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Canadian Arctic Ocean Science Plan 2011

Arctic Science Summit Week
AOSB/PAG
Korea, March 2011

Robert Fudge
Director, National Centre for Arctic Aquatic Research Excellence (NCAARE)
Fisheries and Oceans Canada

Canada

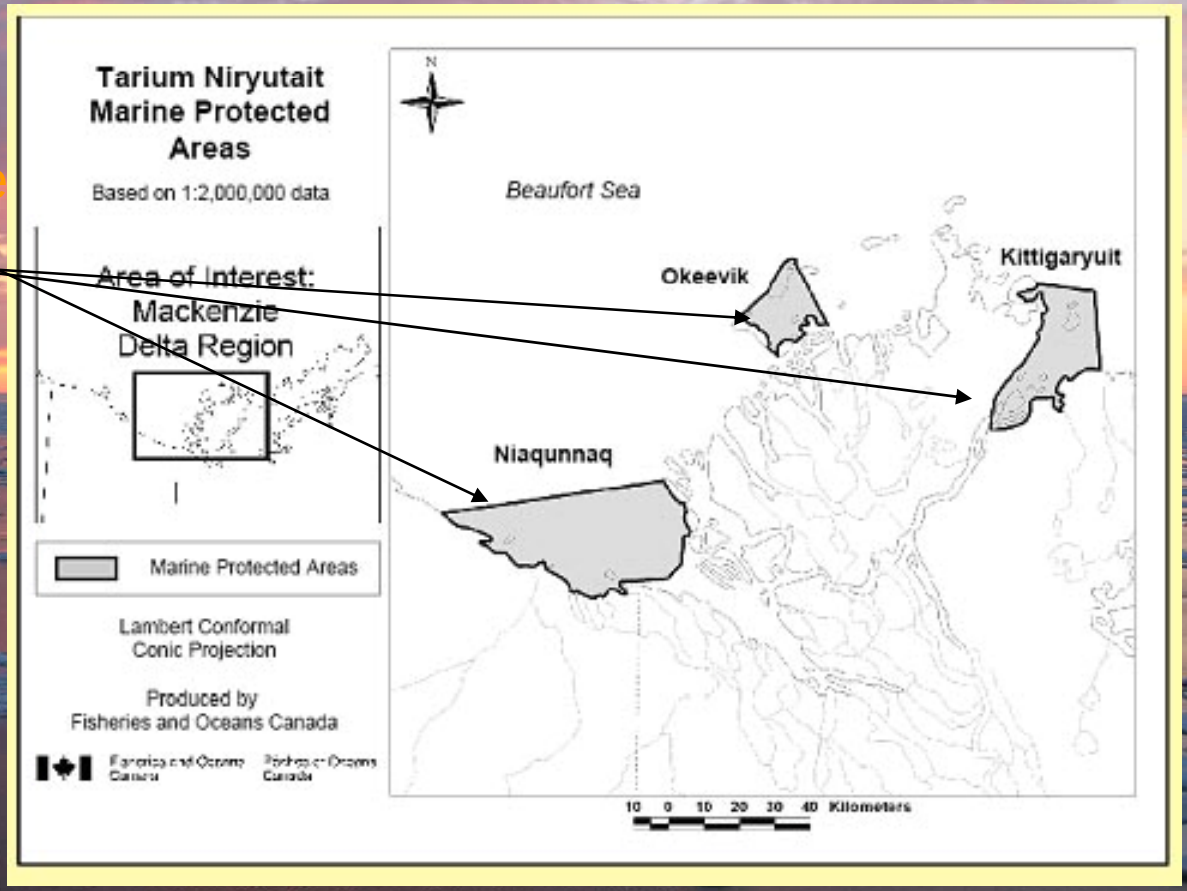
Canadian Arctic Science Drivers

SCIENCE PRIORITIES

- Ecosystem Science
- Climate Change
- Sea-ice status and change studies
- Freshwater inputs and fluxes through the Arctic
- Emerging Fisheries
- Subsistence Fisheries
- Marine Protected Areas – Beaufort Sea, North West Passage
- Oil & Gas Industry Exploration
- UNCLOS program – seismic and multi-beam
- Canadian High Arctic Research Station (in Cambridge Bay)

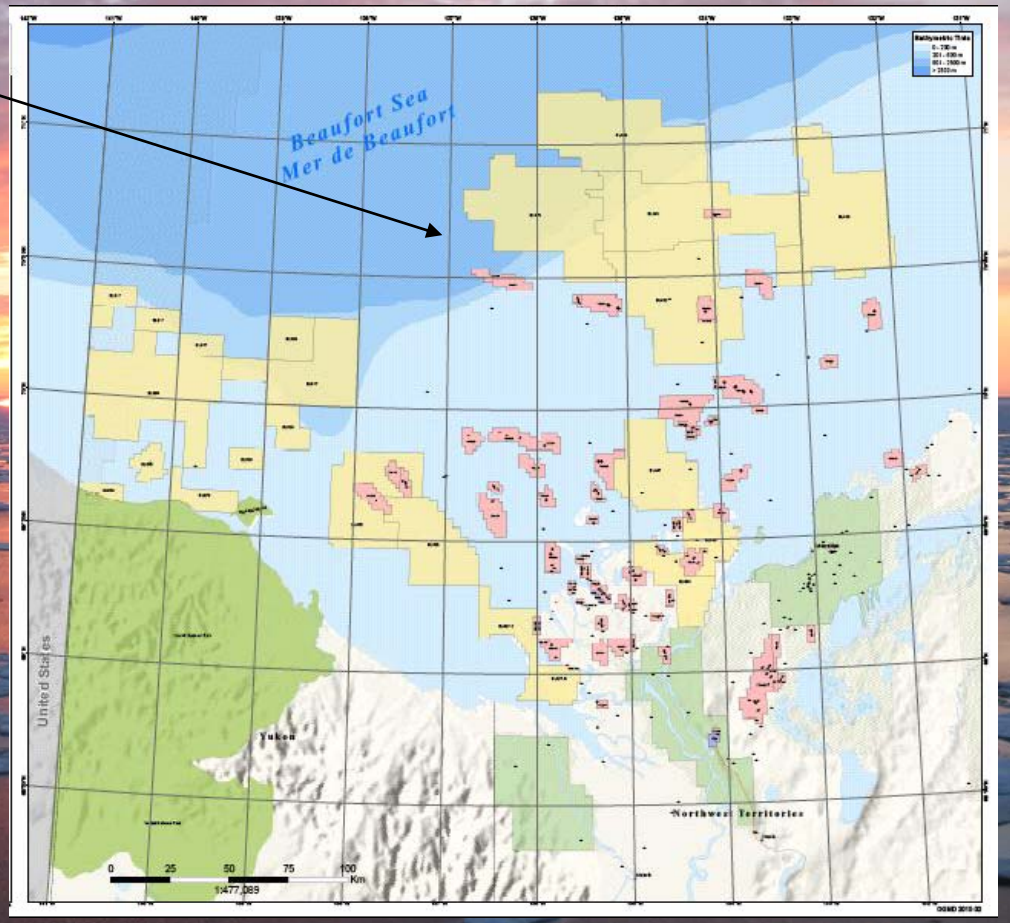
Canadian Arctic Marine Protected Area (MPA)

- Announced Aug 26, 2010
- Three areas in Mackenzie Delta Region
- Total of 1800km2
- The purpose of **Tarium Niryutait MPA** is to conserve and protect the marine ecosystem and protect biological resources within the MPA



Beaufort Sea Exploration/Development

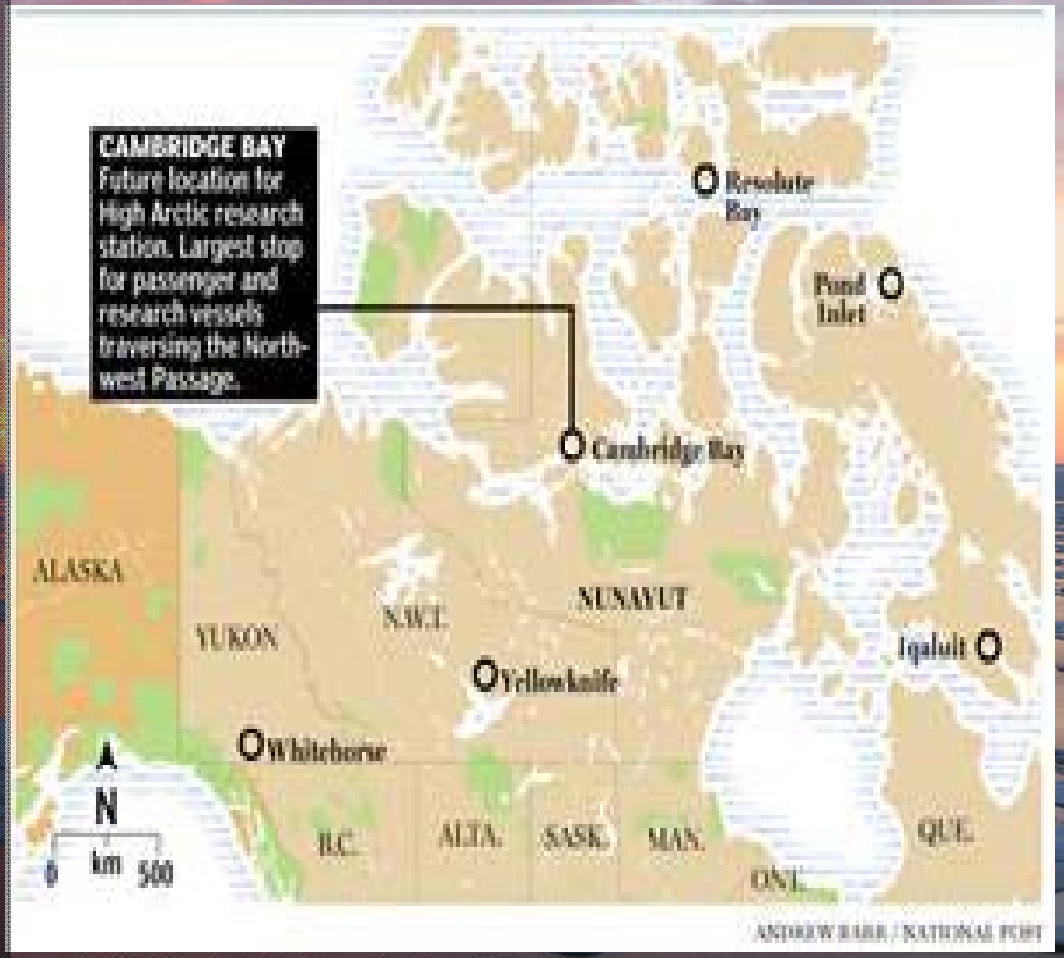
- Lease holdings in Beaufort Sea
- Evaluating Oil Potential – exploration ramping up
- Government and Industry working together to gather environmental data and assess risk
- Beaufort Regional Environmental Assessment (BREA) – 5 year Indian and Northern Affairs Canada (INAC) program to address EA



Canadian Priorities in Arctic Ocean Science

Canadian High Arctic Research Station

- Announced on August 10, 2010 that the new Canadian High Arctic Research Station will be located in Cambridge Bay, Nunavut.
- $2M was allocated to a feasibility study to establish preliminary analysis on costs and operational functionality.
- $18M was allocated to the design phase (e.g., detailed costing, scheduling and specifications)
- Construction begins in 2-3 years
- Science priorities investigated



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Canadian Arctic Ocean Science Program - 2011

2011 Programs:

- Canada's Three Oceans - Turbo
  - *CCGS Louis S. St-Laurent* - St. John's to Cambridge (Jul 09 to 21)
  - *CCGS Sir Wilfrid Laurier* - Victoria to Barrow (Jul 08 to 20)
- Joint Ocean-Ice Study (JOIS)
  - *CCGS Louis S. St-Laurent* (30 day Science Program) - Cambridge to Canada Basin (Jul 21 to Aug 18)
- AIM (Arctic Ice Monitoring) / MGH (Mackenzie Gas Hydrate)
  - *CCGS Sir Wilfrid Laurier* - Cambridge Bay, Nunavut to Nome, Alaska (Sept 25 to Oct 9)

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Canadian Arctic Ocean Science Program - 2011

2011 Programs :

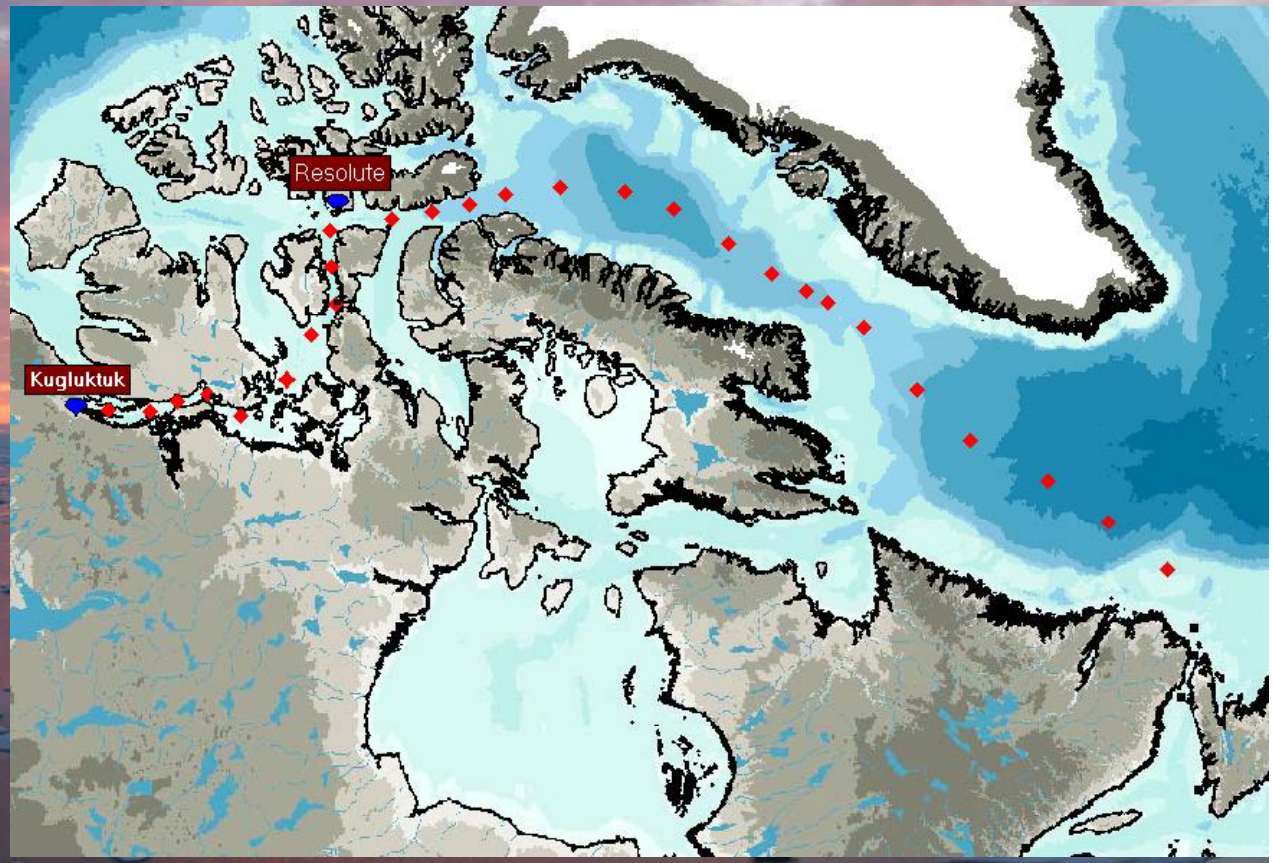
- UNCLOS - Continental Shelf Mapping/Seismic program
  - *CCGS Louis S. St-Laurent* (42 days) working with *USCG Cutter Healy* in Makarov Basin and Sever Spur area (Aug 18 to Sept 29)
- ArcticNet
  - *CCGS Amundsen* (Jul 17 to Nov 3)
- Hudsons Bay Moorings
  - *CCGS Pierre Radisson* - (Jul 5 to Aug 9 and Sept 9 to 20) IML
  - *CCGS Pierre Radisson* - (Jul 9 to Aug 19) BAYSYS ArcticNet
- Barrow Strait Program
  - *CCGS Des Groseilliers* - Barrow Strait (Aug 2 to 11)

Canada's Three Oceans (C3O) - East

CCGS Louis S. St-Laurent

July 9 to 21

- XCTD's 4 times daily, Wildlife observations
- Leg 1: St John's – Resolute July 9 -16
  - 3 science berths
- Leg 2: Resolute - Kugluktuk July 16 -21
  - Will be a science/policy workshop Arctic science
  - Science underway



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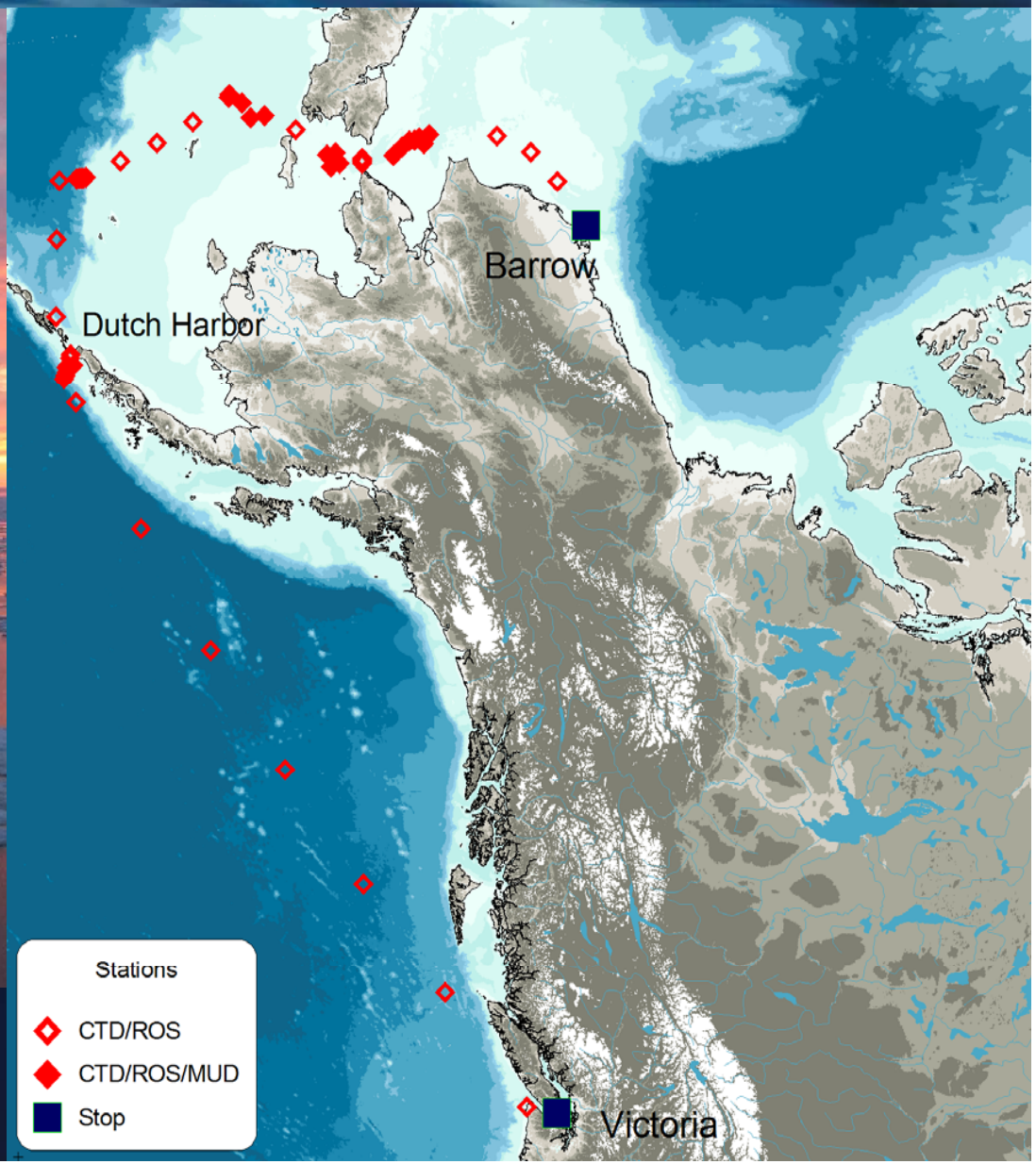
Canada's Three Oceans (C3O) - West

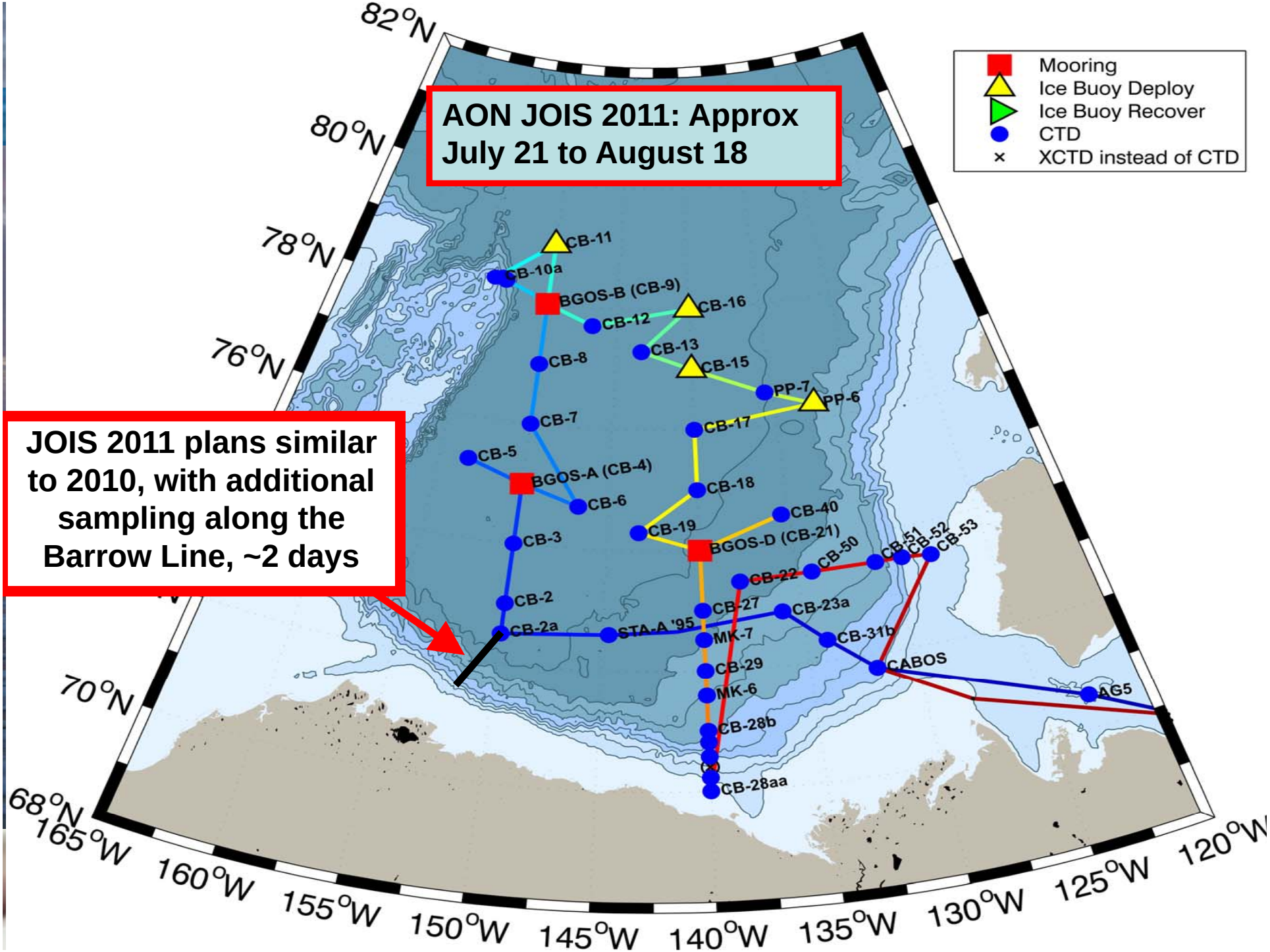
CCGS Sir Wilfrid Laurier
July 8 To 20

- Daily underway XCTD casts (>300m)
- DBO Stations in SCS and Barrow Canyon with CTD/Rosette
- Underway Measurements: Wildlife observations, GPS and Ship's heading, Sounder, Weather, In-lab seawater system
- 3 science berths Victoria - Barrow



AON/Joint Ocean Ice Study (JOIS)

- The Beaufort Gyre in the Canadian Basin is the largest freshwater storage reservoir of the Arctic, however its variability and influence on circulation and the export of freshwater to the global ocean is still poorly understood.
  - 2003 – Joint Ocean Ice Study (US/Can/Japan)
  - 2005 to 2009 – Beaufort Gyre Environmental Program
  - 2010 to 2014 – AON Continuing the Beaufort Gyre Observing Program
    - Successful Collaboration – between Fisheries and Oceans Canada, the US National Science Foundation and Woods Hole Oceanographic Institute


AON JOIS 2011: Approx
July 21 to August 18
JOIS 2011 plans similar to 2010, with additional sampling along the Barrow Line, ~2 days
Mooring
Ice Buoy Deploy
Ice Buoy Recover
CTD
XCTD instead of CTD
82°N
80°N
78°N
76°N
70°N
68°N
165°W
160°W
155°W
150°W
145°W
140°W
135°W
130°W
125°W
120°W
CB-11
CB-10a
BGOS-B (CB-9)
CB-12
CB-16
CB-13
CB-15
CB-8
PP-7
PP-6
CB-7
CB-17
CB-5
BGOS-A (CB-4)
CB-6
CB-18
CB-40
CB-19
BGOS-D (CB-21)
CB-3
CB-50
CB-51
CB-52
CB-53
CB-22
CB-2
CB-27
CB-23a
CB-2a
STA-A '95
MK-7
CB-31b
CB-29
CABOS
MK-6
AG5
CB-28b
CB-28aa

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Arctic Ice Monitoring

CCGS Sir Wilfrid Laurier

Cambridge Bay, NU to Nome, AK

Sept. 25 to Oct. 9, 2011

- To measure the physical properties of sea ice and the upper-ocean waters.
- This investigation addresses environmental concerns of climate change, ocean variability and maritime safety

Main objectives of the expedition:

- Mooring recovery, service and re-deployment
- Mapping of selected properties of seawater (e.g., temperature, salinity, chlorophyll fluorescence, dissolved O2, CO2, and CH4)
- Investigating Gas Hydrates
- Ice Thickness Monitoring – Hazard Assessment

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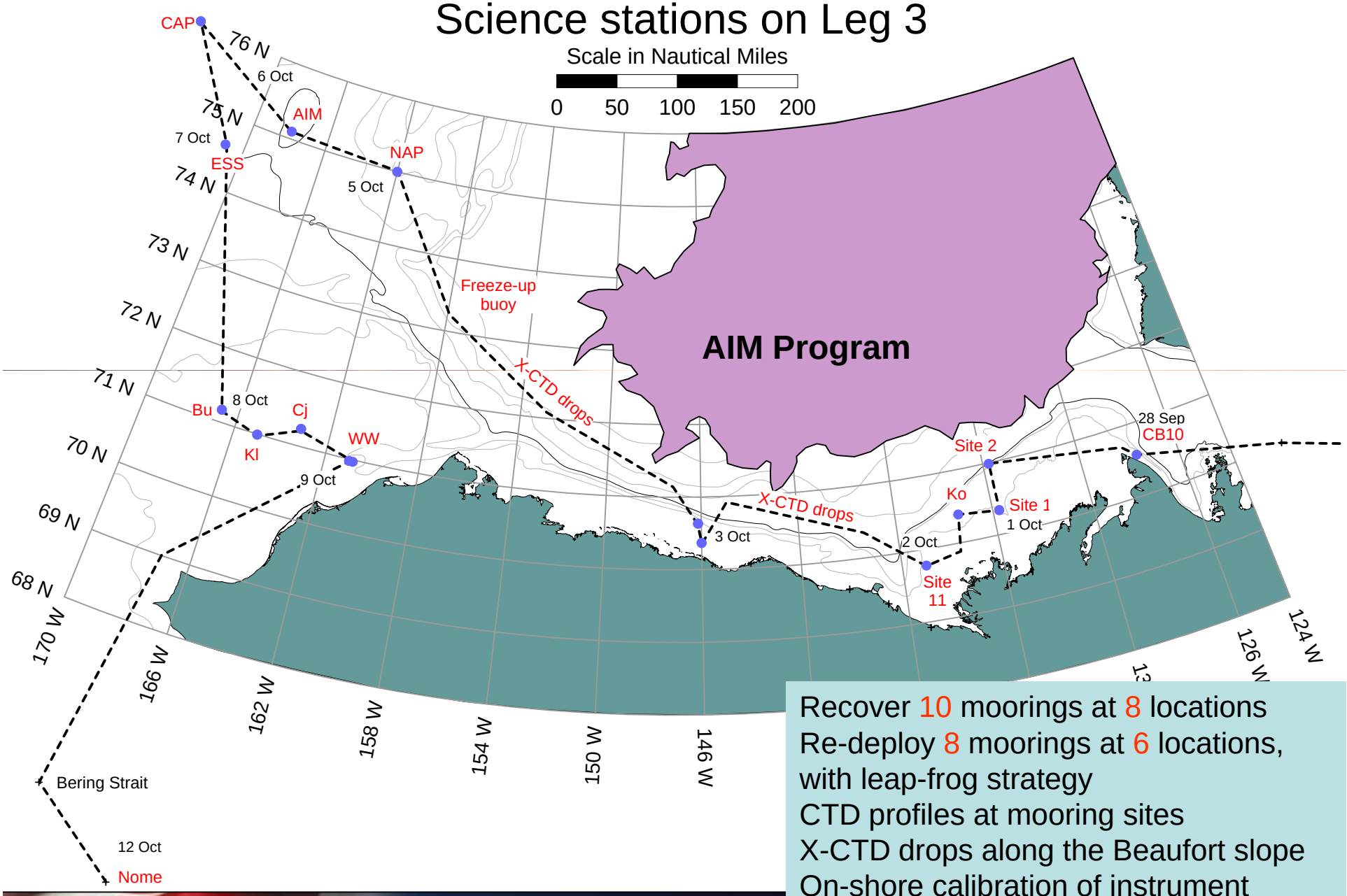
CCGS Sir Wilfrid Laurier, 2011 Arctic Patrol
Science stations on Leg 3



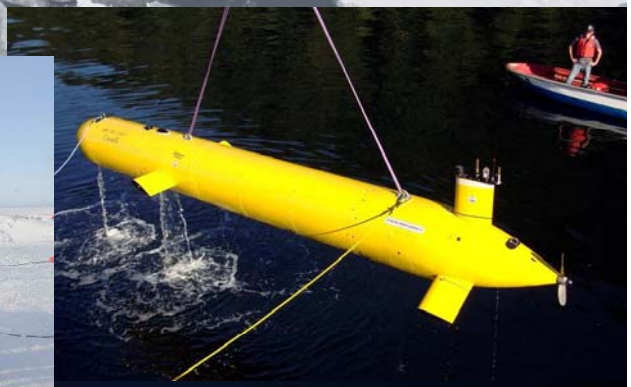
Recover 10 moorings at 8 locations
Re-deploy 8 moorings at 6 locations, with leap-frog strategy
CTD profiles at mooring sites
X-CTD drops along the Beaufort slope
On-shore calibration of instrument compasses

UNCLOS - Continental Shelf Seabed Mapping

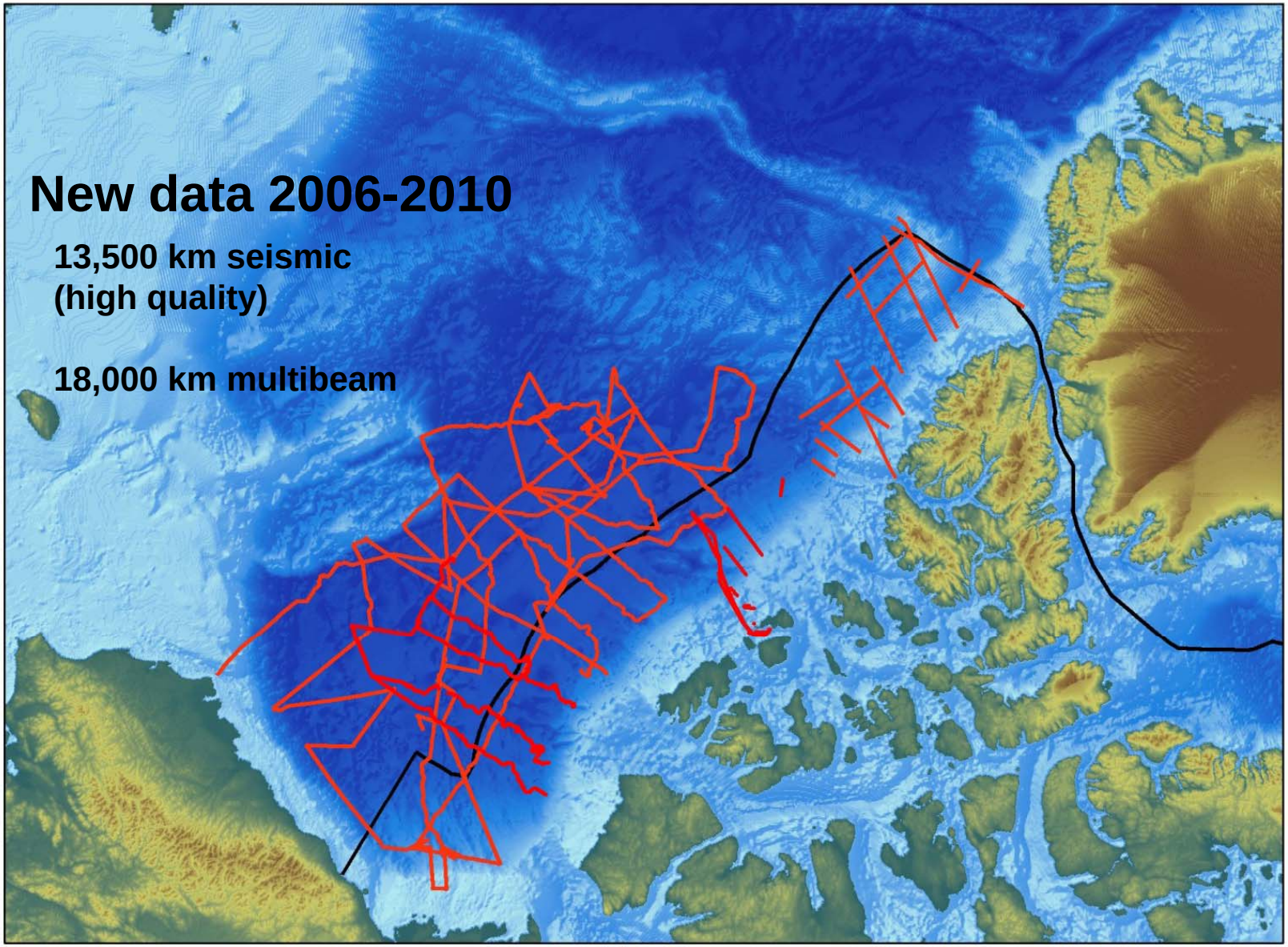
CCGS Louis S. St-Laurent & USCG Cutter Healy

Aug 18 to Sept 29

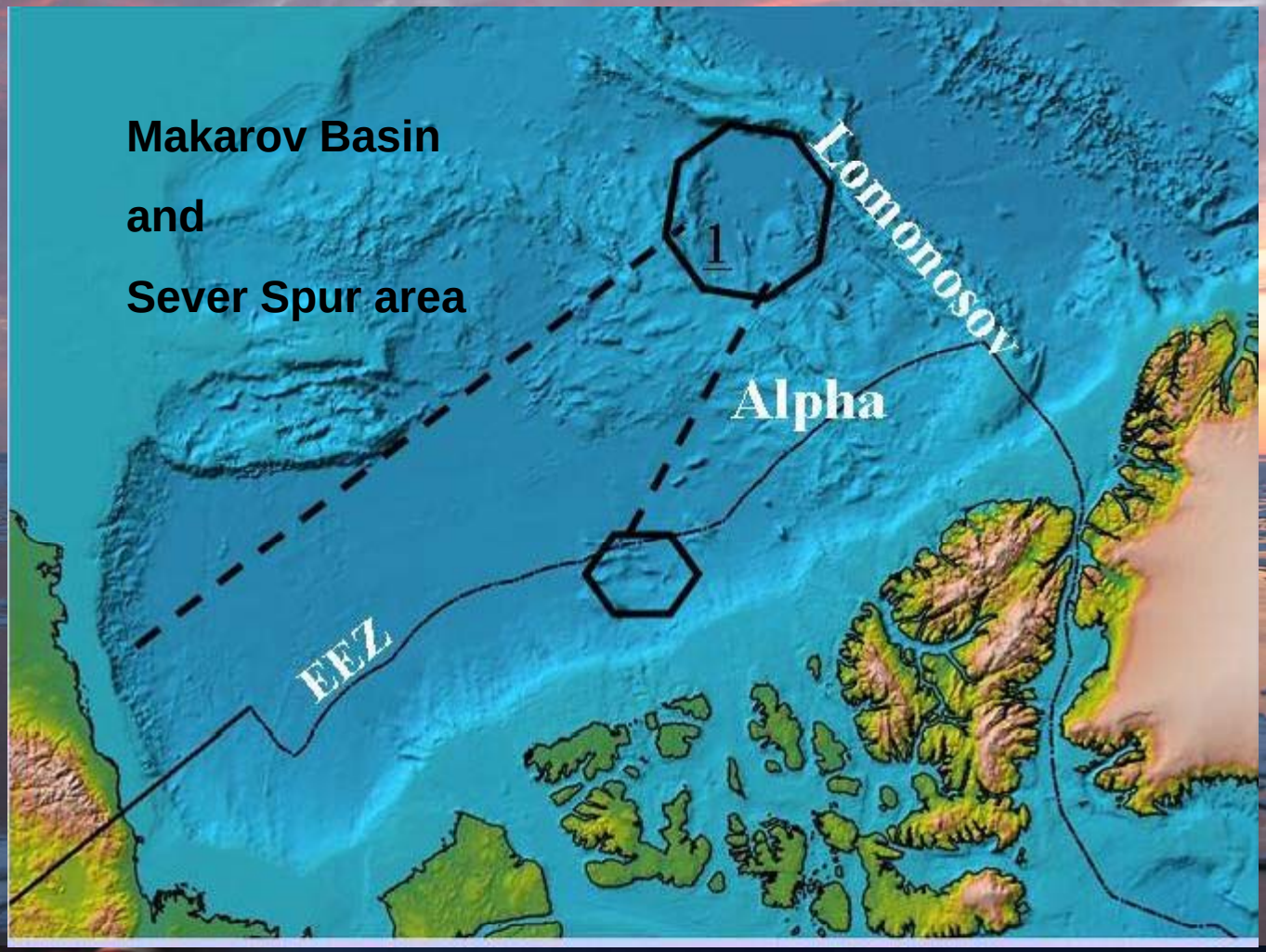
- **Successful seismic surveys**
  - Collected 13,500 km of seismic data (very good quality)
  - Covered most of the extended area
- **Joint operations with US in 2008, 2009 and 2010**
  - able to collect seismic under heavy ice conditions (up to 84)
  - first seismic data in northern Beaufort Sea:
  - Large quantities of sediments in entire Beaufort Sea
  - Fourth joint survey with US planned for 2011
  - Extensive use of AUV's



Status of UNCLOS program after 2010 field season



General UNCLOS survey area for 2011



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ArcticNet

CCGS Amundsen

July 17 to November 3, 2011

- 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.

Science activities

- Mooring deployments, oceanographic and biological sampling

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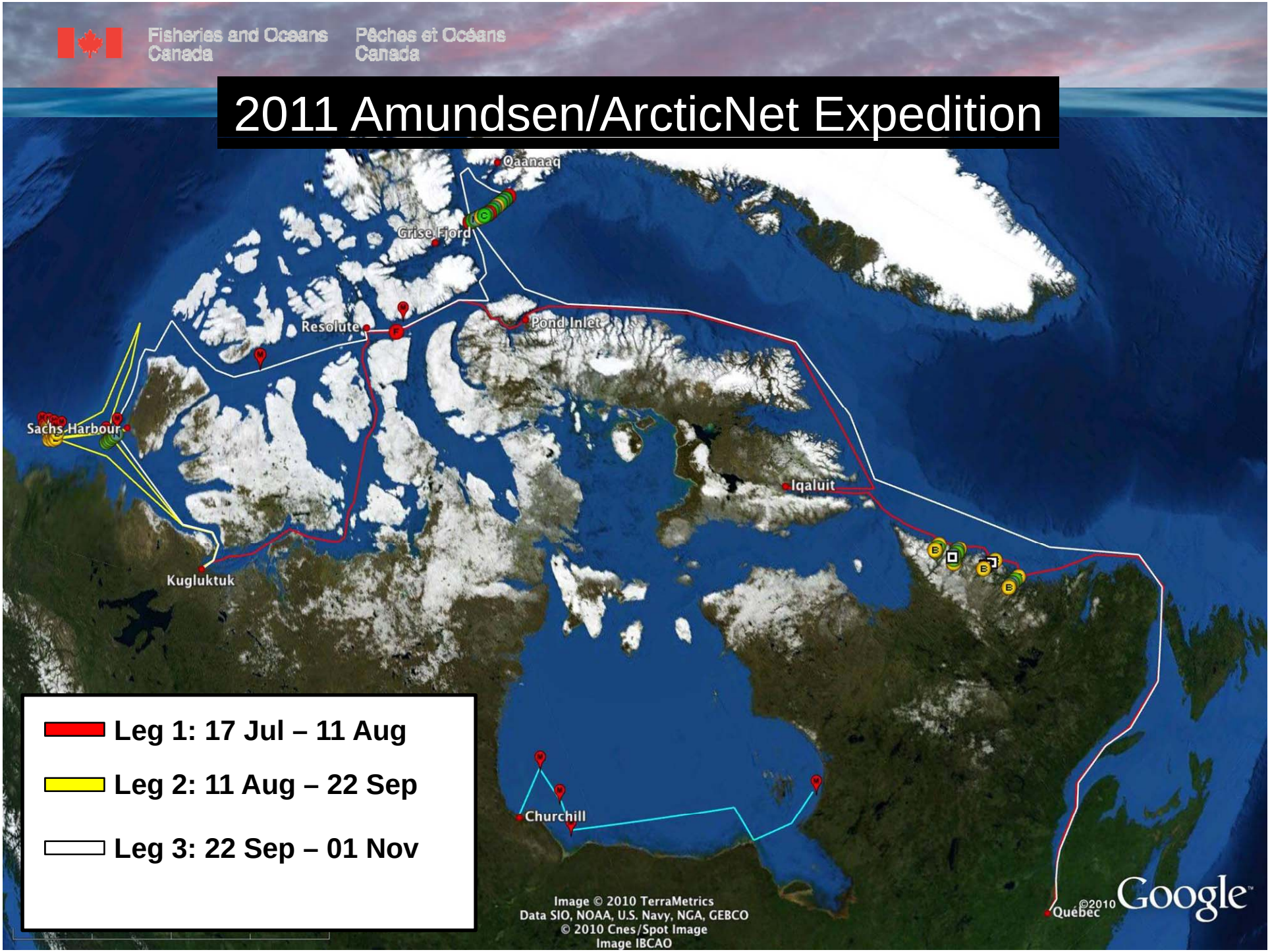
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2011 Amundsen/ArcticNet Expedition
Qaanaaq
Grise Fjord
Resolute
Pond Inlet
Sachs Harbour
Iqaluit
Kugluktuk
Churchill
Québec
Leg 1: 17 Jul – 11 Aug
Leg 2: 11 Aug – 22 Sep
Leg 3: 22 Sep – 01 Nov
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Hudson Bay Mooring Programs - IML

CCGS Pierre Radisson

• This program is an assessment of vulnerability to climate change and adaptation of Marine Infrastructures in Nunavik.

– Study of the Water Level in Nunavik 2008-2011

2010 Science activities

• Retrieved two moorings in the deep water in Hudson Strait and Regent Inlet (Lancaster Sound)

2011 Science activities (July 18 to 24)

• Deployment of two moorings in Hudson Strait
• Deployment of three hydrophones to monitor whale movements
• Recovery of CHS tide gauges moored two years ago

Hudson Bay Mooring Programs - BAYSYS

CCGS Pierre Radisson

Hudson Bay System Study (BaySys) – Sept 9 to19

- One of four Integrated Regional Impact Studies (IRIS) supported by ArcticNet
- The BaySys mooring and sampling program was initiated in 2005
- Main objective is to service 4 moorings in Southern Hudson Bay
- Basic sampling (CTD casts + plankton net tows) will also be carried out at mooring sites

Barrow Strait Throughflow

Barrow Strait

- Time series of freshwater transport (12 years)
- A reduced array of moorings was deployed to extend the time series through to the summer of 2011
- Progress was made in the development of a real time ocean data monitoring system

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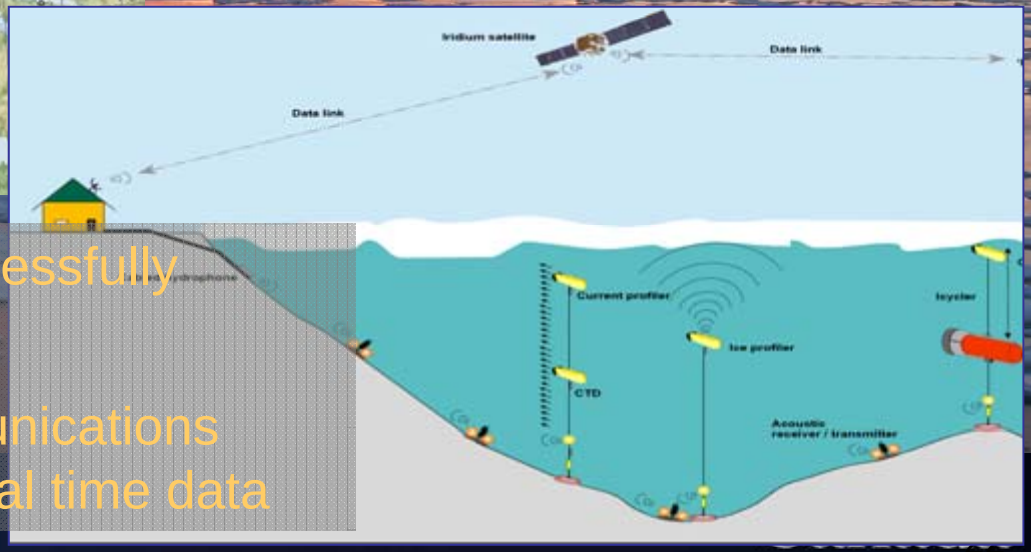
Real time ocean and ice data from Barrow Strait (Partnering with DRDC)

"Northern Watch" camp at Gascoyne Inlet



- In 2009, a 3 km cable was successfully routed through pipe
- In 2010, Iridium satellite communications system successfully relayed real time data

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Plans for 2011 Barrow Strait Work

CCGS Des Groseilliers

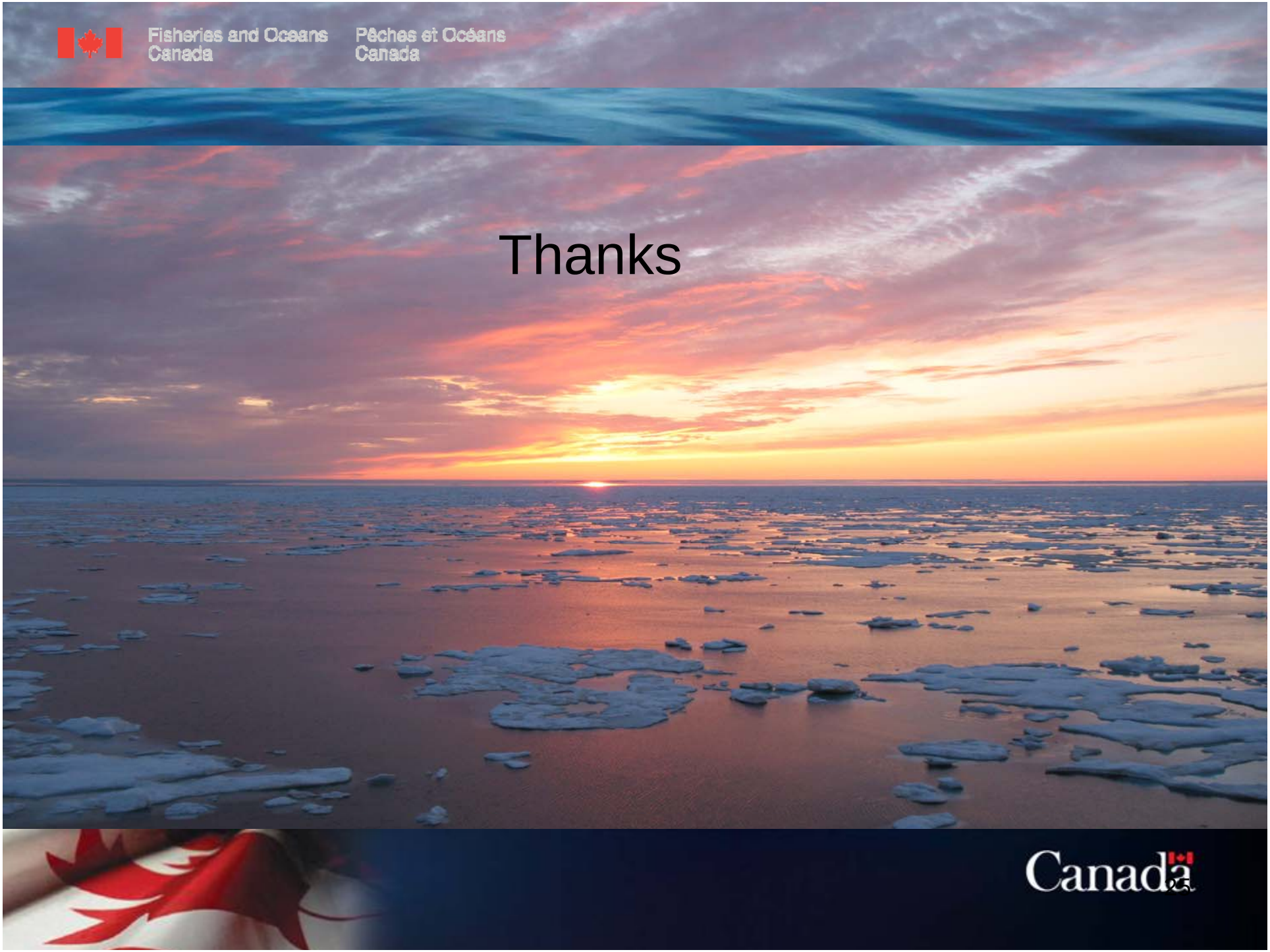
August 02 to August 11, 2011

- Recover 5 moorings at 091º W in Barrow Strait.
- Deploy 2 or 3 moorings at the Southerly site at 091° W.
- Along eastern Barrow Strait line at ~091º W….
  - Complete 17 CTD stations
  - Take water samples for biological and chemical analysis
  - Collect zooplankton samples
- Deploy a 5 km extension to the underwater cable at Gascoyne Inlet and an instrumented mooring near the offshore end of the cable.

Canada

Upcoming Activities

- Next PAG Meeting
  - Sidney, British Columbia, Canada,
  - November 15 -17, 2011
  - Institute of Ocean Sciences (IOS)
  - Handout available.
  - For information contact Gillian Lichota (PAG Secretariat) Gillian.Lichota@noaa.gov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Thanks
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