

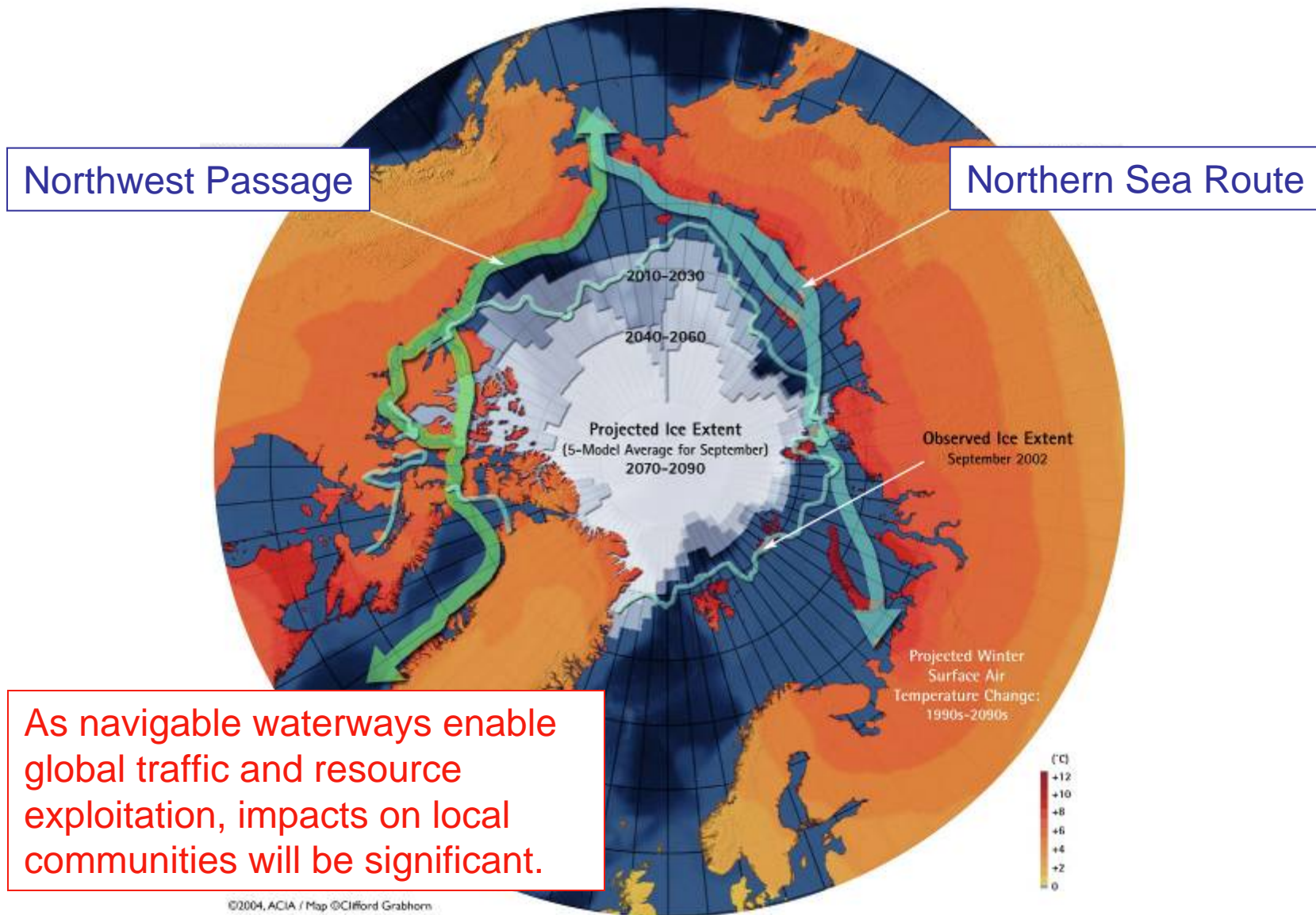
# Case Study 4: Multinational Field Projects

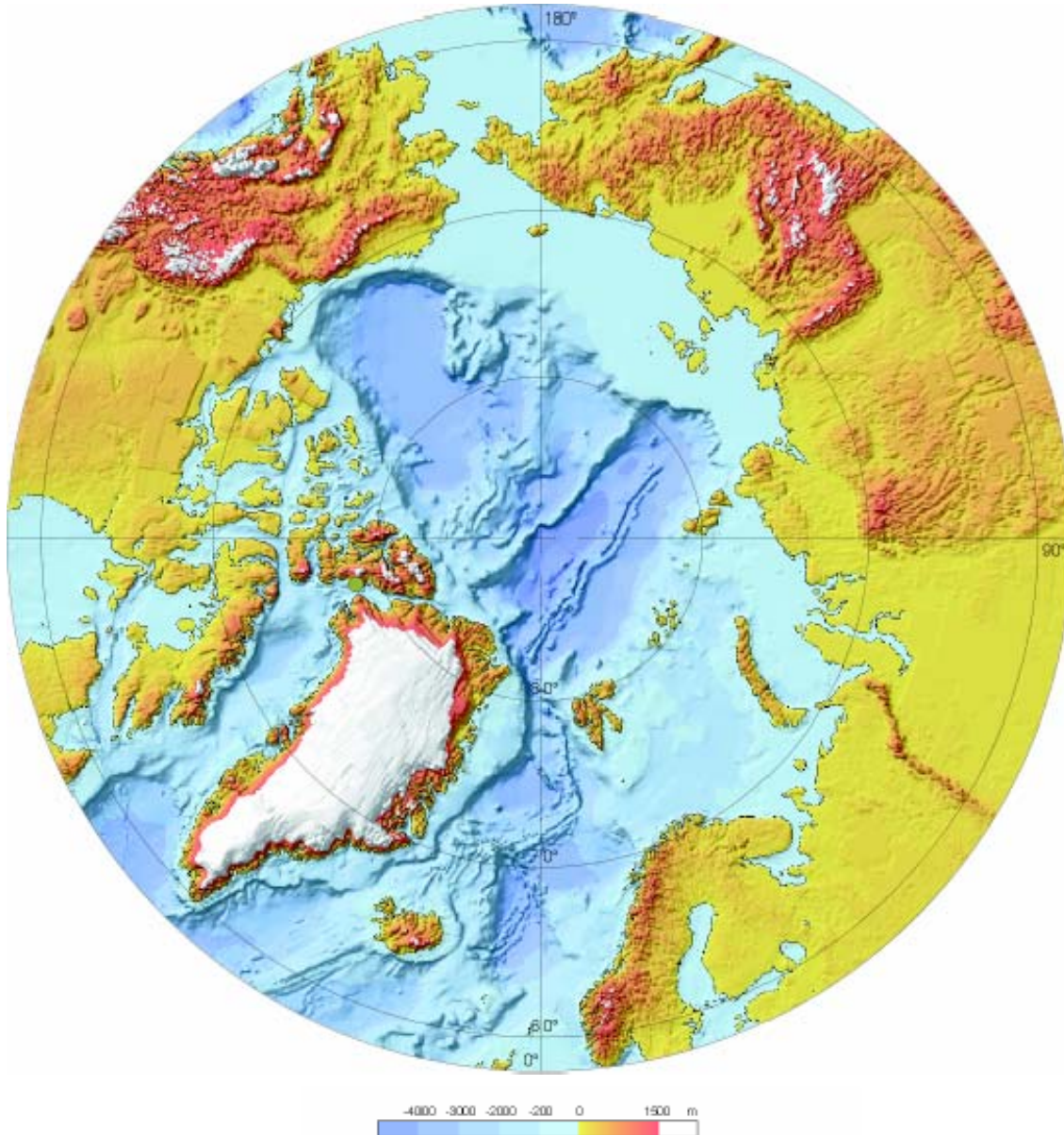
H. Kassens, S. Priamikov, V. Rachold, J. Thiede, L. Timokhov



North Pole, 1991

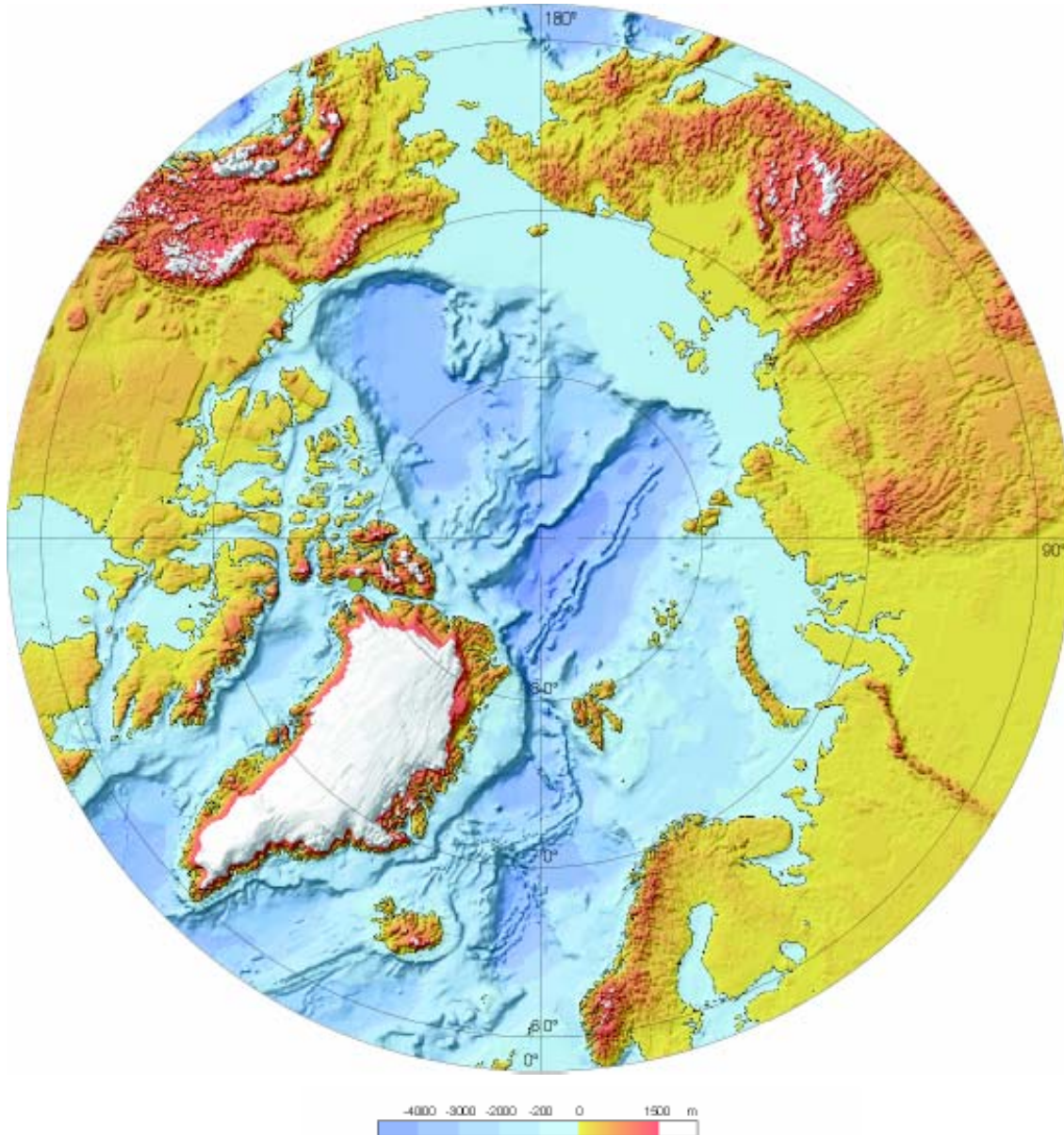
# A retracting ice cover is felt first and most strongly around the circum-arctic shelves





## Arctic Shelf Seas:

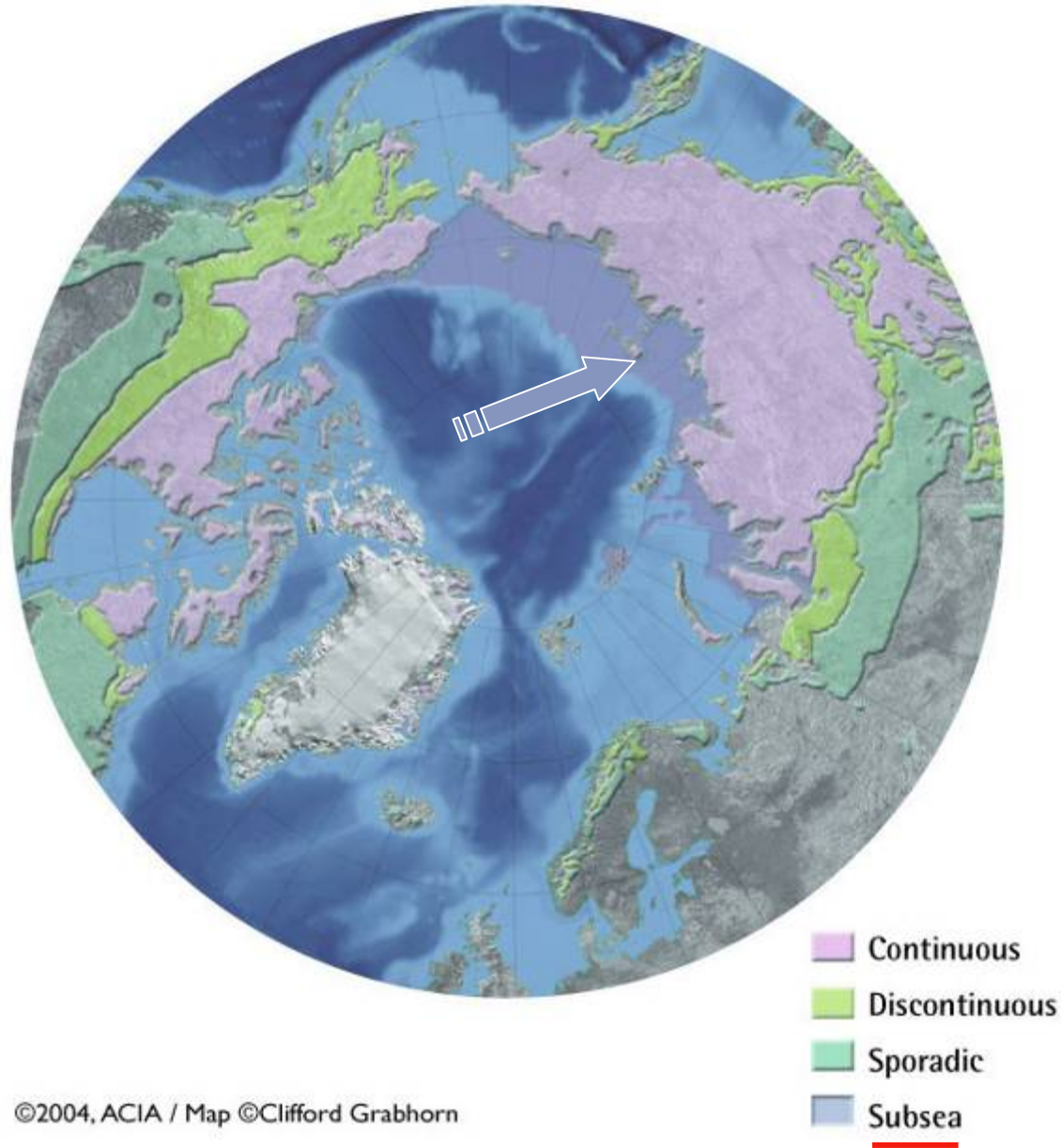
- Cover half the Arctic Ocean (and represent 25% of global ocean shelves)
- Collect freshwater from Siberian and Canadian rivers leading to a freshwater lid over the entire Arctic Ocean
- Have prime roles in sea-ice and brine formation and material transport



## Arctic Shelf Seas:

- Are the most biologically productive areas in the Arctic
- Are critically important to indigenous communities, given higher trophic levels and contaminant pathways
- Offer important waterways via the circum-Arctic flaw-lead polynya system

# Arctic Shelf Seas host subsea permafrost regions - virtually unexplored territory -



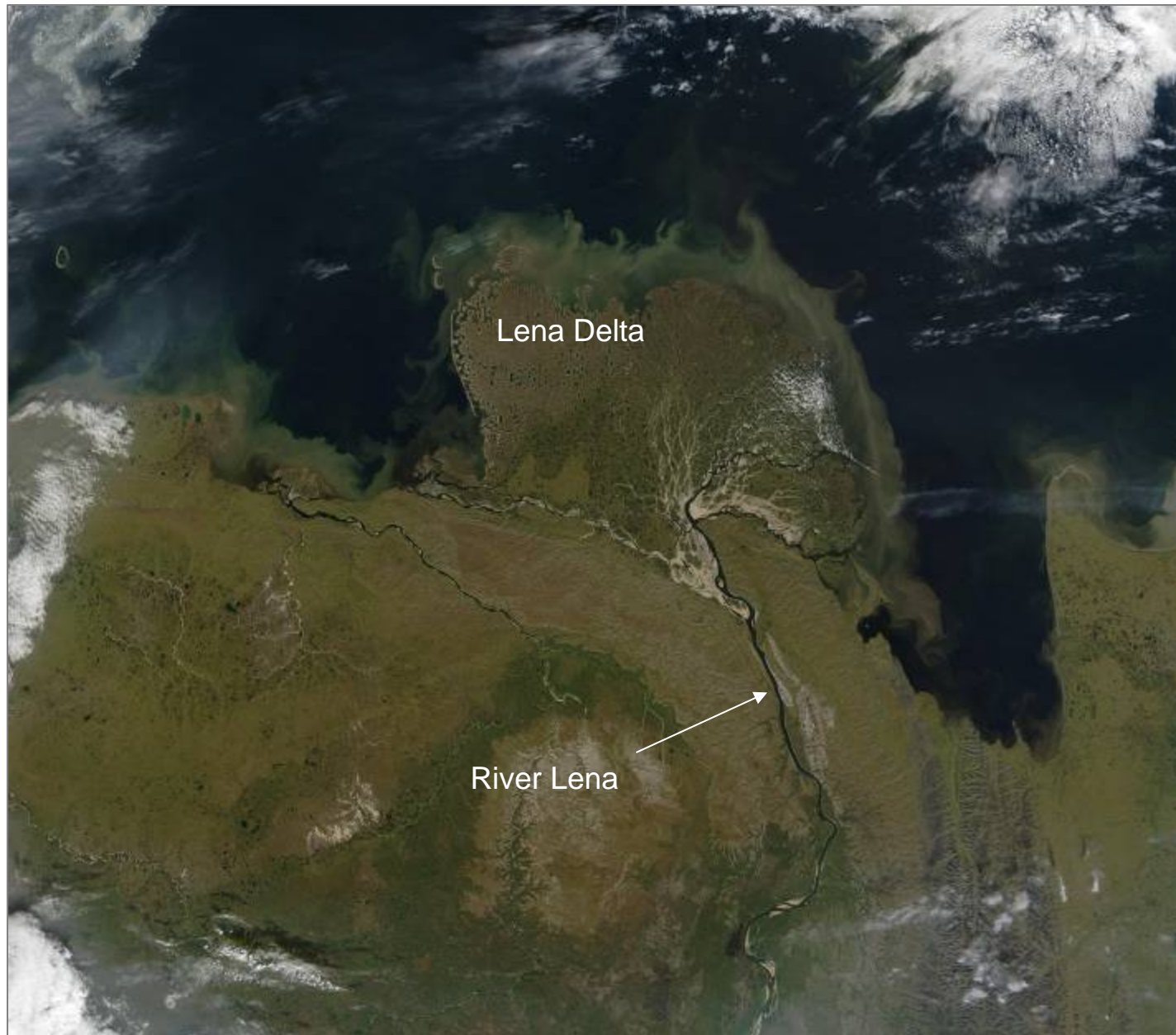
# Thawing Permafrost in the Siberian Arctic



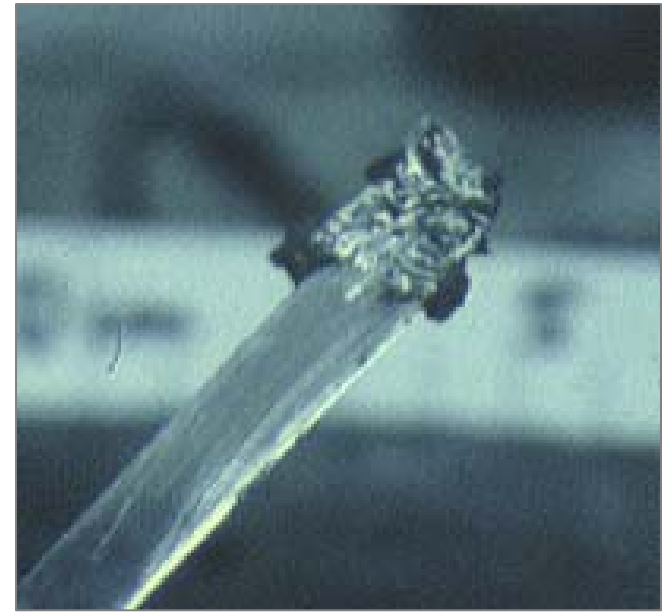
Ice complex, Lena Delta (A. Sher)

Arctic coastlines are highly variable and are the site of greatest socio-economic activity. Within the Arctic soils and sediments large pools of methane hydrates and methane gas pockets are present. The fate of these methane pools, with their potential to significantly add to the greenhouse gases in the atmosphere, is unknown but could be significant for climate change.

# Subsea Permafrost in the Laptev Sea



## Subsea Permafrost in the Laptev Sea

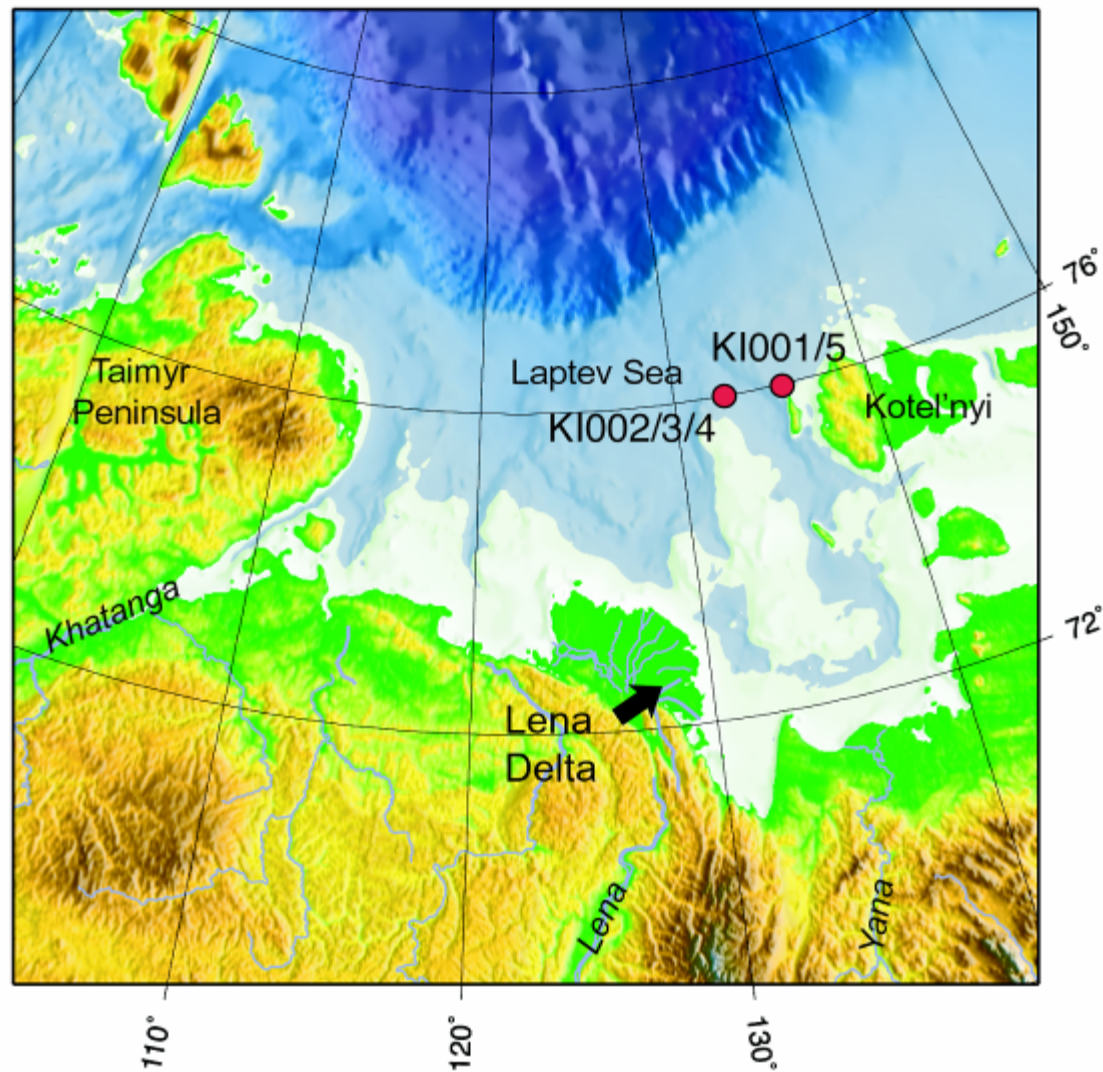


Frozen sediments off the Lena Delta  
(IK9321-8; 12 m water depth)



# Subsea Permafrost in the Laptev Sea

8.000 ka BP, sea level -20 m

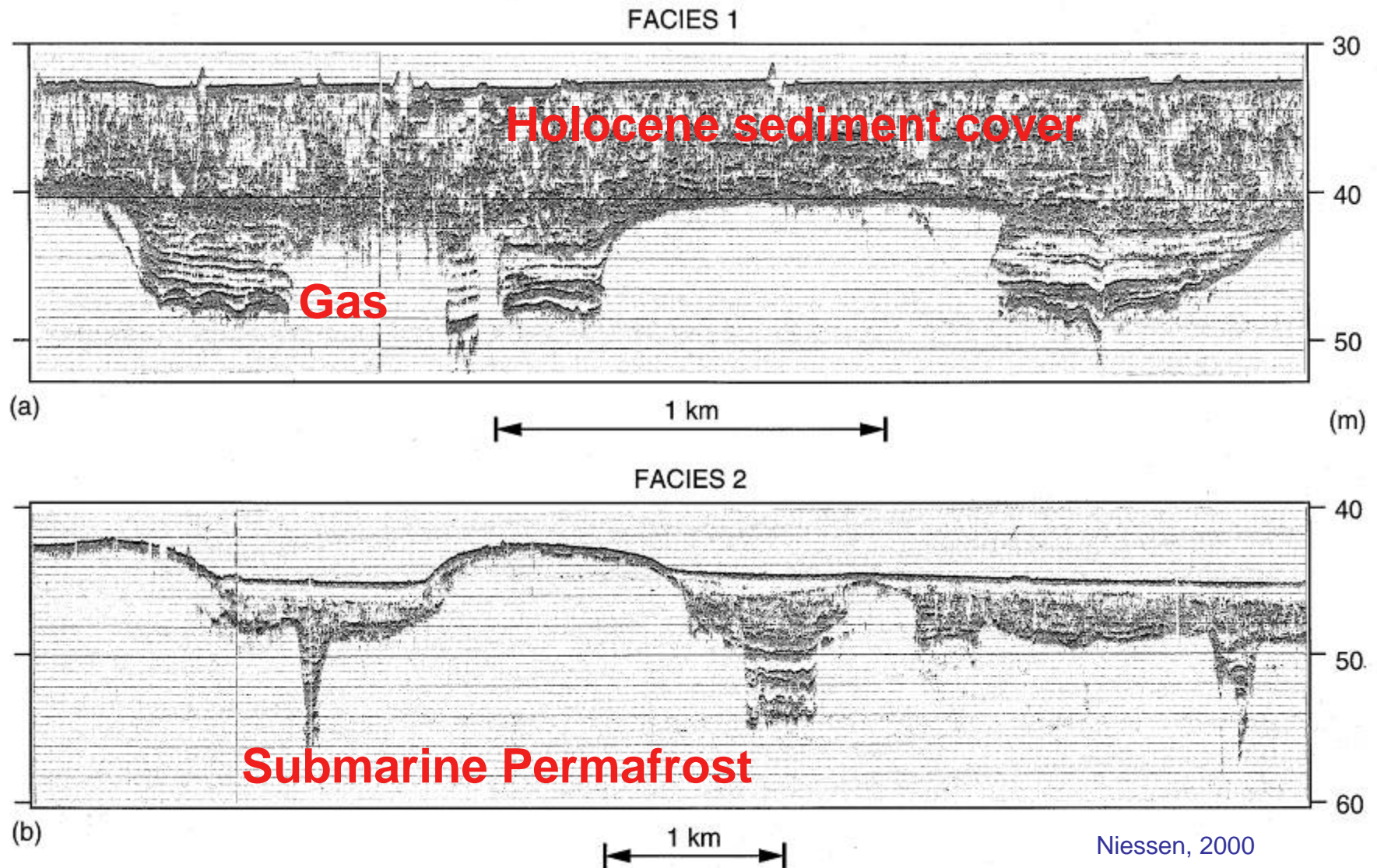


# Subsea Permafrost in the Laptev Sea



Massiv ice layers with sediment inclusions in the eastern Laptev Sea  
(KI005-2-4; 15 m below sea floor; 42 m water depth)

# Subsea Permafrost Below the Unfrozen Holocene



Niessen, 2000

# Laptev-Sea System: Process Studies on Permafrost Dynamics

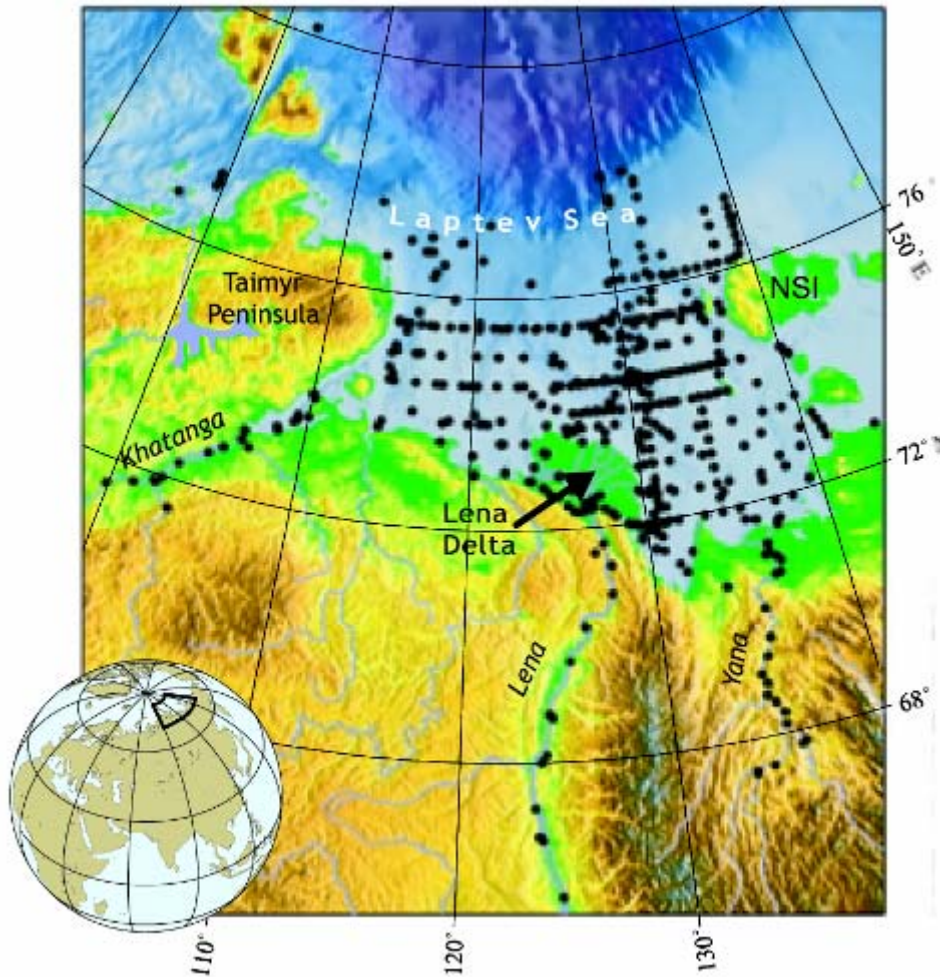


## Research Objectives

- Microbial-driven processes in permafrost
- Temperature-fields in permafrost
- Geochemical alteration of permafrost
- Stages of permafrost development
- High-resolution seismic characterisation of subsea permafrost
- Stability of subsea permafrost
- History of subsea permafrost



# Laptev-Sea System: Process Studies on Permafrost Dynamics



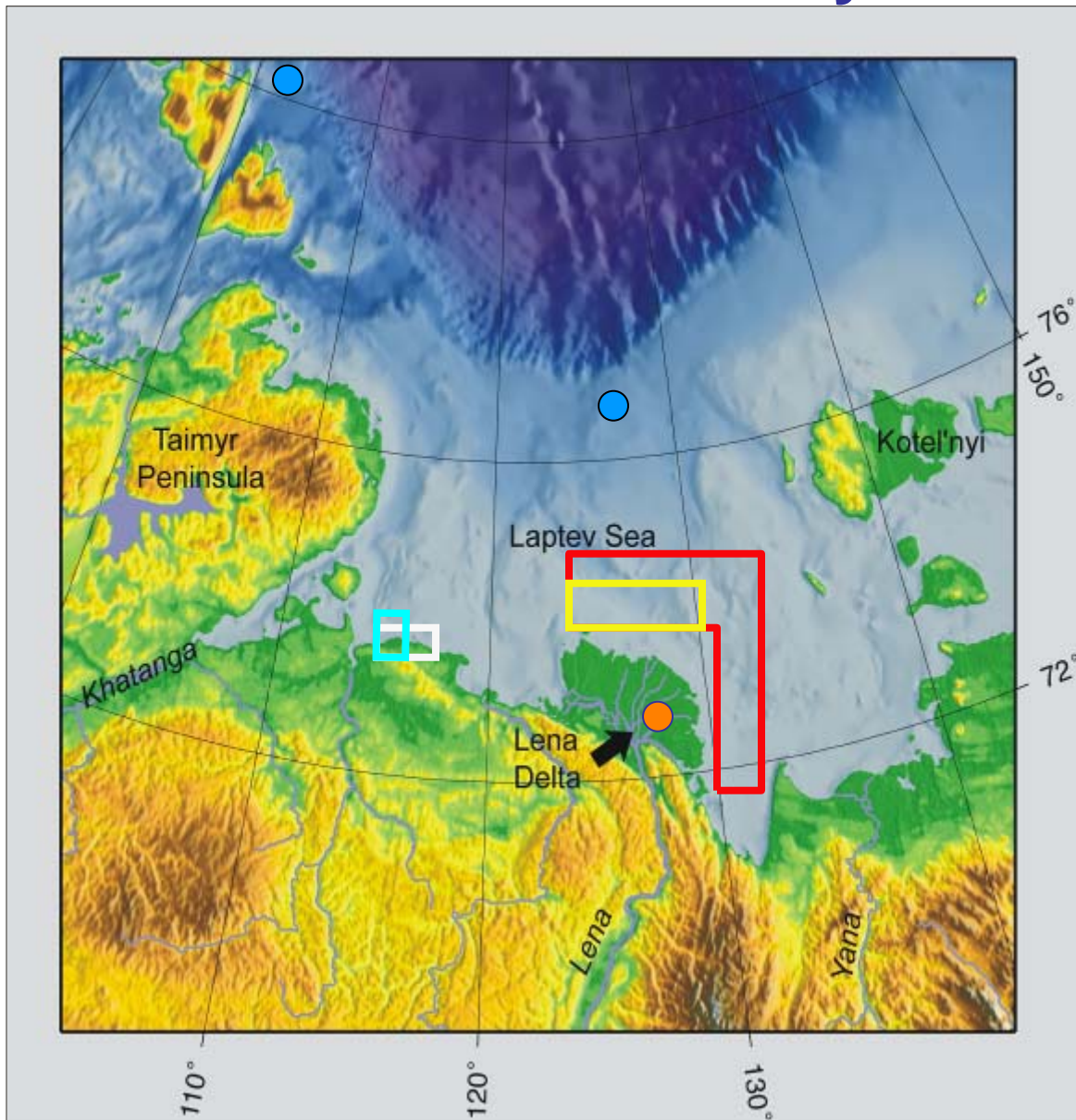
## Project partner

- Alfred-Wegener-Institut für Polar- und Meeresforschung
- IFM-GEOMAR
- Lena Delta Reserve, Tiksi
- Otto-Schmidt-Labor für Polar- und Meeresforschung
- Permafrost Institute, Yakutsk
- State Research Center for Arctic and Antarctic Research, Saint Petersburg
- State Research Center for Geology of the Ocean, Saint Petersburg
- Universities of Bremen, Hamburg and Moscow

## Funding

- BMBF, AWI, IFM-GEOMAR, University of Bremen, Russian Ministry for Education and Science
- ca. 2 Mill. Euro / Year
- 1.7.2003 bis 30.9.2006

# Laptev-Sea System: Process Studies on Permafrost Dynamics



2003

- LENA-ANABAR  
(Cape Mamontovy Klyk)
- TRANSDRIFT IX  
(Laptev Sea)

2004

- LENA 2004  
(Samoylov)
- TRANSDRIFT X  
(Laptev Sea)

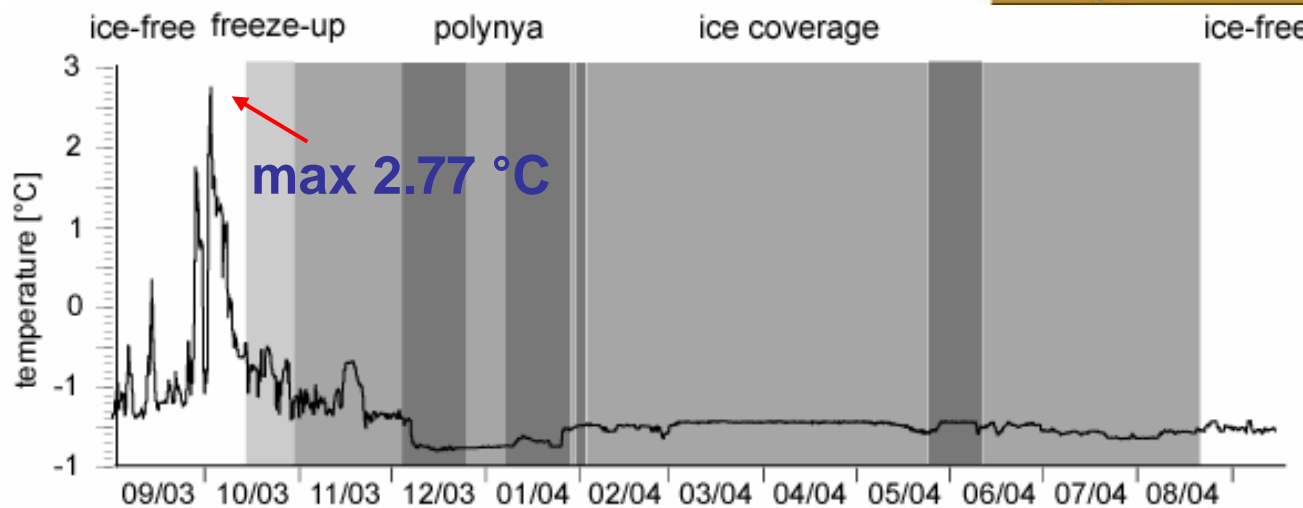
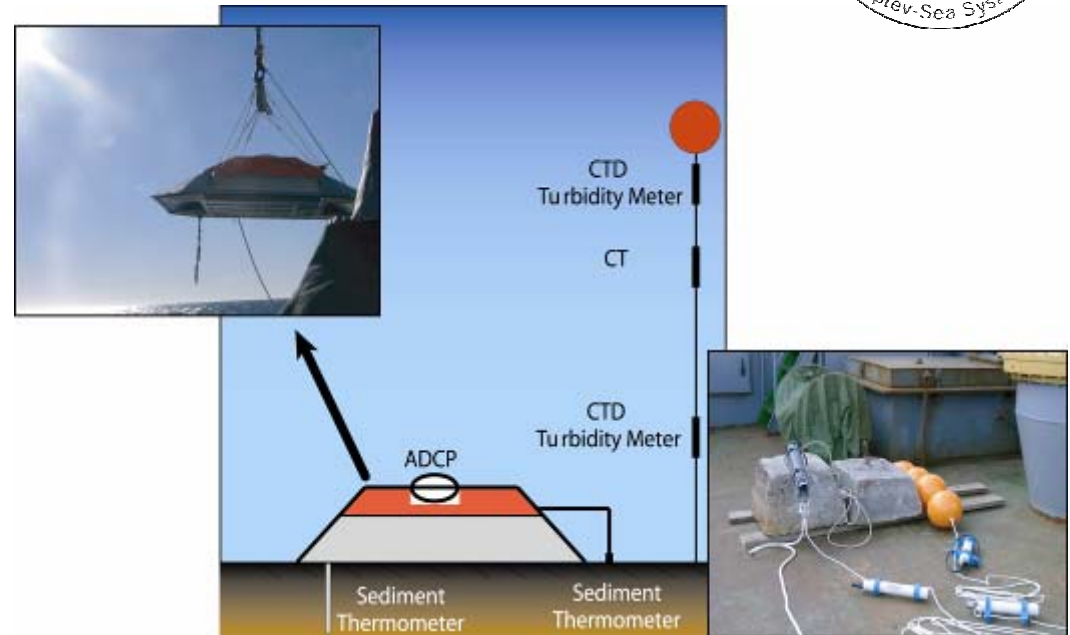
2005

- COAST I  
(Cape Mamontovy Klyk)
- LENA 2005  
(Samoylov)
- NABOS  
(northern Laptev Sea)
- TRANSDRIFT XI

# Laptev-Sea System: Process Studies on Permafrost Dynamics



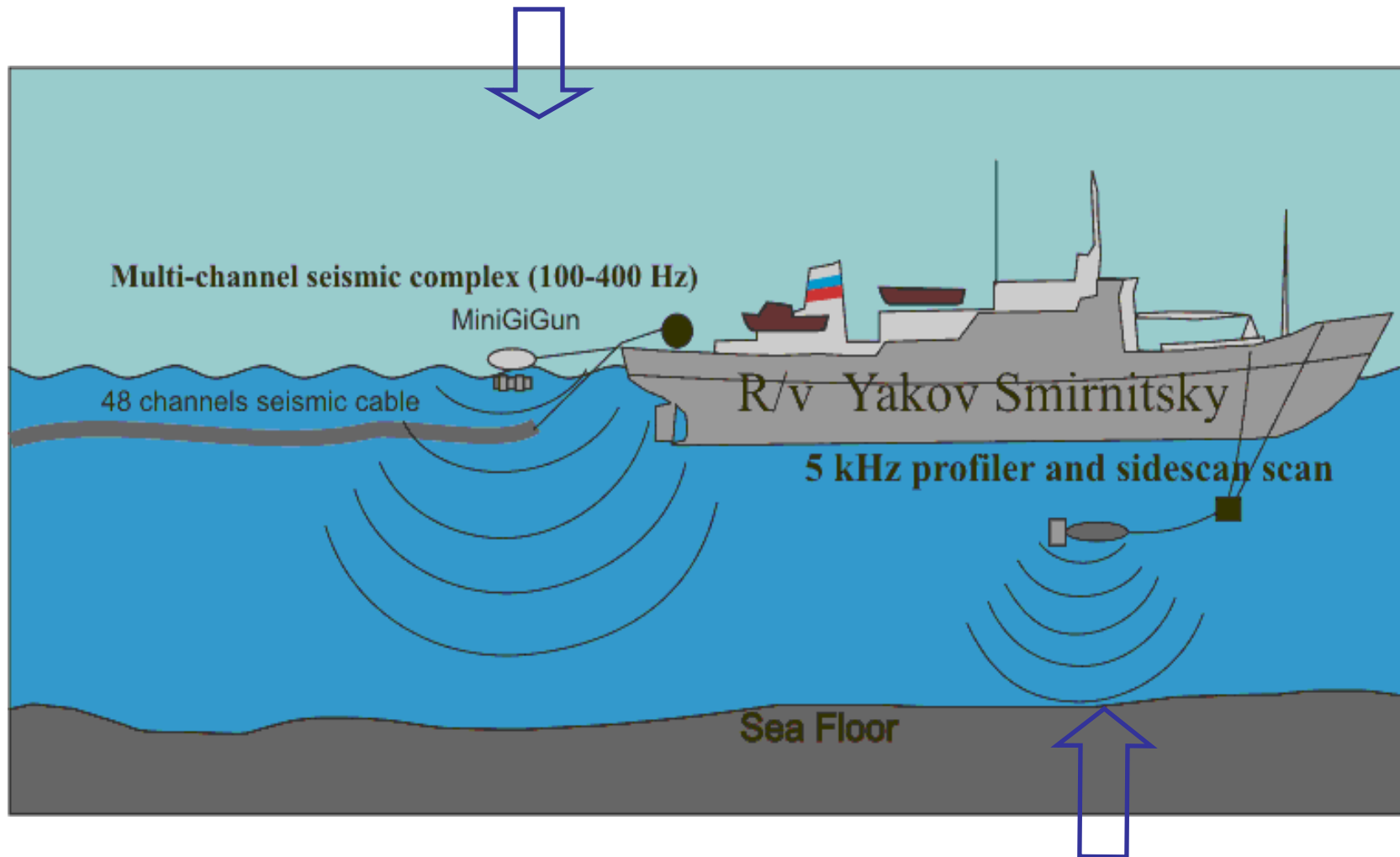
Seafloor observatories  
2003/04



# Laptev-Sea System: Process Studies on Permafrost Dynamics



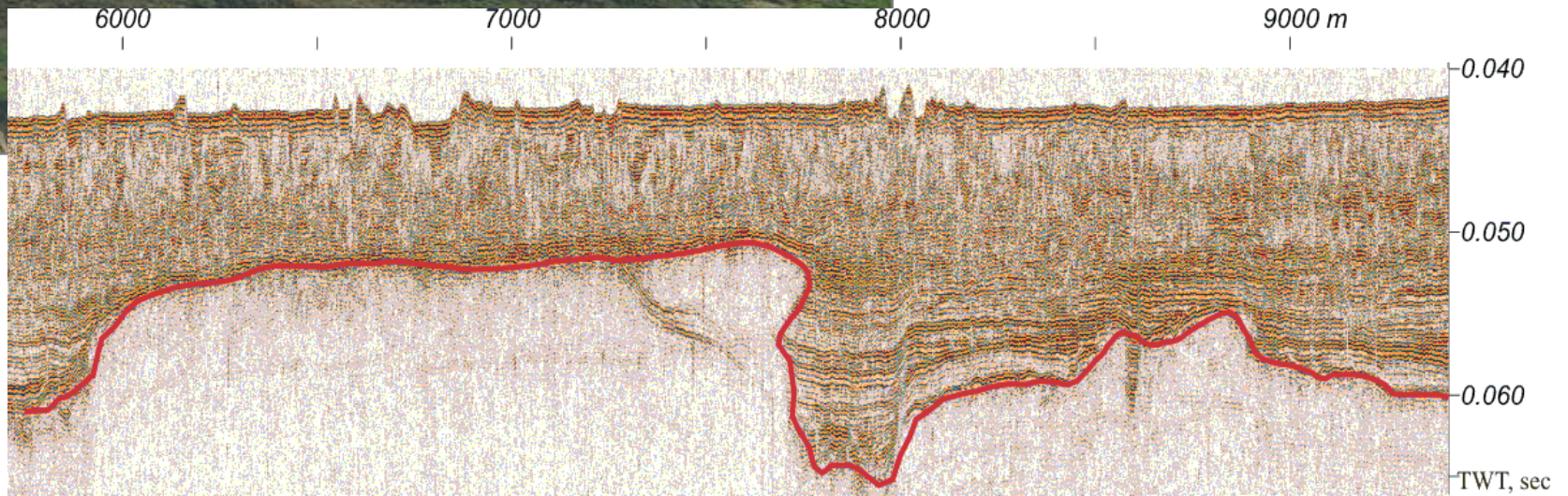
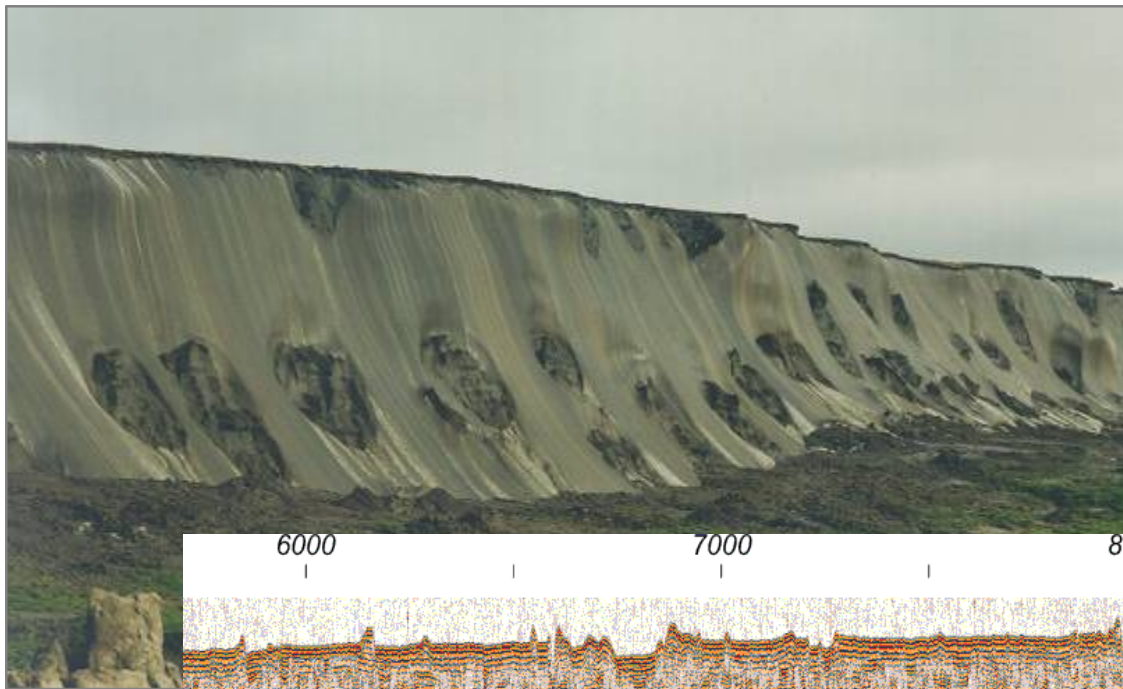
Multi-channel low frequency (100-400 Hz) seismic acoustic profiling



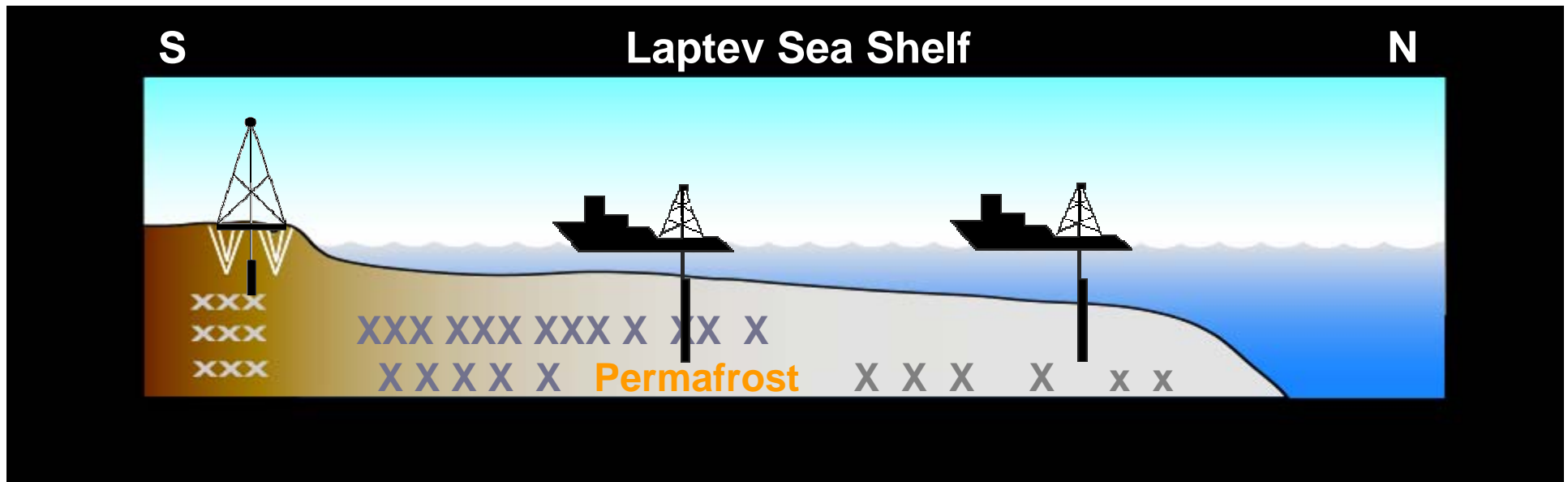
Single channel high frequency (5 kHz) High Resolution profiling



# Laptev-Sea System: Process Studies on Permafrost Dynamics



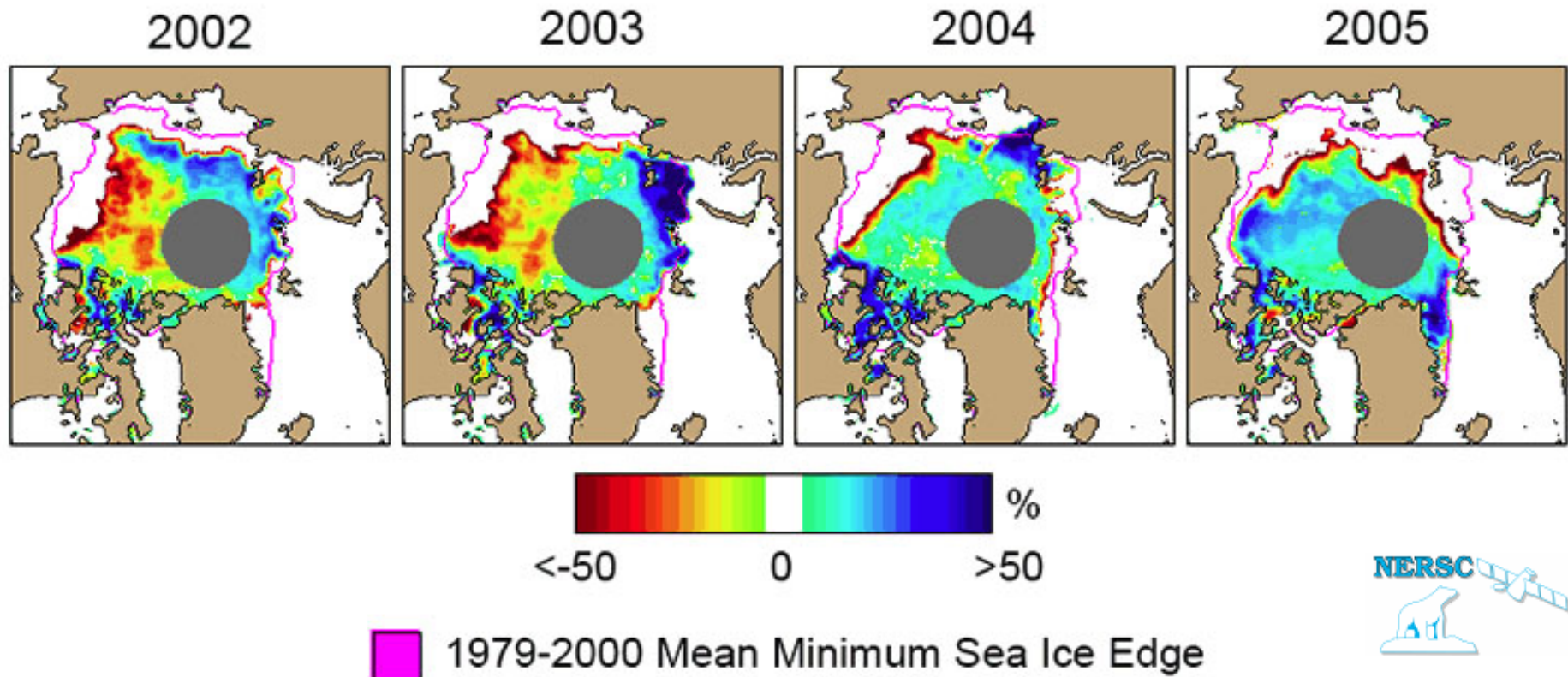
# Process Studies on Permafrost Dynamics: Drilling Permafrost



# Process Studies on Permafrost Dynamics: Drilling Permafrost



# Cooperation in Pan-arctic Field Research - Perspectives -



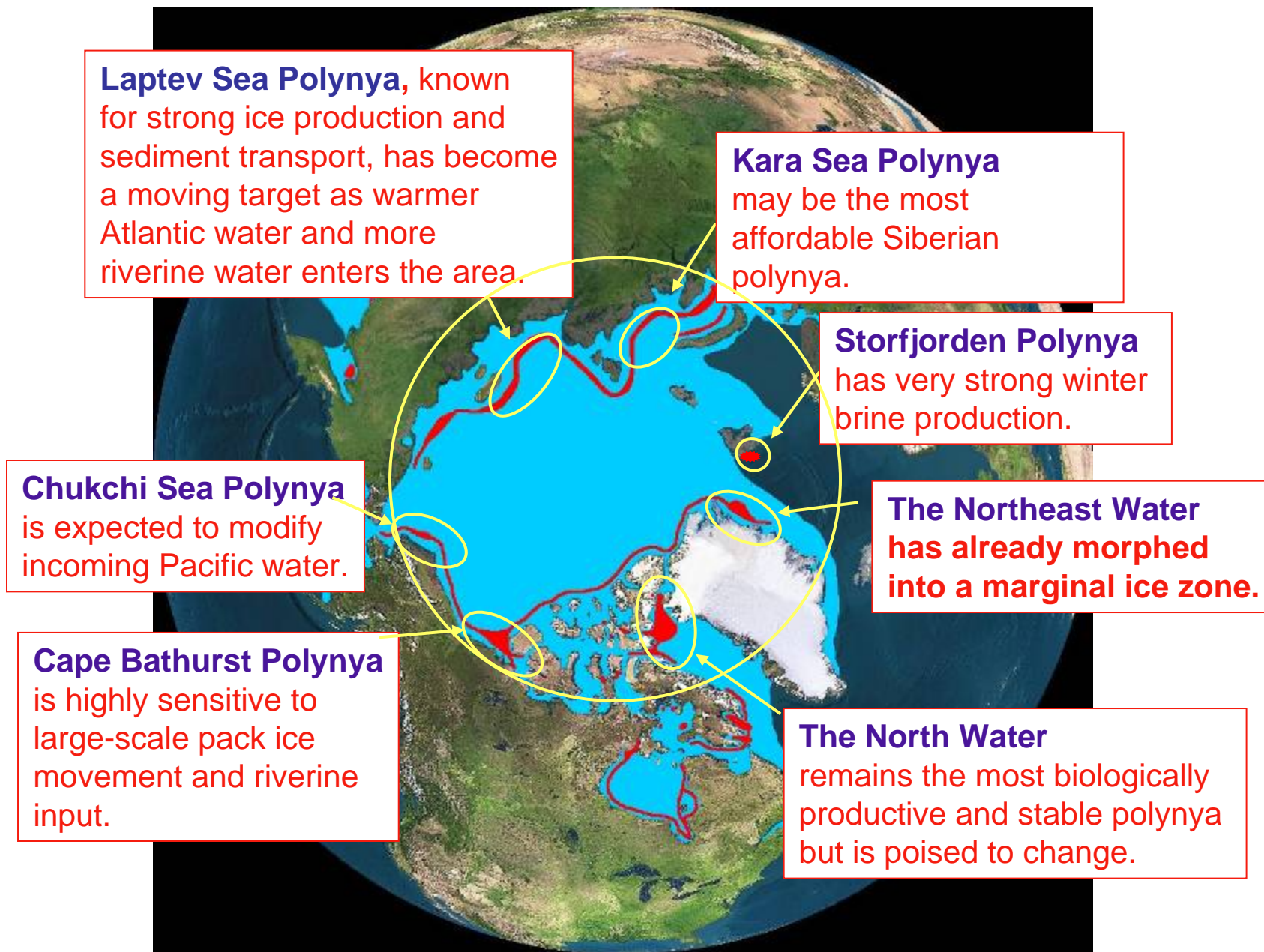
# ICARP II: Arctic Shelf Seas (WG 6)

## - Six Big Issues -



- Changes in shelf-ocean dynamics and brine production
- Changes in cross-shelf transport
- Changes in ecosystems and impacts on marine resources and local communities
- Phenology of key ecosystems events
- Evaluations of the paleorecord in developing future scenarios
- Responses of Arctic polynyas to climate change (integrators of all of the above)

# Response of polynyas to climate change



# Highlights in 2006

- **IMPETUS 2006**

**Saint Petersburg  
June 25 - 29**

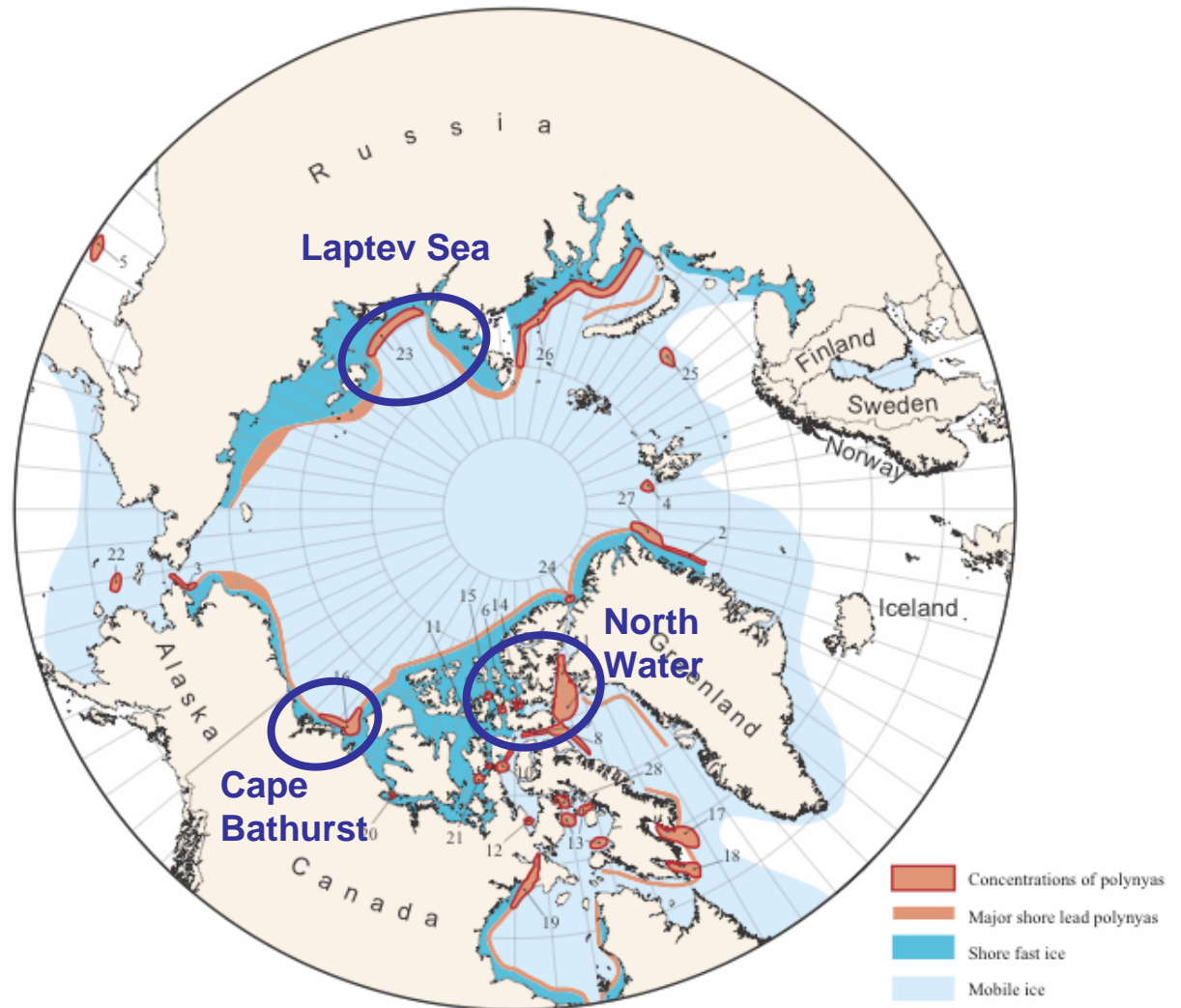
A major science-coordination meeting for international polynya researchers, with funding through the German Ministry for Education and Science; expecting > 40 attendees for intensive scientific exchange and planning (ICARP II, IPY, IAPP, Laptev-Sea-System, CFL, Pan-AME-IPY)



# Highlights in 2006

- **Summer-Fall 2006 fieldwork in the North Water and Cape Bathurst Polynya (ArcticNet programs) and Laptev Sea Polynya (NABOS'06)**

Continuation of parallel multi-disciplinary research in three major Arctic polynyas, helping to meet the goals of the International Arctic Polynya Program (IAPP)





# Highlights in 2006

- **International Polar Year:**

**Opening of the IPY Eurasian Arctic Sub-office (EAS) at the State Research Center for Arctic and Antarctic Research in Saint Petersburg (in co-operation with the Otto-Schmidt-Laboratory and the Fram-Arctic Laboratory)**

[www.ipyeaso.aari.nw.ru](http://www.ipyeaso.aari.nw.ru)

In co-operation with IPY IPO the sub-office will promote and support IPY-projects in the Eurasian Arctic.

Sponsored by: AARI, NPI, AWI, NSF/OPP



# Highlights for the future

- **Funding decision on the Eurasian Shelf Seas in the Arctic's Changing Environment: Frontal Zones & Polynya Systems in the Laptev Sea, a German-Russian proposal (2006 - 2009).**

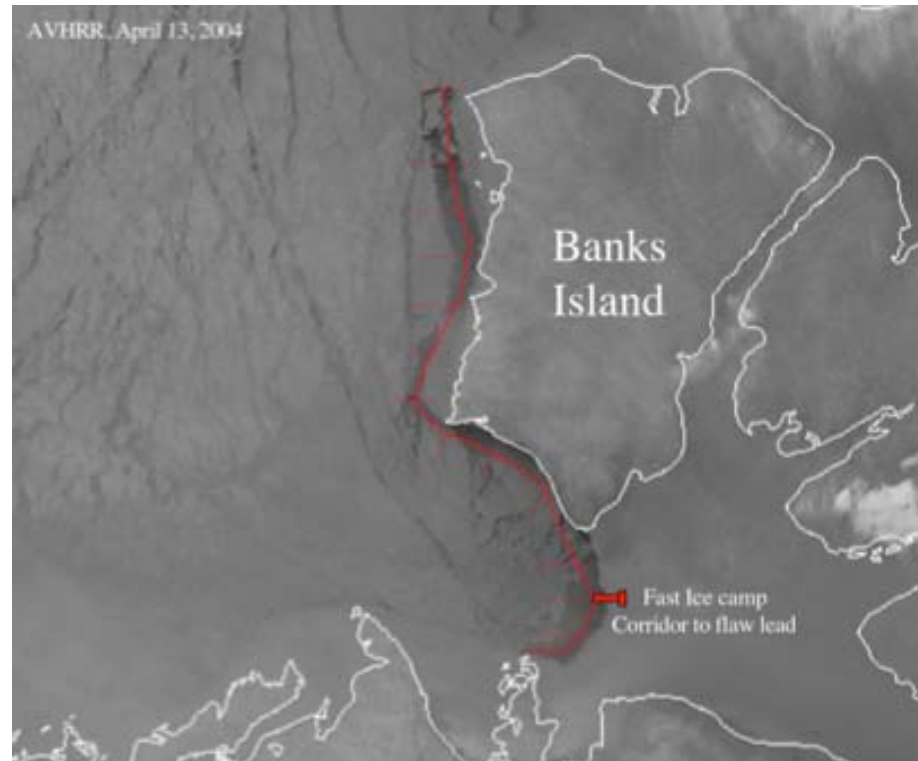
Year-round, integrated system studies of sea ice cover, water column and sea floor across and along frontal zones and the Laptev Sea flaw-polynya system during two seasonal cycles.



# Highlights for the future

- **Funding decision on the Circumpolar Flaw Lead (CFL) system, a Canadian IPY proposal for overwintering in the Cape Bathurst flaw-lead-polynya system (2006 - 2009)**

An exciting and ambitious overwintering expedition (November 2007 - July 2008), whereby the ship, the CCG Amundsen, would remain mobile throughout the year for multidisciplinary sampling and experimentation



# Russian-German Co-operation in Science and Education

- Otto-Schmidt-Laboratory for Polar and Marine Research in Saint Petersburg



- POMOR: Masterprogram for Applied Polar and Marine Sciences at the State University of Saint Petersburg



# Otto Schmidt Laboratory for Polar and Marine Research



## Goals

- to promote the progress of research and closer cooperation with scientists from Russia
- to initiate and coordinate international research projects
- to establish and develop a laboratory for polar and marine sciences (incl. a strict quality management)
- to support highly qualified Russian scientists in polar and marine science

# Otto Schmidt Laboratory for Polar and Marine Research



**German-Russian Cooperation in  
Polar and Marine Sciences**

**BMBF and MON**

**Otto Schmidt Laboratory**



**Bilateral Advisory Board**

**Project Management Offices**

**AWI IFM-GEOMAR AARI  
Bremerhaven Kiel St. Petersburg**

**Bilateral Research Programs,  
Opportunities, and Facilities**

- Fellowship Program
- Visiting Scientists
- Summer School
- Laboratories
- Library
- Data Bank

- 160 scientists from 16 research institutions and universities in Kazan, Moscow, Saint Petersburg, Tiksi, and Yakutsk participated in the OSL fellowship program since 2000.
- Fields of research: meteorology, oceanography, marine chemistry, biology, and geosciences.
- 255 scientific articles have been published and 423 talks and posters have been presented at scientific conferences.
- 58 fellows participated in the visiting scientists program

## Funding

- Russian and German Ministries for Education and Science, AARI, AWI, IFM-GEOMAR
- 1.3.2005 bis 29.2.2008 (3. period)
- 430 TEuro per annum

# Master Program for Applied Polar and Marine Sciences



POMOR at the State University of Saint Petersburg is:

- offering students interdisciplinary studies in applied polar and marine sciences
- a new master program for highly qualified students of meteorology, oceanography, biology, marine chemistry, geography, geology and geophysics
- carried out by the universities of Bremen and St. Petersburg, the Alfred Wegener Institute for Polar and Marine Research, the IFM-GEOMAR and the Association of North German Universities.
- funded by DAAD, BMBF, AWI, IFM-GEOMAR, and the Universities of St. Petersburg, Bremen, Hamburg and Kiel.



# Master Program for Applied Polar and Marine Sciences



## 6 Modules

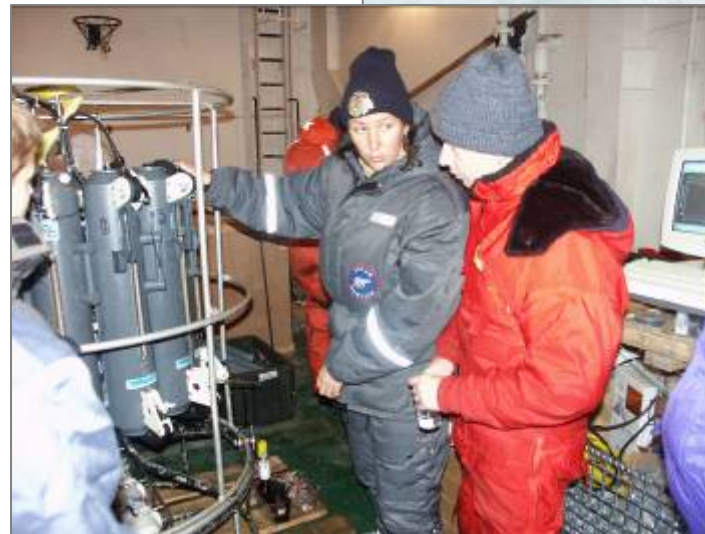


- Ocean basins, morphology and sediments
- High seas and coastal water oceanography
- Ecosystems: structure and functioning
- Non-living resources
- Coastal systems: processes and management
- Polar systems

## Common block

- German
- English
- Presentation and data management

## Master thesis and examinations





# Arctic Research: a Global Necessity



The Arctic provides  
a Preview of Earth's  
Future Climate

10 Years of Change in  
Arctic is a Preview for  
the next 25 Years in the  
Rest of the world.

