



Extended Range Forecast for Atlantic Hurricane Activity in 2007

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Forecast Summary

TSR predicts an active Atlantic hurricane season in 2007.

The TSR (Tropical Storm Risk) extended range forecast for Atlantic hurricane activity in 2007 anticipates a return to high activity. Based on current and projected climate signals, Atlantic basin and US landfalling tropical cyclone activity are forecast to be 60% above the 1950-2006 norm in 2007. There is a high (~80%) likelihood that activity will be in the top one-third of years historically. The forecast spans the period from 1st June to 30th November 2007 and employs data through to the end of November 2006. TSR's two predictors are the forecast July-September 2007 trade wind speed over the Caribbean and tropical North Atlantic, and the forecast August-September 2007 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. Monthly updated forecasts will be issued through to August 2007.

Atlantic ACE Index and System Numbers in 2007

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2007	164 (\pm 60)	3.9 (\pm 1.8)	8.8 (\pm 2.9)	15.7 (\pm 4.6)
57yr Climate Norm (\pm SD)	1950-2006	102 (\pm 61)	2.7 (\pm 1.9)	6.2 (\pm 2.6)	10.3 (\pm 4.0)
Forecast Skill at this Lead	1987-2006	13%	12%	4%	0%

- 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 Wind > 33Kts.
SD = Standard Deviation.
FE (Forecast Error) = Standard Deviation of Errors in Replicated Real Time Forecasts 1986-2005.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1987-2006.

There is a 79% probability that the 2007 Atlantic hurricane season ACE index will be above average (defined as an ACE index value in the upper tercile historically (>115)), a 15% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (71 to 115)) and only a 6% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<71)). The 57-year period 1950-2006 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 (1950-2006).
Upper Tercile = ACE index value greater than 115.
Middle Tercile = ACE index value between 71 and 115.
Lower Tercile = ACE index value less than 71.

ACE Index & Numbers Forming in the MDR, Caribbean Sea and Gulf of Mexico in 2007

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2007	137 (\pm 58)	3.6(\pm 1.6)	6.5 (\pm 2.6)	10.9 (\pm 3.9)
57yr Climate Norm (\pm SD)	1950-2006	79 (\pm 59)	2.3 (\pm 1.8)	4.3 (\pm 2.5)	7.0 (\pm 3.3)
Forecast Skill at this Lead	1987-2006	16%	19%	14%	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 78% probability that in 2007 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 (>91)), a 17% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (40 to 91) and only a 5% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<40)). The 57-year period 1950-2006 is used for climatology.

USA Landfalling ACE Index and Numbers in 2007

		ACE Index	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2007	4.1 (\pm 2.2)	2.2 (\pm 1.7)	4.7 (\pm 2.2)
57yr Climate Norm (\pm SD)	1950-2006	2.4 (\pm 2.2)	1.5 (\pm 1.3)	3.1 (\pm 2.0)
Forecast Skill at this Lead	1987-2006	13%	13%	12%

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 = $\times 10^4$ knots².

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 2007 the USA landfalling ACE index will be above average (defined as a USA ACE index value in the upper tercile historically (>2.57)), a 15% likelihood it will be near-normal (defined as a USA ACE index value in the middle tercile historically (1.12 to 2.57) and only a 9% chance it will be below-normal (defined as a USA ACE index value in the lower tercile historically (<1.12)). The 57-year period 1950-2006 is used for climatology.

Caribbean Lesser Antilles Landfalling Numbers in 2007

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2007	2.4 (\pm 2.3)	0.4 (\pm 0.4)	0.7 (\pm 0.6)	1.7 (\pm 1.1)
57yr Climate Norm (\pm SD)	1950-2006	1.4 (\pm 2.0)	0.2 (\pm 0.5)	0.4 (\pm 0.7)	1.1 (\pm 1.0)
Forecast Skill at this Lead	1987-2006	2%	5%	16%	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 = $\times 10^4$ knots².

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 2007

The key factors behind the TSR forecast for an above-average hurricane season in 2007 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 for the Atlantic MDR (10°N - 20°N, 20°W - 60°W). The current forecasts for these predictors are $0.68 \pm 0.74 \text{ ms}^{-1}$ weaker than normal (1977-2006 climatology) and $0.34 \pm 0.29^\circ\text{C}$ warmer than normal (1977-2006 climatology). The forecast skills (assessed for the period 1987-2006) for these predictors at this lead are 34% and 37% respectively.

The probability of 2007 seeing above-average hurricane activity to 80% likelihood is also supported independently by examining the link between El Niño events in +ve AMO (Atlantic Multidecadal Oscillation) years (as we are experiencing now) and the level of hurricane activity in the following year. Since 1950 there have been 10 El Niño events in +ve AMO years. Eight out of ten of these (i.e. 80% of years) were followed by above-average (i.e. upper tercile) hurricane activity in the following year. This is because El Niño conditions tend to reverse sign by the following summer.

The Precision of Seasonal Hurricane Forecasts

The 2004 and 2005 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, forecasts for the 2006 hurricane season proved less impressive. This raises the following questions: what is the precision of seasonal hurricane forecasts when assessed over many years?; to what lead times are current seasonal hurricane forecasts useful?; and how typical are years such as 2006? These three questions are addressed in this recent article:

Saunders, M. A., Winds of change, *Post Magazine Risk Report*, pp28-29, 9 November 2006, <http://tsr.mssl.ucl.ac.uk/docs/Hurricanes-Post09112006.pdf>

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://tropicalstormrisk.com>. The first TSR monthly forecast update for the 2007 Atlantic hurricane season will be issued on the 5th January 2007.

