The ArkLaMiss Observer

Summer 2007 Edition

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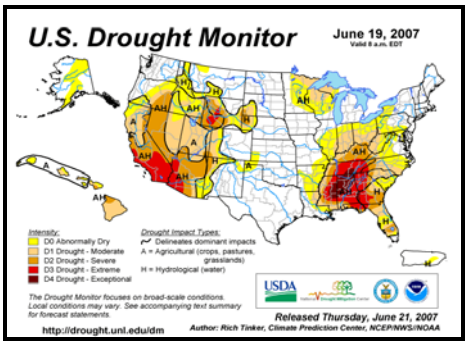
Drought of Spring and Early Summer of 2007

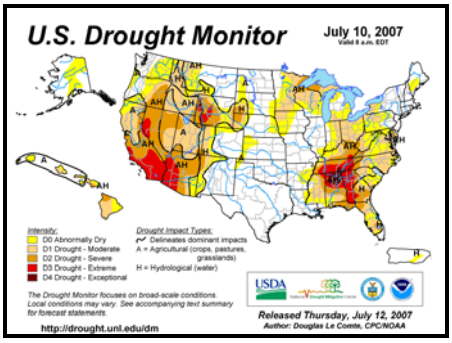
By: Marty Pope, Service Hydrologist

The "drought of 2007" began in January and February with much below normal rainfall, especially over Mississippi. Rainfall was again scarce over the ArkLaMiss Region during the month of March. Rainfall ranged from 0.25 inch to around 2.00 inches for the entire month. Many rainfall stations across the region set all time record low rainfall totals for the month of March, including Jackson, MS (0.90 inch). Rainfall continued to be below normal over most of the area during the months of April and May. Especially hard hit was Central, North Central, East and Northeast Mississippi. The U.S. Drought Monitor, a collaborative effort between several government agencies including the National Weather Service, showed conditions deteriorate until its peak around the middle of June. Extreme to exceptional drought conditions prevailed over more than half of Mississippi, while abnormally dry to moderate drought prevailed over Southeast Arkansas and Northeast Louisiana.



Even though rainfall for the month of June was below normal, rainfall began to increase during the last week of the month. Conditions rapidly improved during the first half of July. Rainfall totals were above normal for all of the WFO Jackson Hydrologic Service Area for the first half of the month. Notice the improvement by the July 10th issuance of the U.S. Drought Monitor.

(The Unites States Drought Monitor can be accessed through the web at the following address: http://www.drought.unl.edu/dm/monitor.html



Impacts of the Drought of 2007: Area farmers rely on spring rainfall to sustain their crops into the summer. With an exceptionally dry spring, especially in Mississippi, farmers were the hardest hit. By the time the drought peaked around the middle of June, the state's corn crop had suffered tremendous loss. Cattle farmers were hurt as their pastures and watering ponds dried up. The greatest damage to crops seems to have been over Central and East Mississippi where drought conditions were the worst. Hay farmers have suffered as their fields have dried up in many places. Trees and tree seedlings suffered much damage across Mississippi. Late June and July rainfall saved many other crops in the field, including cotton and soybeans.

Area lakes were affected by the drought. Many area lakes, including the Ross Barnett, had not reached their summer pool by the middle of July; however, July rainfall was slowly filling the lakes. United States Corps of Engineers lakes in the Yazoo River Basin, such as Grenada Lake and Okatibbee Lake, north of Meridian, were well below their summer pools. These lakes will require much more rainfall to fill these lakes even with substantial July rainfall.

Hurricane Climatology

By: Christopher Bannan, Journeyman Forecaster, and Joanne Culin, Meteorologist Intern

One of the biggest current debates concern global warming and its effects on many weather phenomena, such as droughts, floods, severe storms, and Hurricanes; the latter of which will be the focus of this article. Many argue that tropical cyclones have become more frequent and intense due to the warming of the global atmosphere, while other scientists feel that we are experiencing a natural cycle of increased hurricane activity.

Although the past decade has seen an increase in tropical cyclone development, it may not be as uncommon to see trends of higher or lower than normal activity. Since 1995, the tropical cyclone (TC) activity has increased with the average number of tropical storms (TS) to develop in a year being 15, 8 strengthening into a hurricane (H), and 4 becoming major hurricanes (MH) of category 3 or higher. Compare this to the previous 25 year period, where an average of just over 9 tropical storms developed, 5 becoming hurricanes and 1-2 strengthening into major hurricanes. Since the 1880s, tropical cyclones have undergone cycles consisting of roughly 20 years of active and quiet patterns. Given in the chart are the years in which there have been active periods and less active ("quiet") trends and the average number of storms during those time periods.

Note that prior to and after the 1970-1994 quiet cycle, the hurricane and major hurricane

Active Cycles:

1880-1903	TS 8.5	H 5.5	MH 1.5
1931-1950	TS 10.1	H 5.3	MH 2.2
1950-1969	TS 10	H 6.5	MH 3.3
1995-2006	TS 14.7	H 8.2	MH 3.9

Quiet Cycles:

1904-1930	TS 5.8	H 3.5	MH 1.5
1970-1994	TS 9.3	H 5.0	MH 1.5

Yearly average for entire 156 year time period:

TS 8.7 H 5.3 MH 1.9

activity has been substantially higher. However, the quiet cycle of 1970-1994 was as productive as the active cycle of 1880-1903, but given the previous 39 years and the following 12 years, this period is less active with regard to development of stronger storms. Even more impressive, is that the 1904-1930 quiet cycle boosts a much lower number of storms than any other cycle, including the yearly average.

What is causing these active and quiet cycles in hurricane activity? Those who argue for a natural variability solution rather than global warming indicate that a big proponent is from the Atlantic Multi-Decadal Oscillation (AMO). The AMO is an ongoing series of long-duration changes in the sea surface temperature of the North Atlantic Ocean, with cool and warm phases that may last for 20-40 years at a time, contributing a difference of about 1°F between extreme phases. These changes are natural and have been occurring for at least the past 1000 years. Since the water temperature drives the heat engine of a tropical cyclone, this oscillation can play an important role in development trends in hurricane activity. The following table lists the warm AMO and cold AMO cycles:

Warm AMO Cycles:	Cool AMO Cycles:
1880-1902	1902-1929
1929-1964	1970-1990
1995-present	

Comparing this table with the previous table of active/quiet hurricane cycles reveals that the AMO trends match up well with tropical cyclone activity, with the AMO starting up a few years before the tropical cyclone activity.

The advancement of technology has greatly contributed to the increased number of detected tropical cyclones over the past few decades. In 1995, the advent of the geostationary weather satellite allowed forecasters to locate storms that previously have been undetected in the ocean. Since then, satellites have grown to be a vital tool that allows forecasters to view more than just pictures of the storm, but rather interpret temperatures readings, wind estimates and derive the central pressure of the storm. Coupled with reconnaissance aircraft, more tropical cyclones have been able to be detected and therefore measured and recorded. If the record-breaking 2005 season had occurred prior to the advent of reconnaissance, it is reasonable to assume that at least 12 storms would have gone undetected, or not classified as tropical cyclones as they remained in the open Atlantic. This would have decreased the total number of storms from 27 to 15, which is still above normal but well below some of the other very active seasons. As technology has improved,

reanalysis has shown that previous storms may have been underestimated and are now achieving higher category ratings. Such was the case with Andrew from 1992, which was originally a category 4, but has since been further analyzed with improved techniques and recently been given a category 5 status.

Prior to these technological advancements, the only way to get a good measurement of tropical cyclones were for them to make landfall. In recent years, populations have boomed across coastlines with about 70-80% of the world's population living within 50 miles of the coast. Back in the 1800's and early 1900's, there were large areas of the coast that were not highly populated. This would account for a few small storms making landfall without ever being recorded. Given that scenario, it is possible that 1999's Hurricane Bret could have gone unnoticed if it had made landfall about 100 years prior since it was a very small category 4 storm that struck a sparsely populated area in Texas. Bret quickly weakened by the time it got far enough inland that it could have been mistaken for a weak tropical storm and not the category 4 intensity that it achieved prior to that landfall. Even though we are in an active cycle, there still can be "down" years. Both last year, and this season thus far have been slow, even though we are in an active and warm AMO cycle. There are other environmental factors to influence the development of tropical cyclones. Dry air and shear (strong winds aloft that can tear a system apart) are two other impacts on storms. Last year, there was an abnormal amount of dry air across the tropical Atlantic. Moreover, the ocean temperatures were actually a little cooler last year than the previous year. In addition, this year there has been quite a lot of shear across the tropics that will inhibit storm development. With all of these factors, the number of storms that occurred last year was still above normal, but less than the predictions of well above normal season. What will happen this year is still too early to tell, with the peak of hurricane season just under 2 months away.

In summary, the question still remains: does global warming have an affect on tropical cyclone activity? It is still too early to definitely say. It is clear there is some correlation between active and quiet periods with warm and cool AMO cycles. In addition, it has been shown that sea surface temperatures have been increasing since 1970, but overall increase in major hurricanes only occurred once the shift into a warm AMO cycle transpired. That said, global warming may be aiding in some ocean temperatures rise and when intense hurricanes develop, they strengthened more than they might otherwise have. However, it is still unclear just how much global warming is playing in the increased frequency of tropical cyclones, or if it just due to the natural variability of the AMO. It is clear, though, that with a warm AMO expected to persist for another 10-20 years, that tropical activity will remain high and the risk for major hurricane development will remain present.

Interesting Hurricane Facts:

- Lowest pressure recorded in a hurricane in the Atlantic Basin: 882 mb by Hurricane Wilma in 2005
- Greatest number of tropical storms in one season: 27 in 2005
- Strongest winds recorded/estimated in a landfalling hurricane: 200mph by Hurricane Camille in 1969
- Lowest recorded pressure in a landfalling hurricane: 895mb by The Florida Keys Hurricane in 1935
- Least number of storms to develop in a single season: 1 tropical storm developed and it did not become a hurricane in 1914
- Top three states with the most landfalling hurricanes: Florida with 119, Texas with 60, and Louisiana with 52
- Top three states with the most landfalling major hurricanes: Florida with 37, Louisiana with 20, and Texas with 19
- Costliest Hurricane: Katrina in 2005 with estimated damage of $81 billion
- Number of hurricanes to strike the US mainland: 279.96 have been category 3 and only 3 have been category 5
- Most landfalling hurricanes in a single season: 7 in 1886

A Description of the Downburst

By: Eric Carpenter, Senior Forecaster

It is a hot, muggy afternoon in late July with little breeze. Towering cumulus clouds have developed into "thunderheads" and before you know it, the sky turns dark and a thunderstorm is upon you. In just a few seconds, blinding rain is accompanied by wind that seems to accelerate to hurricane strength. Lawn furniture, plastic swimming pools, and trash cans are blown down the street, and even a few trees come crashing down in your neighborhood. Then as quickly as it started, the wind and rain subside. Was it a tornado? No, it was actually a ***downburst***, one of the least recognized yet most common weather phenomena in the ArkLaMiss. So just what are downbursts and where do they originate from?

The large majority of thunderstorms that develop in the ArkLaMiss during the summer are short-lived and non-severe. They contain both an updraft and a downdraft at their peak (Fig.1). Downdrafts form when precipitation can no longer be supported by the updraft, and the precipitation (rain, hail) falls bringing colder air down to the ground, where it spreads out in a divergent pattern. Typically, wind gusts of less than 35 mph are experienced where a downdraft makes contact with the ground, but under the right atmospheric conditions, intense downdrafts known as downbursts are generated resulting in surface winds that exceed 50 mph (Fig. 2). In fact, winds in a downburst have been known to reach 150 mph, so it is no wonder that downbursts are sometimes mistaken for tornadoes!

Based on their size, downursts are classified as either ***macrobursts*** or ***microbursts***. Large downbursts with wind damage swaths greater than 2.5 miles are known as macrobursts, while smaller downbursts with damaging winds extending less than 2.5 miles are known as microbursts. In the ArkLaMiss, microbursts tend to be more frequent than macrobursts because summertime thunderstorms are usually disorganized. At times however, storms do become organized, and multiple downdrafts can combine to produce one larger area resulting in more widespread damage. (Fig. 3)

When a severe thunderstorm warning is issued in your area during the summer, it is often the result of a microburst being detected. Doppler radar allows meteorologists to see microbursts before they reach the ground, but there are times when smaller microbursts from smaller thunderstorms may go undetected. Our Hazardous Weather Outlook contains information regarding high potential for damaging winds (microbursts) if conditions happen to be favorable on a given summer day. Remember that intense microbursts can cause tornado-like damage! (Fig. 4)

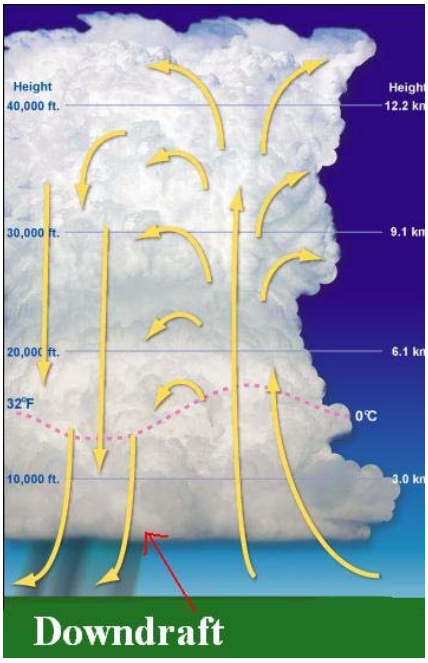


Figure 1: This schematic shows wind flow associated with the mature thunderstorm

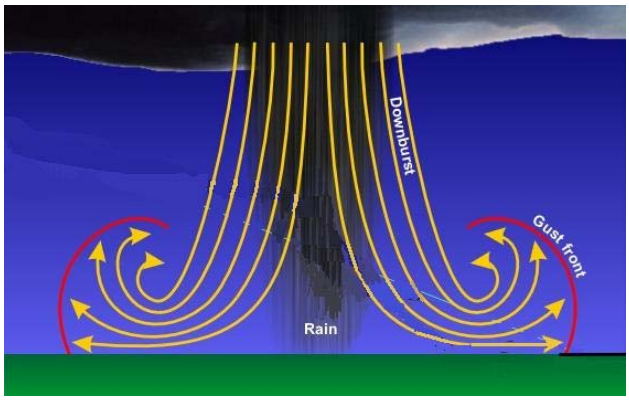


Figure 2: During hot summer afternoons when the atmosphere is very unstable, thunderstorms and downdrafts can become particularly intense resulting in downbursts as shown in this image.

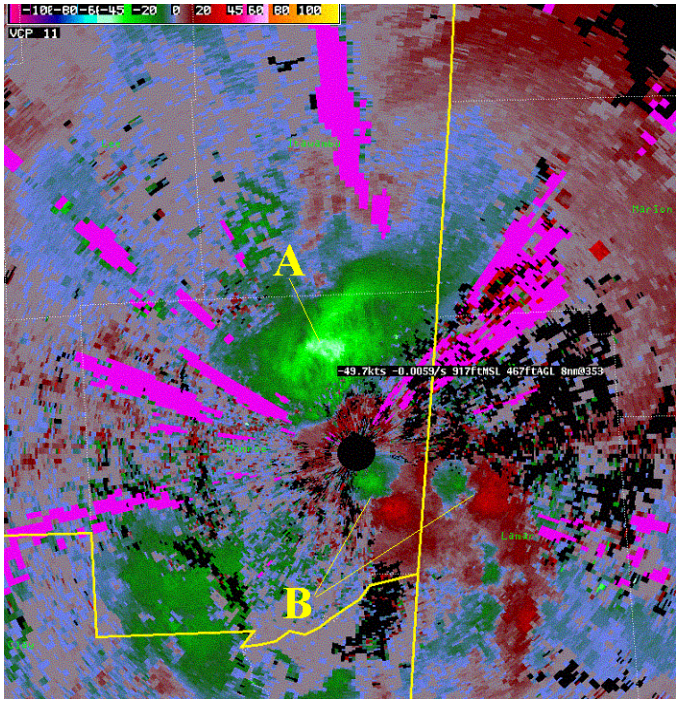


Figure 3: This image was taken in July of 2003 from the Columbus AFB radar. The area denoted by "A" represents a macroburst. The bright green indicates winds moving toward the radar at more than 50 mph. the features denoted by "B" are downdrafts from non-severe thunderstorms, with sizes more comparable to that of the microburst.

Figure 4: The tree damage in this photo was a result of an intense downburst. Notice the divergent damage pattern caused by the spreading out of winds. In contrast, tornadoes produce convergent damage signatures.

COOP Corner

By: Carolyn Bryant, Observing Program Leader

The National Weather Service (NWS) Cooperative Observer Program (COOP) is truly the Nation's weather and climate observing network of, by and for the people. More than 11,000 volunteers across the nation take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are truly representative of where people live, work and play.

In NWS Jackson's area of responsibility we have approximately 100 COOP stations. All of the stations record at least daily precipitation. Many of these stations also record temperature information. Some of the cooperative observers provide additional hydrological or meteorological data, such as soil temperatures and evaporation.

Daily data are transmitted via telephone or internet. After the end of each month, observers send all their information for that month to our office in Jackson. From there the data is sent to the National Climatic Data Center in Asheville, NC, for historical archiving.

Volunteer weather observers conscientiously contribute their time so that observations can provide the vital information

needed. These data are invaluable in learning more about the floods, droughts, heat and cold waves affecting us all. The data are also used in agricultural planning and assessment, engineering, environmental-impact assessment, utilities planning, and litigation. COOP data plays a critical role in efforts to recognize and evaluate the extent of human impacts on climate from local to global scales.

To all our COOP observers: **Thank You!!** Your data is more valuable than you might realize.

Congratulations to the Mississippi Agricultural and Forestry Experiment Station at MSU in Starkville for 125 years of cooperative observations. What an outstanding accomplishment!

Representatives from the National Weather Service in Jackson presented an Honored Institution Award to the staff at MAFES in May. Pictured from left to right: Alan Gerard, Carl Blair of MAFES, and Carolyn Bryant. Photo courtesy of Bob Ratliff and the Office of Agricultural Communications at MSU.

!!Fun Stuff for the Kids!!

Fun Weather Facts:

- **The record for the item carried farthest by a tornado is a personal check that traveled 223 miles from Stockton, Kansas to Winnetoon, Nebraska, in an F3 tornado in 1991**
- **A 1917 F4 tornado in Connecticut picked up a jar of pickles and dropped it, unbroken, in a ditch 25 miles away.**
- **Cars can be carried away in only 2 feet of water on the road!**
- **Small fish fell in east London in May 1984. Tornadoes sometimes suck up small animals and carry them for miles within the thunderstorm, finally dropping them out in heavy rain.**
- **Raindrops do not look like teardrops. They are usually round and flat.**
- **A cumulus cloud half a mile wide, half a mile long, and half a mile high weighs about 1.5 billion pounds!**
- **Although it seems much wider, the electric current channel of a typical lightning bolt is only about the size of a pencil.**

Lightning Quiz:

Fill in the blank with the correct words. Use these words:

die fire electricity explode shortest water tree tallest thunder telephone

1. **About 100 people _____ each year from lightning and the fires it causes.**
2. **Don't use a _____ unless there is an emergency.**
3. **_____and lightning occur together.**
4. **Lightning can make a tree _____ by heating the sap in the tree.**
5. **Lightning hits the _____ objects.**
6. **Lightning takes the _____ path.**
7. **When lightning forms, clouds become charged with _____.**
8. **If you are outside when there is lightning, don't go under a _____.**
9. **When lightning strikes, it can start a _____ that kills people and animals.**
10. **If you are in _____ get out. Stay away from the beach.**

Answers: 1. die, 2. telephone, 3. thunder, 4. explode, 5. tallest, 6. shortest, 7. electricity, 8. tree, 9. fire, 10. water

Reaching Out to You!

By: Ashley Wester, Journeyman Forecaster/Editor, and Alan Campbell, Journeyman Forecaster

Our goal here at the National Weather Service in Jackson, MS is to protect life and property. In an attempt to do this, we issue various types of watches, warnings, and advisories to alert you, the public, of impending hazardous weather that is either occurring or could possibly occur in your area. Knowing that hazardous weather is possible in your area is one thing, but what should you do if hazardous weather is threatening you and/or your family?

When hazardous weather occurs, seconds can literally mean the difference between life and death. Staying calm and knowing the correct instructions to follow could save your life. This is why the National Weather Service in Jackson, MS believes it is important to educate people about severe weather safety and preparedness. In our efforts to accomplish this task, we offer various forms of outreach, such as talks and setting up booths at area events, just to name a few. We provide these services for any community, school, public/private group, or business that is interested in learning about severe weather safety and how to prepare for it. We also offer office tours that allow you to see what the National Weather Service is and what we do.

If you would like to schedule to have someone come and talk to your community, school, group, business, or if you would like for us to set up a booth at your next event, please contact Steve Wilkinson, Alan Campbell, or Ashley Wester. If you would like to schedule an office tour, please contact Marty Pope or Karen Dungan. All can be reached at the National Weather Service in Jackson, MS at (601) 936-2189.

Events in which we recently participated:

May 31: Meteorologist Alan Campbell went to the Naval Air Station in Meridian to speak with about 20 students involved in the Starbase Atlantis Program about severe weather safety.

June 1: Meteorologist Ashley Wester went to the Walnut Grove Library to speak with about 15 students on severe weather safety.

June 12: Warning Coordinator Meteorologist went to Meridian to speak to the local Exchange Club on severe weather safety.

June 18: Warning Coordinator Meteorologist went to attended a meeting of the Kiwanis Club in Jackson to present on severe weather safety.

June 19: Meteorologist Ashley Wester visited Salem Baptist Church in Collins to speak to about 30 senior citizens on severe weather safety.

June 20: Meteorologist Ashley Wester went to Philadelphia to speak with 10 teachers involved in the Starbase Atlantis Program about basic meteorology and severe weather safety.

July 16: Meteorologist Brad Bryant went to the Wacky Weather Workshop held at Jackson State University for a group of about 10-15 teachers. He spoke on basic meteorology and severe weather safety.

Back To School!!!

A Note to Teachers – As mentioned above, we do school talks regularly. For younger age groups, we typically discuss severe weather safety. For older groups (usually middle school and above), we teach on basic meteorology and severe weather safety. Also, if there is a particular subject you would like us to touch on, or something specific you want, we would be happy to accommodate your requests. Please keep us in mind in planning for the upcoming school year!

Thank You!!!

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If you have questions, comments, or suggestions for our newsletter, please contact Ashley Wester at (601) 936-2189 or Ashley.Wester@noaa.gov. Special Thanks for those who contributed to this summer's newsletter!