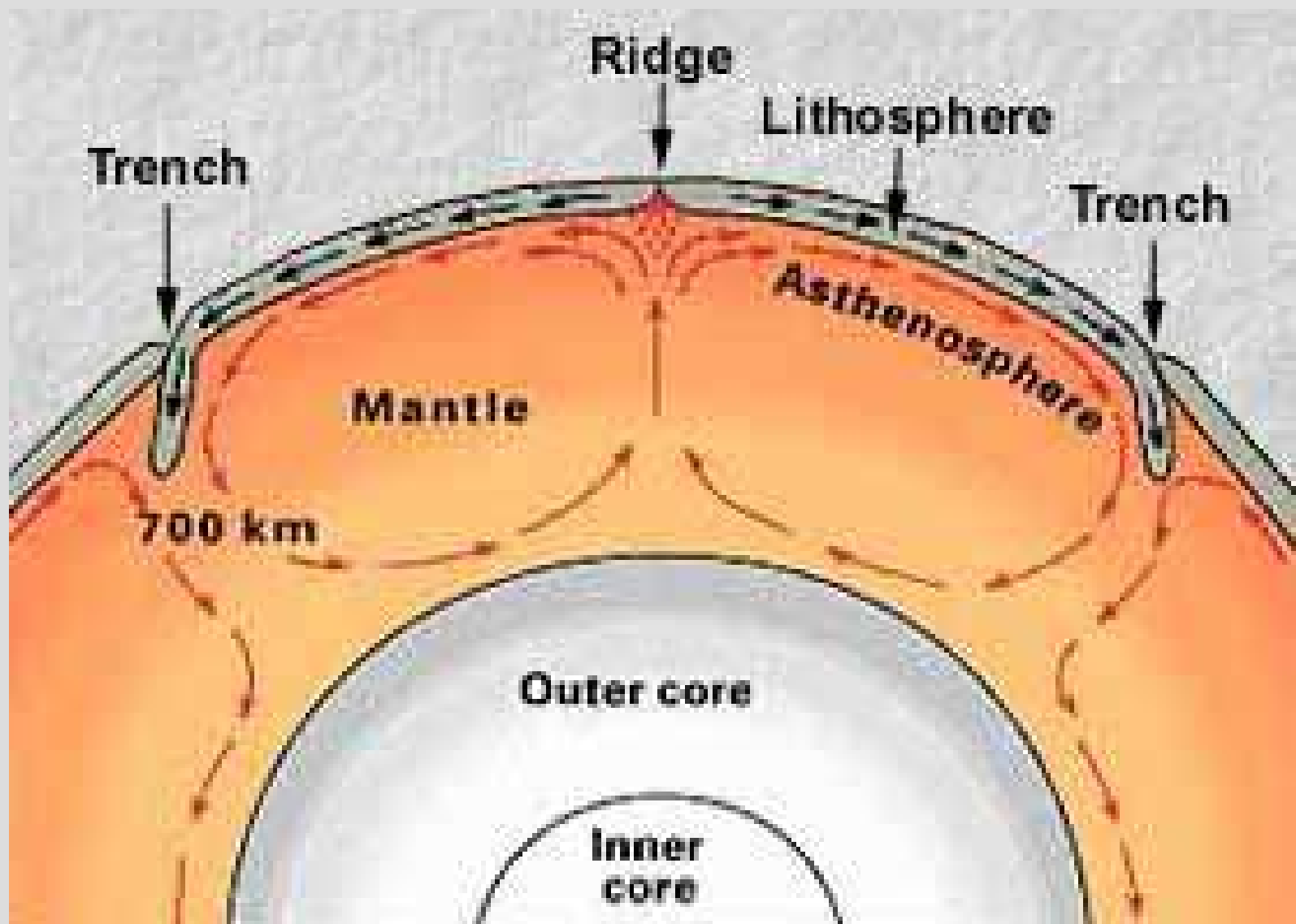


Lithosphere

and

Lithosphere

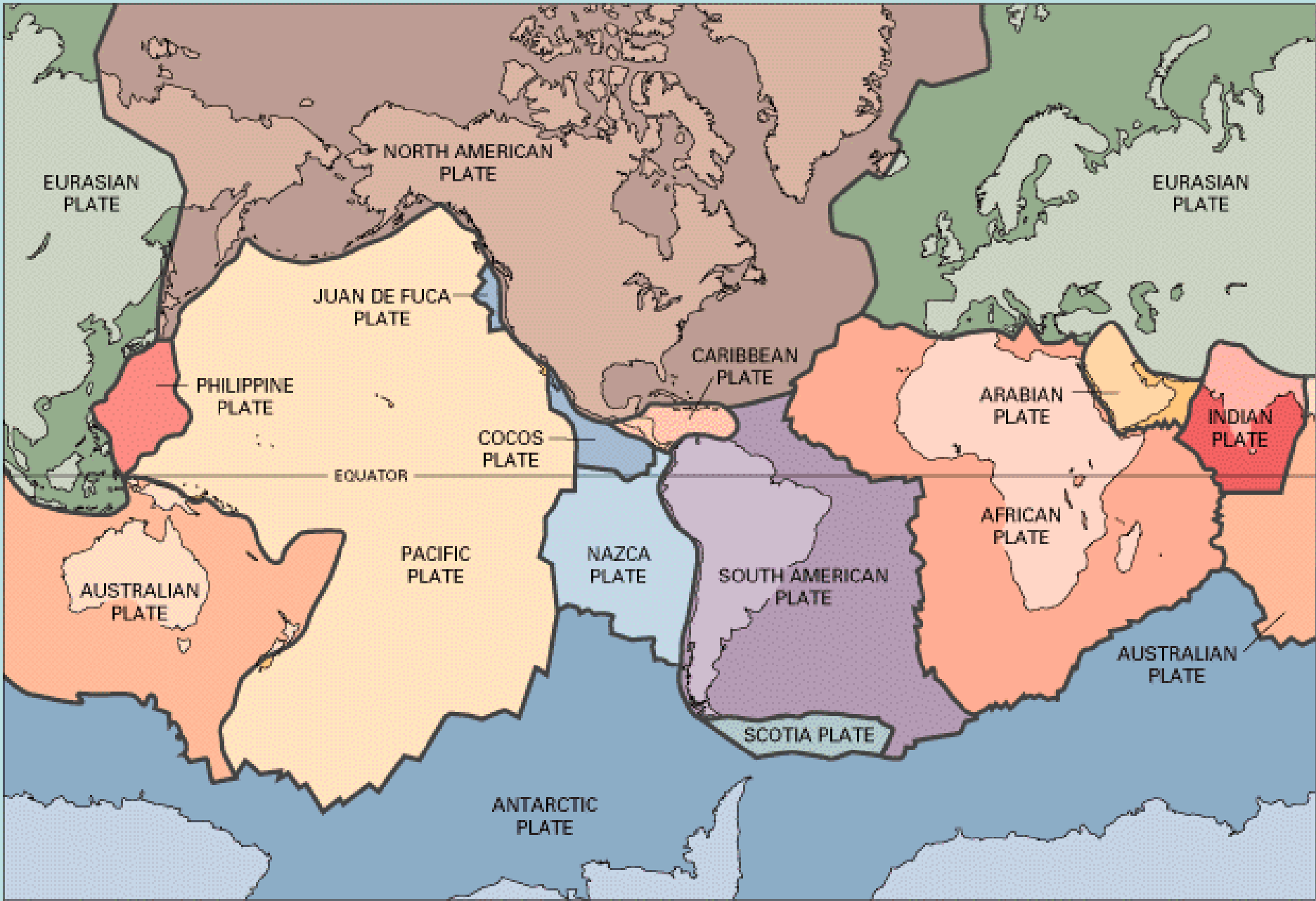
- The ***lithosphere*** is made of the earth's crust, and the upper portion of the mantle.
- This upper mantle is less dense than the mantle underneath, so it is able to “float” on the mantle below.
- The mantle just below the lithosphere is called the ***asthenosphere***.
- The asthenosphere has a plastic like consistency, and it carries the lithosphere.



Lithospheric Plates

- Since the lithosphere floats on the asthenosphere, it is able to move with convection currents created by the lower mantle.
- The lithosphere is divided into plates which are called lithospheric plates. The movement of these lithospheric plates is what we call **Plate Tectonics**. What was once called the theory of **continental drift**, (where it was thought that only the continents moved) is now the theory of plate tectonics where it includes the sea floor moving, too.

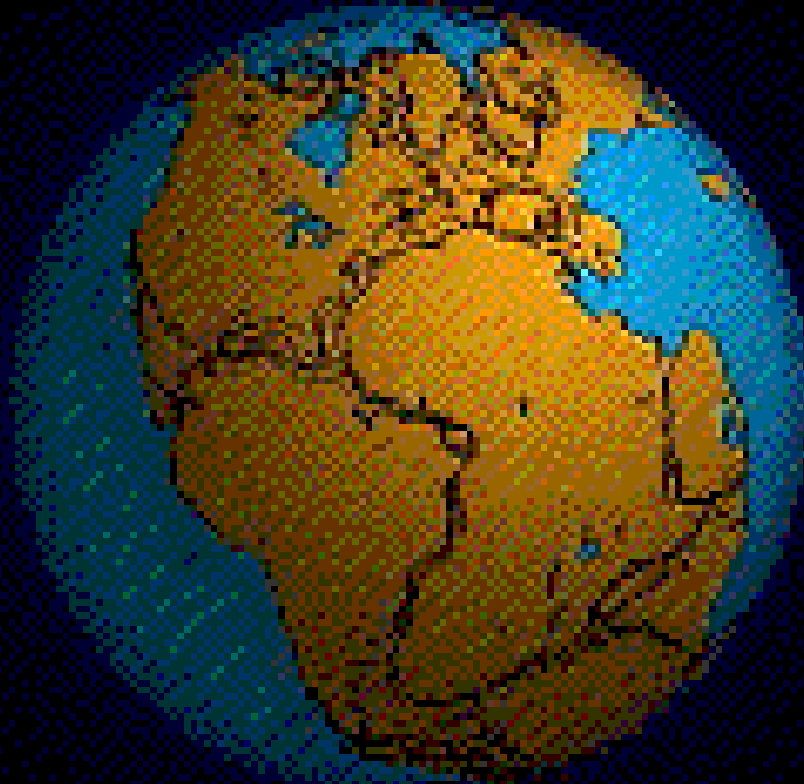
Lithospheric plates, are large, irregularly shaped slabs of oceanic and/or continental crust.



Evidence to support theory

- The theory of continental drift (or plate tectonics) was first proposed by a German scientist named Alfred Wegener (pronounced Vay-Guh-Ner).
- He proposed that at one time, all the continents were connected.
- By looking at a map of the world, it can be seen that the continents can be put together like a puzzle.

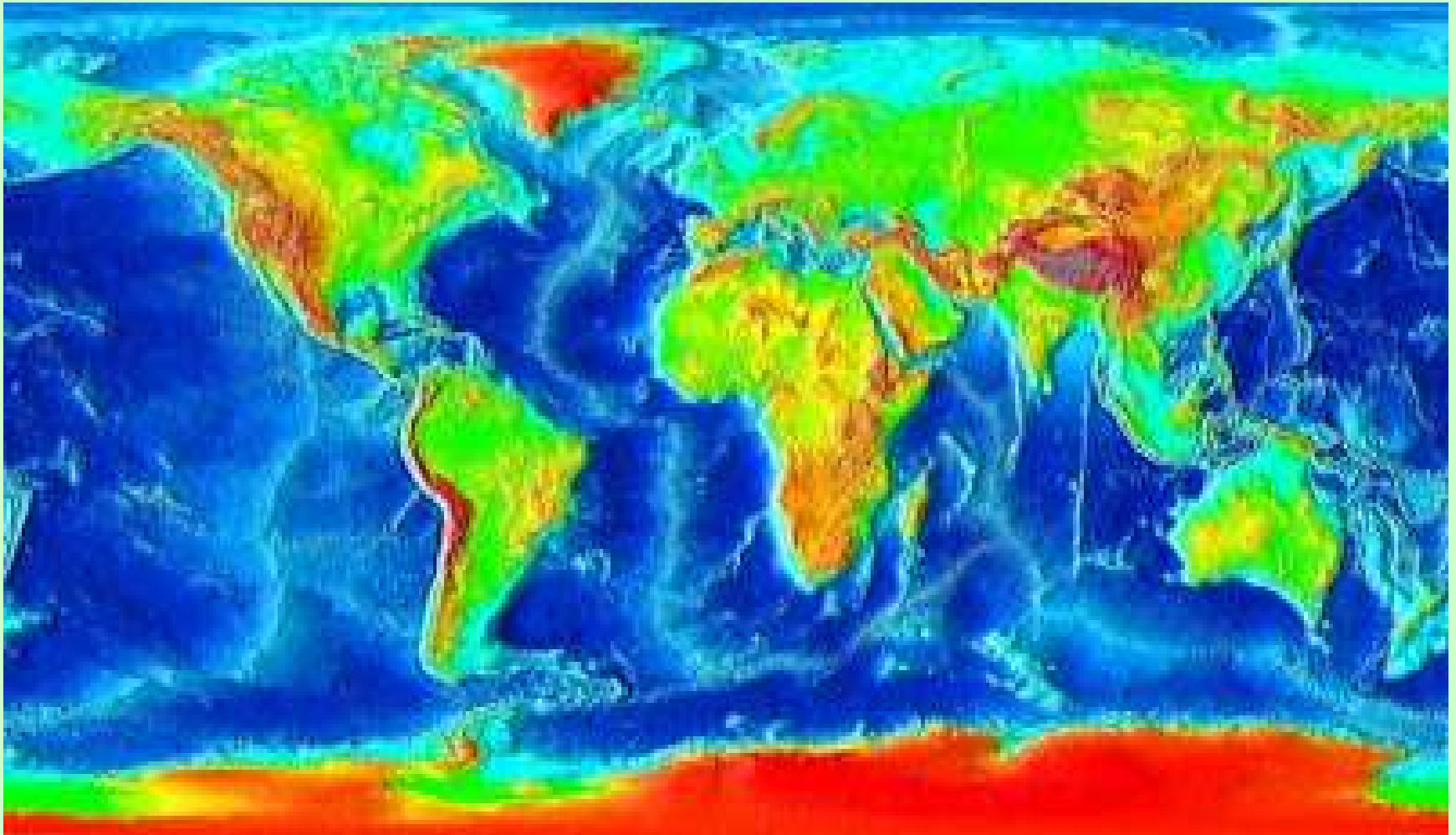
Pangaea



But they don't fit exactly...or do they?

- Actually, they are an extremely close fit.
- If we take into consideration the processes of erosion, weathering, and collisions, as well as include the continental shelves, the continents fit nearly perfectly.

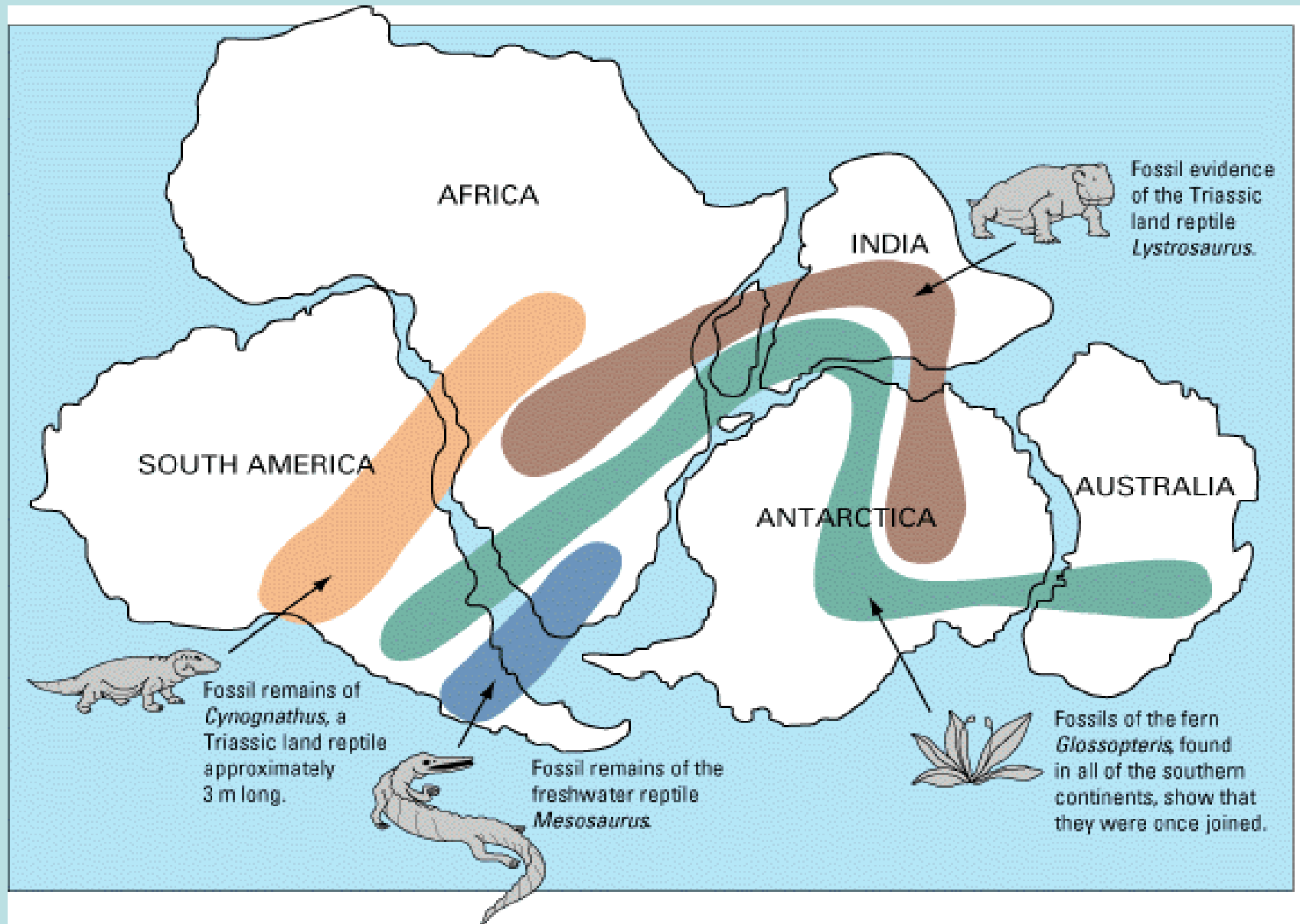
Map showing continental shelves (light blue areas)



Is that the only evidence?

- No.
- Evidence from fossils show that at boundaries where the continents were touching, the same type of fossils were found.
- For instance, plant and animal fossils that were found in North America, were also found in Africa.

Fossil evidence

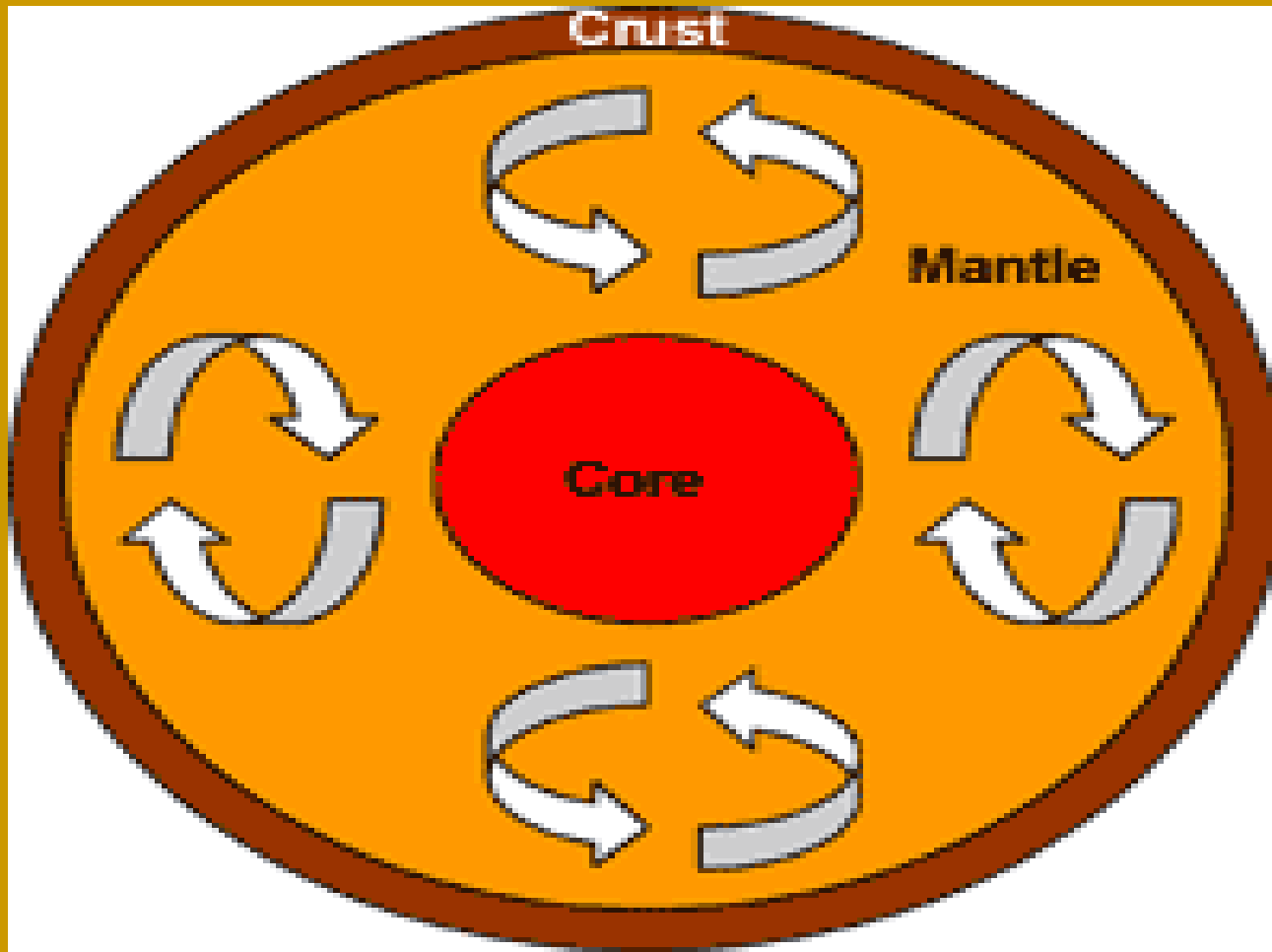


The same method of matching types of fossils applies to rocks and ice, too.



So, How do these plates move,
anyway?

- **Convection currents**



Effects of plate movement

- Earthquakes
- Volcanoes
- Tsunamis
- Mountains
- Sea-floor spreading

Let's look at the different plate motion

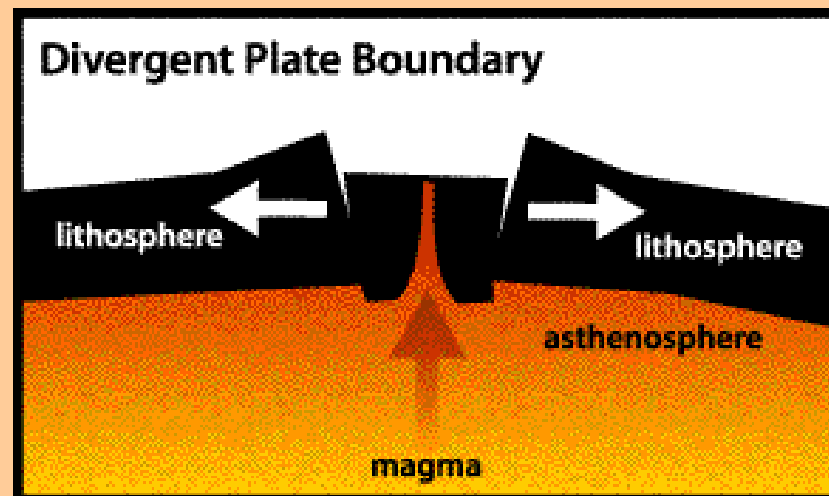
- There are 3 types of ***boundaries*** that exist. These are the boundaries between plates. They are:
- Divergent boundaries
- Convergent boundaries
- Transform boundaries

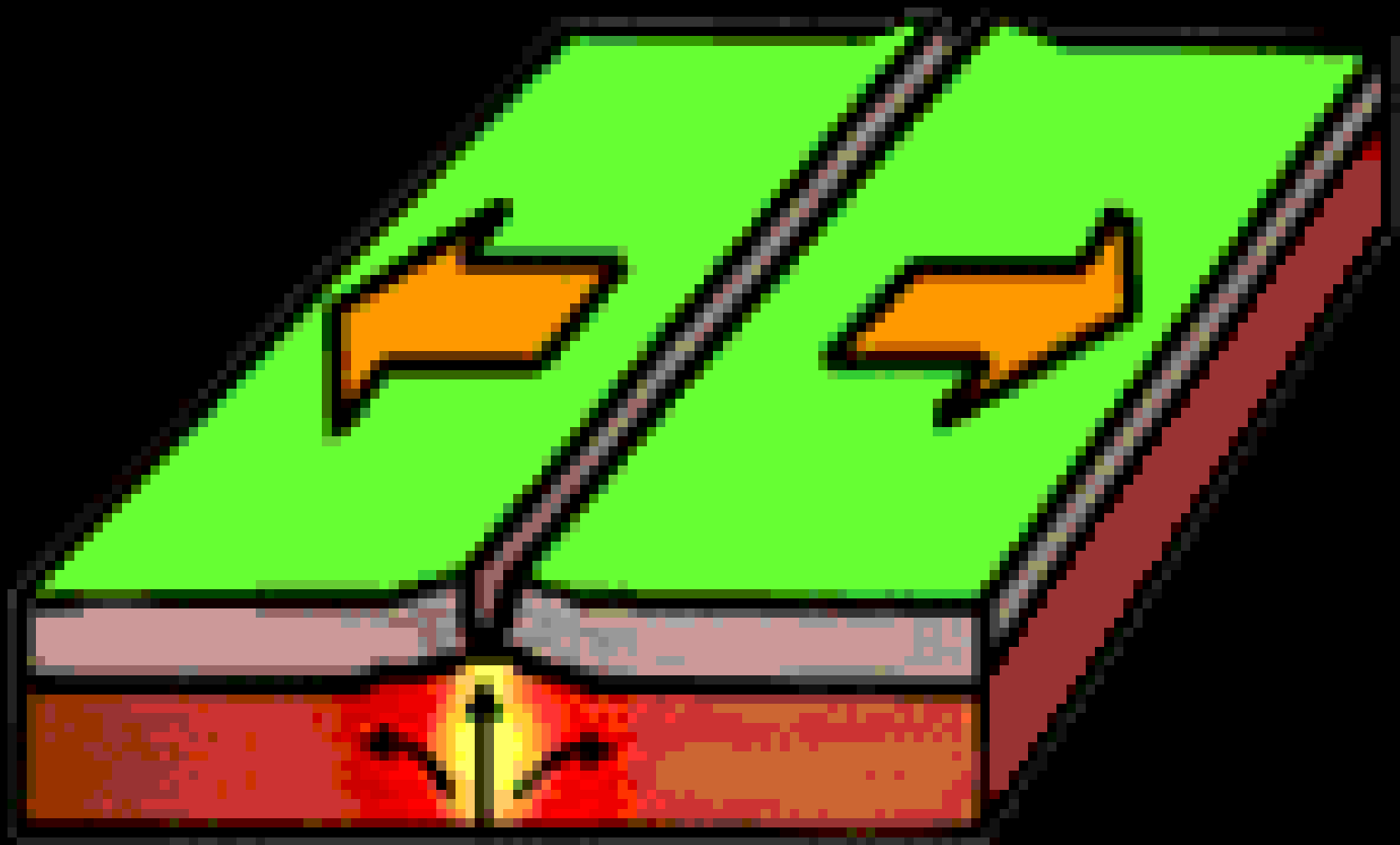


Divergent Boundaries

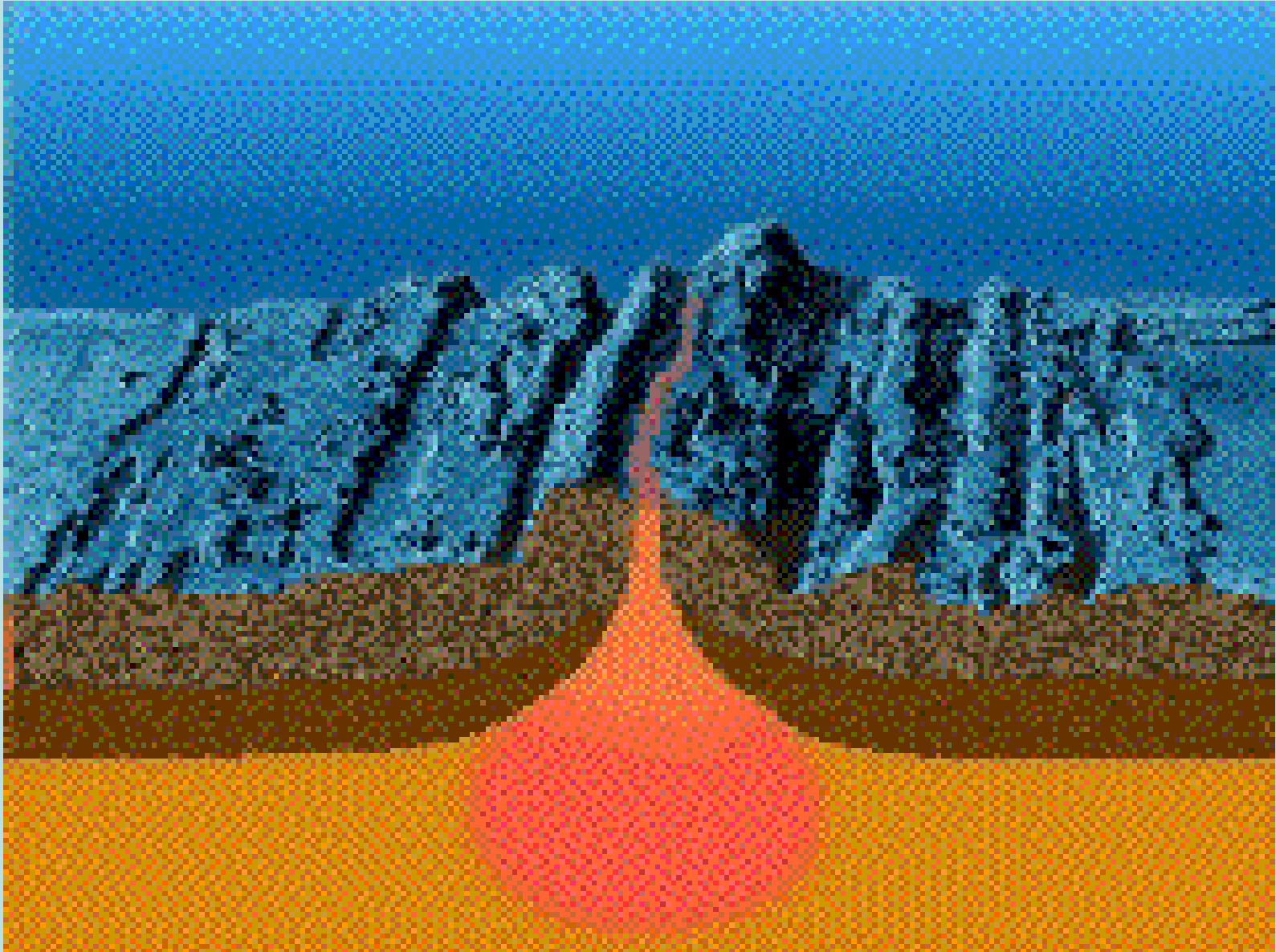


- Diverge means to “draw apart.” When boundaries diverge, they move away from each other.
- This can cause sea-floor spreading, shallow earthquakes, and fault-block mountains.

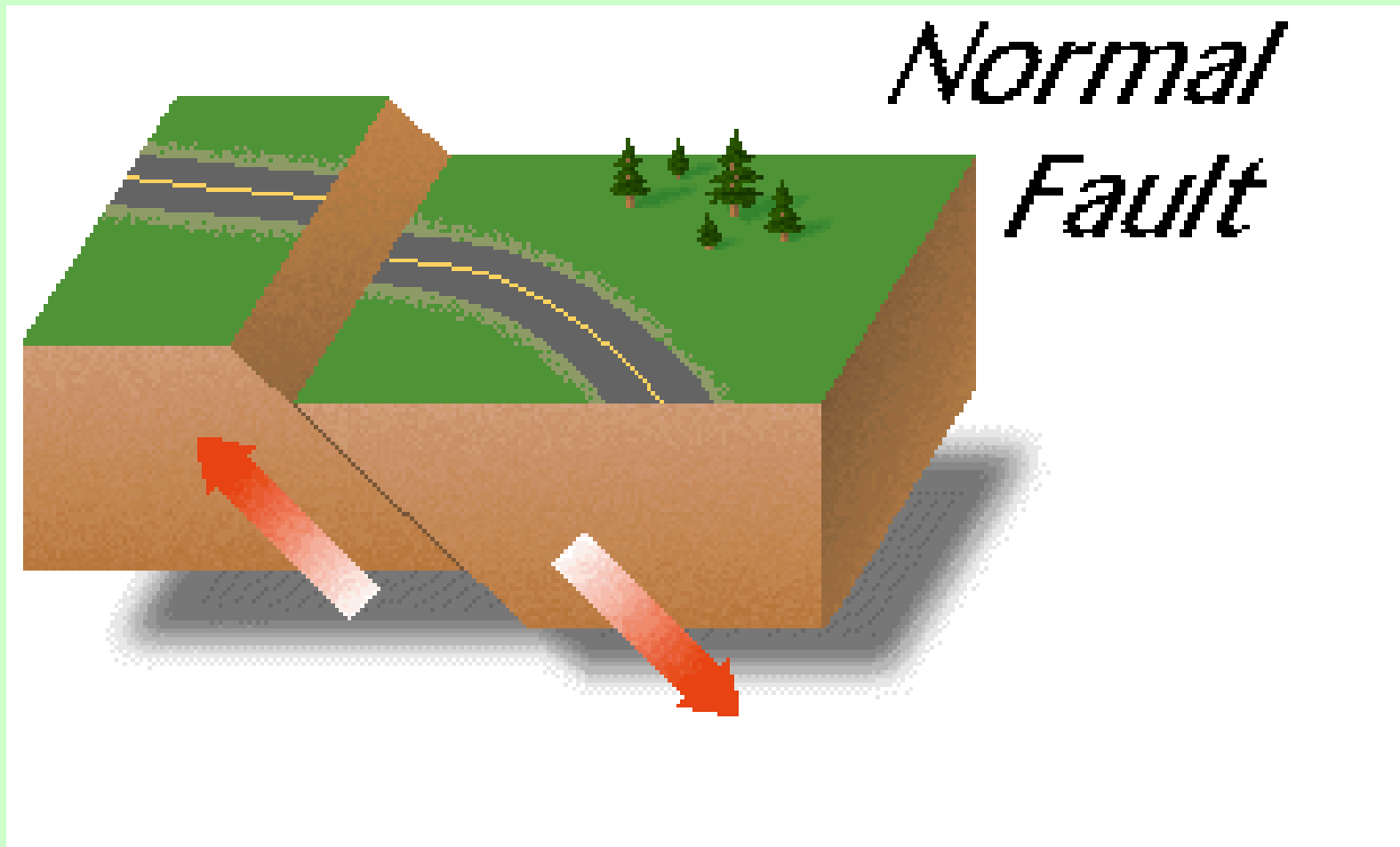




Sea-floor spreading at a divergent boundary



When divergent boundaries affect areas on land, “normal faults” occur.





Convergent Boundaries



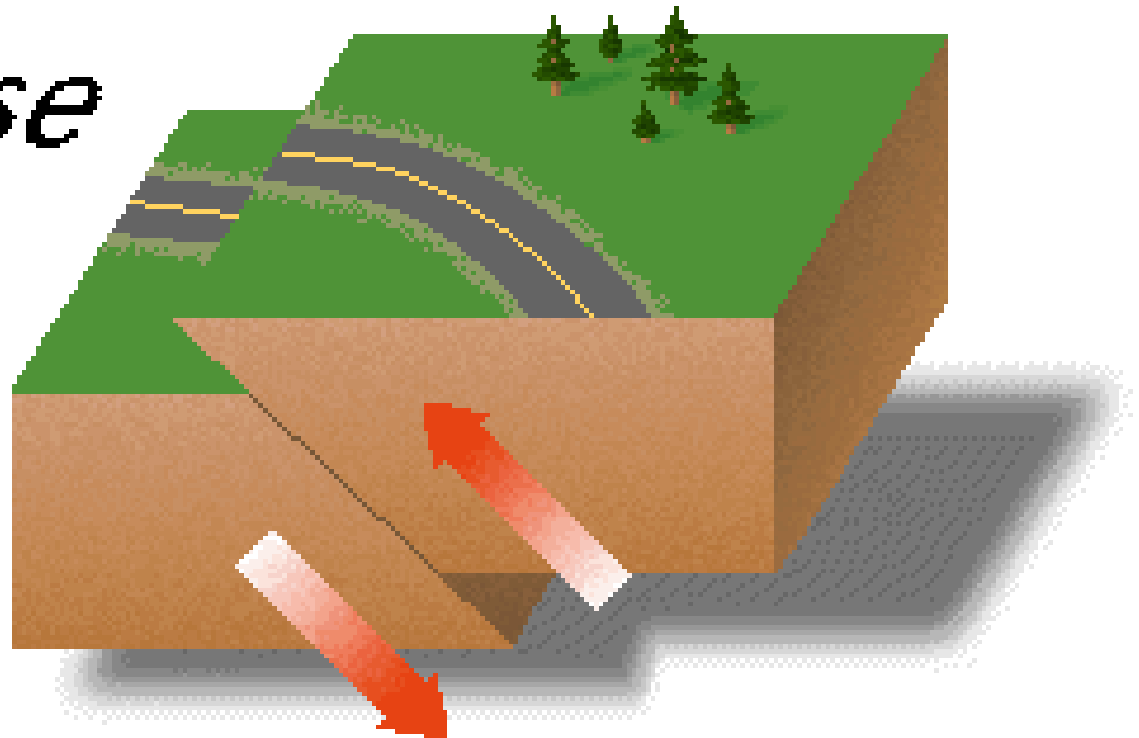
- **Convergent Boundaries**: Here crust is destroyed and recycled back into the interior of the Earth as one plate dives under another. These are known as ***Subduction Zones*** - mountains and volcanoes are often found where plates converge. There are 3 types of convergent boundaries: Oceanic-Continental Convergence; Oceanic-Oceanic Convergence; and Continental-Continental Convergence.





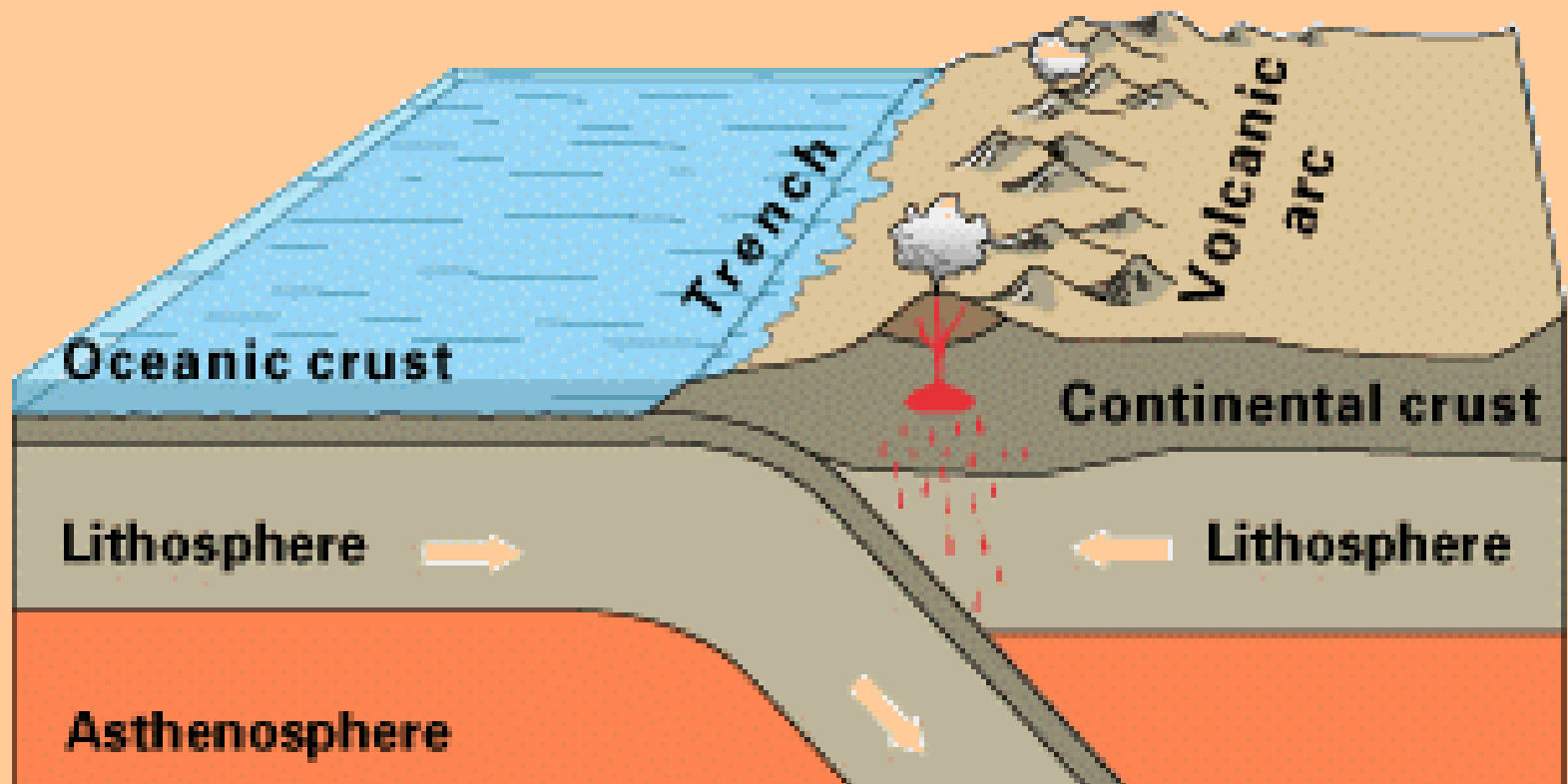
When convergent boundaries affect areas on land, a reverse fault can occur.

Reverse Fault



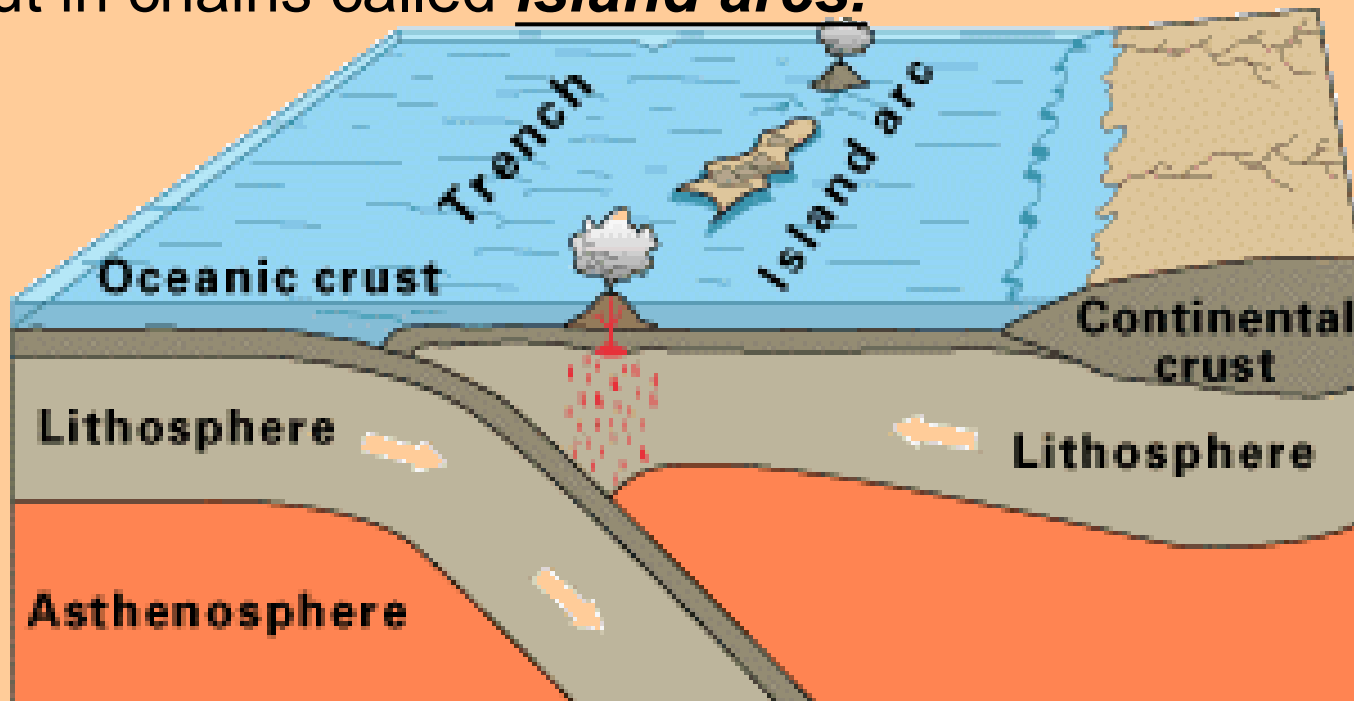
Continental-oceanic plate convergence

Because oceanic crust is more dense than continental crust, when they converge the more dense oceanic crust goes under the continental crust. This can cause trenches, earthquakes, and volcanoes.

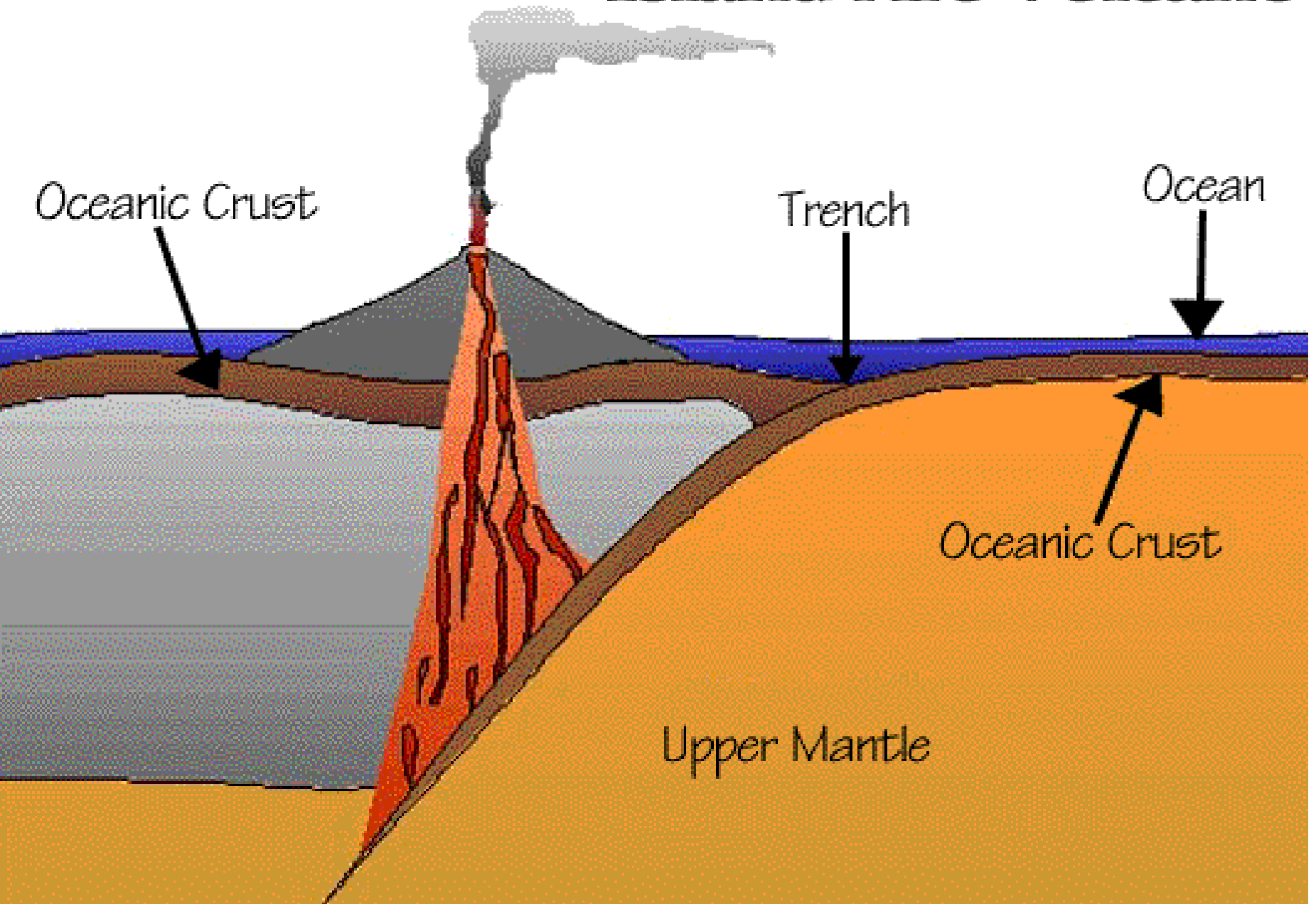


Oceanic-Oceanic plate convergence

When two oceanic plates converge one is usually subducted under the other and in the process a deep oceanic trench is formed. Oceanic-oceanic plate convergence also results in the formation of undersea volcanoes. Over millions of years, however, the erupted lava and volcanic debris pile up on the ocean floor until a submarine volcano rises above sea level to form an island volcano. Such volcanoes are typically strung out in chains called ***island arcs***.

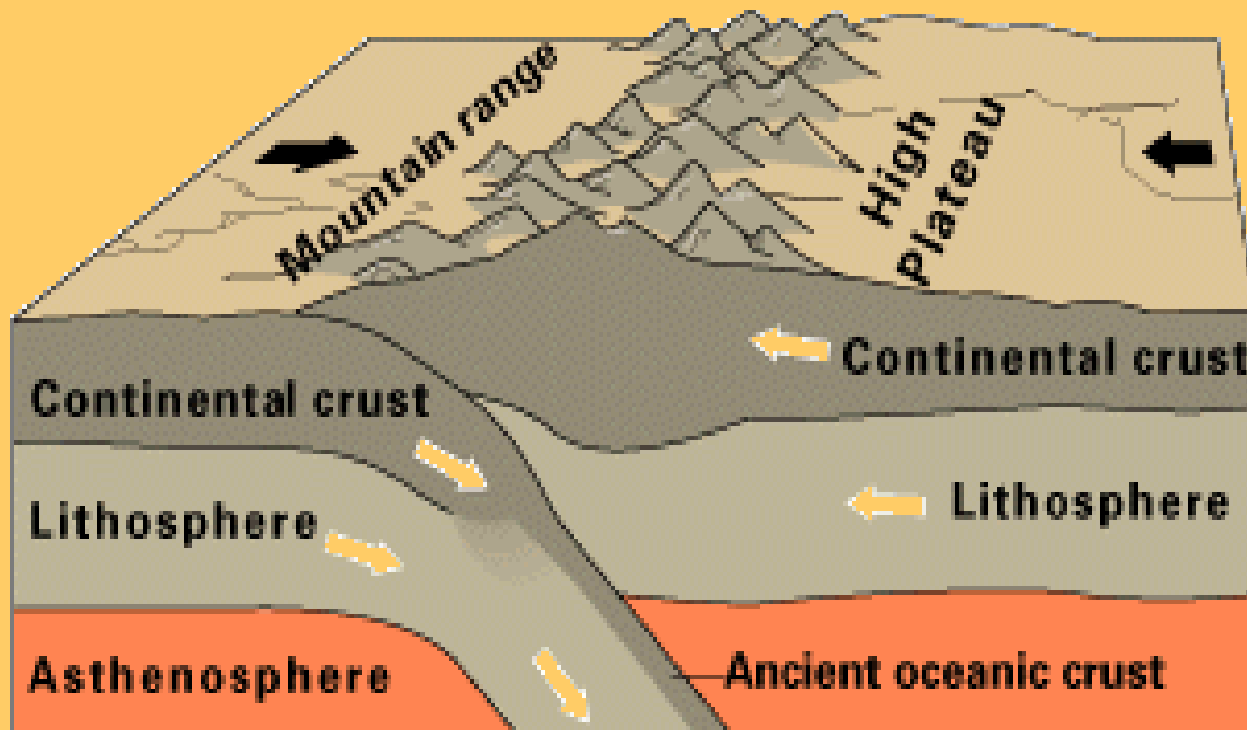


Island-Arc Volcano

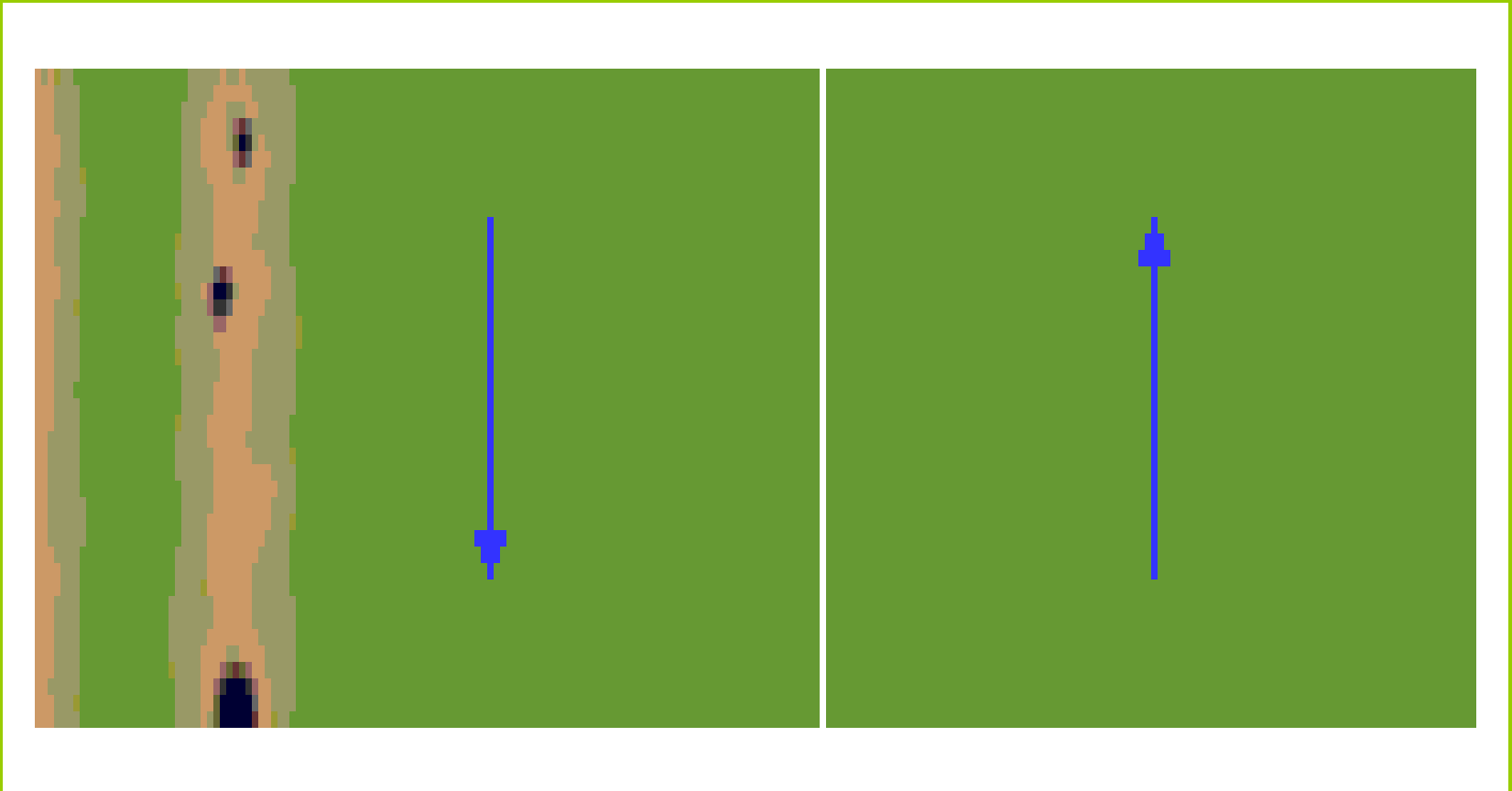


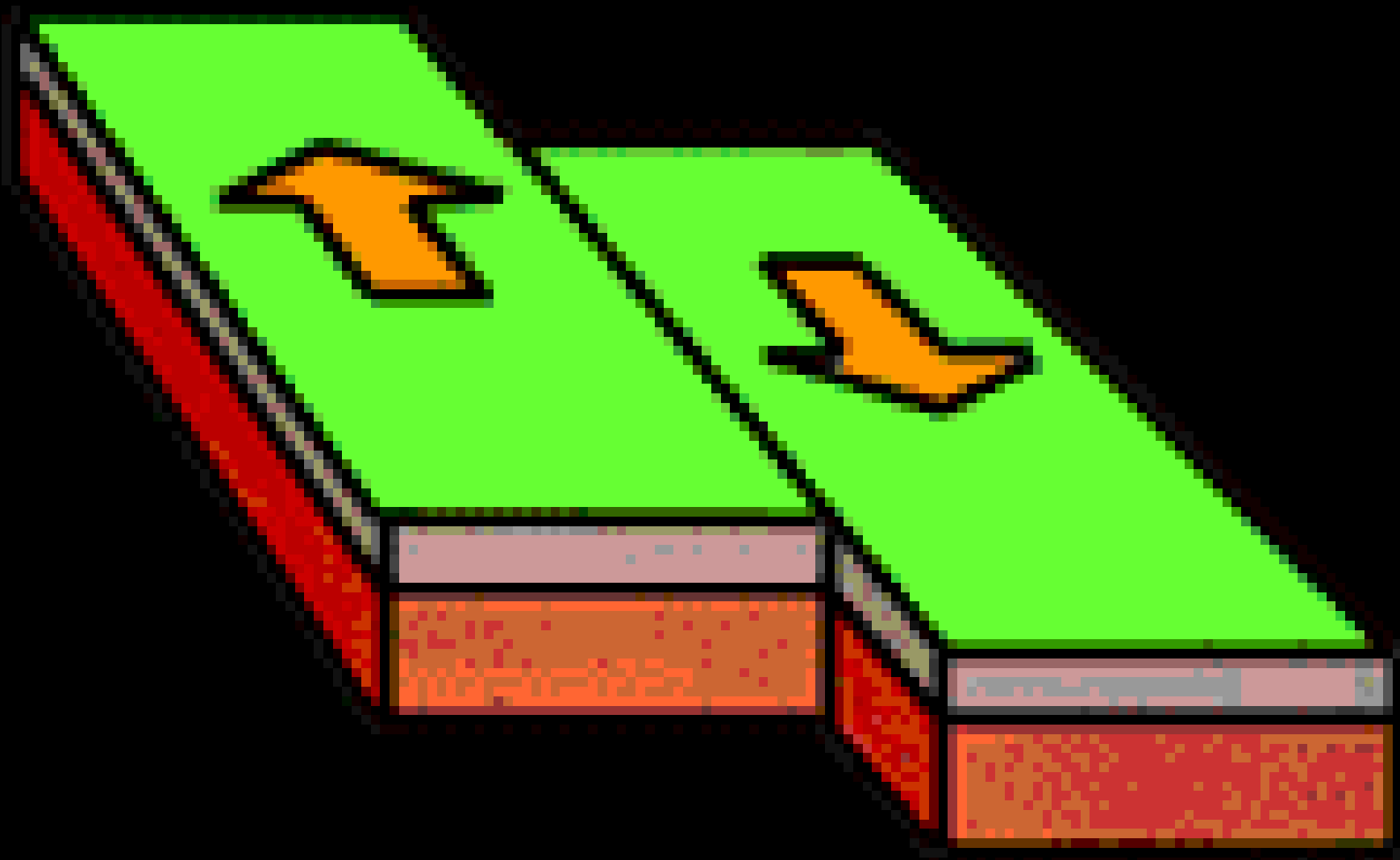
Continental-continental plate convergence

When two continents meet head-on, neither is subducted because the continental rocks are relatively light and resist downward motion. The crust tends to buckle and be pushed upward or sideways.



Transform boundaries neither create nor consume crust. Rather, two plates move against each other, building up tension, then releasing the tension in a sudden and often violent jerk. This sudden jerk creates an earthquake. The “fault” at this boundary is called a ***strike-slip fault***.





San Andreas Fault



The San Andreas Fault is undoubtedly the most famous transform boundary in the world. To the west of the fault is the Pacific plate, which is moving northwest. To the east is the North American Plate, which is moving southeast.

Summary

- What causes the lithospheric plates to move?
- What evidence do we have to support the theory of plate tectonics?
- How many boundary types are there, and what are they called?
- What effects do plate tectonics have on the earth?

