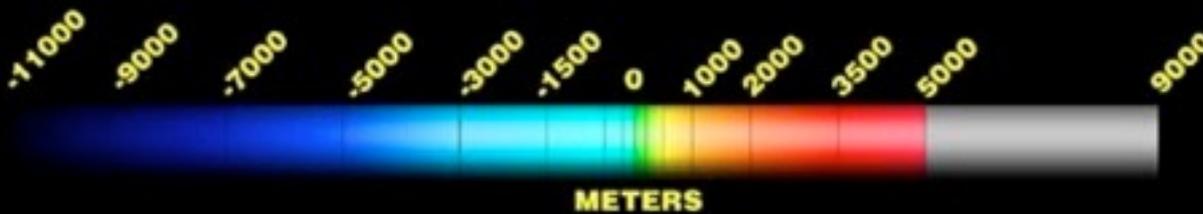
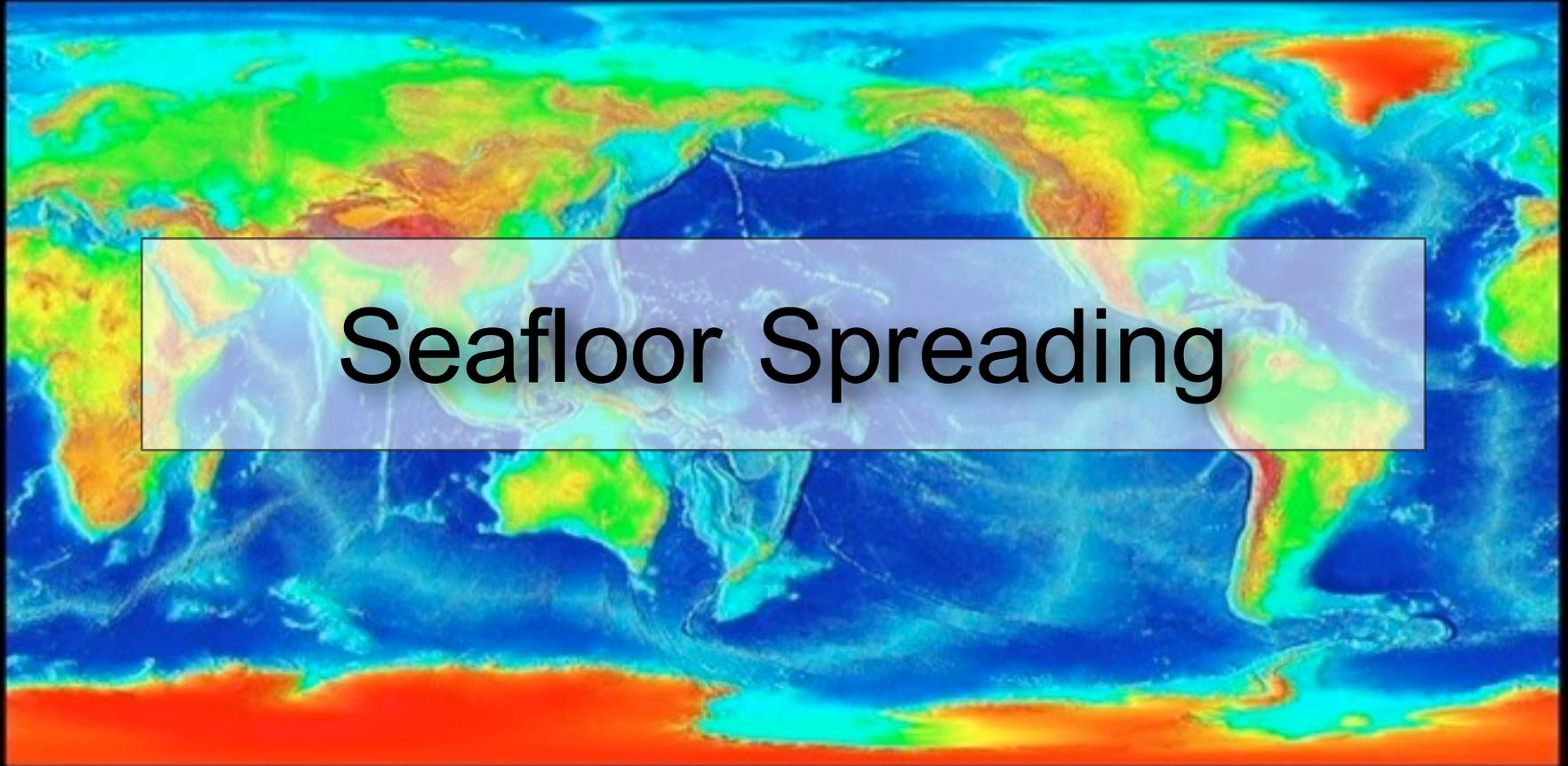


# Seafloor Spreading

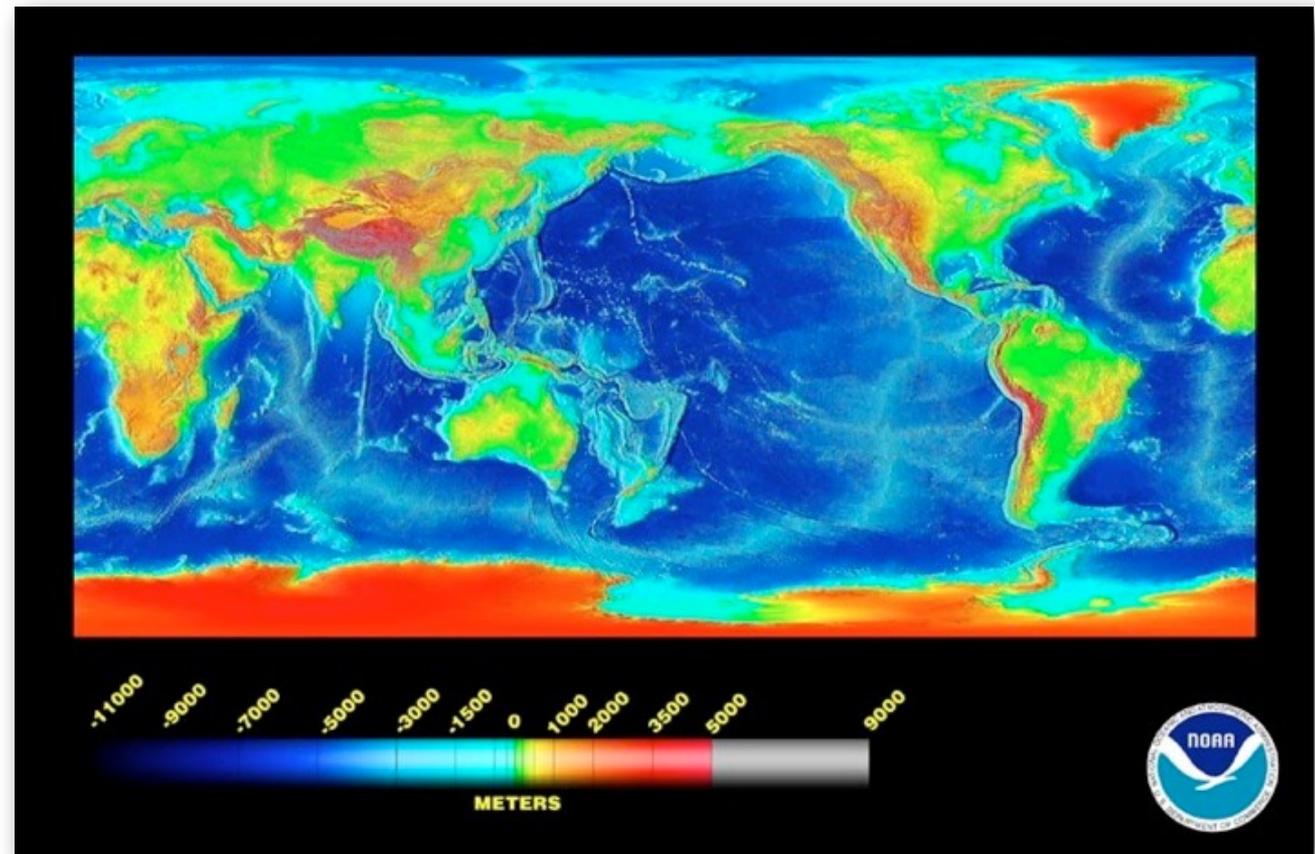


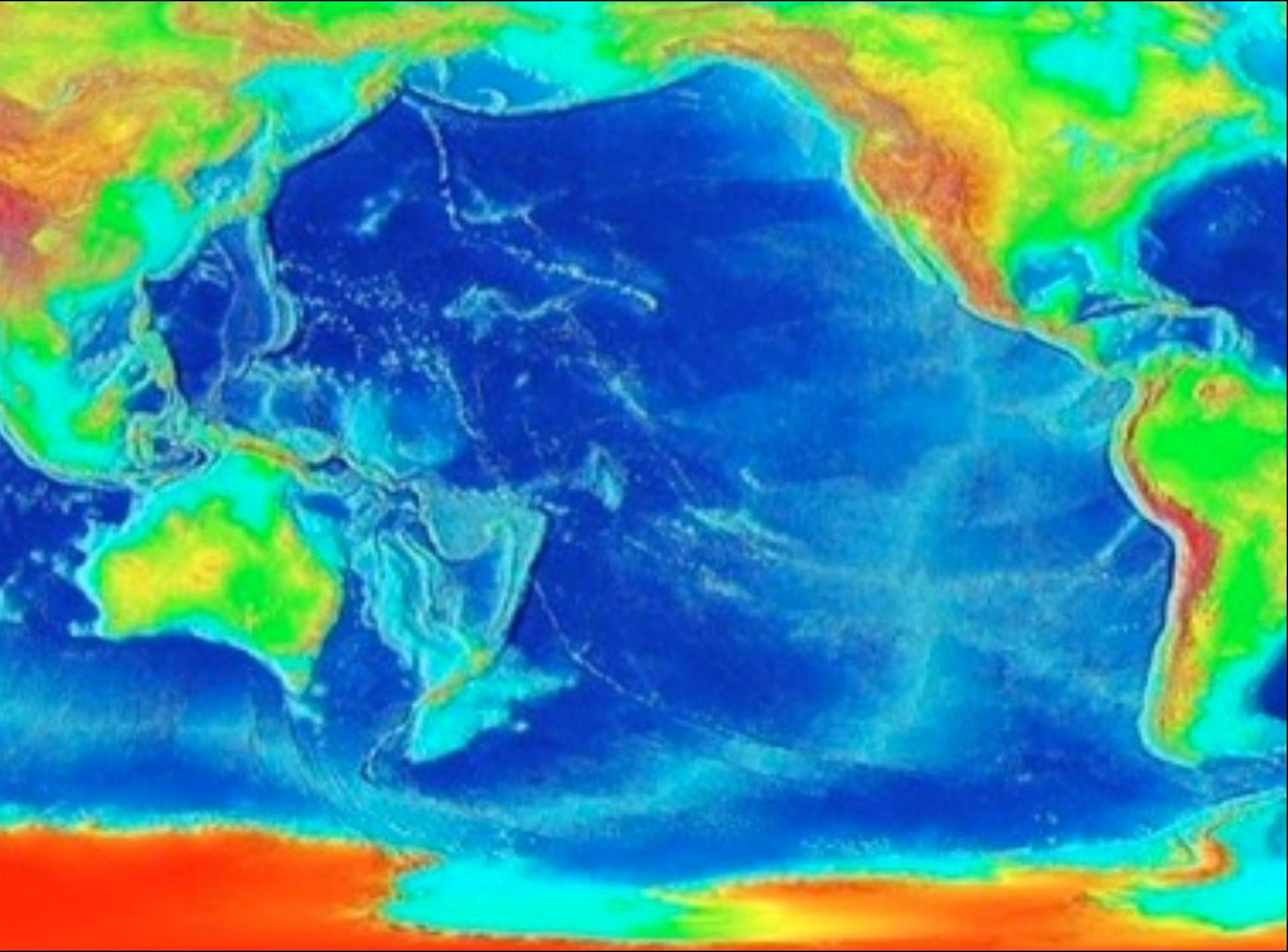
# Evidence from the Seafloor

The seafloor reveals valuable clues about processes such as plate tectonics.

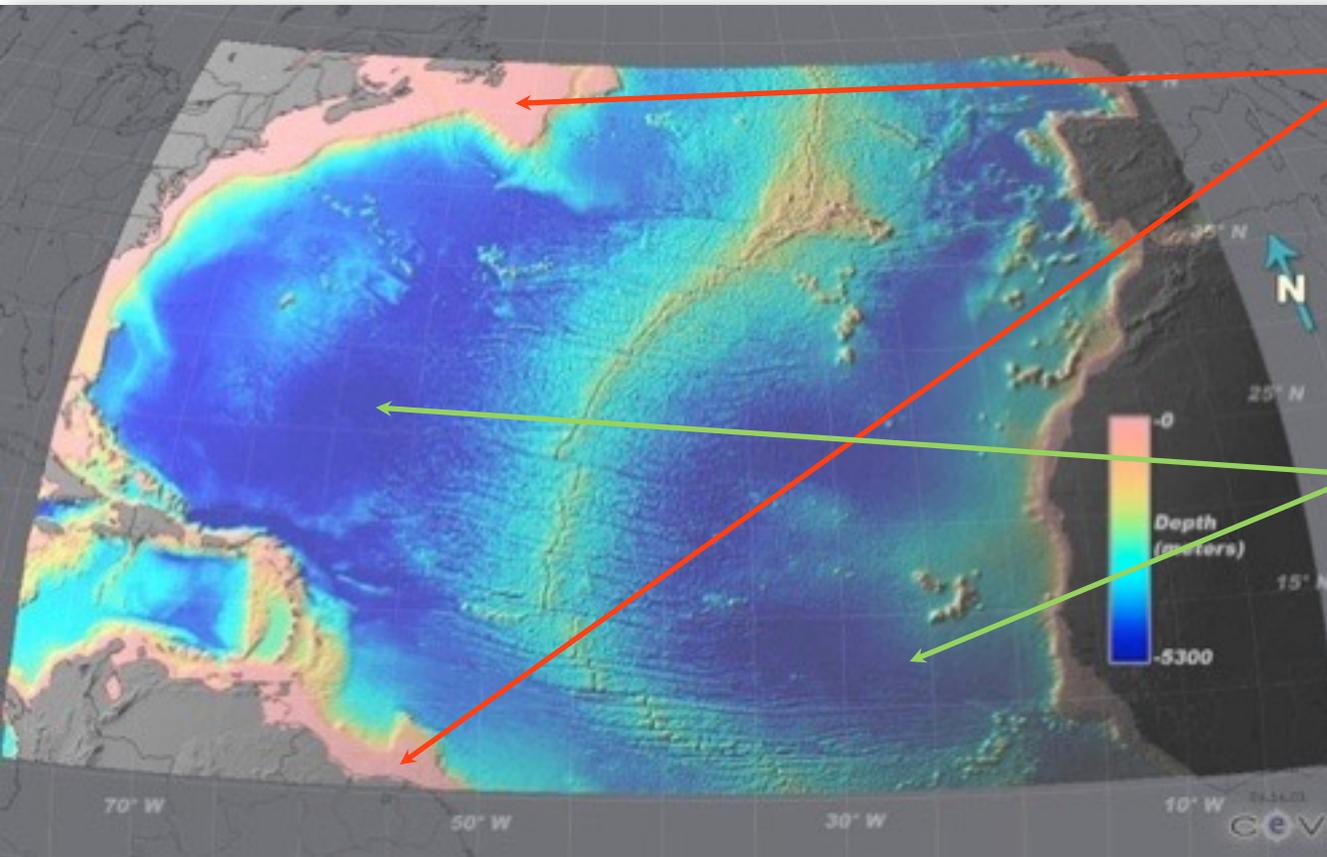
We are familiar with the wide diversity of landforms and geologic processes on the continents - but there is an equal diversity in the ocean basins.

The oceans contain volcanoes, mountain chains, valleys, plateaus, etc.





# Seafloor Topography



Continental shelf  
Narrow, shallow  
ocean surrounding  
continents

Abyssal plain  
Relatively level  
seafloor, often with  
volcanoes

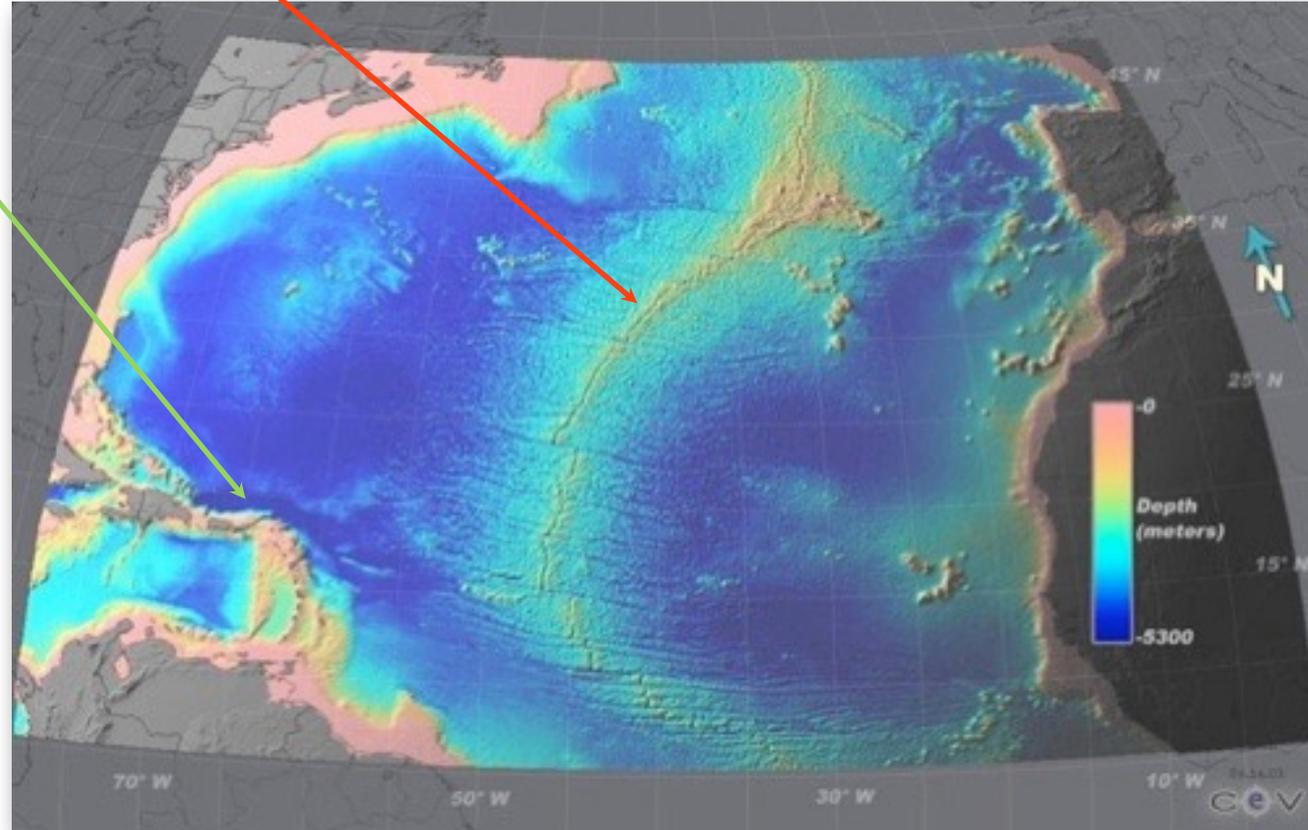
# Seafloor Topography

## Oceanic ridge

- Submarine mountain range that is a source of volcanic activity.
- Topographic feature winding through the ocean basins like the seams on a baseball — 70,000 km long.
- Often found toward center of ocean basins

## Oceanic trench

- Narrow, deepest portion of ocean floor (Puerto Rico trench)
- Found adjacent to some continents or island chains and along the margins of oceans
- Most common around Pacific Ocean

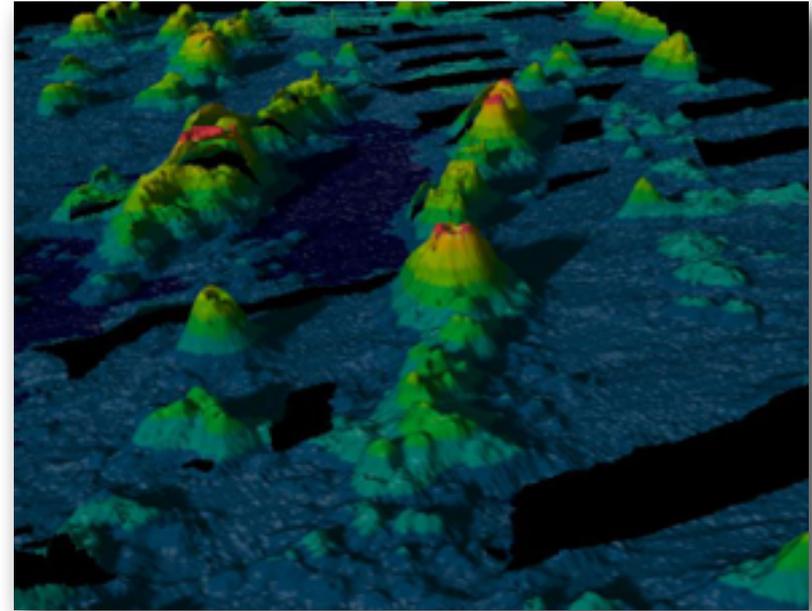


# Seafloor Topography

Dotting the deep-ocean floor are isolated volcanic peaks called *seamounts*. They are most common in the Pacific Ocean.

Where they poke above sea level, they are islands — Hawaii, Azores, etc.

They may gradually sink and erode below sea level.



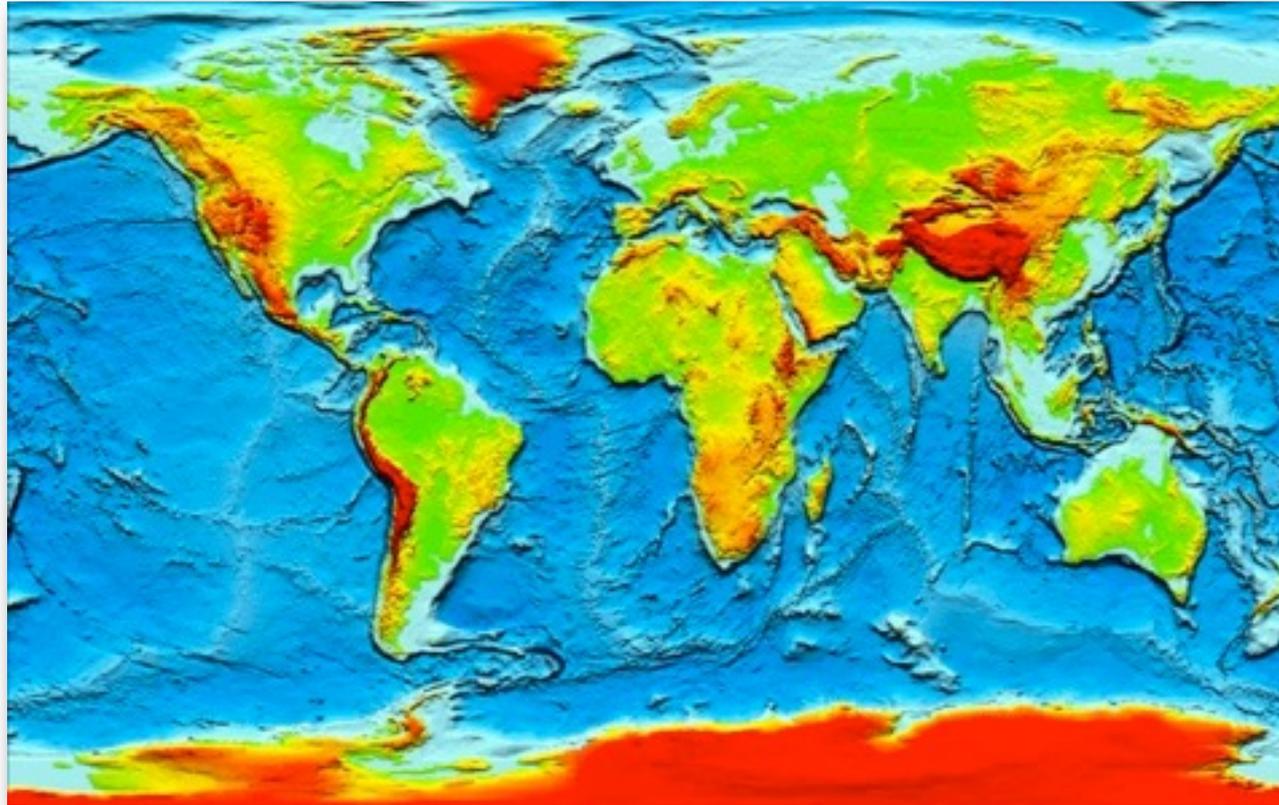
*Guyots* — submerged, flat-topped seamounts.

*Coral atolls* are sinking volcanic island flanked by coral reefs.

Harry Hess was a geologist that was a captain in the Navy during WWII. His ship was equipped with sonar and he was able to study the seafloor.



He was able to map portions of the seafloor and his observations led him to propose a new hypothesis known as *Seafloor Spreading*.

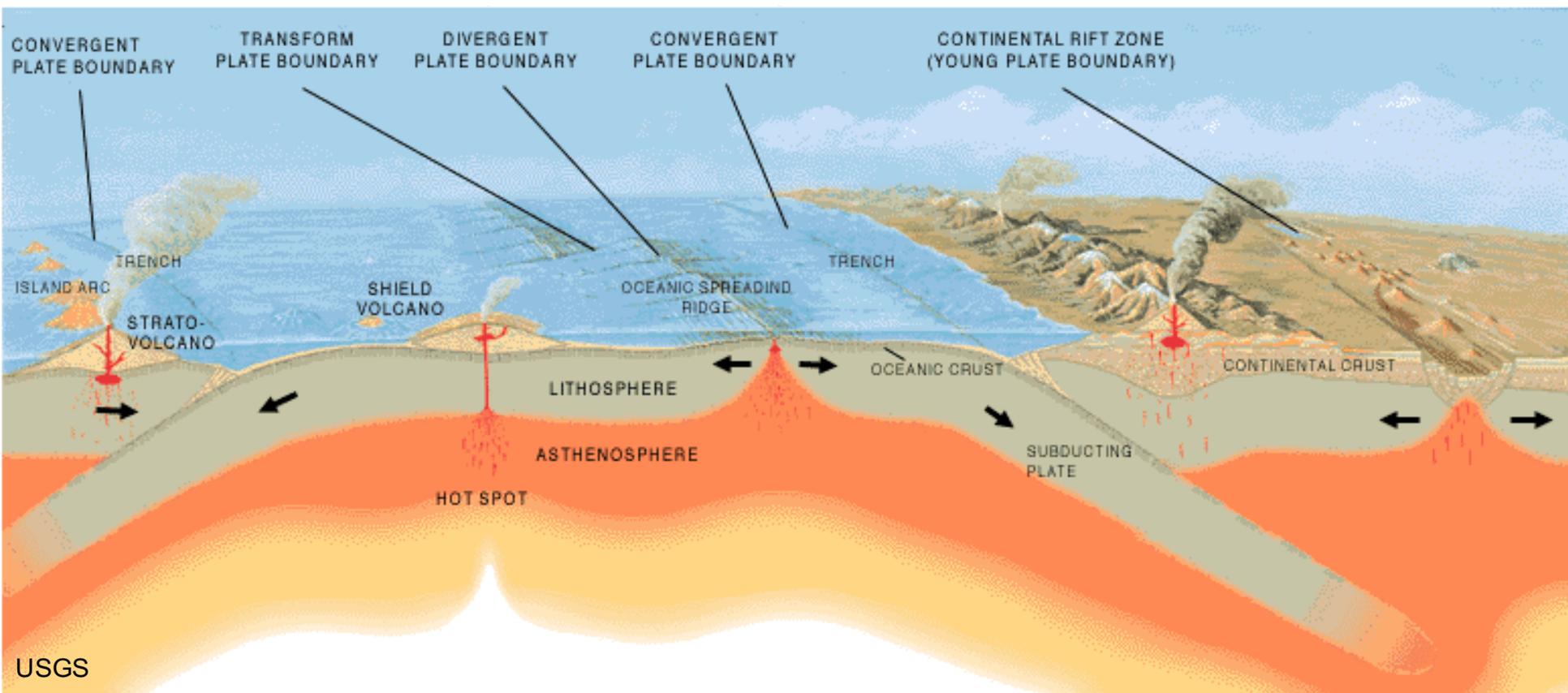


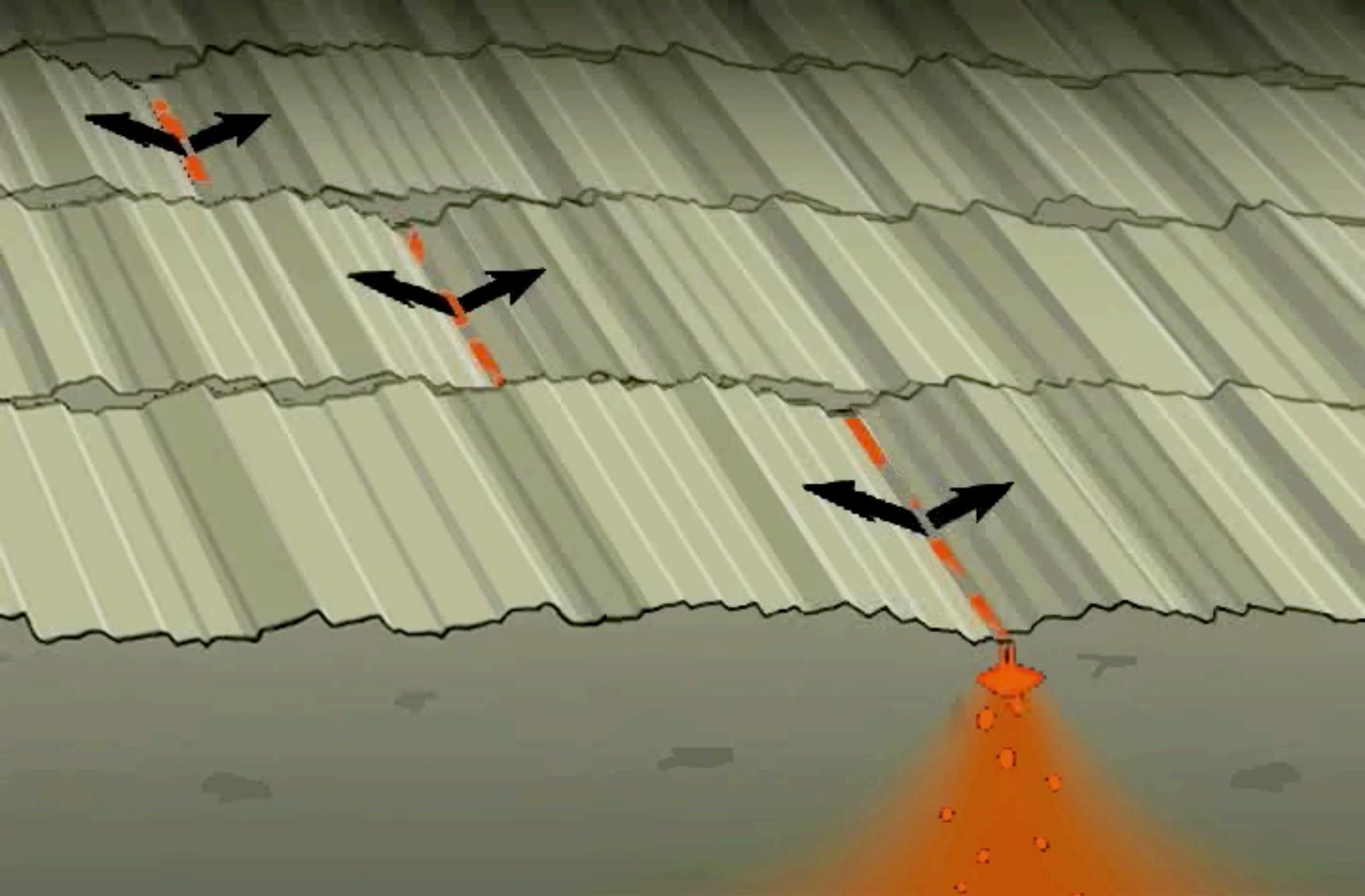
NASA

# Seafloor Spreading Hypothesis

## Oceanic ridges

- Magma rises from mantle, forms new oceanic crust
- Expansion of seafloor results in high elevations
- Seafloor moves away from ridge (conveyer belt) creating a gap for new material

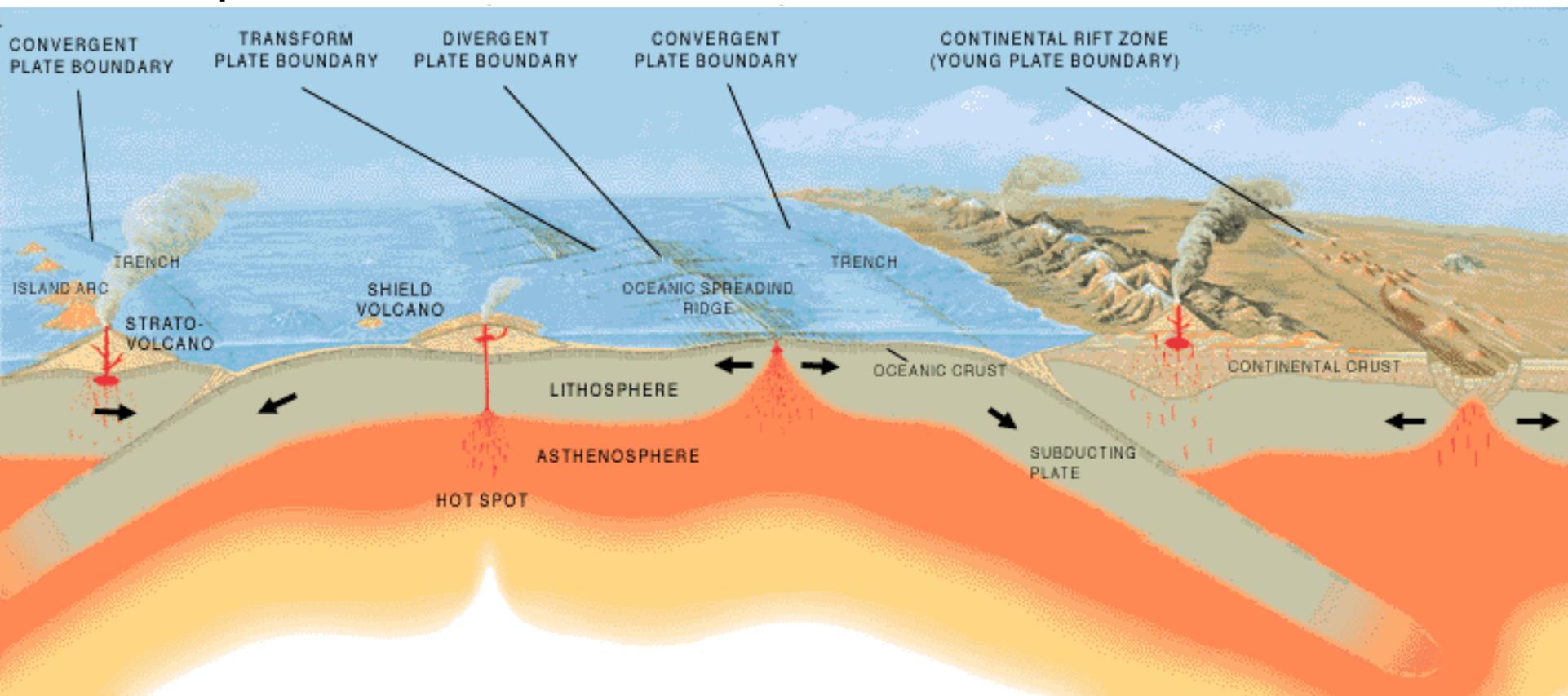


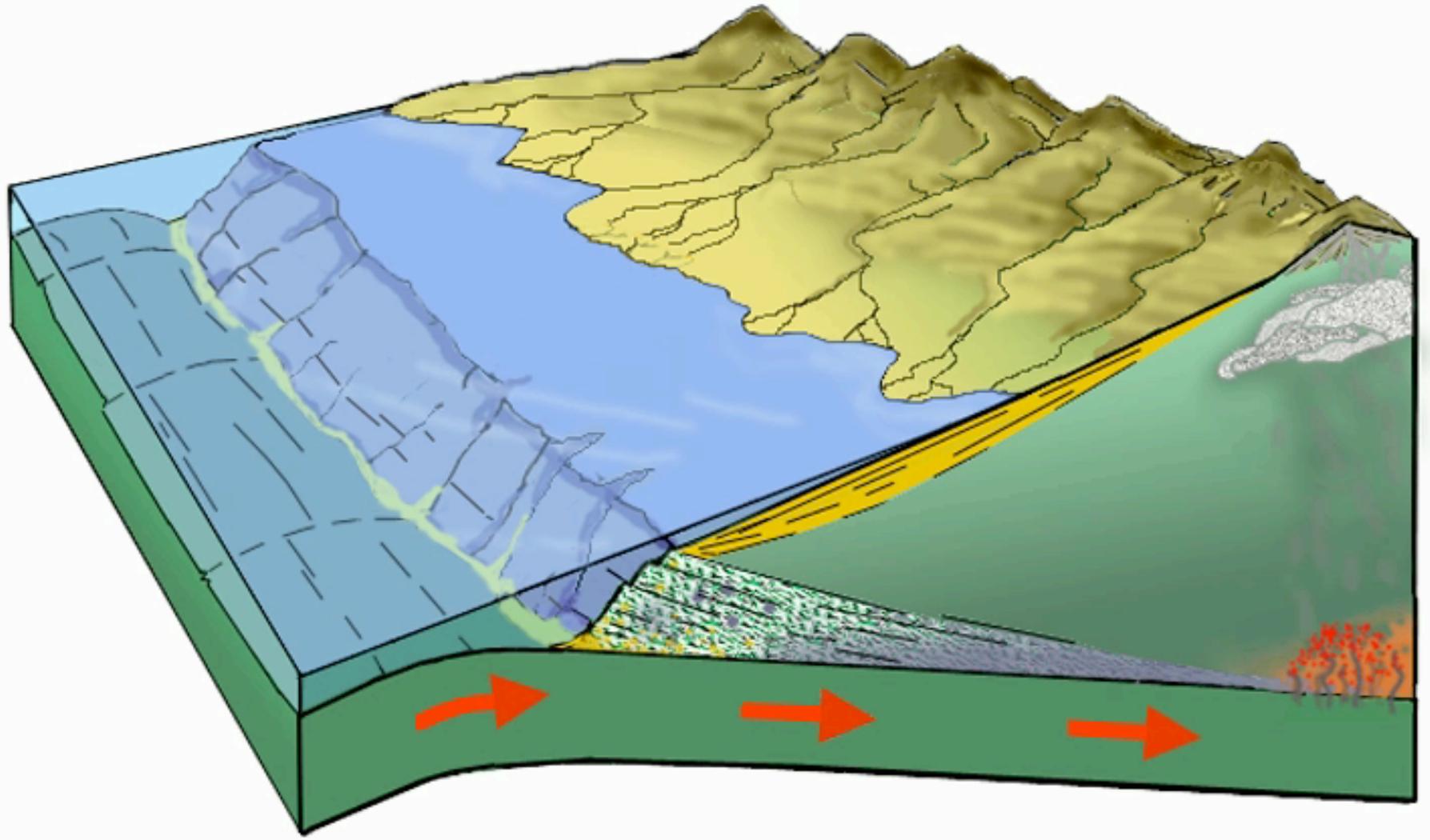


# Seafloor Spreading Hypothesis

## Oceanic trench

- Older seafloor descends into mantle at an **active margin**
- Melting of rocks in the mantle forms magma resulting in volcanism
- Earthquakes common where old seafloor is subducted

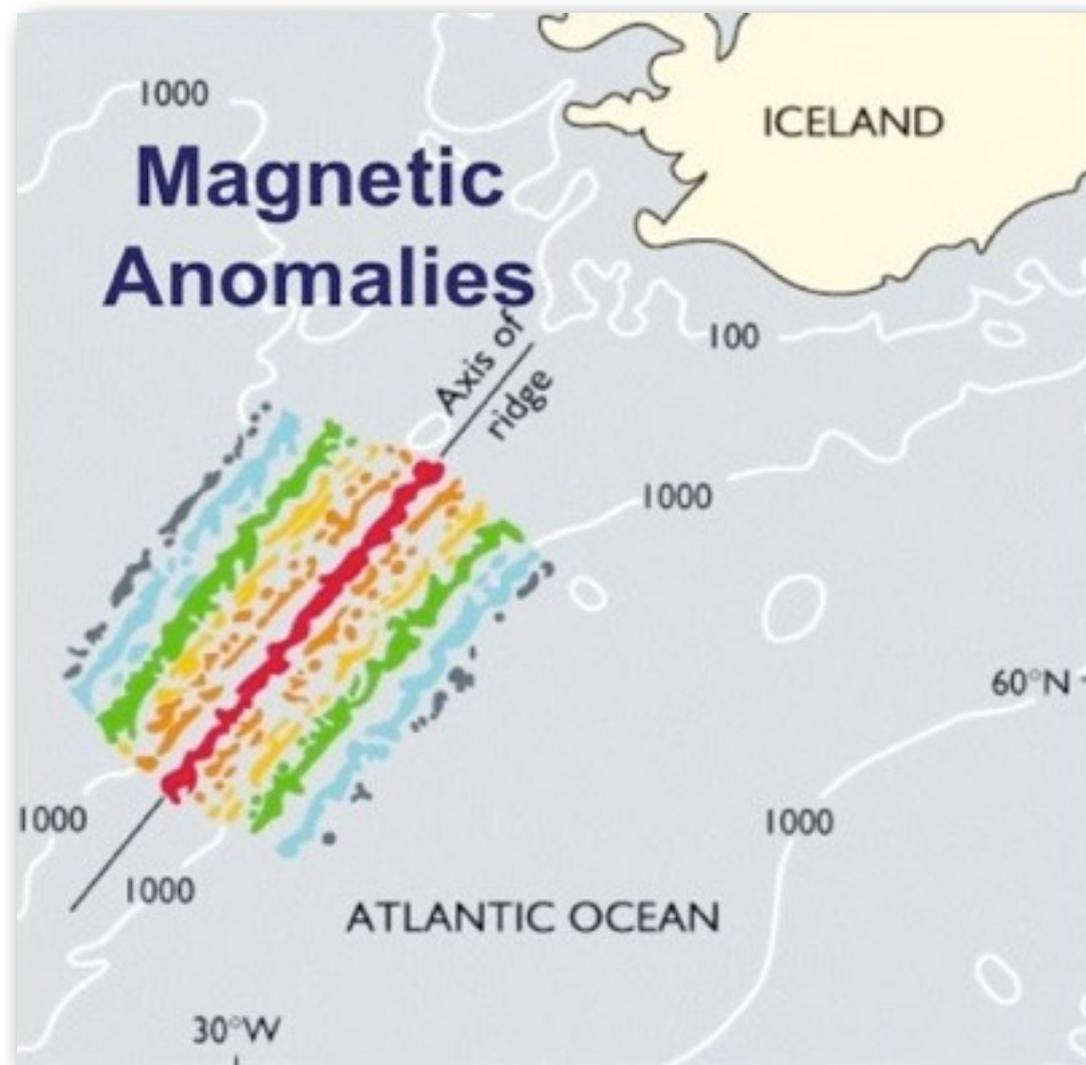




Other evidence that led Hess and others to propose seafloor spreading was based upon magnetic surveys of the seafloor.

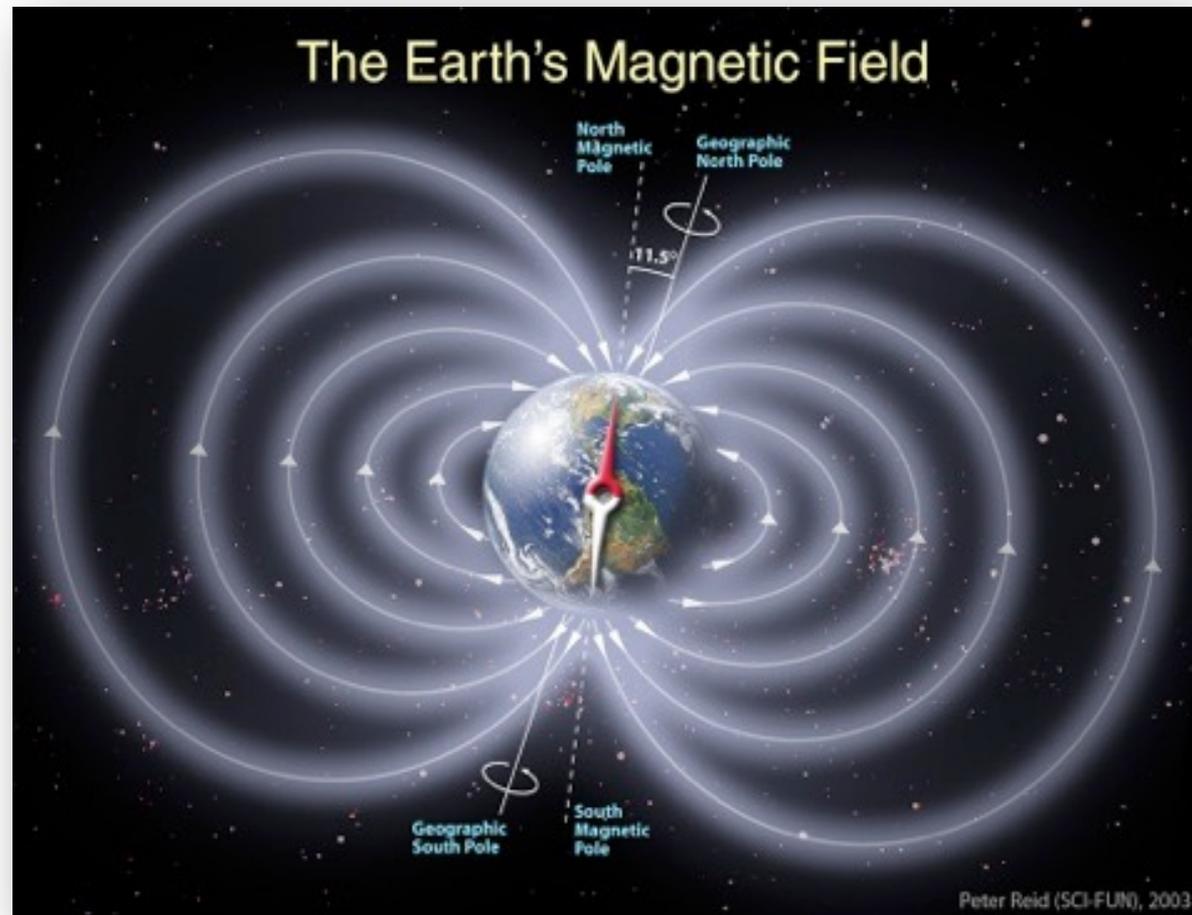
Magnetic data showed that the seafloor had different magnetic zones. Some areas were magnetized consistent with the Earth's current magnetic field but other areas were anomalous and seemed to have a magnetization that was the opposite of the Earth's magnetic field.

These “magnetic stripes” appeared to be parallel to the ridge axis.



Think of the Earth's magnetic field as being a giant bar magnet - today the Earth's magnetic north pole is nearly coincident with its geographic (rotational) north pole.

What we have found is that the Earth's magnetic field has reversed itself many times in the past - the magnetic south pole aligns itself with the geographic north pole.



Each period of normal or reversed polarity averages 250,000 years

Longest = 10's of millions of years

Shortest = 10's of thousands of years

Few thousand years to change polarity (normal → reverse or reverse → normal)??

