



## 268Weather 2020 Atlantic Hurricane Season Forecast

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268Weather continues to forecast that the 2020 Atlantic hurricane season will be above normal, with likely hyperactivity – Accumulated Cyclone Energy (ACE) greater than 187 or in the top 10 percentile of the climate period 1981-2010. My confidence in the forecast and the activity of the season remains very high, similar to or slightly higher than [previous forecasts](#). The forecast spans the full official season – June to November, plus May. In obtaining the forecast, data available through August 12, 2020 were used.

The main reasons for the above normal forecast are the continued well above normal sea surface temperatures (SSTs) across the tropical North Atlantic (TNA) and a likely weak cold El Niño Southern Oscillation (ENSO) or weak La Niña, during the peak of the hurricane season – August to October. A warmer than usual TNA often translates into lighter than usual trade winds and lower vertical wind shear – both very conducive for an above normal Atlantic hurricane season. La Niñas enhance hurricane activity by also encouraging favourable wind shear and other atmospheric conditions conducive for tropical cyclone genesis and development. Notwithstanding, there are still notable uncertainties with the forecast largely due to the unpredictability of the Saharan Dust. Its presence suppresses tropical cyclone activity, while its absence will allow existing favourable conditions to produce a very active season. There continue to be significant levels of relatively dry and or dusty air across the main developing region of the Atlantic for tropical cyclone formation.

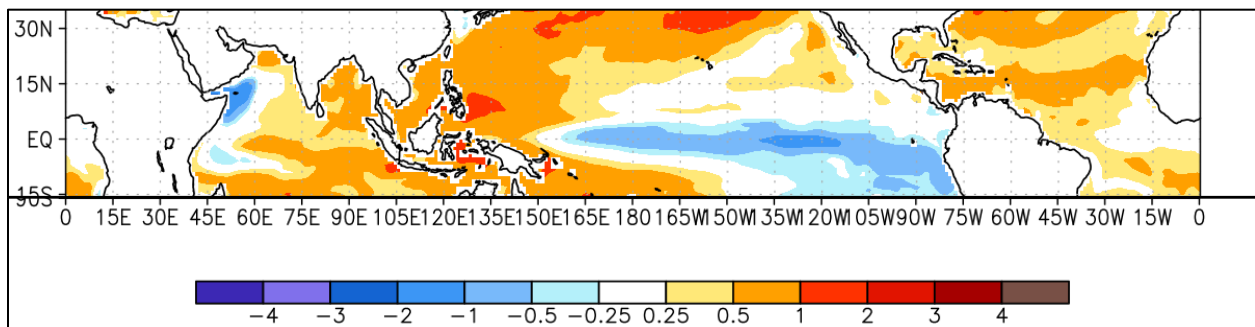


Figure 1: North American Multi-Model Ensemble (NMME) forecast of SSTs – La Niña forecast for the Pacific (middle) and warmer than usual SSTs for the TNA (right top) – Sep 2020.

My forecast calls for 26 named storms (up 3), including Arthur, Bertha, Cristobal, Dolly, Edouard, Fay, Gonzalo, Hanna and Isaias, with 10 becoming hurricanes (up 1) and 4 becoming major hurricanes (down 1). The ACE is forecast to be 218 (up 18). Further, there is a 70% confidence of

- 20 to 32 named storms;
- 7 to 15 becoming hurricanes;
- 3 to 7 becoming major hurricanes and
- 141 to 305 ACE.

The seasonal activity is expected to fall within these ranges in 70% of seasons with similar SST patterns, across the tropical Pacific and Atlantic Oceans, and uncertainties to those expected this year. These ranges do not represent the total possible ranges of activity seen in past similar years. These likely ranges are centred above or well above the 1981-2010 seasonal averages of 106 ACE, 12 named storms, 6 hurricanes and 3 major hurricanes. Most of the predicted activity is expected to occur during the peak of the season – August to September.

There is an 84% probability of an above normal season (up 2%), 13% probability of a near normal season (down 1%) and a 3% probability of a below normal season (down 1%), based on the ACE for the climate period 1981-2010. This forecast is to be taken as a guide and not as gospel. Figures 2 and 3 show there is good skill in forecasting the season, in this case, using the GFDL-FLOR-B01 (GFDL) model SSTs to predict the ACE.

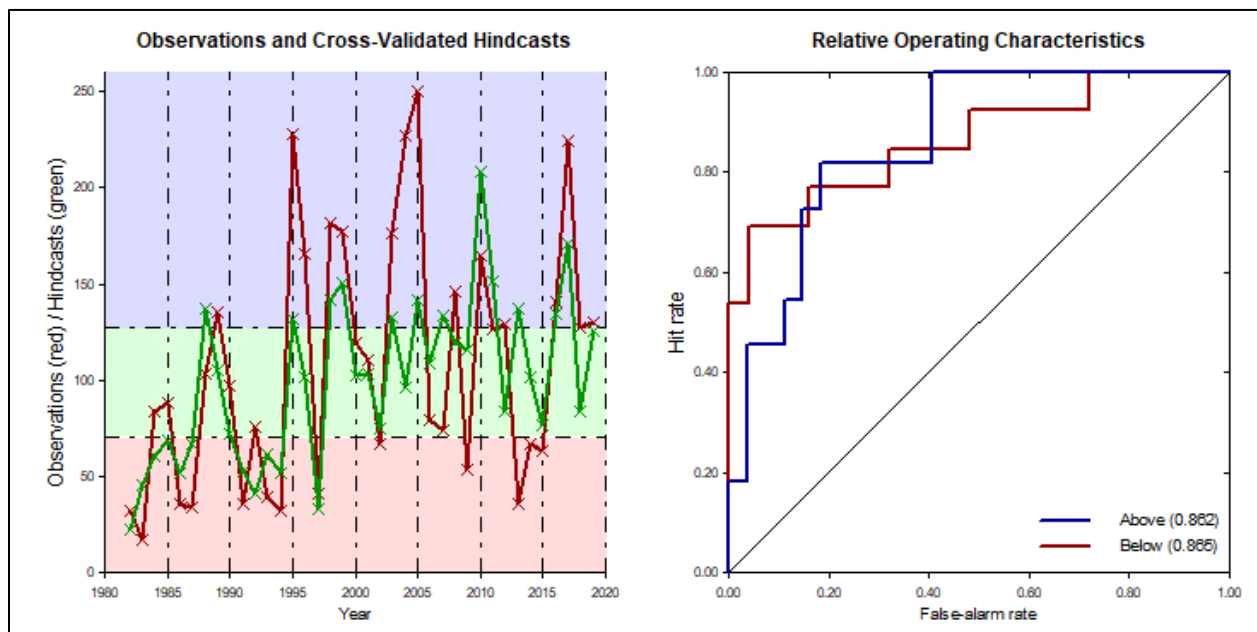


Figure 2a (left): Shows observed vs forecast ACE. The variance is over 45%, using GFDL mean SSTs for August to November 1982-2019, as the training period. Figure 2b (right): The ROC diagram shows very high discrimination by the model in forecasting above and below normal ACE for the season using GFDL SSTs. The GFDL mean SSTs was initialised early August.

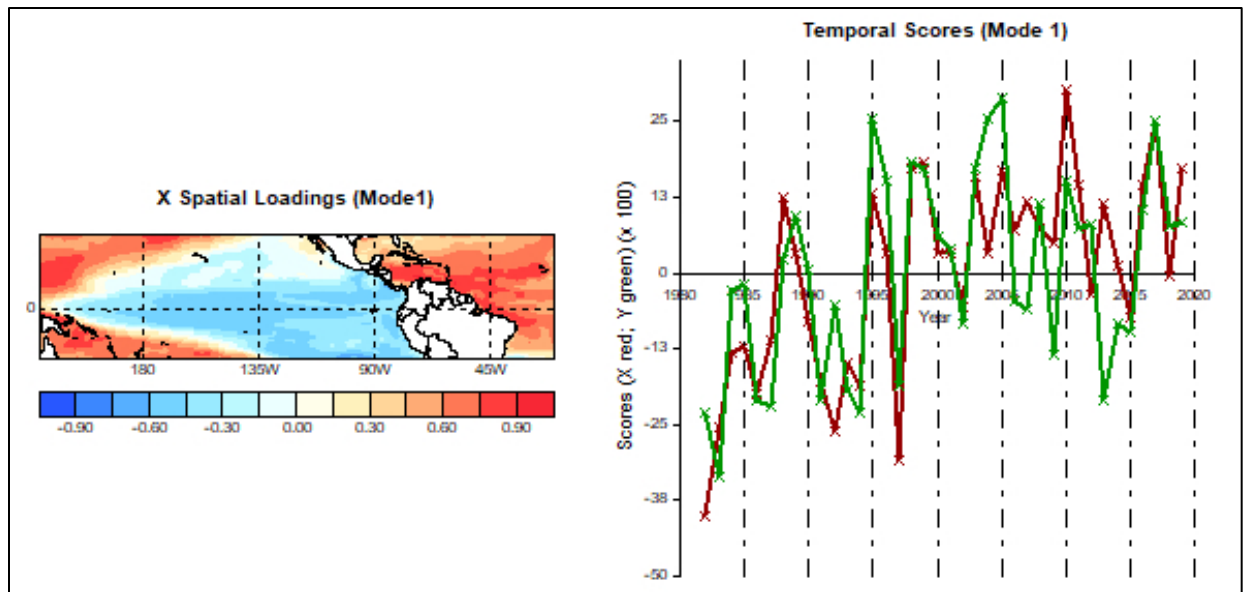


Figure 3: The X special loadings (mode 1) shows the most dominant pattern in SSTs correlation associated with above normal ACE; the reverse pattern is true for below normal ACE. The canonical correlation for this pair of variables (SSTs and ACE) is over 0.74 (74%). From the temporal scores (mode 1), warm SSTs across the tropical Atlantic Ocean simultaneously with cool SSTs across the tropical Pacific Ocean tend to coincide with above normal ACE (or season) and vice versa. Obtained using GFDL mean SSTs for August-November 1982-2019, initialised early August.

## Methodology

This forecast was obtained with the use of the Climate Predictability Tool ([CPT](#)) version 15.7.11, 2019 by Simon J. Mason, Michael K. Tippett and Lulin Song. The software was viewed in canonical correlation analysis (CCA) mode. Input explanatory (X) files used were NOAA NCDC ERSSTv5 mean SSTs for: July 1971-2020 and May to July 1971-2020; CFS2 1982-2020; NCAR CCSM4 1982-2020 and GFDL (FLOR-A06, FLOR-B01 and CM2p1-aer04) 1982-2020 mean SSTs for August to November, initialized early August. The SSTs for CFS2, CCSM4 and GFDL were ensembled (5 Model Ensemble) by finding the simple arithmetic mean of the of the output i.e. the response (Y) variable of all five. The X domain used was 20°S to 30°N and 140°E to 20°W. The Y variables were ACE values, named storms, hurricanes and major hurricanes for the Atlantic Basin (including the Caribbean Sea and the Gulf of Mexico) for the period 1971 to 2020 July for all except the ACE, which goes to 2019.

The following CPT settings were used:

- X modes: maximum was 8 and the minimum was 1
- Training period (NOAA NCDC ERSSTv5): 1971-2019, 49 years for ACE and 1971-2020, 50 years for named storm (NS), hurricane (H) and major hurricane (MH)
- Training period (Models: CFS, CCSM4, GFDL): 1982-2019, 38 years for ACE and 1982-2020 or 39 years for NS, H and MH
- Climatological period – 1981-2010

- Transformation setting: Gamma distribution
- Confidence level: 70%
- Missing value replacement: best near-neighbor
- Target season: August to November for ACE and January to November for NS, H and MH
- All other settings are by default

## Results

Three sets of forecasts were produced, and the final forecast issued is based on the simple arithmetic mean of the three – see tables 1 and 2 below. Note that the forecast spread may not be symmetric around the mean value, given the historical distribution of tropical cyclone activity.

Forecast Parameters	SSTs			Ensemble Mean Forecast
	Jul 1971-2020	May to Jul 1971-2020	Aug to Nov 5 Model Ensemble 1982-2020	
ACE <sup>1</sup>	193 (111-269)	173 (104-266)	219 (139-311)	195 (118-282) <sup>2</sup>
Named Storms	25 (20-31)	25 (20-32)	27 (21-33)	26 (20-32)
Hurricanes	10 (7-14)	10 (7-14)	11 (8-16)	10 (7-15)
Major Hurricanes	4 (3-7)	4 (3-7)	5 (3-8)	4 (3-7)

Table 1: Forecast parameters with 70 percent confidence intervals in (parentheses). <sup>1</sup>ACE forecast for Aug-Nov. <sup>2</sup>Excluding Arthur, Bertha Cristobal, Dolly, Edouard, Fay, Gonzalo, Hanna and Isaias, when included the ACE **forecast for the season is 218(141-305)**.

Forecast Parameters	SSTs			Ensemble Mean Forecast
	Jul 1971-2020	May to Jul 1971-2020	Aug to Nov 5 Model Ensemble 1982-2020	
ACE	A 83, N 14, B 3	A 80, N 16, B 4	A 90, N 9, B 1	A 84, N 13, B 3
Named Storms	A 98, N 1, B 1	A 98, N 1, B 1	A 98, N 1, B 1	A 98, N 1, B 1
Hurricanes	A 88, N 10, B 2	A 85, N 12, B 3	A 91, N 8, B 1	A 88, N 10, B 2
Major Hurricanes	A 81, N 16, B 3	A 80, N 16, B 4	A 84, N 14, B 2	A 82, N 15, B 3

Table 2: Forecast parameters expressed probabilistically. A - above normal; N - near normal and B - below normal.

## Comparison of forecasts for the season

Forecast Parameters and 1981-2010 Average in [brackets]	2020 Forecasts for the Atlantic Hurricane Season				Obs <sup>1</sup> 2020
	Issued April 10	Issued May 10	Issued June 10	Issued July 13	
ACE [105.6]	191 (106-288)	189 (112-276)	202 (122-289)	200 (122-283)	23.1
Named Storms [12]	20 (14-25)	19 (14-23)	21 (17-26)	23 (17-28)	9
Hurricanes [6]	9 (6-12)	9 (6-12)	9 (6-13)	9 (6-13)	2
Major Hurricanes [3]	5 (3-8)	4 (2-7)	5 (2-7)	5 (3-7)	0

Table 3: Forecast parameters with 70 percent confidence intervals in (parentheses). <sup>1</sup>Obs: observed through July.

Forecast Parameters and 1981-2010 Average [in brackets]	2020 Forecasts for the Atlantic Hurricane Season			
	Issued April 10, 2020	Issued May 10, 2020	Issued June 10, 2020	Issued June 13, 2020
ACE [105.6]	A 79, N 16, B 5	A 81, N 16, B 3	A 83, N 14, B 3	A 82, N 14, B 4
Named Storms [12]	A 89, N 9, B 2	A 88, N 10, B 2	A 91, N 8, B 1	A 97, N 2, B 1
Hurricanes [6]	A 72, N 21, B 7	A 69, N 23, B 8	A 73, N 20, B 7	A 74, N 20, B 6
Major Hurricanes [3]	A 82, N 14, B 4	A 76, N 20, B 4	A 79, N 17, B 4	A 82, N 16, B 3

Table 4: Forecast parameters expressed probabilistically. A - above normal; N - near normal and B - below normal.

## Verification of previous forecasts

The tables contain the forecast for each parameter with the 70 percent confidence interval in (parentheses) i.e. 70% of forecasts are likely to fall in this range. ACE is Accumulated Cyclone Energy index. So, for example, the 2017, July 5 (best) forecast is for 16 named storms with a 70% confidence that the number of named storms will be in the range 11-22.

2017	Apr	May	Jun	Jul 5 <sup>1</sup>	Update Aug 4	Obs.
Named Storms	-	-	-	16 (11-22)	<b>18 (13-22)</b>	17
Hurricanes	-	-	-	7 (4-10)	<b>7 (4-10)</b>	10
Major Hurricanes	-	-	-	4 (2-5)	<b>3 (2-5)</b>	6
ACE	-	-	-	140 (75-216)	<b>152 (84-222)</b>	223

Table 5: <sup>1</sup>My maiden forecast of the hurricane season

<b>2018</b>	Apr 10	Update May 10	Update Jun 11	Update Jul 15	Update Aug 10	Obs.
Named Storms	15 (11-19)	13 (10-17)	11 (8-15)	12 (8-15)	<b>11 (9-15)</b>	14 <sup>2</sup>
Hurricanes	7 (4-10)	6 (4-10)	5 (3-8)	5 (3-8)	<b>5 (3-8)</b>	8
Major Hurricanes	4 (2-5)	3 (1-4)	2 (1-4)	3 (1-4)	<b>2 (1-4)</b>	2
ACE	135 (70-200)	119 (63-190)	93 (48-153)	99 (51-167)	<b>93 (51-151)</b>	130 <sup>3</sup>

Table 6: <sup>2</sup>There were 15 named storms in 2018 with an ACE of 132<sup>3</sup> (2.4 from Alberto), which formed in May, outside the range of my forecasts of the hurricane season proper – June 1 to Nov 30.

<b>2019</b>	Apr 10	Update May 16	Update Jun 12	Update Jul 15	Update Aug 15	Obs.
Named Storms	13 (10-18)	12 (9-17)	13 (10-17)	13 (9-16)	<b>12 (9-16)</b>	17 <sup>4</sup>
Hurricanes	7 (4-10)	7 (4-10)	6 (4-9)	6 (4-9)	<b>6 (4-9)</b>	6
Major Hurricanes	3 (1-5)	2 (1-5)	3 (1-5)	3 (2-5)	<b>3 (2-5)</b>	3
ACE	124 (67-201)	113 (62-184)	114 (62-181)	127 (71-198)	<b>136 (77-209)</b>	131

Table 7: <sup>4</sup>There were 18 named storms in 2019 with an ACE of 131 (0.245 from Alberto), which formed in May, outside the range of my forecasts of the hurricane season proper – June 1 to Nov 30.

## Definitions and acronyms

Accumulated Cyclone Energy (ACE) – A measure of a named storm’s potential for wind and storm surge destruction defined as the sum of the square of a named storm’s maximum wind speed (in 10<sup>4</sup> knots<sup>2</sup>) for each 6-hour period of its existence. The 1981-2010 average value of this parameter is 106 for the Atlantic basin.

Atlantic Basin – The area including the entire North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

El Niño – A 12-18-month period during which anomalously warm sea surface temperatures occur in the eastern half of the equatorial Pacific. Moderate or strong El Niño events occur irregularly, about once every 3-7 years on average.

ERSSTv5 – Extended Reconstructed Sea Surface Temperature version five.

CCSM4 – Community Climate System Model version 4.

CFSv2 – Climate Forecast System version 2 GCM.

CMC4 – Canadian Meteorological Centre version 4 GCM.

EMC – Environmental Modeling Center of the United States.

GCM – General Circulation Model.

GFDL-FLOR – Geophysical Fluid Dynamics Laboratory-Forecast-Oriented Low Ocean Resolution GCM.

Hurricane (H) – A tropical cyclone with sustained low-level winds of 74 miles per hour (33 ms<sup>-1</sup> or 64 knots) or greater.

Major Hurricane (MH) – A hurricane which reaches a sustained low-level wind of at least 111 mph (96 knots or 50 ms<sup>-1</sup>) at some point in its lifetime. This constitutes a category 3 or higher on the Saffir/Simpson scale.

Named Storm (NS) – A hurricane, a tropical storm or a sub-tropical storm.

NCAR – US National Centre for Atmospheric Research.

NCDC – National Climate Data Center of the United States

NCEP – National Centers for Environmental Prediction of the United States.

NOAA – National Oceanic Atmospheric Administration of the United States.

Saffir/Simpson Hurricane Wind Scale – A measurement scale ranging from 1 to 5 of hurricane wind intensity. One is a weak hurricane; whereas, five is the most intense hurricane. Tropical North Atlantic (TNA) index – A measure of sea surface temperatures in the area from 5.5-23.5°N, 57.5-15°W.

SSTs – Sea surface temperatures.

Tropical Cyclone (TC) – A large-scale circular flow occurring within the tropics and subtropics which has its strongest winds at low levels; including hurricanes, tropical storms and other weaker rotating vortices.

Tropical Storm (TS) – A tropical cyclone with maximum sustained winds between 39 mph (18 ms<sup>-1</sup> or 34 knots) and 73 mph (32 ms<sup>-1</sup> or 63 knots).

Vertical Wind Shear – The difference in horizontal wind between 200 mb (approximately 40,000 feet or 12 km) and 850 mb (approximately 5000 feet or 1.6 km).

This is the final forecast for the 2020 Atlantic Hurricane Season (June 1 to November 30).