Chapter 2 Geography

Getting to know Earth

Our Solar System

- Sun is at the center of our solar system
  - Contains a lot of Mass
    - » Mass gives the Sun gravitational pull
    - » This keeps the planets in our solar system on their orbits
- The Planets
  - 8 planets in our Solar System
  - Inner/Terrestrial planets: Mercury, Venus, Earth and Mars (have solid rocky crusts)
    - Mercury and Venus: only two planets in our solar system to not have moons.
  - Outer Planets/Gas Giants: Jupiter, Saturn, Uranus and Neptune (less dense, no hard surfaces)
    - All gas giants have rings

Space Objects

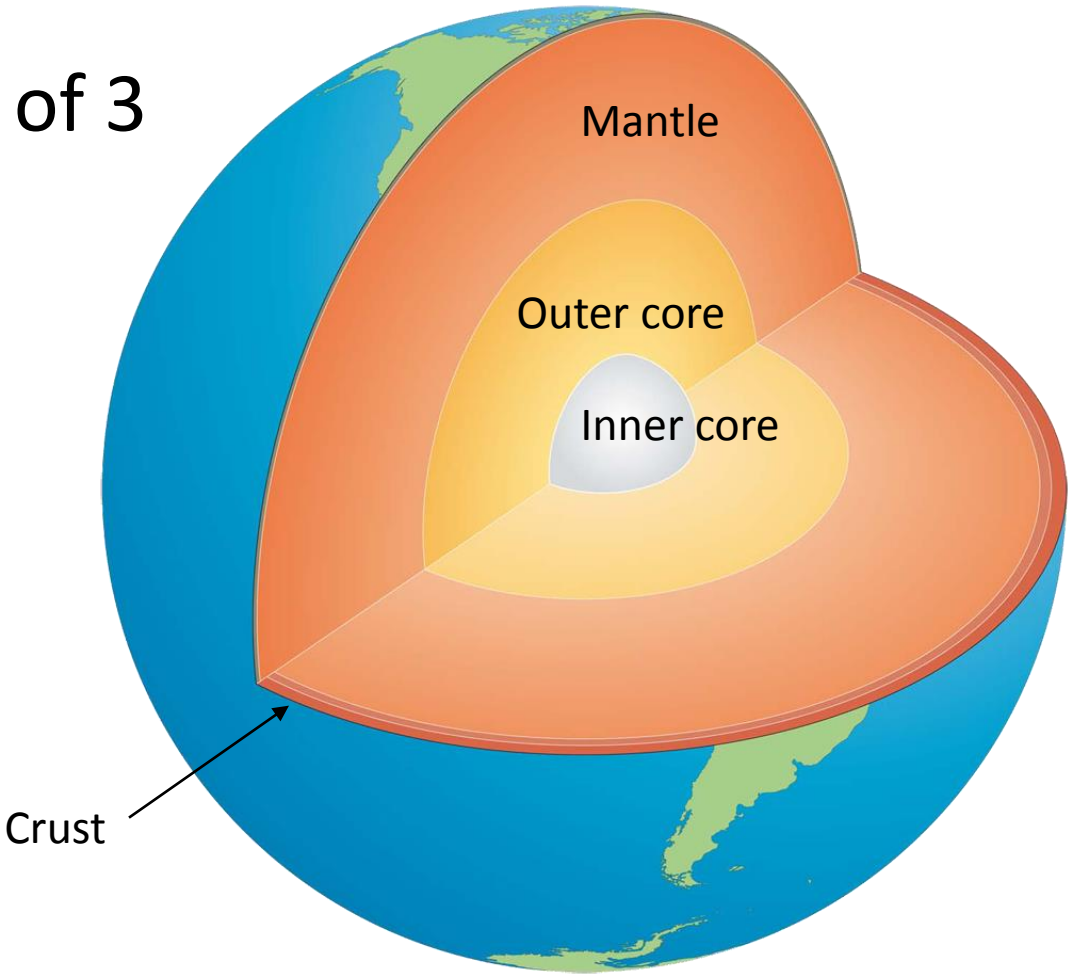
- Asteroids: irregularly shaped objects, many found in the asteroid belt between Mars and Jupiter
- Comets: made up of icy dust particles and frozen gases. Create a “tail” of dust
- Meteoroids: Pieces of space debris
  - Meteorite: Meteoroid that impacts Earth

Getting to Know Earth

- Earth is the largest of the inner planets
  - Water, Land and air
    - Surface is covered by 70% water, 30% land
  - Landforms
    - Physical features of particular shapes and elevations
      - Hills, mountains, plains, plateaus and valleys (etc)
    - Continents: Large land masses. There are 7 of them
      - Continental Shelf: Part of a continent that extends underwater
- Earth's heights and depths
  - Mount Everest: highest point above sea level
  - Dead Sea: Lowest point of dry land (is actually below sea level)
  - Mariana Trench: Deepest known level of the ocean floor

Earth's Structure

- Earth is made up of 3 main layers:
  - Core
  - Mantle
  - Crust

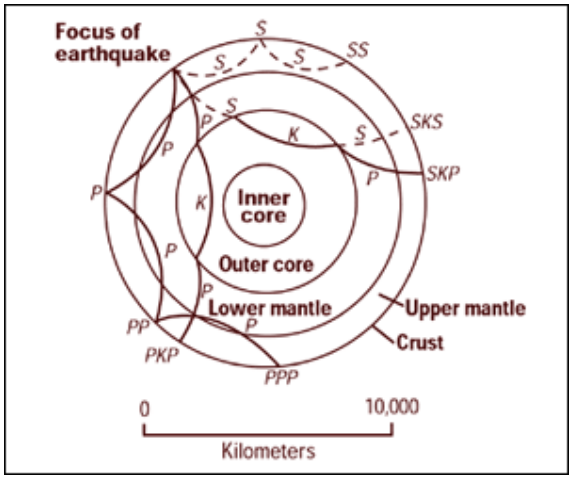


Layered Planet

- Core: Contains two parts
  - Inner core: Solid, hot area at the center of the earth
    - Made up of iron and nickel
  - Outer Core: liquid outer core (surrounds the solid inner core)
- Mantle: Middle layer
  - Thick hot layer of dense rock
- Crust: Outer layer
  - Rocky shell forming the surface of the earth.
  - Broken into plates that float on a partially melted layer of the upper mantle

How do we know what the Earth is made of?

- Geophysical surveys: seismic, gravity, magnetic, electrical
  - Acquisition: land, air, sea and satellite
  - Geological surveys: fieldwork, boreholes, mines



- If you look at a map of the world, you may notice that some of the continents could fit together like pieces of a puzzle.

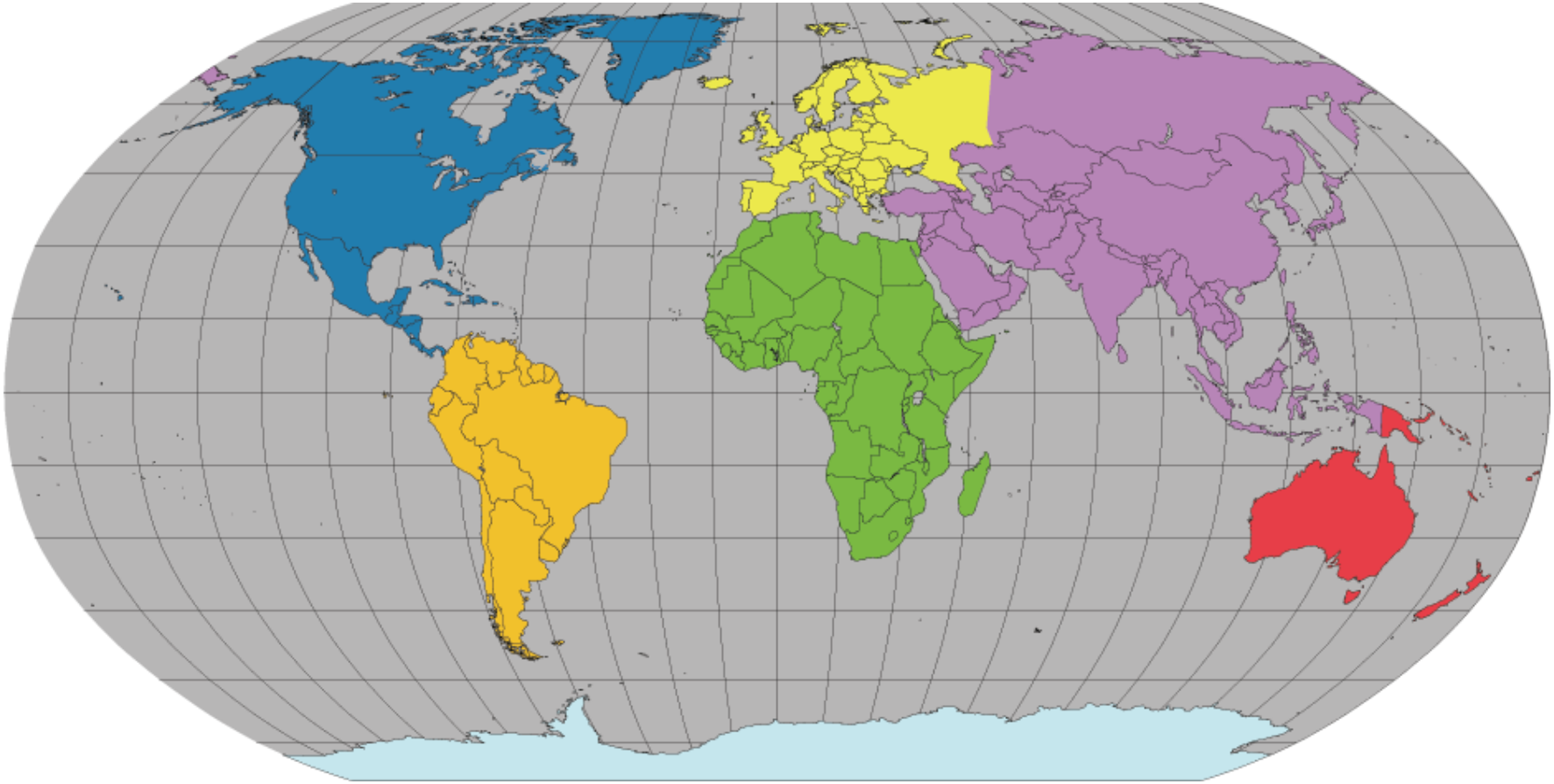
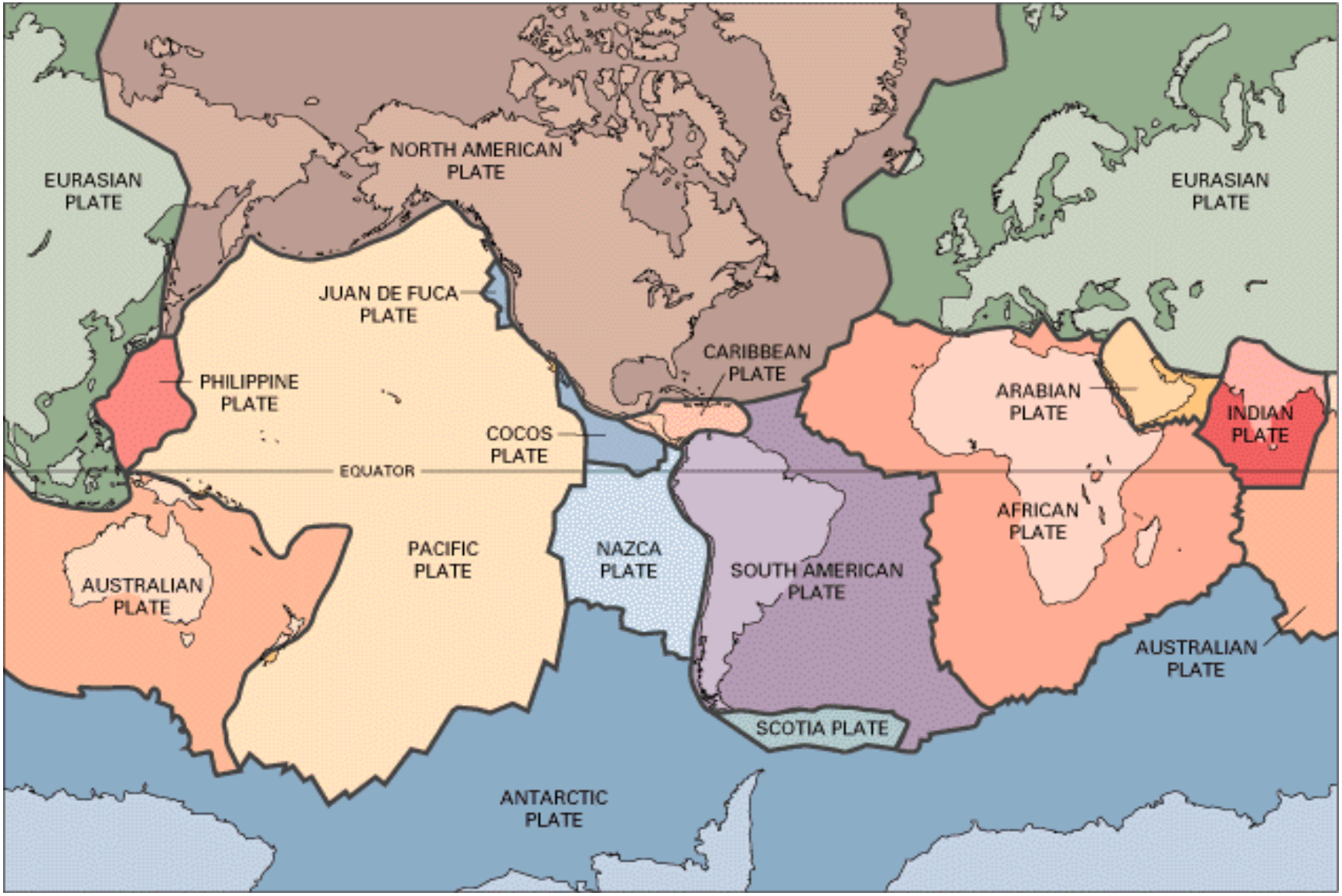


Plate Tectonics

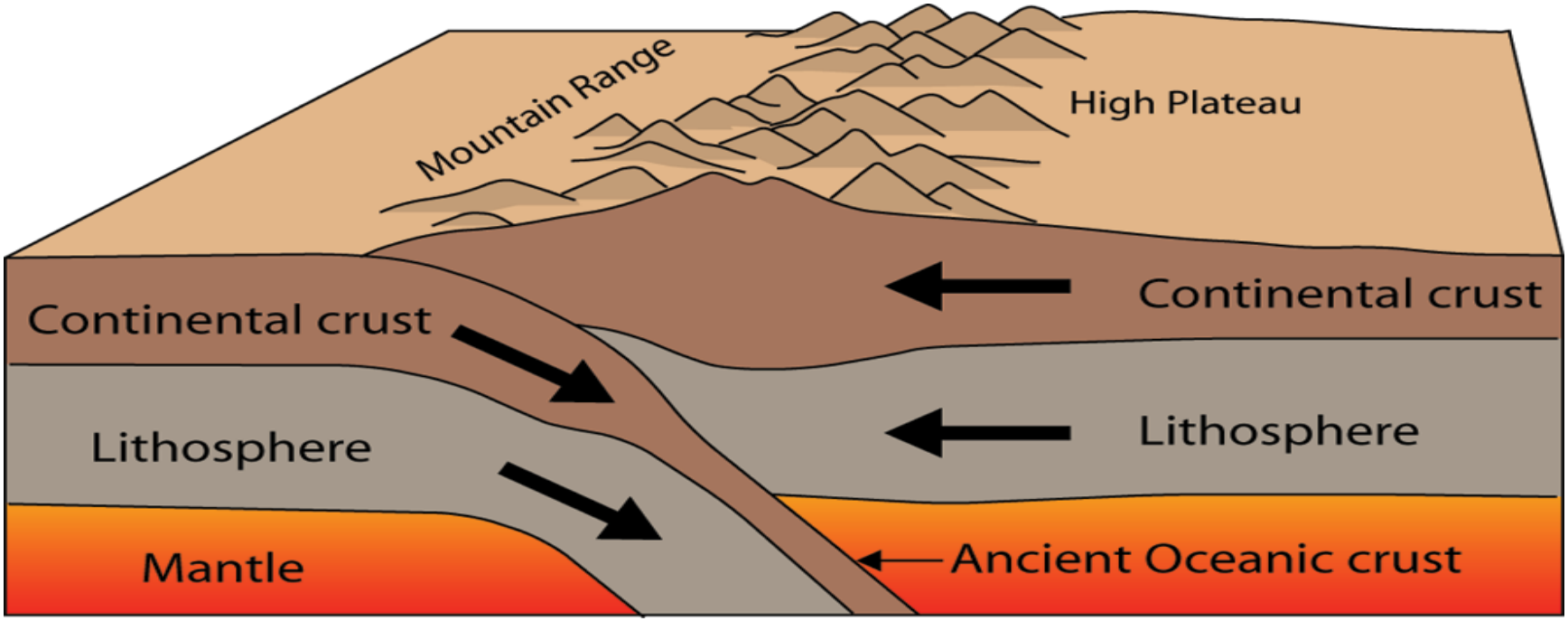
- Pangaea: Supercontinent made up of the 7 continents that were connected, millions of years ago
- The Earth's crust is divided into 12 major plates which are moved in various directions.
- This plate motion causes them to collide, pull apart, or scrape against each other.
  - Push up mountains, create volcanoes and produce earthquakes

World Plates



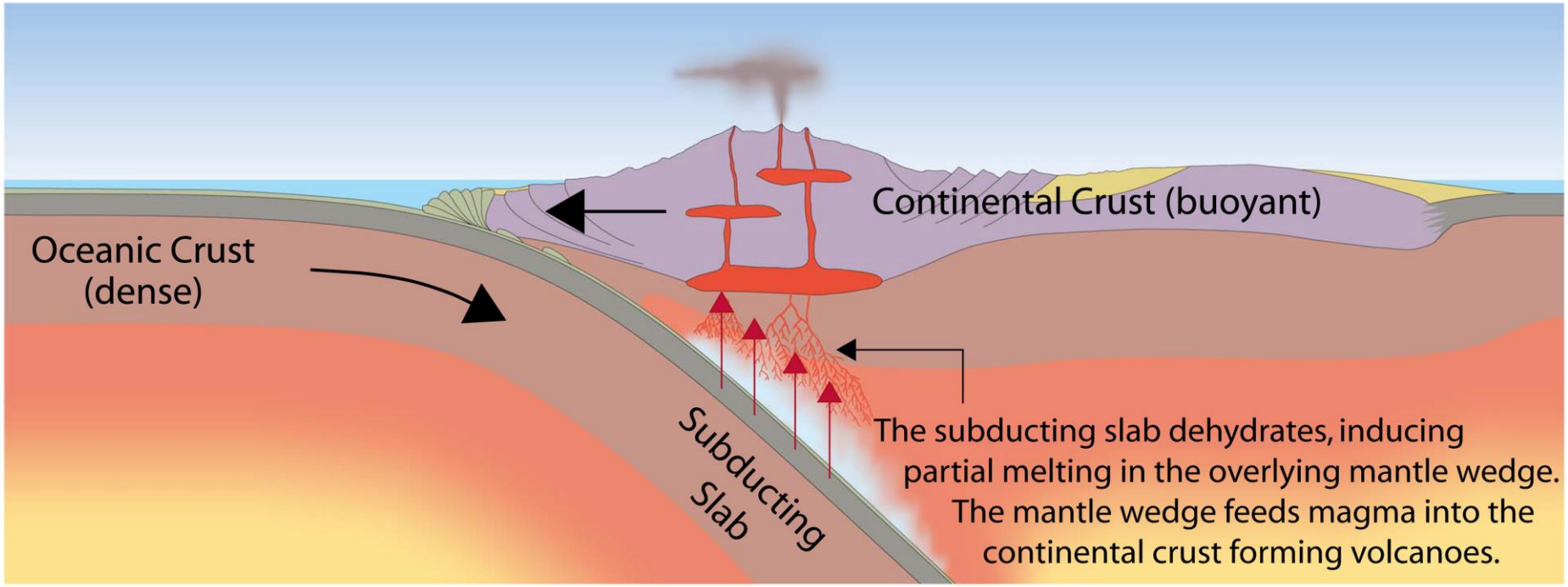
Colliding and Spreading of Plates

- Mountains form in 2 ways when plates collide:
  - 1) Continental Plate-Continental Plate



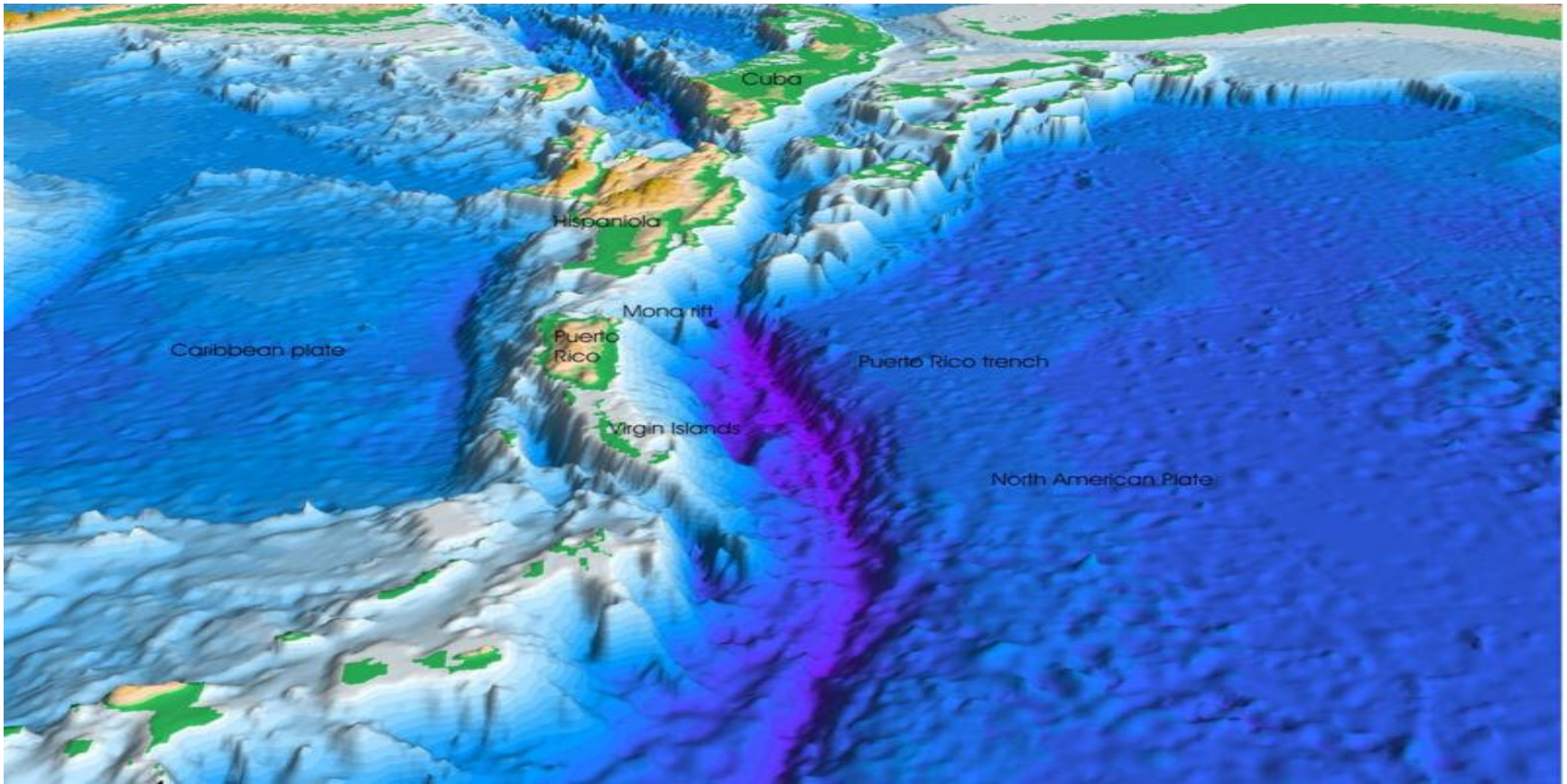
Colliding Plates

- 2) Ocean Plate-Continental Plate Collision
  - Called Subduction: Heavier sea plate, dives beneath the lighter continental plate



Spreading Plates

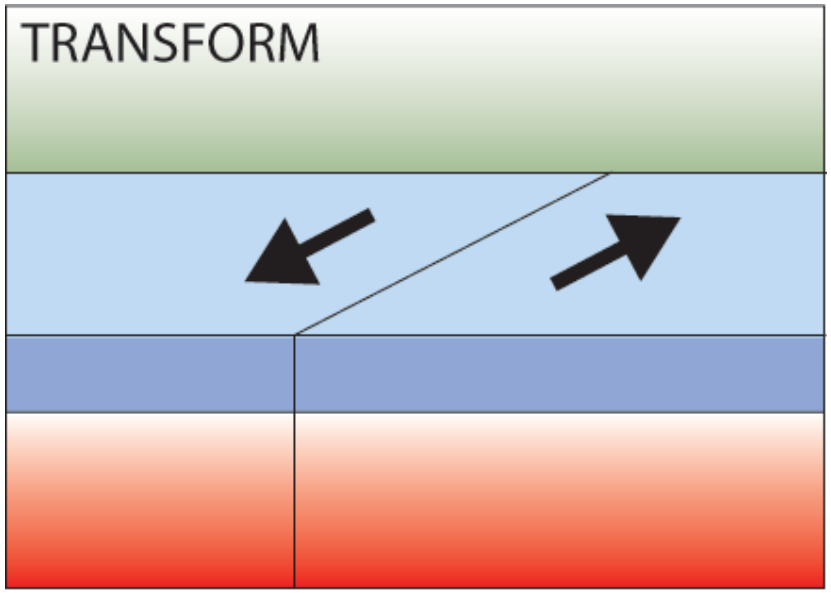
- Two ocean/sea plates pull apart
  - Creates trenches/rifts on the ocean floor

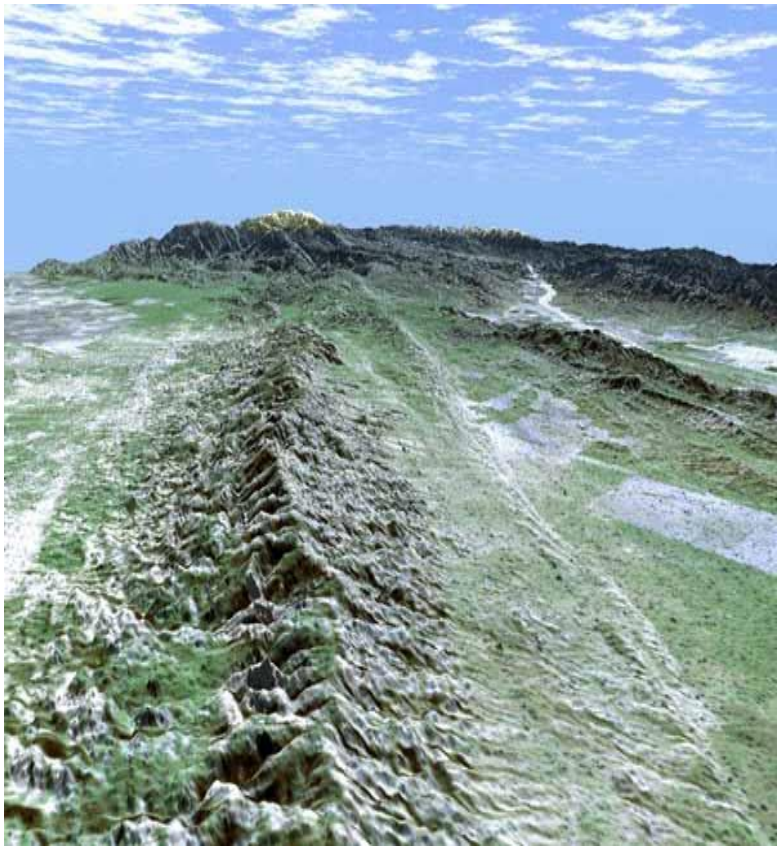


Folds and Faults

- Folds: Plates squeeze the earth's surface creating in layers of rock.
- Faults: plates may grind or slide past each other (San Andreas Fault)

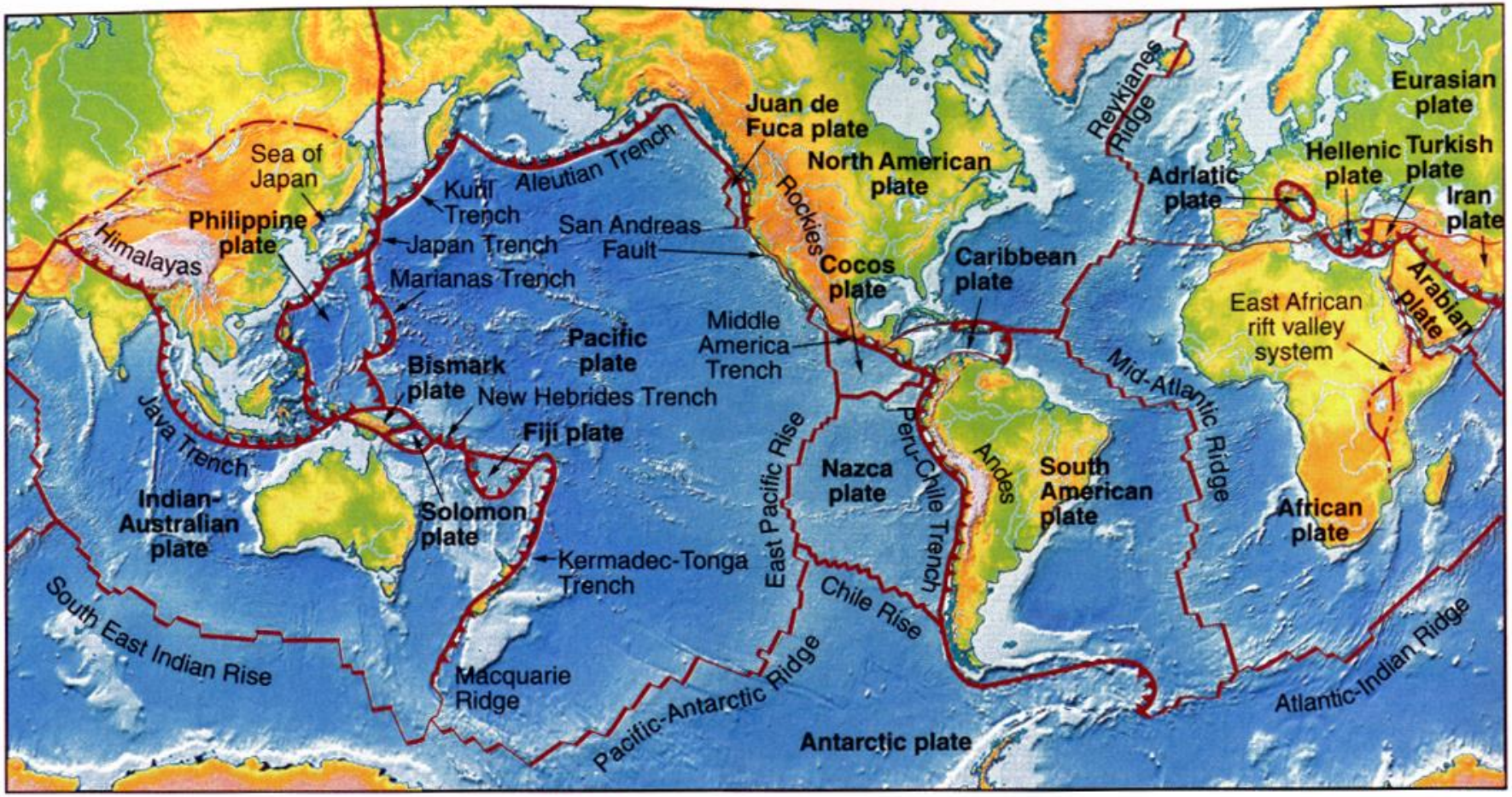
- Where plates slide past each other





Above: View of the San Andreas transform fault

Plate Boundaries



Earth Plate

Earthquakes and Volcanoes

- Earthquake: sudden, violent movement of plates along a fault line
  - Plates Sliding http://video.nationalgeographic.com/video/player/environment/environment-natural-disasters/earthquakes/inside-earthquake.html
- Volcanoes: Mountains formed by lava or magma that breaks through the crust
  - Often rise along plate boundaries where one plate plunges beneath another
  - http://video.nationalgeographic.com/video/player/environment/environment-natural-disasters/volcanoes/volcanoes-101.html

- Ring of Fire: Zone of earthquake and volcanic activity surrounding the Pacific Ocean

- As with volcanoes, earthquakes are **not** randomly distributed over the globe

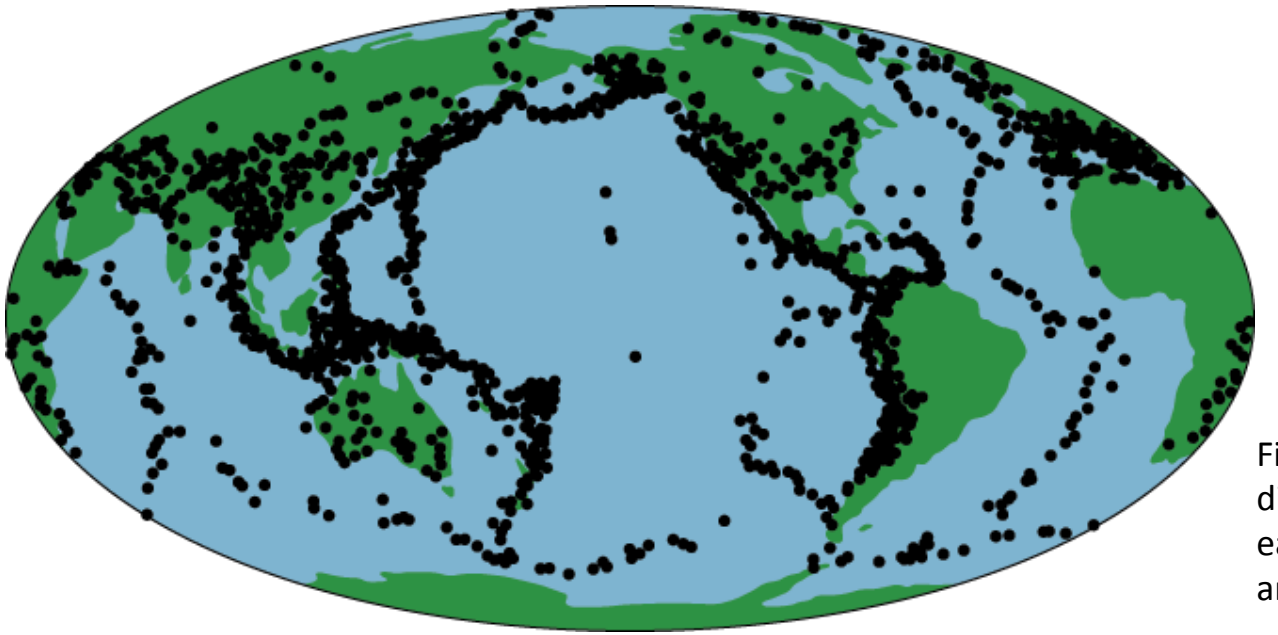
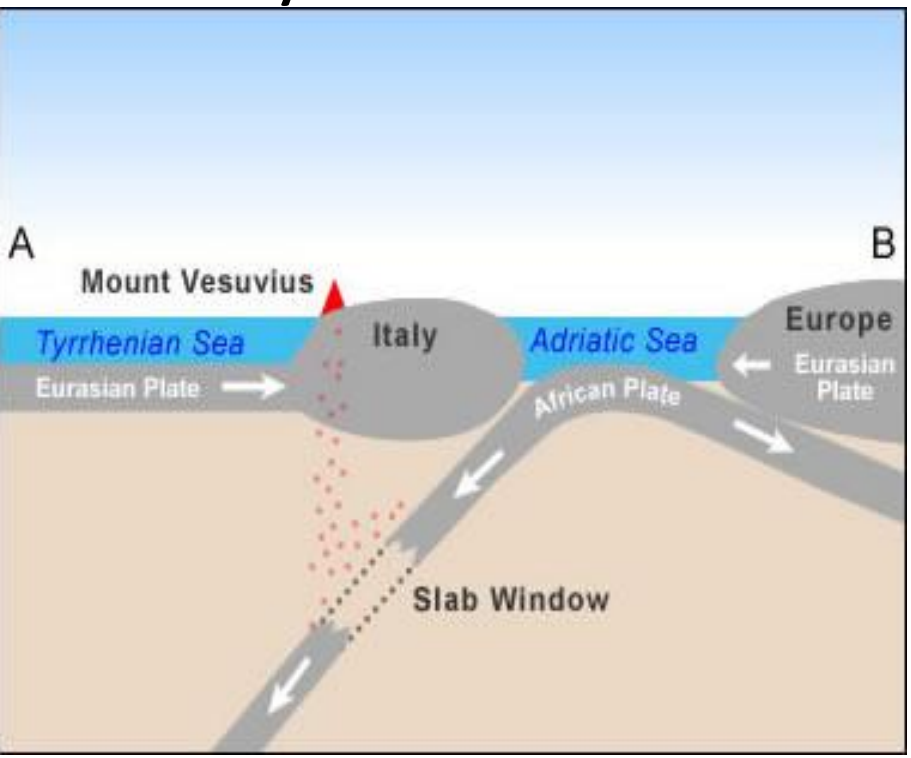


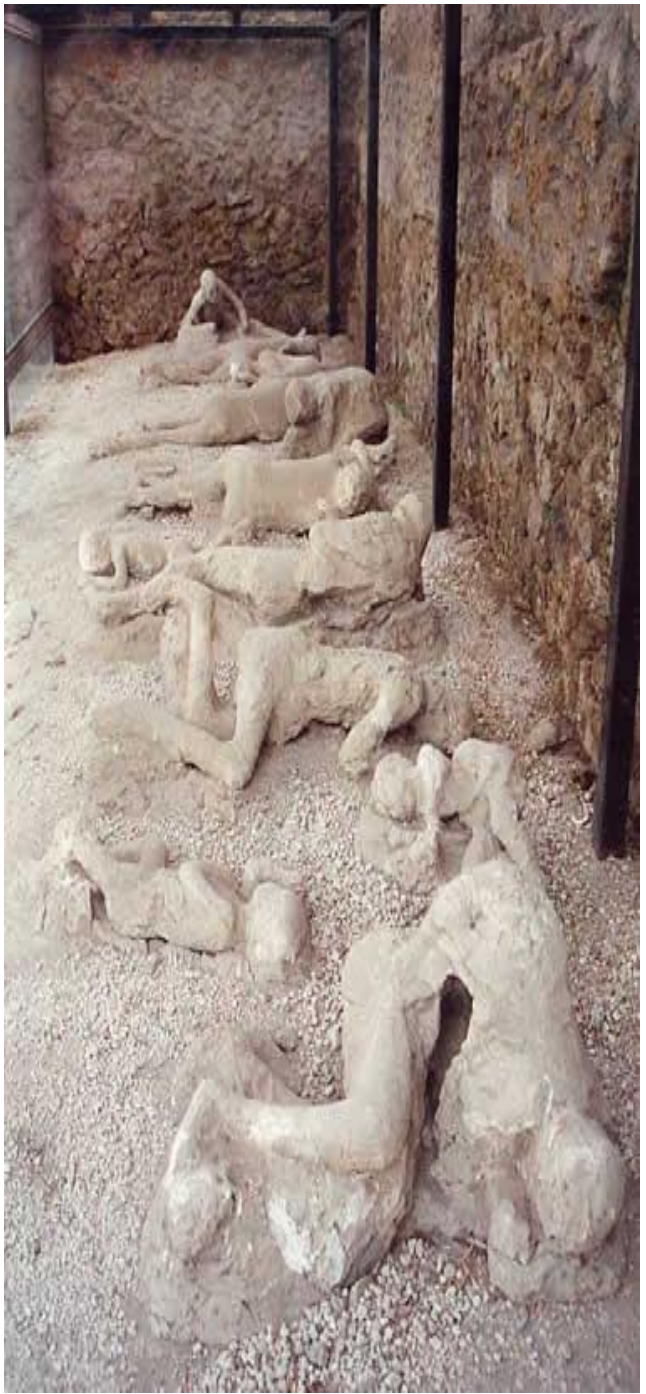
Figure showing the distribution of earthquakes around the globe

- At the boundaries between plates, friction causes them to stick together. When built up energy causes them to break, earthquakes occur. VESUVIUS

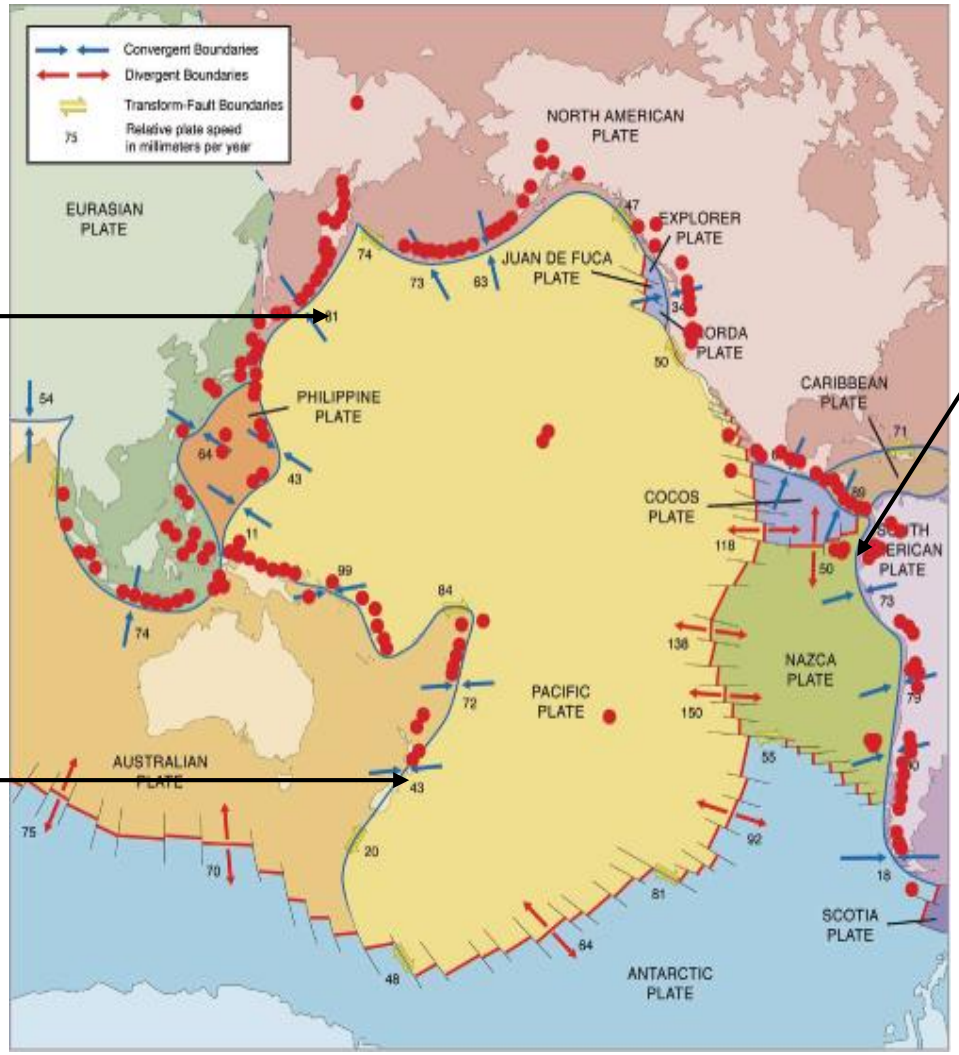
Mt. Vesuvius

- Located in Italy
- One of the most infamous volcanic eruptions in history
- Pompeii and Herculaneum
- Body Casts





Pacific Ring of Fire



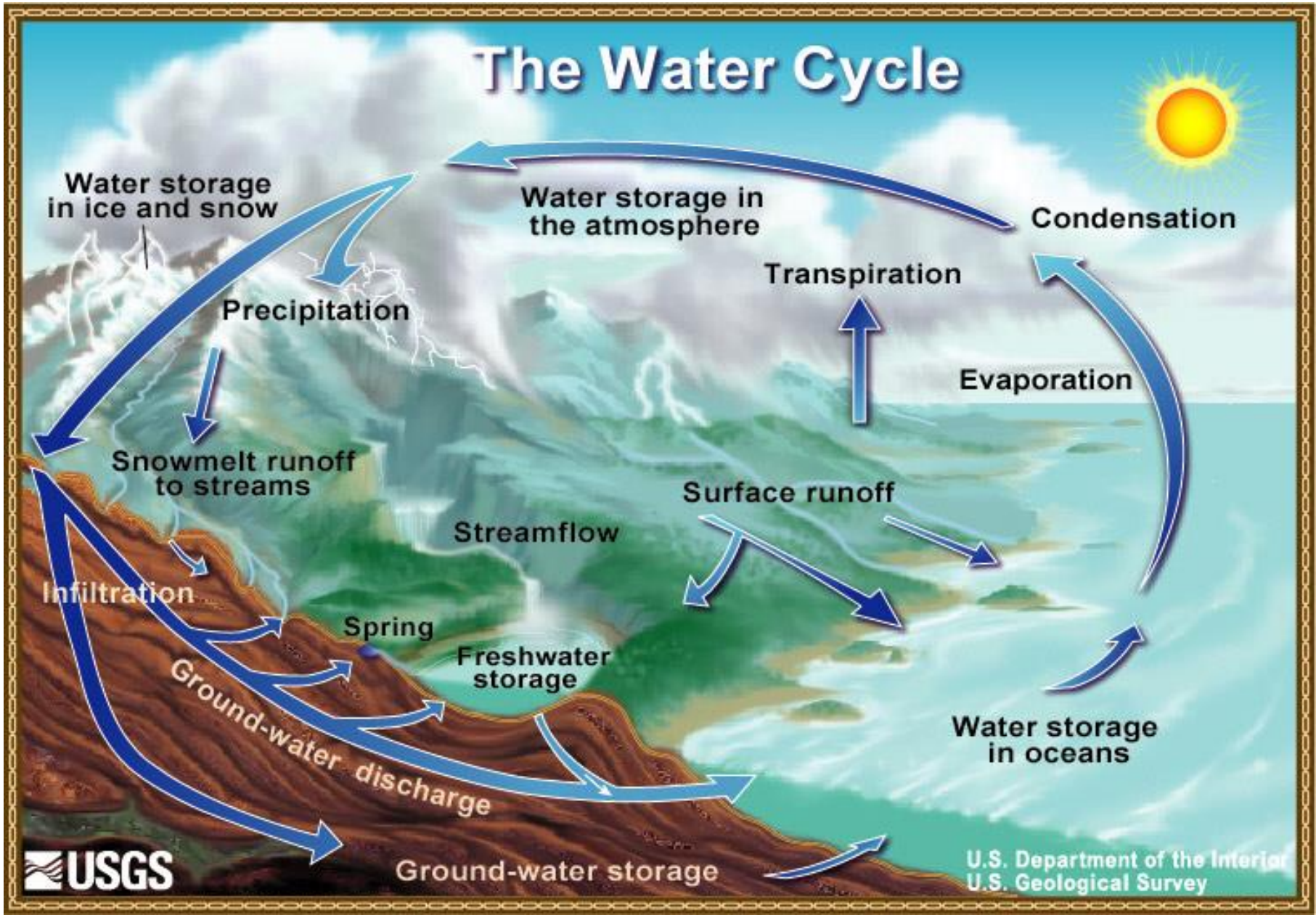
Volcanism is mostly focused at plate margins

External Forces of Change

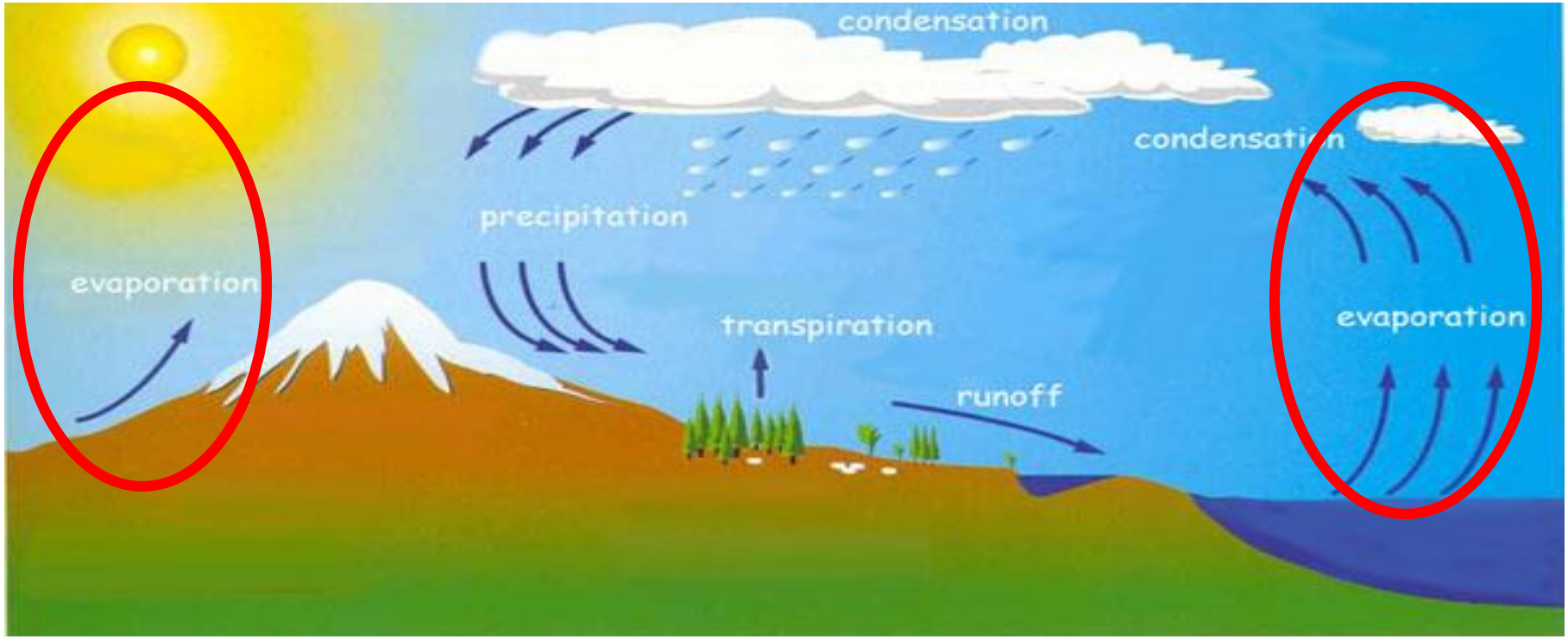
- Weathering: Process that breaks down rocks on the earth's surface
- Erosion: wearing away of the earth's surface by wind, glaciers and moving water
  - Wind Erosion: movement of dust, sand, and soil from one place to another
    - Plants help protect the land from wind erosion
  - Glacial: Large bodies of ice that slowly move across the earth's surface
    - Pick up rocks and soil
    - Melt and recede
    - Icebergs: Sheet glaciers that fell off the coast and into the ocean
  - Water: Fast-moving water causes erosion
    - Storms, rivers

Earth's Water

- The Water Cycle: Name given to the regular movement of water
- Sun begins the cycle
  - Evaporates water into the atmosphere
  - Excess water vapor changes into liquid water
  - Tiny drops of water condense and form clouds
  - Clouds release the moisture back to earth in a form of precipitation (rain, snow or sleet)
  - Precipitation sinks into the ground, and returns to the lakes and oceans


The Water Cycle
Water storage in ice and snow
Water storage in the atmosphere
Condensation
Transpiration
Precipitation
Evaporation
Snowmelt runoff to streams
Surface runoff
Streamflow
Infiltration
Spring
Freshwater storage
Ground-water discharge
Water storage in oceans
Ground-water storage
USGS
U.S. Department of the Interior
U.S. Geological Survey

The Water Cycle

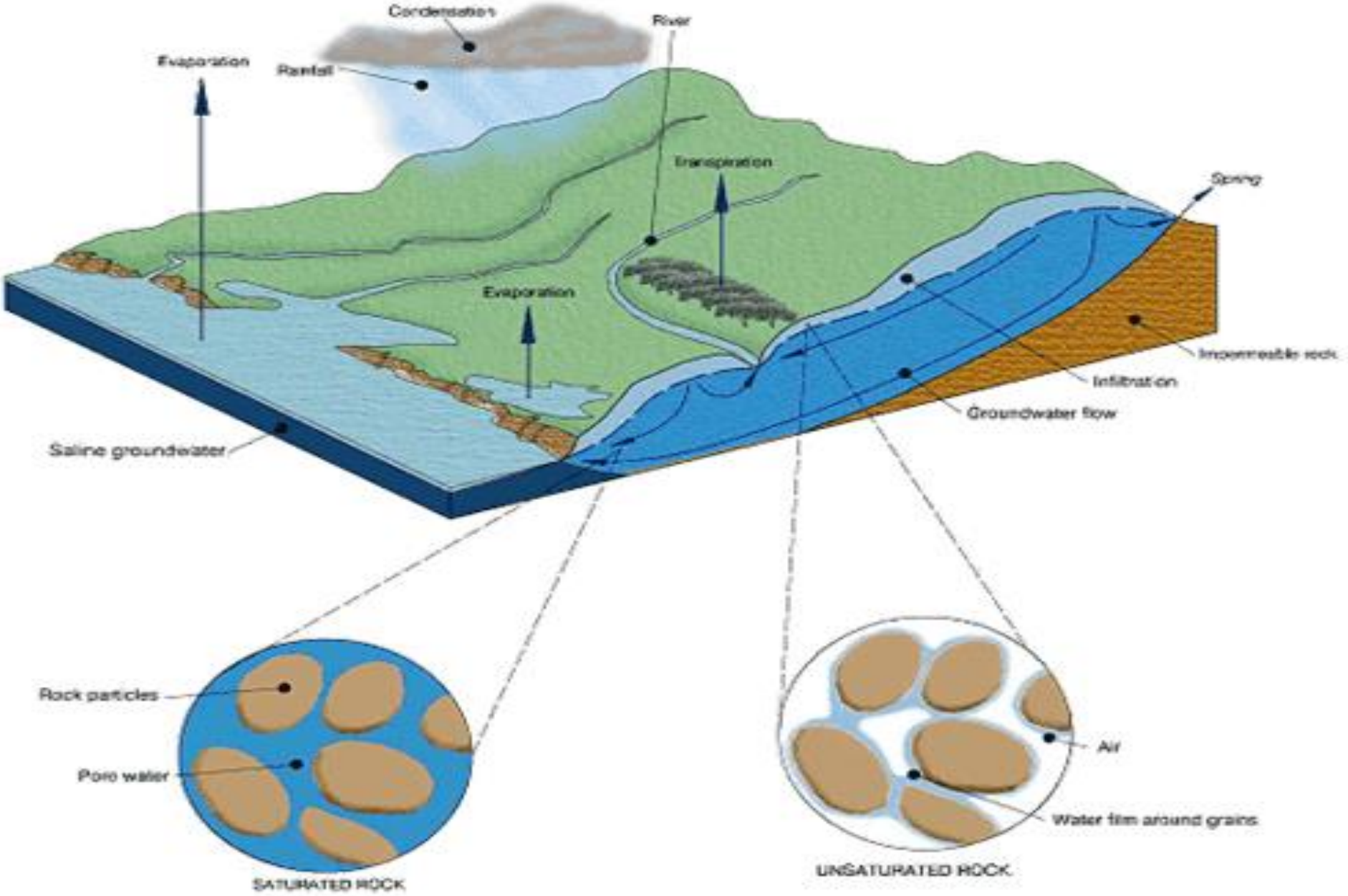


Bodies of Salt Water

- Earth has 97% salt water, 3 % Freshwater
- 4 Oceans: Pacific (largest and deepest), Atlantic, Indian and Arctic
- Seas, gulfs and bays are bodies of salt water smaller than oceans
  - Often partially enclosed by land

Bodies of Freshwater

- Lakes, Streams and Rivers (usually freshwater)
  - Lake: Body of water completely surrounded by land
- Humans depend on freshwater for drinking
- Most large urban areas began as settlements along the shores of freshwater areas
- Groundwater: freshwater that lies beneath the earth's surface (Comes from rain, snow etc)
- Aquifer: underground porous rock later that is often saturated with water
  - Important source of freshwater


Condensation
River
Evaporation
Rainfall
Transpiration
Spring
Evaporation
Impermeable rock
Infiltration
Groundwater flow
Saline groundwater
Rock particles
Pore water
SATURATED ROCK
Air
Water film around grains
UNSATURATED ROCK