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2007 | Expedition Report

CCGS *Amundsen*

LEG 1A
ArcticNet
Labrador Fjords and Hudson Bay

LEG 3A
ArcticNet/SOLAS
Baffin Bay and Canadian Arctic Archipelago

LEG 3B
ArcticNet/SOLAS/CFL
Amundsen Gulf and Beaufort Sea

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AMUNDSEN
BRISE-GLACE DE RECHERCHE CANADIEN
CANADIAN RESEARCH ICEBREAKER

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Part II – Project reports

2007 Expedition Report

The 2007 Expedition Report is a collection of all cruise reports produced by the participating research teams and assembled by the Chief Scientists at the end of Legs 1 and 3 of the ArcticNet Expedition onboard the CCGS *Amundsen*. The ArcticNet Nunavut Inuit Health Survey (Legs 2, 10b and 12) and the International Polar Year (IPY) Circumpolar Flaw Lead (CFL) Study (Legs 4 and 5) were also carried out in 2007 onboard the *Amundsen* but are not covered in this report. The 2007 Expedition Report is divided into two parts:

Part I provides an overview of the expedition, the ship track and the stations visited, and a synopsis of operations conducted during each of the two legs (Legs 1 and 3).

Part II contains the reports submitted by participating science teams or researchers, with details on the specific objectives of their project, the field operations conducted and methodology used, and in some cases, preliminary results. When results are presented, they show the data as they were submitted at the end of the legs in 2007. The data presented in this report are illustrative only and have not been quality checked, thus parties interested in the results should contact the project leader or the researchers who collected the data.

Project reports in Part II are organized according to research topics. The first project presents the core data and information collected onboard the *Amundsen* (pages 28 to 31). Projects 2 to 4 (pages 32 to 50) cover topics of atmosphere, atmosphere-ocean processes and sea ice. Projects 5 to 9 (pages 51 to 88) cover topics of water column structure, ocean circulation and the physical properties of seawater. Geochemical cycling, biogeochemical processes, and biological productivity are treated in projects 10 to 20 (pages 89 to 139). Seabed mapping is covered in project 21 (pages 140 to 148) and finally, ROV operations and sediments and benthos sampling (Sections 22 and 23) (pages 149 to 167).

The 2007 Expedition Report also includes four appendices: 1) the list of stations sampled, 2) the scientific log of activities conducted, 3) a copy of the CTD logbook and 4) the list of participants on board during each leg.

The core navigation data (NAV) and meteorological information (AVOS) as well as oceanographic data collected using the CTD-Rosette, the Moving Vessel Profiler (MVP), the ship-mounted current profiler (SM-ADCP) and the thermosalinograph (TSG) are available in the Polar Data Catalogue (PDC) at www.polardata.ca.

Following ArcticNet's data policy, research teams must submit their metadata to the PDC and insure that their data are archived on the long-term, but it is not mandatory to use the PDC as a long-term archive as long as a link to the data is provided in the metadata (see www.arcticnet.ulaval.ca/Docs/data-policy for more details on data policy).

Part I – Overview and synopsis of operations

1 Overview of the 2007 ArcticNet / *Amundsen* Expedition

1.1 Introduction

Understanding the transformation of the Arctic environment is one of the great challenges faced by Canadians and the national and international scientific communities. ArcticNet is a Network of Centres of Excellence of Canada that brings together scientists and managers in the natural, human health and social sciences with their partners from Inuit organizations, northern communities, federal and provincial agencies and the private sector to study the impacts of climate change and modernization in the coastal Canadian Arctic.

Since 2004, ArcticNet researchers have been conducting extensive multidisciplinary sampling programs in the Canadian Arctic using the Canadian research icebreaker CCGS *Amundsen*. The overarching goal of the ArcticNet marine-based research program is to study on a long-term basis how climate induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean. The knowledge generated from this multi-year program is being integrated into regional impact assessments to help decision makers and stakeholders develop effective adaptation strategies for the changing coastal Canadian Arctic.

The geographic scope of the ArcticNet marine-based research program includes the Beaufort Sea in the western Canadian Arctic, the Canadian Arctic Archipelago and Baffin Bay in the eastern Arctic, and extends into Hudson Bay, Ungava Bay and along the northern Labrador coast.

In the western Arctic, northern Baffin Bay and Hudson Bay, ArcticNet has established long-term oceanic observatories. Each observatory consists of a number of moorings equipped with instruments that gather continuous records of currents, temperature, conductivity, turbidity, dissolved oxygen and the vertical flux of carbon and contaminants. Some moorings are also equipped with autonomous hydrophones to record the acoustic background and the vocalizations of marine mammals.

In July of 2007, the CCGS *Amundsen* left its homeport of Quebec City for an historical 15-month expedition to the Canadian Arctic to support ArcticNet's marine-based research program (see Phase 1 projects at www.arcticnet.ulaval.ca/Research/Phase 1) and several projects funded by the Canadian International Polar Year (IPY) program. These included the Circumpolar Flaw Lead (CFL) study, a large Canadian-led international effort to understand the role of the CFL in a context of Arctic warming; the Canadian Arctic SOLAS (Surface Ocean-Lower Atmosphere Study) project that examined the variability and changes in ocean-atmosphere interactions in response to climate warming in the Canadian Arctic; and the Inuit Health Survey where doctors, nurses, interpreters and scientists used the CCGS

Amundsen to visit the coastal communities of Nunavut, Inuvialuit (NT) and Nunatsiavut (Labrador) to assess the overall health of Inuit residents, including lifestyle, diet, heart disease, bone density, safety habits, and exposure to environmental contaminants.

The main objective of the 2007 ArcticNet/*Amundsen* Expedition was to maintain ArcticNet's network of oceanic observatories by servicing and redeploying the Hudson Bay, northern Baffin Bay and Western Arctic moorings that were deployed in 2006. ArcticNet's ultimate goal is to redeploy these moorings at the same location for at least 7 years (and up to 14 years) to establish long-term marine observatories for monitoring present variability and forecasting future change in Arctic ecosystems. In addition to work conducted at the Mooring stations, shipboard sampling was carried out along the ship track and at designated sampling stations (Figure 1.1). Operations included seafloor mapping, meteorological measurements as well as the sampling of seawater, sediment, plankton, juvenile fish and sea ice.

1.2 Regional settings

1.2.1 Northern Labrador coast

On the first leg of the Expedition, the *Amundsen* supported research efforts to address the prevailing concerns of Nunatsiavut Inuit along the northern Labrador coast. The Nunatsiavut-Nuluak project focuses on three northern Labrador fjords; Nachvak fjord, Saglek fjord and Anaktalak Bay (Figure 1.2) to study the effects of climate change, industrialization (particularly expanding mining/exploration activities) and contaminants on the coastal environment.

1.2.2 Hudson Bay

Hudson Bay is a virtually landlocked, immense inland sea that possesses unique characteristics among the world's oceans: a limited connection with the Arctic and Atlantic Oceans, a low salinity, a high volume of freshwater inputs from numerous rivers that drain central North America, a winter season in which it is completely ice covered while summer is characterized by ice-free conditions. In Hudson Bay, sampling focused on the 2006 moorings locations with the objective of turning over these moorings (Figure 1.2).

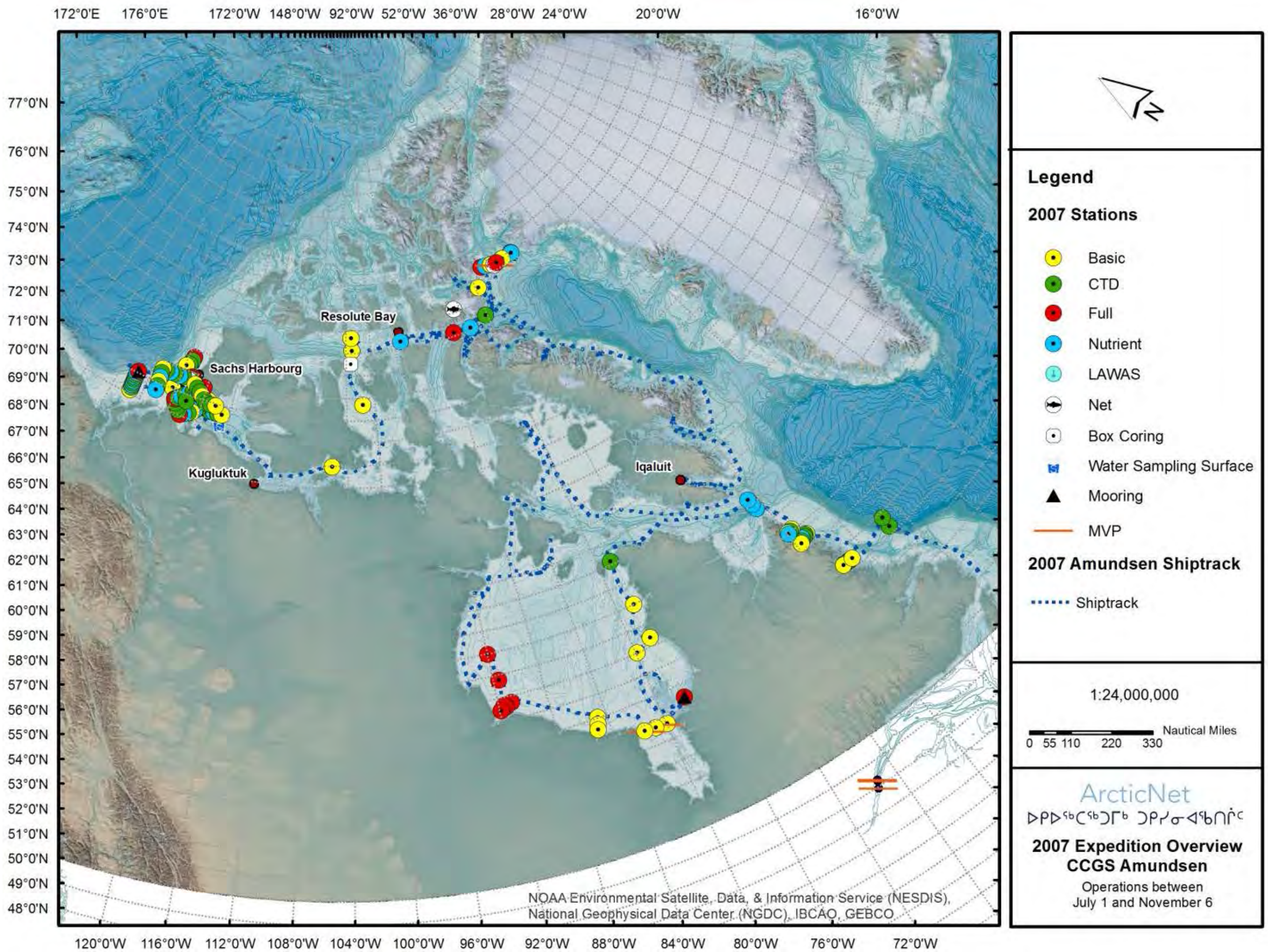

Figure 1.1. Overview of the ship track and the locations of stations sampled in the Labrador fjords and Hudson Bay (Leg 1), as well as in Baffin Bay, the Canadian Arctic Archipelago and the Beaufort Sea (Leg 3) by the CCGS *Amundsen* during the 2007 ArcticNet Expedition. Note that the ship track also shows Leg 2, which was dedicated to the Inuit Health Survey.

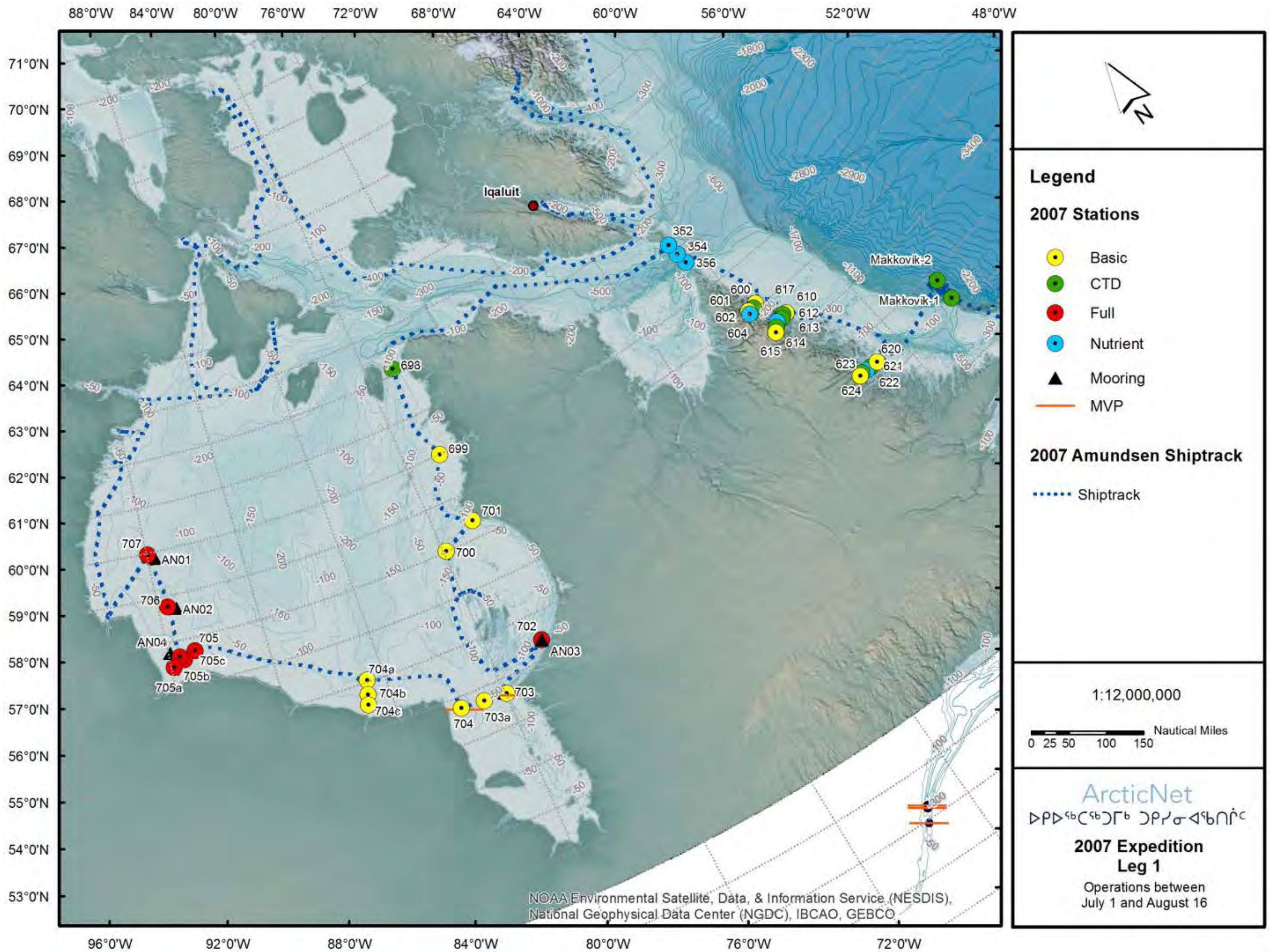

Figure 1.2. Ship track and the locations of stations sampled in three northern Labrador fjords and Hudson Bay by the CCGS *Amundsen* during Leg 1 of the 2007 ArcticNet Expedition.

1.2.3 Baffin Bay

Baffin Bay is located between Baffin Island and Greenland and connects the Arctic Ocean and the Northwest Atlantic (Figure 1.3), providing an important pathway for exchange of heat, salt and other properties between these two oceans. In the south, Davis Strait, which is over 300 km wide and 1000 m deep, connects it with the Atlantic but Baffin Bay's direct connection to the Arctic Ocean consists of three relatively small passages through the islands of the Canadian Arctic Archipelago (CAA). Arctic water also enters Baffin Bay/Davis Strait via the West Greenland Current, which flows northward along the western coast of Greenland. Melting ice sheets, changing sea ice conditions and changing weather also influence oceanographic conditions in Baffin Bay and Davis Strait.

Located in northern Baffin Bay, between Ellesmere Island and Greenland, the North Water (NOW) Polynya is a large, year-round expanse of open water. North Water is the largest (~80,000km^2) and most productive polynya in the Canadian Arctic and in addition to the tremendous marine bird resources in this area, it is of significance to many species of marine mammals. The NOW Polynya has been the subject of a few ecosystem studies, including the Canadian-led study of the NOW Polynya in 1998.

In Baffin Bay, the *Amundsen* served as a research platform to continue the time series of oceanographic measurements in the NOW Polynya and revisit designated stations along the east-west transect across the bay (Figure 1.3). This was also the occasion to recover oceanographic moorings deployed during the 2006 Expedition and to re-deploy these moorings for an additional year to continue monitoring the meteorological and oceanographic parameters in this region.

1.2.4 Canadian Arctic Archipelago (CAA)

The Canadian Arctic Archipelago (CAA) is a vast array of islands and channels that lies between Baffin and Ellesmere Islands in the east and Banks Island in the west (Figure 1.3). While transiting through the Northwest Passage, the science teams aboard the *Amundsen* sampled the atmosphere, sea ice and ocean to extend existing time series. This work is aimed at better understanding how the climate, ice conditions and ocean currents and biogeochemistry are changing under the effects of climate change and industrialization. With diminishing sea ice extent and volume in the Arctic, the Northwest Passage may be ice-free and open to navigation during summer in the near future. Seafloor bathymetric data and sub-bottom information were collected while transiting through the Northwest Passage to map the seafloor and identify potential geohazards and obstacles to the safe navigation of this new seaway.

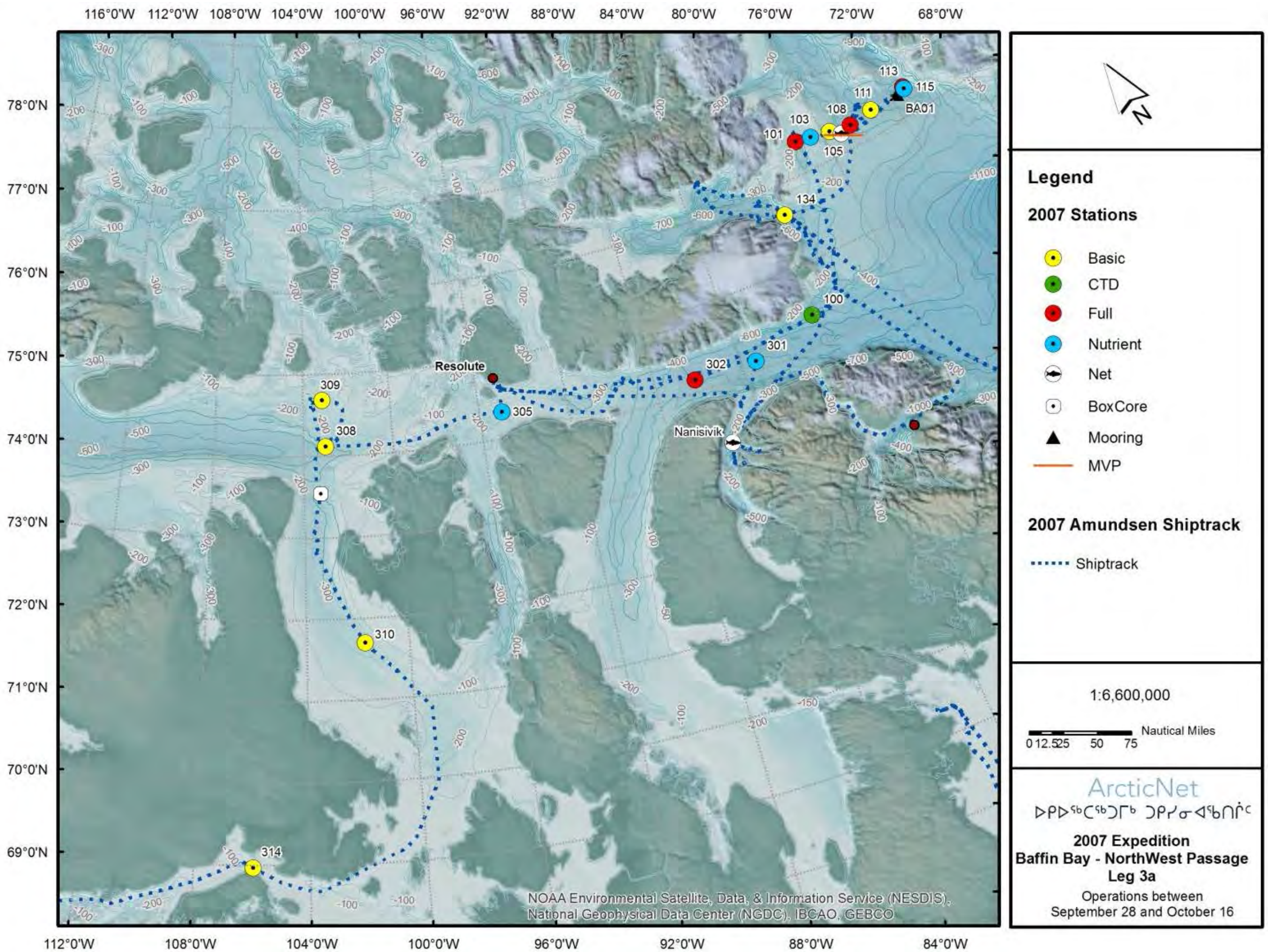

Figure 1.3. Ship track and the locations of stations sampled in Baffin Bay and the Canadian Arctic Archipelago (Northwest Passage) by the CCGS *Amundsen* during Leg 3a of the 2007 ArcticNet Expedition.

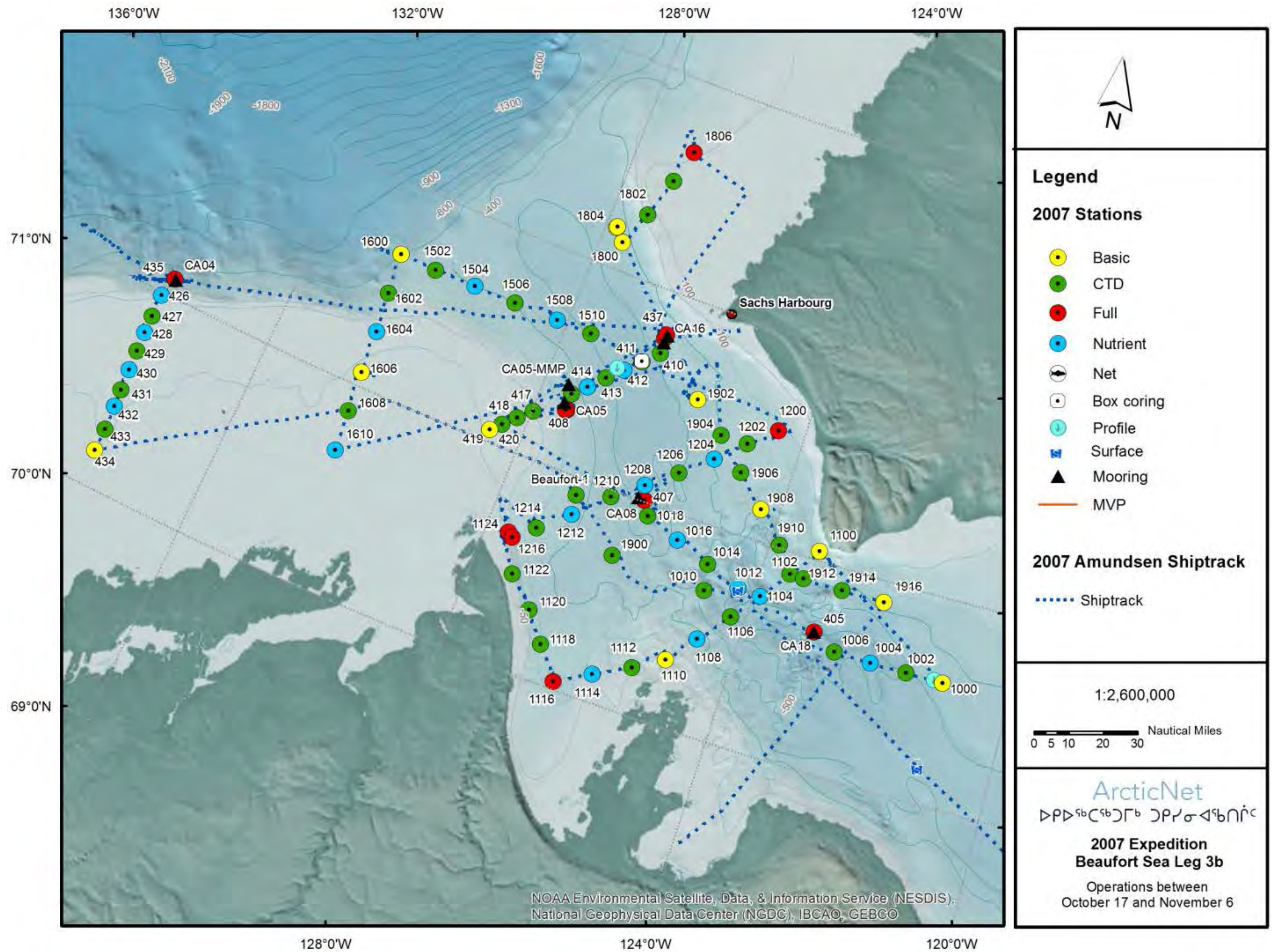

Figure 1.4. Ship track and the locations of stations sampled in the Amundsen Gulf and the Beaufort Sea by the CCGS *Amundsen* during Leg 3b of the 2007 ArcticNet Expedition. Note that Leg 3b was also the commencement of the Circumpolar Flaw Lead (CFL) study.

1.2.5 Beaufort Sea and Amundsen Gulf

At the western end of the CAA lies Amundsen Gulf, which widens into the Beaufort Sea past Banks Island. The Canadian Beaufort Sea (Figure 1.4) is characterized by a broad shelf onto which the Mackenzie River, the largest river in North America, carries largeamounts of freshwater. The mixing of freshwater from the Mackenzie River and Arctic marine waters of the Beaufort Sea establishes an estuarine system over the shelf, with associated inputs of freshwater biota and land-derived nutrients. Along the Mackenzie Shelf stretches the Cape Bathurst Polynya, an expanse of open water, which hosts two distinct phytoplankton blooms per year, with one peak occurring during spring or early summer, and a second occurring in late summer or fall. This highly productive ecosystem is also exceptional since it provides habitat for some of the highest densities of birds and marine mammals in the Arctic. This polynya is also part of the circumpolar flaw lead, which forms in the Arctic sea ice each year, creating a path of thinner ice and interconnected polynyas. The circumpolar flaw lead was investigated during the CFL study (2007-2008 overwintering Expedition started on Leg 3b), which aimed to better understand changes in the flaw lead, and their repercussions for other physical and biological processes in the Arctic Ocean.

1.3 2007 CCGS *Amundsen* Expedition Plan

1.3.1 General schedule

The CCGS *Amundsen* left Quebec City on 26 July for a 15-month expedition in the Canadian Arctic to conduct a wide range of scientific activities in northern Labrador fjords, Hudson Bay, Baffin Bay, the Canadian Arctic Archipelago and the Beaufort Sea. The ship overwintered in the Beaufort Sea for the Circumpolar Flaw Lead (CFL) study and returned to Quebec City on 16 October 2008.

1.3.2 Leg 1 – ArcticNet - 26 July to 17 August 2007 – Labrador fjords and Hudson Bay

From Quebec City, the vessel first headed for the Labrador Sea where a bathymetric survey was conducted on the Makkovik Margin, then traveled to fjords located along the northern Labrador coast to carry out oceanographic sampling operations. The *Amundsen* sampled stations in Hudson Strait while traveling toward Hudson Bay where operations were conducted from 5 to 17 August, focusing on the recovery of moorings deployed in 2006, the deployment of four new moorings, the sampling at designated stations and MVP transects.

1.3.3 Leg 2 – Nunavut Inuit Health Survey – 17 August to 27 September 2007

The second leg of the Expedition was dedicated to the Nunavut Inuit Health Survey conducted as part of the IPY/ArcticNet program. The Nunavut Health Survey started in Churchill on 17 August and ended in Resolute Bay on 27 September. The following Inuit communities were visited: Sanikiluaq (Leg 1), Arviat, Whale Cove, Rankin Inlet, Chesterfield Inlet, Coral Harbour, Repulse Bay, Hall Beach, Igloolik, Cape Dorset, Kimmirut, Iqaluit, Pangnirtung, Qikiqtarjuaq, Clyde River, Pond Inlet, Grise Fiord and Arctic Bay. While the *Amundsen* was used as the platform to conduct the health survey, Leg 2 is not covered in this Expedition Report.

1.3.4 Leg 3 – ArcticNet/SOLAS/CFL - 27 September to 8 November 2007 – Baffin Bay, Canadian Arctic Archipelago, Amundsen Gulf and Beaufort Sea

Leg 3 of the ArcticNet 2007 Expedition was sub-divided into two segments. Leg 3a started in Resolute Bay on 27 September and the ship headed straight for northern Baffin Bay to service two moorings deployed in 2006 and to deploy an additional mooring. A full suite of sampling operations was also carried out at each Mooring stations as well as at stations positioned along the North Water (NOW) transect across Baffin Bay. The ship then traveled west for mooring instrument calibration and an oceanographic and bathymetric survey at the head of Belcher Glacier on the northeast side of Devon Island. The ship finally transited the Northwest Passage and conducted sampling operations along the way. Leg 3b, from 18 October to 8 November, took place in the Beaufort Sea and was the launch of the Circumpolar Flaw Lead (CFL) System study.

2 Leg 1 – 26 July to 17 August 2007 – Labrador fjords and Hudson Bay

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2.1 Introduction

Leg 1 of the 2007 Expedition was centered on the ArcticNet marine-based research program aiming at studying the impacts of climate change in the coastal Canadian Arctic, more specifically at the Makkovik Margin in the Labrador Sea, in three Labrador fjords for the Nunatsiavut Nuluak project, in Hudson Strait and Hudson Bay. The objectives of Leg 1 were to:

- Sample the atmosphere and quantify gas fluxes at the sea ice-seawater-atmosphere interface along the cruise track.
- Conduct oceanographic sampling of the water column for physico-chemical properties and components of the marine food web at designated ArcticNet stations.
- Sample the sediments at designated stations located in the Labrador fjords and in Hudson Bay.
- Retrieve and re-deploy instrumented moorings at key locations in Hudson Bay (AN01, AN02, AN03 and AN04).
- Obtain bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and conduct three dedicated surveys, at the Makkovik continental margin in the Labrador Sea and at two sites in Hudson Bay.

2.1.1 Nunatsiavut Nuluak project – northern Labrador fjords

In northern Labrador, concern about the ecological integrity of the marine environment has been expressed in terms of the effects of climate change, of industrialization (modernization, particularly expanding mining/exploration activities) and contaminants. The Nunatsiavut Nuluak project is designed to address the predominant concerns of local Inuit as identified through the study of three marine ecosystems: Anaktalak Bay (the shipping route to the Voisey's Bay nickel mine), Saglek Bay (an ecosystem recovering from a historical source of PCB contamination) and Nachvak Fjord (a pristine ecosystem adjacent to the Torngat Mountains National Park Reserve). The project involved a shore-based research program (from a longliner and small boats) and a ship-based research program carried out from the CCGS *Amundsen*.

Anaktalak Bay (a fjord) is located south of Nain, and is extensively used by Labrador Inuit for harvesting (both from the water and adjacent shores) and travelling. The Voisey's Bay Nickel Company (VBNC) has recently developed a nickel-copper-cobalt mine and plans to mill in the region, which will discharge treated effluent to the head of Anaktalak Bay. The fjord will be used as its main shipping route. Local Inuit are concerned about the impact of potential spills and shipping on the Anaktalak Bay ecosystem, especially during winter when ice conditions may be disrupted. The work conducted in Anaktalak Bay will help understanding the marine ecosystem, and collect baseline data to test the feasibility of the monitoring program proposed by the Nunatsiavut Government in collaboration with the Voisey's Bay Nickel Company (VBNC).

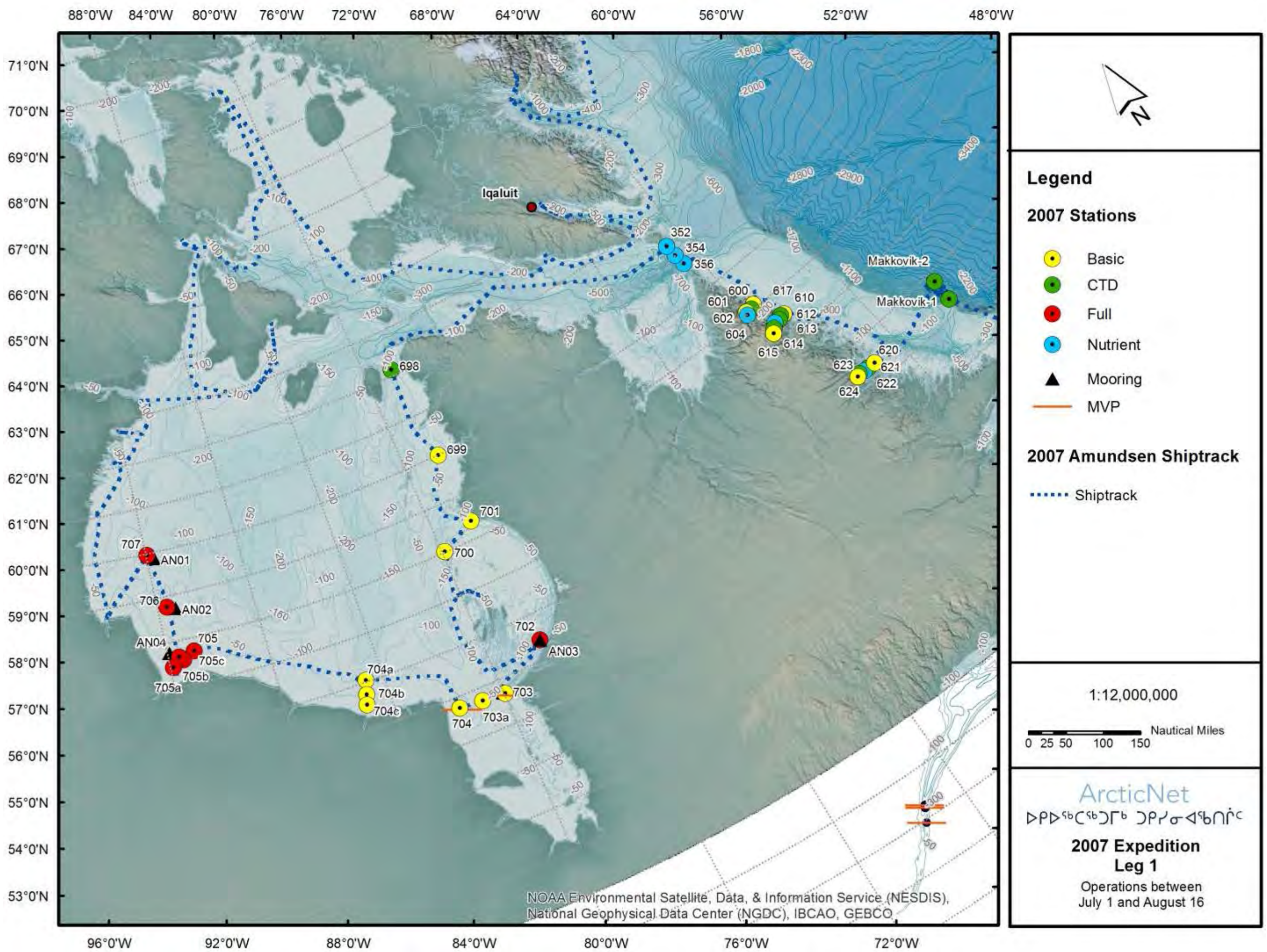

Figure 2.1. Ship track and the locations of stations sampled in three northern Labrador fjords and Hudson Bay by the CCGS *Amundsen* during Leg 1 of the 2007 ArcticNet Expedition.

Saglek Bay, which is part of Saglek fjord, constitutes the southern boundary of the Torngat Mountains National Park Reserve. More than 10 km^2 of sediments in Saglek Bay have been contaminated with PCBs due to erosion from an adjacent military site. The Nunatsiavut Government (formerly the Labrador Inuit Association) collaborated with the Department of National Defence and the Environmental Sciences Group (ESG) and other stakeholders to identify the extent and effect of this contamination. Now that the shore-based source of PCBs has been removed, there is a need to develop a long-term monitoring program for Saglek so that future advisories are based on meaningful data. The proposed work focused on re-establishing baseline conditions with a view to establishing appropriate indicators for future monitoring.

Nachvak fjord, located adjacent to the recently established Torngat Mountains National Park Reserve, provides an important reference site for the collection of baseline data on pristine Labrador fjords. Current data further suggest that Labrador is experiencing climate change at a slower rate than other parts of the North. The monitoring of this pristine fjord will serve as a reference for assessing and understanding the effects of future climatic change in the region.

The specific objectives of the Nunatsiavut Nuluak project were to:

- Determine the spatial variability of phytoplankton production and biomass in the coastal zone and compare the observed variability across latitudinal gradients (i.e. between fjords) and across longitudinal gradients (i.e. mouth versus head) within each fjord.
- Determine the spatial variability of zooplankton production and biomass in the coastal zone and compare the variability across latitudinal gradients (i.e. between fjords) and across longitudinal gradients (i.e. mouth versus head) within each fjord.
- Determine the spatial variability in nutrient production rates within and between each fjord.
- Determine the role of environmental conditions on the phytoplankton and zooplankton dynamics.
    - o Compare seasonal differences in the fjords (results from July 2007 to results from fall 2006).
    - o Determine oceanographic conditions using vertical profiles with a CTD probe.
    - o Determine the concentrations of inorganic nutrients (NO_3, NO_2, PO_4, and $Si(OH)_4$) with a nutrient autoanalyzer.

2.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 1. Detailed cruise reports provided by onboard participants and including specific objectives, methodology and preliminary results for projects conducted during this leg are available in Part II of this report.

During this leg, the *Amundsen* traveled from Quebec City, QC (26 July) to Churchill, MB (17 August) and visited 43 stations with an overall tally of operations and activities as follows:

- 8 CTD casts
- 30 CTD-Rosette casts
- 2 MVP transects
- 29 light and phytoplankton profiles, including Secchi disk and PNF.
- 3 VMP profiles
- 41 plankton tows and trawls, including horizontal and vertical net tows, Hydrobios and RMT.
- 22 box cores sampling of the sediments

- 3 dedicated bathymetry / sub-bottom mapping surveys
- 2 moorings recovery and four deployments in Hudson Bay

A detailed scientific log for all sampling operations conducted during Leg 1, giving the positions and depths of the visited stations is available in Appendices 1 and 2.

2.2.1 Timeline of operations

On 29 and 30 July, a bathymetric survey was conducted on the Makkovik Margin in the Labrador Sea using the ship's integrated EM-300 multibeam echosounder. The targeted area that was mapped was bounded by previous surveys conducted in 2004 and 2006. CTD casts and a VMP profile were also performed at two stations located in the Makkovik survey area.

Anaktalak Bay (Stations 620-624; Figure 2.1) was the first fjord visited on 31 July, where two Basic, two CTD and one Nutrient stations were sampled. In Saglek fjord (Stations 610-617, Figure 2.1), visited on 1 August, two Basic, three CTD and one Nutrient stations were carried out, while in Nachvak fjord (Stations 600-604, Figure 2.1), two Basic, one CTD and one Nutrient stations were conducted on 2 August.

Operations conducted at Basic stations included one or two deployments of the CTD-Rosette, a fluorescence vertical profile with the PNF and euphotic depth determinations using the Secchi disk. An oblique tow with the Tucker net and a vertical tow with the multi-net sampler (Hydrobios) were also used to sample zooplankton and ichtyoplankton in the water column, and finally, a box core sampling of the surface sediments was conducted. A CTD vertical profile was carried out at each CTD and Nutrient station, with water samples being also collected at different depths in the water column using the Rosette at Nutrient stations.

On 3 August, the CTD-Rosette was deployed at three Nutrient stations (352, 354 and 356; Figure 2.1) situated at the mouth of Hudson Strait. Vertical profiles of temperature, salinity, fluorescence and dissolved oxygen were obtained and water samples were collected at different depths for nutrients, contaminants and phytoplankton parameters. Also, while in transit through Hudson Strait, the *Amundsen* followed a path south of the 2006 ship track to extend the seabed mapping coverage obtained the previous year.

From 5 to 17 August, the *Amundsen* conducted operations in Hudson Bay (Stations 698 to 707 and Mooring stations AN01, AN01, AN03 and AN04; Figure 2.1). Operations included recovering the three moorings deployed in 2006, deploying 4 new moorings, sampling at designated Mooring/Full stations and carrying out two MVP transects. Moreover, before redeploying the moorings for another year, compasses of all current meters need were calibrated (recovered instruments also needed to be post-calibrated) on land and in relative proximity of the mooring sites. Two calibration sites were identified in Hudson Bay:

Kuujjuaraapik and near the Nelson River sampling area. These sites were accessed with the *Amundsen*'s helicopter.

First, on 5 and 6 August, CTD Station 698 and Basic Stations 699, 700 and 701, were visited in northeastern Hudson Bay with the usual suite of sampling operations including CTD-Rosettes, zooplankton net tows and box cores. From Station 700, the CCGS *Amundsen* headed towards Sanikiluaq for a 48-h stop on 6-8 August. In the afternoon of 6 August, senior officials from the community were invited onboard for a presentation and discussions, followed by a dinner and a tour of the ship. The following days were dedicated to the Sanikiluaq community Health Survey, which was part of the 2007 Nunavut Inuit Health Survey IPY/ArcticNet program carried out during Leg 2.

The ship then headed for Mooring/Full Station 702 (AN 03-06), which was reached on 9 August. Operations at this station focused on the mooring recovery and calibration of current meters on shore using the helicopter. The mooring AN03 was successfully recovered and redeployed (AN03-07) for another year. The *Amundsen* headed towards James Bay to carry out a 60 nautical miles long MVP transect across the mouth of the Bay. CTD-Rosette stations at the beginning (703), mid-point (703a) and end of the transect (704) served as calibration points for the MVP.

At the mouth of the Winisk River on 12 August, 3 new Basic stations were sampled (labeled 704a, 704b, and 704c) before heading for the Nelson River, which was reached in the evening of 13 August. The main operations conducted in the Nelson River were the recovery of moorings AN05-06 and AN04-06, and the re-deployment of AN04-07. AN05-06 was successfully retrieved but AN04-06 was lost likely because it was located in a scour zone. A new mooring at AN04-07 was successfully deployed. During the oceanographic sampling operations at Full stations along a transect from the Nelson estuary into the Bay (705, 705a, 705b and 705c), mooring technicians used the helicopter to access the shore of the Nelson River estuary to calibrate current meter compasses.

Before reaching the port of Churchill, two new moorings were deployed on 15 and 16 August at AN02-07 and AN01-07 (AN01-06 was not recovered), with associated oceanographic sampling operations at Full Stations 706 and 707.

2.3 Chief Scientist's comments

The 2007 Leg 1 operations were successfully completed between 23 July and 16 August 2007. More than 40 scientists participated in the leg and were supported by 40 CCGS crew members. The scientific mission followed the science plan as provided by ArcticNet with only a few modifications due to weather and scientific expediency. Some stations were added to the west and east sides of Hudson Bay and the nearest existing station was selected for the numbering convention. It would be good in future iterations that the numbering system follows something like 710, 720, 730 so that numbers can be added between stations as required.

The weather was quite good until the last 5 days of the leg and several hours of sampling were lost due to strong winds between the Winisk River and the Nelson River estuary. Two moorings were lost; one in the scour zone of the Nelson Estuary and the other at Station 707. The mooring at Station 707 indicated that the releases were still on the bottom but recovery was unsuccessful even after a few hours of dragging.

A very busy community visit was conducted in Sanikiluaq, completed with an elder visit and science tour of the ship by members of the committee.

The Chief Scientist and all the science participants would like to thank the Commanding Officer, officers and crew of the CCGS *Amundsen* for their hard work and invaluable support which made this cruise a success.

3 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and the Canadian Arctic Archipelago

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3.1 Introduction

Leg 3a took place from 27 September to 18 October and focused on ArcticNet's marine-based research program in Baffin Bay (NOW transect time series) and the Canadian Arctic Archipelago, starting in Resolute and ending in Paulatuk. A contingent of the Canadian Arctic-SOLAS (Surface Ocean – Lower Atmosphere Study) program was also onboard during Legs 3a and 3b to conduct fieldwork as part of the International Polar Year (IPY).

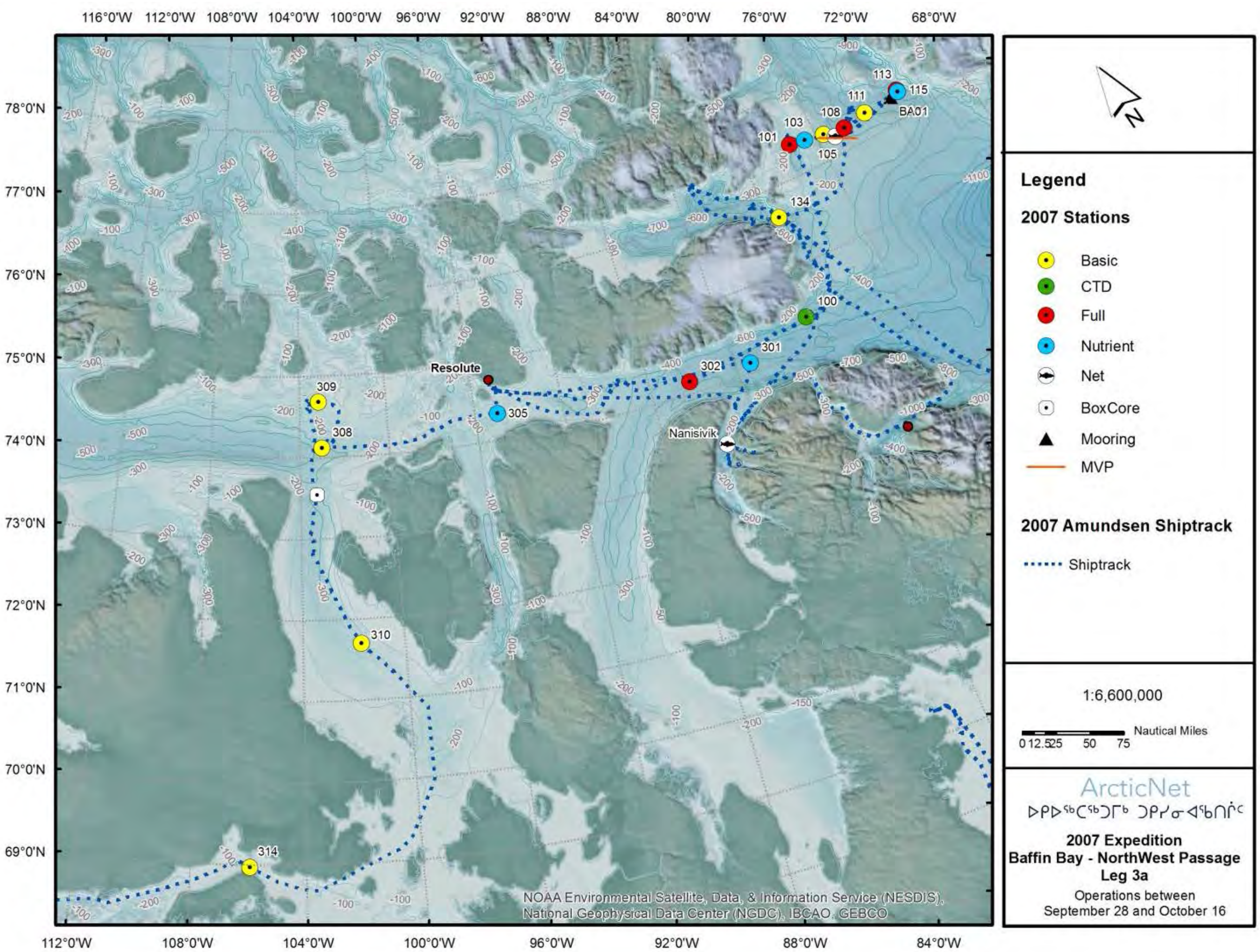

Figure 3.1. Ship track and the locations of stations sampled in Baffin Bay and the Canadian Arctic Archipelago (Northwest Passage) by the CCGS *Amundsen* during Leg 3a of the 2007 ArcticNet Expedition.

The specific objectives of the ArcticNet field program during Leg 3a were to:

- Sample the atmosphere and quantify gas fluxes at the sea ice-seawater-atmosphere interface along the cruise track.
- Conduct oceanographic sampling of the water column for physico-chemical properties and components of the marine food web at designated stations.
- Sample the sediments at designated stations located in Baffin Bay and the Canadian Arctic Archipelago.
- Conduct the inaugural dive of the *Amundsen*'s Remotely Operated Vehicle (ROV).
- Retrieve, service and re-deploy two moorings the NOW Polynya in Baffin Bay (BA01 and BA03) and deploy one new mooring at BA02.
- Conduct MVP profiling along the NOW transect across Baffin Bay.
- Test a prototype of mesopelagic trawl to sample zooplankton and ichthyoplankton.
- Obtain bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and a conduct dedicated survey at Belcher Glacier on Devon Island.

3.1.1 Arctic-SOLAS (Surface Ocean – Lower Atmosphere Study)

The domain of the surface ocean and lower atmosphere is a complex, highly dynamic component of the Earth system. Better understanding of the physics and biogeochemistry of the air–sea interface and the processes that control the exchange of mass and energy across that boundary define the scope of the Surface Ocean-Lower Atmosphere Study (SOLAS) project (see www.solas-int.org for more information).

SOLAS team members were onboard the *Amundsen* during Legs 3a and 3b to conduct atmospheric and oceanographic sampling as part of the Canadian International Polar Year (IPY) Arctic-SOLAS program. The project's goal is to study the ocean and atmosphere in concert along an eastern-western transect through the Canadian Arctic Archipelago. The specific objectives for Leg 3a (and 3b) were to:

- Quantify continuously atmospheric trace gases, aerosols and particles involved in atmospheric chemistry and climate, with a focus on the sulfur cycle.
- Quantify key trace gases in the upper water column at designated ArcticNet stations, with a focus on the biological production and cycling of climate active gases dimethyl sulfide (DMS) and nitrous oxide (N_2O).

3.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 3a. Detailed cruise reports provided by onboard participants and including specific objectives, methodology and preliminary results for projects conducted during this leg are available in Part II of this report.

During this leg, the *Amundsen* traveled from Resolute (27 September) to Paulatuk (18 October) with 34 stations visited and an overall tally of operations and activities as follows:

- 4 CTD casts
- 44 CTD-Rosette casts
- 28 light and phytoplankton profiles, including Secchi disk, PhytoFlash and PNF.
- 13 VMP profiles
- 6 LAWAS profiles
- 53 plankton tows and trawls, including horizontal and vertical net tows, Hydrobios, Agassiz trawl, RMT and prototype mesopelagic trawl
- 10 box cores and 2 van Veen grabs to sample the sediments
- 4 short-term sediment traps deployments
- One on-ice operation using the helicopter
- 2 ROV test dives (inaugural dives) in northern Baffin Bay (Station 115) and Admiralty Inlet.
- One dedicated bathymetry / sub-bottom mapping survey (initially planned at Belcher Glacier, but carried out at Station 108 in northern Baffin Bay)
- 2 mooring recovery attempts (both failed) and no mooring deployed in Baffin Bay, and one mooring recovery attempt in Beaufort Sea (failed).

A detailed scientific log for all sampling operations conducted during Leg 3a with the positions and depths of the visited stations is available in Appendices 1 and 2.

3.2.1 Timeline of operations

Leaving Resolute Bay on 27 September, the *Amundsen* headed east for Baffin Bay. Along the way, Station 100 was quickly visited to collect seawater for drifting sediment traps and for initial preparations. Sea ice in Lancaster Sound and along Ellesmere Island considerably slowed the approach to Station 101, which was reached 9 hours behind schedule.

On 29 September, sampling operations began slightly off Station 101, where the ice conditions were impractical, while the mooring team went on land to calibrate the compasses on the current meters. The ship slowly crawled to mooring BA03 but the area was filled with aggregated floes of solid old ice (9+/10) and it was deemed impossible to open and maintain a sufficiently large hole to release the mooring to the surface safely. The mooring recovery was postponed until the NOW transect was completed.

On 30 September, the ship slowly made its way amidst the ice floes to Nutrient Station 103 and Basic Station 105, which were successfully sampled. After leaving Station 105, the MVP was deployed; the first half of the section went well but the system malfunctioned so the operation was cancelled.

The floating sediment traps were deployed two miles west of Station 115, which was reached early on 1 October. The location was surrounded by icebergs of various sizes, with several huge ones in relative proximity. The two acoustic releases on mooring BA01-06 answered from a location a few hundred feet away and a response was also obtained from

BA01-05. Both releases of BA01-06 confirmed the command but nothing came up to the surface. The Zodiac was deployed and a visual search for the moorings was undertaken, but nothing was seen. The ship also made passes over the mooring coordinates and no line of instruments was visible on the EK60 echosounder. Given the presence of numerous icebergs in the area, it is plausible that the upper portion of the mooring has been carried away.

The inaugural ROV dive took place on 1 October at Station 115. Although a shallow dive of the cage and sortie of the sub was planned, glitches occurred during operations and it was decided to fix those before attempting a complete ROV dive. The full suite of operations planned for Station 115 was completed successfully and the ship sailed east.

After completing Nutrient Station 113 and Basic Station 111, Full Station 108 was reached at 16:45 on 2 October. After discussing the mooring program with the project leaders, it was decided to cancel the deployment of instruments initially planned for mooring BA02. The decision was motivated by the modest success rate of recoveries in the North Water Polynya and the need to keep the Beaufort Sea mooring program flexible.

Ice maps showed that the Belcher Glacier and approaches were surrounded by ice, making bottom mapping there impossible, so a mapping survey was inserted into the schedule at Station 108 to make up for this lost opportunity. By the time all the scientific operations planned at Station 108 were successfully completed, ice conditions at mooring site BA03 had not improved, making a second journey and recovery attempt impractical.

The waters close to the Belcher Glacier were ice-covered on 4 October, which again precluded the planned seabed mapping operation. Station 134 (Basic) was established in Jones Sound to the southeast of the entrance to the Belcher Glacier. Glacier operations scheduled by B. Danielson (U. Alberta) were carried out successfully using the helicopter but a problem with the meteorological station made the download of the data impossible. In the evening of 4 October, the CTD-Rosette cast scheduled for Station 300 was cancelled by the Commanding Officer due to strong winds, swell and currents. Such bad conditions made station-keeping and safe deployment very difficult.

The ship refuelled at Nanisivik and left on 6 October. An experimental mesopelagic trawl was deployed just off of Nanisivik. The deployment was slow and challenging, due to the nature of the operation and to difficulties to position the ship in the narrow passage, but once the net was in the water, the operation went smoothly and the retrieval was uneventful. A second deployment of the ROV proceeded in Admiralty Bay: the launch, dive and recovery operations were very successful and the ship was able to maintain minimal drift while the ROV was diving.

The ship left Admiralty Bay and sailed towards Basic Station 301, which was selected to make up for the lost opportunity at Station 300, and had also been visited in 2006. Full Station 302 was completed successfully but some operations (VMP, RMT, LAWAS, Phytoflash) were abandoned due to increasingly strong winds and incoming snowstorm.

The substrate was inappropriate for the boxcore, but sampling with the Agassiz sled was highly successful, bringing on board a high biomass of diverse organisms.

While sailing toward Nutrient Station 304, the seas rose dramatically and the bridge decided to turn to the south to sail under the relative protection of Prince Reagent Inlet, then set a course for Resolute. Six hours were lost due to bad weather and Station 304 was cancelled (and replaced by Station 305). After a short stop, the ship left Resolute for Station 305 at 17:00 then headed directly to Basic Station 308 (and skipped Station 312), which was reached the next morning (9 October), with the BBC crew filming some of the scientific activities.

As the ship sailed west in order to work in Viscount-Melville Sound, Radarsat images showed that the ice floes had compacted so the course was altered to go north and slightly west to avoid being trapped against the land south of Melville. The ship transited in a mixture of old heavy ice and thinner, soft ice. The ship halted at a safe distance from a large ice floe on 10 October for a Basic station while the helicopter flew B. Tremblay's team and the BBC filming crew to a nearby ice floe. The on-ice operations were a success but took nearly 6 hours longer than anticipated due to difficulties in locating an adequate site and to drilling problems.

The *Amundsen* sailed to Station 310 after a stop at an ad-hoc box core station (Box core A; 73°32.844' N; 103°17.934' W) to make up for the lost box core opportunities. Once Station 310 was concluded, the ship sailed directly to Station 314.

The ship then transited to a sheltered position to the northwest of Kugluktuk to meet with the CCGS *Louis Saint-Laurent* and arrived there on the morning of 13 October with a 5-hour delay due the heavy sea conditions. The weather forecast was once again not very good with winds from the northeast with gusts in excess of 35 knots and it was decided to head directly for the westernmost line (400) in the Beaufort Sea (see Figure 4.1). Basic Station 434 was reached at 09:00 on 15 October and the three mooring technicians left in the helicopter for calibrations on land. The line of short CTD stations went well and operations started at Mooring Station CA04 (Full Station 435).

As meteorological conditions deteriorated, the strong winds and waves created damages to the ship and the scientific equipment (gas cylinder, Hydrobios) and slightly injured a crew member. Operations were put on hold and the CO_2 flux tower was brought down as the ship drifted and damages were tended to. Only parts of the drifting sediments traps were recovered (the reflector, beacon and Argo float) and presumably the rope linking the instruments was cut by a piece of drifting ice. While waiting for the winds to abate and the weather to improve, the releases of mooring CA04 were interrogated. An erratic answer was received that suggested the mooring was nearly two kilometers off its position. A second attempt to contact releases and search for the mooring with the ship and Zodiac was made the following morning with no success. The new mooring (CA04-07) was deployed successfully. The rest of line 400 was abandoned and the ship sailed for Sachs Harbour.

The Chief Scientist's comments can be found at the end of Leg 3b, in Section 4.3 below.

4 Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

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4.1 Introduction

Leg 3b was carried out from 18 October to 7 November and was dedicated to operations in the Amundsen Gulf and Beaufort Sea as part of the IPY-CFL study and the Arctic-SOLAS program. The rationale and objectives of the Arctic-SOLAS field program are described in the introduction to Leg 3a above (Section 3.1.1).

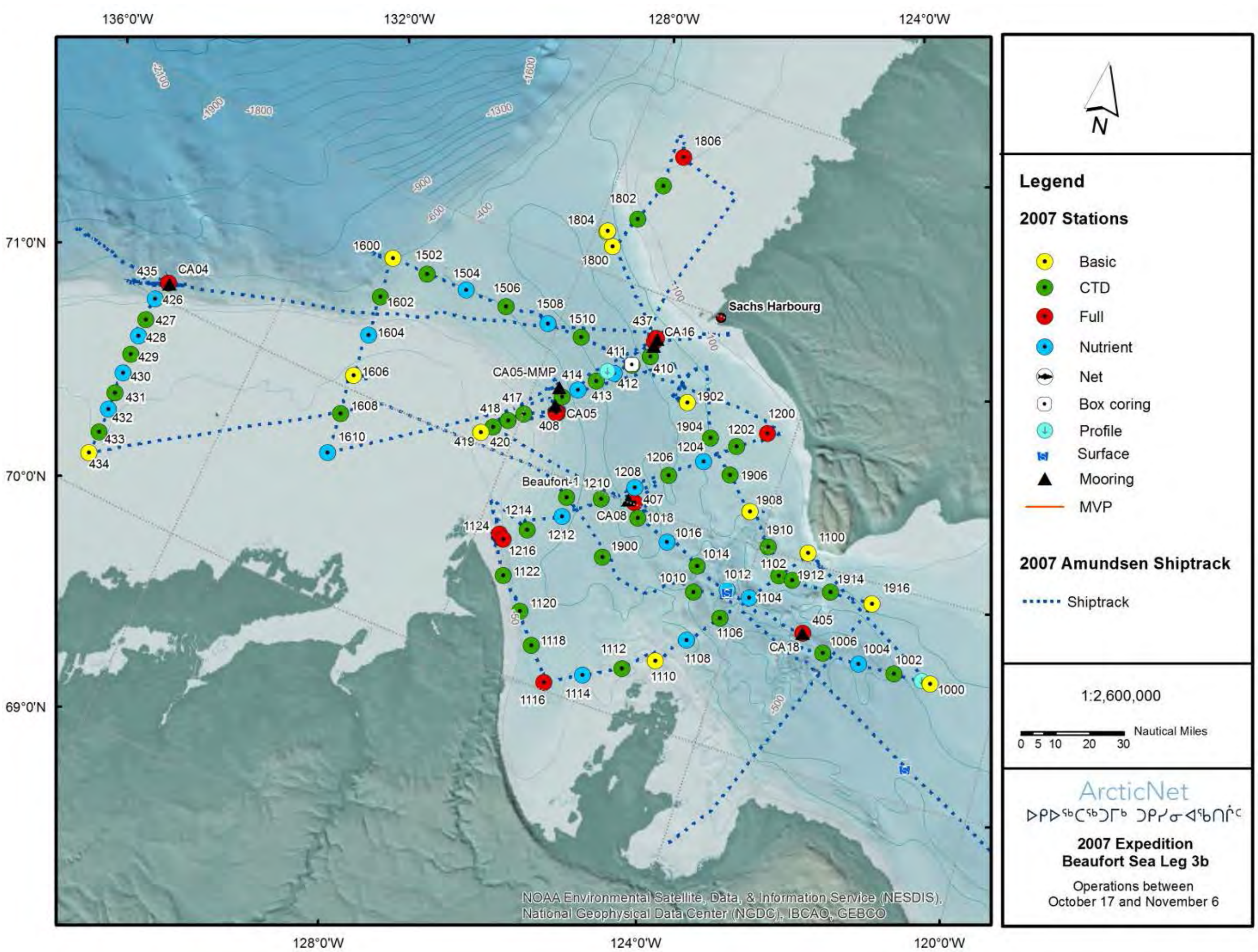

Figure 4.1. Ship track and the location of stations sampled in the Amundsen Gulf and the Beaufort Sea by the CCGS *Amundsen* during Legs 3a (westernmost Stations 426-435 only) and 3b of the 2007 ArcticNet Expedition. Note that Leg 3b was the commencement of the Circumpolar Flaw Lead (CFL) study and overwintering expedition.

The specific objectives of Leg 3b were to:

- Sample the atmosphere and quantify gas fluxes at the sea ice-seawater-atmosphere interface along the cruise track.
- Sample the water column for physico-chemical properties of the water and components of the marine food web at a total of 84 stations.
- Sample the sediments at 20 stations located in the Amundsen Gulf and the Beaufort Sea.
- Retrieve and re-deploy instrumented moorings the Beaufort Sea.
- Obtain bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and conduct a dedicated survey in Franklin Bay.

4.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 3b. Detailed cruise reports provided by onboard participants and including specific objectives, methodology and preliminary results for projects conducted during this leg are available in Part II of this report.

During this leg, the *Amundsen* traveled from Sachs Harbour (18 October) to Paulatuk (8 November) and 84 stations were visited with an overall tally of operations and activities as follows:

- 35 CTD casts
- 61 CTD-Rosette casts
- 26 light and phytoplankton profiles, including Secchi disk and PNF.
- 12 VMP profiles and 11 SCAMP profiles
- 29 LAWAS profiles
- 41 plankton tows and trawls, including phytoplankton net tows, horizontal and vertical zooplankton net tows, Hydrobios, Agassiz trawl and RMT
- 20 box cores and one van Veen grab to sample the sediments
- 2 short-term sediment traps deployments
- 11 on-ice operations using the helicopter or the ice cage
- One dedicated bathymetry / sub-bottom mapping survey carried out near Station 1118 in Franklin Bay
- One mooring recovery was successful out of the two attempted (although the second one was located) and 5 moorings were deployed in the Beaufort Sea, including 2 MMP moorings.

A detailed scientific log for all sampling operations conducted during Leg 3b with the positions and depths of the visited stations is available in Appendices 1 and 2.

4.2.1 Timeline of operations

In Sachs Harbour, the mooring technicians went on land to calibrate the instruments. There were gale wind and freezing spray warnings in effect for the region and delays ensued until conditions improved. The ship headed to Mooring Station 437, which was reached around 22:30 and operations started but had to be cancelled as the sea state degenerated rapidly. With equally bad weather forecasted for the next day, the ship proceeded north to complete the transect line from Stations 1806 to 1800 under the protection of Banks Island. According to the coordinates given in the cruise plan, these stations were much too shallow (less than 20 m of water under the keel) to conduct most science operations. The line was moved 18 miles to the west in order to have enough water to work and the five stations were all completed on 19 and 20 October.

In the morning, the *Amundsen* headed to mooring CA16 (Station 437) to assess conditions and it was deemed that the mooring deployment was feasible. CA16-07 was deployed successfully but the weather was too rough to deploy the adjacent MMP mooring so CTD stations to the south were conducted. The MMP deployment at CA16 went smoothly and the sampling along line 400 (408-419) continued until mooring CA05 (Station 408) was reached. All the operations typically done at Full stations were performed at 408, the new moorings CA05-07 and CA05-MMP-07 were deployed and triangulated, and a CTD cast was done after the deployments.

The ship then proceeded east along the central line and reached mooring CA08 (Station 407). The mooring did not answer and a ROV dive was planned for the next day to try to locate it. A survey of the bottom was done during the night, both for mapping purposes and to identify potential obstacles for the ROV dive. The ROV dive went very well, all the bottom area around the assumed position of the mooring was surveyed visually as well as with the sonar, but the train wheels (anchor) were not found and it was established that the mooring was not within a 100-m radius of its triangulated position (which had a precision of 10 meters). Since mooring instruments were getting short, a new mooring at CA08 was not deployed.

A series of CTD and Nutrient stations were conducted toward the next mooring site CA18/Station 405. The releases of the mooring answered and the mooring was triggered but it took a long time to come up and, unfortunately, the white mid-water buoy came up first without the upper section. Evidence from moorings CA08 and CA18 points toward an unusual year where ice rafting may have been more intense than usual. The new mooring CA18-07 was deployed smoothly with the top instruments lowered by 10 meters in order to increase the safety margin and reduce the risks of ice damage.

The ship proceeded east with CTD stations and Basic station 1000, then moved close to Banks Island to complete Basic Station 1100. It then traveled south with a series of CTD and Nutrient stations, arriving at Full Station 1116 in the night of 28 October. There was a fair amount of new ice at this station and some operations were cancelled (i.e. Tucker, RMT). As it was impractical to use the Zodiac, the SCAMP was deployed from the moonpool. It was impossible to deploy the MVP in ice; so three new CTD stations were added (1118, 1120, 1122) on the way to Full Station 1216. Box cores were also done at Stations 1120 and 1122 to see if a spatial gradient in benthos community richness existed toward the hotspot. On arrival, 8 hours were spent mapping the ROV deployment site, which was slow and difficult with the ice and strong currents. These strong currents were oriented to the northwest and, along with winds of 25-30 knots and drifting ice floes, made it impossible to hold the ship in position for the ROV deployment; the dive was cancelled. Mooring CA08-06 was interrogated from Stations 1210, 1208 and 1206 in case it had drifted south or north from its triangulated position and the mooring answered at Station 1208. The next 2 hours were spent triangulating it but the operation was difficult amidst winds of 40 knots and drifting ice, and it took a long time to obtain a valid set of coordinates. The new ice and strong winds made any recovery attempt impossible, but the coordinates could be used next year as a starting point for the search. From there, the ship proceeded north along a line of CTD and Nutrient stations. Station 1200 was completed before moving west to complete lines 1500 and 1600.

On 1 November, the community of Paulatuk was contacted to see if there was an interest for a community visit and the response was very enthusiastic.

With the high winds and cold temperatures, several glitches were experienced with the Rosette probably because the heater in the Rosette shack did not adequately maintain the ambient temperature. It was decided to migrate Rosette operations to the moonpool after the completion of line 1600. Activities on line 1900 resumed during the evening of the 3 November, but operations were again interrupted by engine problems. Station 1908 was completed in the morning of 5 November and two CTD stations were performed on the way to the last Basic station (1916). However, the multi-conductor cable of the Rosette and the cable guide were damaged and the Rosette cast for Basic Station 1916 and the last two CTD stations of line 1900 were cancelled until the necessary repairs could be completed. Once other operations were completed on 6 November, the ship sailed to Paulatuk, where a community visit of the ship was organized.

4.3 Chief Scientist's comments (Legs 3a and 3b)

The present Chief Scientist's report covers both the ArcticNet (Leg 3a, 27 September – 18 October) and CFL (Leg 3b, 18 October – 8 November) portions of Leg 3 of the 2007 Expedition. A SOLAS (Surface Ocean Lower Atmosphere Study) contingent was also present on board, bringing an additional atmospheric component to a predominantly ocean and ice-based science program. Despite some severe ice conditions, strong winds and bad weather, more than 20 science operations were successfully conducted on a daily basis, including the inaugural dives of the ROV (remotely operated vehicle) and the first deployment of an experimental mesopelagic trawl.

The community visit in Paulatuk took place on 6 and 7 November. In the evening, 14 elders were hosted and activities included a tour of the ship, a formal diner with community members, HTC, coast guard and scientists, and a presentation of the CFL study and of the

Amundsen. The event was very pleasant and the interactions were rich and positive. Teenagers from the local school came on board in the morning of 7 November and were taken on a tour of science and navigation stations of the ship.

The Chief Scientist and the science participants of Leg 3 express their gratitude to the Commanding Officer Lise Marchand and the officers and crew of the CCGS *Amundsen* for their unrelenting support and comprehension throughout the cruise.

Part II – Project reports

1 Meteorological, oceanographic and navigation data – Legs 1 and 3

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1.1 Introduction

A suite of core data and information is collected during the CCGS *Amundsen's* annual expedition using various systems and instruments. Ship position and navigation data (CNAV and POS-MV) and meteorological information (AVOS, Environment Canada) are collected on a continuous basis. Oceanographic data is collected using a CTD-Rosette, a Moving Vessel Profiler (MVP), a ship-mounted current profiler (SM-ADCP) and an underway thermosalinograph (TSG) system.

The datasets collected are processed, archived and managed by the ArcticNet/*Amundsen* technical and data management team. All variables from the datasets are verified and quality controlled using time series and mapping plots, and spurious data and outliers are flagged. The processed datasets will be archived on the Polar Data Catalogue (PDC) at www.polardata.ca.

1.2 Description of systems and available data

1.2.1 Navigation and ship position information – POS-MV and C-Nav

The *Amundsen* is equipped with a POS-MV (Position and Orientation Systems for Marine Vessels) and a C-Nav DGNSS Precise Point Positioning systems. Both these systems record data continuously, with the POS-MV data having a better resolution and accuracy than the C-Nav data. Thus, C-Nav data are used only when POS-MV data are unavailable for a period of 20 seconds or longer. Both systems use WGS 84 Geographic Coordinates.

Table 1.1. Variables measured by the navigation systems onboard the CCGS *Amundsen*.

Variable	Units
Date	yyyy/mm/dd
Hour UTC	HH:MM:SS
Latitude	deg N
Longitude	deg E
GPS source	POSMV:1 CNAV:0

Variable	Units
Heading	deg N
Roll	deg
Pitch	deg
Heave	m
Track	deg N
Speed	Knt

Three types of datasets are issued from the navigation systems and are available for the two legs of the 2007 *Amundsen* Expedition:

- the complete data
- a 15-minute reduced version
- a ship track

The QA/QC process for the NAV data is described in the README file attached to the archived data on the PDC (CCIN 12447). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the NAV data is available in the reference section of this project report.

1.2.2 Meteorological information – AVOS (Environment Canada)

An Environment Canada Automated Volunteer Observing Ship (AVOS) system was continuously recording meteorological data on atmospheric pressure, wind speed and direction, air temperature and humidity during the 2007 *Amundsen* Expedition.

Table 1.2. List of meteorological instruments and recorded variables of the AVOS system.

Instrument	Variable	Specifications
Vaisala Digital Barometer – PTB-210	Atmospheric pressure	Range: 50 to 1100 hPa Accuracy: 0.35 hPa Resolution: 0.1 hPa
Young R.M. Anemometer - 05103	Wind speed	Range: 0 to 100 m/s Initial accuracy: 0.3 m/s
	Wind direction	Range: 0 to 360° Initial accuracy: 3°
Rotronic Meteorological – MP10	Air temperature	Range: -40 to 60°C Initial accuracy: 0.2°C
	Humidity	Range: 0 to 100% RH Initial accuracy: 1% RH

The QA/QC process for the AVOS data is described in the README file attached to the archived data on the PDC (CCIN 12518). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the AVOS data is available in the reference section of this project report.

1.2.3 CTD-Rosette

The *Amundsen*'s CTD-Rosette was used to perform vertical profiles of water column properties and to collect water samples. A description of the instruments and sensors used on the CTD-Rosette and the variables measured, as well as an account of the operations conducted during Legs 1 and 3, are provided in Section 7. The CTD logbook detailing the location, date and time, and depth of CTD-Rosette casts for each leg of the 2006 *Amundsen* Expedition is available in Appendix 3.

The CTD data are available in raw and processed formats on the PDC. The QA/QC process for the CTD data is described in the README file attached to the archived data on the PDC (CCIN 12713). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the CTD data is available in the reference section of this project report.

1.2.4 Moving Vessel Profiler (MVP)

The Moving Vessel Profiler (MVP) was used to conduct a portion of the transect crossing North Water Polynya from Ellesmere Island to Greenland. More information on MVP operations can be found in Section 7.

1.2.5 Ship-mounted current profiler (SM-ADCP)

The *Amundsen* is equipped with a hull-mounted Acoustic Doppler Current Profiler (ADCP) continuously recording current velocity and direction under the ship and along the transit route. Data was collected during Legs 1, 2a and 2b, but datasets are unprocessed.

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2 Atmospheric aerosols and trace gases (Arctic-SOLAS) – Leg 3

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2.1 Introduction

The primary goal of this study was to follow the sulfur cycle in the atmosphere in collaboration with the other SOLAS groups on board who looked at ocean-atmosphere sulfur exchange. Gas-phase dimethyl sulfide, measured on board with the proton transfer mass spectrometer (PTR-MS), can be oxidized to form sulfur dioxide, also measured on board, which can be further oxidized to sulfuric acid and either nucleate to form new particles or condense onto existing particles. This was monitored using various aerosol size distribution instruments as well as a time-of-flight aerosol mass spectrometer (ToF-AMS). Secondary goals were to measure other trace gases and characterize the aerosol population in a polar marine environment.

2.2 Methodology

2.2.1 Sampling instruments

All of the instruments except for the MOUDI were located in a controlled temperature structure located behind the bridge of the CCGS *Amundsen*. Approximately 30 feet of ⅜ inch stainless steel line was run out to the mast ~10 feet above the bridge for aerosol sampling. A ¼ inch Teflon line was run parallel to the aerosol sampling line to measure the trace gases. A second shorter line ~10 feet was situated above the structure housing the instruments. The PTR-MS measurements were split between the two sampling locations.

2.2.2 Trace gas measurements

An Ionicon PTR-MS was employed to measure multiple volatile organic carbon and sulfur compounds. Some of the species measured were acetaldehyde, acetone, acetic acid, benzene, dimethyl sulfide (DMS), hydrogen sulfide, methanol, methacrolein, methyl ethyl ketone, methyl vinyl ketone and toluene. Measurements were obtained continuously on 30-second intervals. Ozone (Thermo Environmental U.V. Photometric Analyzer Model 49) and sulfur dioxide (Thermo Environmental Pulsed Fluorescence Analyzer Model 43 S) were also measured continuously from the mast sampling site.

2.2.3 Aerosol measurements

Size distributions of aerosols between 10-500 nm were obtained with a sizing mobility particle sizer (SMPS), total fine particles (> 3 nm) were measured with a condensation particle counter (CPC) and size distributions for the coarse fraction (0.5-20 µm) were measured with an aerodynamic particle sizer. Real-time continuous measurements of aerosol composition were obtained with a ToF-AMS for the first 3 weeks of the measurement campaign. Aerosol composition was also obtained from a MOUDI impactor placed above the bridge.

Atmospheric aerosols were also collected by the U. Calgary group using two high volume samplers (hi-vols). The hi-vols were installed above the bridge. One was equipped with SO_2 and particulate filter for the collection of bulk aerosols and their precursors. The other was equipped with a 5-stage cascade impactor for the collection of size-segregated aerosols. Collection of bulk aerosols was done daily, while collection of size segregated aerosols was done over a 3-day period. “Field blanks” were also obtained.

2.2.4 DMS measurements

Atmospheric DMS measurements were also made during Leg 3. Samples were collected through a Tenax tube using a portable, battery-operated sampler equipped with mass flow controller. Samples were collected on the deck containing the hi-vols. During Leg 3a (ArcticNet program), samples were collected every hour for 24 hours. During Leg 3b (CFL Study), samples were taken every one to one and a half hour for 6 to 12 hours a day. During Leg 3a, surface water samples were also collected every two hours for DMS analysis. All samples were analysed on board using a gas chromatograph fitted with a sulphur chemiluminescence detector provided by the Meterological Service of Canada (S. Sharma).

2.2.5 Other measurements

CO_2 in the atmosphere was also measured using a LICOR CO_2 analyzer. The difference between CO_2 in the atmosphere and CO_2 in a cylinder of compressed air (yet to be calibrated to international standards) was used to determine the presence of ship stack emissions. Relative humidity and temperature sensors were placed at the level 5, on the exterior of the ship, to obtain temperature measurements at two heights so that boundary layer heights could be calculated. Unfortunately, interference from the ship’s radio and radar signals rendered these temperature measurements useless.

2.3 Preliminary Results

The data needs to be quality checked due to frequent fumigation of the inlet lines by smoke stack emissions. Chemical and stable isotope analysis of the aerosol samples will be performed in laboratories at the University of Calgary.

2.4 Comments and recommendations

J. Bottenheim (Environment Canada) expressed an interest in measuring atmospheric DMS between this fall (2007) and the next one (2008), when C-SOLAS will use the equipment again. To do so, additional cylinders of H_2 and O_2 aboard the ship would facilitate use of the GC-SCD and DMS samplers by Bottenheim's group during the spring. However, due to weight and logistical restrictions, spare cylinders were not placed on board. This is unfortunate, as data from the spring would have been very interesting to have in addition to the two fall periods, particularly if another group measured DMS in the water at that time.

The fume hood in the Paleolab needs to be fixed. Putting the ozone exhaust outside causes ice to form in the tubing that blocks the exhaust. Moreover, incineration time should be logged. Samples of the fuel and engine lubricants used on board would also be useful.

3 Surface meteorology and flux program – Legs 1 and 3

ArcticNet Phase I – Project 3.1: Ocean-Ice-Atmosphere Coupling and Climate Variability. http://www.arcticnet.ulaval.ca/pdf/phase1/31.pdf.

Project leaders: Tim Papakyriakou[1] (papakyri@cc.umanitoba.ca), Darek Bogucki[2] and Will Drennan[2]
Cruise participant Leg 1: Bruce Johnson[1]
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3.1 Introduction

The instruments deployed on the CCGS *Amundsen* as part of the surface meteorology and flux program of the ArcticNet program and the Circumpolar Flaw Lead System Study (CFL, Leg 3b) provide information on:

- Bulk meteorology and microclimatology;
- Detailed information on the air-sea exchange of momentum, heat, radiation and CO_2;
- Pertinent near surface and surface sea water (sea ice) properties.

The surface fluxes constitute the upper and lower boundary forcing for the ocean and atmosphere, respectively, and therefore provide a spatial and temporal measure of air-sea coupling across the studied sampling region. The objective of the measurement program is to quantify the spatial and temporal rates (and associated variability) in the exchange of energy, momentum and mass (H_2O and CO_2). The objective of the research program, through collaborations with other researchers, is to better understand the atmosphere's contribution in determining ocean properties (physical, biological, and chemical) through its effect on those oceanic biophysical and biogeochemical processes that are affected by near surface flows of heat, radiation, momentum and CO_2.

In order to quantify CO_2 exchange on a regional or global scale it is useful to relate the exchange to parameters that are readily measured with remote sensing techniques since satellites can provide global coverage on a daily timescale. Although remote sensing methods allow for better comparison of ocean carbon uptake over changing locations and seasons, there is also variability in oceanic CO_2 uptake estimates depending upon how the exchange calculation is formulated, since it is not measured directly by this technique. Many satellite-derived estimates have been obtained using wind speed, but uncertainties of this relationship grow at higher wind speeds. Wave slope, a less commonly measured parameter, may hold a stronger relationship with CO_2 exchange than wind speed, providing an opportunity to lower estimate uncertainties.

3.2 Methodology

3.2.1 Eddy correlation flux system and surface meteorology

A tower-based eddy correlation flux and surface meteorology system was installed on the foredeck of the CCGS *Amundsen* during Leg 1, in July 2007. Meteorological sensors installed on the 8-m tower measured bulk air temperature, relative humidity, wind speed, wind direction and atmospheric pressure in conjunction with the eddy correlation system (Table 3.1).

The tower was damaged during Leg 2, so the system was re-installed during the first half of Leg 3 with some modifications (Figure 3.1a). The base of the tower was strengthened using 4 feet long steel rods that were inserted approximately 2 feet inside the aluminum legs of the tower.

Gimbaled radiometers mounted on a frame installed on the top of the wheelhouse provided a continuous record of surface incoming solar (wavelengths of 0.3 to 3 µm) and long-wave (wavelengths of 3 to 50 µm) radiation. A third, non-gimbaled sensor provided a measure of incident photosynthetically active radiation (PAR; wavelength range between 0.4 and 0.7 µm) (Figure 3.1b). A pressure transducer, vented to outside air, was mounted in the datalogger enclosure at the base of the tower. An infrared temperature transducer was mounted on the starboard side of the foredeck to measure surface skin temperature (Figure 3.1d) and was orientated to look forward at an incidence angle of approximately 45°. A laser precipitation monitor was mounted facing forward on the front rail on top of the wheelhouse (Figure 3.1c).

The eddy correlation system consisted of fast response sensors to measure fluctuations in air temperature, H_2O and CO_2 concentrations, wind speed and ship motion along each of the three principal coordinate axes. Wind speed was measured using a Gill (R3) Wind Master Pro sonic anemometer and gas concentrations were measured using two infrared gas analyzers. An open-path IRGA (LI-COR LI-7500) was mounted on the tower at the same height as the sonic anemometer, and a closed-path IRGA (LI-COR LI-7000) was housed in the acquisition container on the foredeck of the ship. A heated and insulated sample tube was used to draw air from the tower to the IRGA inside the container.

Sensor output was collected on Campbell Scientific data loggers. A CR5000 was used for the fast response sensors (sonic anemometer, IRGA's, Motion Pak), with data collected at a frequency of 10 Hz and stored on a compact flash card connected to the data logger. Data from the remaining sensors were collected with a CR1000 (foredeck) and a CR23X (wheelhouse) scanned at 2-sec intervals and archived as 1-minute averages. Data was retrieved from the data loggers at regular intervals and stored on a computer in the acquisition container.

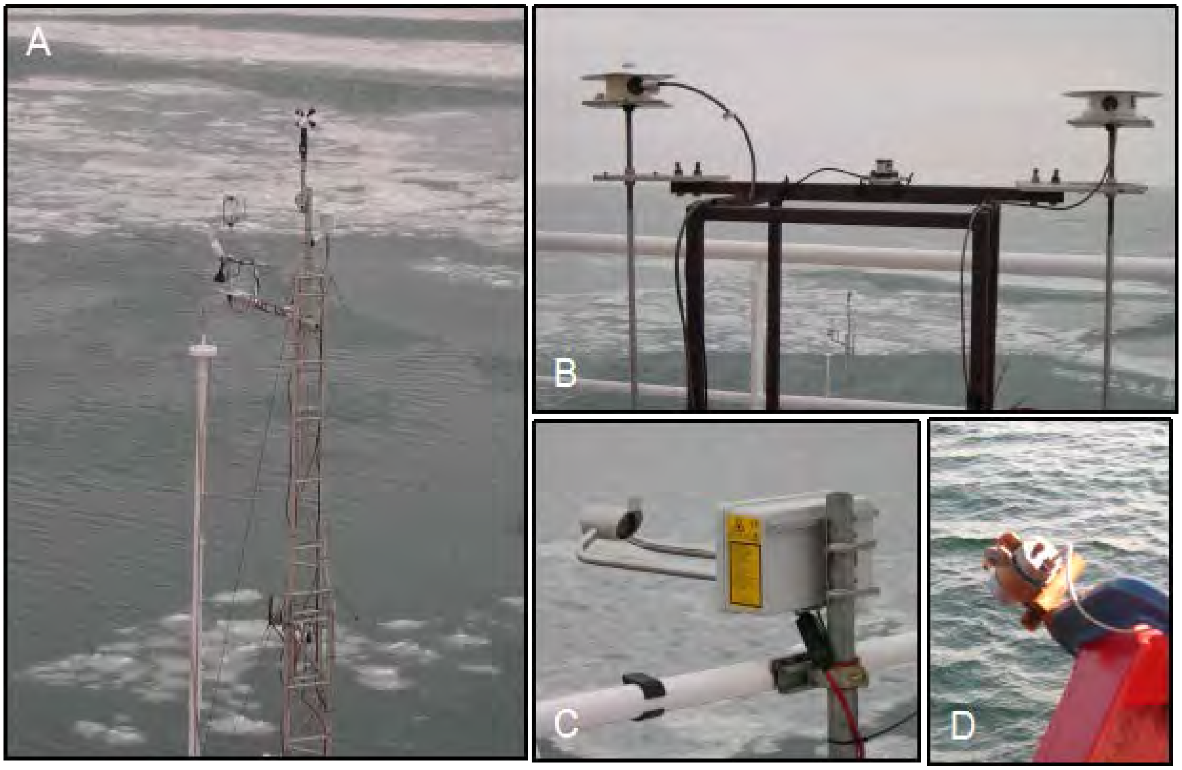

Figure 3.1. Eddy correlation flux and surface meteorology system. a) flux tower on foredeck; b) radiometers on top of wheelhouse; c) laser precipitation monitor on top of wheelhouse; d) infrared temperature transducer on foredeck rail.

Table 3.1. Sensors and associated specifications (manufacturers listed below).

Sensor	Variable	Unit	Height (m)[a]	Scan (s)/ Avg (min)	Specs / Accuracy
Wind monitor (RM Young 05103MA)	Horizontal wind speed and direction (ws and wd[b])	m/s; º	8.45	2 sec/ 1 min	±0.6 m/s ±3º deg
Temperature/relative humidity probe (Vasailla HMP45C212)	Temperature and relative humidity (T and RH)	ºC %	7.53(Leg 1)	2 sec/ 1 min	Humidity ±2% 0-90% @ 20ºC ±3% 90-100% @ 20ºC 0.05% RH/ºC Temperature ± 0.1 ºC
Pyranometer (Eppley, model PSP)	Incoming shortwave radiation (SW_in)	W/m^2	7.0	2 sec/ 1 min	~±5%
Pyrgeometer (Eppley, model PIR)	Incoming longwave radiation (LW_in)	W/m^2	7.0	2 sec/ 1 min	~±10%
PAR/Quantum sensor (LI-190)	Photosynthetic Active Radiation PAR	$\mu mol/m^2$	7.6	2 sec/ 1 min	~±5%
Pressure transducer (RM Young 61205V)	Patm	kPa		2 sec/ 1 min	
Temperature transducer (Everest infrared transducer, model 4000.44 ZL)	Surface temperature (T_{srfc})	ºC	1.6 m	3 sec/ 1 min	±0.5 ºC accuracy
Multi-axis inertial sensor (MotionPak, Systron Donner)	3D acceleration and angular rate (x,y,z) of tower	º/s g	6.48	10 Hz	rate <0.004º/s acc <10 µg

Sensor	Variable	Unit	Height (m)[a]	Scan (s)/ Avg (min)	Specs / Accuracy
Gas Analyzer (LI-COR LI-7500)	CO_2 concentration (ρCO_2)	µmol/ m^3	7.1	10 Hz	RMS noise ±0.1 µmol/mol zero drift 0.1 µmol/mol/ºC gain drift 0.1%/ºC
	H_2O concentration (ρO_2)	mmol/ m^3	7.1	10 Hz	RMS noise ±0.14 mmol/mol zero drift 0.3 %/ºC gain drift 0.15%/ºC
Gas Analyzer (LI-COR LI-7000)	CO_2 concentration (ρCO_2)	µmol/ m^3	7.1	10 Hz	RMS noise ±0.1 µmol/mol zero drift 0.3 µmol/mol/ºC gain drift 0.2%/ºC
	H_2O concentration (ρO_2)	mmol/ m^3	7.1	10 Hz	RMS noise ±0.14 mmol/mol zero drift 0.02 mmol/mol/ºC gain drift 0.4%/ºC
Wind fluctuations (Gill R3 ultra-sonic anemometer)	3-dimensional wind vector (u,v,w) speed of sound (SOS)	m/s	7.1	10 Hz	RMS noise <1% offset <0.01 m/s SOS < 0.5% accuracy

[a] From deck; [b] Measured winds are apparent, relative to the ship's speed and course over ground.
LI-COR Instruments, Lincoln NE; The Eppley Laboratories, Newport, RI; Systron Donner Intertial Division; Concord, CA; Everest Inrterscience, Inc, Fullerton, CA; Campbell Scientific Canada Ltd, Edmonton, AB; Gill Instruments, Ltd., UK; Vaisala, Inc., Woburn, MA; RM Young Company, Traverse City, MI; Kipp & Zonen, Delft, The Netherlands.

A network of valves (Figure 3.2), constructed during Leg 1, was used to facilitate the flow of reference gases and calibration gases to the LI-7000 inside the acquisition container. Ultra-high pure N_2 gas was continuously supplied to the reference cell of the gas analyzer at a flow rate of 70-80 mL/min. By manually opening and closing valves, N_2 can be supplied to the reference and sample cells at the same time for zeroing the analyzer, and a calibrated CO_2 gas can be passed through the sample cell for setting the CO_2 span of the analyzer. This system of valves was also used for calibrating the open-path IRGA. To calibrate the LI-7500, the sensor head and electronic control box were removed from the tower and set up in the acquisition container. Calibration of the LI-7000 was done once per day, while calibration of the LI-7500 was done at weekly intervals, or as necessary.

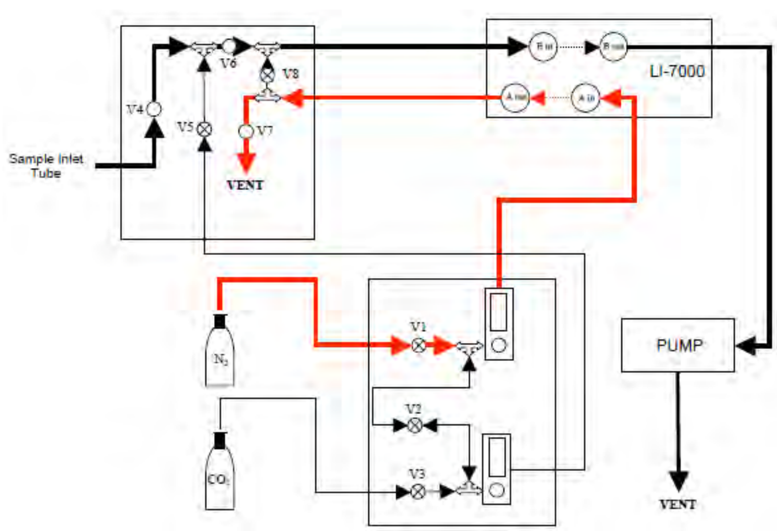

Figure 3.2. Schematic of valve system for flow of gases to LI-7000 gas analyzer.

An under-way pCO_2 system, hooked up to the ship's seawater intake, was installed in the forward engine room of the ship during Leg 1 in August 2007 (Figure 3.3; left photo). Alterations were made to the set-up during Leg 3 (Figure 3.3; middle and right photos) and the system became again fully operational on 23 October 2007.

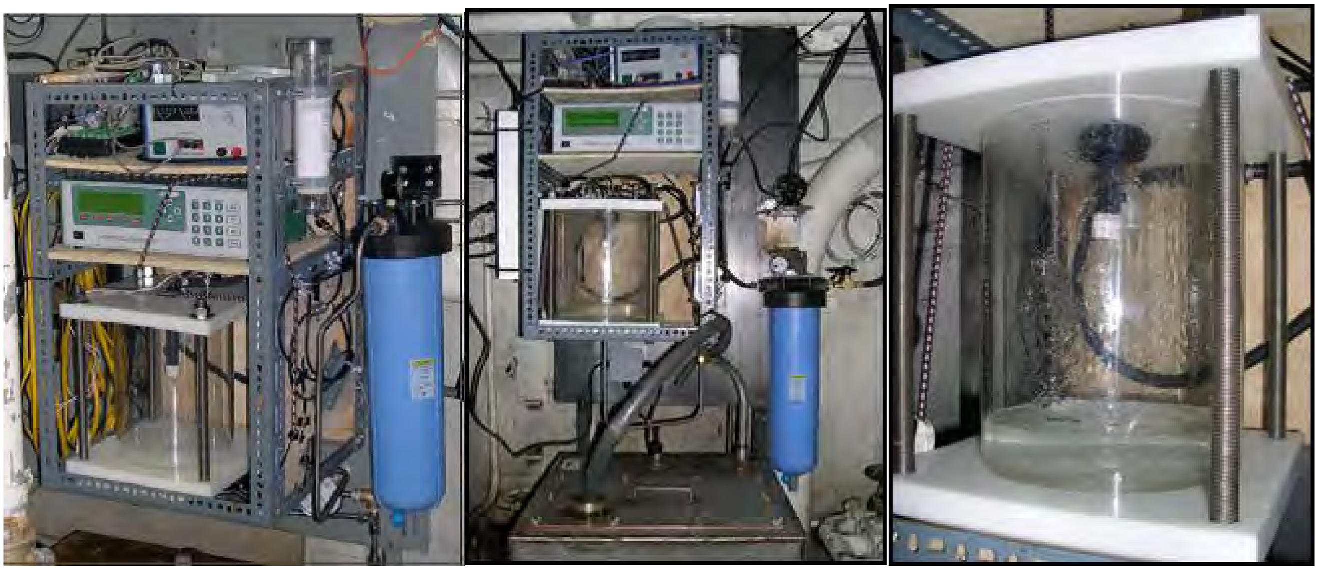

Figure 3.3. Seawater pCO_2 flow-through system in the forward engine room.

The principal of the pCO_2 measurement is based on the equilibration of carrier air with seawater and subsequent determination of the CO_2 concentration in the carrier air. Temperature correction of the CO_2 concentration will be accomplished following Takahashi et al. (1993). In this system, a continuous flow of seawater passes through an equilibration tank (Figure 3.4). A fixed volume of air is re-circulated continuously through the system to maintain near equilibrium in terms of gas concentration with the flowing seawater. After circulating through the equilibration tank, the air is passed through an infrared gas analyzer (LI-COR LI7000) to measure CO_2 concentration.

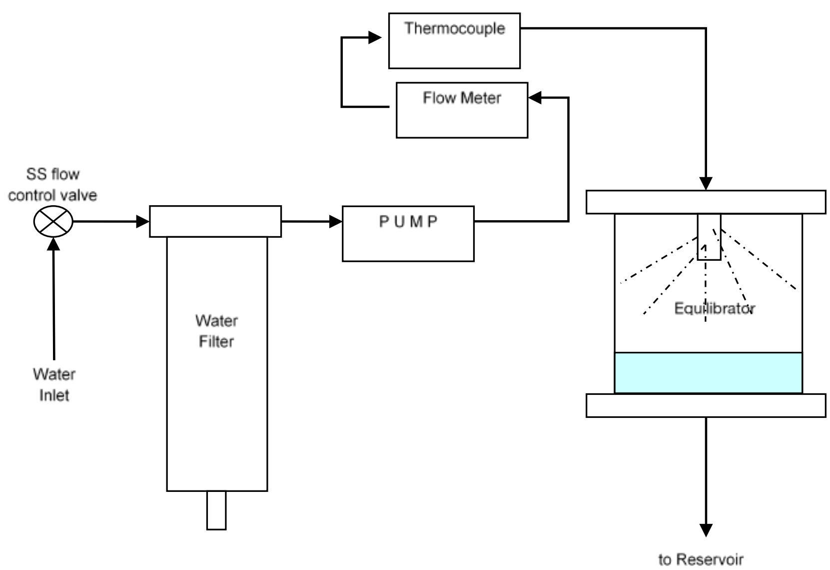

Figure 3.4. Schematic of water flow through pCO_2 system.

Differential CO_2 concentration measurements in the system's air loop were made relative to dry- and CO_2- free air. A network of valves was added to the system to facilitate setting the CO_2 zero and span of the gas analyzer without interrupting the airflow within the equilibration tank. Calibration of the IRGA was done daily in a similar manner to that described for the eddy correlation flux system.

The equilibration tank is constructed with clear acrylic tubing (9"OD, 8½" ID) inset into 1" thick squares of high-density polyethylene (HDPE). The internal volume of the tank is 10.5 L (r = 10.8 cm; h = 28.6 cm). The ends of the cylinder are sealed by insetting the acrylic cylinder into grooves machined into 1" thick squares of high-density polyethylene (HDPE). The contacts between the acrylic tubing and HDPE plates are made with nitrile O-rings. Particulates were removed from the flow at the system's inlet using a Pentek (Pentek Filtration, Sheboygan, WI) Bag Filtration System equipped with an 800-micron nylon mesh filter bag. Water temperature and flow were measured using a 22 AWG Type T thermocouple junction and a vortex flow meter (Sparling/Oval model FLP08), respectively.

Water was drawn from the ship's seawater intake using a March (March Pumps, Glenview, IL) "Orbital" Magnetic Drive pump, passed through an 800-micron nylon mesh filter bag, and pumped into the equilibration tank through a "shower head" (Figures 3.3 and 3.4). The incoming seawater passed through a vortex flow meter and a thermocouple junction before entering the equilibration tank. Seawater drained from the tank by gravity through an outlet in the bottom HDPE plate into a stainless steel holding reservoir, and then the water was pumped into the ship's wasted water outlet. There was ~6 cm (2.2 L) of water maintained in the bottom of the tank, and water flow through the system was maintained at ~2 L/min. Air flow through the remaining headspace (8.3 L) was maintained at 3.5 L/min, providing a residence time of air in the tank of ~2.5 minutes. Output from the gas analyzer, thermocouple and flow meter were recorded by a CR1000 data logger (Campbell Scientific) with a scan interval of 2-sec and archived as 1-minute averages.

3.2.2 Estimates of Arctic air-sea CO_2 transfer using QuikSCAT scatterometer

Current air-sea flux measurements by the U. Miami group will allow determining the air-sea CO_2 exchange along the ship track. With a relation between this shipboard exchange measurement and concurrent satellite measurements of wave slope, the satellite wave slope measurements can be used to extrapolate the shipboard CO_2 transfer estimates in location and time. As a way of validating this correlation, wave slope was also concurrently measured locally by extending a set of laser altimeters (Laser Wave Slope Measurement System or LAWAS) off the side of the ship. The wave slope measurements are timed to coincide with QuikSCAT satellite passes so that comparison can be made between the wave slopes derived from the satellite signal and the shipboard measured wave slopes, providing a check of the satellite measurement and ensuring that it can be appropriately correlated with the shipboard air-sea CO_2 exchange measurement.

During Leg 3, LAWAS was deployed from the foredeck of the CCGS *Amundsen* (Figure 3.5) to measure wave slope while the QuikSCAT microwave scatterometer passed overhead, taking concurrent surface roughness measurements. The system consists of four RIEGL near infrared (0.9 μm) laser range finders, whose optical heads are mounted 30 cm apart at the corners of a square. Each laser acquires a time series of the waves directly beneath it. Combining the four data sets, the wave slope will be determined. A motion pack is mounted on top of the deployed optical head to account for movement of the instrument during deployment (Figure 3.6).

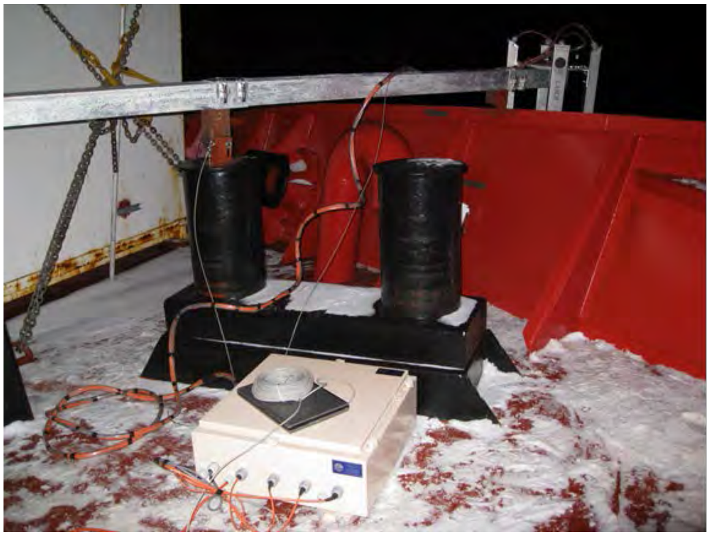

Figure 3.5. LAWAS deployment setup on the foredeck during Leg 3.

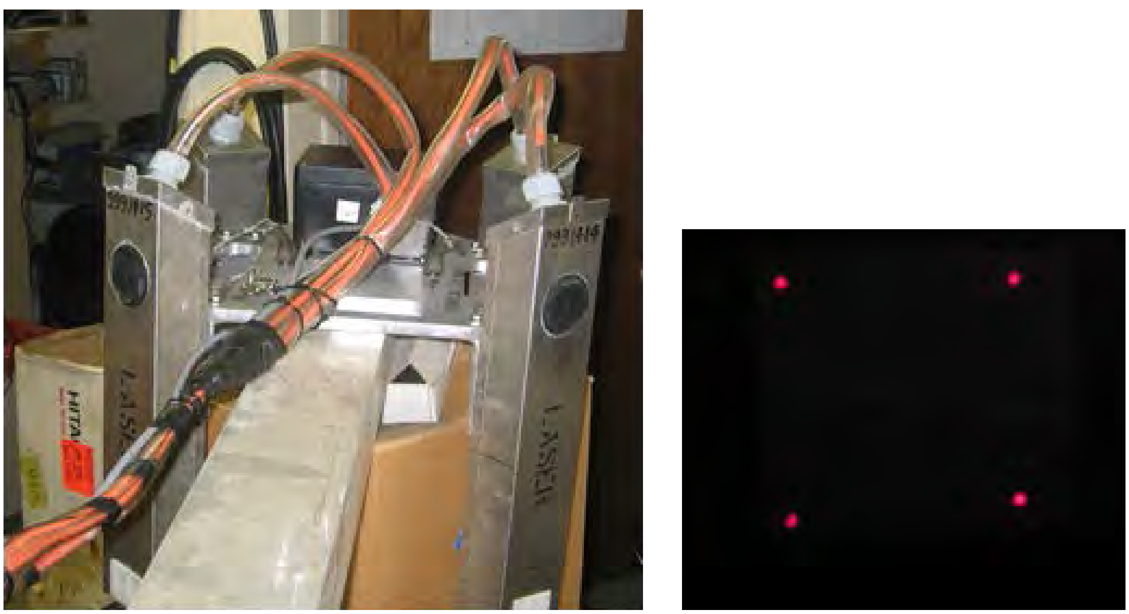

Figure 3.6. LAWAS optical head and footprint.

Each sample consisted of four wave height time series given by LAWAS, which will later be converted to a wave slope time series. Each sample was correlated with a QuikSCAT overpass (Table 3.2).

Table 3.2. LAWAS deployments during Leg 3.

Date	Station	Latitude (N)	Longitude (W)	QuikSCAT Pass (UTC)
Sep 29	101	76°38.000	077°40.000	00:18 Sep 30
Oct 1	115	76°18.000	071°17.000	01:07 Oct 2
Oct 2	108	76°14.000	074°34.000	23:00 Oct 2
Oct 2	108	76°13.000	074°38.000	00:41 Oct 3
Oct 4	133	75°37.000	079°28.000	10:13 Oct 4
Oct 15	434	70°10.000	133°30.000	15:30 Oct 15
Oct 20	1804	72°12.000	127°50.000	15:00 Oct 20
Oct 20	437	71°47.000	126°33.000	04:35 Oct 21
Oct 21		71°33.000	127°03.000	14:33 Oct 21
Oct 21	417	71°18.000	127°36.000	04:09 Oct 22
Oct 22		71°16.000	127°32.000	14:07 Oct 22
Oct 23	407	71°00.000	126°01.000	15:22 Oct 23
Oct 23	1018	71°04.000	125°54.000	04:58 Oct 24
Oct 24	1018	70°49.000	124°48.000	04:32 Oct 25
Oct 25	410	70°39.000	123°00.000	14:30 Oct 25
Oct 26		70°36.000	121°08.000	14:03 Oct 26
Oct 26		70°36.000	120°59.000	15:44 Oct 26
Oct 26	1100	71°03.000	123°15.000	05:20 Oct 27
Oct 27	1104	70°44.000	123°56.000	15:18 Oct 27
Oct 28		70°04.000	126°20.000	14:52 Oct 28
Oct 28		70°04.000	126°20.000	16:33 Oct 28
Oct 28		70°21.000	127°04.000	04:28 Oct 28
Oct 29		70°41.000	127°47.000	04:02 Oct 30
Oct 30	1212	70°49.000	126°53.000	14:00 Oct 30
Oct 30	1210	70°57.000	126°28.000	15:41 Oct 30
Oct 30	1208	71°04.000	126°03.000	05:16 Oct 31
Oct 31		71°29.000	124°30.000	13:33 Oct 31
Oct 31	1200 F	71°33.000	124°21.000	15:14 Oct 31
Nov 1		71°40.000	128°49.000	16:29 Nov 1
Nov 1		71°39.000	131°05.000	04:24 Nov 2
Nov 2		71°05.000	130°29.000	16:03 Nov 2
Nov 3		71°33.000	125°43.000	13:56 Nov 3
Nov 3		71°33.000	125°49.000	15:37 Nov 3
Nov 4		71°17.000	124°45.000	04:46 Nov 5
Nov 5	1908 B	71°10.000	124°14.000	16:25 Nov 5

3.2.3 Data processing

Post processing will be undertaken at the University of Manitoba for:

- Data screening and quality control;
- Computation of true wind speed and direction;
- Computation of heat, momentum and mass fluxes.

3.3 Preliminary results

Charted below are surface meteorology data collected from the flux tower on 4 August 2007 (note that time is UTC). The air temperature was obtained from the HMP45C212 probe and the ocean surface temperature from the Everest IR transducer (Figure 3.7). The incoming short-wave radiation and the photosynthetically active radiation (PAR) are shown in Figure 3.8.

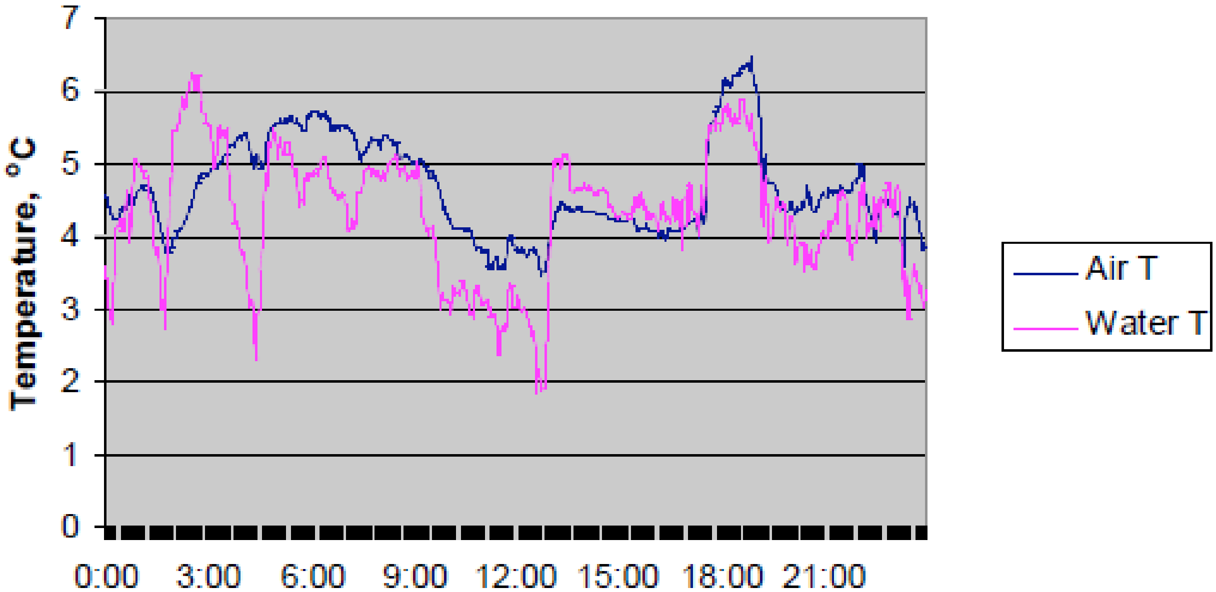

Figure 3.7. Air and water surface temperature measured during Leg 1 on 4 August 2007.

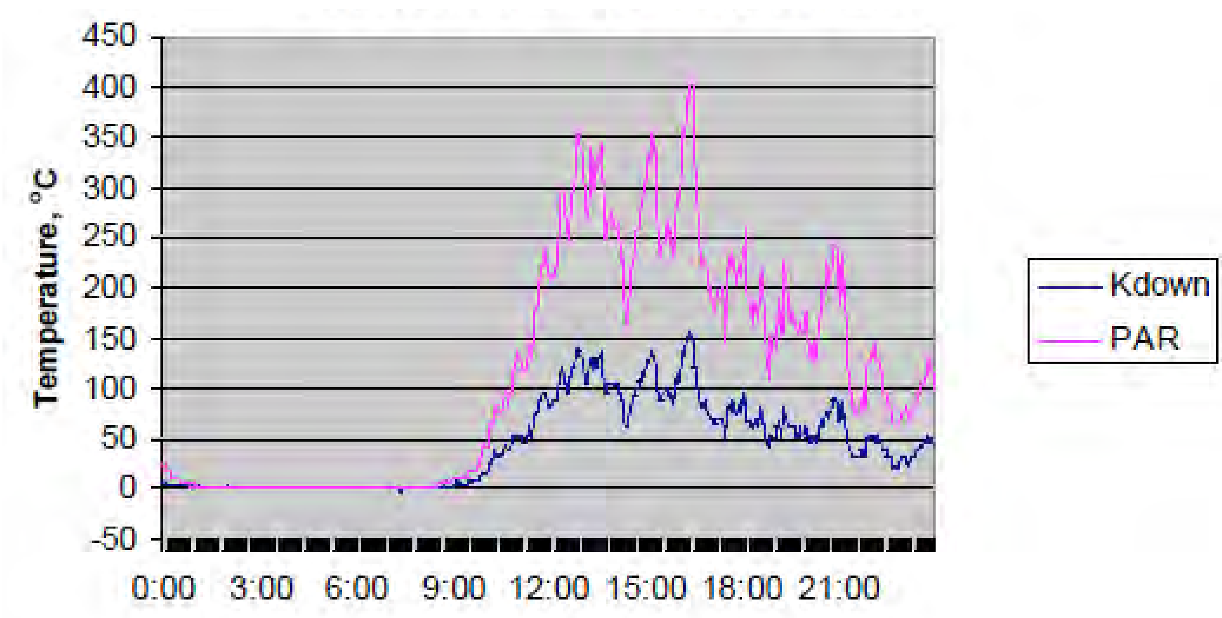

Figure 3.8. Incoming short wave radiation (Kdown) and PAR measured during Leg 1 on 4 August 2007.

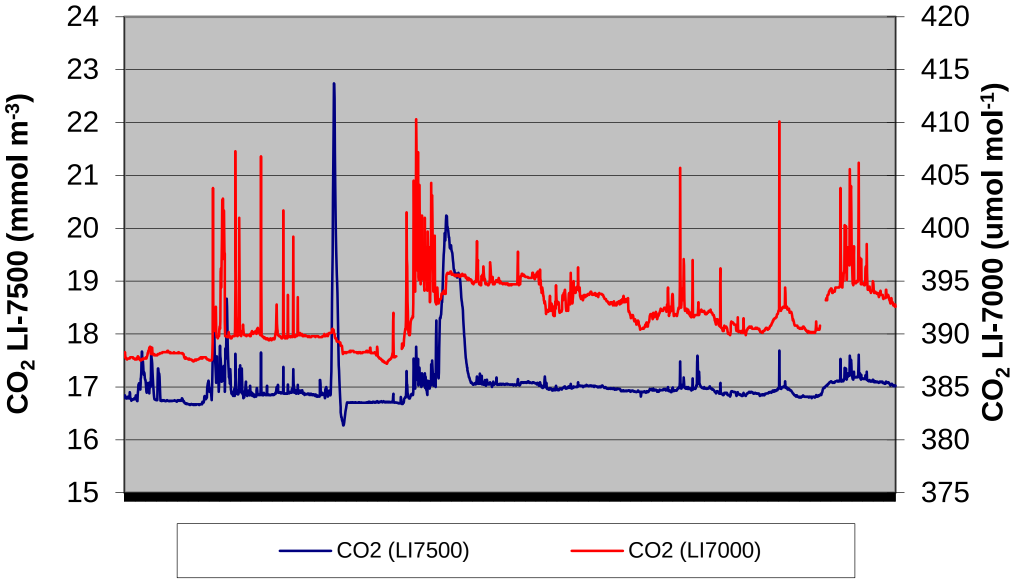

Figure 3.9. CO_2 molar density (LI7500) and molar fraction (LI7000) for the period 0130h 23 October 2007 to 1850h 24 October 2007, showing effect of ship's exhaust (all times UTC).

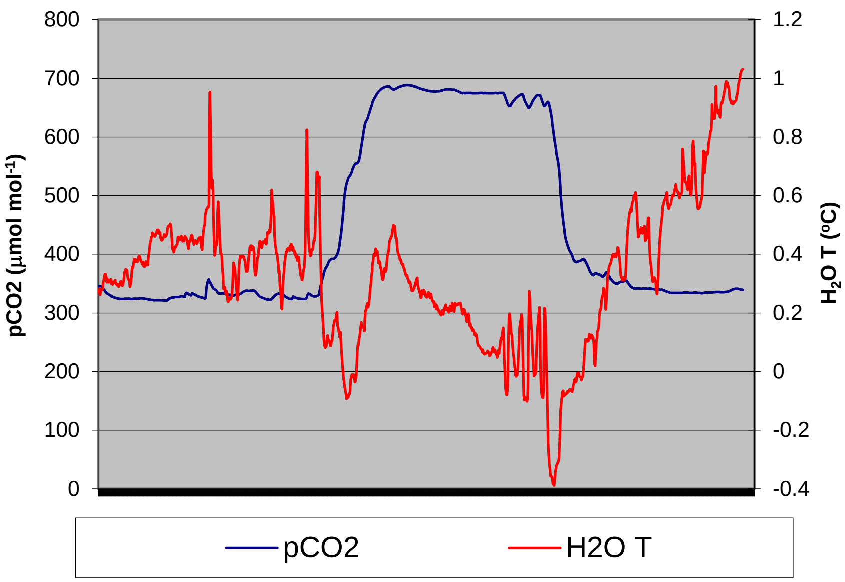

Figure 3.10. Seawater pCO_2 and H_2O temperature for the period 2230h 22 October 2007 to 1640h 23 October 2007 (UTC).

Reference

Takahashi, T., Olafsson, J., Goddard, J.G., Chipman, D.W. and S.C. Sutherland, 1993. Seasonal variation of CO_2 and nutrient salts in the high latitude oceans: a comparative study. Global Biogeochem. Cycles, 7 843-848.

4 Sea ice dynamics – Leg 3b

ArcticNet Phase I – Project 1.1: Warming Coastal Seas & Shrinking Sea Ice. http://www.arcticnet.ulaval.ca/pdf/phase1/11.pdf.
ArcticNet Phase I – Project 3.1: Ocean-Ice-Atmosphere Coupling and Climate Variability. http://www.arcticnet.ulaval.ca/pdf/phase1/31.pdf.

Project leader: David Barber[1] (dbarber@cc.umanitoba.ca)
Cruise participants Leg 3b: Monika Pucko[1], Phil B.J. Hwang[1], Pascale Collin[1], Mukesh Gupta[1] and Dan Leitch[1]
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4.1 Ice physical microstructure (Ice Raid)

4.1.1 General ice conditions

During Leg 3b, pancake ice was encountered very frequently, likely due to the strong southeast wind, which prevailed during most of this period. As air temperature quickly declined to about -20°C on 3 November, frost flowers were frequently encountered on the bare ice surface.

4.1.2 Physical sampling

The field program (Ice Raids) was designed to obtain the physical-microstructure properties of snow and sea ice. To access the ice surface during Leg 3b, the ice cage was used (Figure 4.1), lowered from the starboard side of the ship. Air and ice temperatures were measured using a hand-held temperature probe (Traceable, Digital Thermometer, 4000C).

Ice surface condition (i.e. snow, frost flower or slushy layer) was recorded. In case of slushy layer, the surface layer was scraped and the sample put into a Whirlpak bag to measure salinity. The thickness of the slushy layer was also measured if it was thick enough. In case of frost flower, the standard procedure was to:

- Take photos of frost flowers using a digital camera (Pentax, Potio W30) mounted on a purpose-made camera stand to estimate spatial coverage of frost flower.
- Take micro-scale photos of frost flowers using the macro setting.
- When a slushy layer was observed underneath frost flowers, it was also described.

In case of snow, the snow depth was measured, the characteristics of snow were defined (i.e. the presence of slushy layer), and some pictures were taken. Standard procedures also included taking photos of snow grain size and measuring capacitance (snow wetness). Two ice cores were taken: one for microstructure analysis and the other for salinity measurement. To measure bulk ice salinity, the ice cores were cut into several pieces at 2.5-5 cm intervals and the pieces were put in a waterproof bag until it melted. Conductivity, temperature and salinity were then recorded using a conductivity meter.

Figure 4.1. Ice cage (left) used in Ice Raids to obtain the physical-microstructure properties of snow and sea ice, and a photo of frost flowers (right) taken during an Ice Raid on 6 November.

The cold lab (-20°C) was set up to take ice microstructure photography. The temperature of the cold lab was generally kept between -15°C and -20°C, but occasionally increased up to -8°C. The problem was solved by the crew on 3 November and the temperature was constant around -20°C. For thick section photography, an ice core was cut into pieces and the pieces attached onto a glass plate by applying three layers of freshwater around the piece. A thick section was then prepared by shaving down the ice piece to about 5-10 mm thick and pictures were taken with a digital camera (Canon PowerShot G2). These photos could be used to see air bubbles, brine pockets and tubes distribution (Figure 4.2) but a stereomicroscope was also used to observe the distribution of air bubbles or brine inclusions at a higher resolution. The ice core was then shaved down again to obtain a thin section measuring a few millimeters on which cross- and parallel-polarization images were taken by putting polarized sheets under the ice sample and between the ice and the camera (Figure 4.2).

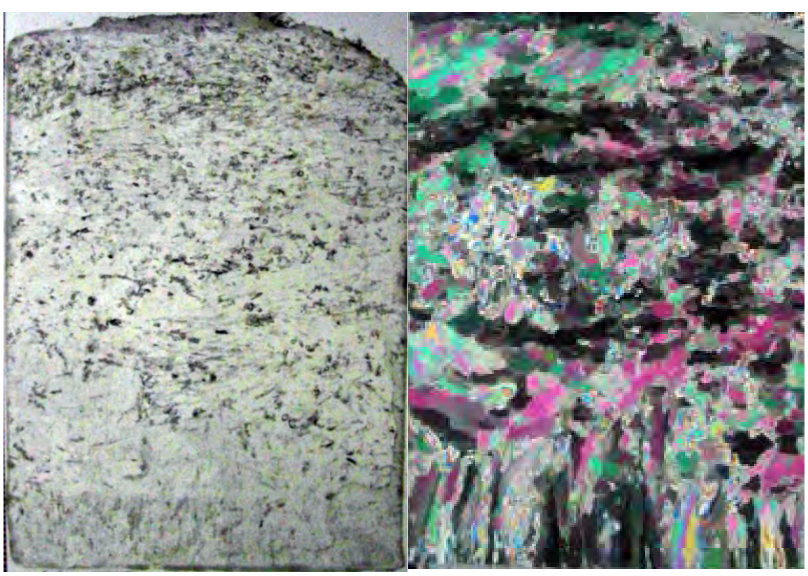

Figure 4.2. Examples of photographs of thick (left) and thin (right) sections cut from an ice core sampled during Leg 3b.

A total of 14 ice samples were collected for physical-microstructure analyses (Table 4.1). Ice thickness varied between 5 and 30.5 cm, and the ice samples included nilas, consolidated pancake and grey ice.

Table 4.1. Summary of ice physical-microstructure sampling during Leg 3b.

Date	Station #	Local time (hh.mm)	Type of ice	Ice microstructure*
06-11-2007	1916	01.00	Grey ice (12 cm)	thick (x), thin (x)
05-11-2007	1908	09.45	Consolidated pancake (30.5 cm)	thick (x), thin (x)
05-11-2007	1908	09.00	Grey ice (12 cm)	thick (x) , thin (x)
03-11-2007	1902	10.45	Consolidated pancake (22 cm)	thick (v), thin (x)
03-11-2007	1902	10.45	Nilas (5 cm)	thick (v), thin (v)
02-11-2007	1606	11.30	Consolidated pancake (6 cm)	thick (v), thin (v)
31-10-2007	1200	11.00	Consolidated pancake (10 cm)	thick (v), thin (v)
31-10-2007	1200	11.00	Consolidated pancake (14.5 cm)	thick (v), thin (v)
30-10-2007	1208	13.30	Consolidated pancake (8-9 cm)	thick (v), thin (v)
30-10-2007	1208	13.31	Nilas (??)	N/A
29-10-2007	1216	12.00	Nilas with snow/frost flower cover (10 cm)	thick (v), thin (v)
28-10-2007	1116	12.30	Nilas (6 cm)	thick (v), thin (v)
27-10-2007	1110	16.45	Nilas (8-9 cm)	thick (v), thin (v)
26-10-2007	1000	14.30	Slush/grease ice (unconsolidated)	N/A

*Thick (v): vertical thick section, thin (v): vertical thin section.

4.2 Surface EM measurements

4.2.1 Objectives

Ship-based ice-EM measurements were conducted to investigate the interactions between microwave signatures (both active and passive) and sea ice thermo-physical properties. The observed data will be used to calibrate sea-ice products from the satellite sensors and to evaluate the theoretical microwave emission/scattering models. These results will provide more advanced knowledge of how microwave signature reacts to the evolution of sea ice thermo-physical properties on small scales during the fall freeze-up period.

4.2.2 Instrumentation and methods

The radiometers were dual polarized (vertical and horizontal) radiometers at 37 and 89 GHz with 6° beamwidth antennas (Radiometrics). The radiometers were mounted about 12 m above the sea surface on the portside of the ship (Figure 4.3). During transects, the radiometers were fixed at the incident angle of 55°. Whenever the ship was stationary, the incident angle of the radiometers was modified from 30° to 150° at a 5° interval. A network camera (Canon, VB-C10R) was mounted on a rail right beside the wheelhouse. The initial set-up for the camera was pan=0.00°, tilt=-25.00° and zoom=43.40° and was changed to tilt=-40.00° on 1 November. The pictures were taken every 10 seconds to 1 minute depending on surface conditions. A hand-held digital camera was also used to record the visual surface condition.

A C-band polarimetric (VV, VH, HV, HH) scattereometer system (PROSENSING) was deployed about 7.56 m above the sea surface (Figure 4.3). Whenever the ship was stationary, measurements were done from -30° to 30° in the azimuth, with the 0° reference at a perpendicular line to the shipside and from 20° to 60° in elevation at 5° increment. An infrared transducer (Everest, 4000L) was mounted on a rail in the shed for the C-band scattereometer system (Figure 4.3). The ice thickness camera was set up on the main deck at the port side.

The feasibility of using Laser Wave Slope (LAWAS) to estimate sea ice surface roughness was also investigated in collaboration with S. Woods from the University of Miami (see report in Section 3 above for more details on the LAWAS and the measurement methodology).

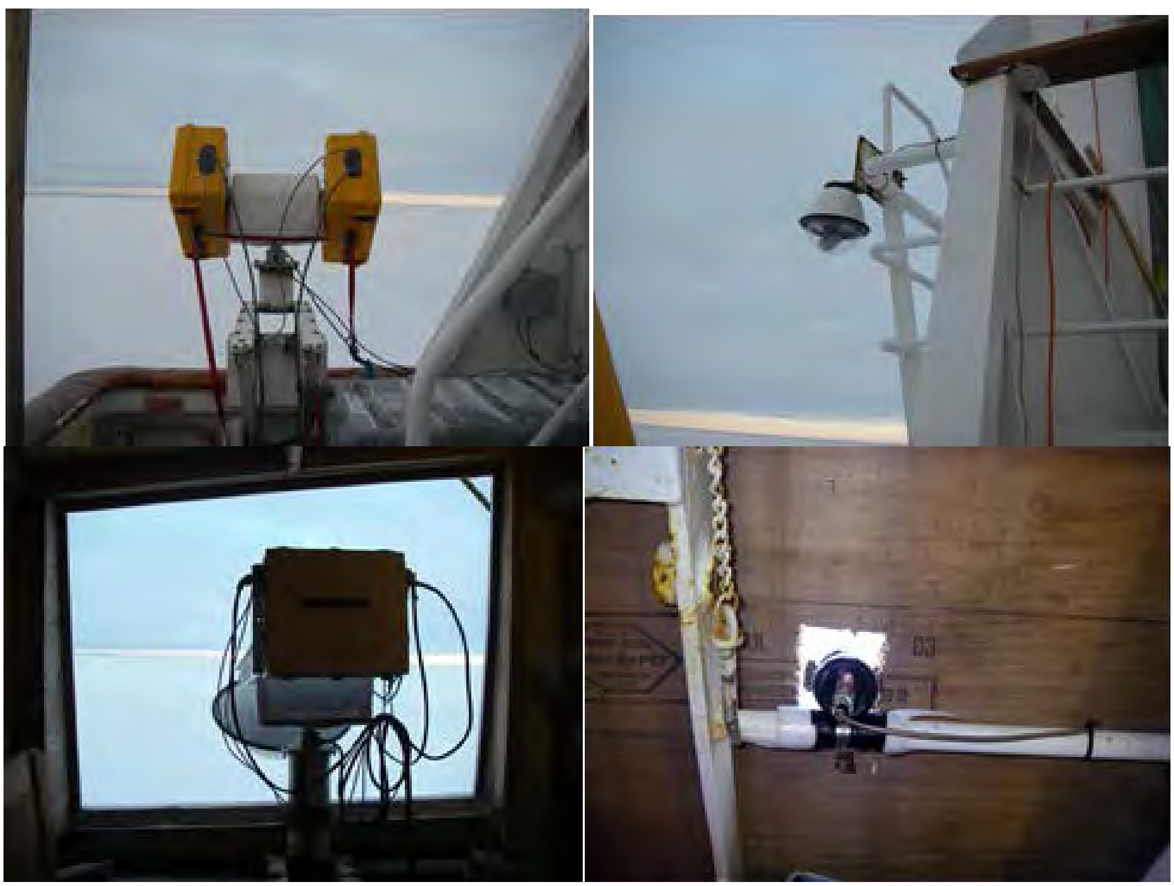

Figure 4.3. Microwave radiometer system (top left), webcam (top right), scattereometer (bottom left) and infrared transducer (bottom right).

4.3 Dissolved organic matter and contaminants

Water and ice were collected onboard using the Rosette and the ice cage at selected stations for the determinations of color dissolved organic matter (CDOM), fluorescence of dissolved organic matter (FDOM), salinity, oxygen isotope ($\delta^{18}O$) and hexachlorocyclohexanes (HCHs) (Table 4.2). Water samples were collected at 0, 5, 10, 25, 50, 100 and 200 m on contaminant casts. Surface samples were always collected on the forward deck using a bucket during the Rosette cast. $\delta^{18}O$ was collected from the Rosette by CFL Team 5 during Basic and Full stations at of 0, 5, 7.5, 10, 25, 50, 100, 200 m and bottom depths.

The surface water was collected directly on the ice by scooping the surface with a bottle for each ice station. The CDOM and FDOM samples were collected at selected stations. For the ice station selected for CDOM and FDOM analysis, $\delta^{18}O$, HCH, salinity were collected, physical properties of sea ice were noted and vertical microstructure analysis of the ice was processed. Due to problems with the spectrophotometer Cary 50, the CDOM samples were stored at 4°C and measurements of CDOM will be completed at University of Manitoba.

CDOM and FDOM analyses will also be performed after the cruise in laboratories at the University of Manitoba. Stable isotope analysis of water and ice samples will be analyzed outside of the University.

Ice samples for HCHs concentration and enantiomeric composition were collected at each Basic and Full station where the newly formed ice was present (except for 30 October 2007). The samples for oxygen isotope composition ($\delta^{18}O$) and salinity were taken along with all ice samples. The ice samples were collected in collaboration with the contaminant team (G. Stern) in order to link HCHs concentration and chiral composition in different parts of the environment with the Arctic climate changes (see report in Section 19). In cases where more than one type of ice was present, two ice samples were collected. A total of 12 samples of newly formed sea ice were collected for HCH analyses (Table 4.2).

Ice samples for HCH analysis were collected from the ice cage (see Section 2.1 on Ice Raid). When the ice was thin enough, the ice chipper was used. In case of thicker ice (>15 cm), the ice cores were taken. The total of 4-8 L of melted ice was pumped through a glass-fiber filter followed by an ENV+ solid-phase extraction (SPE) cartridge using peristaltic pumps. The cartridges and GFFs were stored in -80 °C and brought to the DFO (Winnipeg) for further chemical analysis.

Table 4.2. Summary of CDOM, FDOM and HCH sampling in sea ice during Leg 3b.

Date	Station #	Type of station	Optical water	Optical ice	HCH ice	Microstructure
06-11-2007	1916	Basic		x	x	x
05-11-2007	1908	Basic		x	x (2 types)	x
01-11-2007	1600				x	
02-11-2007	1606				x	x
03-11-2007	1902	Full	x	x	x	x
29-10-2007	1216	Full	x		x	x
30-10-2007	1212	Nutrients	x			
30-10-2007	1208	Basic		x		x
31-11-2007	1204	Basic				
31-10-2007	1200	Full	x	x	x (2 types)	x
28-10-2007	1116	Full	x		x	x
27-10-2007	1110	Basic	x	x	x	x
27-10-2007	1108	Nutrients	x			
07-10-2007	1104	CTD-Nutrients	x			
24-10-2007	1016	CTD-Nutrients	x			
24-10-2007	1012	CTD-Nutrients	x			
26-10-2007	1002	CTD-Nutrients	x			
26-10-2007	1000	Basic	x	x	x	x
20-10-2007	437	Mooring/Full	x			
22-10-2007	420	Mooring/Full	x			
21-10-2007	415	Nutrients	x			
21-10-2007	414	Nutrients	x			
22-10-2007	408 CA-1507	Mooring/Full	x			
23-10-2007	407 CA08-06	Mooring/Full	x			
25-10-2007	405	Full	x			
		Total	**18**	**7**	**12**	**10**

4.4 Comments and recommendations

Temperature of the cold room (Lab 555) and the refrigerated room (Lab 554) was fluctuating with changes of air temperature outside and should be verified on a regular basis. A periodic reading should be done every 2 hours and a log sheet posted outside of the labs with the time, temperature readings and the initials of the person responsible of noting them down. This is important to insure the quality and integrity (e.g. not melting) of the samples processed and/or stored in these laboratories.

5 Mooring program – Legs 1 and 3

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. http://www.arcticnet.ulaval.ca/pdf/phase1/11.pdf.

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5.1 Introduction

The overarching objective of the ArcticNet Mooring Program, begun in 2004, is to establish long-term oceanographic observatories in Baffin Bay (NOW Polynya region), in the Beaufort Sea and in Hudson Bay (**Error! Reference source not found.**), to track changes in the physical, biological and geochemical properties of Canadian Arctic and subarctic waters and collect fundamental information to better understand how climate warming is affecting the Arctic.

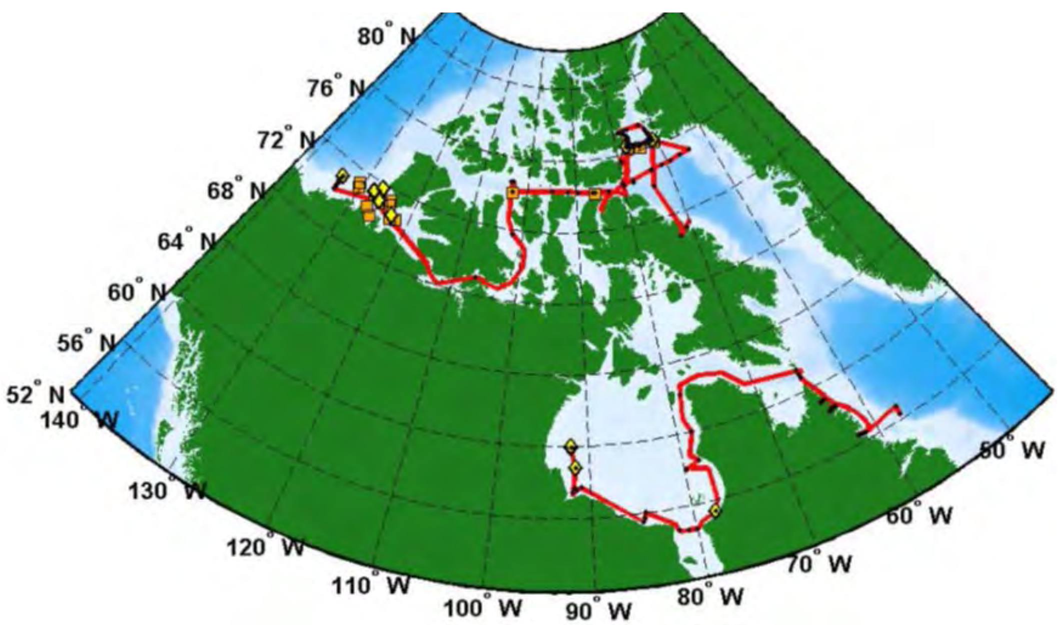

Figure 5.1. Location of ArcticNet oceanographic moorings. Mooring recoveries and deployments were carried out in Hudson Bay (Leg 1), Baffin Bay and the Amundsen Gulf/Beaufort Sea from the CCGS *Amundsen*. Ship track (red line) is shown with CTD-Rosette locations (black dots), SCAMP profiling sites (orange squares) and mooring sites (yellow diamonds).

In 2007, mooring operations were conducted from the CCGS *Amundsen* in Hudson Bay during Leg 1, and in Baffin Bay and the Beaufort Sea during Leg 3. The primary objectives of the ArcticNet mooring program for 2007 were to:

- Recover and re-deploy two moorings in Hudson Bay (AN01 and AN03) and deploy one new mooring at AN02;
- Recover the four North Water Polynya (NOW) moorings in northern Baffin Bay;
- Recover the three ArcticNet moorings (CA04, CA08 and CA18) deployed in the Beaufort Sea in 2006, and re-deploy two of these moorings (CA04 and CA08) as well as deploy four new moorings (two of which were MMP moorings).

5.1.1 Regional objectives

The objective of the Hudson Bay moorings redeployed in 2007 (labeled AN##-07) is to study the strength of the anti-cyclonic circulation along the Hudson Bay coast which involves currents very close to shore. The second objective is to investigate the west-east gradient in productivity close to the main rivers.

The moorings deployed in Baffin Bay in 2006 were to be re-deployed in 2007 (labeled BA##-07) with the aim of investigating the particulate organic carbon (POC) fluxes relative to the oceanographic characteristics (current speeds, temperature, salinity, etc.) in the North Water (NOW) Polynya.

The primary objective of the Beaufort Sea moorings re-deployed in 2007 (labeled CA##-07) aim at better understanding the character and causes of variability and change in the Canada Basin. The secondary objective is to improve understanding of the influence of topography on the exchange of waters between the continental shelf and the ocean basin. The Beaufort Sea moorings carried sediment traps to measure the carbon flux and were equipped with ADCP current profilers and CTD sensors to measure associated oceanographic conditions to investigate the fluid dynamics in relation to detrital transport.

Table 5.1. ArcticNet moorings deployed in 2007 in Hudson Bay (AN) and the Beaufort Sea (CA) during Legs 1 and 3 of the CCGS *Amundsen* Expedition. No moorings were re-deployed in Baffin Bay in 2007.

Mooring ID	Area	Rationale	Program	Latitude N	Longitude W	Depth (m)
Hudson Bay						
AN01-07	Hudson Bay W, north of Nelson River	Located very close to shore to study the strength of anti-cyclonic circulation along the HB coast and to investigate W-E gradient in productivity close to main rivers. This mooring is part of the BaySys project.	ArcticNet	59°58.494	091°56.544	106
AN02-07	Hudson Bay W, north of Nelson River but closer to than AN01	Same as AN01-07	ArcticNet	58°47.082	091°31.458	82
AN03-07	Hudson Bay E, near Great Whale River	Same as AN01-07	ArcticNet	55°24.486	077°55.830	136
Beaufort Sea						

Mooring ID	Area	Rationale	Program	Latitude N	Longitude W	Depth (m)
CA04-07	Kugmallit Valley (upper Mackenzie Shelf slope)	CASES site: Study Shelf-Basin interactions (together with CA07 and CA12).	ArcticNet-CFL	71°04.872	133°38.112	306
CA05-07	Amundsen Gulf near Mackenzie Shelf	Productivity HOTspot on the eastern slope of the shelf (benthic sampling). Monitor intermittent upwelling of cold-saline water on the eastern shelf although origin of the upwelling is much closer to Cape Bathurst (e.g. CA06). Ocean circulation is highly variable, but along-shelf flow of Pacific-derived water entering the Amundsen Gulf may be recorded at depth.	ArcticNet-CFL	71°18.816	127°36.138	202
CA05-MMP-07	Amundsen Gulf near Mackenzie Shelf	Mooring equipped with moving profiler (MMP) to track fluorescence and ocean properties at the eastern shelf. Pacific-derived waters (Beaufort Undercurrent) entering Amundsen Gulf can be monitored here. Circulation highly variable on a monthly to seasonal scale.	ArcticNet-CFL	71°24.198	127°38.112	233
CA08-07	Amundsen Gulf W (central)	Center of the Cape Bathurst Polynya (Barber and Hanesiak 2004).	ArcticNet-CFL	71°3.234	126°01.362	395
CA16-07	Amundsen Gulf near Sachs Harbour	Productivity COLDspot (opposite CA05). Monitor the intrusion of water masses coming from the Canada Basin into the Amundsen Gulf, at surface and at depth. Circulation dictated by behavior of the Beaufort Gyre with eddies detected during CFL.	ArcticNet-CFL	71°47.424	126°29.574	309
CA16-MMP-07	Amundsen Gulf near Sachs Harbour	Mooring equipped with moving profiler (MMP) to track fluorescence and ocean properties at the Gulf mouth. Waters from the Canada Basin entering the Amundsen Gulf can be monitored here.	ArcticNet-CFL	71°45.204	126°30.330	356
CA18-07	Amundsen Gulf E (deepest point)	Deepest point in the Amundsen Gulf. Deep trap moored at this location show no trend in the particle flux signal but strong resuspension signal	ArcticNet-CFL	70°39.966	122°59.460	542

5.2 Methodology

5.2.1 Mooring design and instrumentation

ArcticNet moorings were designed in a taut-line configuration (Figure 5.2). The first instrument deployed close to the surface was a conductivity-temperature (CT) probe with different models of Sea-Bird or Alec instruments being used. Sediment traps located at 100 m and/or 200 m were always attached 5 to 110 m below a current meter on the mooring line. Acoustic Doppler Current Profilers (ADCPs) were deployed at 100 m so they could provide current velocity and direction data from 100 m upwards while classical RCM11 current meter were used at 200 m and 400 m. Tables 5.6 to 5.12 in Section 5.2.5 detail the mooring line design and instrumentation employed on the individual moorings deployed in 2007, but the configuration of the mooring line generally consisted of:

- a top float

- a Conductivity, Temperature and Depth (CTD) probe to record water characteristics
- a Hydrophone – bioacoustics and underwater noises
- RCM 4/7/11 plus Conductivity, Temperature and Depth (CTD) probe to record current velocity and direction and water characteristics
- sediment trap to collect descending sediment for particle flux analysis and accumulation rates
- an Acoustic Doppler Current Profiler (ADCP)
- in-line floatation to balance the weight/ float balance throughout the mooring line
- sediment trap to collect descending sediment for particle flux analysis and accumulation rates
- RCM 4/7/11 plus Conductivity, Temperature and Depth (CTD) probe to record current velocity and direction and water characteristics
- in-line floatation to balance the weight/ float balance throughout the mooring line
- two tandem mooring releases
- an anchor (one to three train wheels)

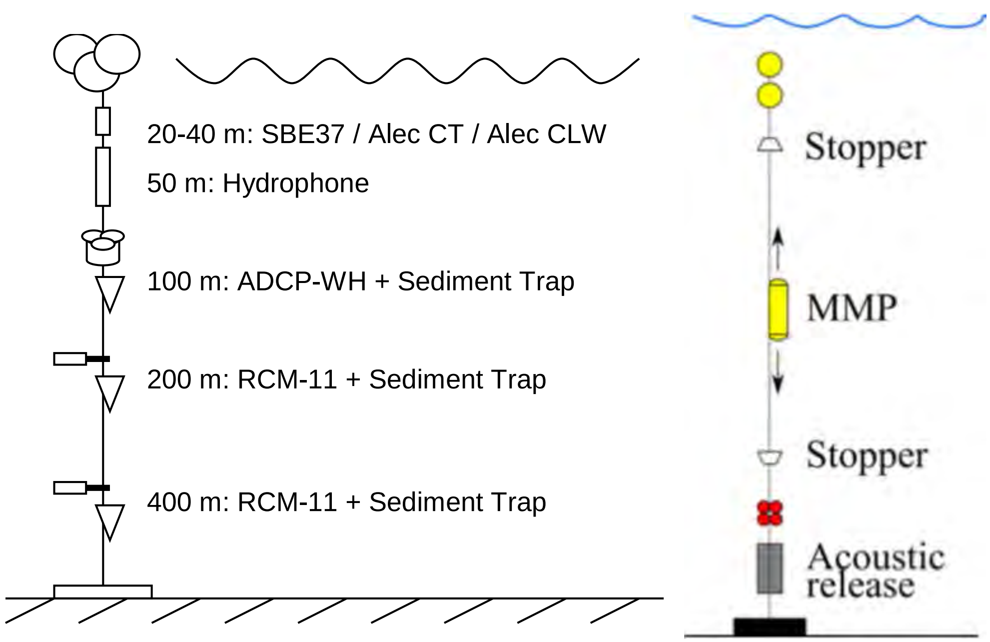

Figure 5.2. Illustration of a typical ArcticNet mooring (left) and of a MMP mooring (Beaufort Sea) (right) setup and orientation.

5.2.2 Mooring equipment calibration and verification

<u>Sensors calibration and validation</u>

The sensors on Aanderaa RCM, SeaBird and JFE-ALEC instruments were calibrated by the manufacturers and were validated by the Université Laval and/or ArcticNet technical team (details on the source and status of calibrations & verifications for all instruments are provided in Boisvert et al. 2010 and Meredyk 2014).

Field verifications of internal compasses

Compass accuracy is essential for current meters deployed near or above the Arctic Circle due to the reduced magnitude of the horizontal component of the earth's magnetic field. It was therefore important to verify internal compasses near the approximate latitude where they were deployed. Care was taken to eliminate all ferrous material in the mooring cages and in the environment when conducting these verifications.

The internal compasses of all ADCPs and current meters needed for the moorings deployed in each of the three regions were verified on shore close to their respective deployment sites (Table 5.2 and 5.3).

The compass verification procedure followed standard manufacturer protocols and were conducted with a tilt and rotate jig using a tripod with a spinning top fixture, where the instrument was installed (Meredyk 2014). A Garmin hand-held GPS unit was used to establish a distinct true North sight line from the tripod to a landmark, and the successive instrument direction readings were obtained by rotating the unit relative to this true North direction, in 10-degree increments.

In the Beaufort Sea region, current meter compasses (Aquadopp and RCM11) were verified either in Tuktoyaktuk, NWT, on 15 October 2007 or in Sachs Harbour on 18 October 2007 by the ArcticNet technical staff (Table 5.2 and Figure 5.3).

Table 5.2. Compass verification field operations conducted in 2007 for mooring intruments deployed in 2007 in Hudson Bay in Leg 1 and in the Beaufort Sea during Leg 3.

Instrument	SN	Region	Pre-calibration site	Pre-calibration date	Pre-calibration status
Hudson Bay					
RCM7	10298	HB	Nelson River, MB	2007	good
CNL	6080	HB	Nelson River, MB	2007	good
RCM11	280	HB	Nelson River, MB	2007	good
WHS	333	HB	Nelson River, MB	2007	good
RCM11	290	HB	Belcher Islands, MB	2007	good
Beaufort Sea					
AQD	2688	BS	Tuktoyaktuk, NWT	2007	good
AQD	2747	BS	Tuktoyaktuk, NWT	2007	good
AQD	2752	BS	Tuktoyaktuk, NWT	2007	good
CNL	6075	BS	Tuktoyaktuk, NWT	2007	good
RCM11	285	BS	Sachs Harbour, NT	2007	good
CNL	6088	BS	Sachs Harbour, NT	2007	good
AQD	2754	BS	Sachs Harbour, NT	2007	good
AQD	2793	BS	Sachs Harbour, NT	2007	good
CNL	6081	BS	Sachs Harbour, NT	2007	good
AQD	2778	BS	Sachs Harbour, NT	2007	good
AQD	2746	BS	Sachs Harbour, NT	2007	good
CNL	6085	BS	Sachs Harbour, NT	2007	good
AQD	2479	BS	Sachs Harbour, NT	2007	good
AQD	2699	BS	Sachs Harbour, NT	2007	good

Instrument	SN	Region	Pre-calibration site	Pre-calibration date	Pre-calibration status
AQD	2764	BS	Sachs Harbour, NT	2007	good
CNL	6082	BS	Sachs Harbour, NT	2007	good

CNL: Nortek Continental (ADCP); WHS: RDI ADCP Workhorse-Sentinel; HB: Hudson Bay; BS: Beaufort Sea

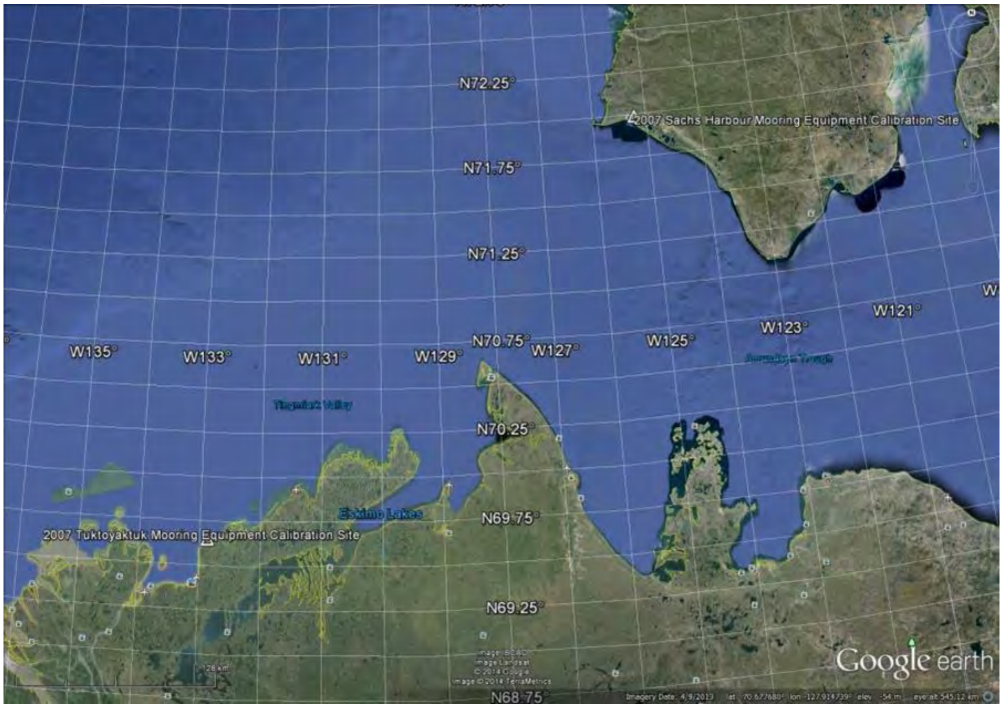

Figure 5.3. Location of mooring equipment compass verification sites in the Beaufort Sea region in 2007.

Figure 5.4. Location of mooring compass verification sites in Hudson Bay in 2007.

In Hudson Bay, two RCM4 (4046, 740) units and an RDI ADCP WH-Sentinel (296) deployed in 2006 were inadequately calibrated (magnetic North used instead of the True North) and these three instruments needed to be post-calibrated on the Belcher Islands upon their recovery in 2007. However, AN03-06 mooring instruments were not post-calibrated in 2007 and they present inaccurate heading data. The compasses of all instruments deployed in 2007 successfully passed verification either at Belcher Islands or Nelson River (Table 5.2 and Figure 5.4).

5.2.3 Mooring recovery and deployment operations

In 2006, seven moorings (30 instruments) were deployed in Hudson Bay, Baffin Bay and Beaufort Sea, but recovery success was low in 2007 with only two moorings (AN03-06 and CA18-06) and one current meter from AN01-06 being recovered (Figure 5.5). Mooring AN03-06 was partially recovered with three of the four probes deployed on the line being retrieved. Mooring CA18-06 was only partly recovered (only the two deepest RCMs were recovered) and the upper part of the line appeared to have been damaged by ice.

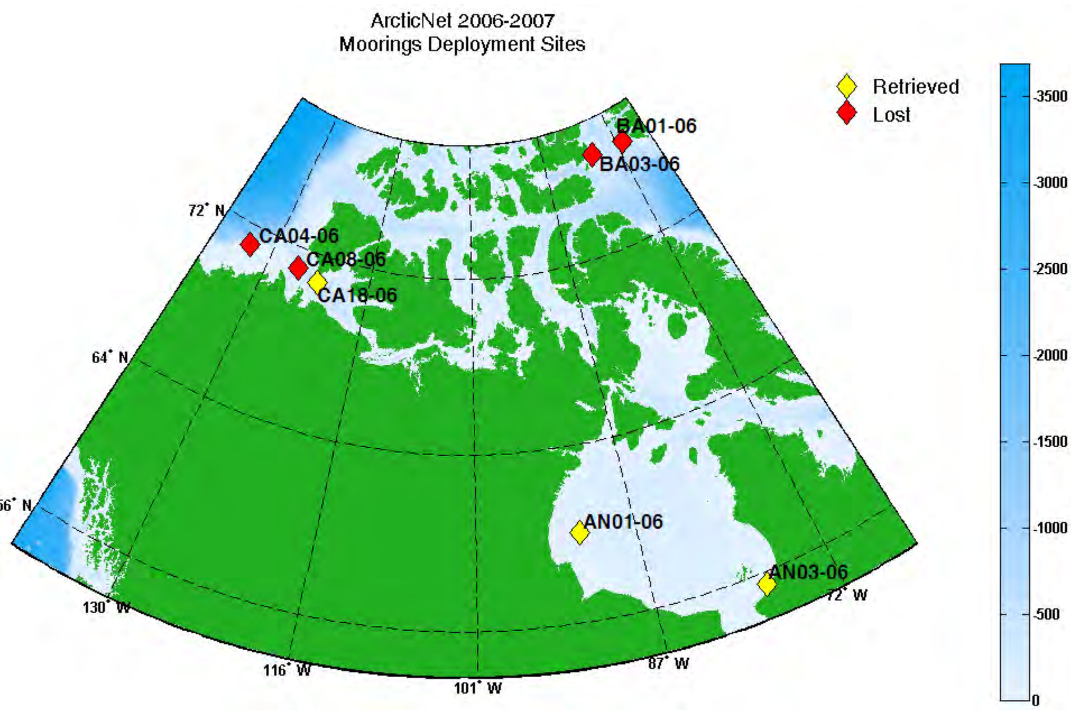

Figure 5.5. Locations of mooring recovery operations Hudson Bay, Baffin Bay and the Beaufort Sea conducted in 2007.

Hudson Bay (Leg 1)

One mooring was recovered (AN03-06) in 2007 and four moorings were deployed (AN01-, AN02-, AN03-, MH01/AN04-07; Figure 5.6) in Hudson Bay from the CCGS *Amundsen* in August 2007. Unfortunately, compasses of instruments recovered from AN03-06 were not verified and thus the only mooring recovered in 2007 revealed inaccurate heading data.

Furthermore, the 2006-2007 dataset in Hudson Bay contained no accurate compass data. A general magnetic declination correction, with an assumption of proper instrument function, would be the only post-processing option left for this dataset.

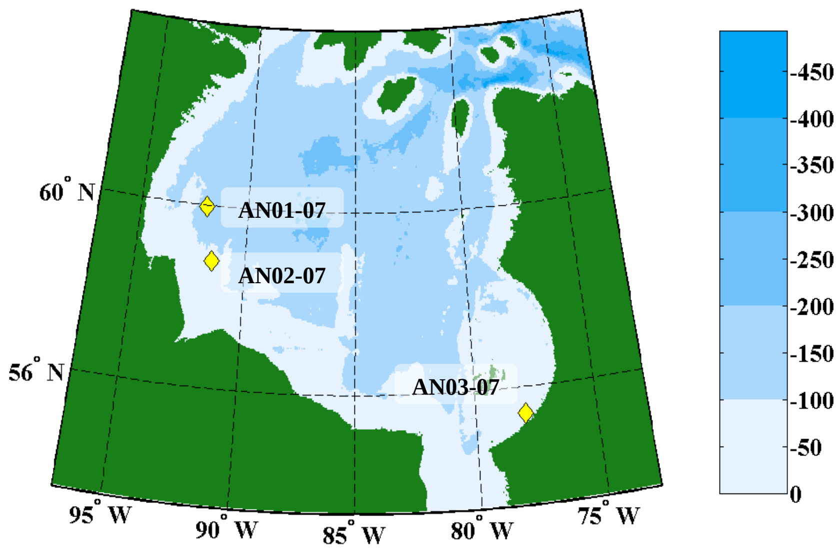

Figure 5.6. ArcticNet mooring deployments in Hudson Bay during Leg 1 of the 2007 *Amundsen* Expedition.

Table 5.3. Summary of ArcticNet 2007 mooring recovery and deployment operations in Hudson Bay with 2007 and 2009 recovery results.

Mooring ID	Program	Deployed	Recovered	Latitude (N)	Longitude (W)	Depth (m)
AN01-06	ArcticNet	2006	LOST	59°58.638	091°56.628	106
AN03-06	ArcticNet	2006	2007	55°24.438	077°55.704	130
MH01 / AN04-07	Manitoba Hydro	2007	2009	57°34.194	091°37.704	65
AN01-07	ArcticNet	2007	2009	59°58.494	091°56.544	106
AN02-07	ArcticNet	2007	2009	58°47.082	091°31.458	82
AN03-07	ArcticNet	2007	2009	55°24.486	077°55.830	136

Baffin Bay (Leg 3)

The re-deployments of four moorings was canceled due to communication problems with the acoustic releases and the prevailing bad weather and heavy ice conditions. The mooring team was able to communicate with the releases on BA01-06 but the mooring didn’t actually release. After many unsuccessful attempts to release the mooring, it was decided to leave the recovery for a future expedition. The location of mooring BA03-06 was surrounded by ice and no recovery attempt was made.

Table 5.4. 2007 ArcticNet mooring operations in Baffin Bay with 2006 recovery results.

Mooring ID	Program	Deployed	Recovered	Latitude (N)	Longitude (W)	Depth (m)
BA01-06	ArcticNet NOW	2006	LOST	76°19.692	071°13.626	670
BA03-06	ArcticNet NOW	2006	LOST	76°23.154	077°24.624	358

Beaufort Sea (Leg 3)

Only the bottom half of one mooring was recovered (CA18-06) and 7 new moorings were deployed in 2007 (Table 5.5). Of the seven moorings deployed in the southern Beaufort Sea (Figure 5.7) two included McLane Mooring Profilers (MMP), a moving profiler sliding up and down along the mooring line recording temperature, salinity and fluorescence data (Figure 5.2). The MMP moorings were paired to moorings CA05 and CA16 that contained a full suite of oceanographic equipment (i.e. sediment traps, current meters, CTDs), so that the CTD data on the MMP moorings could be verified with the adjoining mooring and increase the resolution of the water column data.

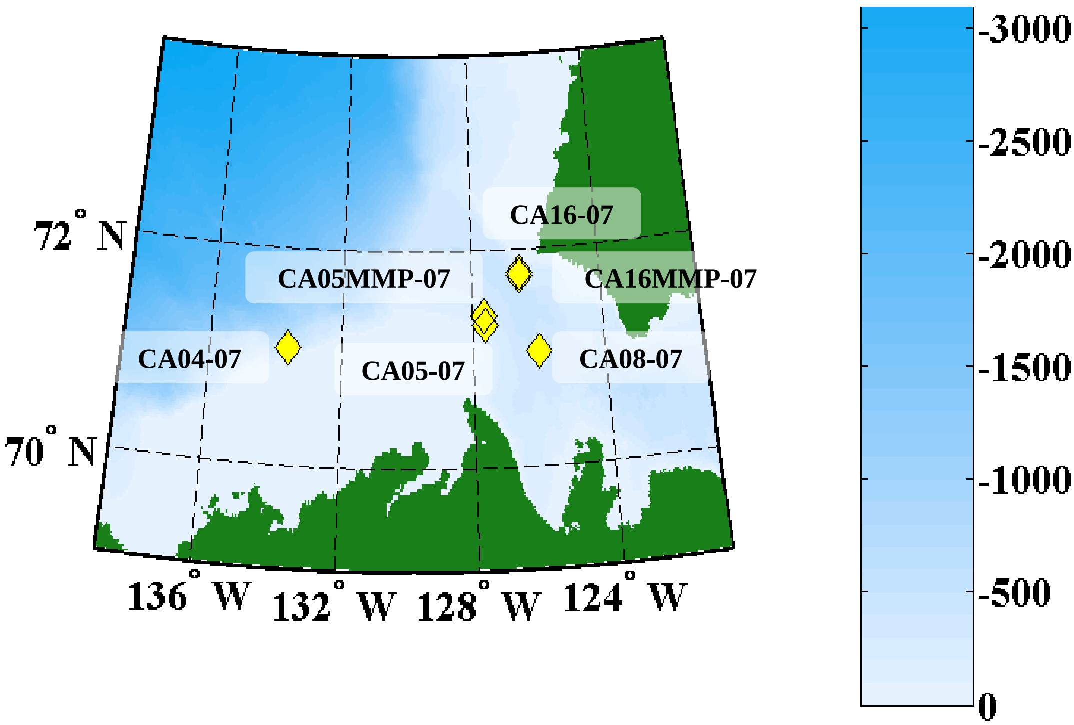

Figure 5.7. 2007 ArcticNet mooring deployments in the Beaufort Sea.

Table 5.5. Summary of ArcticNet 2007 mooring recovery and deployment operations in the Beaufort Sea during Leg 3 with 2008 recovery results.

Mooring ID	Program	Deployed	Recovered	Latitude (N)	Longitude (W)	Depth (m)
CA04-06	ArcticNet	2006	LOST	71°04.812	133°37.764	301
CA08-06	ArcticNet	2006	LOST	71°00.624	126°03.966	397
CA18-06	ArcticNet	2006	2007 (half)	70°39.906	122°59.556	543
CA04-07	ArcticNet	2007	2008	71°04.872	133°38.112	306
CA05-07	ArcticNet	2007	2008	71°18.816	127°36.138	202
CA05-MMP-07	ArcticNet	2007	2008	71°24.198	127°38.112	233
CA08-05	ArcticNet	2007	2008	71°03.234	126°01.362	395
CA16-07	ArcticNet	2007	2008	71°47.424	126°29.574	309
CA16-MMP-07	ArcticNet	2007	2008	71°45.204	126°30.330	356
CA18-07	ArcticNet	2007	2008	70°39.966	122°59.460	542

Only the lower half of mooring CA18-06 was recovered from the three moorings initially deployed during the 2006 Expedition in the Beaufort Sea. This mooring took a long time to come up and, unfortunately, the white mid-water buoy came up first without the upper section of the mooring. The Kevlar rope was damaged and the rings on the buoys were deformed by strain, a possible sign that ice had ablated the top portion of the mooring. The top half of CA18-06 was apparently snagged by ice (likely on 16 May 2007, as seen by a drop in depth in the recovered RCM11). Therefore, all of the equipment and data above the RCM11 (272) had been lost. The evidence gathered at CA08 and CA18 mooring locations points toward an unusual year when ice rafting may have been more intense than usual. The decision was made to lower the top instruments by 10 meters on the new mooring deployed (CA18-07) in-order to increase the safety margin and minimize damage by ice.

Communications with the acoustics releases from mooring CA04-06 were unsuccessful from various distances, within 1-10 km radius from the deployed 2006 position. The ROV was launched on position and found the steel-mooring ring (in which the releases chain passes through). The ring appeared to have been broken by strong ice forces applied on top of the mooring (

Figure 5.8).

Figure 5.8. 2007 ArcticNet Beaufort Sea CA04-06 mooring salvage.
Photo shows the mooring's ice-damaged acoustic release ring.

Communications with the acoustics releases from mooring CA08-06 were also unsuccessful from various distances within 1-10 km radius from the 2006 position. The ROV also dove on position but couldn’t locate the mooring or the anchor. It was thought that the mooring had shared the same fate as CA04-06, and so it was decided to continually try to communicate with the acoustic releases, following a northwest transect corresponding to the direction of the breaking ice in 2007. The mooring was finally located 2 km off the original position but the new location of the mooring was not recorded and unfortunately, the weather (winds exceeding 40 knots) and the heavy ice conditions around the new mooring position prevented any attempts of retrieving this mooring in 2007.

Seven new ArcticNet moorings were successfully deployed in the Beaufort Sea in 2007 (Table 5.5 and Figure 5.7).

5.2.4 Mooring deployment and recovery methodology

Deployment methodology

In preparation for the deployment, all the instruments were programmed and mounted into their respective frames or floats, and the mooring releases were verified for proper functioning. The mooring was then assembled top-down on the foredeck according to the planned design and instrumentation, and all attachments were double checked.

A Toolbox Meeting with Mooring and Ship's crew was held on the foredeck to identify roles and review safety considerations. The Zodiac was launched (if deemed necessary) and the date and time were recorded at the start of mooring operations.

All components of the mooring were lowered from the deck to the water surface using the A-frame, starting with the top float, until all mooring component were in the water. The Zodiac maintained the mooring line taut as it was deployed to avoid getting the equipment entangled. The final release of the anchor was preceded by the Zodiac releasing its tack of the top float and the confirmation of the correct depth and position for the mooring. The mooring was left to free-fall into position and the time and target location of the last seen position of the top float were noted down.

The vessel verified communications with the acoustic releases and proceeded to 3 triangulation points at ~100 m around the target location to calculate the anchor position using a MatLab® script (Figure 5.9). The resulting triangulated position of the mooring was recorded in the field deployment sheets.

A post-deployment CTD cast was conducted and the CTD profile plots for each mooring site were kept within the field deployment Excel workbook and archived at ArcticNet (Figure 5.10). The foredeck was cleaned and the remaining mooring equipment and cages were secured on the foredeck.

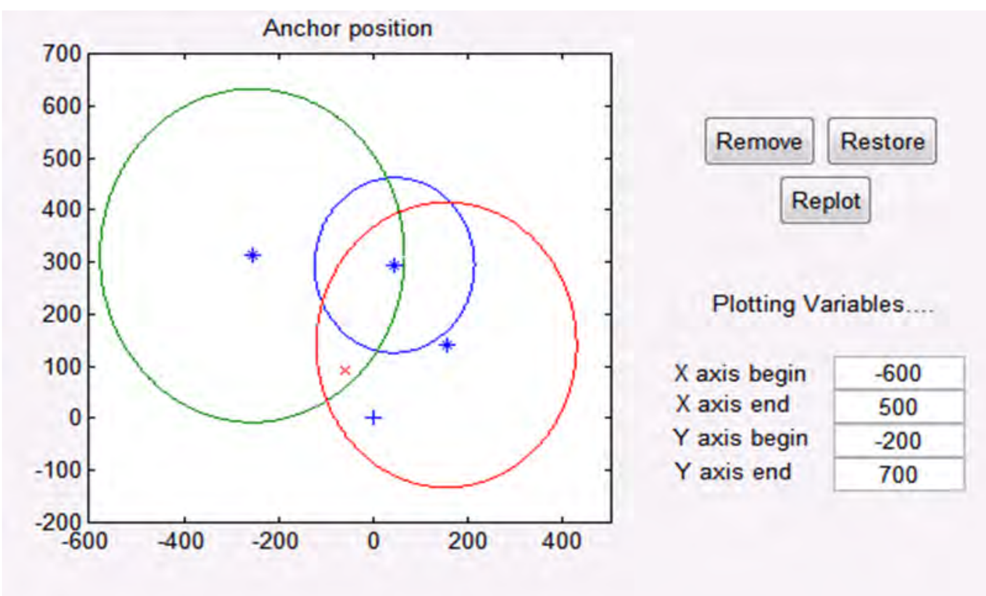

Figure 5.9. Triangulation plot from BS1-14 using Art's Acoustic Survey Matlab Script.

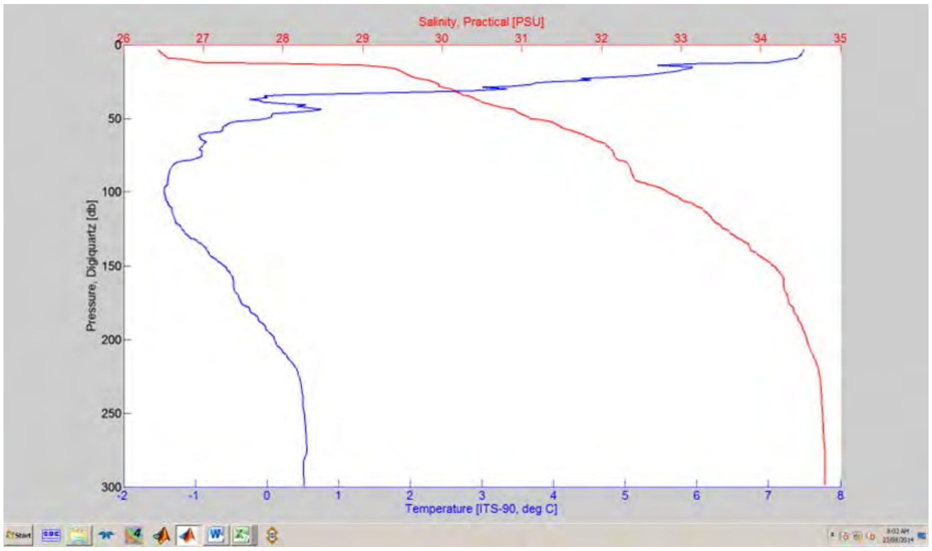

Figure 5.10. Example of a CTD-Rosette temperature and salinity profile (BS2-14).

<u>Recovery methodology</u>

A CTD cast was conducted at each mooring site prior to recovery to obtain a profile of water column properties near the mooring while it was still in place. This cast also served to determine possible sensor drift over time for the moored instruments and obtain accurate data on the acoustic properties of the water.

Transducer ranges were taken on the mooring's acoustic releases from several positions around the mooring site to verify approximate location and distance from the ship. When greater accuracy was needed (due to poor visibility or nearby ice), triangulation was done by taking three range fixes from points surrounding the target location: ranges and locations were logged and a program was run to determine the most likely location of the mooring. The ship was then re-positioned down-drift from this location and another range was taken before sending the release code and the release time logged.

When the mooring surfaced, the time and its location (distance and direction from the ship's position) were logged. The Zodiac was launched and hooked onto the top float when all floatation components had reached the surface. The Zodiac then pulled the mooring alongside the ship and hooked it onto the A-frame winch hook. As the sections of mooring were lifted on deck, the time was logged when each instrument came out of the water.

5.2.5 Data recovery and processing

Of the 46 moored instruments deployed in 2006 in the three study regions, only 14 were retrieved in 2007 and 32 were lost. All datasets obtained from these instruments have been quality controlled and processed (Boisvert et al. 2010). Quality control included metadata and calibration coefficients validation, verification of the instruments depth and clock, and the comparison of mooring data with Rosette-CTD data recorded at the mooring sites.

Mooring designs and instrumentation for each ArcticNet mooring deployed in 2006 and successfully recovered in 2007 are presented for each region (Hudson Bay, Baffin Bay and Beaufort Sea) along with data recovery results and data processing comments (Tables 5.6 to 5.12).

Hudson Bay

Table 5.6. Mooring AN01-06 was deployed in Hudson Bay in 2006 but could not be recovered in 2007.

Region Hudson Bay		**Latitude N** 59° 58.6316'	**Bottom depth** 106 m
Mooring ID AN01-06		**Longitude W** 091° 56.6231'	
Deployment Date & Time (UTC)	2006-09-22 14:43	**Recovery Date & Time (UTC)** Not recovered	

Table 5.7. Mooring design and instrumentation used for Mooring AN03-06 deployed in Hudson Bay in 2006 and recovered in 2007, with post-processing data recovery rate for each moored instrument.

Region Hudson Bay		**Latitude N** 55° 24.4388'	**Bottom depth** 134 m
Mooring ID AN03-06		**Longitude W** 077° 55.7046'	
Deployment Date & Time (UTC)	2006-09-14 17:15	**Recovery Date & Time (UTC)** 2007-08-09 19:57	

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
2*Viny Top float	0.0	13.7			
Poly rope 3/4	0.6	13.7			
JFE-ALEC CT Probe (SN# 686)	0.0	14.3	0%	Instrument was lost	Boisvert et al. 2010
Kevlar 5/16 Line	5.0	14.3			
ORE SS-30 Float	1.0	19.3			
Kevlar 5/16 Line	5.0	20.3			
RCM 4 (SN# 4046)	0.6	25.4	100%	Approximate time tags	Boisvert et al. 2010
Kevlar 5/16 Line	20.0	26.0			
AURAL M2 Hydrophone (SN# 58D7	1.5	46.1			Y. Simard (UQAR-ISMER)
Kevlar 5/16 Line	10.0	47.6			
ORE SS-30 Float	1.0	57.6			
Kevlar 5/16 Line	10.0	58.6			
RCM 4 (SN# 740)	0.6	68.7	96%	Current velocity & direction not valid before 2006-10-12 20:28; Approximate time tags	Boisvert et al. 2010
Kevlar 5/16 Line	20.0	69.3			
WH-ADCP (300kHz) Current Meter (SN#296)	1.0	89.4	0%	Instrument did not record data	Boisvert et al. 2010
Kevlar 5/16 Line	10.0	90.4			
Technicap PPS 3/3 Sediment Trap (SN# 03-199)	2.0	100.4			Lalande and Fortier 2011
Kevlar 5/16 Line	20.0	102.4			
3*Benthos (17")	0.0	122.5			
Kevlar 5/16 Line	5.0	122.5			
2*IXSEA/ OCEANO Acoustic releases	1.6	128.6			
Chain 1/2	0.7	129.2			

Region	Hudson Bay	**Latitude N**	55° 24.4388'	**Bottom depth**	134 m
Mooring ID	AN03-06	**Longitude W**	077° 55.7046'		
Deployment Date & Time (UTC)	2006-09-14 17:15	**Recovery Date & Time (UTC)**	2007-08-09 19:57		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Poly rope 3/4	3.0	129.9			
Chain 1/2	0.6	132.9			
2 Train Wheels	0.5	133.5			

Baffin Bay

Table 5.8. Mooring BA01-06 was deployed in Baffin Bay in 2006 but could not be recovered in 2007.

Region	Baffin Bay	**Latitude N**	76° 19.6948'	**Bottom depth**	670 m
Mooring ID	BA01-06	**Longitude W**	071° 13.6288'		
Deployment Date & Time (UTC)	2006-09-16 22:42	**Recovery Date & Time (UTC)**	Not recovered		

Table 5.9. Mooring BA03-06 was deployed in Baffin Bay in 2006 but could not be recovered in 2007.

Region	Baffin Bay	**Latitude N**	76° 23.1567'	**Bottom depth**	358 m
Mooring ID	BA03-06	**Longitude W**	077° 24.6258'		
Deployment Date & Time (UTC)	2006-08-18 23:32	**Recovery Date & Time (UTC)**	Not recovered		

Beaufort Sea

Table 5.10. Mooring CA04-06 was deployed in the Beaufort Sea in 2006 but could not be recovered in 2007.

Region	Beaufort Sea	**Latitude N**	71° 04.8090'	**Bottom depth**	301 m
Mooring ID	CA04-06	**Longitude W**	133° 37.7620'		
Deployment Date & Time (UTC)	2006-10-12 23:47	**Recovery Date & Time (UTC)**	Not recovered		

Table 5.11. Mooring CA08-06 was deployed in the Beaufort Sea in 2006 but could not be recovered in 2007.

Region	Beaufort Sea	**Latitude N**	71° 00.5840'	**Bottom depth**	392 m
Mooring ID	CA08-06	**Longitude W**	126° 03.7700'		
Deployment Date & Time (UTC)	2006-10-17 23:53	**Recovery Date & Time (UTC)**	Not recovered		

Table 5.12. Mooring design and instrumentation used for Mooring CA18-06 deployed in the Beaufort Sea in 2006 and recovered in 2007, with post-processing data recovery rate for each moored instrument.

Region	Beaufort Sea	**Latitude N**	70° 39.9075'	**Bottom depth**	543 m
Mooring ID	CA18-06	**Longitude W**	122° 59.5530'		
Deployment Date & Time (UTC)	2006-10-18 17:02	**Recovery Date & Time (UTC)**	2007-10-25		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
2*Viny Top float	0.0	16.6			
Poly rope 3/4	0.6	16.6			
ALEC CLW Probe (SN# 0285)	0.0	17.2	0%	No data was recorded	Boisvert et al. 2010
Kevlar 5/16Line	20.0	17.2			
ORE SS-30 Float	1.0	37.3			
Kevlar 5/16Line	10.0	38.3			Boisvert et al. 2010
RCM 11 (SN# 274)	0.6	48.3	0%	No data was recorded	
Kevlar 5/16Line	40.0	48.9			
WH-ADCP (300kHz) Current Meter (SN# 7844)	1.0	89.1	0%	No data was recorded	Boisvert et al. 2010
Kevlar 5/16Line	10.0	90.1			
Technicap PPS 3/3 Sediment Trap (SN# 03-174 (20))	2.0	100.2			
Kevlar 5/16Line	20.0	102.2			
ORE SS-30 Float	1.0	122.3			
Kevlar 5/16Line	80.0	123.3			
McLane Sediment Trap	2.0	203.7			
Kevlar 5/16 Line	10.0	205.7			
RCM 11 (SN# 272)	0.6	215.8	50%	Unreliable pressure data; 163 days of unreliable data after 16-May-2007 (43%)	Boisvert et al. 2010
Kevlar 5/16 Line	200.0	216.4			
ORE SS-30 Float	1.0	417.4			
Kevlar 5/16Line	70.0	418.4			
Technicap PPS 5/2 Sediment Trap (SN# 03-226 (66))	2.0	488.7			L. Fortier (U. Laval); Metadata CCIN 10476
Kevlar 5/16Line	10.0	490.7			
RCM 7 (SN#10301)	0.6	500.8	60%	Unusable calibration data on Current velocity and Pressure	Boisvert et al. 2010
Kevlar 5/16Line	30.0	501.4			
3*NIPR (17")	0.0	531.5			
Kevlar 5/16Line	5.0	531.5			
2*IXSEA/ OCEANO Acoustic releases	1.6	537.6			
Chain 1/2	0.7	538.2			
Poly rope 3/4	3.0	538.9			
Chain 1/2	0.6	541.9			
3 to4 Train Wheels	0.5	542.5			

5.3 Comments and recommendations

5.3.1 Leg 1 – 26 July to 17 August 2007 – Labrador fjords and Hudson Bay

The NOW transect could not begin on the Greenland side as mooring instruments needed to be calibrate on Canadian ground. Permits to calibrate instruments in Greenland should be filed in advance. Otherwise, a different location, in Canadian waters, is needed to properly calibrate mooring equipment.

5.3.2 Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

In the Beaufort Sea (and NOW Polynya) area, it is recommended that moorings be setup 20 m deeper (top float height) than the 2006 deployment designs to avoid or reduce loss and damage of moored equipment due to ice.

The mooring releaser ring needs to be stronger for future moorings.

Evidence gathered at CA08 and CA18 points toward an unusual year (2006-2007) when ice rafting may have been more intense than usual. The top instruments were lowered by 10 meters on the new CA18-07 in order to increase the safety margin and avoid ice damage in the future.

Mooring operations were performed at all times, day and night, many times in rough weather, while the ship was surrounded by ice, which is not a good practice for safe mooring operations. Mooring operations should be restricted to daytime in weather conditions suitable for Zodiac launching and safe handling of mooring and deck equipment.

References

INRS technical reports:

Rail M.E. and Gratton Y. 2011. Distribution of temperature and salinity in the Canadian Arctic Archipelago during the 2007 and 2008 ArcticNet sampling expeditions. Report No R1243, INRS-ETE, Québec (Qc): vii + 65 p.

Boisvert D., Rail M.E., Bélanger C. and Gratton Y. 2010. ArcticNet 2007-2008 mooring data – Quality control report. Internal report (unpublished), INRS-ETE, Québec (Qc): v + 38 pp.

ArcticNet mooring report:

Meredyk, S. 2014. 2007 Mooring Field Operations Report. ArcticNet Inc., Québec (Qc), 43 pp.

6 Canadian Arctic Buoy Program – Leg 3a

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. http://www.arcticnet.ulaval.ca/pdf/phase1/11.pdf.

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6.1 Introduction

The Canadian Arctic Archipelago (CAA) is expected to become navigable in the near future. Current estimates are based on simulation results from General Circulation Models (GCMs). The spatial resolution of GCMs, however, only allows for a coarse representation of the CAA. To this end, higher resolution models are needed in order to better predict the future evolution of the sea ice in the CAA. Until now, sea-ice dynamic models have been calibrated against buoy drift data in the Arctic Ocean from the International Arctic Buoy Program (IABP) but IABP has no buoys deployed in the CAA. Whether the calibration of these models, and the continuum assumption upon which they are based, are still valid at high resolution remains an open question. To address this, *in-situ* measurements were made within the narrow passages of the CAA. In particular, the temporal evolution of sea-ice deformations, internal ice stress and ice thickness were monitored. These measurements will be used to calibrate/validate a high-resolution sea-ice model that is being developed at McGill University. The sea-ice model is based on the granular material rheology (Tremblay and Mysak 1997). The dynamical part of the model is now solved using the Generalized Minimum Residual method (GMRES), with a line Successive Overrelaxation (LSOR) preconditioner. This new implementation constitutes a significant improvement in numerical efficiency and allows for the integration of the model at high resolution over a domain including both the CAA and the Arctic Ocean.

6.2 Methodology

Three ice buoys were deployed each year for 3 years in the M'Clintock or the Viscount-Melville Channels within the CAA. The buoys are manufactured by METOCEAN (Dartmouth, Nova Scotia) and are tested and pre-programmed in house prior to deployment. Three types of buoys were used: a Spherical Drifter (SVP), an Ice Stress Buoy (ISB), and an Ice Mass Balance Buoy (IMBB). The SVP includes a Global Positioning System (GPS) and an Iridium transmitter. The ISB includes a Campbell scientific data-logger, a Global Positioning System (GPS), an ARGOS transmitter, 2-meter barometric pressure and surface air temperature, and a set of Geokon strain gauges for sea-ice stress measurements. The IMBB is equipped with a GPS, a Campbell scientific data-logger, a Global Positioning

System (GPS), an ARGOS transmitter, 2-meter barometric pressure and surface air temperature, a thermistor string within sea ice, and above-ice and below-ice acoustic sounders measuring the height of the surface and bottom.

During Leg 3a, three SVP and 1 IMBB were successfully deployed and are presently transmitting data via Iridium and ARGOS – this data is available online upon request. This year, the ISB was not deployed as the buoy is currently in development at METOCEAN and will be deployed starting in 2008. A third SVP was deployed instead. The buoys were deployed using the logistic support of the CCGS *Amundsen* and its helicopter.

The proposed buoy arrangement allowed the direct measurement of sea-ice thermodynamic growth/melt (using the IMBB), growth through sea-ice convergence (ridging) by monitoring the changes in area enclosed by the three buoys, sea ice mechanical properties (using the internal ice stress measurements from the ISB, together with a knowledge of the wind forcing from local weather stations and reanalysis data), and sea-ice deformation using the stress and strain-rate information for the set of three buoys. The life expectancy of a buoy is approximately 2 years. The 3-year buoy deployment effort will therefore provide four years of data. This data will feed into a longer-term modeling effort by B. Tremblay (McGill U.) who is working together with PhD students and postdocs on the validation of the high-resolution sea-ice model of the Canadian Arctic Archipelago (including the Arctic Ocean).

Currently, sea-ice drift data from the CAA are quasi non-existent. The IABP focuses mainly on the Arctic Ocean, and of its 39 presently active buoys, one is located at the mouth of the Nares Strait (between Greenland and Ellesmere Island), and one at the mouth of the Lancaster Sound. Also, sea-ice drift estimates from passive microwave imagery SSM/I are not possible in the CAA due to the small deformations present over the usual 3-day swath period. This buoy deployment effort will complement the IABP. The Buoys also provided surface air temperature and pressure, which are being assimilated in reanalysis products and weather prediction models such as National Centers for Environmental Prediction - National Center for Atmospheric Research, and European Center for Medium-Range Weather Forecasts. The calibration/development of the high-resolution model for this region will give a unique opportunity to address questions such as the timing of the opening of the Northwest Passage to navigation, and the future of the sea-ice cover in the CAA in a warming world. This is crucial for Canada for the management of its interior waters and economic planning/development of the High Arctic.

7 Water column structure and ocean circulation (CTD-Rosette, MVP and ADCP operations) – Legs 1 and 3

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. http://www.arcticnet.ulaval.ca/pdf/phase1/11.pdf.

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7.1 Introduction

The general objective was to describe the water masses and general oceanic circulation in the Labrador fjords and Hudson Bay (Leg 1), and at the North Water (NOW) Polynya, in the Northwest Passage and the Beaufort Sea (Leg 3) as part of ArcticNet's marine-based program.

7.2 Methodology

7.2.1 Instrumentation

Physical parameters were recorded using a ship mounted RD Instruments Ocean Surveyor ADCP, a Brooke Moving Vessel Profiler (MVP) 300 and a Rosette frame equipped with 24 bottles of 12 L and an array of sensors described in Table 7.1.

Table 7.1. Description of the instruments and sensors used on the Rosette.

Instrument	Manufacturer	Type	Properties	Serial number	Max depth (m)
CTD	SeaBird	SBE-911	Sampling rate: 24Hz		6800
Temperature	SeaBird	SBE 3plus	Range: -5°C to +35°C Accuracy: 0.001	4204	
Conductivity	SeaBird	SBE 4C	Range: 0 to 7 S/m Accuracy: 0.0003	2696	
Pressure	SeaBird		Accuracy: 0.015% of full range	90584	
Oxygen	SeaBird	SBE-43	Range: 120% of saturation	0427	7000

Instrument	Manufacturer	Type	Properties	Serial number	Max depth (m)
			Accuracy: 2% of saturation		
pH	SeaBird	SBE-18	Range: 0 to 14 Accuracy: pH 0.01	0452 switched to 0444 on cast 024 of Leg 3	1200
Nitrates	Satlantic	MBARI ISUS	Range: 0.5 to 200 µM Accuracy: ± 2 µM	132 switched to 134 on cast 143 of Leg 3	1000
PAR	Biospherical			4664	
SPAR	Biospherical			20147	
Fluorometer	Sea Point			2465	
Transmissometer	WetLab			CST-558DR	
Altimeter	Benthos			1044 switched to 1061 on cast 028	

7.2.2 Probe calibration

pH: Tests were done three times during Leg 1 and twice during Leg 3 using two buffers at pH 4 and pH 7. Results were good and consistent.

Salinity: Samples were taken for calibration on many Contaminants sampling casts as well as on Nutrient casts at Mooring stations. Samples were analyzed onboard with a GuildLine Autosal (model 8400B). Results were not always satisfactory; for instance a Rosette cast (#139 in Leg 3) was compared with a SCAMP profile and it was concluded that there was an offset on the Rosette salinity data and that this dataset would need to be corrected accordingly.

Oxygen: Oxygen calibration was performed onboard using Winkler's method and a Mettler Toledo titration machine. Reagent blanks were performed once in Leg 1 and twice during Leg 3, and results showed that the reagents were good (m<4). Oxygen samples were taken on seven occasions with satisfactory results.

7.2.3 Sampling sites

During Leg 1, CTD cast were done in Labrador fjords, in Hudson Strait and in Hudson Bay while the MVP was used twice during transect lines with Inukjuak and at the junction of James Bay and Hudson Bay (Figure 7.1). The hull mounted ADCP recorded throughout Leg 1, from Quebec City to Churchill.

During Leg 3, CTD casts were conducted in Baffin Bay at the North Water (NOW) Polynya study area, outside Belcher glacier, along the Northwest Passage and in the Beaufort Sea at the Circumpolar Flaw Lead (CFL) study area (Figure 7.2).

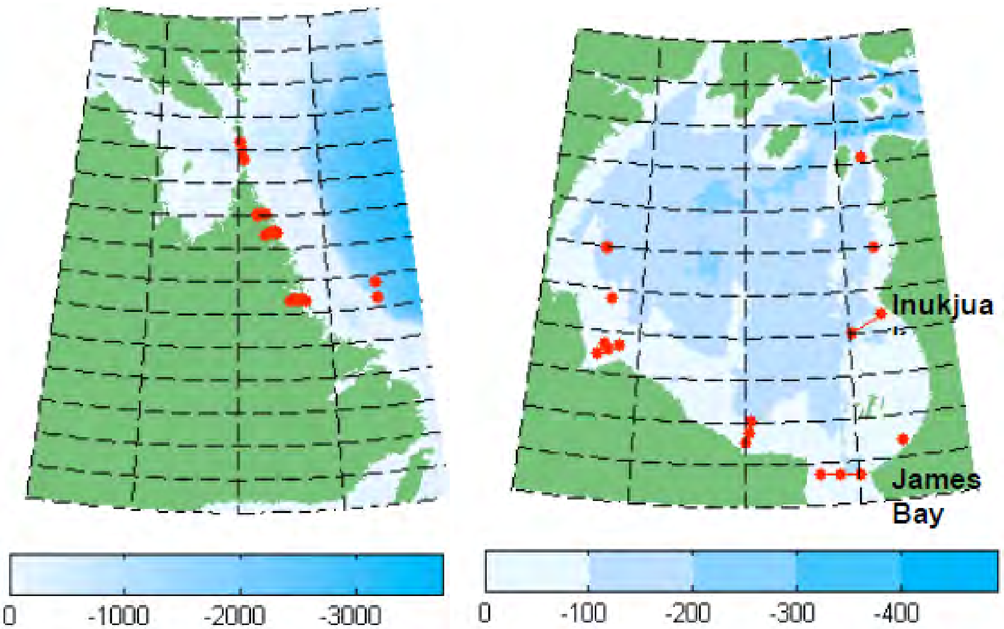

Figure 7.1. CTD-Rosette cast locations in the Labrador fjords (left) and Hudson Bay (right) during Leg 1 and the two MVP transects conducted in Hudson Bay at Inukjuak and at the mouth of James Bay.

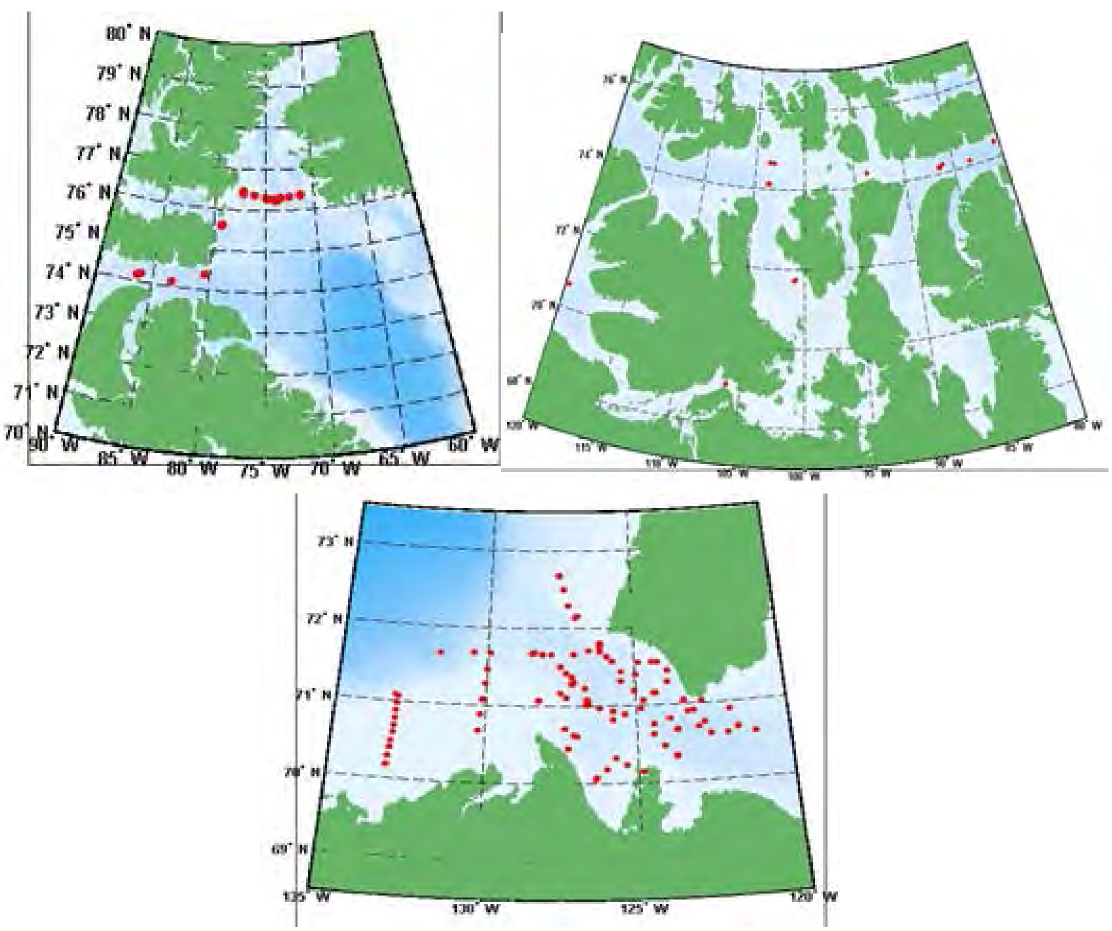

Figure 7.2. Maps showing the locations of CTD casts in Baffin Bay (upper left panel), the Northwest Passage (upper right panel) and Beaufort Sea (bottom panel) during Leg 3.

MVP water column profiling was conducted once in Baffin Bay, but the transect was not completed due to problems with the instrument. During Leg 3, the hull mounted current meter (ADCP) recorded continuously from Resolute Bay on 27 September to Paulatuk on 7 November.

7.2.4 Water samples

Water was collected from the Rosette by the different science teams. Here are examples of usual depths of bottle closure:

Nutrients (J.-É. Tremblay's team): Chlorophyll maximum, 10 m above and 10 m under chlorophyll maximum, at salinity of 33.1, as well as 5, 10, 20, 30, 40, 50, 60, 70, 80, 100, 120, 140, 160, 180, 200, 250 and 300 m, and then every 100 m to the bottom.

Primary production (M. Poulin, M. Gosselin and C. Michel's team): chlorophyll maximum, 100 m, 75 m, 100%, 50%, 30%, 15%, 5%, 1% and 0.2% of light measured with a Secchi disk before the cast.

Contaminants (G. Stern's team): 4, 5, 7.5, 10, 25, 50, 100 and 200 m.

Mercury (G. Stern's team): three water masses within the water column, one at the surface, one in the middle and one at the bottom.

DMS (Leg 3; M. Levasseur's team): Chlorophyll maximum, 50%, 15%, 5% and 0.2% of light measured with a Secchi disk before the cast.

DIC (Leg 3; H. Thomas' team): 0, 5, 10, 20, 30, 40, 50, 60, 80, 100, 120, 140, 160, 180, 200, 250 and 300 m, and then every 100 m down to the bottom.

CDOM (Leg 3; P. Larouche's team): 60 m, 50%, 30%, 10% and 1% of light measured with a Secchi disk before the cast.

7.2.5 Data availability

All information on CTD-Rosette casts is summarized in the CTD Logbook (Appendix 3) and include cast and station numbers, date and time of sampling in UTC, latitude and longitude, bottom and cast depths, as well as any comment relating to the cast. A Rosette sheet was also created for every cast and included the same information than the CTD Logbook plus the bottle distribution among the sampling teams. The weather information was recorded in every Rosette sheet as well as in the meteorological logbook. For every cast, data recorded at the moment of bottle closure were averaged and logged in the 'bottle files'. These averages recorded parameters in a 10-seconds time span, from 3 seconds before bottle closure to 7 seconds after it. The bottle files also included information about bottle position, time and date, pressure, temperature, salinity, transmissivity, chlorophyll, oxygen, irradiance and pH measurements.

During Leg 1, between 30 July and 16 August 2007:

- 40 CTD casts were performed with the Rosette;
- 960 bottles were closed providing 11 520 L of seawater.

During Leg 3, between 28 September and 8 November 2007:

- 143 CTD casts were performed with the Rosette;
- ADCP data was collected along the cruise track in North Water Polynya, Lancaster Sound, McClintock Channel and Beaufort Sea;
- A portion of the transect crossing North Water Polynya from Ellesmere Island to Greenland was done by the MVP.

7.3 Comments and recommendations

Sensors: Most of the sensors worked well throughout Legs 1 and 3. The pH probe encountered some problems because of water intrusion in the cables, while the altimeter got some problems for a still unknown reason and the nitrate sensor stopped working properly by the end of Leg 3.

Bottles: A few times during the cruise, bottles (#13 and #23) did not close.

Deck material (winch, A-frame, etc.): The winch overheated once, which had occurred on previous Legs.

8 Turbulence measurements (VMP and SCAMP) – Leg 3

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. http://www.arcticnet.ulaval.ca/pdf/phase1/11.pdf.

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8.1 Introduction

Turbulence is usually defined as the irregular, random component of fluid motion. In the seas and oceans, this phenomenon is closely associated with sheared flow induced by the breaking internal waves. The resulting 'eddies' generated by this flow induce strain that enhance the production of overturns at smaller and smaller scales to viscosity. This energy cascade (primarily directed toward smaller scales) promotes scalar mixing and the ending of turbulence. When this process occurs in the upper ocean layer (< 100 – 150 m), it promotes pollutants dispersion, the growth of marine organisms (especially plankton) and the transfer of momentum, heat and gases across the surface.

To date, few studies have tried to understand and quantify turbulent processes in the Arctic Ocean and most have dealt with the special case of Barrow Strait (Melling et al. 1984, Crawford et al. 1999, Marsden et al. 1994), a region known to be highly active in terms of vertical transport and mixing. Other projects such as the *Coordinated Eastern Arctic Experiment* (CEAREX) conducted east of Greenland (Padman and Dillon 1991) and the *Lead Experiment* (LAEDEX) conducted north of Alaska (McPhee and Stanton 1996) had also focused on the physical characteristics of turbulence in these Arctic regions. These studies have brought some answers on turbulent processes such as the role of diurnal tides and high frequency internal waves, but did not clarify the problem for other locations in the Arctic. The general objectives of this study were to:

- Outline a general pattern of active turbulence in the High Arctic and Baffin Bay;
- Identify the main physical processes responsible of the observed mixing;
- Specify the role of turbulence in terms of biological production.

8.2 Methodology

8.2.1 Description of profiling instruments (VMP and SCAMP)

Turbulence acts first on the velocity field as the propagating waves create line vortices, which continuously advect each other in complex ways. Those complexes structures are relatively stable, and the mixing then mainly occurs in regions of intense strain created between nearby vortices. The large resulting velocity gradients at small scales (1 mm to 1 cm) can be detected by an airfoil shear probe, a piezo-ceramic bender that generates an electrical charge in response to cross-axial forces. The signal collected by this probe (u') and the deducted shear (du'/dz) can be used to estimate the rate of loss of kinetic energy in turbulent events ($\varepsilon \propto (\partial u'/\partial z)^2$, expressed in W kg^{-1} or m^2 s^{-3}. This parameter ranges from 10^{-10} W kg^{-1} in the deeper parts of the oceans to 10^{-1} W kg^{-1} in the more active regions.

A Vertical Microstructure Profiler (VMP) equipped with two of these shear probes was used to sample the turbulent vector field in open water. This profiler was deployed at each Basic (30 min) and Full stations (60 min) for a sequence of profiling. As turbulence is best understood by statistical analysis, the profiling sequence was essential to predict the intensity and the characteristics of the turbulent flows. The VMP falls through the water column at a rate of 0.6 ms^{-1} and samples at a rate of 512 Hz, allowing one measurement per millimetre. The VMP was also equipped with a Sea-Bird CTD (Conductivity, Temperature and Depth sensor, sampling rate 64 Hz) and two fast-response thermistors (sampling rate 512 Hz).

As vortices are created, the scalar fields (i.e. temperature) are compressed by the strain created between the turbulent structures of the flow. The scalar variance is then driven to smaller scales via eddies as the energy cascade progresses. As soon as they are formed, thermal anomalies blend into the background by molecular diffusivity at a rate χ the rate of loss of thermal variance (°C^{-2} s^{-1}), which constitutes the far end of turbulence or the smaller possible tracks of overturns.

This turbulent mark can be detected by the Self-Contained Autonomous Profiler (SCAMP), a profiler designed to directly estimate the thermal variance produced by diapycnal mixing. This instrument was equipped with two fast response thermistors to measure the temperature gradient at every 0.01 s. Since it falls through the water column at a rate of 0.1 m s^{-1}, the resulting precision is of 1 mm, which is sufficient to resolve the complete scalar spectrum and estimate $\chi \propto (\partial T'/\partial z)^2$. The SCAMP is also fitted with PAR, accurate T, accurate C and pressure sensors, and a fluorometer. The SCAMP was used as a complementary instrument in profiling sequence mode at some Basic (deployed from the moonpool, 90 min) and Full stations (deployed from the Zodiac, 120 min, or the moonpool, 90 min).

8.2.2 Sampling stations

In total, 66 profiles were taken with the SCAMP and 100 profiles with the VMP at a total of 27 stations (Table 8.1).

Table 8.1. Stations and locations of turbulence profiles conducted with the VMP and SCAMP instruments during Leg 3.

Station	Date	Location	Latitude N	Longitude W	Instrument

Station	Date	Location	Latitude N	Longitude W	Instrument
101	29-SEP-07	Baffin Bay	76°16.050	077°16.001	SCAMP
101	30-SEP-07	Baffin Bay	76°17.982	077°13.764	VMP
105	30-SEP-07	Baffin Bay	76°11.412	075°19.608	VMP
115	01-OCT-07	Baffin Bay	76°13.272	071°11.400	SCAMP
111	02-OCT-07	Baffin Bay	76°10.806	073°04.104	VMP
108	03-OCT-07	Baffin Bay	76°08.184	074°24.564	SCAMP
108	03-OCT-07	Baffin Bay	76°07.854	074°30.210	VMP
302	07-OCT-07	Northwest Passage	74°05.394	086°07.980	SCAMP
308	09-OCT-07	Northwest Passage	74°04.752	103°04.746	SCAMP
308	09-OCT-07	Northwest Passage	74°04.464	103°01.704	VMP
309	10-OCT-07	Northwest Passage	74°24.076	103°04.649	VMP
434	15-OCT-07	Amundsen Gulf	70°06.522	133°19.488	VMP
435	17-OCT-07	Amundsen Gulf	71°02.448	133°24.804	VMP
1806	19-OCT-07	Amundsen Gulf	72°26.284	127°07.319	VMP
1800	20-OCT-07	Amundsen Gulf	72°04.926	127°24.210	VMP
437	21-OCT-07	Amundsen Gulf	71°28.278	126°20.592	VMP
408	22-OCT-07	Amundsen Gulf	71°10.200	127°19.308	SCAMP
408	22-OCT-07	Amundsen Gulf	71°10.116	127°19.308	VMP
407	23-OCT-07	Amundsen Gulf	71°00.510	125°34.554	SCAMP
407	24-OCT-07	Amundsen Gulf	71°01.386	125°34.716	VMP
405	25-OCT07	Amundsen Gulf	70°23.982	123°01.158	SCAMP
405	25-OCT-07	Amundsen Gulf	70°23.604	123°00.678	VMP
1000	26-OCT-07	Amundsen Gulf	70°21.504	120°35.394	VMP
1100	27-OCT-07	Amundsen Gulf	71°01.380	123°09.282	VMP
1110	27-OCT-07	Amundsen Gulf	70°11.454	124°32.592	VMP
1116	28-OCT-07	Amundsen Gulf	70°02.298	126°12.450	SCAMP
1124	29-OCT-07	Amundsen Gulf	70°23.718	127°25.752	SCAMP
1124	30-OCT-07	Amundsen Gulf	70°25.578	127°29.730	VMP
1200	31-OCT-07	Amundsen Gulf	71°19.628	124°08.303	VMP
1200	31-OCT-07	Beaufort Sea	71°19.752	124°15.546	SCAMP
1600	02-NOV-07	Beaufort Sea	71°19.806	130°34.656	SCAMP
1600	02-NOV-07	Beaufort Sea	71°24.744	130°29.430	VMP
1606	02-NOV-07	Beaufort Sea	71°02.844	130°18.642	SCAMP
1902	03-NOV-07	Amundsen Gulf	71°20.070	126°33.600	SCAMP
1908	05-NOV-07	Amundsen Gulf	71°05.319	124°11.532	SCAMP
1916	06-NOV-07	Amundsen Gulf	70°32.400	122°05.148	SCAMP

8.3 Preliminary results

An example of vertical profile obtained with the SCAMP is presented in Figure 8.1.

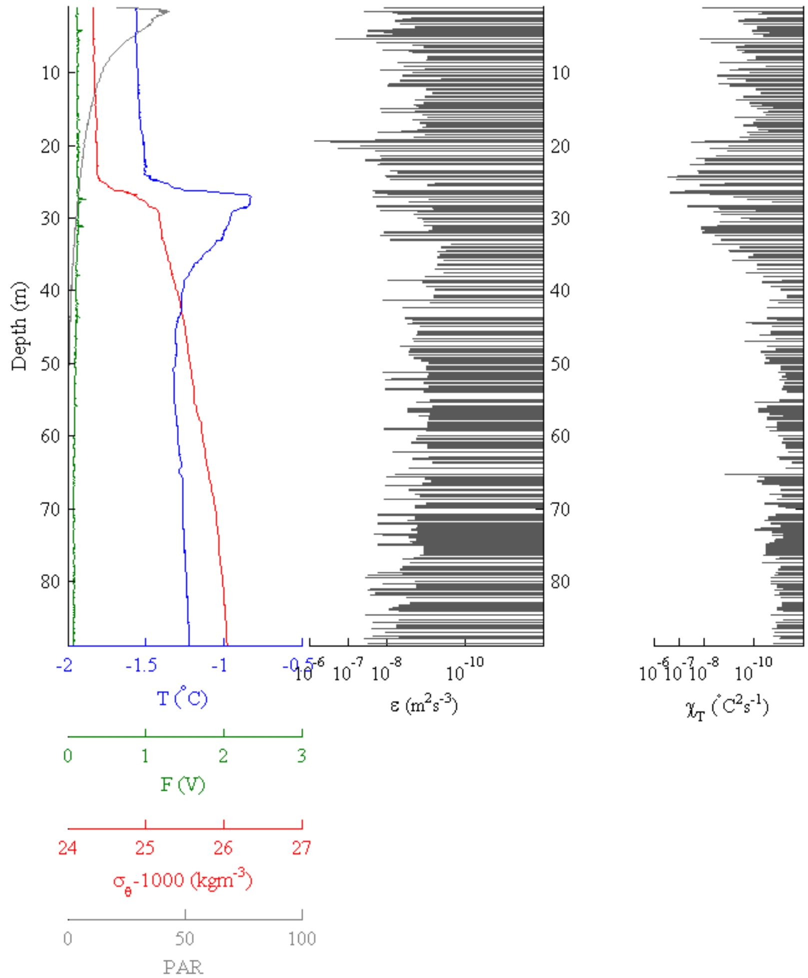

Figure 8.1. Example of profiles obtained by the SCAMP. From left to right: temperature, fluorescence, density and PAR profiles, rate of loss of kinetic energy, ε [m^2 s^{-3}] and rate of destruction of thermal variance χ_T [°C^{-2} s^{-1}].

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9 Ocean colour and freshwater circulation in Hudson Bay – Leg 1

ArcticNet Phase I – Project 3.1 Ocean-Ice-Atmosphere Coupling and Climate Variability in Hudson Bay. http://www.arcticnet.ulaval.ca/pdf/phase1/31.pdf.

Project leader: David G. Barber[1] (david.barber@umanitoba.ca)
Cruise participants Leg 1: Greg McCullough[1], Klaus Hochheim[1], Andrea Rossnagel[1] and Caitlin Munroe[2]

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9.1 Introduction

Sampling was conducted in support of three major objectives:

- Make ocean colour measurements with associated water quality data in Hudson Bay to assist in improving the quality of and validating remote sensing determinations of suspended solids, chlorophyll and chromophoric dissolved organic matter (CDOM);
- Sample water for delta-O18 and dissolved organic matter for fluorescence determinations (FDOM);
- Install and test meteorological and remote sensing systems to be employed for sea ice and ocean color measurements in subsequent ArcticNet/CFL legs.

9.2 Methodology

9.2.1 System testing

Initial setup and testing of the shipboard microwave scatterometer and passive microwave radiometers were successfully completed. These instruments will be used in subsequent legs to measure sea ice and sea surface properties in support of various experiments. The ceilometer, webcam, and Skycam were installed. The Skycam system (measuring fraction cloud cover) will require some modifications to make it operational for subsequent legs; these modifications are being worked on and will be operational for the next scientific leg. The ceilometer (measuring cloud heights) and webcam (to monitor sea state/ice cover in the MW imaging FOV) are operational.

The ocean color instruments, including the AC-9, HyperSAS and HyperOCR in water profiling system were successfully deployed in Leg 1 in Hudson Bay.

9.2.2 Passive microwave measurements

Passive microwave measurements (89 and 37 GHz; Figure 9.1) were taken during Leg 1 in support of research on emissivity of the ocean as a function of sea state. Table 9.1 provides a summary of the data recorded; these observations include transit data at 37-

degree depression angles and at station observations ranging from 20-60 degree depression angles.

Figure 9.1. Passive microwave system, 89 and 37 GHz, installed and tested during Leg 1.

Table 9.1. Passive microwave measurements 37 and 89 GHz during Leg 1.

Station	Date (y/m/d)	GPS_WP	GPS #	Time (QC DST)	Time UTC	Start		End	
						Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)
600	2007/08/02	SBR600		07:00:00	11:00:00	59°05.081	063°25.882		
600									
LN_2	2007/08/02	SBR_Ln2		20:09:00	00:09:00	59°17.861	063°03.488		
LN_2	2007/08/03	10	2	06:52:00	10:52:00			61° 00.092	064°45.625
354	2007/08/03	10	2	06:56:56	10:56:56	61°00.092	064°45.625		
354		10	2	07:13:05	11:13:05				
352	2007/08/03	11	2	09:59:00	13:59:00	61°16.040	064°48.603		
352	2007/08/03	11	2	10:15:00	14:15:00	61°16.040	064°48.603		
352	2007/08/03	11	2	10:29:00	14:29:00				
LN_3	2007/08/03	12	2	18:52:15	22:52:15	61°34.020	068°09.119		
LN_3	2007/08/03	13	2	21:36:20	01:36:20			61° 51.450	069°17.672
LN_4	2007/08/03	14	2	11:16:55	16:16:55	62°25.638	074°41.300		
LN_4	2007/08/04	15	2	14:02:44	18:02:44			62° 14.004	075°38.439
LN_5	2007/08/05	16	2	07:09:04	11:09:04	61°11.547	078°54.347		
LN_5	2007/08/05	19	2	19:45:00	23:45:13			59° 34.197	078°58.278
LN_6	2007/08/05	20	2	23:48:00	03:48:00	59°33.514	078°59.178		
LN_6		20A		12:46:00	16:46:00			58° 15.000	078°53.000
LN_7	2007/08/06	21	2	09:39:00	12:39:00	58°13.078	079°03.211		
LN_7	2007/08/06	22	2	10:52:40	14:52:40	58°09.879	079°16.092		
LN_7	2007/08/06	23	2	12:46:00	16:46:00	58°04.960	079°35.577		
LN_7	2007/08/06							58° 00.184	079°53.443
700	2007/08/06	24	2	15:29:03	19:29:03	58°00.515	079°52.942		

Station	Date (y/m/d)	GPS_WP	GPS #	Time (QC DST)	Time UTC	Start		End	
						Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)
700				15:41:33	19:41:33				
Sanikiluaq	2007/08/07	25	2	15:00:17	19:00:17	56°36.899	079°11.118		
Sanikiluaq	2007/08/07			15:10:11	19:10:11				
Sanikiluaq	2007/08/07			15:34:10	19:34:10				
Sanikiluaq	2007/08/07			15:55:15	19:55:15				
LN_8	2007/08/09	26	2	08:50:39	12:50:39	55°14.527	079°39.103		
LN_8	2007/08/09	27	2		17:02:36			55°22.536	078°06.041
LN_9	2007/08/10	37	2	13:14:51	17:14:51	55°05.121	078°53.710		
LN_9	2007/08/10			16:48:48	20:48:48			54°42.723	079°57.756
LN_10	2007/08/11	42	2	10:08:00	14:08:00	54°56.558	081°44.731		
LN_10	2007/08/11			20:43:00	00:43:00			55°54.000	083°53.000
704c	2007/08/12	10	1	07:00:26	11:00:26	55°31.528	084°57.086		
704c	2007/08/12	11		11:18:14	15:18:14			55°36.991	084°54.486

9.2.3 Ocean color

The HyperOCR profiler (Figure 9.2) is an in-water hyperspectral sensor used to observe the spectral properties of the water column from 300 to 800 nm (256 channels). Table 9.2 summarizes the locations where multiple profiles were completed, these generally extended to 30-60 m depth depending on local bathymetry. Water samples were collected at each site and were prepared for analysis for total suspended solids, chlorophyll, DOC, CDOM and FDOM, among others.

Figure 9.2. HyperOCR, hyperspectral profiling instrument at the surface.

Table 9.2. HyperOCR profiles conducted during Leg 1.

Station	Date (y/m/d)	Time (QC DST)	UTC	GPS_WP	Latitude (N) Start	Longitude (W) Start	Pressure tare	File ID
624	2007/07/31	12:24:45	16:24:45	1	56°25.159	062°04.460	11.415912	624_aa
624	2007/07/31	12:33:27	16:33:27	1	56°25.159	062°04.460		624_ab
624	2007/07/31	13:11:49	17:11:49	1	56°25.159	062°04.460		624_ad
624	2007/07/31	13:18:00	17:18:00	1	56°25.159	062°04.460		624_ae
620	2007/07/31	17:50:43	21:50:43	620	56°23.980	061°13.868	11.315718	620_aa
620	2007/07/31	18:01:36	22:01:36	620_2	56°23.917	061°14.290		620_ab
620	2007/07/31	18:08:17	22:08:17	620_3	56°23.880	061°14.514		620_ac
620	2007/07/31	18:36:32	22:36:32	620_4	56°23.768	061°13.693		620_ad
602	2007/08/02	11:14:00	15:14:00	602	59°03.198	063°52.050	11.296931	602_aa
602	2007/08/02			602	59°03.198	063°52.050		602_ab
602	2007/08/02	11:23:15	15:23:15	602	59°03.198	063°52.050		602_ac
602	2007/08/02	11:40:00	15:40:00	602	59°03.198	063°52.050	11.340776	602_ac?
699	2007/08/05	13:18:00	17:18:00	699	59°59.899	078°26.244	11.253069	699_aa
699	2007/08/05	13:30:00	17:30:00	699	59°59.899	078°26.244		699_ab
702	2007/08/09	14:33:24	18:33:24	30	55°23.284	077°55.215	11.284407	702_HB_aa
702	2007/08/09	14:59:31	18:59:31	33	55°23.461	077°54.957		702_HB_ab
702	2007/08/09	15:09:02	19:09:02	34	55°23.467	077°54.937	11.372077	702_HB_ac
702	2007/08/09	15:35:56	19:35:56	35	55°23.614	077°54.730		702_HB_ad
703	2007/08/10	17:30:56	21:23:00	38	54°42.723	079°57.756	11.228048	730_JB_aa
704	2007/08/11	06:12:05	10:38:30	39	54°45.624	081°42.861	11.347028	
704	2007/08/11	06:51:00	10:51:00	39	54°45.624	081°42.861		704_jb_aa
704	2007/08/11	06:56:00	10:56:00	39	54°45.624	081°42.861		704_jb_ab
704	2007/08/11	07:08:18	11:08:18	40	54°44.650	081°43.450		
704	2007/08/11	07:57:20	11:57:20	40	54°44.650	081°43.450		704_jb_ac
704	2007/08/11	08:01:00	12:01:00	41	54°45.370	081°43.800		704_jb_ad

The HyperperSAS instrument (Figure 9.3) covers the same spectral range as the HyperOCR profiler and is an above water sensor that was mounted on the bow of the ship. Sample locations are listed in Table 9.3. At-station data was generally collected during operations that required the ship to stay on location and at a specific orientation (e.g. CTD-Rosette casts).

Figure 9.3. HyperSAS instrument as mounted on the *Amundsen* during Leg 1.

Table 9.3. HyperSAS measurements during Leg 1.

Station ID	WPT	Date (d-m-y)	Time (UTC)	Latitude (N)	Longitude (W)	Comments
624	624	31-07-07	14:58:12	56°25.160	062°04.460	at station, various angles, time intervals
620	620	31-07-07	21:50:43	56°23.980	061°13.868	at station, various angles, time intervals
602	602	2-08-07	15:05:34	59°03.198	063°52.050	at station, various angles, time intervals
604	604	2-08-07	19:14:59	58°59.837	063°53.598	at station, various angles, time intervals
352	352	3-08-07	14:22:00	61°15.728	064°51.689	at station, various angles, time intervals
699	669	5-08-07	17:43:00	59°59.899	078°26.244	at station, various angles, time intervals
700	700	6-08-07	18:58:00	58°00.184	079°53.443	at station, various angles, time intervals
702		9-08-07	17:35:35	55°24.363	077°55.779	at station, various angles, time intervals
703 704		10-08-07 11-08-07	21:06:21 10:45:00	54°40.476 54°45.800	079°57.511 081°43.022	at station, various angles, time intervals at station, various angles, time intervals
704	43	11-08-07	14:17:41	54°58.467	081°45.062	in transect data, 10 min seg
704	44	11-08-07	14:29:52	55°01.012	081°45.533	in transect data, 10 min seg
704	45	11-08-07	14:44:14	55°04.125	081°45.995	in transect data, 10 min seg
704	46	11-08-07	14:59:14	55°06.307	081°46.300	in transect data, 10 min seg
704	47	11-08-07	15:12:54	55°08.192	081°46.632	in transect data, 10 min seg
704	48	11-08-07	15:43:35	55°12.467	081°47.350	in transect data, 10 min seg
704	49	11-08-07	16:35:03	55°20.333	081°48.450	in transect data, 10 min seg
704	50	11-08-07	17:42:23	55°30.917	081°54.733	in transect data, 10 min seg
704	51	11-08-07	18:05:26	55°33.583	081°59.765	in transect data, 10 min seg
704	52	11-08-07	18:25:10	55°35.533	082°04.500	in transect data, 10 min seg
704	53	11-08-07	18:55:00	55°37.367	082°12.868	in transect data, 10 min seg
704 705a	54	11-08-07 14-08-07	19:34:49 13:00:28	55°39.588 57°27.597	082°23.952 091°53.865	in transect data, 10 min seg at station, various angles, time intervals

Data was collected with the sensors oriented at a number of angles (typically 35, 40 and 45 degrees). The instrument was generally oriented 90-135° away from the sun depending on ship heading. In transit data was also collected on 11 August at 10-minute intervals.

9.2.4 Spectral absorption and attenuation in the water column

Water column profiles were recorded at selected stations (Table 9.4) using an instrument package including a WetLabs AC9 which recorded absorption and attenuation at 9 wavelengths corresponding to spectral bands sensed used by MODIS and MERIS for remote sensing of ocean properties detectable by ocean color. The AC9 package included a Seabird SBE17+ with depth, conductivity and temperature sensors, and WetLabs chlorophyll and CDOM fluorescence meters. Nearly simultaneous profile measurements were also captured using an Idronaut equipped with pressure conductivity and temperature sensors, and with a nephalometric turbidity meter.

Where possible, the AC9 package was deployed from the *Amundsen*'s Zodiac or barge immediately after capturing water column profiles of spectral upwelling and down welling light data with the Satlantic HyperOCR instrument described above. Water quality measurements (Table 9.5 and 8.6) were made in conjunction with these physical and optical profile data.

Table 9.4. Times and locations of water column observations of spectral absorption and attenuation in combination with associated water quality data (Leg 1).

Station	Date	Time	Folder	Run#	Sample platform	Latitude (N)	Longitude (W)	Depth (m)
620	31 07 2007	22:02	AC9SBE070806	1	Zodiac	56°24.044	061°13.112	70
602	02 08 2007	15:26	AC9SBE070806	2	Zodiac	59°03.230	063°52.069	158
701	06 08 2007	06:46	AC9SBE070806	5	Rosette	58°23.272	078°22.415	84
B05	14 08 2007	19:26	AC9SBE070815	8	Barge	57°04.574	092°29.793	9
B08	14 08 2007	20:11	AC9SBE070815	9	Barge	57°10.596	092°20.020	8
B11	14 08 2007	21:13	AC9SBE070815	10	Barge	57°16.724	092°08.693	13
B12	14 08 2007	21:43	AC9SBE070815	12	Barge	57°18.959	092°06.829	19
706	15 08 2007	10:56	AC9SBE070815	13	Barge	58°46.854	091°31.177	81

9.2.5 Water quality

Samples were collected for water quality analysis in conjunction with the optical measurements described above and to support investigation of freshwater, CDOM and suspended solids from the Hudson Bay watershed and to investigate circulation around the periphery of Hudson Bay and through Hudson Strait into the Labrador Sea. Water was sampled either by dip sampling at the surface from the *Amundsen*'s Zodiac or barge and/or using the Rosette (Table 9.5) and parameters to be determined for each station are indicated in Table 9.6. Samples identified as either “FT” or “ER” in Table 9.5 and 8.6 were collected from lines from the ship’s hull, about 4-5 m below the water line.

Water was filtered on board, and the filtrate was retained for determinations of CDOM and FDOM spectra, DOC, dissolved nitrates, nitrites, delta-O18 and salinity. GF/F filters were retained for determinations of chlorophyll-*a*, total suspended solids and fraction of organic material, and particulate carbon and nitrogen. Water was sampled from above the limit of salt intrusion in five rivers: the Pavungnituk, Kogaluk, Polemund, Grande Baleine, Hayes and Nelson. From these samples, filtrate (through a membrane filter) was retained for silica determinations, and an additional filter was retained for particulate phosphorous analysis.

Table 9.5. Station locations and depths where water quality samples were taken in the Labrador Sea and Hudson Bay during Leg 1.

Station*	Date	Time	Sample platform	Latitude (N)	Longitude (W)	Depth (m)	Sample depth (m)
FT01	27 07 2007	11:12	In transit	48°57.013	067°32.055		0.05
FT02	28 07 2007	18:56	In transit	50°53.717	057°43.759		0.05
FT03	29 07 2007	09:06	In transit	53°11.673	055°14.652		0.05
FT04	29 07 2007	18:22	In transit	54°58.843	056°28.844		0.05
FT05	30 07 2007	21:35	In transit	56°47.271	057°17.861		0.05
FT06	31 07 2007	02:40	In transit	56°33.852	058°29.337		0.05
FT07	31 07 2007	06:00	In transit	56°22.120	059°30.000		0.05
FT08	31 07 2007	09:39	In transit	56°22.566	061°02.900		0.05
624	31 07 2007	15:28	Zodiac	56°25.141	062°04.411	62	0.05
620	31 07 2007	22:02	Zodiac	56°24.044	061°13.112	70	0.05

Station*	Date	Time	Sample platform	Latitude (N)	Longitude (W)	Depth (m)	Sample depth (m)
FT09	01 08 2007	06:42	In transit	57°16.948	060°57.175		0.05
FT10	02 08 2007	07:05	In transit	58°49.450	062°48.870		0.05
602	02 08 2007	15:26	Zodiac	59°03.230	063°52.069	158	0.05
356	03 08 2007	13:56	Rosette	60°44.660	064°40.870	296	2
356	03 08 2007	13:56	Rosette	60°44.660	064°40.870	296	150
354	03 08 2007	16:54	Rosette	60°59.947	064°45.760	518	2
354	03 08 2007	16:54	Rosette	60°59.947	064°45.760	518	175
354	03 08 2007	16:54	Rosette	60°59.947	064°45.760	518	400
352	03 08 2007	19:52	Rosette	61°15.962	064°48.901	268	2
352	03 08 2007	19:52	Rosette	61°15.962	064°48.901	268	175
ER01	03 08 2007	22:57	In transit	61°35.200	068°13.500		0.05
ER02	04 08 2007	09:10	In transit	62°39.500	072°25.500		0.05
ER03	04 08 2007	14:21	In transit	62°28.500	074°17.200		0.05
ER04	04 08 2007	22:47	In transit	62°38.000	076°53.600		0.05
698	05 08 2007	06:24	Rosette	62°08.082	078°42.427	149	5
698	05 08 2007	06:24	Rosette	62°08.082	078°42.427	149	20
698	05 08 2007	06:24	Rosette	62°08.082	078°42.427	149	45
698	05 08 2007	06:24	Rosette	62°08.082	078°42.427	149	120
Pavungnituk R.	05 08 2007	13:00	Helicopter	60°02.000	077°13.000		0.05
Kogaluq R.	05 08 2007	14:36	Helicopter	59°36.578	077°28.973		0.05
ER05	05 08 2007	15:38	In transit	60°02.511	079°00.459		0.05
Polemund R.	05 08 2007	16:17	Helicopter	59°29.692	077°27.258		0.05
699	05 08 2007	17:19	Rosette	59°59.968	078°26.099	88	0.05
699	05 08 2007	17:19	Rosette	59°59.968	078°26.099	88	10
699	05 08 2007	17:19	Rosette	59°59.968	078°26.099	88	37
ER06	06 08 2007	02:58	In transit	58°54.180	079°19.580		0.05
701	06 08 2007	06:46	Rosette	58°23.272	078°22.415	84	2
701	06 08 2007	06:46	Rosette	58°23.272	078°22.415	84	25
701	06 08 2007	06:46	Rosette	58°23.272	078°22.415	84	65
ER07	06 08 2007	14:35	In transit	58°10.350	079°12.490		0.05
700	06 08 2007	19:22	Rosette	58°00.588	079°52.943	140	3
700	06 08 2007	19:22	Rosette	58°00.588	079°52.943	140	32
700	06 08 2007	19:22	Rosette	58°00.588	079°52.943	140	134
ER08	07 08 2007	03:26	In transit	57°13.480	080°11.240		0.05
ER09	09 08 2007	04:45	In transit	56°34.820	079°37.250		0.05
ER10	09 08 2007	09:01	In transit	55°38.500	080°26.200		0.05
ER11	09 08 2007	12:18	In transit	55°14.230	079°50.920		0.05
702	09 08 2007	18:59	Zodiac	55°28.641	077°55.261	122	0.05
702	09 08 2007	20:47	Rosette	55°24.612	077°55.766	142	25
702	09 08 2007	20:47	Rosette	55°24.612	077°55.766	142	131
GW01	09 08 2007	21:24	Barge	55°15.970	077°47.251		0.05
Great Whale R.	09 08 2007	21:45	Helicopter				0.05
GW02	09 08 2007	22:08	Barge	55°16.576	077°49.183		0.05
GW03	09 08 2007	22:37	Barge	55°17.220	077°51.900		0.05
GW04	09 08 2007	23:00	Barge	55°21.132	077°53.466		0.05
ER12	10 08 2007	18:45	In transit	54°57.830	079°30.880		0.05
703	10 08 2007	21:33	Rosette	54°40.608	079°57.199	46	10
703	10 08 2007	22:06	Zodiac	54°40.608	079°57.199	46	0.05
703a	11 08 2007	05:01	Rosette	54°42.988	080°50.074	92	2

Station*	Date	Time	Sample platform	Latitude (N)	Longitude (W)	Depth (m)	Sample depth (m)
703a	11 08 2007	05:01	Rosette	54°42.988	080°50.074	92	40
703a	11 08 2007	05:01	Rosette	54°42.988	080°50.074	92	80
704	11 08 2007	10:45	Rosette	54°45.800	081°43.022	34	19
704	11 08 2007	10:45	Zodiac	54°45.800	081°43.022	34	0.05
ER13	11 08 2007	16:47	In transit	55°23.212	081°48.939		0.05
ER14	11 08 2007	20:21	In transit	55°41.800	083°34.800		0.05
704a	12 08 2007	03:33	Rosette	56°02.264	084°41.699	100	7.5
704a	12 08 2007	03:33	Rosette	56°02.264	084°41.699	100	33
704b	12 08 2007	07:39	Rosette	55°44.351	084°50.087	67	6
704b	12 08 2007	07:39	Rosette	55°44.351	084°50.087	67	27
704c	12 08 2007	11:27	Rosette	55°31.586	084°57.194	33	19
704c	12 08 2007	11:27	Zodiac	55°31.586	084°57.194	33	0.05
WR58	12 08 2007	11:32	Zodiac	55°25.165	084°53.627	22	0.05
WR59	12 08 2007	11:52	Zodiac	55°22.287	084°55.161	11	0.05
WR60	12 08 2007	12:10	Zodiac	55°20.188	084°56.529	8	0.05
WR62	12 08 2007	12:32	Zodiac	55°19.680	084°57.119	6	0.05
WR63	12 08 2007	12:55	Zodiac	55°20.517	084°59.407	6.6	0.05
ER15	13 08 2007	05:03	In transit	56°28.754	086°01.601		0.05
ER16	13 08 2007	15:22	In transit	57°13.178	088°39.406		0.05
705c	13 08 2007	21:46		57°42.587	090°54.085	37	5
705c	13 08 2007	21:46		57°42.587	090°54.085	37	3
705c1	13 08 2007	22:24	Zodiac	57°37.127	090°56.839		0.05
705c2	13 08 2007	22:40	Zodiac	57°32.844	090°59.210		0.05
705c3	13 08 2007	22:58	Zodiac	57°29.620	091°00.899		0.05
705c4	13 08 2007	23:12	Zodiac	57°26.408	091°02.442		0.05
705c5	13 08 2007	23:31	Zodiac	57°23.317	091°03.978		0.05
705b	13 08 2007	23:52	Rosette	57°34.124	091°23.939	41	2
705b	13 08 2007	23:52	Rosette	57°34.124	091°23.939	41	10
705	14 08 2007	06:51	Rosette	57°41.658	091°38.488	44	3
705a	14 08 2007	16:25	Rosette	57°26.726	091°53.507	44	31
705a	14 08 2007	16:25	Rosette	57°26.726	091°53.507	44	3.5
Hayes R.	14 08 2007	18:11	Helicopter	56°57.550	092°22.170		0.05
B03	14 08 2007	18:51	Barge	57°00.650	092°36.234		0.05
B04	14 08 2007	19:11	Barge	57°02.553	092°33.189		0.05
B05	14 08 2007	19:26	Barge	57°04.574	092°29.793		0.05
B06	14 08 2007	19:43	Barge	57°06.720	092°26.497		0.05
B07	14 08 2007	19:54	Barge	57°07.851	092°24.818		0.05
Nelson R.	14 08 2007	19:55	Helicopter	56°56.012	092°48.065		0.05
B08	14 08 2007	20:11	Barge	57°10.596	092°20.020		0.05
B10	14 08 2007	20:44	Barge	57°14.644	092°13.248		0.05
B11	14 08 2007	21:13	Barge	57°16.724	092°08.693		0.05
B12	14 08 2007	21:43	Barge				0.05
BLANK	14 08 2007	13:24		57°18.959	092°06.829		
706	15 08 2007	10:56		58°46.854	091°31.177	81	

* Samples labeled “FT” were collected at the Tygon tube outlet in the Paleo-laboratory along the port gangway. Samples labeled “ER” were collected at the stainless-steel tube outlet in the engine room.

Table 9.6. List of water quality samples taken at each station and depth during Leg 1.

Station*	Sample depth	Chl *a*	TSS		Dissolved								Particulate	
	(m)	vol. (ml)	vol. (ml)	wt. (mg)	O18	Sal	FDOM	CDOM	DOC	Nut Laval	Nut FWI	Si	PP	POC/N
FT01	0.05	842	1358	0.1314	x	x	x	x	x					
FT02	0.05	1300	2190	0.1302	x	x	x	x	x					
FT03	0.05	1250	2267	0.1303	x	x	x	x	x					
FT04	0.05	2236	3900	0.1324	x	x	x	x	x					
FT05	0.05	1002	3205	0.1309	x	x	x	x	x					
FT06	0.05	1500	4297	0.1300	x	x	x	x	x					
FT07	0.05	2040	4020	0.1318	x	x	x	x	x					
FT08	0.05	1410	3439	0.1305	x	x	x	x	x					
624	0.05	2000	3880	0.1326	x	x	x	x	x	x				
620	0.05		4000	0.1291	x	x	x	x	x	x				
FT09	0.05	1500	5605	0.1329	x	x	x	x	x					
FT10	0.05	1000	2000	0.1298	x	x	x	x	x					
602	0.05	1340	3490	0.1303	x	x	x	x	x	x				
356	2	1000	2875	0.1304	x	x	x	x	x	x				
356	150	1000	2690	0.1296	x	x	x	x	x	x				
354	2	1253	2540	0.1316	x	x	x	x	x	x				
354	175		3415	0.1311	x	x	x	x	x	x				
354	400		2700	0.1312	x	x	x	x	x	x				
352	2	1000	2695	0.1307	x	x	x	x	x	x				
352	175	1000	2700	0.1305	x	x	x	x	x	x				
ER01	0.05	1070	4000	0.1305	x	x	x	x		x				
ER02	0.05	1500	4000	0.1305	x	x	x	x		x				
ER03	0.05	1150	3000	0.1309	x	x	x	x		x				1155
ER04	0.05	1000	3000	0.1325	x	x	x	x		x				1002
698	5	750	1600	0.1298	x	x	x	x		x				750
698	20	708	1420	0.1332	x	x	x	x		x				696
698	45	750	2040	0.1313	x	x	x	x		x				750
698	120	950	2400	0.1317	x	x	x	x		x				
Pavungnituk R.	0.05		868	0.1329	x	x	x	x		x	x	x		260
Kogaluq R.	0.05		700	0.1324	x	x	x	x		x	x	x		250
ER05	0.05	1119	2040	0.1327	x	x	x	x		x				650
Polemund R.	0.05		255	0.1334	x	x	x	x		x	x	x		87
699	0.05	1000	2205	0.1299	x	x	x	x		x				712
699	10	795	1768	0.1326	x	x	x	x		x				750
699	37	900	1789	0.1294	x	x	x	x		x				837
ER06	0.05	1000	1818	0.1311	x	x	x	x		x				750
701	2	1000	1600	0.1343	x	x	x	x		x				672
701	25				x	x	x	x		x				
701	65	1163	2000	0.1299	x	x	x	x		x				670
ER07	0.05	1208	2000	0.1324	x	x	x	x		x				501
700	3	2000	4330	0.1318	x	x	x	x		x				1504
700	32	1500	4980	0.1307	x	x	x	x		x				1506
700	134		6099	0.1297	x	x	x	x		x				1850
ER08	0.05	1771	4800	0.1325	x	x	x	x		x				1501
ER09	0.05	2000	4200	0.1308	x	x	x	x		x				1500
ER10	0.05	2500	4000	0.1313	x	x	x	x		x				1250

Station*	Sample depth	Chl *a*	TSS		Dissolved							Particulate		
	(m)	vol. (ml)	vol. (ml)	wt. (mg)	O18	Sal	FDOM	CDOM	DOC	Nut Laval	Nut FWI	Si	PP	POC/N
ER11	0.05	2500	3800	0.1296	x	x	x	x		x				1750
702	0.05	600	1000	0.1321	x	x	x	x		x				500
702	25	1500	3000	0.1301	x	x	x	x		x				1420
702	131	1000	3810	0.1297	x	x	x	x		x				1115
GW01	0.05		500	0.1309	x	x	x	x		x				180
Great Whale R.	0.05	185	523	0.1332	x	x	x	x		x		x	132	160
GW02	0.05		500	0.1305	x	x	x	x						110
GW03	0.05	100	500	0.1306	x	x	x	x				x	155	100
GW04	0.05	155	500	0.1321	x	x	x	x						218
ER12	0.05	1000	2000	0.1311	x	x	x	x		x				1000
703	10	900	3000	0.1314	x	x	x	x		x				800
703	0.05	1000	2000	0.1299	x	x	x	x		x				750
703a	2	1783	2610	0.1302	x	x	x	x		x				1750
703a	40	1152	1255	0.1304	x	x	x	x		x				1002
703a	80	1375	1500	0.1311	x	x	x	x		x				1002
704	19	1250	3200	0.1315	x	x	x	x		x				1002
704	0.05	1250	3015	0.1301	x	x	x	x		x				1000
ER13	0.05	1515	3560	0.1313	x	x	x	x		x				1000
ER14	0.05	1150	3445	0.1308	x	x	x	x		x				1150
704a	7.5	900	3680	0.1334	x	x	x	x	x	x				900
704a	33	500	2020	0.1318	x	x	x	x	x	x				500
704b	6	750	2200	0.1317	x	x	x	x	x	x				750
704b	27	500	1400	0.1298	x	x	x	x	x	x				505
704c	19	1190	3000	0.1318	x	x	x	x	x	x				750
704c	0.05	830	2240	0.1327	x	x	x	x	x	x				500
WR58	0.05		1510	0.1314										
WR59	0.05		1340	0.1300										
WR60	0.05		1520	0.1317										
WR62	0.05		1515	0.1312										
WR63	0.05		1472	0.1303										
ER15	0.05	1500	3210	0.1311	x	x	x	x	x	x				1004
ER16	0.05	805	2600	0.1328	x	x	x	x	x	x				1000
705c	5	1330	3350	0.1301	x	x	x	x	x	x				1030
705c	3	1000	2800	0.1334	x	x	x	x	x	x				1000
705c1	0.05	1000	2000	0.1310	x	x	x	x	x	x				500
705c2	0.05	1000	2000	0.1312	x	x	x	x	x	x				
705c3	0.05		1656	0.1326	x	x	x	x	x	x				
705c4	0.05	500	1400	0.1314	x	x	x	x	x	x				
705c5	0.05	260	850	0.1321	x	x	x	x	x	x				
705b	2	1000	2000	0.1333	x	x	x	x	x	x				1000
705b	10	1000	2000	0.1324	x	x	x	x	x	x				1000
705	3	1500	3000	0.1302	x	x	x	x	x	x				1000
705a	31	1465	3540	0.1320	x	x	x	x	x	x				900
705a	3.5	1000	3320	0.1308	x	x	x	x	x	x				750
Hayes R.	0.05	80	**1	**1	x	x	x	x	x	x	x	x	70	72
B03	0.05	55	**1	**1	x	x	x	x	x	x			55	55
B04	0.05	48	**1	**1	x	x	x	x	x	x			48	48

Station*	Sample depth	Chl *a*	TSS		Dissolved								Particulate	
	(m)	vol. (ml)	vol. (ml)	wt. (mg)	O18	Sal	FDOM	CDOM	DOC	Nut Laval	Nut FWI	Si	PP	POC/N
B05	0.05	36	172	0.1296	x	x	x	x	x	x			36	36
B06	0.05		100	0.1303	x	x	x	x	x	x				
B07	0.05	51	152	0.1309	x	x	x	x	x	x			20	50
Nelson R.	0.05	81	**1	**1	x	x	x	x	x	x	x	x	80	91
B08	0.05		221	0.1299	x	x	x	x	x	x				
B10	0.05	100	252	0.1307	x	x	x	x	x	x			34	100
B11	0.05	50	216	0.1305	x	x	x	x	x	x				82
B12	0.05	106	355	0.1295	x	x	x	x	x	x			100	103
BLANK		1000	1310	0.1326										750
706		1224			x	x	x	x	x	x				1200

* Samples labeled "FT" were collected at the Tygon tube outlet in the Paleo-laboratory along the port gangway. Samples labeled "ER" were collected at the stainless-steel tube outlet in the engine room.
**Ran out of pre-weighed filters; unfiltered water returned to Winnipeg for subsequent filtration.

10 Barium sampling – Leg 3

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10.1 Introduction

In the Canadian Arctic, barium (Ba) is mainly released from the North American continent and can therefore be used as a tracer for terrestrial freshwater input. Together with ^{18}O, a tracer for freshwater input from precipitation and ice melt, all freshwater sources to the Arctic can be quantified.

10.2 Methodology

Samples for barium were taken from the Rosette parallel to samples for ^{18}O, at approximate depths of 5, 10, 25, 50, 75, 100, 150, 200 and 500 m (Table 10.1). 15 ml Nalgene bottles were rinsed three times, then filled and spiked with 15 µl concentrated HCl. Sample bottles were sealed with parafilm and taken for later analysis using isotope dilution mass spectrometry.

Table 10.1. Stations sampled for barium during Leg 3.

Station	Latitude (N)	Longitude (W)	CTD Cast	Date
101	76°26.057	077°27.409	0706003	29/09/07
105	76°15.391	075°54.549	0706008	30/09/07
115	76°19.873	071°14.452	0706009	01/10/07
111	76°17.380	073°18.379	0706014	02/10/07
108	76°15.467	074°37.379	0706017	03/10/07
301	74°07.226	083°19.632	0706022	07/10/07
302	74°09.011	086°13.186	0706024	07/10/07
305	74°19.828	094°58.834	0706026	08/10/07
308	74°08.297	103°06.713	0706028	09/10/07
309	74°39.234	103°06.870	0706030	10/10/07
310	71°43.772	101°53.616	0706033	11/10/07
314	68°59.966	106°36.186	0706034	12/10/07
435	71°03.532	133°42.678	0706048	17/10/07
437	71°46.642	126°31.183	0706057	21/10/07
408	71°17.000	127°32.166	0706069	22/10/07
407	71°00.931	126°00.744	0706075	23/10/07

11 Short-term vertical fluxes using drifting sediment traps – Leg 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf

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11.1 Introduction

Sediment traps have been used to estimate the sinking flux of organic material in the ocean and to assess the composition of that flux. There are two pathways along which organic carbon sediments in the water column:

- Carbon fixed by phytoplankton through photosynthesis in surface waters can be transferred to higher trophic level by zooplankton grazing. Part of this carbon can be used by other organisms including fish, mammals and bird, while another part may be exported at deeper depth in the form of fecal pellets (feces). This pathway favours transfer to the pelagic ecosystem;
- Phytoplankton carbon that is not used or consumed can be directly exported through sedimentation of intact cells. This pathway leads to food input to the benthic (sea floor) community.

This study investigated the biogeochemical cycling of carbon and other organic constituents through the use of short-term particle interceptor traps. The general objective of this study was to characterize the sinking export of carbon and organic material from the euphotic zone (magnitude and composition of the sinking fluxes and material), and the transformation of material during its sinking to depth. This research aimed at understanding how climate-related changes in the distribution, timing, magnitude and type of primary production may affect the fluxes of material to the benthic and pelagic food webs.

11.2 Methodology

During Leg 3, short-term sediment traps were deployed at six stations throughout the Canadian High Arctic. It was originally planned to deploy traps at the 12 Full stations (Full and Mooring stations) but heavy ice condition at Stations 101, 1116, 1216 and 1200 did not permit FST deployment. Due to the tight schedule and strong prevailing winds, Station 437 was transformed into a Basic station, allowing no time for FST deployment. Finally, Station 1806 was too shallow for deployment.

The traps consist of PVC cylinders with an internal diameter of 10 cm and a height to diameter ratio of 7. Before each deployment, seawater collected at 200 m depth at a previous station was filtered through 0.22 µm filter membranes. The traps were filled with the filtered seawater to create a dense layer. A series of five PVC cylinders were installed on a line at each sampling depth (50, 100 and 150 m) in order to collect enough material to perform subsequent analyses. At the surface, the trap line was attached to a positioning system (ARGOS and radio beacon) and a series of small floats (Viny floats) to minimize vertical motion. The traps were deployed for a period of 12-24 hours. Upon recovery, the traps were placed in a dark cold room for 8 h. After allowing the sediments to settle, the supernatant was removed and the bottom volume (ca. 1000 ml) of the traps was kept for analysis. Samples were analyzed for particulate organic carbon and nitrogen (POC/PON), dissolved organic carbon (DOC) and nitrogen (DON), stable isotopes (Isotopes), biogenic silica (BioSi), total chlorophyll *a* and phaeopigments (total chl*a*), exopolymeric substances (EPS), phytoplankton composition and abundance (Cells), fecal pellet abundance (FP) and DAPI (Table 11.1).

Another aspect of this project was to evaluate the spatial and vertical distribution of dissolved organic carbon and nitrogen in Arctic marine waters, as these constituents play important roles in the cycling of organic material on the shelves. Water column samples were taken at all Basic and Full stations throughout the Canadian High Arctic for a total of 30 stations.

Table 11.1. Deployment/recovery and analysis details of the free-drifting particle interceptor traps during Leg 3.

Station	Duration (d)	Deployment		Recovery		Target depths (m)	POC/PON	DOC/DON	Isotope	BioSi	Chl *a*	EPS	Cells	FP	DAPI
		Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)										
101	No deployment														
115	0.61	76°19.410	071°21.880	76°20.8445	071°31.536	50, 100, 150	6	6	3	6	6	9	3	3	N/A
108	0.91	76°15.667	074°27.985	76°13.080	074°44.630	50, 100, 150	6	6	3	6	6	9	2	3	N/A
302	0.36	74°09.160	086°11.140	74°10.890	086°31.770	50, 100, 150	6	6	3	6	6	9	3	3	6
1806	No deployment														
437	No deployment														
408	0.95	71°16.828	127°38.819	71°22.227	127°50.043	50, 100	4	4	2	4	4	6	2	2	4
407	0.95	71°00.850	125°57.590	71°09.090	125°43.030	50, 100, 150	6	6	3	6	6	9	3	3	5
405	0.93	70°40.060	123°02.800	70°35.410	122°55.980	50, 100, 150	6	6	3	6	6	9	3	3	6
1116	No deployment														
1216	No deployment														
1200	No deployment														

12 Carbon system analysis – Leg 3

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12.1 Introduction

The ocean's exchange of carbon dioxide (CO_2) with the atmosphere is governed by the biogeochemical cycling of carbon and physical processes throughout the water column, which determine the concentration of dissolved inorganic carbon in the surface waters. Of the seven relevant carbon system parameters, a minimum of two is needed to calculate the others and fully describe inorganic carbon chemistry, over-determination of the system being beneficial.

12.2 Methodology

During ArcticNet/CFL Leg 3, a total of 445 samples were analyzed for dissolved inorganic carbon (DIC) and total alkalinity (TA), pH was determined for 248 samples, yielding two/three relevant parameters (Table 12.1). During Leg 3a (27 September to 18 October), 500 ml water samples were collected from the Rosette at several depths for determination of DIC and TA. Samples were usually first to be taken from the Niskin bottles, or preceded only by dissolved oxygen, nitrous oxide (N_2O), and carbon monoxide (CO), at individual casts and depths. Due to the presence of a team analyzing seawater for mercury concentrations, with the exception of three stations, samples were not spiked with $HgCl_2$, but stored in the dark at 4°C and analyzed within 24 hours of sampling. During Leg 3b, 500 ml water samples were collected as before, but spiked with 200 µl of saturated $HgCl_2$ solution and analyzed on board before the end of the leg. DIC was determined as before using the VINDTA. Afterwards, TA was determined using a TIM 865 automatic titrator from Radiometer Analytical. All TA samples were analyzed in duplicates.

DIC and TA were analyzed on board using a VINDTA 3C (Versatile Instrument for the Determination of Titration Alkalinity) by Marianda. TA was determined by titrating a volumetrically accurate subsample using HCl as titrant, and a set of three electrodes, a Ross pH electrode, a reference AgCl electrode and an auxiliary platinum electrode. To measure DIC, a volumetrically determined subsample was acidified with 8.5% H_3PO_4 to convert all inorganic carbon into gaseous CO_2. The CO_2 was stripped out of the sample using ultra-pure N_2 gas, transferred into a coulometric titration cell and detected using the coulometric method (Johnson et al. 1993).

In addition to DIC and TA, water samples for pH were taken from the same bottles directly after DIC/TA samples. pH samples were collected in plastic bottles and analyzed immediately using a HP 8453 spectrophotometer. pH will be calculated using the absorbance measurements obtained from the coloration of water samples with Phenol Red and Cresol Purple.

Table 12.1. Stations sampled for DIC, TA and pH during Leg 3.

Station	Latitude (N)	Longitude (W)	CTD Cast	Date	Samples taken
101	76°26.057	077°27.409	0706003	29/09/07	DIC & Alk
105	76°15.391	075°54.549	0706008	30/09/07	DIC & Alk
115	76°19.873	071°14.452	0706009	01/10/07	DIC & Alk
108	76°15.467	074°37.379	0706017	03/10/07	DIC & Alk
134	75°38.267	079°29.094	0706020	04/10/07	DIC & Alk
301	74°07.226	083°19.632	0706022	07/10/07	DIC & Alk
302	74°09.011	086°13.186	0706024	07/10/07	DIC & Alk
308	74°08.297	103°06.713	0706028	09/10/07	DIC & Alk
309	74°39.234	103°06.870	0706030	10/10/07	DIC & Alk
310	71°43.772	101°53.616	0706033	11/10/07	DIC & Alk
314	68°59.966	106°36.186	0706034	12/10/07	DIC & Alk
434	70°10.781	133°32.774	0706037	15/10/07	DIC & Alk
428	70°47.174	133°41.684	0706043	16/10/07	DIC & Alk
435	71°03.532	133°42.678	0706048	17/10/07	DIC & Alk
1806	72°39.786	127°07.026	0706050	19/10/07	DIC & Alk, pH
1800	72°08.290	127°41.207	0706054	20/10/07	DIC & Alk, pH
437	71°46.642	126°31.183	0706057	21/10/07	DIC & Alk, pH
408	71°17.000	127°32.166	0706069	22/10/07	DIC & Alk, pH
420	71°03.863	128°27.282	0706072	23/10/07	DIC & Alk, pH
407	71°00.931	126°00.744	0706075	23/10/07	pH, DIC & Alk
405	70°39.958	123°00.623	0706085	25/10/07	DIC & Alk, pH
1000	70°36.097	120°59.180	0706092	27/10/07	DIC & Alk, pH
1100	70°02.675	123°15.446	0706094	27/10/07	DIC & Alk, pH
1110	70°20.256	124°57.496	0706100	28/10/07	DIC & Alk, pH
1116	70°02.577	126°16.722	0706103	28/10/07	DIC & Alk, pH
1216	70°36.892	127°34.854	0706109	30/10/07	DIC & Alk, pH
1200	71°02.900	124°16.501	0706119	31/10/07	DIC & Alk, pH
1600	71°38.767	131°01.414	0706127	02/11/07	DIC & Alk, pH
1606	71°04.236	130°33.406	0706130	02/11/07	DIC & Alk, pH
1610	70°40.451	130°26.509	0706133	03/11/07	DIC & Alk
1902	71°32.773	125°47.921	0706135	03/11/07	DIC & Alk, pH
1908	71°09.319	124°16.232	0706140	05/11/07	DIC & Alk, pH

Reference

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13 Carbon and nutrients fluxes – Leg 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf

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13.1 Introduction

The Arctic climate displays high inter-annual variability and decadal oscillations that modulate growth conditions for marine primary producers. Much deeper perturbations recently became evident in conjunction with globally rising CO_2 levels and temperatures (ACIA 2004, Comiso 2003). The thickness and extent of Arctic sea-ice decrease rapidly (Johannessen et al. 1999, Rothrock et al. 1999) and the ice-free season is extending both in the Arctic (Laxon et al. 2003) and subarctic (Stabeno & Overland 2001). Models predict further reductions in ice cover (ACIA 2004). These changes entail a greater penetration of light into surface waters, which is expected to bolster phytoplankton production (Rysgaard et al. 1999), food web productivity and CO_2 drawdown by the ocean. At present, phytoplankton production varies by two orders of magnitude across the Canadian Arctic, but the forcing mechanisms are poorly understood and quantified. In the Canadian Archipelago, the productivity of phytoplankton is likely to be limited by light or the supply of allochtonous nitrogen, depending on ice conditions. The supply of allochtonous nitrogen is influenced by climate-driven processes, mainly the large-scale circulation, river discharge, upwelling and regional mixing processes. Over most of the western Arctic, and especially the Beaufort Sea, the concentrations of inorganic nitrogen (i.e. nitrate, nitrite and ammonia) at surface remain low throughout the year and the phytoplankton possibly depend on local recycling and the dissolved organic nitrogen (DON; e.g. urea, amino acids and primary amines) supplied by rivers. A large portion of the phytoplankton biomass is typically located within subsurface chlorophyll maxima (SCM). SCM productivity is possibly in balance with the episodic supply of nitrate across the halocline and/or the supply of ammonium and nitrate by local recycling and nitrification, respectively. Despite the importance of SCM for the food web and CO_2 fluxes, little is known about their structure, turnover and susceptibility to environmental variability and change.

The main goals of this project for Leg 3 of ArcticNet 2007&CFL were to:

- Establish the horizontal and vertical distributions of phytoplankton nutrients and the influence of different processes (e.g. mixing, upwelling and biological processes) on these distributions;
- Characterize the detailed vertical structure of chlorophyll-*a* with respect to irradiance, nutrient supply and physical structure;
- Experimentally assess causal relationships between phytoplankton productivity and the availability of light;

- Determine the utilisation of different sources of inorganic and organic nitrogen by phytoplankton and bacteria;
- Experimentally assess the relationships between nitrogen concentration, temperature, photosynthesis and the kinetics of nitrogen uptake.

Ancillary objectives were to calibrate the *SeaPoint* fluorometer and *ISUS* nitrate probe attached to the Rosette.

13.2 Methodology

Samples for inorganic nutrients (ammonium, nitrite, nitrate, orthophosphate and orthosilicic acid) were taken at all Rosette stations (Table 13.1) to establish detailed vertical profiles (see Figure 13.1 for vertical sampling resolution). Additional samples for dissolved organic nitrogen (DON) and urea were taken at stations where incubations were performed. Ammonium was determined immediately after collection using modifications of the manual fluorometric method (e.g. Holmes et al. 1999). Urea samples were stored frozen and DON samples were preserved with acid and stored in the dark at 4°C for post-cruise determination. The concentrations of nitrate, nitrite, orthophosphate and orthosilicic acid were determined on fresh samples using an Autoanalyzer 3 (Bran+Luebbe) with colorimetric methods adapted from Grasshof (1999).

Samples for the natural abundance of ^{15}N and ^{13}C in particulate organic matter were taken at 5 m and in the chlorophyll maximum at stations where incubations were performed (Table 13.1). Volumes ranging from 12 to 20 liters were filtered onto 47 mm pre-combusted GF/F filters with a peristaltic pump and the filters were desiccated at 60°C in a drying oven. These data will be used for nitrogen uptake calculations and to assess the nitrogen status of phytoplankton communities.

SetCol protocol (Bienfang 1981) was carried out with water from the chlorophyll maximum at the stations where incubations were performed to measure the sinking rate of the microalgal cells. Fractions from the top, the middle and the bottom part of the column were filtered on GF/F filter and extracted with acetone to determine the chlorophyll concentrations. Samples for the taxa composition were taken in the top, the middle and the bottom fraction in a second column and were stored with acid Lugol for a post-cruise analysis.

The relationship between light and the uptake of C and N by phytoplankton (light-gradient incubation in Table 13.1) from the chlorophyll maximum and from surface was assessed using dual labelling with stable isotopes of C and N in four light-gradient modules (10 light intensities). Temperature was maintained at *in situ* levels with a chilling circulator. Samples from all modules were spiked with ^{13}C-bicarbonate; two modules received saturating additions of ^{15}N-nitrate, ^{15}N-ammonium (or ^{15}N-urea, or ^{15}N-nitrite), and the other two trace additions Incubations were terminated by filtration onto 24-mm GF/F filters. All filters were desiccated at 60°C and stored dry for post-cruise determination of isotopic enrichment and particulate organic carbon and nitrogen.

The effect of temperature on photosynthesis and the kinetics of nitrate, ammonium or nitrite uptake were determined in two laboratory incubators maintained at 0 and 6°C with high-capacity chilling circulators. Sun-simulating fluorescent tubes provided illumination. For each incubator, bottles were spiked at 6 different concentrations with the target ^{15}N-labelled nitrogen source. The nitrate bottles were also spiked with ^{13}C-bicarbonate.

The effects of incubation treatments (variable nutrient additions, temperature and light conditions) on the photosynthetic characteristics of phytoplankton were assessed by Pulse Amplitude Modulated fluorometry (PAM; Heinz-Walz). Nitrate data were used to calibrate the ISUS nitrate probe. Calibration of the Rosette fluorometer was achieved by comparing the instrument's output with extracted chlorophyll *a* and PAM data. The Phytoflash system was powered by a CTD (SBE-19) and deployed in self-contained mode from the front deck (nighttime).

Table 13.1. List of sampling stations and measurements for nutrients cycling during Leg 3.

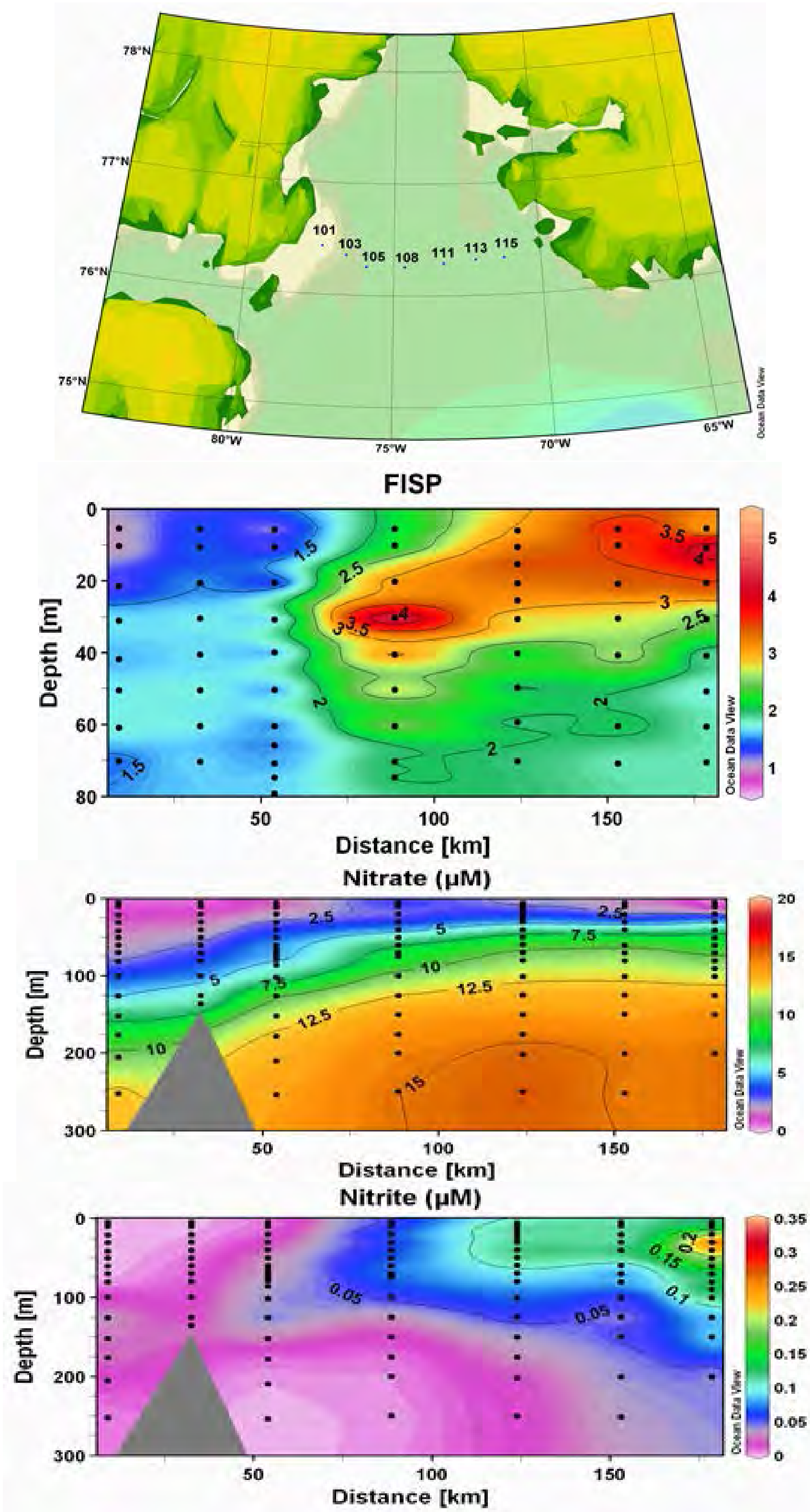
Station	Cast	Date	UTC	Nuts	PAM	Kinetics	Light gradient	Phytoflash
101	003	29/09/2007	20:29	X	X	X	X	X
103	005	30/09/2007	09:11	X				
105	007	30/09/2007	16:47	X	X			
115	009	01/10/2007	14:53	X	X		X	X
113	012	02/10/2007	07:04	X				
111	014	02/10/2007	12:41	X	X			
108	017	03/10/2007	10:07	X	X	X	X	X
134	020	04/10/2007	07:23	X	X			
301	022	07/10/2007	10:37	X				
302	024	07/10/2007	20:34	X	X	X	X	
305	026	08/10/2007	23:52	X				
308	028	09/10/2007	17:41	X	X			
309	030	10/10/2007	11:43	X	X			X
310	033	11/10/2007	21:09	X	X			
434	037	15/10/2007	19:14	X	X			
432	039	15/10/2007	23:24	X				
430	041	16/10/2007	01:12	X				
428	043	16/10/2007	03:24	X				
426	045	16/10/2007	07:33	X				
435	048	17/10/2007	21:03	X	X		X	
1806	050	19/10/2007	18:14	X	X	X	X	
1800	054	20/10/2007	9:59	X				
437	057	21/10/2007	1:31	X	X			
412	060	21/10/2007	11:24	X				
414	063	21/10/2007	19:00	X				
408	069	22/10/2007	15:15	X	X	X	X	
420	072	23/10/2007	7:02	X	X			
407	076	24/10/2007	3:48	X	X	X	X	

Station	Cast	Date	UTC	Nuts	PAM	Kinetics	Light gradient	Phytoflash
1016	080	25/10/2007	1:48	X				
1012	082	25/10/2007	5:58	X				
405	085	25/10/2007	21:17	X	X	X	X	
1004	089	26/10/2007	10:43	X				
1000	092	26/10/2007	22:28	X	X			
1100	094	27/10/2007	10:12	X	X			
1104	096	27/10/2007	13:52	X				
1108	098	27/10/2007	18:13	X				
1110	100	28/10/2007	00:06	X	X			
1114	102	28/10/2007	6:18	X				
1116	103	28/10/2007	14:22	X	X	X	X	
1120	106	29/10/2007	1:03	X				
1216	109	30/10/2007	00:34	X				
1212	111	30/10/2007	12:56	X				
1208	114	31/10/2007	5:59	X				
1204	116	31/10/2007	9:45	X				
1200	119	31/10/2007	23:03	X				
1508	122	01/11/2007	14:00	X				
1600	127	02/11/2007	3:00	X				
1604	129	02/11/2007	12:15	X				
1606	130	02/11/2007	18:41	X				
1610	133	03/11/2007	00:47	X				
1902	135	03/11/2007	15:55	X				
1908	140	05/11/2007	15:17	X				

13.3 Preliminary results

Chlorophyll fluorescence and the concentrations of nitrate, nitrite, silicate and phosphate along the section of the North Water Polynya in the Baffin Bay (Leg 3) are shown in Figure 13.1. Nutrient concentrations were typically low in the upper mixed layer, reflecting prior utilization by diatoms. The nutrient deficit extended deeper in the west, just east of the sill, presumably reflecting biological consumption upstream in the southbound Arctic outflow. This scenario is consistent with the relatively deep extent of chlorophyll fluorescence in the region. Isopleths were widely spaced on the vertical, which is indicative of relatively weak density stratification at the onset of wind-driven mixing in autumn. By contrast, isopleths were closely spaced in the east, where the vertical stratification remained strong due to reduced wind exposure.

The chlorophyll maxima on the section seem sited on the nitracline in the western part of the bay. This result tends to prove that the growth of the phytoplankton is limited by the contribution in new nitrogen form (nitrate). This kind of relationship suggests that the phytoplankton lowers progressively the nitracline during the ice-free season until it reaches the depth (ca. 70 metres) where the light is inefficient to support a gross growth which seems happen in the eastern part of the bay.


78°N
77°N
76°N
75°N
101
103
105
108
111
113
115
80°W
75°W
70°W
65°W
Ocean Data View
FISP
Depth [m]
Distance [km]
Nitrate (µM)
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Distance [km]
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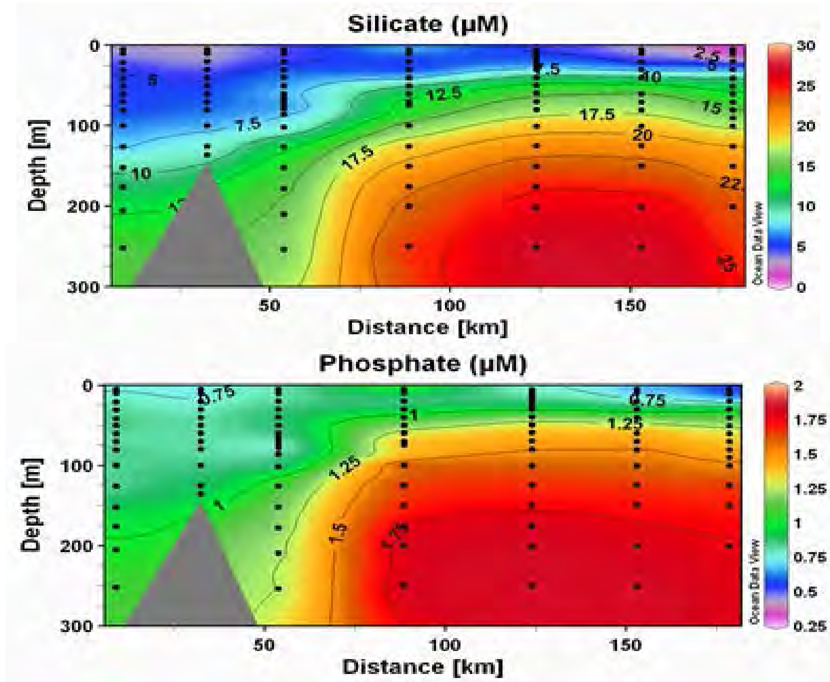

Figure 13.1. Location of stations sampled for nutrient determination in Baffin Bay during Leg 3 (upper panel previous page) and longitudinal sections of chlorophyll fluorescence (FISP, arbitrary unit), nitrate, nitrite, silicate and phosphate (µM) in the upper 300 m of the Baffin Bay. Note the change of vertical scale for the fluorescence panel (100 m). Black dots mark sampling depths and numbers on the map identify the sampling stations. These stations are represented on the panel from 101 (left) to 115 (right).

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14 DMS(P) cycling and nitrous oxide (N2O) (Arctic-SOLAS) – Leg 3

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14.1 Introduction

This project aimed to better understand the distribution of dimethylsulfide (DMS) in the Arctic. DMS is produced by marine phytoplankton and bacterioplankton from its precursor dimethylsulfoniopropionate (DMSP). DMS forms a significant link in the natural sulfur cycle, transporting the element from the ocean to the land via the atmosphere. When DMS is released from the surface ocean and oxidized in the atmosphere, it contributes to the formation of cloud condensation nuclei and thus decreases to amount of solar radiation reaching the surface of the earth. Thus the marine microbial loop exerts an important influence on atmospheric chemistry and climate by modifying patterns of cloudiness, albedo and acid precipitation. The objective of the project was to determine DMS production rates in the Arctic Ocean through a suite of measurements and experiments on board the CCGS *Amundsen*.

The biogenic gas nitrous oxide (N_2O) is produced by bacterial activity as a by-product of the nitrogen cycle during nitrification and denitrification processes. When released into the atmosphere, N_2O is a potent greenhouse gas, the third in importance after CO_2 and methane. Average concentrations in the atmosphere and the ocean are 300 ppm and 8 nM respectively but seawater concentration varies greatly depending on oceanographic and biological conditions. The objectives were to determine the distribution of N_2O in surface waters of the Canadian Arctic Archipelago along an east-west transect.

14.2 Methodology

14.2.1 DMS(P) cycling

Concentrations of DMS and its precursor DMSP were measured in the water column at a total of 27 stations (Table 14.1) at the following depths: 100% incident light, 50%, 5%, 0.2% and at the deep chlorophyll maximum. Seawater was also collected at the surface to preserve phytoplankton and bacterioplankton to determine their abundance and taxonomic diversity. Phytoplankton will be identified microscopically in the lab after the cruise.

Bacterial communities will be characterized using the CARD-FISH method, in which cells are hybridized with fluorescent probes specific to target bacterial clades.

Incubations with amendments of DMSP labeled with radioisotopic sulfur (^{35}S-DMSP) were conducted. During short incubations lasting 3 hours, DMSP consumption by the planktonic community was measured and the transfer of the consumed sulfur into various reservoirs was determined. The following rate measurements were obtained from these short incubations: Particulate DMSP production, DMSP incorporation into macromolecules, DMS production, and the production of dissolved sulfur compounds. Long incubations (22 hours) were also conducted with ^{35}S-DMSP to determine the proportion of the bacterial clades consumed DMSP using the MAR-CARD-FISH technique.

Surface DMS was sampled continuously from the ship's seawater intake every 2 hours from 8 October to 14 October. This will allow the atmospheric DMS team (U. Calgary) to have continuous seawater concentrations alongside their atmospheric measurements. This monitoring revealed a strong diurnal cycle in DMS concentrations, which was investigated further at Station 407 on 23-24 October. Surface DMS and DMSP concentrations were measured every 2 hours as was done previously. In addition, four vertical profiles of DMSP and DMS concentrations were conducted over 24 hours using the Rosette and bacterial samples marked with the CARD-FISH probes were collected. On two occasions (night and day), incubation experiments with ^{35}S-DMSP amendments were also conducted.

14.2.2 Nitrous oxide (N2O)

Samples were collected at the same stations and depths as DMS(P), including a few stations where vertical profiles were extended to the bottom (Table 14.1). A total of 275 samples were collected and will be brought back to DFO-IML for analyses during winter 2007-2008. An inter-calibration of methods and instruments was arranged to sample in parallel at two stations (1606 and 1902, same depths) with R. Maranger's team (U. Montreal) who also measured N_2O as part of the CFL Study.

Table 14.1. Stations sampled for DMS(P) cycling and N_2O concentrations during Leg 3.

Station	DMS + DMSP	N_20	Phyto + bacteria	CARD-FISH	^{35}S	MAR-CARD-FISH
115 (01/10)	x	x	x	x	x	x
108	x	x	x	x	x	x
134	x	x	x	x	x	x
302	x	x	x	x	x	x
308	x	x	x	x	x	x
309	x	x	x	x	x	x
310	x	x	x	x	x	x
314	x	x	x	x	x	x
Surface (bucket)	x	x	x	x	x	x
434	x	x	x	x	x	x
435	x	x	x	x	x	

Station	DMS + DMSP	N_20	Phyto + bacteria	CARD-FISH	^{35}S	MAR-CARD-FISH
1806	x	x	x	x	x	
437	x	x				
408	x	x	x	x	x	
407	4 times	4 times	2 times	4 times	2 times	2 times
1000	x	x	x	x	x	
1116	x	x	x	x	x	
1216	x	x	x	x	x	
1200	x	x	x	x	x	
1600	x	x	x	x	x	
1606	x	x	x	x	x	
1902	x	x				

14.3 Preliminary results

Some analyses were performed on the ship and examples of results are shown in Figure 14.1 and 13.2.

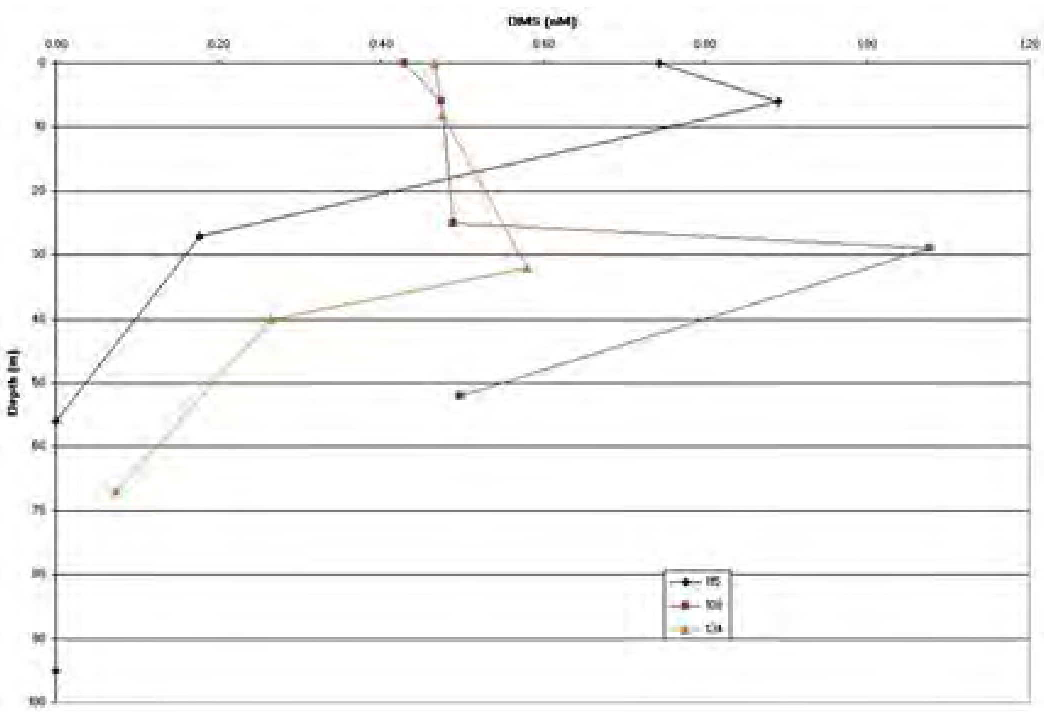

Figure 14.1. Vertical profiles of DMS concentrations at 3 stations (115, 108, 134) in Leg 3.

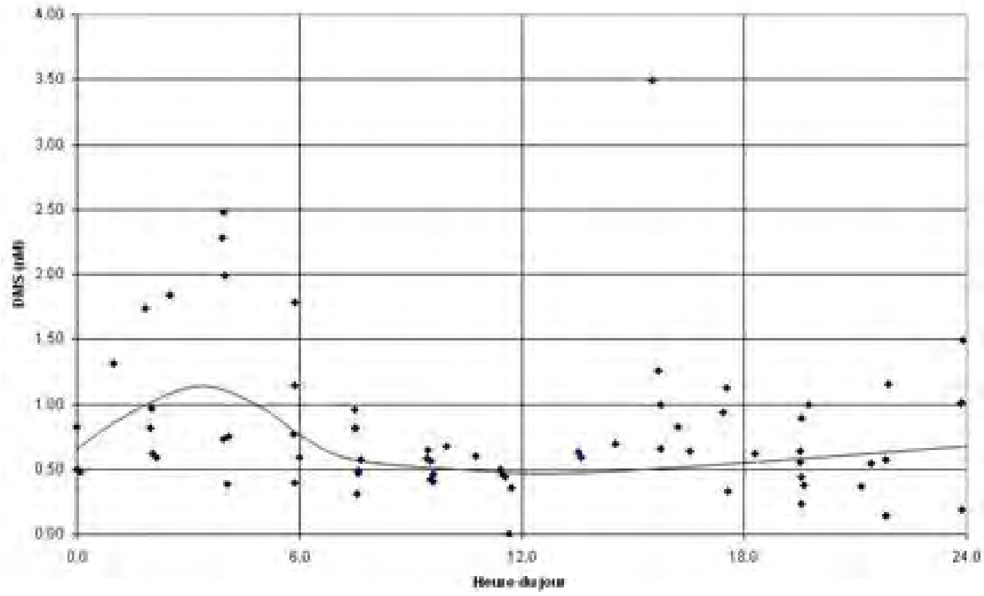

Figure 14.2. Diurnal cycle in DMS concentrations observed during Leg 3.

15 Bacterial carbon cycling (CFL Study) – Leg 3b

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15.1 Introduction

The goals of this project were to measure bacterial carbon production, community respiration (directly and via ETS activity) and bacterial biomass, in order to elucidate the role of bacterial in ecosystem carbon processing. Another objective of the IPY-CFL study was to measure nitrous oxide (N_2O) concentrations in the water column to determine whether this by-product of nitrification and denitrification processes accumulates in the Beaufort Sea region.

15.2 Methodology

The primary goals for Leg 3b were to set up the laboratories, make sure all the necessary material was available and ready for Legs 4-10 (CFL Study overwintering in Beaufort Sea), perform some preliminary tests of new methods and see the sampling region for the first time. Projects in the lab typically focused on temperate lakes and there was a need to adjust methods accordingly.

Table 15.1. Stations and type of samples collected for bacterial processes during Leg 3b (CFL Study).

Station	Date in 2007	Cast#	Depth (m)	BP	BR	ETS	BA	N_2O
1200	10-25	119	80	X			X	
			60	X			X	
			50	X			X	
			30	X			X	
			10	X			X	
			0	X			X	
1000	10-26		Surface	X	X			
			Ice	X	X			
1000	10-27		30					X
			0					X
			Air					X
1116	10-28	103	80	X				
			60	X				
			50	X				
			40					X
			30	X				
			10	X				
			0	X				X

Station	Date in 2007	Cast#	Depth (m)	BP	BR	ETS	BA	N_2O
			Air					X
1216	10-29	109	50					X
			0					X
			Air					X
1200	10-31	119	80	X			X	
			60	X			X	
			50	X		X	X	
			30	X			X	
			10	X			X	
			0	X		X	X	
1200	11-01	119	100	X				
			80				X	
			70	X				
			60				X	
			50	X	X	X	X	
			30	X			X	
			10	X	X		X	
			5	X	X		X	
			0			X		
1606	11-02	131	50					X
			0					X
			Air					X
1902	11-03	135	30					X
			5					X
			Air					X
1902	11-03	136	200					X
			47					X
			5					X
			Air					X

BP: Bacterial production
BR: bacterial/community respiration
ETS: Electron Transport Systems Activity
BA: Bacterial Abundance
N_2O: Nitrous oxide, headspace gas exchange

16 Phytoplankton, optical properties and remote sensing – Leg 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf

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16.1 Introduction

To understand and monitor biophysical processes in complex coastal waters it is necessary to use remote sensing methods. Previous studies showed that optical properties of the Beaufort Sea and the Amundsen Gulf region are dominated by the freshwater outflow from the Mackenzie River leading to a bias in the estimation of phytoplankton biomass using remote sensing data. There is thus a need to develop specific methods to make more effective use of remote sensing data. The building of a database of inherent optical properties relating a wide variety of physical and biological conditions is a crucial step towards this goal.

The general objective of this project was to study the relationships between the spatial and temporal distribution of the phytoplankton and the physical marine environment in the Canadian Arctic using remote sensing data with an emphasis on the Beaufort Sea and the Baffin Sea. The specific objectives for the ArcticNet/CFL Leg 3 cruise were to:

- Estimate the ability of current bio-optical algorithms to measure chlorophyll-*a* concentration;
- Develop specific algorithms for a variety of ocean color sensors, which will in turn provide a better understanding of the Beaufort Sea and the Baffin Sea physical and biological processes;
- Analyze light absorption properties of Arctic phytoplankton.

To reach these objectives, the following parameters were measured:

- Transparency of the water with a Secchi disk;
- Light profiles in the water column with a Profiler of Natural Fluorescence (PNF 300);
- Pigment composition of phytoplankton with the high performance liquid chromatography method (HPLC);
- Algal pigments;
- Total suspended matter;
- Chromophoric dissolved organic matter (CDOM).

16.2 Methodology

Vertical light profiles were done with a PNF-300, and water transparency was measured using a Secchi disk at every station to determine the photic depths, except for stations that were sampled during the night. Water samples were collected at each station using the CTD-Rosette system at 6 photic depths corresponding to 100%, 50%, 10% and 1% of surface irradiance levels, at the chlorophyll maximum and at 60 m to provide reference data under the pycnocline. Surface water was collected using a clean bucket at all stations and sub-samples were immediately collected to measure CDOM, chlorophyll-*a*, algal pigments and suspended matter concentrations.

Filtrations were performed for chlorophyll determination (HPLC techniques), a_{ph}, total suspended matter (TSM) and chromophoric dissolved organic materiel (CDOM). For chlorophyll-*a* and algal pigments measurements, water samples were filtered through 25 mm GF/F filters, flash frozen and stored in liquid nitrogen on the ship. Samples were shipped frozen at the end of the leg for analysis in the lab.

CDOM samples were filtered using 0.2 µm Anotop® syringe filters (Whatman) and collected into 60 mL acid-cleaned amber glass bottles. The bottles were stored frozen (-20˚C) in the dark on the ship. Samples were shipped south for analysis at the end of the leg.

Total suspended matter was measured by filtering up to 2 litres of water using pre-weighted 25 mm GF/F filters. The filters were stored on the ship at –80 ˚C, to stop pigment degradation (Sosik 1999), and were transported south at the end of the leg to complete the analysis.

A total of 33 stations were sampled with a total of 617 samples collected (Table 16.1).

Table 16.1. List of stations visited and samples collected during Leg 3.

Date	Station	Latitude (N)	Longitude (W)	Chl-*a* (HPLC)	Algal pigments	TSM	CDOM
2007-09-29	101	76°24.223	077°25.227	5	5	5	5
2007-09-30	105	76°17.722	075°44.075	6	6	6	6
2007-10-01	115	76°22.224	071°18.236	3	6	6	6
2007-10-02	111	76°18.054	073°05.908	3	6	6	6
2007-10-03	108	76°17.722	074°40.309	3	6	6	6
2007-10-04	134	75°35.526	079°28.192	3	6	6	6
2007-10-07	301	74°07.226	083°19.632	2	2	2	2
2007-10-07	302	74°09.902	086°11.981	3	6	6	6
2007-10-09	308	74°07.565	103°01.634	3	6	6	6
2007-10-10	309	74°38.580	103°33.346	3	6	6	6
2007-10-11	310	71°42.383	101°44.785	3	6	6	6
2007-10-12	314	68°59.966	106°36.186	3	6	6	-
2007-10-14	Amundsen Gulf	70°10.640	121°02.140	1	1	1	1
2007-10-15	434	70°10.414	133°30.948	3	5	5	5
2007-10-17	435	71°04.741	133°38.872	3	6	6	6
2007-10-19	1806	72°40.680	127°07.160	3	6	6	6

Date	Station	Latitude (N)	Longitude (W)	Chl-*a* (HPLC)	Algal pigments	TSM	CDOM
2007-10-20	1800	72°09.254	127°44.921	3	6	6	6
2007-10-20	437	71°48.126	126°30.319	3	5	5	5
2007-10-21	MW2	71°45.237	126°30.422	1	1	1	1
2007-10-22	408	71°16.860	127°32.530	3	6	6	6
2007-10-23	420	71°04.420	128°25.099	2	4	4	4
2007-10-23	407	71°01.042	126°01.933	3	5	5	5
2007-10-25	405	70°40.198	123°00.772	2	5	5	5
2007-10-26	1000	70°35.842	120°59.738	3	6	6	6
2007-10-27	1100	71°02.424	123°15.229	3	6	6	6
2007-10-27	1110	70°19.333	124°56.148	2	5	5	5
2007-10-28	1116	70°03.916	126°19.043	3	6	6	6
2007-10-29	1216	70°35.840	127°42.260	2	3	3	3
2007-10-31	1200	71°13.652	124°27.656	3	6	6	6
2007-11-01	1600	71°39.952	130°46.056	2	5	5	5
2007-11-02	1606	71°39.952	130°46.056	3	5	5	5
2007-11-03	1902	71°23.470	125°41.513	3	5	5	5
2007-11-05	1908	71°08.640	124°20.803	3	6	6	6
TOTAL	**33**			**95**	**176**	**176**	**170**

16.3 Comments and recommendations

CDOM samples [$a_{CDOM}(\lambda)$] were supposed to be analysed on board using a Cary 50 spectrophotometer. Unfortunately, the instrument broke between Legs 1 and 3 and samples were stored and brought back at the end of the leg. The effect of a long storage on data quality is not known and bringing back the samples puts additional strain on the already limited airplane capacity. A back up spectrophotometer should be brought on board to measure CDOM samples in the future. Finally, better ways need to be put in place to ship samples at the end of a leg.

References

Sosik, H., 1999. Storage of marine particulate samples for light absorption measurements. Limnology and Oceanography 44 (4): 1139–1141.

17 Phytoplankton and primary production – Legs 1 and 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf
ArcticNet Phase I – Project 3.3 Climate Variability / Change and Marine Ecosystem Resources in Hudson Bay. http://www.arcticnet.ulaval.ca/pdf/phase1/33.pdf

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Cruise participants Leg 1: Joannie Ferland[1], Marjolaine Blais[1] and Benoît Philippe[1]
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17.1 Introduction

17.1.1 Leg 1 – 26 July to 17 August 2007 – Hudson Bay

The general objective for Leg 1 was to characterize the spatial variability in phytoplankton biomass and production in the coastal areas of Hudson Bay, which are under the influence of southern freshwater inflow. These phytoplankton parameters will be related to environmental factors governing the dynamics of phytoplankton.

The following parameters and measurements were determined:

- Surface irradiance continuous (Li-I-COR sensor 2 pi);
- Water transparency (Secchi disk);
- Light profiles in the water column (Profiler of natural fluorescence; PNF 300);
- Dissolved (DOC) and total (TOC) organic carbon concentrations (Shimadzu TOC-5000 analyser);
- Dissolved organic carbon (COD) /nitrogen (NOD) (Teckmar-Dorhmann analyser; for C. Michel, DFO-FWI);
- Chlorophyll *a* concentration and phaeopigments for phytoplankton size classes: >0.7 µm, >5 µm, >20 µm (Turner Designs fluorometer);
- Concentration of particulate organic carbon (POC) /nitrogen (NOP) (CHN analyser);
- Phytoplankton pigment composition (high performance liquid chromatography; HPLC);
- Abundance and taxonomic composition of phytoplankton (inverted microscopy);
- Abundance of pico- and nanophytoplankton and heterotrophic bacteria (flux cytometry);
- Abundance and biomass of autotrophic and heterotrophic protists (<20 µm et >20 µm) (epifluorescence microscopy).

17.1.2 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago

Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

This ArcticNet project focused more specifically on understanding the development of the summer-fall phytoplankton communities along an east to west environmental gradient in the Canadian High Arctic. On the other hand, the CFL component of the project (Leg 3b) looked at atmospheric, oceanic and hydrologic forcings of sea ice extent that dictate the overall seasonal production of phytoplankton in the flaw lead and adjacent fast ice.

The main objective of the ArcticNet study was to determine the environmental variables that govern the abundance, composition and production of the summer-fall phytoplanktonic communities in the Canadian High Arctic from the North Water (NOW) in Baffin Bay to the Mackenzie shelf in the Beaufort Sea, including the Northwest Passage. Leg 3 visited stations in Baffin Bay, the Northwest Passage and the Beaufort Sea, including a suite of stations as part of the Circumpolar Flaw Lead (CFL) system study in the Beaufort Sea southwest of Banks Island.

The main goal of the ArcticNet project was to compare the phytoplankton communities between the eastern and the western Arctic in terms of algal species composition and abundance and to establish the relationships between the environmental variables and the changes occurring in the abundance, the species composition and the primary production of the Arctic planktonic microflora. The following hypotheses were tested:

- Nutrients gradient from the eastern to the western Arctic will influence the species composition of the phytoplankton;
- Temperature and salinity gradient from the eastern to the western Arctic will affect the species composition of the phytoplankton;
- Summer-fall phytoplankton communities of the eastern Arctic are more productive than the ones of the western Arctic.

The CFL project focused on the western Arctic region, southwest of Banks Island, and attempted to solve the following questions:

- How do the landfast and flaw lead regions differ in the timing and rates of primary production?
- Is the phytoplankton community composition and structure different between these two regions?
- Is biological production in these regions light and/or nutrient limited?

17.2 Methodology

17.2.1 Leg 1 – 26 July to 17 August 2007 – Hudson Bay

At each station, water samples for phytoplankton parameters were collected with Niskin bottles attached to the CTD-Rosette (Table 17.1). Incident PAR (photosynthetically available radiation) was continuously recorded with a Li-Cor 2pi sensor. At every station, light profiles were taken in the water column using a PNF-300 and the transparency of the water was assessed using a Secchi disk to determine the photic depths (except when arrival on stations occurred at night).

Size fractioned (<0.2 µm, >0.7 µm, >5 µm) primary production experiments (Table 17.2) were completed 11 times to estimate daily primary production at 7 photic depths (corresponding to 100%, 50%, 30%, 15%, 5%, 1%, and 0.2% of surface irradiance) following JGOFS protocol for simulated *in situ* incubation. Nitrogen status of phytoplankton was determined 13 times at the depths of 50% surface irradiance and Chl *a* maximum. Samples processing and primary production analyses will be conducted in Rimouski.

Table 17.1. Summary of stations visited and number of depths sampled for phytoplankton standing stock parameters during Leg 1.

Station	Date in 2007	DOC/DON	DOC/TOC	CHl	POC/N	HPLC	Epifluoresc ence	Cells	Bacteria	Pico-/ Nano-plankton
624	31-07	9	4	9	4	1	2	3	6	6
620	31-07	8	4	8	4	1	2	3	6	6
617	01-08	11	4	10	4	1	2	3	6	6
615	02-08	10	4	9	3	1	1	3	6	6
600	02-08	11	4	10	4	1	-	3	6	6
602	02-08	11	4	10	4	1	-	3	6	6
356	03-08	9	4	8	4	1	2	3	4	4
354	03-08	8	4	-	-	-	-	-	4	4
352	03-08	9	4	6	3	1	2	3	6	6
698	05-08	8	4	8	4	1	-	3	5	5
699	05-08	10	5	10	5	1	2	3	6	6
701	06-08	9	4	9	4	1	2	3	6	6
700	06-08	11	4	10	4	1	-	3	6	6
702	10-08	9	3	9	4	1	2	3	6	6
703	10-08	7	4	X	4	1	2	3	6	6
703b	11-08	-	-	-	-	1	2	3	-	-
704	11-08	7	4	7	4	1	2	3	6	6
704b	12-08	7	4	5	4	1	-	3	5	5
704c	12-08	-	4	4	4	1	2	3	4	4
705a	14-08	6	3	6	4	1	2	3	4	4
705	14-08	7	4	7	4	1	2	3	6	6
706	15-08	8	4	8	4	1	-	3	6	6
707	17-08	9	4	9	4	1	-	3	6	6

Table 17.2. Summary of stations visited and number of depths sampled for phytoplankton rate measurement experiments during Leg 1.

Station	Date in 2007	Primary production	Nitrogen status
620	31-07	7	2
617	01-08	7	2
600	02-08	7	2
699	05-08	7	2
701	06-08	7	2
702	10-08	7	2
704c	12-08	7	2
705	14-08	7	-
705a	14-08	7	-
706	15-08	7	-

In parallel, samples were collected at 2 stations at the maximum of chlorophyll *a* for J. Michaud (U. Laval). The team also participated in the community visit and presented the project and activities done for phytoplankton and nutrients analyses to the visitors.

17.2.2 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago

Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

Water sampling was carried out with the CTD-Rosette system collecting water at optical depths corresponding to 100%, 50%, 30%, 15%, 5%, 1% and 0.2% of surface irradiance, at the deep maximum chlorophyll (Chl max), and at 75 m and 100 m. Six stations were visited in the Baffin Bay region (101, 105, 108, 111, 115, 134), six stations in the Northwest Passage (301, 302, 308, 309, 310, 314), and 20 stations in the Amundsen Gulf – Beaufort Sea region (405, 407, 408, 420, 434, 435, 437, 1000, 1100, 1110, 1116, 1200, 1216, 1600, 1606, 1800, 1806, 1902, 1908, 1916). Total and fractionated chlorophyll (Chl) and chlorophyll >20 µm were measured at each corresponding optical depth, the Chl max, at 75 m and 100 m at all sampling site whenever feasible. Routine analyses performed on seawater samples are indicated in Table 17.1. Particulate organic carbon (POC) and nitrogen (PON) were done at 50% and 15% surface irradiance, the Chl max and at 100 m. Pico/nanoplankton and bacteria (Pico/Bact) were done at 50%, 30%, 5% and 1% surface irradiance, and at Chl max and 100 m. Planktonic cells were collected at 50% and 15% surface irradiance and at Chl max for species composition and abundance. Dissolved (DOC) and total organic carbon (TOC) were done at 50% and 15% surface irradiance, and at Chl max and 100 m. Samples for pigment analysis by high pressure liquid chromatography (HPLC) were collected at Chl max only at ArcticNet stations plus at 50% surface irradiance at CFL stations. Protists <20 µm and >20 µm for epifluorescence microscopy and FISH were collected at 50% surface irradiance and at Chl max for CFL stations only. Stations 301, 420, 1100 and 1800 were sampled at nighttime without Secchi deployment; therefore, fixed water depths were used, while Stations 1908 and 1916 were sampled from the moonpool at fixed water depths.

Primary production experiments were conducted at only five sampling sites in the Canadian High Arctic during September-November 2007 (Stations 101, 108, 115, 302 and 309), due to heavy sea conditions, which contributed to the damage of the front deck incubator, and resulted in an interruption of primary production experiments after Station 309. Water samples were collected at seven optical depths (100%, 50%, 30%, 15%, 5%, 1% and 0.2% surface irradiance), inoculated with ^{14}C and incubated on the front deck of the ship for 24 h. Water samples at Chl max were incubated to the nearest optical depth. After the incubation, filtrations were performed in the Radvan and scintillation vials were counted aboard the ship using the scintillation counter.

Incident light was also recorded continuously with a PAR sensor (Li-Cor) located on a flat surface on top of a container in front of the ship. At almost all stations sampled, underwater light profiles were performed with a PNF.

Table 17.3. List of stations and variables collected for phytoplankton measurements and experiments during Leg 3.

Date (mm-dd-yy)	Station #	DOC/TOC	POC/PON	Chl *a*			HPLC >0.7 µm	Cells	Pico.	Bact.	Prim. Prod.	Epifluo<20 µm	Epifluo>20 µm	FISH
				Total	>5um	>20um								
09/29/07	101	16	5	11	11	11	1	6	12	12	21	-	-	-
09/30/07	105	16	5	11	11	11	1	6	12	12	-	-	-	-
10/01/07	115	16	5	11	11	11	1	6	12	12	21	-	-	-
10/02/07	111	16	5	11	11	11	1	6	12	12	-	-	-	-
10/03/07	108	16	5	11	11	11	1	6	12	12	21	-	-	-
10/04/07	134	16	5	11	11	11	1	6	12	12	-	-	-	-
10/07/07	301	16	5	9	9	9	1	6	10	10	-	-	-	-
10/07/07	302	16	5	11	11	11	1	6	12	12	21	-	-	-
10/09/07	308	16	5	10	10	10	1	6	10	10	-	-	-	-
10/10/07	309	16	4	11	11	11	1	7	12	12	21	-	-	-
10/11/07	310	16	5	10	10	10	1	6	10	10	-	-	-	-
10/12/07	314	12	4	9	9	9	1	6	8	8	-	-	-	-
10/15/07	434	12	4	7	7	7	1	6	8	8	-	-	-	-
10/17/07	435	16	5	10	10	10	1	6	10	10	-	-	-	-
10/19/07	1806	12	5	9	9	9	2	4	12	12	-	8	2	2
10/20/07	1800	12	4	10	10	10	2	4	12	12	-	8	2	2
10/20/07	437	16	5	11	11	11	2	6	12	12	-	8	2	2
10/22/07	408	16	5	11	11	11	2	6	12	12	-	8	2	2
10/23/07	420	8	2	7	7	7	1	4	8	8	-	4	1	1
10/23/07	407	16	5	11	11	11	2	6	12	12	-	-	-	-

Date (mm-dd-yy)	Station #	DOC/TOC	POC/PON	Chl*a* Total	Chl*a* >5um	Chl*a* >20um	HPLC >0.7 µm	Cells	Pico.	Bact.	Prim. Prod.	Epifluo<20 µm	Epifluo>20 µm	FISH
10/25/07	405	12	3	7	7	7	1	4	10	10	-	4	1	1
10/26/07	1000	16	5	11	11	11	2	6	12	12	-	8	2	2
10/27/07	1110	8	2	7	7	7	1	4	8	8	-	4	1	1
10/28/07	1116	16	5	11	11	11	2	6	12	12	-	7	2	2
10/29/07	1216	8	2	5	5	5	1	2	6	6	-	4	1	1
10/31/07	1200	16	5	11	11	11	2	6	12	12	-	3	1	2
11/01/07	1600	12	3	9	9	9	1	4	10	10	-	-	-	1
11/02/07	1606	8	3	8	8	8	2	4	10	10	-	-	-	2
11/03/07	1902	16	5	11	11	11	2	6	12	12	-	-	-	2
11/05/07	1908	16	5	11	11	11	2	6	12	12	-	-	-	2
TOTAL	**30**	**424**	**131**	**293**	**293**	**293**	**41**	**163**	**324**	**324**	**105**	**66**	**17**	**25**

17.3 Comments and recommendations

The temperature of the deck incubator was maintained at sea surface temperature by flow-through water pumped from the sea surface to the incubator. In Leg 1, the water pumped to the incubator was 5 to 10°C higher than surface waters. Moreover, the water was not clean and contained particles that affected the light intensity of the incubation tubes. Therefore, a more efficient and cleaner flow-through water circulation system is needed for the deck incubator. In order to avoid further damage to the front deck incubator, a movable steel structure should be built to cover the incubator when bad sea conditions prevail, or think of a more protected location on the ship.

The PAR Li-Cor sensor should perhaps be relocated somewhere else than the top surface of the front deck container on starboard because of night ship illumination for sailing and/or front deck operations.

A safer way to transport water sample bottles (heavy) from the Rosette shack to lower deck laboratories should be put in place.

18 Zooplankton and ichtyoplankyon – Legs 1 and 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf
ArcticNet Phase I – Project 1.5 Changes in Dietary Pattern and Impacts on Chronic Diseases Emergence. http://www.arcticnet.ulaval.ca/pdf/phase1/15.pdf.
ArcticNet Phase I – Project 3.3 Climate Variability / Change and Marine Ecosystem Resources in Hudson Bay. http://www.arcticnet.ulaval.ca/pdf/phase1/33.pdf.
ArcticNet Phase I – Project 3.7 Nunatsiavut Nuluak: Baseline Inventory and Comparative Assessment of Three Northern Labrador Fiord-based Marine Ecosystems. http://www.arcticnet.ulaval.ca/pdf/phase1/37.pdf.

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18.1 Introduction

During Leg 1, the objectives of the zooplankton team were to collect micro- and meso-zooplankton in tree Labrador fjords, as part of a study on the health of the fjord ecosystems led by the Environmental Sciences Group (ArcticNet Project 3.7) and to collect micro- and meso-zooplankton and fish larvae in Hudson Bay as part the 'Marine productivity and sustained exploitation of emerging fisheries' study (ArcticNet Project 1.4 led by L. Fortier and J. Gagné). The goals were to document and anticipate the present and future availability of marine renewable resources and to propose management strategies for a sustainable exploitation. Zooplankton samples collected during Leg 1 were also of use in other subprojects such as the cycling of contaminants (G. Stern) while part of the samples collected were used in a study to identify the sources and pathways of omega-3 fatty acids in the Arctic marine food chain (ArcticNet Project 1.5; J. Michaud, E. Dewailly and L. Fortier). At some stations, zooplankton samples were also collected for genetic studies at Woods Hole Oceanographic Institution (V. Starczak) and at UQAR (F. Dufresne and A. Radulovici).

For Leg 3, the general objective of this project fitted into the overarching goal of ArcticNet Project 1.4 led by J.-É. Tremblay titled 'Marine productivity and sustained exploitation of emerging fisheries' which is to assess the impact of sea-ice cover reduction and increasing sea temperatures on biological productivity, fisheries resources and marine mammal populations of the coastal Canadian Arctic. This assessment aims to document and anticipate the present and future biodiversity/availability of marine renewable resources, and to propose management strategies for a sustainable exploitation. Aboard the CCGS *Amundsen*, key indices of the ecosystem maturity at the end of the biological production season (September to November) were collected and automated instruments that record all year-long the vertical flux of biogenic matter and marine mammal distribution were re-deployed. Leg 3 consisted thus mainly of a monitoring cruise following up on the previous ArcticNet 2005 and 2006 Expeditions, but differed from the previous expeditions, since it also contained a component of the 15-month *Amundsen* Expedition as part of Canada's contribution to the International Polar Year (IPY) 2007-2008. In particular, Leg 3b (18 October – 8 November) was the beginning of the Circumpolar Flaw Lead (CFL) Study, which examines on an annual cycle how the physical processes moderate biogeochemical processes within the changing northern flaw lead ecosystem nearby Banks Island in the Beaufort Sea. Therefore, the sampling conducted during Leg 3b can be seen as a pre-winter survey of the flaw lead area to get an indication of the status of the marine ecosystem at the end of the growth season and associated physical forcing.

Over the course of Leg 3, operations spanned an East to West gradient in the Canadian High Arctic over a large spectrum of sampling conditions and three oceanographic regions: 1) the NOW Polynya of Baffin Bay (Eastern Arctic), 2) the Northwest Passage through the Canadian Arctic Archipelago, including opportunistic sampling nearby Nanissivik, and 3) the southeastern Beaufort Sea (Western Arctic) comprised of the Mackenzie and Banks Shelves, and of the Amundsen Gulf area (the CFL study region).

The main field objectives of this project were to:

- Assess zooplankton / fish abundance and diversity by using various plankton nets;
- Track zooplankton / fish biomass and distribution with the EK60 Echosounder;
- Turnover the automated sediment traps and hydrophones deployed on the moorings.

In addition, zooplankton samples collected will also serve other ArcticNet-CFL subprojects such as the cycling of contaminants (G. Stern). As well, part of the samples collected will be used in a study to identify the sources and pathways of omega-3 in the Arctic marine food chain (J. Michaud, E. Dewaily and L. Fortier) to assess the importance of omega-3 fatty acid in the traditional diet of Inuit communities. The respiration rates of the zooplankton community will be quantified at chosen stations (G. Darnis and L. Fortier) and zooplankton samples will be collected for genetic studies at Woods Hole Oceanographic Institution (V. Starczak) and at UQAR (F. Dufresne and A. Radulovici).

18.2 Methodology

In total, zooplankton and fish sampling was conducted at 17 stations during Leg 1 (Table 18.1) and 32 stations during Leg 3 (Table 18.2). During Leg 3 however, the ice conditions (multiyear ice floes or fast-growing sea ice) severely constrained the sampling at many stations. Acoustics EK60 monitoring was done continuously during the whole cruise. On the moorings, one automated sediment trap was recovered (CA18C) and 9 were deployed (in Beaufort Sea only).

Table 18.1. Summary of stations visited and samples collected during Leg 1.

	Station			Sampling gear			
Date in 2007	ID	Area	Depth (m)	4X1 Monster Net	Hydrobios	RMT	Tucker Net
31-07	620	Labrador	49		X		X
31-07	624	Labrador	53		X		
01-08	617	Labrador	131		X		XX
02-08	600	Labrador	214		X		X
02-08	602	Labrador	158		X		XX
02-08	615	Labrador	122		X		X
05-08	699	Hudson Bay	84	X			X
06-08	700	Hudson Bay	144	X			X
06-08	701	Hudson Bay	72	X			X
09-08	702	Hudson Bay	127	X	X	X	X
10-08	703	Hudson Bay	50	X			X
11-08	704	Hudson Bay	27				XX
12-08	704b	Hudson Bay	58				X
14-08	705	Hudson Bay	54	X	X	X	X
14-08	705a	Hudson Bay	33				XX
15-08	706	Hudson Bay	76	X		X	X
16-08	707	Hudson Bay	111	X			X

Table 18.2. Summary of stations visited and samples collected during Leg 3.

	Station		Sampling gear						Use of sample							
Date	ID	Type	Tucker Net	4X1 (Monster)	Hydrobios	RMT	Trawl	Sediment traps	Taxo. (Fortier)	Contam. (Stern)	Lipids (Michaud)	DNA (UQAR)	Genetic (WHOI)	ETS/Bio. (Darnis)	Swimmers (Sampei)	# of BOSA
30-Sep	101	Full	Ice	X	X	Ice			X	X	X			X		-
30-Sep	105	Basic	X	X					X	X	X	X				2
30-Sep	106	Nuts.				X			X	X						-
01-Oct	115	Full	X	X	X	X			X	X	X	X	X		X	-
02-Oct	111	Basic	X	X					X	X	X	X				-

Station			Sampling gear						Use of sample								
Date	ID	Type	Tucker Net	4X1 (Monster)	Hydrobios	RMT	Trawl	Sediment traps	Taxo. (Fortier)	Contam. (Stern)	Lipids (Michaud)	DNA (UQAR)	Genetic (WHOI)	ETS/Bio. (Darnis)	Swimmers (Sampei)	# of BOSA
02-Oct	108	Full	X	X	X	X			X	X	X	X	X	X		6
04-Oct	133	Basic	Ice	X					X	X	X	X	X			-
06-Oct	Nanissivik	Trawl					X		X	X	X					247
07-Oct	302	Full	Ice	X	X	Ice			X	X	X	X	X			1
09-Oct	308	Basic	X	X					X	X	X	X	X	X		-
10-Oct	309	Basic	Ice	X	X				X	X	X	X	X			-
11-Oct	310	Basic	X	X					X	X	X	X	X	X		5
15-Oct	434	Basic	X	X					X	X	X		X			3
16-Oct	435 (CA04)	Full	X	X	X	Storm		2 deploy.	X	X	X		X			2
19-Oct	437 (CA16)	Full	X	X	Broken	Storm			X	X	X		X	X		2
19-Oct	1806	Full	X	X	Broken	X			X	X	X	X	X			15
20-Oct	1800	Basic	X	X					X	X	X		X			3
21-Oct	437 (CA16)	Full			X			2 deploy.	X		X					-
22-Oct	408 (CA05)	Full	X	X	X	X		1 deploy.	X	X	X		X	X	X	2
23-Oct	420	Basic	X	X					X	X	X					-
23-Oct	407 (CA08)	Full	X	X	X	X			X	X	X		X	X	X	1
25-Oct	405 (CA18)	Full	X	X	X	X		1 recov. 3 deploy.	X	X	X	X	X	X	X	1
26-Oct	1000	Basic	X	X					X	X	X		X	X		-
27-Oct	1100	Basic	X	X					X	X	X		X	X		-
27-Oct	1110	Basic	X	X					X	X	X	X	X			3
28-Oct	1116	Full	Ice	X	X	Ice			X	X	X		X	X		-
30-Oct	1216	Full	X	X	X	Broken			X	X	X		X			-
31-Oct	CA08	Mooring						1 deploy.								-
31-Oct	1200	Full	Ice	X	X	Ice			X	X	X		X	X		-
2-Nov	1600	Basic	X	X					X	X	X	X	X			-
2-Nov	1606	Full	Ice	X	Ice	Ice			X	X	X					-
3-Nov	1902	Basic	Ice	X					X	X	X					-
5-Nov	1908	Full	Ice	X	X	Ice			X	X	X					-
6-Nov	1916	Basic	Ice	X					X	X	X					-

18.2.1 Zooplankton and fish sampling

<u>**Vertical tows**</u>

4x1-m² Square (Monster Net, Figure 18.1a): Frame rigged with four square 1-m² opening nets (2 x 200 µm mesh, 2 x 500 µm mesh), out-rigged with a 10 cm diameter net (50 µm) and equipped with flowmeters (2 GOs and 2 TSKs). These nets were used for integrated water column sampling. During deployment in Leg 1, winch speed varied between 0.25 and 0.5 m s^{-1} while winch speed down was <30 m/min to avoid mixing of the nets. During Leg 3, winch speed up was 40 m/min. The content of one 200 µm (TSK-QT) and one 500 µm mesh-net were preserved in formaldehyde for taxonomy (Fortier). The content of the other nets were sorted for contaminants, lipids and genetics studies. At some stations during Leg 3, ETS assays were performed using one of the integrated tows. This gear was systematically deployed at all Basic and Full stations, except in the Labrador fjords where it was not deployed (see Table 18.1 and 17.2 for details).

Hydrobios: Multi plankton sampler (**Error! Reference source not found.**b) equipped with nine 200 µm-mesh nets (opening 0.75 m^2 (Leg 1) and 0.50 m^2 (Leg 3). This sampler allowed for depth specific sampling of the water column. The Hydrobios is also equipped with a CTD to record water column properties while collecting biological samples. When deploying during Leg 1, winch speed was around 0.5 m s^{-1} from surface to bottom (not sampling) and around 0.25 m s^{-1} from bottom to the surface (sampling). When deploying during Leg 3, winch speeds down and up were both 40 m/min. The Hydrobios was deployed at Basic stations in the Labrador fjords and at Full stations in every region when conditions were favourable. At some stations, the content of each net was divided between preservations (4% buffered formaldehyde) and ETS assays were performed (see Table 18.1 and 17.2 for details). The recurrent problem with the Hydrobios' flowmeters has not been resolved (they did not work in the water, while they were working on deck).

<u>Oblique tows</u>

Double 1-m² (Tucker Net, **Error! Reference source not found.**c): Rigged with two 1 m^2-opening nets (200 µm and 500 µm in Leg 1; 500 µm mesh each in Leg 3), out-trigged with a 10 cm diameter net (50 µm mesh) and equipped with flowmeters (1 GO & 1 TSK) and a temperature-depth recorded (TDR). When towed, ship sailed at 2.0-2.5 knots. Winch speed down was around 30 m/min (0.5 m s^{-1}) and around 20 m/min on the way up. This gear was mainly used to catch fish larvae (see Figure 18.5 for details of the catches) and to provide water column zooplankton samples from the upper 100 m layer. One of the 500-µm mesh net was preserved in 4% buffered formaldehyde for taxonomy and the other 500 µm mesh net was sorted for contaminants, lipids and genetics studies. This gear was deployed at Basic and Full stations when conditions were favourable.

RMT: Rectangular Mid-water Trawl (**Error! Reference source not found.**d) of an opening of 9 m^2 fitted with a 1600 µm mesh-net and equipped with a flowmeter and a TDR. When towed, ship speed was typically 2-3 knots; and winch speed down was 30 m/min (0.5 m s^{-1}) and around 20 m/min on the way up. This net, only deployed at Full stations, was used to catch larval and juvenile fish. Collected zooplankton was equally divided for taxonomic and contaminant studies.

Trawl: Experimental Mid-water Trawl (**Error! Reference source not found.**e) fitted with multiple mesh size; flexible mouth opening; depth, fish counting and aperture probes. This sampler was tested to catch adult fish (with validation of the EK-60 echosounder). The pelagic trawl was deployed once at an opportunistic location nearby Nanissivik (Lancaster Sound) during Leg 3.

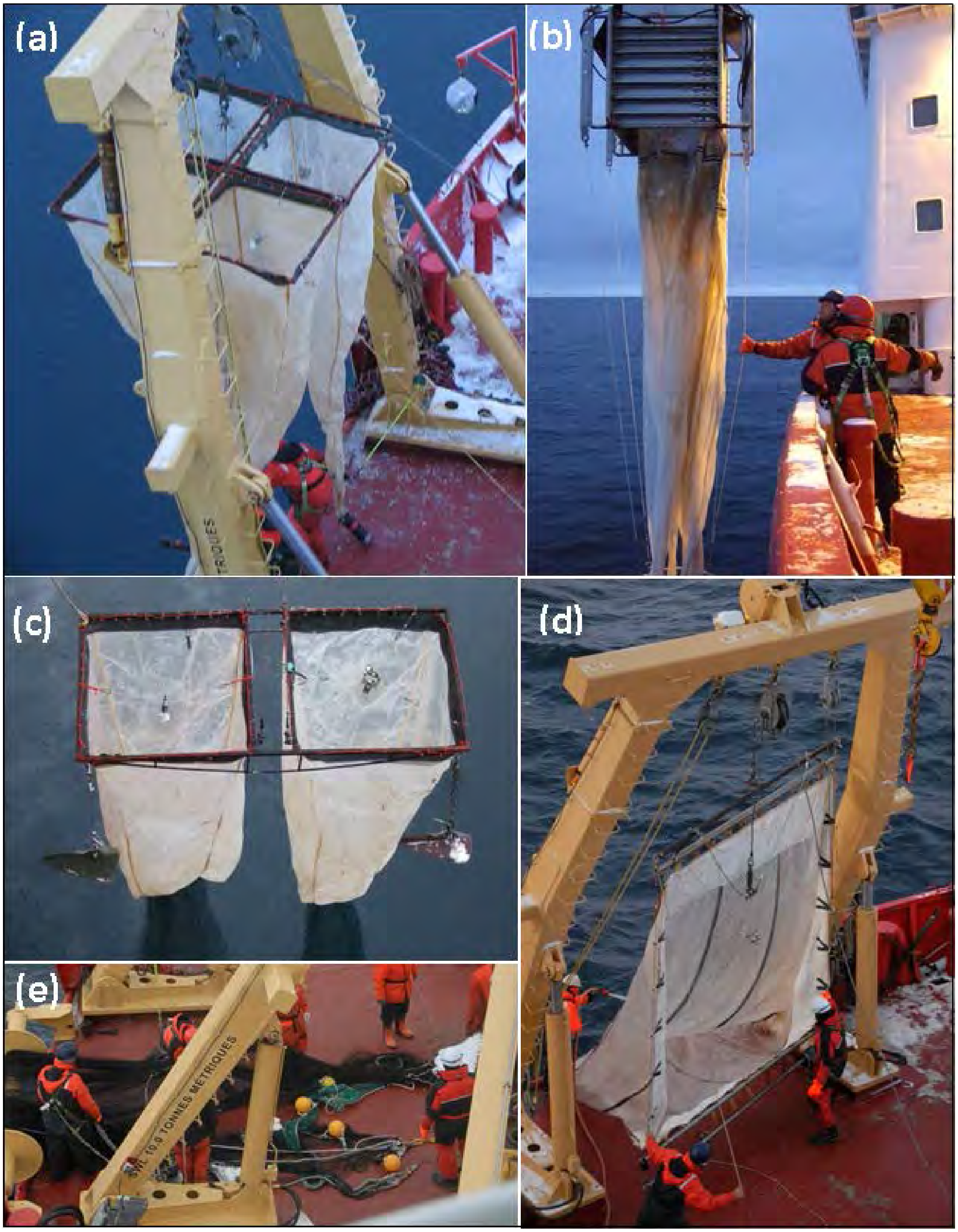

Figure 18.1. Photos of the different sampling equipment used to collect zooplankton and young fish. (a) 4x1-m² Square (Monster Net), (b) Hydrobios Multi plankton sampler, (c) Double 1-m² (Tucker Net), (d) RMT (Rectangular Mid-water Trawl) and (e) Experimental Mid-water Trawl.

Table 18.3. Details of the ETS/biomass assays performed during Leg 3.

			Vertical profiles (Hydrobios)		Integrated (Monster Net)		Stage-specific (Monster Net)	INT solution (#)
Date	Station	Sampling	ETS	Biomass	ETS	Biomass	ETS	
30-Sep	101	275 - 0 m	X	X				1
02-Oct	108	430 - 0 m	X	X				1
09-Oct	308	335 - 0 m				X		-
11-Oct	310	169 - 0 m				X		-
19-Oct	437	340 - 0 m			X	X	X	1
22-Oct	408	185 - 0 m			X	X	X	1
24-Oct	407	380 - 0 m	X	X				2
25-Oct	405	580 - 0 m	X	X				2
26-Oct	1000	350 - 0 m			X	X	X	2
27-Oct	1100	240 - 0 m			X	X		2
28-Oct	1116	220 - 0 m	X	X				2
31-Oct	1200	190 - 0 m			X	X		2

18.2.2 Acoustic monitoring

The *Amundsen* is equipped with a scientific echosounder, the EK-60 that continuously monitored the distribution of zooplankton and fish in the water column. A particular attention was devoted to Arctic cod, *Boreogadus saida*, which plays a key role in Arctic marine ecosystems.

18.2.3 Mooring operations

The automated sediment traps were installed on oceanographic moorings to collect sequentially over the year the vertical flux of sinking particles (e.g. senescent plankton, fecal pellets and detritus). The characterization of the vertical particle flux constitutes key information to understand marine ecosystem dynamics and the impacts of environmental changes. For example, the magnitude of the flux's biogenic component (the organic fraction) is directly linked to surface biological production and food web processes. In coastal shelf areas (such as Beaufort Sea), the collection of sinking particles also serves to estimate the input of terrigenous material (the inorganic fraction) into the Arctic Ocean. Both biological production and terrigenous inputs are expected to increase with sea ice reduction and temperature increases in the Arctic. The consequences of these environmental changes on the food web and carbon cycling are unknown. Hence, the sediment trap deployments constitute a crucial element of ArcticNet's monitoring program that aims to establish a long-term series of marine observatories in the Canadian Arctic.

The mooring program suffered a very serious setback during Leg 3 of ArcticNet-CFL 2007. None of the two mooring deployed in Baffin Bay in 2006 were recovered and only the lower third of CA18 (one the three moorings deployed last year in Beaufort Sea) was recovered. As a result, only one sequential sediment trap was retrieved out of the 11 traps deployed in these two regions during the 2006 ArcticNet Expedition (Figure 18.2 and 17.3). In both regions, the primary problem seemed to be the ice (icebergs or thick sea ice) hitting or damaging the moorings. A second hypothesis is that the batteries of the acoustic releasers experienced a major technical failure. For a complete report on the mooring problems and the way they were handled, see Section 4.

Figure 18.2. The single sediment trap time-series retrieved during Leg 3 (from CA-18, 490 m).

On the other hand, the pool of mooring equipment provided by the new CFI grant allowed maintaining the marine observatories in Beaufort Sea as part of the CFL-IPY overwintering program. The 5 planned moorings equipped with sediment traps were therefore deployed in Beaufort Sea as scheduled (as were the two planned MMP moorings). However, moorings/sediment traps were not deployed in Baffin Bay this year. As a result of the sediment trap shortage, it was also decided to deploy the trap that was reserved for an under-ice experimental time-series in spring 2008 as part of the CFL study. Thus, all the new Technicap PPS-3/3-24 cups that were brought onboard the CCGS *Amundsen* were deployed (Figure 18.3). A summary of the moorings equipped with sediment traps that were recovered and deployed during Leg 3 is provided in Table 18.4.

Table 18.4. Summary of the recovery/deployment of moored sediment traps during Leg 3.

Date	Mooring	Operation	Latitude (N)	Longitude (W)	Sediment trap	Depth
18-Oct	CA-04	Deployment	71°04.842	133°37.970	Technicap PPS 3/3-24	112 m
					Technicap PPS 3/3-24	205 m
21-Oct	CA-16	Deployment	71°47.403	126°29.742	Technicap PPS 3/3-24	113 m
					Technicap PPS 3/3-24	214 m
22-Oct	CA-05	Deployment	71°18.800	127°35.400	Technicap PPS 3/3-24	112 m
25-Oct	CA-18	Recovery	70°39.897	122°59.563	Technicap PPS 5/2-24	490 m
26-Oct	CA-18	Deployment	70°40.050	122°59.563	Technicap PPS 3/3-24	105 m
					Technicap PPS 3/3-24	203 m
					Technicap PPS 5/2-24	490 m
31-Oct	CA-08	Deployment	71°03.229	126°01.384	Technicap PPS 3/3-24	101 m

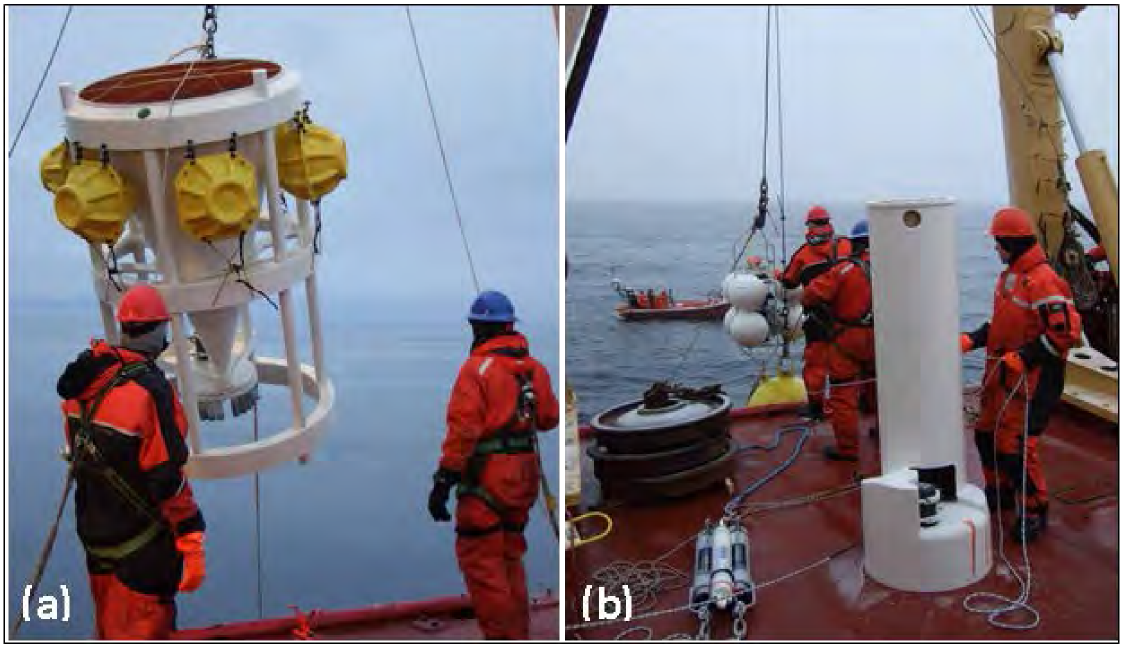

Figure 18.3. Moored sediment traps: (a) large PP5 retrieved at CA18 and (b) new PP3-24 cups deployed at CA05.

18.3 Preliminary results

18.3.1 Leg 1 – 26 July to 17 August 2007 – Labrador fjords and Hudson Bay

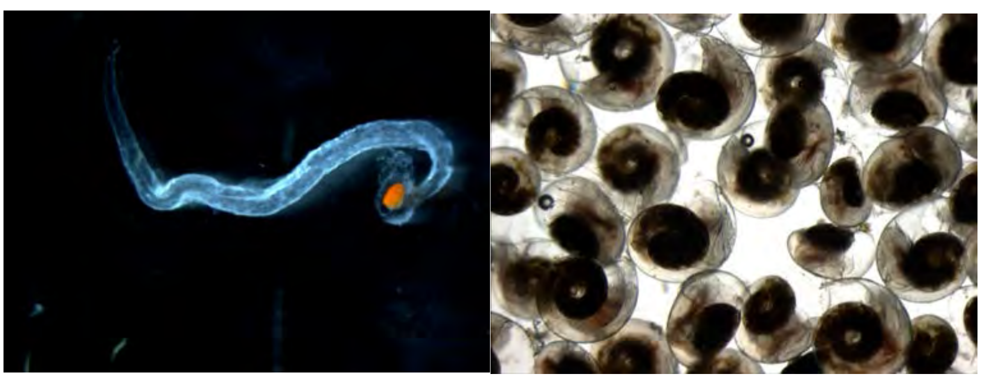

Figure 18.4. Appendicularian *Oikopleura* sp (top) and Pteropods *Limacina helicina* (bottom).

In the Labrador fjords, copepods generally dominated the meso-zooplankton bulk assemblage. In Hudson Bay, the assemblage varied between stations, but chaetognaths and the amphipod *Themisto libellula* often dominated the meso-zooplankton*.* At some stations, on the Western side of the Bay in particular, high abundances of appendicularians (Figure 18.4), an important component of the microbial food web, were observed as well as pteropods (Figure 18.4). These observations are of course qualitative and it is only after taxonomic analyses that the concentration of each taxa will be clearly established. A total of 56 fish larvae were collected and only one was an Arctic cod. Among fish aged 0+, a total of 8 sand lances and 3 capelins were captured with the RMT at Station 705.

4.1.1 *Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago*
Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

No adult fish were caught but several Arctic Cod juveniles (~250 individuals) got caught by the trawl (Figure 18.5).

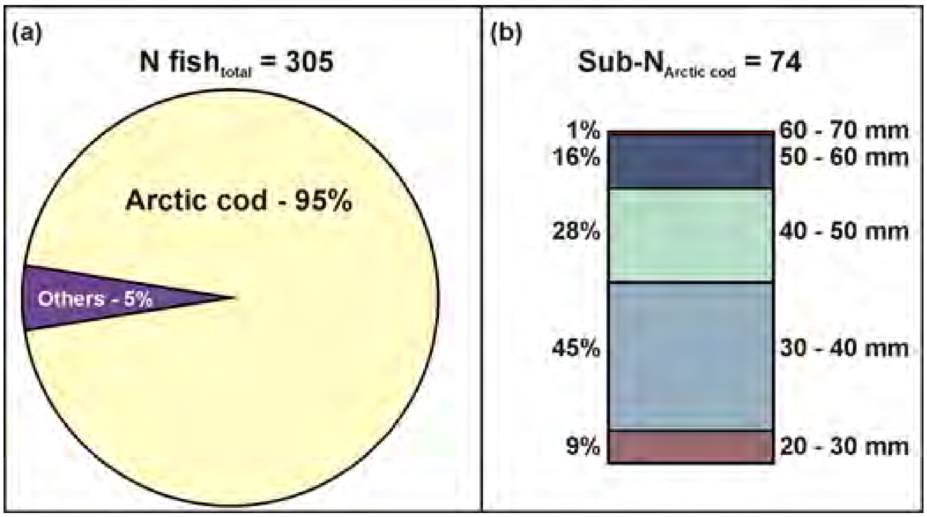

Figure 18.5. Summary of the young fish catches (larvae & juvenile) during Leg 3. (a) Total number of fish and (b) length classes of Arctic cod (*Boreogadus saida*).

During Leg 3a, an acoustic layer was detected between 20 and 100 m below the surface (Figure 18.6) everywhere along the route of the vessel from Resolute to the Greenland coast. Based on the analysis of the split-beam information, it seemed to contain mostly small fish and large zooplankton. When comparing the vertical distribution of the echoes to that of the water column characteristics obtained from Rosette casts, the acoustic layer appeared to be associated with an intrusion of warmer waters below the surface. Another acoustic layer likely resulting from the presence of larger fish and associated with different water mass was present between 250 and 500 m. This layer, which according to its multifrequency acoustic signature also contains zooplankton, was more concentrated in the western part of Lancaster Sound. It settled on the bottom of the NOW Polynya around the 350 m depth contour, especially on the Canadian side.

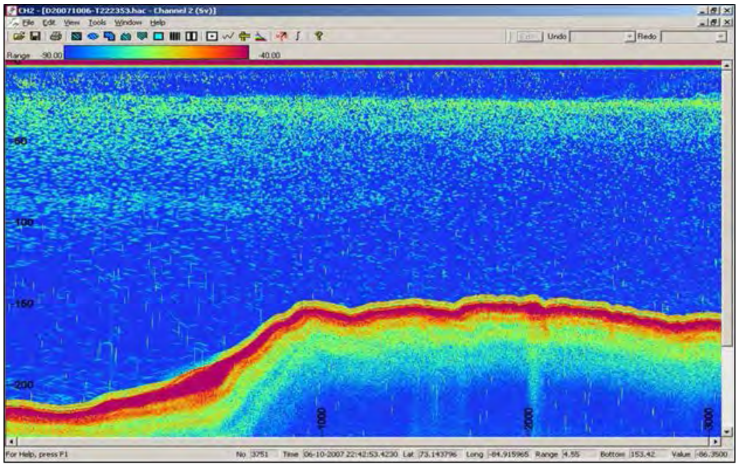

Figure 18.6. Typical EK-60 feature in Eastern Arctic taken nearby Nanissivik on 6 October 2007.

An experimental pelagic trawl was also available on the *Amundsen* to sample concentrations of juvenile and adult fish for ecological studies and EK60 echo validation. This trawl was deployed on 6 October off Nanisivik in the upper acoustic layer between 25 and 50 m. The catch consisted mainly of small Arctic cod about 4-5 cm long and large amphipods (Figure 18.7), confirming our interpretation of the echograms based on the TS (Target Strength) – size relation published by Crawford and Jorgenson (1996) for *B. saida*. It thus appears that juvenile Arctic cod might represent the main source of this extensive epipelagic layer, which was also detected during previous ArcticNet surveys. Juveniles of that key prey species could therefore be widely distributed slightly below the surface over immense expenses of the eastern Arctic Ocean, at least at this time of the year, in association with specific water masses.

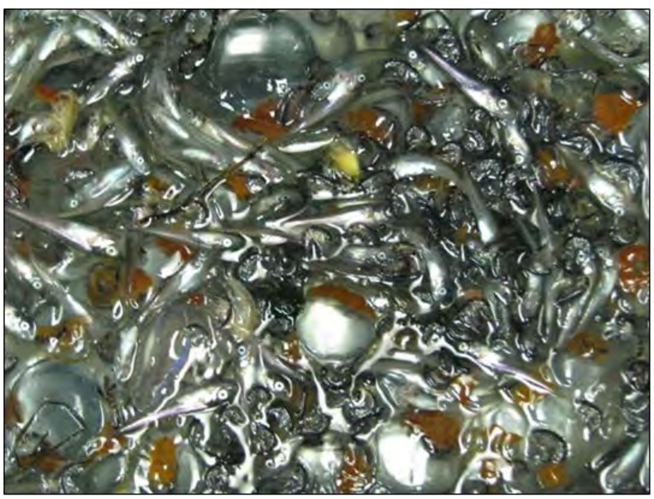

Figure 18.7. The catch of small Arctic cods made with the experimental trawl at Nanissivik during Leg 3.

Zooplankton and fish biomasses were much less important west and south of Lancaster Sound based on the acoustic records for the Eastern entrance of Melville Sound and from M^c^Clintock Channel to Queen Maud Gulf. They increased in Coronation Gulf to reach high values again through to the Amundsen Gulf. Based on the analysis of the EK-60 data obtained during previous ArcticNet surveys, this area and the Lancaster Sound – Baffin Bay region had been identified as hotspots for the sampling of juvenile and adult Arctic cod. Unfortunately, the pelagic trawl could not be deployed again because of logistic and operational constraints. Biomasses returned to a low level in the Beaufort Sea survey area.

18.4 Comments and recommendations (Leg 1 only)

The computer used for the Hydrobios experienced some hard drive problems and it is recommended to back up all files on the server as soon as the tow is finished. One of the two TDR was not functioning so the remaining TDR was put on the Tucker at the very last moment before deployment and was retrieved as soon as the gear was back on deck.

In conclusion, after a few initial glitches in the setup of instruments, all were functioning properly.

19 Contaminants sampling program – Legs 1 and 3

ArcticNet Phase I – Project 1.3 Contaminant Cycling in the Coastal Environment.
http://www.arcticnet.ulaval.ca/pdf/phase1/13.pdf

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19.1 Introduction

This project addressed the questions of how climate variability in physical forcing and the biogeochemical response to this primary forcing affect hexachlorocyclohexane (HCH) and mercury (Hg)/methyl mercury (MeHg) contaminant cycling in the Arctic. Ultimately, changes in delivery and biogeochemical cycling of these contaminants will be related to their levels in fish, marine mammals and the people who consume them as part of their traditional diets.

Hudson Bay represents an excellent model system for studying the impacts of climate change on biogeochemical processes and contaminant cycling because it is virtually a self-contained system with well-constrained terrigenous inputs and marine exchanges. This coastal region is very important for organic carbon cycling, energy transfers to higher trophic levels, and presumably also for the cycling of contaminants.

An additional sampling campaign containing three new projects was undertaken during ArcticNet and CFL 2007-2008 (Leg 3). The first project was designed to obtain a detailed picture of PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid) concentrations in near shore and open ocean sites in the Canadian Arctic. The second project aimed at determining occurrence and levels of currently used pesticides (CUP) in Arctic air and surface water. A third project collected air samples at multi-heights to study the flux of α-HCHs out of the Arctic Ocean.

19.1.1 Hexachlorocyclohexane (HCH)

Technical HCH is a mixture of several isomers, the most abundant being α-HCH (60-70%), γ-HCH (5-12%) and β-HCH (10-15%) (Iwata et al. 1993). Technical HCH and pure γ-HCH (lindane, pesticide active isomer) have been used for over 50 years and are now ubiquitous in water throughout the northern hemisphere (Dickhut et al. 2004, Harner et al. 1999, Iwata et al. 1993, Jantunen and Bidleman 1995, 1996, 1998, Jantunen et al. 2004, Lakaschus et al. 2002, Schreitmüller and Ballschmiter, 1995) with the highest levels found in the surface water layers near pack ice in the Arctic Ocean. Global production of technical HCH was estimated at 10 megatons between 1948-1997, where China consumed the largest amount, almost half global production followed by the former Soviet Union and India (Li 1999).

Technical HCH was banned or heavily restricted by China, the former Soviet Union and India between the mid-1980s and 1990 (Li et al. 1998, 2003). Concentrations of α-HCH in Arctic air responded quickly to these large-scale usage changes and declined by an order of magnitude from the early 1980s to mid-1990s in steps that closely matched global usage and emission estimates. As a consequence, the direction of net gas exchange in Arctic waters reversed from deposition in the 1980s to air-water equilibrium or volatilization in the mid-1990s.

The α-isomer is the prominent in Arctic air, water, biota and soil, and moves northward via cold-condensation, a process whereby the contaminant evades into the atmosphere, drifts with atmospheric currents, and condenses in colder climates where at colder temperatures increasingly favours the water and extensive ice cover inhibit further evasion. Hence the contaminant accumulates disproportionately in the Arctic.

All three HCH isomers bioaccumulate. Differences in the relative body burdens of α-HCH and β-HCH among species result from selective metabolism and varying concentration distributions in Arctic Ocean water masses (Li and Macdonald 2005). Levels of ΣHCHs in ringed seal (*Phoca hispida*) blubber were higher in the Canadian Archipelago compared to eastern Greenland and Svalbard, reflecting the higher water concentrations in the Archipelago (deWit et al. 2004, Muir et al. 2000). Near Barrow, Alaska, α-HCH was the most abundant isomer in ringed seal whereas β-HCH predominated in polar bear (*Ursus maritimus*) (Kucklick et al. 2002). Bowhead whales (*Balaena mysticetus*) showed a reversal of α-HCH/β-HCH ratios in their blubber as they migrated from the Bering to the Beaufort seas (Hoekstra et al. 2002). Proportions of β-HCH/ΣHCHs or β-HCH/α-HCH in the Canadian Arctic have increased since the 1970s and 1980s (Li and Macdonald 2005) in ringed seal blubber (Muir et al. 2003), northern fulmar (*Fulmaris glacialis*) eggs (Braune et al. 2002) and polar bear fat (Norstrom et al. 2003).

HCHs are persistent and have an estimated half-life of 25 years in water and 8 years in the human body. Air samples taken at Alert, NT by the North Contaminants Program between 1993-1997 had half lives ranging from 9-17 years for α-HCH (Hung et al. 2005), which is far longer than the half lives of α-HCH in the Great Lakes region of 3-6 years (Cortes and Hites 2000). HCHs are endocrine disrupters, cause nervous system and reproductive damage, as well as cancer.

19.1.2 α-HCH flux experiments

α-HCH is chiral, consisting of two enantiomers, (+) and (-), a left and right-handed form of the same compound. Technical HCH was manufactured as racemic mixtures, i.e. equal amounts of (+) and (–) enantiomers. The enantiomer fraction (EF), defined as the amounts of the (+)/[(+) + (-)] enantiomers, is 0.500 for the racemic pesticide and is altered by biological processes only. Abiotic processes, such as transport phenomena, hydrolysis and photolysis, are not enantioselective. Enantioselective biotic pathways include enzymatic degradation and preferential membrane permeation (Hegeman and Laane 2002, Müller and Kohler 2004, Möller and Hühnerfuss 1993, Hühnerfuss et al. 1993, Ulrich et al. 2001).

Enantiomers are useful as marker compounds to follow transport processes. Freshly applied racemic pesticides that undergo atmospheric transport from source regions are expected to remain racemic. HCHs have been banned in industrialized countries and their legacy exists as residues in water bodies and soils, where they have undergone partial degradation by microbial action. Enantiomer signatures aid in distinguishing microbially processed residues that have been recycled from water and soil to the atmosphere (Bidleman and Falconer 1999, Bidleman and Leone 2004, Eitzer et al. 2003, Leone et al. 2001). Non-racemic α-HCH is found in Arctic air and water (Jantunen and Bidleman 1995, 1996, 1998, 2007, Bidleman et al. 2007, Harner et al. 1999, Shen et al. 2004).

19.1.3 Currently used pesticides (CUPs)

The fate of pesticides applied to agricultural fields is of great interest because they are manufactured to be toxic to biota and some organisms. Currently used pesticides (CUPs) are generally more volatile and less persistent than the older style organochlorine pesticides, such as HCHs, but they can still undergo atmospheric transport through volatilization and deposition followed by reemissions. They ultimately make their way to sensitive ecosystems including the Canadian Arctic. CUPs include: dacthal, chlorothalonil, endosulfan and Chlorpyrifos, which have been reported in Arctic air (Hung et al. 2005, Jantunen et al. 2007, Shen et al. 2005, Pozo et al. 2006, Chernyak et al. 1996), seawater (Jantunen et al. 2007, Chernyak et al. 1996, Weber et al. 2006), sub-arctic/arctic lake water (Muir et al. 2004), snow (Hermanson et al. 2005, Chernyak et al. 1996) and fog (Chernyak et al. 1996).

19.1.4 Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS)

PFOA and PFOS are the two major perfluoros present in North Atlantic waters. They range in concentrations from <10 to 500 pg/L. Previous work has shown that they are present in somewhat higher concentrations in near shore waters sampled around Nain (June and September 2006) and Resolute Bay (June 2006). The objective was to obtain a more detailed picture of PFOA and PFOS concentrations in near shore and open ocean sites to test the hypothesis that concentrations follow a declining gradient away from land.

Flourinated materials are found in a wide range of applications because of their unique stability toward redox agents as well as for their inert and nonadhering surface properties. They are used in many commercial products such as paints, polishes, packaging, lubricants, firefighting foams, cookware, and stain repellents. During the past six years, scientists and consumers became more aware of these materials when 3M, a longtime major manufacturer of these compounds, declared that it was stopping production of some perfluorinated compounds, including PFOS and PFOA. The primary reason for withdrawing PFOS from the marketplace was the discovery that it is persistent, bioaccumulative, and toxic in animal studies. The U.S. Environmental Protection Agency subsequently requested more information on PFOA to ascertain the sources of human exposure and to determine the environmental effects.

19.1.5 Mercury (Hg) and Methyl Mercury (MeHg)

Mercury (Hg) has long been known as a neurotoxin, and has emerged as a contaminant of great concern in the Arctic. Although global Hg emissions are declining, marine mammals in certain areas in the Arctic have exhibited increasing Hg concentrations during the past two decades. Hg concentrations have been observed in liver of beluga whales from the Beaufort Sea area since 1982, peaking at 29.0 µg/g (wet wt., age corrected; 41.5 µg/g without age correction) in 2002, and remaining as high as 13.5 µg/g in 2002 (consumption guidelines for fish tissue are 0.5 µg/g). The biomagnification of Hg throughout the foodweb is well documented; however, the cyclical behavior of Hg and how abiotic Hg interacts with the foodweb is not well understood. This project also investigated oceanic and riverine inputs/exports of Hg into or out of specific geographical regions such as Hudson Bay.

19.1.6 Seabed sediments and river material

Z.Z. Kuzyk (U. Manitoba)'s project focused on the distribution and composition of sedimentary organic matter in Hudson Bay. The study aimed to gain insight into the key sources of organic material, the relative importance of terrestrial vs. marine sources (primary production), the transport and modification the organic materials undergo once they enter the bay, and how these processes may be modified by predicted climate change. The organic carbon cycle of marine systems is at the heart of the predicted impacts of Arctic climate change and changes are projected to be greater and perhaps faster in Hudson Bay, owing to its more southerly latitude and contact with terrestrial systems (ACIA 2005; Gagnon and Gough 2005; Gough and Wolfe 2001; Westmacott and Burn 1997). An additional objective was to examine the nature of the coupling between organic matter and contaminant behaviour and gain insight into how this coupling may be modified by environmental change. Many of the key processes that control contaminants involve the organic carbon cycle. Recent studies have provided evidence that climate change is shifting patterns of contaminant exposure in the Arctic by, for example, altering aquatic primary production (Outridge et al. 2007). However, little is known about the mechanisms or consequences of change in Arctic marine systems.

19.2 Methodology

19.2.1 Hexachlorocyclohexane (HCH)

Water (4 L) was collected from the Rosette at all Full and Basic stations as well as some Nutrient and CTD stations. At the surface, a Van Dorn sample bottle (or plastic bucket, in some instances) was used to collect the water. Where feasible, transects across water bodies were collected. In the lab, water was pumped through a glass-fiber filter followed by an ENV+ solid-phase extraction (SPE) cartridge using peristaltic pumps (Figure 19.1). On Legs 1 and 3, 16 and 29 profiles were collected respectively, usually consisting of 8 or 9 depths, with the emphasis on the upper water column. Filters and cartridges were frozen and brought back to the Freshwater Institute for analysis. $^{18}\delta O$ and salinity samples were also collected at each site and depth where HCH samples were taken.

Figure 19.1. HCH water filtration in the aft chemistry lab.

19.2.2 α-HCH flux experiments

Air samples were collected at three heights above the water, at ~1 m, ~6 m and ~12 m to determine the flux of α-HCH and its enantiomers (75m^3, n=3). A modified PS-1 (Tisch Environmental, Village of Cleves, OH, USA) sampler was used consisting of 7.6 cm diameter GFF followed by one PUF plug (6.8 cm diameter x 4.2 cm). Parallel low volume water samples (4 L, n=10) were also collected but passing water through a glass fibre filter (47 mm) followed by a ENV+ (200mg, Jones Chromatography) SPE cartridge.

19.2.3 Currently used pesticides (CUPs) (Leg 1 only)

During Leg 1, parallel air (~600 m^3, n=21) and water samples (~100 L, n=17) were continuously collected to determine occurrence and levels of CUPs. Air sampling was done by drawing 500-700 m^3 of air, at a flow rate of 0.5 m^3/min, through a glass fiber filter (Whatman, Maidstone, England, 20.3 x 25.4 cm, EPM 2000, collects 99% of particles >0.3 μm) followed by two plugs of polyurethane foam (PUF), each 8 cm diameter x 7.5 cm tall, that collect the gaseous phase. Where water sampling was done by pushing 100 L of water through a glass fibre filter (GFF, 142 mm) followed by a column of XAD-2 resin (Amberlite, macroreticular styrene divinylbenzene copolymer, 20-60 mesh size, Rohm and Haas, Supelco, Bellefonte PA, USA, 1.5 cm i.d., 75 mL settled volume) to concentrate the dissolved fraction.

19.2.4 Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS)

PFOA and PFOS are likely present as residuals in polymers used on the ship because of past use as stain repellents, floor polishes, lubricants in Teflon (PFOA only) and therefore could be sources of contamination, especially in ship and lab air. Water was collected off the Rosette through Norprene and Tygon tubing directly into polyethylene containers to limit contact with ship air as much as possible (Figure 19.2 left). Other possible sources of contamination to be avoided were Teflon tubing and bottles, Gortex or other stain repellent coated clothing, and possibly KimWipes and waterproof paper.

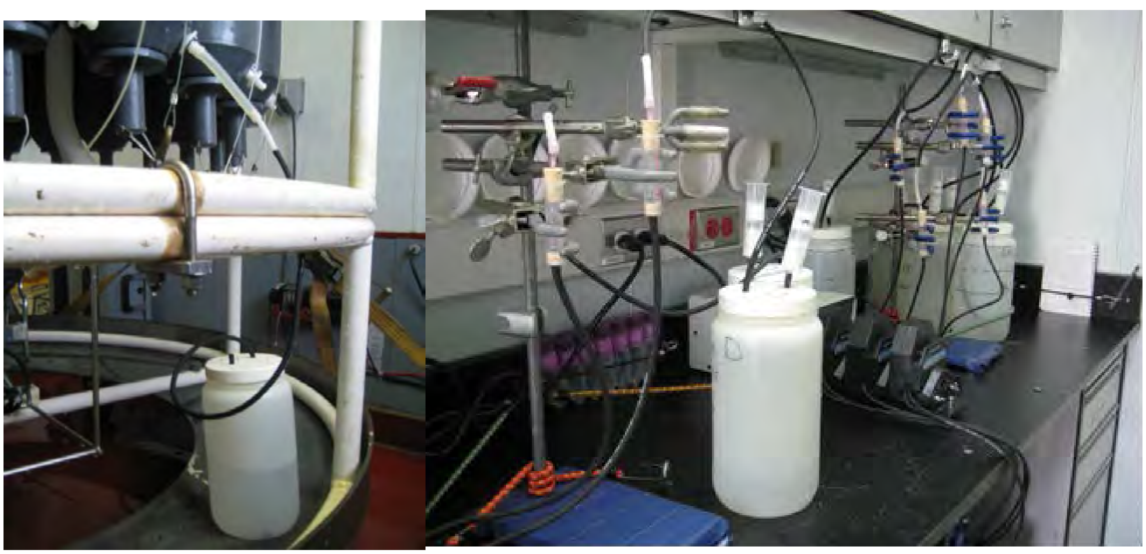

Figure 19.2. Collection of water from the Rosette for PFOS and PFOA analyses (left) and filtration of water through WAX cartridge with additional cartridge acting as an air filter (right).

During both legs, between 1 and 2 L of water was pumped through 6 ml (150 mg) WAX solid phase extraction cartridges at a flow rate of 10 ml/minute using peristaltic pumps (Figure 19.2 right). The cartridges were preconditioned (18 July) and shipped dry in 50 ml polypropylene vials, sealed with parafilm wax. Prior to filtration, the cartridges were spiked with 50 µl of an internal standard made up of 11 PFC's. In order to avoid air contamination during filtration, an additional WAX cartridge packed with polyurethane foam was used as an air filter. After filtration, cartridges were returned to the polypropylene vials, resealed with Parafilm and refrigerated at 4°C.

Water blanks using pre-cleaned HPLC water and cartridge recovery checks were performed to identify contamination sources. As an additional check of on-board collections and extractions, duplicate water samples were collected at a number of stations. These duplicate water samples will be sent back for extraction in a clean room setting for comparison to ship extraction.

During Leg 1, water was collected in depth profiles using a Van Dorn water sampler for surface water and the Rosette for 5, 10, 25, 50, 100 and 200 meters at 6 stations (624, 620, 354, 702, 705 and 707). A spatial study was also conducted with water from 4 m (Rosette collection) at 14 stations, beginning near the Makkovik Margin, through the Labrador Sea, Hudson Strait and Hudson Bay. This spatial study continued in Leg 3 throughout the North Water (NOW) and the Northwest Passage. During Leg 3, water was collected in depth profiles using a plastic bucket for surface water and the Rosette for 5, 10, 25, 50, 100 and 200 meters at 2 stations (111, 435). A spatial study was also conducted with water from 5 m (Rosette collection) at 9 stations (134, 301, 302, 305, 308, 309, 310, 314, and 434).

19.2.5 Air sampling

The air sampler was set up on the bow of the ship on the starboard side for all Full stations, most Basic stations, and several transects. Samples were collected on a glass-fiber filter and polyurethane foam (PUF) for analysis of organic contaminants. Air samples collection time ranged between 3 and 30 hours. A total of 16 samples were collected in Leg 1 and 32 samples in Leg 3. Filters and PUFs were frozen at -20°C and shipped frozen back to the Freshwater Institute for HCH contaminant analysis.

Figure 19.3. Air sampler / Ptarmigan perch on the bow of the ship.

19.2.6 Mercury and Methyl Mercury (Leg 1 only)

During Leg 1, the mercury team onboard the CCGS *Amundsen* focused on the input/export of Hg (dissolved, particulate and organic (MeHg)) into Hudson Bay. Sampling began in the Labrador fjords to test the equipment and sampling technique. The area of study began at Hudson Strait where Stations 356 and 352 were sampled to look at the movement of Hg into the Bay from the Labrador Sea.

Preliminary CTD profiles were conducted at each station and were used to pick different water masses to sample based on salinity and temperature measurements. This sampling method represents mercury movement with horizontal oceanic water mass transport. In addition, the stations selected provided a cross-sectional measurement of mercury within the Straits and the movement of water masses between shelf basins. The inputs of Hg into the Bay from the various rivers that empty into it were also investigated and river waters were sampled around Hudson Bay.

On the East shore, surface samples (dissolved, particulate and methyl mercury) were collected upstream from the communities on Povungnituk, Kogaluc and Great Whale Rivers. Complementary samples just outside these estuaries were also sampled from the *Amundsen* using the CTD-Rosette. In the James Bay area, Stations 703 (flow of Hg out from James Bay) and 704 (water flowing into James Bay from Hudson Bay) were sampled with the objective of differentiating between the input of Hg from Hudson Bay into James Bay and the input from the rivers that empty into James Bay. Sampling in the Winisk River was attempted by Zodiac but it was impossible to reach freshwater.

Figure 19.4. The Portable In-Situ Laboratory for Mercury Speciation (PILMS) onboard the *Amundsen* (left). Tekran 2600 for Total Mercury analysis (right) and a Brooks Rand Distillation, Purge and Trap system for the Methyl Mercury analysis.

On the southeast side of the Bay, the Nelson and Hayes Rivers were sampled (dissolved, particulate and methyl mercury) as well as Stations 705 and 706. This series of samples will illustrate the input of Hg from the freshwater systems into Hudson Bay.

All Hg and MeHg samples were preserved with hydrochloric acid or sulfuric acid, respectively. Time permitting, all samples were be analyzed in the Portable In-situ Laboratory for Mercury Speciation built specifically for the ship or back in Winnipeg to the Ultra Clean Trace Elements Lab at the University of Manitoba.

19.2.7 Biota sampling (mercury, stable isotopes)

The main focus of this study was to link physical and biological processes to mercury levels in the food web and to target the pelagic food web biomagnification and bioaccumulation of mercury with stable isotopes and fatty acids. Thus, all biological samples collected were measured for total mercury and MeHg along with stable isotopes to place organisms into their associated trophic levels.

Biological samples were collected at Basic and Full stations along the cruise transect. Various zooplankton families and fish samples were collected using the vertically towed Monster net (200 and 500 µm), an oblique Tucker net (2x500 µm) and the RMT (rectangular midwater trawl, 1600 µm). Zooplankton and fish were sorted into families, placed into plastic vials and Whirlpak bags and frozen until they can be analyzed for THg, MeHg, stable isotopes and fatty acids. Zooplankton was collected at 12 stations in Leg 1 and at 32 stations in Leg 3.

Additionally, total body length (the distance from the front of the head to the tip of the longest uropod) of the individuals of the hyperiid species *Themisto sp.*, an amphipod widely distributed throughout the High Arctic was measured to the nearest 0.5 mm. Animals greater than 18 mm are considered adult and smaller than that free living juvenile. The individuals were divided into size classes; 0-10 (newly hatched individuals/Juvenile 1), 11-15 (Juvenile 2), 16-20 (1 year old immatures), 21-30 (individuals of over 2 years old), >30 and whenever possible, separated into different vials as described above.

19.2.8 Seabed sediments and river material sampling (Leg 1 only)

Seabed sediments were retrieved by box core from the CCGS *Amundsen*. A small clamshell type grab sampler, deployed from the Zodiac or barge was used to collect sediment samples from the inner shelf and coastal zone. River samples were also collected to characterize the terrestrial organic material transported from the watershed to the bay. Rivers were sampled upstream of any saltwater influence, traveling there by boat (Zodiac or barge) or helicopter. Suspended sediment was collected with a submersible pump/filtration unit while riverbed or bank sediments were collected by hand with a trowel.

Various organic geochemical techniques were used to characterize the sedimentary organic matter in the samples. Bulk properties such as organic and inorganic carbon content, nitrogen content, stable isotope ratios ($\delta^{3}C$, $\delta^{5}N$), and trace and major elements were determined. Rock-Eval™ pyrolysis and alkaline CuO oxidation (a method for quantifying lignin) were conducted. A geochronology for the sediment cores was established using ^{210}Pb and ^{137}Cs. Contaminants analysis included Hg and in some cases PCBs. During Leg 1, various samples were collected to build on the major sample set collected in Hudson Bay in September-October 2005 as part of Leg 2 of the 2005 ArcticNet Expedition. In collaboration with S. Bentley's team (MUN), twelve push-cores of sediment were collected from the box core samples and two additional core surface samples were taken. River bank materials were collected from six rivers (Povungnituk, Kogaluc, Polemond, Great Whale, Nelson and Hayes; Table 19.1). Large volume (>100 L) water samples from four of these rivers (Povungnituk, Kogaluc, Great Whale, Nelson) were filtered to collect samples of suspended sediment. Filtered river water from all of the rivers was also retained for characterization of dissolved organic substances such as lignin.

Table 19.1. Rivers sampled for organic matter characterization in Hudson Bay during Leg 1.

River	Date in 2007	Local time	Latitude (N)	Longitude (W)
Povungnituk	05-Aug	12:30	60°02.000	077°13.000
Kogaluc	05-Aug	15:30	59°36.578	077°28.973
Polemond	05-Aug	16:30	59°29.692	077°27.258
Great Whale	09-Aug	13:25	55°16.490	077°42.730
Hayes	14-Aug	14:05	56°57.550	092°22.177
Nelson River	14-Aug	16:00	56°56.012	092°48.065

19.2.9 Ice sampling (Leg 3 only)

Ice samples for HCHs concentration and enantiomeric composition were collected at each Basic and Full station where the newly formed ice was present (Table 19.2). The samples for oxygen isotope composition ($\delta^{18}O$) and salinity were taken along with all ice samples. The ice samples were collected in collaboration with the sea ice team and the ice microstructure analysis was made on most of them (see Section 3). In cases where more than one type of ice was present, 2 ice samples were collected. A total of 12 samples of newly formed sea ice for HCHs, $\delta^{18}O$ and microstructure analysis was collected.

Table 19.2. Ice sampling locations for HCHs during Leg 3b.

Date	Station	Type of ice	HCH sample #	$\delta^{18}O$ sample #
26 Oct 07	1000	slushy pancake ice	AN07-LV-268	284
27 Oct 07	1110	nilas	AN07-LV-285	301
28 Oct 07	1116	nilas	AN07-LV-294	310
29 Oct 07	1216	nilas	AN07-LV-301	312
31 Oct 07	1200	consolidated pancake ice	AN07-LV-310	321
01 Nov 07	1600	consolidated pancake ice (slushy pieces collected)	AN07-LV-320	331
02 Nov 07	1606	consolidated pancake ice (slushy pieces collected)	AN07-LV-327	338
03 Nov 07	1902	nilas (smooth with nidle-like frost flowers and no slushy	AN07-LV-337	348

Date	Station	Type of ice	HCH sample #	$\delta^{18}O$ sample #
		layer)		
03 Nov 07	1902	grey ice with 0.5-1 cm of snow on top	AN07-LV-338	349
05 Nov 07	1908	big pancake floes with a 1 -1.5 cm layer of snow on top	AN07-LV-347	359
05 Nov 07	1908	nilas from between big pancakes with nidle-like frost flowers and a thin (a few mm) slushy layer on top	AN07-LV-346	358
06 Nov 07	1916	grey ice with a thin slushy layer (a few mm) and a lot of big shining conical-like frost flowers on top	AN07-LV-349	361

Ice samples were collected from the ice cage (Figure 19.5). When the ice was thin enough, the ice chipper was used. In case of thicker ice (>15 cm) the ice cores were taken. The total of 4-8 L of melted ice was pumped through a glass-fiber filter followed by an ENV+ solid-phase extraction (SPE) cartridge using peristaltic pumps. The cartridges and GFFs were stored in -80 °C and brought to the DFO (Winnipeg) for further chemical analysis.

Figure 19.5. Ice cage/ice corer used to sample ice in Leg 3.

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20 Biogeochemical cycling of mercury – Leg 3a

ArcticNet Phase I – Project 1.3 Contaminant Cycling in the Coastal Environment. http://www.arcticnet.ulaval.ca/pdf/phase1/13.pdf

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20.1 Introduction

Concentrations of the neurotoxin mono-methylmercury (MMHg) are increasing in many marine mammals of the Canadian Arctic to levels that may be toxic to Northern peoples consuming these animals as part of a traditional diet. The objective of this project was to determine the source of this MMHg to Arctic marine foodwebs and build on work completed during the previous two ArcticNet Expeditions (2005 and 2006).

One of the key processes resulting in the contamination of biota with mercury (Hg) is the formation of methylated Hg species, such as MMHg, from inorganic Hg(II) species which themselves are not as readily bioaccumulated. The methylation of Hg(II) in marine sediments has been shown to take place in various temperate locations, while in freshwater systems, it has recently been demonstrated that Hg can be methylated to MMHg in certain regions of the water column (i.e. the hypolimnion). However, most of the research conducted thus far on Hg biogeochemical cycling in the Arctic has focused on atmospheric processes which result in the deposition of Hg(II) in marine and coastal systems but the link from the deposition of Hg(II) to the formation of MMHg is still missing. Methylation-demethylation processes resulting in the formation and removal of MMHg are part of the major redox transformations that constitute the biogeochemical cycle of Hg in Arctic seawater. These processes are still poorly understood despite the importance of such information in constructing regional or global Hg models.

A high proportion of the total Hg (THg, all forms of Hg in a sample) measured in the lower parts of the water column during ArcticNet 2005 and 2006 existed in methylated forms such as MMHg and dimethylmercury (DMHg, a volatile, toxic form of Hg that can be photolyzed to MMHg); the working hypothesis was that Hg(II) can be methylated directly in the water column. In other words, the production of methylated Hg species in bottom sediments alone is not enough to result in the concentrations measured in the overlying water column. By adding different Hg stable-isotope tracers to seawater samples in incubation experiments, water column Hg methylation rates will be measured to determine if this process is a potential source of Hg contamination to marine organisms in the Canadian Arctic. Using the same techniques, the rates of some of the other major biogeochemical processes will also be quantified, such as reduction and demethylation reactions, implicated in the cycling of Hg in Arctic marine waters. In addition, background concentrations of a broad range of Hg species in the water column were also measured:

THg, MMHg, DMHg and DGEM (dissolved gaseous elemental mercury) to continue building a baseline against which potential future changes in the distribution of dissolved Hg species can be compared. This work will result in the measurement of the first rate constants of some of the major biogeochemical pathways in the cycle of Hg in Arctic marine waters, which will in turn provide valuable information towards building a regional Hg model. The overall understanding of Hg cycling in the Arctic will be enhanced, allowing better predicting changes in this cycle as climate change continues to impact the Arctic.

20.2 Methodology

20.2.1 Sample collection and processing

At each station, the water column was sampled at two different depths, sub-surface chlorophyll maximum and the bottom of the oxycline (Table 20.1), using Teflon-lined Niskin bottles mounted on the ship's Rosette. From each depth, water was collected in separate acid-washed Teflon bottles for THg and MMHg analysis using standard ultra-clean procedures such as the "clean hands, dirty hands" protocol. THg and MMHg samples were preserved by acidification within 12 hours of collection. For the purpose of the isotope-addition methylation experiments, water was collected in certified ultra-clean amber boston-round glass bottles and 1 L glass jugs by twice overfilling each bottle from the bottom – using C-flex tubing – to preserve *in situ* redox conditions. Water was also collected and filtered for sulfate and DOC analysis.

Table 20.1. Stations sampled for mercury cycling experiments during Leg 3.

Station ID	Cast number	Depths sampled (m)	Work Conducted
101	004	60, 216	Full suite of samples and experiments
115	011	20, 211	Full suite of samples and experiments
302	025	34, 327	Full suite of samples and experiments
308	029	26, 190	Full suite of samples and experiments
309	031	26, 151	Ambient THg and MMHg sampling only
314	034	20, 80	Ambient THg and MMHg sampling only
434	036	9, 35	Ambient THg and MMHg sampling only
435	046	33,125	Full suite of samples and experiments

20.2.2 Methylation experiments

The basic design of the methylation experiments was to add Hg(II) of a specific isotope and measure the concentration of MMHg and DMHg containing that particular isotope of Hg after various incubation times to obtain a time series of data from which methylation rates can be calculated.

$^{198}Hg(II) \rightarrow MM^{198}Hg + DM^{198}Hg$; Methylation rate = % of ^{198}Hg added that is converted to MMHg or DMHg per day per L of water.

Samples also received a spike of isotopically labelled MMHg to monitor the decrease in that species over time from both demethylation reactions and the production of DMHg from MMHg.

$MM^{199}Hg \rightarrow {}^{199}Hg(II)$; Demethylation rate = % of $MM^{199}Hg$ lost per day.
$MM^{199}Hg \rightarrow DM^{199}Hg$; Methylation rate = % of $MM^{199}Hg$ added that is converted to DMHg per day per L of water.

Incubation samples were split into three different series for each depth. Two of these series received a high-level addition of $^{198}Hg(II)$ stable-isotope tracer and a low-level addition of $MM^{199}Hg$. Samples from these series were incubated in the dark at 4°C for 0, 12 and 24 hours, after which time samples were either acidified (series 1) or frozen (series 2) to stop all biotic activity and preserve the sample. The acidification versus freezing comparison was done to ensure that acidifying samples, which is currently the protocol most often used to preserve Hg water samples, does not induce artifact methylation of the inorganic Hg(II) tracer.

These samples will be analysed for $MM^{198}Hg$ and $MM^{199}Hg$ back at the University of Alberta to quantify methylation and demethylation reaction rates, respectively. The third incubation series was conducted in 1-L glass jugs amended with high-level additions of both $^{198}Hg(II)$ and $MM^{199}Hg$, and incubated for 0, 12 and 24 hours at 4°C in the dark. At the end of the predetermined incubation period, samples were purged with a flow of UHP nitrogen and volatile Hg species were captured by adsorption on carbo-traps (for DMHg) and gold-traps (for DGEM). This experiment will allow to determine the rate at which DMHg is produced in the water column and if it is predominantly formed from Hg(II) or from MMHg. At the same time, it will allow to quantify the reduction of both Hg(II) and MMHg, as measured from the production of DGEM, which is the reduction end-product. At Station 115, this experiment was also replicated in the presence of light to qualitatively determine whether light enhances or inhibits any of the processes resulting in the formation of volatile Hg species (DMHg and DGEM). A third isotope of Hg (i.e. one that is neither ^{198}Hg nor ^{199}Hg) during the analysis of the carbo- and gold-traps, will also enable the measurement of background ambient levels of both DMHg and DGEM in the water column.

20.3 Preliminary results

Due to the complex analytical nature of this work, no samples were analyzed while on board the CCGS *Amundsen*. Samples were returned to the *Biogeochemistry Lab* at the University of Alberta for low-level Hg analyses using various mass-spectroscopy techniques.

21 Seabed mapping – Legs 1 and 3

ArcticNet Phase I – Project 1.2: Coastal Vulnerability in a Warming Arctic.
http://www.arcticnet.ulaval.ca/pdf/phase1/12.pdf
ArcticNet Phase I – Project 1.6: The Opening NW Passage: Resources, Navigation, Sovereignty & Security. http://www.arcticnet.ulaval.ca/pdf/phase1/16.pdf

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Cruise participants Leg 1: Steve Brucker[1] and Ian Church[1]
Cruise participants Leg 3: Steve Brucker[1] and Doug Cartwright[1]
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21.1 Introduction

The Ocean Mapping Group (OMG) was on board the *Amundsen* to perform seabed mapping as part of its role in ArcticNet's research program. The primary purpose of the mapping for Legs 1 and 3 of the 2007 Expedition was to collect as much bathymetry and sub-bottom information as possible while transiting between science stations.

Leg 1 took place in the Labrador fjords, Hudson Strait and Hudson Bay. Aside from rare inclement weather, bathymetry and sub-bottom data were successfully collected during the entire cruise.

Leg 3 covered northern Baffin Bay, the Northwest Passage, and Amundsen Gulf / Beaufort Sea. Inclement weather was fairly common, as was the presence of both multi-year and newly formed ice. These led to a loss and/or degradation of data.

21.2 Methodology

21.2.1 Equipment

- Kongsberg-Simrad EM300 30 kHz multibeam echosounder;
- Knudsen K320R 3.5 kHz sub-bottom profiler;
- Applanix POS/MV 320 motion and orientation sensor;
- C&C Technologies CNAV GPS;
- Surface sound speed probe (temporary replacement);
- Seabird SBE911 CTD, deployed from the Rosette.

21.2.2 Onboard logging and processing procedures

Multibeam and sub-bottom profile collection began shortly after leaving Quebec City (Leg 1) and again upon boarding the *Amundsen* near Resolute at the beginning of Leg 3. CNAV GPS was logged separately, first on the SIS PC, then on the Knudsen PC, with this feed of data being augmented by the depth from the EK60. Both the multibeam and sub-bottom systems were logged continuously throughout Legs 1 and 3, except for two days in Leg 3 (1 and 2 November) when the sub-bottom transducers were being acoustically isolated.

The EM300 data were logged in the Kongsberg-Simrad raw format and converted to the OMG format after line completion (new survey lines were automatically generated every half hour). The soundings were cleaned and inspected in near real-time with the two crew members maintaining a 24-hour watch throughout the cruise. Backups of the raw and processed data were made every few days onto external USB hard drives or DVDs (though they were copied to the processing computer in near real-time and mirrored to a second internal hard drive on a nightly basis).

The K320R data were logged in the Knudsen binary format (.keb). Data were converted to OMG format and then backed up in the manner mentioned earlier.

The CNAV data consisted of NMEA strings and was captured to a text file using HyperTerminal, with a new files being created at approximately midnight (GMT) every day. At the end of each day (GMT), this data was backed up to the processing computer and converted to OMG format. The data were then plotted geographically for visual inspection.

For surface sound speed, the probe data was manually entered in SIS when a change in surface sound speed was observed and was then logged directly in the EM300 raw data files. At the beginning of Leg 3, surface sound speed was logged and utilized real time by SIS, but the probe malfunctioned about a week in. Sound speed profiles (Rosette CTD) were collected at each station. Raw files (collected in binary format) were converted to text files, copied to the processing PC and finally converted to OMG format, at which time the profiles were visually inspected for spurious data points. High-resolution CTD casts were decimated to 1-metre bins using a median filter. Profiles were tagged with time and ship's position in real-time. If CTD profiles did not extend to full ocean depth, they were extended using either the World Ocean Atlas 2001 (Leg 1) or the SVP editor in the SIS software package (Leg 3) before being input to the EM300 logging software. Post-processing of the multibeam soundings with respect to sound speed profiles will be done upon return to UNB.

21.2.3 Mapping procedures and system performance

During transit between stations, coverage from previous transits was loaded into Aldebaran. This allowed the helmsman to steer coverage and build upon the previously collected data. Surveys were accomplished in previous expeditions at the following locations visited during Leg 1:

- Makkovik continental margin, Labrador Sea;
- Station 699, Hudson Bay;
- Station 702, Hudson Bay.

In Leg 1, data quality was very good in most cases. Survey line running was at times freehand, with the helmsman steering coverage to maintain overlap between adjacent lines, but mostly performed with the use of survey lines plotted on either Aldebaran or SIS.

B. Maclean at GSC, requested coverage to complete seabed mapping at the centre of Hudson Straight. Most of the requested area was completed while transiting through the Strait but not all due to tight time constraints.

Surveys accomplished in previous expeditions existed at these sites visited during Leg 3:

- Northern Baffin Bay, NE of Station 108;
- Station 1216, Franklin Bay.

Multibeam data quality was good in most cases during Leg 3, but severely degraded or even non-existent during heavy swell and sea ice. Sub bottom data was generally good under most circumstances including ice breaking and heavy seas. Survey line running was at times freehand, with the helmsman steering coverage to maintain overlap between adjacent lines, but mostly performed with the use of survey lines plotted on either Aldebaran or SIS.

The SIS (EM 300) PC crashed on Thursday, 4 October at approximately 0900 UTC and despite several hours of trying to debug it by OMG and Laval staff, it was impossible to power up the PC. SIS was installed on a spare laptop, the necessary offsets were entered and data successfully logged. The laptop was used until 0200 UTC on 24 October when a spare Kongsberg PC (HWS-11) was found aboard, which was an upgrade to the previous PC (HWS-10).

21.3 Preliminary results

21.3.1 Leg 1 – 26 July to 17 August 2007 – Labrador fjords and Hudson Bay

Results from multibeam and sub-bottom profiles conducted at the Makkovik margin in the Labrador Sea and in Hudson Bay during Leg 1 are shown in Figure 21.1 to 21.3.

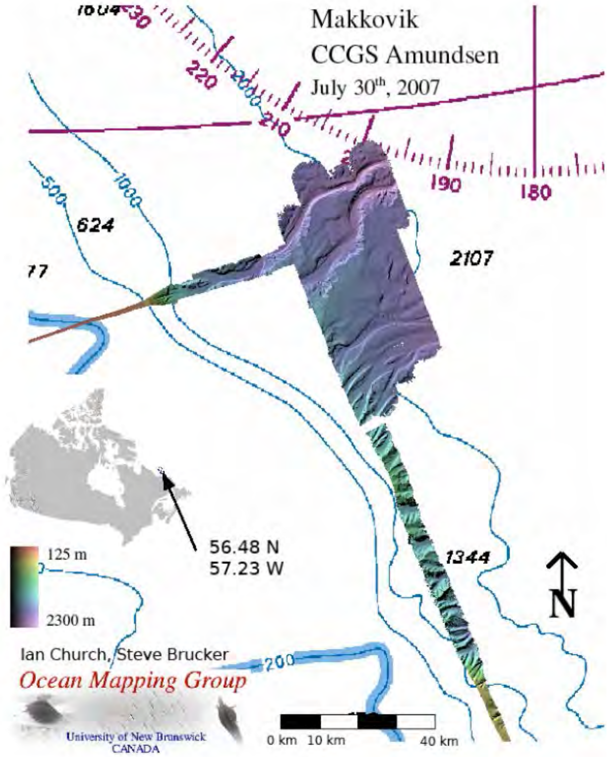

Figure 21.1. Bathymetry of the seafloor surveyed with the multibeam at Makkovik in northern Labrador Sea during Leg 1.

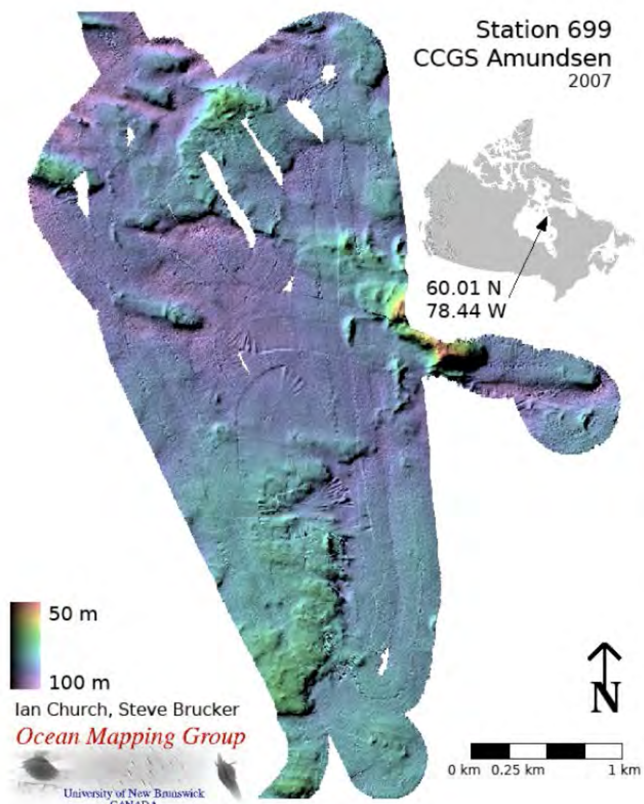

Figure 21.2. Bathymetry of the seafloor surveyed with the multibeam at Station 699 in northern Hudson Bay, during Leg 1.

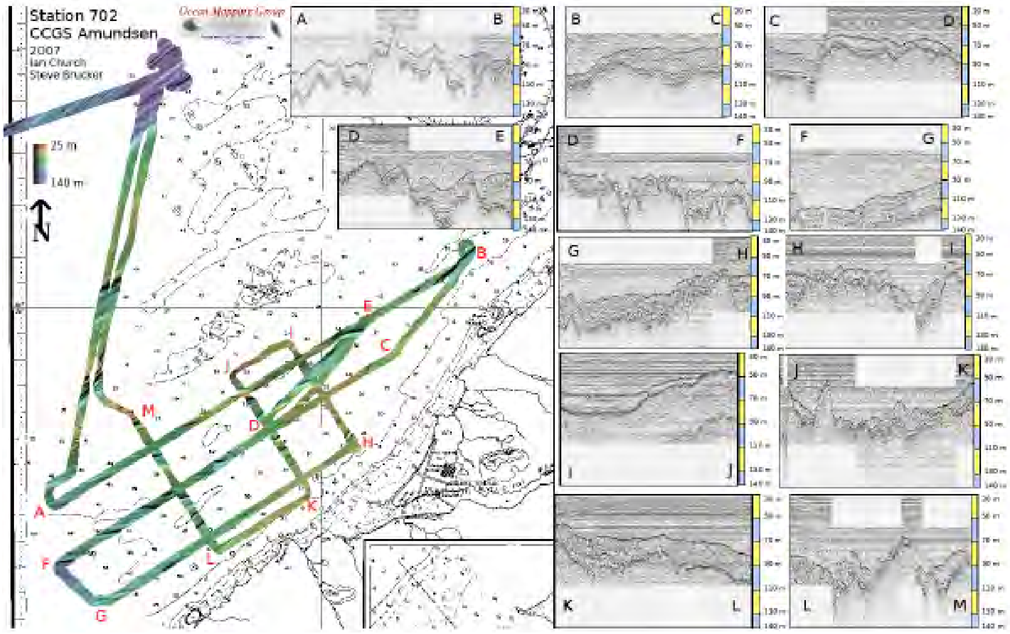

Figure 21.3. Bathymetry of the seafloor and sub-bottom information surveyed with the multibeam system at Station 702 in Hudson Bay, during Leg 1.

21.3.2 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago

Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

<u>Northern Baffin Bay – Station 108</u>

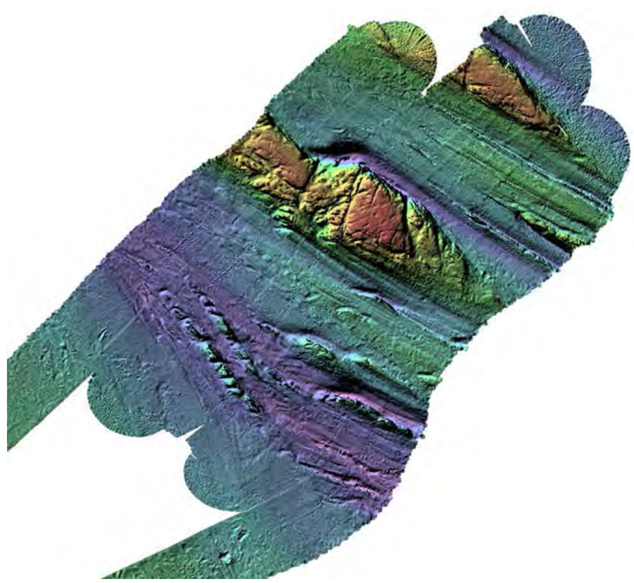

Figure 21.4. Bathymetry of the seafloor surveyed with the multibeam in northern Baffin Bay, NE of Station 108, during Leg 3.

Franklin Bay – Station 1216

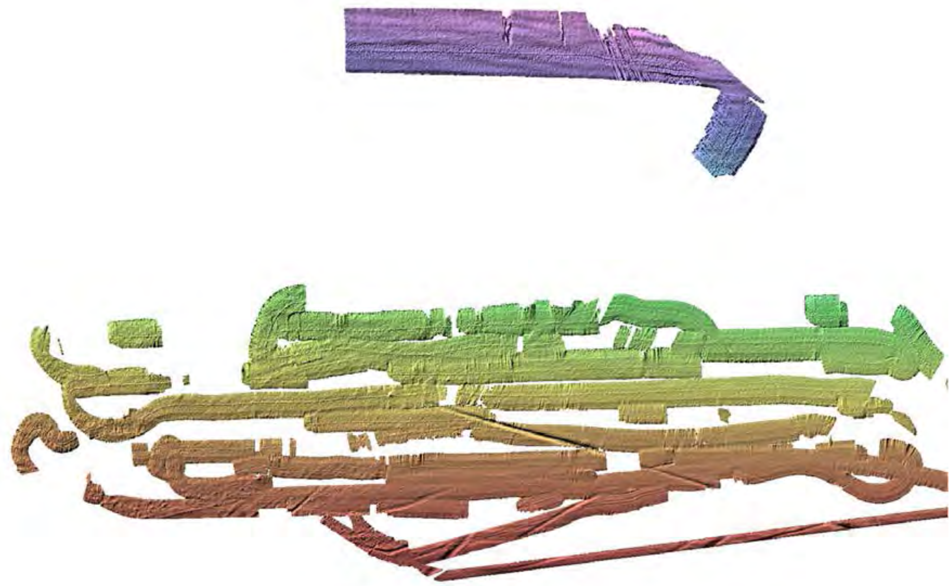

Figure 21.5. Bathymetry of the seafloor surveyed with the multibeam in Franklin Bay, at Station 1216, during Leg 3.

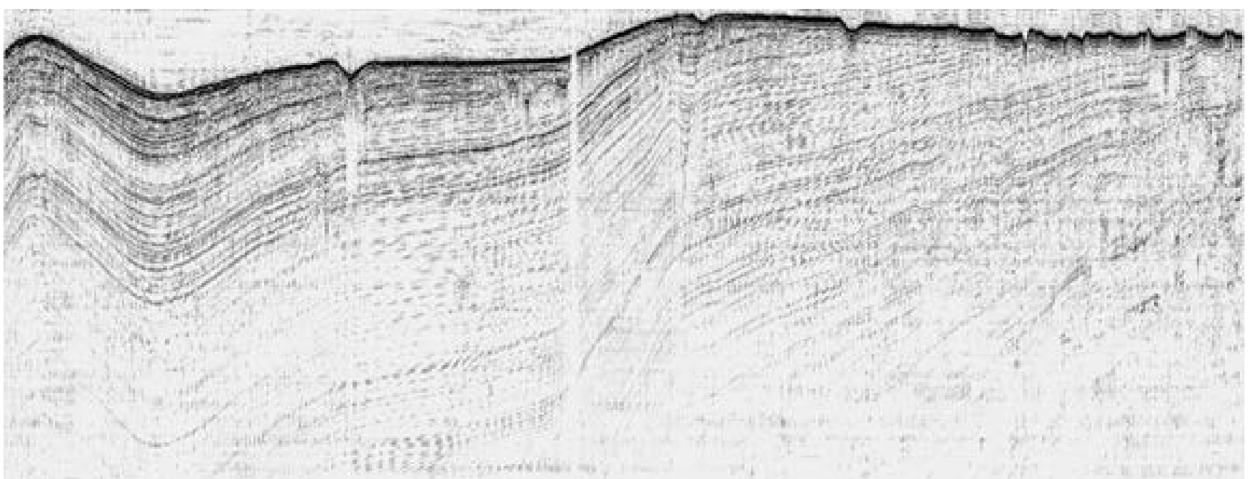

Figure 21.6. Sub bottom profile (50-90 metres) taken at Station 1216 in Franklin Bay during Leg 3.

22 Remotely Operated Vehicle (ROV) operations – Leg 3a

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22.1 Introduction

From 27 September to 8 October, the Canadian Scientific Submersible Facility (CSSF) sent V. Auger to help the ArcticNet team prepare and deploy their Sub-Atlantic Super Mohawk Remotely Operated Vehicle (ROV) for its first dives as well as to provide in-the-field training to the personnel operating the ROV. Originally, it was hoped that the ROV could be promptly setup and used to recover lost moorings. Due to time and schedule constraints, these complex operations were however postponed to be replaced by 3 short sea-trial dives of the ROV which allowed both the ROV team and ship's crew to get familiar with the steps and considerations of operating an ROV from the CCGS *Amundsen*.

In retrospection, the approach taken during this expedition was essential to establish the procedures and operational familiarities required for the safe deployment and use of the ROV onboard the *Amundsen*. Both the *Amundsen* and ROV team now have a sound foundation to continue using their ROV and develop its potential.

22.2 Methodology

22.2.1 Initial preparations

Upon arrival on the ship, it was clear that the overall system would require 2 or 3 days of work before a dive could be attempted. The moonpool area was filled with larges boxes, which had to be moved, and the control room and ROV control equipment was only partially setup. Furthermore, the ROV and TMS required extensive inspection and testing for the first dive. The main tasks performed in preparation for the ROV sea trials were to:

- Empty the moonpool area of boxes and clean the control room to allow for the setup of equipment;
- Inspect the Vehicle;
    - o A leak was found on the TMS drum shaft. The top hose clamp was slightly tightened until the leak stopped. The compensator was then filled and the leak cleaned. There is still sweating occurring at the base of the drive shaft gearbox. The base-seal

should be cleaned or replaced but there was not enough oil onboard to perform this task right away.
    - o Both TMS' compensators (2700cc each) were nearly empty. This was due to the oil slowly making its way into the tether over the course of the past months, a common occurrence in oil compensated systems. The ROV's termination box also emptied due to the same effect. In order to avoid the unnecessary loss of oil, the compensator valves could be close when the system is not used for extended periods of time.
    - o The inspection was completed and the vehicle and TMS cleaned in order to verify every connection and fitting on the system.
    - o All the vehicle's functions and support systems were tested.
- Complete the setup of the control room, and install and test the navigation systems;
- Melt the 2-3 feet of ice that had formed in the moonpool.

By the evening of 30 September, after approximately 40 hours of work, the vehicle was fit to dive and all support systems were operational. At this point the main concern was an intermittent communication problem with the vehicle's telemetry, which could not be pin-point by the team.

For each dive, teams were established for safe launch, operation, and recovery of the vehicle (Table 22.1 and 21.2). Also, it was agreed that if winds exceeded 25 knots, a dive would be aborted before the sea build-up led to unsafe operation and recovery. Furthermore, the captain or ROV supervisor could abort a dive at any time if he/she believed the operation was unsafe.

Table 22.1. The ROV launch and recovery team and their tasks.

Position	Main tasks
ROV Supervisor	Directs the operations in the moonpool room and communicates with both the bridge and ROV control room.
Crew Supervisor	Ensures the overall safety of the operations taking place in the moonpool room.
Winch Operator	Operates the main umbilical winch under the direction of the ROV supervisor.
Crane/Cable Guide Operator	Operates the crane and then the cable guide under the direction of the ROV supervisor.
ROV Pilot	Sits at the consoles and pilots the ROV under the direction of the ROV supervisor via a hands-free telephone headset system. The pilot also reports any fault or concern to the ROV supervisor.
2 Crew	Hook and unhook the TMS. Stabilize the vehicle and TMS while it is free hanging. Assist as directed.

Table 22.2. The ROV basic operations team and their tasks.

Position	Main tasks
ROV Supervisor	Supervises the technical aspects of the dive.
ROV Pilot	Operates the ROV under the direction of the ROV supervisor.
Investigator	Guides the ROV team to achieve the scientific objectives of the dive. The investigator is often the person that has planned the dive and its objectives with the ROV team.
Winch Operator	Operates the main umbilical winch under the direction of the ROV supervisor.

22.2.2 Dives

A total of 3 dives took place during Leg 3a.

Dive 1 – 1 October 2007

This dive was designed to familiarize all involved personnel and develop operational procedures on the use of the ROV system onboard the *Amundsen*. In preparation for this first dive, all involved parties took part in a meeting which outlined the dive's goals, explained what was expected of each group, and addressed any concerns on this initial operation. An important point that was raised during this meeting was that the ship did not have a bow thruster, a fact that limited the ship's ability to keep station during dives. The goals of the dive were to:

- Validate all systems underwater;
- Familiarize the ROV team and ship's crew on the deployment and recovery of the system through the moonpool;
- Familiarize the ROV team with important vehicle maneuvers, such as exiting the TMS, flying the vehicle around the TMS, using the navigation system and sonar, and entering the TMS.

Dive #1 Log

12:30	Dive starts. Original lifting system is unsafe - going with a strap. TMS lifting point is too far forward causing an unacceptable pitch. There is a turn in the cable leading the TMS to turn to port. Fit some tag lines to help control the TMS while lowering it into the water. At this point - decision is taken that the ROV will not venture outside of the moonpool due to the TMS' pitch. Testing that the ROV can control TMS rotations went okay. Vehicle can turn TMS with approximately 80% thrust. All systems are working well - no faults detected. Problems with Navigation system - cannot track - decision to look at this once vehicle is back on deck. Test with the winch to ensure that it pays in and out smoothly. Vehicle recovery.
14:30	Vehicle back on deck and moon-pool closed.

Defects and problems

1. TMS' pitch is excessive.
2. A safe TMS lifting apparatus must be built.
3. Loss of vehicle telemetry continues after 30 minutes without problems at start of dive.
4. Winch level-wind is backwards.
5. Navigation system did not track.
6. Cable guide requires a new cable – starboard winch's cable is damaged.
7. Navigation screen to the bridge, network problems.

Post-dive corrections

1. The umbilical lift point was moved all the way back on the lifting rail in order to reduce the pitch as much as possible.
2. Ship's engineering built an angle bracket that mount on the existing lift rail just forward of the new umbilical lift point. A lifting eye was then bolted through the bracket to allow the moonpool room's overhead crane to safely move the TMS.
3. The actual telemetry problem was found after Dive 2, a dirty fibre connection within the control console.
4. The level-wind screw was manually turned until it matched the cable's position and direction on the drum.
5. The navigation system was tested on deck, no problems were found. The system did not track during the dive as we pressed the wrong software button to "wake-up" the transponders for navigation.
6. The cable guide's starboard side winch wire was replaced and cable guide tested for proper operation. Several brackets were also grinded down to facilitate the cable guide lowering.
7. The network switch below the bridge was defective; it was replaced by the ship's electronic technician.

Dive 1 summary

Due to an excessive pitch angle on the TMS, the plan to venture outside of the moonpool had to be abandoned. The pitch was caused by the forward location of the umbilical attach point and was severe enough that the upper-back portion of the TMS was resting against the moonpool wall. The TMS may have pitched even further once outside the moonpool making its recovery unnecessarily difficult. Unfortunately, the lift point could not be tested prior to the dive, as there is not enough headroom in the moonpool room to lift the TMS using the umbilical. This dive however remained a good opportunity to validate all systems and identify any defects as both the TMS and ROV were fully submerged for the first time on this cruise. Once the tests were done, the vehicle was recovered without problems. It is also important to note that the dive allowed fine-tuning the deployment and recovery procedures and manoeuvres.

Dive 2 – 3 October 2007

Four hours were allotted for this dive, which picked up on Dive 1's original goals as well as gave the ship the opportunity to practice station keeping with the TMS in the water column.

Dive #2 Log

8:15	System is ready to dive - ship is doing a CTD.
9:00	CTD is completed - ship gives okay to dive and is now drifting.
9:38	TMS on top of the moonpool.
10:15	Vehicle is in the water at 40 meters - going out of the TMS for flying exercises.
11:15	Going back in the TMS - ship will now try to hold station.
11:40	Ship is done with its station-keeping test - returning to surface with the TMS.
12:00	Dive is over, everything back on deck.

Defects and problems

1. Telemetry problem continues.
2. Video capture computer hangs and requires reboot.
3. Tracklink navigation system works well but periodically gives fatal error messages asking to power-cycle the transducer.

Post-dive corrections

1. Fibre-optic connections were moved from the -10dB to the 0dB connectors. Cleaned all fibres, including ones inside of console. We can no longer reproduce the telemetry problem.
2. The video capture computer also ran the Tracklink software; we separated the two and did several successful capture tests.
3. We could not reproduce this behaviour, maybe (2) was also causing problems with the Tracklink software.

Dive Summary

All dives objectives were reached. The deck crew was confident and both the deployment and recovery were smooth. L. Michaud and P. Massot practiced flying around the TMS and were able to familiarize themselves on the Super Mohawk's particular flying dynamic. Michaud also practiced flying from the TMS' camera and successfully "parked" the vehicle back in the TMS. Once the ROV was back in the TMS, the ship practiced station keeping for approximately half an hour. Establishing the ship's ability to keep station is essential to successful ROV operations. The captain was able to gain valuable information on the drag behaviour of the TMS during these manoeuvres. As expected, the TMS essentially remained directly below the moonpool during the entire dive but abrupt ship motion could cause steep cable angles.

Dive 3 – 6 October 2007

This final training dive was designed to mimic a video exploration dive. Four hours were available for this opportunistic dive during which the *Amundsen* was sheltered from foul weather in Admiralty Inlet. After departure from the Nanissivik port, a dive area was specifically selected for its flat muddy bottom (300 m depth) which would facilitate bottom exploration as well as minimize the risk of a TMS collision with rising subsea features should the ship have problem holding station. The goals of the dive were to:

- Familiarize the night crew with the deployment and recovery procedures;
- Provide more flying practice around the TMS;
- Safely bring the system to the bottom, only if the ship can hold station;
- Explore a small area and do a short transect if time allows;
- Return to the TMS from the bottom and safely enter TMS.

Dive #3 Log

21:00	System is ready to dive – ship is drifting. Lowering TMS through moonpool and stopping TMS at 30 m depth – ship is free to manoeuvre. Vehicle exits the TMS – fair currents make it difficult to keep TMS in sight. Lost sight of TMS for approximately 10 minutes. Found TMS again, several turns in the tether from the search. Found out that the trim buttons were both pressed causing the vehicle to behave abnormally hence making the search for the TMS harder than it had to be. Took out the turns (~8) in the tether. Lowering TMS at 20 m/min while P. Massot is flying around it. TMS near bottom ~ 40 m according to ship's echo sounders. L. Michaud flies the vehicle to the bottom, slowly going away from the TMS' mouth. Vehicle is on bottom at 311 meters – exploring and practicing landings and transects in soft mud. Compass cannot be used – navigation system is reliable enough to work. Vehicle returns to the TMS. P. Massot practices flying in the TMS camera and parks the vehicle. Beginning recovery at 25 m/min.
23:45	Vehicle is back on deck.

Defects and problems

1. Video capture computer crashed during the dives – computer completely hangs and requires reboot.
2. Tracklink software still hangs and gives an error message asking for a transducer power-cycle.

Post-dive corrections

1. The captured video was corrupted during the computer crash. Considerable effort was put into piecing together the corrupted file in order to extract some of the video. While some of the video was recovered, the capture software had other problems and the original data was corrupted. Some video snippets and images were however recovered. It may be possible to recover more of the video and images but is likely not worth the effort. P. Massot will look into the capture card problem, the last hints pointed towards an IRQ conflict.
2. The Tracklink software "crashed" several times. While it was easy and relatively quick to get going again, the problem was an annoyance. This matter should be discussed with LinkQuest Inc.

Dive summary

All of the dive's objectives were reached and the vehicle explored a bottom crawling with life. The night's crew first deployment was smooth and without incident, the ship held station beautifully, never venturing outside of the watch circle, and both P. Massot and L. Michaud were able to widen their piloting skill sets.

The main hiccup during the dive was the lost-of-sight of the TMS shortly after the vehicle's exit. While there was a considerable current, the accidental enabling of the *trim* buttons was believed to be the main cause of this problem. The *trim* buttons are used to apply a constant vehicle attitude to offset surrounding currents, a useful feature when you've enabled it on purpose. The excessive *trim* easily simulated a stronger current and greatly reduced the vehicle's manoeuvrability, leading to the loss-of-sight of the TMS. The TMS was however in-sight after approximately 10 minutes and while there was some turns in the tether they were all taken out and offered a improvised tutorial on a situation that both pilots will face again.

With approximately 30 minutes of bottom time, both pilots were able to fly the vehicle on the bottom and practice soft landings and travels. The ability to travel without suspending sediments is an important skill as good video footage and exploration depend on it. It is also important to note that the vehicle's compass does not work well enough to rely on. The turn counter, a useful tool that tells you how many turns you've put into the tether, uses the compass and can therefore not be trusted. During the bottom exploration, care was taken to offset each right turn with a left turn, a good habit in any case.

Upon return to the cage, special care was taken when paying-in as the presence of a turn in the tether could easily have caught in the TMS and caused damage leading to loss of vehicle telemetry, etc. The tether did not have any turns and the ROV was returned in the TMS without problem to begin recovery.

22.3 Comments and recommendations

During the preparations, it became evident that ArcticNet's technicians have a wide range of responsibility and tasks to perform on the vessel. While they were able to offer some help during the system preparation, their many responsibilities made it difficult to dedicate as much time to the ROV as they would want or would be required if the system was used frequently.

The Super Mohawk system is a good vehicle with great potential but it is important to remember that the *Amundsen* operation is just beginning and will require some supplies and tools. During this visit, a list of concerns and things to do was compiled in order to make the vehicle a reliable tool to the users of the *Amundsen*. The "must" points below are things and items the vehicle and team require.

Must do

- Starboard vertical propeller blade needs to be resurfaced. It is damaged and likely unbalanced. This unbalance will cause unnecessary strain on the propellers shaft and possibly reduce its lifespan.
- The TMS slip-ring torque arrester is secured to the TMS drive motor electrical cable and connector and not a fixed bracket as shown in the slip-ring's user manual. While this came from the factory this way, a proper torque arrester bracket should be built and installed to remove the unnecessary strain on both the oil-filled hose and drive motor electoral connection.
- Leak in the port arm's wrist cylinder. This problem was known but we had too little hydraulic oil (Tellus 22) to perform this task without risking our ability to dive the vehicle.

- Contact Sub-Atlantic concerning the radio interference problems on the pilot's console. They have likely seen and fixed this problem before.
- Contact LinkQuest concerning the constant power-cycle that must be performed on the transducer during operation.
- Organize spare and establish any missing critical spares.
- Establish any missing tools or instruments required for the proper offshore maintenance of the vehicle.
- Refit the TMS drive gear housing. It is slowly leaking oil from the base-seal.

Must buy

- Fibre-optic kit that will allow the team to perform vehicle re-termination.
- Fibre-optic light meters to troubleshoot communication problems.
- Fibre-optic spare connectors and patch cables.
- Vehicle oil-supply of all 3 necessary oil. Tellus 22, Castrol Hyspin, and Transformer oil.
- Hydraulic fittings, valves, hoses, etc.
- Compensation bottles and nozzles, at least 2 more.
- Spare set of FOCAL multiplexer board (top and bottom).

ROV suggestions

- Install altimeter on the TMS. This is almost "must" item as it will help keep the TMS at a safe distance from the bottom. Dragging the TMS on the bottom can have catastrophic consequences.
- Install a radio and strobe beacon on the vehicle. Should the vehicle be separated from the TMS for any reason, these beacons will be invaluable in finding the vehicle again.
- Install a camera on the cable guide. This isn't necessary but would be a great addition, as it would allow the ROV pilot to guide the vehicle in the moonpool more efficiently than with only the supervisor's commands.
- Flush all vehicle oils. This is a good thing to do for oil that has been sitting for over 3 years.
- Switch both cameras internal with NTSC cameras. The FOCAL multiplexer boards will handle NTSC and this would remove a layer or complexity to the system. Keeping the housing and changing only the electronics will also be much cheaper than changing the entire camera.
- Look at important non-critical spares for vehicle's support systems. Navigation and videos are currently the vehicle's only deliverable for scientific mission, if these missions are to be successful, spares for these support systems should be available.
- Build a sturdier pole for the Tracklink system to reduce vibration.
- Add spare fibres from the winch to the control room - having these fibres in protective coating would also be beneficial against abrasion.

General suggestions

- Investigate usage of ship's Dynamic Positioning system for ROV operations.
- Prepare future moorings with an ROV in mind. Insert a weak leak the ROV will be able to manipulate or cut free.
- Consider a user-pay usage or other revenue system for ROV missions.
- Consider marketing of the ROV's capabilities to other science groups.

- Think of ways to extend vehicles capability while considering the moonpool limitations.

The ArcticNet/*Amundsen* Super Mohawk is a system with great potential. It is however important to keep in mind that it is in its infancy and that both the ROV team and the *Amundsen* crew need to continually develop and practice their skills in order to competently handle problematic situations and successfully complete complex missions such as mooring salvage and scientific sampling.

For the ROV team, it would be beneficial to continue a partnership with CSSF, which can help with advice and mission planning as well as provide further training and assistance during offshore missions. ArcticNet's ROV team is often very busy with other responsibility and the helping hand of an experienced ROV pilot has already proven valuable.

The CCGS *Amundsen* did very well during this visit. The ship was able to hold station without the use of a dynamic positioning (DP) or bow thruster. While the ship does have DP, mechanical problems did not allow using it. Dynamic positioning or a bow thruster would be extremely beneficial to ROV operations under less-than-perfect weather conditions.

The future uses of the ROV are unclear at the moment. It is certain to eventually serve as a tool in mooring salvage as well as seafloor exploration. There has also been some interest in its use to inspect the ship's hull and propellers for damage, a task performed by ROVs on other icebreakers to plan dry dock repairs. Regardless of the short-term work plans, it is important for both the ROV team and the *Amundsen* crew to continue using the ROV on a periodic basis. Not only will this improve the team's performance and skill, it will ensure that the vehicle and team are ready to dive when called upon.

23 Sediments and benthos – Legs 1 and 3

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. http://www.arcticnet.ulaval.ca/pdf/phase1/14.pdf.
ArcticNet Phase I – Project 3.7 Nunatsiavut Nuluak: Baseline Inventory and Comparative Assessment of Three Northern Labrador Fiord-based Marine Ecosystems. http://www.arcticnet.ulaval.ca/pdf/phase1/37.pdf.

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23.1 Introduction

23.1.1 Leg 1 – 26 July to 17 August 2007 –Labrador fjords and Hudson Bay

The primary objectives of core study in Leg 1 were to:

- Evaluate the temporal and spatial variations in terrestrial sediment supply from rivers (Bentley team, samples archived at Memorial University);
- Collect undisturbed core tops for correlation with existing archived piston cores (Lajoie/ Lajeunesse; samples archived at U. Laval);
- Collect biomarkers in sediments (Philippe/Massé; samples archived at U. Plymouth, UK);
- Collect sediment-bound lignins for biogeochemical analysis (Kuzyk; samples archived at U. Manitoba).

23.1.2 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago

Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

<u>High resolution biomarkers studies using box core sediments</u>

Specific biomarkers from sea ice diatoms can be used to determine the presence of past Arctic sea ice. Previously, the U. Plymouth team have demonstrated that an unusual chemical biomarker, derived from sea ice diatoms, can be detected in sediments below sea ice, thus providing a proxy measure for sea ice cover in the past. Analysis of sediment material collected with the help of Dr. A. Rochon (UQAR) and his colleagues during the

2005 ArcticNet Expedition revealed the presence of this biomarker across the entire Canadian Arctic Archipelago from the NOW region in Baffin Bay through to the Beaufort Sea. Notably, analysis of extracted sediments showed significant temporal and spatial variations in the concentration of the sea ice biomarker, indicating variations in sea ice cover in the past and between different locations.

The aim of the current fieldwork was to obtain a series of box core sediments across the CAA in order that similar measurements of biomarker concentration could be made during the more recent periods of deposition (10s to 100s of years). These data would then be calibrated against known satellite records of sea ice over the last 30 years, before applying a suitable calibration model to more extended historical datasets obtained previously. A further aim of the current fieldwork was to collect sufficient amounts of representative species of the Arctic ecosystem in order to be able to perform analyses of their lipid contents and study the transfer of sea ice biomarkers across food chains. Benthic specimens were to be collected using a purpose built Agassiz trawl which was tested for the first time on board.

Biodiversity and secondary productivity of benthic communities in areas of enhanced and reduced ("hot spots" and "cold spots") productivity and diversity in the Canadian Arctic

It is widely recognized that wide areas of the Arctic are changing from arctic to subarctic conditions. Rapid warming is causing higher water temperatures and reduced ice cover, two factors that will certainly provoke severe ecosystem changes propagating through all trophic levels. Over the past decade, a geographical displacement of marine mammal population distribution has been observed, that coincides with a reduction of benthic prey populations. According to a widely accepted conceptional model, the relative importance of sea-ice, pelagic and benthic biota in the overall carbon and energy flux will shift from a sea-ice algae-benthos to a phytoplankton-zooplankton dominance. In the context of the potential benthic community changes, it is essential to establish benchmarks in biodiversity at key locations in the Canadian Arctic prior to (a) the expected changes in ice cover, ocean chemistry and climate and (b) the future human activities (transport, trawling or dredging, drilling, etc.) that are likely to happen in response to the predicted environmental changes. Unlike Canada's two other oceans, there is an opportunity to document pristine conditions before ocean change and exploitation occur.

The objective of this component of the project was to describe and compare the biodiversity and secondary productivity of benthic communities in areas of enhanced and reduced ("hot spots" and "cold spots") productivity and diversity in the Canadian Arctic.

23.2 Methodology

23.2.1 Leg 1 – 26 July to 17 August 2007 –Labrador fjords and Hudson Bay

Box cores were collected at 21 stations from Anaktalak Fjord in the Labrador Sea to Cape Churchill in Hudson Bay, including coastal deltaic, fjord, and mid-bay settings (Table 23.1). Push cores were collected for many research groups (see Introduction), and slabs for digital X-radiography were collected by the Bentley team (MUN) (Figure 23.1).

The coring system used was a Reineck-type spade-foot corer with 0.25 m^2 surface area, and depth of 60 cm. Stops on the corer central column controlled core penetration to a maximum of 40 cm in most cases. Cores collected from gravelly substrates were generally shorter, and some cores collected from soft deltaic muds exceeded 40 cm in depth. The coring system performed well under all conditions, with no misfires and little water leakage from the box, in most cases. Winch speeds for all deployments ranged from 25 m/min in the hardest and softest substrates, and 40 m/min in moderately soft sandy muds.

Table 23.1. Locations sampled for sediments using the boxcore during Leg 1.

Date in 2007	Local time	Latitude (N)	Longitude (W)	Depth (m)	Core ID	Comments
31/07	14:59	56°26.420	062°00.050	115	624BC	
01/08	15:08	58°30.090	062°41.490	135	617BC	
02/08	14:20	59°03.130	063°52.390	148	602BC	
05/08	16:13	60°00.580	078°26.540	94	699BC	
06/08	05:18	58°23.230	078°22.480	89.	6 701BC	
06/08	18:34	58°01.410	079°49.930	147	700BC	
09/08	20:20	55°24.310	077°56.320	134	702BC	
09/08	23:34	55°19.780	077°48.800	73.6	702-1-BC	
10/08	01:52	55°17.230	077°49.280	60	702-2-BC	
10/08	19:22	54°40.440	079°57.130	62	703BC	
110/8	08:52	54°45.850	081°43.010	27	704BC	no x-ray taken
12/08	00:21	56°02.240	084°44.430	103	704A-BC	
12/08	04:56	55°44.390	084°50.030	58.3	704B-BC	
12/08	08:47	55°31.120	084°57.030	25.6	704C-BC	no x-ray taken, gravel and cobbles
14/08	04:15	57°39.530	091°35.580	63	705BC	
14/08	14:35	57°22.010	091°52.540	36	705A-BC	box damaged by cobbles, no x-ray taken
14/08	16:57	57°16.630	091°49.960	14.6	705A-3-BC	too little penetration, second try follows
14/08	17:17	57°16.680	091°49.920	14.2	705A-3-BC	
14/08	19:19	57°22.470	091°46.460	28.1	705A-5-BC	
15/08	10:21	58°46.660	091°31.02	80	706BC	Gravel and cobbles; only surface and subsurface samples
16/08	07:37	59°58.970	091°57.78	101	707BC	Gravel and cobbles; no X-ray taken

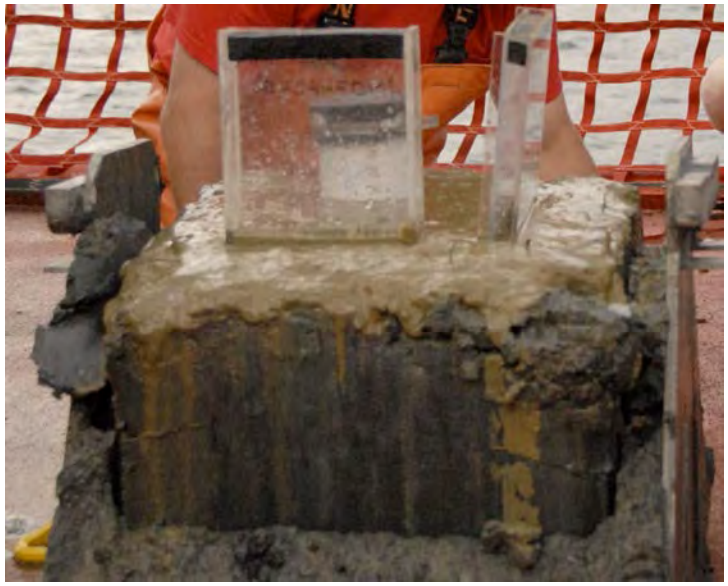

Figure 23.1. Boxcore from Anaktalak Fjord (Leg 1), with X-radiographic and pushcore subsamplers inserted, and box removed.

23.2.2 Leg 3a – 27 September to 18 October 2007 – Baffin Bay and Canadian Arctic Archipelago

Leg 3b – 18 October to 8 November 2007 – Amundsen Gulf and Beaufort Sea

A summary of sampling operations conducted to collect sediment and benthos using the box core, the Agassiz trawl and the Van Veen grab during Leg 3 is provided in Table 23.2.

<u>**Sediment sampling**</u>

Sediments were collected using a box core from a range of locations including the NOW Polynya region in Baffin Bay, the eastern edge of Viscount Melville Sound, McClintock Strait, Dease Strait and the Beaufort Sea. Cores suitable for sectioning were obtained from 12 sites, with surface sediment also collected from a further location in the McClintock Strait (Table 23.3). Following retrieval, each core was mounted using newly designed and constructed sectioning equipment brought by the team from U. Plymouth. In general, cores were sectioned according to the following:

0 (surface) – 2.0 cm: 1 mm/slice
2.0 cm – 5.0 cm: 2 mm/slice
5.0 cm – core bottom (15-25 cm): 10 mm/slice

Table 23.2. Summary of sampling operations conducted to collect sediment and benthos using the box core, Agassiz trawl and Van Veen grab during Leg 3.

		Box core			Agassiz sledge						Van Veen Grab			
					Start position		End position							
Station	Date	Latitude (N)	Longitude (W)	Depth (m)	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Time (min)	Depth (m)	Latitude (N)	Longitude (W)	Depth (m)	Comment
101	09-30	76°31.300	077°23.250	252										Gravel and cobbles
105	09-30	76°15.300	075°53.640	366							76°15.660	075°53.280	357	
115	10-01	76°18.200	071°39.540	682	76°19.140	071°29.0300	76°18.800	071°28.830	5	681				
111	10-02	76°18.170	073°05.990	611										
108	10-03				76°12.720	074°44.400	76°12.640	074°44.630	5	445				
134	10-04										75°34.130	079°28.190	550	Grab empty
302	10-07				74°12.590	086°38.570	74°13.000	086°59.440	10	490				
308	10-09	74°07.770	103°04.170	341	74°07.590	103°09.380	74°06.990	103°09.680	10	355				
309	10-10				74°38.470	103°06.050	74°38.070	103.04.610	10	168				
314	10-12	69°00.490	106°34.670	114	69°00.210	106°35.780	69°00.490	106°25.120	10	110				Agassiz empty
434	10-15	70°10.190	133°34.730	38	70°10.540	133°35.640	70°10.210	133°36.120	10	38				First Agassiz empty
428	10-15	70°47.260	133°43.740	70										
1806	10-19	72°45.020	127°18.080	138	72°44.420	127°13.750	72°44.960	127°14.910	10	133				Agassiz empty (2 times)
					72°45.060	127°15.610	72°44.980	127°17.720	5	137				
1800	10-20	72°11.730	127°49.080	356	72°10.970	127°46.980	72°11.420	127°49.950	10	358				
437	10-20	71°46.770	126°30.010	326	71°47.940	126°34.910	71°48.420	126°36.150	5	339				
408	10-21	71°19.260	127°39.140	193	71°18.710	127°38.260	71°19.020	127°38.690	5	190				
420	10-23				71°03.680	128°24.200	71°03.890	128°23.600	5	42	71°03.870	128°23.270	45	First Agassiz empty, Grab empty
407	10-24	71°01.860	126°02.710	399	71°01.410	126°01.890	71°01.790	126°02.920	5	400				Agassiz empty
405	10-25				70°39.338	123°02.130	70°38.940	123°01.410	10	615				
1000	10-26	70°35.660	120°55.280	359	70°35.540	120°57.290	70°36.110	120°56.150	10	364				
1100	10-27	71°01.860	123°15.920	272	71°02.260	123°15.480	71°01.940	123°15.790	10	277				

		Box core			Agassiz sledge						Van Veen Grab			
					Start position		End position							
Station	Date	Latitude (N)	Longitude (W)	Depth (m)	Latitude (N)	Longitude (W)	Latitude (N)	Longitude (W)	Time (min)	Depth (m)	Latitude (N)	Longitude (W)	Depth (m)	Comment
1110	10-27	70°20.650	124°57.580	88										Box damaged by a big rock
1116	10-28	70°02.560	126°17.390	230										
1120	10-28	70°20.190	127°01.500	205										
		70°20.840	127°03.090	197										
1122	10-29	70°28.550	127°26.010	55	70°27.760	127°24.510	70°27.820	127°24.590	5	56				Agassiz empty
		70°29.340	127°28.350	42										
1216	10-29				70°44.670	127°54.460	70°45.120	127°55.110	5	73				
1214	10-30	70°43.640	127°21.340	211	70°42.380	127°18.860	70°42.730	127°19.800	5	218				
1200	10-31	71°33.990	124°18.860	197										
411	11-01	71°37.990	126°43.590	434										
		71°38.120	126°44.500	435										
1600	11-01	71°39.830	130°48.650	527	71°39.200	130°44.480	71°39.710	130°47.30	5	457				Agassiz empty
1606	11-02	71°03.820	130°37.490	48	71°03.880	130°36.630	71°03.850	130°37.06	5	48				
1902	11-03	71°33.190	125°45.610	350										
1916	11-06	70°53.920	122°07.490	420										

For high-resolution sampling, all sections were collected as single samples, bagged and taken to U. Plymouth in the UK for analysis. Low-resolution samples (>5.0 cm) were divided into 2 portions (A and B); Samples 'A' were taken to Plymouth, samples 'B' were left onboard the *Amundsen*. In addition to the box cores obtained during Leg 3, the team sectioned 3 box cores obtained during Leg 1. These were at Stations 701, 617 and 707 though only the Station 701 core was sectioned at high resolution (2 mm/slice).

Table 23.3. Summary of box cores sections at stations sampled during Leg 3.

Station	Sections of core (cm)	Slice thickness (cm)
115	0-5.2	0.2
	5.2-15.2	1.0
111	0-1.0	0.1
	1.0-5.0	0.2
	5.0-25.0	1.0
308	0-2.0	0.1
	2.0-5.0	0.2
	5.0-20.0	1.0
'312'		Surface only
314	0-2.0	0.1
	2.0-5.0	0.2
	5.0-25.0	1.0
434	0-2.0	0.1
	2.0-5.0	0.2
	5.0-25.0	1.0
428	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
1806		Surface only
1800	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
408	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
1000	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
1116	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
1122	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0
1214	0-2.0	0.1
	2.0-5.0	0.2
	5.0-?	1.0

Specimen collection

The Agassiz trawl was deployed for the first time at Station 115 and during this deployment, it was felt that additional weight would improve the efficiency of the equipment. Ultimately, it was decided that no weight should be added to the equipment as this first attempt resulted in a net full of mud after recovery. The correct procedure for deploying the trawl therefore consists in deploying a length of cable corresponding to the depth of the investigated area plus around 40 m of extra cable so that the instrument remains at the seabed during the operations. The trawling operations were usually performed during 5 to 15 minutes (site dependent) at a speed around 1-1.5 knot.

The specimens collected were frozen and taken to the UK for analysis. Briefly, these specimens will be frozen dried and the samples obtained will be extracted and analysed using a combination of open column chromatography and gas chromatography techniques (GC-MS).

The following species were collected for lipid analyses: *Ophiura sarsi, Ophiura robusta, Ampharete acutiformis, Ctenodiscus crispatus, Nymphon sp., Und. Amphipods, Mya sp., Sclerocrangon sp., Asterias rubens, Sclerocrangon boreas, Yoldia sp., Gorgonocephalus arcticus, Und. Isopods, Und. Mytilidae.* Further identification work will be carried out at the Université du Québec à Rimouski.

Benthic macrofauna structure and composition

For the determination of macrofauna structure and composition, sediments were collected with box cores. At each station, a sediment sub-sample of 0.125 m^2, varying from 10-15 cm depth, was passed through a 500 mesh sieve and preserved in a 10% buffered seawater formalin solution for further identification in the laboratory. The specimens collected in the Agassiz were identified to the lowest taxonomic level and counted. Some species were frozen for further identification.

23.3 Preliminary results

Catches in the Agassiz consisted mainly of brittle stars, worms, fishes, molluscs and amphipods. In Viscount Melville Sound, an unexpected sea spider was collected, which is only distributed in the Arctic. An octopus, some big shrimps and sea stars were also collected (Figure 23.2).

Figure 23.2. Photos of benthic macrofauna collected during Leg 3: Sea spider (left), large shrimp (middle) and octopus (right).

Appendix 1 - List of stations sampled during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Depth (m)
Leg 1								
1	St. Lawrence Estuary	MVP	01/Jul/2007	13h50	UTC-4	47°56.027	069°31.191	21.3
1	St. Lawrence Estuary	MVP	02/Jul/2007	11h06	UTC-4	48°12.900	069°18.260	63
1	St. Lawrence Estuary	MVP	02/Jul/2007	12h30	UTC-4	48°15.540	069°16.270	171
1	St. Lawrence Estuary	ROV	03/Jul/2007	N/A	UTC-4	N/A	N/A	N/A
1	Makkovik-1	CTD	29/Jul/2007	10h08	UTC-4	56°18.000	057°23.310	900
1	Makkovik-2	CTD	30/Jul/2007	17h14	UTC-4	56°47.300	057°17.800	2027
1	621	CTD	31/Jul/2007	07h09	UTC-4	56°24.900	061°31.000	108.9
1	622	Nutrient	31/Jul/2007	08h17	UTC-4	56°24.940	061°44.030	83
1	623	CTD	31/Jul/2007	09h54	UTC-4	56°26.580	061°56.080	85
1	624	Basic	31/Jul/2007	11h00	UTC-4	56°25.140	062°04.410	53.3
1	620	Basic	31/Jul/2007	17h36	UTC-4	56°24.056	061°13.127	60
1	617	Basic	01/Aug/2007	11h16	UTC-4	58°29.980	062°41.510	134
1	610	CTD	01/Aug/2007	16h09	UTC-4	58°31.320	062°50.330	117
1	612	CTD	01/Aug/2007	16h59	UTC-4	58°28.120	062°59.420	34
1	613	Nutrient	01/Aug/2007	18h00	UTC-4	58°28.940	063°13.290	255
1	614	CTD	01/Aug/2007	19h34	UTC-4	58°24.000	063°23.320	112.8
1	615	Basic	01/Aug/2007	20h53	UTC-4	58°19.076	063°33.017	120
1	600	Basic	02/Aug/2007	06h10	UTC-4	59°05.360	063°25.760	208.6
1	601	CTD	02/Aug/2007	09h45	UTC-4	59°02.660	063°37.470	25.5
1	602	Basic	02/Aug/2007	11h11	UTC-4	59°03.160	063°52.570	150
1	604	Nutrient	02/Aug/2007	15h25	UTC-4	58°59.380	063°53.750	53
1	356	Nutrient	03/Aug/2007	04h24	UTC-4	60°44.650	064°40.930	298.5
1	354	Nutrient	03/Aug/2007	07h10	UTC-4	60°59.990	064°45.520	512.7
1	352	Nutrient	03/Aug/2007	10h04	UTC-4	61°16.370	064°48.650	268
1	698	CTD	05/Aug/2007	01h45	UTC-4	62°08.150	078°43.000	156
1	699	Basic	05/Aug/2007	12h55	UTC-4	59°59.750	078°26.260	84
1	701	Basic	06/Aug/2007	02h46	UTC-4	58°23.220	078°22.430	84
1	700	Basic	06/Aug/2007	15h23	UTC-4	58°00.700	079°52.910	139
1	702	Full	09/Aug/2007	14h20	UTC-4	55°24.600	077°55.930	117
1	AN03	Mooring	09/Aug/2007	15h21	UTC-4	55°24.560	077°55.790	126
1	703	Basic	10/Aug/2007	17h13	UTC-4	54°40.600	079°57.230	37
1	James Bay entrance	MVP	10/Aug/2007	20h04	UTC-4	54°41.678	080°13.259	74
1	703a	Basic	11/Aug/2007	01h00	UTC-4	54°42.970	080°50.150	85
1	James Bay entrance	MVP	11/Aug/2007	01h43	UTC-4	54°42.410	081°39.070	85
1	704	Basic	11/Aug/2007	06h04	UTC-4	54°45.720	081°43.000	28
1	704a	Basic	11/Aug/2007	23h35	UTC-4	56°02.210	084°41.580	100
1	704b	Basic	12/Aug/2007	03h38	UTC-4	55°44.490	084°50.341	60
1	704c	Basic	12/Aug/2007	07h03	UTC-4	55°31.530	084°57.070	26
1	705c	Full	13/Aug/2007	17h46	UTC-4	57°42.390	090°54.000	29
1	705b	Full	13/Aug/2007	19h50	UTC-4	57°34.010	091°23.977	35
1	AN04	Mooring	13/Aug/2007	23h01	UTC-4	57°39.340	091°35.820	65
1	705	Full	13/Aug/2007	23h55	UTC-4	57°38.900	091°33.770	53
1	705a	Full	14/Aug/2007	07h14	UTC-4	57°27.080	091°53.060	29
1	AN02	Mooring	15/Aug/2007	05h17	UTC-4	58°46.970	091°31.420	75
1	706	Full	15/Aug/2007	06h24	UTC-4	58°46.800	091°31.120	74
1	AN01	Mooring	16/Aug/2007	03h31	UTC-4	59°58.997	091°56.551	106
1	707	Full	16/Aug/2007	05h19	UTC-4	59°58.650	091°57.250	100
Leg 3a								
3a	100	CTD	28/Sep/2007	18h38	UTC-4	74°23.317	080°12.109	715
3a	101	Full	29/Sep/2007	11h35	UTC-4	76°23.650	077°25.210	360
3a	103	Nutrient	30/Sep/2007	05h11	UTC-4	76°21.447	076°37.343	146
3a	105	Basic	30/Sep/2007	08h30	UTC-4	76°18.860	075°37.960	322
3a	N/A	RMT	30/Sep/2007	18h30	UTC-4	76°13.426	075°08.363	395
3a	N/A	MVP	30/Sep/2007	22h08	UTC-4	76°11.700	075°03.900	440
3a	115	Full	01/Oct/2007	05h08	UTC-4	76°20.459	071°13.238	668

Appendix 1 - List of stations sampled during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Depth (m)
3a	BA01	Mooring	01/Oct/2007	N/A	UTC-4	76°18.200	071°39.540	N/A
3a	113	Nutrient	02/Oct/2007	03h05	UTC-4	76°19.120	071°11.910	570
3a	111	Basic	02/Oct/2007	05h37	UTC-4	76°18.285	073°13.402	612
3a	108	Full	02/Oct/2007	16h50	UTC-4	76°16.036	074°31.471	443
3a	134	Basic	04/Oct/2007	03h23	UTC-4	75°38.270	079°29.120	547
3a	Nanissivik	Trawl	06/Oct/2007	17h33	UTC-4	75°08.186	084°52.725	244
3a	301	Nutrient	07/Oct/2007	06h37	UTC-4	74°07.233	083°19.596	690
3a	302	Full	07/Oct/2007	12h30	UTC-4	74°09.080	086°10.690	529
3a	305	Nutrient	08/Oct/2007	18h48	UTC-5	74°19.766	094°58.873	167
3a	308	Basic	09/Oct/2007	08h25	UTC-5	74°07.250	103°01.470	350
3a	309	Basic	10/Oct/2007	04h00	UTC-5	74°41.024	103°07.056	158
3a	N/A	BoxCore	10/Oct/2007	23h58	UTC-5	73°32.910	103°18.120	358
3a	310	Basic	11/Oct/2007	12h58	UTC-5	71°42.220	101°43.250	199
3a	314	Basic	12/Oct/2007	14h22	UTC-5	68°58.290	105°57.210	91
3a	N/A	Surface	14/Oct/2007	10h40	UTC-6	70°10.640	121°02.140	403
3a	Beaufort-1	CTD	14/Oct/2007	21h00	UTC-6	70°55.040	126°56.150	272
3a	434	Basic	15/Oct/2007	09h04	UTC-6	70°10.400	133°33.530	49
3a	433	CTD	15/Oct/2007	16h35	UTC-6	70°17.217	133°34.030	53
3a	432	Nutrient	15/Oct/2007	17h23	UTC-6	70°24.367	133°35.689	57
3a	431	CTD	15/Oct/2007	18h22	UTC-6	70°29.386	133°37.191	61
3a	430	Nutrient	15/Oct/2007	19h10	UTC-6	70°35.616	133°38.841	69
3a	429	CTD	15/Oct/2007	20h17	UTC-6	70°41.540	133°40.360	63
3a	428	Nutrient	15/Oct/2007	21h23	UTC-6	70°47.250	133°41.540	68
3a	427	CTD	16/Oct/2007	00h13	UTC-6	70°52.430	133°42.290	76
3a	426	Nutrient	16/Oct/2007	01h30	UTC-6	70°59.030	133°43.490	89
3a	435	Full	16/Oct/2007	03h53	UTC-6	71°04.930	133°39.140	306
3a	CA04	Mooring	16/Oct/2007	18h51	UTC-6	71°04.874	133°38.110	306
Leg 3b								
3b	437	Full	19/Oct/2007	01h13	UTC-6	71°46.510	126°31.190	341
3b	1806	Full	19/Oct/2007	12h10	UTC-6	72°39.740	127°07.200	96
3b	1804	CTD	19/Oct/2007	21h38	UTC-6	72°29.880	127°15.420	50
3b	1802	CTD	19/Oct/2007	23h33	UTC-6	72°18.070	127°27.070	49
3b	1800	Basic	20/Oct/2007	02h02	UTC-6	72°08.010	127°39.710	380
3b	1804	Basic	20/Oct/2007	08h58	UTC-6	72°11.440	127°49.930	357
3b	1800	Basic	20/Oct/2007	09h36	UTC-6	72°11.730	127°49.800	356
3b	437	Full	20/Oct/2007	14h57	UTC-6	71°47.650	126°30.650	307
3b	CA16	Mooring	20/Oct/2007	17h45	UTC-6	71°47.533	126°29.347	300
3b	410	CTD	21/Oct/2007	02h27	UTC-6	71°42.070	126°29.750	406
3b	411	CTD	21/Oct/2007	04h01	UTC-6	71°37.810	126°42.970	438
3b	412	Nutrient	21/Oct/2007	05h23	UTC-6	71°33.763	126°55.561	416
3b	413	CTD	21/Oct/2007	07h14	UTC-6	71°29.745	127°08.639	374
3b	N/A	LAWAS	21/Oct/2007	08h15	UTC-6	71°33.550	127°02.360	414
3b	CA16-MMP	Mooring	21/Oct/2007	12h04	UTC-6	71°45.237	126°30.422	350
3b	414	Nutrient	21/Oct/2007	15h38	UTC-6	71°25.380	127°21.190	312
3b	415	CTD	21/Oct/2007	17h15	UTC-6	71°21.923	127°32.478	247
3b	408	Full	21/Oct/2007	19h30	UTC-6	71°17.065	127°30.832	206
3b	417	CTD	22/Oct/2007	02h49	UTC-6	71°13.240	127°58.850	78
3b	418	CTD	22/Oct/2007	04h40	UTC-6	71°09.645	128°10.122	60
3b	419	CTD	22/Oct/2007	05h56	UTC-6	71°06.315	128°20.514	51
3b	N/A	LAWAS	22/Oct/2007	08h02	UTC-6	71°16.900	127°32.350	198
3b	408	Full	22/Oct/2007	09h15	UTC-6	71°17.000	127°32.180	202
3b	CA05	Mooring	22/Oct/2007	14h57	UTC-6	71°18.840	127°35.430	205
3b	CA05-MMP	Mooring	22/Oct/2007	20h30	UTC-6	71°24.170	127°38.020	235
3b	420	Basic	23/Oct/2007	00h19	UTC-6	71°03.500	128°28.810	37
3b	407	Full	23/Oct/2007	09h00	UTC-6	71°00.510	125°57.800	407
3b	CA08	Mooring	23/Oct/2007	N/A	UTC-6	71°00.650	126°03.760	N/A

Appendix 1 - List of stations sampled during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Depth (m)
3b	1018	CTD	24/Oct/2007	18h24	UTC-6	70°56.633	125°50.374	402
3b	1016	Nutrient	24/Oct/2007	17h48	UTC-6	70°52.888	125°18.588	330
3b	1014	CTD	24/Oct/2007	21h58	UTC-6	70°49.080	124°46.260	380
3b	1012	Nutrient	24/Oct/2007	23h58	UTC-6	70°45.290	124°14.410	529
3b	N/A	Surface	25/Oct/2007	00h16	UTC-6	70°45.180	124°14.600	532
3b	1010	CTD	25/Oct/2007	02h02	UTC-6	70°41.550	124°42.110	507
3b	405	Full	25/Oct/2007	04h13	UTC-6	70°40.035	122°59.421	550
3b	CA18	Mooring	25/Oct/2007	10h24	UTC-6	70°39.897	122°59.653	611
3b	1006	CTD	26/Oct/2007	03h02	UTC-6	70°36.050	122°37.650	550
3b	1004	Nutrient	26/Oct/2007	04h40	UTC-6	70°35.977	122°04.801	487
3b	1002	CTD	26/Oct/2007	06h42	UTC-6	70°36.061	121°32.663	458
3b	N/A	LAWAS	26/Oct/2007	07h50	UTC-6	70°36.150	121°07.650	431
3b	1000	Basic	26/Oct/2007	08h38	UTC-6	70°36.030	120°59.710	371
3b	1100	Basic	26/Oct/2007	22h10	UTC-6	71°02.670	123°15.870	265
3b	1102	CTD	27/Oct/2007	06h12	UTC-6	70°53.800	123°34.737	392
3b	1104	Nutrient	27/Oct/2007	07h53	UTC-6	70°45.130	123°53.750	420
3b	1106	CTD	27/Oct/2007	10h33	UTC-6	70°36.800	124°12.870	442
3b	1108	Nutrient	27/Oct/2007	12h12	UTC-6	70°27.670	124°34.400	253
3b	1110	Basic	27/Oct/2007	14h02	UTC-6	70°19.090	124°54.320	90
3b	1112	CTD	27/Oct/2007	21h55	UTC-6	70°13.780	125°19.230	102
3b	1114	Nutrient	28/Oct/2007	00h19	UTC-6	70°08.140	125°49.440	137
3b	1116	Full	28/Oct/2007	03h14	UTC-6	70°02.260	126°18.080	224
3b	1118	CTD	28/Oct/2007	16h43	UTC-6	70°11.103	126°39.160	205
3b	1120	CTD	28/Oct/2007	19h04	UTC-6	70°19.243	126°59.059	216
3b	1122	CTD	29/Oct/2007	00h08	UTC-6	70°27.250	127°23.550	56
3b	1124	Full	29/Oct/2007	16h54	UTC-6	70°38.116	127°39.604	148
3b	1216	Full	29/Oct/2007	18h30	UTC-6	70°37.030	127°34.891	177
3b	1214	CTD	30/Oct/2007	03h21	UTC-6	70°42.160	127°18.270	225
3b	1212	Nutrient	30/Oct/2007	06h56	UTC-6	70°49.356	126°53.722	273
3b	1210	CTD	30/Oct/2007	09h43	UTC-6	70°58.150	126°26.610	348
3b	1208	Nutrient	30/Oct/2007	20h10	UTC-6	71°04.690	126°01.870	415
3b	1206	CTD	31/Oct/2007	02h06	UTC-6	71°11.360	125°36.980	394
3b	1204	Nutrient	31/Oct/2007	03h45	UTC-6	71°18.490	125°11.090	307
3b	1202	CTD	31/Oct/2007	06h17	UTC-6	71°25.783	124°47.341	220
3b	1200	Full	31/Oct/2007	09h35	UTC-6	71°32.190	124°24.490	204
3b	411	BoxCore	01/Nov/2007	00h34	UTC-6	71°37.990	126°43.590	434
3b	1510	CTD	01/Nov/2007	04h25	UTC-6	71°40.124	127°36.144	376
3b	1508	Nutrient	01/Nov/2007	06h18	UTC-6	71°40.186	128°09.501	342
3b	1506	CTD	01/Nov/2007	12h16	UTC-6	71°40.120	128°51.090	281
3b	1504	Nutrient	01/Nov/2007	13h46	UTC-6	71°40.030	129°31.180	291
3b	1502	CTD	01/Nov/2007	15h32	UTC-6	71°39.800	130°10.140	256
3b	1600	Basic	01/Nov/2007	16h41	UTC-6	71°39.877	130°45.016	463
3b	1602	CTD	02/Nov/2007	04h53	UTC-6	71°28.107	130°40.898	210
3b	1604	Nutrient	02/Nov/2007	06h13	UTC-6	71°16.596	130°36.406	159
3b	1606	Basic	02/Nov/2007	08h04	UTC-6	71°04.110	130°33.600	47
3b	1608	CTD	02/Nov/2007	17h22	UTC-6	70°52.396	130°30.327	44
3b	1610	Nutrient	02/Nov/2007	18h47	UTC-6	70°40.467	130°26.507	34
3b	1900	CTD	03/Nov/2007	05h09	UTC-6	70°42.366	126°07.863	233
3b	1902	Basic	03/Nov/2007	08h30	UTC-6	71°33.130	125°43.140	343
3b	1904	CTD	04/Nov/2007	19h53	UTC-7	71°25.653	125°12.565	272
3b	1906	CTD	04/Nov/2007	22h17	UTC-7	71°17.350	124°44.680	244
3b	1908	Basic	05/Nov/2007	00h27	UTC-7	71°09.070	124°17.280	363
3b	1910	CTD	05/Nov/2007	13h20	UTC-7	71°00.910	123°51.510	311
3b	1912	CTD	05/Nov/2007	15h19	UTC-7	70°53.770	123°22.340	424
3b	1914	CTD	05/Nov/2007	19h45	UTC-7	70°53.709	122°46.563	395
3b	1916	Basic	06/Nov/2007	01h30	UTC-7	70°53.880	122°08.090	421

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
Leg 1																	
1	St. Lawrence	MVP	01/Jul/2007	13h50	UTC-4	47°56.027	069°31.191	MVP ↓	21.3	30	210	16	11.9	9.45	1009.7	79	0/10
1	St. Lawrence	MVP	01/Jul/2007	14h12	UTC-4	47°56.600	069°33.250	MVP ↑	22.7	15	210	17	12.2	9.49	1011.88	78	0/10
1	St. Lawrence	MVP	02/Jul/2007	11h06	UTC-4	48°12.900	069°18.260	MVP ↓	63	30	252	16	17.8	6.96	1016.98	73	0/10
1	St. Lawrence	MVP	02/Jul/2007	12h15	UTC-4	48°15.200	069°15.900	MVP ↑	158	230	230	10	14.1	6.57	1016.53	72	0/10
1	St. Lawrence	MVP	02/Jul/2007	12h30	UTC-4	48°15.540	069°16.270	MVP ↓	171	45	230	10	14.1	6.57	1016.5	72	0/10
1	St. Lawrence	MVP	02/Jul/2007	13h57	UTC-4	48°23.500	069°05.461	MVP ↑	235	47	230	6	13.9	7.75	1016.7	71	0/10
1	St. Lawrence	ROV	03/Jul/2007	N/A	UTC-4	N/A	N/A	ROV ↓	N/A	N/A	205	20	N/A	N/A	N/A	N/A	0/10
1	Makkovik-1	CTD	29/Jul/2007	10h08	UTC-4	56°18.000	057°23.310	CTD ↓↑	900	N/A	114	15	9.0	7.13	1010.2	83	0/10
1	Makkovik-2	CTD	30/Jul/2007	17h14	UTC-4	56°47.300	057°17.800	CTD ↓	2027	30	173	12	9.8	9.02	1009	89	0/10
1	Makkovik-2	CTD	30/Jul/2007	17h53	UTC-4	56°47.300	057°17.800	CTD ↑	2028	35	181	4	11.3	9.08	1008.5	82	0/10
1	Makkovik-2	CTD	30/Jul/2007	18h23	UTC-4	56°47.500	057°17.800	VMP ↓	2025	271	157	5	11.5	9.1	1008	80	0/10
1	Makkovik-2	CTD	30/Jul/2007	19h14	UTC-4	56°47.600	057°18.100	VMP ↑	2020	228	154	14	11.2	9.12	1008	80	0/10
1	621	CTD	31/Jul/2007	07h09	UTC-4	56°24.900	061°31.000	CTD ↓	108.9	227	266	6	9.8	6.31	1007	90	0/10
1	621	CTD	31/Jul/2007	07h15	UTC-4	56°24.900	061°30.900	CTD ↑	109	226	249	8	9.8	6.31	1007	90	0/10
1	622	Nutrient	31/Jul/2007	08h17	UTC-4	56°24.940	061°44.030	CTD-Rosette ↓	83	275	240	5	9.8	6.31	1007	90	0/10
1	622	Nutrient	31/Jul/2007	09h48	UTC-4	56°24.990	061°44.030	CTD-Rosette ↑	82	272	270	15	9.8	6.31	1007	90	0/10
1	623	CTD	31/Jul/2007	09h54	UTC-4	56°26.580	061°56.080	CTD ↓	85	270	270	5	9.8	6.31	1007.5	90	0/10
1	623	CTD	31/Jul/2007	10h02	UTC-4	56°26.580	061°56.080	CTD ↑	91	286	240	5	9.8	6.31	1007	90	0/10
1	624	Basic	31/Jul/2007	11h00	UTC-4	56°25.140	062°04.410	PNF ↓	53.3	289	336	6	9.8	6.31	1007.5	90	0/10
1	624	Basic	31/Jul/2007	11h07	UTC-4	56°25.120	062°04.380	PNF ↑	51.9	261	336	5	9.8	6.31	1007.5	90	0/10
1	624	Basic	31/Jul/2007	11h07	UTC-4	56°25.110	062°04.380	Secchi Disk ↓	50	261	334	5	9.8	6.31	1007.5	90	0/10
1	624	Basic	31/Jul/2007	11h10	UTC-4	56°25.110	062°04.380	Secchi Disk ↑	49	263	330	5	9.8	6.31	1007.5	90	0/10
1	624	Basic	31/Jul/2007	11h31	UTC-4	56°25.140	062°04.410	CTD-Rosette ↓	54.2	333	335	4	9.8	6.31	1007.5	90	0/10
1	624	Basic	31/Jul/2007	12h04	UTC-4	56°25.130	062°04.140	CTD-Rosette ↑	56.6	292	240	5	9.8	6.31	1007	90	0/10
1	624	Basic	31/Jul/2007	12h31	UTC-4	56°25.140	062°04.270	Hydrobios ↓	63.4	298	240	5	9.8	6.31	1007	90	0/10
1	624	Basic	31/Jul/2007	12h59	UTC-4	56°25.130	062°04.360	Hydrobios ↑	47.6	85	240	5	9.8	6.31	1007	90	0/10
1	624	Basic	31/Jul/2007	14h58	UTC-4	56°26.420	062°00.020	Box Core ↓	115	46	240	5	9.8	6.31	1008	90	0/10
1	624	Basic	31/Jul/2007	15h04	UTC-4	56°26.410	062°00.090	Box Core ↑	119	25	240	5	9.8	6.31	1008	90	0/10
1	620	Basic	31/Jul/2007	17h36	UTC-4	56°24.056	061°13.127	PNF ↓	60	87	41	12	9.8	6.31	1009	90	0/10
1	620	Basic	31/Jul/2007	17h45	UTC-4	56°24.050	061°13.120	PNF ↑	60	87	41	12	9.8	6.31	1009	90	0/10
1	620	Basic	31/Jul/2007	18h05	UTC-4	56°24.040	061°13.100	CTD-Rosette ↓	61.3	82	36	12	9.8	6.31	1009.5	90	0/10
1	620	Basic	31/Jul/2007	18h42	UTC-4	56°24.030	061°13.190	CTD-Rosette ↑	60.6	98	17	9	9.8	6.31	1010	90	0/10
1	620	Basic	31/Jul/2007	19h05	UTC-4	56°24.070	061°13.060	Hydrobios ↓	52	48	332	5	9.8	6.31	1010	90	0/10
1	620	Basic	31/Jul/2007	19h14	UTC-4	56°24.100	061°13.100	Hydrobios ↑	39.5	42	340	9	9.8	6.31	1010	90	0/10
1	620	Basic	31/Jul/2007	19h31	UTC-4	56°24.000	061°13.910	Horizontal Net Tow ↓	79.2	150	344	8	9.8	6.31	1010	90	0/10
1	620	Basic	31/Jul/2007	19h43	UTC-4	56°24.070	061°13.460	Horizontal Net Tow ↑	53	313	337	8	9.8	6.31	1010	90	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	617	Basic	01/Aug/2007	11h16	UTC-4	58°29.980	062°41.510	PNF ↓	134	31	354	15	N/A	N/A	1013.0	N/A	0/10
1	617	Basic	01/Aug/2007	11h30	UTC-4	58°30.000	062°41.210	PNF ↑	133.2	56	339	16	N/A	N/A	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	11h32	UTC-4	58°29.990	062°41.130	Secchi Disk ↓	132	70	350	15	N/A	N/A	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	11h34	UTC-4	58°29.990	062°41.130	Secchi Disk ↑	132	73	350	15	N/A	N/A	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	11h34	UTC-4	58°29.960	062°41.070	Secchi Disk ↓	161	90	348	15	N/A	N/A	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	11h37	UTC-4	58°29.960	062°41.060	Secchi Disk ↑	161	90	348	15	N/A	N/A	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	12h13	UTC-4	58°30.000	062°41.350	CTD-Rosette ↓	136	185	330	9	8.9	3.7	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	12h52	UTC-4	58°29.900	062°41.300	CTD-Rosette ↑	130	145	10	13	8.9	3.7	1013.7	N/A	0/10
1	617	Basic	01/Aug/2007	13h08	UTC-4	58°29.960	062°41.430	Hydrobios ↓	132	182	10	15	6.5	4.2	1013.7	N/A	0/10
1	617	Basic	01/Aug/2007	13h30	UTC-4	58°30.000	062°41.360	Hydrobios ↑	131	213	10	10	7.0	3.8	1013.7	N/A	0/10
1	617	Basic	01/Aug/2007	14h10	UTC-4	58°29.860	062°41.110	Horizontal Net Tow ↓	133	147	10	17	5.6	4.4	1013.7	N/A	0/10
1	617	Basic	01/Aug/2007	14h28	UTC-4	58°29.780	062°41.120	Horizontal Net Tow ↑	127	200	10	16	5.6	4.4	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	14h37	UTC-4	58°29.970	062°41.430	Horizontal Net Tow ↓	131	55	10	15	6.2	4.4	1013.5	N/A	0/10
1	617	Basic	01/Aug/2007	14h57	UTC-4	58°29.980	062°41.520	Horizontal Net Tow ↑	129	100	20	13	6.2	4.2	1013.7	N/A	0/10
1	617	Basic	01/Aug/2007	15h08	UTC-4	58°30.090	062°41.480	Box Core ↓	135	340	10	14	6.1	4.4	1013.8	90	0/10
1	617	Basic	01/Aug/2007	15h13	UTC-4	58°30.080	062°41.500	Box Core ↑	138	320	10	14	6.1	4.4	1013.8	91	0/10
1	610	CTD	01/Aug/2007	16h09	UTC-4	58°31.320	062°50.330	CTD ↓	117	5	44	19	6.6	3.97	1013.5	89	0/10
1	610	CTD	01/Aug/2007	16h17	UTC-4	58°31.240	062°50.400	CTD ↑	124	245	33	21	6.6	3.97	1013.5	89	0/10
1	612	CTD	01/Aug/2007	16h59	UTC-4	58°28.120	062°59.420	CTD ↓	34	215	35	7	6.4	4.14	1013.5	87	0/10
1	612	CTD	01/Aug/2007	17h04	UTC-4	58°28.120	062°59.420	CTD ↑	34.6	243	47	9	6.4	4.14	1013.5	87	0/10
1	613	Nutrient	01/Aug/2007	18h00	UTC-4	58°28.940	063°13.290	CTD-Rosette ↓	255	217	49	17	7.9	2.64	1013.5	80	0/10
1	613	Nutrient	01/Aug/2007	18h41	UTC-4	58°28.850	063°13.690	CTD-Rosette ↑	254	252	68	18	7.9	0.99	1013.5	78	0/10
1	614	CTD	01/Aug/2007	19h34	UTC-4	58°24.000	063°23.320	CTD ↓	112.8	253	3	4	7.3	3.43	1013.5	79	0/10
1	614	CTD	01/Aug/2007	19h42	UTC-4	58°23.960	063°23.350	CTD ↑	109.2	253	6	3	7.3	3.57	1013.5	79	0/10
1	615	Basic	01/Aug/2007	20h53	UTC-4	58°19.076	063°33.017	CTD-Rosette ↓	120	225	Calm	Calm	6.7	3.85	1014.2	83	0/10
1	615	Basic	01/Aug/2007	21h49	UTC-4	58°19.203	063°32.307	CTD-Rosette ↑	130	326	Calm	Calm	6.9	3.54	1014.1	82	0/10
1	615	Basic	01/Aug/2007	22h05	UTC-4	58°19.260	063°32.230	Hydrobios ↓	132	348	Calm	Calm	7.5	3.50	1014.1	77	0/10
1	615	Basic	01/Aug/2007	22h25	UTC-4	58°19.380	063°32.040	Hydrobios ↑	133	358	Calm	Calm	7.3	3.43	1014.2	83	0/10
1	615	Basic	01/Aug/2007	22h43	UTC-4	58°19.450	063°31.940	Horizontal Net Tow ↓	119	17	Calm	Calm	7.1	3.42	1014.2	83	0/10
1	615	Basic	01/Aug/2007	23h00	UTC-4	58°19.750	063°32.200	Horizontal Net Tow ↑	138	322	Calm	Calm	7.5	3.93	1014.0	83	0/10
1	600	Basic	02/Aug/2007	06h10	UTC-4	59°05.360	063°25.760	PNF ↓	208.6	267	250	12	9.0	2.42	1013.0	76	0/10
1	600	Basic	02/Aug/2007	06h21	UTC-4	59°05.350	063°25.770	PNF ↑	208.8	253	250	11	9.1	2.62	1013.0	75	0/10
1	600	Basic	02/Aug/2007	06h21	UTC-4	59°05.350	063°25.790	Secchi Disk ↓	208.8	253	250	11	9.1	2.62	1013.0	N/A	0/10
1	600	Basic	02/Aug/2007	06h24	UTC-4	59°05.340	063°25.790	Secchi Disk ↑	212	253	264	9	9.14	2.62	1013.0	75	0/10
1	600	Basic	02/Aug/2007	06h33	UTC-4	59°05.300	063°25.850	CTD-Rosette ↓	212.5	246	257	10	9.2	2.72	1013.0	76	0/10
1	600	Basic	02/Aug/2007	07h23	UTC-4	59°05.020	063°25.860	CTD-Rosette ↑	197.7	290	38	8	8.8	3.26	1013.0	75	0/10
1	600	Basic	02/Aug/2007	07h38	UTC-4	59°05.250	063°25.020	Hydrobios ↓	214	23	41	10	7.7	3.44	1013.0	80	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	600	Basic	02/Aug/2007	08h16	UTC-4	59°05.330	063°26.070	Hydrobios ↑	214	9	40	10	7.4	2.97	1013.8	80	0/10
1	600	Basic	02/Aug/2007	08h30	UTC-4	59°05.500	063°26.000	Horizontal Net Tow ↓	214	N/A	220	5	8.5	2.7	1013.7	76	0/10
1	600	Basic	02/Aug/2007	08h45	UTC-4	59°05.370	063°26.250	Horizontal Net Tow ↑	214.8	240	Calm	Calm	9.7	2.7	1013.7	71	0/10
1	601	CTD	02/Aug/2007	09h45	UTC-4	59°02.660	063°37.470	CTD ↓	25.5	119	105	2	10.5	4.45	1013.8	71	0/10
1	601	CTD	02/Aug/2007	10h00	UTC-4	59°02.830	063°38.800	CTD ↑	156	N/A	60	5	11.1	3.48	1016.1	68	0/10
1	602	Basic	02/Aug/2007	11h11	UTC-4	59°03.160	063°52.570	PNF ↓	150	276	90	8	13.1	6.72	1013.5	61	0/10
1	602	Basic	02/Aug/2007	11h22	UTC-4	59°03.290	063°52.300	PNF ↑	151	20	95	10	12.3	5.0	1015.6	70	0/10
1	602	Basic	02/Aug/2007	11h29	UTC-4	59°03.290	063°52.300	CTD-Rosette ↓	150	13	95	10	12.3	5.0	1015.6	70	0/10
1	602	Basic	02/Aug/2007	12h10	UTC-4	59°03.300	063°52.520	CTD-Rosette ↑	150	6	110	10	10.5	3.6	1013.2	79	0/10
1	602	Basic	02/Aug/2007	12h55	UTC-4	59°03.130	063°52.130	Hydrobios ↓	150	325	100	7	11.3	2.9	1013.0	68	0/10
1	602	Basic	02/Aug/2007	13h17	UTC-4	59°03.150	063°52.350	Hydrobios ↑	148	355	100	10	12.2	3.3	1012.6	65	0/10
1	602	Basic	02/Aug/2007	13h37	UTC-4	59°03.110	063°52.040	Horizontal Net Tow ↓	148	70	90	18	11.8	4.4	1012.3	65	0/10
1	602	Basic	02/Aug/2007	13h50	UTC-4	59°03.280	063°52.320	Horizontal Net Tow ↑	149	180	90	15	11.9	5.5	1012.3	64	0/10
1	602	Basic	02/Aug/2007	13h55	UTC-4	59°03.070	063°52.140	Horizontal Net Tow ↓	149	110	80	15	11.8	5.5	1012.5	62	0/10
1	602	Basic	02/Aug/2007	14h05	UTC-4	59°03.270	063°52.280	Horizontal Net Tow ↑	160	250	100	20	13.1	5.6	1012.1	58	0/10
1	602	Basic	02/Aug/2007	14h20	UTC-4	59°03.130	063°52.390	Box Core ↓	148	62	30	21	13.7	5.9	1012.2	56	0/10
1	602	Basic	02/Aug/2007	14h37	UTC-4	59°03.170	063°52.430	Box Core ↑	148	345	30	21	13.7	5.4	1012.2	56	0/10
1	604	Nutrient	02/Aug/2007	15h25	UTC-4	58°59.380	063°53.750	CTD-Rosette ↓	53	230	20	12	15.9	5.8	1012.5	49	0/10
1	604	Nutrient	02/Aug/2007	15h55	UTC-4	58°59.390	063°53.500	CTD-Rosette ↑	51	245	360	8	16.7	4.3	1012.3	47	0/10
1	356	Nutrient	03/Aug/2007	04h24	UTC-4	60°44.650	064°40.930	CTD-Rosette ↓	298.5	272	157	3	9.2	1.6	1012.0	65	0/10
1	356	Nutrient	03/Aug/2007	05h19	UTC-4	60°44.750	064°36.280	CTD-Rosette ↑	299	198	133	12	3.8	2.38	1011.0	86	0/10
1	354	Nutrient	03/Aug/2007	07h10	UTC-4	60°59.990	064°45.520	CTD-Rosette ↓	512.7	131	132	14	3.7	1.46	1010.0	89	0/10
1	354	Nutrient	03/Aug/2007	08h08	UTC-4	61°05.970	064°15.090	CTD-Rosette ↑	508	168	140	16	3.9	1.55	1009.7	89	0/10
1	352	Nutrient	03/Aug/2007	10h04	UTC-4	61°16.370	064°48.650	CTD-Rosette ↓	268	65	65	10	3.1	1.25	1009.4	93	0/10
1	352	Nutrient	03/Aug/2007	10h58	UTC-4	61°15.880	064°57.280	CTD-Rosette ↑	261	324	140	13	4.6	0.52	1009.0	87	0/10
1	698	CTD	05/Aug/2007	01h45	UTC-4	62°08.150	078°43.000	AC-9 ↓	156	300	330	16	6.2	5.2	1002.0	91	0/10
1	698	CTD	05/Aug/2007	02h15	UTC-4	62°08.070	078°42.730	AC-9 ↑	152	100	290	16	6.3	5.2	1002.3	87	0/10
1	698	CTD	05/Aug/2007	02h25	UTC-4	62°08.070	078°42.850	CTD-Rosette ↓	149	135	300	17	6.3	5.4	1002.3	87	0/10
1	698	CTD	05/Aug/2007	02h57	UTC-4	62°08.020	078°42.650	CTD-Rosette ↑	144	202	310	20	7.1	5.7	1002.5	85	0/10
1	699	Basic	05/Aug/2007	12h55	UTC-4	59°59.750	078°26.260	PNF ↓	84	245	240	6	8.4	9.5	1005.5	92	0/10
1	699	Basic	05/Aug/2007	13h04	UTC-4	59°59.930	078°26.160	PNF ↑	85	250	240	5	8.4	9.5	1005.5	91	0/10
1	699	Basic	05/Aug/2007	13h04	UTC-4	59°59.930	078°26.160	Secchi Disk ↓	85	250	240	5	8.4	9.5	1005.5	91	0/10
1	699	Basic	05/Aug/2007	13h07	UTC-4	59°59.940	078°26.140	Secchi Disk ↑	85	250	240	5	8.4	9.5	1005.5	91	0/10
1	699	Basic	05/Aug/2007	13h17	UTC-4	59°59.950	078°26.070	CTD-Rosette ↓	86	165	230	5	8.6	9.1	1005.5	91	0/10
1	699	Basic	05/Aug/2007	13h50	UTC-4	59°59.940	078°26.150	CTD-Rosette ↑	75	178	230	6	8.9	9	1005.2	90	0/10
1	699	Basic	05/Aug/2007	14h02	UTC-4	60°00.080	078°25.000	Horizontal Net Tow ↓	78	300	240	8	8.7	9	1005.3	91	0/10
1	699	Basic	05/Aug/2007	14h13	UTC-4	59°59.930	078°26.120	Horizontal Net Tow ↑	77	40	220	8	8.7	9.3	1005.3	91	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	699	Basic	05/Aug/2007	14h28	UTC-4	60°00.010	078°25.960	Vertical Net Tow ↓	87	91	230	5	9	9.8	1005.4	89	0/10
1	699	Basic	05/Aug/2007	14h40	UTC-4	60°00.220	078°26.170	Vertical Net Tow ↑	85	137	240	3	10.8	9.7	1005.2	81	0/10
1	699	Basic	05/Aug/2007	14h45	UTC-4	60°00.000	078°25.900	Sounding for Box Core	86	354	230	8	8.9	9.6	1005.1	91	0/10
1	699	Basic	05/Aug/2007	16h00	UTC-4	N/A	N/A	Sounding for Box Core (end)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	699	Basic	05/Aug/2007	16h13	UTC-4	60°00.580	078°26.540	Box Core ↓	94	280	205	3	9.2	10.4	1004.5	88	0/10
1	699	Basic	05/Aug/2007	16h15	UTC-4	60°00.580	078°26.540	Box Core ↑	95	279	213	3	9.2	10.4	1004.5	88	0/10
1	699	Basic	05/Aug/2007	16h25	UTC-4	60°00.600	078°26.600	Sounding for Box Core	95	0	200	2	9.6	10.5	1004.4	84	0/10
1	699	Basic	05/Aug/2007	17h28	UTC-4	59°59.050	078°26.100	Sounding for Box Core (end)	76	154	190	2	9.4	10.6	1004.3	85	0/10
1	701	Basic	06/Aug/2007	02h46	UTC-4	58°23.220	078°22.430	CTD-Rosette ↓	84	320	70	15	10.6	7.4	996.5	93	0/10
1	701	Basic	06/Aug/2007	03h18	UTC-4	58°22.990	078°23.170	CTD-Rosette ↑	101	340	80	18	10.3	7.4	996.4	94	0/10
1	701	Basic	06/Aug/2007	03h30	UTC-4	58°23.120	078°22.580	Horizontal Net Tow ↓	75	70	75	15	10.9	7.4	996.1	93	0/10
1	701	Basic	06/Aug/2007	03h43	UTC-4	58°23.190	078°22.490	Horizontal Net Tow ↑	85	170	70	15	10.6	7.4	995.8	93	0/10
1	701	Basic	06/Aug/2007	04h00	UTC-4	58°22.940	078°23.130	Vertical Net Tow ↓	101	246	60	20	12.6	7.42	995.6	85	0/10
1	701	Basic	06/Aug/2007	04h09	UTC-4	58°22.930	078°23.220	Vertical Net Tow ↑	101	261	57	19	10.7	7.35	995.4	92	0/10
1	701	Basic	06/Aug/2007	04h19	UTC-4	58°22.880	078°23.360	AC-9 ↓	101	232	56	17	12.1	7.31	995.4	86	0/10
1	701	Basic	06/Aug/2007	04h57	UTC-4	58°22.780	078°24.230	AC-9 ↑	107	219	40	18	12.9	7.39	995.1	86	0/10
1	701	Basic	06/Aug/2007	05h18	UTC-4	58°23.230	078°22.480	Box Core ↓	90	62	44	20	10.6	7.39	994.6	94	0/10
1	701	Basic	06/Aug/2007	05h21	UTC-4	58°23.220	078°22.480	Box Core (bottom)	85	66	44	22	10.5	7.5	994.7	95	0/10
1	701	Basic	06/Aug/2007	05h25	UTC-4	58°23.200	078°22.480	Box Core ↑	85	86	42	23	10.5	7.5	994.7	95	0/10
1	701	Basic	06/Aug/2007	06h06	UTC-4	58°22.240	078°26.590	VMP ↓	100	230	55	23	11.1	7.48	996.4	93	0/10
1	701	Basic	06/Aug/2007	08h15	UTC-4	58°16.900	078°47.760	VMP ↑	69	246	50	25	14.2	7.14	996.1	80	0/10
1	701	Basic	06/Aug/2007	08h44	UTC-4	58°15.332	078°54.091	VMP ↓	60	245	50	25	10.6	7.71	995.9	93	0/10
1	701	Basic	06/Aug/2007	14h25	UTC-4	58°00.610	079°53.120	VMP ↑	140	250	10	17	9.3	6.8	996.0	89	0/10
1	701	Basic	06/Aug/2007	14h37	UTC-4	58°00.600	079°52.920	AC-9 ↓	138	90	0	20	9.5	7.4	996.3	88	0/10
1	701	Basic	06/Aug/2007	14h55	UTC-4	58°00.240	079°53.370	AC-9 ↑	140	147	350	21	9.4	7.8	996.4	85	0/10
1	701	Basic	06/Aug/2007	15h03	UTC-4	58°00.540	079°52.980	PNF ↓	141	145	350	20	9.4	7.8	996.5	85	0/10
1	701	Basic	06/Aug/2007	15h05	UTC-4	58°00.620	079°52.390	PNF ↑ (reading problem)	139	104	350	22	9.4	7.8	996.5	85	0/10
1	701	Basic	06/Aug/2007	15h06	UTC-4	58°00.620	079°52.390	Secchi Disk ↓	139	104	350	22	9.4	7.8	996.5	85	0/10
1	701	Basic	06/Aug/2007	15h08	UTC-4	58°00.000	079°52.980	Secchi Disk ↑	137	104	350	22	9.4	7.8	996.5	85	0/10
1	700	Basic	06/Aug/2007	15h23	UTC-4	58°00.700	079°52.910	CTD-Rosette ↓	139	195	350	22	9.4	7.9	997.0	86	0/10
1	700	Basic	06/Aug/2007	16h18	UTC-4	58°00.200	079°52.440	CTD-Rosette ↑	147	164	345	22	9.9	8	998.0	86	0/10
1	700	Basic	06/Aug/2007	16h21	UTC-4	58°00.130	079°52.480	PNF ↓	146	173	345	22	10.3	7.97	998.0	85	0/10
1	700	Basic	06/Aug/2007	16h26	UTC-4	58°00.110	079°52.580	PNF ↑	146	150	340	22	10.3	7.97	998.0	85	0/10
1	700	Basic	06/Aug/2007	16h36	UTC-4	57°59.930	079°52.880	Vertical Net Tow ↓	141	179	340	23	9.6	7.99	998.7	87	0/10
1	700	Basic	06/Aug/2007	16h50	UTC-4	57°59.960	079°52.980	Vertical Net Tow ↑	139	168	340	25	12.4	7.66	998.8	77	0/10
1	700	Basic	06/Aug/2007	17h06	UTC-4	57°59.760	079°53.110	Horizontal Net Tow ↓	140	113	340	20	11.4	7.36	999.0	80	0/10
1	700	Basic	06/Aug/2007	17h21	UTC-4	57°59.500	079°52.340	Horizontal Net Tow ↑	136	72	330	21	8.9	7.6	999.0	87	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	700	Basic	06/Aug/2007	17h28	UTC-4	58°00.520	079°52.940	Horizontal Net Tow ↓	142	127	330	21	8.3	7.6	999.3	87	0/10
1	700	Basic	06/Aug/2007	17h41	UTC-4	57°59.510	079°52.090	Horizontal Net Tow ↑	146	270	340	23	9.2	6.5	999.6	83	0/10
1	700	Basic	06/Aug/2007	18h34	UTC-4	58°01.410	079°49.860	Box Core ↓	147	172	335	25	10.0	6.83	1000.0	78	0/10
1	700	Basic	06/Aug/2007	18h41	UTC-4	58°01.370	079°20.010	Box Core ↑	144	163	134	18	10.6	6.47	1000.7	77	0/10
1	702	Full	09/Aug/2007	14h20	UTC-4	55°24.600	077°55.930	CTD ↓	117	312	190	14	18.2	11.4	1007.1	61	0/10
1	702	Full	09/Aug/2007	14h30	UTC-4	55°24.690	077°55.340	CTD ↑	124	346	190	15	17.6	11.7	1006.9	64	0/10
1	AN03-06	Mooring	09/Aug/2007	15h21	UTC-4	55°24.560	077°55.790	Mooring AN03-06 Recovered	126	318	190	13	18.2	10.9	1006.9	62	0/10
1	AN03-06	Mooring	09/Aug/2007	15h38	UTC-4	55°24.310	077°55.750	Mooring AN03-06 Recovered (on board)	129	157	190	17	18.0	11.5	1006.0	63	0/10
1	AN03-06	Mooring	09/Aug/2007	16h00	UTC-4	N/A	N/A	Mooring AN03-06 Recovered (end)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0/10
1	702	Full	09/Aug/2007	16h22	UTC-4	55°24.400	077°55.670	PNF ↓	126	275	232	22	15.3	11.38	1006.8	79	0/10
1	702	Full	09/Aug/2007	16h27	UTC-4	55°24.450	077°55.620	PNF ↑	124	343	230	26	15.3	11.38	1006.8	79	0/10
1	702	Full	09/Aug/2007	16h38	UTC-4	55°24.630	077°55.750	Secchi Disk ↓	135	204	215	24	15.1	11.54	1006.7	83	0/10
1	702	Full	09/Aug/2007	16h40	UTC-4	55°24.630	077°55.740	Secchi Disk ↑	135	174	220	23	16.6	11.83	1006.6	75	0/10
1	702	Full	09/Aug/2007	16h49	UTC-4	55°24.620	077°55.740	CTD-Rosette ↓	135	42	208	21	18	11.76	1006.7	70	0/10
1	702	Full	09/Aug/2007	17h11	UTC-4	55°24.640	077°55.750	CTD-Rosette ↑	134	73	211	20	15	10.41	1007.0	65	0/10
1	702	Full	09/Aug/2007	17h23	UTC-4	55°26.640	077°55.270	Horizontal Net Tow ↓	134	36	210	11	16	10.1	1006.7	69	0/10
1	702	Full	09/Aug/2007	17h37	UTC-4	55°24.980	077°55.280	Horizontal Net Tow ↑	130	280	210	13	16	10.2	1006.7	66	0/10
1	702	Full	09/Aug/2007	17h55	UTC-4	55°24.800	077°55.020	Vertical Net Tow ↓	125	198	220	15	15	11	1006.5	79	0/10
1	702	Full	09/Aug/2007	18h07	UTC-4	55°24.890	077°55.600	Vertical Net Tow ↑	131	6	235	18	15.5	11.47	1006.5	79	0/10
1	702	Full	09/Aug/2007	18h30	UTC-4	55°24.390	077°55.560	Hydrobios ↓	131	225	236	16	15.8	11.59	1006.9	74	0/10
1	702	Full	09/Aug/2007	18h46	UTC-4	55°24.340	077°55.540	Hydrobios ↑	117	212	236	16	15.5	11.5	1007.0	76	0/10
1	702	Full	09/Aug/2007	19h10	UTC-4	55°24.380	077°55.530	RMT ↓	129	2	240	11	15.1	11.89	1007.0	78	0/10
1	702	Full	09/Aug/2007	19h33	UTC-4	55°24.680	077°55.160	RMT ↑	124	132	240	11	15.1	11.89	1007.0	78	0/10
1	702	Full	09/Aug/2007	20h20	UTC-4	55°24.310	077°56.320	Box Core ↓	134	234	250	12	14.9	10.79	1007.0	79	0/10
1	702	Full	09/Aug/2007	20h28	UTC-4	55°24.300	077°56.330	Box Core ↑	135	255	250	15	14.9	11.46	1007.0	78	0/10
1	702	Full	09/Aug/2007	23h34	UTC-4	55°19.784	077°48.799	Box Core ↓	74	335	60	5	11.7	13.85	1008.0	93	0/10
1	702	Full	09/Aug/2007	23h40	UTC-4	55°19.783	077°48.814	Box Core ↑	74	338	60	5	11.7	13.85	1008.0	93	0/10
1	702	Full	10/Aug/2007	01h52	UTC-4	55°17.230	077°49.270	Box Core ↓	60	142	340	13	10.1	14.3	1008.0	97	0/10
1	702	Full	10/Aug/2007	01h57	UTC-4	55°17.190	077°49.250	Box Core ↑	60	179	340	13	10.1	14.3	1008.0	97	0/10
1	AN03-07	Mooring	10/Aug/2007	07h35	UTC-4	55°24.410	077°55.710	Mooring AN03-07 Deployed	125	29	3	15	7.3	10.7	1010.0	99	0/10
1	AN03-07	Mooring	10/Aug/2007	08h11	UTC-4	55°24.477	077°55.916	Mooring AN03-07 Deployed (end)	137	0	20	17	7.3	10.7	1010.0	99	0/10
1	702	Full	10/Aug/2007	08h56	UTC-4	55°24.520	077°55.980	PNF ↓	135	33	10	16	7.7	10.66	1010.0	94	0/10
1	702	Full	10/Aug/2007	09h00	UTC-4	55°24.520	077°55.980	PNF ↑	135	55	10	16	7.7	10.66	1010.0	95	0/10
1	702	Full	10/Aug/2007	09h01	UTC-4	55°24.520	077°55.930	Secchi Disk ↓	136	45	10	18	7.7	10.69	1011.0	95	0/10
1	702	Full	10/Aug/2007	09h03	UTC-4	55°24.520	077°55.910	Secchi Disk ↑	136	54	10	18	7.7	10.69	1011.0	95	0/10
1	702	Full	10/Aug/2007	09h12	UTC-4	55°24.400	077°55.860	CTD-Rosette ↓	126	200	0	15	7.7	10.71	1011.0	96	0/10
1	702	Full	10/Aug/2007	09h57	UTC-4	55°24.000	077°56.090	CTD-Rosette ↑	132	220	0	18	8.9	10.77	1011.0	92	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	703	Basic	10/Aug/2007	17h13	UTC-4	54°40.600	079°57.230	PNF ↓	37	346	333	15	7.9	9.55	1013.8	95	0/10
1	703	Basic	10/Aug/2007	17h18	UTC-4	54°40.600	079°57.220	PNF ↑	39	351	330	13	7.9	9.55	1013.8	95	0/10
1	703	Basic	10/Aug/2007	17h19	UTC-4	54°40.610	079°57.220	PNF ↓	37	354	336	16	7.1	9.5	1013.7	97	0/10
1	703	Basic	10/Aug/2007	17h23	UTC-4	54°40.620	079°57.210	PNF ↑	37	354	340	16	7.1	9.5	1013.7	97	0/10
1	703	Basic	10/Aug/2007	17h33	UTC-4	54°40.610	079°57.200	CTD-Rosette ↓	38	339	340	16	6.9	9.48	1013.9	98	0/10
1	703	Basic	10/Aug/2007	18h05	UTC-4	54°40.420	079°57.170	CTD-Rosette ↑	63	348	350	15	6.8	9.41	1014.0	99	0/10
1	703	Basic	10/Aug/2007	18h19	UTC-4	54°40.420	079°57.030	Horizontal Net Tow ↓	67	92	340	14	6.8	9.39	1014.0	99	0/10
1	703	Basic	10/Aug/2007	18h30	UTC-4	54°40.470	079°56.440	Horizontal Net Tow ↑	48	51	340	13	6.9	9.5	1014.0	99	0/10
1	703	Basic	10/Aug/2007	19h01	UTC-4	54°40.580	079°57.420	Vertical Net Tow ↓	45	172	345	14	7.3	9.6	1014.0	99	0/10
1	703	Basic	10/Aug/2007	19h07	UTC-4	54°40.580	079°57.430	Vertical Net Tow ↑	44	178	338	14	7.3	9.6	1014.0	99	0/10
1	703	Basic	10/Aug/2007	19h22	UTC-4	54°40.440	079°57.130	Box Core ↓	63	156	338	12	8.7	9.13	1014.5	93	0/10
1	703	Basic	10/Aug/2007	19h23	UTC-4	54°40.440	079°57.140	Box Core (bottom)	62	164	344	13	8.7	9.13	1014.5	93	0/10
1	703	Basic	10/Aug/2007	19h25	UTC-4	54°40.430	079°57.140	Box Core ↑	62	167	340	13	8.7	9.13	1014.0	93	0/10
1	N/A	MVP	10/Aug/2007	20h04	UTC-4	54°41.678	080°13.259	MVP ↓	74	280	350	17	7.3	9.42	1014.0	98	0/10
1	N/A	MVP	11/Aug/2007	00h47	UTC-4	54°43.020	080°50.240	MVP ↑	86	277	330	11	7.5	7.6	1016.6	99	0/10
1	703a	Basic	11/Aug/2007	01h00	UTC-4	54°42.970	080°50.150	CTD-Rosette ↓	85	190	340	8	7.6	7.7	1016.8	99	0/10
1	703a	Basic	11/Aug/2007	01h20	UTC-4	54°42.970	080°50.070	CTD-Rosette ↑	86	250	0	5	7.9	7.6	1016.8	98	0/10
1	N/A	MVP	11/Aug/2007	01h43	UTC-4	54°42.410	081°39.070	MVP ↓	85	275	340	11	7.5	7.6	1016.7	99	0/10
1	N/A	MVP	11/Aug/2007	04h54	UTC-4	54°44.690	081°27.460	MVP ↑	39	282	40	4	7.2	7.9	1017.0	99	0/10
1	704	Basic	11/Aug/2007	06h04	UTC-4	54°45.720	081°43.000	PNF ↓	28	31	63	3	7.1	6.97	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h08	UTC-4	54°45.670	081°43.010	PNF ↑	28	16	62	3	7.1	6.97	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h09	UTC-4	54°45.670	081°43.010	Secchi Disk ↓	28	16	62	3	7.1	6.97	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h13	UTC-4	54°45.610	081°43.040	Secchi Disk ↑	28	23	50	2	7.5	6.94	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h14	UTC-4	54°45.570	081°43.060	Secchi Disk ↓	27	20	20	1	7.5	6.94	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h17	UTC-4	54°45.520	081°43.090	Secchi Disk ↑	27	20	342	1	7.5	6.94	1017.7	99	0/10
1	704	Basic	11/Aug/2007	06h46	UTC-4	54°45.800	081°42.970	CTD-Rosette ↓	27	5	91	2	7.1	6.88	1017.7	98	0/10
1	704	Basic	11/Aug/2007	07h12	UTC-4	54°45.630	081°43.260	CTD-Rosette ↑	27	30	39	6	7.9	6.82	1017.7	95	0/10
1	704	Basic	11/Aug/2007	07h27	UTC-4	54°46.080	081°43.230	Horizontal Net Tow ↓	27	325	59	6	7.8	6.73	1017.8	95	0/10
1	704	Basic	11/Aug/2007	07h34	UTC-4	54°46.070	081°43.570	Horizontal Net Tow ↑	26	207	54	7	7.9	6.73	1018.0	95	0/10
1	704	Basic	11/Aug/2007	07h41	UTC-4	54°45.910	081°43.660	Horizontal Net Tow ↓	27	122	56	7	7.9	6.8	1018.0	95	0/10
1	704	Basic	11/Aug/2007	07h47	UTC-4	54°45.740	081°43.580	Horizontal Net Tow ↑	27	346	65	7	7.9	6.8	1018.0	95	0/10
1	704	Basic	11/Aug/2007	08h52	UTC-4	54°45.850	081°42.980	Box Core ↓	27	93	70	9	7.7	6.9	1018.0	95	0/10
1	704	Basic	11/Aug/2007	08h56	UTC-4	54°45.820	081°46.050	Box Core ↑	27	107	70	9	7.7	6.9	1018.0	95	0/10
1	704a	Basic	11/Aug/2007	23h35	UTC-4	56°02.210	084°41.580	CTD-Rosette ↓	100	320	110	35	7	6.5	1001.0	97	0/10
1	704a	Basic	12/Aug/2007	00h05	UTC-4	56°02.070	084°44.430	CTD-Rosette ↑	104	320	120	25	11.2	6	1000.5	81	0/10
1	704a	Basic	12/Aug/2007	00h21	UTC-4	56°02.240	084°44.420	Box Core ↓	103	320	120	27	9	5.8	999.7	89	0/10
1	704a	Basic	12/Aug/2007	00h29	UTC-4	56°02.290	084°44.490	Box Core ↑	102	338	120	27	9	5.8	999.7	89	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	704b	Basic	12/Aug/2007	03h38	UTC-4	55°44.490	084°50.341	CTD-Rosette ↓	60	18	140	22	8.6	7.2	996.1	94	0/10
1	704b	Basic	12/Aug/2007	04h03	UTC-4	55°44.360	084°50.020	CTD-Rosette ↑	59	10	140	16	9.5	7.23	995.7	93	0/10
1	704b	Basic	12/Aug/2007	04h13	UTC-4	55°44.470	084°50.120	Horizontal Net Tow ↓	60	327	140	15	10.9	7.01	995.7	87	0/10
1	704b	Basic	12/Aug/2007	04h30	UTC-4	55°44.870	084°50.770	Horizontal Net Tow ↑	61	314	150	19	9.2	7.31	995.5	94	0/10
1	704b	Basic	12/Aug/2007	04h56	UTC-4	55°44.390	084°50.050	Box Core ↓	58	346	159	22	9.6	7.59	995.5	95	0/10
1	704b	Basic	12/Aug/2007	04h58	UTC-4	55°44.390	084°50.030	Box Core (bottom)	58	342	159	22	9.6	7.59	995.5	95	0/10
1	704b	Basic	12/Aug/2007	05h01	UTC-4	55°44.410	084°50.000	Box Core ↑	58	351	165	22	9.7	7.49	995.8	95	0/10
1	704c	Basic	12/Aug/2007	07h03	UTC-4	55°31.530	084°57.070	PNF ↓	26	293	233	22	10.1	8.1	996.0	91	0/10
1	704c	Basic	12/Aug/2007	07h06	UTC-4	55°31.610	084°57.060	PNF ↑	26	300	232	25	10.1	8.1	996.0	91	0/10
1	704c	Basic	12/Aug/2007	07h13	UTC-4	55°31.700	084°57.100	Secchi Disk ↓	26	218	235	22	9.8	8.1	996.5	91	0/10
1	704c	Basic	12/Aug/2007	07h15	UTC-4	55°31.710	084°57.080	Secchi Disk ↑	26	210	238	23	9.8	8.1	996.5	91	0/10
1	704c	Basic	12/Aug/2007	07h37	UTC-4	55°31.540	084°57.140	CTD-Rosette ↓	25	231	252	27	10.3	7.8	996.4	88	0/10
1	704c	Basic	12/Aug/2007	08h10	UTC-4	55°31.500	084°56.980	CTD-Rosette ↑	25	154	250	21	9.5	7.3	996.9	94	0/10
1	704c	Basic	12/Aug/2007	08h47	UTC-4	55°31.730	084°57.030	Box Core ↓↑	26	250	260	25	9.2	7.8	997.4	92	0/10
1	705c	Full	13/Aug/2007	17h46	UTC-4	57°42.390	090°54.000	CTD-Rosette ↓	29	347	135	5	9.6	8.7	1017.2	86	0/10
1	705c	Full	13/Aug/2007	17h58	UTC-4	57°42.540	090°54.090	CTD-Rosette ↑	30	322	102	6	9.9	8.33	1014.0	88	0/10
1	705b	Full	13/Aug/2007	19h50	UTC-4	57°34.010	091°23.977	CTD-Rosette ↓	35	166	110	12	10.7	9.85	1012.0	90	0/10
1	705b	Full	13/Aug/2007	20h06	UTC-4	57°33.772	091°24.290	CTD-Rosette ↑	34	195	110	13	10.5	9.67	1012.0	90	0/10
1	AN04-07	Mooring	13/Aug/2007	23h01	UTC-4	57°39.340	091°35.820	Mooring AN04-07 Deployed	65	45	100	16	9	8.72	1009.0	96	0/10
1	AN05-06	Mooring	13/Aug/2007	23h18	UTC-4	57°39.402	091°35.797	Mooring AN05-06 Recovered	68	90	100	16	9	8.72	1009.0	96	0/10
1	705	Full	13/Aug/2007	23h55	UTC-4	57°38.900	091°33.770	Horizontal Net Tow ↓	53	345	90	14	9.1	8.6	1008.3	96	0/10
1	705	Full	14/Aug/2007	00h08	UTC-4	57°38.860	091°40.280	Horizontal Net Tow ↑	53	129	100	10	9.1	8.5	1008.2	92	0/10
1	705	Full	14/Aug/2007	00h23	UTC-4	57°38.810	091°40.570	Vertical Net Tow ↓	54	270	90	18	8.7	8.6	1007.7	92	0/10
1	705	Full	14/Aug/2007	00h30	UTC-4	57°38.820	091°40.590	Vertical Net Tow ↑	53	272	90	19	10.1	8.5	1007.6	87	0/10
1	705	Full	14/Aug/2007	01h36	UTC-4	57°39.830	091°28.900	Hydrobios ↓	46	268	90	17	8.4	8.6	1006.6	93	0/10
1	705	Full	14/Aug/2007	01h55	UTC-4	57°39.880	091°28.801	Hydrobios ↑	45	272	80	18	9.4	8.6	1006.4	89	0/10
1	705	Full	14/Aug/2007	01h58	UTC-4	57°39.830	091°37.640	RMT ↓	45	141	80	20	9.4	8.6	1006.1	88	0/10
1	705	Full	14/Aug/2007	02h15	UTC-4	57°40.370	091°57.650	RMT ↑	42	202	100	15	8.5	8.7	1005.9	94	0/10
1	705	Full	14/Aug/2007	02h58	UTC-4	57°41.650	091°38.420	CTD-Rosette ↓	37	320	80	20	9	8.7	1006.0	91	0/10
1	705	Full	14/Aug/2007	03h20	UTC-4	57°42.070	091°38.640	CTD-Rosette ↑	38	340	85	18	8.5	8.6	1005.8	94	0/10
1	705	Full	14/Aug/2007	04h15	UTC-4	57°39.530	091°35.610	Box Core ↓	63	171	76	15	7.9	8.25	1005.7	99	0/10
1	705	Full	14/Aug/2007	04h16	UTC-4	57°39.530	091°35.580	Box Core (bottom)	68	159	65	17	7.9	8.25	1005.7	99	0/10
1	705	Full	14/Aug/2007	04h20	UTC-4	57°39.530	091°35.510	Box Core ↑	66	197	60	16	8	8.38	1005.5	99	0/10
1	705a	Full	14/Aug/2007	07h14	UTC-4	57°27.080	091°53.060	PNF ↓	29	43	36	14	8.4	9.63	1005.8	94	0/10
1	705a	Full	14/Aug/2007	07h18	UTC-4	57°27.140	091°53.050	PNF ↑	29	23	22	13	8.4	9.63	1005.8	94	0/10
1	705a	Full	14/Aug/2007	07h19	UTC-4	57°27.150	091°53.050	Secchi Disk ↓	29	14	29	12	8.4	9.63	1005.8	94	0/10
1	705a	Full	14/Aug/2007	07h21	UTC-4	57°27.170	091°53.060	Secchi Disk ↑	29	7	19	12	8.5	9.62	1006.0	94	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	705a	Full	14/Aug/2007	12h26	UTC-4	57°26.740	091°55.070	CTD-Rosette ↓	37	325	350	10	8.5	9.9	1005.9	96	0/10
1	705a	Full	14/Aug/2007	12h58	UTC-4	57°26.500	091°53.400	CTD-Rosette ↑	38	45	0	5	8.7	9.1	1006.2	97	0/10
1	705a	Full	14/Aug/2007	13h55	UTC-4	57°26.960	091°52.920	Horizontal Net Tow ↓	34	104	80	5	8.8	8.9	1005.8	96	0/10
1	705a	Full	14/Aug/2007	14h01	UTC-4	57°26.680	091°52.790	Horizontal Net Tow ↑	38	277	80	5	9	8.9	1005.8	96	0/10
1	705a	Full	14/Aug/2007	14h10	UTC-4	57°26.650	091°53.470	Horizontal Net Tow ↓	37	172	100	5	9	8.9	1005.3	94	0/10
1	705a	Full	14/Aug/2007	14h15	UTC-4	57°26.570	091°53.220	Horizontal Net Tow ↑	38	73	100	5	9.1	9.5	1005.9	94	0/10
1	705a	Full	14/Aug/2007	14h25	UTC-4	57°27.010	091°52.560	Box Core ↓	36	303	100	3	9.3	9.3	1005.8	95	0/10
1	705a	Full	14/Aug/2007	14h41	UTC-4	57°27.010	091°52.530	Box Core ↑	38	215	100	3	9.3	9.3	1005.8	95	0/10
1	705a	Full	14/Aug/2007	16h57	UTC-4	57°16.630	091°49.880	Box Core ↓	15	194	106	7	9.5	11.51	1005.7	93	0/10
1	705a	Full	14/Aug/2007	16h59	UTC-4	57°16.670	091°49.960	Box Core (bottom)	15	192	101	8	9.6	11.55	1005.7	93	0/10
1	705a	Full	14/Aug/2007	17h01	UTC-4	57°16.680	091°49.940	Box Core ↑	15	189	103	7	9.6	11.55	1005.8	91	0/10
1	705a	Full	14/Aug/2007	17h17	UTC-4	57°16.680	091°49.930	Box Core ↓	14	196	108	8	9.7	11.43	1005.7	90	0/10
1	705a	Full	14/Aug/2007	17h19	UTC-4	57°16.680	091°49.920	Box Core (bottom)	14	196	109	7	9.8	11.33	1005.6	89	0/10
1	705a	Full	14/Aug/2007	17h20	UTC-4	57°16.680	091°49.920	Box Core ↑	14	195	109	8	9.8	11.33	1005.6	89	0/10
1	705a	Full	14/Aug/2007	19h19	UTC-4	57°22.740	091°46.460	Box Core ↓	28	323	91	11	11	10.6	1004.7	87	0/10
1	705a	Full	14/Aug/2007	19h21	UTC-4	57°22.470	091°46.460	Box Core (bottom)	28	328	94	11	11	10.6	1004.7	87	0/10
1	705a	Full	14/Aug/2007	19h22	UTC-4	57°22.460	091°46.460	Box Core ↑	28	335	94	12	11	10.6	1004.7	87	0/10
1	AN02-07	Mooring	15/Aug/2007	05h17	UTC-4	58°46.970	091°31.420	Mooring AN02-07 Deployed	75	188	260	5	9.5	9.2	1000.0	98	0/10
1	AN02-07	Mooring	15/Aug/2007	05h34	UTC-4	58°46.970	091°31.500	Mooring AN02-07 Deployed (end)	75	189	290	3	9.5	9.18	999.9	98	0/10
1	706	Full	15/Aug/2007	06h24	UTC-4	58°46.800	091°31.120	PNF ↓	74	202	262	3	9.3	9.19	999.4	99	0/10
1	706	Full	15/Aug/2007	06h29	UTC-4	58°46.810	091°31.160	PNF ↑	75	178	275	3	9.3	9.2	999.3	99	0/10
1	706	Full	15/Aug/2007	06h30	UTC-4	58°46.810	091°31.160	Secchi Disk ↓	75	173	282	3	9.3	9.2	999.3	99	0/10
1	706	Full	15/Aug/2007	06h33	UTC-4	58°46.800	091°31.160	Secchi Disk ↑	75	165	293	3	9.3	9.2	999.3	99	0/10
1	706	Full	15/Aug/2007	06h56	UTC-4	58°46.830	091°31.160	CTD-Rosette ↓	73	169	235	2	9.5	9.21	999.2	99	0/10
1	706	Full	15/Aug/2007	07h34	UTC-4	58°47.170	091°31.140	CTD-Rosette ↑	76	83	215	6	9.6	9.21	999.0	99	0/10
1	706	Full	15/Aug/2007	07h42	UTC-4	58°47.270	091°31.170	AC-9 ↓	77	303	225	5	9.8	9.21	998.8	99	0/10
1	706	Full	15/Aug/2007	08h13	UTC-4	58°47.553	091°31.316	AC-9 ↑	75	22	240	3	9.0	9.22	998.6	99	0/10
1	706	Full	15/Aug/2007	08h22	UTC-4	58°47.715	091°31.330	Horizontal Net Tow ↓	77	300	260	3	9.0	9.22	998.5	99	0/10
1	706	Full	15/Aug/2007	08h33	UTC-4	58°47.503	091°31.423	Horizontal Net Tow ↑	76	99	220	5	9.3	9.21	998.0	99	0/10
1	706	Full	15/Aug/2007	08h43	UTC-4	58°47.497	091°31.335	Horizontal Net Tow ↓	76	75	220	5	9.3	9.21	998.0	99	0/10
1	706	Full	15/Aug/2007	08h54	UTC-4	58°47.520	091°31.354	Horizontal Net Tow ↑	75	10	Calm	Calm	9.4	9.21	998.0	99	0/10
1	706	Full	15/Aug/2007	09h17	UTC-4	58°47.841	091°31.331	RMT ↓	77	265	Calm	Calm	9.3	9.2	998.0	99	0/10
1	706	Full	15/Aug/2007	09h31	UTC-4	58°47.573	091°31.279	RMT ↑	75	60	170	2	9.2	9.2	997.9	99	0/10
1	706	Full	15/Aug/2007	09h57	UTC-4	58°46.677	091°30.999	Box Core ↓	81	190	135	5	9.0	9.2	1000.0	99	0/10
1	706	Full	15/Aug/2007	10h11	UTC-4	58°46.677	091°30.999	Box Core ↑	78	N/A	130	5	8.9	9.21	997.7	99	0/10
1	706	Full	15/Aug/2007	10h21	UTC-4	58°46.660	091°31.023	Box Core ↓	80	335	170	3	8.9	9.21	997.5	99	0/10
1	706	Full	15/Aug/2007	10h26	UTC-4	58°46.660	091°31.024	Box Core ↑	80	349	170	3	8.9	9.21	997.5	99	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	707	Full	15/Aug/2007	18h04	UTC-4	59°58.610	091°56.640	CTD-Rosette ↓	98	14	70	7	9.3	10.73	997.6	87	0/10
1	707	Full	15/Aug/2007	18h12	UTC-4	59°58.640	091°56.660	CTD-Rosette ↑	99.3	307	59	6	9.4	10.57	997.6	87	0/10
1	AN01-07	Mooring	16/Aug/2007	03h31	UTC-4	59°58.997	091°56.551	Mooring AN01 -07 Deployed	106	277	50	14	11	9.9	1000.5	78	0/10
1	707	Full	16/Aug/2007	05h19	UTC-4	59°58.650	091°57.250	Horizontal Net Tow ↓	100	231	54	17	9.1	9.98	1001.4	82	0/10
1	707	Full	16/Aug/2007	05h58	UTC-4	59°58.830	091°57.820	Horizontal Net Tow ↑	101	313	63	21	11.5	9.88	1001.6	74	0/10
1	707	Full	16/Aug/2007	06h09	UTC-4	59°58.860	091°58.510	Horizontal Net Tow ↓	102	293	59	20	9.3	9.86	1002.0	83	0/10
1	707	Full	16/Aug/2007	06h22	UTC-4	59°58.740	091°59.520	Horizontal Net Tow ↑	102	200	66	20	9.1	9.99	1002.0	81	0/10
1	707	Full	16/Aug/2007	06h31	UTC-4	59°58.750	091°59.980	Vertical Net Tow ↓	106	230	57	17	8.5	10.05	1002.0	83	0/10
1	707	Full	16/Aug/2007	06h44	UTC-4	59°58.900	092°00.090	Vertical Net Tow ↑	107	273	39	19	9.4	10.06	1002.3	84	0/10
1	707	Full	16/Aug/2007	07h32	UTC-4	59°58.940	091°57.750	Box Core ↓	103	253	41	24	10.4	9.91	1003.0	81	0/10
1	707	Full	16/Aug/2007	07h37	UTC-4	59°58.970	091°57.780	Box Core (bottom)	101	231	41	23	10.4	9.91	1003.0	81	0/10
1	707	Full	16/Aug/2007	07h41	UTC-4	59°59.000	091°57.940	Box Core ↑	101	258	38	24	11.2	9.86	1003.0	76	0/10
Leg 3a																	
3a	100	CTD	28/Sep/2007	18h38	UTC-4	74°23.317	080°12.109	CTD-Rosette ↓	715	115	235	7	-3	-1.17	1011.0	94	6/10
3a	100	CTD	28/Sep/2007	19h17	UTC-4	74°22.757	080°13.332	CTD-Rosette ↑	713	172	235	5	-2.6	-0.99	1011.0	97	6/10
3a	101	Full	29/Sep/2007	11h35	UTC-4	76°23.650	077°25.210	Secchi Disk ↓	360	231	120	6	-3.8	-1.3	1016.0	84	7/10
3a	101	Full	29/Sep/2007	11h37	UTC-4	76°23.650	077°25.210	Secchi Disk ↑	360	231	120	6	-3.8	-1.3	1016.0	84	7/10
3a	101	Full	29/Sep/2007	11h45	UTC-4	76°23.990	077°23.960	PNF ↓	346	250	100	6	-3.9	-1.3	1016.0	84	7/10
3a	101	Full	29/Sep/2007	11h50	UTC-4	76°23.880	077°24.960	PNF ↑	336	318	90	5	-3.6	-1.3	1018.0	84	7/10
3a	101	Full	29/Sep/2007	11h58	UTC-4	76°24.010	077°25.170	Water Sampling ↑	335	002	100	5	-3.6	-1.3	1018.7	84	7/10
3a	101	Full	29/Sep/2007	14h12	UTC-4	76°24.170	077°25.030	CTD-Rosette ↓	329	321	60	5	-2.5	-1.26	1018.7	87	7/10
3a	101	Full	29/Sep/2007	14h52	UTC-4	76°24.730	077°26.120	CTD-Rosette ↑	338	268	45	3	-3.1	-1.2	1018.8	84	7/10
3a	101	Full	29/Sep/2007	16h30	UTC-4	76°26.080	077°27.350	CTD-Rosette ↓	315	066	310	3	-3.8	-1.2	1016.7	84	7/10
3a	101	Full	29/Sep/2007	17h30	UTC-4	76°26.760	077°26.669	CTD-Rosette ↑	295	170	310	5	-3.9	-1.2	1017.0	89	7/10
3a	101	Full	29/Sep/2007	18h41	UTC-4	76°27.305	077°26.337	Phytoplankton Net ↓	287	140	330	3	-3.7	-1.25	1017.0	89	7/10
3a	101	Full	29/Sep/2007	18h48	UTC-4	76°27.305	077°26.337	Phytoplankton Net ↑	287	136	330	3	-3.7	-1.25	1017.0	89	7/10
3a	101	Full	29/Sep/2007	19h13	UTC-4	76°27.750	077°25.281	CTD-Rosette ↓	269	228	330	2	-3.8	-1.25	1017.0	90	7/10
3a	101	Full	29/Sep/2007	19h50	UTC-4	76°28.244	077°24.174	CTD-Rosette ↑	275	221	340	4	-3.9	-1.22	1017.0	90	6/10
3a	101	Full	29/Sep/2007	20h15	UTC-4	76°22.030	077°41.890	Lawas ↓	280	015	10	4	-4.4	-1.17	1017.0	91	6/10
3a	101	Full	29/Sep/2007	20h35	UTC-4	76°23.190	077°27.650	Lawas ↑	281	041	15	5	-4.4	-1.17	1017.0	91	6/10
3a	101	Full	29/Sep/2007	21h10	UTC-4	76°23.160	077°29.580	Phytoflash ↓	262	156	280	5	-4.3	-1.3	1017.0	90	6/10
3a	101	Full	29/Sep/2007	21h50	UTC-4	76°20.360	077°29.310	Phytoflash ↑	264	081	350	5	-4.4	-1.25	1017.0	88	6/10
3a	101	Full	29/Sep/2007	22h17	UTC-4	76°20.360	077°28.500	Vertical Net Tow ↓	276	230	10	7	-4.5	-1.17	1017.0	89	6/10
3a	101	Full	29/Sep/2007	22h35	UTC-4	76°32.840	077°27.870	Vertical Net Tow ↑	280	264	20	4	-3.9	-1.25	1017.0	88	6/10
3a	101	Full	29/Sep/2007	22h58	UTC-4	76°51.820	077°29.650	Hydrobios ↓	283	137	360	7	-4.5	-1.25	1017.0	88	5/10
3a	101	Full	29/Sep/2007	23h15	UTC-4	76°33.870	077°20.750	Hydrobios ↑	280	106	10	7	-4.9	-1.25	1016.9	89	6/10
3a	101	Full	29/Sep/2007	23h51	UTC-4	76°33.870	077°22.750	VMP ↓	275	168	40	7	-5.5	-1.3	1019.2	92	6/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	101	Full	30/Sep/2007	00h01	UTC-4	76°29.780	077°22.720	VMP ↑	275	156	32	7	-5.5	-1.3	1019.2	92	6/10
3a	101	Full	30/Sep/2007	00h02	UTC-4	76°29.840	077°27.010	VMP ↓	275	152	30	7	-5.5	-1.3	1019.2	92	6/10
3a	101	Full	30/Sep/2007	00h12	UTC-4	76°29.950	077°22.950	VMP ↑	270	140	30	9	-5.5	-1.2	1019.2	93	6/10
3a	101	Full	30/Sep/2007	00h14	UTC-4	76°29.970	077°22.940	VMP ↓	270	144	40	8	-5.5	-1.2	1019.2	93	6/10
3a	101	Full	30/Sep/2007	00h20	UTC-4	76°29.990	077°22.930	VMP ↑	270	128	26	8	-5.5	-1.2	1019.2	93	6/10
3a	101	Full	30/Sep/2007	01h36	UTC-4	76°31.250	077°23.240	Box Core ↓	252	316	15	6	-5.7	-1.3	1018.9	94	6/10
3a	101	Full	30/Sep/2007	01h42	UTC-4	76°31.300	077°23.180	Box Core (bottom)	251	288	15	6	-5.7	-1.3	1018.9	94	6/10
3a	101	Full	30/Sep/2007	01h52	UTC-4	76°31.440	077°23.250	Box Core ↑	249	250	5	7	-5.8	-1.3	1018.8	94	6/10
3a	103	Nutrient	30/Sep/2007	05h11	UTC-4	76°21.447	076°37.343	CTD-Rosette ↓	146	300	10	4	-4.7	-1.4	1015.8	95	9/10
3a	103	Nutrient	30/Sep/2007	05h41	UTC-4	76°20.933	076°37.685	CTD-Rosette ↑	147	311	20	6	-4.6	-1.3	1015.6	95	9/10
3a	105	Basic	30/Sep/2007	08h30	UTC-4	76°18.860	075°37.960	Horizontal Net Tow ↓	322	321	110	1	-3.4	-1.35	1014.5	80	2/10
3a	105	Basic	30/Sep/2007	08h43	UTC-4	76°18.720	075°37.400	Horizontal Net Tow ↑	318	108	110	1	-3.4	-1.35	1014.5	80	2/10
3a	105	Basic	30/Sep/2007	08h58	UTC-4	76°19.070	075°37.450	Vertical Net Tow ↓	323	17	320	2	-3.2	-1.31	1014.5	80	2/10
3a	105	Basic	30/Sep/2007	09h20	UTC-4	76°17.770	075°43.850	Vertical Net Tow ↑	321	313	350	2	-3.3	-1.34	1014.3	80	2/10
3a	105	Basic	30/Sep/2007	09h40	UTC-4	76°19.020	075°37.680	VMP ↓	320	305	200	2	-3.5	-1.19	1014.1	79	3/10
3a	105	Basic	30/Sep/2007	10h00	UTC-4	76°18.890	075°38.510	VMP ↑	320	315	40	2	-3	-1.16	1013.9	80	3/10
3a	105	Basic	30/Sep/2007	10h07	UTC-4	76°18.870	075°38.880	Secchi Disk ↓	319	80	60	2	-2.8	-1.12	1013.8	81	2/10
3a	105	Basic	30/Sep/2007	10h10	UTC-4	76°18.870	075°38.880	Secchi Disk ↑	319	100	60	2	-2.8	-1.12	1013.8	81	2/10
3a	105	Basic	30/Sep/2007	10h20	UTC-4	76°18.830	075°38.920	PNF ↓	319	140	40	5	-3.4	-1.14	1013.7	83	2/10
3a	105	Basic	30/Sep/2007	10h25	UTC-4	76°18.630	075°39.120	PNF ↑	321	147	30	5	-3.7	-1.2	1013.7	85	2/10
3a	105	Basic	30/Sep/2007	10h52	UTC-4	76°18.710	075°39.170	CTD-Rosette ↓	320	300	20	5	-3.7	-1.2	1013.6	89	2/10
3a	105	Basic	30/Sep/2007	11h45	UTC-4	76°19.120	075°36.800	CTD-Rosette ↑	322	260	40	3	-3.3	-1.17	1012.9	90	2/10
3a	105	Basic	30/Sep/2007	12h48	UTC-4	76°16.290	075°50.800	CTD-Rosette ↓	347	282	25	8	-3.8	-1.2	1014.7	91	3/10
3a	105	Basic	30/Sep/2007	13h34	UTC-4	76°15.520	075°54.040	CTD-Rosette ↑	357	275	30	7	-3.4	-1.2	1014.3	91	3/10
3a	105	Basic	30/Sep/2007	13h43	UTC-4	76°15.380	075°54.660	CTD-Rosette ↓	357	295	36	7	-3.4	-1.18	1014.3	90	3/10
3a	105	Basic	30/Sep/2007	14h36	UTC-4	76°14.580	075°58.390	CTD-Rosette ↑	357	300	43	4	-3.7	-1.14	1013.9	91	3/10
3a	105	Basic	30/Sep/2007	15h02	UTC-4	76°15.670	075°52.980	Van Veen Grab ↓	357	179	98	3	-4.6	-1.27	1013.7	93	4/10
3a	105	Basic	30/Sep/2007	15h12	UTC-4	76°15.660	075°53.280	Van Veen Grab (bottom)	357	197	101	3	-4.6	-1.27	1013.7	93	4/10
3a	105	Basic	30/Sep/2007	15h18	UTC-4	76°15.590	075°53.580	Van Veen Grab ↑	356	220	146	7	-4.9	-1.28	1013.7	94	4/10
3a	105	Basic	30/Sep/2007	15h37	UTC-4	76°15.660	075°53.050	Box Core ↓	354	223	126	1	-5.0	-1.24	1013.6	94	4/10
3a	105	Basic	30/Sep/2007	15h44	UTC-4	76°15.600	075°53.010	Box Core ↓ (bottom)	355	245	0	3	-4.8	-1.27	1013.4	94	4/10
3a	105	Basic	30/Sep/2007	15h52	UTC-4	76°15.500	075°53.160	Box Core ↑	353	240	10	5	-4.8	-1.27	1013.4	94	4/10
3a	105	Basic	30/Sep/2007	16h04	UTC-4	76°15.299	075°53.639	Box Core (bottom)	366	255	100	1	-4.6	-1.25	1010.8	94	4/10
3a	105	Basic	30/Sep/2007	16h16	UTC-4	76°15.186	075°53.939	Box Core ↑	358	284	120	1	-4.6	-1.25	1010.8	94	4/10
3a	N/A	N/A	30/Sep/2007	18h30	UTC-4	76°13.426	075°08.363	RMT ↓	395	226	270	3	-4.6	-1.06	1009.9	81	0/10
3a	N/A	N/A	30/Sep/2007	19h04	UTC-4	76°13.161	075°08.659	RMT ↑	388	260	N/A	N/A	-4.5	-0.81	1009.6	81	0/10
3a	N/A	MVP	30/Sep/2007	22h08	UTC-4	76°11.700	075°03.900	MVP ↓ (failure)	440	85	50	6	-3.8	-0.78	1007.3	91	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	N/A	N/A	01/Oct/2007	03h48	UTC-4	76°19.410	071°21.880	Sediment Traps Deployed	687	228	126	15	-3.2	-0.19	1004.0	83	0/10
3a	N/A	N/A	01/Oct/2007	04h18	UTC-4	76°19.541	071°23.054	Sediment Traps Deployed (end)	995	297	110	14	-3.2	-0.16	1004.0	83	0/10
3a	115	Full	01/Oct/2007	05h08	UTC-4	76°20.459	071°13.238	Vertical Net Tow ↓	668	274	110	16	-2.9	-0.21	1003.7	81	0/10
3a	115	Full	01/Oct/2007	05h45	UTC-4	76°20.503	071°12.410	Vertical Net Tow ↑	667	250	130	15	-2.5	-0.09	1004	78	0/10
3a	115	Full	01/Oct/2007	06h13	UTC-4	76°20.476	071°11.352	Horizontal Net Tow ↓	670	283	120	12	-3.1	-0.09	1003.5	78	0/10
3a	115	Full	01/Oct/2007	06h30	UTC-4	76°20.489	071°14.039	Horizontal Net Tow ↑	677	290	110	13	-3.5	-0.1	1003.4	79	0/10
3a	115	Full	01/Oct/2007	06h53	UTC-4	76°20.993	071°15.376	RMT ↓	667	346	120	9	-1.8	-0.02	1003.5	76	0/10
3a	115	Full	01/Oct/2007	07h13	UTC-4	76°21.491	071°17.198	RMT ↑	649	259	120	19	-2.4	-0.01	1003.4	75	0/10
3a	115	Full	01/Oct/2007	10h48	UTC-4	76°19.800	071°13.900	CTD-Rosette ↓	685	85	80	5	-3.1	-0.13	1003.9	74	0/10
3a	115	Full	01/Oct/2007	12h00	UTC-4	76°20.700	071°17.500	CTD-Rosette ↑	666	0	50	4	-3.4	-0.1	1003.08	75	0/10
3a	115	Full	01/Oct/2007	12h00	UTC-4	76°20.700	071°17.110	Secchi Disk ↓	668	358	60	3	-3.2	-0.11	1002.99	75	0/10
3a	115	Full	01/Oct/2007	12h04	UTC-4	76°20.750	071°17.260	Secchi Disk ↑	664	358	78	3	-3.2	-0.11	1002.99	75	0/10
3a	115	Full	01/Oct/2007	12h06	UTC-4	76°20.800	071°17.390	PNF ↓	664	358	88	2	-3.2	-0.11	1002.99	75	0/10
3a	115	Full	01/Oct/2007	12h14	UTC-4	76°20.890	071°17.670	PNF ↑	663	3	44	2	-3	-0.13	1002.92	75	0/10
3a	115	Full	01/Oct/2007	13h43	UTC-4	76°21.910	071°19.110	ROV ↓	638	86	341	7	-3.6	-0.07	1001.84	76	0/10
3a	115	Full	01/Oct/2007	14h20	UTC-4	76°22.140	071°18.590	ROV ↑	631	94	3	9	-3.8	-0.13	1001.48	76	0/10
3a	115	Full	01/Oct/2007	14h46	UTC-4	76°22.210	071°18.250	CTD-Rosette ↓	633	199	350	11	-3.7	-0.12	1001.32	78	0/10
3a	115	Full	01/Oct/2007	15h33	UTC-4	76°22.120	071°19.030	CTD-Rosette ↑	629	256	351	10	-2.5	-0.09	1000.92	76	0/10
3a	115	Full	01/Oct/2007	16h03	UTC-4	76°20.900	071°15.928	Hydrobios ↓	650	269	330	9	-3.3	-0.17	998.41	77	Icebergs
3a	115	Full	01/Oct/2007	17h01	UTC-4	76°20.605	071°15.766	Hydrobios ↑	661	228	350	3	-2.2	-0.14	997.8	71	0/10
3a	115	Full	01/Oct/2007	17h30	UTC-4	76°21.060	071°14.950	Phytoplankton Net ↓	648	343	326	15	-2.8	-0.18	999.9	71	0/10
3a	115	Full	01/Oct/2007	17h40	UTC-4	76°21.060	071°14.630	Phytoplankton Net ↑	650	59	330	14	-2.8	-0.18	999.9	71	0/10
3a	115	Full	01/Oct/2007	18h50	UTC-4	76°20.884	071°31.536	Sediment Traps Recovered	687	300	345	17	-2.6	-0.29	996.9	68	0/10
3a	115	Full	01/Oct/2007	19h41	UTC-4	76°19.658	071°22.136	CTD-Rosette ↓	686	189	330	19	-2.8	-0.24	996.6	73	0/10
3a	115	Full	01/Oct/2007	20h28	UTC-4	76°17.550	071°20.180	CTD-Rosette ↑	687	142	340	20	-2.2	-0.18	996.9	61	0/10
3a	115	Full	01/Oct/2007	20h40	UTC-4	76°19.160	071°21.000	Lawas ↓	685	60	330	20	-3.0	-0.23	996.0	63	0/10
3a	115	Full	01/Oct/2007	21h15	UTC-4	76°18.720	071°17.640	Lawas ↑	686	58	340	20	-3.2	-0.25	996.1	61	0/10
3a	115	Full	01/Oct/2007	21h26	UTC-4	76°18.790	071°16.950	Phytoflash ↓	682	335	330	20	-3.2	-0.26	996.0	60	0/10
3a	115	Full	01/Oct/2007	22h08	UTC-4	76°18.380	071°16.010	Phytoflash ↑	681	330	330	25	-3.4	-0.24	995.8	69	0/10
3a	115	Full	01/Oct/2007	22h23	UTC-4	76°18.000	071°16.510	VMP ↓	678	272	350	18	-2.8	-0.24	995.7	72	0/10
3a	115	Full	01/Oct/2007	22h25	UTC-4	76°18.000	071°16.510	VMP ↑	678	272	350	18	-2.8	-0.24	995.5	72	0/10
3a	BA01-06	Mooring	01/Oct/2007	N/A	UTC-4	N/A	N/A	Mooring BA01-06 Lost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3a	BA01-05	Mooring	01/Oct/2007	N/A	UTC-4	N/A	N/A	Mooring BA01-05 Lost	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3a	115	Full	01/Oct/2007	23h22	UTC-4	76°18.200	071°39.540	Box Core ↓	682	125	340	17	-3.3	-0.32	995.3	75	0/10
3a	115	Full	01/Oct/2007	23h54	UTC-4	76°19.190	071°28.780	Box Core ↑	697	N/A	318	23	-1.6	-0.33	997.7	68	Icebergs
3a	115	Full	02/Oct/2007	00h19	UTC-4	76°19.140	071°29.030	Agassiz Trawl ↓	681	109	335	19	-3.1	-0.34	997.6	71	0/10
3a	115	Full	02/Oct/2007	01h01	UTC-4	76°18.800	071°28.830	Agassiz Trawl ↑	689	86	320	21	-3.4	-0.36	997.2	74	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	113	Nutrient	02/Oct/2007	03h05	UTC-4	76°19.120	071°11.910	CTD-Rosette ↓	570	194	330	20	-4.1	-0.32	997.2	83	0/10
3a	113	Nutrient	02/Oct/2007	04h05	UTC-4	76°18.670	071°09.210	CTD-Rosette ↑	573	204	330	20	-3.5	-0.23	997.2	80	0/10
3a	111	Basic	02/Oct/2007	05h37	UTC-4	76°18.285	073°13.402	CTD-Rosette ↓	612	135	320	17	-5.6	-0.64	997.7	86	0/10
3a	111	Basic	02/Oct/2007	05h59	UTC-4	76°18.237	073°13.164	CTD-Rosette ↑	611	141	310	13	-4.2	-0.67	995.1	80	0/10
3a	111	Basic	02/Oct/2007	06h16	UTC-4	76°18.126	073°13.068	Vertical Net Tow ↓	591	145	310	16	-5.0	-0.63	995.0	80	0/10
3a	111	Basic	02/Oct/2007	06h45	UTC-4	76°17.926	073°13.439	Vertical Net Tow ↑	575	142	310	17	-4.9	-0.61	994.9	80	0/10
3a	111	Basic	02/Oct/2007	07h00	UTC-4	76°16.300	073°06.790	Horizontal Net Tow ↓	575	105	310	14	-2.8	-0.6	995.0	75	0/10
3a	111	Basic	02/Oct/2007	07h15	UTC-4	76°16.240	073°04.390	Horizontal Net Tow ↑	583	70	300	17	-5.4	-0.63	994.9	80	0/10
3a	111	Basic	02/Oct/2007	08h45	UTC-4	76°18.360	073°13.000	CTD-Rosette ↓	595	170	320	21	-3.7	-0.55	997.7	79	0/10
3a	111	Basic	02/Oct/2007	09h47	UTC-4	76°18.200	073°11.130	CTD-Rosette ↑	596	175	310	14	-2.4	-0.58	996.6	74	0/10
3a	111	Basic	02/Oct/2007	09h54	UTC-4	76°18.180	073°10.730	Secchi Disk ↓	594	208	310	15	-4	-0.57	996.7	77	0/10
3a	111	Basic	02/Oct/2007	09h58	UTC-4	76°18.180	073°10.730	Secchi Disk ↑	594	208	310	18	-4	-0.57	996.7	77	0/10
3a	111	Basic	02/Oct/2007	10h18	UTC-4	76°18.140	073°09.490	PNF ↓	592	175	315	20	-4.1	-0.54	996.6	77	0/10
3a	111	Basic	02/Oct/2007	10h25	UTC-4	76°18.140	073°09.490	PNF ↑	592	175	315	20	-4.1	-0.54	996.6	77	0/10
3a	111	Basic	02/Oct/2007	10h45	UTC-4	76°18.130	073°08.190	VMP ↓	594	167	320	18	-3.6	-0.45	994.8	71	0/10
3a	111	Basic	02/Oct/2007	11h13	UTC-4	76°18.010	073°06.840	VMP ↑	591	168	320	21	-3.7	-0.41	994.1	72	0/10
3a	111	Basic	02/Oct/2007	11h37	UTC-4	76°18.050	073°05.910	CTD-Rosette ↓	592	170	310	17	-3.5	-0.39	994.0	73	0/10
3a	111	Basic	02/Oct/2007	12h23	UTC-4	76°18.120	073°03.300	CTD-Rosette ↑	617	199	318	25	-4.1	-0.34	996.5	74	0/10
3a	111	Basic	02/Oct/2007	13h09	UTC-4	76°18.170	073°05.990	Box Core ↓	611	155	320	25	-5.2	-0.46	996.3	72	0/10
3a	111	Basic	02/Oct/2007	13h21	UTC-4	76°18.120	073°05.850	Box Core (bottom)	604	151	328	28	-4.6	-0.41	996.5	70	0/10
3a	111	Basic	02/Oct/2007	13h33	UTC-4	76°18.060	073°05.710	Box Core ↑	596	144	325	20	-4.2	-0.35	996.6	68	0/10
3a	N/A	N/A	02/Oct/2007	15h57	UTC-4	76°15.923	074°26.949	Sediment Traps Deployed	447	15	300	19	-5.3	-0.7	996.7	68	Icebergs-Bergy
3a	N/A	N/A	02/Oct/2007	16h23	UTC-4	76°15.667	074°27.985	Sediment Traps Deployed (end)	443	140	310	20	-5.4	-0.7	997.0	67	Icebergs-Bergy
3a	108	Full	02/Oct/2007	16h50	UTC-4	76°16.036	074°31.471	Vertical Net Tow ↓	443	140	320	22	-5.3	-0.9	997.0	66	Icebergs-Bergy
3a	108	Full	02/Oct/2007	17h13	UTC-4	76°16.007	074°32.701	Vertical Net Tow ↑	446	152	310	14	-2.3	-0.95	997.9	62	Icebergs-Bergy
3a	108	Full	02/Oct/2007	17h25	UTC-4	76°15.960	074°33.160	Hydrobios ↓	441	146	317	19	-3.6	-0.93	998.1	64	Icebergs-Bergy
3a	108	Full	02/Oct/2007	17h51	UTC-4	76°15.810	074°33.320	Hydrobios ↑	444	na	301	19	-4.7	-0.89	998.5	67	Icebergs-Bergy
3a	108	Full	02/Oct/2007	18h01	UTC-4	76°15.550	074°33.130	Horizontal Net Tow ↓	443	141	308	16	-5.1	-0.9	998.7	68	Icebergs-Bergy
3a	108	Full	02/Oct/2007	18h15	UTC-4	76°15.385	074°31.638	Horizontal Net Tow ↑	444	40	300	14	-5.5	-0.94	998.8	67	Icebergs-Bergy
3a	108	Full	02/Oct/2007	18h50	UTC-4	76°14.485	074°35.365	Lawas ↓	438	307	310	15	-5.6	-0.89	999.5	67	Icebergs-Bergy
3a	108	Full	02/Oct/2007	19h13	UTC-4	76°14.289	074°36.358	Lawas ↑	436	250	300	14	-5.6	-0.85	999.7	68	Icebergs-Bergy
3a	108	Full	02/Oct/2007	19h26	UTC-4	76°14.019	074°35.592	RMT ↓	458	94	300	11	-5.3	-0.86	999.9	68	Icebergs-Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	108	Full	02/Oct/2007	19h36	UTC-4	76°14.025	074°34.347	RMT ↑	441	52	300	13	-5.3	-0.85	1000.2	65	Icebergs-Bergy
3a	108	Full	02/Oct/2007	20h05	UTC-4	76°13.590	074°34.060	Lawas ↓	445	300	310	17	-5.5	-0.88	1000.3	65	Icebergs-Bergy
3a	108	Full	02/Oct/2007	20h47	UTC-4	76°13.880	074°37.850	Lawas ↑	448	320	320	15	-5.5	-0.88	1000.8	61	Icebergs-Bergy
3a	108	Full	02/Oct/2007	20h56	UTC-4	76°13.910	074°38.570	VMP ↓	446	308	320	13	-5.6	-0.87	1000.9	61	Icebergs-Bergy
3a	108	Full	02/Oct/2007	21h30	UTC-4	76°13.640	074°40.940	VMP ↑	445	275	320	10	-5.5	-0.98	1001.3	57	Icebergs-Bergy
3a	108	Full	02/Oct/2007	21h40	UTC-4	76°13.590	074°41.600	Phytoplankton Net ↓	451	301	315	12	-5.5	-0.98	1001.3	57	Icebergs-Bergy
3a	108	Full	02/Oct/2007	21h50	UTC-4	76°13.600	074°42.230	Phytoplankton Net ↑	454	312	290	8	-5.6	-0.93	1001.6	67	Icebergs-Bergy
3a	108	Full	02/Oct/2007	22h08	UTC-4	76°13.530	074°43.340	CTD-Rosette ↓	453	305	310	8	-5.6	-0.93	1001.6	68	Icebergs-Bergy
3a	108	Full	02/Oct/2007	22h45	UTC-4	76°13.400	074°46.200	CTD-Rosette ↑	453	297	320	10	-5.6	-0.97	1002.1	63	Icebergs-Bergy
3a	108	Full	02/Oct/2007	23h10	UTC-4	76°13.370	074°47.510	Agassiz Trawl ↓	457	68	310	7	-5.7	-1.06	1002.4	63	Icebergs-Bergy
3a	108	Full	02/Oct/2007	23h20	UTC-4	76°13.250	074°47.910	Agassiz Trawl ↑	453	57	310	5	-5.8	-1.06	1002.7	64	Icebergs-Bergy
3a	108	Full	03/Oct/2007	05h14	UTC-4	76°16.032	074°36.310	Phytoflash ↓	448	265	340	11	-5.8	-0.84	1006.48	69	Icebergs-Bergy
3a	108	Full	03/Oct/2007	05h53	UTC-4	76°15.518	074°37.201	Phytoflash ↑	448	180	335	10	-5.3	-0.73	1007.19	66	Icebergs-Bergy
3a	108	Full	03/Oct/2007	06h08	UTC-4	76°15.465	074°37.417	CTD-Rosette ↓	444	180	340	10	-4.9	-0.69	1007.25	66	Icebergs-Bergy
3a	108	Full	03/Oct/2007	07h02	UTC-4	76°15.103	074°38.038	CTD-Rosette ↑	443	190	317	8	-4.8	-0.66	1007.9	68	Icebergs-Bergy
3a	108	Full	03/Oct/2007	07h05	UTC-4	76°15.097	074°38.082	Secchi Disk ↓↑	443	195	317	8	-4.8	-0.66	1007.9	58	Icebergs-Bergy
3a	108	Full	03/Oct/2007	07h38	UTC-4	76°14.847	074°38.841	PNF ↓	442	160	350	6	-4.7	-0.66	1008.3	56	Icebergs-Bergy
3a	108	Full	03/Oct/2007	07h41	UTC-4	76°14.847	074°38.966	PNF ↑	442	150	350	5	-4.7	-0.66	1008.3	56	Icebergs-Bergy
3a	108	Full	03/Oct/2007	08h26	UTC-4	76°14.540	074°40.330	CTD-Rosette ↓	439	225	0	3	-4.5	-0.64	1008.8	62	Icebergs-Bergy
3a	108	Full	03/Oct/2007	09h08	UTC-4	76°14.350	074°41.410	CTD-Rosette ↑	436	220	10	5	-4	-0.68	1009.2	60	Icebergs-Bergy
3a	108	Full	03/Oct/2007	13h07	UTC-4	76°13.090	074°50.350	CTD-Rosette ↓	441	221	6	8	-3.1	-1.08	1014.0	61	Icebergs-Bergy
3a	108	Full	03/Oct/2007	13h27	UTC-4	76°13.020	074°51.09	CTD-Rosette ↑	436	258	15	8	-3.2	-1.11	1014.2	62	Icebergs-Bergy
3a	108	Full	03/Oct/2007	13h58	UTC-4	76°13.120	074°44.590	Sediment traps Recovered	447	40	358	7	-4.9	-1.14	1014.5	63	Icebergs-Bergy
3a	108	Full	03/Oct/2007	14h14	UTC-4	76°13.080	074°44.630	Sediment traps Recovered (end)	447	82	6	9	-5.2	-1.27	1014.7	64	Icebergs-Bergy
3a	108	Full	03/Oct/2007	15h39	UTC-4	76°12.720	074°44.400	Agassiz Trawl ↓	445	167	335	4	-5.3	-1.09	1015.6	70	Icebergs-Bergy
3a	108	Full	03/Oct/2007	16h11	UTC-4	76°12.644	074°44.634	Agassiz Trawl ↑	446	232	350	8	-5.2	-0.84	1015.9	75	Icebergs-Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	134	Basic	04/Oct/2007	03h23	UTC-4	75°38.270	079°29.120	CTD-Rosette ↓	547	275	55	17	-7	-1.35	1018.7	79	8/10
3a	134	Basic	04/Oct/2007	04h24	UTC-4	75°37.866	079°29.405	CTD-Rosette ↑	546	302	60	20	-6.4	-1.1	1016.3	83	8/10
3a	134	Basic	04/Oct/2007	04h40	UTC-4	75°37.746	079°29.221	Vertical Net Tow ↓	544	137	57	24	-6.8	-1.13	1015.5	83	8/10
3a	134	Basic	04/Oct/2007	05h09	UTC-4	75°37.597	079°29.405	Vertical Net Tow ↑	545	150	50	22	-6.9	-1.15	1015.7	86	8/10
3a	134	Basic	04/Oct/2007	05h23	UTC-4	75°37.536	079°29.214	Vertical Net Tow ↓	546	210	40	20	-7.1	-1.15	1035.9	86	8/10
3a	134	Basic	04/Oct/2007	05h47	UTC-4	75°37.475	079°29.245	Vertical Net Tow ↑	545	235	55	20	-6.9	-1.13	1015.9	86	8/10
3a	134	Basic	04/Oct/2007	06h08	UTC-4	75°37.275	079°28.972	Lawas ↓	543	50	48	25	-5.4	-1.13	1015.7	85	8/10
3a	134	Basic	04/Oct/2007	06h26	UTC-4	75°37.174	079°28.966	Lawas ↑	545	36	50	na	-7	-1.15	1015.8	86	8/10
3a	134	Basic	04/Oct/2007	07h46	UTC-4	75°36.345	079°28.245	Secchi Disk ↓	543	240	40	15	-6.4	-1.19	1015.0	86	8/10
3a	134	Basic	04/Oct/2007	07h48	UTC-4	75°36.340	079°28.245	Secchi Disk ↑	543	240	40	15	-6.4	-1.13	1015.0	86	8/10
3a	134	Basic	04/Oct/2007	07h53	UTC-4	75°36.237	079°28.132	PNF ↓	542	295	45	19	-6.6	-1.22	1015.4	86	8/10
3a	134	Basic	04/Oct/2007	08h03	UTC-4	75°36.153	079°28.037	PNF ↑	543	279	40	20	-6.2	-1.21	1015.4	86	8/10
3a	134	Basic	04/Oct/2007	09h02	UTC-4	75°35.400	079°28.190	CTD-Rosette ↓	541	350	50	15	-6.2	-1.19	1015.1	85	8/10
3a	134	Basic	04/Oct/2007	10h07	UTC-4	75°34.510	079°28.750	CTD-Rosette ↑	547	320	60	20	-5.9	-1.17	1014.7	89	8/10
3a	134	Basic	04/Oct/2007	10h50	UTC-4	75°34.130	079°28.190	Van Veen Grab ↓	550	144	40	22	-6.5	-1.17	1014.2	89	8/10
3a	134	Basic	04/Oct/2007	11h07	UTC-4	75°33.950	079°27.890	Van Veen Grab ↑	553	150	30	18	-6.5	-1.14	1013.9	90	9/10
3a	Nanissivik	N/A	06/Oct/2007	17h33	UTC-4	75°08.186	084°52.725	Mesopelagic Trawl ↓	244	135	170	18	-5.1	0.88	1023.7	71	0/10
3a	Nanissivik	N/A	06/Oct/2007	19h45	UTC-4	73°09.206	085°00.743	Mesopelagic Trawl ↑	222	220	130	11	-5.1	0.77	1023.5	73	0/10
3a	301	Nutrient	07/Oct/2007	06h37	UTC-4	74°07.233	083°19.596	CTD-Rosette ↓	690	345	140	5	-2.8	-0.33	1021.2	66	2/10
3a	301	Nutrient	07/Oct/2007	07h53	UTC-4	74°07.020	085°22.020	CTD-Rosette ↑	686	300	130	20	-2.5	-0.23	1021.1	69	2/10
3a	302	Full	07/Oct/2007	12h30	UTC-4	74°09.080	086°10.690	Sediment Traps Deployed	529	256	100	25	-2.4	-0.7	1021.4	82	2/10
3a	302	Full	07/Oct/2007	12h49	UTC-4	74°09.160	086°11.140	Sediment Traps Deployed (end)	532	271	90	24	-2.7	-0.8	1021.3	84	2/10
3a	302	Full	07/Oct/2007	13h27	UTC-4	74°09.060	086°10.770	Secchi Disk ↓	530	265	100	21	-1.8	-0.8	1020.9	77	2/10
3a	302	Full	07/Oct/2007	13h30	UTC-4	74°09.060	086°10.800	Secchi Disk ↑	530	279	100	20	-1.8	-0.8	1020.9	77	2/10
3a	302	Full	07/Oct/2007	13h37	UTC-4	74°09.050	086°10.900	PNF ↓	530	267	90	21	-1.8	-0.8	1020.9	77	2/10
3a	302	Full	07/Oct/2007	13h41	UTC-4	74°09.050	086°10.900	PNF ↑	532	274	90	23	-2.2	-0.74	1020.9	80	2/10
3a	302	Full	07/Oct/2007	14h04	UTC-4	74°09.020	086°11.430	CTD-Rosette ↓	529	277	85	19	-2.1	-0.71	1020.9	83	2/10
3a	302	Full	07/Oct/2007	14h54	UTC-4	74°08.990	086°13.300	CTD-Rosette ↑	527	297	90	27	-1.8	-0.74	1020.5	92	2/10
3a	302	Full	07/Oct/2007	15h21	UTC-4	74°08.700	086°13.640	Phytoplankton Net ↓	530	113	100	25	-2	-0.8	1020.4	93	1/10
3a	302	Full	07/Oct/2007	15h31	UTC-4	74°08.600	086°13.880	Phytoplankton Net ↑	525	102	90	29	-1.9	-0.8	1020.3	93	1/10
3a	302	Full	07/Oct/2007	15h34	UTC-4	74°08.580	086°13.890	Phytoplankton Net ↓	525	100	90	26	-1.9	-0.8	1020.3	93	1/10
3a	302	Full	07/Oct/2007	15h44	UTC-4	74°08.550	086°14.090	Phytoplankton Net ↑	529	62	90	26	-1.8	-0.79	1020.1	92	1/10
3a	302	Full	07/Oct/2007	16h30	UTC-4	74°09.017	086°13.124	CTD-Rosette ↓	528	290	100	26	-2	-0.81	1017.2	96	1/10
3a	302	Full	07/Oct/2007	17h22	UTC-4	74°09.130	086°15.260	CTD-Rosette ↑	528	280	100	26	-2.1	-0.68	1016.7	96	1/10
3a	302	Full	07/Oct/2007	17h42	UTC-4	74°09.219	086°16.142	Hydrobios ↓	530	276	100	30	-1.8	-0.6	1016.7	95	1/10
3a	302	Full	07/Oct/2007	18h22	UTC-4	74°09.269	086°17.662	Hydrobios ↑	533	275	100	28	-1.3	-0.6	1017.0	95	1/10
3a	302	Full	07/Oct/2007	18h40	UTC-4	74°09.297	086°17.644	Hydrobios ↓	529	290	100	29	-1.3	-0.6	1016.8	95	1/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	302	Full	07/Oct/2007	19h17	UTC-4	74°09.468	086°18.803	Hydrobios ↑	533	284	100	30	-1.1	-0.6	1016.7	96	1/10
3a	302	Full	07/Oct/2007	19h45	UTC-4	74°09.988	086°23.583	Vertical Net Tow ↓	532	280	100	28	-1.1	-0.6	1016.9	98	1/10
3a	302	Full	07/Oct/2007	20h16	UTC-4	74°10.260	086°24.450	Vertical Net Tow ↑	532	285	100	32	-1.1	-0.6	1016.6	98	1/10
3a	302	Full	07/Oct/2007	20h37	UTC-4	74°10.720	086°27.810	Horizontal Net Tow ↓	532	260	100	26	-0.5	-0.6	1016.6	98	1/10
3a	302	Full	07/Oct/2007	20h45	UTC-4	74°24.020	086°28.730	Horizontal Net Tow ↑	531	140	100	27	-0.2	-0.6	1016.4	98	1/10
3a	302	Full	07/Oct/2007	21h13	UTC-4	74°10.790	086°30.980	Sediment Traps Recovered	532	30	100	26	-1.2	-0.7	1016.4	99	1/10
3a	302	Full	07/Oct/2007	21h34	UTC-4	74°10.890	086°31.770	Sediment Traps Recovered (end)	532	250	100	22	-1.2	-0.7	1016.6	99	1/10
3a	302	Full	07/Oct/2007	22h04	UTC-4	74°11.890	086°36.870	CTD-Rosette ↓	501	280	110	18	2.8	-0.79	1016.8	99	1/10
3a	302	Full	07/Oct/2007	22h45	UTC-4	74°12.230	086°38.500	CTD-Rosette ↑	491	1	140	20	2.6	-0.7	1017.0	89	1/10
3a	302	Full	07/Oct/2007	22h58	UTC-4	74°12.590	086°38.570	Agassiz Trawl ↓	490	288	140	19	1.3	-0.7	1017.1	93	1/10
3a	302	Full	07/Oct/2007	23h28	UTC-4	74°13.000	086°38.440	Agassiz Trawl ↑	486	225	135	21	1.2	-0.7	1017.1	95	1/10
3a	305	Nutrient	08/Oct/2007	18h48	UTC-5	74°19.766	094°58.873	CTD-Rosette ↓	167	60	220	18	-7	-1.2	1023.7	83	1/10
3a	305	Nutrient	08/Oct/2007	19h23	UTC-5	74°19.944	094°58.456	CTD-Rosette ↑	168	44	190	15	-5	-1	1023.8	77	1/10
3a	308	Basic	09/Oct/2007	08h25	UTC-5	74°07.250	103°01.470	Phytoplankton Net ↓	350	117	60	20	-7	-1.4	1014.9	91	7/10
3a	308	Basic	09/Oct/2007	08h43	UTC-5	74°02.190	103°01.140	Phytoplankton Net ↑	350	55	70	22	-6.5	-1.3	1014.6	93	7/10
3a	308	Basic	09/Oct/2007	08h54	UTC-5	74°07.280	103°01.340	Secchi Disk ↓	350	265	70	24	-6.4	-1.3	1014.3	92	8/10
3a	308	Basic	09/Oct/2007	08h57	UTC-5	74°07.280	103°01.340	Secchi Disk ↑	350	265	70	24	-6.4	-1.3	1014.3	92	8/10
3a	308	Basic	09/Oct/2007	09h01	UTC-5	74°07.230	103°01.670	PNF ↓	357	260	60	17	-4.3	-1.35	1014.1	89	8/10
3a	308	Basic	09/Oct/2007	09h05	UTC-5	74°07.210	103°01.780	PNF ↑	350	280	60	17	-4.3	-1.35	1014.1	89	8/10
3a	308	Basic	09/Oct/2007	09h38	UTC-5	74°07.570	103°01.630	CTD-Rosette ↓	351	260	60	19	-3.5	-1.36	1013.5	88	8/10
3a	308	Basic	09/Oct/2007	10h45	UTC-5	74°07.440	103°02.890	CTD-Rosette ↑	352	260	70	21	-0.6	-1.34	1013.0	81	8/10
3a	308	Basic	09/Oct/2007	10h57	UTC-5	74°07.960	103°04.920	Vertical Net Tow ↓	351	223	60	22	-4	-1.36	1012.0	93	8/10
3a	308	Basic	09/Oct/2007	11h17	UTC-5	74°08.120	103°04.840	Vertical Net Tow ↑	347	240	60	19	-4.1	-1.32	1011.7	95	8/10
3a	308	Basic	09/Oct/2007	11h28	UTC-5	74°08.200	103°04.990	Vertical Net Tow ↓	342	249	70	20	-4.2	-1.3	1011.6	95	8/10
3a	308	Basic	09/Oct/2007	11h50	UTC-5	74°08.300	103°05.400	Vertical Net Tow ↑	341	246	80	16	-3.1	-1.26	1011.0	95	8/10
3a	308	Basic	09/Oct/2007	12h42	UTC-5	74°08.290	103°06.740	CTD-Rosette ↓	346	250	85	18	-3.6	-1.29	1012.3	96	9/10
3a	308	Basic	09/Oct/2007	13h31	UTC-5	74°08.150	103°06.540	CTD-Rosette ↑	345	263	90	20	-1	-1.24	1011.5	90	9/10
3a	308	Basic	09/Oct/2007	13h44	UTC-5	74°08.190	103°07.300	Vertical Net Tow ↓	345	276	90	17	-1	-1.24	1011.5	90	9/10
3a	308	Basic	09/Oct/2007	14h08	UTC-5	74°08.240	103°07.540	Vertical Net Tow ↑	345	251	75	20	-3.1	-1.27	1010.9	95	9/10
3a	308	Basic	09/Oct/2007	14h28	UTC-5	74°08.160	103°07.220	Horizontal Net Tow ↓	347	234	70	17	-1	-1.28	1010.7	92	9/10
3a	308	Basic	09/Oct/2007	14h44	UTC-5	74°08.060	103°07.740	Horizontal Net Tow ↑	358	304	65	20	-2.7	-1.31	1010.4	96	9/10
3a	308	Basic	09/Oct/2007	14h57	UTC-5	74°07.920	103°07.910	VMP ↓	357	318	75	20	-1.4	-1.33	1010.4	95	9/10
3a	308	Basic	09/Oct/2007	15h15	UTC-5	74°07.910	103°08.690	VMP ↑	356	351	80	18	-2.2	-1.29	1010.0	95	9/10
3a	308	Basic	09/Oct/2007	15h26	UTC-5	74°07.880	103°09.020	CTD-Rosette ↓	353	255	60	19	-2.4	-1.28	1009.9	96	9/10
3a	308	Basic	09/Oct/2007	15h59	UTC-5	74°07.625	103°09.146	CTD-Rosette ↑	359	240	60	16	-2.6	-1.25	1006.8	91	9/10
3a	308	Basic	09/Oct/2007	16h05	UTC-5	74°07.586	103°09.375	Agassiz Trawl ↓	355	213	60	18	-2.9	-1.23	1006.5	95	8/10
3a	308	Basic	09/Oct/2007	16h37	UTC-5	74°06.987	103°09.678	Agassiz Trawl ↑	363	156	60	15	-2.9	-1.26	1006.2	97	8/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	308	Basic	09/Oct/2007	17h02	UTC-5	74°07.774	103°04.106	Box Core ↓	341	237	60	19	-2.6	-1.3	1005.2	98	9/10
3a	308	Basic	09/Oct/2007	17h10	UTC-5	74°07.745	103°04.149	Box Core (bottom)	342	228	60	18	-2.7	-1.3	1005.7	98	9/10
3a	308	Basic	09/Oct/2007	17h16	UTC-5	74°07.744	103°04.147	Box Core ↑	344	227	60	18	-2.7	-1.3	1005.7	98	9/10
3a	309	Basic	10/Oct/2007	04h00	UTC-5	74°41.024	103°07.056	Hydrobios ↓	158	237	20	26	-6.5	-1.4	1005.8	92	9+/10
3a	309	Basic	10/Oct/2007	04h17	UTC-5	74°40.804	103°07.337	Hydrobios ↑	160	234	355	26	-6.6	-1.4	1006.0	92	9+/10
3a	309	Basic	10/Oct/2007	04h48	UTC-5	74°40.502	103°07.827	Vertical Net Tow ↓	160	110	15	22	-7.8	-1.4	1005.7	92	9+/10
3a	309	Basic	10/Oct/2007	04h59	UTC-5	74°40.295	103°07.980	Vertical Net Tow ↑	159	124	10	24	-8	-1.4	1005.8	92	9+/10
3a	309	Basic	10/Oct/2007	05h19	UTC-5	74°40.127	103°07.749	VMP ↓	161	192	5	22	-7.2	-1.4	1006.5	91	9+/10
3a	309	Basic	10/Oct/2007	05h47	UTC-5	74°39.786	103°08.015	VMP ↑	159	264	339	20	-7.1	-1.35	1006.8	91	9+/10
3a	309	Basic	10/Oct/2007	06h03	UTC-5	74°39.667	103°07.666	Phytoflash ↓	162	63	355	18	-7.9	-1.4	1009.6	92	9/10
3a	309	Basic	10/Oct/2007	06h27	UTC-5	74°39.372	103°07.277	Phytoflash ↑	164	106	350	21	-8.5	-1.4	1007.0	93	9/10
3a	309	Basic	10/Oct/2007	06h45	UTC-5	74°39.304	103°06.977	CTD-Rosette ↓	165	225	345	26	-8.5	-1.4	1007.0	93	9+/10
3a	309	Basic	10/Oct/2007	07h20	UTC-5	74°38.877	103°05.618	CTD-Rosette ↑	172	200	335	27	-7	-1.4	1008.0	85	9+/10
3a	309	Basic	10/Oct/2007	07h30	UTC-5	74°38.823	103°06.159	Phytoplankton Net ↓	166	335	322	25	-5.4	-1.4	1008.0	85	9/10
3a	309	Basic	10/Oct/2007	07h43	UTC-5	74°38.684	103°06.073	Phytoplankton Net ↑	169	126	320	22	-8.6	-1.4	1008.0	92	9/10
3a	309	Basic	10/Oct/2007	08h22	UTC-5	74°38.470	103°06.050	Agassiz Trawl ↓	68	48	330	20	-8.4	-1.38	1008.5	91	9/10
3a	309	Basic	10/Oct/2007	08h52	UTC-5	74°38.070	103°04.610	Agassiz Trawl ↑	169	75	310	21	-8.7	-1.38	1008.4	91	9/10
3a	309	Basic	10/Oct/2007	10h37	UTC-5	74°39.280	103°32.420	Secchi Disk ↓	175	240	330	24	-8.5	-1.45	1008.5	91	8/10
3a	309	Basic	10/Oct/2007	10h40	UTC-5	74°39.280	103°32.420	Secchi Disk ↑	175	240	330	24	-8.5	-1.45	1008.5	91	8/10
3a	309	Basic	10/Oct/2007	10h45	UTC-5	74°39.070	103°32.620	PNF ↓	175	230	330	23	-8.5	-1.45	1008.5	91	8/10
3a	309	Basic	10/Oct/2007	10h49	UTC-5	74°38.980	103°32.670	PNF ↑	174	246	330	20	-8.5	-1.45	1008.5	91	8/10
3a	309	Basic	10/Oct/2007	11h08	UTC-5	74°38.550	103°33.230	CTD-Rosette ↓	171	155	330	20	-8.6	-1.39	1010.3	90	8/10
3a	309	Basic	10/Oct/2007	11h52	UTC-5	74°38.190	103°32.220	CTD-Rosette ↑	165	175	315	24	-5.8	-1.35	1011.0	84	8/10
3a	N/A	N/A	10/Oct/2007	23h58	UTC-5	73°32.910	103°18.120	Box Core ↓	358	58	310	10	-10.1	-1.53	1017.8	93	9/10
3a	N/A	N/A	11/Oct/2007	00h05	UTC-5	73°32.910	103°18.050	Box Core (bottom)	359	67	310	10	-10.4	-1.52	1017.9	93	9/10
3a	N/A	N/A	11/Oct/2007	00h15	UTC-5	73°32.890	103°18.000	Box Core ↑	360	65	315	12	-10.4	-1.43	1017.9	93	9/10
3a	310	Basic	11/Oct/2007	12h58	UTC-5	71°42.220	101°43.250	Secchi Disk ↓	199	241	75	26	-6.1	-1.29	1006.3	96	8/10
3a	310	Basic	11/Oct/2007	13h06	UTC-5	71°42.230	101°44.240	Secchi Disk ↑	196	262	60	29	-6.1	-1.29	1006.3	96	8/10
3a	310	Basic	11/Oct/2007	13h13	UTC-5	71°42.280	101°44.650	PNF ↓	199	273	65	30	-4.9	-1.27	1006.1	97	8/10
3a	310	Basic	11/Oct/2007	13h17	UTC-5	71°42.300	101°44.690	PNF ↑	202	262	70	27	-4.9	-1.27	1006.1	97	8/10
3a	310	Basic	11/Oct/2007	13h27	UTC-5	71°42.380	101°44.800	CTD-Rosette ↓	199	272	60	29	-3.5	-1.23	1005.8	97	8/10
3a	310	Basic	11/Oct/2007	14h14	UTC-5	71°42.530	101°46.670	CTD-Rosette ↑	204	295	75	30	-3.1	-1.19	1004.7	97	8/10
3a	310	Basic	11/Oct/2007	14h27	UTC-5	71°42.600	101°47.320	Horizontal Net Tow ↓	200	301	70	23	-2.5	-1.2	1004.3	95	8/10
3a	310	Basic	11/Oct/2007	14h46	UTC-5	71°42.670	101°49.630	Horizontal Net Tow ↑	200	226	100	22	-3.4	-1.2	1004.3	95	8/10
3a	310	Basic	11/Oct/2007	14h57	UTC-5	71°42.780	101°49.860	Vertical Net Tow ↓	201	266	70	28	-4	-1.23	1004.2	96	7/10
3a	310	Basic	11/Oct/2007	15h13	UTC-5	71°42.960	101°49.930	Vertical Net Tow ↑	199	285	65	28	-1.6	-1.19	1003.8	92	7/10
3a	310	Basic	11/Oct/2007	16h09	UTC-5	71°43.778	101°53.637	CTD-Rosette ↓	215	285	74	26	-2.5	-1.2	1003.5	95	7/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	310	Basic	11/Oct/2007	16h46	UTC-5	71°43.859	101°53.616	CTD-Rosette ↑	213	279	77	24	-1	-1.1	1003.0	90	7/10
3a	310	Basic	11/Oct/2007	16h50	UTC-5	71°43.882	101°53.601	Phytoplankton Net ↓	210	256	77	22	-0.4	-1.1	1003.0	87	7/10
3a	310	Basic	11/Oct/2007	17h04	UTC-5	71°43.962	101°53.577	Phytoplankton Net ↑	206	249	80	22	-1.3	-1.2	1002.8	90	5/10
3a	314	Basic	12/Oct/2007	14h22	UTC-5	68°58.290	105°57.210	VMP ↓	91	290	210	25	-0.4	-0.62	994.1	81	0/10
3a	314	Basic	12/Oct/2007	14h36	UTC-5	68°58.780	105°59.840	VMP ↑	99	288	210	27	-0.4	-0.58	994.1	81	0/10
3a	314	Basic	12/Oct/2007	14h39	UTC-5	68°58.890	105°59.990	VMP ↓	85	287	210	26	-0.4	-0.51	994.0	82	0/10
3a	314	Basic	12/Oct/2007	14h58	UTC-5	68°59.920	106°05.800	VMP ↑	82	290	208	27	-0.4	-0.46	993.9	81	1/10
3a	314	Basic	12/Oct/2007	16h00	UTC-5	69°00.006	106°36.104	Secchi Disk ↓	108	26	200	24	-0.3	-0.25	992.9	82	1/10
3a	314	Basic	12/Oct/2007	16h03	UTC-5	69°00.006	106°36.104	Secchi Disk ↑	108	26	200	24	-0.3	-0.25	992.9	82	1/10
3a	314	Basic	12/Oct/2007	16h10	UTC-5	68°59.974	106°36.164	CTD-Rosette ↓	107	42	190	16	3.1	-0.31	993.6	71	1/10
3a	314	Basic	12/Oct/2007	16h57	UTC-5	69°00.084	106°36.427	CTD-Rosette ↑	110	43	190	16	0.4	-0.3	993.4	82	1/10
3a	314	Basic	12/Oct/2007	17h13	UTC-5	69°00.214	106°35.766	Agassiz Trawl ↓	110	323	200	25	-0.5	-0.33	993.3	83	1/10
3a	314	Basic	12/Oct/2007	17h34	UTC-5	69°00.490	106°35.120	Agassiz Trawl ↑	117	344	200	27	-0.8	-0.29	992.9	85	1/10
3a	314	Basic	12/Oct/2007	17h55	UTC-5	69°00.510	106°34.840	Box Core ↓	116	11	195	23	2.4	-0.24	993.2	75	1/10
3a	314	Basic	12/Oct/2007	17h58	UTC-5	69°00.490	106°34.670	Box Core (bottom)	114	22	193	28	2.4	-0.24	993.2	75	1/10
3a	314	Basic	12/Oct/2007	18h03	UTC-5	69°00.510	106°34.530	Box Core ↑	112	357	199	26	0.6	-0.21	993.1	80	1/10
3a	N/A	N/A	14/Oct/2007	10h40	UTC-6	70°10.640	121°02.140	Water Sampling	403	336	100	17	-5.4	0.05	1008.4	77	0/10
3a	Beaufort-1	N/A	14/Oct/2007	21h00	UTC-6	70°55.040	126°56.150	CTD-Rosette ↓	272	280	90	25	-4.2	-0.18	1011.6	78	0/10
3a	Beaufort-1	N/A	14/Oct/2007	21h23	UTC-6	70°55.210	126°56.830	CTD-Rosette ↑	270	269	90	24	-3.9	-0.18	1011.5	76	0/10
3a	434	Basic	15/Oct/2007	09h04	UTC-6	70°10.400	133°33.530	Lawas ↓	49	22	120	20	-3.9	-1.4	1005.4	88	8/10
3a	434	Basic	15/Oct/2007	09h45	UTC-6	70°09.890	133°33.390	Lawas ↑	38	112	110	21	-4.2	-1.3	1005.4	89	9/10
3a	434	Basic	15/Oct/2007	10h20	UTC-6	70°10.170	133°30.280	Secchi Disk ↓	44	44	110	24	-4.1	-1.4	1005.0	89	8/10
3a	434	Basic	15/Oct/2007	10h27	UTC-6	70°10.290	133°30.200	Secchi Disk ↑	44	42	110	24	-4.1	-1.4	1005.0	89	8/10
3a	434	Basic	15/Oct/2007	10h35	UTC-6	70°10.370	133°29.580	PNF ↓	40	85	110	19	-3.9	-1.4	1005.3	89	8/10
3a	434	Basic	15/Oct/2007	10h39	UTC-6	70°10.390	133°29.580	PNF ↑	44	45	110	19	-3.9	-1.4	1005.3	89	8/10
3a	434	Basic	15/Oct/2007	11h20	UTC-6	70°10.420	133°31.000	CTD-Rosette ↓	41	280	120	20	-3.7	-1.4	1005.6	89	8/10
3a	434	Basic	15/Oct/2007	11h47	UTC-6	70°10.350	133°31.710	CTD-Rosette ↑	39	310	100	22	-1.2	-1.4	1005.7	82	8/10
3a	434	Basic	15/Oct/2007	12h04	UTC-6	70°10.410	133°31.740	Horizontal Net Tow ↓	39	60	110	20	-2.4	-1.44	1005.5	85	8/10
3a	434	Basic	15/Oct/2007	12h13	UTC-6	70°10.670	133°31.540	Horizontal Net Tow ↑	42	340	100	19	-3.5	-1.44	1005.4	88	8/10
3a	434	Basic	15/Oct/2007	12h31	UTC-6	70°10.650	133°31.640	Vertical Net Tow ↓	46	296	105	21	-2.9	-1.45	1005.6	88	8/10
3a	434	Basic	15/Oct/2007	12h36	UTC-6	70°10.630	133°31.690	Vertical Net Tow ↑	45	280	105	20	-1.7	-1.44	1005.6	84	8/10
3a	434	Basic	15/Oct/2007	12h47	UTC-6	70°10.740	133°32.070	VMP ↓	39	20	100	19	-1.5	-1.42	1005.6	83	8/10
3a	434	Basic	15/Oct/2007	12h59	UTC-6	70°10.870	133°32.480	VMP ↑	40	15	105	19	-2.7	-1.44	1005.4	87	8/10
3a	434	Basic	15/Oct/2007	13h14	UTC-6	70°10.780	133°32.790	CTD-Rosette ↓	41	275	93	17	-2.5	-1.45	1005.3	90	8/10
3a	434	Basic	15/Oct/2007	13h29	UTC-6	70°10.730	133°33.090	CTD-Rosette ↑	40	268	101	20	-3.3	-1.44	1005.1	89	8/10
3a	434	Basic	15/Oct/2007	13h39	UTC-6	70°10.700	133°33.470	Agassiz Trawl ↓	52	200	99	18	-3.7	-1.43	1005.1	91	8/10
3a	434	Basic	15/Oct/2007	13h59	UTC-6	70°10.370	133°34.350	Agassiz Trawl ↑	38	220	101	19	-3.6	-1.45	1005.0	92	8/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	434	Basic	15/Oct/2007	14h26	UTC-6	70°10.220	133°34.630	Box Core ↓	38	310	96	22	-2.3	-1.37	1005.0	91	8/10
3a	434	Basic	15/Oct/2007	14h27	UTC-6	70°10.190	133°34.730	Box Core (bottom)	38	341	103	25	-2.3	-1.37	1005.0	90	8/10
3a	434	Basic	15/Oct/2007	14h28	UTC-6	70°10.180	133°34.800	Box Core ↑	38	343	99	23	-2.3	-1.37	1005.0	90	8/10
3a	434	Basic	15/Oct/2007	14h53	UTC-6	70°10.540	133°35.640	Agassiz Trawl ↓	38	216	101	23	-3	-1.33	1004.6	91	8/10
3a	434	Basic	15/Oct/2007	15h23	UTC-6	70°10.210	133°36.120	Agassiz Trawl ↑	37	22	103	20	-3.3	-1.28	1004.4	90	8/10
3a	433	CTD	15/Oct/2007	16h35	UTC-6	70°17.217	133°34.030	CTD ↓	53	299	100	22	-3	-1.18	1003.9	90	2/10
3a	433	CTD	15/Oct/2007	16h48	UTC-6	70°17.146	133°34.171	CTD ↑	49	300	100	18	-2	-1.18	1004.3	88	2/10
3a	432	Nutrient	15/Oct/2007	17h23	UTC-6	70°24.367	133°35.689	CTD-Rosette ↓	57	290	100	22	-2.7	-1.13	1003.8	92	2/10
3a	432	Nutrient	15/Oct/2007	17h39	UTC-6	70°24.230	133°36.520	CTD-Rosette ↑	58	294	97	22	-0.8	-1.14	1004.0	84	2/10
3a	431	CTD	15/Oct/2007	18h22	UTC-6	70°29.386	133°37.191	CTD ↓	61	300	100	20	-2.4	-0.9	1003.7	90	2/10
3a	431	CTD	15/Oct/2007	18h30	UTC-6	70°29.266	133°37.571	CTD ↑	64	302	100	16	0.8	-0.8	1003.7	80	2/10
3a	430	Nutrient	15/Oct/2007	19h10	UTC-6	70°35.616	133°38.841	CTD-Rosette ↓	69	302	100	23	-2.3	-0.9	1003.3	90	2/10
3a	430	Nutrient	15/Oct/2007	19h31	UTC-6	70°35.430	133°39.987	CTD-Rosette ↑	67	266	100	20	-2	-1	1004.0	86	1/10
3a	429	CTD	15/Oct/2007	20h17	UTC-6	70°41.540	133°40.360	CTD ↓	63	304	100	23	-2	-1	1003.7	91	0/10
3a	429	CTD	15/Oct/2007	20h27	UTC-6	70°41.460	133°40.780	CTD ↑	67	300	100	21	-1.2	-1	1003.7	88	0/10
3a	428	Nutrient	15/Oct/2007	21h23	UTC-6	70°47.250	133°41.540	CTD-Rosette ↓	68	289	100	20	-0.1	-1.03	1003.9	85	1/10
3a	428	Nutrient	15/Oct/2007	21h48	UTC-6	70°47.140	133°43.010	CTD-Rosette ↑	71	298	110	24	-0.8	-1.01	1003.7	85	1/10
3a	428	Nutrient	15/Oct/2007	22h18	UTC-6	70°47.260	133°43.740	Box Core ↓	70	262	90	25	-1.6	-1.03	1003.4	87	1/10
3a	428	Nutrient	15/Oct/2007	22h25	UTC-6	70°47.270	133°43.850	Box Core ↑	70	280	90	21	-1.6	-1.03	1003.4	87	1/10
3a	427	CTD	16/Oct/2007	00h13	UTC-6	70°52.430	133°42.290	CTD ↓	76	293	95	26	-1.7	-1.04	1003.26	85	1/10
3a	427	CTD	16/Oct/2007	00h22	UTC-6	70°52.400	133°42.650	CTD ↑	83	286	100	28	-1.7	-1.04	1003.26	85	1/10
3a	426	Nutrient	16/Oct/2007	01h30	UTC-6	70°59.030	133°43.490	CTD-Rosette ↓	89	292	110	30	-2.2	-1.05	1002.9	87	1/10
3a	426	Nutrient	16/Oct/2007	01h55	UTC-6	70°58.010	133°44.090	CTD-Rosette ↑	101	278	90	27	-2.3	-1.06	1003.6	86	1/10
3a	N/A	N/A	16/Oct/2007	03h12	UTC-6	71°05.310	133°36.000	Sediment Traps Deployed	345	285	110	30	-2.2	-0.64	1003.1	81	3/10
3a	N/A	N/A	16/Oct/2007	03h32	UTC-6	71°05.090	133°36.200	Sediment Traps Deployed (end)	338	285	110	32	-0.3	-0.58	1004.2	78	3/10
3a	435	Full	16/Oct/2007	03h53	UTC-6	71°04.930	133°39.140	CTD-Rosette ↓	306	292	90	33	-1.8	-0.59	1004.0	76	3/10
3a	435	Full	16/Oct/2007	04h38	UTC-6	71°04.458	133°41.508	CTD-Rosette ↑	279	185	90	25	-1.8	-0.6	1004.0	78	3/10
3a	435	Full	16/Oct/2007	04h58	UTC-6	71°04.336	133°43.646	Horizontal Net Tow ↓	280	214	90	23	-0.8	-0.6	1003.8	79	3/10
3a	435	Full	16/Oct/2007	05h10	UTC-6	71°04.968	133°44.425	Horizontal Net Tow ↑	276	151	80	26	-2.3	-0.6	1003.6	83	3/10
3a	435	Full	16/Oct/2007	05h19	UTC-6	71°03.862	133°44.368	Vertical Net Tow ↓	276	257	80	24	-1.8	0.6	1003.7	84	2/10
3a	435	Full	16/Oct/2007	05h38	UTC-6	71°03.861	133°45.867	Vertical Net Tow ↑	276	270	90	27	-2.2	-0.7	1003.5	85	2/10
3a	435	Full	16/Oct/2007	06h06	UTC-6	71°03.639	133°47.807	Hydrobios ↓	276	270	90	24	-1.5	-0.7	1003.4	83	2/10
3a	435	Full	16/Oct/2007	06h24	UTC-6	71°03.398	133°48.277	Hydrobios ↑	283	273	80	24	-1.5	-0.7	1000.3	81	2/10
3a	CA04-07	Mooring	16/Oct/2007	18h51	UTC-6	71°04.874	133°38.110	Mooring CA04-07 Deployed	306	N/A	93	5	-2,6	N/A	1008,01	N/A	N/A
3a	435	Full	17/Oct/2007	12h34	UTC-6	71°04.980	133°37.820	Secchi Disk ↓	313	238	67	6	-2.9	-0.7	1007.0	87	1/10
3a	435	Full	17/Oct/2007	12h36	UTC-6	71°04.950	133°37.900	Secchi Disk ↑	311	236	62	6	-2.9	-0.7	1007.0	87	1/10
3a	435	Full	17/Oct/2007	12h41	UTC-6	71°04.920	133°38.100	PNF ↓	308	240	53	6	-3	-0.72	1007.1	85	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3a	435	Full	17/Oct/2007	12h44	UTC-6	71°04.910	133°38.140	PNF ↑	307	241	60	7	-3	-0.72	1007.1	85	0/10
3a	435	Full	17/Oct/2007	13h01	UTC-6	71°04.730	133°38.900	CTD-Rosette ↓	295	241	69	7	-3.2	-0.7	1007.2	90	0/10
3a	435	Full	17/Oct/2007	13h44	UTC-6	71°04.420	133°39.990	CTD-Rosette ↑	273	227	69	12	-2.2	-0.7	1007.3	88	0/10
3a	435	Full	17/Oct/2007	13h53	UTC-6	71°04.380	133°40.170	Phytoplankton Net ↓	270	245	63	10	-2.5	-0.7	1007.3	87	0/10
3a	435	Full	17/Oct/2007	14h17	UTC-6	71°04.200	133°40.890	Phytoplankton Net ↑	265	252	75	10	-2.4	-0.72	1007.3	86	0/10
3a	435	Full	17/Oct/2007	14h22	UTC-6	71°04.080	133°41.340	VMP ↓	263	270	76	12	-2.1	-0.73	1007.4	86	0/10
3a	435	Full	17/Oct/2007	14h52	UTC-6	71°03.600	133°42.610	VMP ↑	250	271	69	13	-0.9	-0.72	1007.6	83	0/10
3a	435	Full	17/Oct/2007	15h03	UTC-6	71°03.530	133°42.710	CTD-Rosette ↓	252	249	66	12	-0.9	-0.72	1007.6	83	0/10
3a	435	Full	17/Oct/2007	15h43	UTC-6	71°03.230	133°44.030	CTD-Rosette ↑	242	231	29	7	-3.2	-0.72	1007.9	92	0/10
Leg 3b																	
3b	437	Full	19/Oct/2007	01h13	UTC-6	71°46.510	126°31.190	CTD-Rosette ↓	341	279	100	32	-2.8	0.14	1007.6	79	1/10
3b	437	Full	19/Oct/2007	01h31	UTC-6	71°46.530	126°31.100	CTD-Rosette ↑	341	286	95	30	-1.3	0.18	1007.7	75	1/10
3b	437	Full	19/Oct/2007	01h50	UTC-6	71°46.790	126°33.140	Horizontal Net Tow ↓	339	297	95	27	-3.3	0.24	1007.5	77	1/10
3b	437	Full	19/Oct/2007	02h04	UTC-6	71°46.910	126°34.680	Horizontal Net Tow ↑	355	280	90	34	-2.8	0.22	1007.4	76	1/10
3b	437	Full	19/Oct/2007	02h15	UTC-6	71°46.940	126°34.650	Vertical Net Tow ↓	360	283	100	29	-3	0.22	1007.3	77	1/10
3b	437	Full	19/Oct/2007	02h40	UTC-6	71°47.140	126°34.520	Vertical Net Tow ↑	350	292	105	35	-3.4	0.24	1007.2	78	1/10
3b	1806	Full	19/Oct/2007	12h10	UTC-6	72°39.740	127°07.200	CTD-Rosette ↓	96	298	80	30	-8.1	-0.4	1008.9	79	1/10
3b	1806	Full	19/Oct/2007	12h37	UTC-6	72°40.080	127°06.890	CTD-Rosette ↑	106	297	90	25	-7.1	-0.47	1008.9	78	1/10
3b	1806	Full	19/Oct/2007	12h41	UTC-6	72°40.160	127°06.960	Secchi Disk ↓	102	303	90	28	-5.8	-0.47	1009.0	77	1/10
3b	1806	Full	19/Oct/2007	12h43	UTC-6	72°40.180	127°07.020	Secchi Disk ↑	109	308	90	33	-5.8	-0.47	1009.0	77	1/10
3b	1806	Full	19/Oct/2007	12h50	UTC-6	72°40.280	127°07.000	PNF ↓	108	302	90	28	-6.3	-0.5	1008.6	77	1/10
3b	1806	Full	19/Oct/2007	12h54	UTC-6	72°40.290	127°06.990	PNF ↑	108	302	90	29	-6.3	-0.5	1008.6	77	1/10
3b	1806	Full	19/Oct/2007	13h37	UTC-6	72°40.670	127°07.160	CTD-Rosette ↓	101	299	100	31	-5.5	-0.63	1009.1	75	1/10
3b	1806	Full	19/Oct/2007	14h12	UTC-6	72°41.020	127°07.030	CTD-Rosette ↑	110	323	100	30	-7.2	-0.74	1009.2	78	1/10
3b	1806	Full	19/Oct/2007	14h41	UTC-6	72°41.880	127°08.910	Horizontal Net Tow ↓	106	303	85	29	-6.4	-0.75	1009.3	77	1/10
3b	1806	Full	19/Oct/2007	14h56	UTC-6	72°42.120	127°10.960	Horizontal Net Tow ↑	107	256	105	25	-7.3	-0.96	1009.2	80	1/10
3b	1806	Full	19/Oct/2007	15h03	UTC-6	72°42.200	127°10.840	Vertical Net Tow ↓	117	302	100	30	-7.9	-1.04	1009.0	82	1/10
3b	1806	Full	19/Oct/2007	15h15	UTC-6	72°42.390	127°10.680	Vertical Net Tow ↑	111	291	95	27	-6.1	-1.07	1009.2	77	1/10
3b	1806	Full	19/Oct/2007	15h53	UTC-6	72°42.870	127°10.050	RMT ↓	90	112	95	32	-7.8	-1.12	1008.9	81	1/10
3b	1806	Full	19/Oct/2007	16h22	UTC-6	72°43.660	127°12.388	RMT ↑	120	290	100	30	-6	-1.12	1009.1	80	1/10
3b	1806	Full	19/Oct/2007	16h44	UTC-6	72°43.806	127°12.199	VMP ↓	128	302	90	30	-7	-1.17	1009.0	80	1/10
3b	1806	Full	19/Oct/2007	17h26	UTC-6	72°43.870	127°13.800	VMP ↑	124	305	100	32	-6.9	-1.15	1009.2	83	1/10
3b	1806	Full	19/Oct/2007	17h36	UTC-6	72°43.970	127°13.880	Phytoplankton Net ↓	126	283	107	30	-6	-1.14	1009.2	81	1/10
3b	1806	Full	19/Oct/2007	17h55	UTC-6	72°44.270	127°13.650	Phytoplankton Net ↑	130	287	105	27	-7.3	-1.14	1009.2	81	1/10
3b	1806	Full	19/Oct/2007	18h04	UTC-6	72°44.422	127°13.746	Agassiz Trawl ↓	131	250	110	25	-7.2	-1.1	1009.1	81	1/10
3b	1806	Full	19/Oct/2007	18h26	UTC-6	72°44.957	127°14.906	Agassiz Trawl ↑	137	200	80	27	-8	-1.2	1009.0	82	1/10
3b	1806	Full	19/Oct/2007	18h34	UTC-6	72°45.059	127°15.608	Agassiz Trawl ↓	134	217	110	32	-8	-1.1	1008.9	82	1/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1806	Full	19/Oct/2007	18h57	UTC-6	72°44.977	127°17.721	Agassiz Trawl ↑	135	200	90	26	-7.8	-1.1	1009.0	82	1/10
3b	1806	Full	19/Oct/2007	19h16	UTC-6	72°45.035	127°18.073	Box Core ↓	137	319	100	31	-6.5	-1.1	1009.0	79	1/10
3b	1806	Full	19/Oct/2007	19h19	UTC-6	72°45.021	127°18.075	Box Core (bottom)	137	265	100	31	-6.5	-1.1	1009.0	79	1/10
3b	1806	Full	19/Oct/2007	19h24	UTC-6	72°45.087	127°18.017	Box Core ↑	140	297	100	25	-6.5	-1.1	1009.0	79	1/10
3b	1804	CTD	19/Oct/2007	21h38	UTC-6	72°29.880	127°15.420	CTD ↓	50	274	90	24	-6.6	-0.67	1008.3	81	0/10
3b	1804	CTD	19/Oct/2007	21h47	UTC-6	72°30.100	127°15.720	CTD ↑	52	300	90	19	-5.5	-0.46	1008.7	80	0/10
3b	1802	CTD	19/Oct/2007	23h33	UTC-6	72°18.070	127°27.070	CTD ↓	49	303	90	23	-5.6	-0.52	1008.1	79	1/10
3b	1802	CTD	19/Oct/2007	23h43	UTC-6	72°18.140	127°27.290	CTD ↑	49	285	90	17	-3.7	-0.71	1008.2	77	1/10
3b	1800	Basic	20/Oct/2007	02h02	UTC-6	72°08.010	127°39.710	Horizontal Net Tow ↓	380	264	110	20	-3.3	-1	1007.7	85	2/10
3b	1800	Basic	20/Oct/2007	02h20	UTC-6	72°08.160	127°42.010	Horizontal Net Tow ↑	380	261	110	20	-3.4	-1	1007.7	84	2/10
3b	1800	Basic	20/Oct/2007	02h28	UTC-6	72°08.230	127°42.460	Vertical Net Tow ↓	382	294	103	19	-3.4	-1	1007.7	84	2/10
3b	1800	Basic	20/Oct/2007	02h50	UTC-6	72°08.340	127°42.220	Vertical Net Tow ↑	380	281	110	21	-0.8	-0.93	1007.7	78	2/10
3b	1800	Basic	20/Oct/2007	03h16	UTC-6	72°08.210	127°40.350	VMP ↓	375	320	97	18	-3.1	-0.93	1007.5	83	2/10
3b	1800	Basic	20/Oct/2007	03h47	UTC-6	72°08.220	127°41.240	VMP ↑	376	320	100	20	-2.5	-0.96	1007.8	83	2/10
3b	1800	Basic	20/Oct/2007	04h02	UTC-6	72°08.297	127°41.227	CTD-Rosette ↓	381	293	110	16	-3.2	-0.95	1007.9	83	2/10
3b	1800	Basic	20/Oct/2007	04h54	UTC-6	72°08.463	127°42.606	CTD-Rosette ↑	379	340	110	19	-2.6	-0.93	1008.1	83	2/10
3b	1800	Basic	20/Oct/2007	05h57	UTC-6	72°09.254	127°44.943	CTD-Rosette ↓	366	315	90	20	-3.1	-0.91	1007.9	86	2/10
3b	1800	Basic	20/Oct/2007	06h39	UTC-6	72°09.452	127°45.920	CTD-Rosette ↑	367	0	90	17	-2.9	-0.86	1007.9	89	2/10
3b	1800	Basic	20/Oct/2007	07h00	UTC-6	72°10.382	127°44.454	Lawas ↓	354	104	110	18	-3.6	-0.84	1007.9	87	2/10
3b	1800	Basic	20/Oct/2007	07h30	UTC-6	72°10.382	127°44.454	Lawas ↑	354	100	110	18	-3.6	-0.84	1007.9	87	2/10
3b	1800	Basic	20/Oct/2007	08h10	UTC-6	72°10.970	127°46.980	Agassiz Trawl ↓	358	250	100	17	-2.9	-0.86	1008.0	84	1/10
3b	1800	Basic	20/Oct/2007	08h55	UTC-6	72°11.420	127°49.950	Agassiz Trawl ↑	360	300	100	18	-3.8	-1.01	1008.0	88	1/10
3b	1804	Basic	20/Oct/2007	08h58	UTC-6	72°11.440	127°49.930	Lawas ↓	357	335	100	19	-3.9	-1.05	1008.0	88	1/10
3b	1804	Basic	20/Oct/2007	09h15	UTC-6	72°11.680	127°50.000	Lawas ↑	364	65	110	18	-3.2	-1.08	1007.9	88	0/10
3b	1800	Basic	20/Oct/2007	09h36	UTC-6	72°11.730	127°49.800	Box Core ↓	356	263	100	16	-3.8	-1.08	1007.9	88	1/10
3b	1800	Basic	20/Oct/2007	09h48	UTC-6	72°11.860	127°49.910	Box Core ↑	355	274	100	17	-3.7	-1.08	1007.9	88	1/10
3b	437	Full	20/Oct/2007	14h57	UTC-6	71°47.650	126°30.650	Secchi Disk ↓	307	285	132	20	-2.2	0.16	1008.5	89	0/10
3b	437	Full	20/Oct/2007	14h59	UTC-6	71°47.680	126°30.680	Secchi Disk ↑	309	283	129	22	-2.2	0.16	1008.5	89	0/10
3b	437	Full	20/Oct/2007	15h02	UTC-6	71°47.730	126°30.610	Secchi Disk ↓	307	318	127	20	-1.1	0.16	1008.5	84	0/10
3b	437	Full	20/Oct/2007	15h03	UTC-6	71°47.750	126°30.610	Secchi Disk ↑	307	325	118	23	-1.1	0.16	1008.6	84	0/10
3b	437	Full	20/Oct/2007	15h09	UTC-6	71°47.790	126°30.700	PNF ↓	306	295	126	16	-1.1	0.16	1008.6	84	0/10
3b	437	Full	20/Oct/2007	15h12	UTC-6	71°47.820	126°30.570	PNF ↑	304	301	124	18	-0.7	0.15	1008.7	84	0/10
3b	437	Full	20/Oct/2007	15h47	UTC-6	71°48.130	126°30.330	CTD-Rosette ↓	292	304	121	18	0.4	0.13	1008.7	80	0/10
3b	437	Full	20/Oct/2007	16h39	UTC-6	71°48.733	126°31.787	CTD-Rosette ↑	286	15	N/A	N/A	-1.5	0.11	1008.9	86	0/10
3b	CA16-07	Mooring	20/Oct/2007	17h45	UTC-6	71°47.533	126°29.347	Mooring CA16-07 Deployed	300	140	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	437	Full	20/Oct/2007	19h30	UTC-6	71°46.658	126°31.257	CTD-Rosette ↓	334	287	100	20	-2	0	1009.0	93	0/10
3b	437	Full	20/Oct/2007	20h24	UTC-6	71°46.940	126°32.410	CTD-Rosette ↑	335	315	110	22	-0.7	-0.16	1009.2	92	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	437	Full	20/Oct/2007	20h55	UTC-6	71°97.100	126°33.470	Hydrobios ↓	348	327	120	17	-1.3	-0.2	1009.3	93	0/10
3b	437	Full	20/Oct/2007	21h15	UTC-6	71°47.070	126°33.880	Hydrobios ↑	346	296	120	15	1.3	-0.18	1009.3	88	0/10
3b	437	Full	20/Oct/2007	21h37	UTC-6	71°47.130	126°34.320	VMP ↓	347	320	120	18	-0.8	-0.07	1009.4	94	0/10
3b	437	Full	20/Oct/2007	22h03	UTC-6	71°47.420	126°35.020	VMP ↑	347	22	140	17	-1.1	-0.09	1009.5	93	0/10
3b	437	Full	20/Oct/2007	22h10	UTC-6	71°47.530	126°35.200	Lawas ↓	345	200	150	16	-1.3	-0.1	1009.5	92	0/10
3b	437	Full	20/Oct/2007	22h50	UTC-6	71°47.390	126°35.300	Lawas ↑	350	180	140	15	-1.7	-0.12	1009.5	93	0/10
3b	437	Full	20/Oct/2007	23h25	UTC-6	71°47.940	126°34.910	Agassiz Trawl ↓	339	312	140	14	-1.6	-0.13	1009.5	94	0/10
3b	437	Full	20/Oct/2007	23h54	UTC-6	71°48.420	126°36.150	Agassiz Trawl ↑	332	285	160	16	-1.8	-0.18	1009.6	92	0/10
3b	437	Full	21/Oct/2007	00h54	UTC-6	71°46.760	126°30.210	Box Core ↓	329	341	144	14	-0.7	0.07	1010.0	92	0/10
3b	437	Full	21/Oct/2007	00h00	UTC-6	71°46.770	126°30.010	Box Core (bottom)	326	352	145	17	-1.9	0.11	1010.1	84	0/10
3b	437	Full	21/Oct/2007	01h06	UTC-6	71°46.820	126°29.830	Box Core ↑	325	351	147	17	-1.9	0.11	1010.1	84	0/10
3b	410	CTD	21/Oct/2007	02h27	UTC-6	71°42.070	126°29.750	CTD ↓	406	9	152	15	-1.8	0.05	1010.1	93	0/10
3b	410	CTD	21/Oct/2007	02h41	UTC-6	71°42.110	126°29.790	CTD ↑	405	4	154	11	-1.4	0.15	1010.3	92	0/10
3b	411	CTD	21/Oct/2007	04h01	UTC-6	71°37.810	126°42.970	CTD ↓	438	345	170	15	-1.7	-0.37	1010.5	93	0/10
3b	411	CTD	21/Oct/2007	04h20	UTC-6	71°37.923	126°43.243	CTD ↑	439	344	170	14	-1.7	-0.46	1010.5	93	0/10
3b	412	Nutrient	21/Oct/2007	05h23	UTC-6	71°33.763	126°55.561	CTD-Rosette ↓	416	27	160	12	-1.7	-0.46	1010.0	93	0/10
3b	412	Nutrient	21/Oct/2007	06h18	UTC-6	71°34.025	126°56.739	CTD-Rosette ↑	416	52	180	6	-0.7	-0.11	1010.8	92	0/10
3b	413	CTD	21/Oct/2007	07h14	UTC-6	71°29.745	127°08.639	CTD ↓	374	53	180	10	-1.3	0	1010.8	94	0/10
3b	413	CTD	21/Oct/2007	07h25	UTC-6	71°30.086	127°09.520	CTD ↑	375	58	180	3	-1	0	1010.9	93	0/10
3b	N/A	N/A	21/Oct/2007	08h15	UTC-6	71°33.550	127°02.360	Lawas ↓	414	140	180	7	-0.9	-0.08	1010.9	78	0/10
3b	N/A	N/A	21/Oct/2007	08h43	UTC-6	71°33.270	127°03.460	Lawas ↑	405	215	200	8	-1.2	-0.43	1011.0	76	0/10
3b	CA16-MMP-07	Mooring	21/Oct/2007	12h04	UTC-6	71°45.237	126°30.422	CA16-MMP-07 Deployed	350	190	175	10/15	-1.2	-0.5	1011.3	76	0/10
3b	CA16-MMP-07	Mooring	21/Oct/2007	13h01	UTC-6	71°45.340	126°30.530	CTD ↓	364	352	176	7	-1.8	-0.13	1011.4	93	0/10
3b	CA16-MMP-07	Mooring	21/Oct/2007	13h17	UTC-6	71°45.390	126°30.440	CTD ↑	362	336	175	11	-1.7	-0.09	1011.4	88	0/10
3b	414	Nutrient	21/Oct/2007	15h38	UTC-6	71°25.380	127°21.190	CTD-Rosette ↓	312	344	186	5	-2.4	-0.64	1010.9	88	0/10
3b	414	Nutrient	21/Oct/2007	16h30	UTC-6	71°25.668	127°20.973	CTD-Rosette ↑	315	80	180	4	-1.4	-0.84	1011.0	88	0/10
3b	415	CTD	21/Oct/2007	17h15	UTC-6	71°21.923	127°32.478	CTD ↓	247	330	150	12	-2.6	-0.97	1010.5	84	0/10
3b	415	CTD	21/Oct/2007	17h26	UTC-6	71°21.935	127°32.578	CTD ↑	247	329	135	5	-1.9	-0.79	1010.7	82	0/10
3b	N/A	N/A	21/Oct/2007	18h25	UTC-6	71°16.823	127°38.372	Sediment Traps Deployed	170	110	108	13	-3.1	-0.67	1010.3	87	0/10
3b	N/A	N/A	21/Oct/2007	18h39	UTC-6	71°16.828	127°38.819	Sediment Traps Deployed (end)	167	180	110	15	-3.5	-0.68	1010.2	92	0/10
3b	408	Full	21/Oct/2007	19h30	UTC-6	71°17.065	127°30.832	Horizontal Net Tow ↓	206	306	123	7	-3.9	-0.62	1009.0	90	0/10
3b	408	Full	21/Oct/2007	19h45	UTC-6	71°17.135	127°32.849	Horizontal Net Tow ↑	201	248	140	13	-4.1	-0.59	1009.0	90	0/10
3b	408	Full	21/Oct/2007	19h52	UTC-6	71°17.900	127°33.260	Vertical Net Tow ↓	202	277	135	5	-4.2	-0.59	1009.8	92	0/10
3b	408	Full	21/Oct/2007	20h05	UTC-6	71°17.230	127°33.260	Vertical Net Tow ↑	203	287	180	5	-4.2	-0.58	1009.7	91	0/10
3b	408	Full	21/Oct/2007	20h23	UTC-6	71°17.260	127°33.700	Hydrobios ↓	199	314	135	5	-3.3	-0.56	1009.6	90	0/10
3b	408	Full	21/Oct/2007	20h38	UTC-6	71°17.260	127°34.090	Hydrobios ↑	197	312	135	5	-2.7	-0.56	1009.5	88	0/10
3b	408	Full	21/Oct/2007	21h19	UTC-6	71°17.790	127°36.260	RMT ↓	192	290	135	5	-3.1	-0.57	1009.0	93	0/10

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	408	Full	21/Oct/2007	21h30	UTC-6	71°17.920	127°36.530	RMT ↑	191	356	135	15	-3.6	-0.63	1009.0	89	0/10
3b	408	Full	21/Oct/2007	21h58	UTC-6	71°18.530	127°37.350	Lawas ↓	193	127	135	12	-2.9	-0.63	1009.0	87	0/10
3b	408	Full	21/Oct/2007	22h25	UTC-6	71°18.600	127°38.300	Lawas ↑	188	100	140	10	-3.6	-0.62	1008.9	91	0/10
3b	408	Full	21/Oct/2007	22h44	UTC-6	71°18.710	127°38.260	Agassiz Trawl ↓	190	291	130	8	-3.6	-0.63	1008.6	91	0/10
3b	408	Full	21/Oct/2007	23h02	UTC-6	71°19.020	127°38.690	Agassiz Trawl ↑	197	332	120	15	-3.4	-0.66	1008.5	93	0/10
3b	408	Full	21/Oct/2007	23h17	UTC-6	71°19.260	127°39.140	Box Core ↓	193	306	210	13	-2.2	-0.65	1008.4	92	0/10
3b	408	Full	21/Oct/2007	23h23	UTC-6	71°19.340	127°39.200	Box Core ↑	193	295	200	15	-3.2	-0.63	1008.3	89	0/10
3b	408	Full	22/Oct/2007	00h33	UTC-6	71°16.860	127°32.480	VMP ↓	198	327	113	20	-2.8	-0.62	1008.3	93	0/10
3b	408	Full	22/Oct/2007	01h29	UTC-6	71°16.700	127°34.750	VMP ↑	186	317	104	14	-1.7	-0.66	1008.0	84	0/10
3b	408	CTD	22/Oct/2007	01h39	UTC-6	71°16.680	127°34.960	CTD-Rosette ↓	185	298	130	14	-1.7	-0.66	1008.0	84	0/10
3b	408	CTD	22/Oct/2007	01h58	UTC-6	71°16.690	127°35.450	CTD-Rosette ↑	184	321	105	14	-2.4	-0.71	1007.9	85	0/10
3b	417	CTD	22/Oct/2007	02h49	UTC-6	71°13.240	127°58.850	CTD ↓	78	311	104	13	-2.5	-1.2	1007.6	90	0/10
3b	417	CTD	22/Oct/2007	02h56	UTC-6	71°13.220	127°58.980	CTD ↑	93	309	99	10	-2.5	-1.2	1007.6	90	0/10
3b	418	CTD	22/Oct/2007	04h40	UTC-6	71°09.645	128°10.122	CTD ↓	60	308	110	14	-2.7	-1.3	1006.7	86	0/10
3b	418	CTD	22/Oct/2007	04h45	UTC-6	71°09.669	128°10.127	CTD ↑	60	274	110	14	-1.3	-1.3	1006.5	82	0/10
3b	419	CTD	22/Oct/2007	05h56	UTC-6	71°06.315	128°20.514	CTD ↓	51	316	110	13	-1.8	-1	1006.0	85	0/10
3b	419	CTD	22/Oct/2007	06h03	UTC-6	71°06.404	128°20.687	CTD ↑	50	325	100	13	-1	-0.97	1006.0	81	0/10
3b	N/A	N/A	22/Oct/2007	08h02	UTC-6	71°16.900	127°32.350	Lawas ↓	198	120	110	15	-2.6	-0.88	1006.4	95	0/10
3b	N/A	N/A	22/Oct/2007	08h30	UTC-6	71°16.730	127°32.860	Lawas ↑	194	132	100	14	-2.9	-0.85	1006.6	95	0/10
3b	408	Full	22/Oct/2007	09h15	UTC-6	71°17.000	127°32.180	CTD-Rosette ↓	202	317	100	14	-2.2	-0.88	1006.3	92	0/10
3b	408	Full	22/Oct/2007	09h58	UTC-6	71°17.170	127°33.400	CTD-Rosette ↑	199	290	110	13	-1.1	-0.82	1006.3	84	0/10
3b	408	Full	22/Oct/2007	10h07	UTC-6	71°17.230	127°34.060	Phytoplankton Net ↓	201	203	110	11	0.4	-0.81	1006.4	81	0/10
3b	408	Full	22/Oct/2007	10h23	UTC-6	71°17.410	127°34.690	Phytoplankton Net ↑	200	254	90	12	-2.7	-0.83	1006.3	88	0/10
3b	408	Full	22/Oct/2007	11h04	UTC-6	71°17.013	127°32.981	Secchi Disk ↓	197	117	110	11	-2.4	-0.89	1006.4	88	0/10
3b	408	Full	22/Oct/2007	11h06	UTC-6	71°17.013	127°32.981	Secchi Disk ↑	197	119	110	11	-2.4	-0.89	1006.4	88	0/10
3b	408	Full	22/Oct/2007	11h19	UTC-6	71°17.010	127°32.884	PNF ↓	201	88	110	11	-2.5	-0.9	1006.3	89	0/10
3b	408	Full	22/Oct/2007	11h22	UTC-6	71°17.060	127°32.924	PNF ↑	217	88	110	11	-2.5	-0.9	1006.3	89	0/10
3b	408	Full	22/Oct/2007	12h02	UTC-6	71°16.895	127°32.259	CTD-Rosette ↓	199	126	130	10	-2.5	-0.9	1006.0	89	0/10
3b	408	Full	22/Oct/2007	12h45	UTC-6	71°17.010	127°33.550	CTD-Rosette ↑	196	340	117	7	-2.3	-0.96	1006.4	89	0/10
3b	CA05-07	Mooring	22/Oct/2007	14h57	UTC-6	71°18.840	127°35.430	Mooring CA05-07 Deployed	205	170	160	5	-2.6	-0.8	1006.5	93	0/10
3b	408	Full	22/Oct/2007	16h18	UTC-6	71°18.607	127°37.228	CTD-Rosette ↓	194	160	150	6	-2.9	-0.8	1006.7	95	0/10
3b	408	Full	22/Oct/2007	16h29	UTC-6	71°18.658	127°37.818	CTD-Rosette ↑	191	291	160	3	-3	-0.8	1006.7	96	0/10
3b	N/A	N/A	22/Oct/2007	17h15	UTC-6	71°22.227	127°50.043	Sediment Traps Recovered	186	175	130	2	-2.8	-0.9	1006.8	97	0/10
3b	CA05-MMP-07	Mooring	22/Oct/2007	20h30	UTC-6	71°24.170	127°38.020	CA05-MMP-07 Deployed	235	242	20	3	-2.6	-0.9	1006.8	96	0/10
3b	CA05-MMP-07	Mooring	22/Oct/2007	20h47	UTC-6	71°24.190	127°38.110	CA05-MMP-07 Deployed (end)	233	244	30	2	-2.1	-0.9	1006.8	97	0/10
3b	420	Basic	23/Oct/2007	00h19	UTC-6	71°03.500	128°28.810	Horizontal Net Tow ↓	37	101	290	11	-2.6	-1.15	1007.9	95	1/10
3b	420	Basic	23/Oct/2007	00h29	UTC-6	71°03.610	128°27.720	Horizontal Net Tow ↑	37	38	285	14	-2.9	-1.08	1007.9	95	1/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	420	Basic	23/Oct/2007	00h35	UTC-6	71°03.640	128°27.600	Vertical Net Tow ↓	37	108	290	11	-2.9	-1.08	1007.9	95	1/10
3b	420	Basic	23/Oct/2007	00h39	UTC-6	71°03.680	128°27.560	Vertical Net Tow ↑	37	116	282	14	-2.9	-1.08	1007.9	95	1/10
3b	420	Basic	23/Oct/2007	01h03	UTC-6	71°03.870	128°27.240	CTD-Rosette ↓	36	67	290	16	-0.3	-0.96	1007.9	94	1/10
3b	420	Basic	23/Oct/2007	01h17	UTC-6	71°03.900	128°26.650	CTD-Rosette ↑	37	30	282	17	-3.2	-0.98	1008.1	95	1/10
3b	420	Basic	23/Oct/2007	02h15	UTC-6	71°04.040	128°25.040	CTD-Rosette ↓	42	70	283	14	-3.3	-1.01	1008.7	94	1/10
3b	420	Basic	23/Oct/2007	02h41	UTC-6	71°03.990	128°24.380	CTD-Rosette ↑	42	53	276	17	-3.4	-1.05	1008.9	94	1/10
3b	420	Basic	23/Oct/2007	02h57	UTC-6	71°03.450	128°24.800	Agassiz Trawl ↓	40	15	271	14	-3	-1.07	1008.9	93	1/10
3b	420	Basic	23/Oct/2007	03h05	UTC-6	71°03.600	128°24.430	Agassiz Trawl ↑	40	23	271	15	-3.1	-1.09	1009.0	92	1/10
3b	420	Basic	23/Oct/2007	03h10	UTC-6	71°03.680	128°24.200	Agassiz Trawl ↓	42	19	277	15	-3.4	-1.09	1009.1	92	1/10
3b	420	Basic	23/Oct/2007	03h19	UTC-6	71°03.890	128°23.600	Agassiz Trawl ↑	49	26	284	14	-3.5	-1.1	1009.1	92	1/10
3b	420	Basic	23/Oct/2007	03h31	UTC-6	71°03.880	128°23.310	Van Veen Grab ↓	51	65	275	15	-3.6	-1.1	1009.1	93	1/10
3b	420	Basic	23/Oct/2007	03h33	UTC-6	71°03.870	128°23.270	Van Veen Grab (bottom)	45	73	271	15	-3.6	-1.1	1009.1	93	1/10
3b	420	Basic	23/Oct/2007	03h37	UTC-6	71°03.870	128°23.220	Van Veen Grab ↑	46	69	274	13	-3.6	-1.1	1009.1	93	1/10
3b	407	Full	23/Oct/2007	09h00	UTC-6	71°00.510	125°57.800	Lawas ↓	407	140	310	8	-2.5	-0.65	1009.3	90	0/10
3b	407	Full	23/Oct/2007	09h30	UTC-6	71°00.840	125°57.740	Lawas ↑	401	360	320	10	-2.7	-0.64	1009.3	90	0/10
3b	407	Full	23/Oct/2007	09h33	UTC-6	71°00.840	125°57.640	Sediment Traps Deployed	401	16	320	8	-2.7	-0.64	1009.3	90	0/10
3b	407	Full	23/Oct/2007	09h49	UTC-6	71°00.850	125°57.590	Sediment Traps Deployed (end)	406	121	310	9	-2.7	-0.64	1009.3	90	0/10
3b	407	Full	23/Oct/2007	10h35	UTC-6	71°00.640	126°03.270	Secchi Disk ↓	399	135	290	7	-2	-0.61	1009.8	88	0/10
3b	407	Full	23/Oct/2007	10h38	UTC-6	71°00.640	126°03.270	Secchi Disk ↑	400	135	290	7	-2	-0.61	1009.8	88	0/10
3b	407	Full	23/Oct/2007	10h33	UTC-6	71°00.680	126°03.040	Water Sampling	402	109	290	10	-2	-0.61	1009.8	88	0/10
3b	407	Full	23/Oct/2007	10h46	UTC-6	71°00.780	126°02.440	PNF + Water Sampling ↓	402	215	270	11	-0.9	-0.61	1009.8	89	0/10
3b	407	Full	23/Oct/2007	10h51	UTC-6	71°00.790	126°02.250	PNF + Water Sampling ↑	402	170	270	11	-0.9	-0.61	1009.8	89	0/10
3b	407	Full	23/Oct/2007	11h10	UTC-6	71°01.000	126°01.940	CTD-Rosette ↓	400	91	260	17	-2.1	-0.56	1009.9	93	0/10
3b	407	Full	23/Oct/2007	12h02	UTC-6	71°01.640	126°00.830	CTD-Rosette ↑	401	93	273	14	-1.8	-0.6	1010.2	90	0/10
3b	CA08-06	Mooring	23/Oct/2007	N/A	UTC-6	N/A	N/A	Mooring CA08-06 Recovered (lost)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	407	Full	23/Oct/2007	14h10	UTC-6	71°00.650	126°03.760	Water Sampling	401	174	280	10	-3.9	-0.65	1010.8	96	0/10
3b	407	Full	23/Oct/2007	14h48	UTC-6	71°00.800	126°02.340	Horizontal Net Tow ↓	400	67	271	9	-4	-0.63	1010.8	95	0/10
3b	407	Full	23/Oct/2007	14h59	UTC-6	71°01.060	126°01.650	Horizontal Net Tow ↑	399	4	260	7	-3.9	-0.63	1010.8	94	0/10
3b	407	Full	23/Oct/2007	15h11	UTC-6	71°01.130	126°01.420	Vertical Net Tow ↓	402	56	265	10	-4	-0.65	1010.7	94	0/10
3b	407	Full	23/Oct/2007	15h33	UTC-6	71°01.210	126°00.890	Vertical Net Tow ↑	403	67	276	8	-4	-0.62	1010.8	94	0/10
3b	407	Full	23/Oct/2007	17h03	UTC-6	71°00.897	126°00.991	Water Sampling ↓↑	399	226	240	8	-4	-0.6	1010.4	94	0/10
3b	407	Full	23/Oct/2007	17h12	UTC-6	71°00.900	126°00.900	CTD-Rosette ↓	399	92	244	7	-3.4	-0.6	1010.5	95	0/10
3b	407	Full	23/Oct/2007	18h04	UTC-6	71°01.342	125°59.913	CTD-Rosette ↑	399	6	230	5	-3	-0.62	1010.3	88	0/10
3b	407	Full	23/Oct/2007	18h20	UTC-6	71°01.417	125°59.621	Hydrobios ↓	398	56	230	6	-4	-0.6	1010.3	88	0/10
3b	407	Full	23/Oct/2007	18h49	UTC-6	71°01.522	125°59.439	Hydrobios ↑	398	356	230	6	-4.1	-0.67	1010.1	87	0/10
3b	407	Full	23/Oct/2007	19h00	UTC-6	71°01.516	125°59.299	Vertical Net Tow ↓	398	55	230	6	-4.1	-0.67	1010.1	88	0/10
3b	407	Full	23/Oct/2007	19h30	UTC-6	71°01.633	125°58.926	Vertical Net Tow ↑	403	8	220	7	-3.8	-0.7	1010.0	88	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	407	Full	23/Oct/2007	19h30	UTC-6	71°01.632	125°58.943	Water Sampling ↓↑	403	8	220	7	-3.8	-0.7	1010.0	88	0/10
3b	407	Full	23/Oct/2007	19h48	UTC-6	71°01.823	125°58.630	RMT ↓	404	24	210	6	-3.7	-0.7	1010.0	87	0/10
3b	407	Full	23/Oct/2007	20h07	UTC-6	71°02.020	125°59.090	RMT ↑	401	130	190	4	-3.5	-0.7	1010.0	87	0/10
3b	407	Full	23/Oct/2007	20h30	UTC-6	71°02.310	125°57.860	VMP ↓	405	121	220	5	-3.5	-0.72	1010.0	89	0/10
3b	407	Full	23/Oct/2007	21h20	UTC-6	71°03.190	125°56.140	VMP ↑	333	95	200	4	-3.6	-0.47	1009.9	90	0/10
3b	407	Full	23/Oct/2007	21h10	UTC-6	71°02.970	125°56.560	Water Sampling	403	105	200	6	-3.5	-0.52	1009.9	89	0/10
3b	407	Full	23/Oct/2007	21h48	UTC-6	71°03.670	125°55.550	CTD-Rosette ↓	409	62	190	3	-2.5	-0.46	1009.8	88	0/10
3b	407	Full	23/Oct/2007	22h22	UTC-6	71°04.240	125°55.100	CTD-Rosette ↑	416	1	210	6	-3.5	-0.77	1009.7	86	0/10
3b	N/A	Full	23/Oct/2007	22h33	UTC-6	71°04.480	125°54.850	Lawas ↓	418	136	200	5	-3.3	-0.46	1009.6	87	0/10
3b	N/A	Full	23/Oct/2007	23h13	UTC-6	71°05.130	125°54.260	Lawas ↑	422	222	160	9	-3.7	-0.54	1009.5	87	0/10
3b	407	Full	24/Oct/2007	00h01	UTC-6	71°01.410	126°01.890	Agassiz Trawl ↓	400	283	158	8	-4.1	-0.69	1009.3	88	0/10
3b	407	Full	24/Oct/2007	00h26	UTC-6	71°01.790	126°02.920	Agassiz Trawl ↑	401	284	157	11	-4.1	-0.6	1009.3	87	0/10
3b	407	Full	24/Oct/2007	00h36	UTC-6	71°01.880	126°02.830	Box Core ↓	399	342	150	9	-4.2	-0.6	1009.3	87	0/10
3b	407	Full	24/Oct/2007	00h42	UTC-6	71°01.860	126°02.710	Box Core (bottom)	399	351	151	9	-3.9	-0.58	1009.4	87	0/10
3b	407	Full	24/Oct/2007	00h50	UTC-6	71°01.860	126°02.530	Box Core ↑	399	353	157	11	-2.7	-0.57	1009.4	84	0/10
3b	407	Full	24/Oct/2007	00h53	UTC-6	71°01.900	126°02.490	Water Sampling	405	325	158	10	-2.7	-0.57	1009.4	84	0/10
3b	407	Full	24/Oct/2007	01h27	UTC-6	71°00.400	126°03.080	CTD-Rosette ↓	399	351	160	15	-4.3	-0.77	1009.32	88	0/10
3b	407	Full	24/Oct/2007	01h52	UTC-6	71°00.510	126°02.890	CTD-Rosette ↑	399	38	155	14	-3.6	-0.81	1009.4	86	0/10
3b	N/A	N/A	24/Oct/2007	08h13	UTC-6	71°08.730	125°42.960	Sediment Traps Recovered	407	136	140	17	-4.1	-0.55	1008.2	85	0/10
3b	N/A	N/A	24/Oct/2007	08h35	UTC-6	71°09.090	125°43.030	Sediment Traps Recovered (end)	409	265	120	15	-4.2	-0.54	1009.1	85	0/10
3b	407	Full	24/Oct/2007	09h58	UTC-6	71°00.670	126°03.900	CTD-Rosette ↓	390	16	140	12	-5.6	-0.79	1008.4	88	0/10
3b	407	Full	24/Oct/2007	10h24	UTC-6	71°80.750	126°03.300	CTD-Rosette ↑		332	140	11	-2.6	-0.7	1008.4	79	0/10
3b	1018	CTD	24/Oct/2007	18h24	UTC-6	70°56.633	125°50.374	CTD ↓	402	0	150	13	-5.8	-0.73	1010.4	90	0/10
3b	1018	CTD	24/Oct/2007	18h41	UTC-6	70°56.863	125°49.965	CTD ↑	402	11	160	5	-4.6	-0.8	1010.6	86	0/10
3b	1016	Nutrient	24/Oct/2007	17h48	UTC-6	70°52.888	125°18.588	CTD-Rosette ↓	330	188	170	11	-5.1	-0.9	1010.8	92	0/10
3b	1016	Nutrient	24/Oct/2007	20h40	UTC-6	70°53.880	125°18.340	CTD-Rosette ↑	337	24	190	8	-4.7	-0.95	1011.1	91	0/10
3b	1014	CTD	24/Oct/2007	21h58	UTC-6	70°49.080	124°46.260	CTD ↓	380	98	210	10	-4.6	-0.82	1011.1	94	0/10
3b	1014	CTD	24/Oct/2007	22h08	UTC-6	70°49.120	124°46.650	CTD ↑	379	30	230	4	-4	-0.64	1011.3	95	0/10
3b	1018	CTD	24/Oct/2007	22h13	UTC-6	70°49.160	124°46.750	Lawas ↓	355	315	250	3	-4.3	-0.59	1011.3	94	0/10
3b	1018	CTD	24/Oct/2007	22h45	UTC-6	70°49.310	124°48.020	Lawas ↑	351	236	210	2	-4.3	-0.53	1011.6	93	0/10
3b	1012	Nutrient	24/Oct/2007	23h58	UTC-6	70°45.290	124°14.410	CTD-Rosette ↓	529	317	117	12	-4.2	-0.81	1011.9	87	0/10
3b	1012	Nutrient	25/Oct/2007	00h56	UTC-6	70°44.940	124°14.980	CTD-Rosette ↑	471	334	112	10	-4.6	-0.64	1012.6	87	0/10
3b	N/A	N/A	25/Oct/2007	00h16	UTC-6	70°45.180	124°14.600	Water Sampling	532	292	125	10	-2.8	-0.72	1012.3	83	0/10
3b	1010	CTD	25/Oct/2007	02h02	UTC-6	70°41.550	124°42.110	CTD ↓	507	344	116	13	-4	-0.67	1013.1	86	0/10
3b	1010	CTD	25/Oct/2007	02h22	UTC-6	70°41.420	124°42.390	CTD ↑	512	16	142	9	-3	-0.66	1013.4	82	0/10
3b	N/A	N/A	25/Oct/2007	03h36	UTC-6	70°40.090	123°02.620	Sediment Traps Recovered	554	303	100	10	-3	-0.66	1013.4	82	0/10
3b	N/A	N/A	25/Oct/2007	03h50	UTC-6	70°40.060	123°02.800	Sediment Traps Recovered (end)	558	285	134	10	-3	-0.66	1013.4	82	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	405	Full	25/Oct/2007	04h13	UTC-6	70°40.035	122°59.421	Horizontal Net Tow ↓	550	300	134	9	-4	-1.25	1014.1	91	0/10
3b	405	Full	25/Oct/2007	04h25	UTC-6	70°39.897	123°00.494	Horizontal Net Tow ↑	573	195	130	6	-4	-1.24	1014.1	91	0/10
3b	405	Full	25/Oct/2007	04h32	UTC-6	70°39.846	123°00.796	Vertical Net Tow ↓	577	218	110	9	-4.7	-1.24	1014.0	91	0/10
3b	405	Full	25/Oct/2007	05h06	UTC-6	70°39.937	123°01.480	Vertical Net Tow ↑	566	200	160	8	-4.7	-1.24	1014.5	93	0/10
3b	405	Full	25/Oct/2007	05h22	UTC-6	70°39.756	123°01.160	RMT ↓	599	297	130	6	-4.3	-1.19	1014.7	93	0/10
3b	405	Full	25/Oct/2007	05h41	UTC-6	70°39.446	123°02.366	RMT ↑	607	200	130	9	-4.7	-1.17	1014.7	92	0/10
3b	405	Full	25/Oct/2007	06h06	UTC-6	70°39.358	123°02.131	Agassiz Trawl ↓	615	178	130	9	-4.7	-1.17	1014.7	92	0/10
3b	405	Full	25/Oct/2007	06h33	UTC-6	70°38.980	123°02.493	Agassiz Trawl (bottom)	623	90	130	9	-4.7	-1.2	1014.7	92	0/10
3b	405	Full	25/Oct/2007	07h04	UTC-6	70°38.940	123°01.413	Agassiz Trawl ↑	622	91	180	3	-4.7	-1.2	1014.7	92	0/10
3b	N/A	Full	25/Oct/2007	08h12	UTC-6	70°39.840	122°59.900	Lawas ↓	577	160	150	6	-5	-1.2	1015.8	93	0/10
3b	N/A	Full	25/Oct/2007	08h45	UTC-6	70°39.480	123°00.770	Lawas ↑	611	144	150	6	-5	-1.1	1016.1	88	0/10
3b	405	Full	25/Oct/2007	08h56	UTC-6	70°39.340	123°01.130	VMP ↓	607	305	180	5	-5	-1.1	1016.1	88	0/10
3b	405	Full	25/Oct/2007	09h25	UTC-6	70°39.340	123°02.060	VMP ↑	611	308	150	8	-4.8	-1.1	1016.5	83	0/10
3b	405	Full	25/Oct/2007	11h30	UTC-6	70°39.940	122°59.020	Secchi Disk ↓	551	82	200	3	-4.3	-1.07	1017.7	84	0/10
3b	405	Full	25/Oct/2007	11h34	UTC-6	70°39.950	122°59.050	Secchi Disk ↑	550	82	200	3	-4.3	-1.07	1017.7	84	0/10
3b	405	Full	25/Oct/2007	11h40	UTC-6	70°39.950	122°59.100	PNF + Water Sampling ↓	550	89	200	2	-4	-1.14	1017.8	85	0/10
3b	405	Full	25/Oct/2007	11h45	UTC-6	70°39.960	122°59.080	PNF + Water Sampling ↑	550	90	200	2	-4	-1.14	1017.8	85	0/10
3b	CA18-06	Mooring	25/Oct/2007	10h24	UTC-6	70°39.897	122°59.653	Mooring CA18-06 Recovered	611	300	150	8	-4.8	-1.1	1016.5	86	0/10
3b	CA18-06	Mooring	25/Oct/2007	11h12	UTC-6	70°39.900	122°59.650	Mooring CA18-06 Recovered (end)	611	300	150	8	-4.8	-1.1	1016.5	86	0/10
3b	405	Full	25/Oct/2007	12h10	UTC-6	70°40.190	123°00.870	CTD-Rosette ↓	563	297	181	11	-4.8	-1.18	1018.0	82	0/10
3b	405	Full	25/Oct/2007	13h01	UTC-6	70°39.970	123°01.930	CTD-Rosette ↑	560	278	165	7	-4.9	-0.86	1018.4	83	0/10
3b	405	Full	25/Oct/2007	15h15	UTC-6	70°39.960	123°00.590	CTD-Rosette ↓	560	35	160	5	-4.5	-0.93	1019.4	90	0/10
3b	405	Full	25/Oct/2007	16h18	UTC-6	70°39.723	123°01.421	CTD-Rosette ↑	591	114	270	14	-4.6	-1.2	1019.5	91	0/10
3b	405	Full	25/Oct/2007	16h40	UTC-6	70°39.632	123°01.572	Hydrobios ↓	602	107	260	10	-2.6	-1.2	1019.5	87	0/10
3b	405	Full	25/Oct/2007	17h16	UTC-6	70°39.574	123°01.690	Hydrobios ↑	605	119	260	17	-4.5	-1.2	1019.5	86	0/10
3b	405	Full	25/Oct/2007	17h37	UTC-6	70°39.960	122°59.320	CTD-Rosette ↓	555	106	239	15	-4.5	-1.15	1019.9	87	0/10
3b	405	Full	25/Oct/2007	18h22	UTC-6	70°39.799	122°59.463	CTD-Rosette ↑	582	82	260	12	-4.2	-0.86	1019.9	79	1/10
3b	CA18-07	Mooring	25/Oct/2007	22h22	UTC-6	70°39.870	122°59.460	Mooring CA18-07 Deployed	554	312	190	14	-5.2	-0.93	1019.5	90	1/10
3b	CA18-07	Mooring	25/Oct/2007	00h00	UTC-6	70°40.040	122°59.290	Mooring CA18-07 Deployed (end)	542	300	200	15	-5	-1	1019.5	90	0/10
3b	405	Full	26/Oct/2007	00h03	UTC-6	70°40.020	122°59.570	CTD-Rosette ↓	539	68	205	17	-4.1	-1.08	1019.2	90	0/10
3b	405	Full	26/Oct/2007	00h23	UTC-6	70°39.990	122°59.940	CTD-Rosette ↑	544	38	216	17	-3.1	-1.05	1019.2	90	0/10
3b	N/A	N/A	26/Oct/2007	01h50	UTC-6	70°35.310	122°56.550	Sediment Traps Deployed	651	255	220	14	-4.3	-1.22	1019.1	91	0/10
3b	N/A	N/A	26/Oct/2007	02h08	UTC-6	70°35.410	122°55.980	Sediment Traps Deployed (end)	634	338	230	13	-4.3	-1.2	1019.1	89	0/10
3b	1006	CTD	26/Oct/2007	03h02	UTC-6	70°36.050	122°37.650	CTD ↓	550	90	265	15	-4.4	-1.16	1018.7	90	2/10
3b	1006	CTD	26/Oct/2007	03h18	UTC-6	70°36.180	122°37.550	CTD ↑	547	57	272	20	-4.2	-1.05	1018.6	90	2/10
3b	1004	Nutrient	26/Oct/2007	04h40	UTC-6	70°35.977	122°04.801	CTD-Rosette ↓	487	130	260	16	-3.9	-0.45	1018.2	86	1/10
3b	1004	Nutrient	26/Oct/2007	05h34	UTC-6	70°35.896	122°03.026	CTD-Rosette ↑	487	135	270	9	-3.6	-0.24	1017.7	85	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1002	CTD	26/Oct/2007	06h42	UTC-6	70°36.061	121°32.663	CTD ↓	458	138	270	12	-4.8	-1.25	1017.8	87	8/10
3b	1002	CTD	26/Oct/2007	07h02	UTC-6	70°36.116	121°32.865	CTD ↑	464	137	260	11	-4.5	-1.21	1017.1	84	8/10
3b	N/A	N/A	26/Oct/2007	07h50	UTC-6	70°36.150	121°07.650	Lawas ↓	431	258	270	10	-5.3	-1.29	1016.7	89	8/10
3b	N/A	N/A	26/Oct/2007	08h13	UTC-6	70°36.240	121°08.070	Lawas ↑	423	266	260	14	-5.3	-1.3	1016.7	84	8/10
3b	1000	Basic	26/Oct/2007	08h38	UTC-6	70°36.030	120°59.710	Horizontal Net Tow ↓	371	62	280	13	-4.7	-1.28	1016.4	92	8/10
3b	1000	Basic	26/Oct/2007	08h54	UTC-6	70°36.240	120°58.580	Horizontal Net Tow ↑	368	40	270	12	-5.4	-1.3	1016.1	91	8/10
3b	1000	Basic	26/Oct/2007	09h04	UTC-6	70°36.190	120°58.047	Vertical Net Tow ↓	367	36	260	11	-5.3	-1.3	1016.0	92	6/10
3b	1000	Basic	26/Oct/2007	09h30	UTC-6	70°35.890	120°58.420	Vertical Net Tow ↑	367	24	260	12	-5.5	-1.2	1015.8	91	7/10
3b	N/A	N/A	26/Oct/2007	09h35	UTC-6	70°35.910	120°58.380	Lawas ↓	368	290	250	13	-5.5	-1.2	1015.8	91	6/10
3b	N/A	N/A	26/Oct/2007	10h02	UTC-6	70°35.930	120°59.020	Lawas ↑	368	247	270	10	-5.4	-1.2	1015.6	91	5/10
3b	1000	Basic	26/Oct/2007	10h09	UTC-6	70°35.840	120°58.990	VMP ↓	370	118	260	12	-5.4	-1.2	1015.5	92	8/10
3b	1000	Basic	26/Oct/2007	10h30	UTC-6	70°35.780	120°58.420	VMP ↑	368	170	260	14	-4.5	-1.2	1015.2	92	8/10
3b	1000	Basic	26/Oct/2007	10h46	UTC-6	70°35.540	120°57.290	Agassiz Trawl ↓	364	38	270	8	-4.7	-1.3	1015.0	92	8/10
3b	1000	Basic	26/Oct/2007	11h32	UTC-6	70°36.110	120°56.150	Agassiz Trawl ↑	362	18	250	13	-5.4	-1.3	1014.7	93	8/10
3b	1000	Basic	26/Oct/2007	12h32	UTC-6	70°36.070	120°59.870	Phytoplankton Net ↓	369	77	260	11	-5.2	-1.27	1014.5	92	2/10
3b	1000	Basic	26/Oct/2007	12h50	UTC-6	70°36.010	120°59.850	Phytoplankton Net ↑	371	80	260	11	-5.7	-1.21	1014.4	91	2/10
3b	1000	Basic	26/Oct/2007	12h58	UTC-6	70°35.990	120°59.830	Secchi Disk ↓	370	70	274	11	-5.7	-1.21	1014.4	91	2/10
3b	1000	Basic	26/Oct/2007	13h04	UTC-6	70°35.960	120°59.790	Secchi Disk ↑	372	85	267	9	-5.7	-1.19	1014.4	91	2/10
3b	1000	Basic	26/Oct/2007	13h11	UTC-6	70°35.930	120°59.740	PNF ↓	372	69	266	11	-5.7	-1.17	1014.3	91	2/10
3b	1000	Basic	26/Oct/2007	13h14	UTC-6	70°35.910	120°59.750	PNF ↑	371	87	275	10	-5.7	-1.17	1014.3	91	2/10
3b	1000	Basic	26/Oct/2007	13h31	UTC-6	70°35.840	120°59.720	CTD-Rosette ↓	372	80	269	11	-5.7	-1.18	1014.0	90	2/10
3b	1000	Basic	26/Oct/2007	14h23	UTC-6	70°35.830	120°59.090	CTD-Rosette ↑	370	27	279	12	-4.8	-1.22	1013.7	87	2/10
3b	1000	Basic	26/Oct/2007	14h50	UTC-6	70°35.840	120°55.670	Cage Sampling ↓↑	363	32	281	12	-5.5	-1.29	1013.5	89	6/10
3b	1000	Basic	26/Oct/2007	15h37	UTC-6	70°35.660	120°55.230	Box Core ↓	358	87	267	12	-5.6	-1.21	1013.2	89	6/10
3b	1000	Basic	26/Oct/2007	15h44	UTC-6	70°35.630	120°55.280	Box Core (bottom)	359	84	265	11	-5.5	-1.19	1013.2	89	6/10
3b	1000	Basic	26/Oct/2007	15h54	UTC-6	70°35.570	120°55.310	Box Core ↑	359	85	276	10	-5.5	-1.16	1013.2	87	6/10
3b	1000	Basic	26/Oct/2007	16h28	UTC-6	70°36.095	120°59.146	CTD-Rosette ↓	369	134	270	11	-5.4	-1.27	1012.9	82	8/10
3b	1000	Basic	26/Oct/2007	17h17	UTC-6	70°36.027	120°58.044	CTD-Rosette ↑	367	170	280	2	-4.4	-1.26	1012.6	83	8/10
3b	1100	Basic	26/Oct/2007	22h10	UTC-6	71°02.670	123°15.870	Horizontal Net Tow ↓	265	132	320	16	-8.4	-1.04	1010.9	92	0/10
3b	1100	Basic	26/Oct/2007	22h34	UTC-6	71°02.860	123°13.700	Horizontal Net Tow ↑	256	353	320	17	-9	-0.95	1011.1	94	0/10
3b	1100	Basic	26/Oct/2007	22h46	UTC-6	71°02.890	123°13.950	Vertical Net Tow ↓	258	109	310	15	-9	-1	1011.1	94	0/10
3b	1100	Basic	26/Oct/2007	23h07	UTC-6	71°02.720	123°14.580	Vertical Net Tow ↑	264	100	320	12	-7.6	-1	1011.1	94	0/10
3b	1100	Basic	26/Oct/2007	23h10	UTC-6	71°02.710	123°14.410	Lawas ↓	264	25	320	12	-7.6	-1	1011.1	94	0/10
3b	1100	Basic	26/Oct/2007	23h32	UTC-6	71°02.660	123°14.980	Lawas ↑	267	305	310	13	-8.7	-1	1011.1	93	0/10
3b	1100	Basic	26/Oct/2007	23h42	UTC-6	71°02.550	123°15.330	VMP ↓	269	208	310	13	-8.7	-1	1011.1	93	0/10
3b	1100	Basic	27/Oct/2007	00h03	UTC-6	71°02.300	123°15.470	VMP ↑	271	221	338	6	-7.5	-1	1011.1	94	0/10
3b	1100	Basic	27/Oct/2007	00h13	UTC-6	71°02.260	123°15.480	Agassiz Trawl ↓	277	185	0	5	-7.7	-1.04	1011.1	94	0/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1100	Basic	27/Oct/2007	00h36	UTC-6	71°01.940	123°15.790	Agassiz Trawl ↑	274	183	7	5	-6.8	-1.01	1011.1	91	0/10
3b	1100	Basic	27/Oct/2007	00h47	UTC-6	71°01.870	123°15.900	Box Core ↓	275	178	345	4	-6.5	-1.07	1011.1	84	0/10
3b	1100	Basic	27/Oct/2007	00h51	UTC-6	71°01.860	123°15.920	Box Core (bottom)	272	179	344	4	-6.5	-1.07	1011.2	78	0/10
3b	1100	Basic	27/Oct/2007	00h55	UTC-6	71°01.850	123°15.940	Box Core ↑	272	179	13	3	-6.5	-1.07	1011.2	78	0/10
3b	1100	Basic	27/Oct/2007	02h41	UTC-6	71°02.430	123°15.230	CTD-Rosette ↓	273	349	125	2	-7.9	-1.16	1011.3	87	0/10
3b	1100	Basic	27/Oct/2007	03h18	UTC-6	71°02.250	123°14.840	CTD-Rosette ↑	272	61	187	6	-6.7	-0.88	1011.2	84	0/10
3b	1100	Basic	27/Oct/2007	04h12	UTC-6	71°02.675	123°15.675	CTD-Rosette ↓	266	305	40	3	-7	-0.8	1010.9	79	0/10
3b	1100	Basic	27/Oct/2007	04h58	UTC-6	71°02.406	123°15.056	CTD-Rosette ↑	271	218	140	4	-7.3	-0.6	1010.8	80	0/10
3b	1102	CTD	27/Oct/2007	06h12	UTC-6	70°53.800	123°34.737	CTD ↓	392	288	130	6	-7.3	-1.2	1010.9	85	8/10
3b	1102	CTD	27/Oct/2007	06h30	UTC-6	70°53.606	123°34.575	CTD ↑	394	219	100	6	-7.7	-1.3	1010.9	84	8/10
3b	1104	Nutrient	27/Oct/2007	07h53	UTC-6	70°45.130	123°53.750	CTD-Rosette ↓	420	256	100	4	-7.2	-1	1011.2	82	7/10
3b	1104	Nutrient	27/Oct/2007	08h46	UTC-6	70°44.160	123°55.120	CTD-Rosette ↑	433	190	70	11	-8	-0.93	1011.5	82	6/10
3b	1104	Nutrient	27/Oct/2007	08h43	UTC-6	70°44.250	123°54.900	Lawas ↓	435	195	70	11	-8	-0.93	1011.5	82	6/10
3b	1104	Nutrient	27/Oct/2007	09h30	UTC-6	70°43.260	123°57.050	Lawas ↑	440	68	80	9	-8.1	-0.74	1011.8	85	0/10
3b	1106	CTD	27/Oct/2007	10h33	UTC-6	70°36.800	124°12.870	CTD ↓	442	280	70	10	-8	-1.08	1012.1	85	0/10
3b	1106	CTD	27/Oct/2007	10h52	UTC-6	70°36.710	124°13.670	CTD ↑	456	242	70	7	-7.4	-1.05	1012.2	85	0/10
3b	1108	Nutrient	27/Oct/2007	12h12	UTC-6	70°27.670	124°34.400	CTD-Rosette ↓	253	324	70	12	-7.1	-1.22	1012.7	85	7/10
3b	1108	Nutrient	27/Oct/2007	12h57	UTC-6	70°27.610	124°37.740	CTD-Rosette ↑	215	266	65	7	-7.1	-1.09	1012.9	82	7/10
3b	1110	Basic	27/Oct/2007	14h02	UTC-6	70°19.090	124°54.320	VMP ↓	90	284	42	9	-7.9	-1.51	1013.3	84	7/10
3b	1110	Basic	27/Oct/2007	14h18	UTC-6	70°19.140	124°54.960	VMP ↑	91	318	40	8	-7.2	-1.53	1013.3	83	7/10
3b	1110	Basic	27/Oct/2007	N/A	UTC-6	N/A	N/A	Phytoplankton Net ↓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	1110	Basic	27/Oct/2007	N/A	UTC-6	N/A	N/A	Phytoplankton Net ↑	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	1110	Basic	27/Oct/2007	14h31	UTC-6	70°19.180	124°55.380	Secchi Disk ↓	92	285	92	8	-7.7	-1.49	1013.5	84	7/10
3b	1110	Basic	27/Oct/2007	14h34	UTC-6	70°19.190	124°55.450	Secchi Disk ↑	91	290	91	6	-7.7	-1.49	1013.5	84	7/10
3b	1110	Basic	27/Oct/2007	14h38	UTC-6	70°19.200	124°55.530	Water Sampling ↓↑	86	273	86	10	-7.7	-1.49	1013.5	84	7/10
3b	1110	Basic	27/Oct/2007	14h42	UTC-6	70°19.200	124°55.580	PNF ↓	85	271	85	7	-7.4	-1.49	1013.5	84	7/10
3b	1110	Basic	27/Oct/2007	14h46	UTC-6	70°19.210	124°55.610	PNF ↑	89	274	89	10	-7.4	-1.49	1013.5	84	7/10
3b	1110	Basic	27/Oct/2007	15h11	UTC-6	70°19.350	124°56.190	CTD-Rosette ↓	78	324	48	5	-7.1	-1.47	1013.5	82	6/10
3b	1110	Basic	27/Oct/2007	15h41	UTC-6	70°19.470	124°56.730	CTD-Rosette ↑	62	304	40	5	-7.7	-1.45	1013.8	83	6/10
3b	1110	Basic	27/Oct/2007	16h05	UTC-6	70°19.668	124°56.908	Horizontal Net Tow ↓	67	278	30	4	-7.9	-1.5	1014.0	84	6/10
3b	1110	Basic	27/Oct/2007	16h18	UTC-6	70°19.635	124°58.065	Horizontal Net Tow ↑	71	220	70	6	-7.6	-1.5	1014.1	83	6/10
3b	1110	Basic	27/Oct/2007	16h26	UTC-6	70°19.668	124°58.172	Vertical Net Tow ↓	72	232	60	4	-7.7	-1.5	1014.1	83	6/10
3b	1110	Basic	27/Oct/2007	16h34	UTC-6	70°19.706	124°58.175	Vertical Net Tow ↑	72	220	60	8	-8.4	-1.5	1014.2	83	6/10
3b	1110	Basic	27/Oct/2007	16h45	UTC-6	70°19.794	124°58.252	Cage Sampling ↓	71	234	80	6	-8.8	-1.48	1014.2	85	6/10
3b	1110	Basic	27/Oct/2007	17h13	UTC-6	70°19.986	124°58.224	Cage Sampling ↑	73	196	120	5	-8.8	-1.5	1014.3	86	7/10
3b	1110	Basic	27/Oct/2007	17h22	UTC-6	70°20.180	124°58.240	Cage Sampling ↓	93	187	122	8	-8.9	-1.45	1014.3	87	7/10
3b	1110	Basic	27/Oct/2007	17h36	UTC-6	70°20.290	124°58.210	Cage Sampling ↑	104	185	130	7	-8.9	-1.43	1014.4	87	7/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1110	Basic	27/Oct/2007	18h07	UTC-6	70°20.266	124°57.479	CTD-Rosette ↓	91	56	160	6	-8.2	-1.5	1014.4	87	7/10
3b	1110	Basic	27/Oct/2007	18h29	UTC-6	70°20.484	124°57.524	CTD-Rosette ↑	96	40	140	3	-7.5	-1.5	1014.6	86	7/10
3b	1110	Basic	27/Oct/2007	19h03	UTC-6	70°20.653	124°57.583	Box Core (bottom)	88	342	130	9	-7.4	-1.5	1014.7	85	7/10
3b	1110	Basic	27/Oct/2007	19h07	UTC-6	70°20.673	124°57.625	Box Core (caught in rocks)	88	13	130	9	-7.4	-1.5	1014.7	85	7/10
3b	1112	CTD	27/Oct/2007	21h55	UTC-6	70°13.780	125°19.230	CTD ↓	102	240	120	6	-8.8	-1.67	1015.6	85	10/10
3b	1112	CTD	27/Oct/2007	00h00	UTC-6	70°13.820	125°19.170	CTD ↑	102	240	120	6	-8.8	-1.67	1015.6	85	10/10
3b	1114	Nutrient	28/Oct/2007	00h19	UTC-6	70°08.140	125°49.440	CTD-Rosette ↓	137	316	103	8	-8.1	-1.63	1016.5	83	9/10
3b	1114	Nutrient	28/Oct/2007	00h46	UTC-6	70°08.090	125°49.550	CTD-Rosette ↑	136	301	87	8	-8.6	-1.43	1016.8	79	9/10
3b	1116	Full	28/Oct/2007	03h14	UTC-6	70°02.260	126°18.080	Hydrobios ↓	224	353	109	13	-6.7	-1.36	1017.2	80	9/10
3b	1116	Full	28/Oct/2007	03h29	UTC-6	70°02.120	126°18.740	Hydrobios ↑	222	352	112	13	-7	-1.32	1017.3	82	9/10
3b	1116	Full	28/Oct/2007	03h44	UTC-6	70°02.120	126°18.830	Vertical Net Tow ↓	224	233	114	14	-7.6	-1.32	1017.3	84	9/10
3b	1116	Full	28/Oct/2007	04h04	UTC-6	70°02.067	126°18.920	Vertical Net Tow ↑	221	294	110	13	-8.9	-1.31	1017.4	87	7/10
3b	1116	Full	28/Oct/2007	05h30	UTC-6	70°02.562	126°17.391	Box Core (bottom)	230	109	110	14	-9.4	-1.3	1017.8	83	7/10
3b	1116	Full	28/Oct/2007	05h38	UTC-6	70°02.539	126°17.652	Box Core ↑	231	80	110	14	-9.4	-1.3	1017.8	83	7/10
3b	1116	Full	28/Oct/2007	08h22	UTC-6	70°02.530	126°16.650	CTD-Rosette ↓	228	304	120	6	-9.4	-1.29	1018.2	82	8/10
3b	1116	Full	28/Oct/2007	08h59	UTC-6	70°02.740	126°16.650	CTD-Rosette ↑	233	340	120	11	-9.4	-1.29	1018.2	76	6/10
3b	1116	Full	28/Oct/2007	08h58	UTC-6	70°02.740	126°17.370	Lawas ↓	233	340	120	11	-7.2	-1.2	1018.4	76	7/10
3b	1116	Full	28/Oct/2007	09h27	UTC-6	70°02.920	126°17.290	Lawas ↑	231	140	120	13	-9.7	-1.2	1018.4	80	7/10
3b	1116	Full	28/Oct/2007	09h35	UTC-6	70°03.030	126°17.540	Phytoplankton Net ↓	230	213	120	13	-9.8	-1.2	1018.3	80	6/10
3b	1116	Full	28/Oct/2007	09h53	UTC-6	70°03.220	126°18.230	Phytoplankton Net ↑	233	228	110	13	-9.8	-1.2	1018.3	80	6/10
3b	1116	Full	28/Oct/2007	10h08	UTC-6	70°03.260	126°18.680	Lawas ↓	230	248	120	12	-9.7	-1.3	1018.4	81	6/10
3b	1116	Full	28/Oct/2007	10h45	UTC-6	70°03.460	126°19.280	Lawas ↑	232	213	120	13	-10	-1.3	1018.5	80	5/10
3b	1116	Full	28/Oct/2007	10h47	UTC-6	70°03.460	126°19.280	Secchi Disk ↓	232	215	120	13	-10	-1.3	1018.5	80	5/10
3b	1116	Full	28/Oct/2007	10h49	UTC-6	70°03.480	126°19.470	Secchi Disk ↑	230	210	120	13	-10	-1.3	1018.5	80	5/10
3b	1116	Full	28/Oct/2007	11h05	UTC-6	70°03.650	126°18.880	PNF + Water Sampling ↓	235	58	140	11	-9.5	-1.2	1018.5	81	5/10
3b	1116	Full	28/Oct/2007	11h15	UTC-6	70°03.850	126°18.780	PNF + Water Sampling ↑	233	40	130	12	-9.6	-1.2	1018.6	81	4/10
3b	1116	Full	28/Oct/2007	11h30	UTC-6	70°03.890	126°18.990	CTD-Rosette ↓	232	305	130	10	-9.8	-1.2	1018.7	79	4/10
3b	1116	Full	28/Oct/2007	12h10	UTC-6	70°03.960	126°19.410	CTD-Rosette ↑	233	320	132	14	-10	-1.2	1018.8	78	4/10
3b	1116	Full	28/Oct/2007	12h39	UTC-6	70°04.090	126°19.910	On Ice Sampling ↓	236	202	115	14	-10.2	-1.24	1018.6	79	5/10
3b	1116	Full	28/Oct/2007	13h06	UTC-6	70°04.260	126°19.960	On Ice Sampling ↑	234	198	126	15	-10.3	-1.18	1018.6	81	5/10
3b	1116	Full	28/Oct/2007	13h35	UTC-6	70°03.830	126°20.750	SCAMP ↓	228	203	136	17	-10.6	-1.31	1018.6	81	5/10
3b	1116	Full	28/Oct/2007	14h02	UTC-6	70°03.940	126°20.710	SCAMP ↑	229	208	130	14	-10.9	-1.22	1018.7	82	5/10
3b	1116	Full	28/Oct/2007	14h04	UTC-6	70°03.940	126°20.710	SCAMP ↓	228	208	125	15	-10.9	-1.22	1018.7	82	5/10
3b	1116	Full	28/Oct/2007	14h22	UTC-6	70°03.990	126°20.740	SCAMP ↑	232	214	124	13	-11	-1.18	1018.6	82	5/10
3b	1116	Full	28/Oct/2007	14h24	UTC-6	70°03.990	126°20.740	SCAMP ↓	232	214	125	13	-11	-1.18	1018.6	82	5/10
3b	1116	Full	28/Oct/2007	14h41	UTC-6	70°04.030	126°20.800	SCAMP ↑	230	205	124	18	-11.2	-1.21	1018.6	82	5/10
3b	1116	Full	28/Oct/2007	14h42	UTC-6	70°04.030	126°20.810	SCAMP ↓	229	206	116	16	-11.2	-1.21	1018.6	82	5/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1116	Full	28/Oct/2007	15h01	UTC-6	70°04.060	126°20.900	SCAMP ↑	231	212	135	14	-11.3	-1.23	1018.7	83	5/10
3b	1118	CTD	28/Oct/2007	16h43	UTC-6	70°11.103	126°39.160	CTD ↓	205	332	120	14	-9.5	-1.6	1018.4	80	5/10
3b	1118	CTD	28/Oct/2007	16h53	UTC-6	70°11.173	126°39.206	CTD ↑	210	352	130	12	-8.7	-1.6	1018.2	80	5/10
3b	1120	CTD	28/Oct/2007	19h04	UTC-6	70°19.243	126°59.059	CTD-Rosette ↓	216	332	110	18	-10.2	-1.5	1017.3	82	8/10
3b	1120	CTD	28/Oct/2007	19h39	UTC-6	70°19.744	127°08.207	CTD-Rosette ↑	209	326	110	23	-9.3	-1.5	1017.0	81	8/10
3b	1120	CTD	28/Oct/2007	20h12	UTC-6	70°20.140	127°01.260	Box Core ↓	204	132	110	19	-10.7	-1.4	1016.8	82	8/10
3b	1120	CTD	28/Oct/2007	20h17	UTC-6	70°20.190	127°01.500	Box Core ↑	203	175	110	21	-10.7	-1.4	1016.8	82	8/10
3b	1120	CTD	28/Oct/2007	20h50	UTC-6	70°20.750	127°02.880	Box Core ↓	198	109	110	20	-10.5	-1.4	1016.5	82	7/10
3b	1120	CTD	28/Oct/2007	20h55	UTC-6	70°20.840	127°03.090	Box Core ↑	197	123	110	20	-10.5	-1.4	1016.5	82	7/10
3b	1120	CTD	28/Oct/2007	21h48	UTC-6	70°21.870	127°05.620	Lawas ↓	186	98	120	20	-10.5	-1.4	1016.3	83	7/10
3b	1120	CTD	28/Oct/2007	22h30	UTC-6	70°22.610	127°08.200	Lawas ↑	166	186	110	20	-10.9	-1.5	1016.2	79	
3b	1122	CTD	29/Oct/2007	00h08	UTC-6	70°27.250	127°23.550	CTD ↓	56	308	113	24	-9.6	-1.54	1015.8	78	5/10
3b	1122	CTD	29/Oct/2007	00h12	UTC-6	70°27.320	127°23.810	CTD ↑	54	302	116	23	-8.9	-1.5	1015.7	75	5/10
3b	1122	CTD	29/Oct/2007	00h32	UTC-6	70°27.760	127°24.510	Agassiz Trawl ↓	56	310	112	25	-10.1	-1.47	1015.4	76	6/10
3b	1122	CTD	29/Oct/2007	00h38	UTC-6	70°27.820	127°24.590	Agassiz Trawl ↑	55	234	128	22	-10.1	-1.47	1015.4	76	6/10
3b	1122	CTD	29/Oct/2007	00h40	UTC-6	70°27.910	127°24.650	Agassiz Trawl ↓	57	260	123	25	-9.8	-1.47	1015.4	76	6/10
3b	1122	CTD	29/Oct/2007	00h52	UTC-6	70°28.290	127°25.380	Agassiz Trawl ↑	55	261	124	25	-10.7	-1.48	1015.2	77	6/10
3b	1122	CTD	29/Oct/2007	01h01	UTC-6	70°28.530	127°26.030	Box Core ↓	56	289	114	20	-10.6	-1.49	1015.2	77	6/10
3b	1122	CTD	29/Oct/2007	01h02	UTC-6	70°28.550	127°26.010	Box Core (bottom)	55	308	117	25	-10.6	-1.49	1015.2	77	6/10
3b	1122	CTD	29/Oct/2007	01h04	UTC-6	70°28.570	127°26.030	Box Core ↑	55	320	114	25	-10.6	-1.49	1015.2	77	6/10
3b	1122	CTD	29/Oct/2007	01h37	UTC-6	70°29.320	127°28.250	Box Core ↓	43	308	121	19	-10.5	-1.47	1015.4	78	7/10
3b	1122	CTD	29/Oct/2007	01h40	UTC-6	70°29.340	127°28.350	Box Core (bottom)	42	288	130	21	-8.7	-1.48	1015.3	77	7/10
3b	1122	CTD	29/Oct/2007	01h44	UTC-6	70°29.460	127°28.620	Box Core ↑	42	294	124	20	-8.7	-1.48	1015.3	77	7/10
3b	1216	Full	29/Oct/2007	12h23	UTC-6	70°34.590	127°39.500	On Ice Sampling ↓	43	195	113	21	-9.9	-1.6	1012.8	84	9/10
3b	1216	Full	29/Oct/2007	12h47	UTC-6	70°35.410	127°41.940	On Ice Sampling ↑	41	196	101	25	-9.8	-1.47	1012.8	85	9/10
3b	1216	Full	29/Oct/2007	12h54	UTC-6	70°35.650	127°42.670	On Ice Sampling ↓	41	196	106	25	-9.9	-1.42	1012.8	84	9/10
3b	1216	Full	29/Oct/2007	13h03	UTC-6	70°35.940	127°43.550	On Ice Sampling ↑	40	195	108	23	-9.9	-1.41	1012.8	84	9/10
3b	1216	Full	29/Oct/2007	13h43	UTC-6	70°36.240	127°39.830	Secchi Disk ↓	85	340	108	22	-9.4	-1.51	1012.6	83	8/10
3b	1216	Full	29/Oct/2007	13h49	UTC-6	70°36.470	127°40.390	Secchi Disk ↑	82	359	105	22	-9.4	-1.51	1012.6	83	8/10
3b	1216	Full	29/Oct/2007	13h56	UTC-6	70°36.620	127°41.110	PNF ↓	77	349	104	25	-8.9	-1.51	1012.8	85	8/10
3b	1216	Full	29/Oct/2007	14h02	UTC-6	70°36.780	127°41.660	PNF ↑	74	6	116	24	-8.6	-1.48	1012.8	85	8/10
3b	1216	Full	29/Oct/2007	15h02	UTC-6	70°35.690	127°41.670	CTD-Rosette ↓	48	317	103	24	-6.5	-1.44	1012.6	79	8/10
3b	1216	Full	29/Oct/2007	N/A	UTC-6	N/A	N/A	CTD-Rosette ↑ (cancelled)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	1216	Full	29/Oct/2007	15h09	UTC-6	70°35.840	127°42.260	CTD-Rosette ↓	50	331	110	26	-6.5	-1.44	1012.6	79	8/10
3b	1216	Full	29/Oct/2007	15h30	UTC-6	70°36.300	127°44.280	CTD-Rosette ↑	46	312	107	19	-7.9	-1.39	1012.5	83	8/10
3b	1124	Full	29/Oct/2007	16h54	UTC-6	70°38.116	127°39.604	SCAMP ↓	148	137	87	20	-8.7	-1.5	1012.2	86	8/10
3b	1124	Full	29/Oct/2007	17h42	UTC-6	70°39.530	127°42.920	SCAMP ↑	123	151	91	22	-8.7	-1.42	1012.1	80	8/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1216	Full	29/Oct/2007	18h30	UTC-6	70°37.030	127°34.891	CTD-Rosette ↓	177	66	86	20	-8.5	-1.6	1011.7	86	8/10
3b	1216	Full	29/Oct/2007	19h14	UTC-6	70°37.923	127°35.994	CTD-Rosette ↑	80	7	93	21	-8.8	-1.5	1011.9	85	8/10
3b	1216	Full	29/Oct/2007	19h27	UTC-6	70°38.401	127°37.268	Horizontal Net Tow ↓	175	256	107	18	-8.8	-1.5	1011.8	85	8/10
3b	1216	Full	29/Oct/2007	19h43	UTC-6	70°38.317	127°38.947	Horizontal Net Tow ↑	158	150	90	22	-8.9	-1.5	1011.8	84	8/10
3b	1216	Full	29/Oct/2007	19h56	UTC-6	70°38.480	122°38.250	Vertical Net Tow ↓	156	277	90	20	-8.9	-1.5	1011.7	84	8/10
3b	1216	Full	29/Oct/2007	20h07	UTC-6	70°38.700	127°39.440	Vertical Net Tow ↑	157	300	90	16	-7.9	-1.5	1011.7	83	8/10
3b	1216	Full	29/Oct/2007	20h32	UTC-6	70°39.280	127°41.410	Hydrobios ↓	142	278	90	17	-7.6	-1.5	1011.7	83	8/10
3b	1216	Full	29/Oct/2007	20h43	UTC-6	70°39.470	127°41.490	Hydrobios ↑	144	260	100	18	-6.9	-1.4	1011.6	81	8/10
3b	N/A	N/A	29/Oct/2007	21h43	UTC-6	70°41.250	127°46.300	Lawas ↓	112	62	110	20	-7.3	-1.5	1011.7	81	8/10
3b	N/A	N/A	29/Oct/2007	22h18	UTC-6	70°42.320	127°48.660	Lawas ↑	97	193	80	20	-8.4	-1.4	1011.4	82	8/10
3b	1124	N/A	29/Oct/2007	22h28	UTC-6	70°42.630	127°49.550	VMP ↓	92	220	90	19	-8.2	-1.5	1011.4	84	8/10
3b	1124	N/A	29/Oct/2007	23h15	UTC-6	70°44.190	127°53.700	VMP ↑	72	25	110	20	-7.5	-1.4	1011.3	82	7/10
3b	1216	CTD	29/Oct/2007	23h30	UTC-6	70°44.670	127°54.460	Agassiz Trawl ↓	73	246	110	24	-7.8	-1.4	1011.2	82	5/10
3b	1216	CTD	29/Oct/2007	23h45	UTC-6	70°45.120	127°55.110	Agassiz Trawl ↑	70	275	90	19	-7	-1.4	1011.3	82	2/10
3b	1214	CTD	30/Oct/2007	03h21	UTC-6	70°42.160	127°18.270	CTD-Rosette ↓	225	316	108	28	-7.8	-1.54	1011.16	84	9/10
3b	1214	CTD	30/Oct/2007	03h31	UTC-6	70°42.260	127°18.710	CTD-Rosette ↑	223	305	104	24	-6.6	-1.48	1011.4	82	9/10
3b	1214	CTD	30/Oct/2007	04h44	UTC-6	70°43.575	127°21.462	Box Core ↓	211	309	100	27	-4.8	-1.4	1011.0	76	9/10
3b	1214	CTD	30/Oct/2007	04h47	UTC-6	70°43.576	127°21.461	Box Core (bottom)	211	295	100	27	-4.8	-1.4	1011.0	76	9/10
3b	1214	CTD	30/Oct/2007	04h49	UTC-6	N/A	N/A	Box Core not set off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9/10
3b	1214	CTD	30/Oct/2007	03h46	UTC-6	70°42.380	127°18.860	Agassiz Trawl ↓	225	303	100	29	-5	-1.44	1011.4	77	9/10
3b	1214	CTD	30/Oct/2007	04h07	UTC-6	70°42.728	127°19.798	Agassiz Trawl ↑	218	280	95	20	-6	-1.4	1011.3	81	9/10
3b	1214	CTD	30/Oct/2007	04h50	UTC-6	70°43.625	127°21.432	Box Core ↓	211	308	95	26	-6	-1.4	1011.3	75	9/10
3b	1214	CTD	30/Oct/2007	04h54	UTC-6	70°43.637	127°21.399	Box Core (bottom)	211	295	95	26	-4.6	-1.4	1011.3	75	8/10
3b	1214	CTD	30/Oct/2007	04h58	UTC-6	70°43.657	127°21.390	Box Core ↑	211	298	100	25	-4.6	-1.4	1011.3	75	8/10
3b	1212	Nutrient	30/Oct/2007	06h56	UTC-6	70°49.356	126°53.722	CTD-Rosette ↓	273	321	100	29	-7.9	-1.4	1011.2	83	9/10
3b	1212	Nutrient	30/Oct/2007	07h37	UTC-6	70°49.454	126°55.075	CTD-Rosette ↑	268	321	100	25	-8.1	-1.4	1011.5	83	9/10
3b	1212	Nutrient	30/Oct/2007	07h52	UTC-6	70°49.570	126°55.090	Lawas ↓	271	148	100	24	-8.2	-1.3	1011.4	83	9/10
3b	1212	Nutrient	30/Oct/2007	08h16	UTC-6	70°49.940	126°56.000	Lawas ↑	270	22	110	25	-8.4	-1.4	1011.3	85	9/10
3b	1210	CTD	30/Oct/2007	09h43	UTC-6	70°58.150	126°26.610	Lawas ↓	348	119	115	26	-10.4	-1.5	1012.1	86	9/10
3b	1210	CTD	30/Oct/2007	10h05	UTC-6	70°57.980	126°28.050	Lawas ↑	345	180	90	28	-11	-1.4	1012.0	87	9/10
3b	1210	CTD	30/Oct/2007	10h15	UTC-6	70°58.160	126°27.960	CTD ↓	345	298	100	22	-11	-1.36	1012.0	87	9/10
3b	1210	CTD	30/Oct/2007	10h30	UTC-6	70°58.160	126°28.480	CTD ↑	351	320	100	20	-9.9	-1.37	1012.0	85	9/10
3b	1210	CTD	30/Oct/2007	10h54	UTC-6	70°56.560	126°28.540	Mooring CA 08-06 Interrogation (not found)	337	221	100	22	-10.9	-1.4	1012.0	86	9/10
3b	1208	Nutrient	30/Oct/2007	12h27	UTC-6	71°02.470	126°02.250	Cage Sampling ↓	407	217	100	25	-11.3	-1.19	1011.8	88	9/10
3b	1208	Nutrient	30/Oct/2007	12h56	UTC-6	71°03.400	126°02.990	Cage Sampling ↑	401	203	110	20	-11.5	-1.3	1011.7	86	9/10
3b	1208	Nutrient	30/Oct/2007	20h10	UTC-6	71°04.690	126°01.870	CTD ↓	415	296	100	29	-8.3	-1.12	1009.6	86	9/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1208	Nutrient	30/Oct/2007	20h31	UTC-6	71°05.340	126°01.470	CTD ↑	411	315	120	30	-9.3	-1.13	1009.7	84	9/10
3b	1208	Nutrient	30/Oct/2007	21h15	UTC-6	71°04.190	126°03.180	Mooring CA 08-06 Interrogation (located)	399	188	100	31	-11.9	-1.28	1009.1	90	9/10
3b	1208	Nutrient	30/Oct/2007	23h20	UTC-6	71°02.950	126°01.260	Lawas ↓	397	104	100	30	-10.6	-1	1008.1	89	8/10
3b	1208	Nutrient	30/Oct/2007	23h43	UTC-6	71°03.730	126°02.100	Lawas ↑	400	182	90	30	-10.5	-1	1008.0	88	6/10
3b	1208	Nutrient	30/Oct/2007	23h58	UTC-6	71°04.230	126°02.420	CTD-Rosette ↓	400	328	107	36	-9.9	-0.94	1008.0	88	6/10
3b	1208	Nutrient	31/Oct/2007	00h55	UTC-6	71°05.320	126°04.620	CTD-Rosette ↑	401	333	103	35	-8.8	-1.33	1007.9	87	6/10
3b	1206	CTD	31/Oct/2007	02h06	UTC-6	71°11.360	125°36.980	CTD ↓	394	342	114	37	-9.8	-1.05	1007.5	84	7/10
3b	1206	CTD	31/Oct/2007	02h22	UTC-6	71°12.020	125°37.580	CTD ↑	401	0	124	33	-9.4	-0.95	1008.1	85	7/10
3b	1204	Nutrient	31/Oct/2007	03h45	UTC-6	71°18.490	125°11.090	CTD-Rosette ↓	307	336	110	38	-10.7	-1.13	1008.0	86	2/10
3b	1204	Nutrient	31/Oct/2007	04h41	UTC-6	71°19.134	125°11.445	CTD-Rosette ↑	318	319	110	42	-10.4	-1.1	1008.3	85	2/10
3b	1202	CTD	31/Oct/2007	06h17	UTC-6	71°25.783	124°47.341	CTD ↓	220	338	120	35	-10.8	-1.1	1007.9	84	2/10
3b	1202	CTD	31/Oct/2007	06h29	UTC-6	71°25.775	124°47.243	CTD ↑	222	312	120	35	-9.6	-1.2	1008.2	80	1/10
3b	N/A	N/A	31/Oct/2007	09h06	UTC-6	71°31.960	124°24.160	Lawas ↓	200	285	110	23	-12.2	-1.2	1008.3	79	7/10
3b	N/A	N/A	31/Oct/2007	09h27	UTC-6	71°32.150	124°24.420	Lawas ↑	199	40	110	20	-11.9	-1.1	1008.3	80	8/10
3b	1200	Full	31/Oct/2007	09h35	UTC-6	71°32.190	124°24.490	Hydrobios ↓	204	284	110	19	-12.5	-1.1	1008.1	81	8/10
3b	1200	Full	31/Oct/2007	09h51	UTC-6	71°32.190	124°24.530	Hydrobios ↑	203	314	110	17	-11.5	-1.1	1008.2	79	7/10
3b	1200	Full	31/Oct/2007	10h23	UTC-6	71°32.320	124°24.810	Vertical Net Tow ↓	201	300	100	24	-12.7	-1.1	1007.4	78	7/10
3b	1200	Full	31/Oct/2007	10h43	UTC-6	71°32.380	124°24.850	Vertical Net Tow ↑	203	258	110	22	-12.4	-1.1	1007.5	78	7/10
3b	1200	Full	31/Oct/2007	11h03	UTC-6	71°32.420	124°25.320	Phytoplankton Net ↓	202	256	100	23	-11.1	-1.2	1007.3	76	5/10
3b	1200	Full	31/Oct/2007	11h25	UTC-6	71°32.610	124°26.410	Phytoplankton Net ↑	204	218	100	24	-12.6	-1.2	1006.8	79	5/10
3b	1200	Full	31/Oct/2007	11h42	UTC-6	71°32.640	124°27.300	Secchi Disk ↓	197	175	110	20	-12.6	-1.2	1006.7	78	6/10
3b	1200	Full	31/Oct/2007	11h44	UTC-6	71°32.640	124°27.300	Secchi Disk ↑	197	175	100	22	-12.2	-1.2	1007.0	79	6/10
3b	1200	Full	31/Oct/2007	11h50	UTC-6	71°32.690	124°27.610	PNF + Water Sampling ↓	200	336	100	26	-12.2	-1.2	1007.0	79	7/10
3b	1200	Full	31/Oct/2007	11h53	UTC-6	71°32.700	124°27.670	PNF + Water Sampling ↑	197	347	108	29	-11.5	-1.27	1007.0	80	7/10
3b	1200	Full	31/Oct/2007	12h13	UTC-6	71°32.670	124°27.640	CTD-Rosette ↓	200	311	111	29	-11.7	-1.27	1006.9	80	8/10
3b	1200	Full	31/Oct/2007	12h51	UTC-6	71°32.780	124°28.460	CTD-Rosette ↑	197	329	109	33	-11.4	-1.23	1007.0	79	8/10
3b	1200	Full	31/Oct/2007	13h15	UTC-6	71°32.600	124°24.120	Cage Sampling ↓	201	188	103	26	-12.7	-1.3	1006.7	80	9/10
3b	1200	Full	31/Oct/2007	13h46	UTC-6	71°32.760	124°25.060	Cage Sampling ↑	202	182	121	30	-12.6	-1.21	1007.1	80	9/10
3b	1200	Full	31/Oct/2007	14h18	UTC-6	71°32.920	124°25.910	SCAMP ↓	202	176	114	30	-12.3	-1.21	1007.3	79	9/10
3b	1200	Full	31/Oct/2007	15h29	UTC-6	71°33.260	124°27.450	SCAMP ↑	200	162	113	26	-11.8	-1.22	1007.2	76	9/10
3b	1200	Full	31/Oct/2007	16h13	UTC-6	71°32.713	124°13.839	VMP ↓	200	334	110	28	-11.4	-1.3	1006.8	81	9/10
3b	1200	Full	31/Oct/2007	16h50	UTC-6	71°33.273	124°16.205	VMP ↑	199	12	125	26	-10.6	-1.1	1007.4	82	9/10
3b	1200	Full	31/Oct/2007	17h03	UTC-6	71°33.294	124°16.565	CTD-Rosette ↓	198	321	120	32	-10	-1.1	1006.9	81	9/10
3b	1200	Full	31/Oct/2007	17h40	UTC-6	71°33.440	124°17.680	CTD-Rosette ↑	197	16	120	34	-10.9	-1.08	1006.6	80	9/10
3b	1200	Full	31/Oct/2007	18h36	UTC-6	71°33.978	124°18.837	Box Core ↓	196	285	110	35	-11.7	-1.1	1006.6	78	9/10
3b	1200	Full	31/Oct/2007	18h38	UTC-6	71°33.986	124°18.859	Box Core (bottom)	197	299.3	110	35	-11.7	-1.1	1000.6	78	9/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1200	Full	31/Oct/2007	18h40	UTC-6	71°33.997	124°18.969	Box Core ↑	197	297.5	110	38	-11.7	-1.1	1000.6	78	9/10
3b	411	N/A	01/Nov/2007	00h34	UTC-6	71°37.990	126°43.590	Box Core ↓	434	297	131	27	-10.5	-1.08	1006.2	86	8/10
3b	411	N/A	01/Nov/2007	00h40	UTC-6	71°37.990	126°43.590	Box Core (bottom)	434	302	134	27	-10.3	-0.95	1006.2	87	8/10
3b	411	N/A	01/Nov/2007	00h46	UTC-6	71°38.000	126°43.620	Box Core ↑	432	318	124	28	-10.3	-0.95	1006.2	87	8/10
3b	411	N/A	01/Nov/2007	01h16	UTC-6	71°38.120	126°44.450	Box Core ↓	434	301	128	25	-10.3	-0.78	1006.3	86	8/10
3b	411	N/A	01/Nov/2007	01h22	UTC-6	71°38.120	126°44.500	Box Core (bottom)	435	304	123	25	-10.3	-0.81	1006.3	87	8/10
3b	411	N/A	01/Nov/2007	01h27	UTC-6	71°38.130	126°44.680	Box Core ↑	432	298	116	27	-10.3	-0.81	1006.3	87	8/10
3b	1510	CTD	01/Nov/2007	04h25	UTC-6	71°40.124	127°36.144	CTD ↓	376	317	110	25	-9.5	-1.4	1006.0	86	8/10
3b	1510	CTD	01/Nov/2007	04h39	UTC-6	71°40.114	127°36.805	CTD ↑	373	322	110	25	-7	-1.3	1006.0	81	8/10
3b	1508	Nutrient	01/Nov/2007	06h18	UTC-6	71°40.186	128°09.501	CTD-Rosette ↓	342	306	112	24	-7.8	-1.3	1005.4	87	8/10
3b	1508	Nutrient	01/Nov/2007	07h08	UTC-6	71°40.523	128°14.791	CTD-Rosette ↑ (Cancelled)	333	337	109	28	-5.6	-1.2	1005.7	87	8/10
3b	1508	Nutrient	01/Nov/2007	08h00	UTC-6	71°41.040	128°15.270	CTD-Rosette ↓	337	309	120	25	-6.6	-1.2	1005.8	88	8/10
3b	1508	Nutrient	01/Nov/2007	08h43	UTC-6	71°41.300	128°17.240	CTD-Rosette ↑	335	306	110	27	-6.8	-1.2	1005.8	85	8/10
3b	N/A	N/A	01/Nov/2007	10h12	UTC-6	71°39.930	128°49.010	Lawas ↓	281	86	120	25	-6.3	-1.3	1005.1	91	8/10
3b	N/A	N/A	01/Nov/2007	10h40	UTC-6	71°39.660	128°49.510	Lawas ↑	280	145	110	27	-6.1	-1.3	1004.9	92	6/10
3b	1506	CTD	01/Nov/2007	12h16	UTC-6	71°40.120	128°51.090	CTD ↓	281	321	99	28	-5.6	-1.3	1004.5	91	6/10
3b	1506	CTD	01/Nov/2007	12h31	UTC-6	71°39.920	128°51.780	CTD ↑	279	313	94	26	-4	-1.3	1004.6	87	6/10
3b	1504	Nutrient	01/Nov/2007	13h46	UTC-6	71°40.030	129°31.180	CTD-Rosette ↓	291	318	118	27	-5.1	-1.32	1004.2	86	8/10
3b	1504	Nutrient	01/Nov/2007	14h34	UTC-6	71°39.790	129°33.960	CTD-Rosette ↑	294	297	128	22	-3.9	-1.28	1004.2	79	8/10
3b	1502	CTD	01/Nov/2007	15h32	UTC-6	71°39.800	130°10.140	CTD ↓	256	308	130	25	-5.5	-1.18	1004.0	87	7/10
3b	1502	CTD	01/Nov/2007	15h46	UTC-6	71°39.910	130°11.110	CTD ↑	257	297	125	22	-5	-1.04	1004.1	84	7/10
3b	1600	Basic	01/Nov/2007	16h41	UTC-6	71°39.877	130°45.016	Secchi Disk ↓	463	325	100	21	-5	-1.1	1003.6	86	7/10
3b	1600	Basic	01/Nov/2007	16h44	UTC-6	71°39.900	130°45.986	Secchi Disk ↑	477	307	100	21	-5	-1.1	1003.6	86	7/10
3b	1600	Basic	01/Nov/2007	17h00	UTC-6	71°39.956	130°46.120	CTD-Rosette ↓	473	304	100	22	-5	-1.1	1003.5	82	7/10
3b	1600	Basic	01/Nov/2007	17h57	UTC-6	71°39.980	130°48.990	CTD-Rosette ↑	473	18	132	23	-3.1	-1.06	1003.6	79	7/10
3b	1600	Basic	01/Nov/2007	18h22	UTC-6	71°39.973	130°48.582	Cage Sampling ↓↑	521	115	105	18	-4.8	-1.1	1003.0	82	8/10
3b	1600	Basic	01/Nov/2007	18h44	UTC-6	71°39.945	130°49.273	SCAMP ↓	530	224	112	18	-5.2	-1.1	1003.3	84	7/10
3b	1600	Basic	01/Nov/2007	20h34	UTC-6	71°39.010	130°57.760	SCAMP ↑	618	185	90	19	-5.3	-1	1003.0	83	8/10
3b	1600	Basic	01/Nov/2007	21h00	UTC-6	71°38.760	131°01.210	CTD-Rosette ↓	665	275	100	21	-5.3	-1	1002.8	85	6/10
3b	1600	Basic	01/Nov/2007	22h05	UTC-6	71°38.730	131°04.620	CTD-Rosette ↑	701	298	90	16	-1.8	-0.99	1002.7	77	6/10
3b	1600	Basic	01/Nov/2007	22h00	UTC-6	71°38.720	131°04.340	Lawas ↓	701	294	90	16	-1.8	-0.99	1002.7	77	6/10
3b	1600	Basic	01/Nov/2007	22h30	UTC-6	71°39.070	131°06.250	Lawas ↑	728	205	120	17	-5	-1.1	1002.6	84	6/10
3b	1600	Basic	01/Nov/2007	23h38	UTC-6	71°40.770	130°44.210	Vertical Net Tow ↓	458	280	100	21	-5.1	-1.2	1002.3	83	7/10
3b	1600	Basic	02/Nov/2007	00h03	UTC-6	71°41.290	130°45.390	Vertical Net Tow ↑	481	264	111	20	-4.9	-1.17	1003.0	80	7/10
3b	1600	Basic	02/Nov/2007	00h29	UTC-6	71°41.420	130°47.390	Horizontal Net Tow ↓	499	156	87	18	-5.5	-1.16	1002.5	81	7/10
3b	1600	Basic	02/Nov/2007	00h44	UTC-6	71°41.120	130°47.880	Horizontal Net Tow ↑	504	128	82	21	-5.3	-1.15	1002.6	80	7/10
3b	1600	Basic	02/Nov/2007	01h02	UTC-6	71°41.240	130°49.050	VMP ↓	511	338	100	21	-5	-1.13	1002.5	79	7/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1600	Basic	02/Nov/2007	01h36	UTC-6	71°41.500	130°51.420	VMP ↑	555	354	107	20	-4.5	-1.12	1002.7	79	7/10
3b	1600	Basic	02/Nov/2007	02h16	UTC-6	71°39.200	130°44.480	Agassiz Trawl ↓	457	290	102	18	-5.1	-1.13	1002.6	78	8/10
3b	1600	Basic	02/Nov/2007	02h43	UTC-6	71°39.710	130°47.300	Agassiz Trawl ↑	492	201	95	19	-5.4	-0.94	1002.6	76	8/10
3b	1600	Basic	02/Nov/2007	02h51	UTC-6	71°39.710	130°48.340	Box Core ↓	512	271	85	19	-5.4	-0.92	1002.5	76	8/10
3b	1600	Basic	02/Nov/2007	02h59	UTC-6	71°39.830	130°48.650	Box Core (bottom)	527	268	80	21	-4.7	-0.92	1002.5	76	8/10
3b	1600	Basic	02/Nov/2007	03h05	UTC-6	71°39.930	130°49.110	Box Core ↑	528	268	79	20	-4.7	-0.96	1002.5	75	8/10
3b	1602	CTD	02/Nov/2007	04h53	UTC-6	71°28.107	130°40.898	CTD ↓	210	280	80	20	-5.4	-1.5	1001.9	88	8/10
3b	1602	CTD	02/Nov/2007	05h01	UTC-6	71°28.029	130°41.131	CTD ↑	219	279	85	22	-5.4	-1.4	1002.0	82	8/10
3b	1604	Nutrient	02/Nov/2007	06h13	UTC-6	71°16.596	130°36.406	CTD-Rosette ↓	159	310	70	12	-5.2	-1.5	1001.0	93	8/10
3b	1604	Nutrient	02/Nov/2007	06h30	UTC-6	71°16.425	130°37.983	CTD-Rosette ↑	61	311	80	22	-4.5	-1.5	1001.0	92	8/10
3b	1606	Basic	02/Nov/2007	08h04	UTC-6	71°04.110	130°33.600	Vertical Net Tow ↓	47	211	60	19	-5.4	-1.5	1000.6	89	9/10
3b	1606	Basic	02/Nov/2007	08h10	UTC-6	71°04.120	130°33.680	Vertical Net Tow ↑	47	243	60	19	-5.4	-1.5	1000.6	89	9/10
3b	1606	Basic	02/Nov/2007	09h38	UTC-6	71°04.810	130°28.800	Lawas ↓	46	255	70	17	-4.7	-1.5	1001.2	89	9/10
3b	1606	Basic	02/Nov/2007	10h15	UTC-6	71°04.720	130°30.710	Lawas ↑	48	338	70	15	-5	-1.5	1001.0	85	9/10
3b	1606	Basic	02/Nov/2007	10h21	UTC-6	71°04.740	130°31.070	SCAMP ↓	49	336	60	19	-5.2	-1.5	1001.0	85	9/10
3b	1606	Basic	02/Nov/2007	11h20	UTC-6	71°04.170	130°33.080	SCAMP ↑	48	144	50	17	-5.8	-1.4	1000.9	82	9/10
3b	1606	Basic	02/Nov/2007	11h35	UTC-6	71°03.890	130°33.540	Cage Sampling ↓	165	168	60	19	-5.8	-1.4	1001.0	81	8/10
3b	1606	Basic	02/Nov/2007	11h52	UTC-6	71°03.760	130°34.260	Cage Sampling ↑	48	161	51	18	-6	-1.46	1001.1	79	8/10
3b	1606	Basic	02/Nov/2007	12h39	UTC-6	71°04.240	130°33.060	CTD-Rosette ↓	48	310	58	19	-5.3	-1.48	1001.5	76	9/10
3b	1606	Basic	02/Nov/2007	12h55	UTC-6	71°04.140	130°33.790	CTD-Rosette ↑	47	326	84	16	-5.3	-1.47	1001.7	79	9/10
3b	1606	Basic	02/Nov/2007	13h14	UTC-6	71°04.110	130°34.290	Phytoplankton Net ↓	47	243	52	18	-5.8	-1.47	1001.7	79	9/10
3b	1606	Basic	02/Nov/2007	N/A	UTC-6	N/A	N/A	Phytoplankton Net ↑	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3b	1606	Basic	02/Nov/2007	13h31	UTC-6	71°04.050	130°34.670	Secchi Disk ↓	50	236	53	15	-4.6	-1.44	1002.5	76	9/10
3b	1606	Basic	02/Nov/2007	13h33	UTC-6	71°04.040	130°34.760	Secchi Disk ↑	50	233	47	17	-4.6	-1.44	1002.5	76	9/10
3b	1606	Basic	02/Nov/2007	13h46	UTC-6	71°04.030	130°35.050	PNF ↓	48	228	28	16	-6	-1.44	1002.1	76	9/10
3b	1606	Basic	02/Nov/2007	13h49	UTC-6	71°04.000	130°35.150	PNF ↑	48	231	39	18	-4.5	-1.44	1002.2	74	9/10
3b	1606	Basic	02/Nov/2007	14h16	UTC-6	71°03.920	130°35.790	CTD-Rosette ↓	48	227	36	18	-4.9	-1.44	1002.5	72	9/10
3b	1606	Basic	02/Nov/2007	14h46	UTC-6	71°03.880	130°36.400	CTD-Rosette ↑	48	257	34	18	-5.6	-1.39	1002.5	74	9/10
3b	1606	Basic	02/Nov/2007	14h55	UTC-6	71°03.880	130°36.630	Agassiz Trawl ↓	48	216	39	14	-5	-1.4	1002.6	73	9/10
3b	1606	Basic	02/Nov/2007	15h08	UTC-6	71°03.850	130°37.060	Agassiz Trawl ↑	48	207	37	15	-6.8	-1.42	1002.6	74	9/10
3b	1606	Basic	02/Nov/2007	15h34	UTC-6	71°03.820	130°37.470	Box Core ↓	48	209	37	11	-6.8	-1.44	1002.9	76	9/10
3b	1606	Basic	02/Nov/2007	15h36	UTC-6	71°03.820	130°37.490	Box Core (bottom)	48	201	19	16	-6.6	-1.44	1002.9	76	9/10
3b	1606	Basic	02/Nov/2007	15h38	UTC-6	71°03.820	130°37.530	Box Core ↑	47	202	22	11	-6.4	-1.44	1002.9	76	9/10
3b	1608	CTD	02/Nov/2007	17h22	UTC-6	70°52.396	130°30.327	CTD ↓	44	215	0	20	-7.5	-1.5	1003.1	80	9/10
3b	1608	CTD	02/Nov/2007	17h26	UTC-6	70°52.350	130°30.300	CTD ↑	42	234	5	16	-7.2	-1.54	1003.0	81	9/10
3b	1610	Nutrient	02/Nov/2007	18h47	UTC-6	70°40.467	130°26.507	CTD-Rosette ↓	34	186	5	11	-7.6	-1.6	1003.0	83	9/10
3b	1610	Nutrient	02/Nov/2007	18h57	UTC-6	70°40.327	130°26.607	CTD-Rosette ↑	31	273	5	11	-7.6	-1.6	1003.0	83	9/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind Dir	Wind Speed	Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
3b	1900	CTD	03/Nov/2007	05h09	UTC-6	70°42.366	126°07.863	CTD ↓	233	204	0	21	-16.9	-1.5	1007.3	87	9/10
3b	1900	CTD	03/Nov/2007	05h18	UTC-6	71°42.472	126°08.077	CTD ↑	230	251	0	20	-17	-1.5	1007.4	87	9/10
3b	N/A	N/A	03/Nov/2007	07h56	UTC-6	71°33.390	125°41.046	Lawas ↓	320	0	0	20	-17.7	-1.2	1008.0	86	9/10
3b	N/A	N/A	03/Nov/2007	08h11	UTC-6	71°33.080	125°43.000	Lawas ↑	350	302	20	20	-18.2	-1.2	1009.0	85	9/10
3b	1902	Basic	03/Nov/2007	08h30	UTC-6	71°33.130	125°43.140	Vertical Net Tow ↓	343	170	20	19	-18.7	-1.2	1009.3	85	8/10
3b	1902	Basic	03/Nov/2007	08h56	UTC-6	71°33.100	125°44.600	Vertical Net Tow ↑	350	208	10	18	-18.6	-1.1	1009.6	85	8/10
3b	1902	Basic	03/Nov/2007	09h10	UTC-6	71°32.990	125°45.210	Lawas ↓	346	305	10	17	-17.9	-1.2	1009.8	86	9/10
3b	1902	Basic	03/Nov/2007	09h45	UTC-6	71°32.770	125°47.380	Lawas ↑	348	126	20	21	-18.7	-1.1	1010.3	85	9/10
3b	1902	Basic	03/Nov/2007	09h53	UTC-6	71°32.750	125°47.850	CTD-Rosette ↓	353	220	10	17	-18.5	-1.2	1010.4	85	7/10
3b	1902	Basic	03/Nov/2007	10h47	UTC-6	71°32.750	125°49.880	CTD-Rosette ↑	358	225	20	23	-16	-1.1	1011.2	87	8/10
3b	1902	Basic	03/Nov/2007	11h07	UTC-6	71°33.110	125°51.320	Cage Sampling ↓	360	30	30	18	-18	-1.2	1011.4	85	9/10
3b	1902	Basic	03/Nov/2007	12h14	UTC-6	71°33.360	125°54.700	Cage Sampling ↑	369	129	33	24	-18	-1.68	1012.2	85	9/10
3b	1902	Basic	03/Nov/2007	12h46	UTC-6	71°33.450	125°56.000	SCAMP ↓	373	106	22	18	-18	-1.3	1012.8	85	9/10
3b	1902	Basic	03/Nov/2007	14h07	UTC-6	71°34.230	126°00.450	SCAMP ↑	398	114	19	19	-18.9	-1.15	1014.2	84	9/10
3b	1902	Basic	03/Nov/2007	14h57	UTC-6	71°33.780	125°40.030	Secchi Disk ↓	341	35	18	21	-19.1	-1.31	1014.5	84	9/10
3b	1902	Basic	03/Nov/2007	15h00	UTC-6	71°33.760	125°40.090	Secchi Disk ↑	339	79	20	26	-19.1	-1.31	1014.5	84	9/10
3b	1902	Basic	03/Nov/2007	15h13	UTC-6	71°33.760	125°40.680	PNF ↓	340	231	16	25	-19.3	-1.27	1014.7	84	9/10
3b	1902	Basic	03/Nov/2007	15h17	UTC-6	71°33.660	125°40.740	PNF ↑	N/A	234	23	25	-19.3	-1.27	1014.7	84	9/10
3b	1902	Basic	03/Nov/2007	15h31	UTC-6	71°33.490	125°41.470	CTD-Rosette ↓	N/A	222	15	24	-17.9	-1.2	1014.9	85	9/10
3b	1902	Basic	03/Nov/2007	16h18	UTC-6	71°33.042	125°43.042	CTD-Rosette ↑	346	251	10	19	-18.4	-1.2	1015.6	84	9/10
3b	1902	Basic	03/Nov/2007	16h53	UTC-6	71°33.193	125°45.613	Box Core ↓	350	105	25	19	-19.5	-1.2	1015.8	84	9/10
3b	1902	Basic	03/Nov/2007	17h08	UTC-6	71°33.217	125°46.563	Box Core ↑	350	198	22	18	-19	-1.2	1016.1	85	9/10
3b	1904	CTD	04/Nov/2007	19h53	UTC-7	71°25.653	125°12.565	CTD ↓	272	13	0	0	-12.8	-1.4	1025.0	74	9/10
3b	1904	CTD	04/Nov/2007	20h14	UTC-7	71°25.170	125°12.030	CTD ↑	280	14	Calm	Calm	-13.3	-1.1	1025.0	70	8/10
3b	N/A	N/A	04/Nov/2007	21h30	UTC-7	71°17.310	124°45.680	Lawas ↓	250	128	140	7	-13.8	-1.7	1025.2	72	9/10
3b	N/A	N/A	04/Nov/2007	22h00	UTC-7	71°17.300	124°44.970	Lawas ↑	249	60	160	9	-13.7	-1.2	1025.3	78	9/10
3b	1906	CTD	04/Nov/2007	22h17	UTC-7	71°17.350	124°44.680	CTD ↓	244	95	180	3	-13.3	-1.2	1025.3	78	9/10
3b	1906	CTD	04/Nov/2007	22h40	UTC-7	71°17.400	124°44.180	CTD ↑	240	118	190	9	-13.5	-1.2	1025.2	79	9/10
3b	1908	Basic	05/Nov/2007	00h27	UTC-7	71°09.070	124°17.280	Vertical Net Tow ↓	363	0	167	8	-14.3	-1.27	1025.5	75	9/10
3b	1908	Basic	05/Nov/2007	00h52	UTC-7	71°09.170	124°15.960	Vertical Net Tow ↑	370	3	157	9	-12.9	-1.24	1025.5	72	9/10
3b	1908	Basic	05/Nov/2007	01h42	UTC-7	71°09.400	124°13.240	Hydrobios ↓	376	157	173	8	-14.7	-1.24	1025.4	75	9/10
3b	1908	Basic	05/Nov/2007	02h05	UTC-7	71°09.510	124°12.050	Hydrobios ↑	365	158	138	10	-14.5	-1.21	1025.5	75	9/10
3b	1908	Basic	05/Nov/2007	05h37	UTC-7	71°08.635	124°21.291	CTD-Rosette ↓	250	233	110	8	-15.4	-1.5	1025.1	76	9/10
3b	1908	Basic	05/Nov/2007	06h25	UTC-7	71°08.815	124°19.602	CTD-Rosette ↑	292	231	110	8	-15.4	-1.2	1025.0	76	9/10
3b	1908	Basic	05/Nov/2007	06h38	UTC-7	71°08.865	124°19.222	SCAMP ↓	295	231	130	9	-15.4	-1.5	1024.9	76	9/10
3b	1908	Basic	05/Nov/2007	08h03	UTC-7	71°09.260	124°16.620	SCAMP ↑	365	230	120	10	-15.7	-1.1	1024.4	78	9/10
3b	1908	Basic	05/Nov/2007	08h13	UTC-7	71°09.300	124°16.340	CTD-Rosette ↓	364	229	110	9	-15.8	-1.1	1024.4	79	9/10

Appendix 2 - Scientific log of activities conducted during the 2007 ArcticNet Amundsen Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
3b	1908	Basic	05/Nov/2007	09h10	UTC-7	71°09.470	124°14.690	CTD-Rosette ↑	375	228	140	8	-15.9	-1	1024.4	79	9/10
3b	1908	Basic	05/Nov/2007	09h05	UTC-7	71°09.460	124°14.780	Lawas ↓	375	228	140	7	-15.9	-1	1024.3	79	9/10
3b	1908	Basic	05/Nov/2007	09h45	UTC-7	71°09.540	124°13.590	Lawas ↑	373	226	110	6	-15.7	-1	1024.2	78	9/10
3b	1908	Basic	05/Nov/2007	09h40	UTC-7	71°09.530	124°13.740	Cage Sampling ↓	373	226	140	5	-15.7	-1	1024.3	78	9/10
3b	1908	Basic	05/Nov/2007	10h37	UTC-7	71°09.660	124°12.110	Cage Sampling ↑	362	225	120	6	-16	-1	1024.3	79	9/10
3b	1910	CTD	05/Nov/2007	13h20	UTC-7	71°00.910	123°51.510	CTD ↓	311	49	117	19	-19.6	-1.33	1024.5	79	9/10
3b	1910	CTD	05/Nov/2007	13h41	UTC-7	71°00.990	123°51.190	CTD ↑	311	52	116	20	-19.7	-1.3	1024.6	79	9/10
3b	1912	CTD	05/Nov/2007	15h19	UTC-7	70°53.770	123°22.340	CTD ↓	424	19	86	21	-21.3	-1.32	1025.0	72	9+/10
3b	1912	CTD	05/Nov/2007	16h15	UTC-7	70°53.323	123°22.929	CTD ↑	425	24	90	20	-21.6	-1.1	1024.9	76	9+/10
3b	1914	CTD	05/Nov/2007	19h45	UTC-7	70°53.709	122°46.563	CTD ↓	395	87	20	15	-21.6	-1.2	1024.9	71	9+/10
3b	1914	CTD	05/Nov/2007	20h17	UTC-7	70°53.610	122°46.910	CTD ↑	386	82	50	14	-21.4	-1.2	1024.9	66	9+/10
3b	1916	N/A	05/Nov/2007	22h03	UTC-7	70°54.000	122°08.580	SCAMP ↓	418	94	30	8	-21.6	-1.3	1024.7	69	9+/10
3b	1916	N/A	05/Nov/2007	23h56	UTC-7	70°54.030	122°08.860	SCAMP ↑	418	94	330	5	-23	-1.12	1025.2	75	9+/10
3b	1916	Basic	06/Nov/2007	00h54	UTC-7	70°53.810	122°08.390	Cage Sampling ↓	423	214	316	3	-21.3	-1.13	1025.3	75	9+/10
3b	1916	Basic	06/Nov/2007	01h12	UTC-7	70°53.820	122°08.320	Cage Sampling ↑	423	215	334	3	-20.5	-1.28	1025.3	76	9+/10
3b	1916	Basic	06/Nov/2007	01h30	UTC-7	70°53.880	122°08.090	Vertical Net Tow ↓	421	278	305	5	-20.5	-1.25	1025.3	74	9+/10
3b	1916	Basic	06/Nov/2007	01h59	UTC-7	70°53.900	122°07.880	Vertical Net Tow ↑	421	291	306	4	-20.7	-1.23	1025.3	77	9+/10
3b	1916	Basic	06/Nov/2007	02h42	UTC-7	70°53.920	122°07.540	Box Core ↓	420	301	236	7	-20.8	-1.18	1025.2	79	9+/10
3b	1916	Basic	06/Nov/2007	02h48	UTC-7	70°53.920	122°07.490	Box Core (bottom)	420	302	299	5	-20.8	-1.18	1025.2	79	9+/10
3b	1916	Basic	06/Nov/2007	02h53	UTC-7	70°53.920	122°07.440	Box Core ↑	420	302	235	3	-20.3	-1.2	1025.3	78	9+/10

Appendix 3 - CTD logbook for the 2007 ArcticNet Amundsen Expedition

Leg	Cast#	Station	Date Start UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
Leg 1											
1	1	mak-1	2007-07-30	02:05	56° 18.338	057° 23.092	1466	899	btl 13& 16 didn't trip; pH problems; no nitrates on	CTD	MER
1	2	mak-2	2007-07-30	21:11	56° 47.155	057° 17.816	2027	901	btl 13 didn't trip; pH & trans problems; no nitrates on	CTD	VL
1	3	621	2007-07-31	11:06	56° 24.994	061° 30.986	110	102	pH problems	CTD	MER
1	4	622	2007-07-31	12:20	56° 24.980	061° 44.012	83	78	btl 13 didn't trip; pH problems	nut	VL
1	5	623	2007-07-31	13:54	56° 26.579	061° 55.992	95	82	pH problems	CTD	VL
1	6	624	2007-07-31	15:28	56° 25.141	062° 04.411	62	50	btl 13 didn't trip; pH problems	nut+cont+phyt	MER
1	7	620	2007-07-31	22:02	56° 24.044	061° 13.112	70	59	btl 13 didn't trip; pH problems	nut+cont+phyt	VL
1	8	617	2007-08-01	16:10	58° 29.975	062° 41.417	139	124	btl 13 didn't trip	nut+cont+phyt	Mer
1	9	610	2007-08-01	20:08	58° 31.324	062° 50.332	120	117	no problem reported	CTD	VL
1	10	612	2007-08-01	20:57	58° 28.175	062° 59.275	33	29	no problem reported	CTD	VL
1	11	613	2007-08-01	21:54	58° 28.973	063° 13.979	253	230	btl 13 closed	Nutrients	VL
1	12	614	2007-08-01	23:34	58° 24.006	063° 23.311	113	106	no problem reported	CTD	VL
1	13	615	2007-08-02	00:49	58° 19.174	063° 32.261	130	121			
1	14	600	2007-08-02	10:33	59° 05.310	063° 25.832	202	192	no problem reported	nut+cont+phyt	MER
1	15	601	2007-08-02	13:34	59° 02.666	063° 37.258	140	139	no problem reported	CTD	MER
1	16	602	2007-08-02	15:26	59° 03.230	063° 52.069	158	142	btl 13 closed	nut+cont+phyt	MER
1	17	604	2007-08-02	19:25	58° 59.518	063° 53.663	55	50	no problem reported	nutrients	VL
1	18	356	2007-08-03	08:25	60° 44.660	064° 40.870	296	279	water flowing out of Hudson Strait	nutrients	MER
1	19	354	2007-08-03	11:08	60° 59.947	064° 45.760	518	500	btl 13 didn't trip	nut+cont+phyt	MER
1	20	352	2007-08-03	14:03	61° 15.962	064° 48.901	268	258	btl 13 closed	nut+cont+phyt	MER
1	21	698	2007-08-05	06:24	62° 08.082	078° 42.427	149	143	btl 13 closed	pp	VL
1	22	699	2007-08-05	17:19	59° 59.968	078° 26.099	88	80		nut+cont+phyt	Mer
1	23	701	2007-08-06	06:46	58° 23.272	078° 22.415	84	80	btl 13 closed	nut+cont+phyt	VL
1	24	700	2007-08-06	19:22	58° 00.588	079° 52.943	140	134	water mixed in btl 23 & 24	nut+cont+phyt	VL
1	25	702	2007-08-09	18:21	55° 24.533	077° 55.261	122	116		ctd	mer
1	26	702	2007-08-09	20:47	55° 24.612	077° 55.766	142	131		cont	mer
1	27	702	2007-08-10	13:12	55° 24.420	077° 55.850	136	122	Water mixed in btl 24	cont+phyt+nut	mer
1	28	703	2007-08-10	21:33	54° 40.608	079° 57.199	46	32		cont+phyt+nut	MER
1	29	703a	2007-08-11	05:01	54° 42.988	080° 50.074	92	80		cont+phyt	Mer
1	30	704	2007-08-11	10:45	54° 45.800	081° 43.022	34	23		cont+phyt+nut	mer
1	31	704a	2007-08-12	03:33	56° 02.264	084° 41.699	100	95	bad weather; first m all mixed	cont+nut	mer
1	32	704b	2007-08-12	07:39	55° 44.351	084° 50.087	67	53	bad weather; first m all mixed	phyt+nut	mer
1	33	704c	2007-08-12	11:27	55° 31.586	084° 57.194	33	22	bad weather; first m all mixed	cont+phyt+nut	mer
1	34	705c	2007-08-13	21:46	57° 42.587	090° 54.085	37	25	problems with pH probe	Nutrients	mer
1	35	705b	2007-08-13	23:52	57° 34.124	091° 23.939	41	32	problems with pH probe	Nutrients	mer
1	36	705	2007-08-14	06:51	57° 41.658	091° 38.488	44	36	problems with pH probe	cont+phyt+nut	mer
1	37	705a	2007-08-14	16:25	57° 26.726	091° 53.507	44	31	prob. pH probe + first m mixed on downcast	cont+phyt+nut	mer
1	38	706	2007-08-15	10:56	58° 46.854	091° 31.177	81	68		cont+phyt+nut	mer
1	39	707	2007-08-15	22:04	59° 58.640	091° 56.772	102	92	first m mixed on downcast	ctd	mer
1	40	707	2007-08-16	09:20	59° 58.654	091° 57.235	100	92		cont+phyt+nut	mer
Leg 3a											
3a	1	100	2007-09-28	22:39	74° 23.333	080° 12.150	716	690	pH sensor has troubles	sed traps	VL
3a	2	101	2007-09-29	18:10	76° 24.223	077° 25.227	336	320	no comments	pp	VL
3a	3	101	2007-09-29	20:29	76° 26.057	077° 27.409	316	304	a block of ice touched the cable	nuts	VL

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Leg	Cast#	Station	Date Start UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
3a	4	101	2007-09-29	23:14	76° 27.749	077° 25.250	266	254	no comments	cont.	AJ
3a	5	103	2007-09-30	09:11	76° 21.473	076° 37.382	146	136	ship repositioned when Rosette was at 40 m on downcast	nuts	AJ
3a	6	105	2007-09-30	14:51	76° 17.722	075° 44.075	320	309	no comments	pp+cont	VL
3a	7	105	2007-09-30	16:47	76° 16.298	075° 50.742	347	344	Rosette onboard at 75 m upcast	nuts	VL
3a	8	105	2007-09-30	17:43	76° 15.391	075° 54.569	357	350	no comments	nuts	VL
3a	9	115	2007-10-01	14:53	76° 19.873	071° 14.452	684	667	winch had trouble at 5 m during upcast	nuts	AJ
3a	10	115	2007-10-01	18:48	76° 22.224	071° 18.236	633	615	no comments	pp + DMS	AJ
3a	11	115	2007-10-01	23:38	76° 19.657	071° 22.121	687	663	no comments	cont	VL
3a	12	113	2007-10-02	07:04	76° 19.123	072° 11.852	570	555	btle 13 did not close	nuts	AJ
3a	13	111	2007-10-02	09:33	76° 18.370	073° 13.616	600	595	no comments	sed traps	VL
3a	14	111	2007-10-02	12:41	76° 17.380	073° 18.379	596	588	no comments	nuts	VL
3a	15	111	2007-10-02	15:32	76° 18.054	073° 05.908	591	597	no comments	pp + cont	VL
3a	16	108	2007-10-03	02:08	76° 13.537	074° 43.343	451	442	no comments	cont	AJ
3a	17	108	2007-10-03	10:07	76° 15.467	074° 37.379	447	440	btl 23 didn't closed, pH sensor had problems	nuts	VL
3a	18	108	2007-10-03	12:25	76° 14.543	074° 40.309	438	431	btl 23 didn't closed	pp + DMS	VL
3a	19	108	2007-10-03	17:06	76° 13.111	074° 50.264	441	436	pH sensor troubles	sed traps	VL
3a	20	134	2007-10-04	07:23	75° 38.267	079° 29.094	547	530	no comments	nuts	VL
3a	21	134	2007-10-04	12:51	75° 35.526	079° 28.192	541	526	Btl 23 did not closed, pH sensor had problems. Repositionning of the boat while at 13 m.	pp + cont + DMS	VL
3a	22	301	2007-10-07	10:37	74° 07.226	083° 19.632	690	671	pH sensor had troubles	nuts + pp	VL
3a	23	302	2007-10-07	18:04	74° 09.019	086° 11.442	529	513	pH sensor had troubles. Water column mixed at 17 m.	pp + DMS	VL
3a	24	302	2007-10-07	20:34	74° 09.011	086° 13.186	526	516	pH sensor has been changed prior to this cast	nuts	AJ
3a	25	302	2007-10-08	02:03	74° 11.885	086° 36.796	501	489	no comments	cont	AJ
3a	26	305	2007-10-08	23:52	74° 19.828	094° 58.834	167	164	no comments	nuts	AJ
3a	27	308	2007-10-09	14:36	74° 07.565	103° 01.634	351	343	Altimeter started working 10 m from the bottom	pp + DMS	VL
3a	28	308	2007-10-09	17:41	74° 08.297	103° 06.713	346	334	no comments	nuts	VL
3a	29	308	2007-10-09	20:24	74° 07.902	103° 09.032	353	345	btl 13 did not close	cont	AJ
3a	30	309	2007-10-10	11:43	74° 39.234	103° 06.870	166	162	no comments	nuts	VL
3a	31	309	2007-10-10	16:05	74° 38.580	103° 33.346	175	165	Altimeter started 9 m from bottom	pp + DMS + cont	VL
3a	32	310	2007-10-11	18:26	71° 42.383	101° 44.785	199	194	First 30 m possibly mixed on upcast	pp + DMS + cont	VL
3a	33	310	2007-10-11	21:09	71° 43.772	101° 53.616	216	202	btl 13 did not closed	nuts	AJ
3a	34	314	2007-10-12	21:11	68° 59.966	106° 36.186	107	99	no comments	nuts + pp + DMS +	AJ
3a	35	Beaufort-1	2007-10-15	02:54	70° 54.925	126° 55.093	260	241	no comments	sed traps	AJ
3a	36	434	2007-10-15	17:20	70° 10.414	133° 30.948	45	35	no comments	pp + DMS + cont	VL
3a	37	434	2007-10-15	19:14	70° 10.781	133° 32.774	40	35	no comments	nuts	VL
3a	38	433	2007-10-15	22:38	70° 17.206	133° 34.018	48	44	no comments	CTD	VL
3a	39	432	2007-10-15	23:24	70° 24.336	133° 35.867	56	52	no comments	nuts	AJ
3a	40	431	2007-10-16	00:23	70° 29.386	133° 37.160	61	55	no comments	CTD	AJ
3a	41	430	2007-10-16	01:12	70° 35.548	133° 39.211	66	58	no comments	nuts	AJ
3a	42	429	2007-10-16	02:17	70° 41.054	133° 40.360	53	57	no comments	CTD	AJ
3a	43	428	2007-10-16	03:24	70° 47.174	133° 41.684	71	63	no comments	nuts	AJ
3a	44	427	2007-10-16	06:16	70° 52.430	133° 42.427	76	69	no comments	CTD	AJ
3a	45	426	2007-10-16	07:33	70° 59.004	133° 43.638	89	84	no comments	nuts	AJ
3a	46	435	2007-10-16	09:54	71° 04.933	133° 39.072	302	279	Mixing in water column over 10 m. Supports of two bottles broke.	cont	VL

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Leg	Cast#	Station	Date Start UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
3a	47	435	2007-10-17	19:01	71° 04.741	133° 38.872	295	279	Bottles at 83 m have been closed after 60 m and 75 m.	pp + DMS	VL
3a	48	435	2007-10-17	21:03	71° 03.532	133° 42.678	252	237	no comments	nuts	AJ
Leg 3b											
3b	49	437	2007-10-19	07:11	71° 46.493	126° 31.118	340	329	no comments	sed traps	VL
3b	50	1806	2007-10-19	18:14	72° 39.786	127° 07.026	96	90	no comments	nuts	AJ
3b	51	1806	2007-10-19	19:40	72° 40.680	127° 07.160	100	94	no comments	pp + DMS + cont	AJ
3b	52	1804	2007-10-20	03:38	72° 29.867	127° 15.410	50	49	no comments	CTD	VL
3b	53	1802	2007-10-20	05:34	72° 18.076	127° 27.076	49	44	no comments	CTD	VL
3b	54	1800	2007-10-20	09:59	72° 08.290	127° 41.207	380	365	no comments	nuts	AJ
3b	55	1800	2007-10-20	11:56	72° 09.254	127° 44.921	365	364	no comments	pp + cont	AJ
3b	56	437	2007-10-20	21:48	71° 48.126	126° 30.347	292	278	mixing in water column during whole cast	pp + DMS + cont	AJ
3b	57	437	2007-10-21	01:31	71° 46.642	126° 31.183	333	327	no comments	nuts	VL
3b	58	410	2007-10-21	08:23	71° 42.026	126° 29.638	406	399	no comments	CTD	VL
3b	59	411	2007-10-21	10:02	71° 37.799	126° 42.973	438	426	no comments	CTD	AJ
3b	60	412	2007-10-21	11:24	71° 33.790	126° 55.574	413	407	no comments	nuts	AJ
3b	61	413	2007-10-21	13:11	71° 29.872	127° 08.915	370	363	no comments	CTD	AJ
3b	62	MW-2	2007-10-21	19:00	71° 45.330	126° 30.499	364	345	no comments	CTD	VL
3b	63	414	2007-10-21	21:38	71° 25.372	127° 21.196	310	301	no comments	nuts	AJ
3b	64	415	2007-10-21	23:14	71° 21.925	127° 32.498	248	234	no comments	CTD	VL
3b	65	405	2007-10-22	07:39	71° 16.670	127° 34.912	185	182	no comments	sed traps	VL
3b	66	417	2007-10-22	08:49	71° 13.236	127° 58.800	79	72	no comments	CTD	VL
3b	67	418	2007-10-22	10:41	71° 09.650	127° 10.096	60	54	no comments	CTD	AJ
3b	68	419	2007-10-22	11:51	71° 06.304	127° 20.470	51	48	no comments	CTD	AJ
3b	69	408	2007-10-22	15:15	71° 17.000	127° 32.166	202	192	no comments	nuts	AJ
3b	70	408	2007-10-22	18:00	71° 16.860	127° 32.531	198	192	no comments	pp + DMS + cont	AJ
3b	71	408	2007-10-22	22:21	71° 18.649	127° 37.432	183	185	no comments	CTD	AJ
3b	72	420	2007-10-23	07:02	71° 03.863	128° 27.282	38	32	no comments	nuts	VL
3b	73	420	2007-10-23	08:15	71° 04.042	128° 25.099	42	37	no comments	pp+cont	VL
3b	74	407	2007-10-23	17:11	71° 01.042	126° 01.933	398	386	mixing in water at 10 meters	pp + DMS + cont	AJ
3b	75	407	2007-10-23	23:08	71° 00.931	126° 00.744	399	386	no comments	nuts	VL
3b	76	407	2007-10-24	03:48	71° 03.642	125° 55.584	410	393	no comments	DMS+sed.traps	VL
3b	77	407	2007-10-24	07:26	71° 00.392	126° 03.119	399	382	no comments	DMS	VL
3b	78	407	2007-10-24	15:57	71° 00.659	126° 03.899	390	383	pH sensor had problems	dms	AJ
3b	79	1018	2007-10-25	00:24	71° 56.621	126° 50.390	402	402	no comments	CTD	VL
3b	80	1016	2007-10-25	01:48	71° 52.888	125° 18.577	330	316	mixing over 10 m	nuts	VL
3b	81	1014	2007-10-25	03:53	70° 49.085	124° 46.278	380	368	no comments	CTD	VL
3b	82	1012	2007-10-25	05:58	70° 45.295	124° 14.362	529	507	no comments	nuts	VL
3b	83	1010	2007-10-25	08:02	70° 41.546	124° 42.092	507	489	no comments	CTD	VL
3b	84	405	2007-10-25	18:08	70° 40.198	123° 00.772	562	545	no chlo max	pp+dms	AJ
3b	85	405	2007-10-25	21:17	70° 39.958	123° 00.623	560	546	no comments	nuts	AJ
3b	86	405	2007-10-25	23:36	70° 39.970	122° 59.333	555	537	no comments	micro + cont + traps	VL
3b	87	405	2007-10-26	06:03	70° 40.010	122° 59.560	550	540	Rosette sheet has been erased, information lost	CTD	VL
3b	88	1006	2007-10-26	09:01	70° 36.044	122° 37.682	550	541	pH sensor had troubles	CTD	VL
3b	89	1004	2007-10-26	10:43	70° 35.968	122° 04.541	487	480	propellers running	nuts	AJ
3b	90	1002	2007-10-26	12:43	70° 36.084	121° 32.678	458	439	no comments	CTD	AJ

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Leg	Cast#	Station	Date Start UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
3b	91	1000	2007-10-26	19:32	70° 35.842	120° 59.738	372	365	flush at 5 m	pp + cont + dms	AJ
3b	92	1000	2007-10-26	22:28	70° 36.097	120° 59.180	369	363	no comments	nuts	VL
3b	93	1100	2007-10-27	08:41	71° 02.424	123° 15.229	273	266	no comments	pp + cont	VL
3b	94	1100	2007-10-27	10:12	71° 02.675	123° 15.446	267	257	Rosette hit the bottom	nuts + cont	AJ
3b	95	1102	2007-10-27	12:12	70° 53.813	123° 34.717	389	380	mixing at beginning	CTD	AJ
3b	96	1104	2007-10-27	13:52	70° 45.127	123° 53.713	418	411	no comments	nuts	AJ
3b	97	1106	2007-10-27	16:33	70° 36.794	124° 12.940	442	442	no comments	CTD	AJ
3b	98	1108	2007-10-27	18:13	70° 27.662	124° 34.439	253	239	no comments	nuts	AJ
3b	99	1110	2007-10-27	21:11	70° 19.333	124° 56.148	78	71	no comments	pp + cont	AJ
3b	100	1110	2007-10-28	00:06	70° 20.256	124° 57.496	91	85	no comments	nuts	VL
3b	101	1112	2007-10-28	03:51	70° 13.728	125° 19.187	102	92	no comments	CTD	VL
3b	102	1114	2007-10-28	06:18	70° 08.140	125° 49.436	137	129	no comments	nuts	VL
3b	103	1116	2007-10-28	14:22	70° 02.577	126° 16.722	228	223	no comments	nuts	AJ
3b	104	1116	2007-10-28	17:31	70° 03.916	126° 19.043	232	222	no comments	pp + DMS + cont	AJ
3b	105	1118	2007-10-28	22:43	70° 11.099	126° 39.154	206	196	no comments	CTD	VL
3b	106	1120	2007-10-29	01:03	70° 19.280	126° 58.214	216	207	no comments	nuts	VL
3b	107	1122	2007-10-29	06:07	70° 27.212	127° 23.673	56	44	no comments	CTD	VL
3b	108	1216	2007-10-29	21:09	70° 35.840	127° 42.260	49	36	Propellers mixed water column	pp + DMS + cont	AJ
3b	109	1216	2007-10-30	00:34	70° 36.892	127° 34.854	173	164	no comments	nuts	VL
3b	110	1214	2007-10-30	09:21	70° 42.150	127° 18.210	225	216	no comments	CTD	VL
3b	111	1212	2007-10-30	12:56	70° 49.369	126° 53.774	273	264	Nitrate sensor had troubles	nuts	AJ
3b	112	1210	2007-10-30	16:13	70° 58.152	126° 27.918	347	339	no comments	CTD	AJ
3b	113	407	2007-10-31	02:09	71° 04.660	126° 01.850	414	403	no comments	CTD	AJ
3b	114	1208	2007-10-31	05:59	71° 04.211	126° 02.405	400	388	Bottles closed at wrong depths because of positioning to avoid ice	nuts	VL
3b	115	1206	2007-10-31	08:07	71° 11.323	125° 36.954	394	387	no comments	CTD	VL
3b	116	1204	2007-10-31	09:45	71° 18.473	125° 11.069	307	305	Risk of mixing in water column over 10m.	nuts	VL
3b	117	1202	2007-10-31	12:18	71° 25.783	124° 47.333	220	210	no comments	CTD	AJ
3b	118	1200	2007-10-31	18:16	71° 32.662	124° 27.656	197	186	no comments	pp + DMS + cont	AJ
3b	119	1200	2007-10-31	23:03	71° 02.900	124° 16.501	198	194	no comments	nuts	VL
3b	120	1510	2007-11-01	10:26	71° 40.134	127° 36.196	376	370	no comments	CTD	AJ
3b	121	1508	2007-11-01	12:20	71° 40.189	128° 10.616	339	331	not sampled: pH and nitrates sensors got problems, bottles fired sequences got wrong and a lot of mixing from boat repositioning	nuts	AJ
3b	122	1508	2007-11-01	14:00	71° 41.029	128° 15.259	337	332	Mixing in water column over 10 m. Nitrate sensor problems	nuts	AJ
3b	123	1506	2007-11-01	18:17	71° 40.106	128° 50.959	281	272	oxygen sensor did not worked.	CTD	AJ
3b	124	1504	2007-11-01	00:00							
3b	125	1502	2007-11-01	21:36	71° 39.836	130° 10.330	256	246	no comments	CTD	AJ
3b	126	1600	2007-11-01	22:59	71° 39.952	130° 46.056	473	482	Stopped at 427 m on downcast. Nitrate sensor problems	pp + DMS + cont	VL
3b	127	1600	2007-11-02	03:00	71° 38.767	131° 01.414	675	670	no comments	nuts	VL
3b	128	1602	2007-11-02	10:53	71° 28.082	130° 40.906	207	204	no comments	CTD	AJ
3b	129	1604	2007-11-02	12:15	71° 16.566	130° 36.894	59	50	no comments	nuts	AJ
3b	130	1606	2007-11-02	18:41	71° 04.236	130° 33.046	48	38	no comments	nuts	AJ
3b	131	1606	2007-11-02	20:16	71° 03.936	130° 35.741	47	37	Risk of mixing in the water column while at 9 m.	pp + DMS + cont	AJ

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Leg	Cast#	Station	Date Start UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
3b	132	1608	2007-11-02	23:22	70° 52.394	130° 30.313	44	31	no comments	CTD	VL
3b	133	1610	2007-11-03	00:47	70° 40.451	130° 26.509	34	24	no comments	nuts	VL
3b	134	1900	2007-11-03	11:10	71° 42.368	126° 07.856	230	224	no comments	CTD	AJ
3b	135	1902	2007-11-03	15:55	71° 32.773	125° 47.921	354	345	Nitrate sensor did not worked. Mixing in water column	nuts	AJ
3b	136	1902	2007-11-03	21:34	71° 23.470	125° 41.513	345	338	Nitrate sensor did not function	pp + DMS + cont	AJ
3b	137	1904	2007-11-05	02:46	71° 25.650	125° 12.560	270	267	First Rosette in moonpool. First 50 m had to adjust speed	CTD	VL
3b	138	1906	2007-11-05	05:17	71° 17.345	124° 44.737	244	236	Chloro is unstable. Nitrate sensor troubles.	CTD	VL
3b	139	1908	2007-11-05	12:39	71° 08.640	124° 21.167	259	254	no comments	pp + DMS + cont	AJ
3b	140	1908	2007-11-05	15:17	71° 09.319	124° 16.232	364	360	no comments	nuts	AJ
3b	141	1910	2007-11-05	20:21	71° 00.905	123° 51.514	311	303	no comments	CTD	AJ
3b	142	1912	2007-11-05	22:20	70° 53.759	123° 22.354	424	423	no comments	CTD	AJ
3b	143	1914	2007-11-06	02:46	70° 53.710	122° 46.565	395	391	nitrate sensor has been changed.	CTD	VL

Appendix 4 - List of science participants on the 2007 ArcticNet Amundsen Expedition

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 1a	Baikie, Gary	Parks Canada Visitor Exp.	Parks Canada	Reimer, Ken	Nain	31-Jul-07	Salluit	4-Aug-07
Leg 1a	Bastick, Jacqueline	Msc Student	Environmental Sciences Group, RMC	Reimer, Ken	Quebec City	26-Jul-07	Salluit	4-Aug-07
Leg 1a	Biasutti, Marina	Director of the environment	Nunatsiavut Government	Reimer, Ken	Nain	31-Jul-07	Salluit	4-Aug-07
Leg 1a	Brown, Tanya	Research assistant	Environmental Sciences Group, RMC	Reimer, Ken	Quebec City	26-Jul-07	Salluit	4-Aug-07
Leg 1a	Curran, Peggy	Journalist	The Gazette		Quebec City	26-Jul-07	Salluit	4-Aug-07
Leg 1a	Gilbert, Jean-Philippe	Technician	DFO-IML	Lesage, Véronique	Quebec City	26-Jul-07	Salluit	4-Aug-07
Leg 1a	Kenney, John	Photographer	The Gazette		Quebec City	26-Jul-07	Salluit	4-Aug-07
Leg 1a	Reimer, Ken	Research Scientist	Environmental Sciences Group, RMC	Reimer, Ken	Nain	31-Jul-07	Salluit	4-Aug-07
Leg 1a, Leg 1b	Armstrong, Debbie	Technician	University of Manitoba	Wang, Feiyue	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Barber, Dave	Chief Scientist - Professor	University of Manitoba	Barber, Dave	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Bentley, Sam	Professor	Memorial University	Bentley, Sam	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Binder, Ryan	FJMC Student	FJMC	Stern, Gary	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Blais, Marjolaine	Research assistant	UQAR	Gosselin, Michel	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Blondeau, Sylvain	Technician	Université Laval - Québec-Océan	Michaud, Luc	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Brucker, Steve	EM-300 operator	Ocean Mapping Group	Hughes-Clarke, John	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Church, Ian	EM-300 operator	Ocean Mapping Group	Hughes-Clarke, John	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Delaronde, Joanne	Technician	DFO-Freshwater Institute	Stern, Gary	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Ferland, Joannie	Msc Student	UQAR	Gosselin, Michel	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Gagné, Steve	Technician	Université Laval - Québec-Océan	Michaud, Luc	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Haworth, Rob	Honors Student	Memorial University	Bentley, Sam	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Hoccheim, Klaus	Research Scientist	University of Manitoba	Barber, Dave	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Huelse, Peter	PhD Student	Memorial University	Bentley, Sam	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Jantunen, Liisa	Research Scientist	Environment Canada	Stern, Gary	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Johnson, Bruce	Msc Student	University of Manitoba	Papakyriakou, Tim	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Lago, Véronique	Research assistant	INRS	Gratton, Yves	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Lajoie, Michel	Msc Student	UQAR	Lajeunesse, Patrick	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Latonas, Jeffrey	Msc Student	University of Manitoba	Wang, Feiyue	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Letourneau, Louis	Technician	University Laval	Fortier, Louis	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	MacHutchon, Allison	Technician	DFO-Freshwater Institute	Stern, Gary	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	MacIntyre, Darrow	Journalist	CBC		Nain	31-Jul-07	Sanikiluaq	8-Aug-07
Leg 1a, Leg 1b	Massot, Pascal	Technician	Université Laval - Québec-Océan	Michaud, Luc	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	McCullough, Greg	Post Doctoral Fellow	University of Manitoba	Barber, Dave	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Michaud, Josée	Post-Doctoral fellow	Université Laval	Fortier, Louis	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Michaud, Luc	Ship equipment manager	Université Laval - Québec-Océan	Michaud, Luc	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Munroe, Caitlin	Teacher	Manaugh Elementary School	Barber, Dave	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Philippe, Benoit	Msc Student	UQAR	Gosselin, Michel	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Rail, Marie-Emmanuelle	Research assistant	INRS	Gratton, Yves	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Rosnagel, Andrea	Msc Student	University of Manitoba	Barber, Dave	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Smith, Larry	Professor	University of California, Los Angeles	Fortier, Louis	Quebec City	26-Jul-07	Churchill	17-Aug-07
Leg 1a, Leg 1b	Trent, Doug	Cameraman	CBC		Nain	31-Jul-07	Sanikiluaq	8-Aug-07
Leg 1a, Leg 1b	Wong, Fiona	PhD Student	DFO-Freshwater Institute	Stern, Gary	Quebec City	26-Jul-07	Churchill	17-Aug-07

Appendix 4 - List of science participants on the 2007 ArcticNet Amundsen Expedition

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 1b	Kudluarok, Johnny	Wildlife monitor	Sanikiluaq Fish and Games	Gagné, Jacques	Sanikiluaq	8-Aug-07	Churchill	17-Aug-07
Leg 1b	Kuzyk, Zou Zou	PhD Student	DFO-Freshwater Institute	Stern, Gary	Salluit	4-Aug-07	Churchill	17-Aug-07
Leg 3a	Auger, Vincent	ROV Pilot	ROPOS	Juniper, Kim	Resolute	27-Sep-07	Resolute	8-Oct-07
Leg 3a	Aventurier, Patrick	Photographer	Figaro Magazine	ArcticNet	Resolute	27-Sep-07	Sachs Harbour	16-Oct-07
Leg 3a	Belt, Simon	Research Scientist	University of Plymouth	Gosselin, Michel	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Calamai, Peter	Journalist	Toronto Star	ArcticNet	Resolute	8-Oct-07	Sachs Harbour	16-Oct-07
Leg 3a	Chang, Rachel	PhD Student	University of Toronto, SOLAS	Leaitch, Richard	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Danielson, Brad	Msc Student	University of Alberta	Sharp, Martin	Resolute	27-Sep-07	Resolute	8-Oct-07
Leg 3a	Dillon, Dennis	Cameraman	The Dan Rather report	ArcticNet	Resolute	27-Sep-07	Nanisivik	6-Oct-07
Leg 3a	Gagné, Jacques	Research Scientist	DFO-IML	Gagné, Jacques	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Georgiou, Mark	Senior producer	BBC News	ArcticNet	Resolute	8-Oct-07	Sachs Harbour	18-Oct-07
Leg 3a	Johnson, Bruce	Research associate	University of Manitoba	Papakyriakou, Tim	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Jones, Edward	Soundman	The Dan Rather report	ArcticNet	Resolute	27-Sep-07	Nanisivik	6-Oct-07
Leg 3a	Lehnherr, Igor	PhD Student	University of Alberta	St. Louis, Vincent	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Lemieux, Jean-Francois	PhD Student	McGill University	ArcticNet	Resolute	8-Oct-07	Sachs Harbour	18-Oct-07
Leg 3a	Magee, Robert	Cameraman	BBC News	ArcticNet	Resolute	8-Oct-07	Sachs Harbour	18-Oct-07
Leg 3a	Marx, Willem	Producer	The Dan Rather report	ArcticNet	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Michaud, Sonia	Scientist	Institut Maurice-Lamontagne, SOLAS	Levasseur, Maurice	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Norman, Ann-Lise	Professor	University of Calgary, SOLAS	Norman, Ann-Lise	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Pabi, Sudeshna	PhD Student	Stanford University	Arrigo, Kevin	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Royer, Sarah-Jeanne	Msc Student	Université Laval, SOLAS	Levasseur, Maurice	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Seguin, Allison Michelle	Msc Student	University of Calgary, SOLAS	Norman, Ann-Lise	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a	Shukman, David	Science correspondent	BBC News	ArcticNet	Resolute	8-Oct-07	Sachs Harbour	18-Oct-07
Leg 3a	Simard, Yvan	Research Scientist	DFO-IML	Gagné, Jacques	Resolute	27-Sep-07	Resolute	8-Oct-07
Leg 3a	Tremblais, Jean-Louis	Journalist	Figaro Magazine	ArcticNet	Resolute	27-Sep-07	Sachs Harbour	16-Oct-07
Leg 3a	Tremblay, Bruno	Professor	McGill University	Tremblay, Bruno	Resolute	8-Oct-07	Sachs Harbour	18-Oct-07
Leg 3a, Leg 3b	Ben-Mustapha, Sélima	PhD Student	Sherbrooke University	Larouche, Pierre	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Bourque, Mylène	Msc Student	UQAR	Archambault, Philippe	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Brucker, Steve	EM-300 operator	Ocean Mapping Group	Hughes-Clark, John	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Cartwright, Doug	EM-300 operator	Ocean Mapping Group	Hughes-Clark, John	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Delaronde, Joanne	Technician	DFO-Freshwater Institute	Stern, Gary	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Faye Woods, Sarah	Msc Student	RSMAS	Drennan, Will	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Forest, Alexandre	PhD Student	Université Laval	Fortier, Louis	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Gagné, Steve	Technician	Université Laval - Québec-Océan	Michaud, Luc	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Gagnon, Jonathan	Technician	Université Laval	Tremblay, Jean-Eric	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Janin, Amélie	PhD Student	INRS	Gratton, Yves	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Lago, Véronique	Research assistant	INRS	Gratton, Yves	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Levesque, Keith	ArcticNet ship-based coordinat	Université Laval	Fortier, Louis	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Luce, Myriam	Msc Student	Université Laval, SOLAS	Levasseur, Maurice	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	MacHutchon, Allison	Technician	DFO-Freshwater Institute	Stern, Gary	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Martin, Johannie	PhD Student	Université Laval	Tremblay, Jean-Eric	Resolute	27-Sep-07	To be determined	8-Nov-07

Appendix 4 - List of science participants on the 2007 ArcticNet Amundsen Expedition

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 3a, Leg 3b	Massé, Guillaume	Research Scientist	University of Plymouth	Gosselin, Michel	Resolute	27-Sep-07	Sachs Harbour	18-Oct-07
Leg 3a, Leg 3b	Massot, Pascal	Technician	Université Laval - Québec-Océan	Michaud, Luc	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Michaud, Luc	Ship equipment manager	Université Laval - Québec-Océan	Michaud, Luc	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Poulin, Michel	Research Scientist	Canadian Museum of Nature	Gosselin, Michel	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Prowe, Frederike	PhD Student	Dalhousie University	Thomas, Helmuth	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Rempillo, Ofelia	MSc Student	University of Calgary, SOLAS	Norman, Ann-Lise	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Sévigny, Caroline	PhD Student	INRS	Gratton, Yves	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Sjostedt, Steve	Post-doctoral fellow	University of Toronto, SOLAS	Abbatt, Jonathan	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Tremblay, Geneviève	Technician	UQAR	Michel, Christine	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Tremblay, Jean-Eric	Chief Scientist - Professor	Université Laval	Tremblay, Jean-Eric	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Vare, Lindsay	Post-doctoral fellow	University of Plymouth	Massé, Guillaume	Resolute	27-Sep-07	To be determined	8-Nov-07
Leg 3a, Leg 3b	Letourneau, Louis	Technician	Université Laval	Fortier, Louis	Resolute	27-Sep-07	To be determined	20-Dec-07
Leg 3b	Barber, Doug	CFL Photojournalist	University of Manitoba	Barber, Dave	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Collin, Pascale	Technician	University of Manitoba	Barber, Dave	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Guignard, Constance	Research associate	University McGill	Mucci, Alfonso	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Leitch, Dan	CFL Coordinator	University of Manitoba	Barber, Dave	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Maranger, Roxanne	Professor	Université de Montréal	Maranger, Roxanne	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Name to come	CFL Wildlife monitor			Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Pednault, Estelle	Msc Student	Université Laval	Lovejoy, Connie	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Scarratt, Michael	Research Scientist	Institut Maurice-Lamontagne, SOLAS	Levasseur, Maurice	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Swystun, Kyle	Msc Student	University of Manitoba	Papakyriakou, Tim	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Gupta, Mukesh	Graduate student	University of Manitoba	Barber, Dave	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Hwang, Phil	Graduate Student	University of Manitoba	Barber, Dave	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07
Leg 3b	Pucko, Monika	Graduate Student	University of Manitoba	Stern, Gary	Sachs Harbour	18-Oct-07	To be determined	8-Nov-07