



# Extended Range Forecast for Atlantic Hurricane Activity in 2010

Issued: 7th December 2009

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

## Forecast Summary

**TSR predicts an active Atlantic hurricane season in 2010. Users should note that the precision of TSR's extended range outlooks for Atlantic hurricane activity between 1980 and 2009 is low.**

The TSR (Tropical Storm Risk) extended range forecast for Atlantic hurricane activity in 2010 anticipates an active season. Based on current and projected climate signals, Atlantic basin and US landfalling tropical cyclone activity are forecast to be about 35% above the 1950-2009 norm in 2010. There is a fairly high (~62%) 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 November 2009. 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. The former influences cyclonic vorticity (the spinning up of storms) in the main hurricane track region, while the latter provides heat and moisture to power incipient storms in the main track region. 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 ( $\pm$ FE)	2010	135 ( $\pm$ 59)	3.4 ( $\pm$ 1.8)	7.4 ( $\pm$ 3.1)	13.9 ( $\pm$ 4.9)
60yr Climate Norm ( $\pm$ SD)	1950-2009	101 ( $\pm$ 60)	2.7 ( $\pm$ 2.0)	6.1 ( $\pm$ 2.7)	10.3 ( $\pm$ 4.2)
Forecast Skill at this Lead	1980-2009	11%	8%	1%	2%

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<sup>2</sup>.  
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 62% 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 24% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (71 to 117)) and only a 14% 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 ( $\pm$ FE)	2010	110 ( $\pm$ 55)	3.1( $\pm$ 1.6)	5.3 ( $\pm$ 2.6)	9.1 ( $\pm$ 3.9)
60yr Climate Norm ( $\pm$ SD)	1950-2009	79 ( $\pm$ 58)	2.3( $\pm$ 1.8)	4.2 ( $\pm$ 2.5)	7.0 ( $\pm$ 3.5)
Forecast Skill at this Lead	1980-2009	14%	14%	8%	5%

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 63% 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 26% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (43 to 92) and only an 11% 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 ( $\pm$ FE)	2010	3.5 ( $\pm$ 2.1)	1.9 ( $\pm$ 1.5)	4.4 ( $\pm$ 2.2)
60yr Climate Norm ( $\pm$ SD)	1950-2009	2.5 ( $\pm$ 2.2)	1.5 ( $\pm$ 1.3)	3.1 ( $\pm$ 2.1)
Forecast Skill at this Lead	1980-2009	10%	8%	8%

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 =  $\times 10^4$  knots<sup>2</sup>.

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 64% 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 ( $>2.61$ )), a 24% 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 12% 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 ( $\pm$ FE)	2010	1.9 ( $\pm$ 2.0)	0.3 ( $\pm$ 0.4)	0.6 ( $\pm$ 0.6)	1.3 ( $\pm$ 0.9)
60yr Climate Norm ( $\pm$ SD)	1950-2009	1.3 ( $\pm$ 2.0)	0.2 ( $\pm$ 0.5)	0.5 ( $\pm$ 0.7)	1.0 ( $\pm$ 1.0)
Forecast Skill at this Lead	1980-2009	0%	3%	9%	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 =  $\times 10^4$  knots<sup>2</sup>.

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 both the July-September forecast trade wind at 925mb height over the Caribbean Sea and tropical North Atlantic region ( $7.5^{\circ}\text{N}$  -  $17.5^{\circ}\text{N}$ ,  $30^{\circ}\text{W}$  -  $100^{\circ}\text{W}$ ), and of August-September forecast sea surface temperature for the Atlantic MDR ( $10^{\circ}\text{N}$  -  $20^{\circ}\text{N}$ ,  $20^{\circ}\text{W}$  -  $60^{\circ}\text{W}$ ). The current forecasts for these predictors are  $0.40\pm0.74 \text{ ms}^{-1}$  weaker than normal (1980-2009 climatology) and  $0.20\pm0.29^{\circ}\text{C}$  warmer than normal (1980-2009 climatology). The trade wind prediction is based on a neutral ENSO forecast for August/September 2010 which agrees with the consensus model predictions from the current IRI ENSO forecast ([http://www.iri.columbia.edu/climate/ENSO/currentinfo/SST\\_table.html](http://www.iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html)). The forecast skills (assessed for the period 1980-2009) for these predictors at this lead are 31% and 29% respectively.

## **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 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 extended range forecasts for Atlantic hurricane activity over the last 30 years, while positive, is 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 first TSR forecast update for the 2010 Atlantic hurricane season will be issued on Friday 9th April 2010.



AON BENFIELD UCL  
**Hazard**  
Research  
Centre