



August Forecast Update for Atlantic Hurricane Activity in 2007

Issued: 6th August 2007

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

Forecast Summary

TSR continues to forecast an active Atlantic hurricane season in 2007 but reduces slightly its forecast for US landfalling hurricane activity.

The TSR (Tropical Storm Risk) August forecast update for Atlantic hurricane activity in 2007 continues to anticipate an active season to high probability. Based on current and projected climate signals, Atlantic basin tropical cyclone activity is forecast to be about 35% above the 1950-2006 norm in 2007 and US landfalling tropical cyclone activity is forecast to be about 20% above-norm. There is a high (~60-70%) 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 July 2007. TSR's two predictors for basin activity 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. TSR anticipates the trade wind predictor having a moderate enhancing effect on activity and the sea surface temperature having a neutral effect.

Atlantic ACE Index and System Numbers in 2007

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (\pm FE)	2007	138 (\pm 38)	3.5 (\pm 1.3)	7.8 (\pm 1.7)	14.7 (\pm 2.9)
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	60%	46%	64%	52%

- 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 1987-2006.
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 72% 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 24% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (71 to 115) and only a 4% 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	110 (\pm 45)	3.2(\pm 1.2)	5.5 (\pm 1.6)	9.8 (\pm 2.3)
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	47%	52%	66%	61%

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 66% 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 28% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (40 to 91) and only a 6% 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	2.9 (\pm 1.4)	1.7 (\pm 1.2)	3.9 (\pm 1.7)
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	48%	32%	28%

- 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.
- Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Cross-Validated Hindcasts 1987-2006 made with 5-year Block Removal.

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

There is a 61% 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 30% 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	1.9 (\pm 2.0)	0.4 (\pm 0.4)	0.6 (\pm 0.6)	1.5 (\pm 0.9)
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	30%	26%	38%	23%

- 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 Seasonal Atlantic Hurricane Activity

The key factors behind the TSR forecast for an above-average Atlantic 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 weak enhancing effect 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 $0.51 \pm 0.43 \text{ ms}^{-1}$ (up from last month's value of $0.45 \pm 0.47 \text{ ms}^{-1}$) weaker than normal (1977-2006 climatology) and $0.00 \pm 0.14^\circ\text{C}$ (down from last month's value of $0.11 \pm 0.17^\circ\text{C}$) warmer than normal (1977-2006 climatology). The forecast skills (assessed for the period 1987-2006) for these predictors at this lead are 73% and 84% respectively.

Forecast Model for US ACE Index and US Landfalling Hurricane Numbers

The TSR early August forecast for the US ACE index and US landfalling hurricane and tropical storm numbers in 2007 is made with an ensemble of two models. These are (1) the July 2007 tropospheric wind anomalies between heights of 925mb and 400mb over North America, the east Pacific and the North Atlantic (*Saunders and Lea, 2005*). Wind anomalies in these regions in July are indicative of persistent atmospheric circulation patterns that either favour or hinder evolving hurricanes from reaching US shores during August and September; (2) the TSR early August forecast for the North Atlantic ACE index and hurricane numbers in 2007.

Saunders, M. A. and A. S. Lea, Seasonal prediction of hurricane activity reaching the coast of the United States, *Nature*, 434, 1005-1008, 2005.

Further Information

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>. This is the final TSR monthly forecast update for the 2007 Atlantic hurricane season. A summary of the 2007 Atlantic hurricane season and a verification of the TSR seasonal forecasts will be issued in early January 2008.



Appendix - Predictions from Previous Months

1. Atlantic ACE Index and System Numbers

Atlantic ACE Index and System Numbers 2007					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (\pm SD) (1950-2006)		102 (\pm 61)	10.3 (\pm 4.0)	6.2 (\pm 2.6)	2.7 (\pm 1.9)
TSR Forecasts (\pm FE)	6 Aug 2007	138 (\pm 38)	14.7 (\pm 2.9)	7.8 (\pm 1.7)	3.5 (\pm 1.3)
	4 Jul 2007	142 (\pm 46)	14.7 (\pm 3.4)	7.9 (\pm 2.3)	3.5 (\pm 1.6)
	4 Jun 2007	156 (\pm 48)	15.7 (\pm 3.4)	8.6 (\pm 2.4)	3.9 (\pm 1.5)
	3 May 2007	166 (\pm 50)	16.1 (\pm 3.8)	8.9 (\pm 2.6)	4.0 (\pm 1.5)
	3 Apr 2007	173 (\pm 55)	16.7 (\pm 4.1)	9.2 (\pm 2.7)	4.2 (\pm 1.7)
	5 Mar 2007	177 (\pm 56)	16.7 (\pm 4.3)	9.4 (\pm 2.7)	4.3 (\pm 1.7)
	5 Feb 2007	162 (\pm 57)	15.7 (\pm 4.6)	8.7 (\pm 2.9)	3.9 (\pm 1.7)
	3 Jan 2007	152 (\pm 62)	15.0 (\pm 4.7)	8.3 (\pm 3.0)	3.7 (\pm 1.8)
	7 Dec 2006	162 (\pm 60)	15.7 (\pm 4.5)	8.5 (\pm 2.8)	3.9 (\pm 1.8)
Gray Forecasts	3 Aug 2007	150	15	8	4
	31 May 2007	170	17	9	5
	3 Apr 2007	170	17	9	5
	8 Dec 2006	130	14	7	3
NOAA Forecast	22 May 2007	109-184	13-17	7-10	3-5
Met Office Forecast	19 June 2007	-	12 (\pm 3)	-	-
WSI Corporation Forecasts	25 Jul 2007	-	14	6	3
	19 June 2007	-	15	8	4

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

MDR, Caribbean Sea and Gulf of Mexico ACE Index and Numbers 2007					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (\pm SD) (1950-2006)		79 (\pm 59)	7.0 (\pm 3.3)	4.3 (\pm 2.5)	2.3 (\pm 1.8)
TSR Forecasts (\pm FE)	6 Aug 2007	110 (\pm 45)	9.8 (\pm 2.3)	5.5 (\pm 1.6)	3.2 (\pm 1.2)
	4 Jul 2007	115 (\pm 46)	9.8 (\pm 2.3)	5.6 (\pm 1.8)	3.2 (\pm 1.4)
	4 Jun 2007	129 (\pm 44)	10.8 (\pm 2.5)	6.3 (\pm 1.9)	3.6 (\pm 1.3)
	3 May 2007	139 (\pm 47)	11.3 (\pm 2.8)	6.6 (\pm 2.0)	3.7 (\pm 1.3)
	3 Apr 2007	145 (\pm 53)	11.9 (\pm 3.3)	6.9 (\pm 2.3)	3.9 (\pm 1.5)
	5 Mar 2007	149 (\pm 55)	11.9 (\pm 3.6)	7.1 (\pm 2.4)	4.0 (\pm 1.5)
	5 Feb 2007	135 (\pm 55)	10.9 (\pm 3.9)	6.4 (\pm 2.5)	3.6 (\pm 1.5)
	3 Jan 2007	125 (\pm 60)	10.2 (\pm 4.0)	6.0 (\pm 2.6)	3.4 (\pm 1.6)
	7 Dec 2006	137 (\pm 58)	10.9 (\pm 3.9)	6.5 (\pm 2.6)	3.6 (\pm 1.6)

3. US ACE Index and Landfalling Numbers

US Landfalling Numbers 2007				
		ACE Index	Named Tropical Storms	Hurricanes
Average Number (\pm SD) (1950-2006)		2.4 (\pm 2.2)	3.1 (\pm 2.0)	1.5 (\pm 1.3)
TSR Forecasts (\pm FE)	6 Aug 2007	2.9 (\pm 1.4)	3.9 (\pm 1.7)	1.7 (\pm 1.2)
	4 Jul 2007	3.6 (\pm 1.6)	4.3 (\pm 1.9)	2.0 (\pm 1.3)
	4 Jun 2007	3.9 (\pm 1.6)	4.7 (\pm 1.9)	2.2 (\pm 1.3)
	3 May 2007	4.2 (\pm 1.6)	4.8 (\pm 1.9)	2.3 (\pm 1.3)
	3 Apr 2007	4.4 (\pm 1.6)	5.1 (\pm 2.0)	2.4 (\pm 1.3)
	5 Mar 2007	4.5 (\pm 1.6)	5.1 (\pm 2.0)	2.4 (\pm 1.4)
	5 Feb 2007	4.0 (\pm 1.6)	4.7 (\pm 2.0)	2.2 (\pm 1.4)
	3 Jan 2007	3.8 (\pm 1.9)	4.5 (\pm 2.0)	2.1 (\pm 1.4)
	7 Dec 2006	4.1 (\pm 2.2)	4.7 (\pm 2.2)	2.2 (\pm 1.7)

4. Lesser Antilles ACE Index and Landfalling Numbers

Lesser Antilles Landfalling Numbers 2007					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (\pm SD) (1950-2006)		1.4 (\pm 2.0)	1.1 (\pm 1.0)	0.4 (\pm 0.7)	0.2 (\pm 0.5)
TSR Forecasts (\pm FE)	6 Aug 2007	1.9 (\pm 2.0)	1.5 (\pm 0.9)	0.6 (\pm 0.6)	0.4 (\pm 0.4)
	4 Jul 2007	2.0 (\pm 2.1)	1.5 (\pm 1.0)	0.6 (\pm 0.6)	0.4 (\pm 0.4)
	4 Jun 2007	2.3 (\pm 2.1)	1.7 (\pm 1.0)	0.7 (\pm 0.6)	0.4 (\pm 0.4)
	3 May 2007	2.4 (\pm 2.2)	1.7 (\pm 1.1)	0.7 (\pm 0.6)	0.4 (\pm 0.4)
	3 Apr 2007	2.6 (\pm 2.3)	1.8 (\pm 1.1)	0.8 (\pm 0.6)	0.4 (\pm 0.4)
	5 Mar 2007	2.6 (\pm 2.4)	1.8 (\pm 1.1)	0.8 (\pm 0.7)	0.4 (\pm 0.4)
	5 Feb 2007	2.4 (\pm 2.4)	1.7 (\pm 1.1)	0.7 (\pm 0.7)	0.4 (\pm 0.4)
	3 Jan 2007	2.2 (\pm 2.4)	1.6 (\pm 1.1)	0.7 (\pm 0.7)	0.4 (\pm 0.4)
	7 Dec 2006	2.4 (\pm 2.3)	1.7 (\pm 1.1)	0.7 (\pm 0.6)	0.4 (\pm 0.4)