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**GEOLOGICAL SURVEY OF CANADA  
OPEN FILE 8649**

***CCGS Amundsen 2019804 expedition: marine geohazards  
and sediment transport processes in Baffin Bay, Nunavut***

**A. Normandeau, L.M. Broom, T. Carson, and A.-P. Trottier**

**2019**

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**2019**

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# Table of Contents

|  |    |
|--|----|
| LIST OF FIGURES.....                               | 3  |
| LIST OF TABLES .....                               | 4  |
| 1. BACKGROUND AND OBJECTIVES.....                  | 5  |
| 2. PARTICIPANTS .....                              | 6  |
| 3. SUMMARY OF ACTIVITIES.....                      | 7  |
| 4. PRELIMINARY RESULTS .....                       | 10 |
| 5. EQUIPMENT AND PROCEDURES.....                   | 10 |
| 5.1 KNUDSEN 3260 ECHO-SOUNDER .....                | 10 |
| 5.2 EM-302 MULTIBEAM ECHOSOUNDER .....             | 10 |
| 5.4 CORING .....                                   | 11 |
| REFERENCES.....                                    | 15 |
| APPENDIX A: STATION SUMMARY .....                  | 16 |
| APPENDIX B: GEOGRAPHIC LOCATIONS OF STATIONS ..... | 18 |

## LIST OF FIGURES

|  |    |
|--|----|
| Figure 1: Summary of activities for CCGS Amundsen 2019804 cruise (ArcticNet Leg 3).....  | 9  |
| Figure B2: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) near Bylot Island .....     | 18 |
| Figure B3: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) near Scott Inlet .....      | 19 |
| Figure B4: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) offshore Qikiqtarjuaq. .... | 20 |
| Figure B5: Location of ArcticNet stations (black dots), GSC stations (white dot) and survey lines (red lines) near Qikiqtarjuaq. ....      | 21 |
| Figure B6: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) in Southwind Fjord.....     | 22 |
| Figure B7: Location of GSC stations (white dots) and survey lines (red lines) near Pointe-des-Monts. ....                                  | 23 |
| Figure B8: Location of GSC stations (white dots) and survey lines (red lines) near Cap-à-l'Aigle. ....                                     | 24 |

## **LIST OF TABLES**

|   |    |
|---|----|
| Table 1: Participants for the Geological Survey of Canada portion of 2019804.....         | 6  |
| Table 2: Description of the opportunistic mapping operations undertaken during Leg3. .... | 11 |
| Table 3: Specifications of the EM302 .....  | 11 |
| Table 4: Physical property sampling summary.....  | 13 |
| Table 5: Summary of Torvane measurements .....  | 14 |
| Table 6: Summary of constant volume sampling .....  | 14 |
| Table A1: Summary of stations collected during 2019804 .....                              | 16 |

## **1. BACKGROUND AND OBJECTIVES**

Since 2012, the Baffin Bay Geohazards Activity of NRCan's Public Safety Geoscience Program has conducted research to improve the understanding of geological processes and hazards (geohazards) in Baffin Bay to support stakeholder decisions on the use of offshore areas and provide northern communities with better knowledge for improving public safety. The 2019 Preliminary Findings Report for the SEA in Baffin Bay states that there are knowledge gaps in the region regarding geohazards, seismicity, seabed characteristics (depth and sediment thicknesses), tsunamis and oil seeps. These knowledge gaps limit the assessment of the risk they pose to communities that are located at or near sea-level.

Leg 3 of CCGS Amundsen was an opportunity for collecting seafloor information (multibeam bathymetry and sub-bottom profiles) and sediment cores from different regions along eastern Baffin Island. The ship sailed from Resolute Bay to Quebec City, passing by eastern Baffin Island. This cruise report is not intended to give a detailed overview of all the activities conducted during the cruise. Rather, it is intended to give details about the Geological Survey of Canada (GSC) activities during the cruise and the data collected by GSC and archived at GSC. Therefore, for non-GSC activities conducted during this cruise, the readers are invited to contact Amundsen Science.

The main objective of this 2019804 cruise for the GSC was to refine estimates of the recurrence of marine geohazards in eastern Baffin Island. Specifically, the cruise aimed at:

- 1) Opportunistic multibeam mapping of nearshore marine geohazards
- 2) Collecting sediment cores in the fjords to assess the stability of slopes near the communities. This stability analysis will allow us to understand what magnitude of earthquake was/is required to trigger a sediment failure.
- 3) Recovering a mooring deployed during CCGS Hudson cruise 2018042
- 4) Collecting surficial box cores to understand modern sediment transport processes in southern Baffin Bay.

## **2. PARTICIPANTS**

For the Geological Survey of Canada purposes, four participants led the different operations on board the ship (Table 1).

**Table 1: Participants for the Geological Survey of Canada portion of 2019804**

| <b>First name</b> | <b>Last name</b> | <b>Organization</b>         | <b>Role</b>        |
|-------------------|------------------|-----------------------------|--------------------|
| Alexandre         | Normandeau       | Geological Survey of Canada | Chief Scientist    |
| Laura             | Broom            | Geological Survey of Canada | Physical Scientist |
| Tom               | Carson           | Geological Survey of Canada | Lead technician    |
| Annie-Pier        | Trottier         | Université Laval            | Hydrography        |

### **3. SUMMARY OF ACTIVITIES**

The 2019804 cruise began in Resolute Bay where scientific participants boarded the ship and a Coast Guard crew change took place (Fig. 1). The ship then sailed towards Pond Inlet where most of the GENICE program (Microbial Genomics for oil spill preparedness in the Canadian Arctic) took place, led by the National Research Council. During the GENICE program, seabed mapping and sediment cores were collected in Eclipse Sound to map seafloor processes originating from Bylot Island. These activities were opportunistic since the GENICE program only had day-time operations on land. During the night, seabed mapping could be conducted while during the day, sediment coring and CTD-Rosettes could be completed.

On August 19<sup>th</sup>, we sailed to Scott Inlet where the program aimed at collecting CTD-Rosettes and Van Veen grabs for the University of Calgary. A full 24h was dedicated to this program and one box core (station 005) was collected for GSC-A purposes. Near the end of these operations, the CTD-Rosette cable ruptured and was lost to the seafloor. Since the CTD-Rosette was a major part of the ArcticNet and Department of Fisheries and Oceans (DFO) programs, a few ideas were discussed to find sensors that could replace the ones lost at sea. The CCGS Amundsen had a spare rosette on board but did not have many of the spare sensors left. Two options were considered. We knew the CCGS Louis-St-Laurent (LSSL) was in Clyde River for mapping purposes with the Canadian Hydrographic Service (CHS). Our first option was to contact the ship and ask if they had spare parts for a CTD-Rosette. The second option was to contact the Bedford Institute of Oceanography to ask if they had spare parts that could be shipped to Qikiqtaulik in a short period of time. That afternoon, both options were considered viable and we started making phone calls. The captain first called the CCGS LSSL to know if there was a Rosette on board. We learned that there was indeed a Rosette for the Joint Ocean Ice Studies (JOIS) program of DFO in the Beaufort Sea, led by Dr. Jane Eert. We therefore contacted Dr. Eert to discuss the possibility of borrowing some of the equipment on board. Dr. Eert agreed to lend the sensors we needed since it would benefit the DFO KEBBAB program which was one of the objectives of this Amundsen leg. After learning that the sensors were to be used later in the season for the JOIS program, we realized we could not be using these instruments for the remainder of the cruise. Therefore, we contacted Peter Pledge (NRCan) and Adam Hartling (DFO) to see if they had the sensors we needed and if they were available for our purposes. In the evening, both responded that the instruments were available and could be shipped priority to Qikiqtaulik. By the end of the day, we had a firm plan to move ahead: Borrow the LSSL sensors for a few days while we wait for the BIO sensors to arrive. Once the BIO sensors arrive, we would send back the LSSL sensors by helicopter. That evening, we sailed towards Clyde River to borrow the sensors from the LSSL.

During the night, we mapped part of the Clyde trough while waiting for the LSSL to be ready to welcome us on board via our helicopter. The following morning, August 21<sup>st</sup>, our helicopter went on board the LSSL and borrowed sensors that could be installed on the CCGS Amundsen Rosette. We started sailing towards the first station of the DFO KEBBAB program, which was about 8h away from Clyde River. During that time, the sensors were successfully installed on the spare

Rosette and we could resume our program. The BIO spare sensors were also sent that day for Qikiqtarjuaq and were scheduled for 5-6 days later.

The KEBBAB program aimed at collecting box cores, nets and CTD-Rosettes along 5 nearshore/offshore transects in southern Baffin Bay. GSC had interests in collecting push cores at these locations to understand sediment transport processes on the seafloor. Therefore, at each KEBBAB station where box cores were collected, we also collected a push core.

At the end of the first transect, we sailed towards Qikiqtarjuaq to collect piston cores offshore a small longshore drift channel system (station 011) and in Coronation fjord. We also mapped these systems. Following the mapping and coring in these locations, we sailed towards the second transect of the KEBBAB program. On August 26<sup>th</sup>, the BIO sensors were planned to arrive in Qikiqtarjuaq. However, fog in Qikiqtarjuaq forced the cancellation of the flight. The next flight for Qikiqtarjuaq was scheduled for August 28<sup>th</sup>. On August 27<sup>th</sup>, we noticed that a flight to Pangnirtung was possible for 9am. We thus called First Air in Iqaluit to ask if they could put our packages on the Pangnirtung flight. Our sensors arrived in Pangnirtung on August 27, at 10am. In the afternoon, we sent our helicopter to Pangnirtung to collect our sensors. However a fog bank prevented the helicopter to reach its destination and it had to come back. Later in the afternoon, we tried again and this time, it reached Pangnirtung and brought back the sensors.

On August 28<sup>th</sup>, we realized that there was a weather window to reach the LSSL and get Dr. Eert's sensors back. A storm was coming our way for August 29<sup>th</sup>-31<sup>st</sup>, we thus had to send the equipment back that day. Since Qikiqtarjuaq did not have access to helicopter fuel, we sailed towards the community so that the helicopter flight towards the LSSL, which was now in Pond Inlet, could be made safely by fueling up in Clyde River. We began a helicopter flight towards the LSSL in the morning. While our helicopter was in flight, the LSSL captain accepted to send their helicopter to meet us 60 NM south of Pond Inlet. In early-afternoon, the transfer of equipment was done and Dr Eert's sensors were safely back on board. In the meantime, we got our CTD-R to work, although some issues occurred but were resolved on August 29<sup>th</sup>. When the issues were resolved, we continued the KEBBAB program. This CTD-Rosette problem was resolved thanks to the generous help of many people: Captain Alain Gariépy and his team, Dr. Jane Eert, Dr. Christine Michel, Mike Dempsey, Peter Pledge and Adam Hartling. On board the Amundsen, Lou Tisné with the help of Paco Ferrand was largely responsible for making everything work.

The KEBBAB program was completed on September 1<sup>st</sup> in the morning. After the final site, we transited towards Southwind Fjord, where multibeam mapping, sediment coring and a mooring recovery was planned. These operations were completed by the end of the day and we began our transit south towards Quebec City. On the way back, ArcticNet operations were completed in Hudson Strait and Labrador.

After the work in Nain (Labrador) was completed, we decided to quickly head back towards the St. Lawrence Estuary to avoid two storms coming in Labrador Sea, one of them being Hurricane Dorian. By doing this, we decided to skip three stations that were planned offshore Labrador. Due to this, we arrived in the St. Lawrence Estuary approximately 2 days early. We took advantage of

this by collecting multibeam bathymetry and sub-bottom profiler data and sediment cores near Pointe-des-Monts, Franquelin and St. Siméon. We arrived in Quebec City for demobilization on September 10, putting an end to the CCGS Amundsen season.

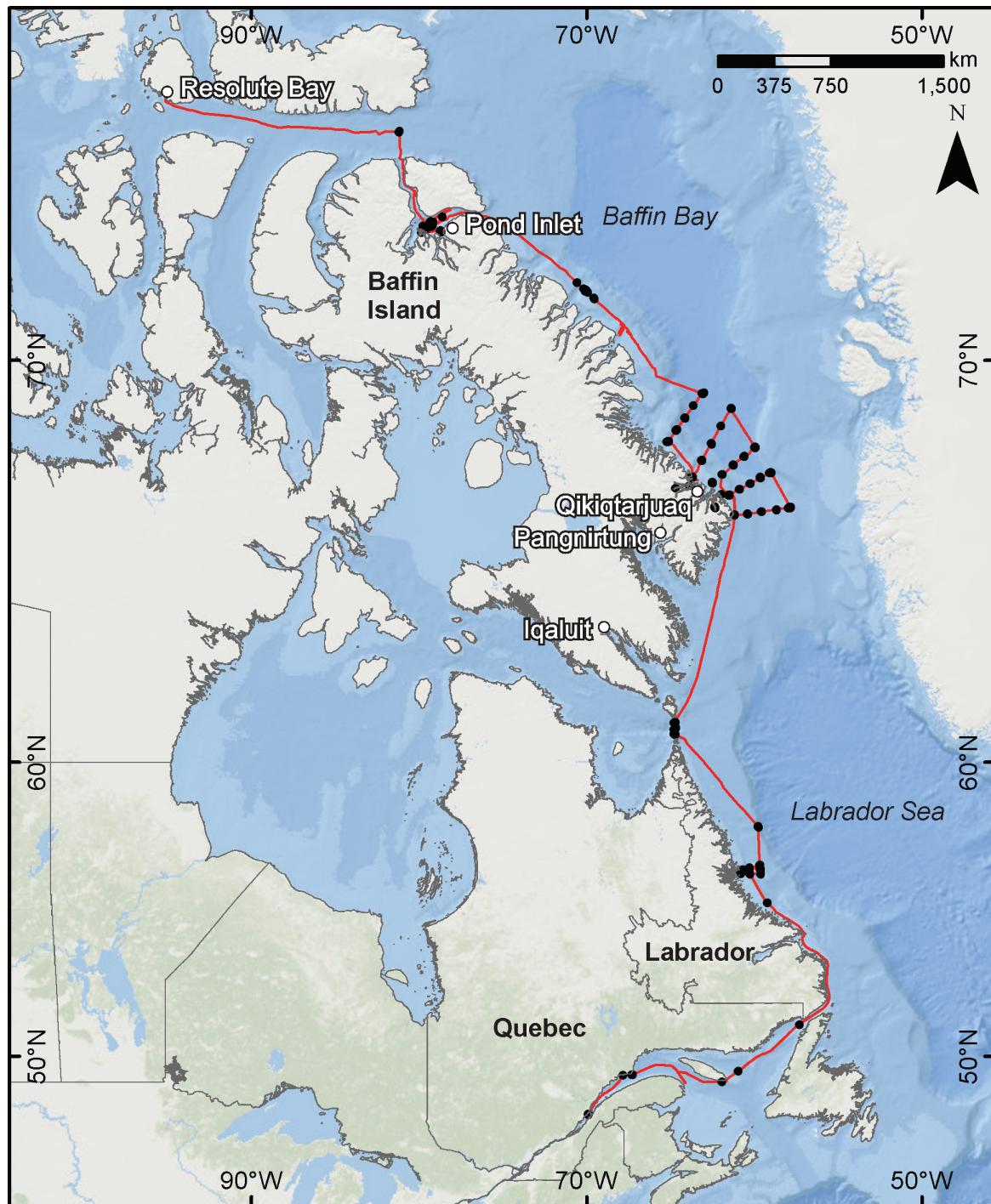


Figure 1: Summary of activities for CCGS Amundsen 2019804 cruise (ArcticNet Leg 3)

## 4. PRELIMINARY RESULTS

The CCGS Amundsen 2019804 cruise allowed the collection of:

- 1) 8 gravity cores
- 2) 7 piston cores
- 3) 25 box cores
- 4) 1 mooring recovery
- 5) ~ 8000 km of 3.5 kHz CHIRP surveys
- 6) ~ 674 km<sup>2</sup> of dedicated multibeam bathymetry mapping (Table 2)

Preliminary results show the presence of extensive channel systems along eastern Baffin Island, with the presence of sediment waves. These sediment waves suggest that turbidity currents are active along the coast, especially where glaciers provide large volumes of sediment to deltas. The push cores collected in Baffin Bay will be used to assess modern sediment transport processes on the seafloor.

## 5. EQUIPMENT AND PROCEDURES

### 5.1 Knudsen 3260 Echo-Sounder

Since May 2016, a new Knudsen 3260 deck unit has been installed onboard the Amundsen. It was acquired to replace the old 320-BR system that had shown signs of high degradation at the end of the 2015 field season. The new system operated using a USB connector instead of a SCSII communication port. Sub-bottom profiles were acquired all along transits at a frequency of 3.5 kHz to image sub-bottom stratigraphy of the seafloor.

### 5.2 EM-302 multibeam echosounder

The Amundsen is equipped with an EM302 multibeam sonar (Table 3) operated with the *Seafloor Information System* (SIS). Attitude is given by an *Applanix POS-MV* receiving RTCM corrections from a *CNAV 3050* GPS receiver. Position accuracies were approximatively < 0.8m in planimetry and < 1m in altimetry. Beam forming at the transducer head is done by using an *AML* probe. CTD-Rosette casts, when available, were used for sound speed corrections.

All the data acquired during the cruise were post-processed in real-time using the CARIS HIPS&SIPS 11.1 software. This post-processing phase is essential to rapidly detect any anomaly in the data collection. The final addition of the 2018 data will be done upon the return of the ship in Quebec City.

**Table 2: Description of the opportunistic mapping operations undertaken during Leg3.**

| Location                        | Date         | Duration (hr) | Area (km <sup>2</sup> ) |
|---------------------------------|--------------|---------------|-------------------------|
| Bylot Island deltas             | 2019-08-17   | 6             | 24                      |
| Bylot Island Glaciers           | 2019-08-18   | 7             | 109                     |
| Eclipse Sound                   | 2019-08-18   | 2,5           | 96                      |
| Scott Inlet                     | 2019-08-20   | 7             | 51                      |
| Clyde Inlet                     | 2019-08-21   | 10            | 114                     |
| Qikiqtarjuaq & Coronation fjord | 2019-08-24   | 8,5           | 208                     |
| Offshore Qikiqtarjuaq           | 2019-08-28   | 7             | 61                      |
| Franquelin, Quebec              | 2019-09-08   | 4             | 10,97                   |
|                                 | <b>Total</b> | 52            | 673,97                  |

**Table 3: Specifications of the EM302**

|                        |             |
|------------------------|-------------|
| <b>Beams</b>           | 216         |
| <b>Frequency</b>       | 30kHz       |
| <b>Swath</b>           | 5.5 x depth |
| <b>Max Swath Angle</b> | 150 degrees |
| <b>Depth Range</b>     | 10m-7000m   |

#### 5.4 Coring

During the 2019804 cruise, four types of coring equipment were used: 1) VanVeen grab sampler; 2) gravity core; 3) piston core; 4) box core.

- 1) The Van Veen grab sampler was used for the GENICE program and was provided by the GSC. However, no samples were collected or archived for and by the GSC.
- 2) The gravity corer, provided by Amundsen Science, worked very well throughout the cruise and took several useful samples. There were a few locations which had a very hard or rocky seabed and damaged the cutter on the gravity core. When the bevelled part of the cutter was damaged, it was replaced with a spare during the trip.
- 3) The piston corer, provided by Amundsen Science, worked very well during the cruise. There was also one cutter replaced after being damaged. The only other issue with the piston coring system was related to the winch used to deploy and recover the corer. This winch needed the hydraulic brake adjusted on three different occasions throughout the cruise. The same winch was used for all of our sampling equipment and all of the nets.
- 4) There were three box cores onboard, which gave us plenty of spares and options. On two different occasions, the bucket on the box core had to be straightened in the engine room with a hydraulic press. On a few occasions, when the bucket hit a rough seabed, the bucket

was deformed. When not repairable by hand with a hammer, it was sent to the engine room. Another issue that came up was with the locking mechanism which locks the blade open before deployment. The locking mechanism releases when the box core is hoisted up off the seabed. When the lock releases, it springs back by a bungee cord. The bungee cord had to be replaced with a new one which gave the lock more pull and making the locking mechanism more efficient.

### ***Onboard gravity core processing and subsampling***

A total of 41.67 m of sediment was obtained from 40 cores (7 PC and 8 GC and 25 BC). All cores were processed according to standard GSC Atlantic core procedures (Mudie et al., 1984). All core barrels were kept in sequence, from the bottom to the top, as the barrels were taken apart. Starting with the bottommost barrel each 10 ft length of liner was extruded from the barrel and cut in half, using a modified pipe cutter. The sediment in the liner was cut using a wire saw and the section ends were carefully capped to minimize disturbance to the sediment surface. The top end cap was labelled with the cruise number, station number, section label and as top. The base of the piston core is designated with the letter A and the top of the base section is designated as B. Each section was taken into the geo Lab. Each core, starting with the base section AB, was processed using the following procedure. The core liner was labelled with an up arrow, cruise number, station number, section label and the top and base of the section were labelled with the appropriate letter. End caps were removed if the sediment was not too fluid, and the section length was measured and recorded.

Undrained shear strength measurements and constant volume samples were taken at the top and base of each section where possible. Inert packing was placed in the voids created by the constant volume sampling. The ends of each core section were recapped, taped and sealed with beeswax to prevent further oxidation and drying. Whole core analysis and core splitting and processing will occur at the GSC Atlantic Core Processing Laboratory.

The sealed core sections were stored upright in custom-made whole core portable racking units in the starboard refrigerated reefer container and maintained at 4°C. All core cutters and catchers were measured, labelled, placed in split liners, waxed and stored upright in buckets in the reefer container.

All station location information, core section lengths, extruded pieces and cutter/catcher lengths, sediment description, core performance information and all relevant field information were documented on deck sheets. Summary of core sections are available in Appendix B.

### ***Physical properties measurements***

Undrained shear strength measurements and constant volume samples were taken at the ends of each section if the condition of the sediment allowed (Table 4-6). The constant volume sampler was inserted into the end of the section, the undrained shear strength measurement was taken and then the constant volume sampler was removed.

The undrained shear strength was measured using a hand-held Hoskin Scientific Torvane according to ASTM Test Method D2573 Field Vane Shear Test in Saturated Fine Grained Soil.

The dial on the Torvane was zeroed, the fins on the vane were gently pushed into the sediment until they were completely inserted. The Torvane was rotated at a constant rate until the sediment failed.

The Torvane dial reading ranges from 0 to 1 and reports values in kg-force/cm<sup>2</sup> units (1 kg/cm<sup>2</sup> = 98.07 kPa). The Torvane has three adapter vanes as described below:

L - Sensitive vane has a range of 0 to 0.2 Kg-force/cm<sup>2</sup>

$$Su = \text{dial reading} * 0.2 \text{ Kg-force/cm}^2$$

M - Regular vane has a range of 0 to 1.0 Kg-force/cm<sup>2</sup>

$$Su = \text{dial reading} * 1 \text{ Kg-force/cm}^2$$

S - High capacity vane has a range of 0 to 2.5 Kg-force/cm<sup>2</sup>

$$Su = \text{dial reading} * 2.5 \text{ Kg-force/cm}^2$$

The L - Sensitive vane was used for a total of 21 undrained shear strength measurements taken during the cruise.

Constant volume samples for bulk density and water content determinations were taken by inserting stainless steel samplers of a known volume. Prior to insertion, the sampler was lightly sprayed with mineral oil and gently wiped with a small Kimwipe tissue. The bevelled edge of the sampler was placed on the flat sediment surface and the carefully inserted into the sediment using two flat-headed spatulas. The sampler is inserted at a constant rate to minimize compression of the sediment within the sampler. The sampler was then carefully removed and the sediment was trimmed using a wire saw and extruded into a pre-weighed 1 oz screw-top glass bottle. The bottle cap was then labelled and sealed using electrical tape to prevent the lid from loosening. A total of 21 constant volume samples were taken during the cruise. The samples will be weighed, dried at 105°C for 24 hours and reweighed to determine bulk density, dry density and water content according to ASTM Test Method D 2216 Laboratory Determination of Water (moisture) Content of Soil and Rock by Mass. All relevant information for the Torvane measurements and constant volumes was recorded on data sheets and input into excel spreadsheets and will be incorporated into the GSC Atlantic physical property database.

**Table 4: Physical property sampling summary**

| Station number | Sample type | # of Torvane Measurements | # of Constant Volume samples |
|----------------|-------------|---------------------------|------------------------------|
| 003            | Gravity     | 2                         | 3                            |
| 004            | Gravity     | 2                         | 2                            |
| 011            | PC          | 4                         | 3                            |
| 036            | PC          | 6                         | 7                            |
| 038            | PC          | 4                         | 4                            |
| 039            | PC          | 2                         | 2                            |
| 040            | PC          | 1                         | 0                            |

**Table 5: Summary of Torvane measurements**

| Station Number | Sample Type | Depth of measurement (cm) | Torvane measurement | Vane used |
|----------------|-------------|---------------------------|---------------------|-----------|
| 003            | Gravity     | 138.5                     | 0.22                | L         |
| 003            | Gravity     | 138.5                     | 0.2                 | L         |
| 004            | PC          | 131                       | 0.12                | L         |
| 004            | PC          | 131                       | 0.14                | L         |
| 011            | PC          | 247                       | 0.36                | L         |
| 011            | PC          | 247                       | 0.23                | L         |
| 011            | PC          | 400                       | 0.47                | L         |
| 011            | PC          | 400                       | 0.48                | L         |
| 036            | PC          | 257                       | 0.38                | L         |
| 036            | PC          | 257                       | 0.28                | L         |
| 036            | PC          | 407                       | 0.46                | L         |
| 036            | PC          | 407                       | 0.49                | L         |
| 036            | PC          | 560                       | 0.45                | L         |
| 036            | PC          | 560                       | 0.38                | L         |
| 038            | PC          | 135                       | 0.11                | L         |
| 038            | PC          | 285                       | 0.25                | L         |
| 038            | PC          | 431                       | 0.3                 | L         |
| 038            | PC          | 431                       | 0.25                | L         |
| 039            | PC          | 148                       | 0.5                 | L         |
| 039            | PC          | 148                       | 0.5                 | L         |
| 040            | PC          | 325                       | 0.32                | L         |

**Table 6: Summary of constant volume sampling**

| Station number | Sample type | Depth of measurement (cm) |
|----------------|-------------|---------------------------|
| 003            | Gravity     | 138.5                     |
| 003            | Gravity     | 138.5                     |
| 003            | Gravity     | 284                       |
| 004            | Gravity     | 131                       |
| 004            | Gravity     | 131                       |
| 011            | PC          | 247                       |
| 011            | PC          | 400                       |
| 011            | PC          | 400                       |
| 036            | PC          | 102                       |
| 036            | PC          | 252                       |
| 036            | PC          | 252                       |
| 036            | PC          | 407                       |

|     |    |     |
|-----|----|-----|
| 036 | PC | 407 |
| 036 | PC | 560 |
| 036 | PC | 560 |
| 038 | PC | 150 |
| 038 | PC | 285 |
| 038 | PC | 431 |
| 038 | PC | 431 |
| 039 | PC | 148 |
| 039 | PC | 299 |

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## APPENDIX A: STATION SUMMARY

**Table A1: Summary of stations collected during 2019804**

| Vessel: CCGS Amundsen |             |                |          |           | Chief Scientist: Alex Normandeau |                                    | Date: August 15 to September 10, 2019 |                     |                 |                |                     |                          |  |
|-----------------------|-------------|----------------|----------|-----------|----------------------------------|------------------------------------|---------------------------------------|---------------------|-----------------|----------------|---------------------|--------------------------|--|
| Station No.           | Sample Type | Day/Time (UTC) | Latitude | Longitude | Water Depth (m)                  | Location                           | Acoustic Target                       | Sampler Length (cm) | TWC length (cm) | PC length (cm) | Gravity core length | Push section length (cm) | Comments   |
| 001                   | Box         | 229/1758       | 72.46002 | -78.70810 | 279                              | Arctic Archipelago - Eclipse Sound | Stratified                            | -                   | -               | -              | -                   | 35                       |  |
| 002                   | Gravity     | 230/0112       | 72.73475 | -78.61824 | 774                              | Arctic Archipelago - Eclipse Sound | Stratified                            | 300                 | -               | -              | 0                   | -                        | 2 attempts at same location with no recovery   |
| 003                   | Gravity     | 230/1507       | 72.64794 | -79.32648 | 690                              | Arctic Archipelago - Eclipse Sound | Stratified                            | 300                 | -               | -              | 288                 | -                        |  |
| 004                   | Gravity     | 230/1825       | 72.56128 | -79.27173 | 714                              | Arctic Archipelago - Eclipse Sound | Stratified                            | 300                 | -               | -              | 281.5               | -                        | Shell at base of core  |
| 005                   | Box         | 232/1333       | 71.38445 | -70.09292 | 303                              | Baffin Bay - Sott Inlet            | Stratified                            | -                   | -               | -              | -                   | 0                        | No push taken. Little recovery (<20 cm), gravel rich & disturbed.                        |
| 006                   | Box         | 234/1117       | 69.31619 | -63.11929 | 1934                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 44.5                     |  |
| 007                   | Box         | 234/1735       | 69.05936 | -63.64361 | 1574                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 0                        | No push taken. Sediment filled half of bucket & disturbed                                |
| 008                   | Box         | 235/0602       | 68.80078 | -64.15421 | 1325                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 46.5                     |  |
| 009                   | Box         | 235/1038       | 68.54064 | -64.65366 | 540                              | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 18                       | 2 attempts. Only half of the box filled. Sediment appeared undisturbed where core taken. |
| 010                   | Box         | 235/1631       | 68.27847 | -65.14224 | 447                              | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 42                       |  |
| 011                   | Piston      | 236/1146       | 67.46695 | -63.82711 | 496                              | Baffin Bay                         | Stratified                            | 900                 | 60              | 551            | -                   | -                        | Hit sand at base   |
| 012                   | Box         | 237/0404       | 67.85829 | -63.15081 | 266                              | Baffin Bay - Broughton trough      | Stratified                            | -                   | -               | -              | -                   | 0                        | Surface too rocky to sample with push core.  |
| 013                   | Box         | 237/1426       | 68.24005 | -62.58835 | 1570                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 46                       | Taken from what looks like a landslide deposit in the 3.5 kHz                            |
| 014                   | Box         | 237/2301       | 68.62046 | -62.00757 | 1810                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 41                       |  |
| 015                   | Box         | 238/0830       | 68.99913 | -61.40610 | 1839                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 42                       |  |
| 016                   | Box         | 238/2233       | 68.15084 | -59.96700 | 1362                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 39                       |  |
| 017                   | Box         | 239/0728       | 67.95210 | -60.62516 | 1610                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 43                       |  |
| 018                   | Box         | 239/1901       | 67.75486 | -61.27049 | 1574                             | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 44                       |  |
| 019                   | Box         | 240/0019       | 67.54455 | -61.93468 | 354                              | Baffin Bay                         | Stratified                            | -                   | -               | -              | -                   | 0                        | Recovered small amount of rocks and sand. Could not be sampled.                          |

|     |         |          |          |           |      |                                |                  |     |     |     |     |   |         |   |
|-----|---------|----------|----------|-----------|------|--------------------------------|------------------|-----|-----|-----|-----|---|---------|---|
| 020 | Box     | 240/0557 | 67.34597 | -62.52218 | 139  | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 0       | No push taken. Too disturbed. On side of box had sand which slumped over                        |
| 021 | Box     | 240/0600 | 67.06297 | -61.51353 | 118  | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 0       | No push taken. Sand/rocky material recovered which was disturbed.                               |
| 022 | Box     | 240/1341 | 67.19871 | -60.89908 | 639  | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 36      |   |
| 023 | Box     | 240/2153 | 67.33220 | -60.27095 | 683  | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 38      |   |
| 024 | Box     | 241/0333 | 67.46177 | -59.65016 | 1421 | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 44      |   |
| 025 | Box     | 241/1141 | 67.59052 | -59.01437 | 1176 | Baffin Bay                     | Stratified       | -   | -   | -   | -   | - | 42      |   |
| 026 | Box     | 242/0336 | 66.77791 | -57.84766 | 700  | Davis Strait                   | Stratified       | -   | -   | -   | -   | - | 30      | Water rushed out when recovered so some of surface may have washed out.                         |
| 027 | Box     | 242/1020 | 66.72641 | -58.70685 | 806  | Davis Strait                   | Stratified       | -   | -   | -   | -   | - | 26      | Sandy sample with pebble and cobble clasts throughout   |
| 028 | Box     | 242/1758 | 66.67263 | -59.56508 | 870  | Davis Strait                   | Stratified       | -   | -   | -   | -   | - | 33.5    |   |
| 029 | Piston  | 243/1319 | 66.78708 | -62.36891 | 180  | Davis Strait - Southwind Fjord | Stratified       | 900 | 22  | 195 | -   | - |         | First liner was broken. About a 2 cm crack at A base of piston core. Sample very sandy.         |
| 030 | Gravity | 243/1505 | 66.78172 | -62.36735 | 173  | Davis Strait - Southwind Fjord | Incoherent       | 300 | -   | -   | 147 | - |         |   |
| 031 | Gravity | 243/1617 | 66.78717 | -62.36233 | 177  | Davis Strait - Southwind Fjord | Incoherent       | 300 | -   | -   | 64  | - |         |   |
| 032 | Gravity | 243/1654 | 66.77791 | -62.36186 | 166  | Davis Strait - Southwind Fjord | Incoherent       | 300 | -   | -   | 149 | - |         |   |
| 033 | Push    | 243/1742 | 66.76055 | -62.34032 | 115  | Davis Strait - Southwind Fjord | Rough incoherent | -   | -   | -   | -   | - | 18 & 19 |   |
| 034 | Gravity | 243/2027 | 66.79707 | -62.37535 | 196  | Davis Strait - Southwind Fjord | Stratified       | 300 | -   | -   | 36  | - |         |   |
| 035 | Mooring | 244/1906 | 66.76298 | -62.33213 | 115  | Davis Strait - Southwind Fjord | -                | -   | -   | -   | -   | - |         |   |
| 036 | Piston  | 251/1944 | 49.27854 | -67.34609 | 312  | Gulf of St. Lawrence           | Stratified       | 900 | 168 | 710 | -   | - |         | In PC a few cm of material fell on deck at BC top. Some sediment appears cracked in AB base     |
| 037 | Piston  | 251/2319 | 49.26020 | -67.85852 | 97   | Gulf of St. Lawrence           | Stratified       | 900 | 0   | 243 | -   | - |         |   |
| 038 | Piston  | 252/1318 | 47.69534 | -69.92172 | 91   | Gulf of St. Lawrence           | Stratified       | 900 | 0   | 575 | -   | - |         | Sediment fell out of BC at B base, so this section of sediment became BB'                       |
| 039 | Piston  | 252/1512 | 47.73155 | -69.91650 | 136  | Gulf of St. Lawrence           | Stratified       | 900 | 0   | 450 | -   | - |         | Material in cutter fell on deck and was bagged with catcher. About 10 cm of material recovered. |
| 040 | Piston  | 252/1801 | 47.72363 | -69.90689 | 112  | Gulf of St. Lawrence           | Stratified       | 900 | 0   | 625 | -   | - |         | Section EF had to be cut with a hacksaw so sample is disturbed                                  |
| 041 | Gravity | 252/1956 | 47.70896 | -69.93758 | 102  | Gulf of St. Lawrence           | Stratified       | 200 | -   | -   | 0   | - |         | No material recovered. Rocky or sandy bottom  |

## APPENDIX B: GEOGRAPHIC LOCATIONS OF STATIONS

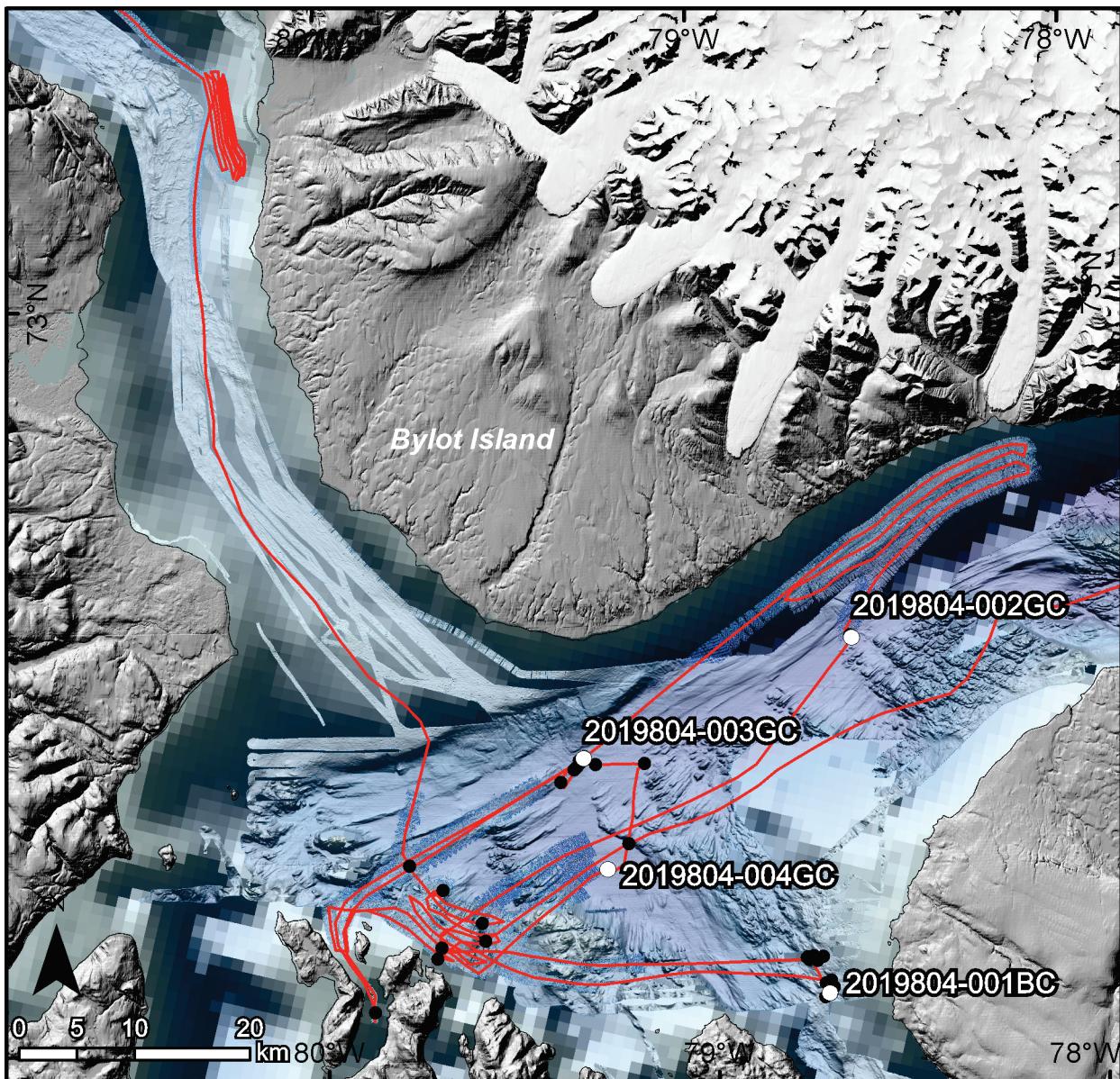
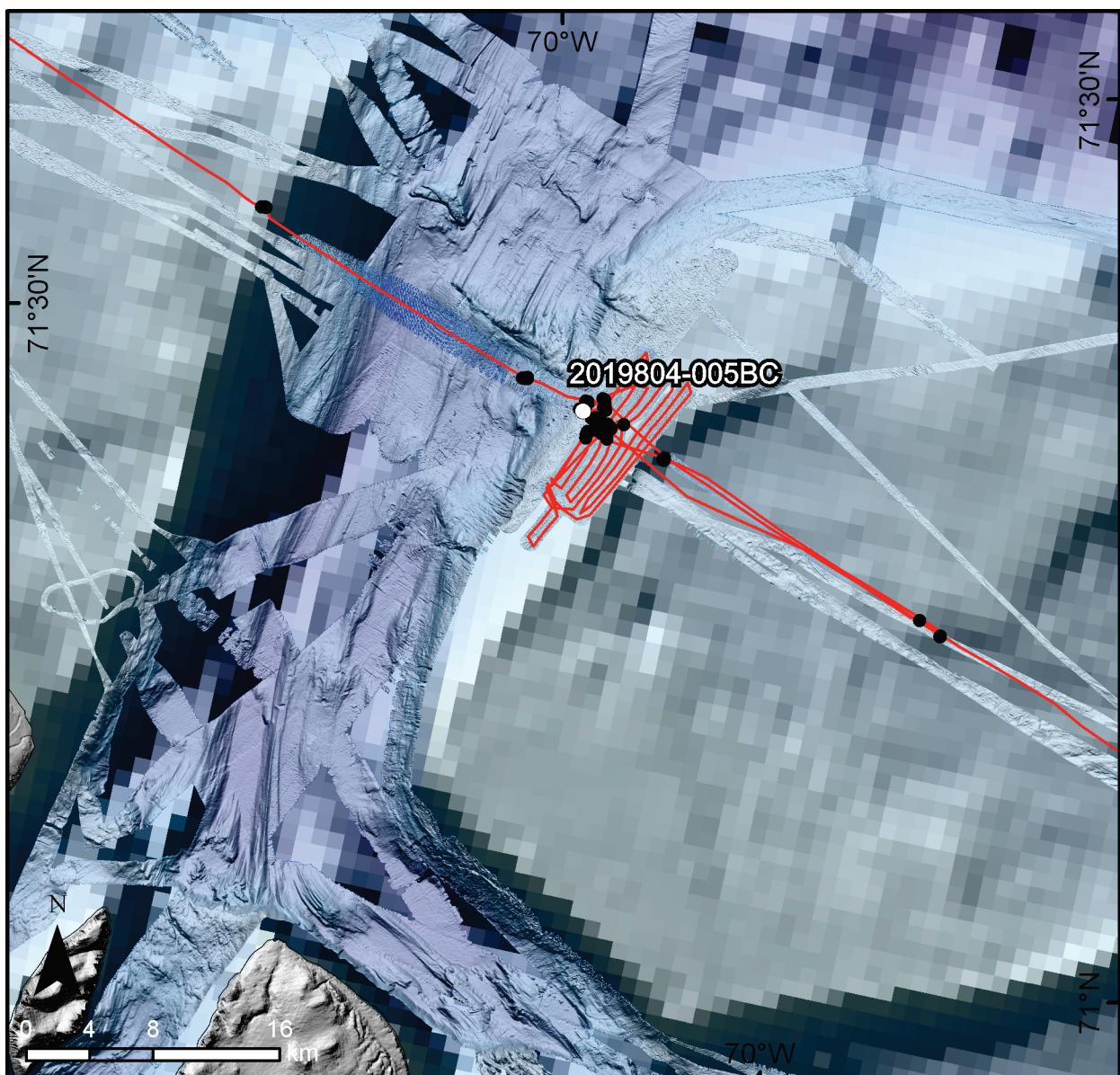


Figure B2: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) near Bylot Island



**Figure B3:** Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) near Scott Inlet.

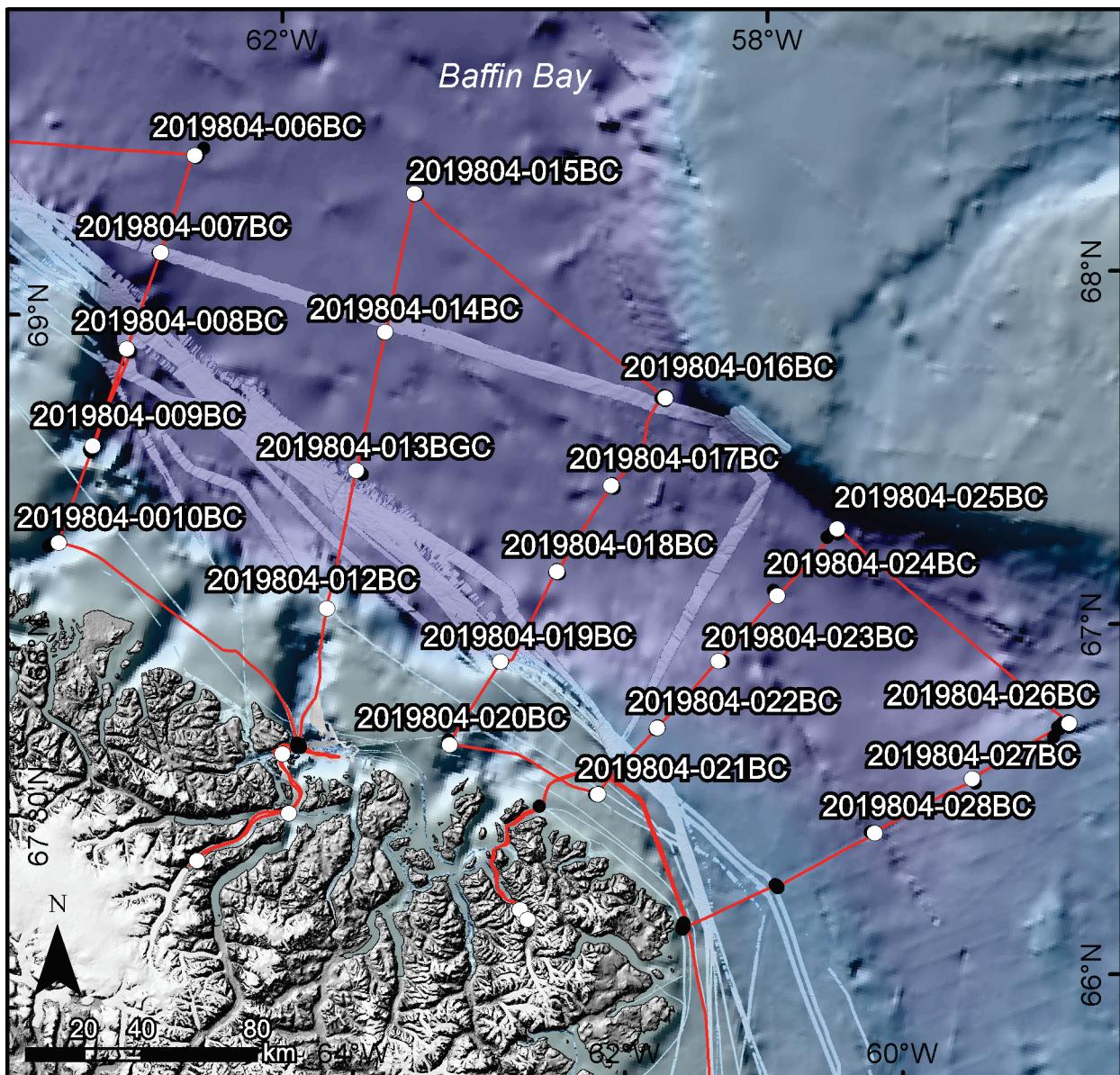


Figure B4: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) offshore Qikiqtarjuaq.

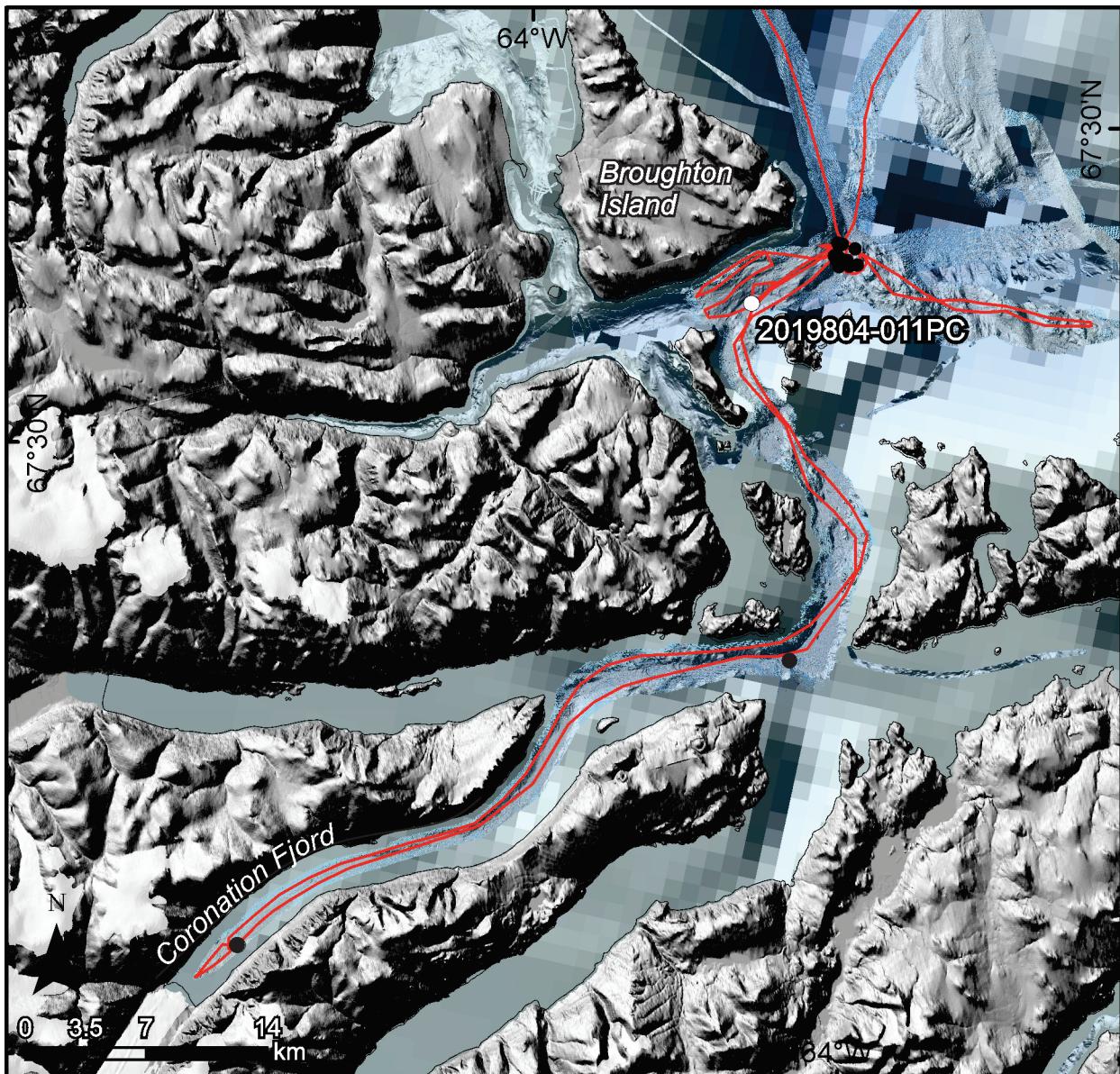


Figure B5: Location of ArcticNet stations (black dots), GSC stations (white dot) and survey lines (red lines) near Qikiqtarjuaq.

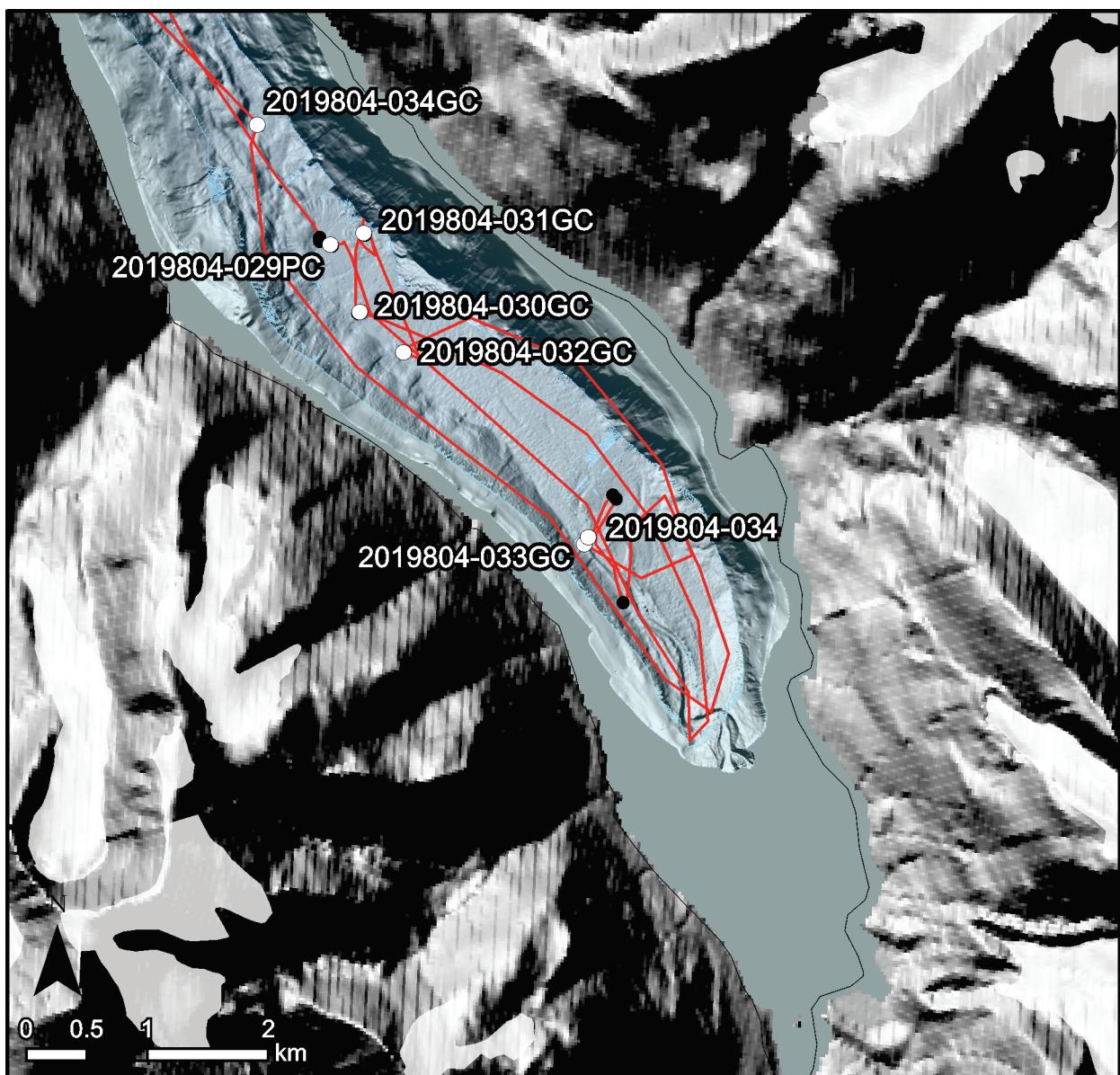


Figure B6: Location of ArcticNet stations (black dots), GSC stations (white dots) and survey lines (red lines) in Southwind Fjord.

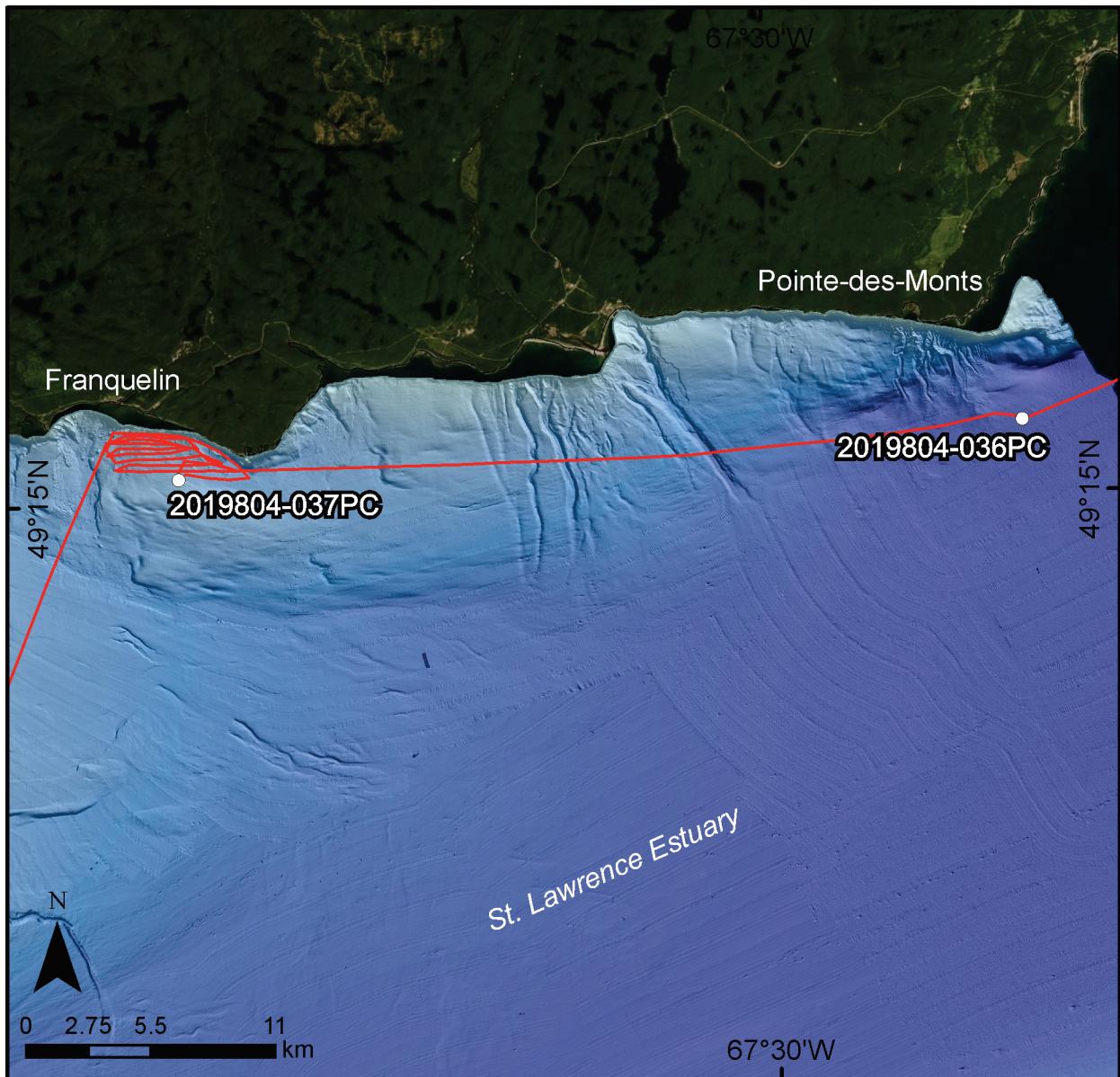


Figure B7: Location of GSC stations (white dots) and survey lines (red lines) near Pointe-des-Monts.

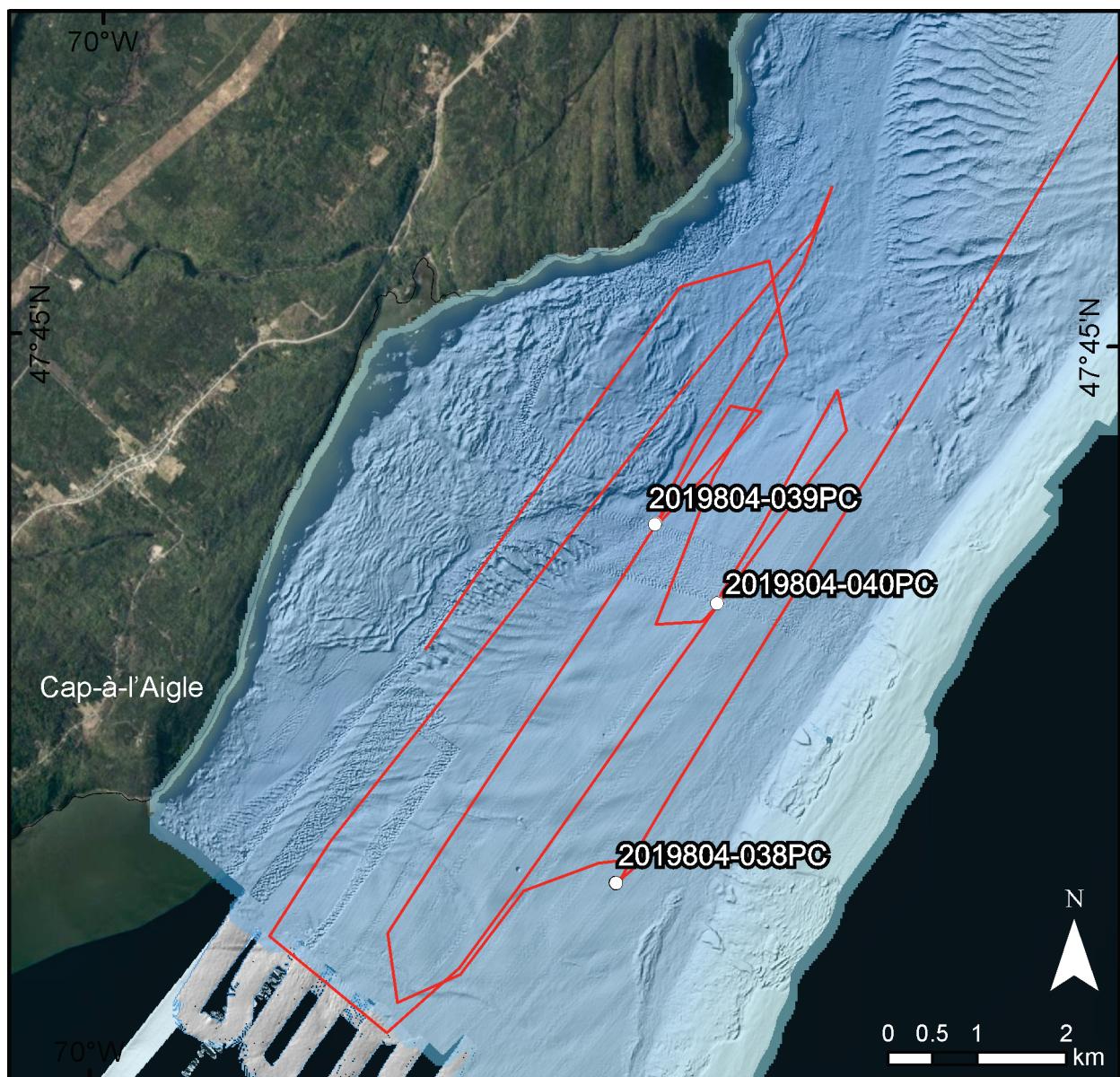


Figure B8: Location of GSC stations (white dots) and survey lines (red lines) near Cap-à-l'Aigle.