



# **NOAA's 2012 Hurricane Season Outlooks**

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



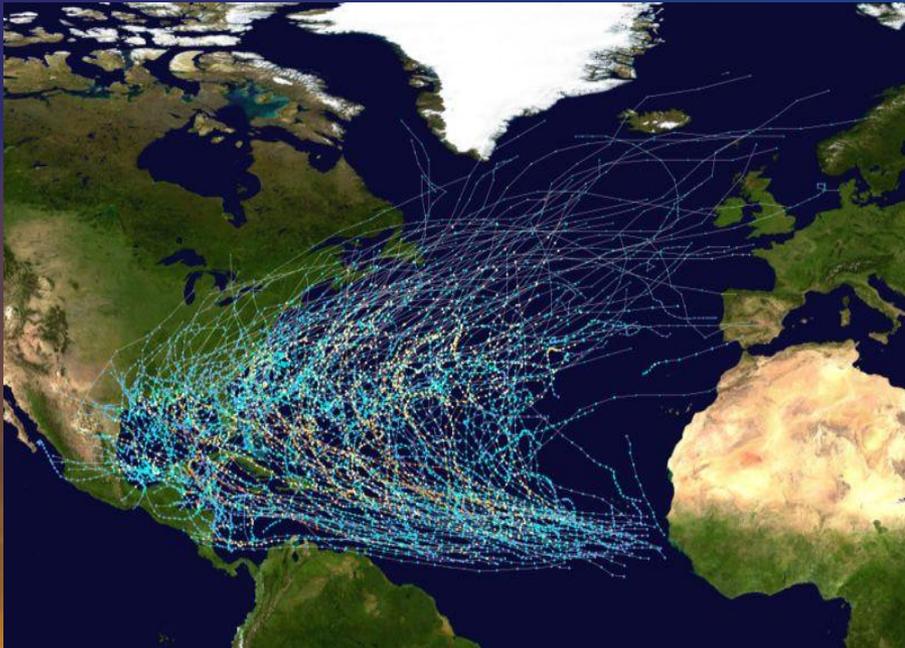
# Outline

- 1. Features of the NOAA's hurricane season outlooks**
- 2. 2012 Outlooks for the Atlantic, eastern Pacific, and central Pacific**
- 3. Recipe for a hurricane**
- 4. Science behind NOAA's seasonal hurricane outlooks**
- 5. Hurricanes are not just a coastal event**
- 6. Summary**



# NOAA's Hurricane Outlook Regions

**Atlantic Basin  
Storm Tracks 1980-2005**



**Central and Eastern North Pacific  
Storm Tracks 1980-2005**

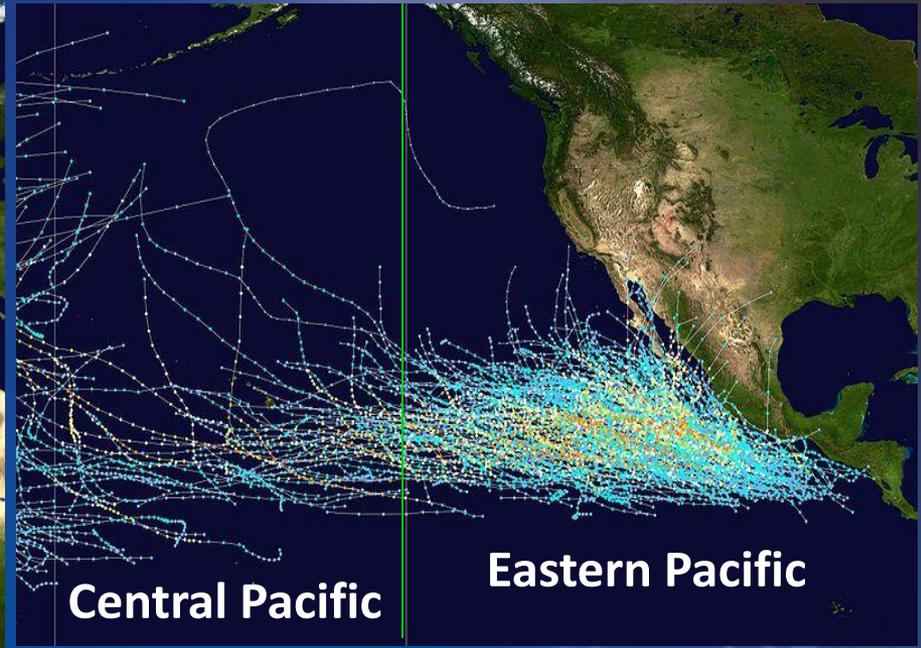


Figure Courtesy of Wikipedia

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



# Features of the NOAA's Hurricane Season Outlooks

- **Atlantic outlooks began August 1998, Pacific outlooks began May 2003.**
- **Outlooks issued late May; Atlantic outlook is updated in early August**
- **Indicate expected overall seasonal activity.**
- **NOT a seasonal hurricane landfall prediction, do not imply levels of activity for any particular location.**
- **Outlooks are probabilistic, include**
  - **Probabilities of season type,**
  - **Likely (70% chance) ranges of named storms and hurricanes**



# NOAA's 2012 Hurricane Season Outlooks

70% likelihood for ranges of named storms and hurricanes.



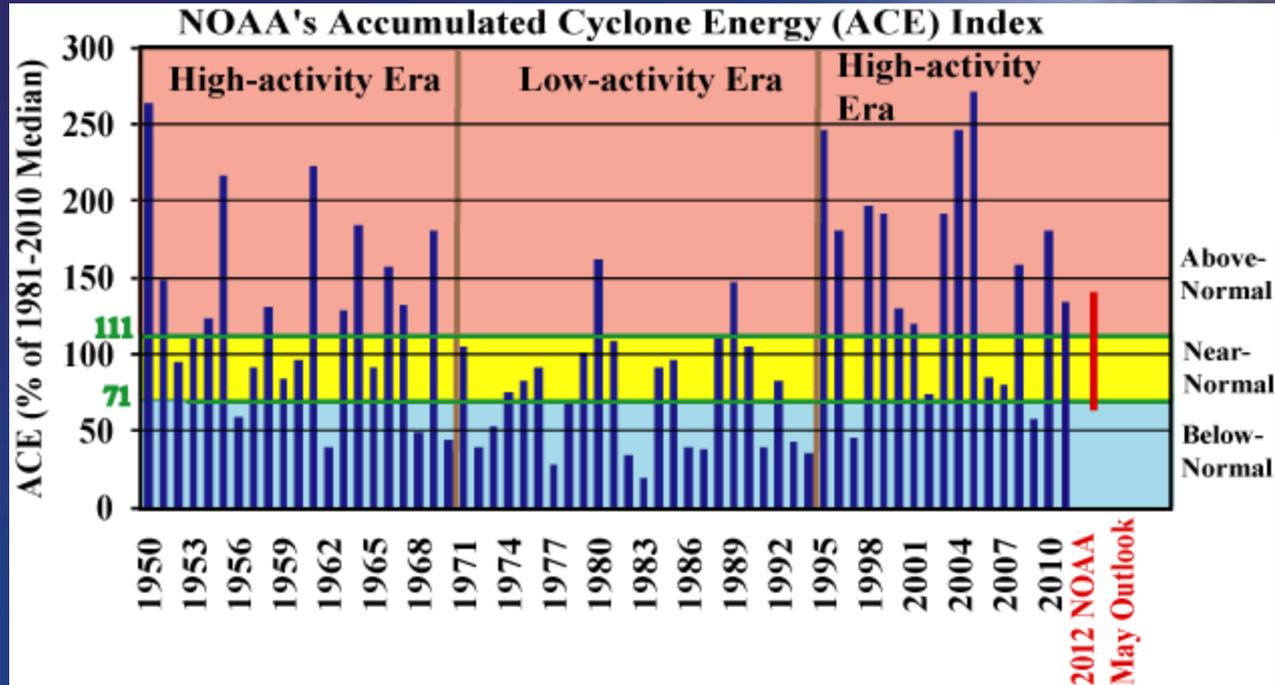
The 2012 outlooks reflect the possibility of competing factors.

## Storm Wind Speed Thresholds

<b>Named Storms:</b>	<b>Wind speeds 39+ mph</b>
<b>Tropical Storms:</b>	<b>Wind speeds 39-73 mph</b>
<b>Hurricanes:</b>	<b>Wind Speeds 74+mph</b>
<b>Major Hurricanes:</b>	<b>Wind speeds 111+mph</b>



# Classifying Atlantic Hurricane Season Strength



- ACE index measures overall season strength by accounting for the combined number, intensity and duration of tropical storms and hurricanes.
- Historically, Atlantic high- and low-activity eras last 25-40 years.
- No indication that current high-activity era has ended.

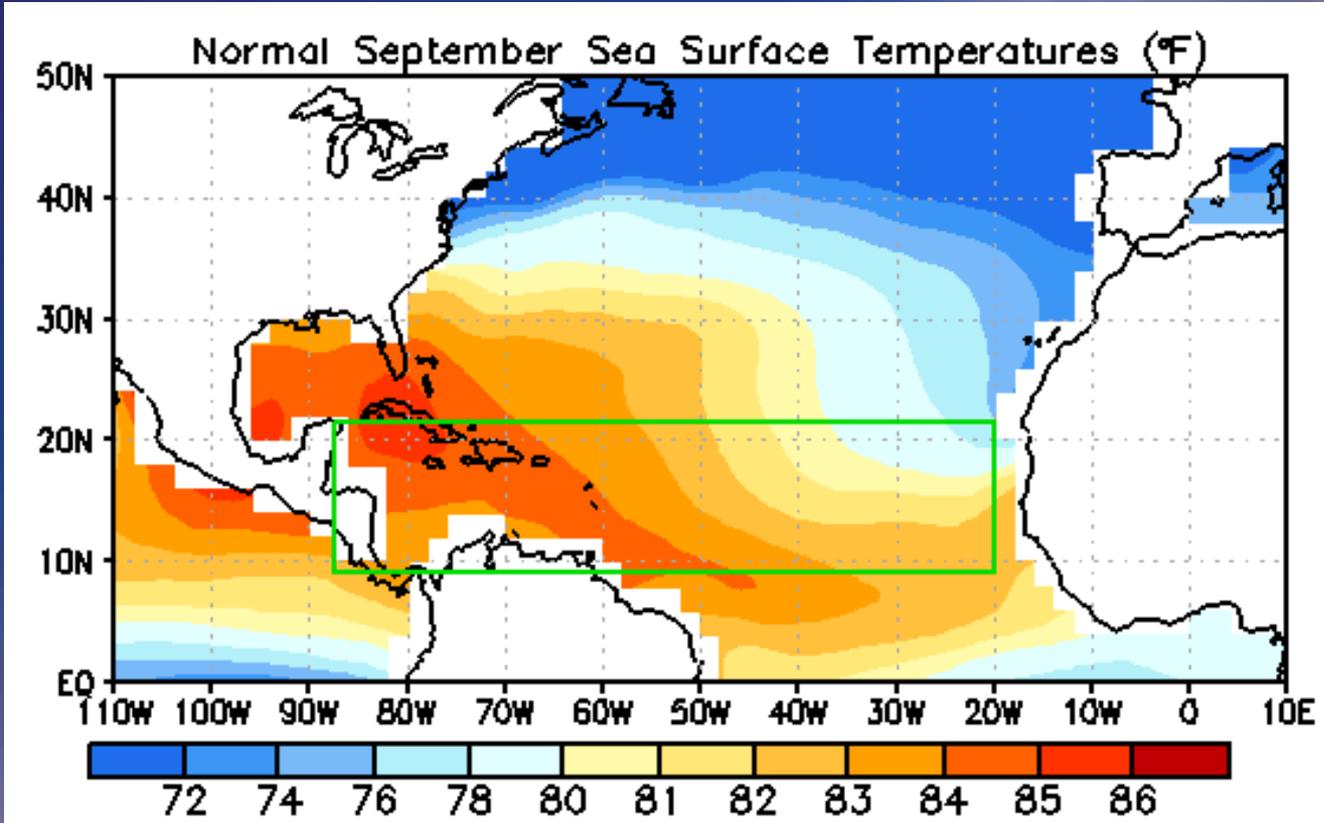


# Recipe for Atlantic Hurricane





# Warm Ocean



Water temperatures above ~80°F can support a hurricane.



# A Pre-Existing "Disturbance" ...

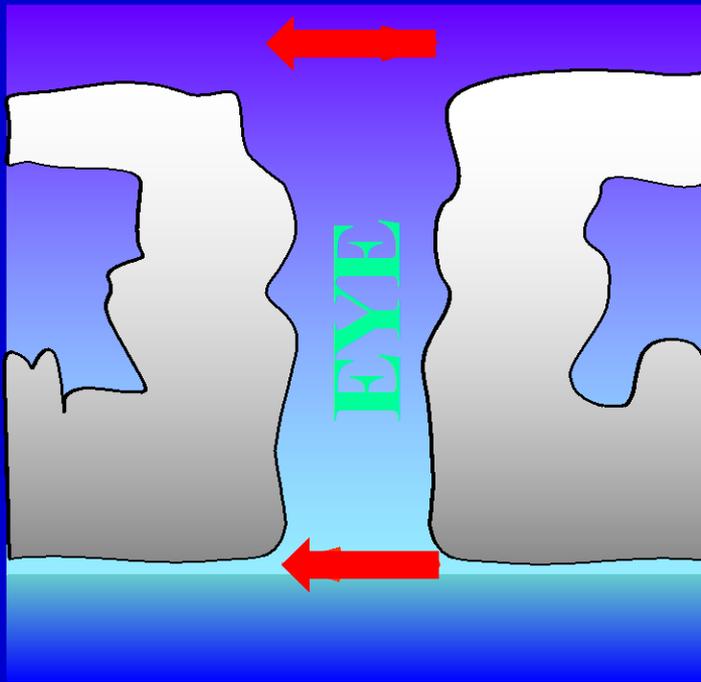


**Hurricanes form from pre-existing disturbances, which are often an area of cloudiness and low pressure moving westward from Africa called an African easterly wave.**



# Not too much "Wind Shear"

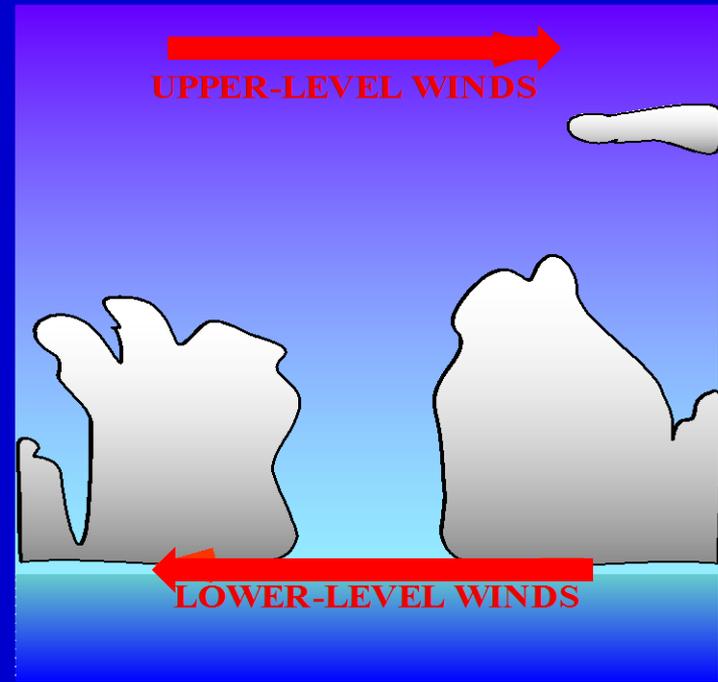
## Weak Wind Shear



**WEAK SHEAR = FAVORABLE**



## Strong Wind Shear

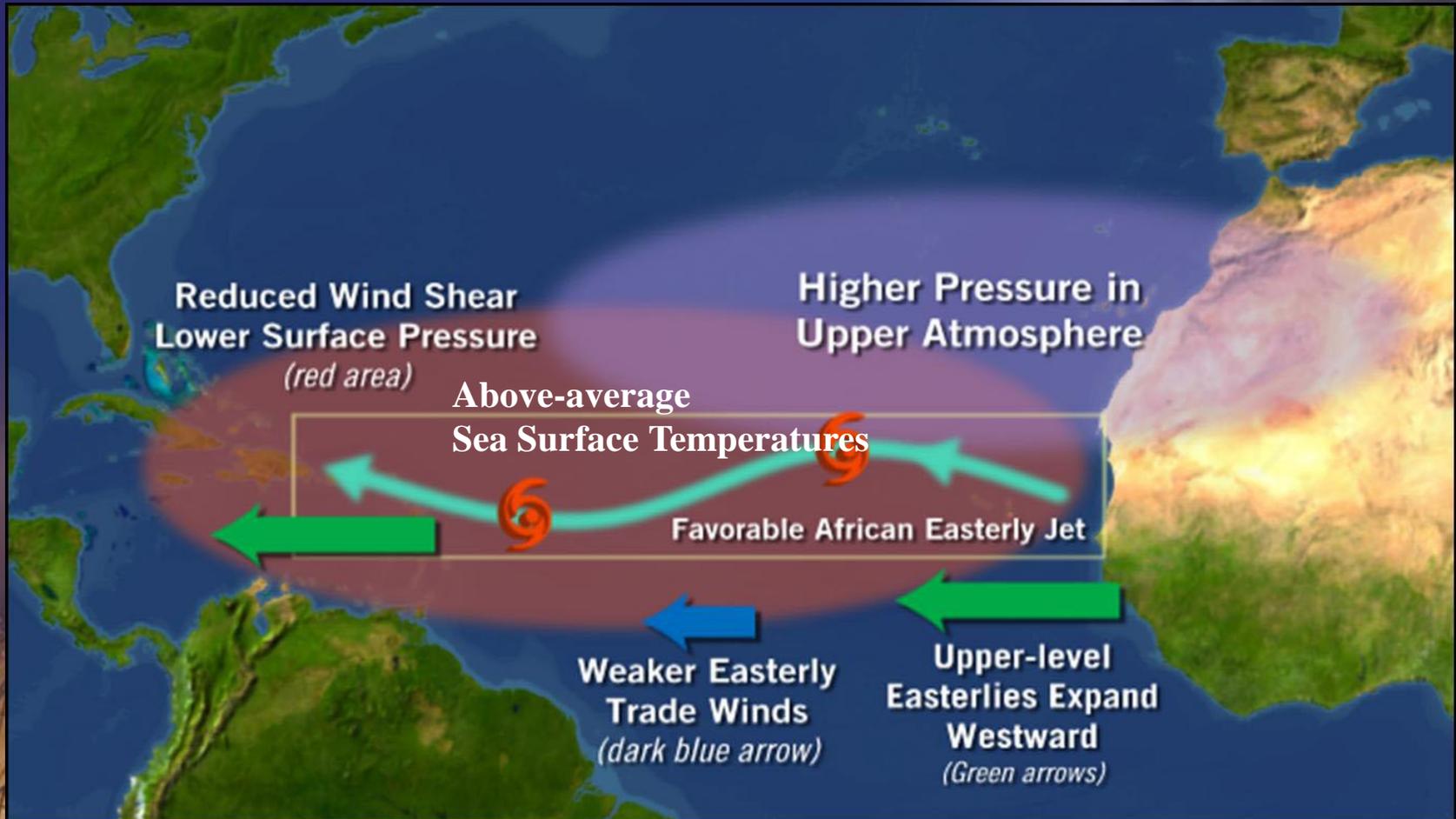


**STRONG SHEAR = UNFAVORABLE**





# Inter-Related Conditions for Atlantic High-Activity Era



This inter-related set of conditions has strong links to tropical climate factors. CPC has an extensive monitoring program to assess and predict these conditions and the associated climate factors.

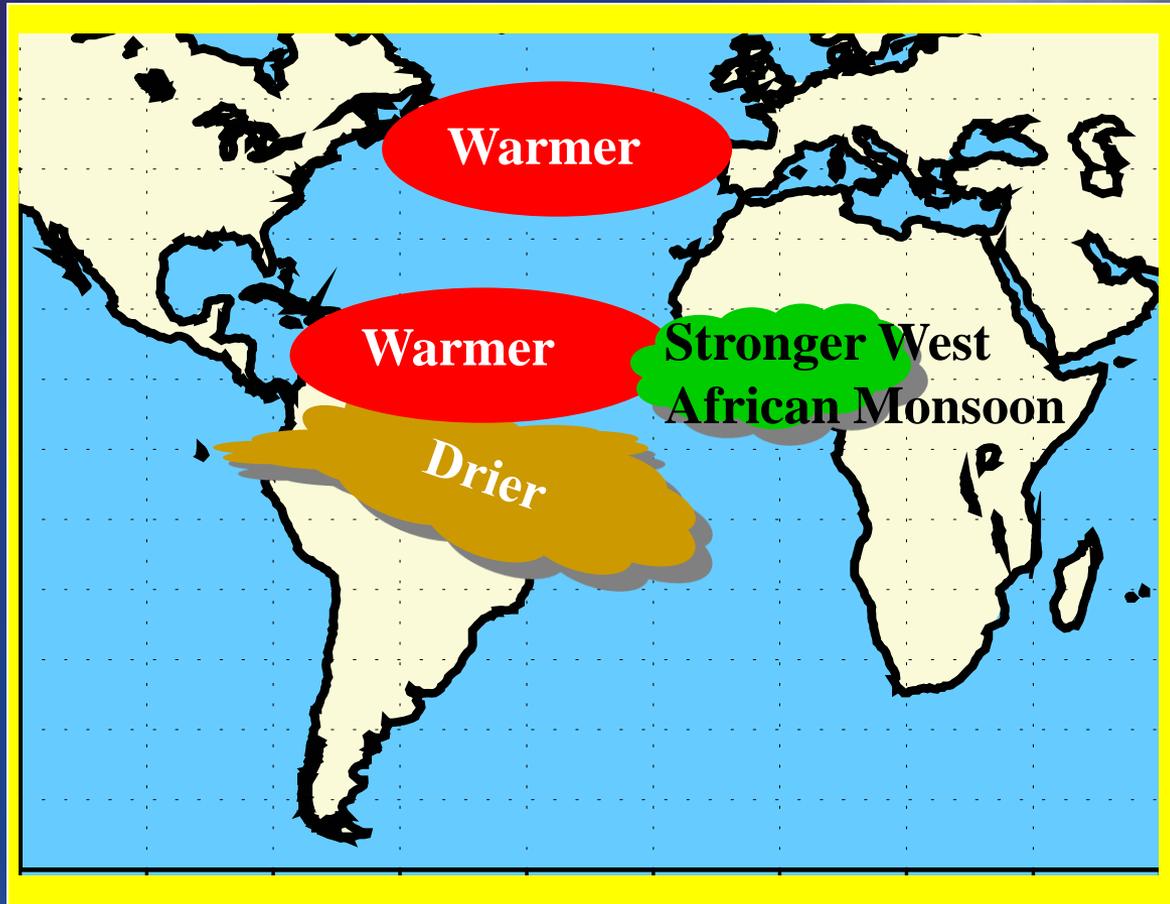


# Science Behind NOAA's Seasonal Outlooks

- **Hurricane season strength is not random.**
- **Seasonal activity reflects an inter-related atmospheric and oceanic conditions – Links to two main tropical climate factors:**
  1. **Atlantic Multi-Decadal Oscillation (AMO, *a.k.a. Tropical multi-decadal signal*) –**
    - **25-40 year fluctuations in Atlantic SSTs and West African monsoon**
    - **Favors a stronger 2012 Atlantic hurricane season**
  2. **El Niño and La Niña:**
    - **Reflect large year-to-year changes in tropical Pacific Ocean temperatures and rainfall**
    - **Possible El Niño favors weaker 2012 Atlantic hurricane season**
- **NOAA's seasonal outlooks based largely on these climate factors.**
- **New climate models (NOAA's Climate Forecast System CFS) are crucial.**



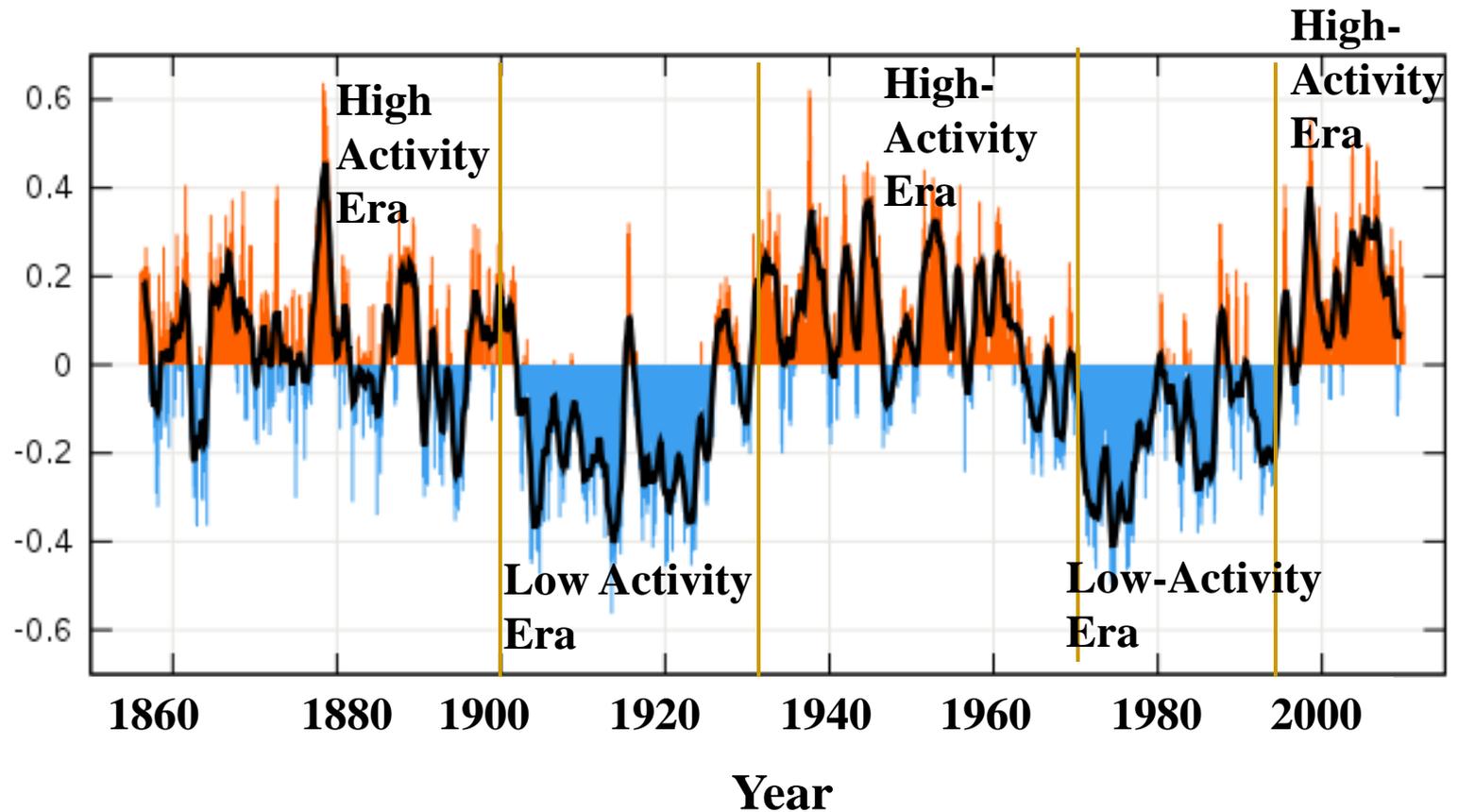
# The Atlantic Multi-Decadal Oscillation (*Tropical Multi-Decadal Signal*) Associated with Atlantic High-Activity Era



**Produces key ingredients of a high-activity era for Atlantic hurricanes: warmer waters, reduced wind shear, and favorable winds that strengthen cloud systems coming from Africa. This pattern favors a stronger 2012 Atlantic hurricane season.**



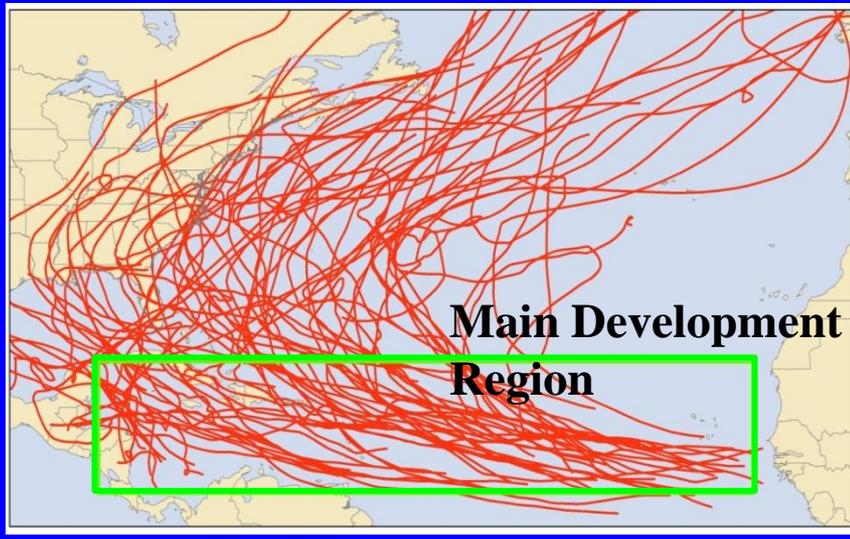
# Time Series of the Atlantic Multi-Decadal Oscillation 1856-2009



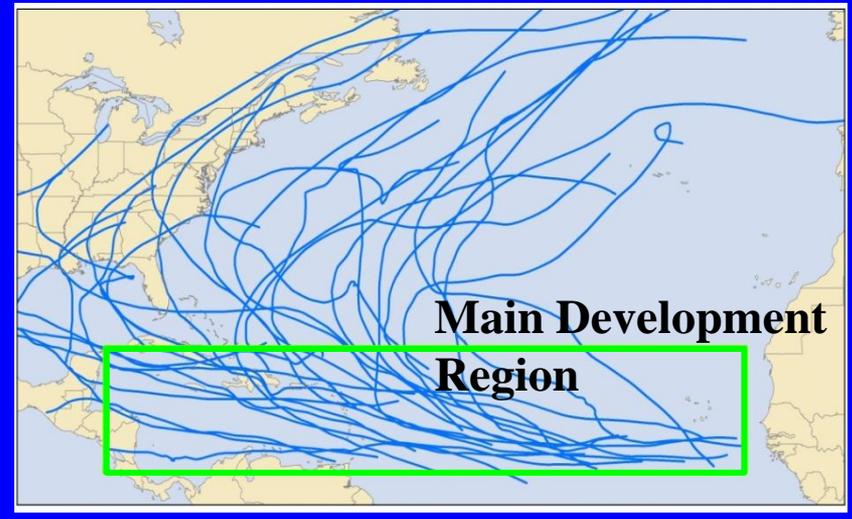


# Hurricane Tracks during High- and Low Activity Eras

**24 Seasons in High-Activity Era  
1959-1970, 1995-2006**



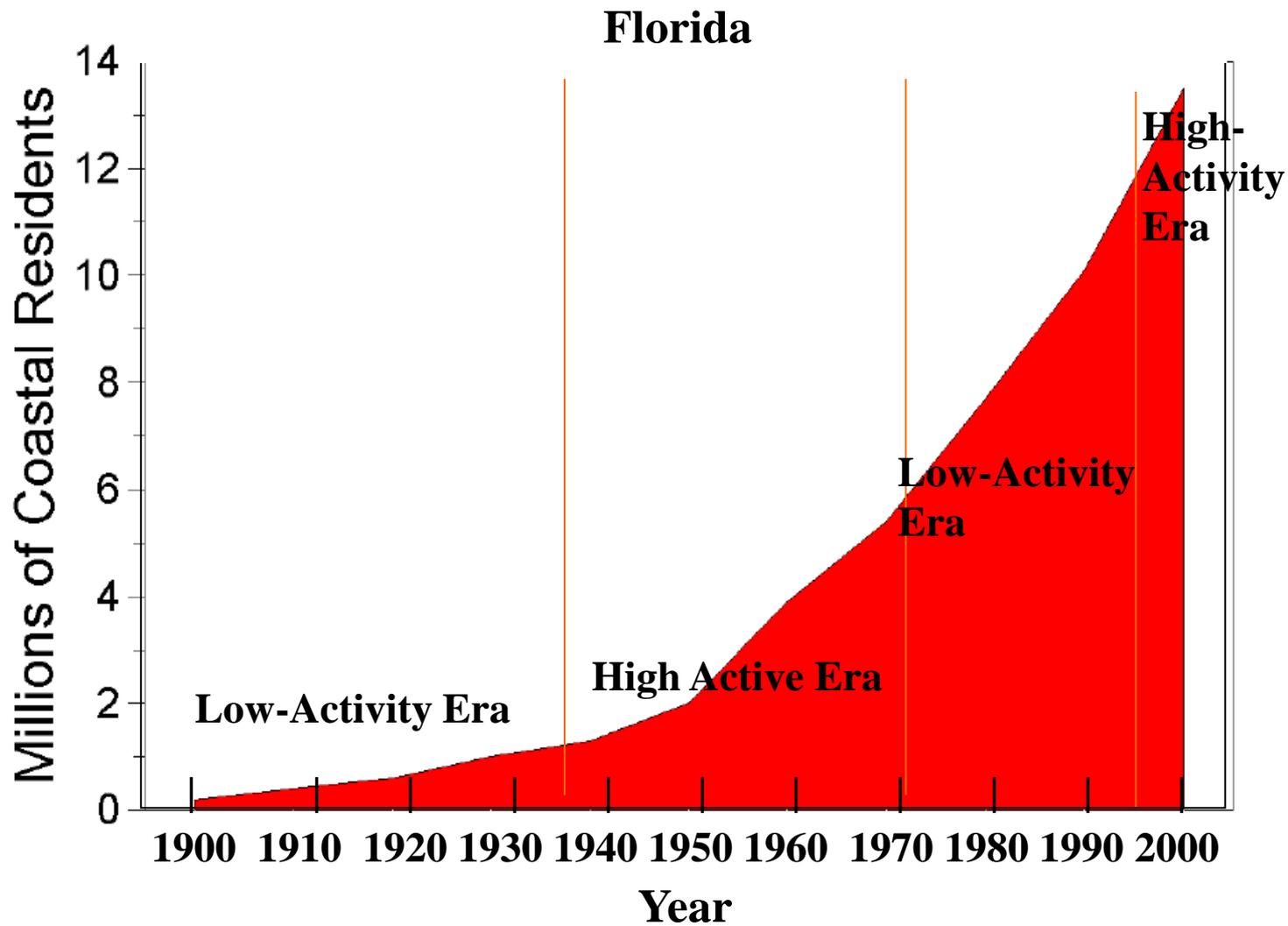
**24 Seasons in Low-Activity Era  
1971-1994**



**Many more hurricanes and major hurricanes form in the Main Development Region, and make landfall, in a high activity era.**



# Florida Coastal Population Growth

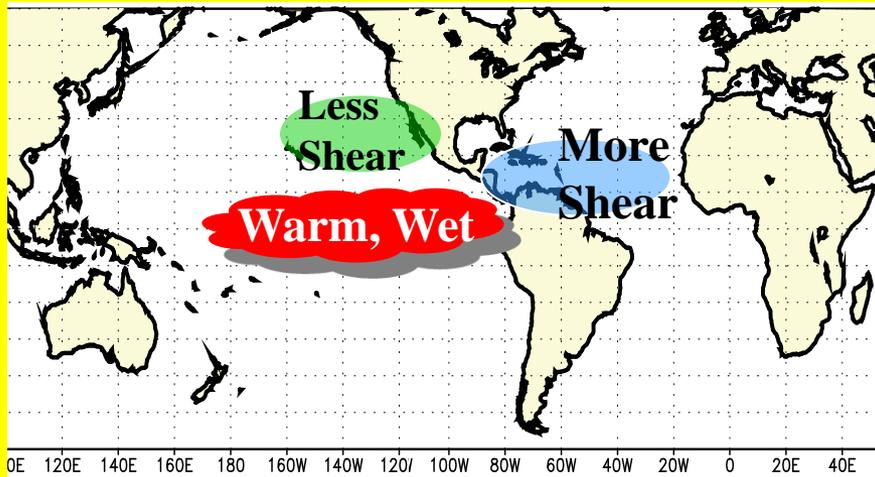




# El Niño and La Niña

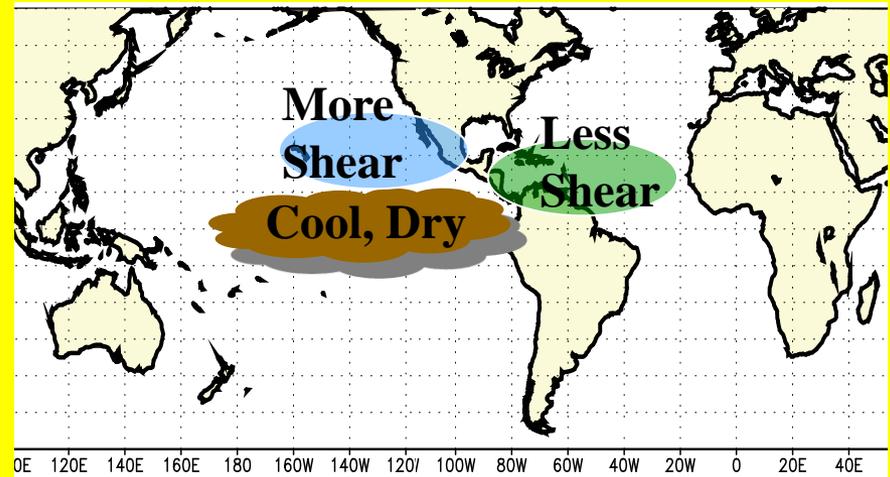
A competing factor for the 2012 Atlantic hurricane season is the possible development of El Niño.

## El Niño



**Atlantic: More shear, fewer hurricanes**  
**Pacific: Less shear, more hurricanes**

## La Niña

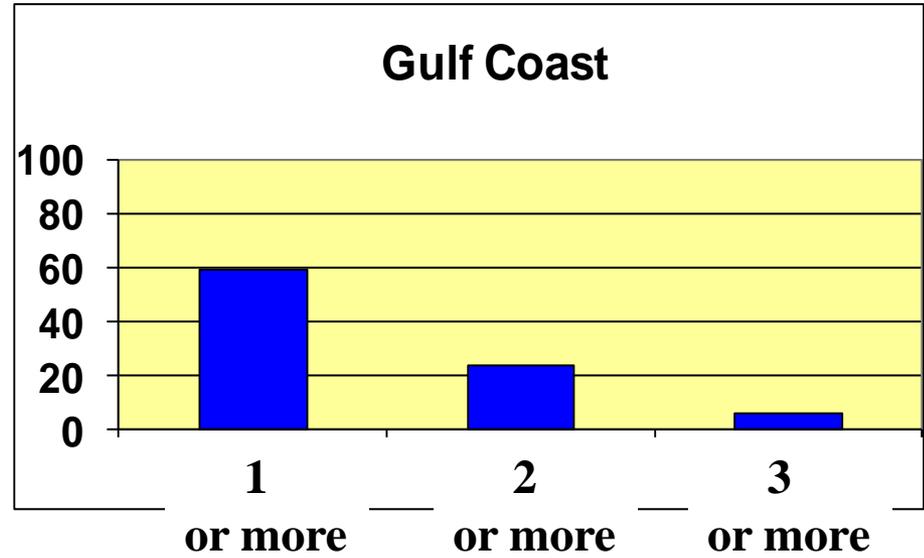
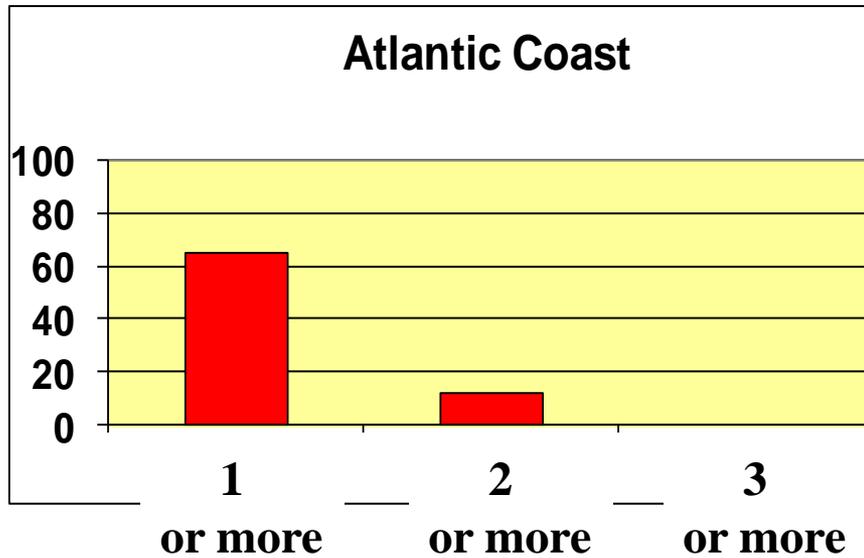


**Atlantic: Less shear, more hurricanes**  
**Pacific: More shear, fewer hurricanes**



# U.S. Hurricane Landfalls During Near-Normal Seasons

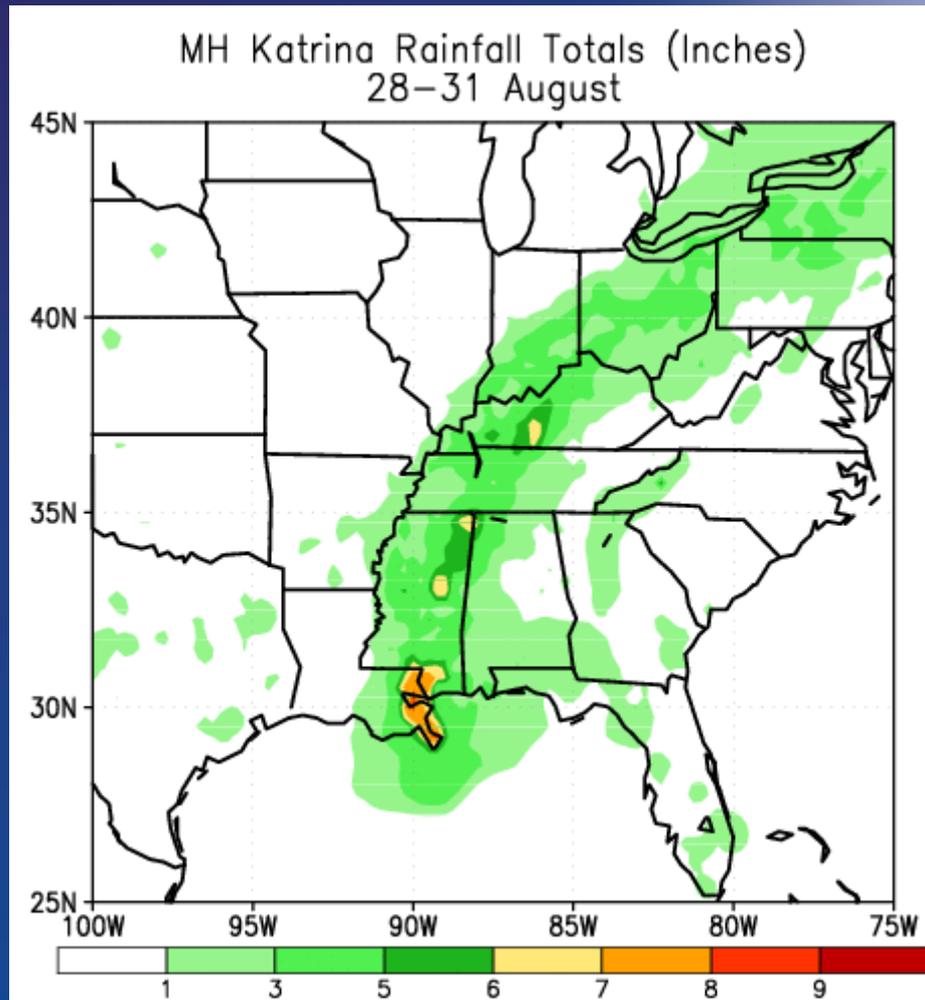
## Percent of Seasons with Specified Hurricane Landfalls



**The U.S. Atlantic Coast and Gulf Coast each experience a hurricane landfall in 60% of near-normal Atlantic hurricane seasons.**



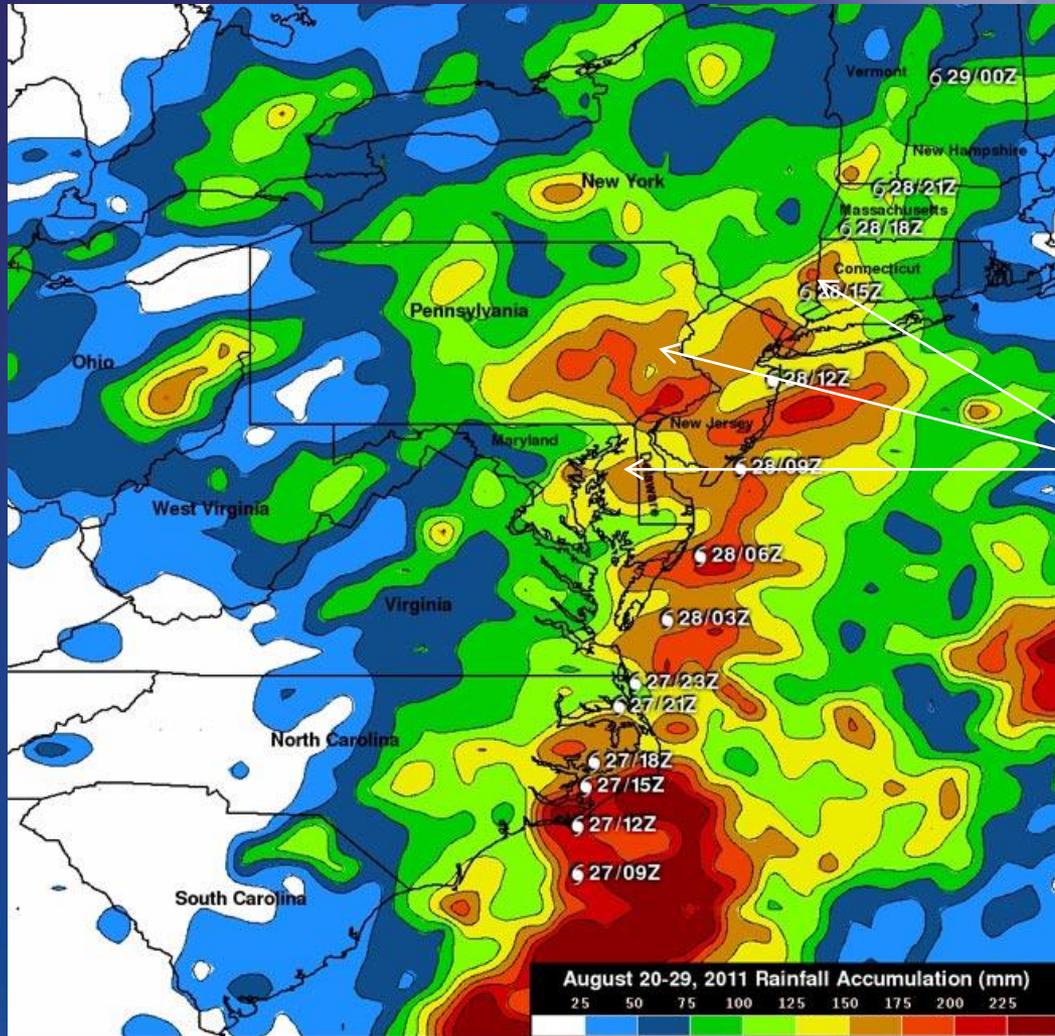
# Hurricanes Are Not Just a Coastal Event



**Leading cause of death is now from inland flooding.**



# Rainfall from Hurricane Irene: 2011



6+ Inches

1 2 3 4 5 6 7 8 9 inches



## Summary

- 1. Near-normal seasons are expected for both the Atlantic and eastern Pacific basins. A below-normal season is expected for the central Pacific region.**
- 2. Main competing climate factors behind the 2012 outlooks:**
  - **Multi-decadal signal: More Atlantic activity, less activity in eastern and central Pacific.**
  - **Possible El Niño: Less Atlantic activity, more activity in eastern and central Pacific.**
- 4. Historically, the U.S. Atlantic and Gulf coasts have equal probabilities (60%) of a hurricane landfall during a near-normal Atlantic hurricane season.**
- 5. Non-coastal hurricane impacts can be large: flooding, heavy rain, strong winds, tornadoes**

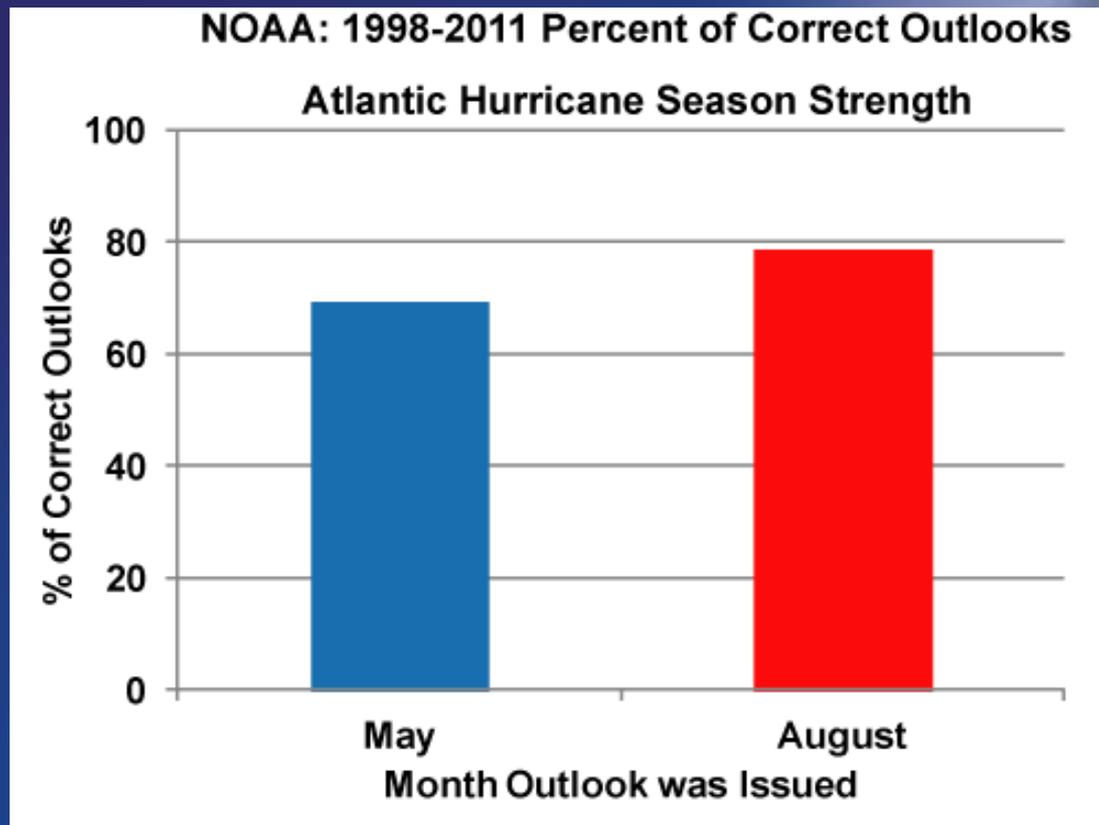


# Supplemental Materials





# Atlantic Outlook Verification: Season Strength



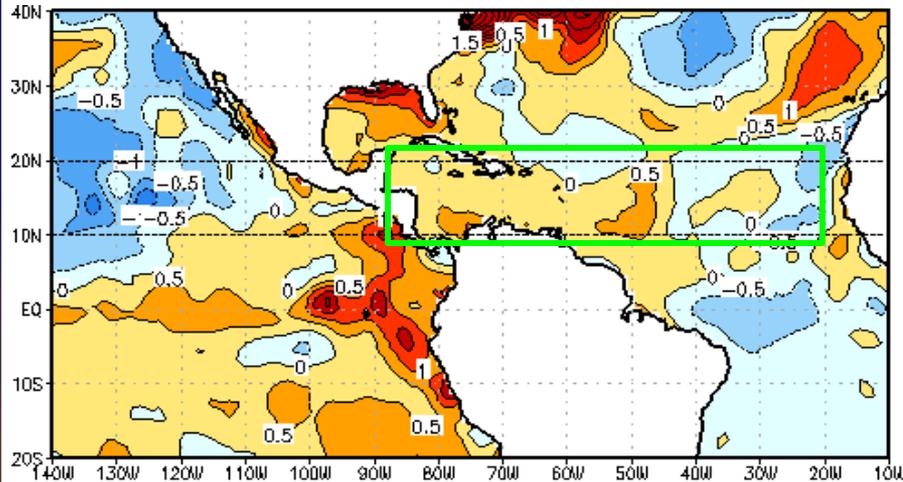
**NOAA' Atlantic hurricane season outlooks issued in May have correctly predicted the season strength (Above-, near-, or below-normal) 70% of the time. Updated outlooks issued in August were correct 79% of the time.**



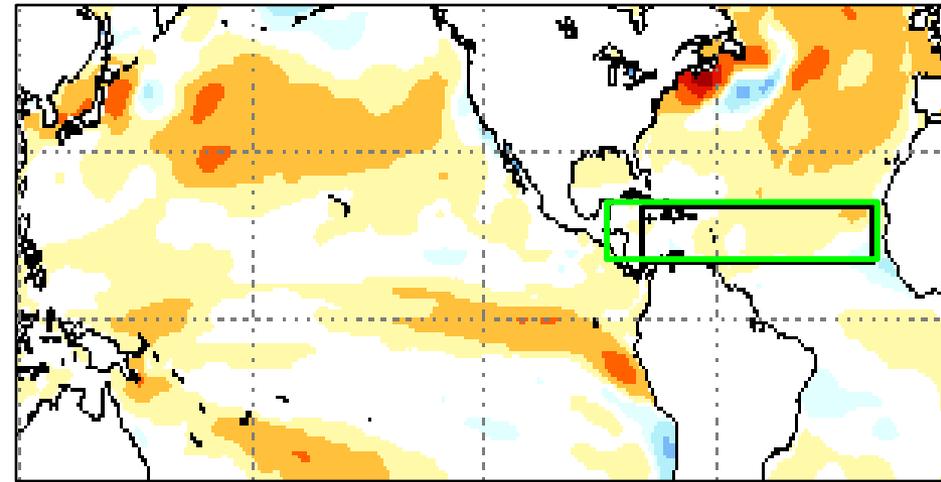
# Atlantic Sea Surface Temperature (SST) Departures (°C)

Another competing factor this season is possibly below-average SSTs in the eastern tropical Atlantic.

### Latest Weekly SST Anomalies



### CFS Forecast AUG-OCT 2012



SSTs are currently below average in the eastern tropical Atlantic.

NOAA's CFS high-Resolution model predicts near-average SSTs in the Main Development Region (Green box), with possibly below-average SSTs in the far eastern tropical Atlantic.

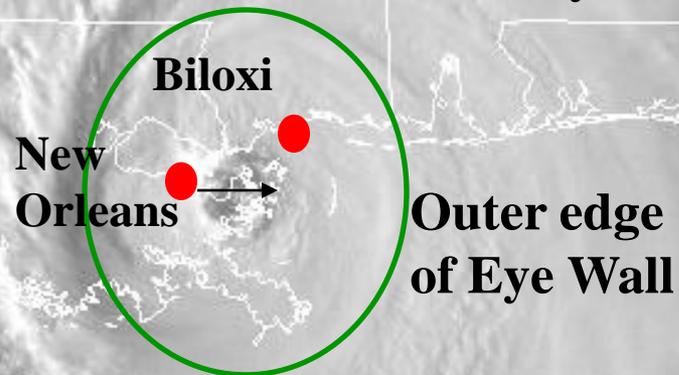


# Hurricane Katrina: 2005

**Eye was 30 miles across**

**Hurricane winds extend 125 miles from center.**

**New Orleans and Biloxi were both in eye wall at same time.**





# Hurricane Irene: 2011

Track of Irene



Irene in Bahamas



Irene along U.S. East Coast

