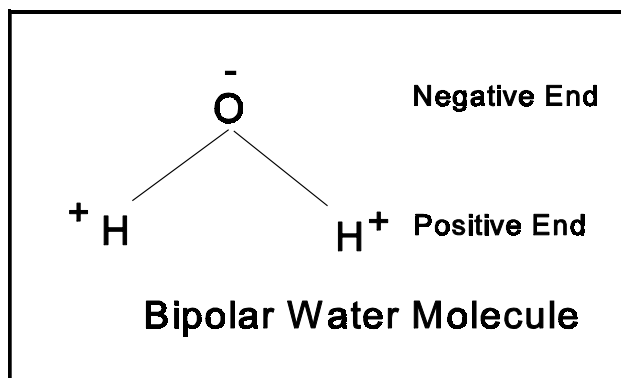


- E. Water expands in volume when it freezes/ becomes colder, in contrast to majority of substances (which contract when colder)
1. Result Density of ice < Density of water: thus ice floats on water
 2. Also of importance for water playing the role of hydraulic press during process of frost wedging
- F. Water strongly influenced by the force of gravity, constantly driven downward, and can possess great erosive/ landscape carving force
- G. Water has property of high surface tension, ability to have strong molecular attractive forces (sticks to itself and electrostatically attracts ionic forms of elements)
1. Capillarity- phenomena of water moving upward against the force of gravity, due to strong electrostatic adhesive forces, most notable in narrow, restricted pore spaces where surface to surface contact in high.
- H. Water acts as a "universal solvent" and can dissolve most any substance over time. Water + carbon dioxide forms a mild carbonic acid solution naturally in hydrosphere, as an acid can result in cationic exchange with positive ionic species, and result in chemical breakdown of substances.
1. Bipolar Water Molecule H₂O



III. THE HYDROLOGIC CYCLE

- A. General Statement: 99% of all earth's water is held in storage in form of oceans, lakes, glacial ice or groundwater.
1. The remaining 1% is involved in the continuous sequence of movement and change in the form of atmospheric moisture, precipitation, and subsequent runoff and drainage, perhaps temporarily stored en route.
- B. The Hydrologic Cycle: a circuit of water movement, with storage areas interconnected by various transfer processes... water moves not only geographically, but through physical states as well.

1. Basic Model: Ocean Water----sun's energy---- evaporation -----atmospheric moisture----- condensation/precipitation-----land/continental waters-----downgradient flow due to gravity----- back to ocean-----and cycling through.
2. Surface to Air: Evaporation prime mechanism for transfer to atmospheric moisture.
 - a. Ocean Evaporation- heat and wind operate on oceans and result in evaporation of water from liquid to vapor form (especially effective in lower latitudes, areas with most direct heating from sun's rays)
 - b. Land Evapotranspiration- water is not only release to the atmosphere on land through evaporation, but also through transpiration of water vapor from plants/trees to the atmosphere.
 - c. Water Vapor Movement:
 - (1) Convection- vertical movement of moistureladen air masses through heat transferprocess
 - (2) Advection - horizontal transport of airmasses by wind currents.
3. Air to Surface: atmospheric water vapor is eventually condensed into liquid or sublimated into ice to form cloud particles = precipitation
4. Surface and Ground Waters: precipitation on land can run several possible courses:
 - a. accumulation/ponding on the continental surfaces (will subsequently be subject to high rates of evaporation).
 - b. surface runoff: in form of streams and rivers, eventually being subject to partial evaporation and final emptying back to sea.
 - c. Infiltration into the ground and uppermost strata comprising the lithosphere; forming "ground water"
 - d. Vegetative interception: the interception of precipitation by the vegetative canopy of the biosphere, may be subject to evaporation or eventually fall to ground.
5. Duration of Cycle: water may become temporarily stored and removed from the cycle from hours to days, to years to 100's of thousands of years...depending on the geohydrologic circumstance.

C. Moisture Inventory:

1. Oceans: contain 97% of earth's water
 - a. >70% of Earth's Surface Covered in Water

2. Glaciers: 2% of all moisture, comprising 75% of worlds fresh water
 - a. Continental Ice Sheets
 - (1) Antarctica
 - (2) Greenland
 - b. Ocean Ice
 - (1) Antarctic Shelf
 - (2) Arctic Sea
 - c. Glaciers = Savings Account of Fresh Water
 - d. Ice-Sea Water Budget
 - (1) Glacial Climates
 - (a) < Ocean Volume
 - (b) > Ice Volume
 - (2) Interglacial Climates
 - (a) > Ocean Volume
 - (b) < Ice Volume
3. Ground water: 0.5% of total
 - a. Surface Transfer
 - (1) Springs
 - (2) Anthropogenic Transfer
4. Fresh Surface Water: 0.2%
 - a. Lakes, Rivers
5. Soil Moisture: 0.1%
6. Atmospheric Moisture: 0.0001%
7. Biological Water: negligible