Department of Earth & Climate Sciences Name_____
San Francisco State University February 9, 2018

ERTH 260 Quiz #1

100 pts.

(25 minutes)

A. Definitions. (5 points each for a total of 20 points in this section).

(a) precipitable water **-- the amount of precipitation that would occur if all the water vapor contained in an atmospheric column of unit are fell as rainfall and was collected in a vessel of the same unit area.**

mixing ratio **-- the amount of water vapor, in grams, in a kilogram dry air parcel.**

(b) atmospheric river—**a wide (~200-300 km), deep (~6 km; 18000 feet), and long (~2000 km) plume of water vapor extending from the tropics or subtropics to the West Coast of the United States.**

(c) The study of the development of and evolution of atmospheric motions and circulation systems as solutions of the fundamental equations of hydrodynamics or other systems of equations appropriate to special situations is the definition of
dynamic meteorology

(d) GOES is an abbreviation...expand it out –
Geostationary Operational Environmental Satellite

B. Unit Conversion. (30 pts)

The average value of atmospheric density at sealevel is approximately $1.24 \text{ X } 10^{-3}$ g cm^{-3}. Convert this to S.I. units (MKS units). Show all work (No credit for correct answer if work is not shown).

1. Given

Atmospheric density in CGS system is $1.24 \text{ X } 10^{-3}$ g cm^{-3}

2. Find

Convert this into S.I. units (MKS units).

3. Relations Needed

Standard conversions as needed.

4. Calculation and Answer

$$\frac{1.24\text{g}}{10^3\text{cm}^3} \text{ X } \frac{1\text{ kg}}{10^3 g} \text{ X } \left(\frac{10^2\text{cm}}{\text{m}}\right)^3 =$$

$$\frac{1.24}{10^3} \text{ X } \frac{1\text{ kg}}{10^3} \text{ X } \frac{10^6}{\text{m}^3} = 1.24 \text{ kg m}^{-3}$$

C. Weather Charts (Total of 50 points in this section).

Figure 1 is the 2130 UTC Infrared Satellite Image and Figure 2 the 2133 UTC surface plot for 4 February 2015. The following questions relate to these charts. Answer in complete sentences.

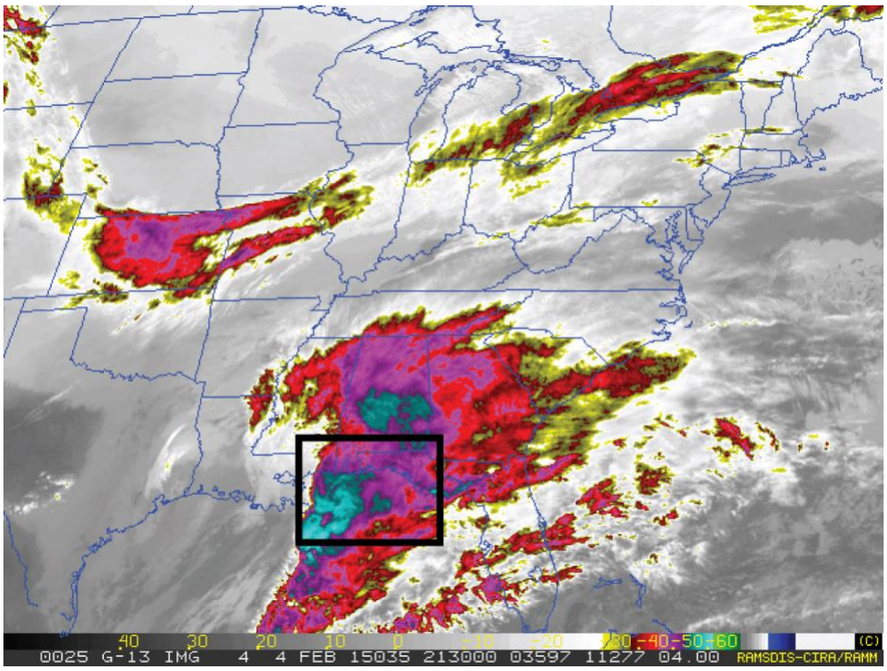

Figure 1: 2130 UTC Infrared Satellite Imag 2130 UTC 4 Feb 2015

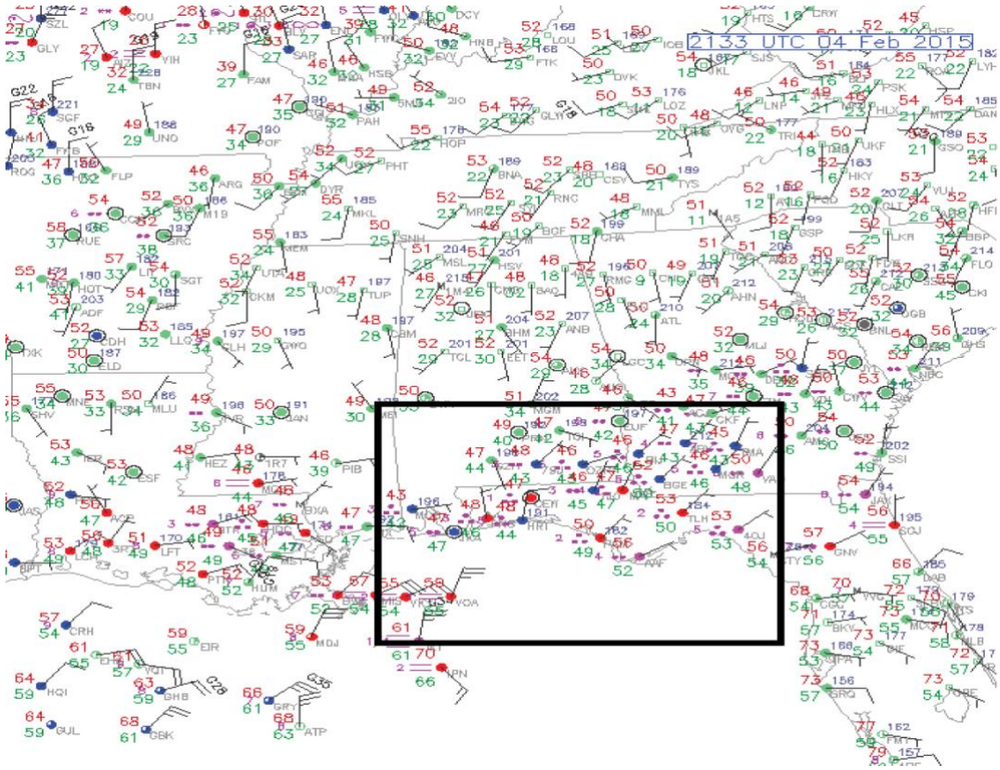

Figure 2: Surface plot of weather data 2133 UTC 4 Feb 2015

1. What is the significance of the colors shown inside the box drawn on Figure 1? Here I would like you to explain what the colors particularly signify and what the implication is meteorologically.(15 pts)

The colors depict, in general, the temperature of cloud tops and the earth's surface. The colors on the portion of the image inside the box are in the range of -30 to -60C comparable to the temperatures of towering cloud forms, like thunderstorms, liable to be associated with substantial precipitation.

2. The box drawn on Figure 2, the surface data plot, generally corresponds to that shown on Figure 1. Generally describe how the weather station data plotted in portions of the box drawn on Figure 2 can be used to verify your answer in (1) just above. (10 pts)

The present weather symbols in the area in the box show that wide spread light to moderate rainfall was occurring in a portion of the southeastern United States. This rainfall is associated with cold cloud tops, suggesting that the rule of thumb relating the coldest tops with precipitation producing cloud forms is valid.

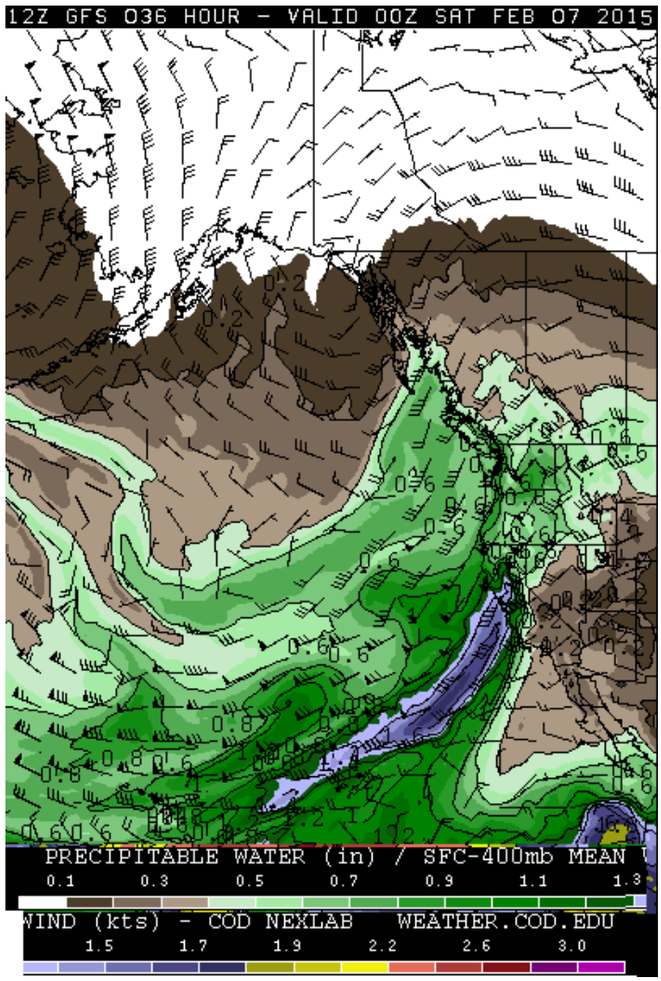

Figure 3 : Forecast of Precipitable Water valid 0000 UTC 7 February 2015

Figure 3 is a forecast for the precipitable water field from the GFS valid 0000 UTC 7 February 2015.

1. Decode the date and time to Pacific Standard Time. (5 pts)

4 PM PST 6 February 2015.

2. Describe how Figure 3 illustrates an Atmospheric River as you defined it in Section A of the quiz. (2-3 sentences) (20 pts)

The chart depicts values of precipitable water, which is a measure of the total amount of water vapor present, and how much rainfall would occur if all that water vapor condensed. The narrow blue to purple plume of precipitable water values corresponds to depths of 1-2 inches. This plume is long (~2000 km), narrow (~400 km or less), and extends from the subtropics or tropics. Hence it corresponds to a feature that would meet the definition for an "atmospheric river."