



# AnuMS 2017 Atlantic Hurricane Season Forecast

Issued: July 5, 2017

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The \*AnuMS (Antigua Met Service) anticipates that the 2017 Atlantic hurricane season will be above normal. The forecast spans the full 2017 Atlantic hurricane season; hence, it includes Tropical Storm Arlene, which formed in April, and Tropical Storms Bret and Cindy, which formed in June. In obtaining the forecast, data through the end of June were used.

The reasons for the above normal forecast are mainly due to the anticipated warmer than usual tropical North Atlantic (TNA) and the unlikely development of an El Niño between now and the end of the season. 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. On the contrary, El Niños usually inhibit tropical cyclone activity.

Our forecast calls for 16 named storms with 7 becoming hurricanes and 4 becoming major hurricanes. The Accumulated Cyclone Energy (ACE) is forecast to be 140. Further, there is a 70% confidence of

- 11 to 22 named storms, which includes Arlene, Bret and Cindy;
- 4 to 10 becoming hurricanes;
- 2 to 5 becoming major hurricanes and
- 75 to 216 ACE, which includes Arlene, Bret and Cindy.

The seasonal activity is expected to fall within these ranges in 70% of seasons with similar SST pattern, 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 expected ranges are centred near or above the 1981-2010 seasonal averages of 106 ACE, 12 named storms, 6 hurricanes and 3 major hurricanes. Most of the predicted activity is likely to occur during the peak months of the hurricane season - August-October.

There is a 60% probability of an above normal season, 30% probability of a near normal season and a 10% probability of a below normal season, based on the ACE for the climate period 1981-2010.

Figures 1, 2 and 3 shows there is considerable skill in forecasting the season, in this case, using the Climate Forecast System version 2 (CFSv2) sea surface temperatures (SSTs) to predict the ACE.

*\*Not to be mistaken for the ABMS*

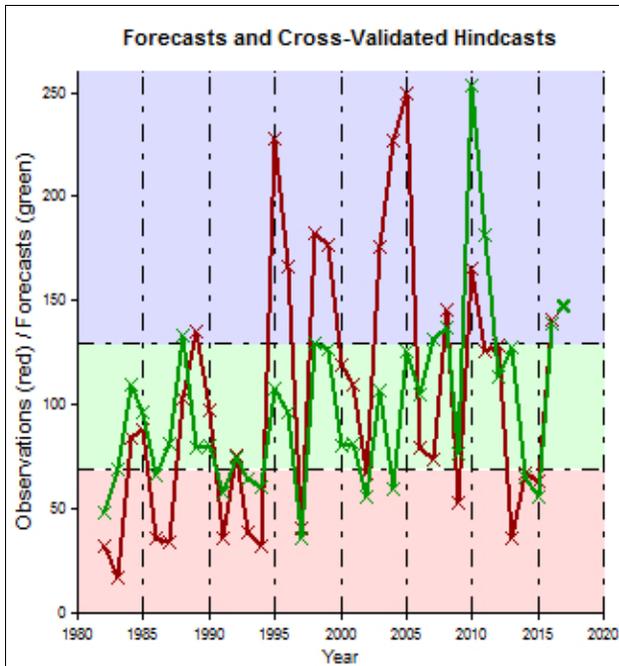


Figure 1: Shows observed vs forecast ACE. The variance is a little over 22%, using CFSv2 mean SSTs for July-November.

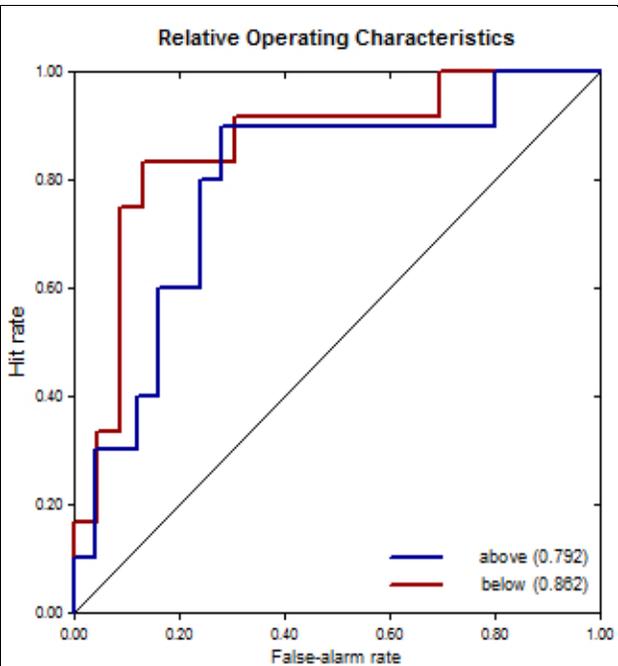


Figure 2: The ROC diagram shows very high discrimination by the model in forecasting above and below normal ACE for the season using CFSv2 SSTs.

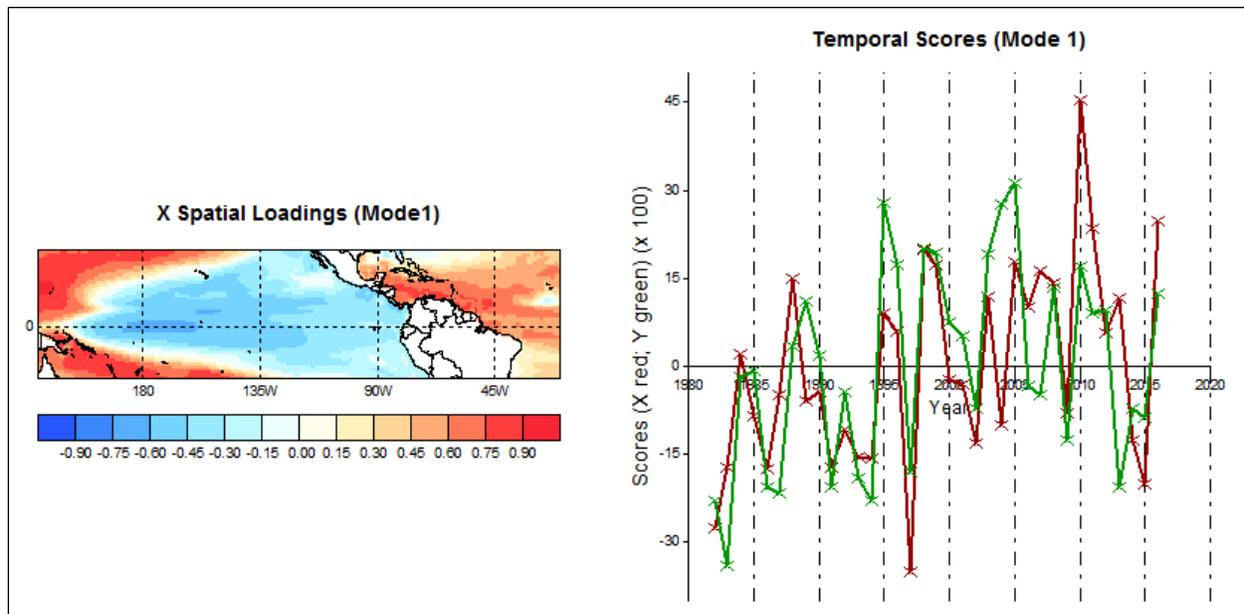


Figure 3: The X special loadings (mode 1) shows the most dominant pattern in SSTs correlation associated with above normal ACE. The canonical correlation for this pair of variable (SSTs and ACE) is 0.65. From the temporal scores (mode 1), warm SSTs across the tropical Atlantic Ocean simultaneously with cold SSTs across the tropical Pacific Ocean tend to coincide with above normal ACE (or season). Obtained using CFSv2 mean SSTs for July-November 2017.

## Methodology

This forecast was obtained with the use of the Climate Predictability Tool ([CPT](#)) version 15.5.10, 2017 by Simon J. Mason and Michael K. Tippett. The software was view in canonical correlation analysis (CCA) mode. Input explanatory (X) files used were NOAA NCDC ERSSTv4 mean SSTs for: May for the period 1960-2017; March-May 1960 2017 and NOAA NCEP EMC CFSv2 ensemble mean SSTs for July-November 1982-2017. The X domain used was 20°S to 30°N and 140°E to 20°W. The response (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 1960 to 2016.

The CPT settings used were:

- X modes: maximum was 8 and the minimum was 1
- Training period: 1971-2016, 46 years.
- Climatological period – 1981-2010
- Transformation setting: Gamma distribution
- Confidence level: 70%
- Missing value replacement: best near-neighbor
- Target season: April to November
- All other settings are by default

Three sets of forecasts were produced and the results are the arithmetic mean of the three.

## 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  $10^4$  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.

ERSSTv4 – Extended Reconstructed Sea Surface Temperature version four.

CFSv2 – Climate Forecast System version 2.

EMC – Environmental Modeling Center of the United States.

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.

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 40000 feet or 12 km) and 850 mb (approximately 5000 feet or 1.6 km).

Our update to this forecast will be made available on August 5, 2017. Also, around August 10, we will be issuing an undated forecast for the season based on the mean of all the forecasts issued by various organizations since June.