AnuMS 2018 Atlantic Hurricane Season Forecast

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The *AnuMS (Antigua Met Service) is projecting that the 2018 Atlantic hurricane season to be above to near normal, a bit less active than previously indicated. The forecast spans the full season – June to November. In obtaining the forecast, data available through May 9, 2018 were used.

The reasons for the above to near normal forecast are mainly due to the expected near or below normal sea surface temperatures across the tropical North Atlantic (TNA) and the likely neutral El Nino Southern Oscillation (ENSO) conditions across the tropical Pacific Ocean. A colder than usual TNA often translates into stronger than usual trade winds and higher than normal vertical wind shear – both very conducive for a below normal Atlantic hurricane season. Warm ENSOs inhibit hurricane activity and cold ENSOs do the opposite. Neutral ENSOs neither inhibit nor enhance. Notwithstanding the forecast, there is significant uncertainty, as it is somewhat unclear as to how cool TNA well get and whether a warm ENSO will develop.

Our forecast calls for 13 named storms with 6 becoming hurricanes and 3 becoming major hurricanes. The Accumulated Cyclone Energy (ACE) is forecast to be 119. Further, there is a 70% confidence of

- 10 to 17 named storms;
- 4 to 10 becoming hurricanes;
- 1 to 4 becoming major hurricanes and
- 63 to 190 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 expected ranges are centred above or near 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 to October.

There is a 49% probability of an above normal season, 34% probability of a near normal season and a 17% probability of a below normal season, based on the ACE for the climate period 1981-2010. This forecast is to be taken as a guide and not gospel. Forecasts for the upcoming hurricane

season from May, generally only have moderate skill in so doing. As we get closer to the season the forecasting skill naturally increases.

The previous forecast, issued April 10, 2018, called for 15 named storms with 7 becoming hurricanes and 4 becoming major hurricanes. The forecast ACE was 135. That forecast also had a 70% confidence of 11 to 19 named storms; 4 to 10 becoming hurricanes; 2 to 5 becoming major hurricanes and 70 to 200 ACE. Overall, the numbers have decrease slightly with the chance for an above normal season dropping to below 50%. Of the three categories – above normal, near normal and below normal, an above normal season is most likely; however, it does not have the majority probability – there is a 51% probability of a near or below normal season.

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

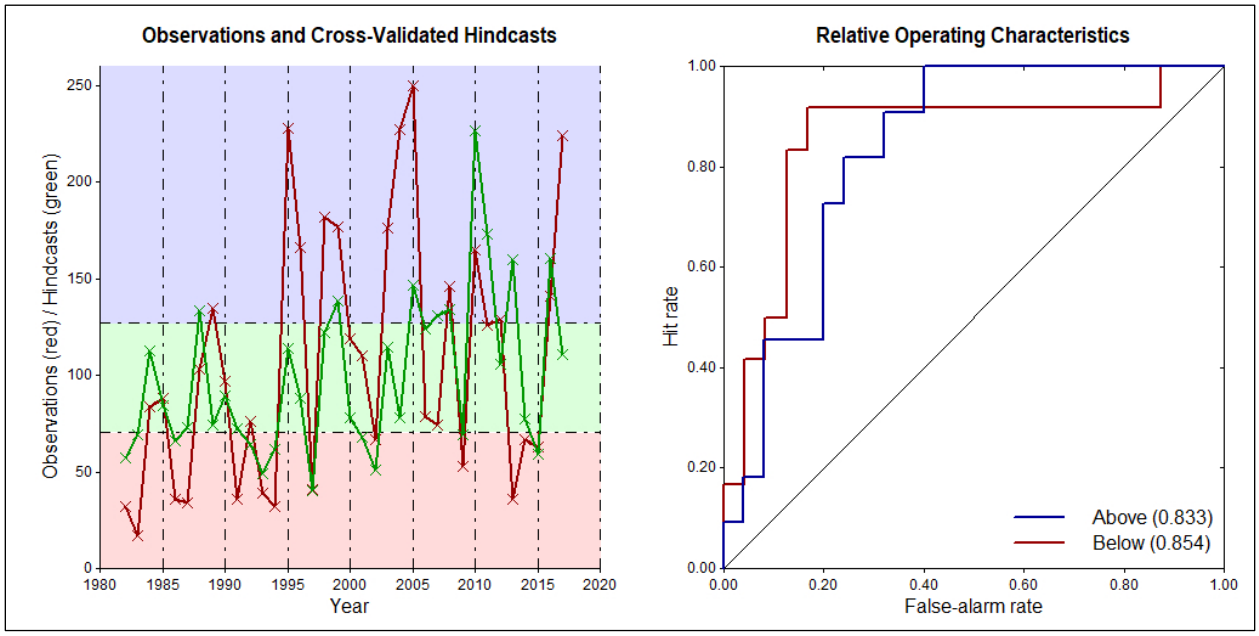

Figure 1a (left): Shows observed vs forecast ACE. The variance is a little over 24%, using CFSv2 mean SSTs for June to November. Figure 1b (right): The ROC diagram shows very high discrimination by the model in forecasting above and below normal ACE for the season using CFSv2 SSTs.

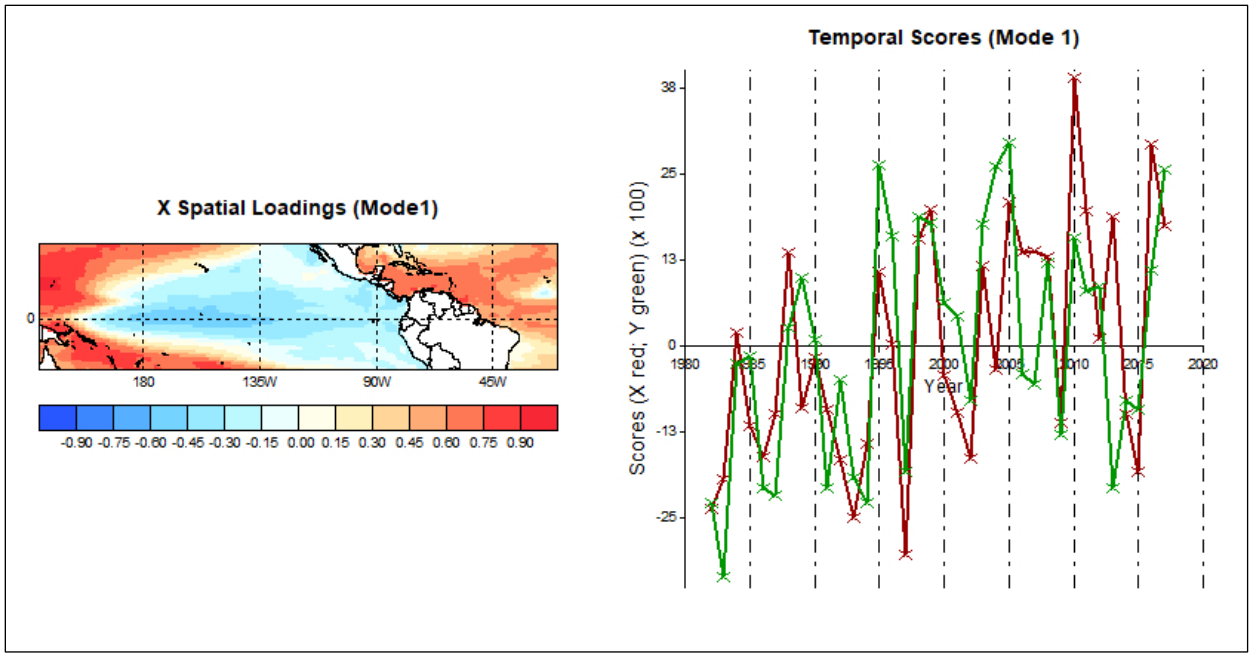

Figure 2: The X special loadings (mode 1) shows the most dominant pattern in SSTs correlation associated with above normal ACE. The canonical correlation for this pair of variable (SSTs and ACE) is over 0.66. From the temporal scores (mode 1), warm SSTs across the tropical Atlantic Ocean simultaneously with cold SSTs across the tropical Pacific Ocean tend to coincide with above normal ACE (or season). Obtained using CFSv2 mean SSTs for June-November 2018.

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: April 1971-2018; February to April 1971-2018 and NOAA NCEP EMC CFSv2 ensemble mean SSTs for June to November 1982-2018, initialized May 1, 2018. 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 1971 to 2017.

The CPT settings used were:

- X modes: maximum was 8 and the minimum was 1
- Training period: 1971-2017, 47 years.
- Climatological period – 1981-2010
- Transformation setting: Gamma distribution
- Confidence level: 70%
- Missing value replacement: best near-neighbor
- Target season: June to November
- All other settings are by default

Results

Three sets of forecasts were produced and the final forecast issued is the simple arithmetic mean of the three. The individual results are listed below.

	SSTs			
Forecast Parameters	**Apr 1971-2018**	**Feb to Apr 1971-2018**	**Jun to Nov 1982-2018**	**Ensemble Mean Forecast**
ACE	118 (62-183)	113 (57-179)	127 (71-209)	119 (63-190)
Named Storms	13 (9-16)	13 (10-17)	14 (11-19)	13 (10-17)
Hurricanes	5 (3-8)	6 (4-9)	7 (4-12)	6 (4-10)
Major Hurricanes	2 (1-4)	3 (1-4)	3 (1-5)	3 (1-4)

Table 1: Forecast parameters with 70 percent confidence intervals (in parentheses).

	SSTs			
Forecast Parameters	**Apr 1971-2018**	**Feb to Apr 1971-2018**	**Jun to Nov 1982-2018**	**Ensemble Mean Forecast**
ACE	A 48, N 35, B 17	A 45, N 34, B 21	A 53, N 33, B 14	A 49, N 34, B 17
Named Storms	A 41, N 40, B 19	A 54, N 35, B 11	A 63, N 30, B 7	A 53, N 35, B 12
Hurricanes	A 28, N 34, B 38	A 37, N 34, B 29	A 52, N 29, B 19	A 39, N 32, B 29
Major Hurricanes	A 29, N 39, B32	A 43, N 36, B 21	A 49, N 32, B 19	A 40, N 36, B 24

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

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^2) 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-1 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-1) 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-1 or 34 knots) and 73 mph (32 ms-1 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).

AnuMS will issue its next Atlantic Hurricane Season Forecast around June 10, 2018.

**Not to be mistaken for the ABMS*