NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Storm Courier

Charleston, SC
Weather Forecast Office

Spring/Summer 2014

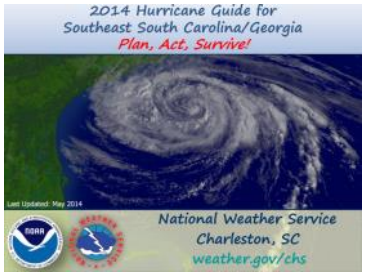
Inside this issue:

Hurricane Guide: Your One-Stop Shop for Being Prepared

by Robert Bright — General Forecaster

Another hurricane season has already arrived, and it is the time to prepare for these dangerous storms if you haven't already. If you are new to the area or just don't know much about these storms, listen up! In an attempt to contribute to the NWS's mission to create a "Weather Ready Nation", NWS Charleston has created a comprehensive hurricane guide as a way to increase public awareness regarding the significant threat posed by tropical storms and hurricanes. Various aspects of tropical cyclones are included in the guide, including descriptions of the numerous hazards they produce, safety/preparedness tips, and a local storm history. Also, descriptions of NWS tropical products and services are provided to help you stay informed about a storm and its possible impacts. One of the more interesting aspects of the guide is the section on storm surge, often the largest threat to life and property from tropical cyclones. In particular, maps are provided showing the areas in southeast South Carolina and southeast Georgia vulnerable to flooding from storm surge alone, and many will likely be surprised to see that it's not just areas right along the immediate coast! Lastly, examples and descriptions of several NWS products are given, such as the National Hurricane Center's wind speed probabilities and local NWS office tropical cyclone impact graphics, along with explanations of how each product should be utilized.

Check out the guide!



NWS Support for the 2014 Cooper River Bridge Run

by John Quagliariello — Senior Forecaster

The 37th Annual Cooper River Bridge Run, which is a 10-kilometer race spanning from Mount Pleasant, SC to Charleston, SC, took place on Saturday April 5, 2014 with about 40,000 runners/walkers participating. However, other events associated with the Bridge Run took place on the prior Thursday and Friday, including the Bridge Run Expo, the Kids Run and Wonderfest, and the Taste of the Bridge Run. Altogether, these events brought approximately 200,000 people to the Charleston area.

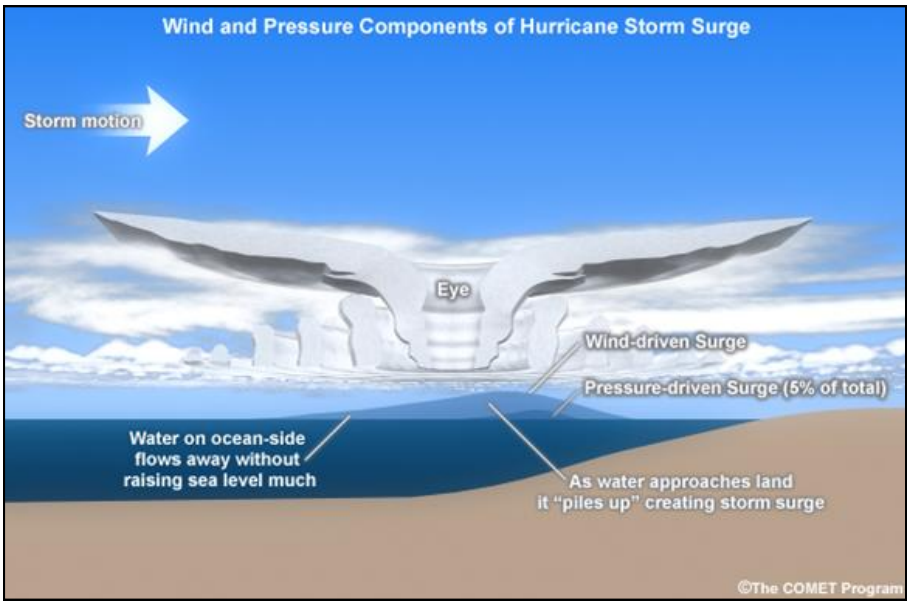
With such a large number of runners, spectators and others participating in the events at multiple venues, the National Weather Service was requested to provide weather support for the safety of the public and over 500 first responders. Meteorologists from our office began preparing early by attending numerous coordination meetings leading up to the event. Site-specific forecasts were issued earlier in the week of the Bridge Run, including aviation and marine forecasts since helicopters and boats were being used for security purposes, and people were being transported across the Charleston Harbor on boats as well. On Friday Apr 4th and Saturday April 5th, four meteorologists were onsite at the Command Post working side-by-side with over 50 people from numerous local, state and federal agencies. Formal stand-up weather briefings and forecast updates were provided, as well as numerous informal weather briefings to key officials.

Command Post for the Cooper River Bridge Run

Storm Surge: Often the Greatest Yet Most Unappreciated Threat from Hurricanes

by Robert Bright — General Forecaster

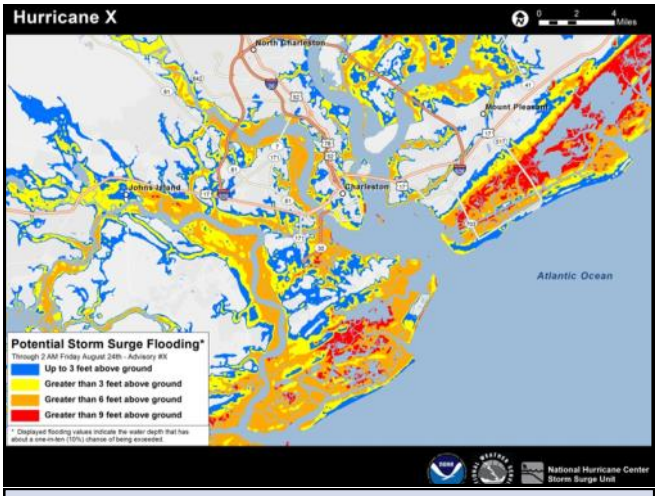
Storm surge is the biggest threat to lives and property along the immediate coast and can cause flooding well inland, especially in low-lying areas like across southeast South Carolina and southeast Georgia. However, numerous studies have shown that many folks either don't understand or don't appreciate the threat from storm surge. So what exactly is this phenomenon? Well, as a storm spins over the ocean it causes water to pile up around it, mainly on the north and east sides in the northern Hemisphere (see image to the right). Once the storm hits land, the water "surges" inland - often at great depths and for long distances. For example, Hurricane Hugo in 1989 produced a storm surge around 8 feet in downtown Charleston and significantly higher just to the north around Bulls Bay. If the storm made landfall south of Charleston, the storm surge would have been much higher.



When trying to figure out the total height of water that could occur, the storm surge alone does not tell the entire story. Astronomical tides are also important to know since a storm surge occurring at high tide can be significantly higher than if it occurs at low tide. The combination of the storm surge plus the astronomical tide is known as the storm tide. It is important to note that waves occur in addition to the storm tide which can also add to the destruction of structures near the coast. Ultimately, people want to know how high the water will get at their location, and that is why the NWS recently began providing forecasts of total water height above ground level, also known as inundation. Beginning in 2014, the NWS will begin issuing a map showing the potential water heights above ground that could occur from hurricanes (and possibly some tropical storms). You can see an example of the map on the bottom right of this page.

For more information about storm surge, check out the National Hurricane Center website. You can find an update to the NHC's products and services for 2014 here. Lastly, to assist in finding out which locations across the southern SC and northern GA coast are vulnerable to storm surge, check out our hurricane guide.

Large rocks deposited into a beachfront home on Folly Beach, SC from Hurricane Hugo's storm surge. [Image courtesy of NWS]



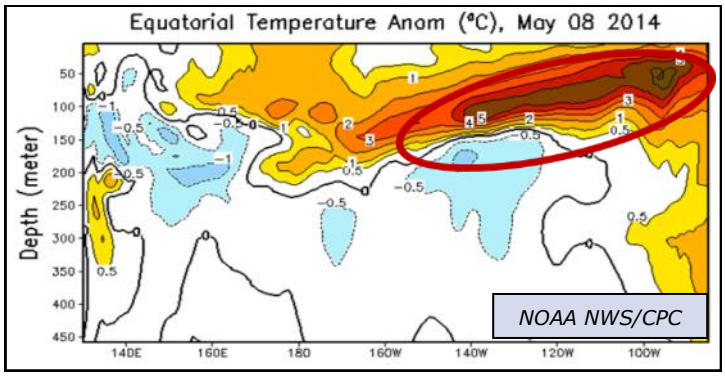
Example of new inundation maps the National Weather Service will begin issuing this year.

Are We on Our Way to an El Niño Event?

by Frank Alsheimer — Science and Operations Officer

The term El Niño, given to the warming of water temperatures in the equatorial Pacific Ocean, actually originated from Peruvian fishermen. It was named El Niño in reference to the Christ child because the water temperatures would routinely increase along the coast of Peru near or just after Christmas. During that time, their main source of income, the anchovy, would move away from the usual fishing grounds to find cooler water, and the fishermen would take up their boats and clean them or do maintenance in preparation for the next fishing season. They also noticed that when the water got unusually warm, they also got unusually large amounts of rain.

Today, the term is used more broadly. It represents an unusual (not seasonal) warming across the central and eastern equatorial Pacific Ocean, just off the coast of Peru. This ocean warming creates feedback effects in the atmosphere, causing changes to the general circulation pattern across much of the globe. El Niño events occur every 3 to 7 years in an irregular cycle, and strong El Niño events occur every 10 to 15 years.



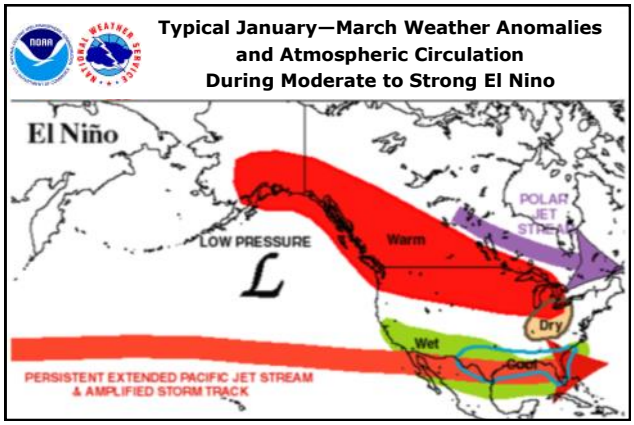
So far this spring, some of the precursor signs of a significant El Niño event have been observed. There have been periodic weakening of the trade winds in the equatorial Pacific, one of the leading indicators of El Niño. Additionally, the ocean waters from 50 to 150 meters below the surface in the central and eastern Pacific Ocean have become very warm this spring (as much as 10F warmer than normal as highlighted in the graphic to the left), another potential sign of an El Niño event. Finally, in the last few weeks, even the surface waters have become a little warmer than normal after being cooler than normal this winter.

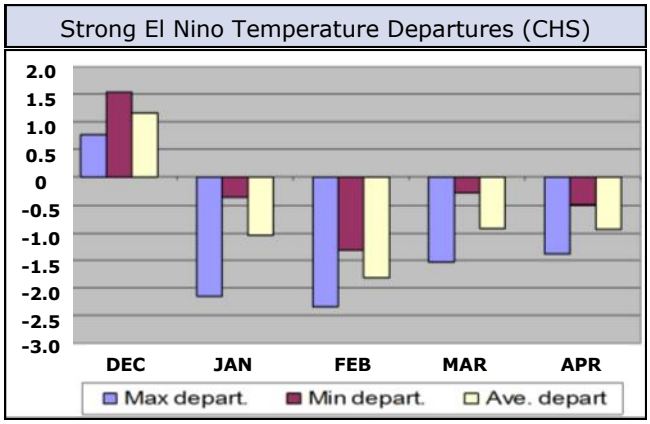
So what does that mean to us in South Carolina and Georgia? Well, there's good news and bad news. First I'll give you the good news. When a strong El Niño event occurs during the summer Atlantic hurricane season, that season usually has fewer named storms than normal. There is also a trend for less of a threat to the southeast U.S. coast. In fact, looking back at the 5 strongest El Niños during the Atlantic hurricane season since 1950, there have been NO hurricanes or tropical storms that have made landfall in either South Carolina or Georgia. See table to the right for more details.

Tropical Cyclone Climatology During Recent Strong El Nino Years

Year	Total Atlantic Tropical Storms	Total Atlantic Hurricanes	Hurricane Landfalls in SC/GA	Tropical Storm Landfalls in SC/GA
1965	6	4	0	0
1972	4	3	0	0
1982	5	2	0	0
1987	7	3	0	0
1997	7	3	0	0
Normal	11.3	6.2		

While the hurricane season tends to be less active, the winters can be more active. Strong El Niños tend to give us cooler and wetter winters than normal due to the unusual strength of the subtropical Jet Stream coming across the Pacific Ocean into the southern portion of the United States. Looking at specific data for Charleston, the temperatures from January through April are usually colder than normal during winters with Strong El Niños. (Similar results are seen at the Savannah, Walterboro, and Fort Stewart observation locations). Meanwhile, precipitation is well above normal.





Meet Our Information Technology Officer

by Jonathan Lamb — General Forecaster

Jeff Stewart is our Information Technology Officer (ITO) whose routine tasks include maintaining office workstations and servers, installing updates, and troubleshooting issues. However, any free time is spent working on new projects to improve the efficiency of office operations and help us provide the best products and services to our customers.

Tracking Severe Weather

We frequently collaborate with staff in other National Weather Service offices to share ideas and make efficient use of resources. One example is a new Severe Weather Warning Log, a collaborative effort between Jeff and a forecaster in the Greenville-Spartanburg, SC office. This new warning log will allow our meteorologists to keep track of severe weather warnings, follow-up statements, storm reports, phone calls, and verification statistics in real-time. It will eventually replace our paper-based warning logging and verification procedures, making our severe weather operations much more efficient.

Getting Ready for AWIPS II

AWIPS, the Advanced Weather Interactive Processing System, is the mission-critical hardware and software used by NWS meteorologists to analyze weather information to produce forecasts, watches, warnings, and other reports. A significant AWIPS upgrade is underway in the NWS to ensure our computer systems are capable of meeting the future needs of our customers. Several years prior to an office's upgrade to AWIPS II, the ITO leads the effort to convert all office programs and forecasting tools to the specifications of the new system. Although some programs are being converted at a higher level, local offices such as ours have developed or modified a large majority of them to suit our unique weather and customer needs. Thus, Jeff has been busy for the last six months working to ensure we are ready for the upgrade, currently scheduled for winter '14-15. Even after we upgrade to AWIPS II, Jeff will be very busy ironing out issues and adding new tools utilizing its enhanced capabilities.

Serving and Learning

by Ron Morales — Warning Coordination Meteorologist

Our office routinely holds meetings and workshops not only for our staff members, but for our customers and partners as well. Workshops may be held multiple times per year, or once every year or two, depending on the customer. Our most recent workshops included: Decision Support Services (DSS), Media Science, and Emergency Management (EM)-National Weather Service (NWS) Partner workshops. This was the first time our office has hosted a DSS workshop. We were so excited about sharing information concerning DSS, that we invited NWS meteorologists from our surrounding offices, too.

You might be asking: "What is DSS?" The simplest form of DSS is providing weather information that helps someone make a more informed decision. Any time weather has the potential to impact the safety or health of a large number of people outdoors, then we can provide special weather information and/or briefings to help Emergency Management and/or first responders protect the lives and property at a particular event. Events may be planned, such as: the Flowertown Festival, Charleston Bridge Run, or the St. Patrick's Day festivities in Savannah, GA. While others may be unplanned such as: chemical spill/Hazmat situation, large explosions, and train/plane crashes to name a few.

Our most recent EM-NWS Partner Workshop

The focus on the DSS workshop was to help better prepare our meteorologists to provide critical weather support for our customers and partners, particularly the EM community. The Media Science Workshops are designed to keep our media partners up-to-date on the latest products, services and advances in the science. Finally, the EM-NWS Partner Workshop provides the opportunity for our staff to not only share information concerning any updates/changes with our products and services, but more importantly, a time for our EM partners to share any comments and/or concerns they may have, and how we can better serve their needs. The term "workshop" implies a two-way flow of information between us and our partners, which we feel is an essential part of improving our customer service and support.

Spotters Play a Vital Role During Two Extraordinary 2014 Winter Weather Events

by Steve Rowley — Senior Forecaster

In order for accumulating snow or freezing rain to occur in our region, cold air and moisture must arrive at the same time. This formula seems simple enough, yet cold air usually retreats in advance of increasing moisture or arrives after moisture has exited our region. As a result, we frequently enjoy multiple, consecutive winters free of significant snow and ice. Since 1996, according to the National Weather Service Storm Data publication, ice storms struck parts of the NWS Charleston SC forecast area on January 2, 2002, January 26, 2004 and January 10, 2011. During the winters since the January 2011 ice storm, the region has only experienced sporadic episodes of flurries and light sleet. Then, after a 3 year break, the rare combination of cold air and moisture set the stage for a major winter storm which deposited freezing rain, sleet, and snow across the region in late January 2014. While climatology might suggest that we were "due" for a winter storm, the season took a turn for the extraordinary when another ice storm struck just a couple of weeks later in mid-February.

Both events featured the "wedge" pattern that accompanies most of our winter storms. The wedge of high pressure east of the Appalachian Mountains provided cold air, and low pressure south of the region provided significant moisture which translated to damaging ice accumulation.

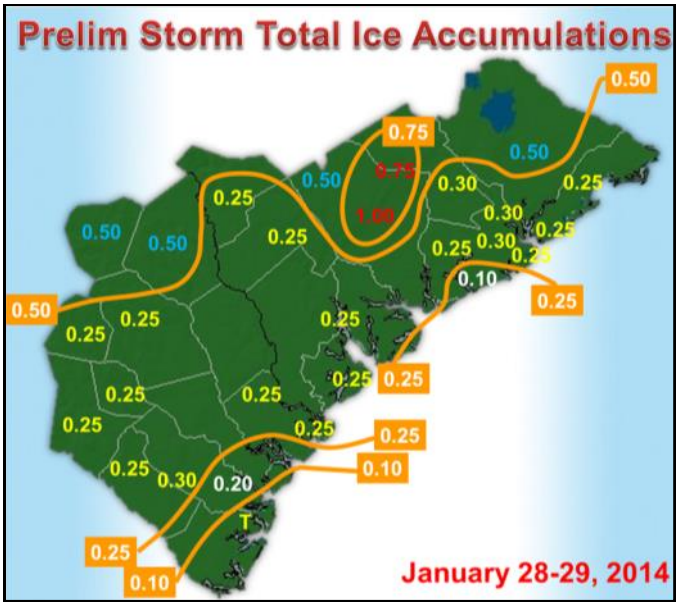
Subtle differences marked the 2014 winter weather events. The January event featured somewhat colder air than the February storm. As a result, virtually every location across the NWS Charleston SC forecast area, including coastal locations, received some amount of freezing rain – a truly rare event. Many locations also reported sleet at some time during the event, and numerous locations even received some snow during the early morning of January 29. During the February storm, the areal coverage of cold air and freezing rain was not as extensive, so damaging ice accumulations were limited mainly to inland sections of the NWS Charleston forecast area. Further, virtually no sleet or snow fell during the February storm.

Ice accumulation between the two storms of one-half to two inches produced extensive damage to trees and power lines, particularly across inland sections of southern South Carolina and southeast Georgia. In some areas, debris removal continued through April.

Your timely Spotter reports played a crucial role in forecast operations during the two winter storms. We received hundreds of storm reports during and after the events, including nearly 200 reports of ice accumulation of at least one-quarter of an inch and associated damage wrought by the weight of ice accretion. The average time which elapsed between our initial issuance of warnings and the first reports of at least 1/4 inch of ice accumulation, closed roads and damage was more than 30 hours.

Hopefully, future bouts of significant winter weather will hold off for at least several winters. Whether winter weather occurs next winter or 10 winters from now, we will continue to rely on your reports to focus and enhance our forecast and warning services.

For more information regarding the January and February 2014 winter events, check out our event review page.



Ice accumulation in West Ashley from January 28-29, 2014 ice storm. [Image courtesy of Daniel Greenstein]

Video Project & Our YouTube Channel

by Blair Holloway — General Forecaster

In early 2013, NWS Charleston began developing a project to create a series of informational videos focusing on various aspects of the National Weather Service. We had the subject matter expertise, but did not have a way to shoot and produce the actual videos. Therefore, a partnership was formed with the Radio and Television Broadcasting program of Trident Technical College in North Charleston.

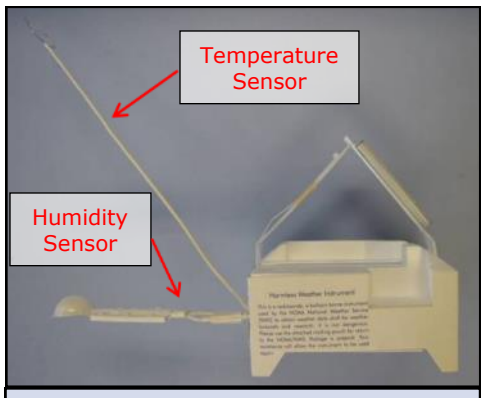
Trident Technical College students film forecaster, Blair Holloway, for our informational video series.

A student in the program worked with the group of meteorologists, split into teams of two, to develop the content of each video as well as the video and production work. The entire process took place throughout the course of 2013 and even into early 2014. All total, four videos were created covering a wide array of NWS related topics including an overview of the agency, severe weather warnings, the forecast process, and observations. Each video has been shared through Facebook and Twitter and uploaded to the office YouTube channel.

Check us out on YouTube to find the videos from this project as well as others, such as our "Ask the SOO" series. In these videos, our Science and Operations Officer, Frank Alsheimer, gives the meteorological explanations behind a number of different phenomena such as the polar vortex, mammatus clouds, and even El Niño. New editions of the "Ask the SOO" series are periodically added to our YouTube channel so remember to check back for the latest. Be sure to find us on our YouTube channel - you can comment on the videos and even suggest future subjects for the "Ask the SOO" series that you would like to know more about!

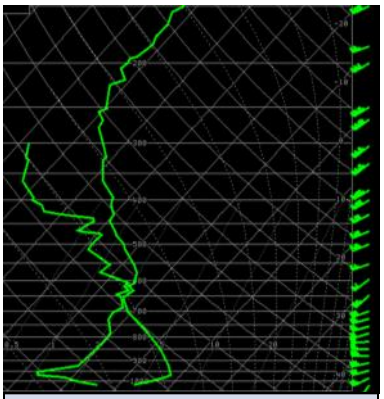
NWS Charleston Transitions to New Radiosondes

by Emily Timte — Meteorologist Intern



An image of the new radiosondes

NWS Charleston recently transitioned to a new type of radiosonde. In fact, we were the last station in the country to switch to them. Radiosondes are the instruments we tie onto the weather balloon that is released twice a day (sometimes more for big weather events). Although the new instruments look different and weigh a lot less, their functions are identical. Sensors on the radiosonde measure temperature, pressure, and humidity, and we are also able to obtain wind speed and direction by tracking the position via GPS. A radio transmitter on the instrument will send the measurements to a ground tracking antenna roughly every second which we are then able to view and quality control. A typical flight lasts 90 to 120 minutes, so we are receiving lots of data! The data will be plotted on a diagram, referred to as a Skew-T, to show conditions in the atmosphere from the surface to about 100,000 feet. This is known as an atmospheric sounding.



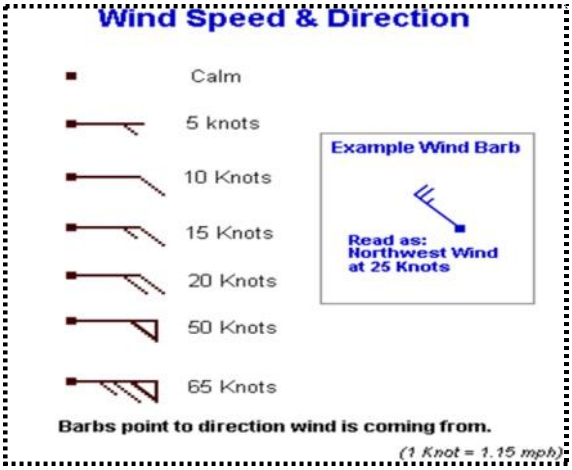
Example of an atmospheric sounding

In order to make forecasts, we need to understand not only what's going on at the surface, but also the environment aloft – radiosonde data allows us to do that. The data is also used as input for the weather forecast models, climate change research, thunderstorms forecasts, etc. If you're interested to see a balloon launch in less than 60 seconds, check out this video on our YouTube channel.

Fascinating Facts About Wind

by Pete Mohlin — Senior Forecaster

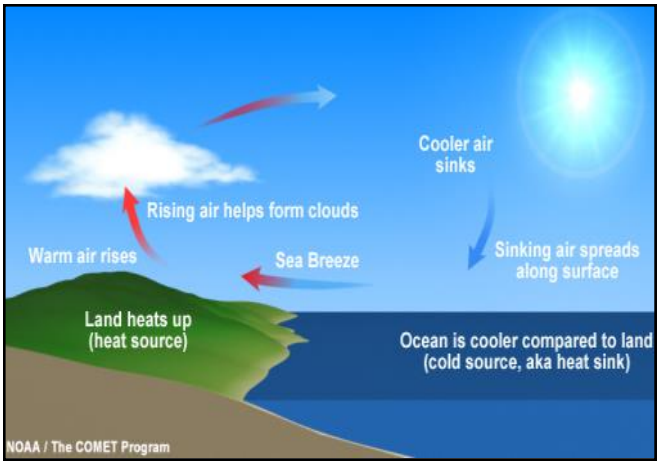
- Wind is defined as air in motion relative to the surface of the earth. It is the direction in which it is coming from, not the direction it is blowing toward.
- It's measured at the surface by an anemometer or wind vane, but in the atmosphere it is measured by a pilot balloon, radiosonde or aircraft navigational techniques.
- The direction and character of the wind will tell you a lot about what kind of weather you might expect. For example if it is shifting in direction, then changes may be forthcoming, or if it's decreasing then we oftentimes expect a continuation of the present weather. Generally speaking if winds are backing (changing in a counter-clockwise direction), then worse weather is upcoming; if winds are veering (changing in a clockwise direction), then improving weather is anticipated.
- Over land at night when the wind speed changes little from the daytime or increases, oftentimes this is indicative that weather changes are on the way.
- Over land the wind speed usually increases during the day and decreases at night. But it's often the opposite across the water; higher winds at night and less during the day.
- Wind speed is the rate at which air is moving horizontally past a given point. It is determined using the Beaufort Wind Scale that was developed in 1805, or from an anemometer.
- Wind speed is a two-minute average, usually measured in knots or mph. One knot (or 1 nautical mile per hour) = 1.15 statute miles per hour.
- On a weather map, wind barbs are used to show the wind direction and wind speed in knots (see below).



Sea Breeze/Land Breeze

During the warmer months of the year, a typical phenomenon that occurs across our forecast area is the sea breeze. The sea breeze is a coastal local wind that blows from sea to land caused by a temperature difference when the sea surface is cooler than the adjacent land. Although the onset, strength, orientation, inward progression and decay of the sea breeze will vary from day to day, it will almost always develop from late winter/spring into the autumn months.

In general, the sea breeze will form in the late morning or early afternoon and will dissipate sometime between sunset and 10 or 11 pm, although there are occasional instances where it starts earlier and/or lingers later. Many times the sea breeze can travel through our entire forecast area, although this can take until late in the day or even at night.



When trying to determine the direction of winds from the sea breeze influences, winds will either back or veer through the path of least resistance. Thus, NW or N winds in the morning will most likely veer (turn clockwise) as the sea breeze develops, whereas SW or W winds in the morning will likely back (turn counter-clockwise).

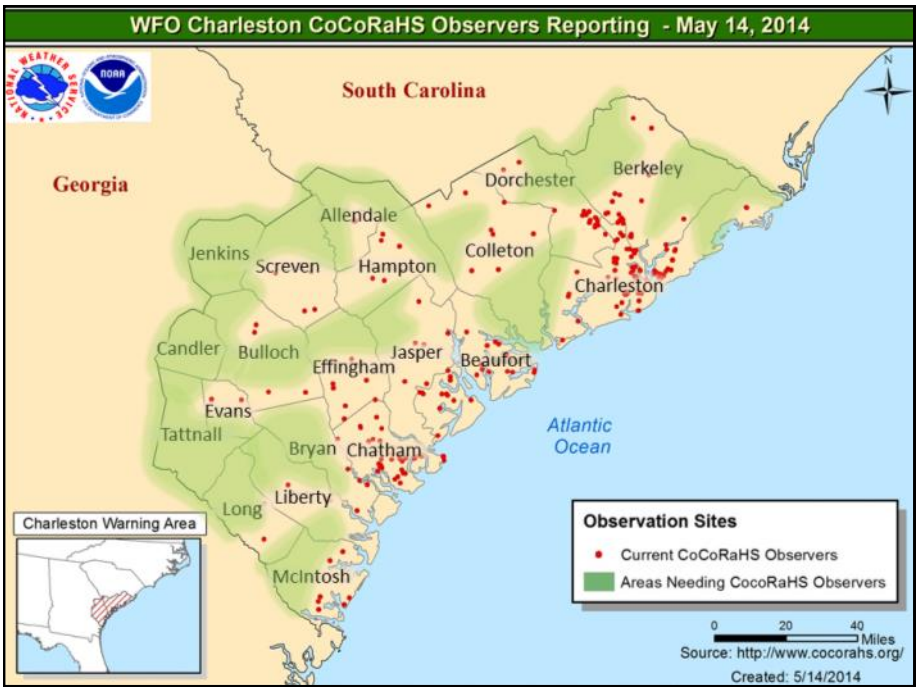
The opposite of a sea breeze is a land breeze. While sea breezes occur during the day, land breezes occur at night. Despite the difference in times at which they occur, the reason for the land breeze's formation is basically the same as the sea breeze, but the role of the ocean and land is reversed.

Land breezes can occur when the land's nighttime temperature is less than the sea surface temperature. They are most common during the fall and winter seasons when water temperatures are still fairly warm and nights are cool. However, unlike the sea breeze, the land breeze is often much weaker.

Have You Joined CoCoRaHS?

by Julie Packett — Meteorologist Intern

CoCoRaHS, also known as the Community Collaborative Rain, Hail, and Snow Network, is a community-based program made up of volunteers who monitor daily precipitation observations right in their backyards or schoolyards. During the month of March, all 50 states participate in a friendly recruiting competition called CoCoRaHS March Madness. Although neither Georgia nor South Carolina won the "CoCoRaHS Cup" this year, Georgia did place 4th in the competition. With the help of local newspapers and word of mouth from loyal observers, southeast Georgia saw a 75% increase in CoCoRaHS observers during March 2014. In addition, this impressive growth rate contributed to well over half of the new CoCoRaHS March Madness additions for the state of Georgia as a whole. Although South Carolina did not fare as well in the competition this year, the Lowcountry currently has nearly double the amount of active CoCoRaHS observers when compared to the GA Coastal Empire's CoCoRaHS community.



Nevertheless, both states have large swaths of area where there are currently no observers. Here at the National Weather Service, we want to eliminate those gaps. "Ground truth" plays a valuable role in our daily procedures, especially during the summer months when precipitation variability can range greatly over a short distance. If you would like to contribute to the daily weather puzzle, join CoCoRaHS today. All that's needed to participate is a CoCoRaHS rain gauge, internet access, and a desire to fill in those gaps. Learn more at www.CoCoRaHS.org.

Website Updates

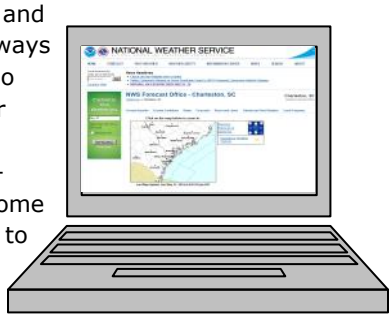
by Ron Morales and Emily Timte

Mobile.weather.gov

Did you know that you can get all of the latest weather information from your local National Weather Service Office on your mobile device? Just enter mobile.weather.gov on your mobile device web browser, then enter your geographical location of interest (i.e., Charleston, SC). Once you have entered your location, you will get the most current conditions for your location, forecasts, satellite and radar data, etc. You can even Tweet a weather or storm damage report to us. Please check it out. We think you will find it very useful.

New Homepage

Our transition to the new website, www.weather.gov/chs, is complete. There still may be minor changes at times, but please take some time to familiarize yourself with the new site. You can check out this website user's guide to help get you started! In the guide, you will find a brief overview of the new layout and menus as well as different ways to get your forecast and also the locations of some of our more popular pages. If you have any questions or comments regarding the new home page, please send an email to chs.webmaster@noaa.gov.



Safe Boating Information

by Pete Mohlin — Senior Forecaster

Smart boating begins by making safety the number one priority of all mariners, and now is an excellent time to review safety precautions. Here are several **boating safety** reminders now that the warmer boating season is here:

- Before you head out on the water remember to file a Float Plan with a family member, a friend or a marina. Include a description of your boat, where you plan to be, and when you expect to return. If you do not return as planned searchers will know where to look.
- Get a free vessel safety check to ensure your vessel complies with both federal and state safety requirements.
- Make sure everyone on board your boat is wearing their own properly fitted life jacket.
- Check the National Weather Service forecast and stay tuned to NOAA Weather Radio All Hazards while on the water.
- Be sure all safety equipment is available and in working order.
- Know the basic rules of navigation and consider taking a boating class with the Coast Guard Auxiliary or Power Squadron.
- Never boat under the influence of drugs or alcohol.

We are also into our typical thunderstorm season, so this is a good time to review some **thunderstorm and lightning safety information**:

- Thunderstorms can be especially dangerous over the open waters where boaters cannot seek a safe harbor. Strong winds, frequent lightning, reduced visibilities in heavy rains, steep and rapidly building waves, waterspouts and even hail can occur in thunderstorms.
- You can tell how close you are to a lightning strike by counting the seconds between seeing the flash and hearing the thunder. For every five seconds you count, the lightning is one mile away. If you see a flash and instantly hear the thunder, the lightning stroke is very close. Take cover immediately.
- The principle lightning safety guide is the 30-30 rule. The first "30" represents 30 seconds. If the time between when you see the flash and hear the thunder is 30 seconds or less, the lightning is close enough to hit you. If you haven't already done so, seek shelter immediately. The second "30" stands for 30 minutes. After the last flash of lightning, wait 30 minutes before leaving your shelter. More than one half of lightning deaths occurs after a thunderstorm has passed.
- Lightning is a threat whenever mastheads begin to glow, you see lightning, hear thunder, there is loud static on your AM radio and/or you hear buzzing sounds on radio antennas.

For additional safe boating information, check the NWS Safe Boating page or the US Coast Guard's website.

National Weather Service
Charleston Weather Forecast Office
5777 South Aviation Avenue
North Charleston, SC 29406
(843) 744-0303
www.weather.gov/chs