

2025 Seasonal Hurricane Outlook

National Weather Service, NOAA Research

ž

퀭

औ

KS

哭

1

12

÷

X

ď

Department of Commerce // National Oceanic and Atmospheric Administration // 1

Hurricane Outlook



Collaboration with many parts of NOAA

Atlantic, East Pacific NHC, AOML Central Pacific CPHC West Pacific WFO Guam (WFO takes lead), NESDIS South Pacific WFO Pago Pago (WFO takes lead), NESDIS

All NCEP/NCO NOAA Comms

https://www.cpc.ncep.noaa.gov/products/outlooks/hurricane.shtml https://www.cpc.ncep.noaa.gov/products/Epac_hurr/index.shtml NORA

Central Pacific Near-Normal Season 1-4 Tropical Cyclones Average is 4-5 TCs

NOAA's 2025 Hurricane Season Outlooks

All ranges of activity are given with a 70% probability.

Eastern Pacific Below-Normal Season 12-18 Named Storms 5-10 Hurricanes 2-5 Major Hurricanes 60-130% Median ACE Averages are 15 NS, 8 H, 4 MH

Atlantic

Above-Normal Season 13-19 Named Storms 6-10 Hurricanes 3-5 Major Hurricanes 95-180% Median ACE Averages are 14 NS, 7 H, 3 MH

	Atlantic	Eastern Pacific	Centra Pacific
Above Normal	60%	20%	20%
Near Normal	30%	30%	50%
Below Normal	10%	50%	30%

For the Atlantic hurricane region, the outlooks indicate a 60% chance of an above-normal season, a 30% chance of a near-normal season, and a 10% chance of a below-normal season. For the East Pacific Hurricane season, the outlooks indicate a 50% chance of below-normal activity, with a 30% chance for near-normal levels, and a 20% chance for above-normal levels. These outlooks are for the overall seasonal activity. They are not a hurricane landfall forecast.

NOAA's May 2025 and 2024 Atlantic Hurricane Season Outlooks



Season Activity and Type	2025 Outlook	May 2024 Outlook <i>(Observed)</i>	1991-2020 Averages
Chance Above Normal	60%	85% (Above)	
Chance Near Normal	30%	10%	
Chance Below Normal	10%	5%	
Total Named Storms	13-19	17-25 (<i>18</i>)	14
Hurricanes	6-10	8-13 (11)	7
Major Hurricanes	3-5	4-7 (5)	3
ACE - Accumulated Cyclone Energy (% Median)	95%-180%	150-245% (<i>168%</i>)	100%

An **above-normal** Atlantic hurricane season is most likely this year (**60**% chance), with moderate certainty due to the forecast for relatively weak forcing factors. This outlook reflects the ongoing high-activity era for Atlantic hurricanes but likely weak forcing from the predicted neutral ENSO and Atlantic Ocean temperatures closer to normal than during many of the past few years.

Chart Notes:There is a 70% probability for each of the predicted ranges.An above-normal season has ACE \geq 126% of the median.An extremely active season has ACE \geq 165% of the median.

X

Expected Atlantic Conditions August-October 2025

High activity era conditions continue ENSO-Neutral

Atlantic Main Development Region

Below-average vertical wind shear

Warm Sea Surface Temperatures

Weaker easterly trade winds

ENSO-Neutral would not impede these factors.

NOAA

Conducive West African monsoon

Hurricane Tracks and Schedule



Basin	"Season"	Outlook Issued
Eastern Pacific	15 May - 30 Nov	May
Central Pacific	1 June - 30 Nov	May

Atlantic



Basin	"Season"	Outlook Issued
Atlantic:	1 June - 30 Nov	May and August

Seasonal Hurricane Outlooks - When



Seasonal Hurricane Outlooks are release in late May and early August. May - Atlantic, East Pacific, Central Pacific, West Pacific

August - Atlantic only (West Pacific is "if needed")





Climatology - Tropical Storms





https://www.nhc.noaa.gov/climo/

ž

Department of Commerce // National Oceanic and Atmospheric Administration // 8

Climatology - Hurricanes





https://www.nhc.noaa.gov/climo/

ž



ENSO Outlook

ž

퀭

त्रौ

x>

哭

 \square

12

·

X

ð

ENSO Materials



Weekly ENSO Update (Monday morning): 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

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



ENSO Status

Over the last couple of months, negative subsurface temperature anomalies weakened in the central and east-central Pacific Ocean.

Above-average temperatures remain in the western and central Pacific, mostly at depth (100-250m).









Official NOAA CPC ENSO Probabilities (issued May 2025)



The official NOAA forecast issued in May indicates a 54% chance of ENSO-Neutral during ASO 2025, a 33% chance of La Niña and a 13% chance of El Niño. During JAS, the peak of the East Pacific Hurricane Season, the odds for ENSO-Neutral are 63%. ENSO forecasts for ASO typically become more reliable as we move through the early summer months. ENSO-Neutral allows local conditions to dictate tropical storm/hurricane activity in the Atlantic and East Pacific.

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 (AMJ is April-May-June, etc.). This is issued by the NOAA Climate Prediction Center (CPC) and NOAA associated partners.



The dynamical model average (dashed black line) predicts ENSO-Neutral to persist through the peak months of the hurricane season (ASO time period). ENSO forecasts for ASO typically become more reliable as we move through the early summer months.

Core suite of models favor ENSO-Neutral, ENSO-Neutral allows local conditions to dictate tropical storm/hurricane activity in the Atlantic and East Pacific.

Caption: Model predicted monthly SST anomalies (°C) for the equatorial Pacific Ocean Niño-3.4 region (see inset, between 170°W-120°W, 5°N-5°S). Colored lines correspond to the models indicated at the lower left. NOAA's thresholds for El Niño and La Niña, are shown in pink and blue shading, respectively. Issued by the NOAA Climate Prediction Center (CPC) and consisting of contributing modeling centers (NCEP, ECCC, GFDL, NCAR, NASA)



Atlantic Conditions

ž

퀭

औ

K>

哭

X

ð



ž

퀭

औ

KS

哭

 \square

12

÷.

X

ð

- ENSO-Neutral conditions were present in the equatorial Pacific Ocean (Blue box). In the Atlantic hurricane MDR (Green box), SSTs were above-average with the largest departures found in the western MDR. The bulk of the North Atlantic was above-normal. These conditions are consistent with the warm phase of the AMO and the ongoing high-activity era for Atlantic hurricanes and also with a decayed La Nina/ENSO-Neutral.
- In the central and east Pacific, observed SSTs were a mix of above and near-average, but generally below-average, wth much warmer SST near Asia and in the mid-latitudes. This pattern projects onto the negative phase of the Pacific Decadal Oscillation (PDO), and **favors weaker hurricane seasons for that portion of the basin. ENSO-Neutral would not impeded the PDO signal while a La Niña could reinforce it.**

Caption: Sea surface temperature anomalies (°C) during April. Blue box denotes the Niño 3.4 region, green box denotes the MDR, and red box denotes the extratropical Atlantic. Data is from the ERSSTv5 dataset. Anomalies are departures from the 1991-2020 means.

Predicted Sea Surface Temperature (SST) Anomalies





Both the CFS and NMME models are predicting above-average SSTs in the MDR during the peak months (August-October) of the Atlantic hurricane season. Both models are also predicting ENSO-Neutral during this period.

ENSO-Neutral would not impede the locally warm conditions in the Atlantic or Eastern Pacific.

ž

큉

औ

x

哭

 \square

12

j.

X

ð

Caption: Predicted SST anomalies (°C) for August-October 2025, (Left) NOAA's Climate Forecast System (CFS) and (Right) the North American Multi-Model Ensemble (NMME). Boxes denote the Main Development Region (MDR) of the Atlantic and the Niño 3.4 regions. CFS (NMME) anomalies are departures from 1991-2020 means. Forecast initial conditions are from April 2025.



(Left) 850-hPa wind anomalies. Some indications of weakened trade winds. Trades weaker, closer to 2022/2021, low-level inflow into West African Monsoon near normal.

(Right) The upper-level circulation shows little to no signal over Africa. The variability suggests a more near-normal start to the west African monsoon, or some interaction on intraseasonal time scales.

Recent Lower-Level and Mid-Level Atmospheric Anomalies - West African Monsoon



850-hPa Anomalous Wind Speed (shading) and Vector

ž

퀭

औ

RS

哭

 \square

「る

÷

X

ď

31-Day Average 24 APR-24 MAY 2025 50N 40N 30N 20N 10N EQ 10S 20W 120W 60W 20E 5.0 40E 100W 850-hPa wind speed (shading, m s⁻) 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

Westerly Anomalies - Weaker Trade winds

600-hPa Anomalous Wind Speed (shading) and Vector











1.5 2.0

2.5

3.0

-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.5 1.0









Model Forecasts - Magnitude of Anomalous Vertical Wind Shear during August-October 2025

ž

큀

त्रौ

x

哭

 \square

12

Ż

X

ď



NOAA's **CFS is predicting near-average vertical wind shear** while the NMME is predicting below-**average vertical wind shear during ASO 2025 across much of the MDR.** These forecasts are consistent with the ongoing high-activity era, a stronger than normal West African monsoon system, and non-interfering ENSO-Neutral.

Caption: Predicted anomalous magnitude of the absolute value of the vertical wind shear (m s⁻¹) for August-October 2025, from (Left) NOAA's Climate Forecast System (CFS) and (Right) the North American Multi-Model Ensemble (NMME). Black box denotes the Atlantic Main Development Region (MDR). Blue (Red) shading indicates anomalously weak (strong) shear. CFS and NMME Anomalies are departures from 1991-2020 means.





CDAS: North Atlantic as of 25-May-2025 daily zonal wind shear magnitude [m/s]



-2

-1

2

6

8

10

-10

-8

ž

NOAA 2024 Atlantic Hurricane Season Outlook



Season Activity and Type	May 2024	August 2024	Actual Observed
Chance Above Normal	85%	90%	Above
Chance Near Normal	10%	10%	
Chance Below Normal	5%	~0%	
Total Named Storms	17-25 🔽	17-24 🔽	18
Hurricanes	8-13 🔽	8-13 🔽	11
Major Hurricanes	4-7 🔽	4-7 🔽	5
ACE - Accumulated Cyclone Energy (% Median)	150-245% 🔽	165-245% 🔽	168

All portions of the 2024 outlook verified as correct for the Atlantic, East Pacific, and Central Pacific



The 2025 Atlantic Outlook in a Historical Perspective

Accumulated Cyclone Energy (ACE) Index - Percent of Median



NOAA's 2025 Atlantic Hurricane Season outlook predicts a 70% probability for an ACE range of 95-180% of the median.

Caption: Seasonal Accumulated Cyclone Energy (ACE) indices (Blue bars) and NOAA's 2025 outlook range with a 70% probability of occurrence (rightmost column) for the North Atlantic basin. Lines indicate NOAA's thresholds for classifying hurricane season activity as below (orange), above (black), or hyper-active (red). ACE=Sum of squares of maximum sustained surface wind speed (measured 6-hourly) for all named storms while at least tropical storm strength.

ACE is undercounted by an unknown amount before the 1970s (1970s and 1980s) due to the lack of (poor quality) satellite imagery over the open Atlantic Ocean.

Hurricane Landfalls - Why Activity Era Matters



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

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

Atlantic Hurricane Season Model Forecast

Summary



	Model	Named Storms	Hurricanes	Maior Hurricanes	ACF (% Median)
Statistical	CPC Regression: Nino 3.4 (-0.35 to 0.25C) MDR SSTA (0 to 0.4C) MDR-Tropics (0 to 0.4C)	16.3-17.7 (17)	6.2-7.5 (6.85)	2.7-3.6 (3.15)	115-158 (137)
	CPC Binning high-activity era: 7 cases: Nino 3.4 (-0.35 to 0.25C) MDR SSTA (0 to 0.4C) MDR-Tropics (0 to 0.4C)	10.3-17.2 (13.75)	5-9 (7)	1.6-5.58 (3.6)	77-191 (134)
Ĺ	AOML regression	10-16 (13)	4.5-9 (7)	2-4 (3)	85-175 (130)
Statistical / Dynamical Hybrid	CFSv2 T126	16-20 (18)	8-11 (9.5)	4-5 (4.5)	145-189 (167)
	NMME (CFSv2, GEM-NEMO, CanCM4i, NCAR)	17-21 (19)	9-11 (10)	4-5 (4.5)	173-221 (197)
	CFS: Hi-Res (Bias adjusted)	12-18 (15)	3-8 (5.5)		66-127 (97)
	GFDL (SPEAR-MED, HiFLOR-S)	11-18 (14.5)	5-10 (7.5)	2-6 (4)	86-184 (135)
Dynamical —					
	ECMWF	10.1-18.9 (14.5)	4.5-9.9 (7.2)		89-191 (140)
	UKMET	7-21 (14)	4-12 (8)	0-6 (3)	51-272 (148)
	Guidance Mean	12.5-19 (15.7)	5.6-9.8 (7.7)	2.4-5.2 (3.8)	92-186 (144)
	NOAA Outlook	13-19 (16)	6-10 (8)	3-5 (4)	95-180 (138)

Caption: Model Atlantic hurricane season predictions for May 2025. The means (in parentheses) and ±1 std. dev. are shown for each prediction parameter. The Guidance Mean and NOAA's 2025 Atlantic hurricane season outlook are shown at bottom.

ž

J

औ

K)

哭

 \square

12

-

Process behind the Outlooks

NOAA's seasonal outlooks based largely on predictions of 3 main climate factors that strongly control Atlantic hurricane season

Atlantic Multi-Decadal Oscillation (25-40 year) signal : Reflects fluctuations in Atlantic sea surface temperatures, West African monsoon.

El Niño and La Niña; Reflect large year-to-year changes in tropical Pacific Ocean temperatures.

Year-to-year fluctuations in Atlantic sea-surface temperatures

Three types of models used: Statistical Dynamical Hybrid Dynamical/ statistical



哭

ž

ď

Summary



2025 Atlantic Outlook Above-normal season most likely 13-19 NS 6-10 Hurricanes 3-5 Major Hurricanes Factors: Positive AMO, ENSO-neutral not interfering 2025 Eastern Pacific Outlook Below-normal season most likely 12-18 NS 5-10 Hurricanes 2-5 Major Hurricanes

Factors: Negative PDO,

ENSO-neutral, active Atlantic.

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.