



# THE TEXAS THUNDERBOLT



National Weather Service - Fort Worth, TX  
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Summer 2012

## NWS Fort Worth

### Leadership Team

#### Meteorologist in Charge

**Tom Bradshaw**

#### Science and Operations Officer

**Greg Patrick**

#### Warning Coordination Meteorologist

**Mark Fox**

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#### Questions? Comments?

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## New Leadership at NWS Fort Worth!

Hello! My name is **Tom Bradshaw**, and I'd like to introduce myself as the new Meteorologist-in-Charge of the Dallas/Fort Worth National Weather Service Forecast Office. Since I arrived on the job in late June, I've been trying to meet as many of you – **our partners and customers** – as I can. But with close to 8 million residents in our 46-county area of responsibility, that's a big job!

Here's a little of my background. I'm a native of Shawnee, Oklahoma, a small town located just outside of Oklahoma City. Like my predecessor, Bill Bunting, I attended the University of Oklahoma, where I received my Bachelors of Science Degree in Meteorology in 1987. I followed that up by completing a MS Degree at Florida State University. I've been in the National Weather Service for 21 years – most of that time spent as a forecaster or Science Operations Officer at Weather Forecast Offices in Albuquerque, Birmingham, and Huntsville, Alabama. In 2004, I moved to Fort Worth and became the Meteorological Services Chief at the NWS Southern Region Headquarters. While there, I had the opportunity to oversee all of our forecast and warning service programs for the Southern United States. In addition, I was fortunate to lead our Regional Operation Center, which provides weather and water decision support to many state and federal emergency response partners, including the State of Texas and FEMA VI.

I feel extremely proud and fortunate to be a part of WFO Dallas/Fort Worth. We're a team of 29 professionals who are dedicated to the protection of life, and to the provision of the best possible weather and water information to all North Texans. Mother Nature probably throws a wider array of impacts at us than anywhere else in the country. Through our recent history, we've faced killer tornadoes and windstorms, raging floods, crippling winter storms and droughts, and devastating wild fires. Despite the human toll and structural costs, we've shown resiliency, as Texans always do - *and always will.*



At the same time, my fellow NWS colleagues and I remain concerned about the extreme weather events that still await us. What happens if another Joplin or Tuscaloosa tornado occurs...this time at rush hour in the heart of Waco...or Sherman...or Dallas? As meteorologists and public servants, what steps do we need to be taking NOW, in concert with our community partners, to improve our ability to warn our citizens and mitigate the great loss of life that could ensue? And what additional steps do each of us as residents need to do to protect ourselves from these kinds of life-changing events?

While the challenges are great, our NWS office and I face them with great enthusiasm. Under the great leadership of our previous Meteorologists-in-Charge, Bill Bunting and Skip Ely, we've forged outstanding relationships with our emergency management and media partners, local and state elected officials, our many Skywarn and associated storm spotters, and our dedicated corps of Cooperative Observers. We're part of a large public/private team that works tirelessly to keep the residents of North Texas safe and informed when it comes to weather and its many impacts.

It's great to be a part of this community, and I look forward to meeting many of you in the weeks and months to come. I warmly invite you to contact me at **817-429-2631** if you have any questions or concerns about our weather, or the services the National Weather Service provides. Thank you!

## Co-op Awards by Troy Marshall

# 45 Years of Service!!



*Thanks to all of  
our Co-op  
Observers for all  
of your hard  
work,  
dedication, and  
service!*

**Nelda Ray** of Youngsport, TX, accepts the Dick Hagemeyer, **45 Year Length of Service Award**, from acting MIC Greg Patrick, NWS Fort Worth. An informal luncheon was held at Johnny's Steakhouse in Salado, TX, in honor of Ms. Ray. The photo was taken by HMT Troy Marshall.

## Welcome Jamie Gudmestad!

I was born and raised in Jamestown, New York. I graduated in 2005 from Mississippi State with a BS in Geosciences with a concentration in Operational Meteorology. I'm now a Master Sergeant in the Air Force Reserve (E-7) and have been in the military for almost 16 years. I have worked in the weather career field in the for 6 years now. I became a Meteorologist Intern at the Midland, TX WFO in February 2007 and got promoted to Journeyman Forecaster in October 2009. I transferred here to Ft. Worth to a Meteorologist Intern slot in June 2012. I have a husband, Joe and two little boys Gunnar (3 years old) and AJ (17 months old). I enjoy running; I've run many 5-Ks and 2 half marathons.



## April 3, 2012 - A Survivor's Story

By Dennis Cavanaugh

"I could feel the pressure change, and I heard a loud crashing noise...I knew we were going to take a direct hit."

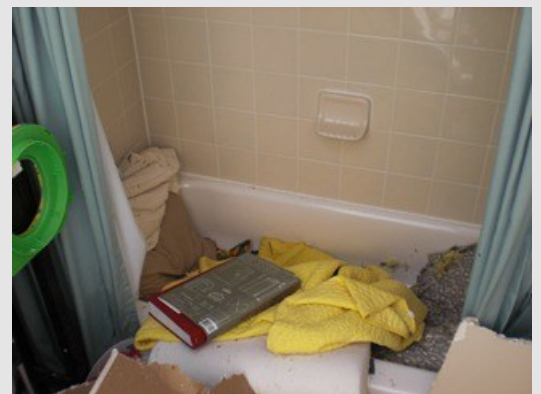
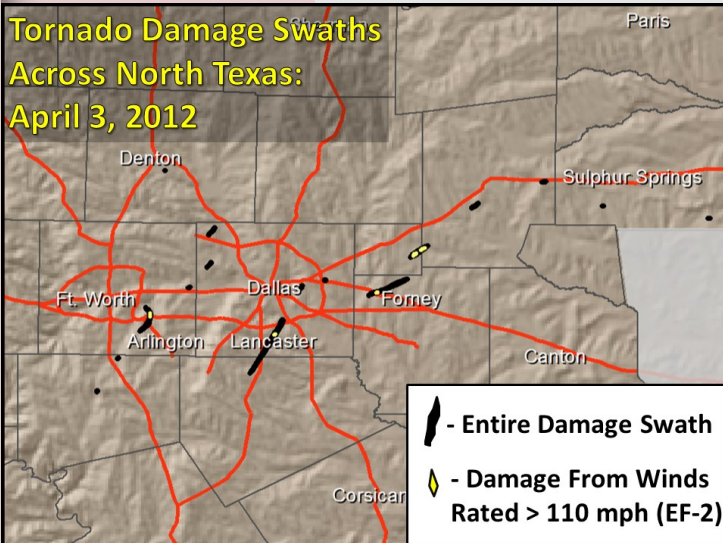
The 3 April 2012 tornado outbreak across north and northeast Texas, including the Dallas-Fort Worth Metroplex, was one of the largest outbreaks in the region's history, producing 20 tornadoes. Most of these tornadoes occurred in between Fort Worth and Sulphur Springs (see image at the bottom of this article). Despite impacting over 650 homes and causing an estimated \$800 million in total damage; no fatalities and few serious injuries were reported. While the NWS here in Fort Worth is actively researching this event in an effort to pinpoint why it occurred and why there were no fatalities; we wanted to share a story of survival from a woman who was in her home when one of the strongest tornadoes of the day struck her house.

On April 4th, the day after the tornado outbreak, several NWS meteorologists went out in teams to survey the extensive damage across the area. During the damage surveys we talked to several individuals and families that were directly impacted by the tornadoes. One story stood out to us because it illustrated the importance of being aware of your surroundings, and knowing what to do to keep your family safe in the event that you're in a tornado warning. Brooke Barnes, who lives in a subdivision in eastern Rockwall County, was in her house alone with her 2 year old son when a strong EF-2 tornado, packing winds in excess of 110 mph, moved into her neighborhood.

Her house (below) was almost completely destroyed.



Brooke and her son survived the storm uninjured, so we asked her to share her story with us so that we could use her experience as an example of what actions you can take to survive a strong tornado. Brooke indicated that she became aware of the threat of tornado on this day when a tornado watch was issued around lunchtime. She also indicated that she became drawn into the severity of the event by watching coverage of tornado damage on all of the local television stations. When she heard that these dangerous storms were headed for Forney and Rockwall, she decided to prepare her bathroom for the worst. "When I heard that there were tornadoes headed this way, I decided it was time to bring blankets, pillows, books, and snacks into the bathtub for my son and I just in case we had to take cover." {A picture of their bathtub, where they sheltered from the tornado, is included below} (Continued on pg. 8)



(Left) - This is an image of all of the surveyed damage swaths produced by tornadoes across North Texas on April 3rd, 2012. The hardest hit areas were Arlington, Lancaster, Forney, and eastern Rockwall into far southwestern Hunt counties. Brooke lives within the track of the eastern Rockwall county tornado.

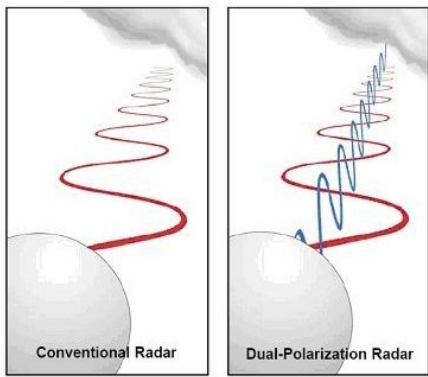


## Dual Polarization Upgrade Coming to North Texas

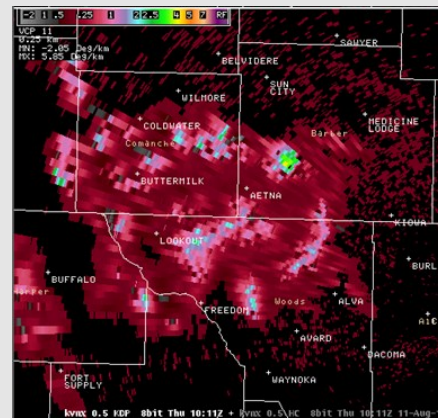
by Jason Dunn

A significant upgrade to the Fort Worth and Central Texas NEXRAD radar systems will take place later this year. The systems will be upgraded to dual polarization which is expected to help improve rainfall estimation and assist with severe weather detection across the region. The current configuration of the NEXRAD radar transmits and receives a single pol horizontal pulse which allows forecasters to determine precipitation intensity but does not give information on size or shape of the targets which it is sampling. After the upgrade, the radar will transmit and receive both horizontal and vertical pulses. This added information will help forecasters determine the size

The specific differential phase product (pictured below) will identify areas where heavy rainfall is occurring. The radar will use this data for better precipitation estimation products. In the image shown, specific differential phase is high in the green and yellow areas of the image. This indicates areas of very heavy rainfall within the overall precipitation shield.



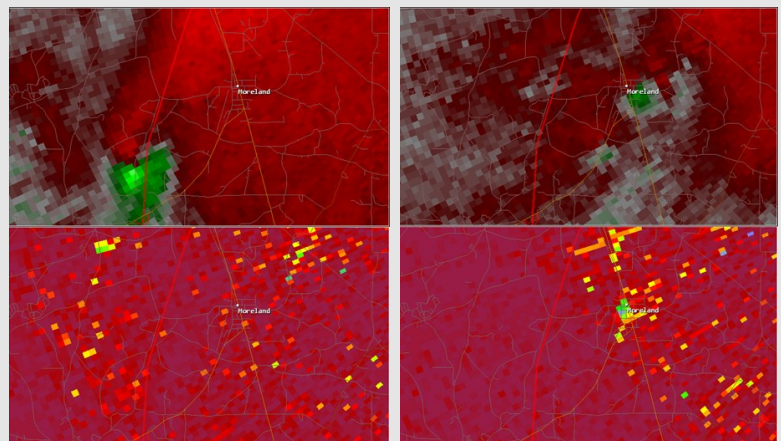
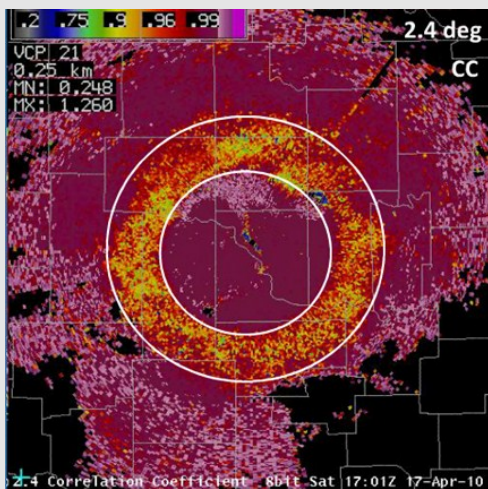
and shape of targets which will lead to improved accuracy in determining precipitation type and intensity. In addition, the new data from dual polarization has also been shown to improve hail size estimates and assist with tornado detection.



Several new products will be available to users of the NEXRAD radar data. These will include correlation coefficient, specific differential phase, differential reflectivity, and a new hydrometeor classification algorithm. While the new products will appear very different from traditional radar products, all of them have specific uses to assist forecasters. For example, the correlation coefficient (pictured below) product tells forecasters where precipitation is all of one type. This can be particularly helpful in winter weather situations. In the correlation coefficient image shown, the yellow ring indicates where frozen precipitation is melting. This real time indication of the melting layer will assist forecasters determine exactly what type of precipitation is reaching the ground.

In addition to precipitation type and intensity, the new dual pol products can also assist in hail size detection and tornado debris detection. While the tornado debris detection will not improve tornado warning lead times, it can be very useful in determining whether or not a tornado is actually occurring. This can be particularly useful with smaller tornadoes or in areas where spotter verification is not possible. In the left image below, you will see an area of strong rotation indicated by the red/green couplet in the top frame. The bottom frame is the corresponding correlation coefficient which is high, indicating all one type of precipitation. A few minutes later, (the right image below) as this rotation crosses a highway and enters a small town, the correlation coefficient dropped significantly, indicating debris was being lofted by an actual tornado. While this storm did already have a tornado warning, the tornado debris signature gave forecasters a much higher confidence that damage was actually occurring.

(Continued on pg. 8...)



## CASA DFW Urban Demonstration Network

by Greg Patrick

An exciting weather radar project is underway in the Dallas-Fort Worth region. The CASA DFW Urban Demonstration Network is a concept that seeks to improve weather hazard detection and response by installing a network of high-resolution weather radars near an urban area. CASA stands for Collaborative Adaptive Sensing of the Atmosphere and is an Engineering Research Center based in Massachusetts.

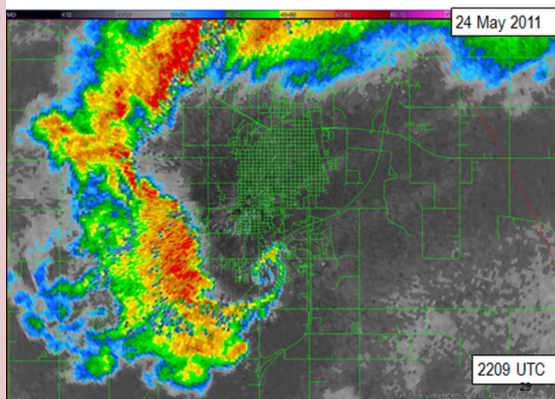
The CASA plan is to install a network of eight low-cost radar systems in the Dallas – Fort Worth area in the next year. The first three radars are scheduled to be online in fall 2012, and project leaders hope to have all 8 radars operational in time for the spring severe weather season in 2013. CASA was initially funded by a 10-year National Science Foundation grant in 2003, and a quasi-operational test bed of 4 radars was established in rural Oklahoma from 2007 – 2011. Those 4 Oklahoma radars have been brought to Texas and refurbished for the DFW Urban Demonstration Network. The radar units are currently stored in a warehouse at DFW Airport and will be installed this fall when additional grant money becomes available.

Funding for the CASA DFW project has come from a variety of sources, including city, county, state, and federal government, academic, and private sector. The North Central Texas Council of Governments, based in Arlington TX, has been the primary CASA partner in establishing relationships with a diverse set of officials in the region. Instead of a single entity “owning” the CASA radar network, NCTCOG and CASA see the potential for a “multi-sector ownership model” whereby the network essentially belongs to the entire north Texas community. In this sense, the DFW region could become a national model for future urban safety infrastructure. Depending on the outcome of the Demonstration and prospects for additional sources of funding, the DFW network could be expanded in the future to cover a large part of north Texas.

The first three radars will be installed in Denton, Arlington, and Addison. The site for the fourth radar will likely be in northwest Fort Worth near Eagle Mountain Lake. The sites for radars 5 – 8 have not yet been finalized, but studies are underway to find suitable locations. Each CASA radar unit costs approximately \$500,000 and has an effective range of 25 miles; the units were designed specifically to operate in a closely-spaced network with other CASA radar units.

Once the CASA radars are operational, meteorologists at the National Weather Service Forecast Office in Fort Worth will have access to the data in real time. The CASA data will supplement, rather than replace, radar data from the WSR-88D network. The adaptive scanning strategy employed by the CASA radars will provide high-resolution radar data with low level scans delivered every 60 seconds. The expected benefits for NWS operations include a higher-resolution depiction of winds, heavy rain and hail in thunderstorms, which will lead to more specific warnings for severe thunderstorms, flash flooding, and tornadoes. The CASA radars will also provide a dataset for initializing very high resolution computer models that could predict location and intensity of thunderstorms up to 3 hours in advance.

**“...the DFW region could become a national model for future urban safety infrastructure.”**



**Example of a CASA radar image on May 24, 2011 near Chickasha OK. The well-defined swirling pattern (seen just below the center of the image) was associated with a tornado on the south side of Chickasha.**

## What is an Integrated Warning Team?

By Melissa Huffman

**True or false:** When severe weather strikes North and Central Texas, NWS Fort Worth works alone to protect life and property.

**False.**

NWS Fort Worth works very closely with print and broadcast media representatives as well as emergency management professionals to send a consistent message to all residents of North and Central Texas. This partnership, called an **Integrated Warning Team**, is crucial during severe weather to make sure the public gets accurate, uniform, and timely weather information from multiple sources. NWS offices nationwide hold IWT workshops to get to know their partners and figure out the best way to work with each other. These IWT workshops follow a simple idea: the time to exchange business cards is not during a severe weather event. NWS Fort Worth has coordinated two IWT workshops this year: one for the North Texas area and one for Central Texas.

The North Texas IWT was held earlier this year in February at the North Central Texas Council of Governments in Arlington. With 150 attendees, it is the largest IWT work-

shop that has been held to date. The North Texas IWT featured a presentation from the principal investigator for the CASA Project over myths of disaster response as well as a panel discussion over outdoor warning sirens and media needs during severe weather.

The Central Texas IWT was held in June at the Heart of Texas Council of Governments in Waco. Approximately 40 people attended the workshop and learned about how the public processes warning information, services NWS Fort Worth can provide during severe weather, and what severe weather operations look like for each IWT partner.

IWT workshops are not a "one and done" kind of deal- they are designed to be regularly occurring meetings to help solve communication issues between IWT partners as well as determine the best ways to get information to the public. Future IWTs are currently in the planning stages.

NWS Fort Worth is currently evaluating the impact of the North Texas IWT on the April 3, 2012 outbreak. Check out future editions of the *Thunderbolt* to see results!



Dallas/ Fort Worth Broadcast Meteorologists at the North Texas IWT



## Dr. Weather:

A single thunderstorm can have a cascading effect on the atmosphere around it. It can change the apparent weather conditions many miles away from where the rain falls and sometimes can cause other new thunderstorms to form. Thunderstorms will often produce a mass of sinking and rain-cooled air that hits the ground and spreads outward. The separation between this rain-cooled air and the much warmer temperatures outside of the thunderstorm is called an **outflow boundary**. Because the rain-cooled air is cooler and denser, it has a higher air pressure and spreads outward until the air pressure difference is equalized. Sometimes these outflow boundaries can travel over 50 miles.

Even well away from a thunderstorm, outflow boundaries can produce very strong winds if the pressure difference between the cool air from the thunderstorm and the surrounding air mass is very high. This usually happens during the afternoon or early evening hours of hot summer days.

**Outflow boundaries** are often called “gust fronts” because they can cause a sharp temperature drop and a quick change in wind direction and wind speed. These sudden changes in wind direction and wind speed can be very hazardous to those participating in activities such as boating and aviation or for firefighters that are fighting wildfires.

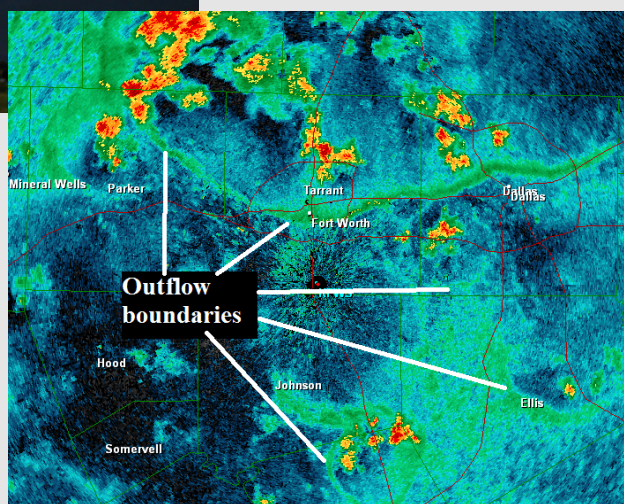
As a thunderstorm outflow boundary travels outward and away from the original storm, it will often lift the air out ahead of it. If there is enough moisture a line of clouds will form. These clouds along outflow boundaries are most commonly called shelf clouds or roll clouds. If the lifted air is both moist and unstable, outflow boundaries can cause new showers or thunderstorms to develop along the outflow boundary. Outflow boundaries show up on radar as narrow lines of low reflectivity that often surround the parent thunderstorms and can be tracked for many hours by meteorologists.

**What are  
outflow  
boundaries  
and are they  
dangerous?**



**(Left) - This is how an outflow boundary looks if you're outside. This cloud formation is called a "shelf cloud". If you see one of these approaching while on a boat move to shore quickly, but safely, as strong winds are likely headed your way!**

**(Right) - This is how outflow boundaries look on radar. Note the large east-west oriented outflow boundary near Ft. Worth and Dallas compared to the smaller arcing boundaries at the bottom of the image. Any of these boundaries may produce strong winds on a summer day!**



## **April 3, 2012 - A Survivor's Story (cont.)**

*From page 3*

Brooke continues, "When I heard that we were in a tornado warning, I decided it was time to move my son and I into the bathtub for safety. We sat there for several minutes waiting for the storm to pass, and I kept my son calm by reading him some of his favorite stories. As the tornado approached, I could feel the pressure change and I heard a loud crashing noise, and from that I knew we were going to take a direct hit. [It was] then that I laid down on top of my son, put a book on top of my head, and prayed for the best."

The tornado tore the entire roof off the house and destroyed nearly every room within Brooke's home. The only room that was spared from significant damage was the bathroom in which Brooke and her son were sheltering. This room was on the lowest floor, contained no windows, and was completely internal; meaning no walls were attached to the external frame of the home. Even in this room, a 2 by 4 was launched through the bathroom mirror from the other side of the wall, so Brooke's decision to further take shelter inside the sturdy bathtub also helped prevent injury for her and her son. "I feel fortunate that we were able to go through something like this without any injury", Brooke said. We applaud Brooke for making all the right decisions on April 3rd, and for having the courage to hunker down and do everything possible to protect her and her son once the tornado struck her house.



**Brooke Barnes, in her bathroom, being interviewed by meteorologist, Melissa Huffman. Note the hole in the mirror where a 2 by 4 was embedded from the tornado.**



**A picture of the room right outside the bathroom door. Extensive heavy debris like this was found in every room of Brooke's house, except for the internal bathroom.**

Taking shelter on the lowest floor of your house, in a room that does not share any wall with the external frame of your home, is the best thing you can do to keep your family safe in the event of a tornado. However, being aware of the weather around you, and the threat for severe weather on any given day is just as important. You can't take protective action if you're not aware that dangerous storms are possible and headed your way. The National Weather Service, print and broadcast media, and emergency management professionals all share in the responsibility for warning the public about approaching severe weather. For more information about this, please see our article on page 6 titled, "What is an Integrated Warning Team?". We will also include an article related to the results of our research regarding the tornado outbreak on April 3rd in the next issue of *The Texas Thunderbolt*. For more information on severe weather safety, please visit one of the following websites:

<http://www.srh.noaa.gov/fwd/?n=skywarn>

<http://www.ready.gov/>

## **Dual Polarization Upgrade Coming to North Texas (cont.)**

*From page 4*

These are just a few examples of some of the new data that forecasters will be looking at with the new dual polarization upgrade. The **Fort Worth radar is scheduled to be upgraded between November 26 and December 9 of this year**. The Central Texas radar (**Granger**) **will be upgraded between November 5 and November 18**. Radar data will be unavailable during this time as significant hardware components will need to be replaced.



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**“Protecting Life and  
Property Across North  
Texas.”**



Thank you to all of the contributors to the Summer 2012 edition of The Texas Thunderbolt! Look for the Winter 2013 edition of The Texas Thunderbolt to become available in January of 2013.

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Visit us on the web at:  
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## Follow NWS Fort Worth on Facebook and Twitter!

If you're looking for some more interaction with your Fort Worth National Weather Service office, you can find us on **Facebook** and **Twitter**!



From Facebook, just search for **“US National Weather Service Fort Worth”**, or follow the Facebook link on the **top-left** from our home page at:

<http://www.weather.gov/fwd>



You can now also follow us on Twitter! We use our twitter handle **@NWSFortWorth** to broadcast updated weather information and provide our thoughts during severe weather events. We also use Twitter to get weather reports and to answer your weather related questions!

From Twitter, follow us: **@NWSFortWorth**  
We also provide weather information under the hashtag: **#txwx**

## Ask Dr. Weather!

If you are interested in the weather and have always wanted to have something weather-related explained, submit us your question! In the next issue of the Texas Thunderbolt, Dr. Weather will answer one of your submitted questions in a full length article. To submit your question, please send an email to [sr-fwd.webmaster@noaa.gov](mailto:sr-fwd.webmaster@noaa.gov).

The most recent Dr. Weather topics include: Thunderstorm Outflow Boundaries, Snow Development, Frost, Microbursts, Landspouts, and Hurricanes & Wind Shear. Send us your question and whether you'd like your name and location included in the article and your question may be featured in the next installment of **Dr. Weather!**

Previous issues of the Texas Thunderbolt can always be found at:

<http://www.srh.noaa.gov/fwd/?n=skywarn>