

ATM 311  
Severe Weather Project

On the course website, you will find the following ERA5 reanalysis plots for 12Z and 21Z for a severe weather event. The date has been removed from all plots:

- 300-mb geopotential height (dam) and wind (kt)
- 500-mb abs. vorticity ( $s^{-1} \times 10^{-5}$ ), geo. height (dam), and wind (kt)
- 700-mb RH, temp. ( $^{\circ}C$ ), geo. height (dam), and wind (kt)
- 850-mb temp. ( $^{\circ}C$ ), geo. height (dam), and wind (kt)

You will also find a WPC surface analyses from 12Z, and an unanalyzed surface analysis from 21Z.

Also on the course website are two pdf files, each containing observed soundings, hodographs, and severe weather indices/variables from 12Z (morning) and 00Z (evening) for most of the upper air sites across the U.S. *Note that the SPC uses virtual temperature to calculate variables like CAPE, CIN, LI, etc.*

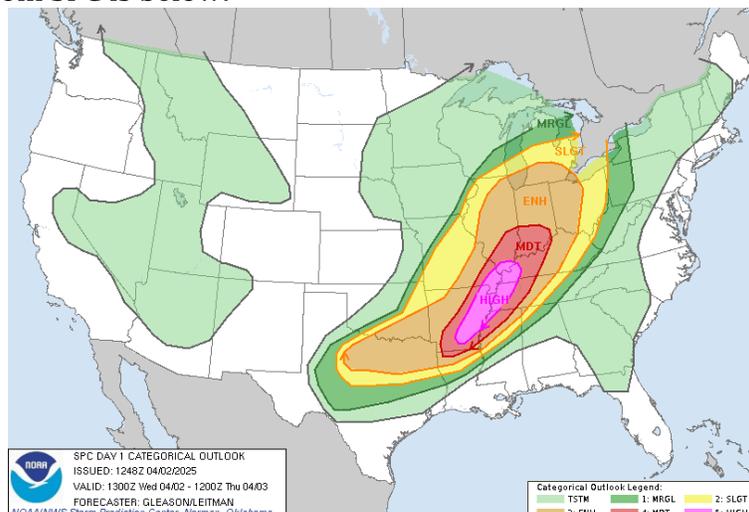
You have also been given one blank map.

\* On the 21Z surface analysis, contour sea level pressure using a contour interval of 4 mb, and label the position of surface high and low pressure centers, as well as frontal boundaries.

\* On the blank map, create a severe weather outlook for the United States for approx. 2200 UTC through 0600 UTC, similar to what the Storm Prediction Center creates. You'll contour the following risk regions:

- \* General non-severe thunderstorms (light green)
- \* Marginal (dark green)
- \* Slight (yellow)
- \* Enhanced (orange)
- \* Moderate (red)
- \* High (pink/magenta)

An example from SPC is below:



# Understanding Severe Thunderstorm Risk Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	Isolated severe thunderstorms possible	Scattered severe storms possible	Numerous severe storms possible	Widespread severe storms likely	Widespread severe storms expected
Lightning/flooding threats exist with <u>all</u> thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense
					

Finally, you will provide a severe weather outlook for the period 2200 UTC—0600 UTC.

Double-spaced, your outlook must contain:

- A **synoptic-scale analysis** that is at least 1 page in length
- A **mesoscale analysis** that is at least 1 page in length
- No more than 3 total pages in length

\*You should start with a **synoptic-scale** (larger-scale) analysis. **In the context of the severe weather outbreak**, describe:

- Upper-level flow and forcing mechanisms (remember that these result in the development of surface lows, which perturb airmasses and result in frontal boundaries)
- Surface boundaries, low-level forcing mechanisms

\*Next, in your **mesoscale analysis, in the context of the outbreak**, describe:

- Citing specific soundings, describe features in the environment that support your forecast
- Are there specific severe hazards (hail, tornado, wind) favorable, or unfavorable? Why/why not?

*Note: It is critical to support your forecast with reasoning (e.g., **Why** is the pattern favorable for hail? **Why** is it less likely for convection in certain areas?).*