

# Coming challenges of the Arctic Region



**Mead Treadwell, Chair**  
**U.S. Arctic Research Commission**  
**Senior Fellow, Institute of the North**  
**Naples Council on World Affairs**  
**Naples, Florida - January 11, 2010**







# US ARCTIC RESEARCH COMMISSION



Mead Treadwell, Chair



Michele Longo Eder



Helvi Sandvik



Virgil (Buck) Sharpton



Vera Kingeekuk Metcalf



Warren Zapol



Charles Vörösmarty

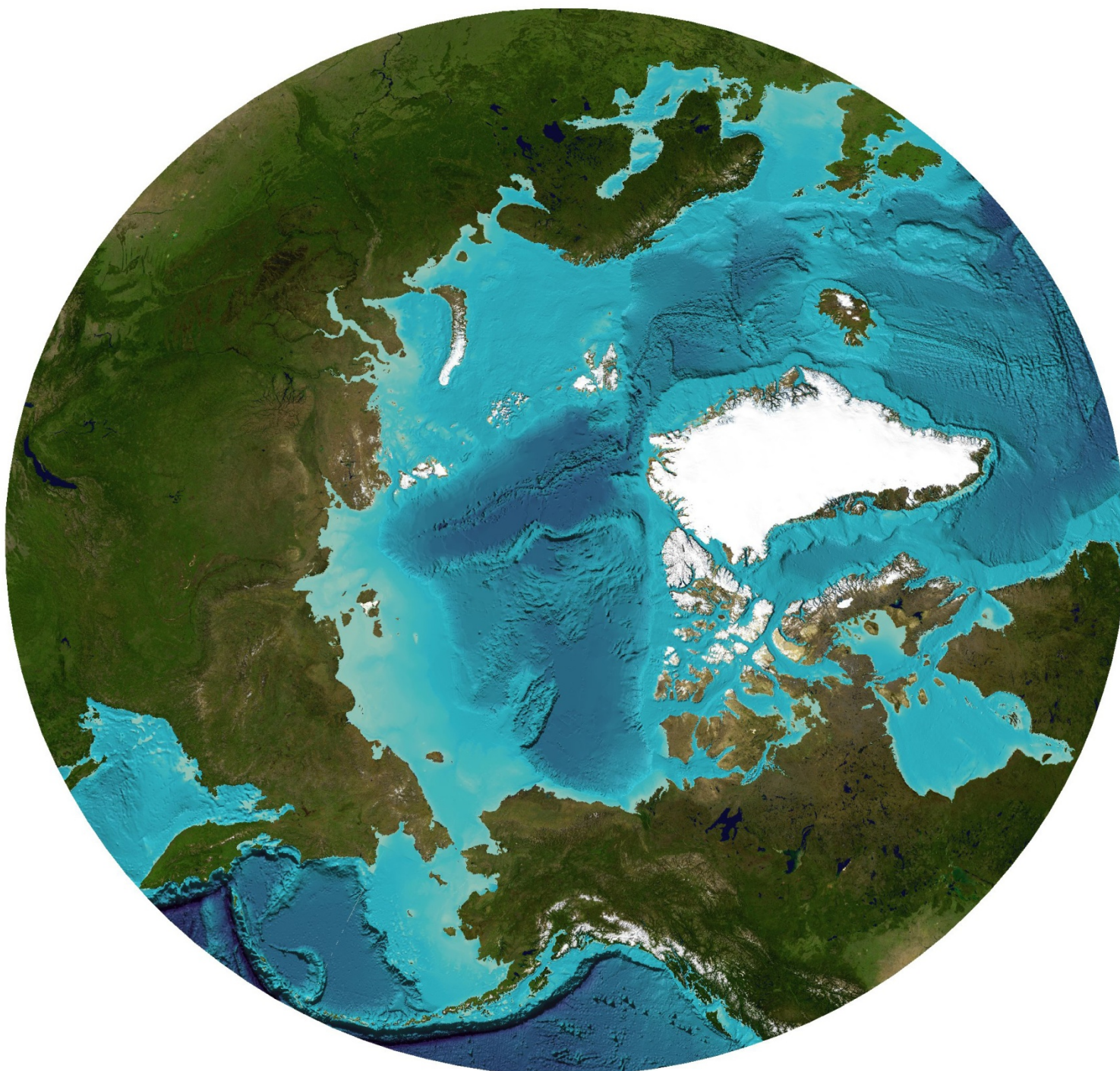


# Check from U.S. to Purchase Alaska from Russia



**August 1, 1868**



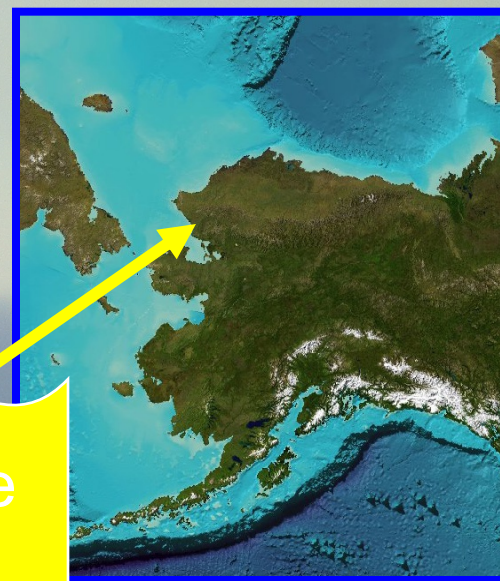






**USARC/USCG Arctic Domain  
Awareness Flight, September 15, 2009**

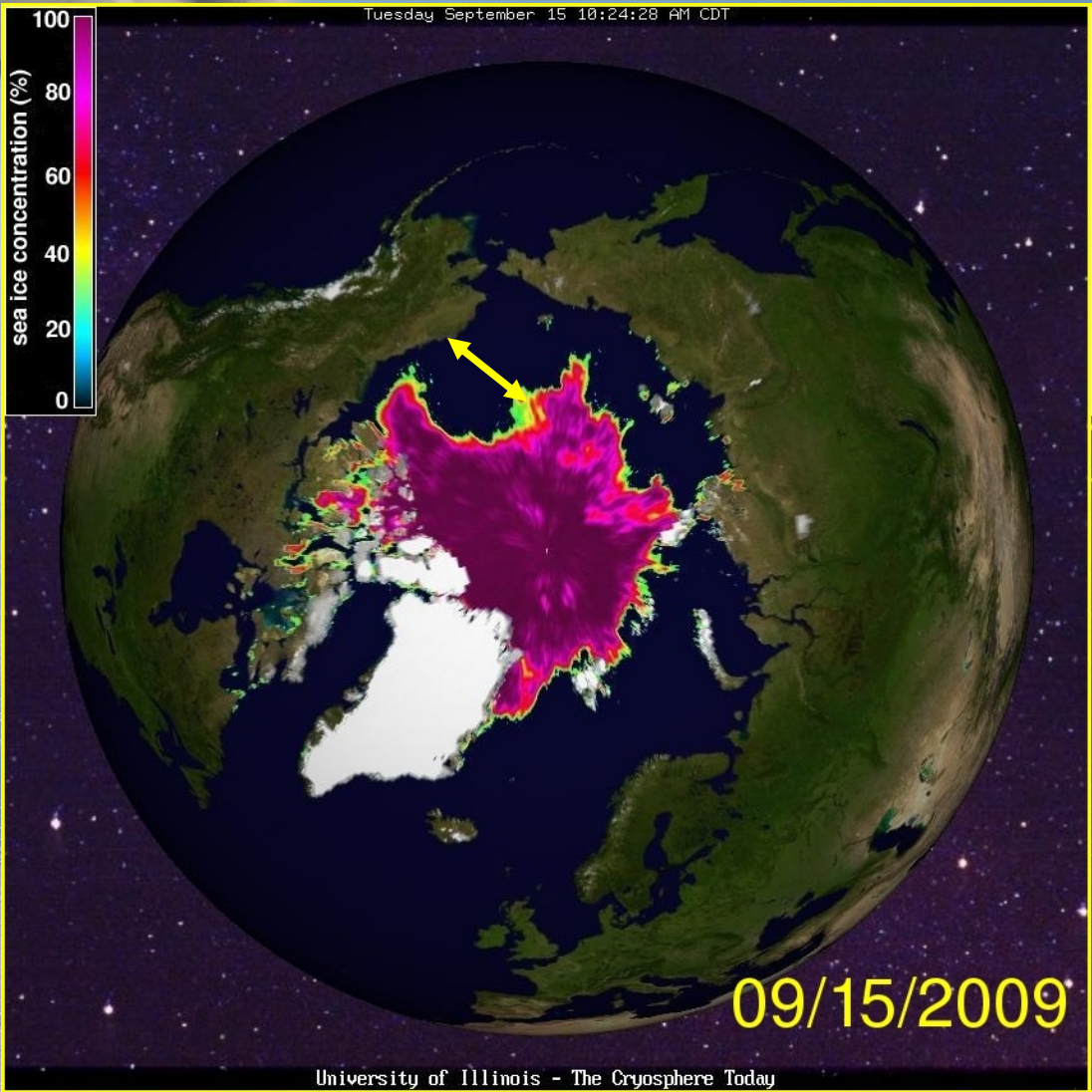




Red Dog Mine  
near  
Kivalina, Alaska







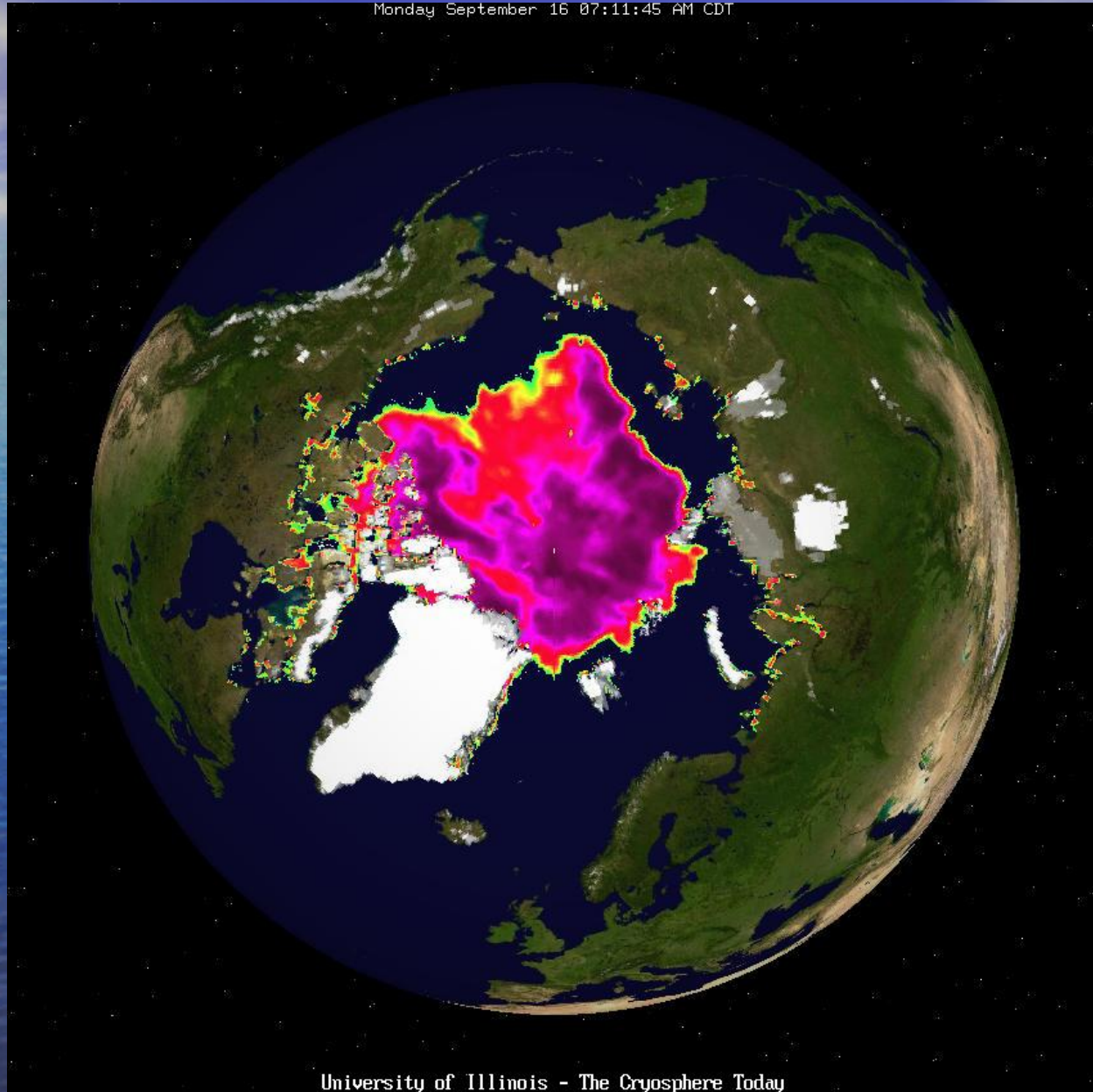






# 16 September 2002

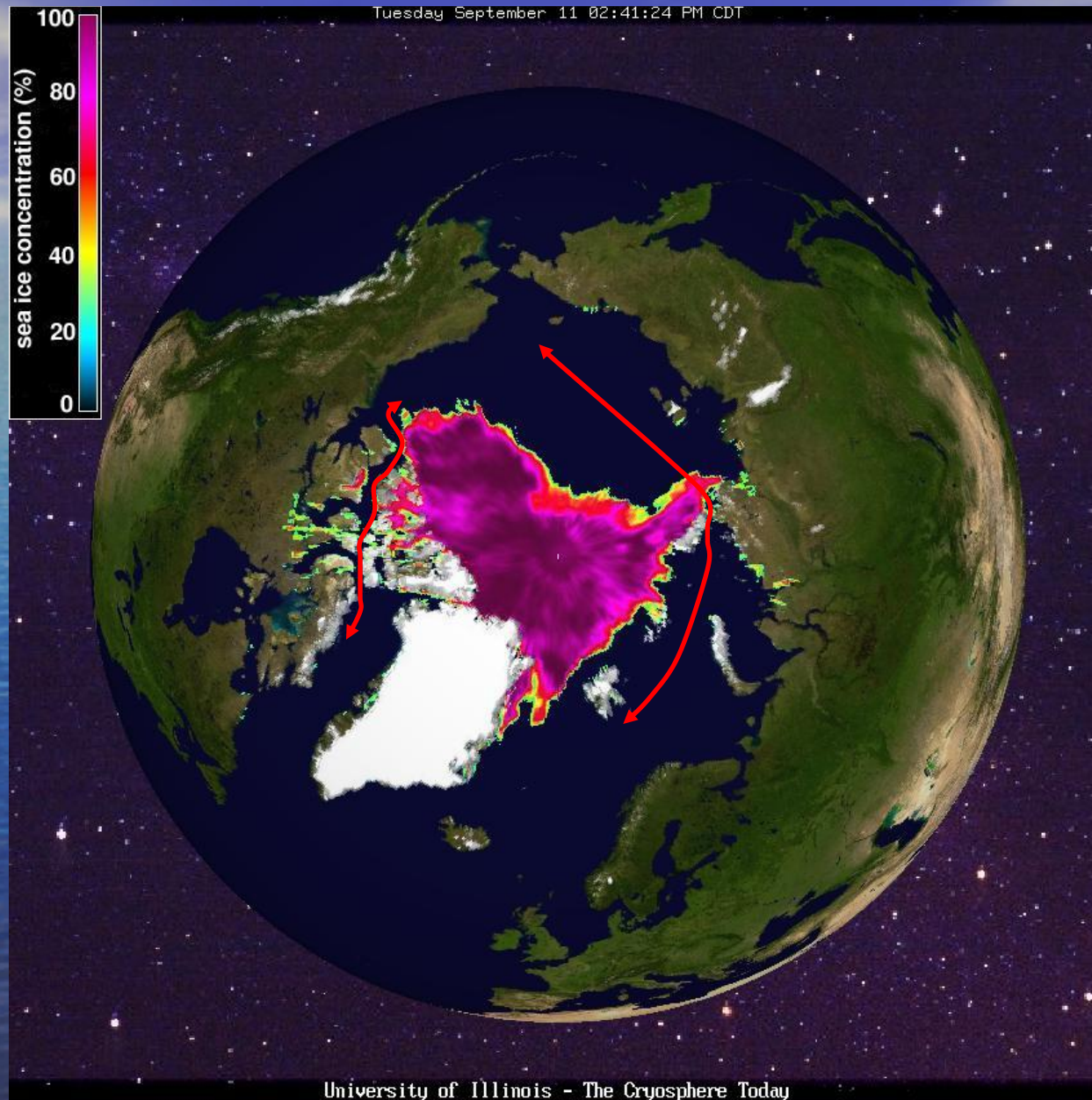
Monday September 16 07:11:45 AM CDT



University of Illinois - The Cryosphere Today



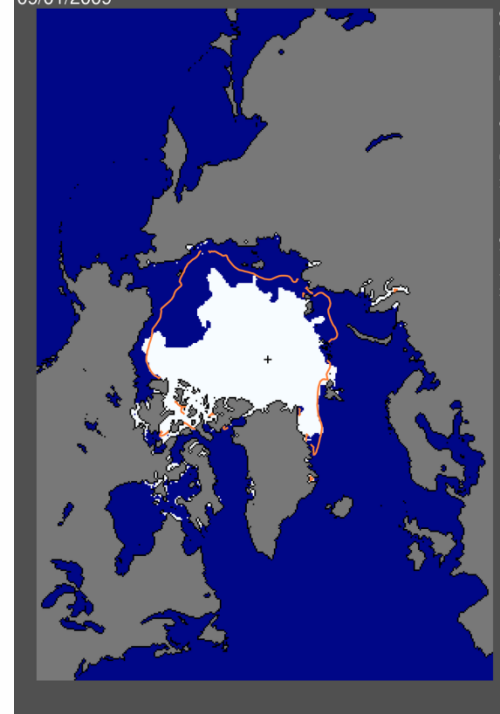
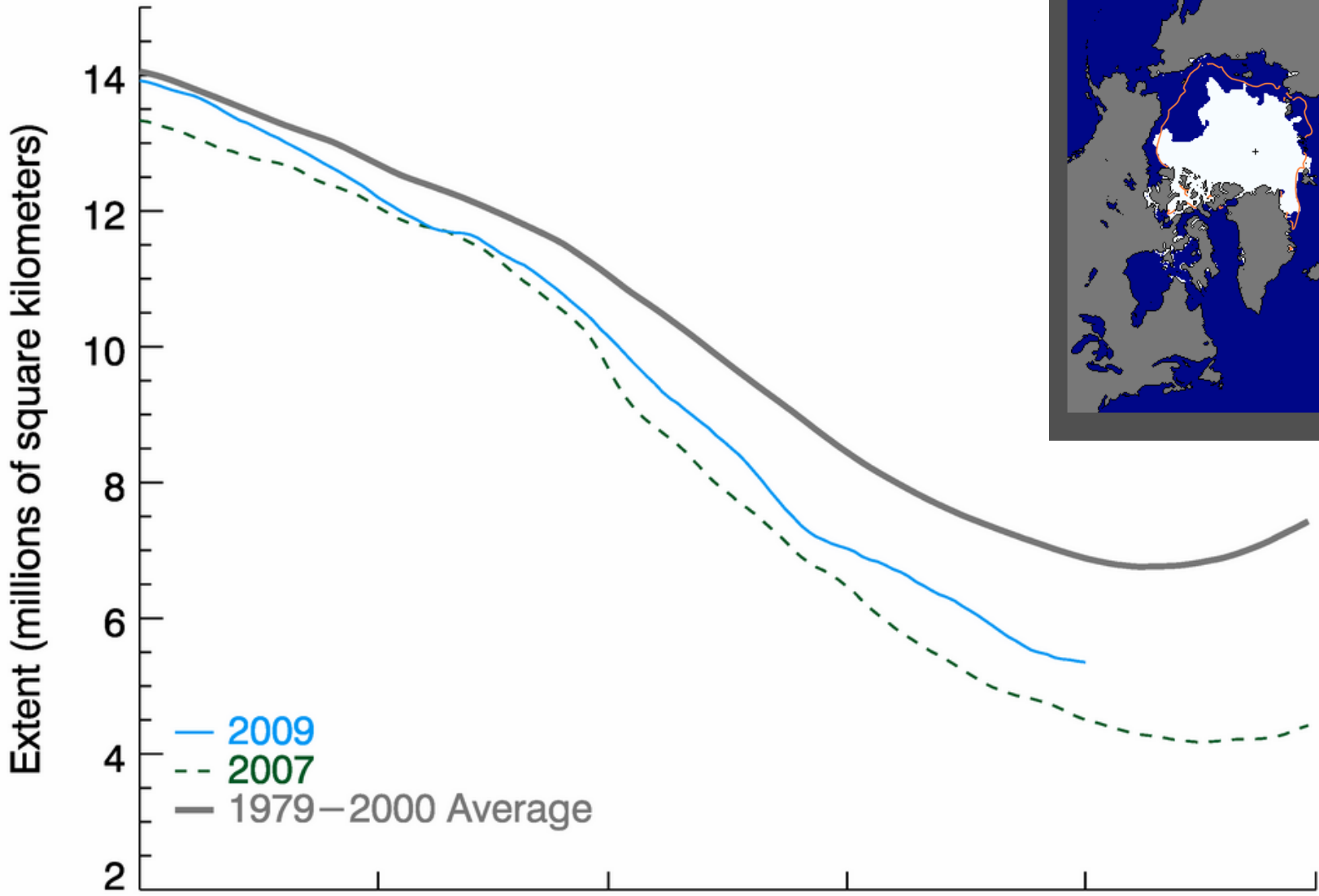
# 11 September 2007





# Arctic Sea Ice Extent

(Area of ocean with at least 15% sea ice)

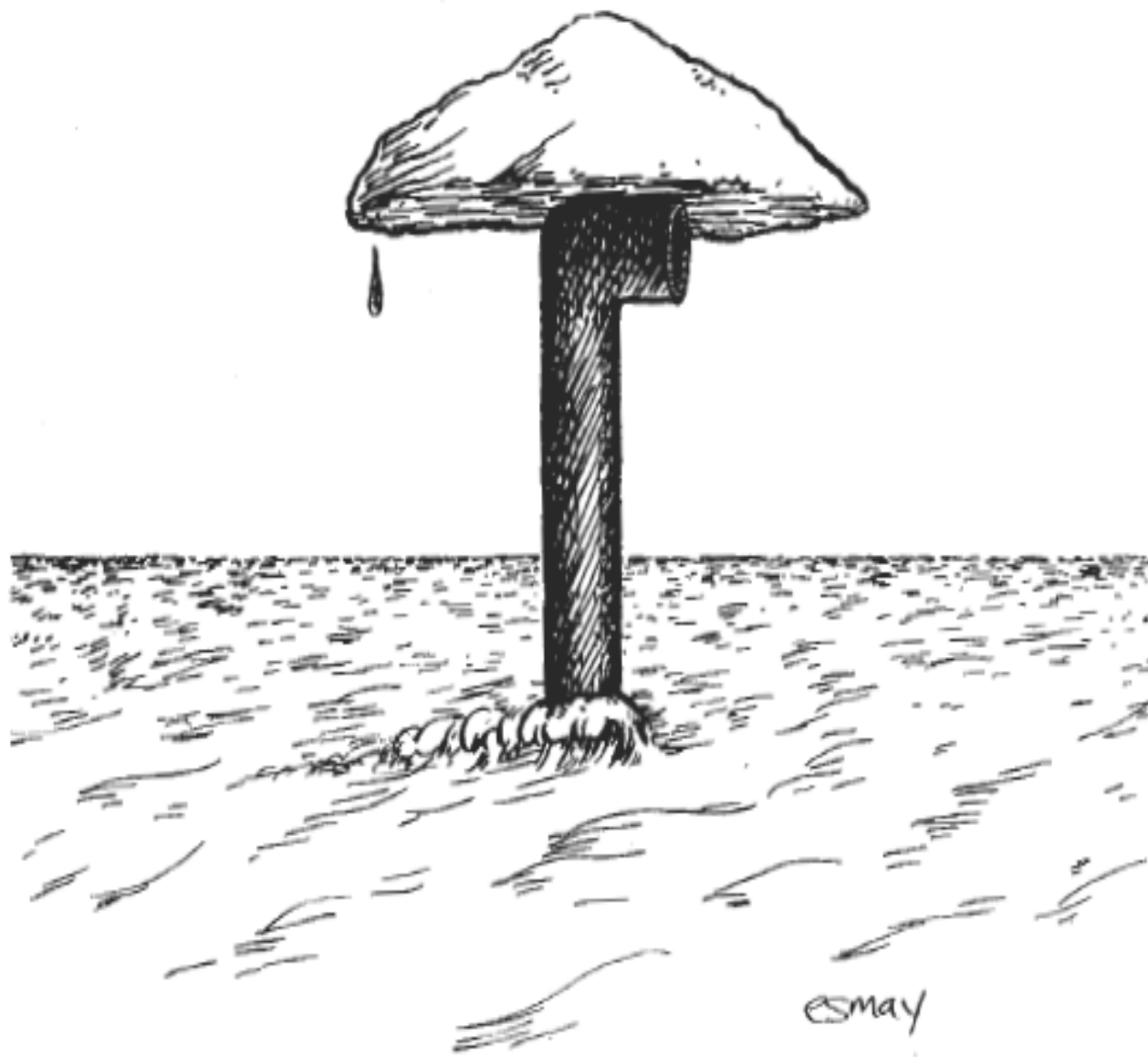


National Snow and Ice Data Center, Boulder, CO

median  
1979-2000

National Snow and Ice Data Center,





*Last Trip Under the Polar Ice Cap*



# Challenges of an Accessible Arctic

## Why the Arctic Matters:

- 1. National security/sovereignty**
- 2. Economics: energy, trade, transport**
- 3. Environment: climate, critters, sustainability**



“This is an area that we have to pay real attention to, but it's not an area that I get called about by reporters or have to answer questions about at the White House yet.” – Secretary of State Hillary Clinton, Newsweek, January 4, 2010





# Challenges of an Accessible Arctic

## Why the Arctic Matters:

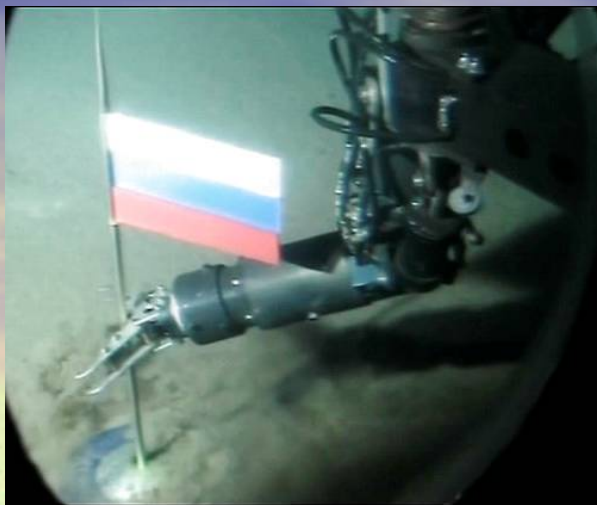
**1. National security/sovereignty**

**2. Economics: energy, trade, transport**

**3. Environment: climate, critters, sustainability**



2007



LAURA KIPNIS ON THE NEW FEMALE PRIDES

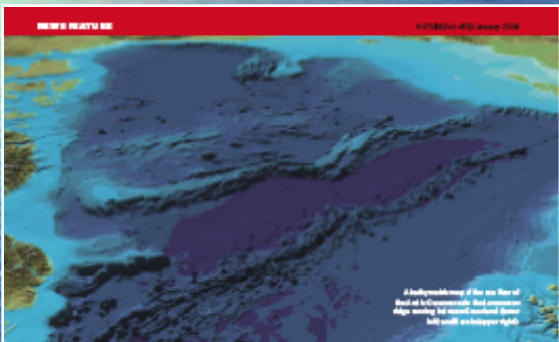
# HARPER'S

HARPER'S MAGAZINE / SEPTEMBER 2007 \$6.95



## COLD RUSH

The Coming Fight for the Melting North  
By McKenzie Frink



## The next land rush

As countries race to file claims to areas of the sea floor before a United Nations deadline, geologists and geophysicists are getting caught up in the frenzy. Daniel Clancy reports.

**R**apidly melting glaciers in the Arctic are exposing vast areas of the sea floor. In some cases, the exposed areas are rich in oil, gas, and other resources. As the world's climate warms, the Arctic region is becoming a hotbed of activity. Countries are racing to file claims to areas of the sea floor before a United Nations deadline. Geologists and geophysicists are getting caught up in the frenzy. Daniel Clancy reports.

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**“The map of the Arctic will change as a result of global warming. The Arctic will be a hotbed of activity. Countries are racing to file claims to areas of the sea floor before a United Nations deadline. Geologists and geophysicists are getting caught up in the frenzy. Daniel Clancy reports.”**

— **Frank Macrae**

Fifty Ye

Joe Klein on Hillary's New Health-Care Plan Why it's better this time

Is There Really A Case Against The Polygamist Prophet?

Ride 'Em Cowboy: Why The Western Won't Die

# TIME

## Who Owns the Arctic?

As global warming shrinks the ice to record lows, the global battle for resources heats up

As global warming shrinks the ice to record lows, the global battle for resources heats up

October 2007 \$4.50

www.time.com

NAVY / MARINE CORPS / COAST GUARD / MERCHANT MARINE

# SEAPOWER

## THE NEW COLD WAR?

U.S., Canada, Russia, Denmark Rush to Stake Arctic Claims

October 2007 \$4.50

NAVY LEAGUE OF THE UNITED STATES

www.navyleague.org

MARAD'S NEW GATEWAY / SPECIAL REPORT: U.S. NAVY PROGRAM REVIEW



A 5-to-6-in. piece of printing has been on the shore of Booth Island, Foul Bay, Nunavut, Canada



# Sovereign Rights and Jurisdiction



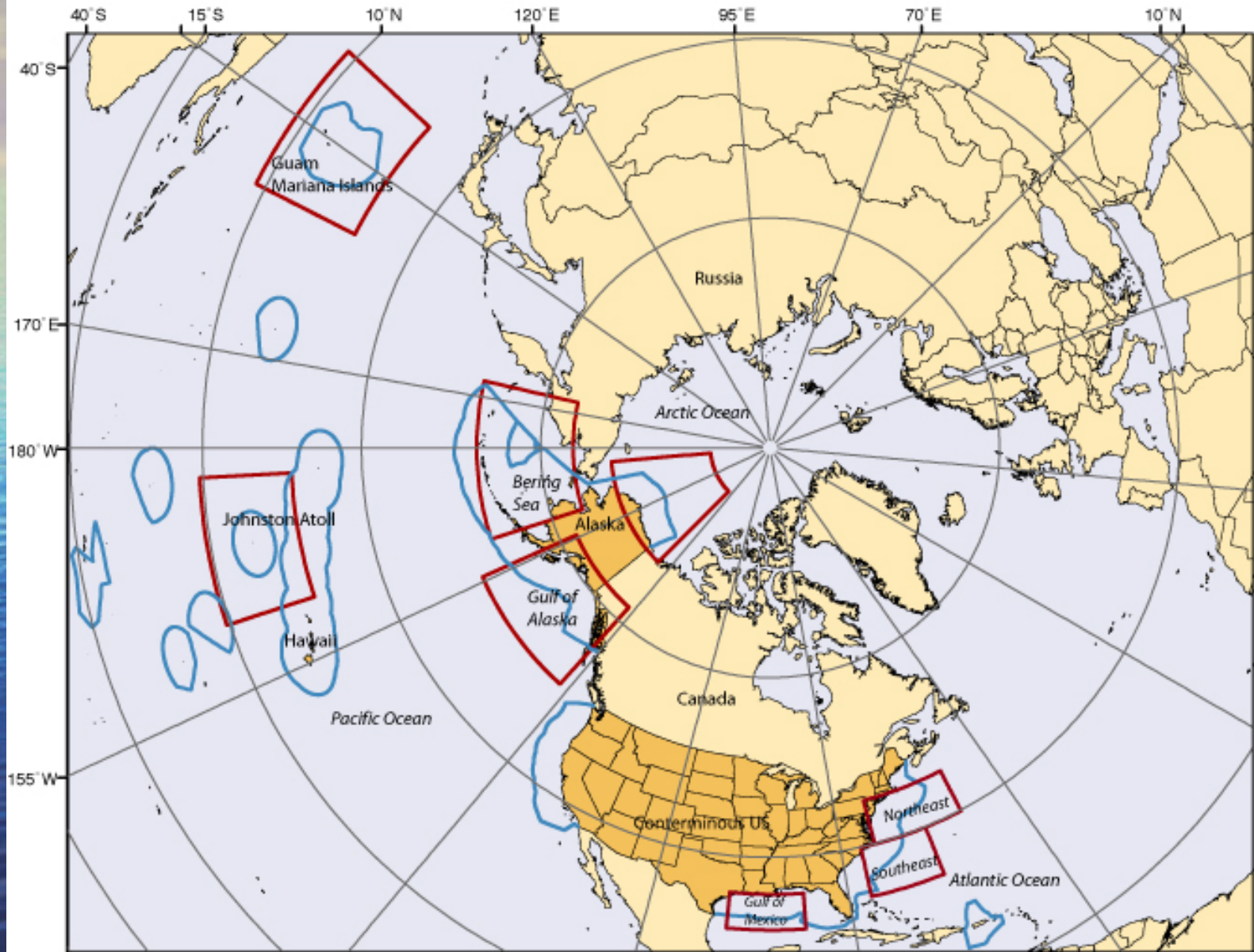
- 1) North Pole
- 2) Lomonosov Ridge
- 3) 200 nautical mile line
- 4) Russian-claimed ECS
- 5) EEZ & CS Dispute







# Where Is Our ECS?





28 May 2008



# THE ILULISSAT DECLARATION

ARCTIC OCEAN CONFERENCE  
ILULISSAT, GREENLAND, 27 – 29 MAY 2008

British Minister for Foreign Affairs and the Premier of  
five coastal States bordering on the Arctic Ocean –  
Federation and the United States of America  
2008 in Ilulissat, Greenland, to hold  
Climate change and  
the livelihoods  
of



# New US Arctic Policy

- National security/homeland security needs
- Protect environment/conserve biological resources
- Environmentally sustainable resource management and development
- Strengthen institutions for international cooperation; ratify Law of the Sea
- Involve indigenous communities in decisions
- Enhance scientific monitoring and research into local, regional and global environmental issues









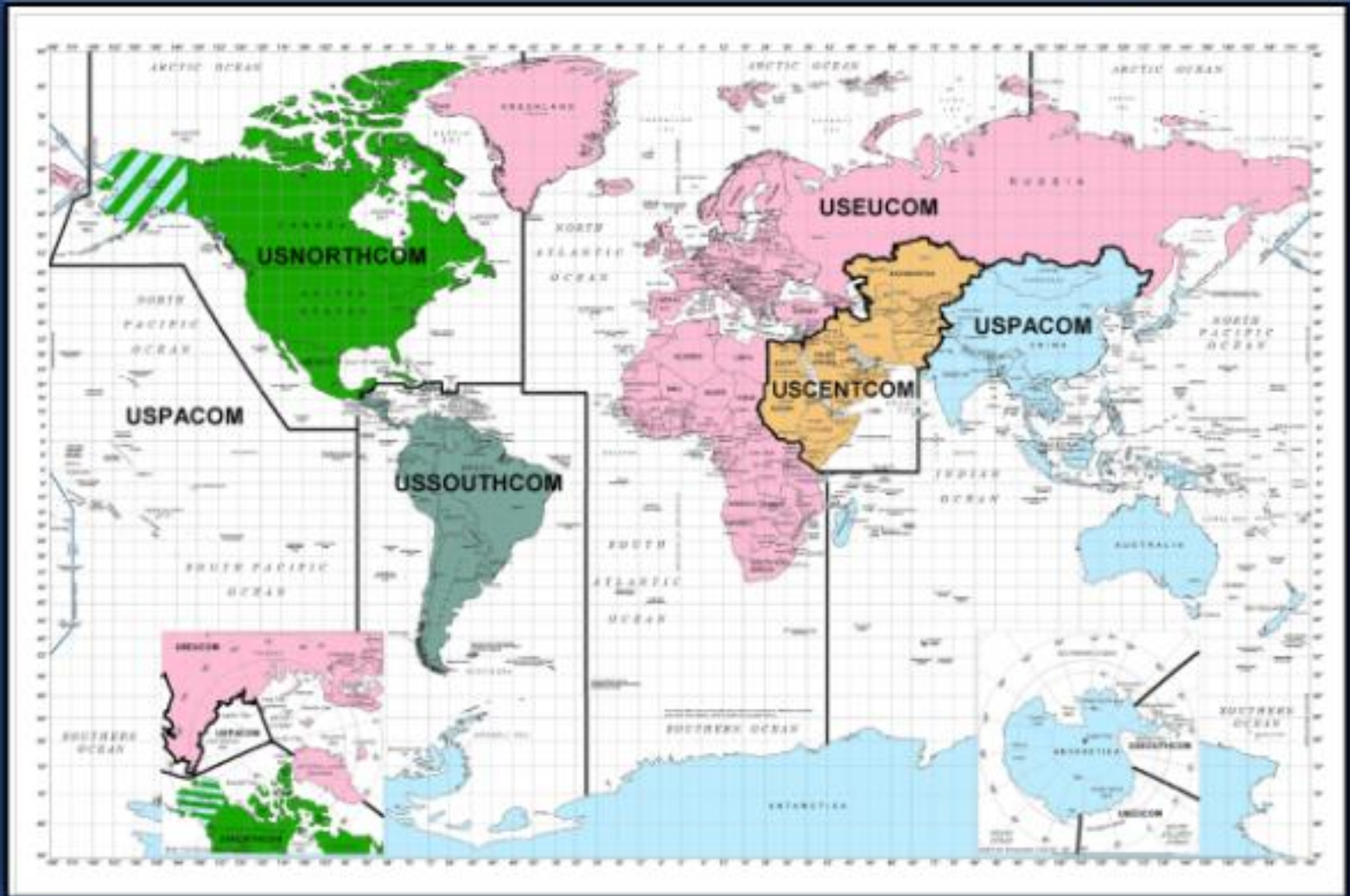
# USARC ECUMENICAL BELIEF



- The United States must maintain its global maritime capability—as a government AND as a Nation
- If the U.S. does not exercise its visible maritime presence in the Arctic Ocean—we cede it to whomever wants it!



# The World with Commanders' Areas of Responsibility





**Analysis Report  
Alaska and Arctic Regions  
Command and Control (A2RC2)  
Limited Objective Experiment**

**NORAD and USNORTHCOM  
Plans, Policy and Strategy Directorate  
Maritime Division**



Lead Analysts:  
Mr. Kevin Curry, N-NC/J84  
Mr. Kevin Baumgardner, N-NC/J84  
Contributing Author:  
Mr. William Ehmel, CTR, N-NC/J84  
Approved by: Col Peter Vanden Bosch, N-NC/J84  
15 Oct 09

**Results:** Data analysis suggests that additional, clearer, senior level guidance is needed; Unified Command Plan (UCP) boundaries should be redrawn; and a single responsible Commander for the Arctic region should be assigned to represent DOD equities.







# Challenges of an Accessible Arctic

## Why the Arctic Matters:

**1.** National security/sovereignty

**2.** Economics: energy, trade, transport

**3.** Environment: climate, critters, sustainability



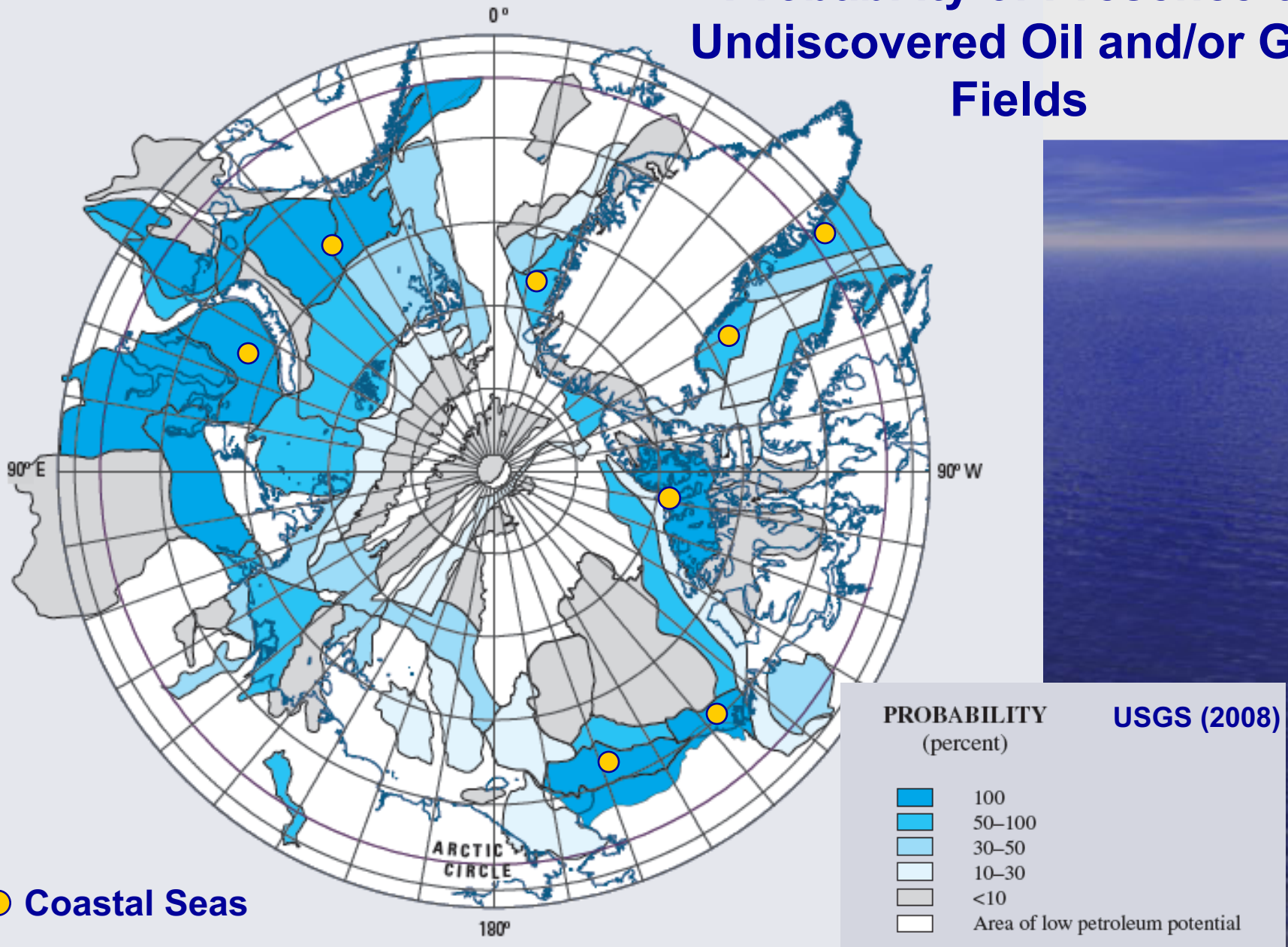
# Oil and Gas: Resources of the North



Source: AMAP



# Probability of Presence of Undiscovered Oil and/or Gas Fields



**‘Wild Card’ Issue ~ New Resource Discoveries**



# U.S. Geological Survey Report ~ July 2008



## Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle

The U.S. Geological Survey (USGS) has completed an assessment of undiscovered conventional oil and gas resources in all areas north of the Arctic Circle, using a geologic approach and probabilistic methodology. The USGS estimates the occurrence of undiscovered oil and gas in 33 geologic provinces thought to be prospective for petroleum. The sum of the mean estimates for each province indicates that 59 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids may remain to be found in the Arctic, of which approximately 84 percent is expected to occur in offshore areas.



Overcasted mountains north of the Labyrinth Group under a midlight rainbow near Galbraith Lake, Alaska, summer 2007. USGS photo by David Stockman.

### Introduction

In May 2008, a team of U.S. Geological Survey (USGS) scientists completed an appraisal of possible future additions to world oil and gas reserves from new field discoveries in the Arctic. This Circum-Arctic Resource Appraisal (CARA) evaluated the petroleum potential of all areas north of the Arctic Circle (66°50' north latitude); quantitative assessments were conducted in those geologic areas considered to have at least a 10-percent chance of one or more significant oil or gas accumulations. For the purposes of the study, a significant accumulation contains recoverable volumes of at least 50 million barrels of oil and/or oil-equivalent natural gas. The study included only those resources believed to be recoverable using existing technology but with the important assumption for offshore areas that the resources would be recoverable even in the presence of permanent sea ice and oceanic water depth. No economic considerations are included in these initial estimates; results are presented without reference to costs of exploration and devel-

opment, which will be important in many of the assessed areas. So-called unconventional resources, such as coal bed methane, gas hydrates, oil shales, and tar sand, were explicitly excluded from the study. Full details of the CARA study will be published later.

A number of offshore areas in Canada, Russia, and Alaska already have been explored for petroleum, resulting in the discovery of more than 400 oil and gas fields north of the Arctic Circle. These fields account for approximately 240 billion barrels (BBOE) of oil and oil-equivalent natural gas, which is about 10 percent of the world's known conventional petroleum resources (conventional production and remaining proved reserves). Nevertheless, most of the Arctic, especially offshore, is essentially unexplored with respect to petroleum. The Arctic Circle encompasses about 6 percent of the Earth's surface, an area of more than 21 million km<sup>2</sup> (8.1 million mi<sup>2</sup>), of which about 8 million km<sup>2</sup> (3.1 million mi<sup>2</sup>) is offshore and more than 7 million km<sup>2</sup> (2.7 million mi<sup>2</sup>) is on continental shelves under less than 500 m of water. The extensive Arctic continental shelves may constitute the

geographically largest unexplored prospective area for petroleum remaining on Earth.

### Methodology

A newly compiled map of Arctic sedimentary basins (Arthur Coomes and others, unpublished work) was used to define geologic provinces, each containing more than 3 km<sup>3</sup> of sedimentary strata. Assessment units (AUs)—suspectible volumes of rock with common geologic traits—were identified within each province and quantitatively assessed for petroleum potential. Because of the sparse seismic and drilling data in much of the Arctic, the usual tools and techniques used in USGS resource assessments, such as discovery process modeling, prospect delineation, and deposit simulation, were not generally applicable. Therefore, the CARA relied on a probabilistic methodology of geologic analysis and analog modeling. A world analog database (Chapman and others, 2006) was developed using the AUs defined in the USGS World Petroleum Assessment 2000 (USGS World Assessment Team, 2000). (Continued on back page)

## “Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle”

- 13% Undiscovered Oil
- 30% Undiscovered Natural Gas
- 20% Undiscovered Natural Gas Liquids

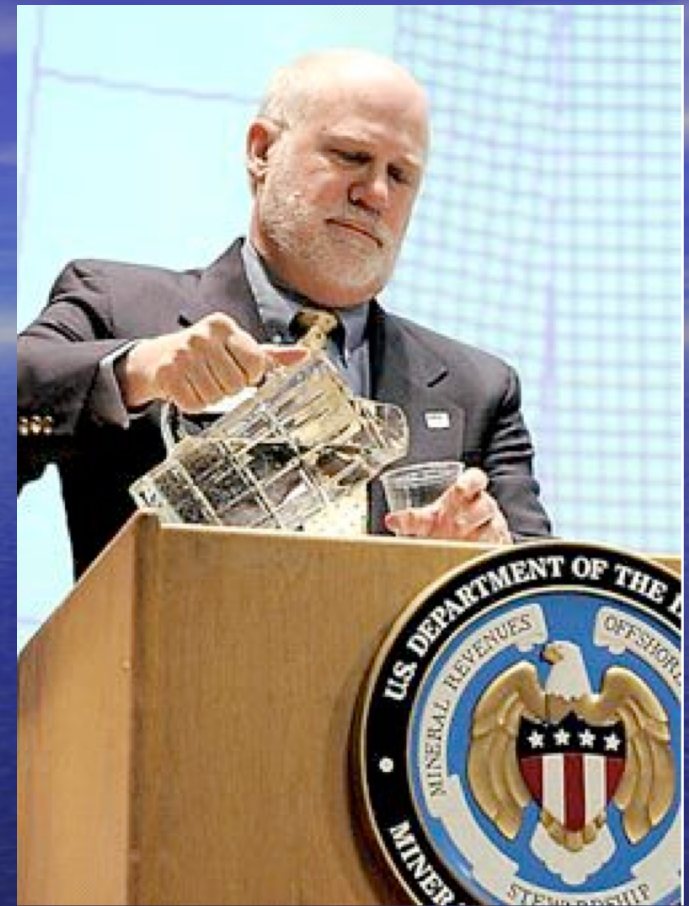
<http://pubs.usgs.gov/fs/2008/3049/>



# Record \$2.7 billion bid for Alaska oil and gas leases



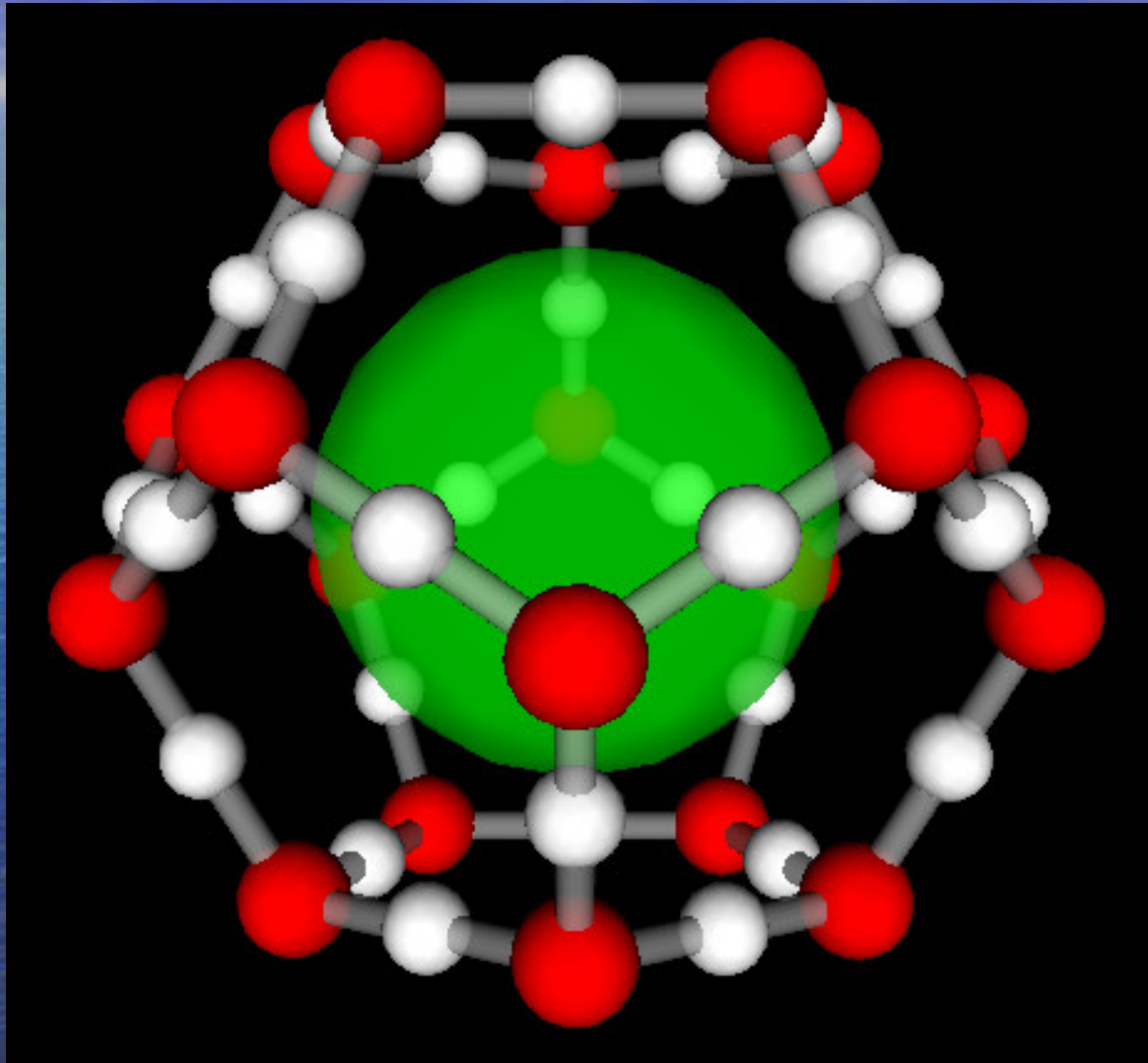
RON ENGSTROM / Anchorage Daily News



Minerals Management Service's Alaska Regional Director John Goll pours a glass of water before reading the 667 lease sale bids for the Chukchi Sea that totaled \$2.66 billion, the largest lease sale in Alaska's history. Photo/Rob Stapleton/AJOC

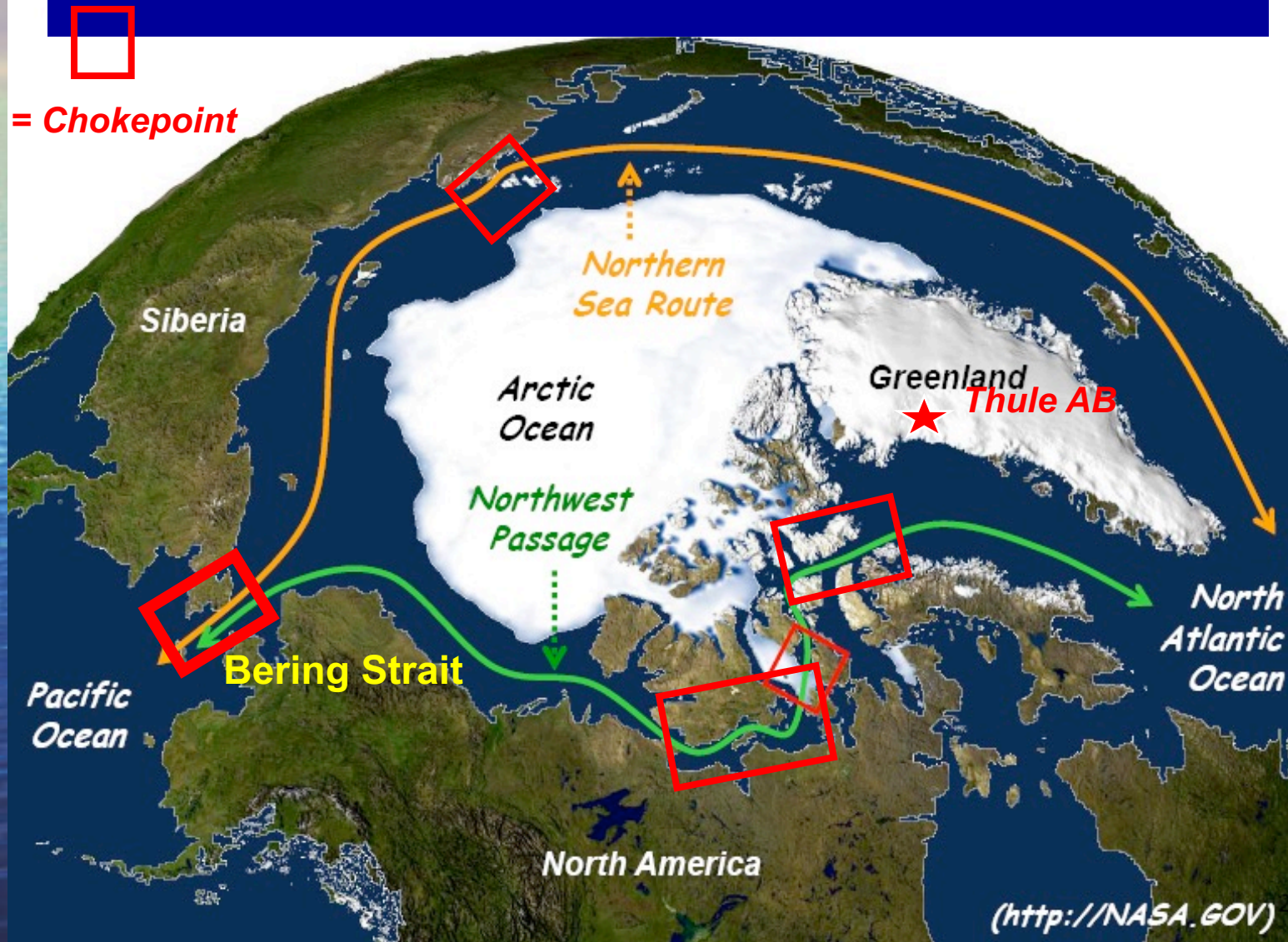


# Gas Hydrate Research





# Potential Arctic Shipping Routes





Build a shipping regime that is  
“safe, secure, and reliable.”





**Arctic Ministers' Approval 29 April 2009 ~  
Negotiated Text**

**Arctic Council  
Arctic Marine Shipping  
Assessment 2009 Report**



ARCTIC COUNCIL  
IN COOPERATION WITH  
2012/2011

**PAME**  
Partnership of the Arctic Marine Environment



## Future Convoy Requirements?



**Icebreaking (Double Acting) Container Ship  
*Norilskiy Nickel* in the Kara Sea  
March 2006**

Aker Arctic



# Arctic Marine Geography

## CHALLENGES & RISKS

Northwest Passage

Draft

Intra-Arctic Route

Choke Point

Central Arctic Ocean Route (2100-nm)

Sea Ice

Cold Climate Ice-Free Ops

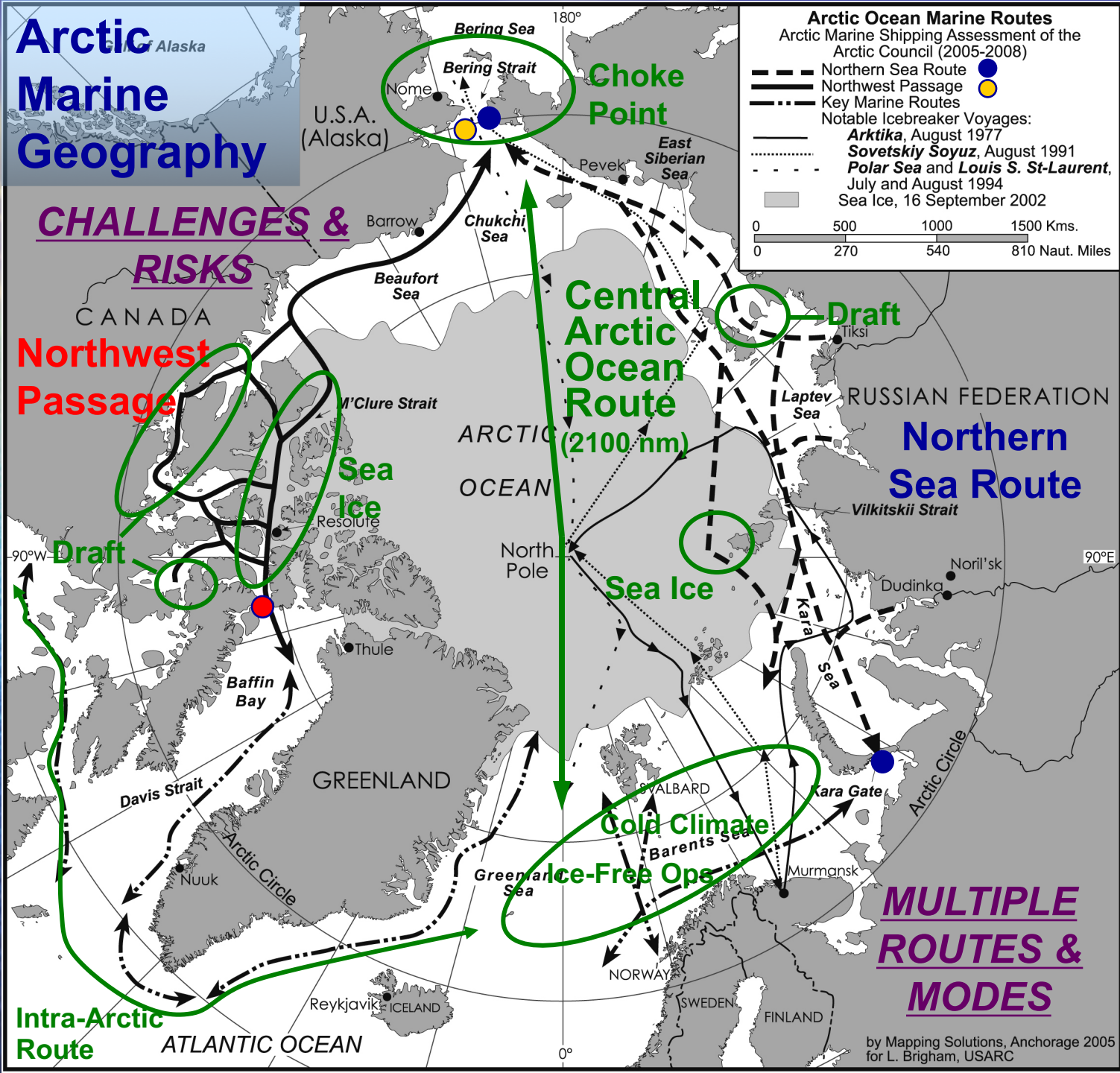
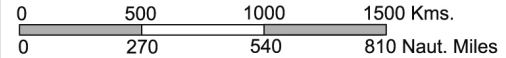
### Arctic Ocean Marine Routes

Arctic Marine Shipping Assessment of the Arctic Council (2005-2008)

- Northern Sea Route
- === Northwest Passage
- Key Marine Routes

Notable Icebreaker Voyages:

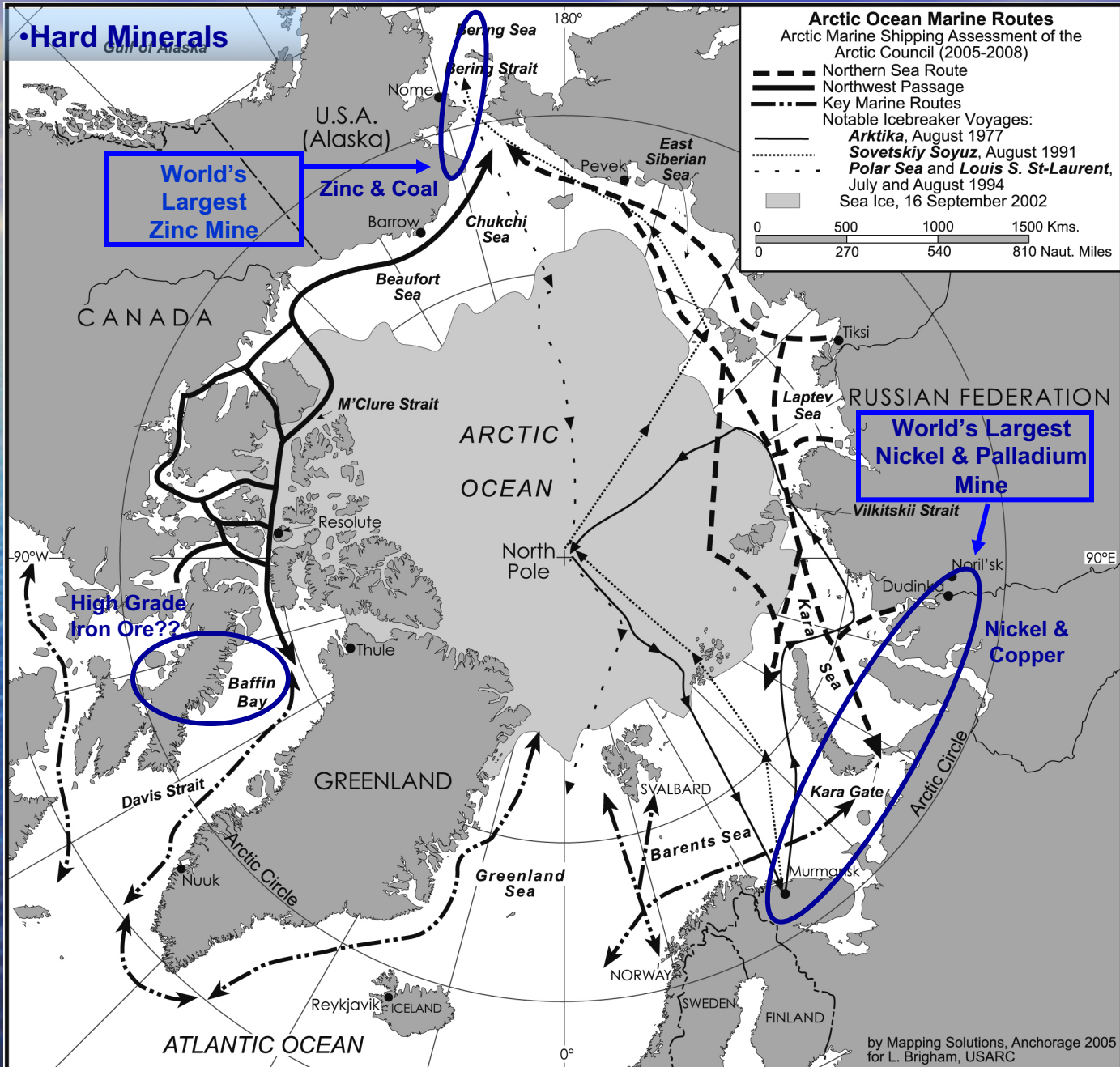
- Arktika**, August 1977
- Sovetskiy Soyuz**, August 1991
- Polar Sea and Louis S. St-Laurent**, July and August 1994
- Sea Ice, 16 September 2002



## MULTIPLE ROUTES & MODES

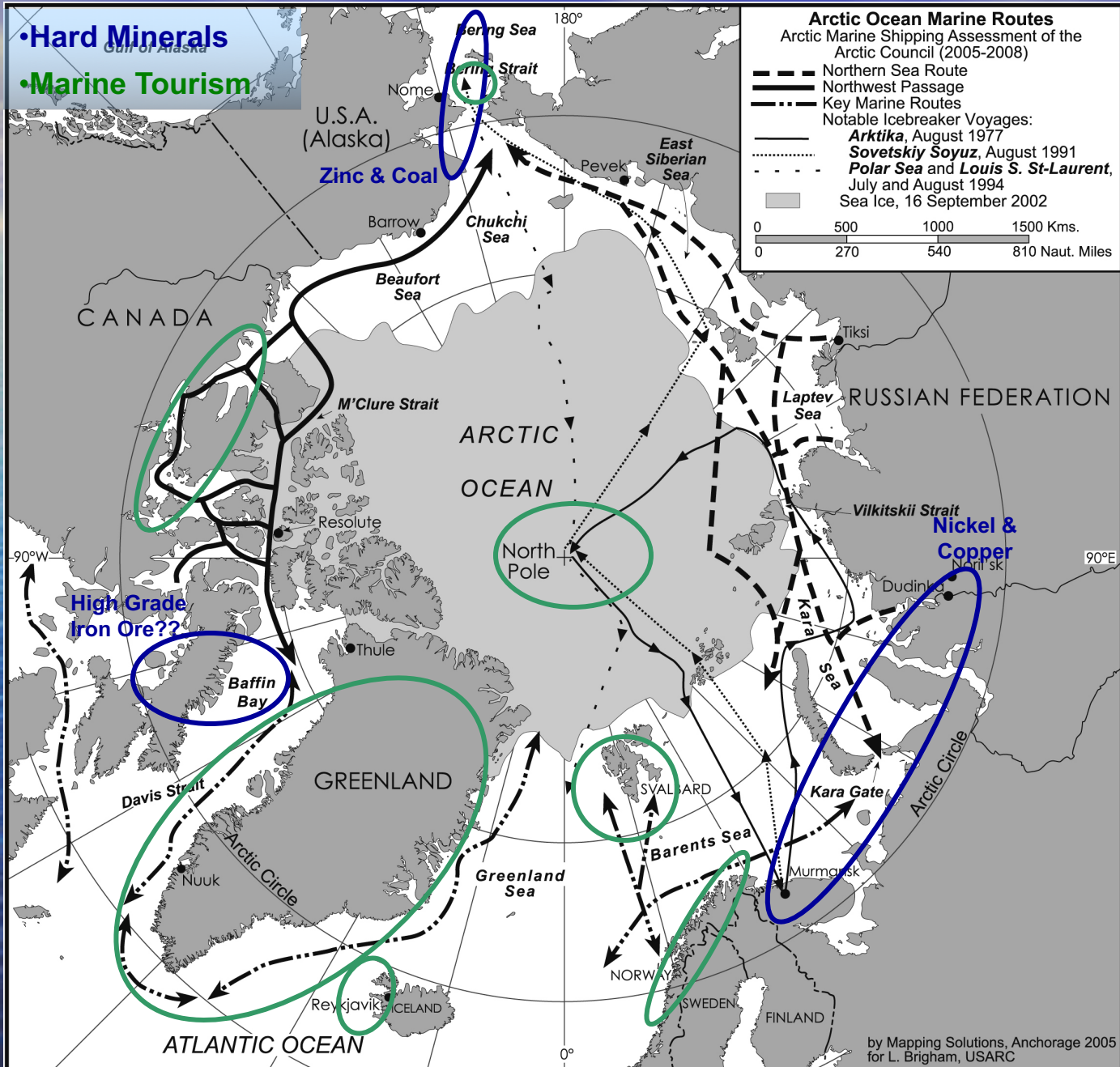


# Today's Arctic Marine Use





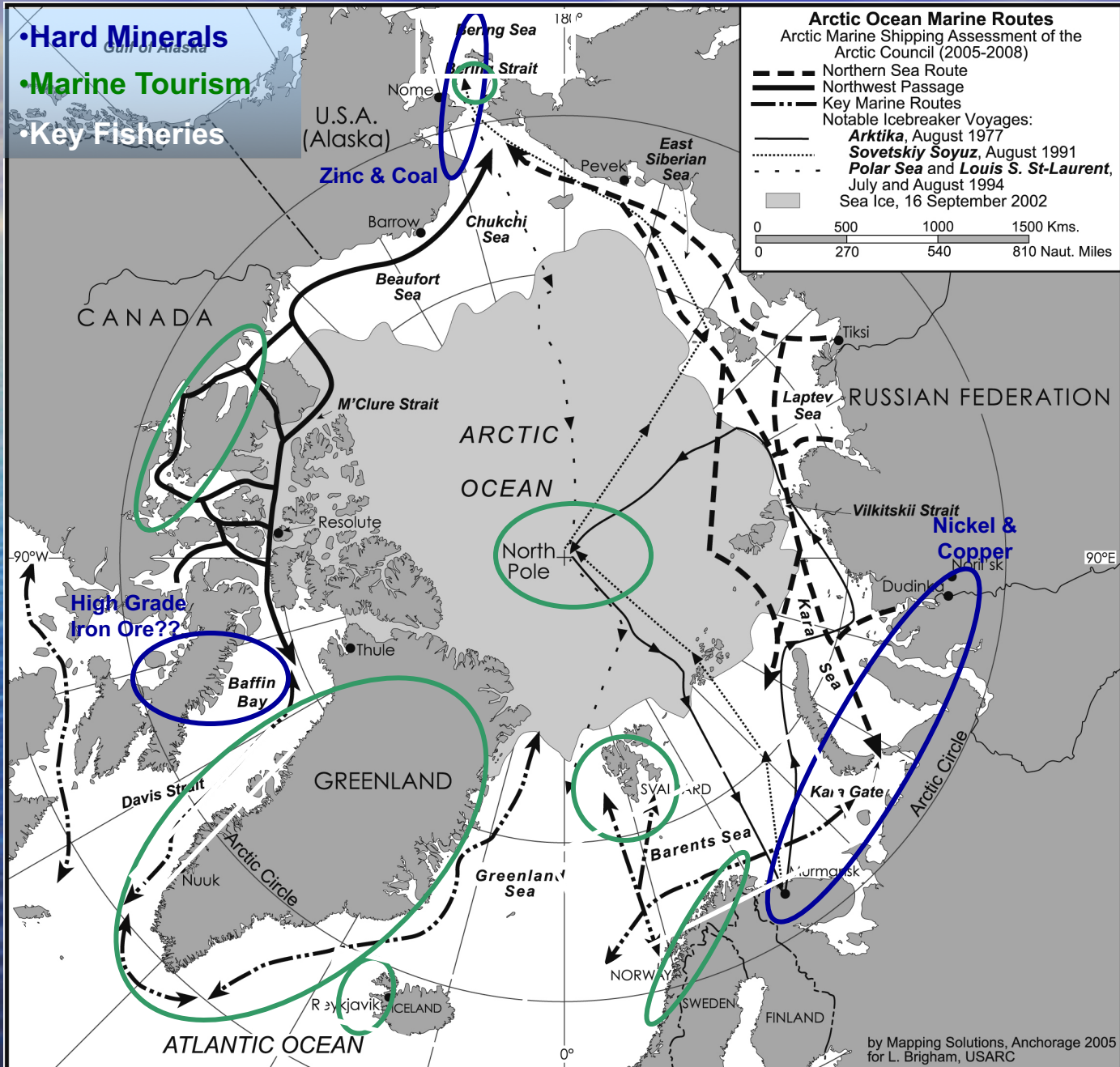
# Today's Arctic Marine Use



by Mapping Solutions, Anchorage 2005  
 for L. Brigham, USARC



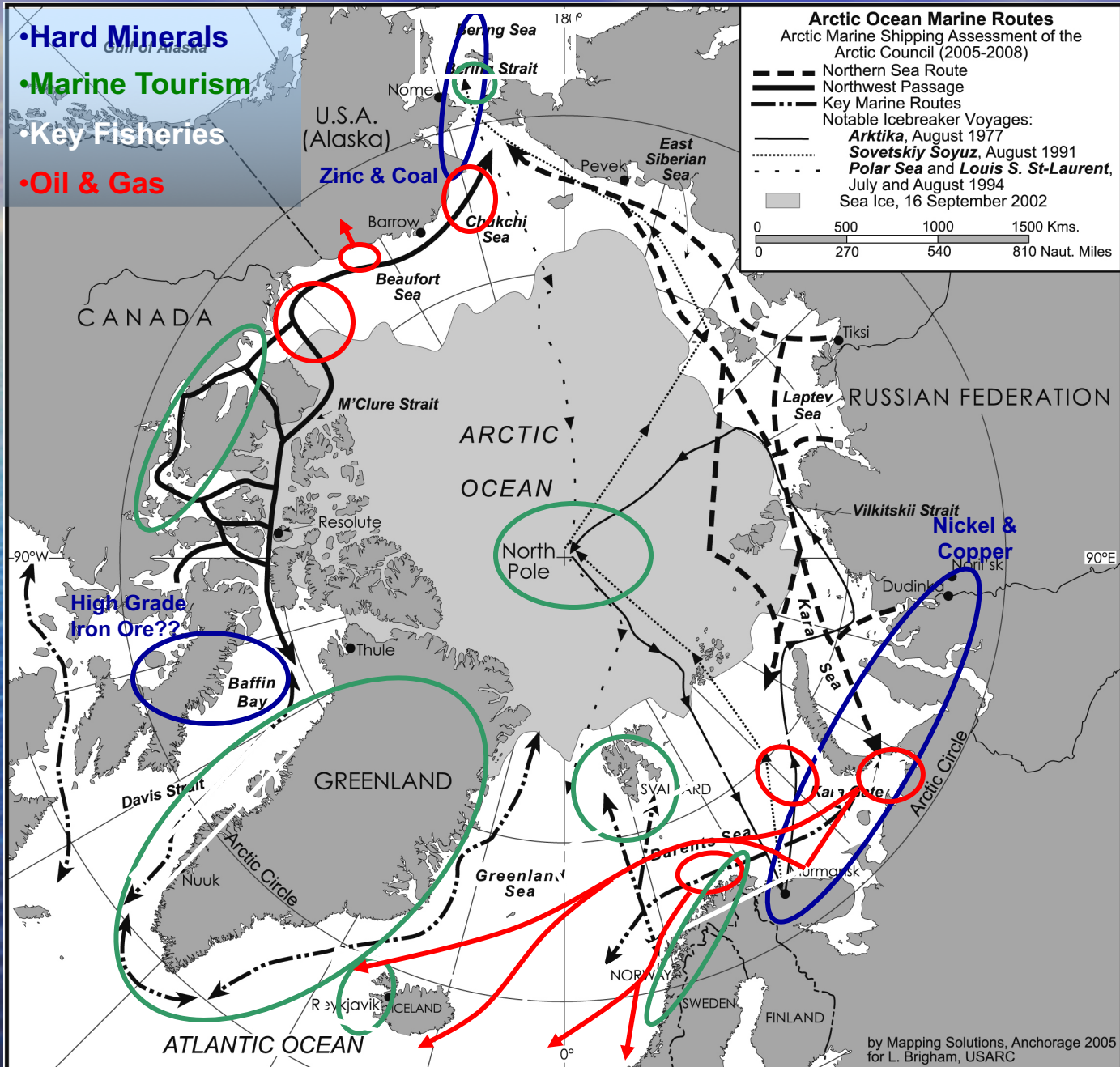
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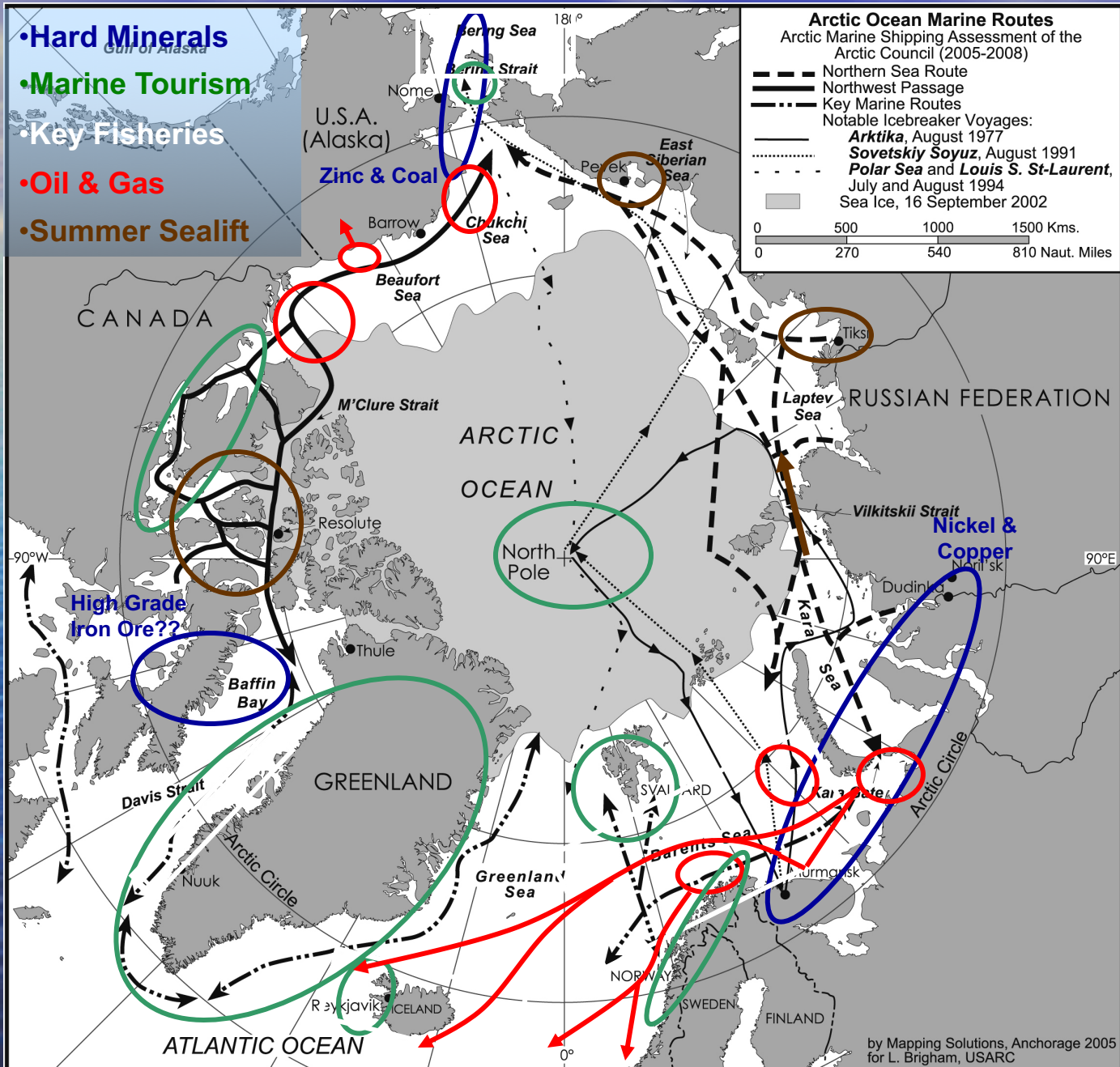


# Today's Arctic Marine Use



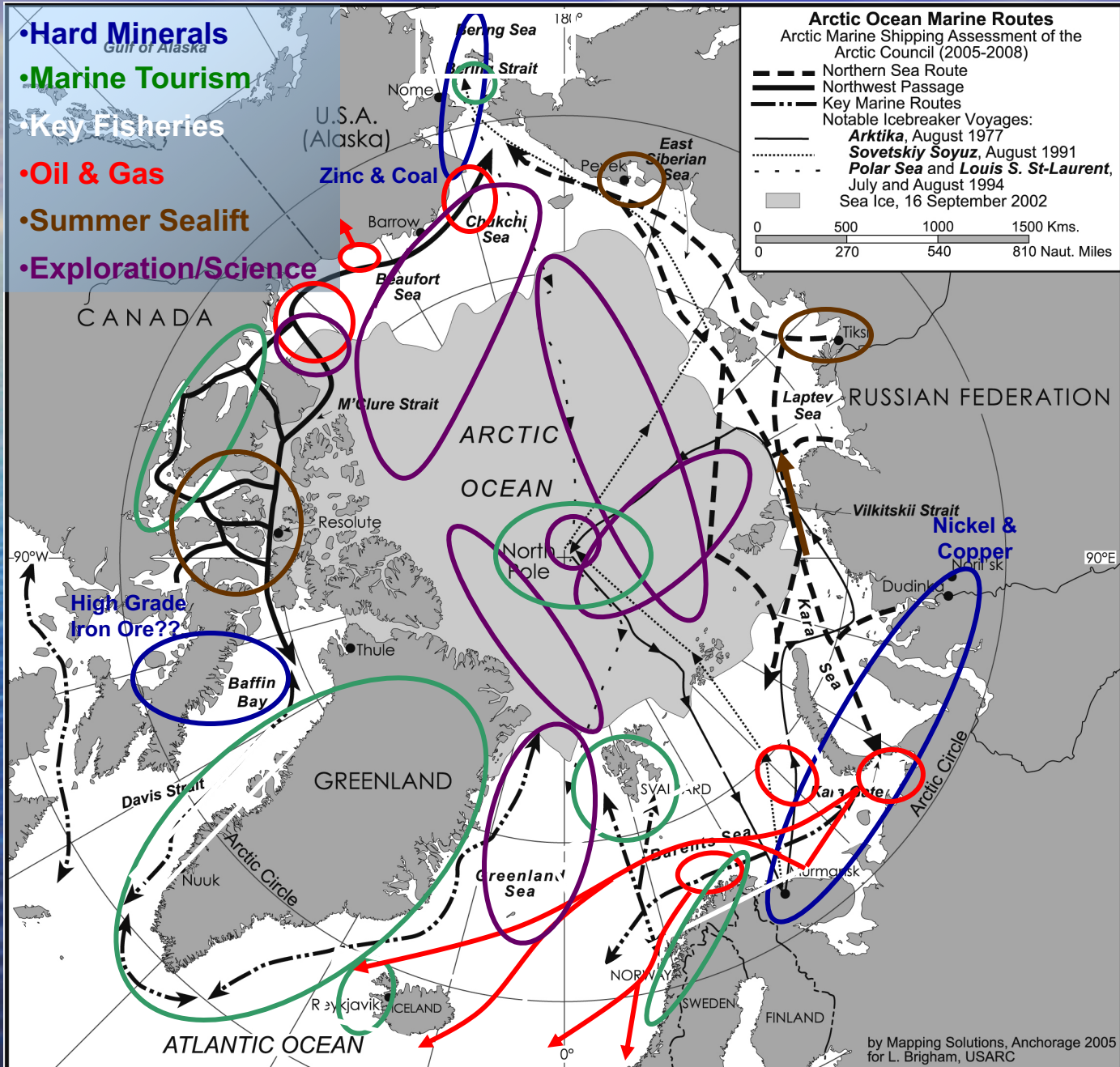
by Mapping Solutions, Anchorage 2005  
 for L. Brigham, USARC

# Today's Arctic Marine Use





# Today's Arctic Marine Use





# ***Icebreaker Transits to the North Pole & Trans-Arctic Voyages (1977-2008):***

- 77 Transits to the North Pole (65 Russia, 5 Sweden, 3 USA, 2 Germany, 1 Canada, 1 Norway)
- 33 Ship Transits to the NP in 2004-2008
- 7 Trans-Arctic Voyages (1991, 1994, 1996, 2005)
- Single Non-summer NP Voyage (*Sibir* Voyage May-June 1987)

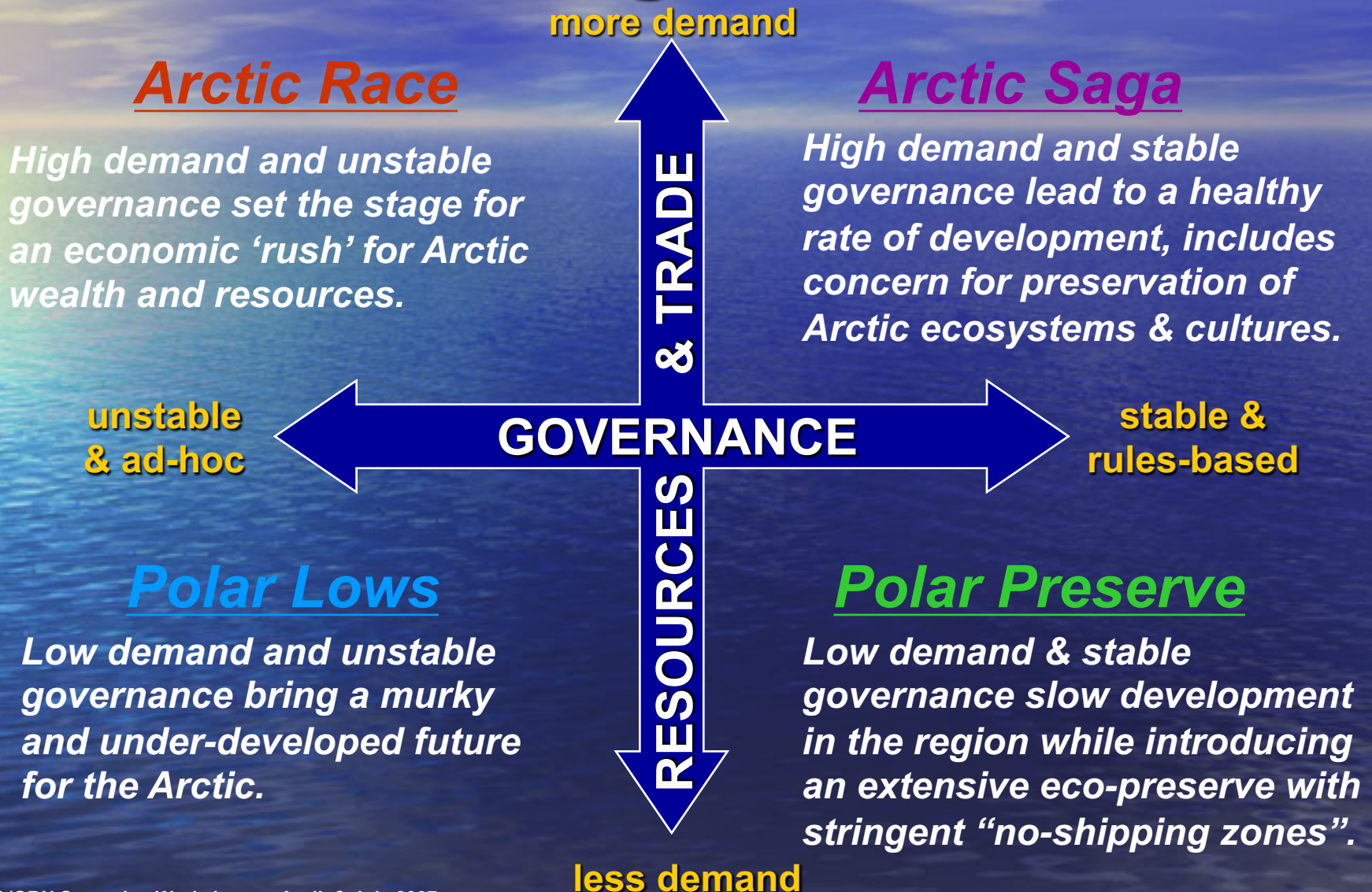


**‘Clear Evidence of  
Central Arctic Ocean  
Navigation’**

**25 May 1987 ~ North Pole  
Soviet Nuclear Icebreaker *Sibir*  
‘A Walk Around the World!’**



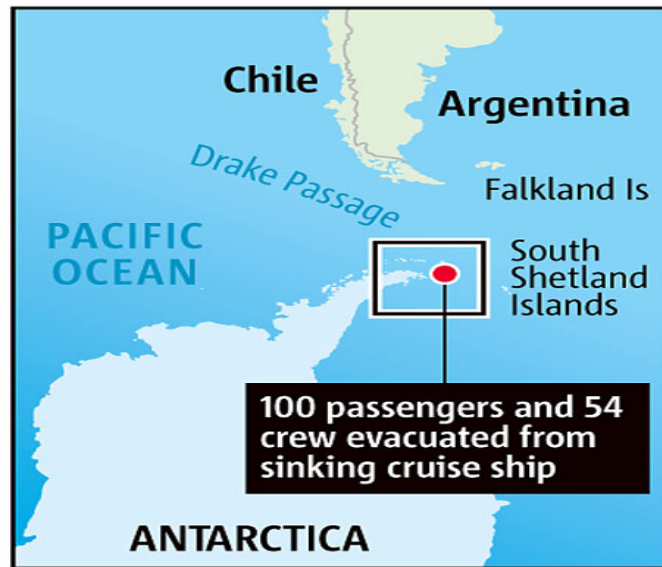
# Scenarios on the Future of Arctic Marine Navigation in 2050





# "Stricken cruise ship off Antarctic evacuated"

MSNBC- 11/23/07







for a living planet®



## Oil Spill

Response Challenges  
in Arctic Waters

- Oil industry pays eight cents a barrel to response fund
- Interagency committee seldom meets
- US spill research program is way behind promise of Oil Pollution Act of 1990

# Great Lakes St. Lawrence Seaway

- PORTS
- CANADIAN LOCKS
- UNITED STATES LOCKS

- LOCKS
- 1 St. Lambert
  - 2 Cote Ste. Catherine
  - 3 Lower Beauharnois
  - 4 Upper Beauharnois
  - 5 Snell
  - 6 Eisenhower
  - 7 Iroquois
  - 8 Welland Canal (8 locks)
  - 9 Soo Locks





# Challenges of an Accessible Arctic

## Why the Arctic Matters:

- 1. National security/sovereignty**
- 2. Economics: energy, trade, transport**
- 3. Environment: climate, critters, sustainability**



ARCTIC  
NORWEGIAN  
2006-2009



Ministerial Meeting  
Tromsø, Norway  
9 April 2006



# Permafrost degradation - NPRA, Alaska

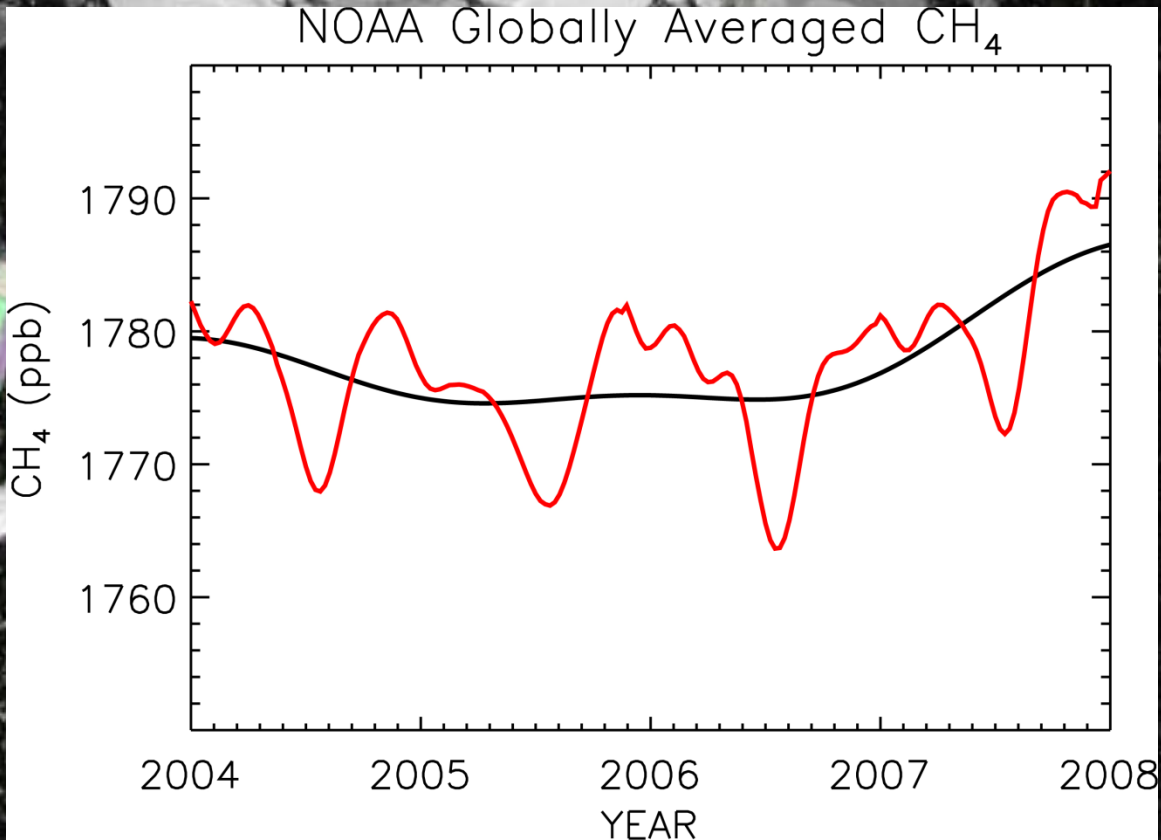
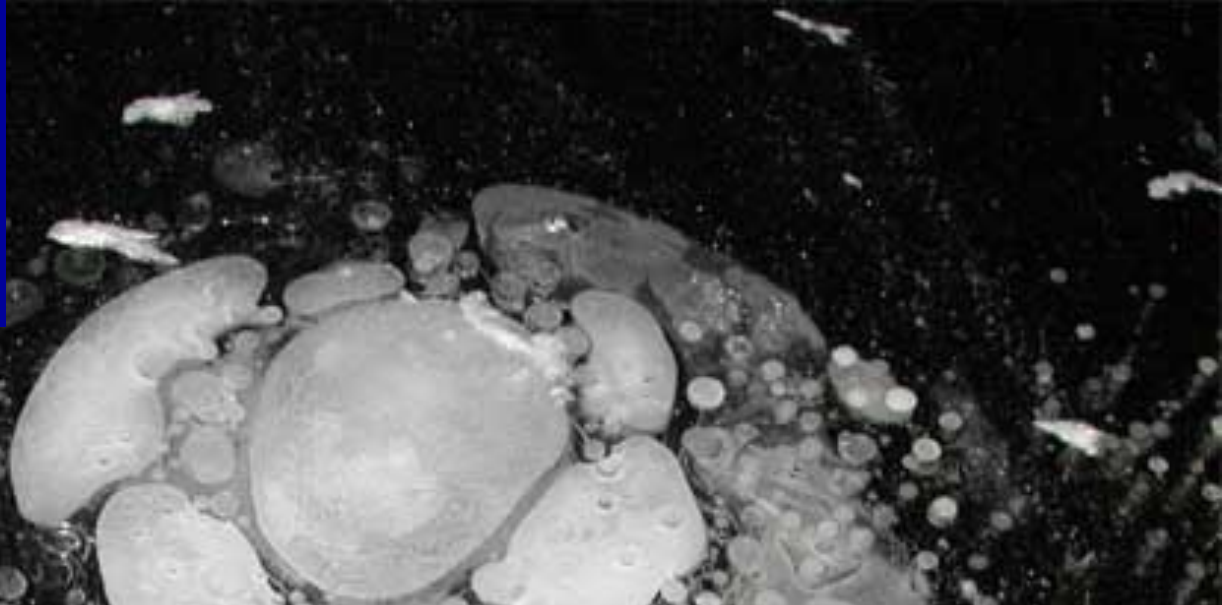


Beaches  
erode...





# Methane spikes...

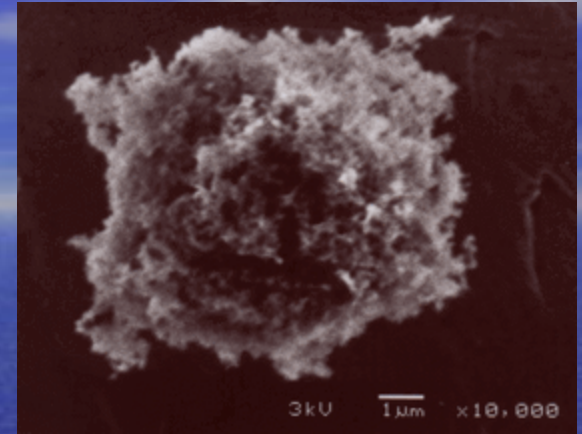






<http://www.youtube.com/watch?v=HvhhsGnC1-c>

# Is soot causing Arctic amplification?



Arctic Council  
Black Carbon Task  
Force, 2009





# Ocean Acidification - Potential Fishery Effect

- Larval blue king crab, Kodiak Alaska, pilot experiment
- Tested range of projected global ocean pH change over the current century.
- ~15% reduction in growth and ~67% reduction in survival when pH was reduced 0.5 units.



M. Litzow and J. Short, AFSC







# Ice-dependent seals

Ringed seals



Bearded seals



Pups in under-snow lairs in coastal fast ice:  
feeds in water column/under ice

Pups/feeds in pack ice zone over shelf,  
in areas of rich benthic productivity

## Varying dependence on sea ice

Pups/molts in marginal ice zone, perhaps as a predator avoidance strategy



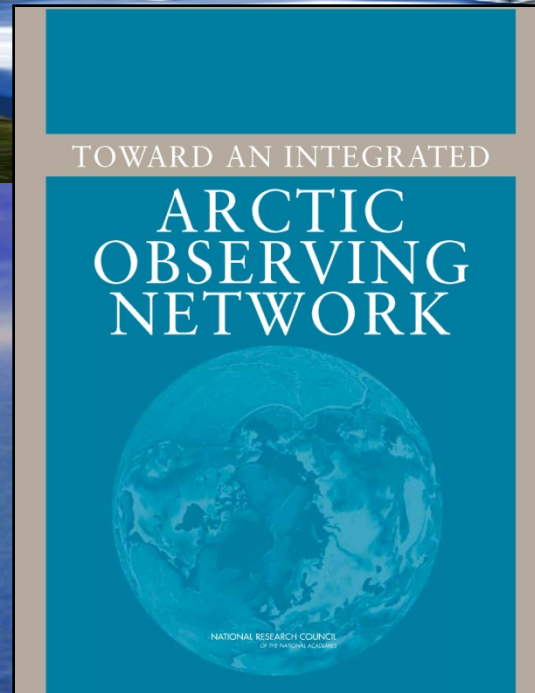
Ribbon seals

Pups in pack ice – uses land haulout sites during summer



Spotted seals









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