COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE ACTIVITY FROM SEPTEMBER 15 – SEPTEMBER 28, 2016

We expect that the next two weeks will be characterized by below-average amounts (<70 percent) of activity relative to climatology. The future intensity of Tropical Depression 12 is the primary wild card in this forecast.

(as of 15 September 2016)

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

This is the eighth 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.

The metric that we are trying to predict with these two-week forecasts is the Accumulated Cyclone Energy (ACE) index, which is defined to be all of the named storm's maximum wind speeds (in 10^4 knots^2) for each 6-hour period of its existence over the two-week period. These forecasts are too short in length to show significant skill for individual event parameters such as named storms and hurricanes. We issue forecasts for ACE using three categories as defined in Table 1.

Table 1: ACE forecast definition.

Parameter	Definition
Above-Average	Greater than 130% of Average ACE
Average	70% - 130% of Average ACE
Below-Average	Less than 70% of Average ACE

2   Forecast

We believe that the next two weeks will be characterized by activity at below-average levels (less than 70 percent of climatology). The average ACE accrued during the period from 1981-2010 from September 15 - September 28 was 23 units, and consequently, our forecast for the next two weeks is for 16 or fewer ACE units to be generated.

The below-average forecast is due to several factors. Ian and Julia should generate very limited ACE before dissipation. Tropical Depression 12 is the primary wild card in this two-week forecast. Several models like the GFS keep the storm very weak, generating little ACE, while the ECMWF intensifies it into a ~960 mb hurricane in ten days. Obviously if the ECMWF forecast bears itself out, ACE could be much higher than forecast here. Two additional areas are currently being monitored. The first is over the central Gulf of Mexico and is very unlikely to form, while the second area is an easterly wave that will move off the coast of Africa on Friday. This area may develop and become a tropical cyclone, but most of the models do not develop this system significantly.

The Madden-Julian Oscillation is forecast to remain relatively weak over the next two weeks, with any amplification occurring over the Maritime Continent in Phases 4-5. These phases are typically associated with near-average Atlantic hurricane activity.

Figure 1 displays the tracks that tropical cyclones have taken during the period from September 15 – September 28 for the years from 1950-2008. Figure 2 displays the September 15 - 28 forecast period with respect to climatology. The September 15 - September 28 period is considered to be part of the climatologically most active part of the Atlantic hurricane season.
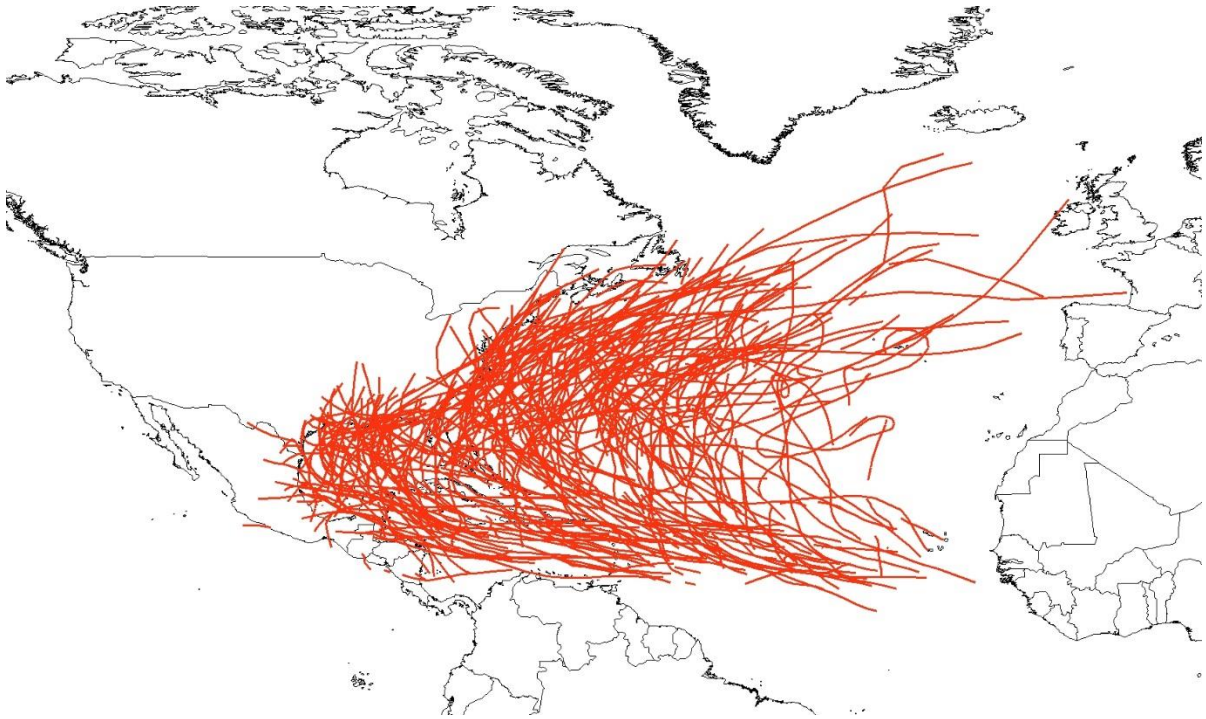

Figure 1: Tracks that named tropical cyclones have taken over the period from September 15 – September 28 for the years from 1950-2008.
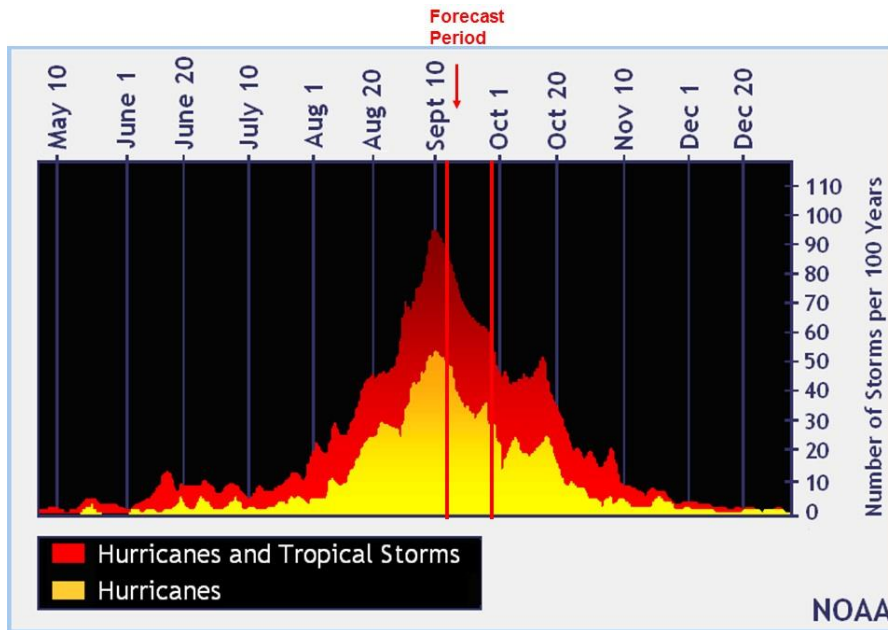
Figure 2: The current forecast period (September 15 – September 28) with respect to climatology. Figure courtesy of NOAA.

We now examine how we believe each of the five factors discussed in the introduction will impact Atlantic TC activity for the period from September 15 – September 28.

1) Current Storm Activity

Ian and Julia should generate very limited amounts of ACE before dissipation. As mentioned in the introduction, the primary wildcard in the forecast is Tropical Depression 12. Most of the global models do not develop the system beyond tropical storm strength, while the ECMWF model takes it to hurricane strength in about one week's time. The system is going to travel through a highly-sheared environment in the next couple of days, and it remains to be seen how much is left of the system at that point as to how intense the storm may get.

2) National Hurricane Center Tropical Weather Outlook

The latest NHC Tropical Weather Outlook has one very low chance area in the Gulf of Mexico and a medium chance area moving over the western part of Africa. The Gulf of Mexico area is very unlikely to form, while the easterly wave that will exit Africa on Friday looks fairly likely to become a TC. However, most models do not develop this TC beyond moderate tropical storm strength.

3) Global Model Analysis

Other than the areas already discussed, none of the global models develop any other areas significantly in the next week.

4) Madden-Julian Oscillation

The Madden-Julian Oscillation is currently relatively weak. The ECMWF continues to forecast a relatively weak MJO, with any amplification occurring in Phases 4-5. (Figure 3). Phases 4-5 are generally characterized by near-average TC activity in the Atlantic. Table 2 displays ACE generated in various MJO phases.
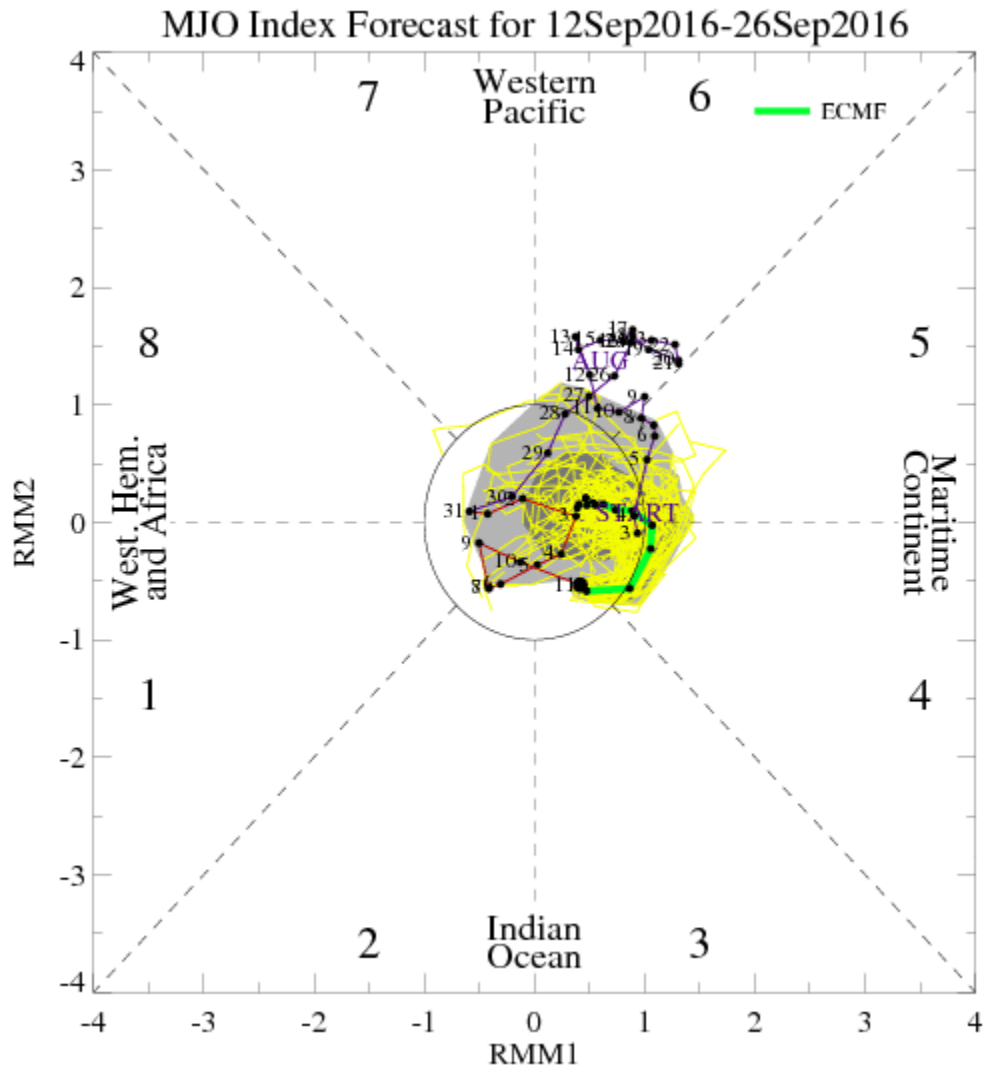

Figure 4: ECMWF forecast of the MJO from September 12, 2016 - September 26, 2016.

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
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
Phase 1-2 / Phase 6-7	1.6	1.8	1.7	2.4	2.0	3.2	2.2

5) Seasonal Forecast

The most recent seasonal forecast calls for a near-average season. We utilize the seasonal forecast as a baseline for our two-week forecasts. This two-week forecast is quite challenging, given the significant uncertainty in the future intensity of Tropical Depression 12.

3   Upcoming Forecasts

The next two-week forecast will be issued on September 29 for the September 29 – October 12 period. A final forecast will be issued on October 13.

VERIFICATION OF SEPTEMBER 1 – SEPTEMBER 14, 2016 FORECAST

The two-week forecast of average tropical cyclone activity from September 1 – September 14 verified in the below-average category. Activity at near-average levels was predicted (19-34 ACE units), and observed activity was at well below-average levels (9 ACE units). Gaston, Hermine, Ian and Julia all contributed to the ACE generated during the two-week period. One significant reason why this forecast busted was due to overestimates of how much ACE Gaston and Hermine would generate. We anticipated Gaston remaining a hurricane longer, and we also thought that Hermine might transition back from post-tropical to sub-tropical after reemerging off of the North Carolina coast, at which point it would have started generating ACE again.