Advanced Warning Operations Course

Simulation Guide:

May 8, 2009 QLCS Event

Presented by the
Warning Decision Training Branch

Acknowledgments

Special thanks to the following people for their time and assistance in the new QLCS courses in the AWOC Severe Track and the May 8, 2009 QLCS Event WES Simulation:

Nolan Atkins (Lyndon State College)
Dan Bikos (CIRA - Colorado State University)
Mike Coniglio (National Severe Storms Laboratory)
Ken Cook (NWS WFO Wichita, KS)
Stephen Corfidi (Storm Prediction Center)
Jeff Evans (Storm Prediction Center)
Karl Jungbluth (NWS WFO Des Moines, IA)
Angela Lese (NWS WFO Louisville, KY)
Dan Miller (NWS WFO Duluth, MN)
Ron Przybylinski (NWS WFO St. Louis, MO)
Pat Spoden (NWS WFO Paducah, KY)
Ray Wolf (NWS WFO Davenport, IA)

Also a special thanks to following WFOs for providing data for this case:

WFO - Paducah, KY
WFO - Springfield, MO
WFO - St. Louis, MO
WFO - Wichita, KS

Cover photo is of high wind damage in Carbondale, IL, courtesy of Steve Jahnke of The Southern Illinoisan Newspaper / Associated Press.

Ed Mahoney, Chief

Warning Decision Training Branch

Training Division, OCWWS

March 22, 2010

Document History

The document history is provided to track updates and changes to the simulation guide. The version number, seen at the bottom of every page, will be updated as each significant change is made to the simulation guide.

Version	Date	Description
1.0	March 22, 2010	Initial Release

To provide feedback, comments or ideas related to this document, please visit our web site at: http://www.wdtb.noaa.gov

Table of Contents

1: How to Use This Document

Welcome to the ***May 8, 2009 QLCS Event*** Simulation Guide! The purpose of this guide is to provide the training facilitator at a forecast office with case-specific materials needed to prepare and deliver effective simulations in support of the severe track of the Advanced Warning Operations Course (AWOC). Four different simulations (three in displaced real-time and one in case study review) cover the life span of the May 8, 2009 derecho. It is at the discretion of the trainer to select which simulation(s) the trainee will be evaluated upon.

Since this document outlines the "answers" to the challenges of the event, it is specifically meant for the use of the training facilitator only.

In order to create effective simulations with this case, you will need to familiarize yourself with the details of this event. We recommend installing the case first followed by reading each section in order. See Table 1-1 for a description of the layout of this document.

Table 1-1: Simulation Guide Layout

1: How to Use This Document
The introduction describes the content of the simulation guide and how to use this document.
2: The May 8, 2009 Event Overview
The event overview provides a summary of the key components of this event.
3: Background Information
Read this section to become familiar with loading a WES simulation, the data characteristics of this case, and information on WESSL.
4: Simulation Suggestions
Descriptions of each of the four simulations, including the performance objectives and evaluation criteria, are contained in this section.

After reviewing the simulation guide and becoming familiar with the details of this event, the training facilitator will be ready to begin loading simulations for the trainee. The training facilitator will need to understand the performance objectives associated with each simulation, which are related to the QLCS training of the AWOC Severe track. You will be able to evaluate the trainee's perfor-

mance either during or after each simulation. Each performance objective has a corresponding suggested evaluation criteria to allow you to assess the trainee's performance, all of which are provided in Section 4 of this document.

This set of AWOC simulations contains effective ways of incorporating immediate feedback to the trainee without training facilitator interaction, and it is possible for the trainee to start and complete the training without the training facilitator present. However, training research indicates that ***one-on-one*** training where the ***training facilitator and trainee participate together for the optimum learning experience*** is the most effective way to run a simulation. While time consuming, this can insure that:

1. The trainee remains focused on the objectives of the simulation,

2. The trainee receives essential feedback on his/her performance, and

3. The training facilitator develops a solid understanding of how well the trainee comprehends the training and how well the trainee transfers the training to application.

In order to manage a simulation session, the training facilitator must be able to run a simulation as documented with the WES install and testing instructions included with the WES software. The simulations will be much more relevant if the local AWIPS customizations (e.g. preferences, procedures, color tables, etc.) are ported to the WES machine as outlined in the WES installation instructions. For more information regarding the WES and it's installation, visit http://www.wdtb.noaa.gov/tools/wes/index.htm

2: The May 8, 2009 Event Overview

During the morning and early afternoon hours of May 8, 2009, a long-lived and very dangerous serial derecho moved across multiple National Weather Service (NWS) County Warning Areas (CWAs), including those of the Wichita, Kansas (ICT), Springfield, Missouri (SGF), St. Louis, Missouri (LSX), and Paducah, Kentucky (PAH) Weather Forecast Offices (WFOs). Within those four CWAs, there were 28 official tornadoes, hail up to 2.75” in size, sustained winds of 60 to 70 mph with wind gusts over 100 mph, and significant flash flooding (Figure 2-1). According to the NWS, there were four deaths, 14 injuries, and approximately $501 million in property and crop damage in the aforementioned CWAs.

Severe weather in the form of a forward propagating mesoscale convective system (MCS) was anticipated for this day, as denoted in the Slight Risk issued by the Storm Prediction Center (SPC). However, the risk was later upgraded to a Moderate Risk by the 1300 UTC outlook. Multiple severe weather watches were issued by the SPC, including two Particularly Dangerous Situation (PDS) severe thunderstorm watches and a tornado watch for the four aforementioned CWAs. See Appendix B for all SPC products related to this event, including all relevant mesoscale discussions. Most of the severe weather reports were associated with a bow echo with embedded tornadoes, sustained wake-low winds associated with the rear-inflow jet (RIJ), and the northern bookend vortex (BV), which later evolved into a mesoscale convective vortex (MCV)

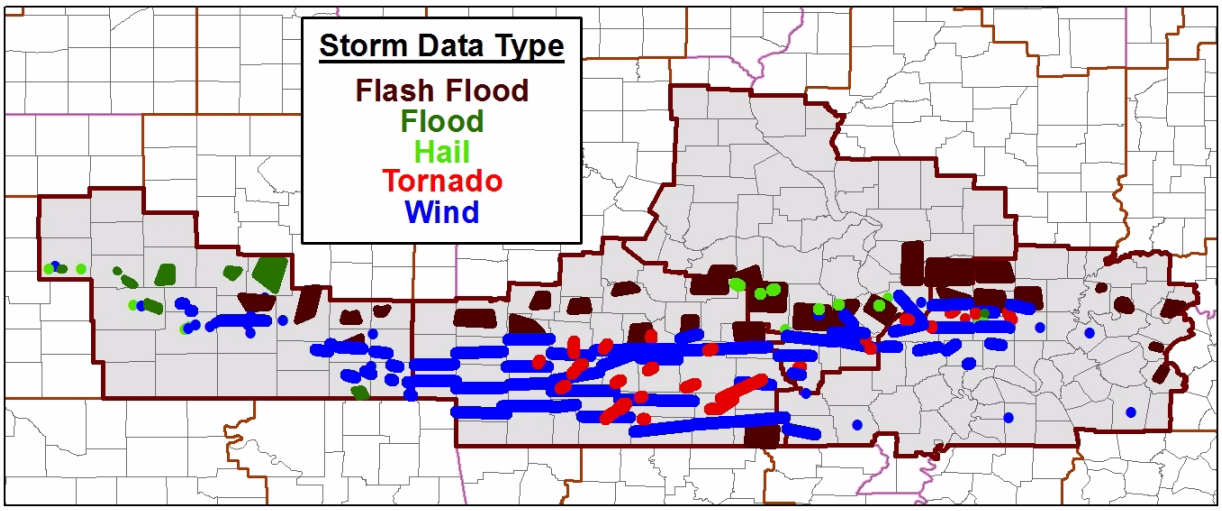


Figure 2-1: Storm reports related to the May 8, 2009 derecho in ICT, SGF, LSX, and PAH. Please see Appendix A for a detailed listing of storm reports for each CWA.

A low amplitude, high shear zonal pattern was in place over the central United States through the latter half of May 7, 2009. Shallow convection formed in a region of isentropic upglide in northeastern Colorado along a quasi-stationary boundary that extended from Illinois to Colorado. This location was also in the right-entrance region of a 60-70 kt 500 mb jet stream near the intersection of CO/KS/NE and ahead of a shortwave feature located in central Colorado. A southward moving outflow boundary generated by this shallow convection collided with the strong moisture return provided by a split 40-50 kt 850 mb low-level jet around 0530 UTC, initiating new convective development in western Kansas.

This new convection interacted and collided with numerous features in the northwestern part of the ICT CWA, forming multiple areas of deep convection with some embedded supercellular features (see Figure 2-2a). The combination of these mesoscale collisions in an environment defined by a rich moisture return (> 70F surface dew points) and most unstable convective available potential energy (MUCAPE) values approaching 1000 J kg^{-1} assisted in creating a forward propagating mesoscale convective system (MCS) in the eastern half of the ICT CWA (see Figure 2-2b). The development and progression of the MCS through eastern Kansas resulted in 1.25 inch hail, wind gusts up to 87 kts (100 mph), and multiple flash floods (see Appendix A for all storm reports).

The primary severe weather threats as the MCS moved into the SGF CWA were strong, sustained winds along the single bowing segment, hail, and a marginal chance for tornadoes (see Figure 2-2c). Winds along the bow echo were estimated between 60 and 90 mph, causing widespread damage and power outages. By 1300 UTC, the hail threat was non-existent along the bow echo while the tornadic threat increased. The first of 19 confirmed tornadoes touched down in the SGF CWA approximately 1.8 E Pilgrim, MO at 1253 UTC. Most tornadoes were rated EF1 or EF2 by NWS storm survey teams. The strengthening of the RIJ and BV provided multiple straight-line wind threats as the MCS traversed the eastern half of the CWA (see Figure 2-2d). KSGF estimated velocities of 80-110 kts approximately 600-2000 ft AGL with the BV between 1321 UTC and 1339 UTC.

Isolated cells and supercells ahead of the MCS began impacting the LSX CWA around 1300 UTC with wind gusts up to 56 kts (65 mph) and baseball-size (2.75 inch) hail. The arrival of the bow echo associated with the MCS brought additional rainfall to the area, resulting in flash floods in four different counties by

1615 UTC, and one tornado approximately 4.4 W Reynolds, MO at 1515 UTC. The BV described earlier in the SGF CWA continued to evolve and became more separated from the bow echo. It will hereafter be denoted as a mesoscale convective vortex (MCV). The MCV produced winds up to 87 kts (100 mph), additional flash flooding, and two brief tornadoes in Madison County, MO.

Multiple severe weather threats were present when the MCS entered the PAH CWA (see Figure 2-2e). The single bow echo was now comprised of multiple line segments, with the RIJ situated behind the southern line segment. A mini-supercell that formed in Cape Girardeau and Union Counties split around 1600 UTC, with the right mover producing golfball-size (1.75 inch) hail in Williamson County from 1639 UTC to 1645 UTC. A high-precipitation supercell in Randolph County, MO (LSX CWA) crossed over into the PAH CWA and produced an EF0 tornado in the town of McBride, MO at 1620 UTC.

The MCV arrived in northern Bollinger County, MO and Perry County, MO (PAH CWA) approximately one hour after the bow echo feature passed through this area. As it approached the KPAH WSR-88D, the strength of the MCV was realized with KPAH 0.5 tilt base velocity estimates of 115 kts (132 mph) at 5000-6000 ft AGL in Bollinger County at 1729 UTC. KPAH continually estimated velocities around 100 kts (115 mph) with the western and southern quadrants of the MCV. Areas impacted by the MCV reported sustained winds of 60-70 mph for nearly an hour or even longer. The MCV tracked eastward across the northern portion of the PAH CWA with strong straight-line winds, flash flooding, and a few weak tornadoes. Because of the radar appearance of the MCV (see Figure 2-2f) and the duration of these sustained winds, this system was dubbed by the locals as the "*Inland Hurricane*."

One of the hardest hit areas was Jackson County, IL, most notably the cities of Carbondale and Murphysboro. A wind gust of 92 kts (106 mph) was measured at the Carbondale airport by an observer after the automated system failed after recording sustained winds of 68 mph and gusts up to 81 mph. An estimated $100 million in damage was caused in Jackson County, IL, including six injuries and one fatality. Approximately 87% of the county had no power at the peak of the outages. Another hard hit area was Williamson County, IL with peak wind gusts estimated at 87 kts (100 mph). Approximately $180 million in damage occurred in Williamson County, including damage to over 10,000 homes. At the peak of the power outages, 95% of the county had no power.

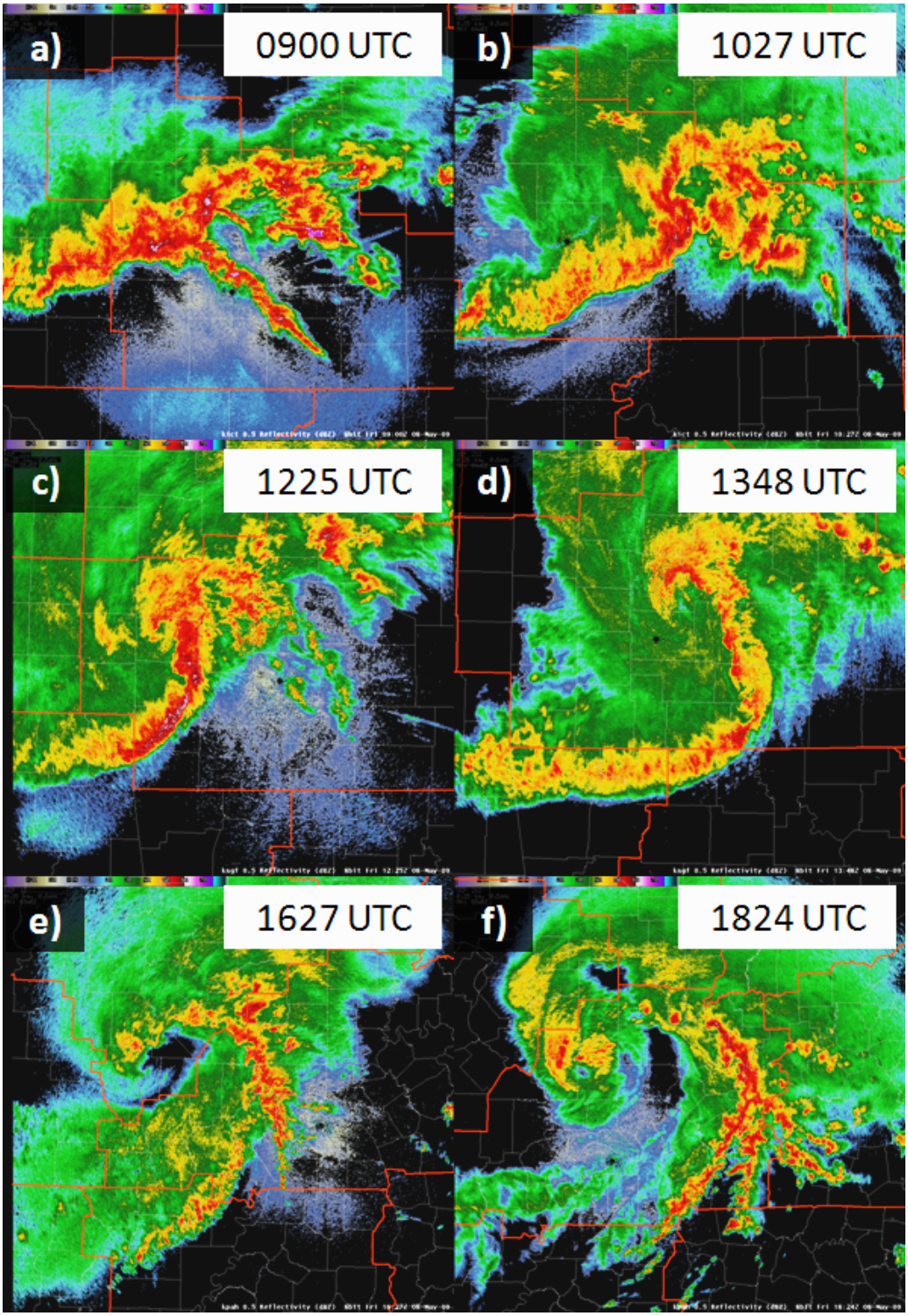


Figure 2-2: 0.5 Reflectivity from a) KICT at 0900 UTC, b) KICT at 1027 UTC, c) KSGF at 1225 UTC, d) KSGF at 1348 UTC, e) KPAH at 1627 UTC, and f) KPAH at 1824 UTC showing the evolution of the MCS from a line of severe storms to a forward propagating MCS containing a bow echo with a BV to multiple bowing line segments associated with, yet separated, from a dominant MCV.

The evolution and maturation of this derecho provides an opportunity to create simulations focusing on many different warning issues. Some of the warning issues for the different severe weather threats include:

Hail Issues: High reflectivity storms during the evolution of the MCS in ICT makes diagnosing the hail threat relatively straightforward. However, as the bow echo moves through SGF, the hail threat becomes less obvious with a shallow, tilted region of 60-64 dBZ reflectivity between 1207 UTC and 1230 UTC. Some isolated storms that form ahead of the MCS provide an additional hail threat that the trainee should recognize. Being more precise with the expected hail sizes in the warnings becomes more challenging with time.

Tornado Issues: The majority of all mesovortices and associated tornadoes are short-lived and shallow in depth (< 10 kft). Therefore, these mesovortices are difficult to detect, and significant lead times will be very challenging to obtain. Radar sampling issues provide a challenge in detecting and determining the tornado threat (e.g., range folding, noisy velocities, range beyond 50 nmi, and occasional dealiasing).

Wind Issues: Three different severe wind threats exist with this complex MCS. The first wind threat is along the gust front of the single bow echo feature with gusts approaching 90-100 mph. Mesovortices and macrobursts along the gust front also produce areas of enhanced velocities. The second threat associated with the MCS is the wake-low winds situated with the RIJ. Areas located along the apex of the RIJ experienced sustained winds of 60 mph well after the gust front passed. The final, and most significant wind threat, is the BV which later develops into the MCV when it approaches the PAH CWA.

The strength of the developing BV is realized as it approaches KSGF which measures velocities of 80-110 kts at 600-2000 ft AGL along the western flank of the feature. Widespread reports of 70-90 mph wind gusts were received by the SGF WFO and areas reported sustained winds of 60 mph for 20-30 minutes after the passage of the BV. As the BV transitions into an MCV, extreme winds are reported along the western and southern quadrants of the feature, including a 106 mph wind gust in Carbondale, IL. The wind threat is obvious from multiple radars across the CWAs. The trainee should recognize and react to the long duration wind threat behind the gust front and with the MCV. Estimating the potential surface winds from radar and determining their duration will be very challenging.

Flash Flooding Issues: The quasi-linear nature of the system during its early development in the ICT CWA allowed for significant rain rates to occur over an extended period of time along an E-W oriented boundary. The majority of the flash flood reports in the SGF, LSX, and PAH CWAs occurred on the northern side of this complex due to the increased precipitation coverage from the BV/MCV feature. It is also important to note that a MCS moved through Missouri and Kentucky approximately ten hours prior to this event. This would lead to increased soil moisture content and likelihood of localized flooding.

3: Background Information

I. Weather Event Simulator

These simulations require that you have at least WES9.0 loaded on your WES machine. The simulations can be installed and ran using WES9.0 or the newly released WES9.2. Do not continue with these simulations until you have successfully installed and tested WES9.0 or WES9.2 in a simulation. Full information on this can be found at http://www.wdtb.noaa.gov/tools/wes/index.htm

II. Loading the Case from DVD

There are three install DVDs for the May 8, 2009 QLCS Event simulations that were shipped to each AWOC facilitator. **The case occupies approximately 39 GB of disk space when converted to Displaced Real Time (DRT)**, so please plan your disk space accordingly.

A README file is provided on the install discs. The README file provides instruction on how to install the information from the DVDs, converting the case data for the simulations localized for SGF and PAH into a displaced real-time (DRT) format, and how to start all of the simulations. A copy of the README file is also provided in Appendix D: Support Materials.

There are also two known issues concerning the running of the DRT WES simulations. These issues and how to resolve them are discussed in the README file and in the bullets below:

- ***The radar may not update after the resumption of the simulation from a pause. To correct this problem, clear the D2D pane and reload the data.***
- ***In WarnGen, the text window may not appear when you make a polygon and click Create Text. Therefore, WarnGen will not function, and the trainee will not be able to issue warnings. To mitigate this problem, close the D2D window and start a new D2D session.***
- ***For WES9.0 machines, if the Flash files (pre- and debriefs) do not play, it can be corrected by reinstalling the Firefox Flash plugin as shown in the WES9.0 installation instructions.***

III. Data Characteristics

The original data sets came from the Wichita, KS (ICT), Springfield, MS (SGF), and Paducah, KY (PAH) Weather Forecast Office (WFO) archives, and most data is accessible during the simulations. While there may be some incomplete or missing data due to the archiving process and to reduce the overall size of the case on your WES hard drive, there is enough data present for the trainee to be able to satisfy the learning objectives.

Radar Data:

The radar data provided on the following pages list the available radars for each CWA initialization, the location of the radar, the time period of available radar data, Volume Coverage Pattern (VCP) setting and VCP changes relevant to the simulation period, and best radar resolution available. Note that Super Resolution data is available for the lowest three elevation scans (i.e., 0.5, 0.9, and 1.3 degree tilts).

ICT CWA Initialization (Simulation 1):

KICT (Primary Radar):
- Located in Sedgwick County, KS
- 0602 UTC May 8th to 1159 UTC May 8th
- VCP 212
- 8-bit resolution data with Super Resolution

KTWX (Secondary Radar):
- Located to the northeast of KICT in Wabaunsee County, KS
- 0605 UTC May 8th to 1159 UTC May 8th
- VCP 21 with switch to VCP 11 at 0645 UTC
- 4-bit resolution data

KVNX (Secondary Radar):
- Located to the southwest of KICT in Alfalfa County, OK
- 0606 UTC May 8th to 1155 UTC May 8th
- VCP 32 with switch to VCP 11 at 0624 UTC
- 8-bit resolution data

KINX (Secondary Radar):
- Located to the southeast of KICT in Rogers County, OK
- 0606 UTC May 8th to 1156 UTC May 8th
- VCP 32 with switch to VCP 21 at 0753 UTC, VCP 12 at 0926 UTC, and VCP 212 at 1110 UTC
- Intermittent 4-bit resolution and 8-bit resolution data with Super Resolution

TICT (Secondary Radar - TDWR):
- Located to the south of KICT in Sedgwick County, KS
- 0605 UTC May 8th to 1159 UTC May 8th
- VCP 90 with switch to VCP 80 at 0649 UTC
- 8-bit resolution data

SGF CWA Initialization (Simulations 2 & 3):

KSGF (Primary Radar):
- Located in Greene County, MO
- 1003 UTC May 8th to 1537 UTC May 8th
- VCP 212 with switch to VCP 211 at 1439 UTC
- 8-bit resolution data with Super Resolution

KEAX (Secondary Radar):
- Located to the northwest of KSGF in Cass County, MO
- 1000 UTC May 8th to 1458 UTC May 8th
- VCP 212
- 8-bit resolution data with Super Resolution

KLSX (Secondary Radar):
- Located to the northeast of KSGF in St. Charles County, MO
- 1310 UTC May 8th to 1859 UTC May 8th
- VCP 12
- Intermittent 4-bit resolution and 8-bit resolution data with Super Resolution

PAH CWA Initialization (Simulation 4):

KPAH (Primary Radar):
- Located in McCracken County, KY
- 1502 UTC May 8th to 1859 UTC May 8th
- VCP 12 with switch to VCP 212 at 1701 UTC
- 8-bit resolution data with Super Resolution

KHPX (Primary Radar):
- Located to the east of KPAH in Todd County, KY
- 1503 UTC May 8th to 1859 UTC May 8th
- VCP 12
- 8-bit resolution data with Super Resolution

KVWX (Primary Radar):
- Located to the northeast of KPAH in Gibson County, IN
- 1503 UTC May 8th to 1859 UTC May 8th
- VCP 21 with switch to VCP 12 at 1658 UTC
- 8-bit resolution data with Super Resolution

KLSX (Secondary Radar):
- Located to the northwest of KPAH in St. Charles County, MO
- 1310 UTC May 8th to 1859 UTC May 8th
- VCP 12
- Intermittent 4-bit resolution and 8-bit resolution data with Super Resolution

Upper Air Data:

Listed under each CWA are the relevant soundings and vertical wind profiler data. Locations of the vertical wind profilers can be viewed in Figure 3-1.

ICT: The ICT CWA is located between upper-air sites. The closest RAOB locations include KDDC (west), KTOP (northeast), and KOUN (south). All soundings are available at 0000 UTC and 1200 UTC on May 8th. Two vertical wind profilers are located within the CWA: HBRK1 (northern part) and NDSK1 (southeastern part). Other relevant profiles include LMNO2 (south) and HVLK1 (west).

SGF: The SGF CWA does include a RAOB location (KSGF) that is available at 0000 UTC and 1200 UTC on May 8th. Other relevant RAOB sites include KLZK (south), KTOP (northwest), and KILX (northeast). The vertical wind profiler CNWM7 is located in the center of the CWA. Other relevant profilers include NDSK1 (west) and BLMM7 (east).

PAH: Most of the PAH CWA is located between upper-air sites. The closest RAOB locations include KOHX (southwest), KSGF (west), KILX (northwest), and KILN (northeast). All soundings are available at 0000 UTC and 1200 UTC on May 8th. KOHX did launch a special sounding at 1800 UTC May 8th. The vertical wind profiler BLMM7 is located in the southwest part of the CWA. Another relevant profiler is CNWM7 (west).

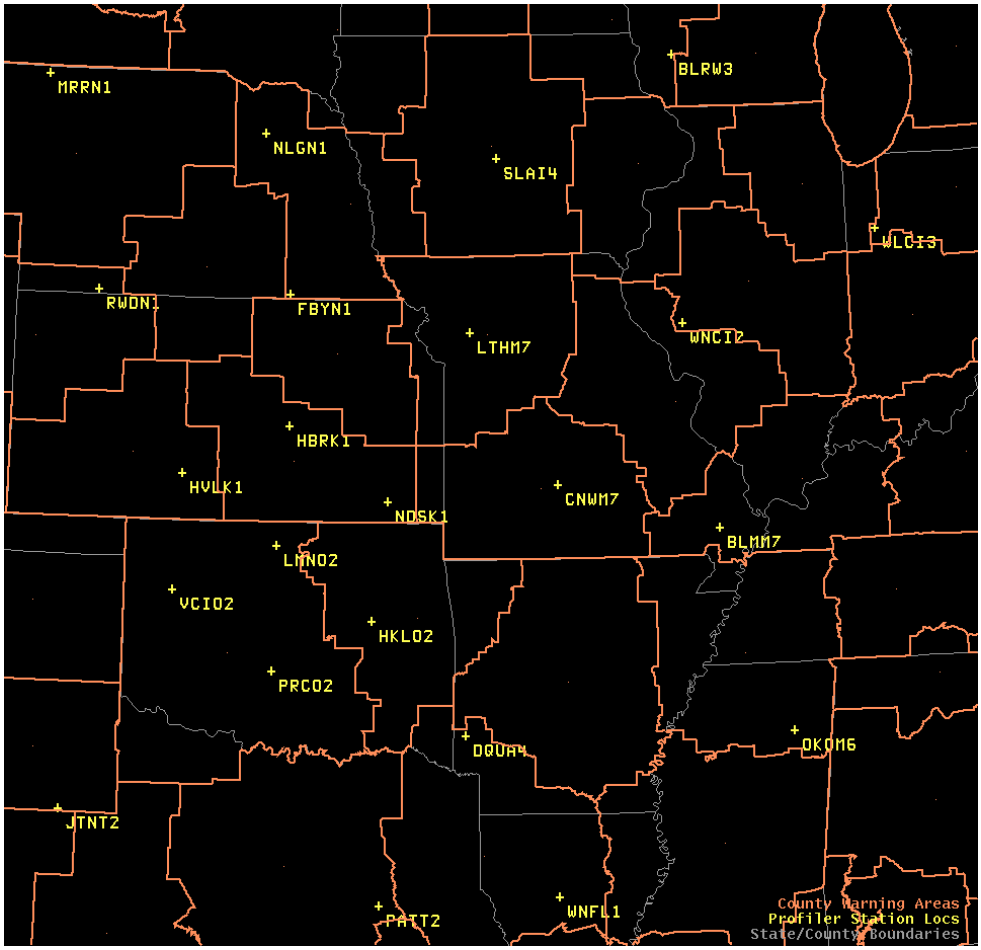


Figure 3-1: Location for each vertical wind profiler station with CWA boundaries (orange).

Model Data:

The following model data exists in this dataset:

ICT: ECMWF, GFS, LAPS, NAM, and RUC

SGF/PAH: GFS, LAPS, NAM, and RUC

Different models exist depending on the map background scale. Note that the LAPS model data for PAH is not available. No model runs were provided prior to 0000 UTC May 8th. Some 0600 UTC May 8th model runs were removed due to significant data quality issues.

Satellite Data:

The majority of the satellite and satellite-derived products are available for all three CWA initializations. Visible satellite images become useful starting at 1215 UTC May 8th.

FFMP Data:

*** *Please note that the Flash Flood Monitoring and Prediction (FFMP) software is not available for this set of WES simulation. Any related performance objectives should refer to the radar-estimated precipitation totals as a data source.* ***

Warnings:

Because the event is already in each CWA when the DRT simulations start, active storm-based warnings are provided to give the trainee time to analyze the situation and issue new warnings. Since these warning(s) are provided in each DRT simulation, **it is important to "*Write Archived Text to Database*"** before starting the simulation. The instructions on how to handle this are provided within the README file described earlier, which can be found on the install disks and in Appendix D.

Procedures:

We have created a few procedures to help users with some basic threat assessment for these simulations:

LAPS_NSE (Planview LAPS analysis of stability and shear parameters)

NAM_NSE (Planview NAM Forecasts of stability and shear parameters)

NAM_UA (NAM Upper-air 00hr analysis for 250 mb, 500 mb, 700 mb, and 850 mb levels)

RUC_UA (RUC Upper-air 00hr analysis for 250 mb, 500 mb, 700 mb, and 850 mb levels)

RUC_NSE (Planview RUC Forecasts of stability and shear parameters)

Users are encouraged to create their own procedures, especially for storm interrogation.

IV. WESSL

The WESSL script for the displaced real-time simulations in SGF and PAH will contain an introductory Articulate presentation that loads immediately after the simulation starts. These presentations provide an overview of the simulation and some background information. The WESSL script will also have many different pop-up windows. Some will require a response from the student, some will have useful reports and information, and some will pause the simulation. Information on how to retrieve the file(s) containing the trainee's responses to the interactive WESSL pop-ups are outlined in their respective performance objective in each displaced real-time simulation in Section 4. After the SGF and PAH simulations, there will be an Articulate debrief of the event. **Loading the appropriate saved settings macro from the simulation setup window will automatically insert the correct WESSL files for each simulation.**

V. Notes from the Offices

Provided here is a brief summary of how the SGF and PAH WFOs prepared for and handled the MCS as it moved through their respective CWA.

WFO - SGF:

The potential for severe weather in the form of a squall line was noted during the day on May 7th. Staffing availability was determined in advance, with a plan developed to bring in two additional staff members during the pre-dawn period to supplement the already scheduled staff. As the system entered the SGF CWA, the potential magnitude of the event was recognized. Two more staff members were called in to handle phones as it moved across the western part of the CWA.

Staffing was increased further after wind reports started coming in from the wake low winds behind the bow-echo, in addition to those associated with the bow-echo and northern bookend vortex. WFO PAH and LSX were requested to take over public and aviation service backup as it became apparent that the forecast office would be hit. At the peak of the event, 13 staff members were working the operations floor.

WFO - PAH:

WFO PAH dealt with severe thunderstorms late on the night of May 7th into the early morning hours of May 8th. After those storms moved out of the CWA, the office began to prepare for the MCS, then located in the western half of the SGF CWA. Knowing they were in a SPC Slight Risk with a likely upgrade to a Moderate Risk, a staffing plan was finalized for the ensuing event and a conference call with local emergency managers was scheduled. Warning responsibilities were sectorized and shared by two warning teams. One team became responsible for warning on any severe threat associated with the MCV, while the other team was responsible for issuing warnings associated with the bow echo ahead of the bookend vortex and any other severe storms that developed in advance of the system. These assignments continued until the MCV moved to within 20 nm of the PAH WFO.

Prior to the system arriving in the PAH CWA, there was constant communication between SGF and PAH regarding the forward propagating MCS and service backup responsibilities. PAH was requested to take over short term grids for SGF at 1130 UTC while they dealt with the MCS until SGF reassumed responsibility around 1400 UTC. As the system moved through the LSX CWA and began entering the PAH CWA, there was extensive coordination with LSX via phone and instant messaging. In one instance, PAH forecasters coordinated with LSX on issuing a tornado warning along their CWA boundary in order to present a consistent and coherent external warning product that could be easily understood and interpreted by media members and the public. WFO LSX also forwarded local reports and observations associated with the MCV to provide a better understanding of what to expect as the system crossed into the PAH CWA.

4: Simulation Suggestions

I. Introduction

Defining effective performance objectives and evaluation criteria are essential to a successful simulation. Each facilitator needs to select relevant performance objectives and determine the appropriate evaluation criteria based on the trainee's personal needs and goals for their individual development. For example, a novice forecaster may need more proactive and rigorous evaluation than an experienced forecaster who may need to brush up on certain applications. Once the focus of the simulation is determined, the workload for the simulation should then be considered.

The performance objectives and associated evaluation criteria are provided as recommendations for assessment of the trainee, and the facilitator is encouraged to modify these or create new ones. All performance objectives are meant to be read to the trainee before the simulation is started to establish a clear understanding of the objectives. Workload management and sectorization of warning operations by threat type and/or geographic boundaries can assist in tailoring the workload to the performance objectives.

There are a total of four sections (one case study review and three displaced real-time simulations) for the May 8, 2009 event. The first localization uses the Wichita, KS (ICT) County Warning Area (CWA) in case study review mode from 0400 UTC to 1144 UTC. Here, the trainee will explore both model data and local observations in combination with satellite and radar data in order to gain an understanding of the development of a Mesoscale Convective System (MCS) from a multicell complex.

The Springfield, MO (SGF) CWA is used for the second simulation (1144 UTC to 1310 UTC) and the third simulation (1310 UTC to 1503 UTC), which are both in displaced real-time. The SGF localization was separated into two different simulations with varying severe weather threats and performance objectives because of the evolution of the system and the long time duration in the CWA. Due to the magnitude of the MCS in the SGF CWA, these two simulations should be taken ***separately***.

The first SGF-based simulation focuses on the continued development of the MCS, which includes the formation of a northern bookend vortex (BV) and strengthening rear-inflow jet (RIJ). The second SGF-base simulation focuses on the tornadic phase of the MCS. During this simulation, the strength of the BV is realized as it approaches the KSGF WSR-88D. Some of the performance objectives focus on meteorological factors that influence the evolution of the system while others relate to warning strategies and situational awareness.

The fourth and final simulation uses the Paducah, KY (PAH) CWA localization from 1602 UTC to 1846 UTC in displaced real-time. This is the longest of the three displaced real-time simulations. However, the workload involved is not as extensive as any of the SGF-based simulations. Here, the trainee is dealing with a mature MCS that provides two separate severe weather threats. The first is a complex bowing line segment with supercells ahead of the system. The second is a very powerful MCV, which evolved from the BV, that arrives approximately one hour after the bowing line segment.

In a real operational environment, a Weather Forecast Office (WFO) will use multiple warning forecasters and sectorize the workload and/or CWA. Some offices will also ensure that another forecaster is on duty to act as a mesoscale analyst. This can be a critical position in a high impact case, or in a case that would prevent it from becoming a high impact case. The mesoscale analyst can provide input on environmental conditions critical to future storm evolution and storm intensity.

Because of the size and magnitude of this event, especially for one person, it is ***highly recommended*** that the facilitator ***sectorizes the warning operations*** for workload management purposes, just like a WFO during a severe weather event. The combination of multiple severe weather threats and numerous local storm reports provided through the WESSL script (Appendix C) can place the trainee in an undesirable high workload, high stress environment. Here, the trainee can focus on one aspect of the MCS, whether it be the tornadic threat, high wind threat, the bow echo, or BV/MCV.

Although the simulation can only be used on one AWIPS computer, the trainer could employ the use of a “warning team” for these events. Here, two trainees can sit at the computer and work as a team, where one can issue warnings and the other can handle the incoming storm reports while both are analyzing the environmental and radar data.

II. Simulation 1 - ICT (0400 UCT - 1144 UTC)

Overview:

This simulation, provided in an enhanced case study mode, will allow the trainee to identify and understand key features and environmental conditions involved with the development and evolution of a mixed mode event into a mature MCS. This will also allow the trainee to analyze data without the constraint of running in a "real-time" environment. The performance analysis provided in this guide is broken down into three sections:

- Synoptic scale & regional mesoscale analysis to identify factors associated with convective initiation and possible downstream impacts
- Radar analysis on convective formation and evolution into a forward propagating MCS
- Downstream forecasting and identification of severe weather hazards

A low amplitude, high shear zonal flow over the central United States, coupled with a shortwave trough, isentropic lift, and a weak surface boundary, provided a region of frontogenetically induced synoptic-scale ascent over CO/NE/KS overnight May 7th into May 8th. The environment was also characterized by a moderately unstable, moist air mass located in OK and southern KS. The arrival of this airmass along a strong low-level jet into a region of isentropic lift north of a subtle boundary from IL to CO helped to initiate a large area of convection in northwest KS. The large latent heat release, multiple mesoscale collisions, convective available potential energy (CAPE), and rich moisture return assisted in creating a forward-propagating MCS over the ICT CWA. As the MCS moved eastward, the MCS evolved into a single bow echo with a large stratiform region and strengthening rear-inflow jet due to substantial cold pooling.

Performance Objectives:

Performance Objective 1 - Perform a comprehensive large-scale analysis and determine the possible severe weather threat(s) for the ICT CWA based on key features found during the analysis. It is recommended that this analysis should be conducted between 0400 UTC and 0800 UTC with the map background scale set to "Regional."

Evaluation Criteria 1.1 - Perform a regional analysis and identify synoptic scale features and areas of ascent relevant to the convective initiation in northwest Kansas.

Answer Key 1.1 - There are numerous features the trainee should identify in his/her analysis that would influence the convection in northwest KS. A strong (~120 kt) zonal jet streak at 250 mb is located over IA/NE/WY. The zonal jet streak exists at 500 mb over IA/NE, but with winds of 60-70 kts, suggesting strong unidirectional shear which can sustain long-lived updrafts (Figure 4-1a). The trainee should recognize that the area of convection located in the CO/NE/KS area, as depicted by GOES IR satellite, is located within the right entrance region of the 500 mb jet and associated with one of two shortwave features, as depicted by the 500 mb heights (Figure 4-1b).

The trainee should also note the developing MCS in central MO associated with the eastern shortwave feature in Figure 4-1b. Both of these shortwaves are located along a subtle E-W oriented quasi-stationary boundary located from IL to CO. This boundary is associated with an area of increased 1000-850 mb frontogenesis, which is important for convective initiation (see AWOC Severe IC 2 - Lesson 2). The trainee should note the southward movement of the convection towards the moisture-rich airmass in OK/KS, which will be discussed further in Evaluation Criteria 1.2.

Isentropic analysis at 310K shows a tight pressure gradient over eastern CO and western KS with ample southerly flow and moisture return based on the 310K mixing ratios (Figure 4-2). The vertical movement of moist air across this pressure gradient, as seen by the sloped potential temperature contours and the slightly elevated CAPE in this region (Figure 4-2b), implies that the convective initiation could be a result of isentropic lift. See AWOC Severe IC 2 - Lesson 2 in regards to isentropic lifting and convective development and AWOC Severe IC 2 - Lesson 1 in regards to presence of instability in a downshear environment.

A strong low-level jet (LLJ) at 850 mb assists in creating low-level directional shear and ample moisture return (see Evaluation Criteria 1.2). The southern outflow boundary associated with this convection collides with the strong moisture return, which also contains increased low-level CAPE and frontogenesis, initiating new storms in west central KS (Figure 4-3).

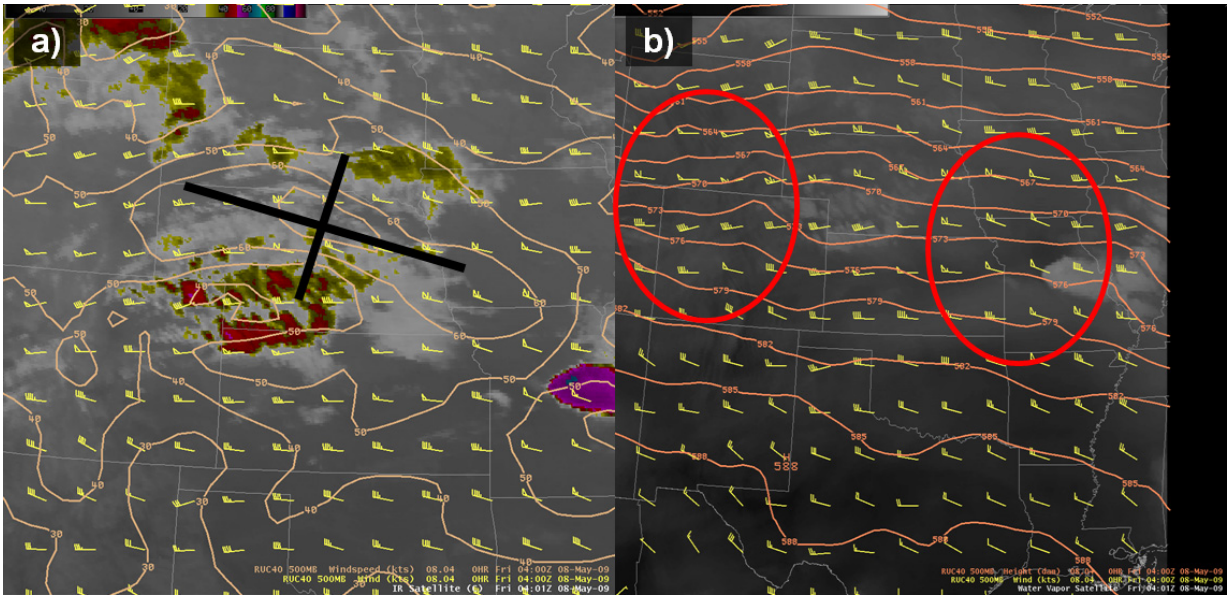


Figure 4-1: a) RUC40 500 mb winds (kts - vectors and contours) and GOES IR satellite at 0400 UTC. The cross is centered over the 500 mb speed maximum. b) RUC40 500 mb winds (kts - vectors), RUC40 500 mb heights (dam - contours), and GOES water vapor satellite at 0400 UTC. The two red circles identify the shortwave troughs embedded in the zonal flow.

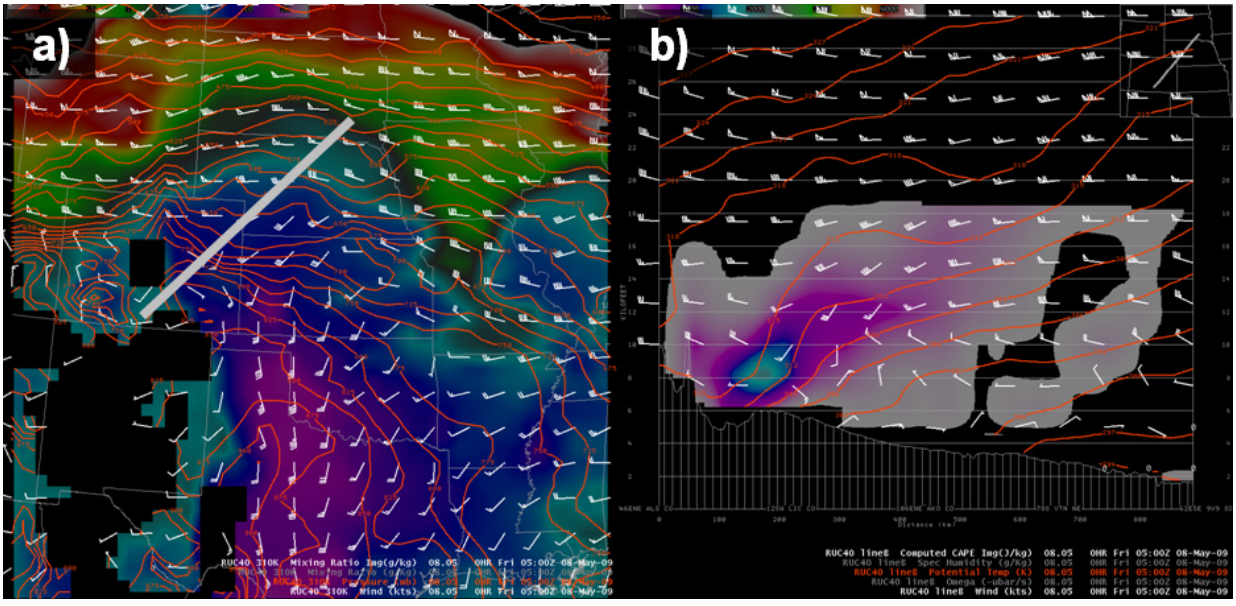


Figure 4-2: a) RUC40 310K Pressure (mb - contours), RUC40 310K winds (kts - vectors), and RUC40 310K mixing ratio (g kg^{-1} - shaded) at 0500 UTC. b) RUC40 potential temperature cross-section (K - contours), RUC40 winds (kts - vectors), and RUC40 CAPE (J kg^{-1} - shaded) at 0500 UTC. The gray line in a) represents the location of the cross-sectional analysis in b).

Evaluation Criteria 1.2 - Document the location and magnitude of the low-level jet (LLJ) in the south central plains, the associated moisture return, and impact on MCS development.

Answer Key 1.2 - Surface observations and 850 mb winds depict a split LLJ over the OK/AR/MO/KS domain due to the MCS located in western MO and the developing convection in association with the short-wave in northwest KS. The western branch of the LLJ intensifies in response to the associated decrease in pressure with the developing convection (Figure 4-4) and possibly due to nocturnal or diurnal influences. Areas showing regions of sustained pressure falls can be associated with regions of persistent lifting (see AWOC Severe IC 2 - Lesson 2).

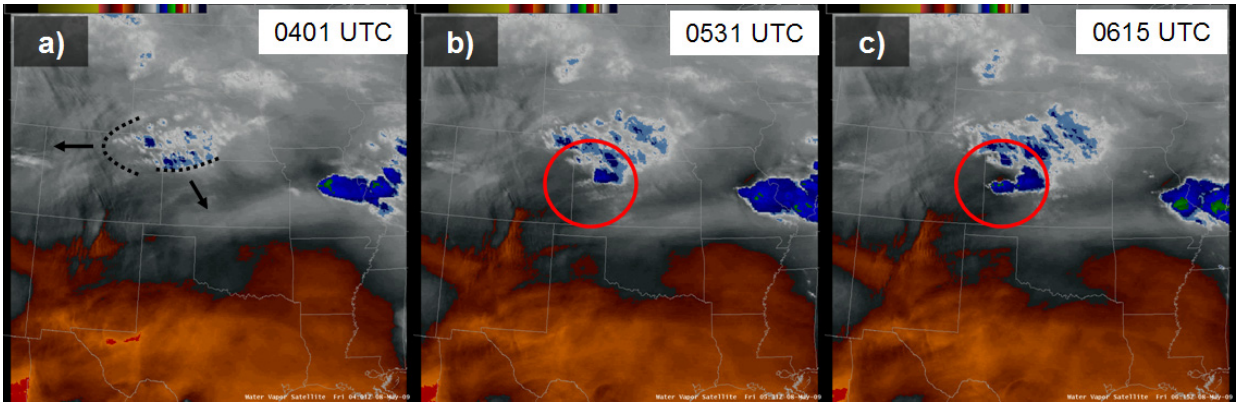


Figure 4-3: GOES water vapor satellite at a) 0401 UTC, b) 0531 UTC, and c) 0615 UTC. The black dashed lines represent outflow boundaries by the initial convection, and the red circle indicates the formation of new convection.

The strong LLJ provided a significantly rich moisture return, with 70F surface dew points reaching Wichita, KS by 0700 UTC. 1000-850 mb moisture transport of over 200 m s^{-1} g kg^{-1} (Figure 4-5a) was greatly enhanced by the 40-50 kt 850 mb flow over western OK, resulting in surface mixing ratios of 16 g kg^{-1} (Figure 4-5b) and 4-5 cm of precipitable water in southern KS. This ample moisture return provides a key ingredient for deep convective formation in southern Kansas.

Evaluation 1.3 - Evaluate the buoyancy of the atmosphere and determine regions of surface-based and elevated CAPE.

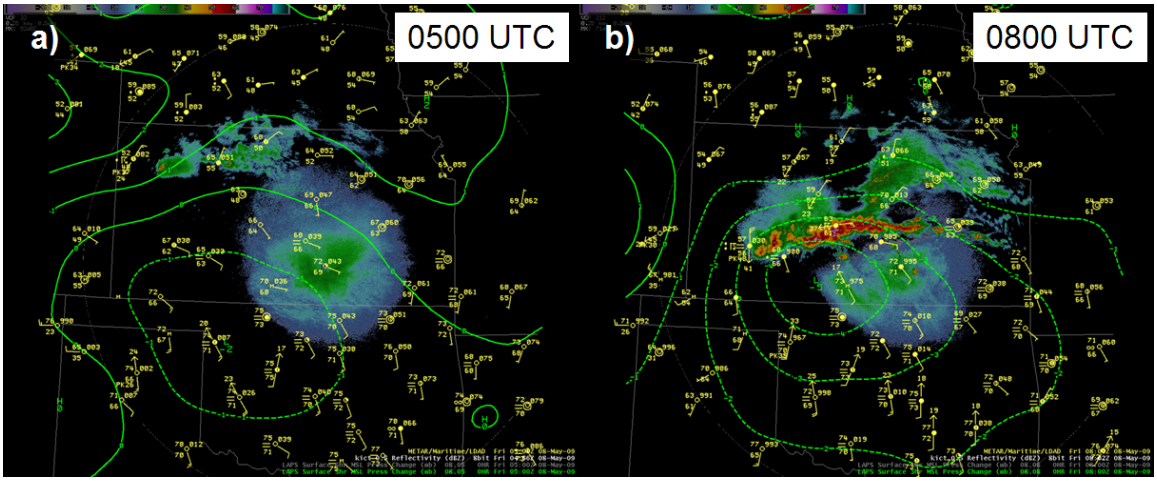


Figure 4-4: METAR/Maritime/LDAD surface observations (yellow), KICT 0.5 Reflectivity, and LAPS surface 3HR MSL pressure change (mb - green contours) at a) 0500 UTC and b) 0800 UTC. Solid (dashed) contours indicate areas of increasing (decreasing) pressure.

Answer Key 1.3 - Areas of surface-based CAPE are associated with the significant moisture return with the LLJ in OK/KS (Figure 4-6a). However, a considerable amount of convective inhibition (CIN) over the region prohibits the amount of surface-based initiation north of it (Figure 4-6b). RUC40 depict most unstable CAPE (MUCAPE) around 1000 J kg^{-1} over regions of northwest KS, suggesting elevated regions of buoyancy north of the surging moisture flux. Recalling the isentropic analysis from Evaluation Criteria 1.1 and the potential temperature cross-sectional analysis in Figure 4-2b, it can be assumed that the initial convective activity in northwest KS is elevated and not surface-based.

Evaluation 1.4 - Using the results from the previous evaluation criteria and model-derived data for the region, determine the severe weather potential (wind, hail, tornadoes, and flash flooding) for the ICT CWA based on the analysis up to 0800 UTC.

Answer Key 1.4 - With deep convection developing in a moderately unstable and moist environment, any area exposed to prolonged periods of heavy rain could have flash flooding potential. The low-level clockwise hodographs with robust mid-level shear and areas of enhanced vertical motion associated with isentropic lift could support long-lived updrafts, which would increase the hail potential. The convective area is moving into a region with

increased MUCAPE, 0-3 km storm relative helicity (SRH), and richer moisture, which would enhance the hail and wind threat. RUC40 model data suggest an area of 0-1 km SRH from 200-300 m^2 s^{-2} and 0-1 km shear of 25-35 kts ahead of the system, which coupled with multiple boundaries, could result in a few tornadoes. Based on the vertical wind profile of the region, robust moisture source, and atmospheric instability, the trainee should recognize the signals present for QLCS intensification to a high-end event.

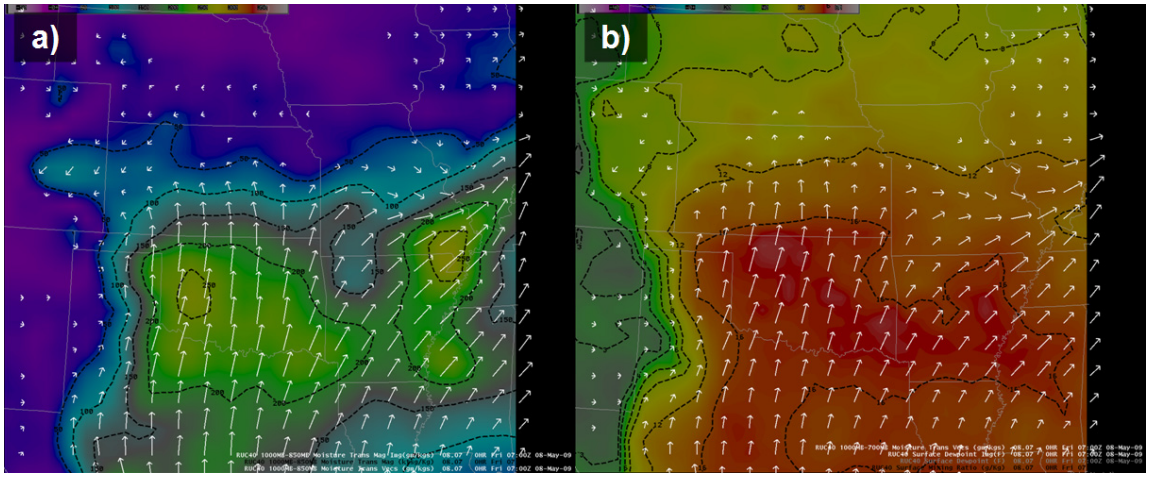


Figure 4-5: a) RUC40 1000-850 mb moisture transport (m s^{-1} g kg^{-1} - vectors and shaded) with contour intervals at 50 m s^{-1} g kg^{-1} (dashed lines) and b) RUC40 surface dew points (F - shaded), RUC40 surface mixing ratios (g kg^{-1} - dashed lines), and RUC40 1000-700 mb moisture transport (m s^{-1} g kg^{-1} - vectors) at 0700 UTC.

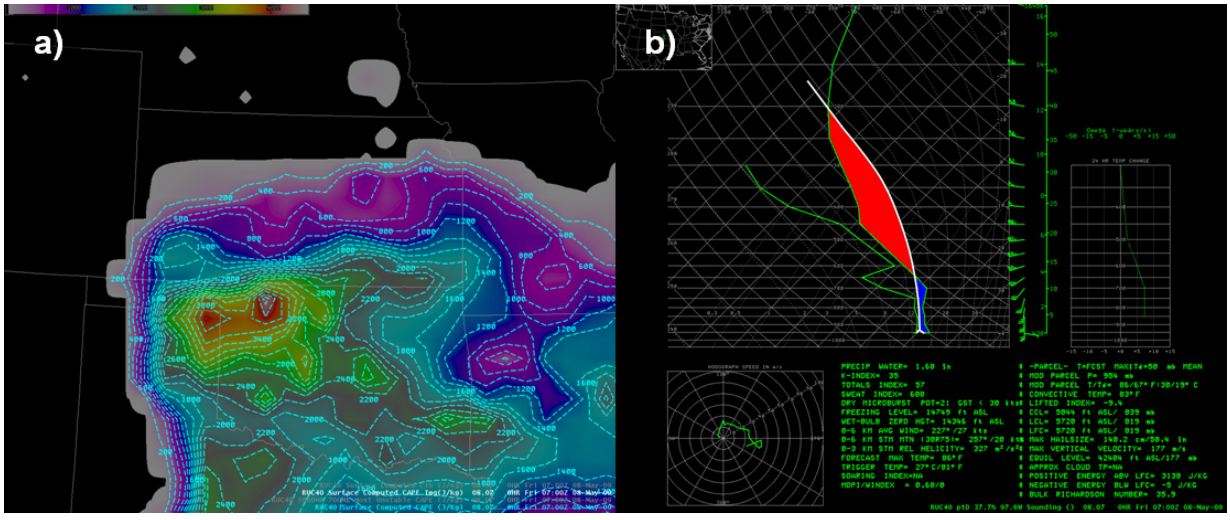


Figure 4-6: a) RUC40 surface-based CAPE (J kg^{-1} - shaded and contours) at 0700 UTC. b) RUC40 model sounding near Wichita, KS (approximately 37.7N, 97.6W) at 0700 UTC. Red (blue) shaded regions represent surface-based CAPE (CIN).

Performance Objective 2 - Identify key observational and radar signatures in the convective evolution of the multi-cellular cluster into a bowing MCS. It is recommended that this analysis should be conducted between 0630 UTC and 1100 UTC with the map background scale set to “WFO” and/or “State.”

Evaluation Criteria 2.1 - Document key features and identify their impacts on the convection in western KS.

Answer Key 2.1 - Three main features exist south and east of the area of initial convection (IC). The E-W oriented feature (F1) moves slowly northward in association with the more substantial moisture return from the LLJ (Figure 4-7a). Two other features (F2 and F3) with a NW-SE orientation can also be seen from KICT (Figure 4-7b,c). It is possible that regions of ascent along the distortion of isentropes from the LLJ resulted in the formation of F2 and F3. The isentropic distortion can be seen in the RUC40 850-mb potential temperature analysis (not shown). The interaction between IC and F1 led to a slight increase in reflectivity between 0748 UTC and 0820 UTC.

F3 begins as an isolated cell forming in northern Pratt County moving into southeast Stafford County. As F3 becomes more linear, it begins to merge with the combination of IC and F1 (herein after denoted as IC/F1) in northwest Reno County around 0832 UTC. This merger continues into Harvey County around 0904 UTC as a small bow in the IC/F1 feature associated with a region of 50-80 kt winds begins to form in response to the cold pool formation.

Isolated features can be identified in both F2 and F3, including significant hail cores and embedded supercellular features between 0941 UTC and 1009 UTC in F3. F2 becomes less pronounced in time and merges with IC/F1, as seen by KTWX. As a bowing segment in IC/F1 becomes more pronounced and begins to propagate forward at 50-55 kts, it will eventually overtake the convection associated with F3.

Evaluation Criteria 2.2 - Identify reflectivity and velocity signatures that characterize the evolution of the multi-cellular storm cluster into a forward propagating MCS. This should include the formation and strength of any bowing segments, the rear-inflow jet (RIJ), and the stratiform region. The trainee should also note any mesovortices during his/her analysis.

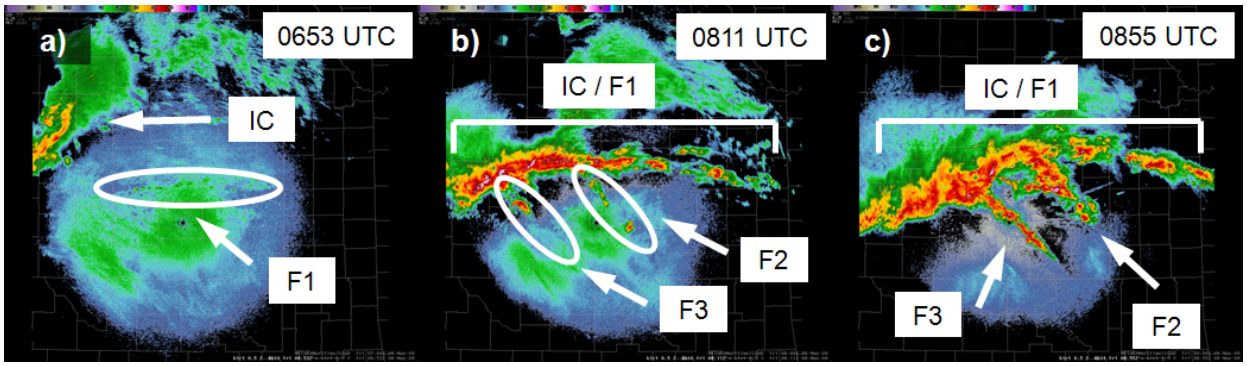


Figure 4-7: Identification of the initial convection (IC), and three different features (F1, F2, and F3) at a) 0653 UTC, b) 0811 UTC, and c) 0855 UTC that influence the evolution of the system as seen through KICT 0.5 Reflectivity.

Answer Key 2.2 - The trainee should trace the origins of the bowing segment to an embedded area of increased velocities as a part of IC/F1 in southwest McPherson County between 0832 UTC and 0841 UTC (Figure 4-8a). Estimated velocities of 82 kts at 0909 UTC in Harvey County and 79 kts at 0923 UTC in northern Sedgwick County were found in the 0.5 degree base velocity product (Figure 4-8b). As the segment moves into western Sedgwick County and later into Butler County, two mesovortices form along the gust front between 0936 UTC and 0955 UTC as the reflectivity pattern transforms into a bowing structure (Figure 4-8c). Overall, there were five mesovortices with the developing MCS; all but one were located along the IC/F1 feature.

The identification of a growing rear stratiform region, a deepening cold pool, and RIJ should alert the trainee to the development of a potentially high-impact MCS, as seen in conceptual models. This evolution should be more pronounced between 0955 UTC and 1027 UTC. The stratiform region located behind the strengthening MCS can be identified as early as 0855 UTC to 0918 UTC. The RIJ is not as easily identified using base velocity from KICT prior to 1100 UTC (Figure 4-8d); however, radar measured velocities of 60-80 kts can be found behind the gust front. The RIJ can be better depicted from KINX (not shown) with an area of 60-95 kts northwest of the radar at 1053 UTC and 1057 UTC. Note that the data from KINX is heavily contaminated with range folding and improper dealiasing.

Evaluation Criteria 2.3 - Determine the severe weather hazards that exist during the convective evolution of this system from 0800 UTC to 1100 UTC.

Answer Key 2.3 - Localized wind threats exist along the IC/F1 feature and some of the embedded supercellular features. The most prominent wind threat exists with the area identified at the initial bowing of the IC/F1 segment (see Evaluation Criteria 2.2). A hail threat exists with numerous areas of reflectivity > 60 dBZ. Some of the more vigorous cells could produce hail up to 1.25 inches in diameter (e.g., 0850 UTC to 0909 UTC in northeast Butler County). Use of reflectivity in the -20C level and the vertically-integrated liquid (VIL) product could assist in the identification of specific hail threats.

Some of the mesovortices along the gustfront have rotational velocities greater than 40 kts, which can enhance the wind and tornado threat. The significant mesovortices were located in northwest Kingman County from 0909 UTC to 0932 UTC and northwest Sedgwick County into western Butler County from 0936 UTC to 0955 UTC (see Figure 4-9 for Sedgwick County example). Radar-derived storm total precipitation estimates of 3-4 inches from southeast Barton County to Marion County, and localized areas in Butler, Chase, and Lyon Counties could result in flash flooding.

Performance Objective 3 - Determine the motion and possible downstream impacts of the evolving MCS. It is recommended that this analysis should be conducted for 1000 UTC to 1144 UTC.

Evaluation Criteria 3.1 - Create a short-term forecast concerning the maintenance and movement of the MCS into the SGF CWAs.

Answer Key 3.1 - Using model-derived Forward Propagation Corfidi Vectors and recognizing the general motion of the system between 0900 UTC and 1144 UTC (approximately 100 degrees at 55 kts), the trainee should deduce a change in motion to 85-90 degrees with a continued forward propagation of at least 50-55 kts. The trainee should identify the key MCS maintenance parameters described in AWOC Severe IC 2 - Lesson 3, such as 0-10 km Bulk Shear, MUCAPE, and 3-8 km lapse rates, and evaluate the longevity of the system. Note that the Volume Browser in D2D only allows for 3-6 km lapse rates (shown in Figure 4-10)instead of 3-8 km lapse rates.

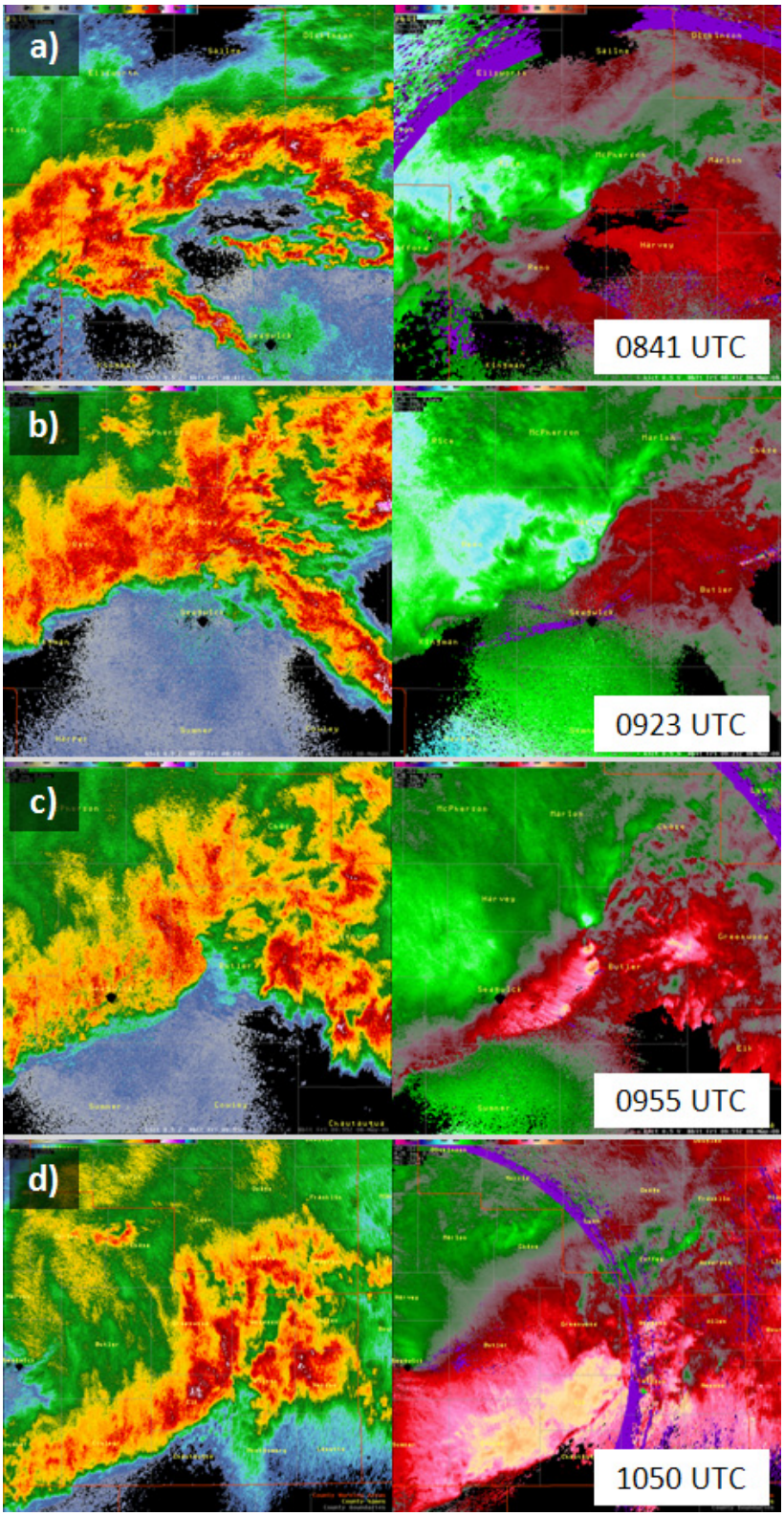


Figure 4-8: KICT 0.5 Reflectivity and 0.5 Base Velocity at a) 0841 UTC, b) 0923 UTC, c) 0955 UTC, and d) 1050 UTC.

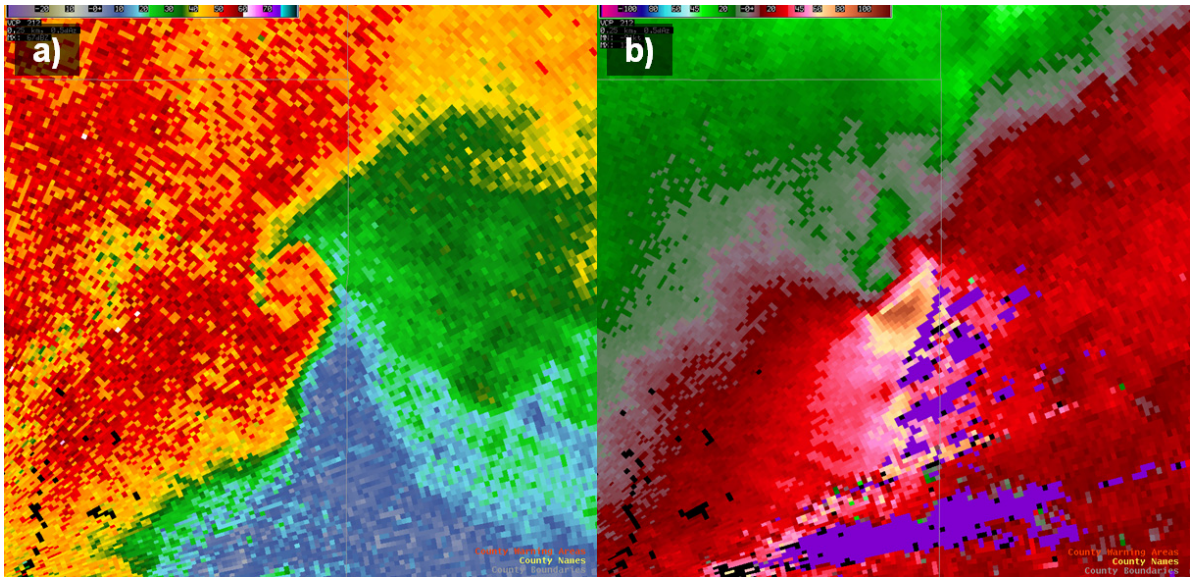


Figure 4-9: KICT a) 0.5 Reflectivity and b) 0.5 Base Velocity at 0946 UTC showing a significant mesovortex in northwest Kingman County. Note that the KICT WSR-88D is located to the southwest of this feature (not shown).

Evaluation Criteria 3.2 - Identify the severe weather threat(s) that could impact neighboring CWAs, most notably the SGF CWA, with the developing MCS.

Answer Key 3.2 - The trainee should evaluate all possible severe weather impacts from this system based on observations up to 1144 UTC, short-term forecast model runs, and MCS conceptual models. Listed below are the different threats that accompany this system.

> ***Wind:*** The trainee should recognize the continued high wind threat from the bowing feature and developing RIJ from radar estimated velocities and aforementioned MCS maintenance parameters. Determining the expected wind magnitude and wind duration, especially with the wake-low winds behind the main gust front, will be more difficult. The wind shear profiles ahead of the system in the mid-levels suggest that sustained, long-lived updrafts can still occur, allowing the MCS to maintain its intensity and provide a continuous wind threat across the region.

Tornadoes: The low-level directional shear will be enhanced along the gust front, especially along and north of the axis of the strengthening RIJ. The combination of localized regions of vorticity generation and cyclonic shear from the gust front and RIJ moving over a region of forecasted 0-1 km and 0-3 km SRH values of 100-300 m^2 s^{-2} over southern Missouri will provide ample low-level shear for tornadoes.

Hail: Model-derived parameters show modest CAPE and lapse rates within the hail growth zone (-10C to -30C) with freezing level heights over 4000 m. Model forecast soundings support modest CAPE values in the -10C to -30C layer in the western half of the SGF CWA at 1200 UTC (Figure 4-11a), but show little CAPE in the eastern half of the CWA at 1300 UTC (Figure 4-11b). Although the directional and shear profiles support long-lived, tilted updrafts, the abnormally high precipitable water (> 4 cm) can reduce the strength of the updraft due to water loading. The overall hail threat in SGF looks to be marginal at best, with the greatest threat in the western portion of the CWA.

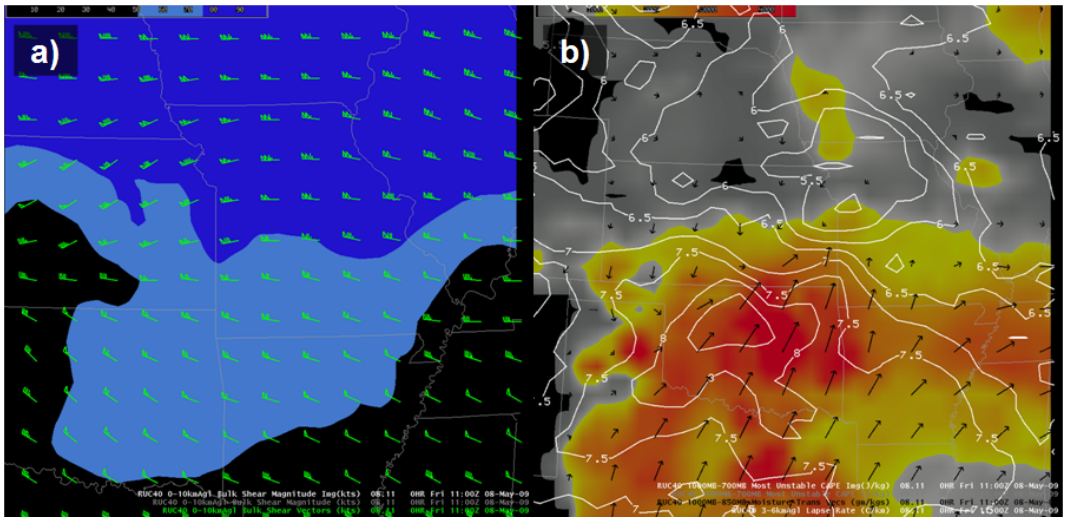


Figure 4-10: a) RUC40 0-10 km AGL bulk shear vectors (kts) at 1100 UTC. Light blue shading represents shear magnitude > 50 kts and dark blue shading represents shear magnitude > 75 kts. b) RUC40 1000-700 mb MUCAPE (J kg^{-1} - shaded), RUC40 1000-850 mb moisture transport (m s^{-1} g kg^{-1} - black arrows), and RUC40 3-6 km AGL Lapse Rate (C km^{-1} - white contours) at 1100 UTC.

Flash Floods: Based on the above normal values of precipitable water and mixing ratios, it can be assumed that any region experiencing prolonged periods of rainfall are susceptible to flash flooding. Use of one-hour, three-hour, and storm-total precipitation products would assist in specifying more localized regions of flash flooding without the use of the Flash Flood Monitoring and Prediction (FFMP) software. Some areas in St. Louis, MO (LSX) and PAH received rainfall from the previous MCS, which was identified during Performance Objective 1. Therefore, the trainee can assume near saturated ground conditions for this region and that additional rainfall will greatly enhance any flash flood threat.

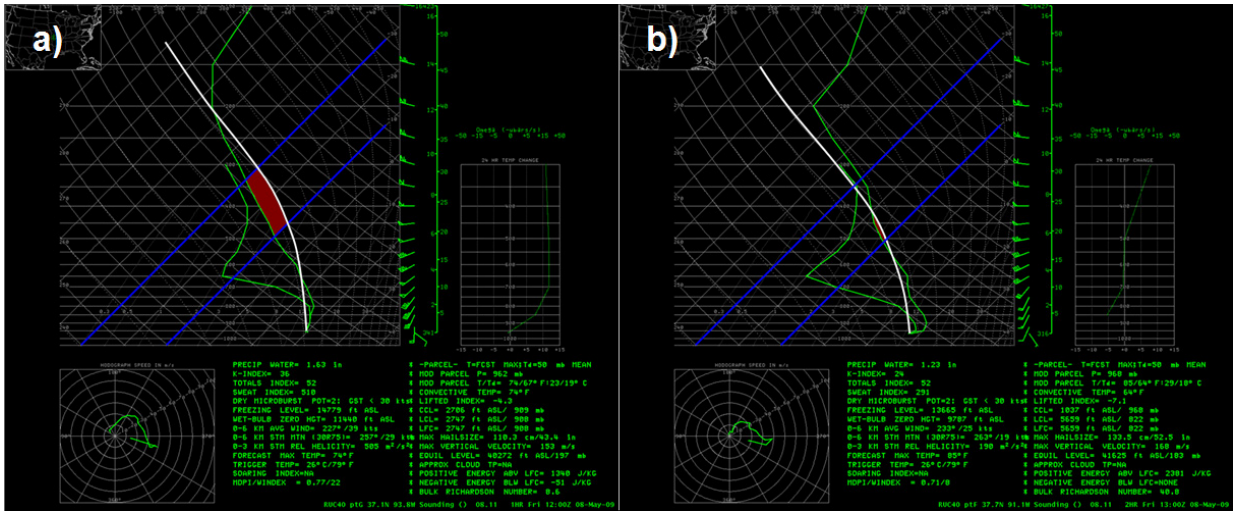


Figure 4-11: a) RUC40 model sounding near Mount Vernon, MO (approximately 37.1N, 93.8W) 1HR forecast for 1200 UTC and b) RUC40 model sounding near Viburnum, MO (approximately 37.7N, 91.1W) 2HR forecast for 1300 UTC. The blue lines represent the -10C and -30C isotherms, the white line represents the parcel trajectory from the surface, and the red shaded region represents the CAPE between the -10C and -30C layer based on lifting a parcel from the surface.

III. Simulation 2 - SGF (1144 UCT - 1310 UTC)

Overview:

This simulation focuses on the maturation of the MCS and the development of an unusually large northern bookend vortex (BV) as it enters the SGF CWA. Because of the size and magnitude of this event, it is ***highly recommended*** that the facilitator ***sectorizes the warning operations*** for workload management purposes. The combination of multiple severe weather threats and numerous local storm reports provided through the WESSL script (Appendix C) can place the trainee in an undesirable high workload, high stress environment. Therefore, focusing on a specific severe weather threat or geographic region during the simulation will keep the trainee in an optimum high situational awareness, low workload warning decision making environment.

Since the simulation starts before 1200 UTC, a variety of products will be available during the opening minutes of the event, including a new Day One Outlook from the Storm Prediction Center (SPC) valid at 1200 UTC and the 1200 UTC soundings. A second SPC Day One Outlook will be provided at 1300 UTC. Particularly Dangerous Situation (PDS) Severe Thunderstorm Watch #266 was issued for the entire CWA at 1055 UTC, which emphasized winds gusts up to 80 mph and hail up to two inches in diameter (see Appendix B). These SPC products and spotter reports are provided in the WESSL script that will run in real-time with the simulation (Appendix C).

Two pause times (1210 UTC and 1242 UTC) are included in the WESSL script to test the trainee's awareness and comprehension of the situation. Interactive WESSL scripts are also included to simulate the interaction between a forecast office and some of our key partners (i.e., emergency managers and local media). Because the event has already entered the SGF CWA, an active warning (see Figure 4-12) is provided in AWIPS with the text details provided in the WESSL script (Appendix C) during the opening minutes of the simulation. This warning will expire at 1200 UTC and cover the initial storm reports that are also displayed in the WESSL script. This will allow time for the trainee to analyze the situation and provide time to issue new warnings.

******You must "Write Archived Text to Database" before starting the simulation for the warning to display. See the README file in Appendix D******

As the developing system moves into the western portion of the SGF CWA, the consolidation of the bowing IC/F1 segment with F2 and F3 (see Figures 4-7 and 4-8 in Simulation 1 - ICT) leads to a singular bow echo propagating at 60 kts from 280 degrees. The formation of a large BV, as seen from KSGF, can be tracked from western Cherokee County, KS at the beginning of the simulation (1144 UTC) to the Cedar County and Dade County border by the end of the simulation (1310 UTC). Over a dozen mesovortices were user identified during the time period of the simulation, but only two tornadoes were confirmed by National Weather Service (NWS) storm surveys (EF-1 in Dade County at 1253 UTC and EF-1 in Greene County at 1305 UTC).

Straight-line winds with peak wind gusts of 70-78 kts (80-90 mph) with the initial gust front and ensuing wake-low winds were reported in 13 counties during this period. Base velocity measurements from KSGF depict the strength of the RIJ and the development of the BV. Hail generally ranging from 1.00 inch to 1.75 inch in diameter are reported with the line in Jasper and Newton Counties as well as with a number of storms ahead of the MCS in the northern part of the CWA. Flash flooding is also a threat during this time period, with reports coming from Vernon and Cedar Counties after receiving approximately 2.5 to 3.5 inches of rain. See Appendix A for all storm reports for SGF.

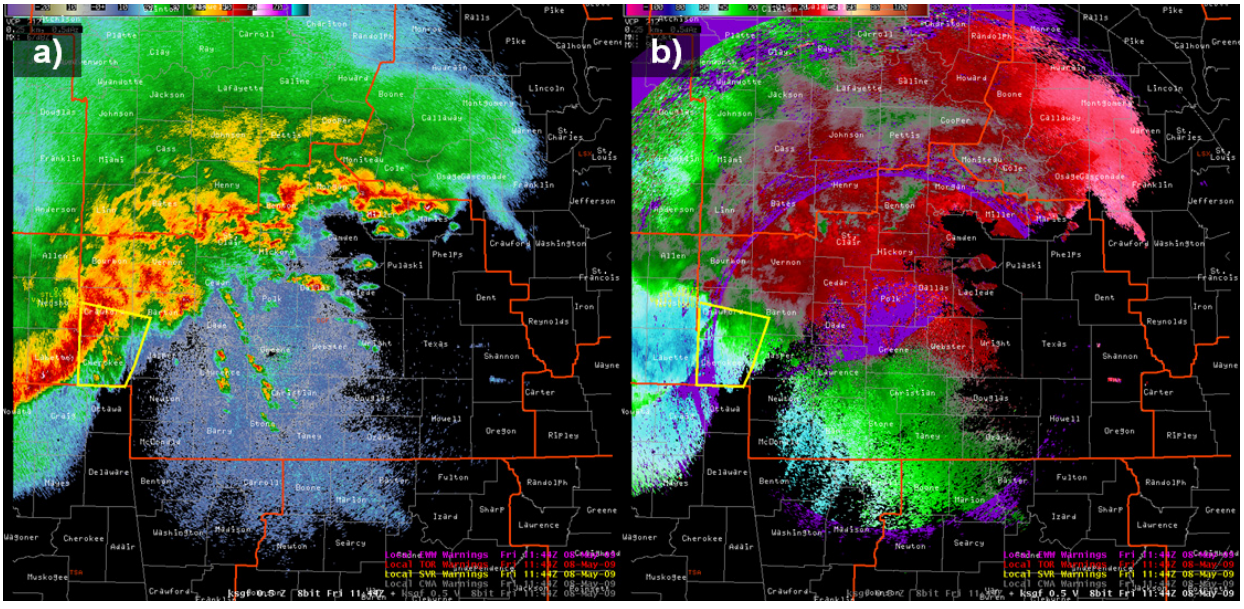


Figure 4-12: KSGF a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1144 UTC with a severe thunderstorm warning (yellow polygon) provided at the start of the simulation. CWA boundaries are denoted in red.

Background Information:

Prior to the MCS crossing into the SGF CWA, multiple hail and high wind reports were received by the ICT Weather Forecast Office (WFO; see Appendix A for all storm reports). High winds resulted in one injury from a vehicle roll-over on the Kansas Turnpike approximately 0.8 N Cassoday in Butler County, KS at 1000 UTC (see ICT CWA Storm Report #27 in Appendix A). High winds were also responsible for a fatality in New Albany in Wilson County, KS at 1051 UTC when a mobile home was destroyed, trapping the victim inside (see ICT CWA Storm Report #38 in Appendix A). The high winds in the central and eastern part of the CWA resulted in numerous structural damage and significant power outages. Localized flash flooding and hail were also reported across the CWA.

**** For a better understanding of the environmental conditions leading up to the event, the trainee should complete Simulation 1 - ICT as an additional pre-brief for Simulations 2 & 3 in the SGF CWA. ****

Performance Objectives:

Performance Objective 1 - Demonstrate processes for continuous evaluation of all hazardous weather threats (tornadoes, damaging winds, hail, and flash floods) to support effective warning methodologies.

> **Evaluation Criteria 1.1 -** Evaluate the level of threat of all severe weather types (hail, wind, tornadoes, flash flood), and discuss the important issues concerning these severe weather hazards. This criteria can be discussed prior to the start of the simulation, during pause times, or at the end of the scenario.
>
> **Answer Key 1.1 -** Considerations for discussion should include the analysis of atmospheric instability, low-level wind profiles and shear, and MCS maintenance parameters (see AWOC Severe IC 2 - Lesson 3). The trainee should recognize that the conditions are favorable for a large wind threat, a moderate hail threat with the bow echo and any cells ahead of the MCS, and a marginal tornado threat based on their radar and environmental analysis. Continuous evaluation during the simulation will allow the forecaster to maintain a high situational awareness of the evolving MCS and associated severe weather threats, especially with the strenghtening RIJ and evolution of the BV.

Performance Objective 2 - Using any or all of the three base moments in radar, demonstrate the ability to detect and then mitigate anomalous propagation, range folding, and improperly dealiased velocities for KSGF.

Evaluation Criteria 2.1 - Document the volume scan times of improper dealiasing, noisy velocities, and range folding that can impact radar analysis of the MCS and associated mesoscale features.

Answer Key 2.1 - Some of the important data quality issues the trainee should identify include:

- Ring of range folding at a range of 84 miles from the radar. This will affect the velocity data in far eastern Kansas (Bourbon, Crawford, and Cherokee Counties), especially from 1144 UTC to 1149 UTC as the bow echo passes through, and the northern counties in the CWA (Benton, Miller, and Morgan Counties, MO).
- Significantly large region of improperly dealiased velocities at 1221 UTC (0.5 tilt)
- Improper dealiasing with the mesovortex at 1239 UTC (0.5 tilt) in Lawrence County, MO

Evaluation Criteria 2.2 - Identify ways to mitigate these data quality issues (range folding, velocity dealiasing, etc.).

Answer Key 2.2 - Adjusting the Pulse Repetition Frequency (PRF) and/or the Volume Coverage Pattern (VCP) of the radar would be the most acceptable way to solve these problems. The use of neighboring radars would provide radar coverage for areas in the western CWA; however, each radar has its own inherent flaw. KEAX does provide 8-bit and super-resolution data, but contains significant data quality issues with the velocity product. Note that KINX and KSRX are not provided in the dataset. Finding vertical continuity with the Lawrence County mesovortex at 1239 UTC will assist in determining the intensity of the mesovortex since it is obscured at the 0.5 tilt by improperly dealiased velocities.

Performance Objective 3 - Using specific data examples, identify the three levels of situational awareness (***perceive***, ***comprehend***, and ***project***) and how they are contributing to your warning decision.

Evaluation Criteria 3.1 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #1 (1210 UTC).

Answer Key 3.1 - At Break #1, the trainee should ***perceive*** the following features:

- Area of rotation near the Crawford County, KS and Barton County, MO county border (Figure 4-13) containing a mesovortex with 112 kts gate-to-gate shear along the aforementioned county border
- Mesovortex along the gust front in western Jasper County, MO
- Strength and elevation of the RIJ in eastern Kansas (Cherokee, Labette, and Neosho Counties)
- Hail threat ahead of the MCS in northwest Laclede County, MO (+65 dBZ)

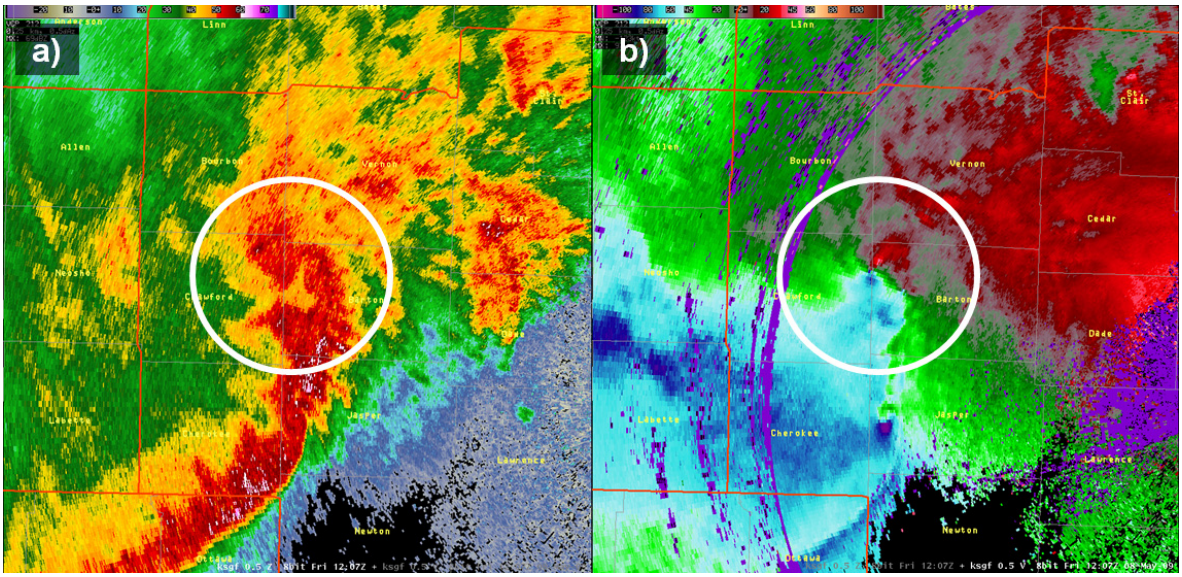


Figure 4-13: KSGF a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1207 UTC showing the developing BV (circled) containing a strong mesovortex.

The trainee should ***comprehend*** that the area of rotation moving into Barton County, which is located on the northern part of the bow echo. This is in the general location of the BV formation, as seen in various conceptual models. The trainee should also be cognizant of the increasing hail threat along the southern end of the bow echo based on the KSGF reflectivity and VIL estimates. Finally, the trainee should ***project*** the development and movement of the BV, the enhanced wind potential (duration and magnitude) with the BV and RIJ, the hail threat ahead of the bow echo, the continuation

of mesovortices within and east of Barton and Jasper Counties. The trainee should monitor the trends of rotational velocity signatures for new mesovortex development, even at these far distances from KSGF (> 50 miles).

Evaluation Criteria 3.2 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #2 (1242 UTC).

Answer Key 3.2 - At Break #2, the trainee should ***perceive*** the following features:

- Large BV and associated wind structure over Barton County, MO
- Mesovortices located in southwest Cedar County, MO and northwest Lawrence County, MO (Note that the Lawrence County mesovortex contains some pixels of improperly dealiased velocities as mentioned in Performance Objective 2)
- Strength and elevation of the RIJ, now extending into Lawrence, Jasper, and Newton Counties

The trainee should ***comprehend*** the depth and strength of the RIJ containing 70 kt winds less than 2000 ft AGL moving into Lawrence County, and the evolution of the BV and associated wind structure in Barton County. Use of local storm reports of damage in Barton and Lawrence Counties (as seen in the WESSL script; see Appendix C) to help corroborate analysis of the WSR-88D velocity values and intensity of wind damage at the surface. The trainee cannot rule out the possibility of mesovortex formation within its circulation due to the dynamic nature of the feature, as seen with a weak mesovortex signature in Barton County. Environmental analysis with respect to vertical wind profiles and shear ahead of the bow echo can assist in providing the trainee a heightened awareness of new mesovortex formation (see Performance Objective 6). The trainee should also recognize the decreasing hail threat with the southern portion of the bow echo based on reduced reflectivity values and VIL.

Finally, the trainee should ***project*** the continued eastward propagation of the MCS, the possible tornadic threat north of the bow echo apex in the cyclonic shear zone, and the wind threat from both the RIJ and BV. Three-dimensional analysis of the RIJ and BV using the Four-Dimensional Storm-Cell Investigator (FSI) tool can assist the trainee in analyzing the straight-

line wind threat. In regards to the BV, the trainee should project the damaging wind threat in associated warnings and statements, especially with enhanced wording in regards to the wind threat moving from Barton County into central and southern Dade County (see Performance Objective 5).

Evaluation Criteria 3.3 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples at the end of the simulation (1310 UTC).

**** Note: Evaluation Criteria 3.3 is recommended if the trainee is to take Simulation 3 - SGF (1310 UTC to 1503 UTC) or if the facilitator wants to test the trainee's awareness. ****

Answer Key 3.3 - At Break #3, the trainee should ***perceive*** the following features:

- Continuation of the large BV into Dade County, moving approximately 45 kts from 275 degrees.
- Significant high wind threat (estimated at 60 to 80 kts in the 0.5 tilt base velocity product) associated with the BV and the RIJ (Figure 4-14; KSGF reflectivity not shown)
- Weakening mesovortex signature associated with a tornado report from Republic, MO in Greene County at 1306 UTC (not shown). See SGF CWA Storm Report #16 in Appendix A for the damage survey and Appendix C for the spotter report in the WESSL script.
- Possible region of mesovortex development just east of Ponce de Leon, MO in northeastern Stone County (not shown)
- Strong cell in southeast Miller County producing half-dollar sized (1.25 inch diameter) hail

The trainee should ***comprehend*** the increase in tornadic productivity with the first two tornado reports associated with this system (see WESSL script in Appendix C and SGF CWA storm reports in Appendix A). More information regarding the increase in mesovortex formation can be found in Performance Objective 6. The trainee should also comprehend the straight-line wind threat with the maxima of base velocities located with the BV near the Cedar County and Dade County border. Three-dimensional analysis of the RIJ and BV using FSI can assist the trainee in analyzing the straight-line wind threat (Figure 4-14).

Finally, the trainee should ***project*** the potential magnitude of the winds associated with the BV, especially as it approaches the radar site. The trainee should also note the possible formation of mesovortices based on the velocity signatures in northern Greene County, southern Polk County, and northeastern Stone County and the possible increase in tornadic activity along the bow echo north of the bow echo apex, as seen in conceptual models (see Performance Objective 6).

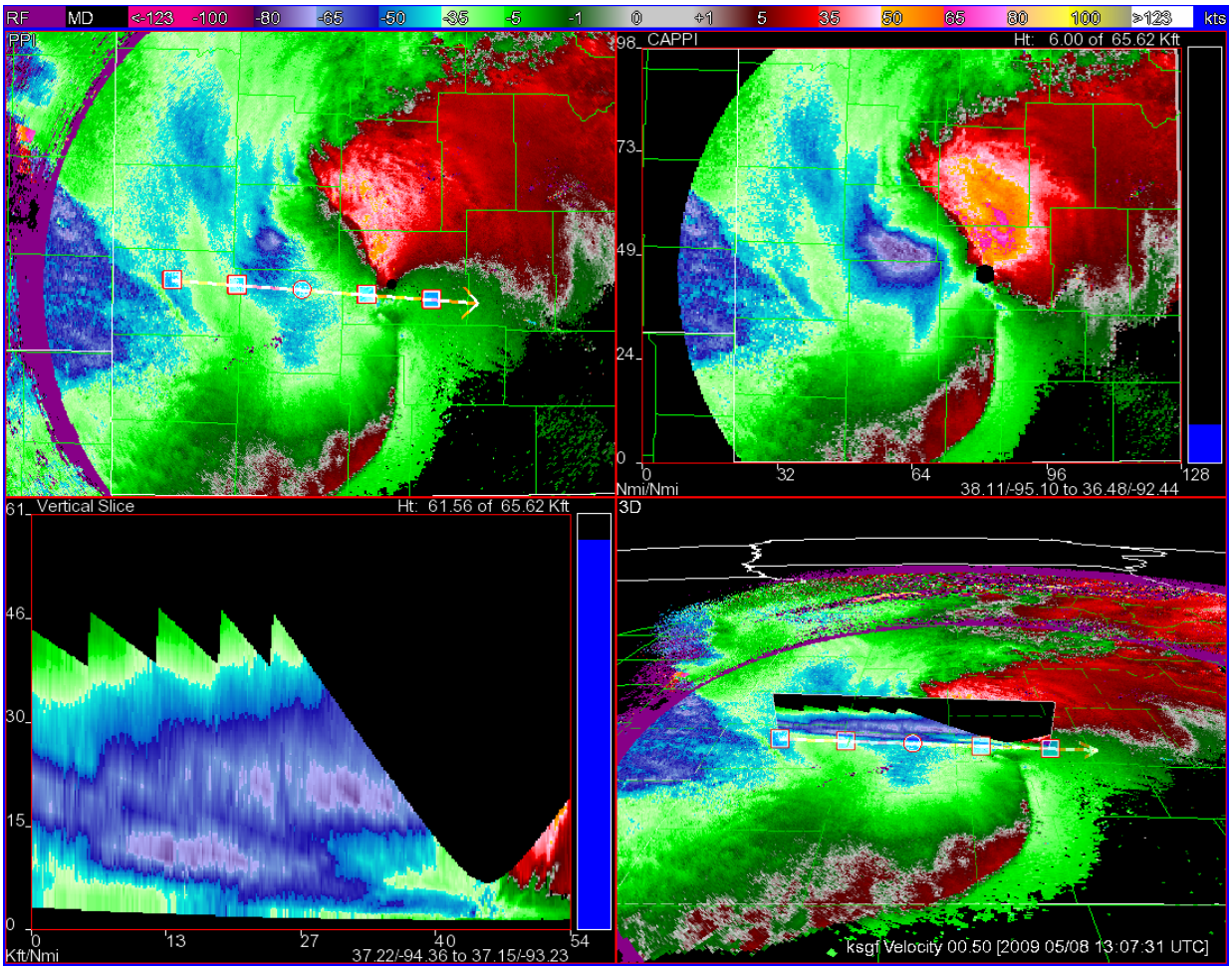


Figure 4-14: KSGF base velocity at 1307 UTC with a cross section taken through to the RIJ (bottom-left) with the Four-Dimensional Stormcell Investigator (FSI).

Performance Objective 4 - Assess the trainee's ability to evaluate and communicate the severe weather threat using the interactive WESSL script (see Appendix C).

Evaluation Criteria 4.1 - The trainee should answer the following question given at 1210 UTC (Note that the simulation is paused at this time):

A local media member in NWSChat is asking "What kind of severe weather threat do you expect to happen later this morning?"

Answer Key 4.1 - The trainee should recognize the potential for a strong bow echo to move eastward across the CWA and provide a basic forecast, which includes the anticipated severe weather threats, for the period after this pause time. Based on the history of the system in the ICT CWA, local environmental analysis, and MCS conceptual models presented in the AWOC courses, the trainee should mention the high wind threat with and behind the bow echo along with a tornadic threat along the gust front. The trainee should also mention the continued evolution of the BV and its associated high wind threat, as based on conceptual models shown in the AWOC QLCS lessons, and the wind threat associated with it.

The trainer can retrieve and evaluate the response by accessing the file ***/data/awips/2009May08_AWOC/wessl/AWOCMay08_PartI.log.YYYYMMDD_HHMM*** where the name of the file "YYYYMMDD_HHMM" represents the date and time that the trainee responded to the interactive script.

Performance Objective 5 - Demonstrate the ability to issue effective warnings, including appropriate polygon coverage, magnitude of threat(s), and call-to-action statements. Note that this performance objective provides a ***generic guideline*** to warning strategies for this event and does not focus on specific features during the simulation.

Evaluation Criteria 5.1 - Issue severe thunderstorm and tornado warnings with appropriate polygon coverage and time duration.

Answer Key 5.1 - *Severe thunderstorm warnings* (SVRs) for this simulation should remain long in duration (i.e., 45 to 60 minutes) and cover areas along and behind the bow echo due to the strong straight-line winds associated with the RIJ. Similar to any severe weather scenario, all warnings should have minimum overlap and no gaps between them. Due to the complex nature and size of the bow echo and BV, issuing multiple SVRs along the line will reduce the text size of each individual warning and allowing users to quickly get to call-to-action statements and any enhanced wording (see Evaluation Criteria 5.2). Warning polygons should encompass the impact area and not be bounded by county borders. It is important for the trainee to have sufficient lead times on his/her SVRs by having warnings issued

ahead of the bow echo and BV. Figure 4-15 shows a warning polygon placed well ahead of the convection in order to capture sufficient lead time of the gust front containing 60 to 80 mph wind gusts.

Tornado warnings (TORs) for this simulation should have smaller polygons in area when compared to SVR polygons. Each warning should focus on an individual mesovortex with a duration of 20 to 30 minutes since QLCS mesovortices are short-fused. Similar to SVRs, TOR polygons should not be bounded by county boundaries and should cover the threat areas expected to be impacted. Understanding velocity trends and recognizing rotational velocities signatures will assist the trainee in identifying possible tornadic mesovortices; thus, pattern recognition for mesovortex formation, such as increased inflow and vertical continuity, is critical in having any warning lead times and a decreased false-alarm rate. Some techniques to assist in quickly identifying QLCS mesovortices prior to tornadic development are as follows:

- Look for increasing rotational velocity magnitudes in the low-levels (i.e., 1.0 to 2.5 km layer). This can include the possibility of jumps in rotational velocities of greater than 10-15 kts in one volume scan.
- Identify rapid deepening of the vortex in the vertical. Some case studies have shown that tornadoes will often occur by the third or fourth volume scan after initial identification of the mesovortex (***This will vary from case to case***).
- Highest probability of tornadic potential occurs towards the end of the vertical growth period and low-level rotational values are generally greater than 40 kts.

Due to the high impact nature of this event and recommended workload management, it is at the discretion of the trainer if the trainee is responsible for *severe weather statements* (SVSs). If the trainee is responsible for SVSs during the simulation, the trainee should follow guidelines set by his/her office on issuing SVSs.

Evaluation Criteria 5.2 - Provide appropriate wording and call-to-action statements for severe thunderstorm warnings, tornado warnings, and severe weather statements.

Answer Key 5.2 - Enhanced wording is needed to convey the high wind threat with the bow echo and the BV, especially for higher populated and metropolitan areas. Specific text in SVRs and SVSs should highlight the damaging straight-line wind threat after the line passes through. Warnings along the bow echo should note that embedded tornadoes can form quickly and would be rain-wrapped. The trainee should have appropriate call-to-action statements in all warnings.

In order for the public and NWS partners to quickly access the enhanced wording and call-to-action statements, the trainee should avoid having excessive text in their products. This can be done by having warnings that do not cover an extremely large area, which would have a long list of all counties and cities in the polygon. Also, all warnings should not include any specific pathcasts.

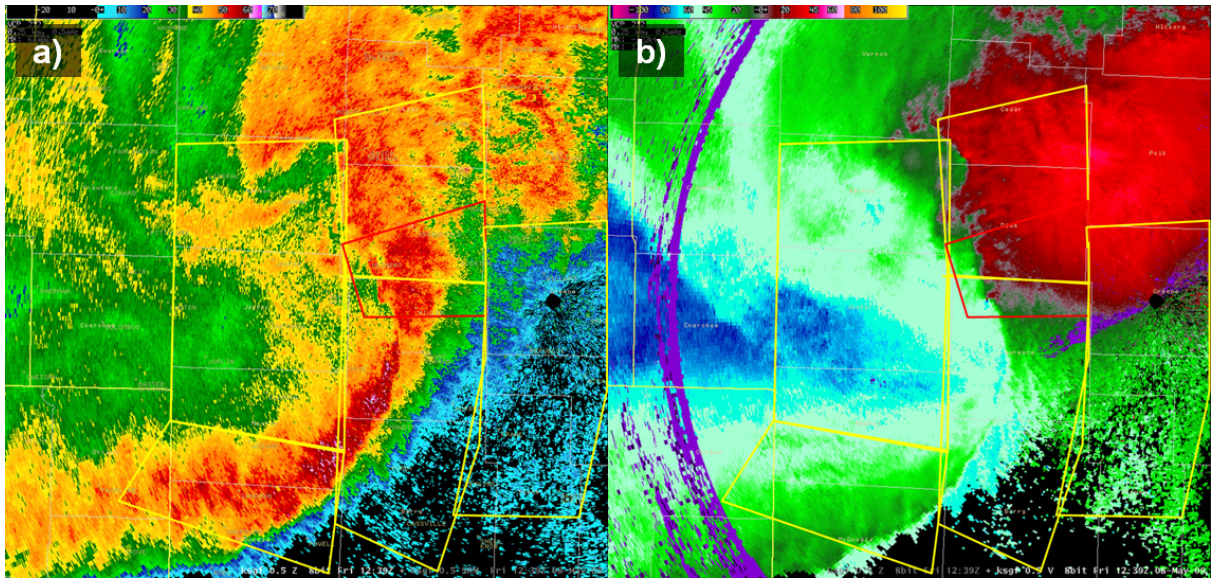


Figure 4-15: KSGF a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1239 UTC with example warning polygons overlaid. SVRs are denoted by yellow polygons and TORs are denoted by red polygons.

Performance Objective 6 - Perform a mesoscale meteorological analysis of the MCS. This should include defining the location and axis of the RIJ and the evaluation of the bow echo structure and the influence of shear on the bow echo. Use this analysis of the RIJ, BV, and bow echo with local environmental data to depict areas of enhanced tornadic potential.

Evaluation Criteria 6.1 - Identify the location and structure of the RIJ. Analysis should include the strength of the RIJ and axis of highest velocities.

Answer Key 6.1 - Starting with the reflectivity products from the KSGF WSR-88D, identifying the weak reflectivity notch from eastern Kansas into southwest Missouri in the trailing stratiform region of the MCS can provide a quick way for the trainee to identify the general location of the RIJ (not shown). Using the radar velocity products, the trainee should note banding features within the velocity values. As the flow of the RIJ becomes more parallel to the radials, the trainee should note the strength of the RIJ. Higher elevation scans (i.e., 1.3 and 1.8 tilt) shows estimated velocities of 90-100 kts at 7-11 kft AGL, especially at 1244 UTC (not shown). Use of FSI can assist in showing the entire structure of the RIJ, as seen in Figure 4-14.

The trainee should identify the axis of the RIJ from the KSGF 0.5 tilt base velocity product. Using the base velocity at 1253 UTC, the trainee should recognize the greater velocity values near Parsons, KS through Joplin, MO and eastwards toward Mount Vernon, MO (Figure 4-16). A local inbound velocity maximum embedded in the mean RIJ flow can be seen approximately 10-15 miles northwest of Monett, MO. The cross-section taken near this region at 1307 UTC in Figure 4-14 shows velocity values of 50 kts from the RIJ descending towards the surface, which resulted in the long-duration 40-60 mph winds well behind the bow echo.

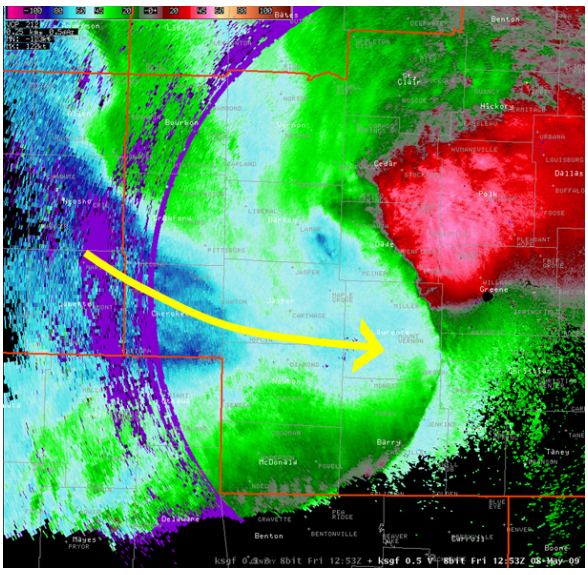


Figure 4-16: KSGF 0.5 Base Velocity at 1253 UTC with the axis of the RIJ denoted by a yellow arrow.

Evaluation Criteria 6.2 - Use radar base data to analyze the structure of the bow echo. The trainee's analysis should include the identification of the gust front associated with the bow echo, reflectivity patterns within the bow echo, and the influences of increased shear from the RIJ and BV on the bow echo structure (i.e., relate the strength of the cold pool *vs.* the strength of the wind shear).

Answer Key 6.2 - Combined analysis of KSGF 0.5 reflectivity, base velocity, and spectrum width show a distinct reflectivity structure in relation to the gust front and the bow echo apex, or inflection point. The location of the gust front is well correlated with increased spectrum width values and significant velocity gradients. The apex of the bow echo generally represents a change in the location of the gust front to that of the convection represented by strong reflectivities (> 50 dBZ).

The convection north of the bow echo apex is characterized by a more ragged appearance, low vertically-integrated liquid (VIL; < 30 kg m2), and generally situated ahead of the gust front (Figures 4-17 and 4-18). The convection located just south of the bow echo apex exhibits a stronger reflectivity gradient along the leading edge, almost unbroken high reflectivity values located behind the gust front, and increased VIL (generally 35-60 kg m2). This strong convection then weakens further to the southwest and exhibits a more cellular appearance with the cells falling back further behind the gust front (Figures 4-17 and 4-18).

This structure is likely influenced by the balance between the component of the pre-gust front vertical shear normal to the gust front and the strength of the cold pool circulation. To the north of the apex, the KSGF vertical wind profile indicated that the 0-3 km shear rapidly increased from 40 kts at 1122 UTC to almost 70 kts by 1249 UTC just before gust front arrival (Figure 4-19). Given the orientation of the gust front, almost all of that shear was directed in a normal component and likely helped to push the ascending air above the gust front rapidly forward, thus limiting the depth of the ascent, leading to a case of the shear overwhelming the cold pool. The result led to forward leaning cells and limited convective coverage (Figure 4-18).

Further south along the gust front, the solid convective coverage is indicative of a better balance between the gust front circulation and the environmental vertical wind shear. The wind shear may be less here, and even if it

was the same, the orientation of the gust front changed to a more southwesterly direction such that the component of the vertical shear perpendicular to the boundary drops, allowing for deeper lifting along the gust front. Eventually, the gust front orientation becomes almost parallel to the environmental shear and so the cross-boundary shear component drops to near zero, allowing the cold pool to dominate and the lifting decreases while the convection slopes from front to rear (Figure 4-18).

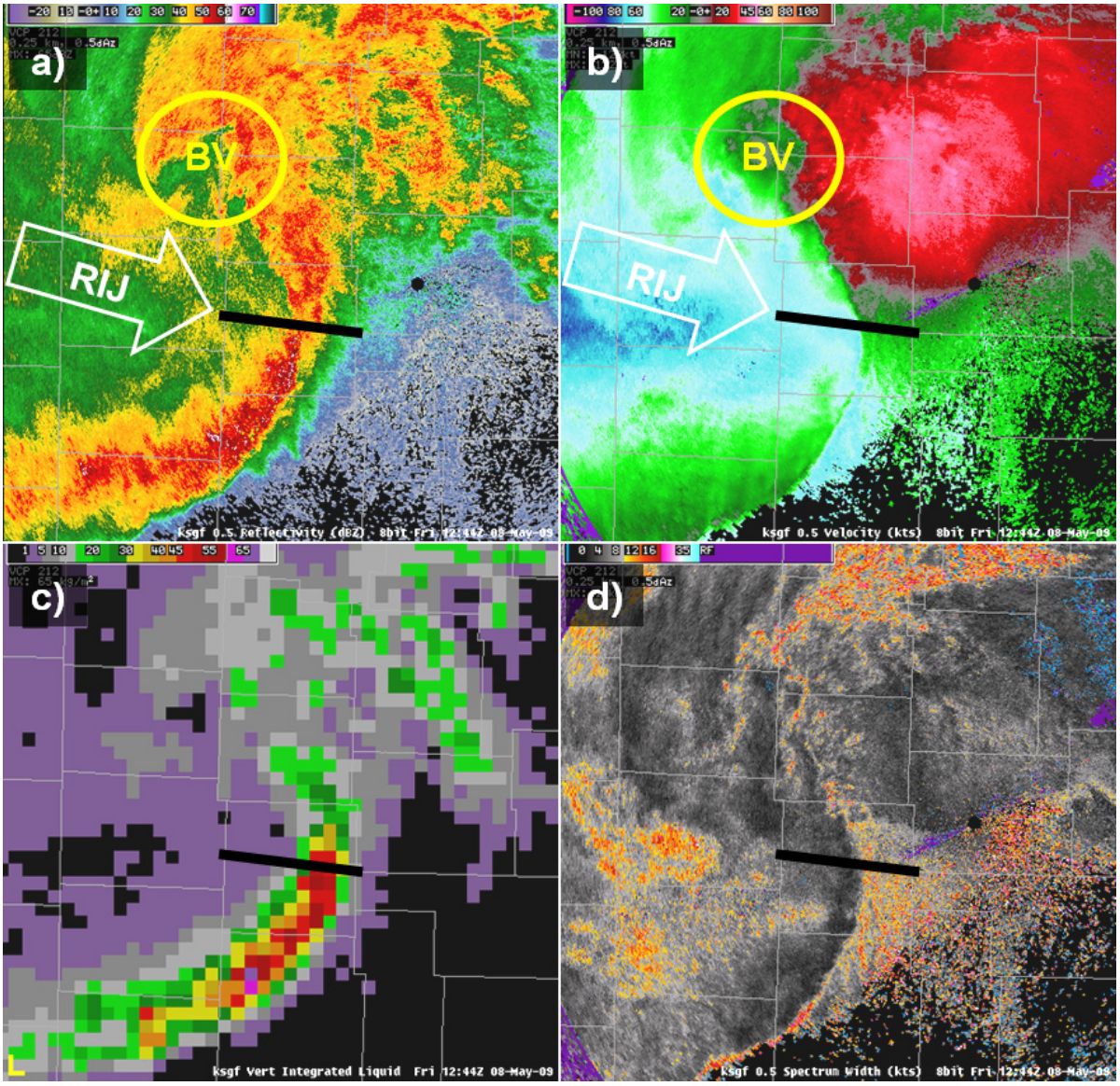


Figure 4-17: KSGF a) 0.5 Base Reflectivity, b) 0.5 Base Velocity, c) VIL, and d) 0.5 Spectrum Width at 1244 UTC. The black line in all four panels represents the approximate location of the bow echo apex. For both a) and b), the yellow circle represents the general location of the BV and the white block arrow represents the general location and orientation of the RIJ.

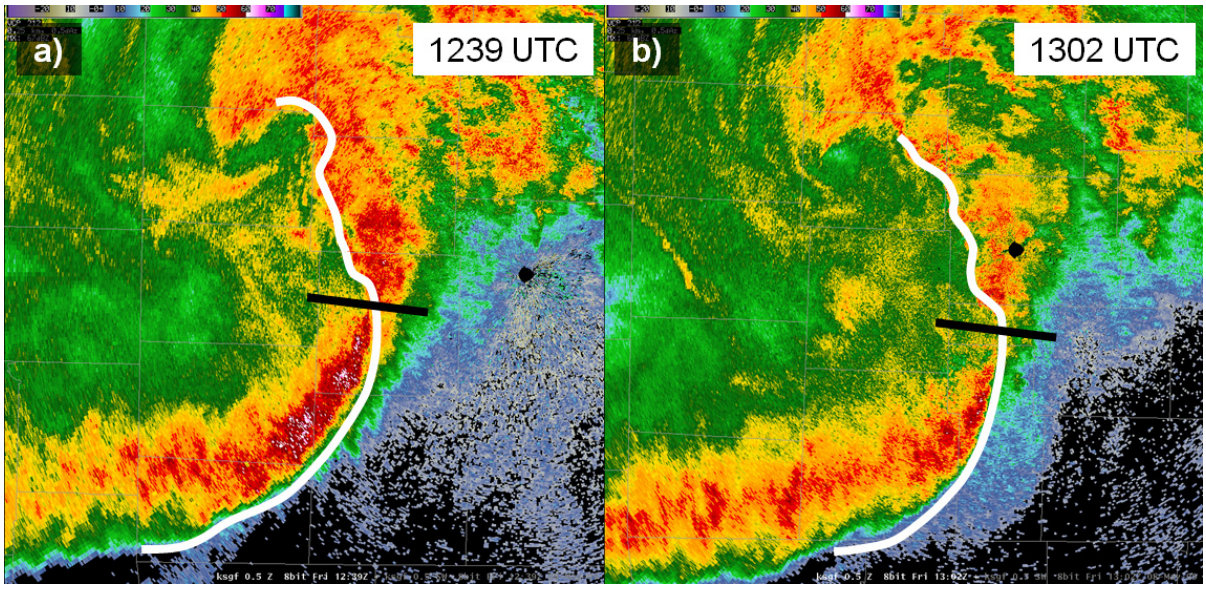


Figure 4-18: KSGF 0.5 Base Reflectivity at a) 1239 UTC and b) 1302 UTC. The white line denotes the gust front based on KSGF 0.5 Spectrum Width analysis at each time. The black line represents the approximate location of the bow echo apex.

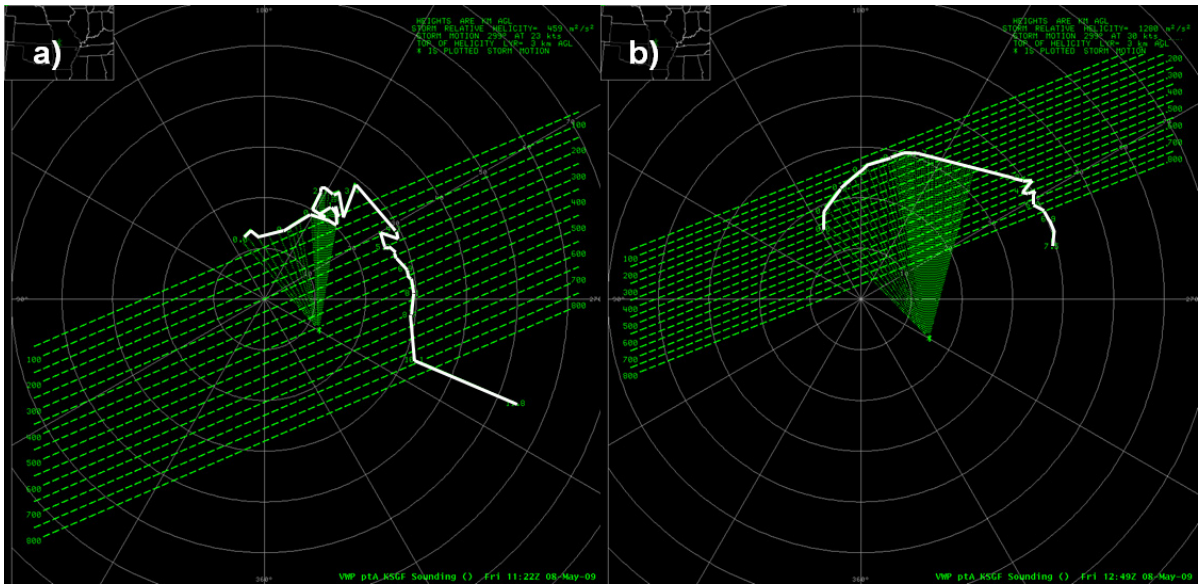


Figure 4-19: Hodograph of vertical wind profile at the location of the KSGF WSR-88D at a) 1122 UTC and b) 1249 UTC.

Evaluation Criteria 6.3 - Define the region(s) along the bow echo that could expect the greatest potential of tornadic activity. The trainee should use the mesoscale wind profile analysis performed in Evaluation Criteria 6.2 and the understanding of conceptual models in his/her discussion.

Answer Key 6.3 - As shown in Evaluation Criteria 6.2, 0-3km shear at KSGF increases from 40 kts to 70 kts as the bow echo approaches the WSR-88D. This storm induced shear profile also influences the low-level helicity ahead of the gust front. Looking at the hodographs in Figure 4-19, the 0-3 km SRH from the radar-based vertical wind profile was 459 m^2 s^{-2} at 1122 UTC and increased to 1280 m^2 s^{-2} at 1249 UTC. This is more than sufficient low-level helicity to allow for rapid formation of mesovortices along the gust front.

Because of the enhanced cyclonic vorticity and increased low-level shear and helicity north of the bow echo apex with the descending RIJ, an increased tornadic threat exists anywhere along the gust front from the bow echo apex northward to the BV in regions of deeper convection. The overall structure of the MCS is well representative of QLCS conceptual models, including a diagram by Atkins and St. Laurient (2008) of a bow echo with a descending RIJ and damaging mesovortices (Figure 4-20). The trainee should recognize more localized threats with any bulges or notches in the gust front, which would enhance horizontal vorticity and updraft intensity, and with areas of convergence, as seen with strong reflectivity gradients and velocity signatures.

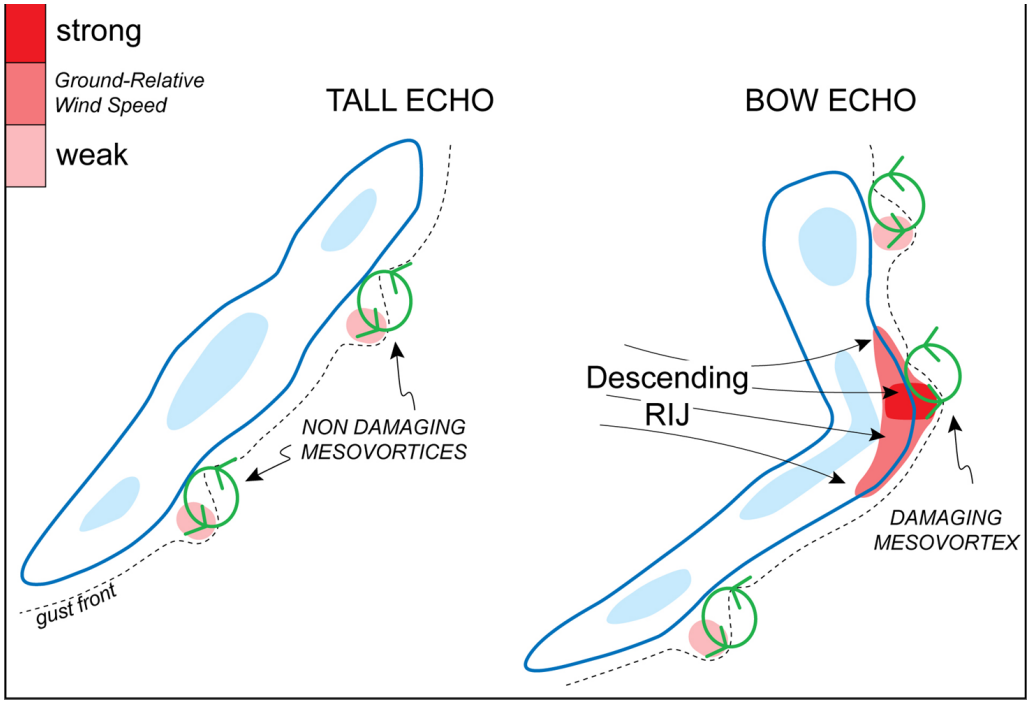


Figure 4-20: Schematic diagram illustrating damaging and non-damaging mesovortices formed within a bow echo from Atkins and St. Laurient (2008).

IV. Simulation 3 - SGF (1310 UCT - 1503 UTC)

Overview:

Simulation 3 is a continuation of the event in Simulation 2 where the maturing MCS now traverses through the eastern half of the SGF CWA. Because of the size and magnitude of this event, it is ***highly recommended*** that the facilitator ***sectorizes the warning operations*** for workload management purposes. The combination of multiple severe weather threats and numerous local storm reports provided through the WESSL script (Appendix C) can place the trainee in an undesirable high workload, high stress environment. Therefore, focusing on a specific severe weather threat or geographic region during the simulation will keep the trainee in an optimum high situational awareness, low workload warning decision making environment.

It is important to note that all warnings issued by the trainee during Simulation 2 ***will not exist*** at the beginning of Simulation 3. However, two active warnings (see Figure 4-21) are provided in AWIPS with the text details provided in the WESSL script (Appendix C) during the opening minutes of the simulation. These warnings will expire at 1320 UTC and cover the initial storm reports that are also displayed in the WESSL script. This will allow time for the trainee to analyze the situation and provide time to issue new warnings.

******You must "Write Archived Text to Database" before starting the simulation for the warnings to display. See the README file in Appendix D******

Particularly Dangerous Situation (PDS) Severe Thunderstorm Watch #266 is still in effect for the entire CWA, as well as the 1300 UTC Day One Outlook from SPC (see Appendix A). The issuance of Tornado Watch #267 at 1420 UTC includes the three easternmost counties in the CWA (Dent, Shannon, and Oregon Counties). Three pause times (1332 UTC, 1405 UTC, and 1427 UTC) and interactive scripts are included in this simulation to evaluate the trainee's comprehension and awareness of the situation. Because of the tornadic activity between the start of the simulation and the second pause time at 1405 UTC, additional time should be spent discussing warning methodologies and threat conveyance.

The main severe weather threat shifts from a hail/wind event to a tornado/wind event as the bow echo passed over the KSGF WSR-88D. Shortly after the start of the simulation (1310 UTC), mesovortex activity increases along the bow echo from central Polk County southward into Taney County. Between 1314 UTC and 1350 UTC, ten tornadoes impacted eight different counties. A total of 17 tornadoes crossed through 13 different counties by the end of the simulation at 1503 UTC. Of those 17 tornadoes, five were rated with an EF-2 intensity and one was rated with an EF-3 intensity (see SGF CWA Storm Reports in Appendix A). Four tornadoes, including the EF-3 tornado in Howell County, occur after the final pause time (1425 UTC), are obscured by range folding or noisy data, and are at least 70 nm from the KSGF WSR-88D.

Strong straight-line winds with peak wind gusts of 70-74 kts (80-85 mph) are reported in 17 counties during this simulation time period. The intensity of the northern bookend vortex (BV) is realized between 1321 UTC and 1339 UTC when the WSR-88D estimated winds of 80-110 kts at approximately 600-2000 ft AGL in the base velocity product. The combination of numerous wind and tornado reports during the simulation will test the trainee's ability to manage and comprehend incoming storm reports while dealing with the current severe weather situation. The WESSL script detailing the storm reports used during this simulation are available in Appendix C.

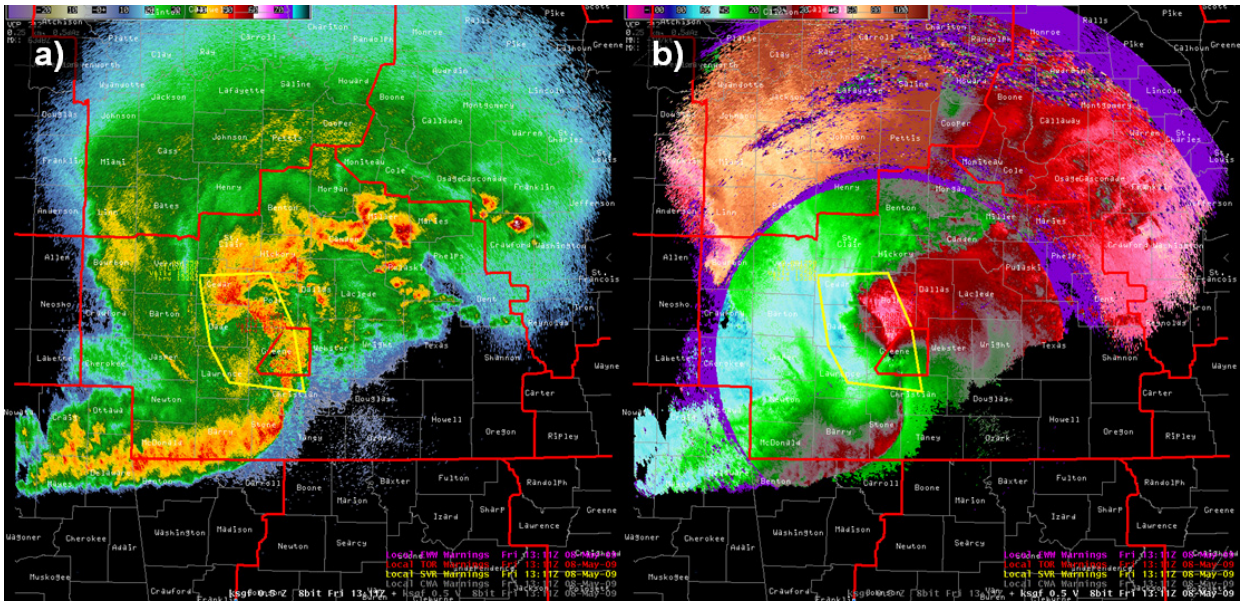


Figure 4-21: KSGF a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1311 UTC with a severe thunderstorm warning (yellow polygon) and tornado warning (red polygon) provided at the start of the simulation. CWA boundaries are denoted in red.

Background Information:

Multiple high wind reports associated with and behind the gust front have been received by the office prior to the start of Simulation 3 (see Appendix A and Appendix C). The first damage reports came in from eastern Kansas where a 1000 ft. transmission tower located at the Cherokee County courthouse was knocked down while 63 structures were damaged in McCune, KS. Widespread power outages and structural damage were reported in all affected counties. Two short-lived tornadoes were confirmed by NWS storm surveys and local emergency managers. An EF1 tornado touched down 1.8 miles east of Pilgrim, MO at 1253 UTC and tracked to the east of town, resulting in damage to trees and outbuildings (see SGF CWA Storm Report #12 in Appendix A). At 1305 UTC, an EF1 tornado touched down 2.2 miles southwest of Republic, MO and tracked through the town of Republic, damaging approximately 50 structures (see SGF CWA Storm Report #16 in Appendix A).

Performance Objectives:

Performance Objective 1 - Demonstrate processes for continuous evaluation of all hazardous weather threats (tornadoes, damaging winds, hail, and flash floods) to support effective warning methodologies.

> **Evaluation Criteria 1.1 -** Evaluate the level of threat of all severe weather types (hail, wind, tornadoes, flash flood), and discuss the important issues concerning these severe weather hazards. This criteria can be discussed prior to the start of the simulation, during pause times, or at the end of the scenario.
>
> **Answer Key 1.1 -** Considerations for discussion should include the analysis of instability parameters, low-level wind profiles and shear, and MCS maintenance parameters (see AWOC Severe IC 2 - Lesson 3). The trainee should recognize the level of the severe weather threats based on current conditions, including the ongoing large-scale high wind threat and increased tornadic threat. Continuous evaluation during the simulation will allow the forecaster to maintain a high situational awareness of the evolving MCS and associated severe weather threats, notably the intensity of the BV as it approaches the KSGF WSR-88D and increased mesovortex activity along the bow echo.

Performance Objective 2 - Using any or all of the three base moments in radar, demonstrate the ability to detect and then mitigate anomalous propagation, range folding, and improperly dealiased velocities for KSGF.

Evaluation Criteria 2.1 - Document the volume scan times of improper dealiasing, noisy velocities, and range folding that can impact radar analysis of the MCS and associated mesoscale features.

Answer Key 2.1 - Some of the important features the trainee should identify include:

- The bow echo moving into a range folded region starting at 1416 UTC. The trainee should note the change from VCP 212 to VCP 211 at 1439 UTC and the consequential change in the range folding location (Figure 4-22).
- Noisy velocity data beyond the first-trip echo, which obscures velocity signatures and mesovortices
- Dealiasing at 1344 UTC (1.8, 2.4, and 3.1 tilt) and 1434 UTC (1.8 tilt)

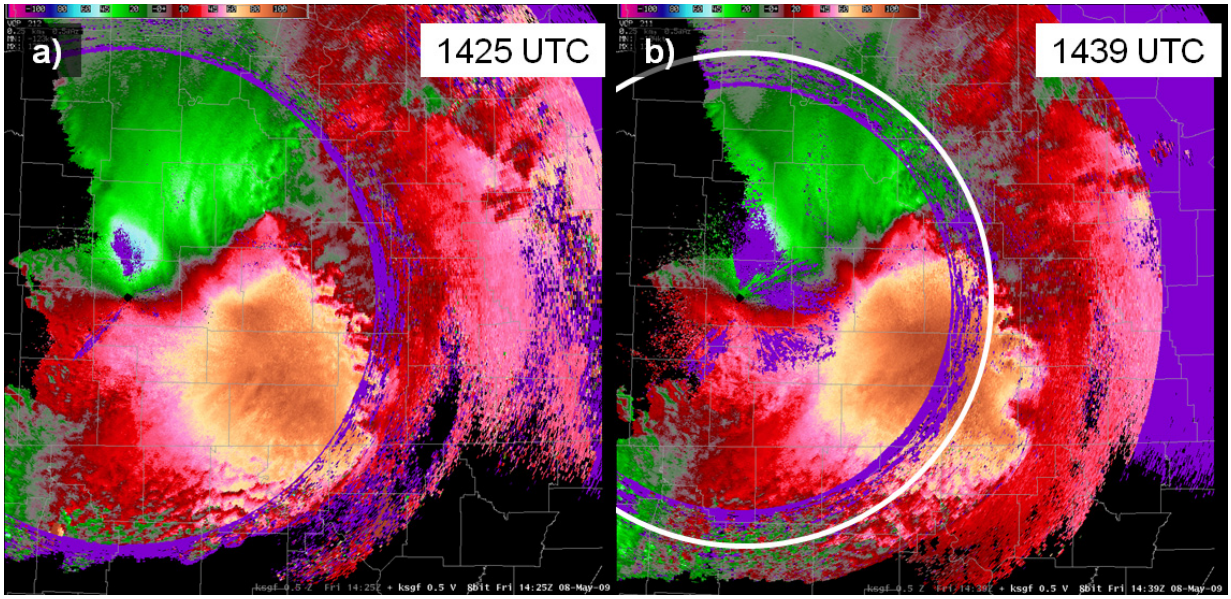


Figure 4-22: KSGF 0.5 Base Velocity at a) 1425 UTC and b) 1439 UTC. Note the ring of velocity range folding east of the radar at 1425 UTC and the change in the radius of the range folding at 1439 UTC (1425 UTC range folding denoted by white circle) based on the VCP change from VCP 212 to VCP 211.

Evaluation Criteria 2.2 - Identify ways to mitigate these data quality issues (range folding, velocity dealiasing, etc.).

Answer Key 2.2 - Adjusting the VCP and/or PRF of the radar is the best way to resolve the radar issues. The closest radar scanning the eastern half of the CWA is KLSX. However, massive range folding exists beyond a 90 mile radius from the site; thus, it only provides coverage for Maries, Phelps, and Dent Counties.

Performance Objective 3 - Using specific data examples, identify the three levels of situational awareness (perceive, comprehend, and project) and how they are contributing to your warning decision.

Evaluation Criteria 3.1 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #1 (1332 UTC).

Answer Key 3.1 - At Break #1, the trainee should ***perceive*** the following features:

- The intensity of the BV located approximately 20 nm north-northwest of the KSGF WSR-88D in Polk County. Using KSGF 0.5 Base Velocity, winds estimated at 90-115 kts were located just east of Eudora, MO in southwest Polk County. The trainee should also recognize the height at which these winds are estimated at, which is approximately 1,100-1,700 ft AGL. This wind field extends southward into Greene County, where estimated winds of 80-90 kts at ~700 ft AGL are located east of Ash Grove, MO (Figure 4-23).
- Complex area of mesovortex activity located near southeast Christian County and northern Taney County (Figure 4-24) involving the following mesovortices:
    - Tornadic mesovortex with ~109 kt gate-to-gate shear located approximately three miles east-southeast of Garrison, MO in southeast Christian County
    - Mesovortex located approximately four miles east of Taneyville, MO in northern Taney County
    - Anticyclonic mesovortex located approximately one mile northwest of Bradleyville, MO in northern Taney County (Some data quality issues exist with this mesovortex)

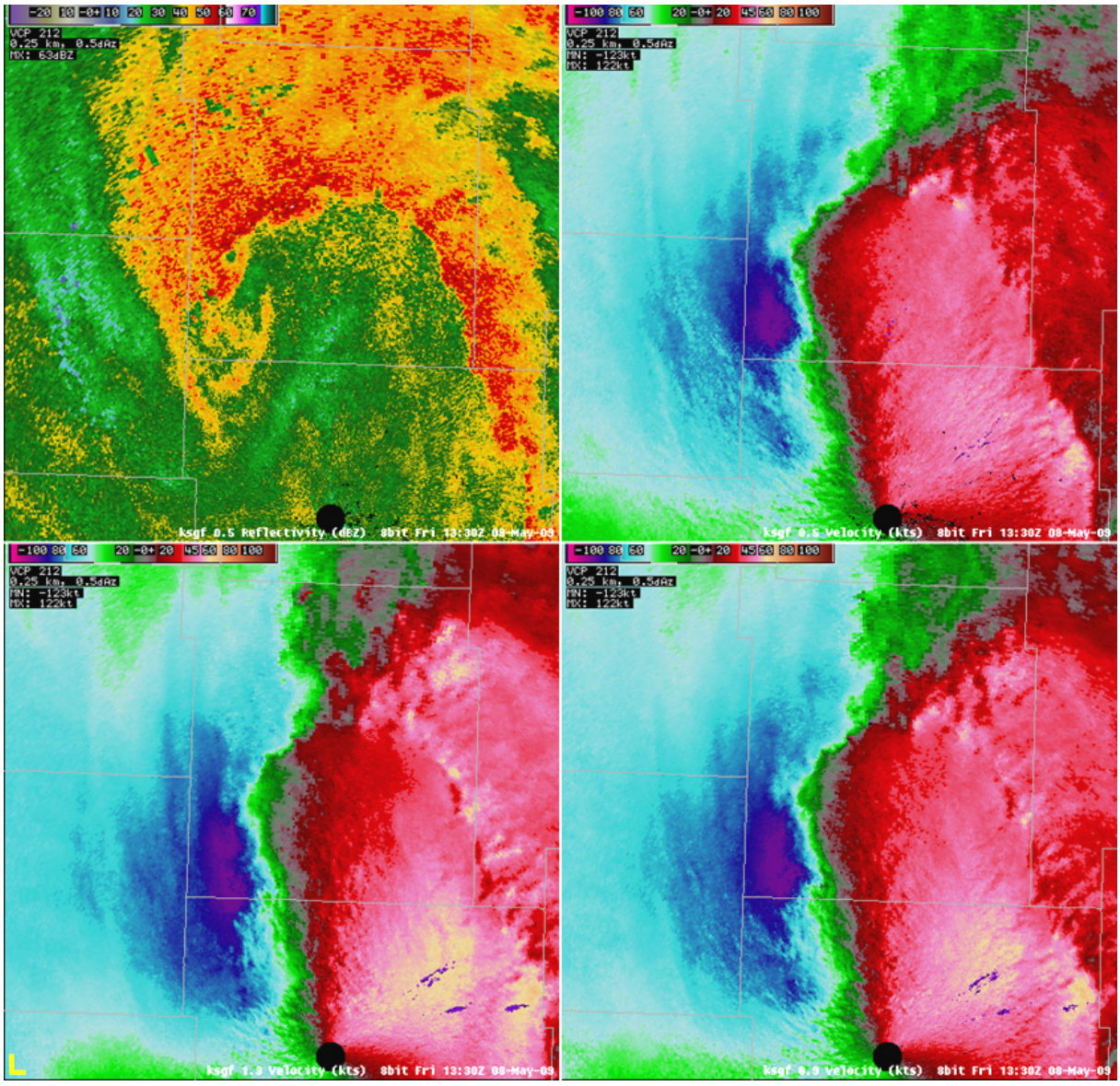


Figure 4-23: KSGF four panel view of 0.5 Base Reflectivity (top-left), 0.5 Base Velocity (top-right), 0.9 Base Velocity (bottom-right), and 1.3 Base Velocity (bottom-left) at 1330 UTC of the BV.

The trainee should then ***comprehend*** the increase in mesovortex activity north of the bow echo apex, as denoted by the velocity and reflectivity signatures, and the extreme wind threat associated with the BV based on the estimated velocities of 80-115 kts. The trainee can perform additional analysis on the formation of mesovortices in this simulation in Performance Objective 6. Finally, the trainee should ***project*** the movement and intensity of the BV through Dallas, Laclede, and northern Webster Counties and the

short-fused nature of tornadic development along the gust front north of the bow echo apex. Extra attention should be focused on the concentration of mesovortex activity moving into Douglas County from northern Taney and southern Christian Counties. The trainee should also be able to project the high wind threat and the possibility of embedded, rain-wrapped tornadoes in their warning products through enhanced wording and call-to-action statements (see Performance Objective 5).

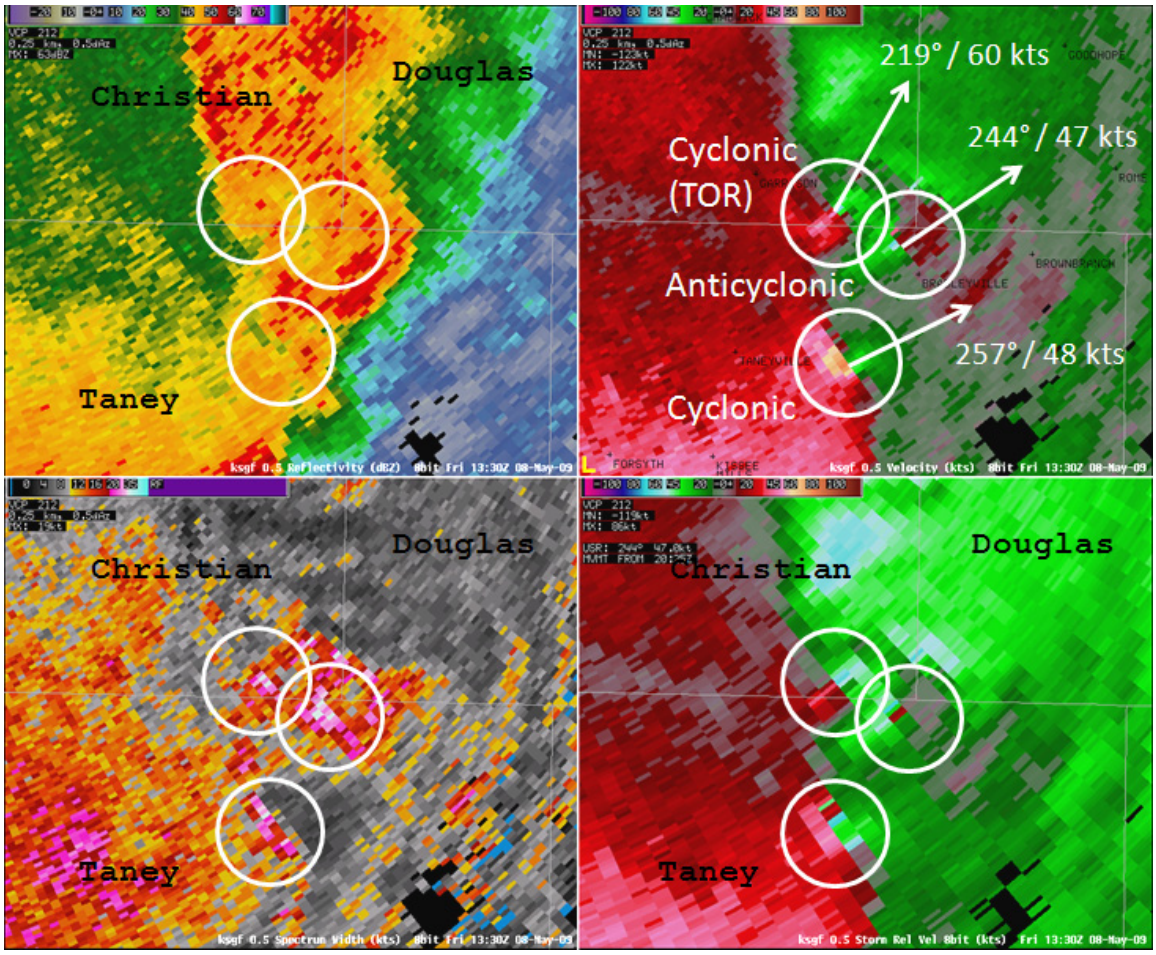


Figure 4-24: KSGF four panel view of 0.5 Base Reflectivity (top-left), 0.5 Base Velocity (top-right), 0.5 Storm Relative Velocity (bottom-right), and Spectrum Width (bottom-left) at 1330 UTC of two cyclonic mesovortices near Garrison, MO and Taneyville, MO and the one anticyclonic mesovortex near Bradleyville, MO. The general motion of each mesovortex is denoted with the 0.5 Base Velocity (top-right). Note the cyclonic mesovortex near Garrison, MO is tornadic (TOR) at this time.

Evaluation Criteria 3.2 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #2 (1405 UTC).

Answer Key 3.2 - At Break #2, the trainee should ***perceive*** the following features:

- Continuation of the BV in Dallas County with strong winds behind the vortex in Polk and Greene Counties
- Large swath of elevated 60-85 kt winds associated with the RIJ in Christian, Douglas, Taney, Ozark, Boone, and Marion Counties
- Notable mesovortices located 2 ENE Odin (Ozark County) and 4 SE Gainesville (Wright County)

The trainee should then ***comprehend*** the increased difficulty in mesovortex detection as the MCS moves away from the KSGF WSR-88D. The difficulty is further enhanced by the characteristically shallow vertical depth of these QLCS mesovortices. The trainee should also comprehend the areal coverage and duration of the high wind threat from the RIJ and BV. Finally, the trainee should ***project*** the possible tornadic threat with the Ozark County and Wright County mesovortices and the continued wind threat based on the movement of the MCS and associated BV. The trainee should continue to convey these threats through appropriate statements and warnings, as described in Performance Objective 5.

Evaluation Criteria 3.3 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #3 (1427 UTC).

Answer Key 3.3 - At Break #3, the trainee should ***perceive*** the following features:

- RIJ with large area of 60-100 kt winds shown by the base velocity product from KSGF
- Bow echo located more than 55 miles from the radar moving into an area of range folded velocities (Figure 4-22)
- Notable mesovortices in southwest Texas County (near Cabool, MO) and central Laclede County (Figure 4-25 for Laclede County mesovortex)

The trainee should ***comprehend*** the impacts on warning decision making with the leading edge of the MCS moving farther from the radar and into a region of range folding and noisy velocity data beyond the first trip echo (Figure 4-22). The trainee should recognize that forecasting mesovortex

activity will become increasingly difficult because of the aforementioned distance from the radar. Finally, the trainee should ***project*** the continued threat of strong wake-low winds associated with the RIJ and BV. The use of local storm reports and information from storm spotters will become critical in identifying and conveying more localized threats (e.g., downbursts and tornadoes) in the warning products.

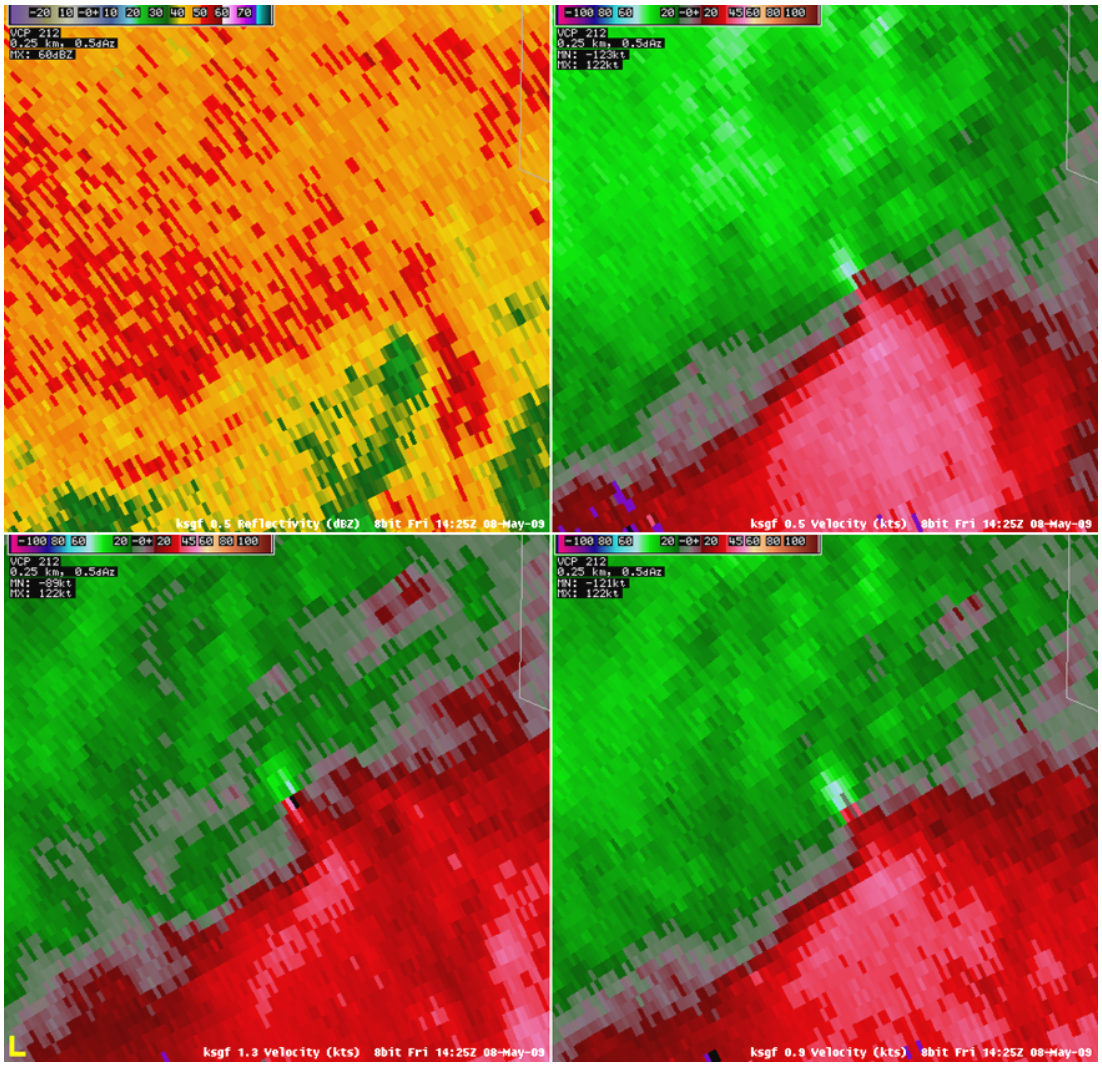


Figure 4-25: KSGF four panel view of 0.5 Base Reflectivity (top-left), 0.5 Base Velocity (top-right), 0.9 Base Velocity (bottom-right), and 1.3 Base Velocity (bottom-left) at 1425 UTC of the mesovortex associated with the BV in Laclede County.

Performance Objective 4 - Assess the trainee's ability to evaluate and communicate the severe weather threat using the interactive WESSL script (see Appendix C).

Evaluation Criteria 4.1 - The trainee should answer the following question given at 1332 UTC (Note that the simulation is paused at this time):

How are you going to convey to the public and NWS partners the seriousness of the high wind speeds expected behind the derecho?

Answer Key 4.1 - The trainee should emphasize the use of strong wording when relaying information to the public and NWS partners on the severity of the high winds. This includes the initial impact from the leading edge of the bow echo, the BV, and the subsequent high wind threat behind the MCS associated with the RIJ and BV. The trainee should mention the strength and duration of the winds expected with behind the system based on their analysis of the KSGF velocity products and local storm reports. There were a number of reports relaying winds up to 60 mph for up to 30 minutes behind the passage of the gust front.

The conveyance of this message to emergency managers, media, first responders, and other important entities should be done through NWSChat, phone calls, conference calls, etc. The forecaster should emphasize to media members the wind threat associated with the MCS so it can be relayed to the public. The use of strong wording and specific call-to-action statements should be used in warnings and subsequent severe weather statements. Given the strength of the velocities seen by KSGF, a forecaster can compare the magnitude of the expected wind threat to that of a weak tornado.

The trainer can retrieve and evaluate the response by accessing the file ***/data/awips/2009May08_AWOC/wessl/AWOCMay08_PartII.log.YYYYMMDD_HHMM*** where the name of the file “YYYYMMDD_HHMM” represents the date and time that the trainee responded to the interactive script.

Performance Objective 5 - Demonstrate the ability to issue effective warnings, including appropriate polygon coverage, magnitude of threat(s), and call-to-action statements. Note that this performance objective provides a ***generic guideline*** to warning strategies for this event and does not focus on specific features during the simulation.

Evaluation Criteria 5.1 - Issue severe thunderstorm and tornado warnings with appropriate polygon coverage and time duration.

Answer Key 5.1 - *Severe thunderstorm warning* (SVR) strategy for this simulation is similar to that of Simulation 2. SVRs should remain long in duration (i.e., 45 to 60 minutes) and cover areas along and behind the bow echo due to the strong straight-line winds associated with the RIJ and BV. Similar to any severe weather scenario, all warnings should have minimum overlap and no gaps between them. Due to the complex nature and size of the bow echo and BV, issuing multiple SVRs along the line will reduce the text size of each individual warning and allowing users to quickly get to call-to-action statements and any enhanced wording (see Evaluation Criteria 5.2). Warning polygons should encompass the impact area and not be bounded by county borders. It is important for the trainee to have sufficient lead times on his/her SVRs by having warnings issued ahead of the bow echo and BV.

Generally, *tornado warnings* (TORs) for this simulation should have smaller polygons in area when compared to SVR polygons, focus on an individual mesovortex, and have a duration of 20 to 30 minutes since QLCS mesovortices are short-fused. Understanding velocity trends and recognizing rotational velocities signatures will assist the trainee in identifying possible tornadic mesovortices; thus, pattern recognition for mesovortex formation, such as increased inflow and vertical continuity, is critical in having any warning lead times and a decreased false-alarm rate. Some techniques to assist in quickly identifying QLCS mesovortices prior to tornadic development are as follows:

- Look for increasing rotational velocity magnitudes in the low-levels (i.e., 1.0 to 2.5 km layer). This can include the possibility of jumps in rotational velocities of greater than 10-15 kts in one volume scan.
- Identify rapid deepening of the vortex in the vertical. Some case studies have shown that tornadoes will often occur by the third or fourth volume scan after initial identification of the mesovortex (***This will vary from case to case***).
- Highest probability of tornadic potential occurs towards the end of the vertical growth period and low-level rotational values are generally greater than 40 kts.

Due to the extensive mesovortex activity along the bow echo and the rapid spin-up time with some mesovortices, it is possible to replace some of the SVRs along the line with larger TOR polygons to cover multiple mesovortices in close proximity to one another. This can provide greater coverage for

portions of the line that do contain multiple mesovortices (see example polygon coverage in Figure 4-26).

For another example of mesovortex clustering, three mesovortices are located in Christian and Taney Counties, including one that produces an EF1 tornado for 11 minutes (see Figure 4-24). One large TOR polygon could cover all mesovortices in this case instead of individual polygons for each mesovortex. Having multiple TORs overlaid on top of each other can create confusion for the media and public. To continue this warning strategy, one might continue to issue larger TORs along the line with the duration still remaining at 30 minutes or less. As multiple mesovortices exist within one warning polygon, the polygon itself should be able to encompass all possible areas of impact while the text highlights the multiple tornadic threats. SVRs must be issued behind the TORs because of the strong wake-low winds from the BV and RIJ situated behind the bow echo. This will ensure that the public is still being warned for the strong sustained winds behind the line that can result in property damage and injury.

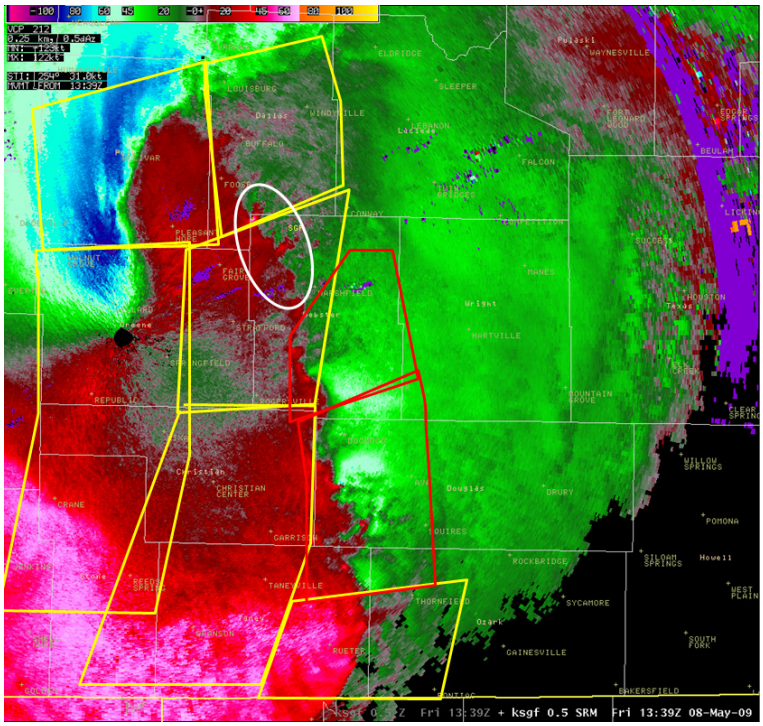


Figure 4-26: KSGF 0.5 Storm Relative Motion at 1239 UTC with example warning polygons overlaid. SVRs are denoted by yellow polygons and TORs are denoted by red polygons. Note how portions of the line are covered by TORs only with little overlay onto SVRs. The white circle indicates an area considered for future TOR warning.

Due to the high impact nature of this event and recommended workload management, it is at the discretion of the trainer if the trainee is responsible for *severe weather statements* (SVSs). If the trainee is responsible for SVSs during the simulation, the trainee should follow guidelines set by his/her office on issuing SVSs.

Evaluation Criteria 5.2 - Provide appropriate wording and call-to-action statements for severe thunderstorm warnings, tornado warnings, and severe weather statements.

Answer Key 5.2 - Enhanced wording is needed to convey the high wind threat with the bow echo and the BV, especially for higher populated and metropolitan areas. Specific text in SVRs and SVSs should highlight the damaging straight-line wind threat after the line passes through. Warnings should note that tornadoes can form quickly along the bow echo and would be rain-wrapped. The trainee should have appropriate call-to-action statements in all warnings. If larger TORs are issued along the line and highlight multiple tornadic threats, as describe in Evaluation Criteria 5.1, the trainee should specifically list each feature and direction/speed in these TORs and subsequent SVSs.

In order for the public and NWS partners to quickly access the enhanced wording and call-to-action statements, the trainee should avoid having excessive text in their products. This can be done by having warnings that do not cover an extremely large area, which would have a long list of all counties and cities in the polygon. Also, all warnings should not include any specific pathcasts.

Performance Objective 6 - Evaluate the mesovortex formation along the bow echo between its apex and the BV. The trainee should focus on the time period just prior to the start of the simulation (1302 UTC) and the second pause time (1405 UTC), which contains the majority of mesovortex and tornadic activity.

Evaluation Criteria 6.1 - Identify the main area of mesovortex development associated with the bow echo. Identify the individual mesovortices in this area between the start of the simulation and the first pause time (1332 UTC) and identify general motion of these mesovortices.

Answer Key 6.1 - The trainee should recognize that the majority of mesovortex development lies along the bow echo gust front just north of the bow echo apex. Details concerning the recognition of the bow echo apex are further describe in Performance Objective 6 in Simulation 2 - SGF. Mesovortices that formed north of the apex generally moved to the east-northeast or northeast as they traveled north along the gust front (see Figure 4-24 for an example of the movement of three mesovortices at 1330 UTC). However, some mesovortices at the bow echo apex moved eastward across the CWA.

In a period from 1307 UTC to 1332 UTC, five mesovortices were user-identified along the gust front just north of the bow echo apex (Figure 4-27). The first mesovortex should be identified by the trainee no later than the 1311 UTC between the 0.9 tilt to the 1.8 tilt just west of the town of Chestnutrigde, MO. All mesovortices form along a significant reflectivity gradient associated in a region characterized by a leading stratiform region with the bow echo (Parker and Johnson 2000). Further discussion of the radar reflectivity appearance of this region can be found in Performance Objective 6 in Simulation 2. The trainee should be able to identify radar signatures at multiple tilts. This will assist the trainee in locating strenghtening mesovortices, which could become tornadic.

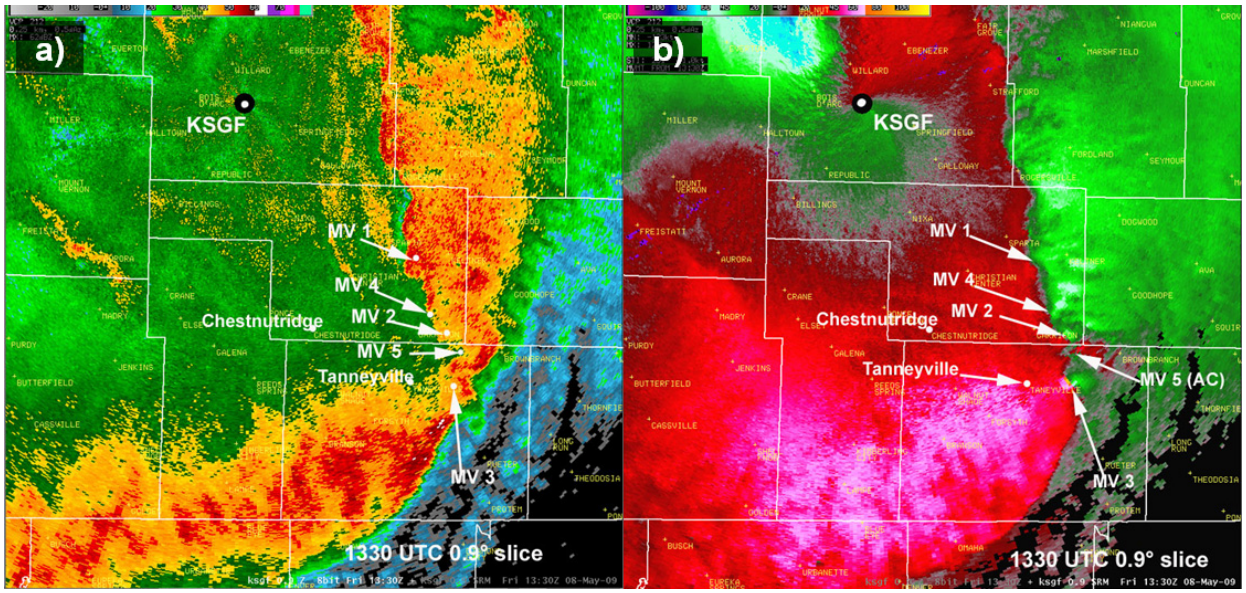


Figure 4-27: KGSF a) 0.9 Reflectivity and b) 0.9 Storm Relative Motion Velocity at 1330 UTC with five mesovortex signatures (denoted here as MV) that formed near the bow echo apex.

Evaluation Criteria 6.2 - Identify the evolution of the bow echo from a linear mode to supercellular features, and determine the main factor that resulted in this change between 1302 UTC and 1344 UTC.

Answer Key 6.2 - The biggest contributor to the storm-based evolution of the bow echo along the gust front is shear, most notably in the low- and mid-levels. One method of showing the shear profile ahead of the MCS is the Conway, MO vertical wind profiler (CNWM7; see Figure 3-1 for its location and Figure 4-28 for hourly profiler data). Near zonal flow exists over the central CWA prior to 1100 UTC. From 1100 UTC through 1400 UTC, more directional shear exists in the lowest 3 km while mid-to-upper level velocities are increasing in magnitude while remaining unidirectional. Note that the 1400 UTC profiler data could be contaminated by the convection near Conway, MO.

Another example of determining the wind profile characteristics is through radar-derived vertical wind profiles. As shown in Performance Objective 6 in Simulation 2, the wind profile taken at the KSGF WSR-88D depicted an increase in 0-3km shear from 40 kts to 70 kts as the bow echo approaches the WSR-88D (Figure 4-19). This storm induced shear profile also influences the low-level helicity ahead of the gust front. Consequently, the 0-3 km SRH at 1122 UTC is 459 m^2 s^{-2} and increases to 1280 m^2 s^{-2} at 1249 UTC. This is more than sufficient low-level helicity to allow for rapid formation of mesovortices along the gust front.

The KSGF 1200 UTC sounding (not shown) provides a similar wind profile to that of CNWM7 at 1200 UTC and the radar-derived wind profile near 1200 UTC (not shown). The KSGF sounding estimated 0-3 km SRH of approximately 250 m^2 s^{-2} and 0-6 km shear of 53 kts ahead of the MCS. By recognizing the storm-induced modification of the local environment and the temporal trends of wind shear with the CNWM7 profiler and radar-derived profiles, the atmosphere is conducive for sustained, tilted updrafts with significant rotation in the low-levels. Therefore, it can be stated that the wind profiles observed become more supportive of a supercell environment, especially since the wind shear strength is quasi-balanced with the cold pool strength.

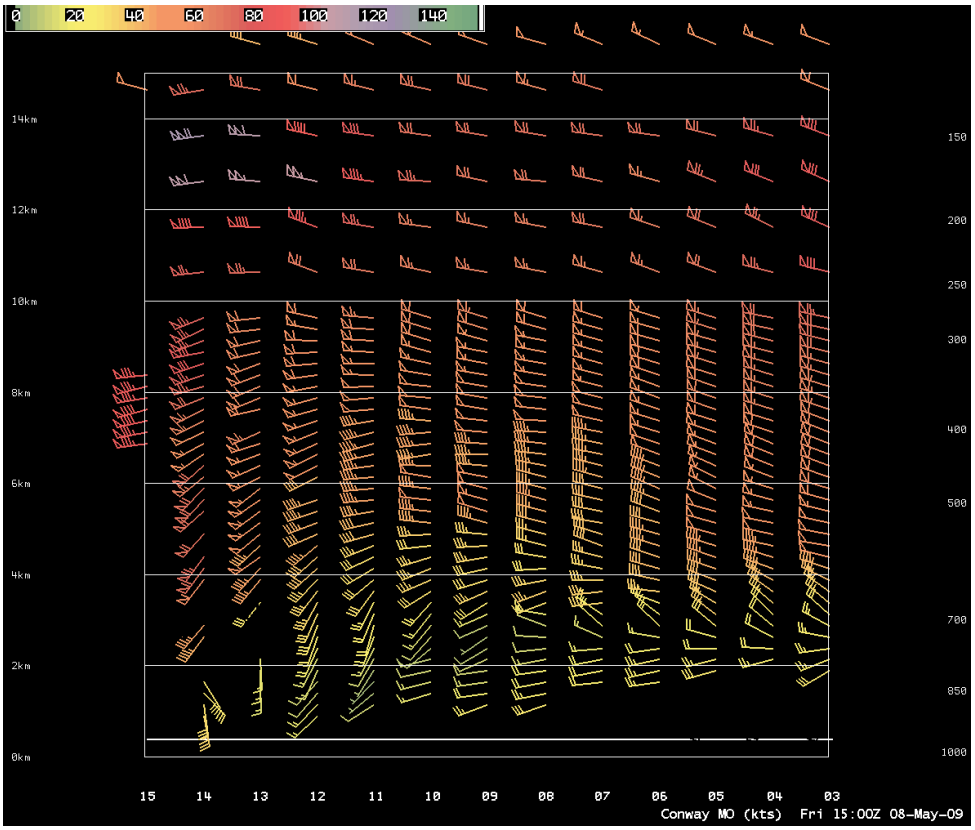


Figure 4-28: Hourly (in UTC) vertical wind profile (in kts) from CNWM7 from 0300 UTC to 1500 UTC.

V. Simulation 4 - PAH (1602 UCT - 1846 UTC)

Overview:

This simulation focuses on the mature and early dissipation stages of the MCS across the Paducah, KY (PAH) CWA. Although the duration of this simulation (2 hours and 44 minutes) is the longest of the displaced real-time simulations, the associated workload is significantly less than any of the SGF-based simulations. However, the facilitator should employ workload management and/or sectorization practices as if they were in a severe weather operations mode.

Tornado Watch #267 (see Appendix B) is in effect for the entire CWA. Tornado Watch #267 describes potential severe weather hazards such as tornadoes, hail up to 2.5 inches in diameter, and wind gusts up to 105 mph. The 1300 UTC Day One Outlook from SPC is in effect at the start of the simulation and was later updated with the 1630 UTC Day One Outlook, which was issued at 1712 UTC (see Appendix B). All SPC products and spotter reports are provided in the WESSL script that will run in real-time with the simulation (Appendix C). Three pause times are inserted into the WESSL script (1638 UTC, 1708 UTC, and 1817 UTC) to evaluate the trainee's comprehension and awareness of the situation. Interactive windows are also in the WESSL script, including one which allows the trainee to discuss coordination efforts with the St. Louis, MO (LSX) forecast office on a particular storm crossing CWA boundaries.

Because the MCS has already entered the PAH CWA, an active warning is provided in AWIPS (see Figure 4-29) with the text details provided in the WESSL script (Appendix C) during the opening minutes of the simulation. This warning will expire at 1615 UTC and cover the initial storm reports that are also displayed in the WESSL script. This will allow time for the trainee to analyze the situation and provide time to issue warnings.

******You must "Write Archived Text to Database" before starting the simulation for the warning to display. See the README file in Appendix D******

Multiple threats and features highlight the opening hour of the simulation. At the beginning of Simulation 4, the large bow echo seen in Simulations 2 and 3 with the SGF localization now has two distinct line segments (BL1 and BL2; Figure 4-30). BL1 stretches from Perry County, MO to northern New Madrid County,

MO, and is generally non-severe. BL2 extends from Bollinger County, MO into Arkansas. The RIJ is oriented behind BL2 with reported wind gusts of 60-80 mph along and behind BL2. A high-precipitation supercell (S1) is located outside of the CWA in Randolph County, IL and moves into the forecast area shortly after the start of the simulation. Ahead of BL1 along the Union County, IL and Jackson County, IL border at 1602 UTC is a splitting mini-supercell. In Figure 4-30, the left-moving supercell is denoted at S2 and the right-moving supercell is denoted as S3. S2 merges with BL1 and the aforementioned Randolph County, IL supercell (S1) in Perry County, IL, by 1640 UTC while S3 stays ahead of the line until 1700 UTC, producing 1.75 inch diameter hail from Colp, IL to Herrin, IL.

From 1700 UTC to 1800 UTC, the primary severe weather threat shifts from the bow echo feature to flash flooding and eventually to the mesoscale convective vortex (MCV). Note that the MCV evolved from the northern bookend vortex (BV) that was described in Simulations 2 and 3. By 1700 UTC, heavy rainfall was occurring over southern Illinois, especially near the intersection of convection with BL1 and BL2 in southern Williamson County, IL and northern Johnson County, IL. The merger of S1 with BL1 in Perry County, IL and Franklin County, IL also enhanced the local rainfall rates, with a report of 0.75 inches of rain falling in less than 30 minutes. The combination of these heavy rain rates with a near saturated ground from an earlier MCS (describe in Simulation 1 - ICT) between 0600 UTC and 0900 UTC resulted in flash flooding, most notably between 1700 UTC and 1730 UTC.

During the evolution of the MCS between Simulation 3 - SGF and Simulation 4 - PAH, the BV became more separated from the bowing line segment and evolved into a MCV. Counties in the northern part of the PAH CWA were impacted by the MCV approximately 60 to 75 minutes after the bowing line segments. Based on the intensity of the MCV from the KLSX WSR-88D and reports from the LSX WFO, it should become the main focus of the trainee as it approaches the CWA. The strongest winds are concentrated on the southern and western flank of the MCV, with reports of significant wind damage coming into the PAH forecast office by 1730 UTC. An unofficial wind gust of 92 kts (106 mph) was recorded at the Carbondale Airport around 1825 UTC. Major structural and tree damage were reported with the winds on the western and southern portions of the MCV throughout the rest of the simulation. There were also two tornadoes, both rated an EF0, embedded in the eastern portion of the MCV (see PAH CWA Storm Reports #20 and #24 in Appendix A).

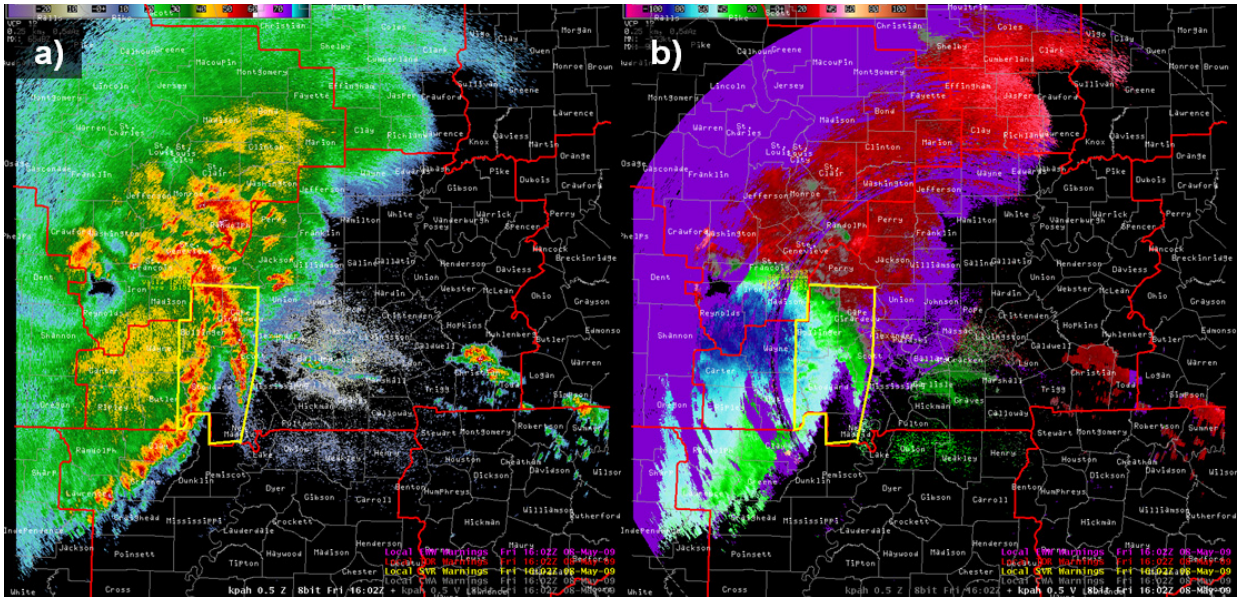


Figure 4-29: KPAH a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1602 UTC with a severe thunderstorm warning (yellow polygon) provided at the start of the simulation. CWA boundaries are denoted in red.

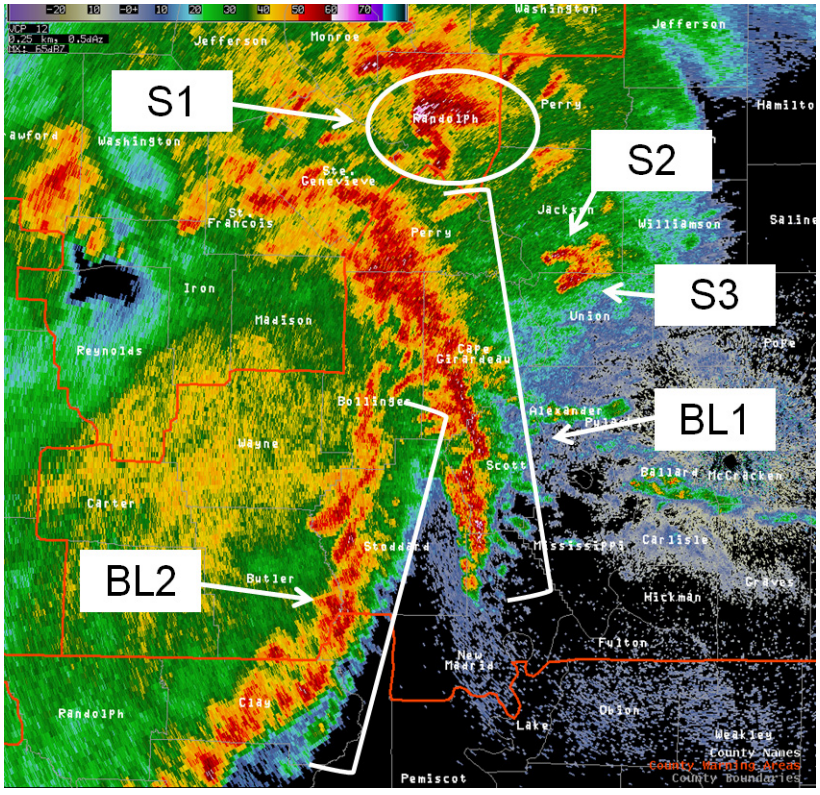


Figure 4-30: KPAH 0.5 Base Reflectivity at 1602 UTC denoting the two line segments (BL1 and BL2) and the three supercell features (S1, S2, and S3). County names are displayed in white and CWA boundaries are displayed in red.

Background Information:

Numerous high wind and hail reports occured in the LSX CWA between the end of Simulation 3 in SGF (1503 UTC) and the beginning of this simulation in PAH (1602 UTC). Convection ahead of the MCS produced hail in multiple counties, including baseball-size (2.75 inch) hail in Washington County, MO at 1434 UTC. (see Appendix A for all storm reports). This Washington County storm evolved into a supercell that continued to produce hail in St. Francois, St. Genevieve, and Randolph Counties. One tornado occured along the bow echo prior to the start of Simulation 4; an EF1 west of Redford, MO in Reynolds County at 1515 UTC (see LSX CWA Storm Report #8 in Appendix A). At 1600 UTC, high winds associated with the MCV began to impact Iron and Reynolds Counties.

Wind reports were already reported in the PAH CWA prior to the start of this simulation. The most significant damage was reported in Ripley County, MO when an intense macroburst produced wind gusts up to 90 mph. Significant structural and roof damage occured in the town of Doniphan, MO, including numerous power outages from downed power lines (see PAH CWA Storm Report #2 in Appendix A). Two fatalities occured on Highway 53 approximately three miles south-southeast of Poplar Bluff, MO in Butler County when their vehicle was struck by a falling tree around 1550 UTC (see PAH CWA Storm Report #3 in Appendix A). A list of all PAH storm reports can be found in Appendix A.

Performance Objectives:

Performance Objective 1 - Demonstrate processes for continuous evaluation of all hazardous weather threats (tornadoes, damaging winds, hail, and flash floods) to support effective warning methodologies.

> **Evaluation Criteria 1.1 -** Evaluate the level of threat of all severe weather types (hail, wind, tornadoes, flash flood), and discuss the important issues concerning these severe weather hazards. This criteria can be discussed prior to the start of the simulation, during pause times, or at the end of the scenario.
>
> **Answer Key 1.1 -** Considerations for discussion should include the analysis of instability parameters, including thermodynamic properties with daytime heating, low-level wind profiles and shear, and MCS maintenance parame-

ters (see AWOC Severe IC 2 - Lesson 3). The trainee should also recognize the level of the severe weather threats based on current conditions, including the ongoing large-scale high wind threat and marginal tornadic threat. Continuous evaluation during the simulation will allow the forecaster to maintain a high situational awareness of the mature MCS and associated severe weather threats. In this case, the trainee should recognize the multiple severe weather threats with the system and recognize the transition of the primary severe weather threat from the supercells and bowing line segments to the MCV. Evaluation of a high-precipitation supercell and MCV moving into the northwestern portion of the CWA should include the use of radar products from KLSX, especially when range folding and improperly dealiased velocities corrupt the base velocity data from KPAH.

Performance Objective 2 - Using specific data examples, identify the three levels of situational awareness (perceive, comprehend, and project) and how they are contributing to your warning decision.

Evaluation Criteria 2.1 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #1 (1638 UTC).

Answer Key 2.1 - At Break #1, the trainee should ***perceive*** the following features:

- Right moving supercell (S3) with 66 dBZ and weak rotation over northwest Williamson County, IL (Figure 4-31d)
- High-precipitation supercell (S1) merging with the northern bowing line segment (BL1) in Perry County, IL (Figure 4-31d)
- RIJ oriented behind the southern line segment (BL2 in Figure 4-31) with base velocity values of 70 to 90 kt winds over Bollinger, Stoddard, and Wayne Counties, MO (not shown)

The trainee should then ***comprehend*** the ongoing severe weather threats associated with and ahead of the bowing line segments, including the three supercells depicted during the opening part of the simulation (Figure 4-31). The trainee should recognize the merger of the Perry County, IL supercell (S1) with the northern bowing line segment (BL1). The trainee should also perceive the wake-low winds behind BL2 and the duration of the high wind threat behind the entire bow echo complex.

Finally, the trainee should ***project*** the continued movement of the bow echo complex and associated wake-low winds behind it, and should project the movement of the right moving supercell (S3) in northwest Williamson County, IL and eventual merger with BL1 based on the relative speed and direction of both features. The trainee should also begin to anticipate the arrival of the MCV located well behind the bowing line segments. Range folding from KPAH obscures the view of the MCV, but the trainee can maintain awareness of the approaching MCV by monitoring the KLSX WSR-88D.

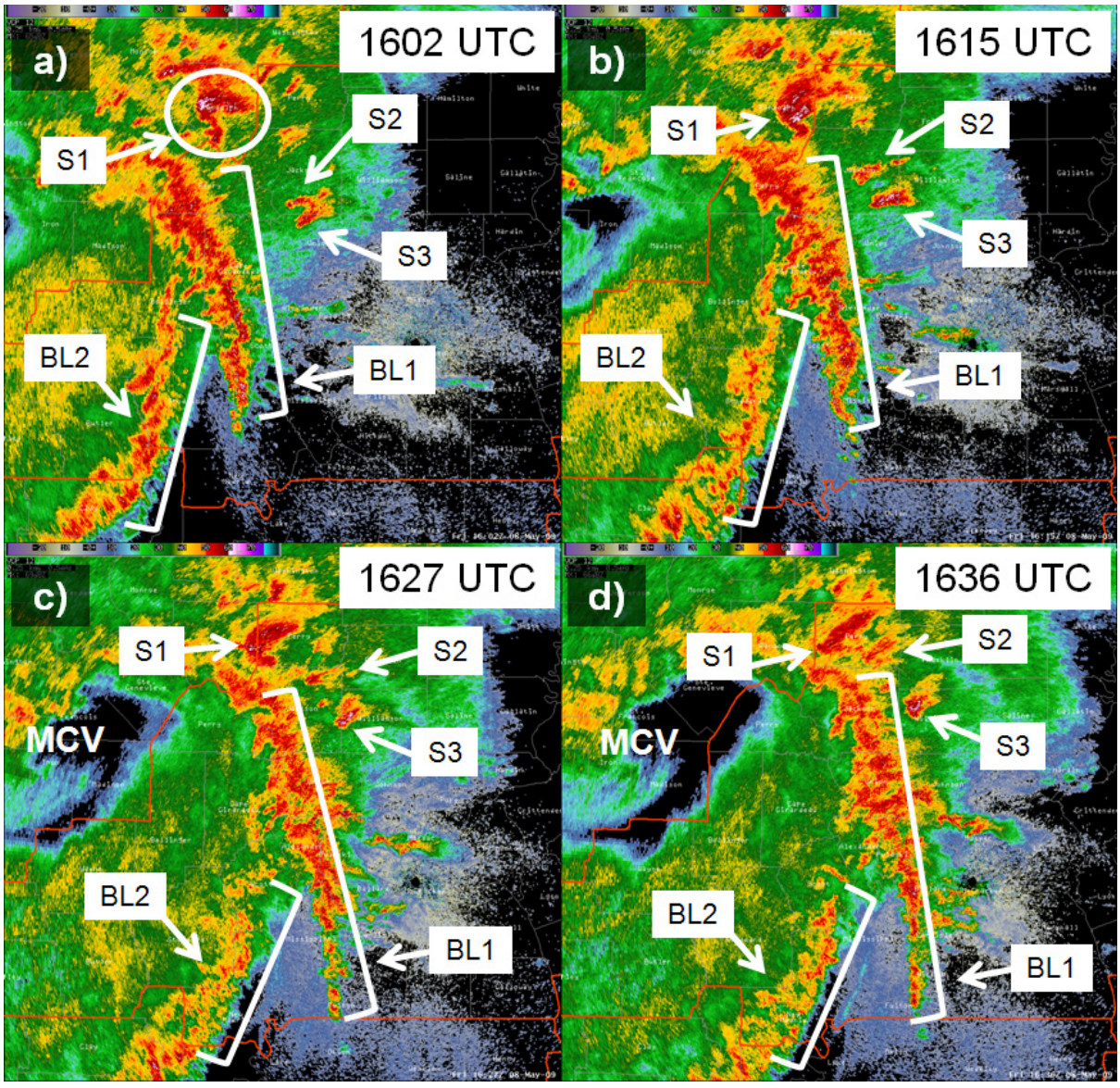


Figure 4-31: KSGF 0.5 Base Reflectivity at a) 1602 UTC, b) 1615 UTC, c) 1627 UTC, and d) 1636 UTC with CWA borders (red). The two line segments associated with the bow echo (BL1 and BL2), three supercell features (S1, S2, and S3), and the mesoscale convective vortex (MCV) are depicted in this figure.

Evaluation Criteria 2.2 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #2 (1708 UTC).

Answer Key 2.2 - At Break #2, the trainee should ***perceive*** the following features:

- Continuation of strong winds associated with the RIJ, now extending into Scott and Cape Girardeau Counties, MO
- MCV moving into the PAH CWA with winds estimated at 60 to 85 kts in northern Bollinger County, MO from the KPAH 0.5 tilt base velocity (as seen at 1706 UTC in Figure 4-32)
- Significant rainfall totals and rain rates (Note: It is at the trainer's discretion to create a performance objective concerning flash flooding with this MCS event):
    - Radar estimated storm total precipitation of 2-4 in. over eastern Jackson County, IL and western Williamson County, IL with areas receiving upwards of 1.25 in. per hour
    - Radar estimating upwards of 2 in. per hour precipitation rates in Perry County, IL

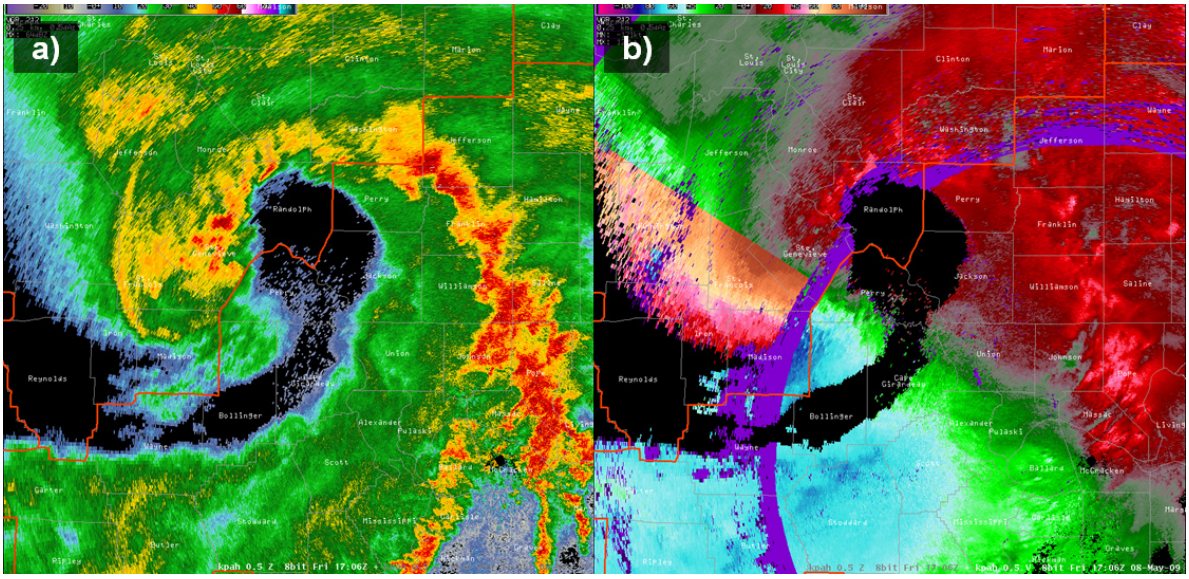


Figure 4-32: KPAH a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1706 UTC with CWA borders (red).

The trainee should then ***comprehend*** the change in the primary severe weather from the bow echo complex containing multiple line segments to the MCV. As the focus of the severe weather threat shifts towards the MCV, the trainee should utilize KLSX to assist in determining the magnitude of the severe weather threat and the appropriate actions to take as it enters the PAH CWA (Figure 4-33). Further discussion about the transition of the primary severe weather threat can be found in Performance Objective 4. The trainee should understand that the strongest winds associated with the MCV are located in the western and southern portions of the circulation, as shown by both KLSX and KPAH. However, a significant swath of improperly dealiased velocities combined with range folded velocities in Madison and Iron Counties, MO up to the 1706 UTC scan at the 0.5 tilt from KPAH (Figure 4-32) prohibits the trainee from viewing the entire wind field of the MCV.

Finally, the trainee should ***project*** what areas could be potentially impacted by the strong winds associated with the MCV. The trainee should track the direction and speed of the MCV with an emphasis on the western and southern quadrants of the system. The trainee should also prepare to issue appropriate severe weather warnings as the MCV approaches the CWA boundary. See Performance Objective 5 for a general guideline for warning polygons and warning text regarding the MCV.

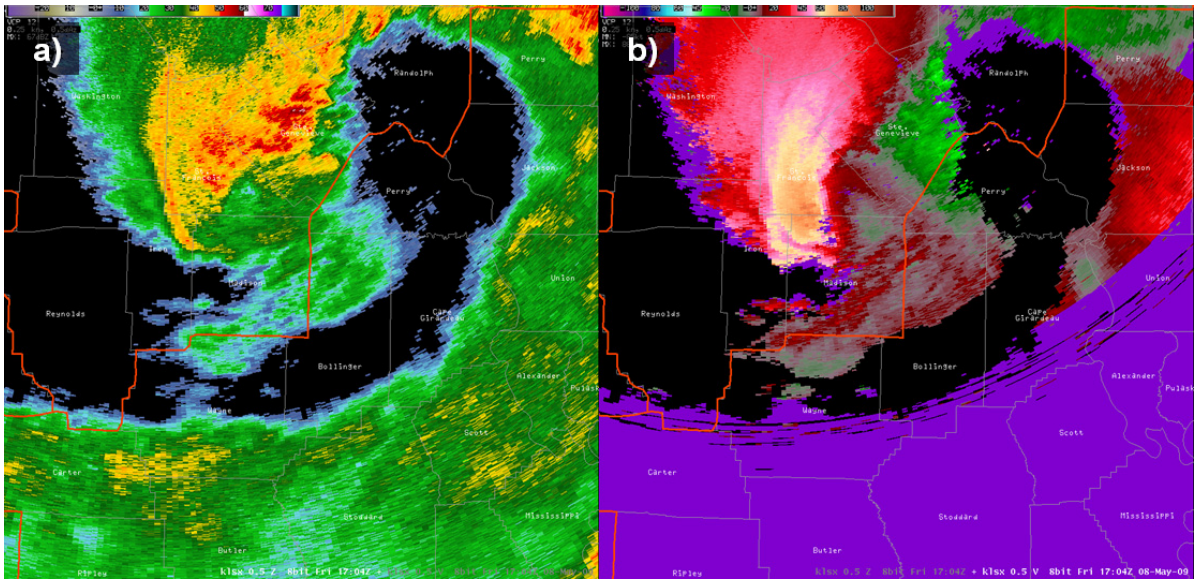


Figure 4-33: KLSX a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1704 UTC with CWA borders (red).

Evaluation Criteria 2.3 - Demonstrate understanding of the three levels of situational awareness as they apply to this event by citing specific examples during Break #3 (1817 UTC).

Answer Key 2.3 - At Break #3, the trainee should ***perceive*** the following features:

- MCV located in the northern part of the PAH CWA with strong winds around the southern and western portions of the MCV in Jackson and northern Union Counties with estimated velocities up to 100 kts (Figure 4-34)
- Dissipating mesovortex in northeast Jackson County that recently produced a tornado four miles south of Elkville, IL

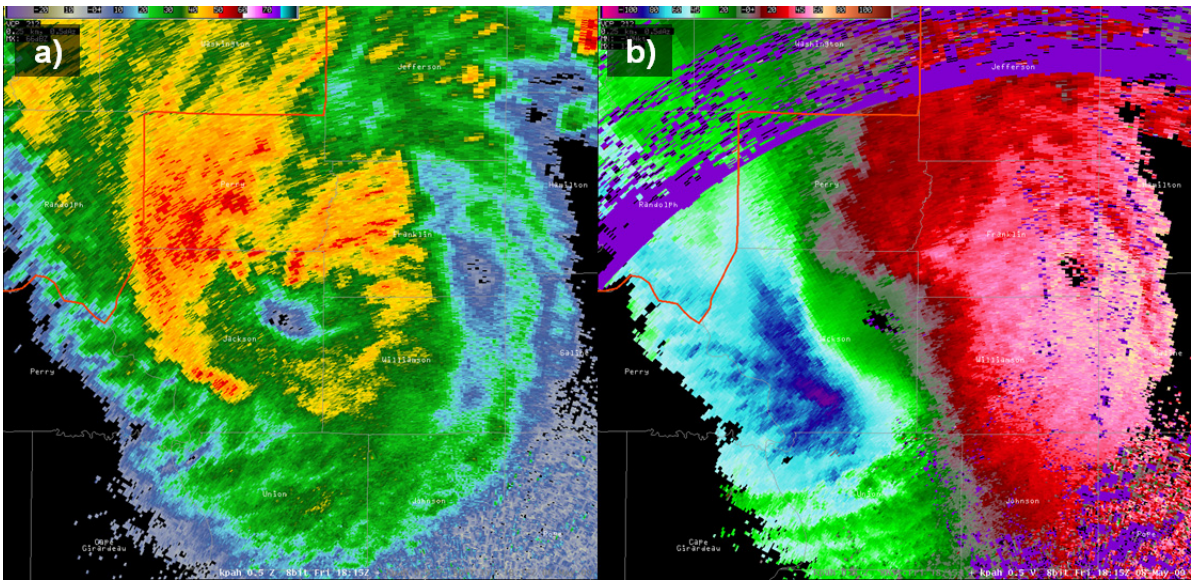


Figure 4-34: KPAH a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1815 UTC with CWA borders (red).

The trainee should then ***comprehend*** the dangerous and dynamic nature of the MCV, especially with the recent tornado report near Elkville, IL that was associated with a mesovortex in the northeastern quadrant of the MCV at 1812 UTC (see PAH WESSL script in Appendix C for the spotter report and PAH CWA Storm Report #20 in Appendix A). The trainee should have high situational awareness in regards to the area of strong straight-line winds in western Jackson County, IL and associated storm reports received during the simulation (see PAH WESSL script in Appendix C). Use of FSI can assist in understanding the three-dimensional structure of the MCV. Finally,

the trainee should ***project*** what areas will be impacted by the MCV, especially the area ahead of the enhanced velocities, and issue appropriate warnings. The potential impact region for these enhanced velocities in IL should include eastern Jackson County, southern Union County, western Williamson County, and northern Franklin County.

Performance Objective 3 - Assess the trainee's ability to evaluate and communicate the severe weather threat using the interactive WESSL script (see Appendix C).

Evaluation Criteria 3.1 - The trainee should answer the following question given at the start of simulation at 1602 UTC (Note that the simulation is paused at this time):

How would you coordinate with WFO LSX on the storm in Randolph County, MO moving towards Perry County, IL?

Answer Key 3.1 - The trainee should state that he/she would contact the WFO LSX via phone call or NWSChat to discuss storm motion and recent history (radar signatures, local storm reports, etc.). With this information, the two offices should attempt to coordinate warning issuance so there is symmetry between the warning polygons from the adjacent CWAs. ***Note that we do not provide the LSX-based warnings in the AWIPS display.*** When a severe weather event is moving from one CWA to another, the WFOs should communicate with each other to ensure a full and complete exchange of relevant information. This is especially true in cases where a storm is moving parallel to and/or in close proximity to a boundary between CWAs. See Figure 4-30 for the location of the Randolph County, IL high-precipitation supercell (S1). Figure 4-31 shows the movement of S1 into the PAH CWA and eventual merger with BL1.

The trainer can retrieve and evaluate the response by accessing the file ***/data/awips/2009May08_AWOC/wessl/AWOCMay08_PartIII.log.YYYYMMDD_HHMM*** where the name of the file "YYYYMMDD_HHMM" represents the date and time that the trainee responded to the interactive script.

Evaluation Criteria 3.2 - The trainee should answer the following question given at 1710 UTC (Note that the simulation is paused at this time):

What actions would you take to convey the wind threat associated with the MCV?

Answer Key 3.2 - The trainee should emphasize the use of strong wording and specific call-to-action statements when relaying information, such as the severity of and expected duration of the high winds, to the public and NWS partners. Multiple severe weather statements should be issued to apprise the public of the situation, including recent storm reports. Given the expected strength of the winds, a forecaster can compare the magnitude of the wind threat to a weak tornado. Although the system does have a "hurricane-like" appearance, relating the wind threat to a hurricane may not portray the severity of the threat accurately since many citizens in this part of the country may have never experienced the strength of a hurricane.

The trainer can retrieve and evaluate the response by accessing the file ***/data/awips/2009May08_AWOC/wessl/AWOCMay08_PartIII.log.YYYYMMDD_HHMM*** where the name of the file "YYYYMMDD_HHMM" represents the date and time that the trainee responded to the interactive script.

Performance Objective 4 - Demonstrate the ability to recognize that the main severe weather event shifted from the bowing line segments and supercells to the MCV.

Evaluation Criteria 4.1 - Demonstrate understanding the need to shift responsibilities and resources in order to focus on the MCV. This can be discussed during the 1710 UTC pause time or at the end of the simulation.

Answer Key 4.1 - As the simulation nears 1700 UTC, the trainee should recognize that there is a decrease in local storm reports associated with the bow echo complex while the MCV approaches the western portion of the CWA. Although the MCV is located in the neighboring LSX CWA at 1700 UTC, the trainee needs to recognize the severe wind threat associated with the approaching MCV and that primary warning operations, which includes revised staffing and sectorization, will transition towards this feature.

The recognition of these extremely strong winds (approximately 80 kts) in the KPAH base velocity data along the southern flank of the MCV is important in estimating its potential impact. An unusually large area of high spectrum width values just south of the location of the KLSX WSR-88D as seen

from the KPAH WSR-88D (not shown) represents a highly sheared environment on the western flank. However, a large area of range folding from KPAH exists before 1701 UTC (Figure 4-35a) and improperly dealiased velocities from KPAH at the 0.5 tilt exist from 1701 UTC to 1715 UTC (with the exception of 1710 UTC), which limits radar data over the MCV (Figure 4-35b). See Evaluation Criteria 4.2 for identifying ways of mitigating these data quality issues, which includes the use of the KLSX WSR-88D to identify the MCV wind threat.

Overall, the trainee should comprehend the potential for extreme damaging winds prior to the MCV entering the PAH CWA by observing this radar data from KLSX (Figure 4-33) and evaluating storm reports from WFO LSX. As the MCV moves into the PAH CWA, using the KPAH WSR-88D and FSI will allow the trainee to evaluate the three-dimensional composition of the MCV and associated wind field.

Evaluation Criteria 4.2 - Identify how the PAH office mitigated the range folding issue, and identify other ways to mitigate the data quality issues that are obscuring the view of the high winds associated with the MCV.

Answer Key 4.2 - The trainee should notice that prior to 1701 UTC, the KPAH WSR-88D is running in VCP 12, which samples 14 elevations during a 4.5 minute volume scan. The trainee should then recognize the change in VCP from VCP 12 to VCP 212 at 1701 UTC. VCP 212 has the same elevation sampling pattern as VCP 12, but VCP 212 uses the Sachidananda-Zrnic (SZ)-2 range folding algorithm on the lowest three elevations. Looking at the base velocity data in Figure 4-35, you can see the decrease in range folding coverage from 1653 UTC to 1706 UTC. However, some areas are still being impacted by poor data quality, this time in the form of improperly dealiased velocity values.

There are other ways in which these data quality issues can be mitigated. One way is to change the PRF for the sector containing the MCV wind field. For example, VCP 212 uses PRF 6 for the SZ-2 Doppler mode (CD) rotations. Using a higher PRF can increase the V_{max} value but decrease the R_{max} range and vice versa. Another way to work around these data quality issues is by utilizing a neighboring radar. The use of KLSX for estimating velocities on the western side of the MCV can provide coverage over the aforementioned range folded and improperly dealiased areas.

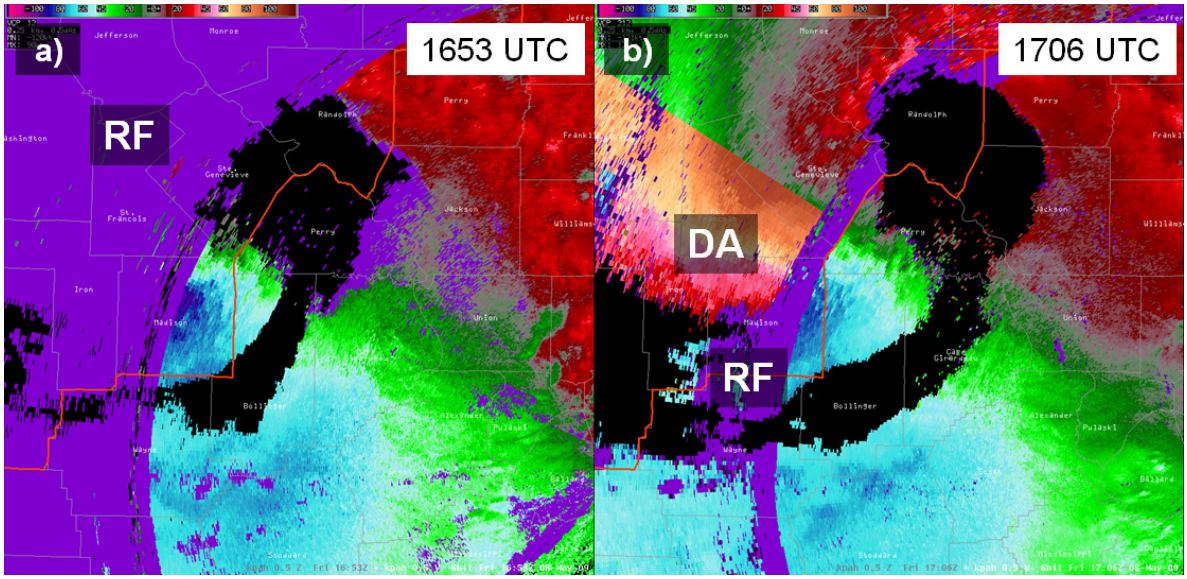


Figure 4-35: KPAH 0.5 Base Velocity at a) 1653 UTC and b) 1706 UTC with CWA borders (red). Areas with range folded velocities are denoted by RF while areas of improperly dealiased velocities are denoted by DA.

Performance Objective 5 - Demonstrate the ability to issue effective warnings, including appropriate polygon coverage, magnitude of threat(s), and call-to-action statements. Note that this performance objective provides a ***generic guideline*** to warning strategies for this event and does not focus on specific features during the simulation.

Evaluation Criteria 5.1 - Issue severe thunderstorm and tornado warnings with appropriate polygon coverage and time duration.

Answer Key 5.1 - The evolution of this mature MCS in the PAH CWA, especially with the MCV (previously denoted as BV in the SGF simulations) now more separated from the bowing line segments, allows for a less complex warning strategy for the trainee in comparison to the MCS seen in the SGF CWA. Here we will discuss the use of *severe thunderstorm warnings* (SVRs) and *tornado warnings* (TORs) for the two phases of this system: the bow echo complex with leading supercells and the trailing MCV.

Early in the simulation, multiple SVRs should be issued along the bow echo complex to cover the high wind threat with the bowing line segments and the wake-low winds behind BL2. SVRs for this simulation should remain long in duration (i.e., 45 to 60 minutes), especially the SVRs that cover the areas

impacted by the wake-low winds associated with the RIJ. Due to the long N-S orientation of the bow echo complex, issuing multiple SVRs will reduce the text size of each individual warnings and allow users to easily find important call-to-action statements and any enhanced wording (see Evaluation Criteria 5.2).

Shorter duration SVRs should be used for the supercells ahead of the system. Warning polygons should encompass the impact area and not be bounded by county borders. There should be minimum overlap and no gaps between warnings. It is important for the trainee to have sufficient lead times on his/her SVRs by having warnings issued ahead of the bowing line segments and leading supercells (see example polygon coverage in Figure 4-36).

As the primary severe weather threat changes over to the MCV during the simulation, long duration SVRs should be issued for areas that will be impacted by the MCV. This is especially for regions expecting extremely strong winds, which are located in the western and southern portions of the MCV. There are two ways about issuing SVRs with the MCV. One way is to have multiple SVRs issued for the MCV, with one polygon covering the western and southern portion containing the radar estimated winds of 80 to 115 kts and another polygon covering the less severe eastern and northern quadrants of the MCV. However, the trainee should be careful with the individual polygon coverage, polygon orientation, the threats expected in each polygon coverage area as the MCV traverses to the east. The other way is to issue one larger SVR covering most of the MCV, especially for the strong straight-line winds in the western and southern quadrants. No matter what type of warning strategy is used for the MCV, these warnings must contain specialized wording emphasizing the seriousness of these high winds (see Evaluation Criteria 5.2).

Due to the relatively small number of mesovortices at this juncture, TOR polygons should remain small in area and focus on only one mesovortex signature. Each warning should have a duration of 20 to 30 minutes since QLCS mesovortices are short-fused. Pattern recognition for mesovortex formation, such as increased inflow and vertical continuity, is critical in having any warning lead times and a decreased false-alarm rate. Some techniques to assist in quickly identifying QLCS mesovortices prior to tornadic development are as follows:

- Look for increasing rotational velocity magnitudes in the low-levels (i.e., 1.0 to 2.5 km layer). This can include the possibility of jumps in rotational velocities of greater than 10-15 kts in one volume scan.
- Identify rapid deepening of the vortex in the vertical. Some case studies have shown that tornadoes will often occur by the third or fourth volume scan after initial identification of the mesovortex (***This will vary from case to case***).
- Highest probability of tornadic potential occurs towards the end of the vertical growth period and low-level rotational values are generally greater than 40 kts.

Because mesovortex signatures in this simulation are not as well defined as those in the SGF-based simulations, the trainee should be more cognizant of reflectivity and velocity pattern recognition and incoming local storm reports. Similar to SVRs, TOR polygons should not be bounded by county boundaries and should cover the areas expected to be impacted.

Although the workload is not as extensive as the SGF-based simulations, the use of workload management is still recommended for this case. It is at the discretion of the trainer if the trainee is responsible for *severe weather statements* (SVSs). If the trainee is responsible for SVSs during the simulation, the trainee should follow guidelines set by his/her office on the issuance of SVSs.

Evaluation Criteria 5.2 - Provide appropriate wording and call-to-action statements for severe thunderstorm warnings, tornado warnings, and severe weather statements.

Answer Key 5.2 - Enhanced wording is needed to convey the high wind threat with and behind the bow echo complex and with the MCV, especially for higher populated areas. Warnings along the bow echo complex and with the MCV should note that embedded tornadoes can form quickly and be rain-wrapped. Specific text in SVRs and SVSs should highlight the damaging wind threat, including the magnitude and duration. The trainee should use specialized wording and place important call-to-action statements informing the public to avoid going outside and to seek shelter immediately, especially with the MCV. Some examples of enhanced wording are:

SEEK SHELTER IMMEDIATELY. THIS IS AN EXTREMELY DANGEROUS AND LIFE THREATENING SITUATION.

VIOLENT STRAIGHT LINE WINDS UP TO 100 MPH CAN CAUSE SIGNIFICANT PROPERTY DAMAGE AND EVEN CAUSE INJURY OR DEATH.

DESTRUCTIVE WINDS CAN BE EXPECTED. IF YOU CANNOT GET UNDERGROUND, GO TO AN INTERIOR ROOM ON THE LOWEST FLOOR OF A STURDY BUILDING. AVOID WINDOWS.

In order for the public and NWS partners to quickly access the enhanced wording and call-to-action statements, the trainee should avoid having excessive text in their products. This can be done by having warnings that do not cover an extremely large area, which would have a long list of all counties and cities in the polygon. Also, all warnings should not include any specific pathcasts.

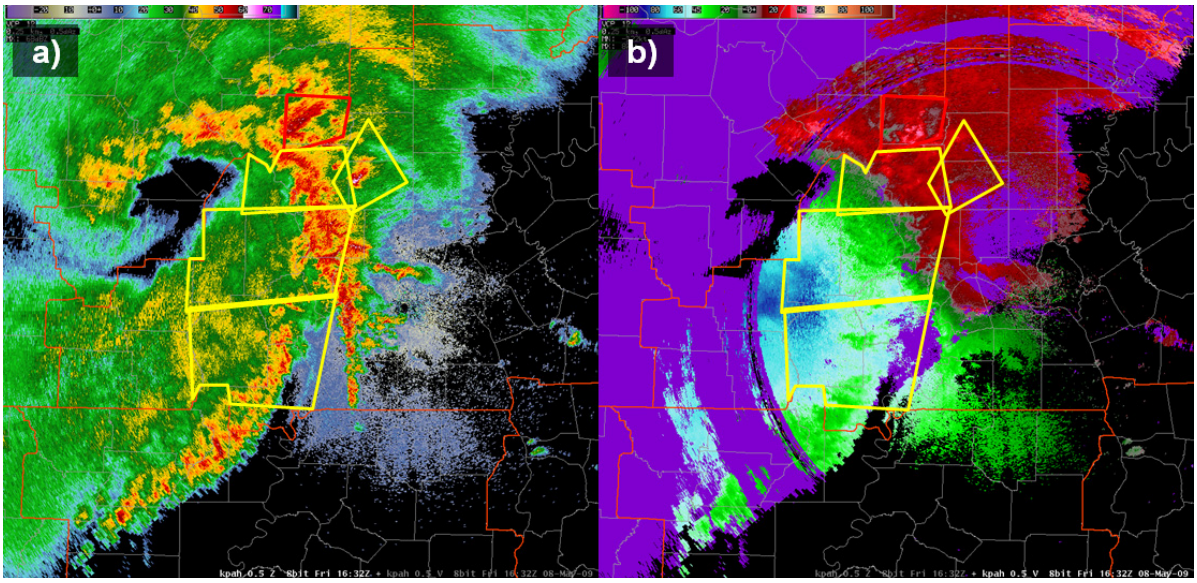


Figure 4-36: KPAH a) 0.5 Reflectivity and b) 0.5 Base Velocity at 1632 UTC with example warning coverage with SVR (yellow polygon) and TOR (red polygon) warnings. CWA boundaries are denoted in red.

Appendix A: Storm Reports

I. ICT CWA Reports

*** A map is provided at the end of each section denoting the location of each storm report.

Rpt #	Location	Time (CST)	Storm Characteristic
1	**Barton County (KS)** 2.6 SE Heizer	0136	**Thunderstorm Wind (EG 61 kt)**
	Estimated by local law enforcement.		
2	**Barton County (KS)** 3.5 NW Dundee	0144	**Hail (0.75 in)**
3	**Barton County (KS)** 0.7 N Ellinwood	0220	**Hail (0.75 in)**
4	**Barton County (KS)** 2.3 WSW Great Bend, 1.8 W Great Bend, 0.3 NW Great Bend, 0.8 S Great Bend	0228- 0400	**Flood**
	Some street flooding was noted across town with rainfall estimates up to 4 inches.		
5	**Sedgwick County (KS)** 3.5 S Maize	0250	**Hail (0.88 in)**
	An off duty National Weather Service employee reported penny to nickel sized hail.		
6	**Sedgwick County (KS)** 2.8 S Maize	0254	**Hail (1.00 in)**
7	**Sedgwick County (KS)** 3.5 S Maize	0254	**Hail (0.88 in)**
8	**Rice County (KS)** 1.1 S Saxman, 5.7 SE Saxman, 7.8 SE Saxman, 6.7 SE Saxman, 3.2 S Saxman	0255- 0800	**Flood**
	Numerous low water crossings or small bridges were washed out due to high water. Concrete structures were damaged by the raging water with some estimates of 2 to 4 inches of rainfall.		

Rpt #	Location	Time (CST)	Storm Characteristic
9	**Rice County (KS)** Lyons, 0.6 WNW Lyons, 1.1 SW Lyons, 1.1 SSE Lyons	0255- 0800	**Flood (0.88 in)**
	Some street flooding was reported in town.		
10	**Sedgwick County (KS)** 3.5 S Maize	0257	**Hail (0.88 in)**
11	**Harvey County (KS)** 0.5 WNW Halstead, 1.5 E Halstead	0300- 0317	**Thunderstorm Wind (EG 70 kt)**
	Extensive damage occurred across town with numerous large trees down and power poles down. Some roof, fence, and vehicle damage was also reported across town from winds estimated between 70 and 80 mph. A local plant had a large door torn from its rail and railroad crossing arms on Main Street were damaged. Nearly 500 homes lost power from the storm.		
12	**Reno County (KS)** 2.4 ESE S. Hutchinson, 3.0 N Yoder, 1.9 NNE Haven, 5.2 N Haven	0300- 0800	**Flood**
	Several roads were washed out from what was reported as a gully washer of rainfall. 3 to 4 inches. 3 to 4 bridges experienced heavy damage and one was completely washed out. A rain gauge in Pleasantville, Kansas reported almost 2 inches of rainfall with some estimates up to 4 inches.		
13	**Sedgwick County (KS)** 3.2 WSW Park City	0300	**Hail (1.00 in)**
	The hail was penny to quarter size.		
14	**Sedgwick County (KS)** 3.5 S Maize	0300	**Hail (1.25 in)**
15	**Harvey County (KS)** 0.1 W Sedgwick, 1.1 ESE Sedgwick	0305- 0316	**Thunderstorm Wind (EG 70 kt)**
	Numerous trees were knocked down across town from wind estimated to be 70 to 80 mph.		
16	**Sedgwick County (KS)** 1.9 SE Maize	0306	**Hail (1.25 in)**
17	**Reno County (KS)** 2.8 ENE Partridge	0310	**Hail (1.25 in)**

Rpt #	Location	Time (CST)	Storm Characteristic
18	**Harvey County (KS)** Sedgwick	0313	**Hail (1.00 in)**
19	**Marion County (KS)** 2.2 SW Marion, 3.2 WNW Florence, 6.0 E Marion, 0.9 NW Marion	0316- 0716	**Flood**
	Main Street in Marion was flooded for a short time. Numerous county roads were flooded.		
20	**Reno County (KS)** 4.0 SSW S. Hutchinson	0320	**Hail (1.00 in)**
21	**Reno County (KS)** 4.0 SSW S. Hutchinson	0320	**Thunderstorm Wind (EG 52 kt)**
	Winds were estimated by spotters along Kansas Highway 96.		
22	**Sedgwick County (KS)** Jabara Arpt	0347- 0401	**Thunderstorm Wind (MG 52 kt)**
23	**Sedgwick County (KS)** 3.0 SSE Maize	0347- 0357	**Thunderstorm Wind (EG 52 kt)**
	Estimated 60 mph winds moved through the area knocking down some tree branches.		
24	**Sedgwick County (KS)** 3.2 WSW Park City	0347- 0401	**Thunderstorm Wind (EG 52 kt)**
	An off duty National Weather Service employee reported estimated wind gusts up to 60 mph.		
25	**Butler County (KS)** 2.6 N Benton, 0.2 N Rosalia	0348- 0411	**Thunderstorm Wind (EG 70 kt)**
	A large swatch of damaging winds moved across the area from Benton to Rosalia including the city of El Dorado with winds measured at 80 mph at the Jefferson elementary school in El Dorado. Numerous large trees were knocked down in Benton, with a mobile home trailer rolled over east of town. The damaging winds destroyed the historic stone silo bearing the name of the town of Towanda. The damaging winds estimated at 70 to 80 mph moved into El Dorado damaging roofs to numerous businesses in downtown and knocking down numerous large trees. Two or three schools in El Dorado had their roofs partially peeled off. The refinery in El Dorado had some large storage tanks dented. The damaging winds continued to move east downing almost every one of the large transmission lines along US 54 highway from El Dorado to Rosalia.		

Rpt #	Location	Time (CST)	Storm Characteristic
26	**Sedgwick County (KS)** 2.3 ENE Greenwich	0350-0401	**Thunderstorm Wind (MG 54 kt)**
27	**Butler County (KS)** 0.8 N Cassoday	0400	**Thunderstorm Wind (EG 61 kt)**

A vehicle was rolled on the Kansas Turnpike near Cassoday. One person was injured (direct).

28	**Butler County (KS)** 0.2 ENE El Dorado	0404	**Thunderstorm Wind (MG 50 kt)**

Report from a KSN Weather Lab Mesonet.

29	**Butler County (KS)** 2.1 ESE El Dorado Res, 3.1 SE El Dorado Res	0404	**Thunderstorm Wind (EG 61 kt)**

Three campers were overturned at the El Dorado Lake state park. Two unoccupied trailers were overturned. A third occupied trailer at the Walnut River area of the lake was also rolled over. Of the two people in the trailer, one suffered a minor (direct) head injury.

30	**Butler County (KS)** 4.3 SE El Dorado	0404	**Thunderstorm Wind (EG 61 kt)**

At the El Dorado airport a small plane was flipped and a metal hanger collapsed.

31	**Butler County (KS)** 0.2 ENE El Dorado	0407	**Thunderstorm Wind (EG 70 kt)**

From a KSN TV weather lab mesonet.

32	**Wilson County (KS)** Fredonia	0407	**Hail (0.88 in)**
33	**Butler County (KS)** 0.2 ENE El Dorado	0409	**Thunderstorm Wind (MG 56 kt)**

Sustained wind speeds of 59 mph gusting 65 mph from a KSN TV weather lab mesonet.

34	**Butler County (KS)** 0.5 WNW Leon	0411	**Thunderstorm Wind (MG 52 kt)**

Measured wind gust by a KSN TV weather lab mesonet.

35	**McPherson County (KS)** Inman, 2.5 W McPherson, 2.3 ENE McPherson, 3.0 SSW Elyria	0428-0628	**Flood**

Water was over 14th Avenue in multiple places. County roads also flooded around Inman.

Rpt #	Location	Time (CST)	Storm Characteristic
36	**Greenwood County (KS)** 1.4 N Reece	0437	**Hail (0.88 in)**
37	**Greenwood County (KS)** 1.4 N Reece	0437	**Thunderstorm Wind (EG 80 kt)**

Sheriff deputy reported estimated wind speeds of 80 mph with half inch size hail.

38	**Wilson County (KS)** 0.9 W New Albany, 0.2 SSW New Albany	0451- 0512	**Thunderstorm Wind (EG 87 kt)**

A mobile home was blown 40 feet and ended up wrapped around a large tree and was totally demolished. A 54 year old woman of the home was found in the wreckage and died. A church in town was totally destroyed and also the town post office was a total loss after it collapsed. Numerous trees were also down across town.

Direct Fatalities: F54MH

39	**Elk County (KS)** 9.3 N Longton, 9.8 NE Longton	0455- 0510	**Thunderstorm Wind (EG 70 kt)**

An estimated 80 mph winds knocked down 6 barns, and broke several trees.

40	**Chase County (KS)** 3.0 SE Matfield Green, 4.8 NNW Saffordville, 5.4 NNW Elmade, 4.9 ENE Cedar Point	0508- 1108	**Flood**

Three to four inches of rainfall caused flooding across the county. Numerous low water crossings were flooded with portions of the Kansas Turnpike near mile post 101 closed because of high water.

41	**Montgomery County (KS)** 1.5 WNW Cherryvale, 2.0 E Cherryvale	0520- 0530	**Thunderstorm Wind (EG 87 kt)**

Numerous trees and buildings received serious damage from winds estimated to be 100 mph. A masonry building and two metal buildings had serious damage. A tractor trailer was overturned on US 169 on the west side of town and a train was derailed near downtown. The storm also knocked down numerous large trees, with one such tree trapping a couple in a storm shelter. The force of the wind also pushed a locomotive down the tracks 40 feet.

42	**Wilson County (KS)** 2.4 WNW Fredonia, 3.5 E Altoona	0520- 0535	**Thunderstorm Wind (EG 78 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Wind speeds of 80 to 90 mph produced widespread wind damage across Fredonia and Altoona. Numerous businesses in Fredonia had some serious roof damage. Sheds and outbuildings in rural areas were destroyed and 42 power poles were downed.

43 **Montgomery County (KS)**
1.1 ENE Independence 0528 **Thunderstorm Wind (EG 51 kt)**

The wind was measured by a KSN TV weatherlab mesonet.

44 **Montgomery County (KS)**
1.6 SE Elk City Lake, 2.2 ESE Independence 0528 **Thunderstorm Wind (EG 52 kt)**

Several trees were blown down across town from Elk City Lake to Independence.

45 **Labette County (KS)**
1.8 W Parsons, 2.4 SE Parsons 0540-0550 **Thunderstorm Wind (EG 70 kt)**

Several large trees were knocked down all over town as thunderstorm winds estimated at 80 mph moved through the area. The storms also knocked down 20 power poles all over town. The strong winds also caused minor roof damage to numerous businesses. The trees and debris fell on houses and cars throughout the town.

46 **Labette County (KS)**
0.6 E Parsons Tri City Arpt 0542 **Thunderstorm Wind (MG 53 kt)**

47 **Labette County (KS)**
0.5 WSW Altamont, 1.3 SE Altamont 0545-0555 **Thunderstorm Wind (EG 70 kt)**

Numerous trees and power poles were knocked down by winds estimated at 80 mph. Outbuildings were damaged by falling trees throughout town.

48 **Neosho County (KS)**
0.6 W (CNU) Johnson Arpt Ch 0548 **Thunderstorm Wind (MG 56 kt)**

49 **Neosho County (KS)**
0.9 NNW Thayer, 0.3 ENE Galesburg 0548-0555 **Thunderstorm Wind (EG 61 kt)**

The towns of Thayer and Galesburg were hit hard by damaging winds estimated at 70 mph. Numerous large trees were blown down across both towns, with some falling on houses and outbuildings. A few businesses in Thayer had portions of their roofs blown off. A few mobile homes in rural areas were rolled over with grains bins lifted off their foundations and thrown into the road.

Rpt #	Location	Time (CST)	Storm Characteristic
50	**Labette County (KS)** 0.8 SW Parsons	0556	**Thunderstorm Wind (MG 60 kt)**

The wind was measured at the KSN TV mesonet.

51	**Greenwood County (KS)** 0.6 E Eureka, 4.6 NW Neal, 3.7 ENE Madison, 3.1 NE Walton	0600- 1015	**Flash Flood**

Three to four inches of rainfall produced widespread flooding of county roads and street flooding in the towns of Madison and Eureka. Most of the rain fell within a two hour period in the morning. The rainfall fell so hard and so fast that schools in Madison were cancelled.

52	**Labette County (KS)** 0.6 E Parsons Tri City Arpt	0600	**Thunderstorm Wind (MG 50 kt)**
53	**Labette County (KS)** 1.9 W Oswego, 0.6 SSE Oswego	0604- 0610	**Thunderstorm Wind (EG 52 kt)**

Numerous trees were knocked down across town as winds estimated around 60 mph moved across the area. The trees fell on outbuildings and vehicles causing damage.

54	**Labette County (KS)** 2.0 WNW Chetopa, 0.3 NNE Chetopa	0604- 0610	**Thunderstorm Wind (EG 56 kt)**

Numerous trees were knocked down across town from winds estimated at 60 mph. Some of the trees fell on outbuildings and vehicles damaging them.

55	**Butler County (KS)** 5.5 N El Dorado Res, 5.0 SSE Cassoday, 3.8 ENE Cassoday, 10.6 NE Potwin,	0647- 1100	**Flash Flood**

Several county roads were closed in the northern part of the county due to high water.

56	**Montgomery County (KS)** 2.1 W Cedar Bluff, 1.6 SW Coffeyville, 3.1 E Coffeyville, 2.1 ENE Cedar Bluff	0700- 1100	**Flood**

Two to four inches of rainfall fell in less than 30 minutes to produce lots of street flooding across Coffeyville. 5 to 10 motorists were stranded when their cars stalled in the high water.

Rpt #	Location	Time (CST)	Storm Characteristic
57	**Woodson County (KS)** 0.9 SW Yates Center, 3.3 WNW Yates Center, 4.1 E Batesville, 5.7 SE Yates Center, 2.8 E Yates Center	0725- 1125	**Flash Flood**

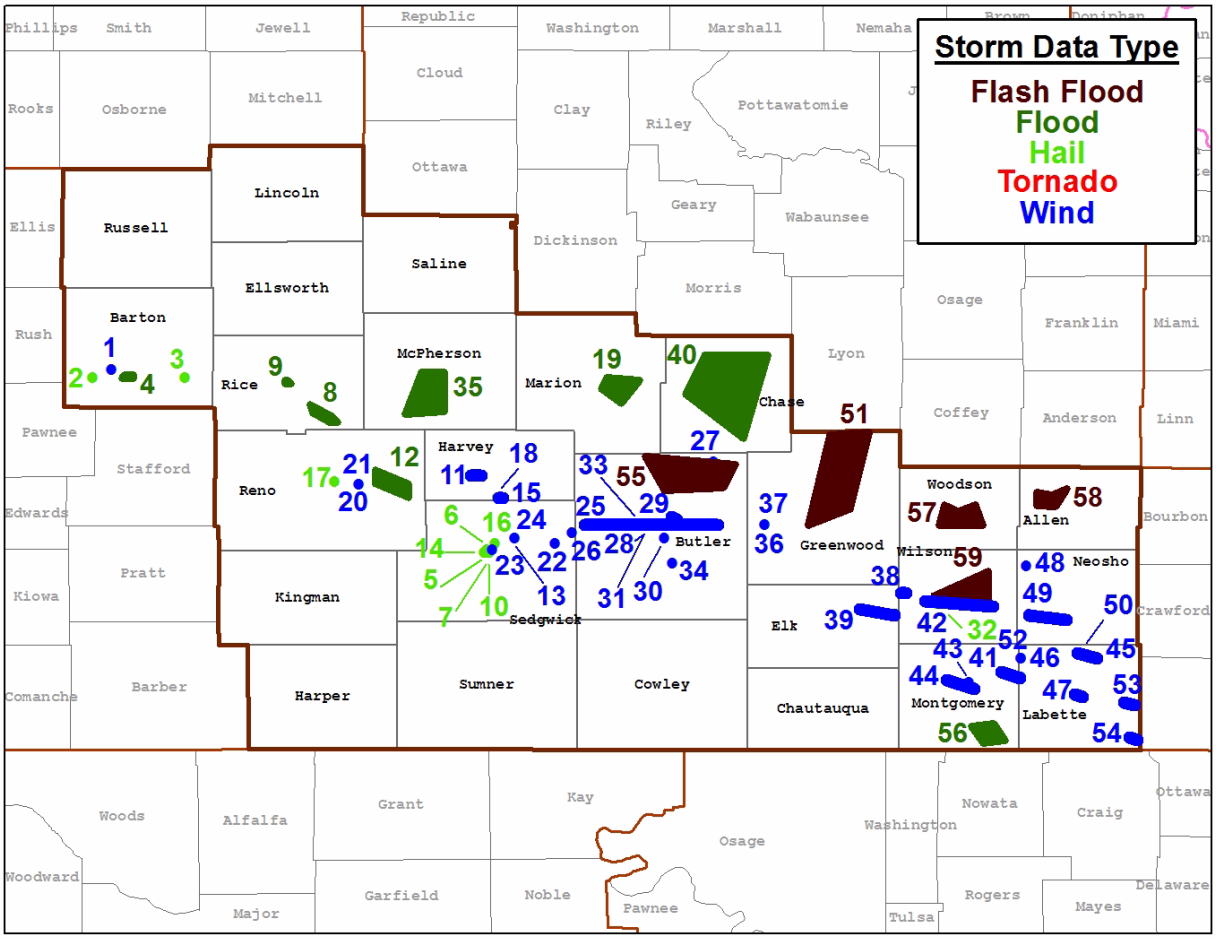
Several county roads were under water during the morning hours due to 2 to 4 inches of rainfall falling in a very short period of time.

58	**Allen County (KS)** 0.7 N Iola, 2.7 WNW Iola, 3.5 SW Iola, 2.5 SSE Iola, 2.3 NNE Gas	0726- 1126	**Flash Flood**

Numerous county roads throughout the county were flooded from 2 to 4 inches of rainfall falling in a very short time period.

59	**Wilson County (KS)** Fredonia, 2.1 NNW Fredonia, 5.0 SE Buffalo, 2.3 E Altoona	0727- 1127	**Flash Flood**

Numerous county roads were under water from 2 to 4 inches of rainfall in a short period of time. The worse flooding occurred from Buffalo to Altoona.


Storm Data Type
Flash Flood
Flood
Hail
Tornado
Wind
Phillips
Smith
Jewell
Republic
Washington
Marshall
Nemaha
Brown
Doniphan
Rooks
Osborne
Mitchell
Cloud
Clay
Riley
Pottawatomie
Ottawa
Ellis
Russell
Lincoln
Geary
Wabaunsee
Dickinson
Saline
Morris
Ellsworth
Barton
Rush
Rice
McPherson
Marion
Chase
Lyon
Osage
Franklin
Miami
Coffey
Anderson
Linn
Pawnee
Stafford
Harvey
Reno
Woodson
Allen
Bourbon
Edwards
Pratt
Kingman
Butler
Greenwood
Wilson
Neosho
Crawford
Kiowa
Elk
Comanche
Barber
Harper
Sumner
Cowley
Chautauqua
Montgomery
Labette
Woods
Alfalfa
Grant
Kay
Osage
Washington
Nowata
Craig
Ottawa
Woodward
Garfield
Noble
Pawnee
Rogers
Mayes
Delaware
Major
Tulsa

II. SGF CWA Reports

Rpt #	Location	Time (CST)	Storm Characteristic
1	**Cherokee County (KS)** 3.5 WNW Hallowell, 2.7 S Lawton	0540- 0603	**Thunderstorm Wind (EG 78 kt)**

A National Weather Service storm survey revealed that damaging winds impacted nearly all of Cherokee County. Widespread damage occurred in the form of downed power poles, uprooted trees, damaged structures, and damaged crops. More specifically, there were several structures that experienced roof damage while windows were blown out of both homes and automobiles. A 1000 foot transmission tower was also knocked down that was built on top of the Cherokee County court house. The Columbus High School football facilities experienced significant damage. The press box was destroyed while several power poles that lit the field were snapped or blown down. One home near Crestline experienced major structural damage. This damage appeared to of occurred from a microburst that produced a concentrated area of 90 mph winds. In Weir, the rodeo grounds and concession stand were completely destroyed, while the bath house in Scammon lost its entire roof. Several campers were also flipped over and damaged at an RV dealership in Columbus.

2	**Crawford County (KS)** 1.7 WNW McCune, 0.4 NNW Coolis	0540- 0605	**Thunderstorm Wind (EG 74 kt)**

Damaging wind gusts occurred across much of the southern half of Crawford County. Damage occurred to numerous structures, trees, power poles, and crops. The most concentrated damage occurred at Southeast High School where the roof of the gymnasium was torn off. The baseball, softball, and football fields all experienced damage as well. In the town of Cherokee, 130 structures were damaged altogether. In McCune, 63 structures were damaged, as well as six vehicles and two grain elevators at the Co-Op.

3	**Barton County (MO)** 1.2 SSW Mindenmines, 2.7 SSW Newport	0603- 0645	**Thunderstorm Wind (EG 70 kt)**

Widespread structural, tree, and power pole damage occurred across the majority of Barton County. The city of Lamar was impacted the greatest with numerous structures sustaining roof damage. A storage building at a lumber store was completely destroyed while the Lamar High School sustained major roof damage, causing rain to flood the gymnasium. Over 2000 residences lost power throughout the county. The community of Liberal had numerous structures that sustained damage, while it was estimated that Golden City had approximately 12 homes with damage.

4	**Jasper County (MO)** 0.8 W Belle Center, 2.7 N Sarcoxie	0603- 0640	**Thunderstorm Wind (EG 78 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Sixty to 90 mph winds impacted nearly all of Jasper County. Damage to trees, structures, business signs, and power poles was widespread. The most significant damage occurred from winds knocking over a television tower at KSN TV on the west side of Joplin. This television tower fell into portions of the studio building, and caused the station to be off-air for several weeks. Part of the tower also fell on a nearby residence, destroying a vehicle and damaging a house. Thousands of Jasper County residences were left without power for several days. Several other homes were damaged from large trees falling on them. The Joplin Globe estimated that at least 2,000 homes had some roof damage and nearly 1500 trees were knocked over.

5 **Newton County (MO)**

0.7 WSW Seneca, 1.6 NE Fairview	0603- 0638	**Thunderstorm Wind (EG 70 kt)**

Severe thunderstorm wind gusts ranging between 60 and 80 mph caused widespread damage to trees, power poles, and structures across much of Newton County. A roof was destroyed on a mobile home located near the intersection of Iris Road and Highway NN. Rain fell into the home, destroying the rest of the structure. In Diamond there were two businesses that had significant roof damage. The Dollar General Store in Neosho sustained roof damage and allowed water to enter the store. One building was destroyed at a fiberglass company in Neosho. A few thousand residences had lost power due to fallen power poles and lines.

6 **Barry County (MO)**

6.0 W Monett Friend Arpt, 2.0 E Osa	0630- 0700	**Thunderstorm Wind (EG 74 kt)**

Destroyed outbuildings, damage to roofs and other structures, downed trees, and knocked over power poles were all a result of 50 to 85 mph wind gusts that impacted almost all of Barry County. Monett was impacted the greatest as hundreds of structures sustained roof damage. Meanwhile several outbuildings west of Monett along Highway 60 were completely destroyed. There were also destroyed outbuildings along Highway 37 near the community of Purdy. A large roof was torn off of a storage facility that blocked a city street for several hours in Monett. The Gizmos Event Center grandstand in Wheaton was heavily damaged, which caused heavy rain to destroy the interior of a banquet hall that was being constructed beneath the grandstand.

7 **Lawrence County (MO)**

4.5 SSW Plew, 3.0 S Halltown	0630- 0657	**Thunderstorm Wind (EG 74 kt)**

Sixty to 85 mph winds caused widespread wind damage across much of Lawrence County. Damage consisted of trees, power poles, structures, and business signs. Winds destroyed a garage along with several outbuildings in Round Grove, and three homes experienced roof and window damage in an area of intense tree damage. A few businesses in Mount Vernon experienced roof and window damage. One home in Miller was destroyed from winds estimated at 85 mph. In Pierce City, most of the city experienced power loss from damaged power lines and poles. Large trees were downed and blocked nearly one half dozen roads, while a roof was completely torn off of an auto shop on Commercial Street.

8 **Dade County (MO)**

4.2 W Meinert, 3.5 E Emmet	0638- 0702	**Thunderstorm Wind (EG 74 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Sixty to 85 mph wind gusts created widespread damage to trees, power poles, and a few structures across much of Dade County. The southern half of the county was impacted the greatest, particularly in the community of Lockwood where numerous large trees were uprooted. Power line damage created power outages for residents of the community. There was also considerable tree and power pole damage in Greenfield as several city streets were blocked by debris. Power outages in Greenfield ranged from 24 to 48 hours.

9 **Cedar County (MO)**

2.0 W Jerico Spgs, 2.4 SE Bearcreek	0650- 0715	**Thunderstorm Wind (EG 70 kt)**

Fifty to 80 mph winds caused damage to trees, boat docks, and boats across southern and central Cedar County. The most significant damage occurred on Stockton Lake, where the State Park Marina, Orleans Trail Marina, and Mutton Creek Marina had expensive damage to docks and boats. The State Park Marina estimates that 1.2 million dollars of damage occurred to the wave wall protector. One boat broke away from a dock and became wedged underneath the dock. In the campgrounds, numerous trees were knocked over and one of the bath houses was destroyed. Several other outbuildings and numerous trees were damaged across the southern portion of the county.

10 **Vernon County (MO)**

1.9 SW Richards, 0.9 ENE Walker, 1.0 NNW Sandstone, 0.9 ESE Reo	0650- 1000	**Flash Flood**

Two to four inches of rain created widespread flooding across much of Vernon County. Locations where flooding was observed included Nevada, sections of Highway 71, sections of Highway 54, and sections of several county roads.

11 **Christian County (MO)**

1.5 Billings, 2.0 NE Abadyl	0653- 0735	**Thunderstorm Wind (EG 78 kt)**

Sixty to 90 mph winds created widespread damage to trees, structures, and power poles across much of the county. Roof damage to homes and businesses was significant in and around the communities of Billings, Nixa, Highlandville, and Ozark. Two mobile homes were heavily damaged in Highlandville from large trees falling on them. Several power poles were knocked over in Nixa, causing damage to some of the mobile units of the school district.

12 **Dade County (MO)**

1.8 E Pilgrim, 3.2 NE Pilgrim	0653- 0655	**Tornado (EF1, L: 1.90 mi, W: 100 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado tracked across a rural section of southeast Dade County. The damage path was intermittent from just south of Fiddlers Ford to Carr Cemetery. The tornado damaged trees and outbuildings along its path.

Rpt #	Location	Time (CST)	Storm Characteristic
13	**Stone County (MO)** 1.2 W Crane, 3.0 SSE Jamesville	0653- 0711	**Thunderstorm Wind (EG 70 kt)**

Sixty to 80 mph winds impacted a widespread area of Stone County. These severe thunderstorm wind gusts downed thousands of trees, particularly in the northern half of the county. The only known structural damage from these winds occurred at the Branson West Wal-Mart. A two foot hole was ripped off the roof causing heavy rain to flow inside the store, damaging merchandise. Several roads were blocked from downed trees.

14	**Greene County (MO)** 2.0 ENE Plano, 1.0 E Strafford	0654- 0731	**Thunderstorm Wind (EG 78 kt)**

Sixty to 90 mph winds caused widespread tree, power pole, and structural damage across much of Greene County. Major roof damage to schools included Willard North Elementary, Fair Grove High School, Ash Grove High School, Bois D Arc Elementary, and Glendale High School. Four students were injured at Fair Grove High School as debris fell into the school while the roof was peeling off. Portions of the elementary and middle school were completely destroyed, along with some light poles on the baseball field. The Ebenezer fire station and fire trucks sustained major damage. Several billboards west of Springfield along Interstate 44 were destroyed. The Sams Club on Highway 65 and Sunshine had a temporary wall that was peeled off of the building. The Willard High School baseball field had major damage to the press box and dugouts. At Fellows Lake, the marina was broken into three pieces, and jammed the boat docks up onto the boat ramp. Thousands of residences across Greene County lost power up to three days.

15	**Cedar County (MO)** 0.8 ENE El Dorado Spgs Arpt, 2.3 ESE Osiris, 3.6 S Arnica, 1.4 SE Caplinger Mills	0700- 1100	**Flash Flood**

Two to four inches of rain fell across Cedar County. Several county roads flooded during this episode. One particular area that experienced significant flash flooding was the intersection of Turkey Creek and Highway AA.

16	**Greene County (MO)** 2.2 SW Republic, 1.3 S Republic Westport Arpt	0705- 0709	**Tornado (EF1, L: 3.88 mi, W: 100 yd)**

The Republic Emergency Management Director visually spotted and tracked a tornado that touched down southwest of Republic and moved across the city. Approximately 50 structures were damaged. The heaviest damage appeared to be concentrated on Kristopher Street.

17	**Polk County (MO)** 0.6 SE Knox, 0.3 NNE Tin Town	0705- 0740	**Thunderstorm Wind (EG 78 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Seventy to 90 mph winds caused massive damage across much of Polk County. The central and southern sections of the county were impacted the greatest. Hundreds of outbuildings were either heavily damaged or destroyed. The communities of Bolivar and Pleasant Hope experienced damage to several hundred structures. At Southwest Baptist University, a large tree fell on a car that was occupied by a student. The student was injured and transported to the hospital. The Marion C. Early High School gymnasium experienced significant damage. In Tin Town, a farm experienced significant damage to the home and all outbuildings.

18 **Taney County (MO)**

2.7 WSW Day, 1.3 NNW McClurg	0710- 0740	**Thunderstorm Wind (EG 70 kt)**

Fifty to 80 mph wind gusts downed thousands of trees across much of Taney County. The northern half of the county was impacted the greatest as structural damage occurred to a modular home in Forsyth from a large tree falling on the structure. Several power poles across the northern half of the county were downed and resulted in power outages.

19 **Greene County (MO)**

1.2 NW (SGF) Springfield Arpt 1.9 NNE (SGF) Springfield Arpt	0714- 0716	**Tornado (EF1, L: 1.76 mi, W: 75 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado touched down in a field about one quarter of a mile west of the intersection of Willard Road and Farm Road 115. A house located along Farm Road 115 sustained heavy damage. A few outbuildings at the same location were destroyed. The tornado crossed Highway 160, and lifted approximately two miles south of Fantastic Caverns.

20 **Polk County (MO)**

1.9 NW Brighton, 2.8 W Burns	0716- 0726	**Tornado (EF1, L: 8.61 mi, W: 250 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado touched down approximately two miles northwest of Brighton, and tracked north across southern Polk County. The tornado lifted approximately two miles east southeast of Bolivar. The tornado damaged or destroyed several outbuildings and barns, and caused moderate to severe damage to frame homes. In addition, numerous trees were uprooted.

21 **Greene County (MO)**

0.5 WNW Ebenezer, 2.4 WNW Hickory Barren	0721- 0725	**Tornado (EF0, L: 3.54 mi, W: 100 yd)**

A National Weather Service storm survey revealed that an EF-0 tornado touched down near the intersection of Highway 13 and Highway WW. The tornado tracked to the northeast over an intermittent path prior to lifting near the intersection of Highway H and Farm Road 148. The tornado damaged several outbuildings and trees along its path.

Rpt #	Location	Time (CST)	Storm Characteristic
22	**Dallas County (MO)**		
	0.2 NNW Redtop, 2.0 SE Handley	0725-0800	**Thunderstorm Wind (EG 74 kt)**

Numerous outbuildings, trees, and power poles were damaged from 60 to 85 mph wind gusts. The greatest impact of these winds occurred over southern Dallas County. One newspaper stated that not a single hay barn across areas of southern Dallas County was fully intact. An Alltel tower was blown down approximately three miles south of Buffalo.

23	**Taney County (MO)**		
	2.7 SE Swan, 3.9 ENE Swan	0725-0728	**Tornado (EF1, L: 2.76 mi, W: 150 yd)**

A tornado touched down in rural sections of the county and caused damage to a home and numerous outbuildings on Essray Road. Intense tree damage also occurred as the tornado tracked into southeastern Christian County.

24	**Christian County (MO)**		
	1.3 SSE Garrison, 6.8 ENE Garrison	0728-0736	**Tornado (EF1, L: 7.19 mi, W: 880 yd)**

This tornado is an extension of the Taney County tornado ***(see Report # 23)***. A National Weather Service storm survey revealed that an EF-1 tornado impacted extreme southeast Christian County. Wind speeds were estimated at 100 mph as the tornado damaged two homes, destroyed a few outbuildings, and downed numerous trees. The tornado eventually tracked into western Douglas County.

25	**Webster County (MO)**		
	1.1 WSW Caddo, 0.5 ESE Rader	0729-0757	**Thunderstorm Wind (EG 74 kt)**

Fifty to 85 mph wind gusts impacted nearly all of Webster County. Over 500 businesses and homes were damaged; meanwhile, hundreds of outbuildings were either damaged or destroyed. Tree damage was intense and widespread across all of the county. A communications tower owned by the Webster County Sheriffs Office was blown down near the community of Elkland. The ticket booth at Marshfield High Schools football field along with the bus barn in Niangua were heavily damaged.

26	**Douglas County (MO)**		
	1.0 NW Ongo, 6.7 E Topaz	0730-0818	**Thunderstorm Wind (EG 70 kt)**

Sixty to 80 mph wind gusts swept across all of Douglas County causing widespread damage to trees, outbuildings, and power poles. Several shops, barns, and other farm related outbuildings were destroyed across the county. In Ava, damage mainly consisted of a few roofs that had minor damage. Communities within the county that were impacted the greatest include Pansy, Goodhope, and Redbank.

Rpt #	Location	Time (CST)	Storm Characteristic
27	**St. Clair County (MO)** 0.8 ENE Roscoe, 1.6 E Vista, 2.8 SE Damascus, 3.8 E Chalk Level	0730- 1130	**Flash Flood**

One to three inches of rain caused flooding of small streams and creeks. One particular stream that experienced significant flooding was Brush Creek. This creek flooded a section of Highway J.

28	**Douglas County (MO)** 2.5 SW Merritt, 0.6 S Merritt	0736- 0738	**Tornado (EF1, L: 2.31 mi, W: 880 yd)**

This tornado is an extension of the Christian County tornado ***(see Report # 24)***. A National Weather Service storm survey revealed that an EF-1 tornado tracked into southwest Douglas County. Trees and a few outbuildings were damaged from the tornado.

29	**Webster County (MO)** 1.5 SE Fordland, 1.1 N Diggins	0738- 0741	**Tornado (EF1, L: 3.77 mi, W: 400 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado touched down near Highway 60 approximately one mile east of Fordland, and tracked northeast to near Diggins Road. The tornado damaged a delivery truck, a roof off the Memory Lane Dairy Farm, several trees, and an outbuilding on Diggins Road.

30	**Douglas County (MO)** 1.1 N Merritt, 2.9 WNW Goodhope	0739- 0741	**Tornado (EF2, L: 2.30 mi, W: 1320 yd)**

A National Weather Service storm survey revealed that an EF-2 tornado with winds up to 130 mph touched down approximately one mile north of Merritt. The tornado tracked northeast along a two and a half mile path before lifting northwest of Goodhope. The tornado damaged two homes, several outbuildings, and numerous trees.

31	**Douglas County (MO)** 1.9 WSW Goodhope, 1.3 NNW Goodhope	0739- 0741	**Tornado (EF2, L: 2.48 mi, W: 880 yd)**

A National Weather Service storm survey revealed that an EF-2 tornado touched down two miles west of Goodhope and tracked northeast for about two and a half miles. The tornado tore a roof off of a home along with damaging numerous trees.

32	**Hickory County (MO)** 0.5 SSW Cross Timbers, 0.4 SE Preston, 1.9 NW Galmay, 4.8 NNE Wheatland	0740- 1130	**Flash Flood**

Rpt #	Location	Time (CST)	Storm Characteristic

Two to four inches of rain fell over Hickory County. Several low lying county roads flooded. A couple of specific locations that flooded included the intersection of Starkes Creek and Highway P and a section of Highway D south of Preston.

33 **Dallas County (MO)**

1.4 ESE March, 1.5 NE Springs Grove	0741-0745	**Tornado (EF2, L: 4.25 mi, W: 400 yd)**

A National Weather Service storm survey revealed that an EF-2 tornado touched down two miles west of Charity and tracked northeast over an intermittent path. The tornado destroyed three frame homes and numerous outbuildings. One indirect fatality and another injury resulted from this tornado. A man and his wife were both injured when their house was destroyed. He later died from a heart attack while being transported to the hospital.

34 **Ozark County (MO)**

0.5 W Longrun, 6.3 ESE Toccoa	0741-0816	**Thunderstorm Wind (EG 70 kt)**

Sixty to 80 mph wind gusts impacted much of Ozark County. The northern half of the county experienced the greatest damage, mainly in the form of uprooted trees. A few outbuildings were also damaged. The Ozark County Times, a newspaper in Gainesville, stated that thousands of trees were damaged. Power poles were also impacted, knocking out power to 2,300 residences and businesses. There were also a few outbuildings in Theodosia and Isabella that were completely destroyed.

35 **Douglas County (MO)**

0.6 SSE Mt. Zion, 1.1 ENE Mt. Zion	0748-0749	**Tornado (EF1, L: 1.13 mi, W: 200 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado touched down near Mt. Zion and tracked about one mile to the northeast. The tornado caused minor home damage, destroyed a barn, and uprooted several trees.

36 **Ozark County (MO)**

1.9 ENE Toledo, 2.1 SW Wasola	0748-0750	**Tornado (EF1, L: 1.65 mi, W: 400 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado impacted a rural section of northwest Ozark County. The tornado destroyed seven outbuildings and damaged three houses. Tree damage was intense, particularly near the intersection of County Road 950 and County Road 955.

37 **Wright County (MO)**

3.2 WNW Grovespring, 0.5 SSE Embree	0751-0818	**Thunderstorm Wind (EG 74 kt)**

Sixty to 90 mph wind gusts caused widespread damage to trees, power poles, outbuildings, homes, and businesses across all of Wright County. The community of Mansfield was impacted the greatest, as power outages from downed utility lines and poles lasted for up to three days. Numerous homes experienced roof damage. Mansfield Building Company experienced heavy damage, while the roof on the Norwood post office was peeled away.

Rpt #	Location	Time (CST)	Storm Characteristic
38	**Laclede County (MO)**		
	0.9 NNW Conway, 0.5 NNE Lynchburg	0753- 0825	**Thunderstorm Wind (EG 70 kt)**

Widespread wind damage occurred across central and southern Laclede County. Trees, outbuildings, and power poles were the primary items that were damaged. In Conway, several homes experienced minor roof damage. Rural areas south of Lebanon experienced the most intense wind speeds. In Lebanon, a few trees were knocked over, however, structural damage was minimal.

39	**Camden County (MO)**		
	0.6 SW Barnumton, 2.3 NNW Damsel, 1.4 NNE Sunrise Beach, 1.3 ENE Lake Ozarks	0800- 1200	**Flash Flood**

Rainfall amounts of two to four inches flooded several areas of Camden County. Two specific locations that flooded include a section of Highway 7 southeast of Barnumton and a section of Highway BB one mile south of Montreal.

40	**Laclede County (MO)**		
	3.0 SW Dove, 1.1 NE Sleeper, 3.6 ENE Russ, 1.8 NE Phillipsburg	0800- 1200	**Flash Flood**

A National Weather Service storm survey revealed that significant flash flooding occurred across much of Laclede County. Several county roads, low water crossings, and drainage culverts were washed out.

41	**Wright County (MO)**		
	2.7 S Loring, 1.1 ENE Boyer	0807- 0810	**Tornado (EF1, L: 3.75 mi, W: 440 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado with 90 to 100 mph winds occurred four miles northwest of Hartville. The tornado destroyed several outbuildings and uprooted numerous trees.

42	**Howell County (MO)**		
	2.1 S Crider, 3.2 SSW Fanchon	0816- 0840	**Thunderstorm Wind (EG 70 kt)**

Sixty to 80 mph winds impacted central and northern Howell County. Damage to trees, power poles, and a few outbuildings were observed. The city of West Plains only sustained minor damage to a few roofs; meanwhile, areas in and around Willow Springs and Mountain View experienced extensive tree and structural damage.

43	**Texas County (MO)**		
	0.8 WNW Plato, 4.5 SSE Maples	0816- 0843	**Thunderstorm Wind (EG 74 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Sixty to 85 mph winds impacted most of Texas County. Thousands of trees were damaged along with more than 200 power poles that were destroyed. Nearly 10,000 power outages were estimated by Intercounty Electric. Numerous outbuildings were either damaged or destroyed. In Gladden, recovery crews worked 15 hours straight to remove storm debris along a one mile stretch of a county road. Hundreds of structures in the community of Licking were damaged. A pavilion structure at the Old City Park was completely flattened by a large tree. Several mobile homes at the Green Acres mobile home park were crushed by downed large trees.

44 **Texas County (MO)**

2.8 S Dunn, 1.6 N Cabool Arpt	0819-0825	**Tornado (EF0, L:6.85 mi, W: 200 yd)**

A National Weather Service storm survey revealed that an EF-0 tornado tracked across rural sections of southwest Texas County. The tornado damaged several outbuildings, while significant tree damage also occurred.

45 **Pulaski County (MO)**

2.2 SE Greenview, 2.8 E Big Piney	0820-0850	**Thunderstorm Wind (EG 70 kt)**

Fifty to 80 mph winds impacted mainly the southern half of Pulaski County. Far southern Pulaski County, which is primarily less populated and rural, experienced the greatest tree damage. A few power poles were also damaged resulting in power outages.

46 **Laclede County (MO)**

4.3 ESE Jones Lebanon Arpt, 4.7 E Jones Lebanon Arpt	0825-0827	**Tornado (EF2, L: 2.00 mi, W: 440 yd)**

A National Weather Service storm survey revealed that an EF-2 tornado touched down near the small community of Oakland. This tornado damaged numerous outbuildings and destroyed a mobile home.

47 **Howell County (MO)**

1.0 NNW Olden, 2.2 NE Olden	0828-0830	**Tornado (EF3, L: 2.17 mi, W: 880 yd)**

A National Weather Service storm survey revealed that an EF-3 tornado impacted a rural area just north of Pomona. The tornado destroyed a frame home. Several cars were thrown 50 yards while two school buses were knocked over. One mobile home and one travel trailer were destroyed, and two outbuildings along with an auto shop were destroyed.

48 **Howell County (MO)**

1.5 NW Trask, 3.5 N Mountain View	0835-0841	**Tornado (EF2, L: 6.68 mi, W: 880 yd)**

A National Weather Service storm survey revealed that an EF-2 tornado tracked across rural sections of northern Howell County. The tornado damaged several homes and outbuildings. Numerous trees were also uprooted from the tornado. This tornado continued into southeastern Texas County.

Rpt #	Location	Time (CST)	Storm Characteristic
49	**Howell County (MO)**		
	3.9 NW White Church, 2.4 ESE Mountain View	0835- 0844	**Tornado (EF1, L: 10.75 mi, W: 880 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado tracked across rural sections of northeast Howell County. The tornado damaged a few homes along with uprooting numerous trees.

50	**Oregon County (MO)**		
	3.1 NW Rover, 3.8 ENE Wilderness	0840- 0906	**Thunderstorm Wind (EG 70 kt)**

Sixty to 80 mph wind gusts impacted all of Oregon County. Significant tree damage was observed countywide, while numerous outbuildings and homes sustained damage. It was relayed to the National Weather Service that several homes in the community of Koshkonong had windows that were blown out. Roof damage was widespread in all communities of Oregon County.

51	**Pulaski County (MO)**		
	0.9 N Waynesville, 0.8 SW Devils Elbow, 1.3 SSE Big Piney, 3.4 WNW Palace	0840- 1300	**Flash Flood**

Two to four inches of rain caused flash flooding over sections of Fort Leonard Wood.

52	**Shannon County (MO)**		
	8.3 W Angeline, 2.9 ENE Munsett	0840- 0905	**Thunderstorm Wind (EG 70 kt)**

Sixty to 85 mph winds caused intense damage to trees, power poles, and structures over much of Shannon County. This damage was widespread, and impacted almost all communities within the county. The Missouri Department of Conservation estimated that nearly 13 million dollars of damage occurred to forest land, some of which was due to tornadoes. Hundreds if not thousands of structures sustained some type of damage. A sawmill was destroyed with only one wall left standing near the intersection of Highway 19 and Highway D.

53	**Texas County (MO)**		
	2.6 SSE Dent, 2.1 NW Licking	0840- 0844	**Tornado (EF1, L: 3.55 mi, W: 440 yd)**

A National Weather Service storm survey revealed that an EF-1 tornado impacted a section of northeast Texas County. The tornado removed a roof from a mobile home and destroyed a barn. Numerous trees were also uprooted.

54	**Texas County (MO)**		
	4.1 SSW Pine Crest, 1.6 SSE Pine Crest	0841- 0844	**Tornado (EF2, L: 3.61 mi, W: 880 yd)**

Rpt #	Location	Time (CST)	Storm Characteristic

This tornado is a continuation of the Howell County tornado ***(see Report # 48)***. A National Weather Service storm survey revealed that an EF-2 tornado entered southeastern Texas County from northern Howell County. The tornado tracked across rural portions of southeastern Texas County, destroying one home and several outbuildings. Two injuries occurred to the residents of the home. Numerous trees were snapped or uprooted. The tornado eventually tracked into west central Shannon County.

55 **Dent County (MO)**

1.3 ENE Coulstone, 3.9 SE Max	0842-0910	**Thunderstorm Wind (EG 70 kt)**

Fifty to 80 mph winds swept across mainly southern sections of Dent County. Thousands of trees were damaged, while power poles were also impacted leaving hundreds of residences without power. Several outbuildings and homes also experienced damage. Montauk State Park observed significant tree damage with an extended period of power outage. The community of Salem experienced significant tree and power pole damage.

56 **Shannon County (MO)**

2.1 N Blue Springs, 1.8 NE Eminence Arpt	0844-0900	**Tornado (EF2, L: 17.40 mi, W: 880 yd)**

This tornado is a continuation of the southeastern Texas County tornado ***(see Report # 54)***. A National Weather Service storm survey revealed that an EF-2 tornado entered rural west central Shannon County from southeastern Texas County. This tornado tracked across forested areas of west central and central Shannon County, uprooting and snapping numerous trees. The Missouri Department of Conservation announced that the tornado and other high winds from this event resulted in $13M of damage to trees. The tornado also damaged a sawmill along its path.

57 **Maries County (MO)**

1.1 W Brinktown, 0.3 SSW (VIH) Rolla/Vichy Arpt, 1.5 SE Summerfield, 5.4 Ene Van Cleve	0900-1300	**Flash Flood**

Two to four inches of rain fell over Maries County that resulted in widespread flooding of county roads. Several roads, low water crossings, and culverts were washed out.

58 **Oregon County (MO)**

1.2 ESE Thayer, 1.6 ENE Myrtle, 3.0 NW Riverton, 6.2 ESE Rover	0900-1300	**Flash Flood**

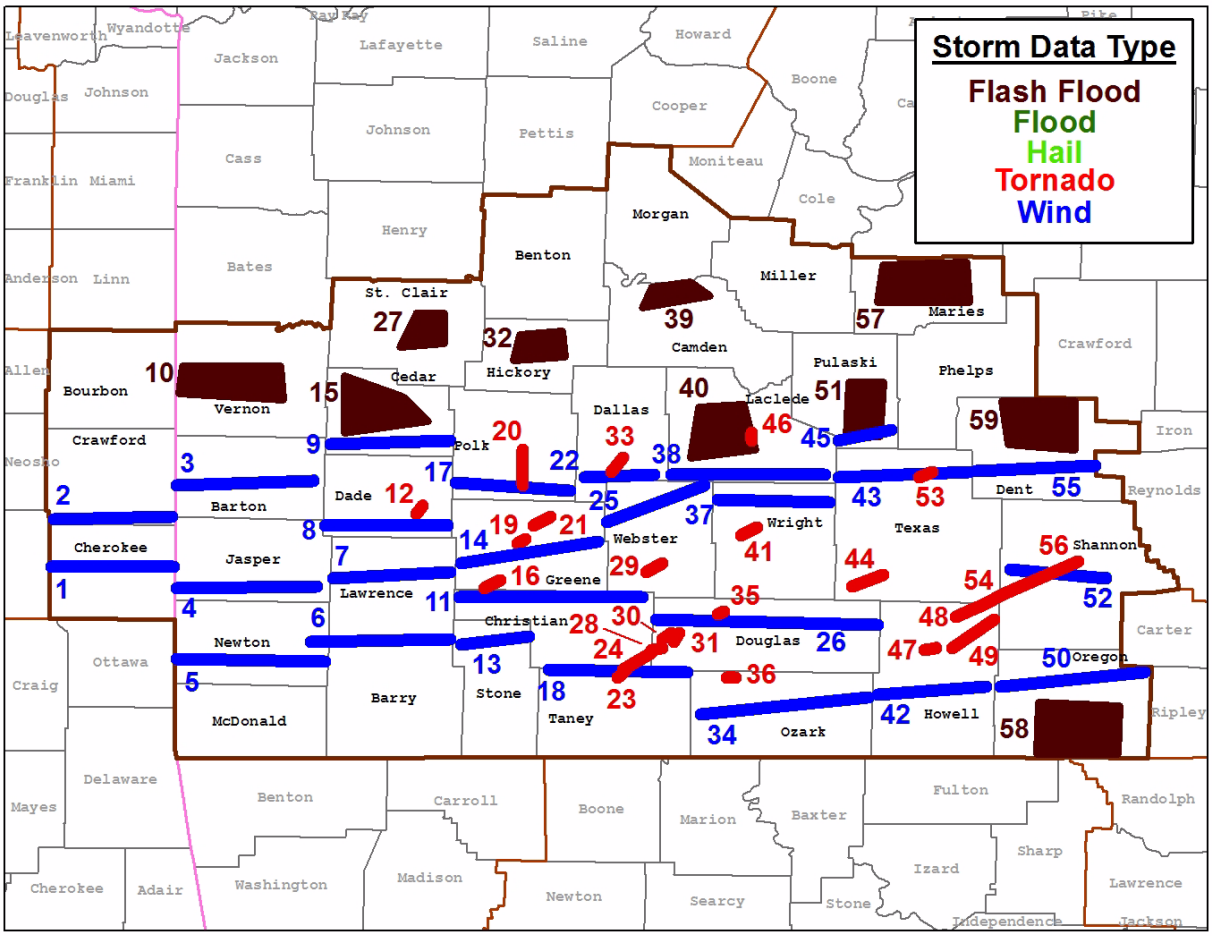
Three to six inches of rain fell over the southern half of Oregon County. This excessive rain resulted in significant flash flooding of creeks, rivers, and streams. Numerous low water crossings became impassable to motorists. Meanwhile, a section of Highway 19 between Alton and Thayer was impassable from Fredrick Creek.

Rpt #	Location	Time (CST)	Storm Characteristic
59	**Dent County (MO)** 1.0 NW Hobson, 0.4 SW Sligo, 4.0 WNW Stone Hill, 5.0 WSW Salem	0910- 1300	**Flash Flood**

Significant flash flooding of low lying roads resulted from one to four inches of rain that fell over Dent County. The northern section of the county experienced the heaviest rainfall, particularly near the community of Sligo.

***** Strong and damaging winds developed in the wake of an intense squall line. These non thunderstorm winds reached gusts up to 90 mph resulting in damage to trees, power lines, and some structures. It was too difficult to determine what damage occurred from thunderstorm winds compared to the wake low winds. Therefore all damage estimates were documented under thunderstorm winds.**

***** Also note that hail did occur within the SGF county warning area, but those reports did not make it to the NWS Verification website. Therefore, they were excluded from the list of final reports. Please refer to the WESSL log in Appendix C to view the more significant hail LSRs.**


Storm Data Type
Flash Flood
Flood
Hail
Tornado
Wind
Leavenworth
Wyandotte
Jackson
Lafayette
Saline
Howard
Boone
Cooper
Johnson
Pettis
Moniteau
Cole
Cass
Henry
Morgan
Benton
Miller
Bates
St. Clair
Camden
Maries
Crawford
Phelps
Pulaski
Bourbon
Vernon
Cedar
Hickory
Dallas
Laclede
Polk
Iron
Barton
Dade
Webster
Texas
Dent
Reynolds
Cherokee
Jasper
Lawrence
Greene
Wright
Shannon
Newton
Christian
Douglas
Carter
Ottawa
Craig
Barry
Stone
Taney
Oregon
McDonald
Ozark
Howell
Ripley
Delaware
Mayes
Benton
Carroll
Boone
Marion
Baxter
Fulton
Randolph
Cherokee
Adair
Washington
Madison
Newton
Searcy
Stone
Izard
Sharp
Lawrence
Independence
Jackson

III. LSX CWA Reports

Rpt #	Location	Time (CST)	Storm Characteristic
1	**Gasconade (MO)** 5.0 S Bland, 7.0 SSE Bland	0658- 0700	**Hail (1.75 in)**
2	**Crawford (MO)** 2.0 N Cuba	0714	**Hail (1.00 in)**
3	**Crawford (MO)** 2.0 W Bourbon, 1.0 W Bourbon	0715- 0720	**Hail (1.00 in)**
4	**Osage (MO)** 0.5 S Freeburg, 2.1 SSW Rich Fountain, 3.2 NNE Byron, 1.9 SSE Byron	0750- 1230	**Flash Flood**

Between 2 and 3 inches of rain fell in a short amount of time causing flash flooding. Highway 89 had two feet of water over it about 4 miles north of Belle.

5	**Iron (MO)** Viburnum	0805	**Hail (1.00 in)**
6	**Washington (MO)** 0.8 NNW Springtown	0834	**Hail (2.75 in)**
7	**Reynolds (MO)** 2.1 NNW Exchange, 0.8 SE Ellington	0910- 0915	**Thunderstorm Wind (EG 56 kt)**

Thunderstorm winds blew down numerous trees along Highway F west of Ellington. Also, several power poles were blown down and a detached garage was severely damaged.

8	**Reynolds (MO)** 4.4 W Redford, 2.6 W Redford	0915- 0917	**Tornado (EF1, L: 1.80 mi, W: 440 yd)**

It was determined that an EF1 tornado occurred 6.5 miles north of Ellington in Reynolds county. Significant roof damage to 2 homes was noted, as well as a chaotic damage pattern in the hundreds of downed trees. Debris was scattered for approximately one quarter of a mile. The tornado damage path was estimated to be approximately 2 miles long and one quarter mile wide.

9	**St. Francois (MO)** 5.0 N Bonne Terre	0915	**Hail (0.75 in)**

Rpt #	Location	Time (CST)	Storm Characteristic
10	**Crawford (MO)** 2.9 WNW Berryman, 5.0 NE Bourbon, 3.1 WSW Oak Hill, 5.2 WNW Vivian	0930- 1430	**Flash Flood**

Up to four inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded including Highways C and N.

11	**Gasconade (MO)** 0.2 NW Eland, 2.9 ENE Owensville, 4.5 SE Bem, 3.8 SE Cleavesville	0930- 1430	**Flash Flood**

Up to 4 inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded for a time including Wildcat Road, Van Horn Road and Glaser Hollow Road.

12	**Ste. Genevieve (MO)** 5.0 W Ste Genevieve	0939	**Hail (1.25 in)**
13	**Randolph (IL)** 1.0 W Madoc	0950	**Hail (1.50 in)**
14	**Iron (MO)** 2.0 WSW Bixby, 0.9 ESE Ironton	1000- 1050	**Thunderstorm Wind (EG 87 kt)**

The survey of damage indicated a large swath of straight line winds with estimated speeds of 60 to 70 mph over the northern third of Reynolds county and large parts of Iron county. Much of the damage was due to fallen trees. While trees were down over most of Reynolds and Iron counties, the tree damage was most concentrated in an area between Bixby and Reynolds, eastward to an area between Ironton and Glover. Within that area, microbursts occurred, with estimated wind speeds up to 100 mph. One particularly intense microburst was surveyed along Highway 21 about 4 miles south of Arcadia where a radio tower was blown down. In these areas, it was noted that up to 80 percent of the forest had been felled. Scattered structural damage, mostly to roofs and out-buildings, was also noted, including the Brown Shoe building in Ironton.

15	**Reynolds (MO)** 4.8 SSW Greeley, Lesterville	1000- 1040	**Thunderstorm Wind (EG 87 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

The survey of damage indicated a large swath of straight line winds with estimated speeds of 60 to 70 mph over the northern third of Reynolds county and parts of northwestern Iron county. Much of the damage was due to fallen trees. While trees were down over most of Reynolds and Iron counties, the tree damage was most concentrated in an area between Bixby and Reynolds, eastward to an area between Ironton and Glover. Within that area, microbursts occurred, with estimated wind speeds up to 100 mph. Three particularly intense microbursts were surveyed along Highway KK just south of Highway J, along Highway UU north of Bunker, and along Highway 49/72 near Lesterville. In these areas, it was noted that up to 80 percent of the forest had been felled. Scattered structural damage, mostly to roofs and outbuildings, was also noted.

16 **Randolph (IL)**
2.0 WNW Steeleville — 1013 — **Thunderstorm Wind (EG 52 kt)**

Two large trees were blown down at the intersection of Illinois Routes 4 and 150.

17 **Washington (MO)**
3.3 S Maryden, 1.6 SW Quaker, 5.7 SW Shirley, 2.2 SSE Cadet — 1015-1530 — **Flash Flood**

Up to three inches of rain fell in a short amount of time causing flash flooding. Numerous roads were flooded for a time including Mill and Jefferson streets in Potosi and New Diggins Road southeast of Potosi. Also, the Big River overtopped its banks and flooded portions of Highway M northeast of Caledonia.

18 **Washington (MO)**
3.4 W Hopewell — 1030 — **Thunderstorm Wind (EG 52 kt)**

Several large trees were blown down 5 miles south of Potosi on Highway 21, blocking the highway for a time.

19 **St. Francois (MO)**
1.1 WSW Iron Mtn, 1.5 SSE Libertyville — 1045-1110 — **Thunderstorm Wind (MG 66 kt)**

Isolated to scattered areas of tree damage were confined across the southern third of St. Francois County. One microburst hit Iron Mountain where two large trees smashed through two homes. Also, numerous power lines were blown down.

20 **St. Francois (MO)**
2.6 WSW Silver Spgs, 2.6 N French Vlg, 0.6 ENE French Vlg, 1.6 ENE St. Francois, 1.4 ESE Farmington, 0.6 W Bismarck Mem Arpt — 1047-1530 — **Flash Flood**

Rpt #	Location	Time (CST)	Storm Characteristic

Up to 4 inches of rain fell in a short amount of time causing flash flooding. Several roads were closed including U.S. Highway 67 north of Bonne Terre. Also, some ties were washed out from under train tracks just south of Bismarck and several water rescues were performed in the Park Hills area. Two homes in Park Hills had up to 8 feet of water in their basements due to the heavy rain.

21 **Madison (MO)**

Roselle, 1.5 NE Cornwall	1050-1115	**Thunderstorm Wind (EG 78 kt)**

A swath of straight line winds, commonly known as downbursts, with estimated winds of 60 to 75 mph extended from the northwest corner of Madison county through Fredricktown along Highway 72 to the Bollinger county line. Much of the damage that occurred was due to fallen trees, that were either uprooted or snapped at the base of the trunk. Structural damage was observed in the town of Fredricktown where roofs and windows were damaged, and a few trees fell onto houses. Eye witnesses reported that the severe wind gusts lasted up to 45 minutes in duration. Within the larger swath of severe winds were pockets of more intense damage caused by microbursts with wind gusts greater than 80 mph. The most intense wind damage occurred in the area from 3 miles north of the intersection of Highways F and V. Many large trees were blown down in this area which were caused by estimated gusts as high as 90 mph.

22 **St. Francois (MO)**

0.7 ESE Cantwell, Farmington	1055-1105	**Thunderstorm Wind (EG 56 kt)**

Thunderstorm winds blew down numerous trees and power lines between Park Hills and Farmington. Also, a house at the intersection of Liberty Street and Jefferson Street sustained moderate roof damage and a restaurant in town sustained moderate roof damage as well. A semi was blown over just north of Park Hills on U.S. Highway 67. No one was injured in the incident.

23 **Madison (MO)**

0.9 ESE Mine La Motte, 1.2 N Fredricktown Muni Aprt	1105-1106	**Tornado (EF0, L: 0.50 mi, W: 50 yd)**

A tornado briefly touched down and traveled to the east. Several trees were blown over by the tornado before it lifted and dissipated.

24 **Madison (MO)**

1.0 W Cornwall, 0.6 WSW Cornwall	1110-1111	**Tornado (EF1, L: 0.47 mi, W: 30 yd)**

A tornado briefly touched down near the intersection of County roads 229 and 234.The tornado then traveled east along County road 234 for half a mile before lifting and dissipating. It blew down a few trees as well as numerous large tree limbs.

25 **Randolph (IL)**

Evansville, Rockwood	1145-1155	**Thunderstorm Wind (EG 52 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Thunderstorm winds caused widespread tree damage as well as power lines in western Randolph County. Some buildings sustained minor shingle damage.

26 **Washington (IL)**

Irvington, 1.4 ENE Dubois, 4.2 W Mc Kinley, 0.6 SE Venedy Station — 1200-1400 — **Flash Flood**

Up to four inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including U.S. Highway 51 and Illinois State Route 153.

27 **Ste. Genevieve (MO)**

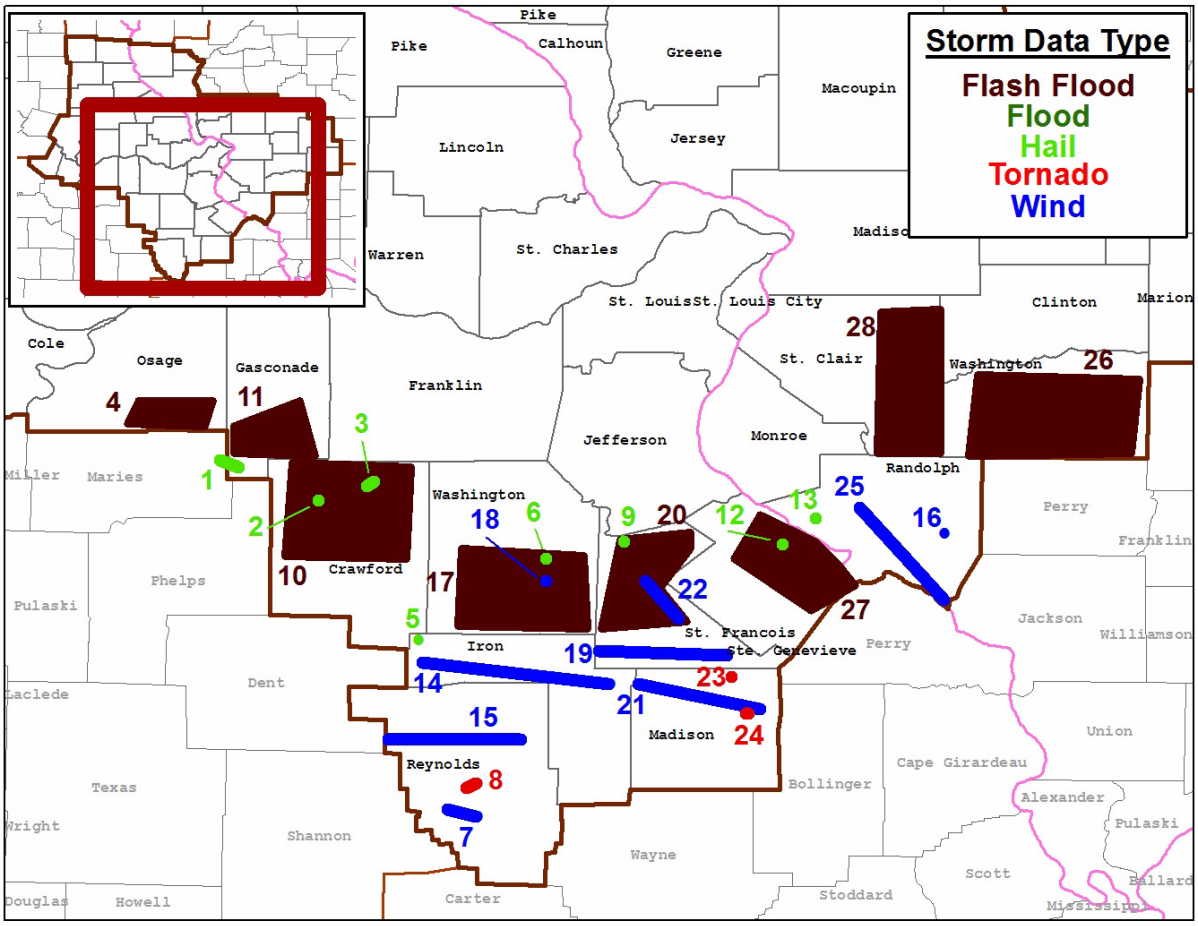
0.6 ENE St Marys, 0.4 SW Minnith, 2.8 SE Lawrenceton, 1.7 SE Brickeys, 0.9 N Ste Genevieve, 0.7 ENE Hicks — 1314-1530 — **Flash Flood**

Up to four inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including U.S. Highway 61 on the north end of St. Mary. Also, a water rescue had to be performed near Bloomsdale.

28 **St. Clair (IL)**

2.8 NE Summerfield, 1.3 E White Oak, 4.5 SW Lenzburg, 1.8 ENE O Fallon — 1400-1630 — **Flash Flood**

Up to three inches of rain fell in a short amount of time causing flash flooding. Several roads were flooded including U.S. Highway 50 between Summerfield and Trenton and Illinois State Route 13 between Lenzburg and Marissa.


Storm Data Type
Flash Flood
Flood
Hail
Tornado
Wind
Pike
Calhoun
Greene
Macoupin
Lincoln
Jersey
Madison
Warren
St. Charles
St. Louis
St. Louis City
Clinton
Marion
Cole
Osage
Gasconade
Franklin
St. Clair
Washington
Jefferson
Monroe
Randolph
Miller
Maries
Phelps
Crawford
Perry
Pulaski
Iron
St. Francois
Ste. Genevieve
Jackson
Williamson
Laclede
Dent
Reynolds
Madison
Union
Cape Girardeau
Texas
Bollinger
Alexander
Wright
Shannon
Wayne
Scott
Douglas
Howell
Carter
Stoddard
Ballard
Mississippi
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

IV. PAH CWA Reports

Rpt #	Location	Time (CST)	Storm Characteristic
1	**Carter (MO)** 7.3 NE Van Buren Muni Arpt	0900	**Thunderstorm Wind (EG 56 kt)**

Six large trees fell across County Road 554. On neighboring properties, about two dozen other very large oak and pine trees came down. A fence was destroyed.

2	**Ripley (MO)** 2.4 SSE Pine, Doniphan	0915-0930	**Thunderstorm Wind (EG 78 kt)**

This intense macroburst was centered along U.S. Highway 160 over western and central Ripley County, including the city of Doniphan. The average path width was about 5.5 miles, averaging from two miles north of Highway 160 to about three miles south. Peak wind gusts near 90 mph caused extensive tree damage, in addition to structural damage in the city of Doniphan. The Ripley County courthouse, a nearby commercial business, and the chamber of commerce building lost portions of their roofs. Rain caused water damage to all three buildings. A museum lost metal roofing. Two houses in the city were damaged by a falling tree. Doors were blown off buildings and blown up to 50 yards. Windows were broken. Winds were measured at 79 mph at the Doniphan Fire Department and estimated at 90 mph by the NWS survey team at the courthouse. A tree fell through a trailer home on Highway Y, splitting it in two. A house in Gatewood was damaged by a falling tree. There were numerous power outages around the county. Many roads were blocked by downed trees.

3	**Butler (MO)** 3.2 SSE Poplar Bluff	0950	**Thunderstorm Wind (EG 61 kt)**

A moving vehicle along Highway 53 was destroyed by a very large oak tree that fell on it. Both occupants of the vehicle were killed, probably on impact. A small fire started in the engine compartment after emergency responders arrived. A 40-foot semi-trailer was overturned in the immediate vicinity of the crushed vehicle. The tin roof was lifted off a barn. A portion of a large shed collapsed.

4	**Perry (MO)** 2.2 W McBride, McBride	1020-1023	**Tornado (EF0, L: 2.20 mi, W: 50 yd)**

The tornado was videotaped by a person at the Perryville airport and shown on local media outlets. The path was visible in a wheat field along County Road 934. Dozens of trees were down near the path, apparently due to inflow winds. Eyewitness accounts of the tornado were obtained. Peak winds were estimated near 65 mph.

5	**Jackson (IL)** 1.4 SSW Raddle, 1.1 SSW Raddle	1026-1027	**Tornado (EF0, L: 0.36 mi, W: 30 yd)**

The reported tornado briefly touched down in a field and caused no known damage.

Rpt #	Location	Time (CST)	Storm Characteristic
6	**Jackson (IL)** 2.0 E Sato, 2.0 NNW Vergennes	1030- 1034	**Tornado (EF1, L: 3.11 mi, W: 100 yd)**

Dozens of large trees were snapped or uprooted. Structural damage occurred to two barns, mainly in the form of roof damage. Power poles were blown over, and one pole snapped. Houses received minor shingle damage. Peak winds were estimated near 95 mph.

7	**Union (IL)** 2.1 WSW Dongola, 0.4 W Dongola	1030	**Thunderstorm Wind (EG 65 kt)**

Three residences were damaged. One of the residences was a mobile home that was moved two feet off its foundation. The home was tied down, which prevented it from rolling. The frame of a neighboring mobile home was bent, its windows were blown out, and the porch was destroyed. Shingles and siding were blown off a house. A large garage sustained extensive damage, mainly to the roof. An outbuilding was blown over. A barn and a shed were destroyed. A calf was killed inside the barn. An antenna tower was blown over. A satellite dish was blown onto a vehicle. Many large trees, power lines, and a power pole were down.

8	**Williamson (IL)** Colp, Herrin	1039- 1044	**Hail (1.75 in)**
9	**Perry (IL)** 1.1 W Winkle, 3.2 W Pyatts, 0.9 NNW Old Duquoin, 2.2 SE Sunfield	1102- 1500	**Flash Flood**

Water was over roadways around the county. Many rural roads were closed due to high water over them. Flash flooding occurred on U.S. Route 51 in DuQuoin. In Pinckneyville, three-quarters of an inch of rain fell in less than thirty minutes.

10	**Graves (KY)** 0.5 SE Fancy Farm	1115	**Thunderstorm Wind (EG 78 kt)**

A microburst along the leading edge of a bow echo produced substantial damage at a farm. The metal top was blown off a cinder block silo. There was siding damage at a residence. A large section of a chick house lost its roof. The path length was about 500 yards, and the width was only 50 yards.

11	**Bollinger (MO)** 3.3 W North Patton, 2.2 NW Sedgewickville	1115- 1145	**Thunderstorm Wind (EG 91 kt)**

Rpt #	Location	Time (CST)	Storm Characteristic

Thousands of trees were blown down, primarily across northern parts of the county. A lot of structural damage occurred along Highway 72. About 250 homes received some degree of damage, ranging from loose shingles to roofs lifted off. Many barns and outbuildings were destroyed. The Patton and Sedgewickville areas were the hardest hit. In particular, the area from Sedgewickville west to the Madison County line suffered extreme damage. Trees fell on houses, roads, and power lines. Power poles were snapped. Extended power outages lasting 3 to 5 days were widespread. A 28-foot camper was overturned in Sedgewickville. Nearby, a manufacturing company was heavily damaged. Six cars parked in front of the building were crushed by metal beams. The roof of the building was torn off. Across the damage area, emergency workers conducted door-to-door welfare checks. Food and water were distributed to those without power. Blocked roads were a major setback to recovery efforts. The damage was almost all north of Marble Hill.

12 **Perry (MO)**

1.6 N Silver Lake, 2.1 N Red Rock	1120- 1200	**Thunderstorm Wind (EG 74 kt)**

Widespread damaging winds affected most of the county. Hundreds of trees were blown down, roofs were blown off, and signs became airborne. In Perryville, the exterior wall of a tire company collapsed. The entire building was deemed a total loss. Structural damage occurred in many communities, mostly due to falling trees. Among other structures, a machine shed was destroyed in Millheim. Most residents of the county experienced some type of damage, ranging from downed trees to roofs off. Vehicles were smashed by falling trees. At a church, the roof was damaged, and tombstones were toppled at an adjacent cemetery. The glass of the front door was blown out. At another church in Altenburg, a 22,000-pound steeple constructed in 1867 blew down onto the roof. A large portion of the roof was peeled off an apartment complex in Perryville, forcing its evacuation. The roof of the new senior center in Perryville was destroyed. Emergency workers conducted door-to-door checks using vehicles and helicopters.

13 **Franklin (IL)**

3.3 WNW Sesser, 3.3 S Mulkeytown, 1.3 ENE Parrish, 1.1 E Ewing	1120- 1500	**Flash Flood**

Widespread flooding was reported over many county roads. Extensive street flooding occurred in West Frankfort. In Christopher, a home was surrounded by floodwater, and a nearby outbuilding was flooded.

14 **Cape Girardeau (MO)**

Oak Ridge, 0.8 SSE Hines Lndg	1125- 1205	**Thunderstorm Wind (EG 70 kt)**

Widespread damaging winds affected northern parts of the county. Over 1,000 trees were blown down, along with power lines. Many roads were blocked. The trees fell on homes, vehicles, and power lines. Power poles were snapped. Extended power outages lasting up to several days were reported. Barns and sheds were blown down. Just west of Oak Ridge, 259 trees were blown down on a single farm. The house and a garage on the farm received holes in their roofs. Windows were blown out of at least one house in Oak Ridge. Towns that experienced the worst damage were north of Jackson, including Daisy and Pocahontas. Several trees were blown down in Jackson, including one that landed on a car.

Rpt #	Location	Time (CST)	Storm Characteristic
15	**Union (IL)** Wolf Lake, Alto Pass	1140- 1230	**Thunderstorm Wind (EG 65 kt)**

Northwest parts of the county were struck hardest by very strong winds associated with the comma head of a bow echo. Widespread tree and power line damage occurred. The most intense destruction was in the Wolf Lake and Alto Pass areas. About 25 homes sustained damage in the county. Power outages were widespread. Numerous trees were snapped along Illinois Route 127, mainly north of Anna. The highway was closed while fire and highway personnel worked to clear it. A large tree fell in Anna, taking down power lines and a couple utility poles.

16	**Jackson (IL)** 1.5 NW Neunert, 2.0 S Reeds	1152- 1245	**Thunderstorm Wind (EG 92 kt)**

Widespread wind damage occurred across Jackson County. Widespread damage to trees, power lines, and structures occurred as the comma head of a bow echo moved east across the county. In the city of Carbondale alone, officials reported 34 properties were deemed total losses from the storm. All but nine of those properties were mobile homes. Damage in the city alone (excluding Southern Illinois University) was estimated near 3 million dollars. Officials estimated about 3,000 trees were down or damaged in Carbondale alone, including the campus of Southern Illinois University. Officials in Murphysboro reported 17 dwellings in that city were total losses. One mobile home was blown over onto a car. Murphysboro officials also reported a police cruiser, a truck, and a mobile command center were destroyed. The city's public works garage was shifted off its foundation, and the city police station was damaged. The peak gust recorded by the automated system at the Carbondale airport was 81 mph before the system failed. An observer at the airport visually observed a separate anemometer located on the rooftop reach 106 mph. The automated system measured a sustained wind of 68 mph before failing. Numerous permanent structures and vehicles were damaged countywide. Small outbuildings were destroyed. The roof of a school collapsed. Carbondale was virtually impassable due to debris. One fatality occurred on Old Route 13 in Murphysboro when a large tree limb fell on a home, knocking an elderly man down a flight of stairs and causing a severe head injury. Emergency responders were delayed by blocked roads. A state disaster declaration was granted for Jackson County. A curfew and state of emergency was declared. Cleanup was expected to take most or all of the summer. Hundreds of trees were blown down in parks, which were closed indefinitely. The preliminary damage estimate for Southern Illinois University was 5 million dollars. Many buildings on campus sustained roof damage. The storm blew out nearly 100 windows in residence halls. Countywide, efforts to restore power were complicated by swampy fields, mud, and downed trees. Eighty-seven percent of the county was without power at the peak of the outages. Widespread power and telephone outages complicated recovery efforts. Most roads were blocked by debris and downed trees. Gas stations were closed in many areas, adding to problems obtaining fuel for generators. Red Cross shelters were opened in Carbondale and Murphysboro. Major grocery stores were closed for at least 12 to 24 hours, and much of their frozen food was lost. Most communication by cell phone and land line was impossible.

17	**Hamilton (IL)** 3.8 WSW Delafield, 2.4 SSW Rural Hill, 2.4 N Broughton, 1.6 NW Thackeray	1200- 1500	**Flash Flood**

Rpt #	Location	Time (CST)	Storm Characteristic

Widespread flash flooding of many roads occurred from McLeansboro south. A vehicle was stranded in floodwaters under the viaduct on Illinois Route 14 in Mcleansboro. The occupants were on top of the roof of their car. Rescue personnel pushed the car to safety. Another vehicle was stuck in floodwaters near a bridge in the southeast part of the county. The motorist did not require assistance.

18 **Jefferson (IL)**
0.2 WNW Cravat, 2.6 NW Waltonville, 1.7 N Belle Rive, 0.7 WSW Harmony — 1200-1500 — **Flash Flood**

High water was reported across many county roads.

19 **Perry (IL)**
Willisville, 2.1 ESE Du Quoin — 1200-1245 — **Thunderstorm Wind (EG 61 kt)**

Across far southern parts of the county including DuQuoin, numerous trees, limbs, and power lines were blown down. This resulted in power outages, though of a much shorter duration than counties to the south. Sheet metal roofing was blown off a house in DuQuoin. This damage occurred on the northern fringe of the widespread high winds associated with a derecho.

20 **Jackson (IL)**
4.0 S Elkville, 0.5 SSE Ward — 1212-1213 — **Tornado (EF0, L: 0.14 mi, W: 40 yd)**

Damage was reported at a coal company, where an office trailer was blown off its foundation. There were several eyewitness accounts of a tornado. Peak winds were estimated near 70 mph.

21 **Franklin (IL)**
West Frankfort, 2.3 N Royalton — 1215-1315 — **Thunderstorm Wind (EG 74 kt)**

Widespread damaging winds across southern Franklin County caused lots of power outages. At the peak of the outages, 49 percent of the county was without power. A state disaster declaration was granted for Franklin County. Among the hardest hit cities was West Frankfort. Peak winds were estimated around 60 mph at Benton, but from 80 to 90 mph around West Frankfort and near the Williamson County line. Thirteen homes were destroyed beyond repair. Damage assessments indicated 184 dwellings sustained damage countywide. Of that number, 114 sustained minor damage, and 70 needed moderate repairs. Numerous trees were blown down, blocking some of the main roads. Near the Williamson County line, trees were blown across the southbound lanes of Interstate 57. Secondary roads stayed blocked for longer periods of time. The hardest hit areas were in and near Royalton, Zeigler, Orient, West Frankfort, and Thompsonville. In Christopher, sheds and carports were overturned, and trees were down on roads and power lines. An uprooted tree landed on a house. The community park in West Frankfort was closed for a little over a week due to downed trees and fences. Some schools were closed for part of the week following the storm.

Rpt #	Location	Time (CST)	Storm Characteristic
22	**Johnson (IL)**		
	1.8 N Goreville, 2.7 W Parker	1215-1250	**Thunderstorm Wind (EG 50 kt)**

Scattered tree limbs and a few trees were blown down on the northern edge of the county. The vast majority of the damage associated with the comma head of a bow echo passed north of the county.

23	**Williamson (IL)**		
	Carterville, 0.7 ENE Paulton	1215-1315	**Thunderstorm Wind (EG 87 kt)**

Widespread wind damage occurred countywide. Extensive tree and power line damage resulted in power outages up to several days long. Many power poles were snapped. Countywide, efforts to restore power were complicated by swampy fields, mud, and downed trees. Ninety-five percent of the county was without power at the peak of the outages. Numerous permanent structures were damaged, including major businesses in downtown Marion and Herrin. A total of 33 homes were heavily damaged or destroyed. It is estimated that over 10,000 homes in the county received minor damage (less than 50,000 dollars per house). Gas leaks were common. Most communication by phone was impossible, including cell phones. Stores were closed, making groceries and gas very difficult to obtain locally in the immediate aftermath of the storm. Travel was nearly impossible due to debris and trees blocking roads. While about two dozen people were treated for storm-related injuries at local hospitals, all but one of them was due to post-storm cleanup. Many school facilities were damaged. The roof of Carterville High School was severely damaged. Several windows were blown out of the school. Minor damage occurred at athletic facilities, including the roof blown off a baseball dugout. Many outbuildings and small structures were destroyed across the county. In Carterville, a garage was lifted and dropped on a vehicle. Many vehicles countywide were damaged or destroyed by falling tree and building debris. A state disaster declaration was granted. A dusk-to-dawn curfew was imposed, and a state of emergency was declared. The Williamson County airport near Marion reported a peak gust of 86 mph. Based on the most severe structural damage east of the airport, peak winds were estimated by storm surveyors close to 100 mph. There was extensive damage at the airport, including hangar buildings. A television station on Route 13 was knocked off the air due to structural and roof damage. All along Route 13, signs were blown down, power poles were down, and windows were smashed. Car dealerships along Route 13 sustained damage due to signs falling on vehicles and windows being blown out. Numerous structures sustained varying degrees of roof damage. A large hotel near the Interstate 57 interchange sustained major roof damage. Many trees were down along Interstate 57 from the Route 13 interchange northward, blocking the southbound lanes. Semis on the interstate were overturned or blown off the highway, causing extended traffic delays. One of the drivers of the semis was seriously injured. A tree fell on a van on the interstate. Damaged or destroyed trees were too numerous to count. Cleanup was expected to last through Labor Day, according to the Mayor of Marion.

24	**Franklin (IL)**		
	1.5 N Royalton, 1.7 N Royalton	1218-1219	**Tornado (EF0, L: 0.29 mi, W: 40 yd)**

This brief tornado was photographed by emergency management personnel. Leaves were observed in the rotation. No damage was located.

Rpt #	Location	Time (CST)	Storm Characteristic
25	**Hamilton (IL)**		
	5.4 WNW Rural Hill, 0.8 N Walpole	1230-1330	**Thunderstorm Wind (EG 52 kt)**

Hamilton County avoided the major wind impact that occurred in places to the south and southwest from a major derecho. There were a few trees down in the Walpole area, but no structural damage was reported.

26	**Saline (IL)**		
	5.1 SW Newhope, 2.3 WSW Cottage Grove	1230-1330	**Thunderstorm Wind (EG 78 kt)**

Widespread wind damage occurred across the county. The pockets of greatest damage were in northern parts of the county including Galatia and Raleigh, as well as southwestern parts around Carrier Mills. Harrisburg itself escaped the worst of the damage, and power outages there only affected several hundred customers. Winds were estimated near 90 mph in the Harco area. Extensive power outages lasted three to six days in the hardest hit areas, including Galatia. The power losses rendered pumping stations that supply water inoperable. Many structures were damaged. Every street in Galatia had trees down across streets, houses, vehicles, or outbuildings. Two homes in Galatia received major damage. Barns were destroyed in the Harco area. A mobile home used as a school for the Amish blew off its foundation. Some roofs were blown off. Other structures were damaged by falling trees. A semi was blown over north of Harrisburg on Illinois 34. Emergency responders had difficulty reaching the scene due to downed trees. Many roads were closed by downed trees and power lines, including major routes such as Illinois 34 and U.S. Highway 45. A state disaster declaration included Saline County.

27	**Franklin (IL)**		
	1.7 SSW Thompsonville, 2.4 NNW Kegley	1245-1248	**Tornado (EF1, L: 2.41 mi, W: 150 yd)**

The tornado resulted in a swath of downed trees in rural areas. Peak winds were estimated near 90 mph. The tornado path continued into Williamson County.

28	**Williamson (IL)**		
	3.2 NNE Corinth, 2.6 E Corinth	1248-1251	**Tornado (EF1, L: 3.10 mi, W: 150 yd)**

This tornado is an extension of the Franklin County tornado ***(see Report # 27)***. The tornado continued into Williamson County from Franklin County. There was a swath of downed trees in rural areas. Peak winds around 90 mph occurred in the Franklin County portion of the track.

29	**Christian (KY)**		
	Hopkinsville	1250	**Thunderstorm Wind (EG 52 kt)**

A trained spotter estimated these strong wind gusts at Western State Hospital.

Rpt #	Location	Time (CST)	Storm Characteristic
30	**McLean (KY)** 0.9 NE Calhoun, 2.2 SSE Buel, 0.8 SE Buel, 2.3 NE Calhoun	1300- 1730	**Flash Flood**

Water was over many roads, including Highway 136.

31	**Muhlenberg (KY)** 1.5 E Central City, 1.1 SSE South Carrollton, 1.0 S Luzerne, 0.7 SE Greenville	1315- 1730	**Flash Flood**

Many roads were flooded in Powderly and Central City. Near Greenville, three to four feet of water flooded a farm, and horses had to be evacuated.

32	**Union (KY)** Morganfield	1338	**Thunderstorm Wind (EG 50 kt)**

Some trees were blown down, mostly small ones.

33	**Posey (IN)** 0.7 E Rapture, 1.1 E Stewartsville, 0.8 ENE Poseyville, 0.8 SSE Poseyville	1400- 1700	**Flash Flood**

Water was running over most roadways.

34	**Spencer (IN)** Rockport, 1.5 SE Newtonville, 1.2 NW Centerville, 1.6 ESE Sand Ridge	1400- 1700	**Flash Flood**

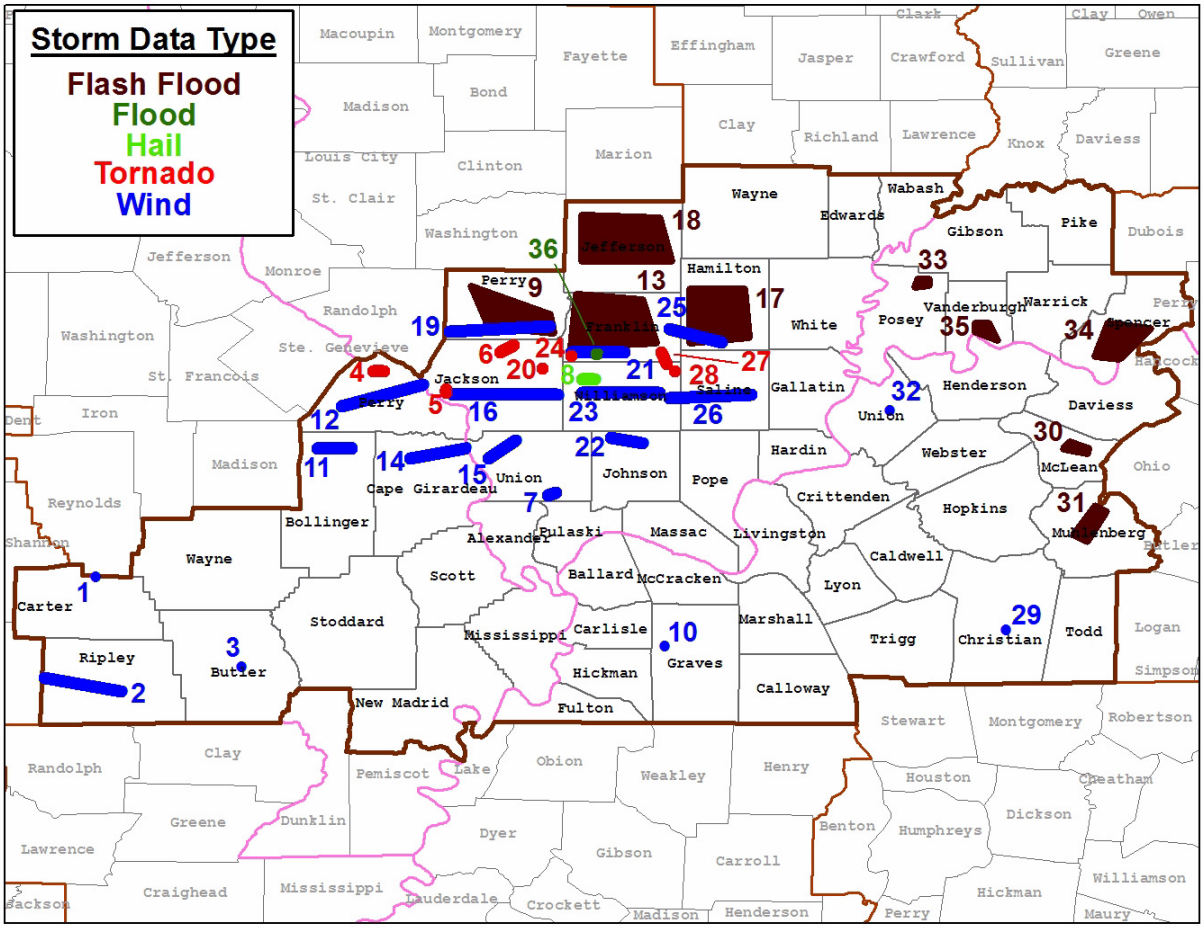
Extensive flooding was reported on county roadways. Water depths ranged from six to eighteen inches on some roads.

35	**Vanderburgh (IN)** 0.6 NW Harwood, 1.8 N Evansville, 3.1 SE Evansville, 1.3 SSW Harwood	1400- 1700	**Flash Flood**

Several roads were closed due to rising water. Water rescues were performed when vehicles stalled in deep water. A valve failure caused sewer water to back into an elementary school. The 15-hour storm total was three inches at Angel Mounds, just southeast of Evansville. More than an inch of rain fell in less than 30 minutes in parts of Evansville.

Rpt #	Location	Time (CST)	Storm Characteristic
36	**Franklin (IL)** 1.5 WNW Plumfield, 1.1 ENE Zeigler, 1.4 S Zeigler, 1.2 WNW Plumfield	1600- 1300	**Flood**

Minor flooding of the Big Muddy River occurred. At the Plumfield gage, where flood stage is 20 feet, the river crested at 23.30 feet on the 11th. Low-lying and bottomland areas were flooded.



Appendix B: SPC Products

I. Convective Outlooks

Day 1 - Valid 0100 UTC

SPC AC 080049

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0749 PM CDT THU MAY 07 2009

VALID 080100Z - 081200Z

...THERE IS A SLGT RISK OF SVR TSTMS TONIGHT ACROSS PARTS OF THE S CNTRL PLAINS...OZARK PLATEAU...AND MIDDLE MISSISSIPPI VALLEY...

...THERE IS A SLGT RISK OF SVR TSTMS THRU LATE EVENING ACROSS PARTS OF THE SRN MID ATLANTIC COAST....

...SOUTH CENTRAL PLAINS INTO PARTS OF THE OZARK PLATEAU...
A LOW AMPLITUDE MID-LEVEL WAVE MAY BE IN THE PROCESS OF MIGRATING EASTWARD ACROSS THE CENTRAL ROCKIES. BUT...A MUCH MORE PROMINENT IMPULSE IS ALSO DIGGING ACROSS THE NORTHERN INTERMOUNTAIN REGION...AND PROGGED TO CONTINUE INTO THE NORTH CENTRAL ROCKIES OVERNIGHT. AS THIS OCCURS...LOWER/MID TROPOSPHERIC WARM ADVECTION APPEARS LIKELY TO STRENGTHEN THIS EVENING ACROSS THE CENTRAL PLAINS...ON THE NOSE OF AN INTENSIFYING LOW-LEVEL JET...ON THE EDGE OF STRONGER CAPPING ELEVATED MIXED LAYER AIR. THIS IS EXPECTED TO BE ACCOMPANIED BY INCREASING CONVECTIVE DEVELOPMENT ...PERHAPS FIRST ACROSS PARTS OF NORTHWEST OKLAHOMA/SOUTHWESTERN KANSAS. THIS MAY NOT OCCUR UNTIL NEAR OR SHORTLY AFTER 06Z...BUT IN THE PRESENCE OF STRONG INSTABILITY ASSOCIATED WITH HIGH LOW-LEVEL MOISTURE CONTENT /CHARACTERIZED BY SURFACE DEW POINTS NEAR 70F/ AND STEEP MID-LEVEL LAPSE RATES...STORMS PROBABLY WILL QUICKLY BECOME SEVERE. DEEP LAYER SHEAR ON THE SOUTHERN FRINGE OF 30-50 KT WESTERLY FLOW WILL BE SUFFICIENT FOR SUPERCELLS.

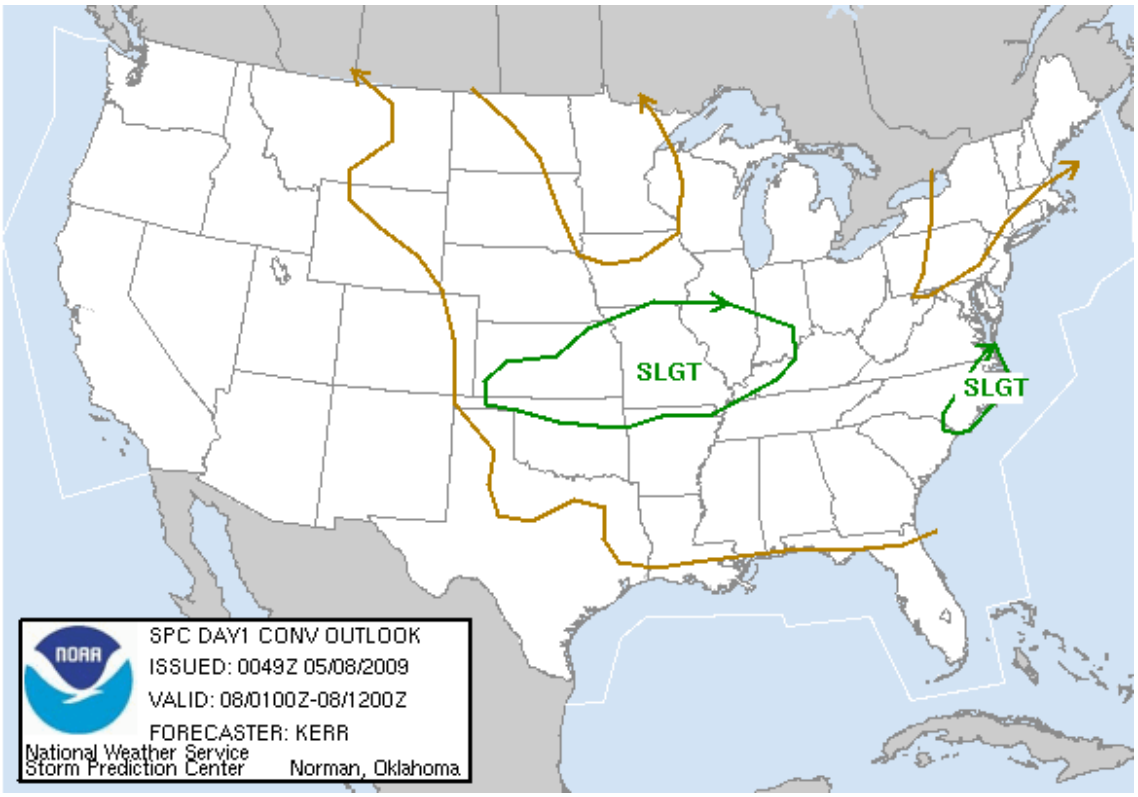
MODELS SUGGEST THAT THE LOW-LEVEL JET WILL STRENGTHEN IN EXCESS OF 50 KTS OVERNIGHT...GRADUALLY VEERING FROM SOUTHERLY TO WEST SOUTHWESTERLY. THIS...COUPLED WITH FAVORABLE LARGE-SCALE FORCING...SUPPORTS THE RISK FOR STORM CONSOLIDATION AND UPSCALE GROWTH INTO A LARGE MESOSCALE CONVECTIVE SYSTEM...WHICH SEEMS LIKELY TO TREK EAST SOUTHEASTWARD IN THE VICINITY OF THE KANSAS/ OKLAHOMA BORDER AREA THROUGH DAYBREAK FRIDAY. GIVEN THE MAGNITUDE OF THE

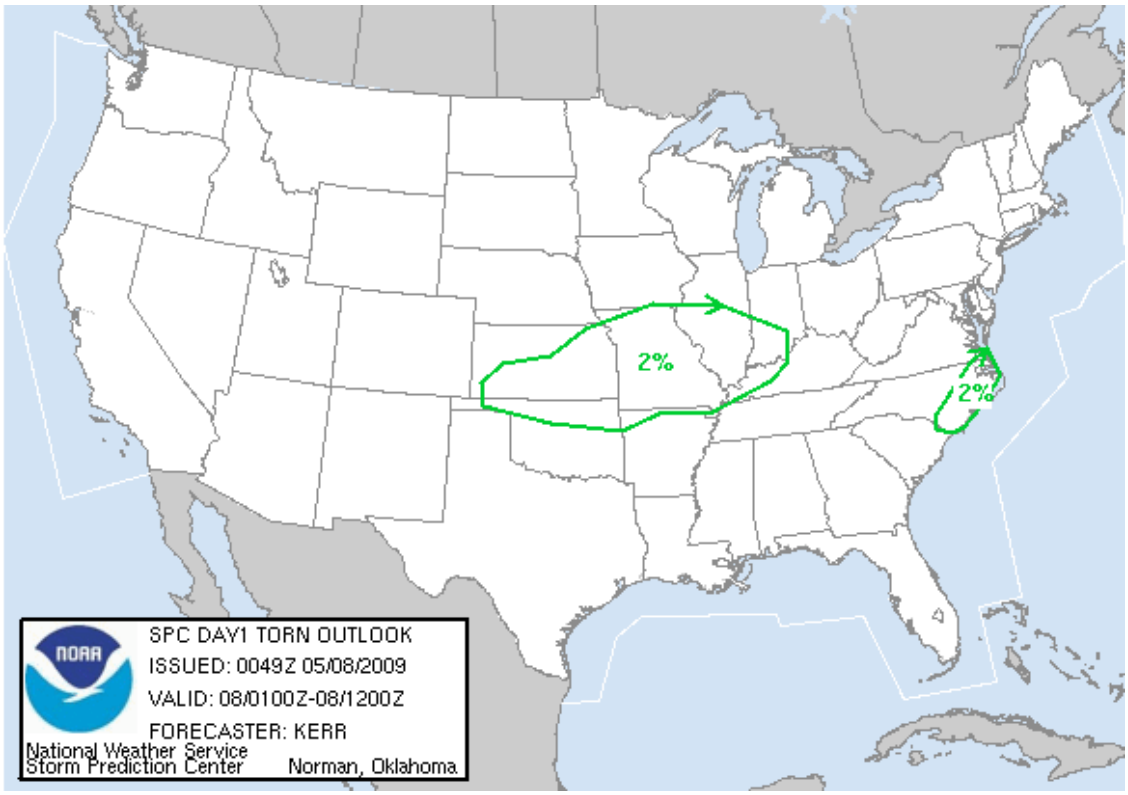
POTENTIAL INSTABILITY...AND THE PRESENCE OF SIZABLE LOWER/MID TROPOSPHERIC TEMPERATURE/DEW POINT SPREADS...AN ORGANIZED DAMAGING WIND EVENT APPEARS POSSIBLE BY LATE TONIGHT IN ASSOCIATION WITH THE EVOLVING CONVECTIVE SYSTEM.

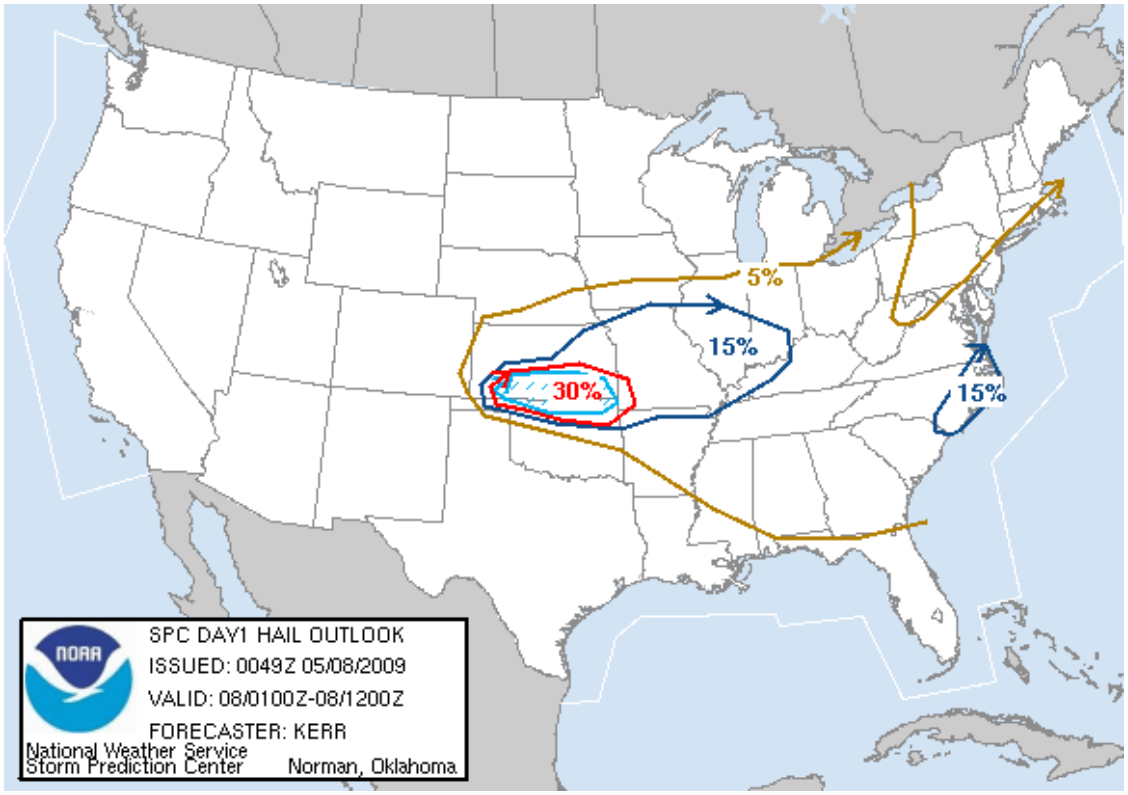
...MIDDLE MISSISSIPPI/LOWER OHIO VALLEY...
BETTER LOW-LEVEL MOISTURE APPEARS LIKELY TO REMAIN GENERALLY CUT OFF FROM THE REGION THROUGH THIS PERIOD. BUT...LINGERING INSTABILITY MAY REMAIN SUFFICIENT TO SUPPORT A CONTINUING SEVERE RISK WITH ONGOING STORMS WHICH HAVE FORMED ALONG A BAROCLINIC ZONE EXTENDING ACROSS NORTHERN MISSOURI/CENTRAL ILLINOIS INTO THE LOWER OHIO VALLEY. ACTIVITY IS BEING SUPPORTED BY FORCING ASSOCIATED WITH A DIGGING LOW AMPLITUDE MID-LEVEL IMPULSE...WHICH IS PROGGED TO GRADUALLY TURN EASTWARD INTO THE LOWER OHIO VALLEY OVERNIGHT.

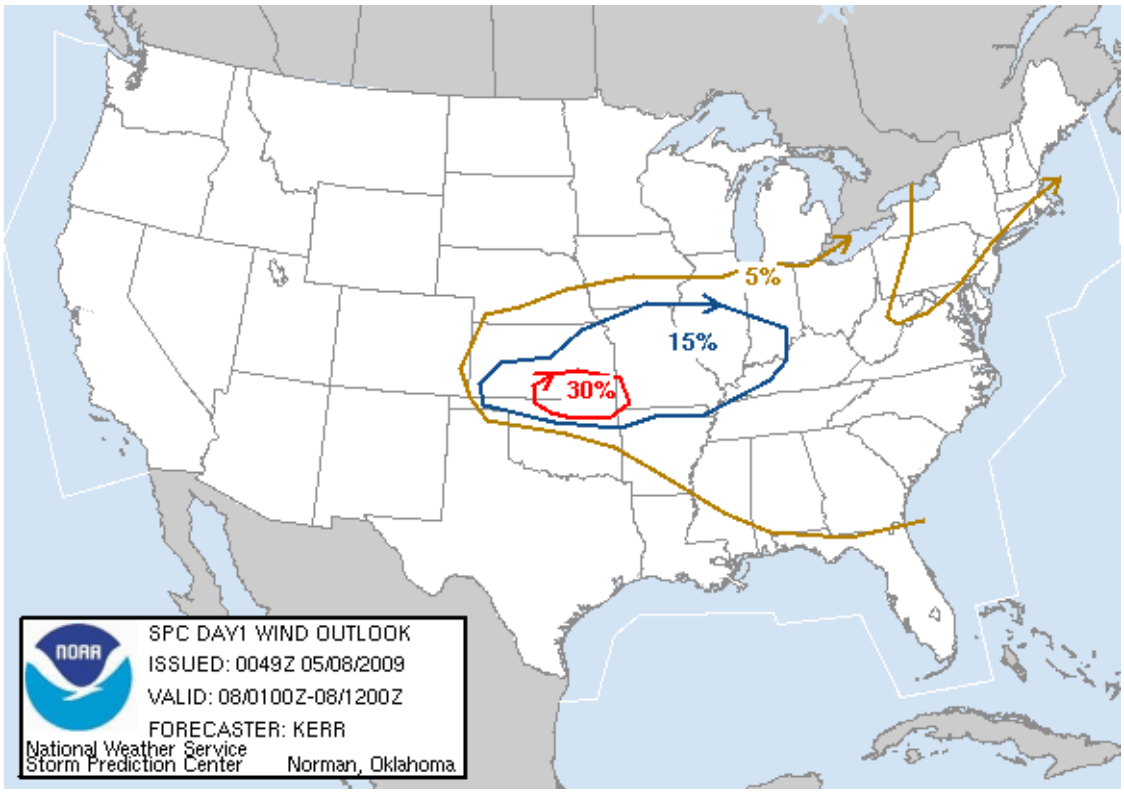
...MID ATLANTIC STATES...
CONVECTIVE POTENTIAL FOR THE MOST PART APPEARS TO BE DIMINISHING. HOWEVER...FORCING ASSOCIATED WITH A LOW AMPLITUDE WAVE TURNING EAST OF THE CENTRAL APPALACHIANS COULD STILL CONTRIBUTE TO VIGOROUS STORM DEVELOPMENT THIS EVENING...PARTICULARLY ACROSS PARTS OF NORTHEASTERN NORTH CAROLINA THROUGH 03-06Z.

..KERR.. 05/08/2009




2%
2%
SPC DAY1 TORN OUTLOOK
ISSUED: 0049Z 05/08/2009
VALID: 08/0100Z-08/1200Z
FORECASTER: KERR
National Weather Service
Storm Prediction Center
Norman, Oklahoma


5%
15%
30%
15%
SPC DAY1 HAIL OUTLOOK
ISSUED: 0049Z 05/08/2009
VALID: 08/0100Z-08/1200Z
FORECASTER: KERR
National Weather Service
Storm Prediction Center
Norman, Oklahoma



Day 1 - Valid 1200 UTC

SPC AC 080551

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
1251 AM CDT FRI MAY 08 2009

VALID 081200Z - 091200Z

...THERE IS A SLGT RISK OF SVR TSTMS FROM PARTS OF THE S CNTRL PLAINS THRU LWR OH AND TENNESSEE VALLEYS....

...SYNOPSIS...
MODELS INDICATE THAT SEASONABLY STRONG FLOW WILL PERSIST IN A BROAD...GENERALLY ZONAL BELT ACROSS THE NORTHERN AND CENTRAL TIER OF THE U.S. THROUGH THIS FORECAST PERIOD. WHILE THIS REGIME APPEARS LIKELY TO REMAIN BROADLY CYCLONIC AT MID-LEVELS...SOME INCREASE IN AMPLITUDE APPEARS POSSIBLE AT UPPER LEVELS. LOW AMPLITUDE RIDGING MAY BUILD ACROSS THE NORTHEASTERN STATES...AS LOW AMPLITUDE TROUGHING SHIFTS ACROSS THE NORTHERN PLAINS/UPPER MISSISSIPPI

VALLEY...ASSOCIATED WITH THE EASTWARD PROGRESSION OF THE PRIMARY HIGH LEVEL JET CORE TO THE LEE OF THE ROCKIES. GUIDANCE IS SUGGESTIVE THAT THIS COULD BECOME SUPPORTIVE OF SIGNIFICANT SURFACE WAVE DEVELOPMENT ACROSS PARTS OF THE UPPER MISSISSIPPI VALLEY INTO THE LOWER GREAT LAKES REGION LATER TODAY/TONIGHT...ACCOMPANIED BY A COLD INTRUSION TO THE LEE OF THE ROCKIES.

LOW-LEVEL MOISTURE...CHARACTERIZED BY LOWER 70S SURFACE DEW POINTS ...HAS ALREADY RETURNED NORTHWARD THROUGH MUCH OF THE CENTRAL/ SOUTHERN PLAINS AND LOWER MISSISSIPPI VALLEY. AND...THE EVOLVING PATTERN SEEMS LIKELY TO FAVOR INCREASING PRE-FRONTAL MOISTURE LEVELS THROUGH THE REMAINDER OF THE CENTRAL AND EASTERN STATES. HOWEVER...THE PRIMARY CONVECTIVE DEVELOPMENT SEEMS LIKELY TO REMAIN FOCUSED ON THE NORTHEASTERN EDGE OF WARM CAPPING ELEVATED MIXED LAYER AIR EMANATING FROM THE SOUTHERN U.S./MEXICAN PLATEAU REGION. THERE ARE INDICATIONS THAT THIS COULD BECOME QUITE EXTENSIVE FAIRLY EARLY IN THE DAY...ULTIMATELY LIMITING CONVECTIVE POTENTIAL AHEAD OF THE MAIN COLD FRONT FROM PARTS OF THE UPPER MISSISSIPPI VALLEY THROUGH THE GREAT LAKES INTO PARTS OF THE NORTHEAST.

...OZARK PLATEAU THROUGH THE LWR OH/TN VALLEYS...
STRONGER FORCING ASSOCIATED WITH AN IMPULSE SHIFTING EAST OF THE CENTRAL ROCKIES IS BECOMING INCREASINGLY EVIDENT IN SATELLITE IMAGERY...ON THE SOUTHERN FRINGE OF THE STRONGER WESTERLIES. THIS APPEARS TO PROVIDE SUPPORT FOR THE STRONG SIGNAL AMONG MODEL DATA SUGGESTING THE EVOLUTION OF A LARGE MESOSCALE CONVECTIVE SYSTEM NEAR/NORTH OF THE KANSAS/OKLAHOMA BORDER INTO SOUTHWEST MISSOURI/ NORTHWEST ARKANSAS BY 12Z THIS MORNING.

IN THE PRESENCE OF STRONG INSTABILITY AND MODERATE TO STRONG DEEP LAYER SHEAR...A SEVERE RISK IN THE FORM OF DAMAGING WINDS/HAIL IS EXPECTED TO CARRY OVER BEYOND DAYBREAK. BUT...OF SIGNIFICANT CONCERN TO CONTINUING SEVERE POTENTIAL THROUGH THE MORNING HOURS IS SUBSTANTIAL FORECAST WEAKENING OF THE LOW-LEVEL JET AMONG SOME MODEL GUIDANCE...INCLUDING THE SREF AND 07/12Z ECMWF. IF THIS OCCURS...A CORRESPONDING WEAKENING OF THE CONVECTIVE SYSTEM MAY ENSUE... ACCOMPANIED BY SUBSTANTIAL MODIFICATION OF THE ENVIRONMENT ACROSS MUCH OF THE OZARK PLATEAU INTO PARTS OF THE LOWER OHIO AND TENNESSEE VALLEYS.

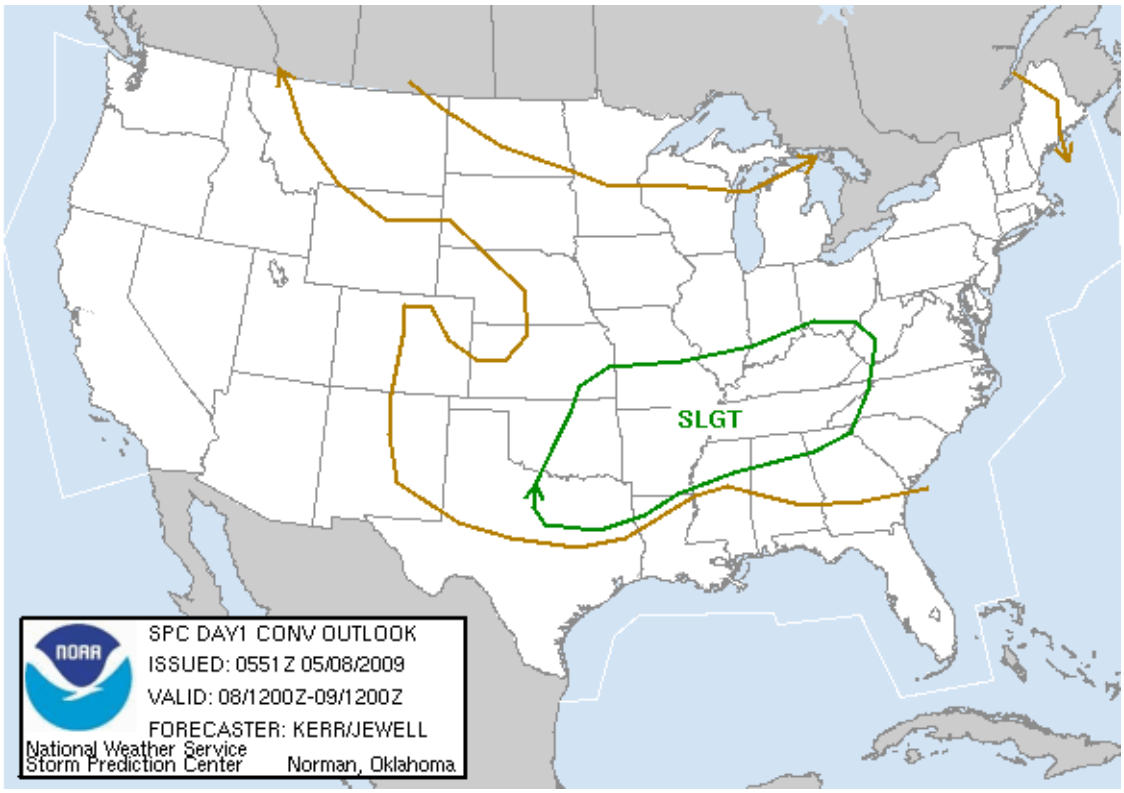
HOWEVER...MODELS MAINTAIN A STRONG CONVECTIVELY ENHANCED OR GENERATED MID-LEVEL SPEED MAXIMUM AND CYCLONIC VORTICITY CENTER EASTWARD THROUGH THE LOWER OHIO AND TENNESSEE VALLEYS DURING THE AFTERNOON AND EVENING HOURS. IN THE PRESENCE OF A MOIST AND AT LEAST MODERATELY UNSTABLE AIR MASS WITH MIXED LAYER CAPE ON THE ORDER OF 1000-2000 J/KG...REGENERATION OF CONVECTIVE DEVELOPMENT APPEARS PROBABLE. PROGGED STRENGTHENING OF SOUTHWESTERLY 850 MB

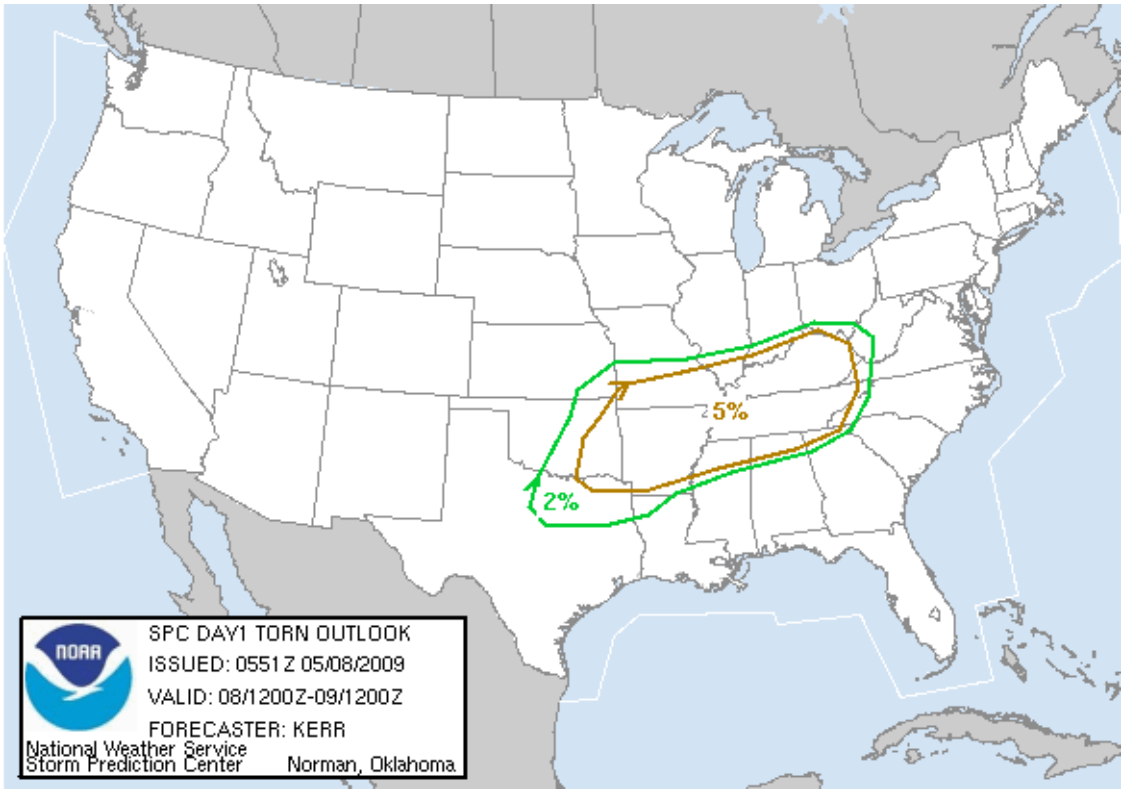
FLOW ACROSS KENTUCKY/TENNESSEE DURING THE AFTERNOON COULD YIELD LARGE ENOUGH LOW-LEVEL HODOGRAPHS TO SUPPORT THE RISK FOR TORNADOES IN MORE DISCRETE ACTIVITY. BUT...DAMAGING WINDS AND LARGE HAIL ARE EXPECTED TO BE A MORE PROMINENT THREAT AS STORM CLUSTERS EVOLVE.

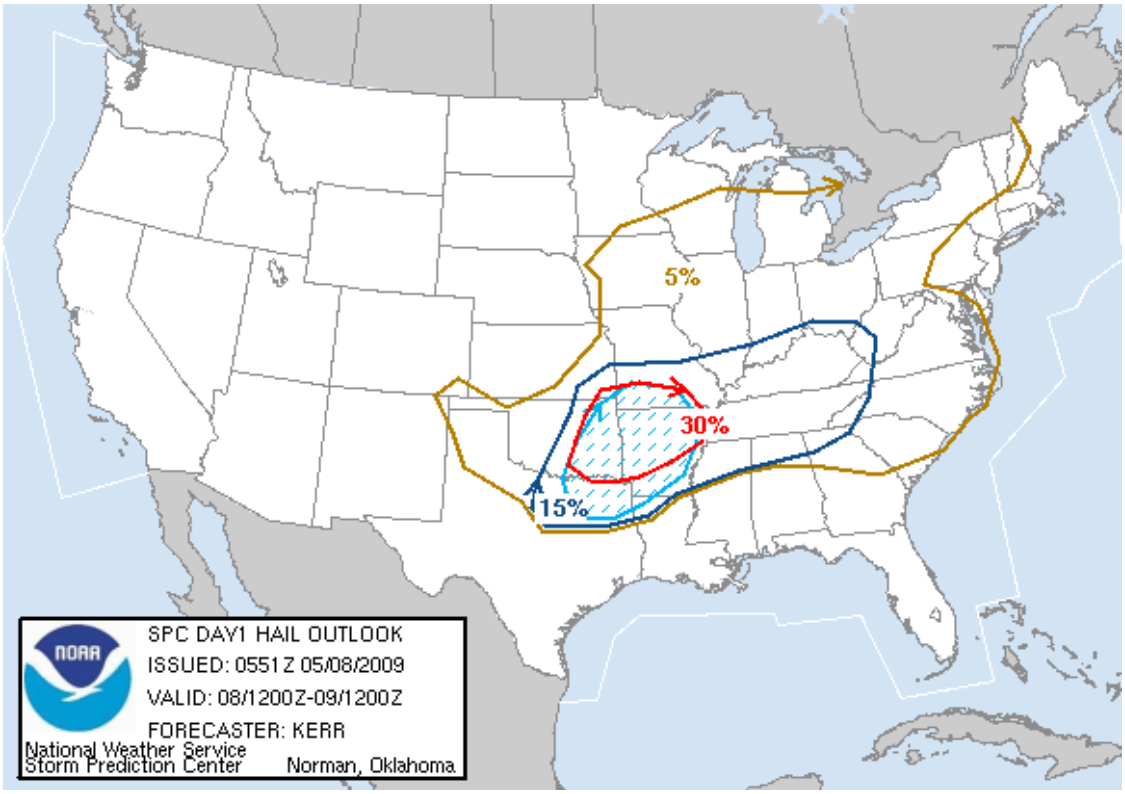
IT IS A DISTINCT POSSIBILITY THAT THE LARGE-SCALE ENVIRONMENT MAY REMAIN FAVORABLE FOR THE MAINTENANCE OF THE ANTICIPATED MESOSCALE CONVECTIVE SYSTEM AT ITS EARLY MORNING STRENGTH THROUGH MUCH OF THE DAY. IF THIS BECOMES THE CASE...THE SEVERE POTENTIAL ACROSS THE OZARK PLATEAU INTO THE LOWER OHIO TENNESSEE VALLEYS MAY BE CONSIDERABLY GREATER THAN CURRENTLY DEPICTED IN THE CATEGORICAL OUTLOOK.

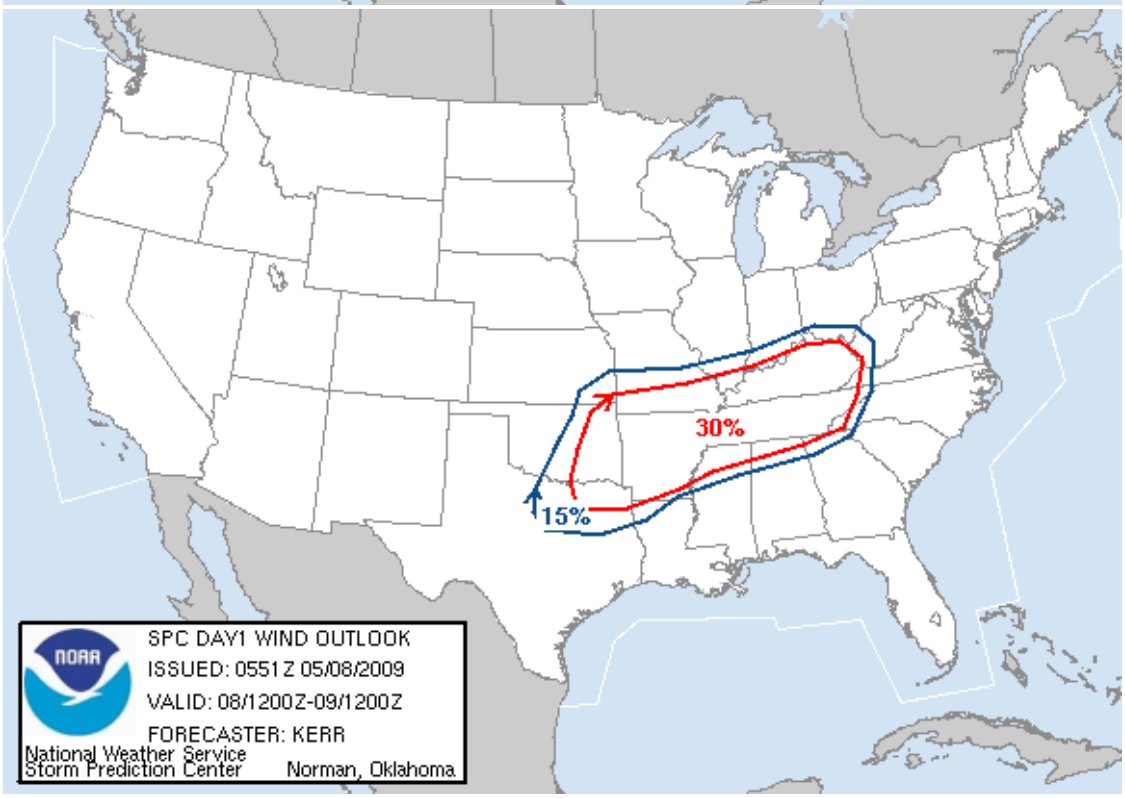
...EASTERN PORTIONS OF THE S CNTRL PLAINS...
A STALLING CONVECTIVE OUTFLOW FROM EARLY MORNING CONVECTION...AND A PRE-FRONTAL THERMAL RIDGE...ARE EXPECTED TO PROVIDE THE FOCUS FOR POSSIBLE CONVECTIVE DEVELOPMENT LATE THIS AFTERNOON AND EVENING ACROSS PARTS OF EASTERN OKLAHOMA...PERHAPS INTO NORTHEAST TEXAS. LOW-LEVEL MOISTURE WILL BE SUPPORTIVE OF STRONG TO EXTREME POTENTIAL INSTABILITY IN THE PRESENCE OF STEEP LAPSE RATES...BUT LOWER/MID TROPOSPHERIC INHIBITION WILL BE AN ISSUE...GIVEN SOMEWHAT WEAK/UNCERTAIN MID-LEVEL FORCING. AT LEAST ISOLATED TO WIDELY SCATTERED STORM INITIATION DOES APPEAR PROBABLE FOLLOWING PEAK AFTERNOON HEATING. IF THIS OCCURS...DEEP LAYER SHEAR WILL BE SUFFICIENT FOR SUPERCELLS. WEAKENING OF LOWER/MID TROPOSPHERIC FLOW BY AFTERNOON MAY LIMIT TORNADIC POTENTIAL...DESPITE POTENTIALLY FAVORABLE LOW-LEVEL HODOGRAPHS...BUT STRONGEST CELLS WILL BE CAPABLE OF AT LEAST PRODUCING VERY LARGE HAIL AND LOCALIZED STRONG DAMAGING WIND GUSTS.

..KERR/JEWELL.. 05/08/2009


SLGT
SPC DAY1 CONV OUTLOOK
ISSUED: 0551Z 05/08/2009
VALID: 08/1200Z-09/1200Z
FORECASTER: KERR/JEWELL
National Weather Service
Storm Prediction Center
Norman, Oklahoma


5%
2%
SPC DAY1 TORN OUTLOOK
ISSUED: 0551Z 05/08/2009
VALID: 08/1200Z-09/1200Z
FORECASTER: KERR
National Weather Service
Storm Prediction Center
Norman, Oklahoma


5%
30%
15%
SPC DAY1 HAIL OUTLOOK
ISSUED: 0551Z 05/08/2009
VALID: 08/1200Z-09/1200Z
FORECASTER: KERR
National Weather Service
Storm Prediction Center
Norman, Oklahoma


30%
15%
SPC DAY1 WIND OUTLOOK
ISSUED: 0551Z 05/08/2009
VALID: 08/1200Z-09/1200Z
FORECASTER: KERR
National Weather Service
Storm Prediction Center
Norman, Oklahoma

Day 1 - Valid 1300 UTC

SPC AC 081209

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0709 AM CDT FRI MAY 08 2009

VALID 081300Z - 091200Z

...THERE IS A MDT RISK OF SVR TSTMS THIS MORNING OVER PORTIONS OF SOUTHERN MO AND NORTHERN AR...

...THERE IS A SLGT RISK OF SVR TSTMS FROM EAST TX INTO THE OH VALLEY...

...DERECHO IN PROGRESS THIS MORNING OVER SOUTHERN MO/NORTHERN AR...

...MID MS VALLEY...
MATURE BOW ECHO NOW OVER SOUTHWEST MO IS EXPECTED TO MAINTAIN INTENSITY AND TRACK EAST-SOUTHEASTWARD ACROSS SOUTHERN MO AND NORTHERN AR THROUGH THIS MORNING. WIDESPREAD DAMAGING WINDS ARE BEING REPORTED WITH THIS BOW...AND WILL LIKELY CONTINUE AT LEAST AS FAR EAST AS THE MS RIVER. FROM THERE EASTWARD...FORECAST IS MORE UNCERTAIN DUE TO EFFECTS OF NOCTURNAL MCS THAT TRACKED ACROSS KY/TN OVERNIGHT. POTENTIAL EXISTS FOR AN ENHANCED THREAT OF DAMAGING WINDS AND ISOLATED TORNADOES AS MO CONVECTIVE SYSTEM INTERACTS WITH REMNANT OUTFLOW BOUNDARY OVER WESTERN KY/TN...WHERE LOW LEVEL VERTICAL SHEAR PROFILES MAY BE STRONGER.

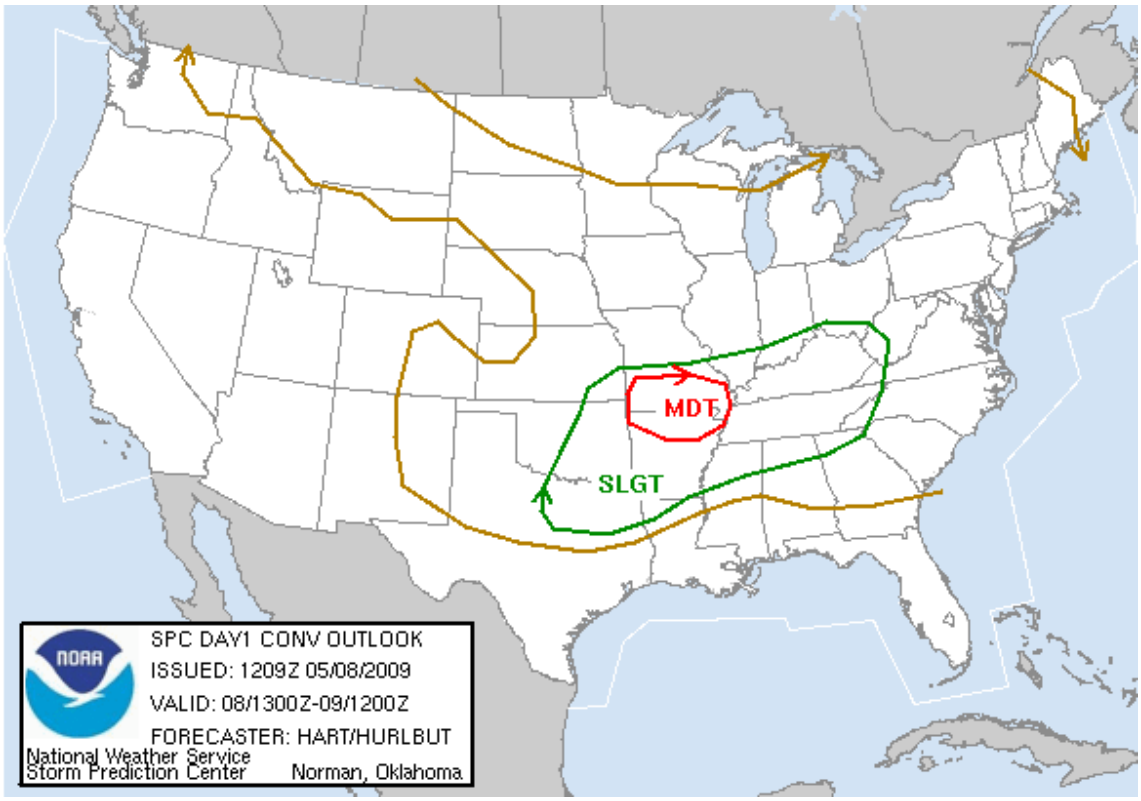
...TX/OK/AR/LA THIS AFTERNOON...
STRONG DAYTIME HEATING AND AMPLE MOISTURE ARE FORECAST THIS AFTERNOON ALONG AND EAST OF SURFACE BOUNDARY EXTENDING FROM EASTERN OK INTO NORTH TX. MLCAPE VALUES OF 3000-4000 J/KG ARE POSSIBLE ALONG THIS AXIS...BUT A RATHER STRONG CAPPING INVERSION WILL LIKELY PERSIST. A COMBINATION OF DIURNAL HEATING AND CONVERGENCE ALONG THE BOUNDARY ARE EXPECTED TO LEAD TO AT LEAST ISOLATED SEVERE STORMS FROM WEST OF DFW TO FSM THIS AFTERNOON AND EVENING. EFFECTIVE SHEAR PROFILES SUGGEST THAT SUPERCELL STRUCTURES ARE LIKELY...ESPECIALLY OVER OK PORTION OF AREA. VERY LARGE HAIL AND DAMAGING WINDS WILL BE POSSIBLE WITH STRONGER CELLS.

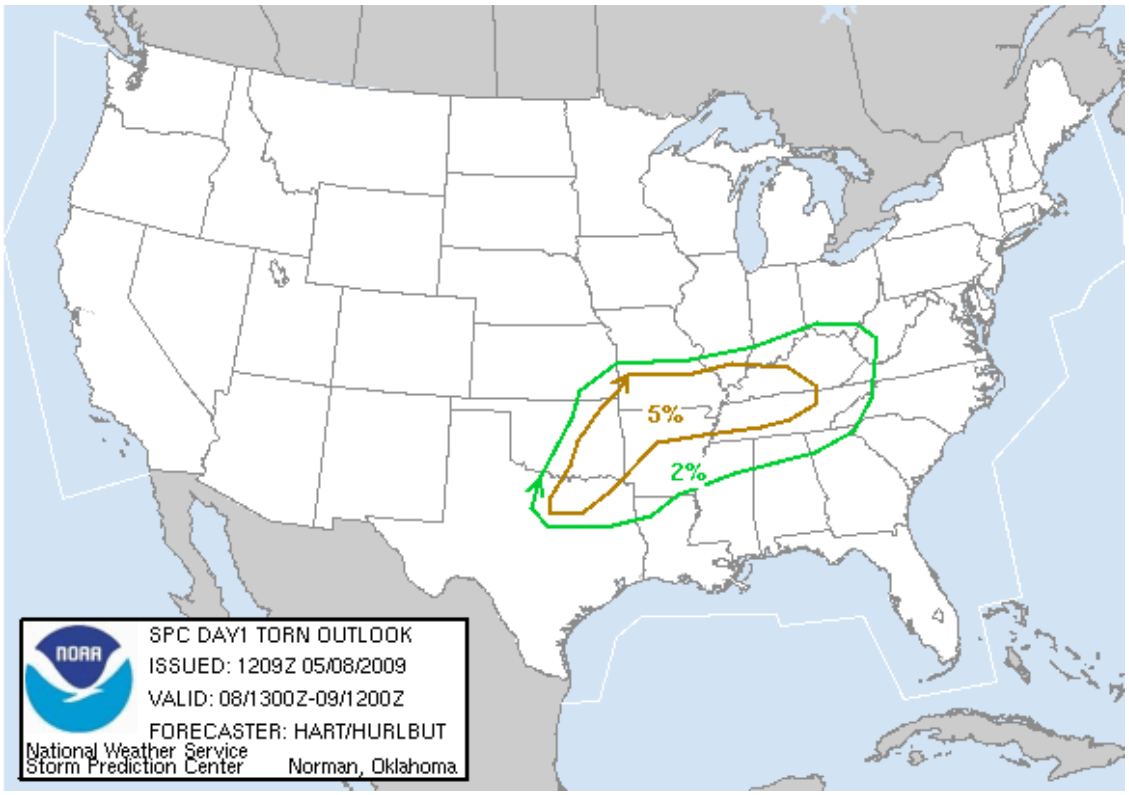
...VA/NC...
REMNANTS OF MCS OVER KY/TN WILL CROSS THE APPALACHIANS THIS MORNING AND MOVE ACROSS NC/VA THIS AFTERNOON. A MOIST AND SUFFICIENTLY UNSTABLE AIRMASS MAY RESULT IN SOME RE-INTENSIFICATION OF STORMS WITH GUSTY WINDS AND HAIL POSSIBLE IN A FEW STORMS. AT THIS

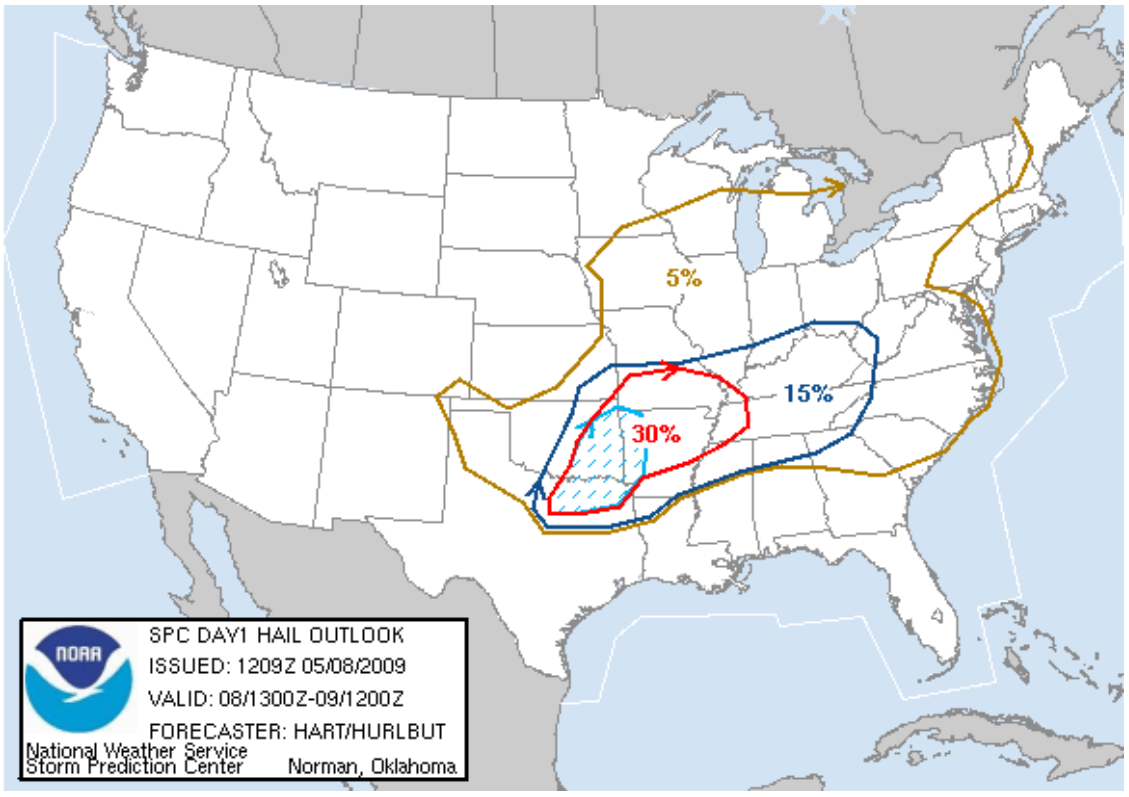
TIME...ORGANIZED SEVERE STORMS ARE NOT ANTICIPATED DUE TO MORE CLOUD COVER AND WEAKER INSTABILITY THAN THE LAST FEW DAYS.

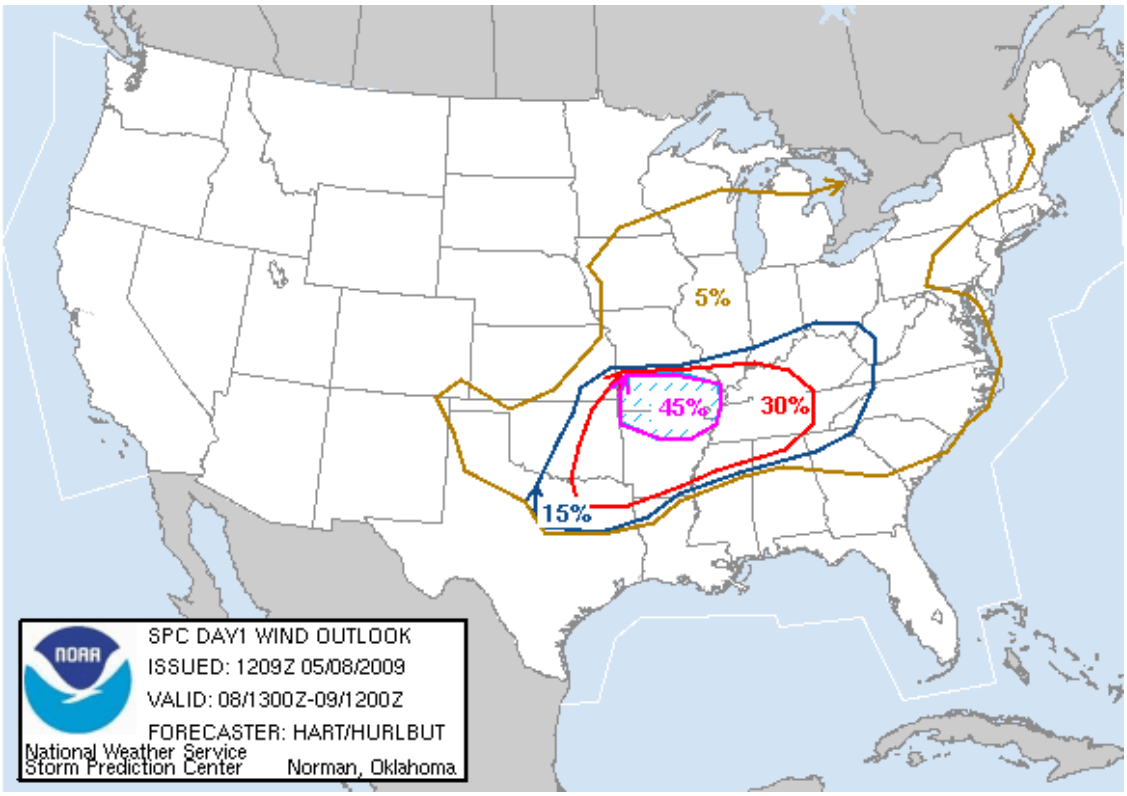
...IA/IL...
A STRONG SHORTWAVE TROUGH IS DIGGING SOUTHWARD ACROSS THE WESTERN DAKOTAS THIS MORNING...AND WILL MOVE EASTWARD AND AFFECT IA THIS AFTERNOON. RATHER COOL TEMPERATURES ALOFT AND MODERATELY STEEP LAPSE RATES MAY RESULT IN A FEW STRONG STORMS CAPABLE OF HAIL THIS AFTERNOON AND EARLY EVENING.

..HART/HURLBUT.. 05/08/2009




5%
2%
SPC DAY1 TORN OUTLOOK
ISSUED: 1209Z 05/08/2009
VALID: 08/1300Z-09/1200Z
FORECASTER: HART/HURLBUT
National Weather Service
Storm Prediction Center
Norman, Oklahoma


5%
15%
30%
SPC DAY1 HAIL OUTLOOK
ISSUED: 1209Z 05/08/2009
VALID: 08/1300Z-09/1200Z
FORECASTER: HART/HURLBUT
National Weather Service
Storm Prediction Center
Norman, Oklahoma



Day 1 - Valid 1630 UTC

SPC AC 081712

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
1212 PM CDT FRI MAY 08 2009

VALID 081630Z - 091200Z

...THERE IS A MDT RISK OF SVR TSTMS PORTIONS OF WRN KY AND NRN TN...

...THERE IS A SLGT RISK OF SVR TSTMS FROM THE SRN PLAINS EWD THROUGH THE TN/LOWER OH VALLEYS EWD TO THE CAROLINAS...

...THERE IS A SLGT RISK OF SVR TSTMS IN THE IA AREA...

...TN/LOWER OH VALLEY...
LONG LIVED BOW ECHO...MOVING EWD AT 60 KT...WAS APPROACHING THE MS RIVER AND IS EXPECTED TO TRACK MOSTLY EWD THROUGH THE REGION THIS AFTERNOON. THOUGH MESOSCALE MODELS SUGGEST WEAKENING WITH

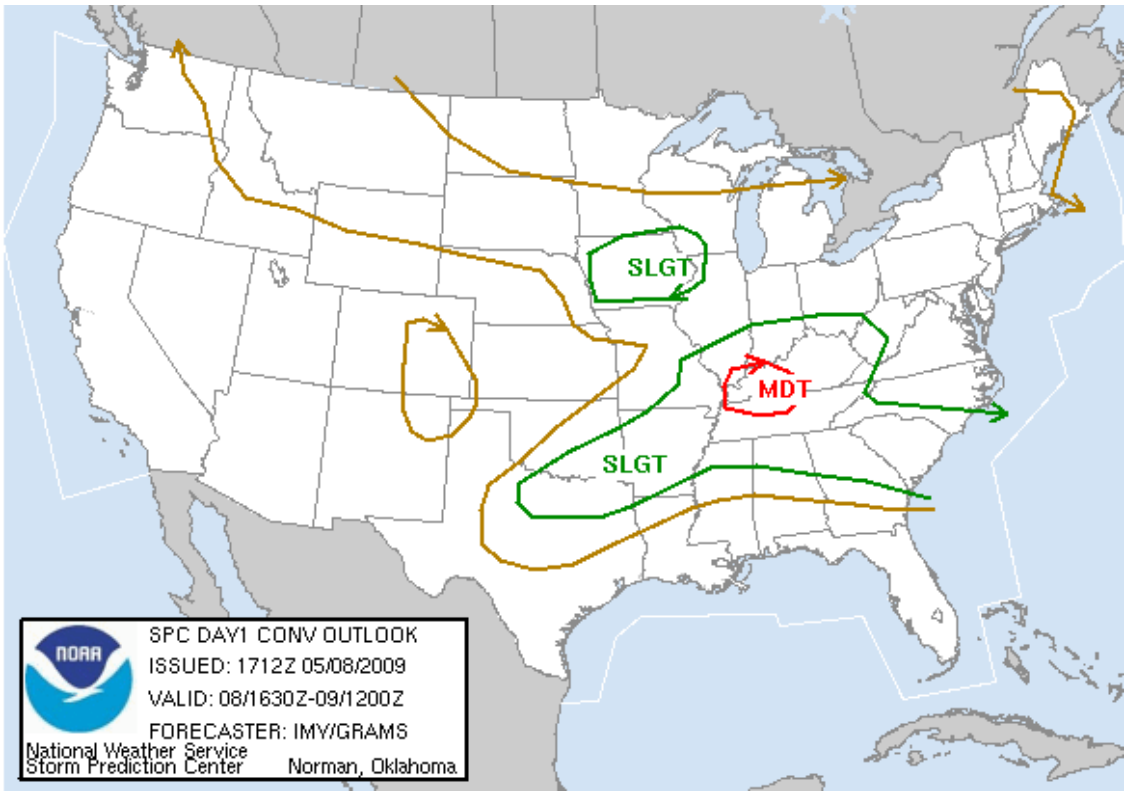
TIME...GIVEN THE WELL ORGANIZED SYSTEM MOVING INTO AN ENVIRONMENT WITH STRONG INSTABILITY...MLCAPES 2000-2500 J/KG...AND EFFECTIVE SHEAR NEAR 40 KT IS EXPECTED TO SUSTAIN WIDESPREAD WIND DAMAGE..SOMETIMES EXTREME. WIND AND HAIL IS FORECAST WITH THE SYSTEM UNTIL IT REACHES THE APPALACHIANS THIS EVENING. LOW LEVEL SHEAR WILL ALSO BE SUPPORTIVE OF TORNADOES...ESPECIALLY WITH THE ROTATING BOW HEADS.

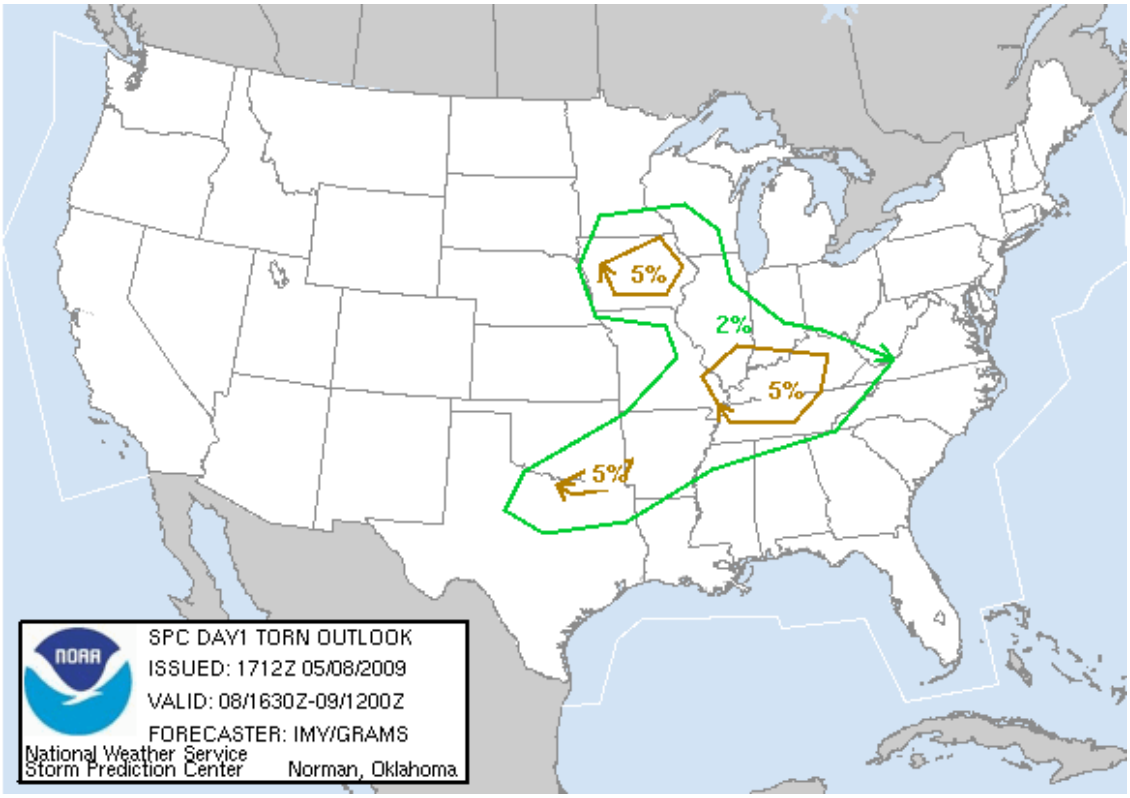
...NRN TX/SERN OK/AR/NRN LA...
COLD FRONT AT MID MORNING EXTENDED FROM SERN KS SWWD INTO WRN TX NEAR LBB. FRONT IS EXPECTED TO MOVE SEWD TO NEAR A SGF-ADM-MAF LINE BY 23Z. MORNING SOUNDINGS SHOWED STRONG CAPPING BETWEEN 850-700 MB...AND THIS SHOULD LIMIT CONVECTION ALONG THE FRONT THROUGH MOST OF THE DAY. DESPITE NO REAL DISCERNABLE SHORTWAVE TROUGH...MODELS DEPICT A SPEED MAX MOVING INTO THE REGION LATE THIS AFTERNOON WITH INCREASING DIFFLUENCE ALOFT. THIS WOULD RESULT IN STRENGTHENING LOW LEVEL CONVERGENCE ALONG THE FRONT... ESPECIALLY IN AND WEST OF THE ARKLATEX. ALL OPERATIONAL/MESOSCALE MODELS SHOW CONVECTION DEVELOPS ALONG THE FRONT IN ERN OK/NRN TX AFTER 22Z. STORMS THAT DEVELOP ARE LIKELY TO QUICKLY BECOME SEVERE GIVEN MLCAPES FROM 3000 TO 4000 J/KG AND MID LEVEL LAPSE RATES NEAR 9 C/KM INDICATE VERY LARGE HAIL WOULD BE THE MAIN THREAT.

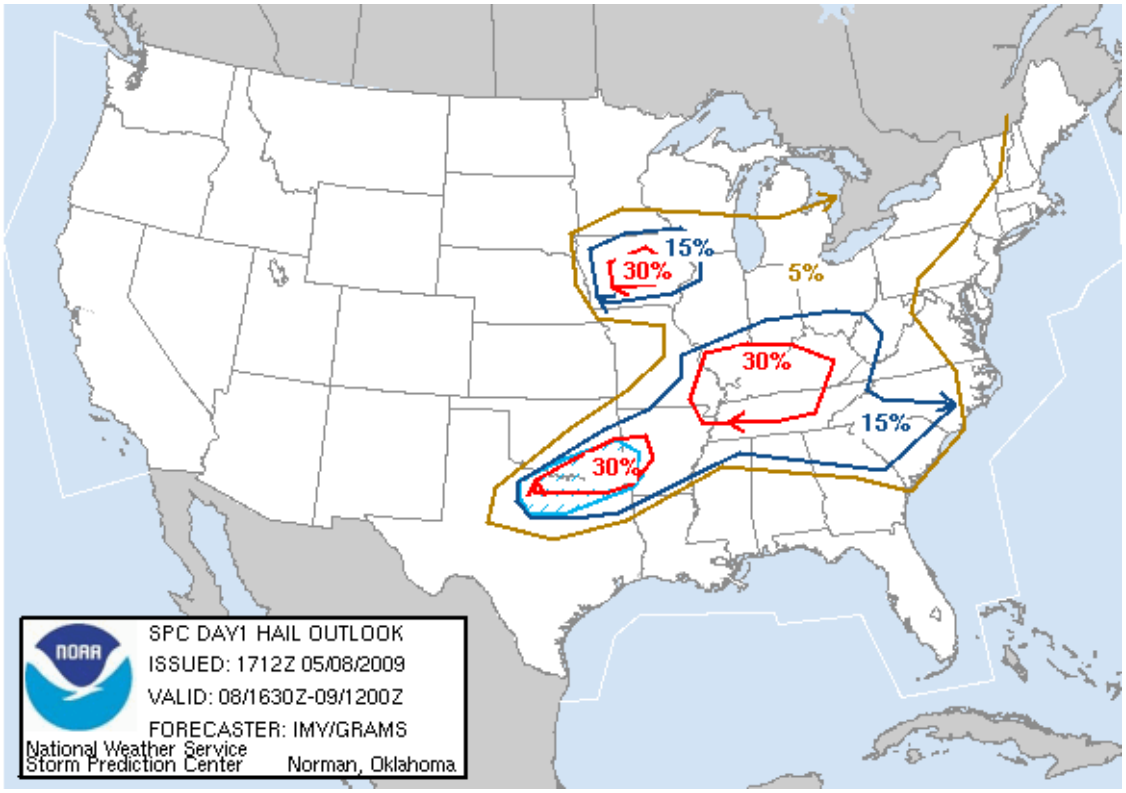
...CAROLINAS.....
REMNANT MCS FROM WRN NC INTO NERN GA IS EXPECTED TO CONTINUE EWD INTO A MOIST AND DESTABILIZING AIR MASS...2000 J/KG MLCAPE WITH TEMPERATURES IN THE 80S. ALTHOUGH ACTIVITY WILL GRADUALLY DEVELOP SOUTH OF THE STRONGER WINDS ALOFT...UNIDIRECTIONAL WLY WINDS AT 20 TO 30 KT THROUGH THE LOWER 6 KM MAY SUPPORT A LINEAR SYSTEM THIS AFTERNOON...WITH WIND DAMAGE THE PRIMARY THREAT.

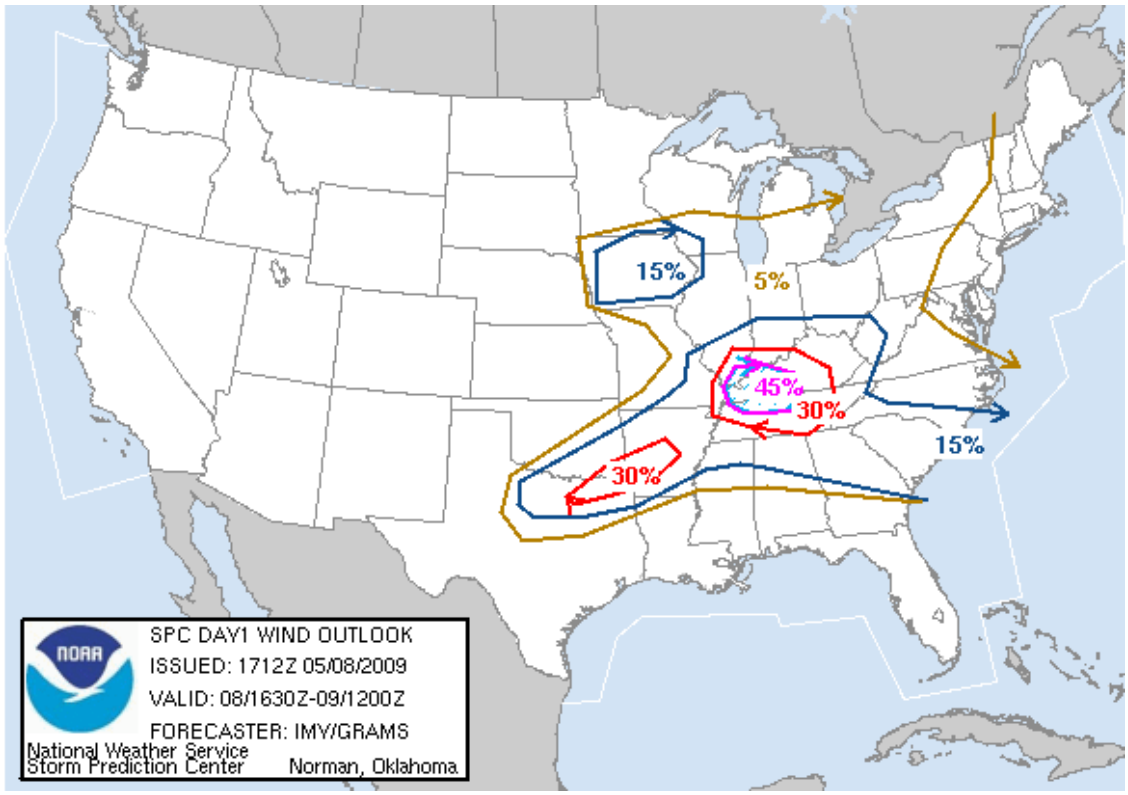
...IA/NWRN IL AND SWRN WI...
A STRONG SHORTWAVE TROUGH OVER CENTRAL NEB/SD WILL TRACK EWD TO NEAR THE NEB/IA BORDER BY 00Z. COLD TEMPERATURES ALOFT...500 MB TEMPERATURES FROM -18 TO -22C...MODERATELY STEEP LAPSE RATES...40-50 KT DEEP LAYER SHEAR AND LIFT ASSOCIATED WITH TROUGH/ASSOCIATED JET MAX SHOULD RESULT IN SUPERCELLS. HAIL AND WIND DAMAGE WILL BE THE MAIN THREATS.

..IMY/GRAMS.. 05/08/2009


SLGT
MDT
SLGT
SPC DAY1 CONV OUTLOOK
ISSUED: 1712Z 05/08/2009
VALID: 08/1630Z-09/1200Z
FORECASTER: IMY/GRAMS
National Weather Service
Storm Prediction Center
Norman, Oklahoma


5%
2%
5%
5%
SPC DAY1 TORN OUTLOOK
ISSUED: 1712Z 05/08/2009
VALID: 08/1630Z-09/1200Z
FORECASTER: IMY/GRAMS
National Weather Service
Storm Prediction Center
Norman, Oklahoma


15%
30%
5%
30%
15%
30%
SPC DAY1 HAIL OUTLOOK
ISSUED: 1712Z 05/08/2009
VALID: 08/1630Z-09/1200Z
FORECASTER: IMY/GRAMS
National Weather Service
Storm Prediction Center
Norman, Oklahoma


15%
5%
45%
30%
15%
30%
SPC DAY1 WIND OUTLOOK
ISSUED: 1712Z 05/08/2009
VALID: 08/1630Z-09/1200Z
FORECASTER: IMY/GRAMS
National Weather Service
Storm Prediction Center
Norman, Oklahoma

II. Severe Weather Watches

Particularly Dangerous Situation (PDS) Severe Thunderstorm Watch 264

SEL4

URGENT - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WATCH NUMBER 264
NWS STORM PREDICTION CENTER NORMAN OK
1205 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
SEVERE THUNDERSTORM WATCH FOR PORTIONS OF

A LARGE PART OF KANSAS
NORTHERN OKLAHOMA

EFFECTIVE THIS FRIDAY MORNING FROM 1205 AM UNTIL 800 AM CDT.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

EXTREMELY DAMAGING THUNDERSTORM WIND GUSTS TO 80 MPH...LARGE HAIL TO 3 INCHES IN DIAMETER...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

THE SEVERE THUNDERSTORM WATCH AREA IS APPROXIMATELY ALONG AND 80 STATUTE MILES NORTH AND SOUTH OF A LINE FROM 55 MILES WEST OF GARDEN CITY KANSAS TO 25 MILES EAST SOUTHEAST OF CHANUTE KANSAS. FOR A COMPLETE DEPICTION OF THE WATCH SEE THE ASSOCIATED WATCH OUTLINE UPDATE (WOUS64 KWNS WOU4).

REMEMBER...A SEVERE THUNDERSTORM WATCH MEANS CONDITIONS ARE FAVORABLE FOR SEVERE THUNDERSTORMS IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS. SEVERE THUNDERSTORMS CAN AND OCCASIONALLY DO PRODUCE TORNADOES.

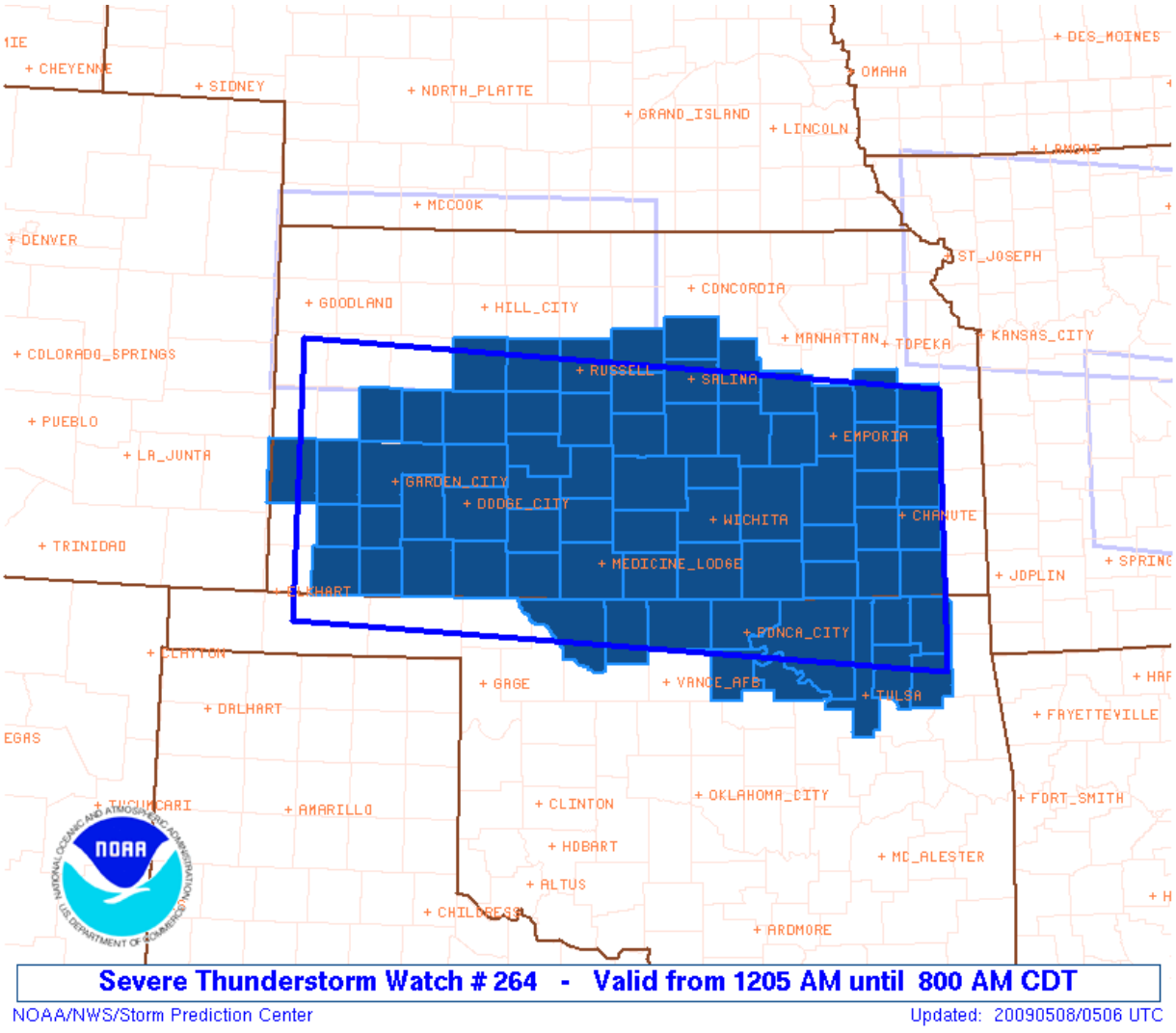
OTHER WATCH INFORMATION...CONTINUE...WW 260...WW 261...WW262...WW 263...

DISCUSSION...TSTMS/SUPERCELLS EXPECTED TO FORM IN THE NEXT 1-2 HOURS IN WAA AREA ALONG SRN FRINGE OF UPR DISTURBANCE AMPLIFYING ESE ACROSS THE CNTRL HI PLNS. COMBINATION OF INCREASINGLY RICH MOIST INFLOW...DEEP EML...AND SEASONABLY STRONG/LARGELY UNIDIRECTIONAL WLY MID/UPR LVL FLOW SHOULD SUPPORT RAPID STORM INTENSIFICATION ONCE CELLS FORM. ALTHOUGH A RISK FOR ISOLD TORNADOES WILL EXIST DURING

EARLY STAGES OF STORM DEVELOPMENT...SFC-BASED CIN AND LIKELIHOOD FOR NUMEROUS STORM INTERACTIONS ONCE ACTIVITY DEVELOPS SUGGEST THAT MAIN SVR THREAT EARLY-ON WILL BE VERY LARGE HAIL. SIZABLE DCAPE SHOULD FOSTER SUBSEQUENT EVOLUTION INTO A FORWARD-PROPGATING MCS...WITH FAIRLY WIDESPREAD DMGG WIND/HAIL.

AVIATION...A FEW SEVERE THUNDERSTORMS WITH HAIL SURFACE AND ALOFT TO 3 INCHES. EXTREME TURBULENCE AND SURFACE WIND GUSTS TO 70 KNOTS. A FEW CUMULONIMBI WITH MAXIMUM TOPS TO 550. MEAN STORM MOTION VECTOR 29035.

...CORFIDI



Particularly Dangerous Situation (PDS) Severe Thunderstorm Watch 266

SEL6

URGENT - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WATCH NUMBER 266
NWS STORM PREDICTION CENTER NORMAN OK
455 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
SEVERE THUNDERSTORM WATCH FOR PORTIONS OF

NORTHERN ARKANSAS
SOUTHEAST KANSAS
SOUTHERN MISSOURI
NORTHEAST OKLAHOMA

EFFECTIVE THIS FRIDAY MORNING FROM 455 AM UNTIL NOON CDT.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

EXTREMELY DAMAGING THUNDERSTORM WIND GUSTS TO 80 MPH...LARGE HAIL TO 2 INCHES IN DIAMETER...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

THE SEVERE THUNDERSTORM WATCH AREA IS APPROXIMATELY ALONG AND 80 STATUTE MILES NORTH AND SOUTH OF A LINE FROM 45 MILES NORTHEAST OF WEST PLAINS MISSOURI TO 40 MILES WEST SOUTHWEST OF BARTLESVILLE OKLAHOMA. FOR A COMPLETE DEPICTION OF THE WATCH SEE THE ASSOCIATED WATCH OUTLINE UPDATE (WOUS64 KWNS WOU6).

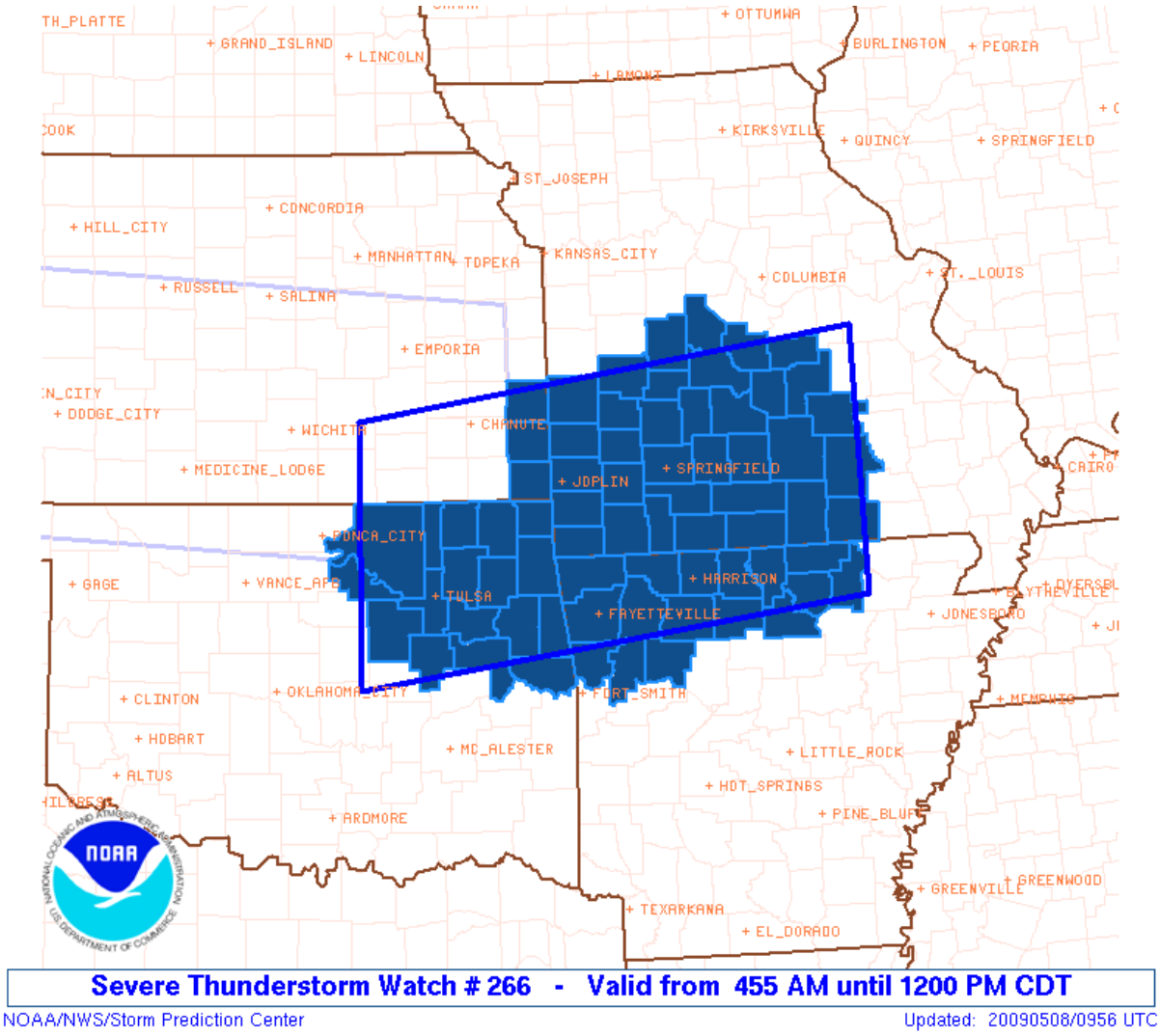
REMEMBER...A SEVERE THUNDERSTORM WATCH MEANS CONDITIONS ARE FAVORABLE FOR SEVERE THUNDERSTORMS IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS. SEVERE THUNDERSTORMS CAN AND OCCASIONALLY DO PRODUCE TORNADOES.

OTHER WATCH INFORMATION...CONTINUE...WW 264...WW 265...

DISCUSSION...A LARGE CLUSTER OF INTENSE CONVECTION OVER SOUTHEAST KS WILL LIKELY ORGANIZE INTO A BOW ECHO THIS MORNING AND RACE EAST-SOUTHEASTWARD ACROSS SOUTHWEST MO/NORTHEAST OK/NORTHWEST AR. HIGH INSTABILITY AND RATHER STRONG WESTERLY FLOW ALOFT SUGGEST THAT A CORRIDOR OF SIGNIFICANT DAMAGING WINDS IS POSSIBLE THROUGH THE MID MORNING. LARGE HAIL WILL ALSO REMAIN POSSIBLE IN THE STRONGEST STORMS.

AVIATION...A FEW SEVERE THUNDERSTORMS WITH HAIL SURFACE AND ALOFT TO 2 INCHES. EXTREME TURBULENCE AND SURFACE WIND GUSTS TO 70 KNOTS. A FEW CUMULONIMBI WITH MAXIMUM TOPS TO 500. MEAN STORM MOTION VECTOR 29035.

...HART



Tornado Watch 267

SEL7

URGENT - IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 267
NWS STORM PREDICTION CENTER NORMAN OK
920 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
TORNADO WATCH FOR PORTIONS OF

PARTS OF NORTHEAST ARKANSAS
PARTS OF SOUTHERN ILLINOIS
WESTERN KENTUCKY
SOUTHEAST MISSOURI
MUCH OF WESTERN AND MIDDLE TENNESSEE

EFFECTIVE THIS FRIDAY MORNING AND AFTERNOON FROM 920 AM UNTIL 400 PM CDT.

TORNADOES...HAIL TO 2.5 INCHES IN DIAMETER...THUNDERSTORM WIND GUSTS TO 105 MPH...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

THE TORNADO WATCH AREA IS APPROXIMATELY ALONG AND 90 STATUTE MILES NORTH AND SOUTH OF A LINE FROM 25 MILES WEST OF WEST PLAINS MISSOURI TO 35 MILES EAST SOUTHEAST OF CLARKSVILLE TENNESSEE. FOR A COMPLETE DEPICTION OF THE WATCH SEE THE ASSOCIATED WATCH OUTLINE UPDATE (WOUS64 KWNS WOU7).

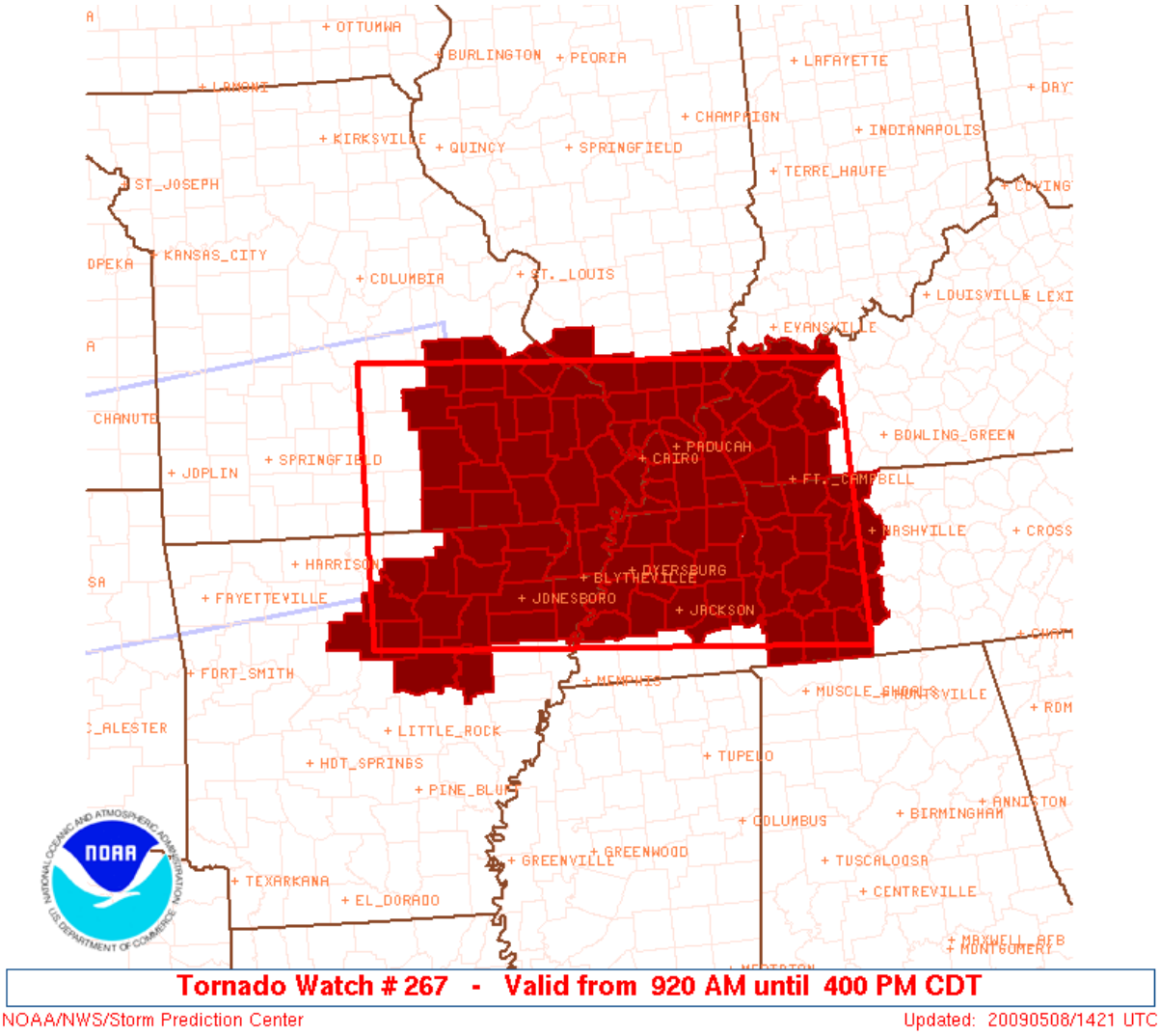
REMEMBER...A TORNADO WATCH MEANS CONDITIONS ARE FAVORABLE FOR TORNADOES AND SEVERE THUNDERSTORMS IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS.

OTHER WATCH INFORMATION...CONTINUE...WW 266...

DISCUSSION...A MATURE VERY INTENSE DERECHO IS MOVING VERY RAPIDLY ALONG THERMAL/INSTABILITY GRADIENT ACROSS MID MS VLY INTO TN AND LOWER OH VALLEYS. WITH A VERY MOIST UNSTABLE AIR MASS AND STRONG VEERING SHEAR PROFILES...EMBEDDED TORNADIC SUPERCELLS WILL CONTINUE TO BE ASSOCIATED WITH THE DERECHO ALONG WITH WIDESPREAD DAMAGING WINDS.

AVIATION...TORNADOES AND A FEW SEVERE THUNDERSTORMS WITH HAIL SURFACE AND ALOFT TO 2.5 INCHES. EXTREME TURBULENCE AND SURFACE WIND GUSTS TO 90 KNOTS. A FEW CUMULONIMBI WITH MAXIMUM TOPS TO 650. MEAN STORM MOTION VECTOR 27055.

...HALES



III. Mesoscale Discussions

Mesoscale Discussion 752

MESOSCALE DISCUSSION 0752
NWS STORM PREDICTION CENTER NORMAN OK
1053 PM CDT THU MAY 07 2009

AREAS AFFECTED...KS/NORTHERN OK

CONCERNING...SEVERE POTENTIAL...WATCH LIKELY

VALID 080353Z - 080600Z

SEVERE THREAT IS EXPECTED TO STEADILY DEVELOP/INCREASE OVERNIGHT ACROSS THE WESTERN/SOUTHERN HALF OF KS AND FAR NORTHERN OK...WITH POTENTIAL FOR SEVERE HAIL/DAMAGING WINDS...ALONG WITH HEAVY RAINFALL. A WATCH WILL LIKELY BE ISSUED BY AROUND 0430Z-05Z.

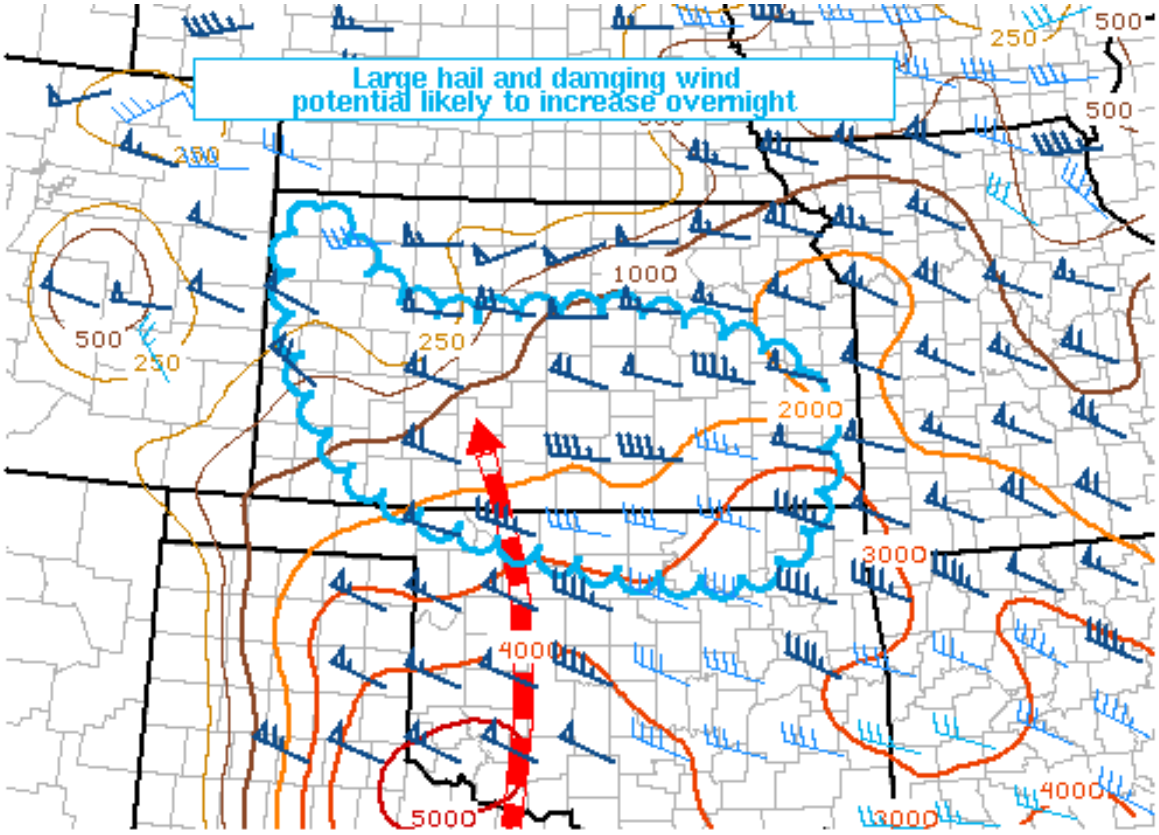
TO THE SOUTH OF A WSW-ENE ORIENTED SURFACE BOUNDARY ACROSS KS...00Z OBSERVED RAOBS/UPPER AIR ANALYSIS REFLECT A RATHER MOIST/POTENTIALLY UNSTABLE AIRMASS FROM NORTH TX AND OK INTO SOUTHERN/EASTERN KS THIS EVENING. 23Z/00Z OBSERVED RAOBS FROM LAMONT OK/NORMAN OK SAMPLED 14.4 G/KG AND 17.5 G/KG MEAN MIXING RATIOS RESPECTIVELY...WITH VERY STEEP MID LEVEL LAPSE RATES /7.5 AND 8.1 C PER KM H7-H5/ AND STRONG ELEVATED POTENTIAL INSTABILITY /3500 AND 4300 J PER KG MUCAPE/.

WITH INCIPIENT DEVELOPMENT PERHAPS ALREADY OCCURRING ACROSS WESTERN KS /WEST OF GCK TO HLC/ PER IR SATELLITE IMAGERY...INITIAL DEEP CONVECTIVE DEVELOPMENT IS ANTICIPATED ACROSS PORTIONS OF WESTERN INTO SOUTH CENTRAL KS EARLY IN THE OVERNIGHT...AIDED BY THE EAST-SOUTHEAST TRANSLATION OF IMPLIED LARGE SCALE ASCENT CURRENTLYACROSS EASTERN CO/NORTHWEST KS. SIMILAR TO A TREND ALREADY NOTED IN REGIONAL PROFILER DATA AND 00Z ANALYSIS OF A WESTERN BRANCH LOW LEVEL JET ACROSS WESTERN OK/SOUTHWEST KS...A STRENGTHENING SOUTHERLY LLJ /50-65 KT/ OVERNIGHT WILL SUPPORT A CONSIDERABLE ISENTROPIC LIFT/ELEVATED MOISTURE TRANSPORT REGIME NORTHWARD INTO SOUTHERN KS. 45-50 KT OF MID LEVEL FLOW...AMPLE VEERING THROUGH THE CLOUD BEARING LAYER...AND VERY STEEP MID LEVEL LAPSE RATES WILL BE RATHER FAVORABLE FOR A SEVERE HAIL RISK WITH MAINLY ELEVATED SUPERCELLS. WITH TIME...IT SEEMS PROBABLE THAT STORMS WOULD LIKELY GRADUALLY CONSOLIDATE AND GROW UPSCALE THROUGH THE OVERNIGHT...WITH POTENTIAL FOR DAMAGING WINDS/TORRENTIAL RAINFALL INCREASING THROUGH THE EARLY MORNING HOURS ACROSS SOUTHERN KS/FAR NORTHERN OK...AND EVENTUALLY INTO ADJACENT SOUTHWEST MO/NORTHWEST AR.

..GUYER.. 05/08/2009

ATTN...WFO...TSA...TOP...ICT...OUN...DDC...GLD...

LAT...LON 38800169 39890151 38870013 38909727 38099518 36379595
37090036 38800169



SPC MCD #0752

Mesoscale Discussion 754

MESOSCALE DISCUSSION 0754
NWS STORM PREDICTION CENTER NORMAN OK
0250 AM CDT FRI MAY 08 2009

AREAS AFFECTED...KS

CONCERNING...SEVERE THUNDERSTORM WATCH 264...

VALID 080750Z - 080845Z

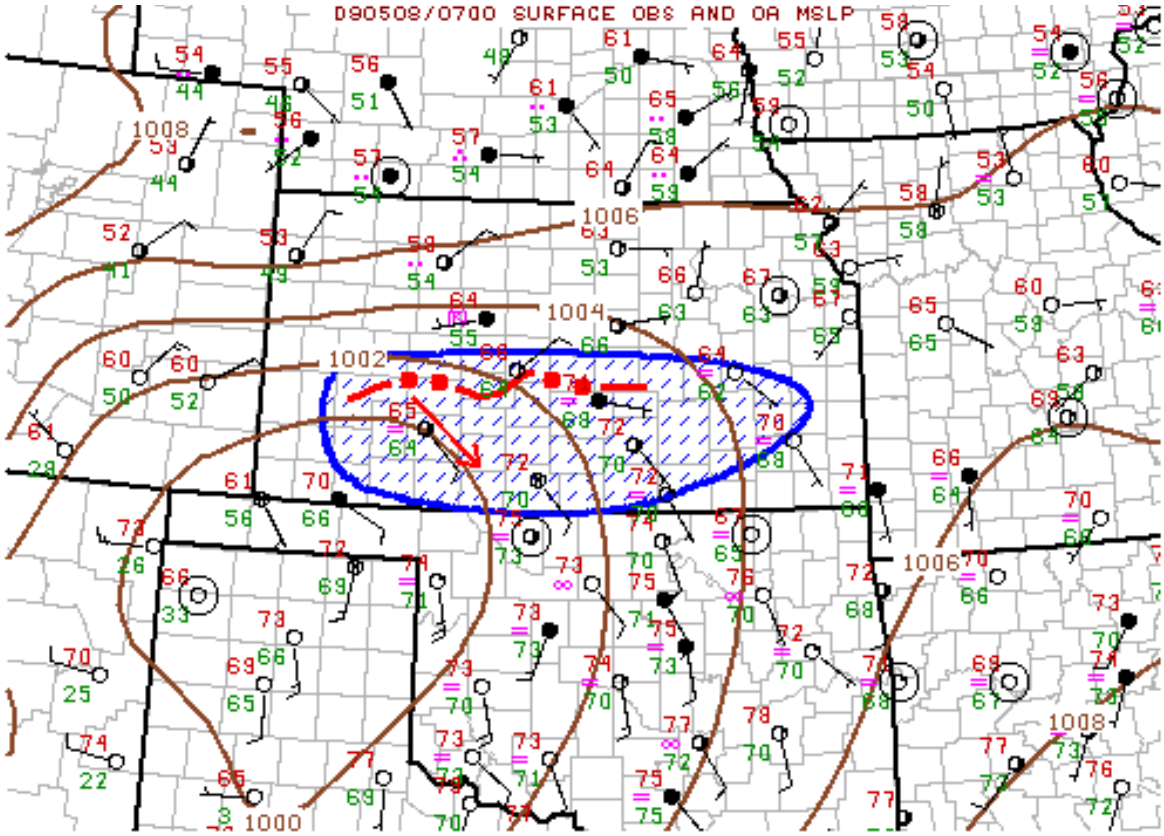
THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 264 CONTINUES.

MCS IS GRADUALLY EXPANDING IN AREAL COVERAGE AS E-W BAND OF CONVECTION BEGINS TO SURGE SEWD AT ROUGHLY 35KT. STRONG SLY LLJ/INFLOW SHOULD ENHANCE FORWARD PROPAGATION SPEED OVER THE NEXT FEW HOURS AS SQUALL LINE MOVES INTO SRN KS. WITH TIME DAMAGING WINDS MAY BECOME AN ISSUE...ESPECIALLY AS PRECIP SHIELD EXPANDS AND FORWARD SPEED INCREASES.

..DARROW.. 05/08/2009

ATTN...WFO...TOP...ICT...OUN...DDC...

LAT...LON 38240112 38489973 38449661 38079530 37499597 36999807
37200078 38240112



Mesoscale Discussion 756

MESOSCALE DISCUSSION 0756
NWS STORM PREDICTION CENTER NORMAN OK
0431 AM CDT FRI MAY 08 2009

AREAS AFFECTED...SRN KS...NRN OK...SWRN MO...NWRN AR

CONCERNING...SEVERE THUNDERSTORM WATCH 264...

VALID 080931Z - 081030Z

THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 264 CONTINUES.

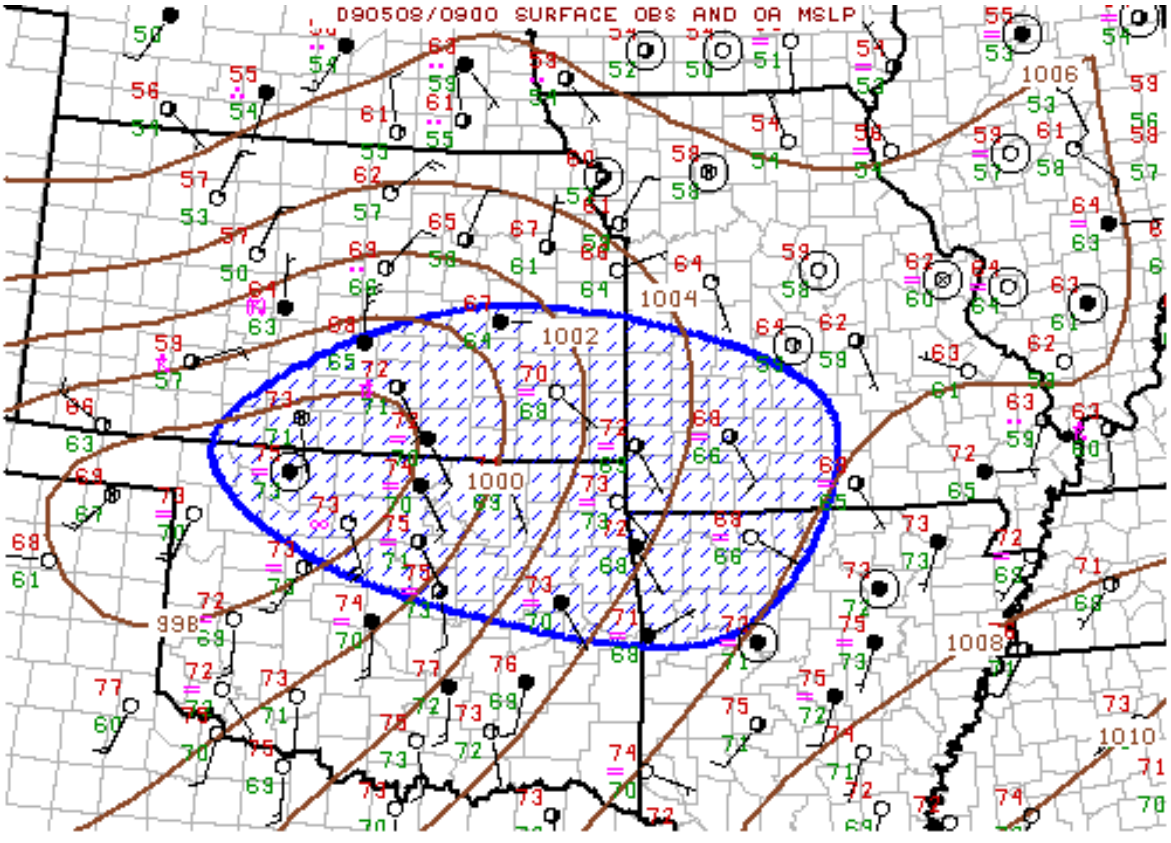
...NEW WW WILL BE ISSUED TO ACCOUNT FOR SEVERE THREAT SPREADING DOWNSTREAM INTO SWRN MO/NWRN AR...

WELL ORGANIZED MCS OVER SRN KS CONTINUES TO EVOLVE WITH SEVERAL WARM ADVECTION-TYPE BANDS BEGINNING TO INTENSIFY ALONG SERN-ERN PERIPHERY OF COMPLEX. THIS ACTIVITY SHOULD CONTINUE TO DEVELOP SEWD WHILE PIVOTING EAST INTO SWRN MO OVER THE NEXT FEW HOURS UPSTREAM...SWRN FLANK IS BEGINNING TO SURGE ACROSS KINGMAN/PRATT/ KIOWA INTO BARBER/COMANCHE COUNTIES. THIS PORTION OF THE LINE WILL SOON SPREAD INTO NRN OK AND APPEARS TO HAVE THE GREATEST POTENTIAL FOR DAMAGING WINDS.

..DARROW.. 05/08/2009

ATTN...WFO...LZK...SGF...EAX...TSA...TOP...ICT...OUN...DDC...

LAT...LON 38469626 37539218 35299347 35819785 37119957 38469626



SPC MCD #0756

Mesoscale Discussion 757

MESOSCALE DISCUSSION 0757
NWS STORM PREDICTION CENTER NORMAN OK
0717 AM CDT FRI MAY 08 2009

AREAS AFFECTED...SERN KS...NERN OK...SRN MO...NRN AR

CONCERNING...SEVERE THUNDERSTORM WATCH 266...

VALID 081217Z - 081315Z

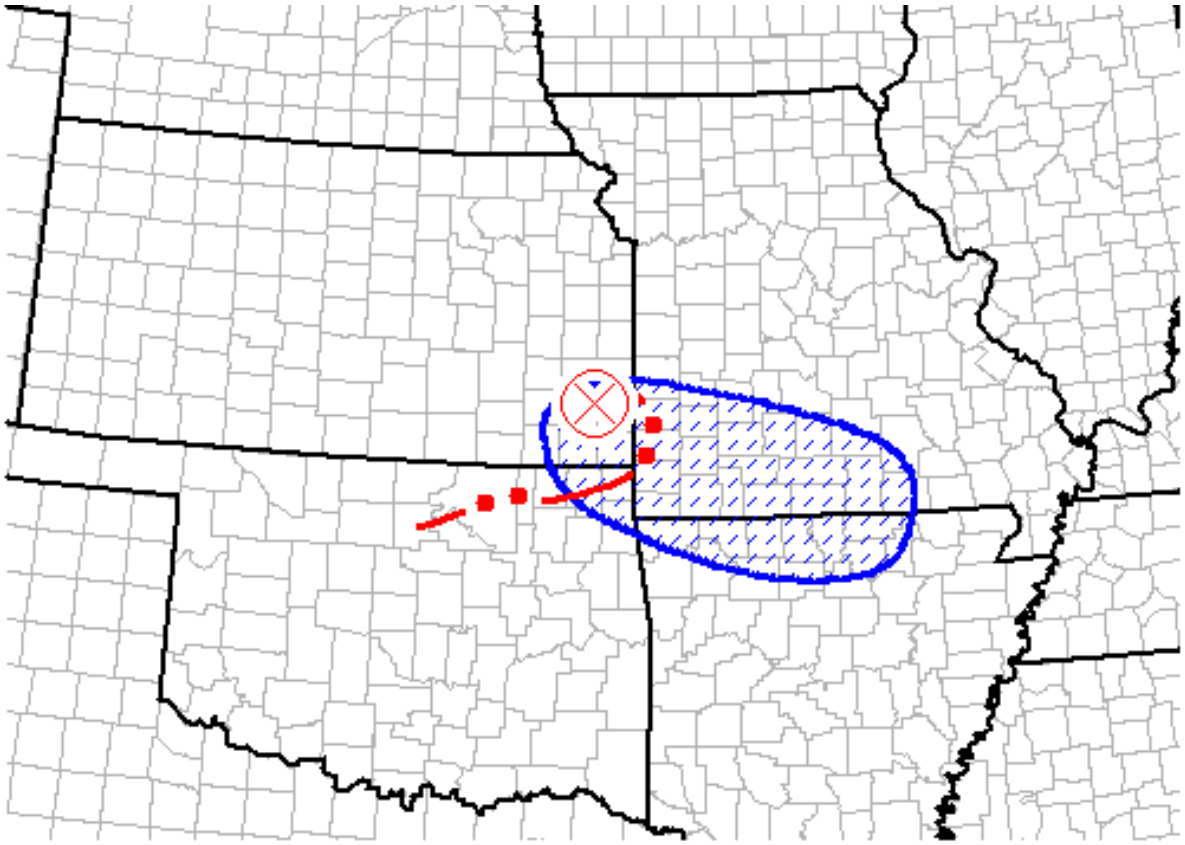
THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 266 CONTINUES.

DAMAGING SQUALL LINE IS MOVING ESEWD AT 60 KT AS MCS BEGINS TO TURN A BIT MORE SWD ALONG EDGE OF STRONG CAP OVER OK. ADDITIONALLY...A FEW SUPERCELLS HAVE RECENTLY DEVELOPED WITHIN WARM ADVECTION PORTION OF THIS MCS...AHEAD OF PRIMARY BOW WITHIN SEVERAL NW-SE ORIENTED LINES. IN SUPPORT OF THIS DEVELOPMENT THE 12Z SOUNDING FROM SGF IS VERY UNSTABLE WITH MUCAPE ON THE ORDER OF 3500-4000 J/KG IF LIFTING A PARCEL JUST OFF THE SFC NEAR 900 MB. NEEDLESS TO SAY WIDESPREAD SIGNIFICANT DAMAGE WILL ACCOMPANY THE BOW AS IT RACES ALONG THE MO/AR BORDER OVER THE NEXT FEW HOURS. AT THIS SPEED IT WILL APPROACH THE SERN PORTIONS OF THE WATCH BETWEEN 15-16Z.

..DARROW.. 05/08/2009

ATTN...WFO...LZK...SGF...TSA...ICT...

LAT...LON 37789432 37099154 36069159 35949311 36639524 37549562
37789432



SPC MCD #0757

Mesoscale Discussion 758

MESOSCALE DISCUSSION 0758
NWS STORM PREDICTION CENTER NORMAN OK
0837 AM CDT FRI MAY 08 2009

AREAS AFFECTED...SERN MO...CNTRL AND NERN AR..WRN TN...NRN MS...NRN AL AND SWRN KY

CONCERNING...SEVERE POTENTIAL...WATCH LIKELY

VALID 081337Z - 081430Z

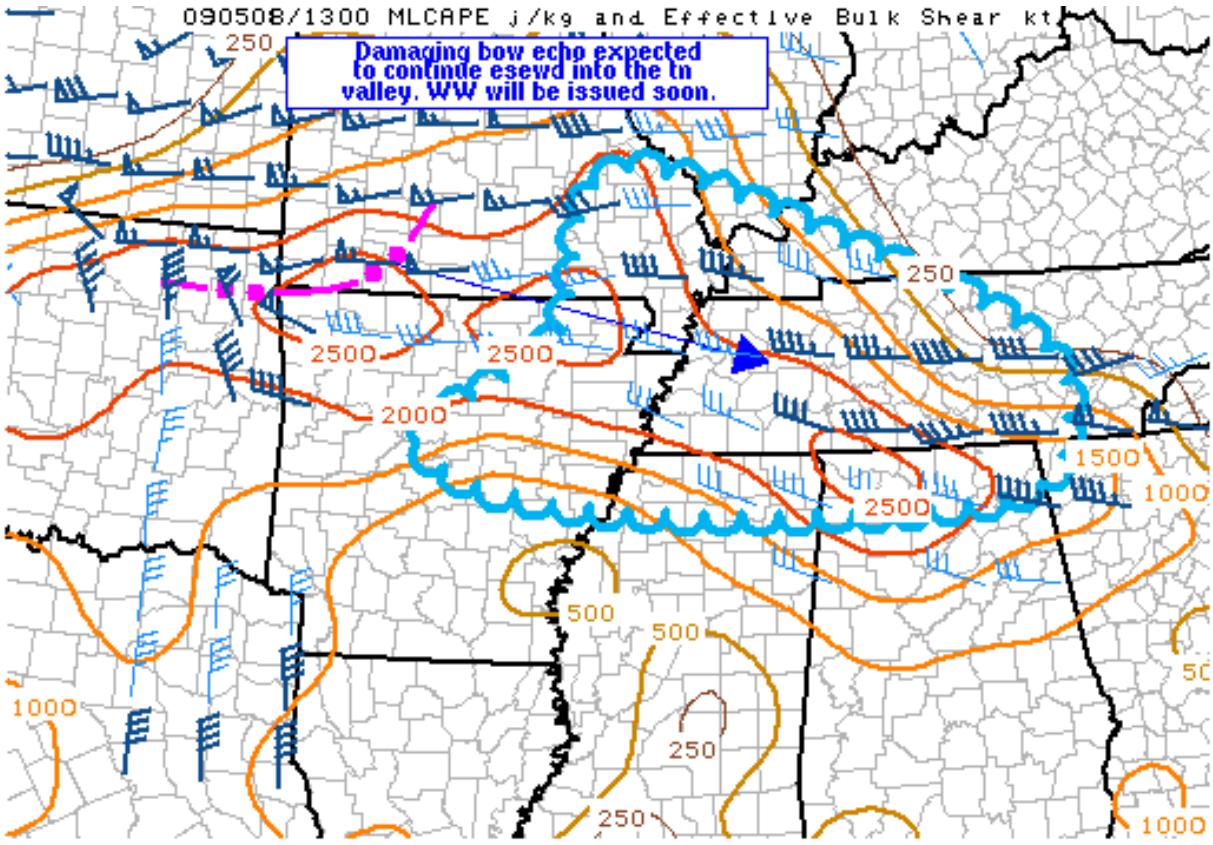
DAMAGING BOW ECHO EXPECTED TO CONTINUE ESEWD INTO THE TN VALLEY REGION. WW WILL BE ISSUED SOON DOWNSTREAM FROM WW 266.

WELL ORGANIZED DAMAGING COMMA HEAD/BOW ECHO SYSTEM WITH A HISTORY OF PRODUCING GUSTS UP TO 80 KT EXTENDS FROM SWRN MO...NWRN AR INTO NERN OK AND IS MOVING ESEWD AT AROUND 60 KT. AS BOUNDARY LAYER CONTINUES TO DESTABILIZE...THIS ACTIVITY IS EXPECTED TO DEVELOP ESEWD THROUGH AXIS OF MODERATE INSTABILITY ALONG NERN EDGE OF STRONGER CAP. DAMAGING WIND AND LARGE HAIL ARE EXPECTED TO REMAIN THE PRIMARY THREATS. HOWEVER...ISOLATED TORNADOES CANNOT BE RULED OUT...ESPECIALLY ALONG NRN AND SRN ENDS OF THE LINE.

..DIAL.. 05/08/2009

ATTN...WFO...MRX...FFC...LMK...OHX...HUN...PAH...MEG...LSX...LZK...

LAT...LON 36838732 35998554 35248520 34488602 34499069 35069283
36089123 37749054 36838732



SPC MCD #0758

Mesoscale Discussion 760

MESOSCALE DISCUSSION 0760
NWS STORM PREDICTION CENTER NORMAN OK
1108 AM CDT FRI MAY 08 2009

AREAS AFFECTED...NWRN AR AND S CNTRL MO

CONCERNING...SEVERE THUNDERSTORM WATCH 266...

VALID 081608Z - 081715Z

THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 266 CONTINUES.

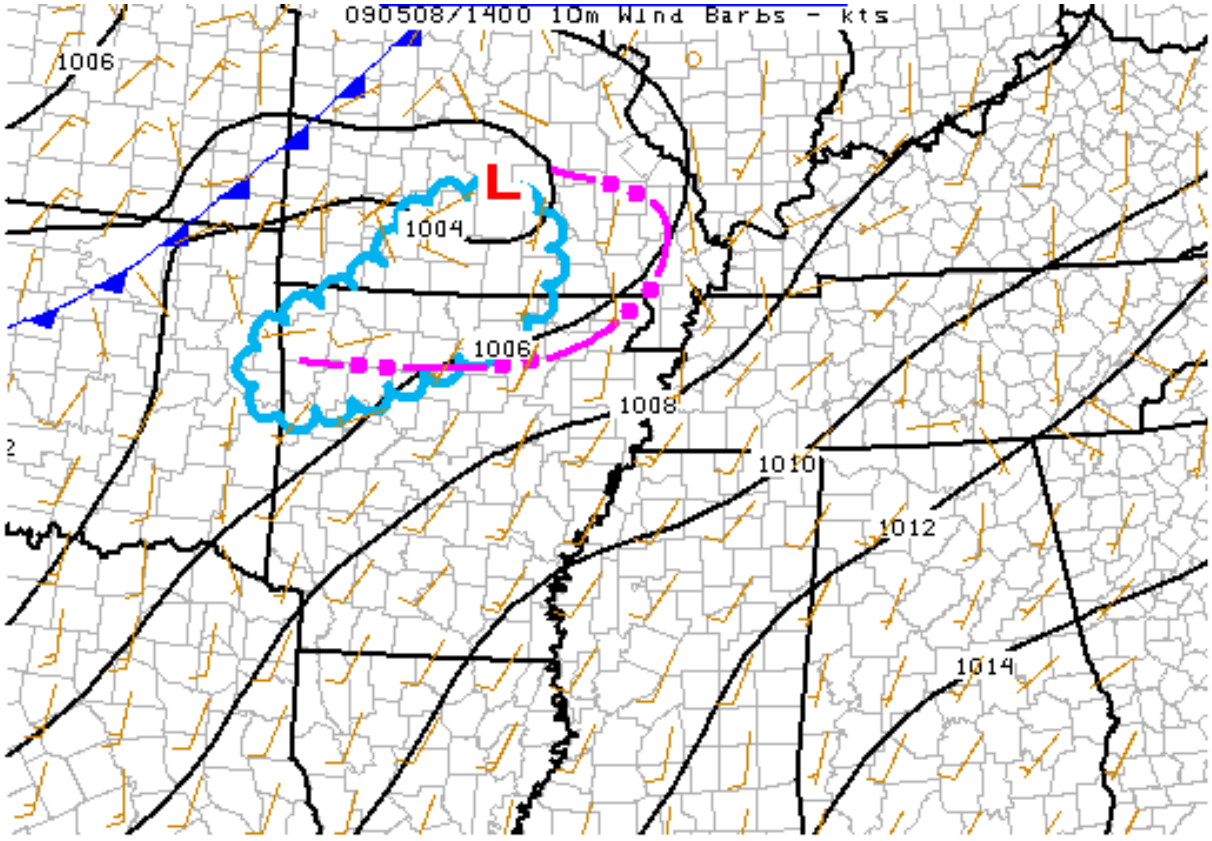
PRIMARY AND MORE SIGNIFICANT SEVERE THREAT HAS SHIFTED INTO TORNADO WATCH 267. HOWEVER...THREAT FOR MOSTLY HAIL AND POSSIBLY ISOLATED DAMAGING WIND GUSTS MAY PERSIST IN REMAINING PARTS WW 266...MAINLY ACROSS NCNTRL AND NW AR NEXT HOUR. WW 266 WILL EXPIRE AT 17Z. UNLESS STORMS ALONG TRAILING END OF OUTFLOW BOUNDARY BEGIN TO SHOW SIGNS OF INTENSIFICATION...ANOTHER WW FARTHER SOUTH WILL PROBABLY NOT BE NEEDED AT THIS TIME.

DAMAGING BOW ECHO HAS SHIFTED EAST OF WW 266 AND IS LOCATED FROM SERN MO SWWD THROUGH NWRN AR. TRAILING END OF OUTFLOW BOUNDARY EXTENDS WWD INTO NCNTRL AND NWRN AR AND IS MOVING SWD. MESOSCALE LIFT PRODUCED BY A STRONG 45-50 KT SWLY LOW LEVEL JET INTERSECTING THE TRAILING OUTFLOW BOUNDARY CONTINUES TO PROMOTE THUNDERSTORM DEVELOPMENT ALONG AND NORTH OF THIS FEATURE. HOWEVER...THE SWLY 850-750 MB FLOW IS RESULTING IN NEWD TRANSPORT OF WARM AIR ALOFT WITH TEMPERATURES AROUND 23C AT THE BASE OF THE EML. THIS HAS CONTRIBUTED TO A STRONG CAP ACROSS THE PRE-CONVECTIVE WARM SECTOR...WHICH SHOULD LIMIT FURTHER ROBUST THUNDERSTORM EVELOPMENT AS THE BOUNDARY CONTINUES SWD.

..DIAL.. 05/08/2009

ATTN...WFO...LZK...SGF...TSA...

LAT...LON 36129445 36549359 36689340 37019316 37399272 37329147
36259164 35249420 35669482 36129445


090508/1400 10m Wind Barbs - kts
1006
L
1004
1006
1008
1010
1012
1014

SPC MCD #0760

Appendix C: WESSL Files

I. WESSL File for Simulation 2 (SGF - Part I)

11:44:00 05/08/09 -text {The simulation has started.}

11:44:20 -command "firefox file://data/awips/2009May08_AWOC/wessl/prebrief_sgf1/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

11:44:20 -pause

11:45:00 -scrolltext {SPC AC 080551

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
1251 AM CDT FRI MAY 08 2009

VALID 081200Z - 091200Z

...OZARK PLATEAU THROUGH THE LWR OH/TN VALLEYS...
STRONGER FORCING ASSOCIATED WITH AN IMPULSE SHIFTING EAST OF THE CENTRAL ROCKIES IS BECOMING INCREASINGLY EVIDENT IN SATELLITE IMAGERY...ON THE SOUTHERN FRINGE OF THE STRONGER WESTERLIES. THIS APPEARS TO PROVIDE SUPPORT FOR THE STRONG SIGNAL AMONG MODEL DATA SUGGESTING THE EVOLUTION OF A LARGE MESOSCALE CONVECTIVE SYSTEM NEAR/NORTH OF THE KANSAS/OKLAHOMA BORDER INTO SOUTHWEST MISSOURI/ NORTHWEST ARKANSAS BY 12Z THIS MORNING.

IN THE PRESENCE OF STRONG INSTABILITY AND MODERATE TO STRONG DEEP LAYER SHEAR...A SEVERE RISK IN THE FORM OF DAMAGING WINDS/HAIL IS EXPECTED TO CARRY OVER BEYOND DAYBREAK. BUT...OF SIGNIFICANT CONCERN TO CONTINUING SEVERE POTENTIAL THROUGH THE MORNING HOURS IS SUBSTANTIAL FORECAST WEAKENING OF THE LOW-LEVEL JET AMONG SOME MODEL GUIDANCE...INCLUDING THE SREF AND 07/12Z ECMWF. IF THIS OCCURS...A CORRESPONDING WEAKENING OF THE CONVECTIVE SYSTEM MAY ENSUE...ACCOMPANIED BY SUBSTANTIAL MODIFICATION OF THE ENVIRONMENT ACROSS MUCH OF THE OZARK PLATEAU INTO PARTS OF THE LOWER OHIO AND TENNESSEE VALLEYS.

HOWEVER...MODELS MAINTAIN A STRONG CONVECTIVELY ENHANCED OR GENERATED MID-LEVEL SPEED MAXIMUM AND CYCLONIC VORTICITY CENTER EASTWARD THROUGH THE LOWER OHIO AND TENNESSEE VALLEYS DURING THE AFTERNOON AND EVENING HOURS. IN THE PRESENCE OF A MOIST AND AT LEAST MODERATELY UNSTABLE AIR MASS WITH MIXED LAYER CAPE ON THE

ORDER OF 1000-2000 J/KG...REGENERATION OF CONVECTIVE DEVELOPMENT APPEARS PROBABLE. PROGGED STRENGTHENING OF SOUTHWESTERLY 850 MB FLOW ACROSS KENTUCKY/TENNESSEE DURING THE AFTERNOON COULD YIELD LARGE ENOUGH LOW-LEVEL HODOGRAPHS TO SUPPORT THE RISK FOR TORNADOES IN MORE DISCRETE ACTIVITY. BUT...DAMAGING WINDS AND LARGE HAIL ARE EXPECTED TO BE A MORE PROMINENT THREAT AS STORM CLUSTERS EVOLVE.

IT IS A DISTINCT POSSIBILITY THAT THE LARGE-SCALE ENVIRONMENT MAY REMAIN FAVORABLE FOR THE MAINTENANCE OF THE ANTICIPATED MESOSCALE CONVECTIVE SYSTEM AT ITS EARLY MORNING STRENGTH THROUGH MUCH OF THE DAY. IF THIS BECOMES THE CASE...THE SEVERE POTENTIAL ACROSS THE OZARK PLATEAU INTO THE LOWER OHIO TENNESSEE VALLEYS MAY BE CONSIDERABLY GREATER THAN CURRENTLY DEPICTED IN THE CATEGORICAL OUTLOOK.

..KERR/JEWELL.. 05/08/2009}
-image /data/awips/2009May08_AWOC/wessl/images/day1otlk_20090508_1200_prt.gif

11:46:00 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1200_hail_prt.gif

11:46:20 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1200_torn_prt.gif

11:46:40 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1200_wind_prt.gif

11:47:00 -scrolltext {URGENT - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WATCH NUMBER 266
NWS STORM PREDICTION CENTER NORMAN OK
455 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
SEVERE THUNDERSTORM WATCH FOR PORTIONS OF

NORTHERN ARKANSAS
SOUTHEAST KANSAS
SOUTHERN MISSOURI
NORTHEAST OKLAHOMA

EFFECTIVE THIS FRIDAY MORNING FROM 455 AM UNTIL NOON CDT.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

EXTREMELY DAMAGING THUNDERSTORM WIND GUSTS TO 80 MPH...LARGE HAIL TO 2 INCHES IN DIAMETER...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

DISCUSSION...A LARGE CLUSTER OF INTENSE CONVECTION OVER SOUTHEAST KS WILL LIKELY ORGANIZE INTO A BOW ECHO THIS MORNING AND RACE EAST-SOUTHEASTWARD ACROSS SOUTHWEST MO/NORTHEAST OK/NORTHWEST AR. HIGH INSTABILITY AND RATHER STRONG WESTERLY FLOW ALOFT SUGGEST THAT A CORRIDOR OF SIGNIFICANT DAMAGING WINDS IS POSSIBLE THROUGH THE MID MORNING. LARGE HAIL WILL ALSO REMAIN POSSIBLE IN THE STRONGEST STORMS.

...HART} -image /data/awips/2009May08_AWOC/wessl/images/ww0266_overview.gif

11:49:00 -text {The following warning is already in effect for your CWA:
BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE SPRINGFIELD MO
616 AM CDT FRI MAY 8 2009
THE NATIONAL WEATHER SERVICE IN SPRINGFIELD HAS ISSUED A

* SEVERE THUNDERSTORM WARNING FOR...
  CHEROKEE COUNTY IN SOUTHEAST KANSAS...
  NORTHWESTERN JASPER COUNTY IN SOUTHWEST MISSOURI...
  SOUTHWESTERN BARTON COUNTY IN SOUTHWEST MISSOURI...
  SOUTHERN CRAWFORD COUNTY IN SOUTHEAST KANSAS...

* UNTIL 700 AM CDT.

* AT 613 AM CDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED
  SEVERE THUNDERSTORMS ALONG A LINE EXTENDING FROM 29 MILES WEST OF
  GREENBUSH TO 31 MILES WEST OF SHERMAN...MOVING SOUTHEAST AT 70
  MPH. THESE STORMS ARE CAPABLE OF PRODUCING QUARTER SIZE
  HAIL...AND DESTRUCTIVE WINDS IN EXCESS OF 80 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS...
THESE STORMS HAVE A HISTORY OF PRODUCING WIDESPREAD WIND DAMAGE ACROSS SOUTHEAST KANSAS. THIS IS AN EXTREMELY DANGEROUS SITUATION. SEEK SHELTER NOW INSIDE A STURDY STRUCTURE AND STAY AWAY FROM WINDOWS. DOPPLER RADAR HAS INDICATED SOME ROTATION WITH THESE STORMS. WHILE NOT IMMEDIATELY LIKELY...A TORNADO MAY STILL DEVELOP. IF A TORNADO IS SPOTTED...ACT QUICKLY AND MOVE TO A PLACE OF SAFETY IN A STURDY STRUCTURE.
&&
LAT...LON 3757 9507 3747 9446 3694 9459 3699 9467
        3700 9508
TIME...MOT...LOC 1114Z 310DEG 61KT 3753 9550 3723 9561
        3701 9599
$$

CSS}

11:53:00 -text {(6:53 AM CDT Cherokee County): The Cherokee County Sheriff's Department reported estimated 70 mph winds 2 miles northeast of Faulkner.} -image /data/awips/2009May08_AWOC/wessl/images/1153Faulknerwind.png

12:00:00 -text {(7:00 AM CDT Crawford County): A trained spotter called to report numerous trees down with one tree down on a house in Frontenac.} -image /data/awips/2009May08_AWOC/wessl/images/1200Frontenacwind.png

12:08:00 -text {(7:08 AM CDT Cherokee County): A spotter calls to report 10 inch tree limbs down along with numerous other tree damage in Weir and estimated the winds at over 60mph.} -image /data/awips/2009May08_AWOC/wessl/images/1208Weirwind.png

12:09:00 -scrolltext {SPC AC 081139

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0709 AM CDT FRI MAY 08 2009

VALID 081300Z - 091130Z

...DERECHO IN PROGRESS THIS MORNING OVER SOUTHERN MO/NORTHERN AR...

...MID MS VALLEY...
MATURE BOW ECHO NOW OVER SOUTHWEST MO IS EXPECTED TO MAINTAIN INTENSITY AND TRACK EAST-SOUTHEASTWARD ACROSS SOUTHERN MO AND NORTHERN AR THROUGH THIS MORNING. WIDESPREAD DAMAGING WINDS ARE BEING REPORTED WITH THIS BOW...AND WILL LIKELY CONTINUE AT LEAST AS FAR EAST AS THE MS RIVER. FROM THERE EASTWARD...FORECAST IS MORE UNCERTAIN DUE TO EFFECTS OF NOCTURNAL MCS THAT TRACKED ACROSS KY/TN OVERNIGHT. POTENTIAL EXISTS FOR AN ENHANCED THREAT OF DAMAGING WINDS AND ISOLATED TORNADOES AS MO CONVECTIVE SYSTEM INTERACTS WITH REMNANT OUTFLOW BOUNDARY OVER WESTERN KY/TN...WHERE LOW LEVEL VERTICAL SHEAR PROFILES MAY BE STRONGER.

..HART/HURLBUT.. 05/08/2009} -image /data/awips/2009May08_AWOC/wessl/images/day1otlk_20090508_1300_prt.gif

12:09:20 -image /data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_hail_prt.gif

12:09:40 -image /data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_torn_prt.gif

12:10:00 -image /data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_wind_prt.gif

12:10:20 -response -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer, and answer the following question by typing your message(s) below.

A local media member in NWSChat is asking:
“What do you expect to happen this morning?”

AFTER CLICKING “OK”, RESUME SIMULATION BY CLICKING “RESUME SIMULATION” IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

12:10:20 -pause

12:10:40 -text {(7:10 AM CDT Barton County): A trained storm spotter reports metal wrapped around trees, trees snapped off 10 feet above the ground and a barn destroyed 2 miles east of Liberal.} -image /data/awips/2009May08_AWOC/wessl/images/1210Liberalwind.png

12:12:00 -text {(7:12 AM CDT Jasper County): The Joplin Police Department reports a mobile home roof blown off at Blackcat Rd and Bell Center Rd in Joplin.} -image /data/awips/2009May08_AWOC/wessl/images/1212Joplinwind.png

12:15:00 -text {(7:15 AM CDT Jasper County): A co-op observer in Joplin just reported 70 mph winds at his house in Joplin.} -image /data/awips/2009May08_AWOC/wessl/images/1212Joplinwind.png

12:16:00 -text {(7:16 AM CDT Jasper County): The Joplin Emergency Manager just relayed a report of golf ball sized hail in Joplin.} -image /data/awips/2009May08_AWOC/wessl/images/1217Joplinhail.png

12:17:00 -scrolltext {

MESOSCALE DISCUSSION 0757
NWS STORM PREDICTION CENTER NORMAN OK
0717 AM CDT FRI MAY 08 2009

AREAS AFFECTED...SERN KS...NERN OK...SRN MO...NRN AR

CONCERNING...SEVERE THUNDERSTORM WATCH 266...

VALID 081217Z - 081315Z

THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 266 CONTINUES.

DAMAGING SQUALL LINE IS MOVING ESEWD AT 60 KT AS MCS BEGINS TO TURN A BIT MORE SWD ALONG EDGE OF STRONG CAP OVER OK. ADDITIONALLY...A FEW SUPERCELLS HAVE RECENTLY DEVELOPED WITHIN WARM ADVECTION PORTION OF THIS MCS...AHEAD OF PRIMARY BOW WITHIN SEVERAL NW-SE ORIENTED LINES. IN SUPPORT OF THIS DEVELOAMENT THE 12Z SOUNDING FROM SGF IS VERY UNSTABLE WITH MUCAPE ON THE ORDER OF 3500-4000 J/KG IF LIFTING A PARCEL JUST OFF THE SFC NEAR 900 MB. NEEDLESS TO SAY WIDESPREAD SIGNIFICANT DAMAGE WILL ACCOMPANY THE BOW AS IT RACES ALONG THE MO/AR BORDER OVER THE NEXT FEW HOURS. AT THIS SPEED IT WILL APPROACH THE SERN PORTIONS OF THE WATCH BETWEEN 15-16Z.

..DARROW.. 05/08/2009} -image /data/awips/2009May08_AWOC/wessl/images/mcd0757.gif

12:19:00 -text {(7:19 AM CDT Jasper County): The Carthage ASOS station just measured a 93 mph wind gust.} -image /data/awips/2009May08_AWOC/wessl/images/1215Carthagewind.png

12:20:00 -text {(7:20 AM CDT Cherokee County): A storm spotter just called to report estimated 70 mph winds in Columbus.} -image /data/awips/2009May08_AWOC/wessl/images/1220Columbuswind.png

12:21:00 -text {(7:21 AM CDT Jasper County): The Carthage Fire Department is reporting 3ft diameter trees down in Carthage.} -image /data/awips/2009May08_AWOC/wessl/images/1210Carthagewind.png

12:23:00 -text {(7:23 AM CDT Jasper County): The Jasper County Sheriff's Department called to report golf ball sized hail in East Joplin and Carthage.} -image /data/awips/2009May08_AWOC/wessl/images/1223Carthagehail.png

12:26:00 -text {(7:26 AM CDT Newton County): A trained storm spotter reports 1 inch hail 3 miles west of Diamond.} -image /data/awips/2009May08_AWOC/wessl/images/1226Diamondhail.png

12:30:00 -text {(7:30 AM CDT Newton County): The Newton Emergency Manager is forwarding numerous reports of trees down near Diamond and roof damage to a metal building, winds were estimated at 70mph.} -image /data/awips/2009May08_AWOC/wessl/images/1230Diamondwind.png

12:30:20 -text {(7:30 AM CDT Jasper County): A trained storm spotter reports roof damage and numerous trees down around the city of Carl Junction.} -image /data/awips/2009May08_AWOC/wessl/images/1230Carljunctionwindl.png

12:34:00 -text {(7:34 AM CDT Barton County): A storm spotter reports tree damage and numerous trees down from Liberal to Lamar.} -image /data/awips/2009May08_AWOC/wessl/images/1234Liberalwind.png

12:42:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer.

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

12:42:00 -pause

12:45:00 -text {(7:45 AM CDT Barry County): A storm spotter reports numerous trees uprooted, power poles down, 3 roofs removed from houses and 4 storage sheds blown over in Monett. Winds were measured at 70 mph.} -image /data/awips/2009May08_AWOC/wessl/images/1250Monettwind.png

12:49:00 -text {(7:49 AM CDT Jasper County): The Jasper County Emergency manager reports numerous tree limbs blown down with winds measured at 65mph. } -image /data/awips/2009May08_AWOC/wessl/images/1249Carterville.png

12:53:00 -text {(7:53 AM CDT Dade County): A storm chaser is reporting a tornado 3 miles southeast of Greenfield.} -image /data/awips/2009May08_AWOC/wessl/images/1253Greenfieldtor.png

13:00:20 -text {(8:00 AM CDT Barry County): A storm spotter reports trees blown down 6 miles south-southeast of Cassville.} -image /data/awips/2009May08_AWOC/wessl/images/1300Cassvillewind.png

13:06:00 -text {(8:06 AM CDT Greene County): A storm spotter reports a tornado on the ground in Republic.} -image /data/awips/2009May08_AWOC/wessl/images/1303Republictor.png

13:09:00 -text {(8:09 AM CDT Miller County): The Iberia Police Department reports half dollar sized hail in Iberia.} -image /data/awips/2009May08_AWOC/wessl/images/1309Iberiahail.png

13:09:20 -command "firefox file://data/awips/2009May08_AWOC/wessl/postbrief_sgf1/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

13:09:20 -pause

13:10 -text {The simulation has ended.}

II. WESSL File for Simulation 3 (SGF - Part II)

13:10:00 05/08/09-text {The simulation has started.}

13:10:30 -command "firefox file://data/awips/2009May08_AWOC/wessl/prebrief_sgf2/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

13:10:30 -pause

13:11:00 -scrolltext {URGENT - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WATCH NUMBER 266
NWS STORM PREDICTION CENTER NORMAN OK
455 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
SEVERE THUNDERSTORM WATCH FOR PORTIONS OF

NORTHERN ARKANSAS
SOUTHEAST KANSAS
SOUTHERN MISSOURI
NORTHEAST OKLAHOMA

EFFECTIVE THIS FRIDAY MORNING FROM 455 AM UNTIL NOON CDT.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

EXTREMELY DAMAGING THUNDERSTORM WIND GUSTS TO 80 MPH...LARGE HAIL TO 2 INCHES IN DIAMETER...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

DISCUSSION...A LARGE CLUSTER OF INTENSE CONVECTION OVER SOUTHEAST KS WILL LIKELY ORGANIZE INTO A BOW ECHO THIS MORNING AND RACE EAST-SOUTHEASTWARD ACROSS SOUTHWEST MO/NORTHEAST OK/NORTHWEST AR. HIGH INSTABILITY AND RATHER STRONG WESTERLY FLOW ALOFT SUGGEST THAT A CORRIDOR OF SIGNIFICANT DAMAGING WINDS IS POSSIBLE THROUGH THE MID MORNING. LARGE HAIL WILL ALSO REMAIN POSSIBLE IN THE STRONGEST STORMS.

...HART} -image /data/awips/2009May08_AWOC/wessl/images/ww0266_overview.gif

13:11:30 -scrolltext {SPC AC 081139

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0709 AM CDT FRI MAY 08 2009

VALID 081300Z - 091130Z

...DERECHO IN PROGRESS THIS MORNING OVER SOUTHERN MO/NORTHERN AR...

...MID MS VALLEY...
MATURE BOW ECHO NOW OVER SOUTHWEST MO IS EXPECTED TO MAINTAIN INTENSITY AND TRACK EAST-SOUTHEASTWARD ACROSS SOUTHERN MO AND NORTHERN AR THROUGH THIS MORNING. WIDESPREAD DAMAGING WINDS ARE BEING REPORTED WITH THIS BOW...AND WILL LIKELY CONTINUE AT LEAST AS FAR EAST AS THE MS RIVER. FROM THERE EASTWARD...FORECAST IS MORE UNCERTAIN DUE TO EFFECTS OF NOCTURNAL MCS THAT TRACKED ACROSS KY/TN OVERNIGHT. POTENTIAL EXISTS FOR AN ENHANCED THREAT OF DAMAGING WINDS AND ISOLATED TORNADOES AS MO CONVECTIVE SYSTEM INTERACTS WITH REMNANT OUTFLOW BOUNDARY OVER WESTERN KY/TN...WHERE LOW LEVEL VERTICAL SHEAR PROFILES MAY BE STRONGER.

..HART/HURLBUT.. 05/08/2009} -image
/data/awips/2009May08_AWOC/wessl/images/day1otlk_20090508_1300_prt.gif

13:12:00 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_hail_prt.gif

13:12:20 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_torn_prt.gif

13:12:40 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_wind_prt.gif

13:13:00 -scrolltext {

MESOSCALE DISCUSSION 0757
NWS STORM PREDICTION CENTER NORMAN OK
0717 AM CDT FRI MAY 08 2009

AREAS AFFECTED...SERN KS...NERN OK...SRN MO...NRN AR

CONCERNING...SEVERE THUNDERSTORM WATCH 266...

VALID 081217Z - 081315Z

THE SEVERE WEATHER THREAT FOR SEVERE THUNDERSTORM WATCH 266 CONTINUES.

DAMAGING SQUALL LINE IS MOVING ESEWD AT 60 KT AS MCS BEGINS TO TURN A BIT MORE SWD ALONG EDGE OF STRONG CAP OVER OK. ADDITIONALLY...A FEW SUPERCELLS HAVE RECENTLY DEVELOPED WITHIN WARM ADVECTION POR-TION OF THIS MCS...AHEAD OF PRIMARY BOW WITHIN SEVERAL NW-SE ORIENTED

LINES. IN SUPPORT OF THIS DEVELOPMENT THE 12Z SOUNDING FROM SGF IS VERY UNSTABLE WITH MUCAPE ON THE ORDER OF 3500-4000 J/KG IF LIFTING A PARCEL JUST OFF THE SFC NEAR 900 MB. NEEDLESS TO SAY WIDESPREAD SIGNIFICANT DAMAGE WILL ACCOMPANY THE BOW AS IT RACES ALONG THE MO/AR BORDER OVER THE NEXT FEW HOURS. AT THIS SPEED IT WILL APPROACH THE SERN PORTIONS OF THE WATCH BETWEEN 15-16Z.

..DARROW.. 05/08/2009} -image /data/awips/2009May08_AWOC/wessl/images/mcd0757.gif

13:13:30 -text {(8:13 AM CDT) The following warning is currently in effect for your CWA:

WFUS53 KSGF 081304
TORSGF
MOC077-081320-
/O.NEW.KSGF.TO.W.0001.090508T1304Z-090508T1320Z/
BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE SPRINGFIELD MO
804 AM CDT FRI MAY 8 2009
THE NATIONAL WEATHER SERVICE IN SPRINGFIELD HAS ISSUED A

* TORNADO WARNING FOR...
  GREENE COUNTY IN SOUTHWEST MISSOURI...

* UNTIL 820 AM CDT.

* AT 803 AM CDT...NATIONAL WEATHER SERVICE DOPPLER RADAR WAS TRACKING A CONFIRMED TORNADO NEAR REPUBLIC...MOVING NORTHEAST AT 55 MPH.

IN ADDITION TO A TORNADO...THIS STORM IS CAPABLE OF PRODUCING DESTRUCTIVE STRAIGHT LINE WINDS IN EXCESS OF 80 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

THE SAFEST PLACE TO BE DURING A TORNADO IS IN A BASEMENT. GET UNDER A WORKBENCH OR OTHER PIECE OF STURDY FURNITURE. IF NO BASEMENT IS AVAILABLE...SEEK SHELTER ON THE LOWEST FLOOR OF THE BUILDING IN AN INTERIOR HALLWAY OR ROOM SUCH AS A CLOSET. USE BLANKETS OR PILLOWS TO COVER YOUR BODY AND ALWAYS STAY AWAY FROM WINDOWS.
IF IN MOBILE HOMES OR VEHICLES...EVACUATE THEM AND GET INSIDE A SUBSTANTIAL SHELTER. IF NO SHELTER IS AVAILABLE...LIE FLAT IN THE NEAREST DITCH OR OTHER LOW SPOT AND COVER YOUR HEAD WITH YOUR HANDS.

&&

LAT...LON 3710 9335 3710 9351 3714 9354 3742 9329

3741 9307 3737 9307 3734 9307 3734 9308
3727 9307 3709 9308 3709 9335
TIME...MOT...LOC 1305Z 242DEG 33KT 3711 9348
$$

VLD}

13:14:00 -text {(8:14 AM CDT) The following warning is currently in effect for your CWA:

WUUS53 KSGF DDHHMM
SVRSGF
MOC039-043-057-077-109-167-081215-
/O.NEW.KSGF.SV.W.0001.090508T1250Z-090508T1320Z

BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE SPRINGFIELD MO
750 AM CDT FRI MAY 8 2009

THE NATIONAL WEATHER SERVICE IN SPRINGFIELD HAS ISSUED A

* SEVERE THUNDERSTORM WARNING FOR...
  SOUTHERN CEDAR COUNTY IN SOUTHWEST MISSOURI...
  NORTHWESTERN CHRISTIAN COUNTY IN SOUTHWEST MISSOURI...
  DADE COUNTY IN SOUTHWEST MISSOURI...
  GREENE COUNTY IN SOUTHWEST MISSOURI...
  NORTHEASTERN LAWRENCE COUNTY IN SOUTHWEST MISSOURI...
  POLK COUNTY IN SOUTHWEST MISSOURI...

* UNTIL 820 AM CDT

* AT 748 AM CDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A LINE OF SEVERE THUNDERSTORMS CAPABLE OF PRODUCING DESTRUCTIVE WINDS IN EXCESS OF 80 MPH. THESE STORMS WERE LOCATED ALONG A LINE EXTENDING FROM 2 MILES SOUTH OF MONTEVALLO TO 5 MILES SOUTH OF GREENFIELD TO 5 MILES NORTH OF AURORA...AND MOVING EAST AT 65 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

DOPPLER RADAR HAS INDICATED SOME WEAK ROTATION WITHIN THIS STORM. WHILE NOT IMMEDIATELY LIKELY...A TORNADO MAY STILL DEVELOP. IF A TORNADO IS SPOTTED...ACT QUICKLY AND MOVE TO A PLACE OF SAFETY IN A STURDY STRUCTURE...SUCH AS A BASEMENT OR SMALL INTERIOR ROOM.

FOR YOUR PROTECTION MOVE TO AN INTERIOR ROOM ON THE LOWEST FLOOR OF YOUR HOME OR BUSINESS. THIS STORM HAS THE POTENTIAL TO CAUSE SERIOUS INJURY AND SIGNIFICANT DAMAGE TO PROPERTY.

THIS STORM HAS A HISTORY OF PRODUCING WIDESPREAD WIND DAMAGE ACROSS...BARTON COUNTY AND JASPER COUNTY IN SOUTHWEST MISSOURI... CHEROKEE COUNTY AND CRAWFORD COUNTY IN EAST KANSAS. THIS IS AN EXTREMELY DANGEROUS SITUATION. SEEK SHELTER NOW INSIDE A STURDY STRUCTURE AND STAY AWAY FROM WINDOWS!

&&

LAT...LON 3780 9343 3742 9322 3698 9313 3704 9378
3729 9395 3778 9405
TIME...MOT...LOC 1248Z 275DEG 55KT 3770 9411 3734 9386
3704 9372
$$

SMM}

13:15:00 -text {(8:15 AM CDT Greene County): A storm chaser spotted a tornado 4 miles southeast of Willard, "I see debris from a house in the air!"} -image /data/awips/2009May08_AWOC/wessl/images/1306Willardtor.png

13:16:00 -text {(8:16 AM CDT Stone County): A Wal-Mart employee calls to report an AC unit blown off the roof of their store northeast of Kimberling City.} -image /data/awips/2009May08_AWOC/wessl/images/1315KimberlingCitywind.png

13:17:00 -text {(8:17 AM CDT Polk County): The Morrisville Emergency Manager reports major damage to the Morrisville school gymnasium.} -image /data/awips/2009May08_AWOC/wessl/images/1325Morrisvillewind.png

13:18:00 -text {(8:18 AM CDT Polk County): The Polk County Sheriff just called to report a tornado on the ground near Brighton.} -image /data/awips/2009May08_AWOC/wessl/images/1318Brightontor.png

13:19:20 -text {(8:19 AM CDT Greene County): KYTV in Springfield reported 70 mph winds at Battlestone and Glenstone.} -image /data/awips/2009May08_AWOC/wessl/images/1319Springfieldwind.png

13:20:00 -text {(8:20 AM CDT Greene County): The public reported a garage roof lifted and thrown into an electrical substation several miles northeast of Ash Grove.} -image /data/awips/2009May08_AWOC/wessl/images/1320Ashgrovewind.png

13:20:20 -text {(8:20 AM CDT Greene County): The Springfield Police Department estimated 70 mph winds in Springfield.} -image /data/awips/2009May08_AWOC/wessl/images/1255Springfieldwind.png

13:21:00 -text {(8:21 AM CDT Dade County): An off duty NWS employee reported large trees down 3 miles southeast of Greenfield.} -image /data/awips/2009May08_AWOC/wessl/images/1321Greenfieldwind.png

13:22:00 -text {(8:22 AM CDT Greene County): A storm chaser calls to report a tornado near Ebenezer.} -image /data/awips/2009May08_AWOC/wessl/images/1315Ebenezertor.png

13:23:00 -text {(8:23 AM CDT Christian County): The Christian County Emergency Manager calls to report roof damage to the Riverside nursing home in Ozark, a 12 inch tree was also snapped off.} -image /data/awips/2009May08_AWOC/wessl/images/1315Ozarkwind.png

13:25:20 -text {(8:25 AM CDT Taney County): Trained storm spotters reported 80 mph winds in Forsythe.} -image /data/awips/2009May08_AWOC/wessl/images/1325Forsythwind.png

13:27:00 -text {(8:27 AM CDT Greene County): The Springfield Police Department reported a roof blown off a house and outbuilding at FR115 and HWY 60 in Springfield.} -image /data/awips/2009May08_AWOC/wessl/images/1332Springfieldwind.png

13:30:00 -text {(8:30 AM CDT Christian County): A storm chaser reported a tornado tearing up trees near Garrison.} -image /data/awips/2009May08_AWOC/wessl/images/1335Garrisontor.png

13:31:00 -text {(8:31 AM CDT Christian County): A storm chaser reports 6 inch tree limbs down in Nixa.} -image /data/awips/2009May08_AWOC/wessl/images/1330Nixawind.png

13:32:00 -response -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer, and answer the following question by typing your message(s) below.

How are you going to convey to the public and NWS partners the seriousness of the wind speeds expected behind the derecho?

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

13:32:00 -pause

13:33:00 -text {(8:33 AM CDT Taney County): A storm spotter reported nickel sized hail in Hollister.} -image /data/awips/2009May08_AWOC/wessl/images/1333Hollisterhail.png

13:34:20 -text {(8:34 AM CDT Taney County): The Taney County Sheriff's Department reports power poles down 2 miles south-southeast of Bradleyville.} -image /data/awips/2009May08_AWOC/wessl/images/1400Bradleyvillewind.png

13:35:00 -text {(8:35 AM CDT Hickory County): A storm spotter reported a cabin roof torn off 4 miles west of Pittsburg.} -image /data/awips/2009May08_AWOC/wessl/images/1335Pittsburgwind.png

13:38:00 -text {(8:38 AM CDT Webster County): A Fordland resident called to report a tornado in Fordland.} -image /data/awips/2009May08_AWOC/wessl/images/1345Fordlandtor.png

13:39:00 -text {(8:39 AM CDT Webster County): The Webster County Sheriff's Department reports a tornado near Fordland.} -image /data/awips/2009May08_AWOC/wessl/images/1330Fordlandtor.png

13:40:00 -text {(8:40 AM CDT Dallas County): A trained spotter reports a tornado on the ground 3 miles southwest of Charity.} -image /data/awips/2009May08_AWOC/wessl/images/1327Charitytor.png

13:40:20 -text {(8:40 AM CDT Greene County): The Greene County Emergency Manager reported winds estimated at 80 mph with significant tree, power line and roof damage throughout Willard.} -image /data/awips/2009May08_AWOC/wessl/images/1340Willardwind.png

13:40:40 -text {(8:40 AM CDT Douglas County): A storm chaser calls to report a tornado on the ground 3 miles west of Goodhope "It's almost a mile wide!"} -image /data/awips/2009May08_AWOC/wessl/images/1355Goodhopetor.png

13:43:00 -text {(8:43 AM CDT Greene County): The Ash Grove Police Department reported windows blown out and structural damage to buildings in Ash Grove.} -image /data/awips/2009May08_AWOC/wessl/images/1343Ashgrovewind.png

13:43:20 -text {(8:43 AM CDT Polk County): A Polk County Sheriff's Deputy reported 70 mph winds which caused roof damage and blew down numerous trees in Morrisville.} -image /data/awips/2009May08_AWOC/wessl/images/1343Morrisvillewind.png

13:46:00 -text {(8:46 AM CDT Webster County): A storm spotter reports minor damage to multiple structures in Seymour.} -image /data/awips/2009May08_AWOC/wessl/images/1330Seymourwind.png

13:47:00 -text {(8:47 AM CDT Douglas County): A Missouri state trooper reports a barn and tractor blocking HWY O in Rome.} -image /data/awips/2009May08_AWOC/wessl/images/1347Goodhopewind.png

13:49:00 -text {(8:49 AM CDT Douglas County): An off-duty NWS employee reports a tornado 4 miles north of Ava} -image /data/awips/2009May08_AWOC/wessl/images/1400Avator.png

13:49:20 -text {(8:49 AM CDT Polk County): The Polk County Emergency Manager called to report trees down on cars and homes in Bolivar with rescues being performed to remove people from their vehicles.} -image /data/awips/2009May08_AWOC/wessl/images/1400Bolivarwind.png

13:50:00 -text {(8:50 AM CDT Ozark County): A storm chaser called to report a tornado 3 miles southwest of Wasola.} -image /data/awips/2009May08_AWOC/wessl/images/1415Wasolator.png

13:53:00 -text {(8:53 AM CDT Douglas County): An Ava resident and trained spotter measured 75 mph winds in Ava.} -image /data/awips/2009May08_AWOC/wessl/images/1340Avawind.png

13:54:00 -text {(8:54 AM CDT Dallas County): A trucker reported large trees uprooted near HWY 65 near Louisburg.} -image /data/awips/2009May08_AWOC/wessl/images/1335Louisburgwind.png

13:57:00 -text {(8:57 AM CDT Webster County): The Webster County Sheriff's Department just reported an outbuilding destroyed and numerous trees greater than 18" in diameter uprooted or snapped 5 miles east of Niangua.} -image /data/awips/2009May08_AWOC/wessl/images/1415Nianguawind.png

14:00:00 -text {(9:00 AM CDT Dallas County): A Dallas County Sheriff's deputy reported numerous trees and an Alltel tower down 3 miles south of Buffalo.} -image /data/awips/2009May08_AWOC/wessl/images/1344Buffalowind.png

14:05:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer.

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

14:05:00 -pause

14:07:00 -text {(9:07 AM CDT Dallas County): A resident reported trees down in Windyville.} -image /data/awips/2009May08_AWOC/wessl/images/1407Windyvillewind.png

14:07:20 -text {(9:07 AM CDT Wright County): The Hartville Police Department calls to report trees being uprooted by a tornado several miles northwest of Hartville.} -image /data/awips/2009May08_AWOC/wessl/images/1402Hartvilletor.png

14:12:00 -text {(9:12 AM CDT Wright County): The Norwood Post Office just called to report their roof was blown off.} -image /data/awips/2009May08_AWOC/wessl/images/1400Norwoodwind.png

14:14:00 -text {(9:14 AM CDT Greene County): The Ebenezer Fire Department called to report their fire station was heavily damaged.} -image /data/awips/2009May08_AWOC/wessl/images/1414Ebenezerwind.png

14:20:00 -scrolltext { The Storm Prediction Center has issued Tornado Watch 267 which includes Oregon, Shannon and Dent counties until 4pm CDT. Tornadoes, Hail to 2.5 inches in diameter and thunderstorm wind gusts to 105 mph are possible in these areas.} -image /data/awips/2009May08_AWOC/wessl/images/ww0267_overview_SGFonly.GIF

14:22:00 -text {(9:22 AM CDT Texas County): A storm chaser reported a tornado 4 miles east of Mountain Grove.} -image
/data/awips/2009May08_AWOC/wessl/images/1422MountainGrovetor.png

14:23:00 -text {(9:23 AM CDT Laclede County): A trained spotter called to report several homes damaged in Conway.} -image
/data/awips/2009May08_AWOC/wessl/images/1423Conwaywind.png

14:24:00 -text {(9:24 AM CDT Laclede County): The Laclede County Sheriff's Department reported a tornado on the ground near Falcon Rd 8 miles east of Lebanon.} -image
/data/awips/2009May08_AWOC/wessl/images/1444Lebanontor.png

14:26:00 -text {(9:26 AM CDT Wright County): Wright County Emergency Manager is relaying several reports received to his office of trees blown down as well as a building damaged in Hartville.} -image /data/awips/2009May08_AWOC/wessl/images/1345Hartvillewind.png

14:27:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer.

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

14:27:00 -pause

14:29:00 -text {(9:29 AM CDT Howell County): Chief of the Pomona Fire Department calls to report a tornado on the ground 1 mile south of Pomona.} -image
/data/awips/2009May08_AWOC/wessl/images/1500WestPomonator.png

14:30:00 -text {(9:30 AM CDT Howell County): A resident reported a 50-foot tall, 3-foot diameter Oak Tree blown down 5 miles east of Willow Springs.} -image
/data/awips/2009May08_AWOC/wessl/images/1430WillowSpringswind.png

14:30:20 -text {(9:30 AM CDT Laclede County): A storm chaser reported a tornado 6 miles southeast of Lebanon.} -image
/data/awips/2009May08_AWOC/wessl/images/1440Lebanontor.png

14:34:00 -text {(9:34 AM CDT Howell County): A citizen reported house damage 1 mile N of West Plains and says, "I think it was a tornado"} -image /data/awips/2009May08_AWOC/wessl/images/1445WestPlainswind.png

14:35:00 -text {(9:35 AM CDT Howell County): A storm chaser called to report a large tornado on the ground 4 miles west northwest of Peace Valley.} -image /data/awips/2009May08_AWOC/wessl/images/1435PeaceValleytor.png

14:35:20 -text {(9:35 AM CDT Howell County): The Howell County Sheriff's Department called to report a tornado 8 miles west of Mountain View.} -image /data/awips/2009May08_AWOC/wessl/images/1435MountainViewtor.png

14:44:00 -text {(9:44 AM CDT Texas County): A storm spotter just called to report a tornado 4 miles east of Hazelton.} -image /data/awips/2009May08_AWOC/wessl/images/1444Hazeltontor.png

14:44:20 -text {(9:44 AM CDT Texas County): The Texas County Emergency Manager called to report several large trees down in Ft. Wood with Cocker and Plato without power.} -image /data/awips/2009May08_AWOC/wessl/images/1500Platowind.png

14:45:00 -text {(9:45 AM CDT Oregon County): The Koshkonong Police Department called to report significant tree damage and windows blown out of homes.} -image /data/awips/2009May08_AWOC/wessl/images/1445Koskkonongwind.png

14:50:00 -text {(9:50 AM CDT Shannon County): The Shannon County Emergency Manager reports numerous structures damaged 6 miles south of Summersville.} -image /data/awips/2009May08_AWOC/wessl/images/1500Summersvillewind.png

14:53:00 -text {(9:53 AM CDT Shannon County): A storm chaser called to report a large wedge tornado 5 miles southwest of Alley Spring.} -image /data/awips/2009May08_AWOC/wessl/images/1445AlleySpringtor.png

15:00:00 -text {(10:00 AM CDT Shannon County): The Eminence Police Department called to report numerous trees down in the city.} -image /data/awips/2009May08_AWOC/wessl/images/1500Eminencewind.png

15:01:00 -text {(10:00 AM CDT Shannon County):A spotter reported numerous 3 foot diameter trees down 20 miles northwest of Eminence} -image /data/awips/2009May08_AWOC/wessl/images/1500Eminencewind.png

15:02:00 -command "firefox file://data/awips/2009May08_AWOC/wessl/postbrief_sgf2/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

15:02:00 -pause

15:03:00 -text {The simulation has ended.}

III. WESSL File for Simulation 4 (PAH)

16:02:00 05/08/09 -text {The simulation has started.}

16:02:20 -command "firefox file://data/awips/2009May08_AWOC/wessl/prebrief_pah/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

16:02:40 -response -text {THE SIMULATION IS NOW PAUSED. After viewing the prebrief, please answer the following question by typing your message(s) below.

How would you coordinate with WFO LSX on the storm in Randolph County, MO moving towards Perry County, IL?

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

16:02:40 -pause

16:03:00 -scrolltext {SPC AC 081139

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
0709 AM CDT FRI MAY 08 2009

VALID 081300Z - 091130Z

...DERECHO IN PROGRESS THIS MORNING OVER SOUTHERN MO/NORTHERN AR...

...MID MS VALLEY...
MATURE BOW ECHO NOW OVER SOUTHWEST MO IS EXPECTED TO MAINTAIN INTENSITY AND TRACK EAST-SOUTHEASTWARD ACROSS SOUTHERN MO AND NORTHERN AR THROUGH THIS MORNING. WIDESPREAD DAMAGING WINDS ARE BEING REPORTED WITH THIS BOW...AND WILL LIKELY CONTINUE AT LEAST AS FAR EAST AS THE MS RIVER. FROM THERE EASTWARD...FORECAST IS MORE UNCERTAIN DUE TO EFFECTS OF NOCTURNAL MCS THAT TRACKED ACROSS KY/TN OVERNIGHT. POTENTIAL EXISTS FOR AN ENHANCED THREAT OF DAMAGING WINDS AND ISOLATED TORNADOES AS MO CONVECTIVE SYSTEM INTERACTS WITH REMNANT OUTFLOW BOUNDARY OVER WESTERN KY/TN...WHERE LOW LEVEL VERTICAL SHEAR PROFILES MAY BE STRONGER.

..HART/HURLBUT.. 05/08/2009} -image
/data/awips/2009May08_AWOC/wessl/images/day1otlk_20090508_1300_prt.gif

16:03:20 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_torn_prt.gif

16:03:40 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_wind_prt.gif

16:04:00 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1300_hail_prt.gif

16:04:20 -scrolltext {URGENT - IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 267
NWS STORM PREDICTION CENTER NORMAN OK
920 AM CDT FRI MAY 8 2009

THE NWS STORM PREDICTION CENTER HAS ISSUED A
TORNADO WATCH FOR PORTIONS OF

PARTS OF NORTHEAST ARKANSAS
PARTS OF SOUTHERN ILLINOIS
WESTERN KENTUCKY
SOUTHEAST MISSOURI
MUCH OF WESTERN AND MIDDLE TENNESSEE

EFFECTIVE THIS FRIDAY MORNING AND AFTERNOON FROM 920 AM UNTIL 400 PM CDT.

TORNADOES...HAIL TO 2.5 INCHES IN DIAMETER...THUNDERSTORM WIND GUSTS TO 105 MPH...AND DANGEROUS LIGHTNING ARE POSSIBLE IN THESE AREAS.

DISCUSSION...A MATURE VERY INTENSE DERECHO IS MOVING VERY RAPIDLY ALONG THERMAL/INSTABILITY GRADIENT ACROSS MID MS VLY INTO TN AND LOWER OH VALLEYS. WITH A VERY MOIST UNSTABLE AIR MASS AND STRONG VEERING SHEAR PROFILES...EMBEDDED TORNADIC SUPERCELLS WILL CONTINUE TO BE ASSOCIATED WITH THE DERECHO ALONG WITH WIDESPREAD DAMAGING WINDS.

...HALES} -image /data/awips/2009May08_AWOC/wessl/images/ww0267_overview.gif

16:05:00 -text {(11:04 AM CDT) The following warning is already in effect for a portion of counties in your CWA:
WUUS53 KPAH 081535 SVRPAH
MOC017-023-031-143-201-207-223-081615-
/O.COR.KPAH.SV.W.0093.090508T1530Z-090508T1615Z/

BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE PADUCAH KY
1030 AM CDT FRI MAY 8 2009

THE NATIONAL WEATHER SERVICE IN PADUCAH HAS ISSUED A

* SEVERE THUNDERSTORM WARNING FOR...
  BOLLINGER COUNTY IN SOUTHEAST MISSOURI...
  EASTERN BUTLER COUNTY IN SOUTHEAST MISSOURI...
  CAPE GIRARDEAU COUNTY IN SOUTHEAST MISSOURI...
  WESTERN NEW MADRID COUNTY IN SOUTHEAST MISSOURI...
  WESTERN SCOTT COUNTY IN SOUTHEAST MISSOURI...
  STODDARD COUNTY IN SOUTHEAST MISSOURI...
  EASTERN WAYNE COUNTY IN SOUTHEAST MISSOURI...

* UNTIL 1115 AM CDT.

* AT 1029 AM CDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A LINE OF SEVERE THUNDERSTORMS CAPABLE OF PRODUCING QUARTER SIZE HAIL...AND DESTRUCTIVE WINDS IN EXCESS OF 70 MPH. THESE STORMS WERE LOCATED ALONG A LINE EXTENDING FROM 8 MILES WEST OF CASCADE TO 6 MILES NORTHEAST OF PUXICO TO 22 MILES SOUTHWEST OF QULIN...MOVING NORTHEAST AT 70 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS...
A TORNADO WATCH REMAINS IN EFFECT FOR THE WARNED AREA. IF A TORNADO IS SPOTTED...ACT QUICKLY AND MOVE TO A PLACE OF SAFETY IN A STURDY STRUCTURE...SUCH AS A BASEMENT OR SMALL INTERIOR ROOM.
THIS IS A DANGEROUS LINE OF STORMS. SEEK SHELTER INDOORS. STAY TUNED TO WEATHER RADIO OR LOCAL MEDIA FOR THE LATEST SEVERE WEATHER INFORMATION.

A TORNADO WATCH REMAINS IN EFFECT UNTIL 400 PM CDT FRIDAY AFTERNOON FOR SOUTHERN ILLINOIS AND WESTERN KENTUCKY AND SOUTHEAST MISSOURI.
&&

LAT...LON 3662 8997 3662 9015 3660 9018 3655 9018
        3651 9021 3650 9027 3732 9026 3732 9016
        3759 9015 3757 8952 3698 8954 3641 8968
        3642 8971 3640 8997
TIME...MOT...LOC 1529Z 247DEG 94KT 3731 9039 3701 9009
        3648 9061
$$
}

16:06:30 -text {(11:06 AM CDT Butler County): The Missouri Highway Patrol called to report a tree fell on a car 1 mile south of Poplar Bluff on Highway 53.} -image /data/awips/2009May08_AWOC/wessl/images/1550PopularBluffwind.png

16:20:00 -text {(11:20 AM CDT Perry County, MO): A storm spotter called to report a tornado 2 miles west of of Mcbride} -image /data/awips/2009May08_AWOC/wessl/images/1620Mcbridetor.png

16:26:00 -text {(11:26 AM CDT Jackson County): The Jackson County Sheriff's Department is reporting a tornado 1 mile S of Raddle} -image /data/awips/2009May08_AWOC/wessl/images/1651Raddletor.png

16:30:00 -text {(11:30 AM CDT Jackson County): 1.5" hail was reported by a storm chaser 4 mi east of Carbondale} -image /data/awips/2009May08_AWOC/wessl/images/1630Carbondalehail.png

16:32:00 -text {(11:32 AM CDT Jackson County): A storm spotter reported a tornado 2 miles east of Sato.} -image /data/awips/2009May08_AWOC/wessl/images/1632Satotor.png

16:35:00 -text {(11:35 AM CDT Perry County, IL): A Perry County official called to report a funnel cloud near Hwy 13 and Hwy 127 near Pinckneyville that just lifted.} -image /data/awips/2009May08_AWOC/wessl/images/1631Pinckneyvillefunnel.png

16:37:00 -text {(11:37 AM CDT Perry County, IL): A storm chaser called to report a tornado just touched down briefly near Pinckneyville but went right back up.} -image /data/awips/2009May08_AWOC/wessl/images/1637Pinckneyvilletorpng.png

16:38:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer.

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

16:38:00 -pause

16:39:00 -text {(11:39 AM CDT Williamson County): A resident reported 1.75" hail in Colp.} -image /data/awips/2009May08_AWOC/wessl/images/1644Colphail.png

16:40:00 -text {(11:40 AM CDT Union County): Emergency manager from the Union County EOC has called reporting trailers damaged on the Union/Pulaski County line with many trees and powerlines down.} -image /data/awips/2009May08_AWOC/wessl/images/1630Dongolawind.png

16:44:00 -text {(11:44 AM CDT Williamson County): A spotter living in Herrin called to report golf ball size hail.} -image /data/awips/2009May08_AWOC/wessl/images/1639Herrinhail.png

16:50:00 -text {(11:50 AM CDT Bollinger County) The Bollinger County Sheriff's Department estimated 70 mph winds near Zalma.} -image /data/awips/2009May08_AWOC/wessl/images/1650Zalmawind.png

17:01:00 -text {(12:01 PM CDT Williamson County): Heavy rain has been reported in Marion, with ponding of water throughout the city and visibility down to 1 block at times due to the heavy rain.} -image /data/awips/2009May08_AWOC/wessl/images/1701Marionflood.png

17:03:00 -text {(12:03 PM CDT Perry County, IL): A co-op observer in Pinckneyville called to report water over roadways and 3/4" of rain in less than 30 minutes.} -image /data/awips/2009May08_AWOC/wessl/images/1702Pinckneyvilleflood.png

17:07:00 -text {(12:07 PM CDT Perry/northern Bollinger County, MO and Jackson/Perry County, IL): WFO St. Louis called to alert you that they have received reports of widespread significant wind damage associated with storms in the "comma head" approaching your CWA.} -image /data/awips/2009May08_AWOC/wessl/images/PAH_2.png

17:08:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer, and answer the following question by typing your message(s) below.

What actions would you take to convey the wind threat associated with the MCV?

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

17:08:00 -pause

17:12:00 -scrolltext { SPC AC 081712

DAY 1 CONVECTIVE OUTLOOK
NWS STORM PREDICTION CENTER NORMAN OK
1212 PM CDT FRI MAY 08 2009

VALID 081630Z - 091200Z

...TN/LOWER OH VALLEY...
LONG LIVED BOW ECHO...MOVING EWD AT 60 KT...WAS APPROACHING THE MS RIVER AND IS EXPECTED TO TRACK MOSTLY EWD THROUGH THE REGION THIS AFTERNOON. THOUGH MESOSCALE MODELS SUGGEST WEAKENING WITH

TIME...GIVEN THE WELL ORGANIZED SYSTEM MOVING INTO AN ENVIRONMENT WITH STRONG INSTABILITY...MLCAPES 2000-2500 J/KG...AND EFFECTIVE SHEAR NEAR 40 KT IS EXPECTED TO SUSTAIN WIDESPREAD WIND DAMAGE..SOMETIMES EXTREME. WIND AND HAIL IS FORECAST WITH THE SYSTEM UNTIL IT REACHES THE APPALACHIANS THIS EVENING. LOW LEVEL SHEAR WILL ALSO BE SUPPORTIVE OF TORNADOES...ESPECIALLY WITH THE ROTATING BOW HEADS.

..IMY/GRAMS.. 05/08/2009} -image
/data/awips/2009May08_AWOC/wessl/images/day1otlk_20090508_1630_prt.gif

17:12:20 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1630_torn_prt.gif

17:12:40 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1630_wind_prt.gif

17:13:00 -image
/data/awips/2009May08_AWOC/wessl/images/day1probotlk_20090508_1630_hail_prt.gif

17:23:00 -text {(12:23 PM CDT Franklin County): The Franklin County Emergency Manager is reporting water over roads in the town of Sesser.} -image
/data/awips/2009May08_AWOC/wessl/images/1723Sesserflood.png

17:27:00 -text {(12:23 PM CDT Perry County, IL): Several Du Quoin residents called to report flash flooding on US Route 51 in Du Quoin and in rural Perry County.} -image
/data/awips/2009May08_AWOC/wessl/images/1723DuQuoinflood.png

17:32:00 -text {(12:32 PM CDT Perry County, MO): The Perry County, MO Sheriff's Department called to report a machine shed destroyed in Millheim.} -image
/data/awips/2009May08_AWOC/wessl/images/1730Millheimwind.png

17:35:00 -text {(12:35 PM CDT Bollinger County): A storm chaser is reporting a lot of structural damage north and south along Hwy 72 near Patton Junction with numerous trees and power lines down.} -image
/data/awips/2009May08_AWOC/wessl/images/1735PattonJunctionwind.png

17:41:00 -text {12:41 PM CDT White County): 1" hail was measured by a resident 4 miles southwest of Enfield.} -image
/data/awips/2009May08_AWOC/wessl/images/1741Enfieldhail.png

17:50:00 -text {(12:50 PM CDT Cape Girardeau County): The county EMA Deputy Director called to report numerous trees and power lines down and paneling blown off the wall of his house with windows blown out in Oak Ridge.} -image
/data/awips/2009May08_AWOC/wessl/images/1750OakRidgewind.png

17:58:00 -text {(12:58 PM CDT Cape Girardeau County): A trained storm spotter registered 80 mph winds in Old Appleton.} -image /data/awips/2009May08_AWOC/wessl/images/1758OldAppletonwind.png

18:05:00 -text {(1:05 PM CDT Jackson County): A co-op observer reported that his weather station recorded a wind gust of 75 mph at Grand Tower.} -image /data/awips/2009May08_AWOC/wessl/images/1805GrandTowerwind.png

18:12:00 -text {(1:12 PM CDT Jackson County): The Jackson County Sheriff's Department just reported a tornado on the ground south of Elkville.} -image /data/awips/2009May08_AWOC/wessl/images/1812Elkvilletor.png

18:15:00 -text {(1:15 PM CDT Jackson County): A resident estimated wind gusts of 70 mph in Gorham.} -image /data/awips/2009May08_AWOC/wessl/images/1800Gorhamwind.png

18:17:00 -text {The simulation is now paused. Take the time to analyze the current conditions, discussing any assigned objectives with your trainer.

AFTER CLICKING "OK", RESUME SIMULATION BY CLICKING "RESUME SIMULATION" IN THE WINDOW WITH THE RED BORDER

*** NOTE: IF THE RADAR DATA IS NOT UPDATING AFTER THE SIMULATION IS RESUMED, CLEAR THE D2D PANE AND RELOAD THE DATA YOU PREVIOUSLY HAD DISPLAYED.}

18:17:00 -pause

18:20:00 -text {(1:20 PM CDT Jackson County): The Jackson County Emergency Manager called to report widespread wind damage throughout the county with numerous tree, power line and structural damage in Grand Tower, Murphysboro, Vergennes and Gorham.} -image /data/awips/2009May08_AWOC/wessl/images/1820GrandTowerwind.png

18:25:00 -text {(1:25 PM CDT Jackson County): A 106 mph wind gust was just measured at Carbondale airport. Multiple injuries have been reported in Carbondale with the city virtually impassable due to debris. Widespread structural damage is reported with numerous trees and powerlines down and a roof collapse on one school.} -image /data/awips/2009May08_AWOC/wessl/images/1825Carbondalewind.png

18:32:00 -text {(1:32 PM CDT Perry County, IL): A spotter reports trees down in Du Quoin with estimated 80 mph winds.} -image /data/awips/2009May08_AWOC/wessl/images/1832DuQuoinwind.png

18:38:00 -text {(1:38 PM CDT Williamson County): The Williamson County airport near Marion called to report structural damage to all buildings at the airport. Their anemometer measured a 88 mph gust.} -image /data/awips/2009May08_AWOC/wessl/images/1838Marionwind.png

18:45:00 -text {(1:45 PM CDT Franklin County): A storm spotter just called to report estimated 70 mph winds in Zeigler.} -image /data/awips/2009May08_AWOC/wessl/images/1845Zeiglerwind.png

18:45:20 -command "firefox file://data/awips/2009May08_AWOC/wessl/postbrief_pah/player.html -texct {Click on “Run WESSL Command to relaunch the presentation”}

18:45:20 -pause

18:46:00 5/08/09 -text {(May 8, 2009 PAH) The simulation has ended.}

Appendix D: Support Materials

This Appendix includes:

WES Installation and Run Simulation Instructions

To install the WES exercises from the DVDs:

1. Insert Disk 1 into your DVD drive of your WES machine.

2. If a terminal window is not open already, open a terminal window.

3. In the terminal window, change the directory to the DVD drive folder:

   For WES9.0 machines: *cd /media/cdrecorder*
   For WES9.2 machines: *cd /media/CDROM*

4. Run the install script found on Disk 1. For WES9.0 machines, add a space and then */media/cdrecorder* after the .csh file.

   For WES9.0 machines:
   csh install-2009May08_ICT-disc1of1.csh /media/cdrecorder
   For WES9.2 machines:
   csh install-2009May08_ICT-disc1of1.csh /media/CROM

5. A prompt will appear in the terminal window asking if you want to proceed with the installation. Press *y* to continue.

6. When the completion message appears, type in the following commands before ejecting the disk:

   cd
   umount /media/cdrecorder or *umount /media/CDROM*

7. To install the data for Disks 2 and 3, you must be logged in as *root* in the terminal on your WES machine. Then repeat Steps 1-6 to continue the installation for the other disks. Again, when running the install script on WES9.0 machines, add a space and then */media/cdrecorder* after the .csh file.

   Example for Disk 2:
   For WES9.0 machines:
   csh install-2009May08_AWOC-disc1of2.csh /media/cdrecorder

For WES9.2 machines:
csh install-2009May08_AWOC-disc1of2.csh /media/CROM

Example for Disk 3:
For WES9.0 machines:
csh install-2009May08_AWOC-disc2of2.csh /media/cdrecorder
For WES9.2 machines:
csh install-2009May08_AWOC-disc2of2.csh /media/CROM

8. After installing both disks, you can log out of the user *root* in the terminal by typing *exit*.

To start viewing the case data for ICT:

1. Open a terminal window if one is not already open and start the case review by typing in the command below:

   enhanced_case_review

2. A window will appear allowing you to open a new D2D session. Ensure that the correct path and localization is selected in the Start D2D window and click *OK*.

   Path: */data/awips/2009May08_ICT*
   CWA: *ICT*

3. To change the time in the D2D display, left click on the time in the lower right corner of the screen. Click on *Set Time* and adjust the date/time to the following:

   May 08, 2009 11:44:00 UTC

   Make sure that *Freeze Time in This Position* is also selected before clicking OK.

4. Because the ICT portion of the study is in the case review mode, the trainee will have freedom to view all of the data up to 11:44 UTC on May 8, 2009.

To convert the SGF and PAH simulations into DRT format:

1. Open a terminal window if one is not already open and start the simulation by typing in the command below:

   start_simulator

2. When the WES Simulation window appears, click on *Tools* and then click on *Convert Case Data to DRT Format*. Ensure that the following directory is selected and click *OK*.

   /data/awips/2009May08_AWOC

3. When the conversion is complete, you will be ready to start running the simulations localized for SGF and PAH. Click on *Exit* to close the WES Simulation window.

To start viewing the WES exercises for SGF and PAH:

1. Open a terminal window if one is not already open and start the simulation by typing in the command below:

   start_simulator

2. Click on *Tools* and select *Write Archived Text to Database*. Select the following directory and enter the localization that will be used (SGF or PAH).

   /data/awips/2009May08_AWOC

   Once the path and localization is selected, click *OK* to proceed. Doing this step will allow for the pre-set warning(s) to display at the beginning of each simulation. This should be done prior to the start of any simulation.

3. When the text is written to database, click on *Run Simulation* in the WES Simulation window. A window will appear stating that all D2D windows should be closed before starting. Ensure that all D2D displays are closed and click *OK*.

4. To load the WES exercises, click on *Load Saved Settings* in the Simulation Entry window. Select the following setting related to each simulation:

SGF Part I: *part1_2009May08_AWOC*
SGF Part II: *part2_2009May08_AWOC*
PAH: *part3_2009May08_AWOC*

5. Click *OK* and wait for the WES Simulation Control window to appear. Ensure that the data is correct and click *OK*.

6. The WESSL script will start running and a window will appear asking for you to start a new D2D session. To do this, open a new terminal window and type in the following command:

   start_awips

7. Ensure that the correct path and localization is selected. Make sure that the *Start AWIPS Text Workstation* is also selected and click *OK*.

   Path: */data/awips/2009May08_AWOC*
   CWA: *SGF* or *PAH*

8. Ensure that the time in the D2D is in real-time format. To change the time in the D2D display, left click on the time in the lower right corner of the screen. Click on *Use Current Real Time* and then *OK*.

Known WES Issues:

1. The radar may not update after the resumption of the simulation from a pause. To correct this problem, clear the D2D pane and reload the data.

2. In WarnGen, the text window may not appear when you make a polygon and click Create Text. Therefore, WarnGen will not function, and the trainee will not be able to issue warnings. To mitigate this problem, close the D2D window and start a new D2D session.

3. For WES9.0 machines, if the Flash files (pre- and debriefs) do not play, it can be corrected by reinstalling the Firefox Flash plugin as shown in the WES9.0 installation instructions.

Name _____ **SADRT- Situation Awareness Decision Requirements Table**

Stop Time:

Assessments so far?
What watches/warnings if any do you have out?
What are you worried about now?
What data is most important right now?
What data or information do you need that you're not getting? Are there any system status issues?
What is this situation going to look like in ( )hours/minutes?
What will be your next action?

Stop Time:

Assessments so far?
What watches/warnings if any do you have out?
What are you worried about now
What data is most important right now?
What data or information do you need that you're not getting? Are there any system status issues?
What is this situation going to look like in ( )hours/minutes?
What will be your next action?

Trainee_____ **Scenario Debrief Worksheet** Date_____ Trainer_____

Trainee Form

Challenges	**How am I doing?** Great	OK	Shaky	Clueless	**Specific Examples from Scenario**
Science					
- Understanding/Applying Conceptual model					
- Discriminating severity					
Technology					
-Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)					
-Use of data sets					
Human Factors					
- Getting/Maintaining SA					
- Managing workload					
- Threat communication to public					
- Managing sectors/boxology					
What would you do different next time? (Filled out with trainer after debrief)					
Follow up actions you'd like to take:					

Trainee _____ **Observation and Assessment Record (OAR)** Date _____ Trainer _____

Trainer Form

Challenges	Examples of what trainee is doing: Good	Examples of what trainee is doing: Other
Science		
- Understanding/Applying Conceptual model		
- Discriminating severity		
Technology		
-Use of Applications (WARNGEN, FFMP, SCAN, procedures, etc)		
-Use of data sets		
Human Factors		
- Getting/Maintaining SA	.	
- Managing workload		
- Threat communication to public		
- Managing sectors/boxology		

Follow up actions:

Team Members: **Warning Log** **Today's Date**

__________/__________ Simulation Location/Date ________________ Page #____________

Warning Type
Tornado - T
Svr Tstm - S
Flash Flood - F
Svr Wx Statement - SVS
Nowcast - **NOW**

List Basis for Warnings (In order of importance):
1 - Reflectivity; 2 - SRM; 3- Base Velocity;
4 - MESO; 5- TVS; 6 - VIL; 7- Precip; 8 - Other Alg
9 - Loop; 10 - Report; 11 - Other (explain)

#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			
#	Type	Issued (UTC)	Expires (UTC)	Counties or portions of counties warned	init	ver
	Basis:		Location and type of wx expected:			

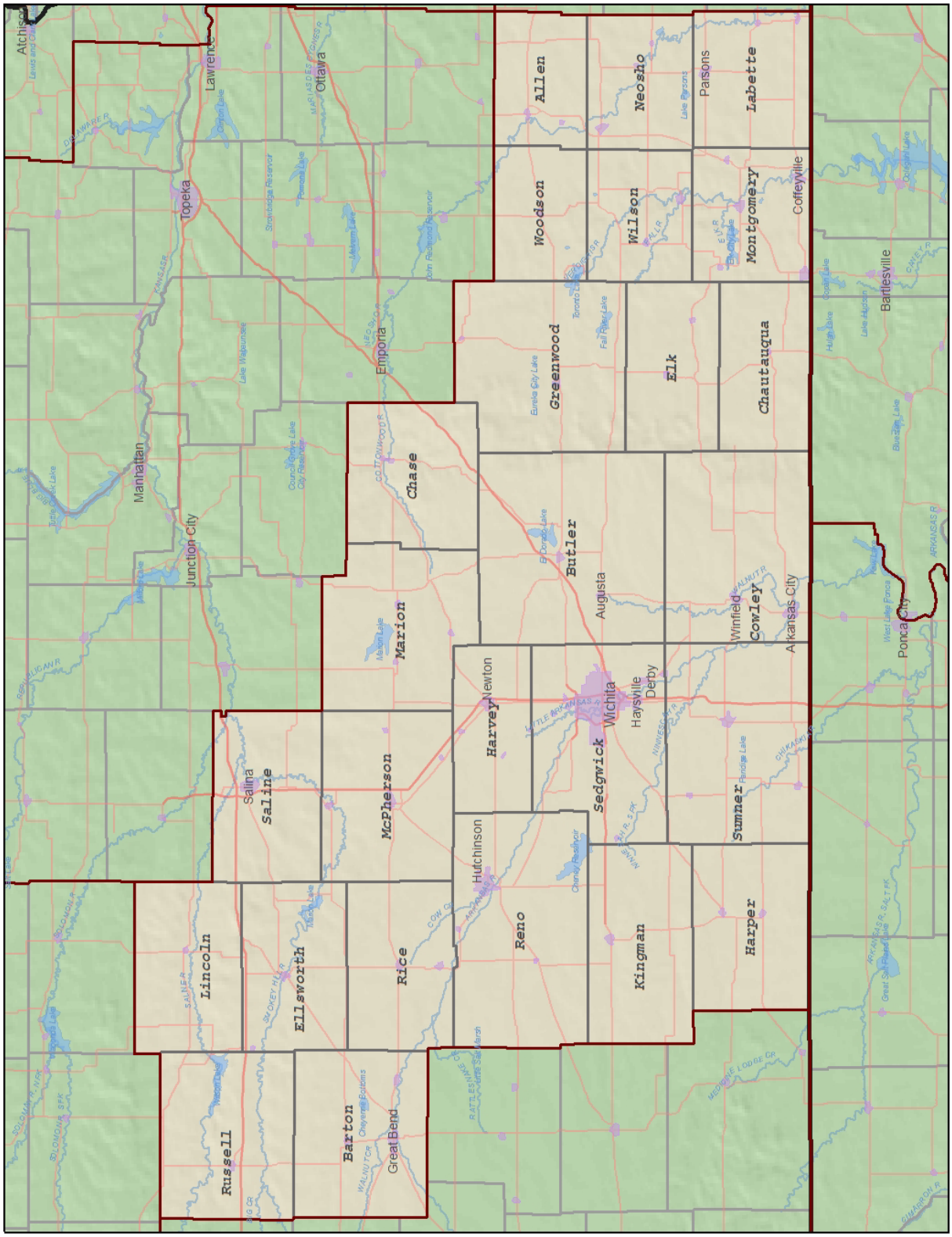


Figure D-1: A map of the Wichita, KS (ICT) CWA

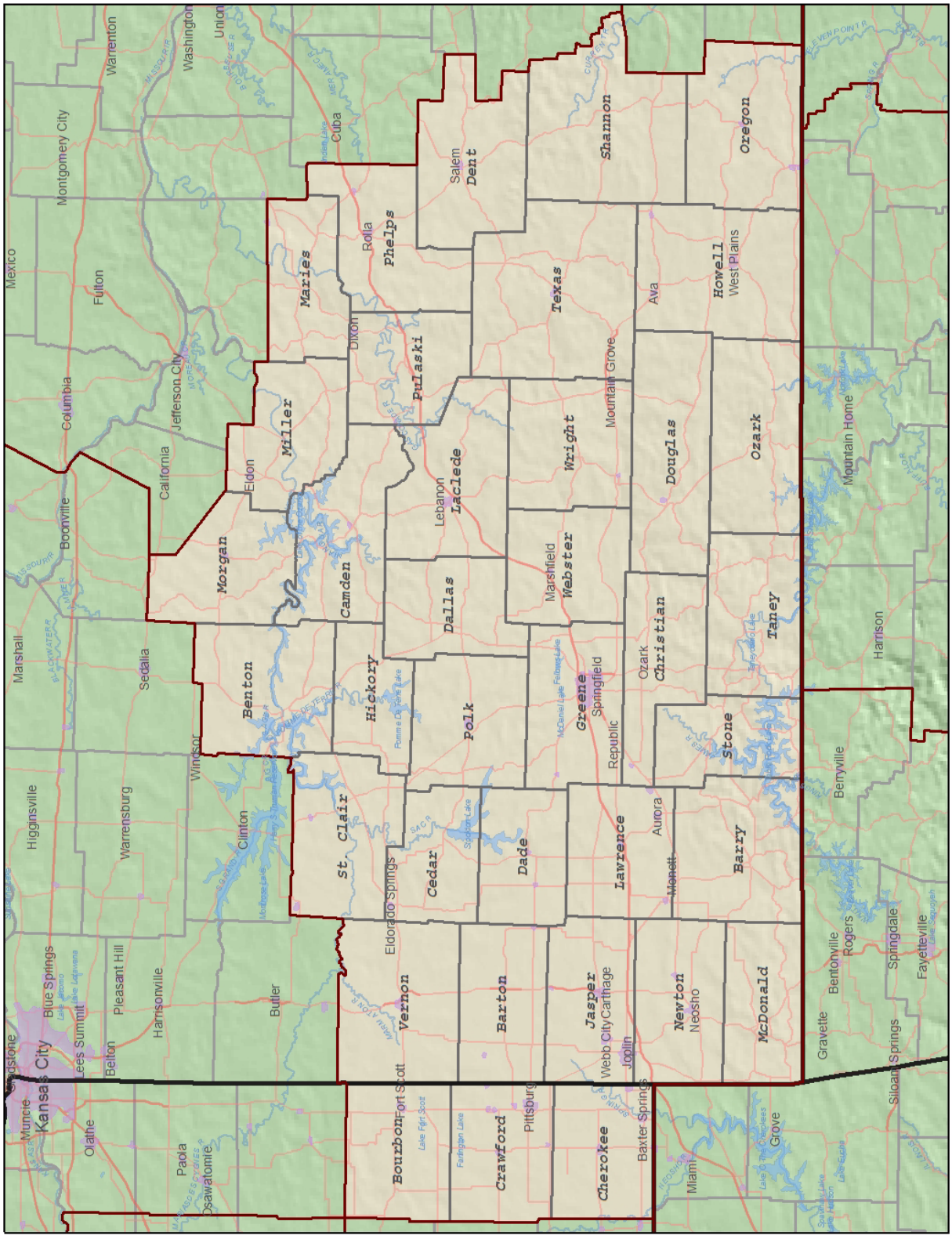


Figure D-2: A map of the Springfield, MO (SGF) CWA

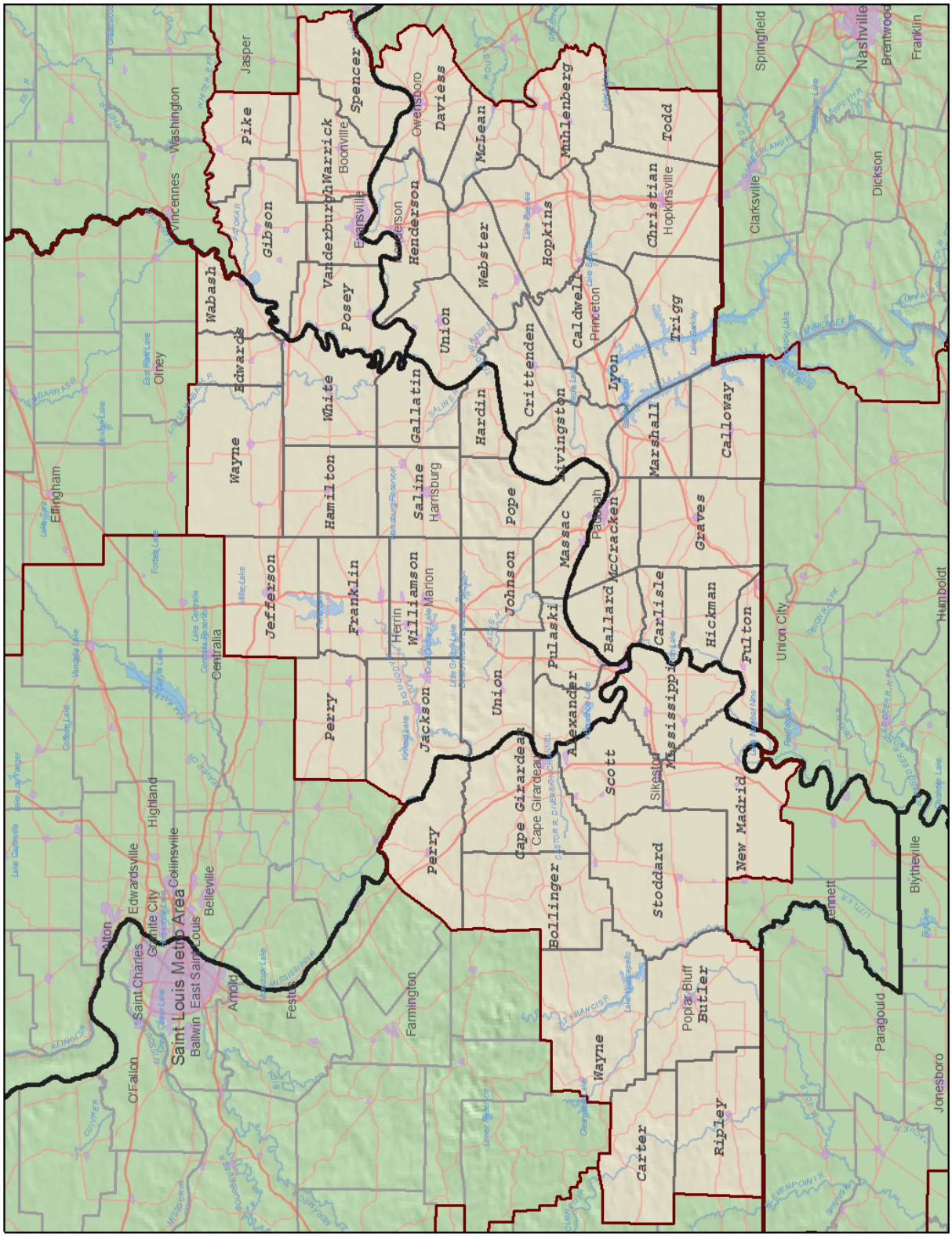


Figure D-3: A map of the Paducah, KY (PAH) CWA