

This
**Dynamic
Earth:**

*the Story of
Plate Tectonics*

Online edition

OBJECTIVE:

Explain the theory of Plate Tectonics.

COMPARE AND CONTRAST DIVERGENT,
CONVERGENT AND TRANSFORM
BOUNDARIES. ***very important.

Describe what geologic features form at each
of the three CONVERGENT boundary
types (oceanic-oceanic, oceanic-
continental, continental-continental).

For each boundary type, give an example of
where they occur on Earth.

Focus on Earth Science PLATE

TECTONICS AND EARTH'S STRUCTURE

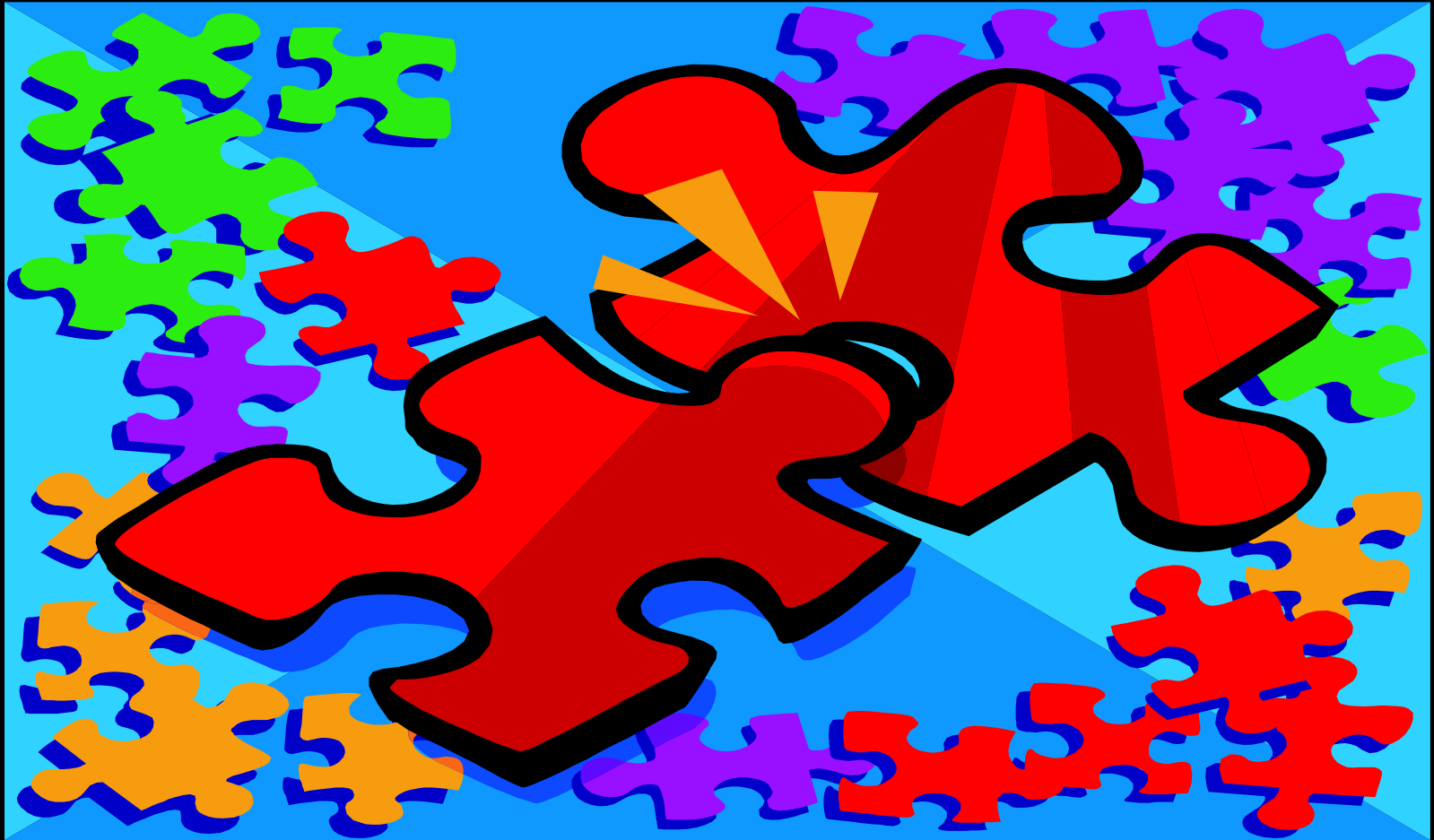
- **S6E5. Students will investigate the scientific view of how the earth's surface is formed.**
- e. Recognize that lithospheric plates constantly move and cause major geological events on the earth's surface.
- f. Explain the effects of physical processes (plate tectonics, erosion, deposition, volcanic eruption, gravity) on geological features including oceans (composition, currents, and tides).
- g. Describe how fossils show evidence of the changing surface and climate of the Earth

- Understand (Know) that lithospheric plates regularly shift and produce major geological events on the earth's surface.

Words we need to know

- Plate tectonics
- Continental Drift
- Pangaea
- Divergent Boundaries
- Convergent Boundaries
- Transform Boundaries
- Subduction
- Alfred Wegner
- Mid Ocean Ridge
- Deep Ocean Trench
- Convection

What do you know about
Pangaea?



Continental Drift

A Segment of: [A First Look: Earth](#)

**The Ocean Floor: Clues About
Continental Drift on Earth**

A Segment of: [Continents Adrift:
An Introduction to Continental Drift
and Plate Tectonics](#)

Restless Continents

The Drifting Continents

- The scientist Alfred Wegener hypothesized that the continents were once a single landmass and drifted apart. This single landmass was called Pangaea. This scientist's hypothesis is supported by fossils and continent's shapes fitting together. Later new evidence, the sea-floor spreading was discovered to support this scientist's theory. This takes place at midocean ridges.



Supercontinent



Geological features



Fossil evidence

What Is the Theory of Plate Tectonics?

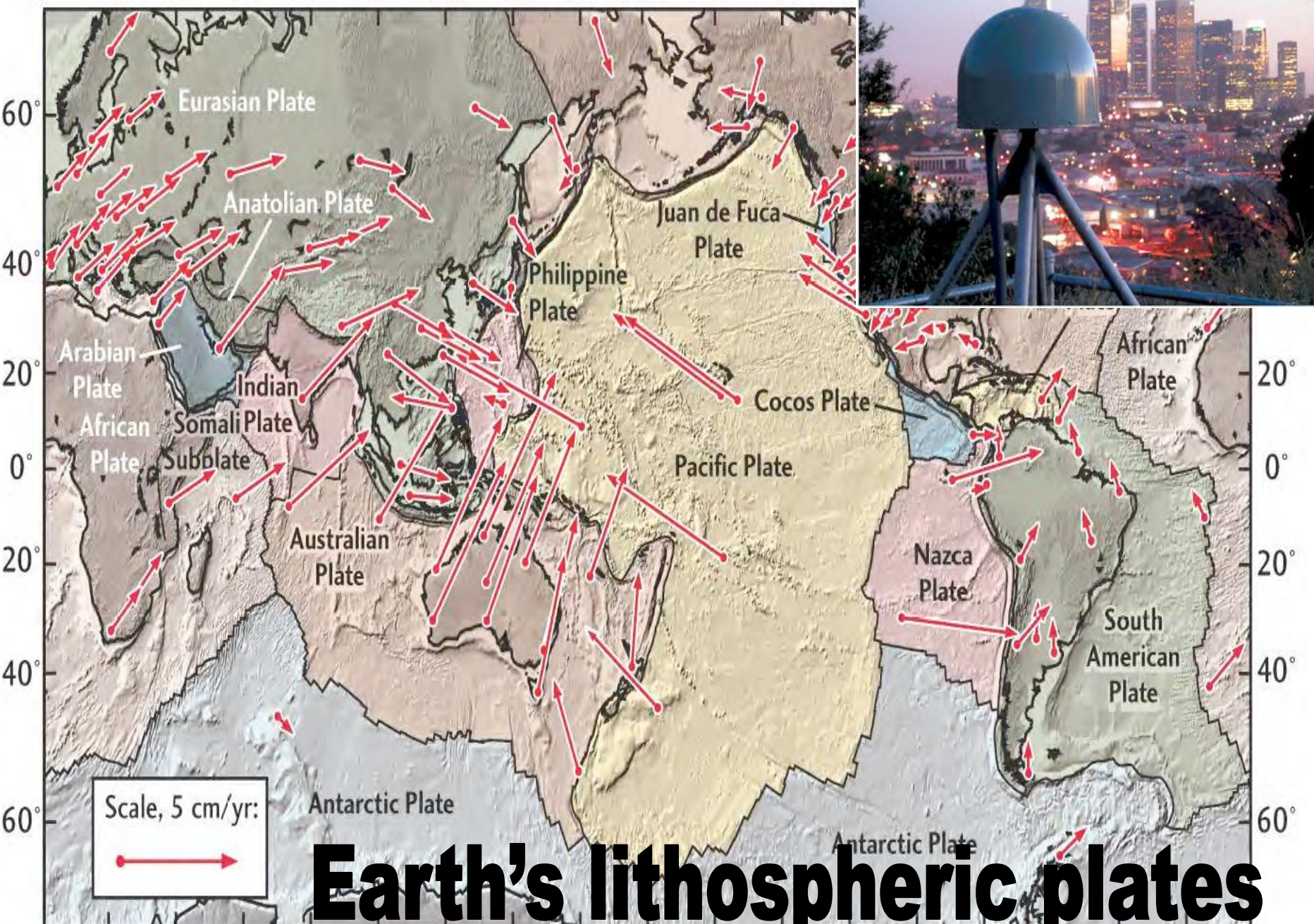
- The theory of plate tectonics states that Earth's lithosphere is broken into many pieces—tectonic plates—that move slowly over the asthenosphere. Scientists can detect this motion only by using special equipment, such as global positioning systems (GPS). Tectonic plates can collide, separate or slide past each other.

A tectonic plate is a slab of Earth's?

lithosphere

- Predict whether the plates will ever come back together again as a supercontinent? Explain your reason with facts

0° 20° 40° 60° 80° 100° 120° 140° 160° 180° 160° 140° 120°



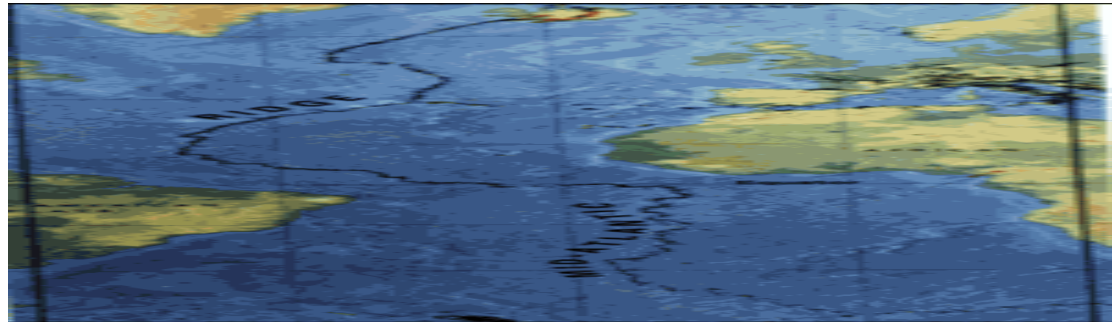


Earth's lithospheric plates

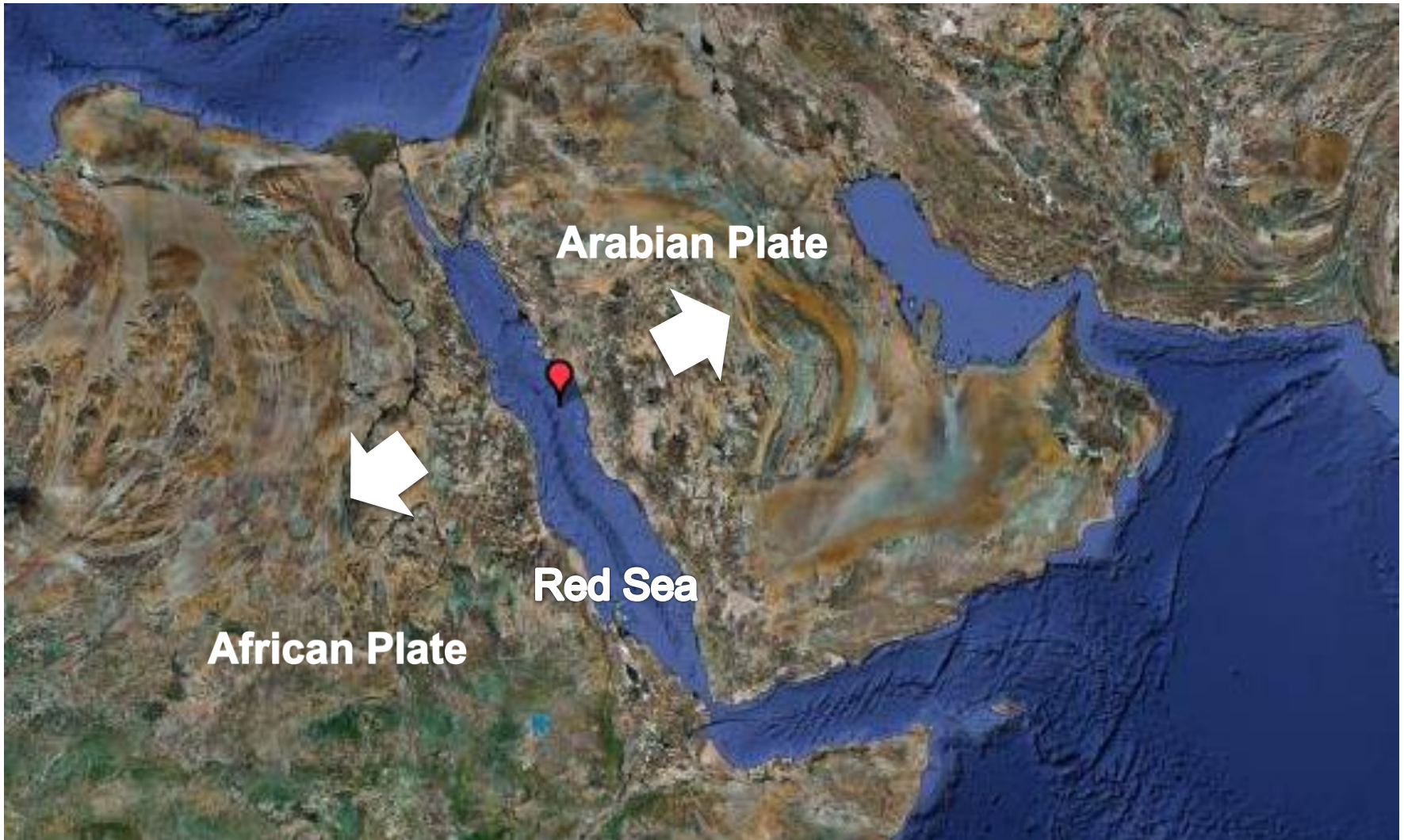
What Happens Where Tectonic Plates converge ?

The places where tectonic plates meet are called *boundaries*.

- **Divergent boundaries**, where tectonic plates move apart/separate. Mid-ocean ridges form at these divergent boundaries because the plates are **pulling away** from each other and magma rises to fill the gap. The boundary forms **Rift Valleys**

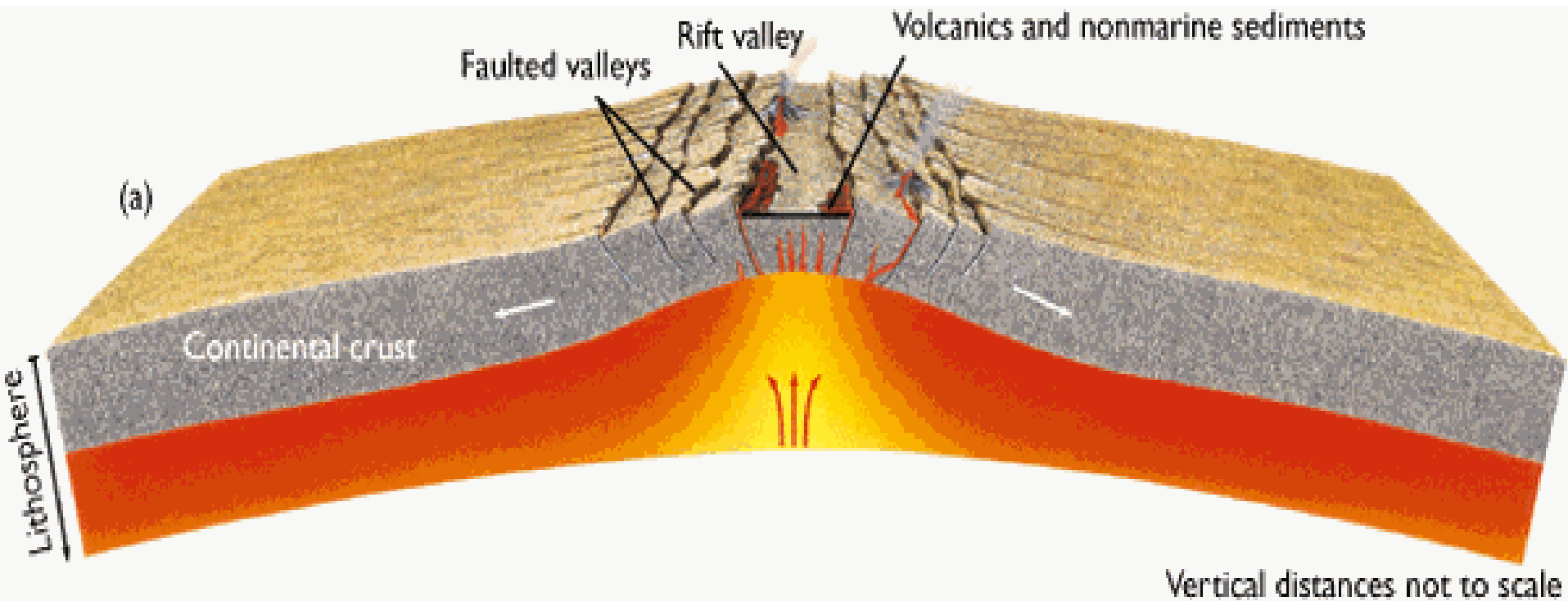


Divergent Boundary – Arabian and African Plates

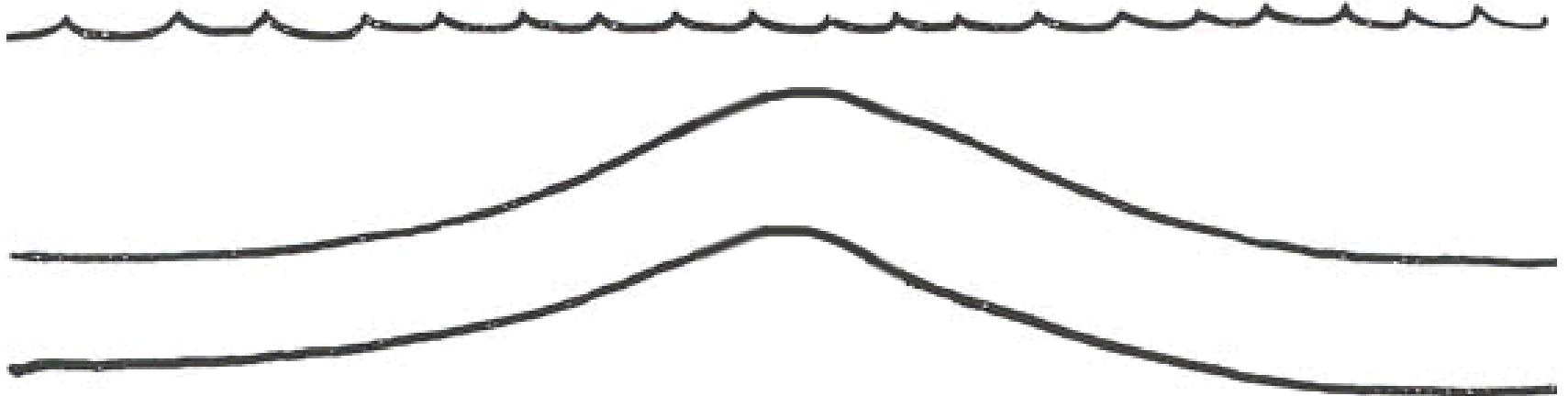


Divergent boundaries -- where new crust is generated as the plates pull away from each other.

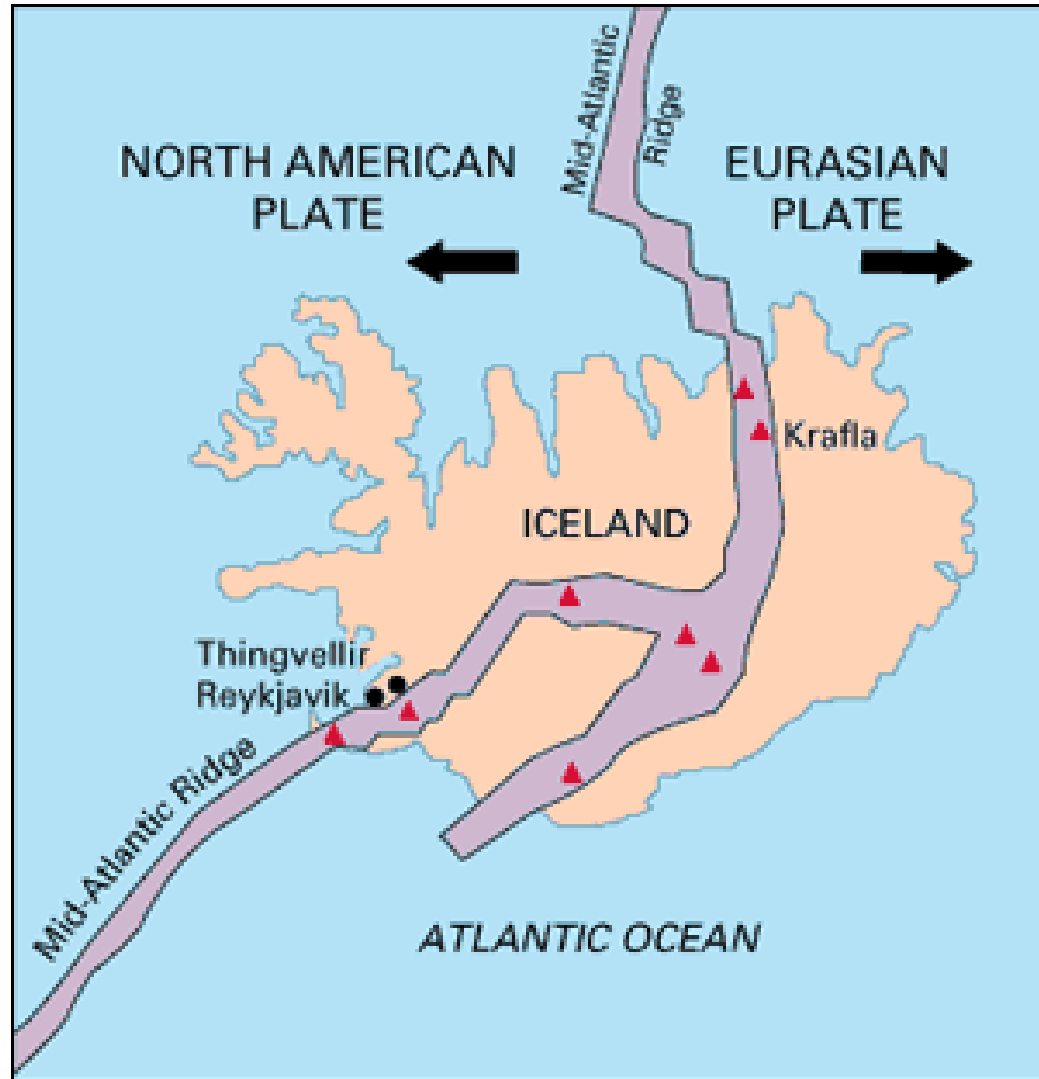
CONTINENTS SPLIT BY STRETCHING AND RIFTING



Divergent Boundary - Oceanic



Divergent Boundary – Iceland



Convergent boundaries, where plates collide/move together. What happens at the boundary depends on the type of crust at the leading edge of each tectonic plate. There are three different types of convergent boundaries:

Convergent Boundary – Indian and Eurasian Plates

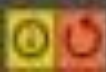
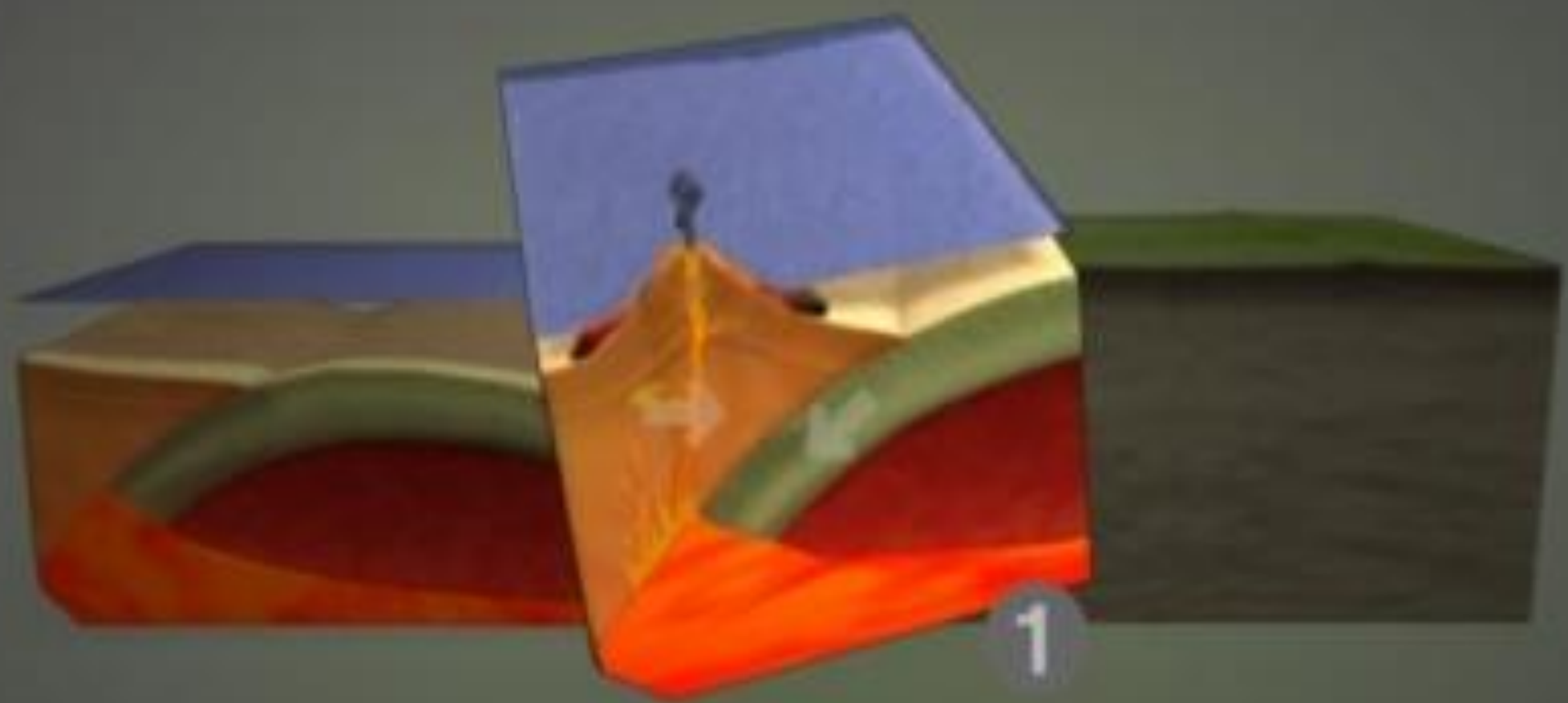


Continental-Continental Boundaries

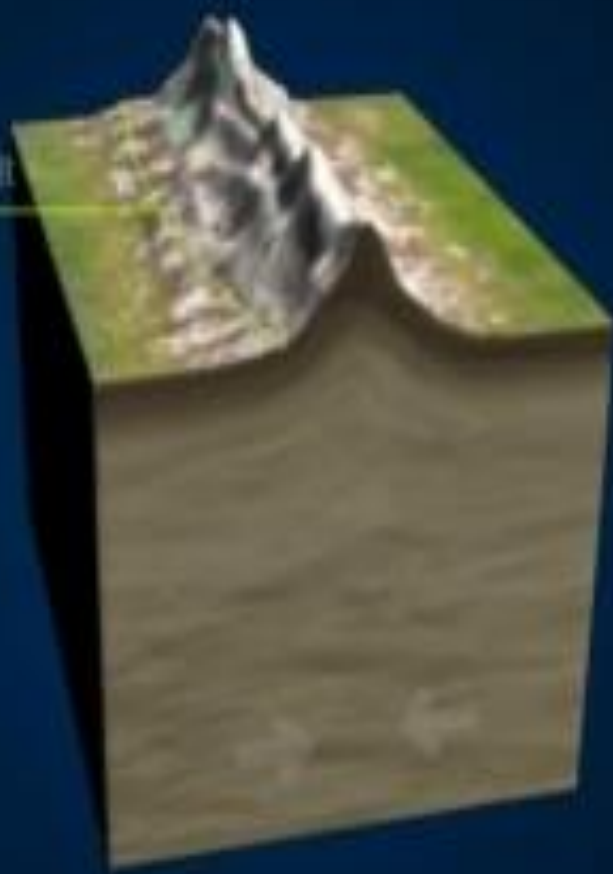
- These form when continental lithosphere on one plate collides with continental lithosphere on another plate. Continental-continental convergent boundaries can produce very tall mountain ranges, such as the Himalayas.

Mountain





Mountain Belt

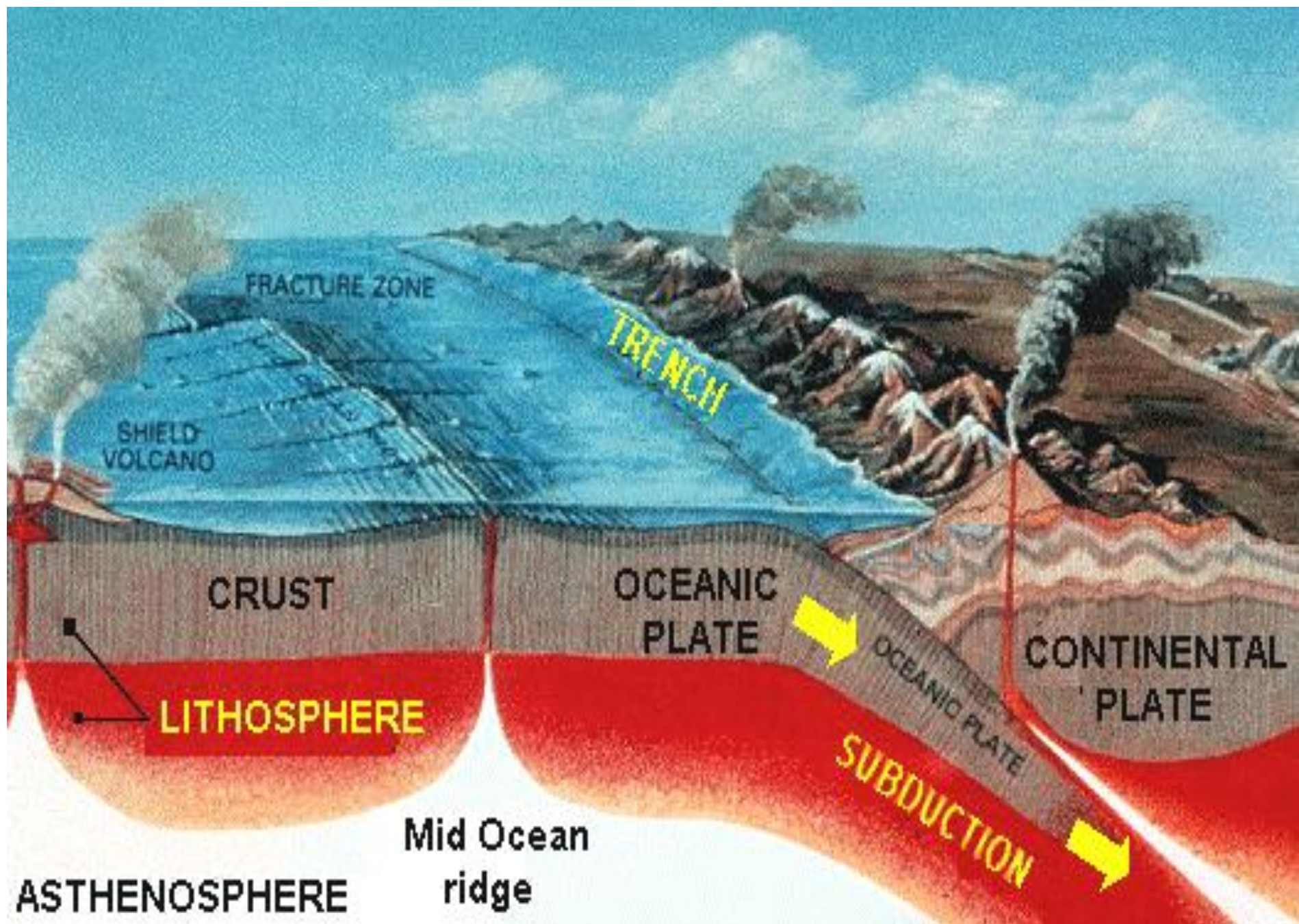


What happens during a continental-continental collision?

- **mountain** ranges

Continental-Oceanic Boundaries

form when **continental** crust on one plate collides with denser **oceanic** crust. When the **denser** oceanic crust sinks into the asthenosphere a **subduction** zone is created. A deep ocean trench can be formed at this boundary.

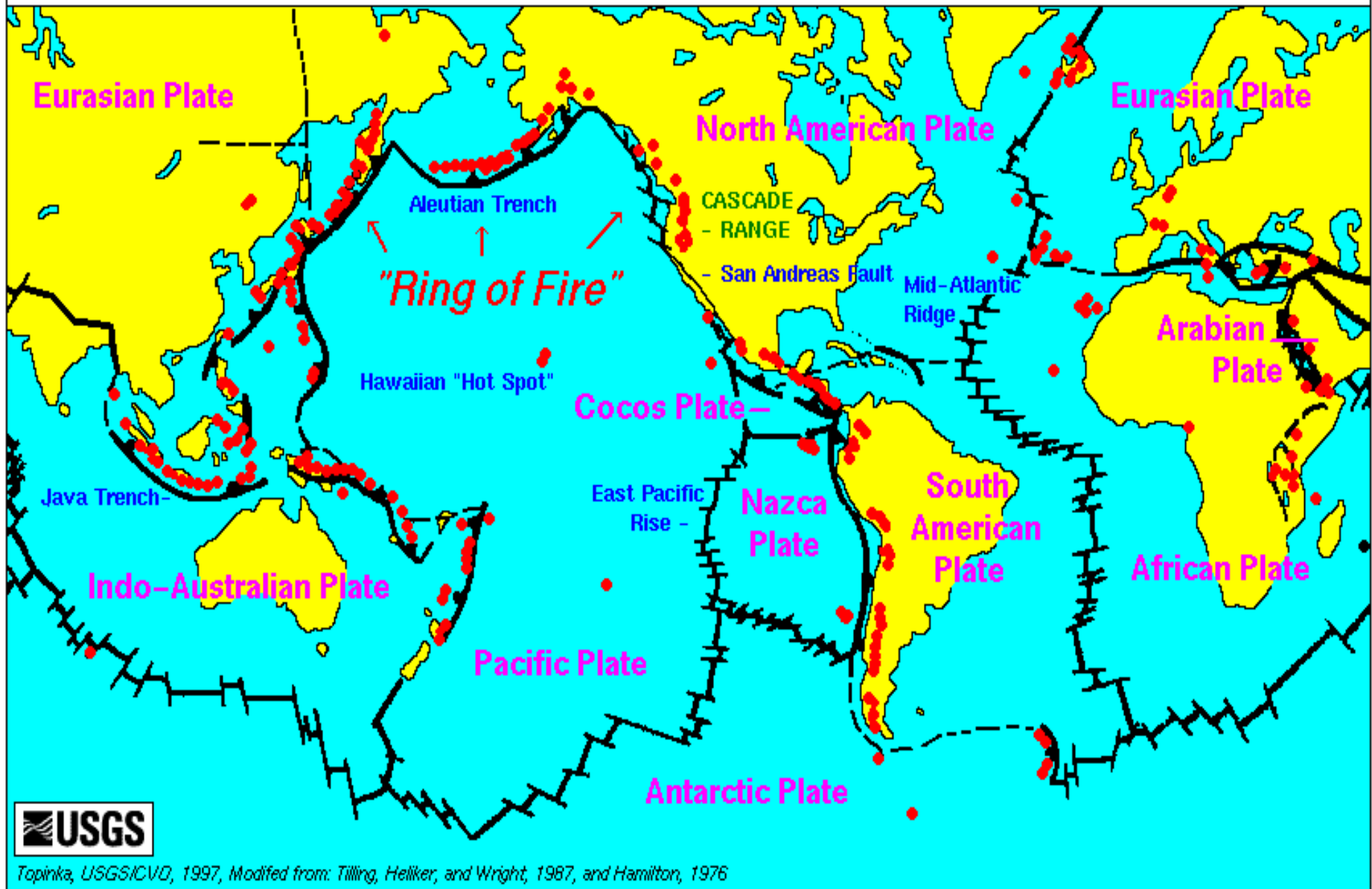


- ***Oceanic-Oceanic***
Boundaries

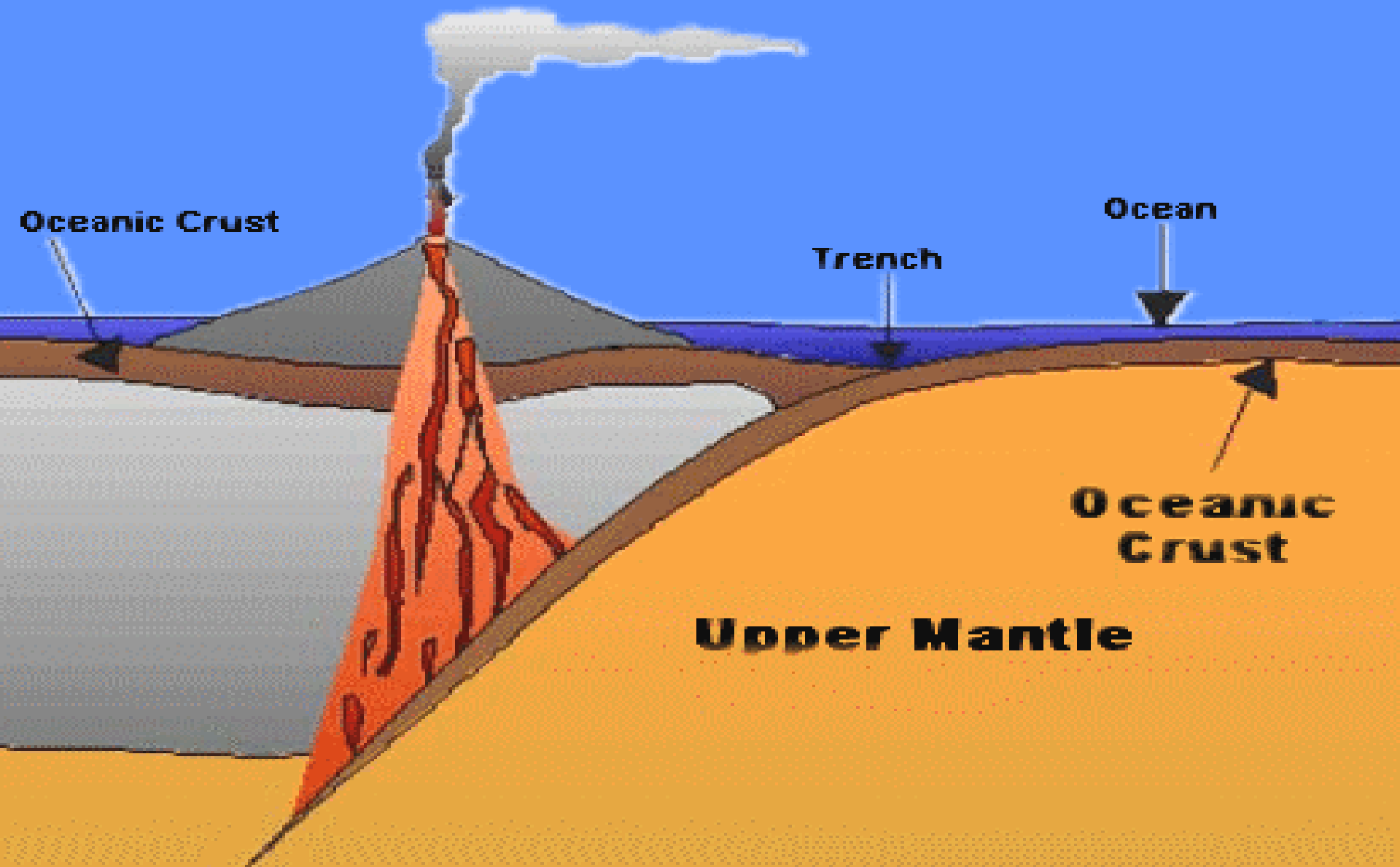
These form when oceanic crust collides with oceanic crust.

One of the plates subducts beneath the other. A series of volcanic islands, called an island arc, can form along the plate boundary.

Active Volcanoes, Plate Tectonics, and the "Ring of Fire"



ISLAND - ARC VOLCANO



Oceanic Crust

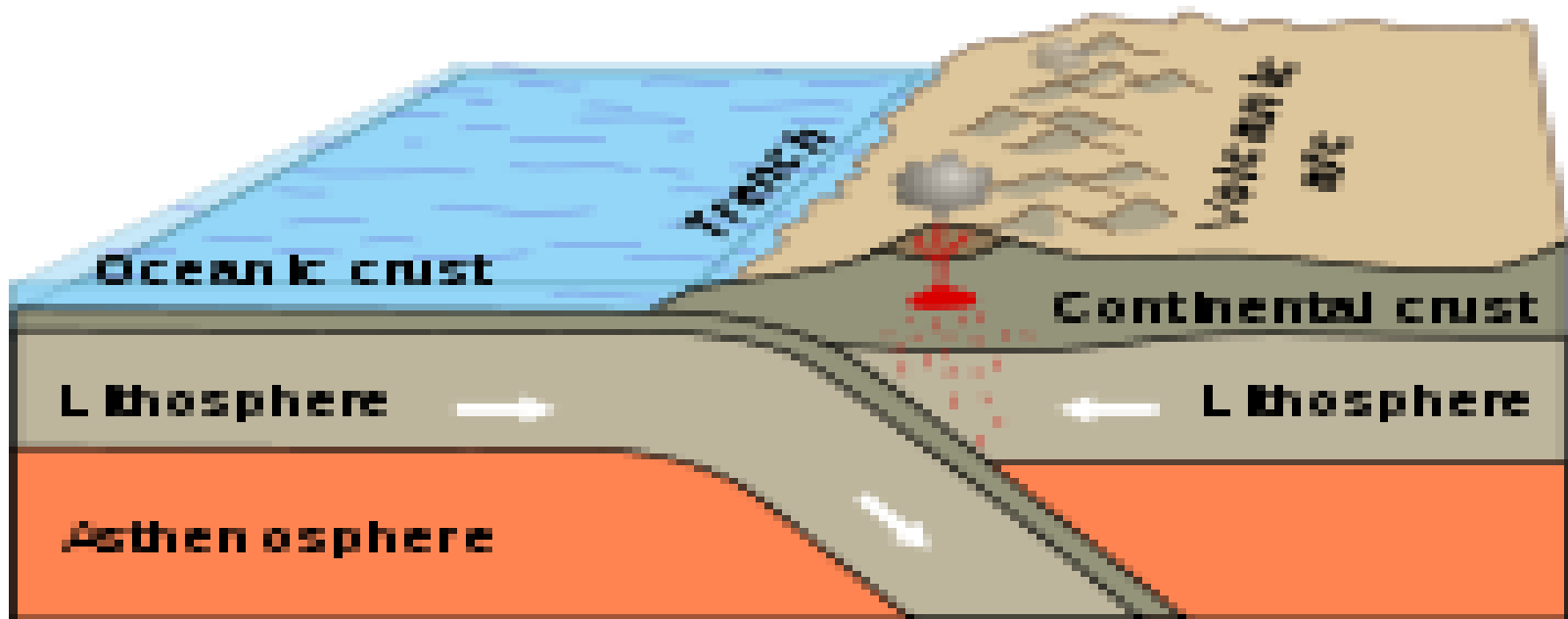
Trench

Ocean

Oceanic Crust

Upper Mantle

- **Explain** Why does oceanic lithosphere sink beneath continental lithosphere at convergent boundaries?



Answer

- Oceanic lithosphere is older and **denser** than continental lithosphere.

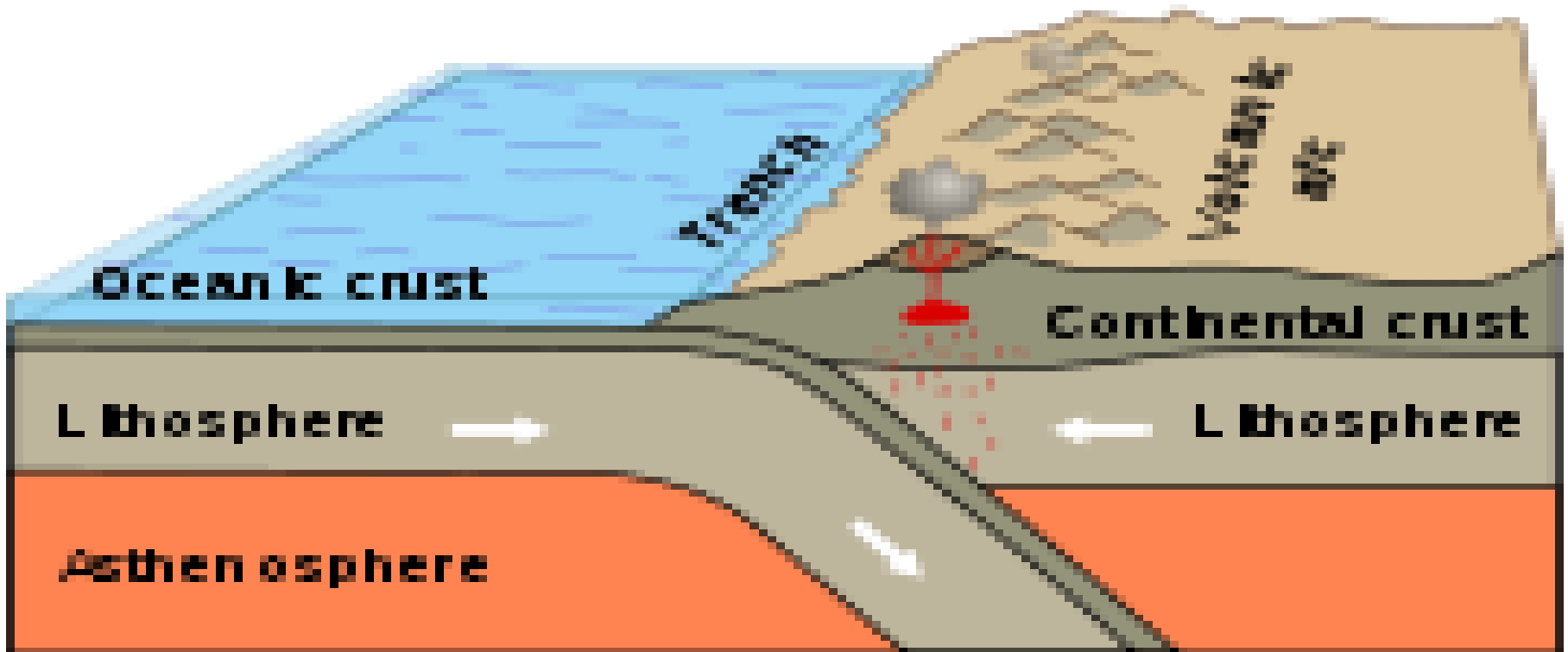
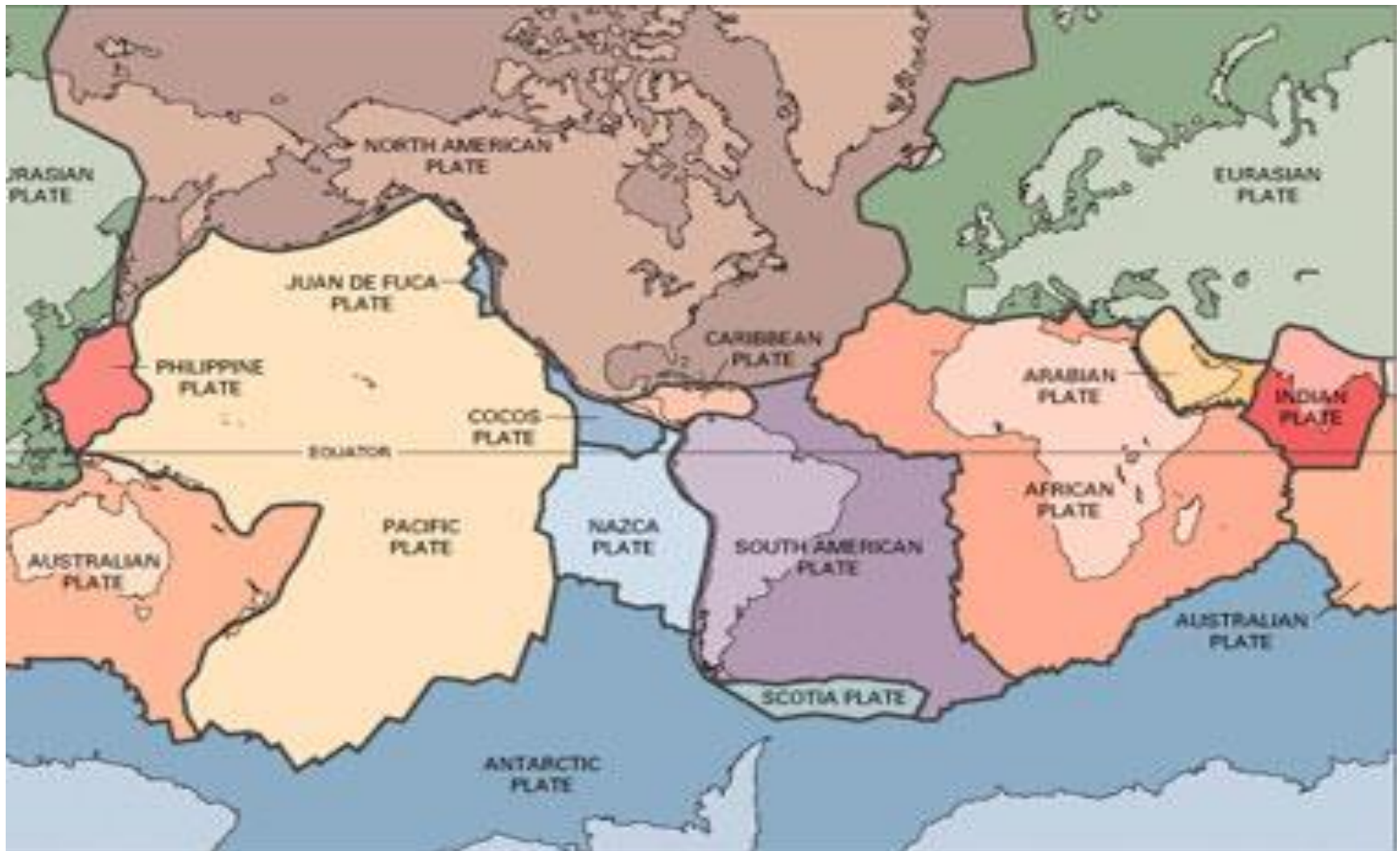


Plate tectonics map plate boundary map



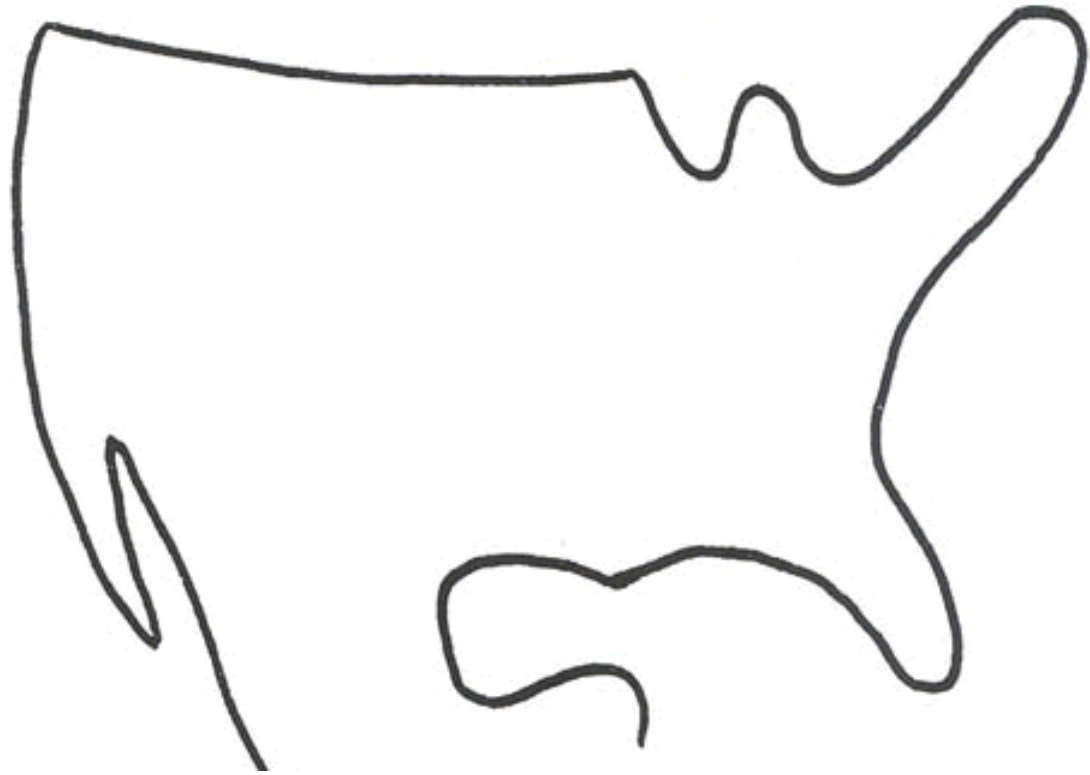
TRANSFORM BOUNDARIES

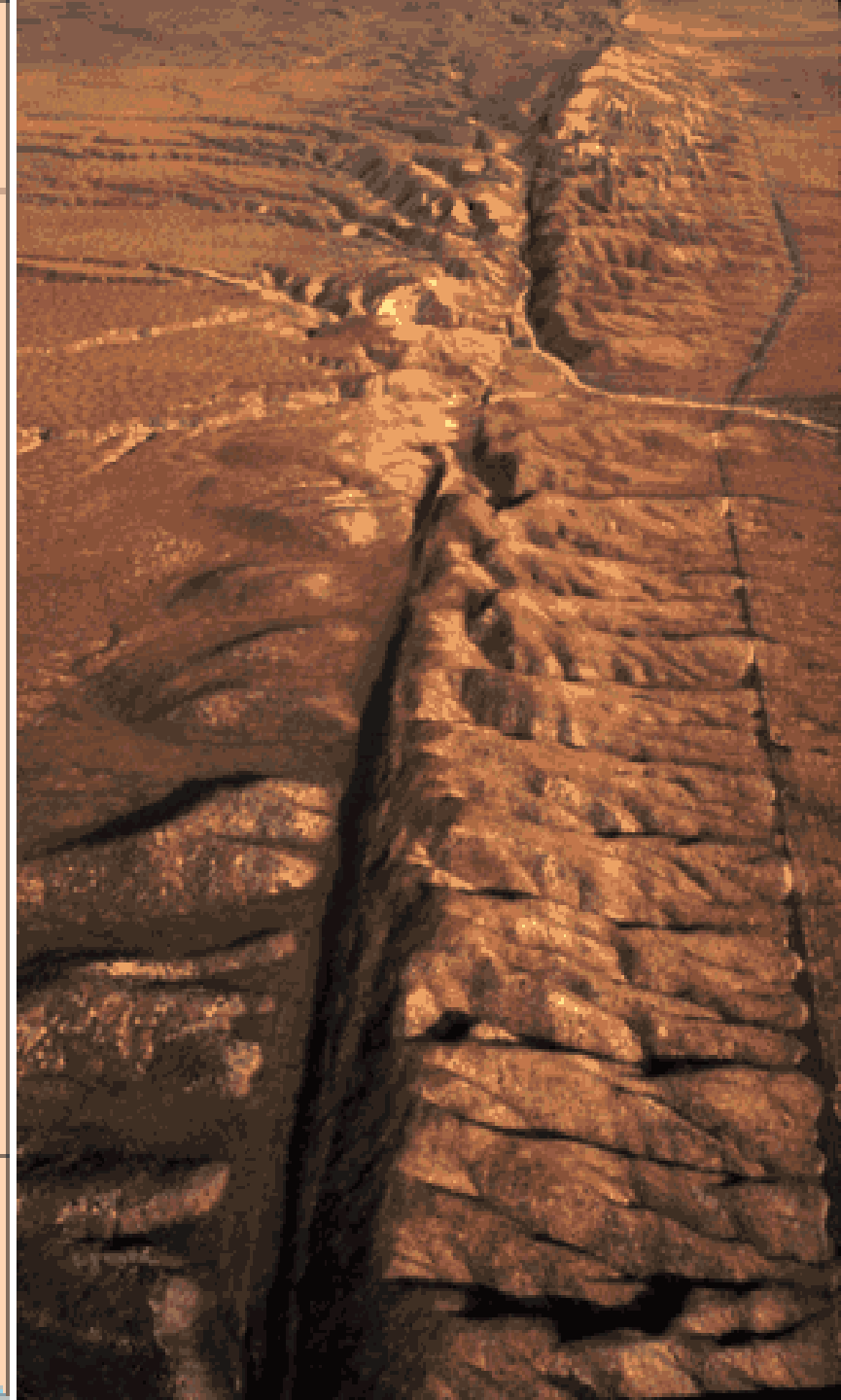
Transform boundaries, where plates slide past each other. Tectonic plates have irregular edges. They grind and jerk as they slide, which produces earthquakes. We can determine the time and location of earthquakes by using a seismograph which locates the epicenter. The point on the Earth's surface directly above the earthquake and focus which is the point inside the Earth where an earthquake begins.

Most transform boundaries are found near mid-ocean ridges.

One well-known transform boundary is the San Andreas fault system in California. It is located where the Pacific and North American plates slide past each other.

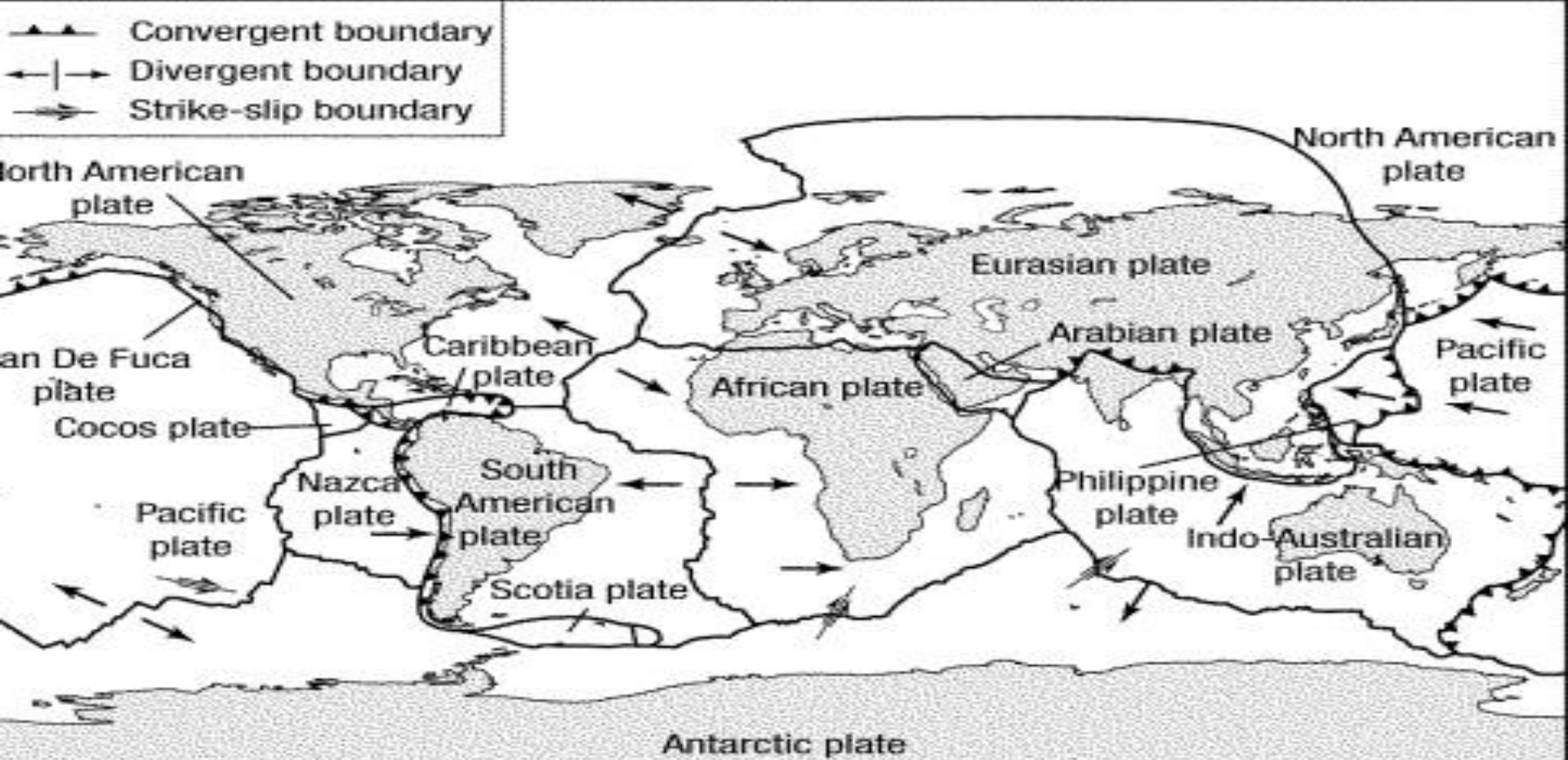
Transform Boundary – San Andreas Fault





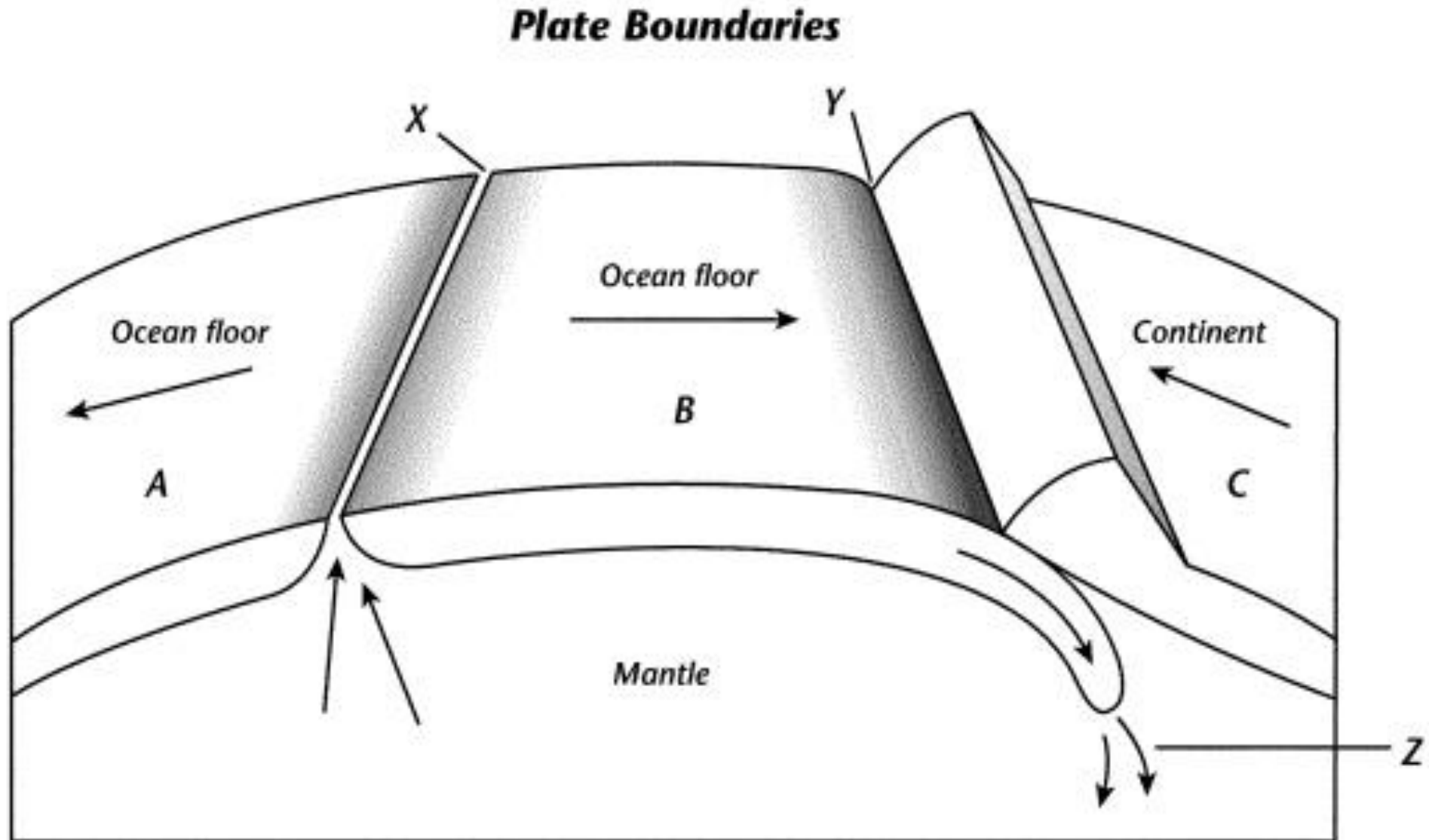
- Predict what type of disaster could occur at **San Andreas fault** system in California?
- At which of these is crust neither created nor destroyed?
 - [A] divergent boundary
 - [B] oceanic-continental subduction
 - [C] transform boundary
 - [D] oceanic-oceanic subduction

According to Figure 4F-1, what type of plate boundary occurs between the North American Plate and the Eurasia Plate? a. transform boundary b. divergent boundary c. convergent oceanic-continental plate boundary d. convergent oceanic-oceanic plate boundary



Which type of plate boundary occurs at X?

What is happening at Z?



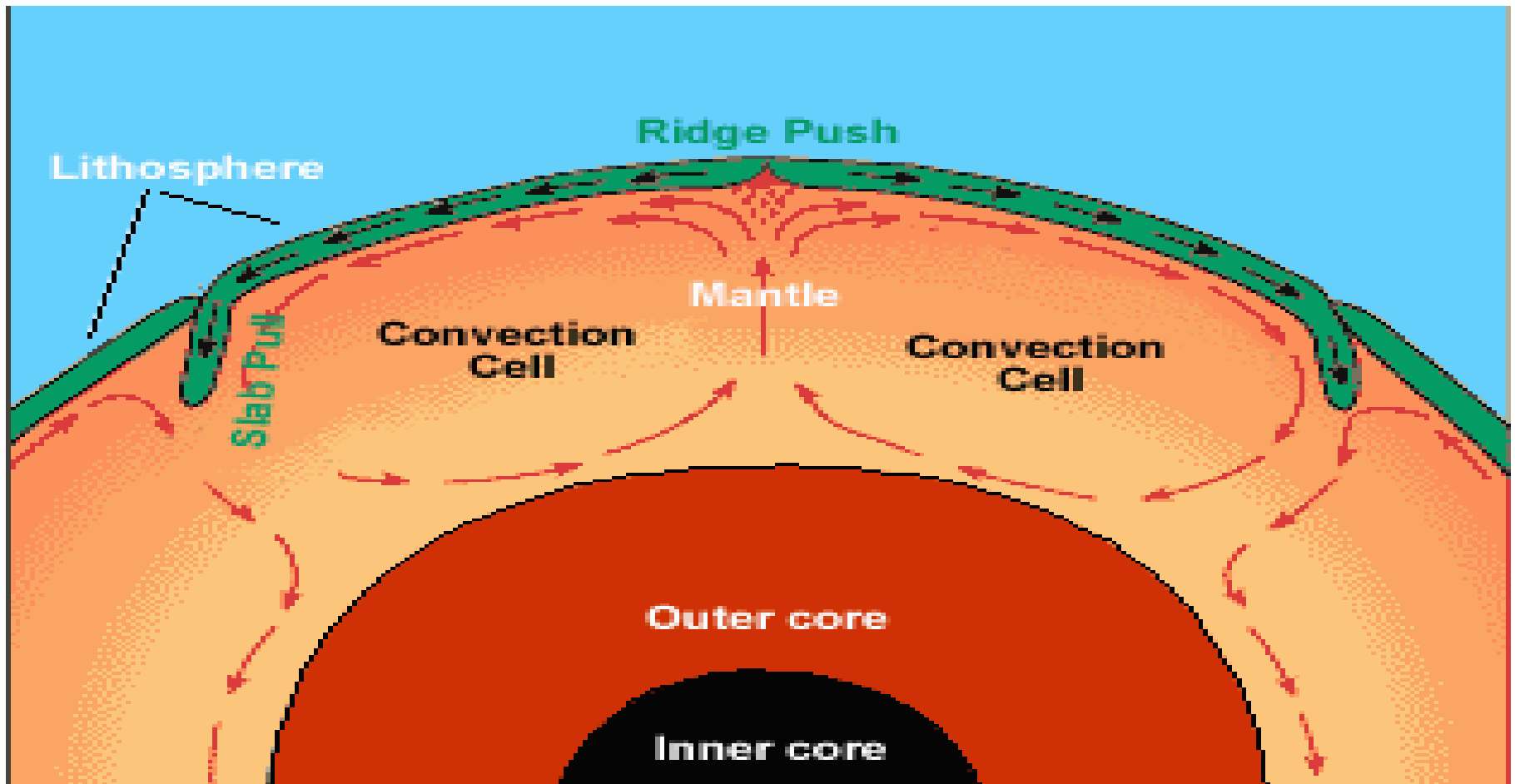
- Why do most major continental mountain chains form at convergent boundaries?

Why Do Tectonic Plates Move?

- Ridge push, convection, and slab pull are three possible driving forces of plate tectonics.

Driving Force	Description
Slab pull	Cold, sinking lithosphere at the edges of a tectonic plate pulls the rest of the plate across Earth's surface.
Ridge push	Gravity pulls newly formed lithosphere downward and away from the mid-ocean ridge. The rest of the plate moves because of this force.
Convection currents	Convection currents are produced when hot material in the mantle rises toward the surface and colder material sinks. The currents pull the plates over Earth's surface.

- **Compare** How is slab pull different from ridge push?



Answer

In slab pull, the driving force comes from subducting slabs. In ridge push, the driving force comes from the formation of new sea floor.

Convection currents

