Earthquakes And Volcanic Activity

Earthquakes

Earthquakes are caused by the movement of the Earth's plates. Discover how to measure the strength of an earthquake and the effects that major earthquakes have had.

What causes an Earthquake:

Earthquake

IS the shaking and vibration of the Earth's crust due to movement of the Earth's plates Earthquakes can happen along any type of plate boundary.

Earthquakes occur when tension is released from inside the crust. Plates do not always move smoothly alongside each other and sometimes get stuck. When this happens pressure builds up. When this pressure is eventually released, an earthquake tends to occur

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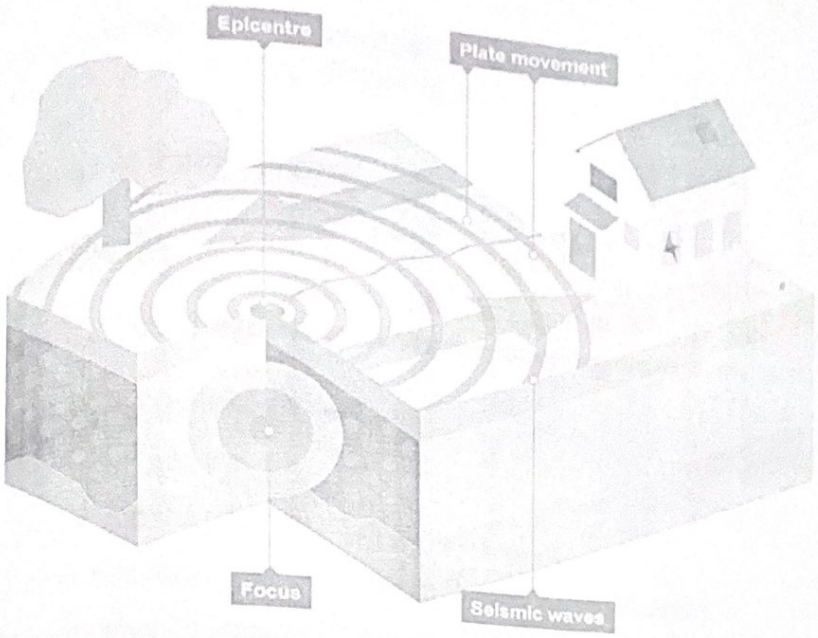
The point inside the crust where the pressure is released is called the focus. The point on the Earth's surface above the **focus** is called the Epicente..

Earthquake energy is released in seismic waves. These waves spread out from the focus. The waves are felt most strongly at the Epicentre, becoming less strong as they travel further away. The most severe damage caused by an earthquake will happen close to the



Effects of an Earthquake

Clearing rubble after an earthquake, Bhuj, India
Earthquakes can destroy settlements and kill many people.\

Impact of Earthquakes

Aftershocks can cause even more damage to an area. It is possible to classify the impacts of an earthquake, by taking the following factors into account:

- short-term (immediate) impacts
- long-term impacts
- social impacts (the impact on people)
- economic impacts (the impact on the wealth of an area)
- environmental impacts (the impact on the landscape)

	Social impacts	Economic impacts	Environmental impacts
Short-term (immediate) impacts	People may be killed or injured. Homes may be destroyed. Transport and communication links may be disrupted. Water pipes may burst and water supplies may be contaminated.	Shops and business may be destroyed. Looting may take place. The damage to transport and communication links can make trade difficult.	The built landscape may be destroyed. Fires can spread due to gas pipe explosions. Fires can damage areas of woodland. Landslides may occur. Tsunamis may cause flooding in coastal areas.
Long-term impacts	Disease may spread. People	The cost of rebuilding a	Important natural and human

Social impacts	Economic impacts	Environmental impacts
may have to be re-housed, sometimes in refugee camps.	settlement is high. Investment in the area may be focused only on repairing the damage caused by the earthquake. Income could be lost.	landmarks may be lost.

Primary and secondary effects of an Earthquake:

Primary effects

- 35000 people injured.
- Buildings and bridges collapsed despite their earthquake proof design.

Secondary effects

- Buildings destroyed by fire when the gas mains fractured.
- 316000 people left homeless and refugees moved into temporary housing.

Predicting earthquakes

Earthquakes are not as easy to predict as volcanic eruptions. However, there are still some ways of monitoring the chances of an earthquake:

- Laser beams can be used to detect **plate movement**.
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- **seismometer** is used to pick up the **vibrations** in the Earth's crust. An increase in vibrations may indicate a possible earthquake.

- **Radon gas** Escapes from cracks in the Earth's crust. Levels of radon gas can be monitored - a sudden increase may suggest an earthquake.

Volcanic Activity (DEF)

An opening in the earth's crust from which lava, ash, and hot gases flow or are ejected during an **Eruption**. b. A similar opening on the surface of another celestial object.

Key facts about volcanoes:

- A volcano is formed by eruptions of lava and ash.
- Volcanoes are usually **cone shaped** mountains or hills.
- When magma reaches the Earth's surface it is called lava. When the lava cools, it forms rock.
- Volcanic eruptions can happen at **destructive** and **constructive** boundaries, but not at conservative boundaries.
- Some volcanoes happen underwater, along the seabed or ocean floor.

Effects of volcanic Eruptions:

Volcanic eruptions can have a devastating effect on people and the environment.

Positive	Negative
The dramatic scenery created by volcanic eruptions attracts tourists. This brings income	Many lives can be lost as a result of a

Positive	Negative
to an area.	volcanic eruption.
The lava and ash deposited during an eruption breaks down to provide valuable nutrients for the soil. This creates very fertile soil which is good for agriculture	If the ash and mud from a volcanic eruption mix with rain water or melting snow, fast moving mudflows are created. These flows are called lahars.
The high level of heat and activity inside the Earth, close to a volcano, can provide opportunities for generating geothermal energy.	Lava flows and lahars can destroy settlements and clear areas of woodland or agriculture.
	Human and natural landscapes can be destroyed and changed forever.

Primary effects:

- 63 people were killed, mainly by poisonous gases.
- Lahars (mudflows of ash and water) covered an extensive area surrounding the volcano.

Secondary effects:

- Ash blocked rivers destroying popular fishing sites and causing flooding. This in turn destroyed crops and livestock.
- Flooding destroyed communications such as road and railway bridges.
- Sediment carried downstream ruined barge transport on the Columbia River.

Volcanoes in history:

AD 79: One of the most famous volcanoes is **Mount Vesuvius**, which sits along the Bay of Naples in southern Italy. It has erupted more than 50 times in the past 2,000 years. It was the AD 79 eruption, which buried Pompeii, that Vesuvius is famous for, but another eruption in 1631 killed some 4,000 people.

10 most deadly recorded volcanic eruptions.

10 Mt. Galunggung Java Indonesia.
9 Mt. Kelut, Indonesia.
8 Mt, Vesuvius, Italy.
7 The Laki Volcanic System, Iceland.
6 Mt.Vesuvius, Italy.
5 Mt.Unzen, Japan.
4 Nevado del Ruiz, Columbia.
3 Mt. Krakatoa, Indonesia

EARTHQUAKE

Definition:

- Earthquake is a sudden violent shaking of the ground, typically causing great destruction, as a result of movements within the earth's crust or volcanic action.
- An Earthquake is the result of a sudden release of energy in the earth's crust that creates seismic waves.

Earthquakes can cause serious destruction to property, injury to people and even kills. It happens when there is sudden movement or breaking of the tectonic plates. Tectonic plates are huge rock pieces within the earth's crust.

Seismic Activity:

- The seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time.
- For Example:

  If you throw stone in a pond of still water, series of waves are produced on the surface of water, these waves spread out in all directions from the point where the stone strikes the water. Similarly, any sudden disturbances in the earth's crust may produce vibration in the crust which travels in all direction from point of disturbances.

Terms Related To Earthquakes

1. Focus (Hypocenter):

   Focus is the point on the fault where rupture occurs and the location from which seismic waves are released.

2. Epicenter:

   Epicenter is the point on the earth's surface that is directly above the focus, the point where an earthquake or underground explosion originates.

3. Fault Line:

   A Fault line is the surface trace of a fault, the line of intersection between the earth's surfaces.

4. Fault plane:

   Fault plane is the cracks or sudden slips of the land.

5. Fault Scrap:

A Fault scrap is the topographic expression of faulting attributed to the displacement of the land surface by movement along faults.

Causes of Earthquakes

Almost every year, earthquakes are recorded in various parts of the world. Since the shear and tear forces are always constant within the earth's plate tectonics, earthquakes can occur at any time. Thousands of minor tremors often take place just because of these constant movements. **The primary cause** of an earthquake is **faults** on the crust of the earth.

"A Fault is a break or fracture between two blocks of rocks in response to stress."

This movement may occur rapidly, in the form of an earthquake or may occur slowly, in the form of creep. Earthquakes develop simply when the underground rocks (plate tectonics) unexpectedly break along fault lines. Earthquakes are measured using observations from seismometers. Main causes of earthquakes are tectonic plate movements, volcanic activity underground explosions or surface causes.

1. Plate Tectonic Movements:

Plate tectonic movements cause the majority of the earthquakes. The movements occur because the plates float on the hotter and denser rock of the mantle. Consequently, these plates are usually in constant movement – past or from each other within the earth's crust. When these plates (rocks) break or slide past each other at boundaries known as fault lines, they release shock waves. The shock waves are results of the energy stored in the earth crust due to the underground pressure of the earth's inner core.

Aside from the shock waves, the tectonic plate movements snag on coarse patches of rock and pull at entangled sections that further crack the earth's crust, producing more faults near the boundaries of the plates. After some period, the buildup energy and movement generates great tensions in the plates and builds pressure on the fault lines. The intense pressure from the shock waves makes the fault lines to collapse, and the plates move over, up and against each other. As a result, an earthquake occurs when the pressure build up along the fault lines becomes stronger than the force holding the tectonic plates together. This happens

when the rocks (plates) suddenly rip apart or fall on either side at ultrasonic speeds releasing the pent-up pressure which moves outward in all directions.

When it reaches the earth's surface, an earthquake occurs which is in the form of ripples (seismic waves) of escaping energy. The rippling effect is what causes the rapid and violent vibration of the earth surface – earthquake, shaking and tearing everything on it including the earth surface itself, structures, and houses. Majority of the earthquakes originate along the edges of the plates and occur in some regions more frequently than others. The National Geographic reports that 80% of the earthquakes occur around the edge of the Pacific plate in Japan, Canada, USA, Papua New Guinea, South America, and New Zealand. Earthquakes severity also differs depending on the amount of stored energy released and the extent of faulting. Geologists believe there is no regularity in the occurrence of earthquakes.

Aftershocks may as well be experienced after earthquake events. Aftershocks refer to smaller shock waves that result from the adjustment of the crust after the principal shock. The aftershocks can worsen the aftermath of the disastrous earthquake outcomes.

2. Volcanic Activity:

Apart from tectonic plate movements, volcanic activity can significantly cause massive earthquakes. Earthquakes normally accompany escaping magma as it rises to the crust during a volcanic eruption. This is mainly due to the sudden displacement and shaking of underground rocks. Volcanic activity also creates fault lines and underground disturbances that can instigate the sudden ripping or falling of the tectonic plates, thus, releasing the pent-up pressure which moves outwards in all directions.

3. Underground Explosions:

Seismic waves (wave shocks) similar to the ones causing earthquakes can be generated by underground explosions. These explosions can be as a result of underground mining or during the construction of railroads, subways, or underground tunnels. However, some of the seismic waves produced by these activities are not as strong as those produced by real earthquakes.

Per se, they can only be felt within the adjacent areas. On the other hand, underground nuclear tests are known to be very dangerous and can produce powerful seismic waves similar to that of a natural earthquake. For this reason, underground nuclear tests have been banned globally.

Surface causes are great explosions, landslides, slips on steep coasts, dashing of sea waves , avalanches , railway trains, heavy trucks, some large engineering projects cause minor tremors. Some of them are manmade, other are natural.

Strength of Earthquake

The intensity and strength of an earthquake is measured on **Richter scale**, the scale invented by **Charles Richter** California, USA in **1935**. Which categories earthquake on the basis of energy released. Scientists measure the strength of earthquakes using machines known as seismographs. **Seismology** is the scientific study of earthquakes and the propagation of elastic waves through the Earth.

Seismometer:

Seismometers are instruments that measure motions of the ground, including those of seismic waves generated by earthquakes, volcanic eruptions, and other seismic sources. Seismometers may be deployed at Earth's surface, in shallow vaults, in boreholes, or underwater.

Effects of Earthquakes

- They cause loss of human life due to collapse of buildings.
- Transport is affected due to disruption of railway and road systems.
- Infrastructure like buildings, dams and bridges develop cracks due to earthquakes.
- Earthquakes have economic effects like setback in trade and agriculture. Assets like houses and other buildings are also destroyed.
- Problems arise due to shortage of electricity. At the same time, underlying cables are disturbed leading to disruption of communication systems.
- It becomes difficult to meet basic necessities of people like food and water.
- Water shortage also leads to rise of epidemics due to lack of proper sanitation.
- It may cause of fire.

- Tsunami is the important effect of earthquakes. Tsunami is a large wave on the ocean, usually caused by an undersea earthquake, a volcanic eruption, or coastal landslide. A tsunami can travel hundreds of miles over the open sea and cause extensive damage when it encounters land.

Earthquake Safety Rules

If you are in house;

- Don't use lift for getting down from building.
- Be prepared to move with your family.

If you are in shop, school or office;

- Don't run for an exit.
- Take cover under a disk/table.
- Move away from window glass.
- Do not go near electric point and cable.
- Keep away from weak portion of the building and false ceiling.

If you are outside;

- Avoid high buildings, walls, power lines and other objects that could fall and create block.
- Don't run through streets.
- If possible, move on to an open area away from hazard including trees.

If you are in vehicle;

- Stop in a safe open place.
- Remain inside vehicle.
- Close window, doors and vents.

➢ After an Earthquake

- Keep calm, switch on the transistor radio and obey instructions.
- Keep away from beaches and low banks of river.
- A huge wave may sweep in Do not re enter badly damaged buildings and do not go near damage structures.
- Turn off the water, gas and electricity.

- Do not smoke, light match or use a cigarette lighter.
- Do not turn on switches there may be gas leak or short circuit.
- If there is any fire, try to put it out or call fire brigade.
- Do not drink water from open containers without having examined it.
- If you aware of people have been buried, tell the rescue team.
- Do not rush and try not to worsen the situation.
- Avoid places where there are loose electric wires and do not come in contact with any metal object.
- Eat something. You will better and more capable of helping other.
- Do not walk around the streets to see what is happening.
- Keep the streets clear so rescue vehicles can access the roads easily.