LAB ASSIGNMENT #5

(due Thursday September 28)
10 points

**** THIS WILL NEED CHANGING – JUST FIND AN EXAMPLE OF DIVERGENCE DOWNSTREAM OF AN UPPER LEVEL TROUGH, AND A COLD FRONT. SHOULD BE AN EXAMPLE SOMEWHERE..**

Learning Objectives:
Upon completion of this lab you will be able to:

- plot gridded model data in a variety of GEMPAK programs.
- articulate the relationship between the ageostrophic wind and regions of divergence.
- investigate the nature of vertical motions in the vicinity of fronts.

For the following problems use the NAM analysis at 1200 UTC 06 September 2017 (in the $MODELDATA directory). This time, use the *title* parameter to describe each plot (variables, times, etc...), and simply staple everything together with this sheet.

1. a) Hand in a plot containing **300-mb geopotential heights** (use a solid line) and **divergence of the ageostrophic wind** (use phelp gfunc to find your variables). Contours of positive divergence should be solid lines, and contours of negative divergence (aka convergence) should be dashed lines. Omit the zero divergence line. (See the **GDCNTR/GDPLOT** section of the lab to review the procedure used to omit the zero line.) Also use the following settings:

```
PANEL    = 0
GDFILE   = /weather/data/gemdata/hds/17090612_eta.gem
GDATTIM  = 170906/12
TEXT     = 0.75
GAREA    = 20;-110;55;-55
PROJ     = lcc/20;-97.5;55
MAP      = 8
CTYPE    = c
LATLON   = 0
CINT     = 3/1
```

   b) Explain, with reference to the ageostrophic wind in this plot, why convergence and divergence are located where they are with respect to the trough.

c) If you had only this plot to look at, where would you expect strong upward vertical motion? How about downward vertical motion? Explain your reasoning using concepts from lecture.

d) Now make a plot of **800-mb vertical motion**, with ascent contoured as solid lines, descent contoured dashed lines, and the zero line omitted. (Remember: $\omega = dp/dt$) To get started, use:

```
SCALE = 3
GFUNC = omeg
```

Describe how the model vertical motion corresponds to the divergence of the ageostrophic wind and what you stated in part (c)?

2. a) Using the same file and the same time, create a plot of **850-mb potential temperature** (every 3 K) over the US (garea=or--).

   b) Plot a cross section of **potential temperature** (contoured every 3 K) and **vertical motion** (using the same conventions as in question 1d) that cuts through the strongest potential temperature gradient (use: cursor cxstns) and identify the location of your selected cross section on your horizontal map of potential temperature. You will see where the NAM domain ends, and that is okay in this case! Use the following parameters to get started:

```
PTYPE    = log
GVECT    =
YAXIS    = 1000/100/100
BORDER   = 1
TEXT     = 0.75
CONTUR   = 3/1
```

   c) Within your cross section, identify where the cold and warm temperatures are located. Do you see evidence of a thermally direct circulation within your cross section? Explain.