

## Atmospheric Moisture

When atmosphere contains enough moisture, water vapor may condense to form:

- Haze
- Fog
- Cloud
- Rain
- Sleet
- Hail
- Snow

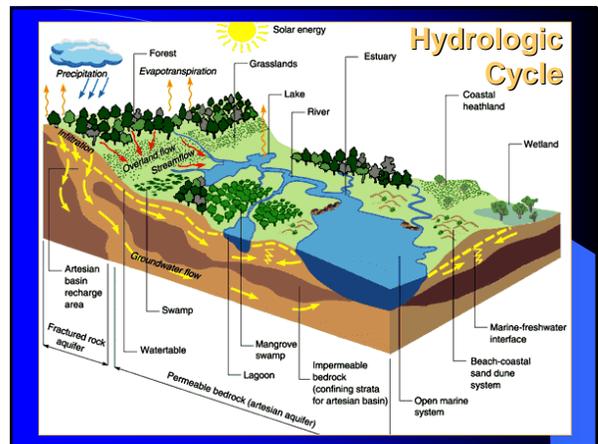
## Water on Earth

- 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

Ocean	Area (M)	Area (Sq Miles)	Volume (Cm <sup>3</sup> )	Volume (Miles <sup>3</sup> )	Mean Depth (M)
Pacific	178,670	724,320	710,000,000	171,000,000	4280
Atlantic	88,300	341,000	350,000,000	84,000,000	3930
Indian	74,800	288,300	292,300,000	70,000,000	3880
Arctic	14,000	54,000	17,100,000	4,100,000	1230

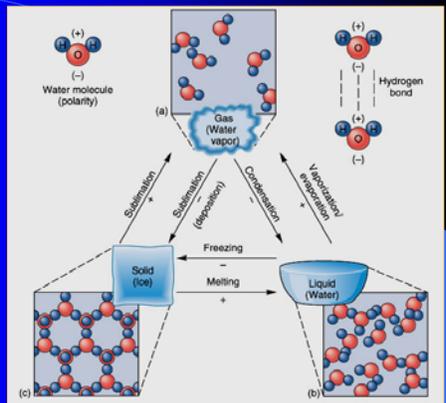
\*Data in thousands (000) includes of marginal seas.



## 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.

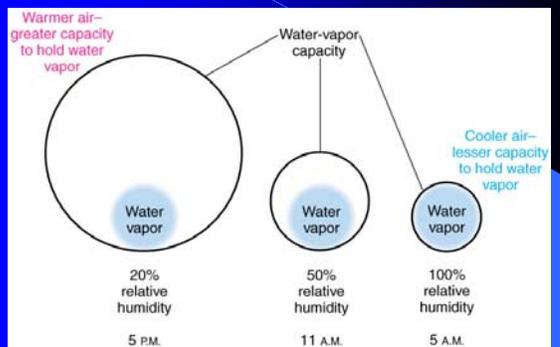
## Three States of Water



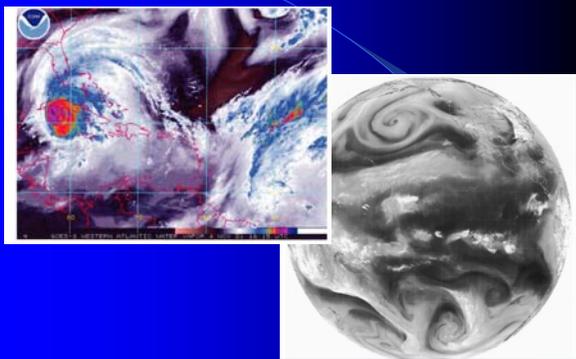
## Humidity

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

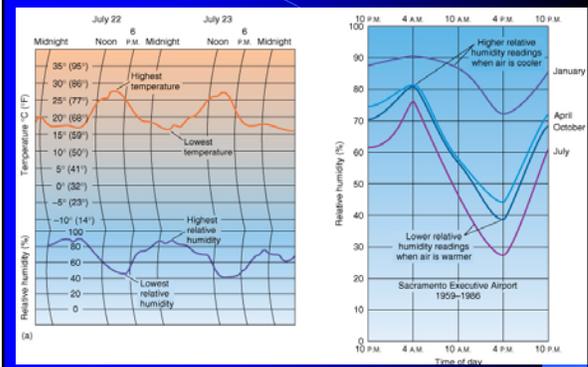
## Relative Humidity



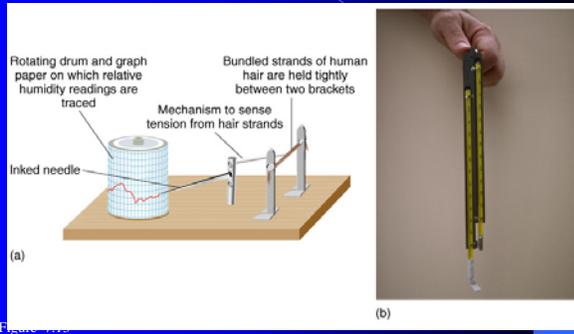
## Water Vapor in the Atmosphere



## Humidity Patterns

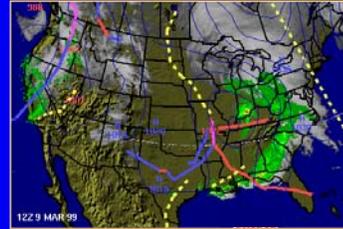


## Humidity Instruments

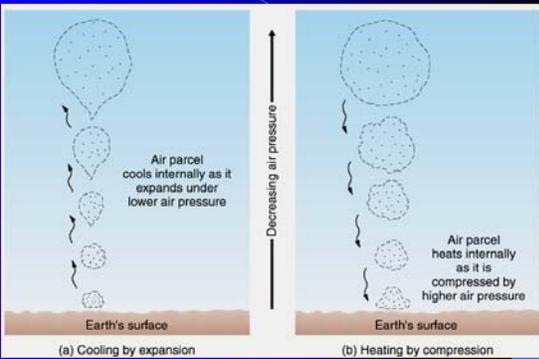


## Atmospheric Stability

- Adiabatic Processes
- Stable and Unstable Atmospheric Conditions

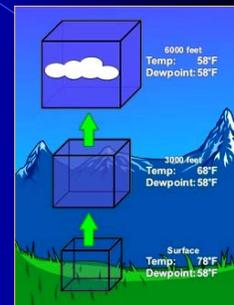


## Adiabatic Processes

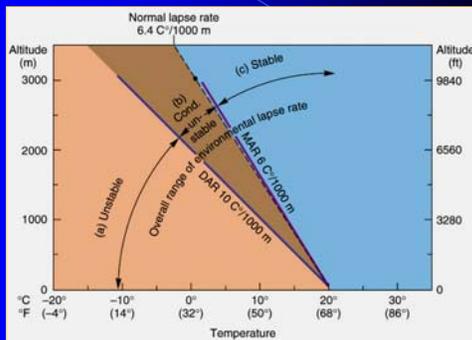


## Adiabatic Processes

- 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.

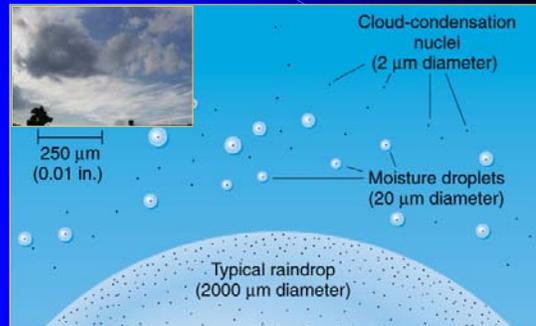


## Cloud Formation Processes

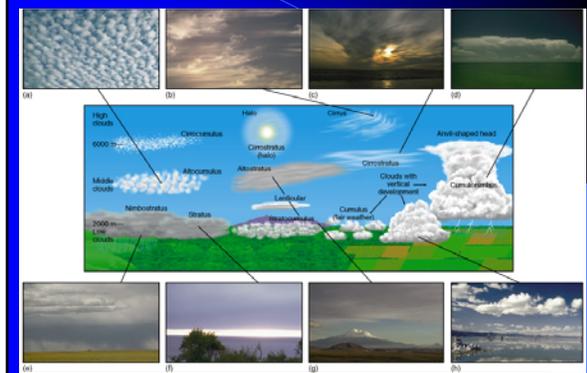
- Moisture droplet
- Cloud-condensation nuclei



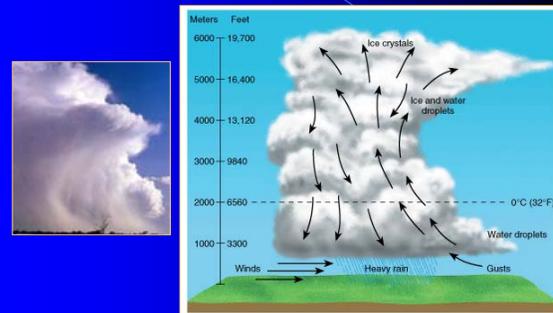
## Moisture Droplets



## Cloud Identification



## Cumulonimbus Development



## Fog



- Advection fog
- Evaporation fog
- Upslope fog
- Valley fog
- Radiation fog

## Advection Fog



## Valley Fog



## Radiation Fog

- Radiation processes dominate
- Thermal, moisture fluxes
- Dynamics and turbulence weak
- Local-scale processes more important

