EARTH'S INTERIOR & PLATE TECTONICS

PARMAR SSC

Methods to know about Earth's Interior

Indirect Sources

- Temperature



- Meteorites



- Earthquake



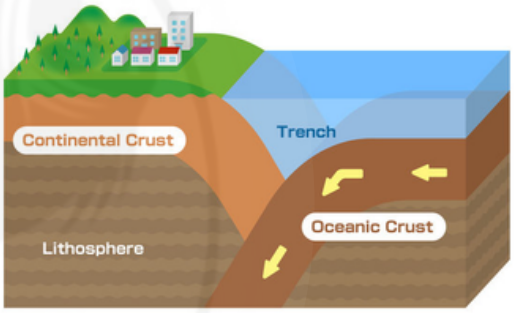
Direct Sources

- Volcanoes



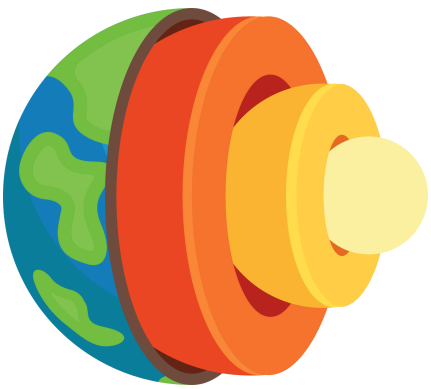
- Rocks





Layers of Earth

- Crust
- Mantle
- Core



Crust has two divisions

Continental Crust

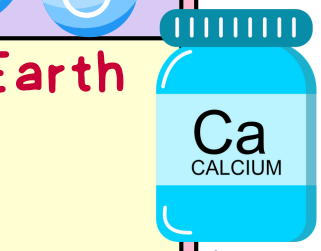
- It is the land of the crust, the outermost layer of the Earth that makes up the Continents & Continental Shelves.
- It is thick (30 Km)
- It is lighter
- It is made of Granitic Rock

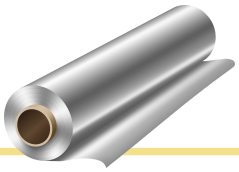
Oceanic Crust

- It is the water part of the crust, the solid layer Earth's crust that lies beneath the Ocean.
- It is thin (5 Km)
- It is Denser
- It is made of Basaltic Rock.

Composition of Earth Crust

- Oxygen : 46.6%
- Silicon : 27.7%
- Aluminum : 8.1%
- Iron : 5%
- Calcium : 3.6%
- Sodium : 2.8%
- Potassium: 2.6%
- Magnesium : 2.1 %
- Others : 1.5%





Most abundant metal found in earth's crust is Aluminum





Mantle

- It is made of Silica and Magnesium (SiMa)
- Thickness : 2900 Km.
- Mantle Has Two Divisions:
  1. Upper Mantle 2. Lower Mantle
- Asthenosphere : It is a Semisolid / semi-molten layer of earth's upper mantle that is mechanically weak and Ductile. It lies beneath the lithosphere (the rigid outermost layer of earth made up of crust and upper solid mantle with 10-200 km of thickness).
- Asthenosphere is a not a part of Lithosphere.
- Asthenosphere is a source of Magma / lava.

Core

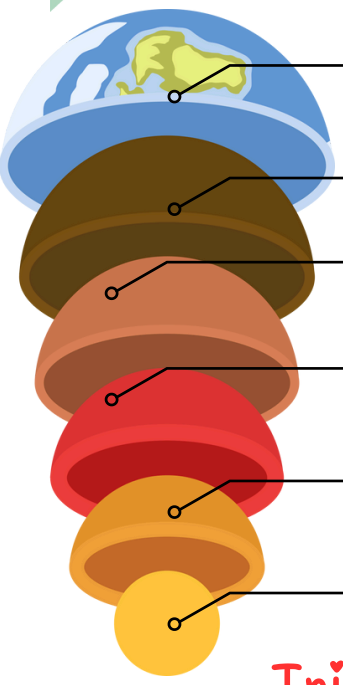
- It is made of Nickel and Iron (NiFe)

It has two divisions

1. Inner Core : It is in solid form (2200 Km)
2. Outer Core : It is in liquid form and shows magnetic properties (1300 Km)

	By Volume	By Mass
Crust	1%	1%
Mantle	84%	68%
Core	15%	31%

Earth's Discontinuity



Upper Crust / ऊपरी परत

Conrad Discontinuity

Inner Crust / आंतरिक परत

Moho Discontinuity

Upper Mantle / ऊपरी आवरण

Repetti Discontinuity

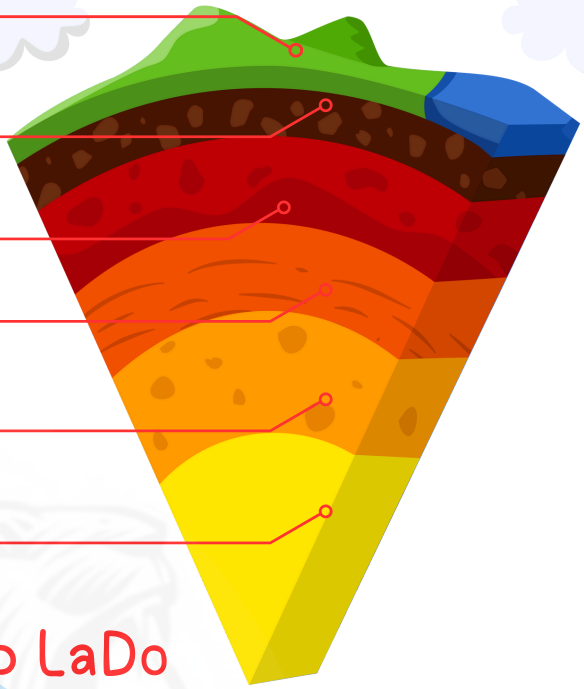
Inner Mantle / आंतरिक आवरण

Guttenberg Discontinuity

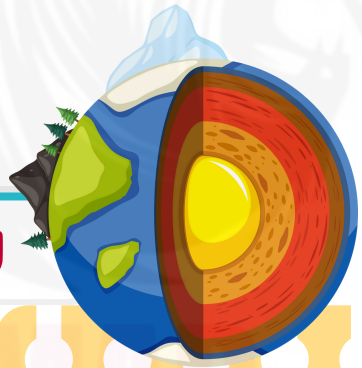
Upper Core / ऊपरी कोर

Lehmann Discontinuity

Inner Core / आंतरिक कोर



Trick : Koi Mujhe Red Gulab LaDo



Force Of Drifting

Theory of Plate Tectonic

- Given by Mckenzie and Parker in 1967. This theory suggests that the Earth's lithosphere is broken into large, rigid plates that move and interact with each other, driving various geological phenomena.

Convection Current Theory

- Given by Arthur Holmes. Holmes theorised that convection current move through mantle, the same way heated air circulate through a room and radically reshape the Earth's surface in the process.



Earthquake

An earthquake is an intense shaking of Earth's surface, which caused due to shifting of Earth's plate. It is a sudden release of energy along the fault lines in the form of waves (also known as Seismic Waves).



1

Epicentre

It is the point on the Earth's surface directly above earthquake's focus (also known as Hypocentre), where the earthquake originates underground.

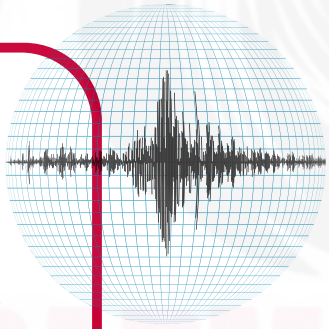


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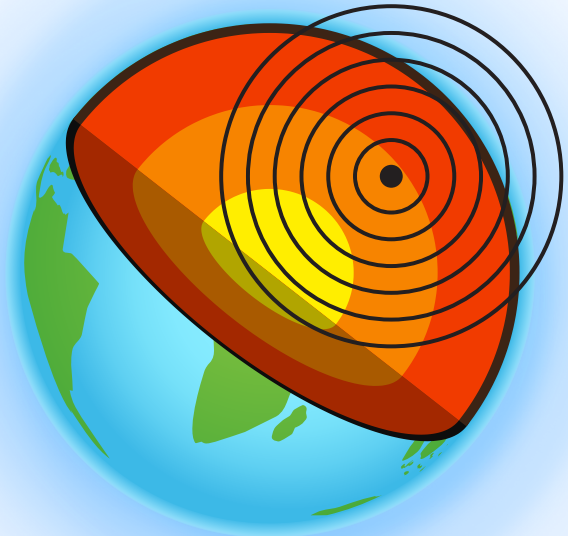
Hypocentre

It is the point within the Earth where the earthquake begins.

Body Waves



- These waves travel through the Earth's interior with high speed.
- They are of two types : P-Waves and S-Waves



Earthquake

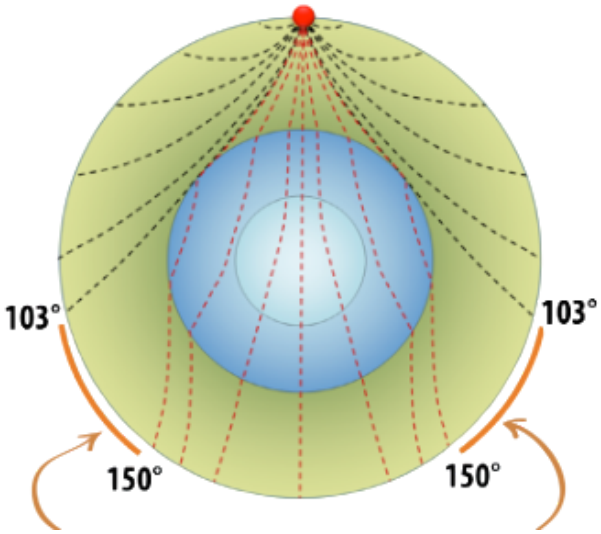
- All natural earthquake occur in lithosphere.
- Earthquake generates seismic waves, which are vibrations that travels through the earth in the form of body waves and surface waves.
- Shallow focus earthquakes have more intensity than the deeper ones.

P-Waves

- They are also known as Primary Waves
- They are the fastest Seismic waves (first to record on Seismograph; 7-8 km/s)
- They can travel through all medium (Solid > Liquid > Gas)
- P-waves are longitudinal compression waves, similar to sound waves.
- They create compression and rarefaction and also causing stretching and squeezing

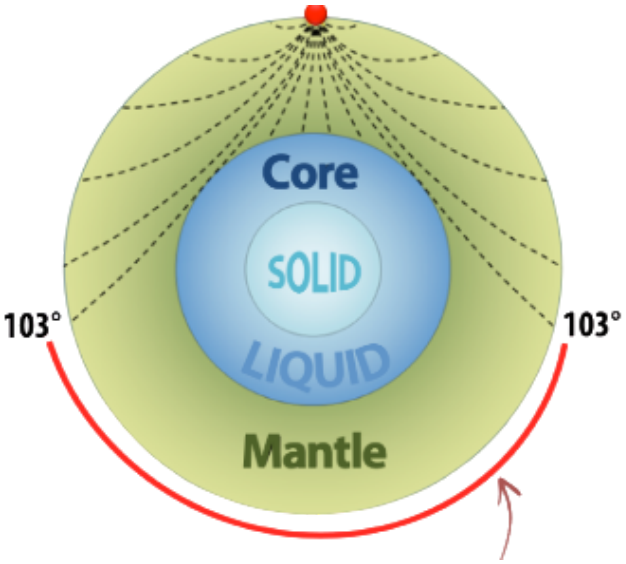
S-Waves

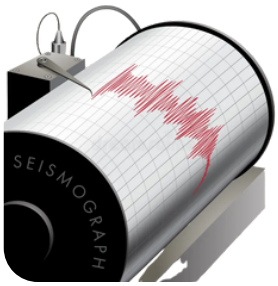
- They are also known as Secondary Waves.
- They are the Slow Seismic waves in comparison to P-Waves; 4-6 Km/s.
- They can travel through only Solid.
- S-waves are Transverse waves that causes the ground to vibrate perpendicular to the direction of waves.
- They create Crest and Trough.

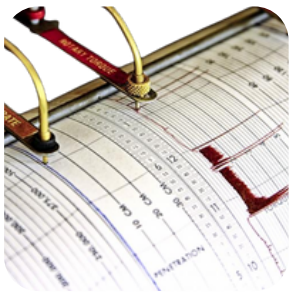


Surface Waves

- When body waves come in contact with surface rocks, they form surface waves
- They are more destructive in nature.
- Rayleigh waves/Love Waves are type of surface waves
- They are last to record on Seismograph







1 Seismograph

A Seismograph is an instrument that measures and registers seismic waves that travel through the Earth as the outcome of an Earthquake

2 Richter Scale

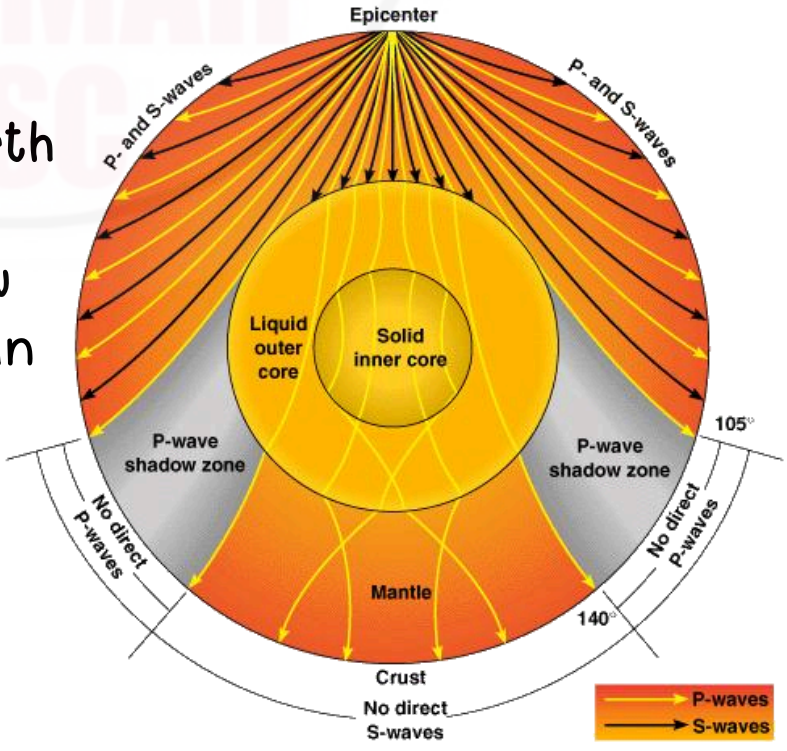
- An instrument to measure magnitude of the earthquake
- It measures magnitude from 0 to 10.
- It is a limitless Scale.

3 Mercalli Scale

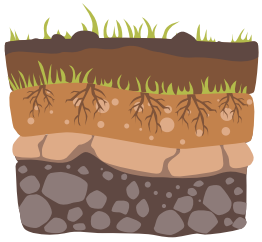
- It is an instrument to measure the intensity of earthquake.
- It measures intensity from 1 to 12.

Shadow Zone Of Seismic Waves

The Shadow Zone of an earthquake is the area of earth where certain seismic waves are not detected. The shadow zone of S-Waves is larger than the shadow zone of P-Waves.















Effects of Earthquake

- **Tsunami :**
  It is a Japanese term. These are harbour waves. It occurs when earthquake occurs at sea floor.
- **Soil Liquefaction**
- **Landslide**
- **Avalanche**
- **Floods**
- **Fire**

Types of Earthquake

01 Collapse Earthquake

These are small earthquake that occur when the roof of underground mine or caverns collapse.

02 Explosion Earthquake

An Earthquake caused by detonation of a chemical or nuclear device.

03 Tectonic Earthquake

An Earthquake caused by movement of earth's tectonic plate.

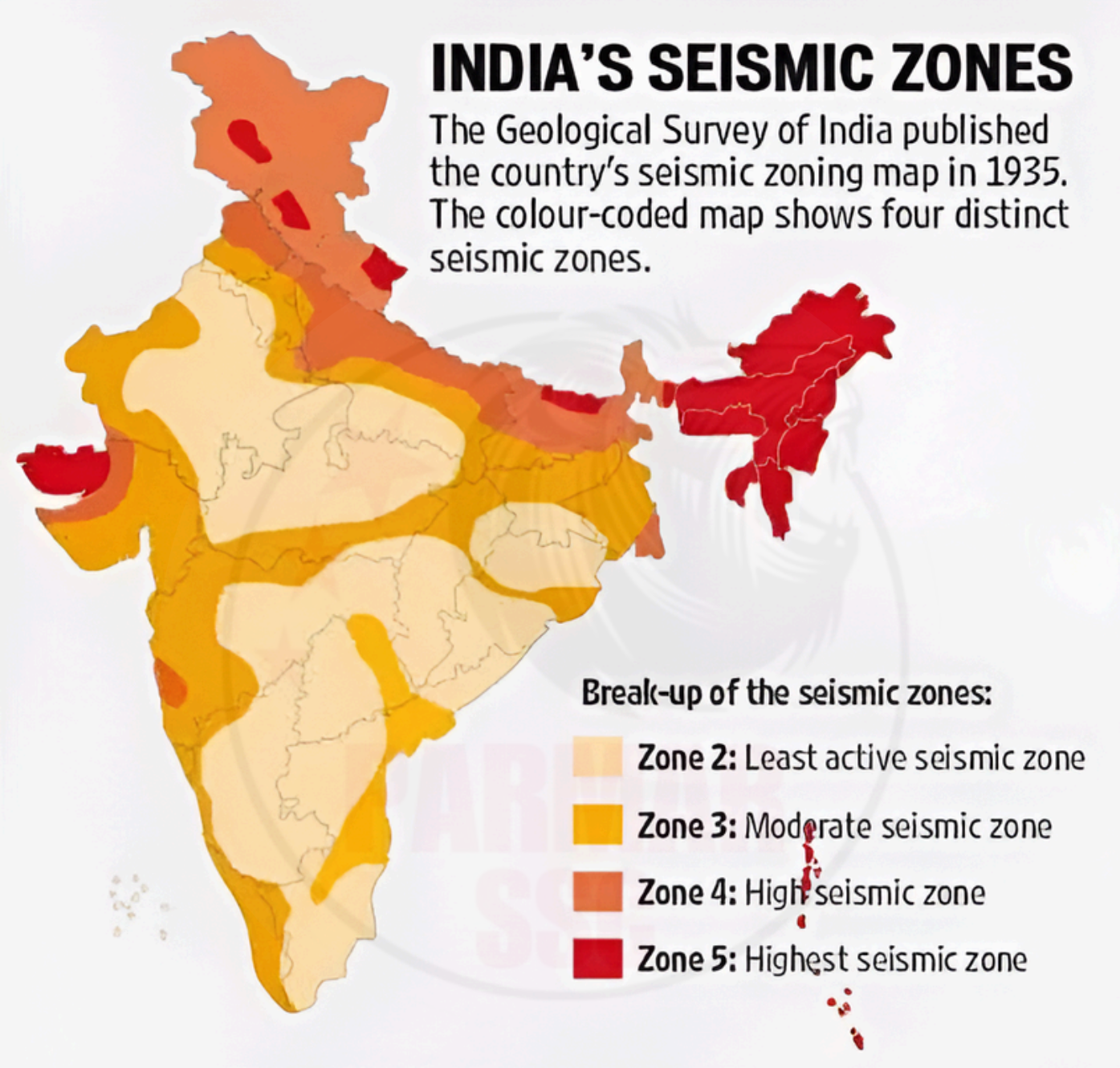
04 Reservoir Induced Earthquake

An Occurrence of earthquakes caused by construction of large reservoirs. This is human-induced earthquake.

05 Volcanic Earthquake

An earthquake that occurs as result of volcanic eruption

Seismic Zones in India





- **Dogs, Cats, cows, elephants, birds, snakes and toads exhibit unusual behavior before earthquake as they are often attributed to their sensitivity to electromagnetic fileds, Infrasound.**

Tectonic Plates

- Lithosphere makes plates comprising crust and Upper Solid part of Mantle.
- There are seven + Few minor Plates

Major Tectonic Plates

1. Pacific Plate
2. North American Plate
3. South American Plate
4. African Plate
5. Antarctic Plate
6. Eurasian Plate
7. Australian Plate

Minor Tectonic Plates

1. Cocos Plate
2. Nazca Plate
3. Caribbean Plate
4. Indian Plate
5. Philippine Plate

Three Types of Plate Boundaries

Divergent

- Occurs When two tectonic plates move away from each other, causes lava to explode, leading to new crust formation.

Convergent

- It happens when plates collide, causing one plate to subduct beneath the other creating a subduction zone, potentially destroying the crust.

Transform

- It is a plate boundary where plates slide pass each other horizontally, neither creating nor destroying crust.

Ring Of Fire



- It is a result of plate tectonic. It is a horse - shoe-shaped region around the pacific Ocean. It is a high earthquake and volcano prone region.

Convection current that occurs in the asthenosphere is the force behind the plate movement. The heat from the Earth's interior causes currents of hot rising magma and cooler sinking magma to flow, moving the lithospheric plates along with them.