

DO NOW - ES

1. Work on your QSC!

Due Next Class

15:00

Stop

Geologic Time Scale Activity

Work on QSC using today's notes

PART TWO

Geologic Processes

Plate tectonics

Earthquakes

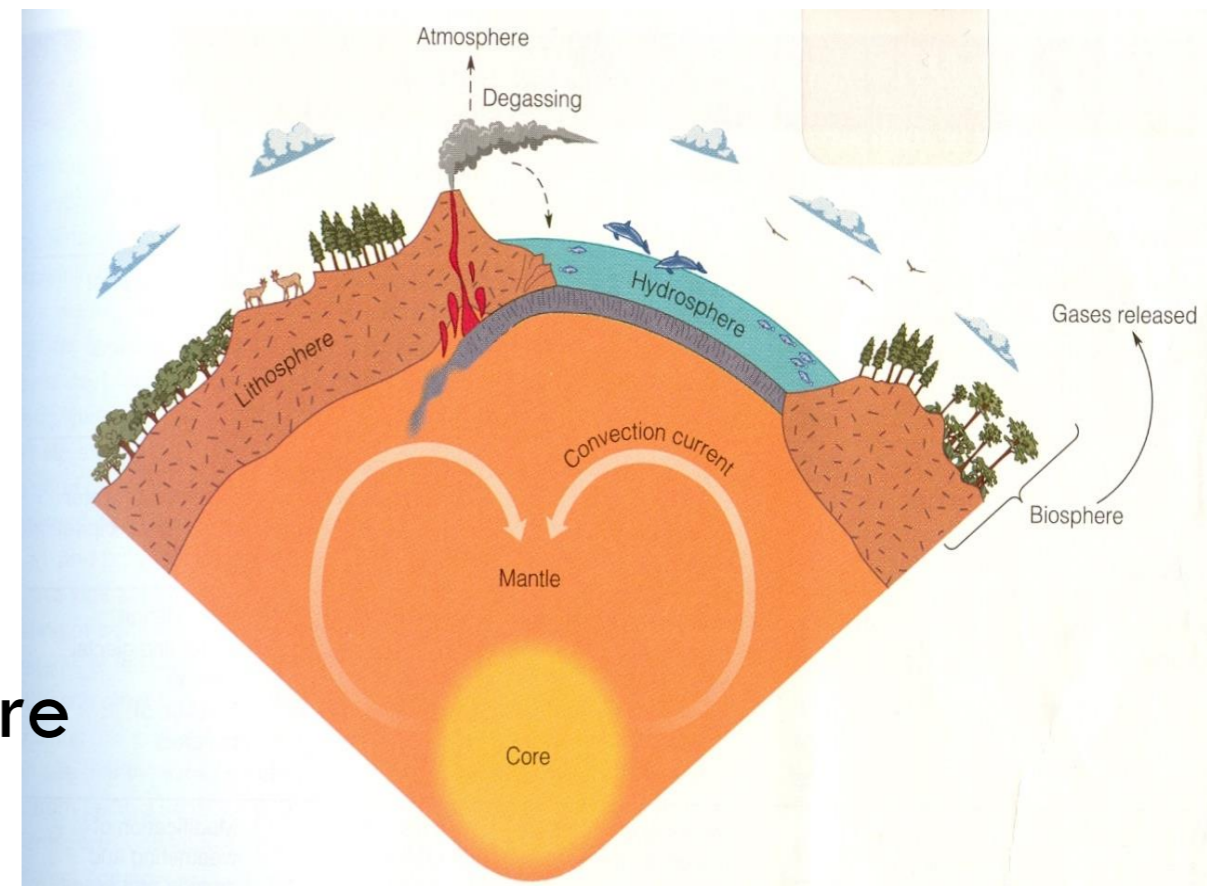
Volcanoes

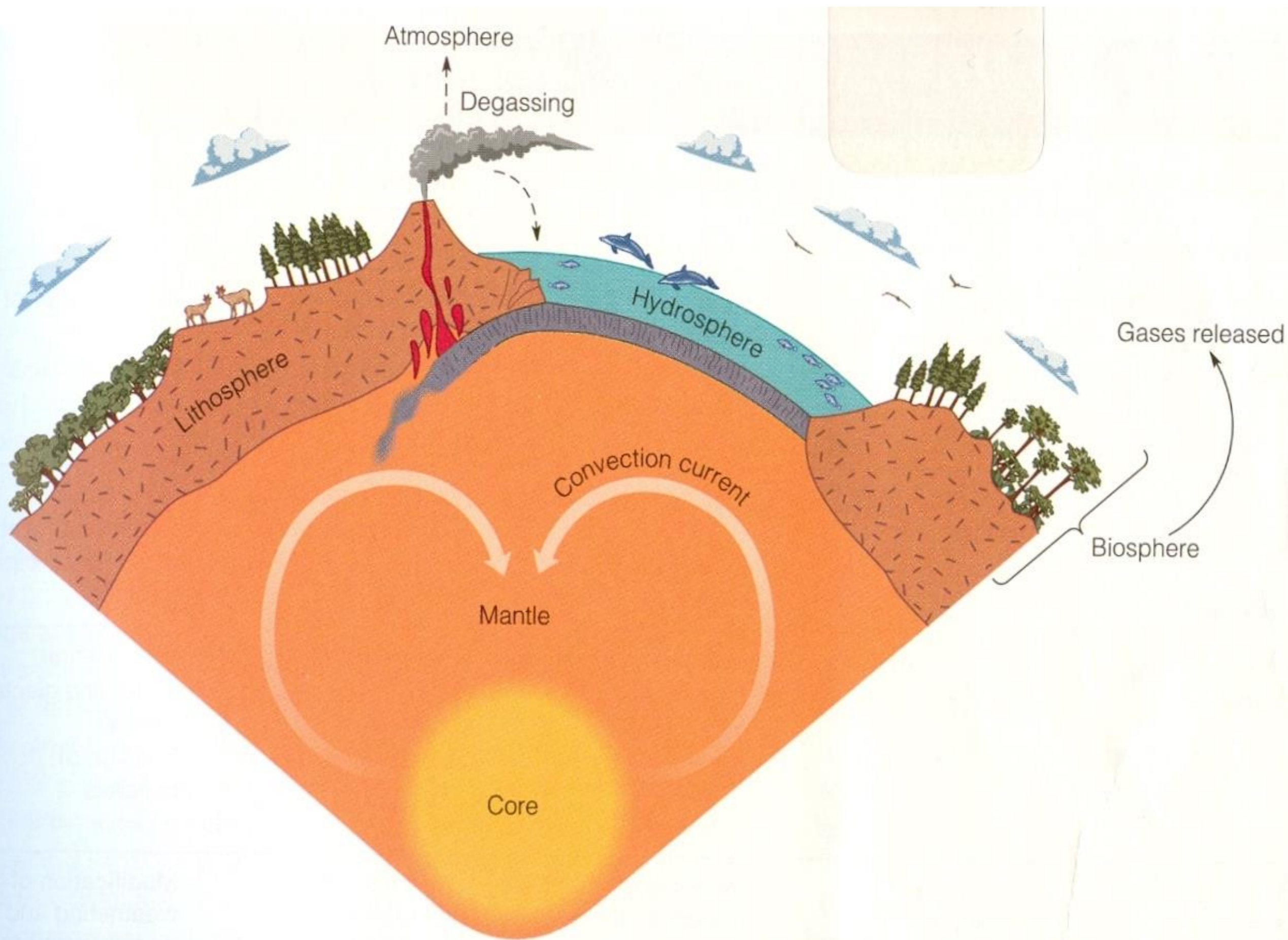
Geologic Time Scale

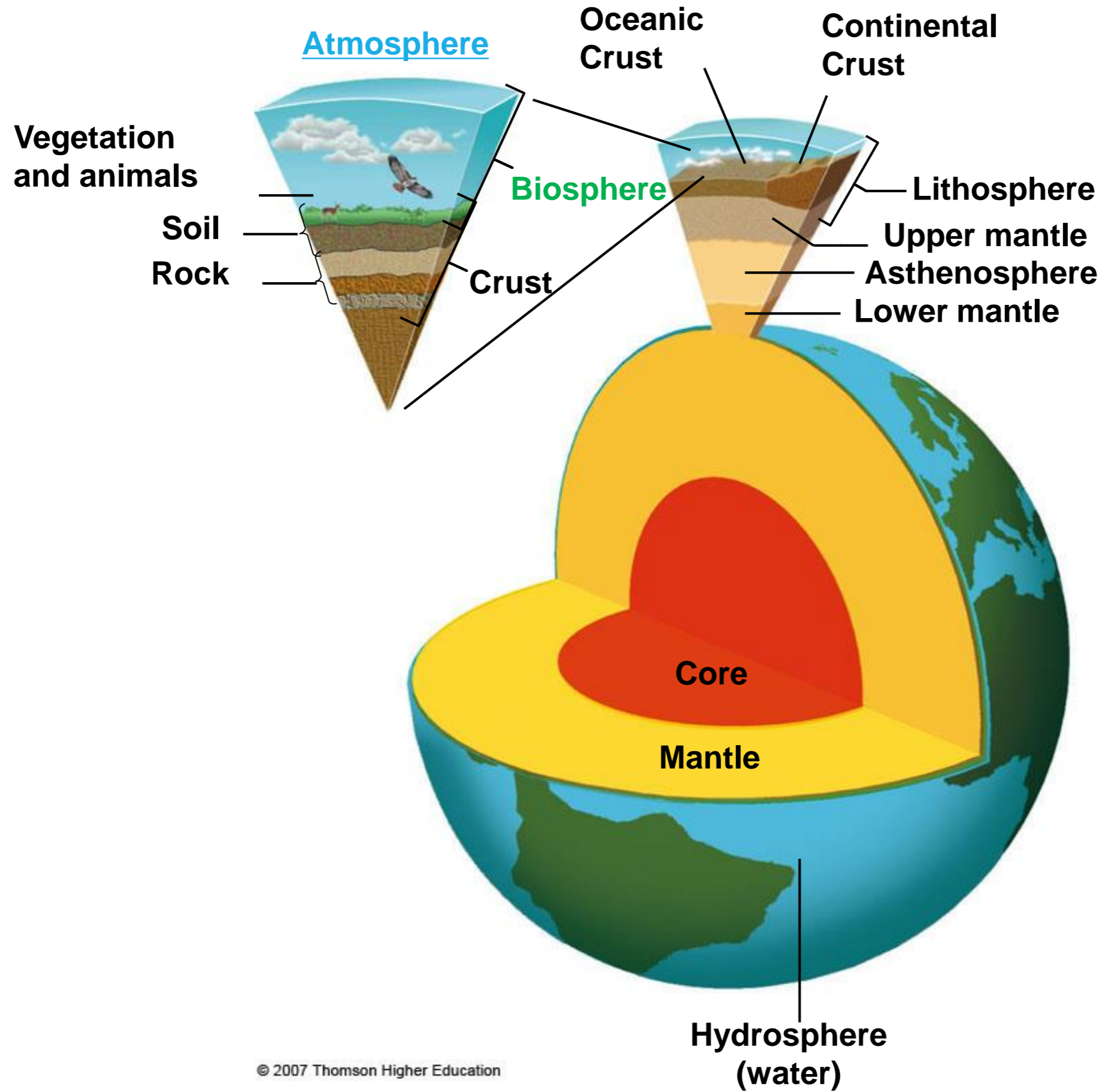
LIFE SUPPORT SYSTEMS: SPHERES

Different spheres on earth:

- Atmosphere- thin membrane of air
 - Allows for life to exist on land and in water
- Hydrosphere- contains earth's water (liquid, ice and vapor)
- Lithosphere- crust and upper mantle- contains fossil fuels, minerals and nutrients
- Biosphere- the global ecosystem where all life is interconnected







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GEOLOGIC PROCESSES

- ① The earth is made up of a core, mantle, and crust and is constantly changing as a result of processes taking place on and below its surface.
- ① The earth's interior consists of:
 - *Crust*
 - *Mantle*
 - *Core*

Crust

- Underlies the continents
- Thinnest layer
- Oceanic (heavy) or continental (light)

Top 8 elements in the earth's crust in order:

- O, Si, Al, Fe (iron), Ca, Na (sodium), P, Mg

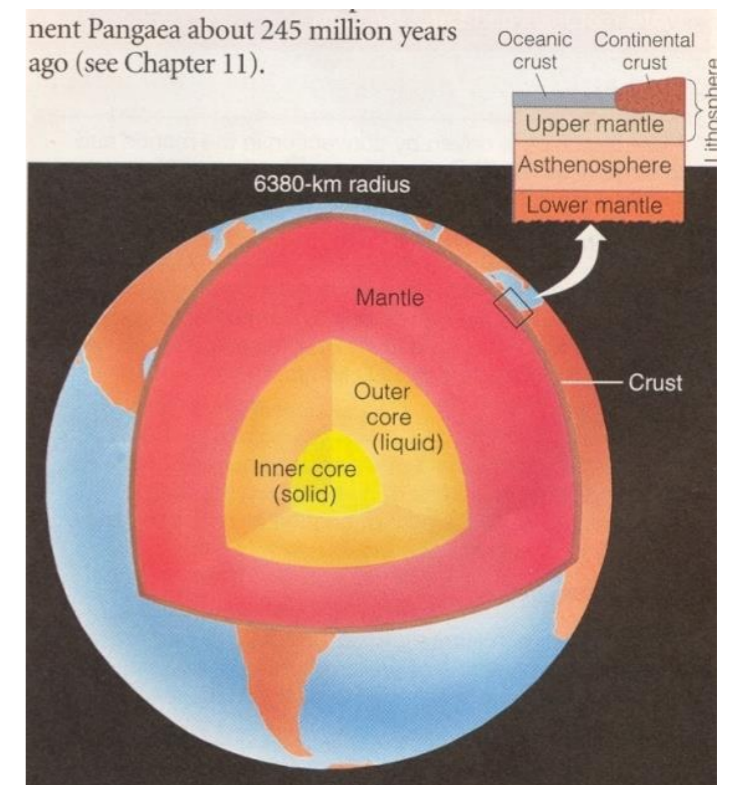
***Lithosphere (the crust and the top part of mantle) - floats on the asthenosphere**

Mantle-

- 70% of Earth's interior
- Two layers
 - Asthenosphere (melted rock- like hot wax)
 - Mesosphere- lower mantle fluid
- Convection currents (constantly moving)
- Contains Mg, Oxygen and Silicon

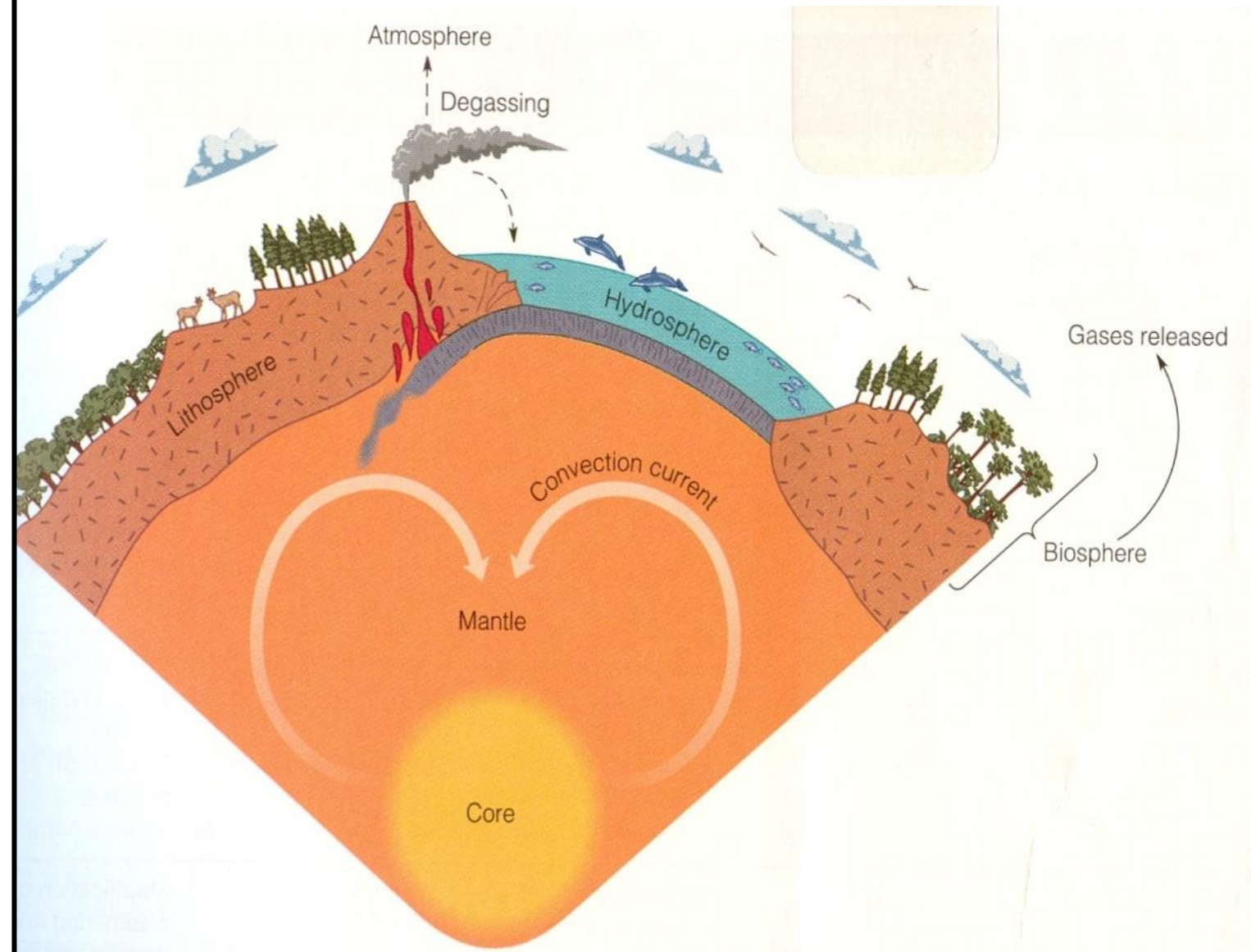
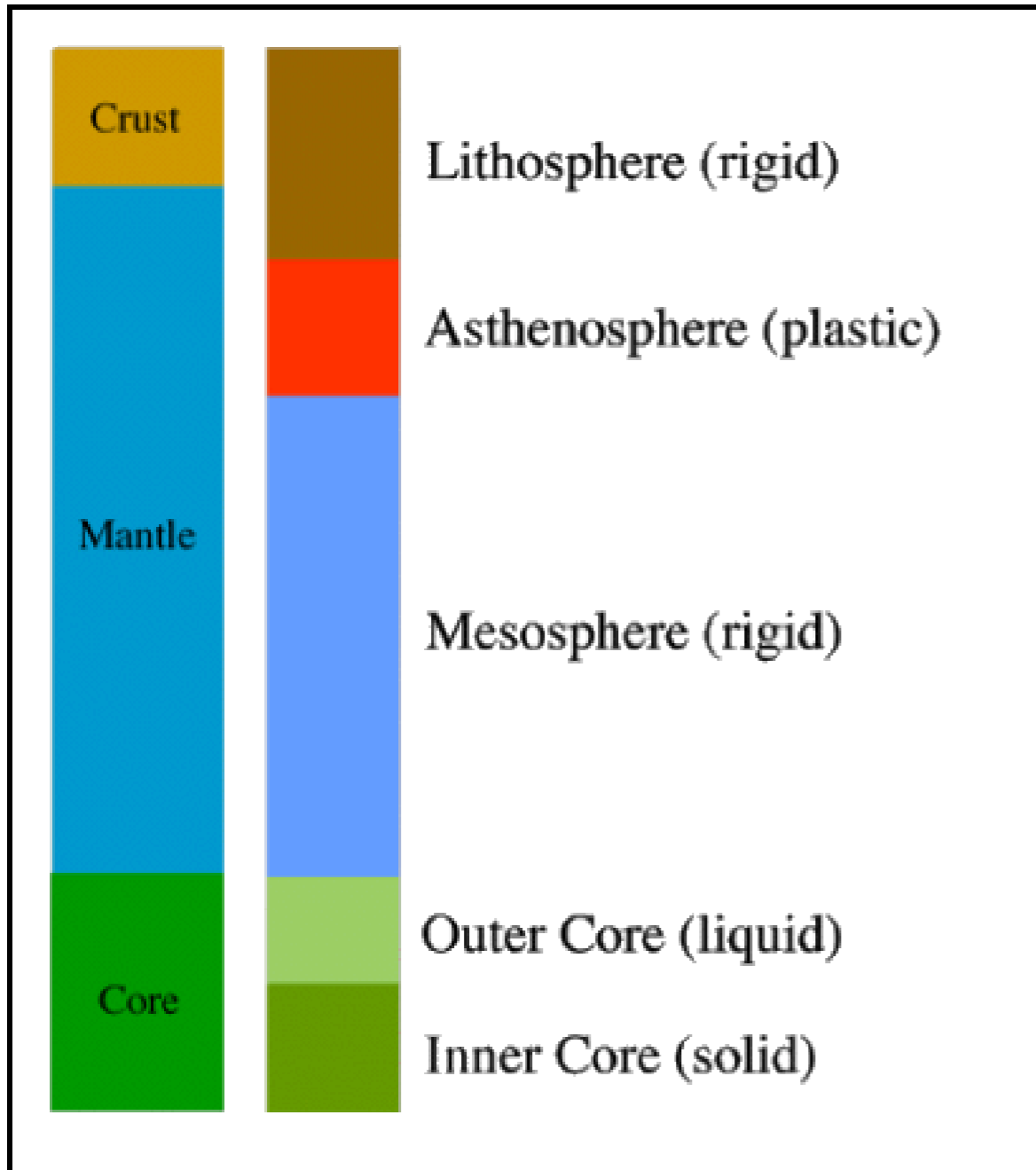
Core-

- Inner portion- solid w/ iron and nickel
- Outer- liquid iron



EARTH'S LAYERS

5 layers defined by Pressure and Temperature



EARTH'S LAYERS

Lithosphere contains two types of crust:

- Oceanic- thin but dense, contains Iron, Magnesium and Silicon
- Continental- thick but light, contains calcium, sodium, potassium and aluminum

Lithosphere is broken into tectonic plates

- 8-10 major plates
- Create plate boundaries

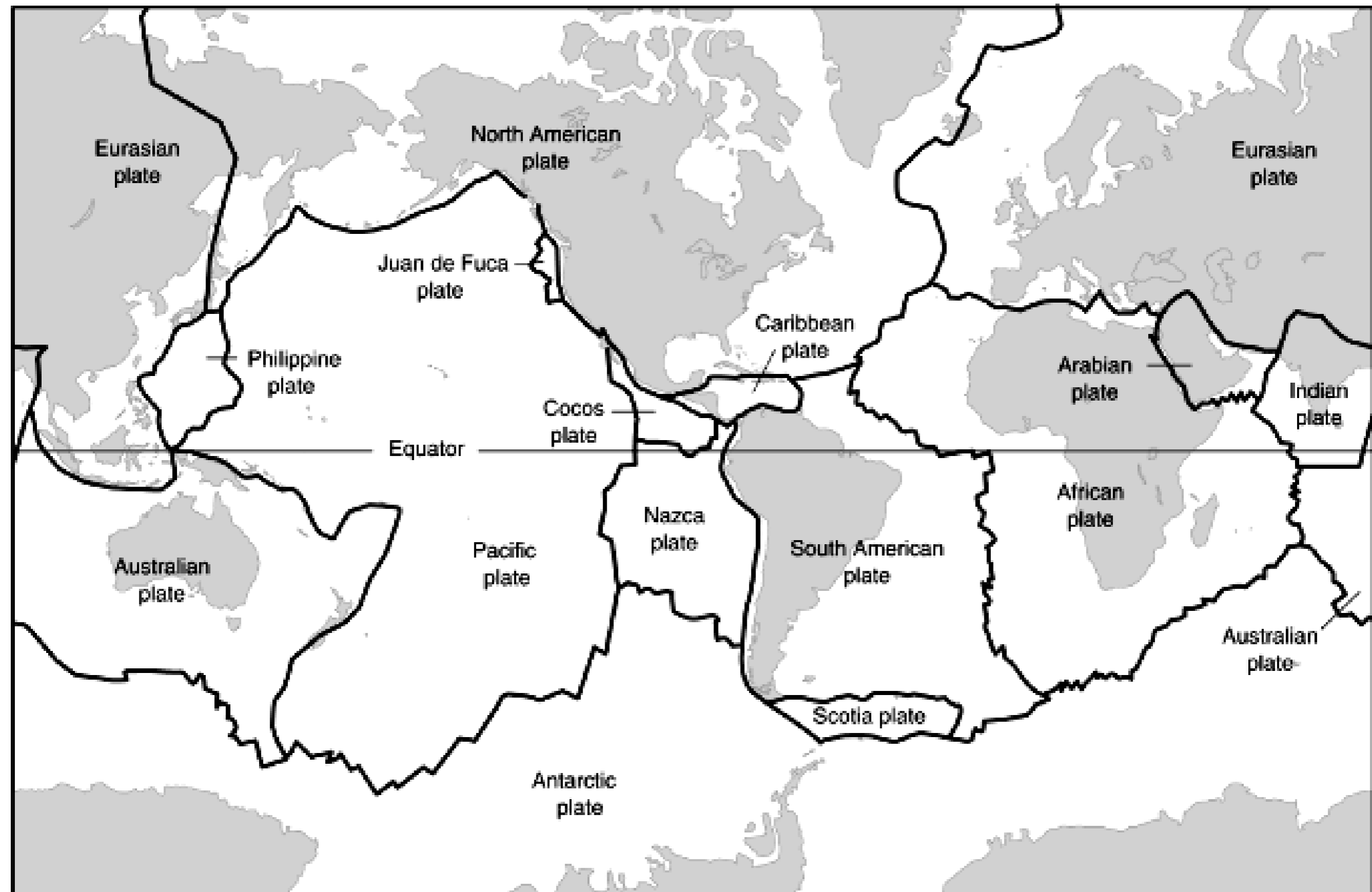


Figure 3.4 Map of Major Tectonic Plates

GEOLOGIC PROCESSES

Tectonic plates: huge rigid plates that are moved with convection cells or currents by floating on ***magma*** or molten rock.

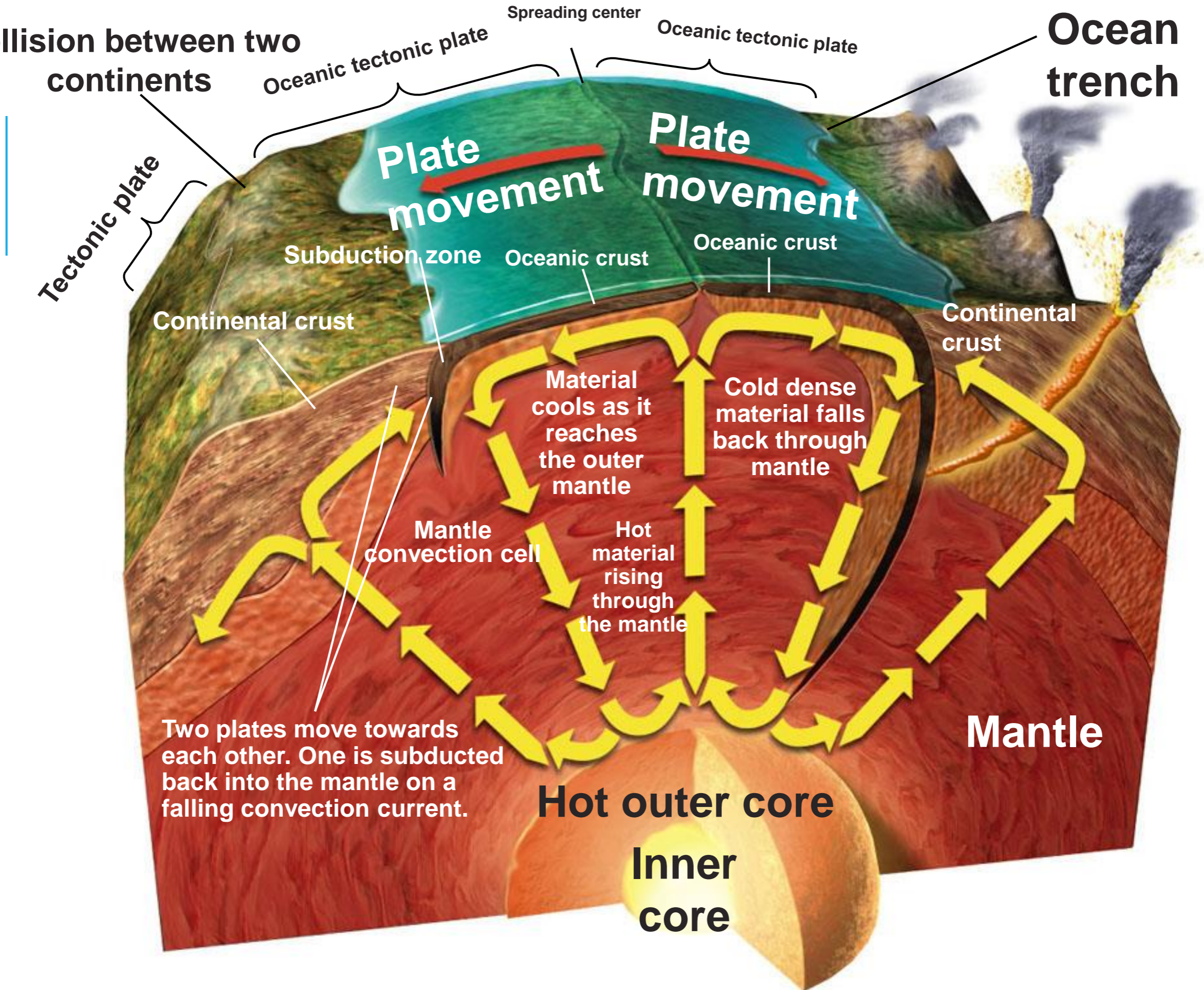
In The Mantle

Convection Cells or Currents-

- move large volumes of rock and heat in loops within the mantle like giant conveyer belts

Collision between two continents

Ocean trench



Two plates move towards each other. One is subducted back into the mantle on a falling convection current.

Hot outer core

Inner core

Mantle

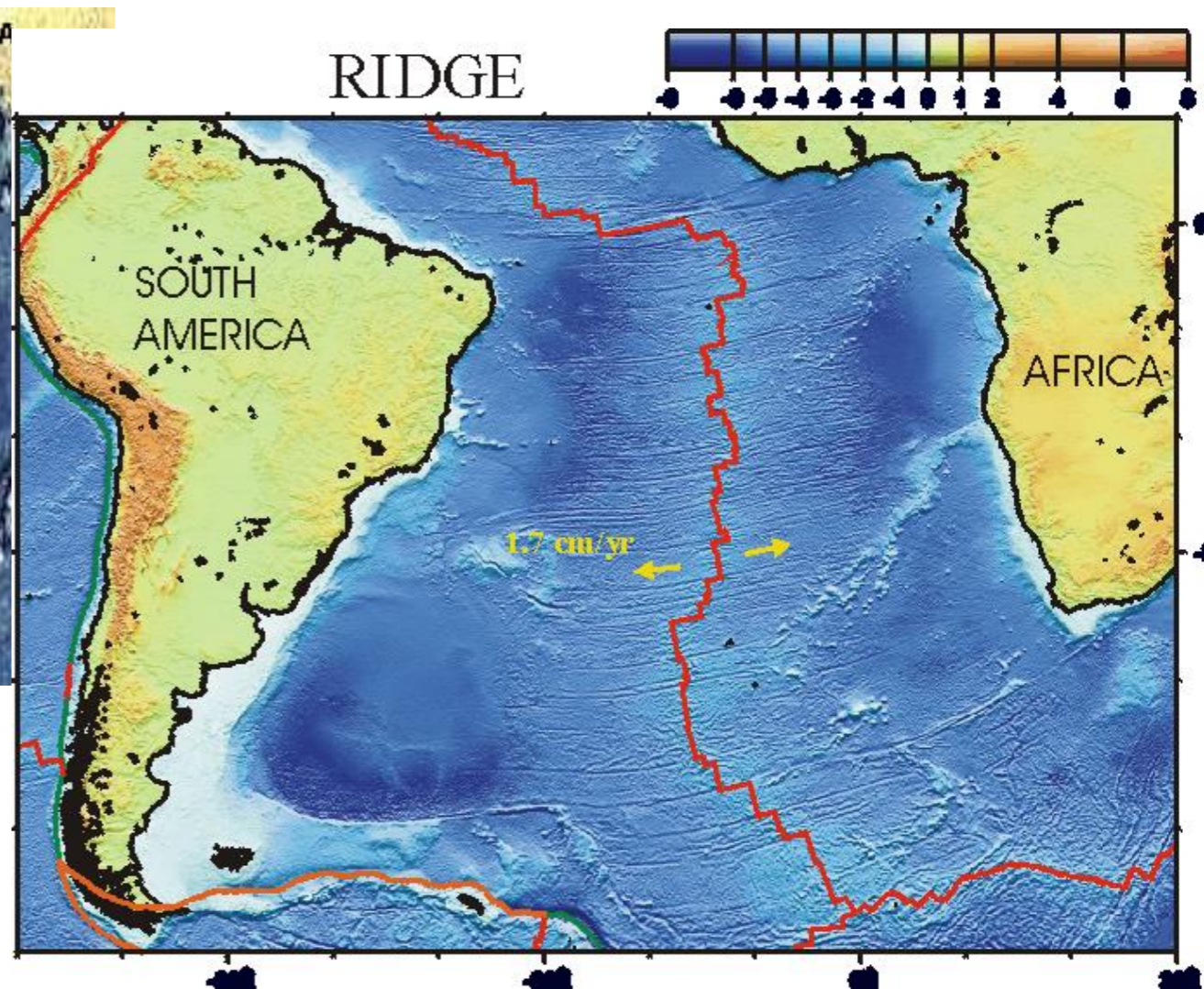
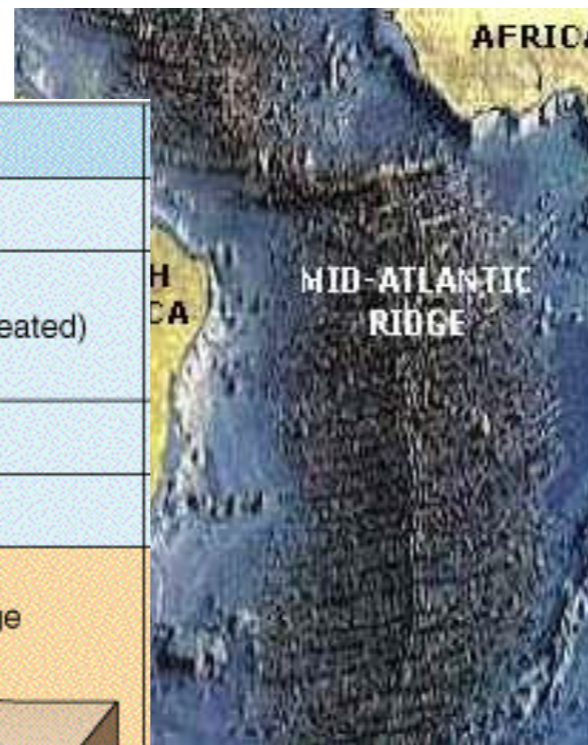
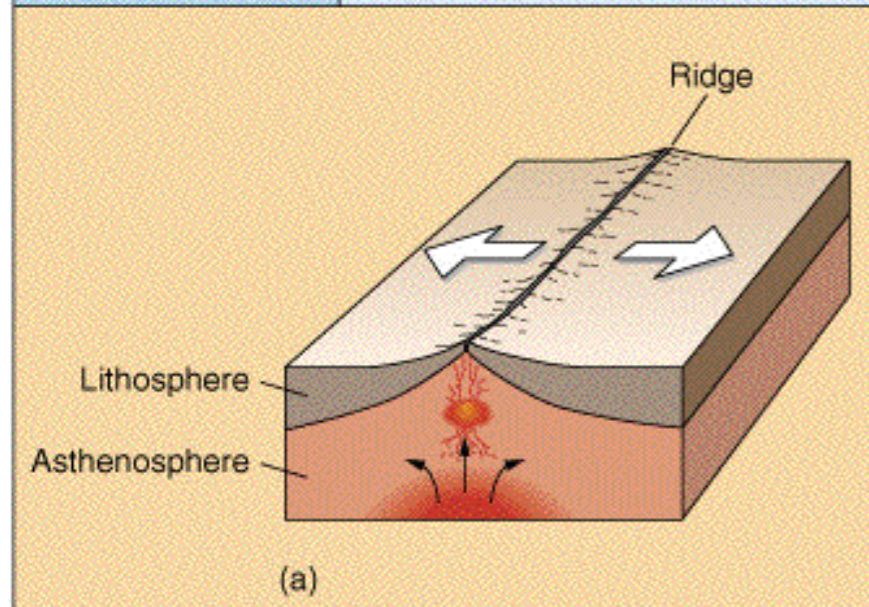
PLATE TECTONICS

- ◎ Plate tectonics is the theory explaining the movement of the plates and the processes that occur at their boundaries.
- ◎ Types of Tectonic plates-
 - Divergent- away from
 - Convergent- toward
 - Transform- slide past
 - Triple Junction- three way split it in crust

Divergent

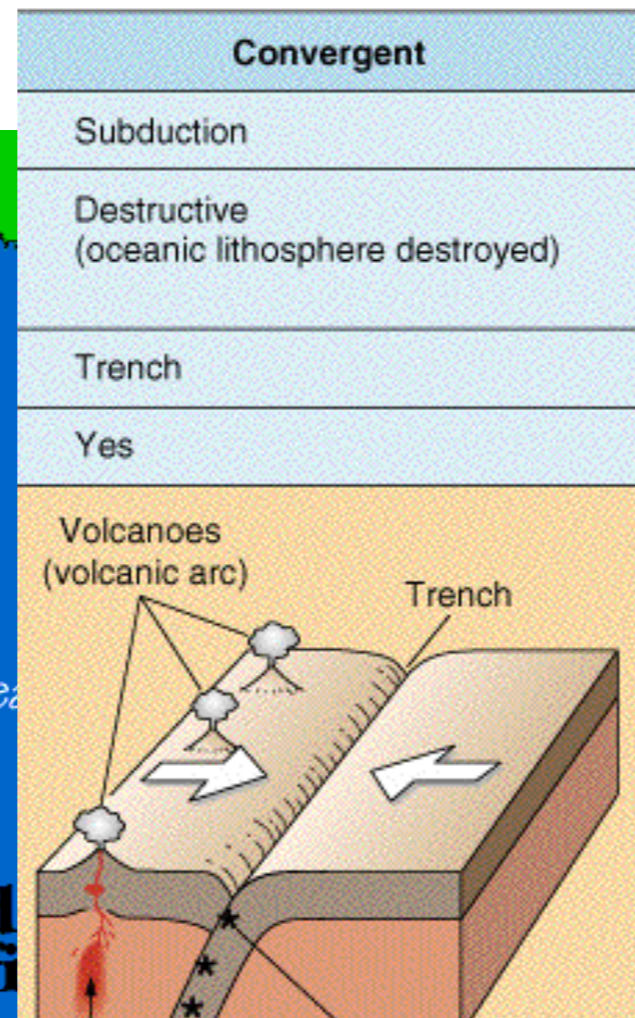
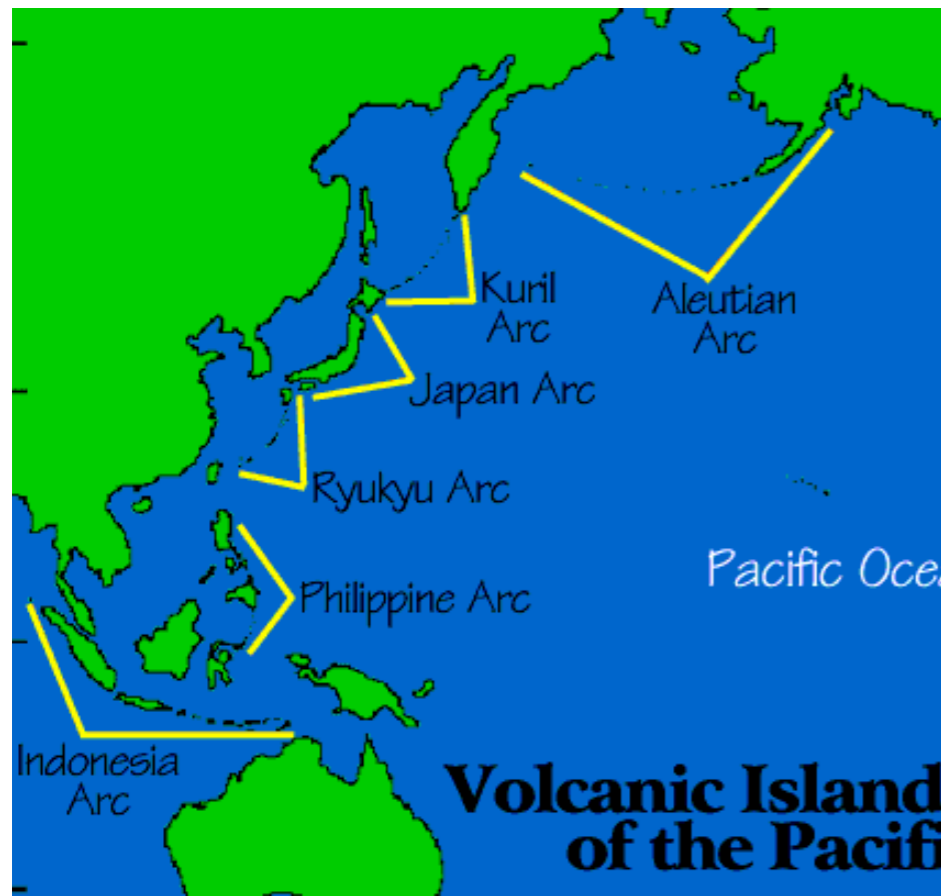
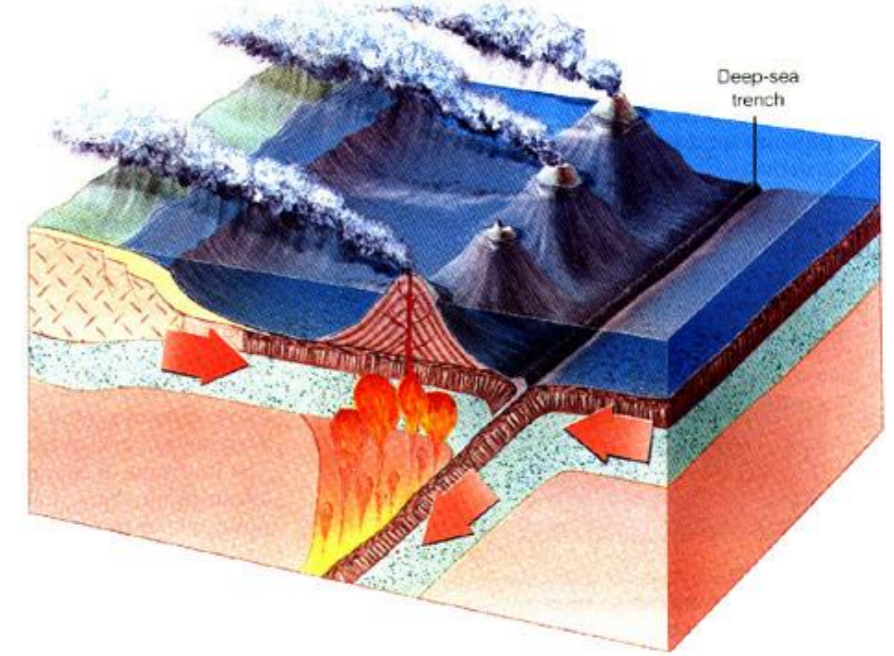
- Found mostly in the ocean
- Magma surging upward to the surface divides plates and pushes them apart creating new crust as it cools and spreads
- Mid Atlantic Ridge
 - N. American Plate is moving away from Eurasian Plate in the N. Atlantic Ocean

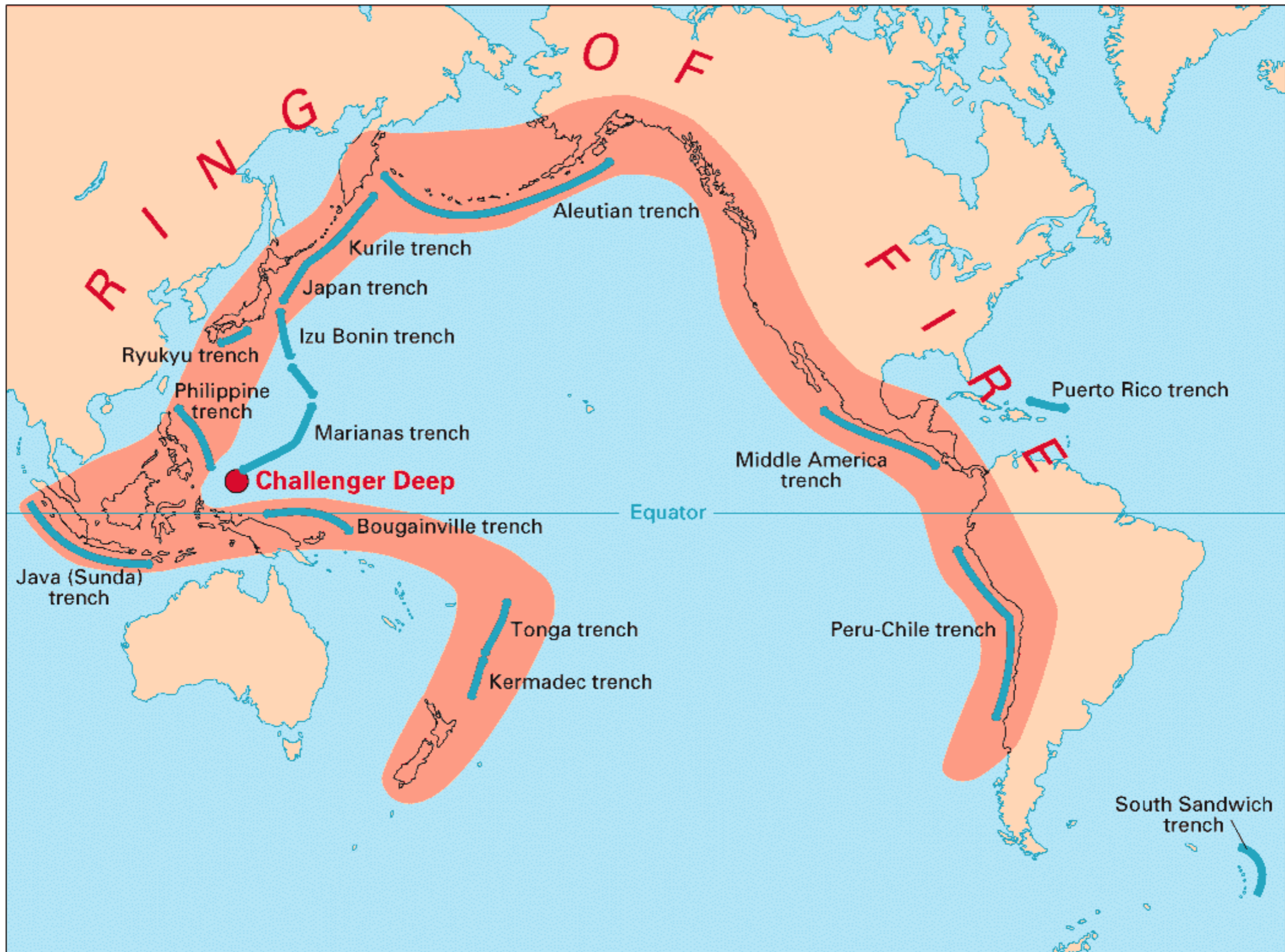
Type of Margin	Divergent
Motion	Spreading
Effect	Constructive (oceanic lithosphere created)
Topography	Ridge/Rift
Volcanic activity?	Yes



Convergent

- Ocean to ocean
 - Volcanic islands = Island Arc of Japan
- Continent to continent
 - Mountains = Himalayan Mountains
- Ocean to continent
 - Ocean trenches, mountains/volcanoes = part of the Pacific Ring of Fire





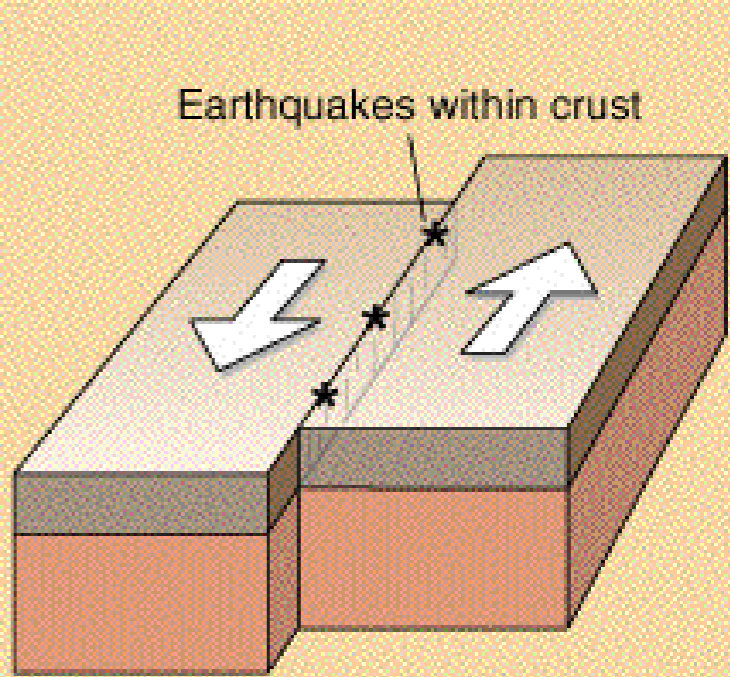
Transform

- Strike-slip fault
- Fault gets stuck, builds pressure and snaps
- Causes Earthquakes
- San Andreas Fault = Pacific Plate vs. North American Plate

The Pacific plate is off the coast of California.

- Lots of volcanoes and earthquakes occur here.
- “California will fall into the ocean” idea.
- It is the largest plate and the location of the ring of fire.

Transform
Lateral sliding
Conservative (lithosphere neither created or destroyed)
No major effect
No

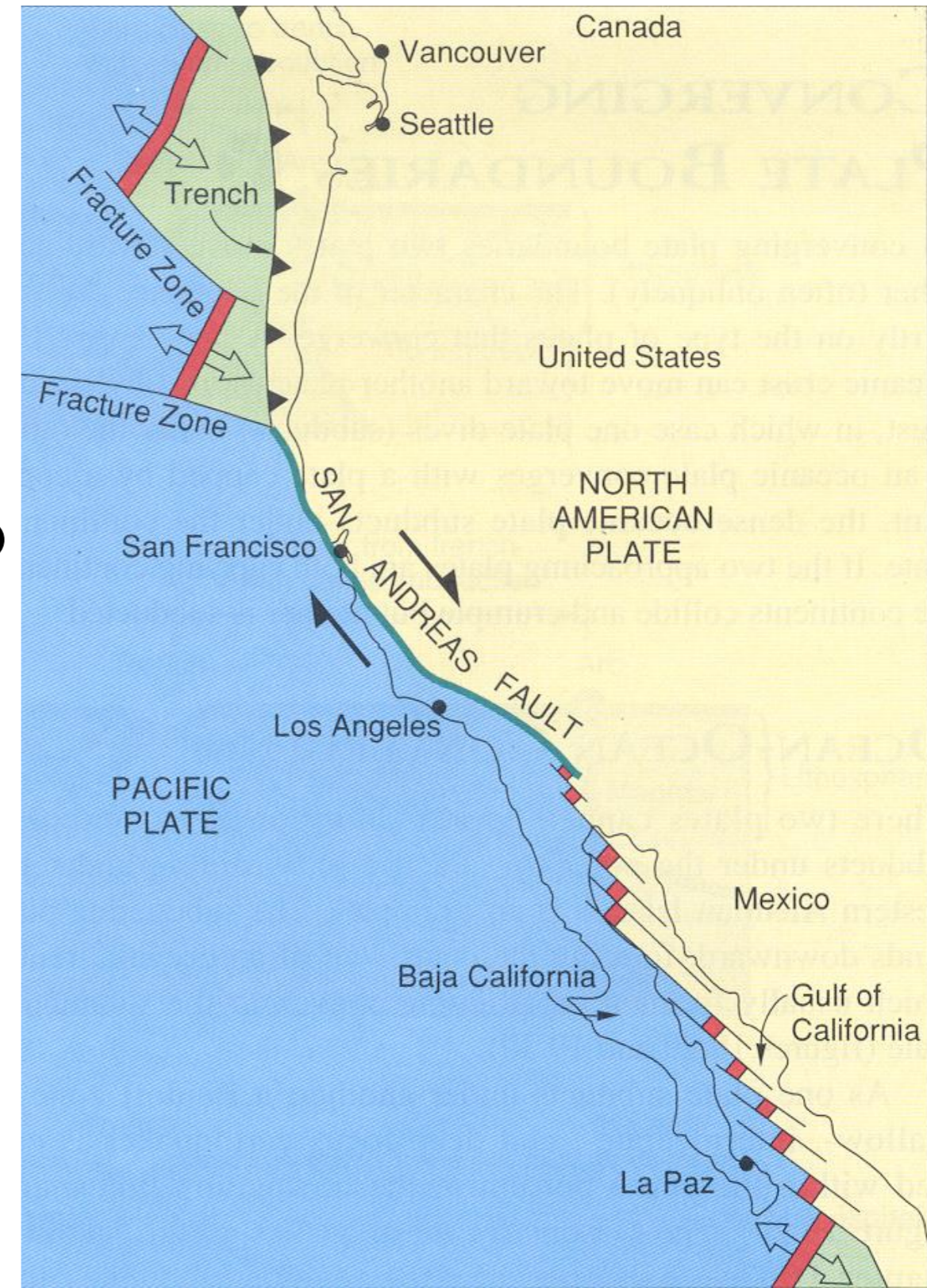


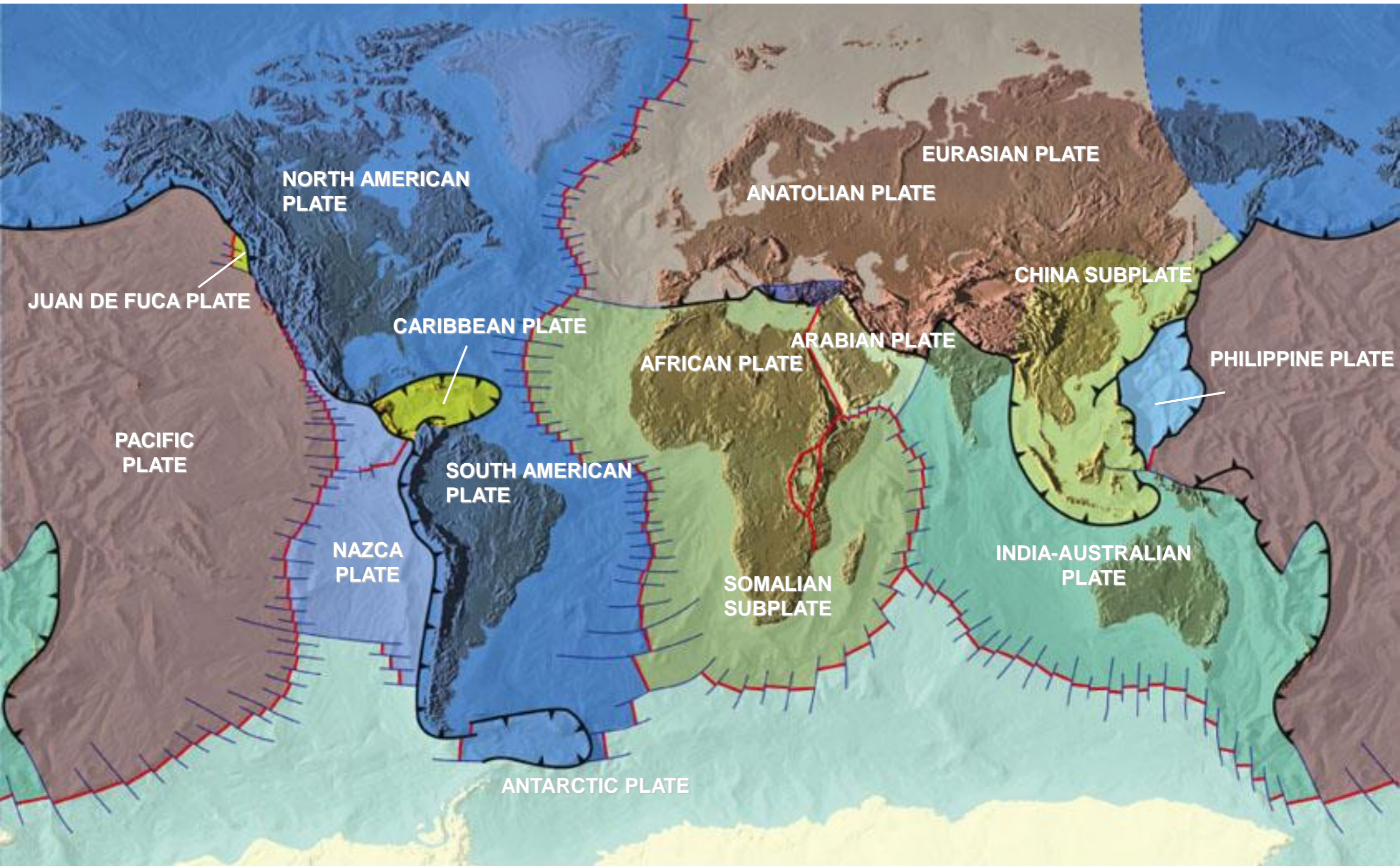
(c)



Transform – plates slide next or past each other in opposite directions along a fracture.

California will not fall into the ocean!





NORTH AMERICAN PLATE

EURASIAN PLATE

JUAN DE FUCA PLATE

ANATOLIAN PLATE

CARIBBEAN PLATE

CHINA SUBPLATE

PACIFIC PLATE

AFRICAN PLATE

ARABIAN PLATE

PHILIPPINE PLATE

NAZCA PLATE

SOUTH AMERICAN PLATE

SOMALIAN SUBPLATE

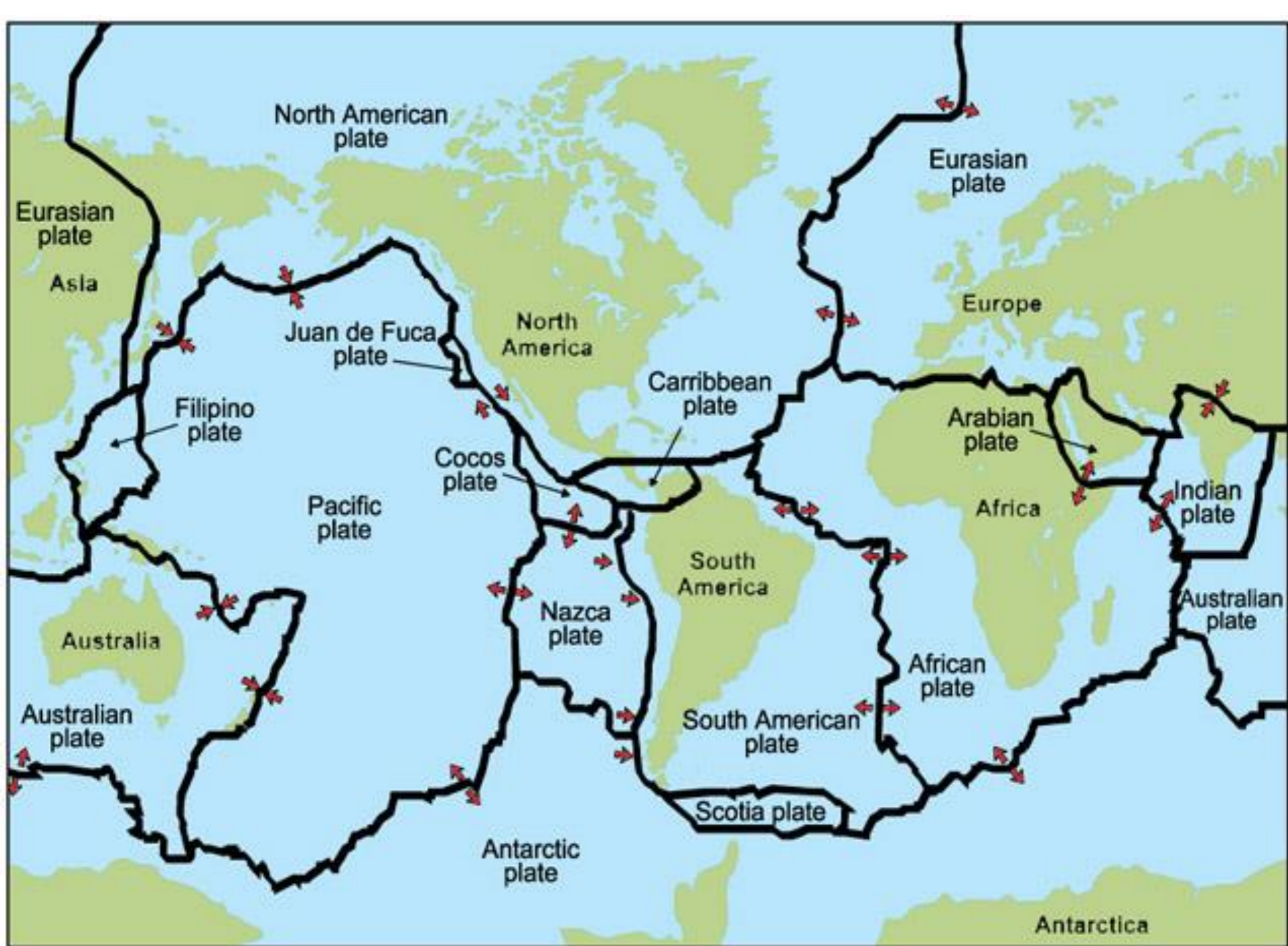
INDIA-AUSTRALIAN PLATE

ANTARCTIC PLATE

 Divergent plate boundaries

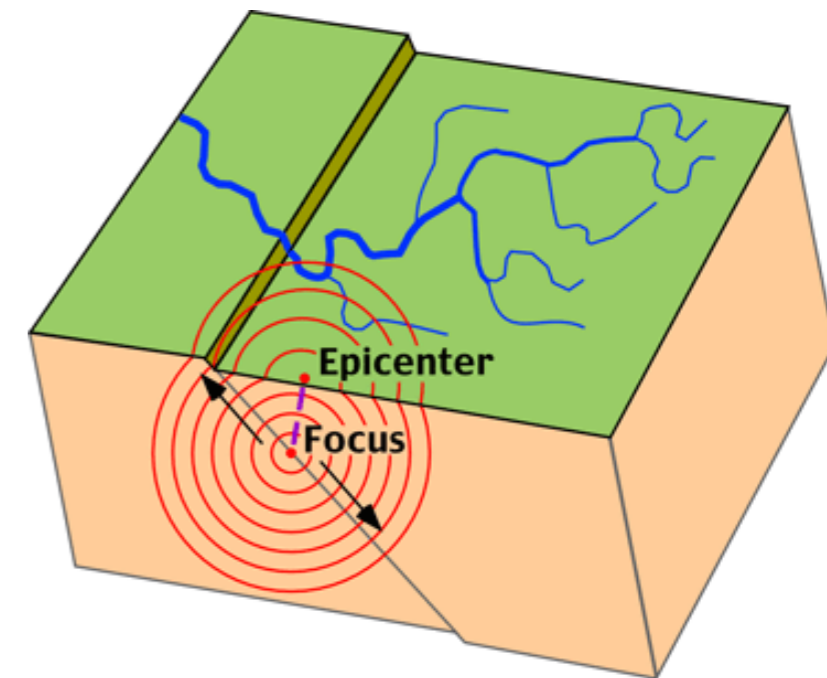
 Convergent plate boundaries

 Transform faults



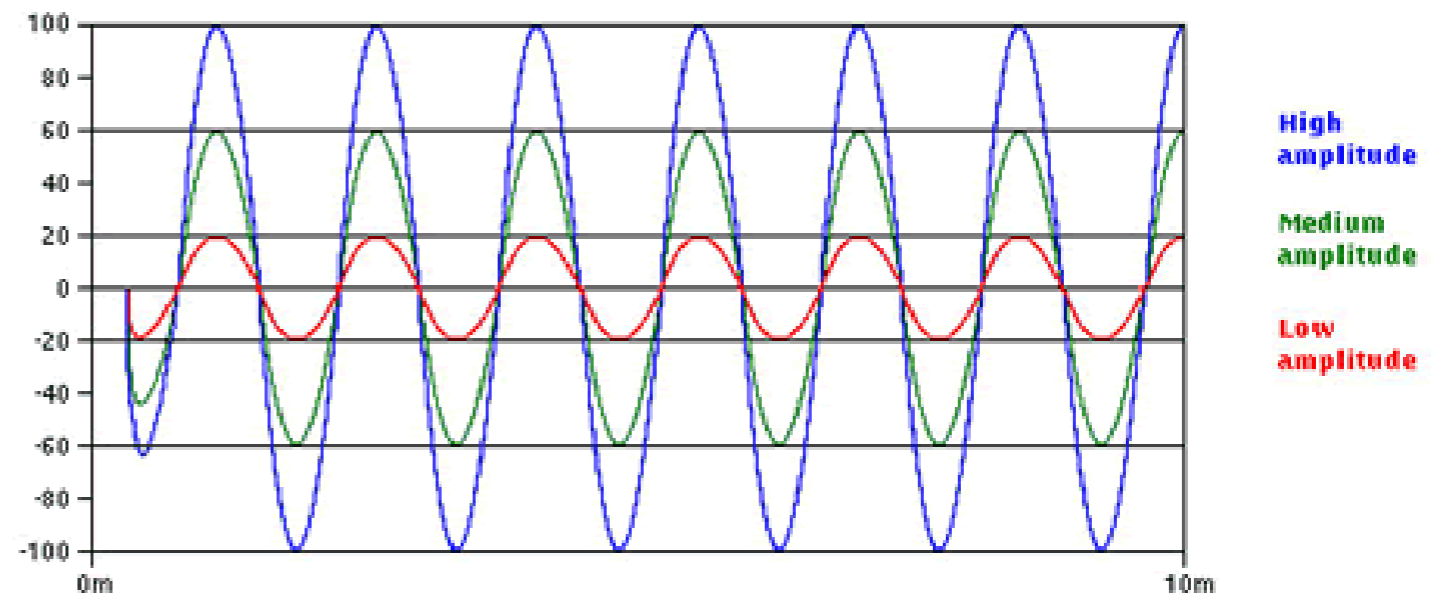
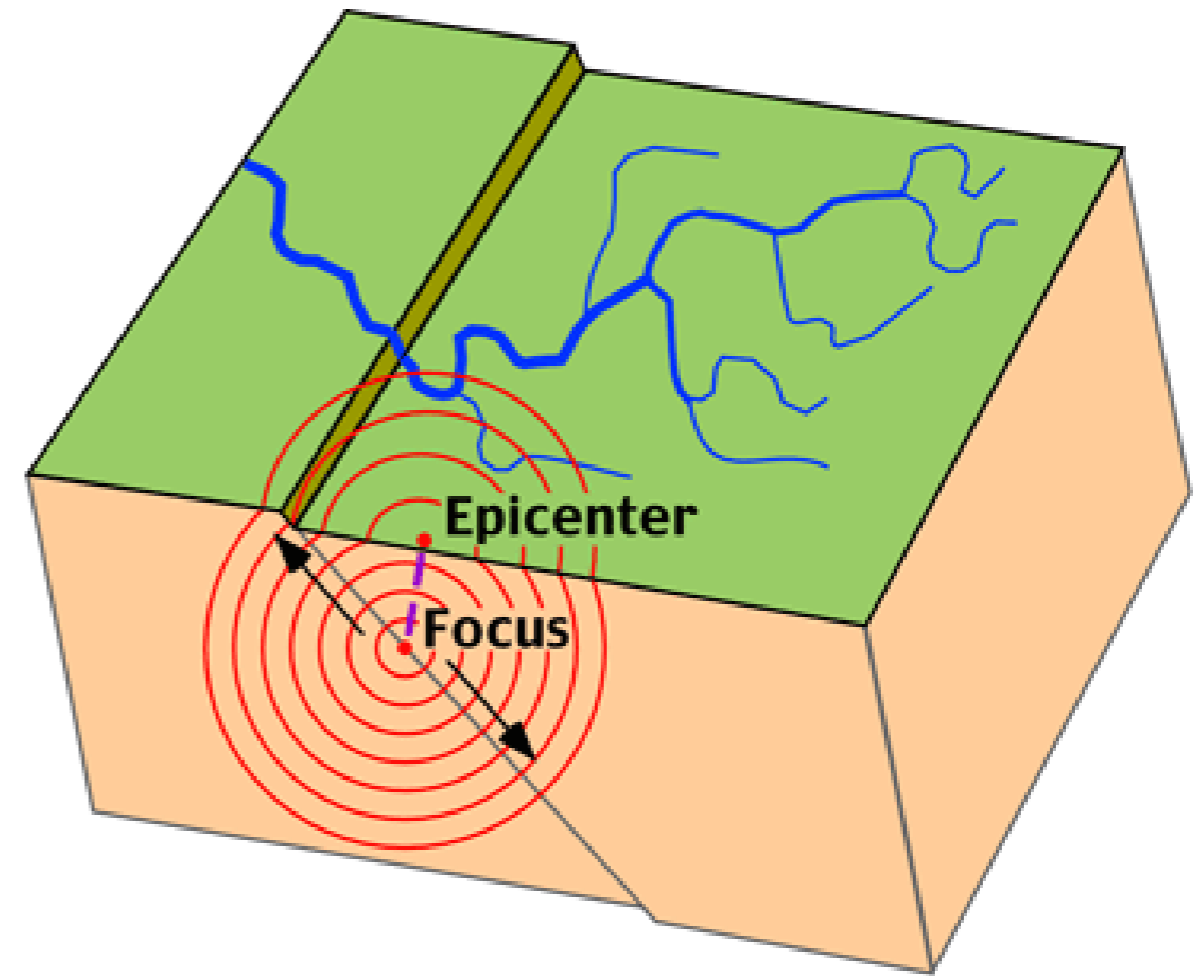
EARTHQUAKES

- Movement due to large fractures (faults) associated with plate boundaries
- Faults- store energy as they are bent and slippage occurs at weakest point
- Release of energy in the form of vibration
 - Focus- source of energy release
 - Epicenter- point on earth directly above focus
 - Magnitude- measure of released energy determined by seismograph
 - Amplitude- the earthquake waves recorded on equipment



Richter scale measure magnitude

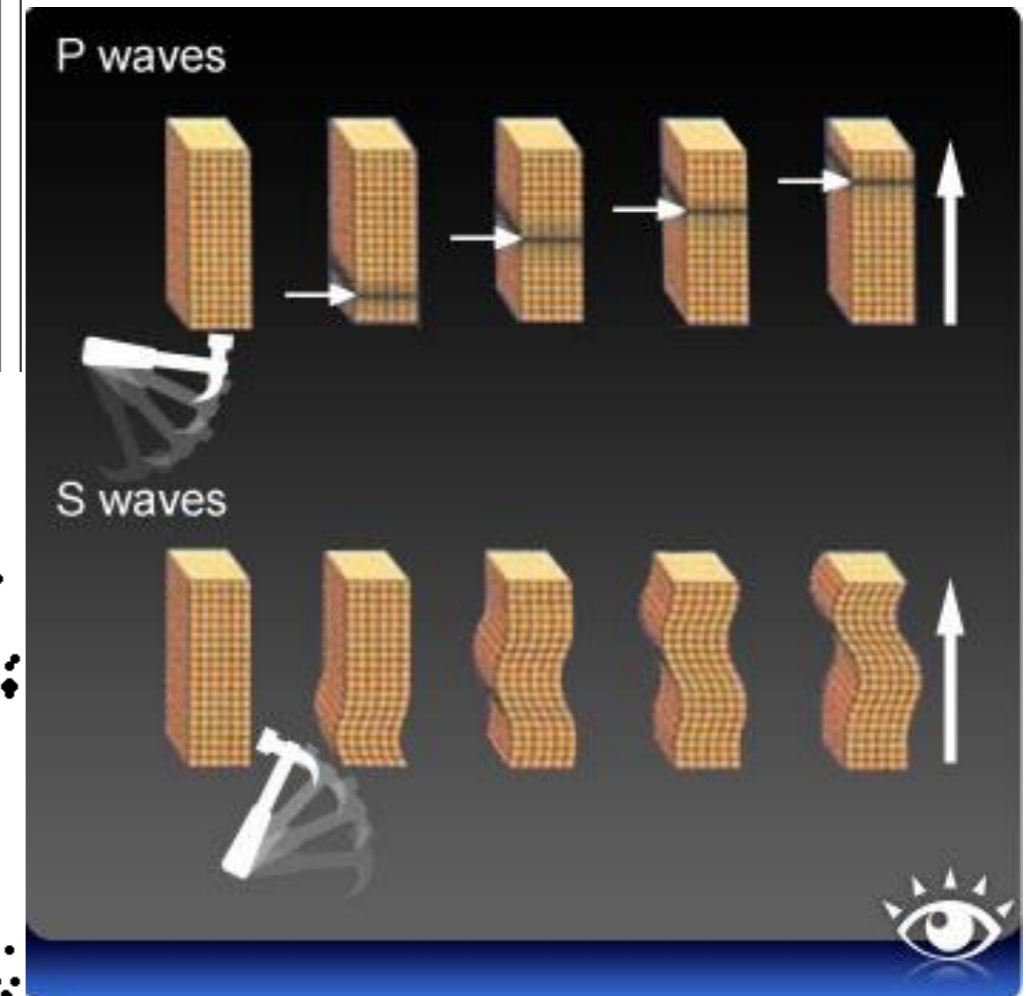
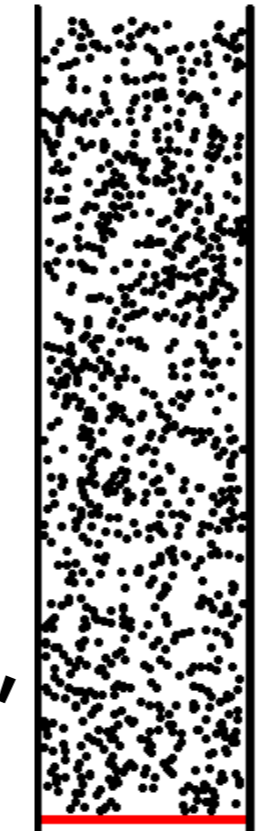
- **Insignificant:** <4.0
- **Minor:** 4.0–4.9
- **Damaging:** 5.0–5.9
- **Destructive:** 6.0–6.9
- **Major:** 7.0–7.9
- **Great:** >8.0



EARTHQUAKES

Seismic Waves:

- P: primary, compress and expand, travel through solids, liquids and gases
 - Faster than S waves
- S: shake, cannot travel through liquid and gases



VOLCANOES

- Magma release
- Extrusion of lava on the surface
- Release of solid rock, gas and ash
- Occur near plate boundaries or hot spots
- Classified by type and form of ejecta
- Climate change-
 - Suspended volcanic material will filter out a portion of incoming solar radiation which in turn will reduce air temperatures in the lower atmosphere

