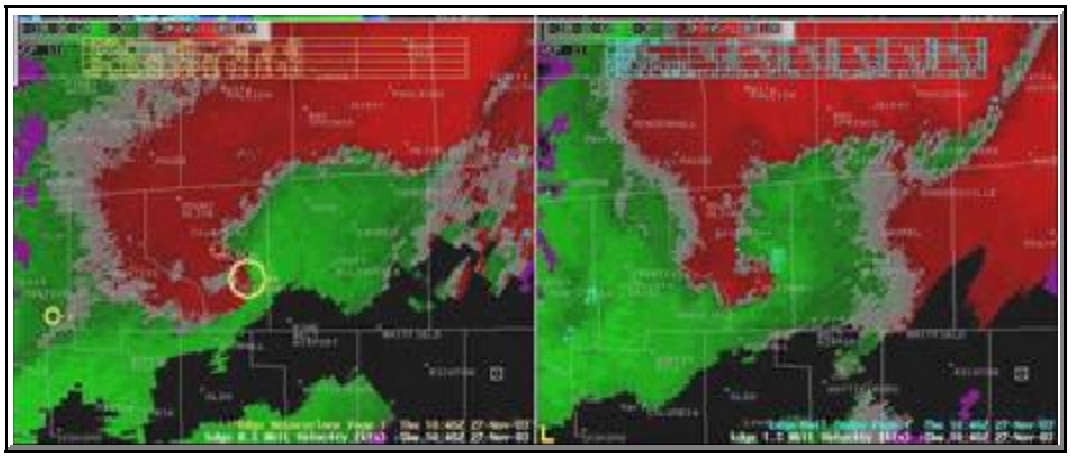
The ArkLaMiss Observer

Fifth Edition, Fall 2004

The official newsletter of the Jackson, MS Forecast Office

While You Were Sleeping

A look at the mini-outbreak of November 27th



This tornadic supercell produced a F-0 tornado over Covington county. The green represents wind moving toward the radar and red is wind moving away from the radar.

What was normally a quiet night on Thanksgiving eve was anything but that in 2003! A vigorous system moving to the northeast from the gulf coast made the morning of Thursday, November 27th a Thanksgiving to remember for the southeastern portions of the forecast area.

On the previous day, Wednesday, an analysis of the computer model data suggested that severe, tornadic weather was possible during the early morning hours Thursday. Forecast data suggested that an approaching warm front would move to the northeast and introduce enough moisture, instability and lift to get strong nocturnal thunderstorms going. Concerns increased significantly when the model sounding data was analyzed. An analysis yielded the following results: 50 knots of 0 km to 6 km wind shear, a 40 to 50 knot southerly low level jet. With anticipated low cloud bases and strong directional changes in the winds near the surface, the development of tornadic supercells became the primary concern, especially given an anticipated favorable upper level jet stream pattern. On Wednesday night, the Storm Prediction Center issued a tornado watch for portions of southeastern Mississippi. The thinking was that the supercells would form south of the warm frontal boundary and move to the east/northeast along it. Any storms that managed to cross over the boundary, ahead of the warm front, were expected to weaken as they moved into an unfavorable environment. Again, this was all expected to occur between the hours of midnight and 6 am on Thursday morning, and it did.

Beginning at 3:00 a.m. the storms began approaching the area from Amite County. As they approached, they took on supercellular characteristics as the rotational velocities within the storms began to tighten, increase and gain greater vertical depth. Over the next three hours, tornadic supercells tracked to the east/northeast through Lawrence, Jefferson Davis, Covington, and Jones counties. By 3:30 a.m. reports of numerous trees being blown down began coming in. The first touchdown of a tornado occurred at 4:11 a.m. about 4 miles southeast of Bassfield. In addition to numerous trees being uprooted, a carport and a chicken house were destroyed. Over the next hour, two more tornadoes touched down, one in Covington county and another in Jones county. In addition to the tornado reports, numerous reports of trees and powerlines down were received. Fortunately, there were no weather-related fatalities during the event.

LIGHTNING KILLS, PLAY IT SAFE

By Christopher Bannan

Lightning is the #2 cause of storm related deaths in the U.S., killing more people than tornadoes or hurricanes. Lightning also inflicts life-long debilitating injuries on many more than it kills. Fortunately, most lightning deaths and injuries are easily avoided.

Photo: Monroe, LA on July 17, 2003 courtesy Derek Deroche

The first step in lightning safety is to plan your outdoor activities to avoid as much of the lightning threat as you can. Watch the local weather forecasts and know your local weather patterns. The forecast from the National Weather Service office in Jackson can be found at www.srh.noaa.gov/jan. The safest place from lightning is inside a large, fully enclosed building with wiring and plumbing, e.g. a typical house. Stay away from any conducting path to the outside: corded telephones; electrical appliances; and plumbing. Don't watch lightning from doorways or windows. If you can't get to a house, a vehicle with a metal roof and metal sides is a good second choice. Roll-up the windows, lean away from the door, and don't touch any conducting path going outside, e.g. radio, keys in the ignition, steering wheel, etc. Remember, it's not the rubber tires insulating you from the ground that makes vehicles safe, but rather the metal shell that conducts the electricity around you -- convertibles, motorcycles, cars made of fiberglass and plastic, and open shelled outdoor recreation vehicles don't count. So, please avoid these types of vehicles. If you can't get to a house or vehicle, then at least avoid the most hazardous places and activities. Stay off elevated places, like buildings, high playground equipment, etc. Keep away from open areas. Get away from tall isolated objects like trees. Going under trees to keep dry is the 2nd leading cause of lightning casualties in the U.S. Stop water-related activities, including fishing, boating and swimming.

Get off of open vehicles like cabin-less tractors, bulldozers, four-wheel recreational vehicles, etc. But remember, ***NO PLACE OUTSIDE IS SAFE NEAR A THUNDERSTORM***. You are much safer going inside a house or car. If you are caught outside and your hair starts standing on end, or you feel a tingling sensation on your skin, lightning is about to strike! Immediately, crouch down into a small ball to make yourself as small a target as possible.

Lightning is definitely the most underrated thunderstorm threat. While no set of guidelines can give you 100% guaranteed safety from lightning, the procedures discussed above can help you avoid the majority of lightning casualties.

For more information on lightning safety, visit www.lightningsafety.noaa.gov.

A word from WCM Jim Butch…

With hurricane season continuing through November and with a peak in severe weather the same month, now is the time to schedule your fall Skywarn spotter training sessions for September and October. For further information call (601) 936-9206 or visit our website at *http://www.srh.noaa.gov/jan/*

Fire Weather Season 2004

Part 1

…a season that was full of changes

It all began in March and April in amidst a very unusual 26 day dry spell. Now, most people consider clear skies, mild temperatures, very low humidities, and breezy winds to be perfect weather conditions. In the world of fire weather, these conditions can make for a busy fire season. What happens is this. The warm, dry, and breezy conditions allow for the moisture to evaporate from plants at a faster rate. The moisture loss creates brittle plants that can easily burn if a fire source is introduced. For example, consider leaf burning in the fall. Notice how well the leaves burn on a warm, dry fall day. Now imagine trying to burn that same pile of leaves in the late spring time, after a period of wet weather. Notice how much more slowly the leaves burn and how they burn less efficiently.

At any rate, during the dry and warm early spring months this past March and April, the conditions had become extremely favorable for the development of wildfires. In fact, national and state foresters had reported several wildfires that had developed. Fortunately, none of the fires became large enough to require the dispatch of an Incident Meteorologist (IMET) to the scene.

Following these events, in late April, an analysis of the dry period by the Fire Weather team at WFO Jackson showed that the established criteria for Red Flag Warnings and Fire Weather Watches needed to be reevaluated. (Red Flag Warnings, RFW's, and Fire Weather Watches, FWW's, are products that are issued to alert various government agencies, such as the Forest Service, of dangerous burning conditions that are due to unusually dry and windy weather.) During the period, it was determined that there had been 3 to 4 days in which the weather would have created extreme burning conditions. In fact, prescribed burn, ignited near Natchez, had briefly gotten out of hand.

A paradox was discovered when these days were cross referenced with the established criteria for the issuance of the RFW's and FWW's. None of these days met the established criteria. To address the issue and to solve the problem, the Fire Weather team, led by team leader Marc McAllister, senior forecaster Mike Edmonston and Incident Meteorologist Bryan Henry formed a larger interagency team with national and state forestry officials. Not surprisingly, the forestry officials had come to a similar conclusion. For safety's sake, and for the protection of life and property, the criteria for Mississippi needed to change.

The interagency team quickly came to a consensus on the new criteria. It is as follows.

Red Flag/Fire Weather Watch Conditions as of May 2004: for Mississippi

Keetch-Byram Drought Indices approaching or greater than 650 from 9-15 to 5-15

OR

Relative Humidity less or equal to 25%

AND

20 foot wind speed of greater or equal to 20 mph

AND

NO rainfall greater than a half inch in the previous five days

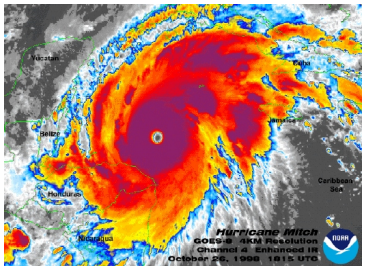
We here at the National Weather Service in Jackson, Mississippi would like to thank our counterparts on the team for their insight and and input into this process.

The "Other" Dangers of Hurricanes

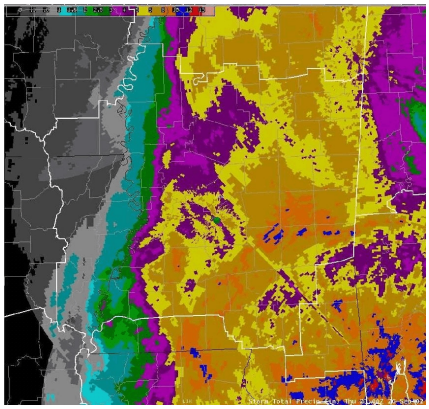
When thinking of the dangers associated with hurricanes, most people immediately think of the strong hurricane force winds and flooding from a vigorous storm surges that are associated with a system as it comes on shore. What frequently goes overlooked are the tornadoes and inland flooding that often occur with some of the systems as they track overland.

Intensive research into the phenomenon of tornadic weather that is associated with land falling tropical systems has yielded interesting results. First, and probably the most obvious, is that not all landfalling tropical systems produce tornadoes. For example, when Tropical Storm Bill moved trough the area last summer (2003), no reports of tornadoes were received in our area as it raced off to the northeast. On the other hand, Tropical Storm Lilly did produce a few tornadoes when it passed through the area in October 2002. While little is known as to why some storms produce the tornadic weather and some do not, some information has been gained as to where, within the storm, the tornadoes form. Numerous studies of landfalling, tornadic tropical systems have shown that the most favorable location for tornadoes is on the northeastern side of the storm, relative to its movement.

Of greater concern than tornadoes, is the concern of inland flooding. When Tropical Storm Isidore came through Mississippi in September 2002, significant flooding was reported as 7 to 10 inches of rain fell across the area over a 72 hour period. Much more devastating, flooding from Hurricane Mitch in 1998 in Honduras and Nicaragua killed a total of 9086 people and severely damaged the economies of both countries, Furthermore, a lot of the vegetation in the vicinity of where the category 5 hurricane made landfall was eradicated due to the intense flooding and mudslides that occurred.



Hurricane Mitch just prior to landfall.



Radar rainfall estimates from Isidore

Does the tropical system need to be as far along in the developmental cycle as a tropical storm or a hurricane to produce significant flooding? The answer is no. In 1994, a pair of tropical low pressure areas moved over central Georgia (over a 2 month period) and stalled. The continuous tropical rainfall allowed for the Flint River to rise to record levels. The flooding event was classified as a 500 year event, meaning that flooding to this degree was estimated to only occur once every 500 years. It appears that a major factor governing the amount of flooding received from tropical systems is the system's speed as it moves along its track. Slower speeds translate to higher rainfall amounts.

Whatever the danger, be it from tropically induced tornadoes or inland flooding, it is important to stay tuned to a reliable news source like NOAA weather radio for the latest information. Situational awareness is the best way to avoid a potentially hazardous situation that could endanger your life.

Test your Spotter

I.Q.

Part 2

1. True or False. Wall clouds are clouds that indicate strong thunderstorm downdrafts.

2. Which of the following is ***not*** an accepted size descriptor for hail?

a) Penny
b) Marble
c) Pea
d) golfball

3. What is the definition of a strong thunderstorm?

a) a storm that has wind gusts of at least 40 mph but less than 58 mph
b) a storm that has continuous lightning and torrential rains
c) a storm that has pea sized hail
d) a and/or c

4. Which weather hazard kills more people per year in the USA?

a) tornadoes
b) flooding
c) lightning
d) extreme cold (frostbite/hypothermia)
e) drought

Supercell over the Midwest

5. True or False. A thunderstorm must be a "supercell" status before it can produce a tornado.

6. The missing ingredient that allows for ordinary or strong thunderstorms to develop into supercells is:

a) moisture
b) instability
c) lifting mechanisms (such as outflow boundaries or fronts)
d) wind shear

7. The best place to be during a thunderstorm event, severe or nonsevere, is:

a) playing golf
b) fishing at the lake
c) outside looking for funnel clouds
d) indoors

8. Which of the following could lead to flash flooding?

a) a large amount of rain over an area over a short period of time from a thunderstorm
b) a dam break
c) a land falling tropical system
d) all of the above
e) a and c only

9. A strong thunderstorm downdraft that occurs on a scale of 4 km or less is classified as

a) a straight line wind
b) a microburst
c) a macroburst
d) a cinnoburst

10. The main dangers associated with land falling hurricanes are

a) flooding from storm surge
b) winds (both hurricane related and tornadic)
c) tsumanis
d) all of the above
e) a and b

11. **True** or **False**. On average, Mississippi has more lightning strikes per year than any other state.

12. **True** or **False**. Supercells that rotate clockwise tend to be good hail producers and generally poor tornado producers.

13. When attempting to cross a flooded road in a vehicle, in order to get somewhere, the best strategy to take is to

a) get up enough speed to ensure that the car makes it safely to the other side.
b) get out of the vehicle and wade out into the flooded area to see how deep it is.
c) roll up the windows to make sure that water doesn't get in the car.
d) find another, nonflooded, route to take.

14. In which month do the most tornadoes occur in Mississippi?

a) November
b) April
c) March
d) May

15. A funnel cloud that touches down over water is called a

a) tornado
b) water spout
c) willie willie
d) aquawhirl

ANSWERS: *1 false, 2 b, 3 e, 4 b, 5 false, 6 d, 7 d, 8 d, 9 b, 10 e, 11 false, 12 true, 13d, 14 b, 15 b*

Fire Weather Season 2004

Part 2

…Quiet in the East, Relatively quiet out west, Alaska up in flames

Burghdorf Junction Fire 2000. Courtesy of Mike Edmonston.

Looking abroad, it was an unusual year in the realm of fire weather in most areas of the county this year. In the east, especially the southeast, it was unusually quiet. This was odd considering that most of the southeast had experienced a warm and very dry spring making the vegetation, especially in parts of Florida and Georgia, ready to burn. The fire season in the southeastern states came to an abrupt end in most areas as the spring rains arrived in late April and early May

On the other hand, in the southwest, fire fighters in Arizona and New Mexico had their hands full with numerous fires in the high elevations. A continuing multi-year drought had enabled the vegetation to remain extremely dry. With the onset of the normal late springtime dry thunderstorms and the misdeeds of arsonists, the fires quickly ignited. (Dry thunderstorms are high-based thunderstorms that produce little to no rainfall only lightning.) An Incident Meteorologist from WFO Jackson was dispatched to the KP fire in late May. The KP fire was situated at the 8,000-9,000 foot elevation levels in the mountains surrounding Alpine, Arizona. While dispatched extreme weather conditions and fire behavior were frequently observed. With daytime humidity levels often falling to less than 5% and with frequent wind gusts to 30 to 40 mph, the fire had no problems roaring to life and spreading up and down mountain slopes each day. The fire activity in the region continued into July, which was when the summer monsoonal rains came.

In the normally volatile mountainous northwestern states, it was relatively quiet, at least initially. Wet weather in May and June allowed for the moisture content in the vegetation to remain intact through the first half of July. The normally dry thunderstorms that occur in early to mid July were wet, thus further inhibiting new fire starts. As the fuels dried out in late July, the fire season began to show signs of life. The pace began to pick up in August with the reestablishment of a strong thermal trough over the region. (A thermal trough is an area of low pressure that develops over an area that experiences high heat.) Meanwhile in the usually quiet state of Alaska, extraordinarily dry conditions during the spring and early summer months led to an extremely active season. By August 1st, 4.5 million acres (in Alaska alone) had burned. Fortunately, the vast majority of this acreage was in the remote interior. In fact, one fire alone had burned over 842,000 acres! Several IMETS were dispatched from offices in the Western Region to provide fire weather support the fire fighting personnel.

Now that fall is rapidly approaching, is fire season over? No way. Normally, the east experiences a second, brief season in October and November. It arrives as the vegetation enters its dormant state. During the fall, recall that there are often periods of time when the weather is warm and dry under deep blue skies and there's a gentle breeze that blows. As the leaves fall from the trees and collect on the ground, they dry out. Well, by now you know the rest of the story and can fill in the rest…

Winter Weather Formation Processes

Winter weather formation processes are complicated and often misunderstood. Subtle differences in the atmospheric temperature and moisture profiles can lead to large differences in both precipitation type and amount. For example, one location might receive 4 inches of snow, while another location just a few miles away may receive sleet or freezing rain. It is the job of meteorologists to interpret these subtle differences in the weather data and provide a forecast that will accurately predict an event. Over the past several decades, meteorologists have gained a wealth of information through research. The knowledge gained has enabled forecasters to better predict these events. The purpose of this article is to share some of the information that has been gained.

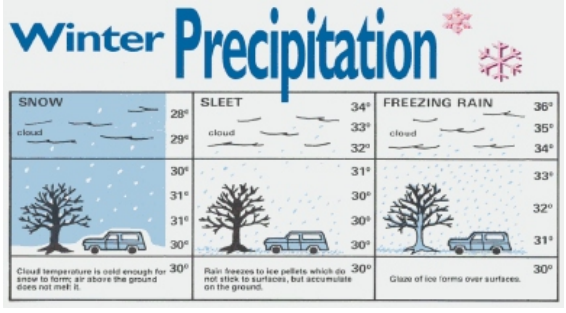
It all boils down to what the temperatures and moisture content look like above the surface, in particular the first few thousand feet. The presence, location and thickness of "warm air pockets", layers of air that are above 32 degrees, dictate the precipitation type (snow, sleet or freezing rain).

In general, for snow to occur, it is necessary for temperatures to be below freezing from the cloud layer(s) down to the surface. The lack of a thick "warm layer" keeps the frozen precipitation from melting. With that said, it is possible to have temperatures at the surface that are above freezing. However, this warm layer must be very thin or the snow will melt.

For sleet to occur one of two things must happen. The first and most common formation process is this. Sub freezing temperatures within the cloud layer allow for snow to form. As the snow begins to fall to the surface, it encounters a thick warm layer. This layer is thick enough to completely melt the snow; however, but not thick enough to extend downward all the way to the ground. After the snow melts in the warm layer, it encounters another, deep sub freezing layer near the surface. The thickness of this second cold layer is enough to allow for the rain drops to freeze and become sleet. The second formation process for sleet is very similar to the first, except for one step. In this formation process, the cloud layer, in which the precipitation forms, is above freezing to begin with. Therefore, the initial form of precipitation is rain, not snow. The rain falls through the warm layer and encounters a similar thick sub freezing layer near the surface. The rain then freezes into sleet before reaching the ground.

Freezing rain, like sleet, has two formation processes. Both of the formation processes are nearly identical to the two formation processes for sleet, except for one small difference. Recall that for sleet to form, it is necessary for there to be a thick, sub freezing layer near the surface. What if the sub freezing layer near the surface was not thick enough to completely freeze the rain drops before they hit the ground? This is the scenario that develops during freezing rain events. The near surface, sub freezing layer is not thick enough to allow for the complete freezing of the rain before it hits the ground. So, the unfrozen drops instead freeze to the surfaces of roads, trees, power lines, grass, and the like.

Twice daily meteorologists launch weather balloons to determine the atmospheric temperature and moisture profiles. Using the data gathered from the balloons along with computer model data and satellite imagery, forecasters use the knowledge above to determine the precipitation type when winter weather systems arrive during the winter months.



Note the effects of the warmer layers in the image above

SUMMERTIME SEVERE

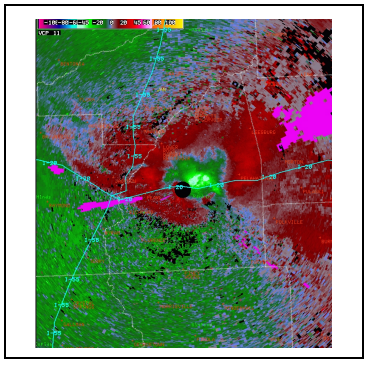
What makes these Storms Tick?

Thunderstorm near Jackson. Courtesy of W. L. Gilmore.

Summertime severe convection is often different that than the severe convection that is experienced during other times of the year. Recall that during the late fall and spring months, eyes are looking to the skies for tornadoes when the storms come. During the summer months that is not the case. Often in the summertime, we are looking strong downdraft winds and on occasion marginally severe hail. Why is this so? It is because of differences in the storms' environment.

The atmospheric conditions during the spring and fall months are often different during convective events. Recall that for thunderstorm formation to occur, moisture, instability and a source of lift are needed. Often during these months a fourth ingredient, strong wind shear, is also present. (Wind shear can be defined as changes wind speed and/or direction with increasing height.) Wind shear, along with noticeably stronger frontal boundaries, serves as a tool that gets storms organized. Commonly, lines of strong storms are observed racing across the forecast area. On occasion, supercells are observed just out ahead of the line, or sometimes within the line itself. Occasionally, one of the supercells will drop a tornado.

During the summer months, the middle and upper level jet streams are normally over the northern half of the United States. As a result, the atmospheric wind shear values are much lower. In addition, the fronts that move through the region are much weaker, partially due to the lack of atmospheric wind support. Without the strong wind shear and strong frontal boundaries, storm organization becomes less of a factor in the overall convective scheme. In addition, the lack of wind shear greatly inhibits the development of supercells, which, in turn limits tornado development. In general, tornado formation during the summer months is not common but on occasion may form when either tropical systems move onshore or when two thunderstorms merge.



Brandon Microburst, August 2003

In the absence of wind shear during the summer months, the main severe concerns become wind and occasionally hail related. Due to intense surface heating on a normal summer afternoon, the instability at the surface is often much higher than it is during other seasons. The added instability serves to make a hot, less dense parcel of air more buoyant and able to rise. As a result, the clouds are able to develop even greater vertical height underneath strong, sustained updrafts and along surface boundaries such as outflow boundaries, sea breeze fronts, and/or differential heating boundaries. Within these updrafts, hail stones are allowed to grow as they are tossed about. Given the height of some of storms, and given the strength of some updrafts, some of the hail stones can become quite large within the storm. The hail stones become too heavy to be supported by the updrafts and they begin to fall to the surface. Fortunately, they pass through about a 15,000 foot warm layer (a layer that has temperatures above freezing) that extends upward from the surface before hitting the ground. This allows for some of the outer coating of the hail stones to melt, which makes them smaller.

Severe winds on a typical summer afternoon often are often generated differently than during other seasons. On a summer afternoon, collapsing thunderstorms produce strong downdrafts that can accelerate under certain conditions like evaporative cooling. (In the case of evaporative cooling, a parcel of saturated air will move through a layer of unsaturated air. As it does so, the rain drops within the parcel will begin to evaporate. The evaporation of the water droplets produces a cooling effect on the parcel. As the parcel cools, it becomes more dense and heavier. The added "heaviness" makes it fall faster. This is what happens when microbursts and macrobursts are observed.) However, during the other seasons, the severe thunderstorm winds are often caused by a strong low level jet stream that descends to the surface within thunderstorm downdraft. It must be noted that there are other processes that can produce severe thunderstorm downdrafts in any season, such as converging winds aloft.

Are You Prepared???

Winter Weather Awareness Day is October 27th this year and Winter Weather Awareness Week is December 6th – 10th. Now is the time to prepare for winter weather by ensuring that your vehicle and home are ready for the onset of inclement weather. Make sure that tire tread and brakes are within the legal limits. This will help in navigating icy and snowy roads. Keep the gas tank at least half full at all times and have emergency supplies in the car. In the home, make sure that there is always several days' food on hand. Winterize your house by making sure that all windows are sealed (caulked) and by making sure that the heating system works. Just in case the electricity goes out, it's always good to have flashlights and batteries and/or candles and matches on hand. Keep combustible objects away from space heaters at all times.