

**COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE  
ACTIVITY FROM OCTOBER 1–OCTOBER 14, 2019**

We expect that the next two weeks will be characterized by above-normal amounts of hurricane activity.

(as of 1 October 2019)

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In Memory of William M. Gray<sup>4</sup>

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 11th year that we have issued shorter-term forecasts of tropical cyclone 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 1966-2016 and defining above-normal, normal and below-normal two-week periods based on terciles. Since there are 51 years from 1966-2016, each tercile is composed of 17 years. The 17 years with the most active ACE periods from October 1-14 are classified as the upper tercile, the 17 years with the least active ACE periods from October 1-14 are classified as the lower tercile, while the remaining 17 years are classified as the middle tercile.

Table 1: ACE forecast definition for TC activity for October 1–14, 2019.

Parameter	Definition
Above-Normal	Upper Tercile ( $>7$ ACE)
Normal	Middle Tercile (3–7 ACE)
Below-Normal	Lower Tercile ( $<3$ ACE)

# 2 Forecast

We believe that the next two weeks will be characterized by activity at above-normal levels ( $>7$  ACE). One of the primary reason that we are forecasting above-normal ACE is that Hurricane Lorenzo is likely to generate 4-5 ACE before becoming post-tropical. The National Hurricane Center has two areas with a very low probability of development over the next five days. The global models indicate that there is the chance of some TC development either in the western Caribbean/Gulf of Mexico or in the eastern/central Atlantic at some point in the next ten days.

The Madden-Julian Oscillation (MJO) is currently in phase 1, which is typically favorable for Atlantic hurricane activity. However, there is considerable question as to whether this is an actual MJO event or just interference from a positive Indian Ocean Dipole event and its associated low-level easterly wind anomalies, as discussed in the latest weekly update from NOAA’s Climate Prediction Center.

Figure 1 displays the formation locations of tropical cyclones from October 1–October 14 for the years from 1966–2018 (e.g., the satellite era), along with the maximum intensities that these storms reached. Figure 2 displays the October 1–October

14 forecast period with respect to climatology. The hurricane season typically begins to die down during this time period. The primary threat formation area shifts westward from the eastern and central tropical Atlantic towards the western Atlantic.

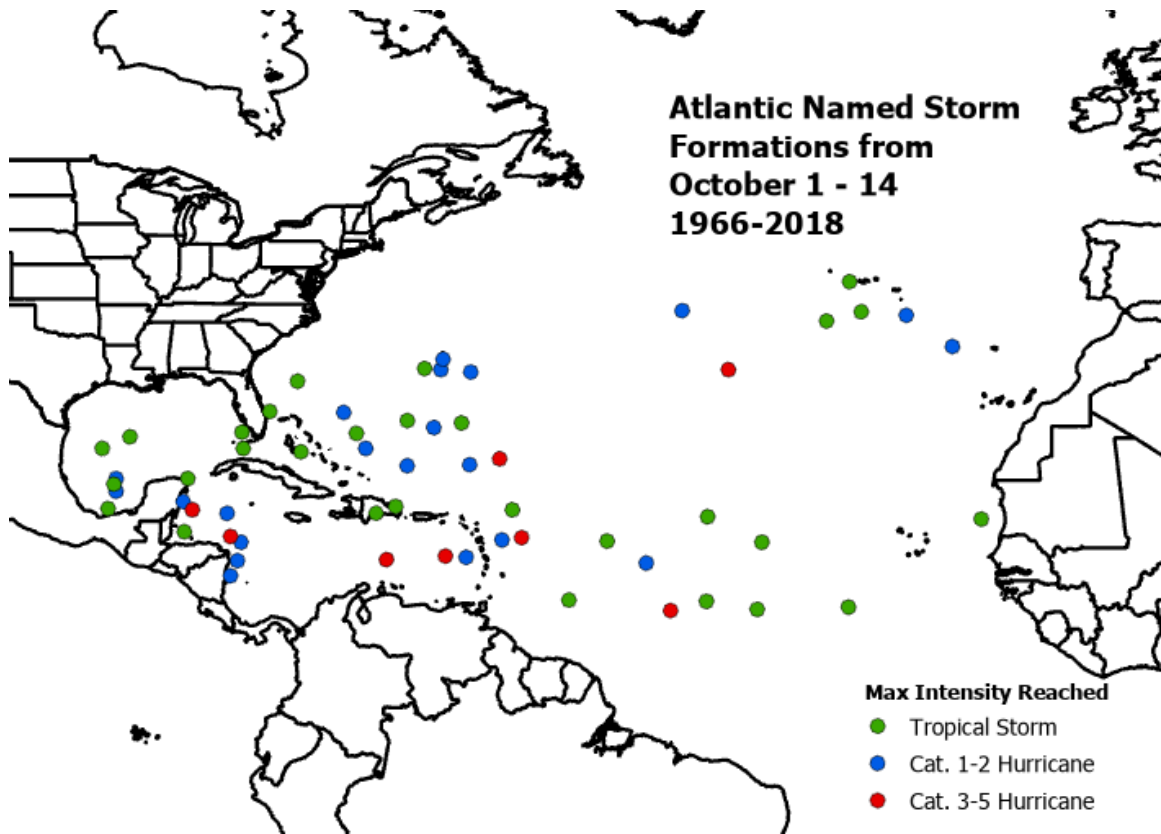


Figure 1: Atlantic named storm formations from October 1–October 14 during the years from 1966-2018 and the maximum intensity that these named storms reached.

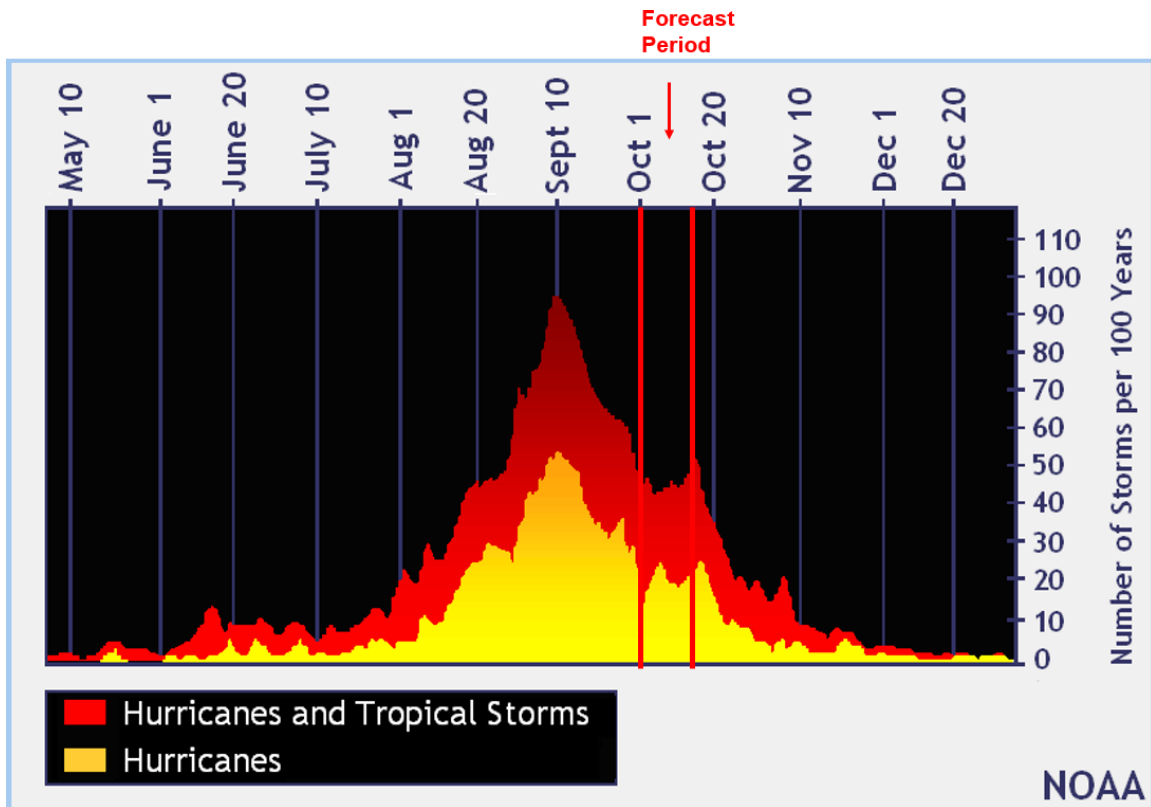


Figure 2: The current forecast period (October 1-14) with respect to climatology. Figure courtesy of NOAA.

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

### 1) Current Storm Activity

Hurricane Lorenzo is likely to produce 4-5 ACE before becoming post-tropical.

### 2) National Hurricane Center Tropical Weather Outlook

The latest NHC Tropical Weather Outlook has two areas with a very low chance (10%) of formation in the next five days.

### 3) Global Model Analysis

The Global Ensemble Forecasting System is highlighting two potential areas for TC formation in the next ten days. One area is in the western Caribbean/Gulf of Mexico, which is a climatologically favored area for TC development during early to mid-October (Figure 3). The other area is in the eastern tropical Atlantic, but this area may have some trouble developing due to the significant cold wake left by Hurricane Lorenzo (Figure 4).

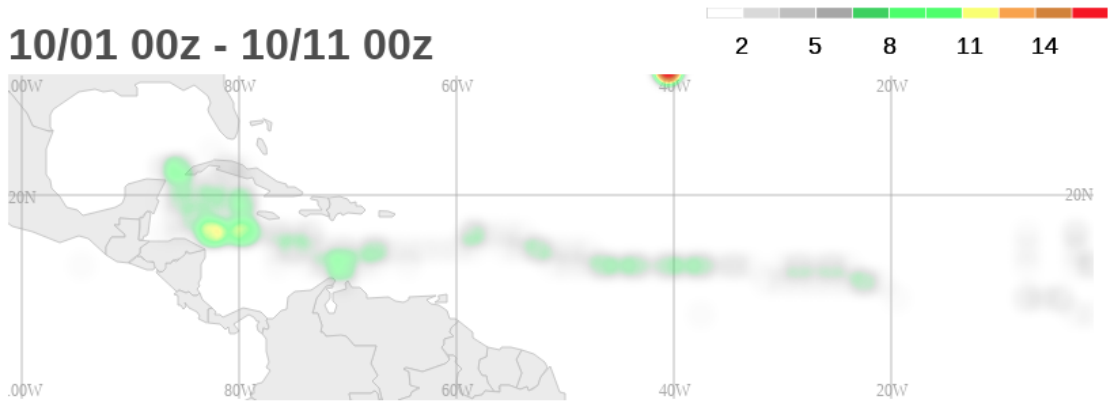


Figure 3: Number of ensemble members from the Global Ensemble Forecasting System with a tropical cyclone in the next ten days. The Global Ensemble Forecasting System has a total of 21 members. Figure courtesy of Central Weather Bureau.

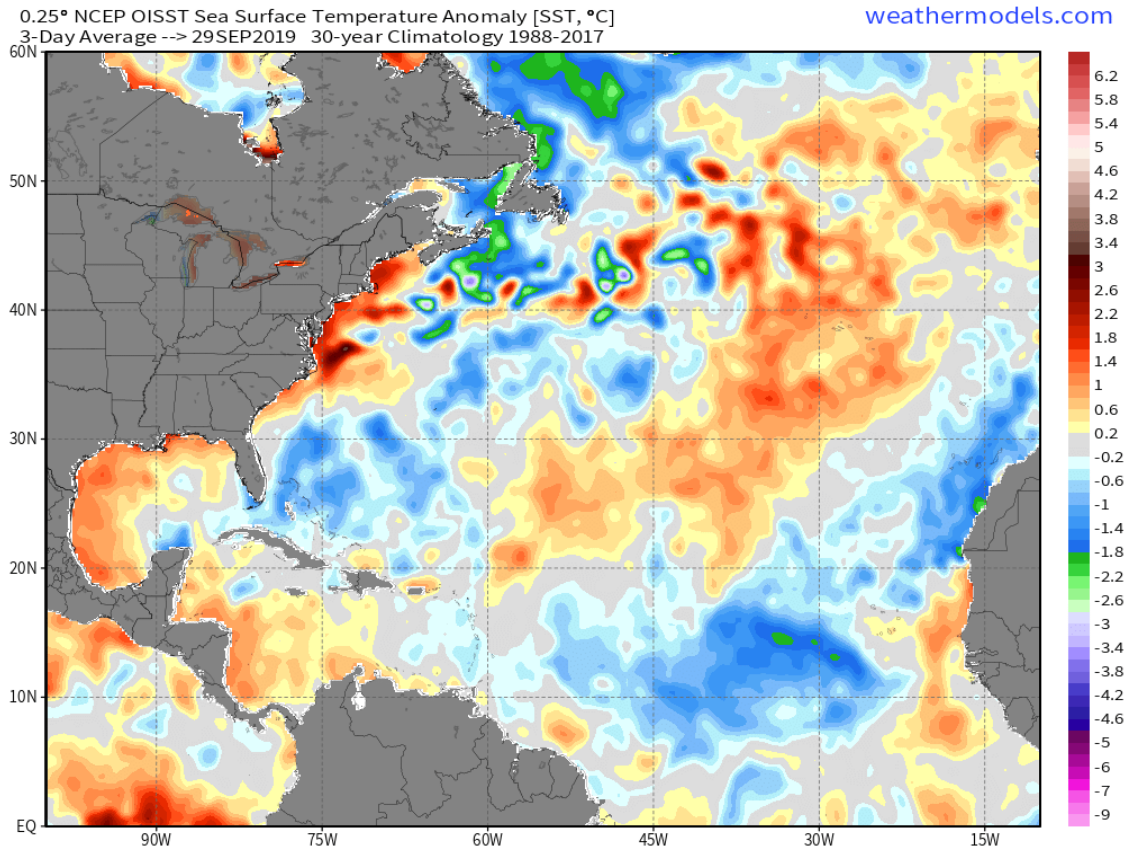


Figure 4: Current sea surface temperature anomalies across the North Atlantic. Note the anomalously cool SSTs in the eastern/central tropical Atlantic left by Hurricane Lorenzo.

#### 4) Madden-Julian Oscillation

The Madden-Julian Oscillation (MJO), as measured by the Wheeler-Hendon index, is currently in phase 1 with relatively high amplitude (Figure 5). However, as was discussed in the recent NOAA Climate Prediction Center weekly update, some of this apparent amplification may be due to a developing positive Indian Ocean Dipole event and associated low-level easterly wind anomalies. The ECMWF model is forecasting little propagation of the signal in the next two weeks (Figure 5). The sub-seasonal signal, whether purely an MJO signal or not, should be relatively favorable for Atlantic TC development (Table 2).

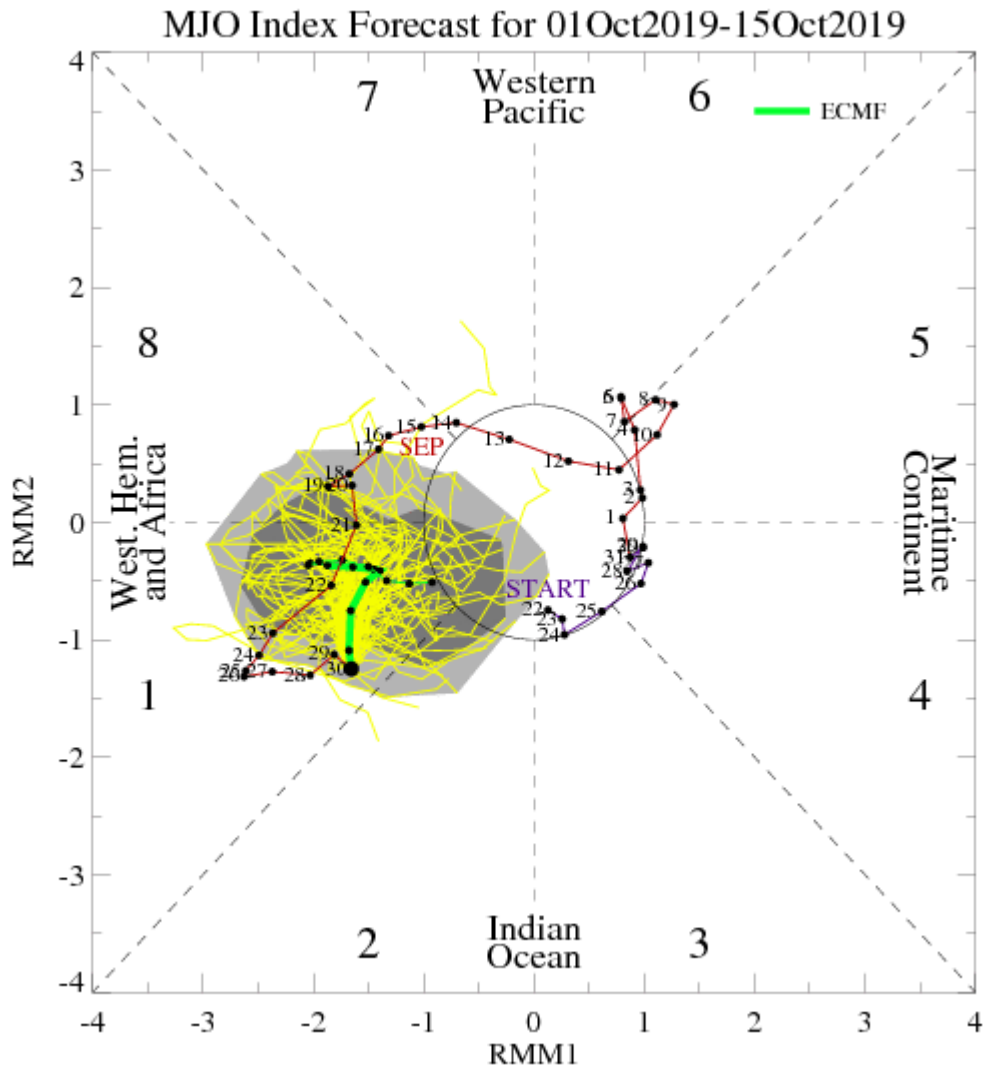


Figure 5: Observed propagation and predicted propagation of the MJO by the ECMWF model.

The Climate Forecast System is generally predicting above-normal shear in the central tropical Atlantic but below-normal shear in the western tropical Atlantic over the next 12 days (Figure 6).

Table 2: Normalized values of named storms (NS), named storm days (NSD), hurricanes (H), hurricane days (HD), major hurricanes (MH), major hurricane days (MHD) and Accumulated Cyclone Energy (ACE) generated by all tropical cyclones forming in each phase of the MJO over the period from 1974-2007. Normalized values are calculated by dividing storm activity by the number of days spent in each phase and then multiplying by 100. This basically provides the level of TC activity that would be expected for 100 days given a particular MJO phase.

MJO Phase	NS	NSD	H	HD	MH	MHD	ACE
Phase 1	6.4	35.9	3.7	17.9	1.8	5.3	76.2
Phase 2	7.5	43.0	5.0	18.4	2.1	4.6	76.7
Phase 3	6.3	30.8	3.0	14.7	1.4	2.8	56.0
Phase 4	5.1	25.5	3.5	12.3	1.0	2.8	49.4
Phase 5	5.1	22.6	2.9	9.5	1.2	2.1	40.0
Phase 6	5.3	24.4	3.2	7.8	0.8	1.1	35.7
Phase 7	3.6	18.1	1.8	7.2	1.1	2.0	33.2
Phase 8	6.2	27.0	3.3	10.4	0.9	2.6	46.8
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Phase 1-2	7.0	39.4	4.3	18.1	1.9	4.9	76.5
Phase 6-7	4.5	21.5	2.5	7.5	1.0	1.5	34.6
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Phase 1-2 / Phase 6-7	1.6	1.8	1.7	2.4	2.0	3.2	2.2

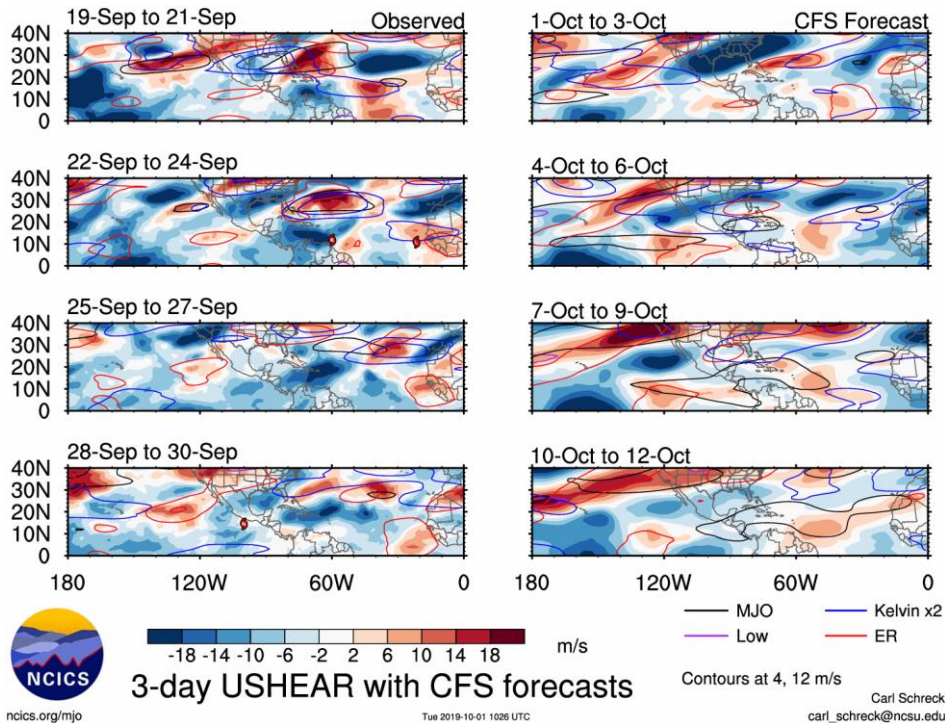


Figure 6: Observed and predicted anomalous 200 minus 850 hPa vertical wind shear from the Climate Forecast System through October 12. Figure courtesy of Carl Schreck.

## 5) Seasonal Forecast

The most recent seasonal forecast calls for a near-average season. We believe that the next two weeks will be above-average, however, largely due to Hurricane Lorenzo.

### **3 Upcoming Forecasts**

The final two-week forecast for 2019 will be issued on October 14.



## **VERIFICATION OF SEPTEMBER 17-30, 2019 FORECAST**

The two-week forecast of tropical cyclone activity from September 17–September 30, 2019 correctly verified in the above-normal category. Above-average ACE was defined to be  $>22$  ACE during the period, and 51 ACE were generated. Lorenzo generated the most ACE during the two-week period, followed by Humberto and Jerry. Karen and Imelda generated much less ACE.