WFO Huntsville Quick Event Review

Date/Time of Event:	November 28, 2005
Forecaster(s) performing review:	Brian Carcione (excerpts by Chris Darden)
Type (and significance) of event:	Broken Severe Squall Line; Isolated Wind Damage/Tornado Event

---

Overview of event:

The base of an upper-level trough closed into an upper low across the southern Rockies late on Sunday, November 27. The low moved east to the Oklahoma-Kansas border around 00Z on the 28th (figure 1) before an upper level jet streak kicked the low northeastward towards the Great Lakes. By 12Z (figure 2), the 500mb low was centered just northwest of Kansas City, Missouri, while the surface low was in central Iowa (figure 3), and the cold front was draped just east of the Mississippi River. The cold front had spawned a severe squall line the day before; the squall line and supercells ahead of the line had spawned tornadoes and damaging straight-line winds across portions of Kansas, Missouri, and Arkansas. However, the line had weakened significantly Sunday night, and was mainly a band of light to moderate rain by the time it approached the northwest corner of Alabama Monday morning.

The atmosphere appeared to be primed for a significant severe weather outbreak. The 12Z OHX and BMX soundings (figures 4, 5) depicted a strong low level jet (60 knots at OHX, 40 knots at BMX) in addition to strong directional shear. Moreover, shear in the lowest kilometer was enhanced by a wedge ridge east of the Appalachians, which backed winds to southeasterly across much of Alabama. The limiting factor for northern Alabama and southern middle Tennessee would be instability. While strong southwesterly flow just off the surface was advecting moisture and warm air into the boundary layer, and model soundings showed significant instability with surface temperatures warming into the mid 70's, abundant cloudiness appeared likely to inhibit diurnal heating. In response, SPC had placed much of Alabama under a moderate risk for severe thunderstorms with their initial Day 1 outlook (figures 6a-d); probabilistic outlooks had a 15% probability of tornadoes with a hatched-in area corresponding to the moderate risk area, a 35% probability of damaging winds, and a 25% probability of large hail. The 12Z update backed off on the hail probability, but enlarged the moderate risk area (and corresponding wind and tornado probabilities) to include more of Alabama. SPC issued tornado watch #884 for most of Alabama just before 10am (valid until 00Z/6pm), then issued another watch, #885, at 11:15 for much of middle Tennessee (also valid until 00Z/6pm).

The rain band/squall line began to re-intensify as it moved into the destabilizing boundary layer over northwest Alabama. However, the air mass was too stable for significant updrafts to develop, and the front moved through Lauderdale, Colbert, and

Franklin counties between 17 and 18Z with little fanfare. Scattered showers developing ahead of the front were watched closely for possible signs of intensification and rotation, but again, the air mass was still too stable across the northern portion of the state, and no lightning was detected in any of the prefrontal showers. Much more unstable air south of interstate 20 allowed several supercells with strong rotation to develop, and post-event surveys across WFO BMX's area found the tracks of several weak tornadoes (all F0) across Autauga, Dallas, Coosa, Elmore, and Jefferson counties. The strongest rotation of the day near the HUN CWA crossed Walker county and approached Cullman county, but stayed to the south and dissipated as it entered Blount county.

The squall line began to intensify as it exited the 3 far western counties and entered Limestone County, and focus turned to radar interrogation. As with many severe events this fall and spring, all of the warnings occurred on the squall line, and most of the storms were low-topped, rendering most of the derived volume products useless. Considering all of the shear in the lower levels, storms often showed strange or alarming reflectivity characteristics: false hooks or appendages, or bow echo-like traits, for example. The main warning decision-making involved interrogating the velocity, or more often the SRM data, to determine if there was any substance behind the reflectivity. As one might expect with the marginally unstable air mass, storms would often show a hook or appendage along with rotation in the SRM for one or two volume scans; however, the "better" storms that were warned for displayed rotation or higher velocities for several consecutive volume scans. Only two storms showed an elevated core: one in northern Madison that moved into Lincoln and Franklin counties (a warning was issued but not verified) and another that moved from Jackson into Franklin County.

After moving rather quickly as it moved through most of the CWA, the front/squall line slowed significantly around 3pm as it outpaced its forcing. It nearly stalled out across the eastern third of the CWA, and did not move out of the CWA entirely until after both tornado watches expired at 6pm. Thunderstorms along the broken squall line occasionally exhibited strong to severe characteristics (such as the elevated core mentioned previously). The strongest storm moved through Marshall and Jackson counties and showed a strong mesocyclone; storm-relative winds exceeded 60 knots below 2500 feet AGL.

By the time both tornado watches ended at 00Z/6pm, the front had cleared most of the area (figure 7), and the watches were allowed to expire. Overall, 4 tornado warnings and 5 severe thunderstorm warnings were issued, with 6 reports of damage in the warnings.

Specific weakness of a model, computer algorithm, office system or procedure that needs to be addressed:

- Forecasters are urged to use caution when making use of the distance-speed tool in the same D2D window with SRM products. D2D automatically uses the tool's motion as the default storm motion without any user interaction, sometimes dramatically changing the data. The setting can be changed back to the default

motion in the Radar Display Controls dialog.

Other lessons we can apply to future events:

- Our outlooks and statements noted the uncertainty with the stability question, and this ended up being quite effective. **While we should show the greatest certainty and highest level of detail on day 1 in the HWO, uncertainty still is clearly a major issue even in the next 6 to 12 hours, and likely should be communicated as such.**

Additional Material (Attached):

Figure 1: 500mb analysis valid 00 UTC, 28 November 2005 (Storm Prediction Center).

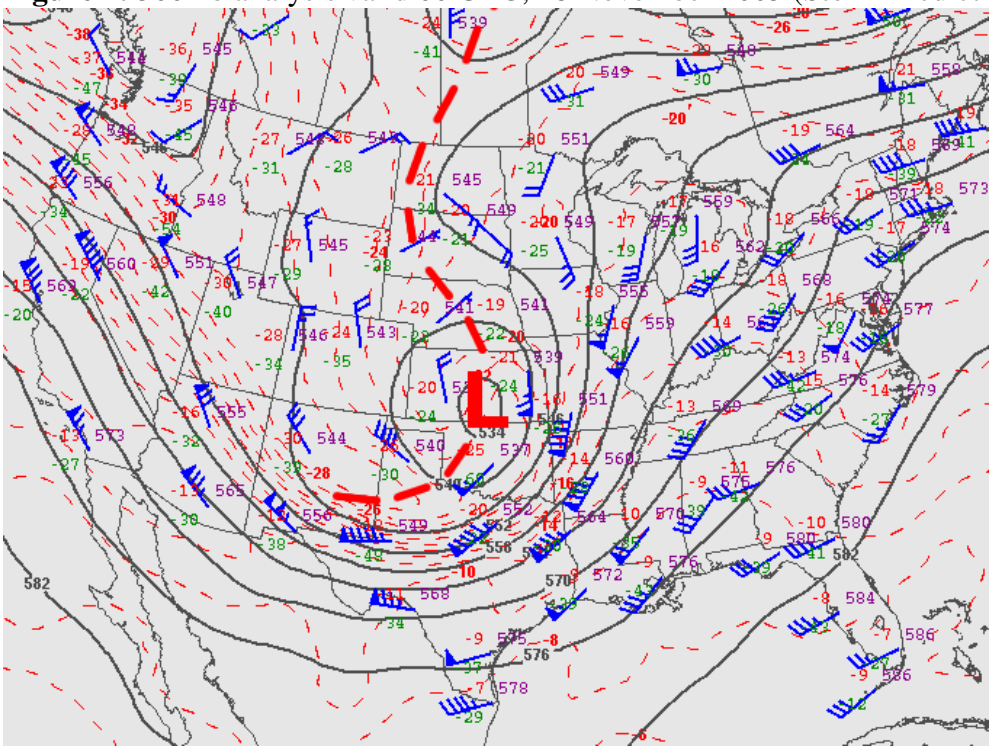


Figure 2: 500mb analysis valid 12 UTC, 28 November 2005 (Storm Prediction Center).

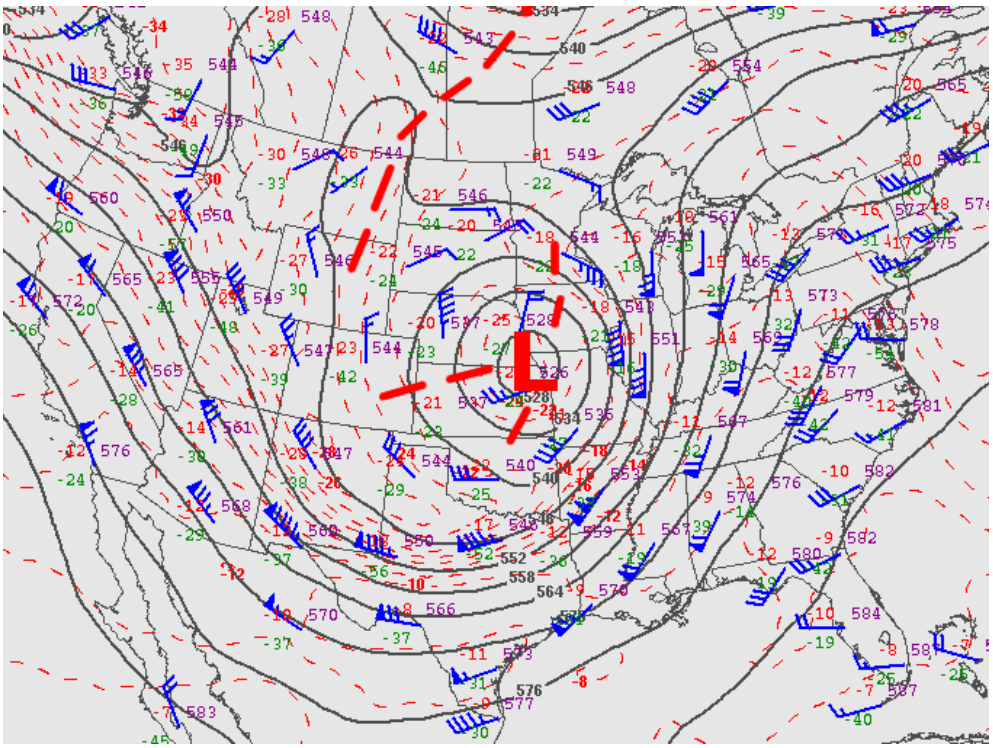


Figure 3: Surface analysis valid 12 UTC, 28 November 2005 (University of Wyoming).

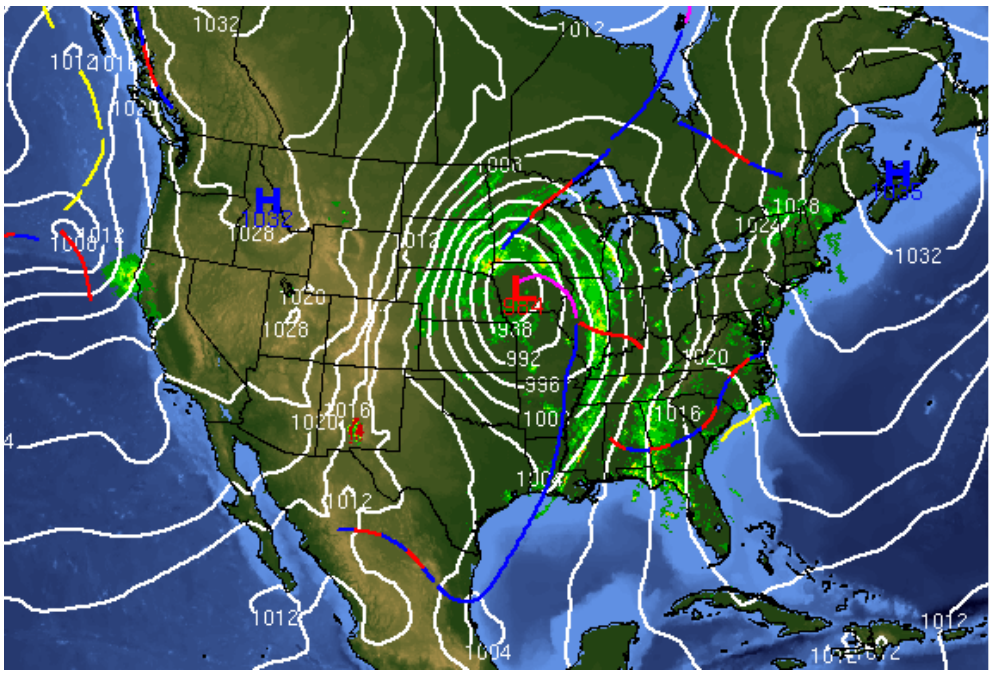


Figure 4: OHX/Nashville, TN sounding valid 12 UTC, 28 November 2005 (University of Wyoming).

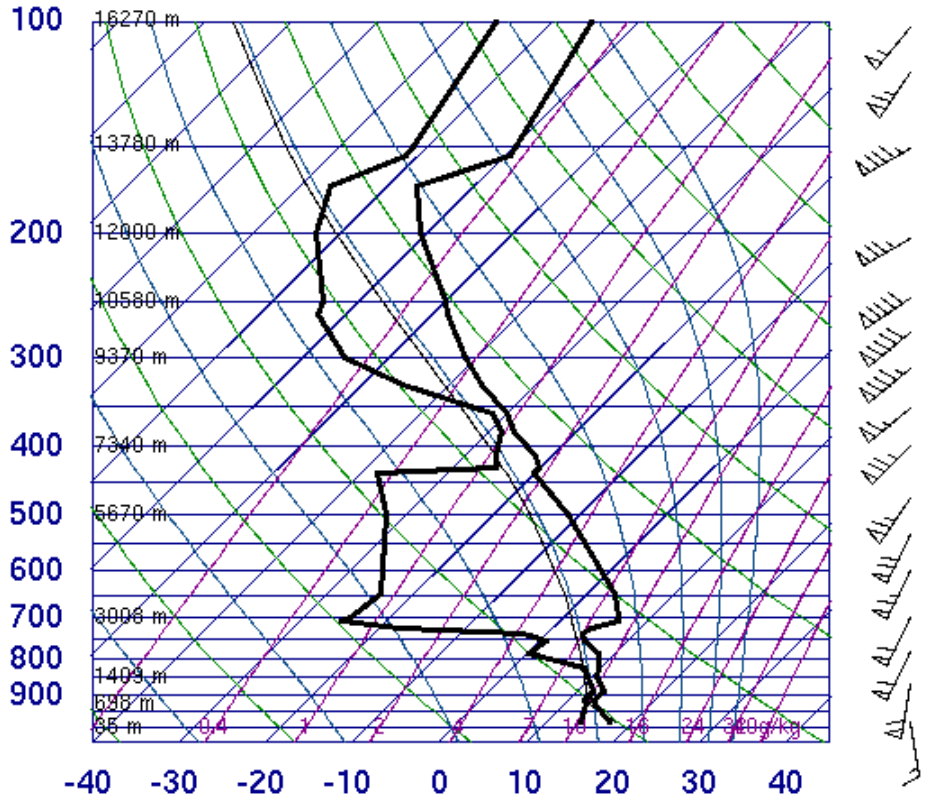


Figure 5: BMX/Birmingham, AL sounding valid 12 UTC, 28 November 2005 (University of Wyoming).

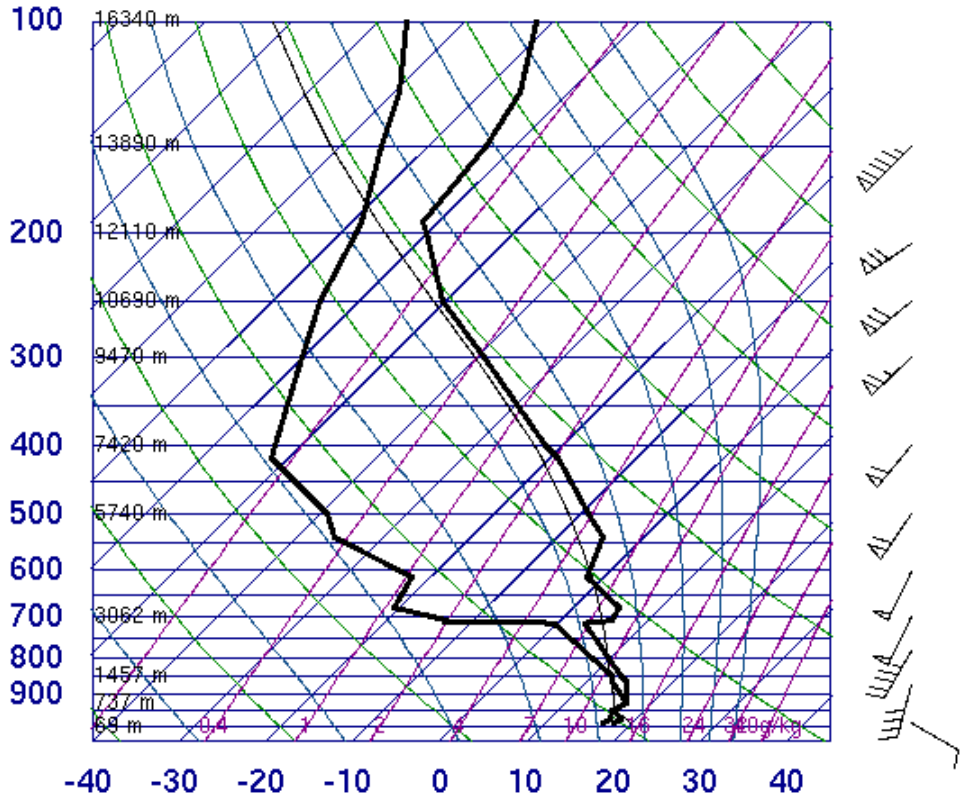
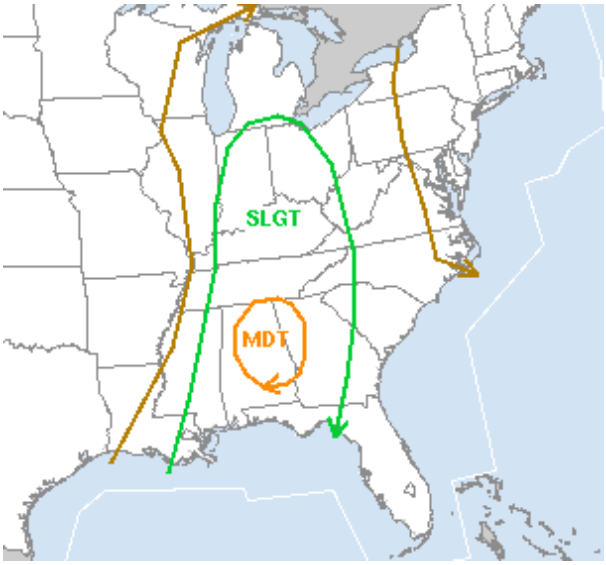
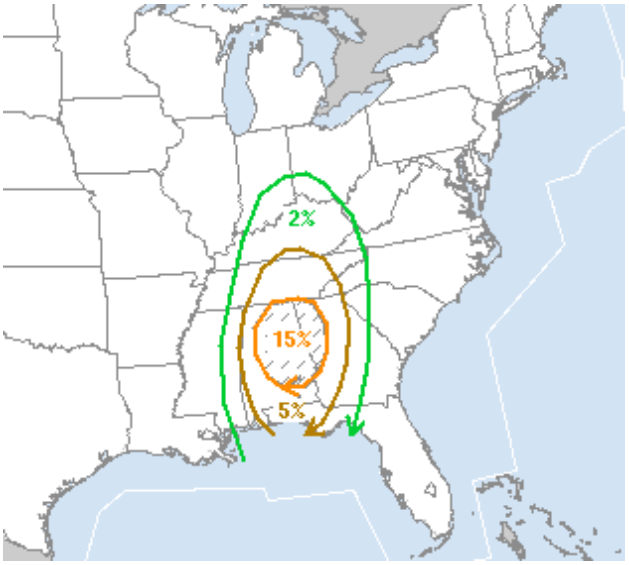


Figure 6: Storm Prediction Center day 1 outlook, issued 06 UTC 28 November 2005. (a) categorical outlook, (b) probabilistic tornado outlook, (c) probabilistic wind outlook, (d) probabilistic hail outlook.





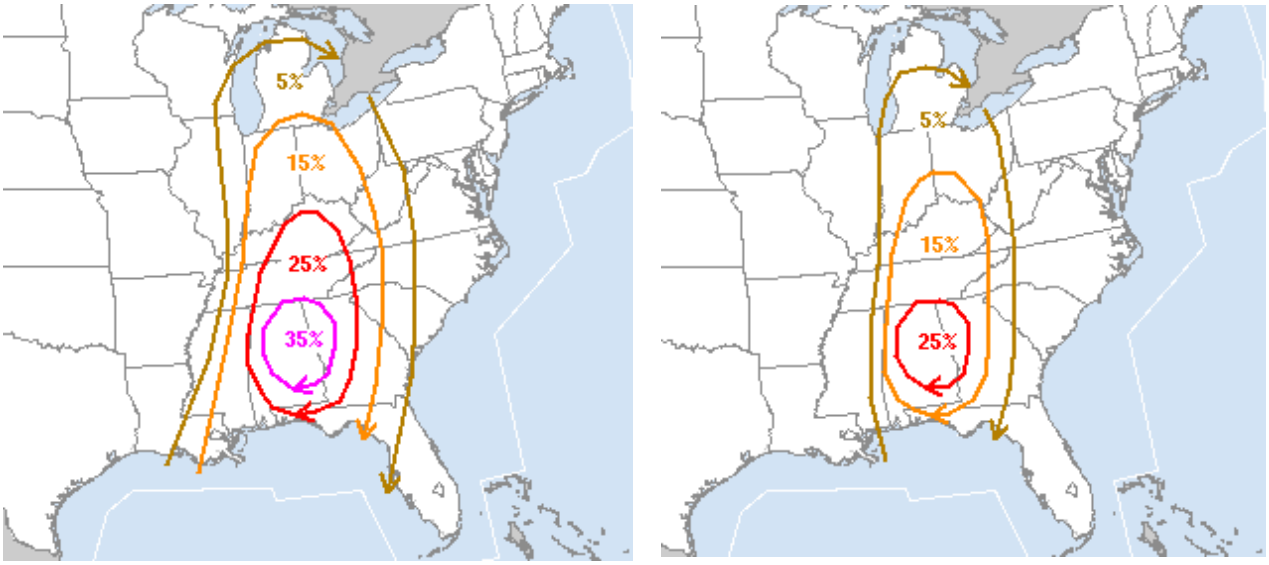


Figure 7: Surface analysis valid 00 UTC, 29 November 2005 (University of Wyoming).