Department of Earth & Climate Sciences Spring 2018
San Francisco State University Name _____

Laboratory Exercise 6:
Joplin Tornado Day--Relationship of Soundings to Horizontal Plots
(100 pts)

The Joplin tornado occurred around 2200 UTC on 22 May 2011.

Here are the 925 mb, 850 mb, 700 mb, 500 mb, 300 mb, and 250 mb weather charts for 12 UTC 22 May 2011. Although that time was 10 hours before the event itself, it's useful to look at the so-called "prestorm" environment so that we can follow the evolution of things during the day. The actual work here is worth 100 pts . You will also present your results orally oral presentations 50 points (assigned separately)

1) You are given the plotted sounding for Springfield Missouri at 12 UTC 22 May 2011. (50 pts(

   a) Determine the following from the sounding for the surface, 925 mb, 850 mb, 700 mb, 500 mb, 300 mb, and 250 mb levels: temperature, wind direction and wind speed. Fill in Table 1 (elevations on the observed sounding plot on the right margin. [Note: use descriptive wind directions...as in SW, or W; and assume the wind speed information is in knots rounded to the nearest 5 knots]) (18 pts)

   b) Fill in the column labeled "Chart" in Table 1 with the temperature and wind information you glean from looking at the the temperature and wind information plotted at the same level on the charts (18 points)

   c) Compare and contrast the information you obtained at each level in Table 1. **Answer on a separate sheet.** (14 points) **The data are similar and mostly identical. There seems to be small differences at lower levels...at 925 mb for example. This might be because so much information besides the mandatory data is plotted for the lower levels that it's difficult to read which corresponds so the actual 925 mb mandatory level**

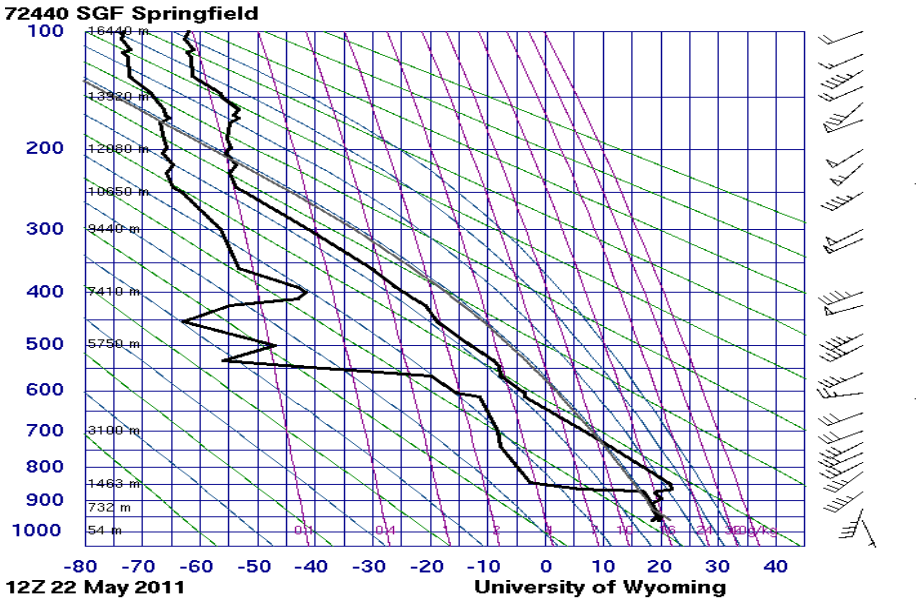


Figure 1: KSGL Sounding, 12 UTC 22 May 2011

925 mb	Chart	Sounding
Temp	22*	20
Wind Direction	SSW	SSW
Wind Speed	25*	35
850 mb	Chart	Sounding
Temp	22	22
Wind Direction	SW	SW
Wind Speed	35	35
700 mb	Chart	Sounding
Temp	7	7
Wind Direction	SW	SW
Wind Speed	30	30
500 mb	Chart	Sounding
Temp	-13	-13
Wind Direction	SW	SW
Wind Speed	40	40

300 mb	Chart	Sounding
Temp	-41	-42
Wind Direction	SW	SW
Wind Speed	50	50
250 mb	Chart	Sounding
Temp	-52	-52
Wind Direction	SW	SW
Wind Speed	45	45

Table 1: Temperature and Wind Information read off of the upper air charts provided and interpolated from the sounding provided in Figure 1.

3) The actual sounding (called *radiosonde*) information plotted in Figure 1 is coded in a special format. Those of you who go on to ERTH 465 will learn this code. The information is then decoded and can be placed in plain English. Here is the decoded 12 UTC 22 May 2011 Springfield sounding.

This information should be the same as that which you placed in the tables above. You'll note, however, that there are far more levels than the six levels for which you have charts above. Those six, plus several others, are known as the ***mandatory levels***. Weather information MUST, by international agreement, be obtained for at least those levels. The other levels are known as ***significant levels***, as explained in class. The students who go on to ERTH 465 will learn about their importance, but we won't discuss this much in ERTH 260.

Questions:
a) For each level shown in the table below, find the corresponding **wind observation only** in the decoded 12 UTC 22 May 2011 Springfield sounding. (12 points)

b) On a separate sheet, discuss general correspondence between all three sets of wind observations (on the charts, the right margin of the sounding, and in the decoded text version of the sounding? (13 pts)

Yes, there is a general correspondence between all three sets of observations. This illustrates how the radiosonde information can be plotted in different ways to provide insight into the atmosphere.

925 mb	
Wind Direction	195 (SSW)
Wind Speed	35
850 mb	
Wind Direction	225 (SW)
Wind Speed	35
700 mb	
Wind Direction	245 (SW)
Wind Speed	31
500 mb	
Wind Direction	235 (SW)
Wind Speed	40
300 mb	
Wind Direction	235 (SW)
Wind Speed	50
250 mb	
Wind Direction	230 (SW)
Wind Speed	47

Table 2: Wind direction and wind speed obtained from the actual radiosonde data given and decoded for 12 UTC 22 May 2011

4) The KSGL sounding given as Figure 1 above is an example of the so-called "Loaded Gun" sounding. Your task here is to compare the KSGL sounding given in Figure 1, with the typical Loaded Gun sounding example discussed in class on Friday 2 March 2018, that for 12 UTC 1 May 2008 for KOUN. (25 pts)

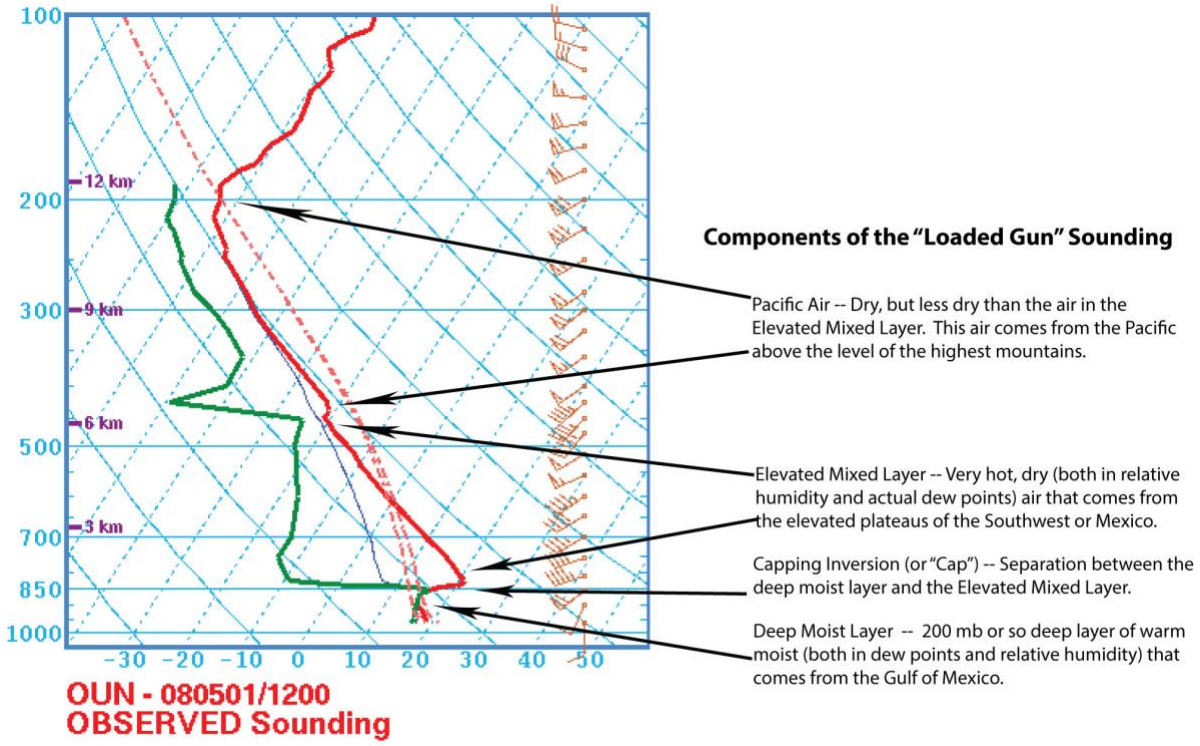
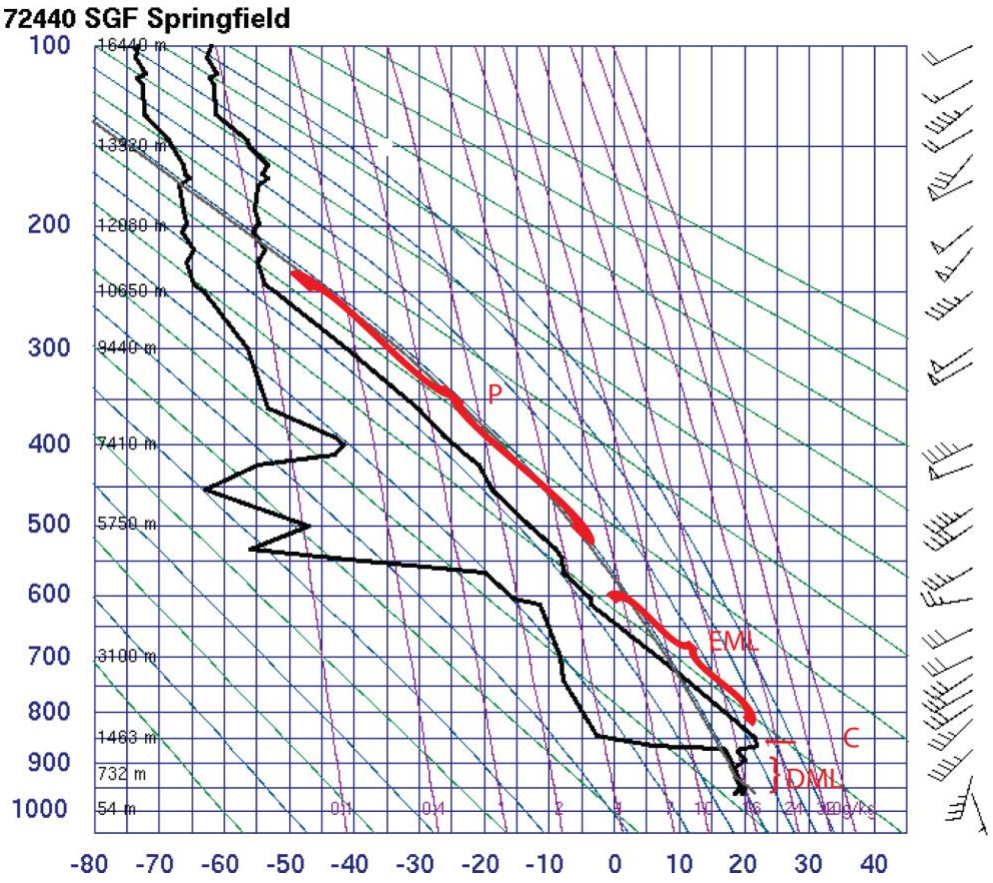


Figure 2: Skew-T Log-p Sounding for KOUN 12 UTC 1 May 2008. This sounding illustrates the so-called "Loaded Gun" Sounding, often associated with the development of severe thunderstorms.

(a) Compare the KSGL sounding given in Fig. 1 with the Loaded Gun prototype given to you for the exercise regarding 1 May 2008. Indicate the following with letters and brackets: Deep Moist Layer (DML); Capping inversion (C); Elevated Mixed Layer (EML); and Pacific Air (P). (12 points)

(b) Is there a general correspondence between this sounding and the general prototype Loaded Gun Sounding given for 1 May 2008? Please explain in several sentences. (6 points)

There are only subtle differences between the overall structure and look of the KSGL sounding compared to that for KOUN on 1 May 2008. For example, the moisture stratification of the Pacific air is slightly different. Other than that, the Deep Moist Layer, the Cap, the Elevated Mixed Layer, and the Pacific Air are all present on both soundings.


72440 SGF Springfield
100
200
300
400
500
600
700
800
900
1000
16440 m
13320 m
12080 m
10650 m
9440 m
7410 m
5750 m
3100 m
1483 m
732 m
54 m
P
EML
C
DML
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40