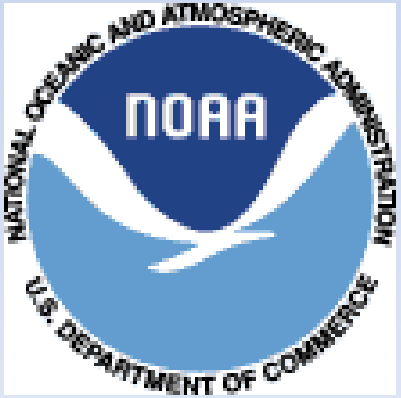
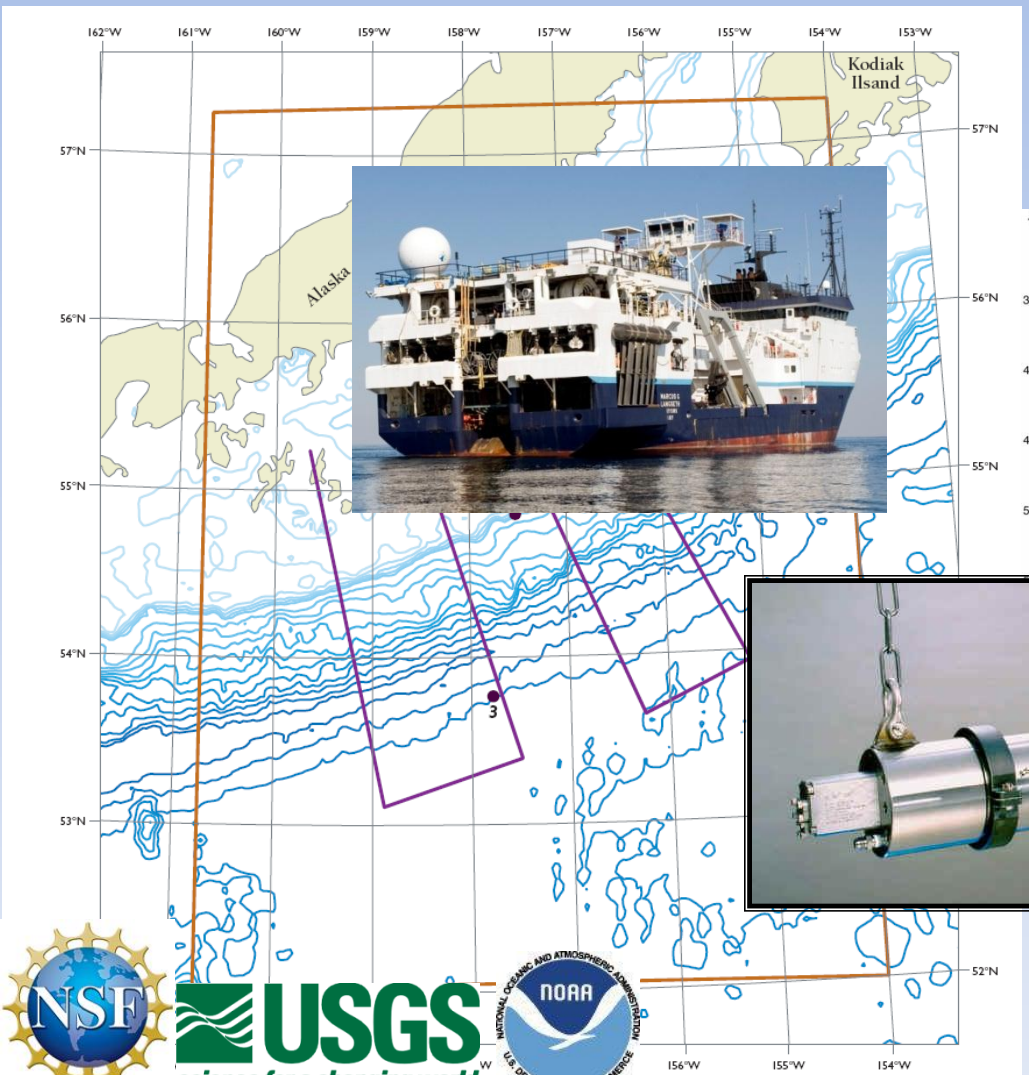
WELCOME

to the Public Hearing on the Draft Programmatic EIS/OEIS for Marine Seismic Research Funded by the National Science Foundation (NSF) or Conducted by the U.S. Geological Survey (USGS)



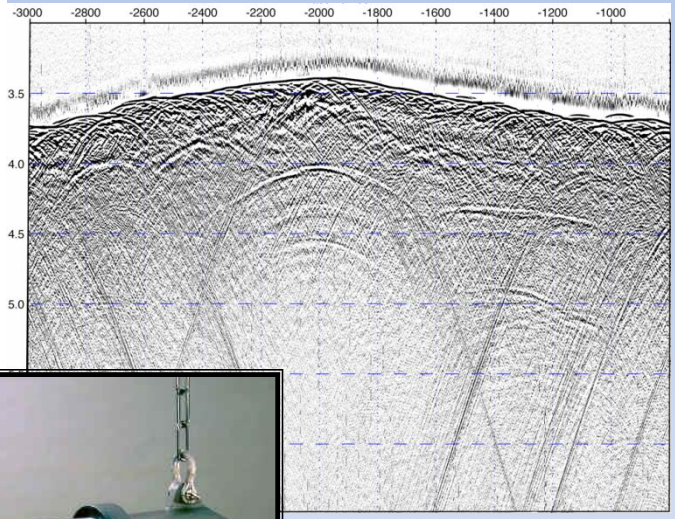
Draft Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey



Public Hearings:

La Jolla, CA
October 25, 2010

Arlington, VA
October 27, 2010



NSF USGS science for a changing world NOAA

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.

USGS
science for a changing world

National Marine Fisheries Service (NMFS)

- Within the US Department of Commerce ‘s National Oceanic and Atmospheric Administration
- Lead federal agency responsible for the stewardship of the nation's offshore living marine resources and their habitat
- Manages, conserves and protects fish, whales, dolphins, sea turtles and other living ocean creatures
- NMFS’ Office of Protected Resources works to conserve, protect, and recover species under the Endangered Species Act and Marine Mammal Protection Act

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 Earth beneath the oceans using seismic data to reveal the underlying structure and stratigraphy of the sediments and deeper crust to help inform our understanding of complex Earth and atmospheric processes which is in support of the NSF & USGS missions.

The Science…

Plate Tectonics

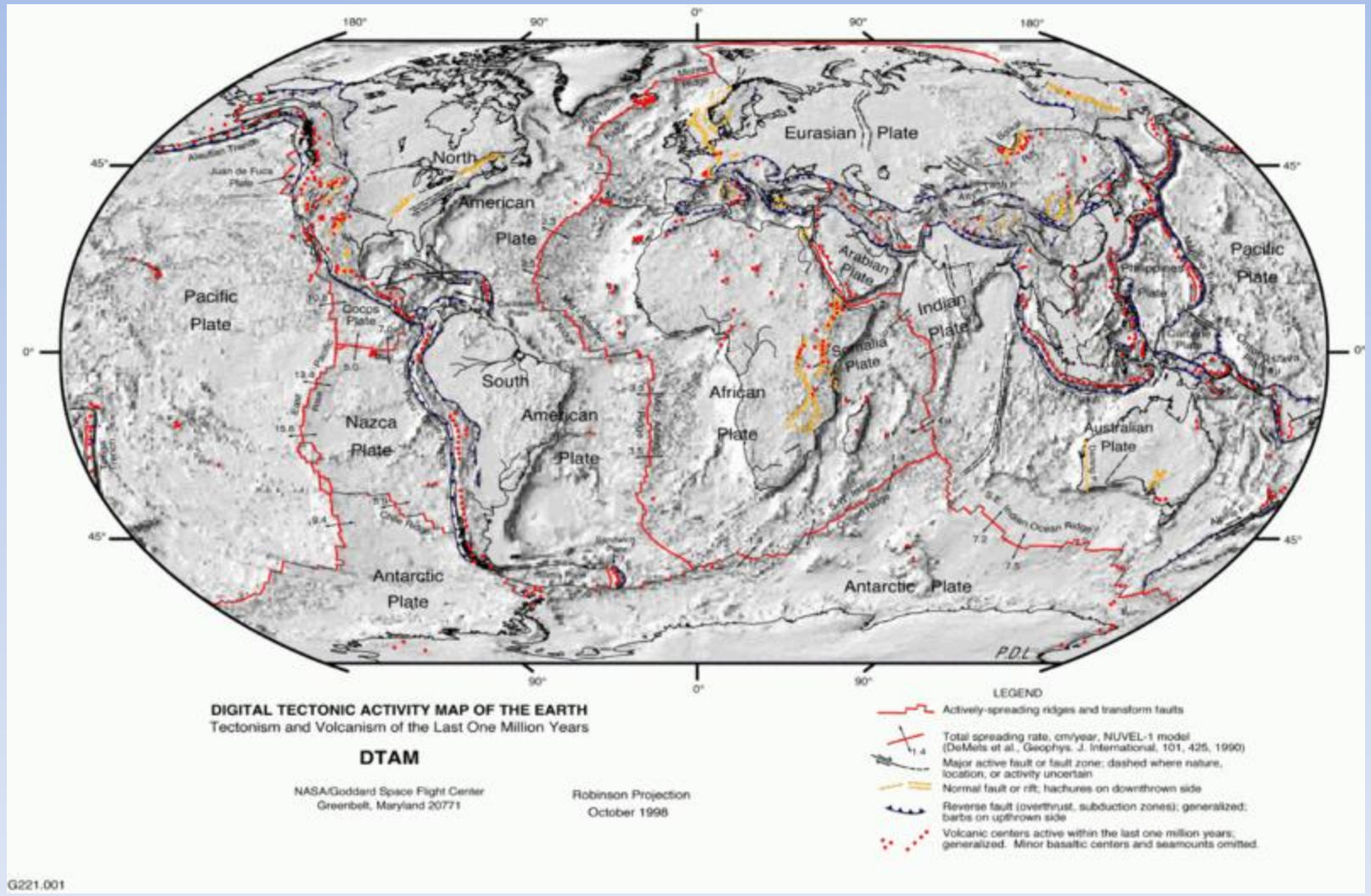
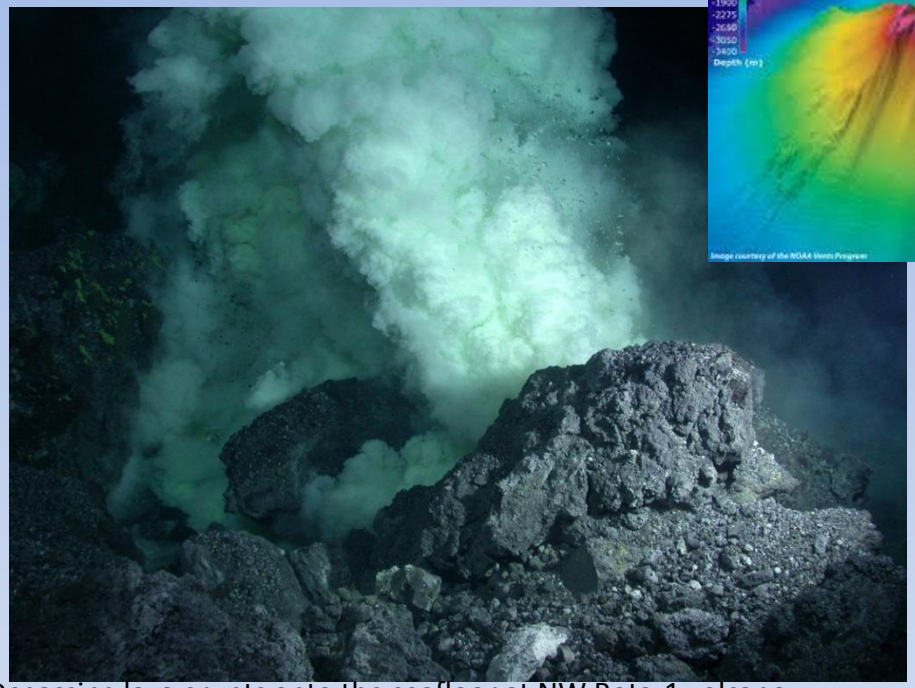


Image created by NASA

Seafloor and Subsurface Features



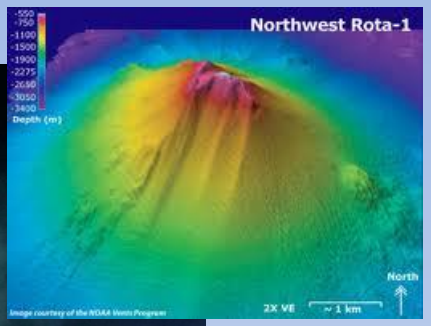


Image from http://nwrota2009.blogspot.com/

Submarine Volcanoes

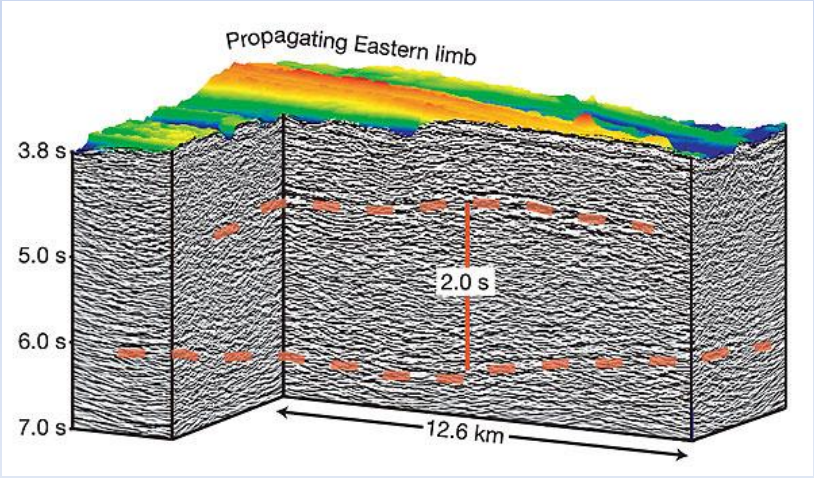
Degassing lava erupts onto the seafloor at NW Rota-1 volcano. (photo credit: copyright Woods Hole Oceanographic Institution). http://oregonstate.edu/dept/ncs/newsarch/2009/May09/rota.html

Image from www.world-science.net

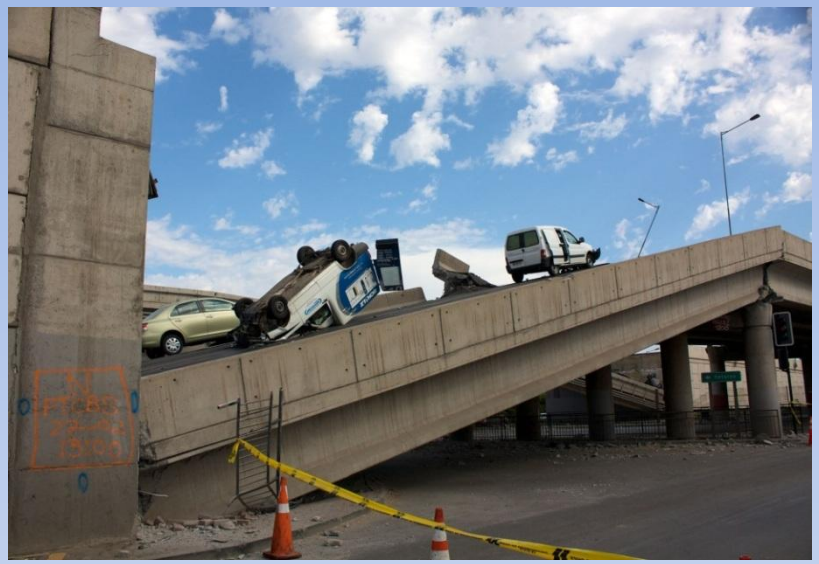
Mid-Ocean Ridges

Magma Chamber

Crust and mantel boundary beneath melt sill (Singh et al. 2006)



Natural Hazards



2010 Chile Earthquake - Santiago
Photo credit: Esteban Maldonado

Earthquakes

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

Landslides

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

Tsunami

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:

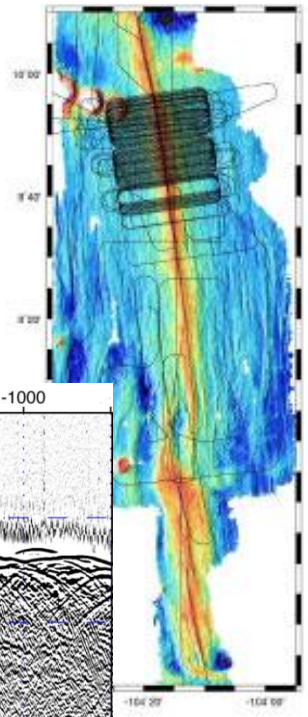
- mapping associated with the Convention on the Law of the Sea to determine the outer limits of U.S. sovereign rights beyond 200 nm
- understanding the dynamic offshore environment for slope failures that may cause tsunamis,

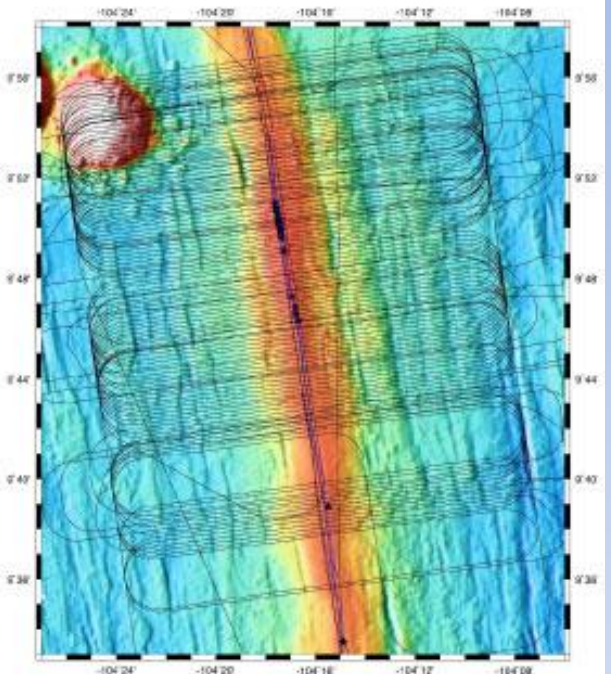
  coastal erosion, faults, gas seeps, and other features
- researching marine aspects of global change, sea level rise, and their impacts on society

USGS
science for a changing world

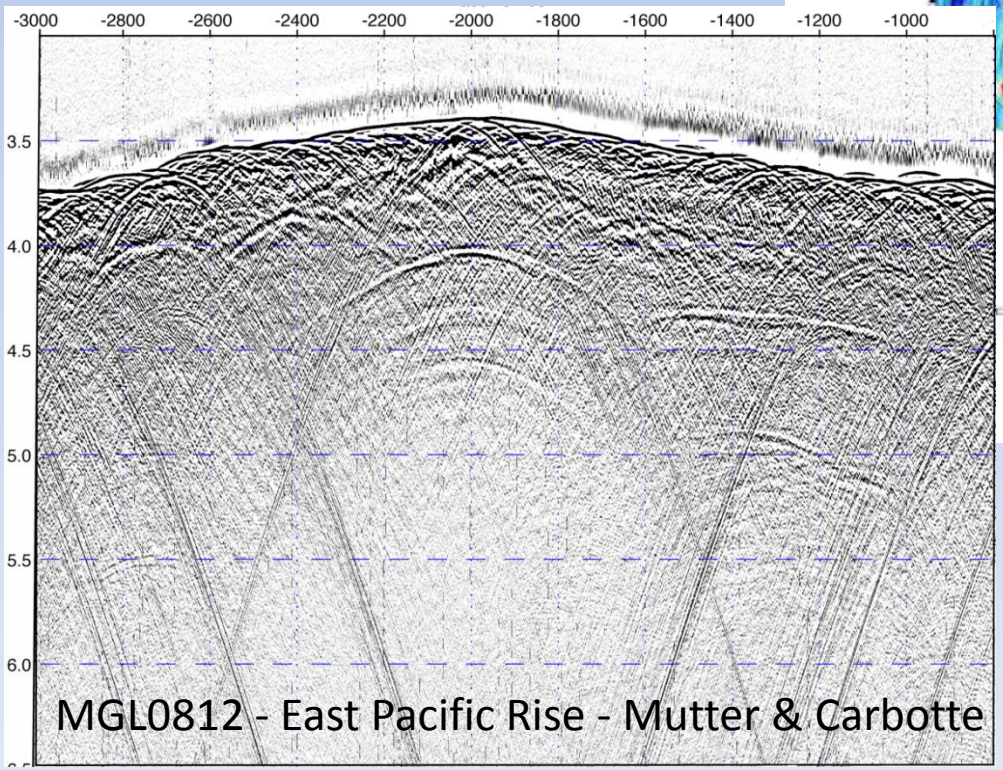
Different types of Marine Seismic Surveys

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



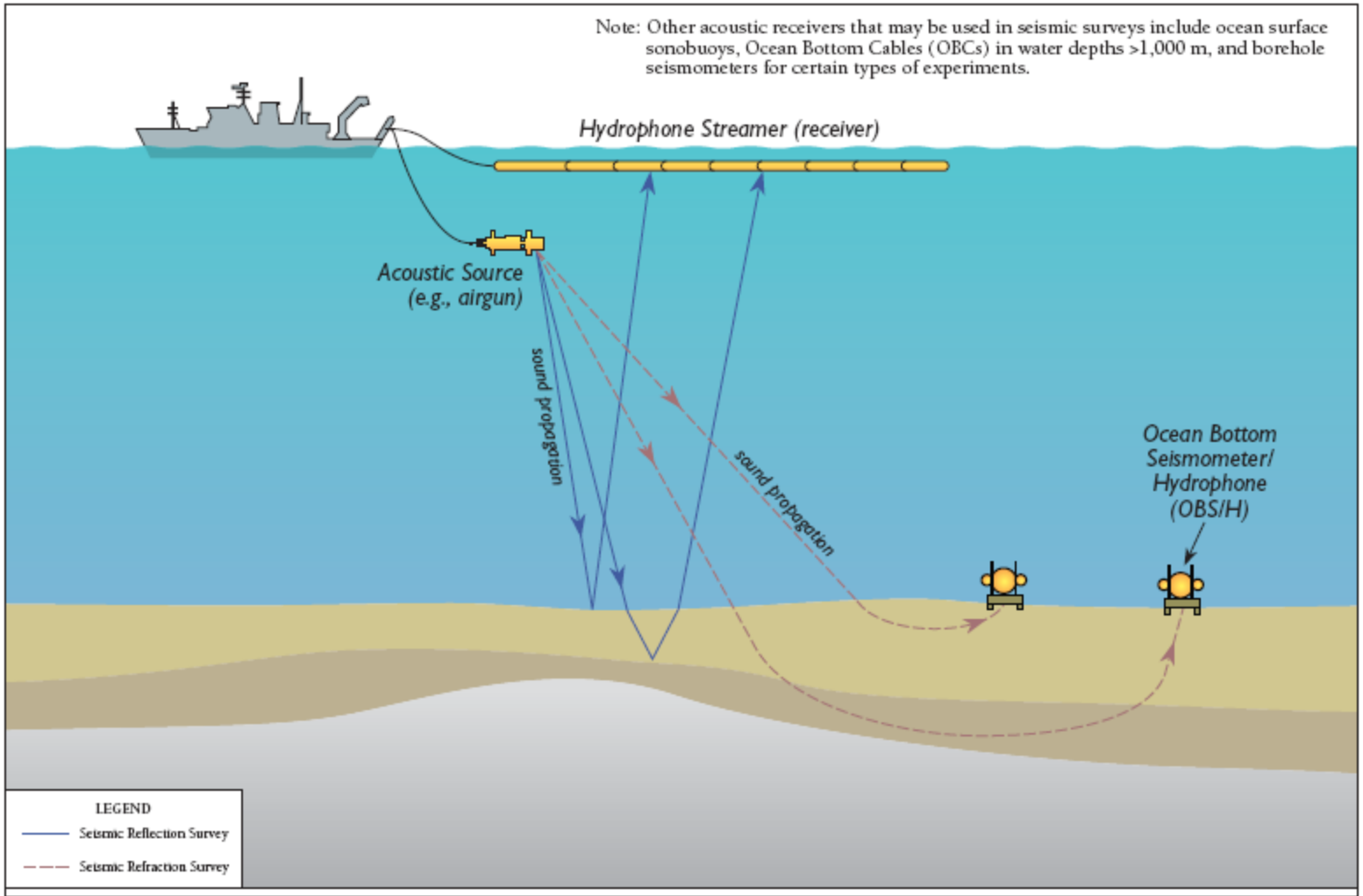


Track line coverage for 3D MCS along the East Pacific Rise. S. Carbotte, LDEO.



MGL0812 - East Pacific Rise - Mutter & Carbotte

Reflection & Refraction Surveys



Not to Scale

Figure 2-1
General Concept of Marine Seismic Reflection and Refraction Surveys

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

Representative Airgun

Streamer Reels on *R/V Langseth*

WHOI Active=Source/Rapid Response OBS/H

PEIS Analysis Approach

- 5 representative Detailed Analysis Areas (DAAs) & 8 Qualitative Analysis Areas (QAAs)
  - Sites where future surveys are likely to occur
  - Sites within a wide range of Longhurst Biomes
- Survey season
- Source levels & configurations (number & type of airguns,2D, 3D, etc.)
- Modeling (AASM, MONM, AIM) to predict **Take Estimates**
- Monitoring and mitigation measures
- 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
- Cumulative Impacts

Harbor seal
(Photo: T. Mangelson, Alaska Sea Grant)

Exemplary (Representative) Analysis Areas

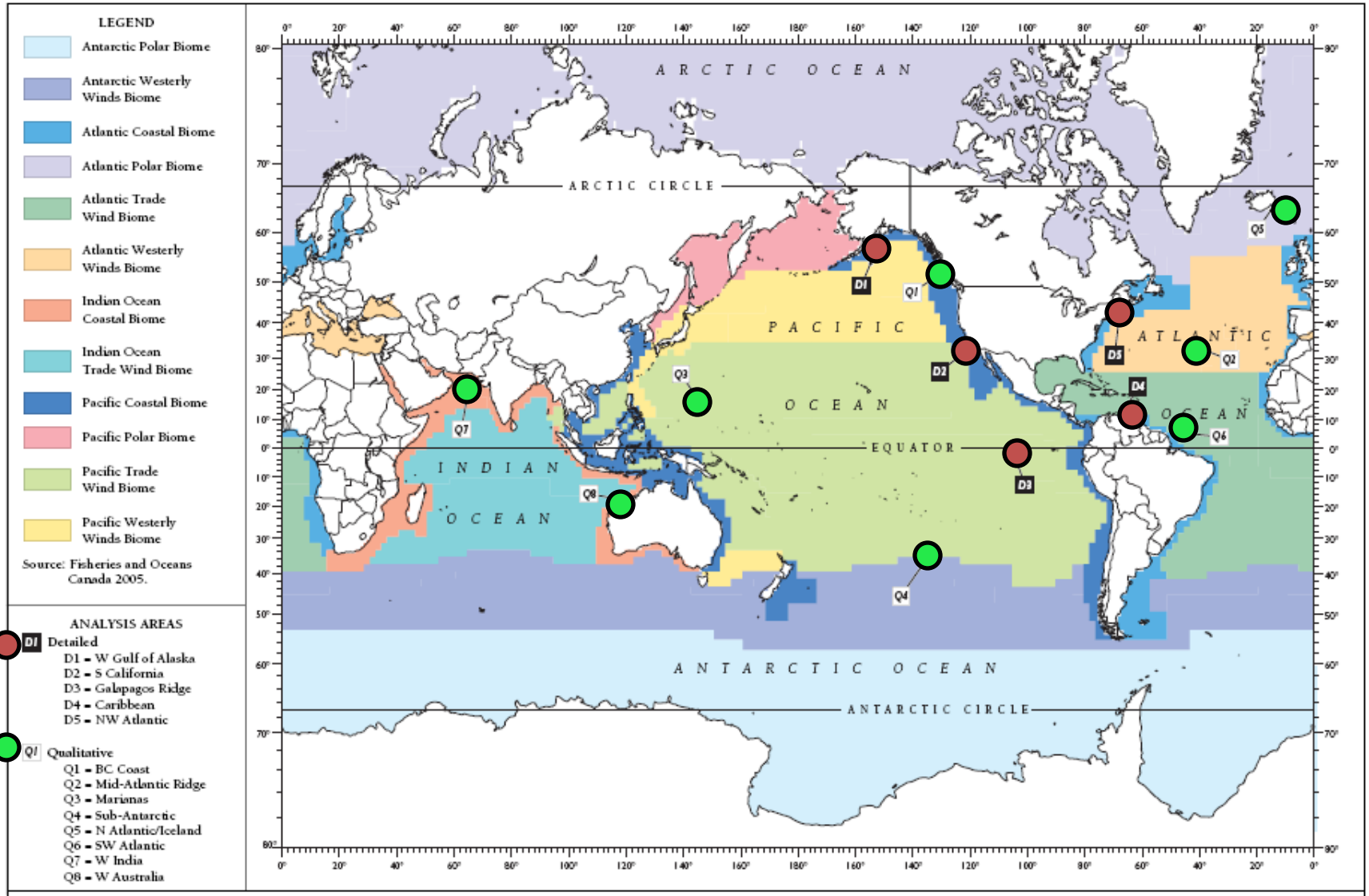
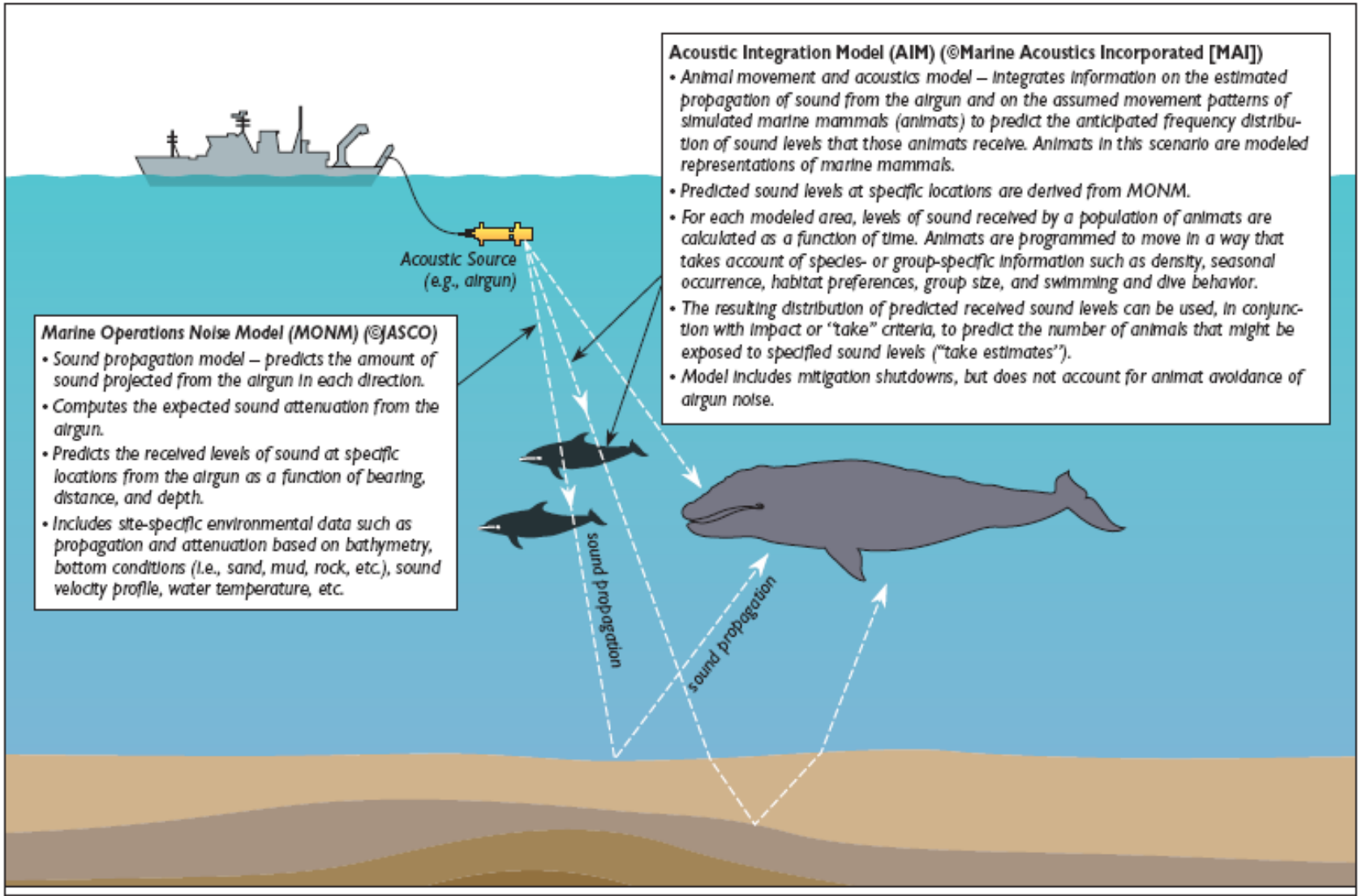


Figure 2-18
Longhurst Biomes and Proposed Detailed and Qualitative Analysis Areas

Modeling

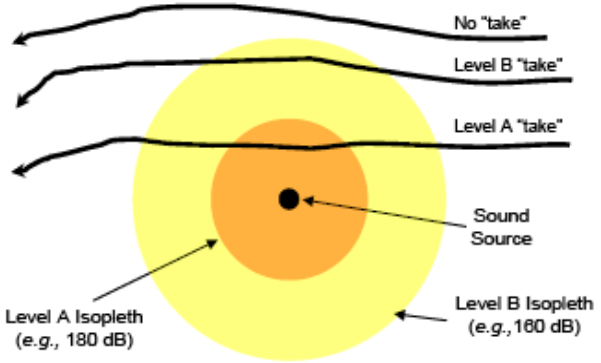


Not to Scale

Figure 2-27
Relationship of Marine Operations Noise Model (MONM) and Acoustic Integration Model (AIM)

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 µPa (rms)
    - Level B Harassment (Behavioral) = 160 dB re 1 µPa (rms)
  - Used the proposed energy (SEL) criterion:
    - Level A Harassment (Injury) = 198 (cetaceans)/186 (pinnipeds) dB re 1 $\mu Pa^2 \bullet sec$
- Considered both flat and M-weighting
- Considered site specific environmental "context"
  - seafloor, temperature, salinity



From 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

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

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 and eliminate Level A impacts or the potential for injury.

Cumulative Impacts:

- Results indicate no significant cumulative effects to the affected environment 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.

Thank you!

- Scripps Institution of Oceanography
- USGS
- NMFS
- John Diebold, LDEO

California sea lion
(Photo: Indianapolis Zoo)

There are 3 ways to comment on the Draft Programmatic EIS/OEIS:

1. Submit written or oral comments at this hearing.
2. Email comments to: nepacomments@nsf.gov
3. Mail comments to:

   Holly Smith
   Division of Ocean Sciences
   National Science Foundation
   4201 Wilson Blvd., Suite 725
   Arlington, VA 22230