

Earth Science

Chapter 12 - Earthquakes

Section 2 – Studying Earthquakes

E.Q.: *Explain the technology used to measure earthquakes and how intensity and magnitude are measured.*

STANDARDS:

- SES2. Students will understand how plate tectonics creates certain geologic features, materials, and hazards.**
- a. Distinguish among types of plate tectonic settings produced by plates diverging, converging, and sliding past each other.**
 - b. Relate modern and ancient geologic features to each kind of plate tectonic setting.**
 - c. Relate certain geologic hazards to specific plate tectonic settings.**

Objectives:

- Describe the instrument used to measure and record earthquakes.**
- Summarize the method scientists use to locate an epicenter.**
- Describe the scales used to measure the magnitude and intensity of earthquakes.**

Studying Earthquakes

- The study of earthquakes and seismic waves is called *seismology*.**
- Seismologists use special sensing equipment to record, locate, and measure earthquakes.**

Recording Earthquakes

seismograph an instrument that records vibrations in the ground

seismogram a tracing of earthquake motion that is recorded by a seismograph

- **Seismographs record three types of ground motion—vertical, east-west, and north-south.**
- **Because they are the fastest, P waves are the first seismic waves to be recorded by a seismograph.**
- **S waves are the second seismic waves to be recorded, and surface waves are the last to be recorded by a seismograph.**

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Locating an Earthquake

- **To determine the distance to an epicenter, scientists consult a lag-time graph and analyze the arrival times of the P waves and S waves.**
- **The start time of an earthquake can also be determined by this graph.**
- **Scientists use computers to perform complex triangulations based on information from several seismograph stations. These calculations help determine the location of an earthquake.**

Before computers were widely available, scientists used simpler, less precise calculations together with maps to locate earthquakes.

Earthquake Measurement

Magnitude

magnitude a measure of the strength of an earthquake

- **Magnitude is determined by measuring the amount of ground motion caused by an earthquake.**
- **While the Richter scale was widely used for most of the 20th century, scientists now prefer to use the moment magnitude scale.**
- **Moment magnitude is a measure of earthquake strength based on the size of the area of the fault that moves, the average distance that the fault blocks move, and the rigidity of the rocks in the fault zone.**

Reading Check

What is the difference between the Richter scale and the moment magnitude scale?

Moment magnitude is more accurate for larger earthquakes than the Richter scale is. Moment magnitude is directly related to rock properties and so is more closely related to the cause of the earthquake than the Richter scale is.

Intensity

Intensity - the amount of damage caused by an earthquake

- **Before the development of magnitude scales, the size of an earthquake was described in terms of the earthquake's effects.**
- **The modified *Mercalli scale* expresses intensity in Roman numerals from I to XII and provides a description of the effects of each earthquake intensity.**