A topographic map of the Pacific Northwest region of the United States, showing the Cascade Range and surrounding areas. The map is color-coded by elevation, with green representing lower elevations and brown/orange representing higher elevations. Numerous yellow dots, red triangles, and red circles are scattered across the map, indicating seismic activity. A semi-transparent dark green rectangular box is overlaid on the map, containing the title and author information. Two inset maps are visible: one in the bottom-left corner showing a magnified view of the western coast, and another in the bottom-right corner showing a magnified view of the Cascade Range.

Earthscope Seminar: the summary

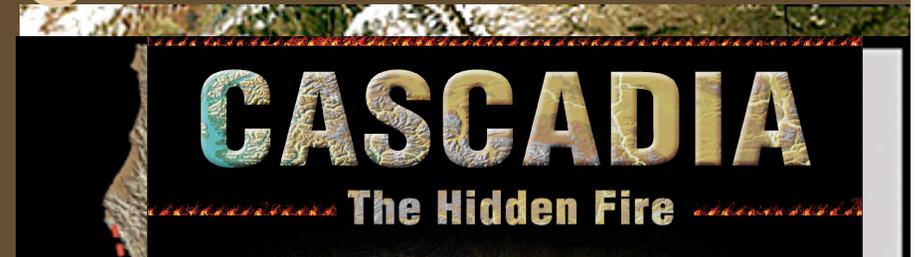
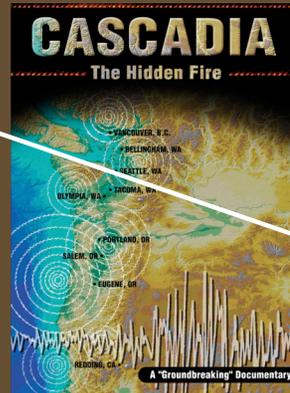
Teresa Mae Lassak
April 30th, 2007

Earthscope

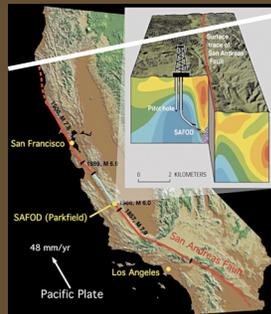
- Use arrays of data (geologic, seismic, exploration) to:
 - Understand the structure, evolution and dynamics of North America.
 - Enhance understanding of SAF.
- Better understand seismic and natural hazards.
- “Investigate the relationship between mantle structure and dynamics, and crustal tectonics, and between tectonics and fluids in the crust.”

Focus regions

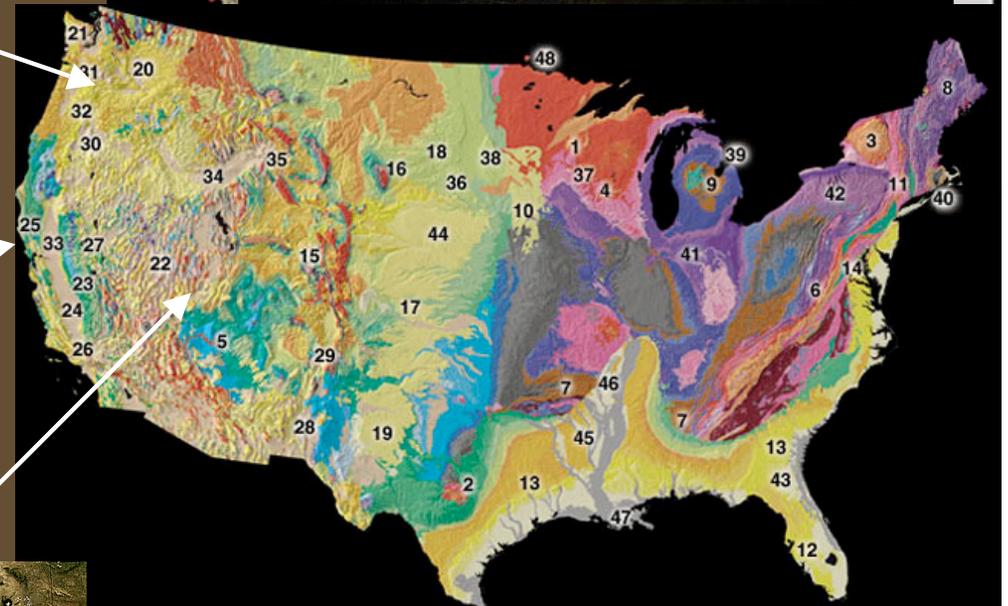
- Cascadia



- San Andreas Fault System



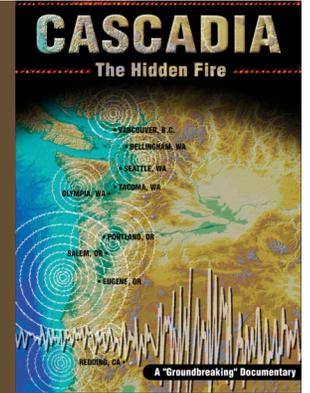
- Colorado Plateau



Data/Techniques Used

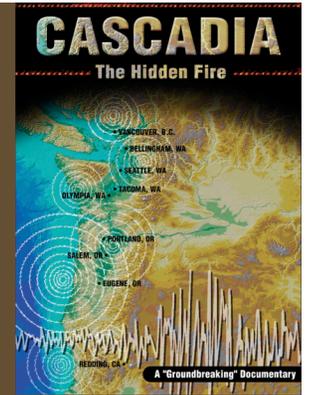
- Broadband seismic stations (Ambient noise)
- Surface deformation data
- Receiver functions
- S-Wave triplications
- Interferometric synthetic aperture radar (InSAR)
- Magnetotelluric electrical resistivity data (MT)
- Seismic reflection
- Drilling
- Gravity measurements

Cascadia



- Geometry of subducted plate?
- Earthquake prediction?

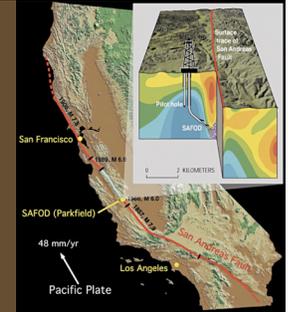
- Papers:
 - Episodic Tremor and slip on the Cascadia subduction zone: The chatter of silent slip
 - G. Rogers and H. Dragert
 - High-Resolution Surface-Wave Tomography from Ambient Seismic Noise
 - N.M. Shapiro, M. Campillo, L. Stehly, and M.H. Ritzwoller
 - Low-Velocity Zone Atop the 410-km Seismic Discontinuity in the Northwestern United States
 - T.-R.A. Song, D.V. Helmberger, and S.P. Grand



Cascadia: Lingerin Questions

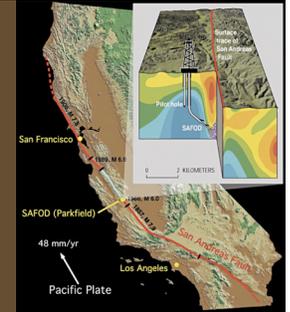
- Yellowstone: what is it?
 - plume?
 - or some thing else?
- What is a mechanism for the flattening of a slab, and subsequent detachment?
- How does a dehydrated slab detach and sink, and how does it affect the flow field in the mantle?
- How could a plume could break through a slab?

San Andreas Fault System



- Geology of SAF
 - Use both geology and seismology
 - SAFOD
- Fluids?
- Papers:
 - Fine-scale structure of the San Andreas fault zone and location of the SAFOD target earthquakes
 - Thurber, C., S. Roecker, H. Zhang, S. Baher, and W. Ellsworth
 - Internal structure of the San Andreas fault at Parkfield, California
 - Unsworth, M.J., P.E. Malin, G.D. Egbert, and J.R. Booker

SAF: Lingering Questions



- Has SAFOD looked at fluids present in the rocks at depth.
- Have there been porosity/permeability studies in the borehole?
- Fluids...
 - Data shows a greater apparent resistivity measured parallel to SAF
 - Interpreted as a high porosity region with saline fluids in fault zone
 - Does that make sense?
- How important is the source of fluids potentially present in SAF?
 - Fluids may be crustal, mantle, or meteoric.
 - Would fluid from different sources be more or less likely to assist in rupture?

Colorado Plateau



- Origin of Colorado plateau thickening?
 - Injection of new material?
 - Other causes?
- Farallon slab affect the uplift?
- Papers:
 - Upper mantle structure beneath the eastern Colorado Plateau and Rio Grande rift revealed by Bouguer gravity, seismic velocities, and xenolith data
 - Roy, M., J.K. MacCarthy, and J. Selverstone
 - Raising the Colorado Plateau
 - McQuarrie, N., and C.G. Chase

CP: Lingerin Questions



- What is our best guess as to what caused the thickening of the Colorado Plateau?
- How would basalt extraction from peridotite (which may leave a lower-density residuum) affect uplift?

North America



USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
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Remaining questions...

- Are surface deformations a manifestation of mantle influence on the lithosphere? If so where and how?
- What types of integrated studies would help begin addressing problems related to our understanding of the crust and mantle within a system?
- Detailed structure of the Moho, 410-, and 660-km discontinuities beneath the western US ?
- What implications/relationship does boundary layer structure have for the surface tectonics of North America?
- Are joint inversions utilizing the vast array of EarthScope data planned/in progress?

Remaining questions...

- Does the group think that other nationwide geophysical exploration projects used in conjunction with Earthscope data would be beneficial to studying the NA continent?
 - a nation-wide gravity survey,
 - nation-wide EM survey,
 - etc...
- How far will Earthscope go?