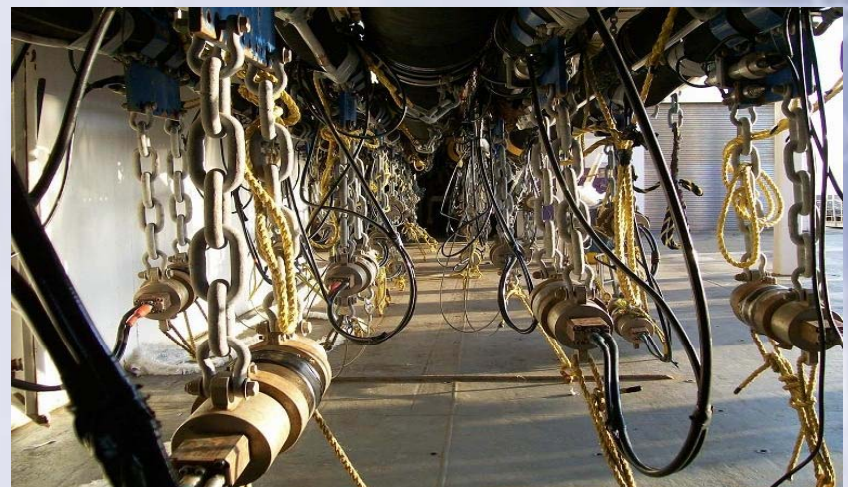




MLSOC NSF Report



2010 Instrumentation

• Processing, Computing and Logging Servers	\$ 26,827
• MCS Streamer Tow Leader Re-Terminations	\$ 101,658
• Sound Source Jumper Rearrangement	\$ 11,272
• MCS Streamer Repairs	\$198,493
• MCS Streamer Recovery Devices	\$
52,400	
• 75kHz ADCP	\$115,394*
• Sound Source Module Connections	<u>\$117,134</u>
•	\$192,157

* Previously funded PAM system (2008) was never purchased. This coupled with funds obtained from sale of the Ewing Streamer will be used to purchase ADCP this year. The balance will then be applied towards the 2011 Instrumentation Award.

2010 Technical Services

Total Award: 3.1 M

2010 Marine Mammal

Total Award: \$887,000

** 400K will be needed to purchase
W-GECHO streamer. NSF will find funds

Draft Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey



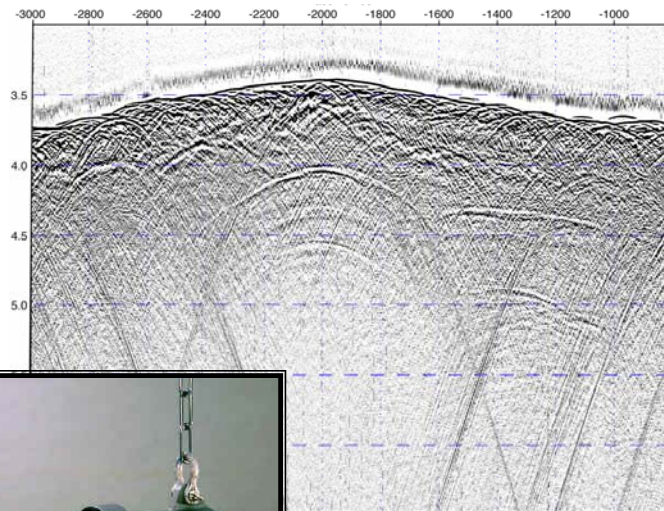
Public Hearings:

La Jolla, CA

October 25, 2010

Arlington, VA

October 27, 2010



Environmental Impact Statements (EIS)

- Analysis pursuant to the National Environmental Policy Act (NEPA)
 - provide full and fair discussion of significant environmental impacts of a proposed action
 - shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment.
- Requires Public involvement
- Programmatic – Examines proposed actions in a more generic way
- Current step - Draft PEIS: seeking public input

Purpose & Need for the Draft Programmatic EIS/OEIS

- Examines the potential impacts that may result from geophysical exploration and scientific research seismic surveys that are funded by NSF or conducted by the USGS
- Proposed Action is for academic and US government scientists to conduct marine seismic research from research vessels operated by US academic institutions and government agencies
- Purpose of the proposed action is the investigation of the geology and geophysics of the seafloor through collection of seismic reflection and refraction data that reveals the structure and stratigraphy of the crust and/or overlying sediment below the world's oceans to help inform our understanding of complex Earth and atmospheric processes which is in support of the NSF & USGS missions.

Energy Level Categorization

- Seismic surveys were divided into two categories in the Draft PEIS:
 - High Energy – Generally > 4 airguns
 - Low energy – Generally ≤ 4 airguns, boomer, sparkers, waterguns, chirp
- Factors that influence categorization include: Source, source volume, tow depth, and spacing

Table 2-13. Defined Low-Energy Sources under Alternative B

<i>Acoustic Source</i>	<i>Volume</i>	<i>Tow Depth</i>	<i>Spacing</i>
GI GUNS			
1-2 GI Guns	Any	Any	Any
3-4 GI Guns	See Appendix F	See Appendix F	See Appendix F
GENERIC SINGLE CHAMBER AIRGUNS			
Tuned array of 4	25-160 in ³ each	See Appendix F	See Appendix F
1 clustered pair	≤ 250 in ³ each	Any	Any
2 small clustered pairs	≤ 45 in ³ each	Any	Any
1 single	≤ 425 in ³	Any	Not applicable
<i>Acoustic Source</i>	<i>Source Level</i>	<i>Tow Depth</i>	
BOOMER, SPARKER, WATER GUN, AND CHIRP	≤ 205 dB re 1 μ Pa-m	1 m	

PEIS Analysis Approach

- Selected 5 representative Detailed Analysis Areas (DAAs) & 8 Qualitative Analysis Areas (QAAs)
 - Sites where future surveys were likely to occur
 - Sites within a wide range of Longhurst Biomes
- Selected likely survey season
- Selected source levels & configurations (number & type of airguns, 2D, 3D, etc.)
- Conducted modeling (AASM, MONM, AIM) to predict **Take Estimates**
 - Model considers environmental context – bathymetry, sub-bottom conditions, sound velocity profiles
- Defined monitoring and mitigation measures
- Identified and assessed affected environment and environmental consequences of the proposed action on the following resources:
 - Animals: marine invertebrates, fish, sea turtles, seabirds, marine mammals (cetaceans, pinnipeds, sea otter, manatee)
 - Socioeconomics
 - Cultural Resources
- Assessed Cumulative Impacts

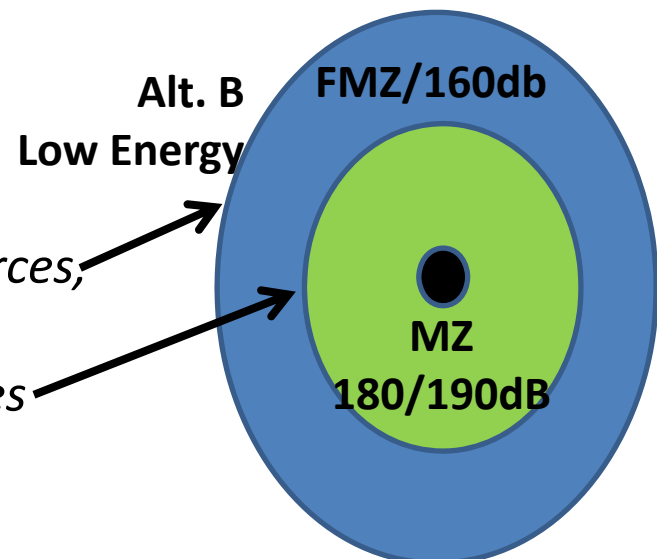


Harbor seal

(Photo: T. Mangelson, Alaska Sea Grant)

Alternatives

- Alternative A: Conduct marine seismic research using cruise-specific mitigation measures
 - *for expected no take situations:*
 - Standard 200-m FMZ
 - *for expected take situations:*
 - Calculate FMZ & MZ for high & low energy sources
- Alternative B (Preferred): Conduct marine seismic research using cruise-specific mitigation measures with generic mitigation measures for low-energy acoustic sources
 - *for expected no take situations:*
 - Standard 200-m FMZ
 - *for expected take situations:*
 - Calculate FMZ for high & low energy sources,
 - Calculate MZ for high energy sources
 - Standard 100m MZ for low energy sources
- No Action Alternative



Public Comment Period

Oct 8 – Nov 22



Photo credit: William Lang

Thanks

Draft Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey



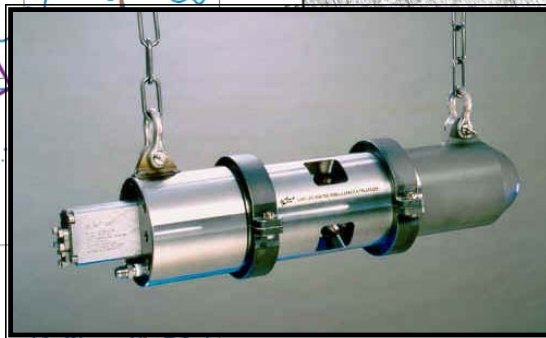
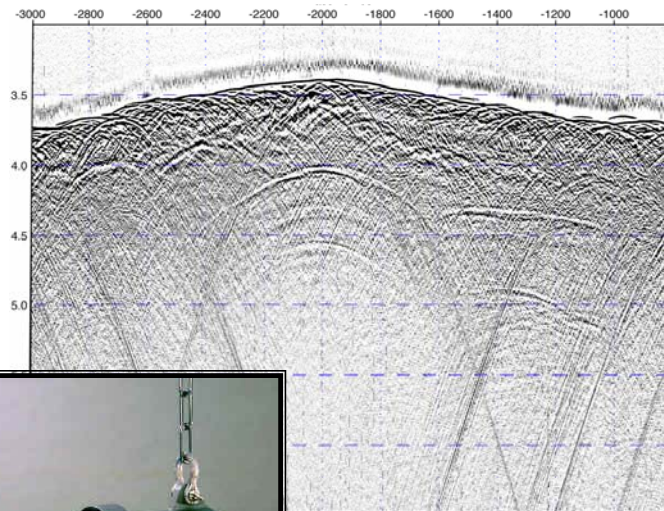
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NSF

- NSF is an Independent federal agency, created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..."
- Funds ~20% of federally supported basic research at U.S. colleges and universities
- Issues ~11,000 grants annually to fund proposals judged by merit-review
- Annual budget of ~\$6.9B (FY 2010)
- NSF-funded researchers have won more than 180 Nobel Prizes as well as other honors



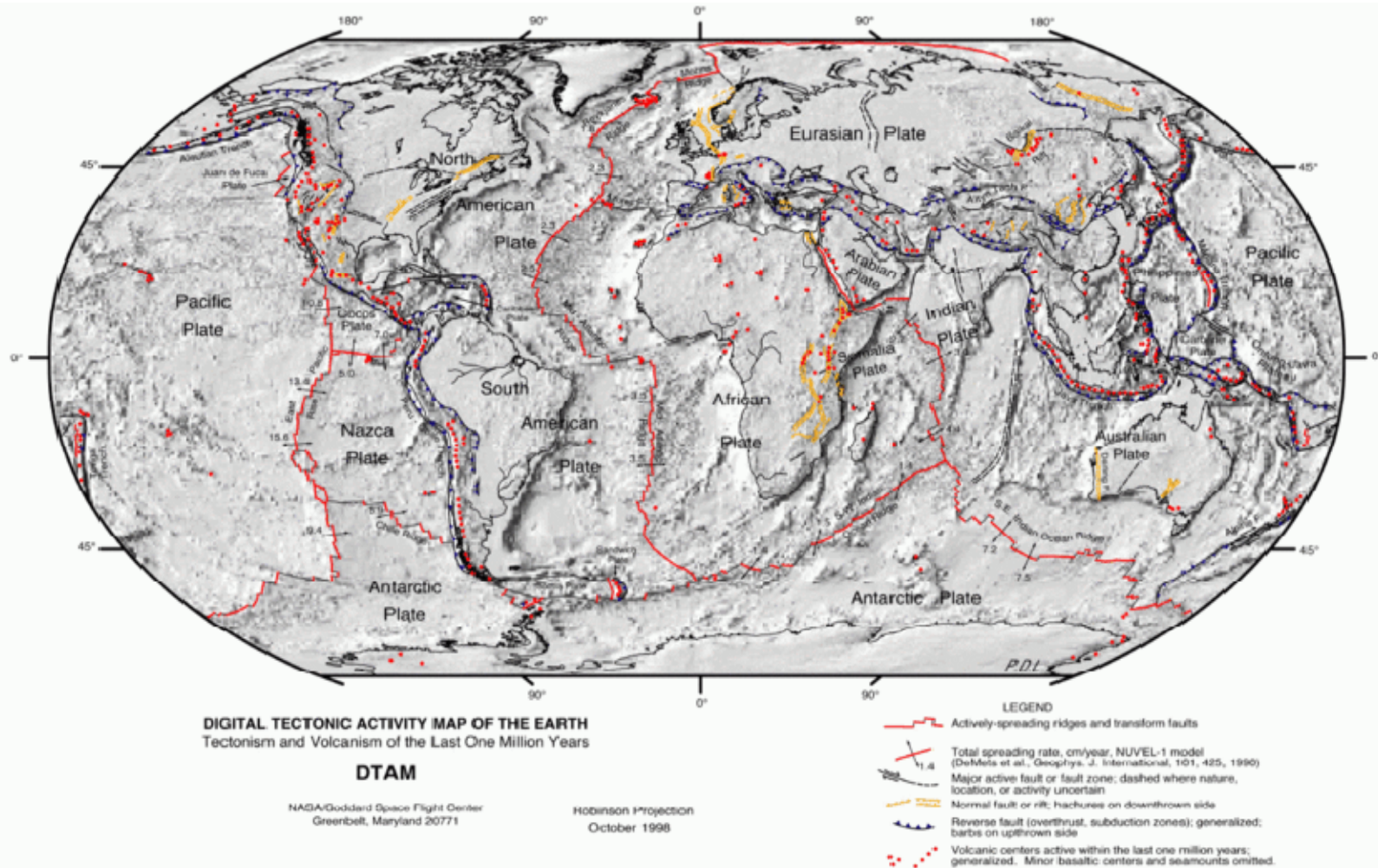
U.S. Geological Survey (USGS)

- Scientific federal agency with no regulatory responsibility
- Within the US Department of the Interior
- The largest U.S. agency dealing with water, earth, and biological sciences. The USGS also has responsibility for civilian mapping (including offshore)
- Collects, monitors, analyzes, and provides scientific understanding about conditions, issues, and problems associated with natural resources, hazards, environments, and climate change.



The Science...

Plate Tectonics



G221.001

Image created by NASA

Seafloor and Subsurface Features

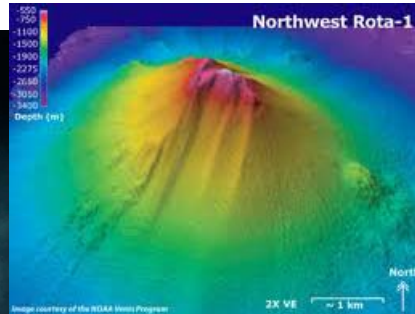
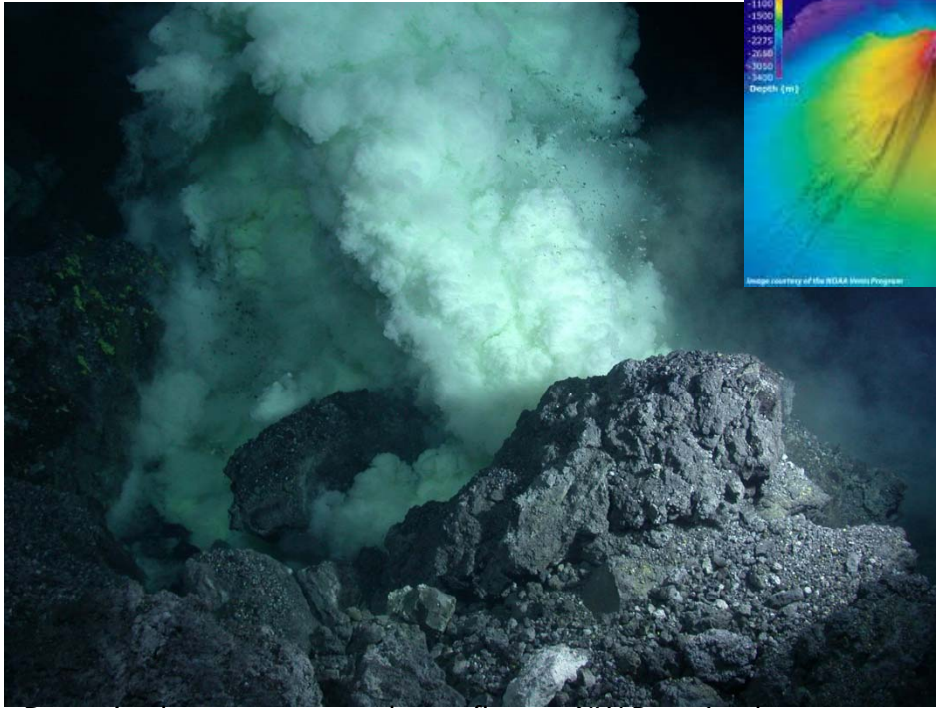


Image from
<http://nwrota2009.blogspot.com/>

Submarine Volcanoes



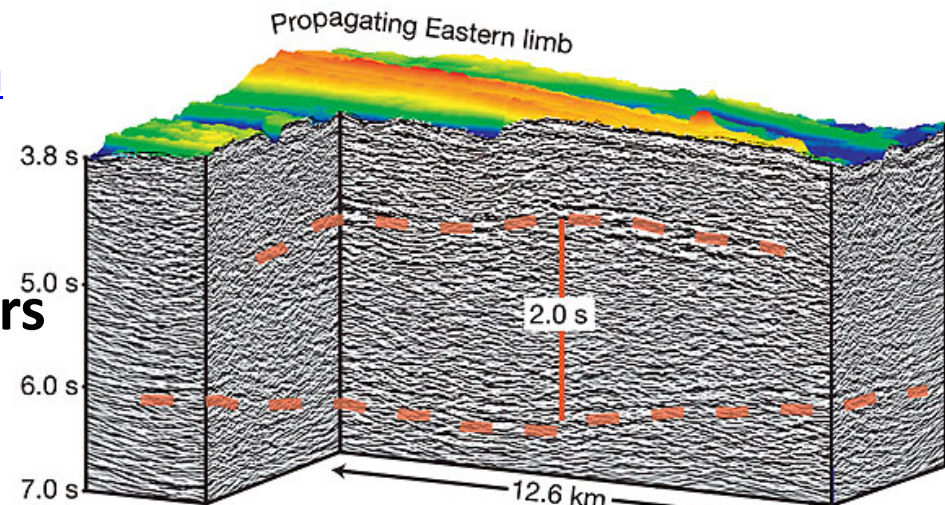
Image from www.world-science.net

Mid-Ocean Ridges

Degassing lava erupts onto the seafloor at NW Rota-1 volcano.
(photo credit: copyright Woods Hole Oceanographic Institution).
<http://oregonstate.edu/dept/ncs/newsarch/2009/May09/rota.html>

Magma Chambers

Magma chamber on the
East Pacific Rise.
Singh et al., Nature, 2006



Natural Hazards



2010 Chile Earthquake - Santiago
Photo credit: Esteban Maldonado



Coastal Landslide caused by the 2010 Haiti Earthquake.
Image from www.gallery.usgs.gov

Landslides

Earthquakes

Tsunami



March 28, 1964, Seward, Alaska. Image from
http://wcatwc.arh.noaa.gov/web_tsus/19640328/19640328.htm

Marine Seismic Research

NSF-funded marine seismic research:

- Science driven: Proposal & merit review process
- Globally ranging, spanning domestic, international, and foreign territorial waters, usually in water deeper than ~1000 m or conducted along transects from shallow to deeper water
- NSF funds 4-7 surveys/year, each lasting 1 to 7 weeks
- *R/V Marcus G. Langseth*: Primary vessel used for high energy surveys
- Other academic vessels used for low energy surveys



R/V Langseth

USGS Marine Seismic Research

USGS Activities

Low energy (e.g., Chirp)

- mostly within 5 nm of the shoreline
- 8 to 12 surveys/yr, each of 1 to 3 weeks' duration
- water depths up to 1000 m on the West Coast, 500 m in the Gulf of Mexico, and 100 m on the East Coast

High energy (e.g., multiple airguns or GI guns)

- 1 to 2 surveys per year, with more frequent surveys possible in the future; duration up to a few weeks
- deepwater cruises both inside and outside the 200 nm limit

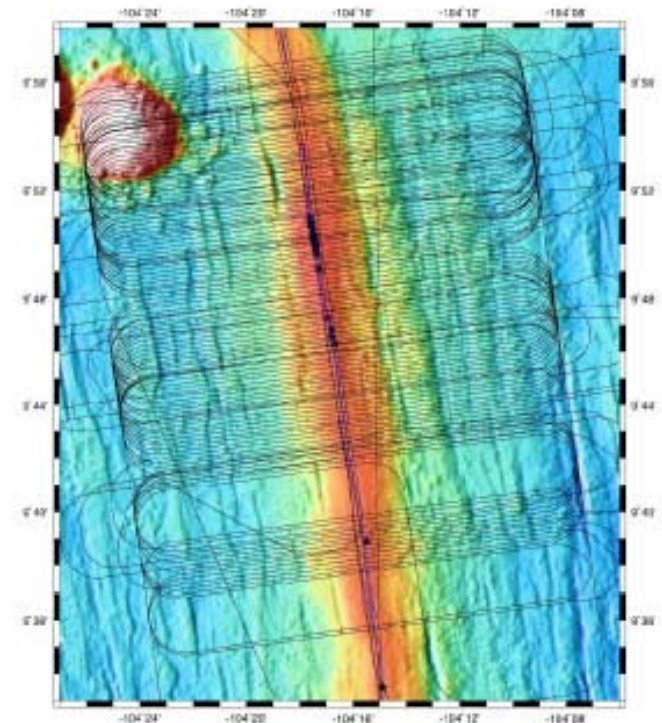
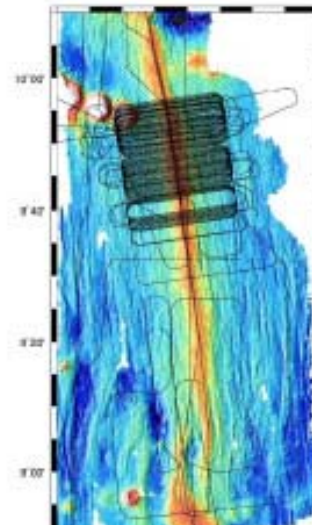
USGS Coastal and Marine Science objectives include:

- mapping to define the outer limits of the U.S. extended continental shelf under Law of the Sea
- understanding the dynamic offshore environment for slope failures, coastal erosion, faults, gas seeps, and other features
- researching marine aspects of global change and their impacts on society

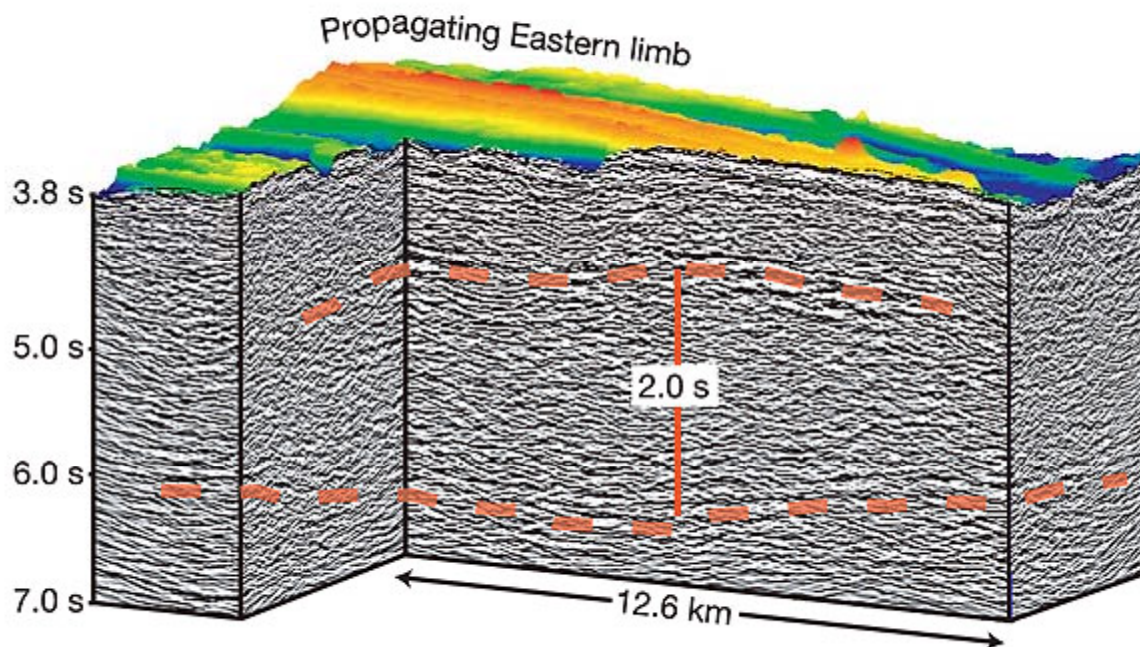


Different types of Marine Seismic Surveys

- 2-D
- 3-D
- Other: VSP; 4-D; OBC

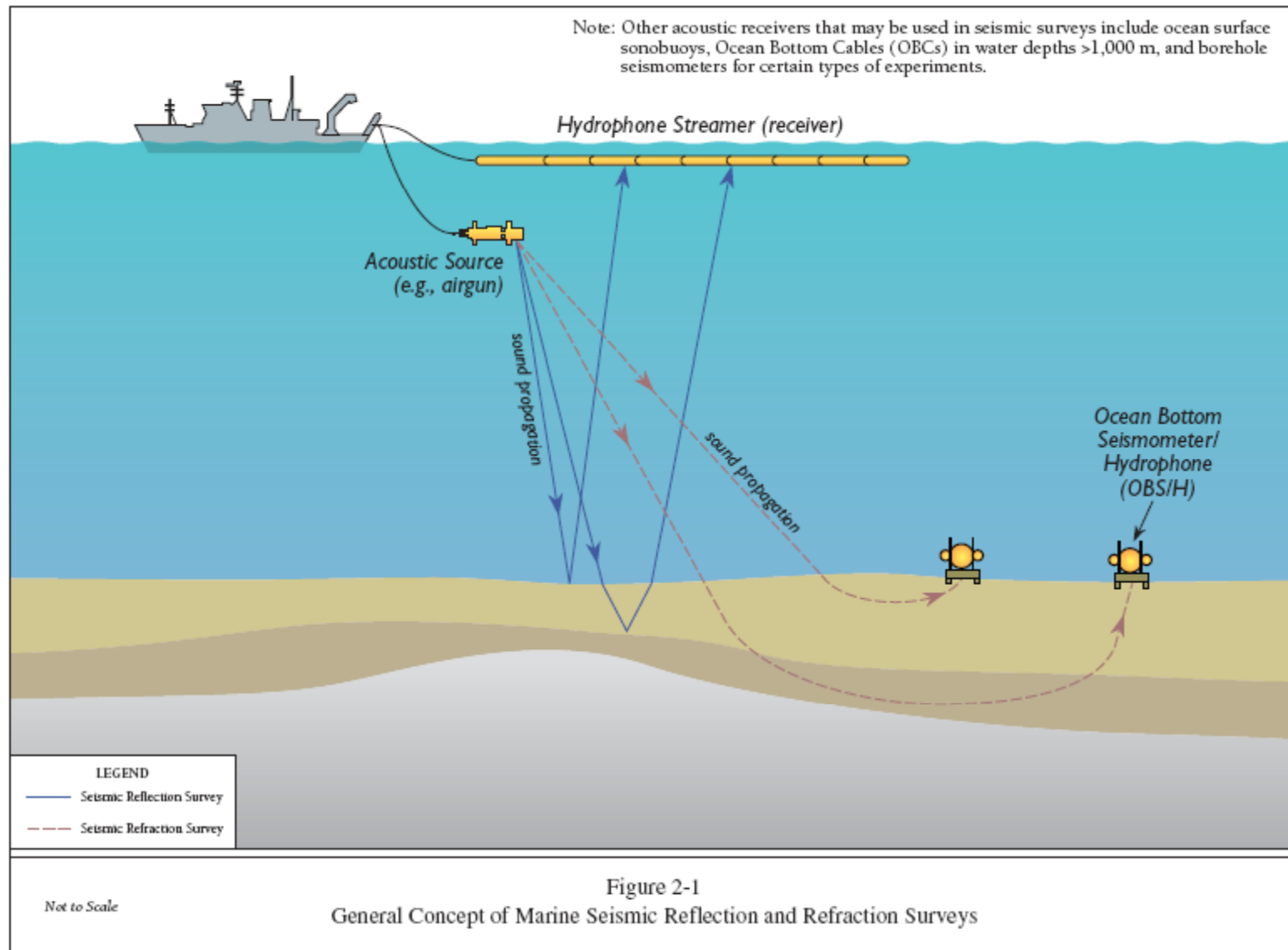


Track line coverage for 3D MCS along the East Pacific Rise. Suzanne Carbotte, LDEO.

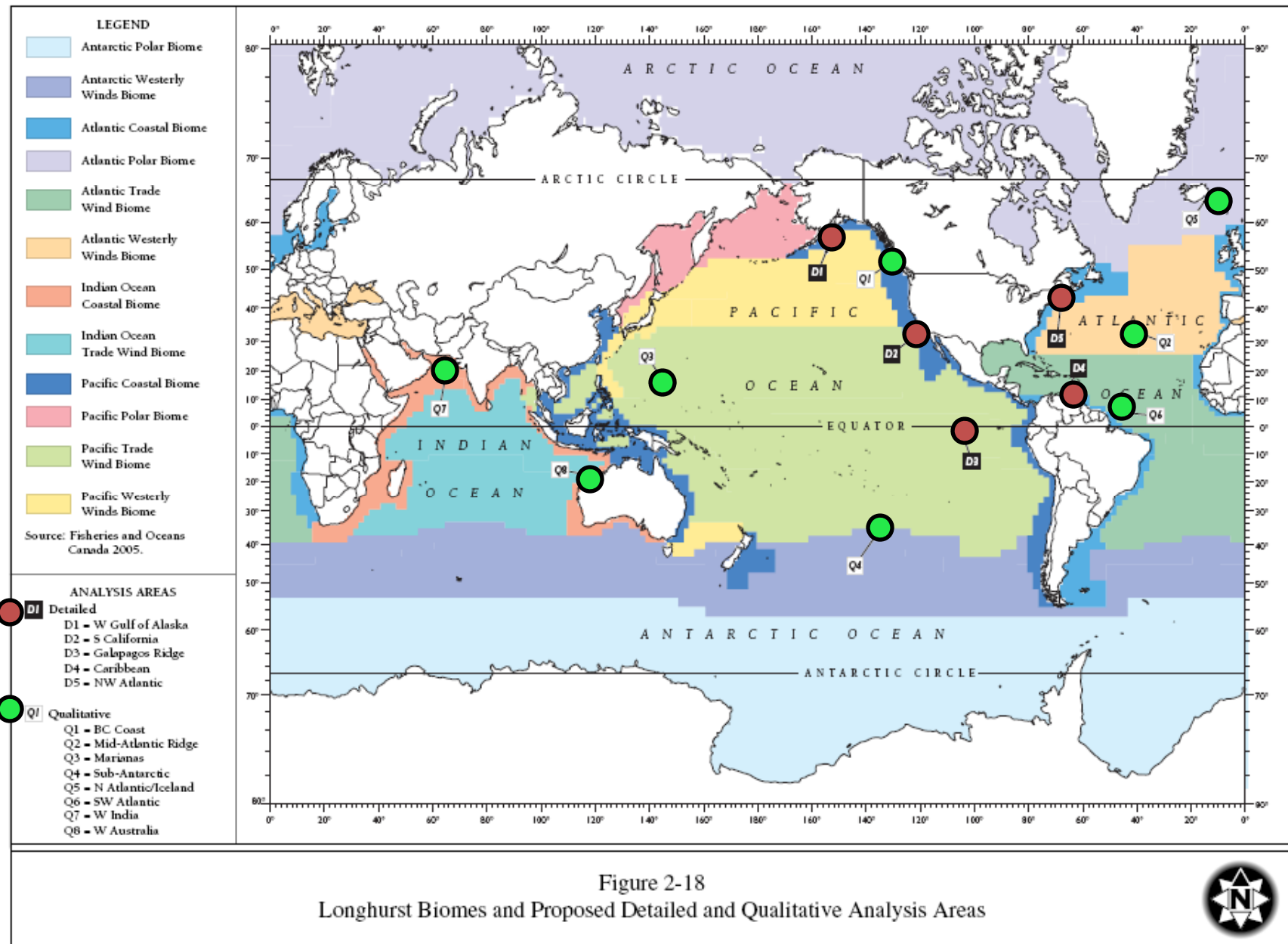


Magma chamber on the East Pacific Rise. Singh et al., Nature, 2006

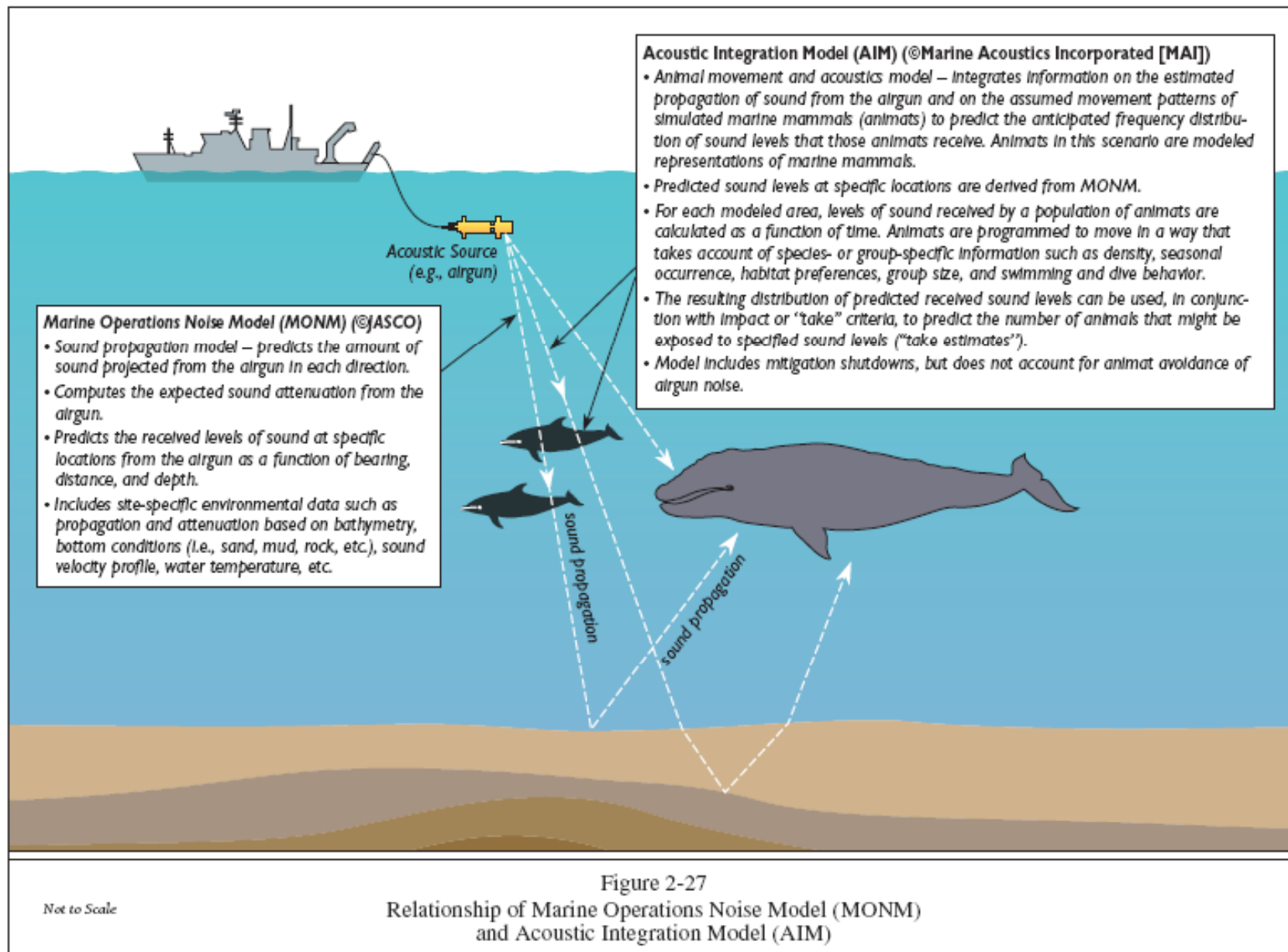
Reflection & Refraction Surveys



Exemplary (Representative) Analysis Areas

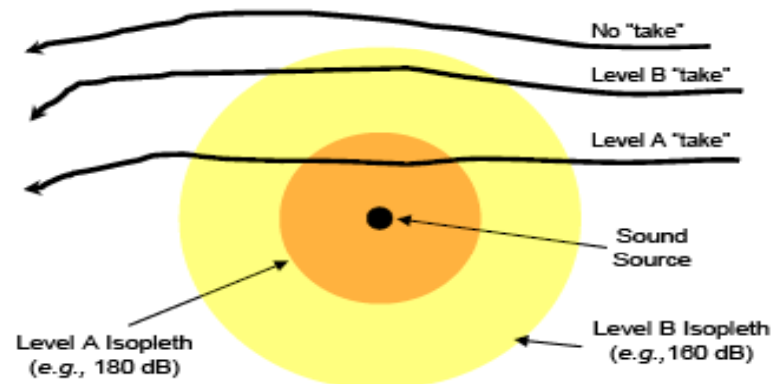


Modeling



Modeling

- Considered both rms and SEL
 - Used existing NMFS guidance on “take” for pulsed sounds:
 - Level A Harassment (Injury) = 180 (cetaceans)/190 (pinnipeds) dB re 1 μ Pa (rms)
 - Level B Harassment (Behavioral) = 160 dB re 1 μ Pa (rms)
 - Used the proposed energy (SEL) criterion:
 - Level A Harassment (Injury) = 198 (cetaceans)/186 (pinnipeds) dB re 1 μ Pa²•sec
- Considered both flat and M-weighting
- Considered site specific environmental “context”
 - seafloor, temperature, salinity



Appendix B (AMR): Figure B-10. Illustration of Pressure-based Exposure or “Take” Methodology (not to scale)

Monitoring & Mitigation

- Mitigation during survey planning phases
- Visual monitoring
- Passive Acoustic Monitoring (PAM)
- Proposed Safety Radii or “Mitigation Zone”
- Mitigation during Operations:
 - Vessel speed/course alteration
 - Airgun power down & shut down
 - Airgun ramp-up
 - Special mitigation measures for circumstances/species of particular concern



Potential Environmental Impacts

Environmental Consequences:

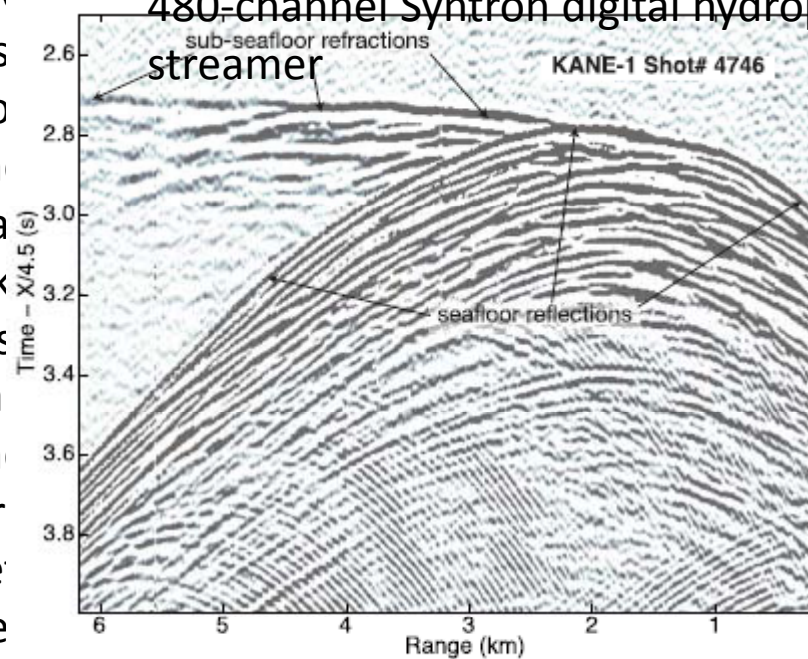
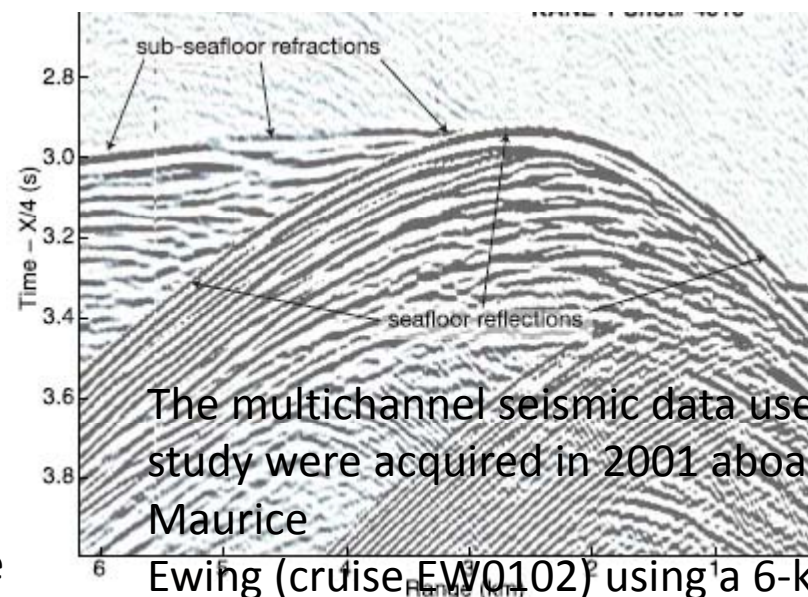
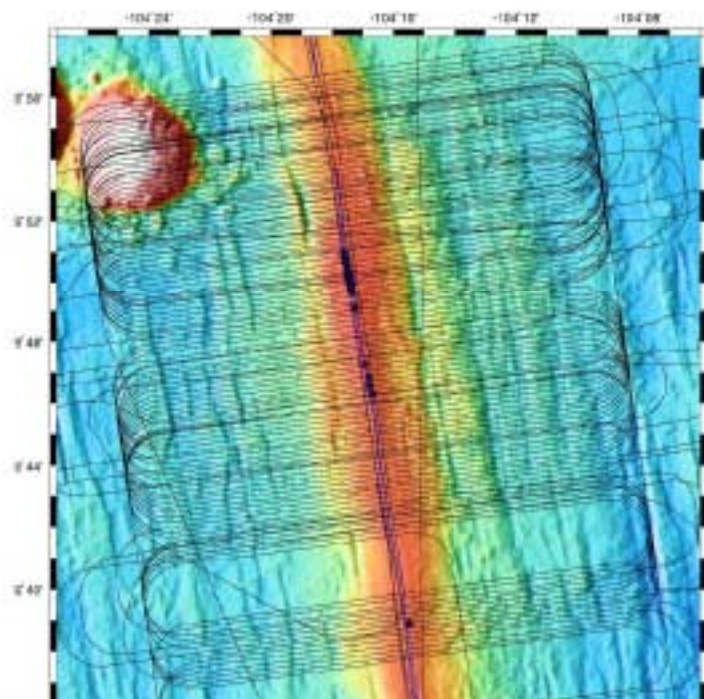
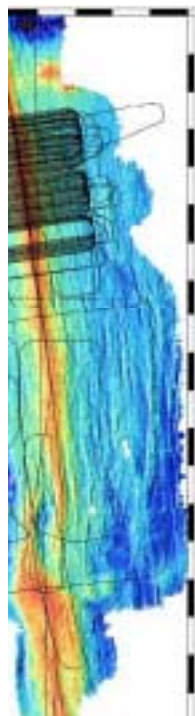
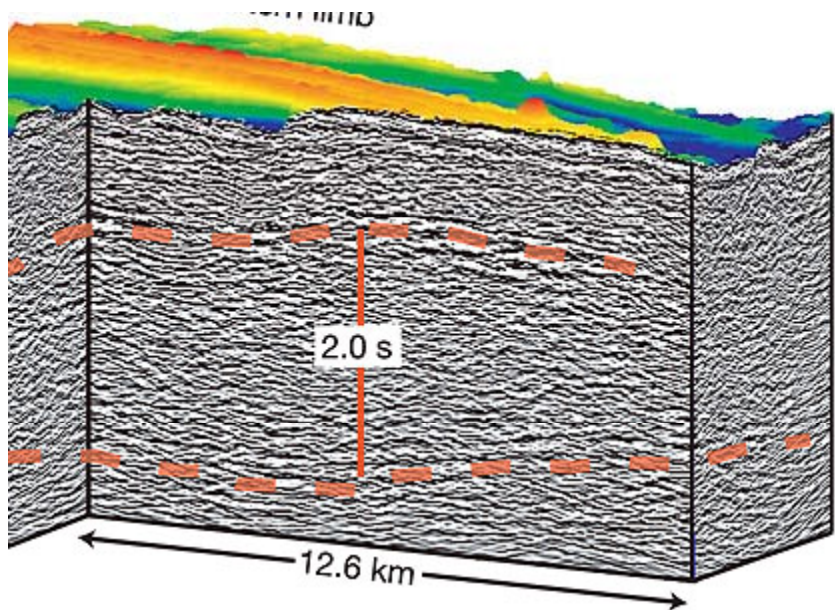
- Direct and indirect affects of the proposed action mainly as a result of noise from acoustic energy sources (e.g. airguns)
- Potential impacts to species are expected to be limited to short-term and localized behavioral disturbances (such as Level B), and not significant to populations.
- Although noise modeling results for DAAs indicate that Level A injury impacts to marine mammals or threatened and endangered species may occur, for actual surveys, additional mitigation measures would be added to the cruise parameters to reduce or eliminate Level A impacts or the potential for injury.

Cumulative Impacts:

- Results indicate no significant cumulative effects to marine resources from proposed actions.
- Monitoring and mitigation, pre-cruise planning, evaluation of other regional activities influence results

Future surveys:

- When future surveys are identified, a site specific environmental analysis will be developed.
- All future seismic surveys would be permitted according to the rules and regulations of the applicable agencies of U.S. federal, state, and foreign governments.
- Incorporate technological advances made in seismic sources, monitoring/mitigation techniques and tools, which demonstrate reduction in environmental impacts.



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