Seabed topography, geological structure and evolution of the sea-ice regime on the Beaufort Shelf at the western entrance to the Northwest Passage: CCGS Nahidik research

Steve Blasco, Robbie Bennett, Vlad Kostylev, Kevin MacKillop, Pat Campbell, Jim Shearer, and Kathy Conlan
CCGS Nahidik: 2005-2008
CCGS Amundsen: 2004-2008
Applied Seabed Geoenvironmental Research Related to Beaufort Sea Hydrocarbon Exploration
Fist Offshore Exploration Well in 16 Years

Devon Paktoa Oil Well 2006
Beaufort-Mackenzie Hydrocarbon Development
Protection of Renewable Resources by Conducting *Prevention* Research

My Kids Will Appreciate it!

Prevention of Well Blowouts, Pipeline Failures, Foundation Failures, Habitat Disturbance
Science Advice To:

• National Energy Board (regulations)
• Inuvialuit (environmental protection)
• Oil Industry (engineering design)
• GNWT/Federal Government Agencies (regulations)
Research Issues

- ice scour
- foundation conditions
- subsea permafrost
- shallow gas
- benthic ecosystem mapping
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Seabed Scouring by Sea-Ice Pressure Ridge Keels
Extreme Scour Depths Vs. Pipeline Burial Depths
ICE KEEL
CRÊTE DE
PRESION SOUS
LA GLACE

80 cm

SCOUR BERM
CRÊTE

SEAFLOOR
FOND MARIN
Relict Ice Scour Regimes?

- 400m water depth
- Widespread scouring in the area
- Scouring to 410m water depth
- Scours up to 3.6m deep

Poster

Canada
Research Issues

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Marine Clays
Foundation Conditions
Change in Slope at Edge of Continental Shelf

CONTINENTAL SHELF
(0.03° - 0.06°)

CONTINENTAL SLOPE

VE = 50:1

1.4°
Slump Feature

10 x 14 km block surveyed during 2004 and 2006, still not complete
Up to 70 m high scarps
May be present across the slope
Active or Ancient
Research Issues

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View Looking South from the Canada Basin Today

Amundsen Gulf

Beaufort Sea

Canada Basin

Inuvik
18,000 Years BP
Late Glacial Maximum

Amundsen Gulf Ice Tongue

Mackenzie Ice Tongue

Inuvik

Future Beaufort Sea

Exposed Beaufort Shelf

View Looking South from the Canada Basin
Beaufort Sea 18,000 Years Ago
Subsea Ice-Bearing Permafrost

Ice Veins

ARK 84  HB1  31.09–31.49 m
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Beaufort Shelf

Mackenzie Trough

2006 Drill Site

Contours in metres

100 km

Natural Resources Canada

Ressources naturelles Canada

Canada
Garry Knolls Mud Volcanoes
• ice scour
• foundation conditions
• subsea permafrost
• shallow gas
• benthic ecosystem mapping
Ecologically and Biologically Significant Areas
Living with disturbance: mud volcanoes and gas vents
Possible whale maw marks at Kaglulik Mud Volcano Site
Side Scan Sonar Profile, Water Depth 52 m
Bottom Feeding?
Whale Maw Marks

Underwater photograph of a whale maw mark made by a Gray Whale

Average about 10 cm deep
Thank You