

LDEO Office of Marine Operations: Marine Geophysical Survey Outcomes 2008- 2011



Langseth Seismic Setup



Tentative Science Schedule (~195 Operating days)

- *January* — Transit to Guam
- *February/March* — Wiens – Marianas (Guam to Guam)
- *April* — Korengaga – Shatsky (Guam to Honolulu)
- *May* - Lynch-Steiglitz- Line Islands Coring (Honolulu-Honolulu)
- *June* — Carbotte/Carton – Juan de Fuca – (Astoria to Astoria)
- *July* — Holbrook – Cascadia Margin- (Astoria to Astoria)

Other Funding Options

- *Sept- Nov* - Pacific Gas and Electric - 3D Survey off of Diablo Canyon- (Offshore CA)

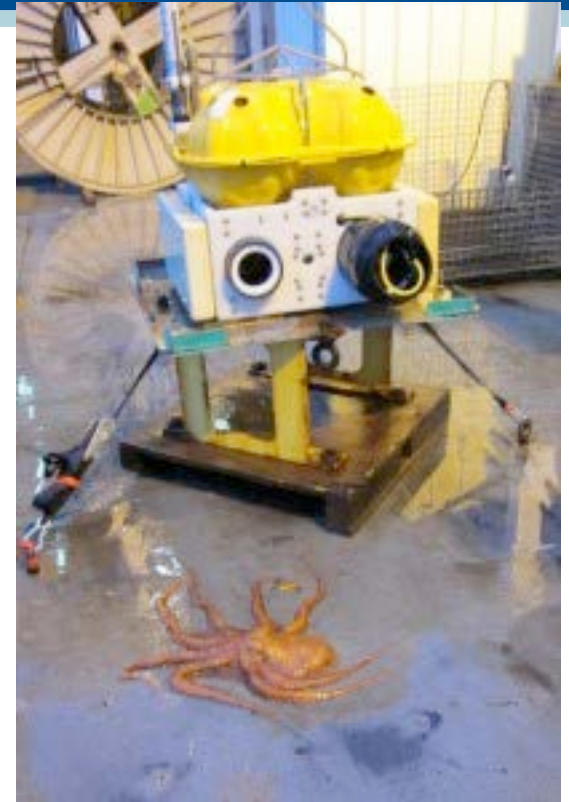
Possible Atlantic Projects for 2013

NSF Projects

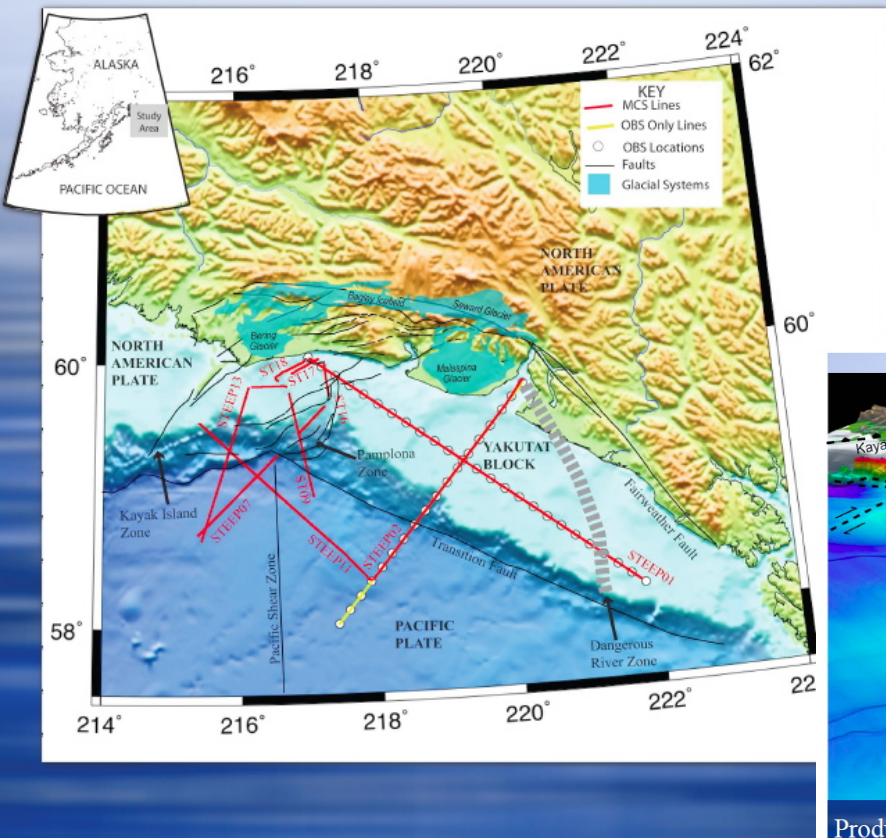
- **Sawyer - 3D Project – Portuguese Margin**
- **Canales - Azores**
- Hayman- Cayman Islands

Other Funding Sources:

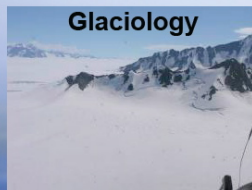
- Canadian Geological Survey – Hudson Bay (~25-35 day survey)
- 1 or 2 USGS Cruises –Extended Continental Shelf (ECS) Mapping
Projects possible on Atlantic Coast. (~30-60 days)



Imaging and Mapping Tectonic-Climate Interactions in the Gulf of Alaska:

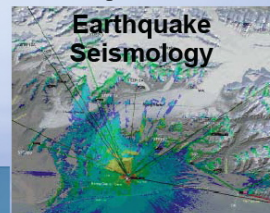


St. Elias Erosion and tectonics Project (STEEP)

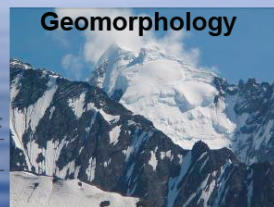


Glaciology

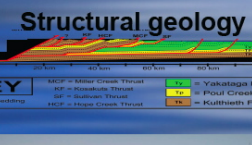
Aimed at getting data that will constrain evolution of the St. Elias orogen



Earthquake Seismology



Geomorphology



Structural geology



Sedimentology



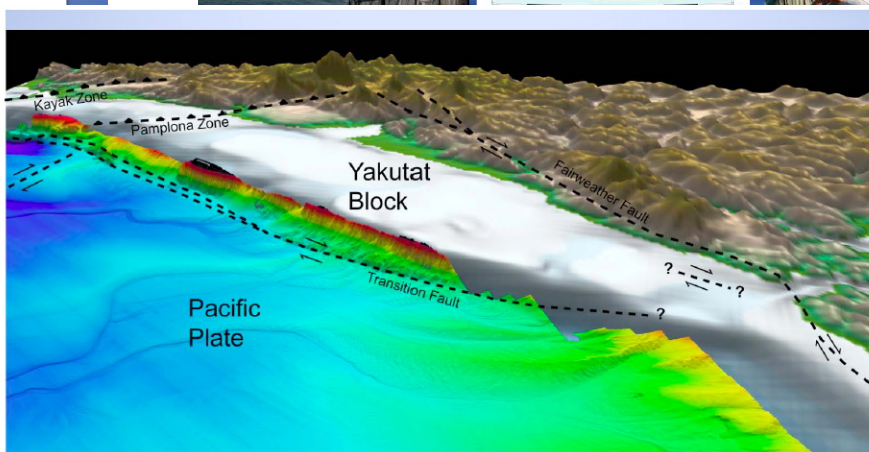
I. Onshore-Offshore seismic



GPS



Thermochemistry



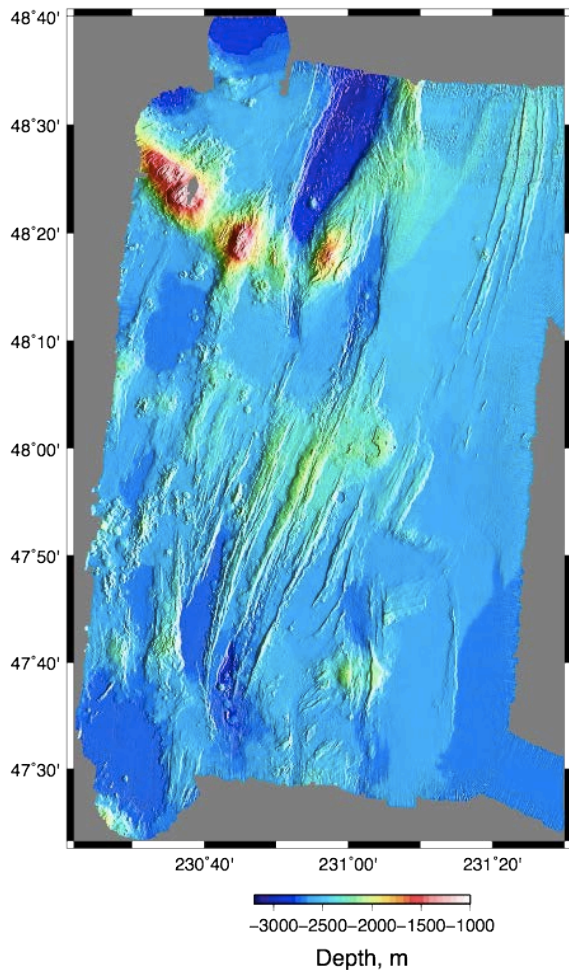
Produced new images of Pamplona Zone, Dangerous River Zone, and Transition fault

Penetrated to basement for the first time in the Gulf of Alaska
Recorded arrivals through entire thickness of Yakutat Block
See posters on Friday for science results (T53B-1941, T53B-1942)

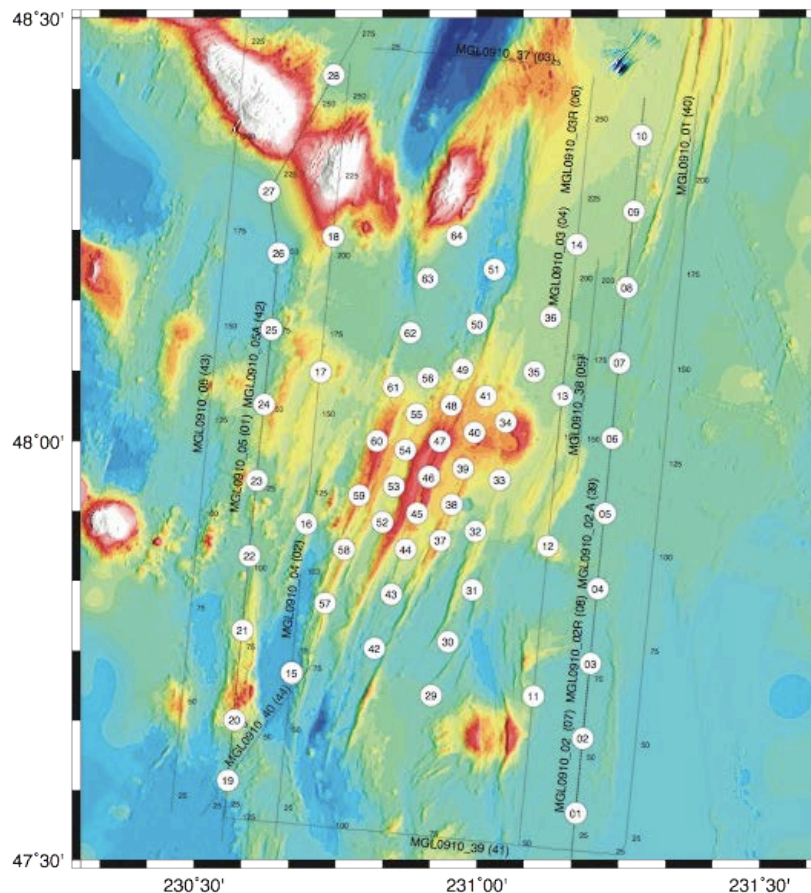
Image from Gulick et al., Geology 2007

Toomey et al., 2009

Endeavour_em122_interp10.grd

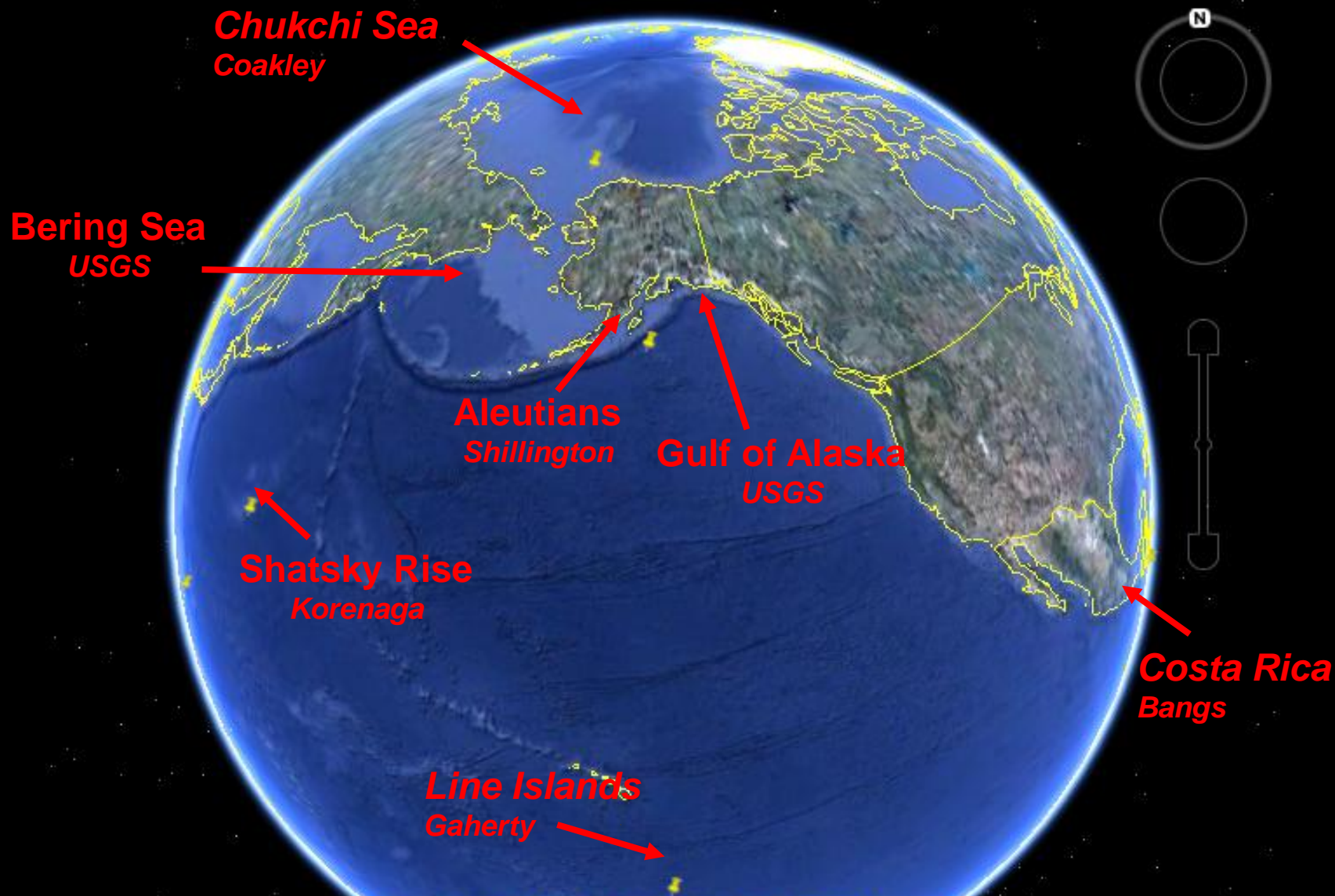


ETOMO Undershoot



R/V Langseth conducted a seismic tomography experiment on the Endeavour segment of the JdF Ridge. During the 30-day leg, 68 four-component, ocean bottom seismometers (OBSs) were deployed in a 90x50 km² area. (Toomey, 2009)

Location of 2010-11 Science Missions



Data SIO, NOAA, U.S. Navy, NGA, GEBCO

© 2009 Europa Technologies

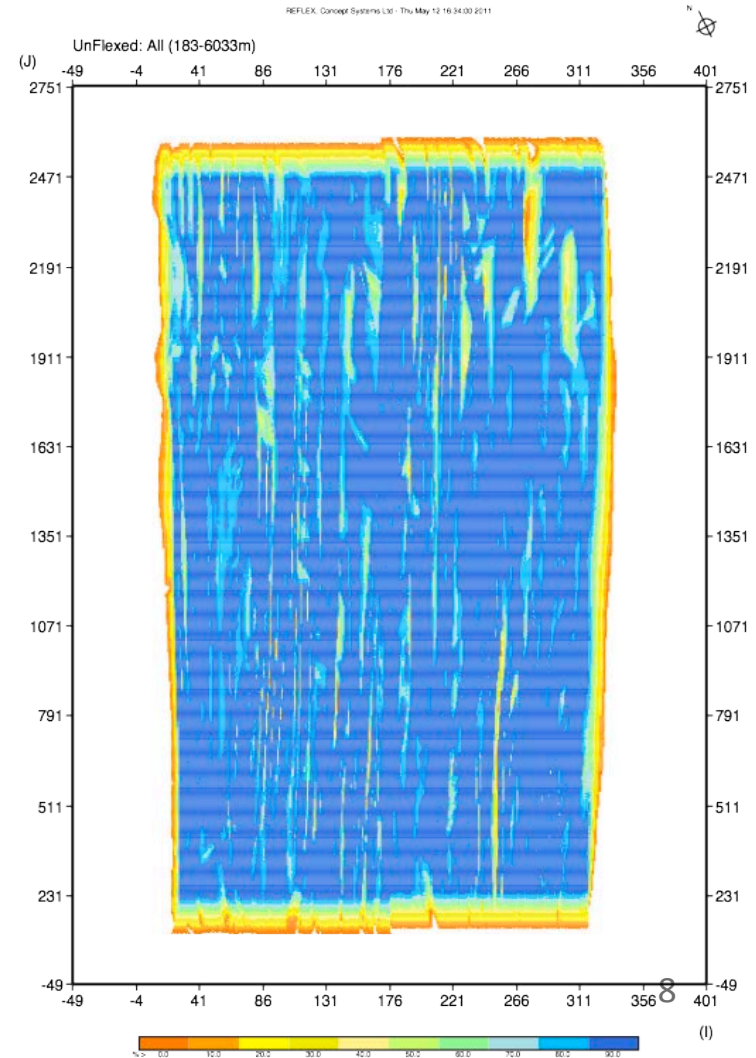
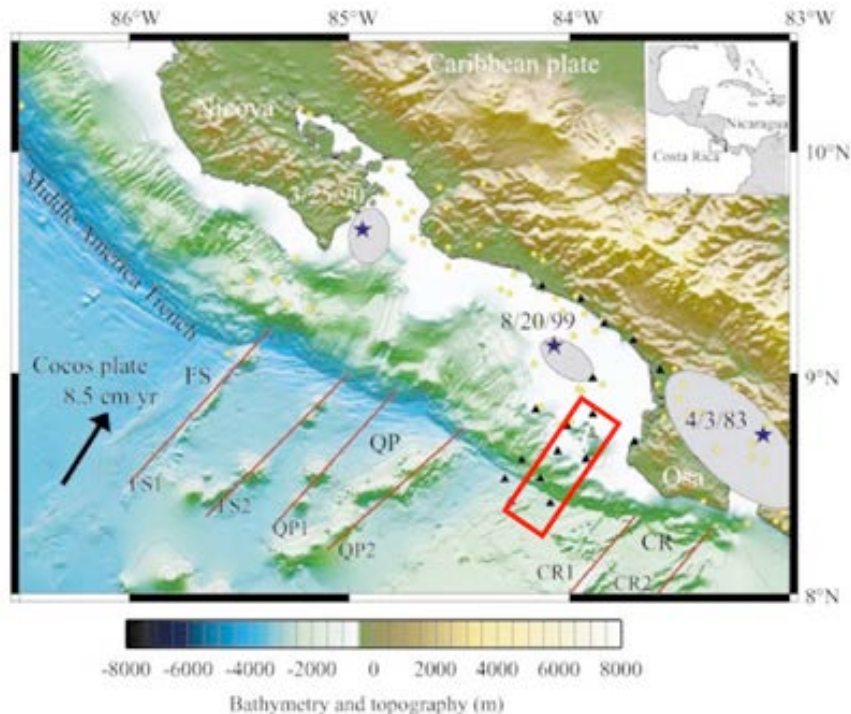
US Dept of State Geographer

© 2009 Tele Atlas

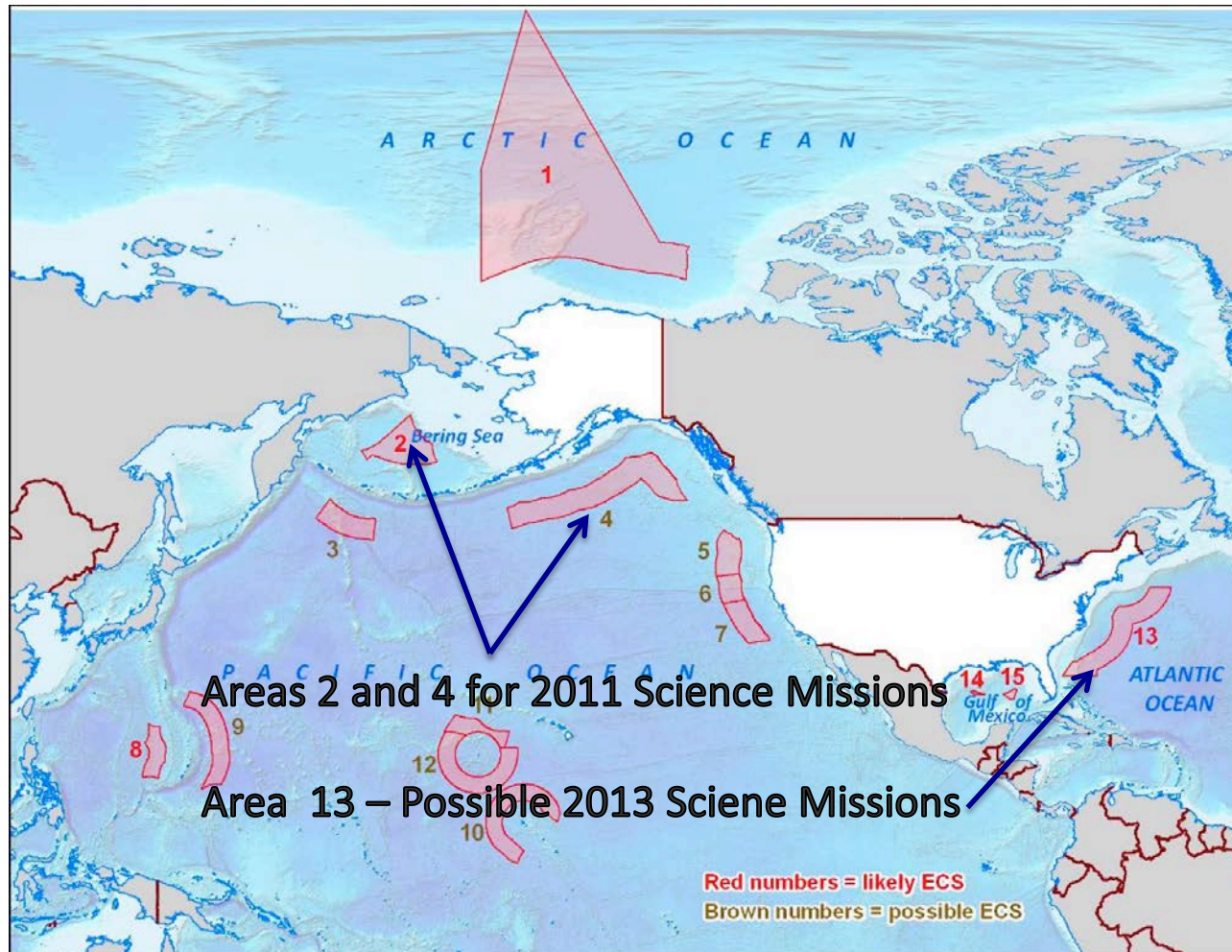
Offshore Costa Rica (Bangs)- April/May 2011

This project acquired a 11 x 55 km volume of 3D seismic reflection data to examine the 3D structure of the Costa Rica convergent margin near Osa peninsula.

Below, regional map of the Middle America subduction zone. The gray ovals are recent earthquake slip areas. The red box is the planned survey area. **Right**, Final 3D coverage achieved over survey area where shades of blue = 70-100% coverage.



Location of USGS Science Missions, Bering Sea and Gulf of Alaska (Map courtesy of USGS)

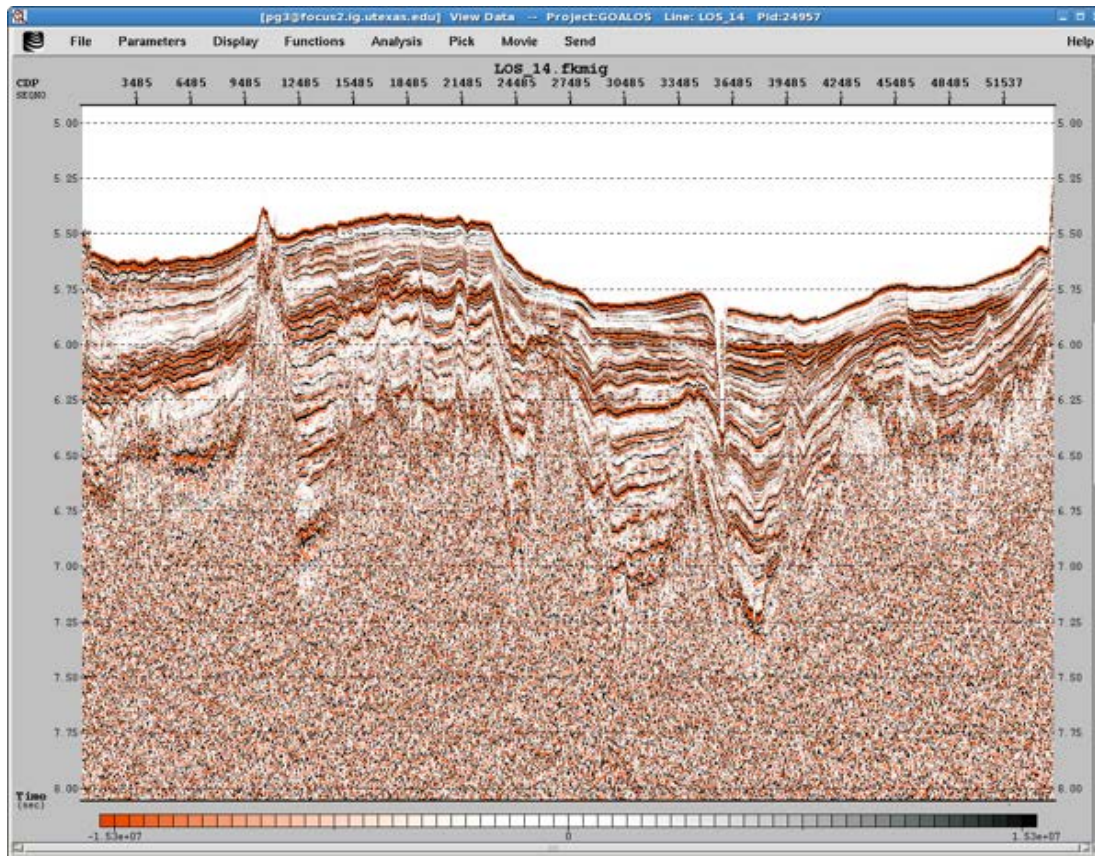


The shaded area on this map illustrates where the U.S. is considering collecting and analyzing data and does not represent the official U.S. Government position on where it has extended continental shelf. This map is without prejudice to boundary depictions and future negotiations.

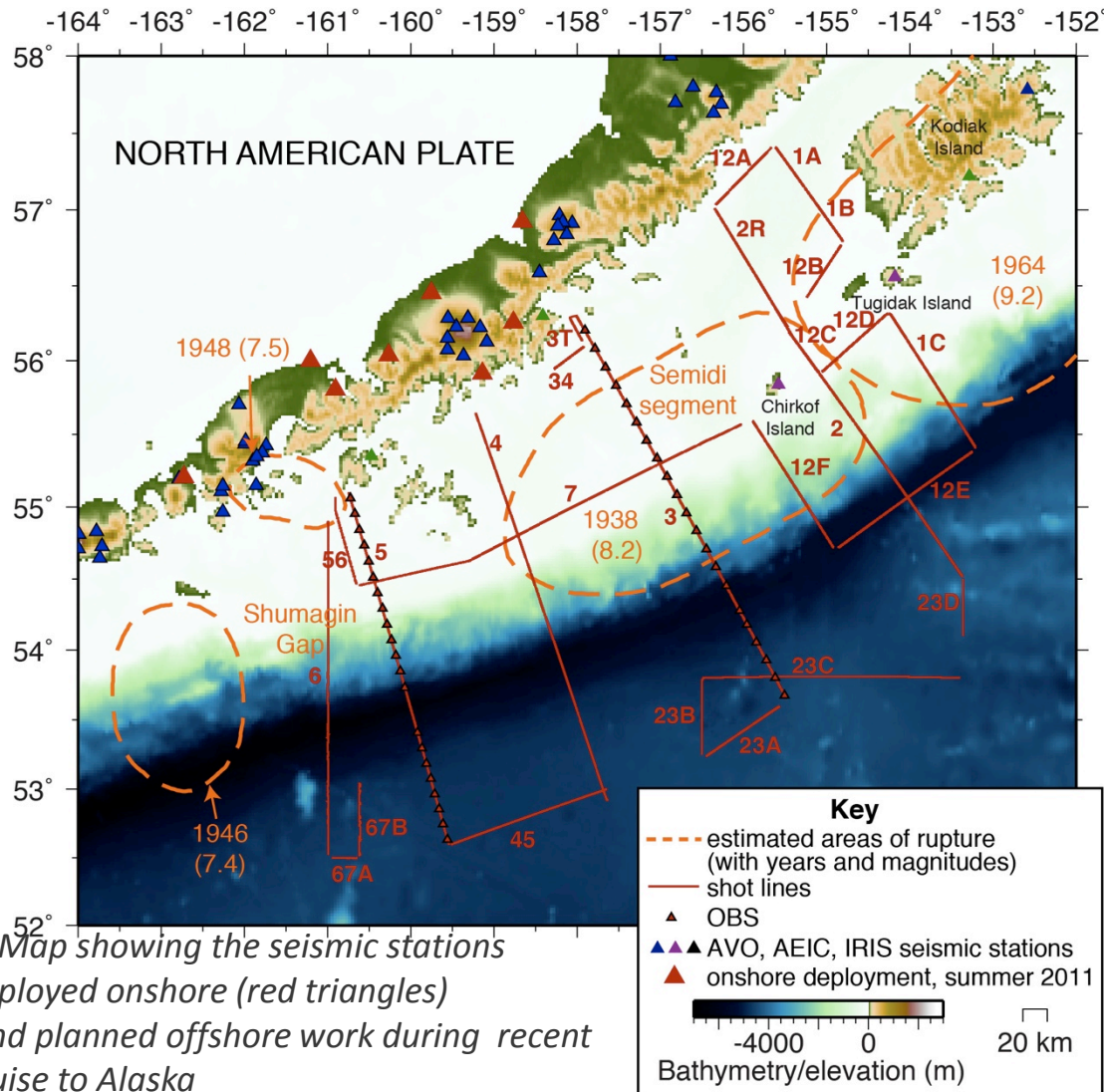
Extended Continental Shelf Project :
Marine geophysics for the purpose of determining geologic framework, crustal nature and sediment thickness in support of delimiting the US extended continental shelf under provisions contained in Article 76 of the Convention on the Law of the Sea.

Gulf of Alaska, June 4 – 26 , 2011 (Childs, Barth, and Gulick)

Image from MGL_1109 shot across the southern end of the Baranof Fan showing an unconformity about midway down the section that predates the Fan, an older extensive channel that likely helped build the Fan, and two small modern channels overlying the older more extensive channel.



2011 Imaging the Sources of Great Alaskan Earthquakes



▲ Map showing the seismic stations deployed onshore (red triangles) and planned offshore work during recent cruise to Alaska

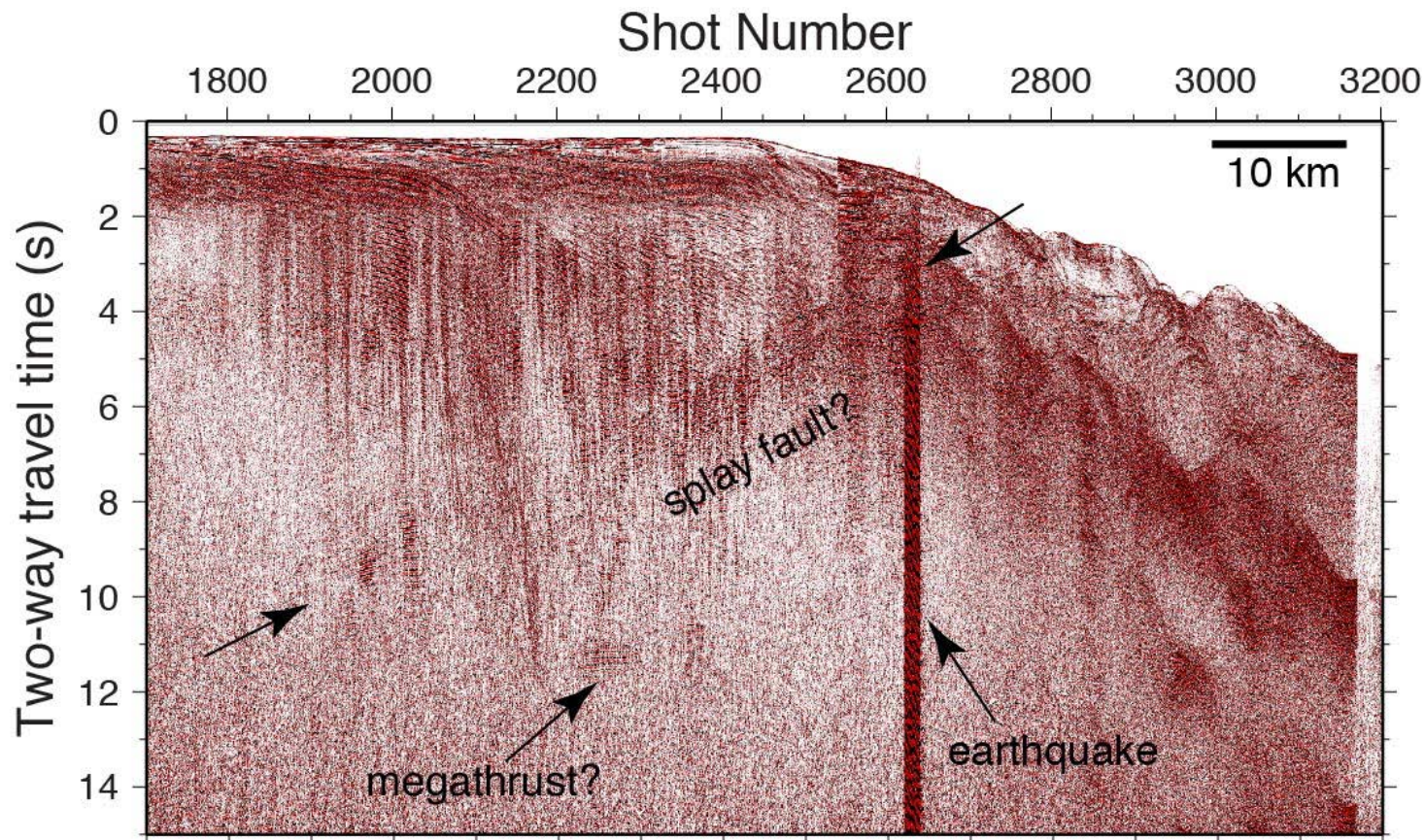
Aleutian Megathrust Project- July 2011

A major tectonic boundary on the seafloor off Alaska has produced fatal earthquakes and tsunamis similar to the recent one in Japan. In 1964, the second largest quake ever recorded happened here, and other parts of the fault may be building energy for another event. Scientists from Lamont-Doherty Earth Observatory are aboard the R/V *Langseth* to better understand what causes these quakes, which will help assess the hazard for Alaska and beyond. (Shillington)

Imaging the Sources of Great Alaskan Earthquakes

Seismic Image from Aleutian Megathrust Project - July 2011 (Shillington)

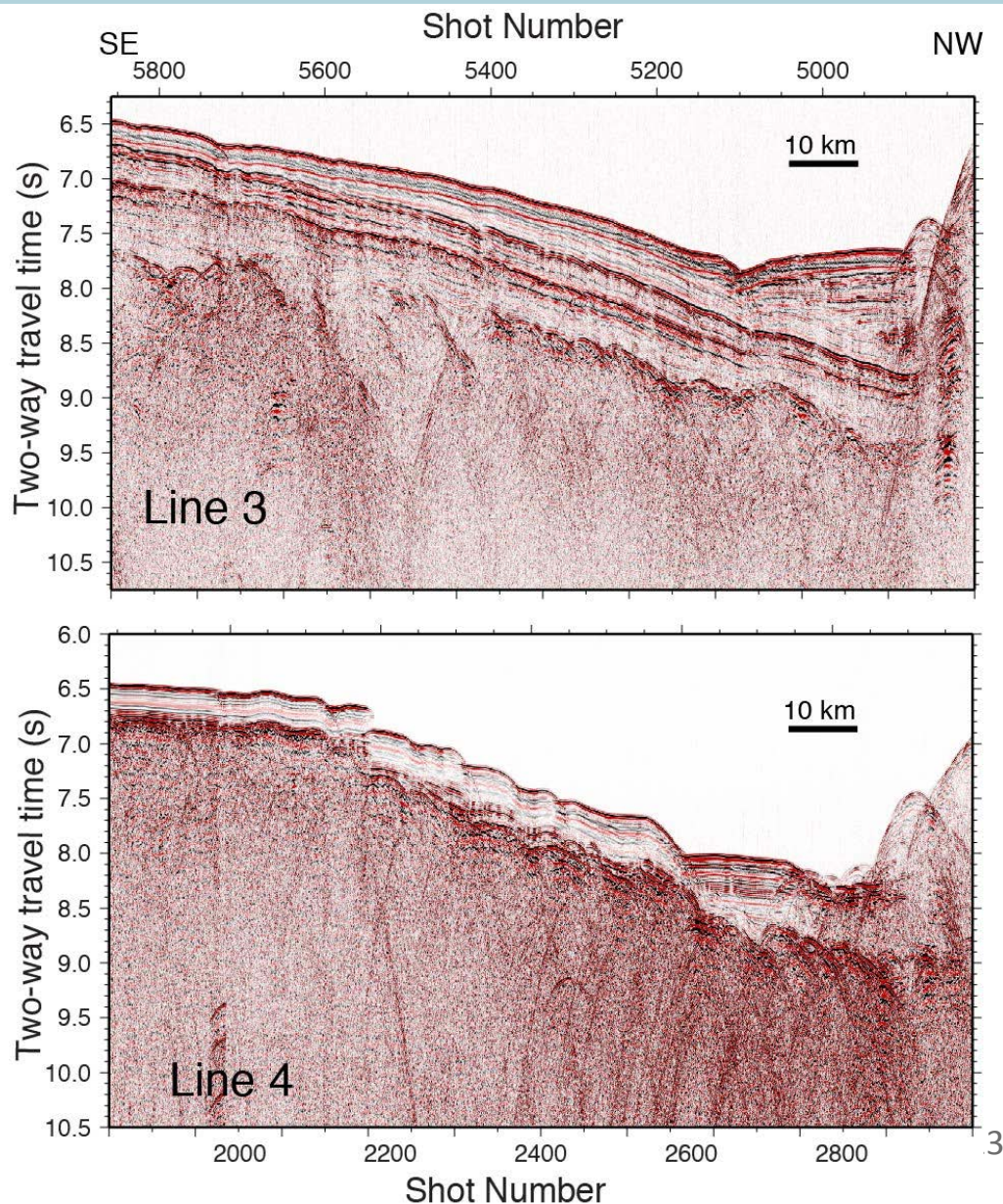
Brute stack from continental shelf in the Shumagin Gap showing deep reflections (possible from the plate boundary) as well as another prominent structure in the overriding plate - possibly a splay fault.



2011 Imaging the Sources of Great Alaskan Earthquakes

Seismic Image from Aleutian Megathrust Project - July 2011 (Shillington)

Comparison of brute stacks of the downgoing oceanic crust in the Semidi segment (above), which appears to have great earthquakes every 50-75 years, and the Shumagin gap (below) which has not had a historic great earthquake. Note the big differences in sediment thickness, faulting associated with bending, and characteristics of oceanic crust.



USGS Extended Continental Shelf

Bering Sea- Aug 2011 (Barth and Scholl)

Right, Large velocity amplitude (VAMP) anomaly structure on Line 1. Note that the length of Line 1 is on the order of 140 km. The underlying annotated blow up of the Big VAMP (Line 1) explains the posit, which will be tested with the velocity data we collect on MGL 1111. VAMP structures like to center themselves over basement knolls or maybe deeply buried seamounts.



Left, Crew getting ready to launch CTD rosette to collect water sample and velocity profiles from deep part of Bering Sea

