

Engaging the next generation of researchers through education

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Manager
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- Why Education and Outreach?
- Strategies
- Undergraduate
- Graduate and professional
- Middle school/high school
- General public



- Need new generation of scientists, engineers, and policy makers
 - Students have to discover geophysics
 - See that it is interesting and challenging
 - Be introduced to career opportunities
- Help generate support for science
- Educate the public about hazards, encourage preparedness
- **IRIS E&O Mission:** We advance awareness & understanding of seismology and geophysics while inspiring careers in Earth Sciences



- Focus on seismology and the use of data
 - Narrow content area that capitalizes on our strengths
- Examine existing resources and identify needs
- Develop or enhance products that meet those needs
- Result is a variety of products for a range of audiences and level of interaction
 - Immersive experience, limited participants
 - 14 summer undergraduate interns
 - Short interaction, broad audience
 - 12 million museum visitors/year



Summer Research Experiences for Undergraduates (REU)

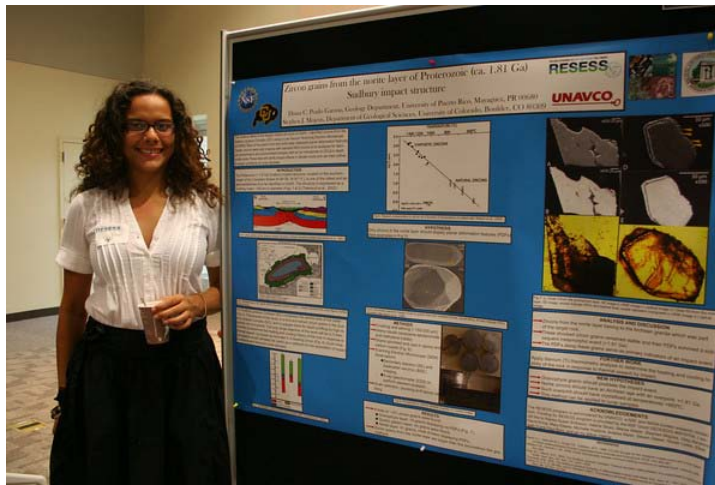
- Encourage more students to choose careers in Earth science
 - Initially a few students working with Consortium members during the summer
- 99 undergraduates have taken part since 1998
 - 49 faculty have hosted, representing 39 Consortium institutions
- 85% of alumni have attained or are pursuing a graduate degree in a field of geoscience



- Student community is established through 1-week orientation at New Mexico Tech
 - Intro to seismology research topics, data analysis, field trips
 - 14 students in 2010
- Connection through rest of summer via online communication
 - Blogs, discussion forum
 - Alumni mentor interaction
- Interns present results at Fall AGU meeting and meet at intern alumni reception
- Potential model for Central American training?



- UNAVCO RESESS program
 - Designed for underrepresented minority students
 - Initial 1-2 summers spent in Boulder, CO
 - Extensive mentoring in research, writing, presenting
 - Multi-year program
 - Students who might not have completed undergrad degree are now in grad school



Transportable Array siting through 2010

- 100 students
- 38 universities
- Nearly 970 sites

Process

- University PIs hire student teams
- Teams receive one week of training
- 2-student teams spend 9 weeks doing site reconnaissance



Field experiences for students

- Researchers often need field assistants for projects
- Many students are interested in field work
 - Hard to find opportunities if not at research institution
 - IRIS REU funding limited to US citizens
- New online database service planned for next year
- Similar to job site, not limited to US institutions or students
 - PIs will submit projects, students will submit CVs
 - Will promote to students from physics, engineering, etc.
- PI application process will be structured to provide learning experience



- USArray data processing workshop in 2009 and 2010
 - Advanced graduate student and early career level
 - Goal is for students to develop new processing techniques
- Data Management System training courses
- PASSCAL training courses
- Potential area of growth for IRIS



Teacher Professional development

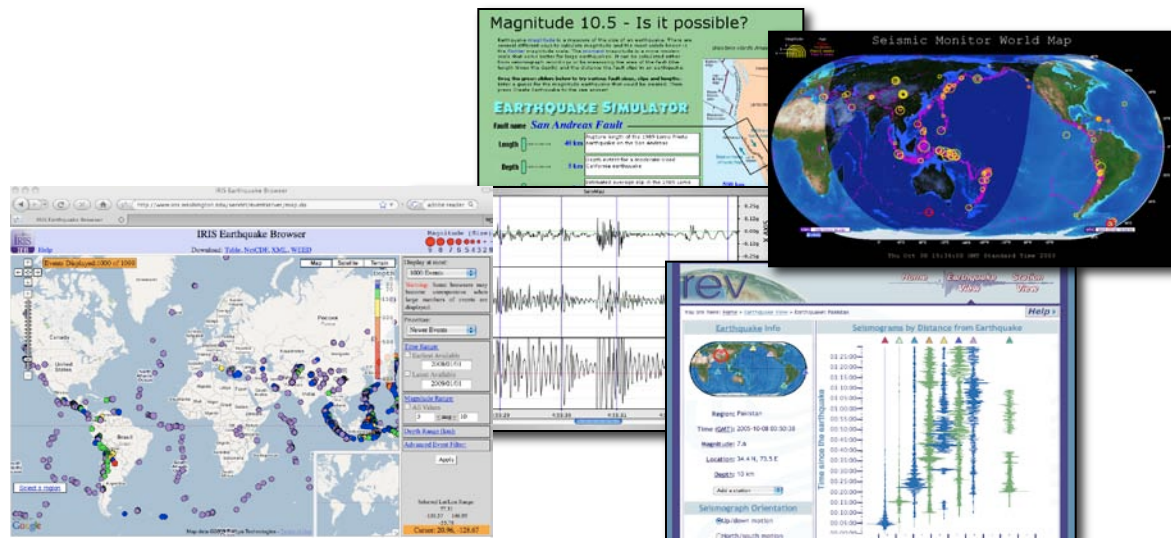
- Improve teacher knowledge and confidence
 - Encourage use of tools and data
- In person workshops – 1 hour to 3 days
 - Ongoing connection and support is most effective
- Leverage via interactions with other groups
 - Support for workshops conducted by others
 - Thousands of teachers reached by monitoring Earth Science & Physics listservs
- Can't reach enough teachers
 - Moving towards online training and train-the-trainer workshops



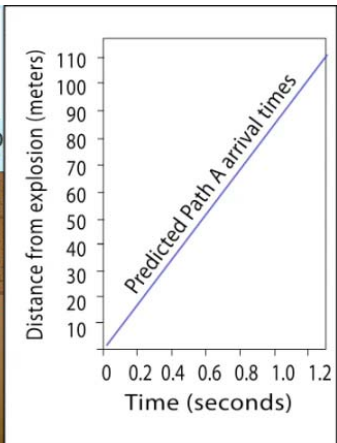
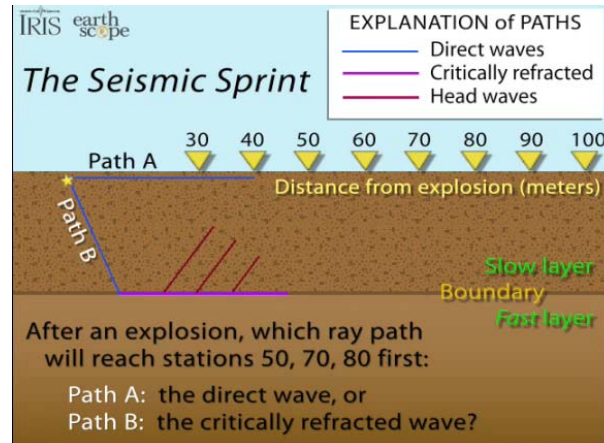
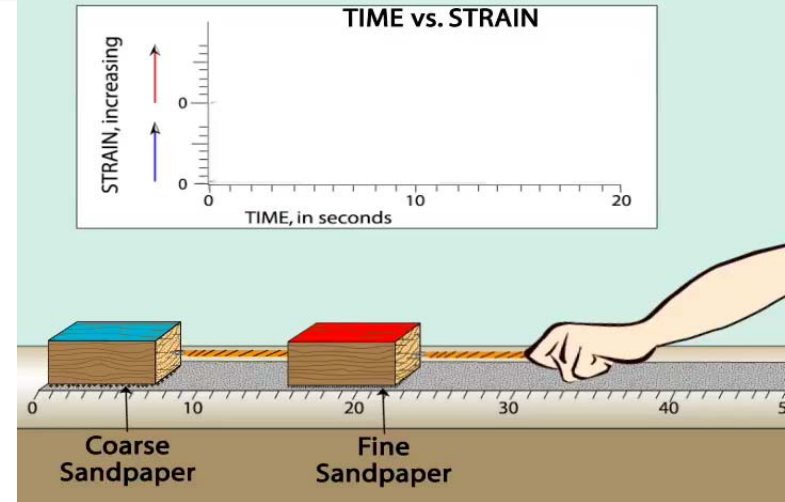
- Primary means of distribution of E&O resources
 - Social networking sites tied to main E&O site
- Activities developed for school and college classroom
- Supported by animations, visualizations and videos
- Interactive software is critical for successful use of seismographs and seismic data.

Elastic rebound in rocks

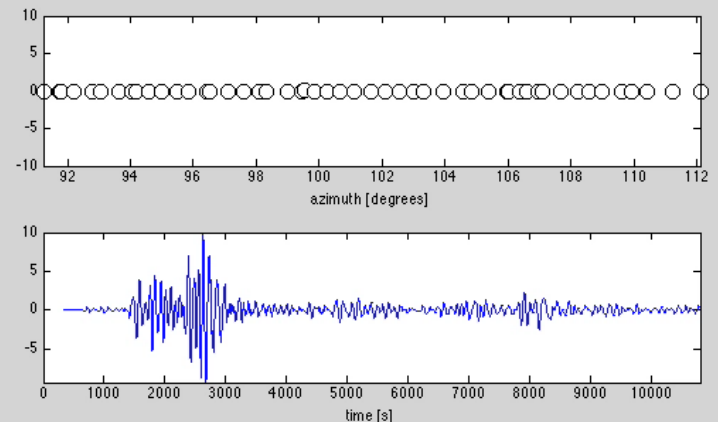
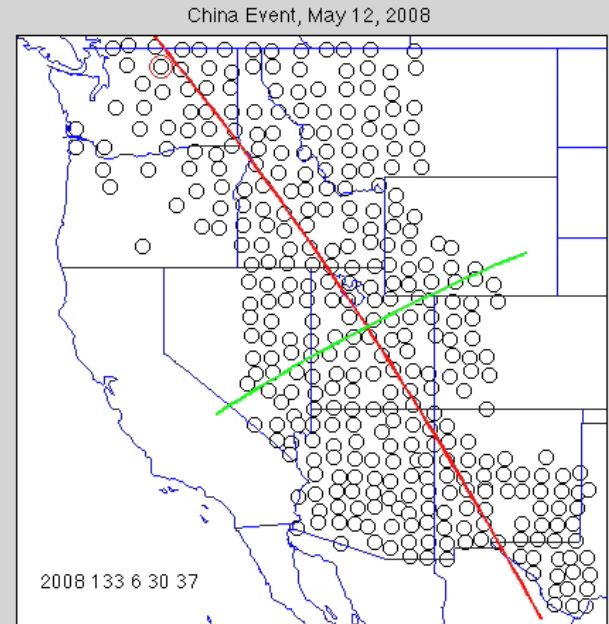
Described by John C. Lahr
USGS Emeritus Seismologist



- Over 40 animations available online
 - Created by Jenda Johnson
- Illustrating concepts related to plate tectonics, earth structure, earthquakes, and volcanoes
- Linked to activities and Teachable Moments



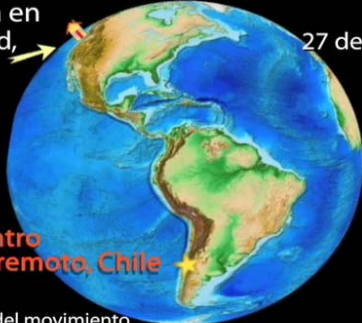
- Specialized versions for some newsworthy earthquakes
 - Developed by Chuck Ammon and Bob Woodward
- Automatic versions now available for all M6+ events via the IRIS Data Management System



Teachable Moment slide sets

- Newsworthy earthquakes motivate students
- Wide range of online resources available but college faculty and teachers have little time to prepare
- Slide sets produced within 1 day
 - Most content from other groups, particularly USGS
 - Try to tell a story
 - In English and Spanish

Terremoto de magnitud 8.8 en el sur de Chile
 10,296 km (6,400 miles; 92.76°) desde la estación
 sísmica en
 Portland,
 OR



**Epicentro
 de terremoto, Chile**

La escala del movimiento
 es exagerado para mostrar los patrones de ondas

Magnitud 8.8 COSTA AFUERA MAULE, CHILE
 Sábado, 27 de Febrero, 2010 a las 06:34:17 UTC

Un Fuerte terremoto de magnitud 8.8 estremeció el Centro de Chile a tempranas horas del sábado. El temblor ocurrió a 200 millas (325 Kilómetros) al Sur oeste de la capital Santiago. El epicentro fue localizado a 70 millas (115 kilómetros) de Concepción, la segunda ciudad más grande de Chile.



Vehículos que manejaban sobre una autopista que colapsó durante el terremoto cerca de Santiago se ven volteados sobre el asfalto después que un terremoto de magnitud 8.8 estremeciera el centro de Chile el Sábado a tempranas horas de la mañana

AP Foto/David Lillo



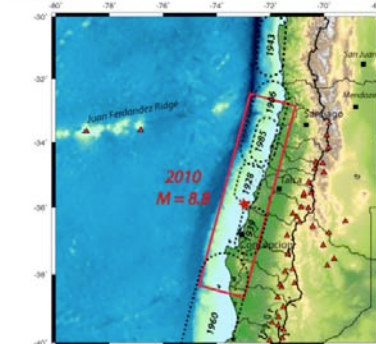
USGS



COSTA AFUERA DE CHILE

USGS

Magnitud 8.8 COSTA AFUERA MAULE, CHILE
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Based on Beck et al., 1998

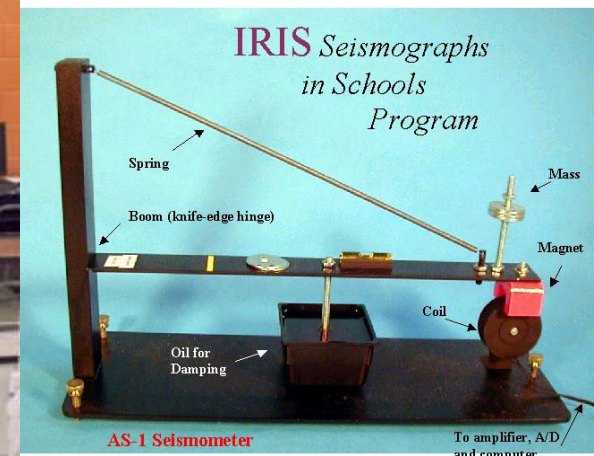
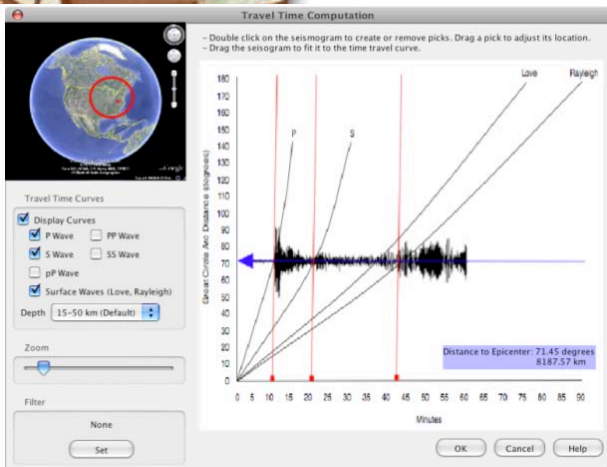
La Zona Costera de Chile tiene registros históricos de terremotos muy fuertes. Desde 1973, han habido 13 eventos de magnitud 7.0 o mayor.

El choque del 27 de febrero originado aproximadamente 230 km al norte de la región fuente del terremoto de magnitud 9.5 de mayo, 1960 – el terremoto más fuerte en todo el mundo en los últimos 200 años o más.

Un bosquejo de la ruptura aproximada de este terremoto de magnitud 8.8 y su relación con los terremotos más fuertes a lo largo de las costas de Chile en este siglo.

Seismographs in Schools

- Promote awareness of local and global seismicity
- Engages students in collecting, analyzing and drawing conclusions from data
- Web database to improve connections between schools
 - Near real time 24 hr displays
 - Gives schools visibility in the community
 - Find-a-teacher tool to contact other schools
 - Discussion forum to share questions



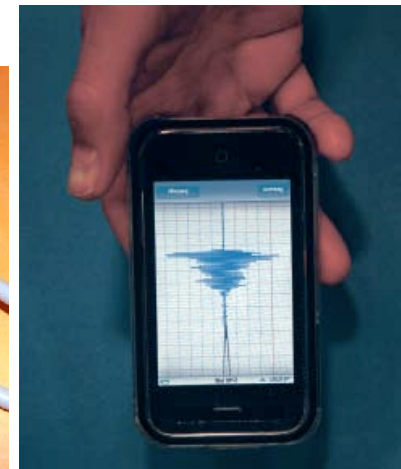
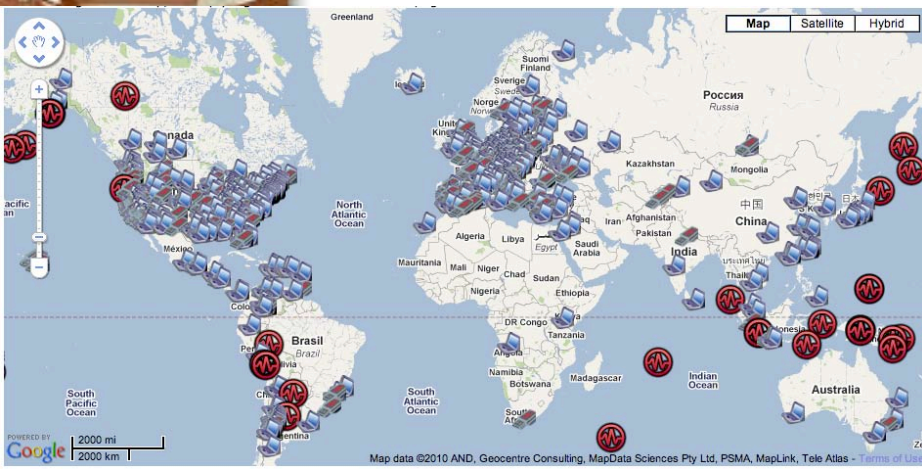
- IRIS provides shared web database
 - UK and Ireland use as their data storage
- For each network
 - Can have own web portal
 - Cross-registration of schools
 - Over 150 US schools
 - 200 international schools

Stations - All Networks



Low cost accelerometers

- USB sensors, iPhones, laptops
 - Students predict and measure shaking
 - Connect personal experience to recorded earthquakes – USGS shakemaps
- Real time earthquake recording network
 - J. Lawrence, Stanford and E. Cochran, UC Riverside
 - Over 1300 global sensors recording earthquakes
 - Will send sensors to schools for cost of postage

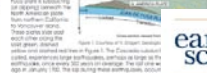


- Provide fundamentals of seismology and broaden awareness
- Over 100,000 educational posters have been distributed to 22 different countries
- Several posters and all 1-pagers are available in Spanish

www.earthscope.org
earth scope onSite
From The Principal Investigator
earth scope is a multi-disciplinary approach to studying the understanding of the Earth and the deep interior. It includes the physical processes that control the evolution of the Earth's interior, the geology of the crust, and the geophysics of the mantle and core. It also includes the study of the Earth's surface, the atmosphere, and the hydrosphere. The magazine is published quarterly and is available in both print and online formats.

Featured science: Epidemic Tremor and Slip in the Pacific Northwest

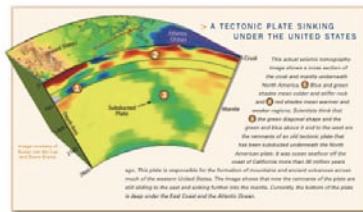
Early in 2011 the Pacific Northwest experienced one of the largest earthquakes in the region in over 100 years. The duration of these aftershocks was longer than any other earthquake in the region. The aftershocks were also unusual in that they occurred in a region that is normally considered to be seismically quiet. This was a surprise to scientists because the region is normally considered to be seismically quiet. This was a surprise to scientists because the region is normally considered to be seismically quiet.



Seismic Tomography

WHEN SCIENTISTS WANT TO KNOW MORE about the rocks in a mountain range, they go there. They pass the rocks through a microscope, measure the weight, color, and texture of the rocks, and sometimes they even taste the rocks. While scientists would like to know more about the rocks deep inside the Earth, they must use other methods because they can't observe the rocks directly with their senses.

Think, how can we explore the rocks that make up the deep Earth? Scientists have drilled holes into Earth's crust, but so far the drill bit has not penetrated the mantle. Boreholes can't take us on a field trip through Earth's layers to see the rocks for our most reliable comparison. Scientists can infer what types of rocks make up the deep Earth from earthquake recordings.



Earthquake Wave Visualizations

Watch seismic waves travel away from an earthquake. Observe each station move up and down. Compare the motion at a station to a recorded seismogram. View the animations at: http://www.iris.edu/hq/earthquake_animations



This Big or That Bigger? Earth's Free Oscillations After Earthquakes
IRIS

Explorando la Tierra Usando Sismología
Sumatra - Andaman Islands Earthquake (M_w=9.0)
Teacher's Guide

- Inspire public interest in the science of seismology and related fields
- Demonstrate that we live on an active planet
- Started with large displays in major museums
- Modified focus to smaller, customizable display in more locations



- Simple real-time display designed for visitor centers, small museums, universities, schools
 - Joint content development with UNAVCO, EarthScope National Office
- Customizable selection of pages to display
 - Near real-time seismicity and ground motion, GPS data, tsunami warnings
 - Anyone can apply for their own display and add their own content
- Over 40 active accounts, reaching over 75,000 visitors per year



- IRIS/SSA Distinguished Lecture Series
 - Convey the excitement of seismology to a general audience
 - Recognize members of the IRIS community
 - 17 Lecturers have given over 99 presentations to up to 400 people
- Targeted materials for USArray
 - Press releases and articles as array moves across US
- Temporary exhibits for the public
 - USA Science and Engineering festival in Washington DC

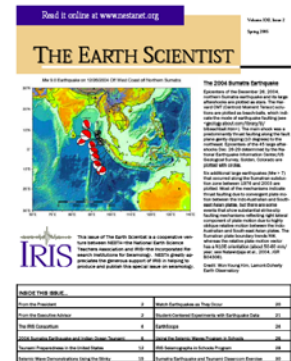


WDAY 6 News at 10!





IRIS
Member
institutions



Earth Science Literacy Initiative

Home	Background	Committee	Timeline	Complementary Projects	Online Workshop	Contact Us
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- Design each product or service for a specific audience and desired depth of involvement
- Ongoing support and group interactions are critical at all levels
- Where possible, consider options for virtual delivery and interactions
- Leverage impact through collaborations

