



## Tropical Cyclone Climatology

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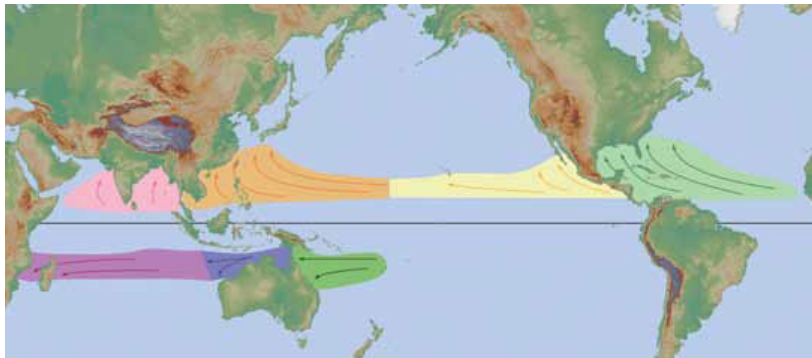
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### Overview

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has a closed low-level circulation. Tropical cyclones rotate counterclockwise in the Northern Hemisphere. They are classified as follows:

- **Tropical Depression:** A tropical cyclone with maximum sustained winds of 38 mph (33 knots) or less.
- **Tropical Storm:** A tropical cyclone with maximum sustained winds of 39 to 73 mph (34 to 63 knots).
- **Hurricane:** A tropical cyclone with maximum sustained winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.
- **Major Hurricane:** A tropical cyclone with maximum sustained winds of 111 mph (96 knots) or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale.

Tropical cyclones forming between 5 and 30 degrees North latitude typically move toward the west. Sometimes the winds in the middle and upper levels of the atmosphere change and steer the cyclone toward the north and northwest. When tropical cyclones reach latitudes near 30 degrees North, they often move northeast.



Tropical Cyclone formation regions with mean tracks (courtesy of the [NWS JetStream Online School](#))

### Atlantic & Eastern Pacific Climatology

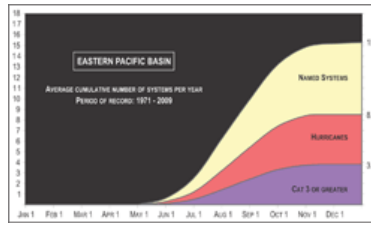
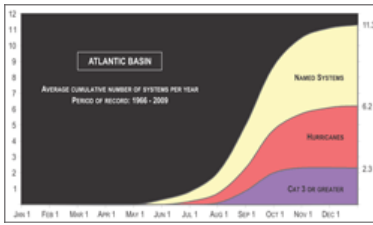
The Atlantic hurricane season runs from June 1st to November 30th, and the Eastern Pacific hurricane season runs from May 15th to November 30th. The Atlantic basin includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The Eastern Pacific basin extends to 140°W.

The following figures and tables describe the progress of a typical hurricane season in terms of the total number of tropical systems and hurricanes produced throughout the year in the Atlantic and East Pacific basins.

In the figures, curves represent the average cumulative production of all named tropical systems, all hurricanes, and those hurricanes which were [Category 3](#) or stronger in those basins.

For example, by the beginning of September in an average year we would expect to have had four named systems, two of which would be hurricanes and one of which would be of category 3 or greater in strength.

The tables list benchmark dates when a given number of tropical systems, hurricanes, or category 3 storms should have been generated.



The average cumulative number of Atlantic systems per year, 1966-2009 The average cumulative number of Eastern Pacific systems per year, 1971-2009

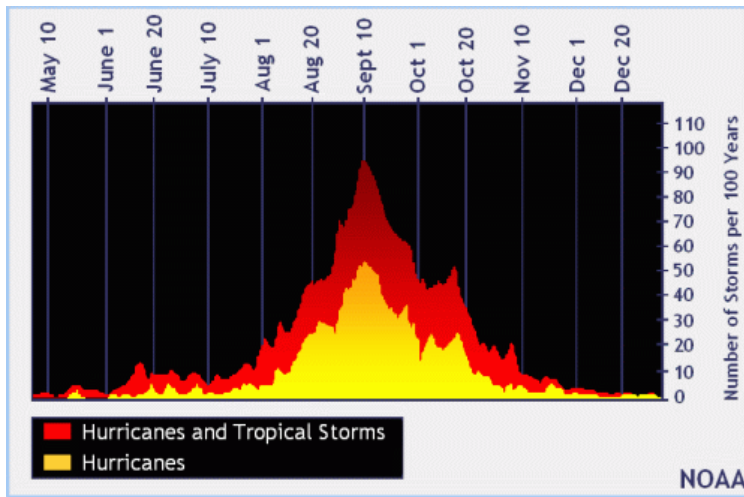
**Table 1.** Progress of the average Atlantic season (1966-2009). Date upon which the following number of events would normally have occurred.

Number	Named systems	Hurricanes	Category 3 or greater
1	July 9	Aug 10	Sep 4
2	Aug 1	Aug 28	Oct 3
3	Aug 13	Sep 9	-
4	Aug 23	Sep 21	-
5	Aug 31	Oct 7	-
6	Sep 8	Nov 23	-
7	Sep 16	-	-
8	Sep 24	-	-
9	Oct 4	-	-
10	Oct 19	-	-
11	Nov 23	-	-

**Table 2.** Progress of the average eastern Pacific season (1971-2009). Date upon which the following number of events would normally have occurred.

Number	Named systems	Hurricanes	Category 3 or greater
1	June 10	June 26	July 19
2	June 25	July 14	Aug 19
3	July 5	July 29	Sep 20
4	July 14	Aug 12	-
5	July 22	Aug 26	-
6	July 30	Sep 9	-
7	Aug 7	Sep 24	-
8	Aug 15	Oct 15	-
9	Aug 24	-	-
10	Sep 1	-	-
11	Sep 10	-	-
12	Sep 19	-	-
13	Sep 28	-	-
14	Oct 11	-	-
15	Nov 5	-	-

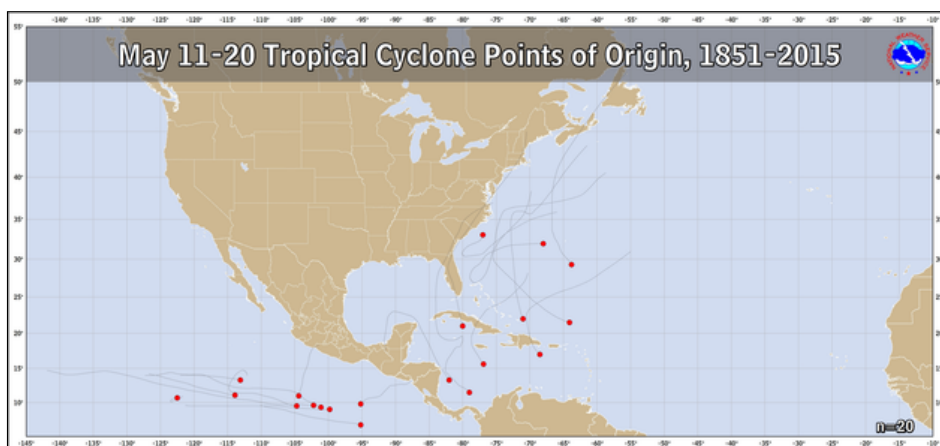
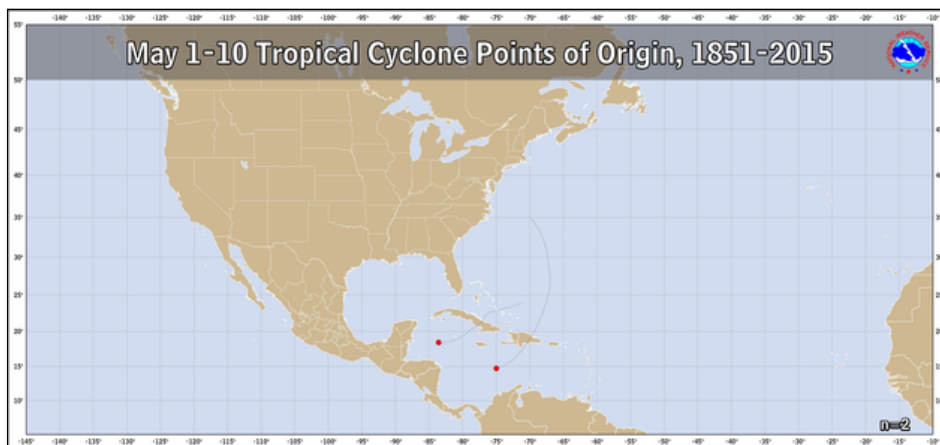
### Number of Tropical Cyclones per 100 Years

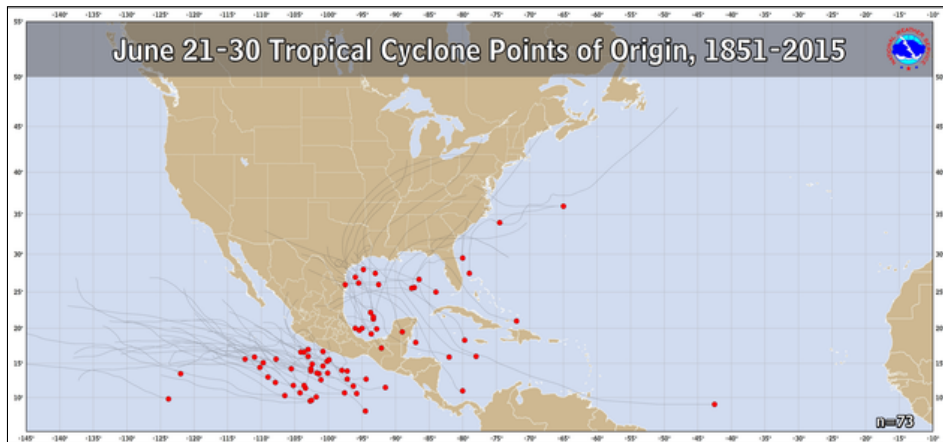
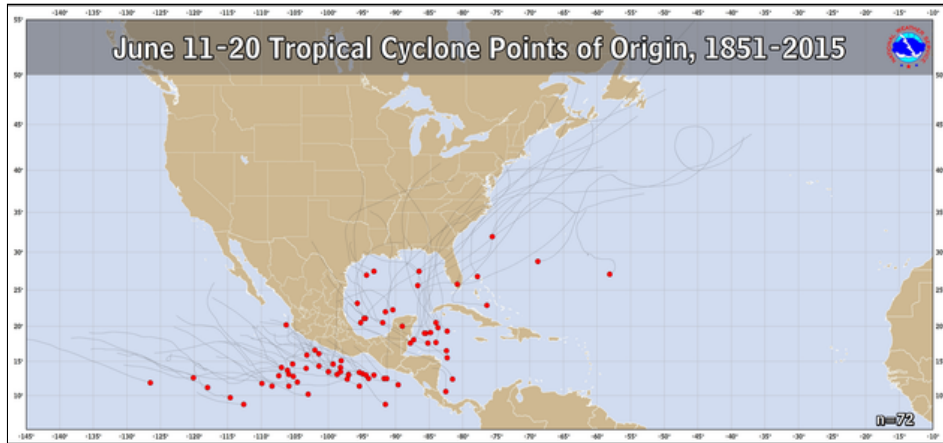
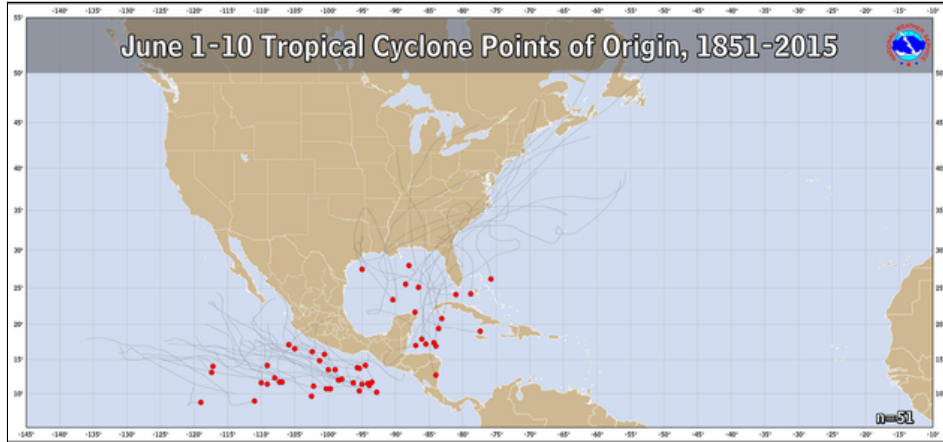
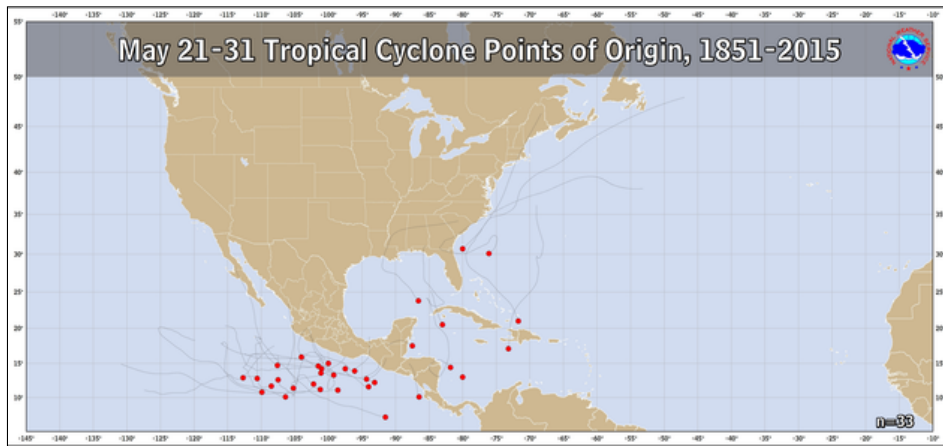


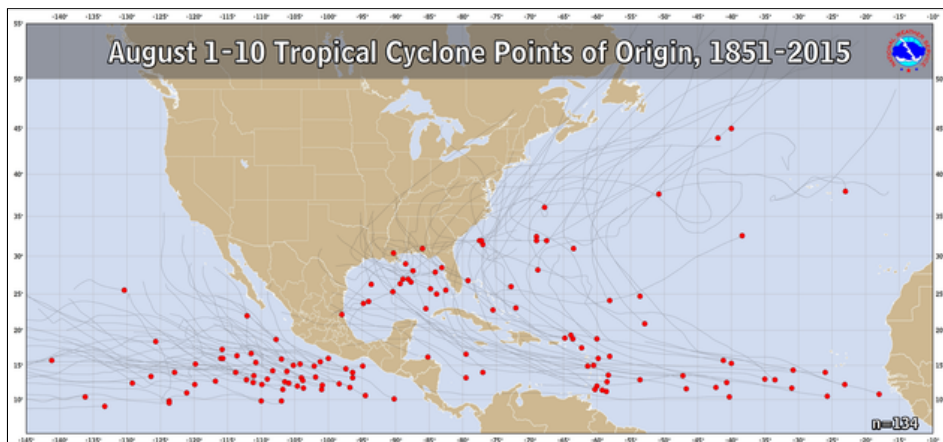
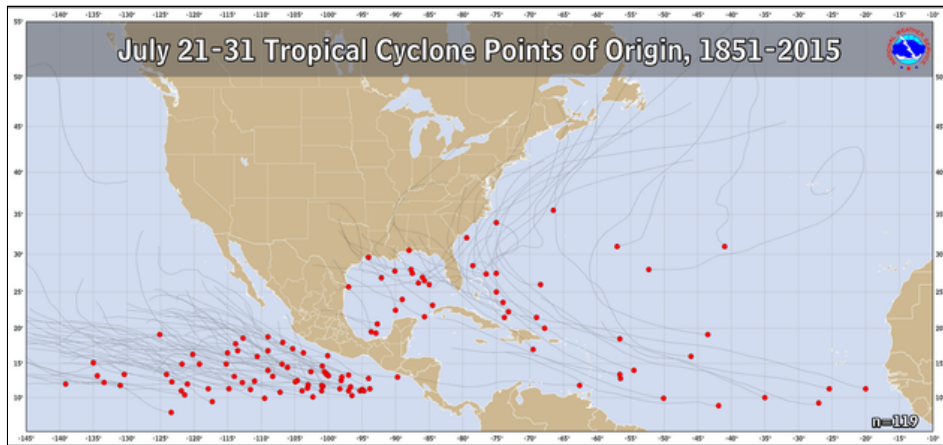
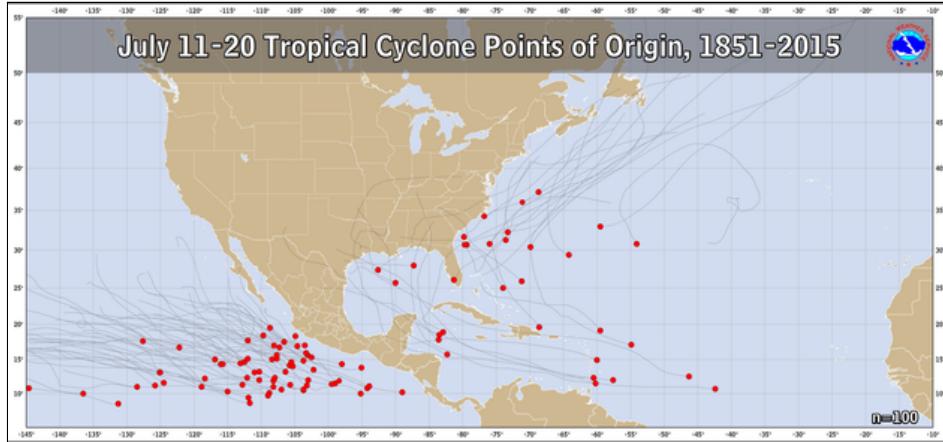
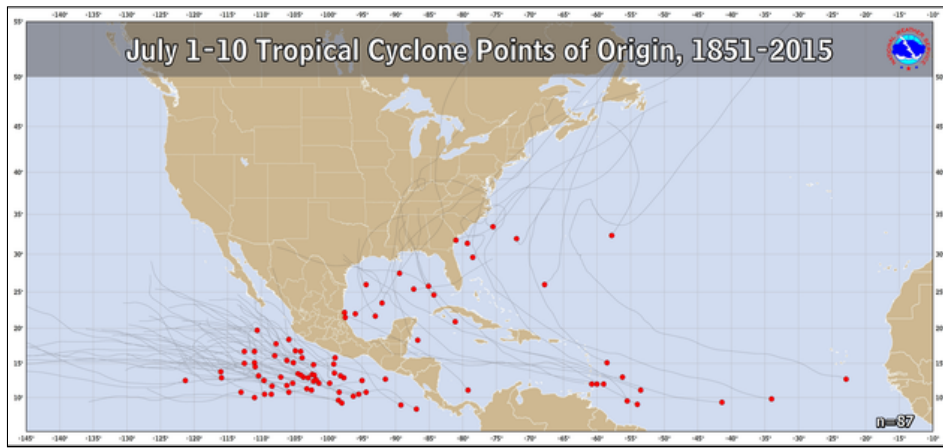
The official hurricane season for the Atlantic Basin (the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico) is from 1 June to 30 November. As seen in the graph above, the peak of the season is from mid-August to late October. However, deadly hurricanes can occur anytime in the hurricane season.

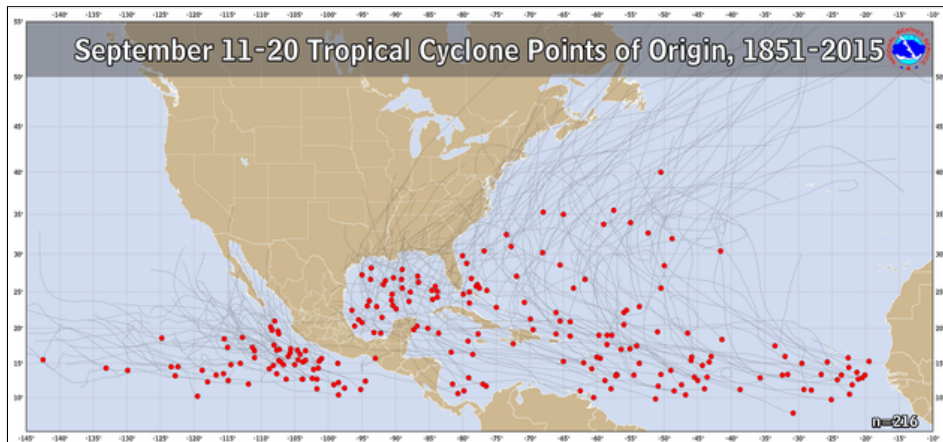
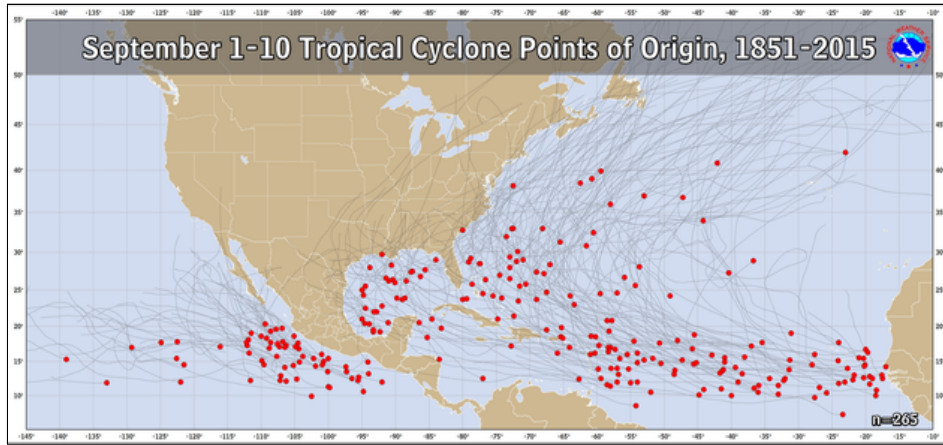
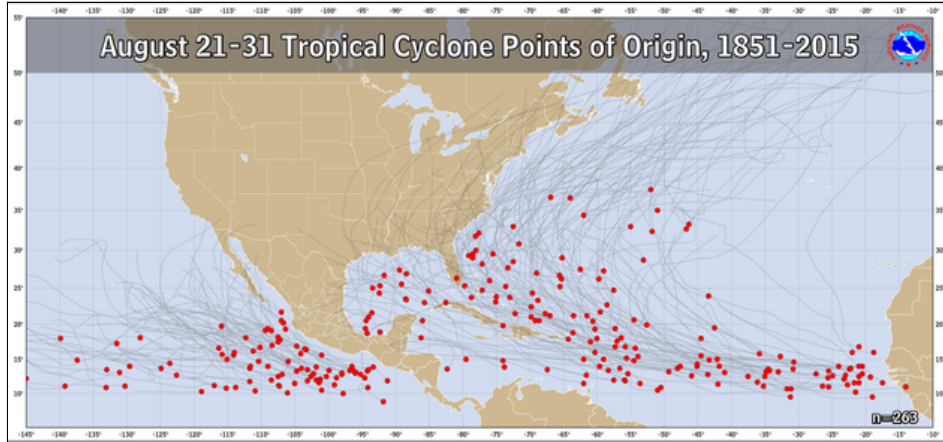
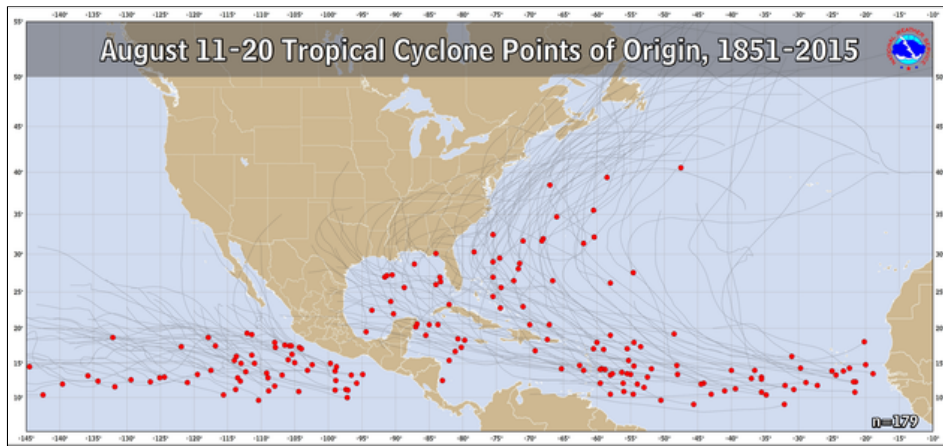
### Points of Origin by 10-Day Period

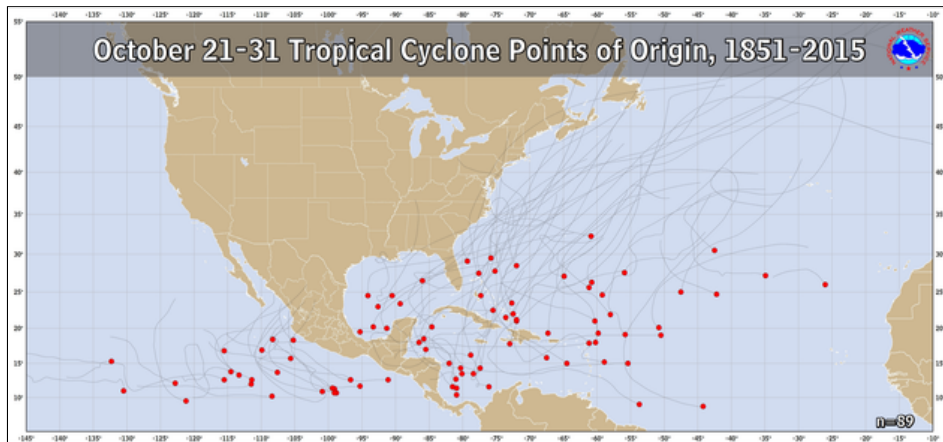
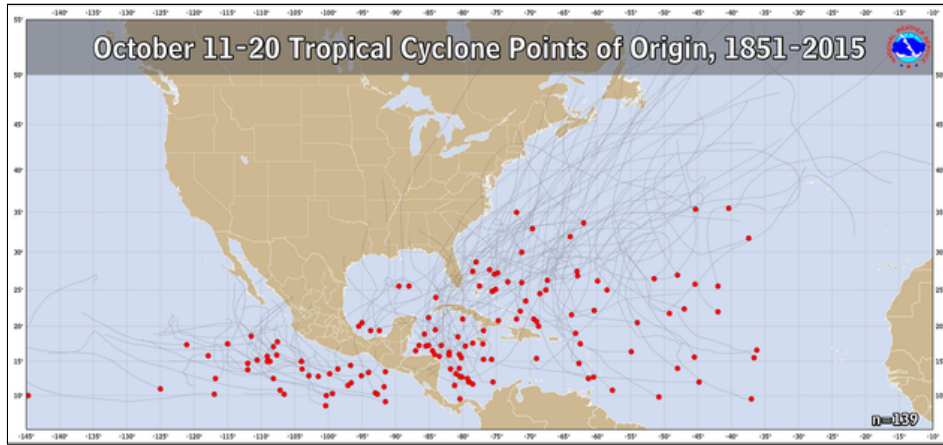
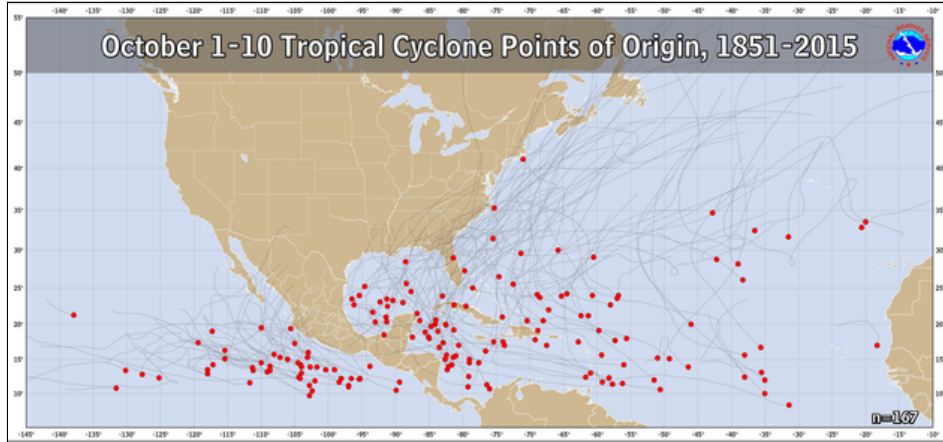
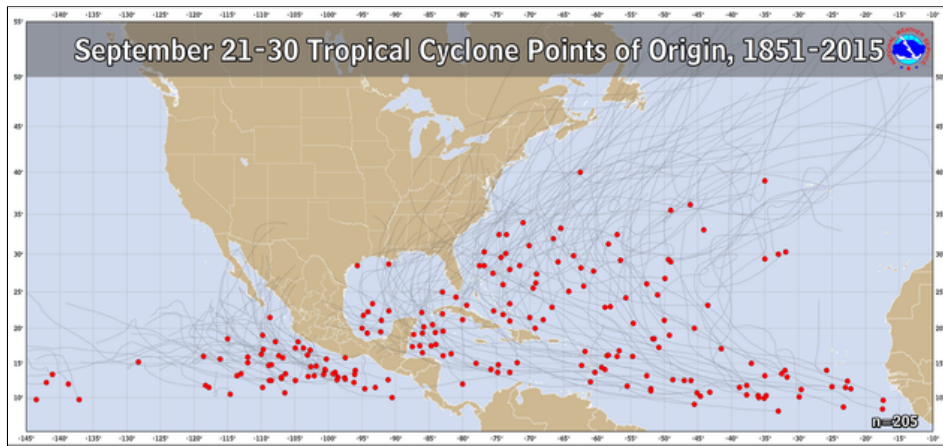
The figures below show the points of tropical cyclone genesis by 10-day periods during the hurricane season. These figures depict named storms only. The source years include 1851-2015 for the Atlantic and 1949-2015 for the Eastern Pacific from [the HURDAT database](#).

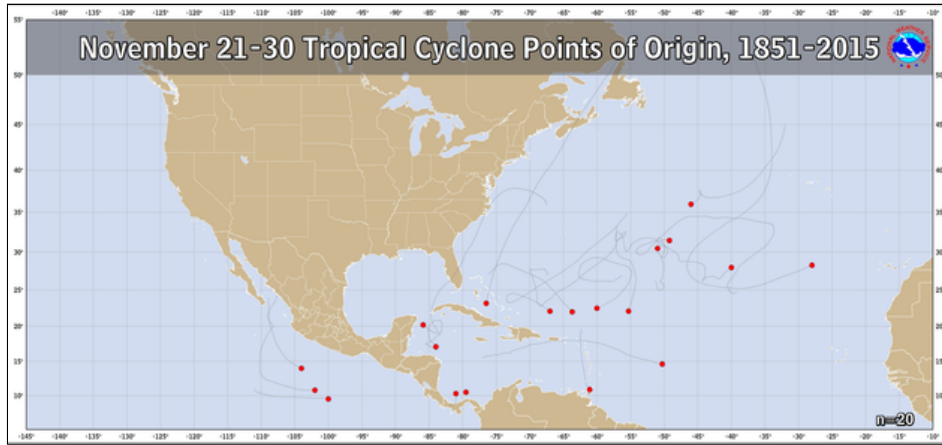
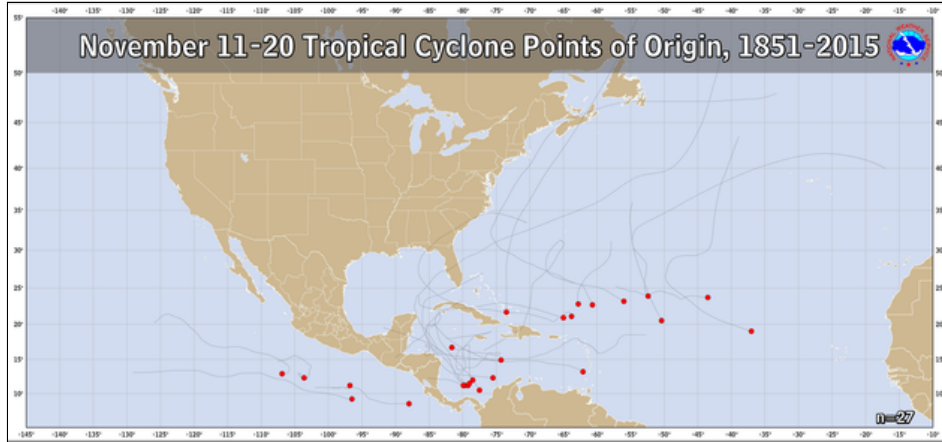
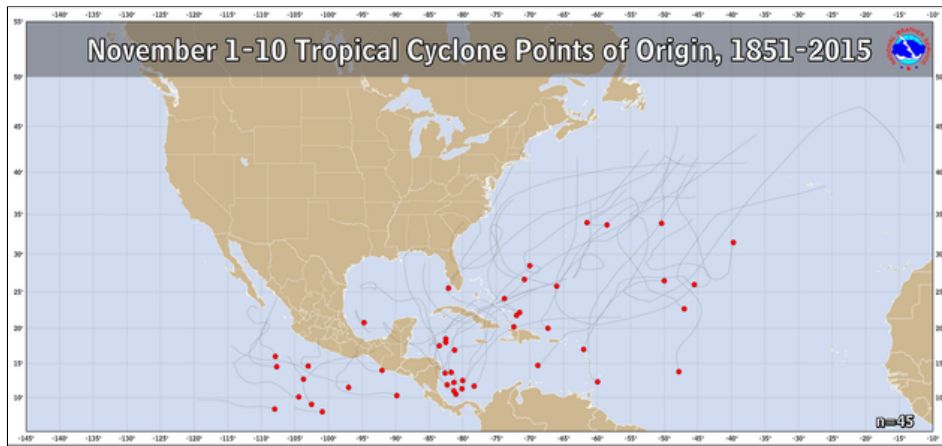








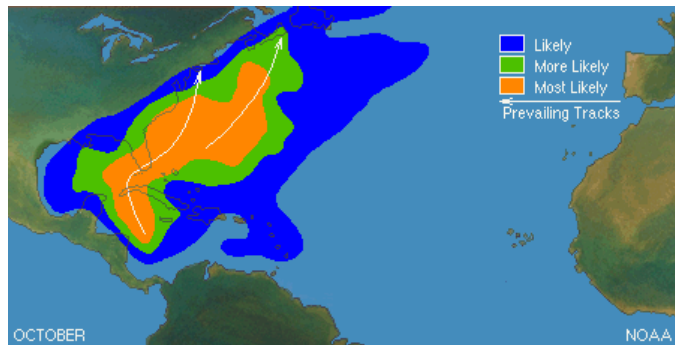
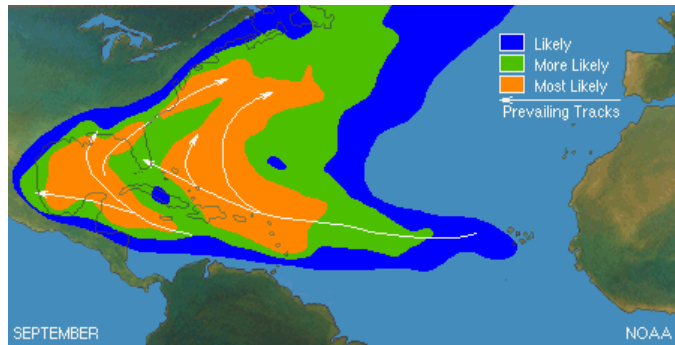
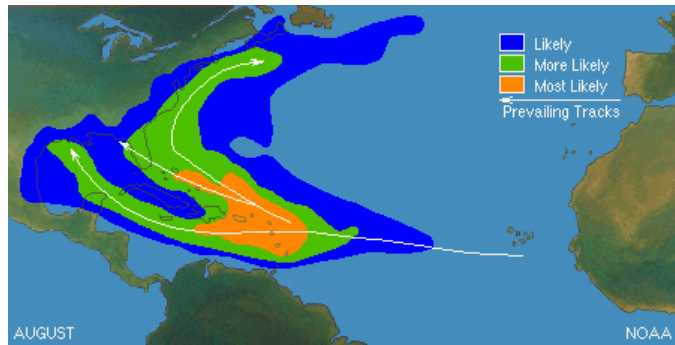
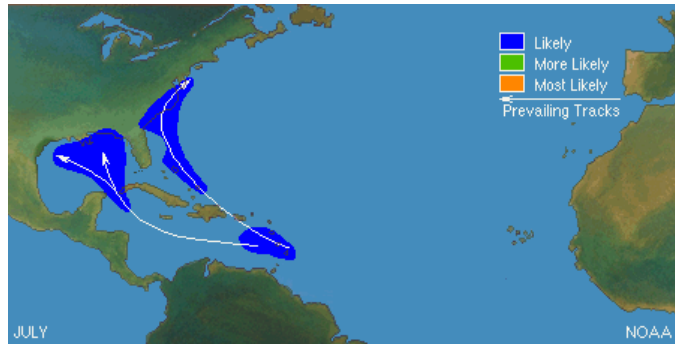
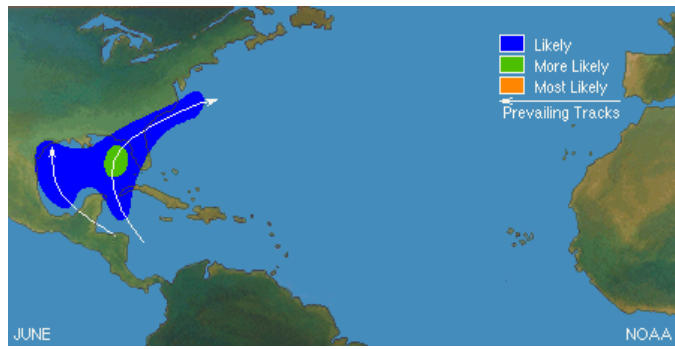


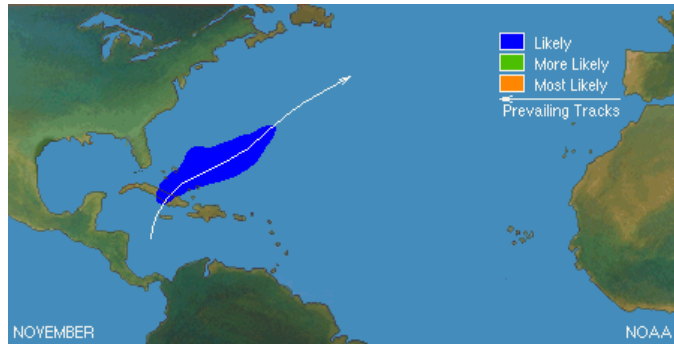


### Climatological Areas of Origin and Typical Hurricane Tracks by Month

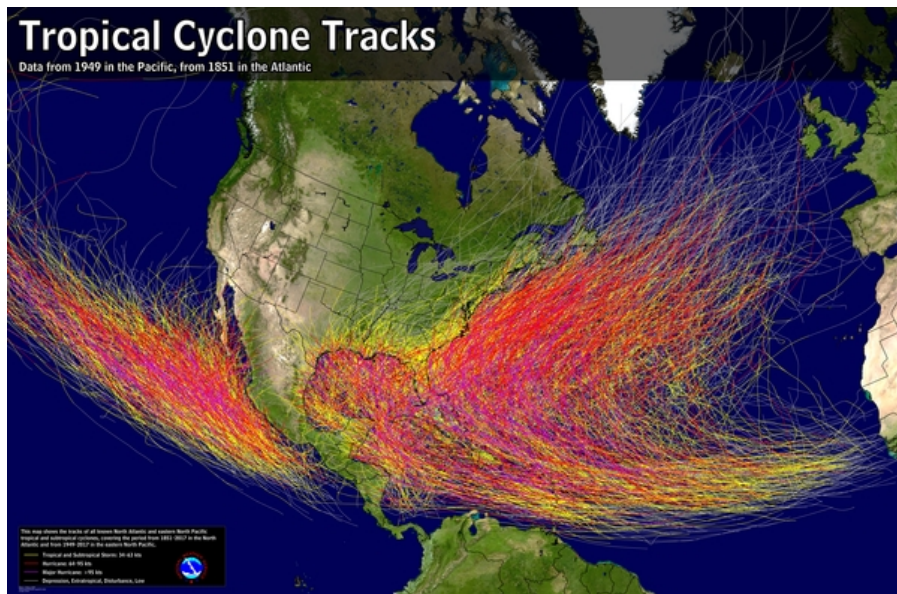
The figures below show the zones of origin and tracks for different months during the hurricane season. These figures only depict average conditions. **Hurricanes can originate in different locations and travel much different paths from the average.** Nonetheless, having a sense of the general pattern can give you a better picture of the average hurricane season for your area.







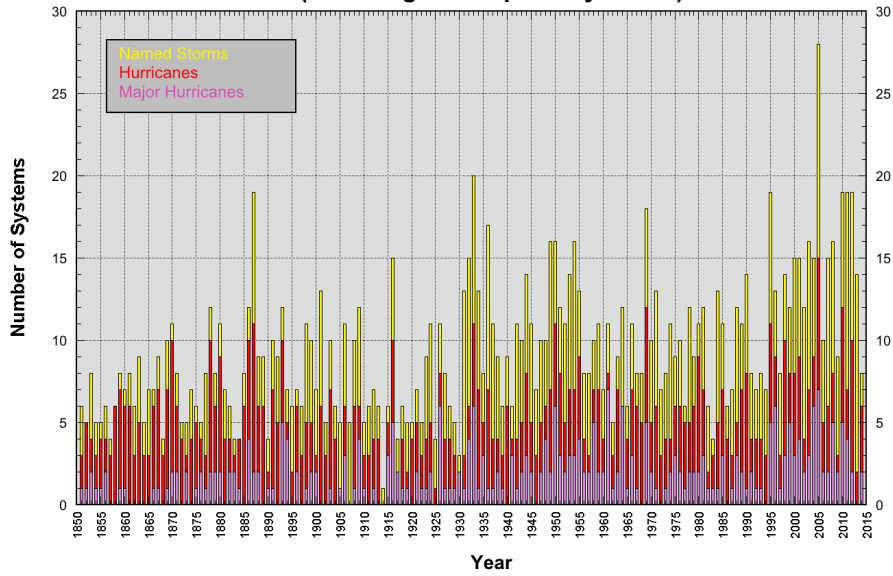
## High Resolution History Maps



All North Atlantic and Eastern North Pacific tropical cyclones

## Named Cyclones by Year

## Atlantic Basin Storm Count (Including Subtropical Cyclones)



Bars depict number of named systems (yellow), hurricanes (red), and category 3 or greater (purple), 1850-2014

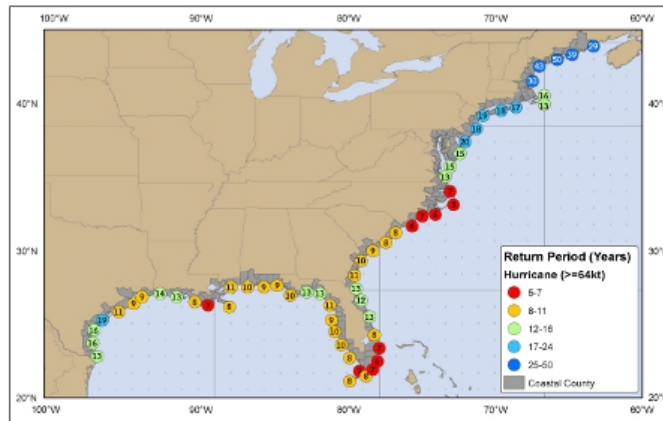
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[Download table of data \(PDF\)](#)

### Hurricane Return Periods

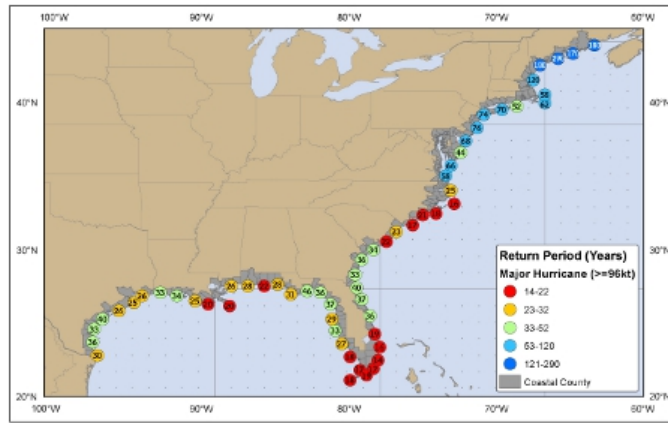
Hurricane return periods are the frequency at which a certain intensity of hurricane can be expected within a given distance of a given location (for the below images 50 nm or 58 statute miles). In simpler terms, a return period of 20 years for a major hurricane means that *on average* during the previous 100 years, a Category 3 or greater hurricane passed within 50 nm (58 miles) of that location about five times. We would then expect, *on average*, an additional five Category 3 or greater hurricanes within that radius over the next 100 years.

More information on return periods can be found from [NOAA Technical Memorandum NWS NHC 38 \(pdf\)](#) on the NHC Risk Analysis Program (HURISK).

Note: *The information on return period is generated with the 1987 HURISK program, but uses data through 2010.*



Estimated return period in years for hurricanes passing  
within 50 nautical miles of various locations on the U.S. Coast



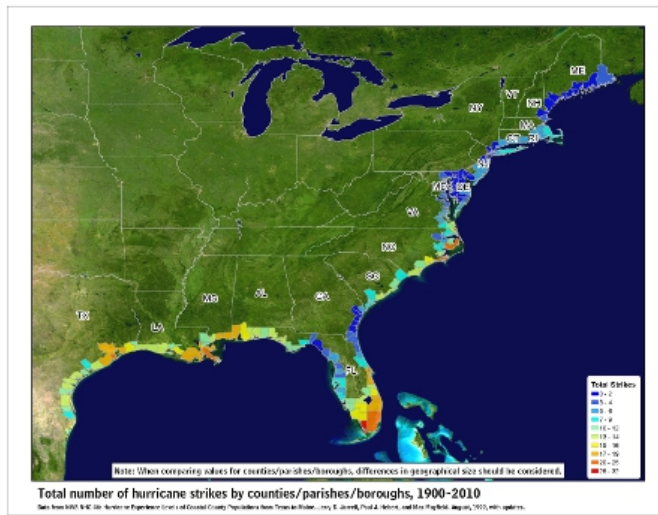
Estimated return period in years for major hurricanes passing within 50 nautical miles of various locations on the U.S. Coast

### CONUS Hurricane Strikes

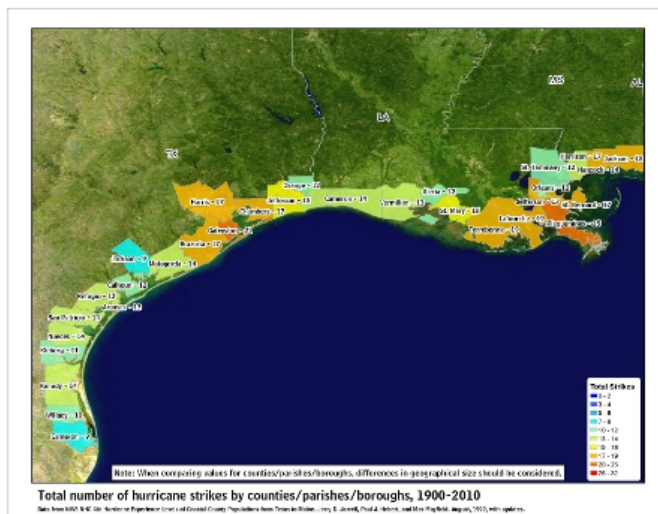


1950-2017 CONUS Hurricane Strikes (Courtesy of NCEI)

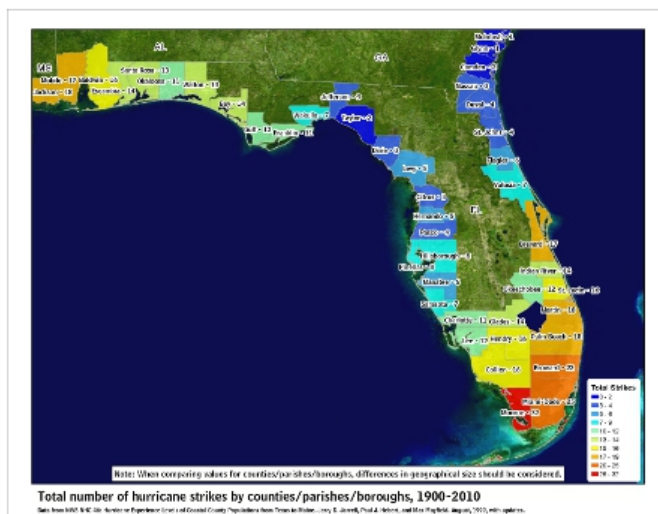
### CONUS Hurricane Strike Density (county maps)



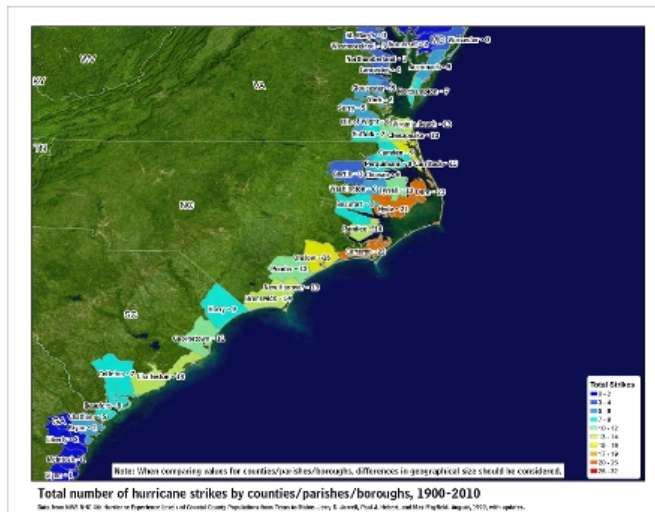
1900-2010 U.S. Hurricane Strikes



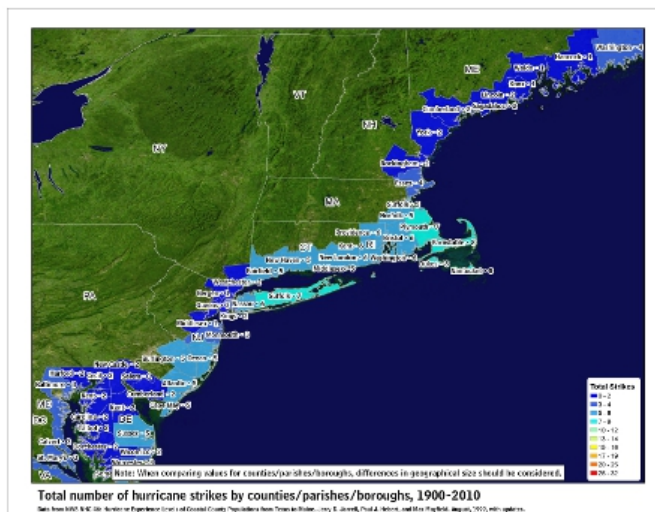
1900-2010 U.S. Hurricane Strikes - West Gulf



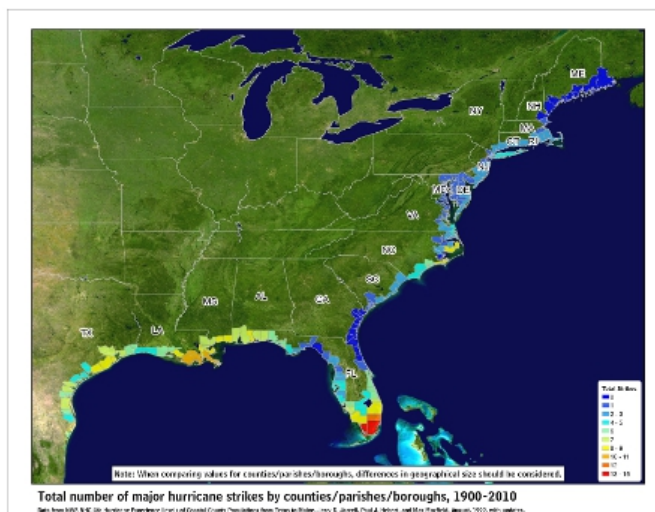
1900-2010 U.S. Hurricane Strikes - East Gulf



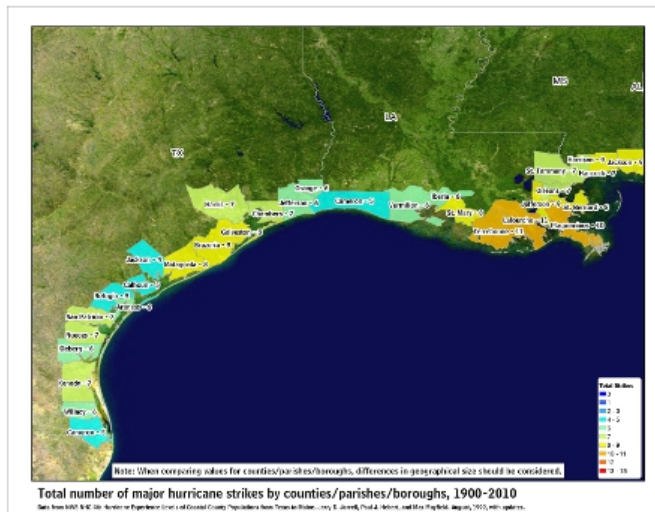
1900-2010 U.S. Hurricane Strikes - Southeast



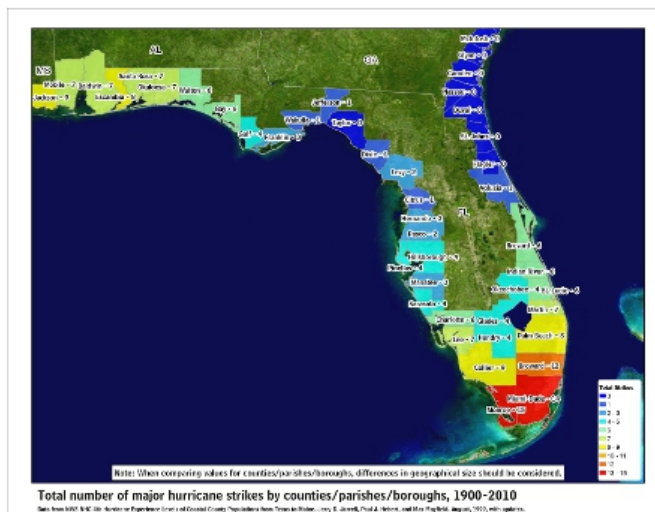
1900-2010 U.S. Hurricane Strikes - Northeast



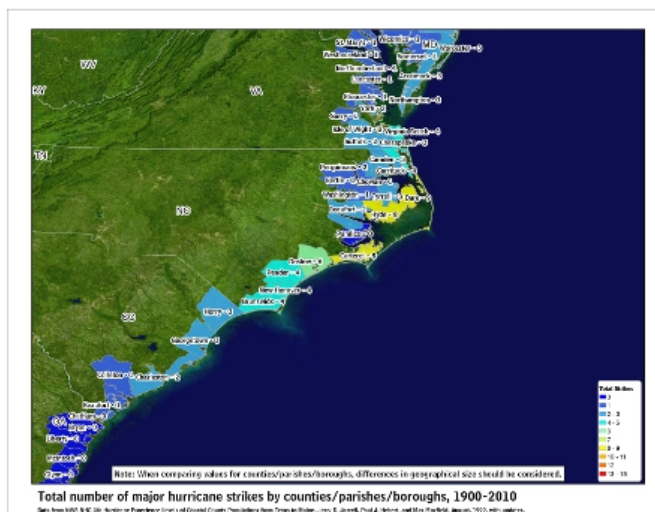
1900-2010 U.S. Major Hurricane Strikes



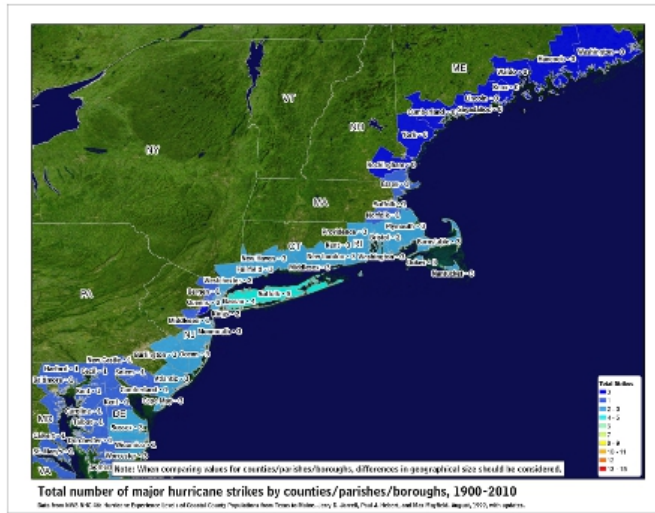
1900-2010 U.S. Major Hurricane Strikes - West Gulf



1900-2010 U.S. Major Hurricane Strikes - East Gulf



1900-2010 U.S. Major Hurricane Strikes - Southeast



1900-2010 U.S. Major Hurricane Strikes - Northeast

## Central Pacific Climatology

The following graphs and charts describe some of the climatology of tropical cyclone activity in the area served by the Central Pacific Hurricane Center, between 140 degrees West longitude and the International Date Line and north of the equator.

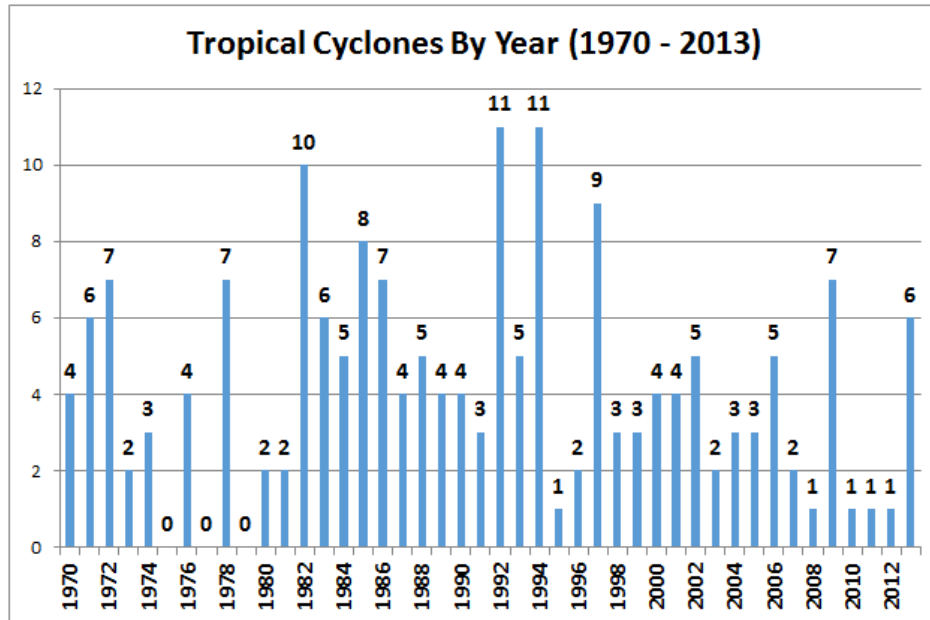
Many factors affect the level of tropical cyclone activity from year to year. Among them are the state of the El Niño Southern Oscillation in the Pacific. Moderate to strong El Niño years are correlated with increased tropical cyclone activity in the Central Pacific and the occurrence of late season storms.

Continuous satellite coverage has been available in the Central Pacific since 1971 so many climatologies start with that date. Earlier accounts of tropical cyclone activity are based on land, ship, and aircraft observations as well as some non-continuous satellite data.

### Hurricane Season Climatology Central Pacific (1971-2008)

	Hurricanes	Tropical Storms	Tropical Depressions	Total
Total Number	58	46	59	163
Percent of All Systems	36%	28%	36%	

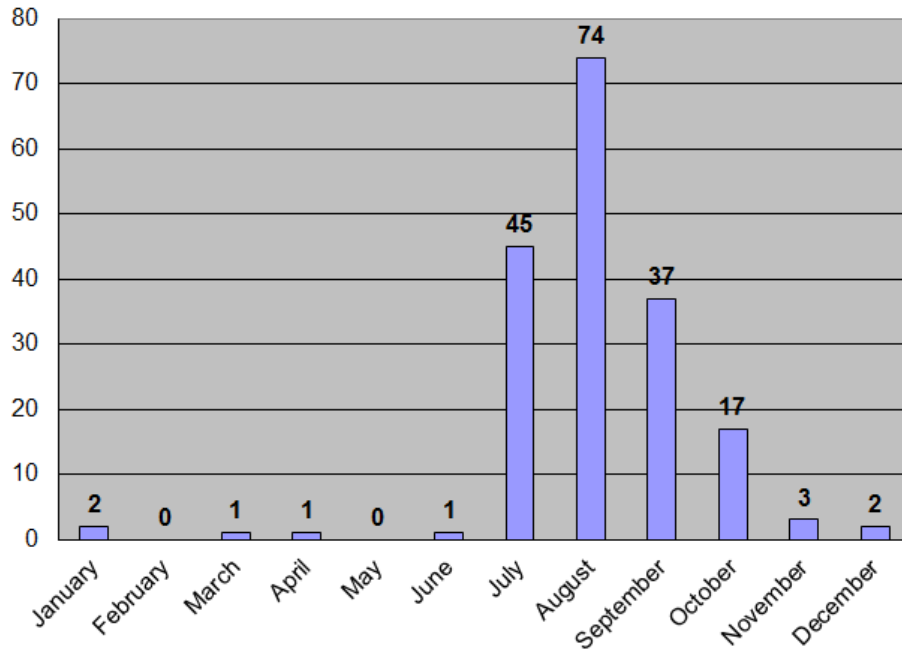
### Tropical Cyclones in the Central Pacific By Year



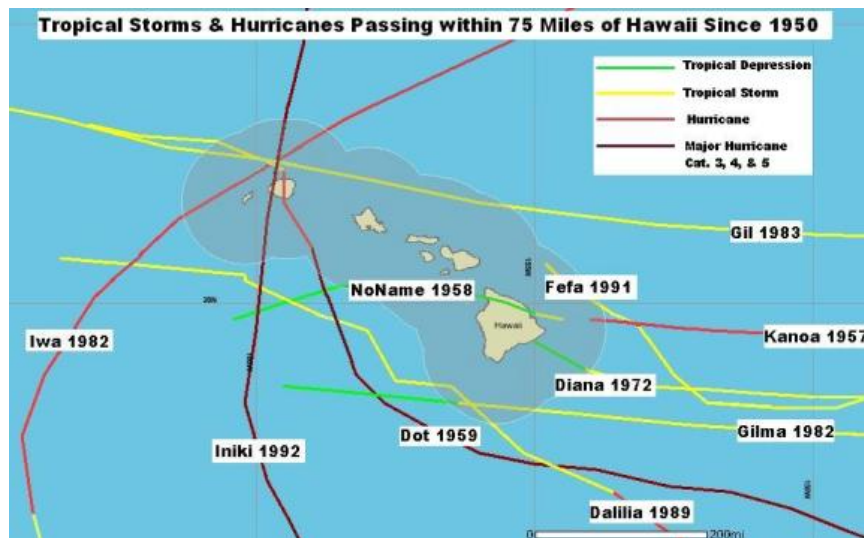
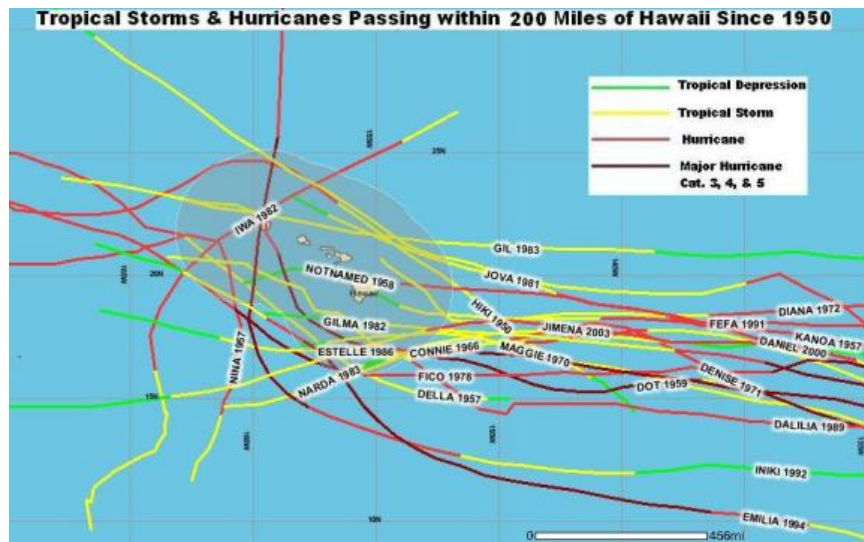
### Tropical Cyclones in the Central Pacific By Month



## Central Pacific Tropical Cyclones by Month 1971 - 2013



The following charts show the storms that have come within 200 miles and 75 miles of Hawaii. Storms that do not make landfall in Hawaii can still cause considerable damage, mostly from winds and surf.



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Learn more about climate impacts from the [NWS Climate Prediction Center](#).

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## Quick Links and Additional Resources





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[Tropical Weather Outlook](#)  
[Audio/Podcasts](#)  
[About Advisories](#)

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[Gridded Forecasts](#)  
[Graphicast](#)  
[About Marine](#)

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[Marine Safety](#)  
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[Weather-Ready Nation](#)  
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[Joint Hurricane Testbed](#)  
[Hurricane Forecast Improvement Program](#)

### OTHER RESOURCES

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[NHC/AOML Library Branch](#)  
[NOAA: Hurricane FAQs](#)  
[National Hurricane Operations Plan](#)  
[WX4NHC Amateur Radio](#)

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[Storm Prediction Center](#)  
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[Local Forecast Offices](#)

### WORLDWIDE TROPICAL CYCLONE CENTERS

[Canadian Hurricane Centre](#)  
[Joint Typhoon Warning Center](#)  
[Other Tropical Cyclone Centers](#)  
[WMO Severe Weather Info Centre](#)



[US Dept of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Hurricane Center](#)  
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[Central Pacific Hurricane Center](#)  
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