April Forecast Update for Atlantic Hurricane Activity in 2010

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by Professor Mark Saunders and Dr Adam Lea
Aon Benfield UCL Hazard Research Centre, UCL (University College London), UK

Forecast Summary

TSR raises its forecast and predicts the 2010 hurricane season will be active with basin activity 60% above the 1950-2009 long-term average. Users should note that the precision of TSR's April outlook for Atlantic hurricane activity between 1980 and 2009 is fairly low.

The TSR (Tropical Storm Risk) April forecast update for Atlantic hurricane activity in 2010 anticipates an active hurricane season to more certainty than forecast in December 2009. Based on current and projected climate signals, Atlantic basin and US landfalling tropical cyclone activity are forecast to be about 60% above the 1950-2009 norm in 2010. There is a high (77%) likelihood that activity will be in the top one-third of years historically. The forecast spans the period from 1st June to 30th November 2010 and employs data through to the end of March 2010. TSR's two predictors are the forecast July-September 2010 trade wind speed over the Caribbean and tropical North Atlantic, and the forecast August-September 2010 sea surface temperature in the tropical North Atlantic. At present TSR anticipates both predictors having a moderate enhancing effect on activity.

Atlantic ACE Index and System Numbers in 2010

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2010	159 (±58)	4.0 (±1.7)	8.5 (±2.8)	16.3 (±4.1)
60yr Climate Norm (±SD)	1950-2009	101 (±60)	2.7(±1.9)	6.1 (±2.6)	10.4 (±4.0)
Forecast Skill at this Lead	1980-2009	12%	7%	6%	7%

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 Wind > 33Kts.
SD = Standard Deviation.
FE (Forecast Error) = Standard Deviation of Errors in Replicated Real Time Forecasts 1980-2009.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1980-2009.

There is a 77% probability that the 2010 Atlantic hurricane season ACE index will be above average (defined as an ACE index value in the upper tercile historically (>117)), a 17% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (71 to 117) and only a 6% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<71)). The 60-year period 1950-2009 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 (1950-2009).
Upper Tercile = ACE index value greater than 117.
Middle Tercile = ACE index value between 71 and 117.
Lower Tercile = ACE index value less than 71.

ACE Index & Numbers Forming in the MDR, Caribbean Sea and Gulf of Mexico in 2010

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2010	134 (±54)	3.7 (±1.5)	6.4 (±2.4)	11.3 (±3.3)
60yr Climate Norm (±SD)	1950-2009	79 (±58)	2.4 (±1.8)	4.3 (±2.4)	7.1 (±3.3)
Forecast Skill at this Lead	1980-2009	14%	12%	16%	14%

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 a 78% probability that in 2010 the MDR, Caribbean Sea and Gulf of Mexico ACE index will be above average (defined as an ACE index value in the upper tercile historically (>92)), a 17% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (43 to 92) and only a 5% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<43)). The 60-year period 1950-2009 is used for climatology.

USA Landfalling ACE Index and Numbers in 2010

		ACE Index	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2010	4.1 (±2.1)	2.3 (±1.5)	5.1 (±2.1)
60yr Climate Norm (±SD)	1950-2009	2.5 (±2.2)	1.5 (±1.3)	3.2 (±2.0)
Forecast Skill at this Lead	1980-2009	13%	13%	9%

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 = $x10^4$ $knots^2$.

Landfall 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 76% probability that in 2010 the USA landfalling ACE index will be above average (defined as a USA ACE index value in the upper tercile historically (>2.61)), an 18% likelihood it will be near-normal (defined as a USA ACE index value in the middle tercile historically (1.15 to 2.61) and only a 6% chance it will be below-normal (defined as a USA ACE index value in the lower tercile historically (<1.15)). The 60-year period 1950-2009 is used for climatology.

Caribbean Lesser Antilles Landfalling Numbers in 2010

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2010	2.3 (± 2.0)	0.4 (±0.4)	0.7 (±0.6)	1.6 (±0.9)
60yr Climate Norm (±SD)	1950-2009	1.3 (±2.0)	0.2 (±0.5)	0.5 (±0.7)	1.1 (±1.0)
Forecast Skill at this Lead	1980-2009	0%	7%	12%	0%

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 boxed region (10°N-18°N,60°W-63°W) (reduced by a factor of 6). ACE Unit = $x10^4$ $knots^2$.

Landfall Strike Category = Maximum 1 Minute Sustained Wind of Storm Directly Striking Land.

Lesser Antilles = Island Arc from Anguilla to Trinidad Inclusive.

Key Predictors for 2010

The key factors behind the TSR forecast for an above-average hurricane season in 2010 are the anticipated moderate enhancing effect of July-September forecast trade winds at 925mb height over the Caribbean Sea and tropical North Atlantic region (7.5°N - 17.5°N, 30°W - 100°W), and of August-September forecast sea surface temperature (SST) for the Atlantic MDR (10°N - 20°N, 20°W - 60°W). The current forecasts for these predictors are 0.81±0.79 ms^{-1} (up from the December forecast value of 0.40±0.74 ms^{-1}) weaker than normal (1980-2009 climatology) and 0.42±0.27°C (up from the December forecast value of 0.20±0.29°C) warmer than normal (1980-2009 climatology). The forecast skills (assessed for the period 1980-2009) for both these predictors at this lead are 26%. The TSR forecast has increased since early December 2009 due primarily to an anomalous warming of the North Atlantic MDR sea surface temperatures in recent months.

The July-September trade wind speed influences cyclonic vorticity (the spinning up of storms) in the main hurricane track region. The August-September MDR SST provides heat and moisture to power incipient storms in the main track region.

The Precision of Seasonal Hurricane Forecasts

The 2004, 2005 and 2008 North Atlantic and U.S. landfalling hurricane seasons were both predicted to have 'high activity' (i.e. within the top one third of years historically) to high (65-70%) probability from the previous December. However, the extended range and April forecasts for the 2006, 2007 and 2009 hurricane seasons proved less impressive. The precision of seasonal Atlantic hurricane forecasts as a function of issue time is assessed over many years in this recent article:

Saunders, M. A., Winds of change, *Post Magazine Risk Report*, pp28-29, 9 November 2006, http://www.tropicalstormrisk.com/docs/Hurricanes-Post09112006.pdf

Users should be aware that the skill of TSR's April forecasts for Atlantic hurricane activity over the last 30 years, while positive, is fairly low.

Further Information and Next Forecast

Further information about TSR forecasts, verifications and hindcast skill as a function of lead time may be obtained from the TSR web site *http://www.tropicalstormrisk.com*. The next TSR forecast update for the 2010 Atlantic hurricane season will be issued on the 4th June 2010.

Appendix - Predictions from Previous Months

1. Atlantic ACE Index and System Numbers

Atlantic ACE Index and System Numbers 2010					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (±SD) (1950-2009)		101 (±60)	10.4 (±4.0)	6.1 (±2.6)	2.7 (±1.9)
TSR Forecasts (±FE)	9 Apr 2010	159 (±58)	16.3 (±4.1)	8.5 (±2.8)	4.0 (±1.7)
	7 Dec 2009	135 (±59)	13.9 (±4.9)	7.4 (±3.1)	3.4 (±1.8)
CSU Forecasts	7 Apr 2010	150	15	8	4
	9 Dec 2009	100-162	11-16	6-8	3-5

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

MDR, Caribbean Sea and Gulf of Mexico ACE Index and Numbers 2010					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (±SD) (1950-2009)		79 (±58)	7.1 (±3.3)	4.3 (±2.4)	2.4 (±1.8)
TSR Forecasts (±FE)	9 Apr 2010	134 (±54)	11.3 (±3.3)	6.4 (±2.4)	3.7 (±1.5)
	7 Dec 2009	110 (±55)	9.1 (±3.9)	5.3 (±2.6)	3.1 (±1.6)

3. US ACE Index and Landfalling Numbers

US Landfalling Numbers 2010				
		ACE Index	Named Tropical Storms	Hurricanes
Average Number (±SD) (1950-2009)		2.5 (±2.2)	3.2 (±2.0)	1.5 (±1.3)
TSR Forecasts (±FE)	9 Apr 2010	4.1 (±2.1)	5.1 (±2.1)	2.3 (±1.5)
	7 Dec 2009	3.5 (±2.1)	4.4 (±2.2)	1.9 (±1.5)

4. Lesser Antilles ACE Index and Landfalling Numbers

Lesser Antilles Landfalling Numbers 2010					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (±SD) (1950-2009)		1.3 (±2.0)	1.1 (±1.0)	0.5 (±0.7)	0.2 (±0.5)
TSR Forecasts (±FE)	9 Apr 2010	2.3 (±2.0)	1.6 (±0.9)	0.7 (±0.6)	0.4 (±0.4)
	7 Dec 2009	1.9 (±2.0)	1.3 (±0.9)	0.6 (±0.6)	0.3 (±0.4)