



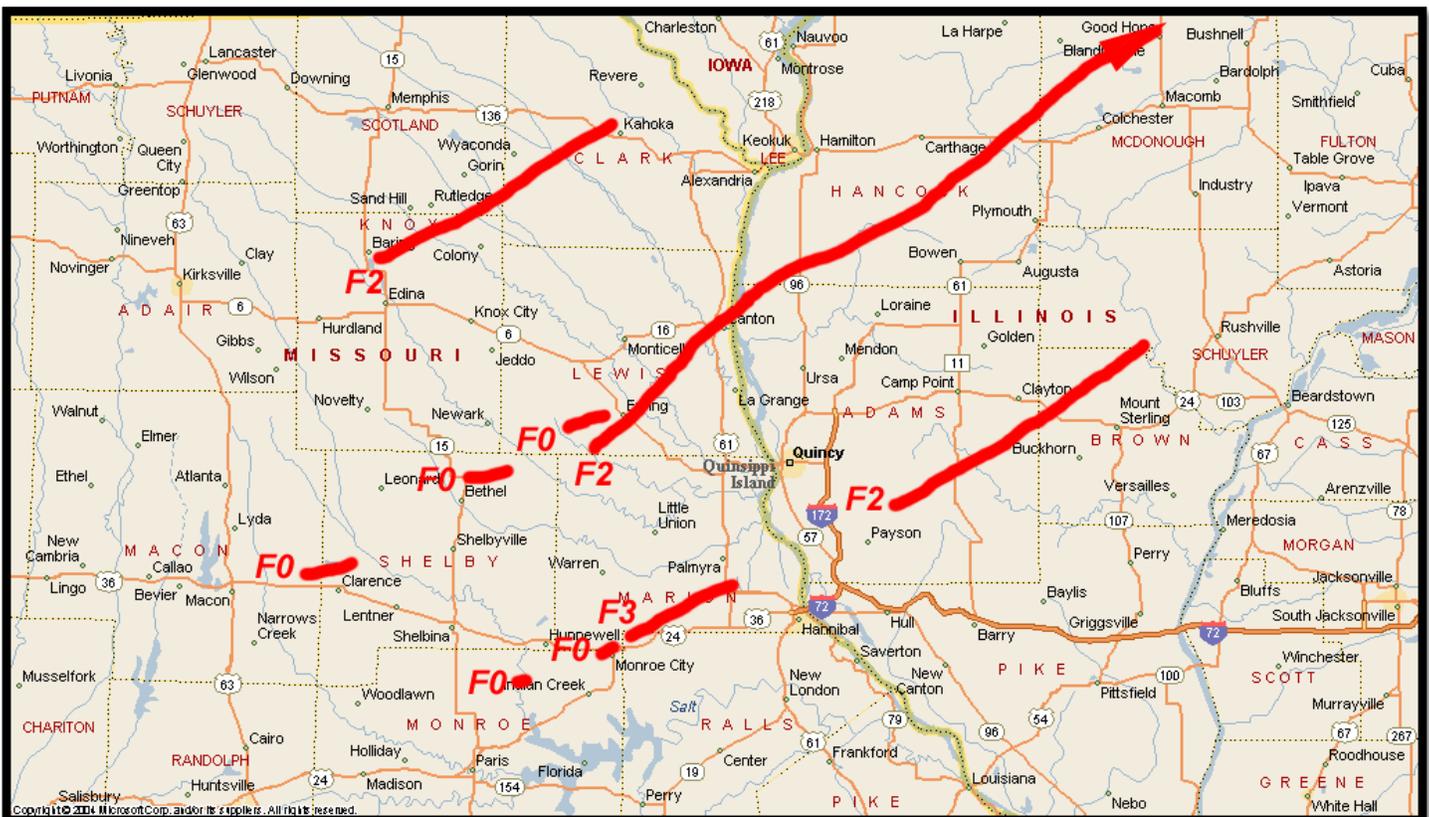
Tornado Outbreak

May 10th, 2003

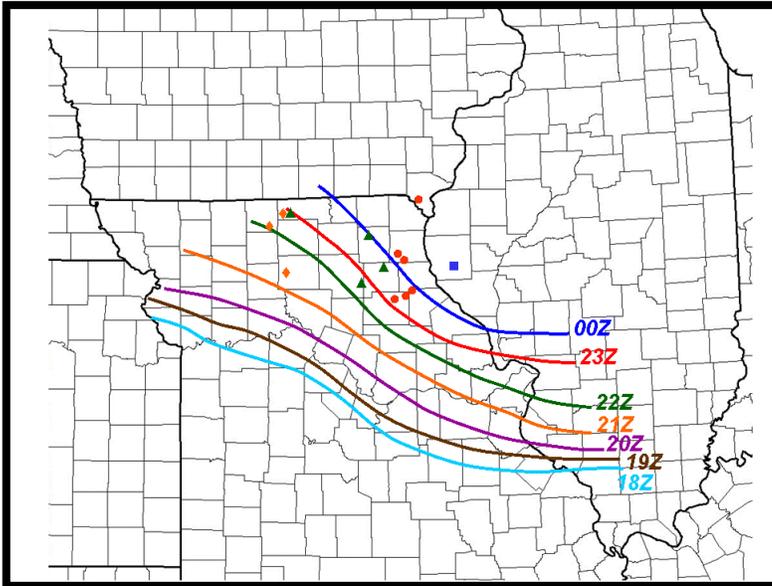
Overview

The period from May 4-10th, 2003 was one of the most active severe weather periods documented in United States History. A record 393 tornadoes occurred across portions of the central and eastern United States. The culminating event was a tornado outbreak which affected the mid-Mississippi Valley on May 10th. Nine tornadoes were documented in northeast Missouri and west-central Illinois within the County Warning Area for the National Weather Service Office in St. Louis. Of the nine tornadoes, four of these were classified as strong (F2 or F3) and long tracked with path lengths >10 miles. The Canton-Lima tornado had the longest documented track of 89 miles and a peak width of 30 yards. Despite damage estimated at 5-7 million dollars, there were no fatalities and only 10 minor injuries. This great fortune was due to the fact that the tornadoes occurred over primarily rural areas and tornado warnings had an average lead time of 23 minutes.

The tornadoes across northeast Missouri and west-central Illinois were produced by three discrete cyclic supercells. The supercells formed over western Missouri along a pronounced dryline, with supercell convective modes noted 40-50 minutes after the initial convective cells. Tornado production for each of the three supercells did not transpire until 1-2 hours after supercell characteristics were first observed. Each supercell produced multiple tornadoes, each successively stronger. While the large scale and mesoscale environment that day seemed supportive of tornadic supercells over a large portion of the Mississippi Valley, the majority of tornadoes were confined to the north of a retreating outflow boundary, where winds were locally backed and the Lifting Condensation Level (LCL) heights were lower. Notable changes were observed in storm structure with each of the three highlighted supercells upon crossing the outflow boundary and prior to producing the strongest tornadoes. The three supercell thunderstorms morphed from classic "flying eagle" structures with low-level appendages and hook echoes, to High Precipitation structures with smaller overall vertical and horizontal dimensions. Storm splits and cell mergers were also noted, as well as an overall decrease in the highest radar reflectivity levels.

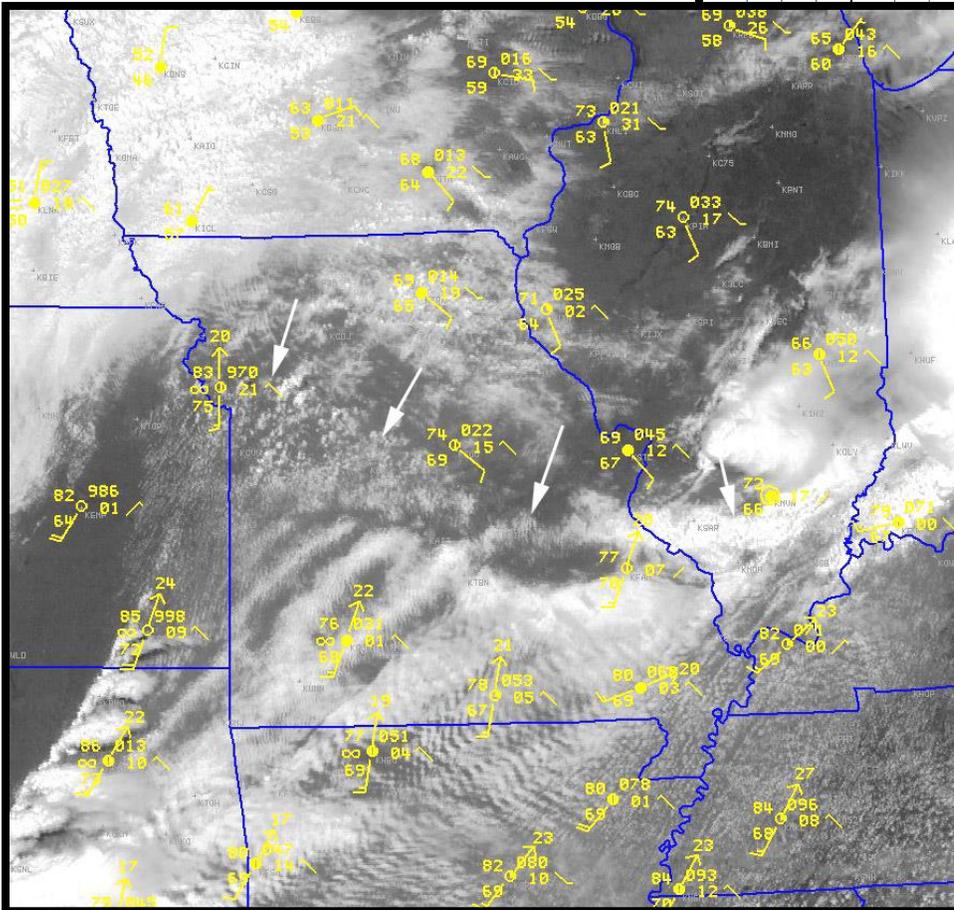
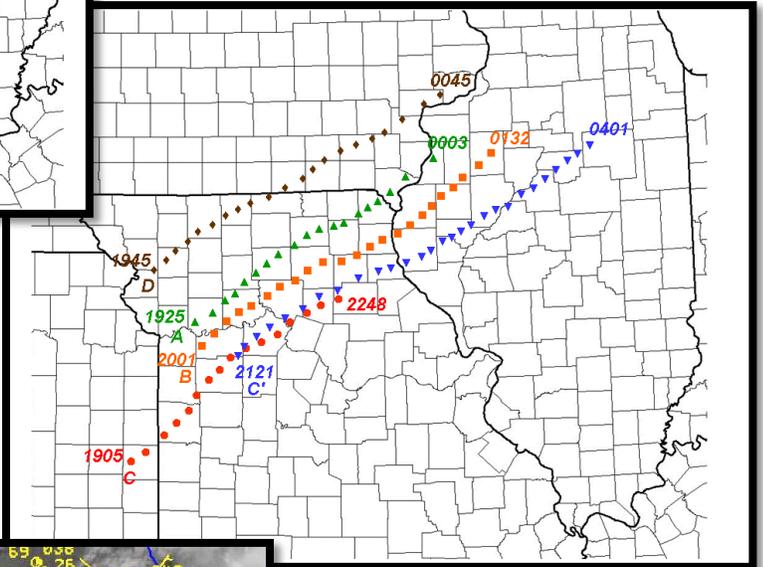


Storm Tracks



Hourly isocrones of subjectively analyzed outflow boundary positions from 1800 UTC 10 May until 0000 UTC 11 May. Annotated marks represent tornado touchdowns. Color of the marker corresponds to the hour preceding the same colored boundary position (e.g. red markers are tornado touchdowns between 2300-2359).

Plot of the maximum radar reflectivity centroid tracks of selected supercells (annotated A-D). The first point is the initial cell with subsequent positions every 15 minutes. Annotated times are UTC.



GOES visible satellite image at 1800 UTC 10 May with selected METARs in yellow. Arrows denote position of the outflow boundary.

Damage Surveys

Supercell A

Baring-Edina Tornado

A damage survey completed by National Weather Service personnel of Knox County, Missouri revealed a 7 mile long tornado path from just north of Edina, Missouri to the Knox-Scotland County Line. The tornado first started about 4 miles north of Edina along Highway EE. Three power poles were snapped off and a couple of trees were damaged. The tornado strengthened as it moved northeast causing damage along County Road 44, Highway K, and County Road 48. Numerous trees were mangled, farm outbuildings were destroyed and power lines downed. A home along County Road 48 suffered major damage losing it's roof and one wall. The damage at this point was rated F2, the strongest along this tornado path. The width of the damage at this point was about 200 yards. The damage path continued northeast downing trees and power lines. It crossed Highway V just west of County Road 76. Along Highway V, two grain bins were destroyed, an old abandoned house was destroyed, and a home lost its garage and part of the roof. The tornado continued northeast and crossed into Scotland County near the North Fabius River.



**Tornado Photo
(Between
Edina and
Baring)**

**Tornado Photo
(Between Edina and
Baring)**



Damage Surveys

Supercell B

Ewing-Canton Tornado

A strong tornado struck Canton, MO during the early evening hours on May 10, 2003. After leaving a path of destruction from near Ewing northeast to the intersection of Highway 61 and Highway P, the tornado entered the Canton area about 6:25 pm CDT. The area hit first was the County Market complex along the South Outer Road, McRoberts Road, and Oak Street. The tornado, at this point reaching high end F2 strength, collapsed the roof of the County Market, and severely damaged the roof and walls of the Comfort Inn. Virtually all the windows on the west and south side of the motel were also broken. Across Oak St. a home suffered serious damage losing its roof and one exterior wall. The tornado traveled northeast and moved across the campus of Culver-Stockton College. The College Field House roof was flattened by the tornado as it continued at F2 intensity. Just hours earlier, the Field House had been full of people attending the graduation ceremony, but no one was there when the tornado hit. The entire roof and a small portion of an upper wall was blown off a brick fraternity house on the campus near the Field House. Other campus buildings suffered roof damage and broken windows. Numerous very large trees on campus were uprooted or mangled by the tornado. The tornado moved northeast into the main residential area of Canton next, where it weakened a bit to F1 intensity. Numerous trees were topped by the tornado, power lines downed, roofs damaged, and garages seriously damaged. Near the intersection of College St. and N 8th St., the tornado turned more north-northeast. Near Henderson and N 8th St., the tornado again reached F2 intensity. At least 8 homes suffered major roof damage and some wall damage. The tornado did its final damage in the mobile home park on the north end of town near Kimberly Drive and Business 61. Two mobile homes were smashed by the tornado and with about 6 others suffering major damage.



Tornado Damage to County Market in Canton, MO

Tornado Photo (Near Durham, MO) Photo courtesy of Chris Novy



Damage Surveys

Supercell C

Ely-Palmyra Tornado

National Weather Service personnel at St. Louis conducted a survey of the damage over parts of northeast Monroe and southern Marion counties in northeast Missouri. Results indicate that the southern-most supercell storm spawned two tornadoes, one in northeast Monroe and the second in southern Marion county Missouri.

The first tornado started in Monroe County along Highway FF near the small community of North Folk (10 miles southwest of Monroe City). Several large trees were either uprooted over snapped at the base of the trunk. Nearby machine sheds and homes sustained little if any damage. The total damage path of this tornado was one quarter mile in length and 40 yards wide. Tornado damage was rated F0 over this area.

A second tornado (Monroe City Tornado) started near the northwest city limits on Monroe City at approximately 6:35 pm CDT. The tornado moved northeast across the northern part of town. Twenty-five homes sustained varying degrees of roof damage due to fallen trees and large tree limbs over these areas. The width of the damage area was 50 yards and damage intensity was rated F0 over this area.

The tornado traveled northeast into far southern Marion County approximately one mile north of the small community of Ely Missouri (or 8 mile northeast of Monroe City). Three farmsteads sustained varying degrees of damage including damage or destroyed machine sheds, grain bins, and barns. The garage attached to a home one mile north of Ely was completely destroyed while the farm house sustained roof and side damage and was moved off its foundation. A relatively new home 200 yards to the east experienced severe damage with the roof of the home tossed over 1/3 mile to the northeast. Much of the south, and parts of the east and west walls of the home were destroyed. A nearby barn located 30 yards to the northwest was completely destroyed with debris tossed 1/4 mile to the north-northeast. Several two-by-four wood planks were driven into the ground at 45 to 60 degree angles into the ground and located 50 to as much as 150 yards downwind from the home. The damage intensity over these areas were rated high-end F2 and low-end F3. The width of the damage area was over 200 yards.

The tornado continued on a northeast path and damaged several machine sheds and homes on two additional farmsteads northwest of the town of West Ely (or 7-8 miles south-southwest of Palmyra Missouri). Numerous trees were damaged or destroyed in the path of the tornado. The width of the damage area varied from 50 to 100 yards while the damage area was rated F1. The tornado traveled across U.S. Highway 61 and 24 and dissipated four miles south of Palmyra Missouri before dissipating. One semi-tractor trailer was overturned on Highway 61 and 24. The damage path of tornado at this point was less than 50 yards and rated F0 intensity. Total damage path of the second tornado was 15 miles.



Tornado Photo SE of Palmyra. Photo courtesy of Blake Naftel (Tempest Tours)



Tornado Damage to brick home in Ely, Missouri

Damage Surveys

Liberty, Illinois Tornado

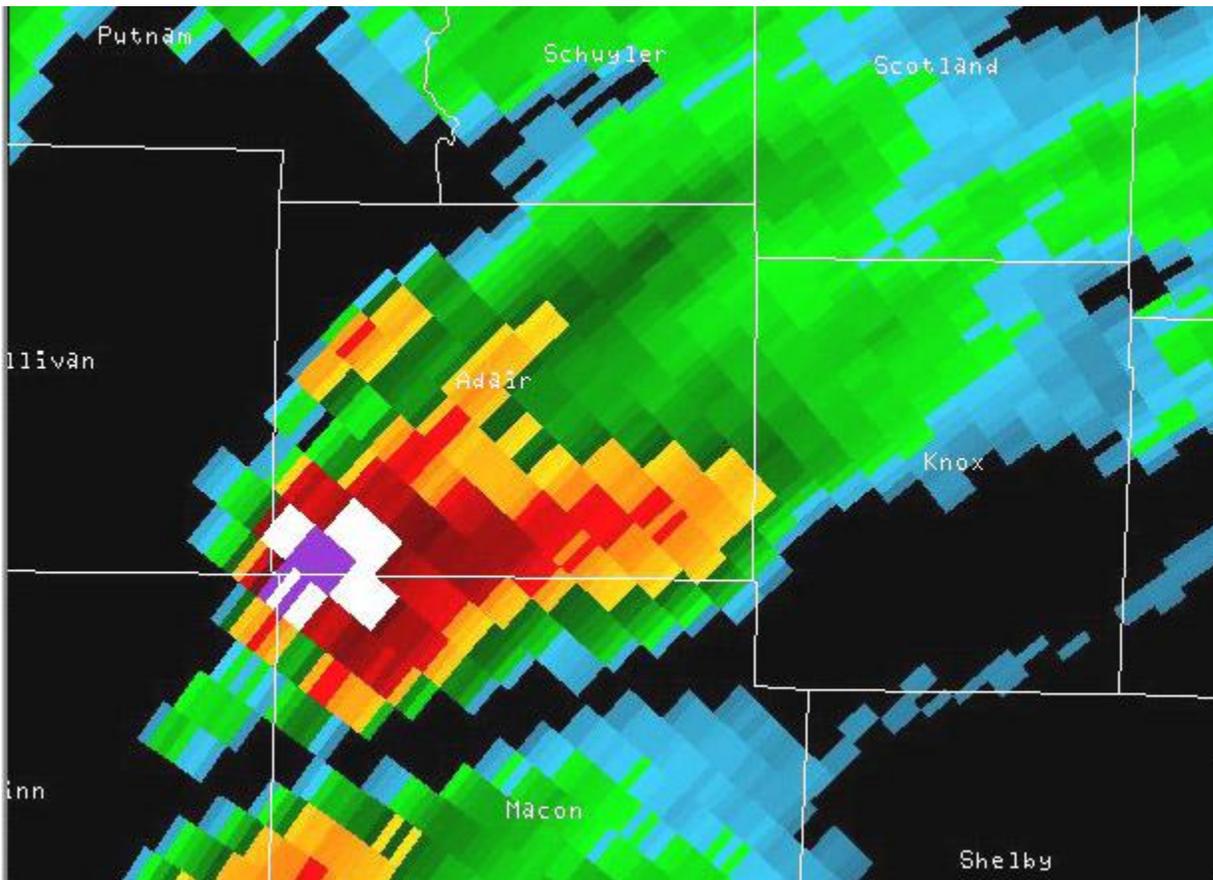
The supercell storm spawned a third tornado in east-central Adams county Illinois approximately 2 miles north of Liberty Illinois and traveled northeast into northwest Brown county Illinois. A number of barns, machine sheds and large trees were damaged or destroyed in the path of the tornado over east-central Adams county. The width of the damage area varied from 75 to as much as 150 yards and was rated F0 intensity during the early part of the path and F1 over the final 4 miles in far eastern Adams county. Tornado #3 entered northwest Brown county Illinois 11/2 miles west of the community of Timewell. Witnesses observed two separate tornadoes, approximately 1/3 mile apart west of Timewell. The damage patterns showed two distinct tracks. The northern tornado damaged one home, two out-buildings and several grain bins while the southern tornado damaged several machine sheds. The two tornadoes merged 1 mile north of Timewell and continued to cause extensive tree damage. Approximately, three miles northeast of Timewell the tornado damaged another farm stead and numerous trees. Six machine sheds were destroyed while a home sustained damage to the roof and west and south sides of the home. A number of large trees in the vicinity of the farmstead was damaged. Five miles northwest of Mount Sterling, several witnesses observed a multi-vortex pattern with several smaller tornadoes rotating around the larger funnel. The width of the damage area (mainly trees) varied from 50 to as large as 300 yards. Numerous trees were snapped at the base of the tree and tossed northeastward. The damage intensity was estimated from F1 to the lower end of F2.

The tornado continued to travel northeast crossing county road 1500 north (5 miles north-northwest of Mount Sterling). Several large trees were either snapped half-way or uprooted at this location. Damage path width ranged from 50 to as large as 100 yards while damage intensity was estimated at the lower end of F1. The tornadic damage intensified a second time as the tornado moved across Illinois Highway 99, 7 miles north of Mount Sterling. One old farm home and a large barn were completely destroyed with debris tossed 1/3 mile to the east. A second farm stead 1/2 mile east experienced damage to several machine sheds, grain bins and a barn. The nearby home sustained little damage. Several large trees in the vicinity of the barn and machine sheds were uprooted or snapped near the base of the trunk. The width of the damage pattern over this area varied from 50 to 100 yards. Damage intensity ranged from F1 to lower end of F2. The tornado lifted northeast of the second farmstead. Little if any tree damage was observed.

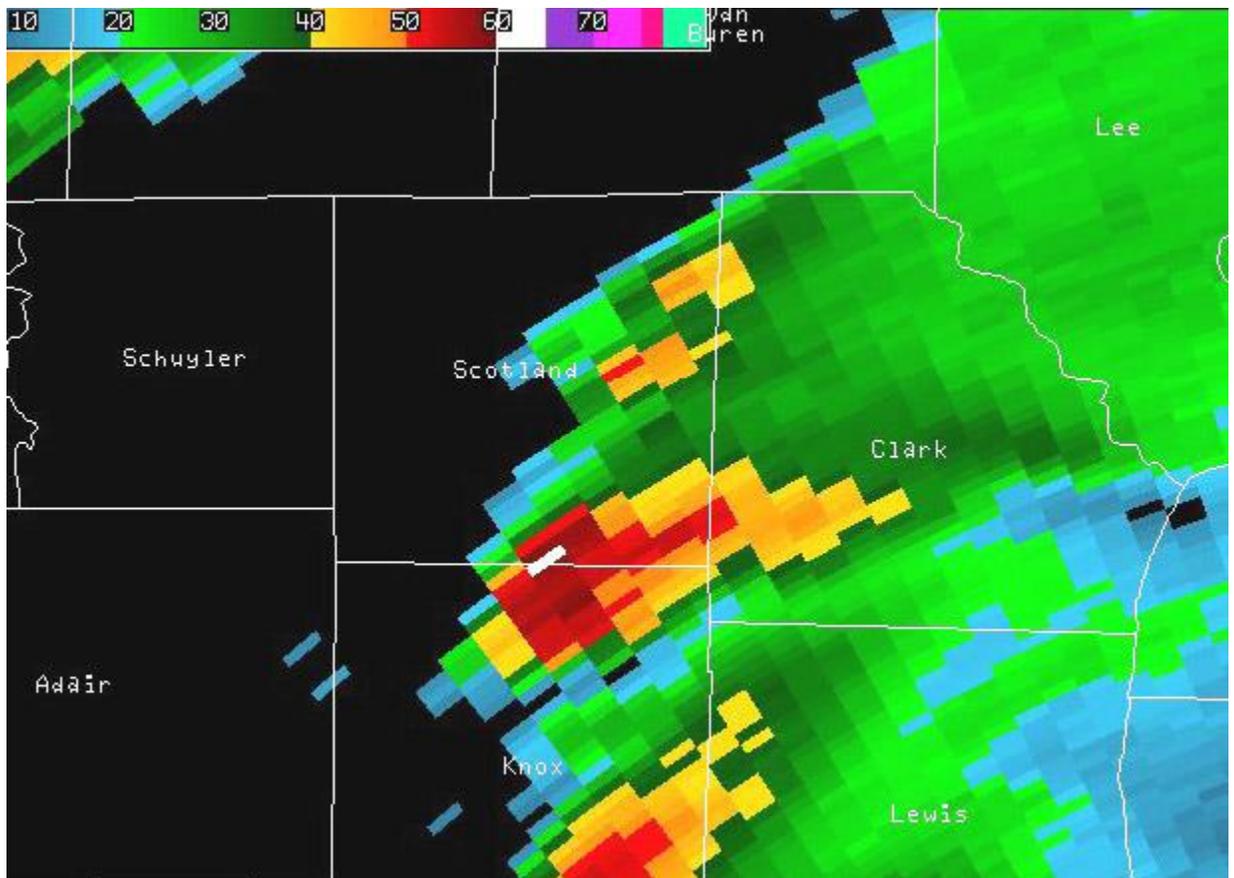
Many witnesses along the track of this tornado did not hear the classic "freight train" sound as heard in other cases. Rather they heard a "swishing" type sound. Additionally, many witnesses did not observe lightning or hear thunder as the tornado passed. I wish to thank the many storm chasers and Mr. Brian Gallaher, Chief of the Mount Sterling Fire Department for providing me valuable information and making my task easier.

Total length of the tornadic damage path of the third tornado was 26 miles, one of the longer continuous tornado damage paths in this case and recent years.

Radar Data

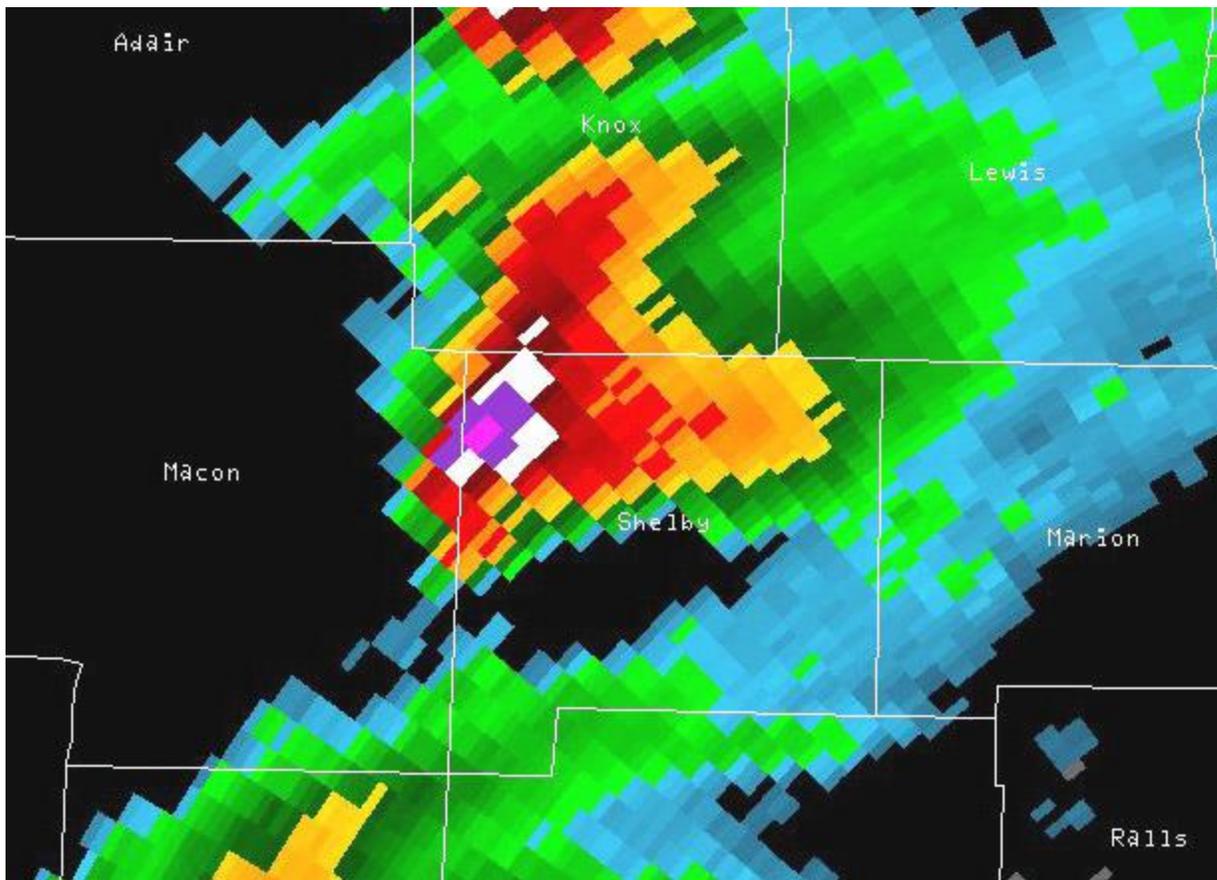


Reflectivity Image of Supercell A at 21:37Z (Prior to crossing outflow boundary)

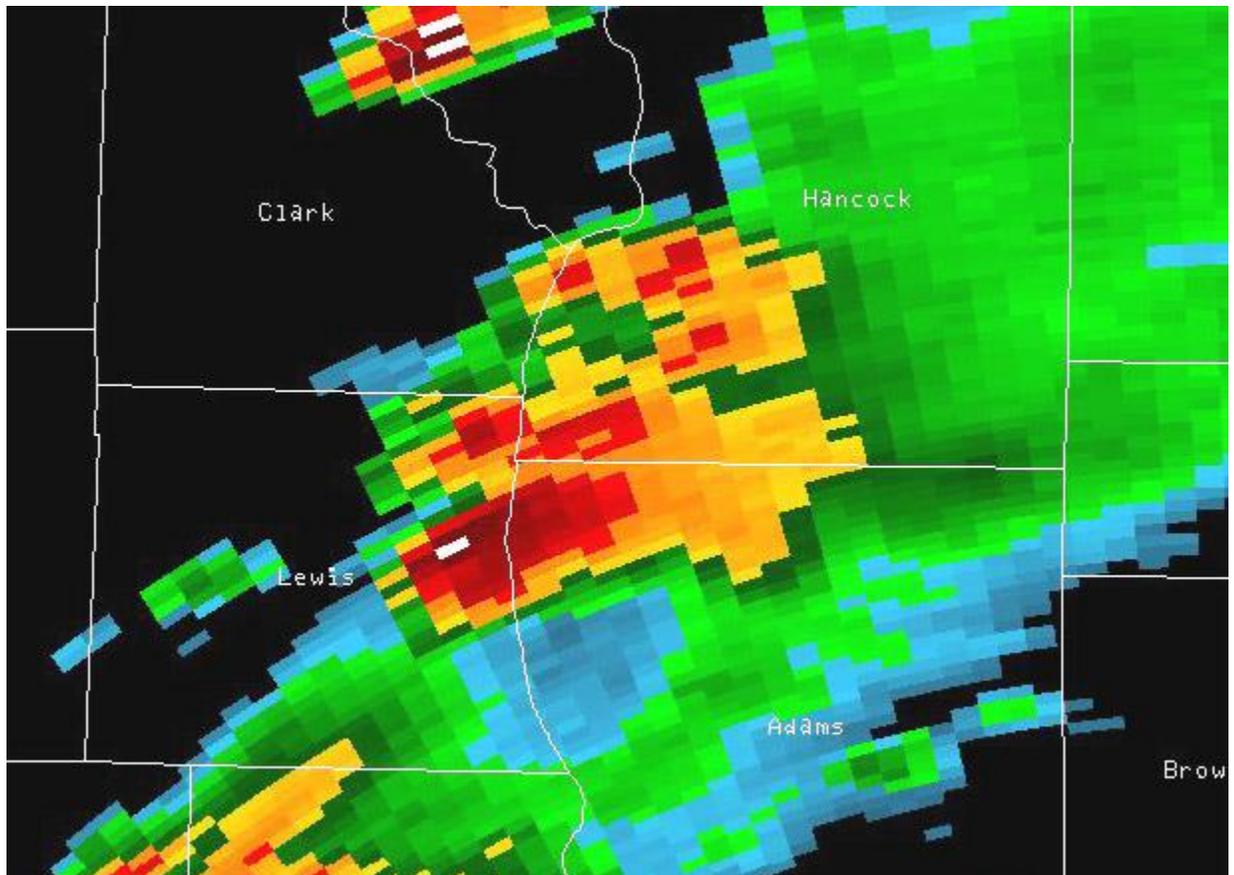


Reflectivity Image of Supercell A at 22:38Z (After crossing the outflow boundary)

Radar Data

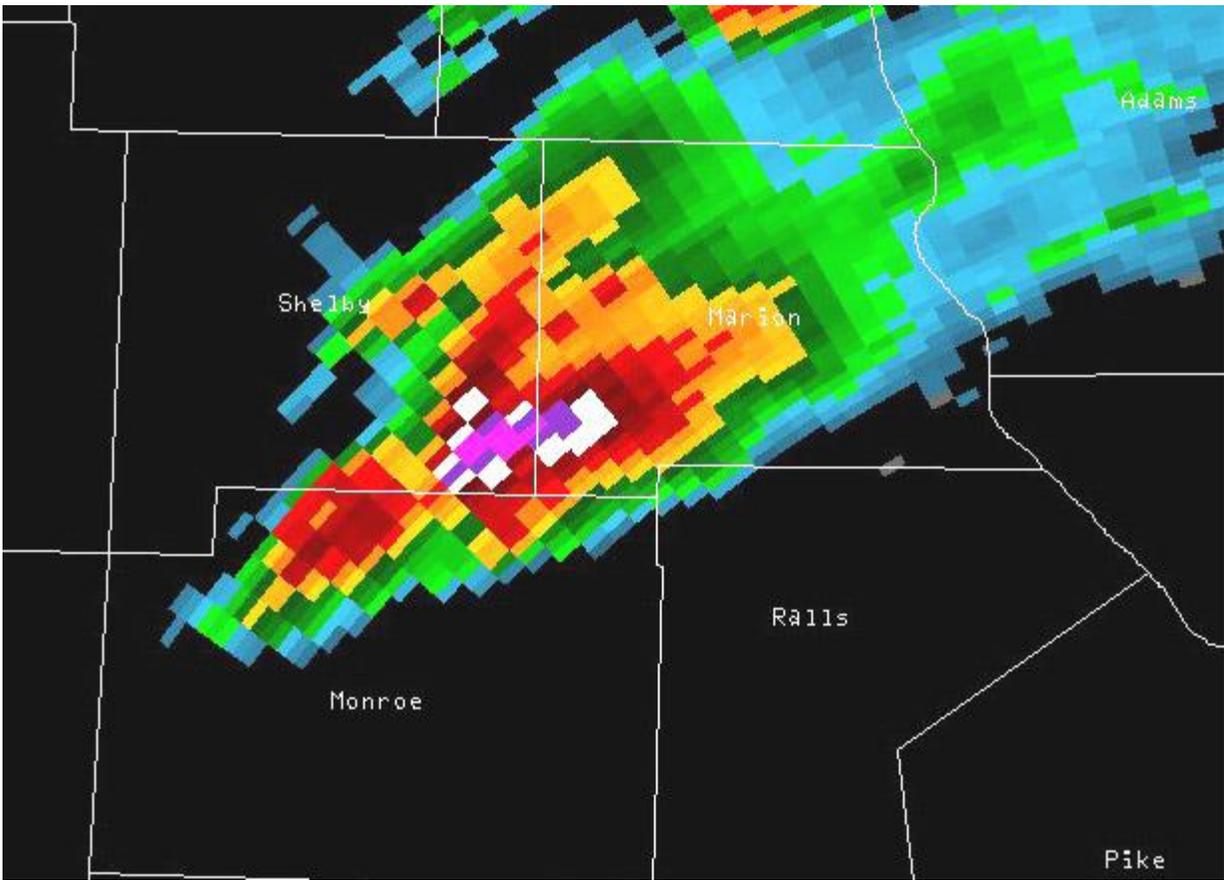


Reflectivity
Image of
Supercell B
at 22:28Z
(Prior to
crossing
outflow
boundary)



Reflectivity
Image of
Supercell B
at 23:29Z
(After
crossing
outflow
boundary)

Radar Data



Reflectivity Image of Supercell C' at 23:24Z (Prior to crossing outflow boundary)



Reflectivity Image of Supercell C' at 23:54Z (After crossing outflow boundary)

Please note that while the severe weather data presented in this event synopsis has been quality controlled, it is still considered unofficial. Official reports & statistics for severe weather events can be found in the **Storm Data** publication (<http://www.ncdc.noaa.gov/IPS/sd/sd.html>) or **Storm Events Database** (<http://www.ncdc.noaa.gov/stormevents/>), available from the National Centers for Environmental Information (NCEI) web page [formerly the National Climate Data Center (NCDC)].

More detailed tornado track information can be accessed using the National Weather Service Damage Assessment Toolkit for all tornadoes beginning in 2012. <https://apps.dat.noaa.gov/StormDamage/DamageViewer/>

Any questions regarding this event review should be address to w-lsx.webmaster@noaa.gov