August Forecast Update for Atlantic Hurricane Activity in 2015

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Forecast Summary

TSR reinforces its previous outlooks and predicts Atlantic hurricane activity in 2015 will be about 55% below the long-term average. The precision of TSR's August outlooks for upcoming hurricane activity is good.

The TSR (Tropical Storm Risk) August forecast update for North Atlantic hurricane activity in 2015 reinforces the TSR extended range, early April and pre-season forecasts, and anticipates hurricane activity in 2015 will be well below norm. Based on current and projected climate signals, Atlantic basin tropical cyclone activity is forecast to be about 55% below both the 1950-2014 long-term norm and about 60% 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 July 2015. The primary reason for predicting a well below norm North Atlantic hurricane season is the development of a moderate-to-strong El Niño event which is expected to persist and strengthen throughout the hurricane season. El Niño events increase the trade wind speed and vertical wind shear over the tropical North Atlantic and Caribbean Sea which suppress hurricane activity. Should the TSR forecast for 2015 verify it will mean that the ACE total for 2013-2015 is easily the lowest 3-year total since 1992-1994, and it would imply that the active phase of Atlantic hurricane activity which began in 1995 has likely ended.

Atlantic ACE Index and System Numbers in 2015

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast	2015	44	1	4	11
65yr Climate Norm	1950-2014	102	3	6	11
10yr Climate Norm	2005-2014	113	3	7	15
Forecast Skill at this Lead	1980-2014	55%	43%	51%	51%

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

There is only a 3% 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 25% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (70 to 120) and a 72% 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.

ACE Index & Numbers Forming in the MDR, Caribbean Sea and Gulf of Mexico in 2015

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast	2015	25	1	3	6
65yr Climate Norm	1950-2014	80	2	4	7
10-yr Climate norm	2005-2014	90	3	6	11
Forecast Skill at this Lead	1980-2014	67%	44%	64%	68%

The Atlantic hurricane Main Development Region (MDR) is the region 10°N-20°N, 20°W-60°W between the Cape Verde Islands and the Caribbean Lesser Antilles. A storm is defined as having formed within this region if it reached at least tropical depression status while in the area.

There is only a 4% probability that the 2015 Atlantic hurricane season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>92)), a 28% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (42 to 92) and a 68% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<42)). The 65-year period 1950-2014 is used for climatology.

USA Landfalling ACE Index and Numbers in 2015

		ACE Index	Hurricanes	Tropical Storms
TSR Forecast	2015	0.8	1	3
65yr Climate Norm	1950-2014	2.3	1	3
10yr Climate Norm	2005-2014	2.1	1	3
Forecast Skill at this Lead	1980-2014	27%	6%	4%

Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the Squares of hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength and over the USA Mainland (reduced by a factor of 6). ACE Unit = $x10^4$ $knots^2$.
Strike Category = Maximum 1 Minute Sustained Wind of Storm Directly Striking Land.
USA Mainland = Brownsville (Texas) to Maine

USA landfalling intense hurricanes are not forecast since we have no skill at any lead.

There is a 21% probability that in 2015 the USA landfalling ACE index will be above average (defined as a USA ACE index value in the upper tercile historically (>2.51)), a 23% likelihood it will be near-normal (defined as a USA ACE index value in the middle tercile historically (1.09 to 2.51)) and a 56% chance it will be below-normal (defined as a USA ACE index value in the lower tercile historically (<1.09)). The 65-year period 1950-2014 is used for climatology.

Caribbean Lesser Antilles Landfalling Numbers in 2015

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast	2014	0.2	0	0	1
65yr Climate Norm	1950-2014	1.3	0	0	1
10yr Climate Norm	2005-2014	0.9	0	1	1
Forecast Skill at this Lead	1980-2014	32%	10%	21%	20%

Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the Squares of hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength and within the region 10°-18°N, 63°-60°W (reduced by a factor of 6).
ACE Unit = $x10^4$ $knots^2$.
Strike Category = Maximum 1 Minute Sustained Wind of Storm Directly Striking Land.
Lesser Antilles = Island Arc from Anguilla to Trinidad Inclusive.

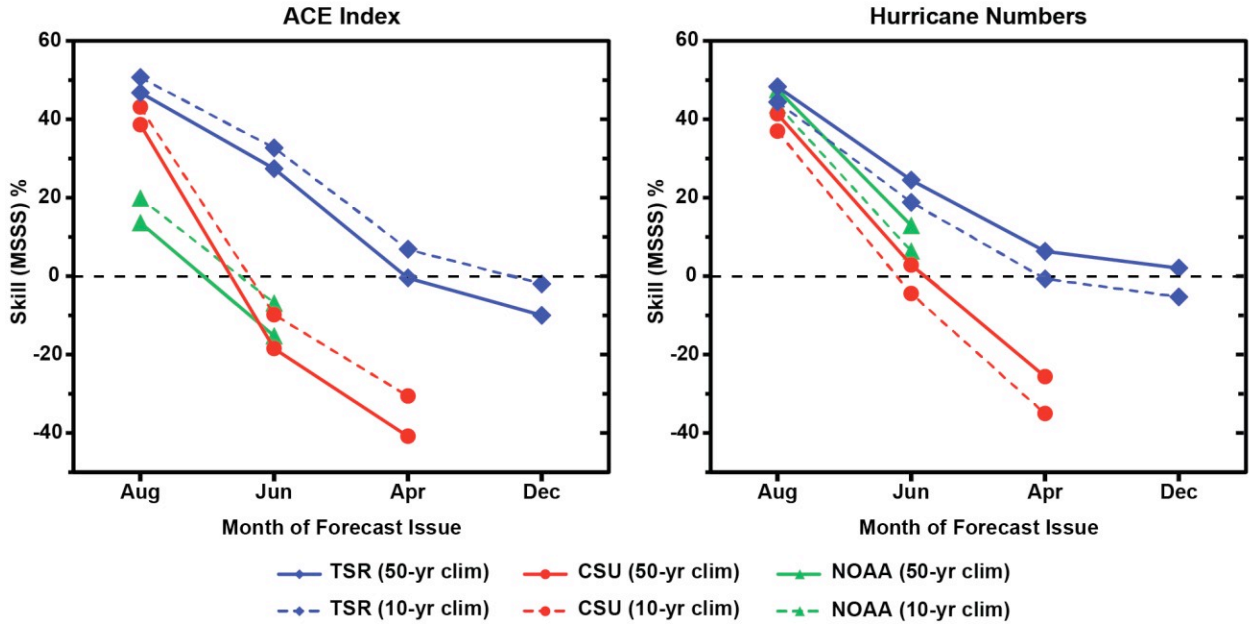
Methodology and Key Predictors for 2015

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 main factor behind the TSR forecast for a well below-norm hurricane season in 2015 is the anticipated moderate supressing effect of the July-September forecast trade wind at 925mb height over the Caribbean Sea and tropical North Atlantic region (7.5°N – 17.5°N, 30°W – 100°W). This field is forecast to be 0.81±0.40 ms^{-1} stronger than normal which is down from the pre-season forecast value of 1.36±0.82 ms^{-1} stronger than normal (1980-2014 climatology). A secondary factor is the August-September forecast sea surface temperature for the Atlantic MDR (10°N – 20°N, 20°W – 60°W). The latter is forecast to be 0.10±0.13°C warmer than normal which is close to neutral but warmer than the pre-season forecast value of 0.33±0.25°C cooler than normal (1980-2014 climatology). The July-September 2015 trade wind prediction is based on the observed July 2015 trade wind speed anomaly. The forecast skills for the July-September trade wind speed and August-September MDR SST are both 83% assessed for 1980-2014. While the likelihood of a well below norm hurricane season is high it should be stressed that uncertainties remain in the forecast values for August-September ENSO and for August-September tropical North Atlantic and Caribbean Sea SSTs.

The Precision of Seasonal Hurricane Forecasts

The figure below displays the skill as a function of lead time for predicting seasonal North Atlantic hurricane activity. The assessment is made for the most recent 10-year period 2005-2014 and employs the actual forecast values issued by three forecast centres: TSR, NOAA (National Oceanic and Atmospheric Administration) and CSU (Colorado State University). The TSR skills displayed below differ from those on page 1 as the latter are computed for the 35-year period 1980-2014.



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 from the figure that there is little skill in forecasting the upcoming number of hurricanes from the previous December. Skill climbs slowly as the hurricane season approaches with moderate-to-good skill levels being achieved from 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*. This is the final TSR outlook for the 2015 North Atlantic hurricane season. A summary of the 2015 Atlantic hurricane season and a verification of the TSR seasonal forecasts that were made will be issued in January 2016.

Appendix – Predictions from Previous Months

1. Atlantic ACE Index and System Numbers

Atlantic ACE Index and System Numbers 2015					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (1950-2014)		102	11	6	3
Average Number (2005-2014)		113	15	7	3
TSR Forecasts	5 Aug 2015	44	11	4	1
	27 May 2015	37	10	4	1
	8 Apr 2015	56	11	5	2
	9 Dec 2014	79	13	6	2
CSU Forecasts	4 Aug 2015	35	8	2	1
	1 Jul 2015	40	8	3	1
	1 Jun 2015	40	8	3	1
	9 Apr 2015	40	7	3	1
NOAA Forecast	27 May 2015	37-79	6-11	3-6	0-2
UK Met Office	21 May 2015	74	9	5	-
Institute of Meteorology, Cuba	4 May 2015	-	8	3	-

2. MDR, Caribbean Sea and Gulf of Mexico ACE Index and Numbers

MDR, Caribbean Sea and Gulf of Mexico ACE Index and Numbers 2015					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (1950-2014)		80	7	4	2
Average Number (2005-2014)		90	11	6	3
TSR Forecasts	5 Aug 2015	25	6	3	1
	27 May 2015	15	5	3	1
	8 Apr 2015	34	6	3	1

3. US ACE Index and Landfalling Numbers

US Landfalling Numbers 2015				
		ACE Index	Named Tropical Storms	Hurricanes
Average Number (1950-2014)		2.3	3	1
Average Number (2005-2014)		2.1	3	1
TSR Forecasts	5 Aug 2015	0.8	3	1
	27 May 2015	0.8	2	1
	8 Apr 2015	1.1	2	1

4. Lesser Antilles ACE Index and Landfalling Numbers

Lesser Antilles Landfalling Numbers 2015					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (1950-2014)		1.3	1	0	0
Average Number (2005-2014)		0.9	1	1	0
TSR Forecasts	5 Aug 2015	0.2	1	0	0
	27 May 2015	0.1	1	0	0
	8 Apr 2015	0.3	1	0	0