

## **EarthScope National Meeting - Pre-meeting workshops May 12, 2009:**

(Update: April 8, 2009)

### **Education and Outreach:**

#### **Interpretive Methods for Scientists: Communicating EarthScope to the Public**

Interpretation creates opportunities for an audience to form their own intellectual and emotional connections to the meanings inherent in a resource. Earth scientists are commonly well versed in ways to convey the Earth resource - its landforms, layers, and processes - effectively to other scientists. But the language of science may not work well with other audiences - it requires interpretation. The National Park Service and other organizations have developed informal educational techniques to convey natural and cultural resources to the public via ranger hikes, evening programs, and museum exhibits. This one-day workshop introduces scientists to such interpretive methods and works with the scientists to develop ways to convey the excitement of EarthScope results to different audiences. The goal is to expand scientists' toolboxes so that they can create opportunities for the public to form their own intellectual and emotional connections to the meanings inherent in the dynamic landscape of North America. (full day)

#### **Instructors:**

Dr. Bob Lillie (OSU and EarthScope National Office)

Allyson Mathis (Grand Canyon National Park)

Bob Roney (Yosemite National Park)

contact: lillier@geo.oregonstate.edu

#### **Exploring the Yellowstone Hotspot Using EarthScope Data: A 1-day Workshop for Teachers**

This workshop is designed to provide information, activities, and materials that teachers can use in their classroom to teach Earth and physical science. Teachers will be shown how to use seismic and Global Position System (GPS) data in the classroom to enhance their students' basic understanding of abstract science concepts and develop critical thinking skills as they investigate multiple lines of evidence gathered through data from the EarthScope program. Teachers will be shown demonstrations of different types of visualizations that researchers have developed from the EarthScope data that make the geophysical processes 'come alive' for the students. All activities are aligned with the National Science Standards. (full day)

Through an exploration of EarthScope learning activities as they relate to the geology and geophysics of the Snake River Plain and evolution of the Yellowstone hotspot, participants will:

- Hear researchers describe how and why EarthScope is investigating the geophysics of the local area,
- Understand how past and present day geologic and geophysical phenomena can help us understand what could happen in the future,
- Improve participants' foundation in basic physics concepts as applied to earth science,
- Be able to implement selected EarthScope activities in their classrooms.

Level: Limited to teachers of middle through high school Earth science and physical science.

Funding provided by the National Science Foundation. Lunch provided; mileage and one night's hotel available for non-local participants. EarthScope will work with you and your school district to pay for a substitute teacher. Registration will be provided for those local teachers who wish to attend EarthScope national meeting sessions.

Registration for this short course will open here on March 2. For further information, contact Jaime Magliocca at [Magliocca@unavco.org](mailto:Magliocca@unavco.org).

**Instructors:**

IRIS and UNAVCO education staff with EarthScope research scientists.

**Online Registration:**

<http://achaia.unavco.org/public/meetings/2009/twg/registeretyh.asp>

***Science planning:***

**High Lava Plains**

Throughout the Cenozoic the High Lava Plains (HLP) province of eastern Oregon has been one of the most volcanically active areas of North America. While aspects of similar Snake River Plain volcanism are well fit by a plume model, the HLP volcanic and tectonic activity do not so obviously fit the expectations of a plume source. A number of recent seismic imaging studies of the HLP crust and upper mantle have been undertaken. Along with the broader images provided by USArray, the more detailed seismic, structural, geochemical, geochronological, geodynamic and petrologic study of HLP structures and volcanic products offer the opportunity to refine the understanding of the mechanisms responsible for the volcanic and tectonic activity in this area and its effect on crustal evolution in this large fragment of the Pacific Northwest. This workshop will bring together participants from various recent HLP studies along with interested attendees from the EarthScope community to present and discuss recent results concerning the origin of the HLP. (full day)

**Workshop organizer:**

Richard W. Carlson (DTM-CIW)  
contact: [rcarlson@ciw.edu](mailto:rcarlson@ciw.edu)

**EarthScope Science Targets in Alaska**

Alaska is the most active part of North America, both tectonically and volcanically. In addition to subduction of the Pacific plate beneath North America at the Alaska-Aleutian trench, Alaska features an active example of terrane accretion. These two tectonic drivers cause active tectonism and seismicity extending as far north as the Arctic Ocean and inland into NW Canada. Alaska and the adjacent part of Canada feature by far the highest topography in North America and the steepest coastal mountains in the world. Vigorous active volcanism extends along almost the entire length of the Aleutian arc and the Wrangell volcanic field (south-central

Alaska) includes some of the largest continental volcanoes on the planet. In a few years EarthScope will deploy USArray to Alaska providing, for the first time, dense broadband seismic array data across the area that will complement the mature geodetic time series data of PBO. This workshop will bring together interested attendees from the EarthScope community to present recent results, discuss, and refine scientific goals for EarthScope studies in Alaska and adjacent Canada. This mini-workshop is intended as a starting point for a future planning workshop which will aid in guiding the USArray deployment and inspire future scientific investigations using EarthScope data. (1/2 day - afternoon) Lunch may be offered jointly with workshop on leveraging USArray; some travel support may also be available (pending funding).

**Workshop organizers:**

Jeff Freymueller (UAF)  
Doug Christensen (UAF)  
contact: jeff.freymueller@gi.alaska.edu

**Leveraging USArray: Opportunities for Onshore/Offshore experiments**

This 1/2-day workshop provides an opportunity to discuss plans for obtaining broadband seismic data using ocean (and lake) bottom seismometers as a complement to USArray as it approaches the Great Lakes, the Atlantic Ocean and the northern Pacific Ocean and Bering Sea. (1/2 day - morning)

Preliminary agenda:

|                                |  |
|--------------------------------|--|
| 9-10:30am                      | Presentations  |
| - USArray                      | Bob Woodward   |
| - Gulf Coast                   | TBD  |
| - Great Lakes                  | David Dolenc, Yevgenie Kontar  |
| - East Coast                   | Karen Fischer  |
| - Alaska                       | Jeff Freymueller or Doug Christensen   |
| - OBSIP                        | John Collins, Jim Gaherty  |
| - Margins                      | Geoff Abers  |
| - PBO                          | Mike Jackson or Bob Woodward   |
| - MT                           | Adam Schultz   |
| - NSF-OCE/EAR                  | Rick Carlson, Greg Anderson  |
| - Participants<br>(1-2 slides) | Spahr Webb, Anne Trehu, Doug Wiens, Beatrice Magnani<br>D. Weeraratne, others                        |
| 10:30-10:45                    | Break  |
| 10:45-12:00                    | Discussion, "How Do We Proceed From Here?"<br>Outline logistics, instrumentation, & funding strategy |

**Workshop Organizers:**

Dayanthie Weeraratne ([dsw@csun.edu](mailto:dsw@csun.edu))  
Anne Trehu ([trehu@coas.oregonstate.edu](mailto:trehu@coas.oregonstate.edu))

**Software/Hardware Training:**

## **PQLX - CANCELLED**

### **Two Training Sessions for Computational Software in Tectonics and Geophysics**

Data from the USArray and PBO components of EarthScope allow an extraordinary opportunity to better understand Earth structure and dynamics. An important component of interpreting such data is the use of computational methodologies to simulate tectonic processes. In this training session the Computational Infrastructure for Geodynamics (CIG), an NSF center, will focus on training of new users in the use of software that can be used for the interpretation and modeling of EarthScope data. During the sessions participants will be given background theory, an overview of the codes including their strengths and weaknesses for solving geodynamic problems, and instruction on downloading and running these codes (including running them on the NSF TeraGrid) and post-processing (visualizing) the results. (each is full day)

Some financial support is available for graduate students and post-docs participating in this training session. For additional information see

<http://geodynamics.org/cig/proposalsndocs/newsdocs/cig-earthscope09-training>

#### **1. Tectonic Models.**

Training will be provided in the use of the PyLith

(<http://www.geodynamics.org/cig/software/packages/short/pylith>) and Gale

(<http://www.geodynamics.org/cig/software/packages/long/gale>) software packages. PyLith is a finite element code for the solution of dynamic and quasi-static tectonic deformation problems in one, two, or three dimensions. Gale is a 2D/3D parallel code that solves problems in orogenesis, rifting, and subduction with a variety of boundary conditions, including free surfaces and coupling to surface erosion models. As time permits, the workshop will also cover how to implement new rheologies and custom surface processes in Gale.

#### **Instructors:**

PyLith: Brad Aagaard (USGS), Charles Williams (GNS Science)

Gale: Walter Landry (CIG)

#### **2. Large-Scale Earth Models.**

Training will be provided in the use of the SPECFEM

(<http://www.geodynamics.org/cig/software/packages/seismo/specfem3d-globe>) and CitcomS

(<http://www.geodynamics.org/cig/software/packages/mc/citcoms>) software packages for modeling structure and dynamics at regional to global scales. SPECFEM3D\_GLOBE simulates global and regional (continental-scale) seismic wave propagation, and handles the effects of lateral variations in compressional-wave speed, shear-wave speed, density, 3D crustal thickness, ellipticity, topography and bathymetry, the oceans, rotation, and self-gravitation. CitcomS is a finite-element code designed to solve convection problems relevant to Earth's mantle and plate tectonics, which can handle a variety of temperature, stress, pressure, and compositional rheologies, thermo-chemical convection, and plate tectonic boundary conditions.

#### **Instructors:**

CitcomS: Eh Tan (CIG)

SPECFEM: TBD

## **New data and data tools for EarthScope data at UNAVCO and other EarthScope facilities**

EarthScope witnessed an explosion of new data and data access tools in 2008, a hands-on introduction to which is the topic of this workshop. New data access tools include the San Andreas Fault Observatory at Depth (SAFOD) Core Viewer, which allows users to view high-resolution photographs of the entire main borehole drill core via a Google Maps interface and which is being extended to support the SAFOD sample request program. UNAVCO's new Data Archive Interface Version 2 offers a much more intuitive and powerful way of locating and accessing Plate Boundary Observatory (PBO) continuous GPS data. The EarthScope Data Portal extends the suite of available tools to allow seamless station discovery and data download across all EarthScope station types. New EarthScope data include large airborne LIDAR acquisitions over active faults and volcanic domains in the Western United States and Alaska, meteorology data sets from recently installed met stations at PBO continuous GPS sites, and tiltmeter measurements from instruments collocated with PBO borehole strainmeters and seismometers. Geophysically interesting examples from all three data sets will be presented along with a broader overview of the data and specifics of data access. (1/2 day)

### **Instructors:**

Adrian Borsa (UNAVCO)  
Fran Boler (UNAVCO)  
contact: borsa@unavco.org

### **Online Registration:**

<http://achaia.unavco.org/public/meetings/2009/twg/registerndad.asp>

## **Getting started with PBO Borehole Strainmeter Data**

PBO strainmeters provide better strain resolution than GPS and can record strain transients at periods much longer than broadband seismometers. This workshop will describe how the strainmeters work, present examples of tectonic strain transients recorded by PBO strainmeters, and outline how to access and work with the data. Although this will not be a hands-on workshop, we will provide a guide to online documentation and software that facilitate working with the strainmeter data. Full-day workshop. Lunch and snacks will be provided. Number of participants: min. 5, max. 25.

### **Instructors:**

Evelyn Roeloffs (USGS)  
Kathleen Hodgkinson (UNAVCO)  
Duncan Agnew (SIO)

Contact Jaime Magliocca ([Magliocca@unavco.org](mailto:Magliocca@unavco.org)) for logistical questions; contact Kathleen Hodgkinson ([hodgkinson@unavco.org](mailto:hodgkinson@unavco.org)) for questions about course content. Some travel money is available for students – please download an application at [http://unavco.org/edu\\_outreach/uscs/2006/straingps/supportapp.pdf](http://unavco.org/edu_outreach/uscs/2006/straingps/supportapp.pdf) and send completed application to J. Magliocca.

**Online Registration:**

<http://achaia.unavco.org/public/meetings/2009/twg/registergswp.asp>

**Methods for Estimating Western US GPS Velocity Field**

Conveners: Wayne Thatcher (USGS), Tom Herring (MIT), Chuck Meertens (UNAVCO)

The purpose of this one-day workshop is to present and discuss methods for determining a GPS velocity field that unifies all available campaign and continuous GPS into a single solution with a common reference frame. The ultimate goal of this exercise is to create such a unified velocity field and make it widely available through UNAVCO for research in active tectonics and earthquake mechanics and application to natural hazards and precise geodetic positioning. The workshop format will permit a small number of invited presentations, breakout groups to consider particular technical issues, and sufficient time for extended discussion. The expected output is a series of recommendations for further research, public archiving of raw data and velocity products, and candidate methodologies for producing first general velocity fields for the western US.

For more information, please contact the conveners. To register, contact [earthscope@coas.oregonstate.edu](mailto:earthscope@coas.oregonstate.edu)

**Online Registration:**

<http://achaia.unavco.org/public/meetings/2009/twg/registermgvf.asp>