

The image is a collage of three photographs illustrating the effects of earthquakes. The top-left photo shows a multi-story building that has been completely destroyed, leaving a pile of rubble. The top-right photo shows a large, multi-story building that has tilted significantly to the right. The bottom photo shows a wide asphalt road with a deep, jagged crack running down its center, exposing the underlying soil and rebar. A few people are visible in the distance on the road.

EARTHQUAKES

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What causes earthquakes:

- earthquakes are usually caused when rock underground suddenly breaks along a fault. This sudden release of energy causes the seismic waves that make the ground shake. When two blocks of rock or two plates are rubbing against each other, they stick a little.

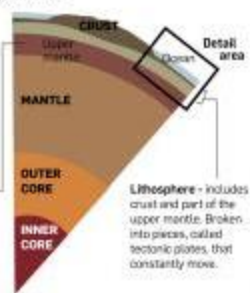
How a earthquake hits:

HOW DISASTER STRIKES

Earthquakes happen after centuries of energy build up within the earth. Here's a look at the forces behind the destruction.

Pieces of a puzzle

The earth has major layers: brittle, rigid crust here most earthquakes occur. Some occur in the upper mantle.



Lithosphere - rigid layer of mantle that breaks into pieces, called tectonic plates, that constantly move.

Lithosphere - includes crust and part of the upper mantle. Broken into pieces, called tectonic plates, that constantly move.

Earthquakes occur near plate boundaries. Earthquakes occur at these faults as plates move and collide.

"Ring of Fire" - Where about 90 percent of the world's earthquakes occur.



Shaky ground

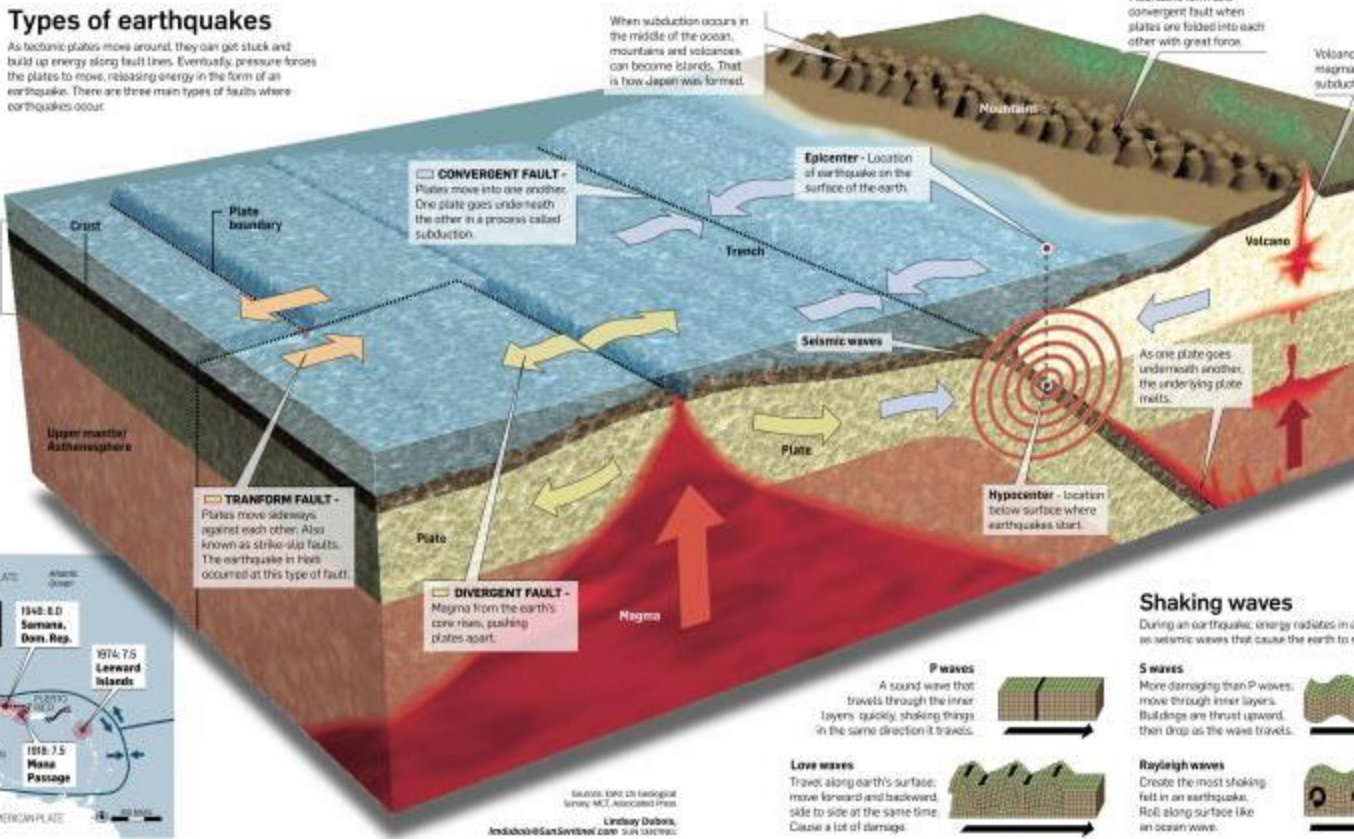
Earthquake in Haiti is estimated to have killed 200,000 to 250,000 people. There have been other major earthquakes in the Caribbean. In 1880, an 8.1 striking along the coast.



Plate boundaries
Fault lines
Direction of plate movement

Types of earthquakes

As tectonic plates move around, they can get stuck and build up energy along fault lines. Eventually, pressure forces the plates to move, releasing energy in the form of an earthquake. There are three main types of faults where earthquakes occur.



CONVERGENT FAULT - Plates move into one another. One plate goes underneath the other in a process called subduction.

TRANSFORM FAULT - Plates move sideways against each other. Also known as strike-slip faults. The earthquake in Haiti occurred at this type of fault.

DIVERGENT FAULT - Magma from the earth's core rises, pushing plates apart.

Epicenter - Location of earthquake on the surface of the earth.

Hypocenter - location below surface where earthquakes start.

P waves - A sound wave that travels through the inner layers, quickly shaking things in the same direction it travels.



Love waves - Travel along earth's surface; move forward and backward, side to side at the same time. Cause a lot of damage.



Shaking waves

During an earthquake, energy radiates in seismic waves that cause the earth to shake.

S waves - More damaging than P waves; move through inner layers. Bulge and trough as the wave travels.



Rayleigh waves - Create the most shaking felt in an earthquake. Roll along surface like an ocean wave.



Source: 2010 US Geological Survey, MCE, Associated Press, Lindsay Dobson, Associated Press, Associated Press, Associated Press

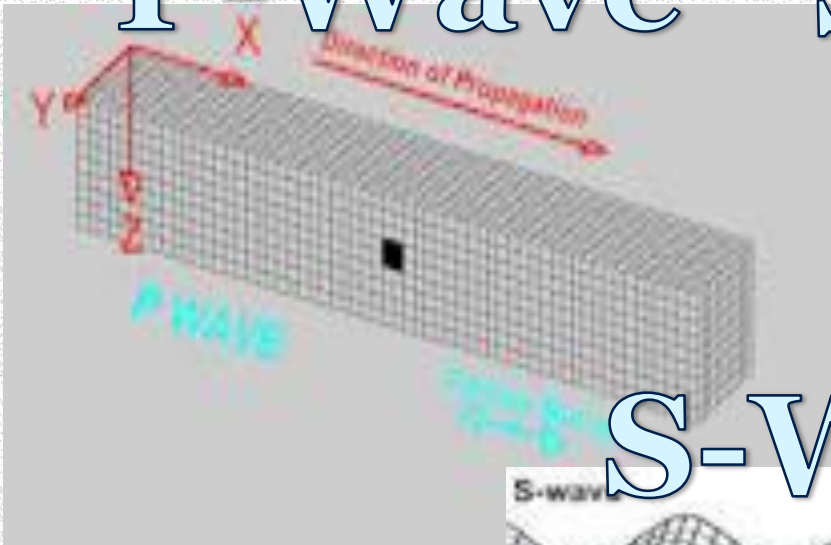
What is a seismic wave?

- A seismic wave is a “mechanical wave” that transfers the energy from the moving crust. The wave always starts at all focus of the earthquakes.
- Seismic waves are the waves of energy caused by the sudden breaking of rock within the earth or an explosion. They are the energy that travels through the earth and is recorded on seismographs.

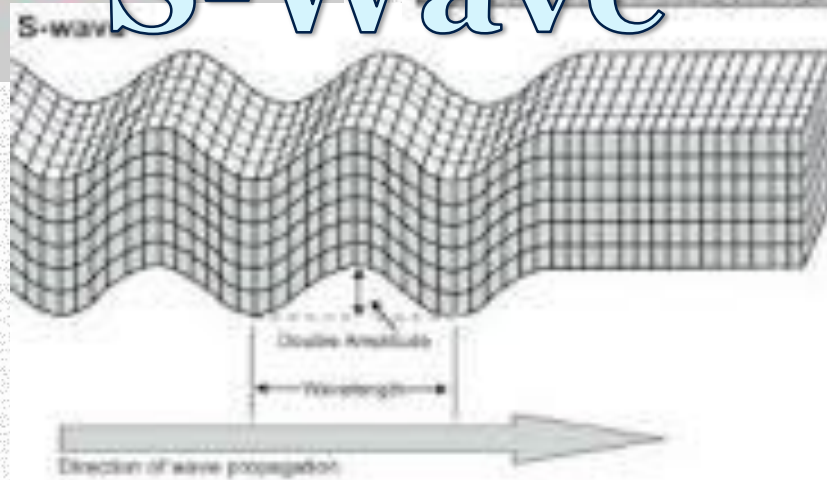
Three types of seismic waves:

- P-wave: the first (primary) wave that is a felt. Its motion is from side to side.
- S-wave: The second (secondary) wave that is felt. Its motion is up and down.
- Surface wave: is felt only when soil and ground have a certain properties.
- Example: Sandy, soils, this causes a “ROLLING” MOTION.

P-Wave Surface Wave



S-Wave



Facts about earthquakes:

- The largest recorded earthquake in the world was a magnitude 9.5 (MN) in Chile on may 22, 1960
- Each year the southern California area has about 10,000 earthquakes. Most of them are so small those keys are not felt.
- Occur when plates move
- Occur at all plate boundaries (convergent, divergent and transform)
- Occur at faults in the middle or within plates.
- Have different intensities- Richter scale.
- The **earliest reported earthquake in California** was felt in 1769 by the exploring expedition of Gaspar de Portola while the group was camping about 48 kilometers (30 miles) southeast of Los Angeles.
- Before electronics allowed recordings of large earthquakes, scientists built large **spring-pendulum seismometers** in an attempt to record the long-period motion produced by such quakes. The largest one weighed about 15 tons. There is a medium-sized one three stories high in Mexico City that is still in operation.
- The **hypocenter** of an earthquake is the location beneath the earth's surface where the rupture of the fault begins. The **epicenter** of an earthquake is the location directly above the hypocenter on the surface of the earth.

Location where they occur:

- P- wave: Earthquakes travel through the earth in all directions from the focus. The ways are moving away from the point where the rocks ruptured cause rock particles to expand contract. This type of earthquake wave causes rocks to compress and expand as the waves move through all parts of the earth.
- S- wave: An s wave is slower than a p wave and can only move through solid rock, not through any liquid medium. It is this property of s waves that led seismologists to conclude that the earth's outer core is a liquid.
- Surface wave: Traveling only through the crust, surface waves are of a lower frequency than body waves, and are easily distinguished on a seismogram as a result. Though they arrive after body waves, it is surface wave that are almost entirely responsible for the damage and destruction associated with earthquakes. This damage and the strength of the surface waves are reduced in deeper earthquakes.

An aerial photograph of a wide, winding river with a large, dark, rocky island in the center. The river flows from the foreground towards the background, where snow-capped mountains are visible under a bright sky. The text "THE END!" is overlaid in the center of the image.

THE END!