

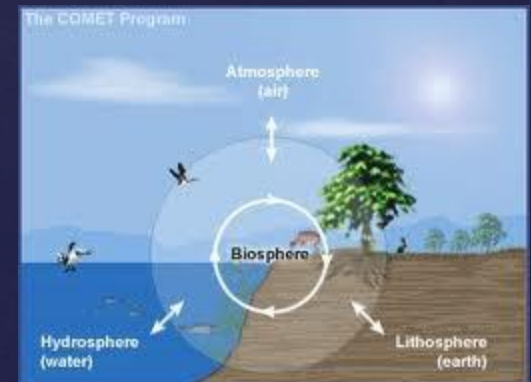
Hydrology and Meteorology

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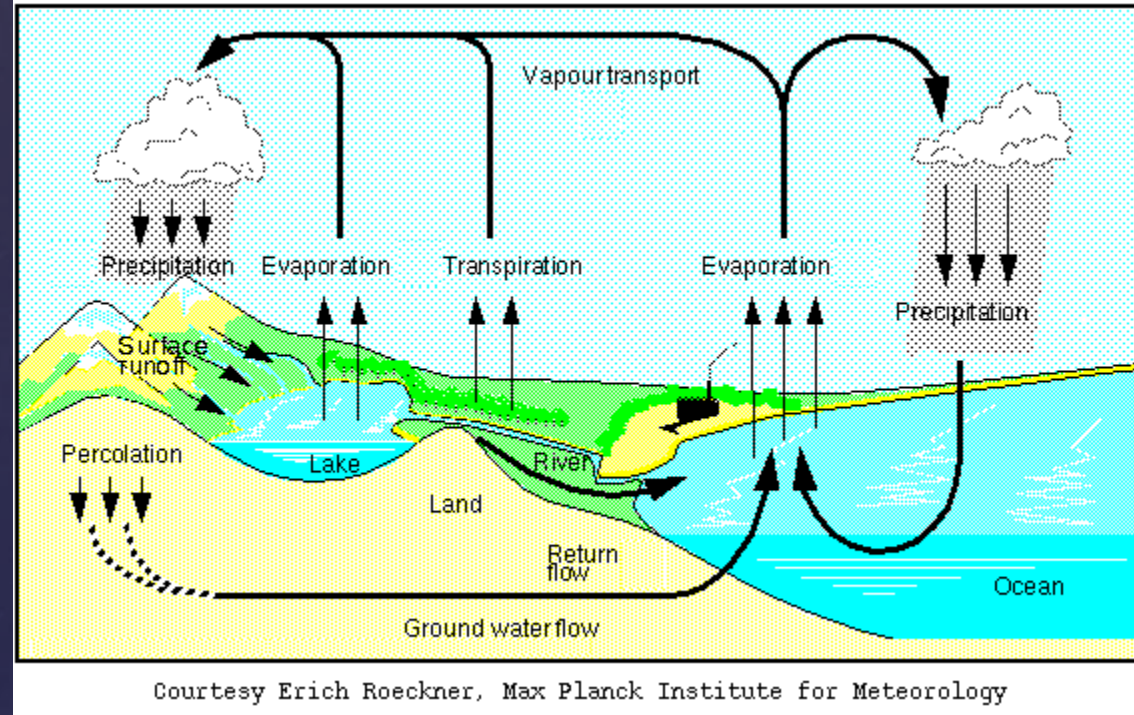


- & Atmosphere – gases and particles surrounding the Earth.
- & Hydrosphere – all water environments.
- & Biosphere – all living things, both plant and animal.
- & Lithosphere – the Earth's crust.

Earth's Systems



- & The Earth's water is divided into 2 categories based on salinity.
- & Salt water has about 35 grams per kilogram and fresh water has less than a gram per kilogram.



Hydrosphere

- ⌘ Oceans cover 71% of the Earth's surface.
- ⌘ The oceans have no boundaries and are called "The World Ocean".
- ⌘ However, we divide the oceans into 5 individual oceans.
- ⌘ A sea is a subdivision of an ocean.

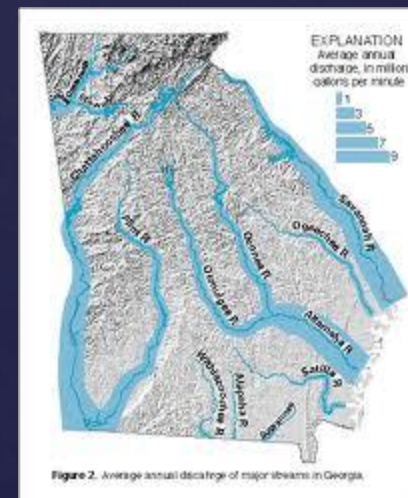
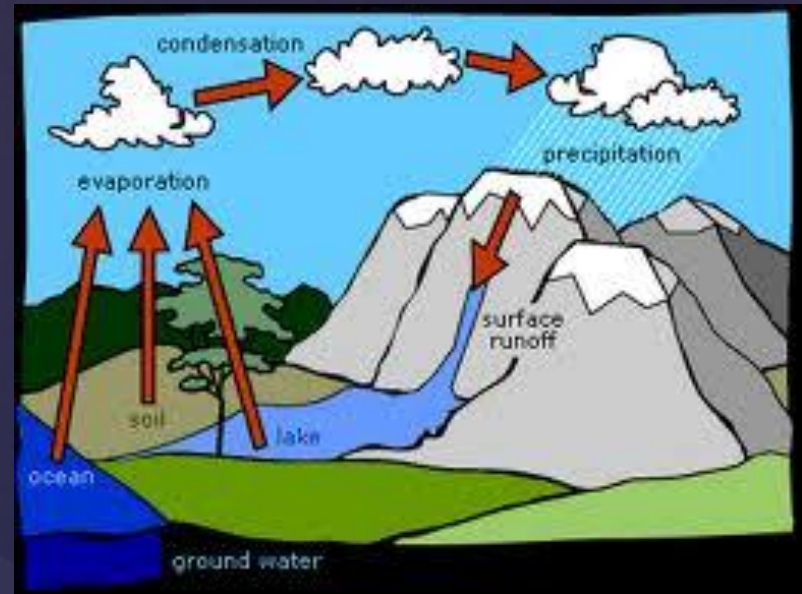
- ⌘ The largest is the Pacific.
- ⌘ Then the Atlantic.
- ⌘ Indian Ocean
- ⌘ Southern Ocean
- ⌘ Arctic Ocean

Salt Water



- ⌘ 3% of the Earth's surface is fresh water.
- ⌘ Glaciers, lakes and rivers are fresh water.
- ⌘ Somewhere between fresh water and salt water is brackish water found in an estuary.
- ⌘ An estuary is where a river empties into an ocean.
- ⌘ Most fresh water is frozen in glaciers and ice caps at the North and South Poles (2.0%). Earth's water is also found as groundwater (.62%), lakes (.09%), our atmosphere (.001%), and rivers (.0001%).

The Water Cycle

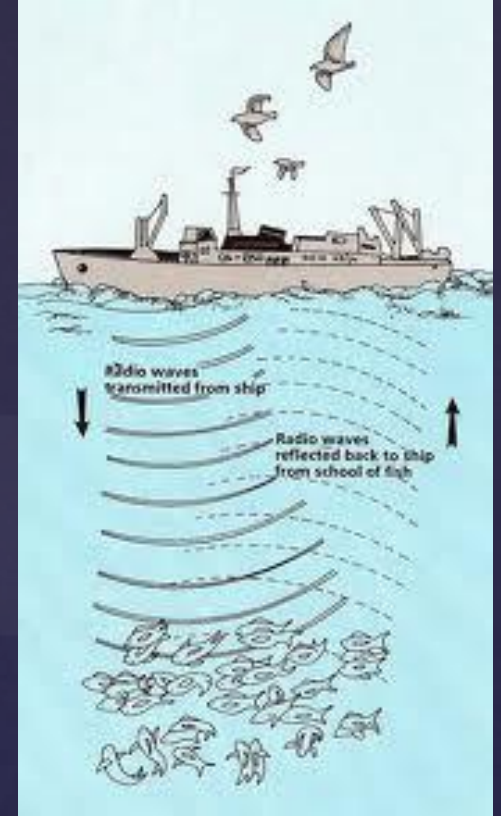


Fresh Water

- & How clouds release water?
- & What is the smallest ocean?
- & What hemisphere is the Southern Ocean in?
- & Transpiration is the release of water from what?

What do you know?

- ⌘ Bathymetry – is the study of the depth contours of the ocean floor.
- ⌘ Bathymetric maps are generated by SONAR. (Sound Navigation And Ranging)
- ⌘ A ship or submarine uses an underwater speaker to send out a pulse of sound called a “PING”.
- ⌘ The operator notes the time it takes for the sound to be reflected back to the ship.



The Ocean Floor



- ⌘ Oceanographers are scientist who focus their studies on the ocean.
- ⌘ They examine the ocean floor to learn about the oceanic crust and plate tectonics.
- ⌘ What is an oceanic trench?
- ⌘ A narrow slice into the ocean floor.
- ⌘ What are seamounts?
- ⌘ Underwater mountains that do not reach the surface.
- ⌘ What do you call seamounts that do reach the surface?
- ⌘ Islands
- ⌘ Seamount ranges are found at tectonic plate boundaries and called?
- ⌘ Mid-ocean ridges

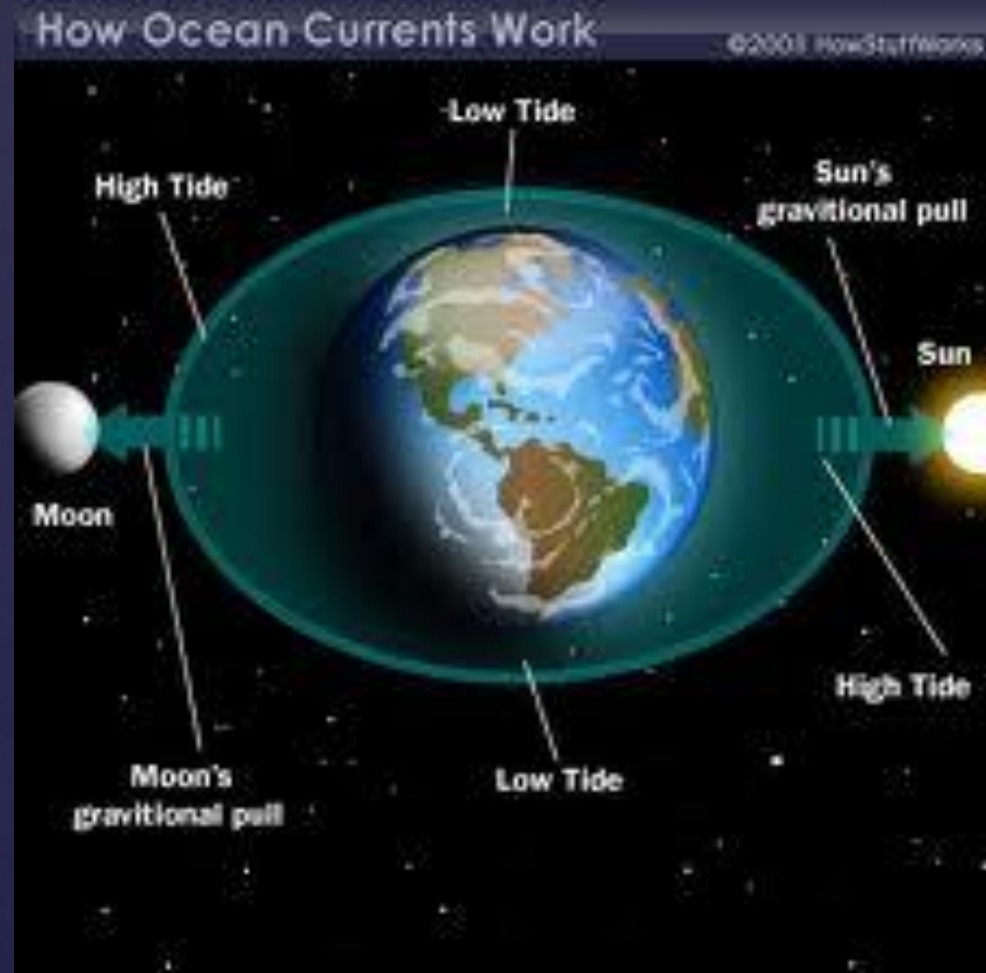
What do you know?

- ⌘ Rift Valleys are deep valleys between the peaks of mid-ocean ridge system.
- ⌘ Seamounts, trenches, mid-ocean ridges and rift valleys are all found on the ocean floor and is the result of tectonic plate activity.



- ⌘ Tides are the rise and fall of sea level.
- ⌘ Tides respond to the gravitational attraction of both the Moon and the Sun.
- ⌘ Tides also occur in large lakes, the atmosphere, and within the solid crust of the Earth.
- ⌘ The Moon tries to pull at anything on the Earth. The Earth is able to hold on to everything except water. This is because water is always moving.

Tides



- ⌘ Each day we have tides, two high tides and two low tides.
- ⌘ Due to the strong gravitational pull Spring Tides will cause very high tides and very low tides.
- ⌘ However, when the Sun, Moon and Earth are not aligned the gravitational forces cancel each other and the tides are not very high or low. This is called Neap Tide.

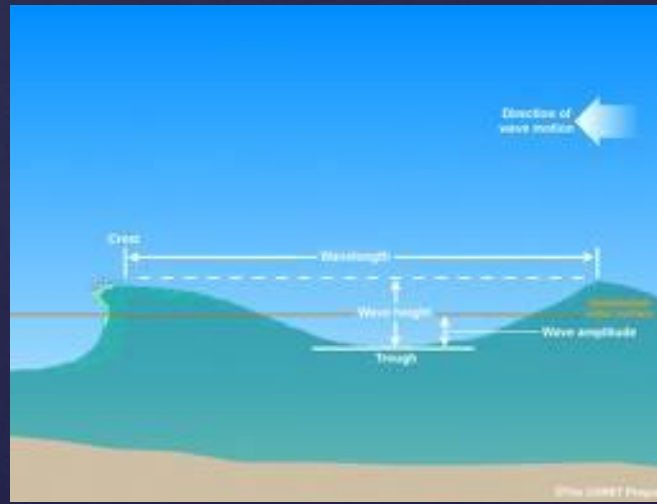
Spring and Neap



- ⌘ Waves move across the surface of the ocean carrying the energy of the wind, but the ocean water does not move along with the wave.
- ⌘ As the energy of a wave moves toward the shore, the particles of water move up and down in a complete circle. Only the energy of the waves moves forward.
- ⌘ A wave is simply a pulse of energy that moves from one particle of water to the next.

- ⌘ Most waves are formed by the wind blowing across the surface of the water.
- ⌘ The harder and longer the wind blows, the higher the wave.
- ⌘ Seismic waves or Tsunamis are caused by movements of the Earth's crust, such as earthquakes on the ocean floor, volcanic eruptions, and underwater landslides.

Waves

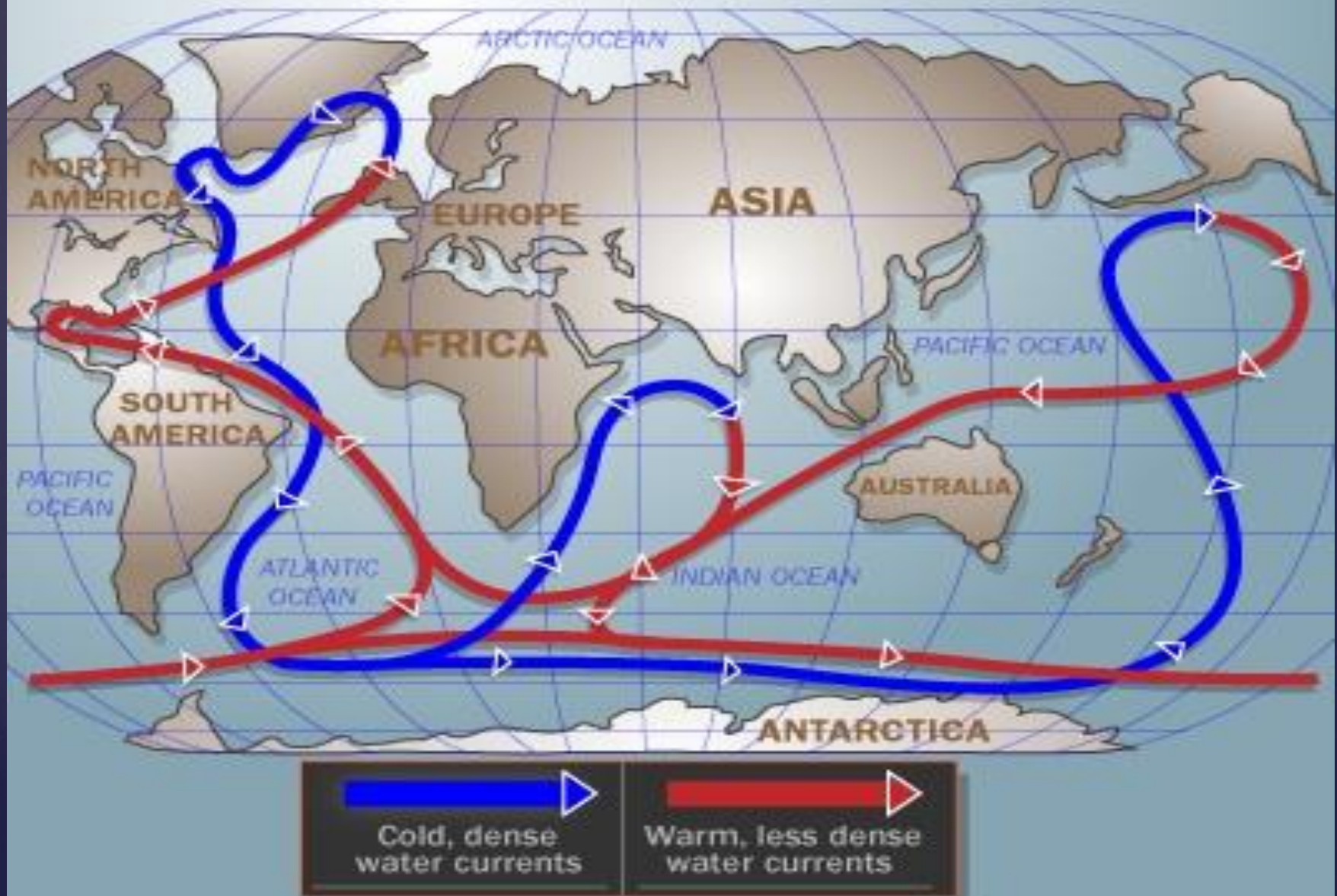


- ⌘ Currents: Ocean water is never still. It is constantly moving in enormous “rivers” called currents.
- ⌘ These currents circulate throughout the oceans of our world like the blood that moves through our body.
- ⌘ Even though the oceans are broken up by continental landmasses, a drop of ocean water could travel from one end of the Earth to the other.
- ⌘ Ocean water is mixed by the currents into one huge planetary ocean.

Current



Global Conveyor Belt



↳ Type of Current

- ↳ Surface
- ↳ Density

↳ Location

- ↳ 1st several km of ocean water
- ↳ Deep Ocean Waters

↳ Cause

- ↳ Global winds
- ↳ Differences in salinity and

↳ Surface currents are caused and moved by global winds.

↳ Density currents or subsurface currents flow in the deep water of the ocean below the surface currents, and are caused by differences in temperature and salinity.

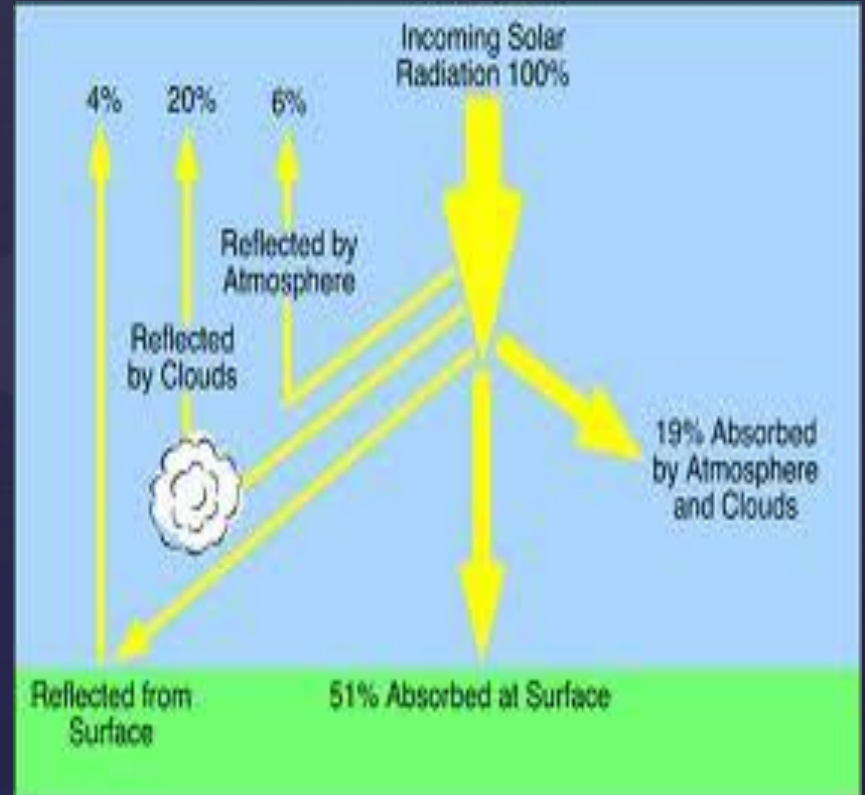
There are two basic types of ocean currents: surface currents and density currents.

& Solar Radiation is heat from the Sun!

& The Sun's energy is spread through the atmosphere in three ways:

RADIATION
CONVECTION
CONDUCTION

Solar Radiation



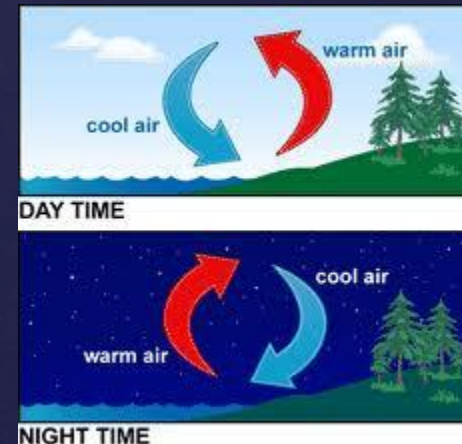
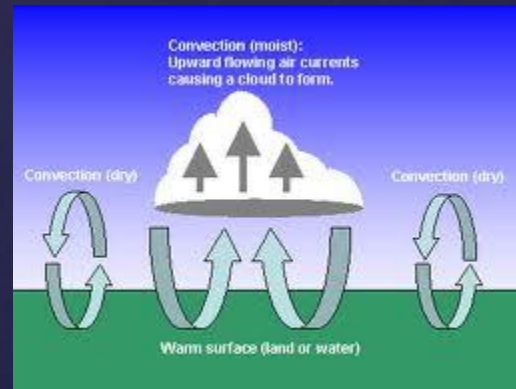
- ⌘ Radiant energy from the Sun.
- ⌘ Light waves from the Sun are absorbed by the Earth and returned to the atmosphere as heat.
- ⌘ The Sun's rays do heat the air directly, but the majority of the radiation's thermal heat impact is felt when it reaches solid ground or liquid water.
- ⌘ Electromagnetic Waves.

Radiation



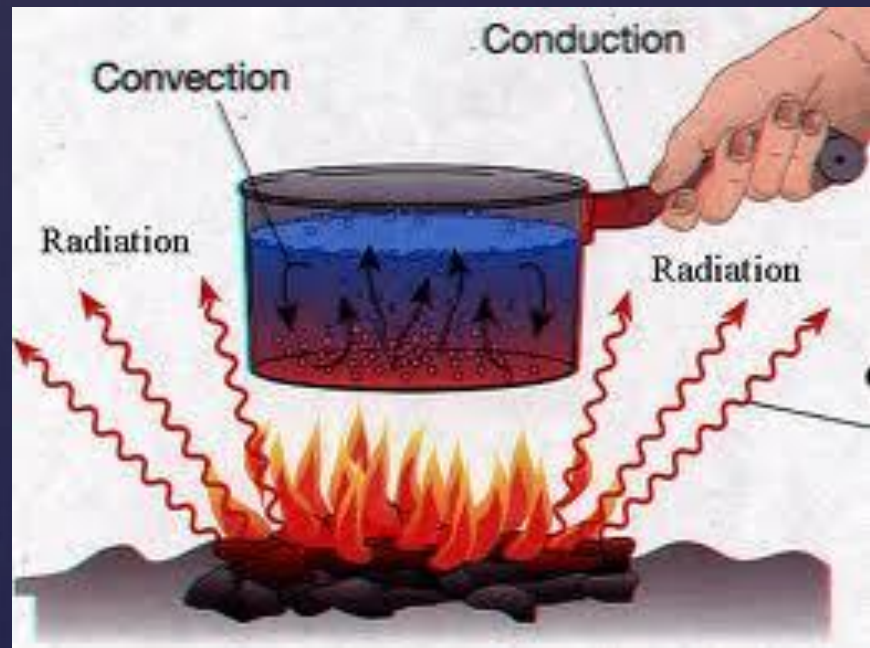
- ⌘ Process where heat is transferred by moving air or water.
- ⌘ Air molecules absorb heat from the ground and cause the atoms to move faster and farther apart.
- ⌘ As they spread out, the warm air becomes less dense, which means lighter, and it begins to rise.
- ⌘ As warm air rises, denser, heavier, and colder air moves in to replace it.
- ⌘ This creates a convection current which causes a constant exchange of air until the surface is eventually heated.

Convection



- & Transfer of heat through contact.
- & When cool air comes into contact with warm air then the cool air is heated.
- & This is why air temperature closer to the ground is warmer.

Conduction

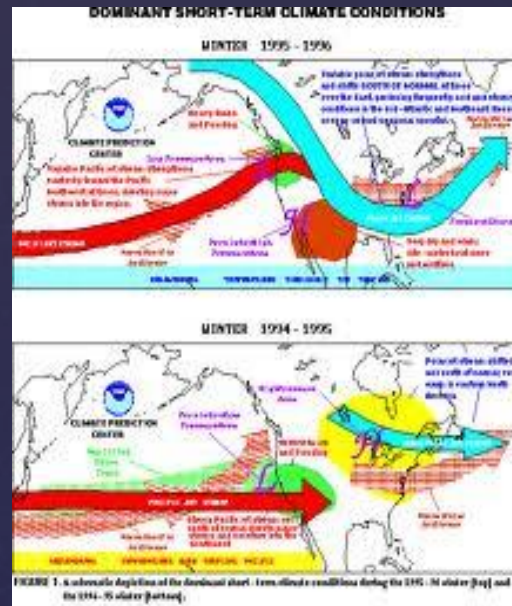


⌘ Weather is daily or even hourly changes.

⌘ Climate is the averaging of those changes over long periods of time for a specific region.

⌘ Six Factors in determining the weather and prevailing climate in an area:

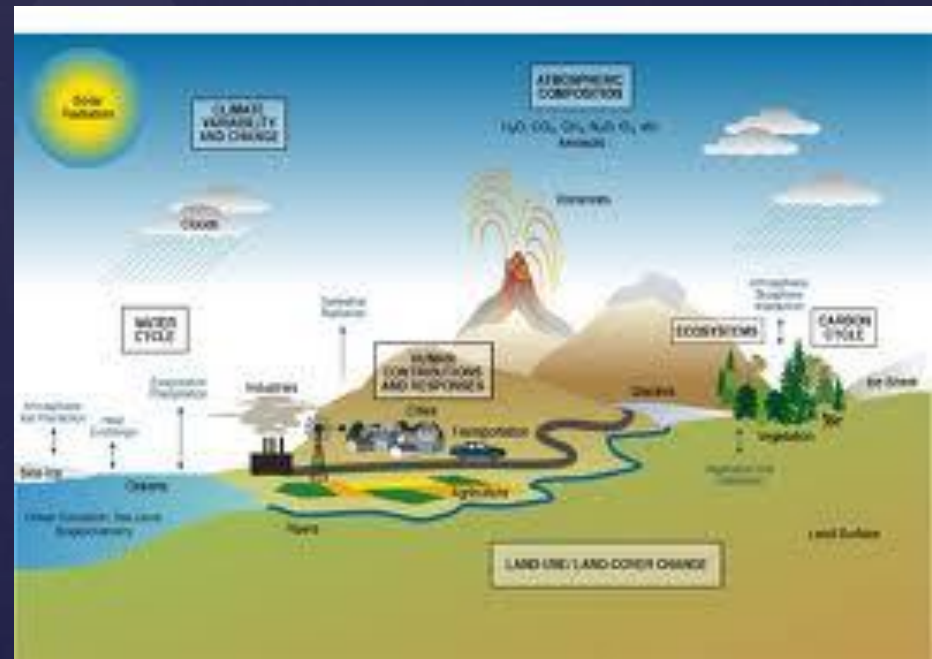
- ⌘ Air temperature
- ⌘ Humidity
- ⌘ Type and amount of cloudiness
- ⌘ Type and amount of precipitation
- ⌘ Air pressure
- ⌘ Speed and direction of wind



Weather Patterns and Events

- & Different Climates are due to what?
- & The Earth's sphere shape
- & Why?
- & When the Sun's rays hit the Earth they strike different parts at different angles.
- & Some areas get bright light while others only get partial light.

Climates



⌘ Air Masses are large bodies of air that have uniform temperature, moisture, and pressure.

⌘ Air Masses from a tropical region bring warm moist air.

⌘ The movement of one air mass displaces another and forms a front.

⌘ Fronts are boundaries that separate different air masses.

⌘ Fronts extend vertical and horizontal.

⌘ Four Fronts:

⌘ Cold

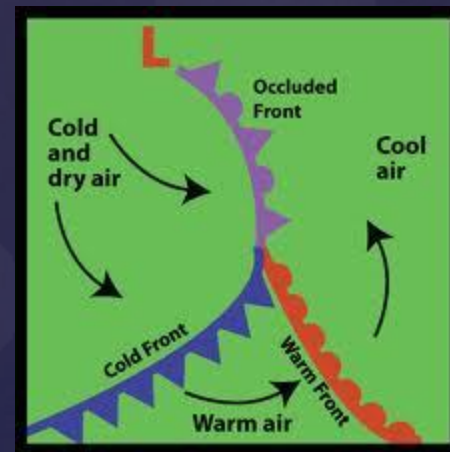
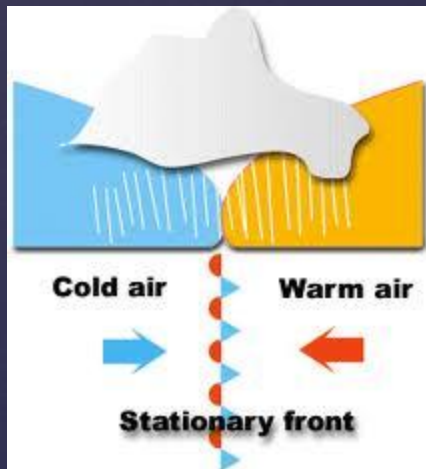
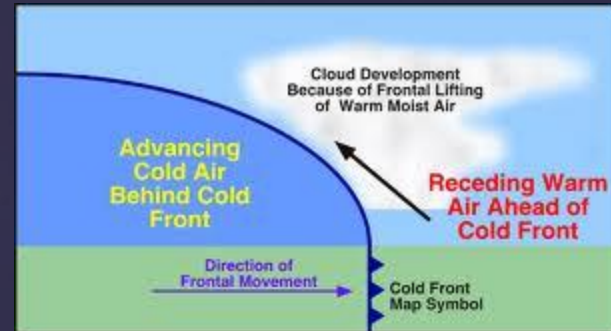
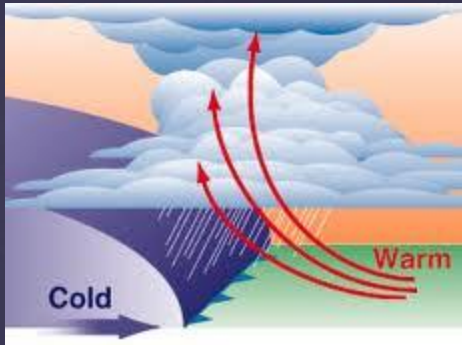
⌘ Warm

⌘ Stationary

⌘ Occluded

Weather Patterns





Fronts

- ⌘ Weather occurs in the lowest layer of the atmosphere called the troposphere.
- ⌘ Weather is composed of a combination of temperature, air pressure, wind and moisture and is caused by the uneven heating of the Earth's surface by the sun.

⌘ Who studies the weather?

Weather



Storms

- ⌘ Is the weather more severe or less severe the greater the difference between two air masses?
- ⌘ Is weather a term used to describe the atmosphere over a long period of time or short period of time?
- ⌘ What are two other names for hurricanes?
- ⌘ Typhoons and Cyclones
- ⌘ Where is tornado ally?
 - ⌘ Nebraska to Texas

What do you know?