



# 2024 Seasonal Hurricane Outlook

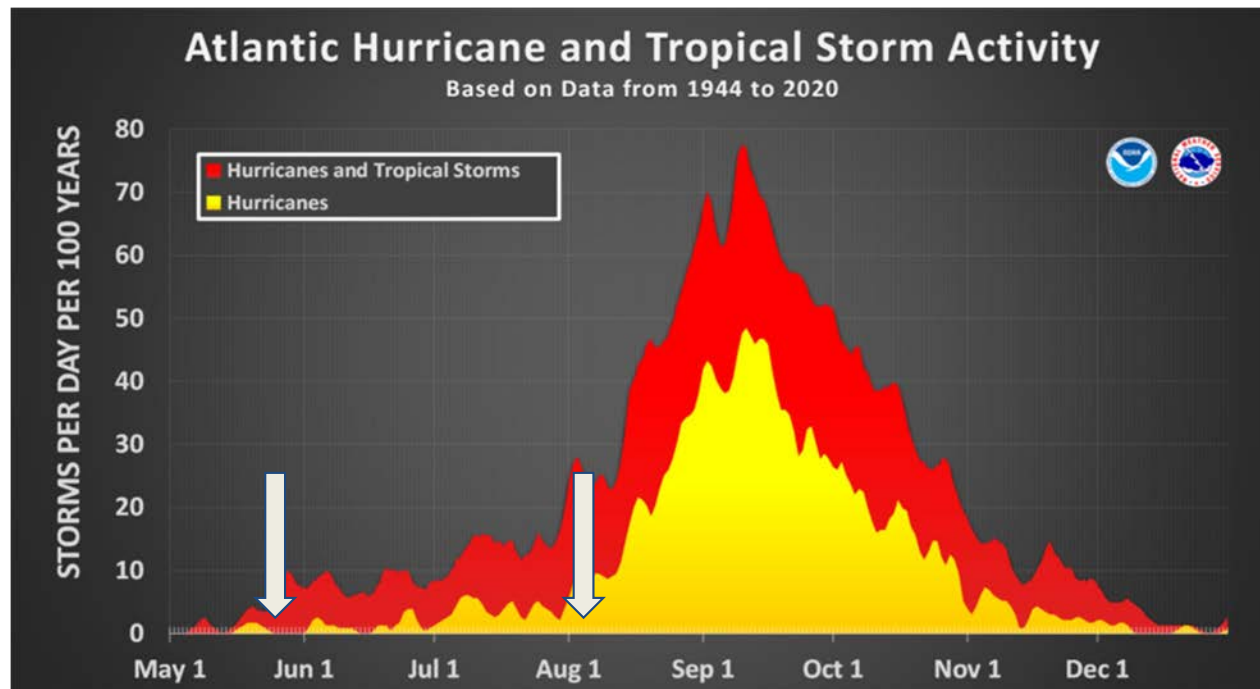
Matthew Rosencrans, Dan Harnos, Hui Wang



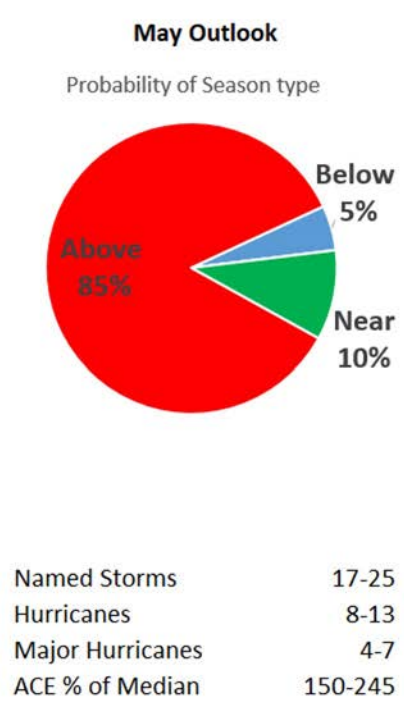
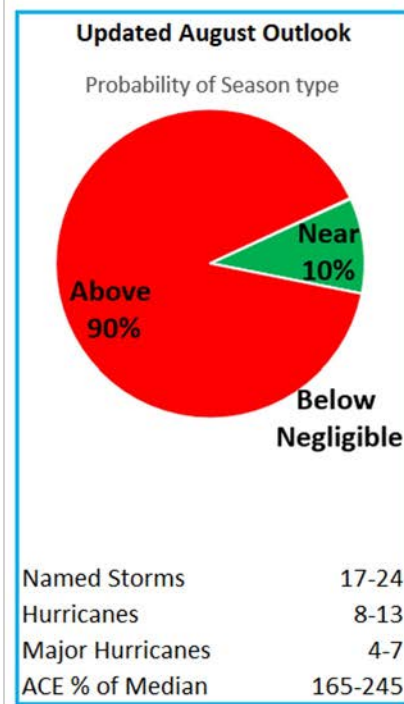
# Seasonal Hurricane Outlooks - When



Atlantic Seasonal Hurricane Outlooks are released in late May and early August.



# NOAA's 2024 Atlantic Hurricane Season Outlooks



Averages 1991-2020

Named Storms	14
Hurricanes	7
Major Hurricanes	3
% Median ACE	100%

These outlooks are for the overall seasonal activity. They are not a hurricane landfall forecast.

For the Atlantic hurricane region, the updated outlook indicates a 90% chance of an above-normal season, a 10% chance of a near-normal season, and a negligible chance of a below-normal season.

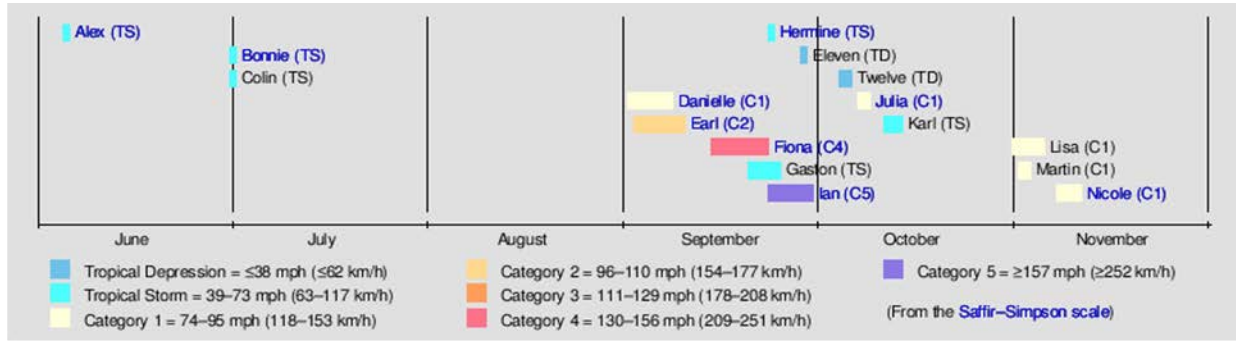
Caption: Red areas represent above-normal, green represents near-normal, and blue for below-normal. Below the chart are the predicted ranges of named storms, hurricanes, major hurricanes, and ACE, with climatology to the bottom right.



# Last 2 years in review

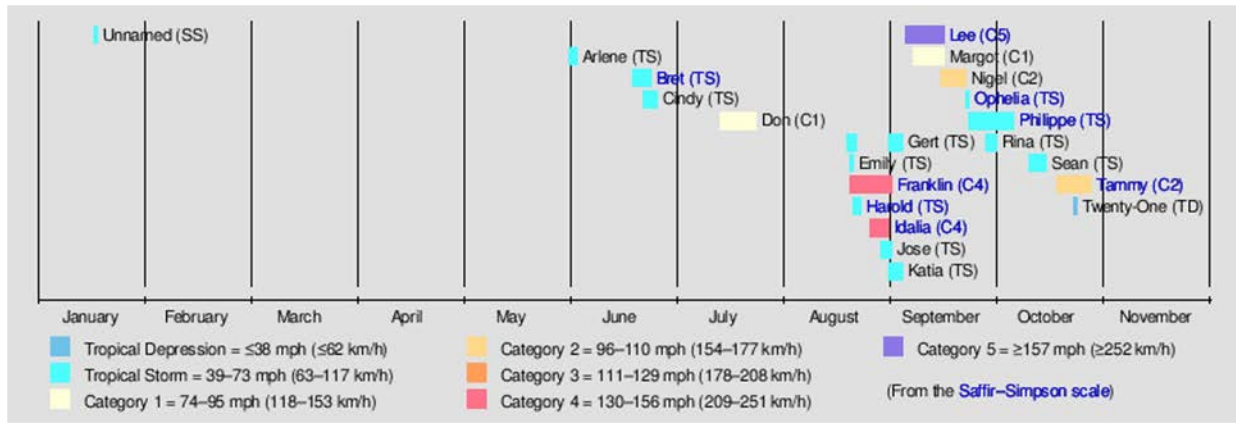
2022  
3 total by Sept 1  
11 after

Result:  
Near-Normal

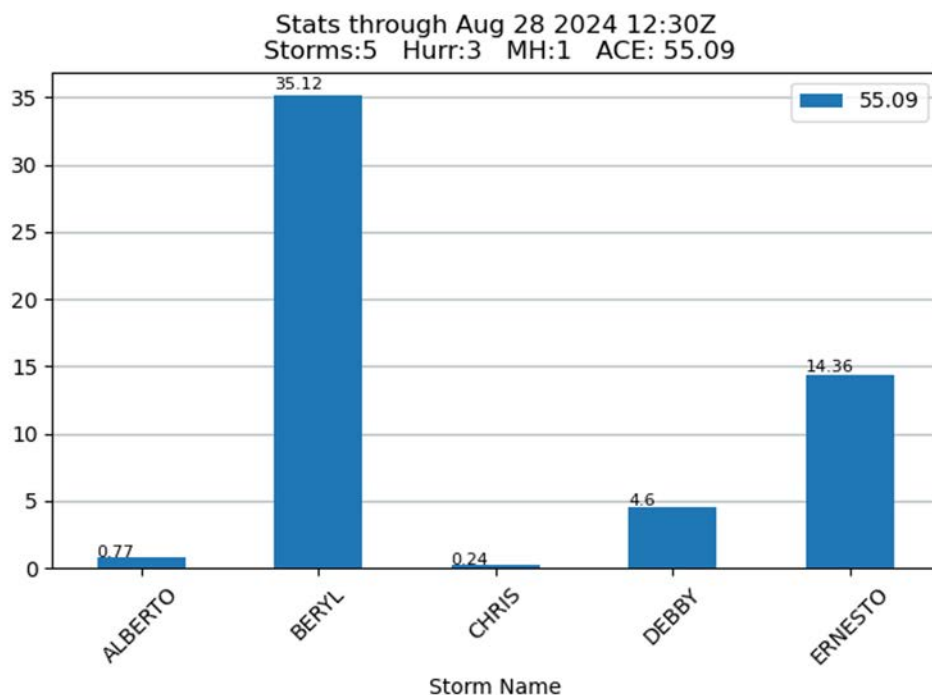


2023  
11 total by Sept 1  
9 after

Result:  
Above-Normal



# 2024 Atlantic Hurricane Season to date

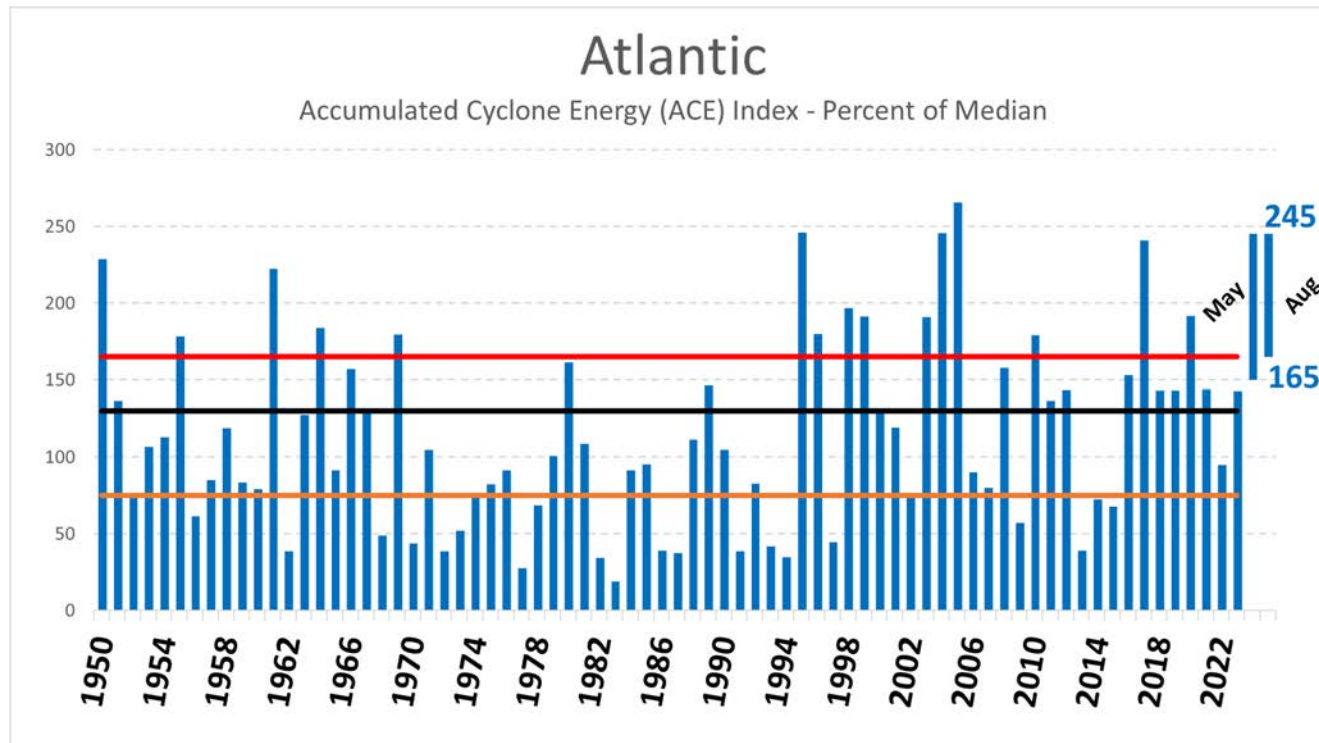


Thru 8/28	Named Storms	Hurr	Major Hurr	ACE
Climo	5.9	2.2	0.8	30
Obs	5	3	1	55

Caption: Bar chart showing the Accumulated Cyclone Energy (ACE) for each named storm in the Atlantic Basin this year. Title also includes the total number of named storms, hurricanes, major hurricanes, and ACE to date.



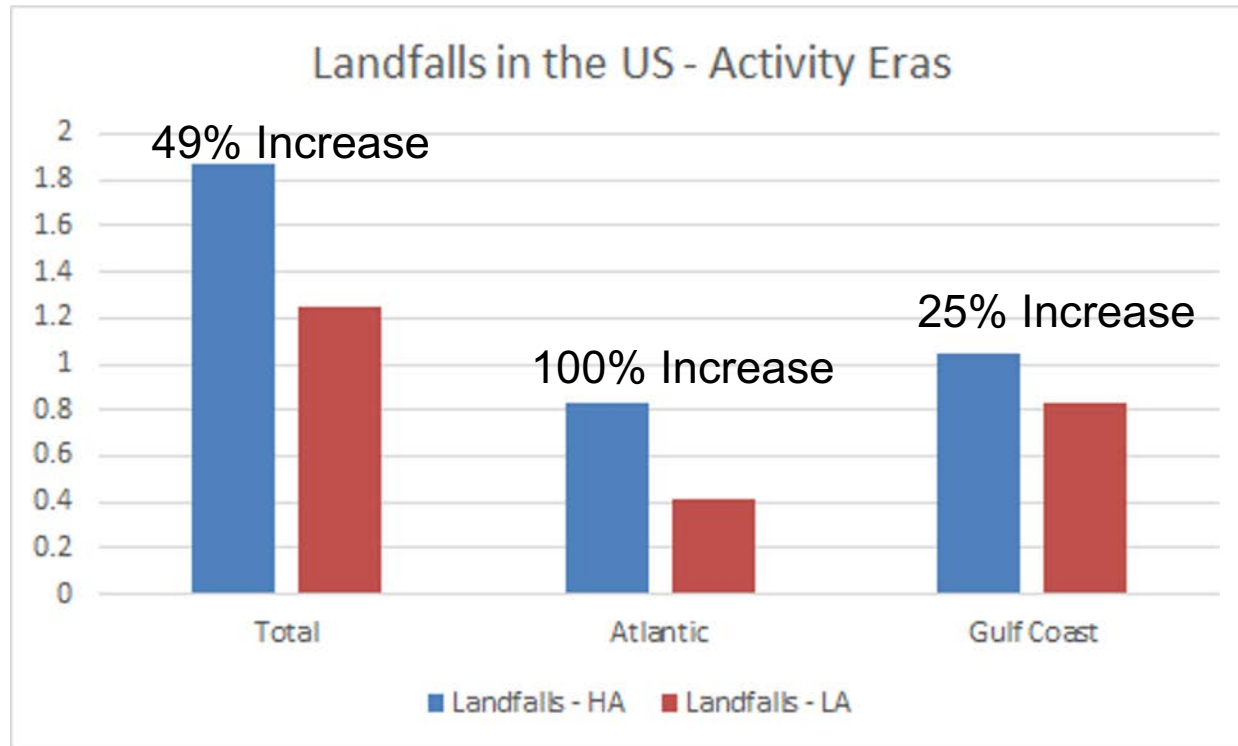
# Atlantic Outlook - Historical Context



Caption: Seasonal Accumulated Cyclone Energy (ACE) indices (Blue bars) and NOAA's 2024 outlook range with a 70% probability of occurrence (rightmost column) for the Atlantic basin. Black (orange) lines indicates NOAA's ACE thresholds for classifying hurricane season strength as above (below). For the Atlantic, the 165% threshold (red line) reflects a hyper-active season.



# Hurricane Landfalls - Activity Era



During high activity eras, largest increase in hurricane landfalls is along Atlantic coast

U.S. sees almost a doubling of seasons with multiple landfalling hurricanes: Occur about every other year compared to about every fourth year.



# What's behind the outlook?

El Niño / La Niña  
Atlantic Conditions  
Other factors





# ENSO Materials



Weekly ENSO Update (Monday morning):

[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)



Monthly ENSO Diagnostic Discussion (2nd Thursday, 0900 ET)

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



Monthly Climate Diagnostics Bulletin (mid-month, approx 13th)

<http://www.cpc.ncep.noaa.gov/products/CDB/>



ENSO Tutorial:

[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)



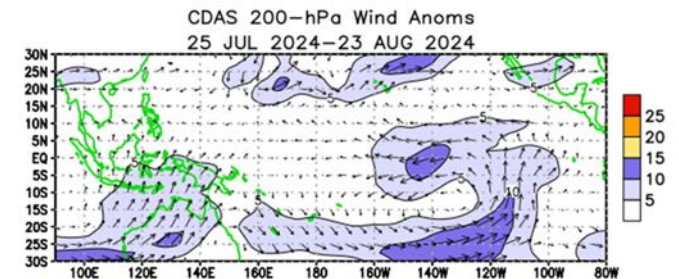
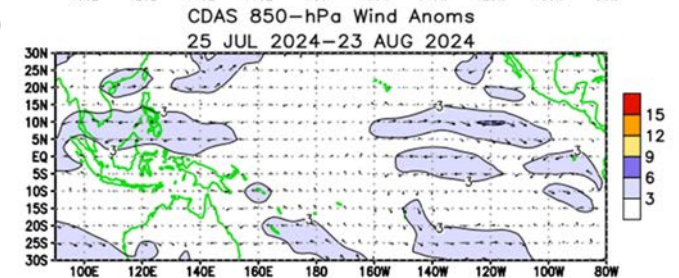
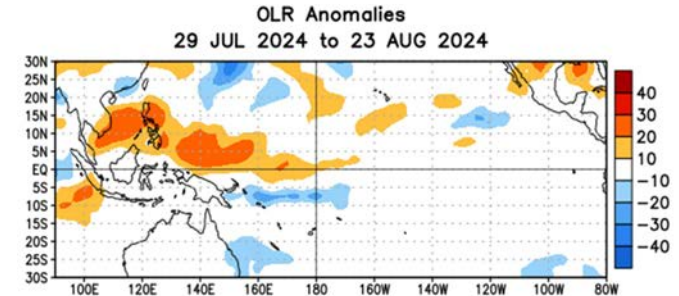
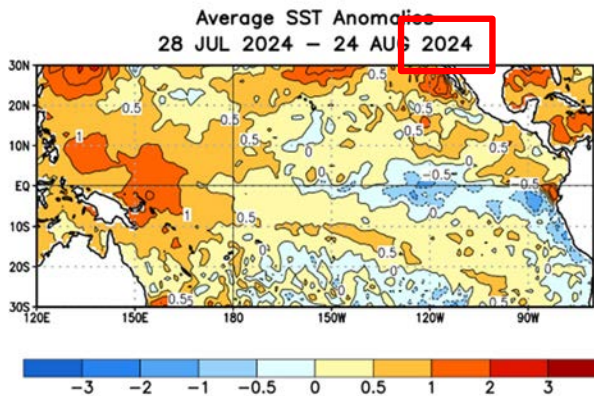
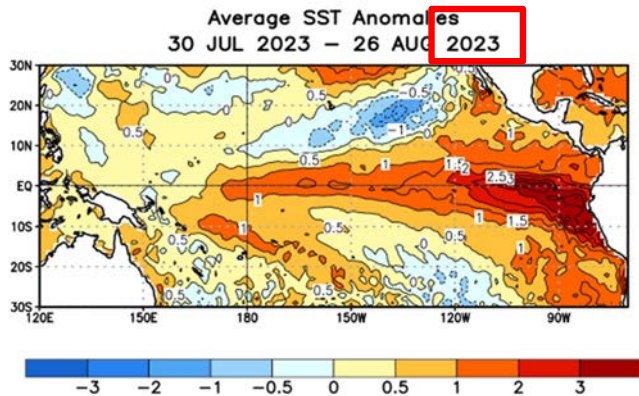


# ENSO Status

La Niña watch

Aug 21 - Niño3.4 0.0°C

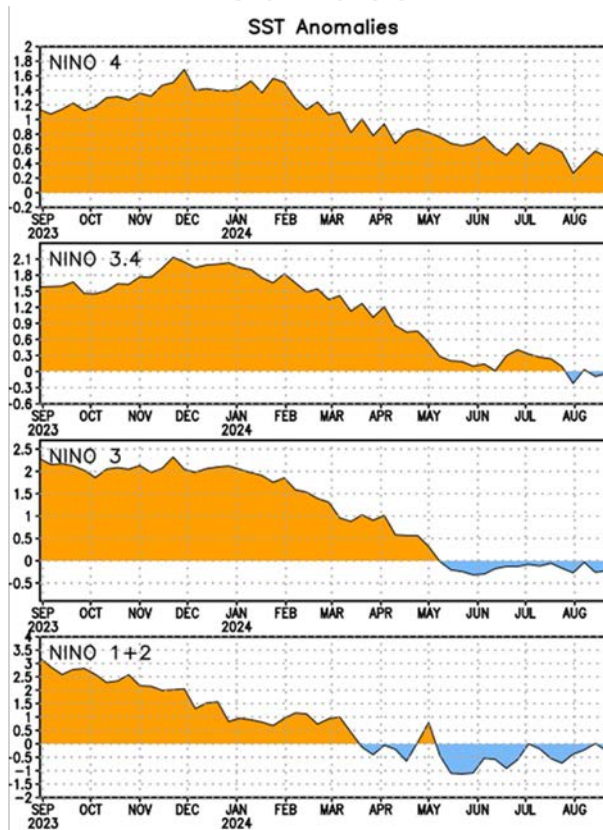
**La Niña favored to emerge during September-November (66% chance)**





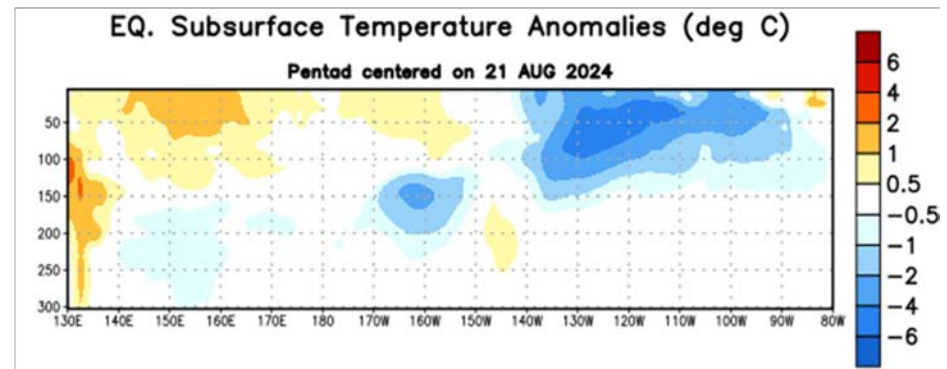
# ENSO Status

## Surface



## At depth

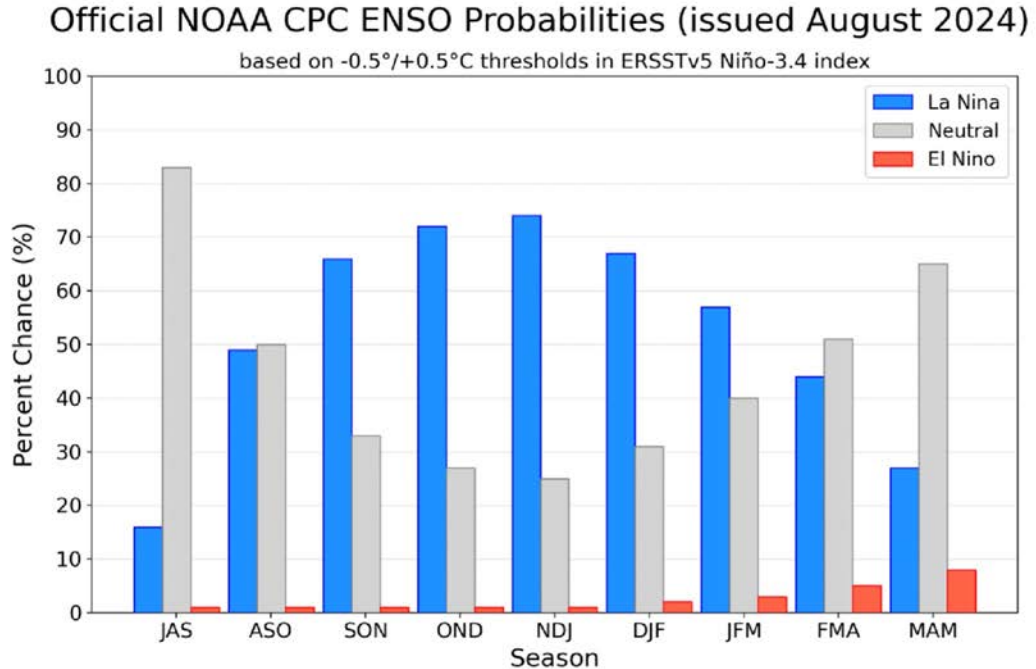
Over the last couple of months, negative subsurface temperature anomalies have persisted in the eastern equatorial Pacific Ocean and extended to the surface.



Below-average temperatures remain at depth in the central Pacific Ocean, with above-average temperatures near the surface in the western and central Pacific.



# CPC/ IRI ENSO Probability Forecast (Aug 10th)



The official CPC/IRI forecast from July indicates transition to La Niña as most likely through ASO 2024. Odds for La Niña during ASO have decreased since the initial outlook. (to 49% from 77% in May). So later La Niña likely.

Caption: Seasonal probabilities for El Niño (Red bars), ENSO-neutral (Grey bars), and La Niña (Blue bars). Seasons are indicated by their 3-letter abbreviation (JJA is June-July-August, etc.). This is issued by the NOAA Climate Prediction Center (CPC) and NOAA associated partners.

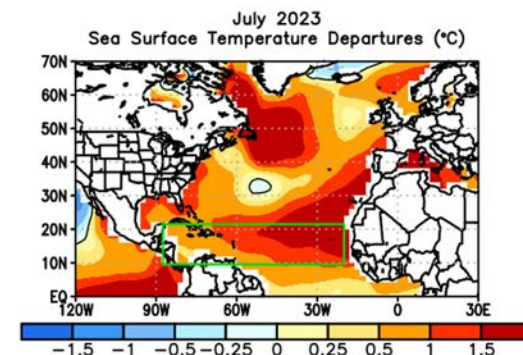
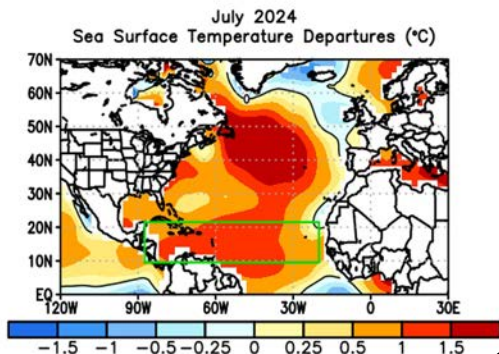


# Atlantic Conditions





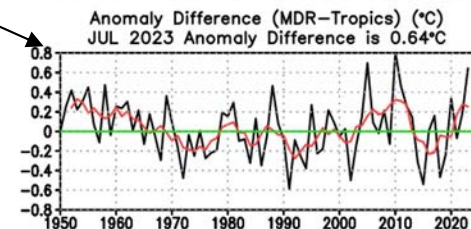
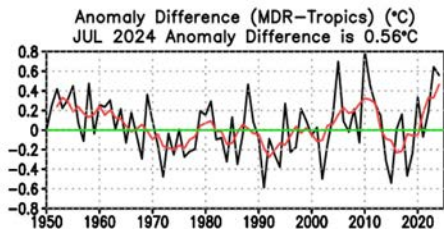
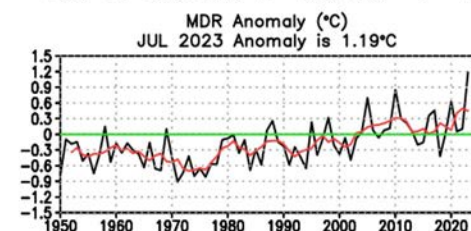
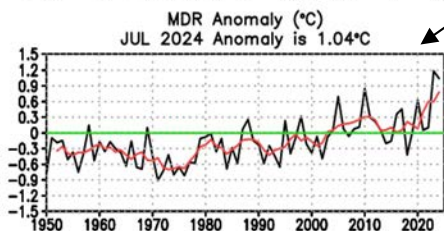
# June 2024 vs 2023 SSTA in MDR



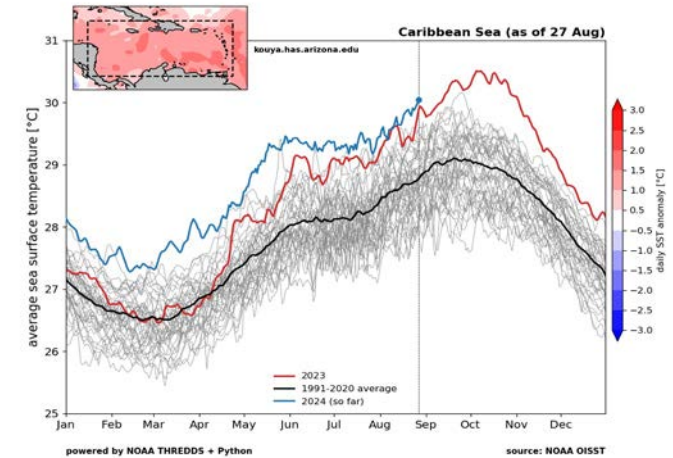
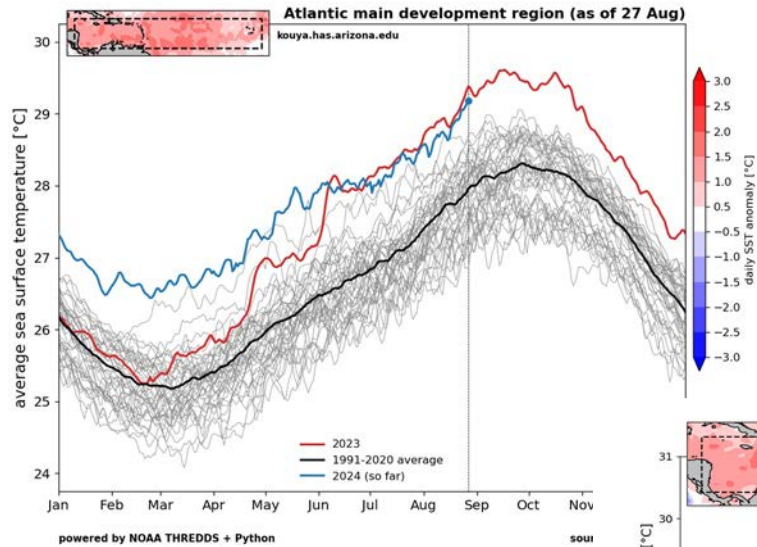
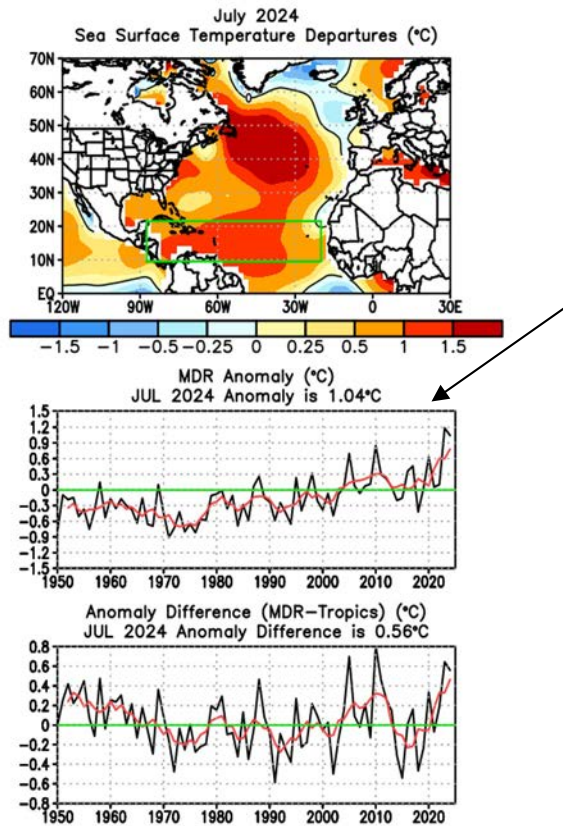
Area-averaged SSTs in the MDR were about 1.04 °C above average during June.

SSTA's in the MDR were about +0.56°C warmer than those for the global Tropics.

Very similar to last year (+1.19C in MDR and +0.64C from Global Tropics)



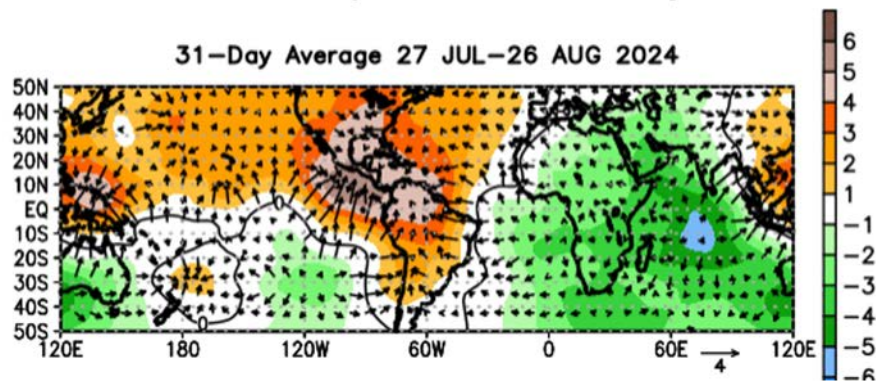
# 2024 SSTA - Atlantic Subbasins



# West African Monsoon

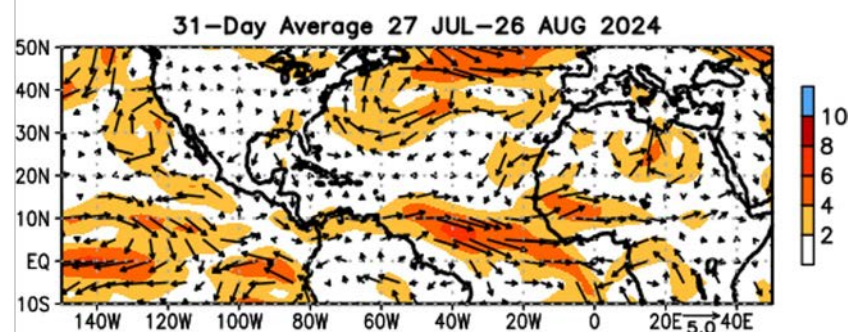


200-hPa Anomalous Velocity Potential and Divergent Wind Vector

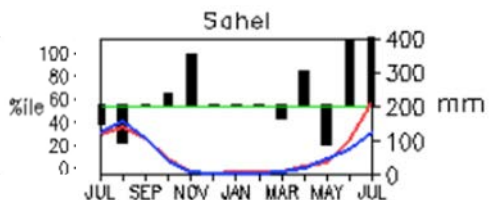


At 200-hPa, velocity potential anomalies indicate an above-normal monsoonal circulation over the West African Monsoon region.

850-hPa Anomalous Wind Speed (shading) and Vector



Trade winds are well below normal and inflow to the West African Monsoon is well above-normal.



The African Sahel has experienced high variability in precipitation in 2024. June and July were well above-average.

Caption: (Top Left) 200-hPa Velocity potential anomalies, warm (cool) tones indicate convergence (divergence). Top Right) Low-level (850-hPa) wind anomalies with vectors, 1991-2020 base period. (Bottom) Areal estimates of monthly mean precipitation amounts (mm, red lines) and precipitation percentiles (% bars) for the most recent 13 months (Janowiak and Xie 1999, J. Climate, 12, 3335–3342). The monthly precipitation climatology (mm, blue line) is from the 1981-2010 base period monthly means. Monthly percentiles are not shown if the monthly mean is less than 5 mm. (Bottom Right) NMME probabilities for precipitation category.

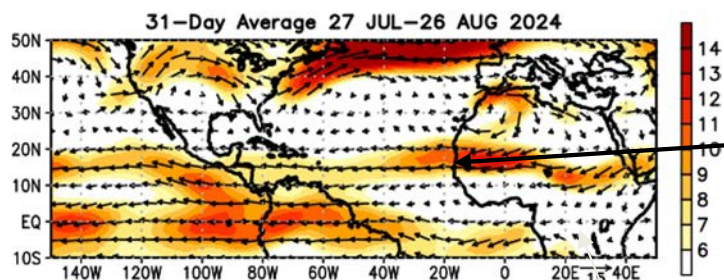


# Observed Low-level Circulation

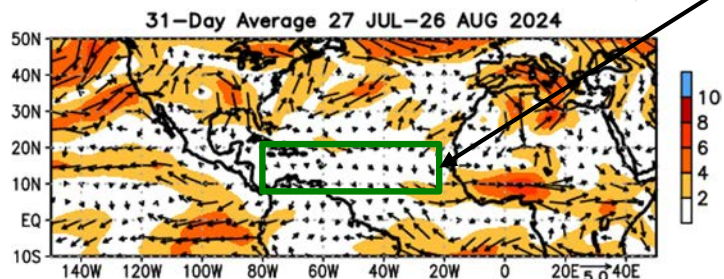


Last 31 Days

600-hPa Wind Speed (shading) and Vector



600-hPa Anomalous Wind Speed (shading) and Vector



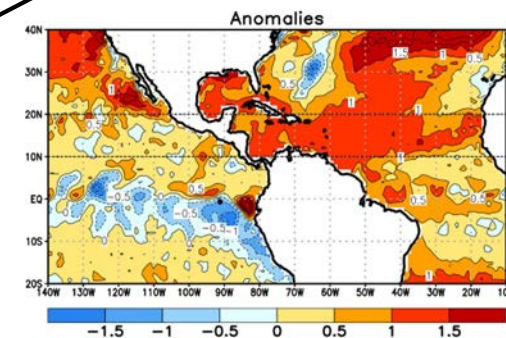
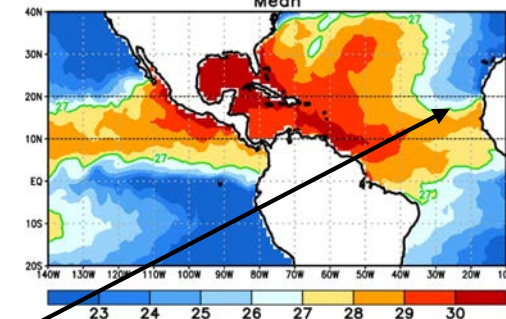
600-hPa wind speed (shading,  $m s^{-1}$ ) and vector: 31-Day average. (Top) Total and (Bottom) Anomalies. Vector scales are below plots. Anomalies are departures from the 1991–2020 period monthly means. NOAA/NWS/NCEP/CPC

African Easterly Jet axis is near 18-19N. Well north of where it was last year, and well north of normal.

Small anomalies for most of the MDR (Green Box), as the core of the AEJ is over western Africa.

This pattern is indicative of the high activity era, maybe even too amplified as waves moving off Africa are pulling in Saharan Air and moving over relatively cooler waters.

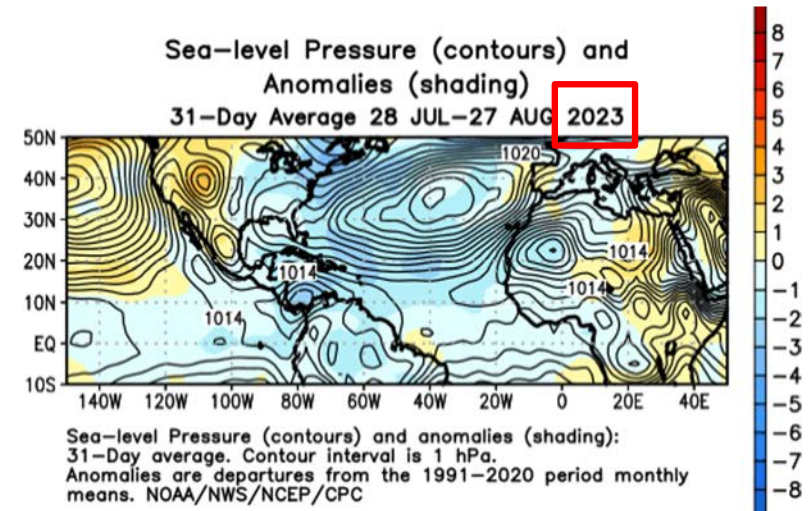
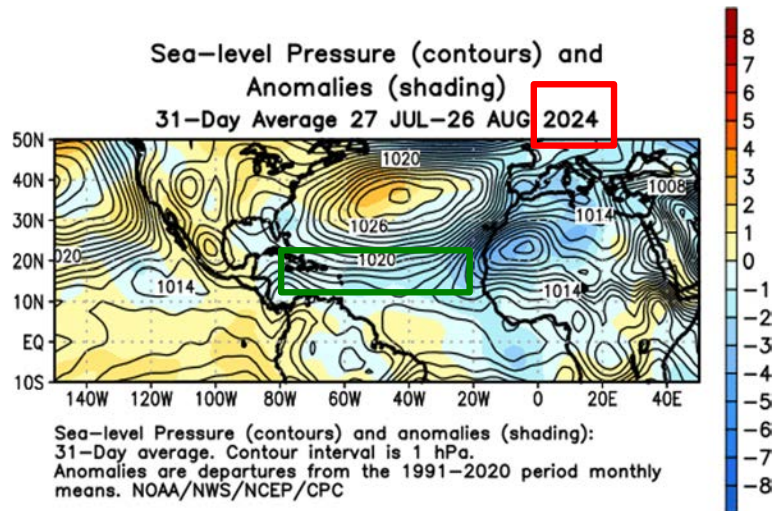
Weekly Sea-Surface Temperatures ( $^{\circ}C$ ) Centered on 21 AUG 2024



Weekly sea-surface temperatures ( $^{\circ}C$ ) centered on 21 AUG 2024. (Top) Total and (Bottom) Anomalies. Anomalies are departures from the 1991–2020 period weekly means. NOAA/NWS/NCEP/CPC

Caption: Climate Data Analysis System (CDAS) analysis of wind anomalies at 700-hPa. Green boxes denote the Main Development Region (MDR) of the Atlantic.

# Sea-level Pressure



Across the MDR, sea-level pressure has been below average (blue shading) throughout the summer. Hallmark of a busy season.

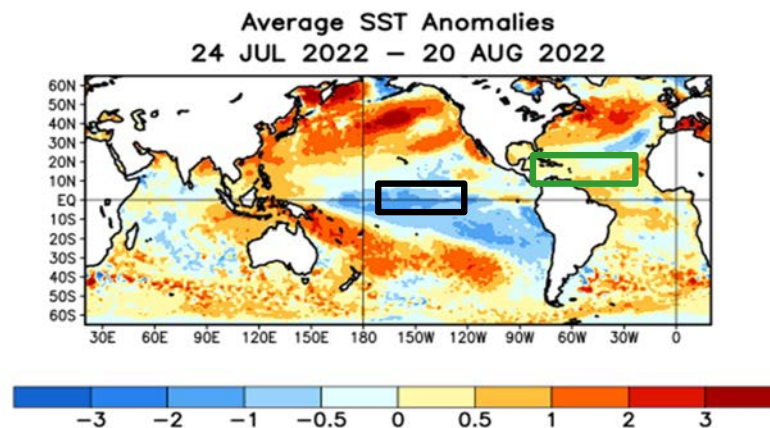
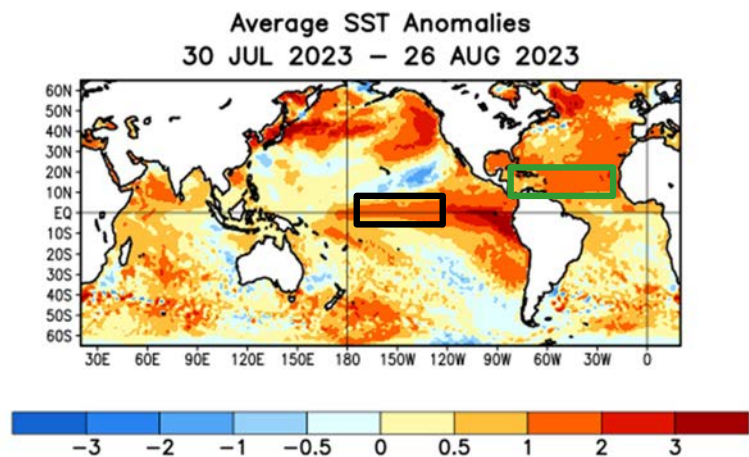
Pressures are slightly higher over the open Atlantic than last year, much lower over Africa (strong monsoon).

Caption: Climate Data Analysis System (CDAS) analysis of SLP anomalies. Green boxes denote the Main Development Region (MDR) of the Atlantic. (Bottom) Forecasts of SLP from CFSv2 and the C3S multi-model.

# Sea-surface Temperature Anomalies



Last year at this time



During May and June, El Niño conditions were present across the equatorial Pacific Ocean (blue box). A mix of SST anomalies is observed in the off equatorial Pacific. In the Atlantic hurricane MDR (green box), SSTs were above-average (record warmth). Strongly above-normal temperatures are evident over much of the western and eastern North Atlantic. Some below-normal temperatures are in the central extratropical Atlantic. **A warm Atlantic and warm Pacific would produce competing forcings for Atlantic tropical cyclone activity.**

Caption: Sea surface temperature anomalies (°C) during July of 2023 and 2022. Green box is the Atlantic MDR, black box is the Niño 3.4 region. Departures from the 1991-2020 means.

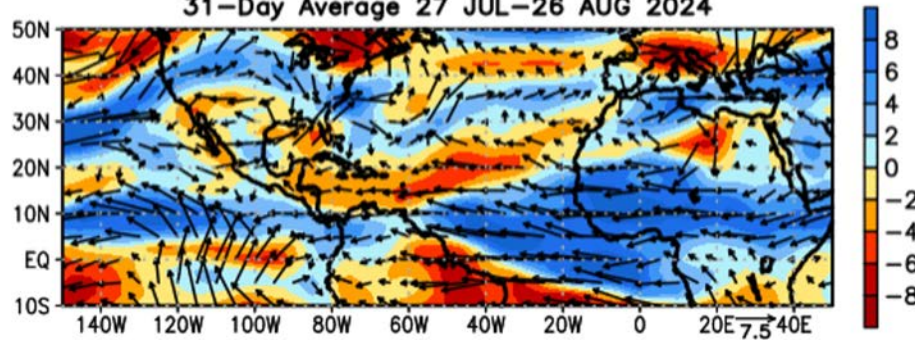


# 200-850 hPa vertical wind shear and Anomalies



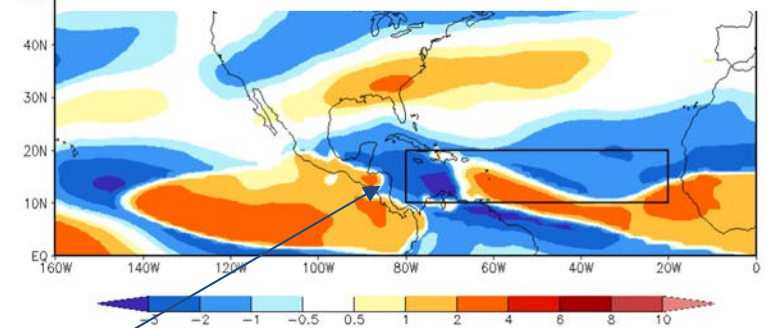
Observed

200–850 hPa Anomalous Vertical Wind Shear  
Magnitude and Vector  
31–Day Average 27 JUL–26 AUG 2024



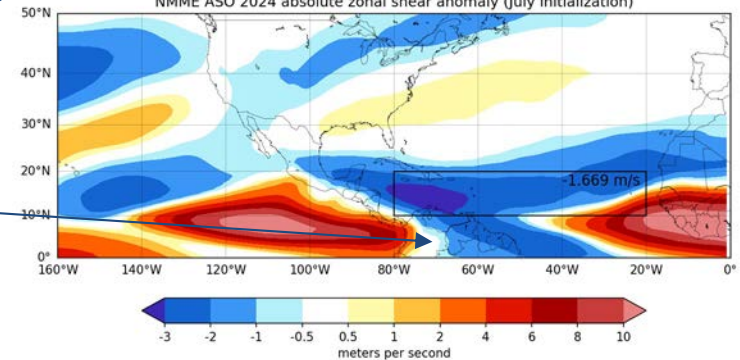
CFS

abs(U200–U850) – abs[Climo(1991–2020)]



NMME

NMME ASO 2024 absolute zonal shear anomaly (July initialization)

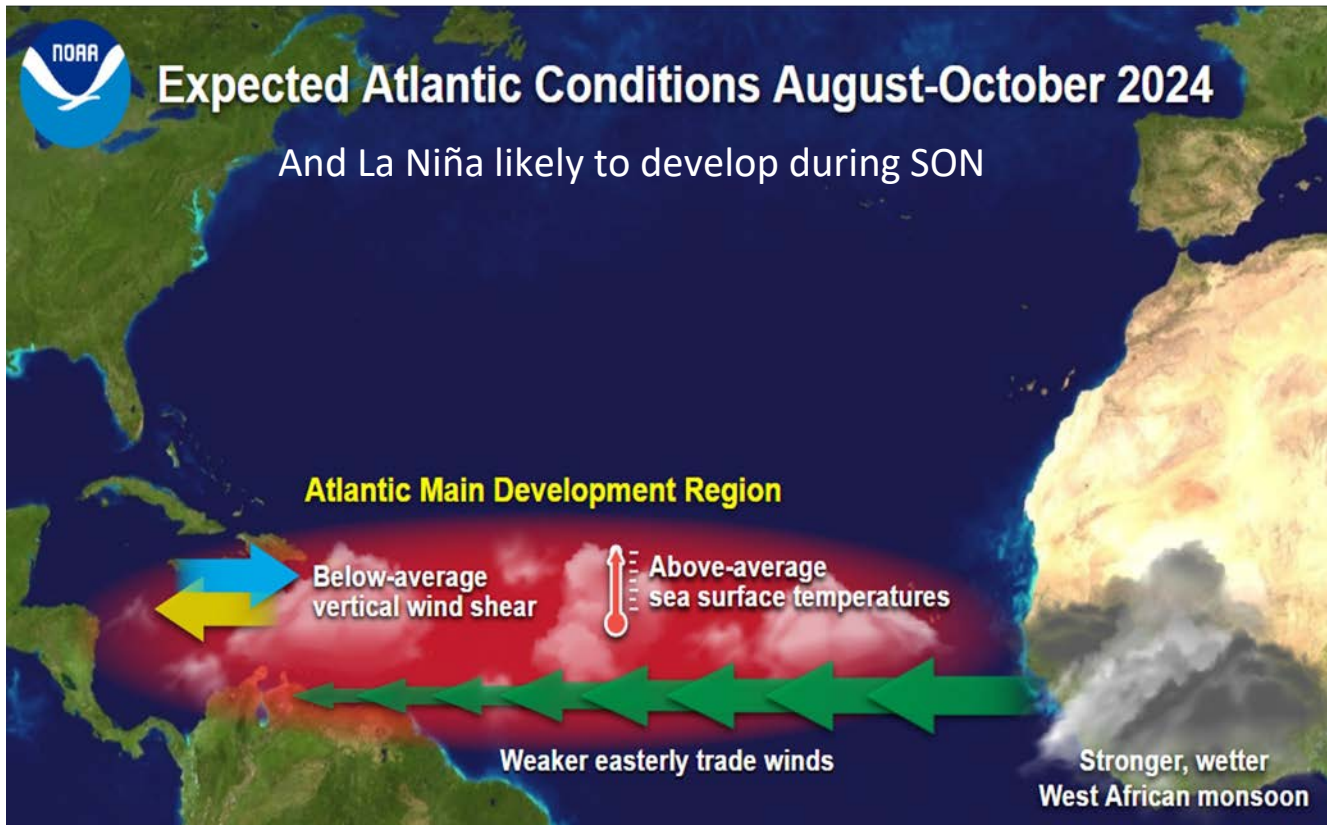


Vertical wind shear has been weaker than average across the Gulf of Mexico and the western MDR.  
Very high wind shear over the eastern MDR (strong monsoon likely driver).

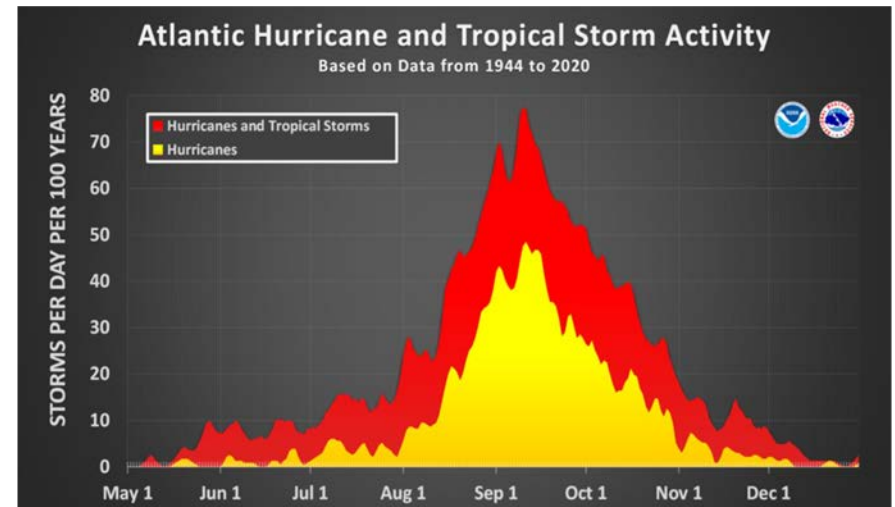
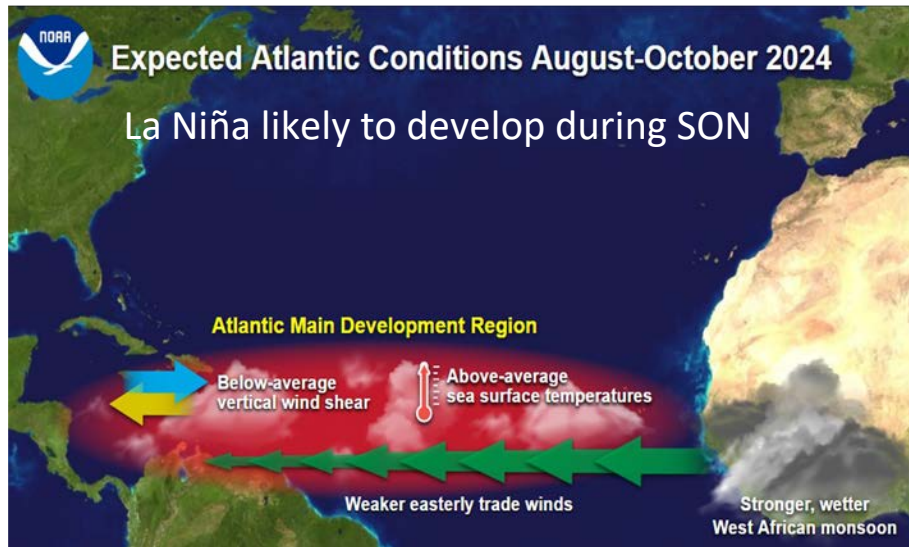
CFS predicts slightly below normal shear and strong shear from monsoon.

NMME predicts below normal shear (7th percentile) and strong shear from monsoon.

# Expected Atlantic Conditions During August-October 2024



# Expected Atlantic Conditions During August-October 2024





# Summary

## 2024 Atlantic Outlook

Above-normal season most likely.

To date

17-24 Named Storms

5 NS

8-13 Hurricanes

3 H

4-7 Major Hurricanes

1 MH

*Factors: VERY Warm Atlantic and La Niña coming*

**It Only Takes One!**

***Prepare now!***

***Help Build a Weather and Climate -Ready Nation***



# Supplemental

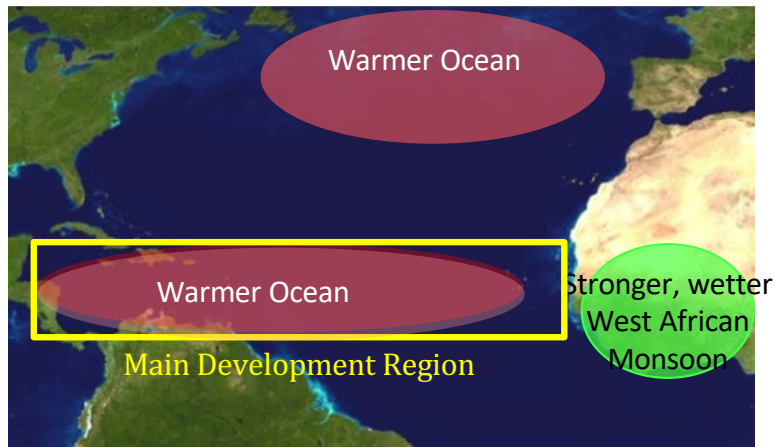




# The Atlantic Multi-Decadal Oscillation (AMO)

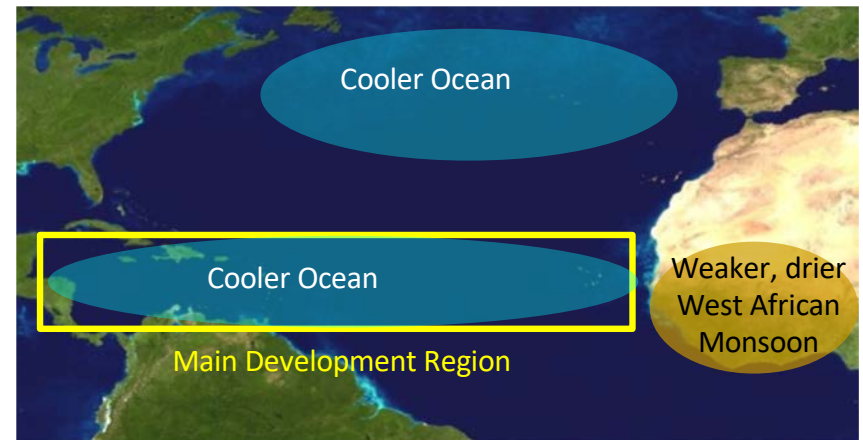


Warm (Positive) Phase of AMO  
Climate Pattern for High-Activity Era



Atlantic: High-activity era  
East Pacific: Lower activity

Cold (Negative) Phase of AMO  
Climate Pattern for Low-Activity Era



Atlantic: Low-activity era  
East Pacific: Higher activity

Caption: Schematic showing sea surface temperature and west African monsoon conditions for opposing phases of the Atlantic Multi-Decadal Oscillation (AMO): (Left) warm phase and (Right) cold phase.