Extended Range Forecast

Atlantic and U.S. Landfalling Tropical Cyclones 2000

Issued: 1st October, 1999

The TSUNAMI Initiative

TSUNAMI aims to improve the competitiveness of the UK insurance industry by using the UK science effort to improve the assessment of risk. TSUNAMI is funded by a consortium of companies from the UK insurance industry and the Treasury. Government funding is through the DTI's Sector Challenge and administered by the British Antarctic Survey, a component body of the Natural Environment Research Council.

Seasonal Prediction of Tropical Cyclones

This two year TSUNAMI-funded research project, endorsed and managed by the Met. Office, is being undertaken by University College London and Reading University.

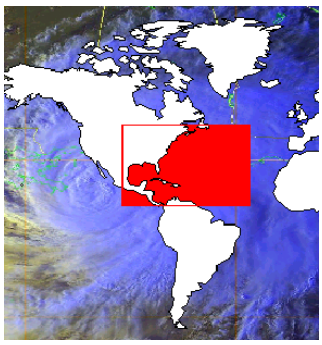
The research project is establishing a new methodology for the long-range seasonal prediction of landfalling tropical cyclones in three ocean basins. These forecasts will offer improved lead-time and skill-level over that available currently.

Statistical methods are used to identify predictors of landfalling events. The predictions used in the forecast are a mix of current climate parameters and dynamical and statistical model predictions of climate parameters for the 2000 Atlantic tropical cyclone season. This paper presents our extended-range forecast for Atlantic seasonal hurricane activity and US strike probability in 2000.

Project Team

The forecast is produced by Dr Mark Saunders and Paul Rockett of the Benfield Greig Hazard Research Centre, University College London.

The project is managed by Mrs Alyson Bedford of The Met. Office. We wish to thank Lance Garrard (TSUNAMI Director) and Mike Cooper (Insurance Industry Representative) for industrial liaison, Dr Chris Thorncroft and Ioannis Pytharoulis (Meteorology Department, Reading University) for dynamical model research, Dr Mike Davey (Hadley Centre for Climate Prediction & Research), and Dr Richard Chandler (Department of Statistical Science, University College London).



Key for tables and graphs:		Sustained Wind
TS	Tropical Storms	34-63 Kts
1&2	Hurricanes, Category 1 & 2 only	64-95 Kts
H	All Hurricanes	>63 Kts
IH	All Intense Hurricanes, Category 3-5	>95 Kts
TC	Tropical Cyclones (TS + H)	
Average	Refers to the 1951-1998 period	

Summary

The following forecasts are based on information available through September 1999:

1. Atlantic Total Numbers in 2000

- Tropical storm, hurricane and intense hurricane numbers to be 70-80% of average. The differences from 'normal' are not significant to within the model error.
- Numbers of events originating between the west coast of Africa and the Caribbean will be below average. Numbers forming in the Caribbean, Gulf of Mexico, and extra-tropical North Atlantic will be slightly below average.
- Chance of at least 1 intense hurricane is 81±19%. (Average chance is 91%).

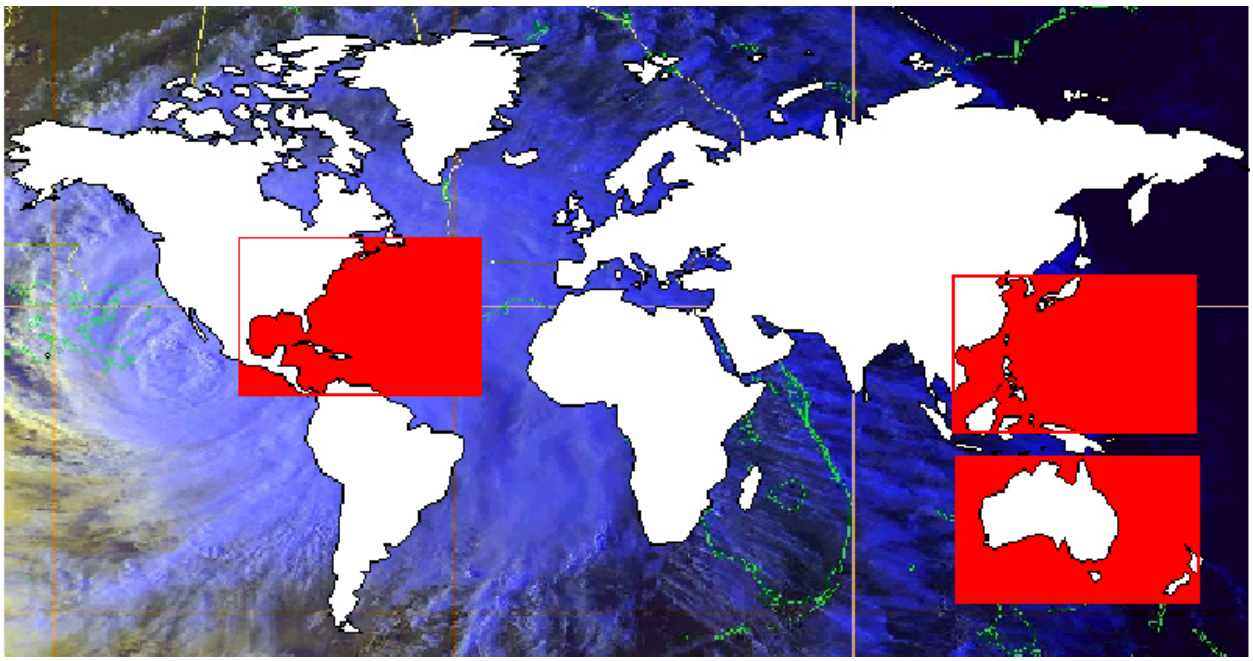
Comparison:

			IH	H	TC
Average	1951-1998	Total 10 :	2.4	5.8	9.8
Actual	1998	Total 14 :	3	10	14
TSUNAMI Forecast	2000	Total 8 :	2 (±1)	5 (±2)	8 (±3)

The main factors behind our forecast are the summer 2000 predictions for slightly cooler than average (-0.1°C) sea surface temperatures in the tropical north Atlantic, and a weak positive ENSO phase (Nino 3.4 anomaly ~ 0.25°C). Both these factors are associated with decreased Atlantic hurricane activity.

2. US Landfalling Activity in 2000

- Landfalling tropical storm, hurricane and intense hurricane numbers to be 80-85% of average for the US as a whole. The differences from 'normal' are not significant to within the model error.
- Activity on the U.S. Gulf Coast to be 85-90% of average.
- Activity on the U.S. East Coast to be 70-80% of average.



Chance of at least one intense hurricane strike:

- 36±10% overall (average is 44%).
- 15±9% for the U.S. East Coast (average is 22%).
- 28±5% for the Gulf Coast (average is 33%).

Comparison:

			IH	H	TC
Average	1951-1998	Total 3:	0.6	1.5	3.1
Actual	1998	Total 7:	0	3	7
TSUNAMI Forecast	2000	Total 3:	0 (+1)	1 (±1)	3 (±2)

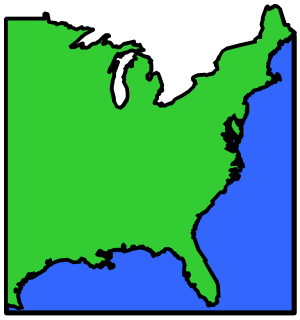
The main environmental factors influencing landfalling activity in 2000 are similar to those affecting total numbers; namely weak El Nino conditions (depressing factor for Gulf and Caribbean landfalls) and cooler than normal sea surface temperatures in the tropical and extra-tropical north Atlantic (depressing factor for U.S. East Coast landfalls).

A post season assessment on the 1999 Atlantic hurricane season will be issued in December 1999.

An extended-range forecast for the NW Pacific seasonal typhoon activity and Asian strike probability in 2000 will be issued in January 2000.

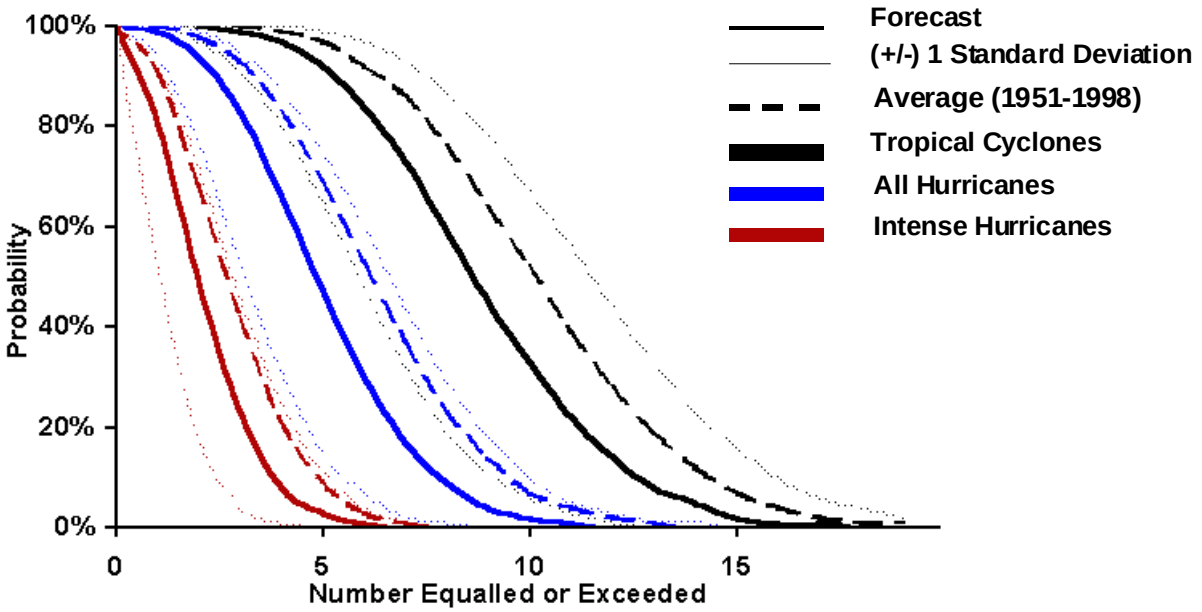
A detailed report on the Atlantic extended-range research methodology, together with a forecast skill comparison against Gray and co-workers, will be available soon from the TSUNAMI website: http://www.nerc-bas.ac.uk/public/tsunami/

Total Number of Atlantic Tropical Cyclones

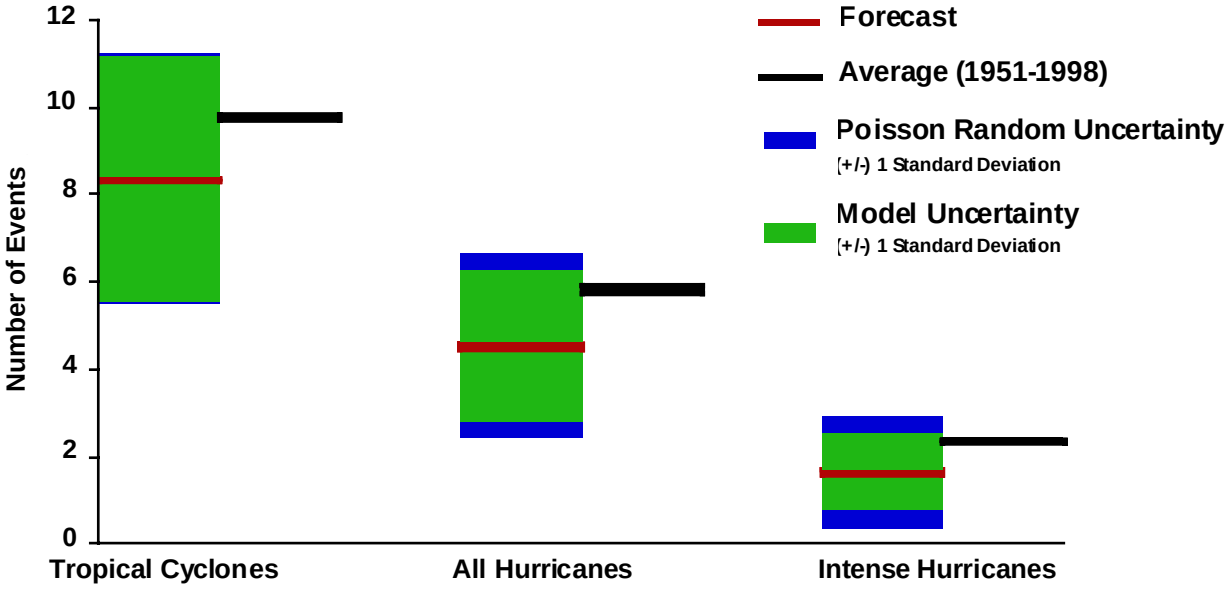


No. of events	Probability of N events (mutually exclusive)							
	Forecast				Normal			
	TC	TS	1&2	IH	TC	TS	1&2	IH
0	0%	2%	6%	19%	0%	2%	3%	9%
1	0%	9%	16%	32%	0%	8%	11%	22%
2	1%	16%	23%	26%	0%	15%	19%	26%
3	2%	20%	22%	14%	1%	20%	22%	21%
4	5%	19%	16%	6%	2%	20%	19%	12%
5	8%	15%	9%	2%	4%	15%	13%	6%
6	11%	9%	5%	1%	7%	10%	8%	2%
7	13%	5%	2%	0%	10%	6%	4%	1%
8	14%	2%	1%	0%	12%	3%	2%	0%
9	13%	1%	0%	0%	13%	1%	1%	0%
10	11%	0%	0%	0%	12%	0%	0%	0%
11	8%	0%	0%	0%	11%	0%	0%	0%
12	6%	0%	0%	0%	9%	0%	0%	0%
13	4%	0%	0%	0%	7%	0%	0%	0%
14	2%	0%	0%	0%	5%	0%	0%	0%
15	1%	0%	0%	0%	3%	0%	0%	0%
16	1%	0%	0%	0%	2%	0%	0%	0%
17	0%	0%	0%	0%	1%	0%	0%	0%
18	0%	0%	0%	0%	1%	0%	0%	0%
19	0%	0%	0%	0%	0%	0%	0%	0%

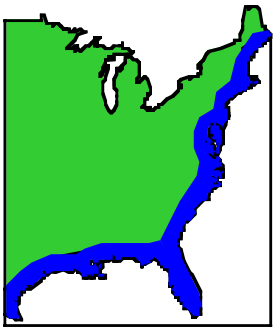
Cumulative Probability of Events



Frequency and Severity Distribution

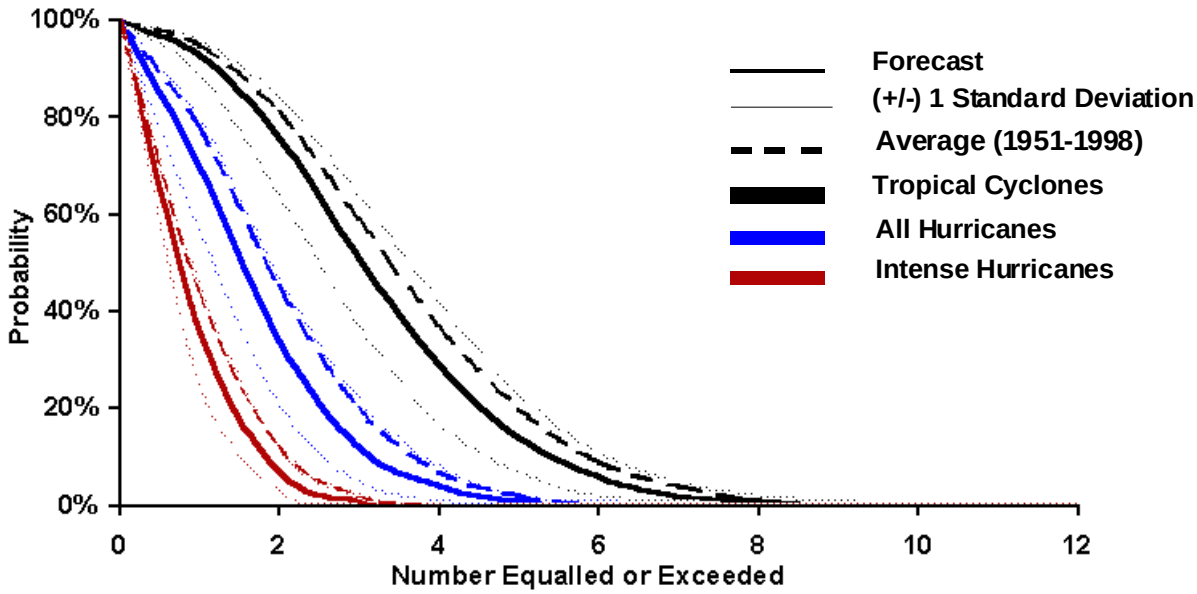


U.S.A. Landfalling Tropical Cyclones

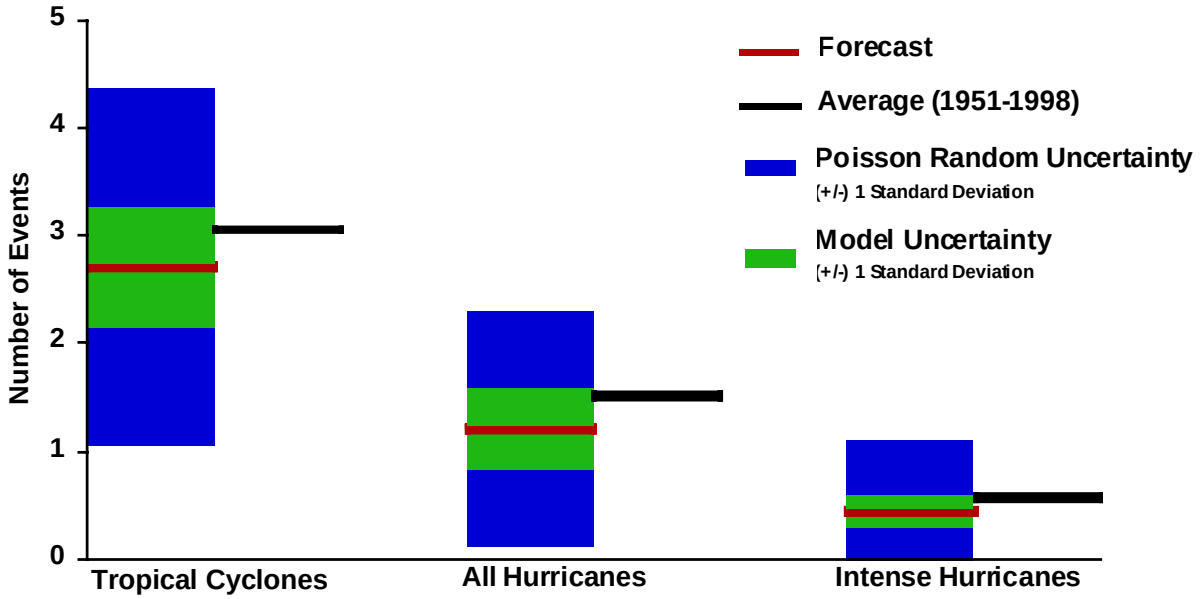


No. of events	Probability of N events (mutually exclusive)							
	Forecast				Normal			
	TC	TS	1&2	IH	TC	TS	1&2	IH
0	7%	22%	46%	64%	5%	21%	39%	56%
1	18%	33%	36%	29%	14%	33%	37%	33%
2	24%	25%	14%	6%	22%	25%	17%	9%
3	22%	13%	4%	1%	22%	13%	5%	2%
4	15%	5%	1%	0%	17%	5%	1%	0%
5	8%	1%	0%	0%	10%	2%	0%	0%
6	4%	0%	0%	0%	5%	0%	0%	0%
7	1%	0%	0%	0%	2%	0%	0%	0%
8	0%	0%	0%	0%	1%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%
12	0%	0%	0%	0%	0%	0%	0%	0%

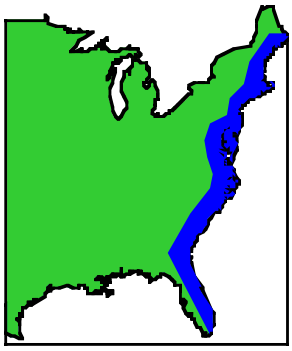
Cumulative Probability of Events



Frequency and Severity Distribution

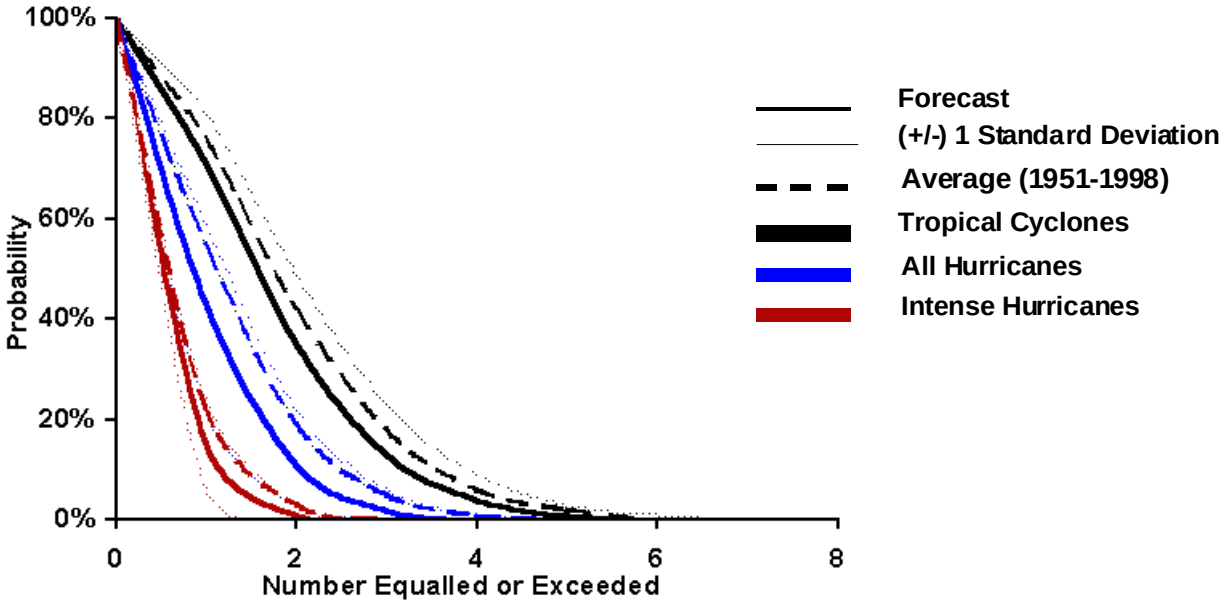


East Coast Landfalling Tropical Cyclones

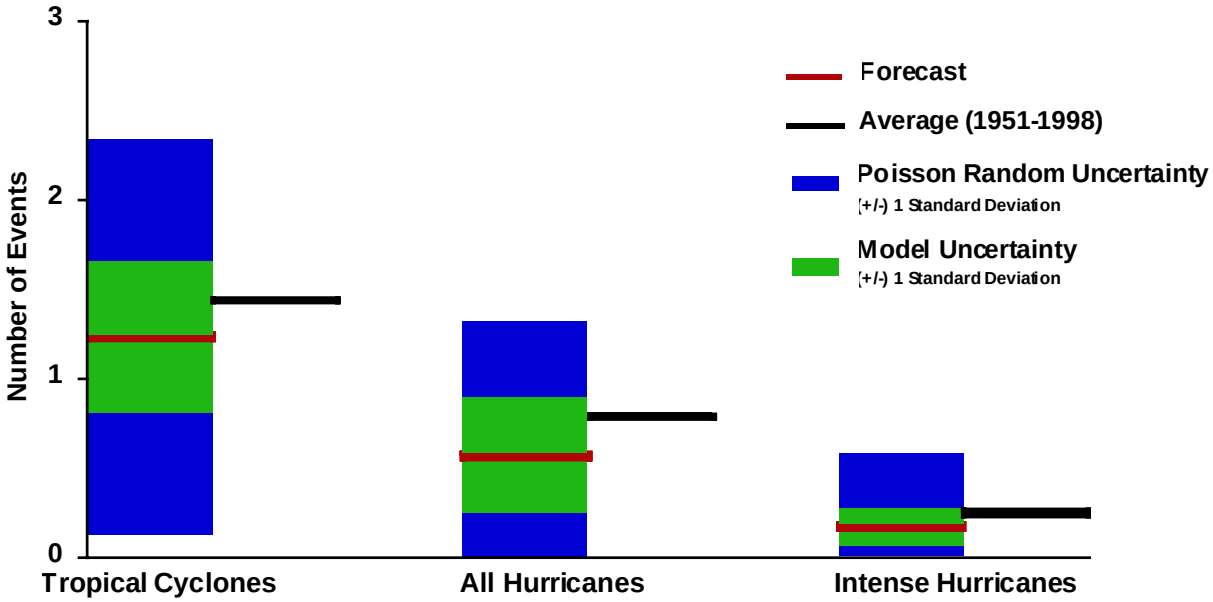


No. of events	Probability of N events (mutually exclusive)							
	Forecast				Normal			
	TC	TS	1&2	IH	TC	TS	1&2	IH
0	29%	52%	67%	85%	24%	52%	58%	78%
1	36%	34%	27%	14%	34%	34%	32%	19%
2	22%	11%	5%	1%	25%	11%	9%	2%
3	9%	2%	1%	0%	12%	2%	2%	0%
4	3%	0%	0%	0%	4%	0%	0%	0%
5	1%	0%	0%	0%	1%	0%	0%	0%
6	0%	0%	0%	0%	0%	0%	0%	0%
7	0%	0%	0%	0%	0%	0%	0%	0%
8	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%
12	0%	0%	0%	0%	0%	0%	0%	0%

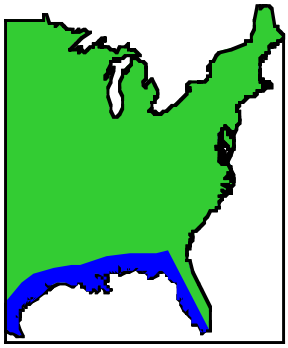
Cumulative Probability of Events



Frequency and Severity Distribution

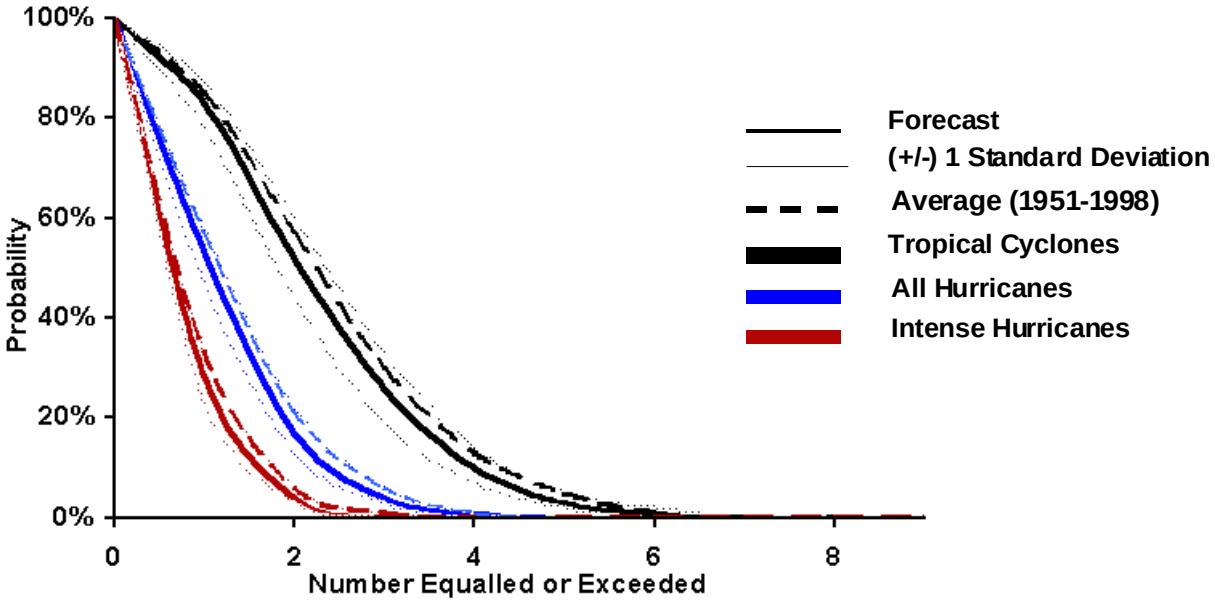


Gulf Coast Landfalling Tropical Cyclones



No. of events	Probability of N events (mutually exclusive)							
	Forecast				Normal			
	TC	TS	1&2	IH	TC	TS	1&2	IH
0	17%	37%	66%	72%	15%	35%	63%	67%
1	30%	37%	28%	24%	28%	37%	29%	27%
2	27%	18%	6%	4%	27%	20%	7%	5%
3	16%	6%	1%	0%	17%	7%	1%	1%
4	7%	2%	0%	0%	8%	2%	0%	0%
5	2%	0%	0%	0%	3%	0%	0%	0%
6	1%	0%	0%	0%	1%	0%	0%	0%
7	0%	0%	0%	0%	0%	0%	0%	0%
8	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%
12	0%	0%	0%	0%	0%	0%	0%	0%

Cumulative Probability of Events



Frequency and Severity Distribution