Physical Geography
GEOGRAPHY 1710
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Chapter 7
Water & Atmospheric Moisture

Atmospheric Moisture
When atmosphere contains enough moisture, water vapor may condense to form:
- Haze
- Fog
- Cloud
- Rain
- Sleet
- Hail
- Snow

Water on Earth
- Water vapor is a colorless, odorless, tasteless, invisible gas that mixes freely with the other gases in the atmosphere
- Evaporation – the conversion of moisture from liquid to gas. Involves molecular escape: molecules of water escape from the liquid surface into the surrounding air.
- Evaporation can take place at any temperature, but higher temperatures cause molecules to move faster and collide more forcefully.
- Depends on three factors:
  - Temperature of water and air
  - Amount of water vapor already in the air
  - Whether the air is still or moving

Land and Water

Hydrologic Cycle
Evapotranspiration

1. Transpiration - the process whereby plants give up moisture through their leaves.
2. Evapotranspiration - total amount of water vapor entering the air from land sources; plants, soil, and other inanimate objects.
3. Potential Evapotranspiration - the amount of evapotranspiration that would occur if the ground at the location in question was saturated all the time.

Humidity

- Relative Humidity
  - Saturation
  - Dew point
- Expressions of Relative Humidity
  - Vapor pressure
  - Specific humidity
- Instruments

Relative Humidity

Water Vapor in the Atmosphere

Humidity Patterns
Humidity Instruments

Atmospheric Stability
- Adiabatic Processes
- Stable and Unstable Atmospheric Conditions

Adiabatic Processes
- Dry adiabatic rate
  - 10 °C/ 1000 m
  - 5.5 °F/ 1000 ft
- Moist adiabatic rate
  - 6 °C/ 1000 m
  - 3.3 °F/ 1000 ft

Stable and Unstable Atmospheric Conditions

Clouds and Fog
- Cloud Formation Processes
- Cloud Types and Identification
- Fog
**Clouds and Fog**

Clouds - collections of minute droplets of water or tiny crystals of ice. visible expressions of condensation. Classified by two factors - form and altitude.

- at any given time, 50% of Earth is covered by clouds.
- not all clouds precipitate, but all precipitation comes from clouds.

**Clouds and Fog**

- precipitation only comes from clouds that have “nimb” in their name.
- receive both insolation from above and terrestrial radiation from below, then either absorb, reflect, scatter, or reradiate this energy.

**Cloud Formation Processes**

- Moisture droplet
- Cloud-condensation nuclei

**Moisture Droplets**

- Cloud-condensation nuclei (2 μm diameter)
- Moisture droplets (20 μm diameter)
- Typical raindrop (2000 μm diameter)

**Cloud Identification**

**Cumulonimbus Development**

- Clouds and Fog
- Cloud Formation Processes
- Moisture Droplets
- Cloud Identification
- Cumulonimbus Development
Fog
- Advection fog
- Evaporation fog
- Upslope fog
- Valley fog
- Radiation fog

Advection Fog

Valley Fog

Radiation Fog
Radiation processes dominate
Thermal, wind factors
Dynamics and turbulence weak
Local-scale processes more important