Carolina SkyWatcher

NWS Morehead City

Spring/Summer 2024

In This Issue:

Coastal Waters Forecasts with Wave Detail Now Available

By: Ryan Ellis, Science and Operations Officer

As people who live along the coast and for the coastal communities that we serve from Duck down to Surf City, we know that marine forecasts are extremely vital to mariners in our community from local fishermen, touring boats, to larger operations such as the Port of Morehead City and the U.S. Marine Corps and Coast Guard. Even those just passing through the Intracoastal Waterway in a small skiff or our offshore waters in a large container ship are at the mercy of the conditions within our oceans, sounds, and rivers.

While we have been providing wave heights and periods for a long time, it is well known that there is usually more than one swell occurring simultaneously. Wave detail allows us to not only give the dominant wave height and period but also provide more information on non-primary swells.

The NWS, through the improved Coastal Waters Forecast (CWF) product, will be providing enhanced wave height, direction and period information in marine forecasts this Spring (see Service Change Notice). Detailed wave forecasts provide additional information regarding wave components (including differing direction and period) in addition to still providing pre-existing forecasts of significant wave height. Please see our Coastal Waters Wave Detail Videos I, II, III, IV and downloadable reference pages for the East Coast / Gulf Coast and West Coast / Pacific Region to learn more.

Coastal Waters Forecast with Wave Detail
(*new wave detail highlighted in yellow*)

Coastal Waters from Cape Charles Light to Virginia-
North Carolina border out to 20 nm-

...SMALL CRAFT ADVISORY IN EFFECT THROUGH LATE SATURDAY NIGHT...

.TODAY...N winds 20 to 25 kt. Seas 9 to 11 ft, occasionally to 14 ft. Wave Detail: SE 8 ft at 16 seconds and NE 7 ft at 7 seconds.
.TONIGHT...N winds 15 to 20 kt, diminishing to 10 to 15 kt after midnight. Seas 8 to 10 ft, occasionally to 13 ft. Wave Detail: SE 8 ft at 15 seconds and NE 6 ft at 8 seconds.
.SAT...NW winds 10 to 15 kt. Seas 6 to 8 ft, occasionally to 10 ft. Wave Detail: E 7 ft at 13 seconds and NW 2 ft at 5 seconds.

Previous Version of Coastal Waters Forecast

Coastal Waters from Cape Charles Light to Virginia-
North Carolina border out to 20 nm-

...SMALL CRAFT ADVISORY IN EFFECT THROUGH LATE SATURDAY NIGHT...

TODAY...N winds 20 to 25 kt with gusts to 30 kt. Seas 8 to 11 ft. Dominant period 16 seconds.
.TONIGHT...N winds 15 to 20 kt, diminishing to 10 to 15 kt after midnight. Seas 8 to 10 ft. Dominant period 15 seconds.
.SAT...NW winds 10 to 15 kt. Seas 6 to 8 ft. Dominant period 13 seconds.

There will be a phased implementation by each NWS Region for the wave component detail in the Coastal Waters Forecast:	
Eastern Region WFOs and WFO Honolulu:	April 15 - April 26
Southern Region WFOs:	April 29 - May 10
Western Region WFOs:	May 13 - May 24

Coastal Waters Forecasts with Wave Detail Now Available

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How Do Waves Work?

There are three fundamental properties of ocean waves: height, period, and direction. Wave height generally refers to how tall a wave is from trough to crest, wave direction is the direction the wave is coming from, and wave period is the time it takes for successive waves to pass a fixed point, such as a buoy. The period is also directly related to how fast waves move, how deep they extend into the ocean, how much energy they contain, which, in turn, influences the size of breaking waves at the coast, and more.

In addition, it is common for there to be multiple, coexisting wave groups that coincide at any given point in the ocean. Some users may only be interested in short period waves because they present hazardous, choppy waves for smaller boats, others may take particular interest in the long period waves given the shoaling hazards they create near shore, while others may be interested in both. The point is, no two wave systems are created equal, any wave system present may be hazardous or of interest to different marine groups, and therefore we feel we should not ignore them.

New Wave Detail Forecasts go beyond providing just provide significant wave height, defined as the average height of the highest one third of all waves at a particular point or region in the ocean. Significant Wave Height remains a fundamental variable of the sea state that our customers will continue to see referenced in forecasts. Additional Wave Detail supplements the Coastal Waters Forecast with wave detail describing differing wave directions and period in addition to maximum wave height.

Here are some training and videos on Understanding Wind Waves and Swell Waves. You can dive deeper into enhanced wave forecasts with the Real Time Near Shore Wave Prediction System.

For the full details on wave detail implementation please visit https://www.weather.gov/marine/wavedetail

Coastal Waters Forecasts with Wave Detail Now Available

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NATIONAL WEATHER SERVICE'S NEW COASTAL WATERS FORECAST

Additional Wave Detail Enhancements

weather.gov/marine/wavedetail

What is happening?

- The National Weather Service (NWS) will provide an enhanced Coastal Waters Forecast (CWF), which will soon include detailed wave information, including height, direction, and period of individual wave systems.
- Wind and weather portions will remain the same.
- The point forecast format will remain unchanged.

Why is this change being made?

- Providing direction, height, and period information for individual wave systems better describes the forecasted sea state to all potential users.
- Detailed wave information better meets the user's needs. Some users may only be interested in short period waves that present hazards on the open waters. Others may only be interested in long period waves that present shoaling and large surf hazards near shore. Still others may be interested in both.

What will the new wave format look like?

- Wave period and direction will be added for any impactful wave systems.
- Wave group detail will feature a single significant wave height (not a wave range).

Old Format	New Format
Seas 6 to 8 ft.	Seas 6 to 8 feet. Wave Detail: South 8 feet at 20 seconds.
Seas 5 to 7 ft, occasionally to 9 ft. (If applicable)	Seas 5 to 7 feet, occasionally to 9 ft. Wave Detail: North 7 feet at 12 seconds and southeast 3 feet at 6 seconds.
Seas 15 to 18 ft.	Seas 15 to 18 feet. Wave Detail: South 17 feet at 22 seconds and east 6 ft at 8 seconds.
Seas 2 to 4 ft.	Seas 2 to 4 feet. Wave Detail: East 4 feet at 5 seconds.

Coastal Waters Forecasts with Wave Detail Now Available

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NATIONAL WEATHER SERVICE'S NEW COASTAL WATERS FORECAST

Additional Wave Detail Enhancements

weather.gov/marine/wavedetail

Did the NWS ask for feedback before making this change?

- Yes. The NWS solicited comments from Sept 2022 through July 2023. Over 500 responses were received. 89% favored the change.

Where can I find the operational Coastal Waters Forecast (CWF)?

- There are multiple ways of finding this forecast
- From the web, visit weather.gov/marine or click the Watches, Warnings & Advisories (WWA) map from your local National Weather Service office website.
- You can hear the forecast on most marine band radios utilizing the WX Channels 1-7.

What if I still want the previous forecast wording?

- The CWF from the Watches, Warnings & Advisories (WWA) map can be displayed either by a point (known as "point-and-click") or an area (known as "zone").
- The area forecast will contain the new wave terminology.
- The point forecast does not currently contain the new detailed wave terminology. It is planned to be implemented in FY 2025.

What else do I need to know?

- Wave period and direction will be added for any impactful wave systems.
- By default, wave groups will be ordered by their height. In some cases where height is the same, the wave period will be considered next.
- Wave detail is optional for inland waterways, e.g., bays and sounds.

Who do I contact if I have concerns with this change?

- Email NWS National Marine Program Manager, Melinda Bailey, at melinda.bailey@noaa.gov and/or marine.weather@noaa.gov.

More Information:

- Please visit: https://www.weather.gov/marine/wavedetail

MHX Staff Gauge Program

By: Casey Dail, Lead Forecaster and Coastal Flooding Team Lead

The North Carolina coastline is very complex and its intricate network of creeks, rivers, sounds, barrier islands and the ocean creates a dynamic that amplifies the risk of coastal flooding. Factors such as tides, storm surges, heavy rainfall, and mesoscale features can play crucial roles in exacerbating flood potential. To address these challenges, it's vital to utilize advanced forecasting techniques that integrate data from multiple sources, including meteorological data, tidal predictions, climatology and accurate observations.

Many areas along the coast are vulnerable to flooding from the ocean, sounds and/or rivers, which is why our local staff gauge program is so important. We have a network of volunteers across vulnerable coastal communities that report both low and high water levels in their respective locations. These observations are invaluable and provide much needed ground truth. Forecasters utilize these observations in addition to automated gauges. By utilizing both types of observations in tandem, forecasters can enhance their understanding of current conditions and improve the reliability and accuracy of forecasts, ultimately helping communities better prepare for and respond to coastal flooding events.

There are currently many volunteers that routinely report water levels across eastern NC. Some of these locations include: Back Creek near Merrimon, Neuse River at James City, Hadnot Creek in Stella, and Silver Lake Harbor in Ocracoke. Recently our office welcomed three new observers in Clubfoot Creek in Havelock, Neuse River near Arapahoe, and Campbell Creek near Aurora.

Tony Saavedra (Observation Program Leader) and Shane Kearns (Lead Forecaster) in Ocracoke

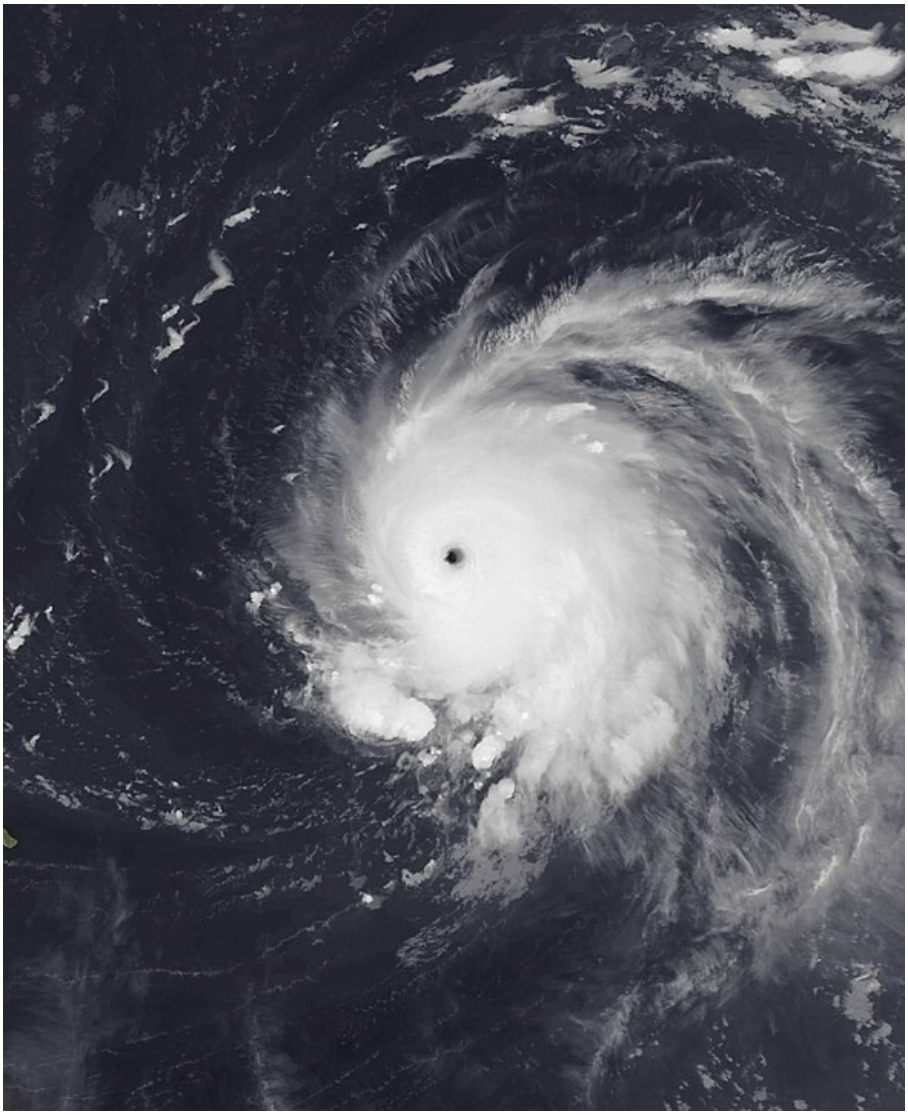
Thank you to all of our volunteers, we appreciate all that you do!

If you live on a local body of water and are interested in volunteering, please let us know at wxobs.mhx@noaa.gov. We provide the gauge, then the homeowner will install the gauge on their dock with guidance from us. This is a great opportunity to be a citizen scientist and help out your local National Weather Service office!

ENSO and the Atlantic Hurricane Season

By: Morgan Simms, Meteorologist and Climate Team Lead

The 2024 Atlantic hurricane season will begin on June 1st. NOAA will release its official 2024 season prediction in a couple of weeks, but two things are already pointing to above-average activity: **record-warm sea surface temperatures** and **a forecast of developing La Nina conditions this summer.**



Hurricane Lee over the open Atlantic on September 8, 2023. It was the most intense storm out of the 20 named systems that formed last season.

Favorable conditions for tropical cyclone development include two important factors: sufficiently warm water temperatures, which acts as fuel for the storms, and low wind shear (change in direction or speed of the wind with height), which would otherwise disrupt storm development. The link between already-warm ocean temperatures and above average activity is clear, but it is the El Nino-Southern Oscillation (ENSO) that plays a role in shear.

ENSO is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean. During El Ninos, water temperatures in the Pacific are above average. During La Ninas, temperatures are below average. If water temperatures are near average, conditions are considered ENSO-neutral. The pattern can play a big role in weather patterns over the United States, including on hurricanes. This post from NOAA's Climate.gov gives a deeper dive into the why, but to summarize - during El Nino hurricane-hostile shear tends to increase over the Atlantic basin, while during La Ninas it tends to decrease.

ENSO and the Atlantic Hurricane Season

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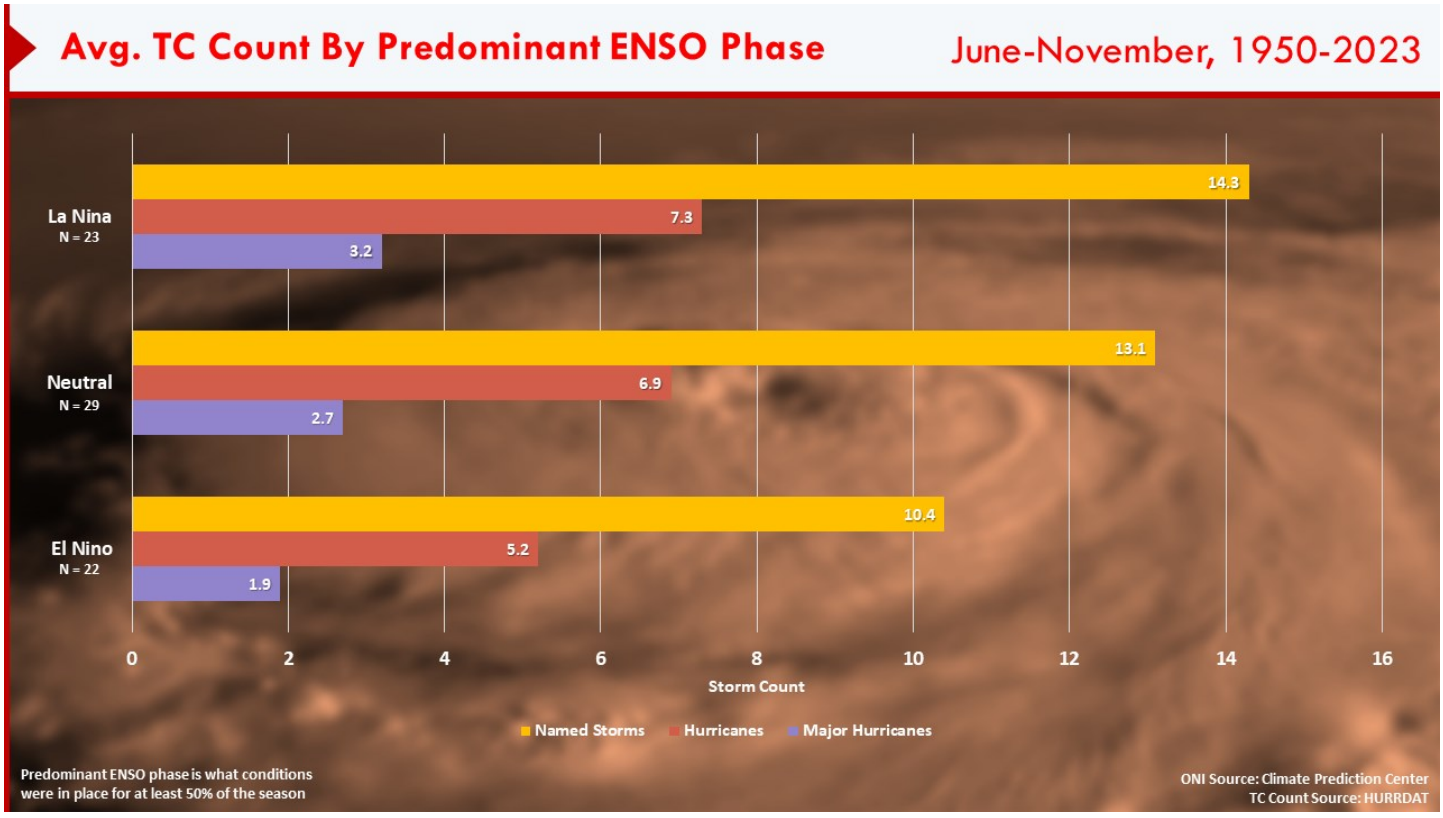
An analysis of seasonal storm counts and the observed ENSO phase from June to November from 1950 to 2023 showcases this difference. Across 22 seasons where El Nino was predominant (present for at least half the season), an average of 10.4 named storms developed including 5.2 hurricanes and 1.9 major hurricanes. Across 23 seasons where La Nina was predominant for any part or all of the time, an average of 14.3 named storms developed including 7.3 hurricanes and 3.2 major hurricanes. Across 29 predominant ENSO-neutral seasons, an average of 13.1 named storms formed including 6.9 hurricanes and 2.7 major hurricanes.



Average count of named storms, hurricanes and major hurricanes by ENSO phase. For seasons where phases were transitioning, binning was determined by which phase was observed more than 50% of the time.

Not all ENSO events work out the same way due to other teleconnections and factors (ocean temperatures, etc). The hurricane season of 1973 and 1975 both occurred during La Ninas, yet both years saw less than 10 named storms. Conversely, the 2023 season occurred during an El Nino but saw 20 named storms.

ENSO and the Atlantic Hurricane Season

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Regardless of above or below average activity, our message stays the same every season - **it only takes one storm to make a big impact.** The 1992 Atlantic hurricane season only had seven named storms, yet it produced Hurricane Andrew - the costliest hurricane to impact the United States until 2005. **Preparedness is key,** and it is never too early to start building a hurricane kit or reviewing plans. Our website, https://www.weather.gov/mhx/hurricaneprep, is a great place to find information and helpful resources.

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