TOP News

2010 Storm Spotter Edition

Volume 4, Issue 1 February, 2010

Special points of interest:

- What is a derecho?
- What severe weather equipment can I get for my home?
- How do I interpret different radar images on the NWS webpage?
- What severe weather information should I report?

Inside this issue:

A Note from the Warning Coordination Meteorologist

Hi folks my name is Chad Omitt and I'm the Warning Coordination Meteorologist with the National Weather Service in Topeka. Our team at the National Weather Service has been busy preparing for this year's spotter safety and training show which will include new video and imagery of severe thunderstorm structure along with associated radar imagery. We recognize that as technology advances it provides new opportunities along with new challenges for county spotters who volunteer to venture out into the county and do their best to communicate what they see from their vantage point. Each year more and more people have access to radar which can be a great tool to improve situational awareness and spotter safety. However, as with any new technology there is a period of familiarization and learning. We feel that it is important that the National Weather Service assist our spotters to better understand basic radar features along with the associated cloud features they may see when out in the field. That is why you will see more examples of radar imagery side by side with the associated cloud features that you will encounter when out in the field in this year's show. We hope to see you out at the spotter shows this year. I also want to let you know that our office remains committed to providing the best service that we can each and every day. I began my career in the commercial weather business at a company called WeatherData Incorporated. There I quickly learned how important it is to provide the best service possible. That philosophy has followed me into the National Weather Service where we continue to try and find new and improved ways to deliver weather information to the residents of Northeast Kansas. A key aspect of that effort is receiving feedback from YOU. We encourage feedback from everyone across northeast Kansas since you are our customers. We want you to think of us as your organization. We are here to provide you with the best service we can. If you have questions or comments about our services please let me know by emailing me at chad.omitt@noaa.gov or by calling me at 785-232-0814.

2010 Spotter Talks

www.weather.gov/topeka

The 2010 Spotter Talk schedule is available on the front page of our website listed above. We hope you can join us for a talk! If you can't make the event for your home county, feel free to attend another!

The Anatomy of a Wind Storm

by Brian Barjenbruch

While tornadoes may cause extensive damage over the course of a few miles and hail could damage roofs across the better part of a county, rarely does a single storm affect more people than a well developed wind storm. These storm systems may be hundreds of miles across, and a single continuous storm may traverse more than 500 miles. Wind speeds in excess of 120 mph, equal to the strength of an EF-2 tornado, have been recorded, and winds greater than 80 mph have been known to last for more than 30 minutes. You may hear any of several names when referring to a damaging wind storm, including "Derecho" (a widespread and usually fast-moving windstorm associated with convection that may include any family of downburst clusters produced by an extratropical MCS, and can produce damaging straight-line winds over areas hundreds of miles long and more than 100 miles across)*, "Bow Echo" (A radar echo which is linear but bent outward in a bow shape. Damaging straight-line winds often occur near the "crest" or center of a bow echo)*, and "Squall Line" (a line of active thunderstorms, either continuous or with breaks, including contiguous precipitation areas resulting from the existence of the thunderstorms)*. "Macrobursts" and "Microbursts" refer to similar meteorological phenomena, but typically on a smaller scale. This article will examine the conditions during which Derechoes develop, when they're most likely, and their unique ability to maintain their strength and structure for an extended period of time.

"Wind speeds in excess of 120 mph, equal to the strength of an EF-2 tornado, have been recorded…"

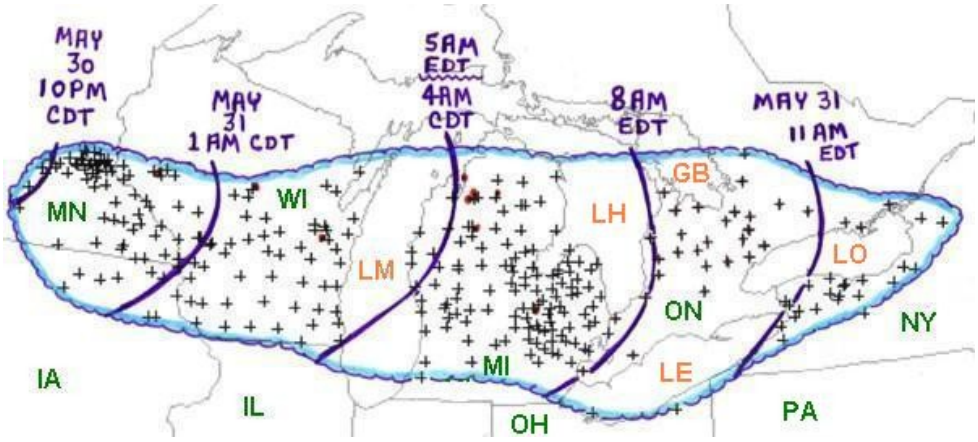

Figure 1. (courtesy of the Storm Prediction Center "About Derechos" web page) Area affected by the May 30-31, 1998 derecho event (outlined in blue). Curved purple lines represent the approximate locations of the "gust front" at three hourly intervals. "+" symbols indicate the locations of wind damage or wind gusts above severe limits (measured or estimated at 58 mph or greater). Red dots and paths indicate tornado events.

Derechos, the most significant classification of wind storm, are most typical during the late spring and summer months (May through August), and occur essentially anywhere east of the Rocky Mountains. Derechos affecting northeastern Kansas are often initiated as one or more supercell thunderstorms on the High Plains of Western Kansas or Eastern Colorado. When optimal conditions exist, these supercell thunderstorms may congeal into a broken line of storms and move to the east, increasing in speed, size, and intensity as they travel.

So, what are the optimal conditions for a massive wind storm in northeast Kansas? Several ingredients must come into place over a large area for a strong wind storm to occur. A good way to start is with a weak stationary frontal boundary oriented roughly west-to-east across the region. Localized thunderstorm development near the frontal boundary is preferred well to the west, perhaps assisted by a weak upper level disturbance. As soon as the initial thunderstorms develop and begin to congeal, they require a steady stream of energy to

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** Definitions from the National Weather Service Glossary available online at http://www.nws.noaa.gov/glossary/*

Mobile Weather Technologies: From Forecasts to Storm Spotting

by Scott Blair

With severe weather season fast approaching here in Kansas, it's a good idea to have several ways to receive weather information. But, this can be quite a challenge once you're on the road traveling, away from the familiar confines of home. Luckily, there are several technologies available to help keep you abreast of rapidly changing weather conditions while on the roadway.

The National Weather Service has a tailored web page for those wishing to retrieve weather forecasts through their cell phones or wireless device. All you need is a wireless device that can surf the Internet along with a wireless Internet service provider. By entering your city and state or zip code, you can immediately gain access to the 7-Day Forecast, current conditions, the latest local radar image, and much more. This service can be found at: http://mobile.weather.gov/

This is only the tip of the iceberg when it comes to mobile weather technology available for your cell phone. Check with your favorite weather provider or media outlet for additional options for weather information on your mobile device.

For those that do not have mobile Internet access, NOAA Weather Radio All Hazards has you covered. NOAA Weather Radio is a nationwide network of radio stations broadcasting continuous

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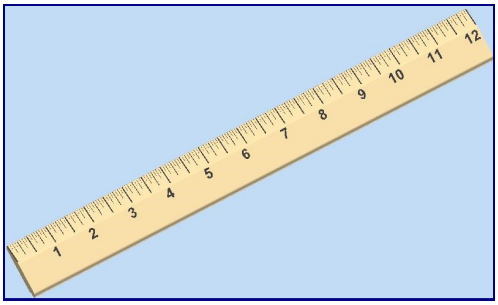
What Can I Use to Measure Severe Weather Events at My Home?

A spotter stationed at their home can help in the severe weather warning and verification process in several ways. First, home spotters have easy access to internet radar (including the information provided by the National Weather Service in Topeka at http://radar.weather.gov/radar.php?rid=twx) and to a telephone, through which they are encouraged to call the NWS when hail, strong winds, or excessive amounts of rainfall are observed. Reporting the magnitude specifics of these events can help meteorologists at the NWS in the warning decision process. Second, having accurate measurements gives meteorologists specific information that can help calibrate the local radar, and monitor trends in the storm development or dissolution processes. Finally, severe weather reports help the NWS verify any warnings that are issued.

Handheld Anemometer

What, then, are some of the instruments that can be used to measure the magnitude of hail, wind, and rain?

Hail: A trusty old ruler is your best bet for measuring hail size. Try to collect a hail sample as soon as it's safe to get outdoors. You may either take a ruler out with you, or bring a sample of the hail indoors. Measure the hail stone along it's longest diameter. To take a picture, it helps to not only have the ruler lying next to the hail stone, but also other comparably sized objects for scale. Hail size can also be roughly estimated when compared to common household objects such as coins, sports balls, or fruit.



Standard Ruler

Wind: There are two primary choices when looking for an instrument to accurately measure wind speed. First, and a bit less safe is a handheld anemometer. These instruments require the individual to stand out in the elements. Wind flows through the collection area, and a wind speed is measured. Obviously, very strong winds (and potential projectiles—including hail!) are potentially hazardous. It is not recommended to be outdoors when a warning is in effect, or anytime you feel unsafe. A second, safer choice would be a mounted anemometer with an in-house readout. These instruments work in a way similar to the handheld anemometer, but have the benefit of allowing the user to remain indoors for both the collection of the wind and mag-

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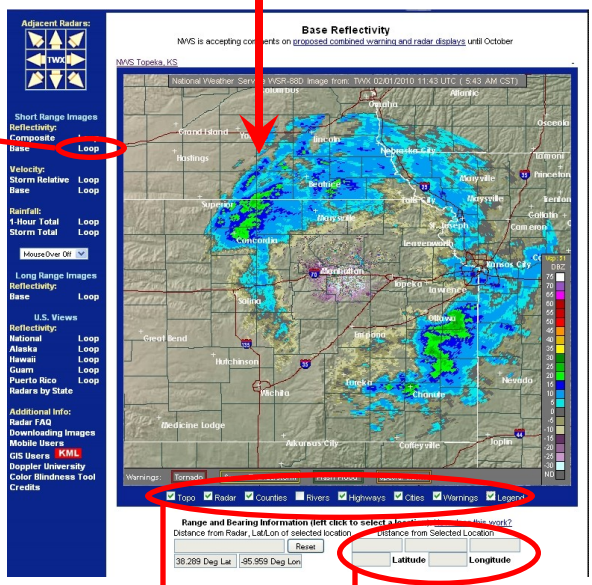
Viewing radar images at *www.weather.gov/topeka*

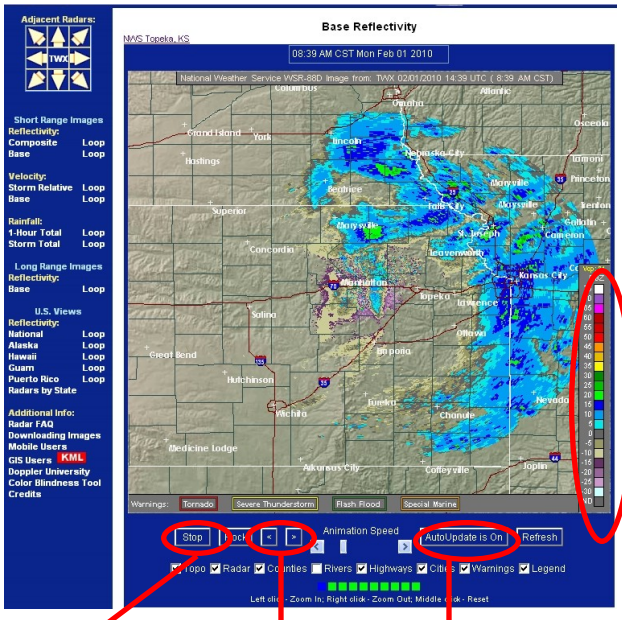
By Jared Leighton

When severe weather forms in your area, it is necessary to remain situationally aware. Current radar images of ongoing weather can be found our website. Here you can see images of current weather, load loops of recent radar images, see current convective warnings, and load radar estimated rainfall totals for the area.

1. Click on the Radar icon to bring up a full screen local radar image.

2. Click on the base reflectivity "Loop" to play a time lapse of the previous 8 scans.





These buttons toggle map features on and off.

Left click anywhere on the map to mark your location, and this readout will display how far the cursor is from your location. Useful for determining distance between your location and the storm.

Starts and stops the radar loop

Allows the user to step forward and backward through the radar loop

AutoUpdate checked "ON" makes sure new images will continually be loaded into the radar viewer

DBZ Legend: Indicates the intensity of the falling precipitation. The warmer colors (higher numbers) indicate intense rain or even hail, while the cooler colors (lower numbers) indicate light precipitation.

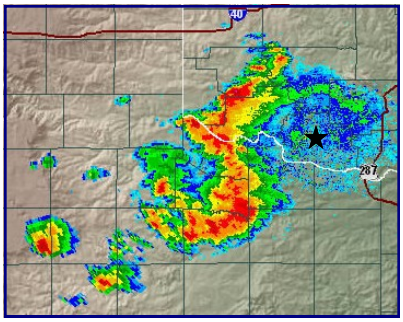
Precipitation Intensity

Light Moderate Heavy

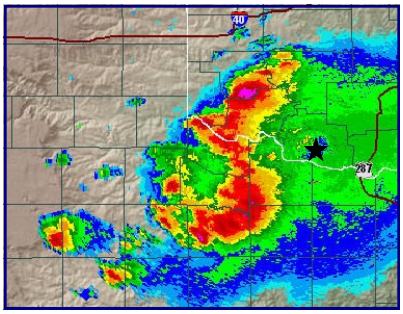
A Primer on Available Radar Imagery

From NWS Jetstream

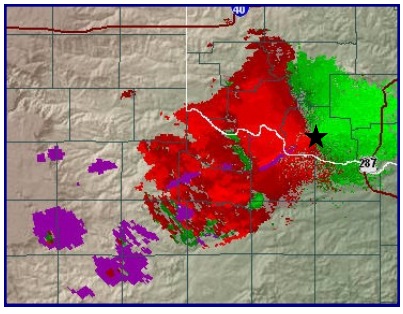
There are two main types of radar imagery that meteorologists view to gather storm information. The first is **Reflectivity**. Reflectivity images are depicted just as they sound—a picture of the weather from the energy *reflected* back to the radar. There are two types of reflectivity images available on the web; **Base** (or ½° elevation) reflectivity and **Composite** reflectivity. The difference between the two will be outlined below.The second is **Velocity**. There are two types of velocity images available on the web; **Base** Velocity and **Storm Relative** Velocity. The difference between the two will be outlined below. In all velocity images, red colors indicate wind moving *away* from the radar with green colors representing wind moving *toward* the radar. It is very important to know where the radar is located as that is your reference point for proper interpolation of the wind's motion. The black star in each image below represents the radar location—in this case from the Frederick, OK radar in southern Oklahoma images 1-3), and from Lake Charles, LA (image 4) along the Gulf Coast.



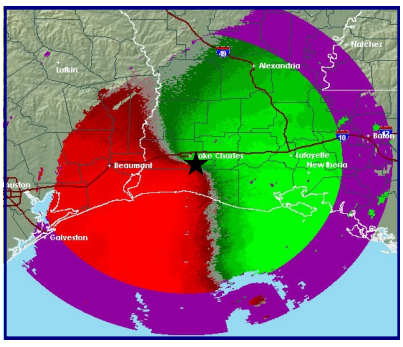
Base Reflectivity (1) is the default image. Taken from the lowest (½° elevation) slice, it is the primary image used to "see what's out there". This image is available upon completion of the ½° elevation scan during each volume scan. The colors on reflectivity images represent the strength of returned energy to the radar expressed in values of decibels (dBZ). These are hourly rainfall rates only and are not the actual amounts of rain a location receives. The total amount of rain received varies with intensity changes in a storm as well as the storm's motion over the ground. Thunderstorms can contain hail which is often a good reflector of energy. Typically, a hailstone is coated with a thin layer of water as it travels through the thunderstorm cloud. This thin layer of water on the hailstone will cause a storm's reflectivity to be greater, leading to a higher dBZ and an over estimate the amount of rain received. Value of 20 dBZ (light/bright green) is typically the point at which light rain begins.



Composite Reflectivity (2) images utilize all elevation scans during each volume scan to create the image. It is composed of the greatest echo intensity (reflectivity) from any elevation angle seen from the radar. It is used to reveal the highest reflectivity in all echoes.



Base Velocity (3) images provides a picture of the basic wind field from the ½° elevation scan. It is useful for determining areas of strong wind from downbursts or detecting the speed of cold fronts. However, since the radar only measures radial velocity, the strength of the wind will always be less than what is actually occurring unless the wind is moving directly toward or away from the radar. In velocity images, red colors indicated wind moving away from the radar with green colors indicating motion toward the radar.



Storm Relative Motion (4) images are useful when looking for small scale circulations (called mesocyclones) in thunderstorms. Often, these small scale circulations are areas where tornadoes form. What separates storm relative motion from base velocity is the motion of storms are "subtracted" from the overall flow of the wind. As storms move, their own motion can mask circulations within themselves. This motion is removed to make the view of the wind relative to the storm. In effect, what is seen is the wind's motion as if the storms were stationary. The transition zone between incoming and outgoing winds are indicated the gray-ish colors between the two. Purple indicated "range folded" areas (areas where the radar is unable to determine the radial velocity).

Tornado Safety if in a Vehicle

The National Weather Service and American Red Cross have established NEW guidance regarding what to do should a tornado develop near your location while in a vehicle. If a tornado threatens while you're in a vehicle, there are several options—some better than others—for you to consider in order to stay safe.

First and foremost, immediately attempt to drive to the nearest sturdy shelter. It's recommended you drive in a direction opposite that of the tornado's movement. A sturdy shelter is the **SAFEST** place you can be during a tornado. A sturdy shelter would be a house or business with a basement or underground safe room. Otherwise, a building with a hallway or interior room on the lowest floor is the next best alternative.

If you cannot safely drive to a shelter, or you encounter flying debris while you are driving, you next best option is to pull over and park. The NWS and ARC now recommend the following as LAST RESORT options:

- Stay in the car with the seat belt on engine running. If the car remains running, the airbags may deploy, offering additional protection to those in the vehicle. Put your head down below the windows, covering with your hands and a blanket if possible. The idea is that with the engine running airbags may deploy and offer some degree of protection if your automobile is overturned. Also, remember that flying debris is a tornado's greatest danger and your car's frame offers some protection from that threat.

- If you can safely get to noticeably lower than the level of the roadway, exit your car and lie in that area covering your head with your hands.

Again, both of these options are LAST RESORT actions, and your choice should be driven by your specific circumstances.

A note from Chad Omitt—Warning Coordination Meteorologist at the National Weather Service in Topeka.

This guidance is not without risk and it reminds me of the guidance that I've heard from marine biologists that if you see a great white shark approaching as you swim you have the option of punching the shark in the snout. Thanks for that advice but my goal is to never be in that situation. Try and stay out of these situations as best you can by staying alert of where you are and where the tornado is at. Situational awareness is critical so as to avoid this dangerous situation. As we mentioned and would like to stress that your first attempt should be to get to a substantial structure, get to shelter. Carry a NOAA All Hazards Radio with

The Hesston, KS tornado on March 13, 1990
Photo taken by Dave Williams
for the Wichita Eagle

Do you know the difference between a WATCH and a WARNING?

Watch: Severe weather is anticipated in the near future. Pay attention to the National Weather Service and local media outlets. Plan and prepare ahead of severe weather development or movement into your area. Watches (Severe Thunderstorm or Tornado) are issued by the Storm Prediction Center in coordination with local NWS Forecast Offices.

Warning: Weather conditions pose an immediate threat to life and property. Put your severe weather plan into action! Warnings (Severe Thunderstorm or Tornado) are issued by your local National Weather Service Office.

Measuring Severe Weather continued from page 3...

nitude read-out. Wind speeds are very difficult to estimate, but using cues laid out by the Beaufort scale (http://www.spc.noaa.gov/faq/tornado/beaufort.html), a rough guess can be made.

Rain: A rain gauge is an inexpensive way to accurately measure rainfall. Gauges can be plastic or metal, and come in a variety of sizes. The two biggest challenges in having a home rain gauge are finding a representative place to mount the gauge (best in an area of clearing away from the house), and remembering to empty the gauge after an event! Cooperative observers for the NWS empty their rain gauges everyday at 7am, and record the results. If you'd like to do something similar, the CoCoRaHS program (http://www.cocorahs.org/) may be the ticket! But again, reports during or immediately following an event can be extremely helpful to NWS meteorologists.

When you do report to the National Weather Service in Topeka, be sure to relay your address (GPS coordinates of you location are even better!), whether the hazard magnitude is measured or estimated, and the time the event occurred. You may contact the NWS-Topeka office by phone (785-232-1493), via e-spotter (www.espotter.weather.gov), or spotter network (www.spotternetwork.org).

Official NWS Rain Gauge

Did you see the radar information on pages 4 and 5? General questions regarding the WSR-88d can be found at: **http://www.srh.noaa.gov/jetstream/doppler/radarfaq.htm**

Reporting Severe Weather

The handy Storm Spotter Guide to Reporting Severe Weather **(at right)** is the perfect size to keep in a wallet, purse, or pocket. Cut along the heavy dotted line around the card, then fold down the middle along the dashed line in the center. Tape together the three sides of the card for a business card sized guide to assist you with storm reporting! Laminate to give the card for even more strength.

Visit

www.weather.gov/topeka

for all the latest severe weather information including text and graphical products, current radar imagery, discussions, and even write-ups of past severe weather events.

NWS-Topeka Storm Spotters

Hazards to Report

Funnel Clouds: Any event
Tornadoes: Any event, and any damage as a result of a tornado
Hail: Every size should be reported, especially if > 0.75" (dime size)
Strong Winds: Any speed >50mph, any damage as a result of wind
Heavy Rainfall: Amounts >1" per hour or flash flooding
Total Snowfall: Accumulated amounts > 1"
Dense Fog: Visibilities < ½" mile

Call **1-800-432-3929** to report severe weather

Visit **www.weather.gov/topeka** for the latest severe weather information

When Submitting a Report:

1. State your name and Spotter ID
2. State your location, and the location of the weather event
3. State the time the event occurred and any known damage

Estimating Wind Speed

- 50-57mph: Small branches or limbs < 2" diameter broken off
- 58-69mph: Large limbs 2-4" diameter down, power lines down
- 70-80mph: Small trees uprooted, limbs >4" down, shingles torn off
- > 80 mph: Large trees uprooted, power poles snapped

Hail Size

National Weather Service
1116 NE Strait Avenue
Topeka, KS 66616

Phone:
1-800-432-3929

Web:
www.weather.gov/topeka

E-mail:
w-top.webmaster@noaa.gov

Topeka News

Mobile Weather Technologies continued from page 3...

weather information. The Radio broadcasts official National Weather Service warnings, watches, forecasts, and other hazard information 24 hours a day, 7 days a week. More information, including transmitter frequencies, can be found at: http://www.nws.noaa.gov/nwr/

If you are a storm spotter, you may have heard of the Spotter Network. This is one of the most robust mobile technologies available to send in real-time severe weather reports into the National Weather Service. This service is free of charge, with nearly 8,000 registered participants since 2006. Initially, the use of this technology was limited to those with an Internet connect and GPS unit synchronized together on a laptop computer. Today, the Spotter Network has been expanded to an iPhone app through RadarScope, allowing storm spotters with iPhones to report severe weather instantly into the National Weather Service. Check out all the features the Spotter Network offers at: http://www.spotternetwork.org/

The Anatomy of a Wind Storm continued from page 2...

sustain them as they begin to organize. As many of these situations begin during the late afternoon and evening hours in the summer months, there is usually a good supply of instability in place to feed the storms. As night falls, additional moisture and instability may be brought into the system via the low level jet stream (a common phenomenon over the central and southern Plains). Finally, the storm system needs wind energy to move it along and keep it organized. Strong southerly winds in the low levels (courtesy of the low level jet) and strong westerly winds aloft are the most typical pattern for a high end wind event. For truly optimal derecho conditions, significant instability would be in place along the entire stationary frontal boundary. The westerly winds aloft would also be quite strong, but at the same speed and from the same direction through a significant depth of the upper atmosphere.

The truly interesting aspect of a well organized wind storm does not lie in its development, but in how it is able to remain so persistently strong for such a long duration. As a derecho begins to organize, the combination of updrafts along the leading edge of the thunderstorm complex and downdrafts behind the leading edge causes the system to develop its own areas of high and low pressure. The pressure gradient enhances wind flow toward the front of the derecho, which in turn helps maintain continuous thunderstorm development as the derecho progresses. In this way, it essentially becomes a self-sustaining storm, maintaining itself as it crosses hundreds of miles and leaving a broad swath of damage in its wake (Fig 1).

The National Weather Service issues severe thunderstorm warnings for derechos and other wind storms of a severe nature. While the threshold for defining a severe thunderstorm is 50 knot (58 mph) wind speeds or one inch hail, the same type of warning is also issued for wind speeds of 100 knots (115 mph) or five inch hail. It is important to remember that a severe thunderstorm warning does indeed indicate severe conditions, and potentially storms with danger equivalent to that of a tornado. Individuals in the path of a severe thunderstorm need to heed the warning and take shelter from the potential dangers!