The Southern Plains Cyclone

A Weather Newsletter for the Residents of western and central Oklahoma and western north Texas

Volume 1 Spring 2003 Issue 2

Meet Your Weatherman Chris Sohl

Hi! My name is Chris Sohl, and I am a Senior Forecaster at the National Weather Service Forecast Office in Norman.

As with most meteorologists, my preoccupation with weather began as a child. Growing up in southwest Oklahoma in the 50s and 60s, I was both apprehensive and fascinated by thunderstorms. Evidently, the fascination side prevailed as I would frequently climb on top of the roof of our house and observe thunderstorms as they approached from the west. The occasional plains dust storm that darkened the skies also impressed me.

I began college at the University of New Mexico in Albuquerque with every intention of pursuing a degree in biology. At the time, I was unaware that one could get a college degree or a job in weather, other than on television. Although UNM had no meteorology program, they did have a large geography department which offered several climatology courses. After taking one of those classes, I was hooked. From that point on, I scrapped biology and began taking all the climatology and geography classes I could find. While finishing up my

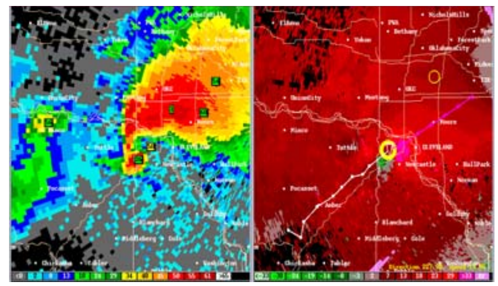
See **Weatherman** on Page 3

Doppler Radar and Its Limitations

By David Andra, Science and Operations Officer

For the meteorologist, few tools are more important to detecting and warning for severe thunderstorms and tornadoes than Doppler weather radar. While the use of radar in meteorology dates back more than 50 years, the most significant advances in radar technology took place in the last decade or so.

The national network of NEXRAD WSR-88D Doppler radars used by National Weather Service meteorologists was deployed in the 1990s. Today, this Doppler radar network provides round-the-clock surveillance of weather conditions across the nation. Sophisticated computers form a part of the radar system and automatically scan the radar data looking for signatures that signal flooding rains, hail, and even developing tornadoes. While Doppler radar revolutionized the way meteorologists detect and warn for severe thunderstorms, it is important to remember that storm spotters, law enforcement personnel, and



Example of Doppler radar data for the thunderstorm that produced the May 3, 1999, Oklahoma City tornado. The image on the left is reflectivity data, showing precipitation intensity, while velocity data are on the right. Image courtesy of the National Severe Storms Laboratory.

See **Radar** on Page 5

The Whys, Whats, and Hows of Severe Weather Reporting

By Karen Trammell, Student Meteorologist

With the arrival of the Southern Plains severe weather season, National Weather Service (NWS) meteorologists become increasingly dependent upon real-time severe weather reports during hazardous weather situations. Hail, damaging wind, flooding, and tornado reports are all critical to warning operations in a forecast office. Often, a forecaster's decision to issue or continue a severe weather warning hinges on reports received from people near or underneath a particular thunderstorm. Despite its importance, the specifics of the reporting process remain a mystery to some of the public. For instance, what phenomena should be reported? How are the severe weather reports received? Why does the NWS need ground truth reports? How are the reports used? Look no further for the answers to these and other questions about severe weather reporting.

NWS forecasters are most interested in knowing about the occurrence of hazardous weather produced by severe and tornadic thunderstorms. By definition, a thunderstorm is considered to be severe if it produces hail with a diameter greater than or equal to three-quarters (0.75) of an inch or damaging winds in excess of 58 miles per hour. As a result, any occurrence of hail or wind speeds exceeding these criteria should be reported to the NWS. In addition to hail size and

See **Reports** on Page 3

Forecaster Forum: Severe Thunderstorm Forecasting — The Basic Ingredients

By Kenny James, Forecaster

Meteorologists have known for a long time that certain ingredients must come together in the atmosphere for thunderstorms to develop and become severe. These factors are constantly monitored during forecasts and warnings, forming the foundation of severe thunderstorm forecasting. Instability, moisture, and a lifting mechanism are three elements essential to the formation of thunderstorms. Vertical wind shear may also be present during severe thunderstorms.

Thunderstorms are created when moist air near or just above the surface is moved upward and allowed to ascend high into the atmosphere. Instability is necessary for this air to rise. Instability occurs when relatively cool air lies above warm and moist air near the surface. In the lower part of the atmosphere, temperature generally decreases with height. How rapidly the temperature decreases, a quantity called the temperature lapse rate, determines the amount of instability. A large lapse rate indicates an unstable atmosphere, whereas a stable atmosphere has a smaller lapse rate. Like a hot air balloon, when kicked upward, unstable air will accelerate upward until it becomes cooler than its surroundings. As a result, unstable air is conducive to thunderstorm development.

Forecasters use many indices to gauge the instability of the atmosphere. The most common way of expressing instability is with a quantity called the convective available potential energy or CAPE. As with the temperature lapse rate, the higher the CAPE value, the more unstable the air and the faster it will rise. In addition to CAPE, other expressions, such as the lifted index and the Showalter index, work in a similar manner but are used less often.

Moisture is another essential ingredient for thunderstorm development. Besides the most obvious fact that large amounts of water vapor must be present for a cloud to form, moisture also increases the instability and upward motion in the atmosphere. When air is lifted, its temperature cools. When the air temperature drops to the dew point temperature, some of the moisture will condense, forming a cloud. When moisture condenses, heat is released. This released heat, called latent heat, makes the air more buoyant and allows it to rise more easily. As a result, a strong updraft and a strong thunderstorm forms.

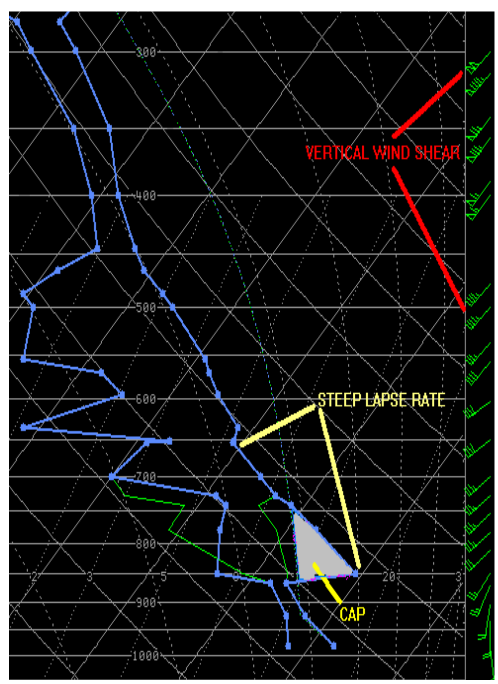
The primary source of moisture in Oklahoma and western north Texas is the Gulf of Mexico. Strong southerly winds transport large amounts of moisture northward into the southern Plains during the spring and summer. Dew point temperature is the most common way of measuring moisture. Precipitable water is another method and is often used to assess the heavy rain and flooding potential. Although relative humidity is a common quantity reported to the public, forecasters rarely use it to forecast thunderstorms. Relative humidity is not a good indicator of the total moisture content because it depends on temperature as well as the moisture content.

The last ingredient needed for basic thunderstorm development is a lifting mechanism. Lift forces air upward until it reaches the point that it can rise on its own. Common lifting mechanisms include warm, cold, and stationary fronts, drylines, and thunderstorm outflow boundaries. The heavier air behind these boundaries lifts the lighter warm, moist air above it, forcing it to rise. During the lifting process, clouds and precipitation form, and if the air rises enough, a thunderstorm develops.

A lifting mechanism is necessary to the development process because of a common feature known as the cap. The cap is a common inhibiting factor on thunderstorm development across the southern Plains. It is a layer of warm and stable air typically located about a mile above the surface. A lifting mechanism is necessary to push air near the surface above this stable layer and into the unstable atmosphere above it. The cap can either prevent thunderstorms from developing or delay development until more lift occurs.

Wind shear, when added to this mixture of instability, moisture, and lift, increases the likelihood of severe thunderstorms. Wind shear is the change of wind speed and/or direction with height in the atmosphere. It causes storms to tilt and creates more separation between the updraft and downdraft. This makes it harder for the cold air and precipitation to cut off the warm and moist air feeding the storm, allowing it to sustain itself for a longer amount of time than an ordinary thunderstorm.

Once thunderstorms have formed, instability and wind shear produce different evolutions and intensities. Typically, thunderstorms with the least potential for high winds and large hail are associated with low instability and shear, while the most significant severe thunderstorm outbreaks are associated with high instability and shear. Information about upcoming thunderstorm events can be found in the Hazardous Weather Outlook issued daily at 7:00 am and Noon. The outlooks can be found on the web at *www.srh.noaa.gov/oun* and heard on all ten area Weather Radio stations.



Meteorologists use this Skew T/Log P diagram to provide information about the vertical temperature, moisture, and wind profiles obtained with a weather balloon. The blue line on the right is the temperature trace, and the blue line on the left is the moisture trace.

Reports: From Page 1

wind speed, severe wind and hail damage, such as downed power poles, large broken tree limbs, and broken windows, should also be reported. During a tornadic thunderstorm, persistent rotating wall clouds, funnel clouds, and tornadoes need to be reported to the NWS as soon as possible. When reporting any of the above, your name and location, the time and date of occurrence, and the location of the event should also be included.

While knowing what to report may be relatively easy, determining when the hail or wind speeds exceed severe limits is not elementary. Because most people do not carry a ruler with them at all times, hail size is most often judged by relating its size to that of a common object. The NWS encourages comparisons to coins and balls used in different sporting events, such as a golf ball, ping-pong ball, or baseball. Do not compare hail size to an object that has more that one size, such as a marble or an egg. Penny-sized hail or bigger is generally considered to be severe. Without wind instruments, wind speeds are difficult for people to determine. The best way to estimate wind speeds is to observe how buildings, trees, and other objects are affected by the wind. The Beaufort scale relates wind speeds to the motion of and damage to objects and can be used to estimate speeds. Always remember to report the size of the largest hailstone or the speed of the highest wind gust rather than an average.

The NWS receives severe weather reports from many different sources, both in real-time and after the event has concluded. Amateur radio spotter networks provide the most continuous and up-to-the-minute ground truth information. During severe weather, spotters are deployed to monitor the behavior of storms and relay reports to the NWS through amateur radio repeaters. A local official or agency, not the NWS, generally coordinates the activities of these networks. Currently, active spotter networks operate in southern, western, northern, and central Oklahoma and western north Texas. Many severe weather reports also come from the public through several different avenues. Both during and after the event, NWS employees call ordinary citizens seeking reports from severe storms believed to have passed over or near them. Members of the public also contact the NWS directly, either by phone or e-mail, with reports. NWS Cooperative observers, local television stations and their trained storm chase teams, city and county emergency managers, and local law enforcement agencies also serve as excellent sources of reports.

Receiving ground truth reports during severe weather is extremely important to the NWS because there is no other way to know with absolute certainty what a particular storm is doing. While Doppler radar can identify which storms are most likely producing hail, strong winds, and rotation, it cannot discern hail size or even tornadoes. As a result, eyewitness reports are critical to forecasters during warning operations. Meteorologists use reports to verify the severity of certain storms and to determine whether to issue and continue warnings. Since they are transmitted to the public, all reports received by the NWS are also used to alert people in nearby cities and counties to the strength of an approaching storm.

Additional information about severe storm spotting, reporting, and the Skywarn program can be found on the web at *www.srh.noaa.gov/oun*.

Handy Severe Weather Reporting Reference Card

Weather to Report:

- **Hail ≥ 0.75” in Diameter**
- **Wind Speeds ≥ 58 mph**
- **Tree and Structural Damage**
- **Rotating Wall Clouds**
- **Funnel Clouds**
- **Tornadoes**

Include with Each Report:

- **Your Name**
- **Your Call Sign (If Applicable)**
- **Your Location**
- **Time and Date of the Event**
- **Location of the Event**

Call the NWS with Reports at 405-360-5928

Weatherman: From Page 1

bachelor's degree at UNM, I discovered that the University of Oklahoma offered a meteorology program and decided to pursue a Master’s degree there.

In the mid to late 70s, while at OU, I participated in my first organized storm chase in a cooperative program between OU and the National Severe Storms Laboratory. Unlike the instrumented chase vehicles in use today, our typical student chase vehicle was an old station wagon that left you wondering in what remote reach of the Texas Panhandle it was going to break down. At least we couldn't cause much more harm to the vehicle by driving through hail shafts.

As I was finishing my degree at OU and for several months after graduation, I worked for WeatherScan, a private forecasting company in Oklahoma City. I began my National Weather Service career in the early 80s as an intern in Sioux Falls, South Dakota. I experienced several major winter storms and some bone crackling cold temperatures. Although I enjoyed my couple of years in South Dakota, I found that I preferred living in a location where the warm season lasts a little longer.

Looking to return to the southern Plains, my next stop was Fort Worth, Texas, where I became a forecaster. Here, I had the opportunity to witness a variety of severe weather. Within a month or so of moving into our new house, a supercell thunderstorm bore down on the neighborhood. Fortunately, the tornadoes it produced were small and brief.

In 1991, I returned to Norman as a lead forecaster where I am very active in testing and implementing new meteorological technologies. Along with my routine forecast duties, I am the office program leader involved in the implementation of a new graphical forecast system. Rather than issuing strictly text-based forecasts, as the NWS has for the past several decades, forecasters now create and maintain a gridded digital forecast database. Along with the text-based forecasts, this system allows for the creation of higher resolution images, tables, and charts that are easier for most users to understand. Many of these forecasts issued by the Norman forecast office can be seen on our webpage at *www.srh.noaa.gov/oun*.

In Weather History: The June 8, 1974 Oklahoma Tornado Outbreak

By Karen Trammell, Student Meteorologist

Two months and four days after the eastern United States was devastated by the infamous Super Outbreak, Oklahoma experienced a smaller, but still damaging, tornado outbreak of its own. On the afternoon of June 8, 1974, twenty-two tornadoes, including fourteen in the Norman warning area, touched down in parts of central and eastern Oklahoma, killing 16 people, injuring almost 300, and causing millions of dollars in property damage. Almost half of these received a Fujita scale rating in the upper half of the scale, with nine deemed F3's and one an F4. Four of the F3 tornadoes touched down in the Oklahoma City and Tulsa metropolitan areas.

The first tornado of the day touched down in southwest Oklahoma City at Will Rogers World Airport at 1:42 pm. Ironically, the building that housed the National Weather Service, which at that time was located at the airport, was the first building hit by this twister. The forecast office sustained only minor damage, although a gas leak forced the temporary evacuation of the employees. The Tulsa Weather Service Office continued the warning and forecast duties for Oklahoma City until the leak was fixed. The tornado moved to the northeast across the city. The first major damage occurred at the corner of SW 44th and Independence. Along the nine mile path, eleven houses, five small businesses, and two mobile homes were destroyed, and almost 700 homes received minor or major damage. Fourteen people were injured. Officials rated this tornado an F3.

Oklahoma County was a tornado hot spot on this afternoon as four more tornadoes touched down within two hours of the first report. The next two tornadoes dropped about a half an hour later near Spencer and Jones. Although they remained on the ground for four and nine miles, respectively, they damaged only power poles and a few small businesses. No injuries were reported. About two hours later, two more tornadoes touched down, one in southwest Oklahoma City and the other near Harrah. The Harrah tornado damaged an Oklahoma Gas and Electric plant. These tornadoes had path lengths of 2.5 and 6 miles.

The most destructive tornado of the day devastated the town of Drumright on the Payne and Creek County line on Highway 33. This F4 tornado began in far southeast Payne county, about three miles southwest of Drumright, at 3:55 pm. It moved to the northeast, affecting the northwest section of Drumright. As it moved through the city, it struck a nursing home and destroyed several well-built, expensive homes. In all, about 100 homes were severely damaged or destroyed and 12 people were killed in Drumright. After leaving Drumright, the tornado continued on its northeasterly course, striking the small community of Olive. Parts of the school and several homes were destroyed, and one person was killed. This tornado also moved near Lake Keystone and Sperry in Pawnee and Osage Counties before lifting near Skiatook. This tornado remained on the ground for 55 miles, killed 14 people, and caused about 3.5 million dollars in property damage.

About an hour after the Drumright tornado touched down, four separate tornadoes dropped in Lincoln County near Stroud and Davenport. The worst of these began at 4:46 pm southwest of Davenport. It destroyed three homes and damaged 257 others as it moved through Davenport. The tornado moved to the northeast into Stroud, where 100 homes were damaged. This F3 tornado traveled eight miles and averaged a width of 1300 yards, which was three times as wide as the Drumright tornado. Fortunately, no fatalities and very few injuries were reported with these four tornadoes.

The Tulsa metropolitan area was hit very hard by tornadoes and flash flooding at around 5:50 pm. This combination produced the worst natural disaster in Tulsa's history at that time. The first tornado, rated an F3, moved northeastward through the city and raked across Catoosa, Claremore, and Big Cabin along its 45 mile track. A second tornado also touched down around 5:50 pm near Sapulpa. After moving into Tulsa, this tornado damaged buildings at Oral Roberts University. This tornado, also rated an F3, traveled 50 miles, and also affected the cities of Broken Arrow, Inola, and Chouteau. A total of 30 million dollars in property damage, three fatalities, and 122 injuries resulted from the tornadoes and flooding in the Tulsa area.

A tornado touches down near Arcadia in Oklahoma County during the June 8, 1974 tornado outbreak. Photo courtesy of Mr. H.E. McClain.

Other tornadoes were also reported near Breckenridge in Garfield County, Little in Seminole County, and McLoud in Oklahoma County during the late afternoon and evening. In addition to the tornadoes, hail, high winds, and flooding were also reported with these storms.

What factors combined on this afternoon to produce this widespread severe weather? A very warm and moist atmosphere was in place over central and eastern Oklahoma. By 1:00 pm, temperatures had warmed into the low to mid 80s, and dew point temperatures had risen into the low to mid 70s. Lower level winds in the Oklahoma City area were from the southeast at 10 to 15 mph, leading to significant wind shear. A cold front extended along the Oklahoma and Texas Panhandle border. By that evening, the cold front stretched along Interstate 35. Many of the storms initiated along this front. The combination of the moist surface conditions, cold front, and wind shear ultimately produced the afternoon's severe weather.

The June 8, 1974, tornado outbreak is only one of many in Oklahoma's history. However, this one is unique in that both Oklahoma City and Tulsa were greatly affected by strong tornadoes in this event. In recent memory, only the May 3, 1999, outbreak compares in this regard. Hopefully, Oklahoma and north Texas will be absent of any tornado outbreaks, such as this one, this season.

Radar: From Page 1

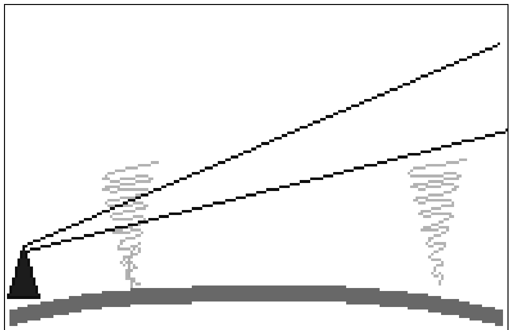
cooperative weather observers remain a vital link in the warning process. Given the capabilities of modern Doppler radar, it is reasonable to ask, "Why are human observers so important?"

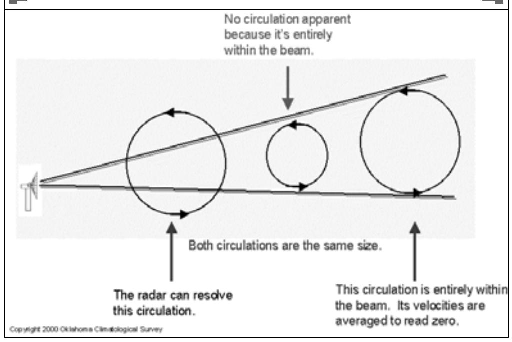
The answers lie in some of the basic limitations of all weather radars. One of the most important limitations arises from the curvature of the Earth. Like a flashlight beam, the beam of radar energy travels in essentially a straight line. As a result, the Earth's surface tends to "fall away" from the beam as the Earth's surface curves below the horizon. This causes the radar to sample increasingly higher altitudes of the atmosphere as it moves away from the radar antenna. At longer ranges from the radar site, the weather near the Earth's surface may not be observed by the radar. This can have important implications for detecting rainfall and snowfall, thunderstorm outflow winds, and even some tornadoes. In these cases, human observers in the local area provide important ground truth reports that supplement the radar information used by forecasters.

The flashlight beam leads to another limitation of radar. Just like a flashlight, the radar beam tends to spread and become wider as it moves away from the radar site. This tendency leads to a loss of resolution or detail that can be seen in the radar information. For example, a strong circulation associated with a developing tornado appears to be weaker than it really is when located far from the radar. While meteorologists are trained to help compensate for this loss of detail, observers and spotters in the local area again provide valuable information to help in the warning and forecast process.

All radars have difficulty determining both precipitation intensity and precipitation type. As a result, another important piece of information provided by humans has to do with what and how much. That is, what kind of precipitation is falling? Is it light rain, heavy rain, snow, sleet, or hail? It is also important to know how much has fallen. The difference between 2 and 12 inches of snow is often hard to determine based on radar data alone. Similarly, rainfall estimates based on radar data alone may be in error by a factor of two or three just because of variations in rain drop size. Rainfall estimates during severe thunderstorms can be especially tainted because the presence of hail. Hailstones are much larger than average raindrops, and since the radar cannot differentiate between liquid and ice, hailstones are seen as very big raindrops. This can lead to overestimates. Therefore, the questions of "What is it?" and "How much is there?" are often ultimately answered by human observers.

It is true that research continues to make radar even more capable in the next few decades. However, it will be a long time, if ever, before radar can provide all of the answers to the warning and forecast questions facing forecasters. Therefore, warning forecasters must continue to use a variety of resources, including spotter reports, experience, and other meteorological data to accurately assess what is happening.





Top: The radar overshoots a tornadic circulation near the ground (on the right) as a result of the Earth's curvature but detects a circulation of similar size closer to the radar. Image courtesy of the Warning Decision Training Branch.

Bottom: The ability of the radar to detect features tends to decrease as the beam moves away from the radar site. Of the three circulations depicted, only the one closest to the radar is detected. The center circulation is too small to be seen by the radar, while the radar interprets the circulation on the right as having no velocity. Image courtesy of the Oklahoma Climatological Survey.

A Picture Worth a Thousand Words: Graphical HWOs

By Steve Nelson
Information Technology Officer

The saying may be old, but for customers of NWS forecasts and warnings, it provides new relevance. During the Spring of 2002, the Norman forecast office began experimenting with software that allows forecasters to graphically depict weather hazards and publish that illustration to the Internet.

The software package, FX-Connect, was developed by the NOAA Forecast Systems Laboratory in Boulder, Colorado, to facilitate collaboration between NWS forecasters, NWS national centers, and their partners. With some local modifications to the FX-Connect software, Norman forecasters use these tools to produce graphical forecasts for the local area. For instance, instead of relying only on a text product to describe the location of a severe thunderstorm, forecasters can load a high-resolution radar image and illustrate the most likely area to receive damaging winds from this storm. This graphic can also be produced very quickly (under 30 seconds).

This experiment continued throughout the spring and summer of 2002, and we received numerous positive comments from users. "(By looking at the graphical product,) I got a far clearer relationship of where things are spatially," commented Gayland Kitch, Director of Emergency Management and Communications in Moore, Oklahoma.

As the experiment moved into the winter months, NWS forecasters produced hazardous weather graphics for heavy snow and ice events with continued positive feedback. During the winter storm of December 3 and 4, 2002, as the snow amount and precipitation type forecast became more clear, ten graphical forecasts were published. This allowed users to more clearly see where the snow and ice would occur and what the expected amounts would be.

As the spring severe weather season heats up, these forecasts will be issued with increased frequency. Look for these graphical forecasts on the web at *www.srh.noaa.gov/oun*.

Big Changes for Your Weather Radio

By Kevin Brown, Senior Forecaster

Feedback from you, our listeners, is very important! This article will inform you of some changes that will be occurring with National Weather Service Radio in your area. We will generally be making changes to the broadcast format, and comments and suggestions from you will help us tailor the broadcasts to what you want to hear. Please do not hesitate to contact us by phone at 405-360-5928 or on the web at *www.srh.noaa.gov/oun*.

Your forecast through seven days… You are probably hearing something a little different with regards to your local forecast. In the past, the seven day forecast for your area was played during each broadcast cycle. Over the past few weeks, we have changed the forecast broadcast by playing a condensed forecast each cycle, and the extended forecast four times an hour. We would like to know if you like this change and what can be done to improve it.

Live severe weather coverage… During periods of significant severe weather, like a tornado or significant wind or hail storm, you may hear us providing live coverage (with human voices!) on Weather Radio, giving you up-to-the-second coverage of spotter reports, observations, radar trends, and severe weather warnings. In addition, we will provide live severe weather forecast briefings for selected events this spring. We normally issue a Hazardous Weather Outlook (HWO) at 7:00 am and Noon each day. On selected weather days, a meteorologist will provide a live briefing to discuss, in greater detail than is provided in the HWO, the what, where, when, and why of the expected severe weather. This will likely be reserved for those days when widespread or significant severe weather is expected. You will know to expect an afternoon live briefing through announcements on Weather Radio and messages on our website.

More human recordings…In addition to the live broadcasts, we also plan to incorporate more human recordings during the next several months. This includes, but will not be limited to, transmitter-specific identification messages. We will use these messages to introduce ourselves, the forecasters and technicians "behind the scenes."

The Weekly Test…Something that will not change, but is very important, is the weekly alert test. The Norman NWS conducts an alert test each Wednesday around Noon, unless there is severe or hazardous weather. This weekly test is provided to allow radio owners to verify that their radios are functioning correctly. These test messages will also be used to advertise upcoming changes and solicit feedback from YOU, our valued customers and partners.

Please let us know what you would like to hear on your local NWS radio station! We value your input and ideas.

Which is Safer – a Car or a Mobile Home?

By Rick Smith, Warning Coordination Meteorologist

Anyone who has seen the aftermath of a significant tornado knows that vehicles and mobile homes are dangerous places to be in a tornado. Recently, researchers at Kent State University raised an issue that caused some people to question the National Weather Service's (NWS) safety guidelines concerning vehicles and mobile homes. Their research, based on surveys of tornado damaged areas and wind tunnel testing, indicates that it might be better for people to leave their mobile home and seek shelter in a vehicle. The researchers also question the NWS advice that you should leave your vehicle and seek shelter in a ditch if a tornado is approaching.

So, is it safer to be in a vehicle, a mobile home, or a ditch when a tornado threatens? The NWS tornado safety guidelines have not changed in response to this research. With the exception of a reinforced tornado shelter well below ground level, there is no perfectly safe place to be in a tornado. If an underground shelter is not available, a permanent home is the next best option. Recent research indicates that deaths in a mobile home when a tornado strikes are 15 times more likely than in a permanent home. Over 10 percent of the housing units in Oklahoma and Texas are mobile homes, and residents of these types of homes are especially at risk when violent storms approach.

Mobile homes, vehicles, and the outdoors provide little or no protection from a tornado and should be avoided. Here are some safety guidelines to follow if you are caught in one of these locations:

- Listen for watches and warnings to avoid being on the road when a severe thunderstorm is in the area. Delay your trip or change your plans to avoid travel into areas where storms are expected or occurring.
- If you encounter a severe storm, try to find shelter as quickly as possible. Highway overpasses should NOT be used as tornado or hail shelters! Find a sturdy building and get inside. Put as many walls between you and the outside as possible.
- People in mobile homes should pay particular attention to threatening weather, since you will need more time to get to shelter. You might consider leaving your mobile home when a watch is issued, instead of waiting for severe weather warnings.
- Ditches, low spots, and culverts should be used as an absolute last resort, and ONLY if you cannot find a substantial shelter and cannot drive out of the path of the tornado.

It is possible to survive a tornado. Develop your severe weather safety plan by deciding now where you will go and what you will do when a tornado threatens. Have multiple ways to hear a warning, and go to your safe place when a warning is issued or if a severe storm threatens you.

Cooperative Observer Notes

Power Zaps and Temperature Gaps — An Improved MMTS Unit

By Steve Smart, Hydrometeorological Technician

The National Weather Service (NWS) is deploying a new Maximum/ Minimum Temperature System (MMTS) readout unit to the field for Cooperative Weather Observers. Recording and reporting daily high and low temperatures for the NWS will be improved greatly, especially in the event of power outages. In addition, loss of data will be minimized or eliminated due to temporary power disruptions from a variety of sources.

The old unit is the C450-1, called the "Dash 1". The microprocessor for this unit has become obsolete, spurring the need for an upgrade. The new unit is the C450-7 and known as the "Dash 7". The processor in the Dash 7 is improved, and it has a more powerful battery and power supply.

At first glance, it appears that the new unit is changed little from the old one. These changes do not affect the measuring capabilities of the unit, as the new unit can report temperatures ranging from -55 to 125 degrees Fahrenheit. The circuitry and measuring algorithms are virtually the same between the two units, and basic operator functions are also identical. In addition, there is very little difference visually between the new and old units, with the exception of the color and some markings on the faceplate.

What is the big change if the two units look and operate identically? The answer lies in what happens when the power goes out. This is where the Dash 7 excels. When the AC power fails, the display on the Dash 7 will go blank except for a decimal point. However, unlike the Dash 1, the unit will continue receiving measurements normally for as long as the battery lasts. The battery life can be up to 24 hours. If the AC power returns to normal before the battery power is exhausted, the display comes back on and no operator action is required. All temperatures will be current, valid, and reliable for recording and reporting purposes.

The Dash 1 is only able to store data for about two hours if the AC power failed. The unit is also not capable of measuring temperatures during the power outage. A large gap of missing data results. This gap of missing data equals the sum of the time of the power outage and the time it takes for the observer to notice the MMTS unit is in a HELP mode. The observer must perform a unit reset before normal operations resume. Further, the observer has no recourse than to record the temperature values as "missing due to a power failure" on the appropriate form. With the new unit, this is no longer the case, with a few exceptions.

Is the Dash 7 completely fail-proof? No. Although the battery life is extended, the power will eventually become drained. If AC power is not returned to the unit before this happens, the unit will lose all data stored and will require a system reset. The observer will know this is the case if the Dash 7 unit displays HELP in the readout window. At this point, the actions necessary to resume normal operations are the same as with the Dash 1.

With the Dash 7, there should no longer be a loss of temperature data due to minor power disruptions. This means more complete temperature data will be available for reporting, recording, and archiving on a daily and monthly basis. In the end, climate databases will be improved and research material will contain data sets without large time gaps. This small upgrade in the MMTS unit will have a profound, far-reaching, positive effect on the nation's weather records.

New Observers

The NWS staff would like to welcome Johnny Branam, Celeste Carpenter, Cindy Davis, Tyson Farmer, Len Miller, and Tim Smith to the NWS Norman cooperative observer program. We look forward to working with all these new observers for many years to come.

Award Recipients

The following observers have recently received Length of Service awards:

Pat Hancock – 40 years
Garland Jones – 10 years

Thank you for the hard work and valuable meteorological data you have collected. We look forward to working with all of you for many more years.

Seasonal Snowfall Totals

Several winter storms hammered parts of Oklahoma and western north Texas this winter, especially during the month of February. As a result, many locations, especially in north central and south central Oklahoma, received above normal snowfall this season. Here are some selected seasonal snowfall totals from around the area:

Braman – 33.0 inches
Woodward – 30.3 inches
Clinton – 12.3 inches
Arcadia – 5.5 inches
Madill – 4.5 inches
Archer City – 2.0 inches
Hollis 5 E – 2.0 inches

Remember to mail the previous month's cooperative observer forms and recording rain gage tapes by the 5th of the month!

South Central and Southeast Oklahoma
Daryl Williams

Northern Oklahoma
Forrest Mitchell

Southwest Oklahoma and Western North Texas
Steve Smart

National Weather Service
Forecast Office
Norman, OK

Phone Number:
405-360-5928

Web Page:
www.srh.noaa.gov/oun

Meteorologist-in-Charge:
Mike Foster

Warning Coordination Meteorologist:
Rick Smith

Science and Operations Officer:
David Andra

Editor:
Karen Trammell

In This Issue:

National Weather Service Forecast Office
1200 Westheimer Drive, Room 101
Norman, OK 73069

Check out our text-based and graphical forecasts for your county at *www.srh.noaa.gov/oun*.

Please share this with friends, relatives, and colleagues. Comments and suggestions are always appreciated, by phone at 405-360-5928 or by e-mail at Karen.Trammell@noaa.gov.