ATM 612 Case Study 2: Due Friday Oct. 20

27-28 April 2011 Severe Weather Outbreak

Data Sources:

http://www.mmm.ucar.edu/imagearchive/
http://www.spc.noaa.gov/exper/archive/events/
http://weather.uwyo.edu/upperair/sounding.html

1.1) Consider the surface and upper air maps for 12 GMT, 27 April, and create a composite chart indicating the locations of the primary surface fronts, dry line, high and low pressure centers, ongoing convection, along with the location of polar jet, subtropical jet, low-level jet, etc.

....What large-scale and mesoscale features might help maintain existing convection or trigger new convection?

....What large-scale and mesoscale features might help limit the area of active convection?

....How does this composite compare to the composite from 19-20 May 2013 from our case study 1?

1.2) Now consider the thermodynamic soundings at 12 GMT for Jackson Thompson Field (JAN), Shreveport (SHV), Little Rock (LZK), Slidel (LIX),Nashville (BNA), Birmingham (BMX), and Peachtree (FFC).

....Which regions would be suspect for large thermodynamic instability later in the day?

....What processes will help to create (destroy) this instability?

1.3) Plot hodographs for JAN and BMX. From these hodographs, estimate the magnitude of Us for each station (approximate length of the hodograph over the lowest 6 km AGL).

....Given that convection develops at these locations, what kind of convection would you expect based on these profiles (ordinary cells, multicells, supercells)?

....What would you anticipate the storm motions to be? (plot them on the hodograph)

1.4) Given all of the above information, which areas would be most suspect for continued severe weather on this day?

2.0) Now consider the general evolution of the storm environment between 12 UTC and 00 UTC, considering the evolution of any mesoscale or synoptic scale boundaries, changes to soundings and hodographs, etc.

....What happens to the ongoing convection between 12 UTC and 18 UTC? How does it impact the mesoscale environment for the anticipated later convection?

....Are there any other significant changes to the larger scale and mesoscale forcing features during the day?

....What factors may have contributed to any stability or vertical wind shear changes evident during the day?

3.0) Now document the evolution of the convection between 18 UTC 27 April and 06 UTC 28 April.

....What mesoscale or synoptic scale features were critical for convective re-triggering during the afternoon?

....What were the primary modes of convective organization during the afternoon?

....What factors may have contributed to the variations in convective mode from morning to afternoon and evening?

4.0) After you have completed the above exercises, read the following paper: "Meteorological overview of the devastating 27 April 2011 tornado outbreak" by Knupp et al. (BAMS, July 2014.... available on the ATM612 web site).