LAB ASSIGNMENT #4
(due Tuesday, September 26)
10 points

Learning Objectives:
Upon completion of this lab you will be able to:
- plot surface and upper air data in a variety of GEMPAK programs.
- make physical connections between the data and a few dynamical concepts discussed in class.

NOTE: Make sure to label each of the plots you create with an appropriate descriptive title using the *__title__* parameter. **Each person must turn in their own maps and analysis, even if you are working with a partner**. Make sure the map you are turning in is neat and legible (This will become increasingly important as you learn new GEMPAK programs and prepare for your case studies).

1. Use the programs presented in the pre-lab to examine a developing cyclone that occurred over the Mississippi River Valley at 0000 UTC 6 February 2008 and plot the following in the traditional station model format:

   - Surface wind (barbs; knots)
   - Mean sea level pressure
   - Surface temperature and dew point (degrees Fahrenheit).

   Center the map over the cyclone by choosing an appropriate GAREA setting. For example, if the cyclone was near Duluth, MN, set the GAREA = DLH-
   (use SFFILE = /ef5/raid6/class/fall09/acwinters/452lab2014/080206_sao.gem and set FILTER = 1)

On the surface map of observations you create, label where you would expect the warm and cold front to be located. Also, label areas of high and low pressure. You **<u>do not</u>** need to contour any of the data.

2. Use observational data from 1200 UTC 19 September 2017 to create vertical profiles of temperature and dew point (in degrees Celsius) at Albuquerque, NM and Riverton, WY (one plot for each station). Use the following parameters to begin your plots (you will need to set the rest):

```
SNFILE    = $UPA/170919_upa.gem
LINE      = 2;4
PTYPE     = skewt
VCOORD    = pres
STNDEX    =
STNCOL    = 1
WIND      = bk1
```

```
WINPOS  = 1
MARKER  = 0
BORDER  = 1
YAXIS   = 1000/100/100
XAXIS   = -40/40/10
FILTER  = 0.5
PANEL   = 0
TEXT    = 0.75
THTALN  = 8/1/1/1
THTELN  = 14/1/1/1
MIXRLN  = 11/2/1/1
```

Compare the two soundings. Which one seems to be a more favorable thermodynamic environment for convection? Explain your reasoning.

3. Using 1200 UTC 26 October 2010 observational data, print out a vertical cross-section of potential temperature (contoured every 5 degrees) along a line of stations from Bismarck, ND to Birmingham, AL (stations are given below). Use the following parameters for your plots:

```
CXSTNS = bis;oax;sgf;bmx
SNFILE = /ef5/raid6/class/fall09/acwinters/452lab2014/101026_upa.gem
VCOORD = pres
PTYPE  = log
YAXIS  = 1000/100/100
TAXIS  =
LINE   = 3/1/1/1
BORDER = 1
CINT   = 5
WIND   = 0
TITLE  = 1/-3/Insert Descriptive Title Here
PANEL  = 0
DEVICE = xw
CLEAR  = y
FILTER = 0.5
TEXT   = 0.75
CURVE  = 2
CONTUR = 3/1
CTYPE  = c
```

The analysis of data (both observational and gridded) within cross sections can provide considerable insight into the structure of the troposphere. For this particular cross section:
- Label where the cold column and warm columns of air are located in the troposphere (below ~300 hPa). Hint: remember you are looking at potential temperature and consider the horizontal temperature contrast, not the vertical.
- With reference to the thermal wind equation, where would you expect to find a column of increasing geostrophic wind speed in the vertical? How did you come to this conclusion?
- Finally, identify where the jet core (wind speed maximum) is located in this cross

section with a "J" and justify your decision for its placement.