THE TEXAS THUNDERBOLT

NATIONAL WEATHER SERVICE -- FORT WORTH, TX
SERVING ALL OF NORTH TEXAS
WWW.WEATHER.GOV/FORTWORTH

WINTER 2009

IN THIS ISSUE

NWS Fort Worth Leadership Team

Meteorologist-In-Charge
Bill Bunting

Science and Operations Officer
Greg Patrick

Warning Coordination Meteorologist
Gary Woodall

Questions? Comments?
sr-fwd.webmaster@noaa.gov

Background image is courtesy of Alan Moller.
© Alan Moller

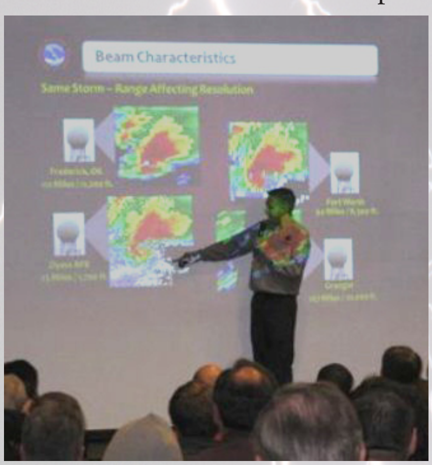
National Weather Service Kicks Off 2009 Awareness Tour

Coordination, Communications, Preparedness

The 2008 severe weather year will go down as one of the more violent years in recent history. Long-lived tornadic storms moved through the area in April, May, and again in December. Flooding, while not as widespread as in 2007, resulted in deadly impacts. Large hail and damaging winds pounded North Texas as well.

The National Weather Service in Fort Worth is ramping up its preparedness efforts for the spring severe weather season. Through April 2, staff from the NWS Forecast Office will conduct coordination visits with media and emergency management staffs, storm spotter training classes, and weather safety and awareness presentations. The staff currently has over 50 stops scheduled for the 2009 tour.

"The 2008 severe weather year was a vicious one. We did not have the widespread flooding as in 2007, but we saw more in the way of tornadoes and damaging thunderstorm winds", said Gary Woodall, Warning Coordination Meteorologist at the NWS Forecast Office in Fort Worth. "We must prepare for whatever 2009 has in store. During our awareness tour, we aim to enhance the already-strong spotter network, emergency communications and warning system, and level of hazardous weather awareness which is in place."



Above:
Forecaster Jason Dunn speaks to the crowd at the Collin County Skywarn program on January 24th. Photo by Bobette Mauck, KD5VYK.

The SKYWARN storm spotter training programs will be a featured part of the awareness tour. The spotter programs discuss the formation and behavior of storms, the production of severe weather, environmental clues which can suggest the possibility of a tornado or other severe weather, spotter reporting procedures, and safety tips. The SKYWARN programs are free, and nearly all are open to the public.

"Storm spotters are a valuable component of the warning system", Woodall stated.

More on Page 2

2009 Awareness Tour

Continued

"Radar is a great electronic tool, but it does not tell us the whole story of what's going on around a thunderstorm. Storm spotters complement the electronic data with their visual observations and reports. This in turn helps us provide the best possible service to North Texans", said Woodall.

Coordination visits will also be a major part of the awareness tour. NWS staff members will meet with emergency officials and media outlets throughout their 46-county area of responsibility. The meetings will ensure that contact information and severe weather procedures are as up-to-date as possible. The NWS staff will distribute awareness material for the local officials to use in their areas.

"Issuing warnings and statements for severe weather is one of our most important jobs", Woodall said. "However, if warnings aren't relayed quickly, or if people don't know how to respond properly, then the warnings will not be effective. The coordination visits help ensure that the warning system is as efficient as possible."

Mark your Calendars!

View the 2009 SKYWARN program schedule:
http://www.weather.gov/fortworth/sptrsch.html

Right:
Fort Worth HAM operator, Mike Heskett (WB5QLD) speaks to the Collin County crowd. Photo by Bobette Mauck, KD5VYK.

Extreme Cold of December 1983

by Jennifer Dunn

Many North Texans remember December 1983 for the extreme cold that plagued the region in the latter half of the month. During that December, several cold fronts brought arctic air to the region and dropped temperatures below freezing for 10 days or more. In the record books, December 1983 remains the coldest winter on record for North Texas. The average temperature across North Texas was 12 degrees Fahrenheit below normal! Now, 25 years later, 12 daily records in Dallas/Fort Worth and 13 daily records in Waco still stand from December 1983.

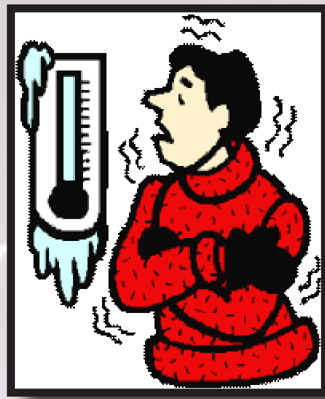
See tables for comparisons between December 1983 and December 2008 at DFW Airport and Waco Airport. All temperatures in degrees Fahrenheit and precipitation in inches.

DFW International Airport	December 1983	December 2008
Average Monthly Temperature (Departure from Normal)	34.8 (-11.9)	49.0 (+2.3)
Average Monthly Maximum Temperature (Departure from Normal)	43.4 (-13.1)	61.1 (+4.6)
Average Monthly Minimum Temperature (Departure from Normal)	26.1 (-10.7)	36.8 (0.0)
Monthly Precipitation Total (Departure from Normal)	0.83 (-1.74)	0.27 (-2.30)
Monthly Snowfall Total	2.0	Trace

SEE PAGE 3 FOR WACO COMPARISONS

Extreme Cold of December 1983
Continued

Waco Airport	December 1983	December 2008
Average Monthly Temperature (Departure from Normal)	38.3 (-10.0)	48.6 (+0.3)
Average Monthly Maximum Temperature (Departure from Normal)	48.1 (-11.0)	62.5 (+3.4)
Average Monthly Minimum Temperature (Departure from Normal)	28.5 (-9.0)	34.6 (-2.9)
Monthly Precipitation Total (Departure from Normal)	0.46 (-2.30)	0.68 (-2.08)
Monthly Snowfall Total	Trace	Trace



Historical Perspective Available:
http://www.srh.noaa.gov/fwd/december1983.htm

A Review of the February 24, 2003 Winter Storm

A technical review of key ingredients and model performance

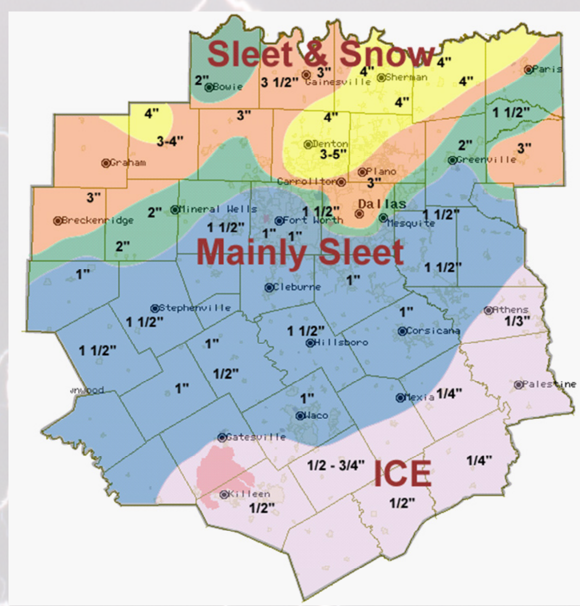
by Tara Dudzik

This February marks the 6th anniversary of the February 24, 2003 high impact winter storm that brought most of the Dallas/Fort Worth area to a halt. Precipitation fell in the form of ice, sleet, and snow with accumulations ranging between 1/2 and 4 inches. The heaviest precipitation fell on the evening of February 24. The fact that this occurred during the evening commute caused an even more substantial impact for residents. Several different lifting mechanisms and ingredients were in place for one of North Texas' most significant winter events. So, what were these key factors, and which numerical models had the best handle on the event?

The set-up started coming together around Noon on Sunday, February 23. A well-defined low pressure system at the surface coinciding with a 500mb shortwave trough began moving into the Southern Plains. In addition, very cold air streamed into North Texas as high pressure was building over the Rockies.

Convection formed by Noon on Monday, February 24 across north central Texas. With temperatures already in the 20s over most of the area, it did not take long for precipitation to transition into a wintry mix.

More on Page 4



Above:
Graphic displaying observed amounts of wintry precipitation during the February 24, 2003 storm.

February 24, 2003 Winter Storm
Continued

However, as is often the case in North Texas, there was a distinct temperature gradient over a short distance. Snow started falling over northern portions of the area, while temperatures in the mid 30s kept precipitation in the form of sleet and rain in and to the south of the Dallas/Fort Worth area.

Looking at the numerical model data, the GFS was more aggressive than the ETA with its very pronounced 500mb shortwave trough and high pressure at the surface. Nonetheless, after a few more model runs, both the GFS and the ETA came into agreement with one another by 6 am on February 24. After further analysis, both models were in good agreement on moisture, potential vorticity, and upward vertical motion (UVM) in the mid-levels throughout the event.

The parameter that the GFS and ETA did not agree on was temperature, and that factor played a major role in the event. Originally, the ETA brought cold air into North Texas much faster than the GFS40. However, as the event got closer, the GFS became more aggressive with filtering cold air into the region. In the end, the GFS40 had the best handle on the temperatures during the hours of the heaviest precipitation. The margin between the two models was rather large, with the ETA80 being 5 to 10 degrees too warm.

See Page 9 for more analysis

Total Lightning Network Offers a New Look at Thunderstorm Activity

by Chris McKinney, NWS Houston, TX

Anyone with an AM radio knows when a thunderstorm is nearby static can be heard over the speaker. This static is caused by electromagnetic energy emitted by lightning. As lightning flashes, it emits energy over a large portion of the electromagnetic spectrum (the visible light range being the most obvious to humans). It turns out that this radiation can be used to detect when and where lightning flashes are occurring within a thunderstorm.

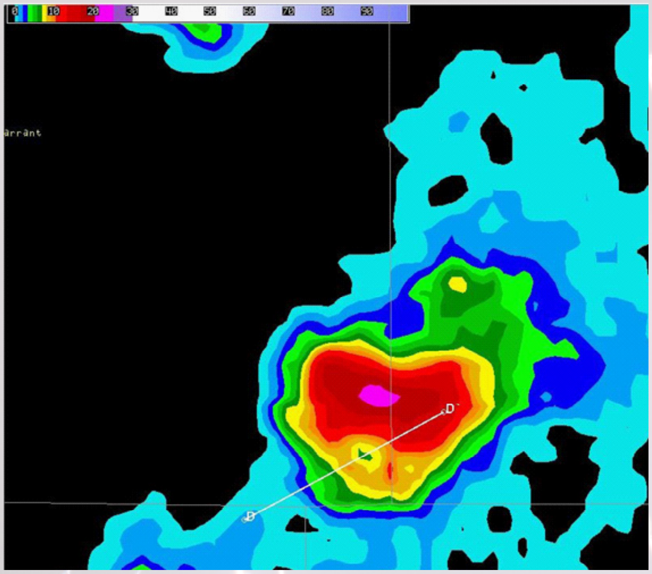
Several lightning detection networks that could detect cloud to ground lightning flashes were deployed across the United States beginning in the early 1980s. These networks were combined in the late 1990s to create the National Lightning Detection Network (NLDN). This network provides the information on lightning ground strikes that is frequently displayed on television.

In the past few years, forecasters at the National Weather Service office in Fort Worth have had access to data from a newer lightning detection network, the Lightning Detection and Ranging (LDAR) network. The LDAR sensors detect lightning much the same way that your AM radio does. At each sensor site, a GPS clock marks the exact time a pulse of lightning noise arrives at the sensor. If four or more sensors detect the same pulse, its' exact location (and time of occurrence) can be determined. A large lightning flash can easily produce over 1000 of these pulses, which can be mapped out to provide an accurate representation of a lightning channel in three dimensions.

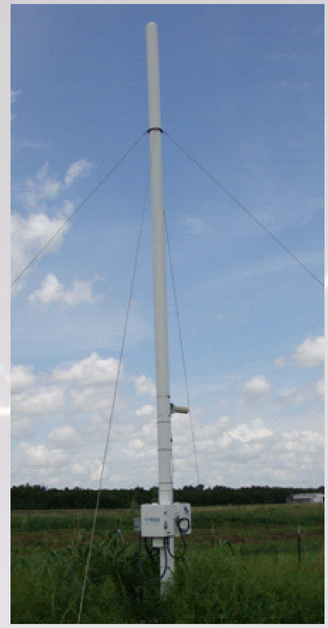
Continued on Page 5

Total Lightning Network
Continued

Every two minutes, the LDAR network counts up the total number of detected lightning flashes across the DFW metroplex. The area is divided up into a grid of 1 kilometer by 1 kilometer boxes, and the number of flashes per box is passed on to forecasters at NWS Fort Worth. The finished product is color-coded and looks similar to a radar reflectivity image.

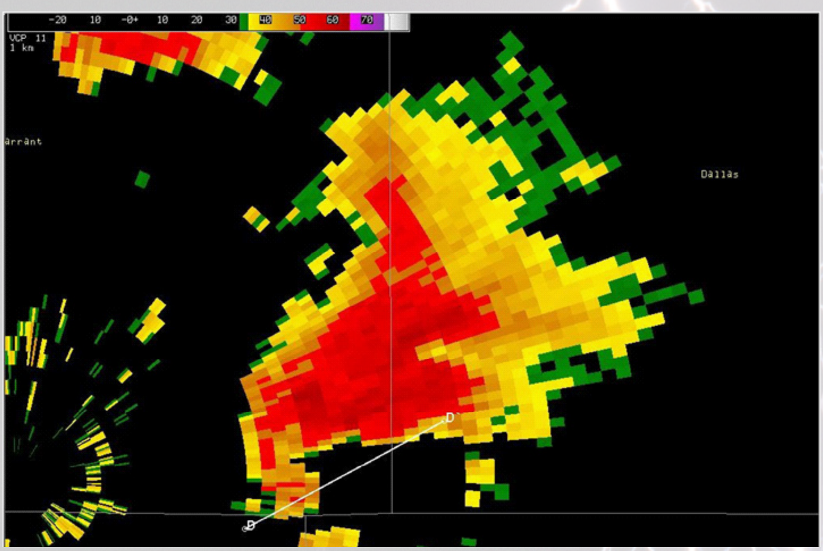


Right:
Total lightning image of a supercell thunderstorm over Tarrant County in April 25, 2005.



Above:
LDAR sensor near Houston, TX, which is part of a network owned by researchers at Texas A&M University.

The Tarrant County storm (above) produced two weak tornadoes, as well as numerous reports of large hail. Of particular interest in this image is the small area of relatively low values on the southwest side of the large blob of lightning activity. This is what forecasters call a lightning hole, and it is an indication of a strong thunderstorm updraft. For comparison, a low-level radar image of the storm at the same time is seen below. Here we can see the classic hook echo shape, often associated with supercell thunderstorms.



Above:
Hook echo from KFWS WSR-88D on April 25, 2005.

The LDAR network provides operational meteorologists and researchers alike with new insight into the electrical activity of thunderstorms. As we continue to learn more about lightning within thunderstorms, we can apply this information to weather forecasting and improving lightning safety for the general public.

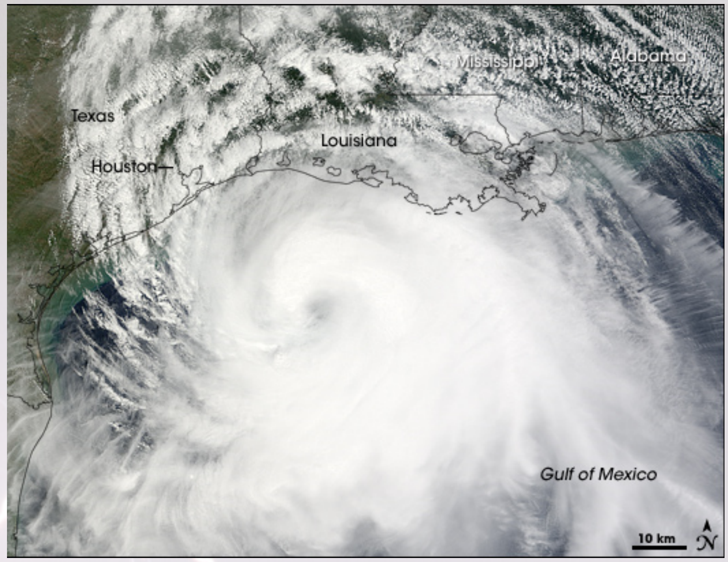
Hurricane Ike Affects North Texas

by Jessica Schultz

North Texans are familiar with severe thunderstorms, flash floods, tornadoes, and even winter weather. Yet many North Texans never experience the effects of a hurricane or tropical storm.

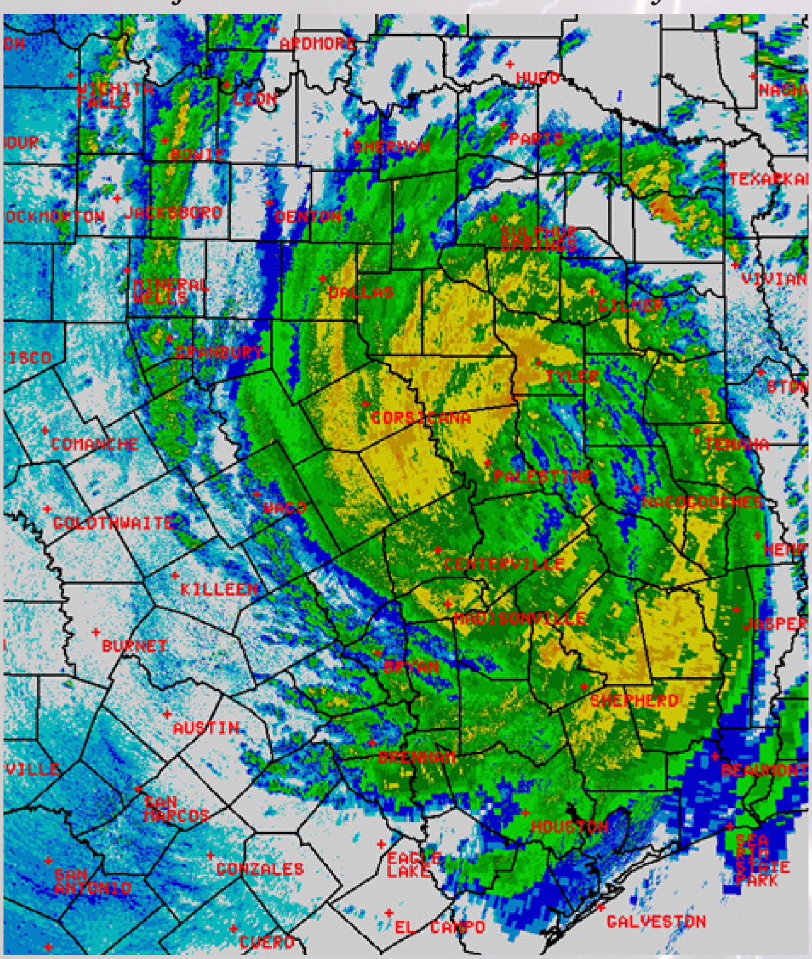
Hurricane Ike made landfall near Galveston, TX during the early morning hours on Saturday, September 13, 2008 as a category 2 storm on the Saffir-Simpson scale. Ike packed a punch with maximum sustained winds of 95 knots (110 mph) at landfall.

Hurricanes thrive on the warm, open waters of the Gulf of Mexico and Atlantic Ocean. Land and friction on the surface of the earth result in the storm weakening after landfall. The rate of weakening varies with each storm.



Above:
Satellite image of Hurricane Ike. NASA Earth Observatory image.

Below:
Radar mosaic image at 1:36 pm on Sept 13. Center of circulation between Palestine and Tyler.



Ike was still a category 1 hurricane as it moved northward into east central Texas. Ike pounded southeastern and eastern sections of North Texas, including areas from Palestine to Athens. An automated weather reporting station near Palestine lost power as Ike approached, so the maximum wind speeds can only be estimated from damage and eyewitnesses.

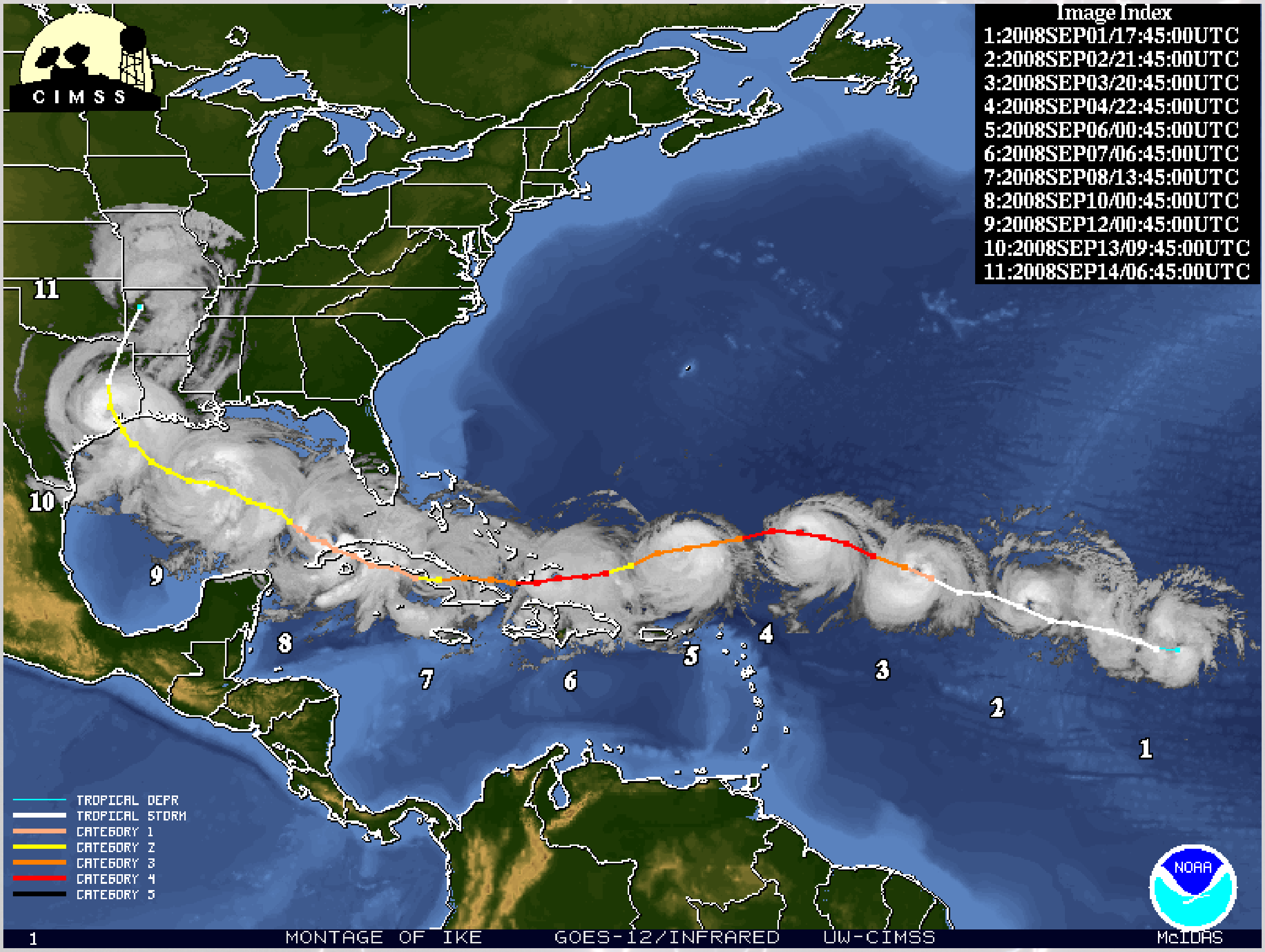
Estimated sustained winds near 70 mph with higher gusts impacted Anderson and Freestone counties. Winds from 45 to 60 mph were estimated across Limestone County. Several counties reported winds in the 30 to 45 mph range, including Henderson, Milam, and Van Zandt.

Numerous trees and power lines were downed across Anderson, Ellis, Falls, Freestone, Henderson, Hunt, Kaufman, Leon, Limestone, Milam, Navarro, Robertson, and Van Zandt counties. More significant damage, including a few houses damaged by falling trees, occurred in Anderson County.

More on Page 7

Hurricane Ike Affects North Texas
Continued

Winds from 20 to 30 mph were observed generally along the Interstate 35 corridor and to the west, including the Dallas/Fort Worth metroplex. Rainfall amounts were locally heavy (ranging from 2 to 4 inches) over eastern portions of North Texas, but due to Ike's relatively fast movement, widespread flooding was not reported. Many locations across far east Texas and western Louisiana experienced winds in the 70 to 80 mph range, multiple tornadoes, and flooding.



Above:
Track of Ike. Numbers correlate to times shown (in UTC) in box.
CIMSS/NOAA image.

Want to Know More?

For additional Ike information, visit the National Hurricane Center archive webpage at www.nhc.noaa.gov or for Ike impacts in the Houston area, visit the NWS Houston webpage at www.srh.noaa.gov/hgx/projects/Ike08.htm

DR. WEATHER'S WISDOM

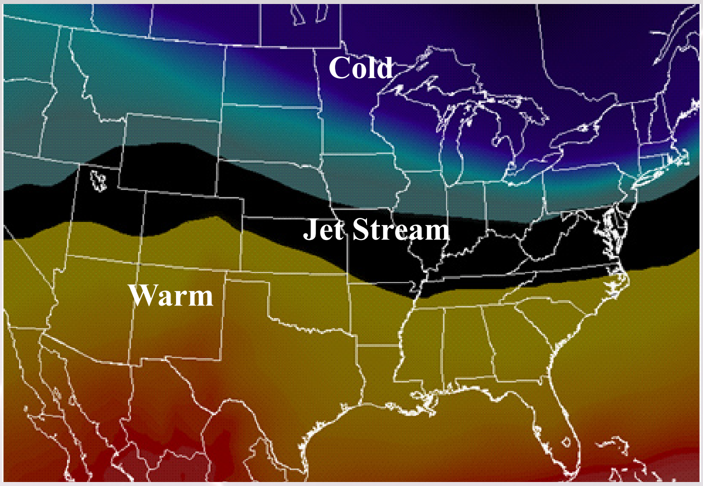
Jet Streams by Ted Ryan

Weathercasts often show the location of the jet stream and how it will evolve over the next several days. Alert weather watchers in North Texas know that if the jet stream dives south out of Canada into our region, it means cold weather is on the way. But believe it or not, the jet stream doesn't bring the cold air south...it's the cold air coming south that brings the jet stream!

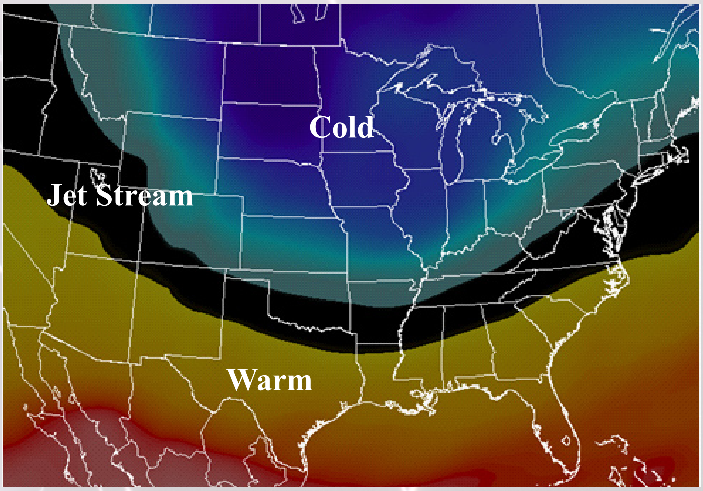
The jet stream is actually created by the interactions of constantly shifting massive upper level "blobs" of warm and cold air around the earth. The regions of warm air are often referred to as ridges or upper level high pressure. These regions typically bring dry and warm conditions. The large masses of cold air are called troughs or upper level lows, and are responsible for cold and unsettled weather. Because warm air is less dense than cold air, it causes a pressure difference that creates wind. This wind grows strongest in regions where the warm ridges and cold troughs meet. This is where the jet stream will always be found.

Lets look at a couple of real examples of upper level patterns and the location of the jet stream. The first example (top image to the right) shows a pattern where much of the country would experience "normal" weather. This is because the cold airmass is located where it is supposed to be - to the north, while the warm airmass is in the south. The jet stream is shown as the black ribbon sandwiched between the warm and cold airmasses. The second example (bottom image to the right) shows that an upper level trough has moved south out of Canada and is bringing arctic air to much of the country. The jet stream seemingly is diving south, but in actuality it is only surrounding and encircling the cold airmass as it moves south.

Using the location and track of the jet stream is an easy way to see the kind of weather pattern that is forecast. But just remember, the jet stream doesn't make the weather colder or warmer; it is merely a by-product of the continuous dance between the cold troughs and warm ridges.



Above:
Jet stream in black. "Normal" weather pattern, with cold air in the north and warm air in the south.



Above:
Jet stream in black. Jet stream "diving" south.

Learn More!

Visit JetStream, the online National Weather Service weather school for more information on the jet streams!

http://www.srh.noaa.gov/srh/jetstream

February 24, 2003 Winter Storm

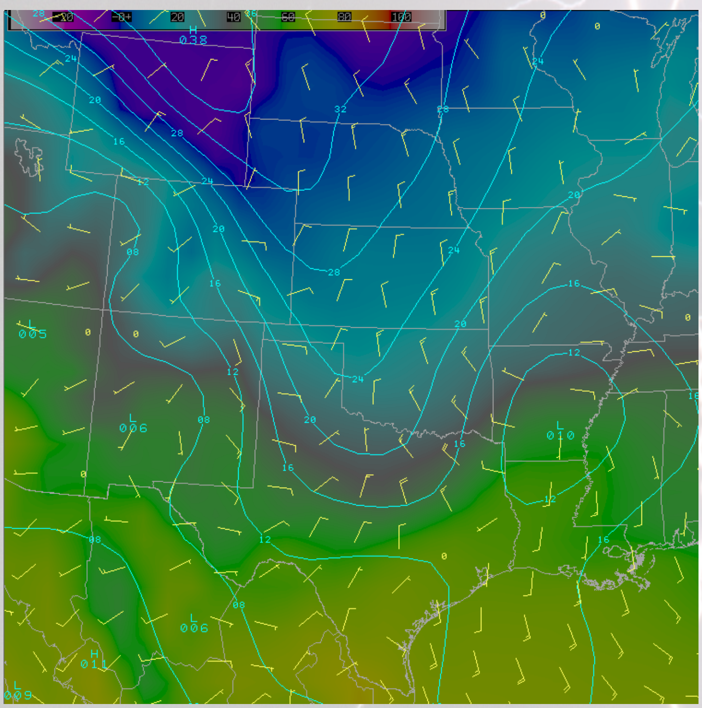
Continued

The precipitation amount (QPF) guidance was one component that both the GFS and ETA missed. The models indicated the heaviest precipitation would be concentrated well south of the Dallas/Fort Worth metroplex; however, the convection and main band of precipitation ended up being to the north of DFW. In addition, neither model had a good handle on the timing of the precipitation, estimating the band to move through around Midnight Tuesday on February 25. This estimate puts the precipitation about 4 to 6 hours too late, with the actual time of the heaviest band being near 6 pm Monday. Even though the models agreed well with each other in terms of precipitation amounts and timing, they both failed to capture those aspects of the actual event.

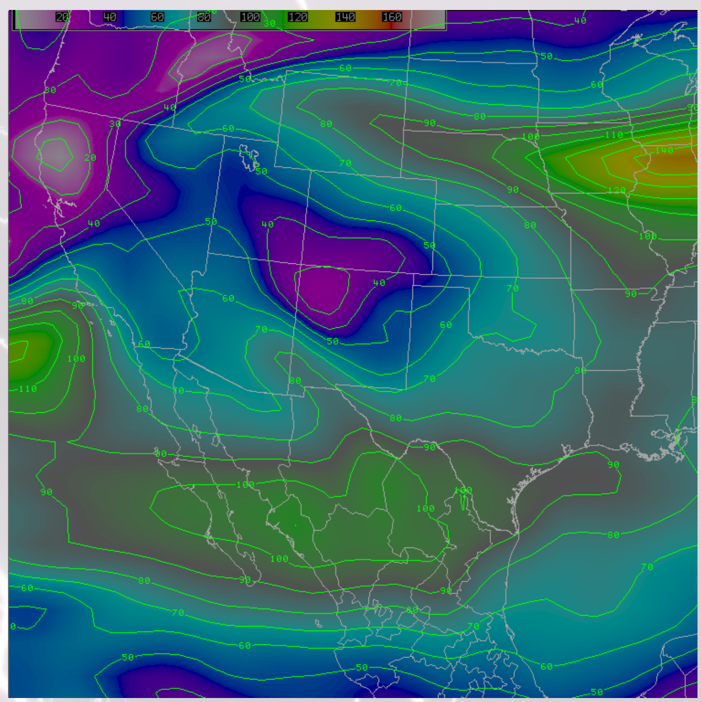
The February 24, 2003 winter storm had all the elements in place for a significant event: ample moisture, an arctic airmass reinforced by strong northerly winds, and strong frontogenesis at several levels. Yet, these components alone did not seem to provide sufficient lift or UVM. After further analysis, a key player appeared to be a 100kt jet max at 300mb. The left exit region of this jet max was situated such that North Texas was in the strongest area of UVM. The jet max and frontogenesis provided the strong lift necessary for the heavy precipitation.

For More...

Visit www.srh.noaa.gov/fwd/sleeticefeb242003.htm



Above:
Surface map from GFS at 6 pm Feb 23. Contours are pressure, image is temperature, and yellow barbs indicate winds. North wind and cold temperatures are filtering into North Texas.



Above:
GFS depiction of 300mb winds (jet stream) at 6 pm Monday Feb 24. Contours and image are wind speed. Note 100kt jet max across northern Mexico and southern Texas.