LOICZ SNAPSHOTS

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The Call of the North: A 13-month Field Program in the Canadian High Arctic

The record low coverage of sea-ice in the Arctic this past winter contributes to a growing body of evidence supporting global climate change. Communities in the high North experience the impacts of this change most dramatically, and as such, Canadian researchers across many disciplines are joining forces to gain a better understanding of the consequences of climate change in the Arctic.

As part of the Canadian International Polar Year (IPY), the Circumpolar Flaw Lead System Study (CFL, website: http://www.ipy-cfl.ca) brings together over 200 scientists from more than a dozen countries for a multi-year study in the Canadian High Arctic. The 13-month field program was conducted aboard the CCGS Amundsen, a Canadian icebreaker that has been refit to become a world-class research platform.

The field season extended from October 2007 to August 2008, with scientific staff and the ship's crew on a 6-week long rotation. The study area was located west of Banks Island, the southwestern most of the islands in the Canadian Arctic Archipelago.

(Fig. 1: Photo by Helmuth Thomas): CCGS Amundsen frozen in the ice in front of Banks Island)

Throughout the winter months the ship was deliberately frozen into the ice, making weekly visits to the open flaw lead system and affording us the opportunity to over-winter the icebreaker in this fascinating and understudied region. Our small team of 5 from Dalhousie University in Halifax collectively manned 8 6-week legs over the course of the 13-month field season. Canadian groups from McGill, Montreal, QC, University of Manitoba, Winnipeg, MB, and the Institute of Ocean Sciences, Victoria, BC complemented the annual sampling with help from colleagues from Gothenburg University in Sweden.

In order to better understand the carbon cycling at the Canadian Arctic Shelf, and in particular its seasonal variability, we collected water samples for on-board analysis of dissolved inorganic carbon (DIC) and total alkalinity (TA). Additionally, continuous recordings of the surface water CO_2 partial pressure were made. We have now begun to investigate the seasonality of the carbon cycle, considering governing processes such as riverine and terrestrial inputs, mixing of the major water masses from the Arctic, Atlantic, and Pacific Oceans, cross shelf carbon exchange, and the role of the atmosphere-ice and ice water interfaces.

Water column sampling could be continued in the winter season, when we were frozen in to ice several meters thick, through the moon pool of the Canadian coastguard ice breaker. Despite the full ice coverage, the moon pool permitted us to lower the CTD, and zooplankton nets, into the water from the interior of the ship and without having to dig a hole in the ice. Only the very few meters close to the ice-water interface were collected from outside, in temperatures often less than -30°C, by drilling a hole with an ice-corer and lowering a homemade contraption that consisted of a small pump, with a small anchor, and a couple meters of garden hose, into the hole to collect water a several depths.

(Fig. 2: Photo by Elizabeth Shadwick) – The CCGS Amundsen in the dark Arctic winter

On the 'Christmas Leg', from December 20th to February 2nd, we were in almost complete darkness for our first month on board. We saw spectacular Northern Lights, but almost no wildlife, except for the occasional Polar Bear, and a ring seal that took up temporary residence in the moon pool. On trips out onto the ice the views of the ship were

spectacular. We were completely isolated from any other human life, and walking on the thick sea ice you'd never have known there was an ocean beneath your feet, if it weren't for the imposing icebreaker whose bright searchlights illuminated the horizon.

(Fig. 3:Photo by Elizabeth Shadwick) - The CCGS Amundsen in the endless summer sunshine

Mid-summer provided a stark contrast with 24-hours of sunlight and frequent polar bear and whale and sea bird sightings. In open water, the CTD was deployed from the deck, with sampling taking place at all hours of the day and night. Throughout the 13-month field program, nine teams of scientists studied everything from the physics of sea ice, to benthic life and zooplankton distributions, to carbon fluxes through the ice and mercury contamination in the water and in marine mammals. This project provided a unique opportunity to collaborate with, and learn from, researchers in all disciplines of Arctic oceanography and ecology. We look forward to the breadth of scientific understanding that emerges from the CFL project, and inevitable insight gained from studying this breathtakingly beautiful piece of our globe.

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