The Abdus Salam
International Centre for Theoretical Physics

United Nations
Educational, Scientific and
Cultural Organization

IAEA
International Atomic Energy Agency

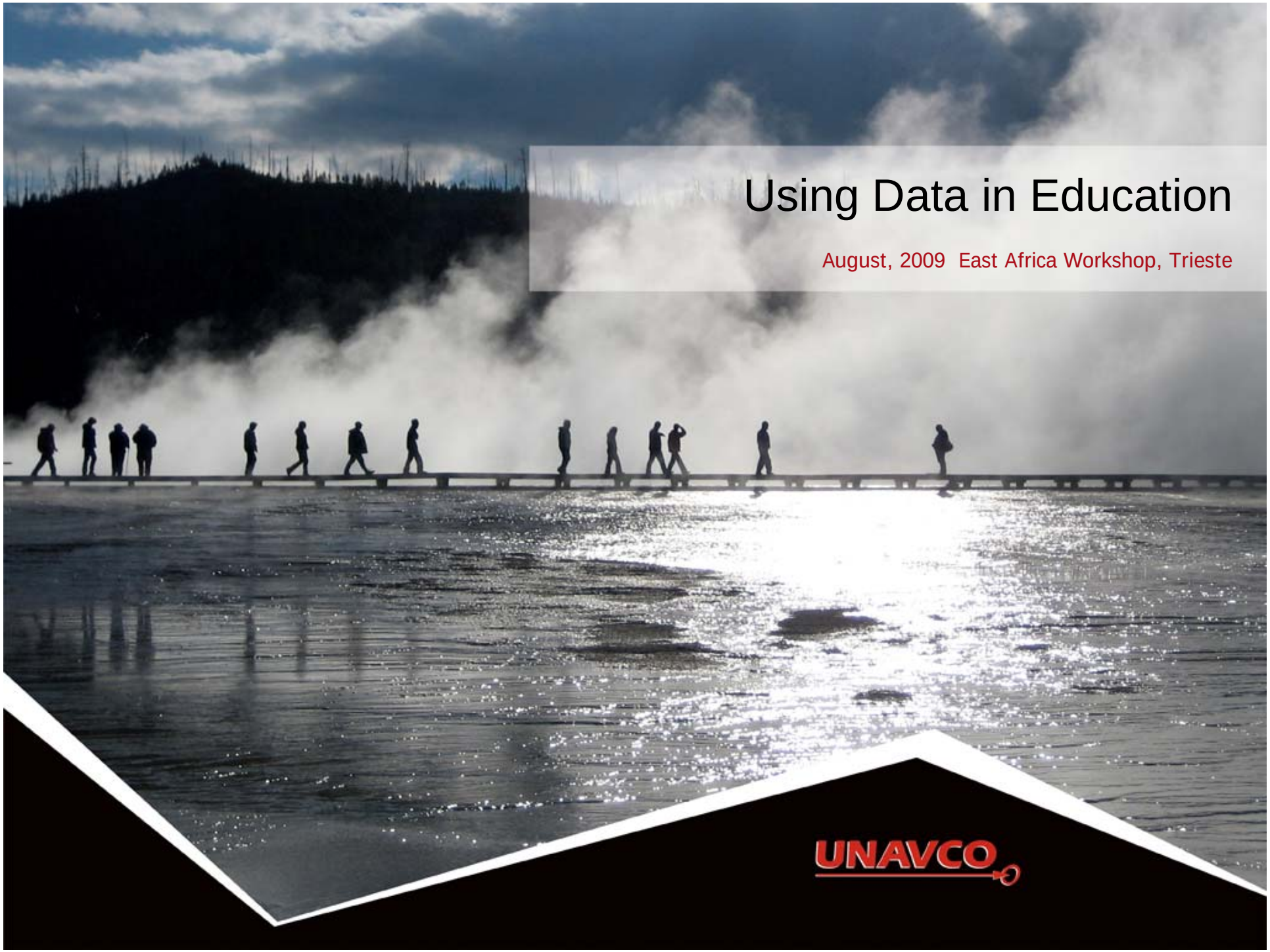
**2053-32**

# Advanced Workshop on Evaluating, Monitoring and Communicating Volcanic and Seismic Hazards in East Africa

*17 - 28 August 2009*

## Education and Outreach

Susan Eriksson
*UNAVCO*
*Boulder*
*USA*


Using Data in Education
August, 2009 East Africa Workshop, Trieste
UNAVCO

# Monday and Friday - Education

- Why talk about education ?
- What types of data
- What will you use it for?
- Resources for data
- Resources for educational framework
- Plan for after the workshop

# At UNAVCO: Education & Outreach Mission

- Promote a broader understanding of Earth science
- Foster collaboration between the scientific and educational communities
- Increase the number and diversity of students

Image courtesy of George Steinmetz

# What do we want to accomplish?

- Scientific discoveries - the ‘content’
  - things we know
  - things we don’t know
  - How we go about ‘finding out’
- Skills of science -?
- Exploration - inquiry

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# Science Literacy - 2009

- Earth scientists use repeatable observations and testable ideas to understand and explain our planet.
- Earth is 4.6 billion years old
- ….is a complex system of interacting rock, water, air, and life.
- Humans depend on Earth for resources
- **Natural hazards pose risks to humans.**
- . . . . .

# What are the skills of science ?

- Mathematics
- Problem solving
- Learning to ask the right questions
- Graphing
- Map reading
- Communication
- ?
- ?

# Education and Training

**UNAVCO Short Course Series:**
**Researchers at different levels**

**Disseminating Knowledge:**
**Teacher and Faculty Workshops**

**UNAVCO Field Courses:**
**Researchers and Students**

# Easy access to data

UNAVCO

Promoting Earth science by advancing high-precision techniques for the measurement of crustal deformation.

- Education & Outreach
- About Us
- Educational Workshops
- Short Course Series
- Map Tools
- Data for Educators
- Teacher Resources
- RESESS Internships
- Outreach Materials
- Newsroom
- Highlights
- Links
- DLESE Search
- Contact Us

## Data For Educators

Looking for interesting data to use in your course? We've worked with educators and scientists to identify GPS stations that illustrate various Earth science processes. The data are the same quality that many scientists use in their research and is in a MS Excel readable format called CVS.

### GPS data that show...

### ...tectonic plates moving

*GPS Data Products*

| Station Id | Location |
|---|---|
| ALBH | Albert Head, Victoria, Canada |
| BEMT | Twentynine Palms, CA |
| NEAH | Neah Bay, WA |
| SBCC | Mission Viejo, CA |
| SEAT | Seattle, WA |

*Educational resources using these stations*

- Using GPS Time Series Plots to Determine Plate Motion in California
- Using GPS Data to Visualize the Influence of a Subducting Plate in the Pacific Northwest
- Visualizing Relationships between Earthquakes, Volcanoes, and Plate Boundaries in the Western United States
- Episodic Tremor and Slip: The Case of the Mystery Earthquakes

### ...movement on different sides of a fault

*GPS Data Products*

| Station Id | Location |
|---|---|
| BEMT | Twentynine Palms, CA |
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*Educational resources using these stations*

- Using GPS Time Series Plots to Determine Plate Motion in California
- Visualizing Relationships between Earthquakes, Volcanoes, and Plate Boundaries in the Western United States

### ...rebound of plates after an earthquake!

*GPS Data Products*

| Station Id | Location |
|---|---|
| CAND | Parkfield,, CA |
| CARH | Parkfield, CA |

*Educational resources using these stations*

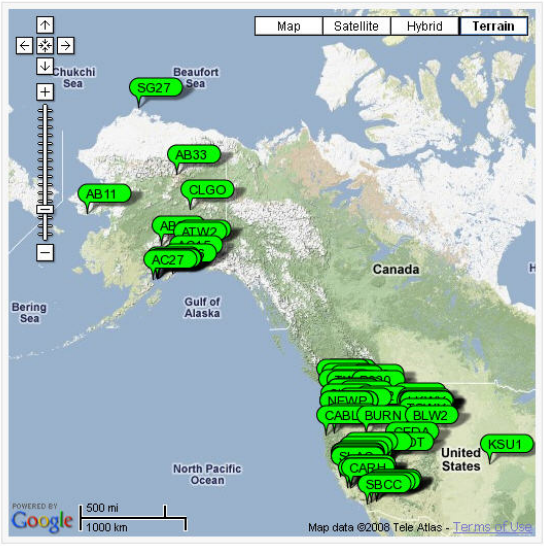
- Using GPS Time Series Plots to Determine Plate Motion in California

### ...movement on a subduction zone

*GPS Data Products*

| Station Id | Location |
|---|---|
| NEAH | Neah Bay, WA |
| PABH | Pacific Beach, WA |

### Selected GPS Stations




To see these stations on a larger map and discover more GPS stations and data, try the Data archive . You can search for GPS stations in your area by clicking on the Station Search tab and selecting a region from the list. A list of the stations will appear below the map with access to the Position Time Series Data in csv format and and in RINEX and pos formats.

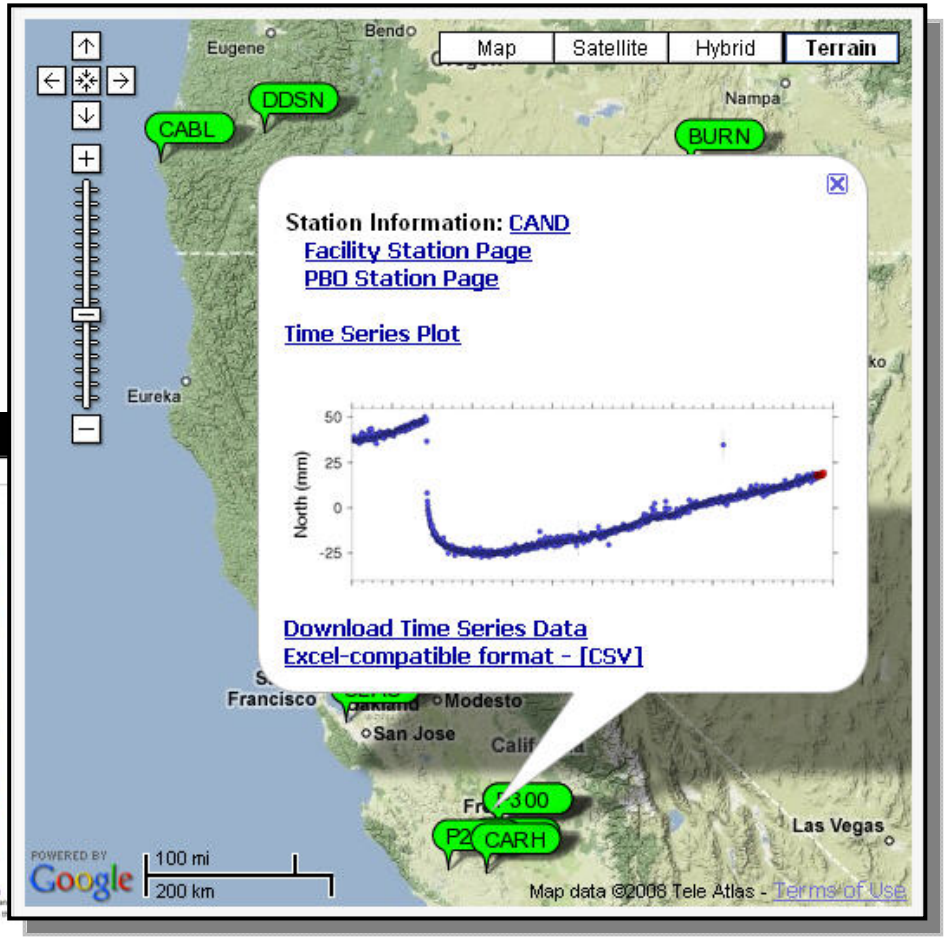
### General GPS Education Materials

*(under construction)*

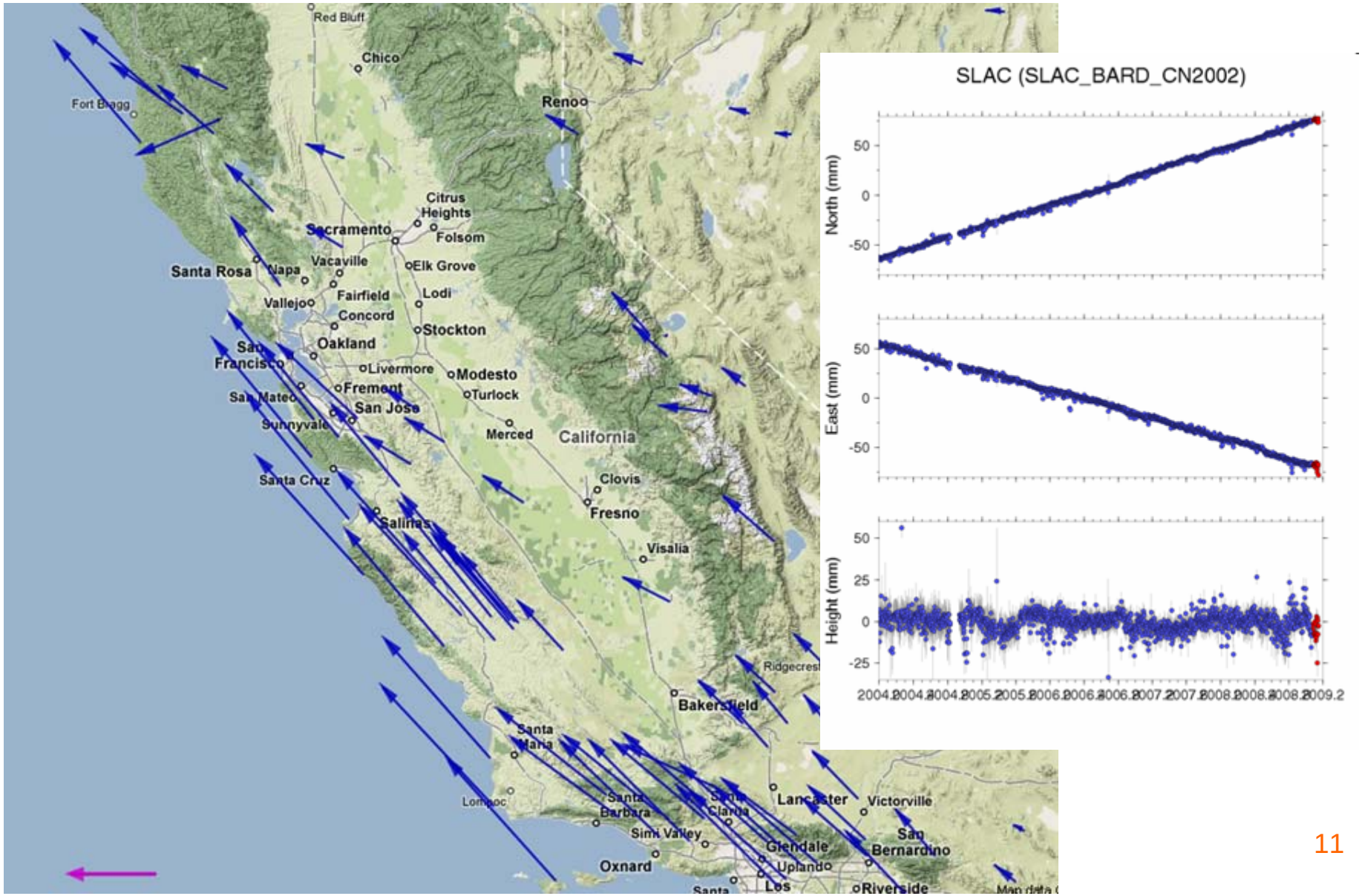
- How to Get Started with Using UNAVCO's GPS Data
- How does GPS Work?
- Locating Position Using GPS

# GPS

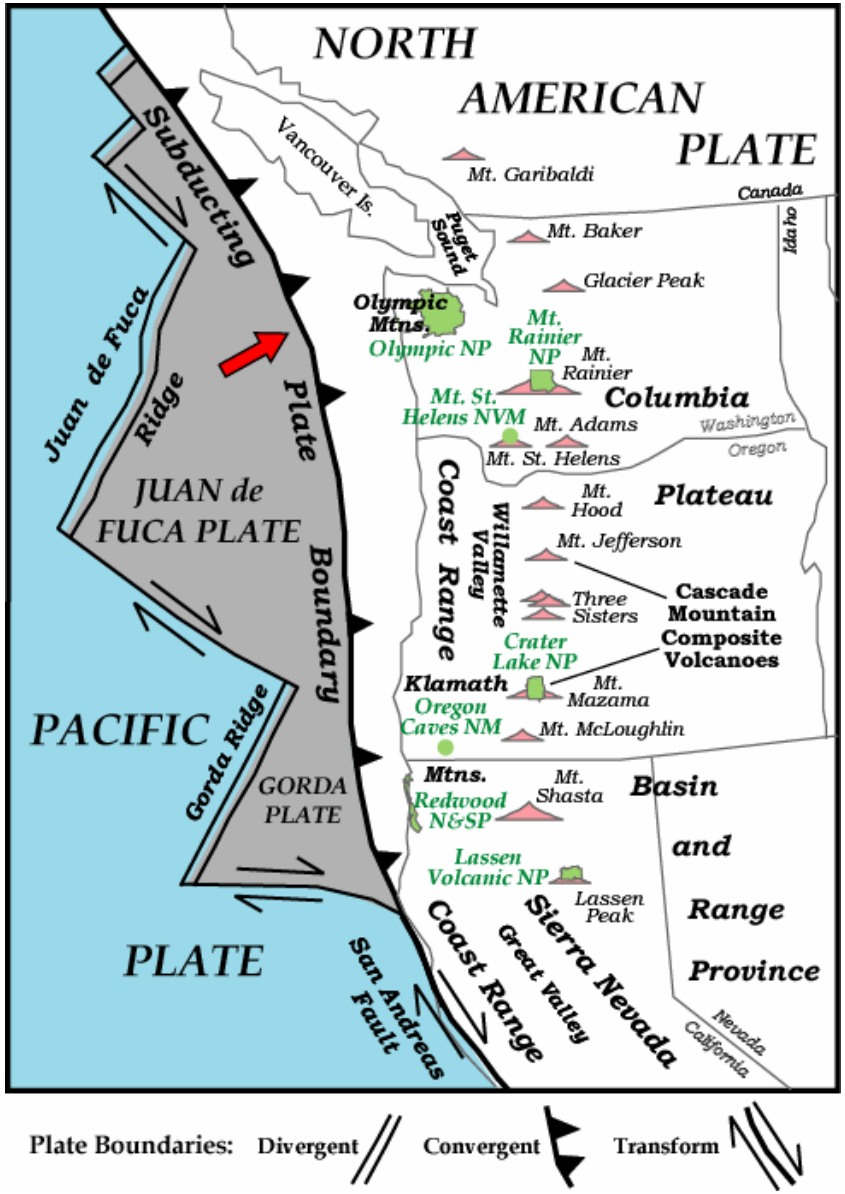
# Using Data in the Classroom

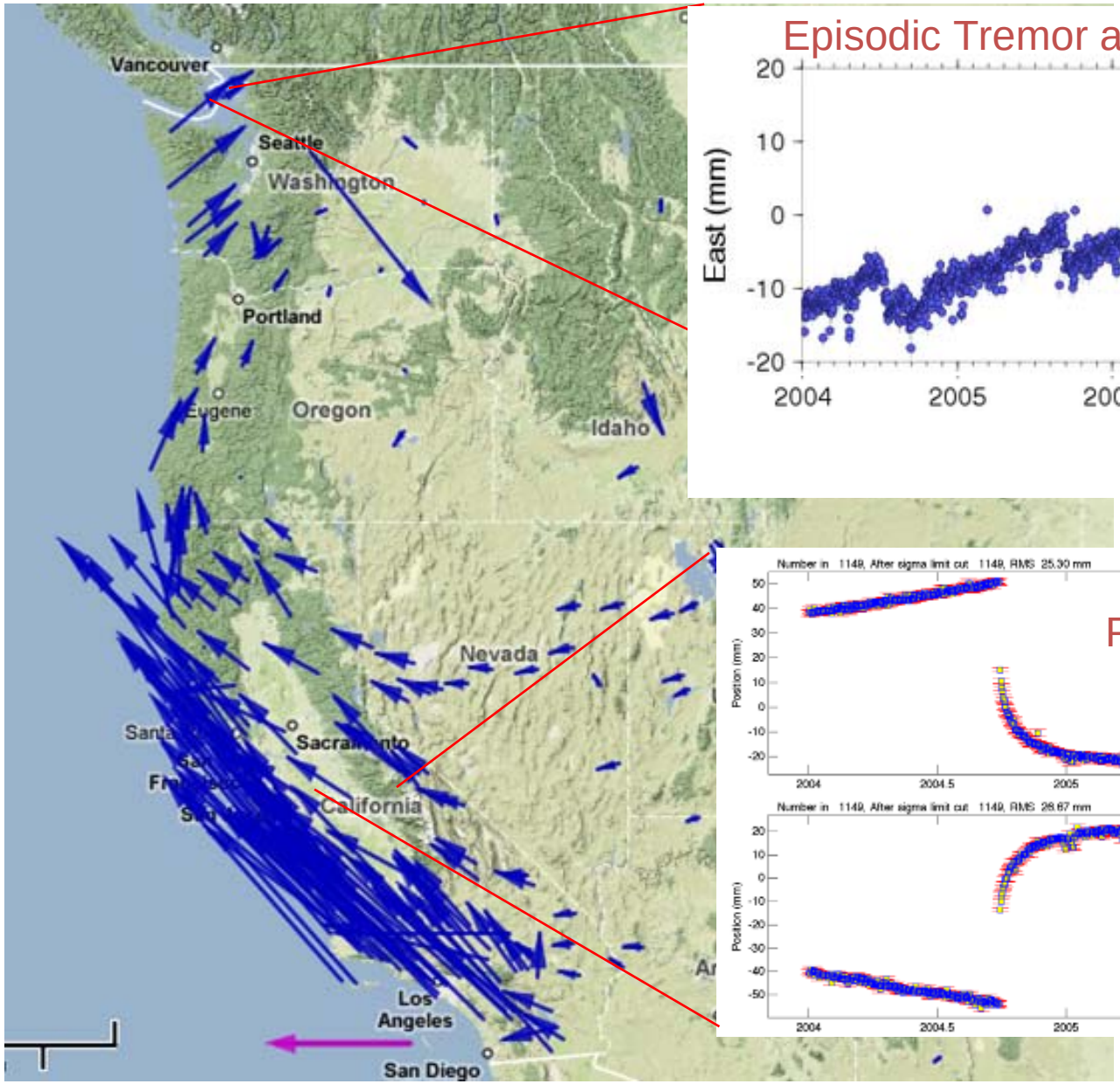
# Plate Motion

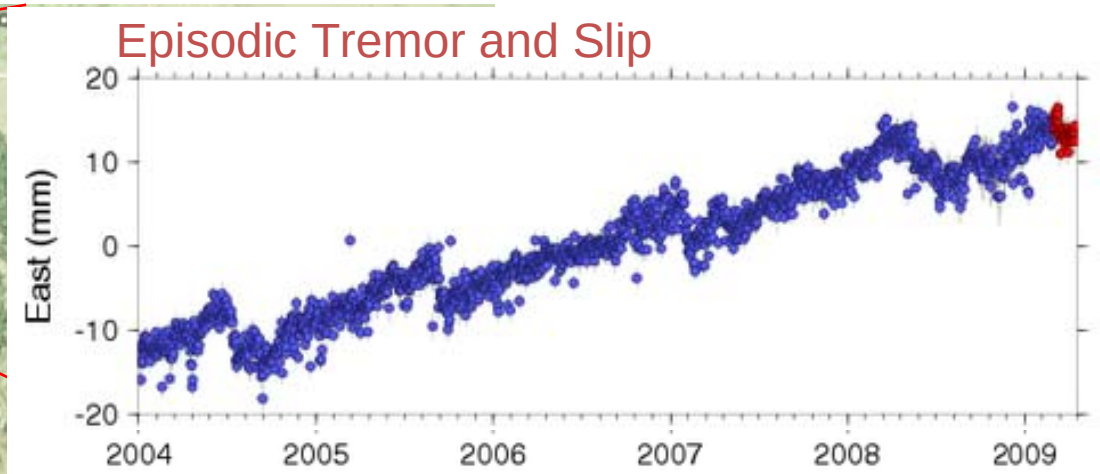


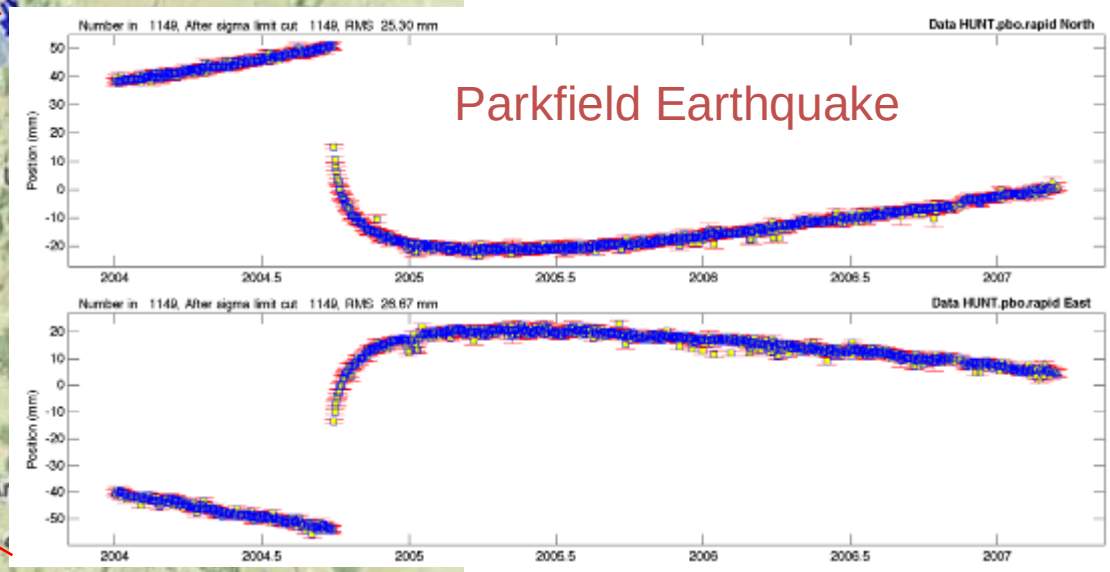
# Cascadia


NORTH
AMERICAN
PLATE
Vancouver Is.
Mt. Garibaldi
Canada
Puget Sound
Mt. Baker
Idaho
Glacier Peak
Olympic Mtns.
Olympic NP
Mt. Rainier NP
Mt. Rainier
Columbia
Plateau
Mt. St. Helens NVM
Mt. Adams
Washington
Oregon
Mt. St. Helens
Mt. Hood
Mt. Jefferson
Three Sisters
Cascade Mountain Composite Volcanoes
Crater Lake NP
Klamath
Mt. Mazama
Oregon Caves NM
Mt. McLoughlin
Mtns.
Redwood N&SP
Mt. Shasta
Basin and Range Province
Lassen Volcanic NP
Lassen Peak
Nevada
California
Subducting
Juan de Fuca
Ridge
Plate
JUAN de FUCA PLATE
Boundary
Coast Range
Willamette Valley
PACIFIC
Gorda Ridge
GORDA PLATE
PLATE
San Andreas Fault
Coast Range
Great Valley
Sierra Nevada
Plate Boundaries:
Divergent
Convergent
Transform

# Transient motion associated with faults



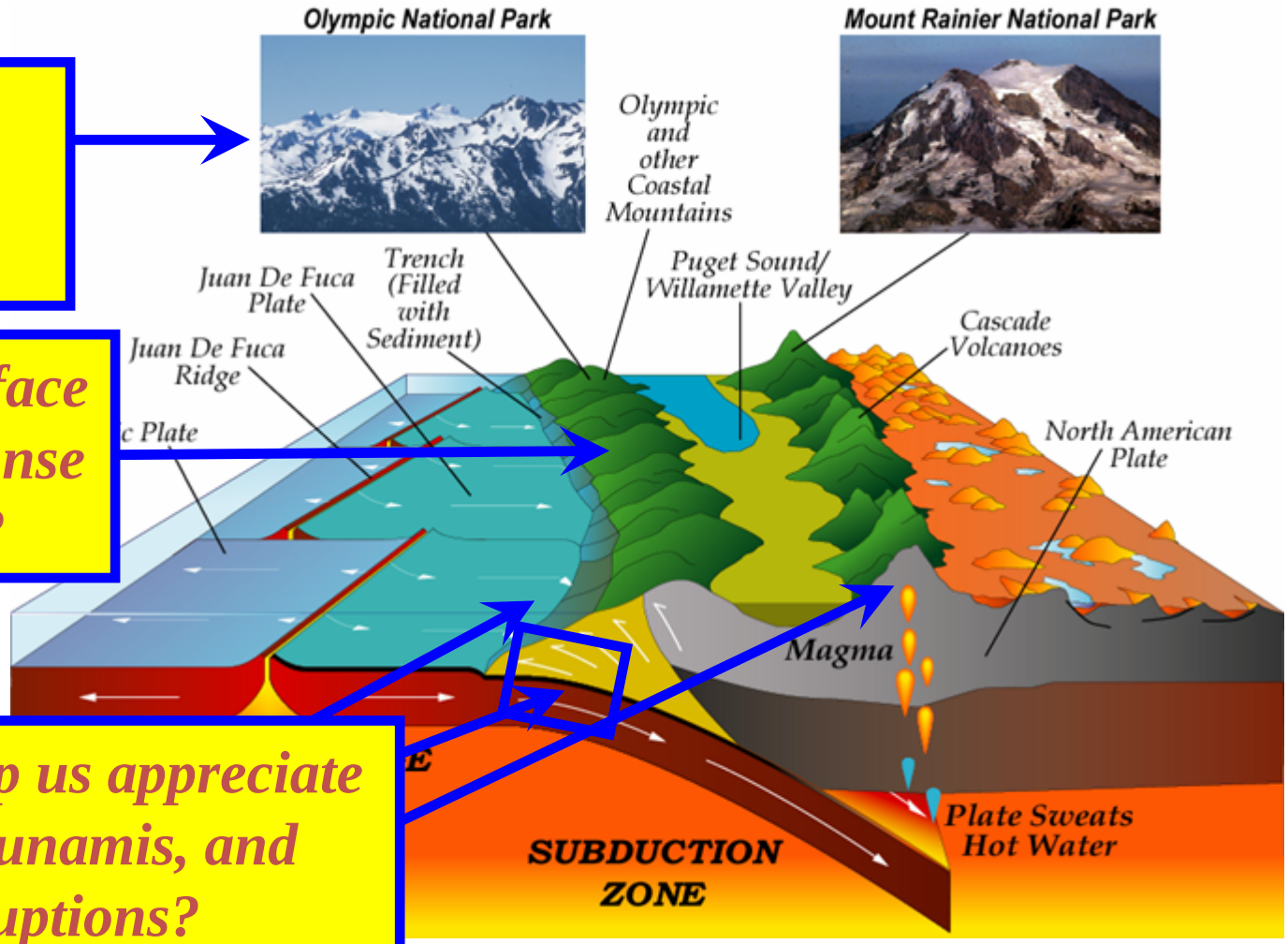



# Cascadia Subduction Zone

*We can see what's on the surface.*

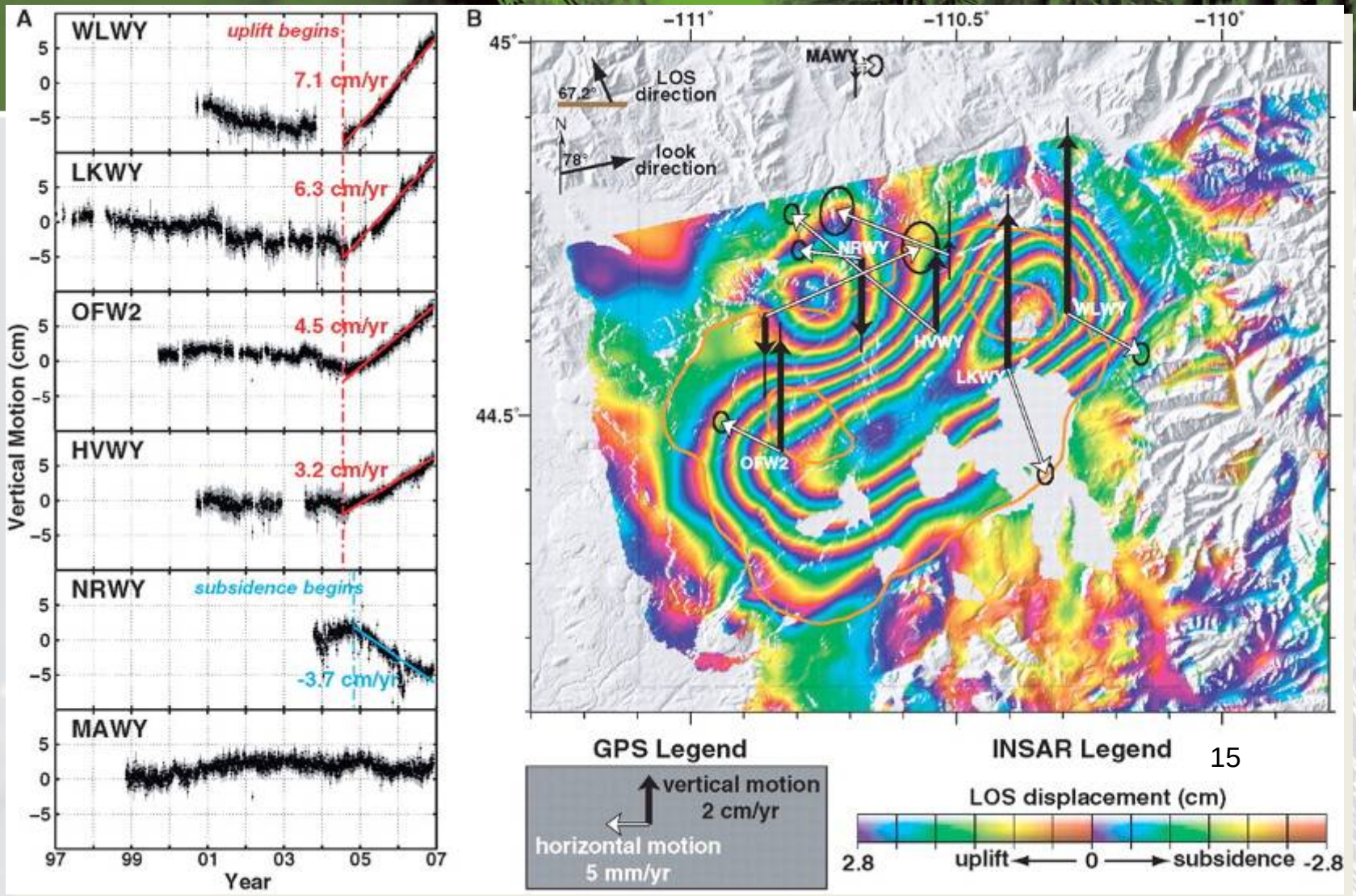
*How does the surface change as a response to subduction?*

*How does this help us appreciate earthquakes, tsunamis, and volcanic eruptions?*



# Yellowstone Ground Motions

**Fig. 2. (A) Temporal variation of vertical ground motions of labeled Yellowstone GPS stations**




W.-L. Chang et al., Science 318, 952 -956 (2007)

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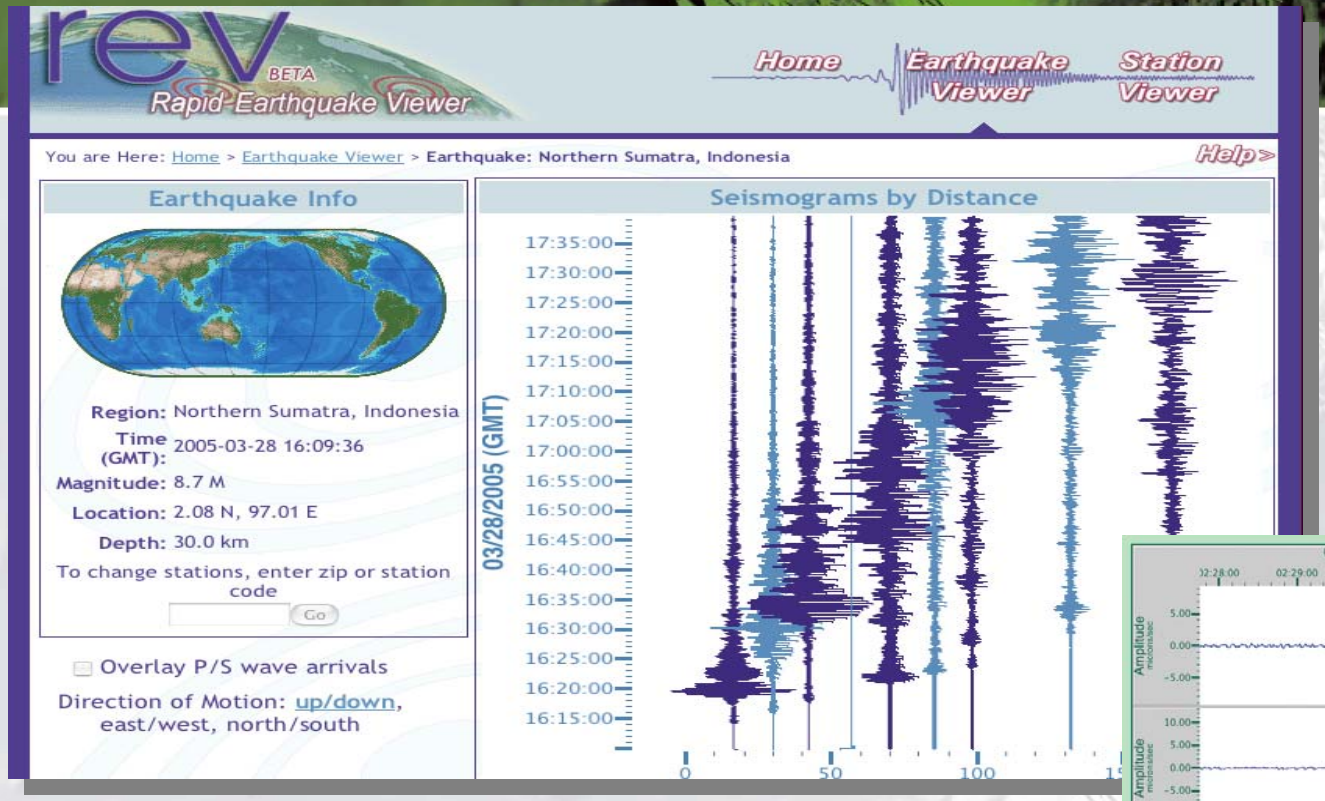
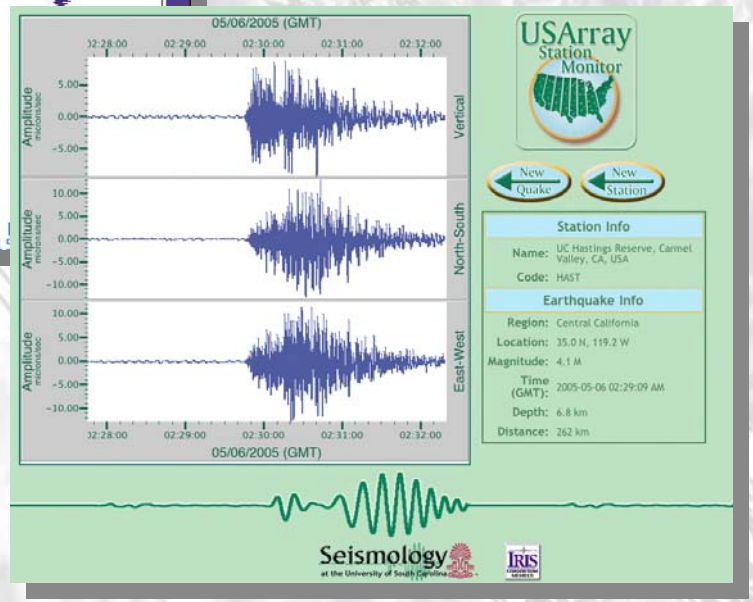
# Tools for Seismic Education- IRIS



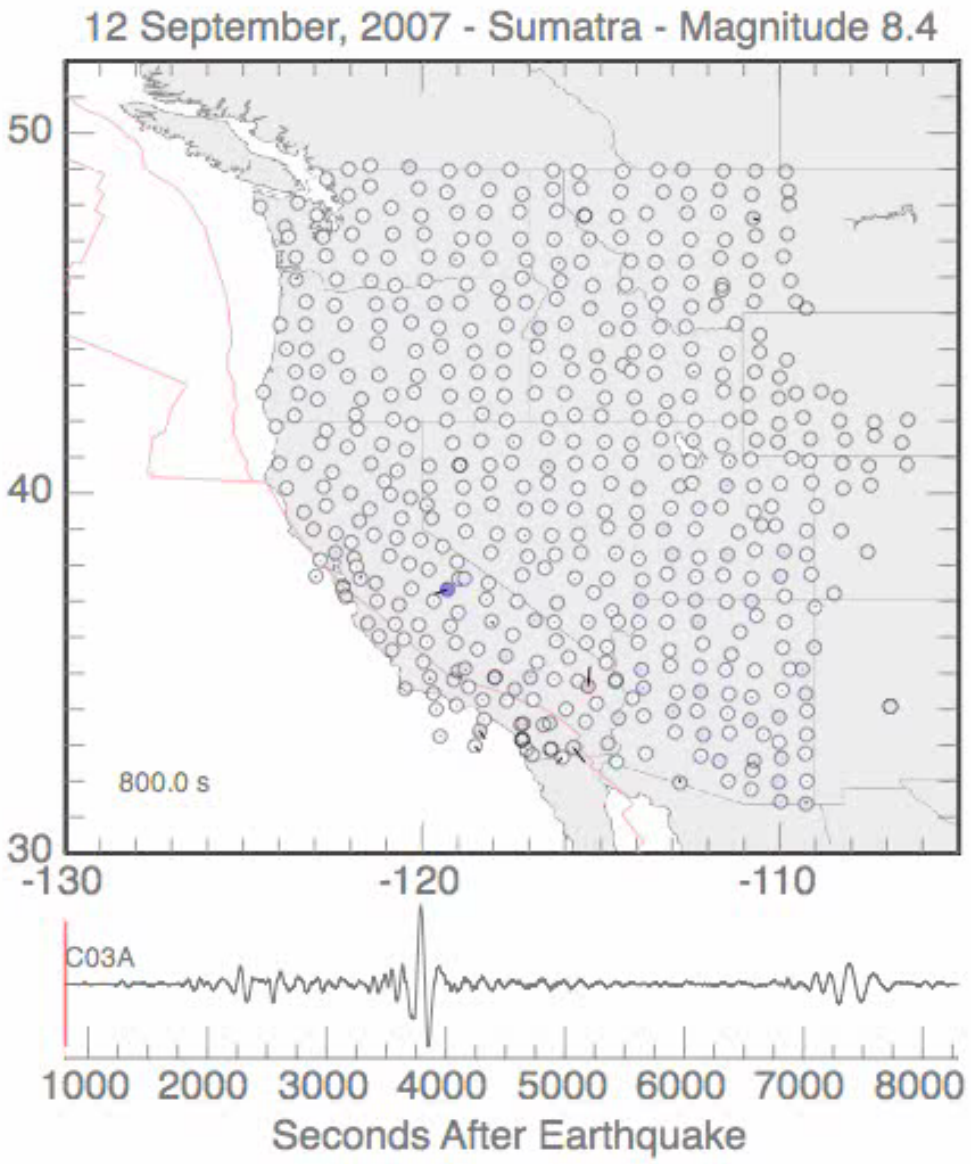

www.iris.edu

# IRIS Seismic tools

- **Seismic Monitor -** quick look at recent (last 2 weeks of larger global seismicity.
- **IRIS Earthquake Browser**
  - Historical seismicity (1960 to present), google map interface, numerous selection options
  - Good for exploring plate tectonics of regions (events colored by depth), can zoom as far as desired.
  - Have classroom exercise for determining seismic hazard (see http://www.iris.edu/hq/resource/2009_tx_region_xiii_workshop
- **Animations and Visualizations**
- **Rapid Earthquake viewer** - http://www.iris.edu/hq/publications/brochures_and_onepagers/edu
- **Wilber** http://www.iris.edu/dms/wilber.htm
  - Graphical interface for selecting and viewing seismograms

# Community Products

- TA visualization from Chuck Ammon
- Uses
  - Workshops
  - Presentations
  - Web
    - Automatically generated version available from IRIS DMC
- Plans
  - Matlab version
  - Special events version for public and media



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