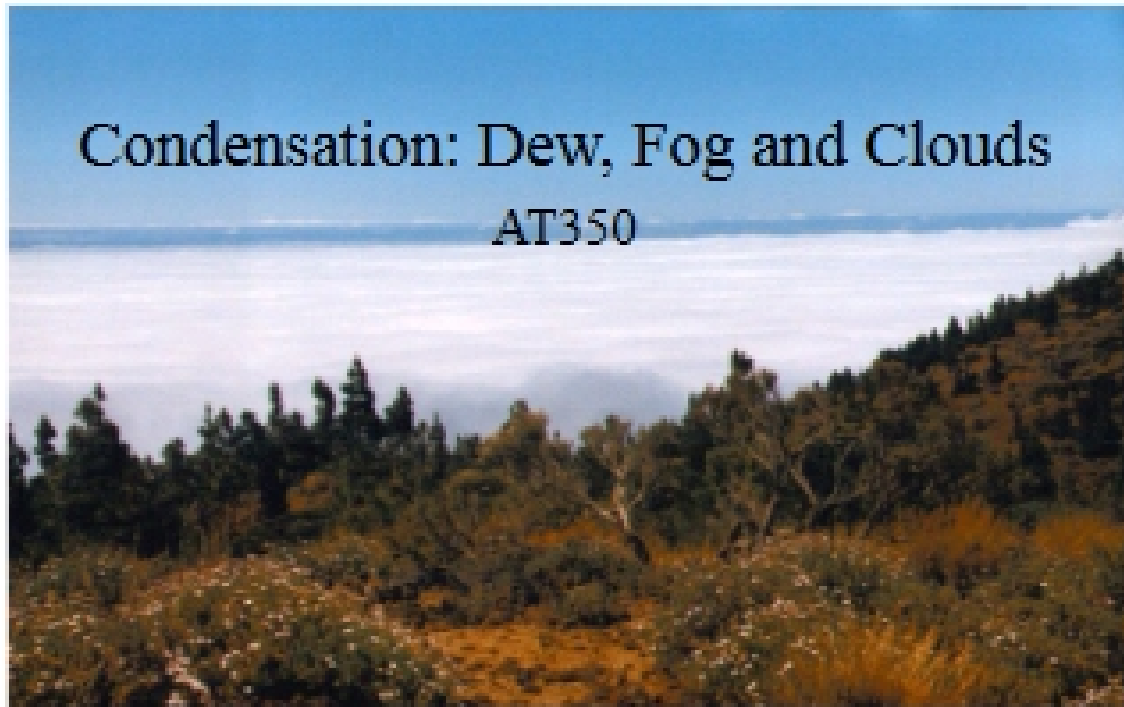
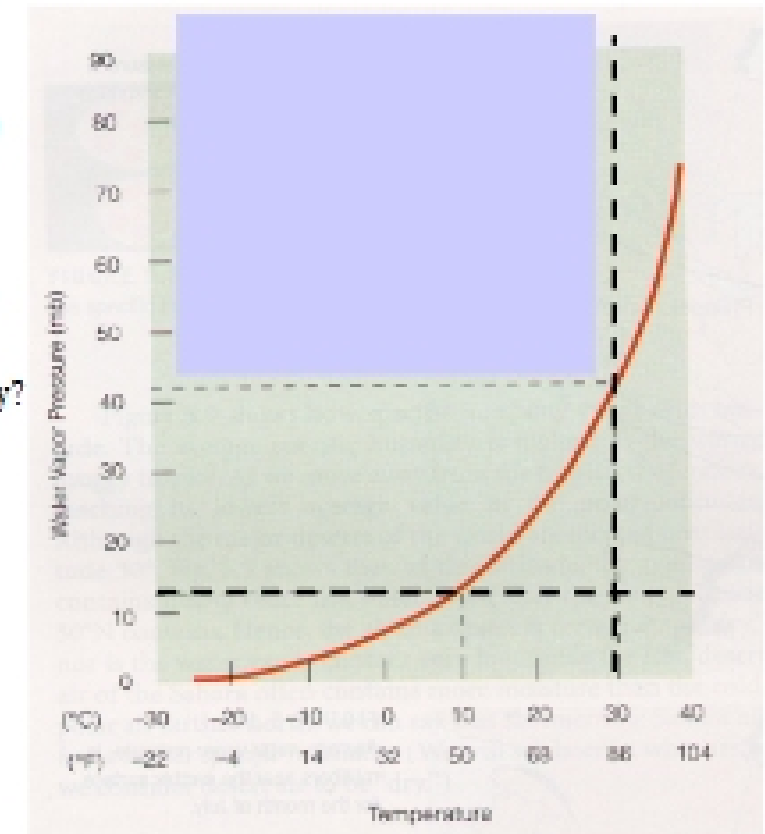


Condensation: Dew, Fog and Clouds

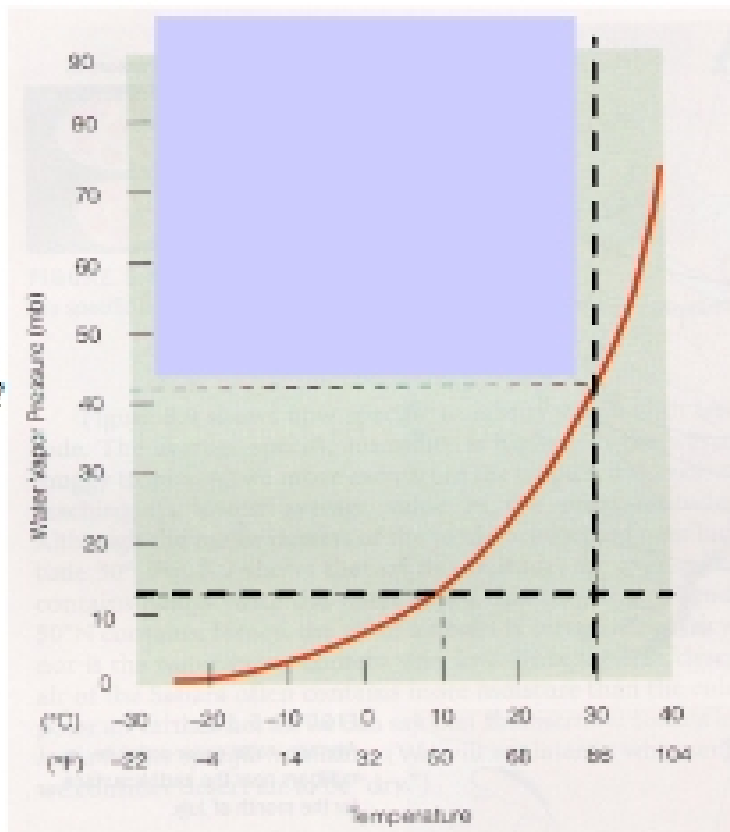
AT350



- $T=30\text{ C}$
- Water vapor pressure=12mb
- What is T_d ?
- What is the sat. water vapor pressure?
- What is the relative humidity?

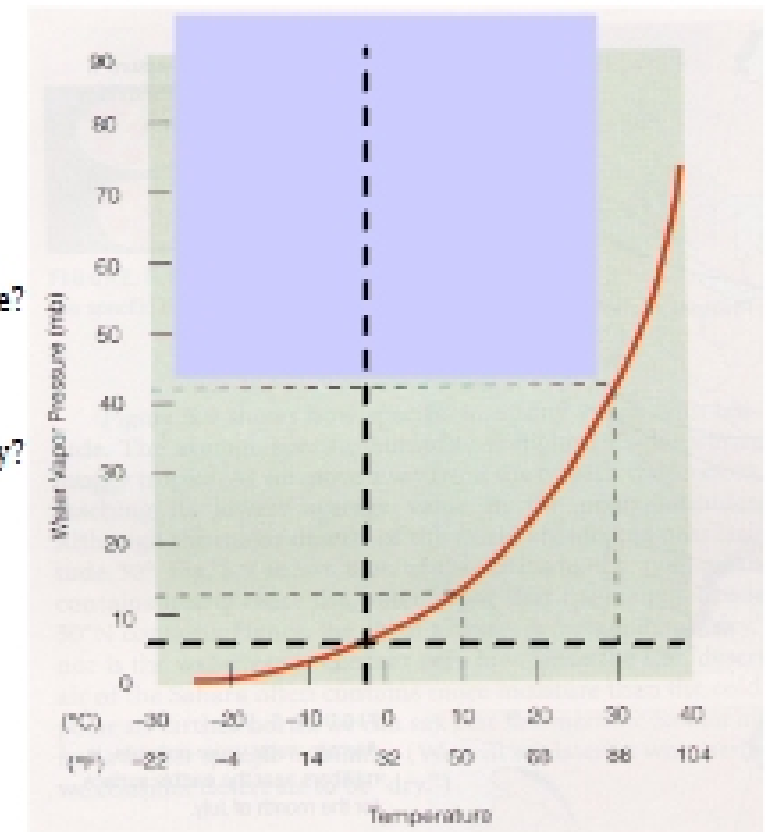


- $T=30\text{ C}$
 - Water vapor pressure=12mb
 - What is T_d ?
 - What is the sat. water vapor pressure?
 - What is the relative humidity?
- ~12/42~29%



- POLAR AIR**
- $T=-2\text{ C}$
 - $T_d=-2\text{ C}$

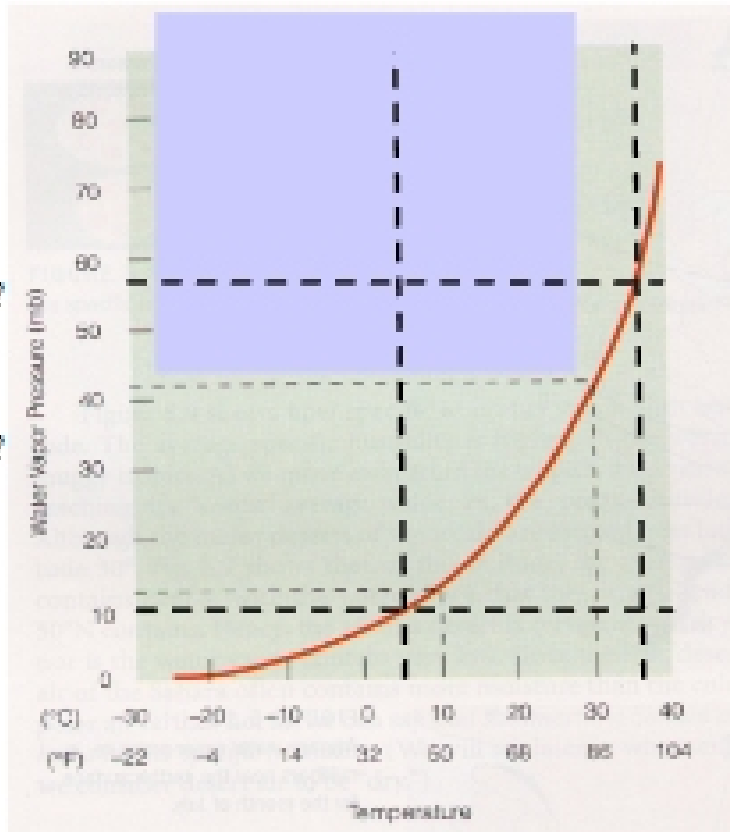
- What is water vapor pressure?
- What is sat. water vapor pressure?
- What is the relative humidity?



DESERT AIR

- T=35 C
- Td= 5 C

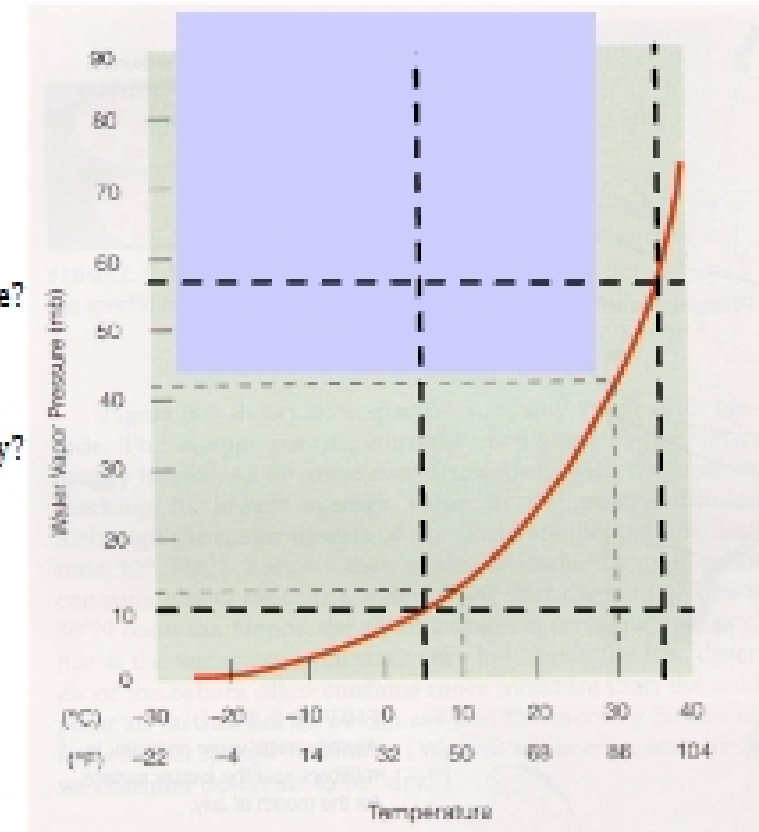
- What is water vapor pressure?
- What is sat. water vapor pressure?
- What is the relative humidity?



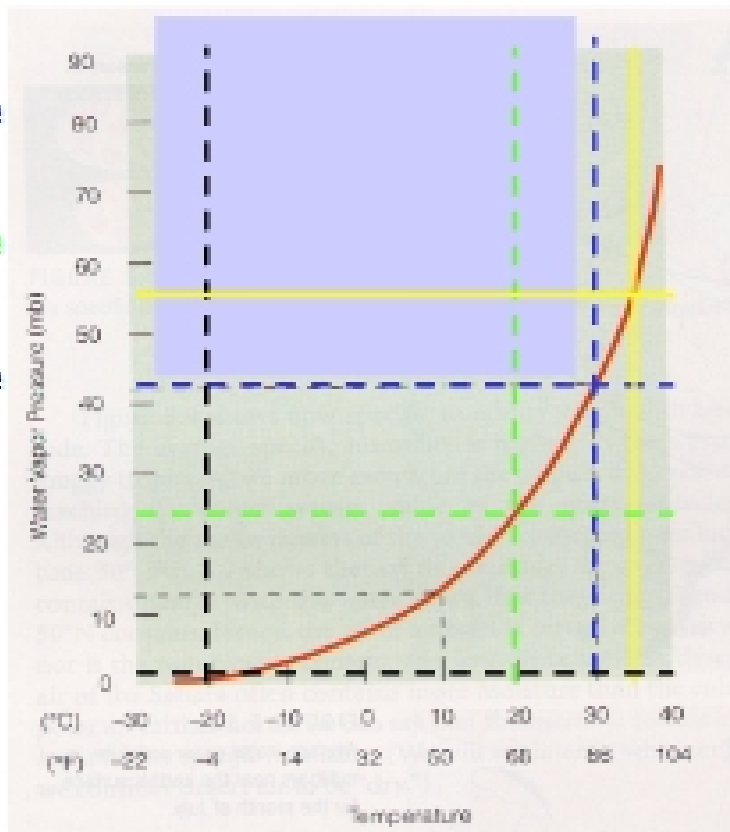
DESERT AIR

- T=35 C
- Td= 5 C

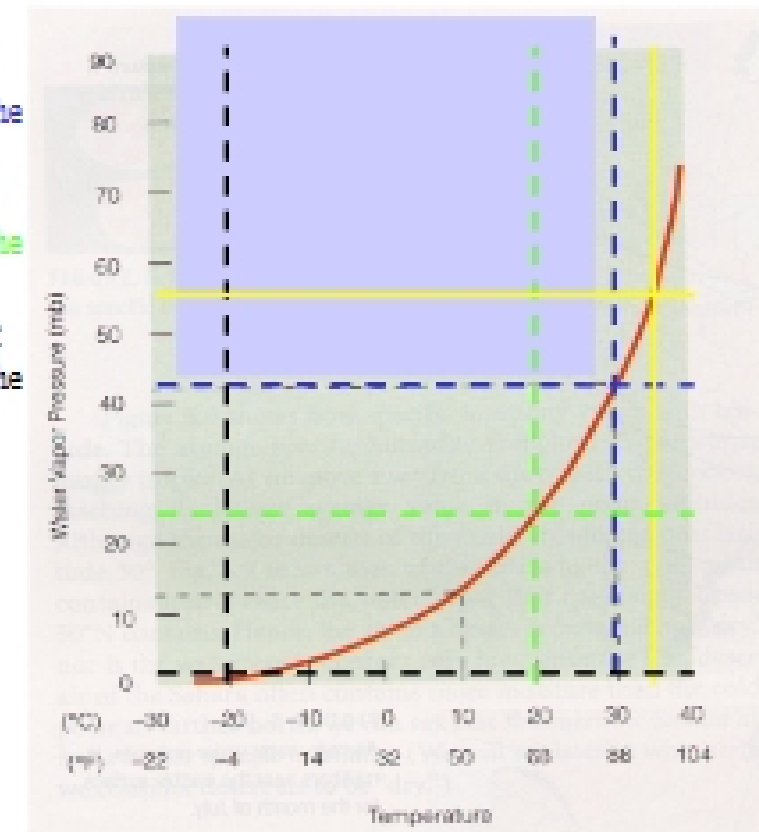
- What is water vapor pressure?
- What is sat. water vapor pressure?
- What is the relative humidity?
~9/56~16%



- If air is saturated at T=30 C and warms to 35 C, what is the relative humidity?
- If air is saturated at T=20 C and warms to 35 C, what is the relative humidity?
- If air is saturated at T=-20 C and warms to 35 C, what is the relative humidity?



- If air is saturated at T=30 C and warms to 35 C, what is the relative humidity? ~75%
- If air is saturated at T=20 C and warms to 35 C, what is the relative humidity? ~43%
- If air is saturated at T=-20 C and warms to 35 C, what is the relative humidity? ~2%



Condensation

- Condensation is the phase transformation of water vapor to liquid water
- Water does not easily condense without a surface present
 - Vegetation, soil, buildings provide surface for dew and frost formation
 - Particles act as sites for cloud and fog drop formation

Dew

- Surfaces cool strongly at night by radiative cooling
 - Strongest on clear, calm nights
- The *dew point* is the temperature at which the air is saturated with water vapor
- If a surface cools below the dew point, water condenses on the surface and dew drops are formed



Frost

- If the temperature is below freezing, the dew point is called the frost point
- If the surface temperature falls below the frost point water vapor is deposited directly as ice crystals
 - *deposition*
- The resulting crystals are known as frost, hoarfrost, or white frost



Cloud and fog drop formation

- If the air temperature cools below the dew point ($RH > 100\%$), water vapor will tend to condense and form cloud/fog drops
- Drop formation occurs on particles known as cloud condensation nuclei (CCN)
- The most effective CCN are water soluble.
- Without particles clouds would not form in the atmosphere
 - RH of several hundred percent required for pure water drop formation