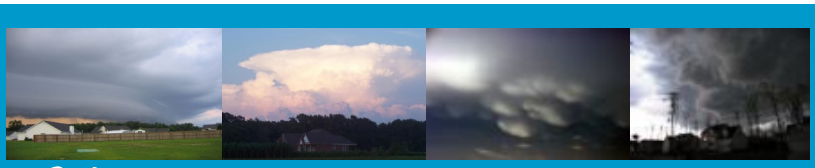


Changing Skies
Over Central North Carolina

VOLUME 14, ISSUE 2 SPRING 2017

NOAA'S NATIONAL WEATHER SERVICE RALEIGH, NC

INSIDE THIS ISSUE:

Hurricane Hunters Coming to Raleigh

USAF WC-130J Hurricane Hunter Aircraft

Hurricane experts from the National Oceanic and Atmospheric Administration (NOAA) will visit five U.S. East Coast cities and one city in Canada, flying aboard a USAF Reserve WC-130J Hurricane Hunter aircraft along with the NOAA G-IV aircraft, to raise awareness of the impacts from tropical cyclones threats and the danger of being caught without a personal hurricane plan.

One of the stops on the 2017 Hurricane Awareness Tour will be Raleigh, North Carolina. This stop will occur at Raleigh-Durham International Airport, on Wednesday, May 10, 2017.

The WC-130J is one of ten such aircraft used by the U.S. Air Force Reservists from the 53rd Weather Reconnaissance Squadron, 403rd Wing, located at Keesler AFB in Biloxi, MS. Military air crews fly directly into the core of tropical cyclones to gather data that are critical for forecasting a tropical cyclone's intensity and landfall.

The NOAA G-IV is part of the agency's fleet of highly specialized research and operational aircraft operated, managed, and maintained by the NOAA Office of Marine and Aviation Operations and based at Lakeland Linder Regional Airport in Lakeland, FL. It flies at high altitude around and ahead of the tropical cyclone, gathering critical data to go into the hurricane forecast models.

National Hurricane Center Director Dr. Rick Knabb, hurricane specialists Daniel Brown and John Cangialosi, Hurricane Hunter mission specialist Warren Madden, the USAF hurricane hunter crew members, and the NOAA aircraft crew members will be on hand to educate residents of vulnerable communities about hurricane preparedness, and will be available for interviews.

Staff from local emergency management offices, non-profit organizations such as the American Red Cross, and personnel from local NOAA National Weather Service forecast offices will be part of the team at each stop.

Community groups, media, elected officials, select local schools (schools by invitation only), and the public are invited to participate and tour the aircraft and exhibits. Public tours will be given from 2:30 to 5 p.m. Registration is not required for the public tours; those wishing to visit this event can simply show up any time between 2:30 and 5 pm.

(continued on page 2)

Hurricane Hunters (continued from page 1)

NOAA G-IV Hurricane Hunter Aircraft

"In addition to the aircraft, several NWS partners will be on hand staffing exhibits and display booths to join us in our effort to promote hurricane awareness, preparedness, and resiliency."

In addition to the aircraft, several NWS partners will be on hand staffing exhibits and display booths to join us in our effort to promote hurricane awareness, preparedness, and resiliency.

The following NWS Partners will have booths, emergency vehicles, and exhibits on display:

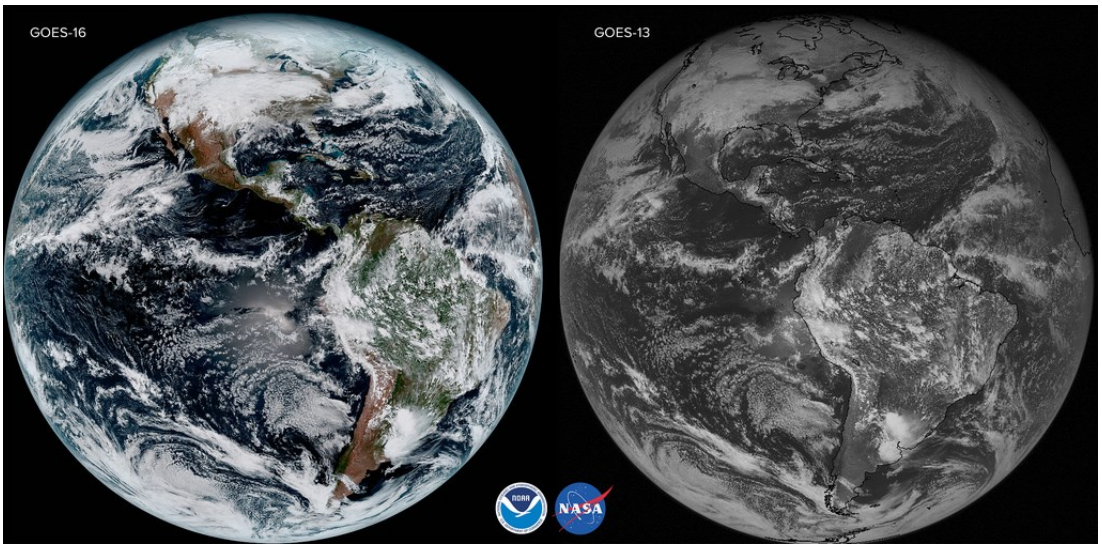
- National Weather Service, Raleigh NC Forecast Office
- Federal Alliance for Safe Homes (FLASH)
- Central Carolina SKYWARN
- American Red Cross (Eastern NC div)
- North Carolina Sea Grant
- U.S. Geological Survey
- North Carolina Association of Floodplain Managers
- North Carolina Emergency Management
- Wake County Emergency Management
- Durham County Emergency Management
- RDU Fire-Rescue

For more information on the Raleigh event, visit :

http://www.weather.gov/rah/2017hat

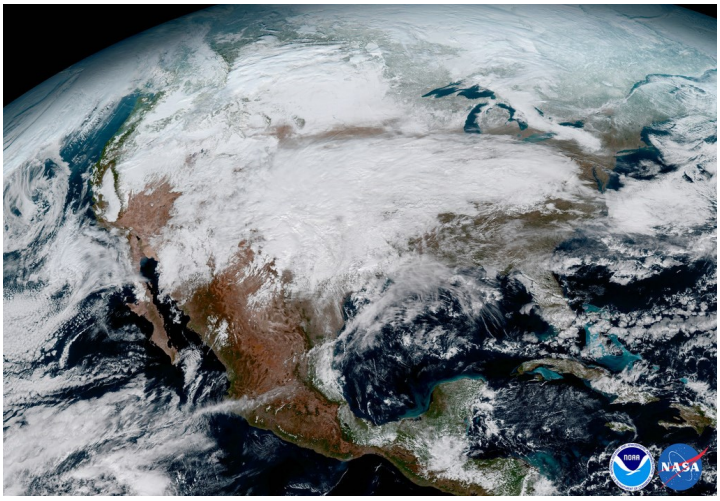
-Nick Petro

The First Views From GOES-16 Were Incredible



When GOES-R Launched from Cape Canaveral, Florida last November, it became GOES-16. The satellite comes equipped with an advanced baseline imager, or ABI, that gives forecasters the ability to look at 16 different channels of data and also to combine them in various ways to create numerous datasets that were not possible with previous technology. GOES-16 gives the forecasters a tool that can lead to:

- Improved hurricane track and intensity forecasts
- Increased thunderstorm and tornado warning lead time
- Earlier warning of ground lightning strike hazards
- Better detection of heavy rainfall and flash flooding risks
- Improved aviation flight route planning
- Improved air quality warnings and alerts
- Better fire detection and intensity estimation
- Improved solar flare warnings for communications and navigation disruptions
- More accurate monitoring of energetic particles responsible for radiation hazards to humans and spacecraft
- Better monitoring of space weather to improve geomagnetic storm forecasting



In the image above, one can already see the leap in quality from the current GOES-13 satellite imagery on the right, to the new GOES-16 imagery on the left.

Still frames don't tell nearly the whole story though. To grasp the true power of GOES-16 one needs to see an animation of the data. For great animations from the new GOES-16 satellite and more information on the instrument, please go to the:

GOES-R Multimedia Page.

-Ryan Ellis

Are You Prepared for Severe Weather Season?

Severe weather is common across North Carolina during the spring, with an average of 16 tornadoes occurring statewide from March through June. In addition to tornadoes, damaging straight-line winds, hail, flooding, and cloud-to-ground lightning all pose a threat to life and property during the springtime. The purpose of this article is to explore severe weather terms with which you should be familiar and steps you can take to keep you and your family safe as we head into spring.

Watch vs. warning

Do you know the difference between a watch and warning?

A ***watch*** means that *the environment is favorable* for a given hazard (e.g., tornadoes or severe hazard). You should be prepared to act if a warning is issued.

A ***warning*** means that a given hazard is *occurring or imminent.* You should seek shelter or take action immediately!

How to prepare for severe weather

- **Develop a safety plan for you and your family**. Information and ideas can be found at https://www.ready.gov/make-a-plan.
- **Be able to identify your location on a map**. Watches and warnings tend to be shown graphically. Know where your county and city are located relative to their surroundings.
- **Have a way to receive emergency alerts**. Whether it is a NOAA Weather Radio, text message notification service, or community sirens, be sure that you will be informed when severe weather threatens.

What to do during severe weather

Tornadoes

When a tornado threatens your area and a tornado warning is issued, keep the following tips in mind:

- *Wherever you are…* have a NOAA weather radio or local news feed available to stay updated on current watches and warnings.
- *If you are at home…* go to your basement or safe room, if possible. Otherwise, take shelter in an interior room away from windows.
- *If you are at work or school…* follow your tornado drill guidelines.
- *If you are outside…* seek shelter inside the nearest sturdy building or, if there are none available, take shelter in a low-lying area.
- *If you are in a vehicle…* drive to the nearest shelter, if you have time. Otherwise, get down in your car and cover your head or abandon your car and take shelter in a low-lying area. **Do not shelter under an overpass!**

"A watch means that the environment is favorable for a given hazard (e.g., tornadoes or severe hazard). You should be prepared to act if a warning is issued.

A warning means that a given hazard is occurring or imminent. You should seek shelter or take action immediately!"

Damaging Winds and Hail

In extreme cases, straight-line winds can be just as devastating as tornadoes. However, even with wind gusts of 60 mph, tree damage and light structural damage are possible, posing a threat to life and property. Additionally, large hail can produce damage to vehicles and structures and threaten the lives of you or your pets, particularly when combined with strong to severe winds. When a severe thunderstorm warning is issued for your area:

Wherever you are… have a NOAA weather radio or local news feed available to stay updated on current watches and warnings. Know that tornadoes can occur in association with severe thunderstorms with little or no lead time.

If you are at home or work… take shelter in an interior room away from windows.

If you are outside… move inside immediately and take shelter in an interior room away from windows.

If you are in a vehicle… **do not shelter under an overpass!** Instead, drive to the nearest sturdy structure and shelter inside away from windows. If unavailable, get down in your car and cover your head.

Flooding

Flooding poses similar threats on either short (called "flash flooding") or long time scales. In North Carolina, longer-term flooding is usually associated with several hours or days of rainfall that leads to rises on creeks, streams, or rivers. This is often a result of land-falling tropical cyclones, such as the flooding associated with Hurricane Matthew last fall. Flooding poses a considerable risk to the public; in fact, flooding leads to more fatalities in a typical year than any other weather hazard across the United States.

When flooding threatens and a flash flood warning or flood warning is in effect:

Stay informed by monitoring a NOAA weather radio or local news feed.

Move away from areas prone to flooding, if it is safe to do so.

Evacuate if told to do so.

Do not go into any room where electrical devices or outlets are submerged, as you could be electrocuted!

Avoid flood waters. **Turn around, don't drown!** Water may be deeper than it appears, especially at night. It only takes 12 -18 inches of flowing water to sweep a vehicle off the road and approximately six inches to knock you off your feet.

Tornado Damage

Lightning

A thunderstorm does not necessarily need to be severe to threaten life and property. Nationwide, hundreds of individuals are injured through lightning strikes every year, with an annual average of two North Carolina fatalities attributed to lightning. The easiest and best way to avoid being struck by lightning is to remember: "When thunder roars, go indoors!" To ensure safety, you should remain sheltered in a building or vehicle for at least 30 minutes following the last rumble or thunder or lightning flash.

For more information

General weather safety information: http://www.weather.gov/safety/
Flood safety: http://www.floodsafety.noaa.gov/index.shtml
North Carolina flood information: http://www.floodsafety.noaa.gov/states/nc-flood.shtml
Lightning safety: http://www.lightningsafety.noaa.gov/
Straight-line wind safety: http://www.nws.noaa.gov/om/wind/
Thunderstorm safety: http://www.nws.noaa.gov/om/thunderstorm/
Tornado safety: http://www.nws.noaa.gov/om/tornado/

-Keith Sherburn

Winter Review: Minimal Snow and Record Warmth

"Although the winter began near-normal, it ended anything but. February ended as the warmest ever for all three climate sites in central North Carolina—Raleigh-Durham, Greensboro, and Fayetteville."

After Hurricane Matthew brought record flooding to much of central North Carolina in early October, the remainder of the fall saw generally above normal temperatures and below normal precipitation. This resulted in abnormally dry conditions to even a moderate drought across much of the area heading into meteorological winter.

December 2016 was generally a near-normal month, which was in stark contrast to the record-shattering warm and wet December of 2015. Despite our area falling below freezing for several days throughout the month, impactful wintry precipitation was limited to a light icing event around the middle of the month. Fortunately, as this occurred on a weekend morning, commuting impacts were minor. Although the weather was not especially noteworthy, continued below normal precipitation across much of the Piedmont exacerbated the abnormally dry conditions across western and northern portions of our area.

January began with near-normal temperatures, but winter arrived in earnest just a few days into the new year. A powerful winter storm brought a wintry mix of precipitation to all locations in central North Carolina, with primarily snow across the northwestern Piedmont with a mix of rain, sleet, and snow observed over the southern Piedmont, Sandhills, and Coastal Plain. Widespread snowfall amounts of over half a foot were observed across the northwestern Piedmont; however, a sharp gradient across the middle of our area meant that snowfall amounts were limited to a dusting to a few inches farther south and east.

January Snow in High Point

In the wake of this system, an Arctic air mass overspread the Carolinas, leading to lows in the teens or single digits over the two following nights. Some rural areas across the northern and northwestern Piedmont even dropped below zero. Temperatures recovered quickly, however, with highs climbing into the 70s or even low 80s just a few days later. The remainder of January was generally near or above normal, leading to monthly average temperatures approximately 5 to 7 degrees above normal. However, wet periods early and late in the month over the Piedmont cut into the abnormally dry conditions and led to the removal of moderate drought across that area.

Although the winter began near-normal, it ended anything but. February ended as the warmest ever for all

(continued on page 8)

USGS and NWS Work Together to Maintain Strong Hydrology Partnership

Doug Walters of USGS speaks to NWS Forecasters

In the aftermath of Hurricane Matthew, river flooding and hydrology forecasting took center stage for weeks as flood waters lingered in eastern North Carolina towns well after Matthew had left the area.

A good river forecast starts with good observations and that is where the U.S. Geological Survey comes in. The USGS is in charge of maintaining many river gauges across the country as well as taking periodic observations of the depth and velocity of the stream flow. These observations allow for the calculation of other variables, such as discharge, which is the volume of water flowing past a given point. This in turn allows hydrologists to evaluate if the river bed beneath the water is changing.

For instance, during Hurricane Matthew, a large amount of sediment was deposited near the gauge on the Tar River at Tarboro. This caused the depth of the river to be shallower and thus changed the calculation for discharge as the water moved downstream. Larger rainfall events since then have scoured out some of this sediment, returning the river to a more normal depth.

Once the observations from the USGS are entered into the database, they are accessed by National Weather Service River Forecast Centers where the data is put into a model and a river forecast is issued. This forecast is sent to the local forecast office like NWS Raleigh to be analyzed and it is here that a decision is made on whether or not a river flood warning should be issued.

Recently, forecasters at NWS Raleigh, NWS Wakefield, VA and NWS Morehead City had a chance to train with the USGS on stream gauges and how observations are taken before they are added to the forecast process.

NWS Forecaster Brandon Locklear helps take depth and velocity readings on the Tar River at Tarboro

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Winter Review (continued from Page 6)

three climate sites in central North Carolina—Raleigh-Durham, Greensboro, and Fayetteville. The monthly average daily maximum temperature at all three locations was over ten degrees above normal, while ten daily record maximum or daily record high minimum temperatures were set. Raleigh-Durham and Greensboro also broke their monthly records for most 70-degree days, with 13 and 11, respectively. In addition to the warmth, the month was also very dry, with less than an inch of precipitation observed in Fayetteville and Raleigh-Durham and less than half an inch in Greensboro. This reversed the improving trend in drought experienced in January and abnormally dry conditions were present across all of central North Carolina by the end of February.

Fans of wintry precipitation may have been disappointed by the relatively quiet 2016-17 winter. Regardless, it will be remembered for a strong January winter storm that posed many forecast challenges for central North Carolina and a remarkably warm February. Additionally, this marks the second winter in as many years where a monthly record for warmth was broken. We will have to wait and see what next winter brings to see if another record will fall.

-Keith Sherburn