Your 24 hour a day source for weather information across Central Indiana

SkyWatch

Volume 11, Issue 1

Inside this Issue

Highlights of the 2008-2009 Winter Season

By Logan Johnson, Climate Services Focal Point

The winter of 2008-2009 will go down as one of the more memorable winter seasons of the past several years across Central Indiana. Here are a couple reasons why:

-Coldest Temperatures since 1997-

A bitter Arctic blast roared into Central Indiana on the 14th of January 2009. Temperatures plunged following a light snow that deposited 2 inches across the Indianapolis area, and fell to a low of 6 degrees on the 14th. This six degrees would seem downright balmy compared to what was about to come. The next day, the 15th, recorded a high of just 7 degrees! That night, under mainly clear skies and with a light coating of fresh snow on the ground, temperatures fell to -9 degrees before midnight, and then in the early morning hours of the 16th, readings bottomed out at -12 degrees at the Indianapolis International

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Above and Below: About 11 inches of snow covers the NWS Indianapolis after the January 29th snow. No one chose to eat their lunch at our picnic table that day.

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Highlights of 2008 - 2009 Winter Season - Continued

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Airport, making it the coldest weather since January 12, 1997 when a low of -12 degrees was also observed. Other locations across Central Indiana were as cold as -22 degrees (Attica in Fountain County). However, this frigid surge was short-lived, as temperatures on the 17th warmed all the way to 35 degrees. The remainder of January finished out on the cold side and made it the coldest January since 2003. The sub-zero readings of mid January 2009 won't soon be forgotten by those who had to venture out in the early morning to try and start their cars!

Above: The woods near NWS Indianapolis were covered with 11 inches of snow after the January 28th storm was through.

Above: Spotter Mary Bennington's wind meter reads between 55 and 60 mph on February 11 2009.

-Biggest Snowfall since 1996-

Just two weeks after the bitter cold of mid-January, Old Man Winter showed that his bag of tricks was mighty full this year, as heavy snow set its sights on the area. Snow began on the 26th and fell, heavily at times, until the mid morning hours of the 28th. When it was all done with, the snowfall had piled up to a three day total of 12.5 inches at the Indianapolis International Airport! This remarkable total proved to be the biggest snowstorm (defined as a consecutive three day accumulation) since the storm of

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Highlights of 2008-2009 Winter Season - Continued

Month	Average Temperature	Temperature Departure from Normal	Precipitation	Precipitation Departure from Normal	Snowfall	Snowfall Departure From Normal
December	30.7	-0.9	5.58	+2.55	2.1	-4.3
January	23.0	-3.5	1.72	-0.76	16.1	+6.8
February	33.9	2.7	2.69	+0.28	5.6	-0.5

Above: A table displays the average temperature, precipitation, snowfall and departure from normal for each month this past winter at Indianapolis

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January 2-4, 1996. Snowfall totals were as high as 16 inches across the area (unofficial observation from a CoCoRaHS observer near Gosport in Owen County). The snow snarled traffic, shuttered schools and businesses, and brought a real meaning to the term "snowed in" to some area residents. The snow began to melt in early February, but was replenished by a 4 inch snow on the third that brought depths back to 10 inches on the ground. However, this melted in remarkably quick fashion as temperatures crested in the middle 50s and low 60s for 5 consecutive days on February 7-11. The snow, which had seemed like it might never disappear, did just that, and so quickly that it was like it had never been here at all. The rapid snow melt teamed up with a heavy rain event on the 11th to produce our first river flooding of 2009 across Central Indiana.

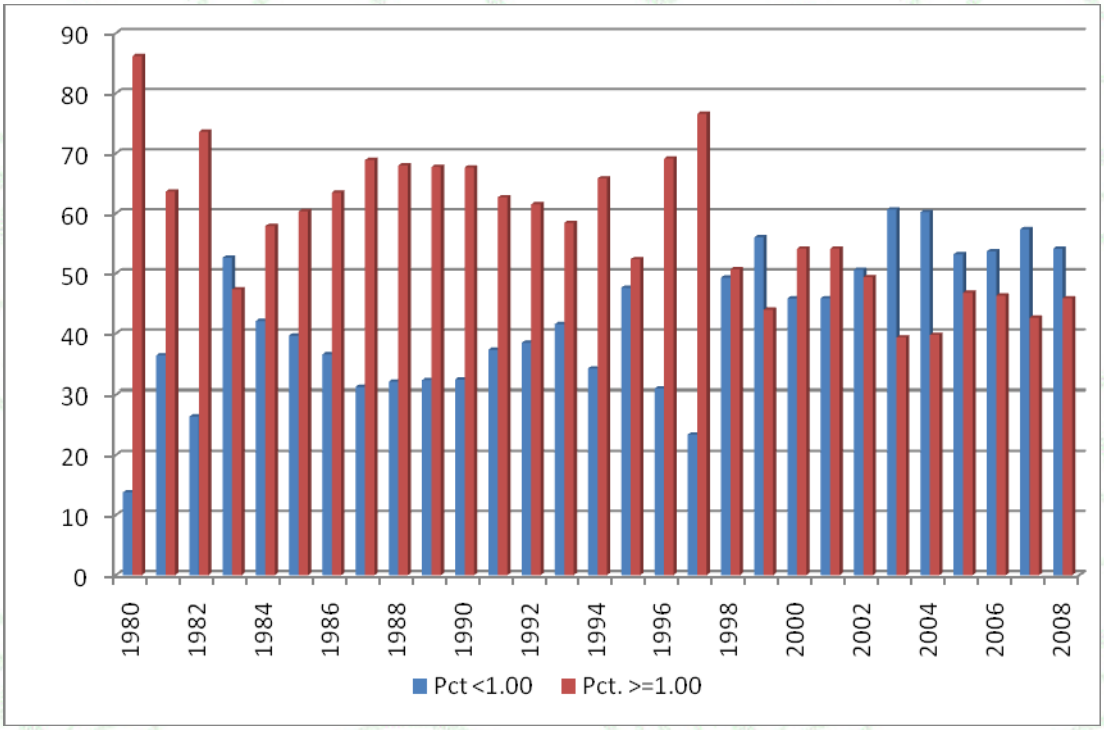
Above: An EF1 tornado touched down on February 11 near Muncie Indiana. The tormado had wind speeds of nearly 100 mph as it damaged this home.

One inch Hail Criteria

By: Dan McCarthy, Meteorologist In Charge

Since 1956, the National Weather Service has defined severe thunderstorms as storms that produce hail ¾-inch diameter or larger, thunderstorm winds of 58 mph, and/or producing a tornado. Over the past several years, there have been over 20,000 severe weather reports across the United States, including 11,000 hail reports. National Weather Service offices in Kansas, southern Nebraska and western Missouri have been experimenting with making the minimum criteria for severe hail one-inch in diameter. Research has indicated that damage from hail doesn't begin until stones are just slightly larger than one-inch in diameter, and since 1950, only four persons have been killed by very large hail.

The Weather Forecast Office in Indianapolis will be training to utilize the one-inch hail criteria for severe thunderstorms beginning April 1st. Figure 1 shows the percentage of hail reported less than one-inch in diameter versus hail reports greater than or equal to one-inch in diameter since 1980 for the state of Indiana. Since the Doppler era began in 1987, the percentage of hail reports equivalent to the size of pennies (.75 of an inch) and nickels (.88 of an inch) have been on average 50% of all hail reports. If one assumes that this corresponds to the number of warnings issued, then this would mean a reduction in warnings of 50%. In 2008, 54% of all hail reports in Indiana was for hail less than one inch in diameter. But, the fact is that many tornado warnings issued are for tornadoes, large hail and damaging winds (due to the rear flank downdraft near the possible tornado), and many severe thunderstorm warnings are issued for damaging winds and hail. Last year, the IND WFO issued a total of 237 severe thunderstorm and tornado warnings for the County Warning area. It is estimated that with the consideration of one-inch diameter hail, this number may be reduced to nearly 180 warnings. The result would be a higher emphasis on the warnings issued for severe thunderstorms across the area.



Above: Figure 1, a chart showing the percentage of hail reported in Indiana since 1980 that is less than one inch in diameter (blue) verses one in or greater in diameter (red)

Beginning April 1st, the IND Weather Forecast Office will be adjusting the warning criteria to be *one-inch diameter hail or larger, thunderstorm winds of 58 mph or greater and/or tornadoes*. But, we ask our spotters that hail the size of pennies and nickels are still reported as this will still be required under current statutes for the Local Storm Reports. Usually, the one-inch hail accompanies these hailstones or leads to larger hail as the storm reaches maturity. For further information, please go to http://www.crh.noaa.gov/ind and view the podcast on the One-inch Hail Criterion headlined on the front page. As always we welcome your views by going to the Feedback link under Contact Us at the bottom of the index on the left side of the page.

Upcoming Events & Spotter Training!

The National Weather Service Office in Northern Indiana in conjuction with IMO SKywarn is hosting an Advanced Spotter Training class entitled : Severe Weather— A Midwestern Perspective, A Detailed look at Severe Weather in the Midwest.

The class will held on Saturday, March 28th, starting at 8:00 AM. The class is being held in Elkhart, Indiana. The cost of the class is $25, and pre-registration is required.
For more details regarding the class, please visit the IMO Skywarn website at:

http://www.imoskywarn.org/

Above: Meteorologist Joe Nield provides spotter training at the 2008 Severe Weather Symposium. You can attend a similar event this year in Elkhart, Indiana on Saturday March 28th

If a full day of spotter information is not for you, there are other opportunities to get spotter training. This spring NWS Meteorologists will be visiting many counties across Central Indiana, providing a 2 hour weather spotter class. A complete schedule of the upcoming classes can be found at the following link.

http://www.crh.noaa.gov/ind/?n=spotter#train

You do not need to register for the 2 hour classes and there are no fees involved. All you need to do is show up, sit back and learn!

The Central Indiana chapter of the American Meteorological Society and the Central Indiana National Weather Association are in the process of re-organizing. Both local chapters will continue to exist on their own, but will begin to hold joint meetings to increase membership and become more active. Each individual chapter will continue to be recognized by their respective national organizations. The chapters are planning their first joint meeting in April of 2009. If you desire more information, or are interested in joining, please contact Chris Wright at cwright@wthr.com.

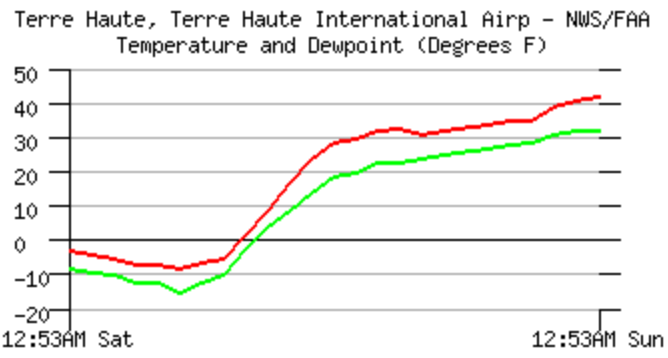
A Week of Wild Winter Weather across Central Indiana

By Chad Swain, Meteorologist

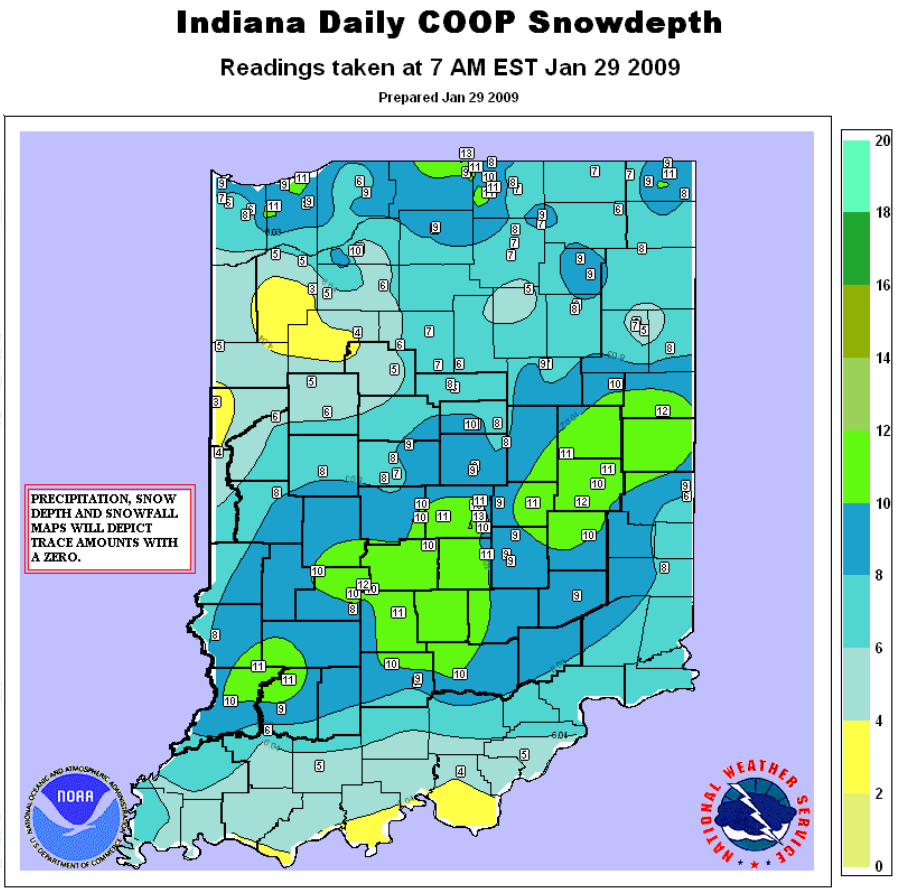
Heavy snow, 50 degree temperature rises, and then more heavy snow impacted Central Indiana during the week of January 27 through February 3. The first system brought snow at times from Monday January 26 through Wednesday January 28, dropping over a foot of snow across portions of Central Indiana. Much of the snow fell during the night of the 27th and morning of the 28th, when an area of low pressure moved from Tennessee through eastern Kentucky.

For Indianapolis, the 12.5 inches of snow that fell during the storm produced the 6th largest snow storm for the city. The last time a bigger snowstorm struck the Indianapolis International Airport was when12.8 inches fell in January 1996. Pictured at the right is a map of snow depth at 7:00 AM January 29 from our cooperative observers. The storm also brought up to a half an inch of ice across southern portions of Central Indiana, with up to an inch of ice near the Ohio River.

Just a few days later, Arctic air settled in to the area and, combined with the snow on the ground, allowed temperatures to bottom out in the -10 to 0 degree range early on January 31. During the day of the 31st, strong southwest winds brought in much warmer air. This allowed temperatures to rebound about 50 degrees in some areas. At Terre Haute, temperatures rose 51 degrees in less than 24 hours.



Above: A Meteogram showing temperatures and dew point at Indianapolis. Notice the sharp rise in temperature and dew point as warmer air arrived on the morning of February 1st.



Above: The snowfall depth map on the morning of January 29th 2009. It shows the biggest snowfall of the season, with 8 to 12 inches across much of Central Indiana. Areas in dark blue indicate 8 to 10 inches, while areas in green indicate 10 to 12 inches.

The morning low was -10, and the high just before midnight was 41 degrees. Below is a 24 hour graph of temperature (red) and dew point (green), from just before 1:00 AM Jan 31 to just before 1:00 AM February 1.

Just a couple of days later, a quick moving low pressure system brought a burst of heavy snow to parts of the area. During the morning rush hour of February 3, snow fell across the Indianapolis area at rates up to 2 inches per hour. A total of just under 4 inches fell at the Indianapolis International Airport, with 2 to 4 inches measured across the Indianapolis Metropolitan area.

Big storms, and big temperature swings. This was exciting weather to observe and experience, but its is also typical winter weather that Hoosiers have come to expect!

Wall Clouds vs. Shelf Clouds

By: John Kwiatkowski, Science and Operations Officer

As a spotter in Indiana, you need to know a lot of things. One of the most important is distinguishing between *wall clouds* and *shelf clouds*. Wall and shelf clouds are associated with a very high percentage of severe weather. However, the types of weather they bring are very different.

Figure One shows a wall cloud. Its presence indicates a great risk of tornadoes or giant hail. Not all wall clouds result in tornadoes, and not all tornadoes originate in wall clouds. But if a wall cloud forms, there is roughly a 50-50 chance of a tornado. Most really strong twisters—those rated 3 or higher on the Enhanced Fujita scale--descend from wall clouds.

Above: Figure One. Wall cloud with two funnels.

If you see a wall cloud, the National Weather Service needs to know right away! The trick is to be sure you've seen one—they may resemble harmless storm features. Tips on wall cloud ID:

Figure Two. Approaching Shelf Cloud

They appear to the rear of a storm. Precipitation will be either over or ending when a wall cloud passes. Wall clouds appear in rain free areas. They are normally cylindrical structures lower than the rest of the cloud base.

This is critical! Wall clouds *rotate*! To make a good observation track a suspicious structure for several minutes to see it is turning (rotation may be slow). Wall clouds are rare. You may go for years without seeing one.

Shelf clouds, as in Figure Two, often indicate damaging straight line winds, but normally not tornadoes. Ways to identify shelf clouds:

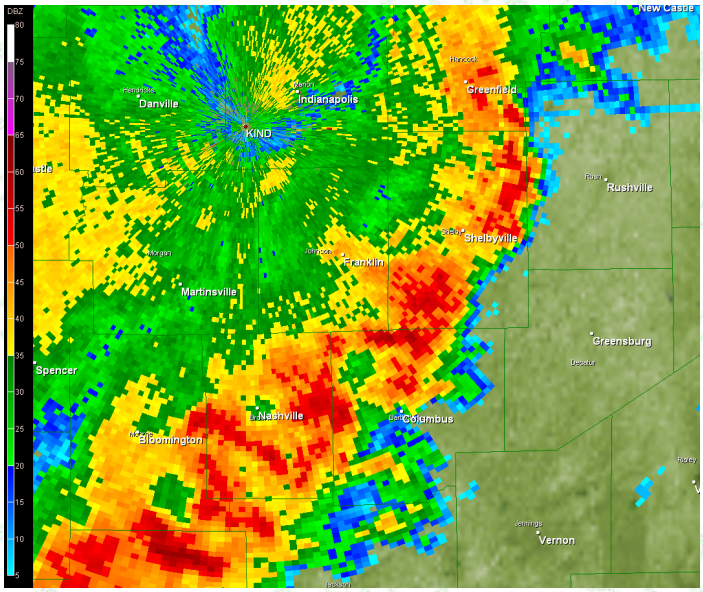
They appear in front of storms. It probably won't be raining yet when you spot one. You may or may not hear thunder. Shelf clouds slope down and away from storms. Shelf clouds often contain debris, or scud, which may move chaotically. Scud is of no real significance, but be careful not to identify it as something else. Shelf clouds are common. You will probably see several yearly.

Knowing the difference between wall and shelf clouds is important to spotters for a couple of reasons. The National Weather Service needs to know what is happening in your community, but beyond that untrained people often report shelf clouds as wall clouds or even tornadoes. If we think that is happening, we will contact a trained spotter for expert report. In that case, knowing how to identify wall clouds vs. shelf clouds could be vital in preventing an unnecessary warning!

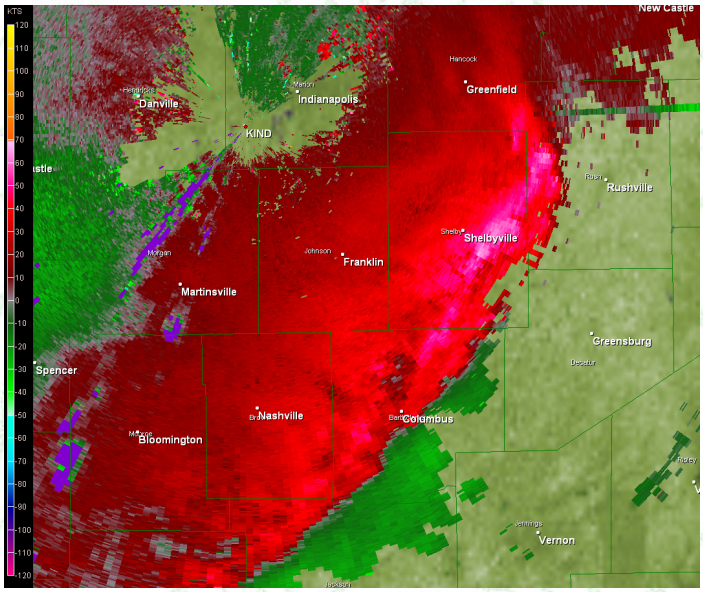
Severe Storms on Radar: What are we Seeing?

By: Chad Omitt, Senior Meteorologist

As we have seen examples of wall clouds and shelf clouds. However, what do the radar features of these storms look like and what do these features represent? Let's take a look at a few examples of severe storms on radar and then take a look at what you would see if you were outdoors looking at the storm.



Above: Reflectivity (energy returned from rain/hail)



Above: Velocity : winds toward (green) or away (red)

Example 1. Line of Storms (squall line)

Here we have a line of storms oriented from SW to NE moving toward the east (right in the photo). The image on the right depicts the wind speed and direction in relation to the radar site which is at top left in the photo. Cloud features associated with lines of storms are shaped by the outflow or cold downdraft associated with the line of storms. This cold outflow which some call a cold pool acts to produce strong outflow winds which are apparent in the photo at top right as characterized by the bright red colors. Those winds also act to produce a large cloud feature along the leading edge of the strong winds known as a shelf cloud. Look at the shelf cloud below that was associated with the radar image above. Impressive! This line of storms produced damage in Shelby County which included a semi that was blown over.

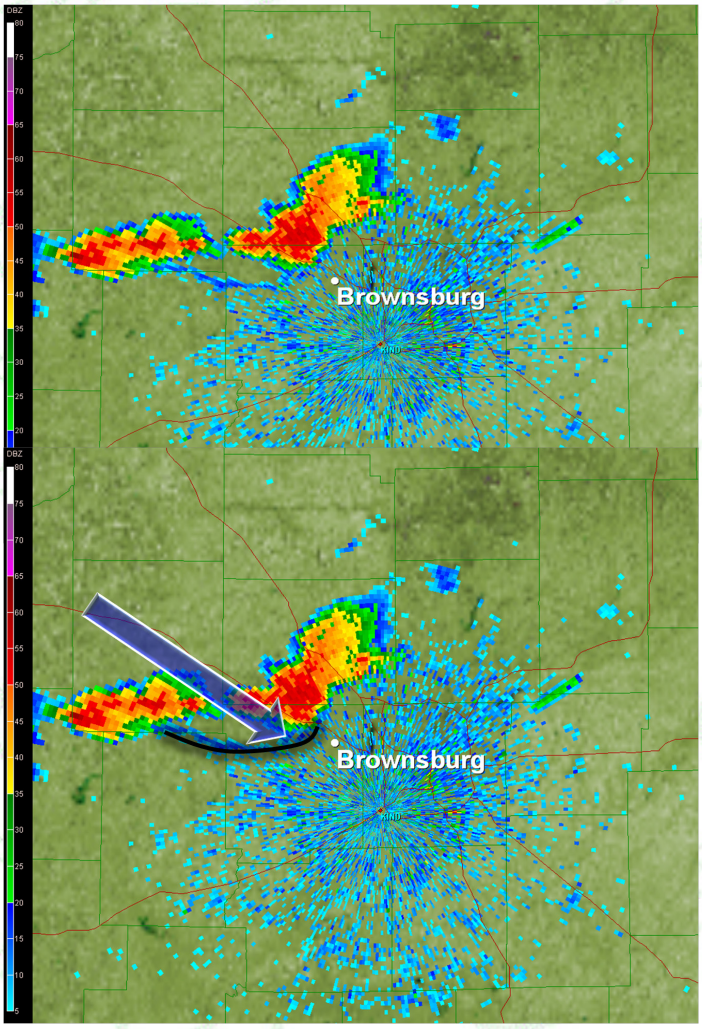
Above: A Shelf Cloud

Example 2. Single Cell with a radar detected outflow boundary

The images above depict a severe thunderstorm that produced damaging straight line winds. To the left you may notice a fine blue line extending from the south side of the large storm to the west (left) and intersecting the storm at far left. This is a radar depiction of an outflow boundary or the

Severe Storms on Radar: What are we Seeing?

By: Chad Omitt, Senior Meteorologist



Above: Two reflectivity radar images showing thunderstorms and a shelf cloud approaching Brownsburg. Below is an image of what the shelf could looked like.

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leading edge of the cold downdraft outflow from a thunderstorm. In many instances, this radar indicated boundary is associated with the position of the shelf cloud that spotters will see in the field. Take a look at the large shelf cloud (below) that was seen from Brownsburg looking west as this storm approached. The radar fine line indicated the processes of downdraft and outflow which produced the shelf cloud you see below. Remember, shelf clouds are associated with downdraft and outflow. All storms regardless of whether they are single cells, supercells or lines produce downdrafts and all can have shelf clouds associated with them.

Example 3: Supercell Thunderstorm: shelf cloud and wall cloud together in the same storm? You bet!

At right we see a radar reflectivity image of a supercell thunderstorm. A supercell storm is one characterized by a persistent rotating updraft called a mesocyclone. This mesocyclone can be identified by Doppler radar velocities. However, there are also some reflectivity signatures that also form which are the result of the process of rotation. One is the hook echo or an appendage that forms on the near the updraft region of the thunderstorm. The wall

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Severe Storms on Radar: What are we Seeing?

By: Chad Omitt, Senior Meteorologist

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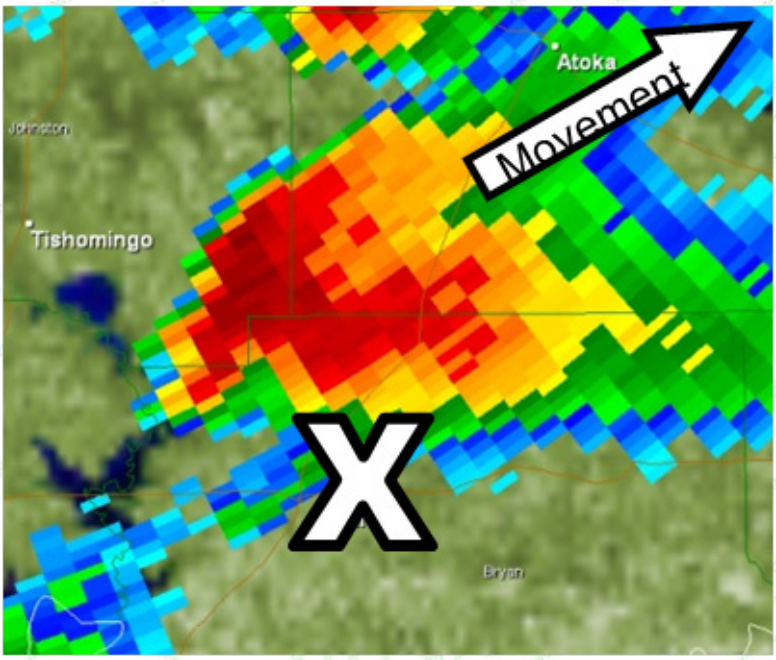
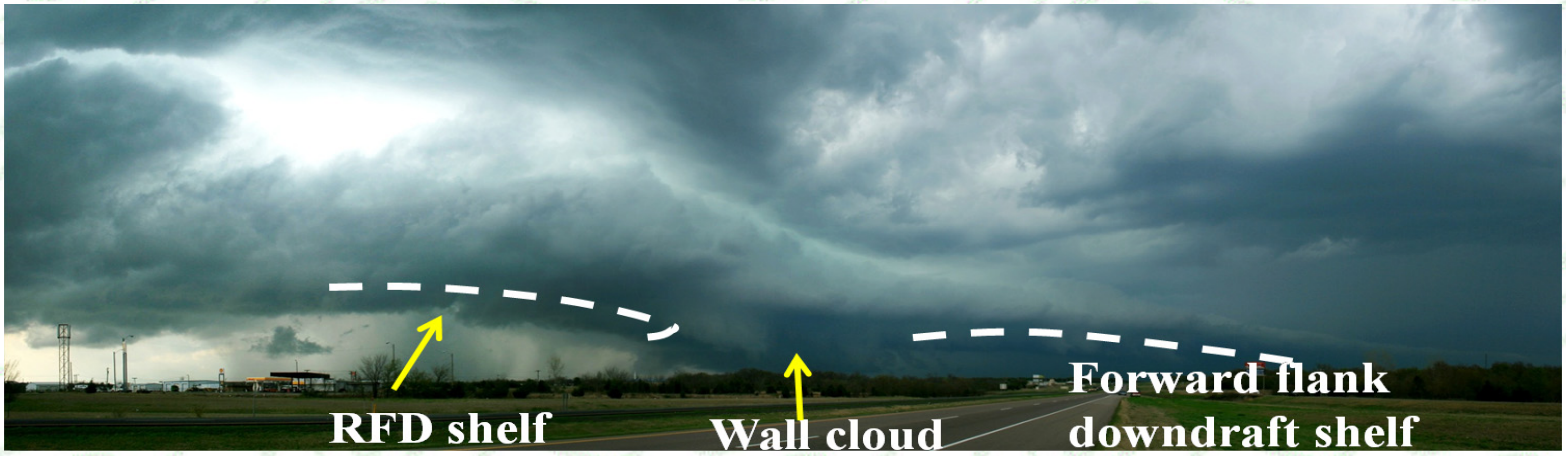
cloud will always be located within the updraft region of a thunderstorm since the wall cloud is the product of an updraft and inflow into a thunderstorm. The hook or appendage evident on radar reflectivity indicates the rotation of rain and hail as indicated by the red colors around the updraft region of the storm as seen to the image above. Many times, a downdraft will form near and southwest of the radar indicated hook echo. This is called the rear flank downdraft or RFD. This downdraft can result in a shelf cloud and occurs to the left of the wall cloud. Let us take a look at the cloud features we would see if we were located near the big white X looking NW. At center we see the wall cloud where inflow and updraft is strongest while to the left we see the shelf cloud that is associated with the rear flank downdraft. YES! You can have a shelf cloud and wall cloud near each other in the same storm.



Above: A supercell on a reflectivity Radar Image. The "X" marks the spot where a spotter might be standing when seeing the picture below.



Remember, these cloud features are produced by the process of downdraft and outflow or updraft and inflow. All storms are the result of these processes at one time or another. What is most important to our spotters is situational awareness of the type of storm you are viewing by using radar whenever possible. It is also very important to think in terms of processes when viewing cloud features. For example, are you looking at the updraft region of a storm i.e. the rain free base or wall cloud? OR are you looking at an area of downdraft and outflow i.e. the shelf cloud. The cloud features we see be it wall clouds or shelf clouds are the result of air moving upward into a storm or down and away from a storm. It is important to remember these ideas when viewing cloud features of storms the next time you are "in the field" spotting.

Ask the Meteorologist about NWS Services

By: Joe Nield, Meteorologist Intern

Question: How does hail form, and what determines the size of the hail?

Answer: Many of you reading this newsletter probably already know that hail is a thunderstorm phenomenon. While it may seem similar to the sleet that occurs during the wintertime, as we will see in a moment, hail forms in a drastically different way than sleet does (sleet occurs when snow falls through a warm layer, melts into raindrops, then freezes again before hitting the ground due to sub-freezing temperatures near the surface).

If you know that hail is a thunderstorm phenomenon, then you may also know that thunderstorms require two main ingredients to form – warm, moist air (instability), and a source of lift. Sometimes, the atmosphere will be so unstable that the instability serves as its own lift. Other times, a trigger mechanism such as a frontal boundary is required to lift the unstable air. For these thunderstorms to become severe, a third ingredient is introduced into the mix – vertical wind shear, or changes in wind speed and direction with height. On a fundamental level, it is variations in these ingredients that determine if hail will form, and how large it will be. Let's assume that thunderstorms are occurring – what can the environment tell us about the potential for hail, and how severe it may be?

Above: Hailstones compared with a coin. Notice the rings in the hailstones, indicating their formation process coming in layers.

Hail formation in a thunderstorm requires three main components.

1. A strong and sustained updraft
2. High liquid water content in the updraft
3. "Hail embryos"

Number 1 is a function of the instability and shear present. The greater the instability, the stronger the updraft will be. Also, the presence of shear induces updraft rotation, which can strengthen the updraft by a factor of 2 or more. In the case of number 2, the instability is generally a function of the moisture (and heat) content. For number 3, "hail embryos" are small pieces of ice or snow that provide a medium on which the stone begins to grow.

As an aside, in reality, nearly all thunderstorms probably contain at least some hail aloft. Whether or not that hail survives in solid form all the way to the surface is another matter altogether.

Assume in our case that these three components are present. We now know that hail formation is likely to occur. How does that happen? First, hail embryos are present in an updraft. These embryos begin to accumulate layers of supercooled water droplets, which freeze on the embryo, causing it to grow. This is why hailstones often have a layered appearance when split open, as in the first example below. As the stone grows larger, it can also accumulate smaller ice particles or even other hailstones, which can cause rapid and irregular growth as in the second example. For this growth process to continue, the hailstone must fall at a speed slower than that of the upward motion in the updraft – otherwise the stone will fall to

Ask the Meteorologist about NWS Services—Continued

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the ground.

We now know how hail forms – and that it is to be expected in our situation. What determines the size of the hail? Hail size is a function of many things, among them the depth of the cloud that is below freezing, the amount of time the hailstone will stay aloft in the updraft to grow, and the influence that melting will have on the stone as it falls.

Above : Hail at least the size of a baseball.

Chances of hail production increase considerably as the height of the melting level lowers. Have you ever wondered why spring storms often bring spectacular amounts of large hail (think April of 2006 in Indianapolis), while similarly severe storms in the depths of summer may produce only small or perhaps marginally severe hail (think July of 2004 in west central Indiana)? This is largely due to the climatological difference in the height of the 0C/32F level. In April, this level is likely to be in the 8-10,000 foot range, and perhaps even lower than that. Once the oppressive heat of August rolls around, it is more likely to be found around 12-14,000 feet. This leads not only to a lesser proportion of the updraft in sub-freezing air, but to a greater amount of time for hailstones to melt as they fall to earth. In addition, hail growth occurs most efficiently in a zone from around -10C to -25C. If there is a great deal of instability in this region of the atmosphere, and thus a strong updraft, larger hail becomes more likely. Conversely, if the same amount of instability were present, but it was concentrated near the surface, with only a small amount available in the hail growth zone, hail is less likely to become large.

As was mentioned earlier, for hail growth to continue, the stone must fall slower than that of the upward motion in the updraft – it must be able to remain suspended within the storm. The greater the instability in the upper reaches of the storm, the longer the hailstones will remain suspended. In addition, remember that if the atmosphere is strongly sheared, and the updraft is rotating, this can increase the updraft strength by a factor of 2 or more, allowing for even more hail growth to occur. Thus, extreme instability and strong rotation can compensate for the higher melting level in the depths of summer by dramatically increasing hailstone residency times in the updraft. In fact, rotation alone can make a good hail environment exceptional, and a poor one adequate.

Lastly, what influence does melting have on a hailstone once it has become too large to remain suspended and falls to earth? For small hailstones, a significant amount of melting can take place. Larger hailstones, however, fall faster than smaller stones, and have a proportionally smaller surface area with respect to their volume, so melting is a negligible influence. This is partially why significant hailstorm environments

Ask the Meteorologist about NWS Services—Continued

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can still occur in the warmest parts of the year, while more marginal hail events may become notably less likely.

The largest hail on record in the United States fell in Aurora, Nebraska on June 22, 2003. The largest stone officially recorded was 7 inches in diameter, with a circumference of 18.75 inches (photo below). The stones left impact craters in the ground up to a foot in diameter and 3 inches in depth, and locals reported holes left in roofs big enough to crawl through. An accurate weight could not be determined for the largest stone, but a slightly smaller stone (6.5 inches in diameter) weighed in at 1.33 pounds.

To summarize, hail forms when small pieces of ice or snow are suspended aloft for significant periods of time by strong updrafts, allowing them to grow by collecting layers of supercooled water droplets. If the updraft is very strong in the region where hail grows best, either through strong instability, rotation, or both, larger hail becomes more likely, since the stone will be held aloft for a longer period of time. When a hailstone becomes too large to be suspended aloft, it falls to the ground. If it is relatively small, it will melt significantly along the way. If it is relatively large, very little melting may occur.

Above: The largest hailstone ever officially recorded.

No matter how hail occurs, the hazard it poses is undeniable. Each one of the 3,000 hailstorms on average per year in the US has the potential to cause some form of property damage – in fact, property damage from hail averages over one billion dollars per year. In addition to the risk of damaging straight line winds in severe thunderstorms, the risk of damage and injury from hail is great, as well. Always pay attention to severe thunderstorm warnings just as you would a tornado warning – seek shelter in a strong building away from windows until well after the storm has passed. When the ice starts falling, you'll definitely be glad you did.

Severe Weather Preparedness Outdoors

By Jason Puma, Senior Meteorologist

Ahh...the return of Spring and Summer. Warmth. The ability to go outside once again and not freeze your tail off. Warmer weather is coming folks, and with it, people across central Indiana will be back outdoors. Also with the spring and summer, come thunderstorms and severe weather.

Above : A little leaguer gets ready to play ball. Does your outdoor league have a severe weather plan?

Did you know that more people are killed or injured by severe weather during the summer and spring months than any other time of the year? This is because more storms occur during the spring and summer, but also because more people are outside. So how can you get prepared for the severe weather this spring and summer? It's simple: Plan now.

First off, get in a routine of checking the weather forecast on a daily basis. You can do this by checking our website, www.weather.gov/ind, or by listening to local media or weather radio. Once you know if storms are possible, you will be able to plan your activity around the weather. If you are planning a picnic or barbeque, you can usually plan these events around the storm, or plan to get indoors when rain begins.

Organized sports leagues for both kids and adults should have a severe weather preparedness plan that provides guidelines as to when a game should be postponed or cancelled and participants are sent to safe locations. When you sign up for an outdoor sports league, be sure to ask what is done when thunderstorms threaten the area. Ask how are the participants notified of severe weather, and where do you go when severe weather strikes. Knowing what to do before severe storms strike is a key in being prepared.

When you are outdoors, some areas will have outdoor warning sirens that sound when severe weather threatens. These sirens are owned, activated and maintained by each county that owns them. The National Weather Service does not own or sound any sirens. However, if a siren is going off, it is a sure sign that you should get indoors to a sturdy structure as storms will be threatening.

Above: A tornado siren. Sirens only alert people who are outdoors, and who are close enough to hear them.

Not every area will have a siren. This is where a NOAA weather radio can be particularly useful. Take a weather radio with you when you go camping, hiking or to your kids baseball game. If a warning is issued, your radio will sound an alarm and alert you to take shelter indoors. Weather radios can be purchased at fine electronic stores everywhere.

Severe Weather PreparednessWeek

By Jason Puma, Senior Meteorologist

Above : Motorists make bad decisions, and attempt to drive through rushing floodwaters.

March 15th through March 21 is severe weather preparedness week in Indiana. During this week, people in Indiana are encouraged to get prepared for severe weather and ensure they have a plan of what to do when severe weather strikes.

A wide variety of severe weather can strike Indiana, including tornados, large hail, straight line winds, and of course, flooding and flash flooding.

Indiana averages 20 tornados each year, and on average, they result in around 3 deaths. More people lose their lives in flooding and flash flooding. Many of these deaths are preventable, as people often venture into high water or drive their vehicles into flood waters. These are poor decisions that people make during a flood event.

Each day during severe weather preparedness week the National Weather in cooperation with local media and local and state government will be sending out information on different types of severe weather that can strike Indiana.

The most important day of the week is Wednesday, March 18th. On this day the National Weather Service will send out two test warnings during the course of the day so that people can practice their severe weather preparedness plans. The first test is planned for sometime between 10:00 AM and 10:30 AM. It is scheduled at that time because most people will be at work or school. When the test warning is sent out, make sure you have a method to receive the warning, whether that be NOAA Weather Radio, broadcast media or via the internet. Do not depend upon a warning siren. Sirens are designed to warn people that are outdoors, and are not designed for you to hear them inside your home or business. Having multiple sources to receive warning information is best, because if one method fails, you will have another to fall back upon. After your receive the warning, put your emergency action plan into effect, and get yourself and co-workers to a safe location. The idea behind this test warning is practice, so that when a real warning is issued, everyone will know exactly where to go and what to do. The two key things to take away from the test warnings are first, getting the information, then second, taking action once you receive the information.

Above: A small NOAA All Hazards radio. Radios like these are inexpensive and may save your life. Next time you need a gift for someone, get them a NOAA All Hazards Radio, to help keep them safe.

A second test warning will be sent out sometime between 7:00 PM and 7:30 PM on March 18th. This is due to the fact that usually people are at different locations at different times of the day, and need to practice their preparedness both at work and at home. When the second test goes out, it is another opportunity to ensure that you receive the warning information and that you enact your preparedness plan.

Summer 2009 Outlook

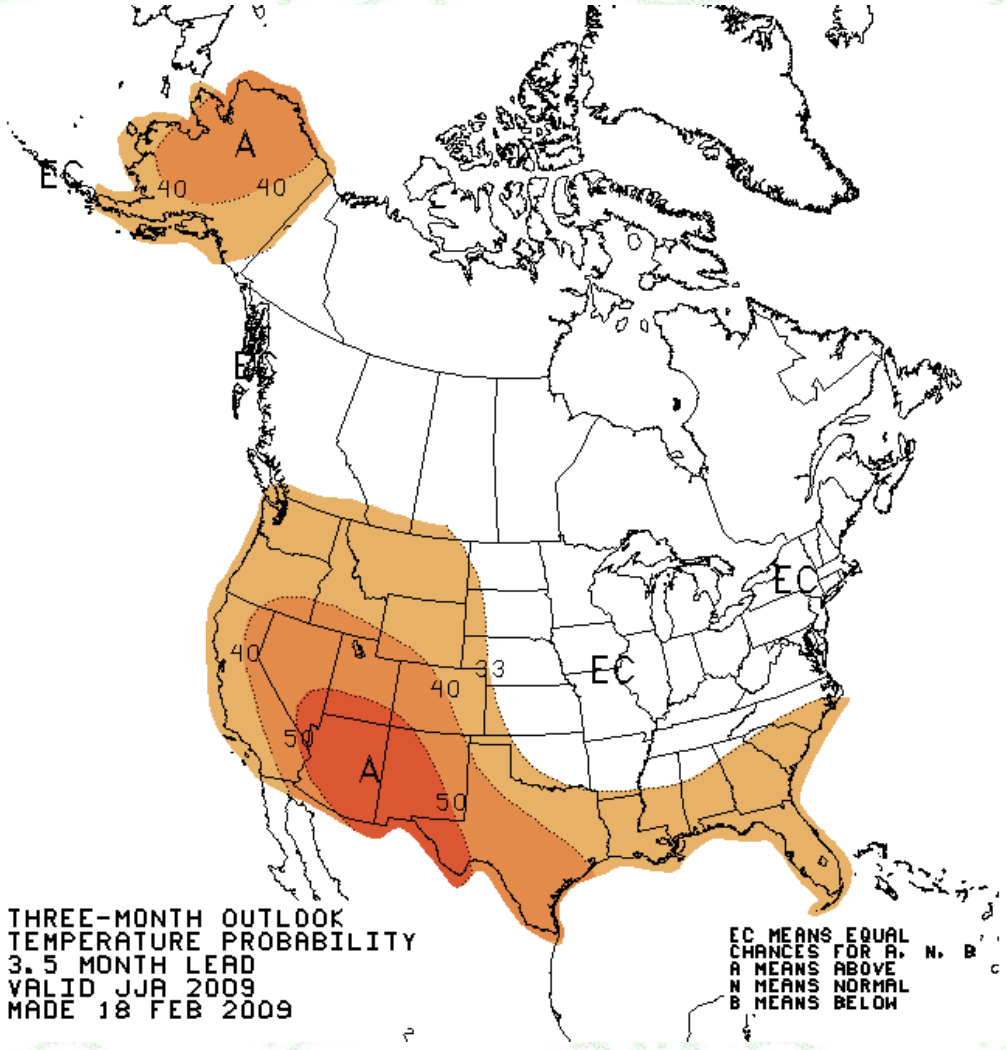
By Jason Puma, Senior Meteorologist

The Climate prediction center is expecting equal chances for above normal, normal or below normal temperatures this summer across Indiana.

The map at the right shows the equal chances area (labeled EC) stretching from Maine and New England across the Great Lakes to Minnesota, and then south to Tennessee and much of Arkansas.

Precipitation wise, the Climate prediction center is expecting equal chances for above normal, normal or below normal precipitation across Indiana.

At the time of this writing La Nina conditions were present in the equatorial Pacific, and atmospheric patterns were consistent with an established La Nina condition. El Nino and La Nina tend to have less of an effect during the summer



Above: The Temperature outlook for Summer 2008 from the Climate Prediction Center.

months than the winter, but it is still something that is considered when making long term forecasts. The Climate center stated in their monthly discussion "Forecasts for June, July and August 2009 are mainly based upon consolidated consensus forecast and long term trends adjusted to some extent by weak signal from various other forecast tools."

The normal high temperature in Indianapolis during the summer months is 83.8 degrees, and the normal low is 63.2 degrees. The summer is also typically the wettest season in Indiana, as the normal precipitation is 12.37 inches. In a full year, the normal amount of precipitation in Indianapolis is 40.95 inches.

Severe Weather Word Search

By Ashlee Moore, Program Coordinator, Indiana Department of Homeland Security

ADVANCED

C O B I C Y C L E H E L M E T O R N A D
O X E K G A W I P E Q U A L W A T E S S
L Y W E A T H E R K J W A R M F R O N T
D M E A I N T E R I O R R O O M H O P O
F E Y S O R V K O E R O N C A E J L M R
R A W A R E N E S S B Y A U L N Q Z B M
O F R D S M A G D A R C T L I O A Y V P
N T S R E K T O I F S V I D G K U F I R
T H U N D E R S T O R M O F H L D D E E
H M P X F A O I C E I J N R T D W E S D
U I E A N V I L H W P T A O N A A B Q I
N T R U Y Z E E A W L E L I I L O R U C
M I C R O B U R S T S L W K N S D I A T
O G E Q A C L M D I J E E A G H I S L I
W A L L C L O U D L N V A N P N W G L O
A T L C I O U D S I M I T V F E A K L N
A E L B L U D G L J I S H O Z Z T E I C
S A F E T Y A T E Z T I E L T X C S N E
G R E D R P H O L Q I O R R H A H I E N
H A P A O G A X E B G N S U U H O G Y T
C E S M I E I Q C E A I E F N A F R V E
V N O A A W E A T H E R R A D I O E B R
H I R G N H A A R T O U V M E L U E W L
E T M E A Z T D I Q P G I F R E P N A R
S T L M H O O B C K L H C U J L I S R E
W H E S A L R V I J S Y E I C G T K N P
Q F A B I L N C T S H E L T E R H Y I O
P L T A I L A S Y H D Z Q W X A Y L N R
F A M I L Y D I S A S T E R K I T P G T
L U Y H P O O U T B R E A K N N O S R W

FIND THE WORDS LISTED BELOW IN THE PUZZLE ABOVE.
WORDS CAN BE FOUND UP, DOWN, STRAIGHT ACROSS OR DIAGONALLY. GOOD LUCK!

ANVIL
AWARENESS
BICYCLE HELMET
CLOUDS
COLD FRONT
DAMAGE
DEBRIS
DITCH
ELECTRICITY
FAMILY DISASTER KIT
FEMA
FLASH
GREEN SKY
HAIL
INTERIOR ROOM
LIGHTNING
MICROBURST
MITIGATE
NATIONAL WEATHER SERVICE
NOAA WEATHER RADIO
OUTBREAK
PETS
RAIN
REPORT
SAFETY
SEVERE
SHELTER
SQUALL LINE
STORM PREDICTION CENTER
STRAIGHTLINE WIND
SUPERCELL
TELEVISION
THUNDER
THUNDERSTORM
TORNADO
WALL CLOUD
WARM FRONT
WARNING
WATCH
WEATHER

News and Notes

Spotters! Remember , this newsletter is for you! You could be a guest columnist in our next issue of "SKYWATCH". If you have an interesting weather story or storm chasing experience to share with the other spotters, submit it to our webmaster at w-ind.webmaster@noaa.gov.

Please keep any submissions to one page of typewritten text. **We are also always looking for pictures of hail, tornados, snow and storm damage that occurred in Central Indiana.** Feel free to send those items also. Any photos submitted may be included in the next edition of Skywatch. We try to give credit for photo submissions where possible. The next issue of "SKYWATCH" is planned for early summer.

Ask a Meteorologist about NWS Services

ADVANCED - ANSWER KEY

FIND THE WORDS LISTED BELOW IN THE PUZZLE ABOVE.
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Have you ever had a question about the weather? I'll bet that you have! Isn't there an old saying that goes there's never a meteorologist around when you need one? Well, now here is your chance. In this section of the newsletter, our staff of meteorologists will try our hardest to answer any and all of your questions concerning Meteorology. I can tell you now that we will not have all the answers, but we will certainly try our best. If you have a question, please send it to our Editor. We will try to answer all questions, and some of the most interesting or common questions and answers will be printed in the next newsletter.

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