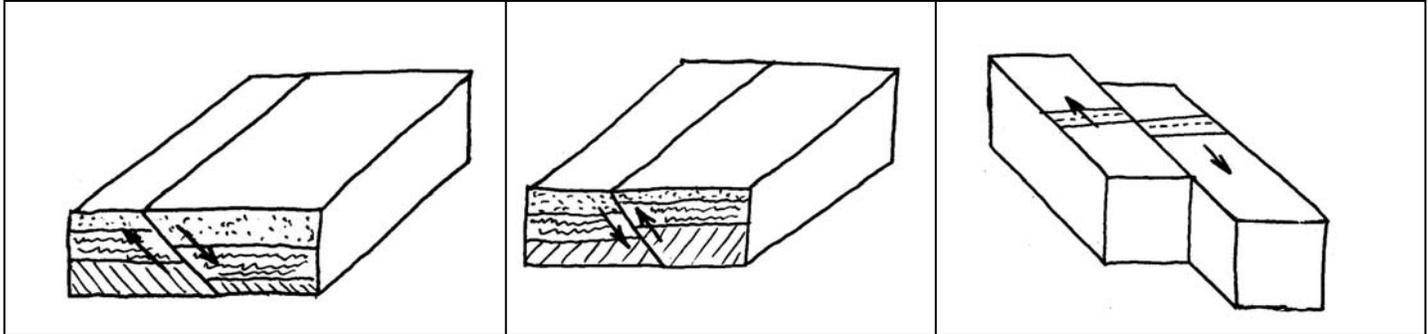


Earthquakes

Overview: I will explain my understanding of earthquakes. I will include where, how and why they occur. I will also discuss types of hazards associated with earthquakes and what we can do to prevent/minimize the damage associated with them.

Definition: A trembling or shaking of the ground caused by the sudden release of energy stored in the rocks beneath the surface.

Where: Earthquakes happen all over the world, but are usually associated with the plate boundaries where the plates are interacting with each other. Where earthquakes might occur used to be a mystery to geologists, but with a new theory called Plate Tectonics, the places where they might happen are neatly put together.



Normal Fault

Reverse Fault

Strike-Slip fault

Block diagrams illustrating major fault types. Arrows indicate relative movement along the fault plane.

Why: About 90% of earthquakes happen at the plate boundaries. This is because the plates are constantly moving due to convection. Plates are moving away, crashing head on and diving under one another and this is why the ground breaks and causes earthquakes.

How: Great forces acting beneath the surface of the earth may put stress on the rock, which may bend or change in shape under strain. The rocks can only bend so far before they break. When they break waves of energy are released and sent out through the Earth. These waves are called seismic waves and are what cause the ground to shake. The place where the earthquake starts is called the epicenter. From that point seismic waves radiated out through the earth in all directions. There are two main types of seismic waves. P waves, which are the faster of the two, vibrate back and forth parallel to the direction the wave is traveling. S waves, which are slower, travel up and down or perpendicular to the direction the wave is traveling. S waves and p waves may cause damage, but are helpful to geologists in determining where an earthquake happened and what magnitude it was.

Hazards: The greatest hazard of an earthquake is ground motion. Ground motion is what causes structures to collapse. Then there is fire, which happens just after the quake because of broken gas mains and water mains mixed with downed power lines. Liquefaction occurs when water-saturated soil or sediment turns from a solid to a liquid due to the ground shaking. Landslides can be triggered when the ground shakes causing flows of dirt and collapsing cliffs. Then there are the aftershocks. These are small earthquakes that follow behind the main earthquake. They can continue for months. Aftershocks can be very dangerous even though they are much smaller in magnitude than the main earthquake. Aftershock can cause collapsed structures to collapse even more. This can be dangerous for rescue personnel looking for trapped people after the main shock has subsided. Last but not least of the main hazards are Tsunamis. These are sometimes called tidal waves and are usually caused by large earthquakes that disturb the sea floor. These great waves travel long ranges very quickly and when they hit the coastline can cause flooding and destruction of coastal structures and boats.

Minimizing/Preventing the Damage: Since we cannot prevent the earthquakes all we can do is try to minimize the damage associated with them. It seems to me the most important thing is the building codes. All structures along known fault areas need to be strict and strictly enforced. Structures need to be built on solid ground not sediment because sediments shake more violently than solid rock as the waves pass below. Buildings in earthquake prone areas should be constructed with non-flammable materials to minimize fires. Although it would not help to minimize the damage from an earthquake, I feel man's greatest answer to the earthquake is to be able to predict when and where "the big one" will happen. If we could gain this knowledge, even seconds ahead of time, many, many lives could be saved.

Conclusion: In general, earthquakes are caused by a release of stored energy in rocks. They occur in a cycle called the elastic rebound theory caused by plate motions in the lithosphere, due to an overall heat flow, called convection, in the earth. Hazards such as ground motion, liquefaction, landslides, aftershocks, and tsunamis can all be caused by earthquakes. In order to minimize and prevent damage and loss of life due to earthquakes (since they can't be predicted successfully at this time), education, raising awareness, planning, and engineering are most effective at this time.