COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE ACTIVITY FROM AUGUST 31–SEPTEMBER 13, 2023

We believe that the most likely category for Atlantic hurricane activity in the next two weeks is above-normal (70%), with normal (25%) and below-normal (5%) being less likely.

(as of 31 August 2023)

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In Memory of William M. Gray[4]

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 August 31–September 13 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 August 31–September 13, 2023.

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

2 Forecast

We believe that the next two weeks have the highest probability to be characterized by activity at above-normal levels (>27 ACE). There are currently three active named storms in the Atlantic basin: Franklin, Idalia and Jose. They are estimated to generate ~10 additional ACE units before dissipation. The National Hurricane Center is currently monitoring two areas for tropical cyclone development in the next week, but neither of these are expected to generate much ACE if they do form. However, global models are quite bullish on TC formation in about one week in the eastern/central Atlantic Main Development Region, and this system has a relatively robust signal of intensifying significantly after formation. There is potential for additional Main Development Region formations following this system as well.

The Madden-Julian Oscillation (MJO) index is forecast to be relatively weak in phases 3-4 over the next ~2 weeks, however, upper-level velocity potential anomalies broadly favor Atlantic hurricane activity with suppressed convection favored over the eastern North Pacific and enhanced vertical motion favored over Africa/Indian Ocean. This anomalous velocity potential pattern results in anomalous upper-level easterlies over the Atlantic Main Development Region and associated reductions in vertical wind shear.

Figure 1 displays the formation locations of TCs from August 31–September 13 for the years from 1966–2022, along with the maximum intensities that these storms reached. Figure 2 displays the August 31–September 13 forecast period with respect to climatology. This period marks the climatological peak of the Atlantic hurricane season. The primary threat formation area for major hurricanes in early- to mid-September is in the eastern and central tropical Atlantic.

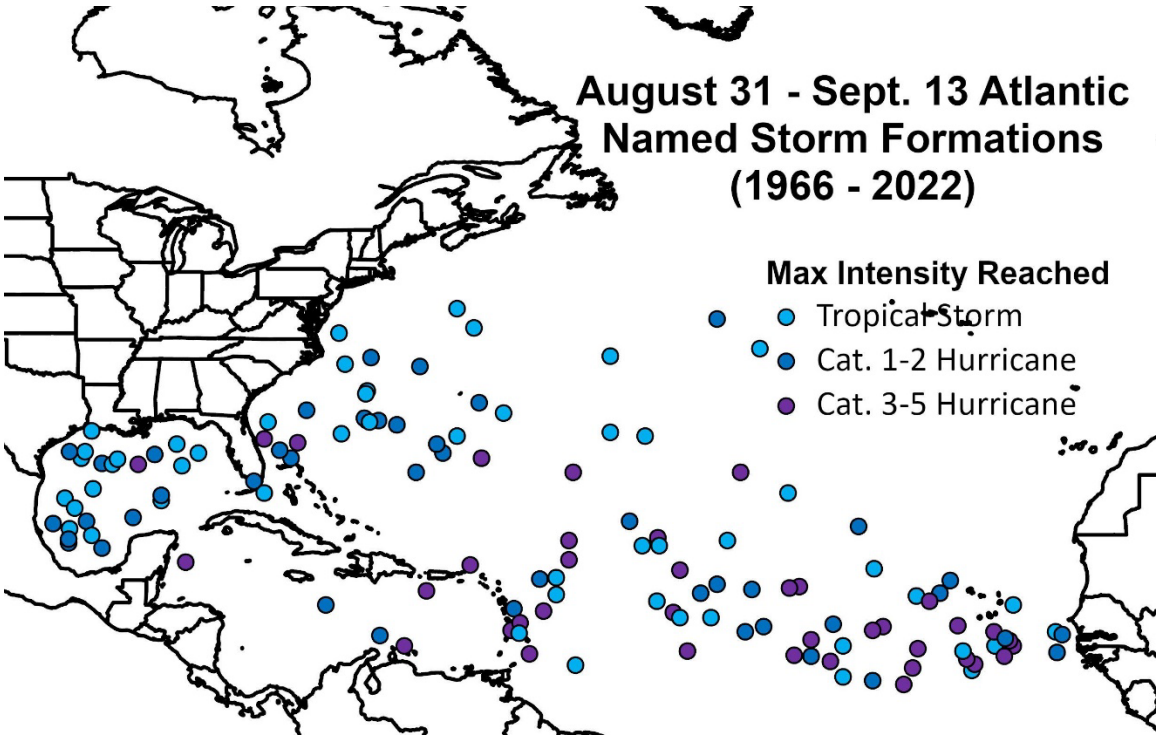

Figure 1: Atlantic named storm formations from August 31–September 13 during the years from 1966-2022 and the maximum intensity that these named storms reached.

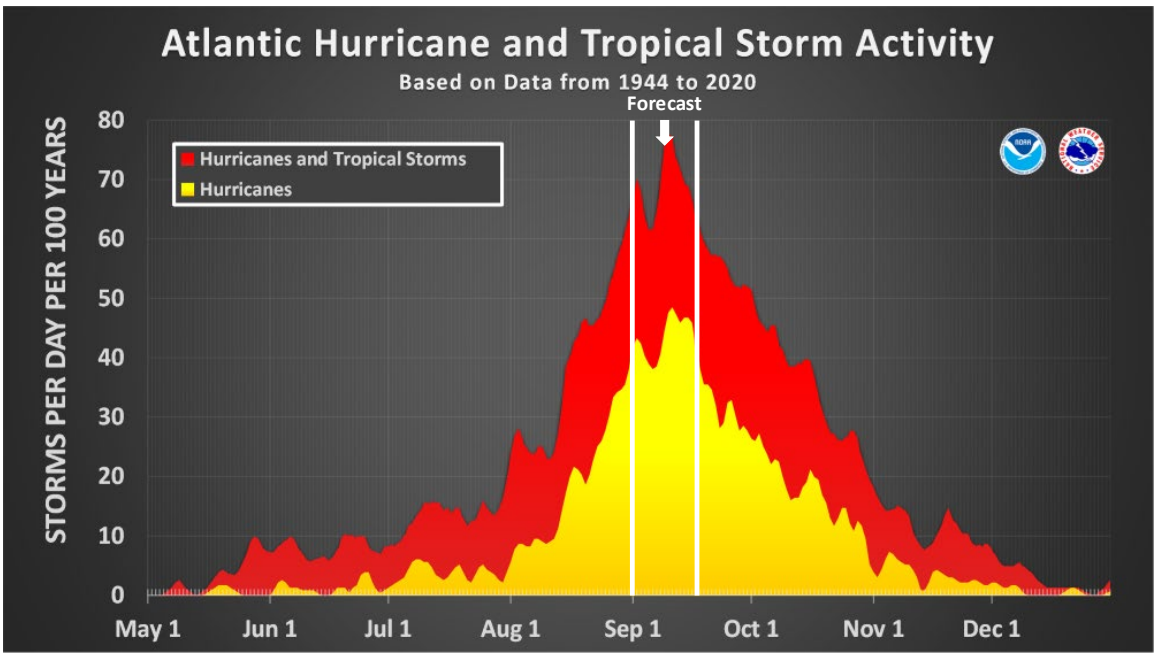

Figure 2: The current forecast period (August 31–September 13) with respect to climatology, delimited with white lines. Figure courtesy of NOAA.

We now examine how we believe each of the five factors discussed in the introduction will impact Atlantic TC activity for the period from August 31 – September 13.

1) Current Storm Activity

There are currently three active TCs in the Atlantic basin. Franklin is estimated to produce ~5 ACE before becoming post-tropical, while Jose is estimated to generate nominal ACE before being sheared apart by the upper-level outflow from Franklin. Idalia is a bit more of a wild card given there is some uncertainty as to whether it can maintain tropical characteristics. ACE generated by Idalia is estimated to range between ~2-8.

2) National Hurricane Center Tropical Weather Outlook

The latest NHC Tropical Weather Outlook is currently monitoring two areas for tropical cyclone development (Figure 3). The high probability area (Invest 94L) has the potential to generate ~2-3 ACE units if it forms. However, it is forecast to track northwestward away from Cabo Verde, moving over cooler waters, limiting its potential to generate large levels of ACE. The low probability area is the remnants of Gert, which has a limited window for reformation before being sheared apart.

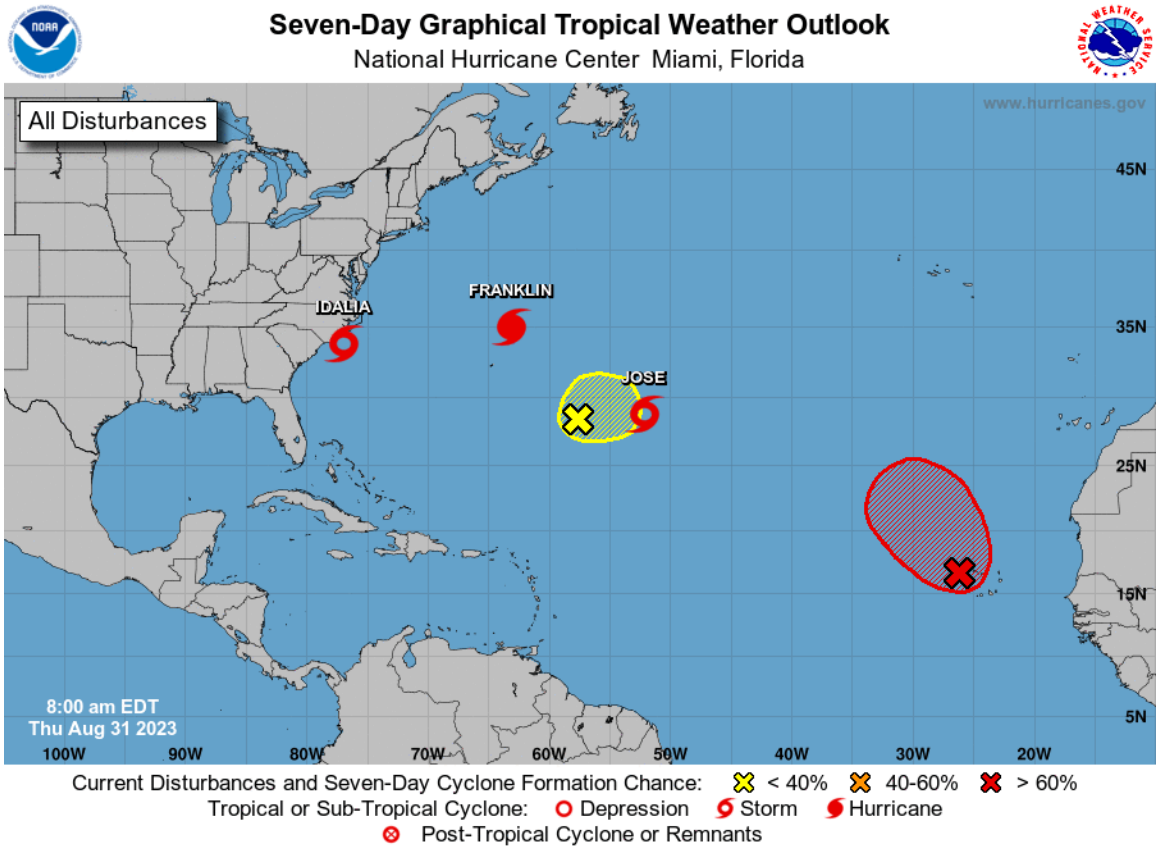

Figure 3: Current Tropical Weather Outlook from the National Hurricane Center. Figure courtesy of NOAA.

3) Global Model Analysis

The ECMWF Ensemble Prediction System (EPS) (Figure 4) is quite aggressive for Atlantic Main Development Region formation and intensification over the next two weeks. The signal has only gotten stronger over the past couple of 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 relatively aggressive with Main Development Region formation over the next two weeks (Figure 5).

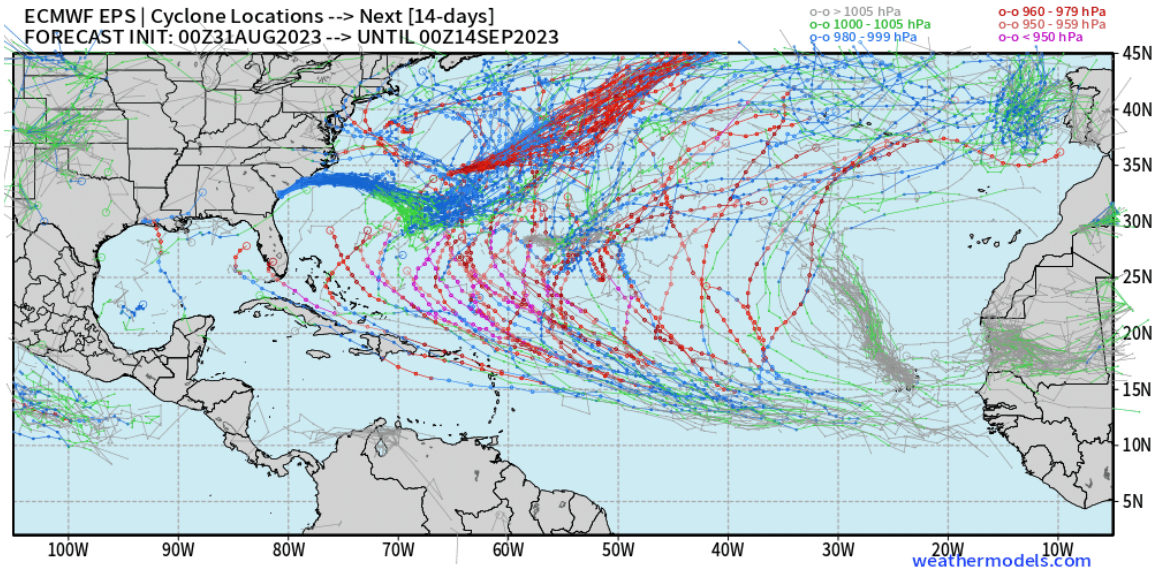

Figure 4: Cyclone locations from the ECMWF EPS ensemble for the next 14 days. Figure courtesy of weathermodels.com

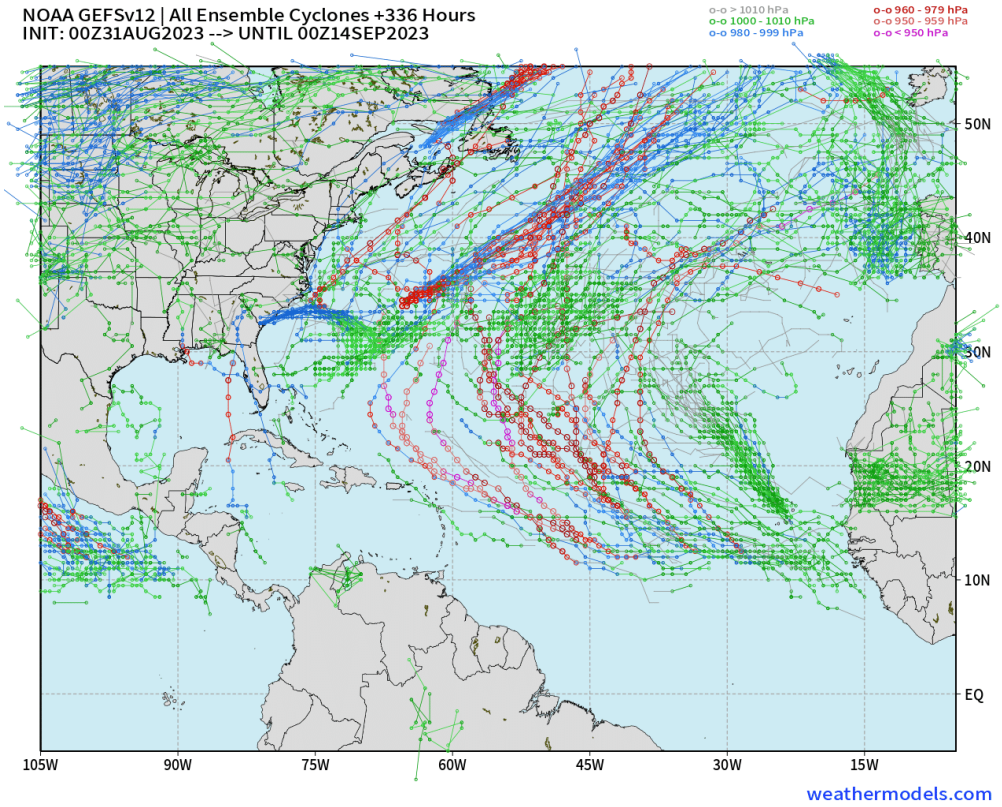

Figure 5: Cyclone locations from the Global Ensemble Forecast System for the next 14 days. Figure courtesy of weathermodels.com.

4) Madden-Julian Oscillation

The Madden-Julian oscillation (MJO), as measured by the Wheeler-Hendon index, is forecast to be relatively weak, predominately in phases 3-4 over the next two weeks (Figure 5). However, the broad-scale velocity potential pattern favors 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 6). This signal may become less favorable towards the end of the two-week period, as subsidence starts to push eastward across Africa. Broadly speaking, 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 6-10 (Figure 7) is provided as an example, highlighting reduced shear across the Main Development Region near the climatological peak of the hurricane season.

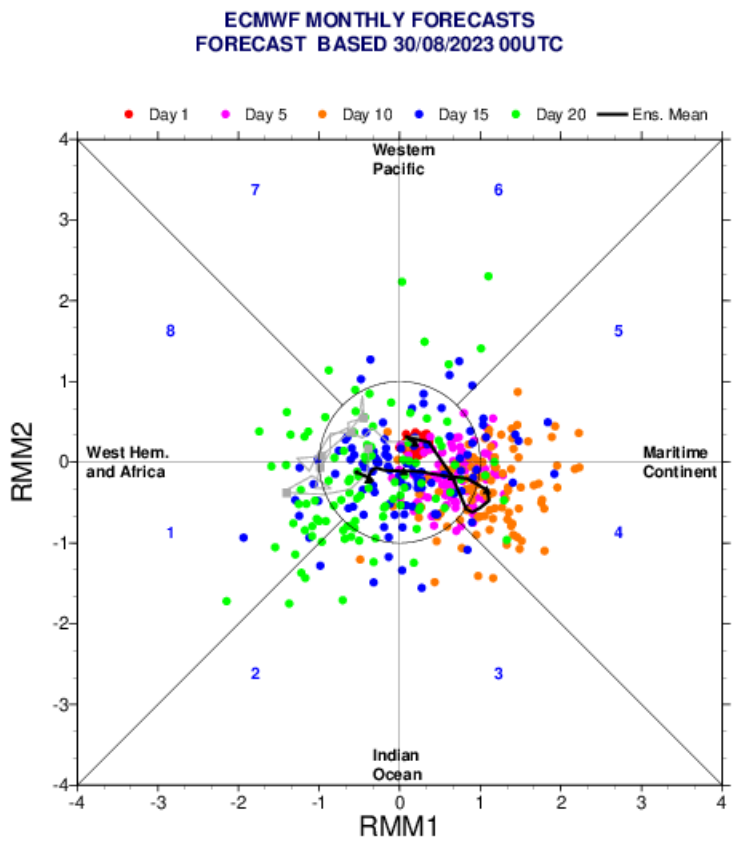

Figure 5: Predicted propagation of the MJO by the ECMWF Ensemble Prediction System. Figure courtesy of ECMWF.

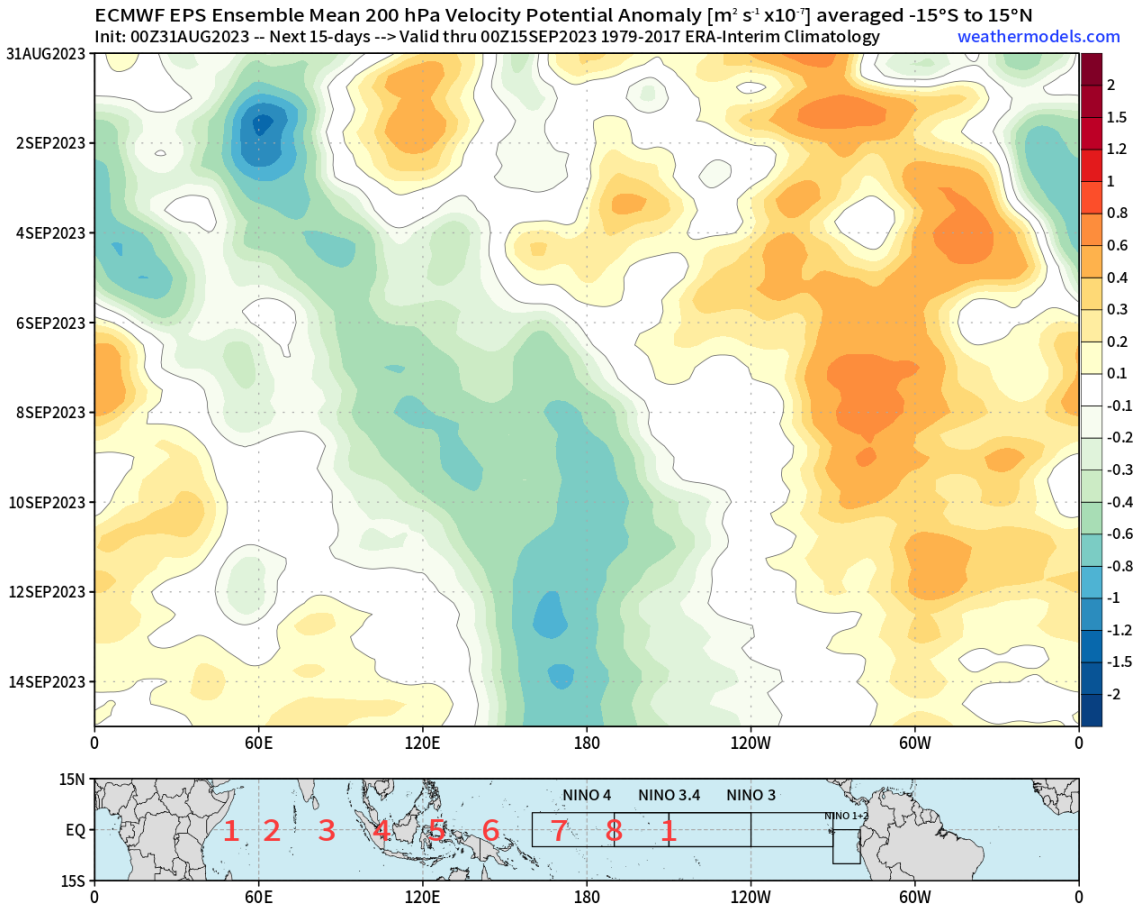

Figure 6: Forecast upper-level velocity potential anomalies by the ECMWF Ensemble Prediction System. Figure courtesy of weathermodels.com.

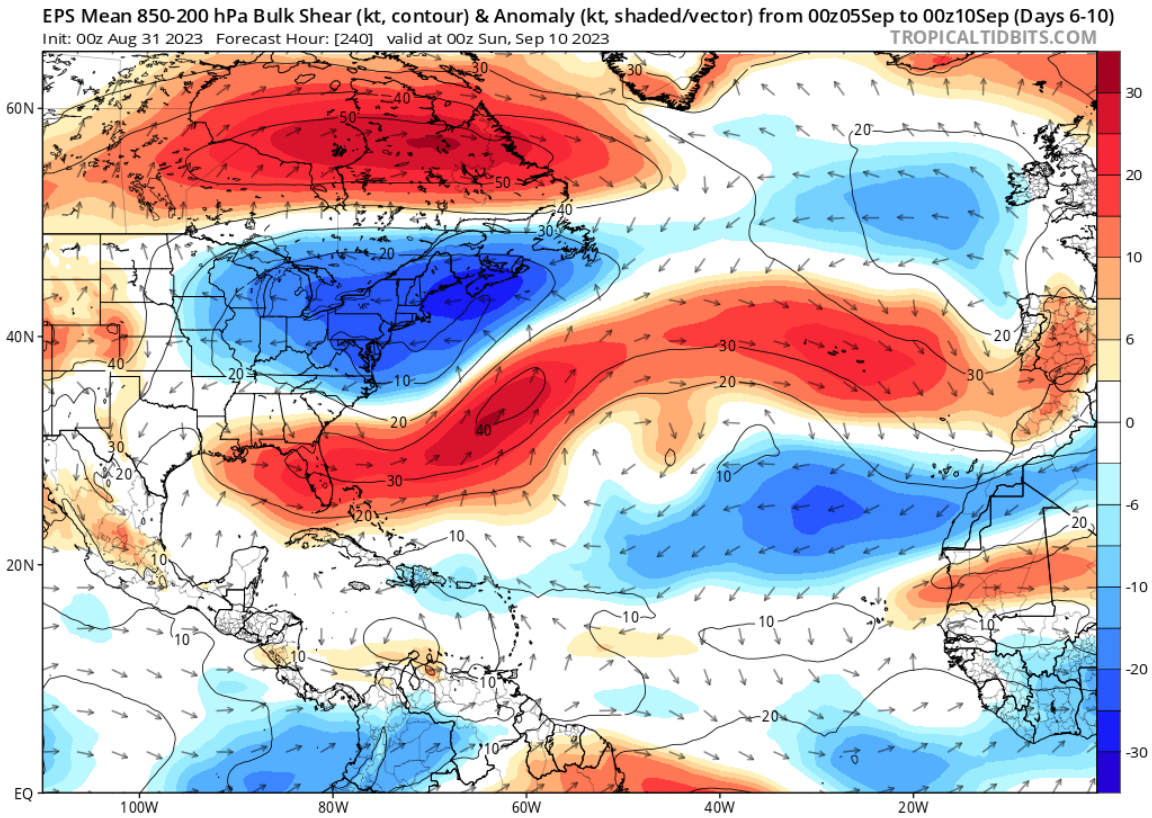

Figure 7: Forecast 200-850 hPa vertical wind shear anomalies for September 6-10 from the ECMWF Ensemble Prediction System. Figure courtesy of Tropical Tidbits.

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 14 for the September 14-27 period. Additional two-week forecasts will be issued on September 28 and October 12.

VERIFICATION OF AUGUST 17–30 FORECAST

The August 17-30 period ended up above average (31 ACE). Franklin produced 23 ACE during the two-week period, Idalia produced 7 ACE, while Emily, Gert and Harold combined for the remaining 1 ACE.

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 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 (>18 ACE)	50%	31
Normal	Middle Tercile (6–18 ACE)	40%	
Below-Normal	Lower Tercile (<6 ACE)	10%	