

CHAPTER 3 INTERIOR OF THE EARTH

SOURCES OF INFORMATION ABOUT THE INTERIOR

a) Direct sources

- Drilling
- Mining
- Volcanic eruption

b) Indirect sources

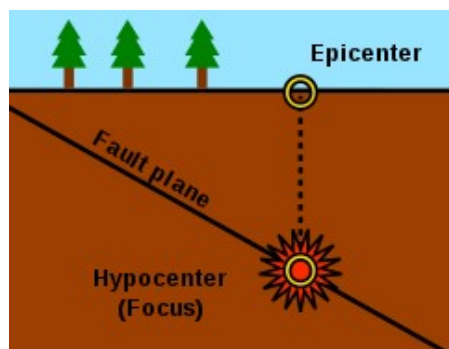
- Meteors
- Gravitation
- Magnetic field
- Seismic activity

EARTHQUAKE

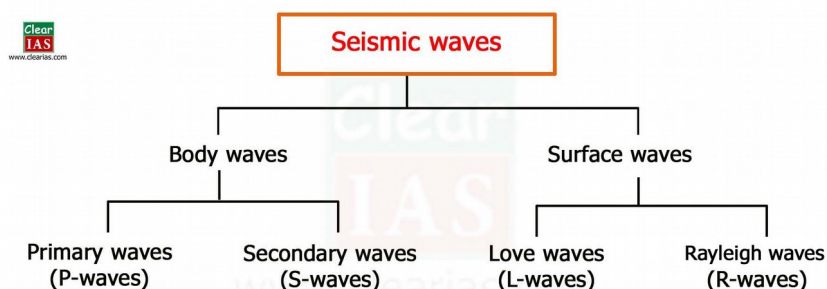
- An earthquake in simple words is shaking of the earth.
- It is caused due to the release of energy, which generates waves that travels in different directions.
- Study of Earthquakes – Seismology
- Instrument used to record earthquake waves – Seismograph.

Structure of an earthquake

- a) Focus or hypocenter – the point where energy is released.
- b) Epicenter – the point on the earth's surface directly above the focus.



Earthquake waves or seismic waves



a) **Body waves**

- generated due to the release of energy at the focus and move in all directions travelling through the body of the earth.
- Body waves are of two types – P waves and S waves

i. **P waves**

- ✓ Primary waves
- ✓ fastest waves
- ✓ Reach the surface first
- ✓ Travel through solid, liquid and gaseous materials.

ii. **S waves**

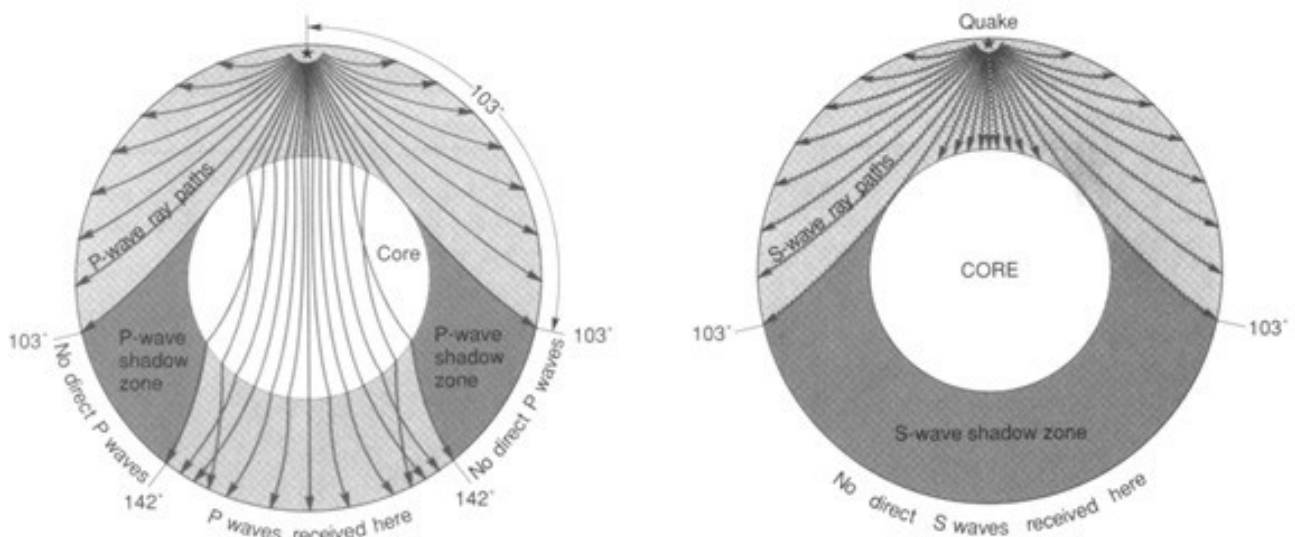
- ✓ Secondary waves
- ✓ arrives at the surface with sometime lag
- ✓ travel only through solid.

b) **Surface waves**

- generated due to the interaction of body waves with the surface rocks.
- Move along the surface
- the last to report on seismograph
- most damaging.

Shadow zone.

- x Shadow zone of p waves – between 105° and 145° away from the epicenter.
- x Shadow zone of S waves – entire zone beyond 105° from the epicenter.



Types of earthquakes

- a) Tectonic earthquake – generated due to the sliding of rocks along a fault plane.
- b) Volcanic earthquake – confined to the areas of active volcanoes.
- c) Collapse earthquake – due to the collapse of the underground mines.
- d) Explosion earthquake – due to the explosion of chemical or nuclear devices.
- e) Reservoir induced earthquake – occur in the areas of large reservoirs.

Measuring earthquakes

1. Richter scale

- magnitude scale
- invented by American seismologist, C.F.Richter
- the magnitude is expressed in absolute numbers 0-10.

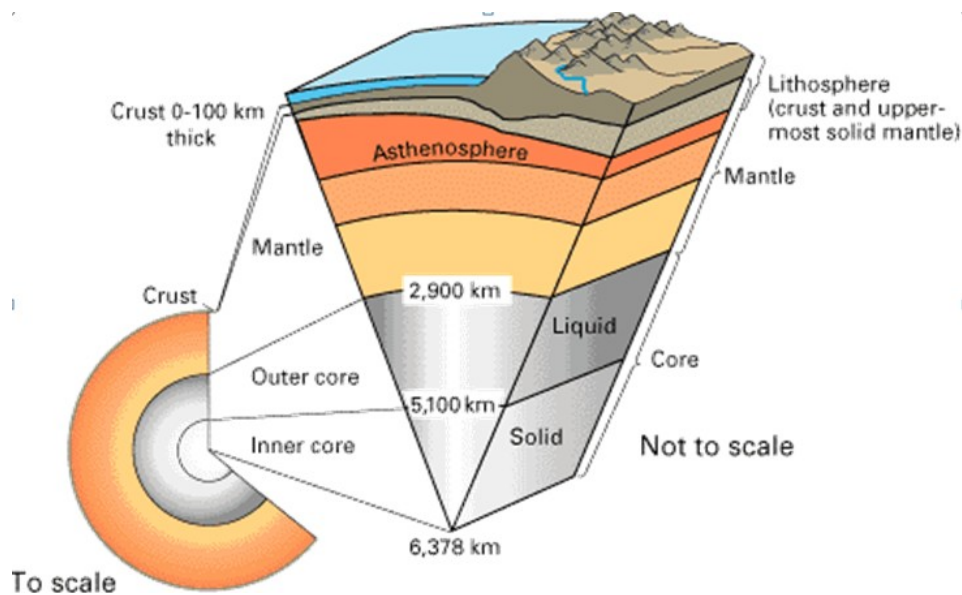
2. Mercalli scale

- intensity scale
- invented by an Italian seismologist, G.Mercalli.
- The range of intensity scale is from 1-12.

Effects of earthquakes

- Ground shaking
- Differential ground settlement
- Land and mud slides
- Soil liquefaction
- Ground lurching
- Avalanches
- Ground displacement
- Floods
- fires
- structural collapse
- falling objects
- Tsunami

STRUCTURE OF THE EARTH



1. The crust

- The outermost solid part of the earth.
- Oceanic crust- Sima- is made up of silicates and magnesium
- Continental crust- sial is made up of silicates and aluminium.
- Oceanic crust is thinner than continental crust.
- Average density of the crust is 2.7 to 3 g/cm^3 .

2. The Mantle

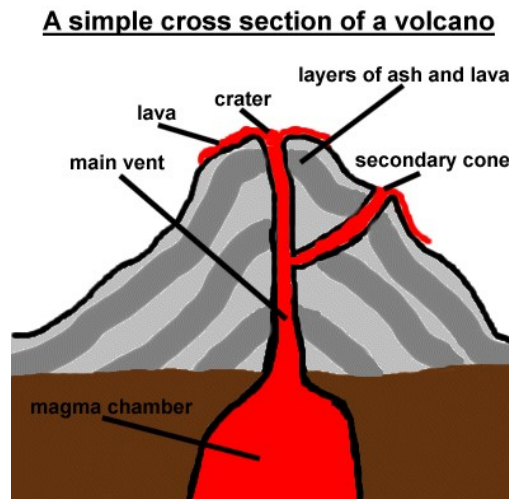
- Layer beneath the crust.
- The boundary between the crust and the mantle is Mohorovicic discontinuity.
- This layer extends upto 2900 km.
- Asthenosphere
 - ◆ The upper portion of the mantle is called Asthenosphere.(astheno means weak)
 - ◆ It is the main source of magma which is in molten state.
 - ◆ The crust and the asthenosphere are together known as Lithosphere.

3. The core

- The boundary between the mantle and the core is Gutenberg discontinuity.
- Outer core is in liquid state and the inner core is in solid state.
- Density of this layer varies from $5-13 \text{ g/cm}^3$.
- Made up of heavy materials like nickel and iron. So it is known as nife layer.

VOLCANOES

- A volcano is a place where gases, ashes and molten rock materials escape to the ground.
- The molten rock materials in the Asthenosphere is known as Magma.
- Once the magma reaches the earth's surface, it is referred to as lava.



Types of volcano

- a) **Active volcano** - An **active volcano** is a volcano that has had at least one eruption during the past 10,000 years. An active volcano might be erupting or dormant.
- b) **Dormant volcano** - A **dormant volcano** is an active volcano that is not erupting, but supposed to erupt again.
- c) **Extinct volcano** - An **extinct volcano** has not had an eruption for at least 10,000 years and is not expected to erupt again in a comparable time scale of the future.

VOLCANIC LANDFORMS

Volcanic landforms are of two types - Extrusive landforms and Intrusive landforms

I. **Extrusive volcanic landforms** – those volcanic landforms formed at the earth surface. They are as follows:

1. Shield volcanoes

- ✓ largest of all volcanoes on the earth.
- ✓ Mostly made up of basalt

- ✓ these volcanoes are not steep because the lava is very fluid when erupted.
 - ✓ Eg: Hawaiiin volcanoes
2. composite volcanoes
- ✓ characterised by the eruption of cooler and more viscous lava than basalt.
 - ✓ Lava accumulates in the vicinity of the vent openings leading to the formation of layers.
3. Caldera
- ✓ most explosive
 - ✓ they collapse on themselves rather than building any tall structures.
 - ✓ The collapsed depressions are called calderas.
 - ✓ Eg: Krakatoa
4. Flood Basalt province
- ✓ these volcanoes outpour highly fluid lava that flows for long distances.
 - ✓ Eg: Deccan traps of Maharashtra.
5. Mid-Ocean ridge volcanoes
- ✓ these volcanoes occur in the oceanic areas
 - ✓ Eg: Mid Atlantic ridge

II. Intrusive volcanic landforms - those volcanic landforms formed beneath the earth's surface. They are as follows.

- a) **Batholith** – large dome shaped intrusive volcanic landforms.
- b) **Laccolith** – small hill or dome shaped landforms
- c) **Lapolith** – Saucer shaped
- d) **Phacolith** – wave like intrusive volcanic landforms
- e) **Sill** – horizontal bodies of intrusive igneous rocks
- f) **Dyke** – vertical wall like structures.

