



# Peak of Hurricane Season is Here



## NOAA Updated 2019 Hurricane Season Outlook

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Collaboration With

National Hurricane Center/ NOAA/ NWS/ NCEP

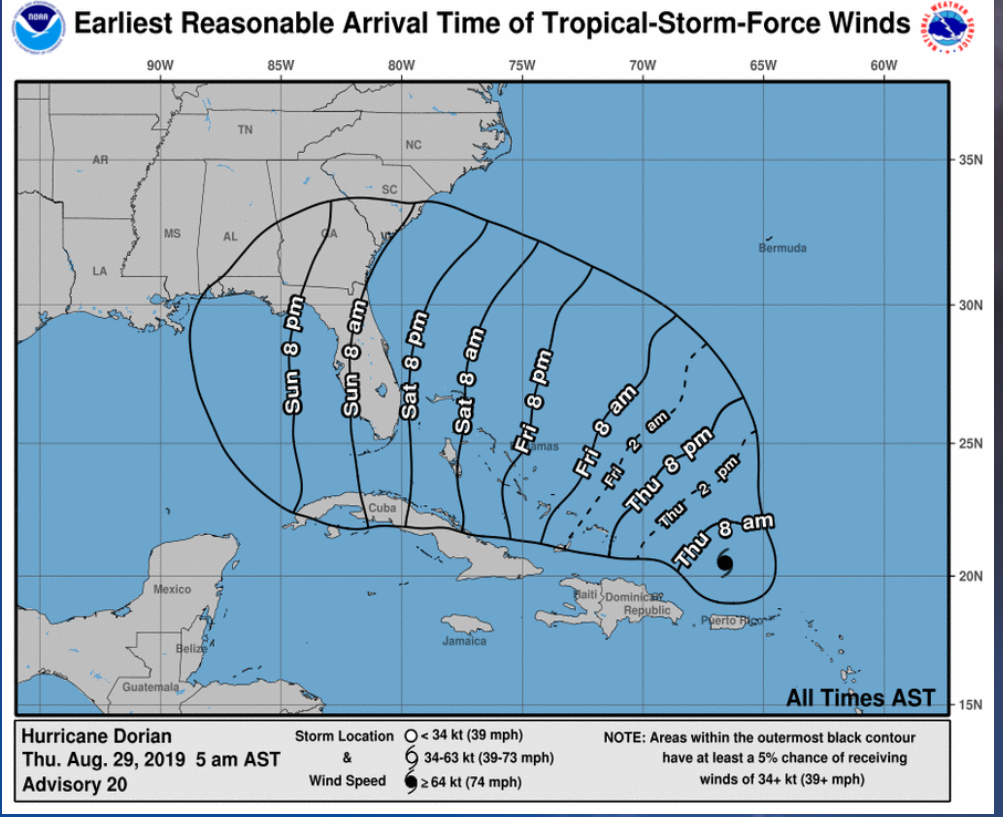
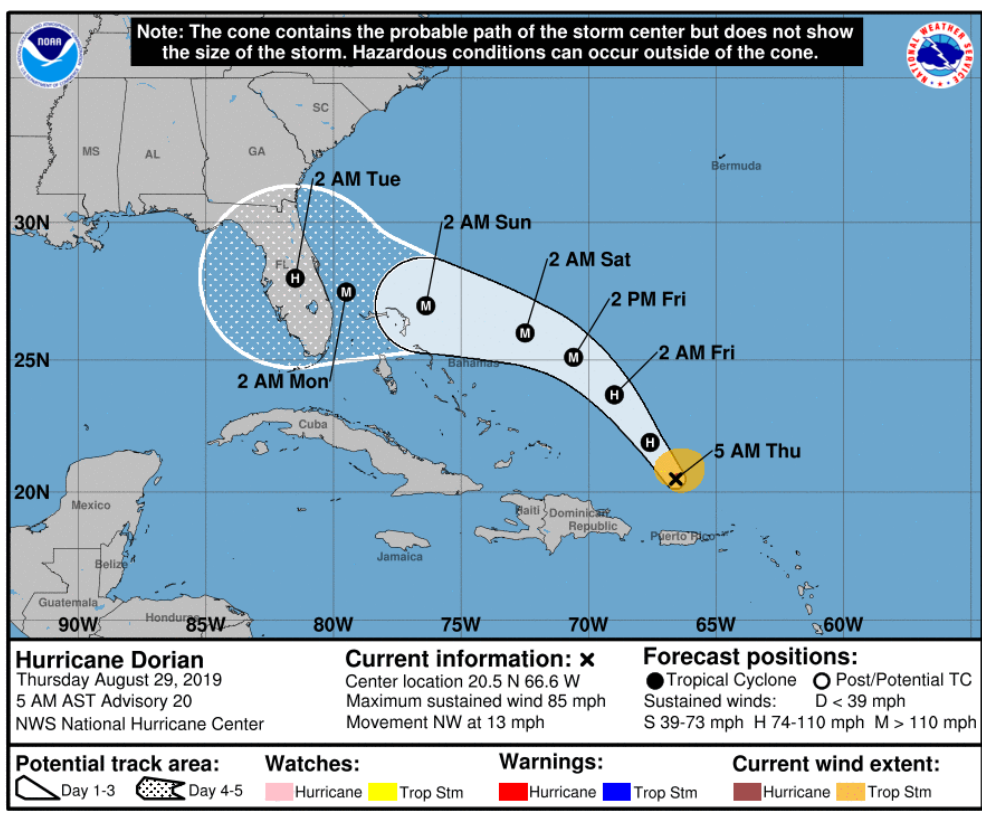
Hurricane Research Division/ NOAA/ OAR/ AOML/ HRD

Presented to NOAA Eastern Region Climate Services: 29 August 2019





# Predicted Path of Hurricane Dorian



Rush Hurricane Preparedness Plans to Completion





## Preparedness

Water/ food for several days  
Batteries  
Flashlights, radio  
Medications  
Kids and Pets needs  
Cash

### Evacuation Zone:

Know where you will go  
Medications  
Important Documents  
Clothing  
Hygiene Items  
Gas for car



## Web Links

### Atlantic Hurricane Outlook

#### Outlook press release

<https://www.noaa.gov/media-release/noaa-increases-chance-for-above-normal-hurricane-season>

#### Outlook technical write-up and analyses

[www.cpc.ncep.noaa.gov/products/hurricane](http://www.cpc.ncep.noaa.gov/products/hurricane)

### El Niño/ La Niña

#### Weekly update of tropical Pacific conditions:

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/lanina/enso\\_evolution-status-fcsts-web.pdf](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf)

#### Tutorial (Technical):

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/ensocycle/enso\\_cycle.shtml](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensocycle/enso_cycle.shtml)

#### Monthly Discussion/ Forecast

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/)



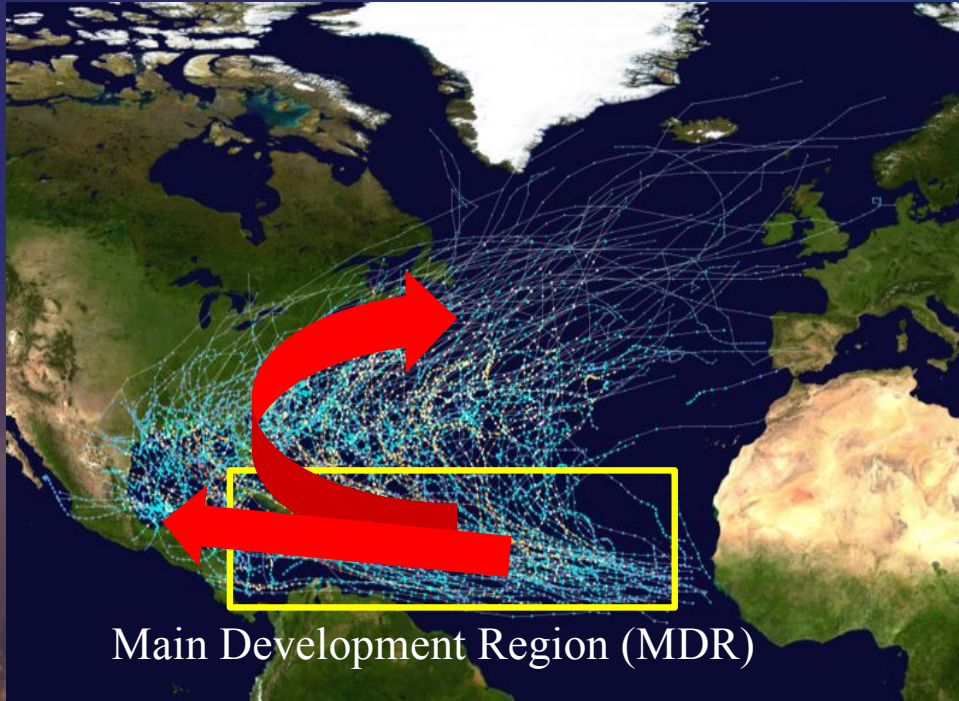
## Outline

1. Historical Atlantic storm tracks and counts
2. Updated 2019 Atlantic hurricane season outlook
3. Factors behind the updated outlook
4. Hurricane landfalls and preparedness
5. Summary



# Historical Atlantic Storm Tracks

## Atlantic Basin Storm Tracks 1980-2005



Main Development Region (MDR)

Figure Courtesy of Wikipedia

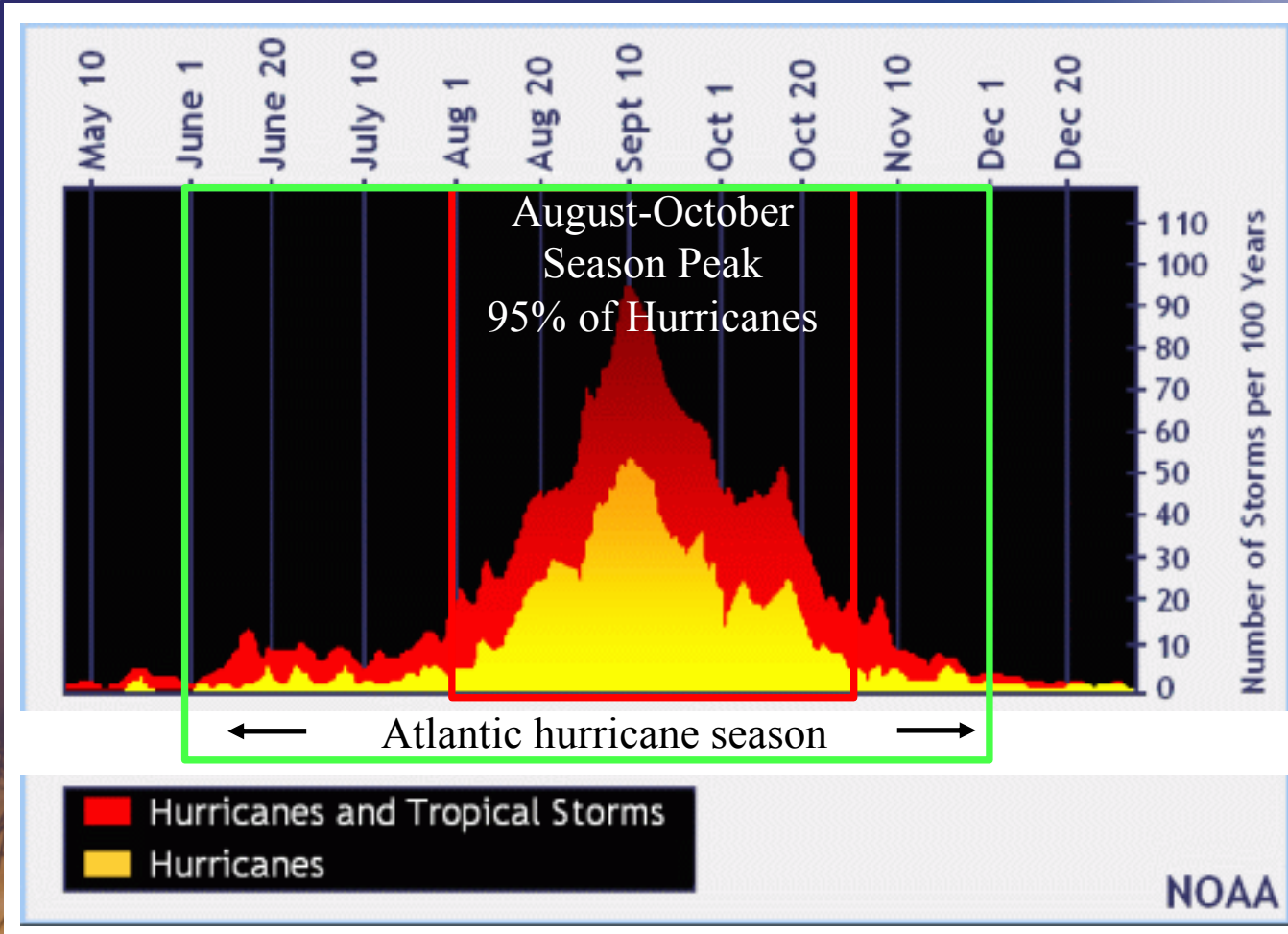
The activity in the Main Development Region (MDR) determines the strength of the hurricane season.

NOAA's seasonal outlooks are based on predicting conditions within the MDR.

During above-normal seasons, storms typically have longer westward storm tracks, which means an increased threat of landfall.



## Historical Atlantic Storm Counts



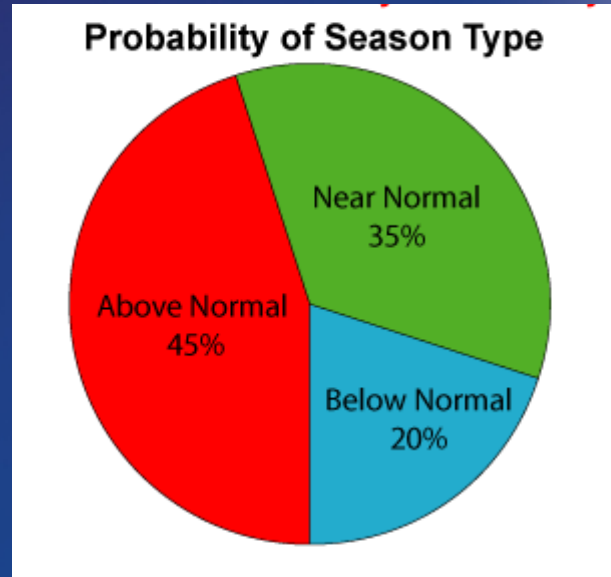
**Average Season:**  
12 Named Storms  
6 Hurricanes  
2-3 Major Hurricanes

NOAA updates its Atlantic hurricane season outlook in early August, to coincide with peak months (August-October) of the hurricane season.



# NOAA's Updated 2019 Atlantic Hurricane Season Outlook

Forecasters increase Atlantic hurricane season prediction



A near-normal or above-normal Atlantic hurricane season is likely.

*Outlook is for the overall seasonal activity. It is not a landfall forecast.*

Activity	August 2019 Outlook	May 2019 Outlook
Named Storms	10-17	9-15
Hurricanes	5-9	4-8
Major Hurricanes	2-4	2-4





# 2019 Atlantic Tropical Cyclone Names \*

~~Andrea~~  
~~Barry~~  
~~Chantal~~  
~~Dorian~~  
~~Erin~~  
Fernand  
Gabrielle

Humberto  
Imelda  
Jerry  
Karen  
Lorenzo  
Melissa  
Nestor

Olga  
Pablo  
Rebekah  
Sebastien  
Tanya  
Van  
Wendy

\*Names selected by the World Meteorological Organization

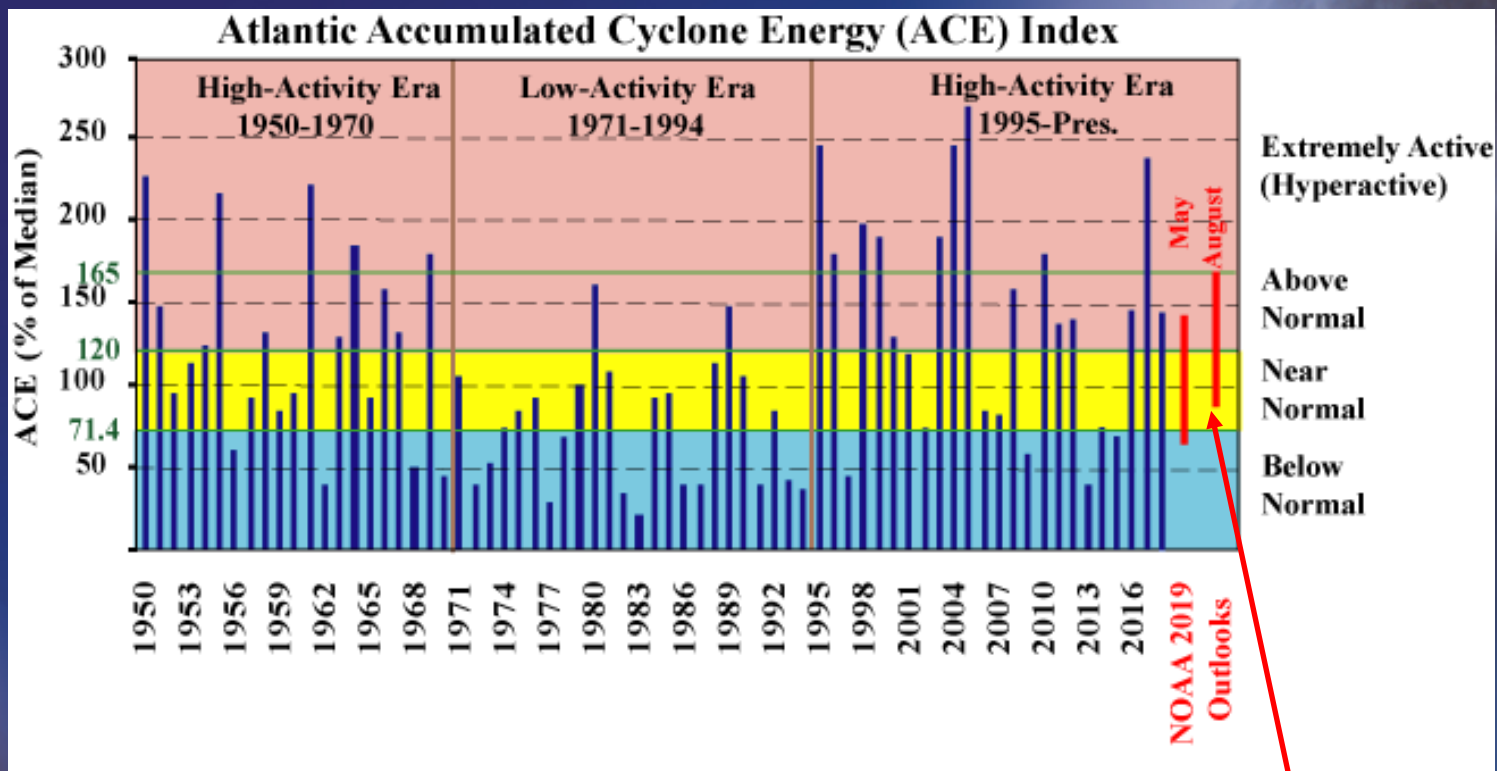
Be prepared: Visit [hurricanes.gov](http://hurricanes.gov) and follow @NWS and @NHC\_Atlantic on Twitter.

August 8, 2019

- 10-17 Named Storms Predicted (Jerry through Rebekah)
- Already had 5 storms to date. Still have a long way to go with this hurricane season.



## The 2019 Atlantic Outlook in a Historical Perspective



70% probability of ACE range 85% - 165% of the median.

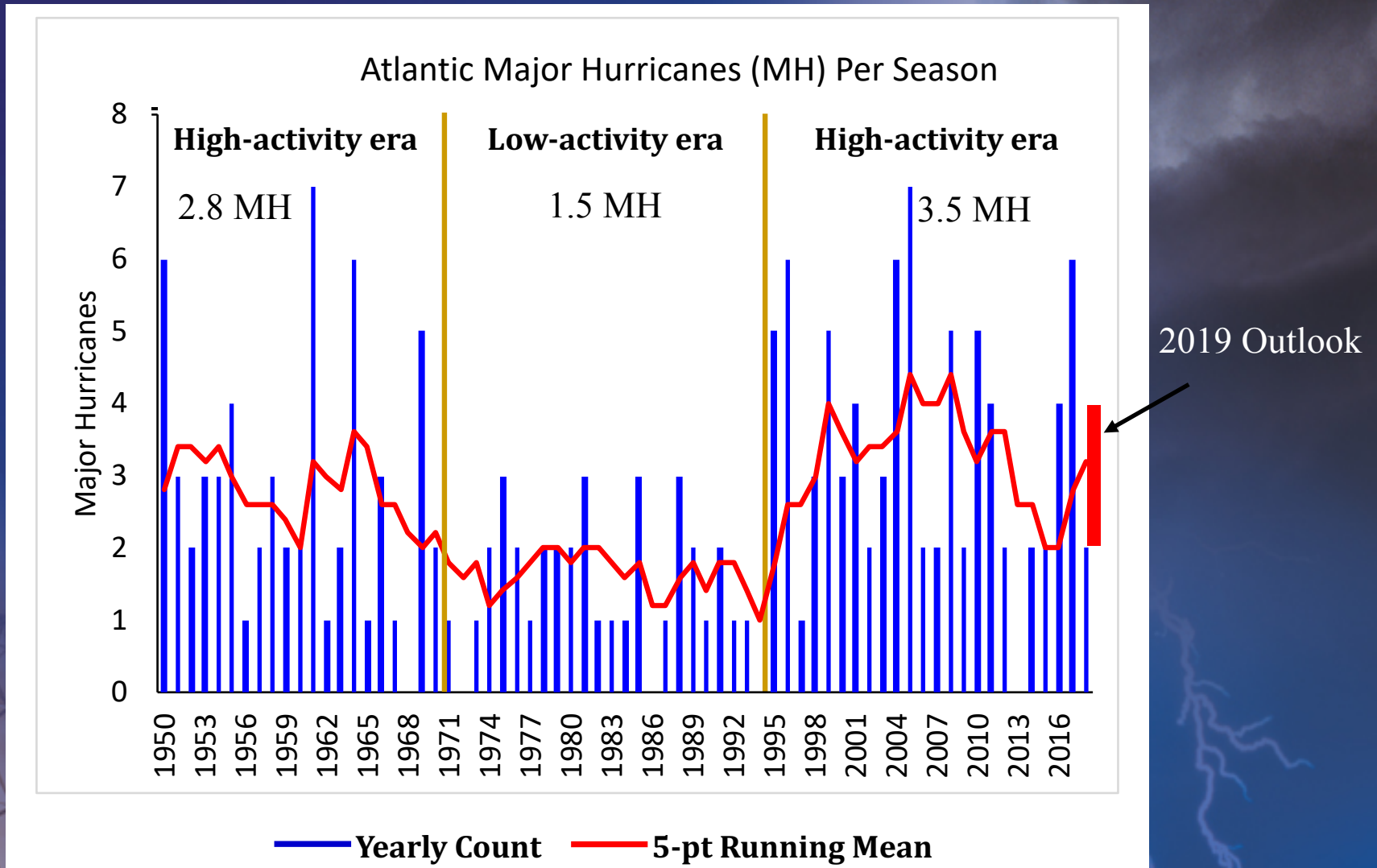
Ongoing conditions associated with the high-activity era favor a more active season for 2019.

High- and low activity eras typically last about 25-40 years. The current high-activity era for Atlantic hurricanes began in 1995.



# The 2019 Outlook in a Historical Perspective

## Major Hurricanes



Much of the year-to-year and decade-to-decade variability is not random.



# Factors Behind the 2019 Hurricane Outlook





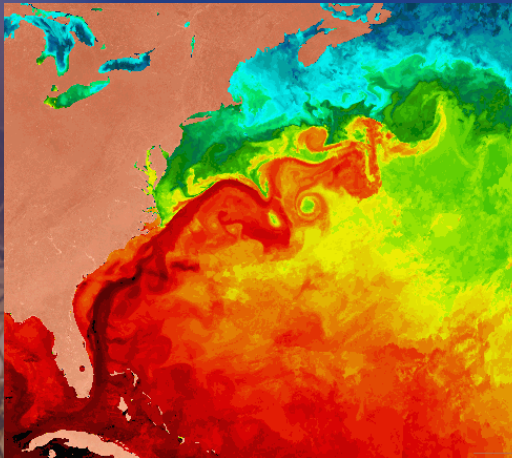
## Underlying Concept behind Seasonal Hurricane Outlook

Hurricanes are ultimately a weather phenomena. **However**, seasonal hurricane activity is generally not random.

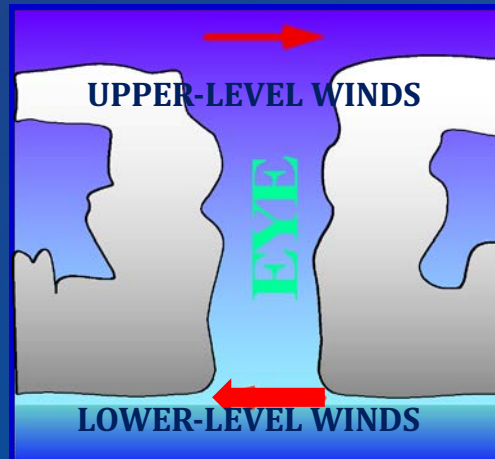
The regional conditions within the MDR (which largely control the number, strength, and duration of hurricanes) are often inter-related, often last for months or seasons, and often have strong climate links.

### Some Regional Conditions That Influence Hurricanes

Atlantic and Pacific Ocean Temperatures



Wind Shear



African Easterly Waves  
Pre-Existing “Trigger”



By predicting the key climate patterns and their combined impacts, we can often predict the strength of the hurricane season.

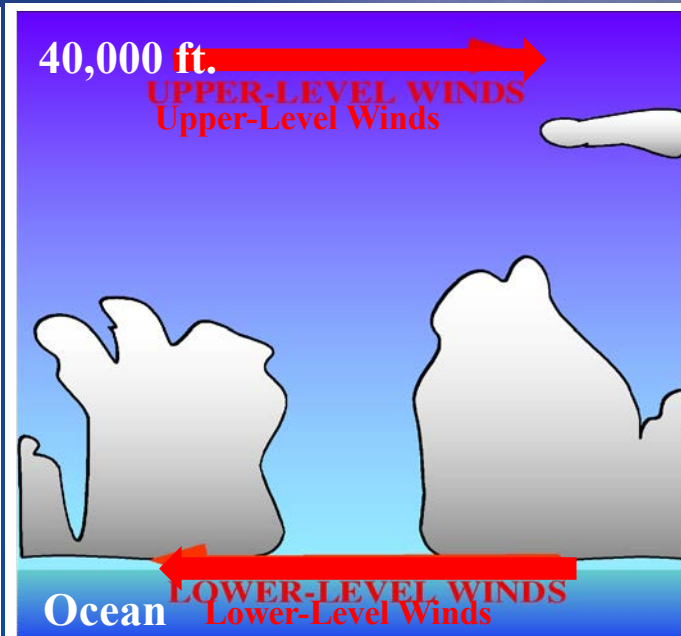
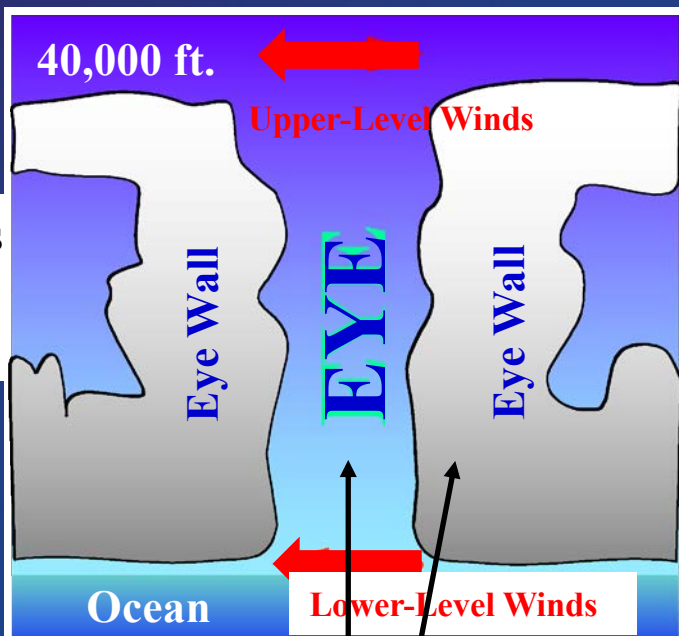


# Hurricanes Require Weak Vertical Wind Shear

Vertical wind shear refers to the change in wind speed and direction going up through the atmosphere.

Hurricanes need weak shear-  
little change in winds.

Hurricanes destroyed by strong  
shear-large change in winds



Looking sideways  
through storm  
clouds



Looking down  
on storm clouds

Lower clouds  
and  
circulation

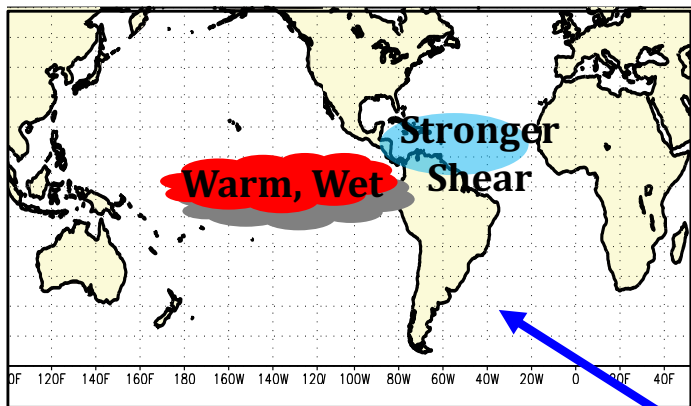
Upper clouds



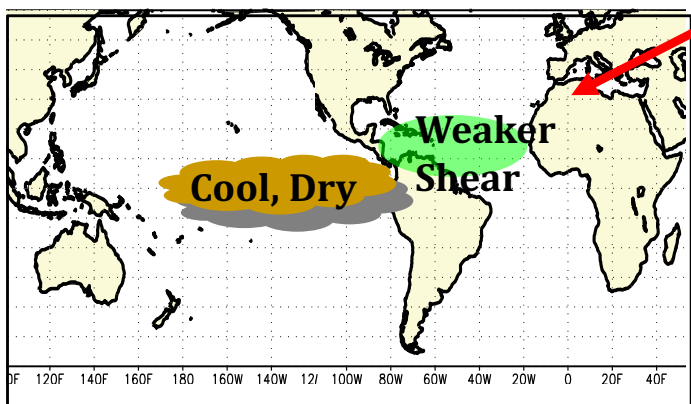
# These Climate Patterns Strongly Influence Atlantic Hurricane Season

El Niño/ La Niña: Year-to-year changes in Atlantic hurricanes

## El Niño: Fewer Hurricanes



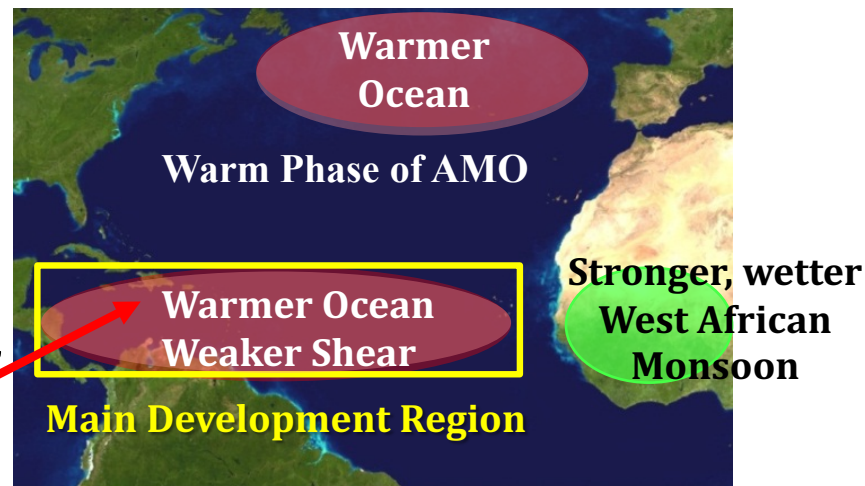
## La Niña: More Hurricanes



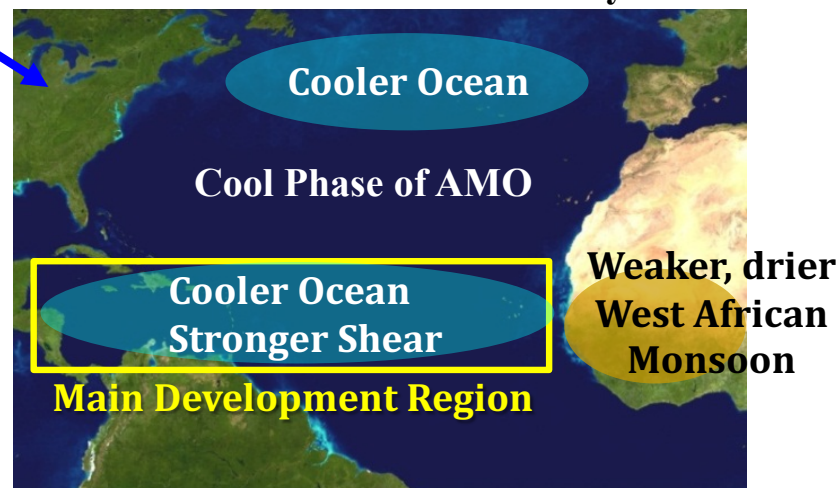
Predicting these climate patterns and their combined impacts is the basis for making NOAA's seasonal hurricane outlook.

Atlantic Multi-Decadal Oscillation (AMO): Multi-decadal cycles in Atlantic hurricanes

## Climate Pattern for High-Activity Era



## Climate Pattern for Low-Activity Era





## Four Reasons Why the Season Could Be More Active

1. El Niño dissipated during July----- In May, forecasters predicted a 60% chance of El Niño during August-October.
2. Reduced duration and strength of El Niño's lingering, suppressing impacts (vertical wind shear and sinking motion) are now predicted.
3. Conducive conditions have developed across the eastern tropical Atlantic and western Africa, as predicted in May--Associated with ongoing high-activity era.
4. Model guidance now predicts more activity than it did in May.

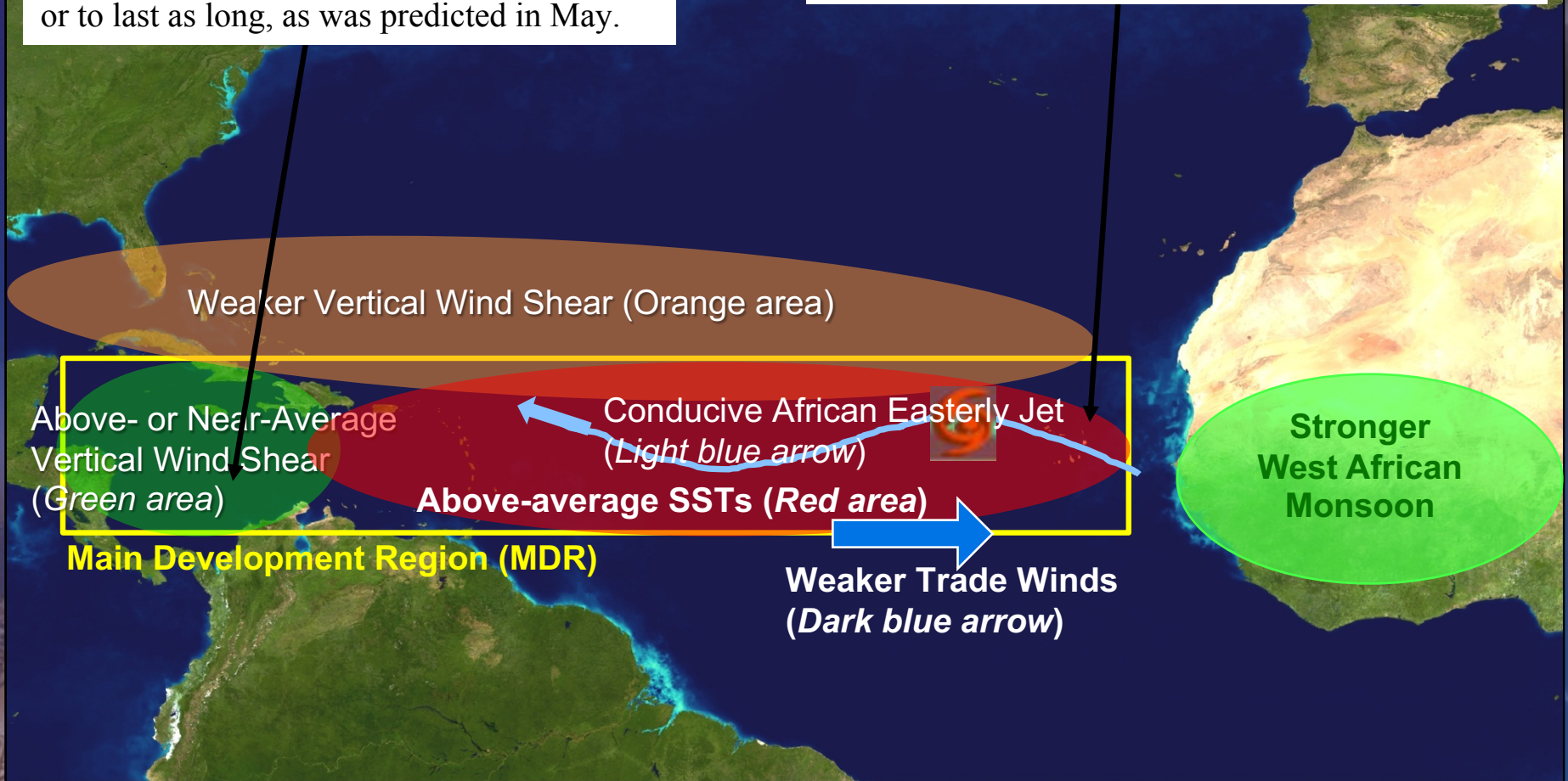




# Expected Conditions During the Peak Months (August-October) of the 2019 Atlantic Hurricane Season

Lingering enhanced wind shear associated with El Niño is not expected to be as strong, or to last as long, as was predicted in May.

In eastern MDR and Africa, high-activity era conditions favor enhanced hurricane activity.





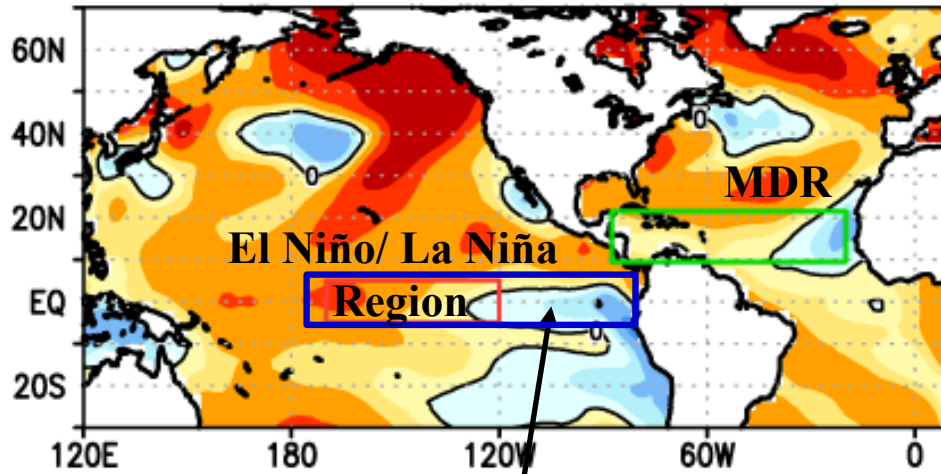
# ENSO Evolution and Forecasts



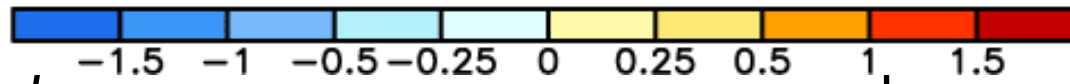
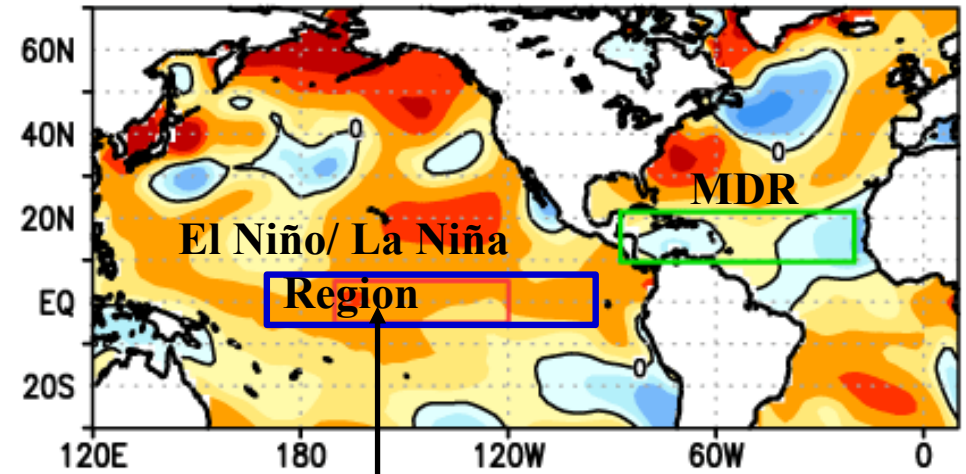


## Recent Sea Surface Temperature Anomalies (°C)

July 2019



May 2019



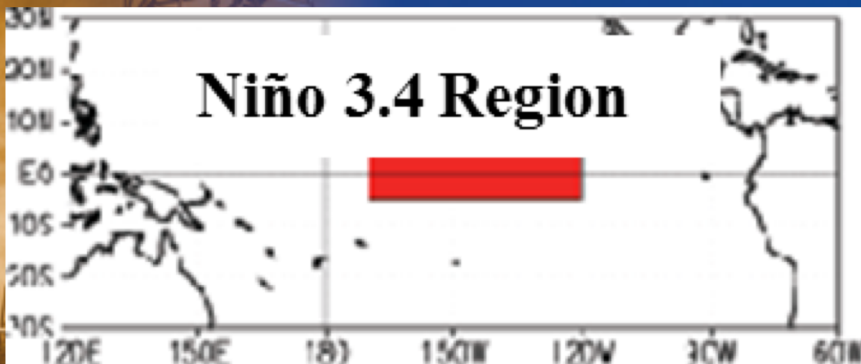
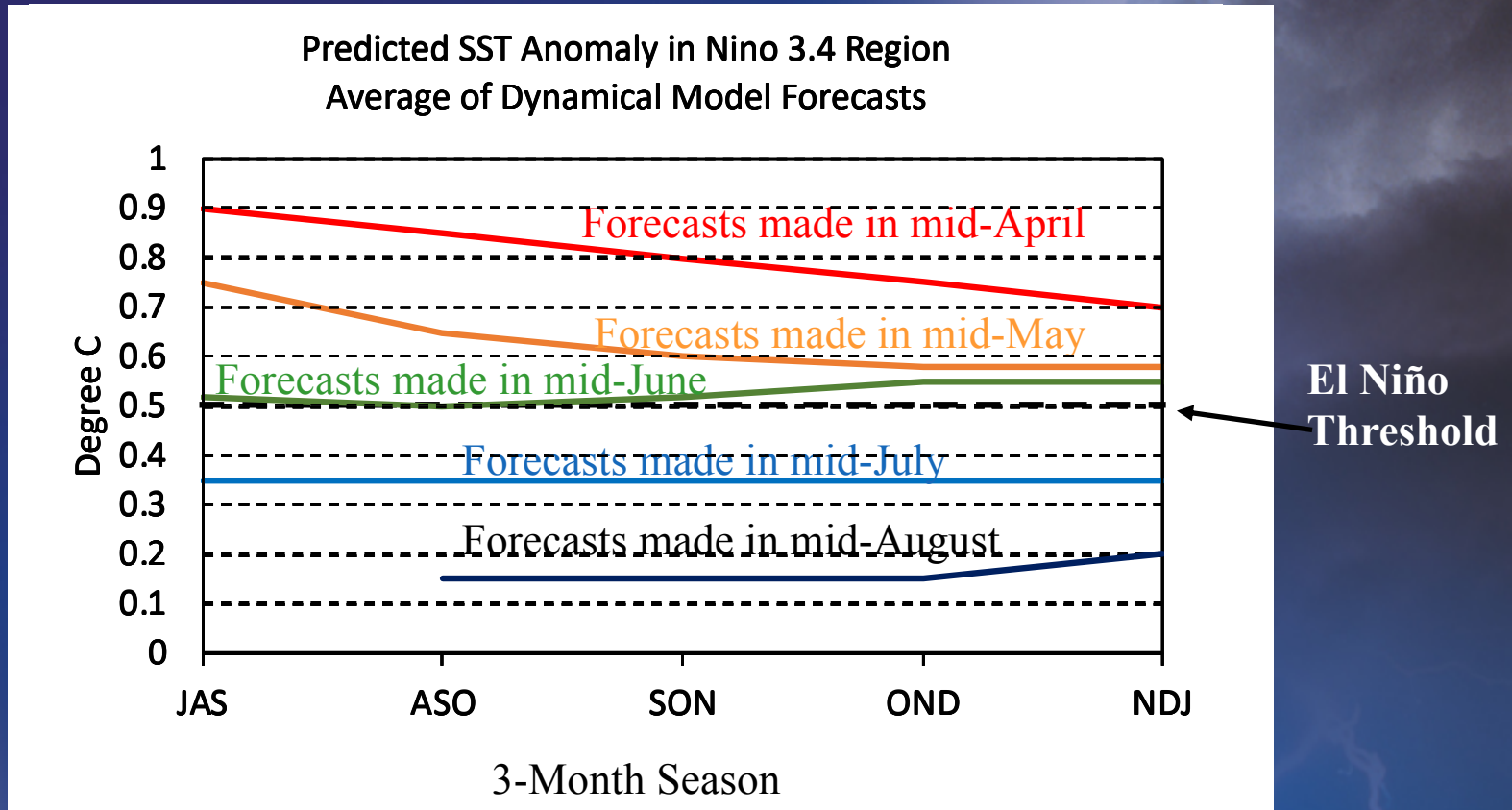
- El Niño dissipated during July
- Currently no El Niño or La Niña.

El Niño

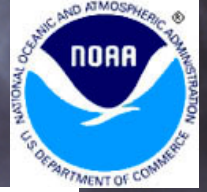




# Dynamical Model SST Anomaly Forecasts: Niño-3.4 Region

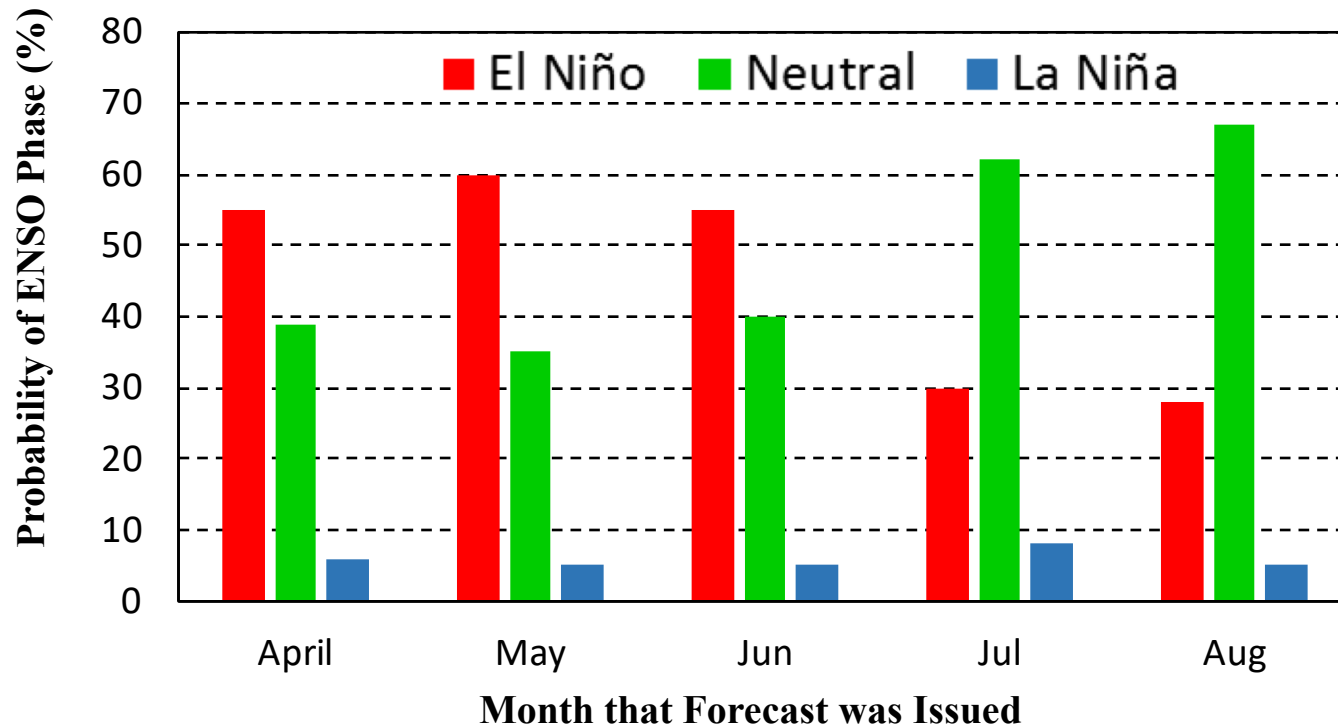


Model predictions from April, May, and June failed to predict the summertime dissipation of El Niño.



## CPC/ IRI ENSO Probability Forecasts for Aug-Oct

CPC probability Forecast for ASO



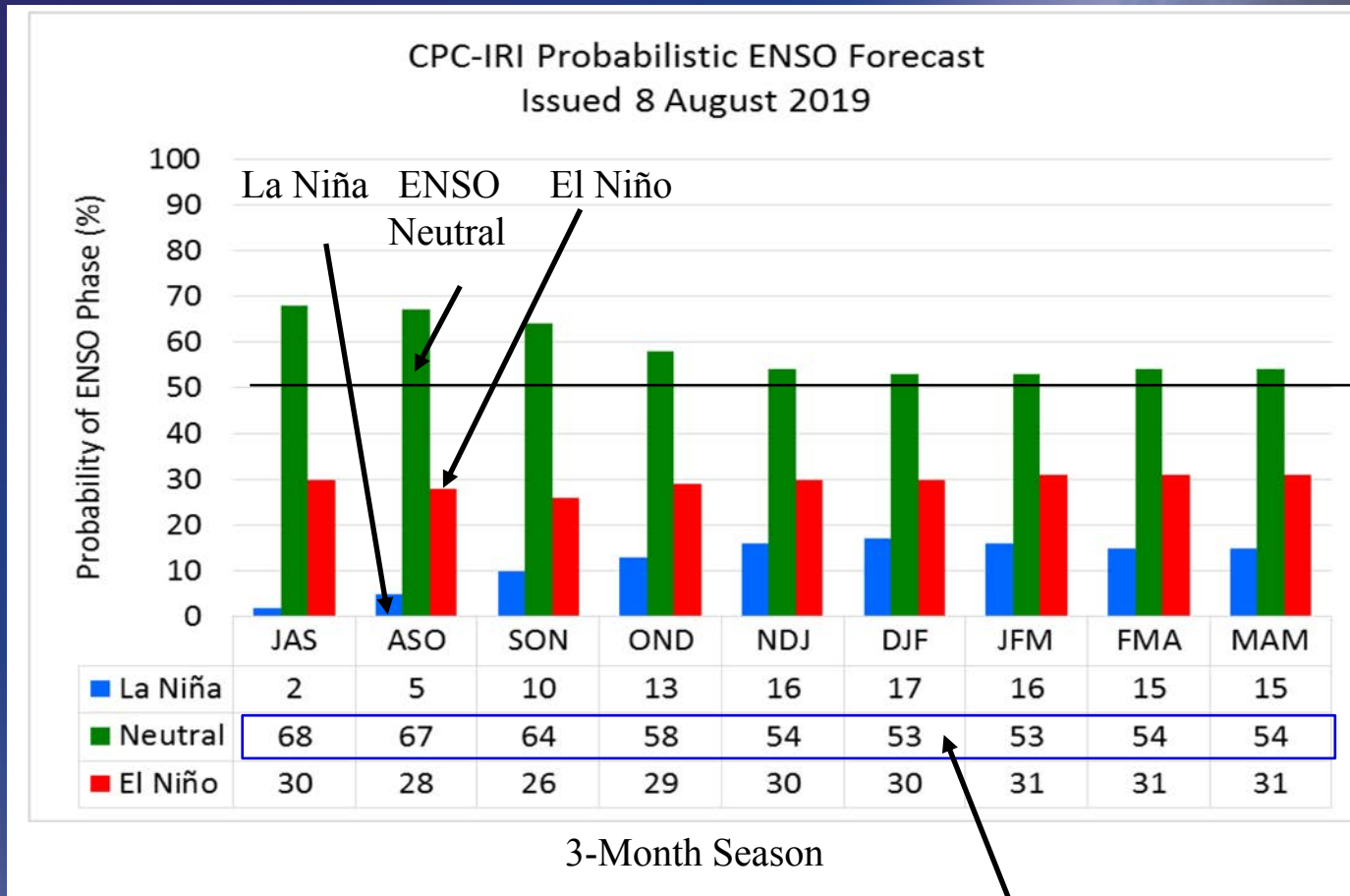
The CPC/ IRI forecast now indicates about a 65% chance of ENSO neutral during ASO 2019, whereas in May and June the forecast was for a 55%-60% chance of El Niño.

The unpredicted dissipation of El Niño is a main reason why the hurricane outlook ranges were raised.



# CPC/ IRI ENSO Probability Forecast

Forecast Issued August 8<sup>th</sup>



Latest forecast predicts about a 50-55% chance of ENSO-neutral through remainder of year.

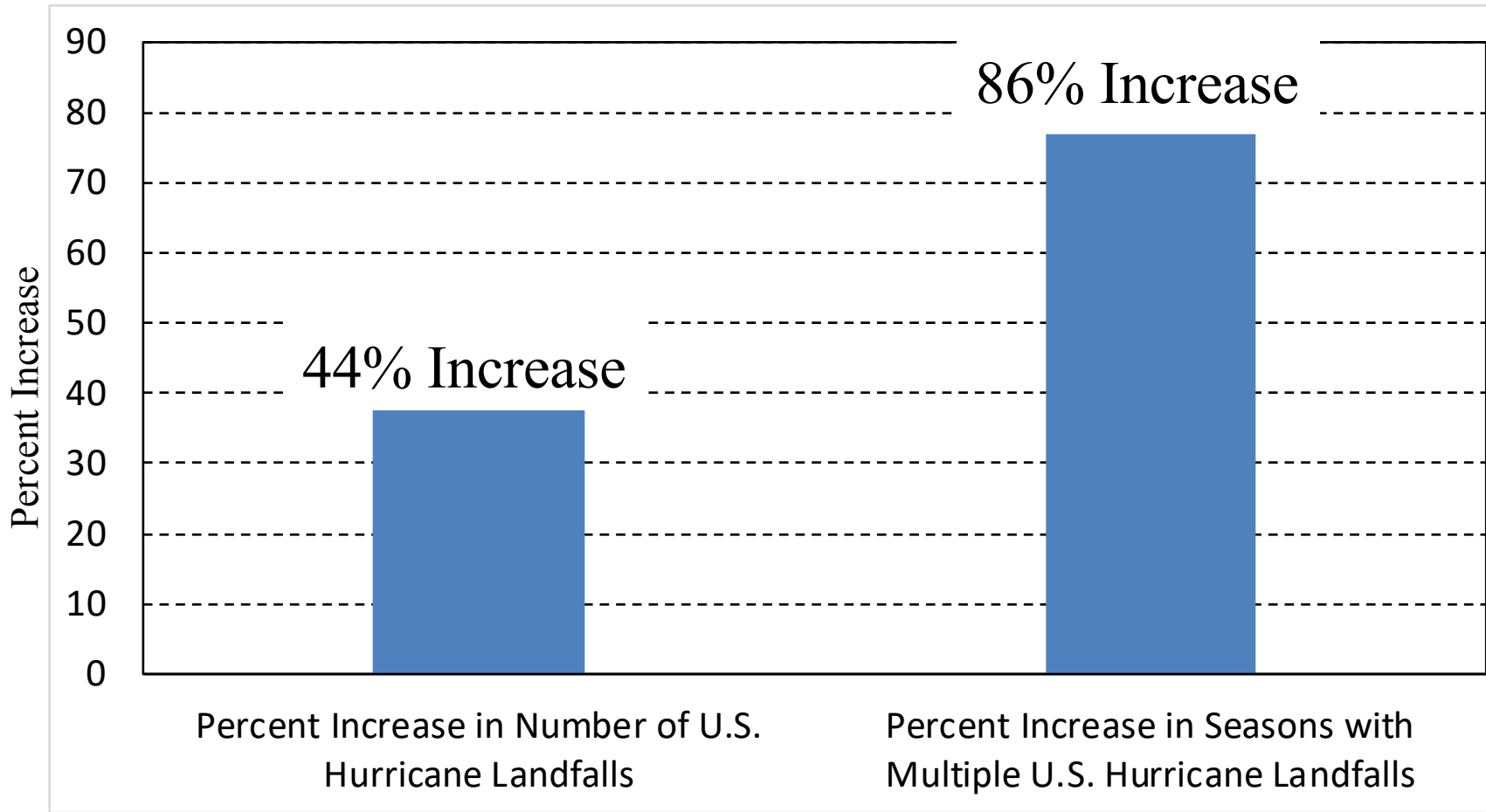


# Hurricane Landfalls, Preparedness and Planning





# The U.S. Sees More Landfalling Hurricanes During High-Activity Eras

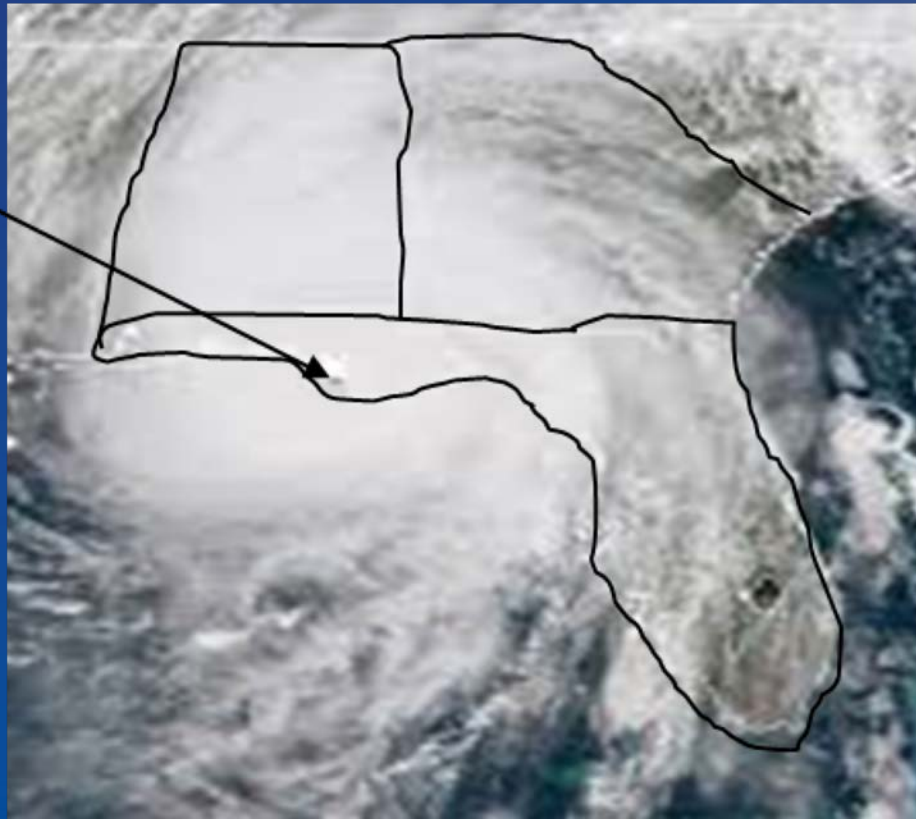






## Did you know?

**80+ million people are Atlantic or Gulf Coast residents that can be impacted by a tropical storm or hurricane.**





**Remember...  
*It Only Takes One!***

***Be Ready! Take Action!***

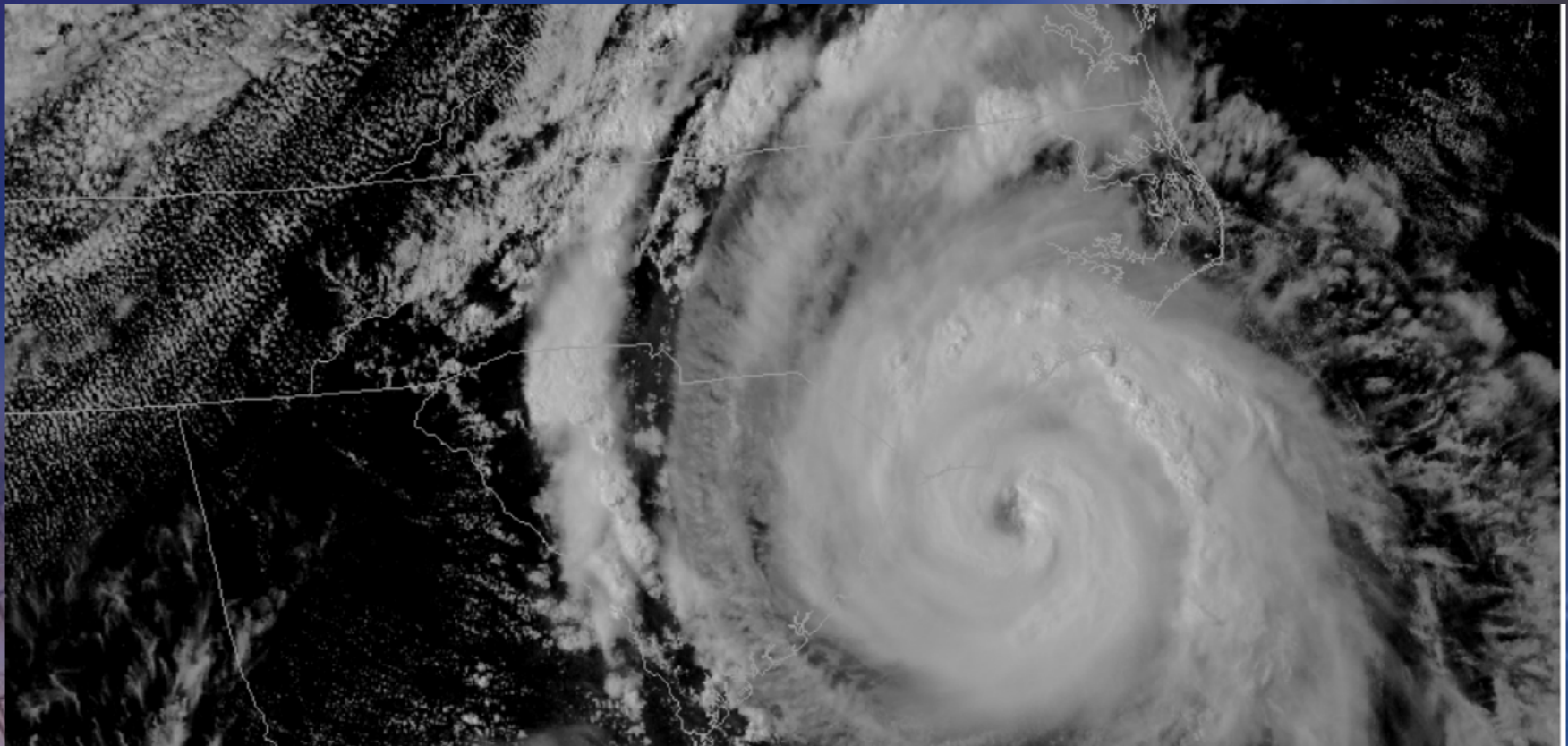
**Prepare for every hurricane season  
regardless of seasonal outlook**





**Great web sites for  
hurricane preparedness**

**Ready.gov**  
**Hurricanes.gov**



**You are your first line of defense if a hurricane strikes**



*Hurricanes are NOT just a coastal event.*

*Your hurricane preparedness plans must reflect both **your personal situation** and the **storm conditions you might expect.***



BOLIVAR PENINSULA IN TEXAS AFTER HURRICANE IKE (2008)

**Storm surge**



**Inland flooding**

**Devastating Winds**



**Tornadoes**

**Rip Currents**

**Downed Trees and Power Lines**



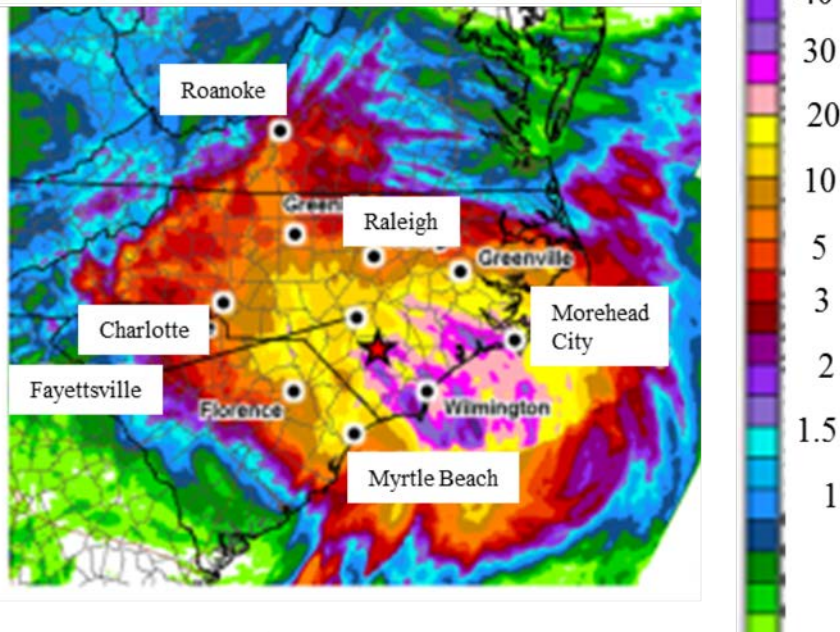
# U.S. Landfalling Hurricanes Last Year

Hurricanes Florence and Michael  
Caused \$50+ Billion in Damage, 100+ lives lost

Each had different characteristics and impacts.

## Hurricane Florence

Total Rainfall (inches): Sep. 13-17



Massive inland flooding.

Typical of a slow-moving tropical storm or a hurricane with long overland track.

## Hurricane Michael (160 mph winds)



Significant coastal impacts: Storm surge, sometimes complete destruction.

Pre-storm preparedness and evacuations saved un-tolled number of lives



## Summary

- We are now in the peak three months (August-October) of the Atlantic hurricane season.
  - Increased likelihood of above-normal activity, with 10-17 named storms, 5-9 hurricanes, 2-4 major hurricanes, and an ACE range of 85%-165% of the median.
  - The main reason for the change from May outlook is that El Niño has dissipated, and its suppressing influence is expected to be weaker and less extensive---ENSO forecasts issued in spring tend to have little skill.
- 
- High-activity era for Atlantic hurricanes continues—more hurricanes and more landfalling hurricanes
  - Coastlines continue to build up—80+ million people have the potential to be impacted by a tropical storm or hurricane.

**Remember...**  
**It Only Takes One!**  
***Be Ready! Take Action!***