Earth and its Interior
Rocks
Plate Movements

Convection Current Theory

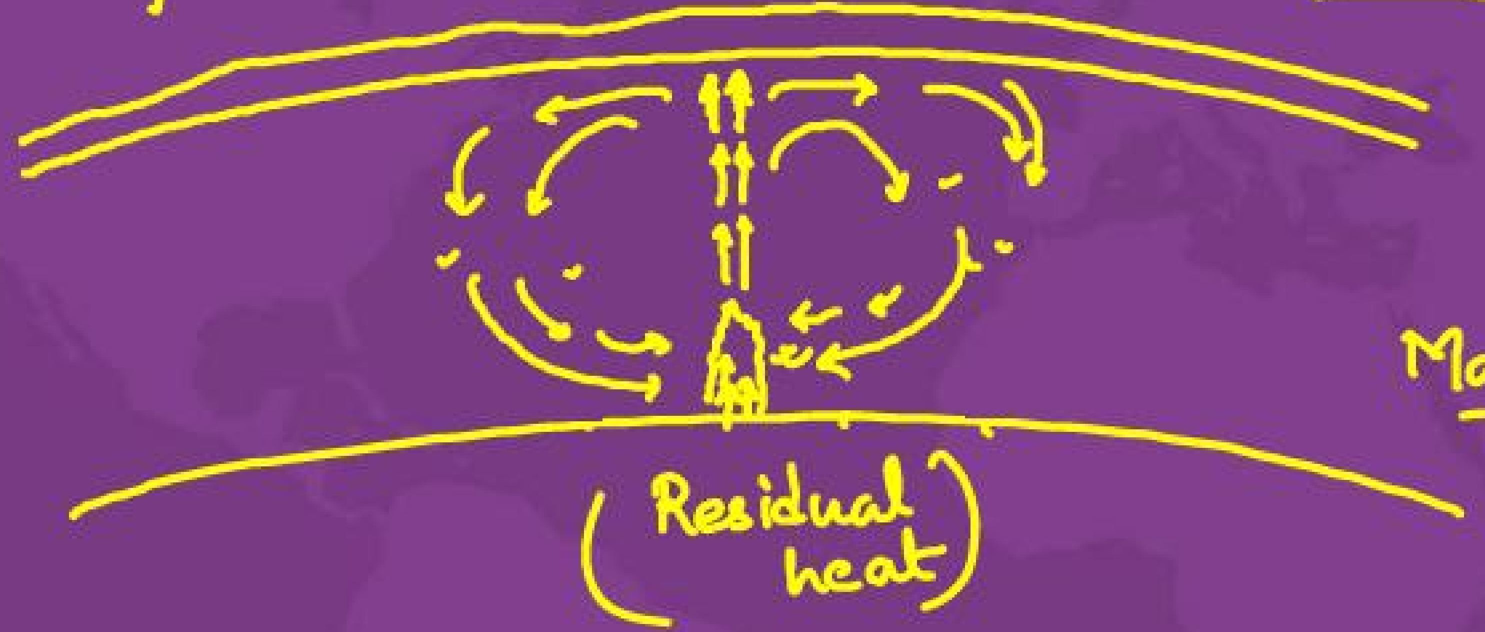
→ Convection → Method of heat transfer by the movement of particles.

↓

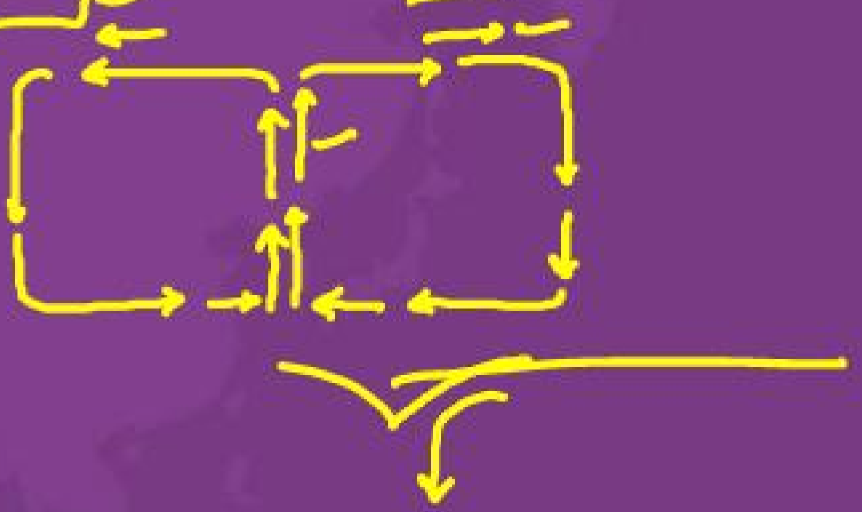
Warmer material rises up & colder substances sink to replace it.

→ Sir Arthur Holmes

→ Presence of convection current in the interior of mantle due to presence of radioactive materials & heat provided from core.



Mantle

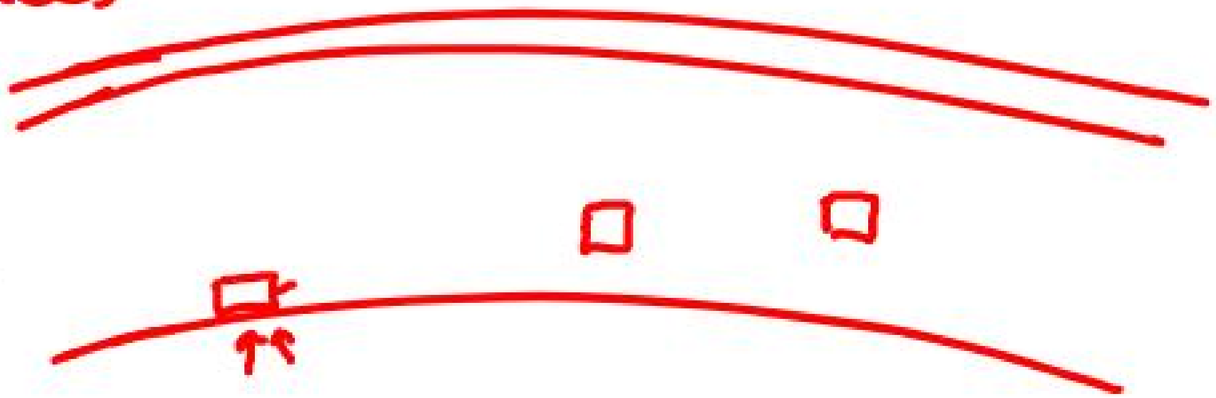


→ Melts the portion of mantle; which becomes lighter, it rises up, while colder solid mantle replaces the vacancy created by rising materials.

→ Why convection in mantle? (Despite mantle being solid)

↓ portion of mantle which experiences heat, starts to melt.

↳ Molten materials being lighter rises up & is replaced by the colder solid from the surroundings.



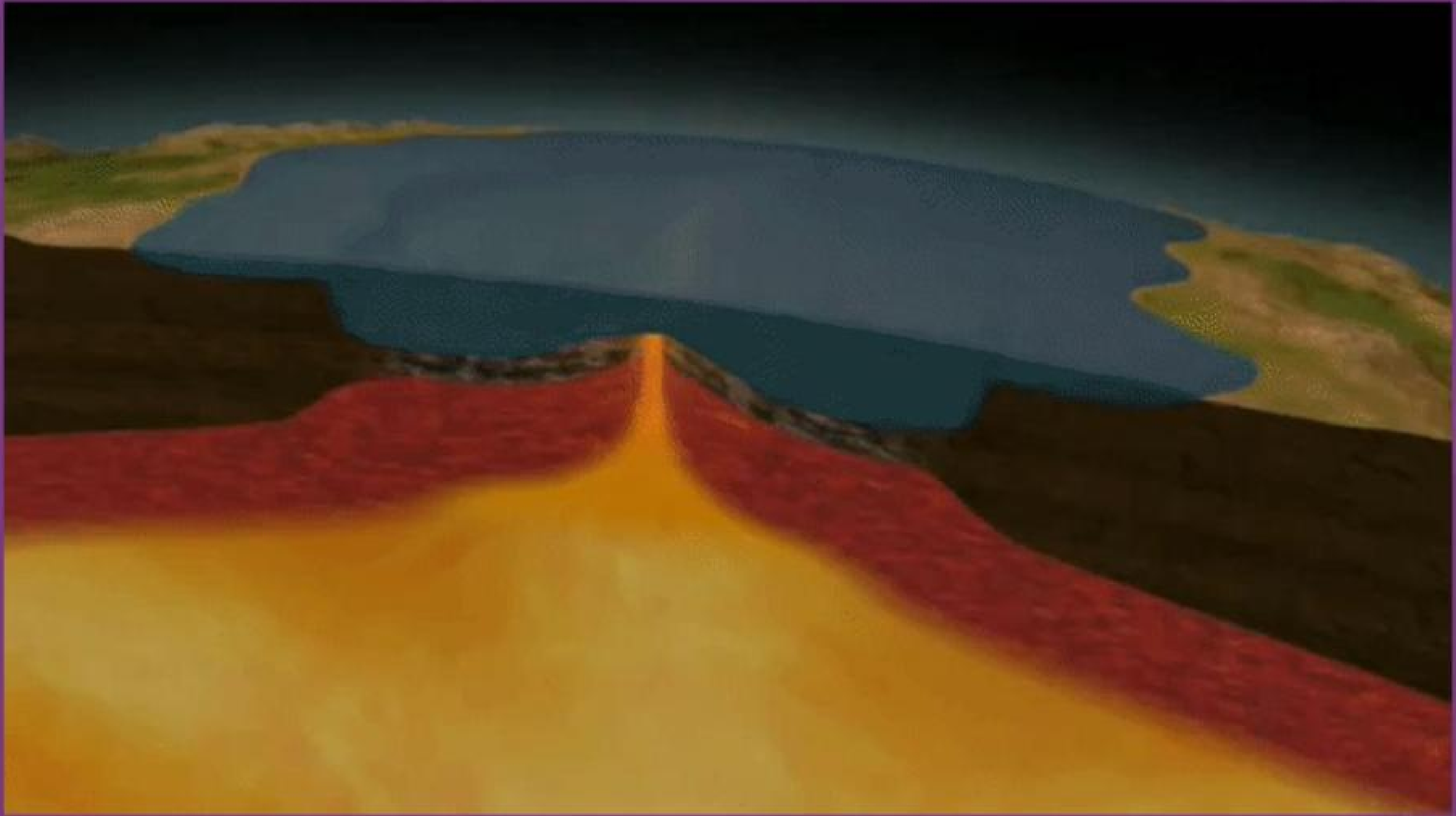
↳ The colder solids also get heated up, melt & rise up.

↳ The gap is filled by nearby solid materials

↳ The process is repeated to generate a convection current.

→ Harry Hess

Sea Floor Spreading



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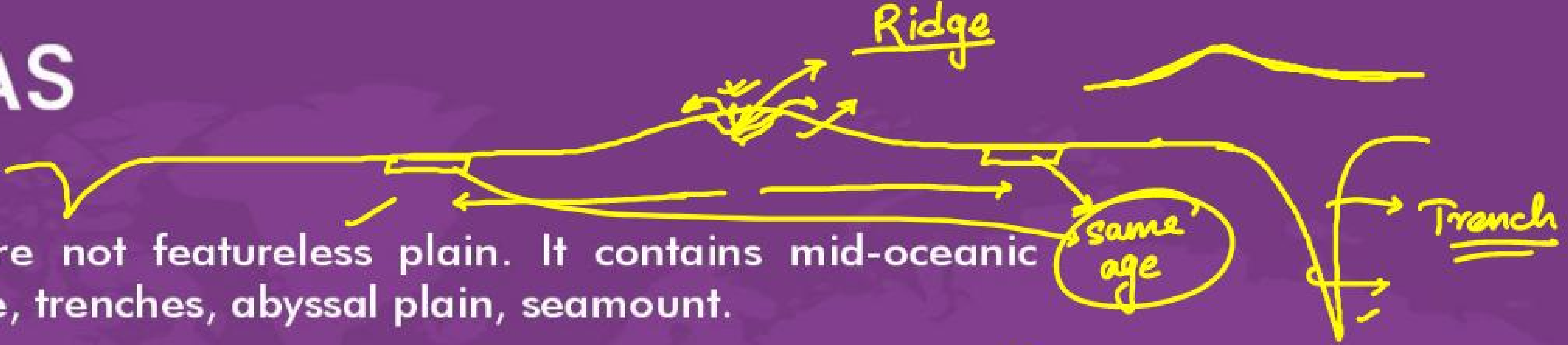
Observations:



1. Oceans are not featureless plain. It contains mid-oceanic ridges, rise, trenches, abyssal plain, seamount.

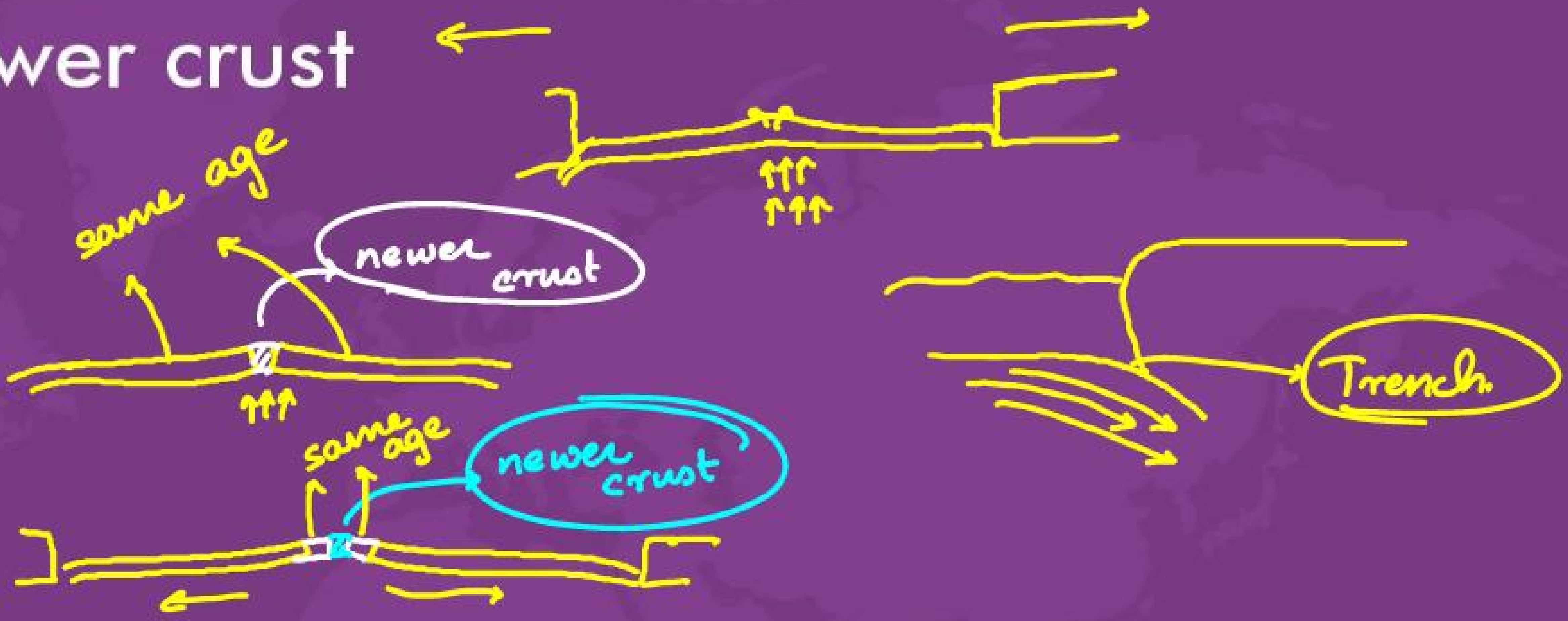
2. Oceanic rocks sample in terms of age were nowhere more than 200 million years old. Continental rocks are way older than oceanic rocks, and some continental rocks formation are as old as 3,200 million years.

3. Near mid-oceanic ridges, rocks sample were younger, and near the trenches, rocks are the oldest but less than 200 million years.

4. On the crest of the mid-oceanic ridges, cracks with the continuous active volcanic eruption were found.

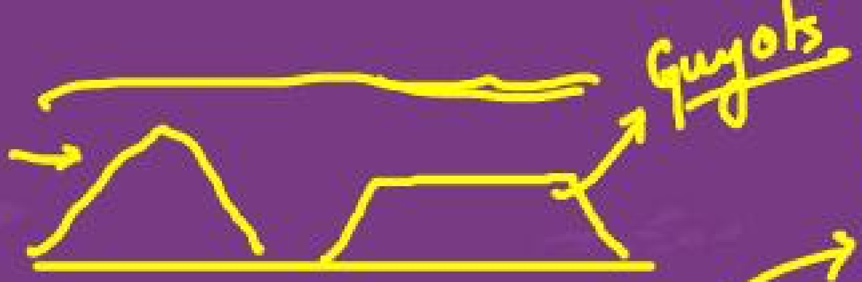
5. Age of rocks and types may similar for any two places equidistant from either side of the crest of the mid-oceanic ridge (MOR).

Creation of newer crust



Theory → Active volcanism leads to creation of a newer crust at mid-oceanic ridges, as the older crust is pushed aside.

The older crust of the ocean is consumed at the oceanic trenches which leads to circulation of oceanic crust.



Presence of plains, seamounts, guyots

Limitations of the Theory:

1. It does not explain the small features of the ocean floors.
2. It does not talk about the movement of the continents.
3. It does not speak in terms of lithospheric regions(plates).

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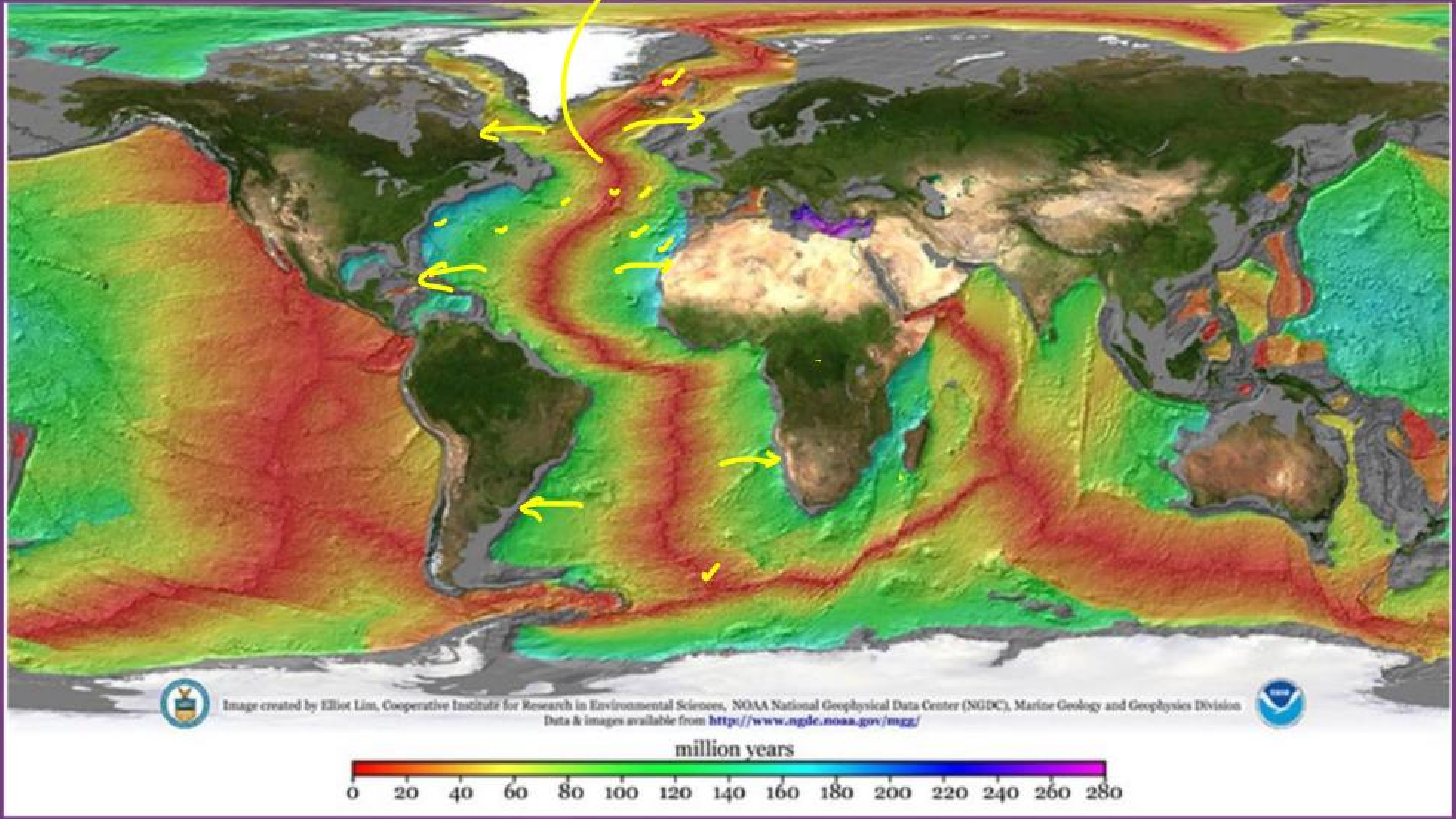
mid oceanic ridge:



Sea Floor Spreading and Plate Tectonics

Observed by Harry Hess, an American Geologist

Corroborated the fact that Continents do Drift

Formed the Basis of Plate Tectonic Theory

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Tektonik

It was the first comprehensive theory to talk about movement and formation of sea floors. Simultaneously other scholars such as McKenzie and Parker, Morgan in 1960s developed a more comprehensive understanding of the movement of the different part of the earth crust (both oceanic and continental) and the related formation. It is explained under the theory of Plate Tectonics.

Lithosphere → [Crust + solid portion of upper mantle]

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Major plates

Minor plates

Plate tectonic Theory

- Lithosphere is broken into Plates
- Moves over the Asthenosphere
- Movement is driven by the internal heat of Earth

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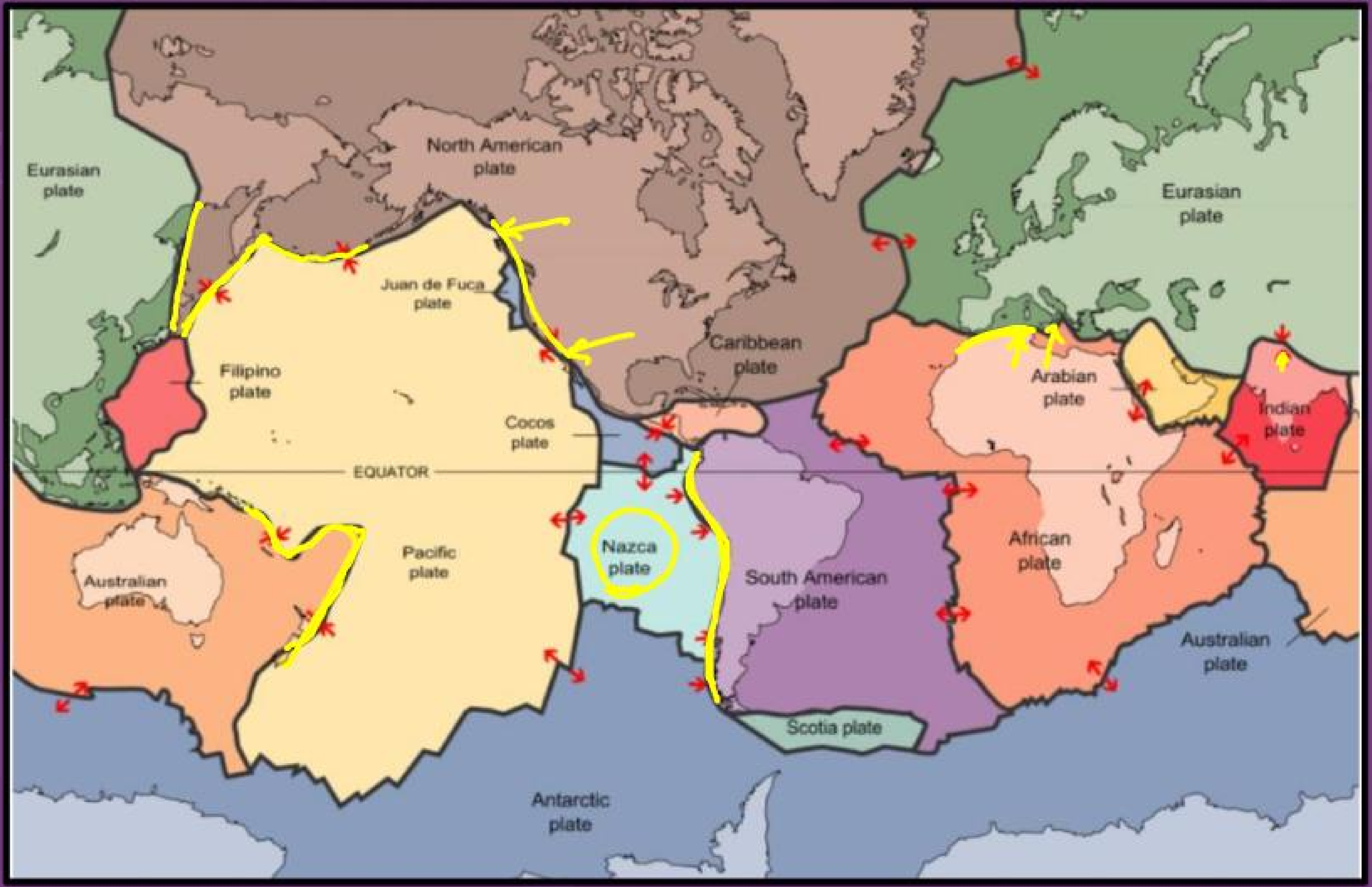
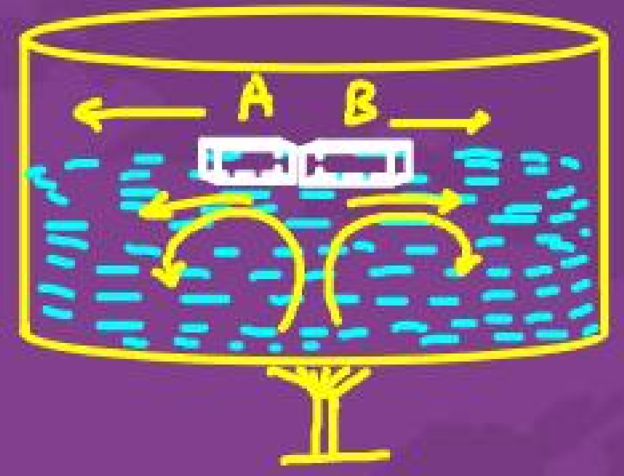
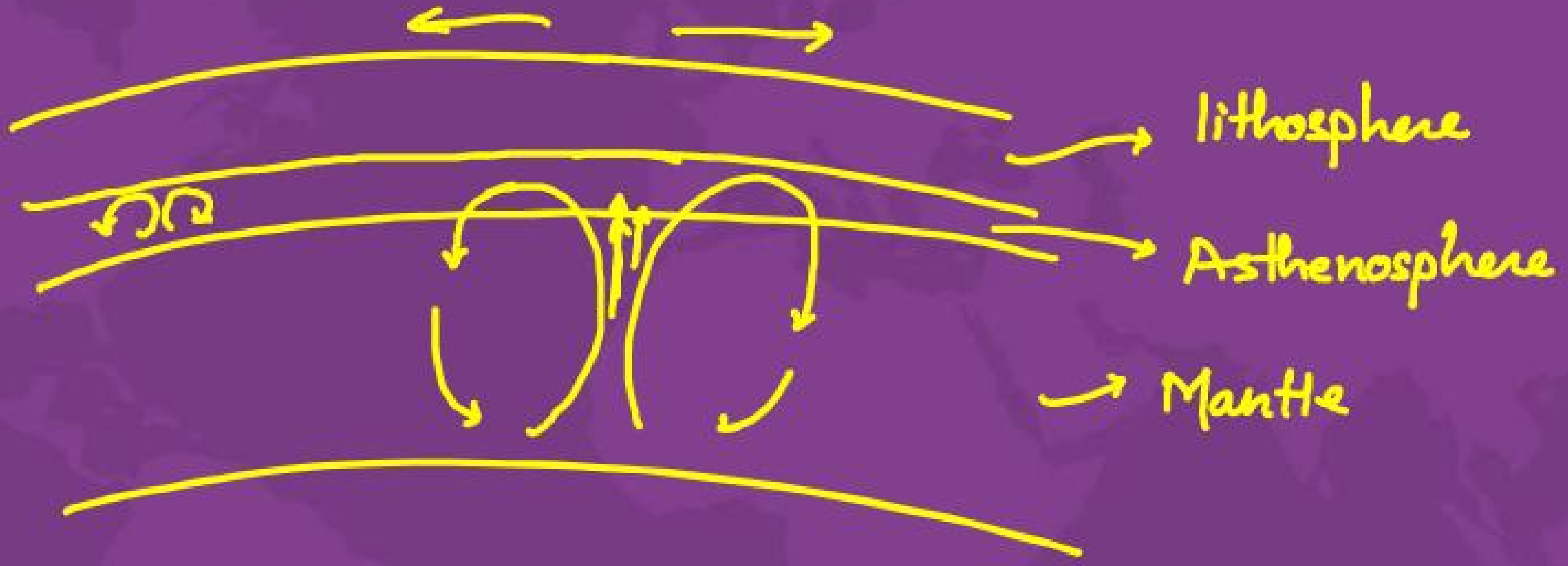
Plate tectonic Theory



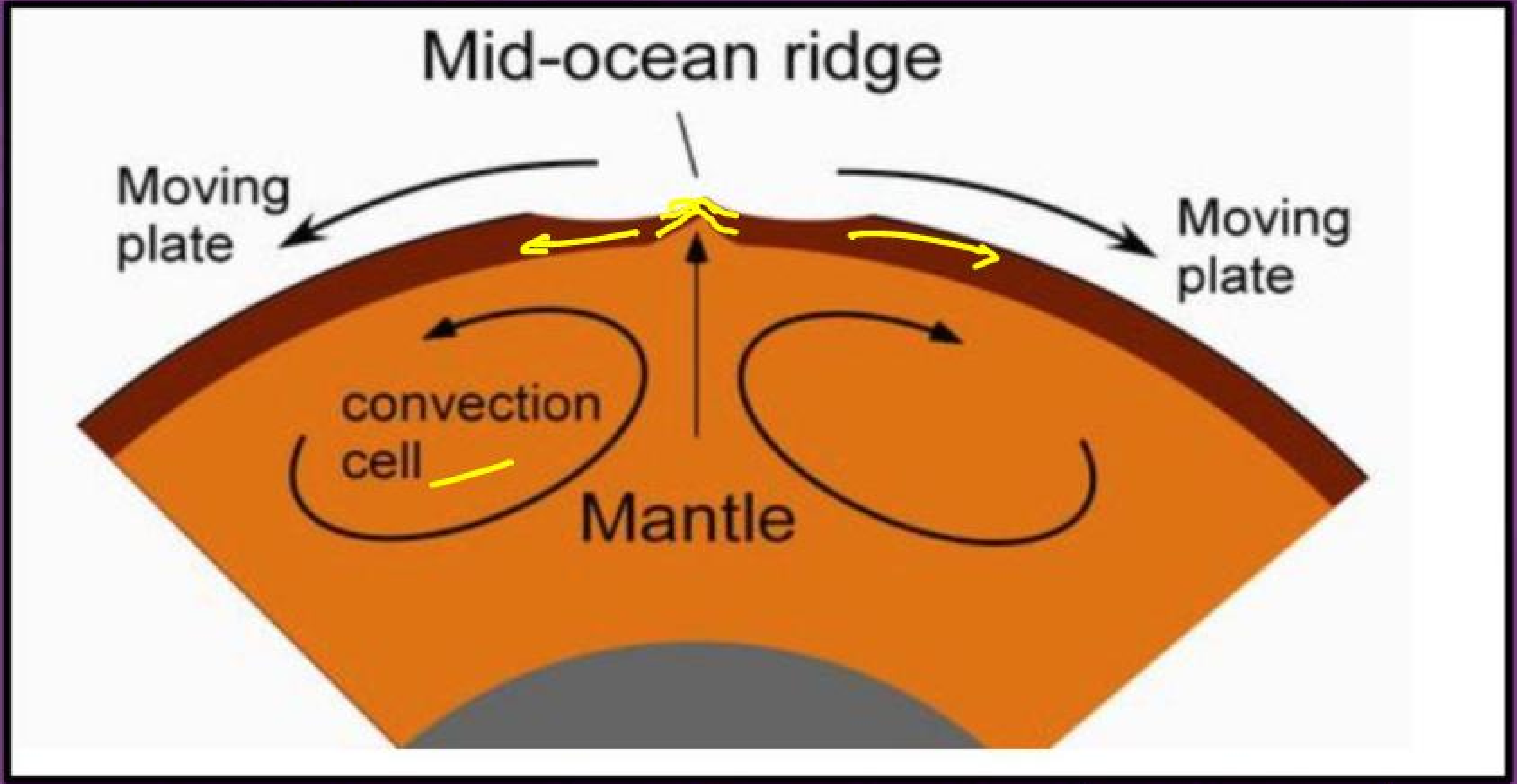
Why do plates move - Interior

Convection current in the mantle makes the plates move with respect to each other.



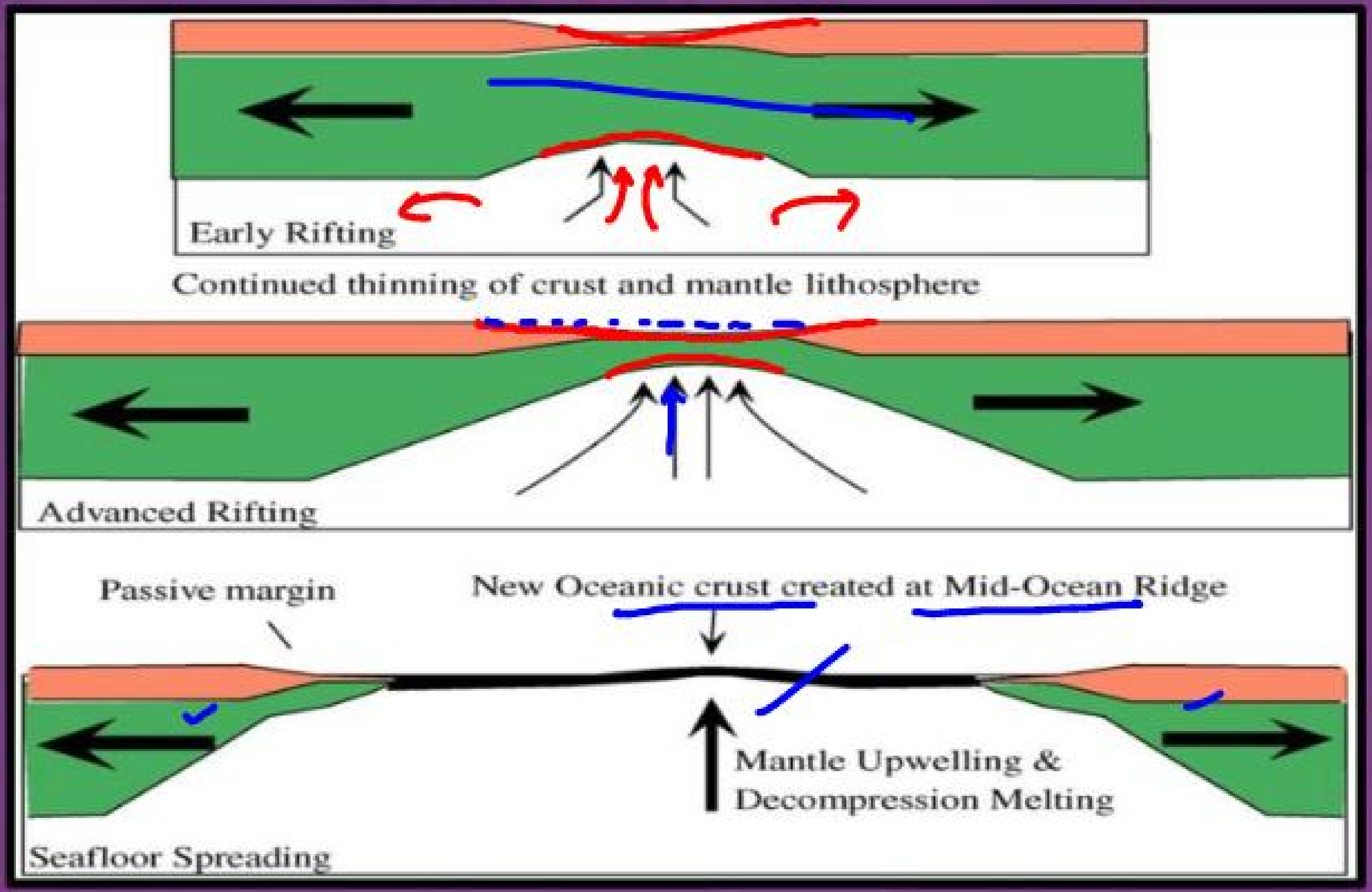


Why do plates move - Interior



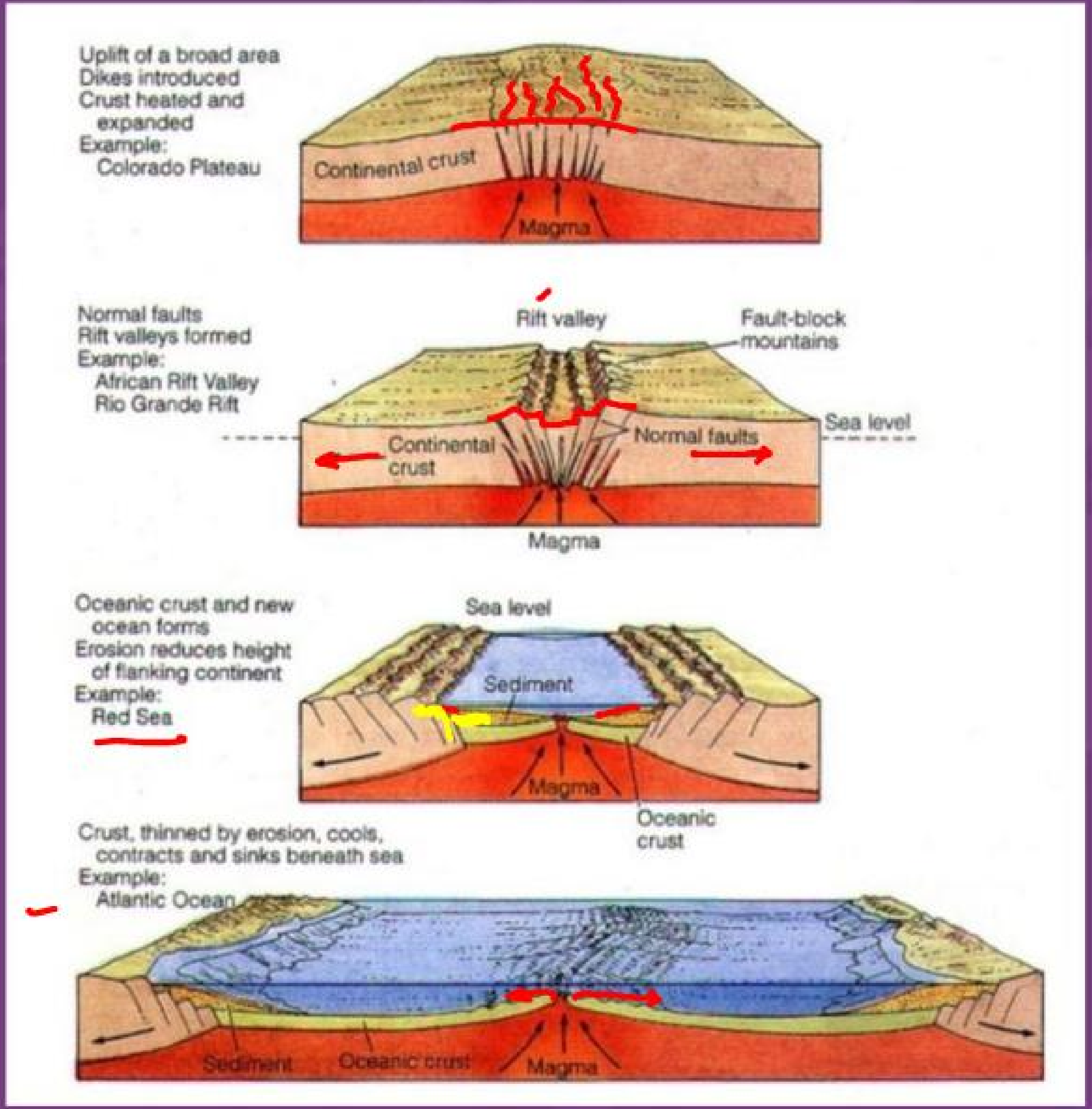
Convection currents from the Mantle rising to the surface

Why do plates move - Interior



(W3H)

Plate Tectonics.



→ What are plates?
  ↳ Lithosphere is broken into sub-parts.

→ Why do they move?
  ↳ Heat from interior

→ How do they move?
  ↳ Towards each other, away/parallel to each other.

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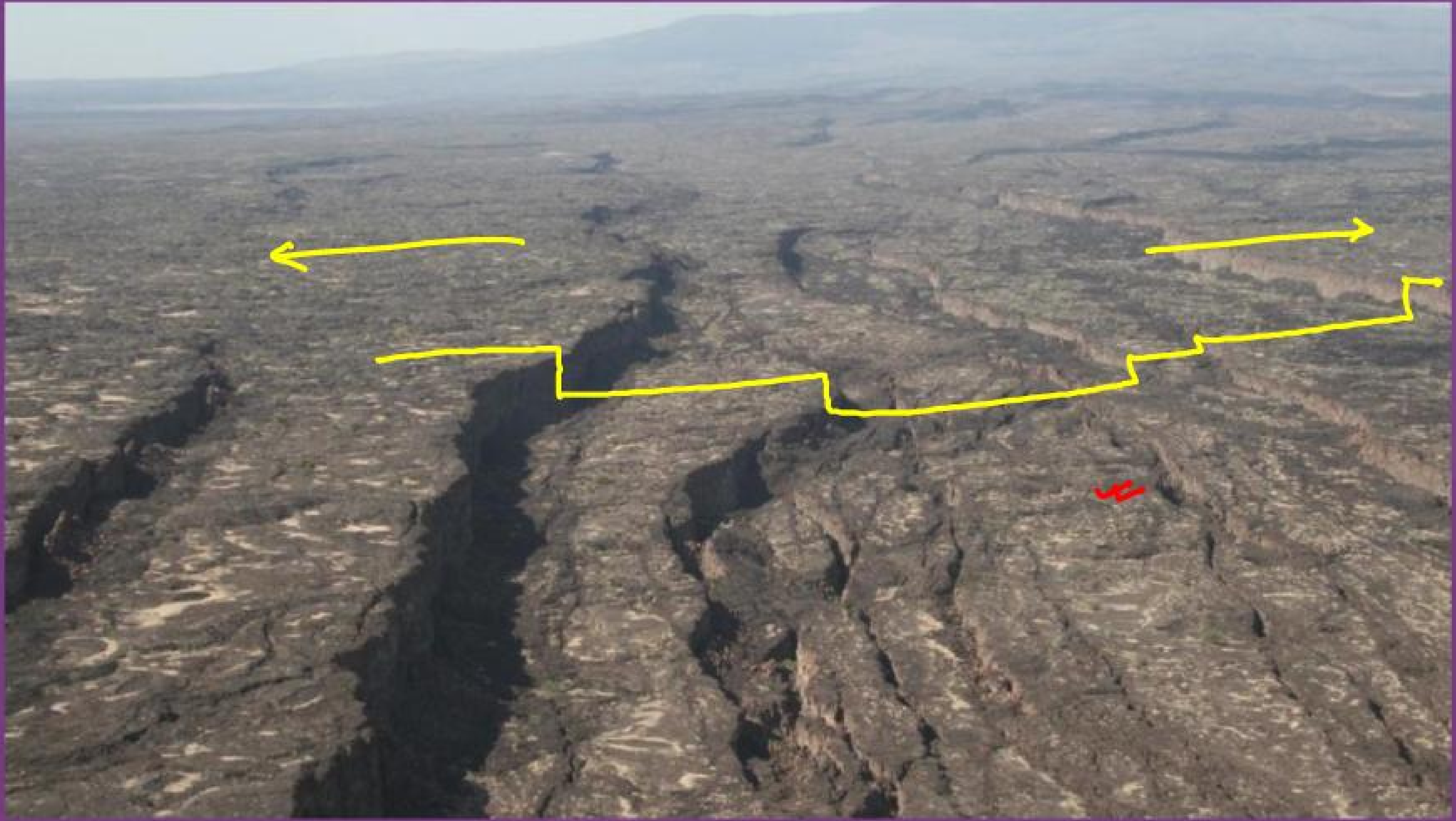

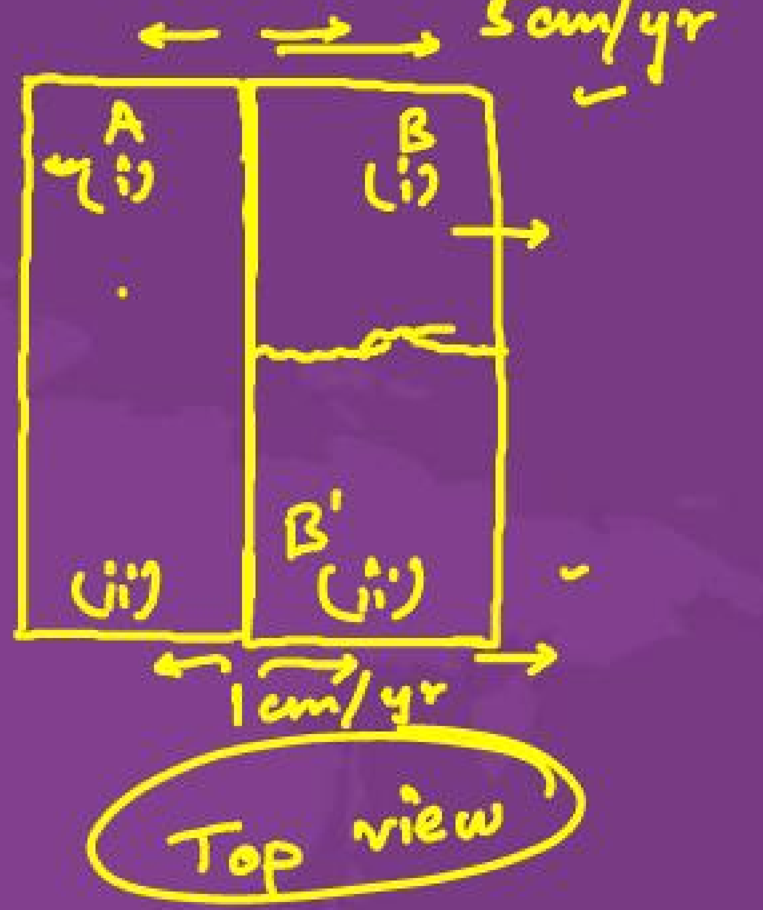

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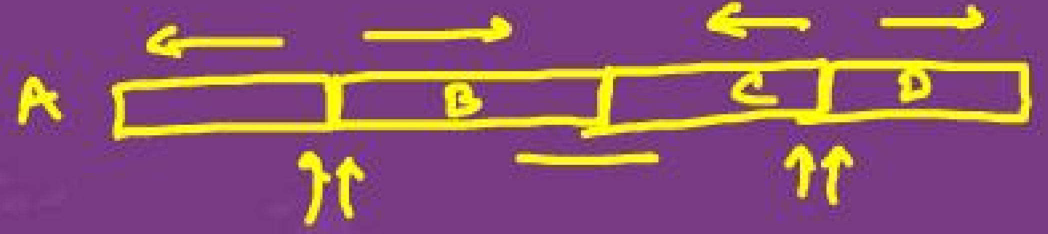
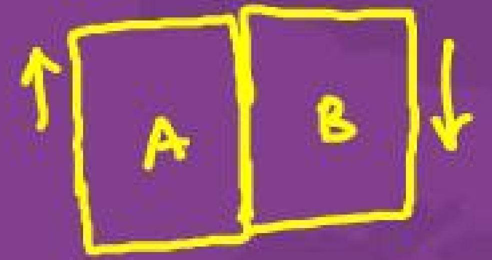
Types of Plate Movements



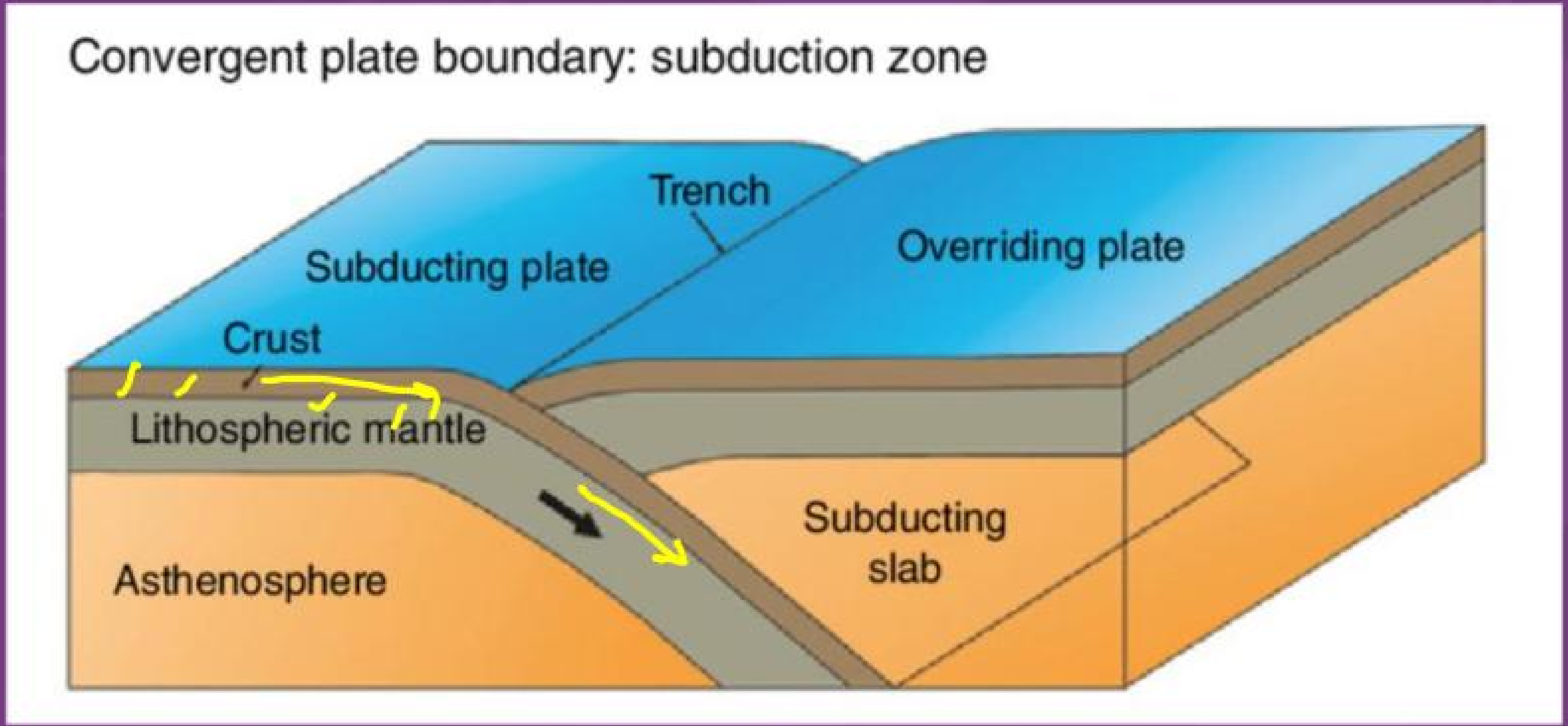


Towards Each Other	Convergent Plates
Away From Each Other	Divergent Plates
Parallel to Each Other	Transform Plates

→ Heavier plate undergoes subduction.
→ Always oceanic plate is heavier.

Convergent Plate Boundaries

→ $\boxed{\text{Destructive plate margins}}$



→ Continental - Continental
→ Continental - Oceanic
→ Oceanic - Oceanic.

slab pull

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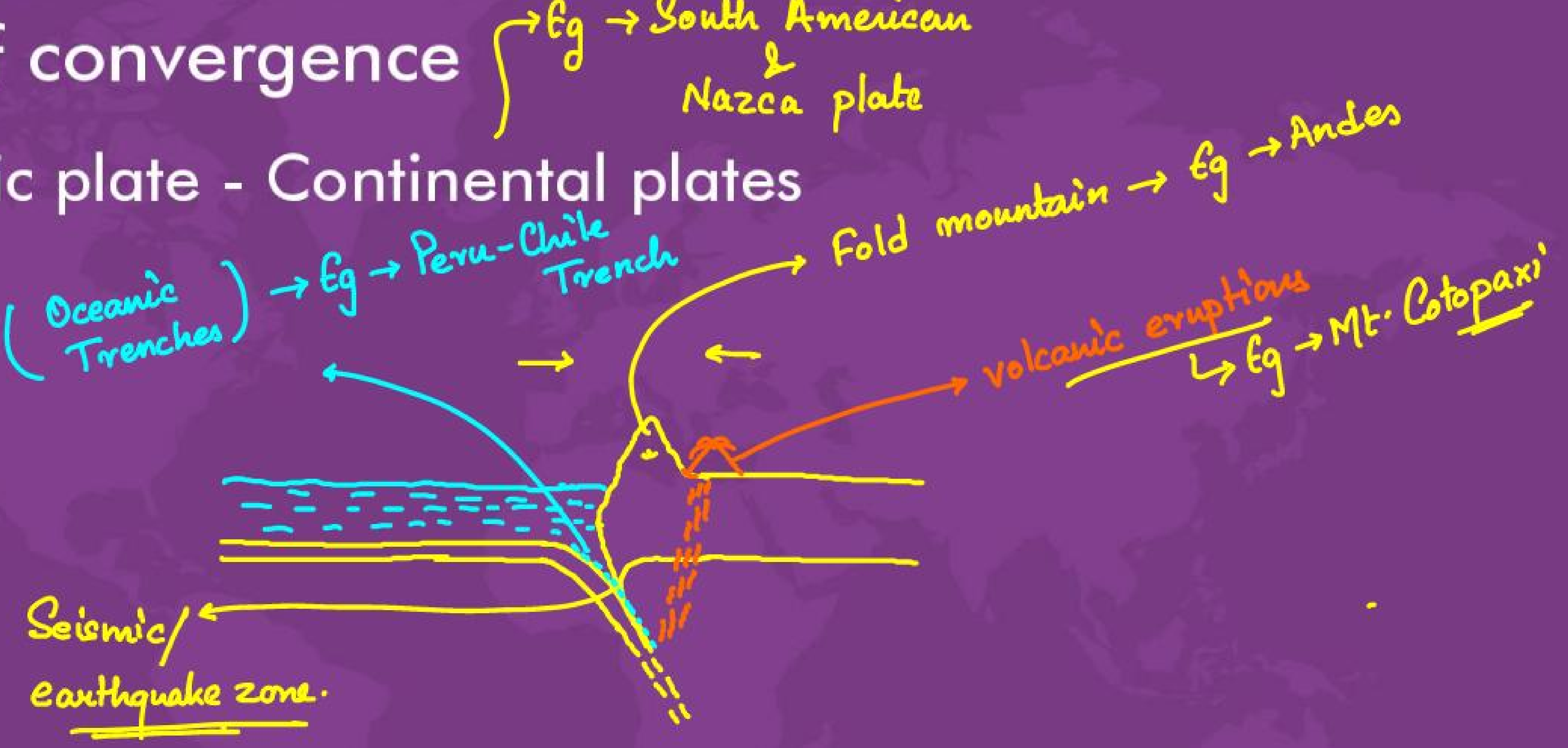
Types of convergence

- Oceanic plate - Continental plates



→ Older oceanic plates are heavier & will undergo subduction.

- Oceanic plate - Oceanic plate

Island

Eg → Indonesian islands. ; Tonga islands,

Oceanic Trench

Eg → (Mariana Trench)

(Earthquake prone zones)

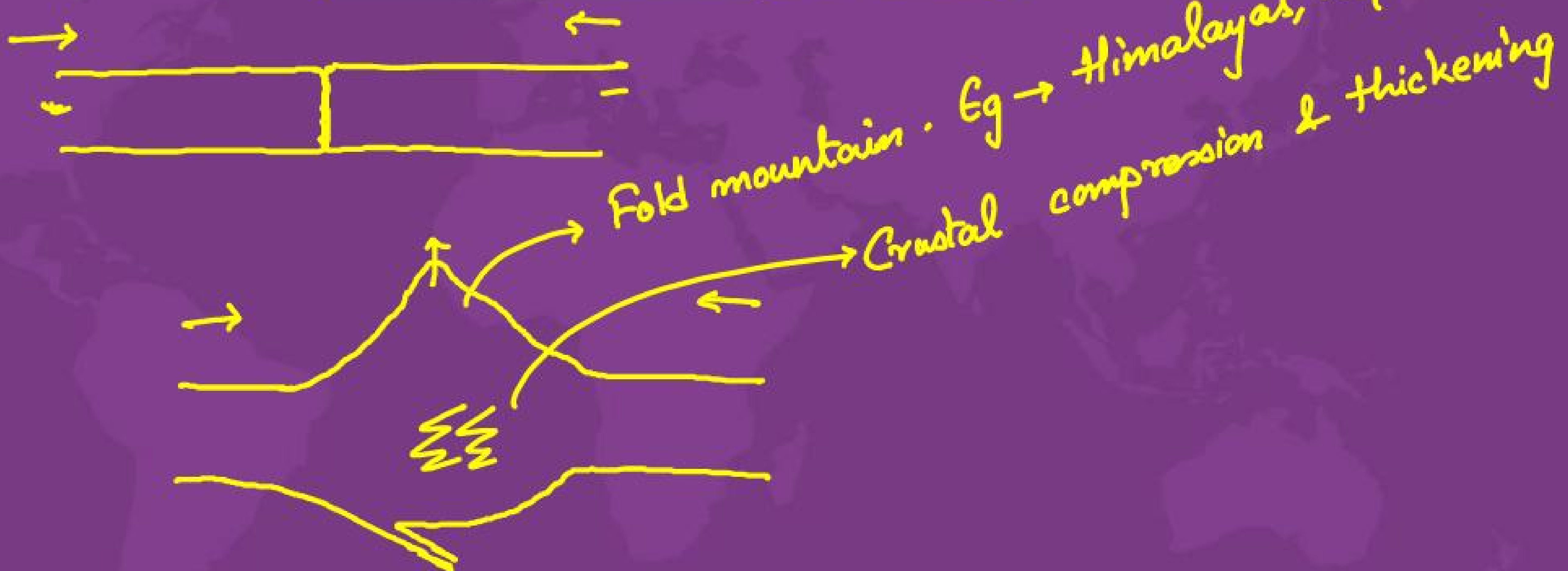
→ As both are light & have less density → compression & deformation predominate subduction.

→ Eg → Indian plate & Eurasian plate

↳ is heavier & undergoes slight subduction

- Continental plate - Continental plate

→ No volcanic eruption → Not enough molten materials and gases are created.
→ Presence of very hard & thick crust due to deformation.



Convergent Plate Boundaries

Landforms

Islands

Fold Mountains

Trenches

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Geographical Phenomenon

Earthquakes and Volcanoes

Convergences around pacific

South American - Nazca
North American - Pacific
Eurasian - Pacific
philippine - pacific
Pacific - Indo Australian

Earthquakes & volcanoes are frequent

Pacific Ring of Fire

Ring of Fire MAP: This map shows the Ring of Fire around the Pacific

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Indian Plate and its Movement

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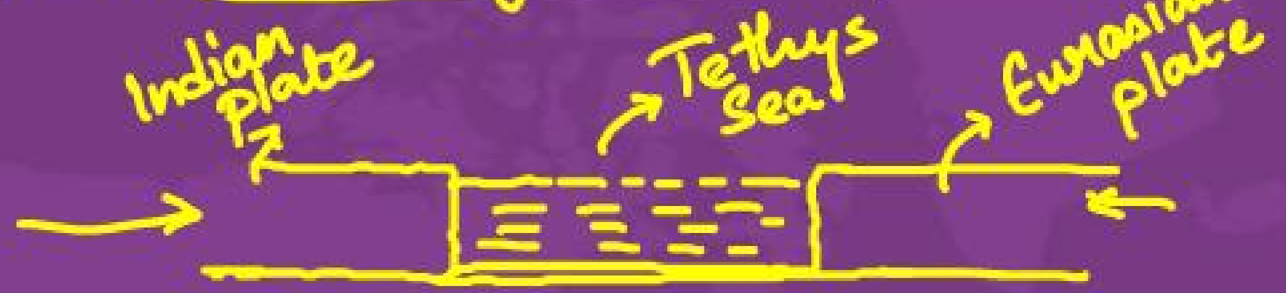
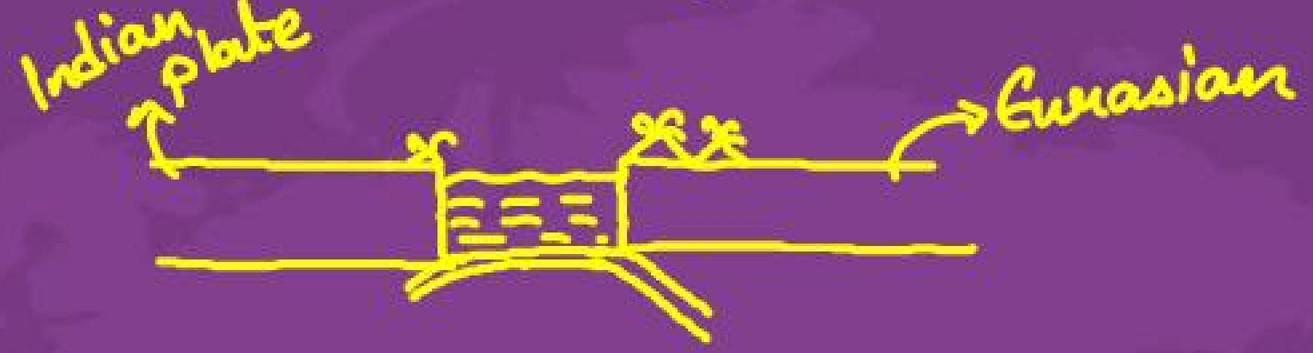
Process of formation of Himalayas.

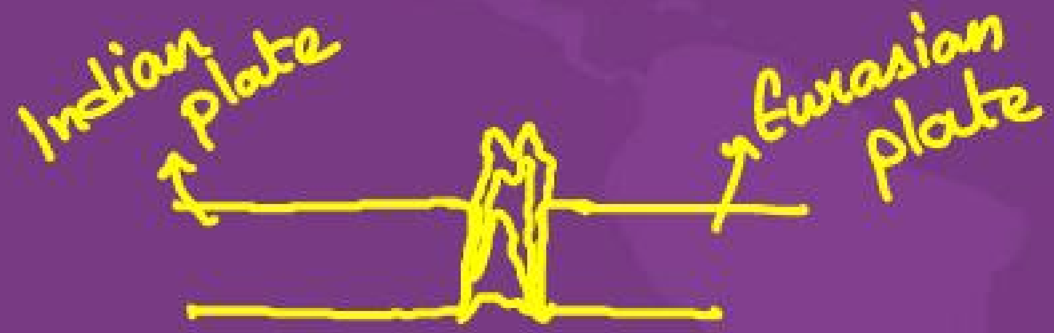
1> Movement of Indian plate



2> Subduction of Tethys. (narrowing of Tethys)



3> Upliftment of Tethean Sea-floor



→ Speed of movement of Indian plate was so high, that entire subduction could not happen & the sea-floor was thrown upwards.

4) Continental - Continental Convergence →

5) [Formation of second range of himalayas]

6) Formation of shiwaliks