NOAA's 2017 Hurricane Season Outlooks

By

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Outlooks made in collaboration with:
National Hurricane Center
Hurricane Research Division
Central Pacific Hurricane Center

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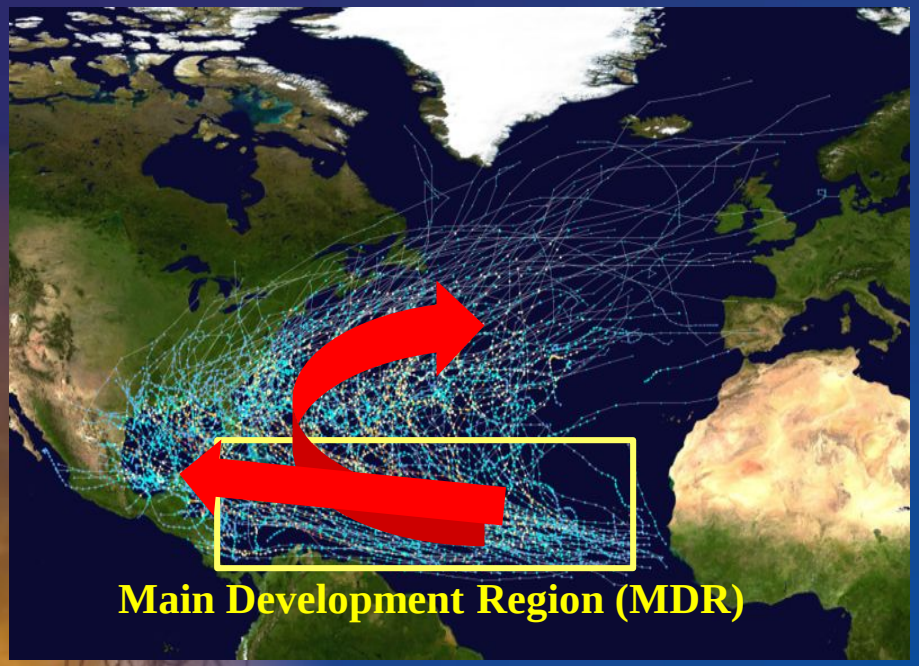
Outline

1. Prediction Regions
2. 2017 Outlooks for the Atlantic, eastern Pacific, and central Pacific
3. The 2017 Atlantic outlook in a historical perspective
4. Hurricane strikes and preparedness
5. Summary

NOAA's Hurricane Outlook Regions

Atlantic Basin
Storm Tracks 1980-2005



Central and Eastern North Pacific
Storm Tracks 1980-2005

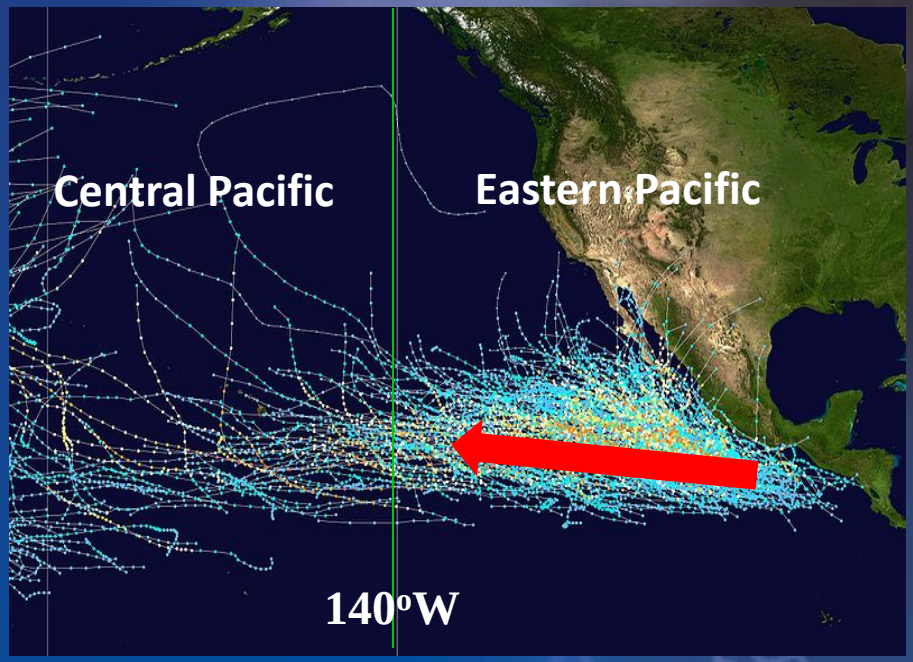
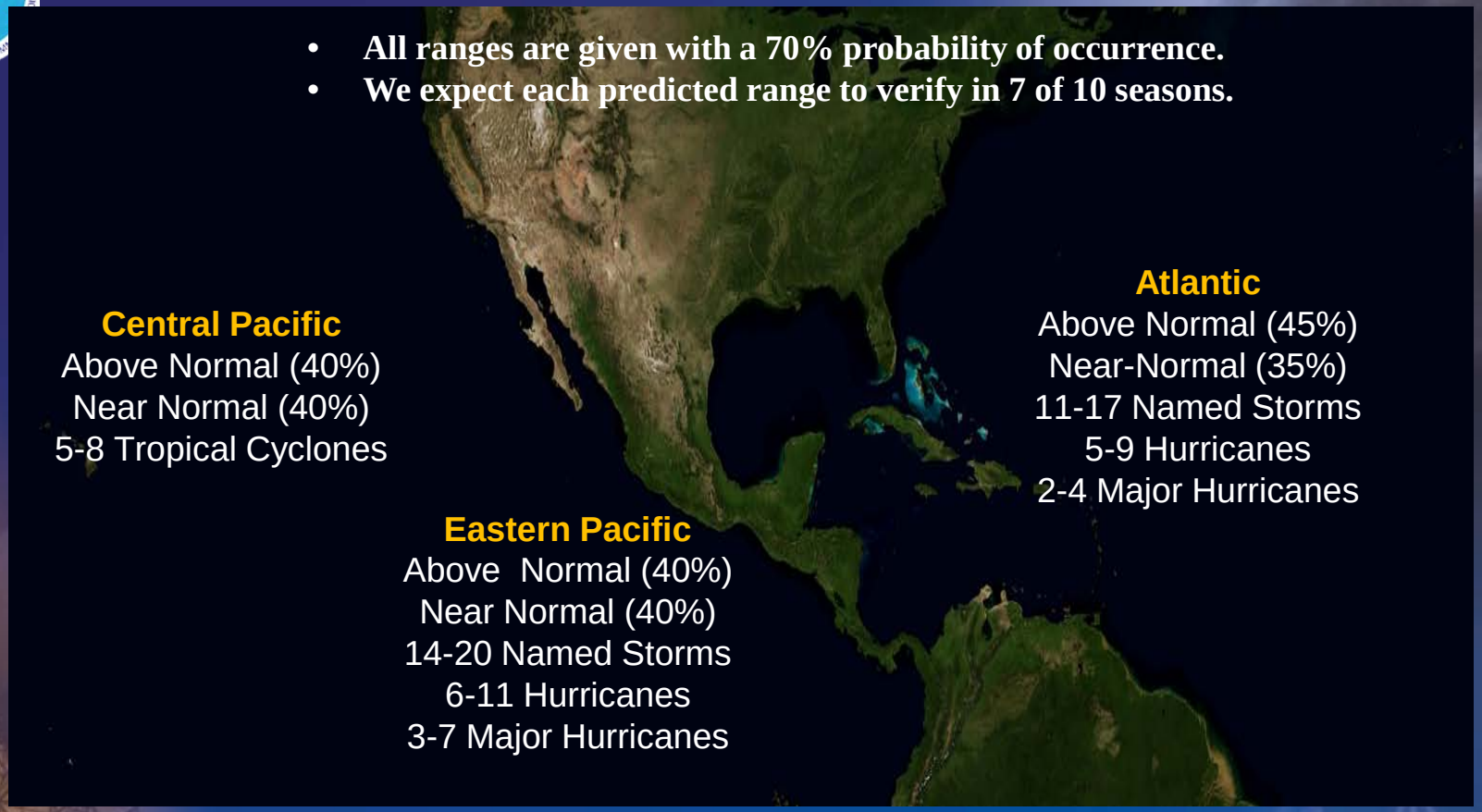


Figure Courtesy of Wikipedia

NOAA issues seasonal hurricane outlooks for the Atlantic basin, the central North Pacific, and the eastern North Pacific.

NOAA's 2017 Hurricane Season Outlooks

- **All ranges are given with a 70% probability of occurrence.**
- **We expect each predicted range to verify in 7 of 10 seasons.**



Central Pacific
Above Normal (40%)
Near Normal (40%)
5-8 Tropical Cyclones

Eastern Pacific
Above Normal (40%)
Near Normal (40%)
14-20 Named Storms
6-11 Hurricanes
3-7 Major Hurricanes

Atlantic
Above Normal (45%)
Near-Normal (35%)
11-17 Named Storms
5-9 Hurricanes
2-4 Major Hurricanes

Near- or above-normal seasons are predicted for all three regions. This is a lot of activity.

Note: Outlooks are NOT a seasonal hurricane landfall prediction, do not imply levels of activity for any particular location.

NOAA's 2017 Hurricane Season Outlooks

For all three hurricane basins, the 2017 outlooks reflect predictions for:

1. Weak El Niño or ENSO-Neutral (No El Niño or La Niña)
2. Near- or above-average ocean temperatures
3. Average or weaker-than-average vertical wind shear

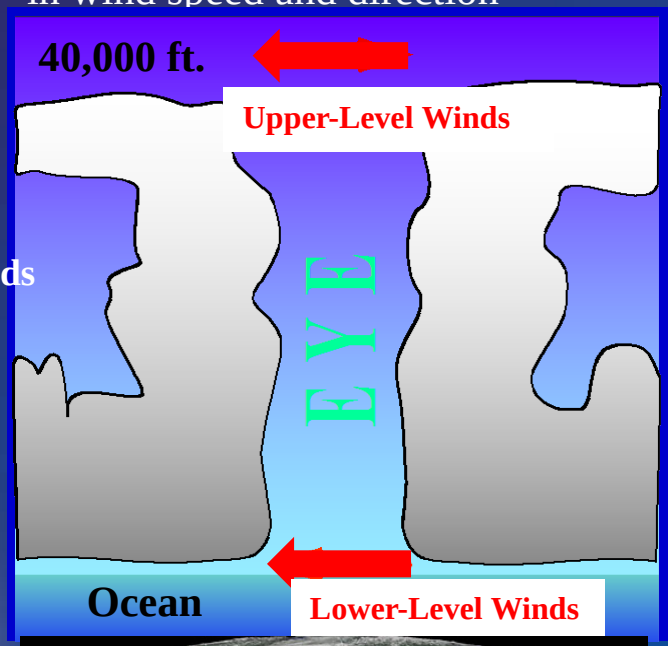
Vertical Wind Shear

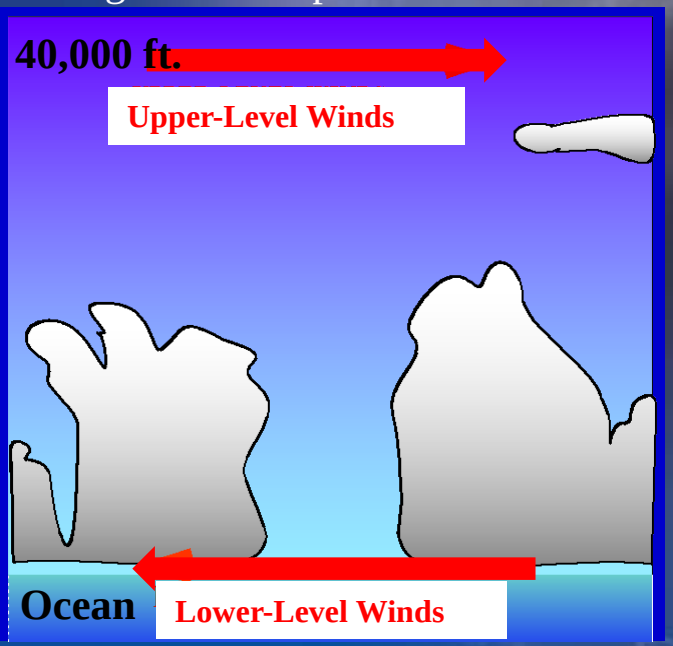
Vertical wind shear refers to the change in wind speed and direction going up through the atmosphere.

Weak Shear- Favorable- little change in wind speed and direction

Strong Shear- Unfavorable- large change in wind speed and direction

Looking sideways through storm clouds



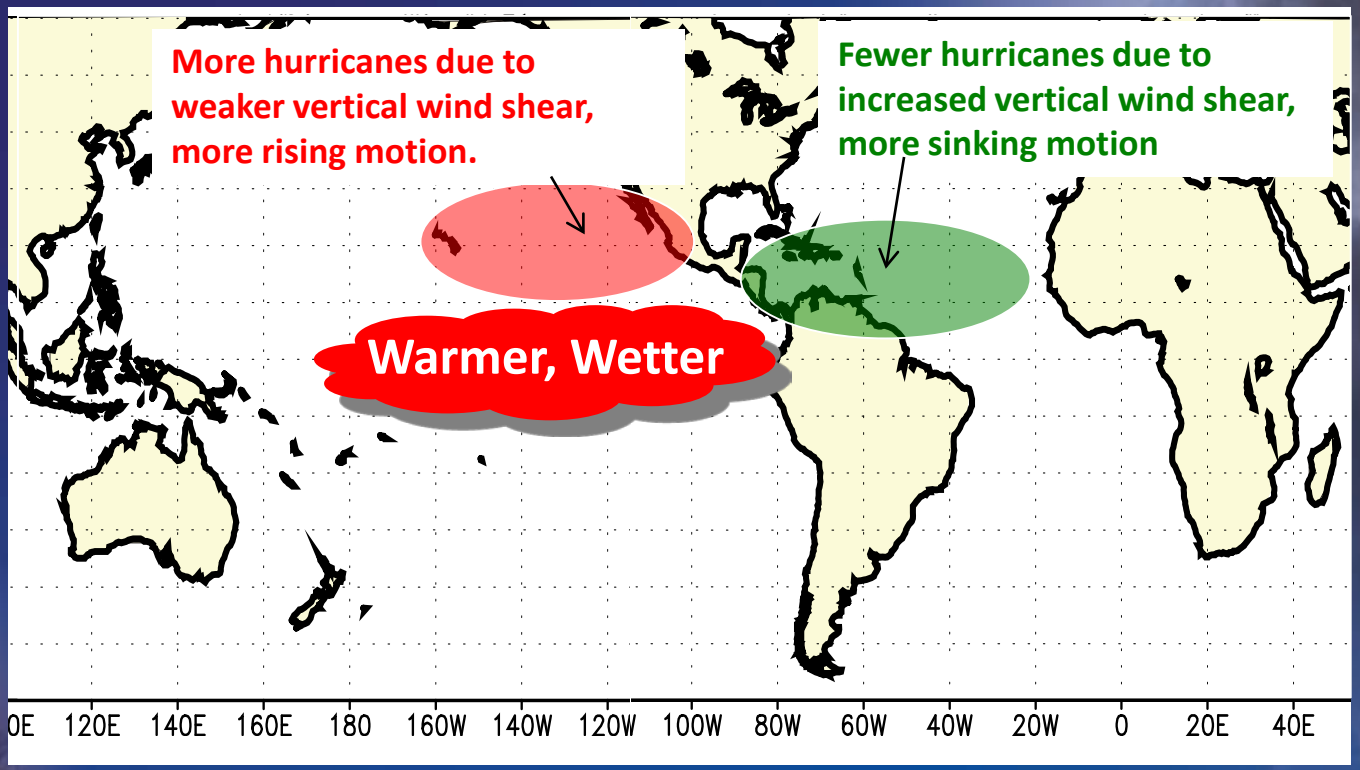


Looking down on storm clouds

Lower clouds and circulation

Upper clouds

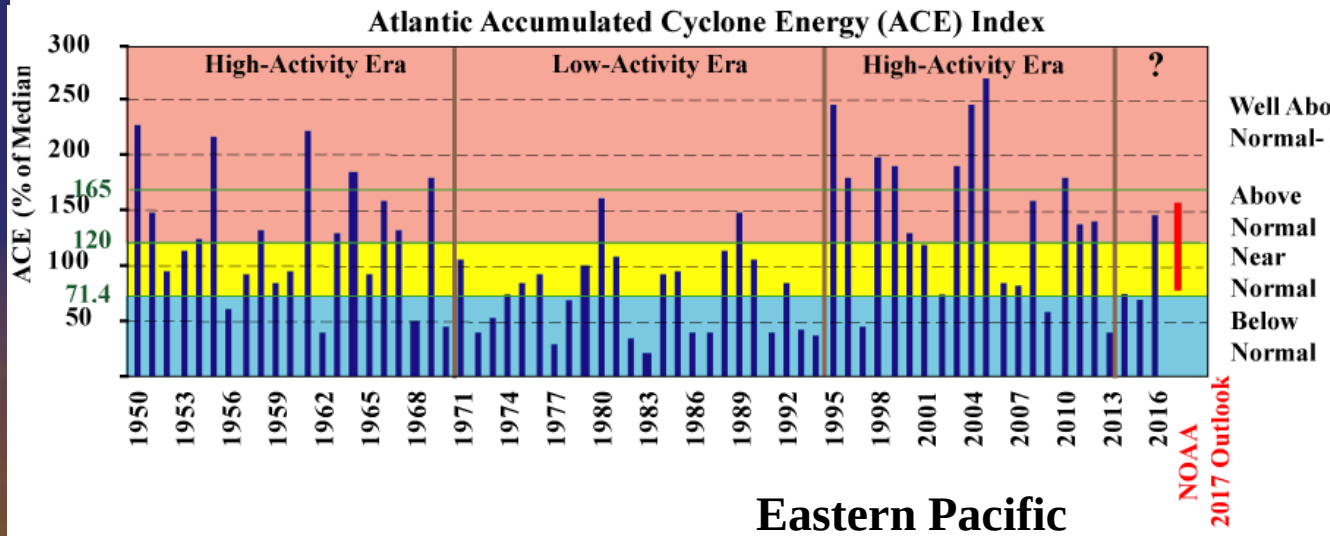
El Niño Impacts on Hurricane Activity



- El Niño has opposite impacts between the Pacific and Atlantic hurricane basins.
- Not sure if El Niño will develop and affect the hurricane seasons.

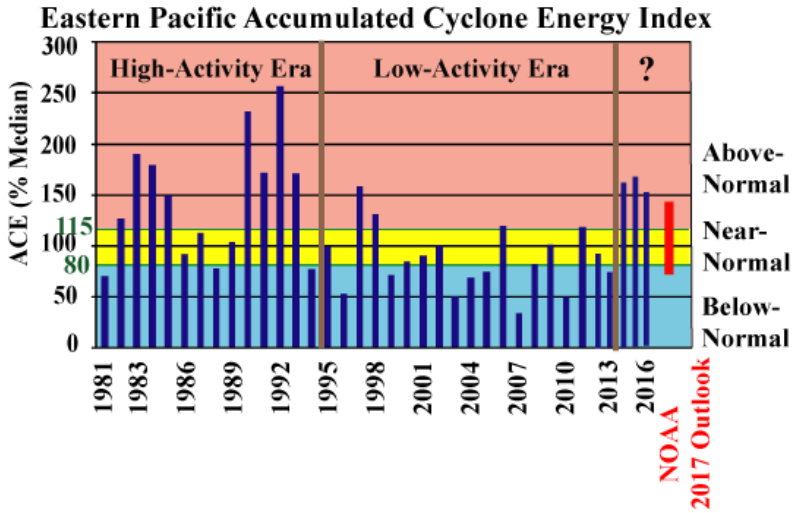
The 2017 Outlooks in a Historical Perspective

Atlantic Basin



Not sure if the high- activity era for Atlantic hurricanes has ended.

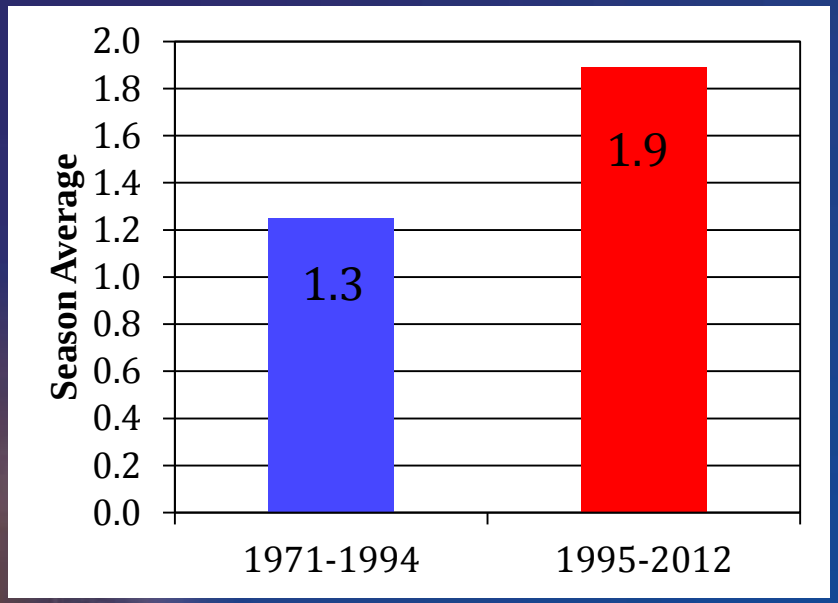
Eastern Pacific



The eastern (and central) Pacific may have shifted into high-activity eras.

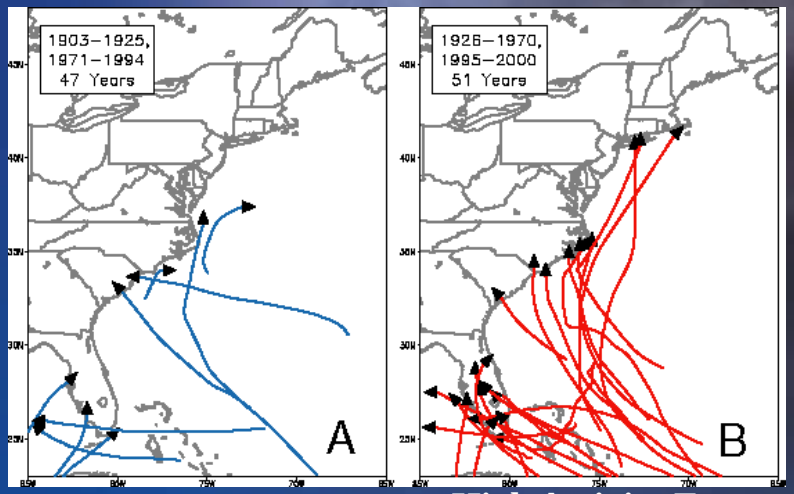
U.S. Hurricane Landfalls During High- and Low-Activity Eras

U.S. Hurricane Landfalls



Since 1995 the U.S. has averaged almost two hurricane landfalls per season, nearly a 50% increase from 1971-1994.

Atlantic Coast Major Hurricanes



Low Activity Eras

High Activity Eras (thru 2000)

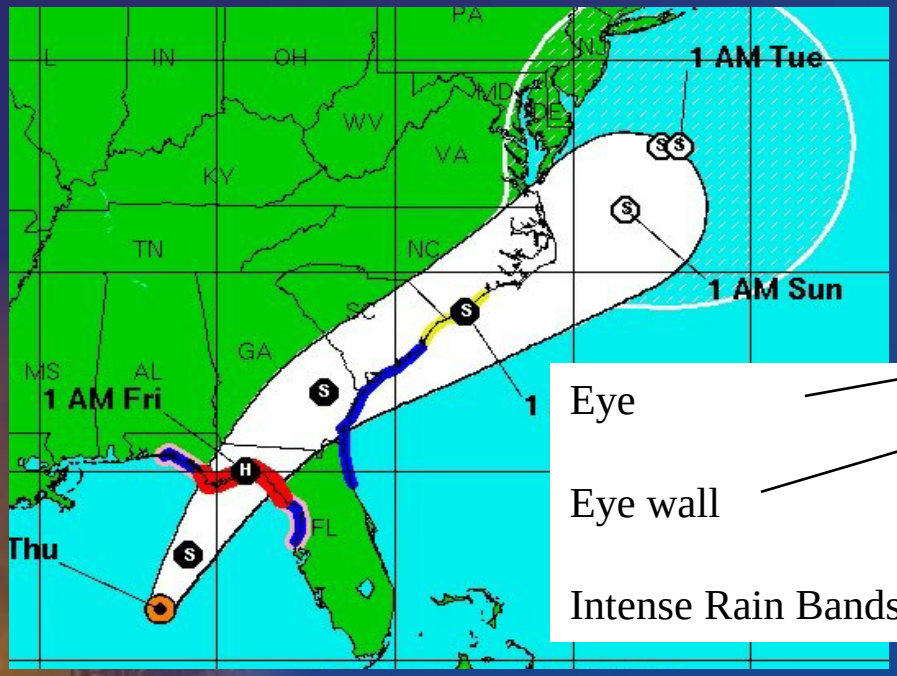
The Atlantic Coast (and Gulf Coast) have far more landfalling major hurricanes during a high-activity era (Right). (Gray et al.)

Last year's above normal Atlantic hurricane season produced

- 5 U.S. landfalling storms: Most since 2008.
- Tropical Storm (TS) Bonnie and H Matthew struck South Carolina.
- TS Colin, TS Julia, and H Hermine made landfall in Florida.

Hurricane Hermine: Last Year

National Hurricane Center:
Hurricane Hermine Forecast



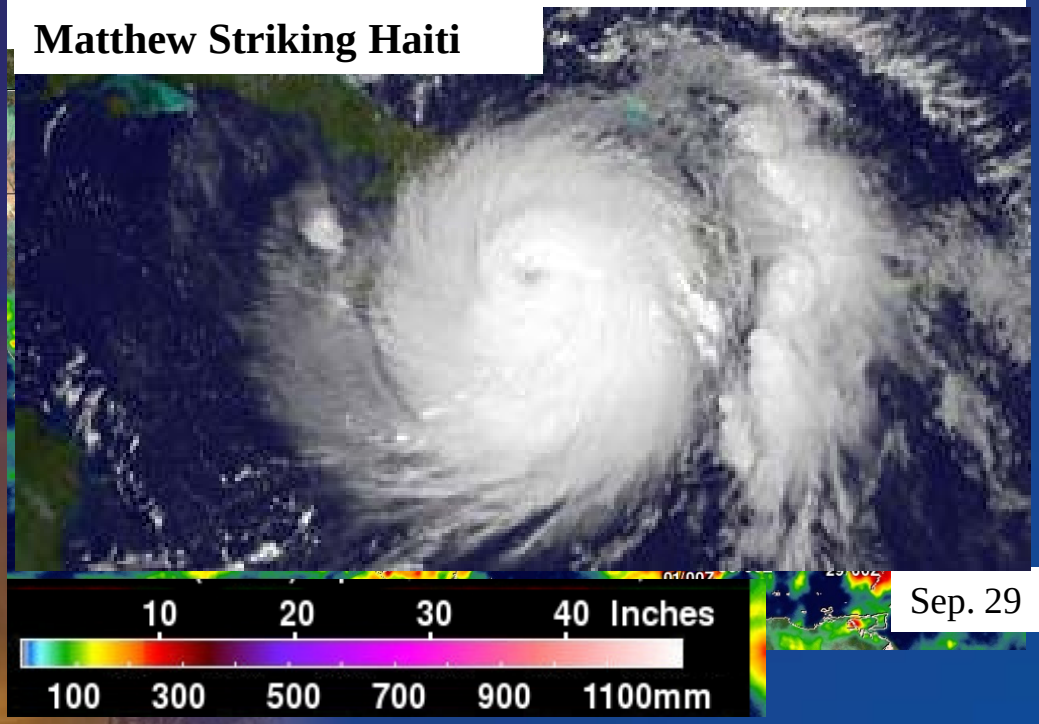
Artist's Rendition: Hermine the Gorilla

http://media.cmgdigital.com/shared/lt/lt_cache/thumbnail/615/img/photos/2016/08/23/dd/dd/OSLBIcRmnOMkgbg-800x450-noPad.jpg

- Hermine struck Florida on Sep. 2nd as a Cat.-1 hurricane with 75-80 mph winds.
- First hurricane to make landfall in Florida since Wilma in 2005.
- Five deaths.
- Rainfall totals of 15-23 inches in 2-3 days.
- Damage: $550 million, severe coastal destruction, 250K without power

Major Hurricane Matthew: Rainfall and Prediction

Matthew Striking Haiti

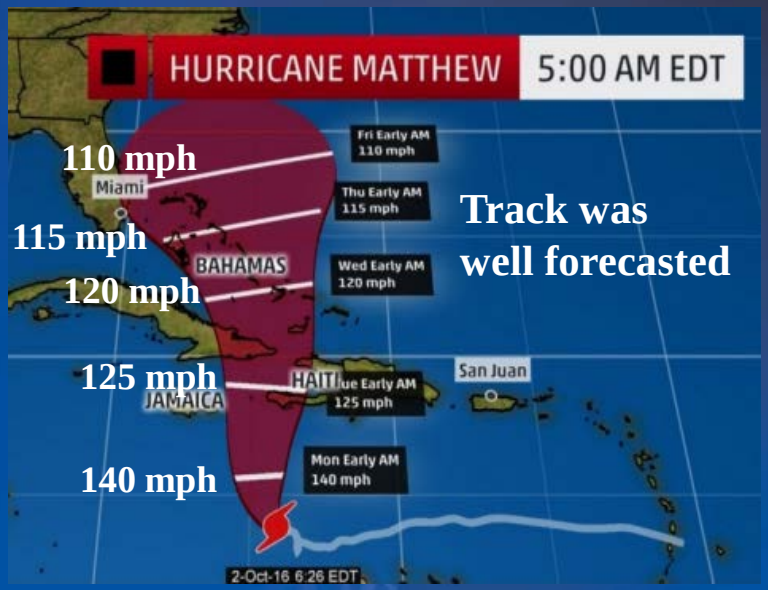


Sep. 29

- Struck Haiti, Cuba, Bahamas as Cat. 4 hurricane (130+ mph winds)
- Killed 900+ people in Caribbean Sea
- Struck U.S. as a Cat.-1 hurricane,, killing 34 people
- Damage: $10-15 billion
- Inland flooding of properties without flood insurance caused tremendous economic loss.

Charleston S.C.

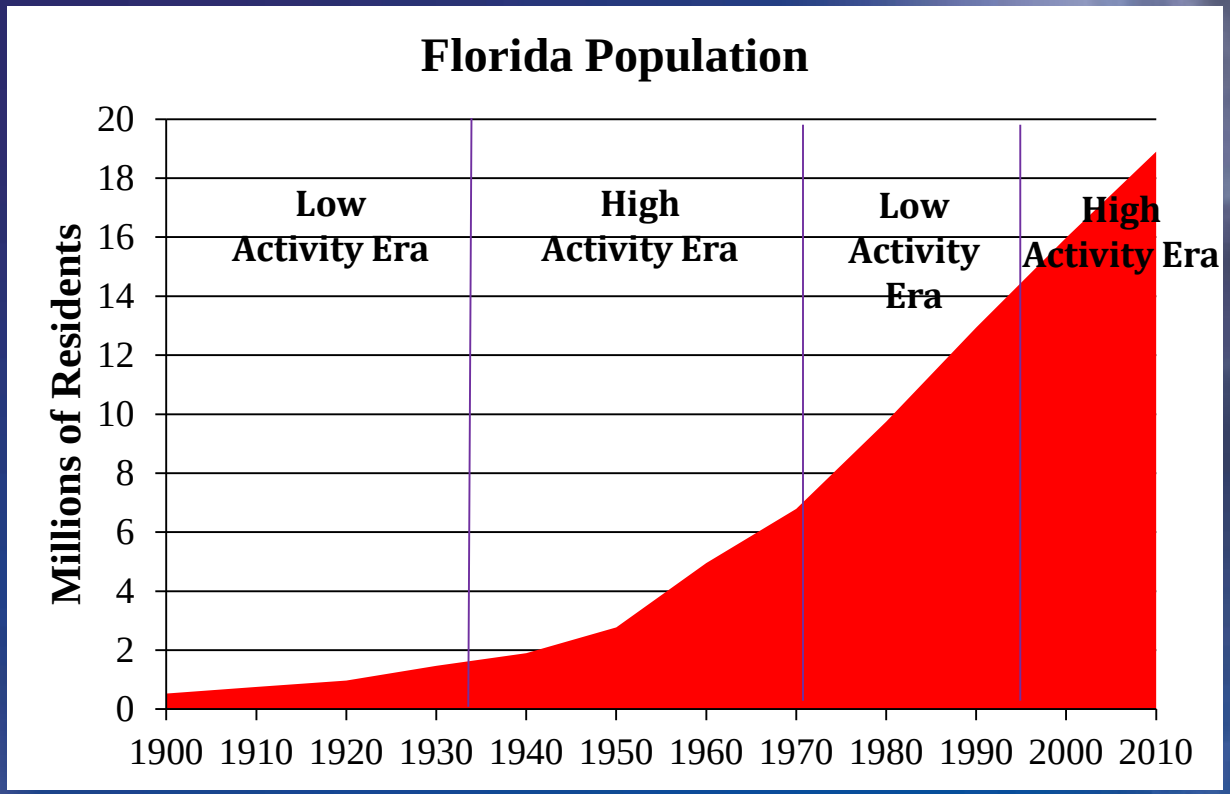
Oct. 2, 2016 Matthew Forecast:
National Hurricane Center



Track was well forecasted

The Weather Channel

Coastal Population Growth



Exponential growth along the Atlantic and Gulf Coasts has put far more people and property ($$$) in harm's way. 80+ million people are considered Atlantic or Gulf Coast residents.

Preparedness

www.ready.gov

Preparedness situations can differ: Location, children, pets, finances, property, transportation, structure of home, etc.

Tropical storms and hurricanes have many different impacts.

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

- Immediate coastal impacts- Storm surge, evacuation, complete destruction
- Non-coastal impacts
- Inland flooding
- Strong winds/ downed trees and power lines
- Tornadoes

A slow-moving tropical storm or a hurricane can cause tremendous damage, flooding, death. Look at Hermine and Matthew just last year.

Summary

We could see another above-normal hurricane season this year in all three hurricane regions (Atlantic, eastern Pacific, and central Pacific).

This is a lot of activity.

- Hurricanes NOT just a coastal event; can impact millions in many different ways.
- Tailor plans to suit your needs, your situation, and your susceptibility to various storm impacts.
- Prepare for every hurricane season regardless of the outlook.
- High-activity era for Atlantic hurricanes began in 1995, following decades of exponential growth in coastal regions. More hurricanes and more people in harm's way.
- Emergency planning/ execution is far more challenging, demands much longer forecast lead times.

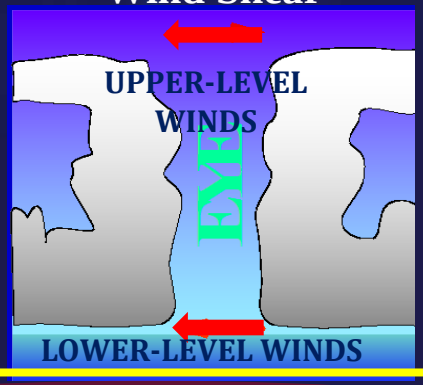
- NFIP: Flood Insurance –Matthew caused $5-$10+ billion in uninsured flood-related losses

Supplemental Materials

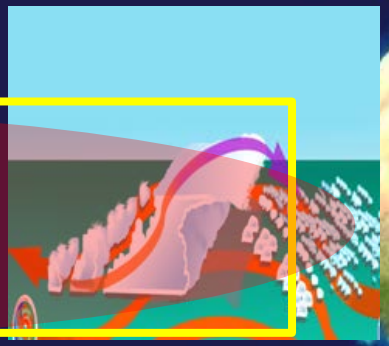
Science Behind NOAA's Seasonal Outlooks

Simplified Recipe for an Atlantic Hurricane

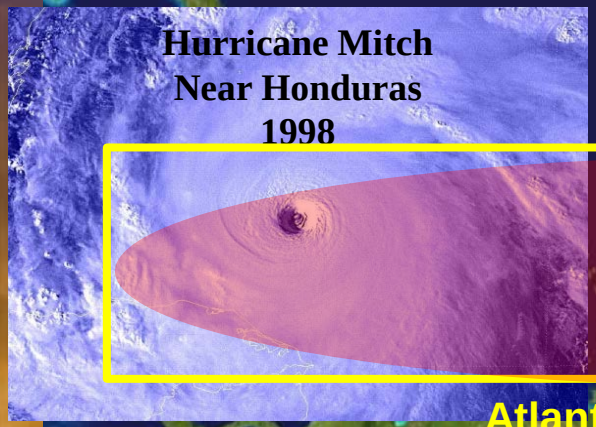
Not too much
"Wind Shear"



Pre-Existing "Trigger"
African Easterly Waves



Hurricane Mitch
Near Honduras
1998



Warm Ocean

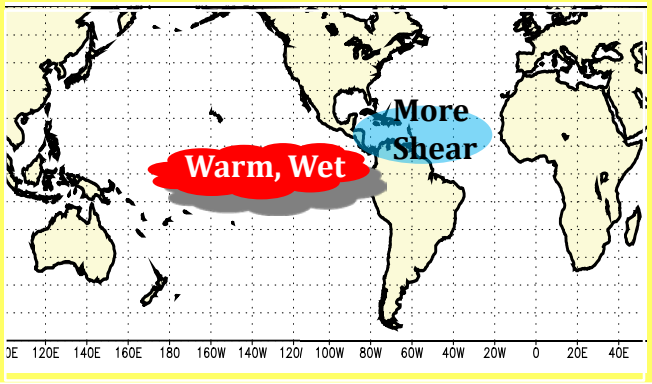
Stronger, Wetter
West African Monsoon

Atlantic Main Development Region

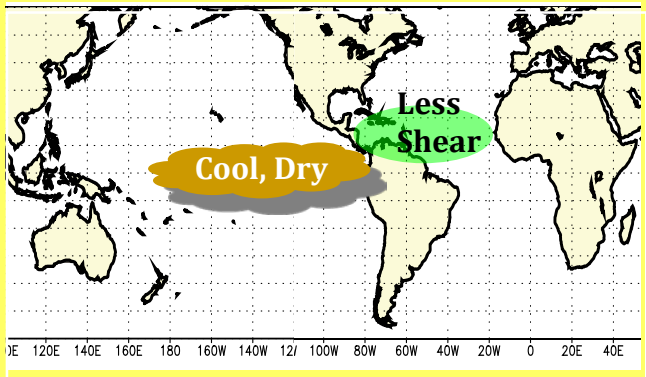
Climate Patterns that Influence Atlantic Hurricane Season Strength

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

El Niño: Fewer Hurricanes



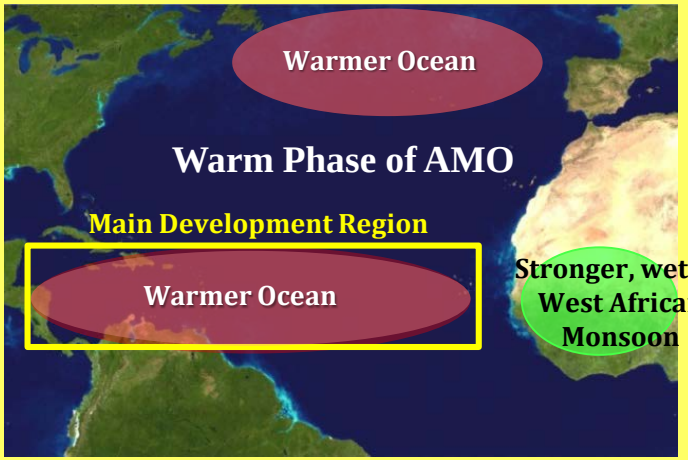
La Niña: More Hurricanes



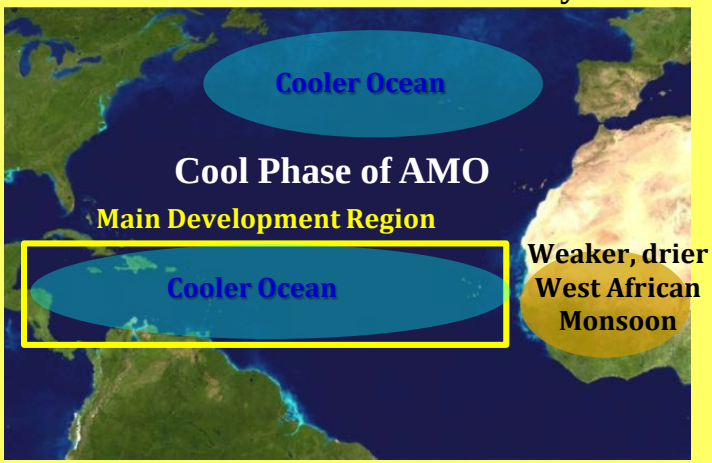
Predicting these climate patterns and their interaction is the basis for making NOAA's seasonal hurricane outlook.

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

Climate Pattern for High-Activity Era



Climate Pattern for Low-Activity Era



Motivating Basis Behind Seasonal Hurricane Outlooks

Observation: While hurricanes are ultimately a weather phenomena, the regional conditions that control the number, strength, and duration of hurricanes often last for months/ seasons at a time, and have strong climate links.

Climate patterns strongly influence regional atmospheric and oceanic conditions in many hurricane basins.

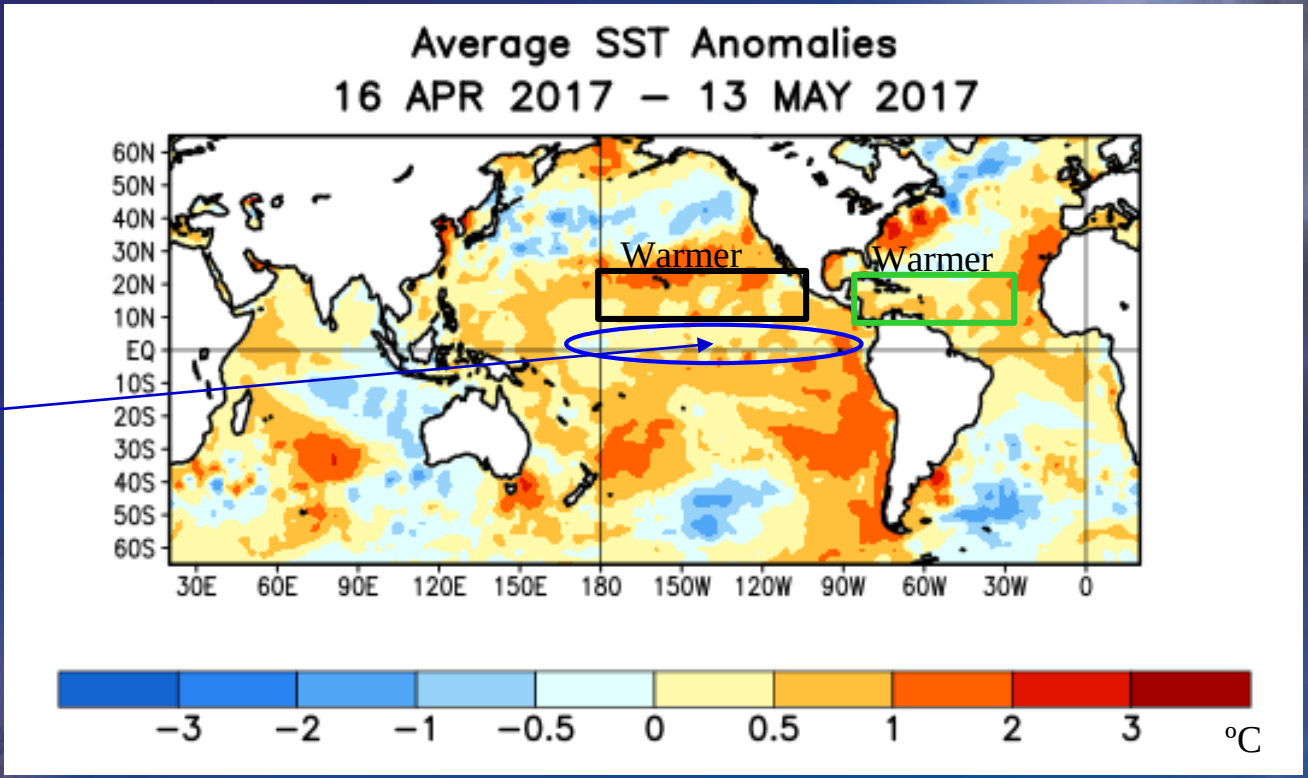
↓

As a result, regional atmospheric and oceanic conditions that affect hurricane activity can persist for months/ seasons at a time.

↓

Therefore, by predicting key climate patterns, we can often predict these regional hurricane-controlling conditions, and therefore predict the strength of the upcoming hurricane season.

Recent Sea Surface Temperature (SST) Anomalies



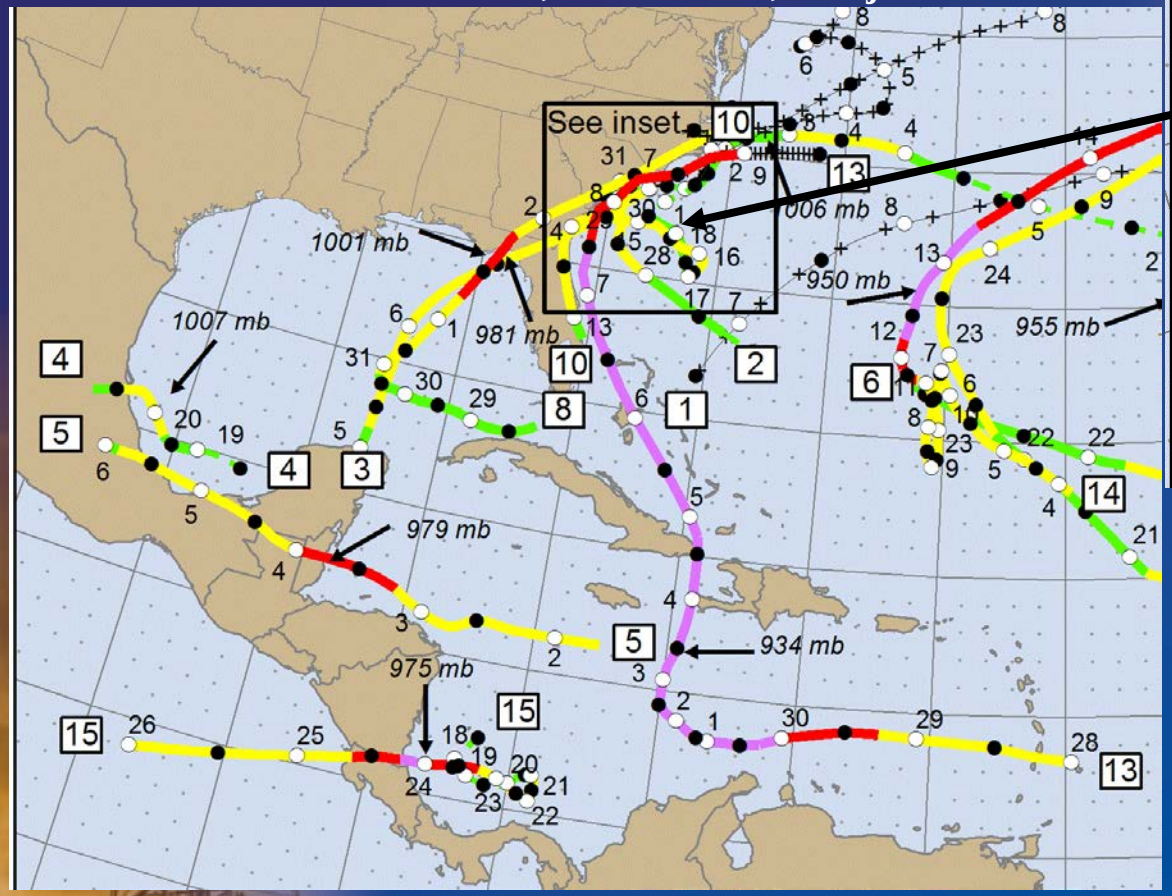
ENSO-Neutral: No El Niño or La Niña

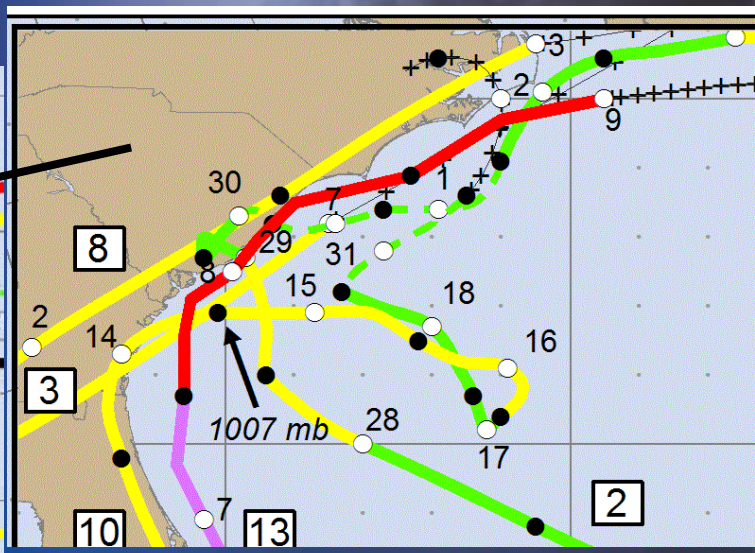
In the equatorial Pacific Ocean, the recent SST anomaly pattern shows ENSO-Neutral conditions (i.e., No El Niño or La Niña).

Above-average SSTs are present in both the Atlantic (Green box) and Pacific (Black box) main hurricane development regions.

Last Year's Above Normal Atlantic Hurricane Season

2016: 15 named storms, 7 hurricanes, 4 major hurricanes

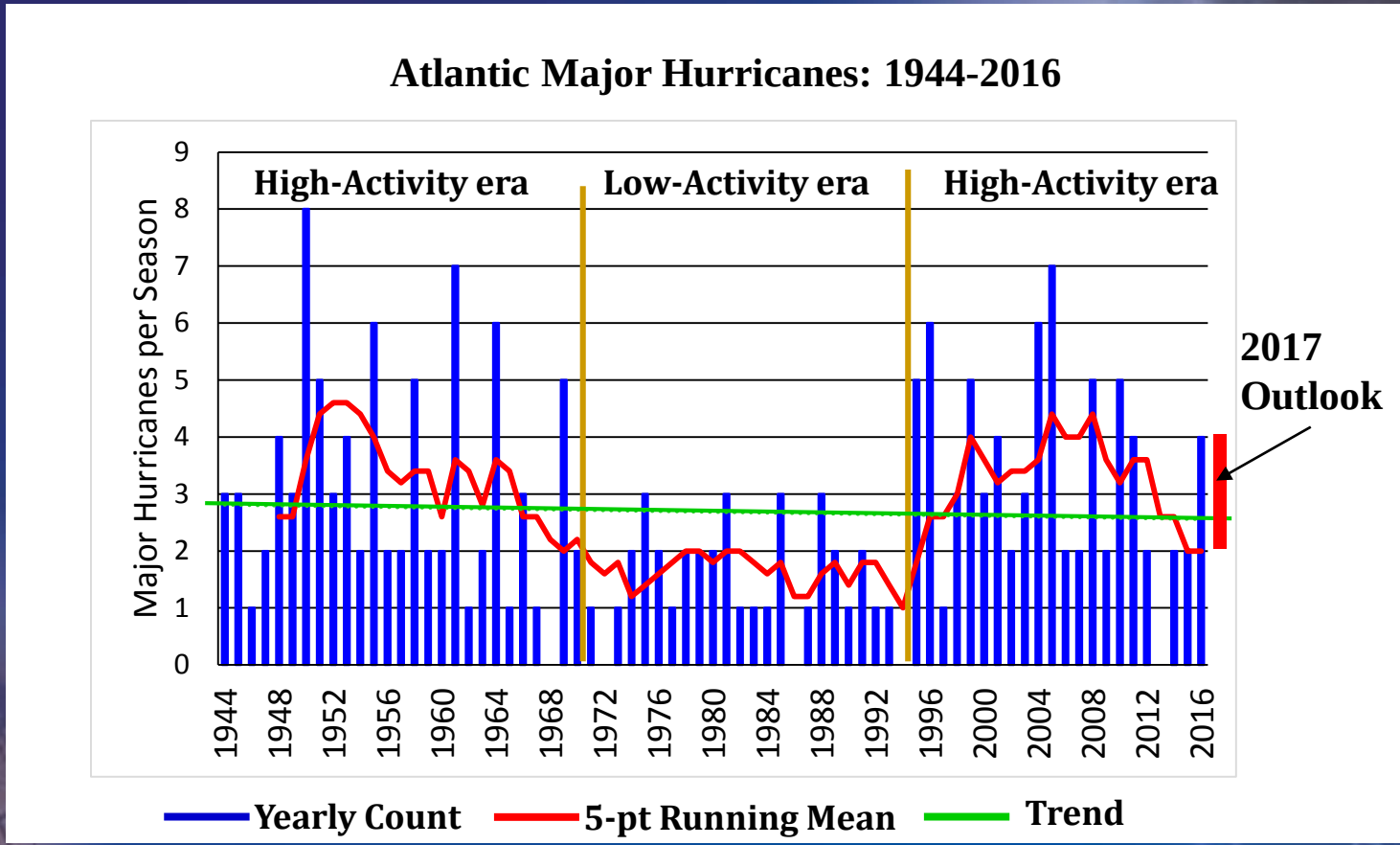




- Major Hurricane
- Hurricane
- Tropical Storm
- Tropical Depression
- Subtropical Storm
- Subtropical Depression
- Wave/Low
- Extratropical Storm
- Position at 0000 UTC
- dd Position/date at 1200 UTC
- # Storm Number

- 5 U.S. landfalling storms: Most since 2008.
- First U.S. hurricane landfall since 2014 (Hermine).
- Tropical Storm (TS) Bonnie and H Matthew struck South Carolina.
- TS Colin, TS Julia, and H Hermine made landfall in Florida.

A Closer Look at the Atlantic Multi-Decadal Signal



Historical record shows alternating 25-40 year periods of increased, and then decreased, hurricane activity (consistent with the ACE time series plot).