Additional Teaching Materials

These pages contain links to IRIS’ educational materials and to activities that range from basic to intermediate in scope and a classroom activity on the following pages of this document.

One-pager handouts & poster

- **Why do Earthquakes Happen?**
  - Type—One page informational
  - Level—Basic
  - Materials—None
  - Objectives—Introduce plate tectonics

- **Exploring the Earth Using Seismology**
  - Type—One page informational
  - Level—Basic
  - Materials—None
  - Objectives—Observe seismic wave paths through the Earth’s interior

Activities

- **Companion Activity to Animation**
  - Type—Short activity *(P.2–6 this document)*
  - Level—Basic
  - Materials—Animation, Overhead markers
  - Objectives—Explore properties of seismic waves;
  - Identify large scale Earth structure properties;
  - Recognize that earthquakes can be recorded anywhere on the planet.

- **Plotting Earthquake Epicenters**
  - Type—Short activity, Long-term monitoring
  - Level—Basic
  - Materials—World map (approx. 30” x 50”)
    - Internet connection
    - Self-adhesive colored dots (1/4 inch diameter)
    - Crayons or color pencils
    - Overhead markers
  - Objectives—Discover unique patterns of earthquakes around the world;
  - Identify locations of deep earthquakes and associated geologic features;
  - Identify locations of large earthquakes and associated geologic features;

- **Human Waves Demonstrate How Seismic Waves Travel**
  - Type—Short demonstration/activity
  - Level—Basic
  - Materials—Stopwatch
  - Objectives—Describe how P and S waves travel through solid and liquid

- **SeisMac**
  - Type—Activity
  - Level—Intermediate
  - Materials—Internet connection SeisMac software Pre-selected data Quicktime software
  - Objectives—Describe the information contained in a three-component seismogram;
  - Identify the first S and P waves on a three-component seismogram
  - Describe how first S and P wave arrivals provide evidence for the curved path seismic waves take when they travel through the Earth
OBJECTIVES

This activity, paired with the 4 Station Seismograph Network animation, is designed for students to:

• explore properties of seismic waves
• identify large scale earth structure properties
• recognize that earthquakes can be recorded anywhere on the planet

LESSON DEVELOPMENT

Review of Earth Structure

Understanding which seismic waves will be detected at a distant seismometer requires a general understanding of Earth structure. A key to understanding this animation is recognizing the Earth has a liquid outer core.

Review of Seismic Waves

An earthquake is the sudden breaking of rock in the Earth. When a break occurs, some of the energy radiates out in the form of seismic waves. For every earthquake there are multiple types of seismic waves that fit in two broad categories:

Body waves (P and S waves; see descriptions at right) travel through the interior of the earth, and for the purposes of this animation, are described as a ray that leaves the earthquake and travels to the recording station.

Surface waves travel over the surface of the earth. These waves are slower, thus arrive after both the P and S body waves. Surface waves are responsible for most of the damage and destruction associated with earthquakes.

VOCABULARY

Seismometer: An instrument that detects motions of the Earth’s surface caused by seismic waves produced during an earthquake.

Seismograph: Generally refers to the seismometer (detector) and its recording device (computer) as a single unit.

Primary Waves (P waves): Compressional waves that move rock particles apart and back together in the direction the wave is traveling. P waves can travel through solid or liquid, so they can travel through all layers of the Earth. P waves are the fastest seismic waves, therefore they will be the first wave to arrive following an earthquake at the recording station.

Secondary Waves (S waves): Shear waves cause vibrations that are perpendicular to the direction the waves are traveling through the rock. Because liquids cannot be sheared in the way a solid can, S waves do not travel through liquids such as the outer core. S waves are slower than P waves, and arrive later. The delay time between the P arrival and the S arrival reveals how far away the earthquake is from the recording station.
1. Label the four main layers of the Earth: Crust, mantle, outer core, and inner core.
2. Draw the path of the body waves from the earthquake to each of the four houses.
3. Label the segments of each path with the type of body wave found on that segment (P, S, P&S).
4. Identify which seismic record belongs to which house.
5. Label the type of wave arrival on each seismic record.
4-Station Seismograph Network: Overhead Image
4-Station Seismograph Network: Earthquake! Key

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