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Earth and its Interior
Rocks
Plate Movements

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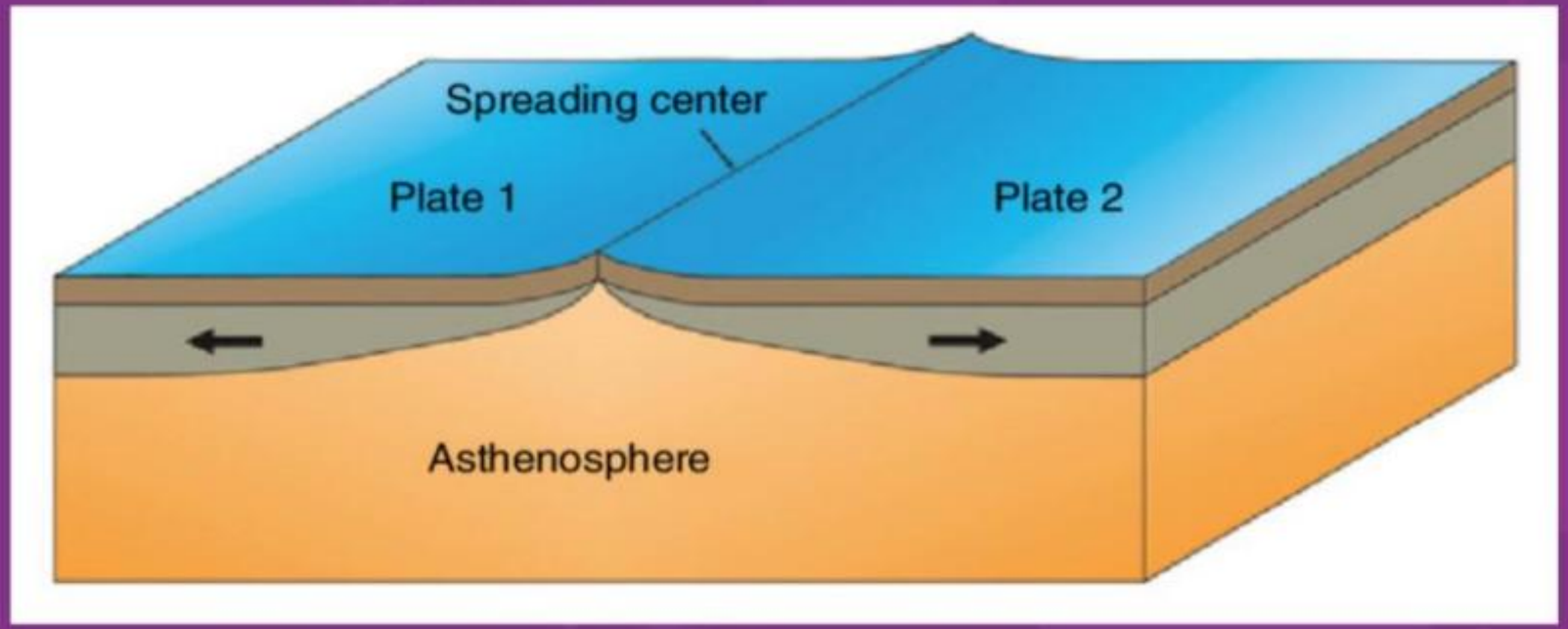
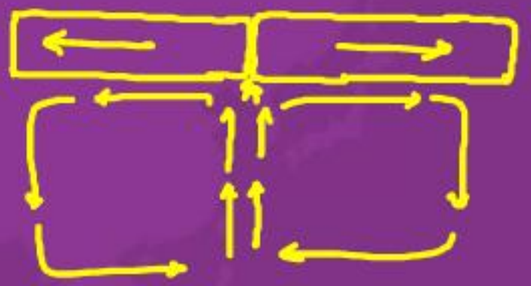
Divergent Plate Boundaries

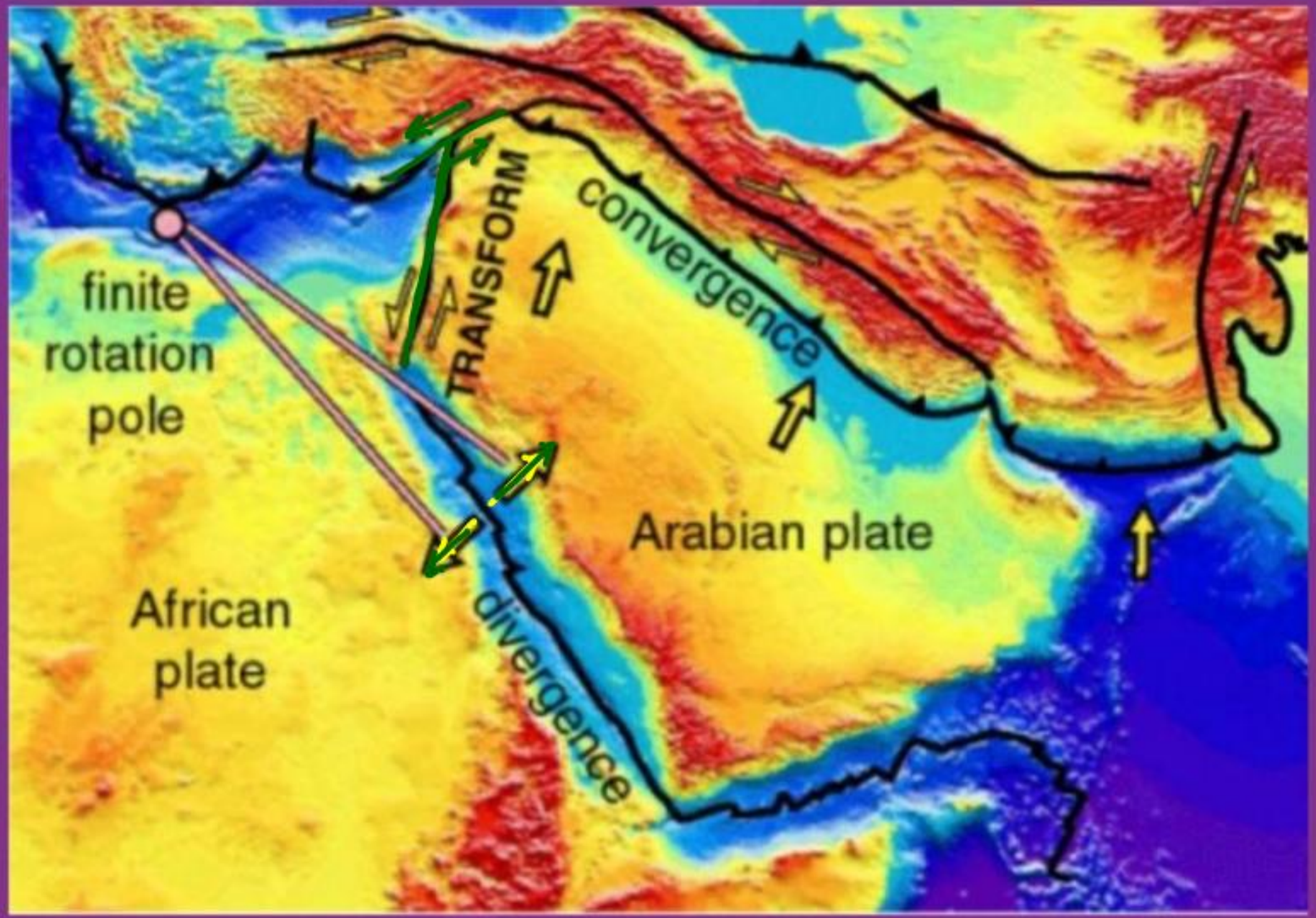
→ Constructive plate margins.

↳ [Due to creation of newer crust.]





Minor earthquakes are observed.


finite
rotation
pole
TRANSFORM
convergence
Arabian plate
African
plate
divergence

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Divergent Plate Boundaries

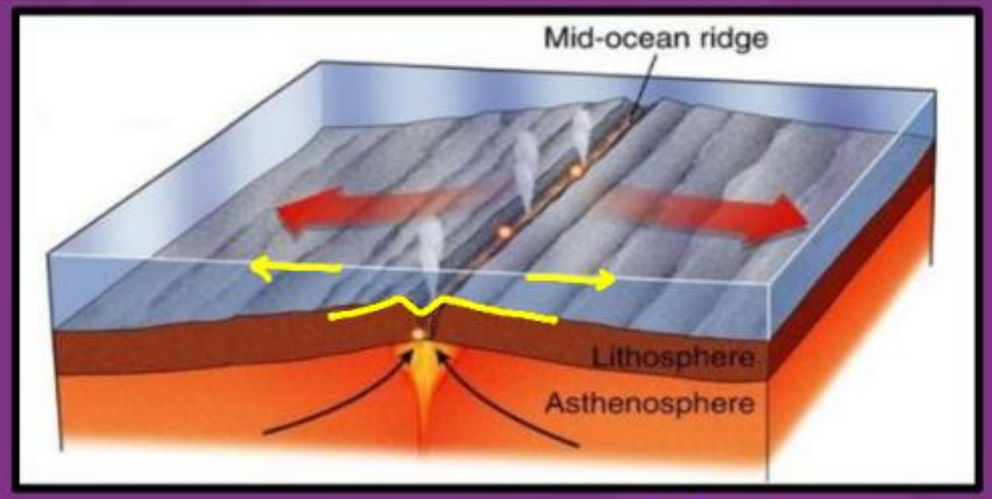
Eg → Iceland

Islands.

Landforms formed :

Mid Oceanic Ridges

Rift Valleys



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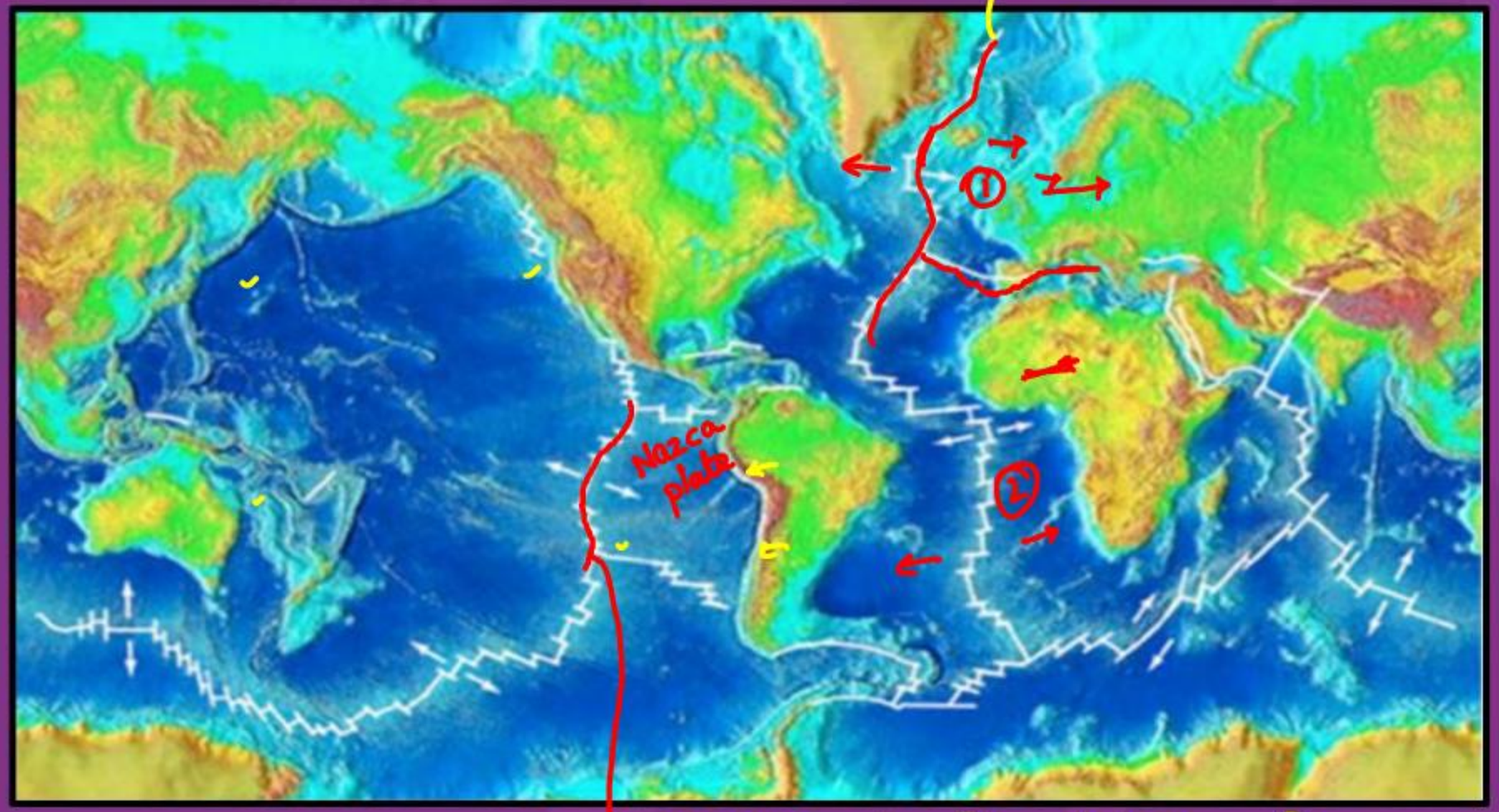
Mid Oceanic Ridges



→ Majority of transform plate margins are perpendicular to the region of divergence

↳ Due to different rates of movement cracks develop and a parallel movement can be observed

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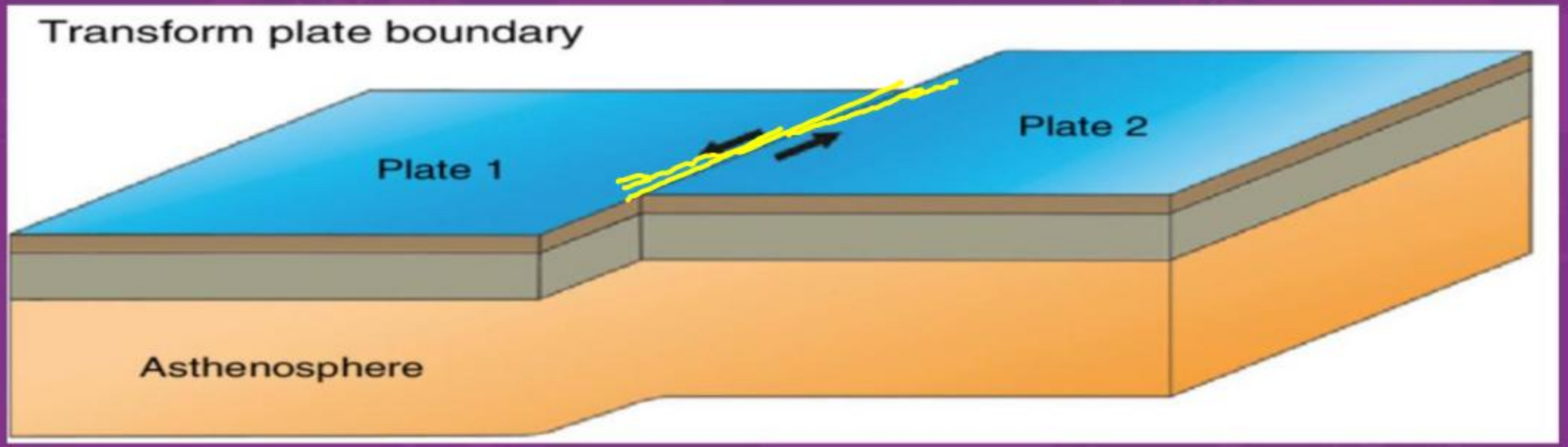
Transform Plate Boundaries

→ conservative plate margin.

→ Parallel movement of plates.



→ Very massive & powerful earthquakes.

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Transform Plate Boundaries

Plates move parallel to each other ; neither creating, nor destroying a feature

Leads to significant tension being built up and creation of earthquakes and faults

→ Eg → San Andreas fault

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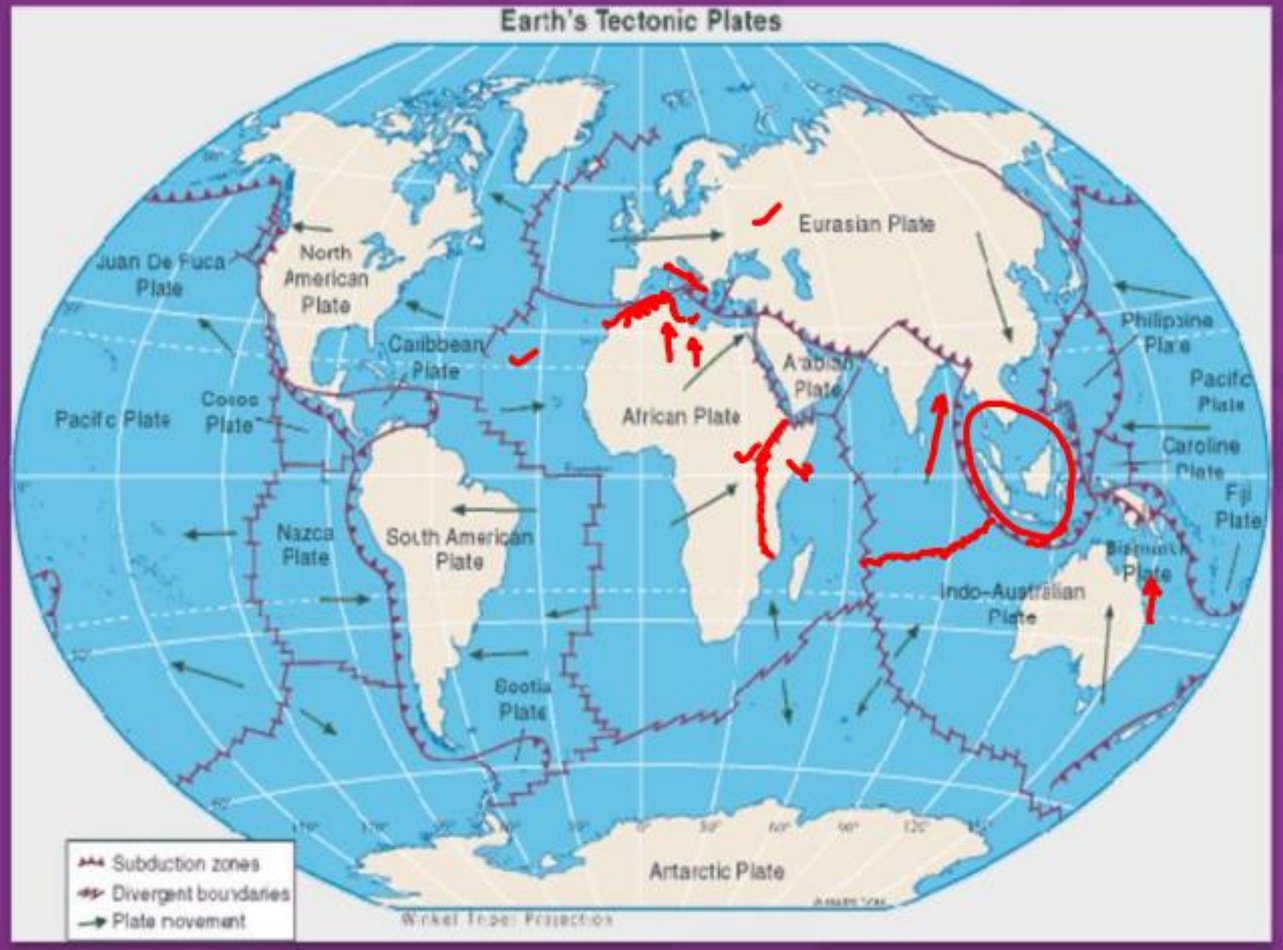
Analysis of the World map



Major Plates :

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

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Previous Year Questions - Prelims

Q1. Which of the following phenomena might have influenced the evolution of organisms?

1. Continental drift
2. Glacial cycles

Select the correct answer using the code given below:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

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Previous Year Questions - Prelims

Q2. Which of the following pairs is/are correctly matched?

Theory/Law :	Associated Scientist
1. Continental Drift :	Edwin Hubble
2. Expansion of Universe :	Alfred Wegener
3. Photoelectric Effect :	Albert Einstein

Select the correct answer using the code given below

a) 2 and 3 only

b) 3 only

c) 2 only

d) 1 only

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Previous Year Questions - Prelims

Q4. In the Structure of the planet Earth, below the Mantle, the core is mainly made of up of which one of the following?

a) Aluminium

b) Chromium

c) Iron

d) Silicon

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Thank you!

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Mains

- Shadow zones of seismic waves.
- Human Induced Earthquakes
- Global distribution of Earthquakes & volcanoes
- Hotspots & Mantle Plumes.

Earthquakes
Volcanoes
Folds & Faults

Prelims

- Basics of earthquakes & volcanoes
- Seismic waves & their properties
- Shadow zones
- Volcanic landforms
- Chemical Properties of Magma.
- Intrusive volcanic landforms.

Endogenic forces
↳ Forces acting from the interior of the planet.

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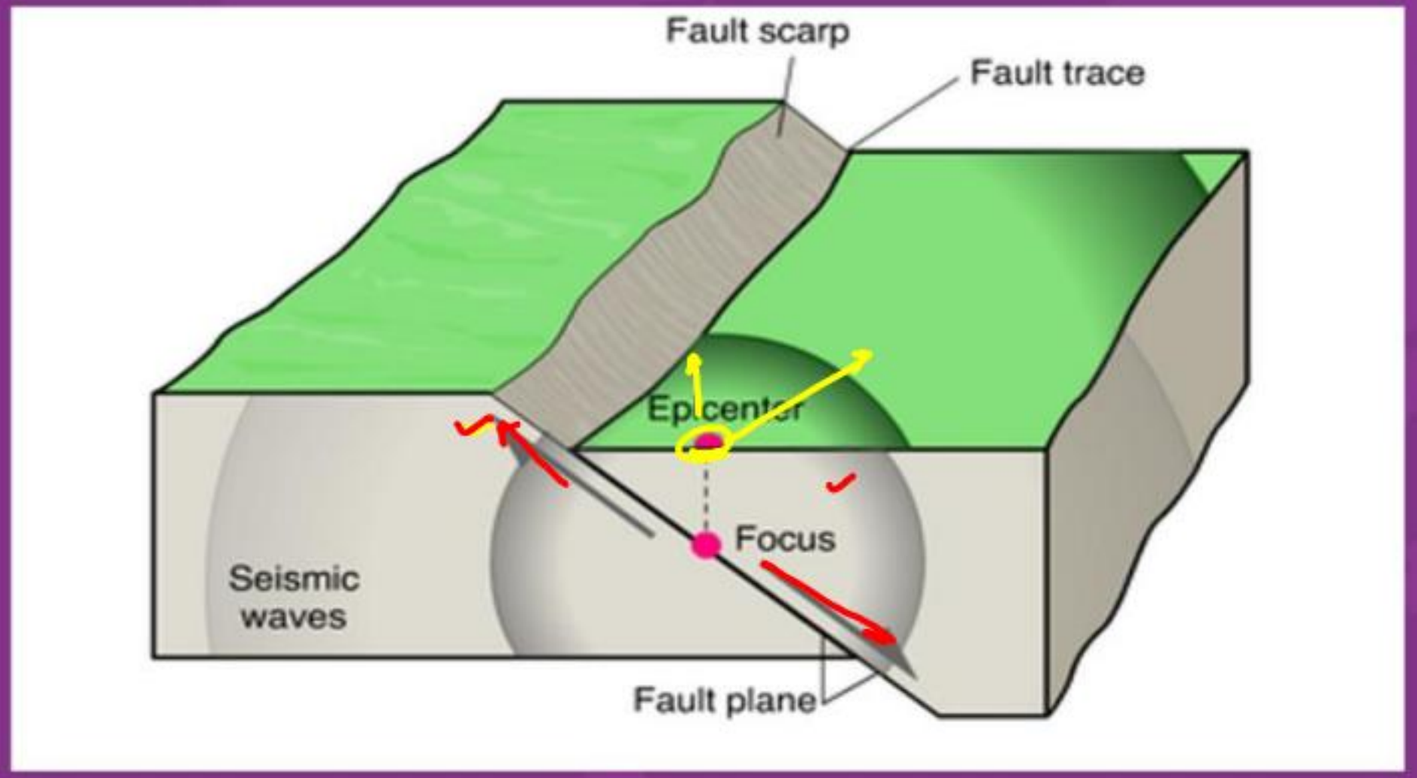
What is an Earthquake?

Focus → The region in the interior where the release of energy happens as the rocks/crust/lithosphere overcomes the force of resistance.

- Earthquakes are caused due to the sudden release of the enormous amount of energy accumulated within the Earth.



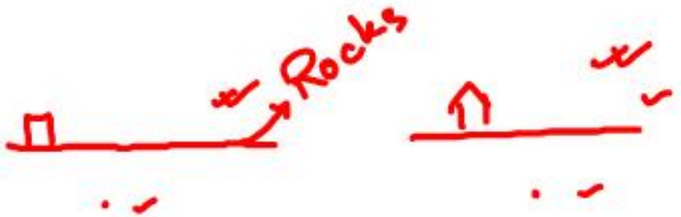
Classification based upon focus.

- Shallow focus (0 - 100 Km)
- Intermediate focus (100 Km - 300 Km)
- Deep focus. (300 Km - 700 Km)

Why no earthquake beyond a depth of 700 Kms?

→ The pressure is so high, that rather than the rocks rubbing against each other; they end up getting deformed.

Intensity of an earthquake → The impact that the earthquake creates on the ground surface.



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What is an Earthquake?

Seismograph.

Intensity is demarcated based upon the Mercalli Scale

Magnitude
- Represents the amplitude of energy released during an earthquake
- Measured on the Richter Scale
  - Logarithmic in nature

An earthquake of magnitude 7 will release 10 times more energy as compared to an earthquake of magnitude 6.

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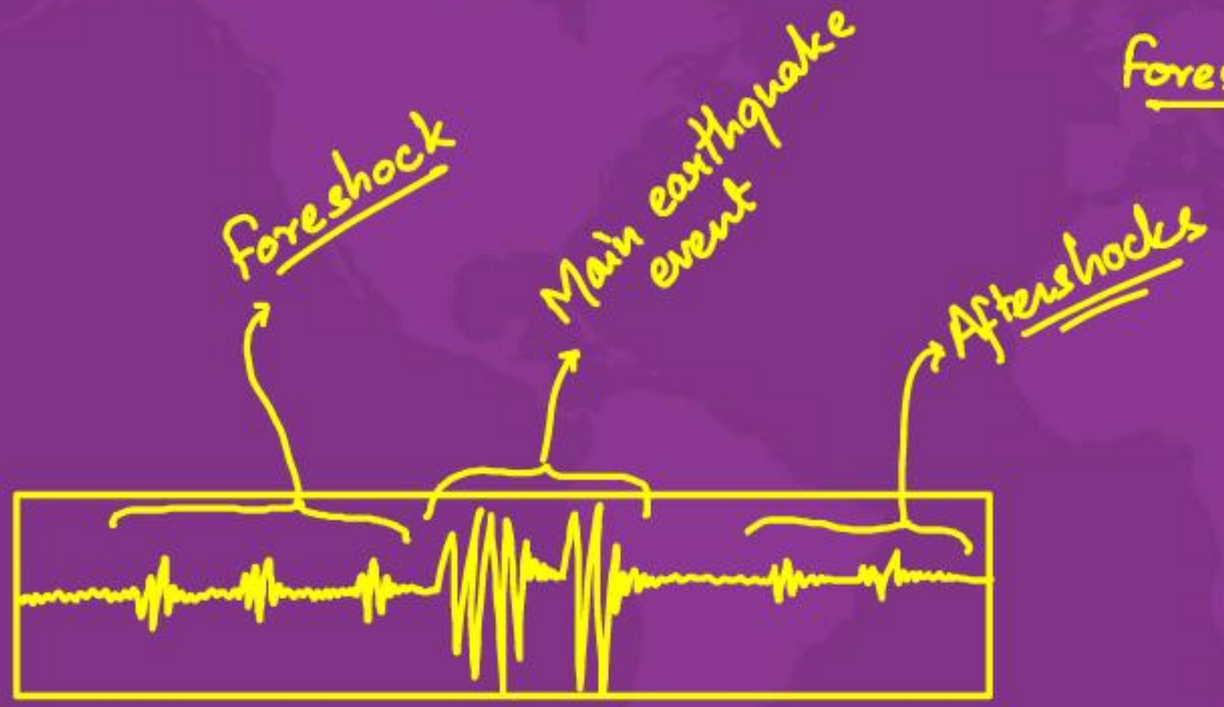
Scale of measurement of seismic waves

Mainly two scales are used in the seismometers:

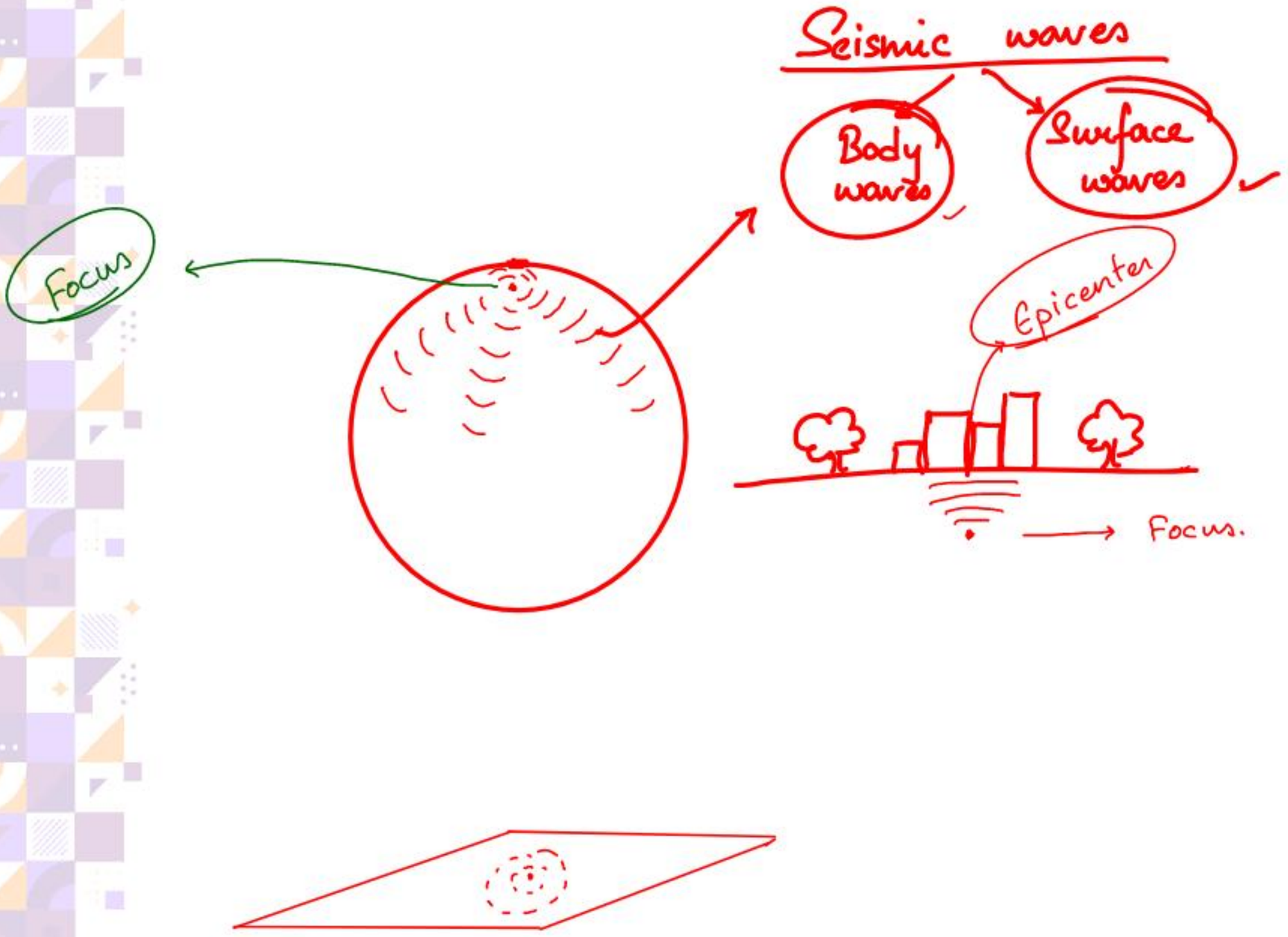
Mercalli Scale	Richter Scale
• It represents the intensity of earthquake • The range of intensity is from 1-12	• It represents the magnitude of the earthquake • The magnitude is expressed in numbers from 1-10

- Amount of energy released by an earthquake, called its magnitude, can be measured by the amplitude of the seismic waves produced.



Foreshocks

Aftershocks



Earthquake swarms

Multiple number of minor earthquakes experienced in the same area over a short duration of time.

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Seismic Waves

- When an earthquake occurs, it releases waves of energy, which are known as Seismic waves.
- It is like the ripples created in water if you throw a stone in it.
- Based on the medium they travel in, earthquake waves can be classified under two categories:
  - Body waves → Travel through the interior of the planet.
  - Surface waves → Get generated on the surface as the body waves disturb the surface.

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Seismic Waves

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Seismic Waves

Body waves → P-wave, S-wave

i) P-wave.

→ Direction of wave motion is the same as the direction of particle movement.
↳ Hence P-waves move very fast.

→ P-waves are able to travel through liquid & gaseous medium.

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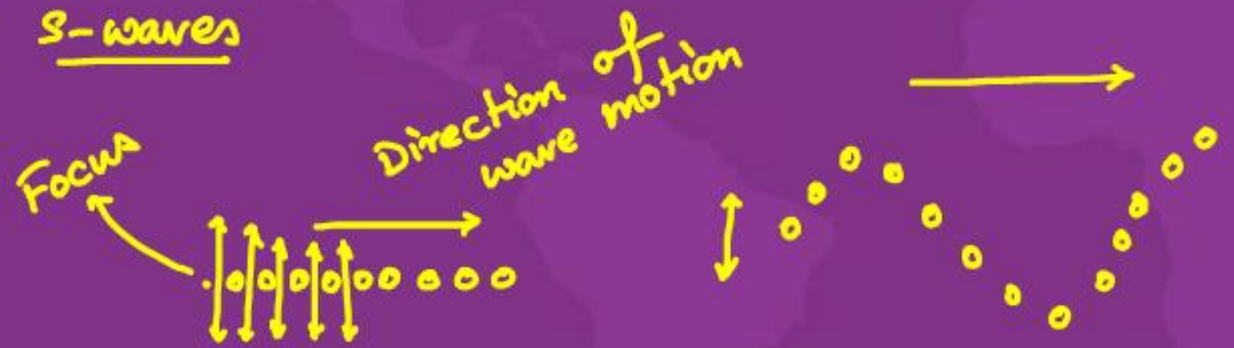
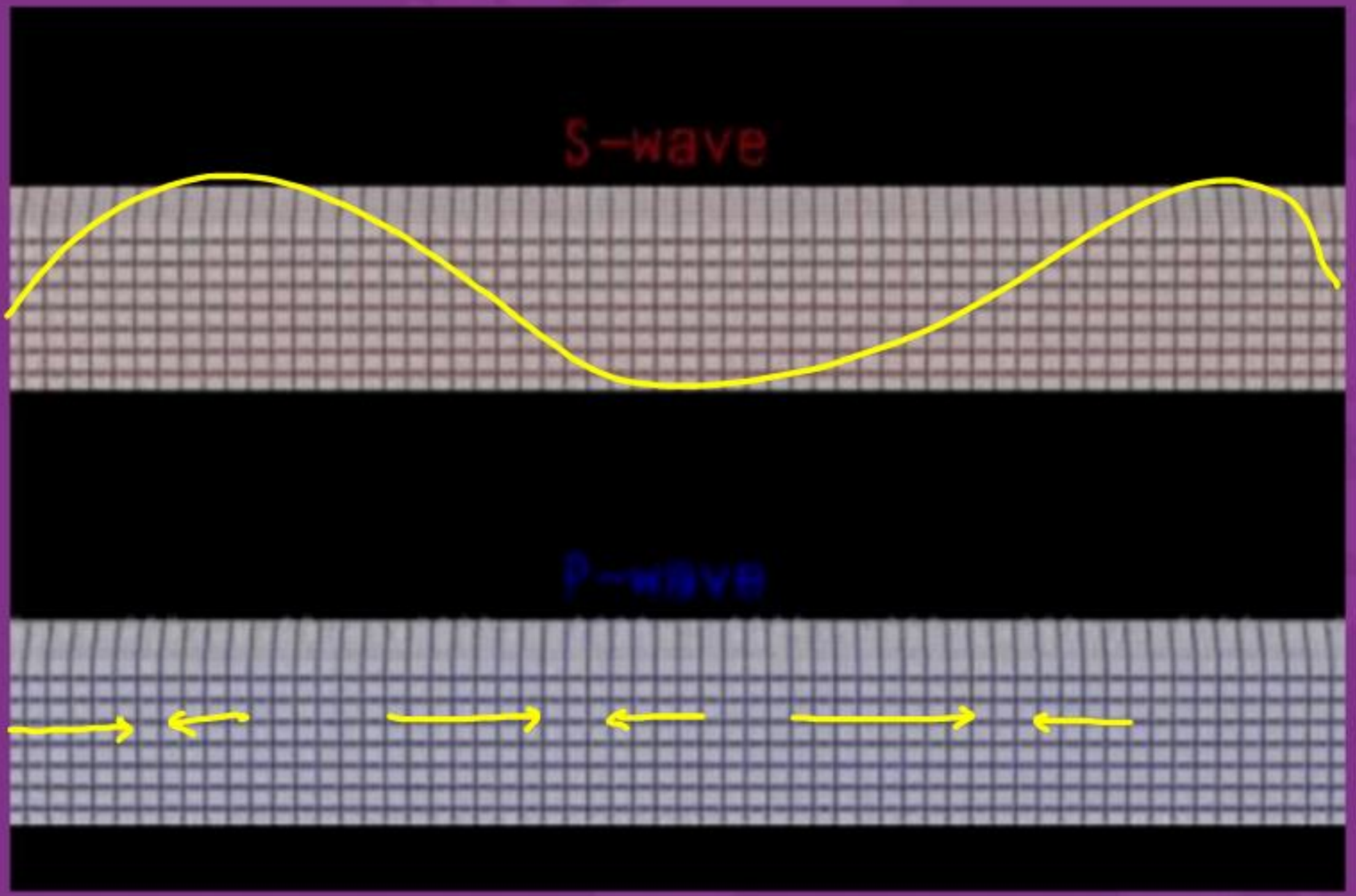
ii) S-waves



→ Direction of wave motion is ⊥ the direction of Particle movement.

→ S-waves are unable to travel through liquids & gases


S-wave
P-wave

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Difference between p waves and s waves

P waves	S waves
P waves are the first waves to hit the earth's surface.	These arrive after P waves.
These waves travel in the speed range of 4.5-13 km/s.	These waves are almost 1.7 times slower than P waves.

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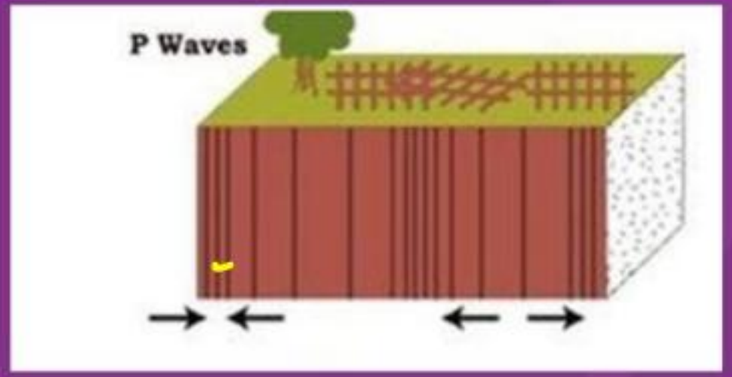
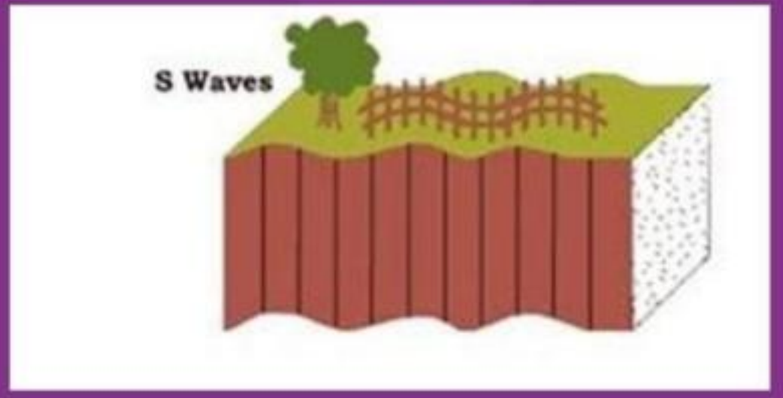
Similar to sound waves

Similar to light waves

P waves	S waves
These waves travel in a linear direction.	These waves travel in a transversal direction.
These waves can travel through solid, liquid and gas.	These waves travel through only solids.





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Surface Waves

They travel from Epicenter outwards.

- Surface waves are those waves that travel on the surface of the earth.
- The destruction caused by earthquakes is primarily done by these waves.
- On the basis of their nature of movement they are classified in two categories:
  - Love waves
  - Rayleigh waves

Note : Speed of seismic waves (P>S>love>rayleigh)

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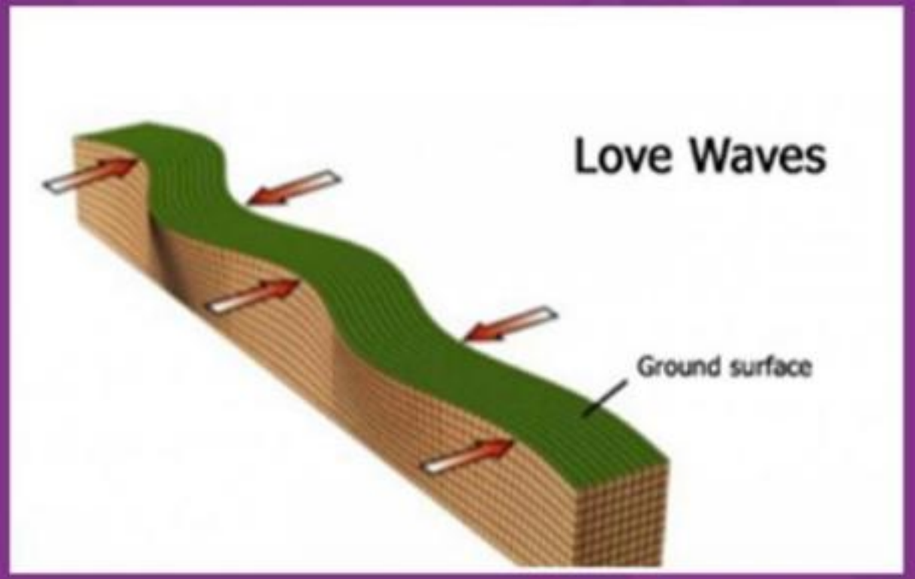
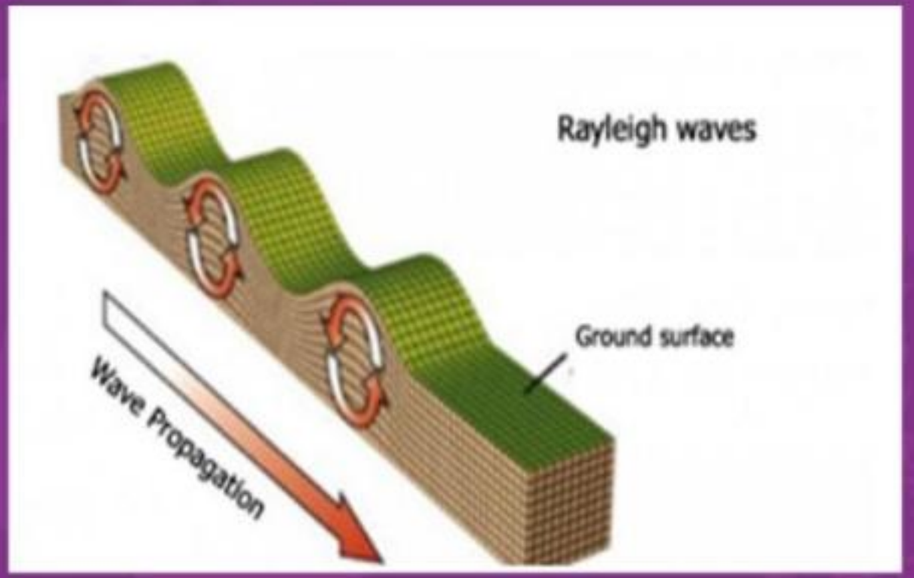
→ Prelims

Difference between Love Waves and Rayleigh Waves

Love wave



Rayleigh waves



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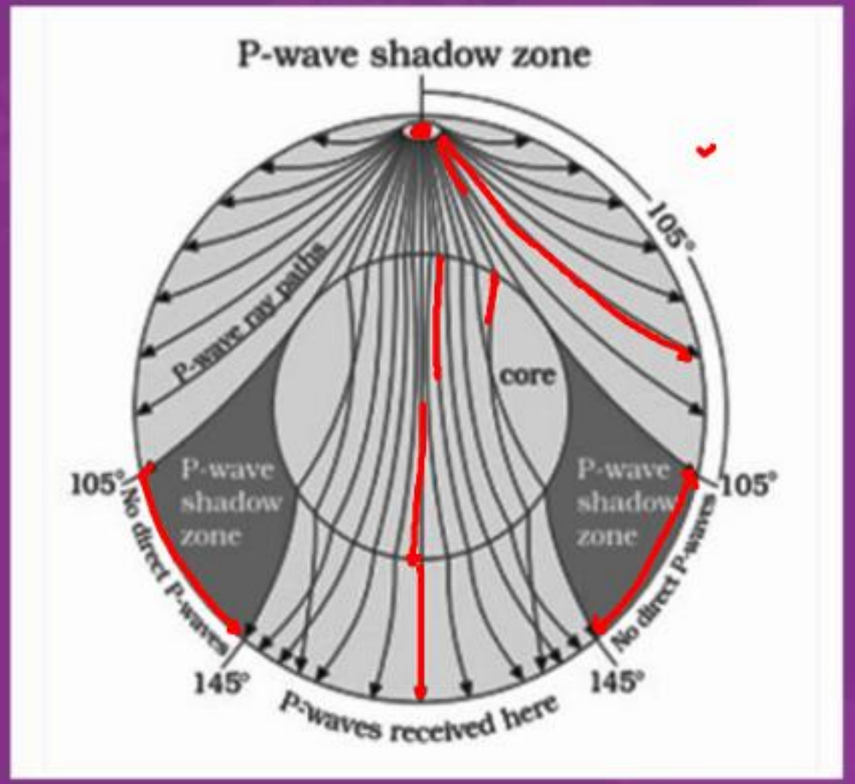
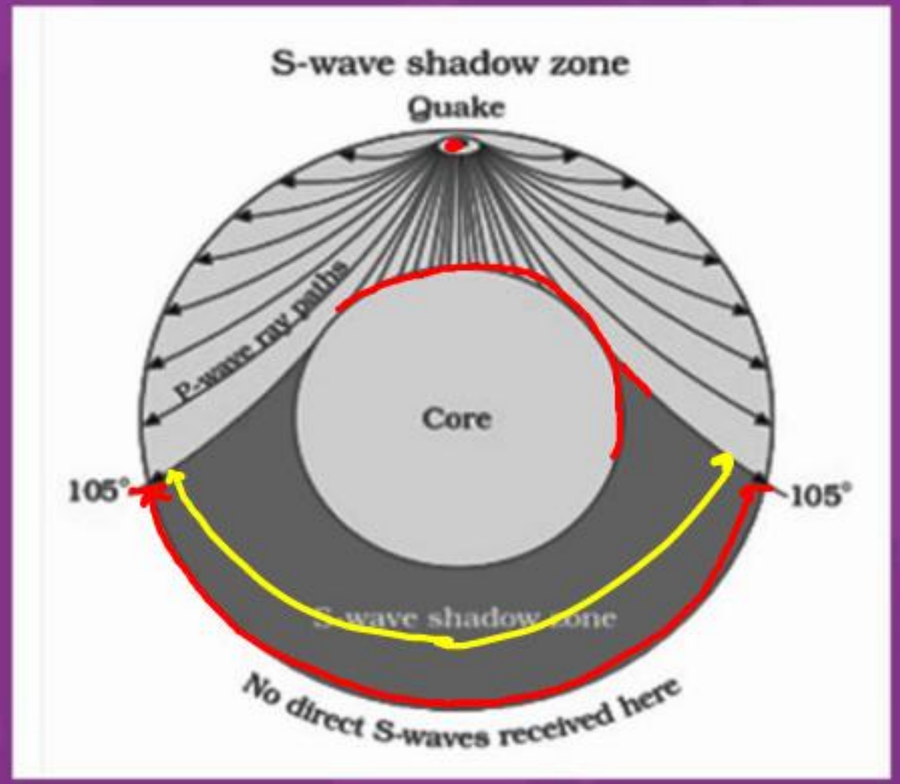
Shadow Zone

Shadow zones for s-waves are much larger as compared to p-waves.

↳ This is because the s-waves are unable to travel through the liquid outer core.





→ Energy, when travels through materials of different densities, experiences a deviation.

→ the seismic waves bend as they travel through the interior;

↳

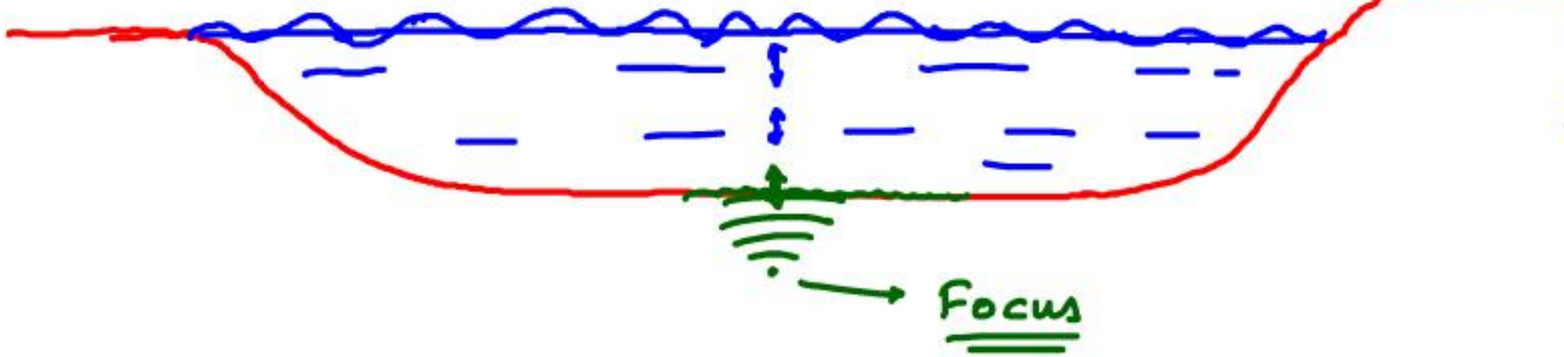
→ Means there are some places where these waves are unable to reach due to the deviation.

↳

→ Those are known as shadow zone of the seismic waves.

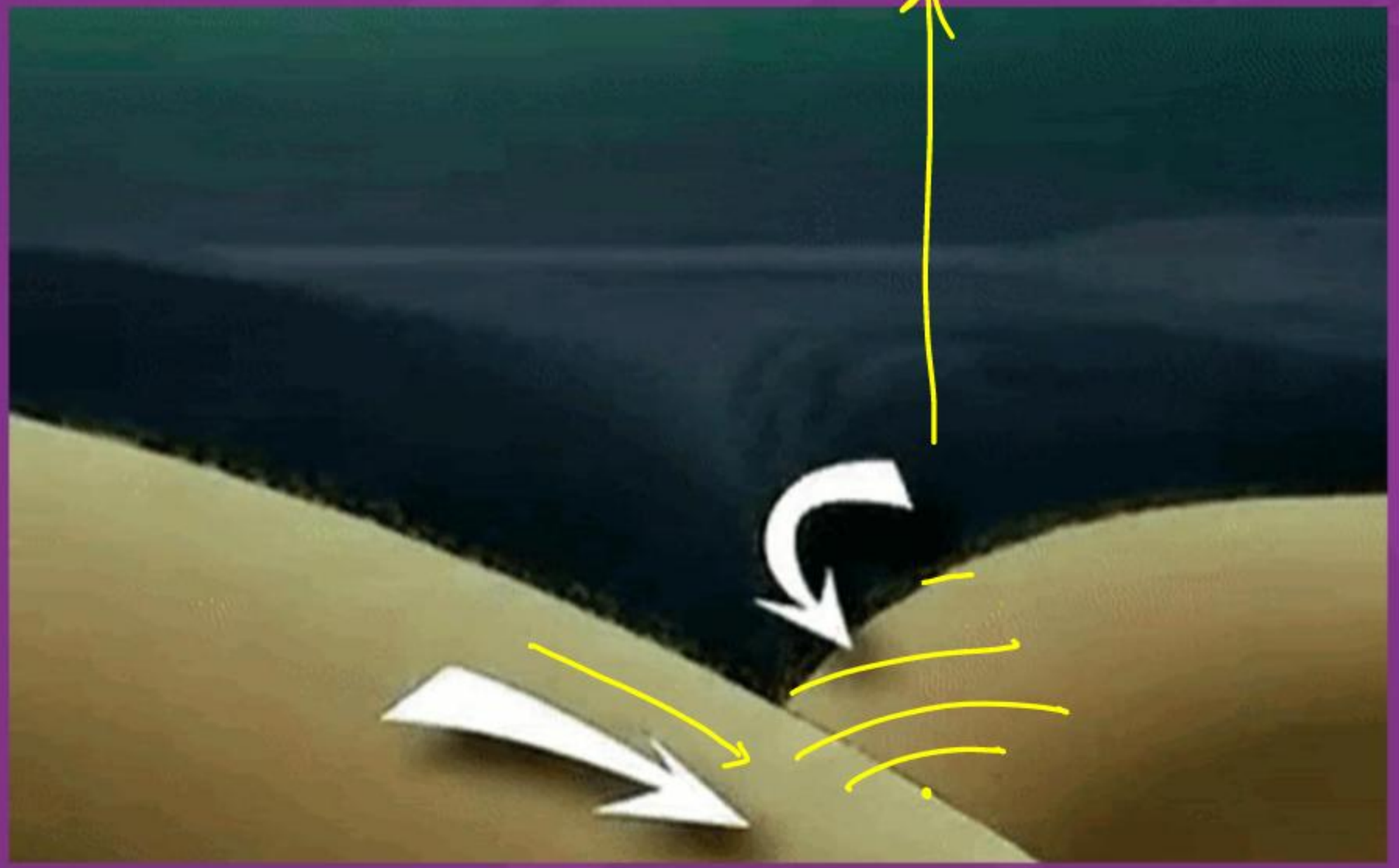
Tsunamis → Giant Wave

→ Is generated whenever there is an occurrence of a strong underwater earthquake.



26th Dec, 2004

→ Triggered by an earthquake near Sumatra.



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Geographical distribution of earthquakes

→ In areas of plate margins.
→ Convergent & Transform → High magnitude earthquakes
→ Divergent → Low magnitude earthquake

- It is true that earthquakes can happen in any part of the world.
- But in the areas of faulting and folding or of crustal weakness, the frequency of earthquakes is more than anywhere else.
- The earthquakes are concentrated in two main belts:
  - → Circum-Pacific Earthquake Belt
  - → Mediterranean-Asia Earthquake Belt

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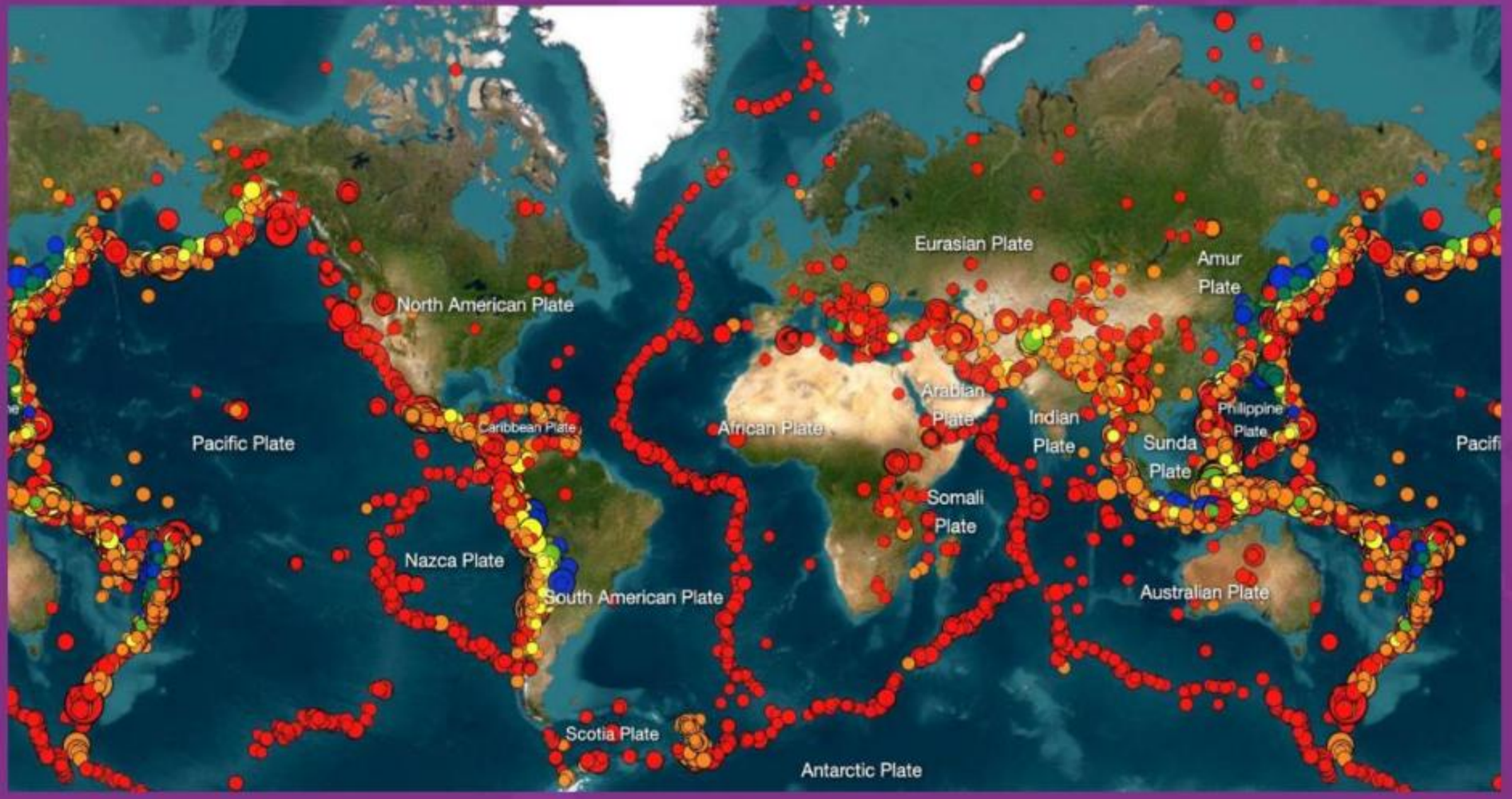
Geographical distribution of earthquakes



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Earthquake Zones of India

Zone II to Zone V