



# S41B-2012

## Raising seismic awareness on-and off-campus with class-built seismometers

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Abstract - In order to engage students of all ages and raise awareness in the general public, we have established a hands-on educational program focused on seismic activity in Idaho and beyond. The program begins with the construction of simple low cost seismometers followed by learning how to record and analyze seismic events. Every step is performed and documented by the students of Geophysics 201: "Seeing the Unseen". The class website provides building instructions, part lists, live data, and processed data from earthquakes from around the globe. The lobby of Boise State University's Geosciences building provides a public display of three seismometers and their live recordings along with a touch screen computer with IRIS-provided software on earthquakes. This display draws a great amount of interest from BSU students of all disciplines and is well visited. The steady increase in class enrollment, as well as the recent inclusion of this class in the Geosciences major core curriculum at BSU indicates the seismology program is working. Off campus, our project draws a lot of attention, and our data is routinely displayed on the Idaho local news. Additionally, we have begun to reach out to local K-12 institutions to place our instruments and further education in seismic awareness.

### Work Flow:

**Hardware: Three Component Seismic Station**  
• Coil / Spring / Magnet  
• Amplifier / Filter  
• A/D

**Data Logger**  
• Amaseis (1 - Channel)  
• WinSDR (1,2, or - Channels)  
• (SWARM - Seismic Wave Analysis and Real-time Monitor)

**Processing with USGS Event Information**  
• WinQuake  
• Amaseis  
• (SAC)  
• (SWARM)

**Information Dissemination**  
• BSU Wiki  
• Media - TV, Newspaper, Radio  
• Comparison and collaboration with colleagues

### INTRODUCTION

Since its inception in 2008 Boise State University's Seismic Station has become a valuable tool for seismologic education on a number of levels:

- BSU undergraduates: Geophysics 201
- K-12 schools: Outreach through demos and placement of seismometers
- General Community: Promotion of earthquake awareness through visibility on campus as well as a presence on the internet and the local media
- Geoscience Community: Detection of local events

### GEOPH 201 - SEEING THE UNSEEN : An Introduction to the Physics of the Earth

Annual class project for students is to construct new seismometers as well as develop and maintain class wiki.



Seismometers are built from the ground up. Complete instructions and part lists are included on the class wiki.



Topics on the class wiki <http://cgiss.boisestate.edu/~kasper/geoph297/wiki/> go beyond seismology and include many aspects of geophysics.

### OUTREACH

Education and increased interest in the geosciences is one of our primary objectives. Several of our class-built seismometers have been placed in area schools which has generated enthusiasm and excitement surrounding seismology within the community.

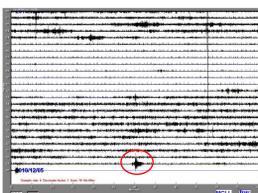


Installation of a seismometer at the Barbara R. Morgan Elementary School in McCall, Idaho was well received by students, faculty, and parents alike, as noted in the schools newsletter (right). (Left) students learn about seismology and the operations of the Slinky vertical sensor.



<http://cgiss.boisestate.edu/~mccall/MCLL.png>

This site shows the helicorder of seismic signals recorded in real-time at the McCall station. An earthquake on December 4, 2010 (circled above) went unreported by the USGS.

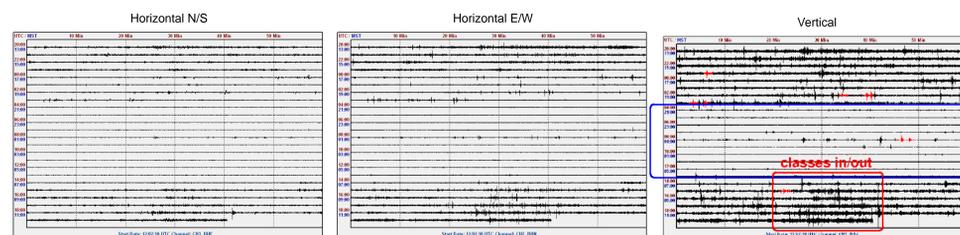


### THE STATION

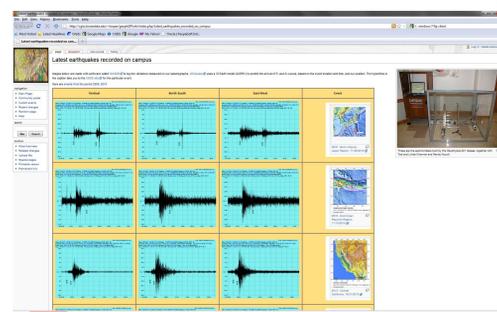


Boise State University's Seismic Station located on the main level of the Math & Geoscience building consists of three components - two horizontal Lehman's and a vertical Slinky seismometers. This is often the location of interviews with local media.

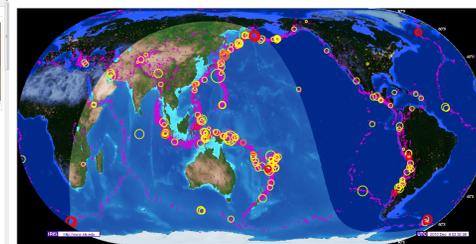
[http://cgiss.boisestate.edu/~kasper/bsu\\_wiggles/](http://cgiss.boisestate.edu/~kasper/bsu_wiggles/)



This site shows live signals of seismic activity. Housed in a busy hallway on campus the seismometers are sensitive to foot traffic and doors closing. Difference between night and day is clearly visible. One can also see enhanced noise during the day around :30 when classes end/start.



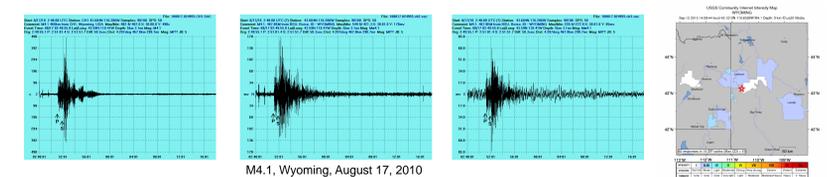
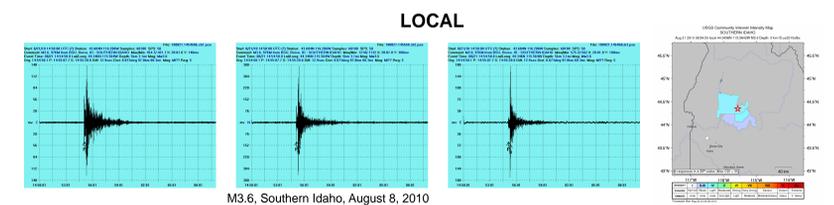
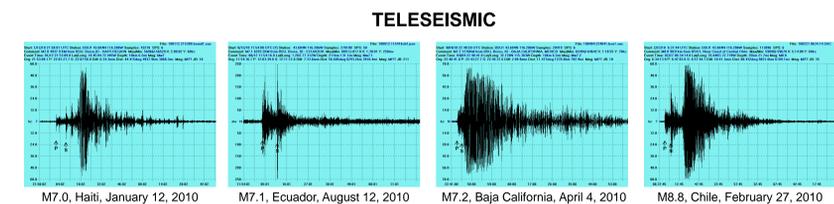
The "Latest Recordings at Boise State" is but one of the many pages on our wiki.



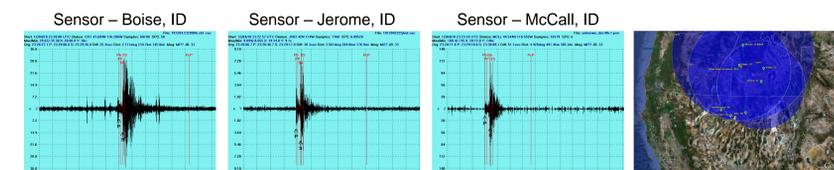
Located next to our seismometers is an interactive learning station created by Incorporated Research Institutions for Seismology, IRIS. The touch screen allows students to explore the latest earthquakes from around the world on the "Seismic Monitor" screen as well as learn about seismology.

### EVENTS

Using winQuake software digital signals recorded on winSDR can be processed with known event information (provided by USGS) to show filtered images along with arrival times of P- and S-waves.



The 1D Earth model (IASP91) used by winQuake's processing software places the P- and S-wave arrival times earlier than we recorded indicating waves propagating through the Western Snake River Plain are slower than the 1D Earth Model.



December 4, 2010 - earthquake recorded at all Idaho stations went unreported by the USGS. Using P- and S-wave arrival times we estimated the epicenter to be near Battle Mountain, Nevada, occurring around 23:28 UTC.

### FUTURE WORK

Boise State's Seismic Station has made several advancements in its two short years. Its goal to educate and heighten seismic awareness and community involvement through education continues in several ways:

- Expansion of student-directed wiki, including research projects
- Development of even lower cost and more efficient seismometers and placement in schools throughout the region
- Incorporation with Boise State's NSF GK-12 program
- Creation of community seismic network