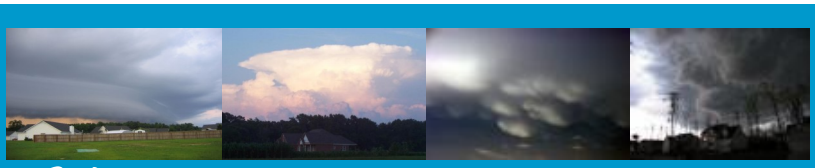



# Changing Skies Over Central North Carolina

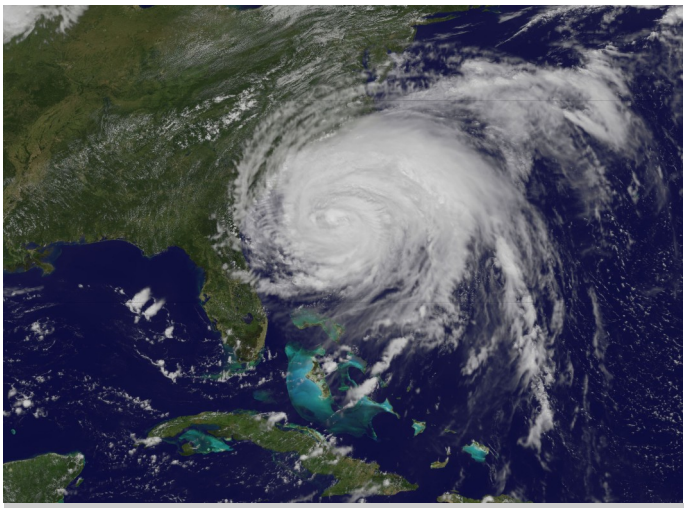
VOLUME 9, ISSUE 2 SUMMER 2012

NOAA'S NATIONAL WEATHER SERVICE RALEIGH, NC


INSIDE THIS ISSUE:



# NC Residents Prepare For Hurricane Season One Year After Irene



**Hurricane Irene Making Landfall in North Carolina**

Last year, North Carolinians saw first hand why it is important to be prepared for Hurricanes every single year. Hurricane Irene cost 7 people in North Carolina their lives. In addition, 2,500 people were temporarily cut off from the mainland as the storm breached highway 12 in 5 places. 444,000 people were left without power and the economic damage from the storm eclipsed $400 million in NC alone, not including the negative impact it had on the tourist season on the Outer Banks. When it comes to preparedness, this year can be no different.

Conditions in the atmosphere and the ocean favor a near-normal hurricane season in the Atlantic Basin this season, NOAA announced from Miami at its Atlantic Oceanographic and Meteorological Laboratory, and home to the Hurricane Research Division.

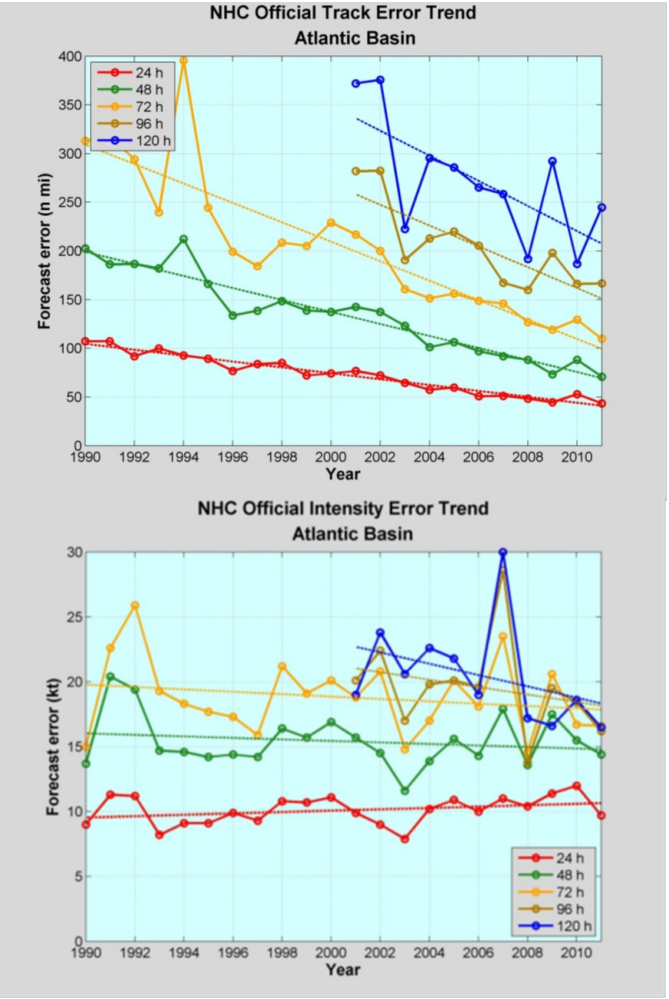
For the entire six-month season, which began June 1, NOAA's Climate Prediction Center says there's a 70 percent chance of nine to 15 named storms (with top winds of 39 mph or higher), of which four to eight will strengthen to a hurricane (with top winds of 74 mph or higher) and of those one to three will become major hurricanes (with top winds of 111 mph or higher, ranking Category 3, 4 or 5). Based on the period 1981-2010, an average season produces 12 named storms with six hurricanes, including three major hurricanes.

Favoring storm development

(continued on page 6)


**Breaks in Highway 12 Seen From Space**

# Hurricane Center Forecasts Improving



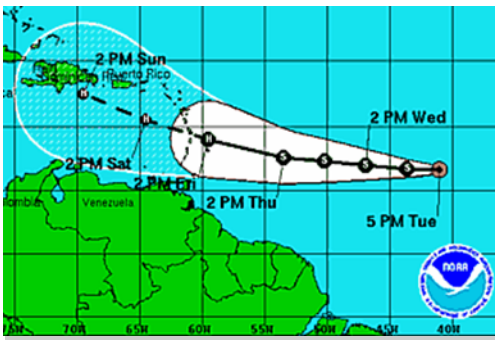

*"Improvements in both track and intensity forecasting have lead to more accurate warnings over shorter spans of coastline."*

As technology improves, so does the ability to predict one of natures biggest puzzles, hurricanes. Often heavily scrutinized because of the bredth and scope of such events, hurricane forecasters at the National Hurricane Center and researchers at the Hurricane Research Division in Miami, Florida continue to make progress in forecasting the track and intensity of tropical cyclones. Some tasks are easier than others, however. Data from 1990-2011 show that tropical cyclone track forecasting has improved dramatically. For example, a 24 hour track forecast in 1990 would have over 100 nautical miles of error one way or the other, on average. By 2011 that error has shrunk to less than 50 nautical miles. Forecasters have made greater improvements on longer time scales. 5 day forecasts began in 2001 with an average track error of 340 nautical miles. Just 10 years later, that error has been reduced to 210 nautical miles.

What tropical cyclone track forecasting has seen continued improvement, intensity forecasting has proven to be a tougher task. 24 hour intensity forecasts have actually slightly decreased in skill from an average error of 9 knots in 1990 to 11 knots in 2011. This increase is not very significant and basically shows no change in forecast skill over the last 21 years. This is most likely an indication that the state of the science is not yet good enough to dissect the microscale physics inside of the hurricane that cause the intensity to fluctuate, sometimes very rapidly. As technology improves and computing power increases, this number should gradually improve in the future. On longer time scales forecasters have fared much better. 5 day forecasts have shown an improvement from a 23 knot average error in 2001 to an 18 knot average error in 2011.

Improvements in both track and intensity forecasting have lead to more accurate warnings over shorter spans of coastline. Not only do better forecasts and warnings save human lives, but the economic impact is reduced when people have more time to board up houses and business, mitigating the damage.

Better forecasts have also resulted in differences in how the forecast is pre-



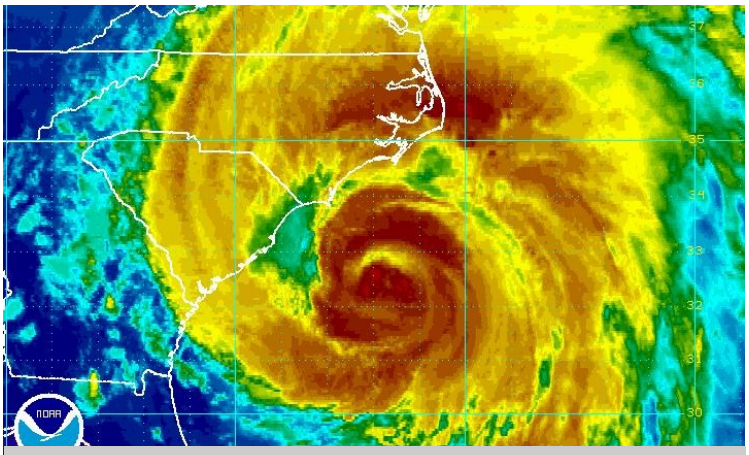

**NHC 5-day Track Forecast Cone**

sented to the public. The three and five day forecast cone has actually shrunk in size as the forecast improves. The cone represents the probable track of the center of a tropical cyclone, and is formed by enclosing the area swept out by a set of circles (not shown) along the forecast track (at 12, 24, 36 hours, etc). The size of each circle is set so that two-thirds of historical official forecast errors over a 5-year sample fall within the circle. The circle radii defining the cones in 2011 for the Atlantic and eastern North Pacific basins are given in the table below. Based on forecasts over the previous 5 years, the entire track of the tropical cyclone can be expected to remain within the cone roughly 60-70% of the time.

**-Ryan Ellis**

| Forecast Period (hours) | Circle radius Atlantic Basin (nautical miles) | Circle radius Eastern North Pacific Basin (nautical miles) |
|---|---|---|
| 12 | 36 | 33 |
| 24 | 56 | 52 |
| 36 | 75 | 72 |
| 48 | 95 | 89 |
| 72 | 141 | 121 |
| 96 | 180 | 170 |
| 120 | 236 | 216 |

# NWS Raleigh Works to Improve Wind Forecasts in Tropical Cyclones



**Hurricane Irene as it Approached the NC Coastline**

The NWS Raleigh along with collaborators from NC State University, 10 other NWS Weather Forecast Offices (WFOs), 3 NWS National Centers, and a NOAA laboratory have been working on a 3 year Collaborative Science, Technology, and Applied Research (CSTAR) project. The project is entitled "Improving Understanding and Prediction of Hazardous Weather in the Southeastern United States: Landfalling Tropical Cyclones and Convective Storms." The project includes more than 50 individual collaborators from numerous offices.

Fitting for this time of year, one portion of the project is aimed on improving inland gridded forecasts of tropical cyclone winds and wind gusts. Forecasters have long experienced difficulties in creating the detailed hourly forecasts of wind and wind gusts with these storms. These difficulties arise with the complexity of hurricanes and tropical storms along with the need to produce forecasts that are based in sound science and that are consistent with the National Hurricane Center (NHC) guidance and with other WFOs.

The project has made

(continued on page 7)

# Be Prepared for Summer Heat Dangers


*"We have broken the record for consecutive 100 degree days with six and are closing in on eclipsing the most 100 degree days in a calendar year, which is 12 ."*

This summer is just underway and already we have seen numerous 100 degree days in both June and July. We have broken the record for consecutive 100 degree days with six and are closing in on eclipsing the most 100 degree days in a calendar year, which is 12.

Regardless of where a given summer stands in the record books, it is still important to understand the terminology used and how to protect yourself and your family from the heat. What is a heat index and why is it important? What is the difference between a heat advisory and an excessive heat warning? What precautions should you take? All of these questions and more will be answered.

What is the Heat Index (HI)? The HI is a measure of how hot it really feels when relative humidity (RH – the % of moisture in the air) is factored with the actual air temperature, but generally speaking, it is the apparent temperature (how hot it feels). The relative humidity is important because when we get hot we start sweating, which cools the body through evaporation. However, high relative humidity slows the evaporation, robbing the body of its ability to cool itself. When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat related illnesses and disorders may develop. Heat index values above 105°F correspond to a level that may cause increasingly severe heat disorders with continued exposure and/or physical activity. The National Weather Service Heat Index Chart is provided here to show which temperature and RH values correspond to a particular HI value.

East of the Rockies, heat waves tend to combine both high temperature and high humidity although some of the worst have been catastrophically dry. Two years ago we had two heat wave events that varied drastically from one another due to the humidity. The first wave was from 6-8 July 2010 and was characterized by temperatures in the 100's across much of central NC, but due to the low RH values, the HI's for that period were less than or equal to the temperature and did not exceed 105 degrees. In contrast, the event from 23 -25 July 2010 was characterized by high temperatures in the upper 90's to low 100's (lower than the previous event), but due to the high RH values, HI's exceeded 110 degrees across much of central NC. These two events demonstrate how RH can impact the apparent temperature.

Heat is the number one weather-related killer. On average, more than 1,500 people in the U.S. die each year from excessive heat. The HI is a measure of excessive heat and is thus the measure used to determine the criteria for heat advisories and excessive heat warnings. A heat advisory is issued for HI values from 105 degrees to 109 degrees for more than 2 hours on any day; or for several consecutive days of 100 to 105 degrees, which are starting to take a toll on local communities. An excessive heat warning is issued for HI of 110 degrees or more for 2 hours on any day. An excessive heat warning or advisory will be issued when an excessive heat event is expected in the next 36 hours. These products are issued when an

## NOAA's National Weather Service

### Heat Index

Temperature (°F)

| Relative Humidity (%) | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 | 98 | 100 | 102 | 104 | 106 | 108 | 110 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 80 | 81 | 83 | 85 | 88 | 91 | 94 | 97 | 101 | 105 | 109 | 114 | 119 | 124 | 130 | 136 |
| 45 | 80 | 82 | 84 | 87 | 89 | 93 | 96 | 100 | 104 | 109 | 114 | 119 | 124 | 130 | 137 | |
| 50 | 81 | 83 | 85 | 88 | 91 | 95 | 99 | 103 | 108 | 113 | 118 | 124 | 131 | 137 | | |
| 55 | 81 | 84 | 86 | 89 | 93 | 97 | 101 | 106 | 112 | 117 | 124 | 130 | 137 | | | |
| 60 | 82 | 84 | 88 | 91 | 95 | 100 | 105 | 110 | 116 | 123 | 129 | 137 | | | | |
| 65 | 82 | 85 | 89 | 93 | 98 | 103 | 108 | 114 | 121 | 126 | 130 | | | | | |
| 70 | 83 | 86 | 90 | 95 | 100 | 105 | 112 | 119 | 126 | 134 | | | | | | |
| 75 | 84 | 88 | 92 | 97 | 103 | 109 | 116 | 124 | 132 | | | | | | | |
| 80 | 84 | 89 | 94 | 100 | 106 | 113 | 121 | 129 | | | | | | | | |
| 85 | 85 | 90 | 96 | 102 | 110 | 117 | 126 | 135 | | | | | | | | |
| 90 | 86 | 91 | 98 | 105 | 113 | 122 | 131 | | | | | | | | | |
| 95 | 86 | 93 | 100 | 108 | 117 | 127 | | | | | | | | | | |
| 100 | 87 | 95 | 103 | 112 | 121 | 132 | | | | | | | | | | |

Likelihood of Heat Disorders with Prolonged Exposure or Streuous Activity

Caution  Extreme Caution  Danger  Extreme Danger

excessive heat event is occurring, is imminent, or has a very high probability of occurrence.

So, what should you do to protect yourself and/or your family from the heat? Studies have shown that the temperature inside a parked vehicle can rise rapidly to a dangerous level for children, adults, and pets. Leaving the windows slightly open does not significantly decrease the heating rate. The effects can be more severe on children because their bodies warm at a faster rate than adults. Some vehicle child safety tips include checking for hot seating surfaces and equipment; Never leave your child unattended in a vehicle, even with the windows down; Teach children not to play in, on, or around cars; Always lock car doors and trunks, even at home; and always make sure all child passengers have left the car when you reach your destination. Don't overlook sleeping infants.

Here are a few other heat wave safety tips:

Slow down - Strenuous activities should be reduced, eliminated, or rescheduled to the coolest time of the day. Individuals at risk should stay in the coolest available place, not necessarily indoors.

Dress for summer- Lightweight light-colored clothing reflects heat and sunlight, and helps your body maintain normal temperatures.

Put less fuel on your inner fires - Foods (like proteins) that increase metabolic heat production also increase water loss.

Drink plenty of water or other non-alcohol fluids - Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. If you have a medical condition that may be impacted by increased fluid consumption, you should consult a physician before increasing your fluid intake. Do not drink alcoholic beverages.

Spend more time in air-conditioned places – If you cannot afford an air conditioner, spending some time each day (during hot weather) in an air conditioned environment affords some protection.

Don't get too much sun - Sunburn makes the job of heat dissipation that much more difficult.

Do not take salt tablets unless specified by a physician.

**-Kathleen Carroll**

# Tweets From NWS Raleigh Coming Soon!

NWS Raleigh's participation in social networking will soon expand to Twitter. By the end of summer, NWS Raleigh will use the microblogging service as another means to share weather and water information rapidly, in common language. Twitter will also give forecasters a tool to heighten awareness through education and encouragement of public response and action to all types of weather and climate events. Readers of posts can also quickly share information, such as reports of hazardous weather with locations and times, along with event images. For all parties involved, use of Twitter by NWS Raleigh should allow for greater situational awareness.

During the summer, NWS Raleigh will determine its overall process for tweeting. A baseline level of service, as the use of Twitter is expanded across the NWS, includes such things as automated "Top News of the Day" stories like those currently found on the NWS Raleigh internet home page, and non-warning NWS products such as public information statements and record event reports. Other information that may be tweeted include: general forecast and weather information; long-fused warnings, watches and advisories such as those for winter weather; weather and climate facts; and, outreach and educational information. Frequently, tweets will link back to official sources of information, such as the NWS Raleigh web site, weather.gov/raleigh. In its early stages, short-fused warnings such as tornado and severe thunderstorm warnings will not be tweeted, as the NWS is working with Twitter to best determine how to do this. Those active in Twitter should not rely on Twitter as the primary means of receiving hazardous weather alerts/warnings.

Similar to Facebook, in which NWS Raleigh started participating in August, 2011, Twitter is considered an experimental service. It will be treated with the appropriate priority, not interfering with the issuance of official NWS products. Many NWS offices will tend to be conservative when tweeting so as not to "overdo it". During very active weather events, it is likely that the volume of information and questions directed toward the NWS will exceed staff members' ability to respond. NWS Raleigh's handle on Twitter will be @NWSRaleigh.

**-Darin Figurskey**

# Hurricane Outlook (from page 1)

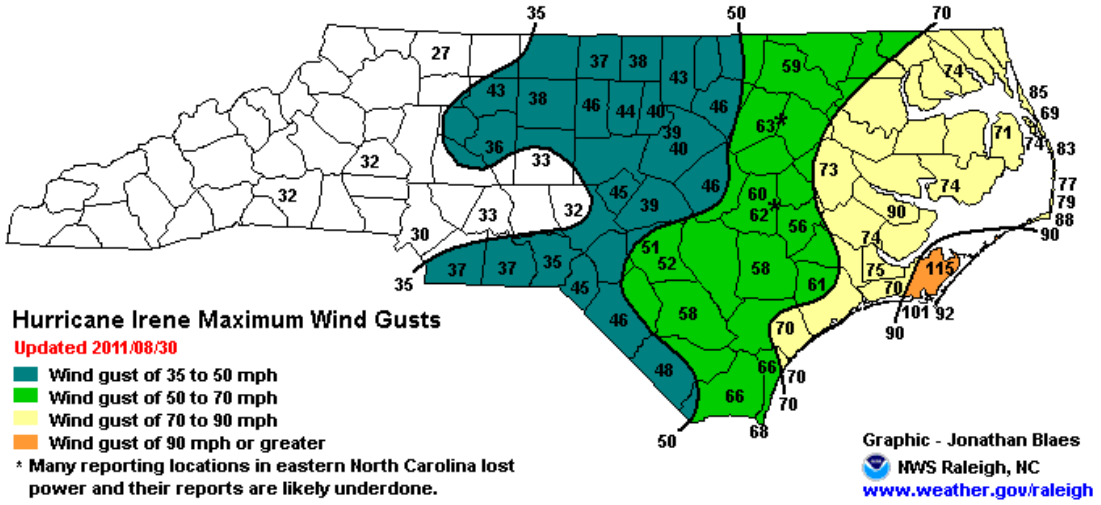
in 2012: the continuation of the overall conditions associated with the Atlantic high-activity era that began in 1995, in addition to near-average sea surface temperatures across much of the tropical Atlantic Ocean and Caribbean Sea, known as the Main Development Region. Two factors now in place that can limit storm development, if they persist, are: strong wind shear, which is hostile to hurricane formation in the Main Development Region, and cooler sea surface temperatures in the far eastern Atlantic.

"Another potentially competing climate factor would be El Niño if it develops by late summer to early fall. In that case, conditions could be less conducive for hurricane formation and intensification during the peak months (August-October) of the season, possibly shifting the activity toward the lower end of the predicted range," said Gerry Bell, Ph.D., lead seasonal hurricane forecaster at NOAA's Climate Prediction Center.

The seasonal outlook does not predict how many storms will hit land. Forecasts for individual storms and their impacts are provided by NOAA's National Hurricane Center, which continuously monitors the tropics for storm development and tracking throughout the season, using an array of tools including satellites, advance computer modeling, hurricane hunter aircraft, and land and ocean-based observations sources such as radars and buoys.

**-Ryan Ellis**
**(source:NOAA)**

# NWS Raleigh Works to Improve TC Forecasts (from page 3)




considerable progress during the past year

and some of the results of the project include:

-Recognition that forecasters use a variety of approaches and techniques to create forecasts of winds and wind gusts which can result in inconsistent forecasts between WFOs.

-A verification analysis of wind forecasts from several recent tropical cyclones which indicated a consistent high bias or over prediction of wind speeds.

-We were fortunate to have Hurricane Irene move through our study area during the project which allowed significant real time and post event examination of the forecasts and the storm's winds and wind gusts. An Irene post assessment was completed.

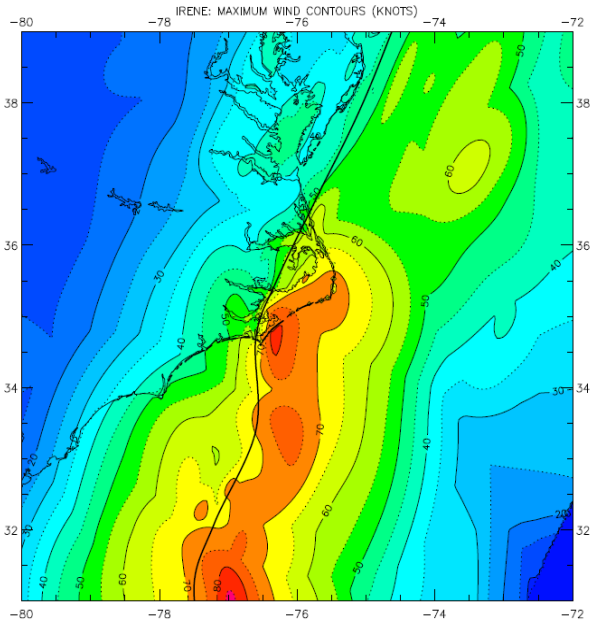
-WFOs use guidance from the NHC to create their local wind forecasts. Through this project, there is better awareness that this guidance has limited spatial and temporal resolution and is based on limited data and contains a considerable amount of uncertainty.

-Improved conceptual models and training materials continue to be developed to provide forecasters with a more consistent scientific foundation to use in their forecasts.

-Several new tools and procedures are being developed and tested to provide forecasters with the resources needed to provide more accurate and consistent forecasts of winds and wind gusts.

-You can learn more about the project and follow future updates on our science and research blog CIMMSE (Collaboration for Improved Meteorology in the Mid-Atlantic and Southeast) - http://cimmse.wordpress.com/

**-Jonathan Blaes**



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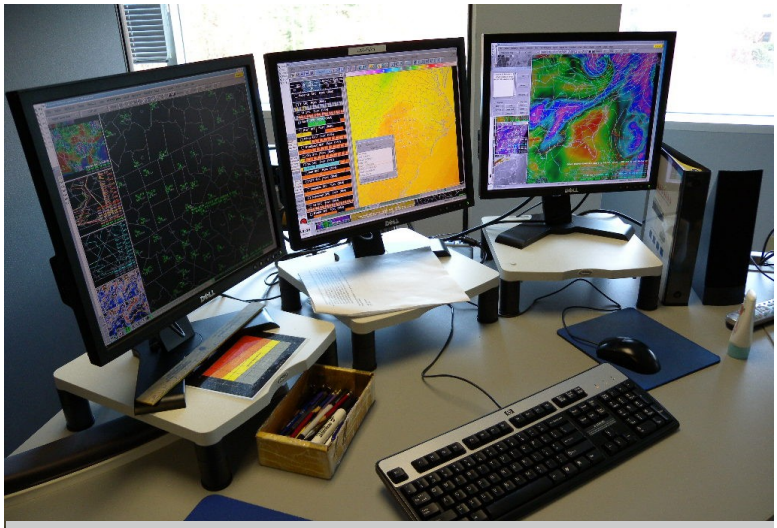
# New Computer System Coming to NWS Raleigh



**AWIPS I Forecasting System Soon to be Upgraded to AWIPS II**

Later this summer, WFO Raleigh will be undergoing a complete overhaul of its computer system. In the current system, called the Advanced Weather Interactive Processing System ( AWIPS), the computers and software allow forecasters to view radar imagery, issue severe weather warnings, analyze satellite imagery and computer model data, type weather discussions, and construct forecast graphics, all on one four-screen workstation. But the computer world changes fast. While these workstations still do a fine job, they are now over 10 years old and are starting to show some wear and tear. Some of the latest interactive computer functionality, like Google-type mapping and customized plots and maps, is missing in the current AWIPS and is not able to be incorporated into this current system. Being able to have new interactive maps would allow us to create more refined, detailed forecasts, and it would allow us to be better prepared to deal with decision support requested by emergency officials. Our new computer system, dubbed AWIPS2, will contain these and other advancements, such as faster processing and improvements to satellite, radar, and upper-air sounding displays. We will also be able to better "layer" certain weather fields, such as satellite imagery atop radar imagery with, for example, a display of local recreation areas as well as a plot of population centers. This will allow us to more quickly assess various weather threats and respond to hasten the protection of life and property, a primary goal of the National Weather Service. Later this year, you will be able to see the results of this upgrade in the form of new information and details to our warning and forecast graphics and products.

**-Gail Hartfield**