

# Plate Tectonics

# Theory of Plate Tectonics- 1960

- Explains that Earth's crust consists of rigid, but moving masses called tectonic plates

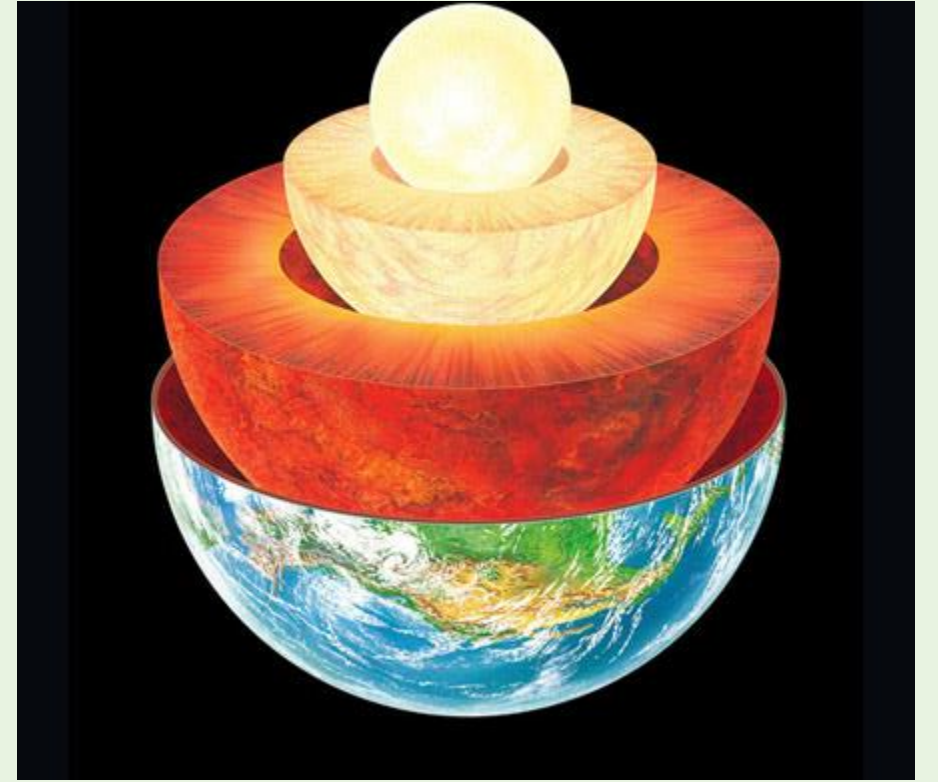


# Reminders: Earth's structure

- Earth's has 3 main layers:

- **Core, Mantle, Crust**

- The **lithosphere** is the outer shell of Earth that is made of rigid crust and upper mantle



The lithosphere is broken into tectonic plates with 2 types of crust:

- **Oceanic Crust**

- Made up of the ocean floor

- **Continental Crust**

- Made up of continental landmasses.

**Important Note: Oceanic crust is always more dense than continental crust! That means oceanic crust will always sink beneath continental crust.**

**Question:** How do the plates move?

- There are 2 mechanisms of plate motion:
  - Slab Pull
  - Mantle Convection

# 1. SLAB PULL

- As colder and denser ocean crust sinks beneath the less dense continental crust, gravity starts to pull the subducting (sinking) plate into the mantle.

# 2. MANTLE CONVECTION

- Takes place through the movement of convection currents
- These currents are a result of unequal heating from the Earth's core which causes hot magma to rise and cool magma to sink down towards the core and heat up again.



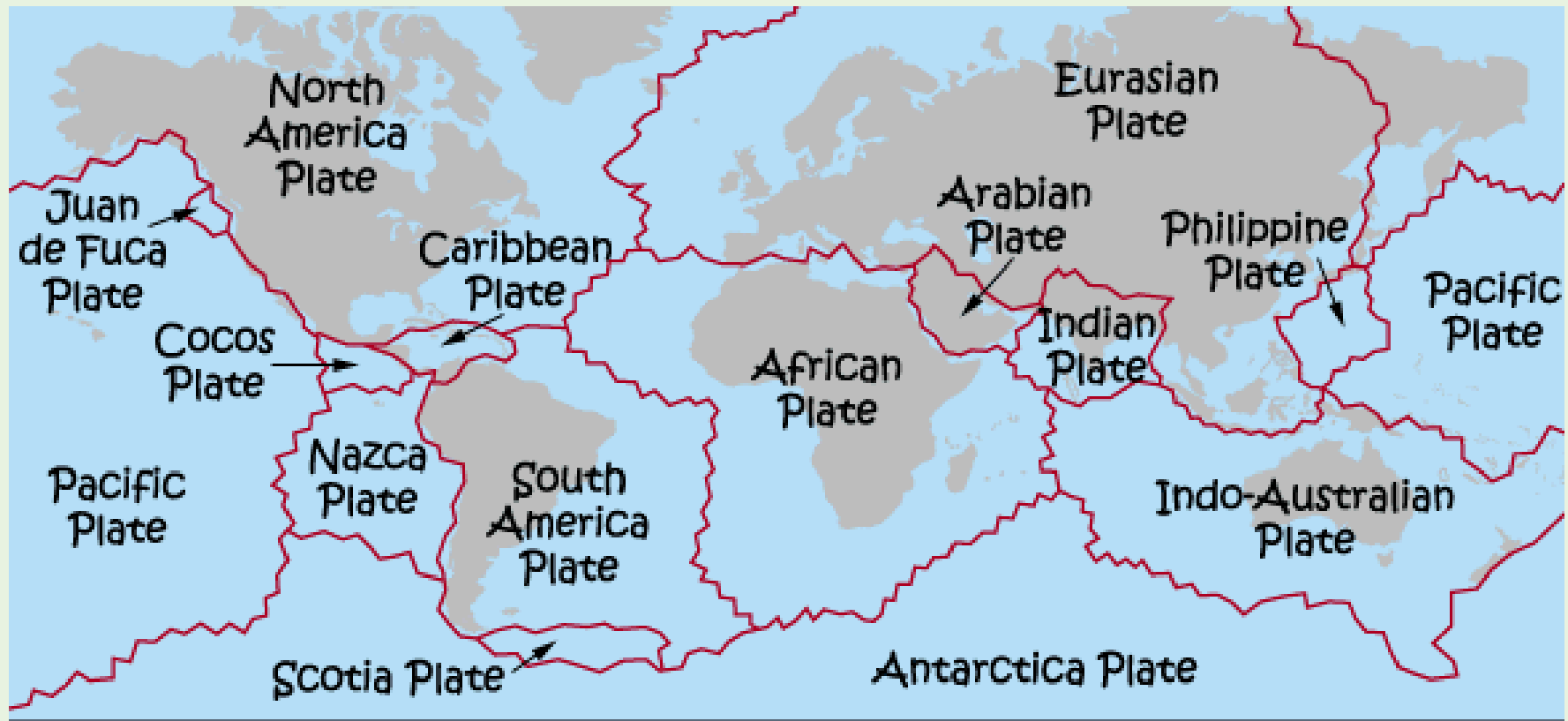
# Watch Mantle Convection





# Tectonic Plate Interactions

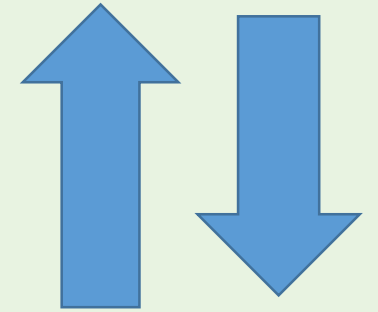
- There are 3 main ways that the plates interact.
- Points of interaction are called **boundaries**



# 1. Divergent Boundary

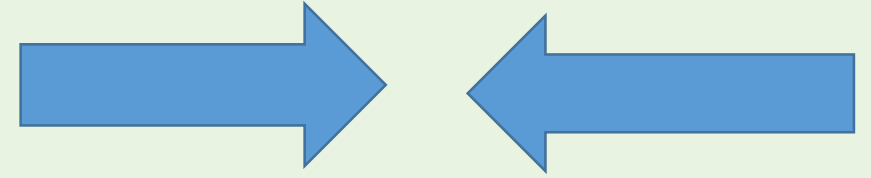
- Plates move away from each other
- The rocks experience tensional stress
- magma rises and fills space between plates creating **new crust** as it cools
- CRUST IS GAINED

## 2. Transform Boundary



- Plates slide past each other
- The rocks experience shear stress
- CRUST IS NEITHER LOST OR GAINED

### 3. Convergent Boundary



- Plates move toward each other
- The rocks experience compressional stress
- CRUST IS LOST

# There are 3 types of convergent boundaries

## 1. Continental-Continental Convergence

- When continental plates collide the plates will crumple and uplift

## 2. Oceanic-Oceanic Convergence

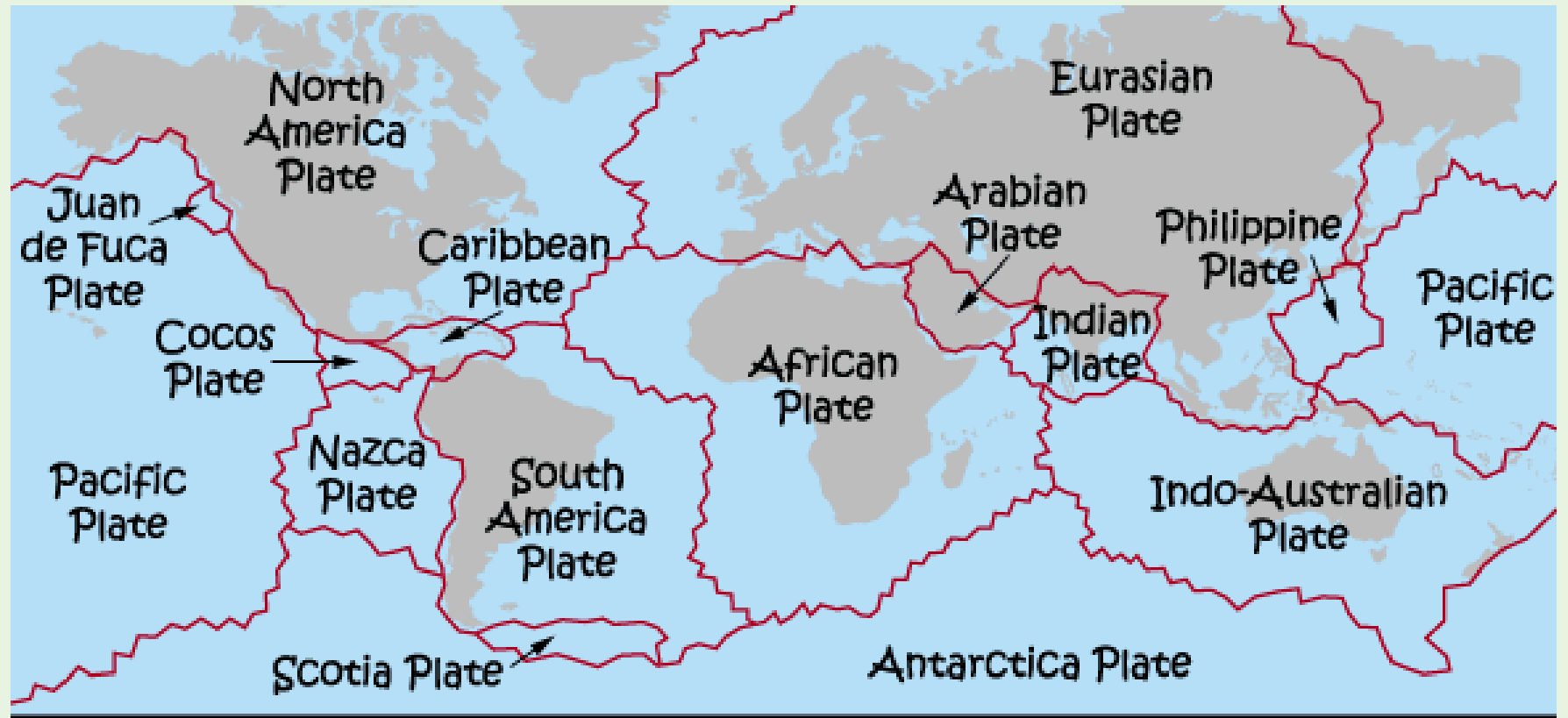
- When oceanic plates collide, the older and more dense plate will sink under the less dense plate

## 3. Continental-Oceanic Convergence

- When an oceanic plate collides with a continental plate the oceanic plate will sink under the other

# PLATE BOUNDARY FEATURES

- When tectonic plates interact, different features will form .

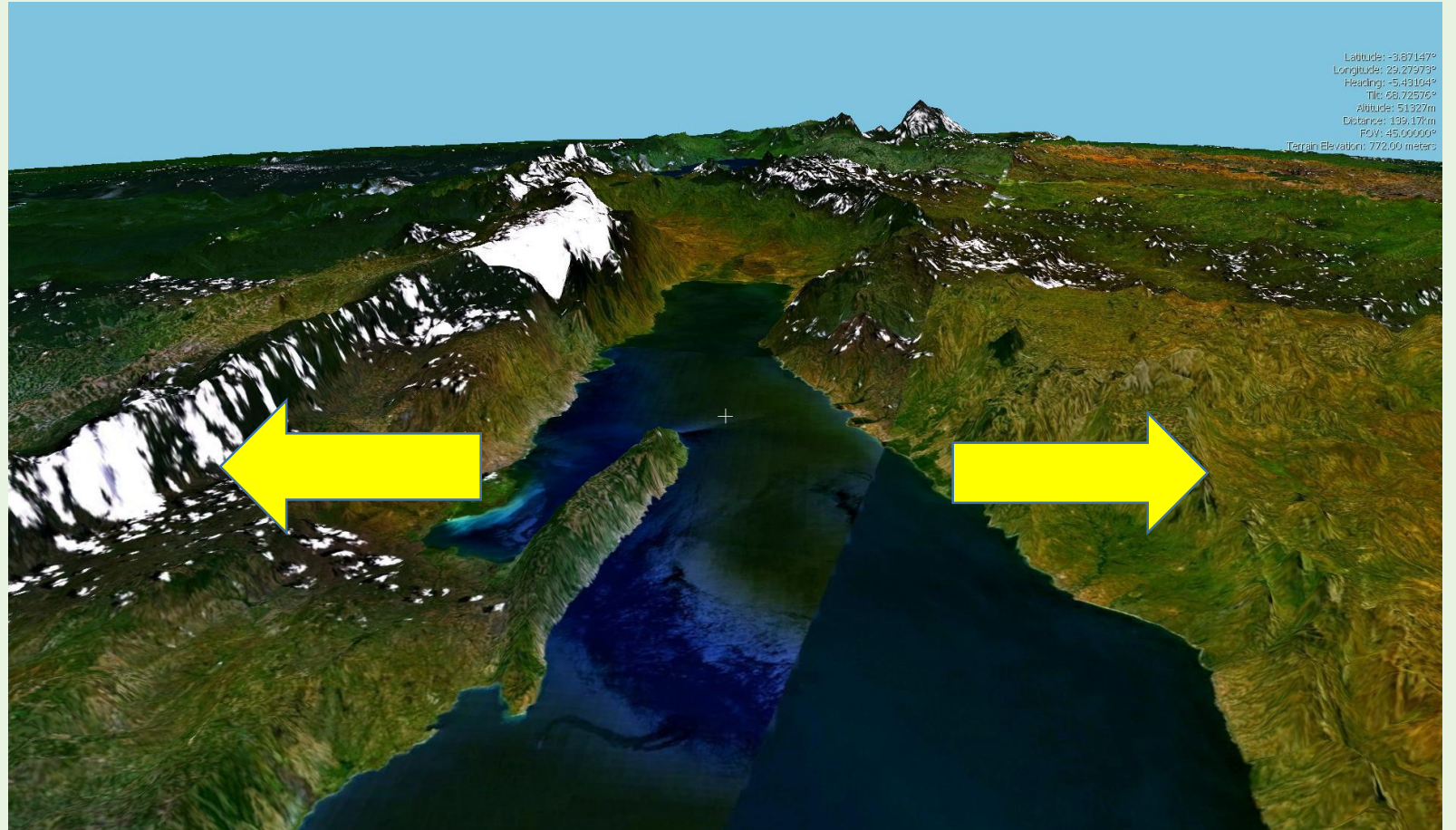


## Features found at **DIVERGENT BOUNDARIES**

- 1. Rift Valley (Ex: East African Rift Valley)
- 2. Mid Ocean Ridges (MOR) (Ex: Mid Ocean Ridge)

# 1. Rift Valley (Divergent)

Forms when plates split apart and a valley forms between the two blocks. It usually has steep sides.

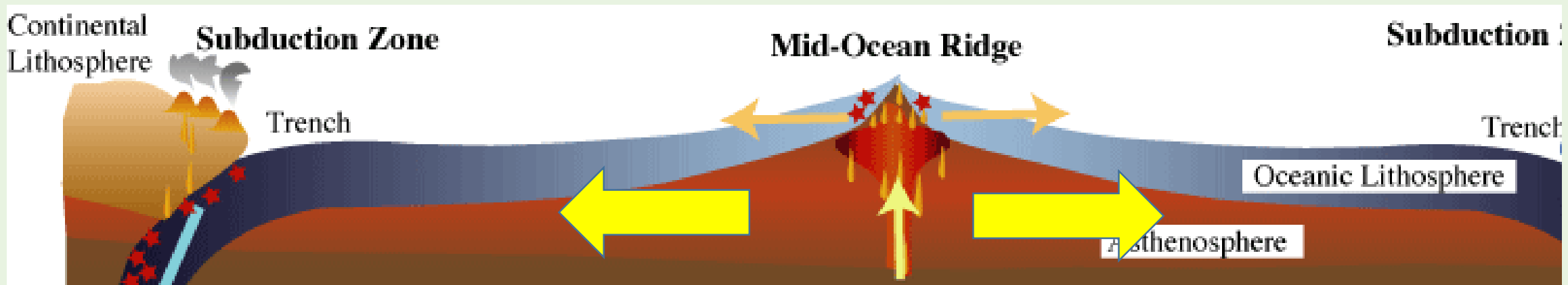
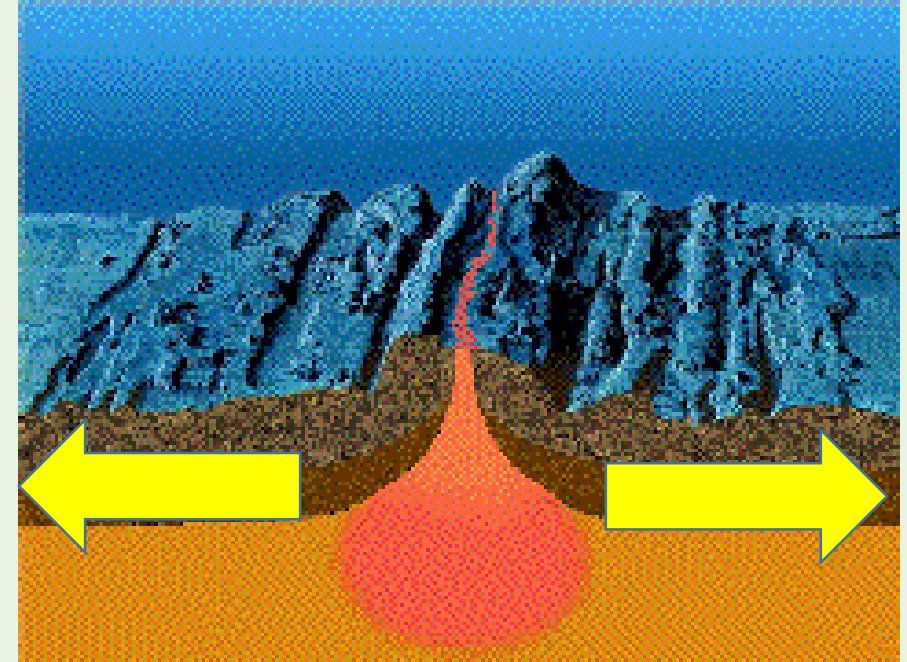




## 2. Mid Ocean Ridge (Divergent)

Underwater mountain range that winds throughout the Earth's oceans.

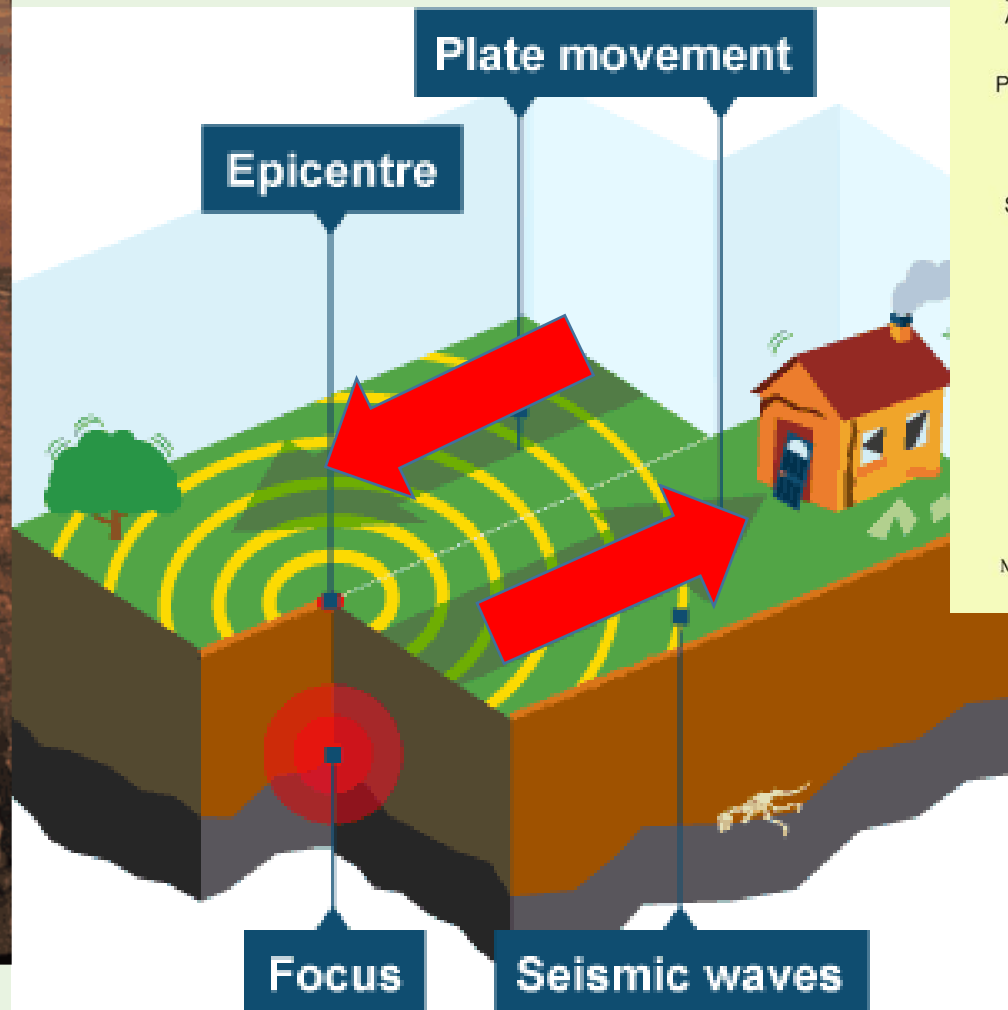
It is the 40,000 miles long



## Features found at TRANSFORM BOUNDARIES

- 1. Earthquakes along faults (Ex: San Andreas Fault)

# Earthquakes - Transform

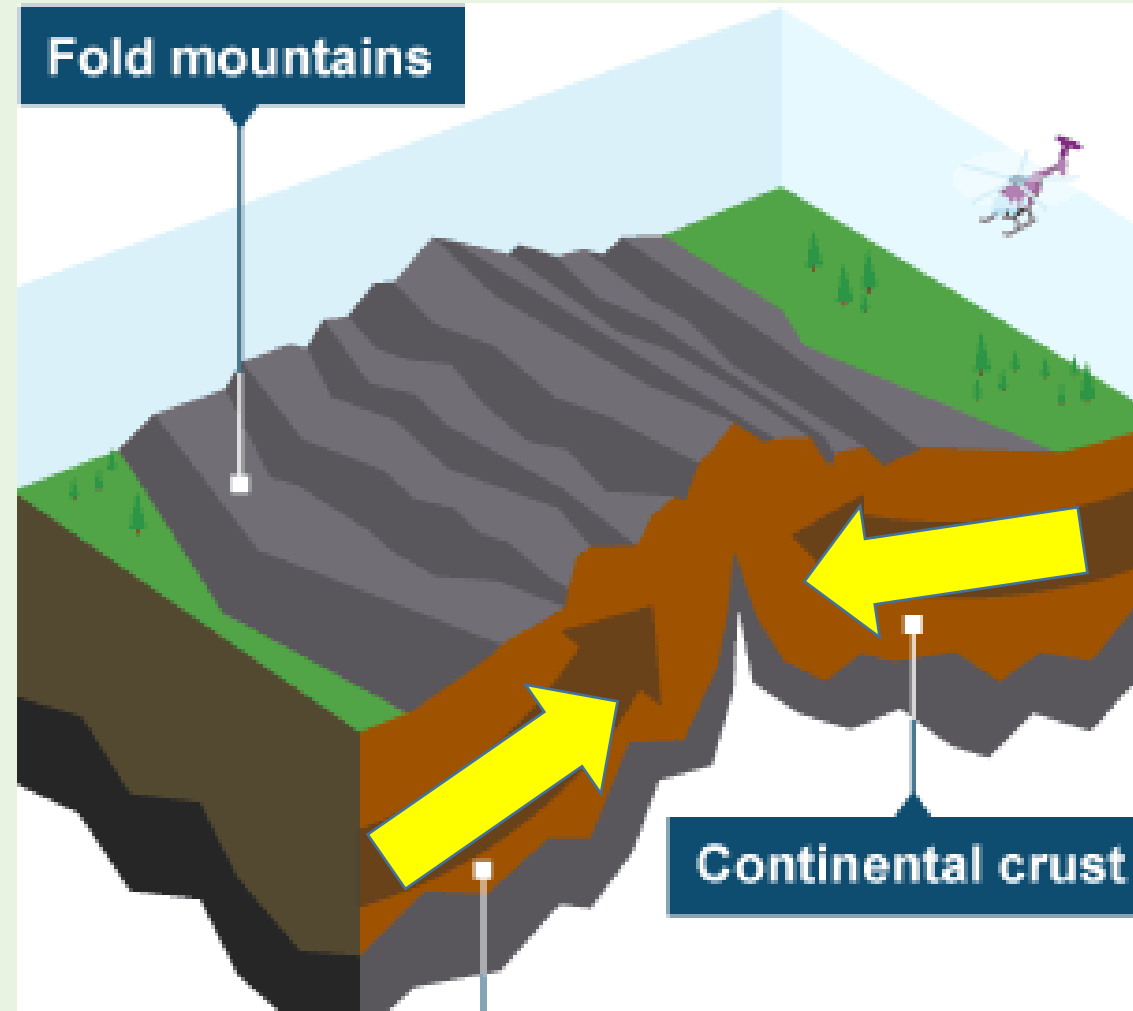


# Features found at **CONVERGENT BOUNDARIES**

- Continental-Continental
  - Folded Mountains (Ex: Appalachian Mountains, Himalayan Mountains)
- Oceanic-Oceanic
  - Subduction Zone
  - Trench (Mariana Trench- 36,000 feet below sea level)
  - Island Arc of Volcanoes (Aleutian Islands)
- Continental-Ocean
  - Subduction Zone
  - Continental Volcanic Arc (Ex: Andes Mountains)
  - Trench (Peru-Chile Trench)

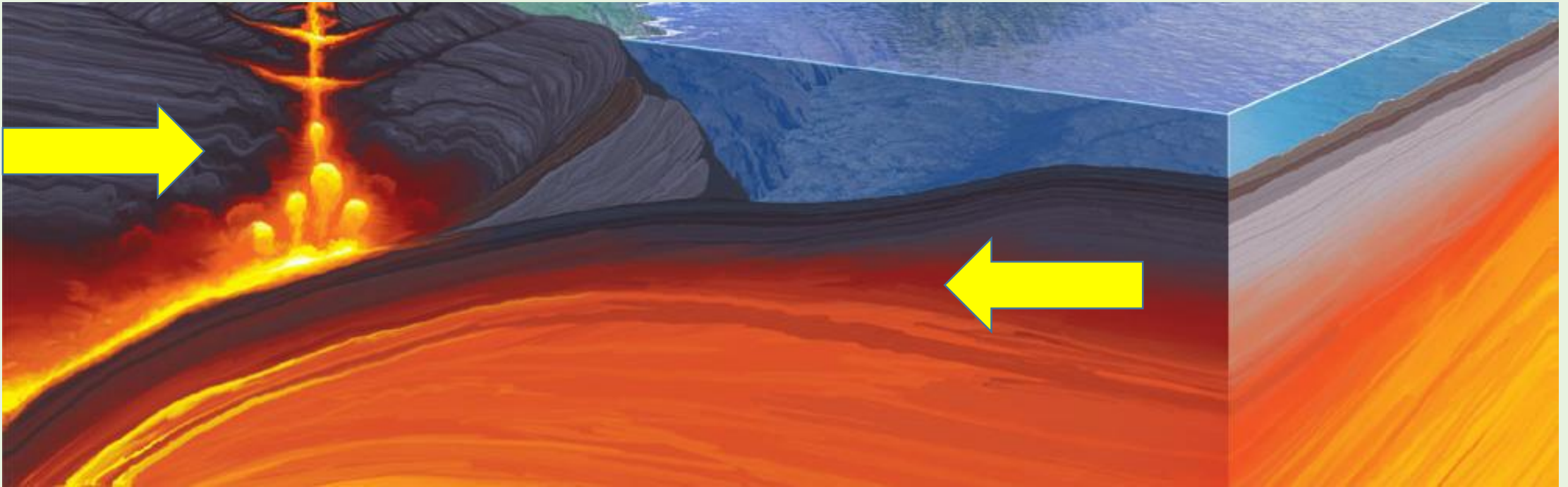
# (C-C) Folded Mountains

plates crumple and uplift to form folded mountains



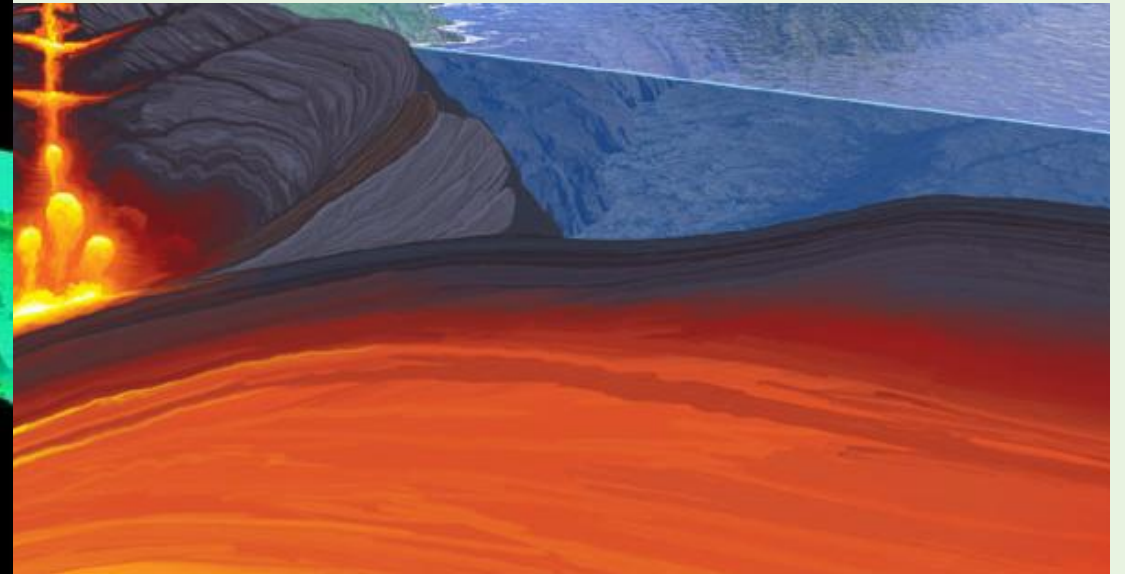
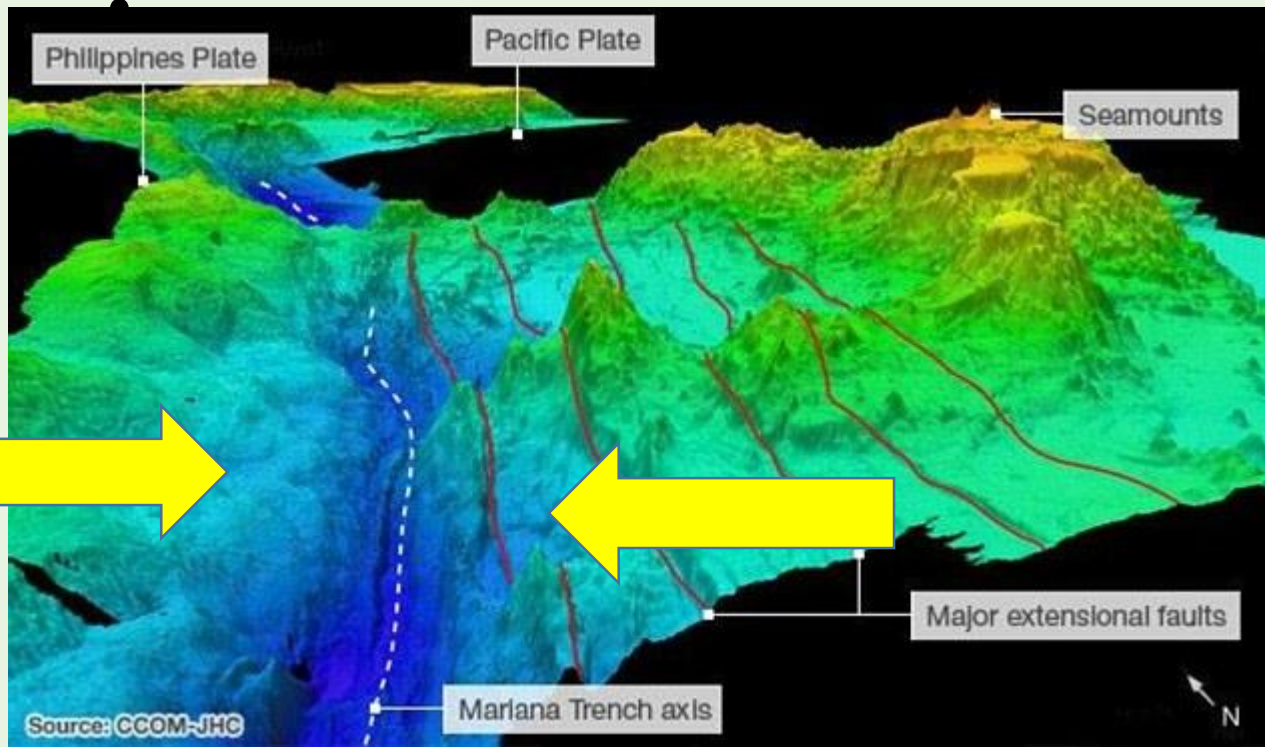
# 1. (O-O) Subduction Zone

A place where 2 plates converge and one sinks beneath the other



# 2. (O-O) Trench

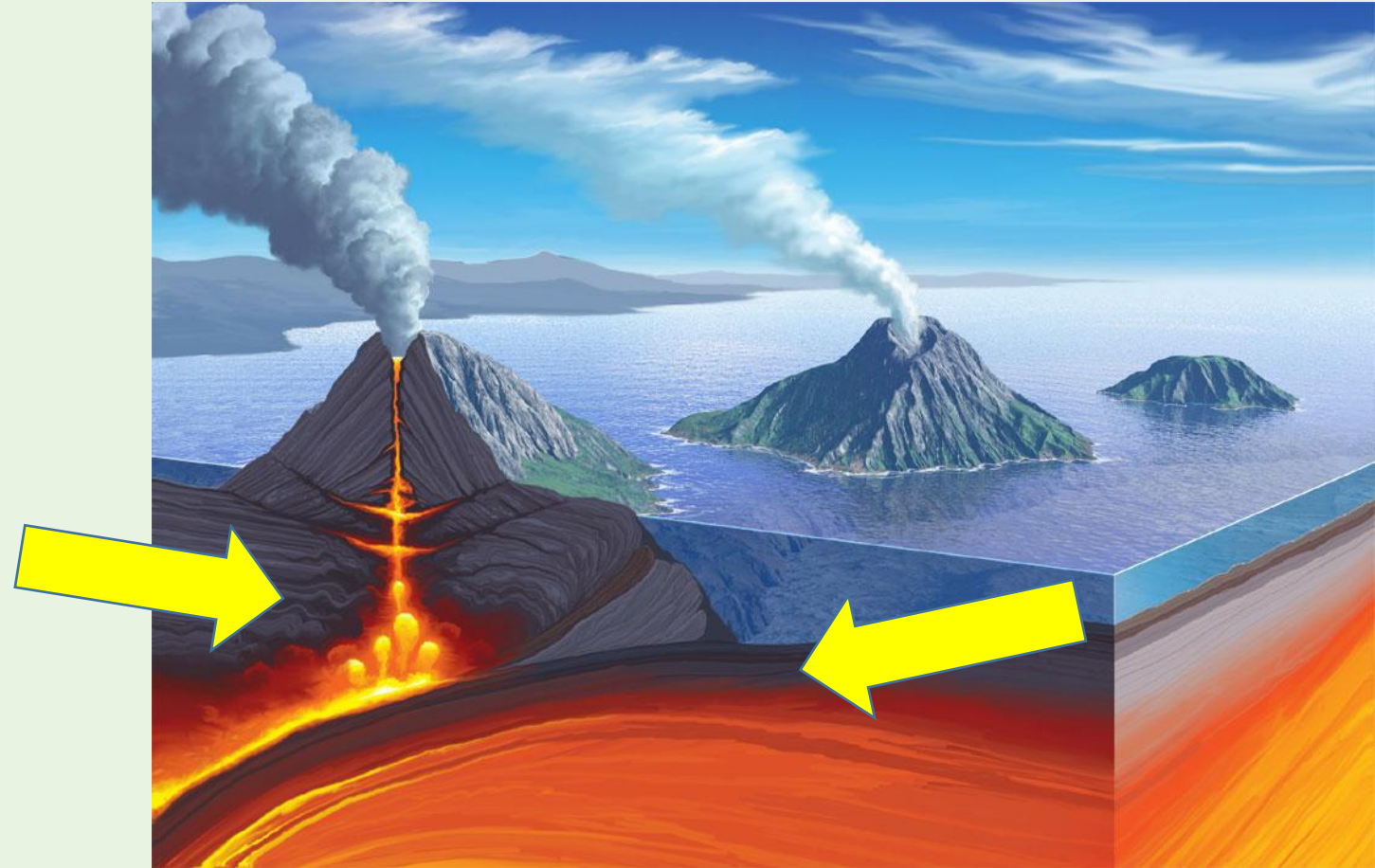
- Trenches form as one plate subducts and melts at a subduction zone



Mariana Trench

### 3. (O-O) Island Arc of Volcanoes

Magma rises to the surface along above a subducting oceanic plate and forms an island chain of volcanoes

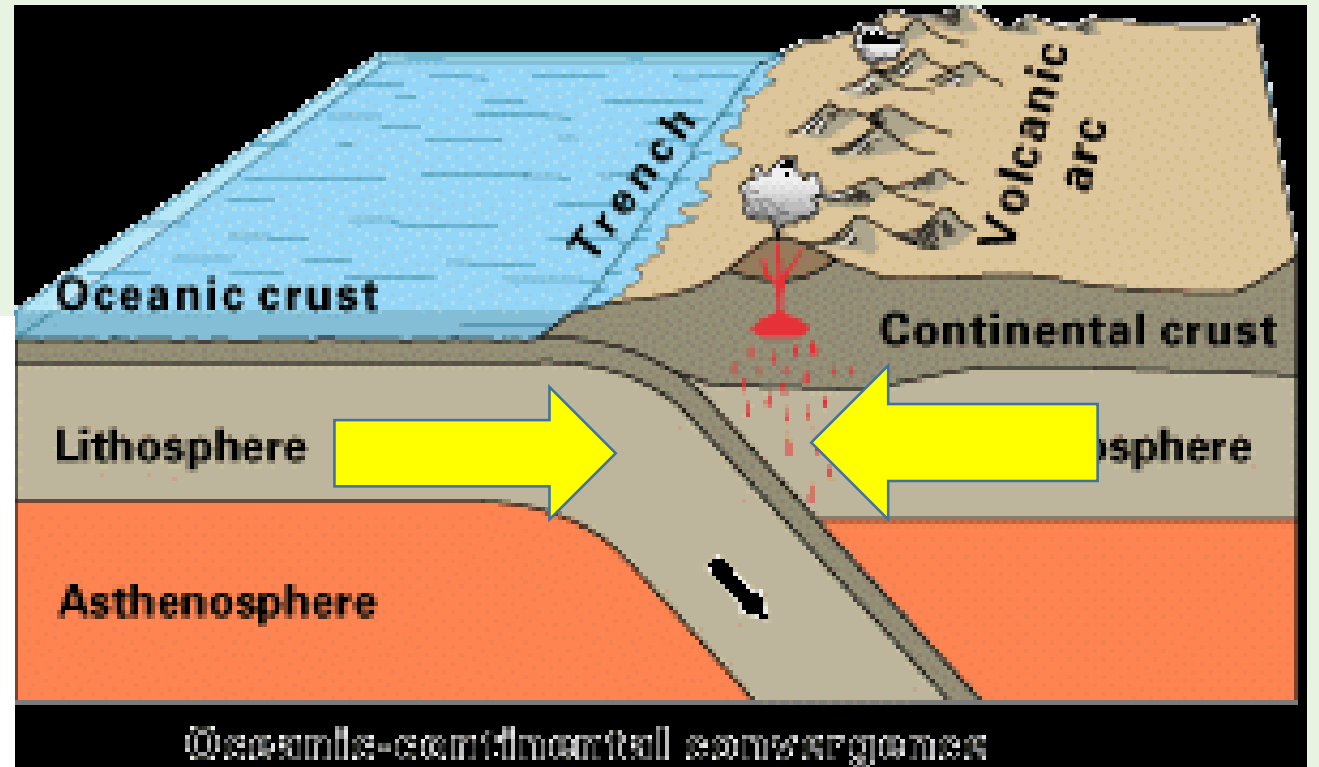
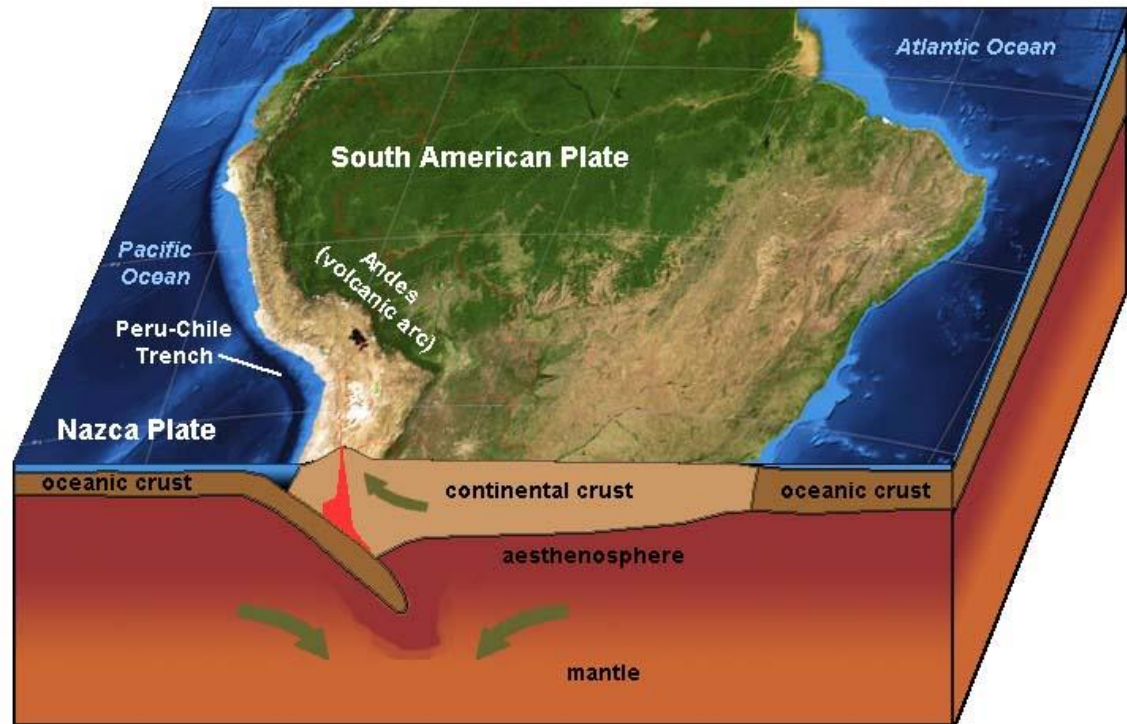


Aleutian Islands



# 1. (C-O) Continental Volcanic Arc

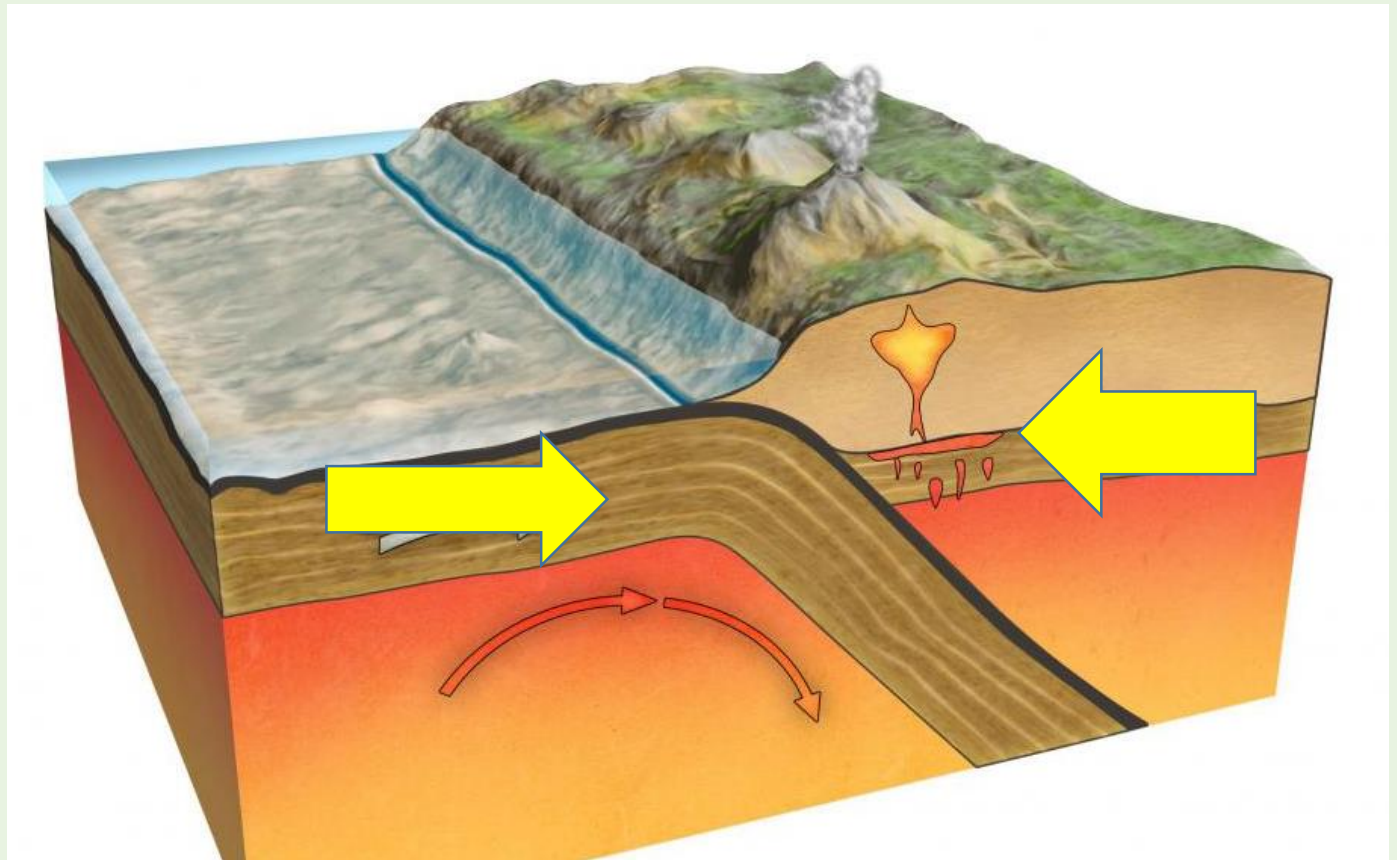
Magma rises to form an continental arc of volcanoes above a subducting plate



Andes Mountains

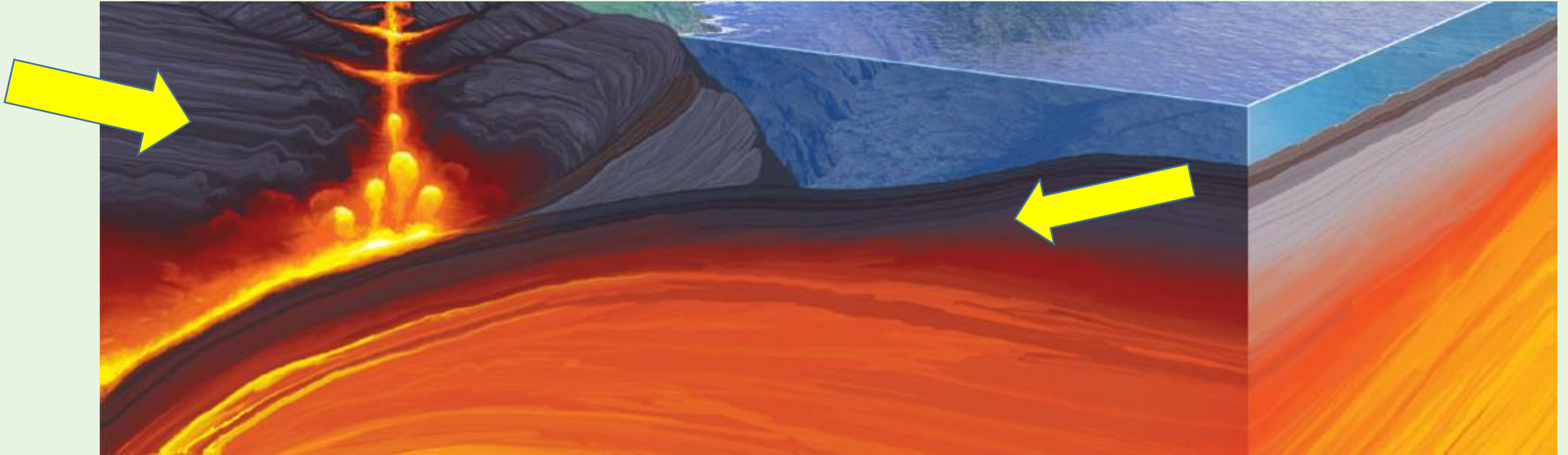
## 2. (C-O) Subduction Zone

- A place where 2 plates converge and one sinks beneath the other



# 3. (C-O) Trench

- Trenches form as one plate subducts and melts at a subduction zone
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# OTHER PLATE MOVEMENT

- **Hot Spot** = Intraplate volcanism (not at a boundary!)
- A hotspot forms near an extra hot part of the mantle where rocks melt and create plumes of rising magma. As tectonic plates move over the plume magma rises through cracks and erupts to form **volcanoes**.

- Ex: Hawaiian Islands

