

### 3A.6

## ANALYSIS OF DATA FROM THE 2008 SUPER TUESDAY SEVERE WEATHER OUTBREAK: AN ARKANSAS PERSPECTIVE

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### 1. INTRODUCTION

The Super Tuesday Severe Weather Outbreak occurred across portions of the mid-South and Ohio Valley regions of the United States on February 5 and 6, 2008. Early in this outbreak, Arkansas was affected by twelve tornadoes, and there were dozens of reports of severe wind gusts and large hail. Tornadoes spawned during this event caused fourteen fatalities across the state, thirteen of which were associated with a record long track tornado, which was on the ground for over two hours.

### 2. ARKANSAS SEVERE WEATHER EVENT: 5 February 2008

The severe weather event began in northwest Arkansas at 1:40 pm CST, when a 70 mph gust was reported near the town of Gentry (Benton County). Severe weather was last reported in eastern sections of the state at 9:32 pm CST, when thunderstorm winds damaged roofs and downed trees in the Helena-West Helena (Phillips County) area. There were thirty reports of severe thunderstorm wind gusts across the state during this period. One of these reports was from Little Rock Adams Field (Pulaski County), with a 67 mph gust at 7:13 pm CST. This was among the highest gusts ever in Little Rock (Table 1), where surface observations have been collected dating back to 1879.

Date	Gust (MPH)
1 Jun. 1999	87
24 Mar. 1996	73
11 Jun. 1999	70
23 Jun. 1987	69
5 Feb. 2008	67
3 Jun. 2007	66
25 Apr. 1961	65
20 Aug. 1993	64
11 Mar. 1997	64
31 Jan. 1973	62

Table 1: Record wind gusts reported at Little Rock.

There were thirty one reports of 3/4" inch hail or larger. One thunderstorm produced baseball sized hail just south of Hamburg (Ashley County) around 3:30 pm

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CST, and up to softball sized hail a few miles south and east of Dermott (Chicot County) around 4:00 pm CST.

Twelve tornadoes were produced in Arkansas during this event (Table 2).

Tornado	Start Time (CST)	Rating	Length (miles)
1	15:26	EF1	.6
2	16:04	EF0	1.1
3	16:27	EF0	.2
4	16:49	EF4	122
5	17:02	EF2	12.5
6	17:31	EF0	.6
7	19:05	EF1	5.5
8	19:19	EF0	.1
9	19:20	EF1	31.9
10	19:30	EF0	7
11	19:48	EF0	8
12	19:59	EF0	.1

Table 2: Tornadoes in Arkansas 5 Feb 2008.

A majority of the tornadoes were rated as EF0 or EF1 on the Enhanced Fujita Scale and were short lived (less than two miles). Only two tornadoes were rated EF2 or greater, but they were responsible for all fatalities during the event (Figure 1).

One of these tornadoes (rated EF4) lasted for 122 miles, the longest track length in the state since 1950 (Table 3).

Date	Track Length (miles)
5 Feb. 2008	122
20 Feb. 1951	112
30 Apr. 1954	92.4
20 Mar. 1955	89.4
24 Dec. 1982	63

Table 3: Tornado track lengths in Arkansas since 1950.

### 3. SYNOPTIC AND MESOSCALE ANALYSIS

A cold front pushed into Arkansas from the northwest during the afternoon of February 5 (Figure 2). Ahead of the front, record or near record high temperatures in the 60s and 70s were occurring, with 30s and 40s just

behind the boundary. This strong baroclinic zone provided a focus for convection.

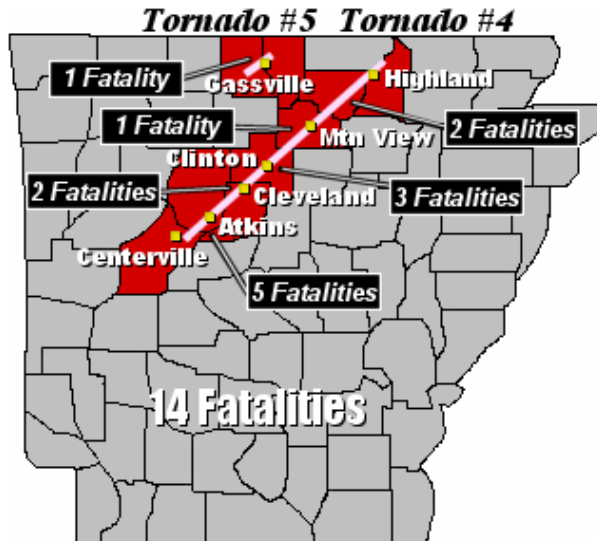


Figure 1: Fatalities in Arkansas during the Super Tuesday Outbreak caused by tornadoes #4 and #5 in Table 2.

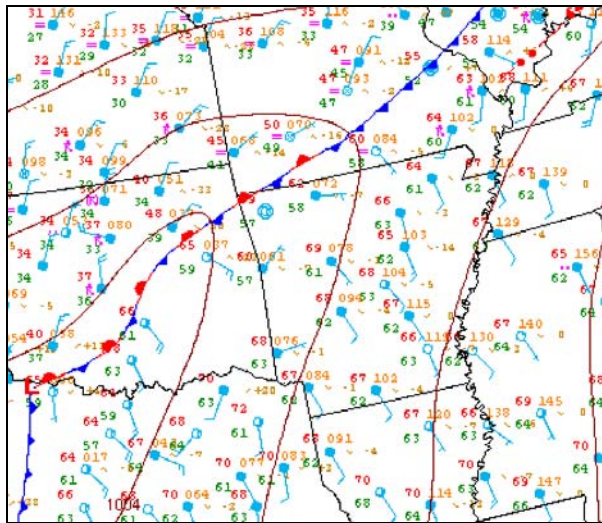


Figure 2: Surface analysis at 18 UTC 5 Feb 2008.

While the front was moving into Arkansas, a deep trough was approaching from the High Plains. A strong upper level jet, and associated diffluence, provided favorable support for organized convection (Figure 3).

During the early morning, convection was suppressed by pronounced convective inhibition (Figure 4). Notable speed and directional shear was already in place, as indicated by a 0-1km helicity value of 234 m2/s2.

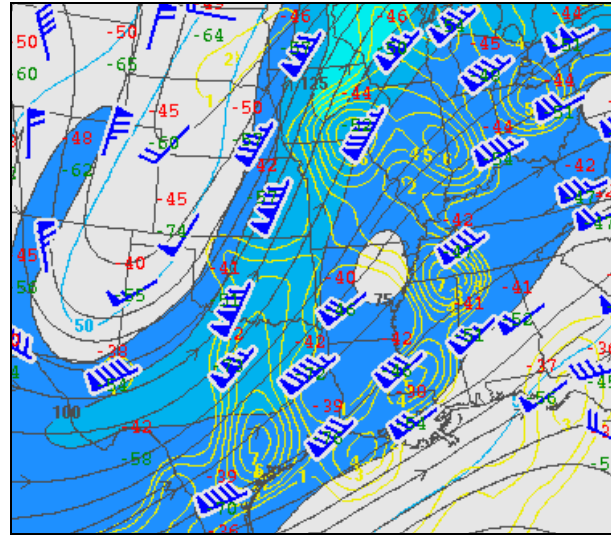


Figure 3: 300 mb analysis at 00 UTC 6 Feb 2008.

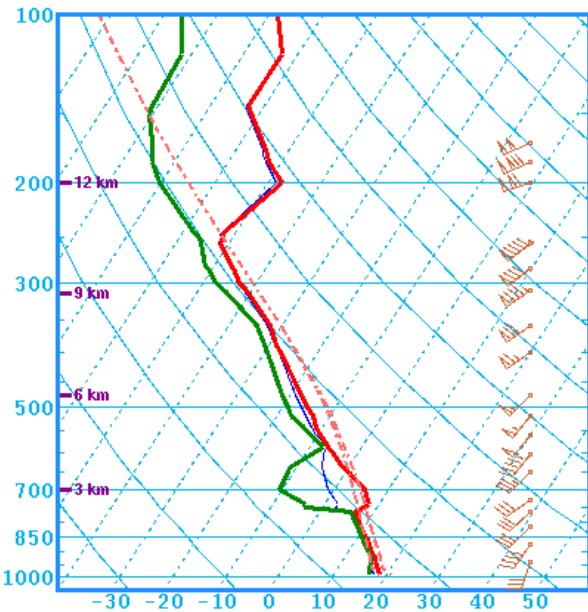


Figure 4: Little Rock sounding at 12 UTC 5 Feb 2008. 0-1km helicity was computed at 234 m2/s2.

By 00 UTC on February 6 (Figure 5), the cap had eroded with winds in the lowest 1 km increasing (mostly between 40 and 60 knots) and a 0-1 km helicity value of 294 m2/s2 (Figure 5).

Favorable low level shear for tornadogenesis was noted across all but extreme northwest portions of the state (Figure 6). 0-1 km helicity values had climbed to over 400 m2/s2 in eastern sections of the state.

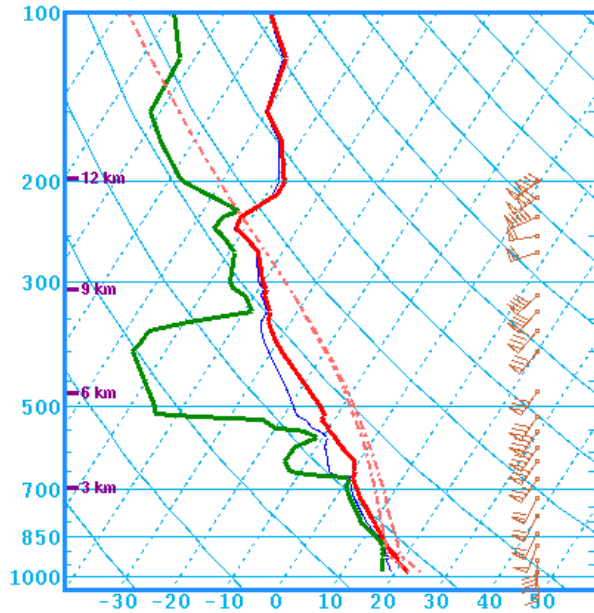


Figure 5: Little Rock sounding at 00 UTC 6 Feb 2008.

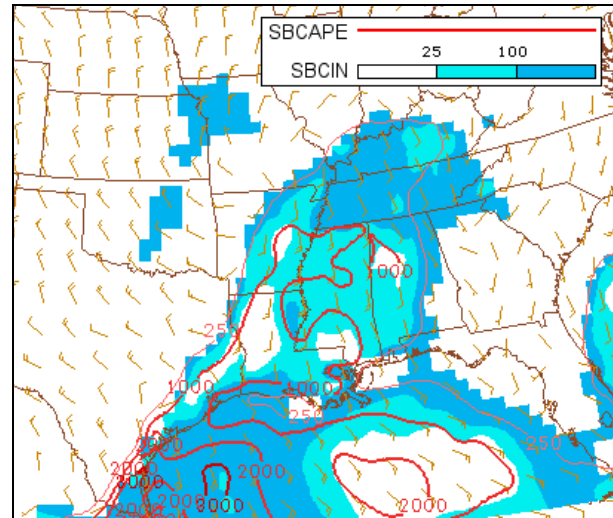


Figure 7: Surface based CAPE (J/kg) and CIN (J/kg) valid at 00 UTC 6 Feb 2008.

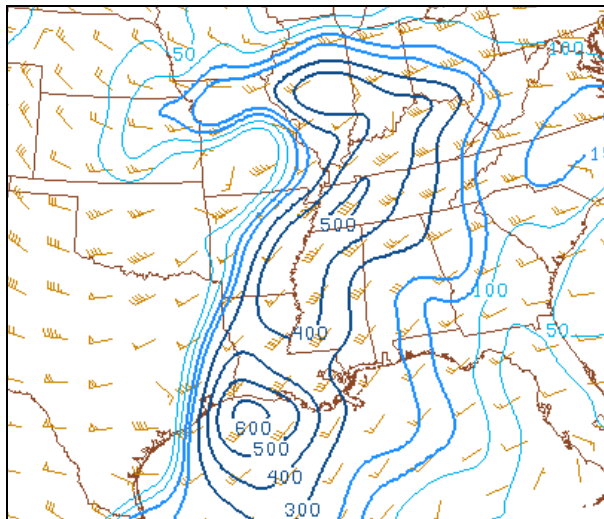


Figure 6: 0-1 km helicity (m<sup>2</sup>/s<sup>2</sup>) at 00 UTC 6 Feb 2008.

Instability analysis at 00 UTC 6 Feb 2008 (Figure 7) indicated that surface based instability across the state was generally 1000 J/Kg or less. While these values appear modest with regard to spring severe weather events, they were sufficient enough to support cool season significant tornadoes (Davies 2006).

As the event unfolded, National Weather Service (NWS) Little Rock meteorologists were focused on an isolated tornadic supercell (A in Figure 8), followed closely by a line of severe thunderstorms that produced damaging wind gusts (B in Figure 8).

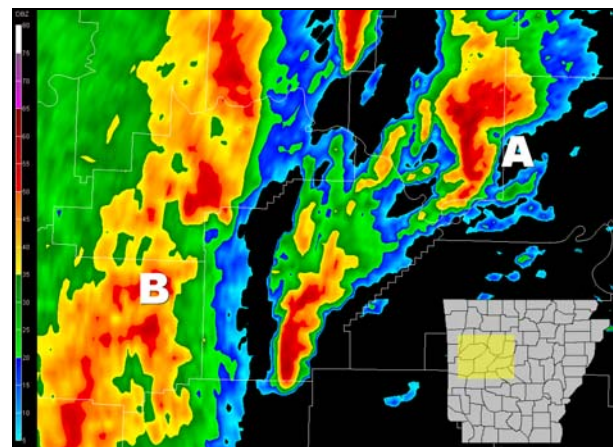


Figure 8: LZK WSR-88D 0.5 degree base reflectivity at 2302 UTC 5 Feb 2008.

The tornado spawned by this supercell formed in the Arkansas River Valley, approximately 1.6 miles south-southeast of Neely (Yell County). Once the tornado crossed the river into Pope County, it strengthened rapidly.

Atkins (Pope County) was one of the first areas devastated by the tornado, which reached the town around 5 pm CST on February 5 (Figure 9). The tornado was responsible for five fatalities in Atkins. Also, damage in and near town was extensive (Figure 10).

The supercell continued to move northeast around 50 mph. At 5:19 pm CST, the tornado was bearing down



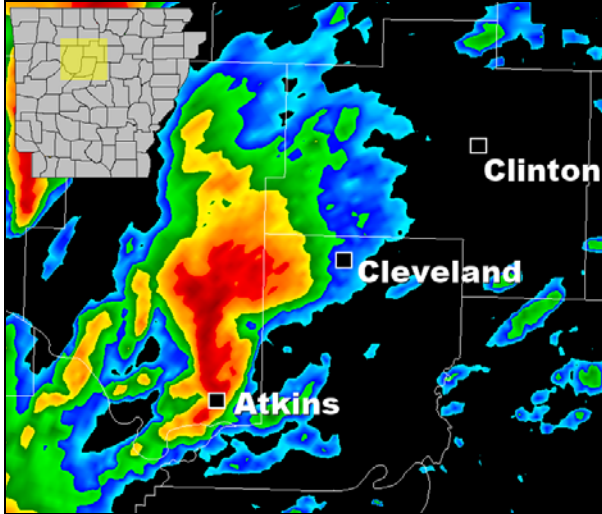


Figure 9: The long track supercell and associated tornado was near Atkins (Pope County) at 2302 UTC 5 Feb 2008.

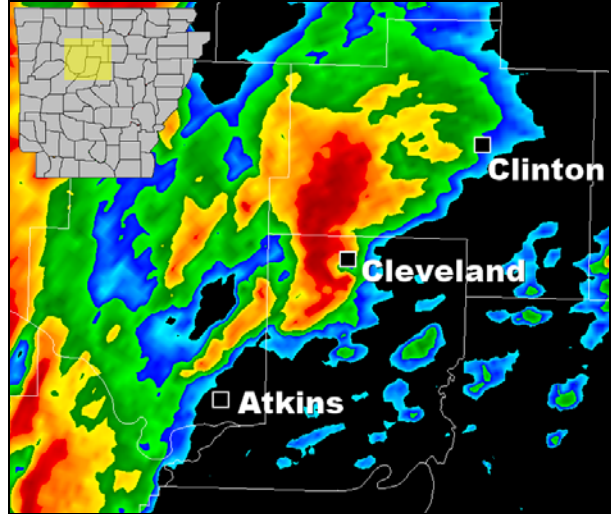


Figure 11: The long track supercell and associated tornado was near Cleveland (Conway County) at 2319 UTC 5 Feb 2008.



Figure 10: Damage produced by the long track tornado at Lucky Landing, 3 miles south of Atkins (Pope County).



Figure 12: There was nothing left of a mobile home 3.2 miles south-southwest of Cleveland (Conway County).

on Cleveland in Conway County (Figure 11). An elderly couple was killed a few miles south-southwest of town when their mobile home was destroyed (Figure 12).

By that time, there were several reports of tornado damage received by meteorologists at the NWS Little Rock forecast office. At 2323 UTC, a Tornado Warning for Van Buren County mentioned that “spotters have confirmed a tornado 18 miles southwest of Clinton.”

The tornado approached Clinton (Van Buren County) around sunset (Figure 13). The tornado produced damage rated EF4 on the Enhanced Fujita Scale. Up until this point, the worst damage was rated EF3. The

tornado destroyed numerous homes and businesses in town, including a boat factory (Figure 14).

Over twenty workers in the boat factory sought shelter before the tornado arrived. However, one person remained in the factory, and was killed when the tornado destroyed the building. In Van Buren County, there were a total of three fatalities.

The supercell and associated tornado progressed through Stone, Izard and Sharp Counties, hitting the communities of Mountain View (Stone County), Zion (Izard County) and Highland (Sharp County). There were three more fatalities in these areas.

At Mountain View (Stone County), a car dealership was destroyed, and a car from the dealership was

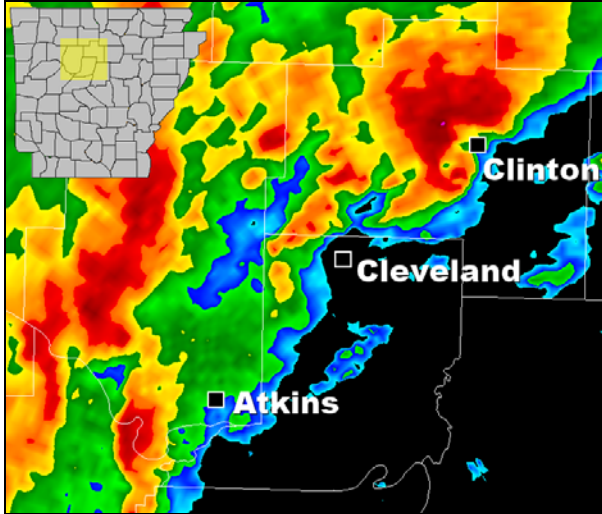


Figure 13: The long track tornado was near Clinton (Van Buren County) at 2336 UTC 5 Feb 2008.



Figure 14: A boat factory was leveled at Clinton (Van Buren County).

thrown over several professional buildings across the street. Near Zion (Izard County), an unofficial measurement from equipment used by a local weather enthusiast recorded a 158 mph gust before the instrument was blown away from where it was installed (Figure 15).

The tornado quickly dissipated just southeast of Hardy (Sharp County). This was approximately two hours and seven minutes after the tornado formed.

**4. POST STORM DAMAGE SURVEYS:  
TRANSLATING THE LONG TRACK TORNADO PATH  
INTO A GEOSPATIAL FORMAT**

The day following the severe weather event in Arkansas, attention turned to mitigation efforts of the

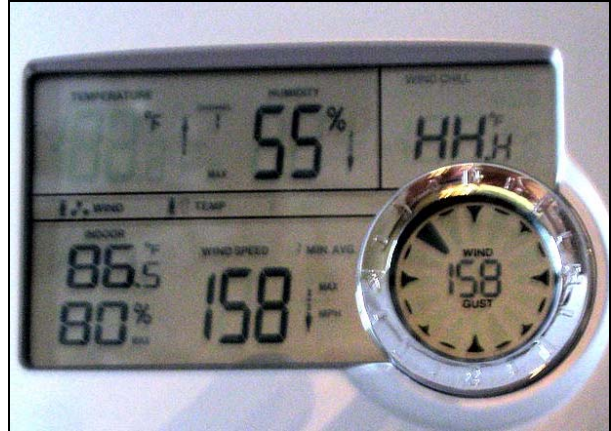


Figure 15: A 158 mph wind gust was recorded near Zion (Izard County) around 0035 UTC on February 6. The photo is courtesy of Josh Lung.

damage caused storms, especially the long track supercell and associated tornado.

NWS Little Rock received requests from national, state, and local agencies to provide locations where the greatest damage occurred to help with relief efforts. To obtain this information, ground surveys took place for several days. GPS units were integrated with mapping software to render georeferenced data that described damage locations (Figure 16).

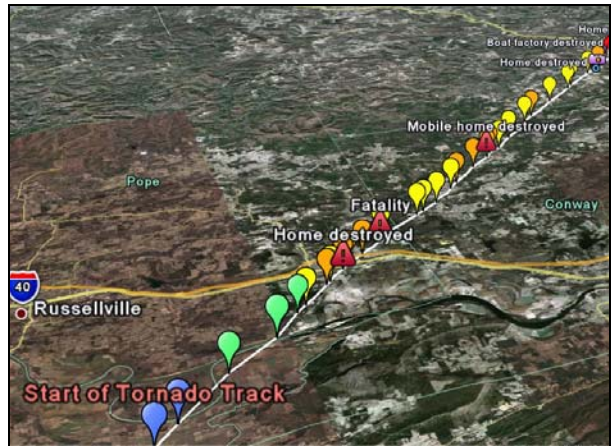


Figure 16: A segment of the long track tornado in Google Earth. Bubbles reveal georeferenced data, including EF-Scale ratings, damage pictures, and path widths.

There were several areas where no roads were available. To cover the track completely and to confirm damage was continuous, NWS Little Rock performed an aerial survey on February 9.

Georeferenced data was collected by other parties as well. All data was submitted to the Arkansas Geographic Information Office (AGIO), and was made readily available.



All collected data allowed NWS Little Rock to provide the best possible information about the track of the deadly tornado, including perspectives on how it interacted with the terrain (Figure 17).

November 2005 Evansville, Indiana Tornado. 23<sup>rd</sup> Conference on Severe Local Storms.4.3

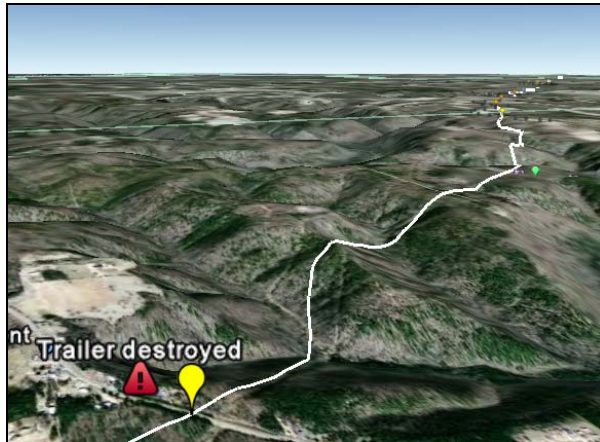


Figure 17: The long track tornado changed direction often in the high terrain between Clinton (Van Buren County) and Mountain View (Stone County) as shown in Google Earth.

## 5. SUMMARY

The Super Tuesday severe weather outbreak on February 5 will be remembered for two killer tornadoes and fourteen fatalities in Arkansas. One of the tornadoes tracked a record 122 miles through seven counties in northern sections of the state.

Damage caused by this long-lived tornado was surveyed extensively. The surveys identified where relief efforts were most needed, and yielded a dataset that will help explain the behavior of the tornado.

While this dataset reveals how the tornado moved through terrain features in applications such as Google Earth, it does not explain why the tornado persisted for over two hours and then rapidly dissipated. This will require further investigation into the mechanisms that sustained the tornado, as well as the forces that contributed to its demise.

## 6. ACKNOWLEDGMENTS

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## 7. REFERENCES

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