The Hydrosphere and Biosphere

The Hydrosphere

- Includes all of the water on or near the Earth's surface including oceans, lakes, rivers, wetlands, polar ice caps, etc.
- How much water on the earth is salt water and how much is fresh water?
- How would you represent this graphically?

The Hydrosphere

- Water Cycle:
  - The continuous movement of water into air on land and back to water sources
  - Includes
    - Evaporation: Process where liquid water is heated and turns into water vapor rising in the atmosphere.
    - Condensation: Process where water vapor turns to liquid in the form of droplets.
    - Precipitation: The droplets of water collide and create larger droplets which fall from clouds as rain, snow sleet or hail.

The Oceans

- Earth's oceans are all connected
  - Atlantic, Pacific, Indian, Arctic cover 70% of the Earth's surface.
  - Pacific Ocean is the largest and has the deepest point. Atlantic, Indian and Artic follow in size order.
  - Ocean water contains more salt (mostly sodium chloride) than fresh water.
  - Salinity: The total quantity of dissolved salts. Average salinity of salt water is 3.5% by weight.
    - Salinity varies based on where in the ocean you are.
    - The Dead Sea: 7X saltier than the ocean
    - Desalination? Ideas?

The Oceans

- Temperature Zones
  - Surface Zone: Warm top layer of the ocean.
  - Thermocline: Temperature decreases faster with increasing depth
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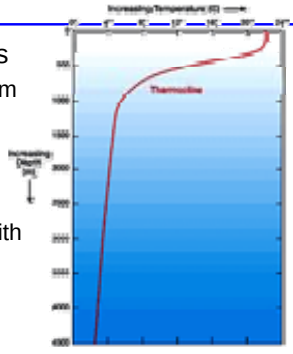
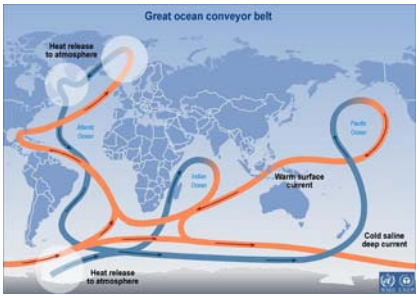


  - Deep Zone: From the base of the thermocline to the bottom of the ocean.
  - Hydrothermal vents: Openings in the Earth's floor where super hot, mineral rich waters enter the ocean.
    - How could hydro thermal vent communities benefit society?
    - Demo?

- The ocean absorbs and stores energy from the sun and therefore helps regulate the temperature in the atmosphere.



Ocean Currents

- Surface Currents:
  - Stream-like motions of water that occur at or near the ocean's surface
  - Wind driven resulting from global wind patterns
  - Can be cold or warm water. Cold and warm do not mix.
  - Examples: The Gulf Stream, EAC
  - See Current Surface Currents

Deep Currents

- under the warmer ocean water.
- Stream-like motions of water that occur at the ocean floor
- Caused by cold water from the Poles sinking
- DENSITY CURRENTS

The Hydrosphere

- Fresh Water
  - Most of it is locked up in icecaps and glaciers.
  - The rest is found in lakes, rivers, wetlands, soil and in the atmosphere.
- Groundwater
  - Rain and melting snow that sinks into the ground
  - Less than 1% of all the drinking water on Earth
  - Aquifers: A rock layer that stores and allows flow of groundwater.

The Biosphere

- Biosphere: the narrow layer around Earth's surface where life can exist
  - Consists of the uppermost part of the geosphere, most of the hydrosphere and the lower part of the atmosphere.
  - Life requires water and a source of energy which are both available in the Biosphere.
  - Near the surface because most of the sunlight is near the surface.

The Biosphere

- Energy Flow:
  - Energy is cycled in the Biosphere to maintain life.
  - Closed System: When nothing enters or leaves
    - Earth is a closed system for matter
  - Open System: When things are exchanged in and out of the system
    - Earth is an open system for energy because it obtains energy from the sun.