Severe Weather Event of 15 November 2005

FIC Report by Bill Schaub, 20 November 2005

Event Summary

This report is on the severe weather that occurred in the Huntsville County Warning Area (HUN CWA) during the evening of 15 November 2005. This event was publicized well ahead of time by the Storm Prediction Center (SPC) and NWS forecast offices in the region. It started with a Day Three Convective Outlook early on 13 November that included northwest Alabama in a slight risk area for severe thunderstorms on 15 November. Our Hazardous Weather Outlook (HWO) on 13 November also mentioned the possibility of severe weather on 15 November. In a Day Two Convective Outlook issued early on 14 November, the SPC put that part of the HUN CWA from I-65 westward under a moderate risk for severe storms, with a slight risk for the remainder. The 15 November 0600Z Day One Convective Outlook was the same except for a high risk area, centered on the Missouri boot heel area, which touched the far northwest corner of Alabama. Then the 15 November 1300Z issuance expanded the high risk area which included northwest Alabama (see Fig. 1).

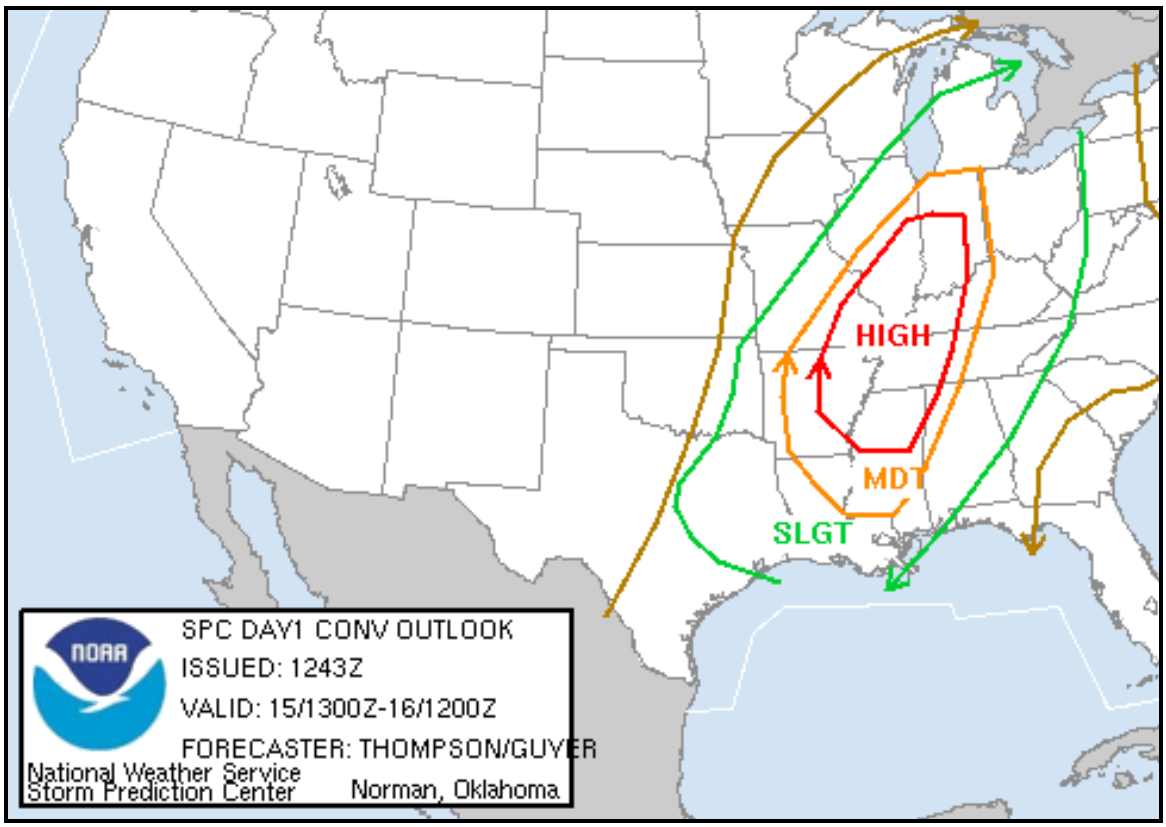

Fig. 1. Day One Convective Outlook issued by the Storm Prediction Center (SPC) for 15 November 2005.

The event produced a concentrated area of severe weather, including several tornadoes, mainly in that part of the high risk area to our northwest and north as shown in Fig. 2. A confirmed F0 tornado in Cullman county Alabama has not been posted to the graphic yet. In the HUN CWA, there was a mixture of large hail, damaging winds, and tornadic weather in parts of northern Alabama between 6 pm and 11 pm. The first three warnings (two SVRs and 1 TOR) were associated with a prefrontal band of storms, while the last five warnings (4 SVRs and 1 TOR) were due to storms within a solid line of convection along a sharp cold front. As of the date of this report, 5 of the 6 SVRs and 1 of the TORs have been verified.

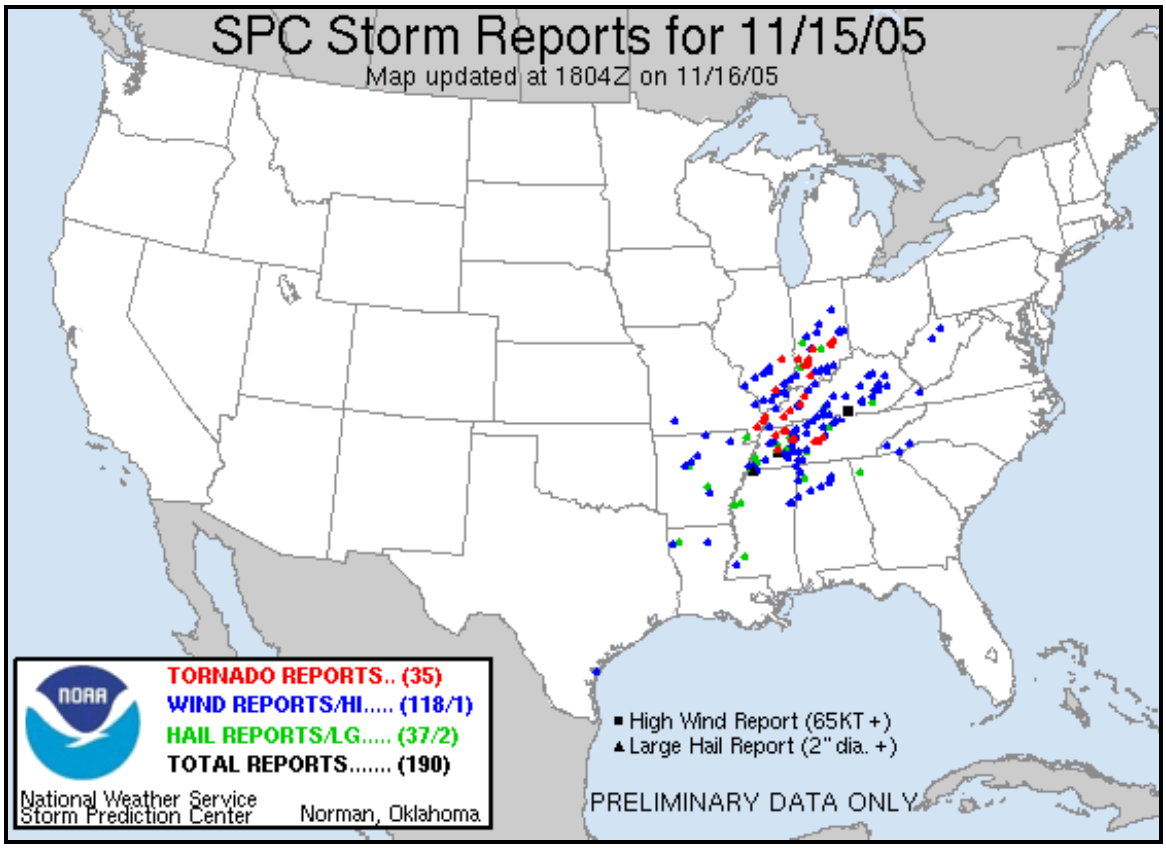

Fig. 2. Severe weather reports from the Storm Prediction Center (SPC) for 15 Novemeber 2005.

The LMA data in general was weak and of little help in the warning decision making process. In contrast, the cloud-to-cloud (CG) lightning was frequent to continuous at times. Consider if you will the severe bow echo that produced a F0 tornado at 830 pm in Crane Hill in west-central Cullman county. The southern end of the bow produced a huge spike in the VIL to 58 kg m^{-2} at 830 pm and 67 kg m^{-2} at 834 pm, while the LMA was weak and showed very little change. The CG lightning was frequent based on the 15-minute data, and showed about a 1 to 3 ratio of positive to negative strokes. The best surge in the LMA occurred in west-central Jackson county as a north-south line of storms, with two or three tiny bows embedded, moved through between 930 pm and 940 pm. In this case, the LMA went from 24 counts at 934 pm to 123 counts at 938 pm,

while the VIL as seen from the KOHX radar was very weak. In this instance, the LMA implied a strong updraft, but no reports of significant weather were received. A disruption in the CG lightning data feed during this time made comparison with the LMA impractical.

Due to the expected extent of severe weather, schedule changes were made on 14 November to increase available staff on 15 November. The event began with seven meteorologists and an electronics technician on hand. Thus, the entire event went very smoothly due to good staffing, and no technology or equipment problems occurred. Tornado watches were in effect for western and central sections of the HUN CWA until 11 pm, and for the eastern section until 1 am on 16 November. In both cases, counties were cleared from west to east prior to the watch expiration times.

Synoptic Discussion

A large pool of very cold air (-35°C to -40°C) at 500 mb covered western Canada on 14 November, and a 500-mb trough was developing over the north-central states, The trough gained amplitude during the day, as the cold air assumed a southeast trajectory in response to ridging over the eastern Pacific. By 15 November, the trough had amplified with its base down over the southern plains, and the coldest air (around -30°C) was over the central plains. Elsewhere over the southeast quadrant of the country, the Gulf of Mexico had opened with a vast warm sector over the region. Within the warm sector, strong advection of warm moist air was occurring. Such was the highly baroclinic situation, that by 1200Z an 850-mb axis of wind confluence with a 40-55 kt jet extended from the Arklatex to over western sections of Tennessee and Kentucky. The 850-mb jet maintained that intensity throughout the day, and at 6 pm it was oriented over central Mississippi, northwest Alabama, and central sections of Tennessee and Kentucky.

As the system moved east during 15-16 November, a strong surface front swept from the central states early on 15 November to the Appalachians by early on 16 November (see Figs. 3 and 4). During the day on 15 November, a line of thunderstorms developed a few miles ahead of the cold front, apparently as a result of outflow from nearly solid convection along the front. By 6 pm (16 November 0000Z), the lead line was into northwest Alabama with the band of frontal convection close behind. Figure 5 shows this in a four panel screen capture of KGWX radar data. The composite reflectivity at the time indicated a mix of bowing line segments and discrete cells in both convective lines, and the 0.5-degree SRM showed rotational couplets in both. The echo tops panel shows that the cells were relatively low-topped, and the VIL was enhanced mainly in those cells with bowing characteristics. As the evening progressed, the instability gained during the day gradually waned as usual, and the severe threat ended with passage of the cold front.

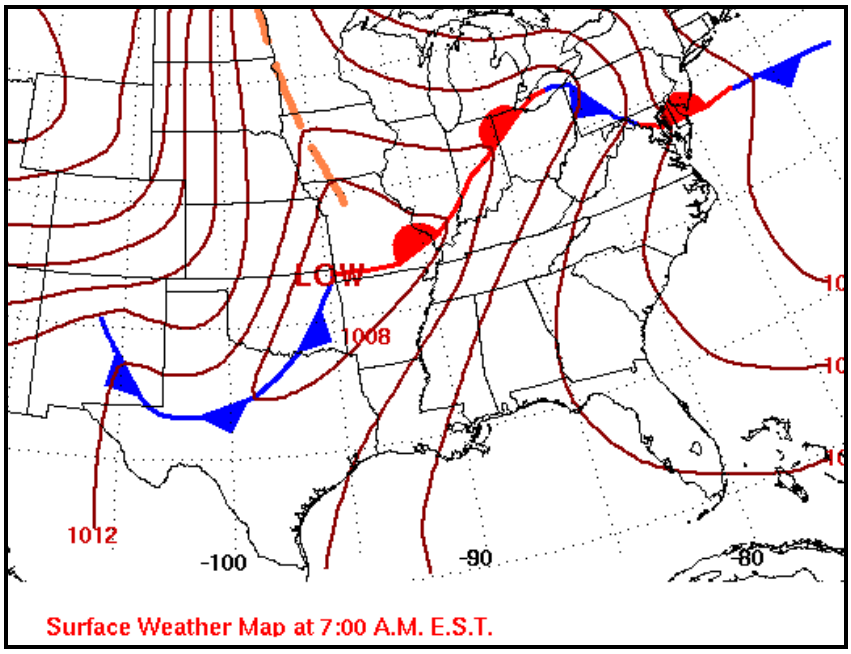

Fig. 3. Surface analysis for 1200Z on 15 November 2005 by the Hydrometeorological Prediction Center.

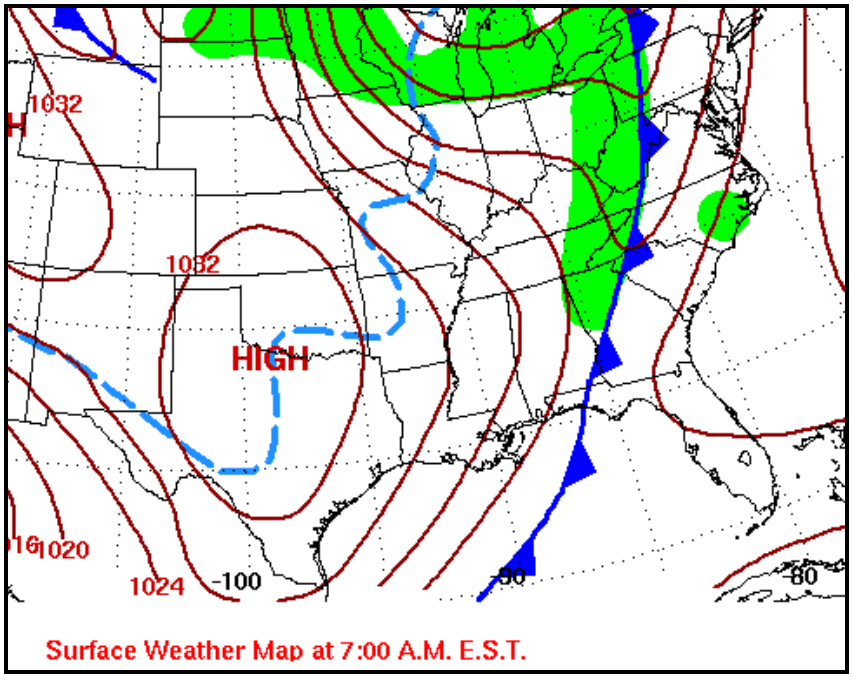

Fig. 4. As in Fig. 3 except for 16 November 2005.

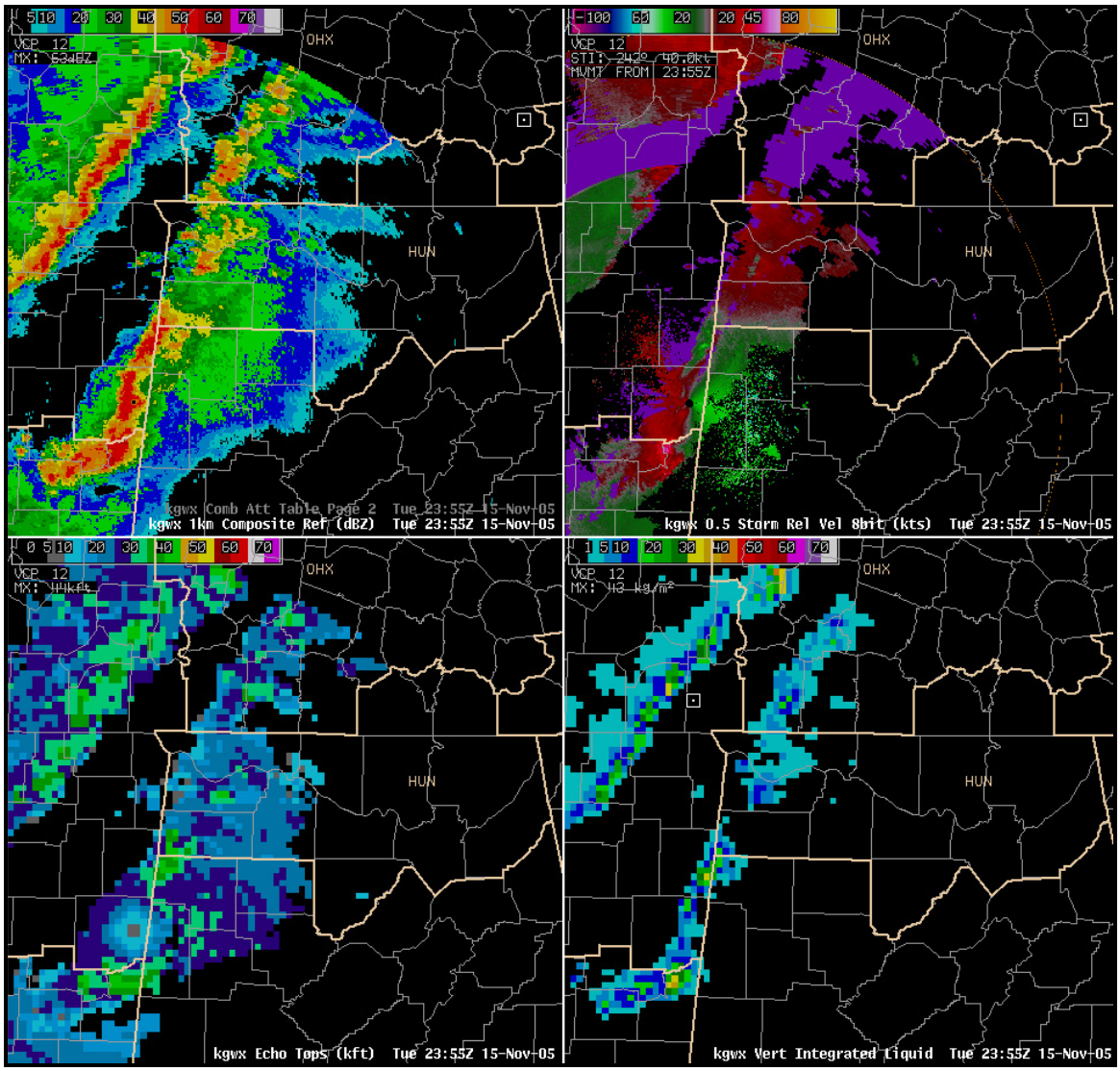

Fig. 5. From left to right and top to bottom, KGWX radar data on 1-km composite reflectivity (dBZ); 0.5-degree storm relative velocity (kt); echo tops (ft x 10^3), and vertically integrated liquid (kg m^{-2}) for 2355Z on 15 November 2005.