The Wilmington Wave

National Weather Service, Wilmington, NC

VOLUME III, ISSUE I

FALL 2013

INSIDE THIS ISSUE:

Summer 2013: Above Average Rainfall

- Brad Reinhart

If you spent time outside this summer, your outdoor activities were probably interrupted by rain at some point. Of course, afternoon showers and thunderstorms during the summertime are fairly common in the eastern Carolinas. But, did you know that we experienced record rainfall totals, rising rivers, and flooding within our forecast area this meteorological summer (June – August 2013)? Here's a recap of what turned out to be quite a wet summer.

Florence, SC received the most rainfall (27.63'') of our four climate sites during the months of June, July, and August. This total was a staggering 12.53'' above normal for the summer months. In July alone, 14.91'' of rain fell in Florence. This made July 2013 the wettest month EVER in Florence since records began in 1948! Wilmington, NC received 25.78'' of rain this summer, which was 6.35'' above normal. North Myrtle Beach, SC and Lumberton, NC received well over 20 inches of rain as well.

Official Climate Site Location	Jun – Aug Rainfall	Departure from Normal
Florence, SC	27.63''	+12.53''
Wilmington, NC	25.78''	+6.35''
N. Myrtle Beach, SC	23.32''	N/A
Lumberton, NC	21.50''	N/A

Excess rainfall must go somewhere, so many of our local rivers rose in response to the heavy rain across the Carolinas. In total, 8 of our 11 river forecast points exceeded flood stage this summer. Some of these rivers flooded multiple times; in fact, our office issued 24 river flood warnings and 144 river flood statements from June to August. On July 6, the N.E. Cape Fear River near Burgaw, NC reached its 5th highest crest on record, and the Lumber River at Lumberton, NC reached its 11th highest crest on record. Meanwhile, the Waccamaw River near Conway, SC spent 25 days above flood stage during the month of July.

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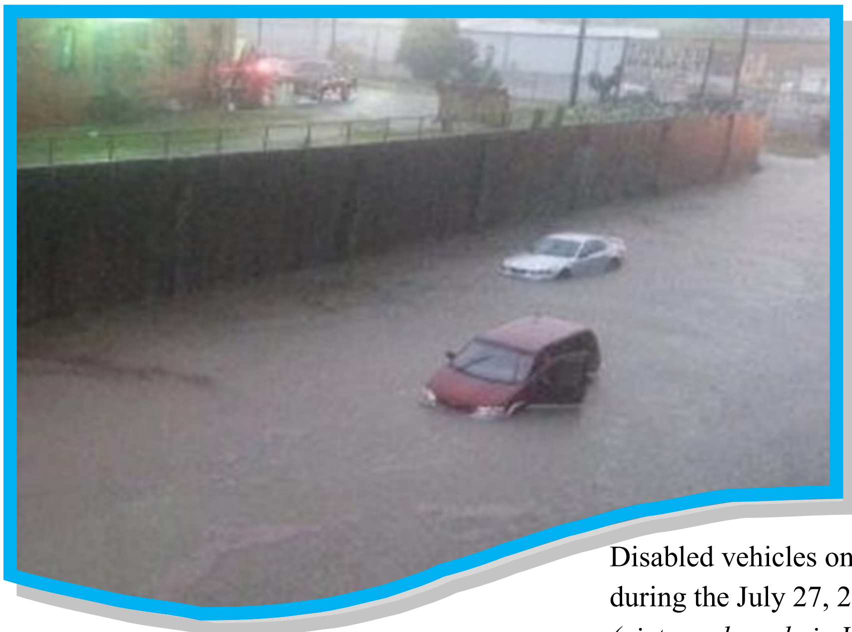
One of the most significant flood events of the summer occurred in Florence County, SC on July 27. Several inches of rain fell over northeastern South Carolina, much of it in a very short period of time. For instance, the Florence Regional Airport received 2.00'' of rain in just one hour en route to a daily rainfall record of 4.10''. A spotter in Effingham, SC measured 3.96'' of rain in a span of just two hours. This heavy rain caused significant flooding in and around the city of Florence. Numerous roads and intersections were closed, and there were several reports of disabled vehicles with water around one foot deep on some roadways in the city.



Disabled vehicles on East Palmetto Street in Florence, SC during the July 27, 2013 flood event
(picture shared via WBTW Facebook)

This summer's abundant rainfall has put Florence on pace to challenge the all-time annual precipitation record for this site. Despite a relatively dry September, 2013 is already one of the twenty wettest years for Florence since records began in 1948. Indeed, we experienced a wet summertime across the eastern Carolinas!

Summer 2013 by the numbers...

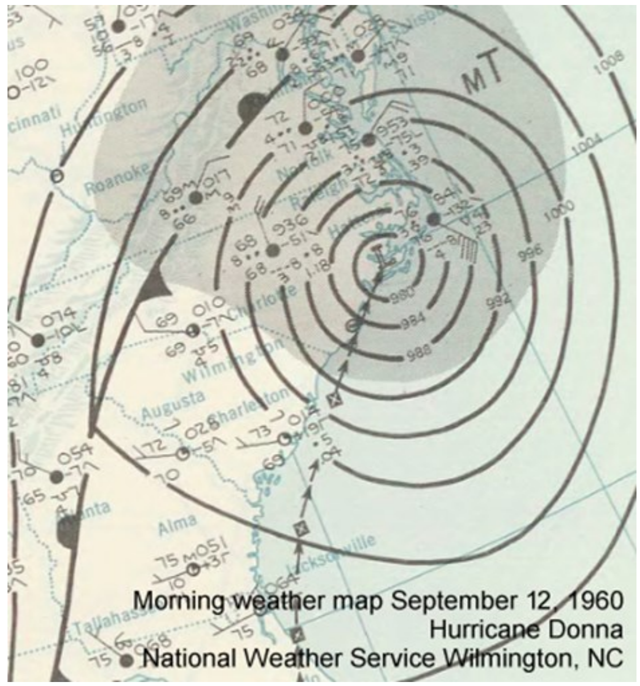
14.91''	All-time monthly rainfall record established in July 2013 at Florence, SC
25	Days in July that the Waccamaw River near Conway, SC remained above flood stage
58	Days this summer that Wilmington, NC received at least a trace of rainfall

The Three Strongest Storms in Wilmington's History

- Tim Armstrong

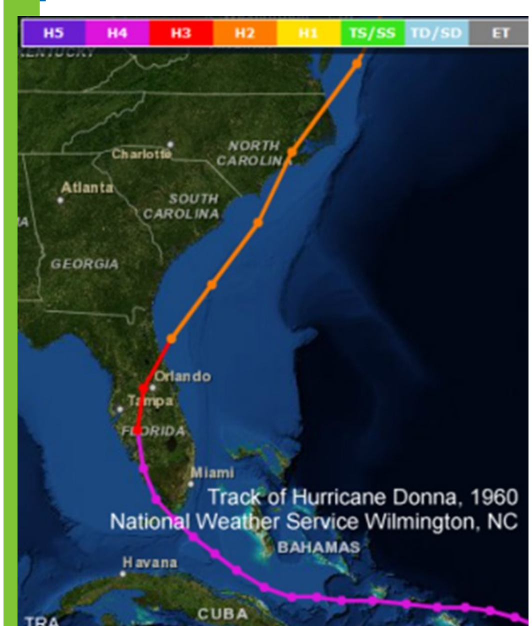
Wilmington certainly has seen its share of powerful storms throughout its history. Using barometric pressure to rank storm intensity, 13 of the 20 strongest storms have been hurricanes – the remainder has been wintertime Nor'easters or springtime severe weather makers. Here are summaries and maps of the three strongest storms to affect Wilmington since records began in 1874. If you're interested in seeing more about these storms and viewing the entire list of the top 20 strongest storms in Wilmington's history, visit this website: *http://www.weather.gov/ilm/Top_20_Storms*

Storm #3 – Hurricane Donna
Date: September 11, 1960
Pressure: 28.41" or 962.1 millibars



Morning weather map September 12, 1960
Hurricane Donna
National Weather Service Wilmington, NC

Hurricane Donna was a classic, long-tracked Cape Verde storm that developed from a tropical wave that moved off the African coast in late August, 1960. Donna became a tropical depression on August 29th and a tropical storm on August 30th while less than 1000 miles west of the African coast. After becoming a hurricane during the morning of September 1st, Donna went through a period of rapid intensification culminating in a 155 mph wind speed on September 5th while about 500 miles east of the Windward Islands. Donna curved northwestward and crossed the northernmost Leeward Islands around midnight on September 5th dealing St. Martin, Anguilla, and St. Thomas a devastating blow.



Track of Hurricane Donna, 1960
National Weather Service Wilmington, NC

Donna passed through the southern Bahamas on September 7th, then turned northwest and hit the northern Florida Keys on September 10th with maximum sustained winds around 130 mph. Donna completed a clockwise turn across central Florida on September 11th and accelerated toward a North Carolina landfall during the morning of September

In Wilmington Donna's highest wind gust was 97 mph at 11:55 p.m. on September 11th. Rainfall totaled 6.26 inches. A report from the Weather Bureau office in Wilmington said tides at Wrightsville Beach and Topsail Beach reached 7 to 8 feet above normal. The eye was said to be very large: 50 to 75 miles in diameter. (Note: this sounds very similar to the large eyes observed with Hurricane Isabel in 2003 and Hurricane Ophelia in 2005) People on "New" Topsail Beach observed 16 foot surf with a 20 second wave periods and wind gusts around 100 mph. In "Ocean Drive Beach" (now part of North Myrtle Beach) wind gusts were also reported near 100 mph with 11 inches of rain.

Donna produced several tornadoes in the eastern Carolinas including a touchdown near Charleston and several across rural eastern North Carolina.

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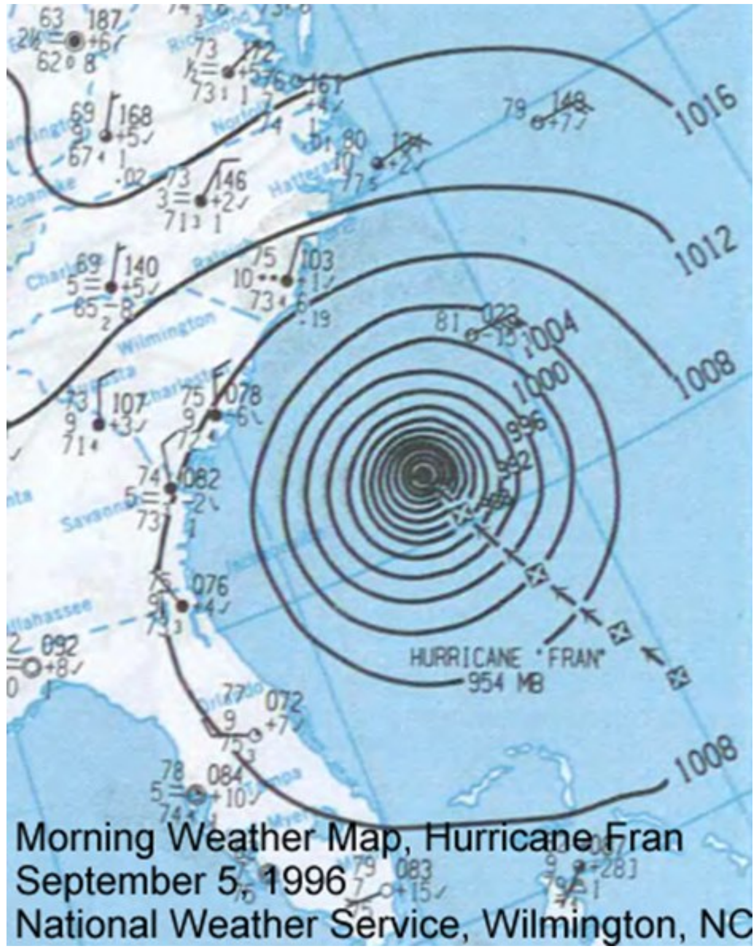
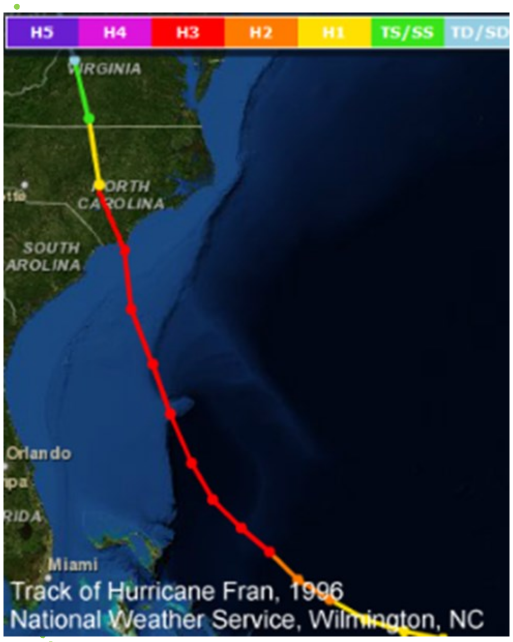
Storm #2 – Hurricane Fran
Date: September 5, 1996
Pressure: 28.39" or 961.4 millibars

Hurricane Fran was the second of four strong hurricanes to strike Southeastern North Carolina during the mid to late 1990s. In July 1996 Hurricane Bertha hit the area hard. Fran reopened Bertha's wounds and produced substantial wind damage well inland across Eastern North Carolina. In the same way that residents of Columbia and Charlotte will always remember Hurricane Hugo's devastating winds, Raleigh (and most inland eastern North Carolina) citizens think of Fran when discussing what impacts an inland hurricane can bring.



Morning Weather Map, Hurricane Fran
September 5, 1996
National Weather Service, Wilmington, NC

Fran was a classic long-tracked Cape Verde hurricane that began its life as a strong tropical wave moving off the African coast on August 22nd. Within just one day of moving offshore Fran's thunderstorms organized sufficiently to become a tropical depression. Fran didn't strengthen into a tropical storm until halfway across the Atlantic on August 27th, and later became a hurricane while about 500 miles east of the Windward Islands on August 28th. Curving well north of the Caribbean Islands and the Bahamas, Fran moved northwestward toward the Southeastern U.S. coast while gradually strengthening into a category 3 hurricane with maximum sustained winds of 120 mph while about 400 miles off the Florida east coast. Fran then turned north and made landfall near Southport during the evening of September 5th with 115 mph winds and a total storm tide as high as 11 feet at Wrightsville Beach and 12 feet on Bald Head Island. A barometer in Southport measured a pressure of 954 millibars, or 28.17 inches.



Track of Hurricane Fran, 1996
National Weather Service, Wilmington, NC

At the Wilmington airport winds gusted to 86 mph, but gusts to 105 mph were measured at the State Port office along the Cape Fear River. The National Hurricane Center received unofficial reports of gusts to 125 mph at Wrightsville Beach and 137 mph along Hewlett's Creek in Wilmington. These unofficial readings were from instruments mounted at non-standard heights very close to rooflines and were not deemed accurate. Multiple reports of gusts 73-77 mph were received from the coast of Horry County, SC. Storm total rainfall in Wilmington was 5.23 inches which includes 0.75 inches that fell on September 4th.

Fran killed 22 people and produced over $1.6 billion in insured property damage in the United States, the vast majority of that in North Carolina. On North Topsail Beach, Hurricane Bertha had destroyed the police department building earlier in the summer, then Fran destroyed the temporary building. New Hanover County officials estimated Fran generated four times as much storm debris as Bertha did. Johnnie Mercer's pier on Wrightsville Beach was destroyed, and the Oceanic Restaurant's pier lost about one-third of its length. In Kure Beach, Bertha destroyed the fishing pier, then Fran damaged the tackle shop that remained.

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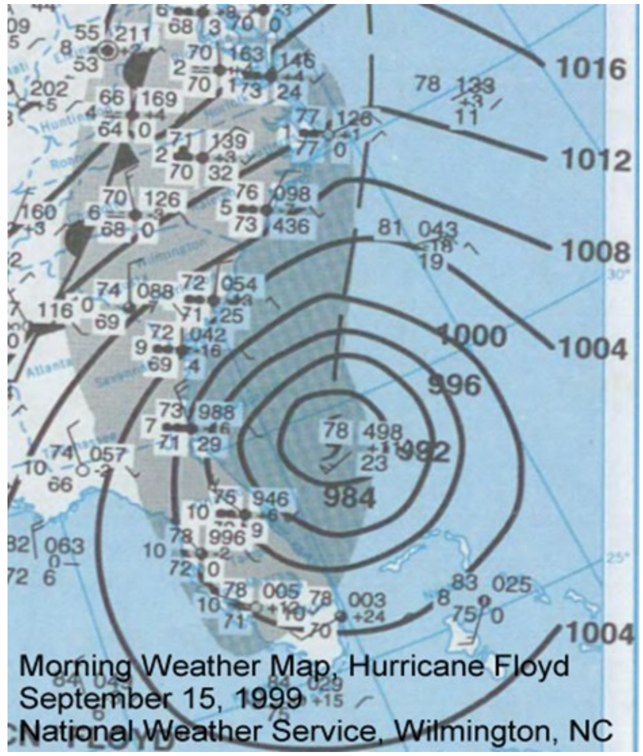
Storm #1 – Hurricane Floyd

Date: September 16, 1999
Pressure: 28.34” or 959.7 millibars

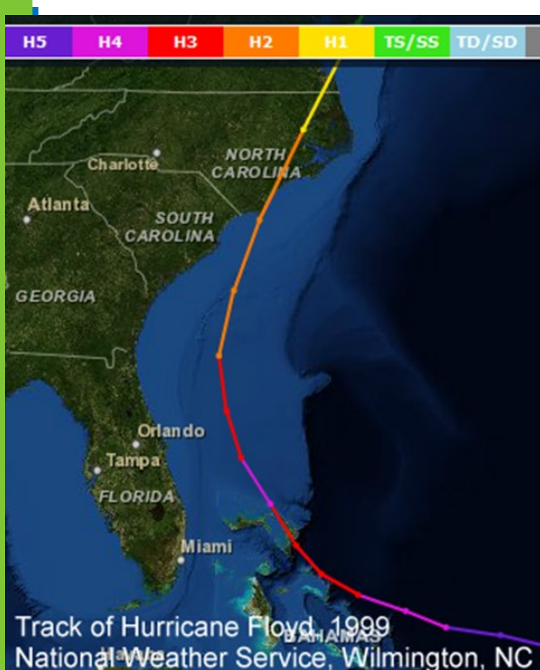


Morning Weather Map, Hurricane Floyd
September 15, 1999
National Weather Service, Wilmington, NC

Hurricane Floyd is the most powerful storm ever to directly strike Wilmington as measured by barometric pressure. Floyd was the last of four strong Cape Fear hurricanes of the 1990s and dealt Eastern North Carolina an historic impact with deadly flooding that extended north into eastern Virginia and the Mid-Atlantic region. While Fran will be remembered for wind, Floyd went down in history for rain and flooding.

Floyd developed from a tropical wave, first attaining tropical depression status on September 7th. After becoming a tropical storm on September 8th and a hurricane on September 10th, Floyd strengthened into a category 3 hurricane while about 400 miles north of Puerto Rico on September 12th. Floyd's winds reached 155 mph on September 13th while just north of the southeastern Bahamas, but fortunately the storm weakened as it moved through the northernmost Bahamas on September 14th and turned north toward the Carolinas. Landfall was near Bald Head Island early in the morning of September 16th as a category 2 storm with maximum sustained winds near 105 mph.

Floyd was preceded earlier in the month by Hurricane Dennis. Dennis was a category 1 hurricane at landfall just north of Cape Lookout on September 4th with generally minor wind and surge, but it dropped 6 to 18 inches of rain across Eastern North Carolina. Floyd's 12 to 24 inches of rain therefore fell on saturated soil, producing flooding unprecedented both in its severity and scope. The Northeast Cape Fear River at Burgaw crested 12 feet above flood stage. The Tar River at Greenville rose 16 feet above flood stage, while upstream at Tarboro it crested 22 feet above flood stage. Huge swaths of land across Eastern North Carolina and Virginia well outside of established flood plains were inundated for days or weeks. Major highways including portions of Interstate 40 were flooded and impassible, delaying the anxious return of residents who had evacuated before the storm.



Track of Hurricane Floyd, 1999
National Weather Service, Wilmington, NC

In Wilmington winds gusted to 86 mph at the ILM airport, the same as in Hurricane Fran. An unofficial peak wind gust of 120 mph was measured at the City of Wilmington's Emergency Operations Center, and at Wrightsville Beach 138 mph winds were unofficially measured at an elevation of eight stories above ground level.

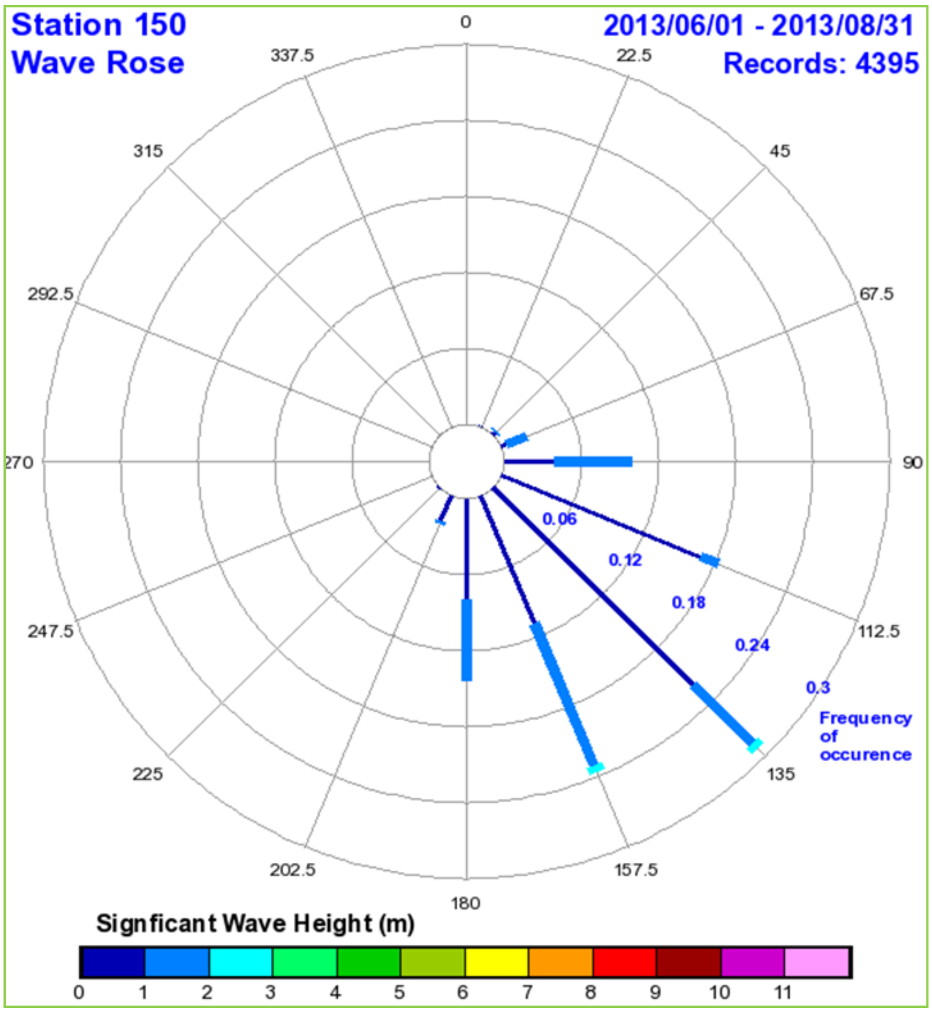
Floyd killed 57 people, 35 in North Carolina alone. Insured losses from Hurricane Floyd totaled $1.32 billion dollars, with perhaps twice that total in uninsured flood-related damage. The USGS calculated Floyd's flooding to have an expected return interval of at least 500 years on some rivers in Eastern North Carolina. Floyd was truly one for the record books.

Summer 2013 at the Masonboro Buoy

- Michael Colby

While most of us spent the majority of time on land this past summer, buoy 41110 positioned 5 miles offshore of Masonboro Inlet was measuring the wave spectrum, continually gathering information on wave height, wave direction, and time intervals between waves. Let's take a look at the information the 41110 Masonboro collected this past summer.

The graph below shows the "frequency of occurrence" of **wave heights**, for corresponding wave directions, over a 3 month period from June through August of 2013 at the Masonboro buoy. The buoy which recorded these measurements is located about 5 miles offshore of Masonboro Inlet.



The most common or frequent wave reported by the buoy over the summer, were waves from a direction of SE with a height of 1 meter or less, as denoted by the longest dark blue bar. Generally these waves ranged between 1 and 3 feet in height. Larger waves of 4-6 feet were most common from a direction of SSE, depicted by the longest medium blue bar. The largest of waves, those in excess of 6 feet arrived from directions of SSE through SE, although they were much less frequent, as illustrated by the short length of the light blue bar.

The plot below shows the "frequency of occurrence" of **wave periods**, also known as wave intervals, for corresponding wave directions over a 3 month period from June through August of 2013 at the Masonboro buoy 5 miles offshore of Masonboro Inlet.

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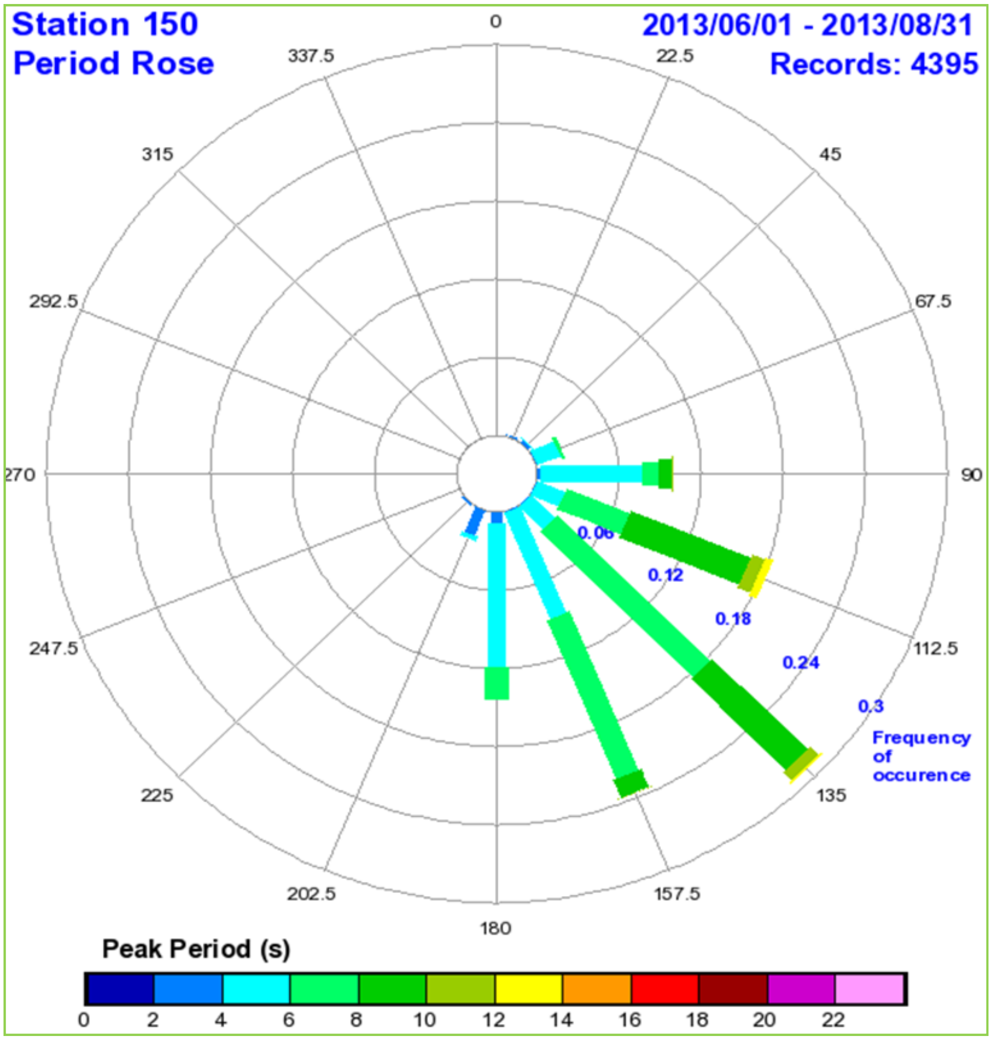
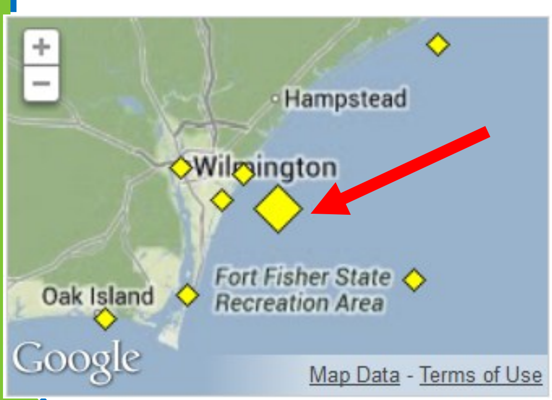


We can see that the most frequent wave direction, denoted by the length of the bar, was from the SE, followed by SSE and ESE. The most frequent wave period from the SE, were waves with periods of 6-8 seconds. Wave periods of 6-8 seconds were also common from the direction of SSE. Notice that long-period waves, or swell, was most common from the ESE, with wave periods between 10-14 seconds recorded. Shorter period waves less than 6 seconds, also known as wind-waves, were observed mostly from the S and SSE, illustrated by the longest light blue bars. A few cold fronts over the summer brought NE-ENE wind-waves as seen by the traces of the dark and light blue bars from those directions. Notice also very short-crested waves less than 2 seconds, a chop, were recorded from the SSW.



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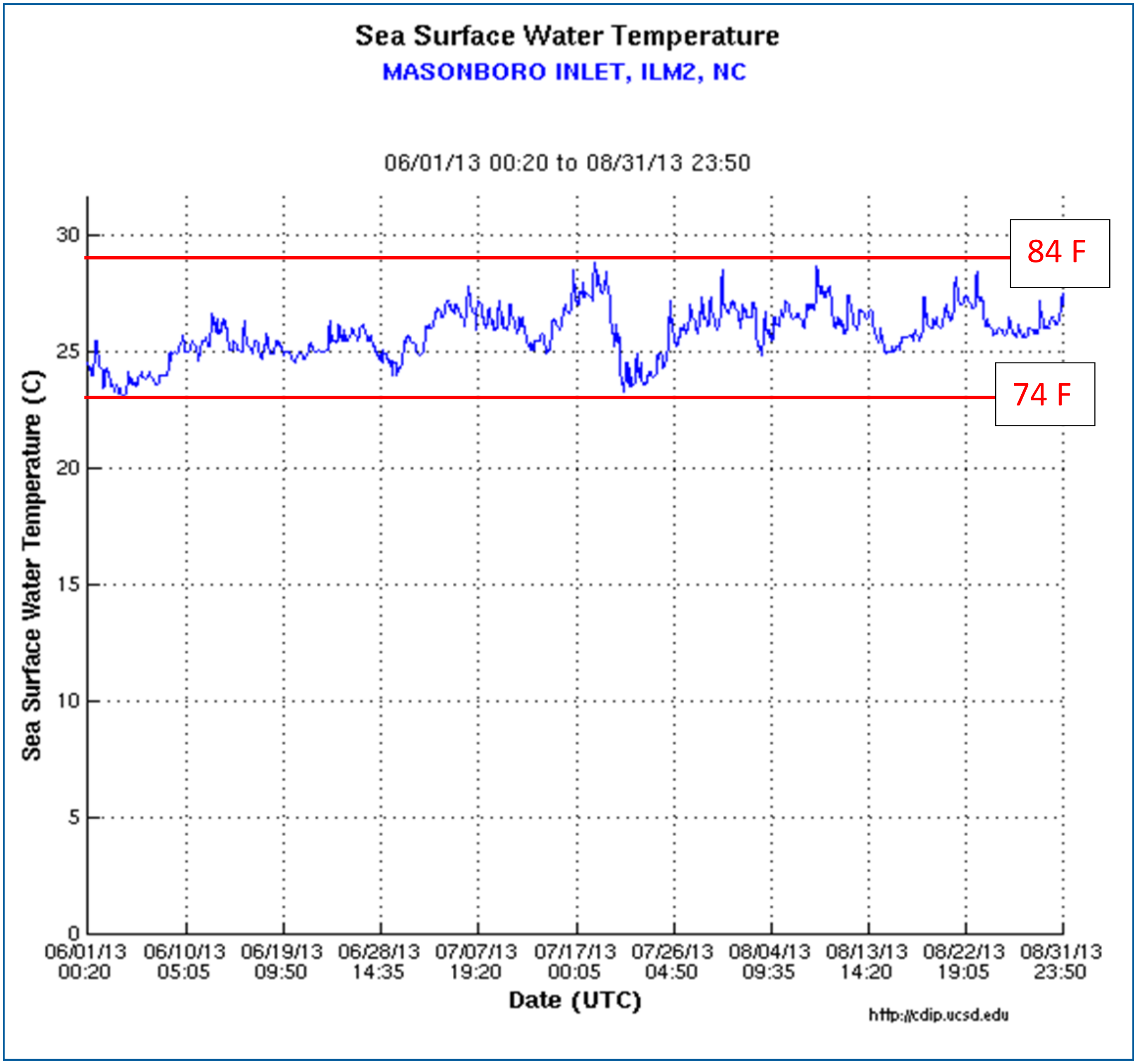


Sea surface temperatures 5 miles offshore of Masonboro Inlet during the summer ranged from 74 to 84 degrees Fahrenheit, with an average temperature around 80 degrees. Notice in middle July, an abrupt and significant cooling of sea surface temperatures occurred. This was the result of strong W and WSW winds that pushed warmer surface waters farther offshore, allowing cooler waters below the surface to rise. This process is known as upwelling and often occurs during or after a period of strong offshore winds.

What is a Tsunami?

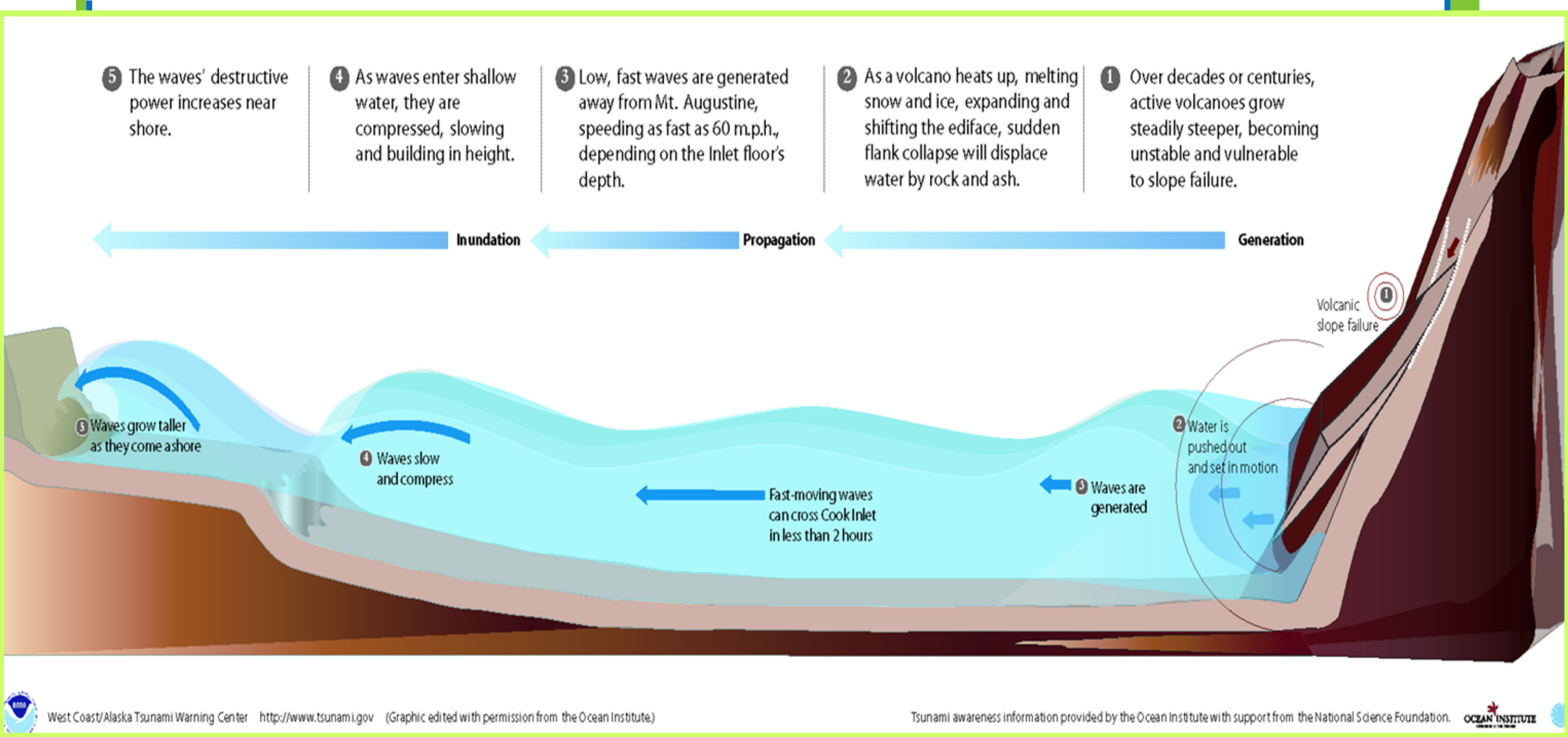
- Michael Caropolo

A Tsunami is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves propagate across the deep ocean with a speed exceeding 500 mph, and a wave height of only a few tens of centimeters or less. Tsunamis waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour. In the deep ocean, destructive tsunamis can be small, often only a few tens of centimeters or less in height and cannot be seen nor felt on ships at sea. But as the tsunami reaches shallower coastal waters, wave height can increase rapidly. Sometimes, coastal waters are drawn out into the ocean just before the tsunami strikes. When this occurs, more shoreline may be exposed than even at the lowest tide. This major withdrawal of the sea should be taken as a natural warning sign that tsunami waves will follow.

As the waves reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction tens of meters (30ft) or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland.

Tsunamis are a threat to life and property for all coastal residents living near the ocean. During the 1990s, over 4000 people were killed by 10 tsunamis. Property damage was nearly one billion dollars.

Although 60% of all tsunamis occur in the Pacific, they can also threaten coastlines of countries in other regions, including the Atlantic Ocean. The most devastating tsunami occurred in December 2004, when a magnitude 9.3 earthquake off of northwestern Sumatra, Indonesia produced a destructive tsunami that impacted the coasts throughout the Indian Ocean, killing 230,000 people, displacing more than one million people, and causing billions of dollars of property damage. The great Krakatau Volcanic eruption of 1883 generated giants waves reaching heights of 40 meters (~ 130 ft.) above sea level, killing more than 35,000 people and wiping out numerous coastal villages.



THE FACTS

- Tsunamis that strike coastal locations are almost always caused by earthquakes. These earthquakes might occur far away or near where you live. While earthquakes occur in all ocean basins around the world, most do not generate tsunamis.
- Some tsunamis can be very large. In coastal areas their height can be as great as 10 m or more (30 m in extreme cases), and they cause impacts like flash floods. Later waves are often full of debris.
- All low lying coastal areas can be struck by tsunamis
- A tsunami consists of a series of waves with crests arriving every 10 to 60 minutes. Often the first wave may not be the largest. The danger from a tsunami can last for several hours after the arrival of the first wave. Tsunami waves typically do not curl and break, so do not try to surf a tsunami.
- Tsunamis can move faster than a person can run
- Sometimes a tsunami initially causes the water near the shore to recede, exposing the ocean floor.
- The force of some tsunamis is enormous. Large rocks weighing several tons, along with boats and other debris can be moved inland hundreds of meters by tsunami wave activity, and homes and buildings destroyed. All this material and water move with great force, and can kill or injure people.
- Tsunamis can occur at any time, day or night.
- Tsunamis can travel up rivers and streams from the ocean.
- Tsunamis can easily wrap around Islands and be just as dangerous on coasts not facing the source of the tsunami.

WHAT SHOULD YOU DO

- If you are in school and you hear there is a tsunami warning, you should follow the advice of teachers and other school personnel.
- If you are at home and hear there is a tsunami warning, make sure your entire family is aware. Prepare a family emergency plan beforehand so that everyone knows what to do. Your family should evacuate your house if you live in a tsunami evacuation zone. Move in an orderly, calm, and safe manner to the evacuation site or to any safe place outside your evacuation zone. Follow the advice of local emergency and law enforcement authorities.
- If you are at the beach or near the ocean and you feel the earth shake, move immediately to higher ground. DO NOT WAIT for a tsunami warning to be announced. Stay away from rivers and streams that lead to the ocean. A tsunami from a local earthquake could strike some areas before a tsunami warning can be announced.
- Tsunamis generated in distant locations will generally give people enough time to move to higher ground. For locally generated tsunamis, where you might feel the ground shake, you may only have a few minutes to move to higher ground.
- High, multi-story, reinforced concrete hotels are located in many low-lying coastal areas. The upper floors can provide a safe place to find refuge should there be a tsunami warning and you cannot move quickly inland to higher ground.

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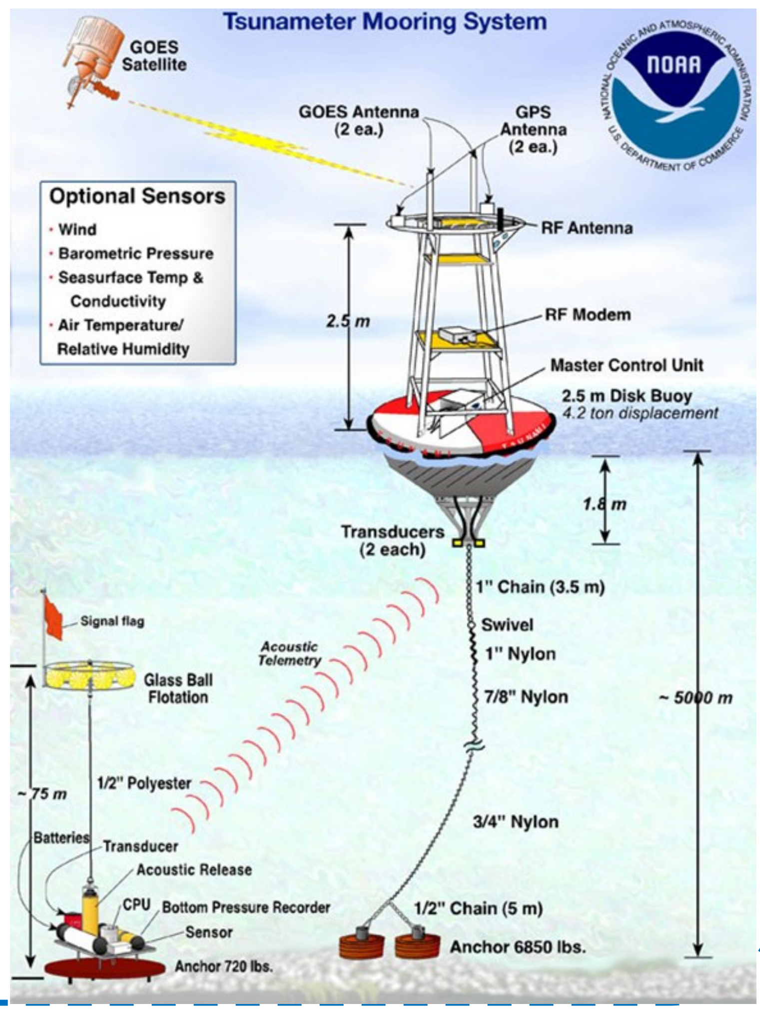
TYPES OF TSUNAMIS

- *Meteorological Tsunami (Meteotsunami)* – Tsunami-like phenomena generated by meteorological or atmospheric disturbances. These waves can be produced by atmospheric gravity waves, pressure jumps, frontal passages, squalls, gales, typhoons, hurricanes, and other atmospheric sources. Meteotsunamis have the same temporal and spatial scales as tsunami waves and can similarly devastate coastal areas.
- *Microtsunami* – A tsunami of such small amplitude that it must be observed instrumentally and is not easily detected visually.
- *Ocean-wide tsunami* – A tsunami capable of widespread destruction, not only in the immediate region of its generation but across an entire ocean. All ocean-wide tsunamis have been generated by major earthquakes.
- *Paleotsunami* – tsunami occurring prior to the historical record or for which there are no written observations.
- *Regional tsunami* – a tsunami capable of destruction in a particular geographic region, generally within 1000 km or 1-3 hours tsunami travel time from its source. Regional tsunamis also occasionally have very limited and localized effects outside the region.
- *Teletsunamis* or *Distant Tsunami* – A tsunami originating from a far away source, generally more than 1000 km or more than 3 hours tsunami travel time from its source

Deep-Ocean Assessment and Reporting of Tsunamis (DART)

An instrument for the early detection, measurement, and real-time reporting of tsunamis in the open ocean, Developed by the NOAA Pacific Marine Environmental Laboratory, the DART system consists of a seafloor bottom pressure recording system capable of detecting tsunamis as small as one cm, and a moored surface buoy for real-time communications. An acoustic link is used to transmit data from the seafloor to the surface buoy. The data are then relayed via a satellite link to ground stations, which demodulate the signals for immediate dissemination to the NOAA Tsunami Warnings Centers. The DART data, along with state-of-the-art numerical modeling technology, are part of a tsunami forecasting system package that will provide site-specific predictions of tsunami impact on the coast.



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PTWC and WC/ATWC

Established in 1949, the Richard H. Hagemeyer Pacific Tsunami Warning Center (PTWC) in Ewa Beach, Hawaii, serves as the warning operations headquarters for the Pacific Tsunami Warning System. The PTWC provides warning for Pacific basin teletsunamis to almost every country around the Pacific Rim and to most of the Pacific island states. The West Coast/Alaska Tsunami Warning Center (WC/ATWC) was established in Palmer, Alaska in 1967 as a direct result of the great Alaskan earthquake that occurred in Prince William Sound on March 27, 1964. Its area or responsibility includes Alaska, California, Oregon, Washington and British Columbia for potential tsunamigenic earthquakes occurring in their coastal areas. In 1996, the responsibility was expanded again to include all Pacific-wide tsunamigenic sources that could affect the California, Oregon, Washington, British Columbia and Alaska coasts. In late 2004, its area of responsibility was expanded again to include the U.S. Atlantic and Gulf of Mexico coasts, Puerto Rico, the Virgin Islands, and the Atlantic coasts of Canada.

Local Hail Study Provides Helpful Information for Forecasters

- Mark Bacon

The National Weather Service (NWS) defines a severe thunderstorm as one producing winds to 58 mph or higher, hail of at least one inch in diameter, or a tornado. In 2010 the severe hail criteria was raised to one inch. This change was based on research indicating that significant damage does not occur until hail size reaches 1 inch (quarter-size) in diameter, and as a response to requests by core partners in emergency management and the media. Particularly in areas of the Central U.S., the frequency of severe thunderstorm warnings issued might have desensitized the public to take protective action during a severe thunderstorm warning.

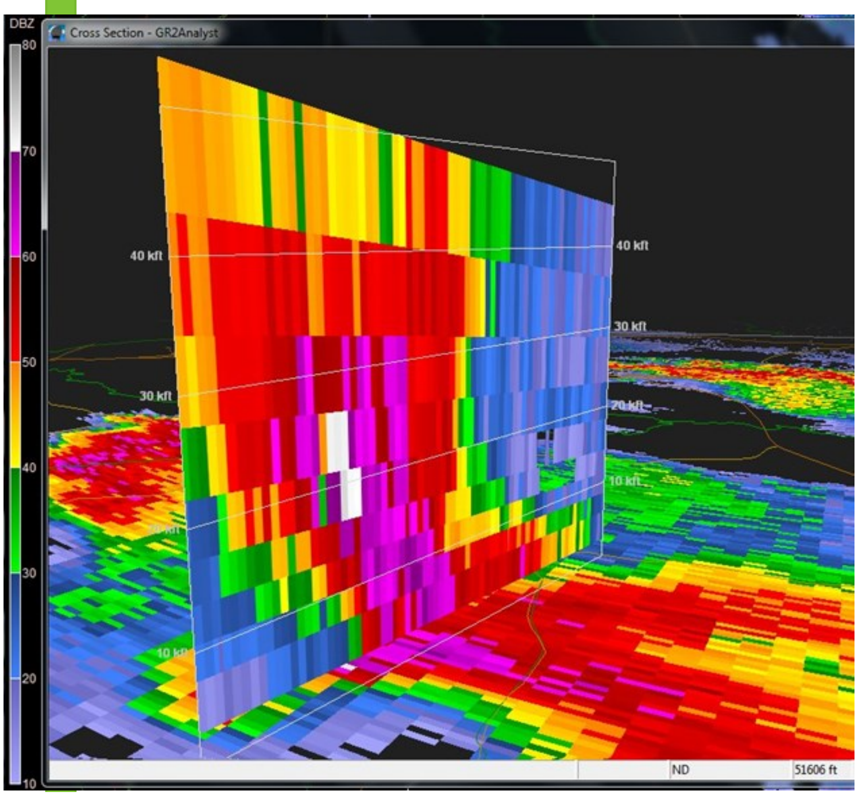

Figure 1. A vertical cross-section of a severe hail-producing thunderstorm. Radar returns of greater than 50dBZ in red, values greater than 60dBZ in purple. Heights in 10,000 ft intervals displayed on vertical grid.

Forecasters at the National Weather Service office in Wilmington, North Carolina conducted a local study to address the new size definition of severe hail and also in the hopes of improving the accuracy of our warnings overall. Weather data was gathered from ‘hail days’ (days on which severe hail occurred within NWS Wilmington’s forecast area of responsibility) for the years 2001-2009. This yielded 637 events to examine initially, although some were discarded in a quality control phase. Archived data showing vertical profiles of temperature and relative humidity was gathered for the hail days. The radar data of the hail-producing storms was then downloaded and examined in the vertical (Figure 1). Previous research had been done in 2007 which found a relationship between the freezing level and the height at which a thunderstorm presents a radar return of 50 dBZ.

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Taking cues from this research, NWS Wilmington forecasters made spreadsheets comparing the various temperature and relative humidity values at different heights as well as certain radar strength values (namely, 50 and 60 dBZ (Figure 2). Again this was both in the hope of addressing the new severe hail size but also to localize the result of the 2007 findings.

Many of the relationships showed little correlation (between which factors lead to severe hail vs. non-severe hail), indicative of the difficulty a forecaster faces when making warning decisions. There was some correlation between the height of the freezing level and a certain 50 dBZ value. Forecasters began to experimentally use the information as guidelines for issuing severe thunderstorm warnings for hail and they turned out to work surprisingly well. The project was finished in 2010 and the results have been used ever since. It has provided forecasters with a tool (Figure 3) for warning for severe hail and has increased the confidence and accuracy of those working the warning desk during severe weather.

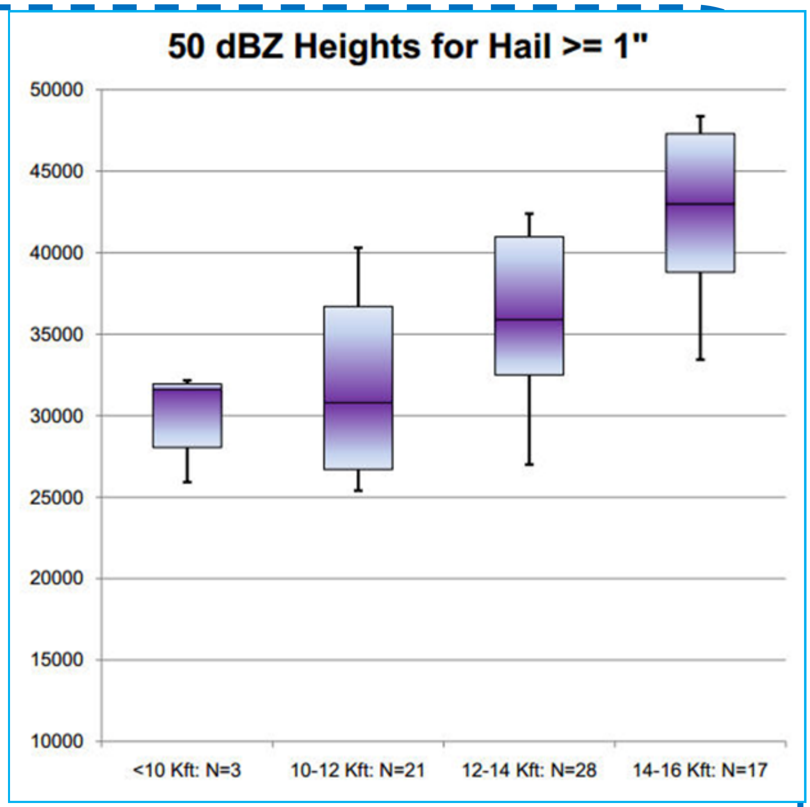


Figure 2. Sample chart from spreadsheet of data showing correlation melting level (ML) and the 50 dBZ radar return height in severe hail-producing thunderstorms.

50 dBz Hail Threshold Calculator

Please utilize sounding or model data to enter freezing level information and then click submit.
Note: this application does not archive data.

Enter the Freezing Level (Melting Level) or Utilize the Table Below

Submit Reset

1 Inch Hail Guidelines

Mlt Lvl	50 dBZ Min Hgt	Mlt Lvl	50 dBZ Min Hgt	Mlt Lvl	50 dBZ Min Hgt	Mlt Lvl	50 dBZ Min Hgt	Mlt Lvl	50 dBZ Min Hgt
8000	18900	9900	23400	11800	28400	13700	35200	15600	40700
8100	19100	10000	23600	11900	28100	13800	35500	15700	41000
8200	19400	10100	23800	12000	28300	13900	35700	15800	41200
8300	19600	10200	24100	12100	28600	14000	36000	15900	41500
8400	19800	10300	24300	12200	28800	14100	36200	16000	41800
8500	20100	10400	24500	12300	29600	14200	36500	16100	42000
8600	20300	10500	24800	12400	29900	14300	36800	16200	42300
8700	20500	10600	25000	12500	30800	14400	37000	16300	42500
8800	20800	10700	25300	12600	31000	14500	37800	16400	42800
8900	21000	10800	25500	12700	31200	14600	38100	16500	43100
9000	21200	10900	25700	12800	31500	14700	38400	16600	43300
9100	21500	11000	26000	12900	31700	14800	38600	16700	43600
9200	21700	11100	26200	13000	32000	14900	38900	16800	43800
9300	21900	11200	26400	13100	32200	15000	39200	16900	44100
9400	22200	11300	26700	13200	32500	15100	39400	17000	44400
9500	22400	11400	26900	13300	32700	15200	39700	17100	44600
9600	22700	11500	27700	13400	33000	15300	39900	17200	44900
9700	22900	11600	28000	13500	34700	15400	40200	17300	45200
9800	23100	11700	28200	13600	35000	15500	40500	17400	45400

Mlt Lvl	50 dBZ Min Hgt	Multiplier
< 11.5 Kft	26	*2.36
11.5-12.5	29	*2.41
12.5-13.5	32	*2.46
13.5-14.5	36	*2.57
>14.5	39	*2.61

50dBZ Warning Criteria=(Mlt Lvl * Multiplier)

Calculate using 1st quartile regression

Figure 3. Table of results used by NWS forecasters for guidance in warning for severe hail.

A Summer of Decision Support

- Stephen Keebler

The National Weather Service in Wilmington North Carolina had a full summer of decision support activities. The summer started out with tropical storm Andrea moving across the southeast in early June. Although Andrea was just a weak tropical storm when it moved across the area on June 7, it still produced a couple of weak tornadoes in the area. Several PowerPoint presentations were sent out via blast emails prior to this event to the emergency managers.

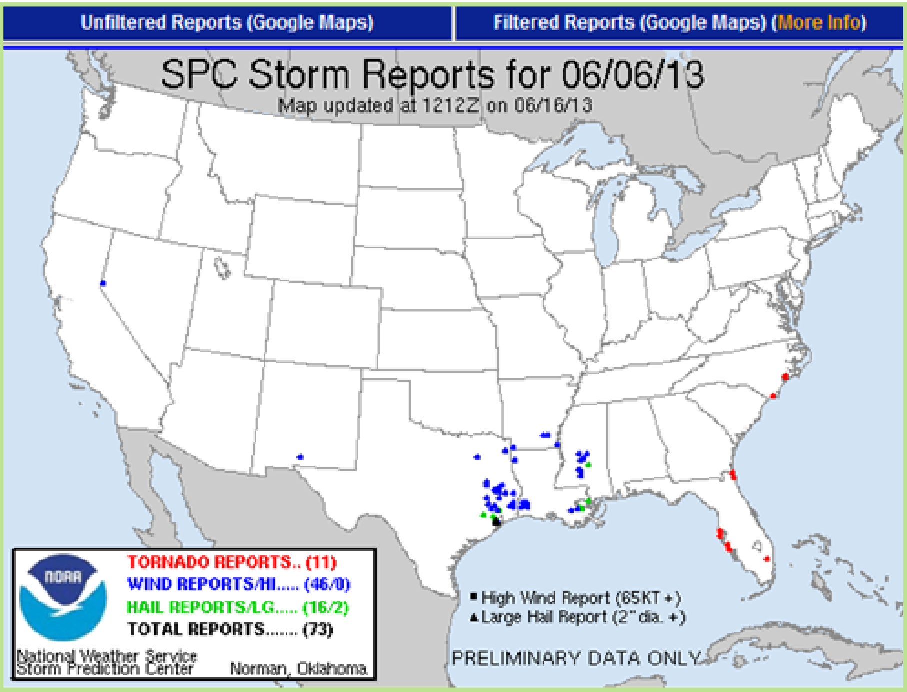
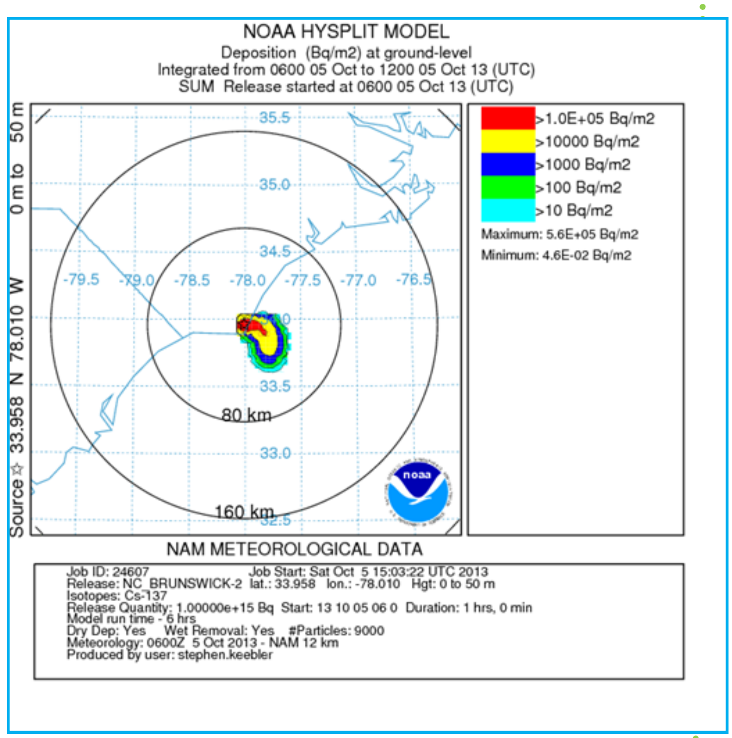


Figure 1. Tornado Reports from Tropical Storm Andrea.

With a busy summer tourist season, the office and local officials added a Viper radio system to increase communication and decision support with lifeguards regarding the rip current risk and other elements of the popular surf forecast. This system provided more timely reports and helped lower the risk of fatalities on the beaches. While the eastern third of the United States was experiencing a very wet summer, fires were raging out west. This provided an opportunity for more decision support from our office. Our local Incident Meteorologist, Terry Lebo, was dispatched to two different fires for a two week time period in late August.

In late September forecasters in the office supported Georgetown South Carolina with the devastating downtown fire with surface observations and expected weather conditions for the hours following the fire.

Finally the office participated in a national exercise with the HySplit (Hybrid Single Particle Lagrangian Integrated Trajectory) model. All of the weather service offices in the agency were informed of a random request from headquarters concerning the use of this model. On October 2, 2013 an exercise scenario with a partial nuclear release at the Brunswick Nuclear Plant was completed.



Decision support has become and will continue to be a major focus for the local as well as the national NWS offices.

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