NOAA's 2016 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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June 2, 2016

Press Release: http://www.noaa.gov/near-normal-atlantic-hurricane-season-most-likely-year

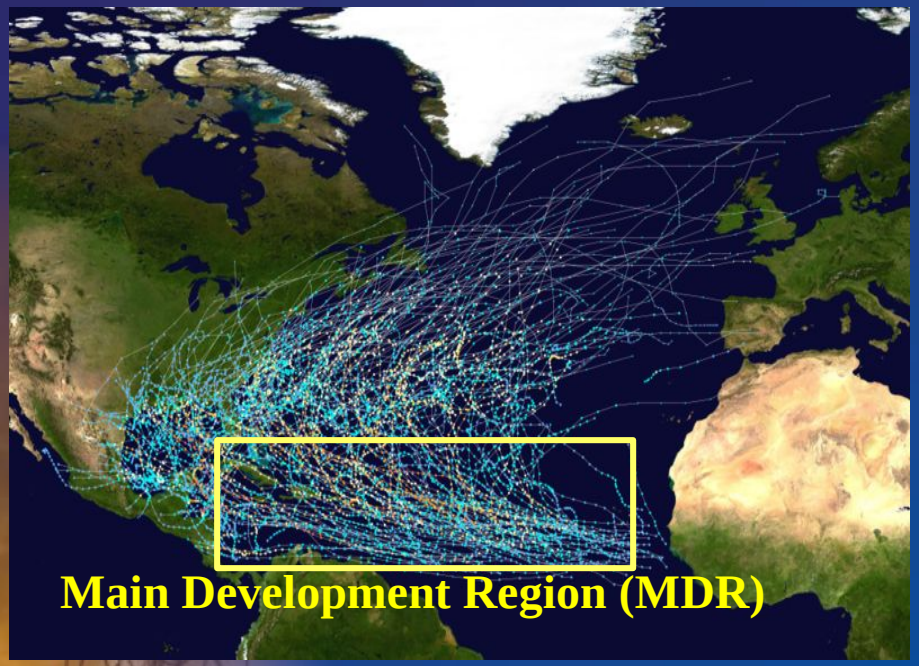
Full Outlook: http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml

Outline

1. Features of the Outlooks
2. 2016 Outlooks for the Atlantic, eastern Pacific, and central Pacific
3. The 2016 Atlantic outlook in a historical perspective
4. Climate factors behind the 2016 hurricane outlooks
   - *La Niña*
   - *Variability in global sea surface temperatures*
5. Summary

NOAA's Hurricane Outlook Regions

Atlantic Basin
Storm Tracks 1980-2005



Central and Eastern North Pacific
Storm Tracks 1980-2005

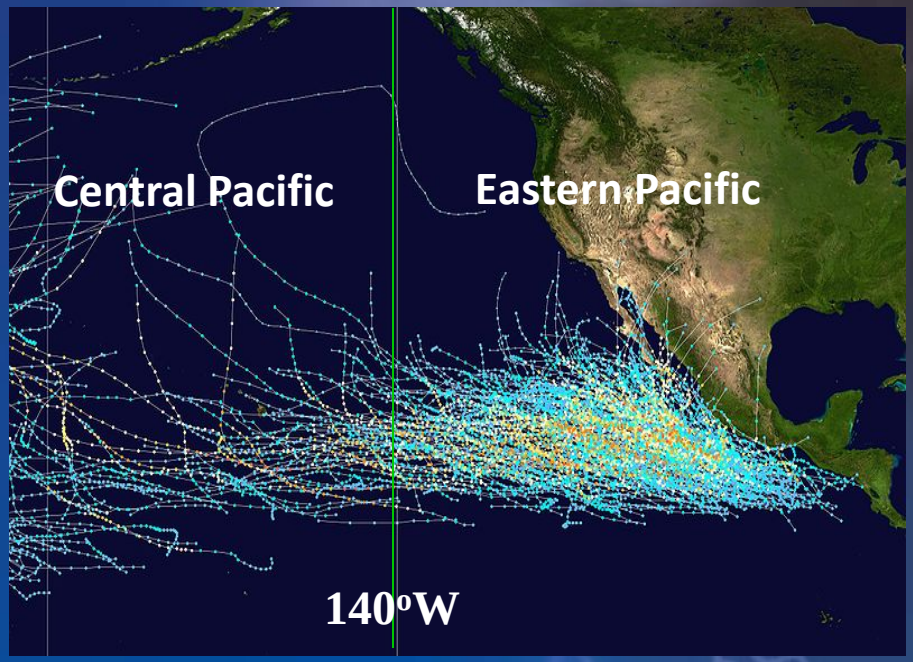


Figure Courtesy of Wikipedia

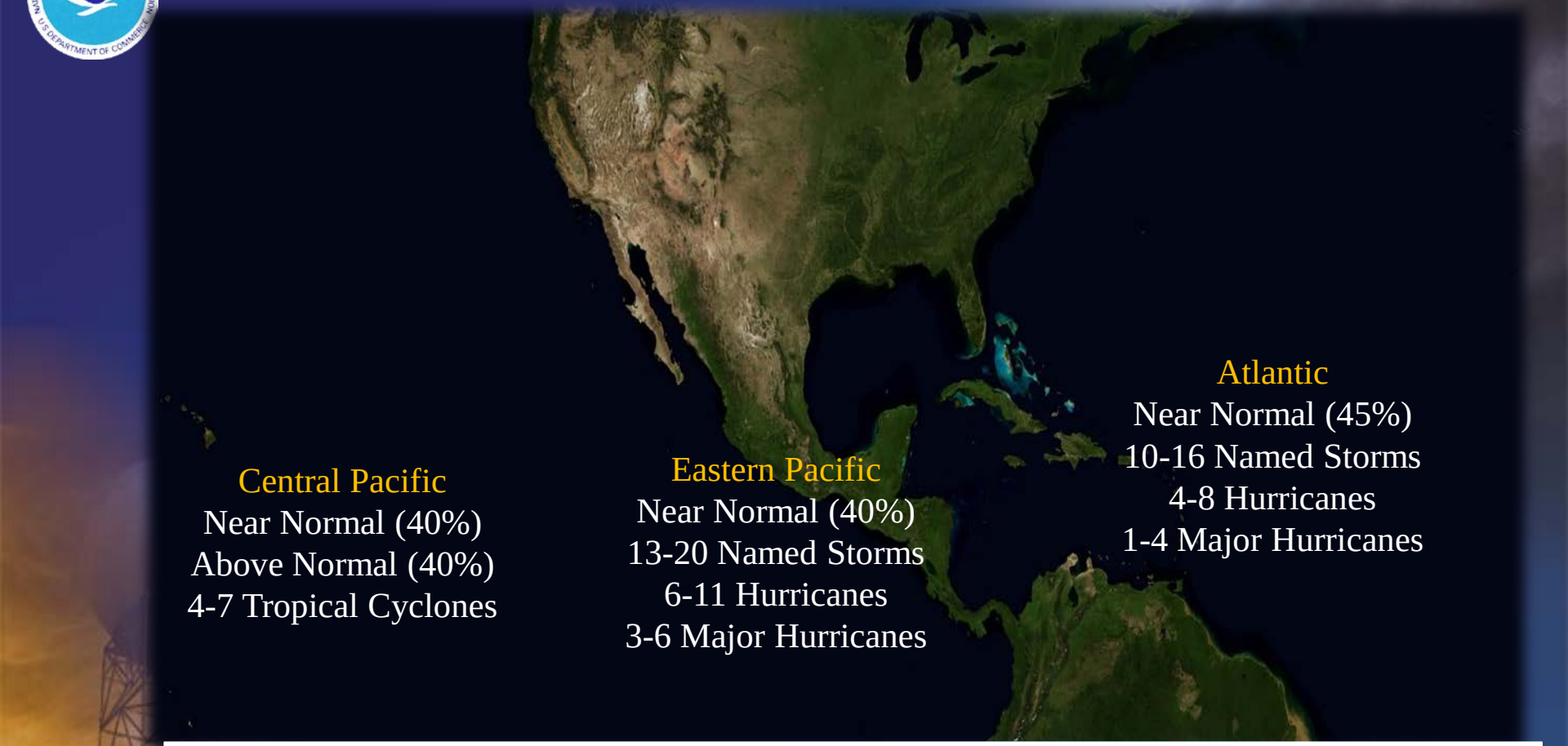
NOAA issues seasonal hurricane outlooks for the Atlantic basin, the central North Pacific, and the eastern North Pacific.

How and When the Outlooks are Issued

1. Outlooks issued in late May
   - Press release, and technical write-up
   - Atlantic outlook has national press conference
   - Central Pacific outlook has press conference in Hawaii

2. Atlantic outlook is updated early August- coincide with peak of season (Aug.-Oct.).
   - Press teleconference, press release, technical write-up

NOAA's 2016 Hurricane Season Outlooks

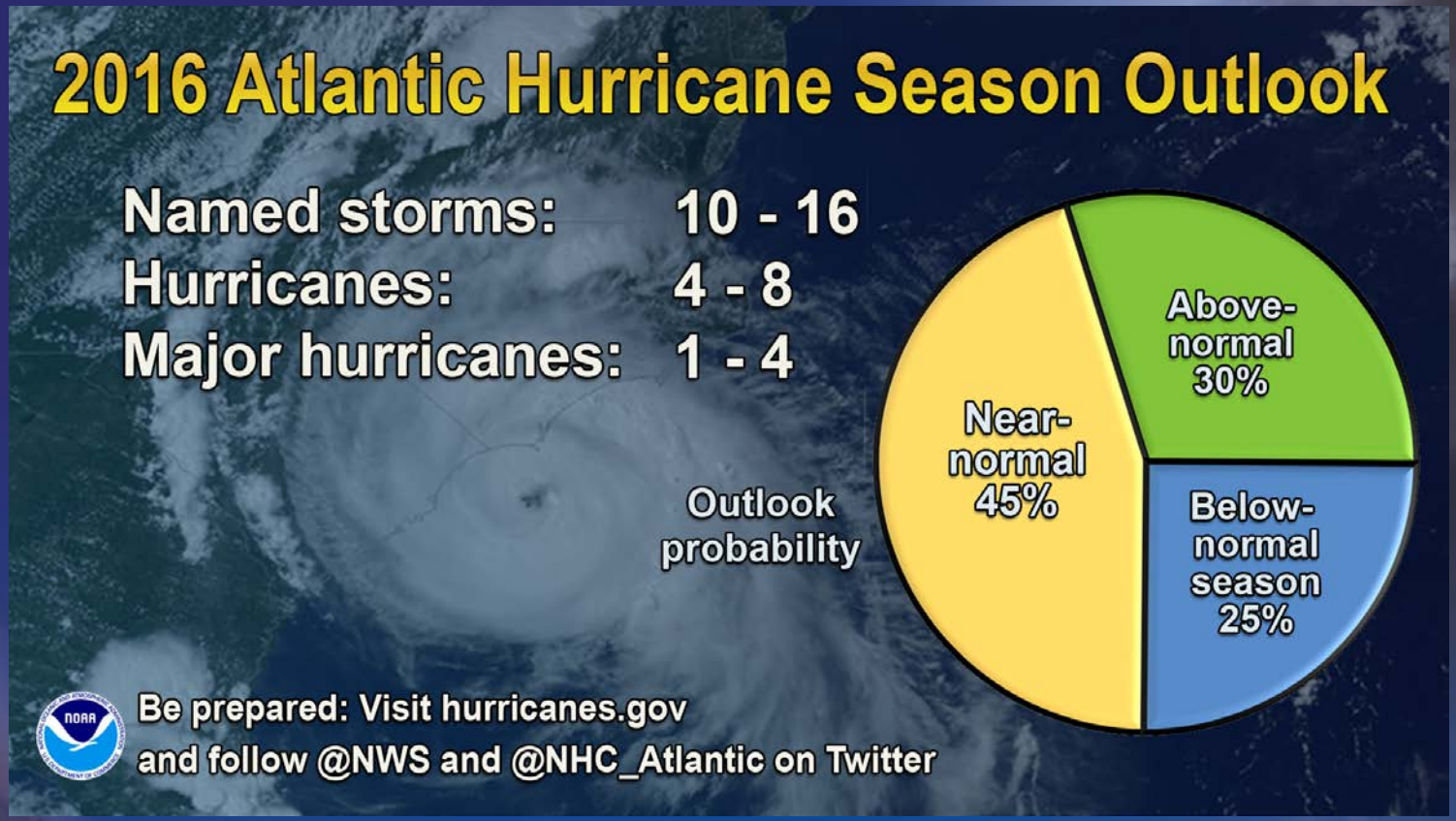


Central Pacific
Near Normal (40%)
Above Normal (40%)
4-7 Tropical Cyclones

Eastern Pacific
Near Normal (40%)
13-20 Named Storms
6-11 Hurricanes
3-6 Major Hurricanes

Atlantic
Near Normal (45%)
10-16 Named Storms
4-8 Hurricanes
1-4 Major Hurricanes

- All ranges are given with a 70% probability of occurrence.
- Outlooks indicate expected overall activity. They are not seasonal landfall forecasts, and do not imply activity for any particular location.

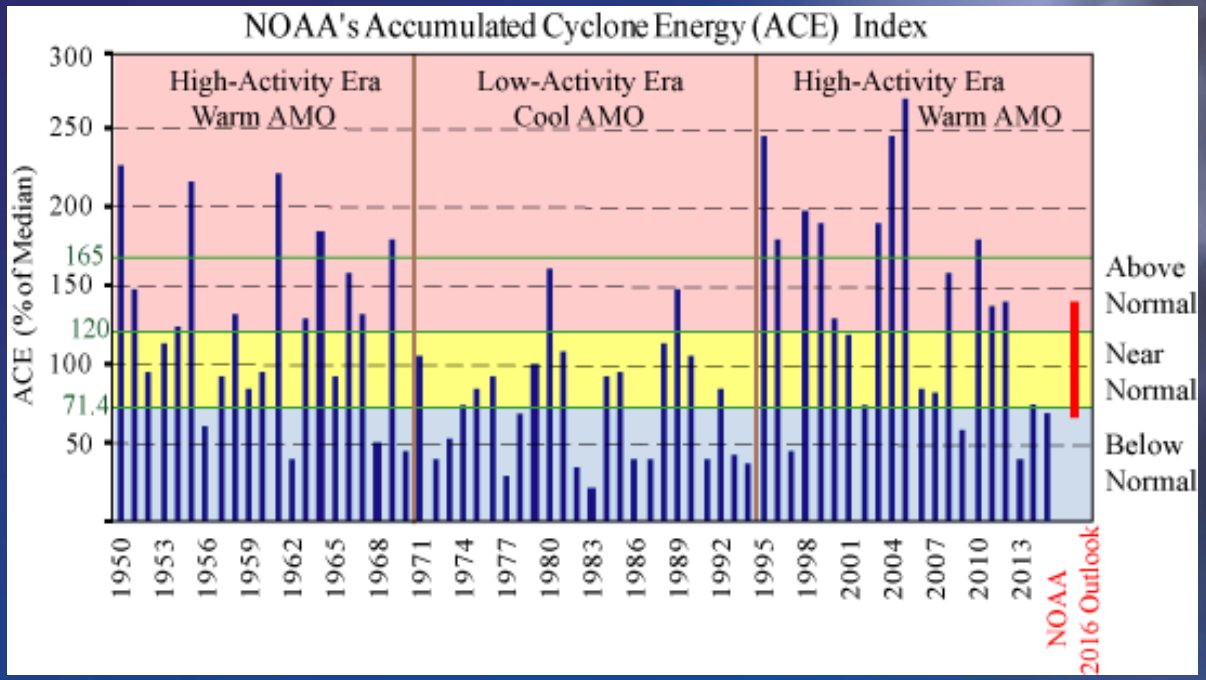


- The predicted ranges are issued with a 70% probability of occurrence
- The predicted ranges are centered near the seasonal averages of 12 Named Storms, 6 hurricanes, and 3 major hurricanes.

This outlook was issued on May 27th , and will be updated in early August.

www.cpc.ncep.noaa.gov/products/hurricane

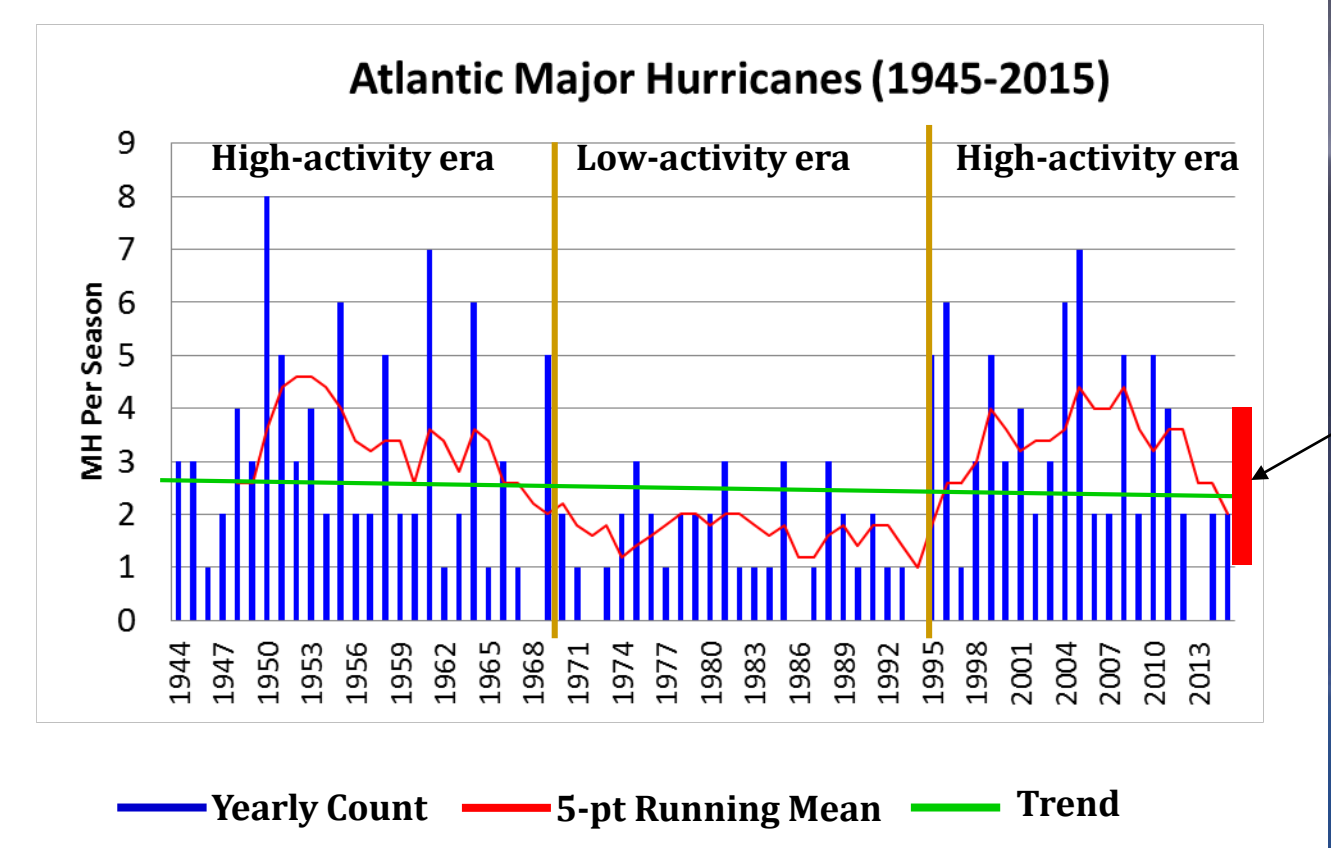
The 2016 Atlantic Outlook in a Historical Perspective



Caption: Seasonal Accumulated Cyclone Energy (ACE) index during 1950-2015 (Blue bars) and NOAA's 2016 outlook range with a 70% probability of occurrence (Red bar). Shading indicates NOAA's ACE thresholds for classifying hurricane season strength. The 165% threshold denotes a hyper-active season.

NOAA's 2016 Atlantic hurricane season outlook indicates that the season will likely be more active than the last three seasons 2013-2015.

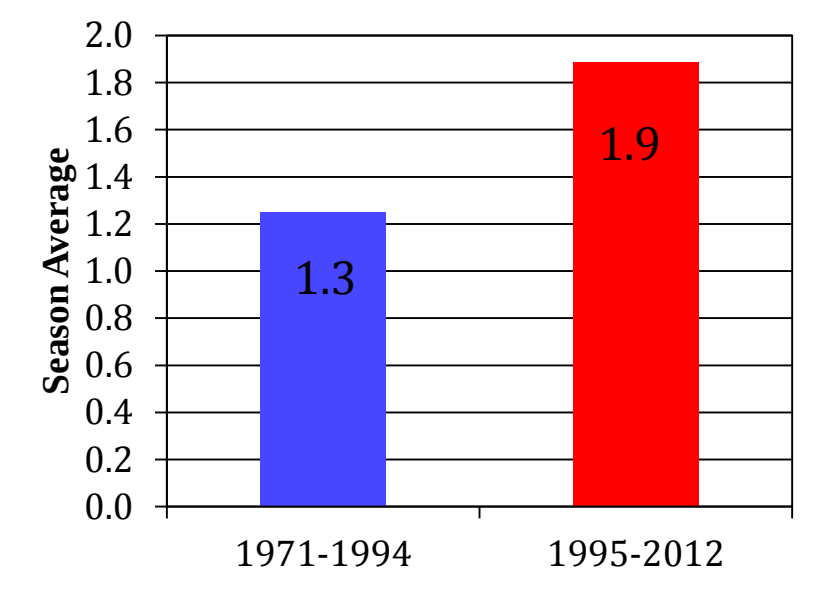
A Closer Look at the Multi-Decadal Signal



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

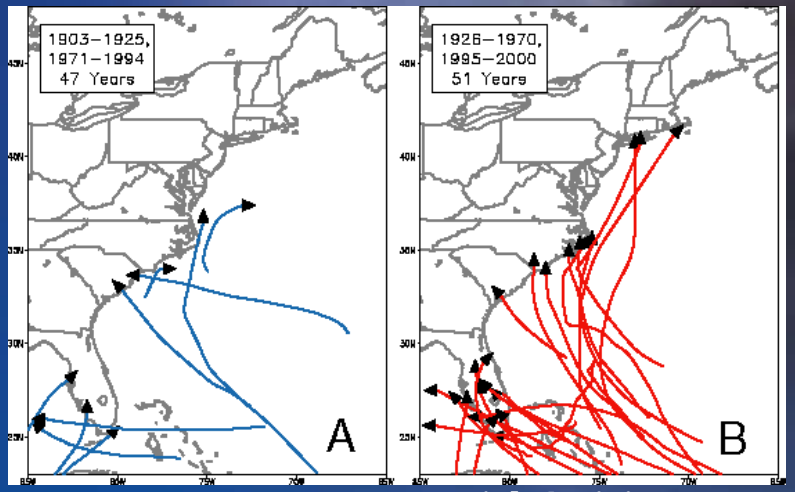
U.S. Hurricane Landfalls During High- and Low-Activity Eras

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

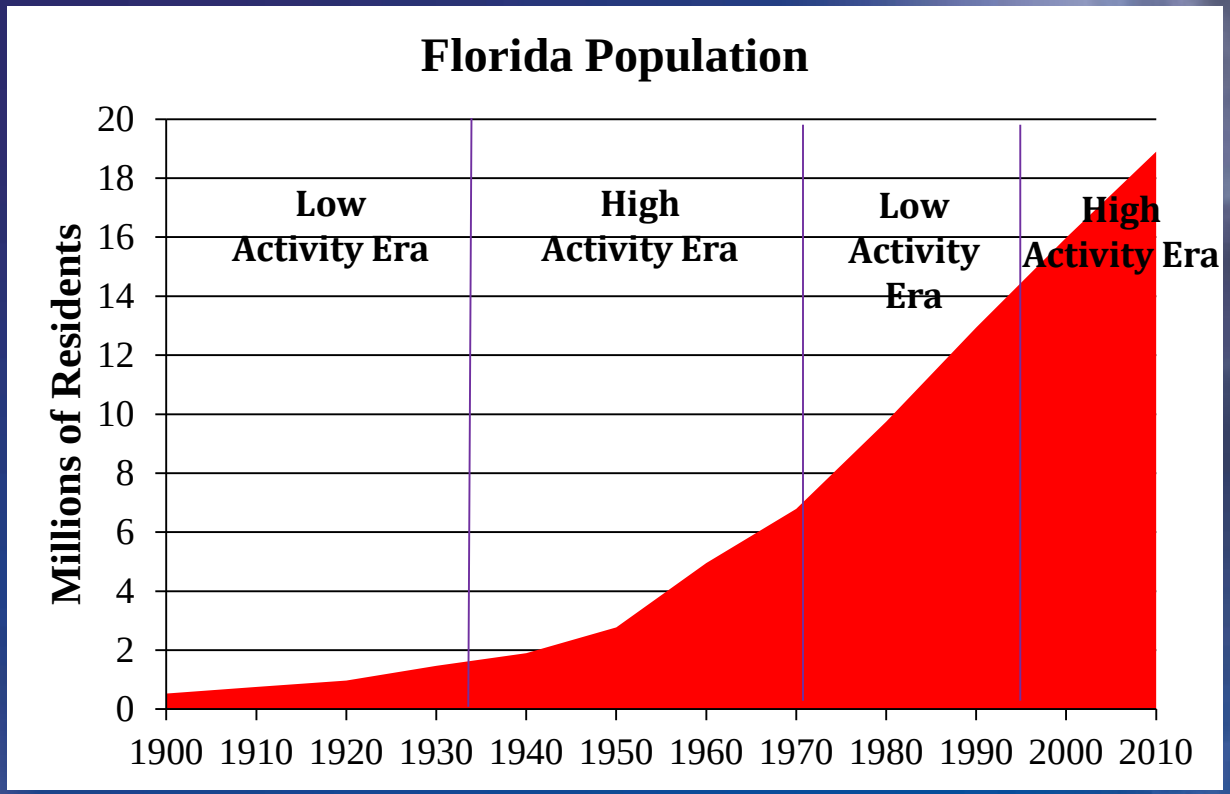


Low Activity Eras

High Activity Eras (thru 2000)

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

Coastal Population Growth

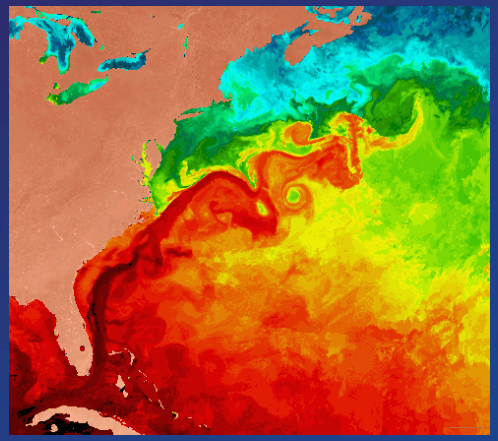


Exponential growth along the Atlantic and Gulf Coasts has put far more people and property ($$$) in harm's way. 80+ million people are considered Atlantic or Gulf Coast residents.

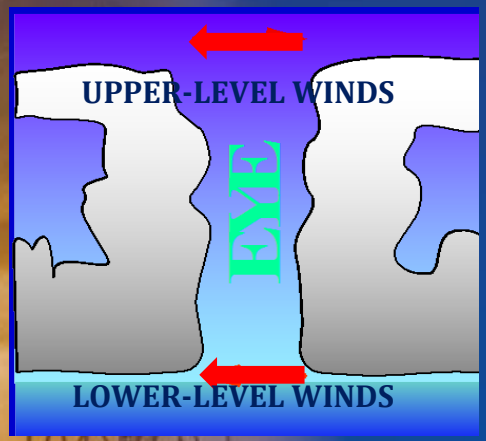
Science Behind NOAA's Seasonal Outlooks

Simplified Recipe for an Atlantic Hurricane

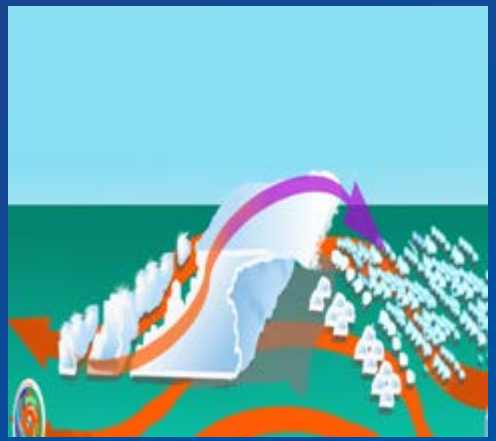
Warm Ocean

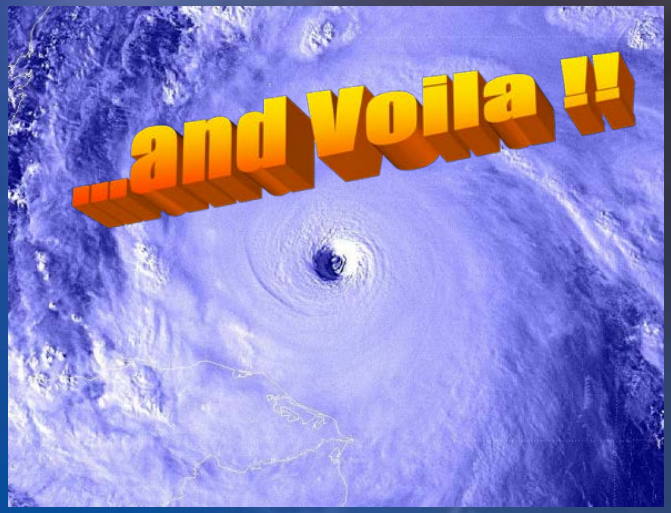


Not too much "Wind Shear"



Pre-Existing "Trigger" African Easterly Waves





Hurricane Mitch Near Honduras 1998

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.

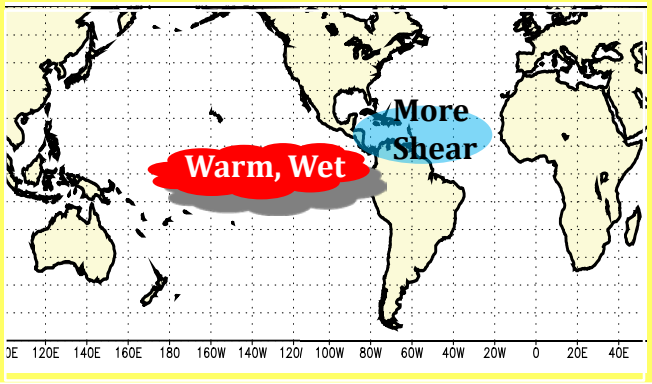
↓

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.

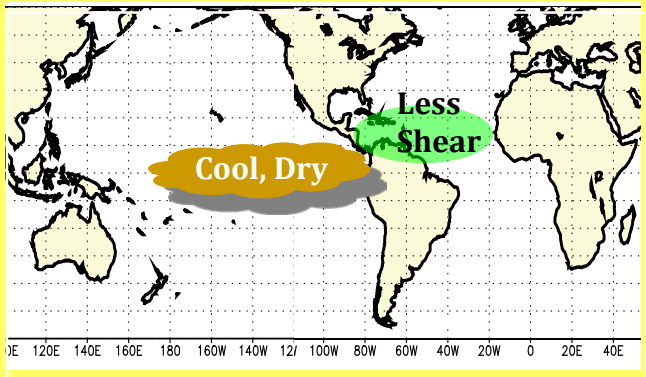
Climate Patterns that Influence Atlantic Hurricane Season Strength

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

El Niño: Fewer Hurricanes



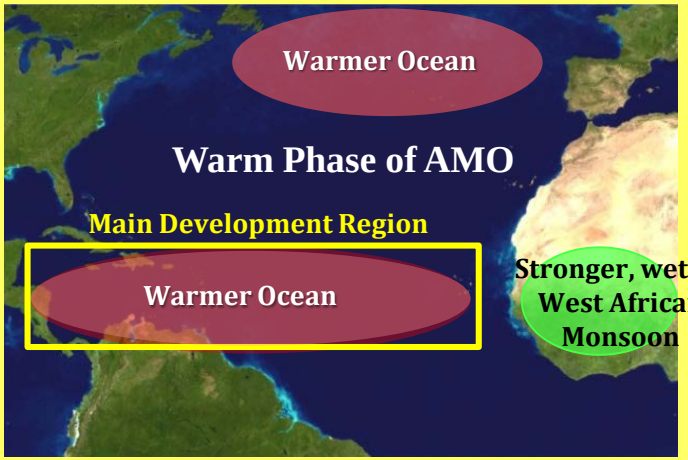
La Niña: More Hurricanes



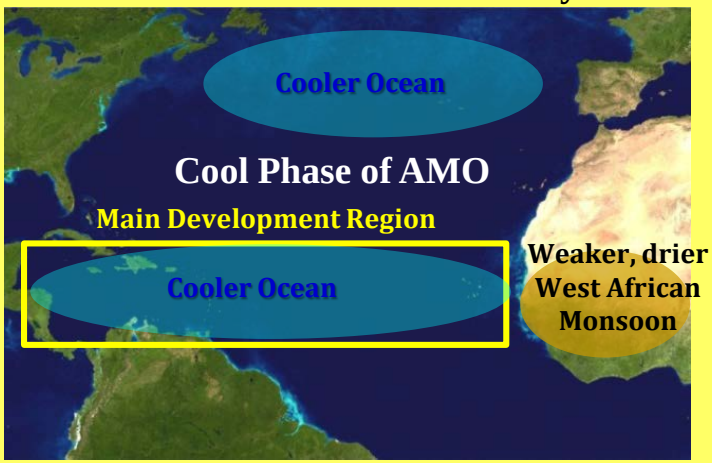
Predicting these climate patterns and their interaction is the basis for making NOAA's seasonal hurricane outlook.

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

Climate Pattern for High-Activity Era



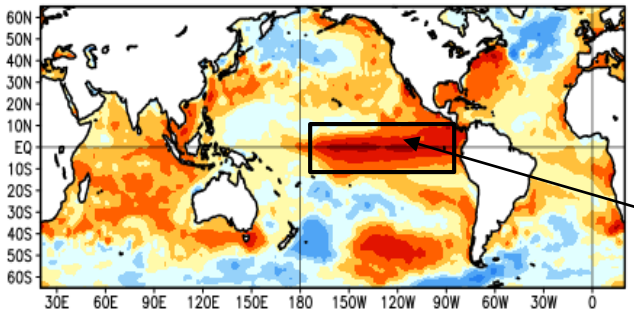
Climate Pattern for Low-Activity Era



Maps of Sea Surface Temperature (SST) Anomalies Show that a Transition from El Niño to La Niña is Currently Underway

Last Winter: SST Anomalies

27 DEC 2015 – 23 JAN 2016

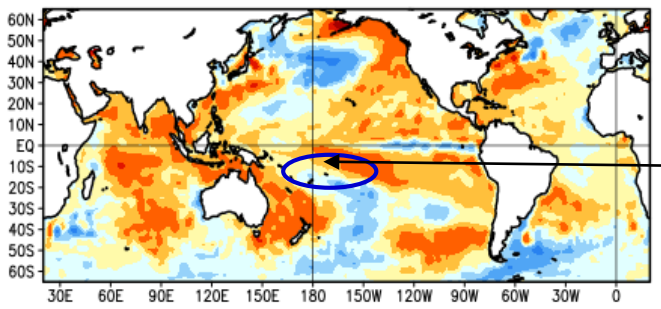


Strong El Niño

A strong El Niño developed last summer.
This map shows the El Niño warmth last winter.

Recent SST Anomalies

1 MAY 2016 – 28 MAY 2016

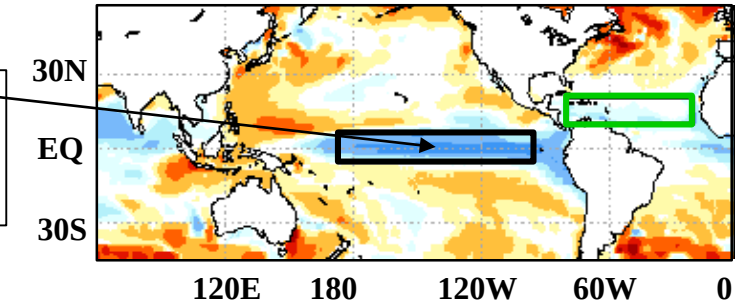


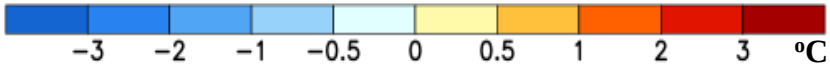
Dissipating El Niño

El Niño is now dissipating.

Predicted SST Anomalies: August-October 2016

Many models predict La Niña to develop during the summer

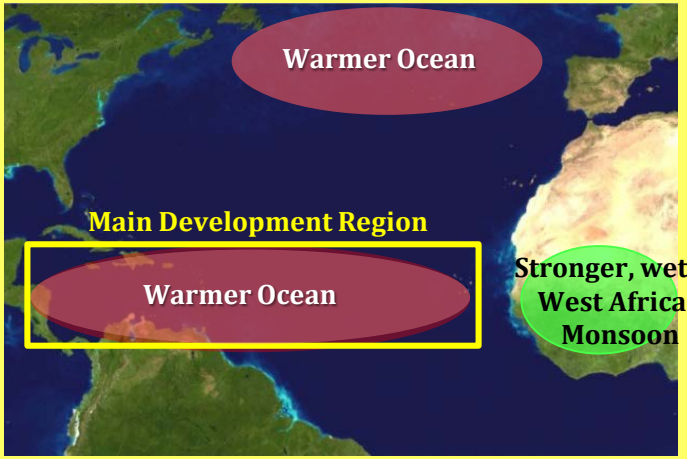




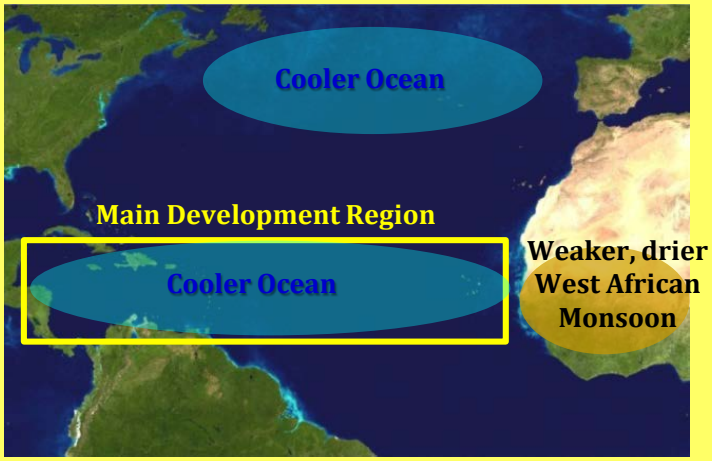
Atlantic Multi-Decadal Oscillation (AMO): Multi-Decadal Fluctuations in Hurricane Activity

The AMO has opposite impacts between the Atlantic and Pacific hurricane basins.

Warm Phase of AMO



Cool Phase of AMO



We may be transitioning From This Pattern

- Atlantic high-activity era
- Central/ eastern Pacific low-activity era

To This Pattern

- Atlantic low-activity era
- Central/ eastern Pacific high-activity era

But we aren't sure → Less confident hurricane season outlook because we don't know if the AMO will be reinforcing or offsetting La Niña's impacts.

Summary

1. Near-normal (45% chance) Atlantic hurricane season. [Near-normal seasons (40% chance) expected for the eastern and central Pacific hurricane regions.]

2. Factors behind the outlooks:

   - La Niña : strengthens Atlantic, weakens central and eastern Pacific seasons.

   - Multi-decadal signal: AMO phase is unclear.

3. Not sure if there will be competing or reinforcing climate patterns this season.

4. At this time, we don't think an extremely active Atlantic hurricane season is likely.

5. A near-normal prediction for the Atlantic hurricane season suggests we could see more hurricane activity than we've seen in the last three years.

6. Prepare for every hurricane season regardless of the seasonal outlook. It only takes one storm to make for a bad year if it strikes your area.