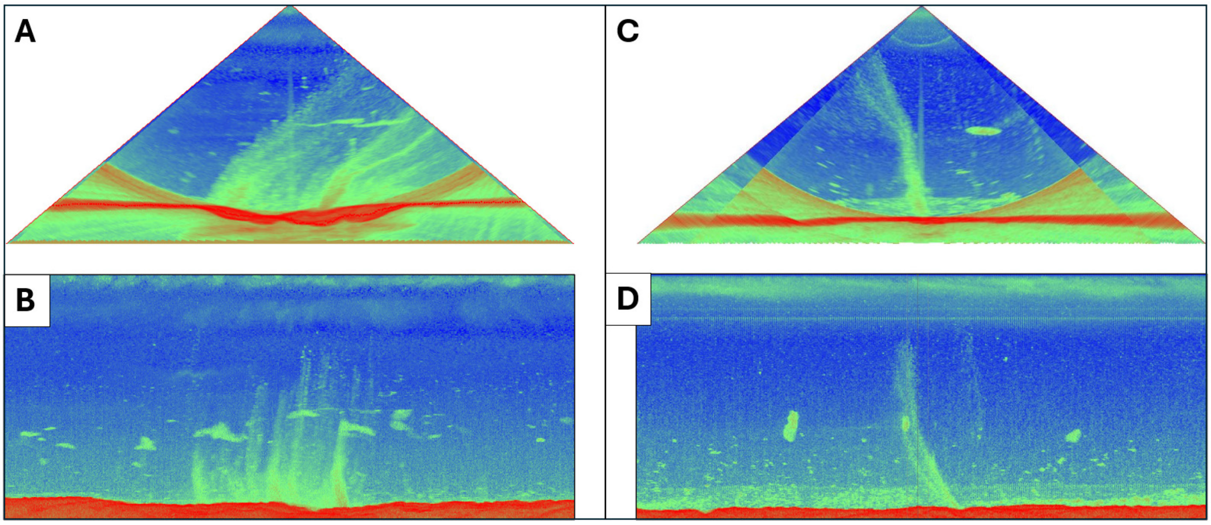


Figure 26. A, B) WCD-line 0003 (EM710) from the Borealis seep site. A) Fan view of gas flares in the water column at the site of Dive 23 to 28. Notice depression at seafloor at the location of the largest flare. «Biological noise» in the water column most likely represents fish. B) R-Stack along ship track crossing the Borealis seep site. Water depth: ~380 mbsl. C, D) WCD-line 0042 (EM710) from the Tvillingen seep site.

C) Fan view of gas flare in the water column at the site of Dive 29. D) R-Stack along ship track crossing the Tvillingen seep site. Water depth: ~355 mbsl.

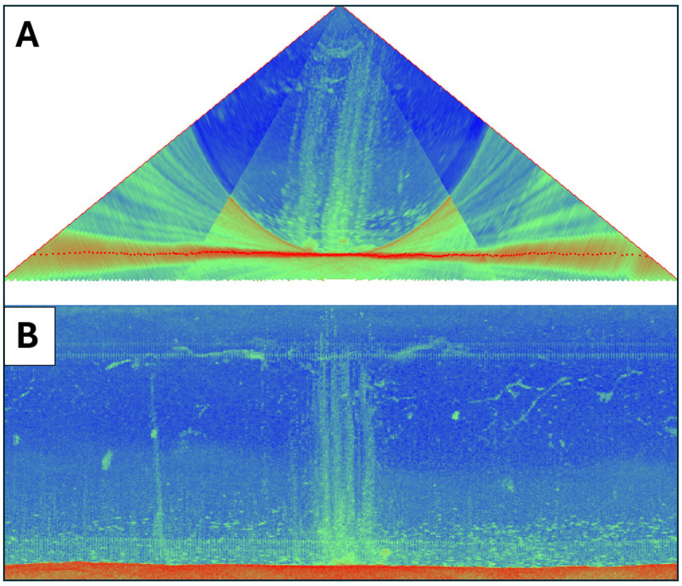


Figure 27. A, B) WCD-line 0125 (EM710) from the Tromsøflaket seep site. A) Fan view of gas flares in the water column at the site of Dive 36 and 37. B) R-Stack along a ship track crossing the Tromsøflaket seep site. Water depth: ~330 mbsl.

8 Media and Outreach

8.1 Media (by Jørn Berger-Nyvoll)

Due to a contract with the English broadcasting company BBC, the research expedition had some limitations on what could be communicated during and immediately after the expedition. These limitations are outlined in the contract between UiT The Arctic University of Norway and the BBC. At the beginning of the expedition, the expedition leadership expressed a wish for participants to exercise caution in what was communicated to the public.

With that background, I looked for alternative stories and focused on gathering documentation, both in the form of still images and video. Initially, I chose to concentrate on the bigger picture, documenting the work onboard the ship during an expedition. This includes documenting all the work from microscopy, sampling, various laboratory work, discussions, and briefings, as well as managing underwater vehicles and working with core samples on deck. Additionally, I chose to take portrait photos of the participants for later use.

In summary, during the expedition, 1,308 still images and 84.6 GB of video were collected. Some of the still images will be made available in UiT's media archive. The videos will be stored for later use, and two news articles have been published on Instagram, UiT.no, and one has been shared by the Norwegian Polar Institute.

https://uit.no/news/article?p_document_id=848296

https://uit.no/news/article?p_document_id=848591

8.2 HUB Ocean (by Jo Øvstaas)

As a representative of the non-profit foundation HUB Ocean, my participation in the Extreme24 research cruise was a significant step towards fulfilling our mission to gain a deeper understanding of ocean science in real-life settings. This hands-on experience was instrumental in validating and enhancing our knowledge, which is crucial for the development of the Ocean Data Platform. During the cruise, I had the opportunity to ask insightful questions, observe various experiments and operations, and engage with leading scientists and technicians. This exposure allowed me to validate and correct many of our ideas concerning data flows, data types, data volumes, and the balance between automated and manual workflows. These insights are essential as we aim to optimize our data collection processes and improve our platform's functionality. One of the highlights of the cruise was gaining a much deeper understanding of the various sensor types used in ocean research. I learned about multibeam sonars, echosounders, sub-bottom profilers, ROVs, seabed landers, corers, CTDs, gas samplers, and more. Each of these instruments plays a vital role in collecting precise and comprehensive ocean data, and understanding their capabilities and limitations is key to our work. Our intention with this work is to leverage the new knowledge gained during the cruise when building the Ocean Data Platform. We are collaborating closely with REV Ocean on their data collection and data infrastructure to scale some of these concepts into various applications, including expedition yachts, commercial ships, racing sailboats, and citizen science initiatives. By integrating these advanced data collection techniques and technologies, we aim to enhance the scope and accuracy of ocean data available for research and conservation efforts.

8.3 Visual Artist (by Martina O’Brien)

As a visual artist, I have closely monitored advancements in seabed research for the last number of years. It was therefore a tremendous opportunity for me to participate in this survey given EXTREME 24 Expedition’s aims were, amongst many critical scientific research endeavours, to increase public awareness globally, and in turn, inform policy making in the Arctic region. In addition, the unique opportunity as an artist to engage with such a multidisciplinary international team of students and scientists, studying this region’s complex marine environment from many different angles was a truly profound experience. Most significantly, it has laid the foundations for further future engagement and collaboration with these experts.

From the outset, my main objective during this residency was to take the opportunity to monitor as many of the scientific procedures taking place aboard as possible. In particular, I had the opportunity to witness a large variety of biological sampling procedures of both macro and micro foraminifera, with Mari Eilertsen and Jan Pawlowski, that took place as a result of individual dives at multiple locations over the course of the cruise. In addition, the opportunity to witness digital microscopy work being undertaken on these specimens in real-time was also of significant interest to me. Further, I also closely monitored the various procedures involved in processing cores, multicores, gravity cores and blade cores with Inés Angeles and the team. The materiality of the equipment, sediments and geological cores too have been significant to me and will play a significant role in my project’s outcome.

Post expedition is when the real work will start for me where I will begin the process of unpacking research, imagery and film gathered and allow for concrete ideas to take shape. The findings of this residency will go towards a major solo exhibition in Lexicon Municipal Gallery, Dublin, in February 2025, and it is envisaged that these new artworks will seek to create a conceptual shift in our relationship with the ocean, offering a novel perspective on findings and shed light on this distant marine environment confronting imminent human impact.

9 Data management

All the data collected during this expedition and work in progress will be deposited at the UiT Dataverse. Geographical species records of fauna will be deposited in Artskart (https://artskart.artsdatabanken.no) and in GBIF (https://www.gbif.org). DNA barcodes of fauna will be deposited in BOLD Public Data Portal (www.boldsystems.org) and in NCBI GenBank (https://www.ncbi.nlm.nih.gov/genbank/).

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12 Appendix

12.1 Table II. Expedition logs.

Date	**Location**	**Activities**	**Notes**
21st May, 2024	Longybearn, Svalbard	Pick up UiT mooring team; shore visit by scientists. Interviews, filming and photography by Communications Teams.	End of Leg 1 and start of Leg 2
22nd May, 2024	Transit to mooring site, mooring deployed, continue transit to Tromsø	Mooring deployment. Interviews, filming and photography by Communications Teams.	
23rd May, 2024	Transit to Tromsø	Interviews, filming and photography by Communications Teams.	
24th May, 2024	Arrival in Tromsø 69° 40.7234'N 18° 59.2140'E.	Leg 1 participants offboarding, Leg 2 participants boarding vessel, unpacking equipment, safety briefings and science presentation of all the team ROV Test (Dive 21)	Departure delayed because of awaiting spare parts for connecting BBC camera and ROV
25th May, 2024	Transit to Superstation 1 – Outer Bjørnøyrenna (Borealis)	ROV Dive on Borealis (Dive 22 aborted, 23 mosaic), training on ROV logging, CTD for sound velocity	Start of the operations delayed because of weather condition during the transit that slowed the steaming. ROV slightly delayed because of SAGE interfering with ROV system

27th May, 2024	Outer Bjørnøyrenna (Borealis)	ROV Dive on Borealis (Dive 27, 28), training on ROV logging, SAGE sensor, Charley deployment, CTD for sound velocity, 1 reference multicore, 6 plankton nets	Samples collection with ROV very difficult because of seafloor condition.
28th May, 2024	Outer Bjørnøyrenna (Kassiopeia)	ROV Dive 30 and GC on Kassiopeia, training on ROV logging, SAGE sensor	
29th May, 2024	Outer Bjørnøyrenna (Dragen, Svanen, Persevs, Kefeus, Karlsvogna, Kusken, Lillebjørn)	ROV Dive on Dragen, Persevs, Kefeus, Karlsvogna with SAGE and MISO camera. Camera video survey on Kusken and Lillebjørn Gravity on Dragen, Svanen, Persevs, Kefeus, Karlsvogna, Kusken and Lillebjørn. Box coring (Lillebjørn), Multicoring (Lillebjorn) and gravity coring (all volcanoes)	While starting the 5th Dive the winch had a ground fault with a low level of oil and we had to abort the dive. We continue the video survey of the last two volcanoes with a UiT rigged camera.
30th May, 2024	Salt Dome	ROV Dive for methane and carbonate sampling, SAGE, MISO and BBC camera. Several evening presentations	
31st May, 2024	Arrival in Tromsø	Disembarking most scientists and the engineers; left Tromsø for transit to Stavanger at around noon.	
1st June, 2024	Transit	Multibeam over abandoned wells.	9.39 Blackout during engine testing at 95% power. Restarted at 11.00.
2nd June, 2024	Two shipwrecks visited during the night and the evening.	ROV Dives with BBC camera mounted on. Multibeam.	

3rd June, 2024	Transit	Multibeam over abandoned wells.	
4th June, 2024	Arrival in Stavanger		End of Leg 2.

12.3 Table III. Leg 1 and Leg 2 sediment samples collected with the ROV and environmental information.

SuperStation name	Date	Sample ID	Latitude (DD)	Longitude (DD)	Depth (m)	Environment
Site 78-48	07.05.2024	IG24-5-KH-03_ROV06-PusC-C3	74.7990	8.4682	2999	Sediment with jelly ball batch
Site 78-48	07.05.2024	IG24-5-KH-03_ROV06-PusC-C2	74.8040	8.4809	2999	Sediment with bivalves
Site 78-48	07.05.2024	IG24-5-KH-03_ROV06-PusC-C1	74.8040	8.4809	2999	Sediment with bivalves
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C2	74.7530	8.3446	2838	Sediment with anemone
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C3	74.7460	8.3311	2755	Sediment with crinoid
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C5	74.7460	8.3309	2755	Sediment with crinoid
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C6	74.7445	8.3267	2829	N/A
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C7	74.7479	8.3374	2770	Forams accumulated at the back of sponge
Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-C8	74.7479	8.4338	2770	Sediment with sea star

Site 78-48	08.05.2024	IG24-5-KH-03_ROV07-PusC-B-red	74.7528	8.3444	2836	Sediment
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C1	76.5865	7.0624	2596	Sediment close to pillow lava
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C2	76.5791	7.1095	3632	Muddy sediment with bioturbation
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C3	76.5883	7.0626	2601	Sediment close to pillow lava
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C4	76.5791	7.1095	2631	Muddy sediment with bioturbation
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C5	76.5087	7.1045	2754	Muddy sediment (with tube worm?)
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C6	76.5791	7.1111	2585	Muddy sediment
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C7	76.5807	7.1045	2754	Muddy sediment (with tube worm?)
Site 76.8	09.05.2024	IG24-5-KH-04_ROV08-PusC-C8	76.5791	7.1111	2585	Muddy sediment
Site 76.8	11.05.2024	IG24-5-KH-04_ROV09-PusC-C4	76.8279	7.3349	3233	Sediment with crinoid

Site 76.8	11.05.2024	IG24-5-KH-04_ROV09-PusC-C2	76.8289	7.3626	3235	Next to old chimney
Site 76.8	11.05.2024	IG24-5-KH-04_ROV09-PusC-C6	76.8289	7.3346	3233	Sediment
Site 76.8	11.05.2024	IG24-5-KH-04_ROV09-PusC-C8	76.8253	7.3299	3256	Sediment (with tube worms?)
Site 76.8	11.05.2024	IG24-5-KH-04_ROV09-Scoo-01	76.8289	7.3328	3235	Mix with wood fragments
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-BlaC-01	77.4407	7.7094	2999	Bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-B-blue	77.4307	7.7094	2999	Bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C8	77.4403	7.7096	2998	Tubular structure inside bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C6	77.4406	7.7096	2999	Outside bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C4	77.4410	7.7104	2999	Next to the bacterial mat and tube worms
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C7	77.4403	7.7094	2997	Tubular structure outside bacterial mat

Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C3	77.4406	7.7096	2999	Outside bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-C5	77.4407	7.7095	2998	Bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-B-red	77.4407	7.7095	2998	Bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-PortACC	77.4399	7.7093	2998	Bacterial mat
Jotul vent site	12.05.2024	IG24-5-KH-06_ROV10-PusC-STBDACC	77.4399	7.7094	2998	White surface retained
Jotul vent site	13.05.2024	IG24-5-KH-06-Scoo-ROV11-01	77.4398	7.7096	2972	Mix
Jotul vent site	13.05.2024	IG24-5-KH-06-PusC-ROV11-C2	77.4374	7.7031	3014	Tube worms
Jotul vent site	13.05.2024	IG24-5-KH-06-PusC-ROV11-C3	77.4374	7.7031	3014	Tube worms
Jotul vent site	13.05.2024	IG24-5-KH-06-PusC-ROV11-C7	77.2624	7.4211	3009	Sediment
Jotul vent site	13.05.2024	IG24-5-KH-06-PusC-ROV11-C8	77.2624	7.4211	3009	Sediment
Jotul vent site	13.05.2024	IG24-5-KH-06-SuSa-ROV11-01	77.4373	7.7022	3052	On small white chimney (Barite)

77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-BlaC-01	77.6008	7.7577	3176	Sediment
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-PusC-C1	77.6008	7.7577	3176	Sediment
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-PusC-C2	77.5991	7.7668	3290	Sediment with crinoid
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-PusC-C7	77.5982	7.7753	3147	Sediment
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-PusC-C8	77.5900	7.8310	3149	Sediment with crinoid and anemone
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-PusC-C4	77.5969	7.7841	3142	Sediment with anemone
77-40 vent site	15.05.2024	IG24-5-KH-08_ROV14-SuSa-01	77.5985	7.7706	3099	Rock
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-C3	77.6592	7.7572	3460	Sediment
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-C5	77.6890	7.7571	3460	Sediment
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-C6	77.6691	7.7666	3500	Sediment inside a hole
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-C7	77.6691	7.7666	3500	Sediment close to a sponge

77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-B2	77.6678	7.7650	3502	Sediment inside a hole
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-B1	77.6678	7.7651	3504	On the rim of a hole
77-40 vent site	16.05.2024	IG24-5-KH-08_ROV15-PusC-ACC	77.6658	7.7631	3492	On the rim of a hole
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-B1	78.3903	5.0872	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-BlaC-01	78.3903	5.0872	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C1	78.3911	5.0887	1994	Sediment with anemone
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C3	78.3931	5.0887	1994	Sediment with anemone
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C4	78.3903	5.0872	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C5	78.3931	5.0887	1994	Sediment with anemone
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C6	78.3903	5.0872	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C7	78.3931	5.0887	1994	Sediment with anemone

Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C8	78.3903	5.0887	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-B2	78.3903	5.0872	1969	Tube worms with bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-PusC-C2	78.3903	5.0872	1969	Bacterial mat
Svyatogor ridge	17.05.2024	IG24-5-KH-09_ROV16-Scoo-01	78.3921	5.0855	1935	Mix
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-BlaC-01	79.6143	3.6563	3573	Sediment with carbonate
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C1	79.6142	3.6569	3571	Sediment close to bacterial mat
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C2	79, 6144	3.6558	3573	Dark sediment
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C3	79.6142	3.6570	3571	Bacterial mat
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C4	79.6141	3.6579	3573	Tube worms
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C5	79.6141	3.6577	3570	Dark sediment
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C6	79.6141	3.6579	3573	Tube worms

Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-PusC-C8	79.6141	3.6579	3573	Tube worms
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-Scoo-02	79.6141	3.6579	3574	Mix
Molloy deep gas flares	18.05.2024	IG24-5-KH-10_ROV17-Scoo-03	79.6130	3.6617	3574	Mix
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C7	79.6139	3.6563	3574	Sediment
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-Scoo-01	79.6139	3.6563	3574	Mix
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-Scoo-02	79.6144	3.6584	3573	Mix
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-Scoo-03	79.6139	3.6563	3574	Mix
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C2	79.6144	3.6584	3573	Tube worms
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C8	79.6143	3.6569	3575	Sediment with starfish
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C1	79.6139	3.6563	3574	Sediment
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C4	79.6139	3.6563	3574	Sediment

Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C5	79.6143	3.6569	3575	Sediment with starfish
Molloy deep gas flares	19.05.2024	IG24-5-KH-10_ROV19-PusC-C6	79.6139	3.6563	3574	Sediment
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-BlaC-01	72.4379	17.6772	396	Bacterial mat
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-B2	72.4377	17.677	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-B1	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C1	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C2	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C3	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C4	72.4377	17.677	396	Borealis main gryphon

Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C5	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C7	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	26.05.2024	IG24-5-KH-13_ROV26-PusC-C8	72.4377	17.677	396	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV27-BlaC-03	72.4379	17.6755	394	Bacterial mat
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV27-BlaC-02	72.4378	17.6769	390	Tube worms
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV27-Scoo-01	72.4378	17.6769	390	Tube worms
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV27-PusC-B1	72.4381	17, 678606	385	Bacterial mat
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-BlaC-01	72.4378	17.6762	397	Borealis main gryphon

Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-B1	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C1	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C2	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C3	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C8	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C7	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Borealis)	27.05.2024	IG24-5-KH-13_ROV28-PusC-C6	72.4378	17.6762	397	Borealis main gryphon
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-BlaC-03	73.0359	16.0635	452	Tube worms

Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C7	73.0379	16.0606	454	Edge of the mud pool
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C6	73.0376	16.0605	454	Edge of the mud pool
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C5	73.0376	16.0605	454	Edge of the mud pool
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C4	73.0376	16.0605	454	N/A
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C3	73.0376	16.0605	454	Tube worms
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-B1	73.0376	16.0605	454	Tube worms with bacterial mat
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-B2	73.0371	16.0716	459	Tube worms with bacterial mat
Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C2	73.0371	16.0716	459	Tube worms with bacterial mat

Outer Bjørnøyrenna (Kassiopeia)	28.05.2024	IG24-5-KH-15_ROV30-PusC-C1	73.0367	16.0725	461	Tube worms with bacterial mat
Outer Bjørnøyrenna (Dragen)	29.05.2024	IG24-5-KH-15_2_ROV31-PusC-B1	73.0671	15.9601	457	Bacterial mat
Outer Bjørnøyrenna (Persevs)	29.05.2024	IG24-5-KH-15_4_ROV32-BlaC-03	73.0487	16.0862	460	Bacterial mat
Outer Bjørnøyrenna (Kefeus)	29.05.2024	IG24-5-KH-15_5_ROV33-PusC-B1	73.0108	16.0944	449	Inside the mud pool

12.4 Table IV. Complete station log.

SuperStation name	Tool	Sample ID	Date	Latitude (DD)	Longitude (DD)	Depth (m)	Comments
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-01	05.05.2024	73.6265	11.2306	2077	Mud stuck to liners was combined for foram analysis
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-02	05.05.2024	73.6265	11.2306	2076	Empty
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_001_0-42	05.05.2024	73.6265	11.2306	2075	eDNA, geochemistry, forams and archive
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_002_0-42	05.05.2024	73.6265	11.2306	2075	eDNA, geochemistry, forams and archive
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_003	05.05.2024	73.6265	11.2306	2075	Liner lost during deployment
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_004_0-64	05.05.2024	73.6265	11.2306	2075	eDNA, geochemistry, forams and outreach
Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_005_0-64	05.05.2024	73.6265	11.2306	2075	Outreach from bio-lab leftover

Dumshaff Abyssal plain	Multi Core	IG24-5-KH-02-MC-03_006_0-54	05.05.2024	73.6265	11.2306	2075	Archive
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_001_0-54	06.05.2024	74.7942	8.3872	3368	eDNA, geochemistry, forams and archive
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_002_0-63	06.05.2024	74.7942	8.3872	3368	eDNA, geochemistry and forams
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_003_0-	06.05.2024	74.7942	8.3872	3368	Living forams, geochemistry, forams, archive and outreach
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_004_0-	06.05.2024	74.7942	8.3872	3368	Archive
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_005	06.05.2024	74.7942	8.3872	3368	Outreach from bio-lab leftover
Site 78-48	Multi Core	IG24-5-KH-03-MC-04_006_0-	06.05.2024	74.7942	8.3872	3368	eDNA, living forams, geochemistry, forams and archive
Site 78-48	Gravity Core	IG24-5-KH-03-GC-01	06.05.2024	74.7942	8.3872	3363	

Site 78-48	Gravity Core	IG24-5-KH-03-GC-01_#2_0-106_Archive	06.05.2024	74.7942	8.3872	3363	
Site 78-48	Gravity Core	IG24-5-KH-03-GC-01_#1_106-206_Archive	06.05.2024	74.7942	8.3872	3363	
Site 78-48	Gravity Core	IG24-5-KH-03-GC-01_CoreCatcher	06.05.2024	74.7942	8.3872	3363	
Site 76.8	ROV Rock Collection	IG24-5-KH-04_ROV08-RocC-01	09.05.2024	76.5791	7.1111	2601	Pillow lava
BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-01	11.05.2024	77.0390	7.7128	2895	Failed-empty
BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-02	11.05.2024	77.0394	7.7135	2896	
BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-02_spoon-01	11.05.2024	77.0394	7.7135	2896	DNA
BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-02_Syringe-A	11.05.2024	77.0394	7.7135	2896	Forams

BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-02_Syringe-B	11.05.2024	77.0394	7.7135	2896	Forams
BoxCore in Site 76.8	Box Core	IG24-5-KH-05-BC-02_Syringe-C	11.05.2024	77.0394	7.7135	2896	Geochemistry
Jotul vent site	Box Core	IG24-5-KH-06-BC-03	12.05.2024	77.4678	7.6811	3184	Failed-empty
Jotul vent site	Box Core	IG24-5-KH-06-BC-04	12.05.2024	77.4683	7.6826	3192	
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_spoon_01	12.05.2024	77.4683	7.6826	3192	DNA
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_spoon_02	12.05.2024	77.4683	7.6826	3192	DNA
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_spoon_03	12.05.2024	77.4683	7.6826	3192	2 spoons for living forams and RNA (later)
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_Syringe-A	12.05.2024	77.4683	7.6826	3192	Forams

Jotul vent site	Box Core	IG24-5-KH-06-BC-04_Syringe-B	12.05.2024	77.4683	7.6826	3192	Forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_Syringe-C	12.05.2024	77.4683	7.6826	3192	Forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_Archive-01	12.05.2024	77.4683	7.6826	3192	Archive
Jotul vent site	Box Core	IG24-5-KH-06-BC-04_Outreach	12.05.2024	77.4683	7.6826	3192	Leftover for outreach
Jotul vent site	Box Core	IG24-5-KH-06-BC-05	13.05.2024	77.4277	8.0449	2312	Jotul vent site (gas flares)
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_spoon-01	13.05.2024	77.4277	8.0449	2312	Half of the left surface collected for forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_spoon-02	13.05.2024	77.4277	8.0449	2312	Other half of the left surface collected for forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_spoon-03	13.05.2024	77.4277	8.0449	2312	2 spoons for living forams

Jotul vent site	Box Core	IG24-5-KH-06-BC-05_Archive-01	13.05.2024	77.4277	8.0449	2312	Archive
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_Syringe-A	13.05.2024	77.4277	8.0449	2312	Forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_Syringe-B	13.05.2024	77.4277	8.0449	2312	Forams
Jotul vent site	Box Core	IG24-5-KH-06-BC-05_Syringe-C	13.05.2024	77.4277	8.0449	2312	Forams
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-02	13.05.2024	77.4277	8.0426	2294	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-02_#4_0-64_Archive	13.05.2024	77.4277	8.0426	2294	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-02_#3_64-164_Archive	13.05.2024	77.4277	8.0426	2294	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-02_#2_164-264_Archive	13.05.2024	77.4277	8.0426	2294	

Jotul vent site	Gravity Core	IG24-5-KH-06-GC-02_#1_264-364_Archive	13.05.2024	77.4277	8.0426	2294	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03	13.05.2024	77.4314	8.0405	2300	Jotul vent site (gas flares)
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_GasSample	13.05.2024	77.4314	8.0405	2300	Gas sample at 63, 163,263 and 363 cm
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_PoreWater	13.05.2024	77.4314	8.0405	2300	Pore water from 18 to 358cm every 20cm (No water from 198,338,358 after 24hr)
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_#4_0-63_Archive	13.05.2024	77.4314	8.0405	2300	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_#3_63-163_Archive	13.05.2024	77.4314	8.0405	2300	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_#2_163-263_Archive	13.05.2024	77.4314	8.0405	2300	
Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_#1_263-363_Archive	13.05.2024	77.4314	8.0405	2300	

Jotul vent site	Gravity Core	IG24-5-KH-06-GC-03_CoreCatcher	13.05.2024	77.4314	8.0405	2300	
77-40 vent site	Box Core	IG24-5-KH-08-BC-06	15.05.2024	77.6155	7.6370	3560	Failed-empty
77-40 vent site	Box Core	IG24-5-KH-08-BC-07	15.05.2024	77.6151	7.6369	3461	
77-40 vent site	Box Core	IG24-5-KH-08-BC-07_spoon-01	15.05.2024	77.6151	7.6369	3461	Spoon from 0-1cm for DNA
77-40 vent site	Box Core	IG24-5-KH-08-BC-07_Syringe-A	15.05.2024	77.6151	7.6369	3461	Forams
77-40 vent site	Box Core	IG24-5-KH-08-BC-07_Syringe-B	15.05.2024	77.6151	7.6369	3461	Forams
77-40 vent site	Box Core	IG24-5-KH-08-BC-07_Syringe-C	15.05.2024	77.6151	7.6369	3461	Forams
77-40 vent site	Box Core	IG24-5-KH-08-BC-07_Archive-01	15.05.2024	77.6151	7.6369	3461	Archive

77-40 vent site	Gravity Core	IG24-5-KH-08-GC-04	15.05.2024	77.6154	7.6368	3460	
77-40 vent site	Gravity Core	IG24-5-KH-08-GC-04_#3_0-105_Archive	15.05.2024	77.6154	7.6368	3460	
77-40 vent site	Gravity Core	IG24-5-KH-08-GC-04_#2_105-205_Archive	15.05.2024	77.6154	7.6368	3460	
77-40 vent site	Gravity Core	IG24-5-KH-08-GC-04_#1_205-305_Archive	15.05.2024	77.6154	7.6368	3460	
77-40 vent site	Gravity Core	IG24-5-KH-08-GC-04_CoreCatcher	15.05.2024	77.6154	7.6368	3460	
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08	17.05.2024	78.3931	5.1683	2004	
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_spoon-01	17.05.2024	78.3931	5.1683	2004	eDNA from 0-1cm
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_Archive-01	17.05.2024	78.3931	5.1683	2004	Archive

Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_Syringe-A	17.05.2024	78.3931	5.1683	2004	Forams
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_Syringe-B	17.05.2024	78.3931	5.1683	2004	Forams
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_Syringe-C	17.05.2024	78.3931	5.1683	2004	Forams
Svyatogor ridge	Box Core	IG24-5-KH-09-BC-08_Outreach	17.05.2024	78.3931	5.1683	2004	Surface archive - outreach
Molloy deep gas flares	Gravity Core	IG24-5-KH-10-GC-05	18.05.2024	79.6138	3.6592	3572	
Molloy deep gas flares	Gravity Core	IG24-5-KH-10-GC-05_PoreWater	18.05.2024	79.6138	3.6592	3572	Pore water from 24 to 104cm every 20cm
Molloy deep gas flares	Gravity Core	IG24-5-KH-10-GC-05_GasSampling	18.05.2024	79.6138	3.6592	3572	Gas sampling 14 to 94cm every 20cm
Molloy deep gas flares	Gravity Core	IG24-5-KH-10-GC-05_#1_0-114_Archive	18.05.2024	79.6138	3.6592	3572	Archive

Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09	19.05.2024	79.6145	3.5570	3747	
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_Archive-01	19.05.2024	79.6145	3.5570	3747	Archive
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_spoon-01	19.05.2024	79.6145	3.5570	3747	Living forams
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_Syringe-A	19.05.2024	79.6145	3.5570	3747	Forams
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_Syringe-B	19.05.2024	79.6145	3.5570	3747	Forams
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_Syringe-C	19.05.2024	79.6145	3.5570	3747	Forams
Molloy deep gas flares	Box Core	IG24-5-KH-10-BC-09_Outreach	19.05.2024	79.6145	3.5570	3747	Outreach
Molloy deep gas flares	Gravity Core	IG24-5-KH-10-GC-06	19.05.2024	79.6138	3.6581	3577	Failed-empty

Storfjordrenna			22.05.2024	76.1070	15.9670		Mooring deployment
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-07	26.05.2024	72.4566	17.6740	352	
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-07_#2_0-100_Archive	26.05.2024	72.4566	17.6740	352	
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-07_#1_100-140_Archive	26.05.2024	72.4566	17.6740	352	
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-08	26.05.2024	72.4210	17.6822	365	12cm is core catcher
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-08_#3_0-100_Archive	26.05.2024	72.4210	17.6822	365	
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-08_#2_100-200_Archive	26.05.2024	72.4210	17.6822	365	
Outer Bjørnøyrenna (Borealis)	Gravity Core	IG24-5-KH-13-GC-08_#1_200-239_Archive	26.05.2024	72.4210	17.6822	365	

Outer Bjørnøyrenna (Borealis)	ROV Carbonate Crust Collection	IG24-5-KH-13_ROV27-CarC-01	27.05.2024	72.4378	17.6769	381	Top layer- isotopes, dating, mineralogy, petrography, food web, fauna
Outer Bjørnøyrenna (Borealis)	ROV Carbonate Crust Collection	IG24-5-KH-13_ROV27-CarC-02	27.05.2024	72.4378	17.6769	384	Lower part- isotopes, dating, mineralogy, petrography, food web, fauna
Outer Bjørnøyrenna (Borealis)	ROV Carbonate Crust Collection	IG24-5-KH-13_ROV27-CarC-03	27.05.2024	72.4382	17.6785	386	Isotopes, dating, mineralogy, petrography, food web, fauna
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05	27.05.2024	72.4372	17.6762	365	
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_001_0-31	27.05.2024	72.4372	17.6762	365	
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_002_0-36	27.05.2024	72.4372	17.6762	365	
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_003_0-38	27.05.2024	72.4372	17.6762	365	Pore water every 2cm till 20cm, all the core is

							sliced every 1cm and archive
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_004_0-27	27.05.2024	72.4372	17.6762	365	Forams
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_005	27.05.2024	72.4372	17.6762	365	
Outer Bjørnøyrenna (Borealis)	Multi Core	IG24-5-KH-13-MC-05_006_0-27	27.05.2024	72.4372	17.6762	365	
Outer Bjørnøyrenna (Tvillingen)	ROV Carbonate Crust Collection	IG24-5-KH-14_ROV29-CarC-01	27.05.2024	72.5844	17.4012	362	Isotopes, dating, mineralogy, petrography
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-01	28.05.2024	73.0369	16.0606	456	Fauna
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-02	28.05.2024	73.0373	16.0637	456	Fauna

Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-03	28.05.2024	73.0370	16.0699	456	Fauna
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-04	28.05.2024	73.0370	16.0699	456	Fauna
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-05	28.05.2024	73.0371	16.0716	459	Fauna
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-06	28.05.2024	73.0371	16.0716	459	Fauna
Outer Bjørnøyrenna (Kassiopeia)	ROV Carbonate Crust Collection	IG24-5-KH-15_ROV30-CarC-07	28.05.2024	73.0369	16.0737	461	Fauna
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06	28.05.2024	73.0361	16.0620	455	

Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_001_	28.05.2024	73.0361	16.0620	455	Empty
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_002_0-57	28.05.2024	73.0361	16.0620	455	0-1cm eDNA, 0-5 and 5-10 cm Mari, 5-57cm in the bag
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_003_0-56	28.05.2024	73.0361	16.0620	455	Archive
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_004_0-31	28.05.2024	73.0361	16.0620	455	0-1cm living forams, rest archive
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_005_0-40	28.05.2024	73.0361	16.0620	455	Porewater every 2cm, sliced every 1cm for geochemistry
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-06_006_0-26	28.05.2024	73.0361	16.0620	455	2cm top and 2cm bottom for biostratigraphy, rest archive
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15-GC-09	28.05.2024	73.0378	16.0594	476	Empty (some leftover kept in plastic bag)

Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-07	28.05.2024	73.0376	16.0606	460	
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-07_001_0-63	28.05.2024	73.0376	16.0606	460	Archive
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-7_002_0-51	28.05.2024	73.0376	16.0606	460	Sliced every 1cm
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-7_003_0-54	28.05.2024	73.0376	16.0606	460	eDNA, forams, archive
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-7_004_0-56	28.05.2024	73.0376	16.0606	460	Archive
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-7_005_0-58	28.05.2024	73.0376	16.0606	460	Porewater, sliced every cm
Outer Bjørnøyrenna (Kassiopeia)	Multi Core	IG24-5-KH-15-MC-7_006_0-52	28.05.2024	73.0376	16.0606	460	Archive

Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15-GC-10	28.05.2024	73.0378	16.0578	464	Isojar, one headspace at 100cm, porewater every 20cm
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15-GC-10_#2_0-100_Archive	28.05.2024	73.0378	16.0578	464	
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15-GC-10_#1_100-193_Archive	28.05.2024	73.0378	16.0578	464	
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15-GC-11	28.05.2024	73.0361	16.0620	465	Isojar
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15--11_#4_0-100_Archive	28.05.2024	73.0361	16.0620		
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15--11_#3_100-200_Archive	28.05.2024	73.0361	16.0620		
Outer Bjørnøyrenna (Kassiopeia)	Gravity Core	IG24-5-KH-15--11_#2_200-300_Archive	28.05.2024	73.0361	16.0620		

Outer Bjørnøyrenna (Kassiopeia)		Gravity Core	IG24-5-KH-15-GC-11_#1_300-366_Archive	28.05.2024	73.0361	16.0620		
Outer Bjørnøyrenna (Dragen)		Gravity Core	IG24-5-KH-15_2-GC-12	29.05.2024	73.0673	15.9587	462	Gas headspace, porewater, one isojar; 257cm + core catcher and cutter
Outer Bjørnøyrenna (Dragen)		Gravity Core	IG24-5-KH-15_2--12__#3_0-100_Archive	29.05.2024	73.0673	15.9587		
Outer Bjørnøyrenna (Dragen)		Gravity Core	IG24-5-KH-15_2--12__#2_100-200_Archive	29.05.2024	73.0673	15.9587		
Outer Bjørnøyrenna (Dragen)		Gravity Core	IG24-5-KH-15_2-GC-12__#1_200-257_Archive	29.05.2024	73.0673	15.9587		
Outer Bjørnøyrenna (Svanen)		Gravity Core	IG24-5-KH-15_3-GC-13	29.05.2024	73.0624	16.0227	466	Gas headspace, porewater, one isojar; 250cm + core catcher and cutter
Outer Bjørnøyrenna (Svanen)		Gravity Core	IG24-5-KH-15_3--13__#3_0-100_Archive	29.05.2024	73.0624	16.0227		

Outer Bjørnøyrenna (Svanen)		Gravity Core	IG24-5-KH-15_3--13__#2_100-200_Archive	29.05.2024	73.0624	16.0227		
Outer Bjørnøyrenna (Svanen)		Gravity Core	IG24-5-KH-15_3-GC-13__#1_200-250_Archive	29.05.2024	73.0624	16.0227		
Outer Bjørnøyrenna (Persevs)		ROV Carbonate Crust Collection	IG24-5-KH-15_4_ROV32-CarC-01	29.05.2024	73.0485	16.0872	459	Fauna
Outer Bjørnøyrenna (Persevs)		Gravity Core	IG24-5-KH-15_4-GC-14	29.05.2024	73.0486	16.0852	463	Two gas headspace, porewater every 20cm, one isojar; 220cm + core catcher and cutter
Outer Bjørnøyrenna (Persevs)		Gravity Core	IG24-5-KH-15_4--14__#3_0-100_Archive	29.05.2024	73.0486	16.0852		
Outer Bjørnøyrenna (Persevs)		Gravity Core	IG24-5-KH-15_4--14__#2_100-200_Archive	29.05.2024	73.0486	16.0852		
Outer Bjørnøyrenna (Persevs)		Gravity Core	IG24-5-KH-15_4-GC-14__#1_200-220_Archive	29.05.2024	73.0486	16.0852		

Outer Bjørnøyrenna (Kefeus)	ROV Carbonate Crust Collection	IG24-5-KH-15_5_ROV33-CarC-01	29.05.2024	73.0115	16.0932	451	Fauna
Outer Bjørnøyrenna (Kefeus)	Gravity Core	IG24-5-KH-15_5-GC-15	29.05.2024	73.0111	16.0933	450	Gas headspace, porewater, one isojar
Outer Bjørnøyrenna (Kefeus)	Gravity Core	IG24-5-KH-15_5--15__#2_0-100_Archive	29.05.2024	73.0111	16.0933		
Outer Bjørnøyrenna (Kefeus)	Gravity Core	IG24-5-KH-15_5-GC-15__#1_100-170_Archive	29.05.2024	73.0111	16.0933		
Outer Bjørnøyrenna (Karlsvogna)	ROV Carbonate Crust Collection	IG24-5-KH-15_6_ROV34-CarC-01	29.05.2024	72.9890	16.1416	445	Fauna
Outer Bjørnøyrenna (Karlsvogna)	ROV Carbonate Crust Collection	IG24-5-KH-15_6_ROV34-CarC-02	29.05.2024	72.9881	16.1428	447	Fauna
Outer Bjørnøyrenna (Karlsvogna)	Gravity Core	IG24-5-KH-15_6-GC-16	29.05.2024	72.9894	16.1424	448	Gas headspace, porewater, one isojar, biostratigraphy

Outer Bjørnøyrenna (Karlsvogna)	Gravity Core	IG24-5-KH-15_6--16__#2_0-100_Archive	29.05.2024	72.9894	16.1424		
Outer Bjørnøyrenna (Karlsvogna)	Gravity Core	IG24-5-KH-15_6-GC-16__#1_100-215_Archive	29.05.2024	72.9894	16.1424		
Outer Bjørnøyrenna (Kusken)	Gravity Core	IG24-5-KH-15_7-GC-17	29.05.2024	72.9569	16.1605	445	Gas headspace, porewater, one isojar, biostratigraphy
Outer Bjørnøyrenna (Kusken)	Gravity Core	IG24-5-KH-15_7--17__#2_0-100_Archive	29.05.2025	73.9569	17.1605		
Outer Bjørnøyrenna (Kusken)	Gravity Core	IG24-5-KH-15_7-GC-17__#1_100-195_Archive	29.05.2026	74.9569	18.1605		
Outer Bjørnøyrenna (Lillebjørn)	Gravity Core	IG24-5-KH-15_8-GC-18	29.05.2024	72.8959	16.1734	439	Gas headspace, porewater every 20cm, one isojar, biostratigraphy
Outer Bjørnøyrenna (Lillebjørn)	Gravity Core	IG24-5-KH-15_8--18__#3_0-100_Archive	29.05.2025	73.8959	17.1734		

Outer Bjørnøyrenna (Lillebjørn)	Gravity Core	IG24-5-KH-15_8--18__#2_100-200_Archive	29.05.2026	74.8959	18.1734		
Outer Bjørnøyrenna (Lillebjørn)	Gravity Core	IG24-5-KH-15_8-GC-18__#1_200-253_Archive	29.05.2027	75.8959	19.1734		
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08	29.05.2024	73.0671	15.9599	463	
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_001_0-7	29.05.2024	73.0671	15.9599	463	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_002	29.05.2024	73.0671	15.9599	463	Empty
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_003	29.05.2024	73.0671	15.9599	463	Empty
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_004_0-6	29.05.2024	73.0671	15.9599	463	Sliced every 1cm

Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_005_0-10	29.05.2024	73.0671	15.9599	463	Living forams, sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Multi Core	IG24-5-KH-15_2-MC-08_006	29.05.2024	73.0671	15.9599	463	Empty
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11	29.05.2024	73.0671	15.9599	463	
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Syringe-01	29.05.2024	73.0671	15.9599	463	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Syringe-02	29.05.2024	73.0671	15.9599	463	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Syringe-03	29.05.2024	73.0671	15.9599	463	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Spoon-01	29.05.2024	73.0671	15.9599	463	eDNA

Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Spoon-02	29.05.2024	73.0671	15.9599	463	Living forams
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-11_Archive	29.05.2024	73.0671	15.9599	463	One push core (004) sliced every 1 cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12	29.05.2024	73.0672	15.9503	473	Reference
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12_Syringe-01	29.05.2024	73.0672	15.9503	473	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12_Syringe-02	29.05.2024	73.0672	15.9503	473	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12_Syringe-03	29.05.2024	73.0672	15.9503	473	Sliced every 1cm
Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12_Spoon-01	29.05.2024	73.0672	15.9503	473	eDNA

Outer Bjørnøyrenna (Dragen)	Box Core	IG24-5-KH-15_2-BC-12_Spoon-02	29.05.2024	73.0672	15.9503	473	Living forams
Salt dome (Tromsøflaket)	ROV Carbonate Crust Collection	IG24-5-KH-16_ROV36-CarC-01	30.05.2024	71.8683	17.3234	337	Isojar, biostratigraphy, gas headspace at 100cm, porewater every 20cm
Salt dome (Tromsøflaket)	Gravity Core	IG24-5-KH-16-GC-19	30.05.2024	71.8685	17.3239	338	
Salt dome (Tromsøflaket)	Gravity Core	IG24-5-KH-16-GC-19_#2_0-100_Archive	30.05.2024	71.8685	17.3239	338	
Salt dome (Tromsøflaket)	Gravity Core	IG24-5-KH-16-GC-19_#1_100-200_Archive	30.05.2024	71.8685	17.3239	338	