



Extended Range Forecast for Atlantic Hurricane Activity in 2015

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Forecast Summary

TSR predicts Atlantic hurricane activity in 2015 will be about 20% below the long-term average. However, forecast uncertainties at this extended range are large.

The TSR (Tropical Storm Risk) extended range forecast for Atlantic hurricane activity in 2015 anticipates another below-norm season. Based on current and projected climate signals, Atlantic basin tropical cyclone activity is forecast to be about 20% below the 1950-2014 long-term norm and about 30% below the recent 2005-2014 10-year norm. The forecast spans the period from 1st June to 30th November 2015 and employs data through to the end of November 2014. TSR's main predictor at this extended lead (6 months before the 2015 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 the trade wind predictor will have a small suppressing effect on activity. The precision of TSR's December outlooks for upcoming Atlantic hurricane activity between 1980 and 2014 is low.

Atlantic ACE Index and System Numbers in 2015

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2015	79 (\pm 58)	2 (\pm 2)	6 (\pm 3)	13 (\pm 4)
65yr Climate Norm (\pm SD)	1950-2014	102	3	6	11
10yr Climate Norm	2005-2014	113	3	7	15
Forecast Skill at this Lead	1980-2014	13%	9%	0%	3%

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 = $\times 10^4$ knots².

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 1980-2014.

Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1980-2014.

There is a 24% probability that the 2015 Atlantic hurricane season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>120)), a 32% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (70 to 120) and a 44% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<70)). The 65-year period 1950-2014 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 (1950-2014).

Upper Tercile = ACE index value greater than 120.

Middle Tercile = ACE index value between 70 and 120.

Lower Tercile = ACE index value less than 70.

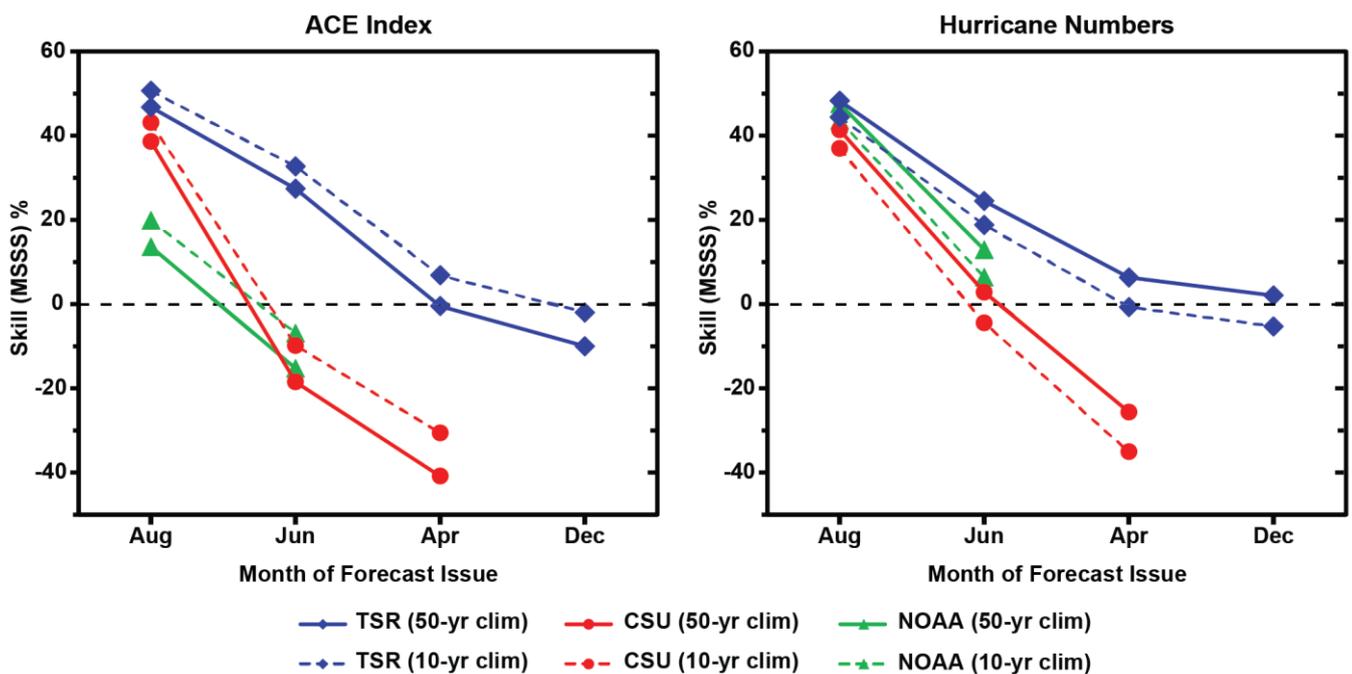
Methodology and Key Predictors for 2015

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 key factor behind the TSR forecast for 2015 hurricane activity being about 20% below the long term norm is the anticipated enhancement of the July-September 2015 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 $0.09 \pm 0.86 \text{ ms}^{-1}$ stronger than normal (1980-2014 climatology). The July-September 2015 trade wind prediction is based on an expectation of weak positive ENSO conditions in July-September 2015 as forecast by a consensus of dynamical and statistical models obtained from the International Research Institute website http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html. The forecast skill for this predictor at this lead time is 32% assessed for 1980-2014. However, it should be stressed that uncertainties in the forecast July-September 2015 trade wind speed at this extended lead are large due to uncertainties in ENSO and in North Atlantic and Caribbean Sea SSTs.

Precision of Seasonal Hurricane Forecasts 2005-2014

The figure below displays the seasonal forecast skill for North Atlantic hurricane activity for the most recent 10-year period 2005-2014. Skill is assessed as a function of lead time for two measures of hurricane activity: ACE and hurricane numbers. The assessment uses the publicly-issued seasonal forecast values from three centres: TSR, NOAA (National Oceanic and Atmospheric Administration) and CSU (Colorado State University).



Forecast precision is assessed 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 (1950-1999) 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 in 2011. It is clear there is little skill in forecasting the upcoming ACE and numbers of hurricanes from the previous December for the period 2005-2014. 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 2005-2014.

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 2015 Atlantic hurricane season will be issued on Wednesday 8th April 2015.