GEOL/ESS 2000 Due Oct. 13, 2017

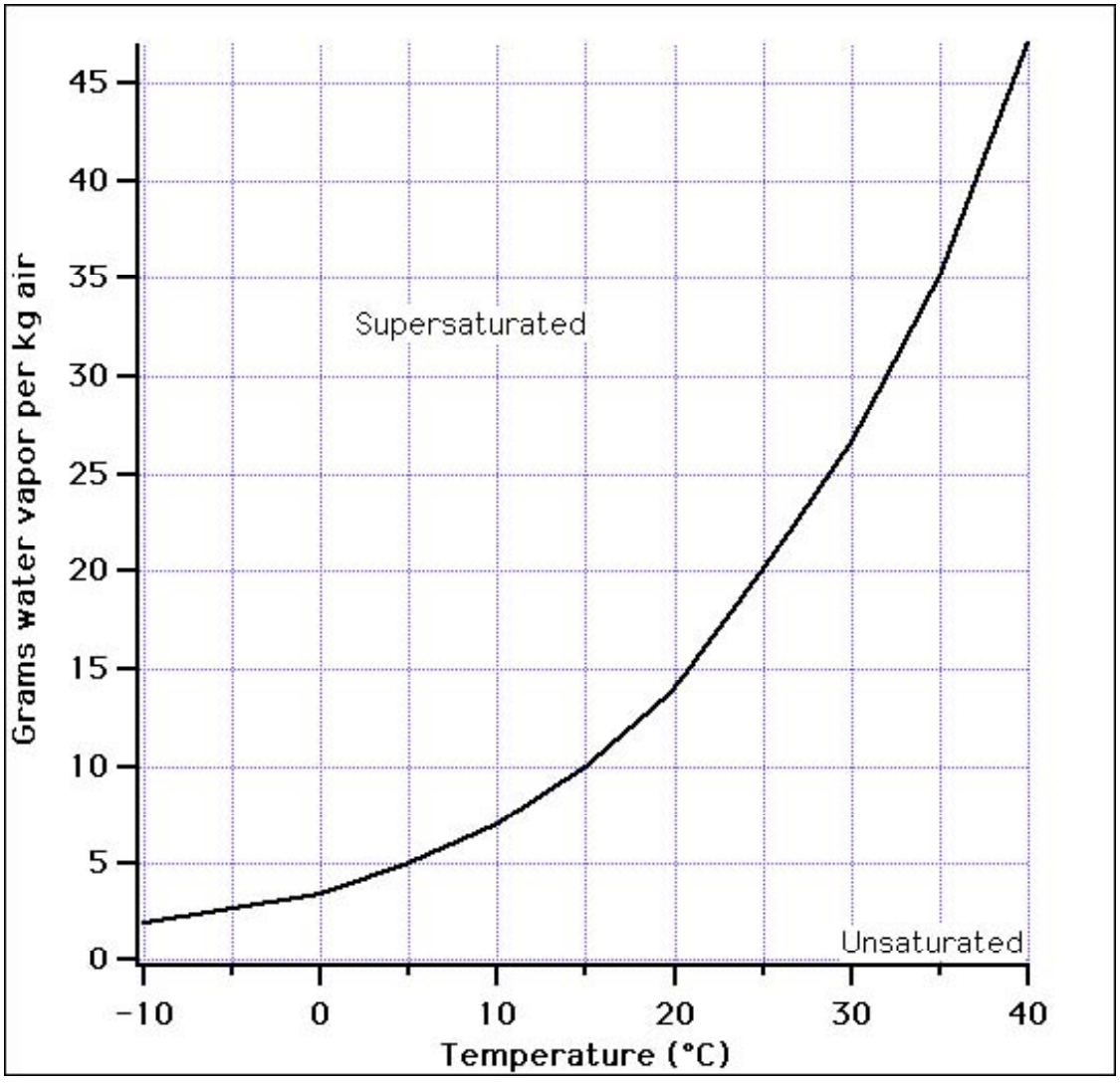
Relative Humidity and Dewpoint

Meteorologists have different ways of talking about the water content of air. On the news weather segment, we are used to hearing about *relative humidity*. Another number you may have heard that is related to the water content of air is *dewpoint*. Both quantities are directly related to the water vapor content of air, which – as we have seen – is relevant to the effect water vapor has in amplifying other temperature forcings.

A. Relative Humidity

The question is, relative to what? Answer: relative to the amount of water vapor that the air can hold at saturation. Put another way: relative to the **water vapor capacity** of the air at a given temperature. Put a third way, relative humidity means "*relative to the amount of water that would exist as vapor in the air at saturation*."

The plot below depicts the amount of water vapor in air at saturation as a function of temperature. The bottom line is that warm air can evaporate a lot more water than cold air!



Using the plot on the first page, answer the following:

1. Air at 15°C is saturated with water vapor when the water vapor content of the air is:

2. The relative humidity of air at 15°C is 50% when its water vapor content equals:

3. Air at 25°C is saturated when its water vapor content is:

4. On the plot on page one, imagine air at 25°C and (10 g H_2O)/(kg air) water content. What is the Relative Humidity?

The point of questions 1 through 4 above is to demonstrate that, when we say that the relative humidity is 50%, the actual amount of water in the air can vary extensively depending on the temperature. A relative humidity of 50% in Florida in August is an extremely different thing from 50% relative humidity in Laramie in January!! The next quantity, *dewpoint*, is considered by many meteorologists to be a better measure of the water content of air than relative humidity.

B. Dewpoint

Another way of talking about the water content of air is to use **Dewpoint**. *Dewpoint is the temperature to which the air must be cooled for saturation to occur*. Air is "humid" when Dewpoint is close to the actual temperature, and air is "dry" when the Dewpoint is far below the actual temperature.

5. Take the same air from number 4. To what temperature would you have to cool the air to reach saturation? What will happen when you reach saturation?

6. If the RH were only 25% at 25°C, to what temperature would you have to cool the air to reach saturation?

7. The temperature AND dewpoint is 5°C in Laramie (100% relative humidity). If you took this air to Florida and warmed it up to 35°C, what would its relative humidity be?