

**COLORADO STATE UNIVERSITY FORECAST OF ATLANTIC HURRICANE  
ACTIVITY FROM OCTOBER 22 – NOVEMBER 5, 2009**

We expect that the next fifteen days will be characterized by average amounts (70-130 percent) of activity relative to climatology. These new 15-day forecasts have replaced the monthly forecasts that we have been issuing in recent years.

(as of 21 October 2009)

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This forecast as well as past forecasts and verifications are available online at  
<http://hurricane.atmos.colostate.edu/Forecasts>

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## VERIFICATION OF OCTOBER 7 – OCTOBER 21, 2009 FORECAST

The 15-day forecast of tropical cyclone activity between October 7 – October 21 verified quite well. Activity at below-average levels was predicted, and only one named storm day generated by Tropical Storm Henri occurred during the 15-day period. Table 1 displays predicted and observed activity over the 15-day period. The Madden-Julian Oscillation (MJO) was quite weak during the early portion of the forecast period and then intensified into Phase 8 towards the end of the period (Figure 1). A generally weak MJO signal together with unfavorable seasonal conditions due to a moderate El Niño event combined to greatly reduce activity relative to what one would typically expect for this period. This general MJO pattern was well-predicted by the Global Forecast System (GFS) ensemble (Figure 2).

Table 1: Observed and predicted activity over the period from October 7 – October 21, 2009. The 1950-2000 October 7 – October 21 climatology is listed in parentheses.

Parameter	Observed	Predicted
Named Storms (NS) (0.9)	0*	
Named Storm Days (NSD) (4.9)	1	
Hurricanes (H) (0.6)	0	
Hurricane Days (HD) (2.3)	0	
Intense Hurricanes (IH) (0.2)	0	
Intense Hurricane Days (IHD) (0.4)	0	
Accumulated Cyclone Energy (ACE) (8)	1	<b>Below Average (6 or Less)</b>

\*Note: Tropical Storm Henri formed on October 6, which is why it is not listed as a named storm in Table 1.

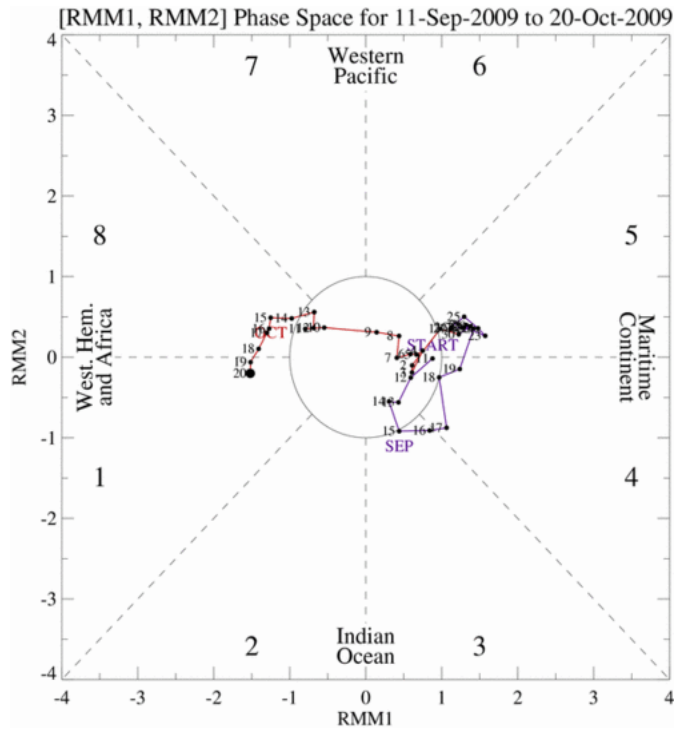


Figure 1: Observed MJO activity over the period from September 11 – October 20, 2009. The MJO was of weak magnitude during the early part of the forecast period before intensifying into Phase 8 late in the period.

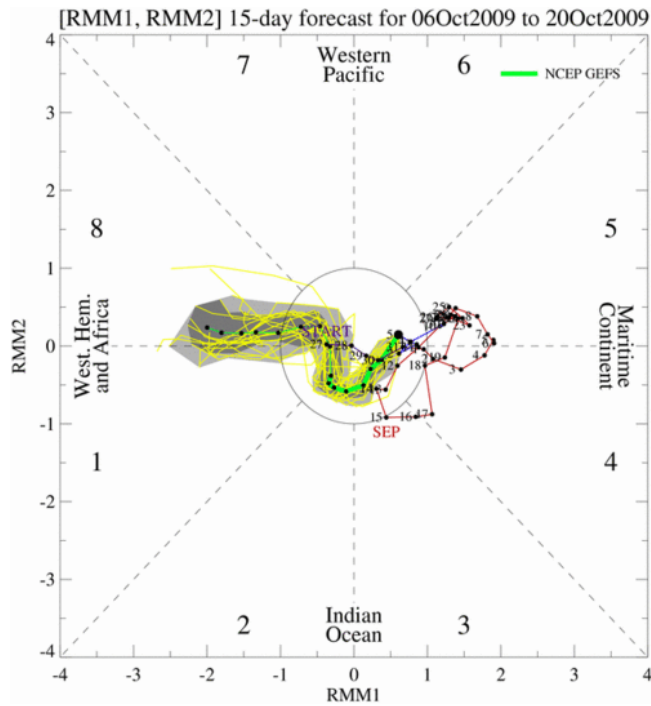


Figure 2: Predicted MJO activity based on the Global Forecast System (GFS) ensemble from October 6 – October 20. The GFS was quite successful in predicting a weak MJO for the first week with amplification into Phase 8 towards the end of the forecast period.

# 1 Introduction

This is the first year that we are issuing fifteen-day forecasts of tropical cyclone activity starting in early August. We have decided to discontinue our individual monthly forecasts. These fifteen-day 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 fifteen-day forecasts is the Accumulated Cyclone Energy (ACE) index, which is defined to be the square of the named storm's maximum wind speeds (in  $10^4$  knots<sup>2</sup>) for each 6-hour period of its existence over the fifteen-day 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 2.

Table 2: 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 fifteen days will be characterized by activity at average levels (70-130 percent of climatology). This is primarily due to the fact that the MJO is predicted to increase in amplitude and be in a quite favorable mode for Atlantic basin storm formation over the next 1-2 weeks (Figure 3). In addition, there is the potential for some development of a system currently located in the southwest Caribbean; although the dynamical forecast models are generally less enthusiastic about this system's development than they were yesterday. We do not foresee an above-average period due largely to the fact that the moderate ENSO event currently in place in the eastern Pacific typically has a strong negative impact on late season activity, especially in the western Caribbean. Average activity for the October 22 – November 5 period over the years from 1950-2000 and the forecast for 2009 are displayed in Table 3.

Figure 4 displays the tracks that tropical cyclones have taken during the period from October 22 – November 5 for the years from 1950-2008. Figure 5 displays the October 22 – November 5 forecast period with respect to climatology. The focus for tropical cyclones during this time period tends to concentrate in the western Caribbean and in the subtropical Atlantic.

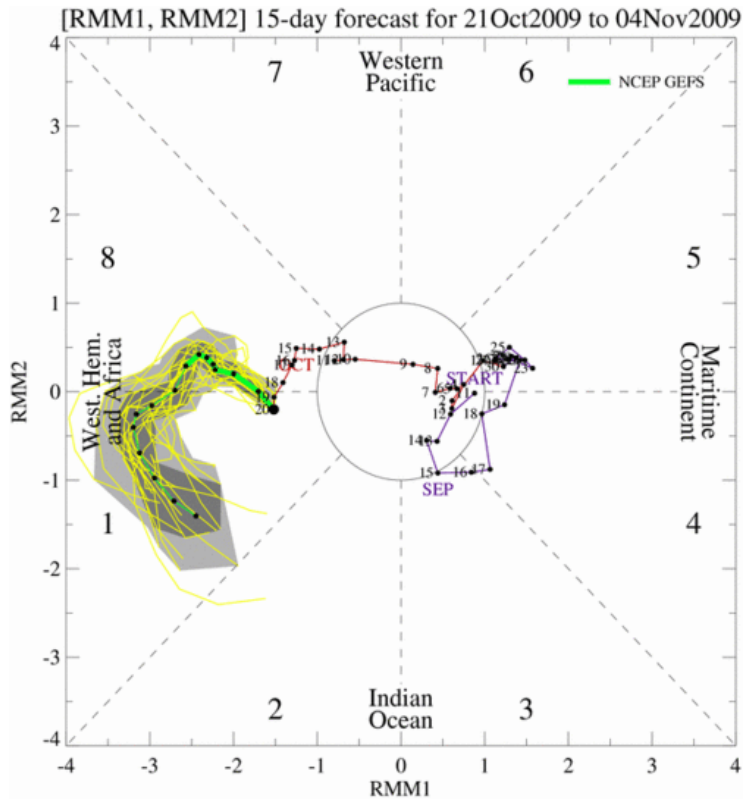


Figure 3: Estimated position of the MJO from September 11, 2009 through October 20, 2009 along with the forecast through November 4 from the ensemble Global Forecast System (GFS). Atlantic tropical cyclone activity is typically enhanced when the MJO is located in Phase 1.

Table 3: Average activity over the period from October 22 – November 5 along with the forecast for October 22 – November 5, 2009.

Parameter	1950-2000 Climatology	Forecast
Named Storms (NS)	0.5	
Named Storm Days (NSD)	2.6	
Hurricanes (H)	0.3	
Hurricane Days (HD)	1.1	
Intense Hurricanes (IH)	0.1	
Intense Hurricane Days (IHD)	0.3	
Accumulated Cyclone Energy (ACE)	5	<b>Average (3.5-6.5)</b>

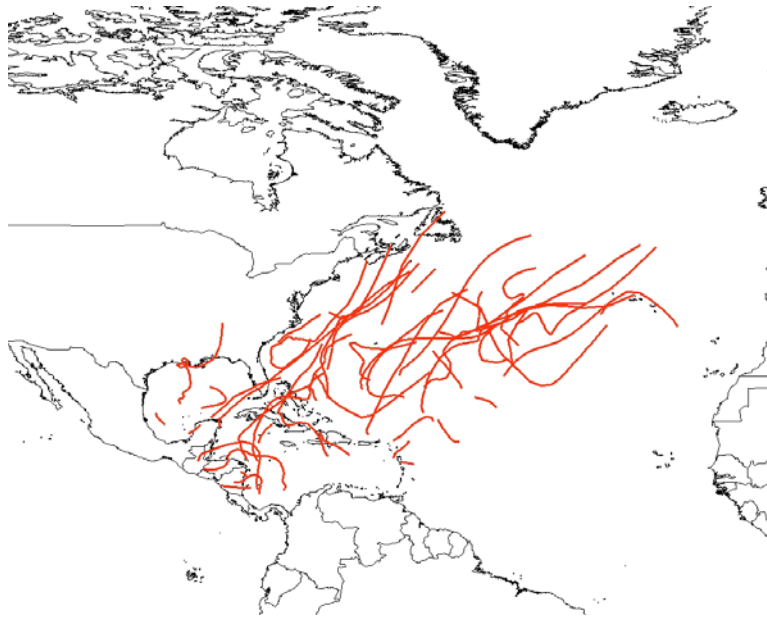


Figure 4: Tracks that tropical cyclones have taken over the period from October 22 – November 5 for the years from 1950-2008.

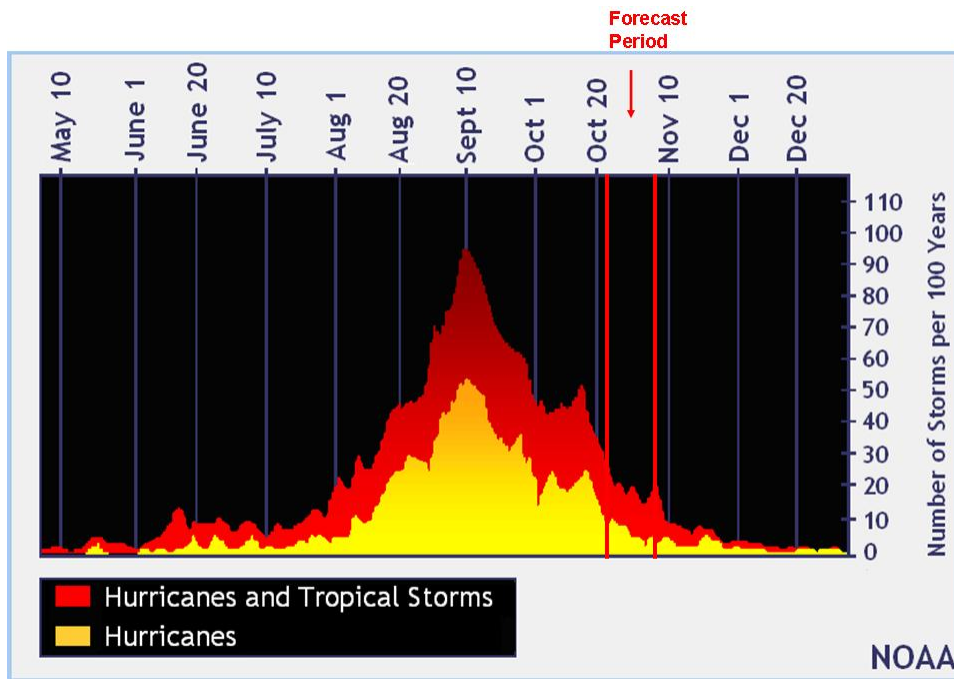


Figure 5: The current forecast period (October 22 – November 5) with respect to climatology. Figure courtesy of NOAA.

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 22 – November 5.

#### 1) Current Storm Activity

No storms are currently present in the Atlantic.

#### 2) National Hurricane Center Tropical Weather Outlook

An area in the western Caribbean is being monitored for signs of tropical cyclone development. The system is given a low probability of development over the next 48 hours.

#### 3) Global Model Analysis

Some of the global models develop the area in the western Caribbean into a tropical cyclone in the next few days, although the models are generally less enthusiastic about this system's development today than they were yesterday.

#### 4) Madden-Julian Oscillation

The Madden-Julian Oscillation is currently increasing in amplitude and is moving into Phase 1 (Figure 3). When the MJO is located in Phase 1, Atlantic basin activity tends to be enhanced significantly (Table 4). The dynamical ensemble Global Forecast System (GFS) is predicting the MJO to remain in Phase 1 with moderate to strong amplitude for the next two weeks. The statistical models for the MJO generally agree with the location of the MJO during week 1, although some of the statistical models weaken the MJO towards the end of the period (Figure 6). Table 4 displays the normalized activity by MJO phase over the period from 1974-2007. Phase 1, where the MJO is predicted to be for most of the period, is highlighted in blue. Despite the favorable MJO phase, we believe that the generally unfavorable large-scale conditions generated by the moderate El Niño event will keep activity at average levels.

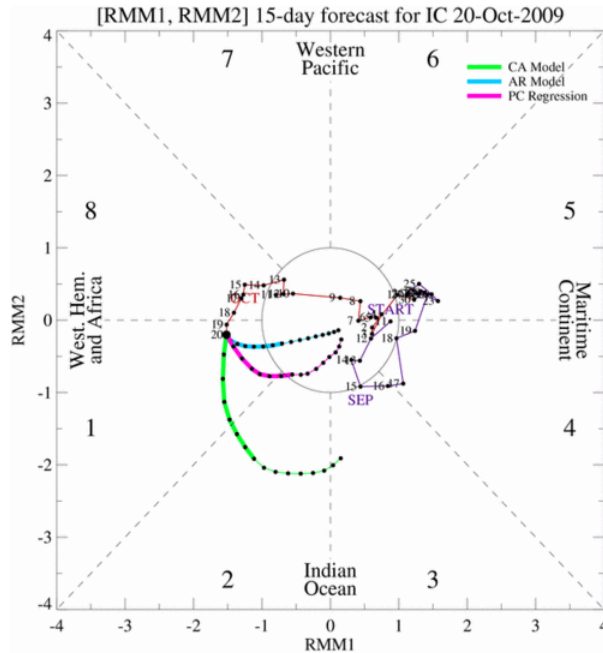


Figure 6: Statistical model forecasts for the MJO from October 21 through November 4. The green line is a constructed analogue (CA) model, the blue line is an autoregressive (AR) model, and the pink line is a lagged linear regression (PC) model.

Table 4: 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. The expected phase of the MJO for the next 15 days (Phase 1) is highlighted in blue.

MJO Phase	NS	NSD	H	HD	MH	MHD	ACE
<b>Phase 1</b>	<b>6.4</b>	<b>35.9</b>	<b>3.7</b>	<b>17.9</b>	<b>1.8</b>	<b>5.3</b>	<b>76.2</b>
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 below-average season. We utilize the seasonal forecast as a baseline for our 15-day predictions.

## **3 Upcoming Verification**

A summary of the entire 2009 hurricane season and verifications of all seasonal and 15-day forecasts will be issued on Thursday, November 19.