Chukchi Edges

aka MGL 11-12

Bernard Coakley
Geophysical Institute
University of Alaska

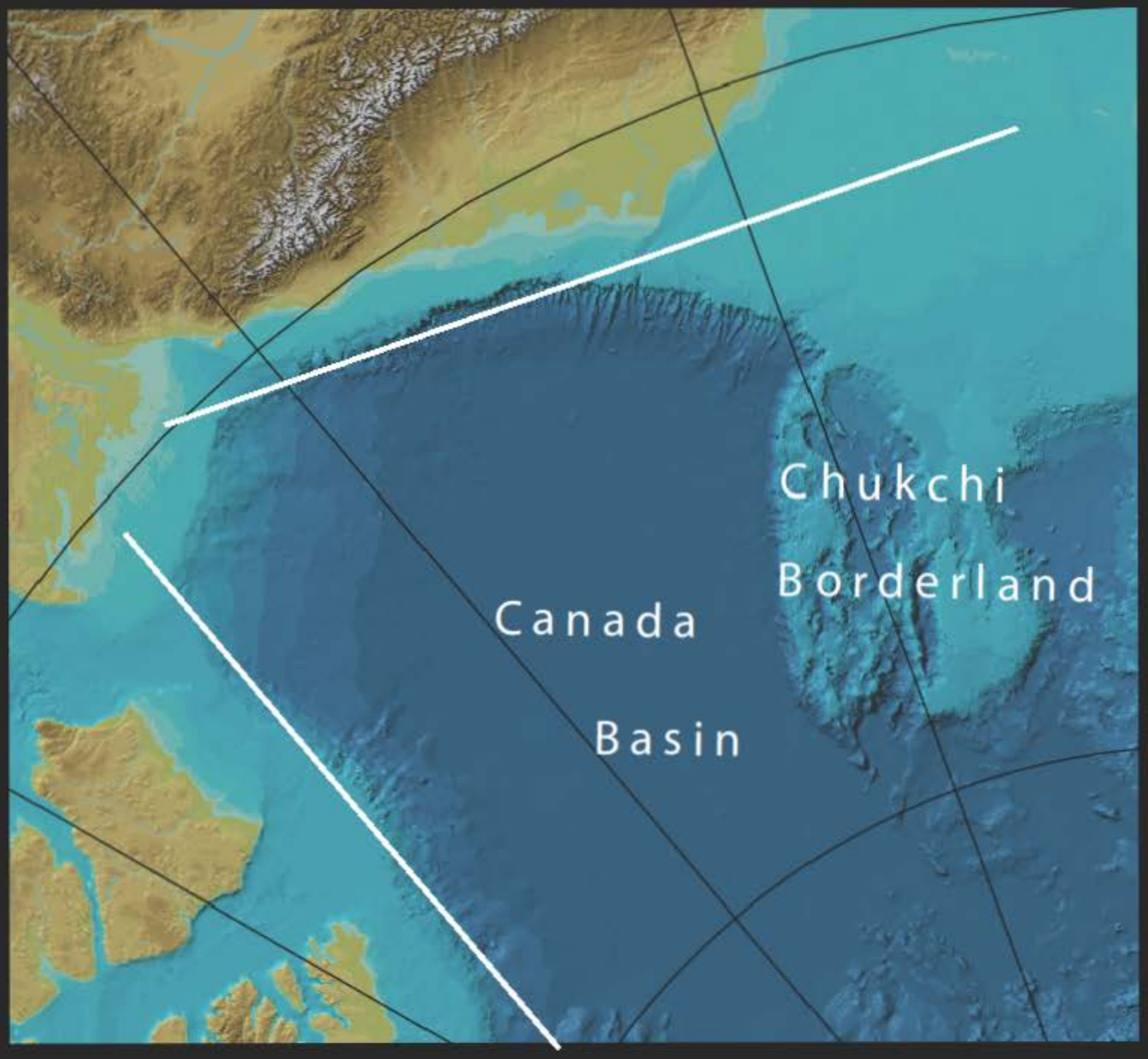
6 March 2012
Open Water Meeting

Chukchi Edges

- NSF funded
- 2-D multi-channel seismic reflection survey
- 8 Sept to 9 Oct; Dutch Harbor to Dutch Harbor
- Acquisition 13 Sept to 5 October
- ~5200 km of multi-channel seismic reflection data
- RV Marcus G. Langseth (non-ice reinforced)
- ~98% MCS uptime

Chukchi Borderland/ Canada Basin

"the Windshield wiper"



Cruise Plan

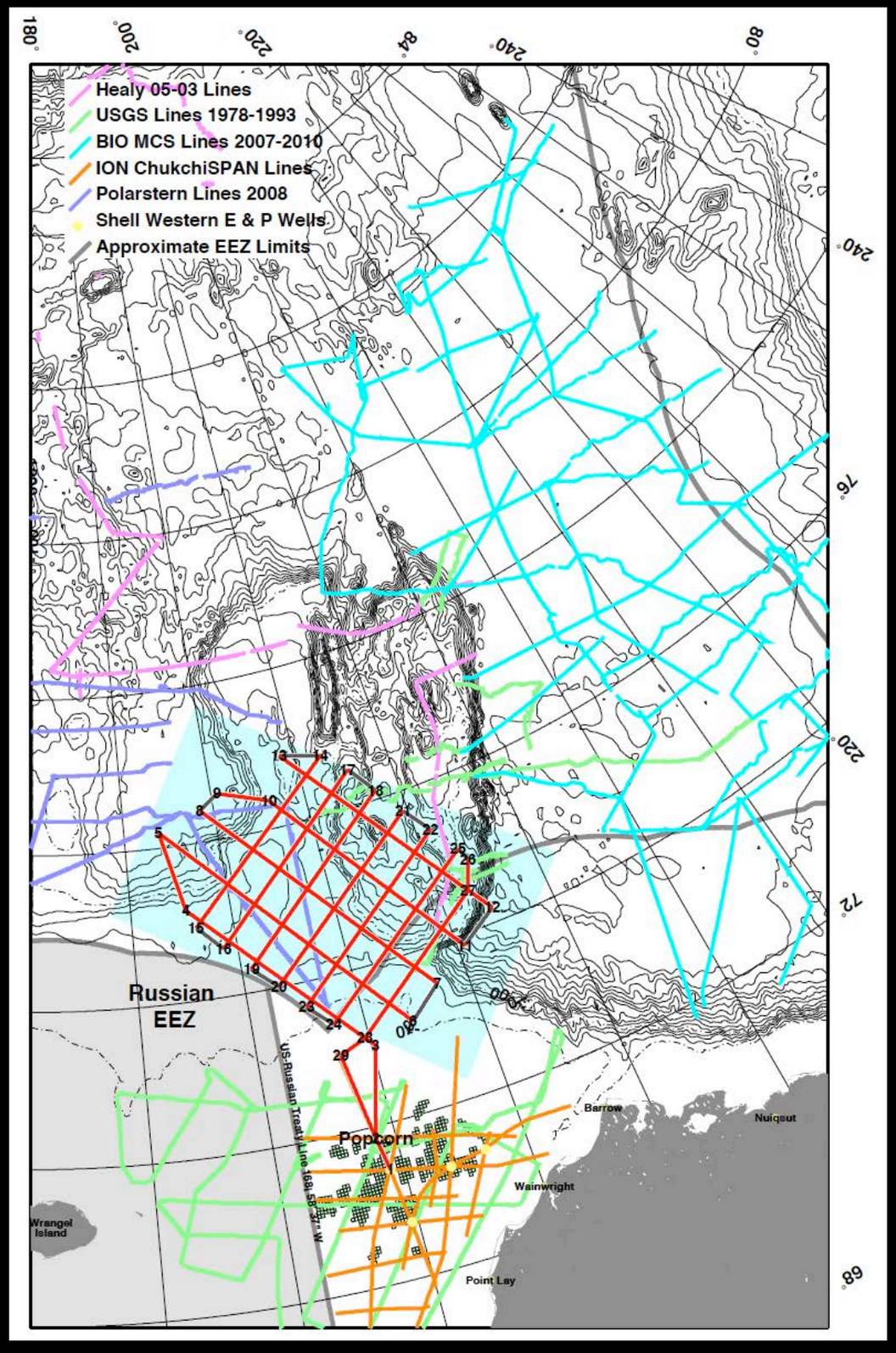


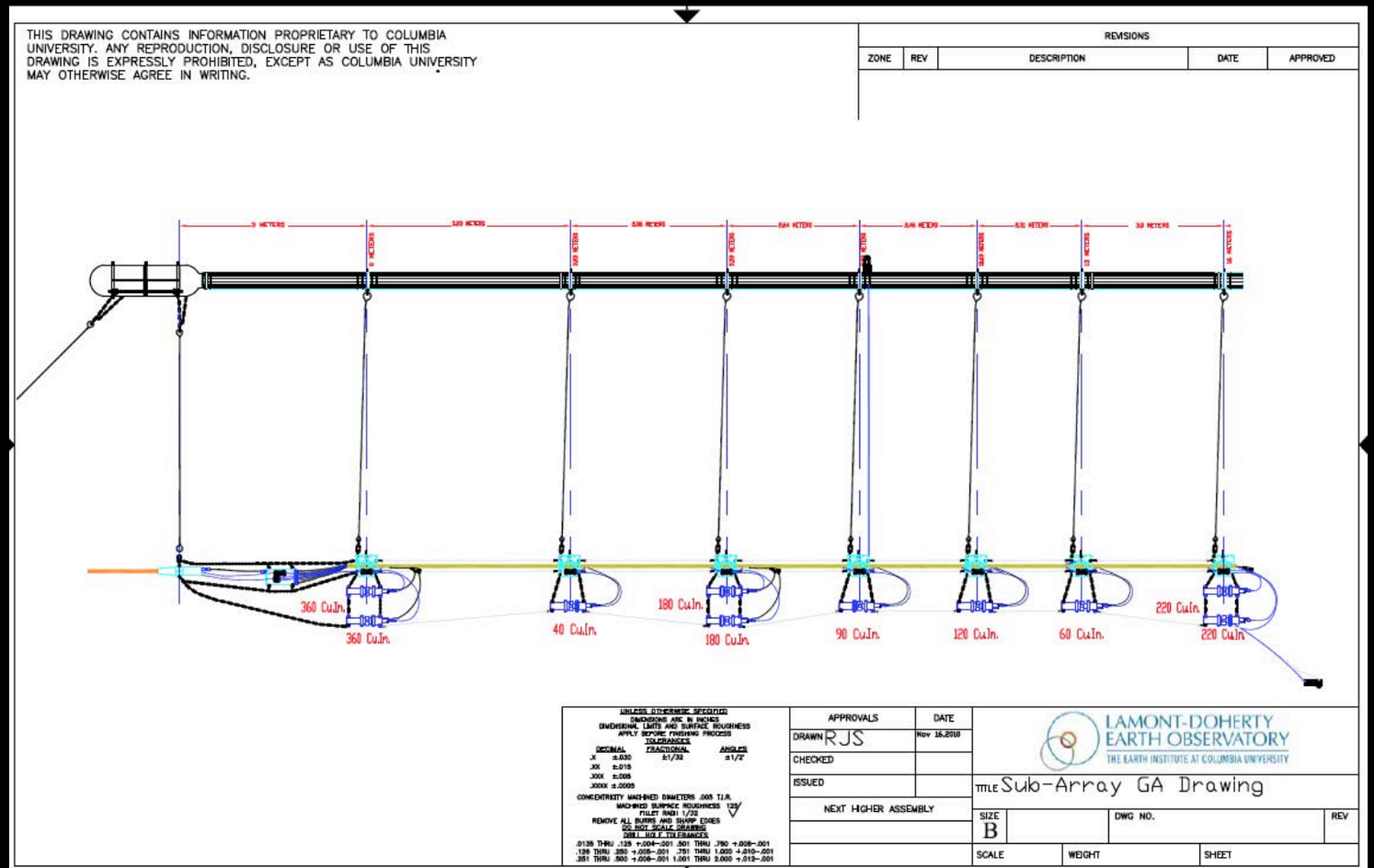
Image Southern Edge Structure
Inter-correlate wells and lines

Test models for the opening of the Canada Basin

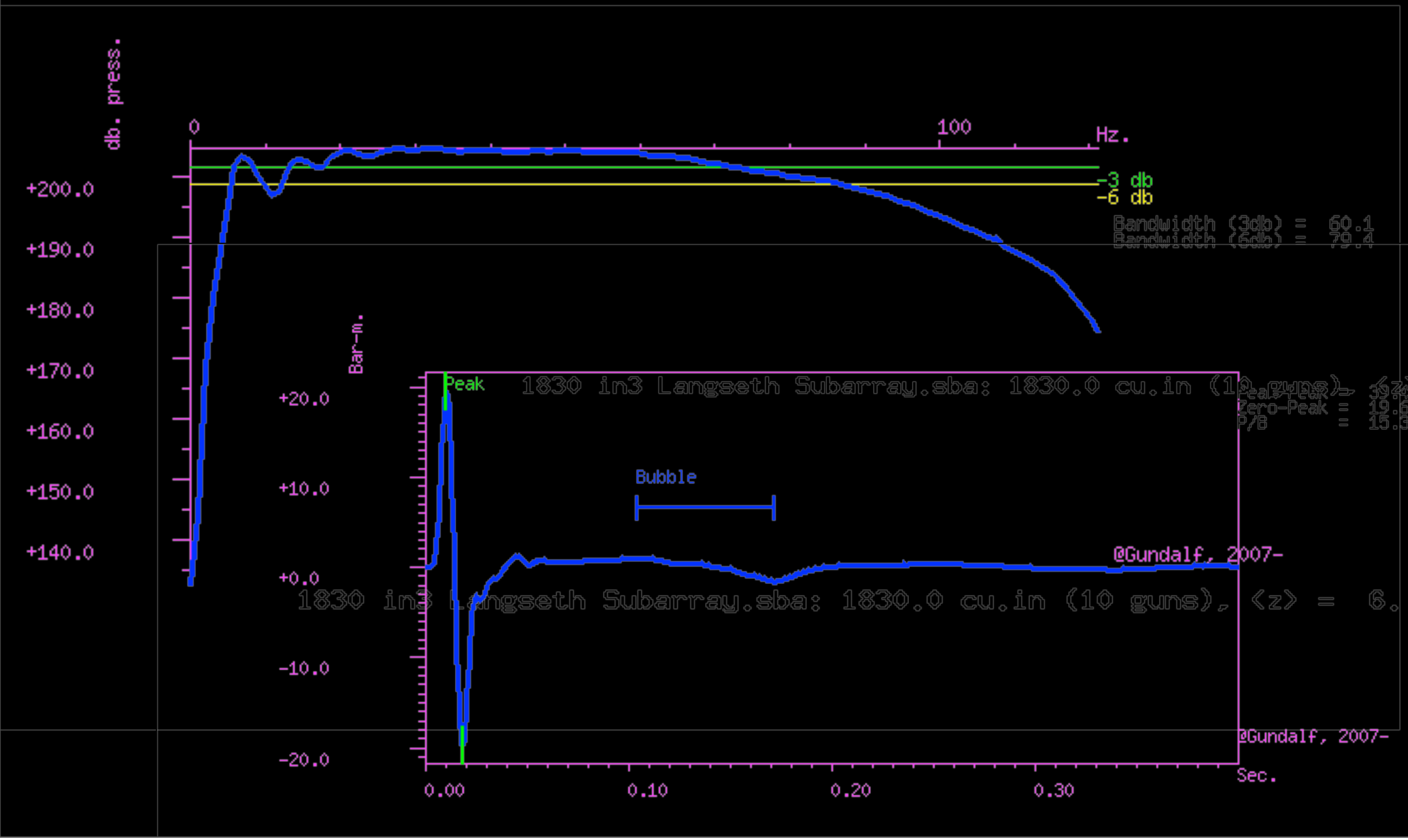
Develop age controls on Arctic Ocean Stratigraphy

MCS Set-up

- 1830 cubic inches total volume over ten independent airguns
- 6 km (458 channels) streamer



Source Signature



Other Acoustic Sources

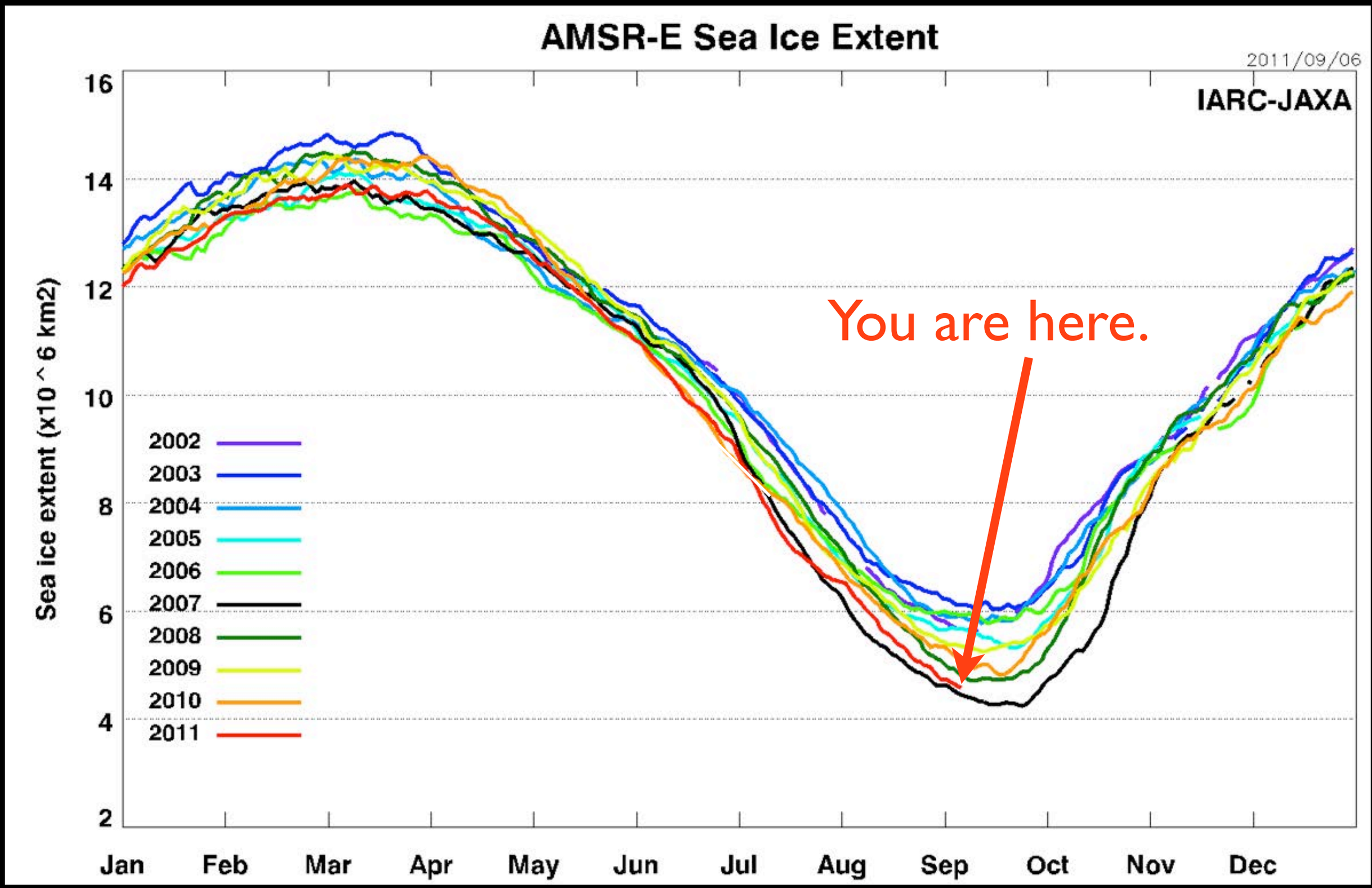
- Kongsberg EM 122 Swath Bathymetric Sonar (12 kHz)
- Knudson 320 B/R sub-bottom profiler (2.0-6.0 kHz)
- Two Acoustic Doppler Current Profilers (ADCP; 75 and 150 kHz)

Other Data Sets

- Gravity Anomaly
- Magnetic Anomaly
- Sonobuoys

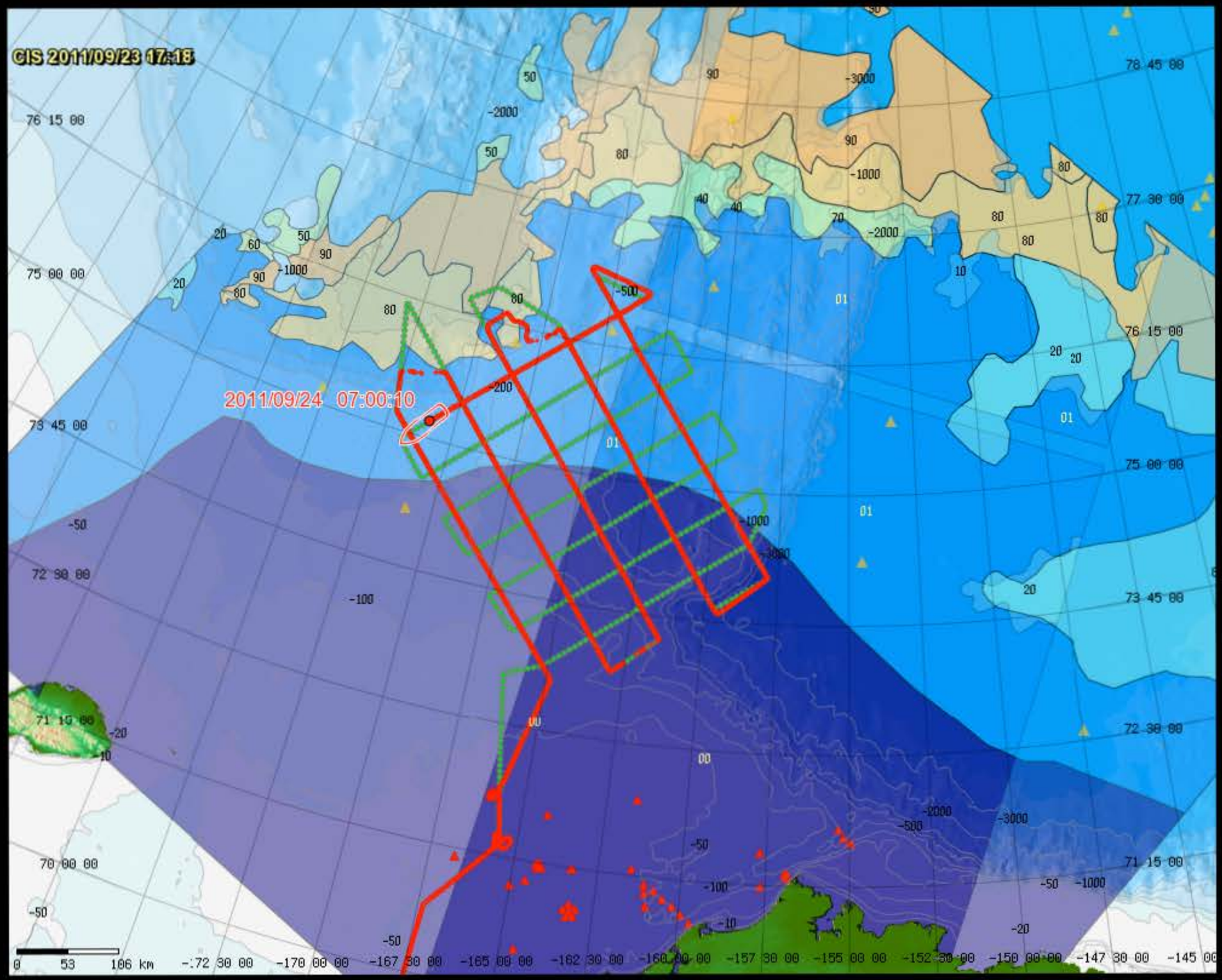
Why use a non-ice reinforced vessel?

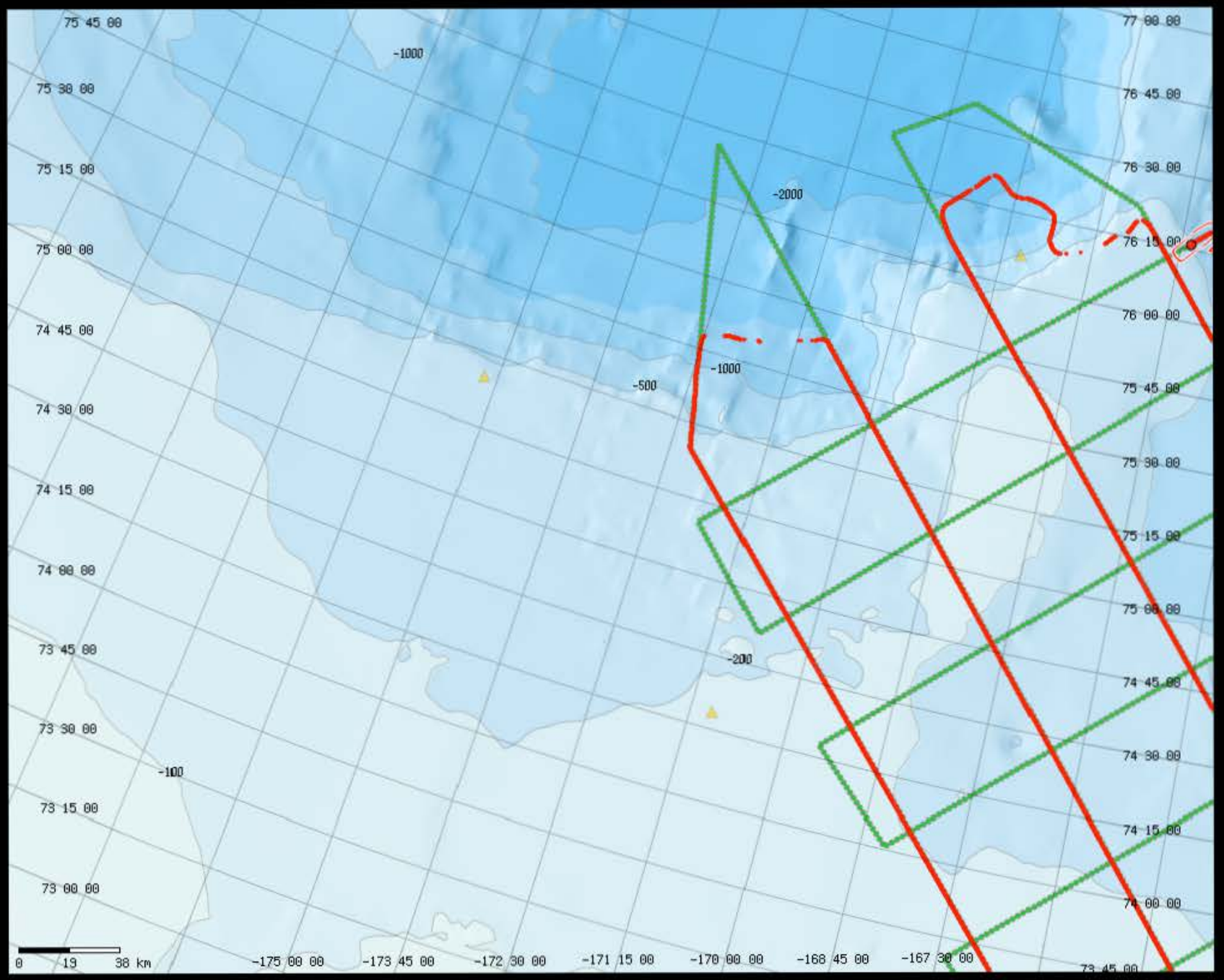
- Scavenger hunt for equipment for Healy (2010)
- Too much competition for Healy time
- RV Langseth schedule availability
- How can we operate safely, including at night?

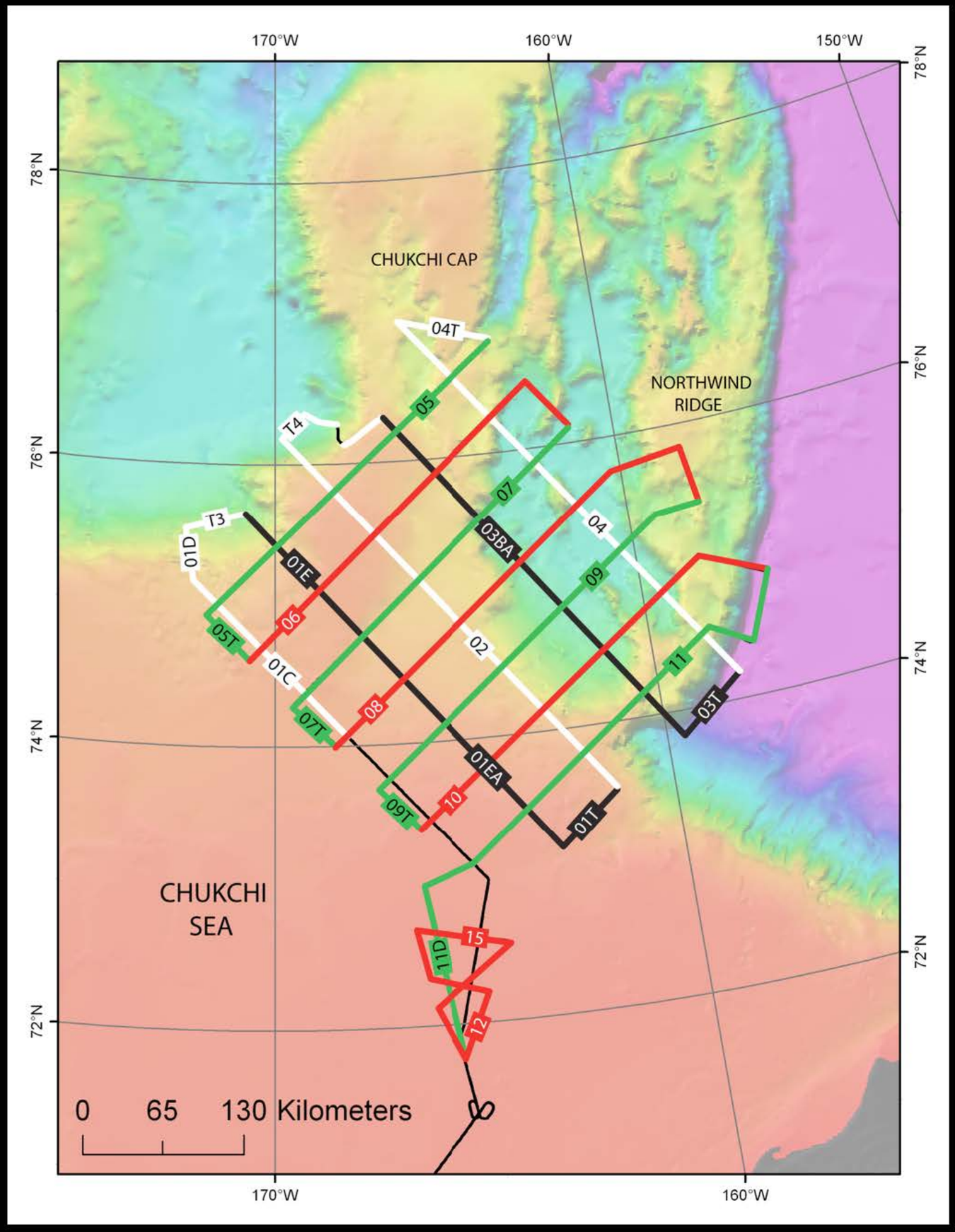

AMSR-E Sea Ice Extent
2011/09/06
IARC-JAXA
Sea ice extent (x10^6 km2)
16
14
12
10
8
6
4
2
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
You are here.

Mapserver Support

Integrates CIS interpreted imagery

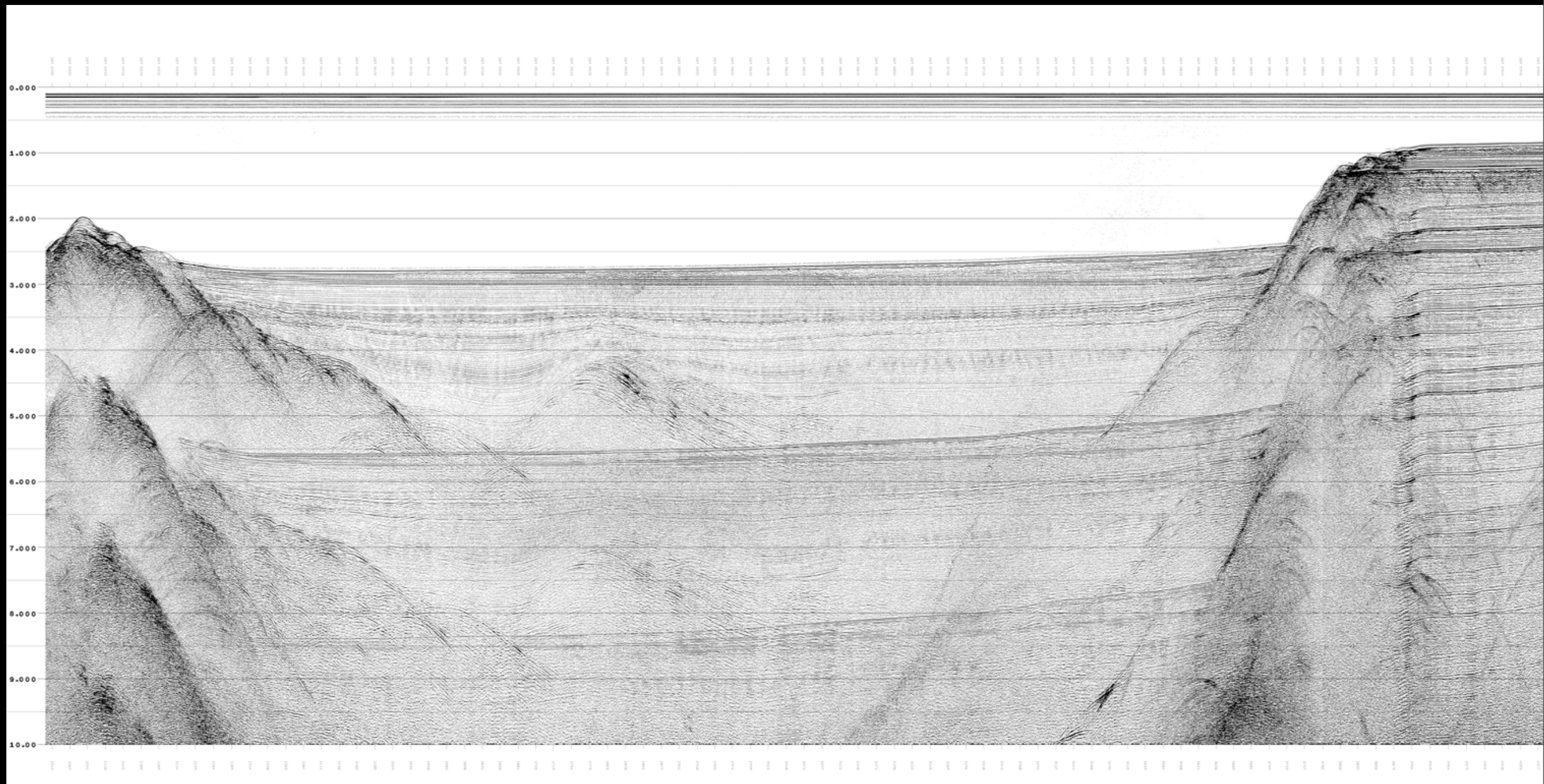


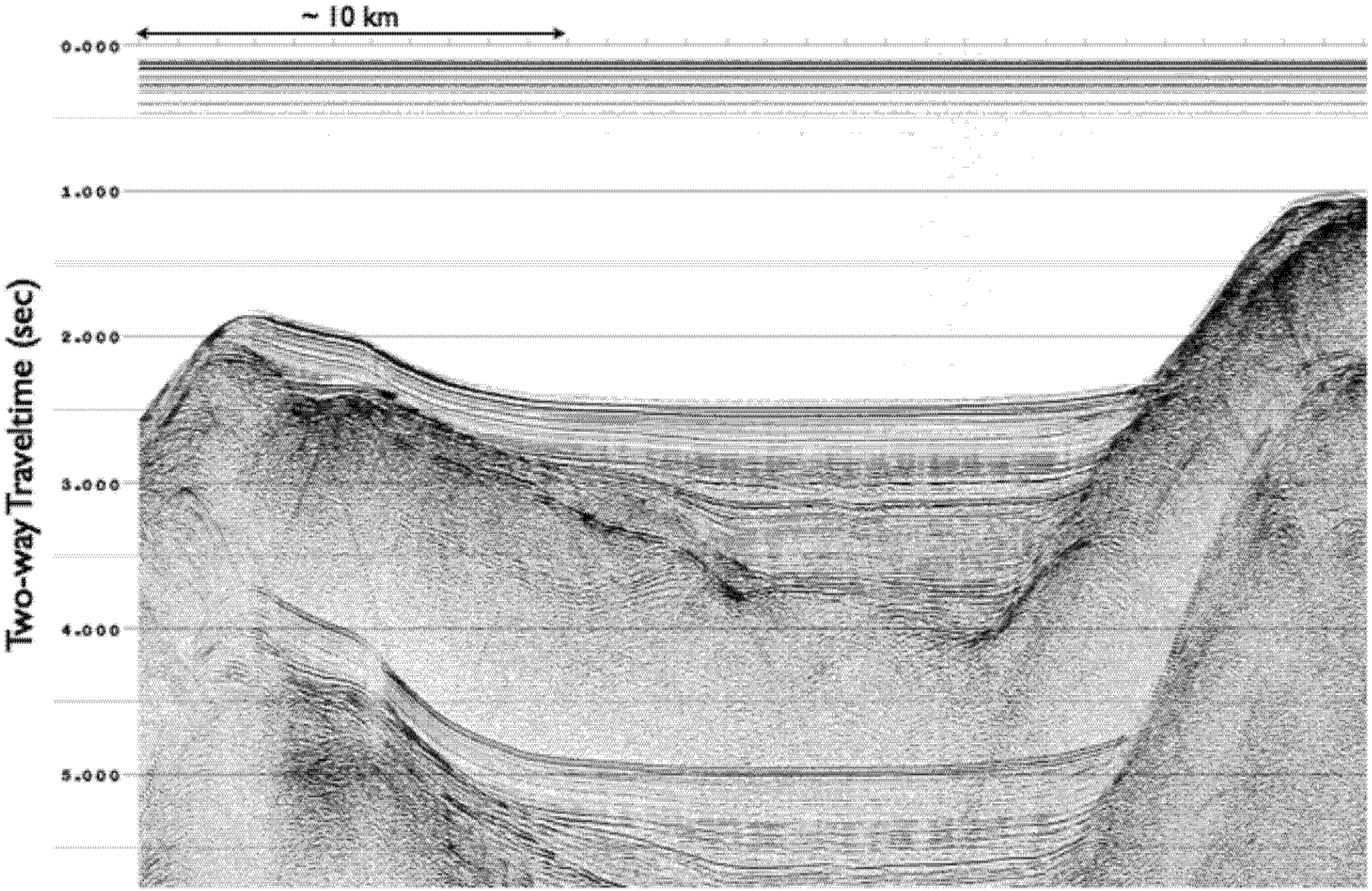

75 45 00
75 30 00
75 15 00
75 00 00
74 45 00
74 30 00
74 15 00
74 00 00
73 45 00
73 30 00
73 15 00
73 00 00
-1000
-2000
-500
-1000
-200
-100
77 00 00
76 45 00
76 30 00
76 15 00
76 00 00
75 45 00
75 30 00
75 15 00
75 00 00
74 45 00
74 30 00
74 15 00
74 00 00
73 45 00
0 19 38 km
-175 00 00
-173 45 00
-172 30 00
-171 15 00
-170 00 00
-168 45 00
-167 30 00


170°W
160°W
150°W
78°N
76°N
74°N
72°N
CHUKCHI CAP
NORTHWIND RIDGE
CHUKCHI SEA
04T
T4
05
07
03BA
04
09
T3
01D
01E
06
05T
01C
02
11
03T
08
07T
01EA
09T
10
01T
11D
15
12
0 65 130 Kilometers

MGL11-12-7b

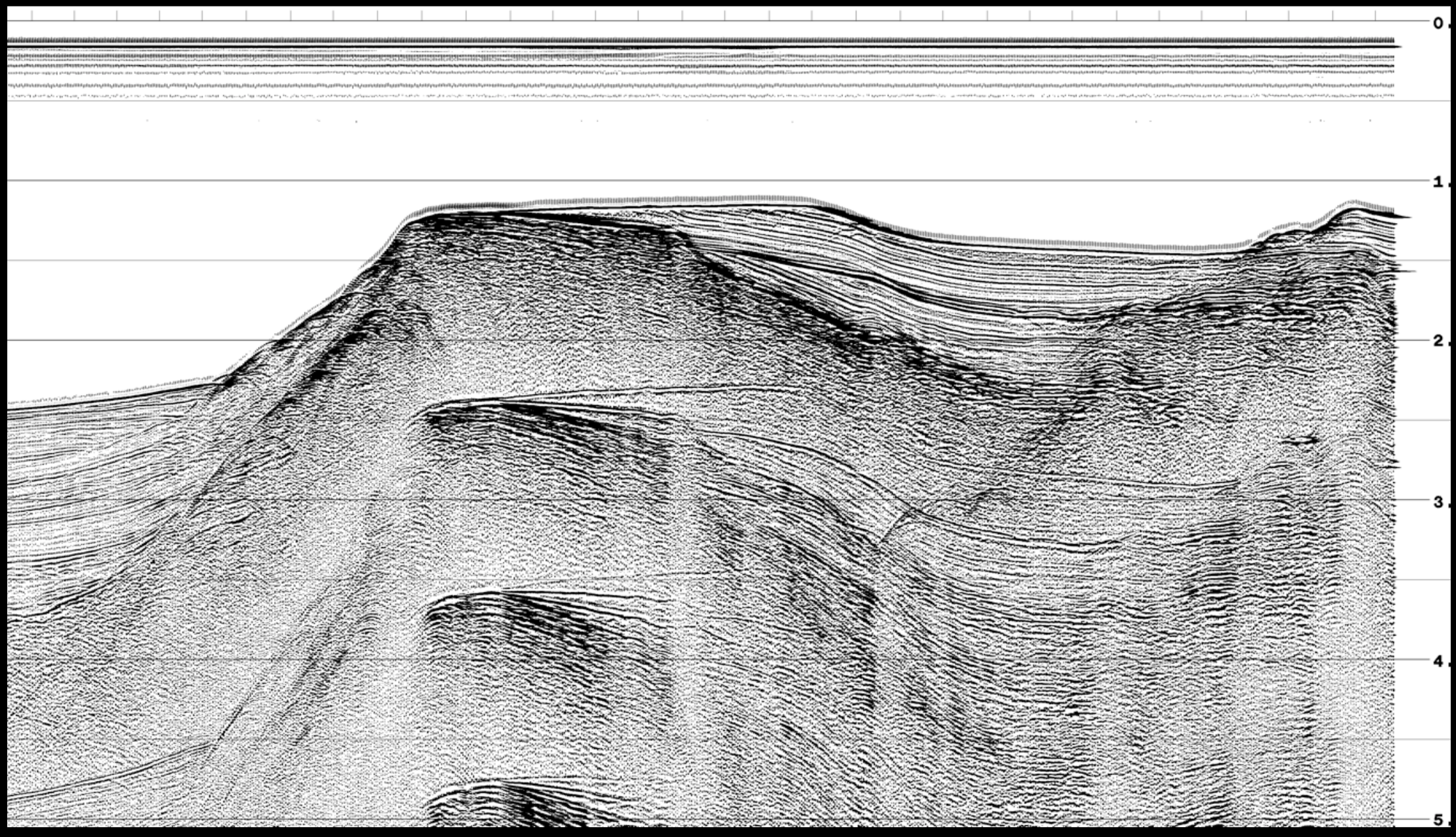
single channel field records



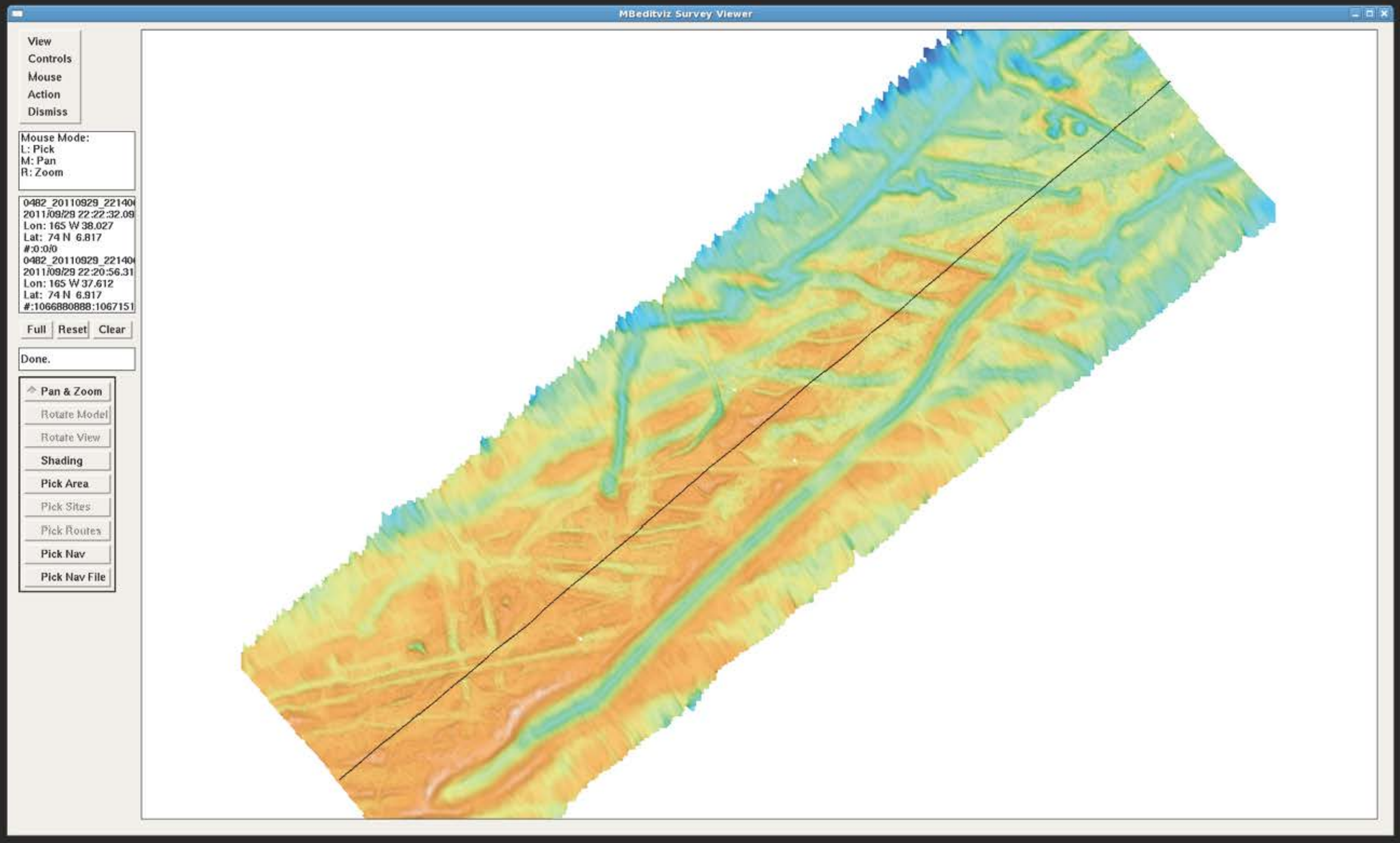

~ 10 km
0.000
1.000
2.000
3.000
4.000
5.000
Two-way Traveltime (sec)

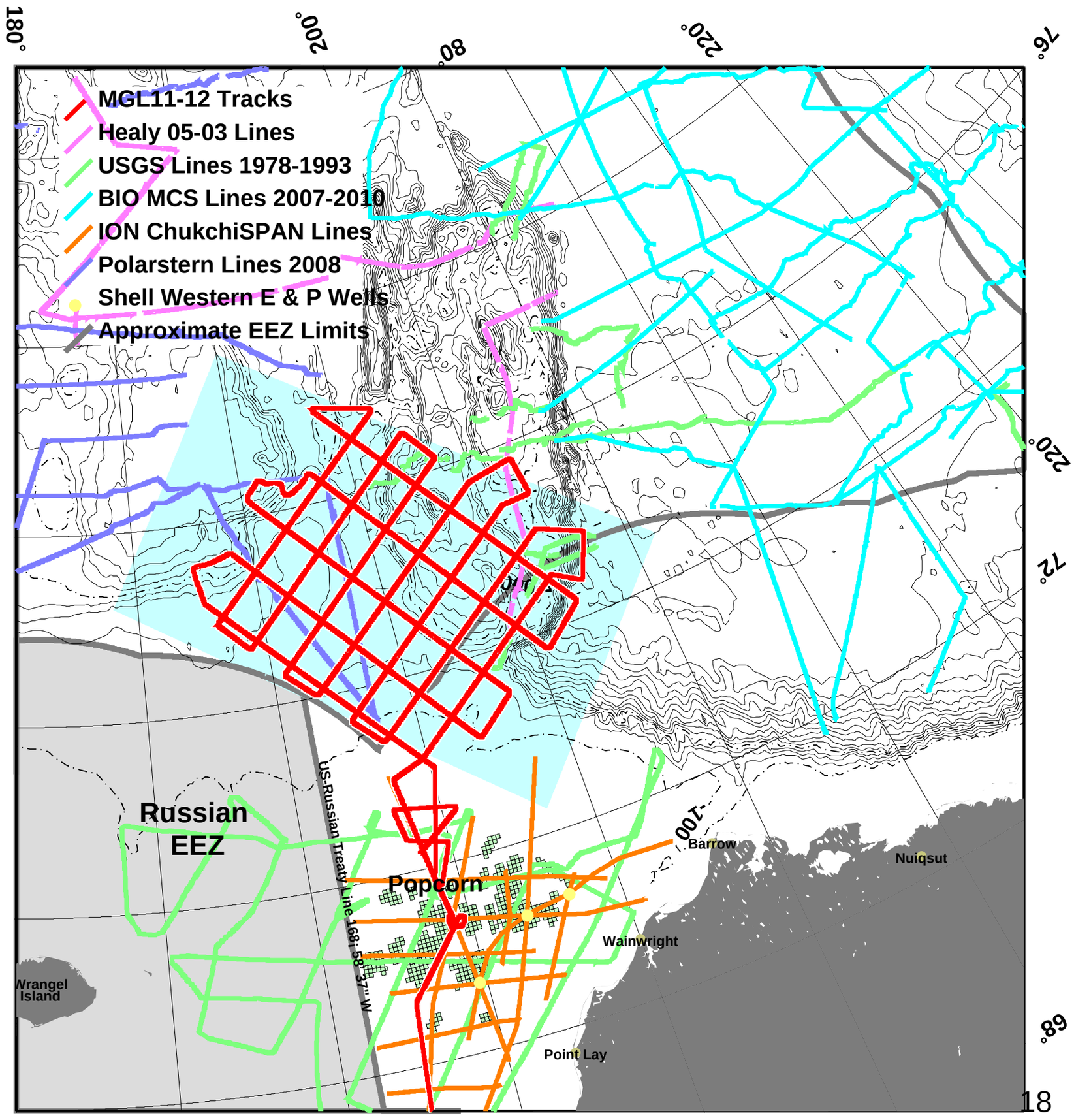
MGL11-12-10c

exposure and erosion



Multi-beam


MBedityiz Survey Viewer
View
Controls
Mouse
Action
Dismiss
Mouse Mode:
L: Pick
M: Pan
R: Zoom
0482_20110929_22140
2011/09/29 22:22:32.09
Lon: 165 W 38.027
Lat: 74 N 6.817
#:0:0/0
0482_20110929_22140
2011/09/29 22:20:56.31
Lon: 165 W 37.612
Lat: 74 N 6.917
#:1066880888:1067151
Full
Reset
Clear
Done.
Pan & Zoom
Rotate Model
Rotate View
Shading
Pick Area
Pick Sites
Pick Routes
Pick Nav
Pick Nav File



Tuesday, March 6, 12

IHA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

AUG 26 2011

Bernard Coakley, Ph.D.
Associate Professor
Department of Geology and Geophysics
348 REIC
900 Yukon Drive
Fairbanks, Alaska 99775

Dear Dr. Coakley:

Enclosed is an Incidental Harassment Authorization (IHA) issued to the University of Alaska Geophysics Institute under the authority of Section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*) to take, by Level B harassment only, small numbers of 11 species of marine mammals incidental to a marine geophysical (seismic) survey in the Arctic Ocean. The IHA is valid from September 5, 2011, through October 23, 2011.

You are required to comply with the conditions contained in the IHA. In addition, you must submit a final report to the National Marine Fisheries Service (NMFS) Office of Protected Resources within 90 days after expiration of the IHA. The IHA requires the monitoring of marine mammals by qualified individuals during activities and reporting of marine mammal observations, including species, numbers, and behavioral modifications potentially resulting from the seismic survey.

If you have any questions concerning the IHA or its requirements, please contact Candace Nachman, Office of Protected Resources, NMFS at (301) 427-8401.

Sincerely,

James H. Lecky, Director
Office of Protected Resources

Enclosure

Monitoring Program

- Visual observations were established to provide real-time sighting data, allowing for the implementation of mitigation procedures as necessary.

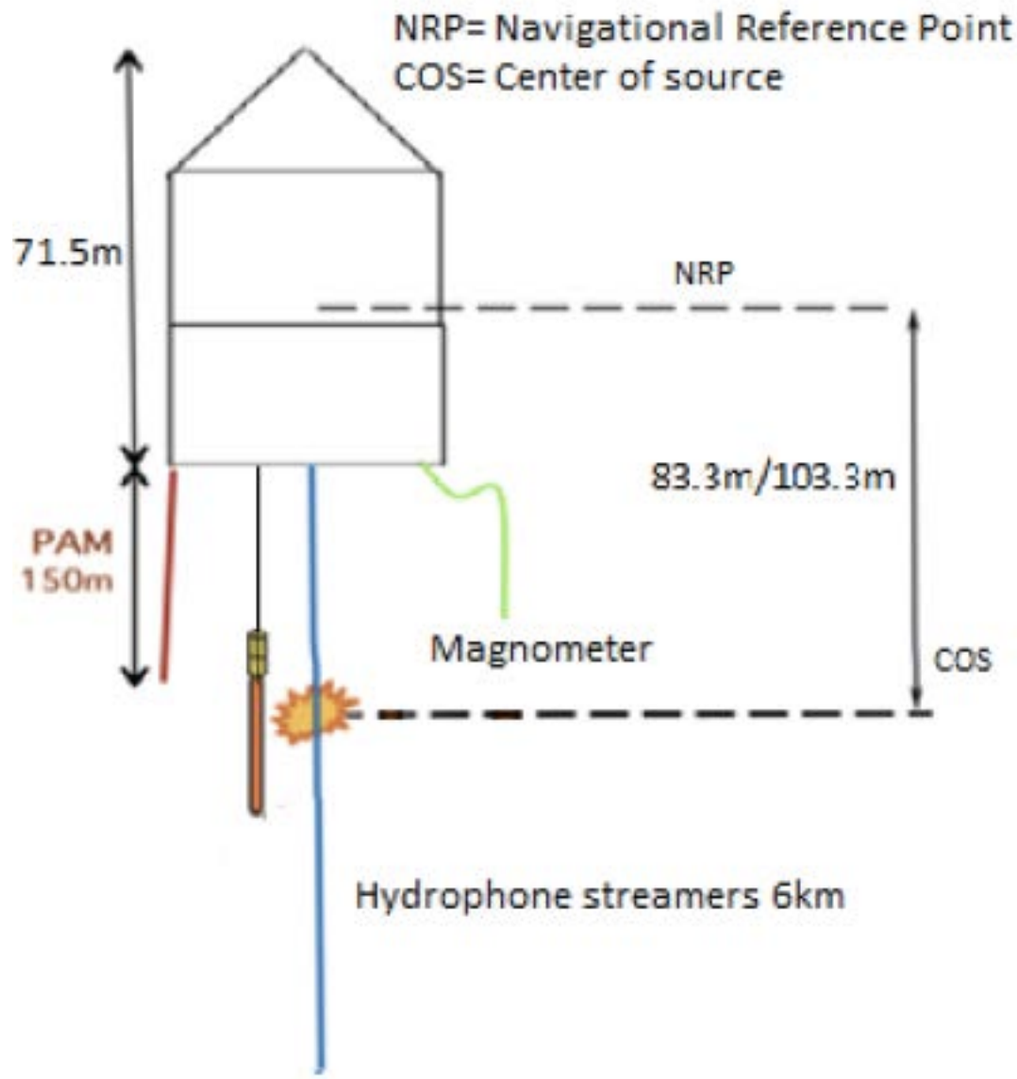
- Operation of a Passive Acoustic Monitoring system to compliment visual observations and provide additional marine mammal detection data.

- Ascertain the effects of marine mammals and marine turtles exposed to sound levels constituting a “take”.

Monitoring Team

- 5 Protected Species Observers (PSO)
- 1 Community Observer
- 7/24 PAM
- Daylight Visual monitoring

Towing Arrangements

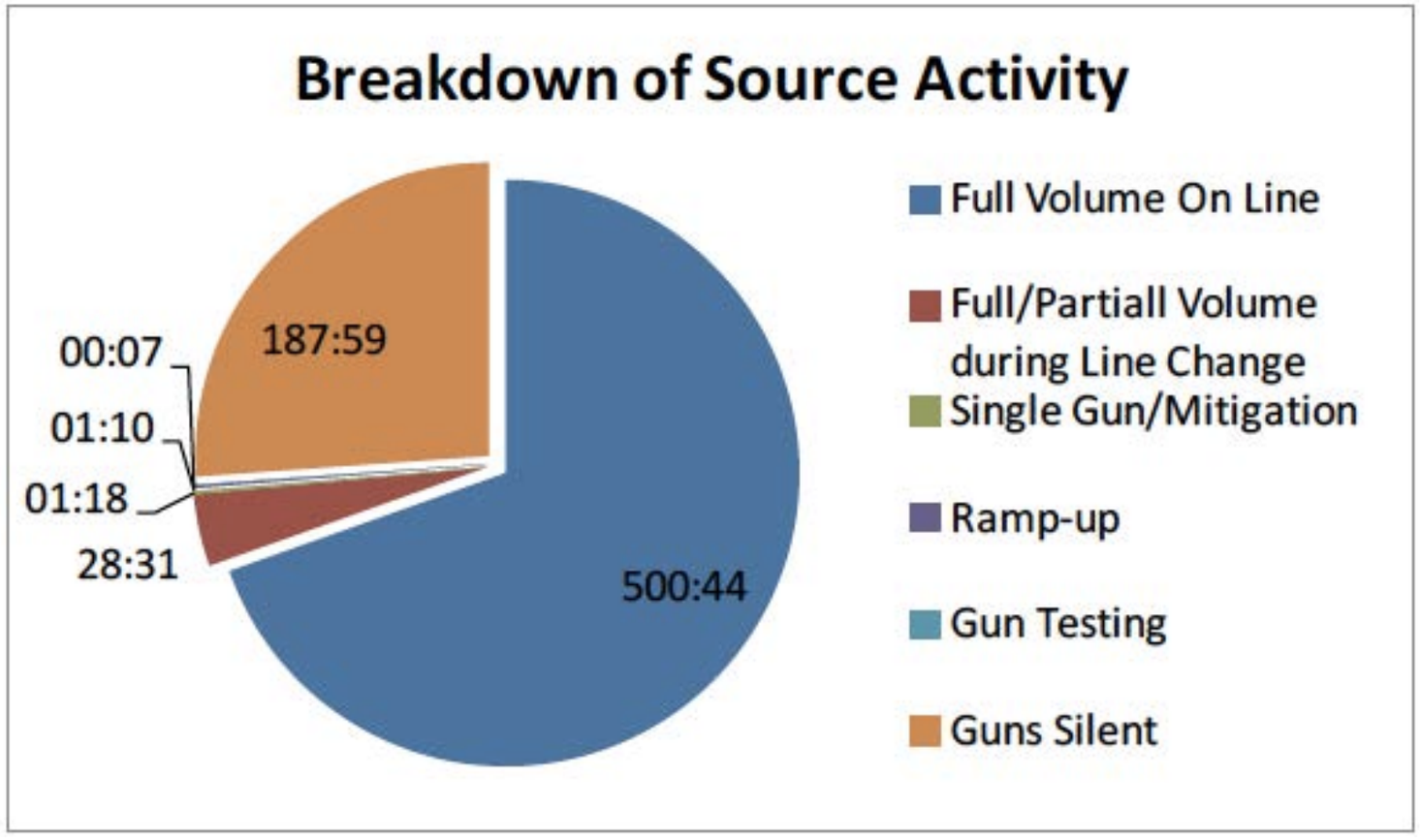


Shut Down Radii

Table 1. Exclusion zone (EZ) radii for triggering mitigation.

Source and Volume	Array Tow Depth (m)	Water Depth (m)	Shut-down EZ for Pinnipeds, Polar Bears 190 dB (m)	Shut-down EZ for Cetaceans 180 dB (m)	Level-B Harassment Zone 160 dB (m)
Single bolt airgun (40 in³)	6	Shallow (<100)	150	296	1,050
		Intermediate (100-1,000)	18	60	578
		Deep (>1,000)	12	40	385
1 string 10 airguns (1830 in³)	6	Shallow (<200)	190	1,870	14,370
		Intermediate (200-1,000)	130	1,400	13,980
		Deep (>1,000)	130	425	14,070

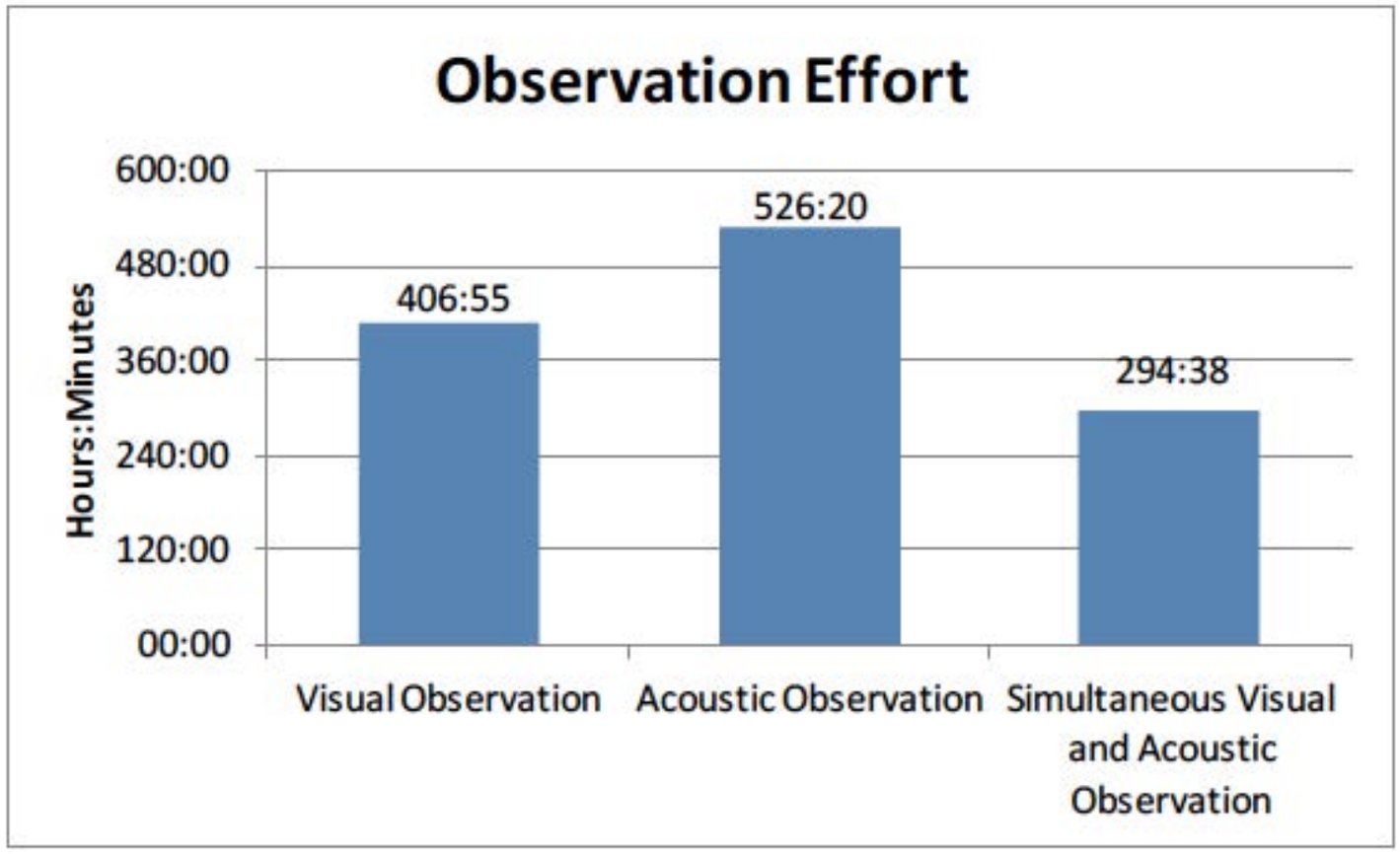
MCS Activity



Source Operations

Acoustic Source Operations	Number	Duration (hh:mm)
Gun Tests		**0:07**
Ramp-up		**1:10**
Day time ramp-ups from silence	**1**	
Day time ramp-ups from mitigation gun	**2**	
Night time ramp-ups from mitigation gun	**0**	
Full power survey acquisition		**500:44**
Full/partial power line changes		**28:31**
Single airgun (40 in^3)		**1:18**
Total time acoustic source was active		**531:50**

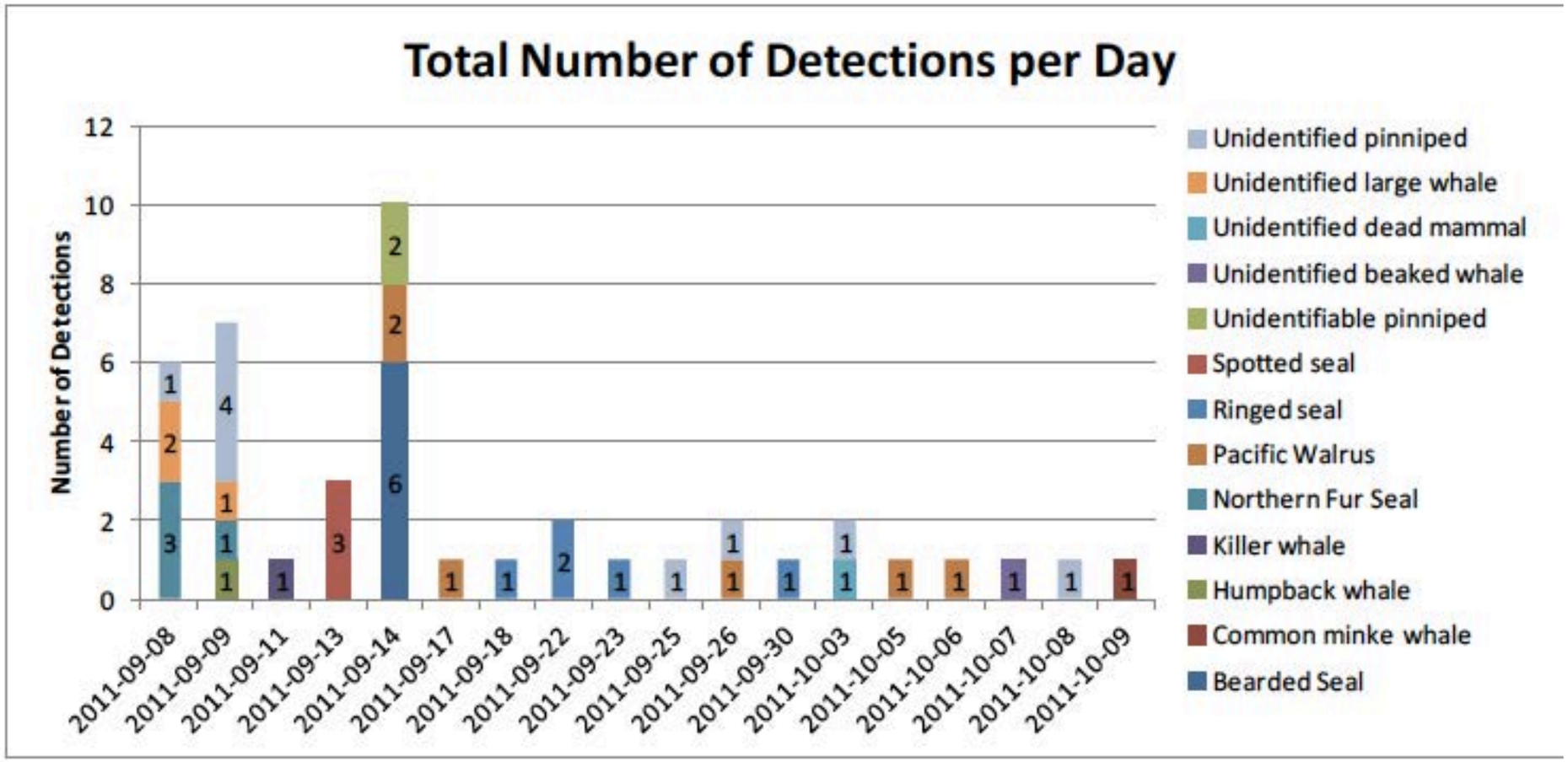
PSO Observations



Mammal Detections

	Total Number of Detection Records	Total Number of Animals Recorded
Cetaceans		
Unidentifiable cetacean	4	5
Mysticetes		
Humpback whale	1	2
Common minke whale	1	1
Odontocetes		
Killer whale	1	5
Pinnipeds		
Pacific walrus	6	14
Spotted seal	3	3
Ringed seal	5	5
Bearded seal	6	7
Northern fur seal	4	9
Unidentifiable pinniped	11	12

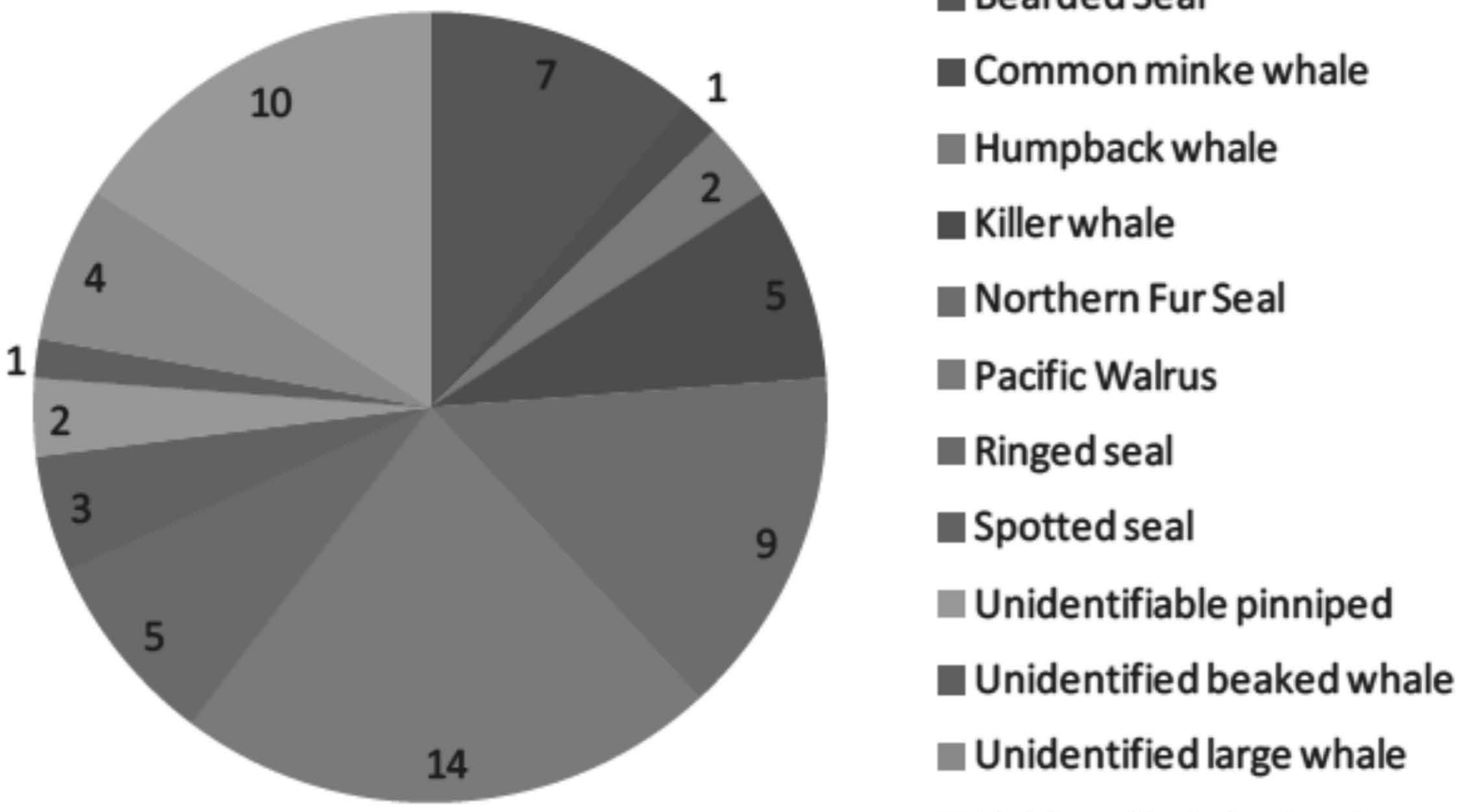
Mammal Detections



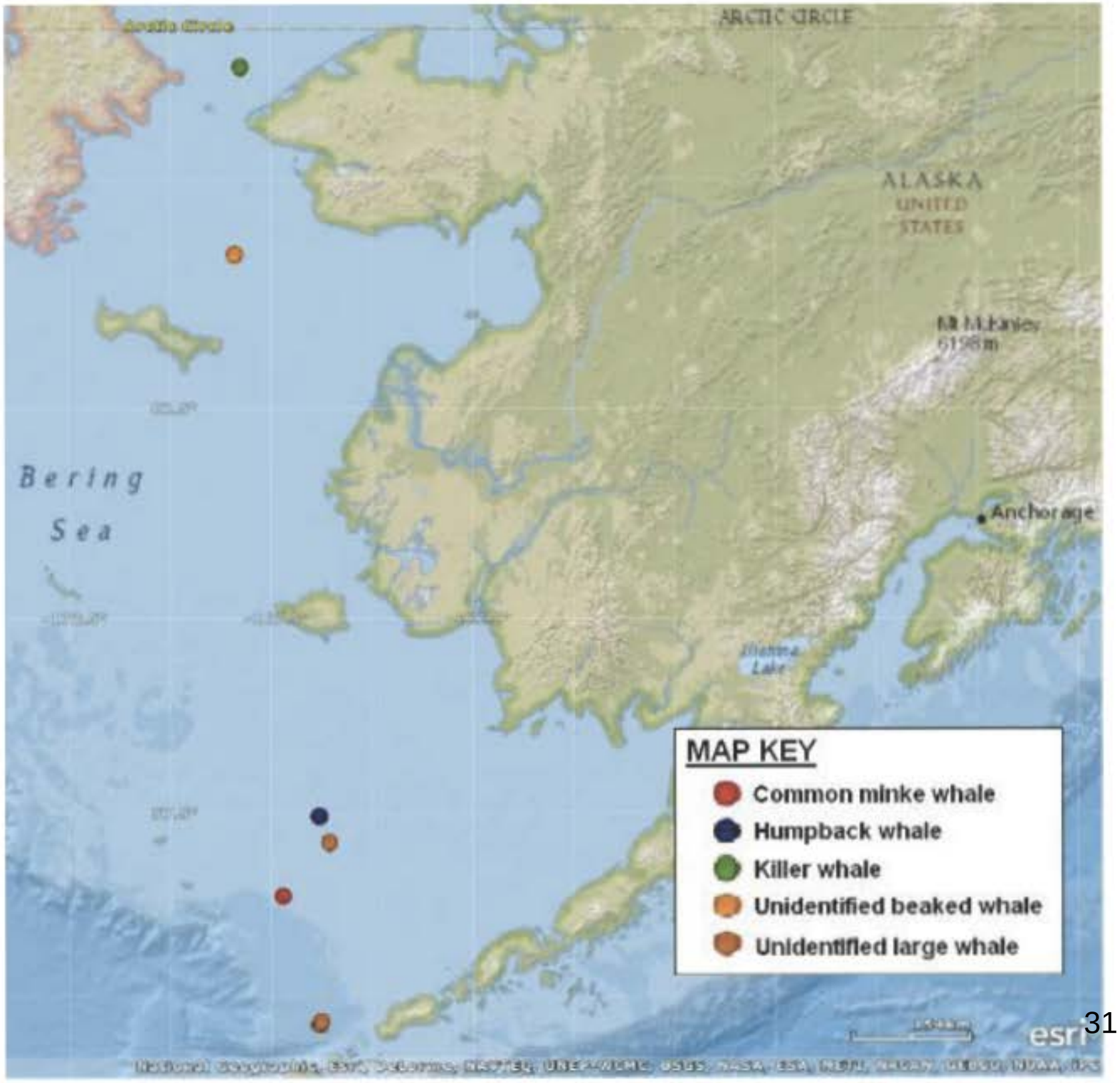
Average Closest Approach

Species Detected	Full Power (1830 in³)		Single Airgun 40 in³		Ramp up / Other Reduced Volume		Not Firing	
	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)
Humpback whale	-	-	-	-	-	-	1	300
Common minke whale	-	-	-	-	-	-	1	140
Killer whale	-	-	-	-	-	-	1	200
Unidentifiable cetacean	-	-	-	-	-	-	4	706
Northern fur seal	-	-	-	-	-	-	4	188
Spotted seal	3	322	-	-	-	-	-	-
Ringed seal	5	173	-	-	-	-	-	-
Bearded seal	6	572	-	-	-	-	-	-
Pacific walrus	4	846	-	-	-	-	2	175
Unidentifiable pinniped	5	594	-	-	-	-	6	230

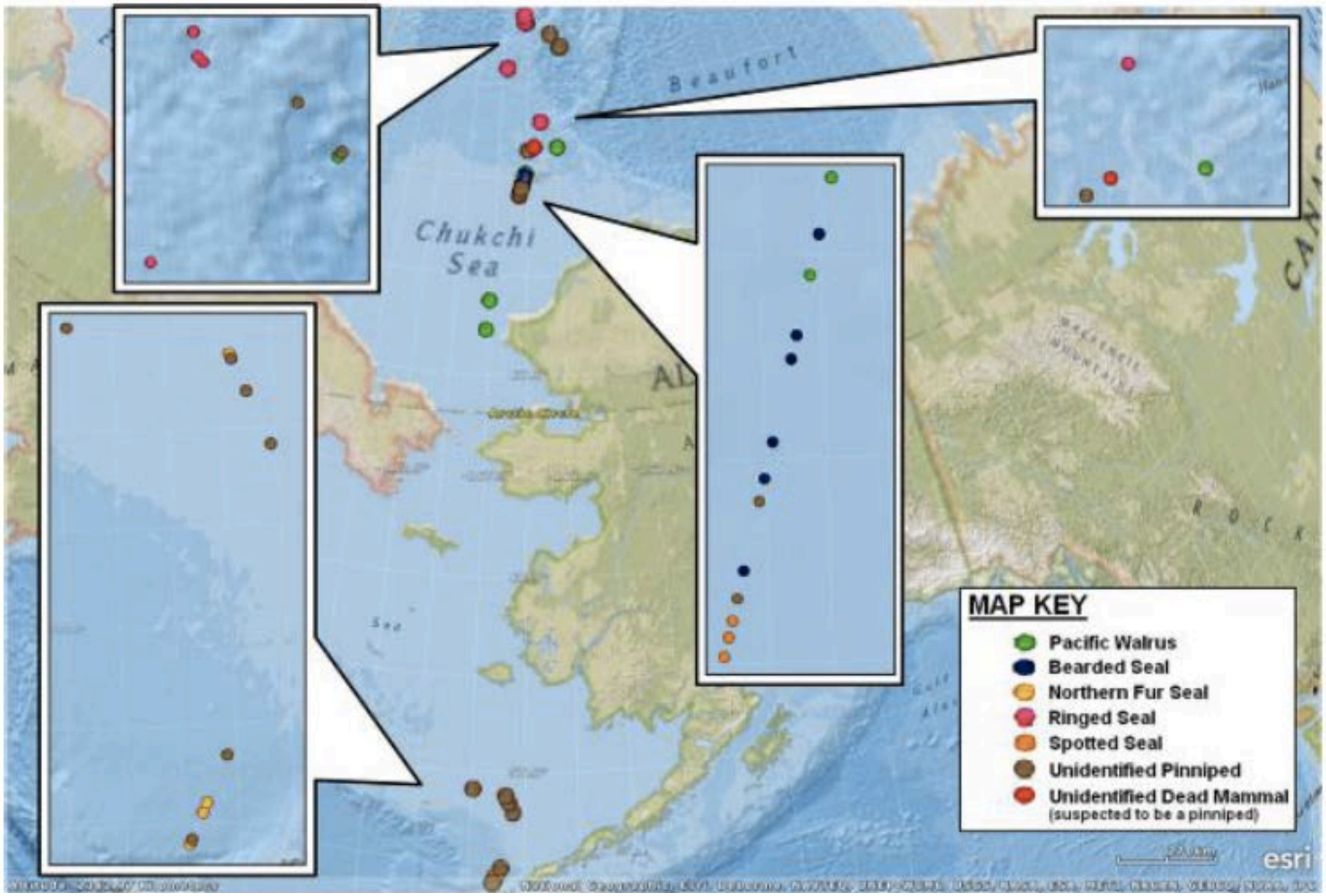
Total Number of Individuals by Species



Cetacean Detections

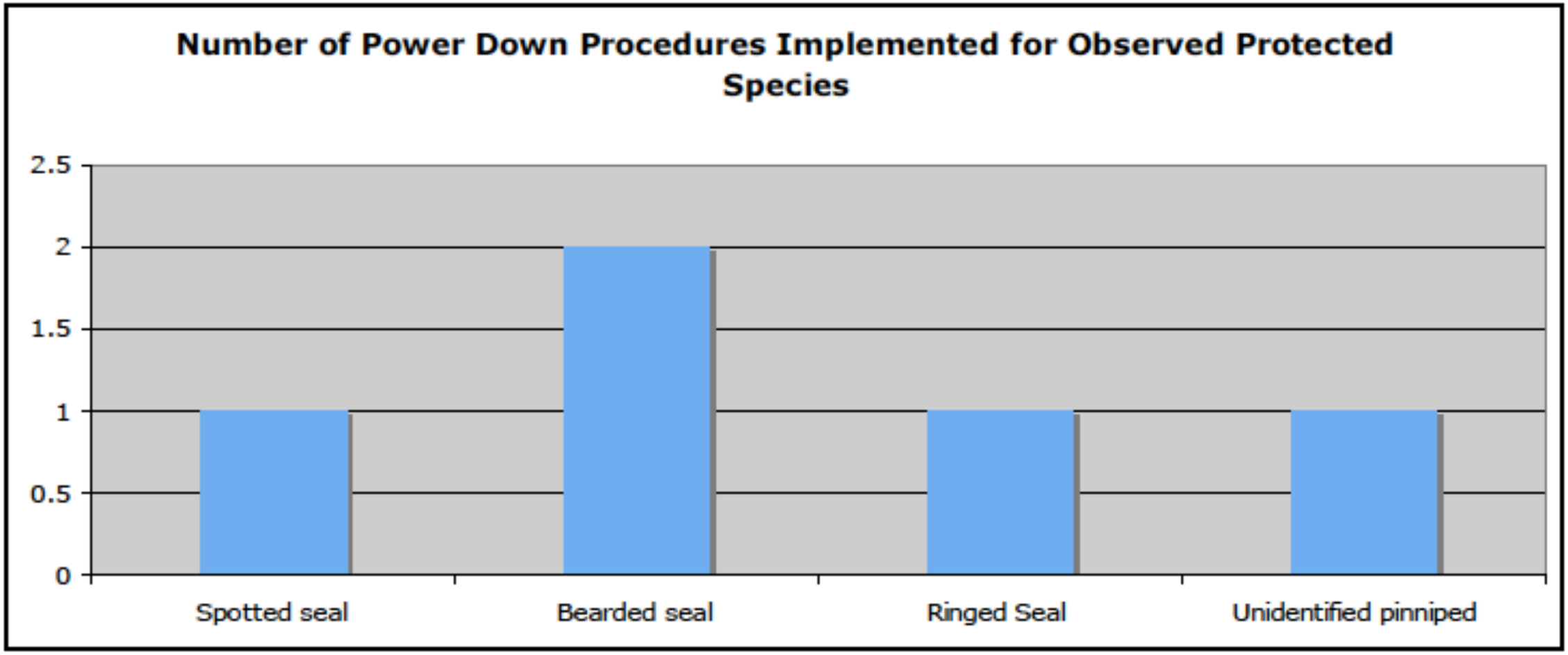


Pinniped Detections



Power Downs by Species

Mitigation Action	Cetaceans		Pinnipeds	
	Number	Duration	Number	Duration
Delayed Ramp-up	0	-	0	-
Power Down	0	-	5	1:32
Shut Down	0	-	0	-
Total	**0**	**-**	**5**	**1:32**



Summary of Mitigation Actions

Date	Visual Detection Number	Species	Group Size	Source Activity (initial detection)	Closest Approach to Firing Source/Power Level	Mitigation Action	Total Duration of Mitigation Event	Comments
13-Sep	15	Spotted seal	1	Full power	160m / 1830 in³	Power down	0:01	Seal seen leaving safety radius, airguns return to full power.
14-Sep	19	Bearded seal	1	Full power	155m / 1830 in³	Power down	0:02	Seal seen leaving safety radius, airguns return to full power.
14-Sep	23	Bearded seal	1	Full power	155m / 1830 in³	Power down	0:18	Seal last seen inside safety radius at 03:44 UTC. Waited 15 min. before returning to full power.
22-Sep	31	Ringed seal	1	Full power	75m / 1830 in³	Power down	0:35	Seal last seen inside safety radius at 20:24 UTC. Waited 15 minutes before initiating ramp up.
3-Oct	38	Unidenti fied pinniped	1	Full power	180m / 1830in³	Power down	0:36	Seal last seen inside safety radius at 4:31 UTC. Waited 15 minutes before initiating ramp up.

Level B Take Totals

Species	IHA Authorized Takes	Number of animals exposed to 180 dB (Cetaceans) / 190 dB (Pinnipeds)	Number of animals exposed to 160 dB
Mysticetes			
Bowhead whale	89	-	-
Gray whale	71	-	-
Humpback whale	2	-	-
Minke whale	2	-	-
Fin whale	2	-	-
Odontocetes			
Beluga whale	794	-	-
Killer whale	2	-	-
Pinnipeds			
Bearded seal	677	2	5
Spotted seal	150	1	2
Ringed seal	7,492	1	4
Ribbon seal	42	-	-

Bottom Line

- Scientifically Successful
- Good Monitoring (thanks PSOs)
- Minimal takes

Social Science

http://scientistatwork.blogs.nytimes.com/author/bernard-coakley/