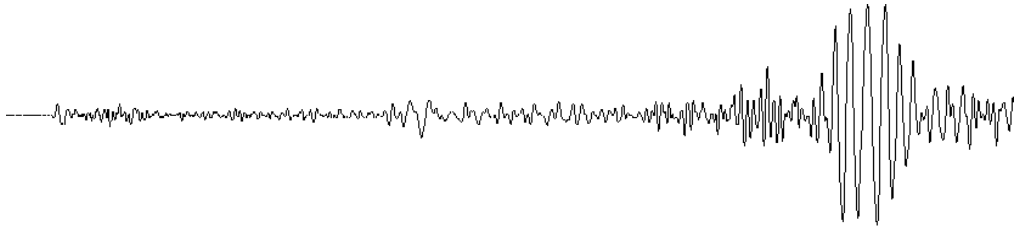
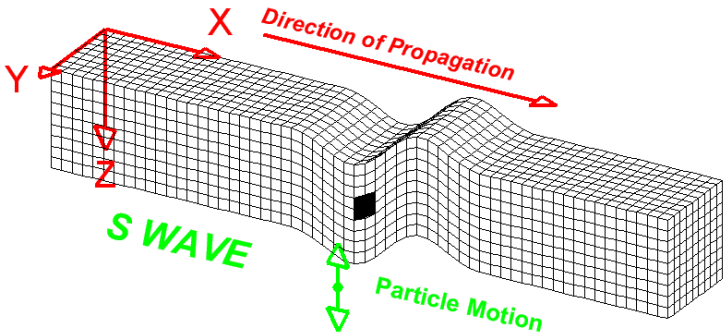


Simple Harmonic Oscillators are Everywhere

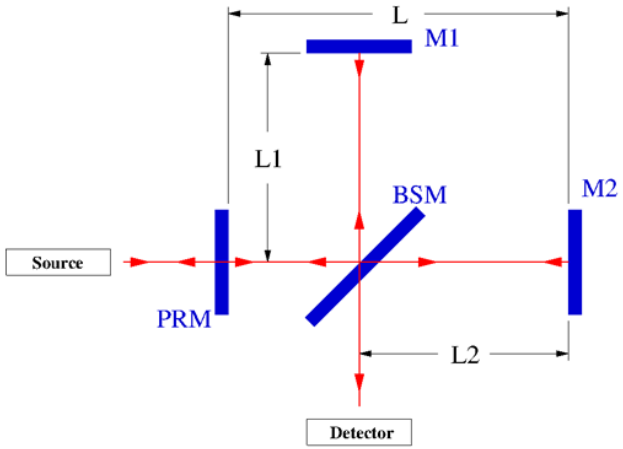


Fermilab QuarkNet
Teachers Workshop
Summer, 2012

Quarknet Teacher Workshop "Activity" Module for Seismometers

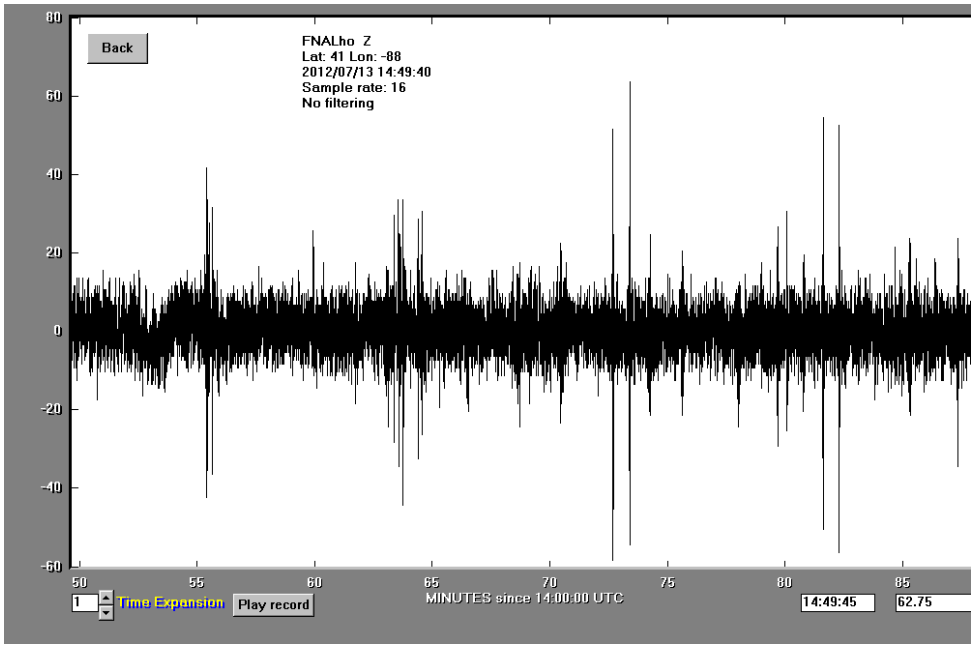
- 1. Seismometers
  - INFILTEC
  - Amaseis
  - WinQuake
- 2. Sound
  - Loading up Python
  - Live Audio Spectrum
- 3. Laser Beams
  - Waist
  - ABCD
- 4. Computer Aided Learning
  - Virtual Earthquake
  - Seismic Eruption
  - Seismic Waves
  - Wave Animations

INFILTEC

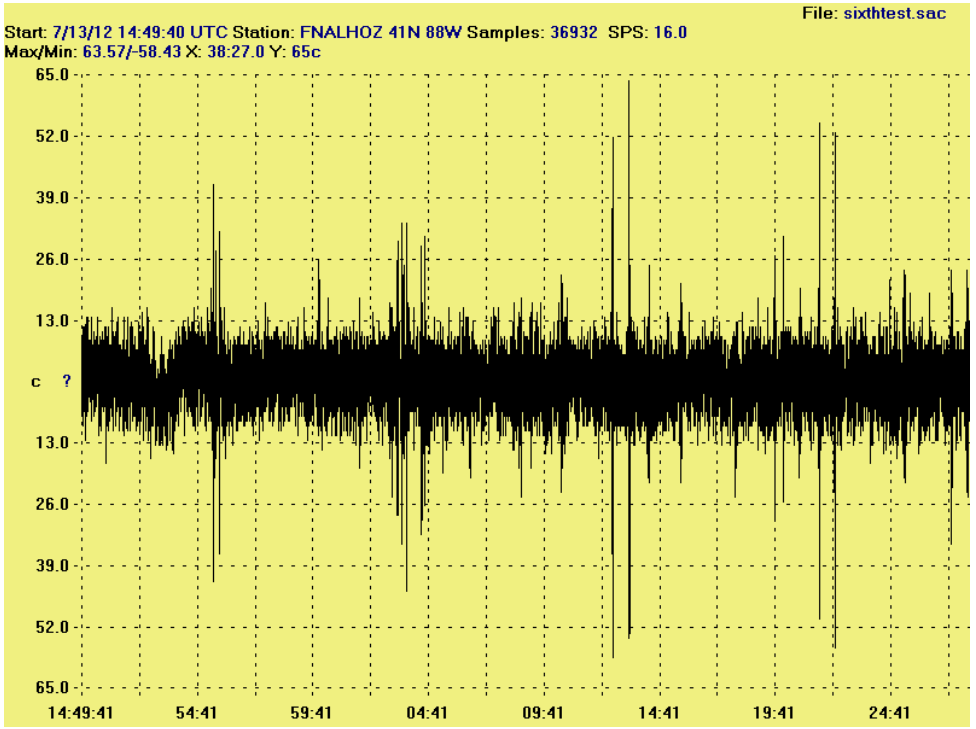


- INFILTEC Seismometers
  - for Science and Students:
- Connect to computers
  - Serial to USB port
- Install AmaSeis
  - Record data from Seismometer
  - Select events
  - Look at Fourier Transform (power) function

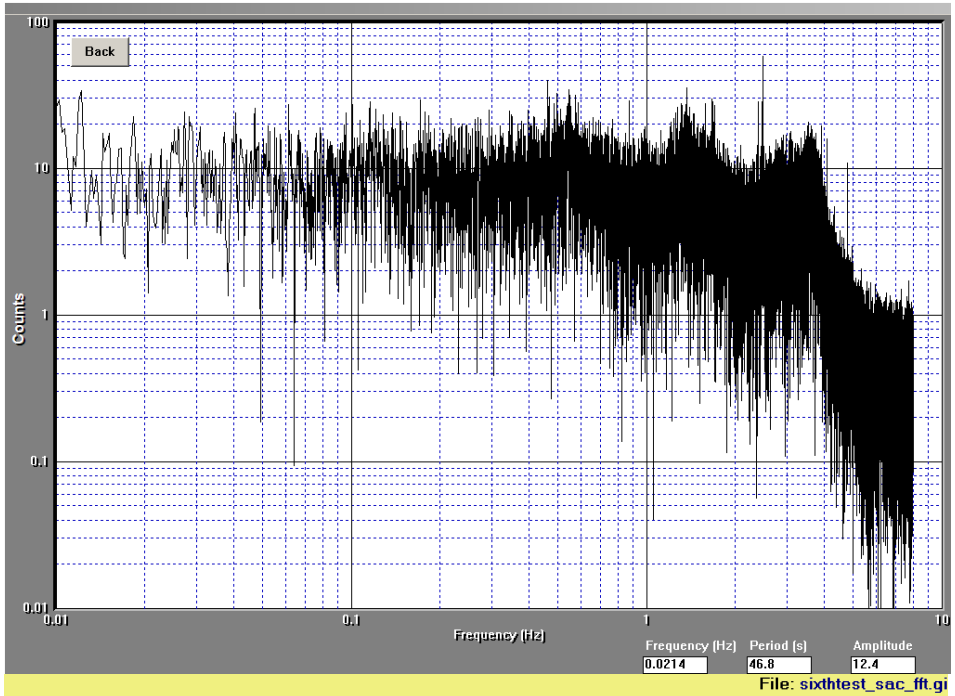
AmaSeis event



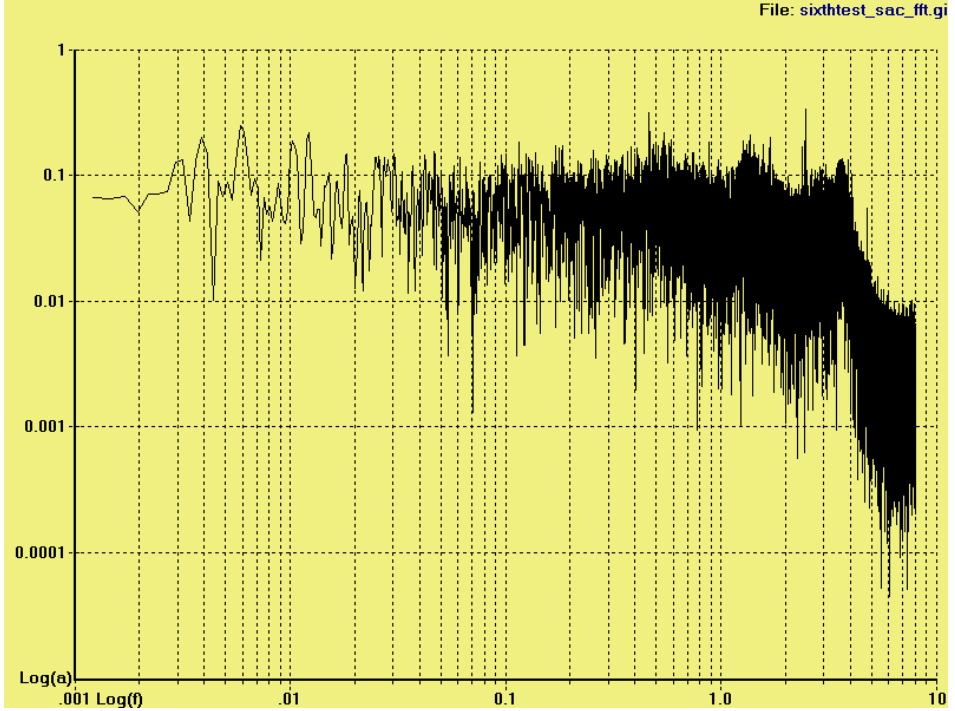
WinQuake event



AmaSeis FFT



WinQuake FFT

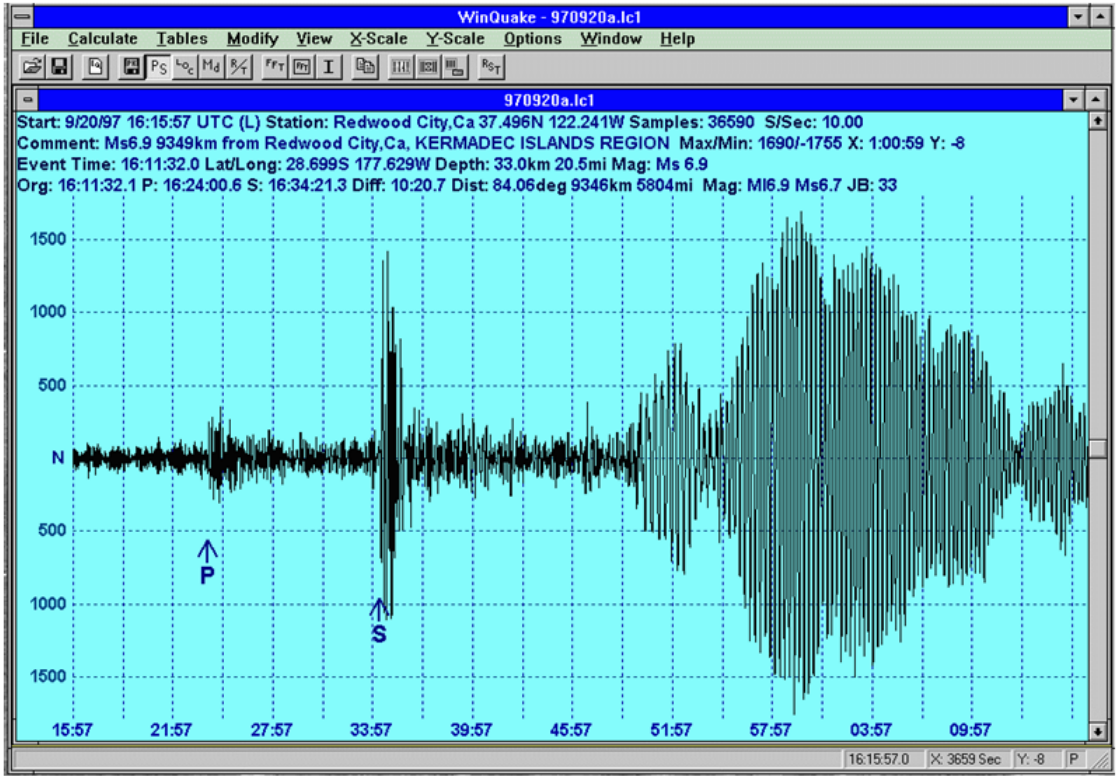


“Activity” Module for Seismometers

- INFILTEC Seismometers
  - Detecting and sharing earthquake information
  - Book drop (or sand bag) detection
  - Triangulating the position of a disturbance
  - Measuring the speed of sound
  - Other interesting activities

WinQuake (and WinSDR)

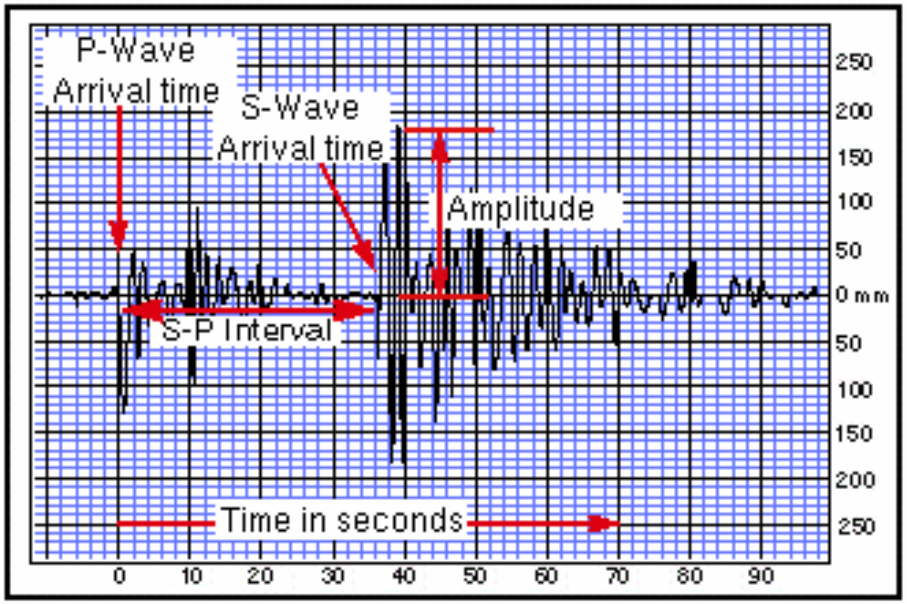
- Other types of Seismometers for education.
- Other Programs to analyze seismometer data.



AS-1 Seismometers

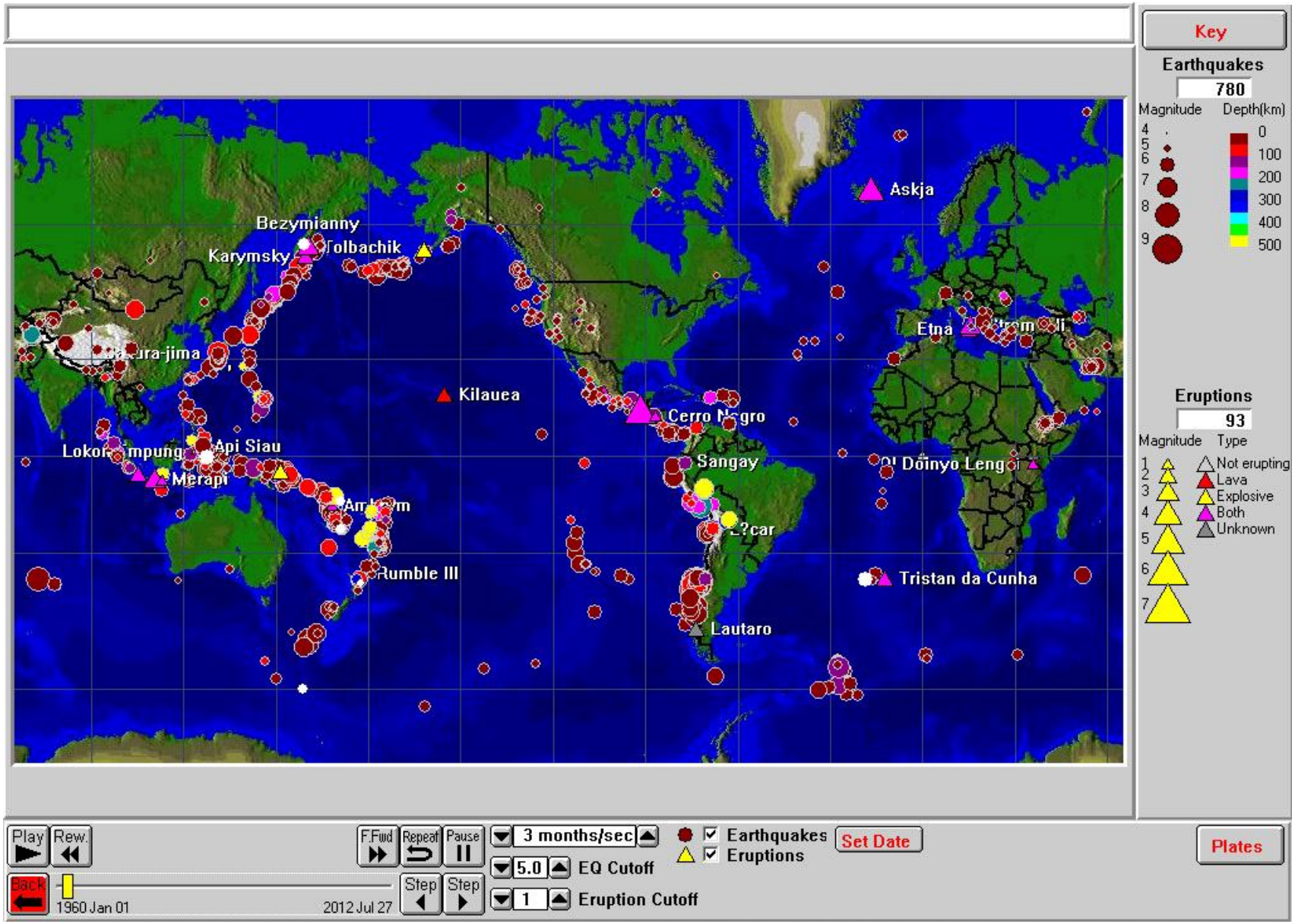
Virtual Earthquake

Geology Labs On-Line

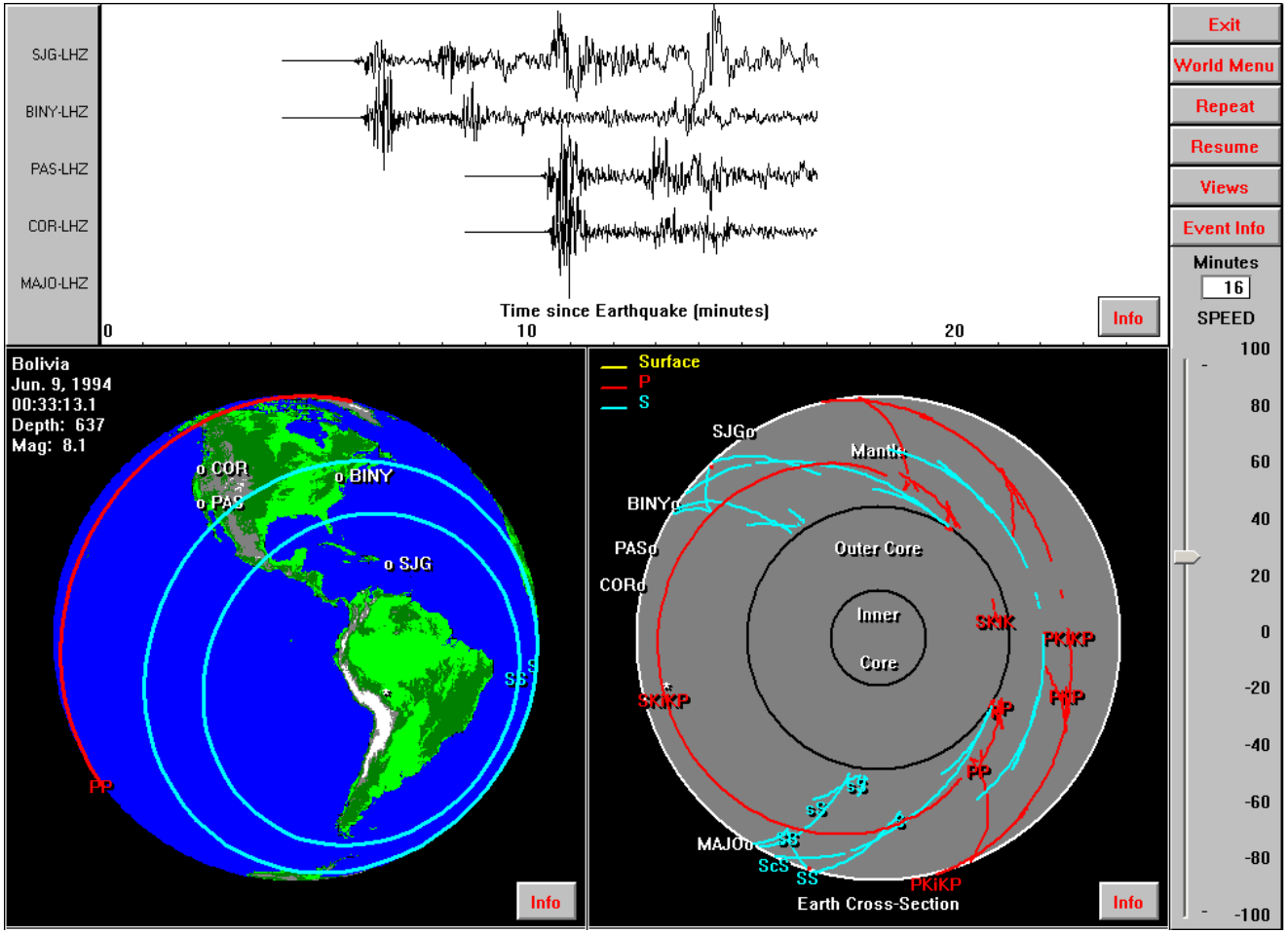


Virtual Earthquake

Seismic Eruption



Seismic Waves



IRIS Educational Software

jAmaSeis	jAmaseis facilitates the study of seismological concepts in middle school through introductory undergraduate classrooms. Users can view a graphical representation of seismic data in real time and can process this data to determine characteristics of seisograms such as time of occurrence, distance from the epicenter to the station, magnitude, and location (via triangulation).	Developed by Ben Coleman, Moravian College.	(Windows, Mac)
SeisMac	Free software-only tool that turns your recent Macintosh laptop into a powerful, educational, three-axis seismograph.	Developed by Daniel Griscom, Suitable Systems.	(Mac)
Seismic/Eruption	Watch how earthquake and volcanic activity changes in space and time throughout the earth.	Developed by Alan Jones, Binghamton University.	(Windows)
Seismic Waves	See how waves propagate from an earthquake hypocenter to seismic stations throughout the earth.	Developed by Alan Jones, Binghamton University.	(Windows)
EqLocate	An interactive program to locate earthquakes using P-wave arrivals	Developed by Alan Jones, Binghamton University.	(Windows)
AmaSeis	A program to obtain seismograms from the AS-1 Amateur Seismometer (see Seismographs in Schools Program for more information)	Developed by Alan Jones, Binghamton University.	(Windows)
Global Earthquake Explorer (GEE)	An education and outreach tool for seismology that aims to make it easy for non-seismologists to retrieve, display and analyze seismic data.	Developed by the Department of Geological Sciences at the University of South Carolina.	(Windows, Mac, UNIX)

Making Waves: Seismic Waves Activities and Demonstrations

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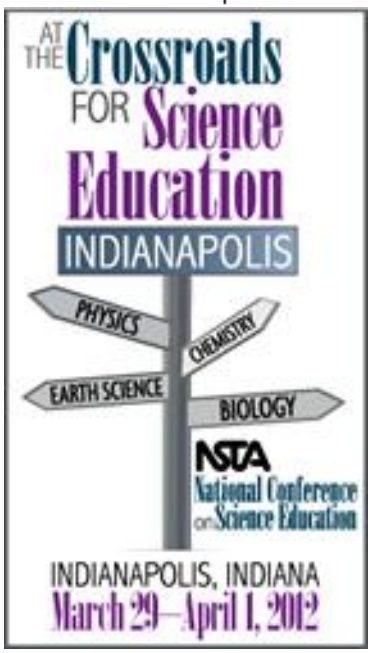
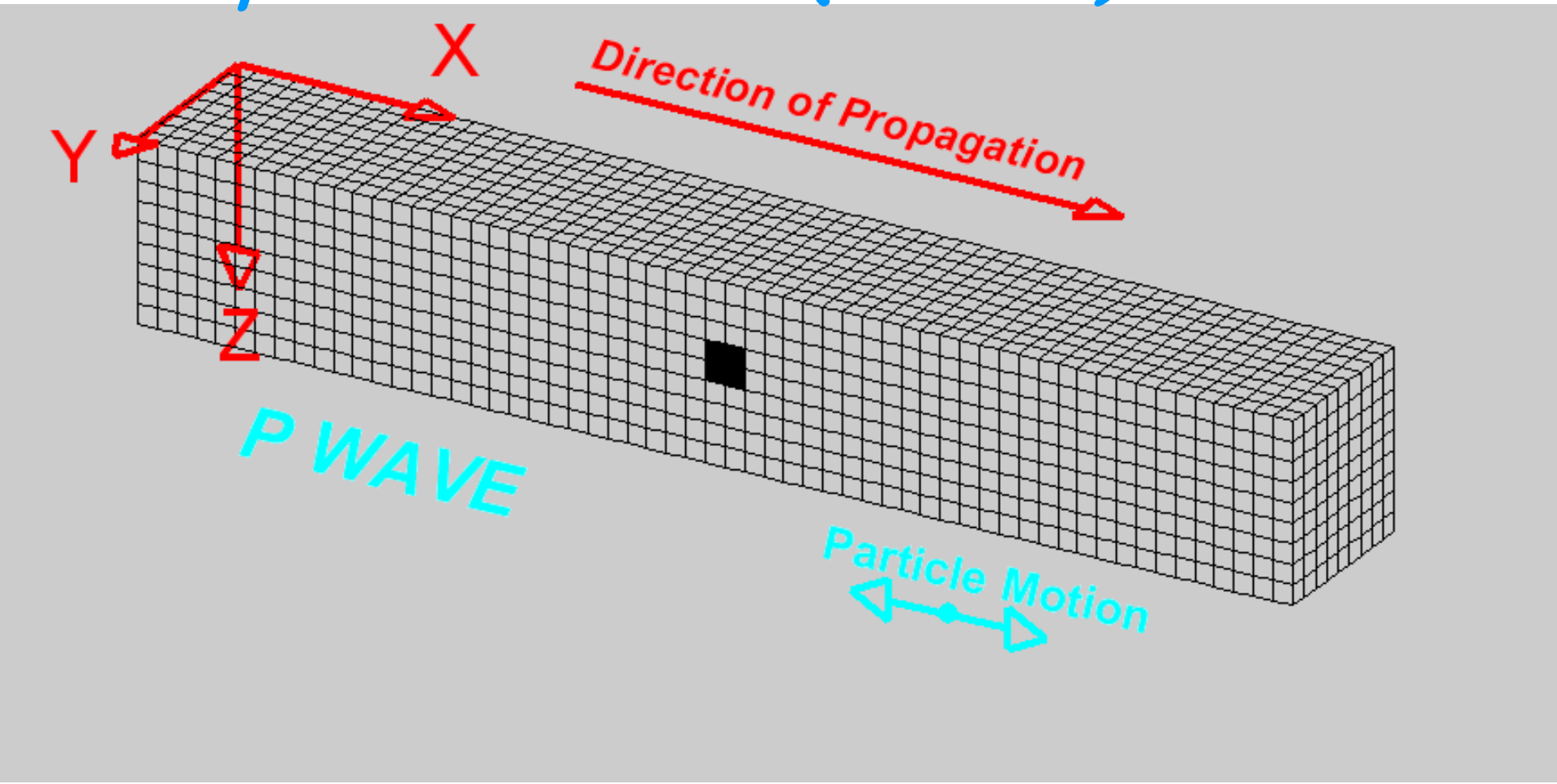
NSTA Conference,
March 2012
Indianapolis, IN



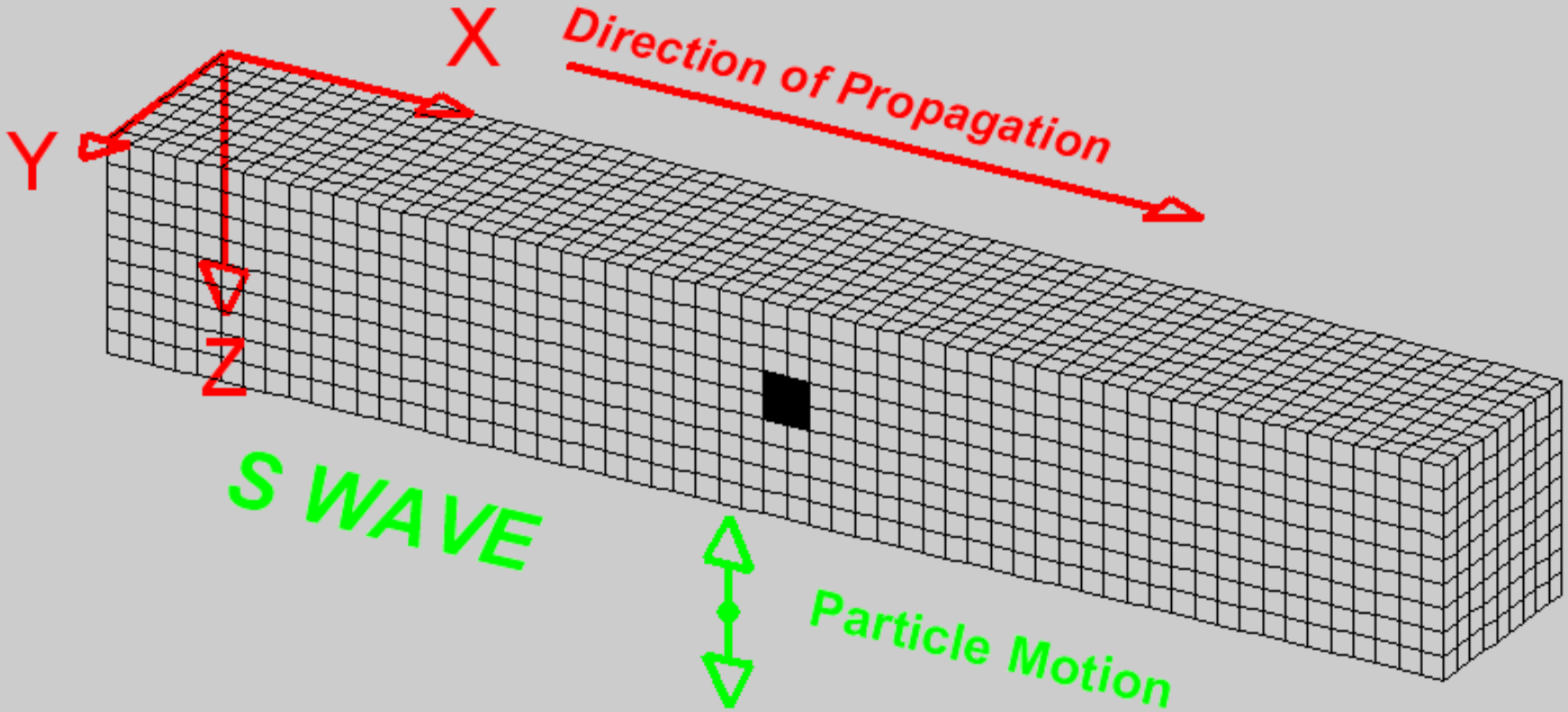
This PowerPoint file: http://web.ics.purdue.edu/~braile/new/SeismicWaves.ppt

Compressional Wave (P-Wave) Animation



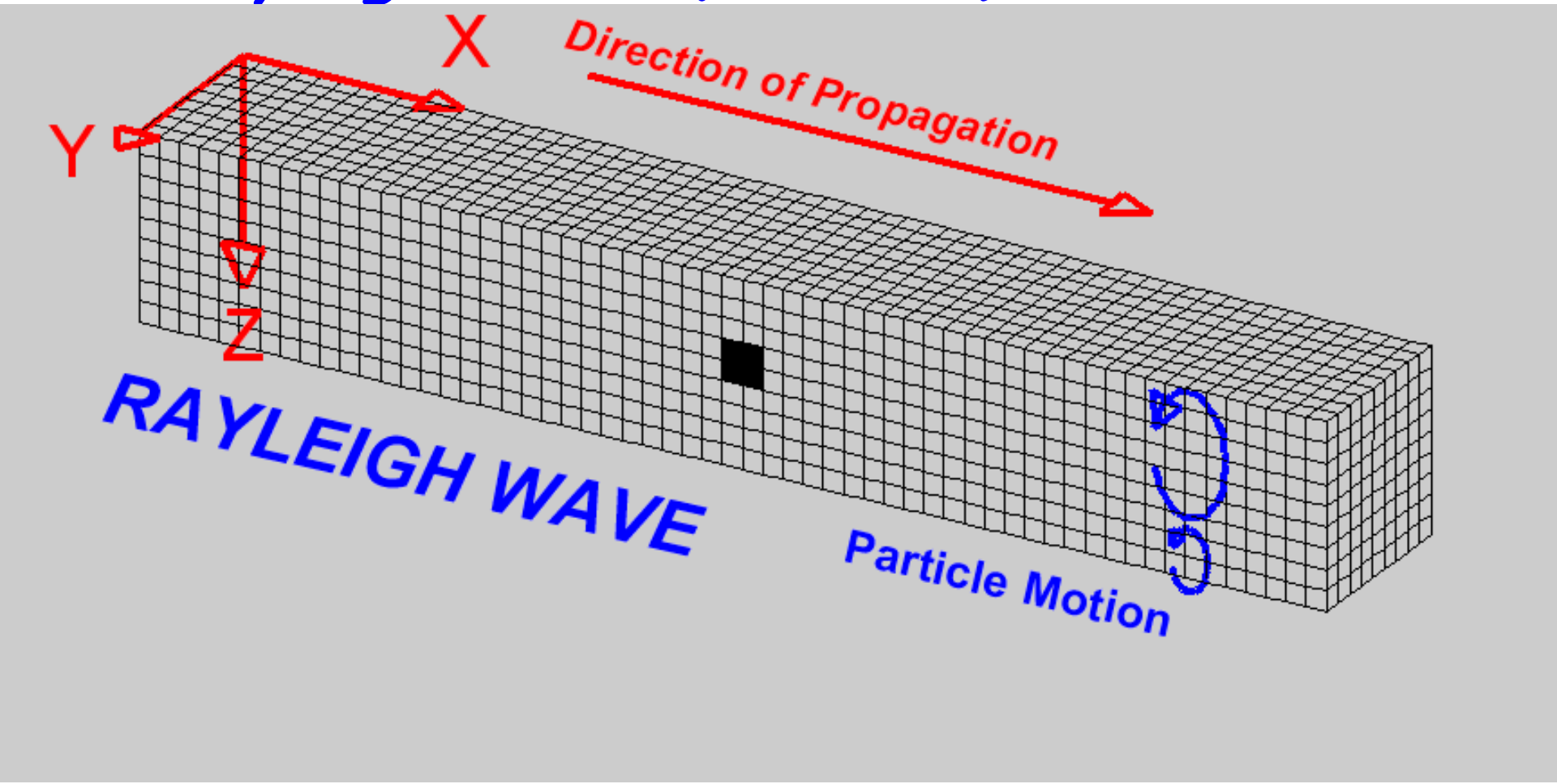
Deformation propagates. Particle motion consists of alternating compression and dilation. Particle motion is parallel to the direction of propagation (longitudinal). Material returns to its original shape after wave passes.

Shear Wave (S-Wave) Animation



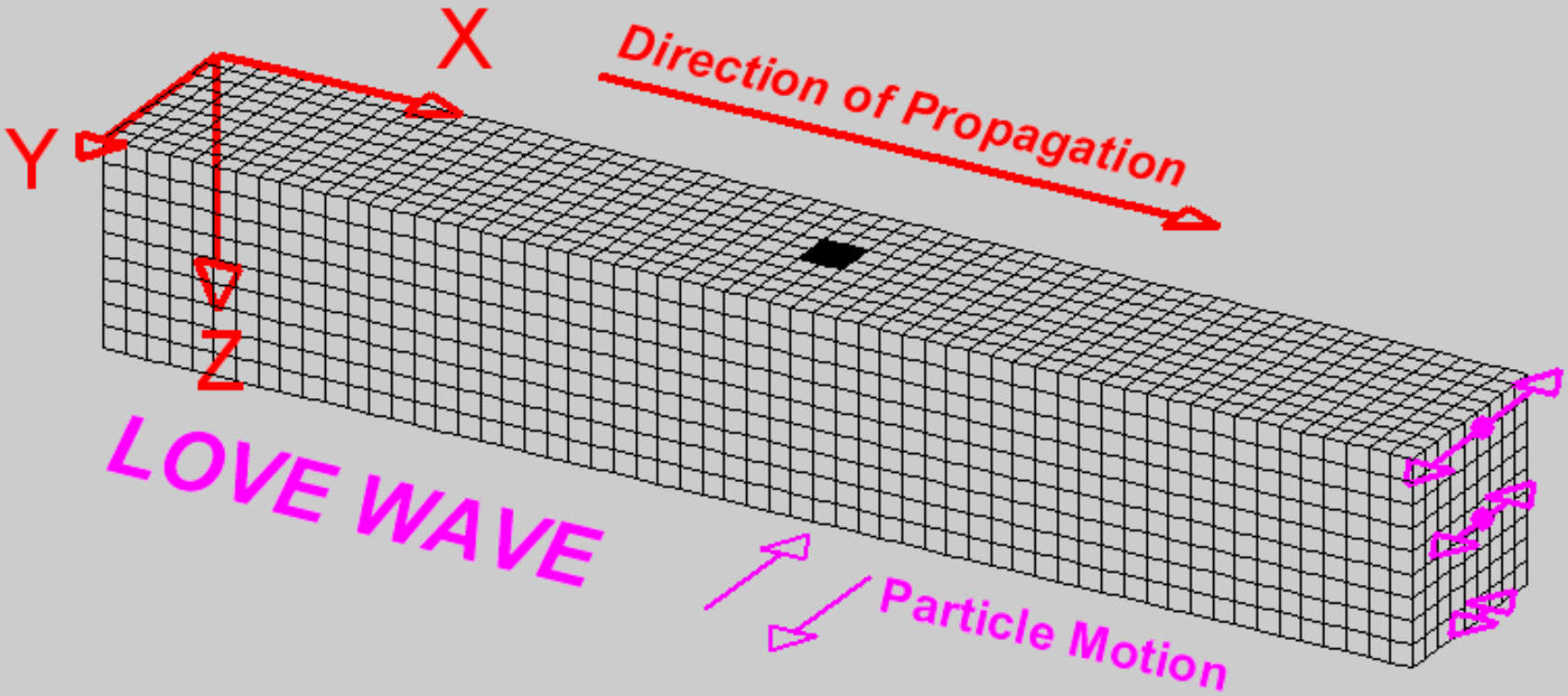
Deformation propagates. Particle motion consists of alternating transverse motion. Particle motion is perpendicular to the direction of propagation (transverse). Transverse particle motion shown here is vertical but can be in any direction. However, Earth's layers tend to cause mostly vertical (SV; in the vertical plane) or horizontal (SH) shear motions. Material returns to its original shape after wave passes.

Rayleigh Wave (R-Wave) Animation



Deformation propagates. Particle motion consists of elliptical motions (generally retrograde elliptical) in the vertical plane and parallel to the direction of propagation. Amplitude decreases with depth. Material returns to its original shape after wave passes.

Love Wave (L-Wave) Animation



Deformation propagates. Particle motion consists of alternating transverse motions. Particle motion is horizontal and perpendicular to the direction of propagation (transverse). To aid in seeing that the particle motion is purely horizontal, focus on the Y axis (red line) as the wave propagates through it. Amplitude decreases with depth. Material returns to its original shape after wave passes.

Live Audio Spectrum

- Using Python
- Captures Sound Waves through the computer’s microphone
- Continuously displays three images

Holometer Music

- holometer music - YouTube
- http://www.youtube.com/results?search_query=holometer+music&oq=holometer+music&gs_l=youtube.12...17077.19030.0.20983.11.11.0.0.0.0.109.625.10j1.11.0...0.0...1ac.17VQzt1NrWA
- Screen clipping taken: 7/31/2012, 7:21 PM

Laser Beams