

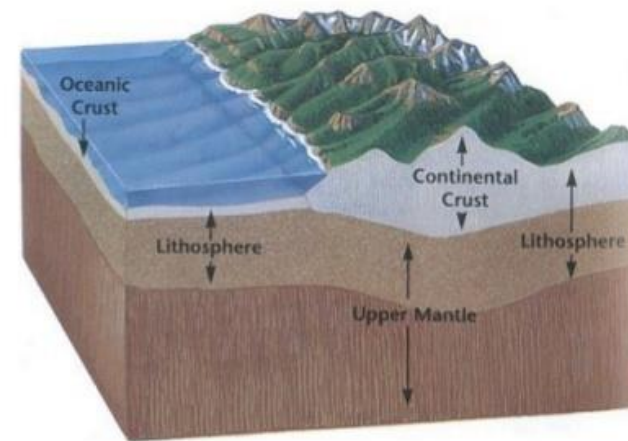
# **STRUCTURE OF THE EARTH**

Essential Question: Why do the continents move, and what causes earthquakes and volcanoes?

# EARTH'S CRUST IN MOTION

- The earth's surface and its geological features, such as mountains, earthquakes, and volcanoes, are all caused by lithospheric plate activity
- (tectonic plates that haven't had a smooth relationship)

## \* Lithosphere



# MOUNTAINS

- Fault- Block mountains: When plates move away from each other, they create **FAULTS**, rock layers that are pulled apart.
- This sometimes causes large blocks of rock to tilt and separate, forming parallel ridges and valleys. Mountains with sharp jagged ridges above wide, flat valleys, like the Teton Range and the Sierra Nevada. Are most characteristic of fault-block mountains.



# MOUNTAINS

- **Folded Mountains:** Plates moving together to exert an enormous amount of pressure on rock from different sides, causing it to fold and squeeze together. You can usually see all of the rock layers if you look at an exposed face of a folded mountain.
- The Appalachian Mountains on the East Coast of the U.S. are an example of ancient folded mountains.
- The Himalayas are a much younger and less eroded example of folded mountains.



# MOUNTAINS

- Volcanic Mountains: When the lava from a volcano cools, it creates another hard layer.
- After layers and layers of hardened lava piles up, the volcano can form a cone-shaped mountain, like Mount Saint Helens and dozens of other volcanoes in the Cascades.
- Underwater Volcanic Mountains: Underwater volcanic eruptions can build mound under water.
- As more lava piles up, eventually the mountain reaches the water's surface. Forming a volcanic islands, such as Hawaii.



# AMAZING VOLCANOES

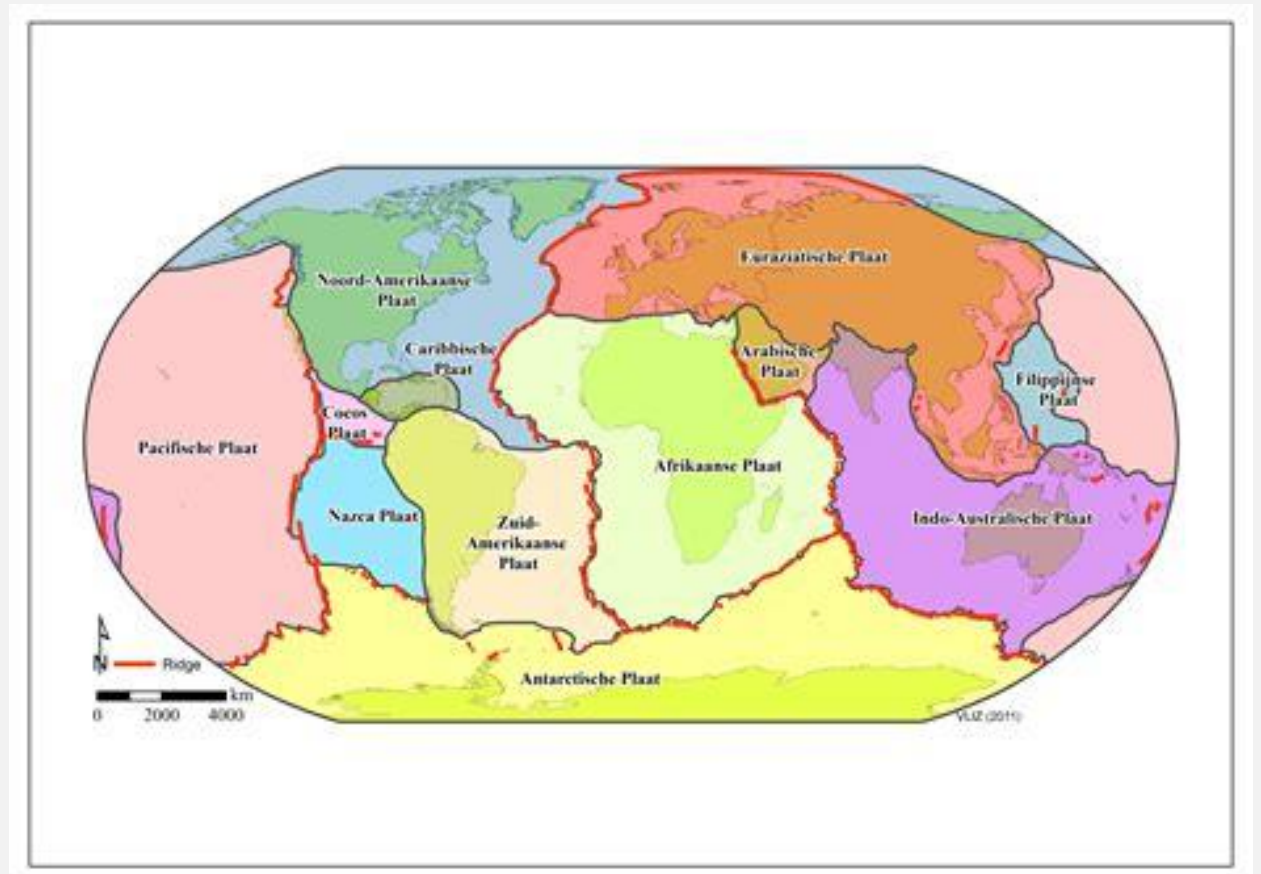


# CONTINENTAL DRIFT

- About 240 million years ago the continents formed one supercontinent called Pangaea.
- Scientists have since found fossils of dinosaurs and plants as well as similar rocks on the eastern coast of South America and the western coast of Africa.
- **Think about it...**
- Is the Earth the same today as it was when dinosaurs roamed?

# PLATE TECTONICS

- The shifting and moving of plates affects the earth's surface and appearance.
- At the plate boundaries (where the edges of plates meet), plates can move apart, collide, overlap, or scrape past each other.
- Uneven heating of the mantle causes **CONVECTION CURRENTS**, or the cycling of heat that drags the plates around.





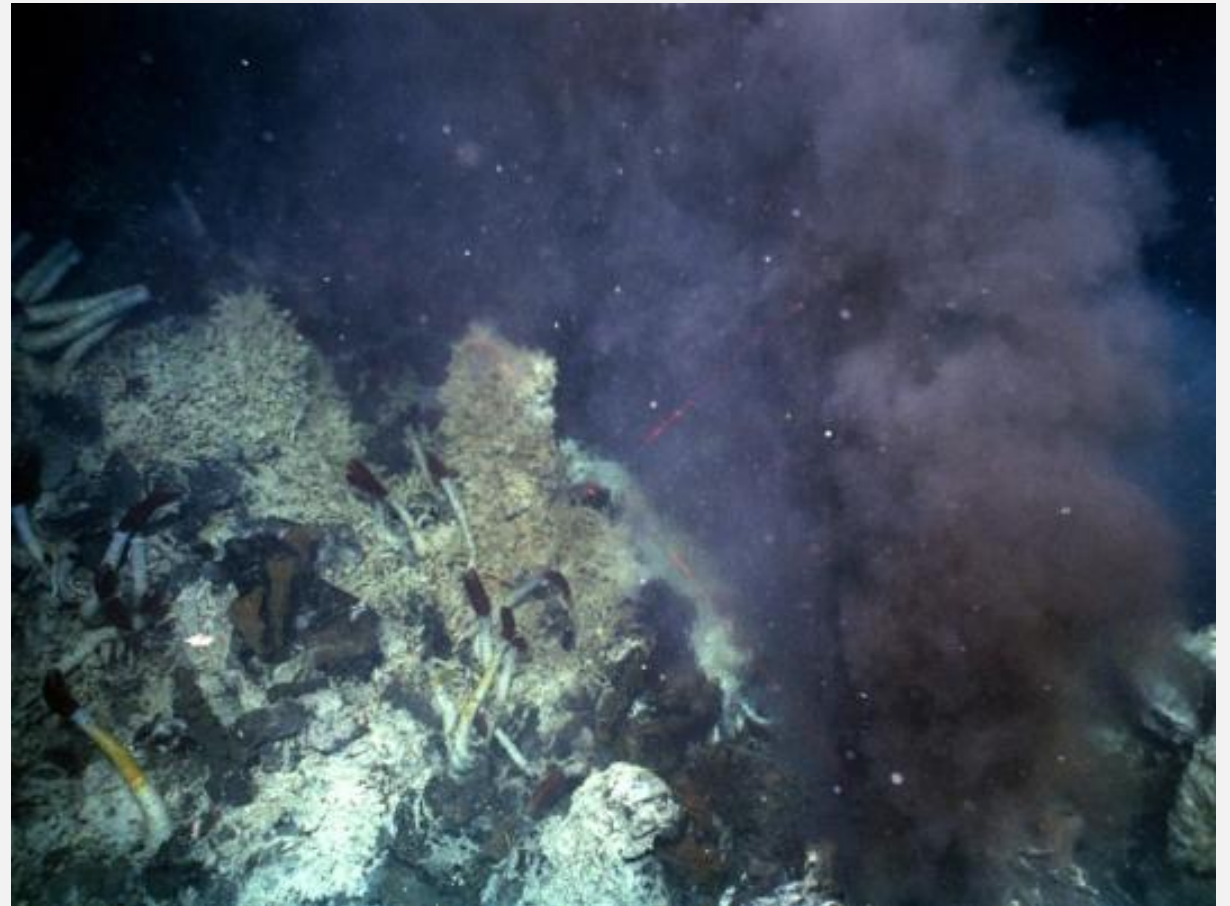
## PLATES MOVING APART

- The boundary between plates moving apart is called a **DIVERGENT BOUNDARY**.
- When plates move apart, magma from the mantle gets pushed up and forms new crust to fill the gaps between the plates.
- This new magma is less dense than the surrounding area, so it usually lifts up and forms ridges in the seafloor.
- Plates that move apart can also form rift valleys, where the each is torn apart.



# SEAFLOOR SPREADING

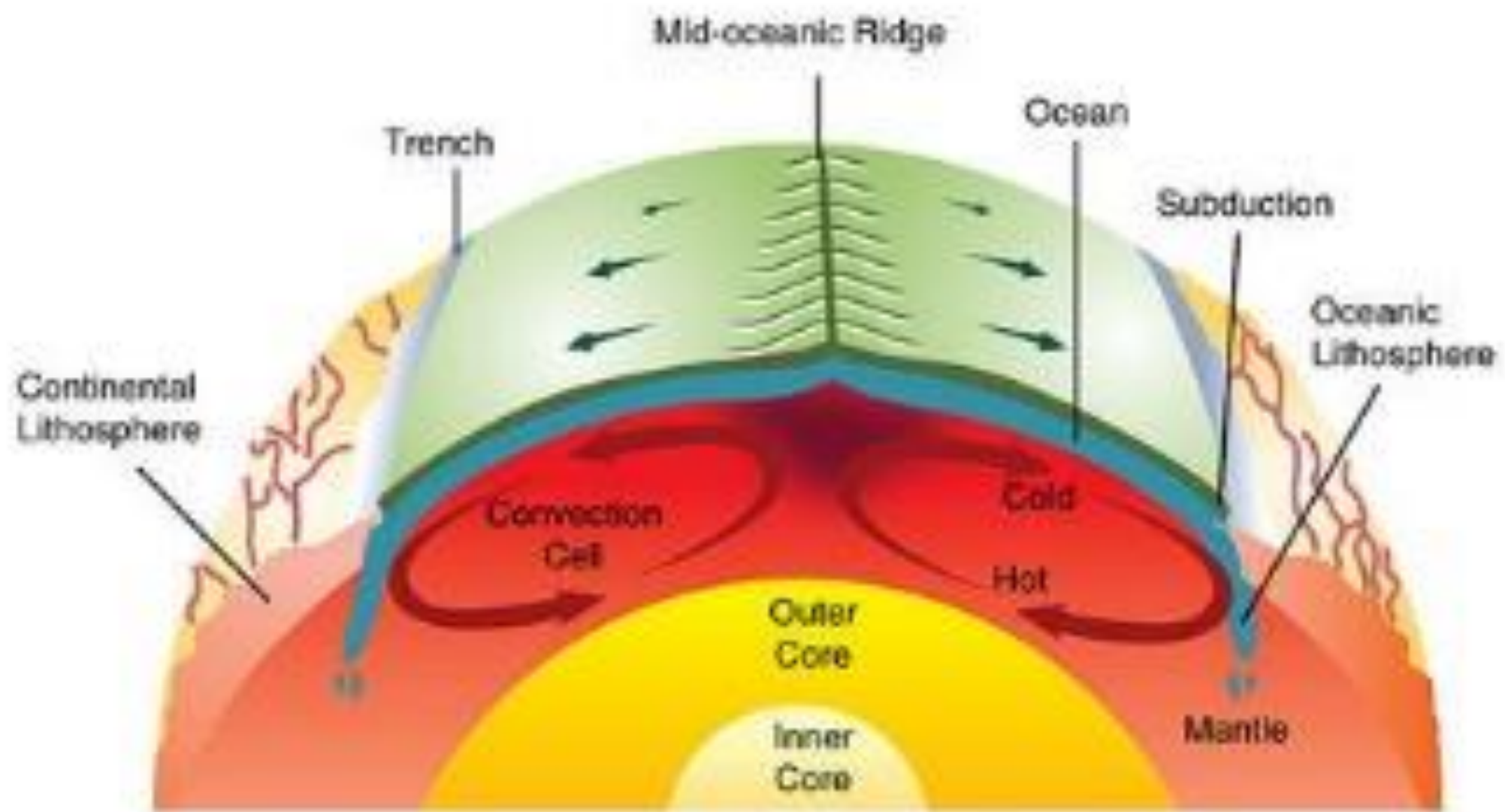
- Using sound waves, scientists mapped the seafloor and discovered a bunch of underwater ridges.
- This led to a theory of SEAFLOOR SPREADING: As plates along the ocean bed spread apart, hot magma is forced upward and flows through the cracks, forming ridges of igneous rock called BASALT.
- Scientists found that rocks were older as they got farther from ocean ridges.
- This supports the idea that new rock is formed at the ridges.
- The magnetic properties of rocks on the seafloor also support the theory; the earth's magnetic field switches back and forth every 200,000-300,000 years.



# PLATES COLLIDING

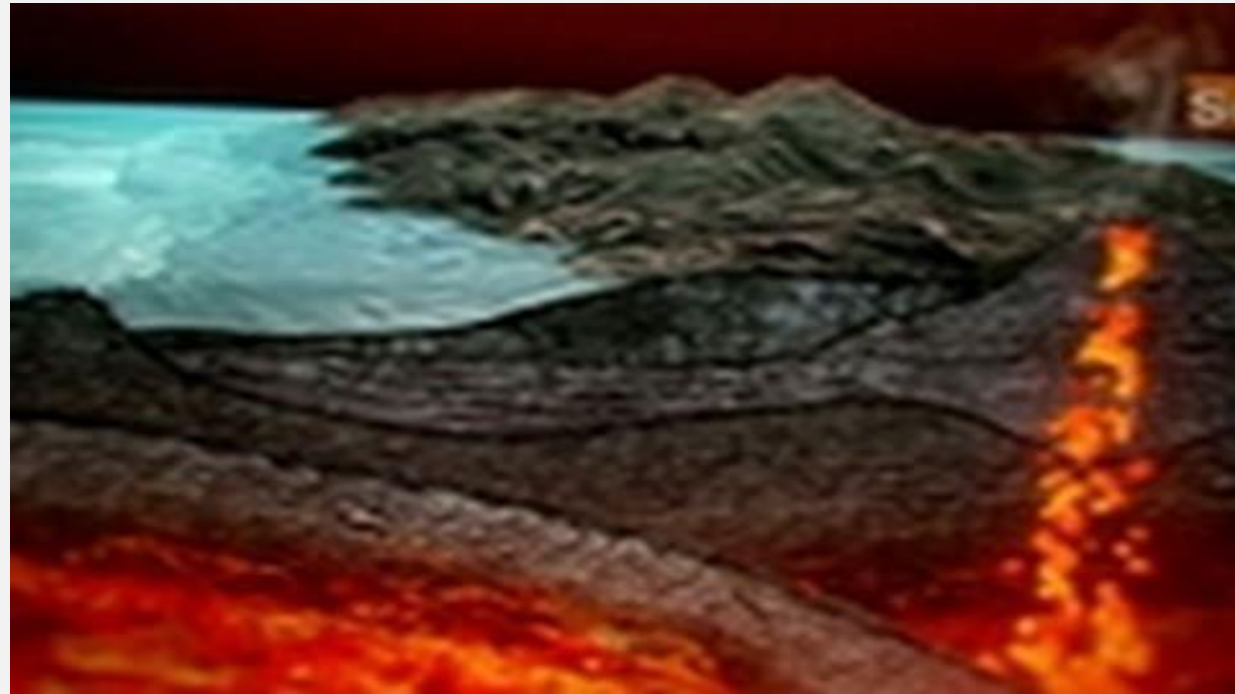
- The boundary between plates moving toward each other is called a **CONVERGENT BOUNDARY**.
- Massive earthquakes occur along these boundaries, often deep under the crust.
- There are two types of plates:
  - Oceanic Plates
  - Continental Plates
- Oceanic plates are denser than continental plates, so when an oceanic and a continental plate collide, the denser oceanic plate sinks into the mantle, a process called **SUBDUCTION**





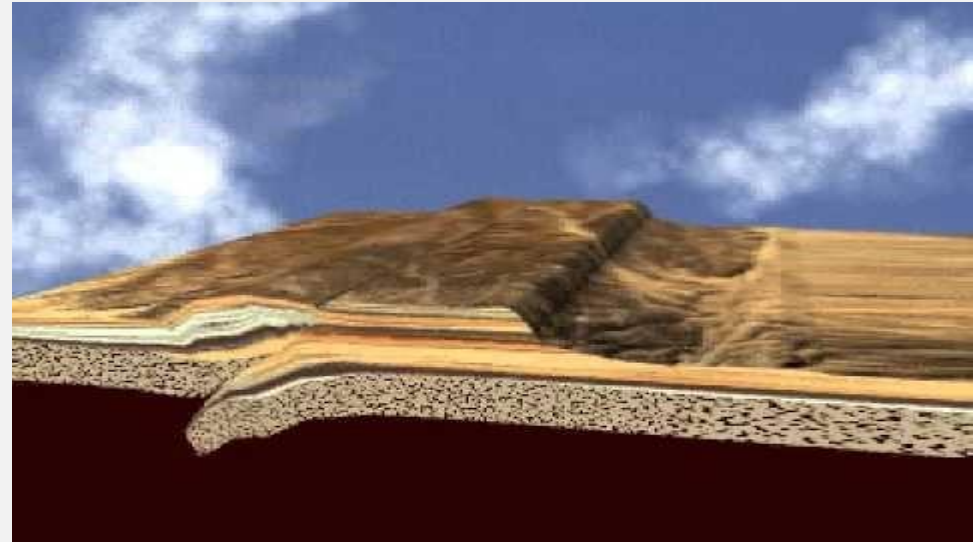


- The area around the sinking plate is called the **SUBDUCTION ZONE**
- The rock around the subducting slab melts into magma.
- Magma, or molten rock, is not as dense as the solid rock of the crust and lithosphere.
- The magma rises to the surface, creating a volcano.
- Volcanos spew magma-when magma reaches the earth's surface, however it is called LAVA



# PLATES COLLIDING

- When two continental plates collide, because they are of equal density, one doesn't get subducted
- Instead, the crusts get compressed into each other, forming folds and crumples, which we see as mountains.





## PLATES COLLIDING

- Oceanic plates occur at midocean ridges where molten rock has cooled and solidified.
- As more molten rock erupts in the ridge, it pushes the oceanic plate away from the ridge.
- As it gets farther away, it gets colder and denser
- So when two oceanic plates collide, whichever plate is older (and therefore colder and denser) will sink underneath the younger (and therefore warmer and less dense) plate.
- One oceanic plate is always a bit less dense than the other.

## PLATES SLIDING PAST EACH OTHER

- When plates slide past each other in different directions, their edges can scrape, causing **EARTHQUAKES**.
- Places that experience frequent earthquakes, like California, are located on top of plate boundaries.
- Plates sliding past each other can also form **FAULTS**.
- Or enormous fractures in the rock bed.
- The boundary between plates sliding past each other is called a **TRANSFORM BOUNDARY**

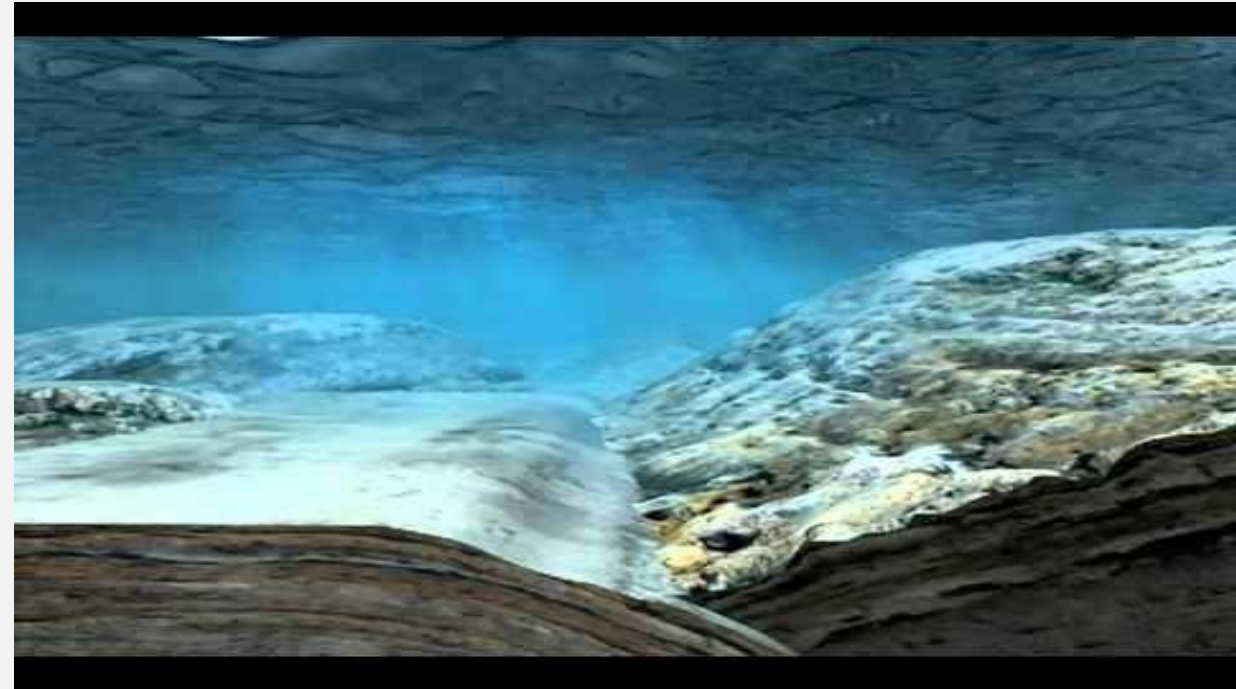


# EARTHQUAKES

- As rocks get strained from rubbing against other tectonic plates, they build up potential energy until they break and move releasing all this stored potential energy.
- This movement and breaking causes vibrations that move outward like a wave-that's an earthquake.
- \*Think of straining rocks like stretching a rubber band
- The rubber band will keep stretching, until at some point, it breaks and releases all of the potential energy it was storing as it stretched.

# TSUNAMIS

- Earthquakes that happen under water can create seismic sea waves, called TSUNAMIS
- As these tsunamis approach land, they can be enormous-
- Sometimes as tall as a nine story building- and can causes a lot of destructions.



# VOLCANOES

- Magma or molten rock, is less dense than the solid rock of the crust and lithosphere, so it constantly wants to rise to the surface.
- When rising high-pressure magma finds an opening to the surface, the magma explodes out of it
- Volcanoes usually form as tectonic plates collide or drift apart to form a long crack, or RIFT
- Or they can just “pop up” at a HOT SPOT, where tons of boiling magma pushes toward the surface in one spot.
- When rising high-pressure magma finds an opening, it explodes to the surface, creating a VOLCANO

