June Forecast Update for Atlantic Hurricane Activity in 2004

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

Forecast Summary

TSR revises its forecasts downward, and anticipates activity will be slightly above average.

The TSR (Tropical Storm Risk) June forecast update for Atlantic hurricane activity in 2004 anticipates a slightly above average season. Atlantic basin and US landfalling tropical cyclone activity are forecast to be ~110% of average in 2004. The forecast spans the period from 1st June to 30th November 2004 and employs data through to the end of May 2004. TSR's two predictors are the forecast July-September 2004 trade wind speed over the Caribbean and tropical North Atlantic, and the forecast August-September 2004 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 the trade wind predictor will have a slight enhancing effect on activity, and the sea surface temperature predictor will have a neutral effect on activity. Monthly updated forecasts will be issued through to August 2004. Appendices give forecasts from prior months.

Atlantic ACE Index and System Numbers in 2004

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2004	101 (±34)	2.4 (±1.3)	6.1 (±1.5)	11.7 (±2.1)
54yr Climate Norm (±SD)	1950-2003	95 (±54)	2.5 (±1.9)	6.0 (±2.3)	9.9 (±3.3)
Forecast Skill at this Lead	1989-2003	50%	40%	51%	38%

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 1989-2003.
Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1989-2003.

There is a 41% probability that the 2004 Atlantic hurricane season ACE index will be in the upper tercile historically, a 46% likelihood it will be in the middle tercile historically and a 13% chance it will be in the lower tercile historically. The 54-year period 1950-2003 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 (1950-2003).
Upper Tercile = ACE index value greater than 108.
Middle Tercile = ACE index value between 64 and 108.
Lower Tercile = ACE index value less than 64.

ACE Index & Numbers Forming in the MDR, Caribbean Sea and Gulf of Mexico in 2004

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2004	85 (±37)	2.4(±1.3)	4.4 (±1.7)	8.1 (±2.5)
54yr Climate Norm (±SD)	1950-2003	73 (±55)	2.2 (±1.8)	4.1 (±2.4)	6.8 (±3.2)
Forecast Skill at this Lead	1989-2003	49%	40%	53%	47%

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 55% probability that in 2004 the MDR, Caribbean Sea and Gulf of Mexico ACE index will be in the upper tercile historically (defined as an ACE index value >79), a 37% likelihood it will be in the middle tercile historically (defined as an ACE index value between 33 and 79) and only an 8% chance it will be in the lower tercile historically (defined as an ACE index value <33). The 54-year period 1950-2003 is used for climatology.

USA Landfalling ACE Index and Numbers in 2004

		ACE Index	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2004	2.4 (±1.2)	1.5 (±0.9)	3.4 (±1.7)
Average (±SD)	1950-2003	2.2 (±2.0)	1.4 (±1.2)	3.0 (±1.9)
Forecast Skill at this Lead	1989-2003	44%	34%	10%

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 Coming Within 30km of 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 49% probability that in 2004 the USA landfalling ACE index will be in the upper tercile historically (defined as a USA ACE index >2.40), a 40% likelihood it will be in the middle tercile historically (defined as a USA ACE index value between 0.90 and 2.40) and an 11% chance it will be in the lower tercile historically (defined as a USA ACE index value <0.90). The 54-year period 1950-2003 is used for climatology.

Caribbean Lesser Antilles Landfalling Numbers in 2004

		ACE Index	Intense Hurricanes	Hurricanes	Tropical Storms
TSR Forecast (±FE)	2004	1.7 (± 2.3)	0.3 (±0.4)	0.6 (±0.6)	1.4 (±1.0)
54yr Climate Norm (±SD)	1950-2003	1.4 (±2.1)	0.2 (±0.5)	0.4 (±0.7)	1.1 (±1.0)
Forecast Skill at this Lead	1989-2003	25%	25%	40%	21%

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 Coming Within 30km of Land.

Lesser Antilles = Island Arc from Anguilla to Trinidad Inclusive.

Key Predictors for 2004

The key factors behind the TSR forecast for a slightly above-average hurricane season in 2004 are the anticipated small 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 the neutral enhancing effect of August-September forecast sea surface temperature for the Atlantic MDR (10°N - 20°N, 20°W - 60°W). The current forecast anomalies (1974-2003 climatology) for these predictors are 0.16±0.45 ms^{-1} (down from last month's value of 0.35±0.55 ms^{-1}) and 0.02±0.20°C (down from last month's value of 0.17±0.25°C) respectively. The corresponding forecast skills for these predictors at this lead are 56% and 55%. The lower values for these two predictors account for the downgrading of the TSR forecasts on last month.

Further Information and Next Forecast

Further information on the TSR forecast methodology, the TSR replicated real-time hindcast skill as a function of lead time, and on TSR in general, may be obtained either from the TSR web site (*http://tropicalstormrisk.com*) or from the 'Extended Range Forecast for Atlantic Hurricane Activity in 2002' document issued on the 23rd November 2001. The next TSR monthly forecast update for the 2004 Atlantic hurricane season will be issued on the 5th July 2004.

Appendix - Predictions from Previous Months

1. Atlantic ACE Index and System Numbers

Atlantic ACE Index and System Numbers 2004					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (±SD) (1950-2003)		95 (±54)	9.9 (±3.3)	6.0 (±2.3)	2.5 (±1.9)
TSR Forecasts (±FE)	7 Jun 2004	101 (±40)	11.7 (±2.1)	6.1 (±1.5)	2.4 (±1.3)
	11 May 2004	120 (±40)	12.6 (±2.6)	6.8 (±1.8)	2.7 (±1.3)
	6 Apr 2004	128 (±50)	13.1 (±3.2)	7.2 (±2.1)	2.9 (±1.5)
	5 Mar 2004	122 (±53)	12.8 (±3.6)	7.0 (±2.4)	2.8 (±1.5)
	5 Feb 2004	139 (±53)	13.7 (±3.5)	7.6 (±2.4)	3.1 (±1.5)
	6 Jan 2004	132 (±59)	13.3 (±3.9)	7.2 (±2.6)	2.9 (±1.6)
	5 Dec 2003	132 (±59)	13.0 (±4.0)	7.2 (±2.7)	2.9 (±1.6)
Gray Forecasts	28 May 2004	-	14	8	3
	2 Apr 2004	-	14	8	3
	5 Dec 2003	-	13	7	3
NOAA Forecast	17 May 2004	88-140	12-15	6-8	2-4
Meteorological Institute, Cuba Forecast	2 May 2004	-	13	7	-

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

MDR, Caribbean Sea and Gulf of Mexico ACE Index and Numbers 2004					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (±SD) (1950-2003)		73 (±55)	6.8 (±3.1)	4.1 (±2.4)	2.2 (±1.8)
TSR Forecasts (±FE)	7 Jun 2004	85 (±37)	8.1 (±2.5)	4.4 (±1.7)	2.4 (±1.3)
	11 May 2004	103 (±42)	9.0 (±2.8)	5.1 (±2.0)	2.7 (±1.3)
	6 Apr 2004	112 (±53)	9.5 (±3.4)	5.5 (±2.4)	2.9 (±1.6)
	5 Mar 2004	106 (±57)	9.2 (±3.9)	5.3 (±2.6)	2.8 (±1.6)
	5 Feb 2004	123 (±57)	10.1 (±3.8)	5.9 (±2.6)	3.1 (±1.6)
	6 Jan 2004	115 (±62)	9.7 (±4.1)	5.5 (±2.8)	2.9 (±1.7)
	5 Dec 2003	115 (±63)	9.5 (±4.2)	5.5 (±2.8)	2.9 (±1.7)

3. US Landfalling Numbers

US Landfalling Numbers 2004				
		ACE Index	Named Tropical Storms	Hurricanes
Average Number (±SD) (1950-2003)		2.2 (±2.0)	3.0 (±1.9)	1.4 (±1.2)
TSR Forecasts (±FE)	7 Jun 2004	2.4 (±1.2)	3.4 (±1.7)	1.5 (±0.9)
	11 May 2004	2.8 (±1.2)	3.8 (±1.7)	1.7 (±0.9)
	6 Apr 2004	3.0 (±1.3)	3.9 (±1.7)	1.8 (±1.0)
	5 Mar 2004	2.9 (±1.3)	3.8 (±1.7)	1.7 (±1.0)
	5 Feb 2004	3.3 (±1.3)	4.1 (±1.7)	1.9 (±0.9)
	6 Jan 2004	3.1 (±1.4)	3.9 (±1.9)	1.7 (±1.1)
	5 Dec 2003	3.1 (±1.4)	3.9 (±1.9)	1.7 (±1.1)

4. Lesser Antilles Landfalling Numbers

Lesser Antilles Landfalling Numbers 2004					
		ACE Index	Named Tropical Storms	Hurricanes	Intense Hurricanes
Average Number (SD) (1950-2003)		1.4 (±2.1)	1.1 (±1.0)	0.4 (±0.7)	0.2 (±0.5)
TSR Forecasts (±FE)	7 Jun 2004	1.7 (±2.3)	1.4 (±1.0)	0.6 (±0.6)	0.3 (±0.4)
	11 May 2004	2.1 (±2.4)	1.6 (±1.0)	0.7 (±0.6)	0.3 (±0.4)
	6 Apr 2004	2.3 (±2.6)	1.6 (±1.1)	0.7 (±0.7)	0.4 (±0.4)
	5 Mar 2004	2.1 (±2.7)	1.6 (±1.1)	0.7 (±0.7)	0.4 (±0.4)
	5 Feb 2004	2.5 (±2.7)	1.7 (±1.1)	0.7 (±0.7)	0.4 (±0.4)
	6 Jan 2004	2.3 (±2.7)	1.7 (±1.1)	0.7 (±0.7)	0.4 (±0.4)
	5 Dec 2003	2.3 (±2.7)	1.7 (±1.1)	0.7 (±0.7)	0.4 (±0.4)