COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE ACTIVITY FROM OCTOBER 1–14, 2025 AND OUTLOOK FOR OCTOBER–NOVEMBER CARIBBEAN ACCUMULATED CYCLONE ENERGY

We favor above-normal activity for the two-week period (59% chance), with normal (40% chance) and below-normal (1% chance) less likely. We anticipate above-average October–November Caribbean Accumulated Cyclone Energy.

(as of 1 October 2025)

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In Memory of William M. Gray[5]

This discussion as well as past forecasts and verifications are available online at
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1   Introduction

This is the 17th year that we have issued shorter-term forecasts of tropical cyclone (TC) activity starting in early August. These two-week forecasts are based on a combination of observational and modeling tools. The primary tools that are used for this forecast are as follows: 1) current storm activity, 2) National Hurricane Center Tropical Weather Outlooks, 3) forecast output from global models and 4) the current and projected state of the Madden-Julian oscillation (MJO).

Our forecast definition of above-normal, normal, and below-normal Accumulated Cyclone Energy (ACE) periods is defined by ranking observed activity in the satellite era from 1966–2024 and defining above-normal, normal and below-normal two-week periods based on terciles. Since there are 59 years from 1966–2024, we include the 20 years with the most ACE from October 1–14 as the upper tercile, the 19 years with the least ACE as the bottom tercile, while the remaining 20 years are counted as the middle tercile.

Table 1: ACE forecast definition and probabilistic forecast for TC activity for October 1–14, 2025.

Parameter	Definition	Probability in Each Category
Above-Normal	Upper Tercile (>10 ACE)	59%
Normal	Middle Tercile (3–10 ACE)	40%
Below-Normal	Lower Tercile (<3 ACE)	1%

2   Forecast

We slightly favor above-normal activity for the next two weeks (>10 ACE). We anticipate Hurricane Imelda generating enough ACE to guarantee the normal tercile before becoming post-tropical. The National Hurricane Center is currently not monitoring any areas for TC formation in the next week. There are model signals for potential development in the central tropical Atlantic and in the northwest Caribbean/Gulf in week two. The Madden-Julian Oscillation (MJO) is fairly weak, but there are some indications that it may start to intensify in the Indian Ocean during mid-October. If that were to occur, it would favor Atlantic TC activity.

Figure 1 displays the formation locations of tropical cyclones from October 1–14 for the years from 1966–2024, along with the maximum intensities that these storms reached. Figure 2 displays the October 1–14 forecast period with respect to climatology. The primary threat area for major hurricane formations shifts farther to the west, with formations picking up considerably in the western Caribbean.
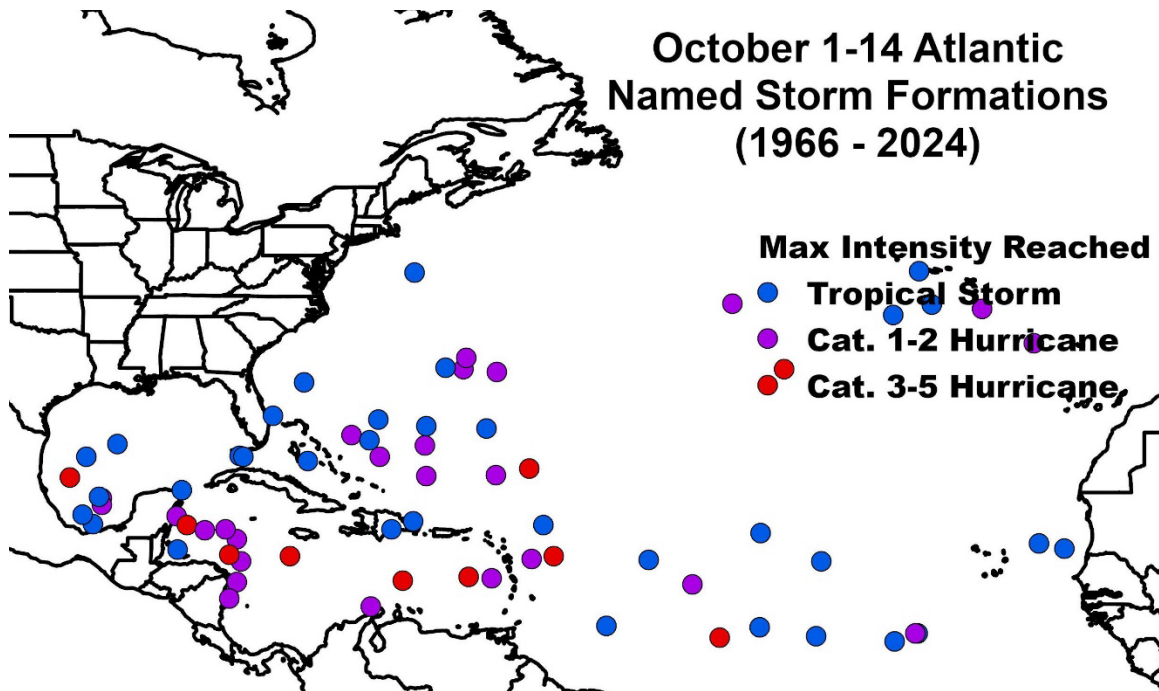
Figure 1: Atlantic named storm formations from October 1–14 from 1966–2024 and the maximum intensity that these named storms reached.
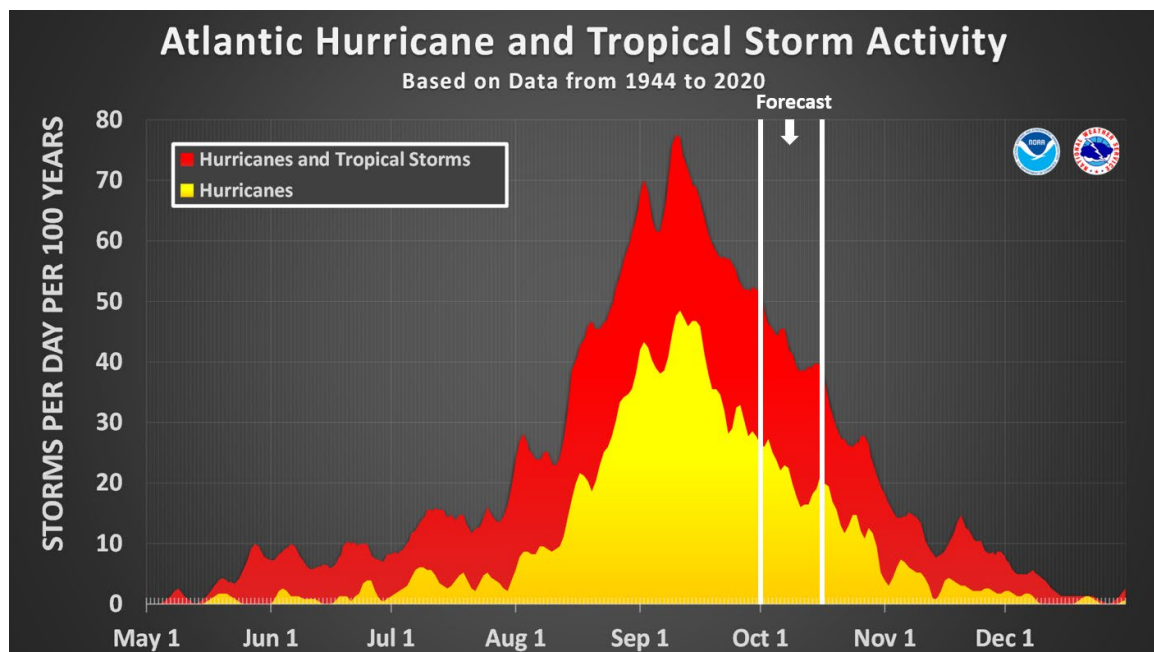

Figure 2: The current forecast period (October 1–14) with respect to climatology, delimited with white lines. Figure courtesy of NOAA.

We now examine how we believe each of the four factors discussed in the introduction will impact Atlantic TC activity for the period from October 1–14.

1) Current Storm Activity

Hurricane Imelda is forecast to track rapidly northeast towards Bermuda (Figure 3) and then become post-tropical. Imelda is anticipated to generate another 2–3 ACE before becoming post-tropical.
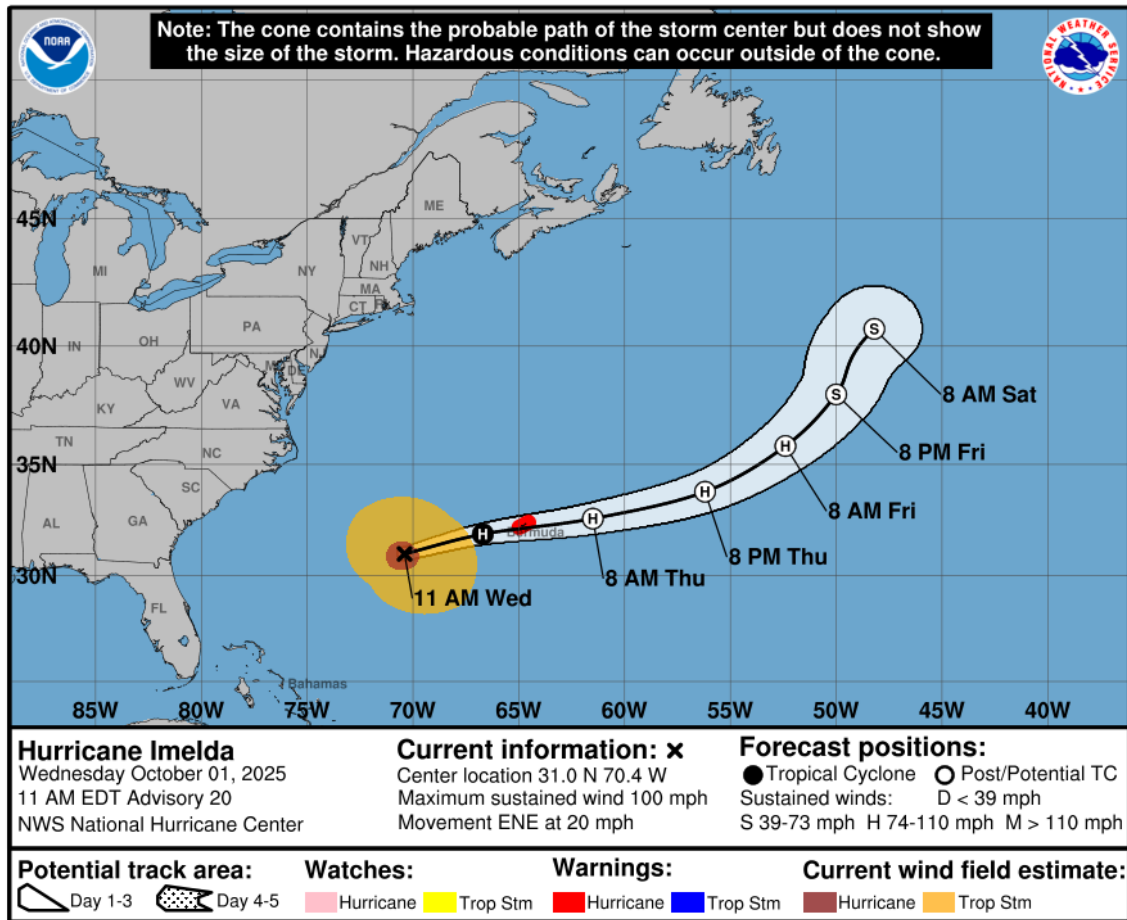

Figure 3: National Hurricane Center forecast for Hurricane Imelda.

2) National Hurricane Center Tropical Weather Outlook

The National Hurricane Center is currently not monitoring any areas for potential TC development (Figure 4).
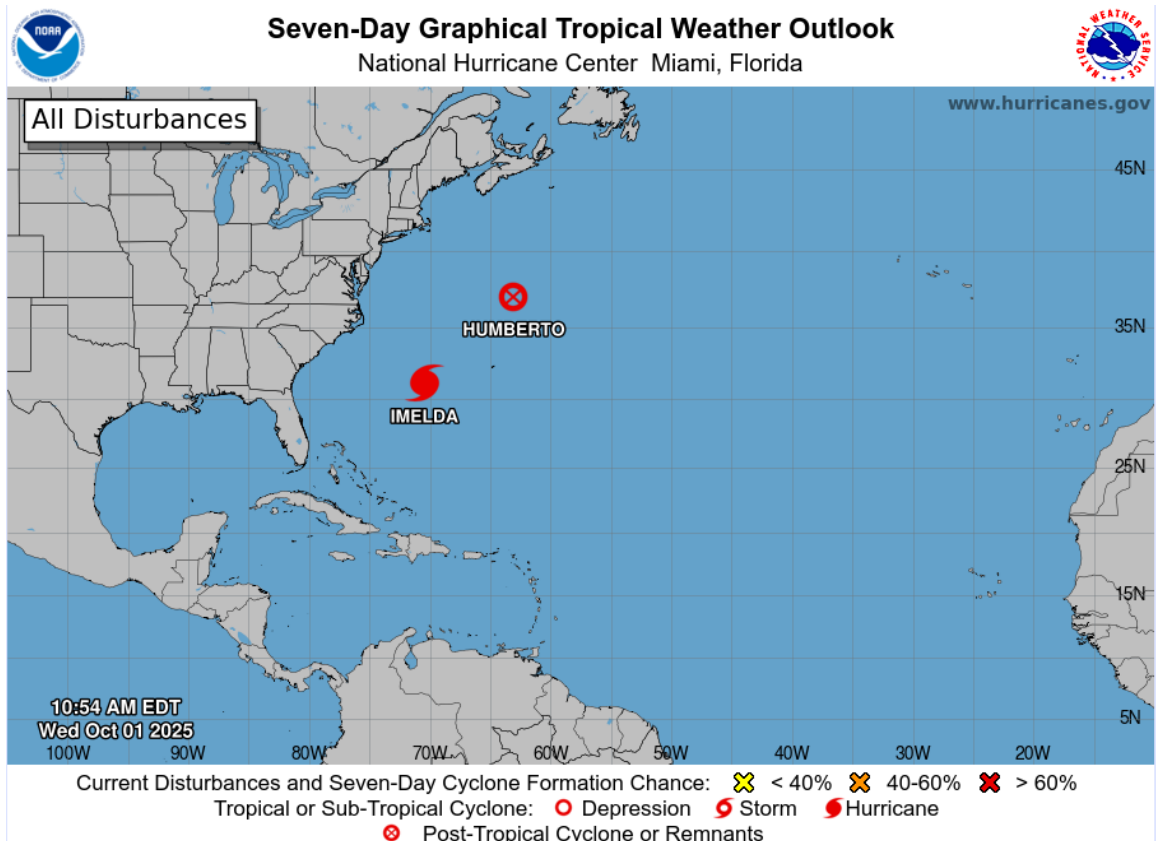
Figure 4: Current National Hurricane Center Atlantic Tropical Weather Outlook.

3) Global Model Analysis

The ECMWF EPS ensemble (Figure 5), ECMWF AI ensemble (Figure 6) and the GEFS ensemble (Figure 7) are highlighting potential TC development in the eastern and central tropical Atlantic as well as in the NW Caribbean/southern Gulf. Most of the signal for TC development is in the second week of the forecast period (e.g., days 8–14).
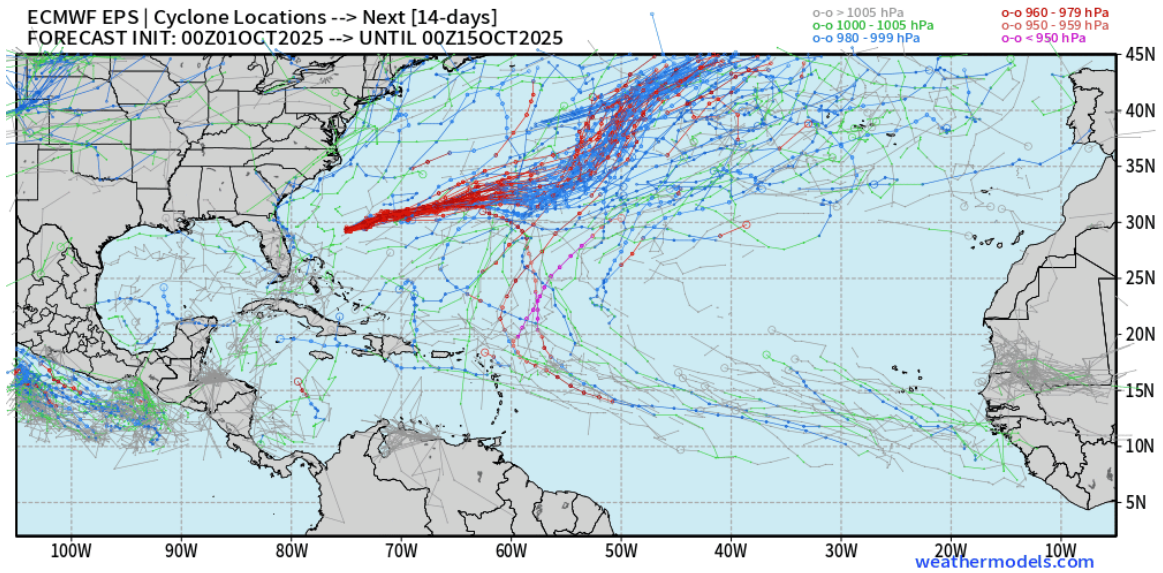
Figure 5: Cyclone locations from the ECMWF EPS ensemble for the next 14 days. Figure courtesy of weathermodels.com
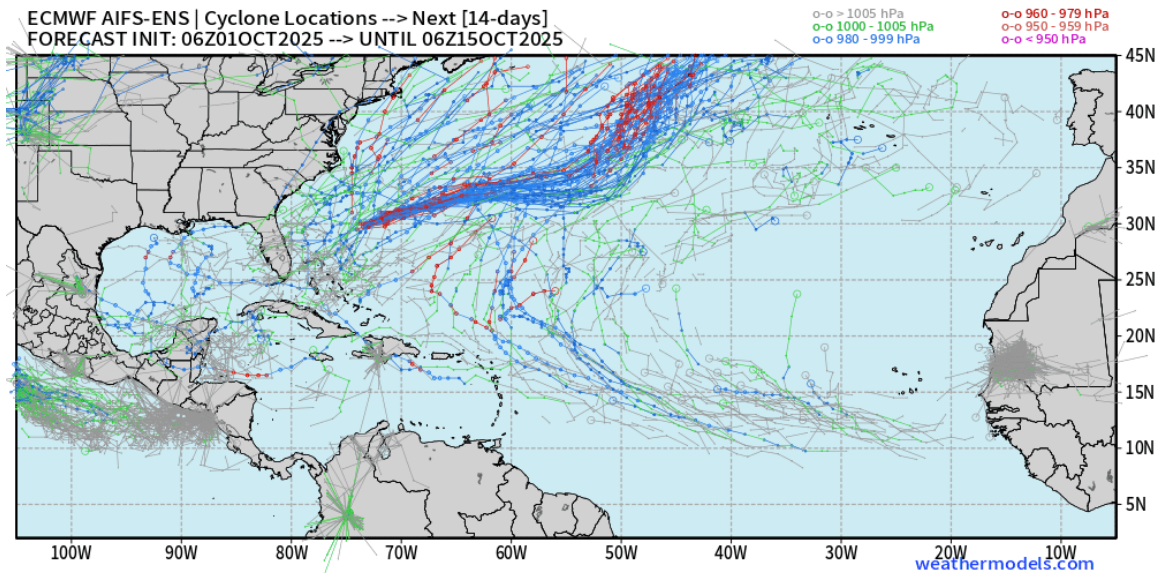

Figure 6: Cyclone locations from the ECMWF AI ensemble. Figure courtesy of weathermodels.com.
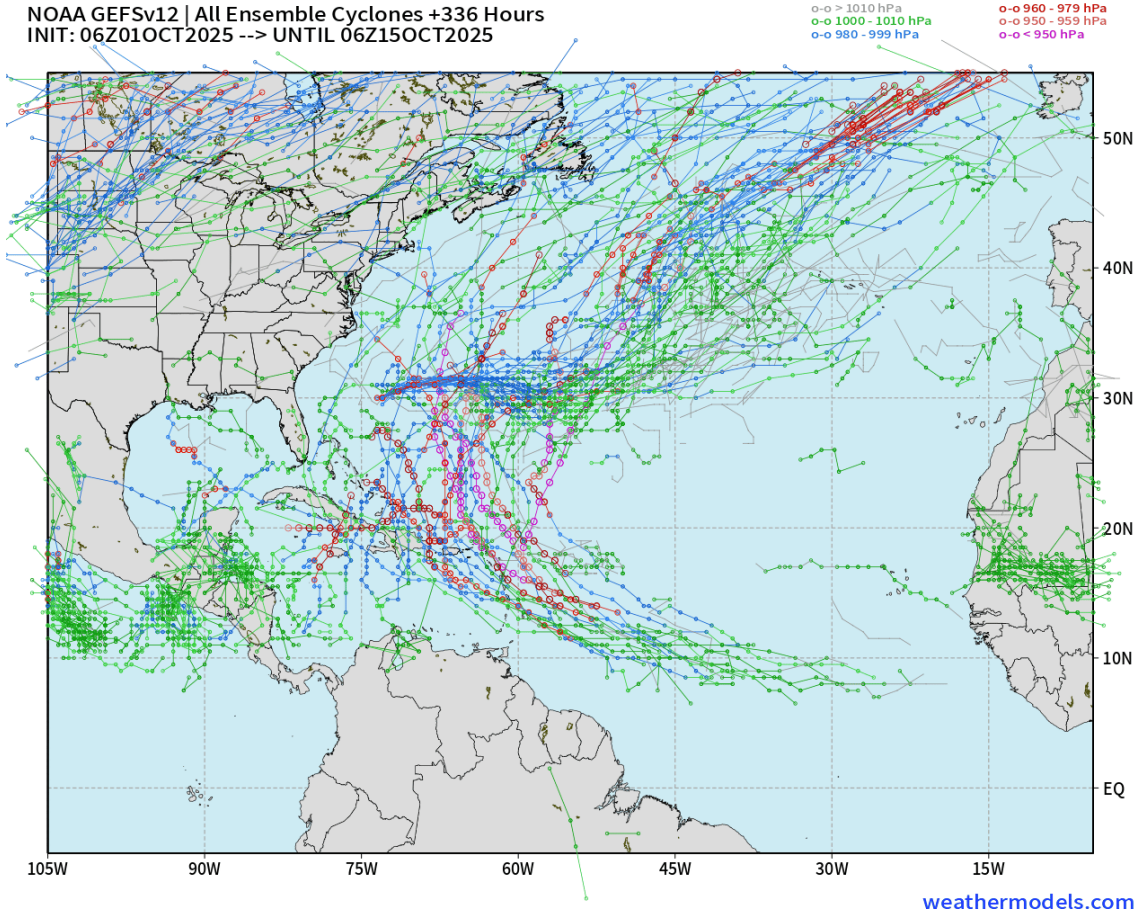
Figure 7: Cyclone locations from the GEFS ensemble for the next 14 days. Figure courtesy of weathermodels.com

4) Madden-Julian Oscillation

The MJO as measured by the Wheeler-Hendon index, is currently located over the Indian Ocean (Figure 8). However, the MJO is forecast by ECMWF to retrograde over Africa, highlighting that other equatorial waves are currently imprinting on the MJO. However, any MJO development that does occur looks to amplify over the Indian Ocean, which would favor reduced Atlantic shear.

Overall, ECMWF is forecasting conducive upper-level winds (e.g., easterly anomalies) across most of the tropical Atlantic and Caribbean over the next 20 days (Figure 9). These favorable upper-level winds should enhance TC activity, especially in mid-October when a Caribbean gyre is likely to develop. Pronounced low-level westerly wind anomalies are forecast to develop over the Caribbean around mid-October, favoring TC development in that region around that time (Figure 10).
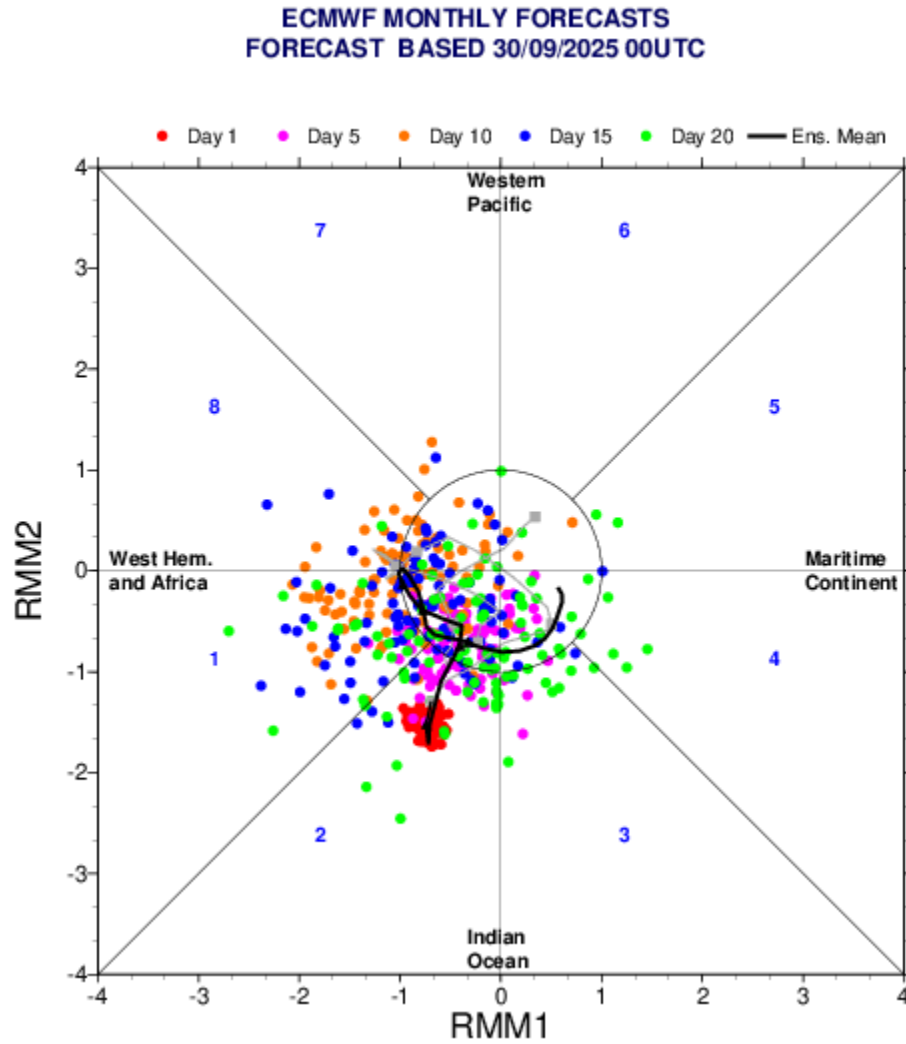
Figure 8: Predicted propagation of the MJO by the ECMWF Ensemble Prediction System. Figure courtesy of ECMWF.
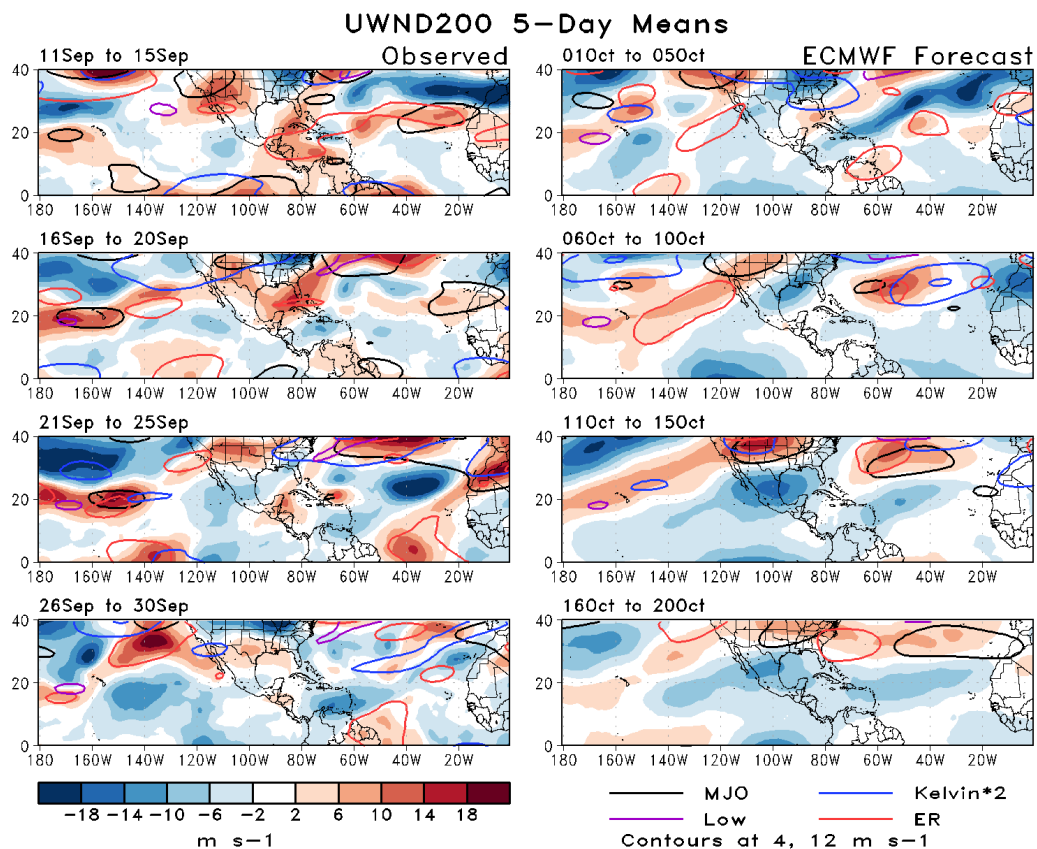
Figure 9: Observed and predicted 200 hPa zonal winds by the ECMWF ensemble for the next 20 days. Upper-level winds are forecast to generally be TC favorable (e.g., easterly anomalies) across the tropical Atlantic and Caribbean for the next four weeks. Figure courtesy of Nick Novella (NOAA/CPC).
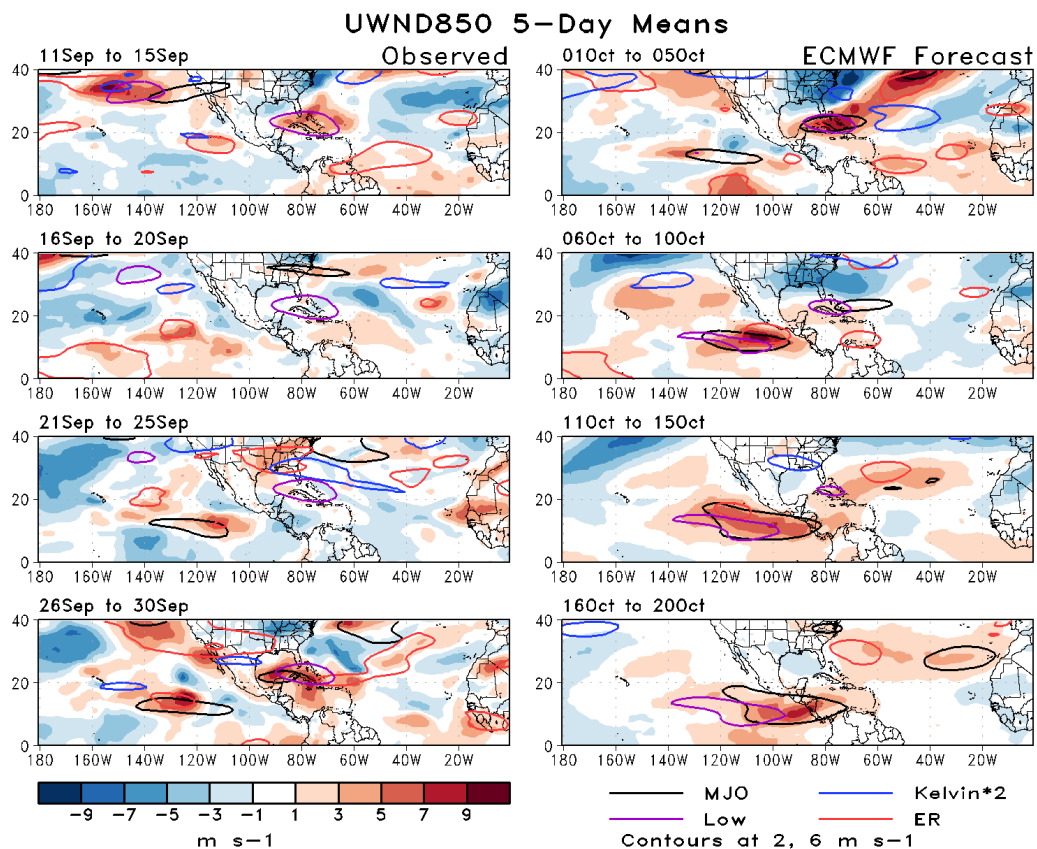
Figure 10: As in Figure 9 but for 850 hPa zonal wind anomalies. Figure courtesy of Nick Novella (NOAA/CPC).

3   Upcoming Forecasts

A final two-week forecast will be issued on October 15 for the October 15–28 period.

VERIFICATION OF SEPTEMBER 17 – 30 FORECAST

49 ACE were generated during the two-week period, which places it in the above-normal category. Gabrielle generated 19 ACE, Humberto produced 27 ACE, and Imelda contributed 3 ACE. We had assigned a 60% probability of normal activity, with a 25% chance of below-normal and a 15% chance of above-normal activity during the two-week period. We certainly did not anticipate the two-week period being as busy as it ended up being.

Table 3 displays the percentage chance that we gave for each category being reached and observed ACE.

Table 3: ACE forecast for TC activity for September 17–30, the probability assigned for each category being reached and observed ACE.

ACE Category	Definition	Probability in each Category	Observed ACE
Above Normal	Upper Tercile (>25 ACE)	15%	49
Normal	Middle Tercile (11–25 ACE)	60%	
Below Normal	Lower Tercile (<11 ACE)	25%	

COLORADO STATE UNIVERSITY FORECAST OF OCTOBER–NOVEMBER CARIBBEAN ACE

In 2011, we published a paper detailing a model that forecast October–November Caribbean hurricane days (Klotzbach 2011) using the state of ENSO and sea surface temperatures in the western tropical Atlantic and Caribbean (e.g., the Atlantic Warm Pool). In an analysis of an article on the October–November portion of the 2020 Atlantic hurricane season (Klotzbach et al. 2022), we revised the model slightly to use the ENSO Longitude Index (Williams and Patricola 2018) to assess the state of ENSO and now use ACE as our primary forecast metric.

For this outlook, we use SSTs from the ERA5 reanalysis to estimate the strength of the Atlantic warm pool, while Christina Patricola has kindly provided an estimated value of the ENSO Longitude Index using daily NOAA OI SSTs. We find that using three-month averages optimizes the hindcast skill of this model over the period from 1979–2024. Table 3 displays the locations and time periods of the predictors, their standardized values relative to 1991–2020 and their effect on October–November Caribbean ACE, defined to span 10–20°N, 88–60°W.

For 2025, the ENSO Longitude Index is slightly negative, indicating cool neutral ENSO conditions. The Atlantic warm pool is the 5th warmest since 1979, trailing (in order from warmest): 2024, 2023, 2010 and 2005. These two predictors, in combination, favor an above-average end to the Atlantic hurricane season in the Caribbean.

Table 3: Listing of predictors of October–November Caribbean ACE. A plus (+) means that positive deviations of the parameter indicate increased October–November Caribbean ACE this year, and a minus (-) means that positive deviations of the parameter indicate decreased October–November Caribbean ACE this year.

Predictor	Values for 2025 Forecast	Effect on Oct–Nov Caribbean ACE
1) July–September ENSO Longitude Index (-)	-0.4 SD	Enhance
2) July–September SST (10–20°N, 85–50°W) (+)	+1.3 SD	Strongly Enhance

These two predictors are then combined in a rank regression model to forecast October–November Caribbean ACE. The model shows a hindcast correlation skill of 0.77 over the period from 1979–2024 (Figure 8).
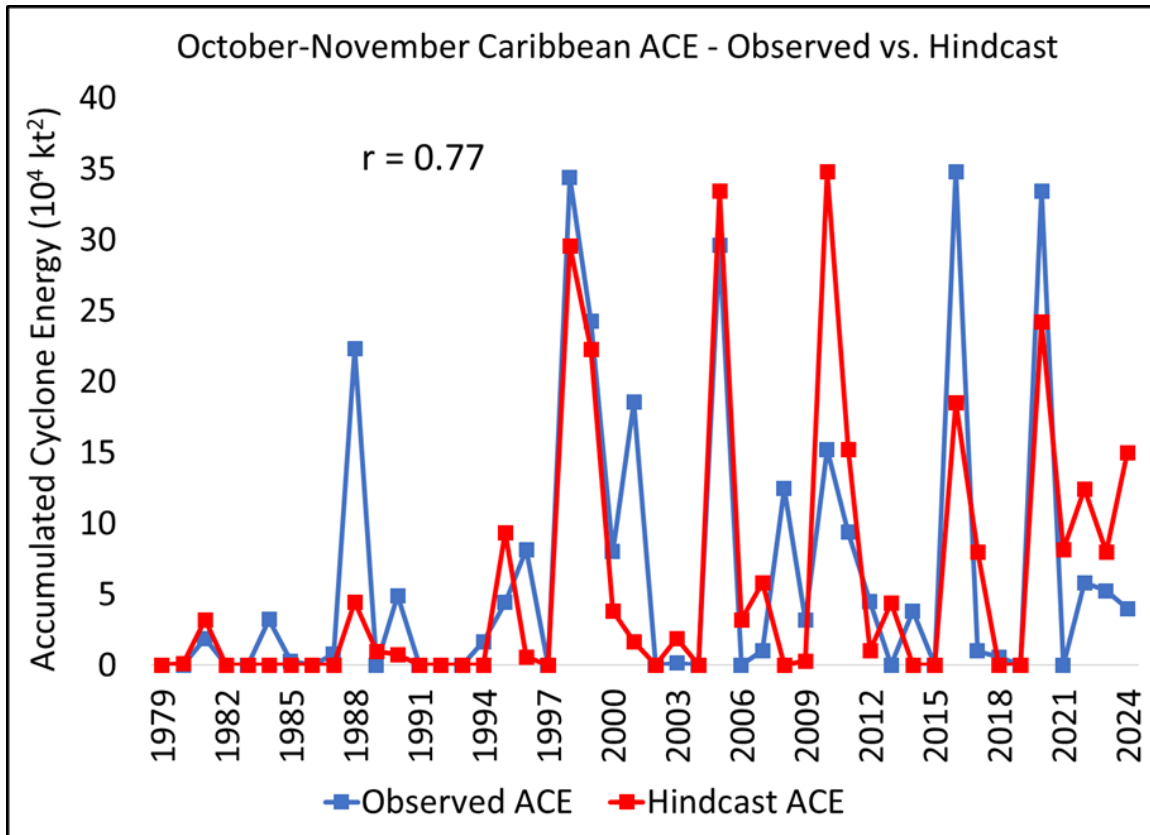
Figure 8: Observed vs. hindcast October–November Caribbean from 1979–2024.

As you can see from the above graph, Caribbean ACE is strongly positively skewed with several years having 0 ACE in the Caribbean during October–November, with other years (such as 2020) having over 30 ACE. The median 1991–2020 ACE is 2, while the mean 1991–2020 ACE is 8.

The forecast from the statistical model for October–November Caribbean ACE in 2025 calls for an ACE of 12 – somewhat above the long-term mean. Given the model signals for a Caribbean gyre developing around mid-October (as discussed earlier in this document) we will go with the raw output from the statistical model and forecast an October–November Caribbean ACE of 12 for 2025.