

**COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE
ACTIVITY FROM SEPTEMBER 14–27, 2023**

We believe that the most likely category for Atlantic hurricane activity in the next two weeks is above-normal (85%), with normal (15%) and below-normal (~0%) being much less likely.

(as of 14 September 2023)

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In Memory of William M. Gray⁴

This discussion as well as past forecasts and verifications are available online at
<http://tropical.colostate.edu>

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1 Introduction

This is the 15th 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, 4) the current and projected state of the Madden-Julian Oscillation (MJO) and 5) the current seasonal forecast.

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 1966–2022 and defining above-normal, normal and below-normal two-week periods based on terciles. Since there are 57 years from 1966–2022, we include the 19 years with the most ACE from September 14–27 as the upper tercile, the 19 years with the least ACE as the bottom tercile, while the remaining 19 years are counted as the middle tercile.

Table 1: ACE forecast definition for TC activity for September 14–27, 2023.

Parameter	Definition	Probability in Each Category
Above-Normal	Upper Tercile (>26 ACE)	85%
Normal	Middle Tercile (10–26 ACE)	15%
Below-Normal	Lower Tercile (<10 ACE)	~0%

2 Forecast

We believe that the next two weeks have the highest probability to be characterized by activity at above-normal levels (>26 ACE). There are currently two active tropical cyclones in the Atlantic basin: Lee and Margot. They are estimated to generate an additional ~14 ACE before dissipation, which is the main reason why we effectively gave a 0% chance of the two-week period ending up below normal. The National Hurricane Center is monitoring one area with a high chance for tropical cyclone (TC) development in the next couple of days (97L). Global models are quite aggressive with intensification chances for 97L, giving us increased confidence that this system could generate the remaining ACE needed to reach the above-normal threshold for the two-week period. The Madden-Julian Oscillation (MJO) is currently weak but is forecast to potentially amplify into phases 3-4 in the next two weeks. These two phases are typically associated with relatively enhanced Atlantic TC activity.

Figure 1 displays the formation locations of TCs from September 14–27 for the years from 1966–2022, along with the maximum intensities that these storms reached. The primary threat formation area for major hurricanes in mid- to late September is in the eastern and central tropical Atlantic. Figure 2 displays the September 14–27 forecast period with respect to climatology. This period immediately follows the climatological peak of the season.

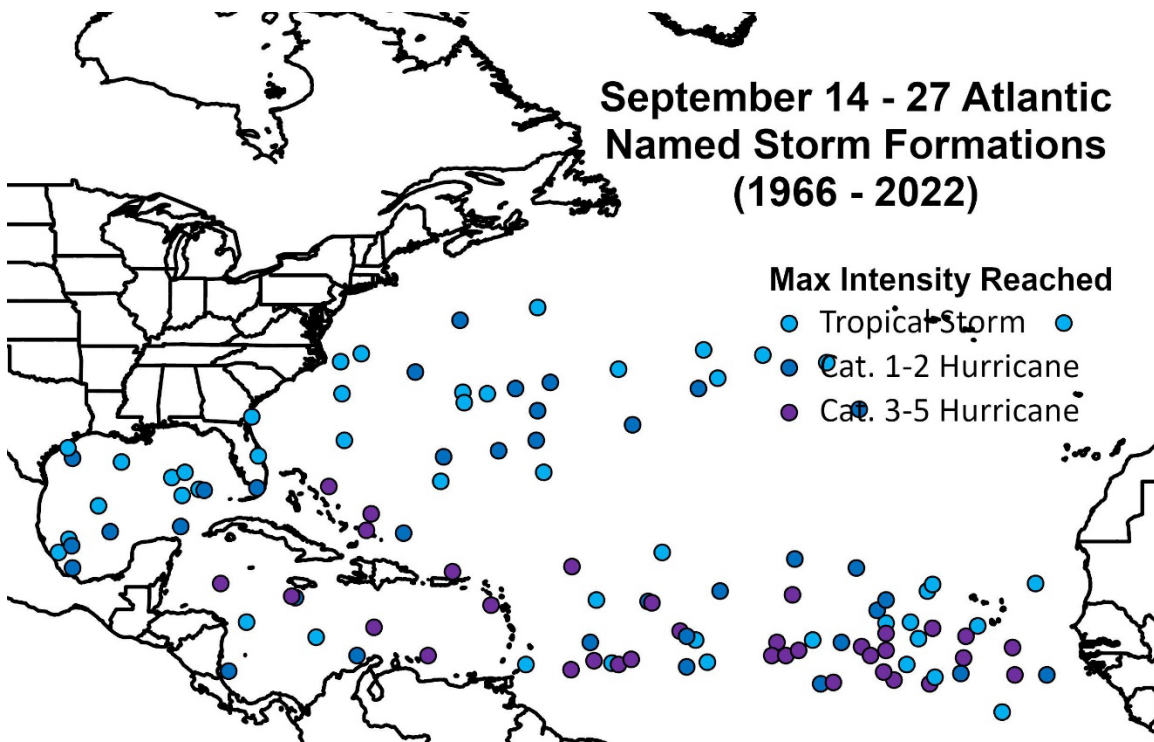


Figure 1: Atlantic named storm formations from September 14–27 during the years from 1966-2022 and the maximum intensity that these named storms reached.

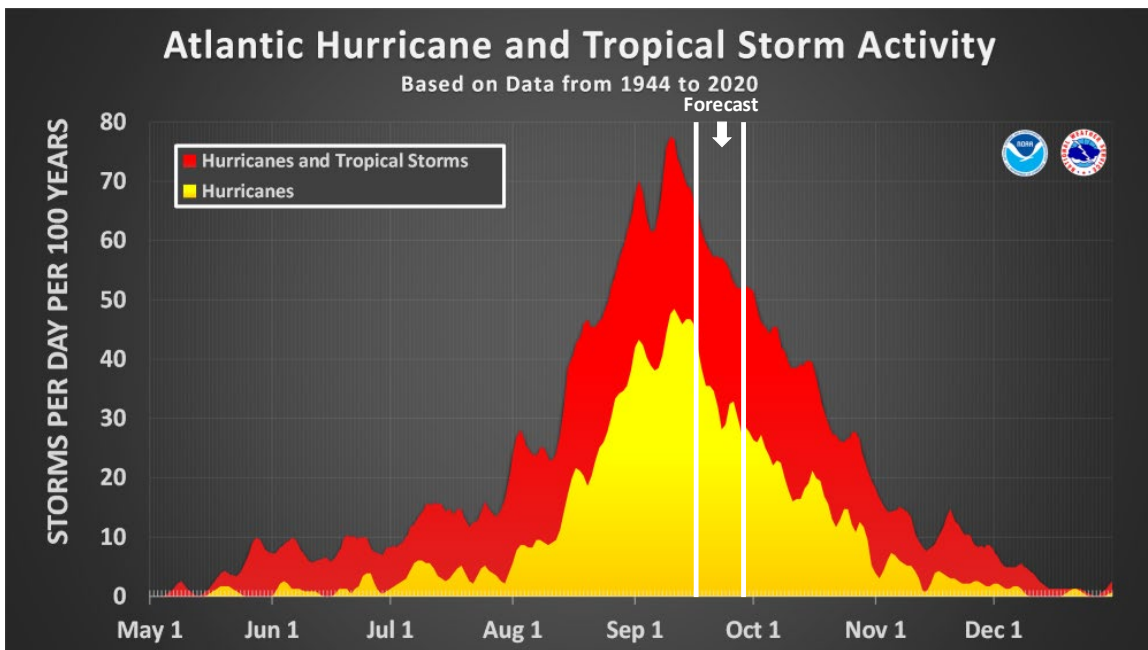


Figure 2: The current forecast period (September 14–27) with respect to climatology, delimited with white lines. Figure courtesy of NOAA.

We now examine how we believe each of the five factors discussed in the introduction will impact Atlantic TC activity for the period from September 14 – 27.

1) Current Storm Activity

There are currently two active TCs in the Atlantic basin. Both Lee and Margot are estimated to produce an additional ~7 ACE before becoming post-tropical.

2) National Hurricane Center Tropical Weather Outlook

The latest NHC Tropical Weather Outlook is currently monitoring one area for tropical cyclone development (Figure 3). The high probability area (Invest 97L) has the potential to generate ~10-25 ACE. Global models are quite vigorous with development of this system, with one of the big questions being how long the system will track across the tropical and subtropical Atlantic before recurving and become post-tropical. A longer track across the warm waters of the tropical and subtropical Atlantic would lead to higher levels of ACE.

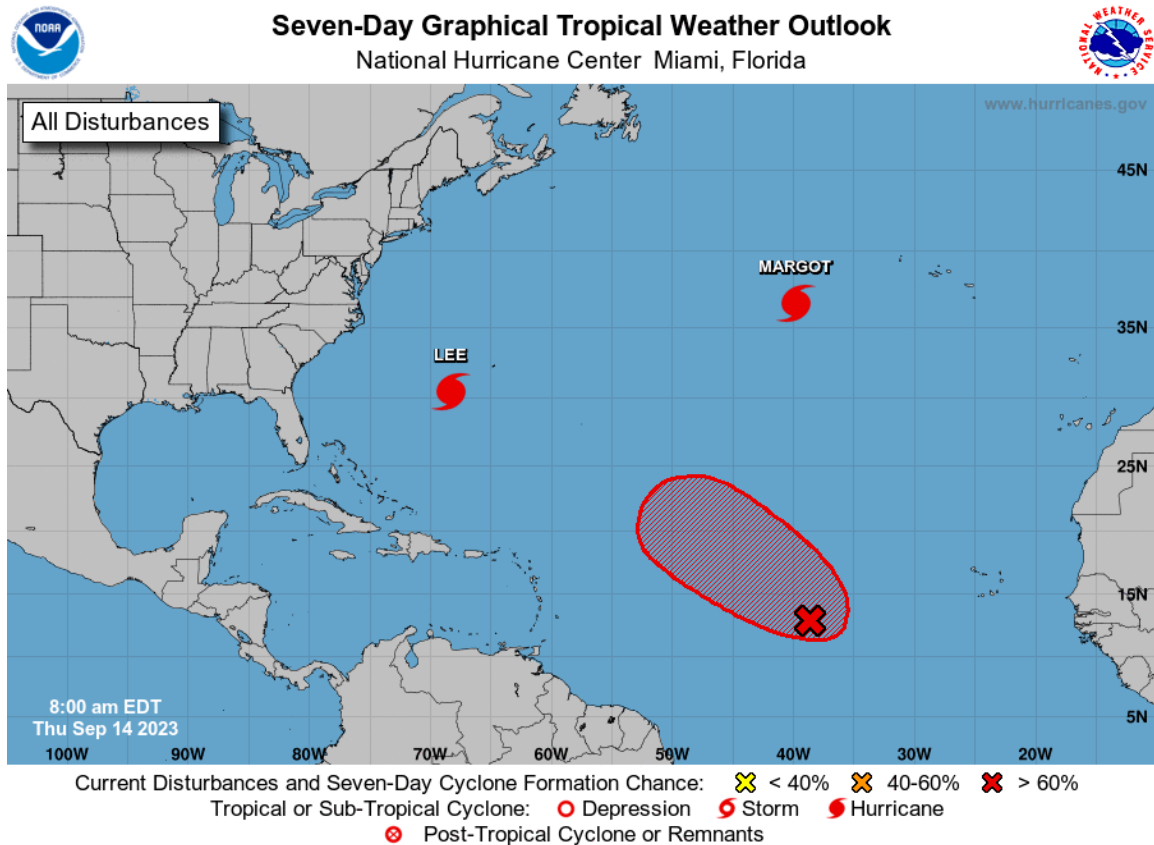


Figure 3: Current Tropical Weather Outlook from the National Hurricane Center. Figure courtesy of NOAA.

3) Global Model Analysis

The ECMWF Ensemble Prediction System (EPS) (Figure 4) is quite aggressive for development of 97L and has a relatively robust signal for another potential Atlantic Main Development Region formation in ~7-10 days. The signal for 97L has been consistently strong for the past several days, giving us increased confidence in this forecast. Also, the signal matches up well with the overall large-scale forcing (discussed in detail in the next section). The Global Ensemble Forecast System is also aggressive with development of 97L as well as the additional eastern Atlantic system formation in ~7-10 days (Figure 5).

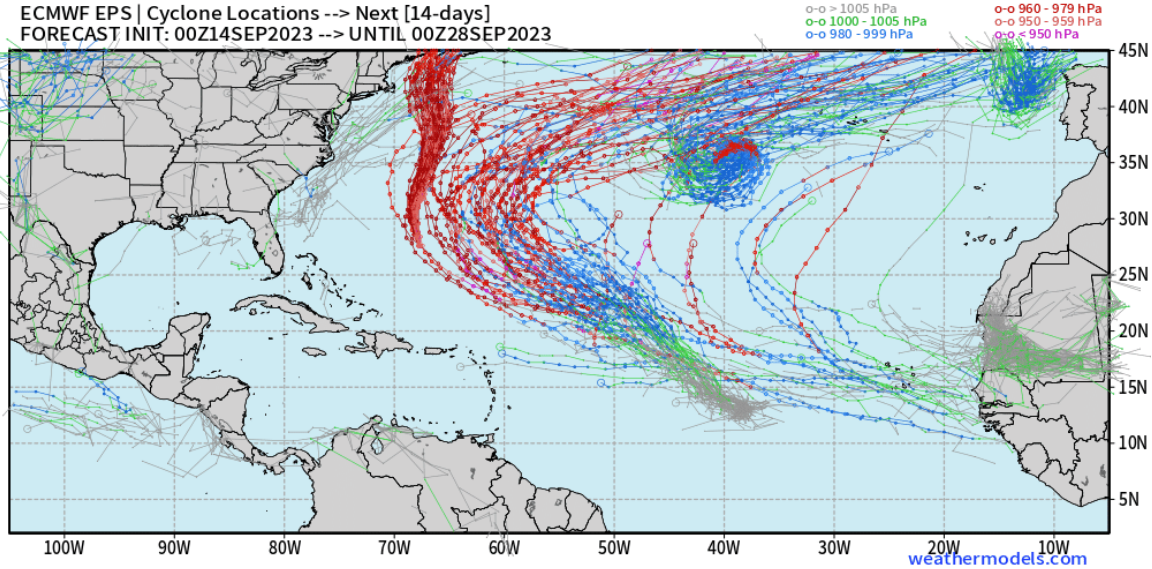


Figure 4: Cyclone locations from the ECMWF EPS ensemble for the next 14 days. Figure courtesy of weathermodels.com

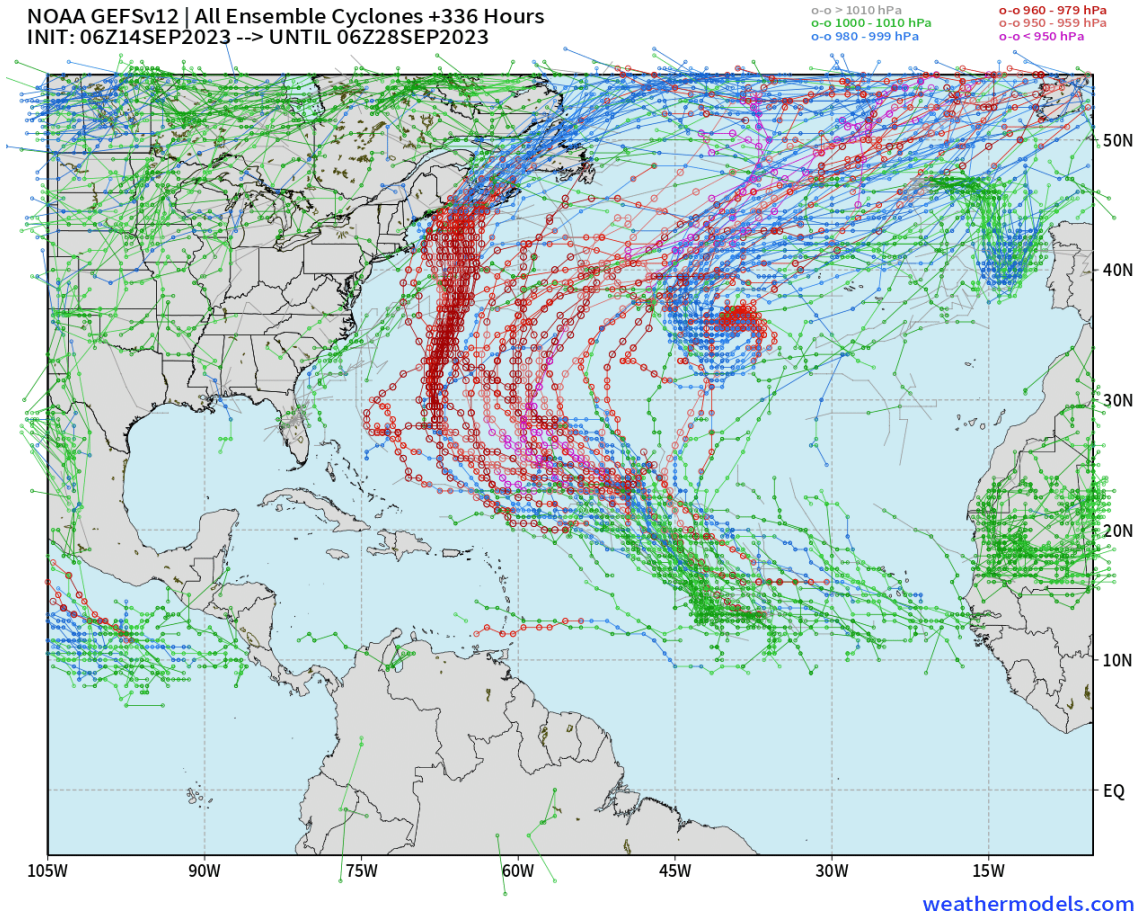


Figure 5: Cyclone locations from the Global Ensemble Forecast System for the next 14 days. Figure courtesy of weathermodels.com.

4) Madden-Julian Oscillation

The Madden-Julian oscillation (MJO), as measured by the Wheeler-Hendon index, is currently relatively weak, but may intensify into phases 3-4 over the next two weeks (Figure 6). The broad-scale velocity potential pattern continues to largely favor Atlantic hurricane activity, with generally anomalously suppressed vertical motion over the eastern North Pacific and upward vertical motion over Africa and the Indian Ocean (Figure 7). This pattern favors anomalous upper-level easterlies over the Atlantic Main Development Region, resulting in reduced levels of vertical wind shear. The ECMWF Ensemble Prediction System vertical wind shear forecast for days 10-14 (Figure 8) is provided as an example, highlighting anomalously weak vertical wind shear across most of the Main Development Region.

ECMWF MONTHLY FORECASTS
FORECAST BASED 13/09/2023 00UTC

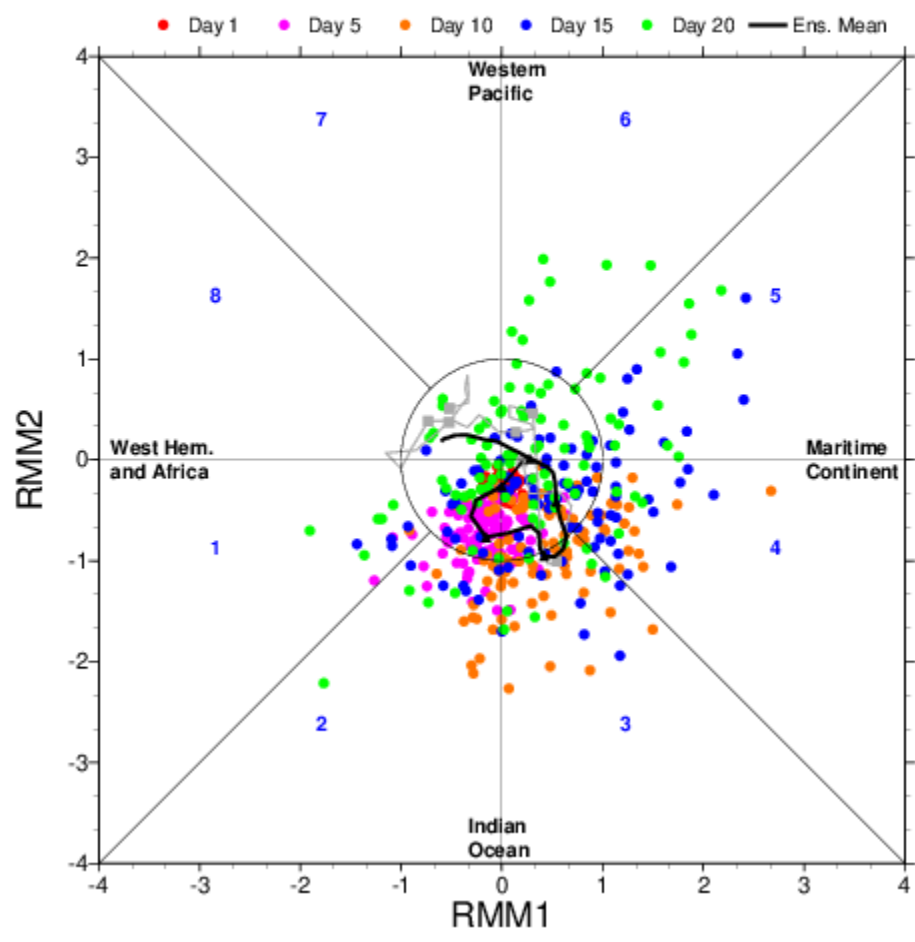


Figure 6: Predicted propagation of the MJO by the ECMWF Ensemble Prediction System. Figure courtesy of ECMWF.

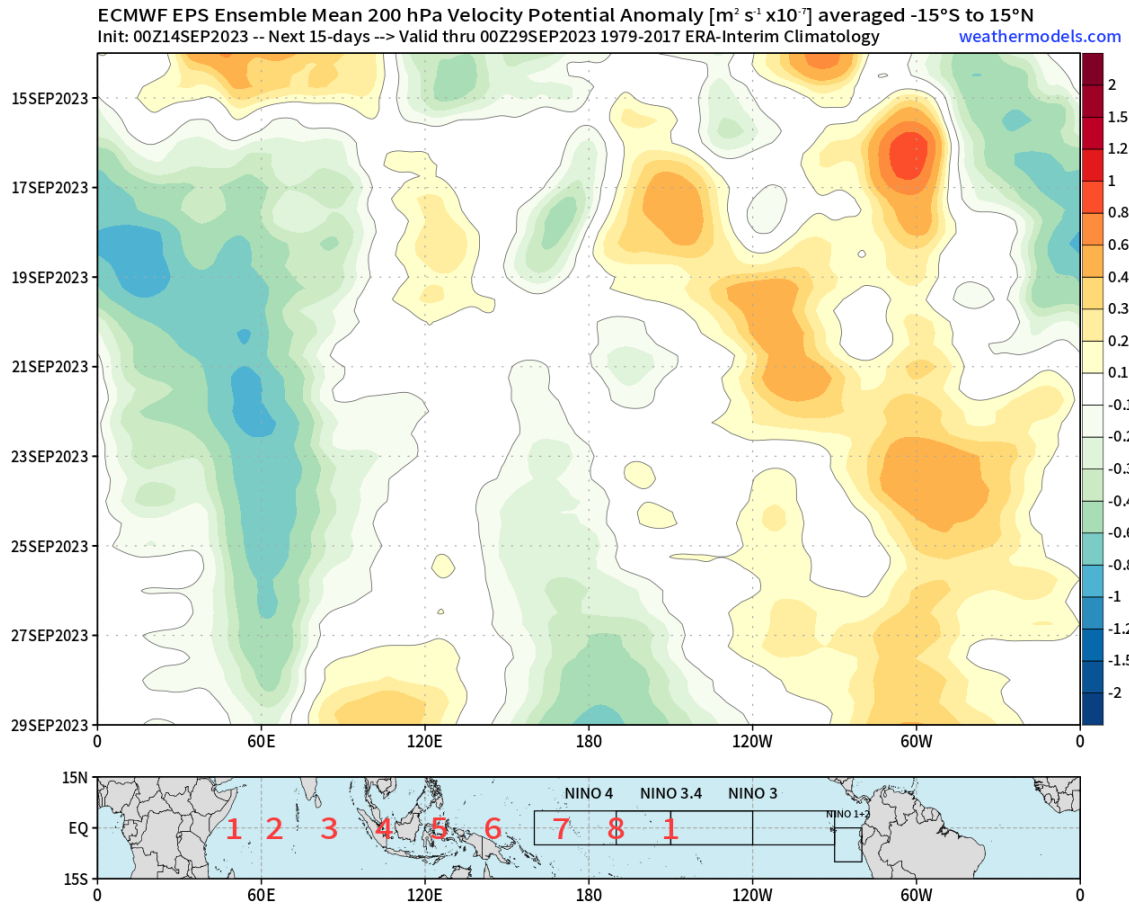


Figure 7: Forecast upper-level velocity potential anomalies by the ECMWF Ensemble Prediction System. Figure courtesy of weathermodels.com.

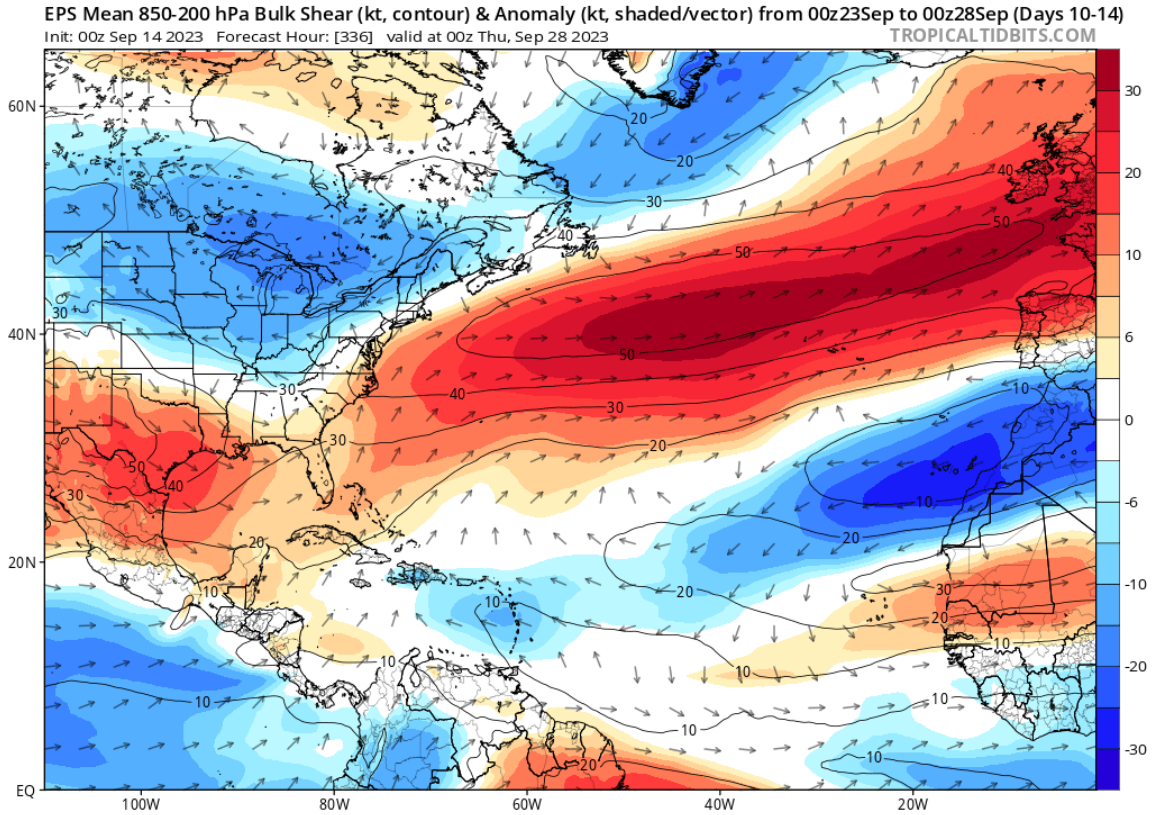


Figure 8: Forecast 200-850 hPa vertical wind shear anomalies for September 23-28 from the ECMWF Ensemble Prediction System. Figure courtesy of Tropical Tidbits.

5) Seasonal Forecast

The most recent seasonal forecast calls for an above-average season. We favor above-average ACE as the most likely outcome for the next two weeks.

3 Upcoming Forecasts

The next two-week forecast will be issued on September 28 for the September 28-October 11 period. A final two-week forecast will be issued on October 12.

VERIFICATION OF AUGUST 31–SEPTEMBER 13 FORECAST

The August 31–September 13 period ended up well above average (49 ACE). Lee produced the most ACE during the two-week period (31 ACE), with Margot (8 ACE), Franklin (4 ACE), Gert (2 ACE), and Idalia, Jose and Katia (~1 ACE each) also contributing towards the ACE that was generated.

Table 2 displays the percentage chance that we gave for each category being reached and observed ACE.

Table 2: ACE forecast for TC activity for August 31–September 13, the probability assigned for each category being reached and observed ACE.

ACE Category	Definition	Probability in each Category	Observed ACE
Above-Normal	Upper Tercile (>27 ACE)	70%	49
Normal	Middle Tercile (14–27 ACE)	25%	
Below-Normal	Lower Tercile (<14 ACE)	5%	