Name:_____ Section: _____

Atmospheric Sciences 101, Spring 2008

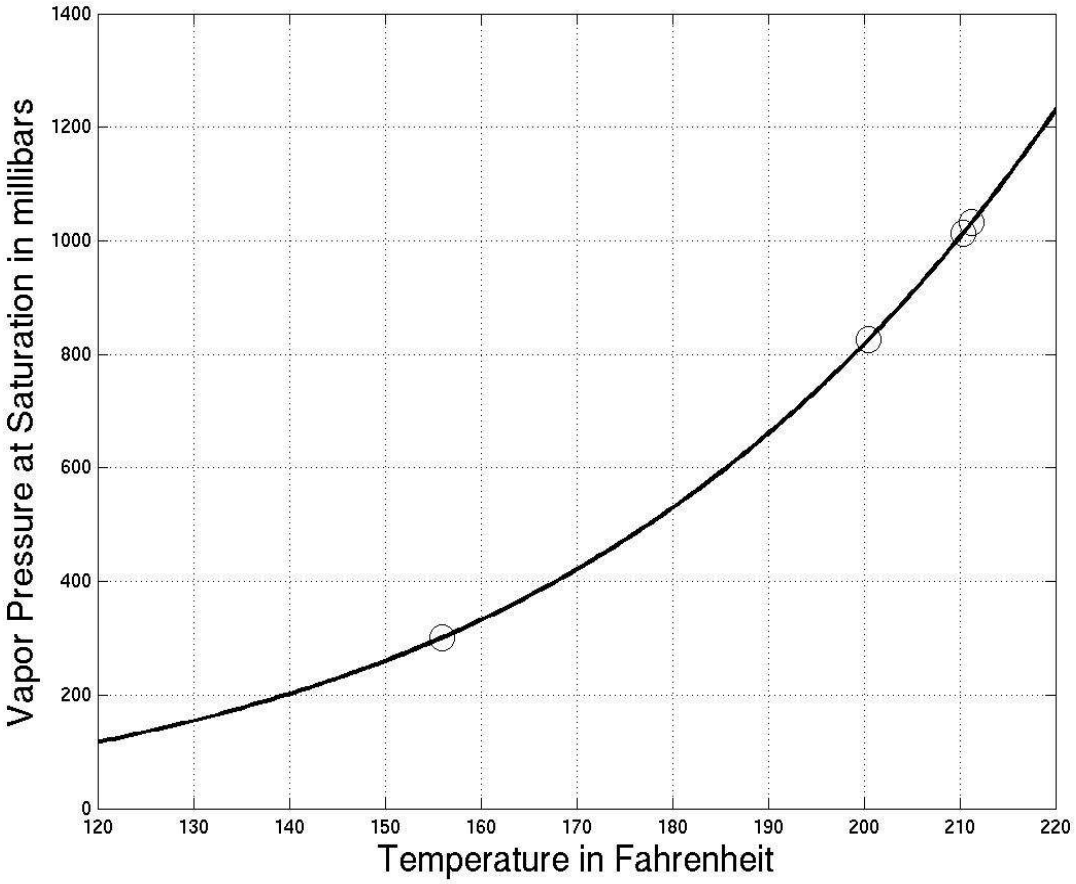
Homework 3 (Due at the beginning of your section, Thursday April 24 or Friday April 25)

Turn in by 4:30 PM on the due date to receive 75% of possible credit

No assignments accepted after 4:30 PM on the due date

1. Saturation Vapor Pressure

A. A pot of water is heated on the stove. How does the pressure inside a water vapor bubble compare to atmospheric pressure when the water finally boils? I.e., is it much higher, somewhat higher, somewhat lower, or much lower? Briefly explain. (The figure below is used for part B, next page)



B. On the previous page, we have plotted saturation vapor pressure vs. temperature (black curve, just like the red curve in figure 4.12 in your book) and marked several geographical locations (circles) where the atmospheric pressure corresponds to the saturation vapor pressure indicated on the left. The four circles correspond to the following locations: On top of Mount Everest, Death Valley, Denver CO, Seattle WA. Match each location with the correct circle. What does the temperature at each circle correspond to? Hint: consider your answer to part A.

C. Joe likes his tea extra hot. In which of the locations listed in part B could Joe brew tea the way he likes it best? Briefly explain.

2. Dewpoint and Humidity

Rank the following air masses in order of most to least water vapor content. (No calculators necessary)

a) 70°F air with a dewpoint of 50°F _____

b) 55°F air at 100% humidity _____

c) 90°F air at 0% humidity _____

d) 13°F air with 74.6% humidity _____

e) 15°F air with a dewpoint of 13°F _____

3. Dewpoint and Latent Heat

On a clear calm night, which air mass is less likely to cool to a temperature well below its dewpoint, one with a dewpoint of 45°F or one with a dewpoint of 65°F? (Consider the effects of latent heat on temperature).

4. Types of Fog

In each case below, is fog likely to form? If so, what type of fog will it be? (ie. Radiation, Advection, etc...)

A. Moist air blows off the pacific and up the Olympic Mountains.

B. Warm, moist air blows north from Hawaii over the cold North Pacific.

C. A calm night on a grassy field with a thick cloud cover and relative humidity = 50%.

D. A heated hot tub is left uncovered in January in North Dakota.

5. Satellite Images

Refer to the two images on the next page (Make sure to look at them on the computer screen so any printing defects don't distort the images).

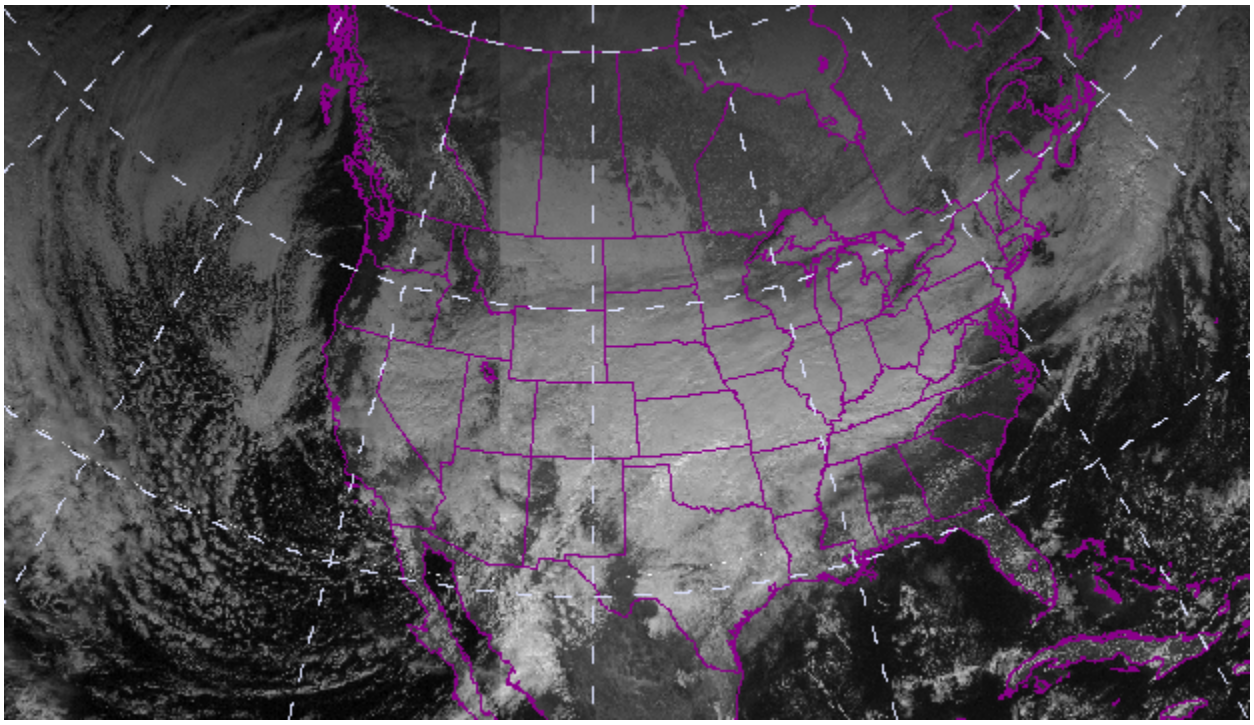
A. In the visible satellite image there appears to be significant cloud coverage above Texas, but in the IR image the cloudy area appears gray. What can you infer about the height of these cloud tops?

B. Both figures show bright clouds over Kansas. What can you infer about the temperature of the tops of these clouds?

C. From the IR image, how does the temperature of the cloud-free Central Plateau of Mexico compare to the temperature of the water in the Gulf of Mexico?

D. In the visible satellite image, the northern Ontario area is dark and mostly cloud free, but in the IR image the area is bright. Why might this be? Hint: These pictures were taken in the wintertime.

Visible:



IR: