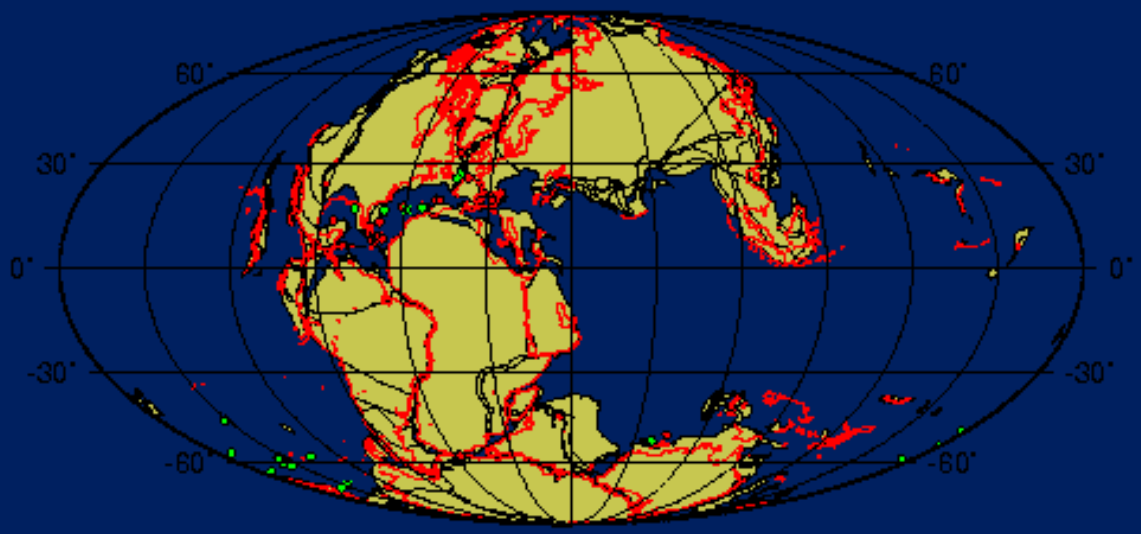
Theory of Plate Tectonics



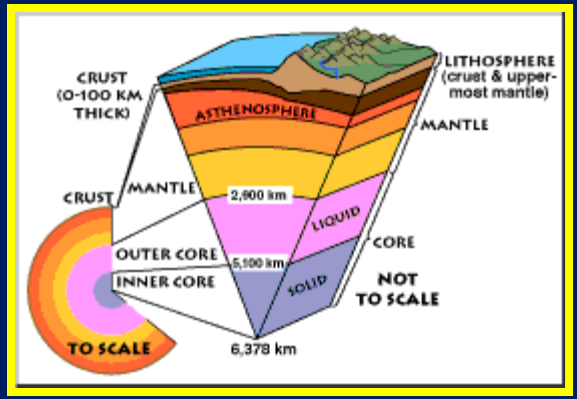
150 My Reconstruction

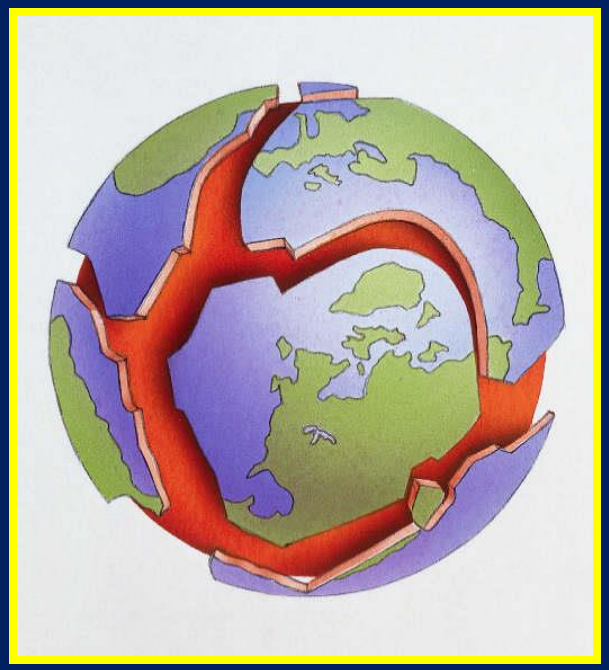
Essential Standard 2.1: Explain how processes and forces affect the lithosphere

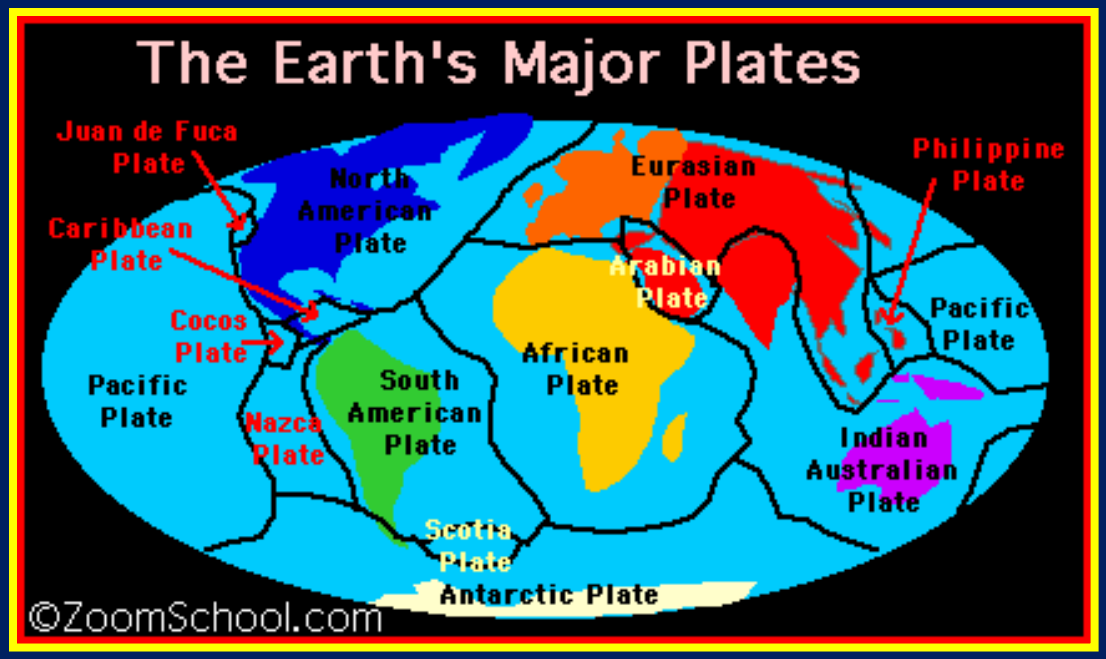
Objective 2.1.1: Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere.

Tectonic Plates

Earth's lithosphere is broken into about a dozen major plates



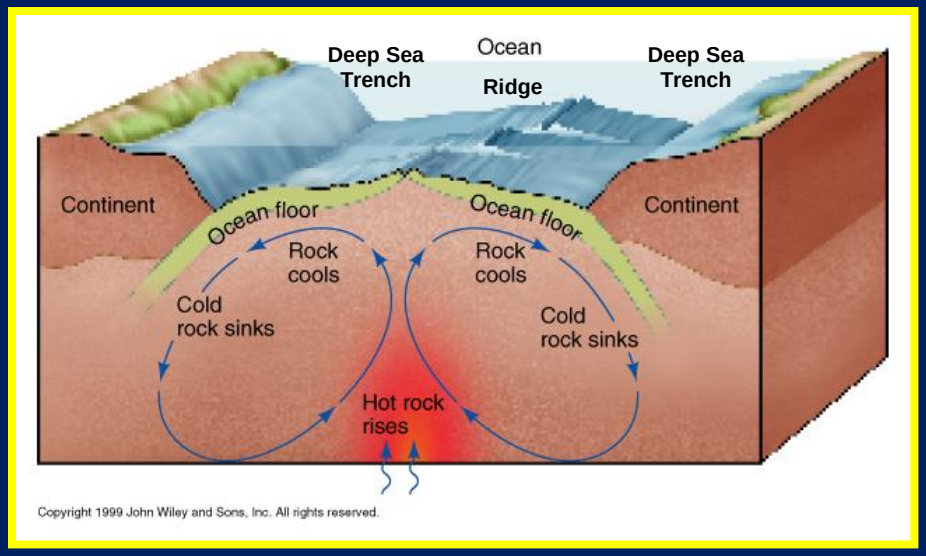




Convection Currents

Heat from Earth's core cause convection currents in the plastic mantle or asthenosphere

Convection Currents

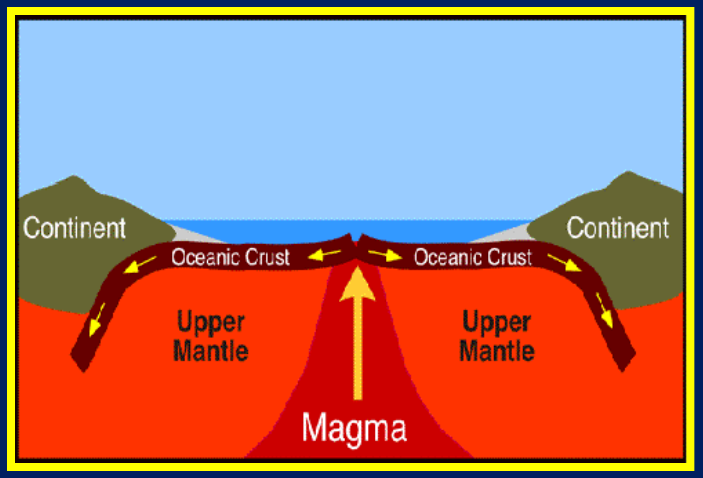


Hot magma rises at ocean ridges

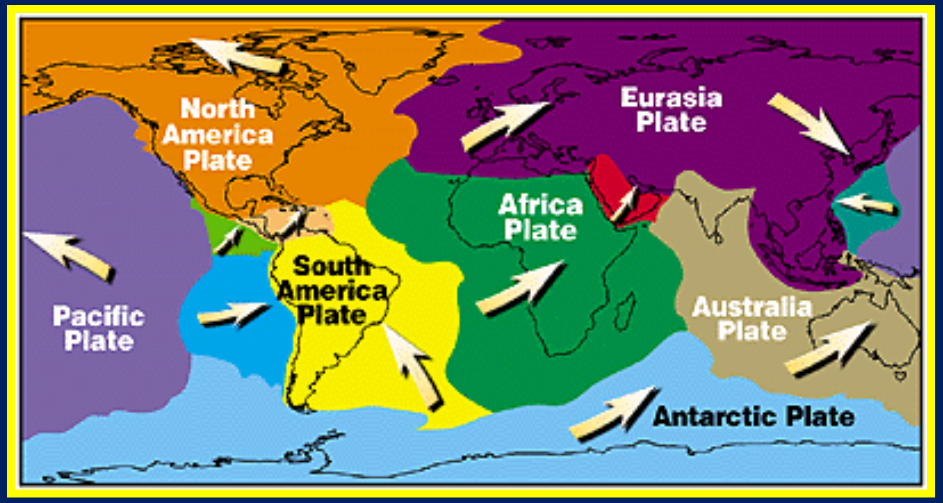
Cool magma sinks at deep sea trenches

Seafloor Spreading

New crust formed at ocean ridges, spreads outward, with continents riding along as passengers.



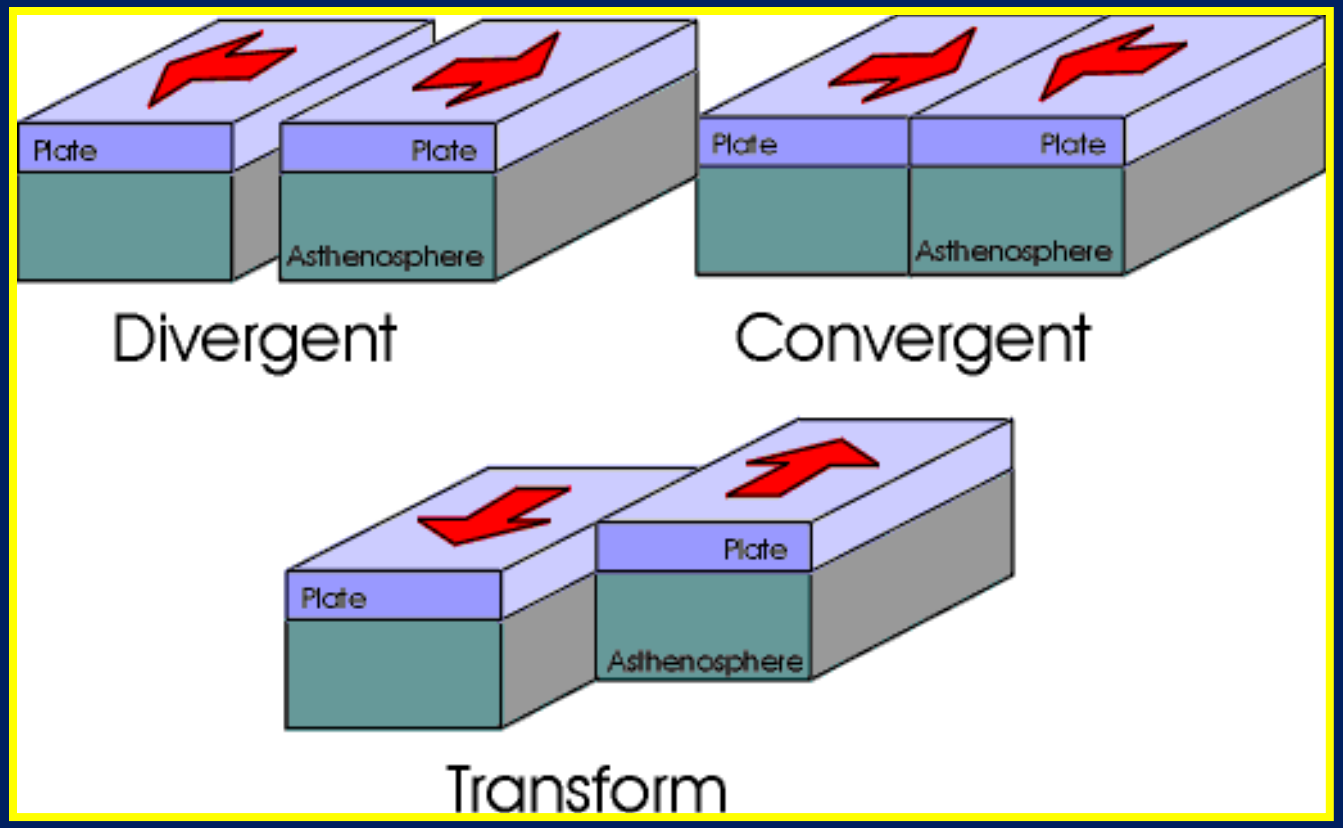
Not the Whole Story



As a result of seafloor spreading, other plates are actually moved in several different directions.

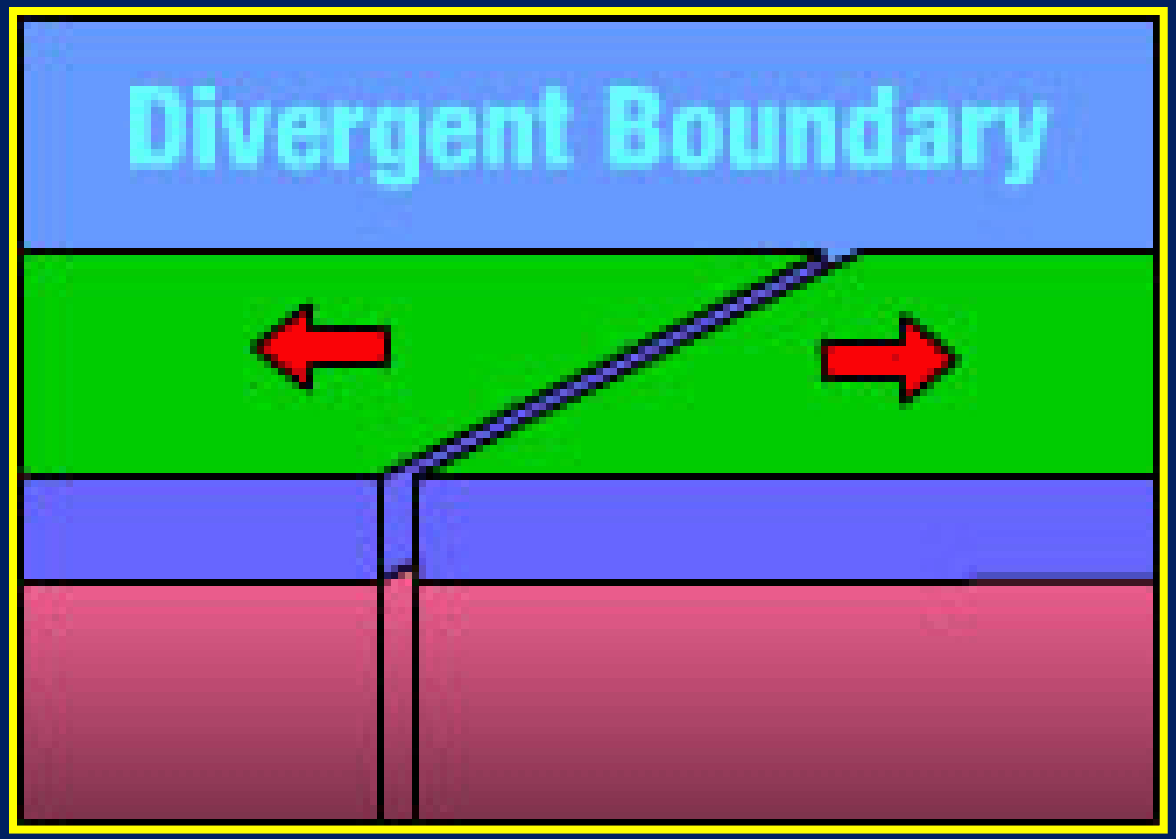
Plate Boundaries

Plate boundaries occur where plates interact and are classified by the type of movement that takes place at the boundaries.



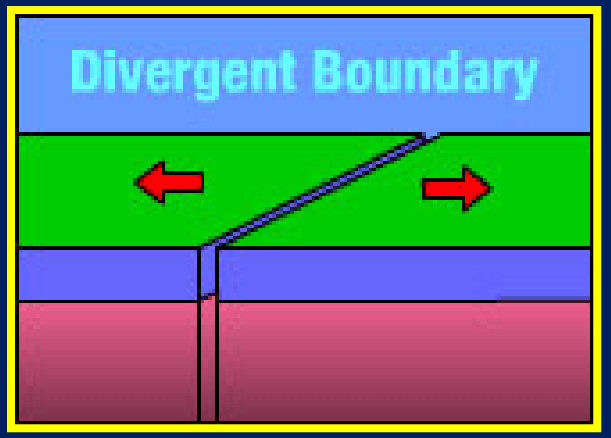
Divergent Boundaries

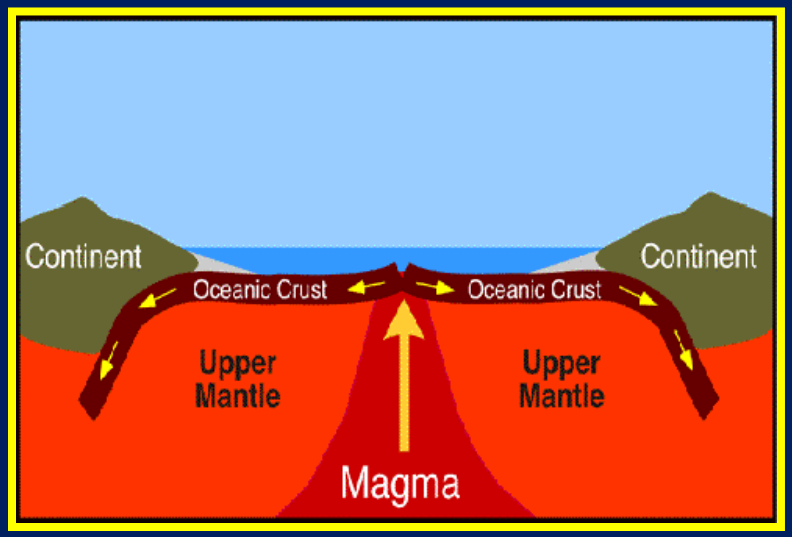
At divergent boundaries, the plates are moving away from each other.



Oceanic – Oceanic Divergent Boundaries

When the two divergent plates contain oceanic crust, a mid-ocean ridge forms with underwater volcanoes.





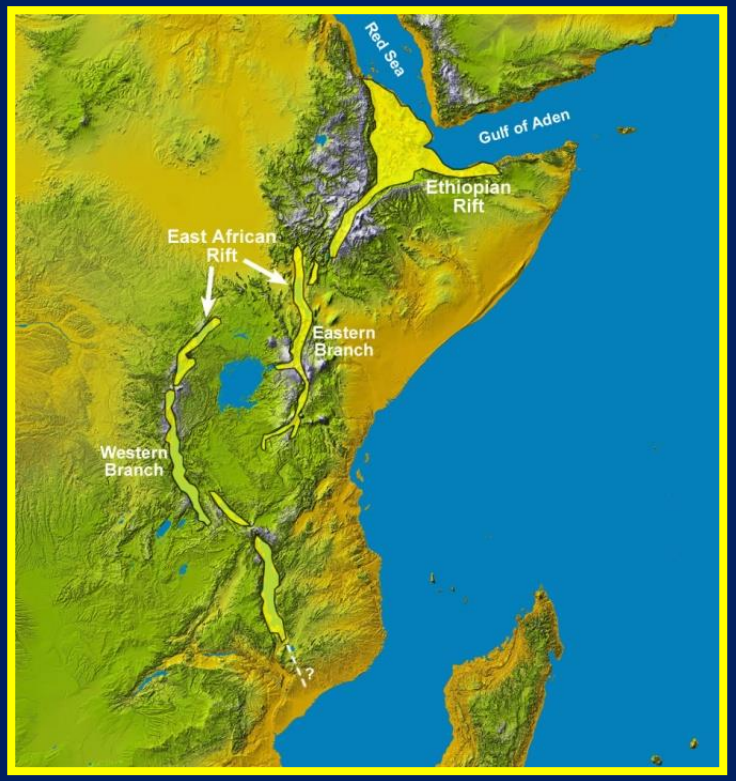
Divergent Boundaries

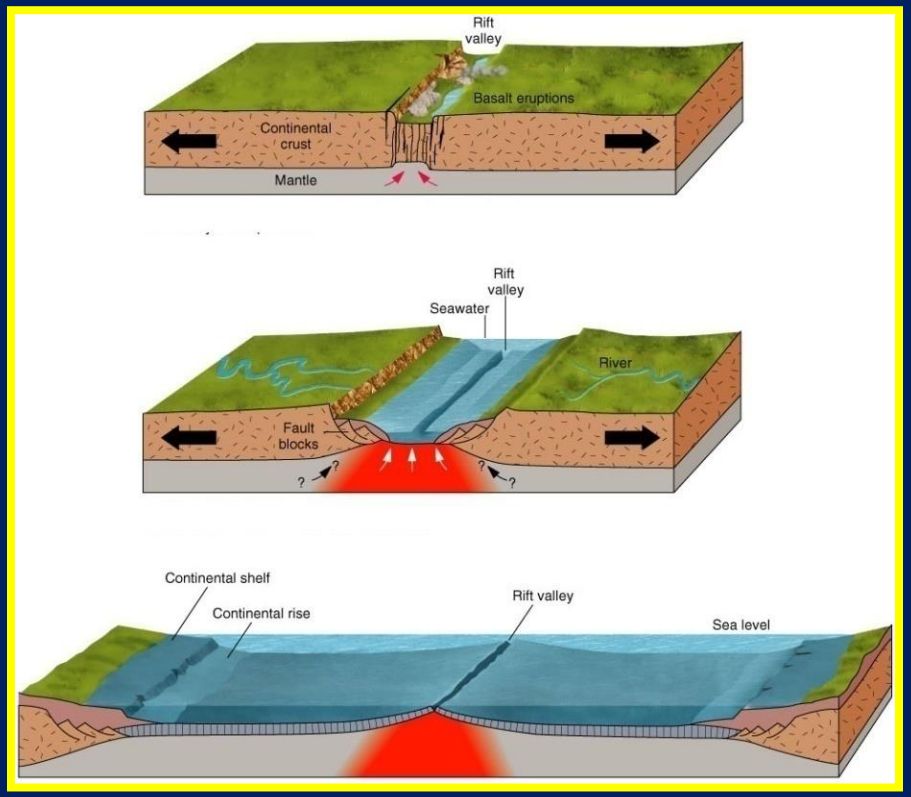
The Mid-Atlantic ridge runs right through Iceland and is responsible for all the volcanoes and geothermal heat found in Iceland.

Midatlantic Ridge in Iceland

Continental Divergent Boundaries

When the two divergent plates contain continental crust, rift valleys form that will eventually fill with water to form new oceans.





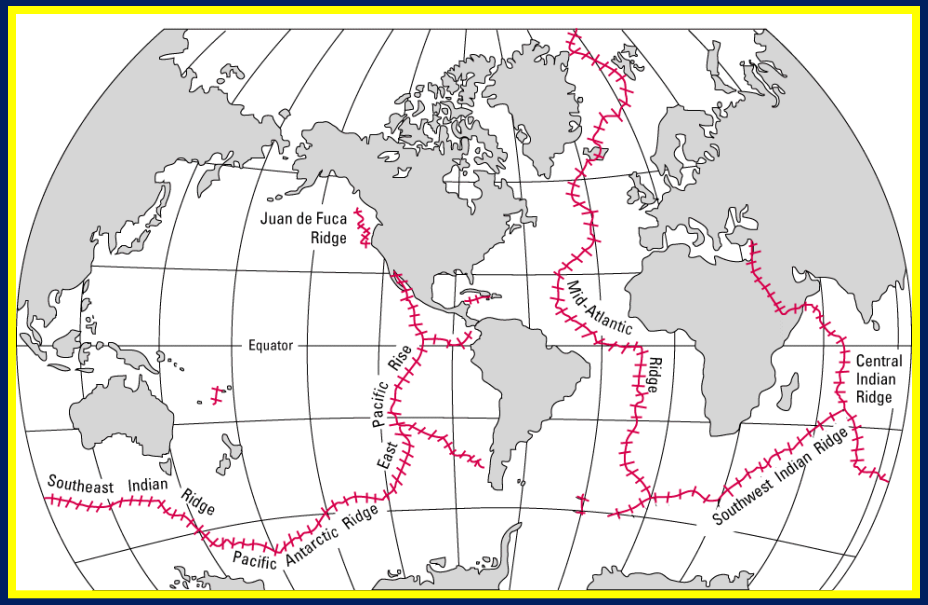
Divergent Boundaries

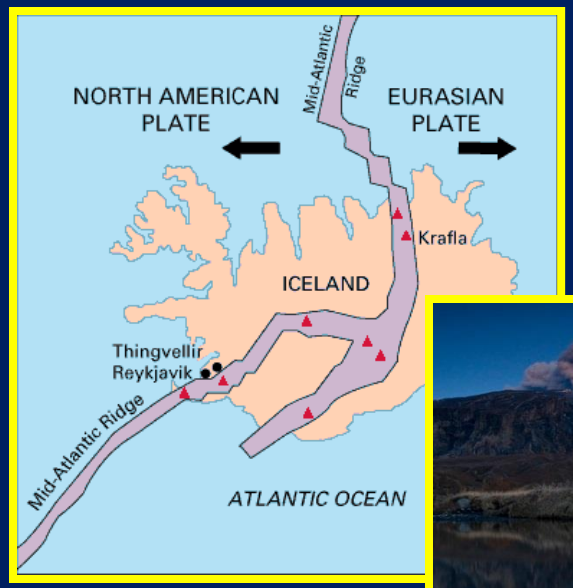
The East African Rift Valley will eventually fill with water and become a new ocean.

Mount Kilimanjaro

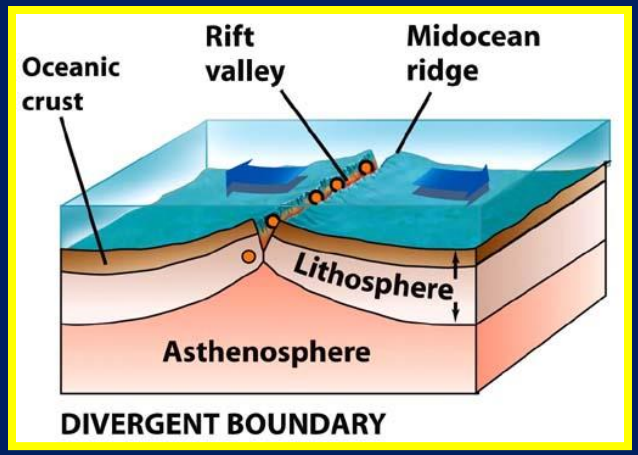
Divergent Boundaries

15% of Earth's Volcanoes and Shallow Earthquake Activity





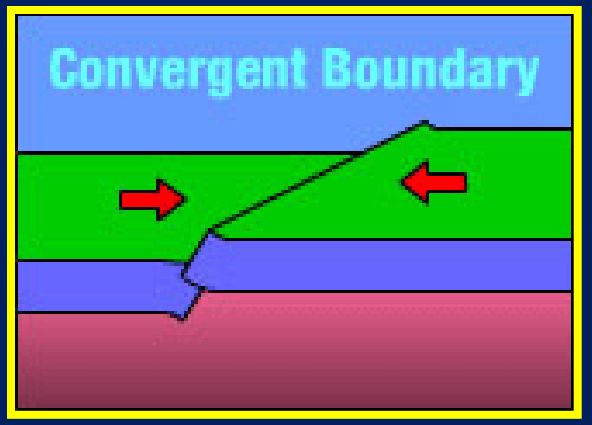
Eyjafjallajokull volcano 2010



● Shallow Earthquakes

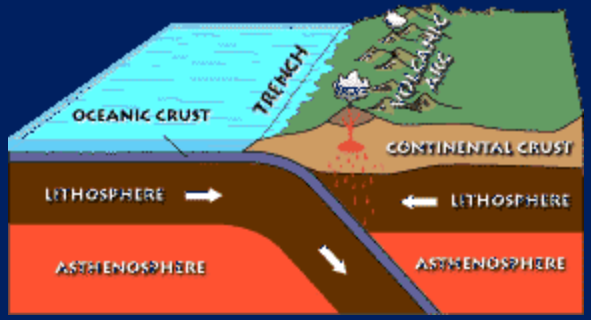
Convergent Boundaries

At Convergent Boundaries, the plates are moving towards each other

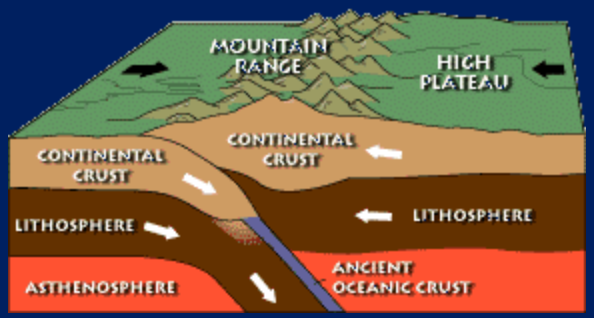


Geological features depend upon type of crusts involved

Oceanic - Oceanic



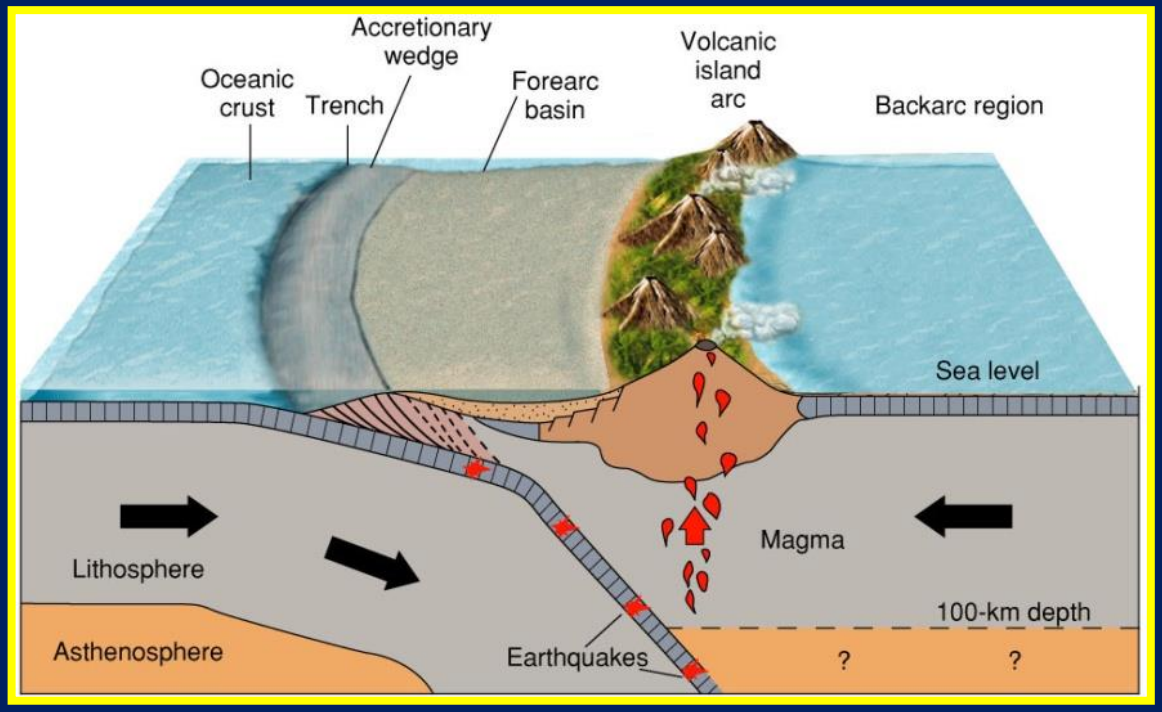
Oceanic - Continental



Continental - Continental

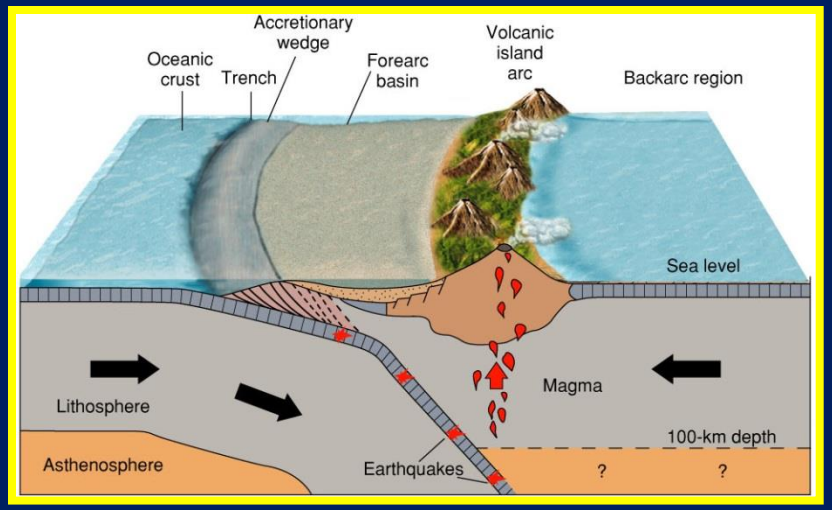
Oceanic – Oceanic Convergent Boundary

When both convergent plates contain oceanic crust, the older, cooler, more dense plate is pulled under the younger plate in a process called subduction.



Oceanic – Oceanic Convergent Boundary

Subducted crust melts, releasing CO_2 and water that rises to help from an arc of volcanic islands.

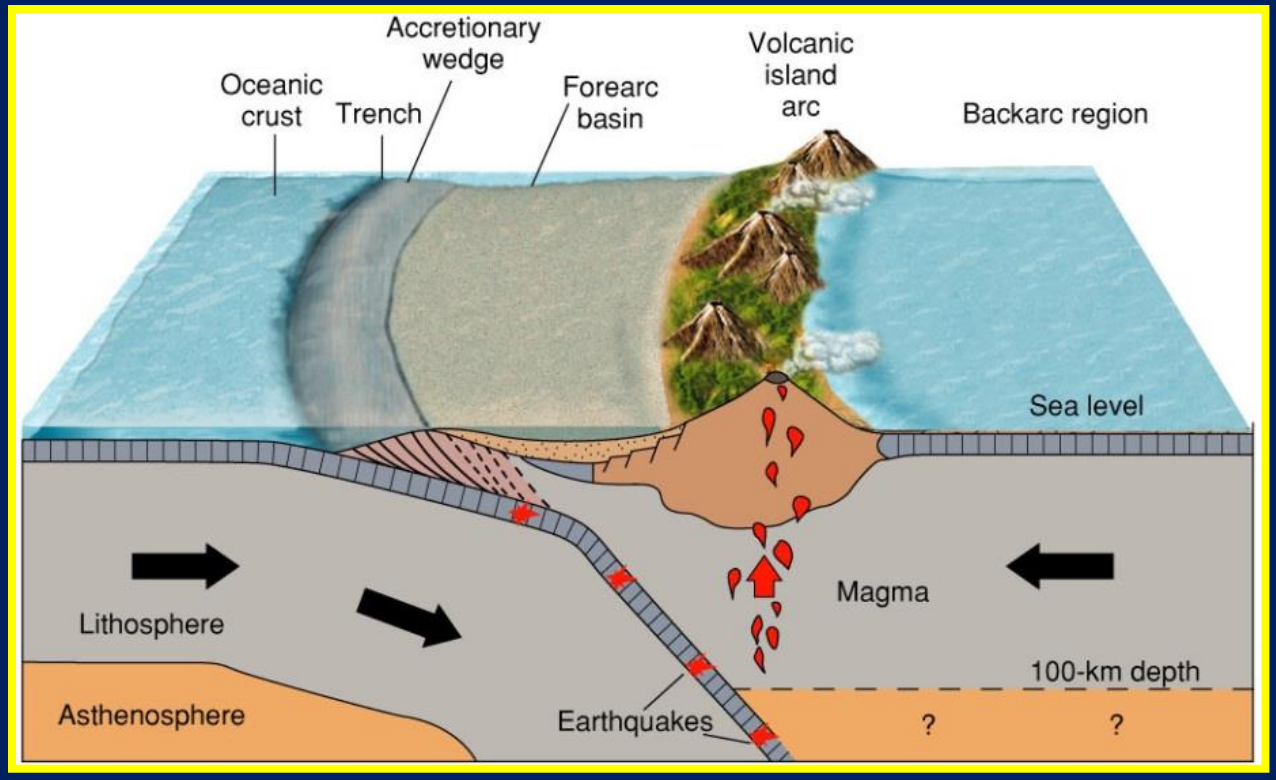


Mariana Islands

Aleutian Islands

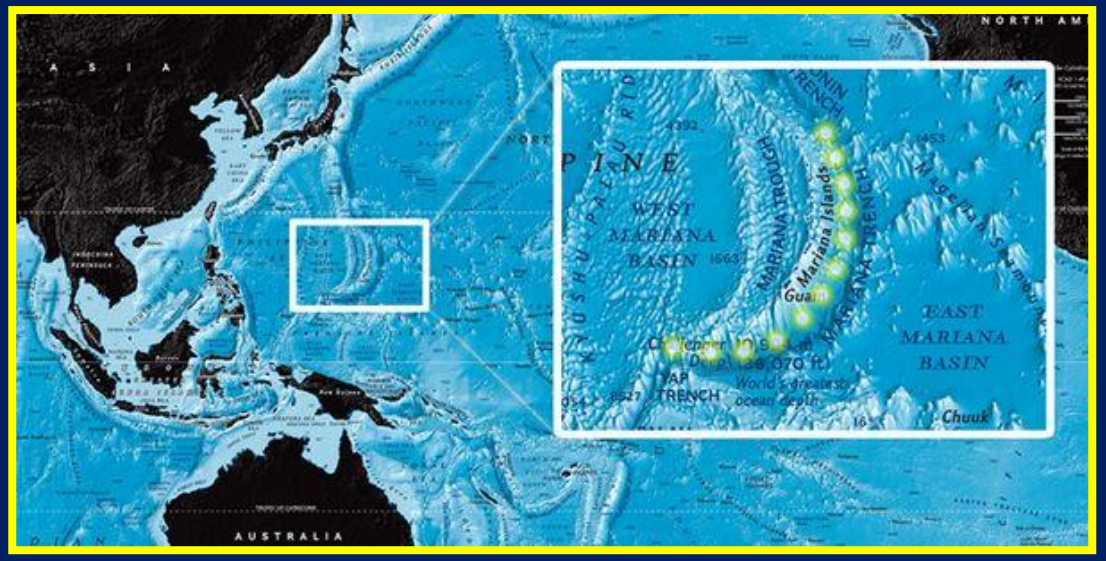
Oceanic – Oceanic Convergent Boundary

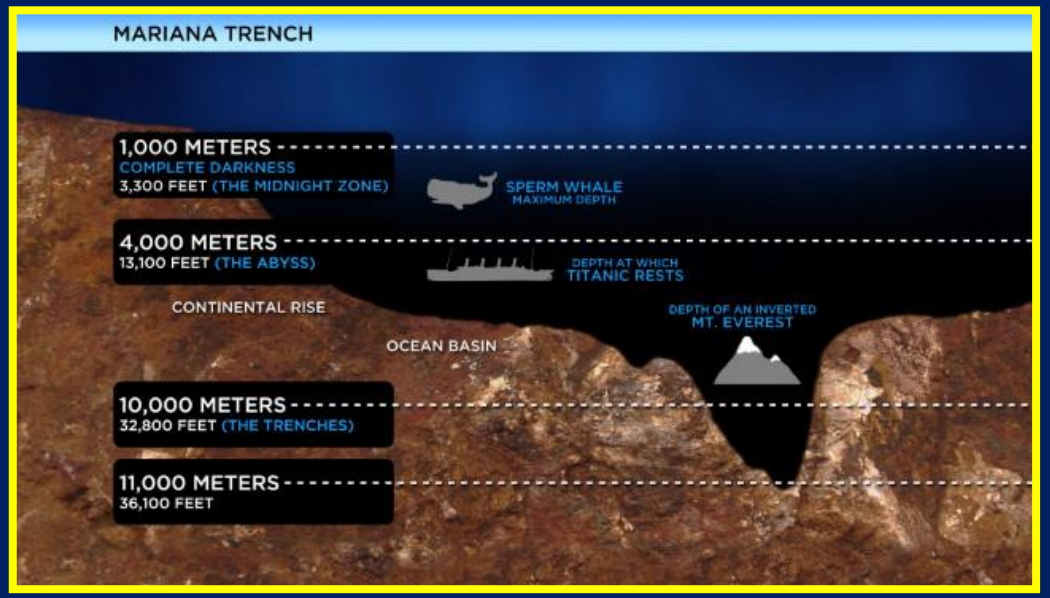
Because subduction zones can run very deep, they are called deep sea trenches.



Oceanic – Oceanic Convergent Boundary

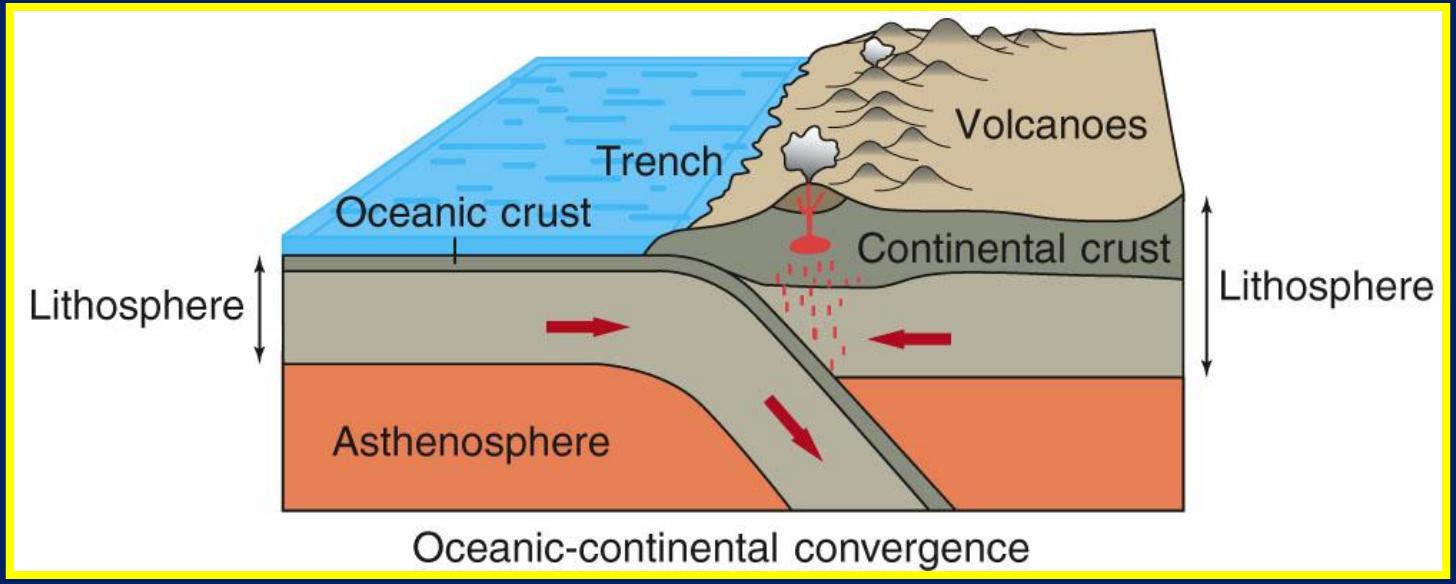
Mariana Trench is the deepest part of the ocean 6.8 miles





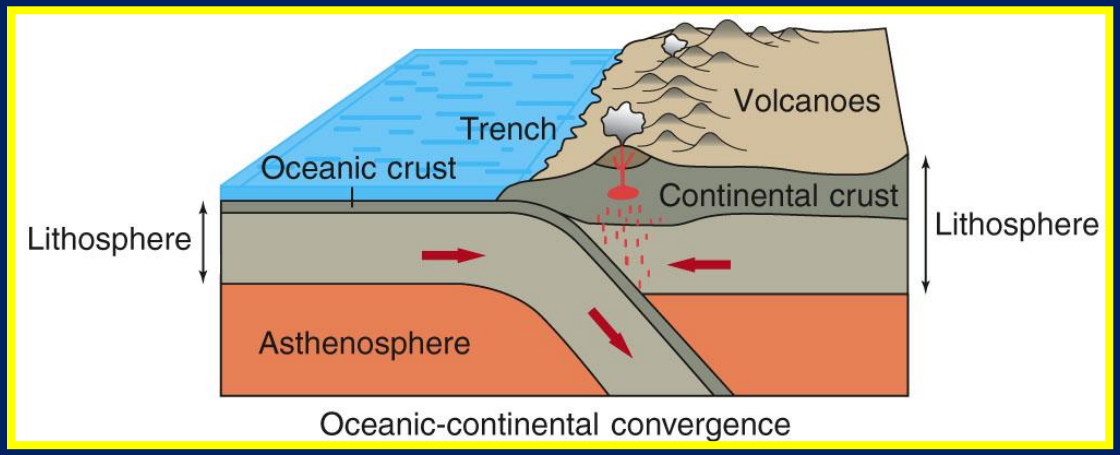
Oceanic – Continental Convergent Boundary

When one of the converging plates contains continental crust and the other contains oceanic crust, the oceanic plate is subducted under the continental plate and, again, a deep sea trench is formed.



Oceanic – Continental Convergent Boundary

As the oceanic plankton fossils are melted, carbon dioxide and water are released that then rise to help form volcanic mountain chains on the continental plate.

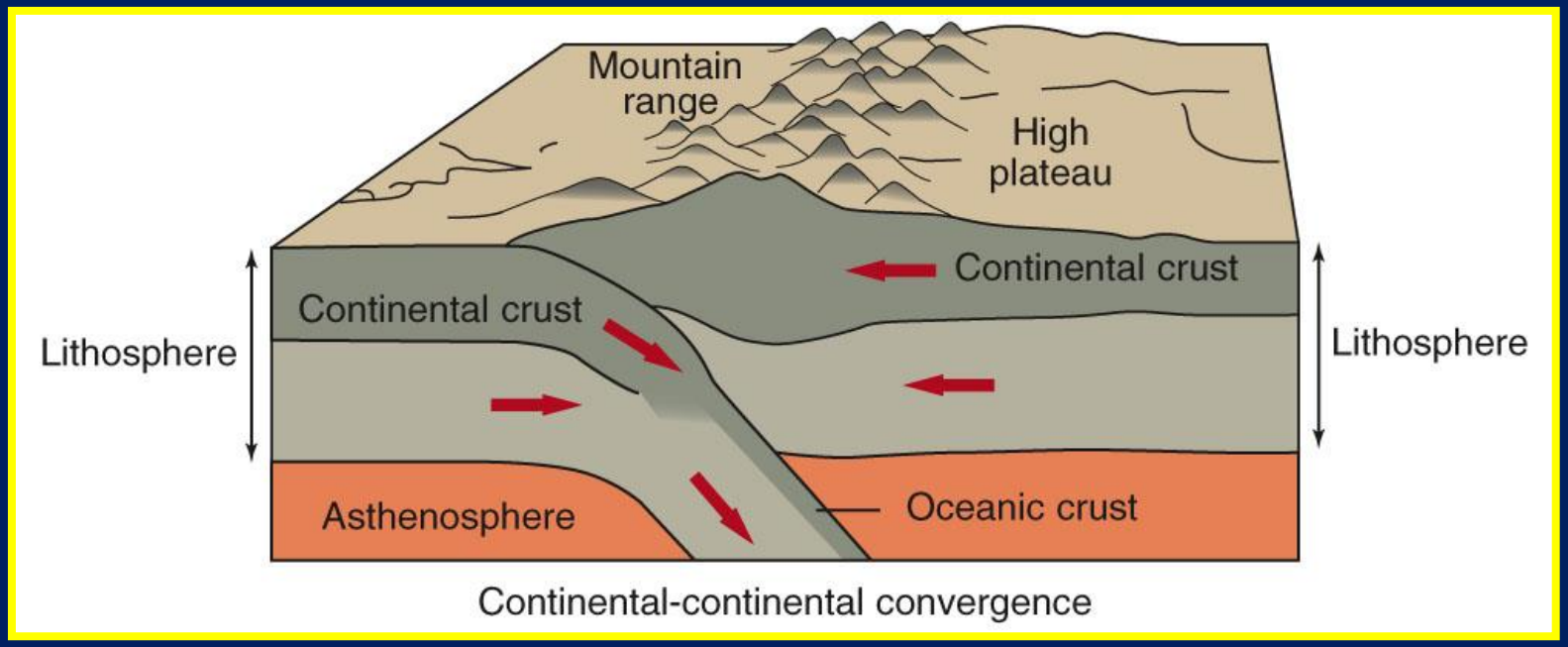


Mount St. Helens

Crater Lake

Continental – Continental Convergent Boundaries

When both of the converging plates contain continental crust, the two plates are uplifted to form folded mountain chains



Continental – Continental Convergent Boundaries

Convergent Boundaries

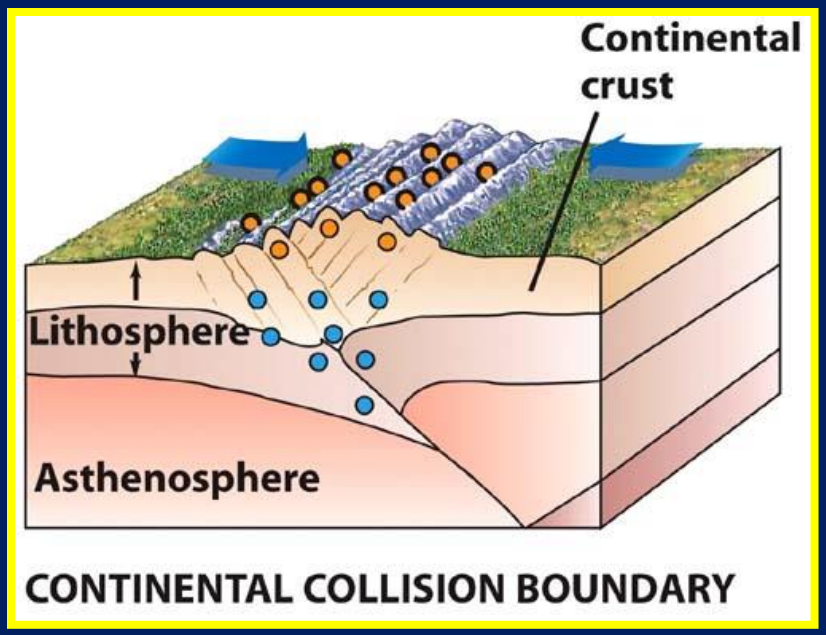
80% of all volcanoes are associated with convergent boundaries

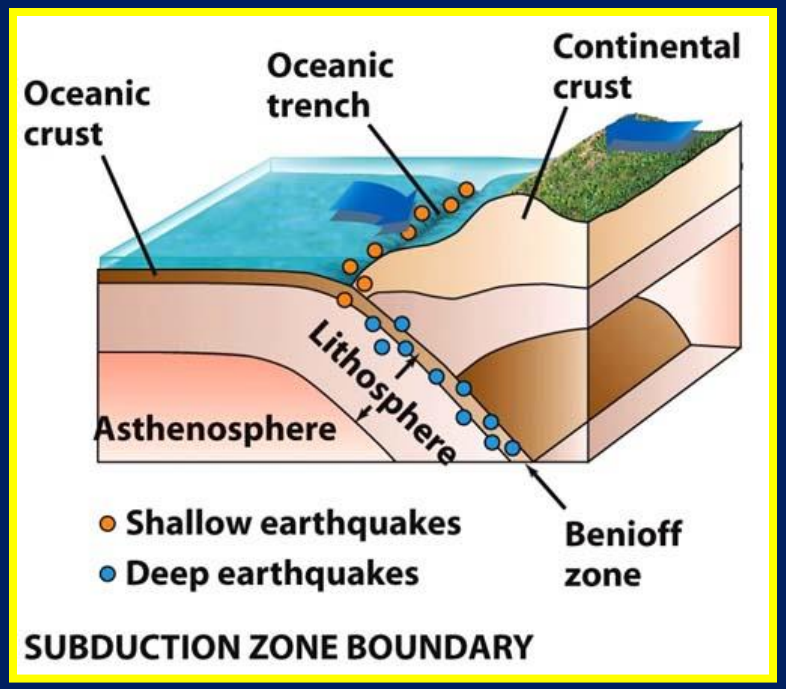
[Johnny Cash – Ring of Fire]

Convergent Boundaries

Continental - Continental

Associated with Shallow and Deep Earthquakes





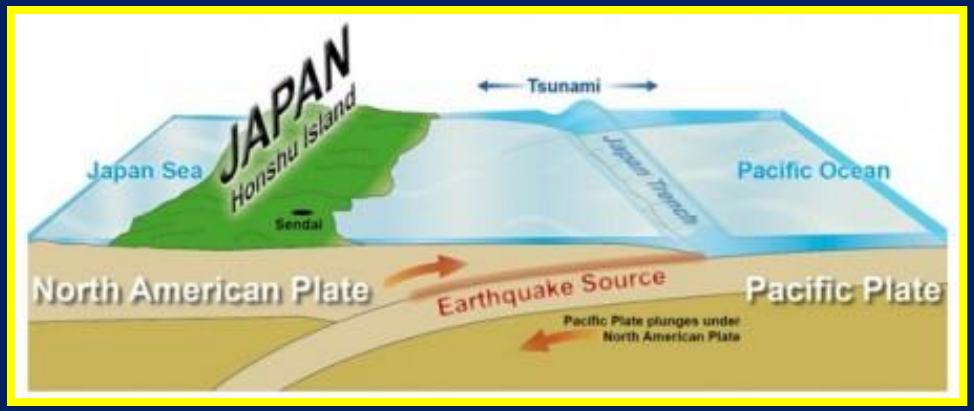
Oceanic - Continental

Associated with the deepest and Most powerful Earthquakes

Convergent Boundaries

Oceanic-Oceanic

Associated with Tsunamis due to the vertical uplift



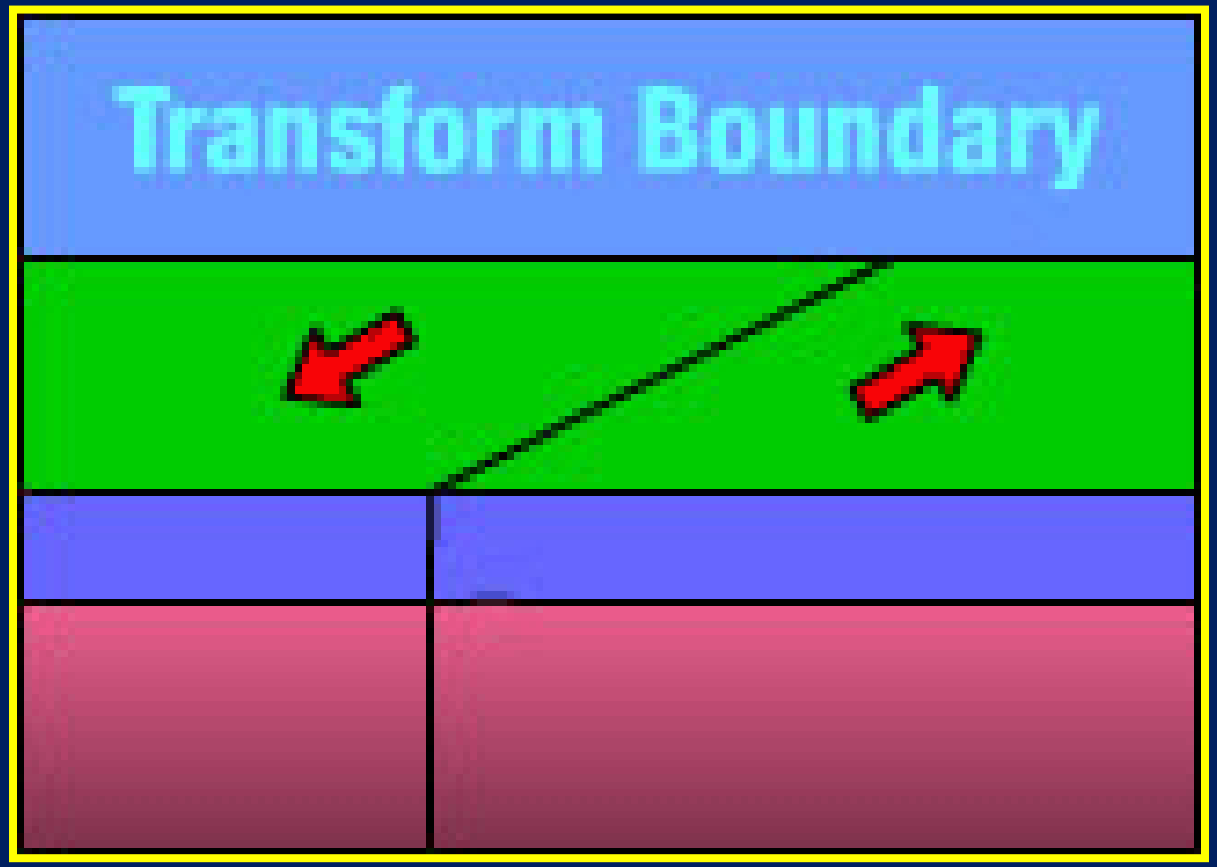
Science of Tsunamis

Thailand - 2004

Japan - 2011

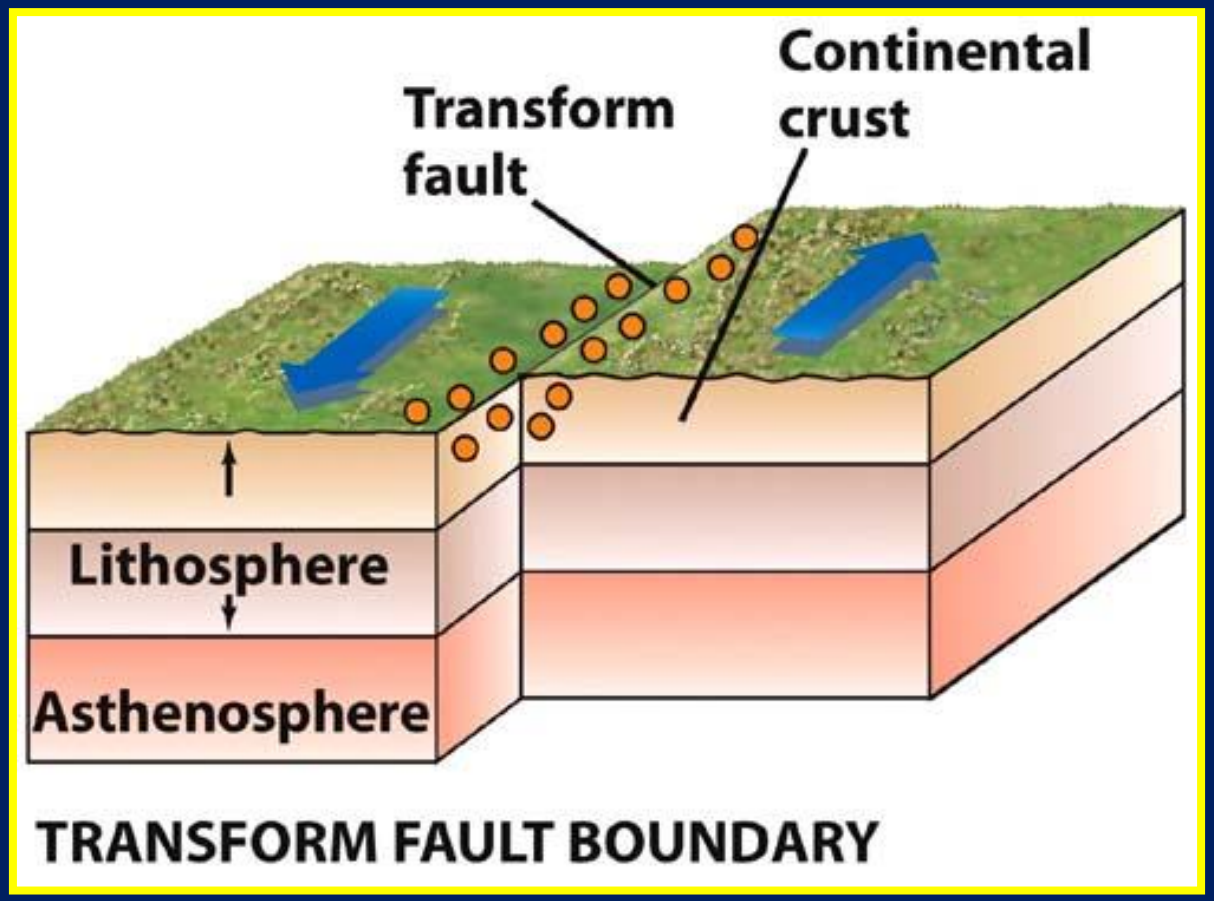
Transform Boundaries

Transform boundaries occur when two plates slide horizontally past each other



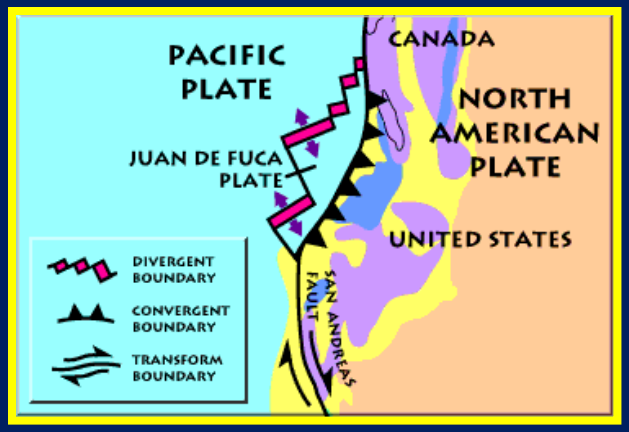
Transform Boundaries

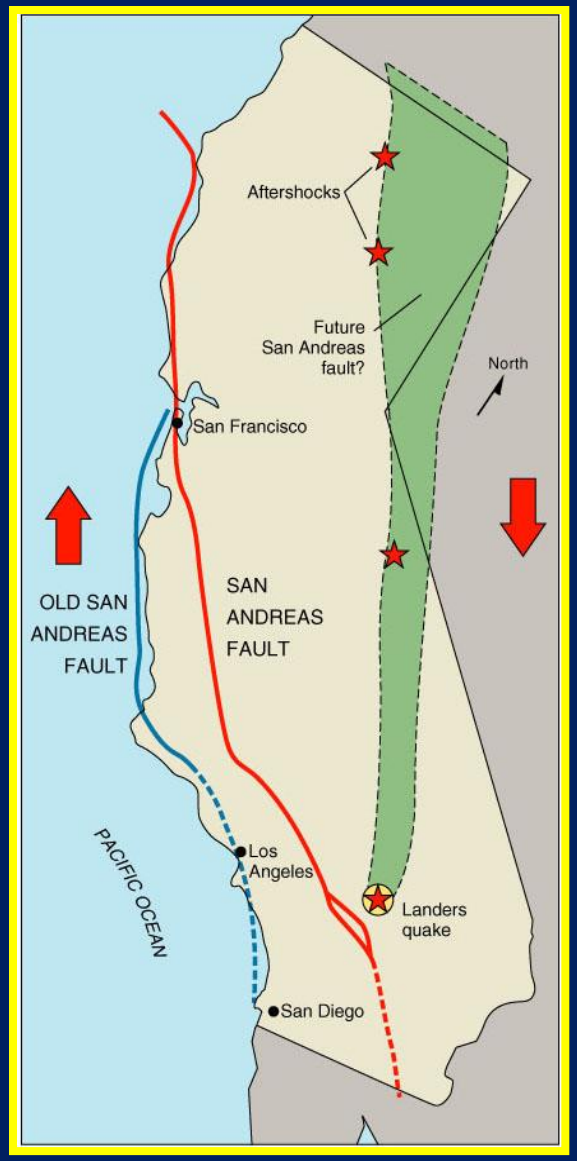
Transform boundaries are associated with frequent, shallow, powerful earthquakes.



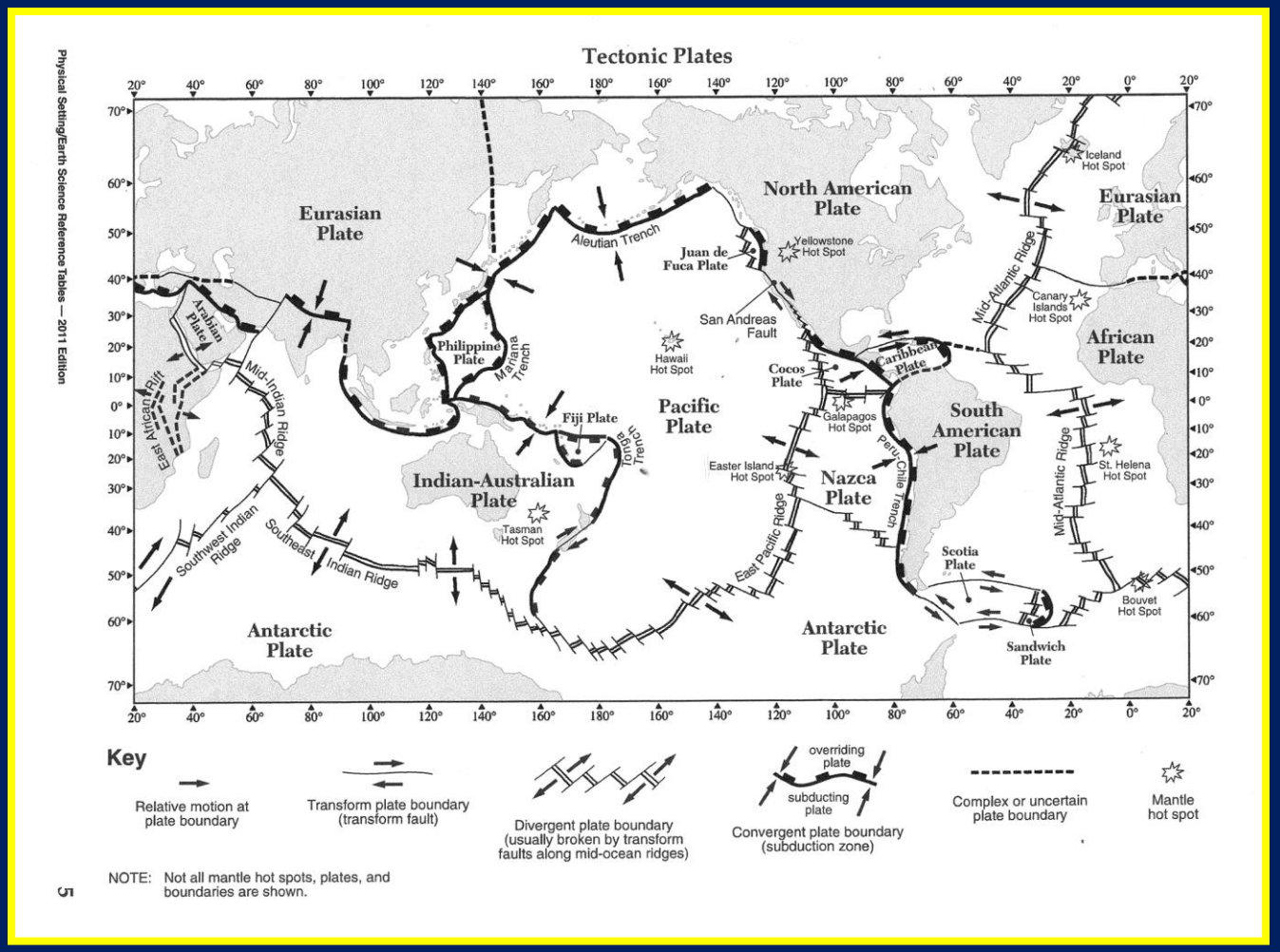
Transform Boundaries

San Andreas Fault





The End


Tectonic Plates
Eurasian Plate
North American Plate
Eurasian Plate
African Plate
Pacific Plate
South American Plate
Indian-Australian Plate
Nazca Plate
Antarctic Plate
Antarctic Plate
Arabian Plate
Philippine Plate
Juan de Fuca Plate
Cocos Plate
Caribbean Plate
Scotia Plate
Sandwich Plate
Fiji Plate
Aleutian Trench
Mariana Trench
Tonga Trench
Peru-Chile Trench
East African Rift
Mid-Indian Ridge
Southwest Indian Ridge
Southeast Indian Ridge
East Pacific Ridge
Mid-Atlantic Ridge
San Andreas Fault
Iceland Hot Spot
Yellowstone Hot Spot
Canary Islands Hot Spot
Hawaii Hot Spot
Galapagos Hot Spot
Easter Island Hot Spot
Tasman Hot Spot
St. Helena Hot Spot
Bouvet Hot Spot
Key
Relative motion at plate boundary
Transform plate boundary (transform fault)
Divergent plate boundary (usually broken by transform faults along mid-ocean ridges)
overriding plate
subducting plate
Convergent plate boundary (subduction zone)
Complex or uncertain plate boundary
Mantle hot spot
NOTE: Not all mantle hot spots, plates, and boundaries are shown.
Physical Setting/Earth Science Reference Tables — 2011 Edition
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