Saturation

• If the number of molecules returning to the layer exactly balances the number escaping, then the system is said to be at **saturation**, and the air is said to be **saturated** with water vapor.

• **This happens when:** The vapor content and temperature are just right to keep everything in balance.
Evaporation

- If the number returning to the water layer is less than the number escaping, then we have net evaporation from the layer, and the air is said to be sub-saturated with vapor

- This happens when: The vapor content is low, or else the temperature is high
Condensation

• If the number returning to the layer is greater than that escaping, then we have net *condensation* to the layer, and the air is said to be *super-saturated* with vapor

• **This happens when:** The vapor content is high, or else the temperature is low
Saturation and Cloud Droplets

• Now suppose we have sub-saturated air, and some of the vapor molecules join to form a water droplet. What would happen to that droplet?

Answer: ......
Saturation and Cloud Droplets

• Now suppose we have sub-saturated air, and some of the vapor molecules join to form a water droplet. What would happen to that droplet?

Answer: Since the air is sub-saturated, the droplet would just evaporate!
Saturation and Cloud Droplets

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Answer: Since the air is sub-saturated, the droplet would just evaporate!

• Sub-saturated air is always dry air (in the sense of no water droplets). Only when the air is saturated will water droplets start to form.
Relative Humidity (RH)

- The most common measure of water vapor content is the **relative humidity (RH)**, which measures how close the air is to being saturated with vapor.

- Specifically, for air at a given temperature, the RH is defined as the ratio of the actual vapor content of the air to the content needed for saturation (at that given temperature); i.e.,

- So RH = 50% (for instance) means the air is only half way to saturation---it needs twice as much vapor to be saturated at the given temperature.