

# Chukchi Edges

on board the RV Marcus G. Langseth

for the NMFS Open Water Meeting

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8 March 2011



# Outline

- Project
- Objectives
- Structure
- Stratigraphy
- Cruise Planning
- Ice Conditions
- Track Sequence
- Instruments
- Array
- Source Signature
- Possible Conflicts?
- Mitigation

# Project

## Exploring for Ideas

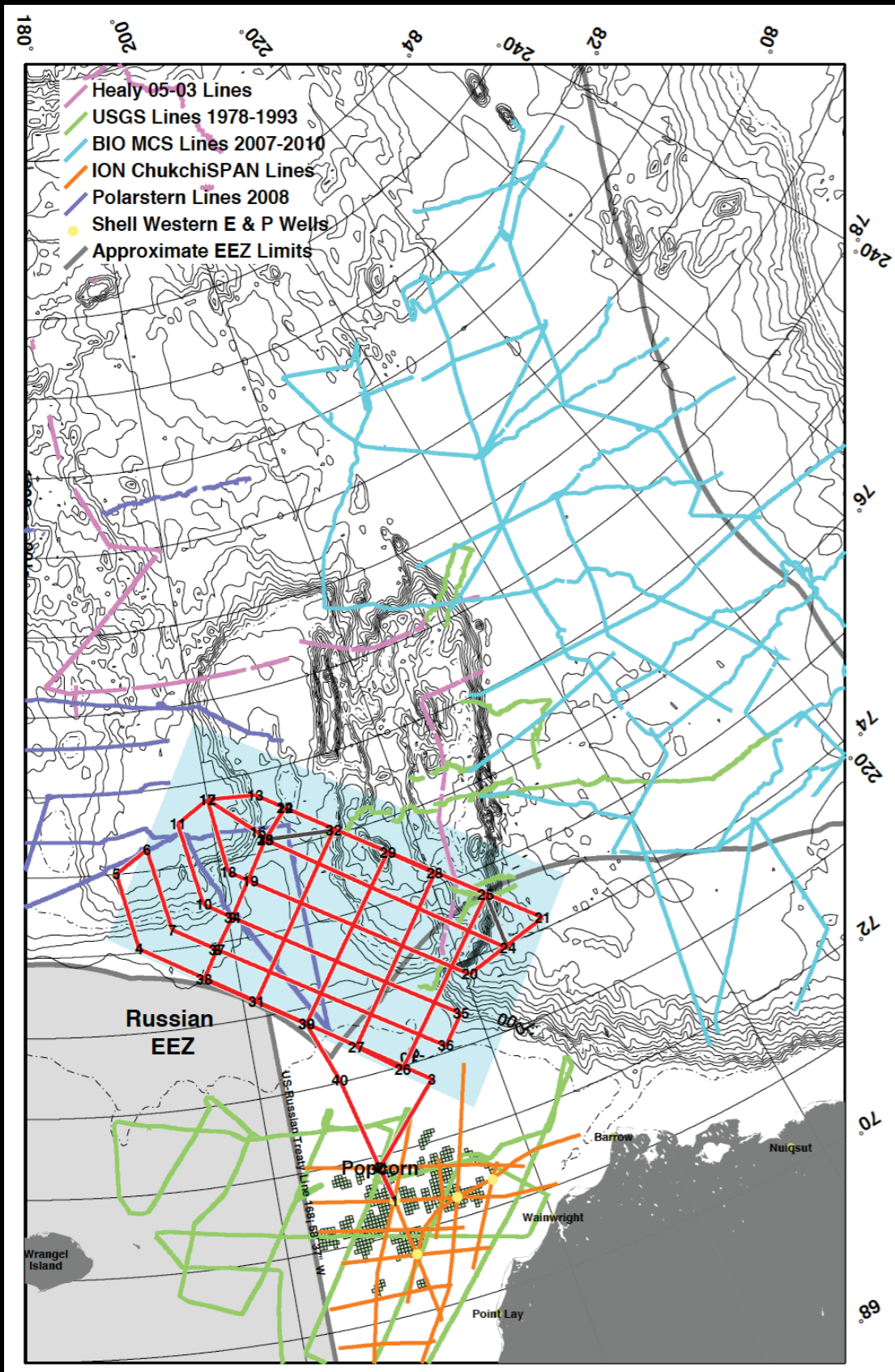
- NOT a 3-D Survey
- Hypothesis driven research
- A type of remote sensing
- NSF - funding
- Will support a PhD student
- Two years of data exclusivity

# Cruise Plan

Image Southern Edge Structure  
Inter-correlate wells and lines

Test models for the opening of  
the Canada Basin

Develop age controls on Arctic  
Ocean Stratigraphy

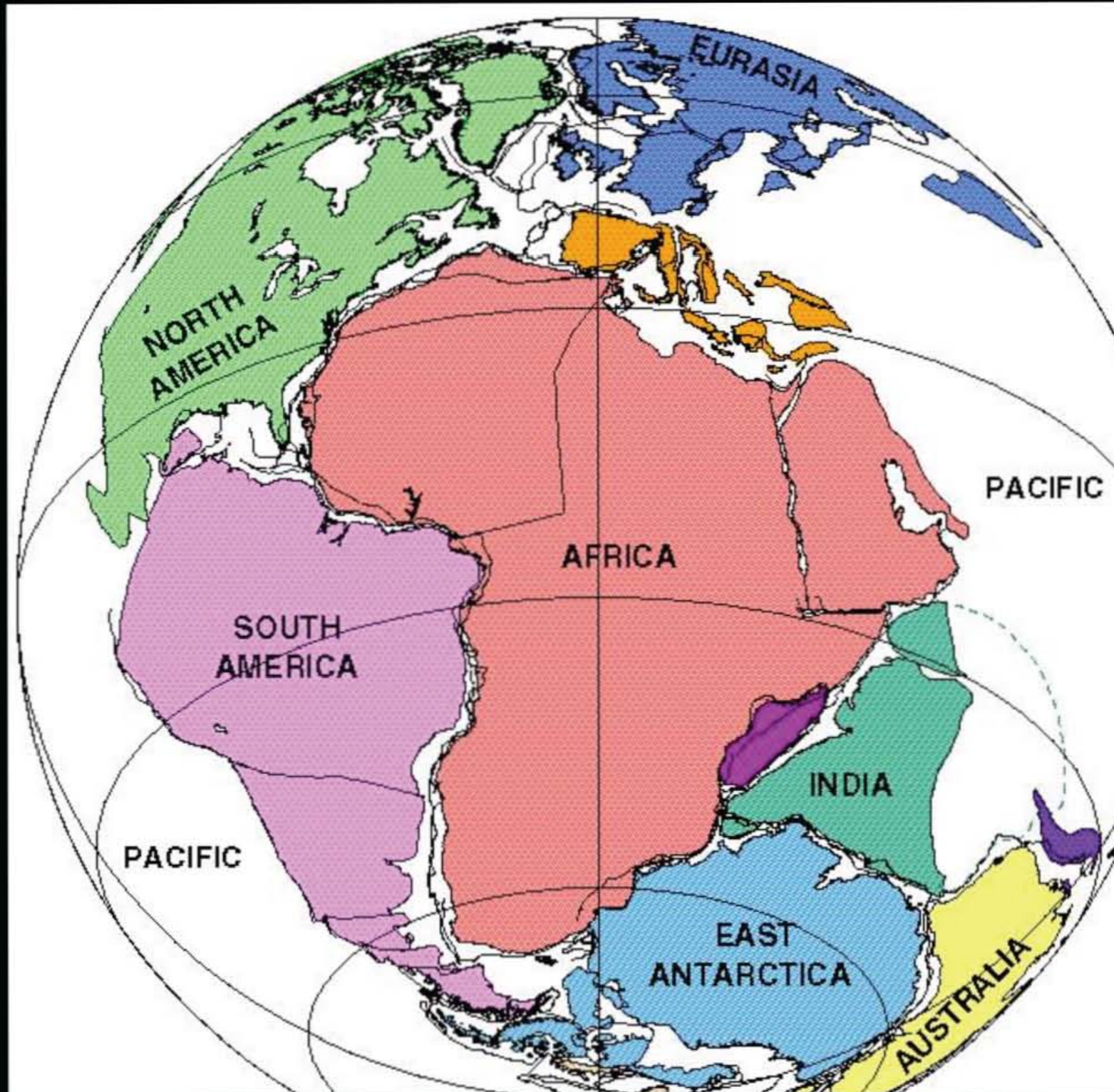


# Geology 101

- Continents are permanent
- Oceans are temporary
- The surface of the earth is in motion
- Layered rocks record the history of the earth
- We can study earth history by imaging stratigraphy with seismic reflection data



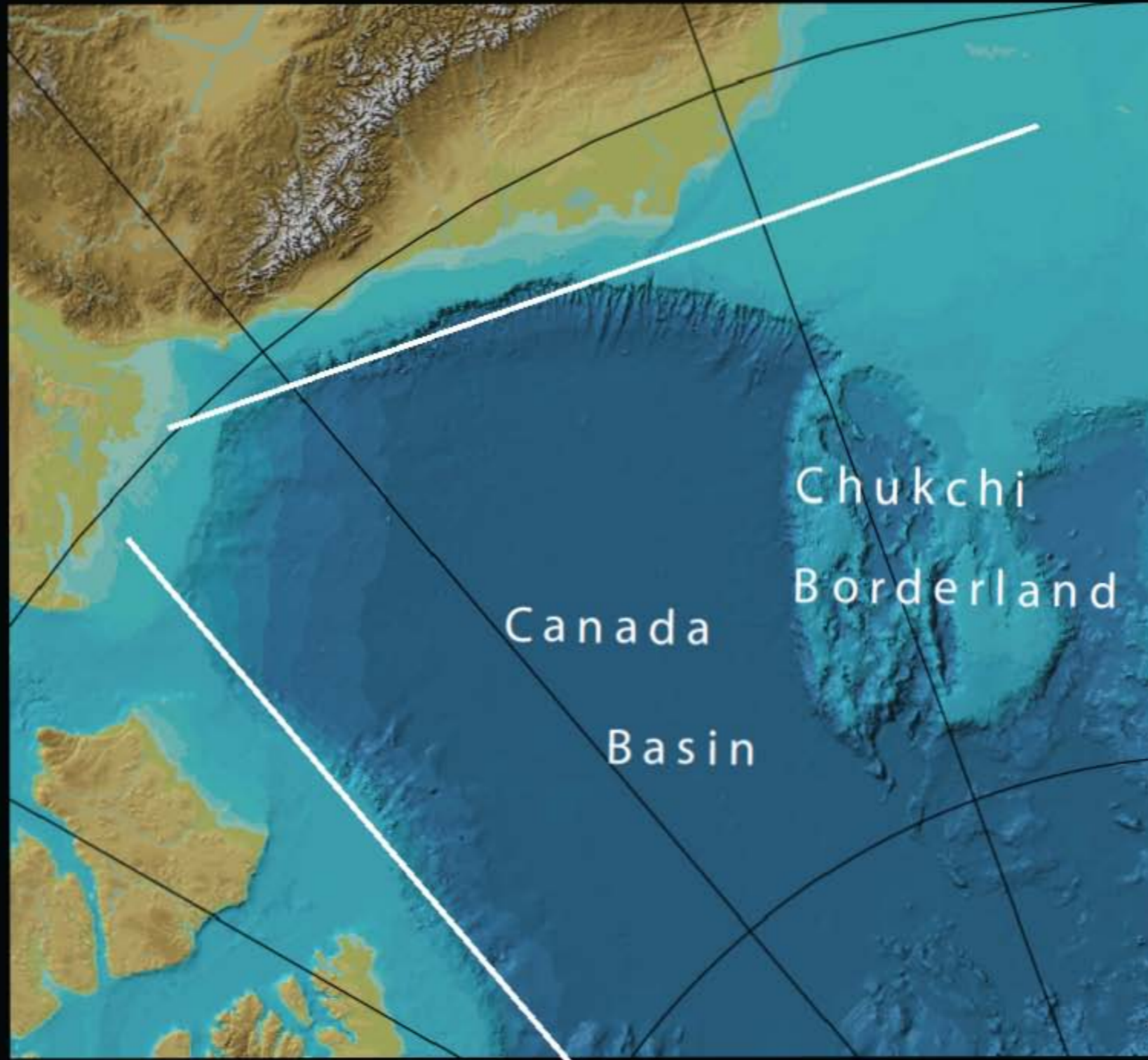
# Continents Fit Together





# Chukchi Borderland/ Canada Basin

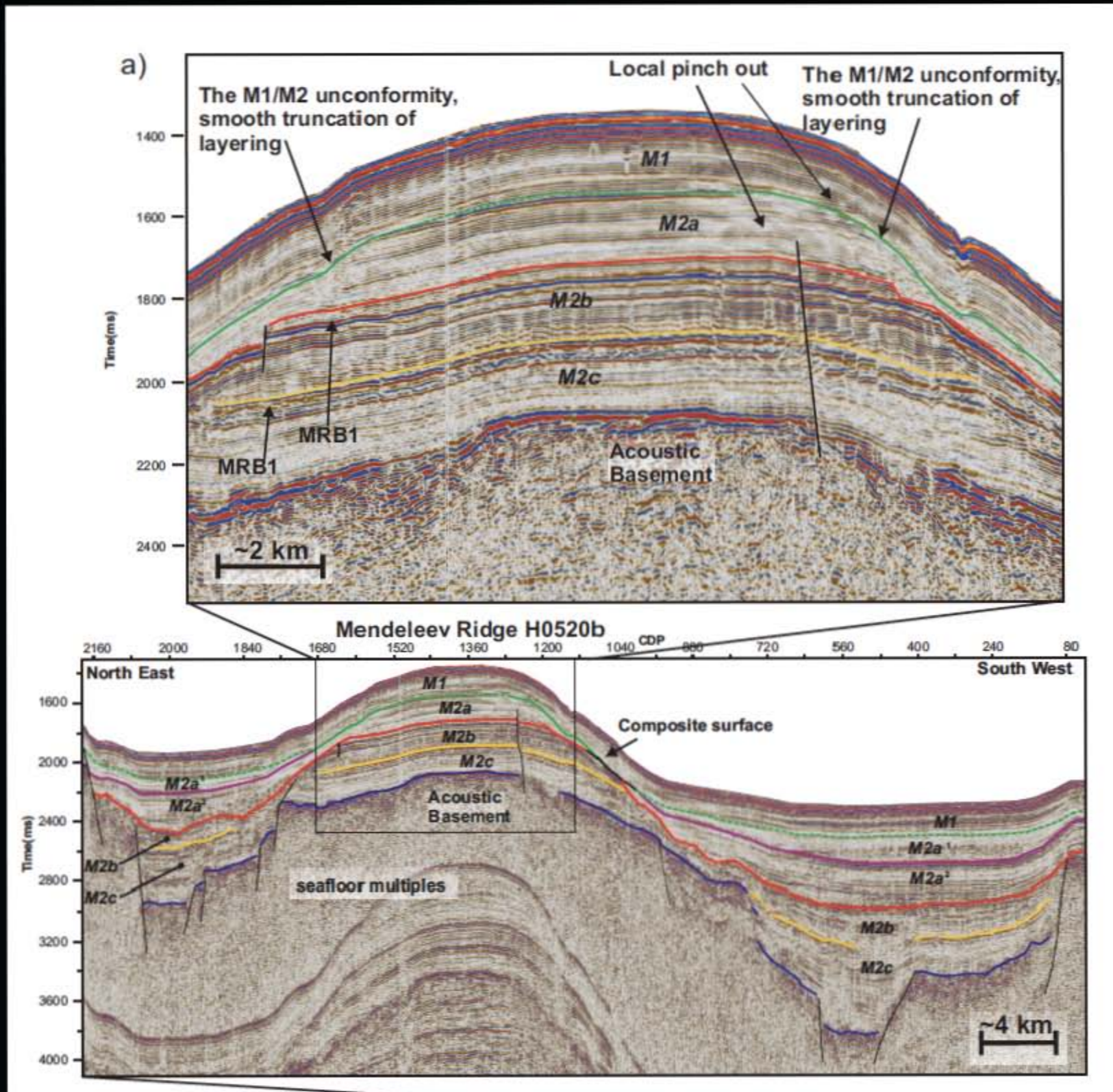
“the Windshield wiper”





# Mendelev Ridge Stratigraphy

## Complex History no Dates





# Cruise Planning

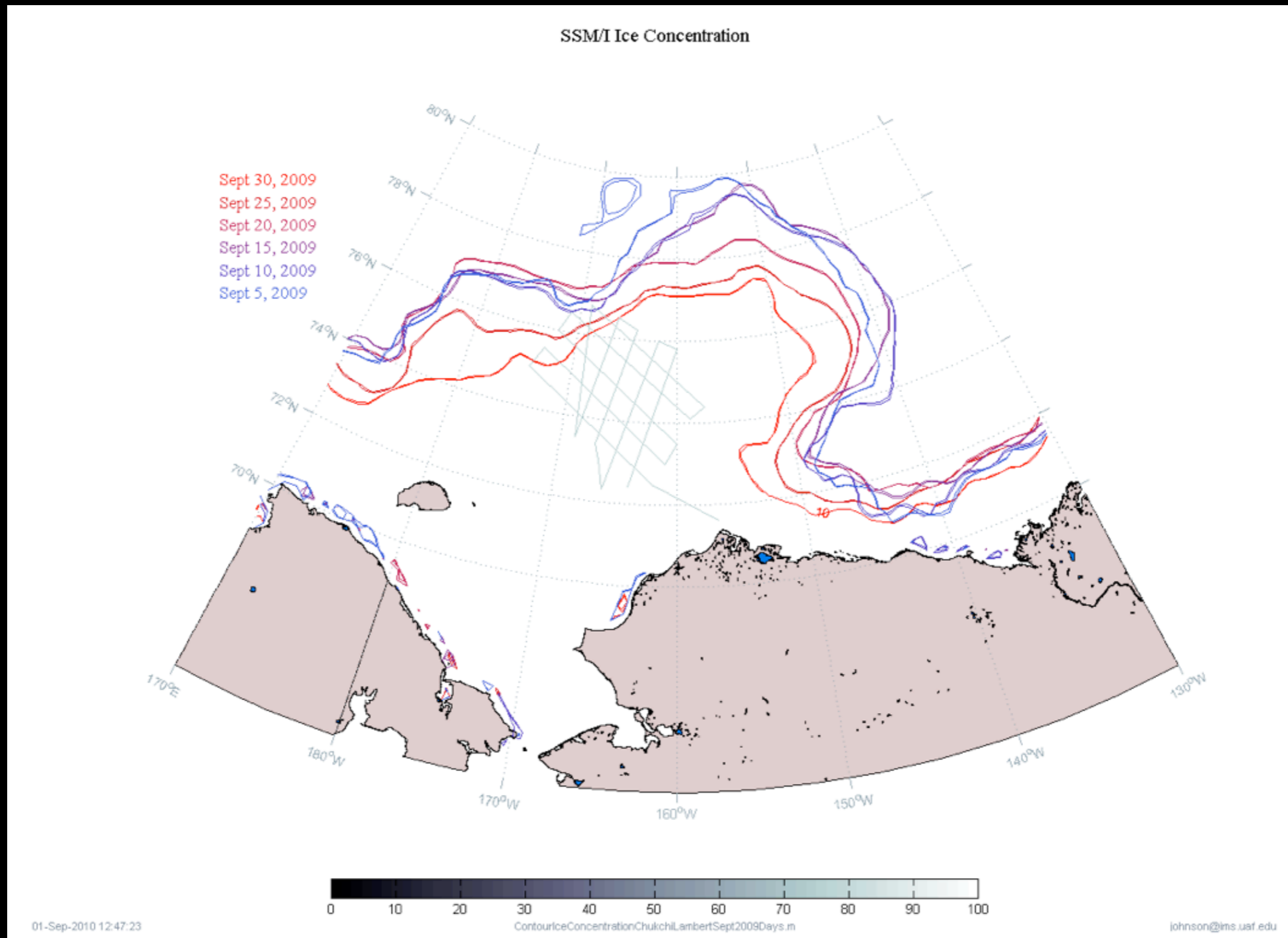
5 September to 9 October 2011  
Dutch Harbor to Dutch Harbor

RV Langseth will arrive in the operational area a few days prior to the ice minimum

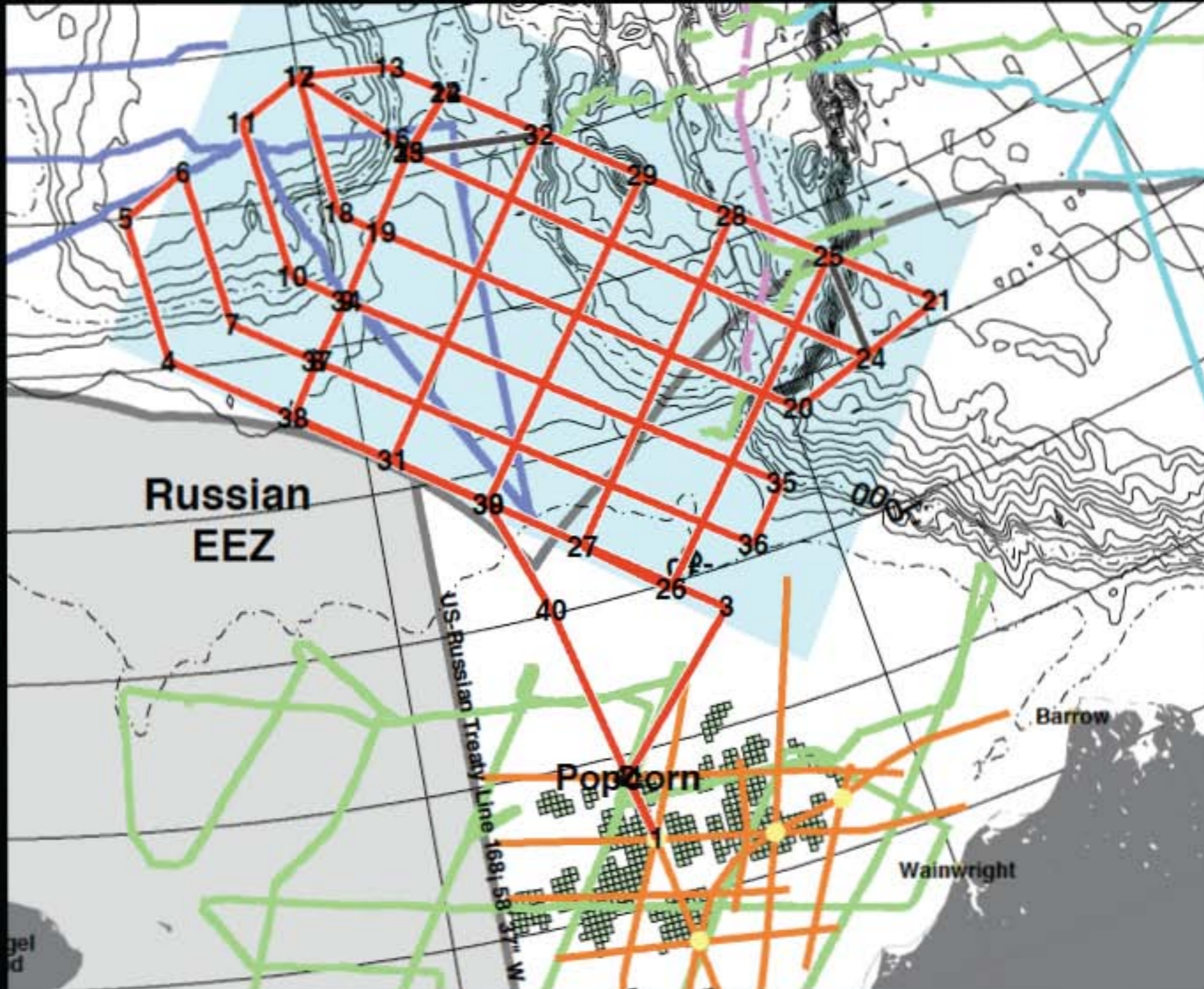
**The Langseth is not ice reinforced**

# Ice concentration

## September 2009



# Track Sequence





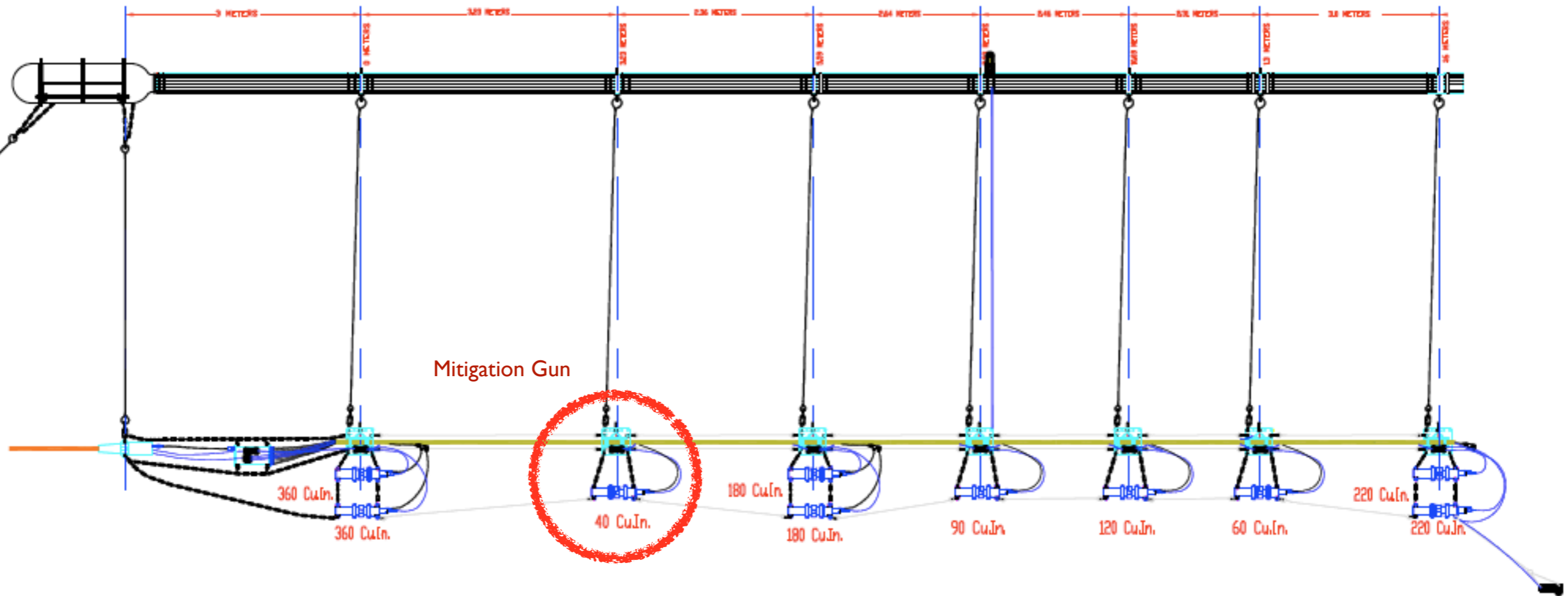
# geophysical equipment

- Kongsberg EM 122 Swath Bathymetric Sonar (12 kHz)
- Knudson 3260 sub-bottom profiler (2.0-6.0 kHz)
- RD Instruments Ocean Surveyor 150 kHz  
Acoustic Doppler Current Profiler
- Bell BGM-3 Gravimeter
- Towed magnetometer
- Sonobuoys

# Multi-channel Seismic Reflection Gear

- RV Langseth is the primary MCS vessel in the academic research fleet.
- It is well-equipped for multi-channel seismic reflection data acquisition and general geophysics
- It is capable of 3-D Survey, but this will be a 2-D survey
- 1830 cubic inches total volume over ten independent airguns
- 40 cubic inch mitigation gun (1 of the 10)
- Approximately 1/3 the volume of a typical oil industry gun array and 1/4 of the volume Langseth can tow
- Langseth will tow a 2 kilometer streamer

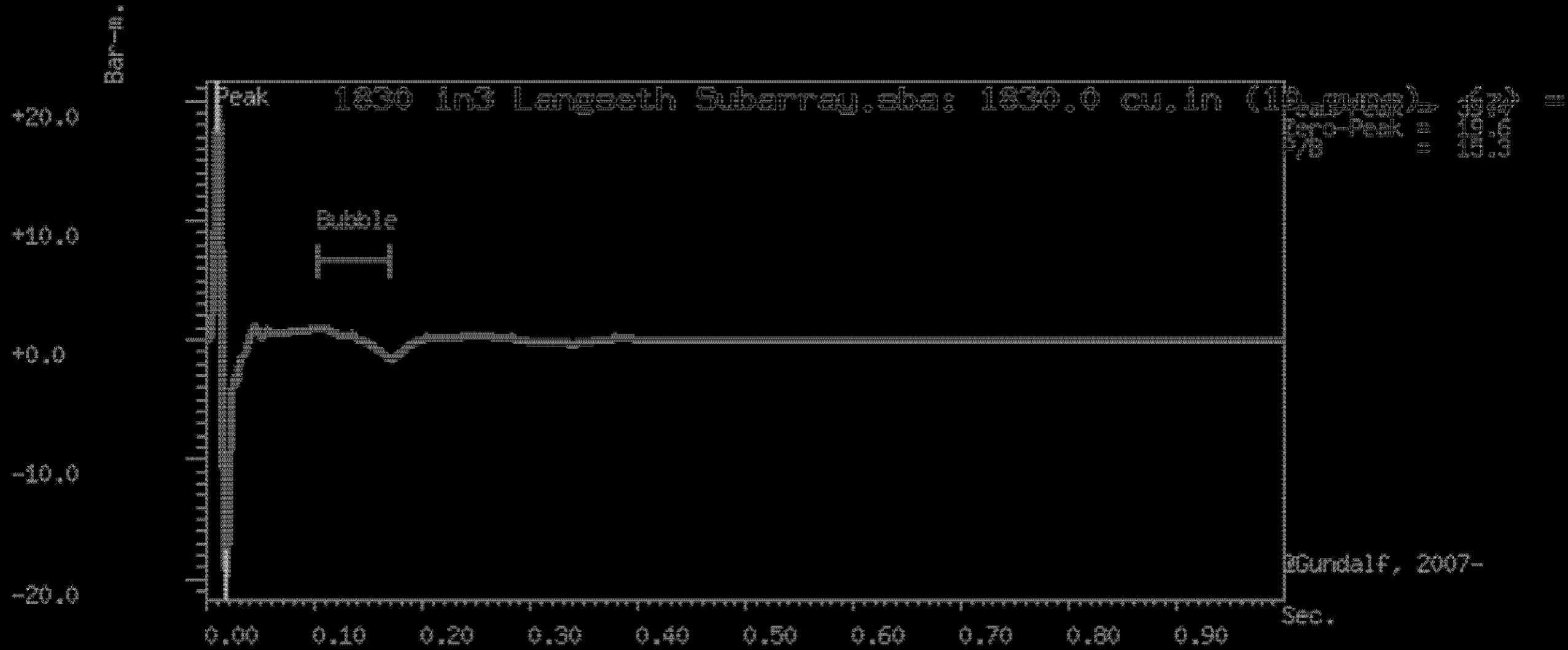
# 10 Gun Array



Seeking relatively high resolution images of stratigraphy and structure



# Source Signature



# Modeled array sound levels

Source and Volume	Tow Depth (m)	Water Depth	Predicted RMS Radii (m)			
			190 dB	180 dB	170 dB	160 dB
Single Bolt airgun 40 in <sup>3</sup>	6	Deep (>1000 m)	12	40	120	385
		Intermediate (100–1000 m)	18	60	180	578
		Shallow (<100)	150	296	500	1050
1 String 10 airguns 1830 in <sup>3</sup>	6	Deep (>1000 m)	130	425	3180	14,070
		Intermediate (100–1000 m)	130	1400	5570	13,980
		Shallow (<100)	190	1870	5510	14,730

TABLE I. Maximum predicted distances to which sound levels  $\geq 190, 180, 170,$  and  $160$  dB re  $1 \mu\text{Pa}_{\text{rms}}$  could be received in various water-depth categories during the proposed survey in the Arctic Ocean. The distances for the 10-airgun array are the averages of modeled 95% percentile distances at modeling sites in each depth range. **The 180- and 190-dB levels are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS;** these levels were used to establish the exclusion zones. If the PSO detects marine mammal(s) within or about to enter the appropriate exclusion zone, the airguns will be powered down (or shut down if necessary) immediately.

# IHA and community outreach

- Consultation with the Alaska Eskimo Whaling Commission - 17 Feb 2011 in Barrow
- Primary AEWC concern focused on real time communications to and from the ship
- Plan of Cooperation has been developed
- Draft Request for IHA has been submitted to NMFS



# Possible Conflicts?

- Closest approach to Barrow will be ~145 nautical miles (270 km) WNW of Barrow.
- Closest approach to any community, while active, will be at our survey starting point ~100 nautical miles (180 km) NW of Point Lay
- I anticipate little or no conflict with community activities during the cruise.
- While active, we should mostly be north of known bowhead migration routes.

# Mitigation Plan

- 5-6 Protected Species Observers on board
- Visual Monitoring from 21 meters above the waterline
- Passive Acoustic Monitoring program
- Ramp up and ramp down procedures
- Power-down procedures

# Results

- Constraint on the development of the Arctic Ocean
- Better understanding of the continents around it
- Preparation for Scientific Ocean Drilling
- One shiny bright, fresh PhD (Ibrahim Ilhan)