HYDROLOGICAL CYCLE

The hydrologic cycle involves the continuous circulation of water in the Earth-Atmosphere system. At its core, the water cycle is the motion of the water from the ground to the atmosphere and back again. Of the many processes involved in the hydrologic cycle, the most important are:

- evaporation
- transpiration
- condensation
- precipitation
- runoff

Evaporation

Evaporation is the change of state in a substance from a liquid to a gas. In meteorology, the substance we are concerned about the most is water.

For evaporation to take place, energy is required. The energy can come from any source: the sun, the atmosphere, the Earth, or objects on the Earth such as humans.

Everyone has experienced evaporation personally. When the body heats up due to the air temperature or through exercise, the body sweats, secreting water onto the skin. The purpose is to cause the body to use its own heat to evaporate the liquid, thereby removing heat and cooling the body. The same effect can be seen when you step out of a shower or swimming pool. The coolness you feel is the removal of body heat through evaporation of the water on your skin.

Transpiration

Transpiration is the evaporation of water from plants through stomata. Stomata are small openings found on the underside of leaves that are connected to vascular plant tissues. In most plants, transpiration is a passive process largely controlled by the humidity of the atmosphere and the moisture content of the soil. Of the transpired water passing through a plant

only 1% is used in the growth process of the plant. The remaining 99% is passed into the atmosphere.

Condensation

Condensation is the process whereby water vapor is changed into a liquid state. In the atmosphere, condensation may appear as clouds or dew. This is also the process whereby water appears on the side of an uninsulated cold drink can or bottle.

Condensation is not a matter of one particular temperature but of a difference between two temperatures: the air temperature and the dewpoint temperature. The dew point is the temperature at which dew can form - it is the point at which air becomes saturated and can not hold any more water vapor. Any additional cooling causes water vapor to condense. Foggy conditions often occur when air temperature and dew point are equal.

Condensation is the opposite of evaporation. Since water vapor has a higher energy level than that of liquid water, when condensation occurs, the excess energy in the form of heat energy is released. This release of heat aids in the formation of hurricanes.

Precipitation

Precipitation results when tiny condensation particles, through collision and coalescence, grow too large for the rising air to support, and thus fall to the Earth. Precipitation can be in the form of rain, hail, snow, or sleet.

Precipitation is the primary way we receive fresh water on Earth. On average, the world receives about 38½" (980 mm) each year over both the oceans and land masses.

Runoff

Runoff occurs when there is excessive precipitation and the ground is saturated (cannot absorb any more water). Rivers and lakes are results of runoff. Some runoff evaporates into the atmosphere, but most water in rivers and lakes returns to the oceans.

If runoff water flows into a lake only with no outlet for water to flow out, then evaporation is the only means for water to return to the atmosphere. As water evaporates, impurities or salts are left behind. As a result, the lake becomes salty, as in the case of the Great Salt Lake in Utah or Dead Sea in Israel.

Evaporation of this runoff into the atmosphere begins the hydrologic cycle over again. Some of the water percolates into the soil and into the ground water only to be drawn into plants again for transpiration to take place.