

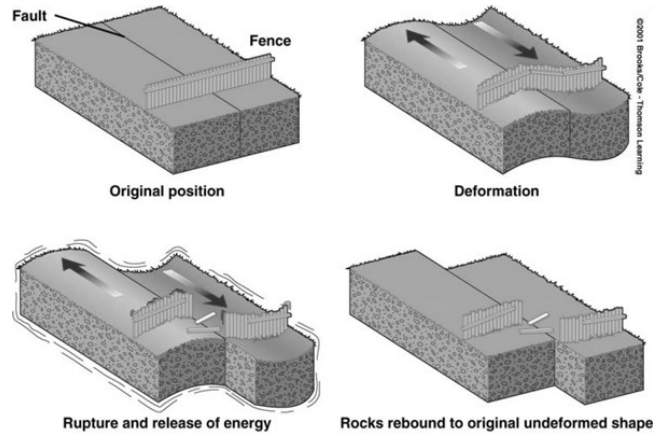
**What are Earthquakes?**

- The shaking or trembling caused by the sudden \_\_\_\_\_
- Usually associated with \_\_\_\_\_ or breaking of rocks
- Continuing adjustment of position results in \_\_\_\_\_

**What is Elastic Rebound Theory?**

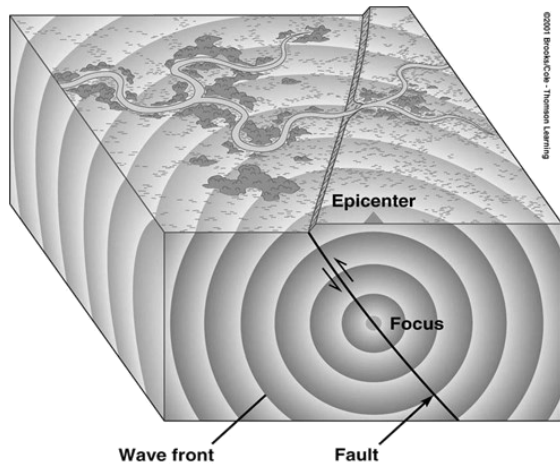
Explains how energy is stored in rocks

- Rocks \_\_\_\_\_ until the strength of the rock is exceeded
- Rupture occurs and the rocks quickly rebound to a \_\_\_\_\_ shape
- Energy is released in \_\_\_\_\_ that radiate outward from the fault

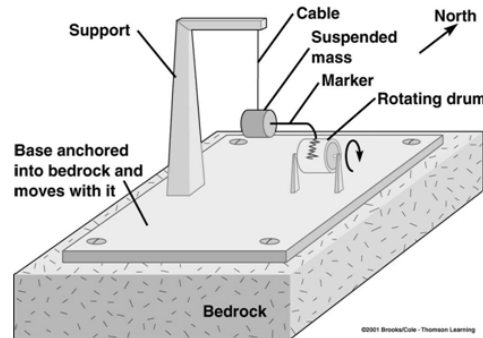


**The Focus and Epicenter of an Earthquake**

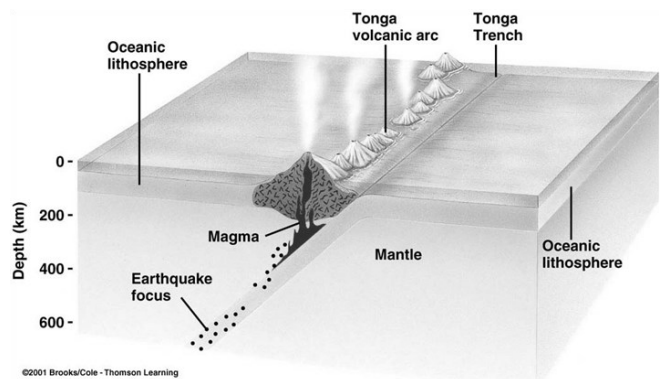
- The point within Earth where faulting begins is the \_\_\_\_\_
- The point directly above the focus on the surface is the \_\_\_\_\_



Seismographs measure and record earthquake events

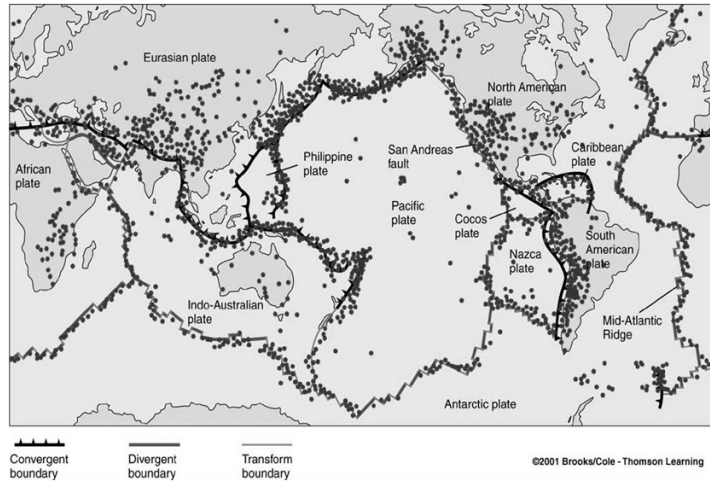


At convergent boundaries, \_\_\_\_\_ increases along a dipping seismic zone called a \_\_\_\_\_



## Where do earthquakes occur and how often?

- About \_\_\_\_\_ of all earthquakes occur in the circum-Pacific belt.
- Most result from \_\_\_\_\_ margin activity.
- About \_\_\_\_\_ occur in the Mediterranean-Asiatic belt .
- remaining 5% occur in the interiors of plates and on \_\_\_\_\_.
- more than \_\_\_\_\_ quakes strong enough to be felt are recorded each year



## Economic and societal impacts of earthquakes



← Building Collapse



Tsunami →



← Fire  
San Francisco Earthquake \_\_\_\_\_

Ground Failure →



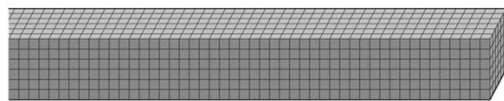
# What are seismic waves?

- A seismic wave is an elastic wave generated by an impulse such as an earthquake or an explosion
- Two types:

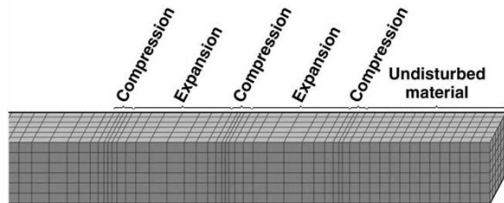
## Body Waves

- Fastest wave
- Travels through solids, liquids and gases
- Compressional wave, material movement is in the same direction as wave movement

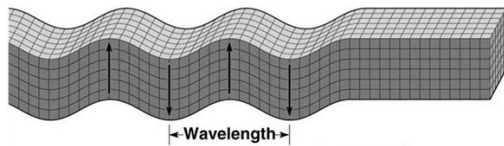
- Slower
- Only through solids
- Move material perpendicular to wave movement.



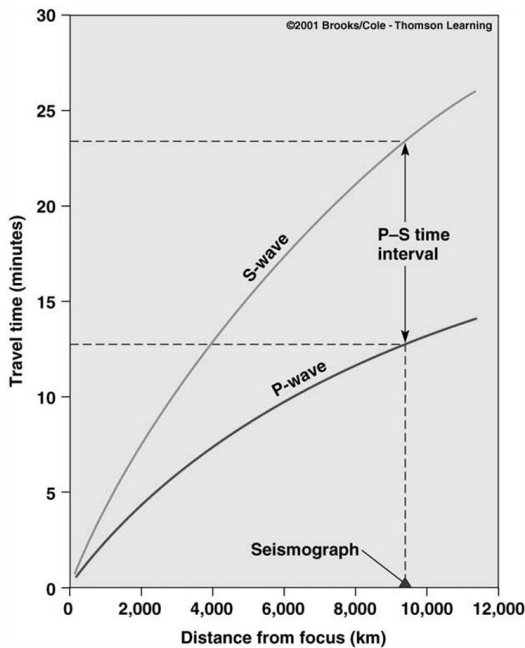
(a) Undisturbed material



(b) Primary wave

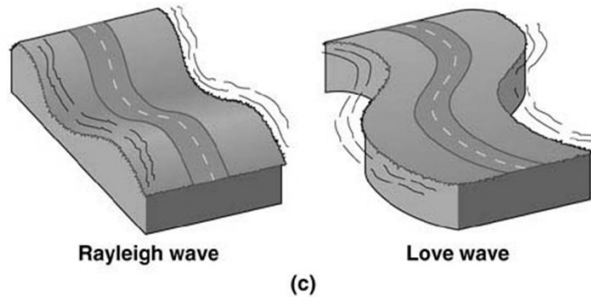


(c) Secondary wave



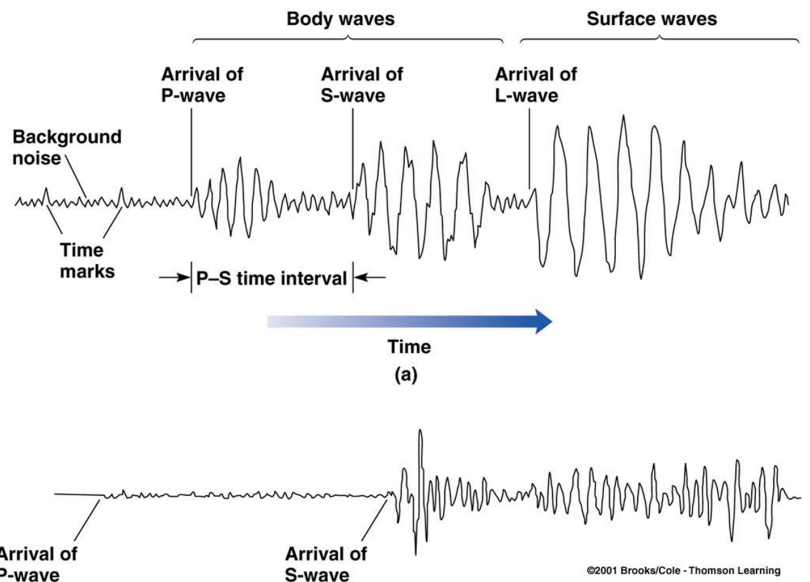
## Surface Waves

- Travel just below or along the ground's surface
- Slower than body waves; rolling and side-to-side movement.
- Especially damaging to buildings

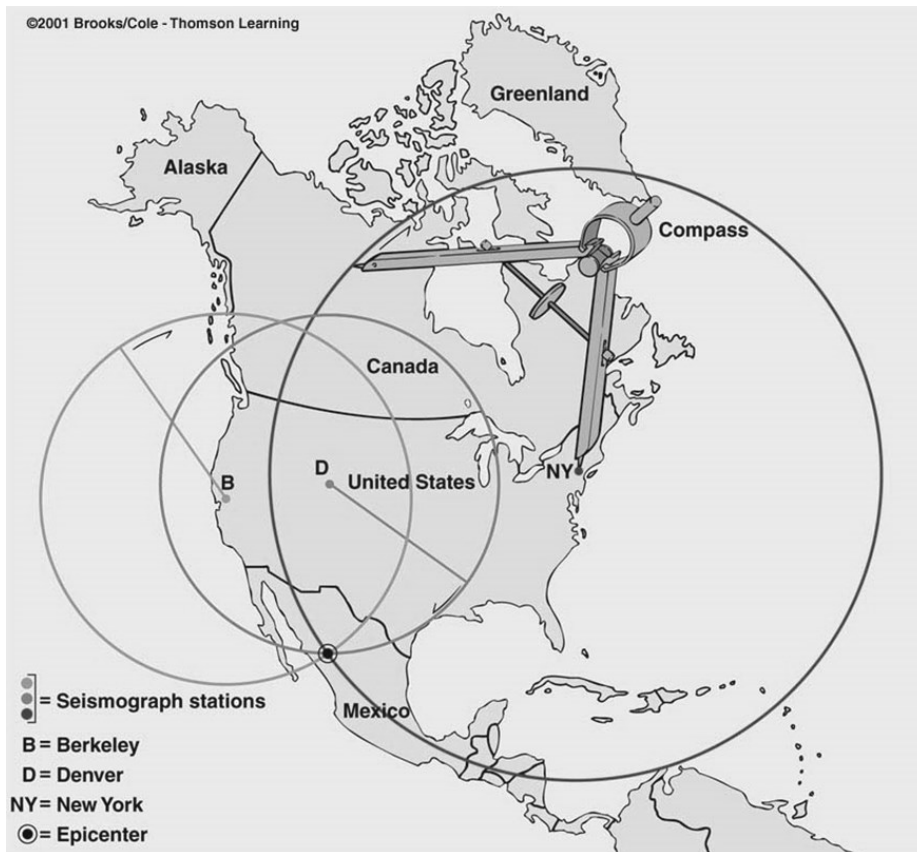


## How is an Earthquake Epicenter Located?

- \_\_\_\_\_ waves arrive first, then S waves, then L & R
- By knowing the speeds of all these waves we can calculate distance by using the \_\_\_\_\_ in arrival times.



Time-distance graph showing the average travel times for P- and S-waves. The farther away a seismograph is from the focus of an earthquake, the longer the interval between the \_\_\_\_\_ of the P- and S- waves



• \_\_\_\_ seismograph stations are needed to locate the epicenter of an earthquake

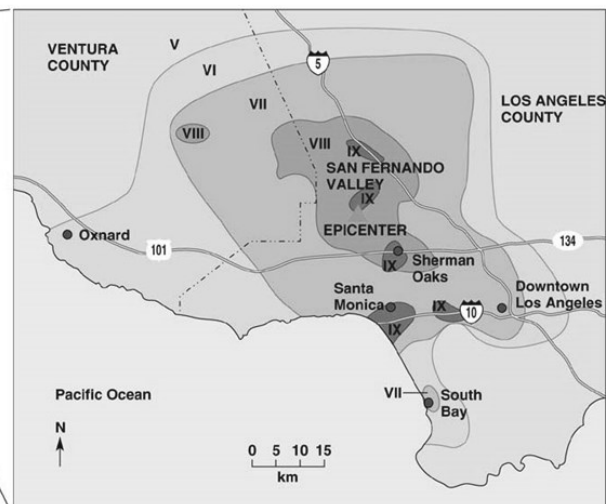
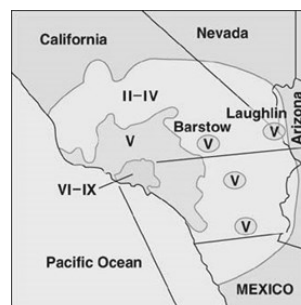
• A circle where the radius equals the distance to the \_\_\_\_\_ is drawn

• The \_\_\_\_\_ of the circles locates the epicenter

**How are size and strength of an earthquake measured?**

• Intensity  
 – subjective measure of the kind of damage done and \_\_\_\_\_ reactions to it

– \_\_\_\_\_ lines identify areas of equal intensity



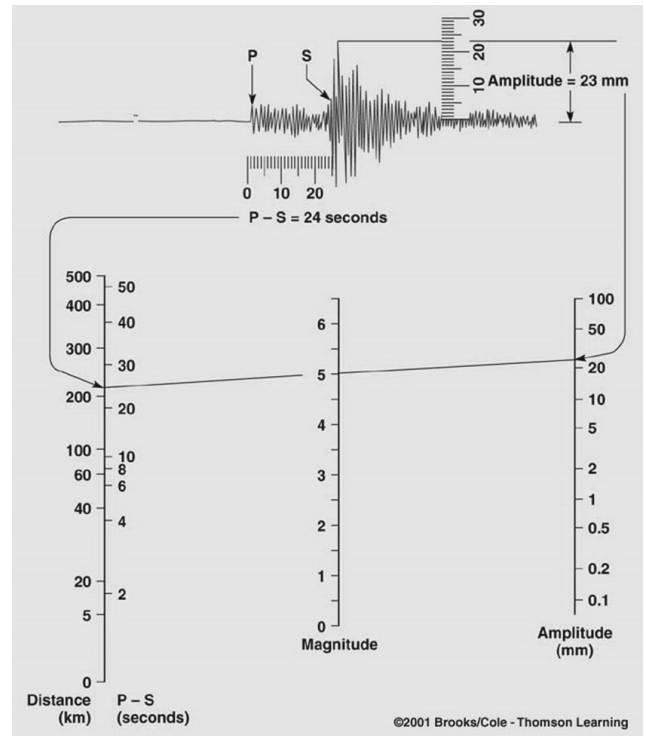
**Modified Mercalli Intensity Map of 1994 Northridge Earthquake (CA)**

©2001 Brooks/Cole - Thomson Learning

•Magnitude

– \_\_\_\_\_ measures total amount of energy released by an earthquake; independent of intensity.

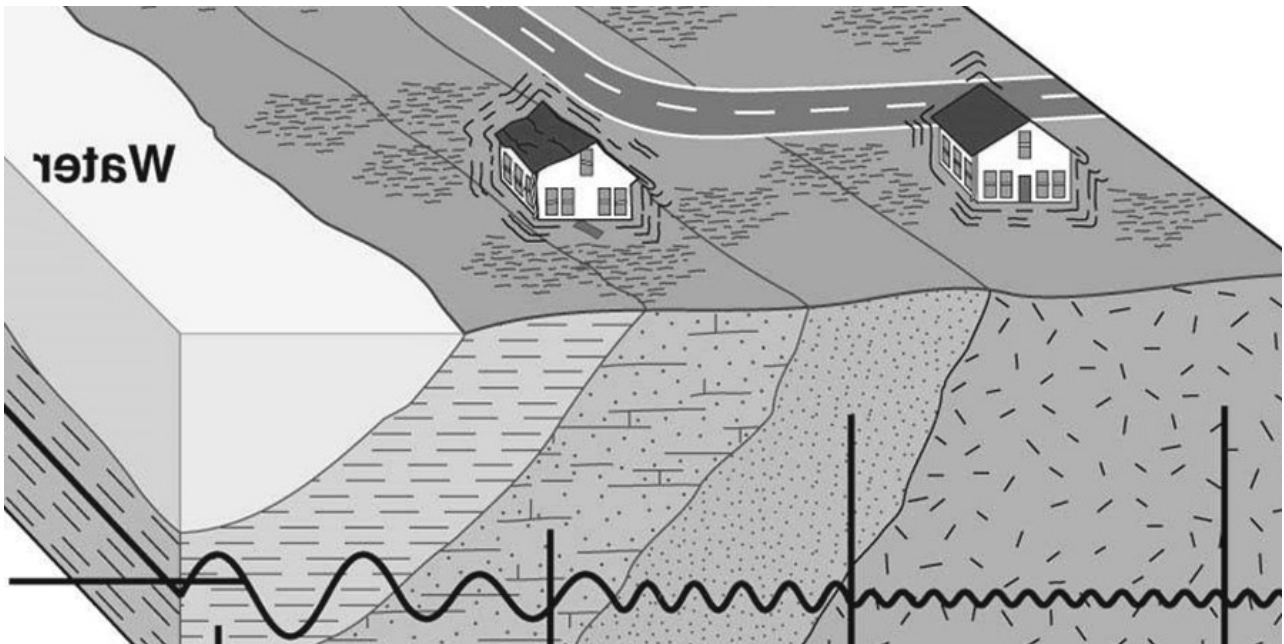
–Amplitude of the largest wave produced by an event is corrected for distance and assigned a value on an open-ended \_\_\_\_\_



**What are the Destructive Effects of Earthquakes?**

Ground Shaking

–amplitude, duration, and damage increases in \_\_\_\_\_ consolidated rocks.

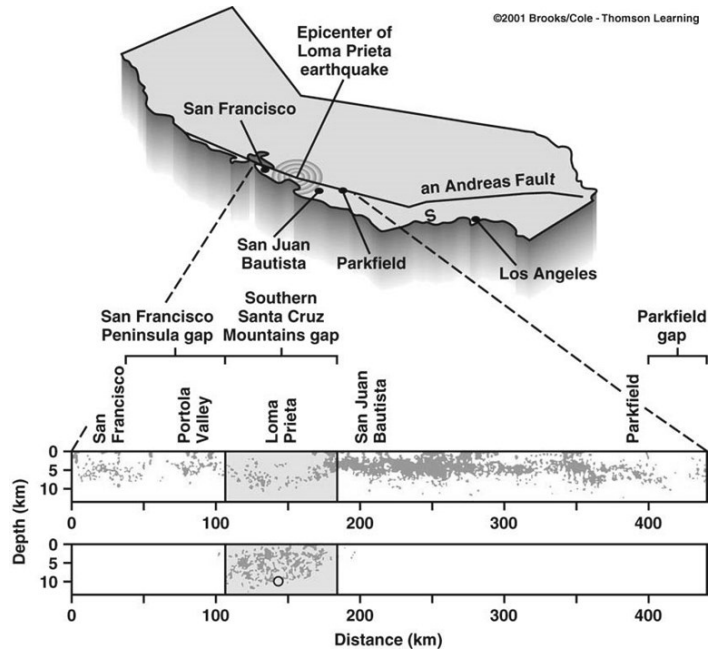


## Can an Earthquake Be Predicted?

changes in elevation or tilting of land surface, fluctuations in groundwater levels, magnetic field, electrical resistance of the ground.

– \_\_\_\_\_ dilatancy model

– \_\_\_\_\_

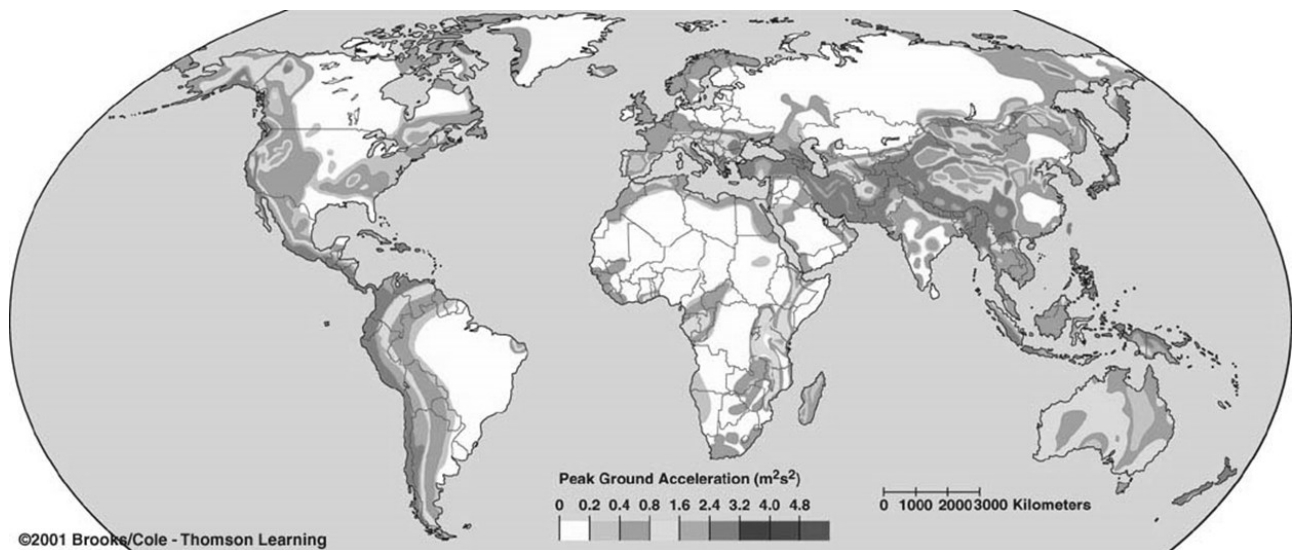


## **Earthquake Prediction Programs**

–include laboratory and field studies of rocks before, during, and after earthquakes.

–monitor activity along \_\_\_\_\_.

–produce risk assessments.



## Can Earthquakes Be Controlled?