

Earthquakes



Rocks Move along Faults

An ***earthquake*** is a shaking of the ground caused by the sudden movement of large blocks of rock along a fault. Earthquakes occur along faults.

A ***fault*** is a fracture, or break, in Earth's lithosphere, along which blocks of rock move past each other.

Earthquakes

- A sudden release of stress in the lithosphere causes an earthquake.
- Shaking and trembling of the earth's crust.
- The waves travel in all directions
- More than 1,000,000 occur a year or one every 30 seconds
- Earthquakes continue until all the energy is used up
- TSUNAMIS- Earthquakes on the ocean floor: causing waves to become greater than 20 meters high

Occurrence of Earthquakes

- About 80 percent of all earthquakes occur in a belt around the edges of the Pacific Ocean.
- In the United States, the best-known fault in this belt is the San Andreas Fault in California.

San Andreas Fault – This is a Transform Boundary that runs from the Gulf of California through the San Francisco area.



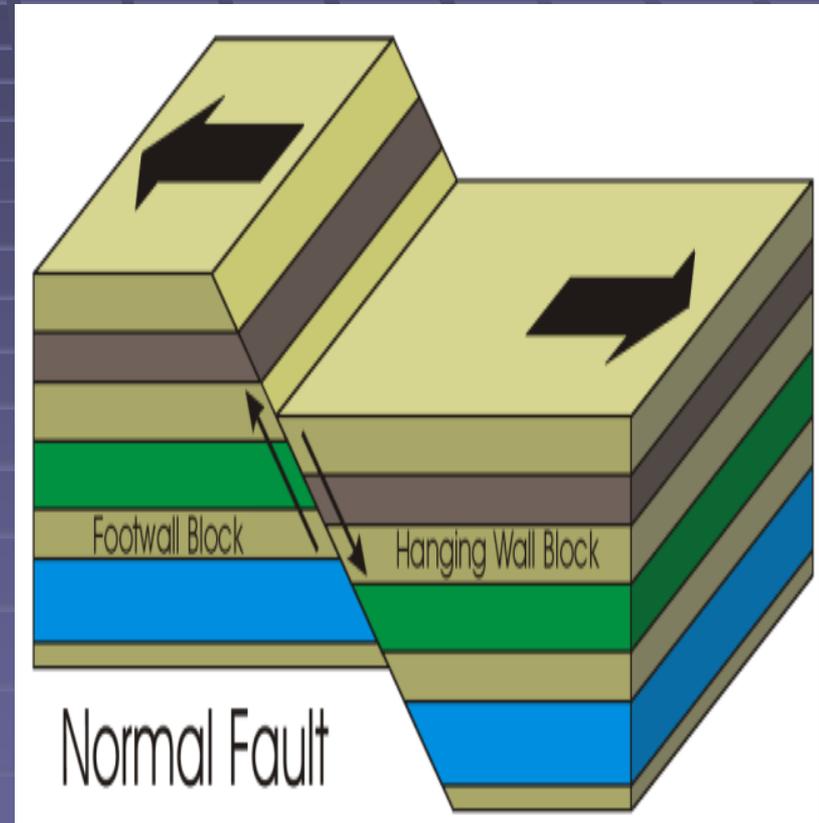
Kinds of Faults

The three main types of faults are

- 1) Normal faults,
- 2) Reverse faults, and
- 3) Strike-slip faults.

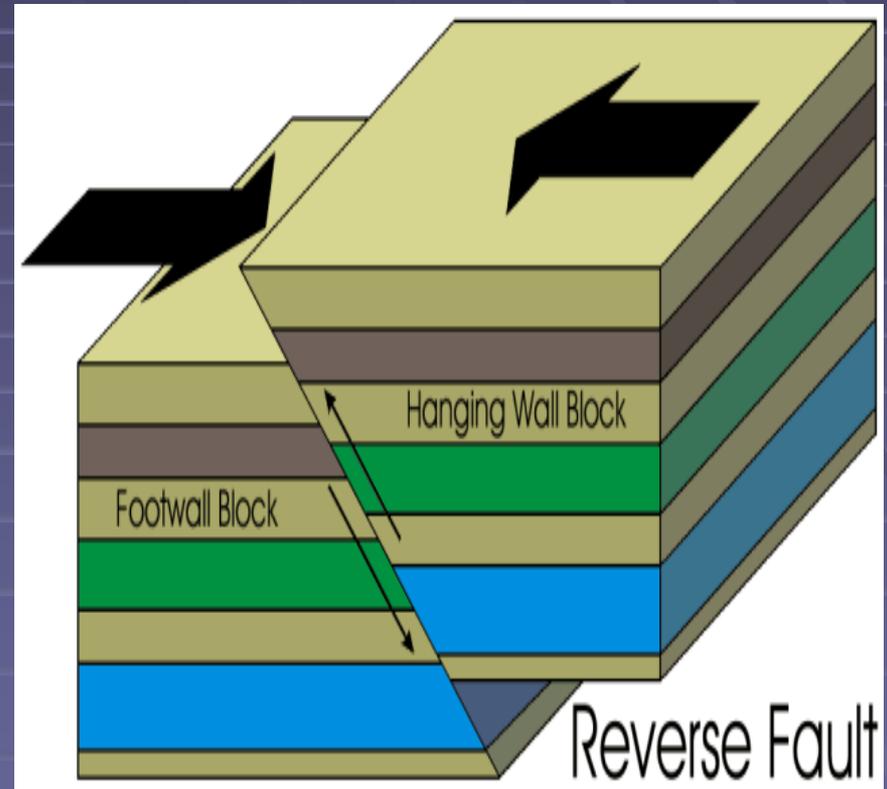
Normal Faults

Here the block of rock above the fault plane slides down relative to the other block. Stress that pulls rocks apart causes normal faults. Example - Great Rift Valley of Africa.



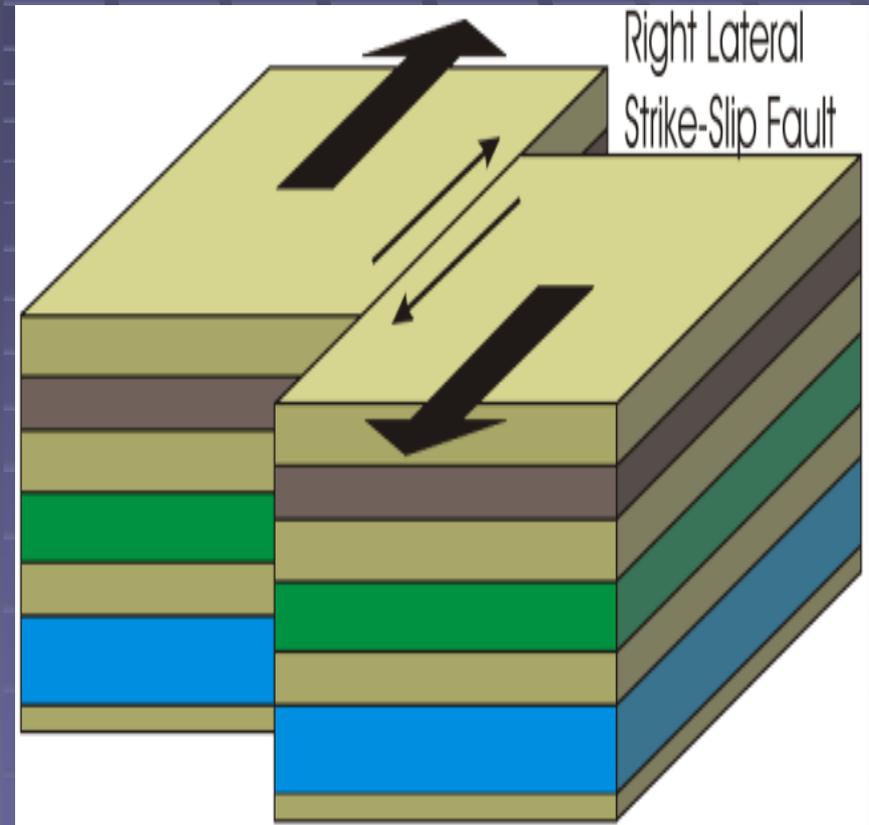
Reverse Faults

Here the block of rock above the fault plane moves up relative to the other block. Stress that presses rocks together causes reverse faults. These faults can occur near collision-zone boundaries between plates. Example - Himalayan Mountains have many earthquakes along reverse faults.



Strike-Slip Faults

Here blocks of rock move sideways on either side of the fault plane. Stress that pushes blocks of rock horizontally causes earthquakes along strike-slip faults. These faults can occur where plates scrape past each other. The San Andreas Fault is a strike-slip fault.

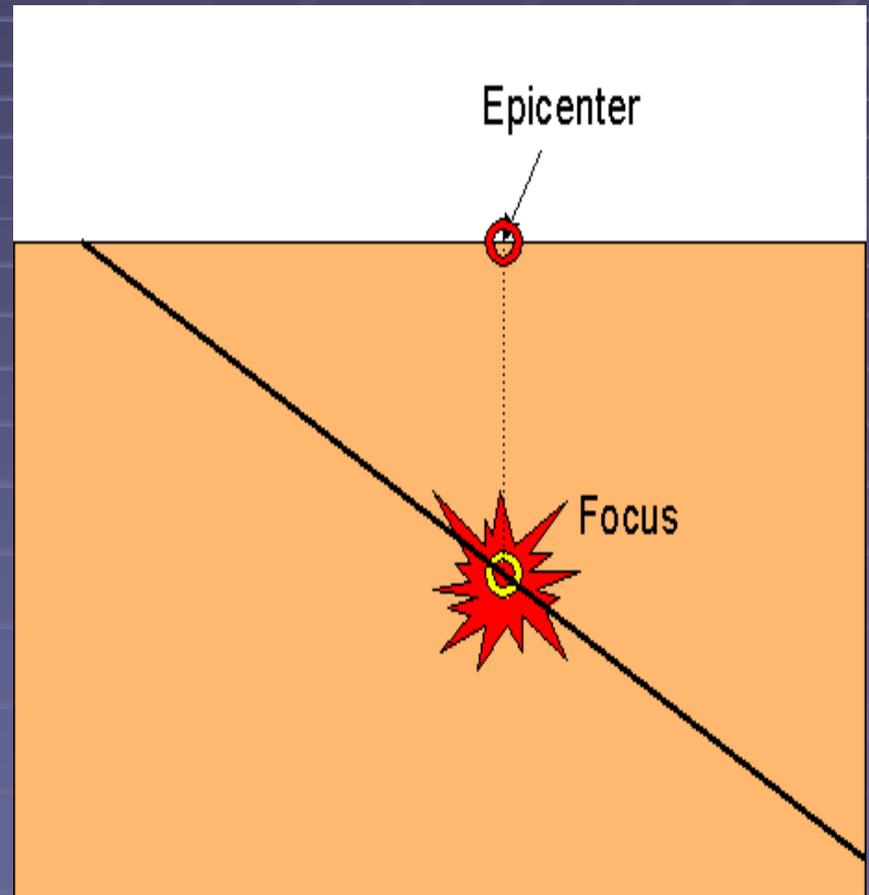


Seismic Waves

Energy from earthquakes travels through Earth. The energy travels as **seismic waves** which are vibrations caused by earthquakes. Seismic waves from even small earthquakes can be recorded by sensitive instruments around the world.

Focus and Epicenter

All earthquakes start beneath Earth's surface. The focus of an earthquake is the point underground where rocks first begin to move. Seismic waves travel outward from the earthquake's focus. The epicenter is the point on Earth's surface directly above the focus.

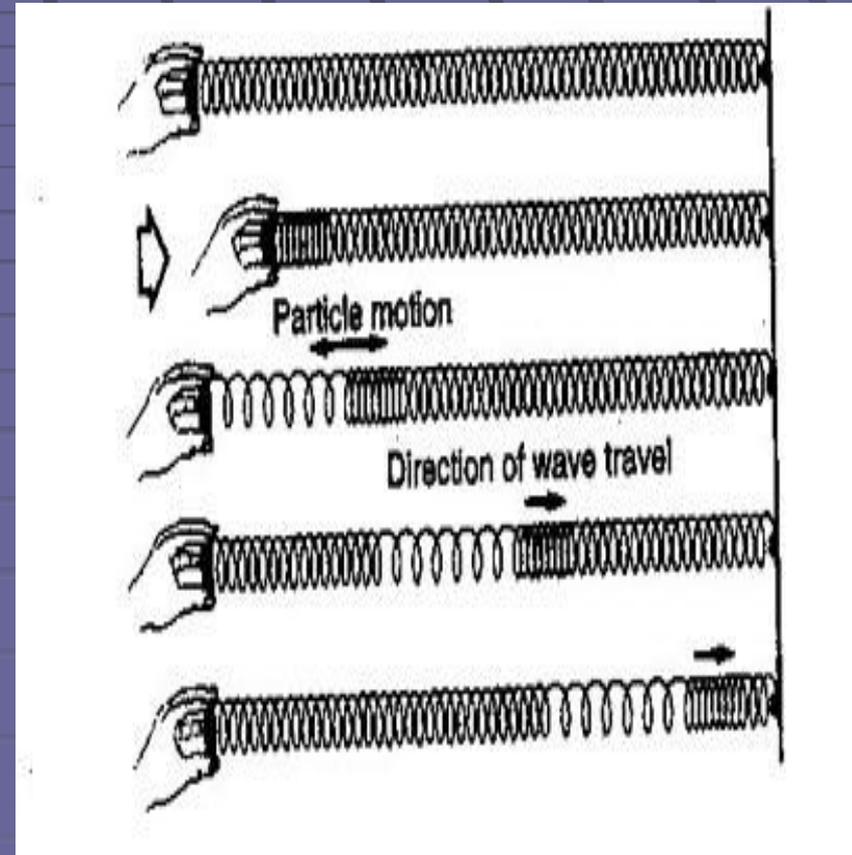


Seismic Waves

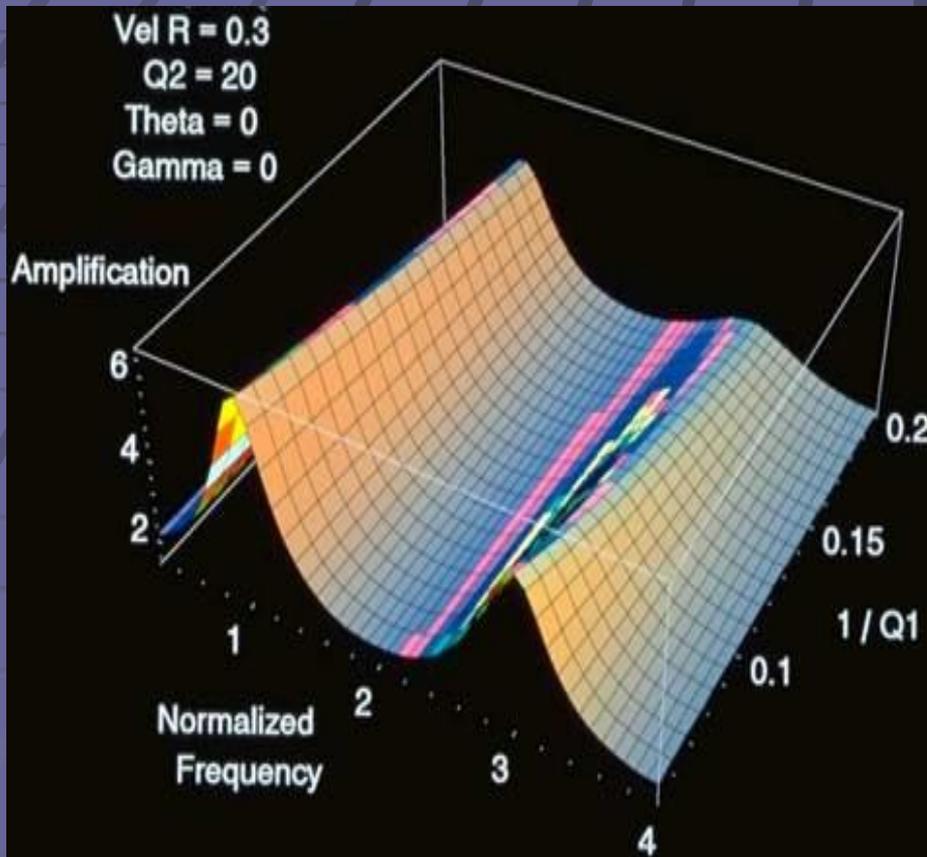
Earthquakes produce three types of seismic waves: primary waves, secondary waves, and surface waves. Each type moves through materials differently. In addition, the waves can reflect, or bounce, off boundaries between different layers. The waves can also bend as they pass from one layer into another. Scientists learn about Earth's layers by studying the paths and speeds of seismic waves traveling through Earth.

Primary or P Waves

- Primary waves are the fastest (5 km or 3mi/sec) and arrive first at the epicenter
- Can travel through solids, liquids, and gases
- They are push-pull waves



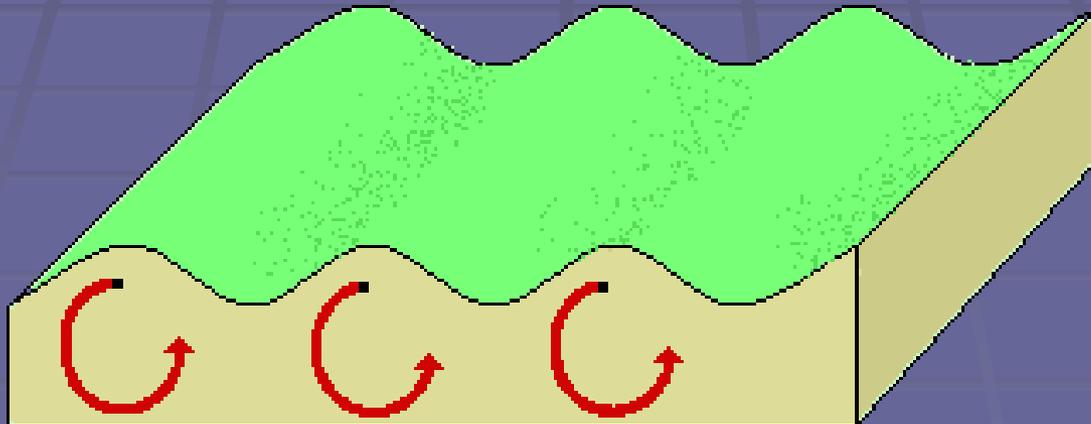
Secondary or S Waves



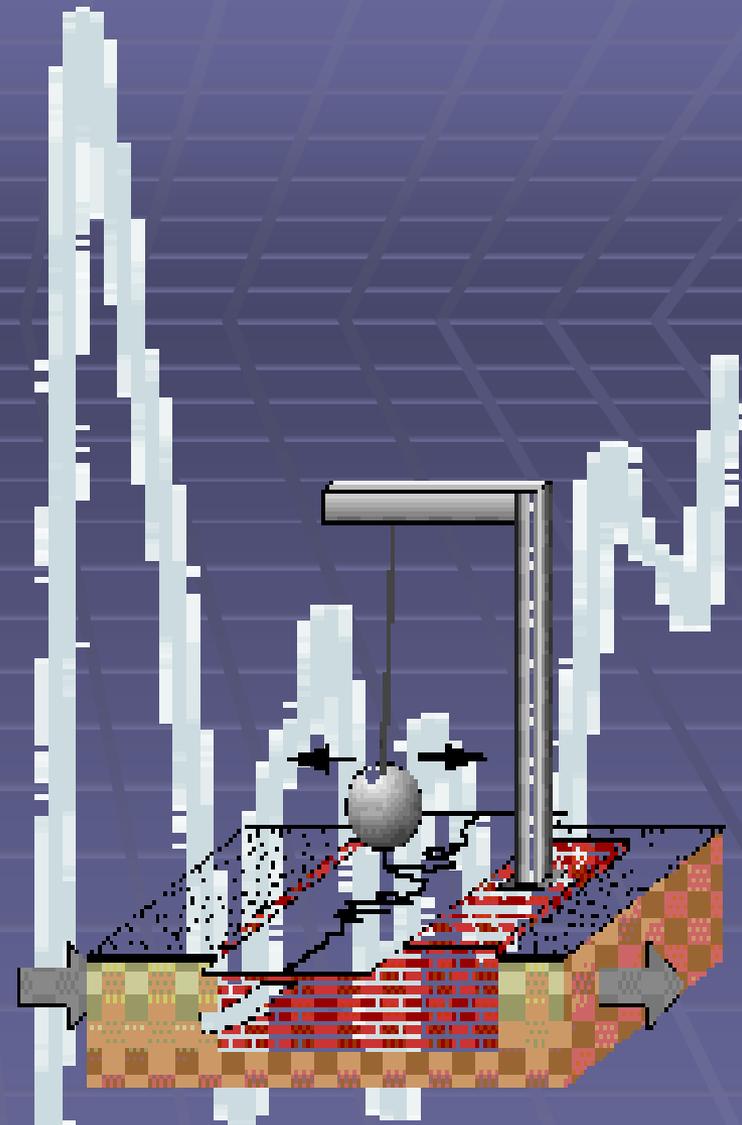
- the second seismic waves to arrive at any particular location after an earthquake,
- travel through Earth's interior at about half the speed of primary waves.
- Can travel through solids, but NOT through liquids and gases
- Move in up-down motion

Surface or L Waves

- seismic waves that move along Earth's surface, not through its interior.
- make the ground roll up and down or shake from side to side.
- Slowest moving seismic waves
- Travel on top of Earth's surface
- cause the largest ground movements and the most damage as they bend and twist the surface



- **Seismograph**-an instrument that constantly records ground movements
- **Seismogram**- Paper record of waves also used to determine an earthquakes magnitude or strength.
- **Seismologists**- scientists who study earthquakes
- **Richter Scale**- a scale that allows scientists to determine earthquake strength based on many readings. 1-10 are levels at which an earthquake is measured based on amount of damage caused; Levels above 7 are destructive. Each increasing number has 32 times more energy.



Damage from Earthquakes

- Loss of life
- Damage to buildings
- Can cause fires (broken natural-gas lines, electrical power lines, or overturned stoves.)

Aftershocks

An aftershock is a smaller earthquake that follows a more powerful earthquake in the same area. Sometimes structures weakened by an earthquake collapse during shaking caused by aftershocks.

Liquefaction

Earthquakes can cause soil liquefaction, a process in which shaking of the ground causes soil to act like a liquid. For a short time the soil becomes like a thick soup. Liquefaction occurs only in areas where the soil is made up of loose sand and silt and contains a large amount of water. As the shaking temporarily changes the wet soil, structures either sink down into the soil or flow away with it.

Tsunamis

A special type of wave, can make water rise more than the height of a 20-story building. This wave, known as a tsunami, is a water wave triggered by an earthquake, volcanic eruption, or landslide. Tsunamis are sometimes called tidal waves.

The End



Ring of Fire