

Chapter 8

The Water Cycle and Climates

The Water Cycle

- Water Cycle
- Transpiration: Water vapor coming from plants
- Infiltration
- Earth's Water Supply:
Only 3% fresh water
- Groundwater
- Zone of Saturation
- Zone of Aeration
- Water Table
- Porosity
- Pore Spaces
- Note: Changing the size of beads does not change the porosity, as long as separate containers have all the same geometric shape particles, packing, and density.

The Water Cycle

- **Permeability**: How fast water goes thru a substance. The more voids in a substance the higher the permeability.
- **Runoff**: When rainfall exceeds the permeability rate if a given soil type.
- **Capillarity**: The upward movement of water against the pull of Gravity. The finer the grains/fibers of a substance the higher in height of elevation water will travel upward against the pull of gravity.

Stream Flow and Watersheds

- There is a lag time between Rainfall and Maximum height of streams and rivers. The larger the water collection area the longer the lag time.
- Perennial Stream
- General Dry/Arid Stream
- Watershed: An area where the precipitation is collected and is subsequently channeled into one major river. Example would be the Hudson River watershed. All rain falling in it's watershed would eventually end up in the Hudson River.

Heat Energy Transfer

- Convection

Energy transfer thru Gases, Liquids, Plastic Mantle

- Conduction

Energy transfer thru the Solid phase of matter

- Radiation

Energy transfer thru outer space, “Vacuum”

Incoming Solar Radiation

- The word “**Insolation**” is taken out of its definition as shown above in the title.
- Maximum Insolation occurs when an object is 90 degrees to a given electromagnetic energy source.
- Black Dark, and Rough surfaces make the best absorbers and emitters of Insolation
- White Smooth, and Shiny surfaces reflect Insolation the best.

Incoming Solar Radiation

- Duration of Insolation: the amount of time insolation strikes a surface. June 21 is when the daylight part of the day is the longest in New York State
- The angle of Insolation is only 90 degrees in the Tropics: Equator North 23 1/2 degrees and Equator South 23 1/2 degrees. NYS never has sunlight striking the Earth's surface at 90 degrees.
- Absorption and Reflection of Insolation.
- Terrestrial Radiation: Infrared Electromagnetic Energy emitted from Earth's surface.
- Greenhouse Effect
- Insolation/Temperature Lag

Insolation/Temperature Lag

- Maximum Insolation always occurs at local Noon.
- Maximum Daily Temperature occurs a few hours after Noon. Takes time for Insolation to warm Earth's surface, then Earth's surface warms up and emits heat waves(Infrared) that are absorbed by Earth's atmosphere.
- Maximum Yearly Temperature occurs in Late July/Early August. Note that it takes weeks from June 21 when Earth receives maximum Insolation to reach max. temp.

Climate

- Long term Weather patterns that can be explained by comparing Evaporation to Precipitation.
- Arid Climate:
When **Evaporation**>**Precipitation**
- Humid Climate:
When **Precipitation**>**Evaporation**

Climate

- Latitude
- Altitude
- Mountain Ranges
- Oceans
- Large Bodies of Water
- Orographic Effect
- Ocean Currents
- Planetary Wind Belts
- Monsoons
- Tropic Storm Tracks