Hurricane Statistics and Perspective

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WHAT WE DO

GAZ Research LLC is newly formed company based on Alan Zimmermann's many decades of insurance industry expertise. The firm's main mission is to provide educational teach-ins on the insurance industry to all levels of participants, including new hires, executives new to the business and recently named directors. The teach-ins are also useful for those in the investment community looking to learn more about how insurance impacts the global financial markets.

Alan Zimmermann has conducted these teach-ins for more than 25 years for more than a thousand participants on three continents.

Teach-ins can be presented in multiple formats including pre-recorded webinars, virtual meetings or in-person presentations. While the focus will be to ensure participants gain a basic industry introduction, presentations can be tailored to include more advanced topics. Custom programs can also be developed upon request.

In addition to the teach-in program, GAZ Research LLC will distribute periodic notes and reports on relevant property-casualty industry topics.

INSURANCE TEACH-INS AND RESEARCH

ALAN ZIMMERMANN

A long-time insurance analyst focuses much of his attention on accounting, regulatory, and other macro-industry matters. He is well known in the insurance industry from his many years on Wall Street. He now spends considerable time conducting educational Teach-ins for all levels in the industry from new hires to executives new to the industry, to recently named directors.

For the last ten years he has been a Managing Director at Assured Research, a research and advisory firm concentrating on the property-casualty industry. Prior to joining Assured Research, he was a Wall Street analyst and executive for many years. He was the head of the property-casualty insurance research team at Macquarie Securities which he joined in 2009 with the acquisition of Fox-Pitt, Kelton. At FPK he held a variety of managerial positions including Director of US Research, Head of US Equities, and international research coordinator.

Prior to joining FPK in 2000, he was an insurance industry analyst at various investment banking firms including Morgan Stanley, Smith Barney, and Prudential Securities, and for many years was named to Institutional Investor Magazine's "All American Research Team" as a top analyst for both the property-casualty and life insurance industries.

Hurricane statistics and perspective

With the Atlantic hurricane season approaching we're seeing forecasts that describe the outlook as "extremely active" and "super-charged.

In their initial forecast for the coming Atlantic season the researchers at Colorado State University project there will be 23 named storms, including 11 hurricanes, of which five are expected to become major (Category 3 or above). For the last thirty years the averages have been 14, 7, and 5, respectively.

The fact that forecasts are above average is not unexpected because sea surface temperatures (particularly in the Main Development Area) are elevated, and the world's weather system is transitioning to La Niña from El Niño. This usually results in more Atlantic hurricanes because of reduced wind shear.

In this report we present historical data on hurricanes to provide perspective for those interested.

Annual hurricane frequency

Eleven or more hurricanes have only occurred seven times in last 100 years.
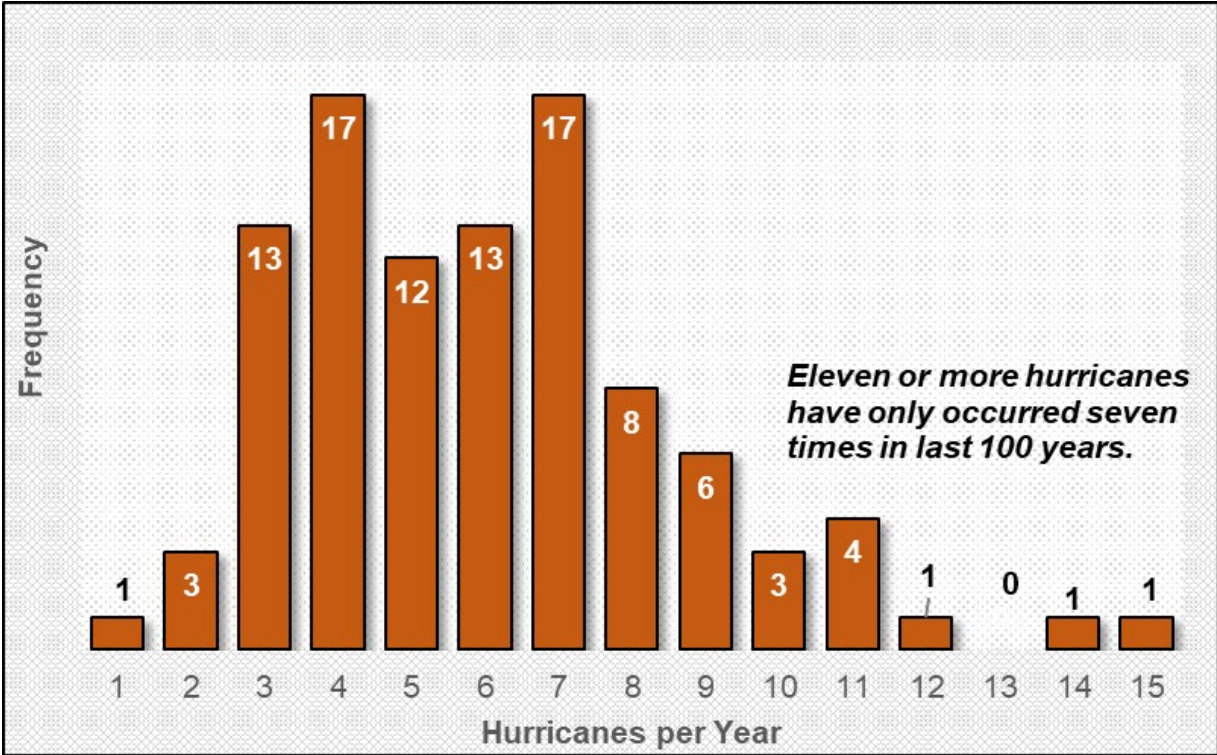
There have been 604 Atlantic Basin hurricanes in the last hundred years. The range has been 1-15. The most frequent occurrences have been four and seven hurricanes which have occurred seventeen times.

Source: NOAA, GAZ Research

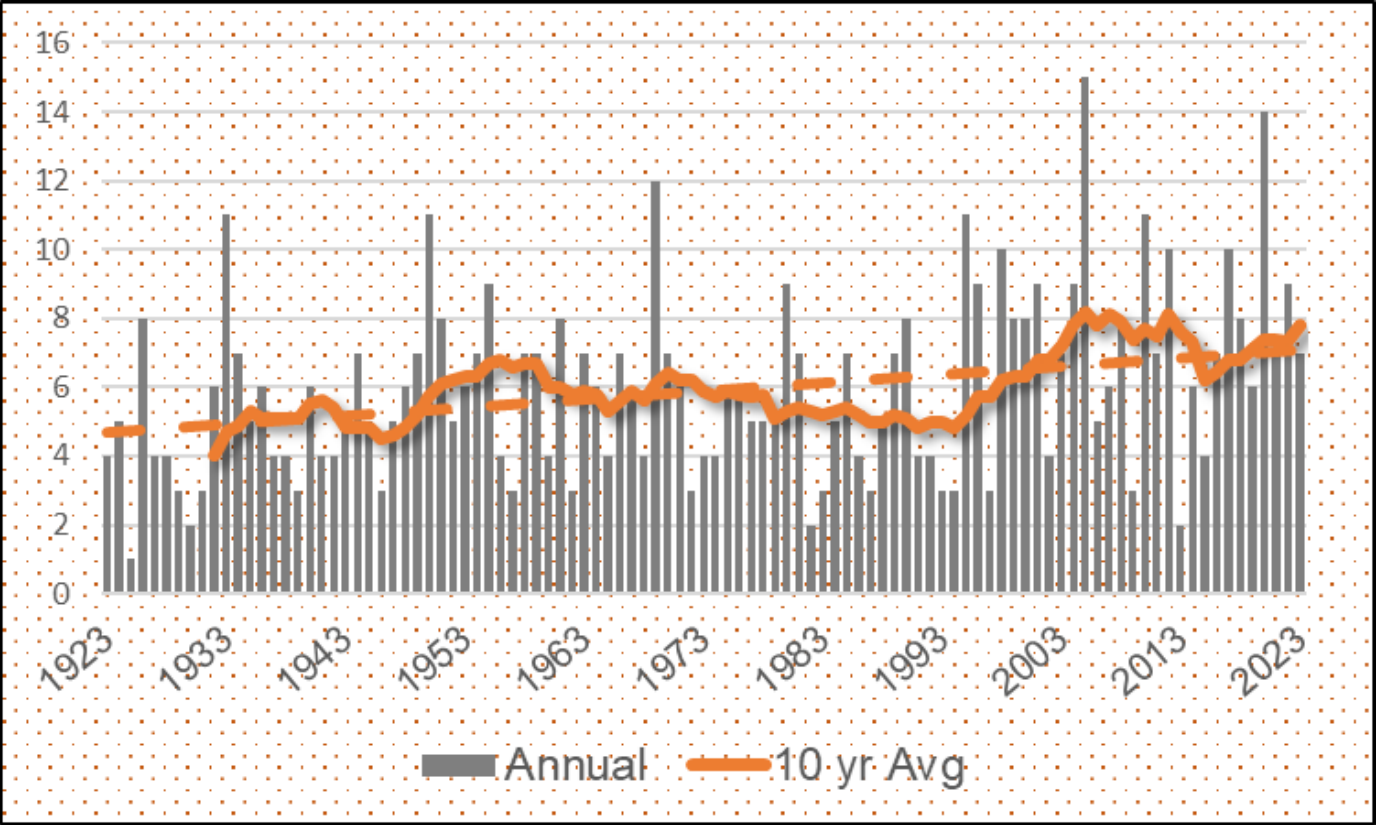# Annual hurricane frequency: Atlantic Ocean vs. Gulf of Mexico
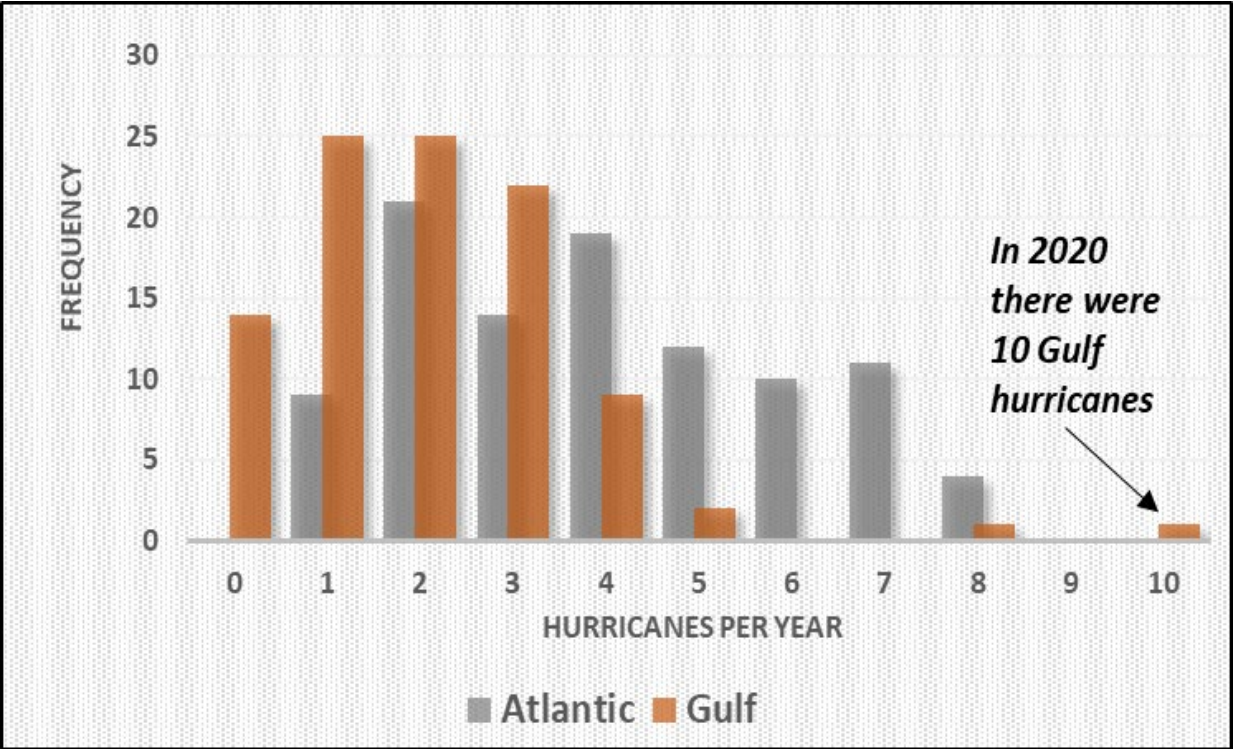
Between the two geographic locations, 398 hurricanes have occurred in the Atlantic Ocean (66%) and 206 have been in the Gulf of Mexico (34%).

2020 stands out because there were ten Gulf hurricanes.

Source: NOAA, GAZ Research
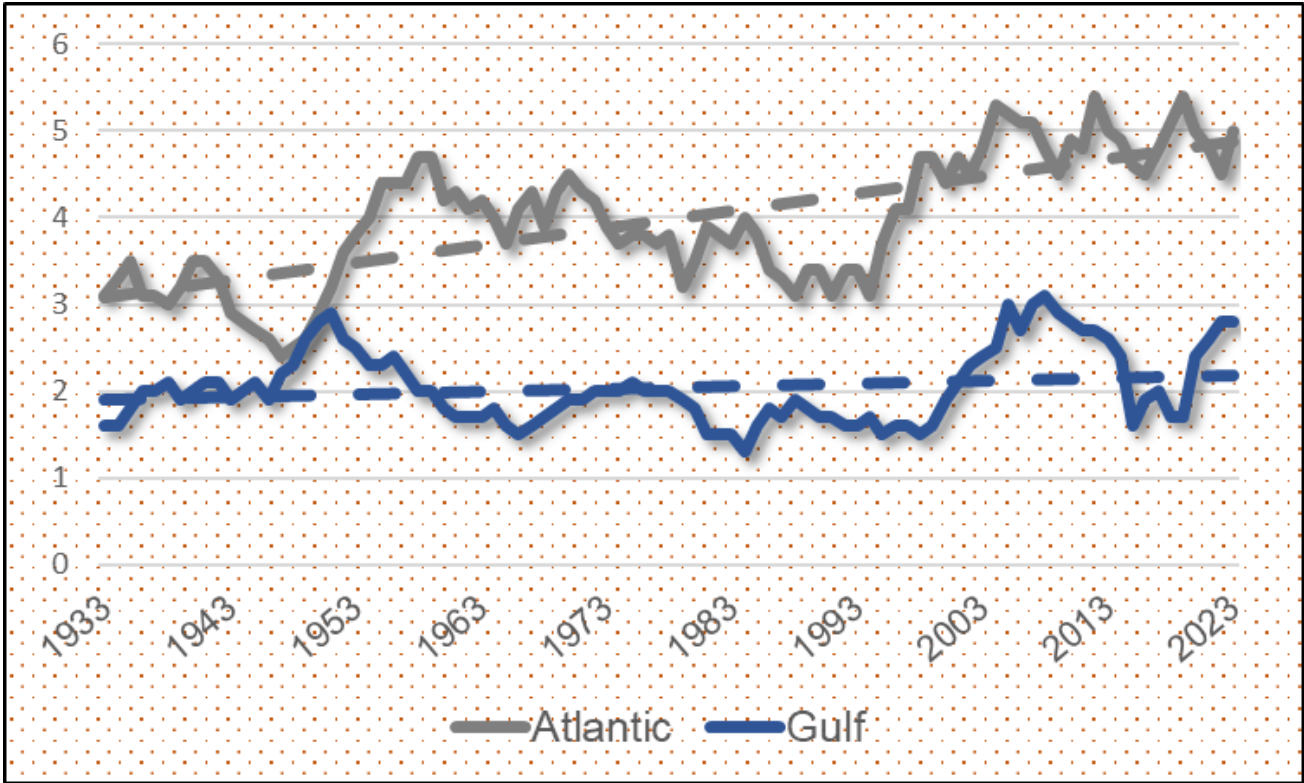
Hurricane trends: Annual vs 10-year average

While the annual number of hurricanes is quite variable, the trend (based on 10-year averages) is clearly UPWARD.

Source: NOAA, GAZ Research

Hurricane trends: Atlantic Ocean vs Gulf of Mexico
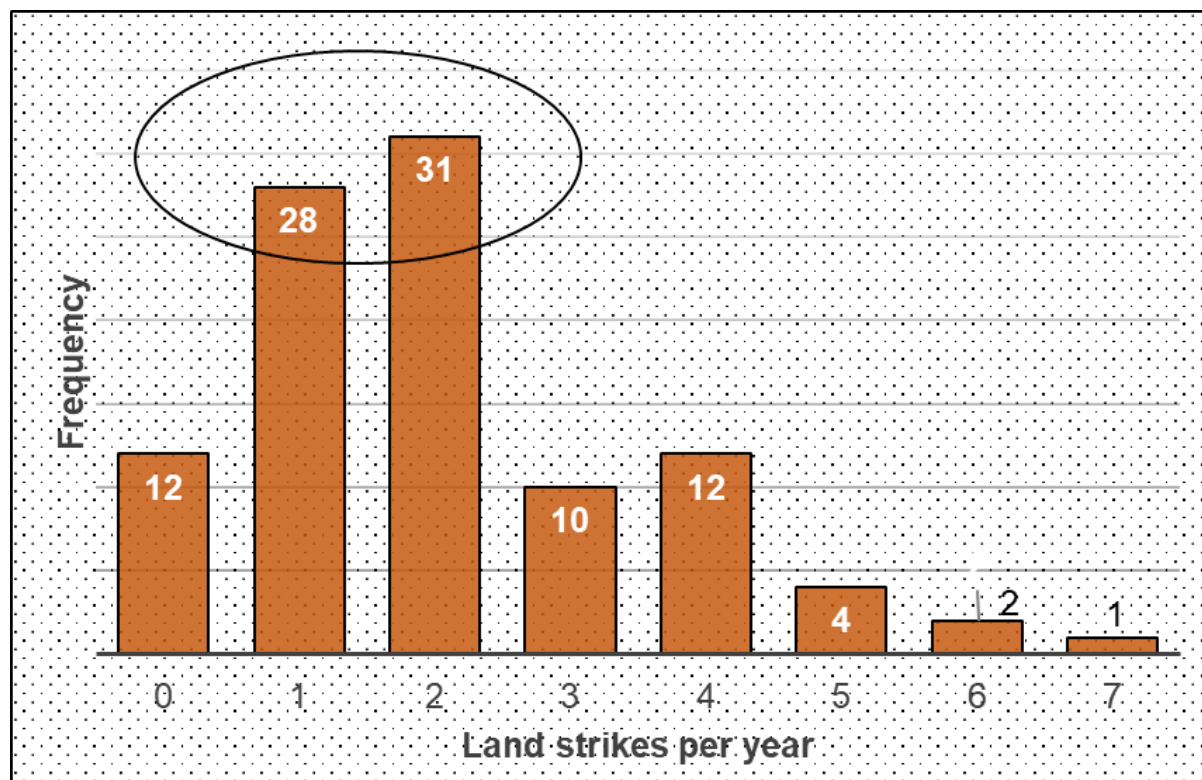
Based on 10-year averages

The hurricane trend in the Atlantic has been rising faster than in the Gulf.

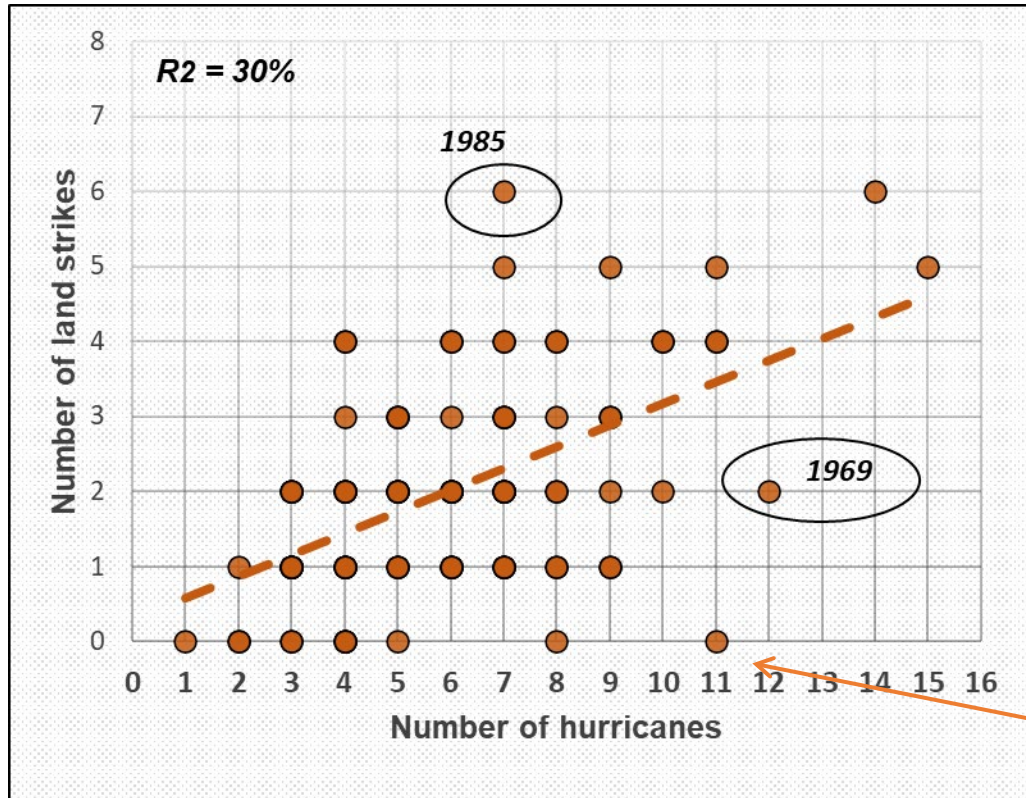Source: NOAA, GAZ Research

Hurricane land strikes per year

Source: NOAA, GAZ Research

Of the 604 hurricanes, 203 (34%) have hit the US mainland (including Puerto Rico, the U.S. Virgin Islands, and the Bahamas).

The most frequent numbers of land strikes are either one or two which happened 28 and 31 times, respectively.

The highest number of land strikes in any year is seven which occurred in 2020.

# Land strikes vs. hurricanes: per year

Source: NOAA, GAZ Research

As you would expect, there are more land strikes in years when there are a greater number of hurricanes. But the relationship is not particularly close (R2=30%).

1985 had six land strikes even though there were only seven storms in total. In 1969 there were 12 hurricanes but only two reached land.

Oddly, in 2010 there were 11 hurricanes, none reached land.

Hurricane and land strike trends

10-year totals
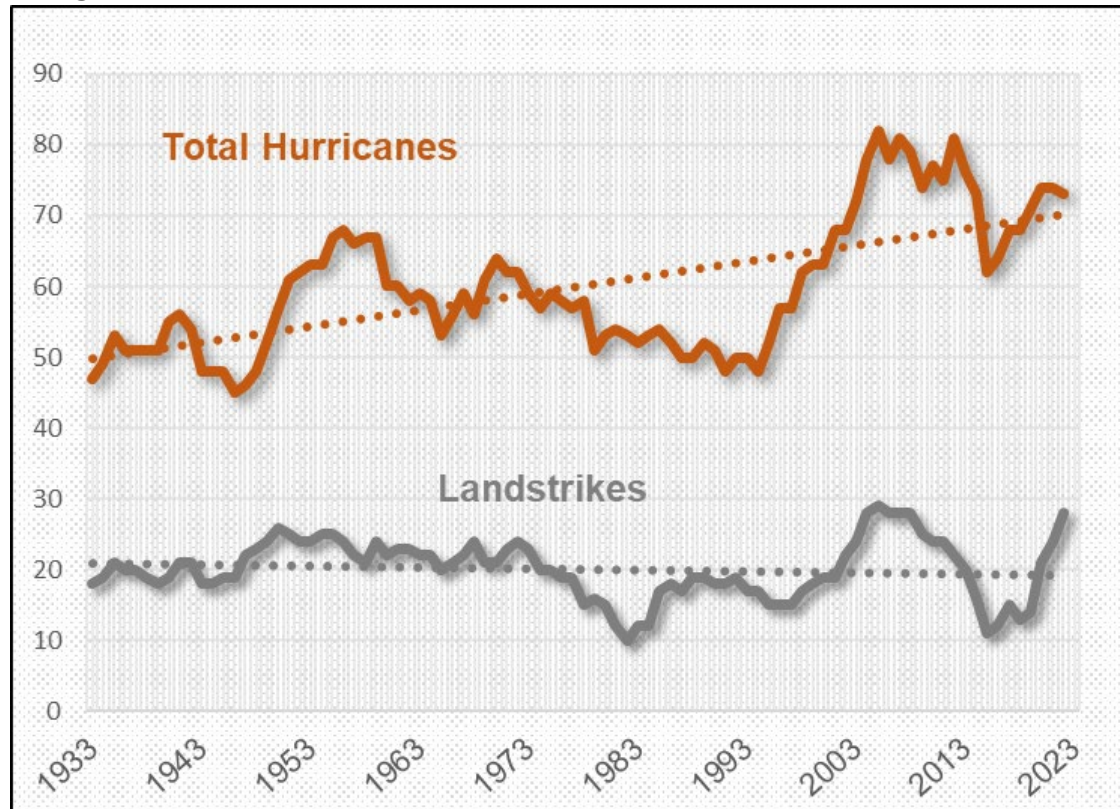
Source: NOAA, GAZ Research

The long-term trend of hurricane frequency has been _upward_ over the last hundred years. But the percentage of land strikes has been declining so the number of strikes has been flat.

Between the two coasts, 21% of Atlantic hurricanes strike land, but 60% in the Gulf.

Land strikes by location

Atlantic Coast	Total	% Strikes	% Hurricanes
Florida (East Coast)	32	16%	5%
North Carolina	23	11%	4%
South Carolina	8	4%	1%
New York	6	3%	1%
Islands (a)	4	2%	1%
Massachusetts	3	1%	0%
Georgia	2	1%	0%
New Jersey	1	0%	0%
Virginia	1	0%	0%
Rhode Island	1	0%	0%
Total Atlantic Coast	**81**	**40%**	**13%**
Gulf Coast			
Florida (West Coast)	53	26%	9%
Texas	33	16%	5%
Louisiana	32	16%	5%
Mississippi	3	1%	0%
Alabama	1	0%	0%
Total Gulf Coast	**121**	60%	20%
Total US	*203*	*100%*	*34%*

40% of all land strikes have been in the Atlantic, while 60% are in the Gulf.

Florida, with two coasts, leads the pack (85), followed by Texas and Louisiana.

Source: NOAA, GAZ Research

Hurricanes by category

Ranking criteria: Saffir-Simpson Scale

| Category	Pressure (MB)	Winds (MPH)	Last 100 years	
			Number	%
Hurricane 1	>980	74-95	227	38%
Hurricane 2	965-980	96-110	123	20%
Subtotal			**350**	**58%**
Major				
Hurricane 3	945-965	111-130	108	18%
Hurricane 4	920-945	131-155	106	18%
Hurricane 5	<920	>155	40	7%
Subtotal			**254**	**42%**
Total			**604**	**100%**

Source: NOAA, GAZ Research

By category, 254, or 42% of the total have been "major" which is Categories 3-5 on the Saffir-Simpson scale.

The annual percentage of "major" hurricanes has remained relatively constant over the period, as seen in the next slide.

Major and total hurricane trends
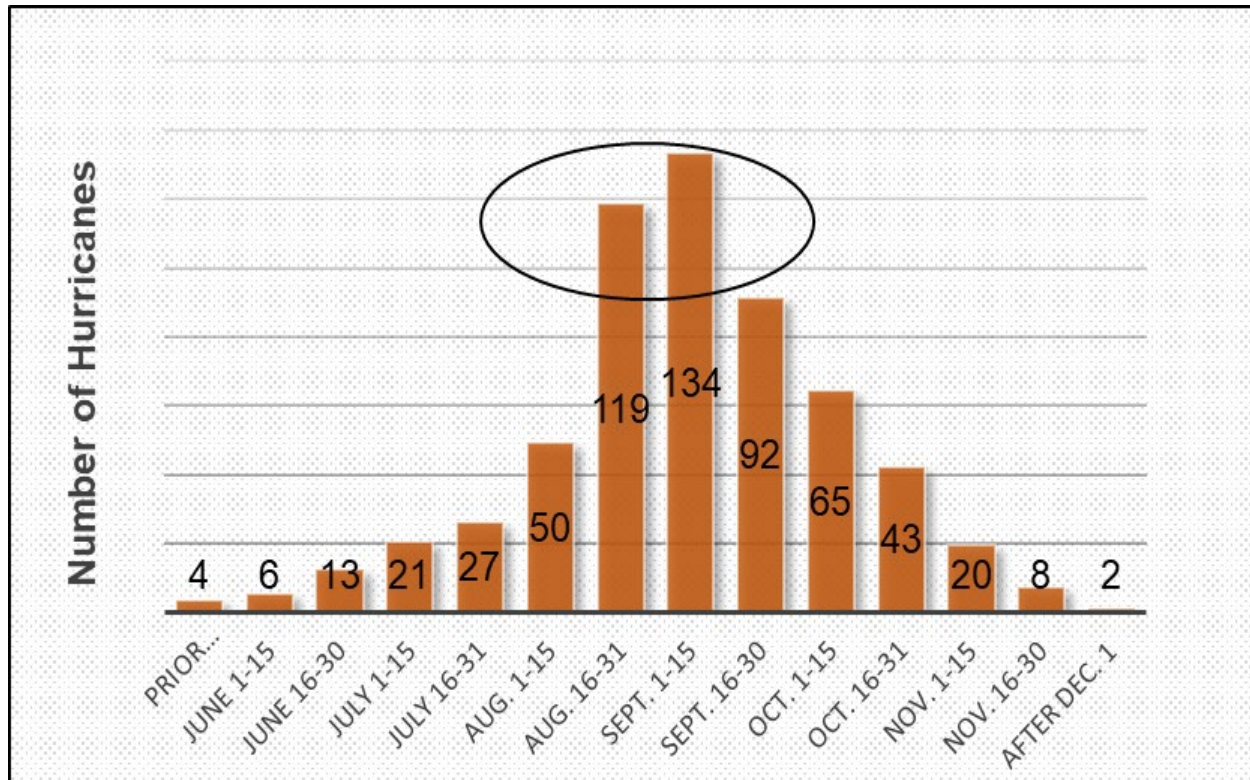
Based on 10-year totals
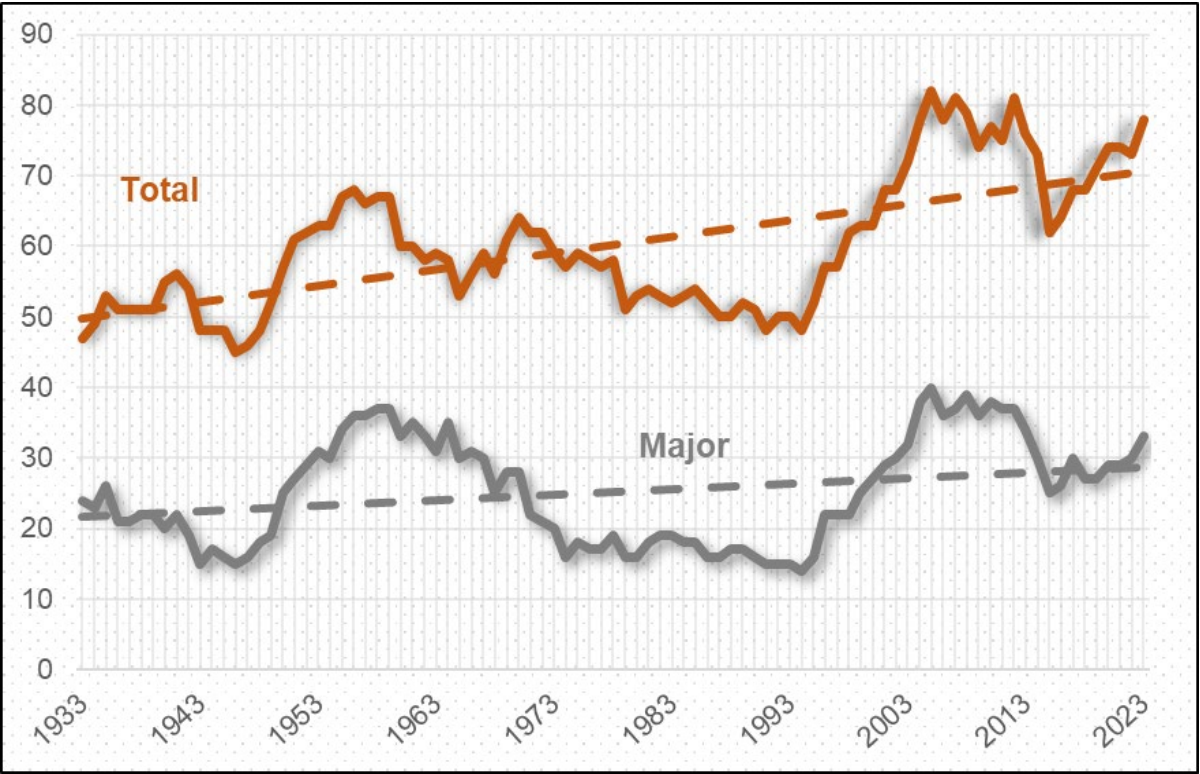
Source: NOAA, GAZ Research

The "major" and total hurricanes trends are roughly the same.

This runs counter to comments suggesting the intensity of hurricanes is increasing.

Hurricanes by date of formation

Source: NOAA, GAZ Research

While June 1 is the official start of the Atlantic hurricane season, historically June and July have not been particularly troublesome months. The real action (and therefore the risk) typically begins around the middle of August and continues into September and October.

Only 71 hurricanes (12% of the total) have occurred before the end of July.

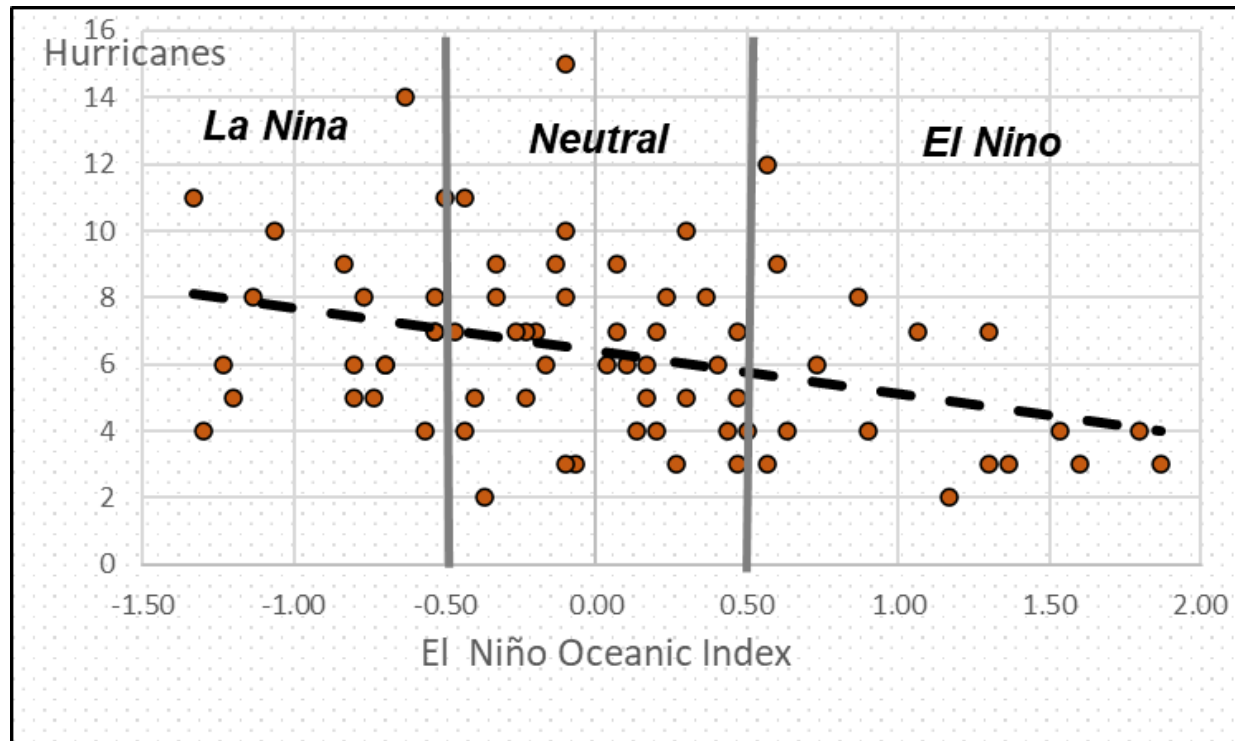# Hurricane intensity by date of formation
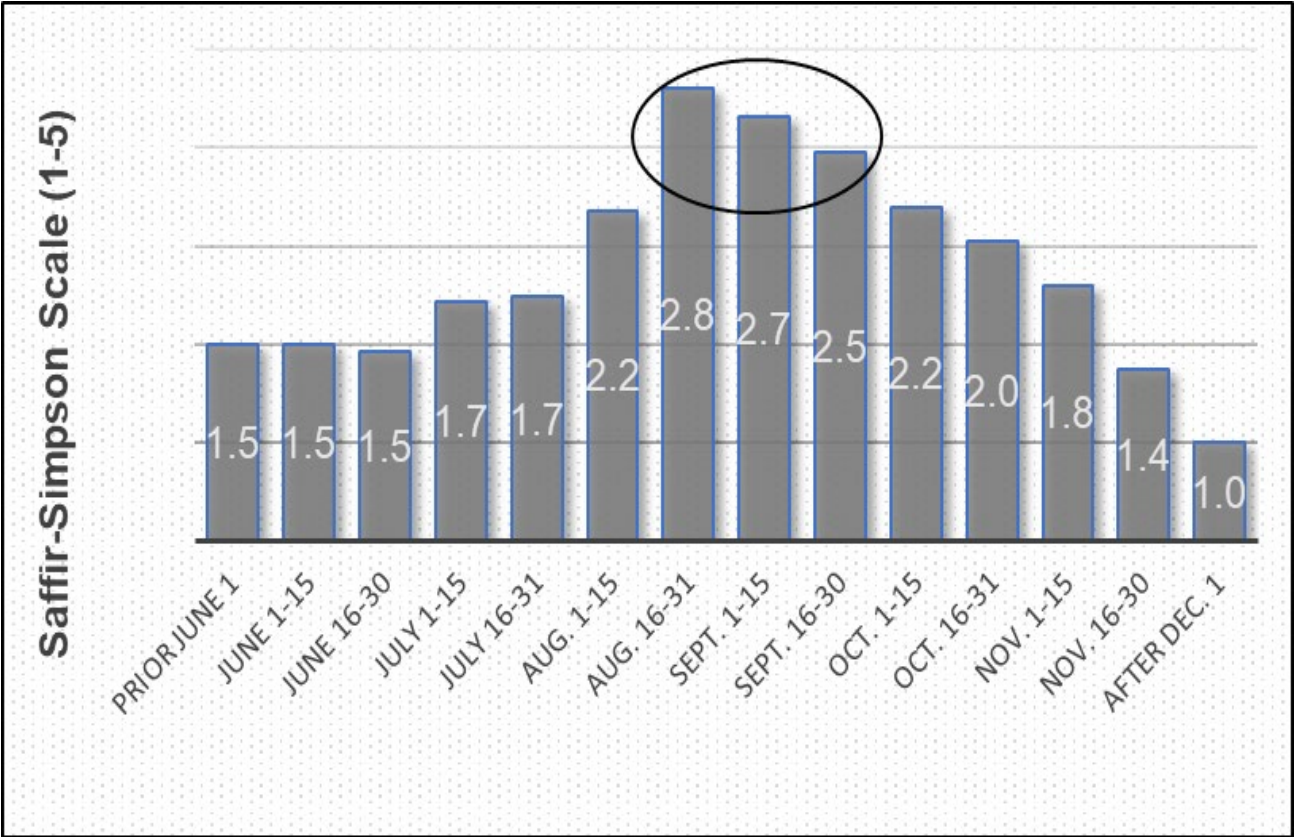
Source: NOAA, GAZ Research

The August-September hurricanes are also more intense.

The average intensity for the storms prior to August is 1.58 on the Saffir-Simpson scale The August-September average is 2.53. Post September the intensity average is 1.68.

The overall average is 2.35.

More hurricanes when La Niña is present

Source: NOAA, GAZ Research

This graph plots NOAA's El Niño Oceanic Index against hurricane numbers in a year. La Niña is present when the index is below -.50 (left side of the chart) while above .50 indicates El Niño. The index is neutral when transitioning from one phase to the other.
NOAA currently puts the odds of having La Niña present from August-October at over 80%.

NCEI Loss Events Greater Than $1.0 Billion: 1980-2023

	Cumulative losses ($ Bil.)	%	Number of events #	%	Largest Loss	Average Loss
Hurricanes	$1,379	52%	62	16%	$195	$22
Severe storms	$455	17%	186	49%	$14	$2
Drought	$353	13%	31	8%	$53	$11
Flooding	$197	7%	44	12%	$45	$4
Wildfires	$142	5%	22	6%	$29	$6
Winter storms	$98	4%	22	6%	$27	$4
Freezes	$36	1%	9	2%	$8	$4
Total	$2,661	100%	376	100%		

Source: National Centers for Environmental Information (NCEI), GAZ Research

Hurricanes have caused the largest losses among the natural catastrophe categories.

Hurricanes losses have the potential to be quite large while severe storms (chiefly tornadoes and hail) which cause the largest number of events have lower severity.

NCEI Hurricane Losses by Category: 1980-2023

Category	Loss Events	Hurricane Land Strikes		Losses		Average Loss
		Number	%Which Cause Loss	$ Billion	% Total	
Cat 1	8	34	24%	$20	1%	$3
Cat 2	2	8	25%	$10	1%	$5
Cat 3	10	13	77%	$154	11%	$15
Cat 4	17	19	89%	$436	32%	$26
Cat 5	14	16	88%	$713	52%	$51
Subtotal	**51**	**90**	**57%**	**$1,334**	**97%**	**$26**
Tropical storms	9			$34	2%	$4
Pacific hurricanes	2			$11	1%	$6
Total	**62**			**$1,379**	**100%**	**$22**

Source: NCEI, NOAA, GAZ Research

Most of the largest losses come from Category 4 and 5 hurricanes.
If a Category 4 or 5 hurricane makes landfall it will almost always cause a loss of at least $1 billion; 31 of the 35 hurricanes in those two categories reached that threshold.

Largest insured hurricane losses (in current $)

None come close to Katrina

Ian now in 2d place

Only Sandy below Cat 4, hit NY NJ

Based on economic losses, Harvey ranks 2d. Uninsured flood damage.

Source: Insurance Information Institute, NOAA, GAZ Research
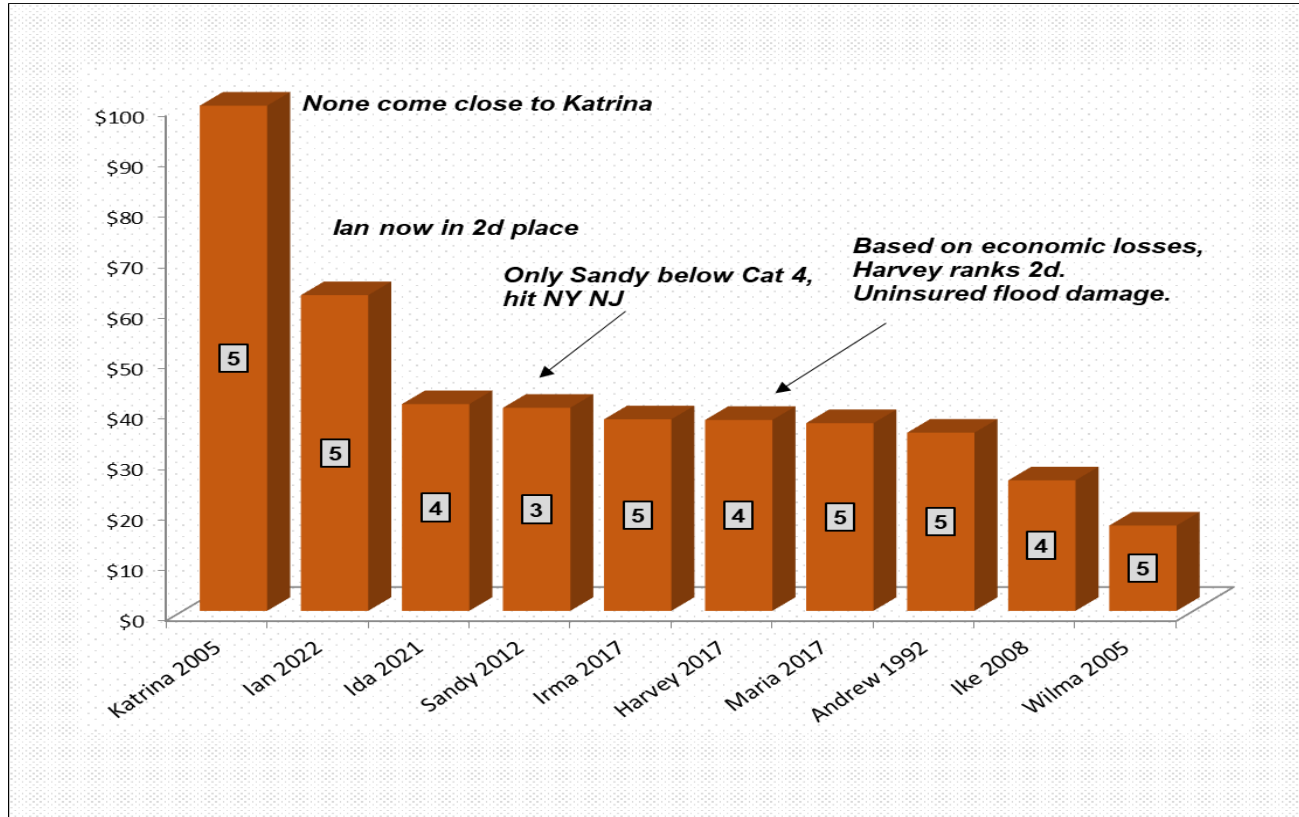
When you look at the hurricanes that have caused the largest losses one point stands out - they strike heavily populated locations. Katrina and Harvey struck major cities (New Orleans and Houston). Ian hit the heavily populated west coast of Florida, while Ida and Sandy recorded most of their losses in the Northeast, particularly New Jersey and New York.

GAZ Research

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THANK YOU

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