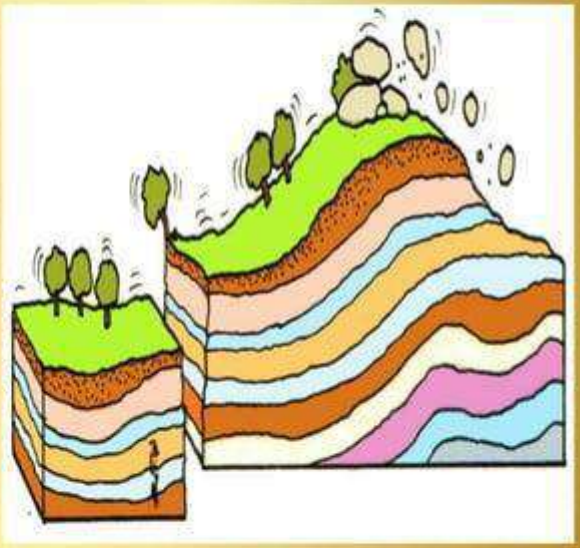
What is Earthquake?

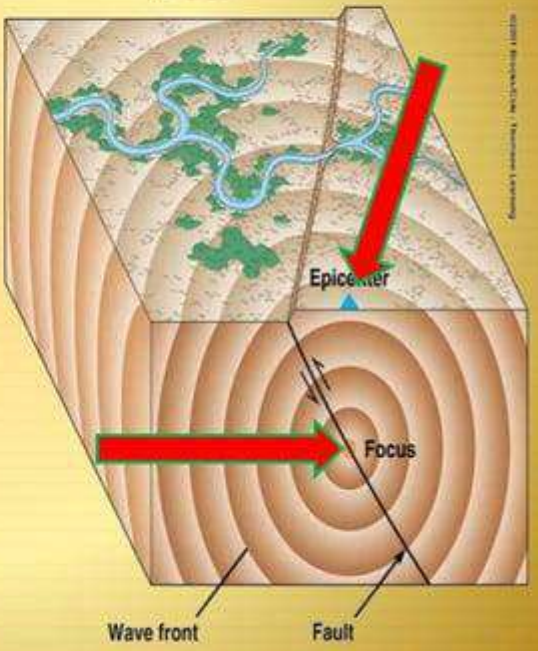
- A natural vibration of the ground or the earth crust produced by forces is called earthquake or seismic forces.
- An earthquake is what happens when two blocks of the earth suddenly slip past one another.



The Focus and Epicenter of an Earthquake

- The point within Earth where faulting begins is the ***focus***

- The point directly above the focus on the surface is the ***epicenter***



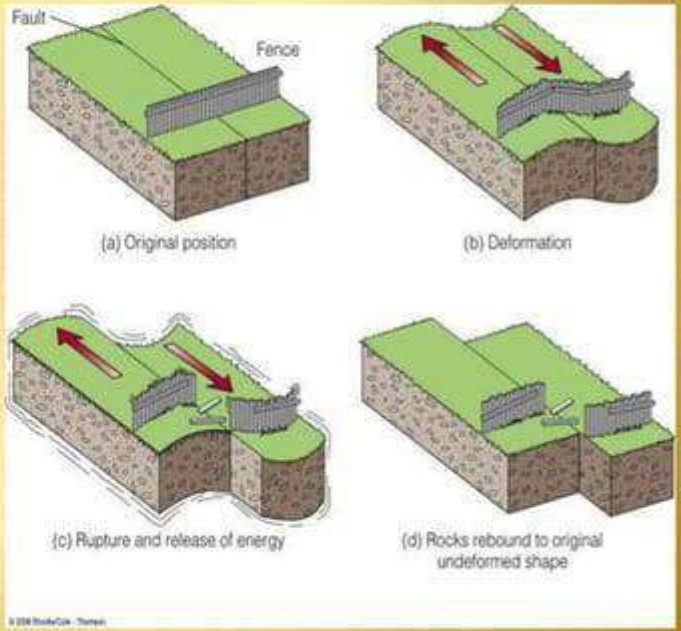
Types of Earthquake

An earthquake, simply defined as the shaking of the earth's surface. On the basis of depth of focus, earthquakes are classified into three types. Following are the three types of earthquakes:

Types	Depth of focus (km)
Shallow Earthquake	60
Intermediate Earthquake	60-300
Deep Earthquake	> 300

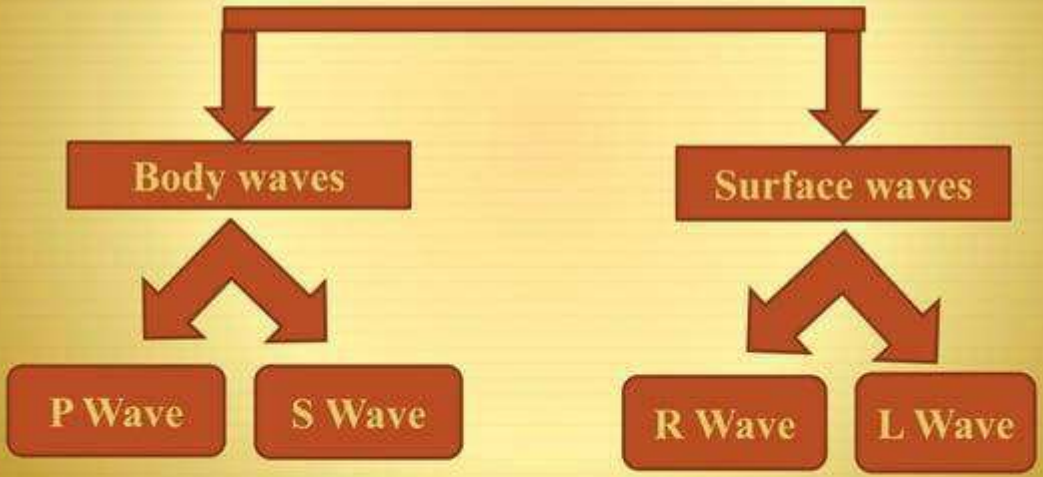
Elastic Rebound Theory

Rocks bend under stress while storing elastic energy. When the strain in the rocks exceeds their strength, breaking will occur along the fault. Stored elastic energy is released as the earthquake. Rocks "snap back", or rebound to their original condition.

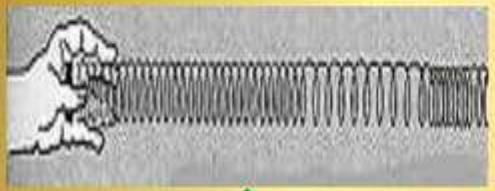


Seismic Waves

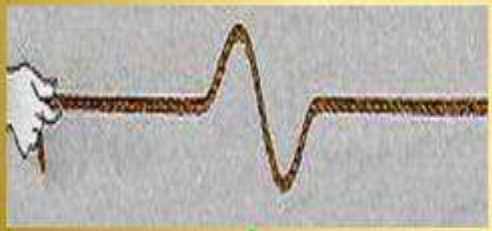
- Two types:



Body Waves



P Wave



S Wave

Primary (P) Wave

- travels through liquids and solids
- pushes and pulls materials as they move through Earth
- travel about 8 km per second
- cause the first movement you feel in an earthquake

Both

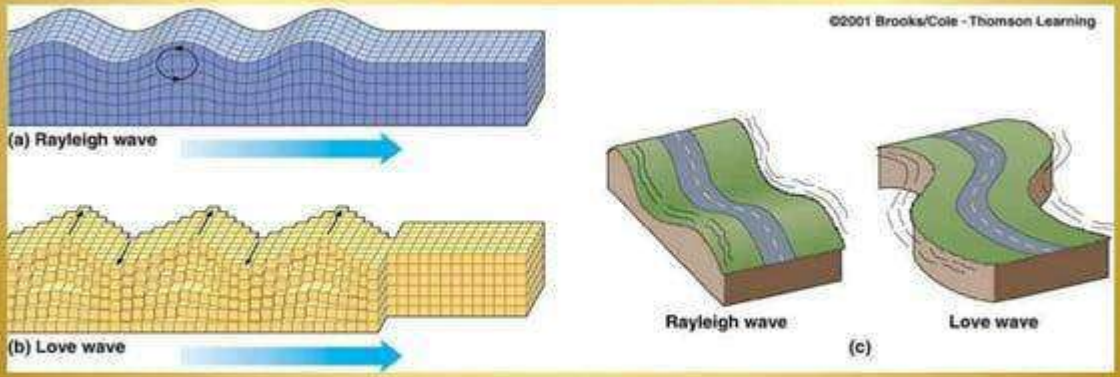
- originate from same focus
- begin at same time
- can be felt at Earth's surface

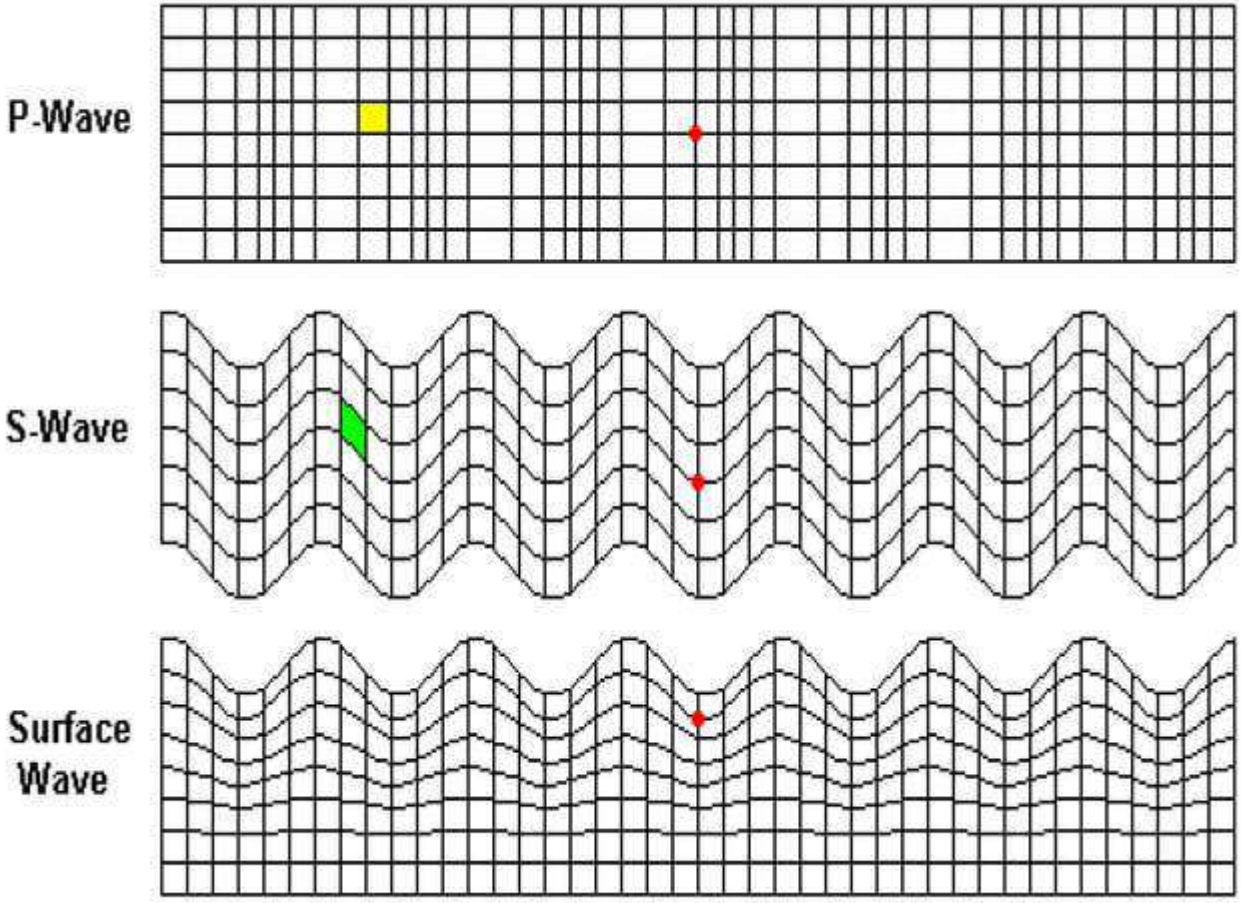
Secondary (S) Wave

- travels through solids only
- makes the rocks vibrate up, down, or sideways
- travel at about 4.5 km per second
- usually cause more building damage

Surface Waves

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

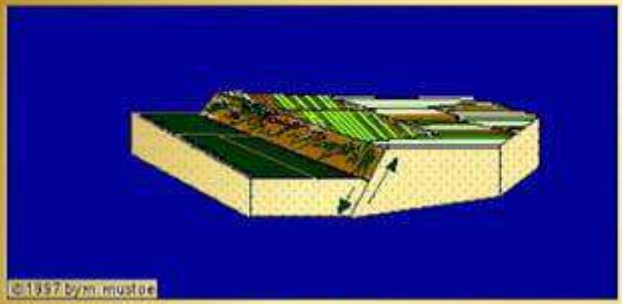



P-Wave
S-Wave
Surface
Wave

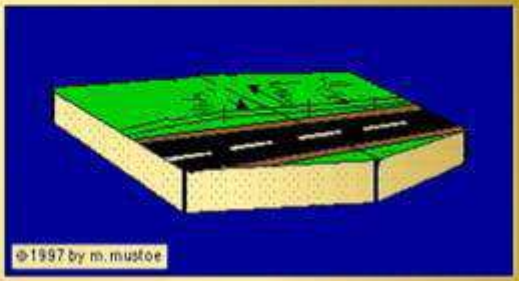
Faults

- A *fault* is a fracture in the Earth's crust
- 3 main fault groups
- Faults are classified depending on how they move.

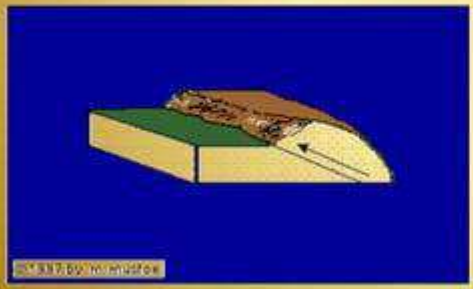
Types of Fault



The Normal Fault



Strike-Slip Fault



Thrust Fault

Normal Fault

Thrust Fault

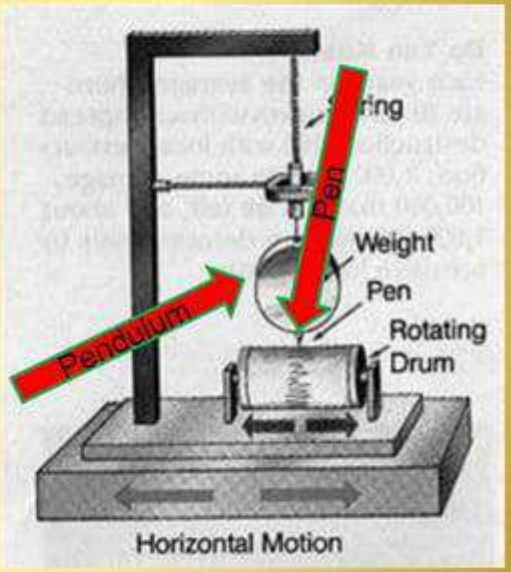
Strike Slip Fault

How does earthquake occurs?

- Most earthquakes happen along the edge of the oceanic and continental plates. [Oceanic plates are under water, continental plates are above.] The earth's crust (the outer layer of the planet) is made up of a bunch of pieces, called plates. The plates get moved around by the liquid layers of magma underneath the Earth's crust. The plates are always bumping into each other, and pulling away from each other or past each other. Earthquakes usually happen when two plates are running into each other or sliding past each other. They can also happen along faults, too though.

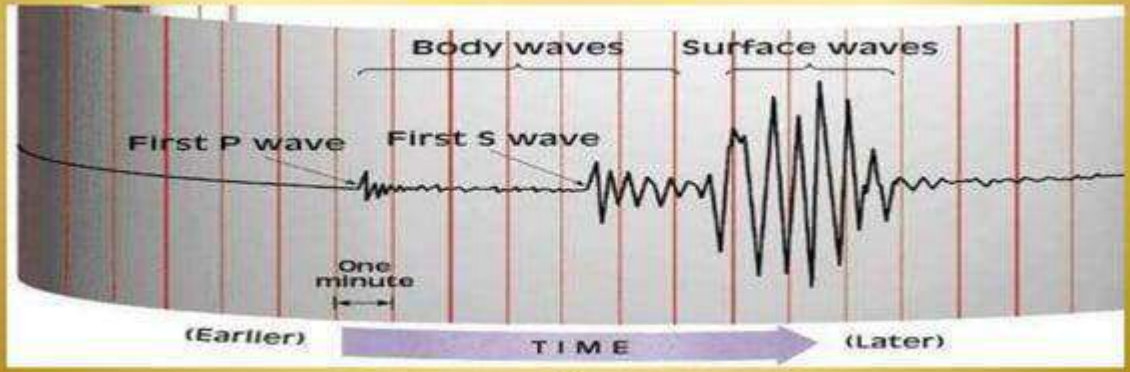
The Seismogram

- The device which records Earth tremors
- A pendulum swings when the earth moves
- The pen attached to the pendulum records the movement



The Richter Scale

- Measures earthquake magnitude.
- Based on the amplitude of the wave produced on the Seismograph.



How are Earthquakes Measured? Richter Scale

The Richter scale

Measures energy waves emitted by earthquake

- 0 - 1.9 — Can be detected only by seismograph
- 2 - 2.9 — Hanging objects may swing

- 3 - 3.9 — Comparable to the vibrations of a passing truck
- 4 - 4.9 — May break windows, cause small or unstable objects to fall

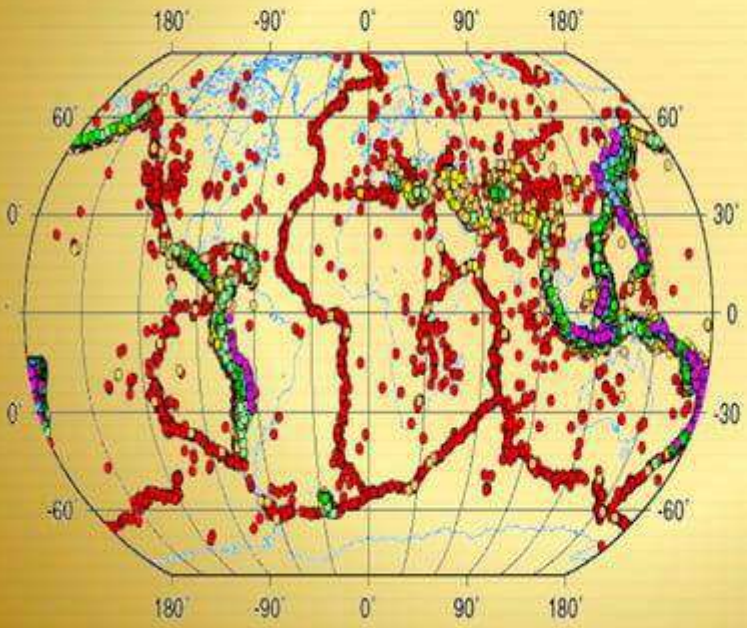
- 5 - 5.9 — Furniture moves, chunks of plaster may fall from walls
- 6 - 6.9 — Damage to well-built structures, severe damage to poorly built ones

- 7 - 7.9 — Buildings displaced from foundations; cracks in the earth; underground pipes broken

- 8 - 8.9 — Bridges destroyed. Few structures left standing
- 9 and over — Near-total destruction, waves moving through the earth visible with naked eye

AFP

Major Earthquakes Zone in the World

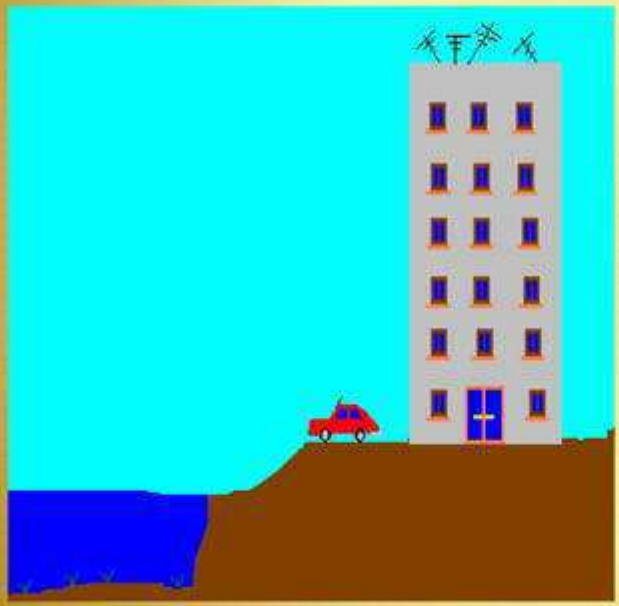


- **Red** dots are shallow
- **Green** are intermediate depth
- **Blue** and purple are deep

The 10 Most Powerful Recorded Earthquakes

Location	Date	Magnitude
1. Chile	22 May 1960	9.5
2. Prince William Sound, Alaska	28 March 1964	9.2
3. Off the west coast of northern Sumatra	26 December 2004	9.1
4. Kamchatka	4 November 1952	9
5. Arica, Peru (now part of Chile)	13 August 1868	9
6. North Pacific coast of America	26 January 1700	9 (estimated)
7. Off Bio-Bio, Chile	27 February 2010	8.8
8. Coast of Ecuador	13 January 1906	8.8
9. Lisbon	1 November 1755	8.7
10. Assam-Tibet	15 August 1950	8.6

Tsunami



- A tsunami is a giant wave (or series of waves) created by an undersea earthquake, volcanic eruption.
- Period 10 - 60 min, Wavelength 100 - 800 km, velocity 230 m/sec (500 mph)
- At coast waves slow down and pile up and come on shore like a very rapidly rising tide

Basic Recommendations for Earthquake Protection

Before the Earthquake:

- Have ready first-aid kit, torches, battery-operated radio, batteries etc and some provisions in a place known to everyone.
- Make an emergency action plan and ensure that the family gathers in a secure place.
- Prepare a telephone list so that, if necessary, you can call the civil protection, fire, medical emergency or police services.

Basic Recommendations for Earthquake Protection

During the earthquake:

- If you are inside a building, stay inside; if you're outside, remain outside.
- Inside a building, look for strong structures, underneath a table or bed, underneath a door lintel, next to a pillar, supporting wall or in a corner and protect your head.
- Do not use the lift and never run headlong towards the exit.
- Extinguish all fires. Do not use any type of flame (match, lighter, candle, etc.) during or immediately after the tremor

Basic Recommendations for Earthquake Protection

After the Earthquake:

- keep calm and ensure that others do the same. Prevent any panic situations.
- Check whether anyone is hurt; give them any necessary first aid.
- Do not repair damage immediately, except if there is broken glass or bottles containing toxic or inflammable substances.
- Keep away from damaged buildings. Move to open areas.