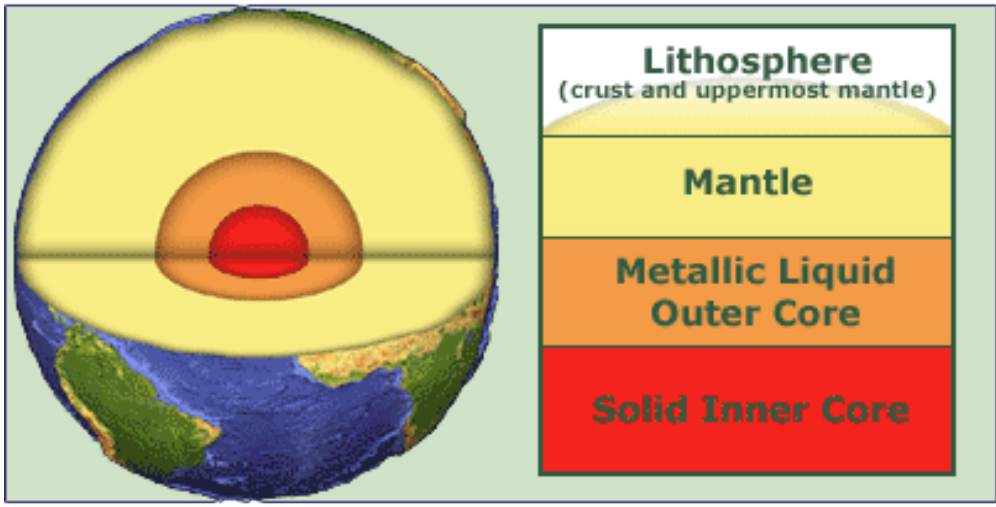
The Theory of Plate Tectonics - Boundaries, Stresses, and Faults

1. What is the theory of plate tectonics?
2. What are the three types of plate boundaries?

What are Plates?

- The ***Earth's crust and upper mantle (Lithosphere)*** are broken into sections called plates



Plates move around on top of the mantle like rafts

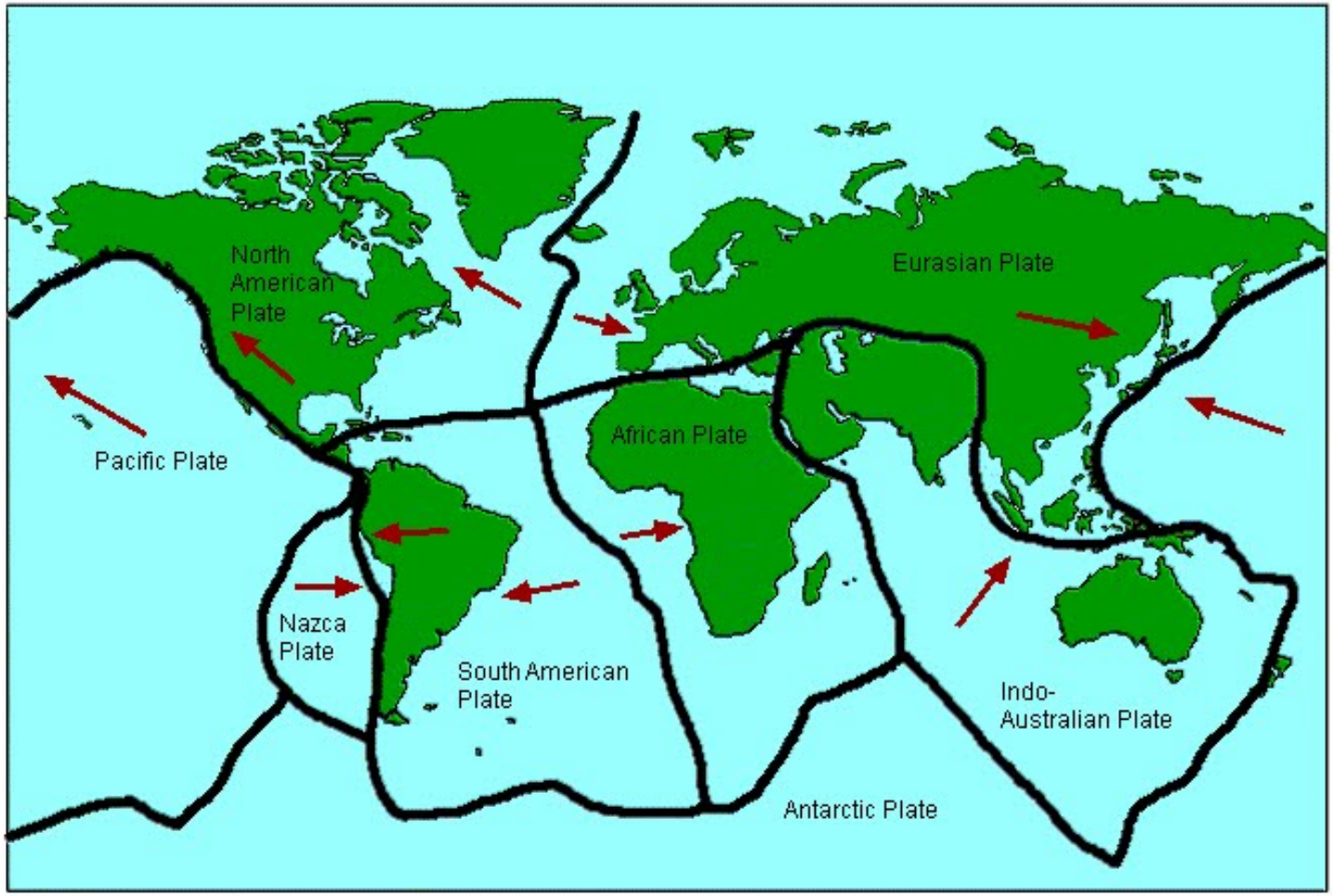
A section of the lithosphere that slowly moves over the asthenosphere, carrying pieces of continental and oceanic crust.

What is the Theory of Plate Tectonics?

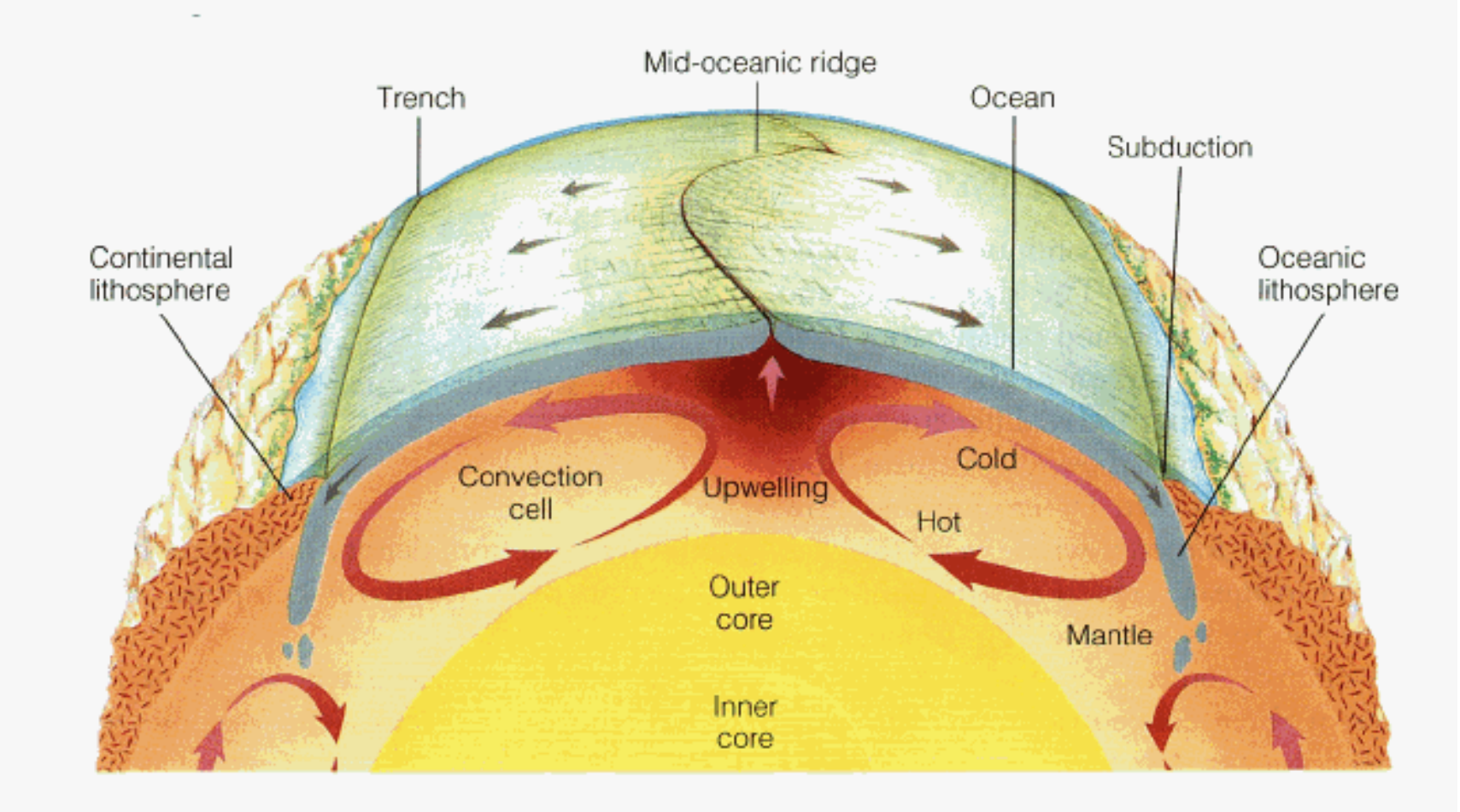
The theory that pieces of Earth's lithosphere are in constant motion, driven by convection currents in the mantle.

- **<u>Plates move slowly</u> in different directions**

❑ **Cause different geologic events (like earthquake, volcano, etc.)**



What makes the plates move?



Convection Currents in the mantle move the plates as the core heats the slowly-flowing asthenosphere (the elastic/plastic-like part of the mantle).

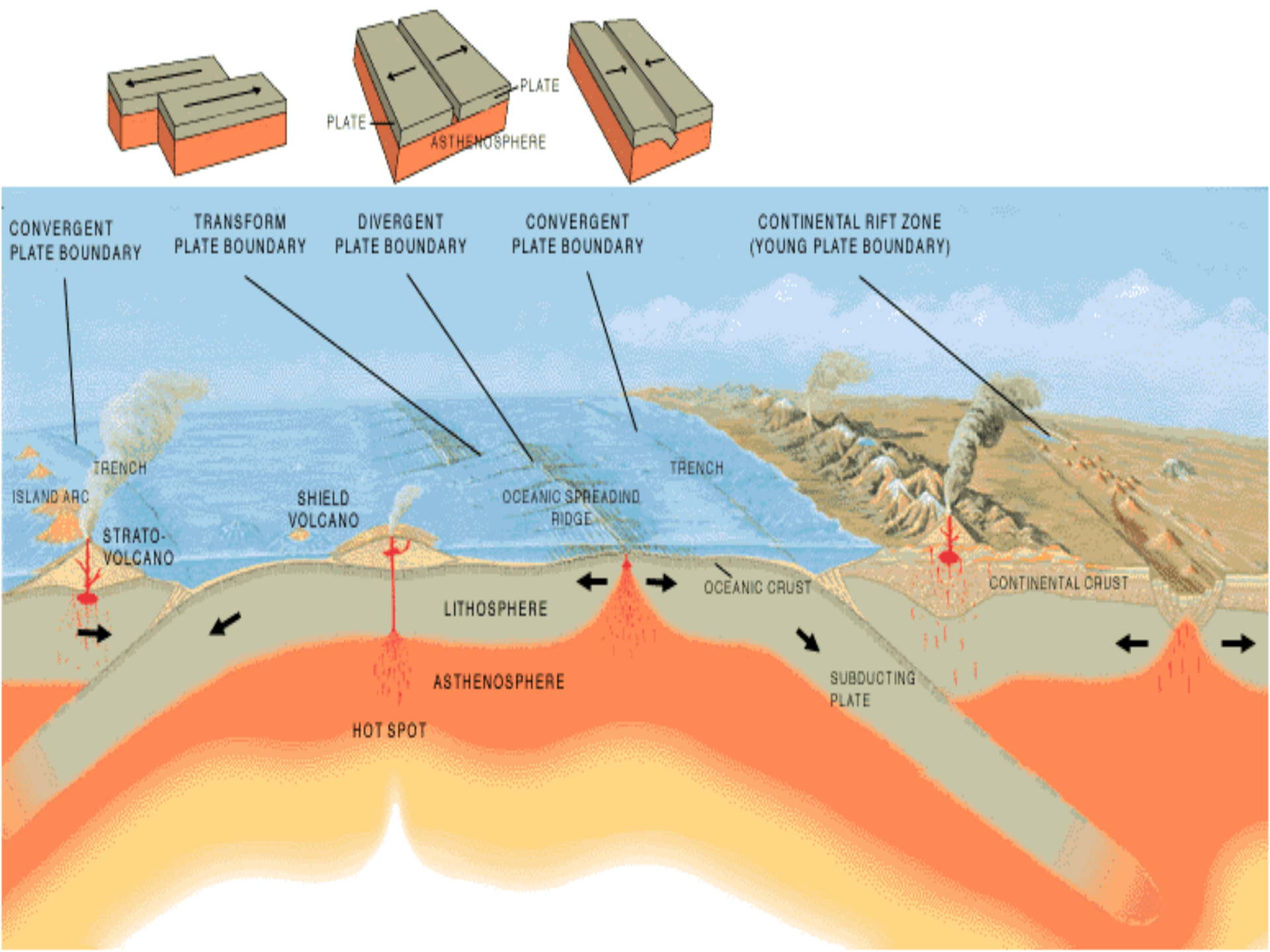
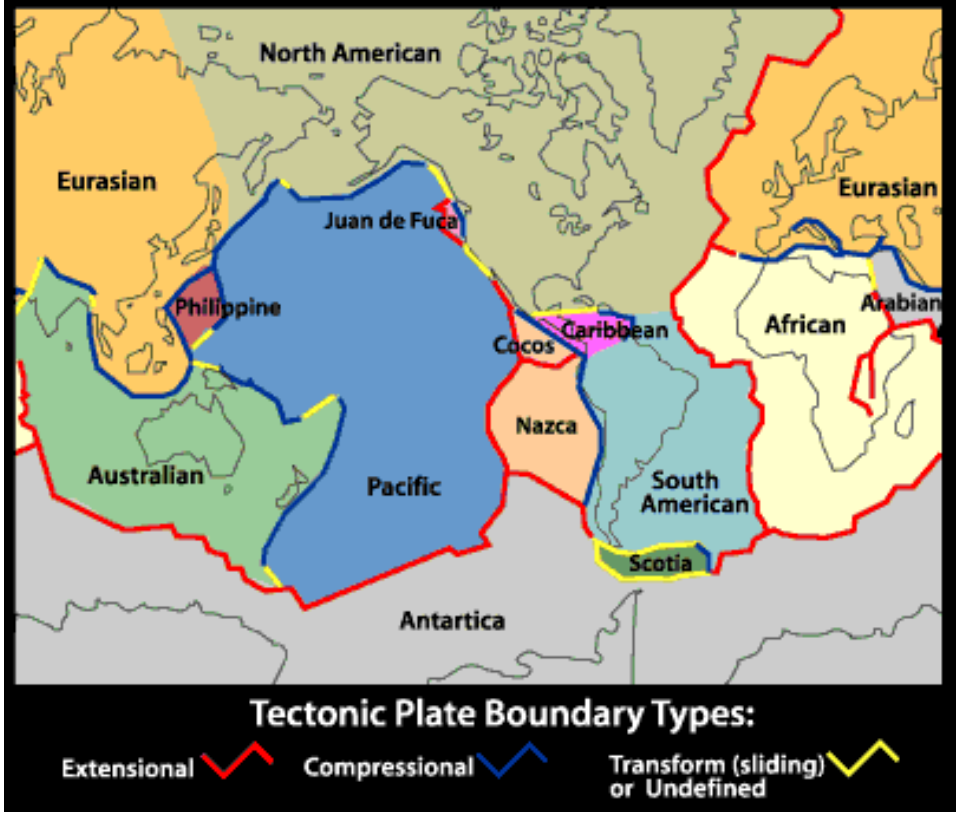


PLATE
PLATE
ASTHENOSPHERE
CONVERGENT PLATE BOUNDARY
TRANSFORM PLATE BOUNDARY
DIVERGENT PLATE BOUNDARY
CONVERGENT PLATE BOUNDARY
CONTINENTAL RIFT ZONE (YOUNG PLATE BOUNDARY)
TRENCH
ISLAND ARC
STRATO-VOLCANO
SHIELD VOLCANO
OCEANIC SPREADING RIDGE
TRENCH
OCEANIC CRUST
CONTINENTAL CRUST
LITHOSPHERE
ASTHENOSPHERE
HOT SPOT
SUBDUCTING PLATE

Plate Boundaries

The edges of Earth's plates meet at plate boundaries.

❖Extended deep into the lithosphere



FAULT – Breaks in Earth's crust where rocks have slipped past each other.

THERE ARE THREE TYPES OF PLATE BOUNDARIES!

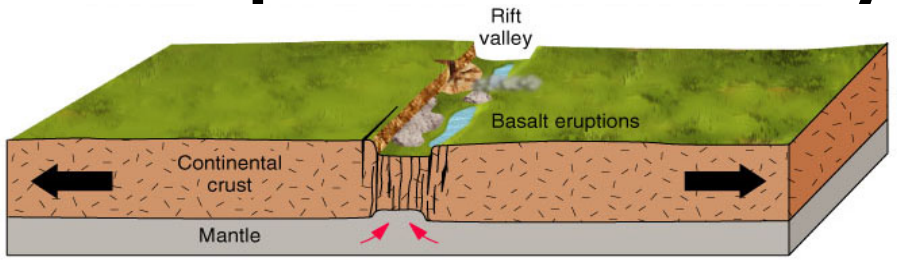
What are the three types of boundaries?

- **Divergent Boundaries**
- **Convergent Boundaries**
- **Transform Boundaries**

A different type of plate movement occurs along each type of boundary.

Divergent Boundaries

A plate boundary where two plates move away from each other.

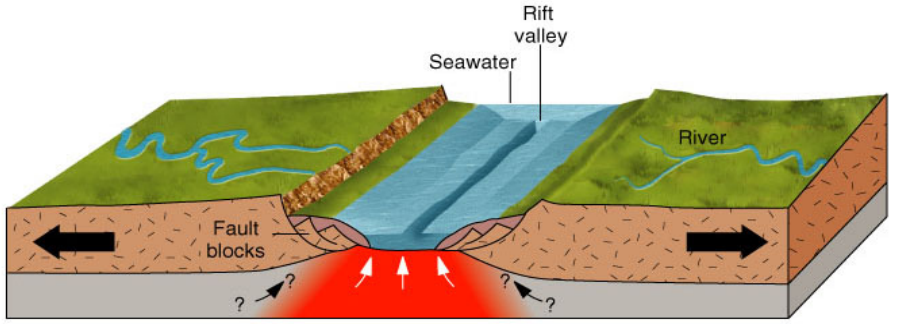


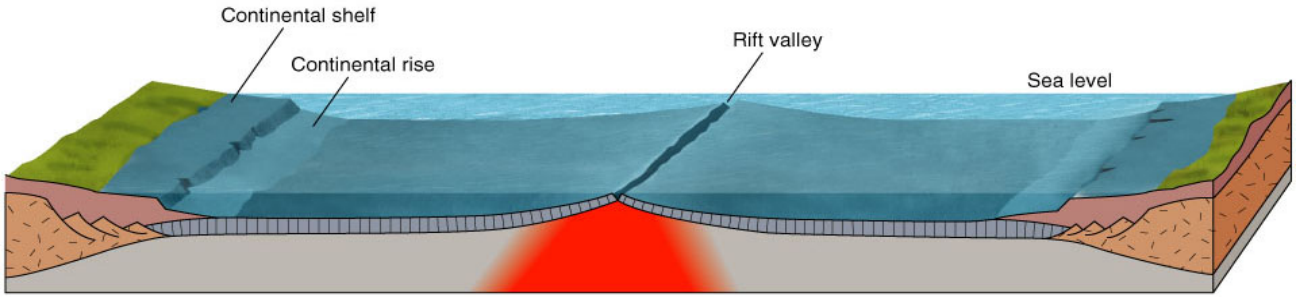
← →

RIFTING

causes

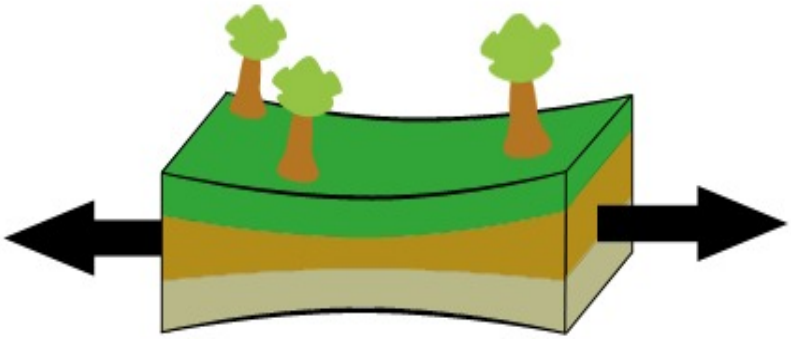
SEAFLOOR SPREADING





How is the rock *pulled* at Divergent Boundaries?

Rock gets <u>THIN</u> in the middle as it is <u>pulled</u> apart.

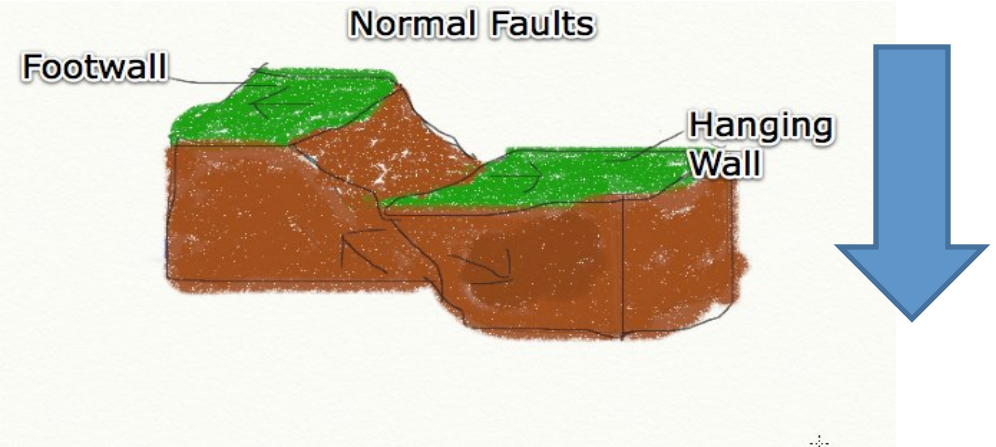


This STRESS is called Tension

What happens when the rock SNAPS from the **Stress of Tension**?

A **Normal Fault** (fault is a break in Earth's crust)

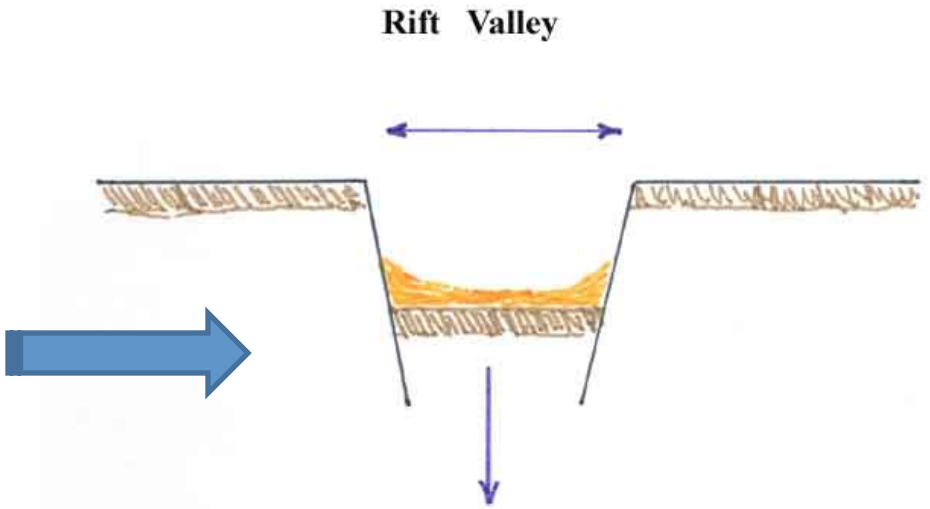
Rock **drops** down as it breaks



What happens next at Divergent Boundaries?

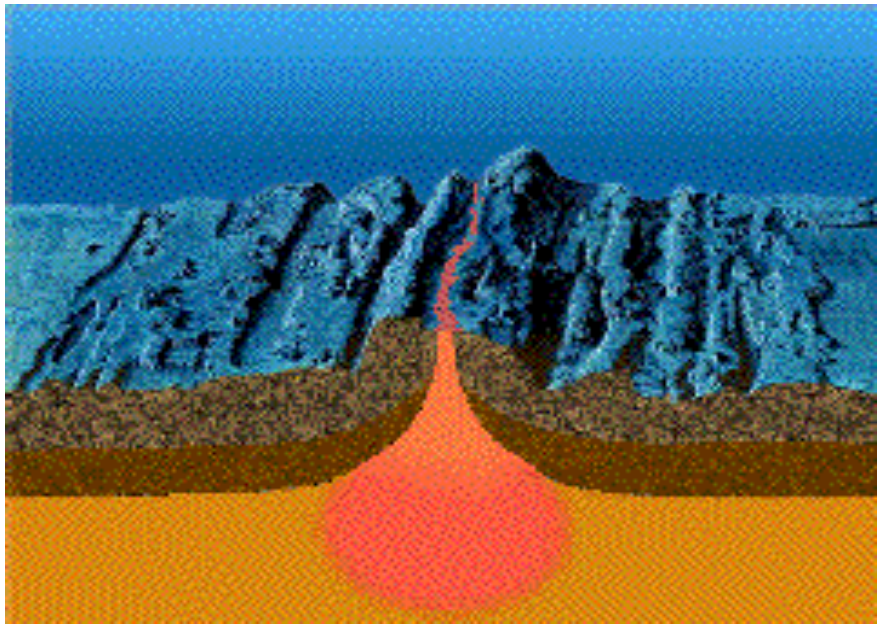
- A geologic feature or event…

  May form <u>RIFT VALLEYS</u> on continents



<u>SEA-FLOOR SPREADING</u>

in the ocean

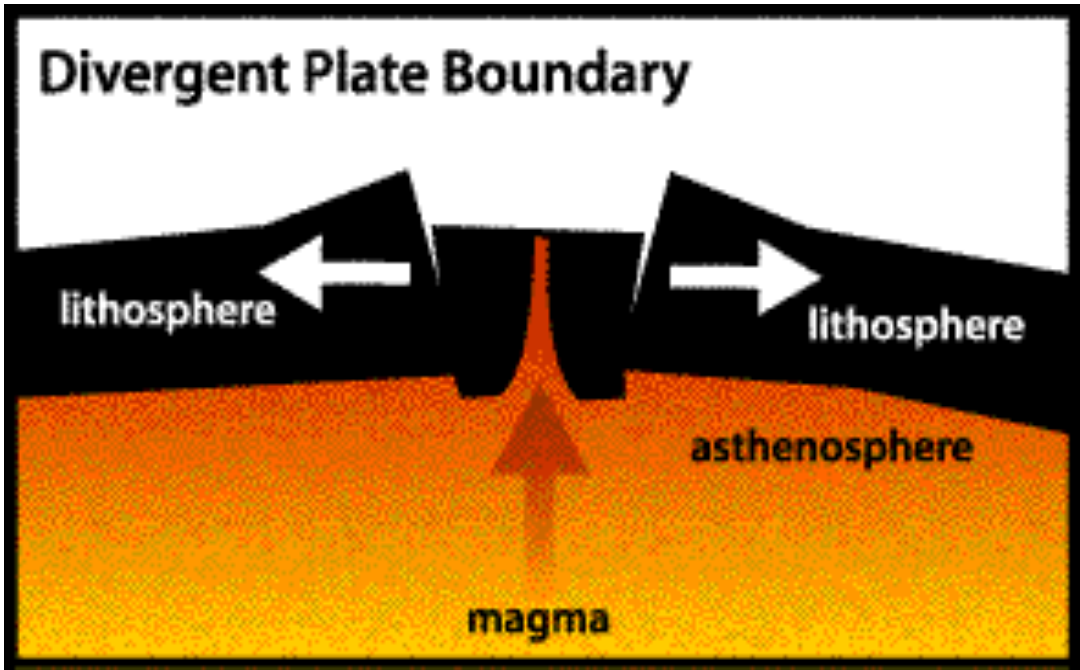


Helpful Hints…

- Divergent is like "dissecting" or "dividing"

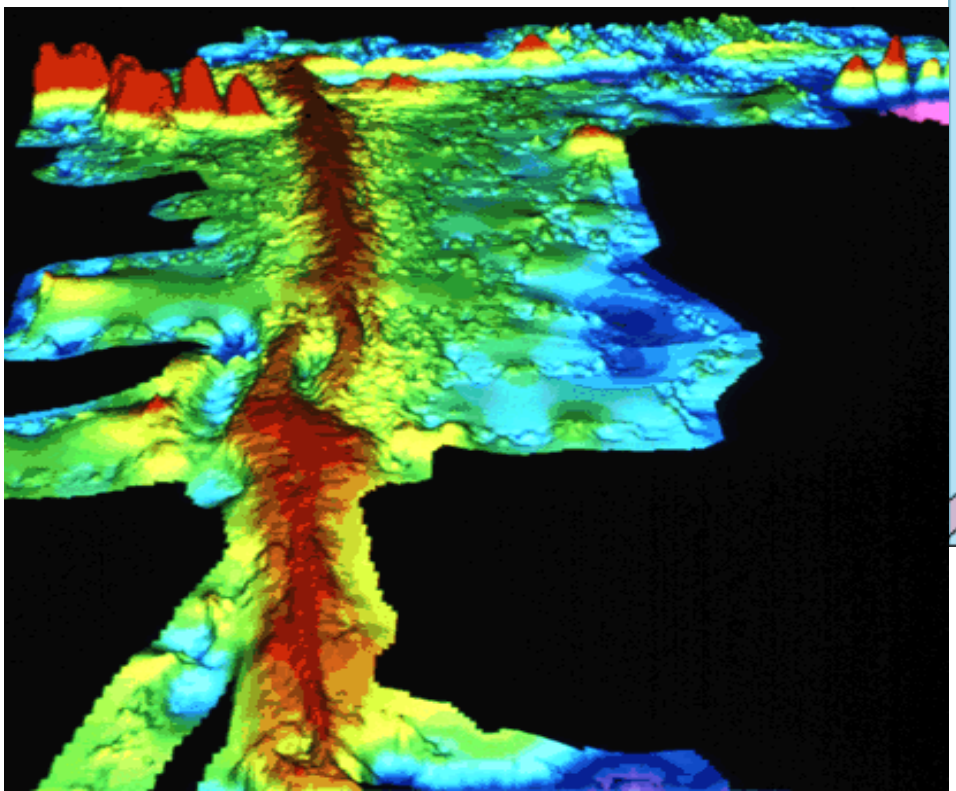
- If you pull warm bubble gum or silly putty, it will thin in the middle until it is stressed so much that it breaks.

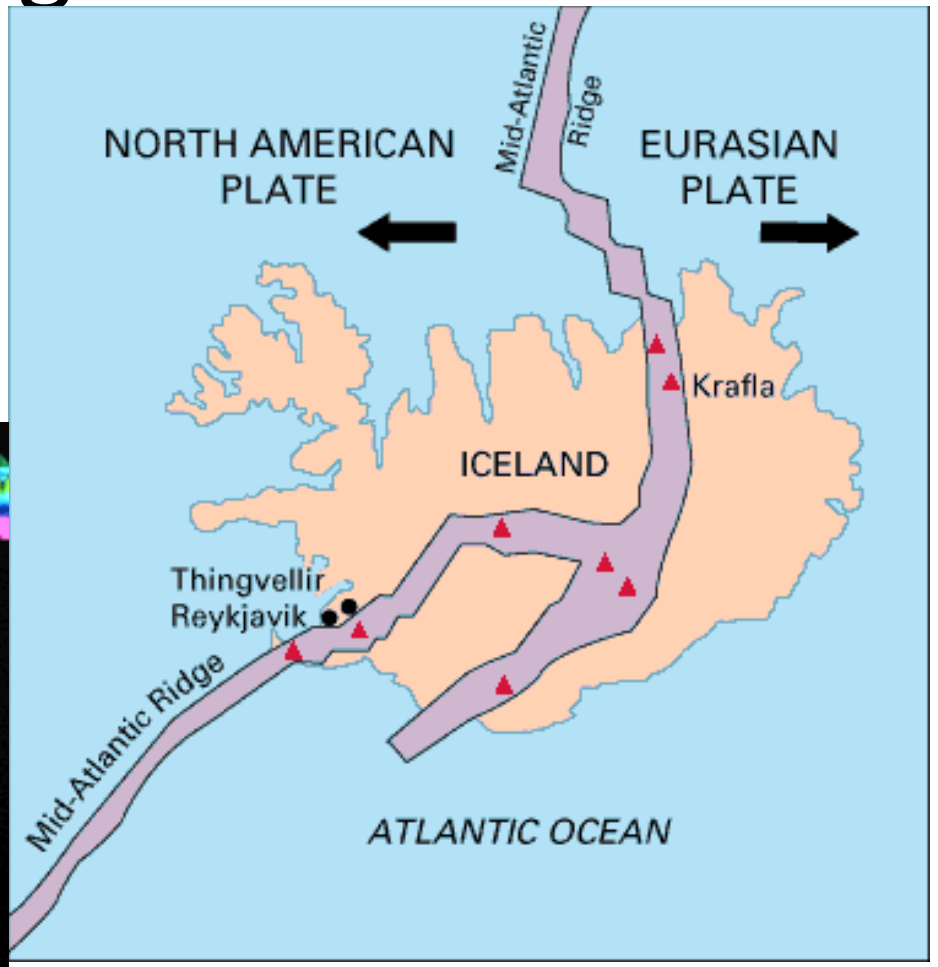
- Happens on land & under H_2O



Features of Divergent Boundaries

- Mid-ocean ridges
- rift valleys
- fissure volcanoes





How is the rock ***pushed*** at convergent boundaries?

A plate boundary where two plates move towards each other.

Boundaries between two plates that are colliding

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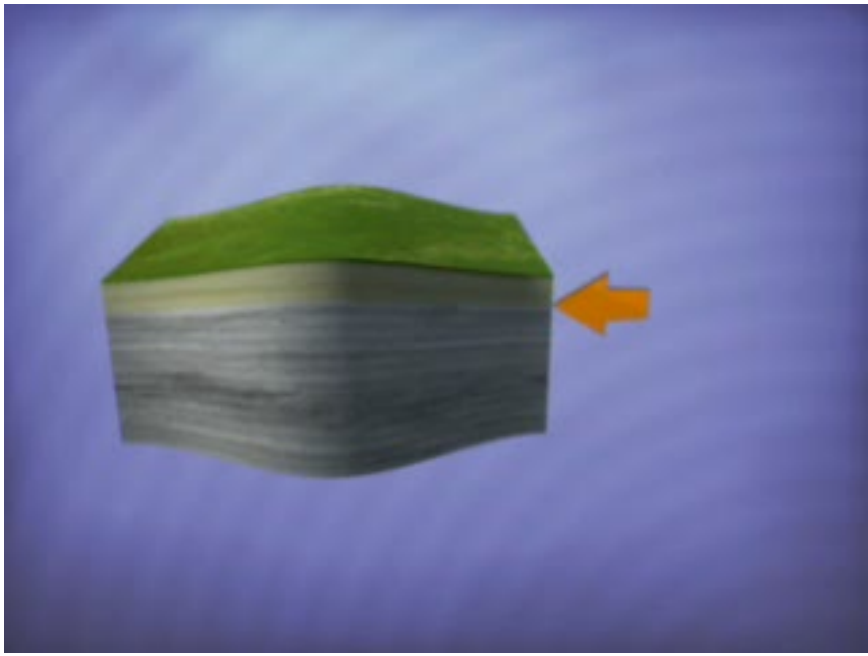
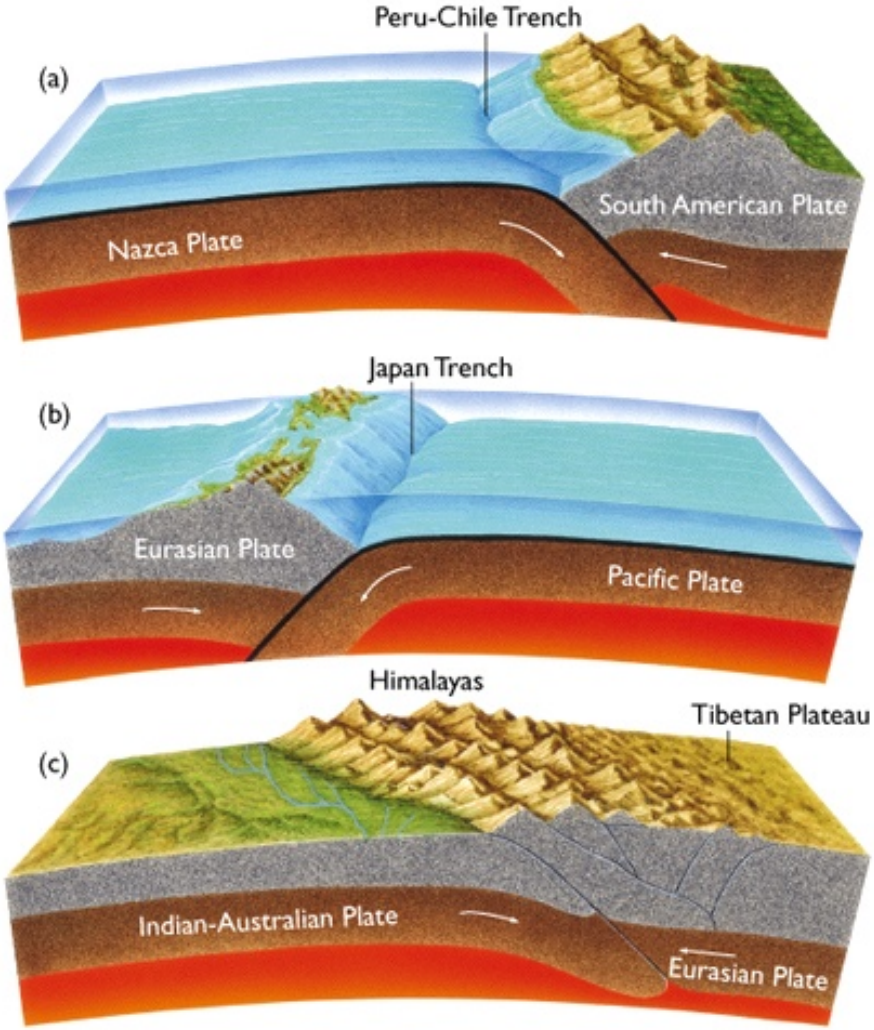
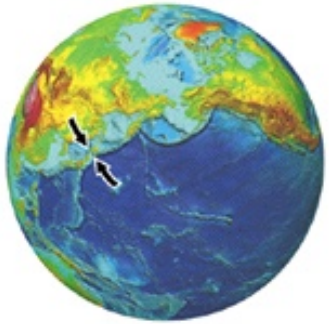
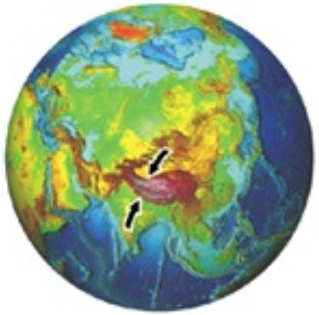


This stress is called **COMPRESSION**

Convergent Boundaries







- Places where plates crash (or crunch) together or subduct (one sinks under)

There are 3 types of Convergent Boundaries…

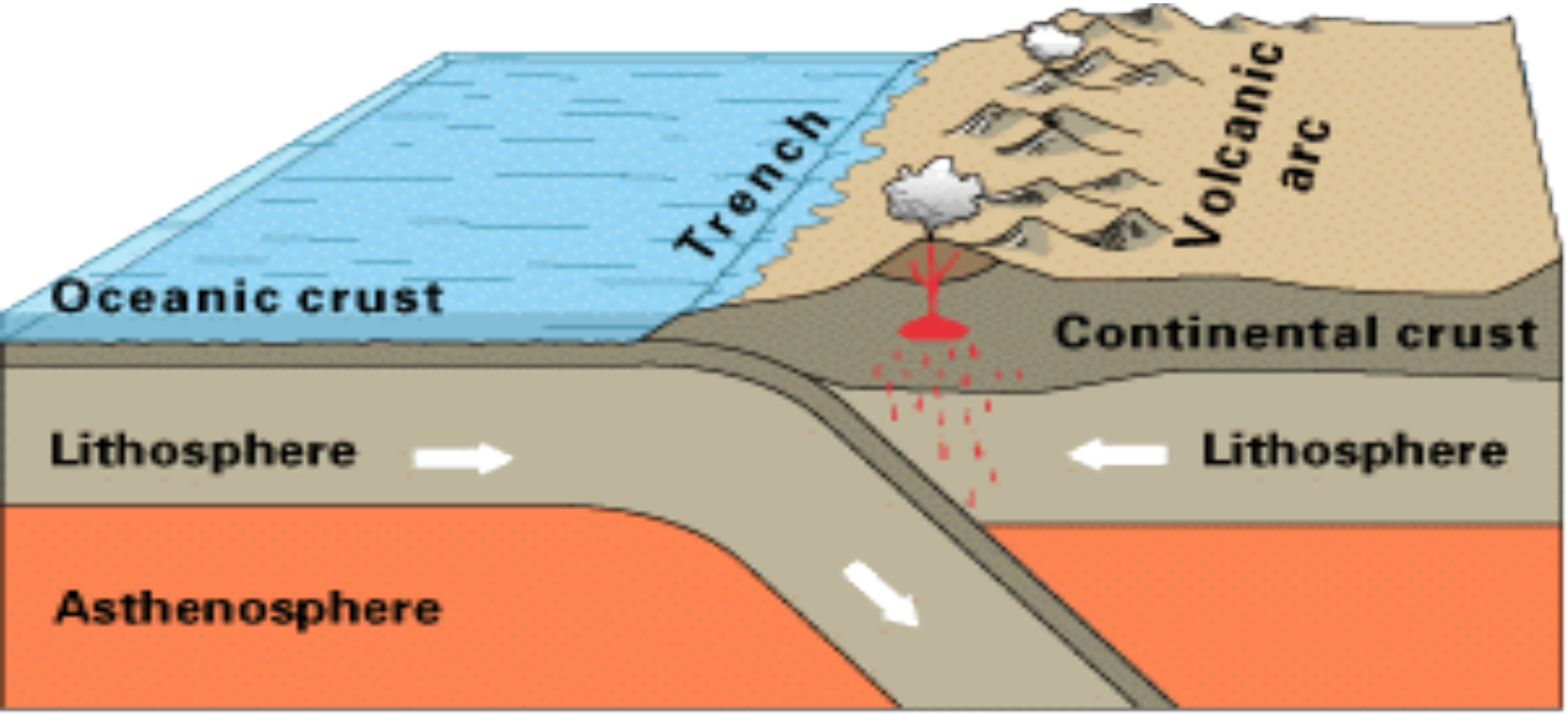
Type 1

Ocean plate colliding with a less dense continental plate

Subduction Zone: The process by which oceanic crust sinks beneath a deep-ocean trench and back into the mantle at a convergent plate boundary.

There are 3 types of Convergent Boundaries…

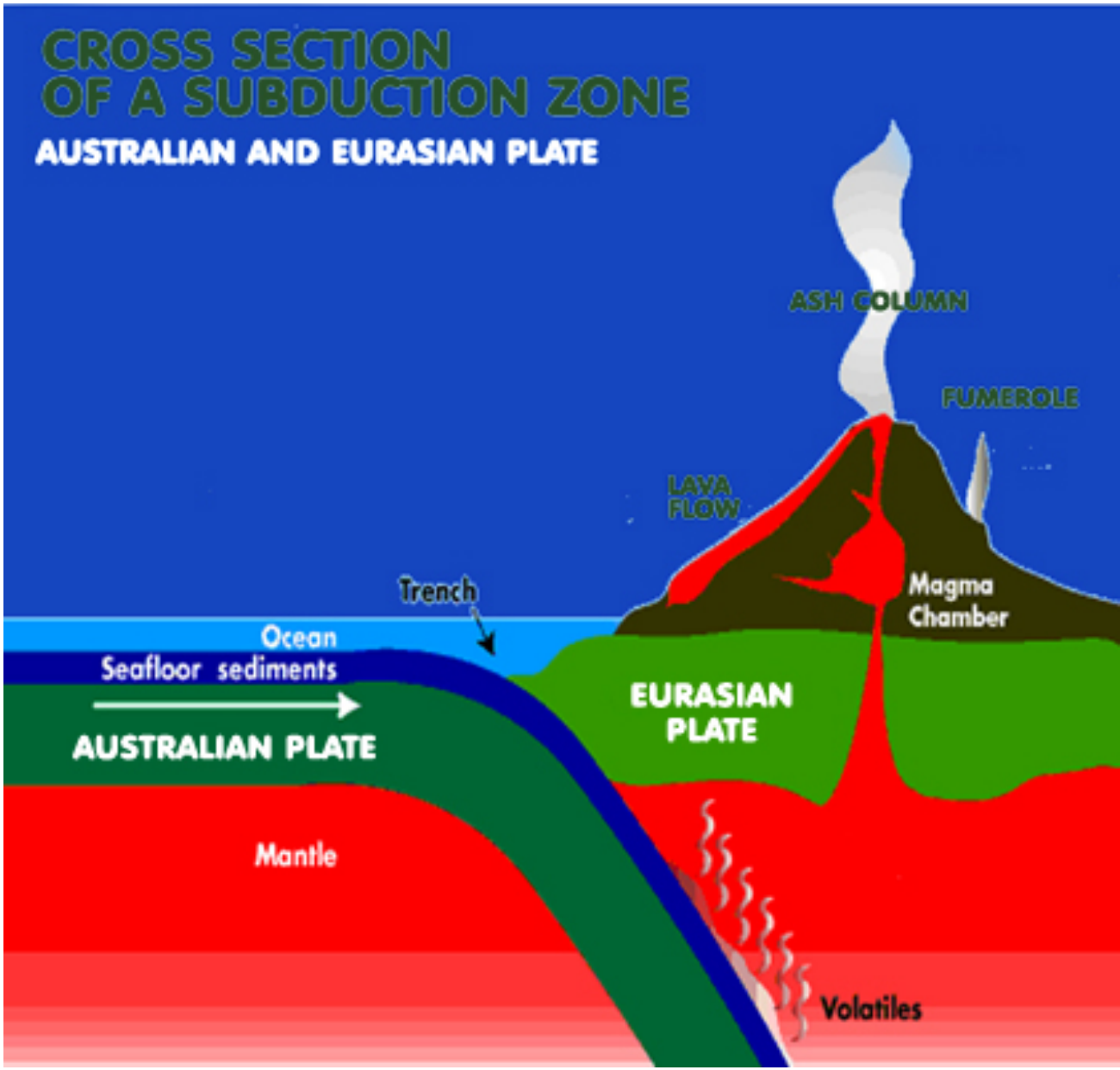
Type 1



Oceanic-continental convergence

What else happens at Convergent Boundaries?

VOLCANOES occur at [subduction zones https://www.youtube.com/watch?v=iF4tCXqpknE](https://www.youtube.com/watch?v=iF4tCXqpknE)

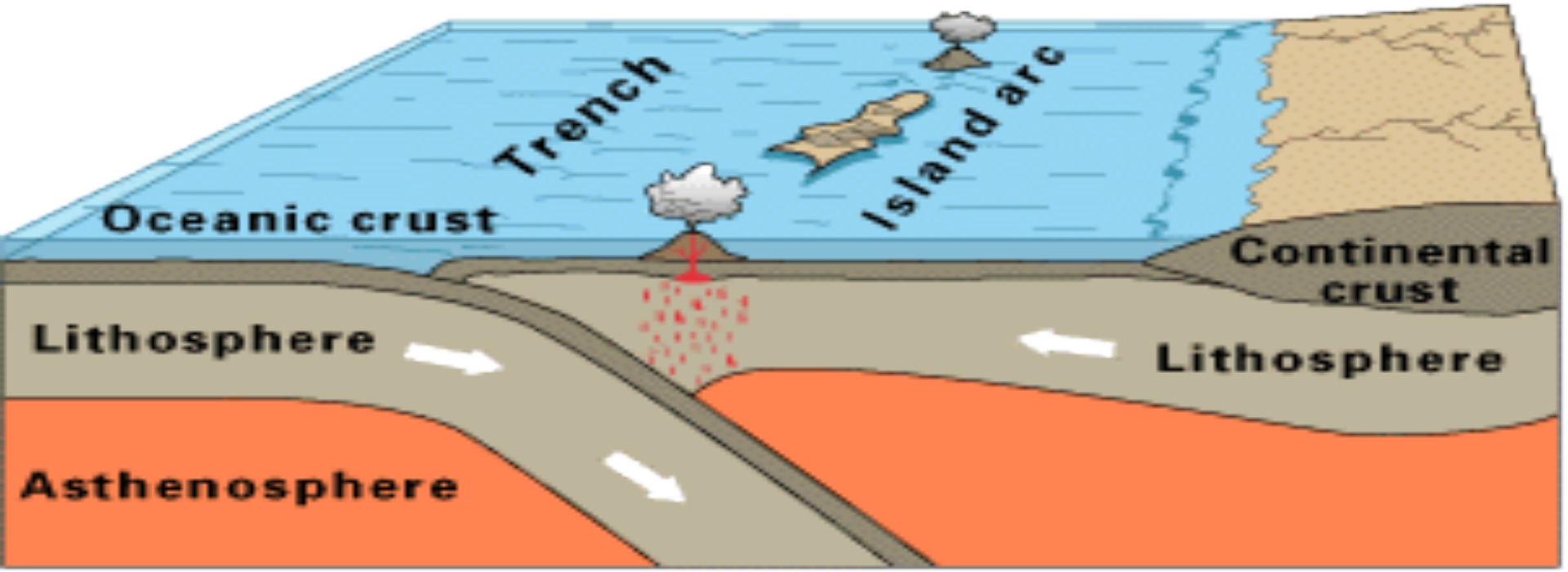


Andes Mountains, South America

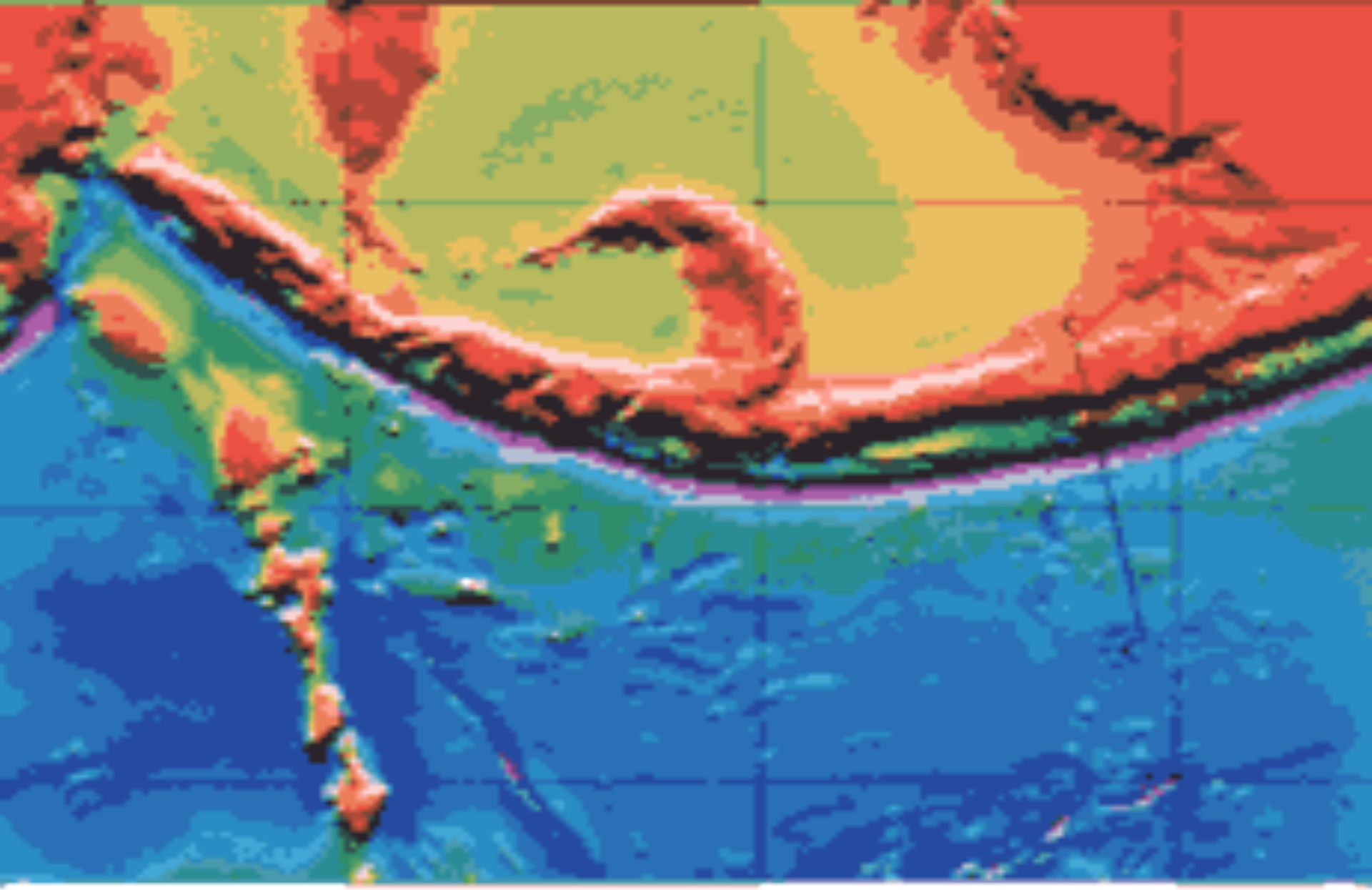
Type 2

- **Ocean plate** colliding with another **ocean plate**

- The less dense plate slides under the more dense plate creating a **subduction zone** called a **TRENCH**



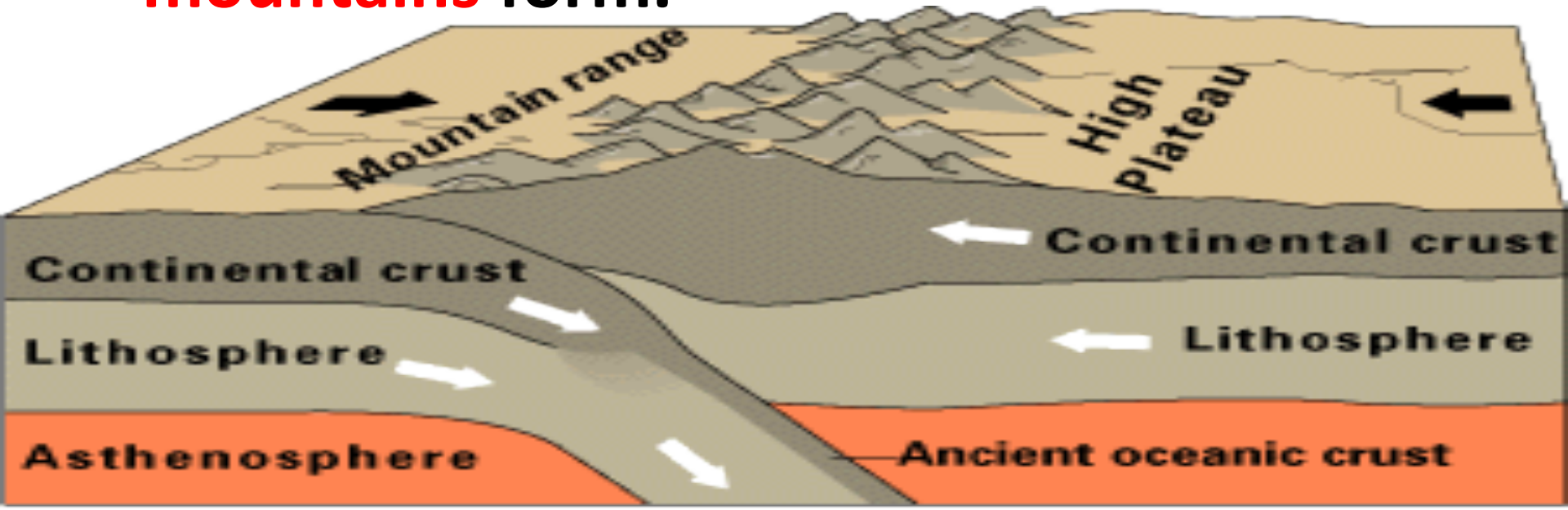
Oceanic-oceanic convergence



Aleutian Islands, Alaska

Type 3

- A **continental plate** colliding with another **continental plate**
- **Have Collision Zones:**
  - A place where **folded** and **thrust faulted mountains** form.



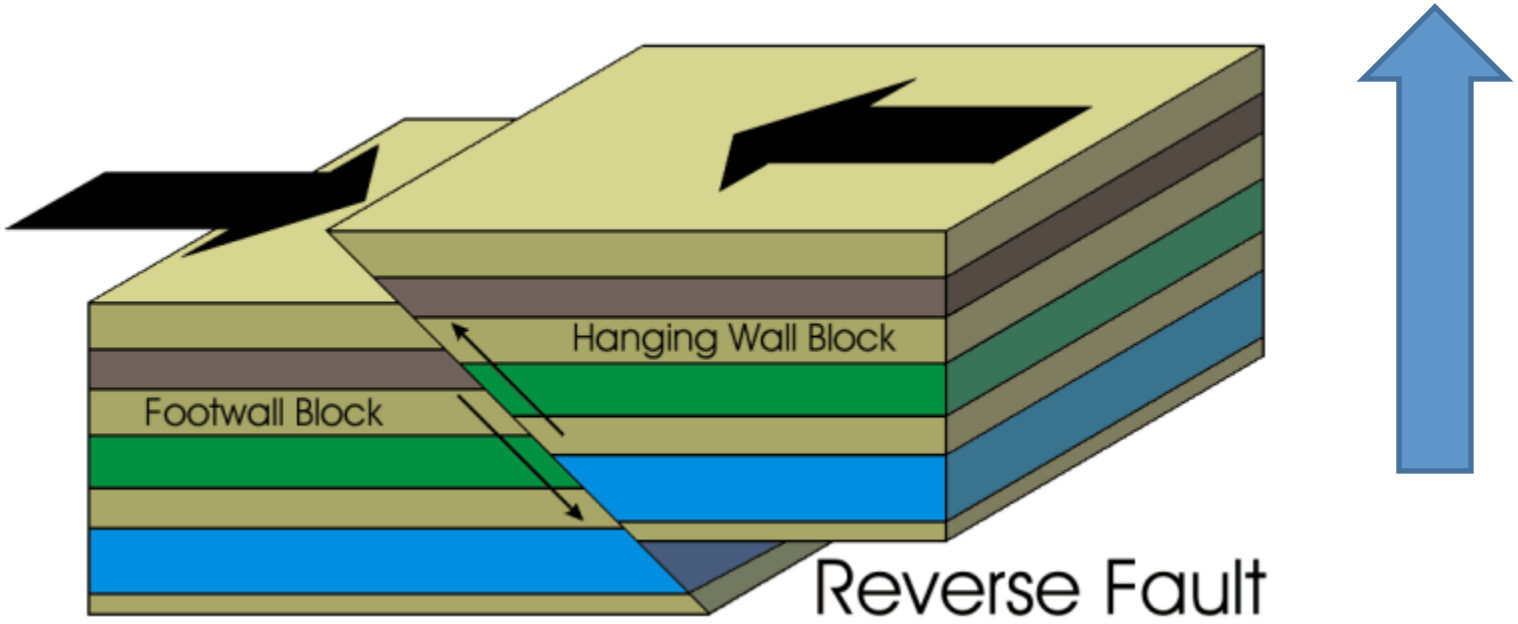
Continental-continental convergence

- May form **Mountain Ranges**.

These are Folded Mountains, like the Himalayas or the Rockies.

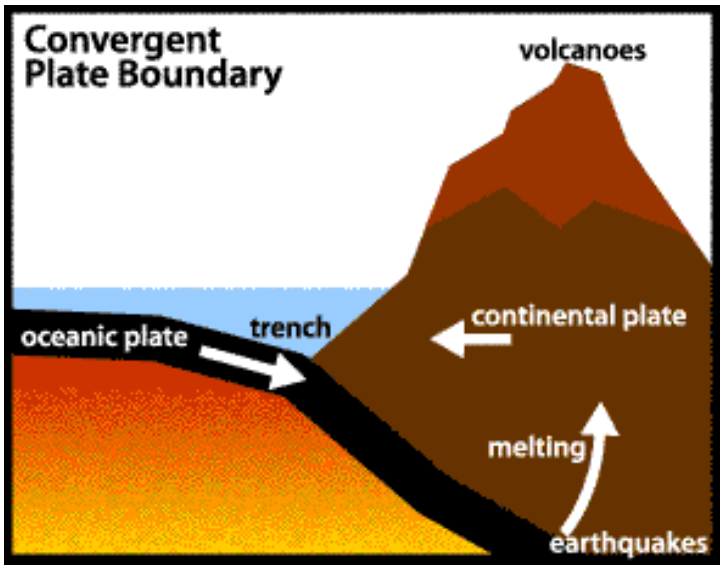
What happens when the rock is squeezed from the **Stress of Compression**?

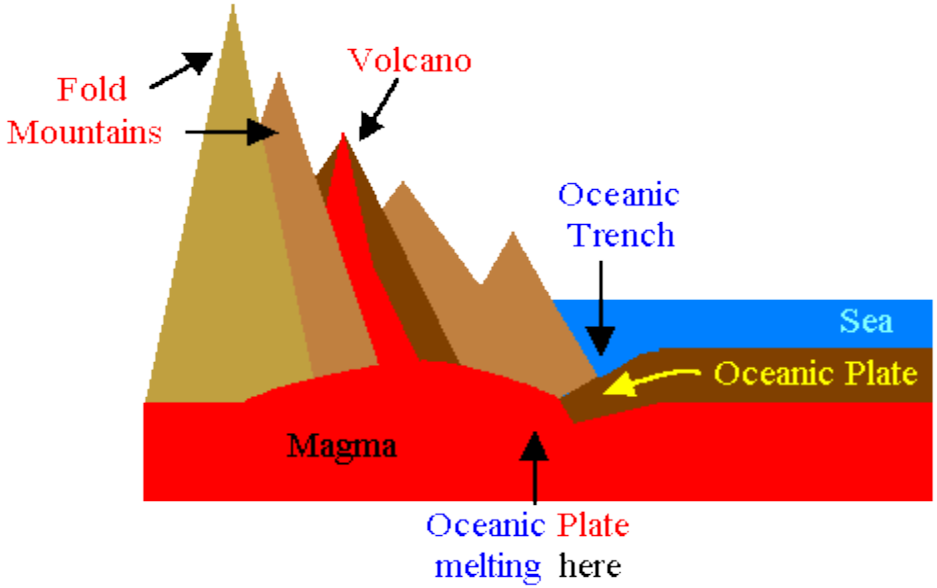
- A **REVERSE FAULT**
- Rock is forced **upward** as it is squeezed.



Helpful Hints…

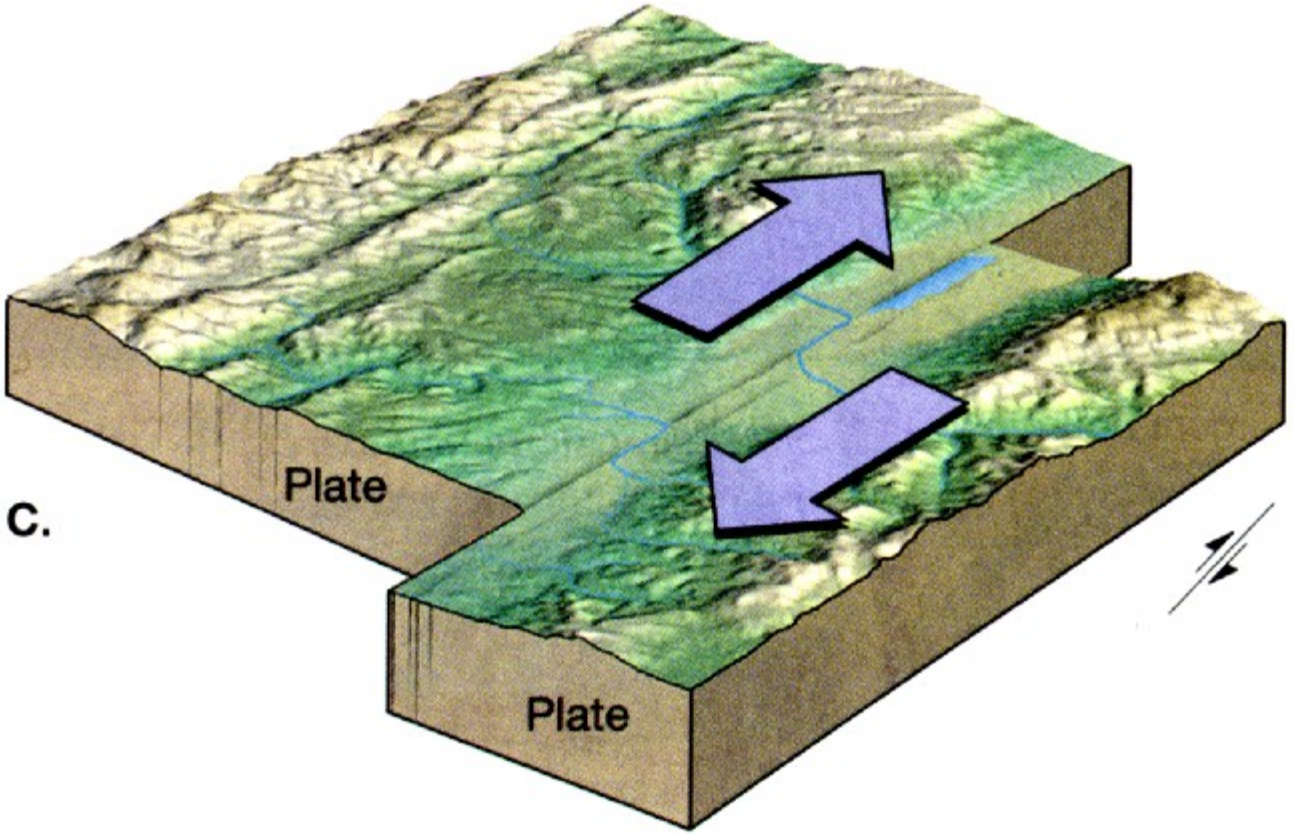
- Convergent = "Connecting" boundaries
- May work like a trash compactor smashing rock.
  - Rock goes crunches up to make folded mountains.
  - Rock goes down "under" @ subduction zone.





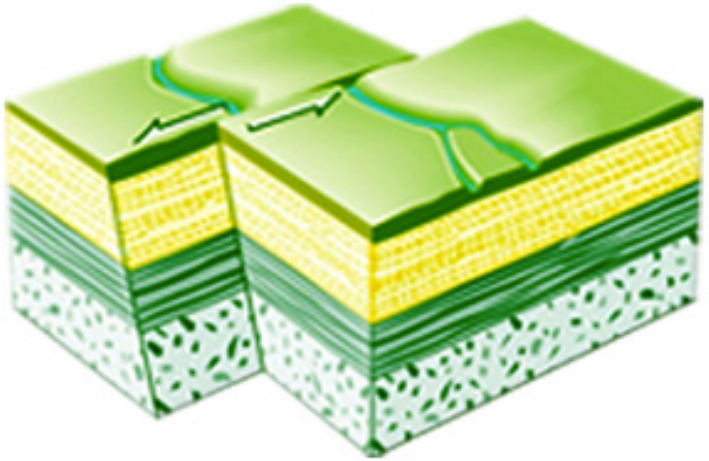
Transform Boundaries

A plate boundary where two plates move past each other in opposite direction.



How is the rock broken at Transform Boundaries?

- Rock is pushed in two **opposite directions** (or sideways, but no rock is lost)

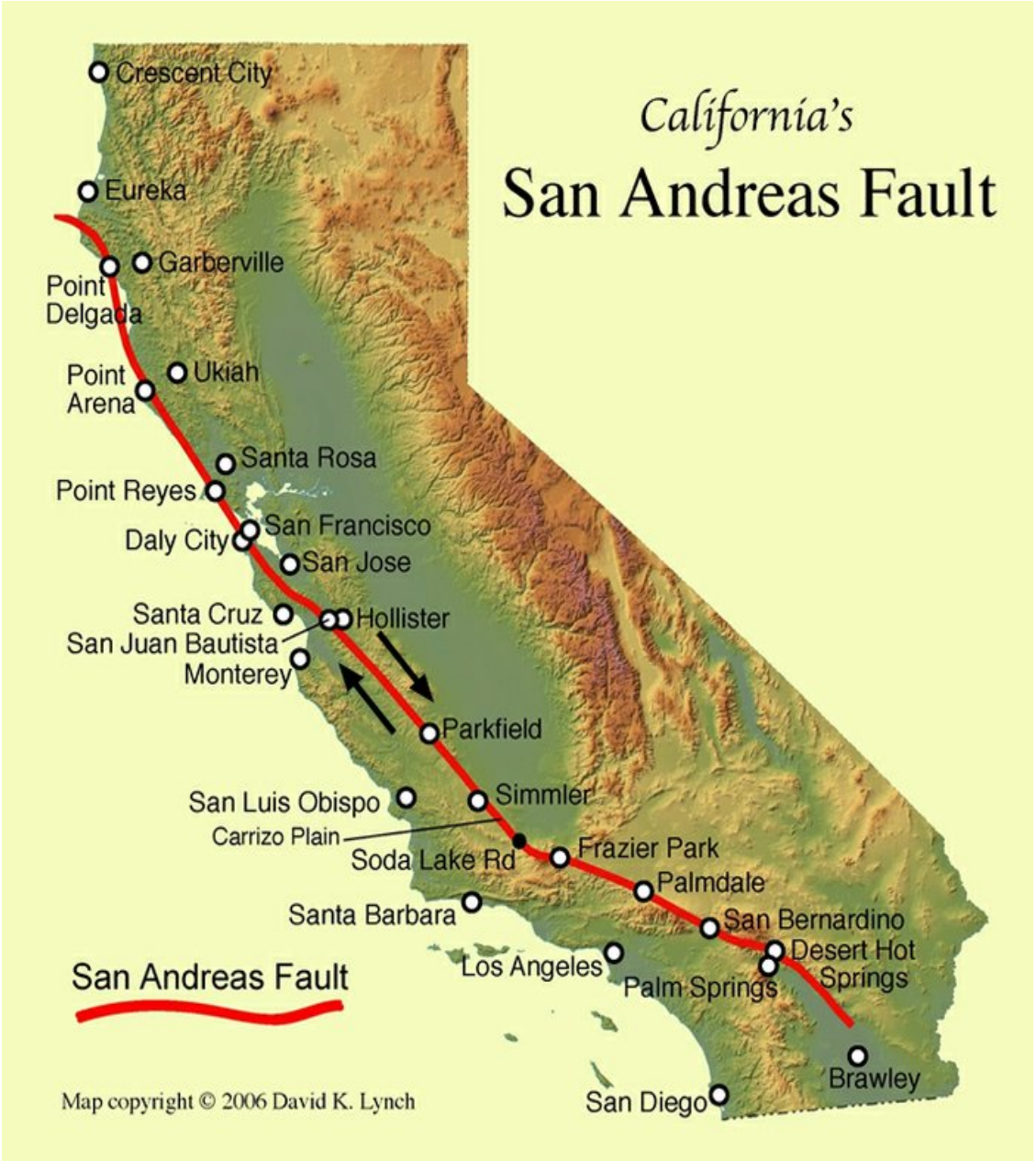


Transform Fault

- This stress is called **SHEARING**

What happens next at Transform Boundaries?

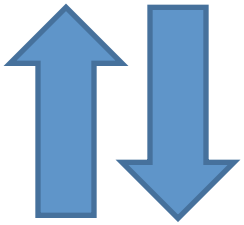
- May cause **<u>Earthquakes</u>** when the rock snaps from the pressure.
- A famous fault @ a Transform Boundary is the *San Andreas Fault in California*.



San Andreas Fault, CA

What happens when the rock is sheared (or "cut") from the **Stress of Shearing?**

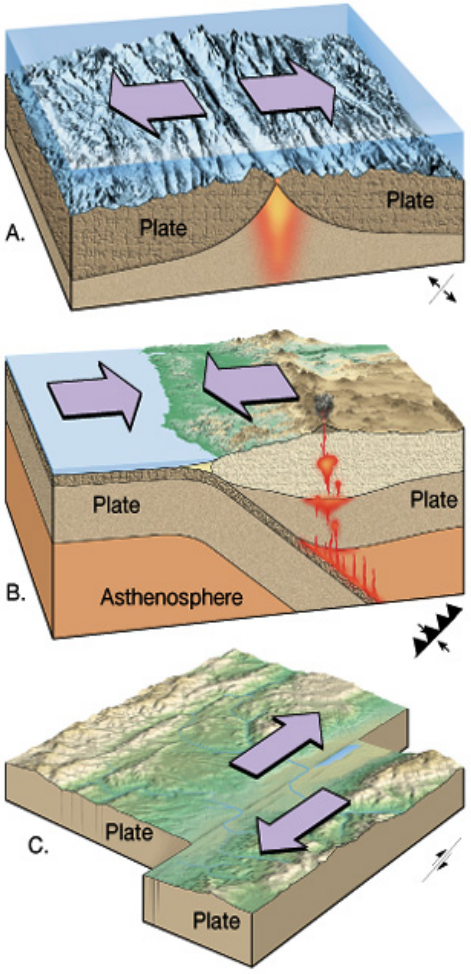
- A **STRIKE-SLIP FAULT**
- Rocks on each side of the fault **slip past each other** as they break.



Helpful Hints…

- Shearing means cutting ("Shears" are like scissors)
- Transform boundaries run like trains going past each other in different directions & they shake the ground!

Plate Boundaries:



Can you match the boundary name correctly with its diagram?

A._____

B._____

C._____

Plate Boundaries:

- Correct Answers:

A. Divergent

B. Convergent

C. Transform