Extended Range Forecast for Atlantic Hurricane Activity in 2017

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Forecast Summary

TSR predicts Atlantic hurricane activity in 2017 will be close to the long-term average. However, the uncertainties associated with this outlook are large and forecast skill at this extended range is historically low.

The TSR (Tropical Storm Risk) extended range forecast for Atlantic hurricane activity in 2017 anticipates a near-normal season. Based on current and projected climate signals, Atlantic basin tropical cyclone activity is forecast to be close both to the 1950-2016 long-term norm and to the recent 2007-2016 10-year norm. The forecast spans the period from 1st June to 30th November 2017 and employs data through to the end of November 2016. TSR's main predictor at this extended lead (6 months before the 2017 hurricane season starts) is the forecast July-September trade wind speed over the Caribbean Sea and tropical North Atlantic. This parameter influences cyclonic vorticity (the spinning up of storms) and vertical wind shear in the main hurricane track region. At present TSR anticipates that July-September trade wind speed will have a near-neutral effect on Atlantic hurricane activity in 2017. The precision of TSR's December outlooks for upcoming Atlantic hurricane activity between 1980 and 2016 is low.

Atlantic ACE Index and System Numbers in 2017

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2017	101 (±58)	3 (±2)	6 (±3)	14 (±4)
67yr Climate Norm (±SD)	1950-2016	101	3	6	11
10yr Climate Norm	2007-2016	99	3	7	14
Forecast Skill at this Lead	1980-2016	12%	7%	1%	1%

Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the Squares of 6-hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength. ACE Unit = $x10^4$ $knots^2$.
Intense Hurricane = 1 Minute Sustained Wind > 95Kts = Hurricane Category 3 to 5.
Hurricane = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.
Tropical Storm = 1 Minute Sustained Winds > 33Kts.
SD = Standard Deviation.
FE (Forecast Error) = Standard Deviation of Errors in Replicated Real Time Forecasts 1980-2016.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1980-2016.

There is a 27% probability that the 2017 Atlantic hurricane season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>119)), a 35% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (69 to 119) and a 38% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<69)). The 67-year period 1950-2016 is used for climatology.

Key: Terciles = Data groupings of equal (33.3%) probability corresponding to the upper, middle and lower one-third of values historically (1950-2016).
Upper Tercile = ACE index value greater than 119.
Middle Tercile = ACE index value between 69 and 119.
Lower Tercile = ACE index value less than 69.

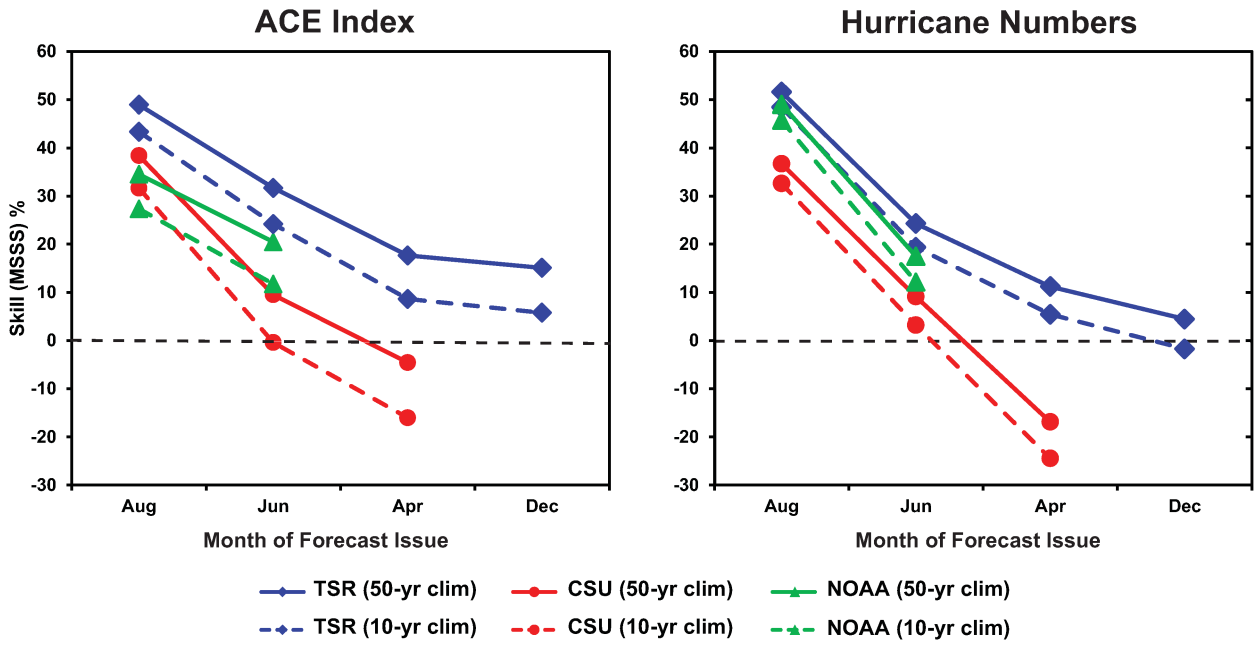
Methodology and Key Predictor(s) for 2017

The TSR statistical seasonal hurricane forecast model divides the North Atlantic into three regions and employs separate forecast models for each region before summing the regional hurricane forecasts to obtain an overall forecast. For two of these three regions (tropical North Atlantic, and the Caribbean Sea and Gulf of Mexico) the forecast model pools different environmental fields involving August-September sea surface temperatures (SSTs) and July-September trade wind speed to select the environmental field or combination of fields which gives the highest replicated real-time skill for hurricane activity over the prior 10-year period. The nature of this process means that the details of the seasonal forecast model can vary subtly from year-to-year and also with lead time within the same year. Separate forecast models are employed to predict the July-September trade wind speed and to predict the August-September SSTs. Finally bias corrections are employed for each predictand based on the forecast model performance for that predictand over the prior 10 years.

The main factor underpinning the TSR forecast for 2017 hurricane activity being close to the long term norm is the anticipated near-neutral effect of the July-September 2017 forecast trade wind at 925mb height over the Caribbean Sea and tropical North Atlantic region (7.5°N – 17.5°N, 100°W – 30°W). The current forecast for this predictor is 0.24±0.89 ms^{-1} weaker than normal (1980-2016 climatology). The July-September 2017 trade wind prediction uses the current expectation of neutral ENSO conditions in July-September 2017 as forecast by the consensus of dynamical and statistical model ENSO outlooks (*http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table-.html*) provided by the International Research Institute for Climate and Society. However, it should be stressed that uncertainties in the forecast July-September 2017 trade wind speed are large due to the large uncertainties in ENSO and in North Atlantic and Caribbean Sea SSTs at this extended range.

Precision of Seasonal Hurricane Forecasts 2003-2016

The figure below displays the seasonal forecast skill for North Atlantic hurricane activity for the 14-year period between 2003 and 2016. This assessment uses the seasonal forecast values issued publicly in real-time by the three forecast centres TSR, NOAA (National Oceanic and Atmospheric Administration) and CSU (Colorado State University). Skill is assessed as a function of lead time for two measures of seasonal hurricane activity: ACE and basin hurricane numbers.



Forecast precision is provided using the Mean Square Skill Score (MSSS) which is the percentage improvement in mean square error over a climatology forecast. Positive skill indicates that the model performs better than climatology, while a negative skill indicates that it performs worse than climatology. Two different climatologies are used: a fixed 50-year (1951-2000) climatology and a running prior 10-year climate norm.

It should be noted that NOAA does not issue seasonal hurricane outlooks before late May and that CSU stopped providing quantitative extended-range hurricane outlooks from the prior December after 2011. It is clear there is little skill in forecasting the upcoming ACE and numbers of hurricanes from the previous December for the period 2003-2016. Skill climbs slowly as the hurricane season approaches with moderate-to-good skill levels being achieved by early August.

TSR was the best performing statistical seasonal forecast model at all lead times for 2003-2016.

Further Information and Next Forecast

Further information about TSR forecasts and verifications may be obtained from the TSR web site *http://www.tropicalstormrisk.com*. The first TSR forecast update for the 2017 Atlantic hurricane season will be issued on Wednesday 5th April 2017.