

2011 Hurricane Guide

**Storm
Tracker 13**



2010 SEASON RECAP

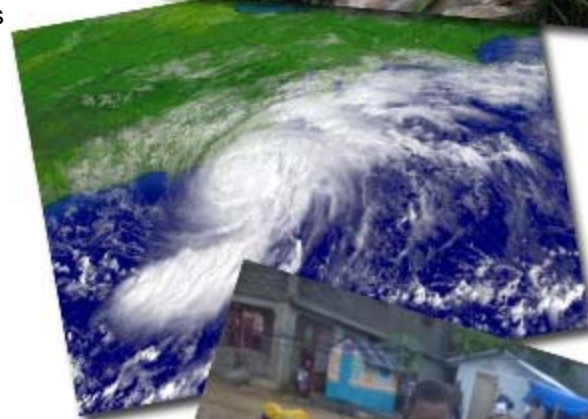
By Frank Johnson

The 2010 hurricane season was another fortunate one for the Carolinas as the storms that came our way stayed out to sea. We are especially fortunate when you consider that this was the third busiest season on record, and only one season had more hurricanes in the Atlantic.

The final numbers on the season are 19 named tropical storms, 12 of which became hurricanes, and 5 major hurricanes, which reached category three or higher. The 19 named storms is the third most on record. Only 1933 (21) and 2005 (28) had more named tropical storms. The twelve hurricanes last season came in second all time. Only the great season of 2005, with Katrina and Rita, had more hurricanes (15). 2005 was the year that we ran out of names, and had to start using the greek alphabet. The final storm in 2005 was Tropical Storm Zeta. Last year our final storm was Hurricane Tomas, but there were only two unused names left on the 2010 list.

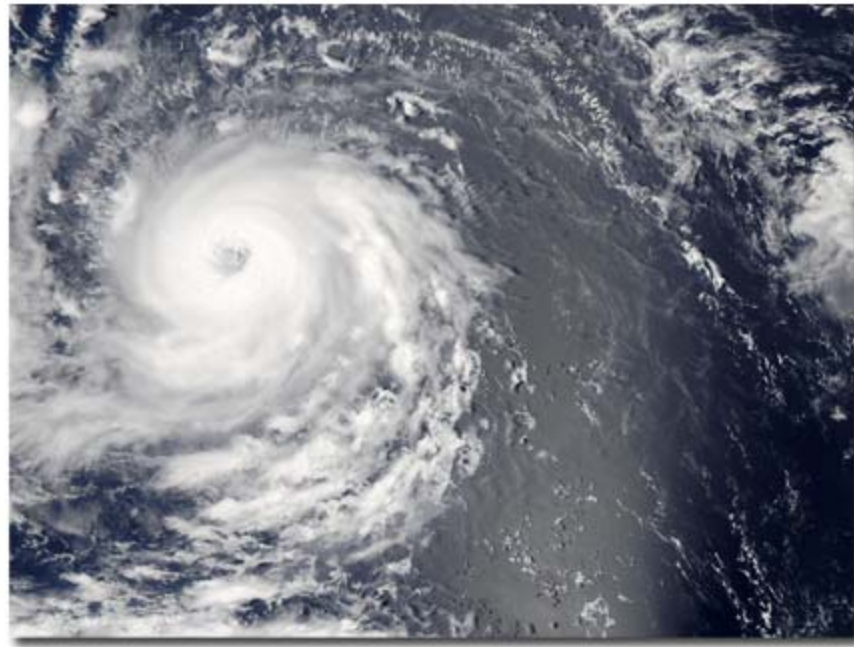
The big questions heading into the 2010 hurricane season were “would the season live up to all the bold forecasts?”, and “what would happen if a hurricane went over the oil spill in the Gulf of Mexico?”. The 2010 hurricane season did live up to the hype, ending up in the record books. Early in the season we had several threats in the Gulf of Mexico. To start July, Hurricane Alex hit Mexico just south of the U.S. border, then a week later a tropical depression doused the area with more heavy rain. Later in the month, Tropical Storm Bonnie moved right over the oil spill, but it was a weakening storm that had moved over Florida first, so effects on the oil were minimal. In August, a tropical depression moved over the oil spill area. It was enough to suspend drilling for a relief well, but it never developed into a tropical storm.

Although it was a very busy hurricane season in the Atlantic, the Carolinas were spared. Our only threat was Hurricane Earl, which stayed a few hundred miles east of the Grand Strand. The storm did brush by the outer banks of North Carolina, but hurricane force winds stayed offshore, and damage was minimal.



2011 HURRICANE NAMES

- Arlene
- Bret
- Cindy
- Don
- Emily
- Franklin
- Gert
- Harvey
- Irene
- Jose
- Katia
- Lee
- Maria
- Nate
- Ophelia
- Philippe
- Rina
- Sean
- Tammy
- Vince
- Whitney



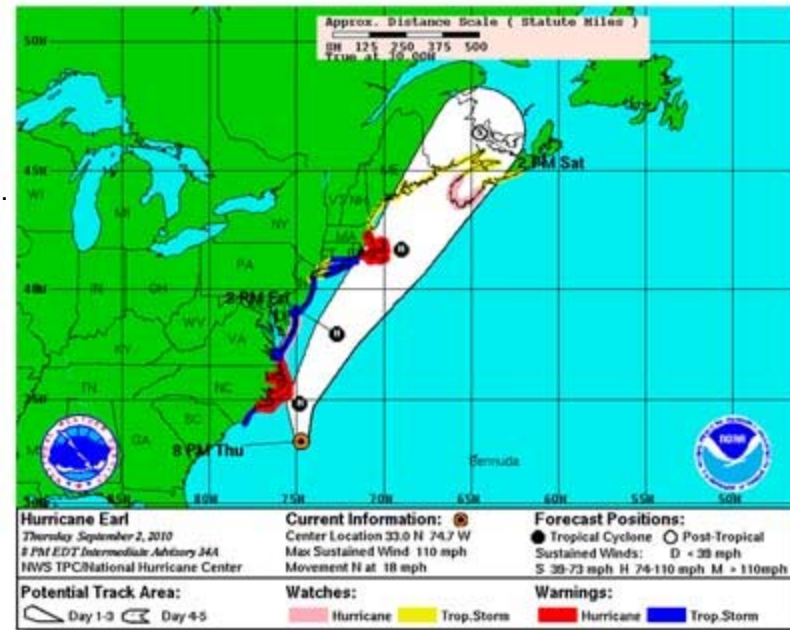
NATIONAL HURRICANE CENTER CHANGES

By Lindsay Milbourne

During the 2010 Atlantic Hurricane Season meteorologists at the National Hurricane Center increased lead time before a tropical system makes landfall. They provided the public with more useful information in terms of the probability of timing and the formation of systems. This is something that has greatly improved over the years. In fact, better data from computer models has allowed scientists to cut track forecast errors in half over the last fifteen to twenty years. However, there's a constant struggle to improve intensity forecasts. Over the past twenty years there are little to no improvements to this type of forecasting.

2011 will be a crucial year for National Hurricane Center scientists behind the scenes as they try to advance hurricane intensity forecasts. To get better intensification, forecasts scientists need to have a finer resolution of weather computer models. This year they will test new experimental models with higher resolution and analyze short term and long term forecasts. Their goal is to not only improve forecasting tropical systems intensity but also improve its track forecast. The National Hurricane Center will test some of these new products on tropical systems that haven't quite reached tropical depression or tropical storm strength. Their plan is to gain a useful forecast to help give people more time to plan if a system is headed their way.

Meteorologists behind the scenes will also implement a six to seven day trial forecast instead of the typical three to five day forecast. This extra time window will be especially helpful to people who work out at sea. It is crucial for them to have plenty of time to shutdown their daily operation and evacuate people. If successful, the extended forecast time is something the National Hurricane Center may issue in the future.



S.C. HURRICANE CLIMATOLOGY

By Lindsay Milbourne

Fortunately for South Carolinians we don't see hurricanes or tropical storms too often. In fact, since 1901 only 27 tropical cyclones have made landfall on the South Carolina coast. A category five storm has never hit our area and only eight hurricanes made landfall with Category 2 to Category 4 strength. The most well know storms to affect South Carolina, Hazel in 1954 and Hugo in 1989, are the only two hurricanes to hit the state with Category 4 intensity. Two Category 3 hurricanes also hit the state. Most recently Gracie in 1959 and before names were assigned to hurricanes, The September 17 hurricane of 1945. There is a possibility that the "Great Storm of 1893" had Category 4 strength, but unfortunately, there was no accurate way to measure this type of intensity before 1900.

Hurricane season in the Atlantic is quite long, starting June 1st and ending November 30th. Hurricanes can form before and after this time period. Most tropical systems that affect South Carolina form in September and October. During September, hot spots for tropical formation include the west coast of Africa and the eastern and western Caribbean. By October, development focuses more on the Caribbean, especially the western Caribbean. In recent years, since 1990, South Carolina has only three rather weak hurricanes make landfall along the coast. In 2004 both Hurricane Gaston and Hurricane Charley struck the coast and in 2002 Tropical Storm Kyle did. Hurricane Floyd in September 1999 dumped very heavy amounts of rainfall over the state (over 15 inches in some spots), but it officially made landfall near Cape Fear, North Carolina.

Although we've been very lucky recently, it's always important to remember that it only takes one storm for us to be not so lucky. Have you kit ready and a plan of action for you and your family even before the season starts.



HURRICANE RESEARCH TOOL

By Frank Johnson

Last year a new research tool started flying through hurricanes, giving scientists hard to get information from these dangerous storms. The Global Hawk unmanned aerial vehicle is a drone that flies into storms while the pilots stay safely on the ground. The Global Hawk is best known for its military uses, including espionage, surveillance and unmanned air to ground attacks. In 2010, NOAA received three of the drones that have been stripped of the military gear, and filled instead with weather monitoring instruments.

The research got going in the Pacific Ocean. The first ever high elevation fly over of a tropical cyclone by an unmanned aircraft took place on August 28th. The Global Hawk flew a 13 hour mission from Edwards Air Force Base in California to Tropical Storm Frank in the eastern Pacific. This first mission was basically to test the Global Hawk's capabilities while flying in weather conditions that can be found in a tropical cyclone. The weather instruments, cameras and radar were also tested, as well as the aircraft's ability to send this weather information back to the ground station.



NOAA's Global Hawks are based out of California, but that does not mean that these drones are for the Pacific Ocean only. One of the big selling points for these aircraft is that they can fly for up to 30 hours straight, and have an 11,000 nautical mile range. That is plenty of time and range to fully explore any Atlantic hurricanes. In fact, the drones flew into Hurricane Earl, the only hurricane to threaten the Carolinas last year. The flight over Earl marked the first flight for an unmanned aircraft over a fully formed hurricane. Because of the Global Hawk's 30 hour fly time, the drone can fly from California into an Atlantic hurricane and still have time to stay with the storm far longer than a traditional manned aircraft can, gathering much more information.

Although the Global Hawk is unmanned, it is still a sizeable aircraft. It is 44 feet long with a wing span of 116 feet. The Global Hawk is 15 feet tall, and weighs 25,600 pounds with a payload capacity of 2000 pounds. It can also fly at 60,000 feet, about twice as high as commercial airliners.

Most of the work in planning an unmanned mission is done before the plane leaves the ground. Global Hawk's flight plan is programmed before the plane takes off, then the pilot can just push the launch button, and the plane will take care of the rest... take off, complete the mission, come back and land with no more human interaction. However, during these flights into hurricanes, the planes are actually manually controlled while the storm is over the hurricane to account for the unexpected weather that can make a flight dangerous.

NOAA is not only using the Global Hawk for hurricane research. In early 2010, the Global Hawk made several research missions to the north pole. Future projects include studying ozone depletion and atmospheric chemistry including dust, aerosols and pollution.

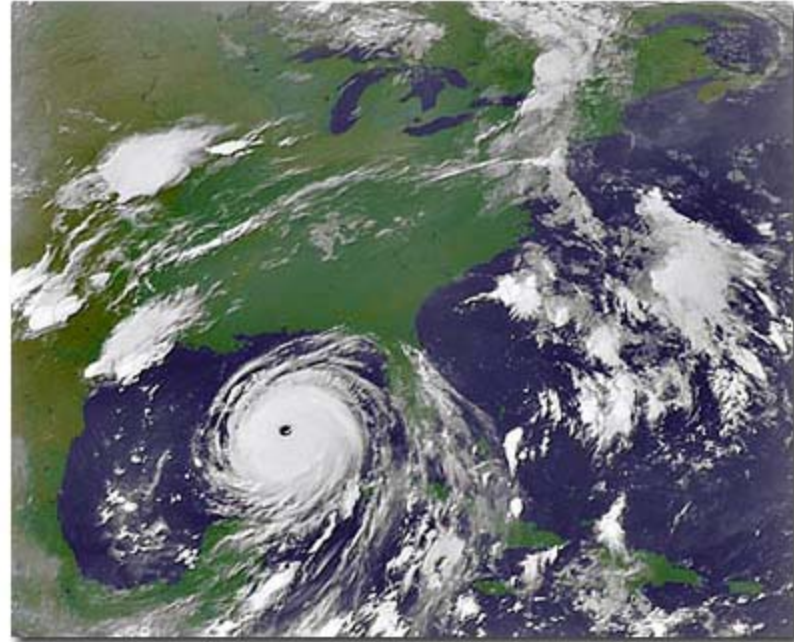
HURRICANE FORMATION

By Lindsay Milbourne

Hurricanes, or tropical cyclones, are large spiraling storms that form and intensify over ocean waters warmer than 80 degrees Fahrenheit. They typically form in an environment where there is plenty of moisture. Light winds between the surface and the upper troposphere are also essential for tropical development. Tropical cyclones are rotating systems and, in order to have enough spin, they need to be at least 300 miles away from the equator. These storms don't just form out of the blue. They form from a disturbance that has enough organization and enough spin to generate good inflow. Once enough organization occurs, a center of low pressure forms. Then, when the winds pick up enough, a tropical depression, tropical storm or hurricane forms.

Over time, if the environment remains favorable, a hurricane will take on a classic appearance with an eye and spiraling outer bands. The eye is the nearly circular center of the storm. It's a region of concentric rings of cumulonimbus clouds that spiral around the low pressure center of the storm. When the eye passes over an area there is often no rain and sometimes even sunny skies. Winds are generally much lighter in this region but strongest in the region directly around the eye or the eye wall. The eye wall is a vertical wall of clouds surrounding the eye.

This is also where the heaviest rain falls. Radiating outward from the eye wall are the spiraling outer bands. They are thin clouds that surround the eye wall where most of the rain falls. The bands can prompt flooding and strong winds too.



TWISTERS AND HURRICANES

By Lindsay Milbourne

Hurricanes not only dump heavy amounts of rainfall and cause flooding, they also are associated with strong thunderstorms and even tornadoes. In fact, almost all tropical systems that make landfall spawn at least one tornado. Tornadoes can occur between a day or two prior to landfall to three days after landfall. Most of these spiraling systems form during the day when temperatures are the warmest, but they can form at night too. Tornadoes that form over the ocean, or waterspouts, are also associated with hurricanes, however the rate at which they form is unknown.

One good thing about tornadoes that spawn from hurricanes is that they typically aren't as strong as tornadoes that form by themselves. Since 1950 no EF4 or EF5 tornadoes associated with hurricanes have been reported. When looking at a hurricane's satellite and radar image as a whole, meteorologists look at the right front quadrant relative to the storm's motion to pinpoint the area at highest risk for tornado formation. Forecasting these types of tornadoes is a challenge. Often times on the radar there is no lightning, and severe cells move at a very fast pace. Thunderstorm cells that are capable of producing tornadoes in a hurricane tend to be smaller and shallower than cells from storm systems that form over land. Regardless of how a tornado forms, they are all very dangerous and, in some cases, can cause a lot of damage. For example, Hurricane Allen in 1980 caused about \$100 billion worth of damage in the Austin, Texas area.



As always, it's really important to know what to do when a tornado strikes because sometimes they come without little warning. Make sure you seek shelter away from windows. An interior room like a closet or a bathroom or a basement is a safe place to go. Also, keep a weather radio and emergency storm kit handy.

FUJIWHARA EFFECT

By Frank Johnson

If hurricanes get too close to each other they can affect each other's motion. This is known as the Fujiwhara Effect. For two hurricanes to affect each other, they need to be within 900 miles. When storms do get that close, one of three things can happen. Most commonly when this happens, the storms disrupt each other's circulations, causing both storms to weaken. In the second instance, if the two storms are of different sizes, the larger storm will destroy the smaller. The larger storm can steal the smaller storm's moisture, or its outflow will create shear that can disrupt the smaller storm's rotation. The smaller storm often merges into the larger storm. This happened in 2005, when Hurricane Wilma destroyed Hurricane Alpha.

The third possibility when two hurricanes get too close to each other is known as the Fujiwhara Effect. This occurs when two similarly sized storms are attracted toward each other and start to rotate around a common point between the two before usually going their separate ways. In 1995, Hurricane Humberto and Hurricane Iris took part in a brief Fujiwhara Effect rotation. There was also a Fujiwhara circulation with two hurricanes that affected the Carolinas. In 1955, one year after Hurricane Hazel, hurricanes Connie and Diane hit North Carolina within a week of each other. Before the storms hit the Carolinas, they were close enough that they rotated around each other. The Fujiwhara Effect changed the path of each storm, and sent them both into North Carolina. If they had not been so close to each other, they both probably would have missed the Carolinas.

The Fujiwhara Effect happens occasionally in the Atlantic, but it is more common in the Pacific. In 1994, Typhoon Pat and Tropical Storm Ruth completed a full revolution around each other before combining into a single storm. Just last August, Tropical storm Namtheun and Severe Tropical Storm Lionrock took part in a Fujiwhara circulation. The interaction caused Namtheun to weaken and then become absorbed into the circulation of Lionrock.

This effect is named after Dr. Sakuhei Fujiwhara, who was Chief of the Central Meteorological Bureau in Japan in the 1930s. He wrote a paper describing the motion of vortices in water. Fujiwhara studied many different types of vortices and observed what happened when they came close to each other. Other scientists have since studied cases when this happens in the atmosphere, particularly with tropical storms. This is where the term "Fujiwhara Effect" is used most often.



AFTER THE STORM

By Chris Still

Much emphasis is put on being ready for a hurricane, but not enough is said about what to do after the storm. The first and foremost thing to do is listen to local television and radio reports, or if you're out of listening range, visit SCNow.com to find out when you will be allowed to return. Depending on the severity of the storm, you may be required to show photo I.D. to prove where you live before you are allowed to proceed home.

Once you are home, evaluate the damage to your property and determine if it is safe to go inside. Walk carefully around the outside and check for loose power lines, gas leaks, and structural damage. If you have any doubts about safety, have your residence inspected by a qualified building inspector or structural engineer before entering.

Do not go inside if: you smell gas, it is flooded, or your house was damaged by fire and has not been declared safe by officials. Remember, many, if not most, casualties happen after the storm when people return home to clean up the damage.



IT'S NOT ALL ABOUT WIND!

By Chris Still

Did you know that evacuations are not ordered directly because of the expected wind? If that was the case, the entire News13 viewing area would have to evacuate every time a hurricane approaches. Instead, evacuation orders are issued based on how far inland the storm surge is expected to penetrate.

When Hurricane Hugo barreled through Eastern Carolina in 1989, some of the worst winds were far inland in places like Sumter and Florence.

When it comes to weather safety, we hide from the wind and run from the water. This is why it is so important to follow evacuation orders.

If your neighborhood is told to evacuate, experts believe there's a good chance your house will flood when the storm surge arrives.

Storm surge happens in a matter of minutes, not hours, so if you wait until the water starts rising to leave, it will probably be too late. Drowning kills more people in hurricanes than anything else.



Is Your House Tough As Nails?

By Chris Still

Here are the top ten things the Institute for Business and Home Safety says you should do to make sure your house can weather the storm. Many are easier and less expensive than you may think.

1. Reinforce your garage door. The key to keeping the roof ON your house is to keep the wind OUT. In order for the wind to be able to lift the roof of your house, it has to get underneath the roof. Wind generally enters your home the same way you do, through an opening such as a door or window. Because it's the largest opening in the house, when the garage door goes, the roof could quickly follow. Install permanent wood or metal stiffeners, or an impact-resistant door that can withstand strong winds. Double-wide (two-car) garage doors can pose a problem because they wobble as the high winds blow and can pull out of their tracks or collapse from wind pressure. Consider retrofit kits, stronger hardware, or even replacement with more strongly constructed materials.



2. Reinforce other doors. Double-entry doors should be secured by heavy-duty head and foot bolts. For double doors, at least one should be secured at both the top and the floor with sturdy sliding bolts. Many bolts that come with double doors are not strong enough to withstand high winds. Your local hardware store can supply reinforcing bolt kits made specifically for their doors.

3. Protect your windows. Install shutters or impact resistant windows. There are many different kinds of hurricane shutters to fit every budget. And if you are handy, there are plans available from organizations such as the American Plywood Association (<http://www.apawood.org>) on how to build your own shutters. If you choose plywood storm shutters, make sure they are a minimum of 7/16" thick. In past hurricanes, returning homeowners have noticed their temporary plywood shutters blown off because they were not adequately fastened.

4. Glue your roof down. According to the IBHS, this is an inexpensive way to strengthen your roof. If you have access in your attic to the underside of your roof, apply construction-grade glue along where the plywood sheathing sits on the rafters or trusses. Also look to see if hurricane straps have been installed on the roof trusses. These are strips of galvanized metal that are wrapped around the ends of trusses and securely fastened to the walls; they help keep the roof fastened to the walls in high winds. They may be too hard to install by yourself, you may have to hire a contractor.

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5. Connections, coverings and codes count. Next time you have to replace the roofing on your house, make sure your contractor removes coverings down to the bare wood (sheathing). Confirm that the rafters and trusses are securely connected to the walls. Refasten existing wood according to proper building code requirements. In addition to the traditional felt paper layer, seal roof joints with a self-stick asphalt tape to protect from water damage. Choose a roof covering that will resist high winds.

6. Got gables? Brace them. Gabled roofs take a beating during a hurricane. Gable bracing often consists of 2"x 4"s placed in an "X" pattern at both ends of the attic. If your end gables do not appear to be braced, use a licensed contractor to install bracing.

7. Be secure. Have your house inspected to make sure porches and carports are properly attached to the house. Winds can push up underneath, and take off roof areas that will open up the rest of the house to high wind entry points. Correcting these construction mistakes could save you a big headache in the event of a storm.

8. Soften-up your landscape. Which would you prefer flying around during a serious hurricane - gravel & rock or organic mulches such as cedar chips or shredded bark. Are there tree limbs that are weak or damaged - do they overhang vulnerable parts of your house? If so, you'll want to get rid of them.

9. Secure the yard. Outdoor furniture, garbage cans, yard ornaments, etc., should be stored so they don't become deadly missiles and end up in your living room. Fuel tanks should be securely anchored to the floor. Larger propane tanks are the property of the propane company - written permission will be needed to anchor them.

10. Make plans. Establish a point of contact for family and friends. Make a list of survival supplies (batteries, water, canned goods and medicine), and replenish now while they are readily available. Buying needed supplies before hurricane season helps you avoid supply issues and long lines. If you take photos or videos of the inside of your house, also include the outside as well to assist in case of an insurance claim.



WIND LOSS MITIGATION CREDIT

By Chris Still

Did you know the design of your house could qualify you for big discounts on your homeowner's policy? It's called the wind loss mitigation credit and is available to South Carolina homeowners in hurricane prone areas.

If your house is designed in a way that makes it resistant to wind damage, then you probably qualify for one or more of these discounts without even realizing it. For example, if your house was built after 2000, odds are it has vinyl windows which could qualify you for a discount.

If your house has a "hip" roof design, meaning it slopes down to the eaves from all four sides, you could qualify for a very hefty discount.

This roof design is more resistant to wind damage than traditional gabled roofs and could save you as much as 15 to 20 percent off your premium.

Discounts are also available for things like wind resistant shingles (now standard on most new houses), reinforced garage doors, and of course, hurricane shutters.

Contact your insurance provider and ask if your house qualifies for a wind loss mitigation credit.



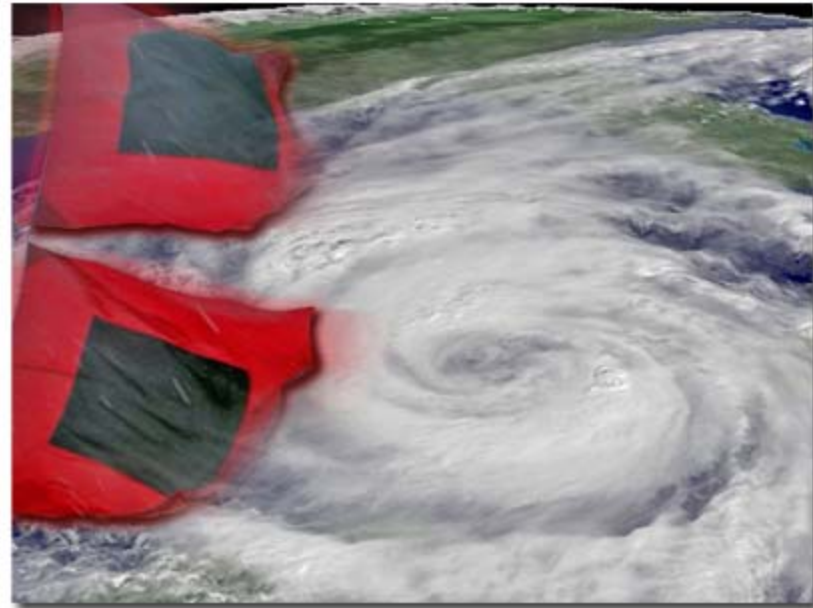
IGOR AND TOMAS RETIRED

By Frank Johnson

The World Meteorological Organization is responsible for naming the planet's tropical storms. The Atlantic storms that affect the Carolinas have six lists of names that rotate, so the names that were used last year (2010) will be used again in 2016. However, two of the names on last year's list will not return in 2016. The names Igor and Tomas have been retired.

When a tropical storm or hurricane causes extreme death or damage, a country can petition the World Meteorological Organization to retire the name. If it is decided that using a name again would be inappropriate, that name is removed, and another starting with the same letter is added to the list. In 2016, the new names will be Ian and Tobias.

Hurricane Igor reached category 4 strength with winds up to 155 mph while over the open Atlantic Ocean. By the time the storm reached Bermuda, it had weakened to a Category one storm. Hurricane Igor had its name retired because of its impact on Canada. Igor made landfall on September 21 near Cape Race, Newfoundland. Igor killed three people and caused \$200 million in damage. This was the most damaging hurricane in Newfoundland history, and was the strongest hurricane to hit Newfoundland since the 1935 Newfoundland Hurricane, which was similar strength.



Tomas was an unusual late season hurricane, and the deadliest storm of the 2010 season. Tomas formed east of the Lesser Antilles and south of 12 degrees N latitude on October 29. This is the farthest east and south a storm has ever formed so late in the season. Tomas became a hurricane after striking Barbados, and strengthened to a category 2 storm before hitting St. Vincent and St. Lucia. This is the worst hurricane to ever hit St. Lucia, causing \$500 million in damage and killing 14 people. Tomas then crossed the Caribbean and moved between Jamaica and Haiti. The heavy rain triggered floods and landslides in Haiti and killed an additional 35 people.

Igor and Tomas are two of the twelve hurricanes to form in the Atlantic last year. 2010 is tied with 1969 for second place for most hurricanes in a season. The record is 2005 with fifteen hurricanes. There were also 19 named tropical cyclones in 2010. This is tied as third place for the number of named tropical systems in a season. Only 2005 (with 28 named storms), and 1933 (with 21 named storms) had more activity than last year. Despite the active 2010 hurricane season, only one weak tropical storm hit the United States. Tropical Storm Bonnie hit south Florida with 40 mph winds in August.

