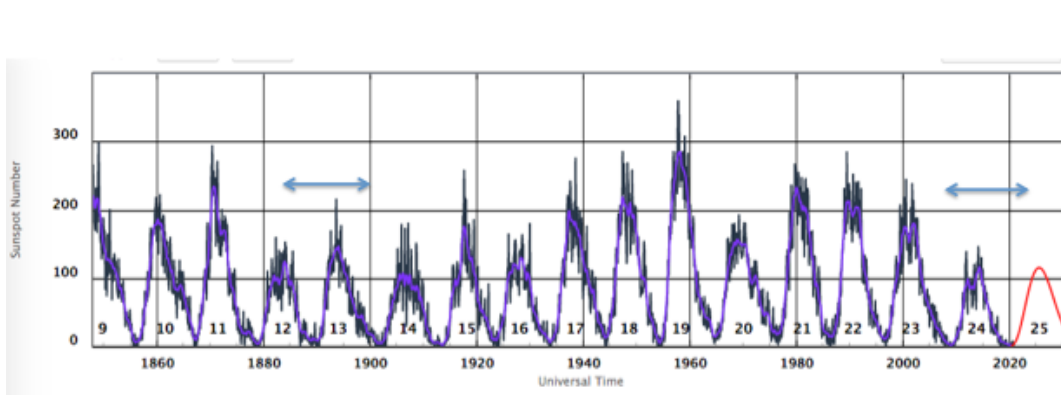
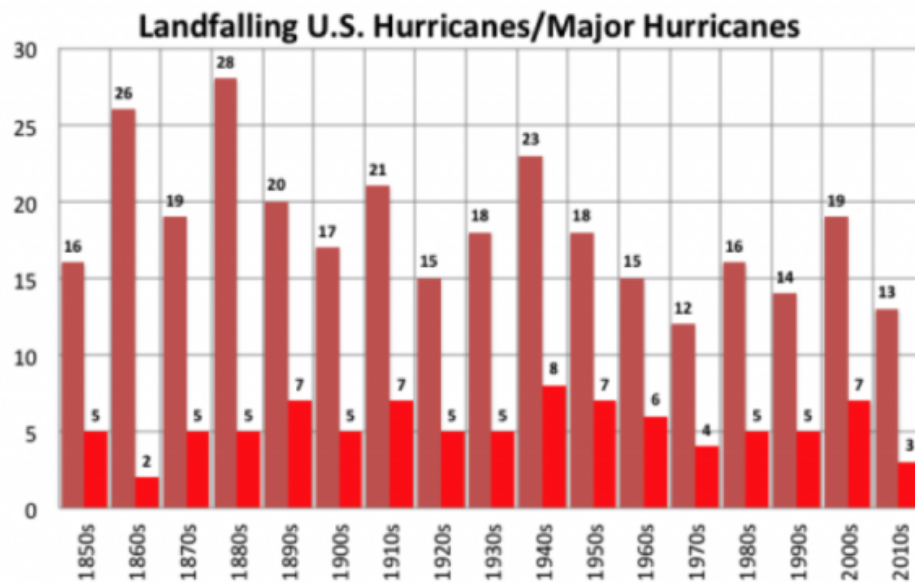


Recent Hurricane Activity is Reminiscent of 1880-1900

We are in a similar solar inactivity period as the 1880s-1900s.



Though landfalls have declined - last decade second least since 1850, there is a bump. Notice the active 1880-1890s!

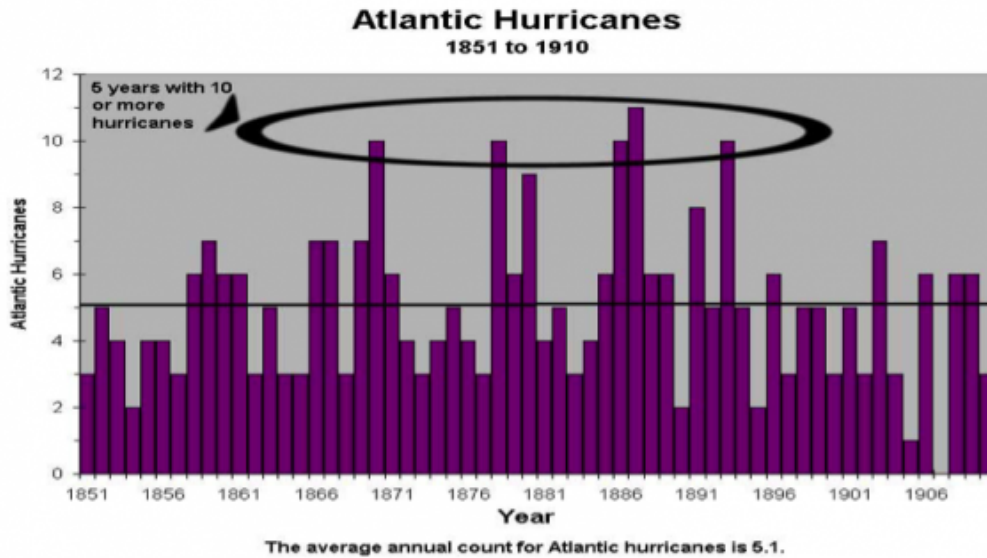


Source: AOML

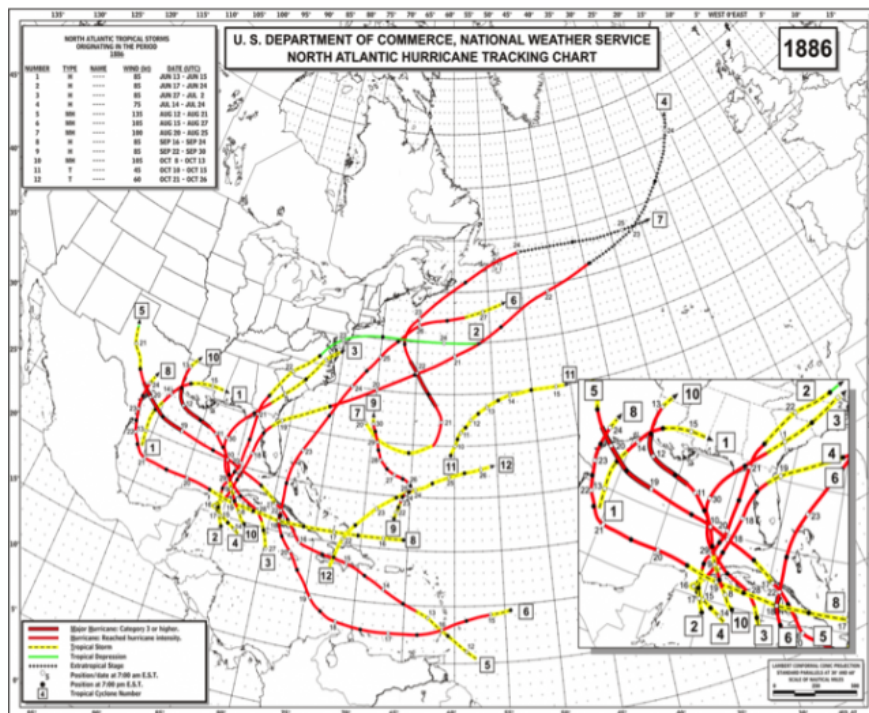
Dr. Neil Frank, longest serving Director of the NHC noted recently:

“Without question the most reliable indicator of a trend in hurricane activity in the Atlantic is to focus on land falling major hurricanes (3-5) in the mainline U.S. I doubt if a major hurricane could have hit the U.S. in the 1800s without being noticed, while a minor hurricane in a remote area could have been undetected so it is important to concentrate on major hurricanes.”

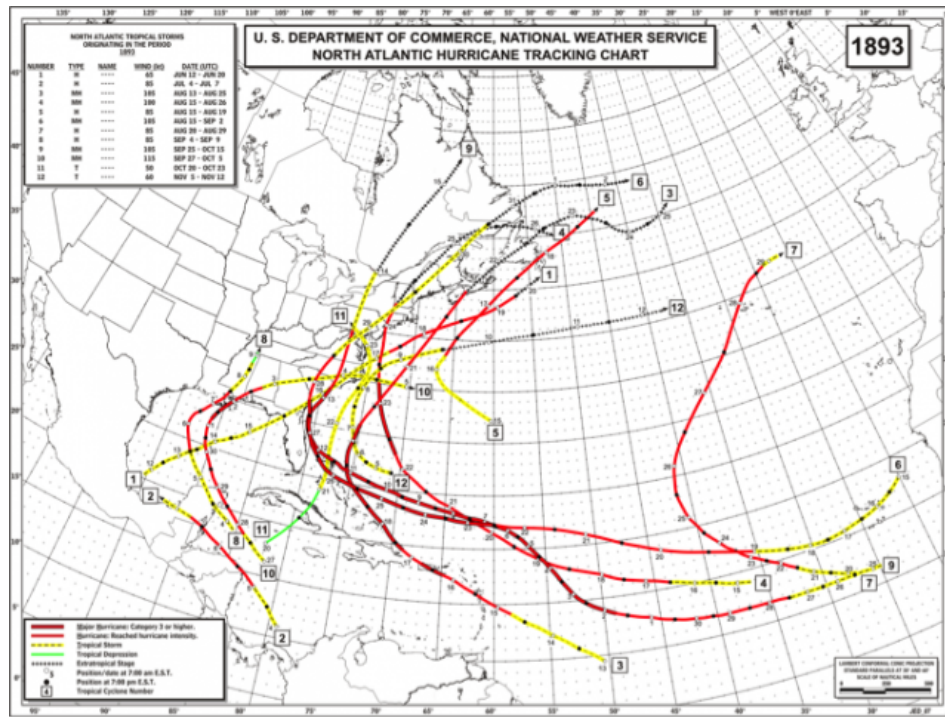
The Atlantic was active 1870-1910.



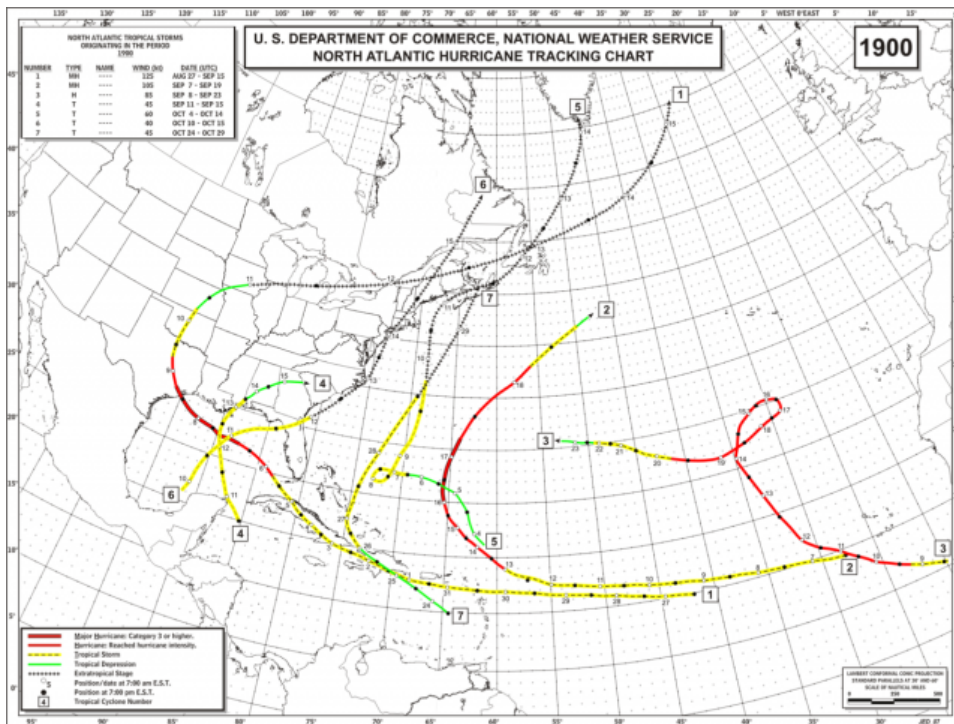
"The most active hurricane season in the U.S. was 1886 when 7 hurricanes hit the Gulf coast (3 in Texas). 4 of the 1886 hurricanes were major hurricanes). One of the major hurricanes in Texas destroyed Indianola on the south shore of Matagorda Bay. At one time there were around 20,000 people in the city before a prior major hurricane in 1875 did major damage. The only thing in Indianola today is a cemetery with numerous headstones with dates 1875 or 1886."



1893 had at least 10 hurricanes. Of those, 5 became major hurricanes. Two of the hurricanes caused over two thousand (2000) deaths in the United States; at the time, the season was the deadliest in U.S. history.



Then there was the quieter but deadly 1900.

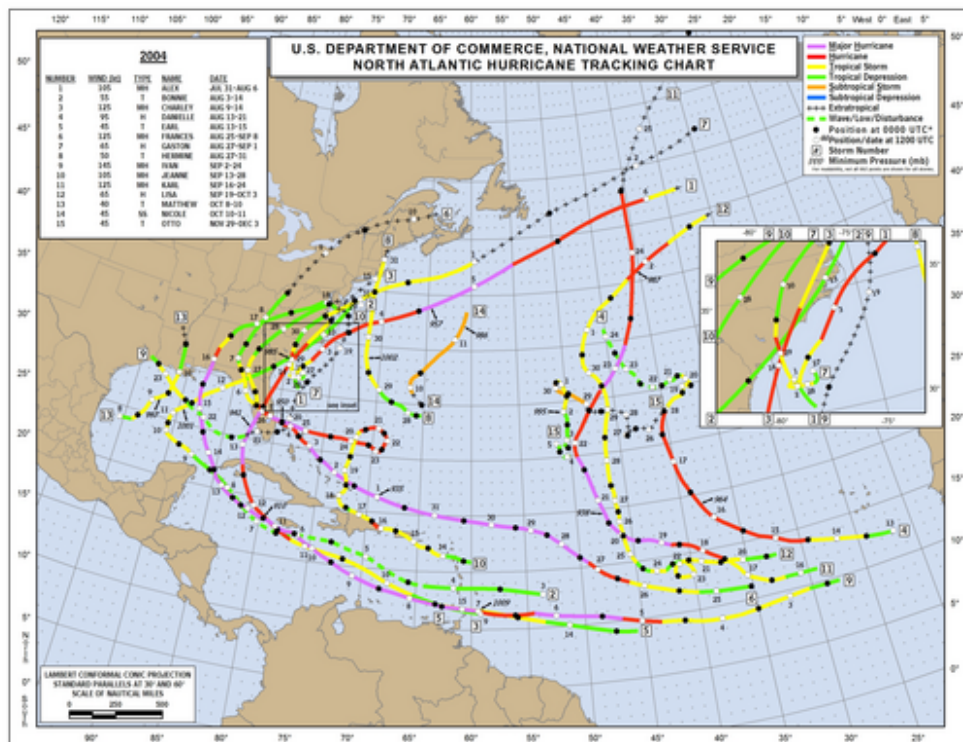


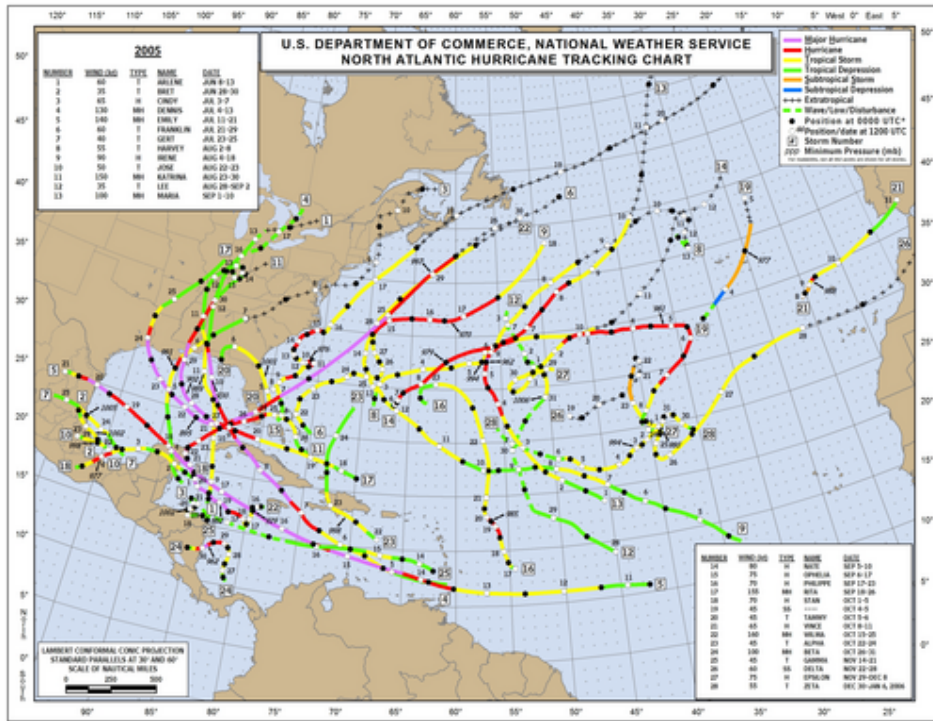
The Galveston Hurricane in 1900 killed at least 8,000 people with some estimates as high as 12,000, making it the deadliest natural disaster in U.S. history.

Galveston Hurricane 1900

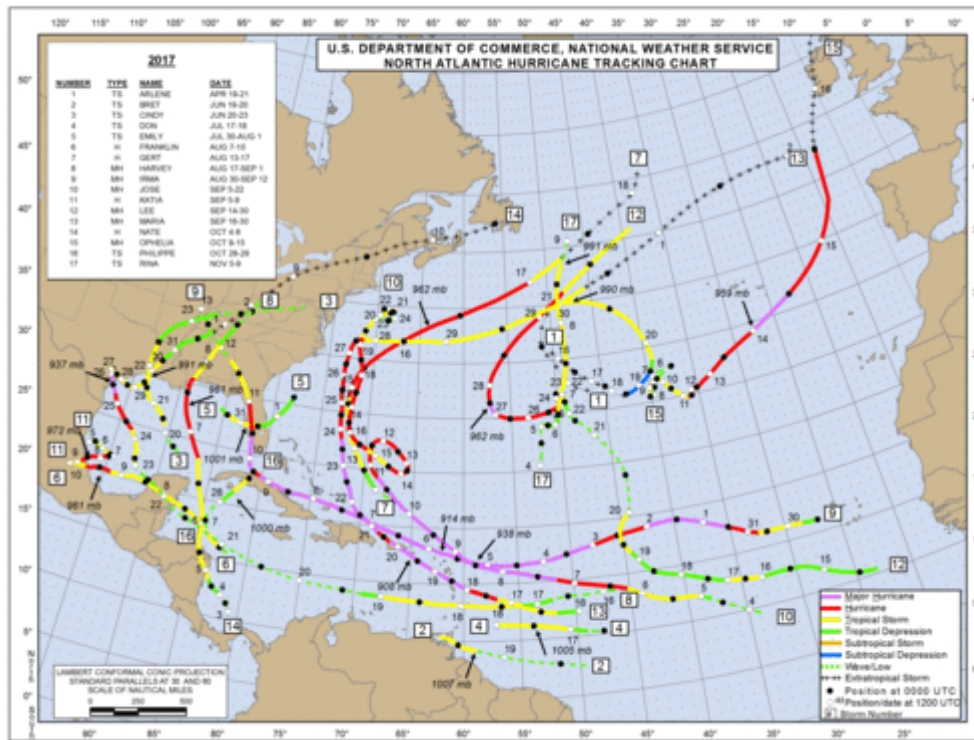


2004 and 2005 were two very active years, in Florida and the Gulf.





As was 2017.



2020 so far has had 28 named storms, tied with 2005.

Northern Hemisphere Tropical Cyclone Activity for 2020 (2020/2021 for the Southern Hemisphere)

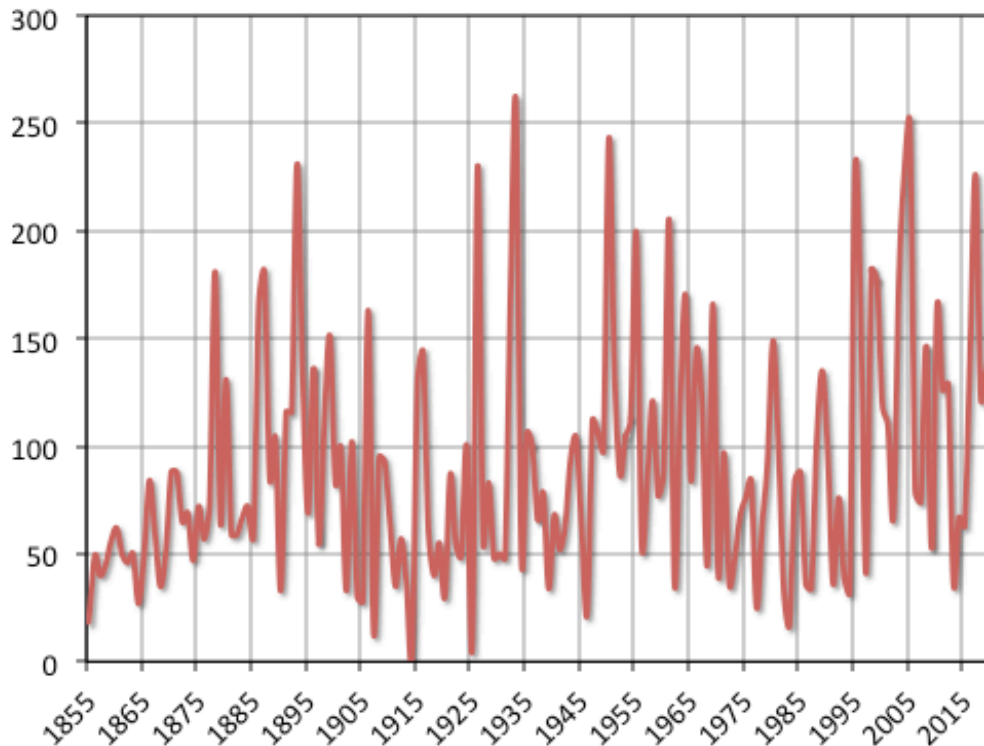
1981-2010 Climatological Activity Through November 01 in Parentheses

Basin	Named Storms	Named Storm Days	Hurricanes	Hurricane Days	Major Hurricanes	Major Hurricane Days	Accumulated Cyclone Energy
North Atlantic	28 (11.2)	98.75 (54.4)	11 (5.8)	29.75 (22.6)	4 (2.6)	6.25 (6.0)	144.1 (98.4)
Northeast Pacific (East of 180°)	14 (16.2)	48.50 (71.8)	4 (8.7)	14.25 (29.6)	3 (4.3)	5.00 (8.9)	74.4 (130.1)
Northwest Pacific (West of 180°)	20 (22.7)	64.50 (117.4)	11 (14.5)	26.25 (57.5)	5 (7.4)	8.75 (19.2)	127.6 (253.1)
North Indian	2 (3.1)	5.75 (8.2)	2 (0.8)	4.00 (1.7)	1 (0.5)	2.25 (0.7)	19.2 (10.8)
Northern Hemisphere	64 (53.2)	217.50 (251.8)	28 (29.8)	74.25 (111.4)	13 (14.8)	22.25 (34.8)	365.3 (492.4)
South Indian (West of 135°E)	0 (1.1)	0.00 (2.8)	0 (0.2)	0.00 (0.3)	0 (0.0)	0.00 (0.0)	0 (2.3)
South Pacific (East of 135°E)	0 (0.2)	0.00 (0.4)	0 (0.1)	0.00 (0.1)	0 (0.0)	0.00 (0.0)	0 (0.6)
Southern Hemisphere	0 (1.3)	0.00 (3.2)	0 (0.3)	0.00 (0.4)	0 (0.0)	0.00 (0.0)	0 (2.9)

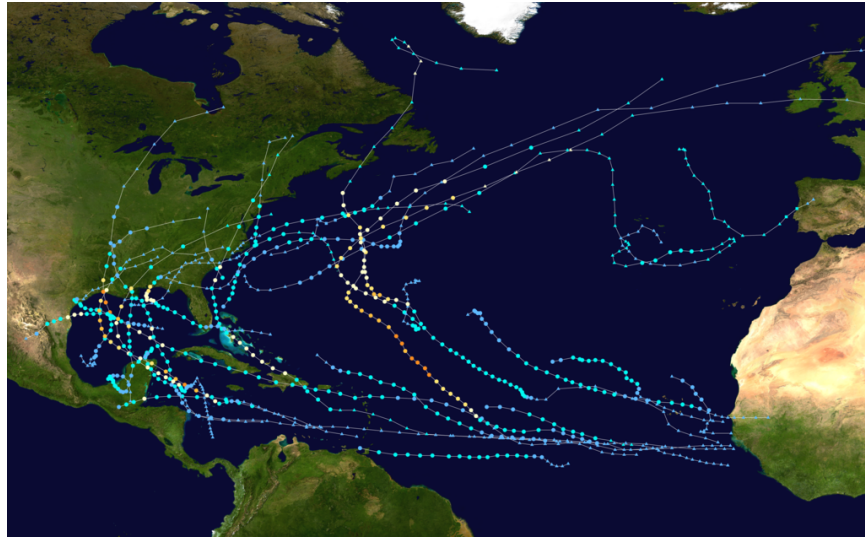
Global statistics were last modified: November 01 2020 09:00 MT

The ACE for the Atlantic is 144.1, which was 161% of normal. But that was 27th highest, far short of 1933, which had an ACE of 259 (290% of normal) and 2005 with 250, 1950 with 243, 1995 with 228, 2004 with 227 and 2018 with 226.

Atlantic Basin ACE Index



The storms for 2020 through Zeta.



SOLAR A FACTOR?

Does somehow a quiet sun favor more storm focus in the Gulf. Note Camille occurred at quiet cycle at diminished cycle 20. The decreased UV ozone related high atmospheric warming may make the atmosphere more unstable for vigorous convection and storm development.

Hurricanes and the sunspot theory

Increased solar activity such as sunspots can warm upper layers of Earth's atmosphere, making the atmosphere more stable and decreasing hurricanes. Sunspot activity varies on an 11-year cycle. Researchers at Florida State University theorize that hurricane activity may increase as sunspots decrease. **Here's how:**

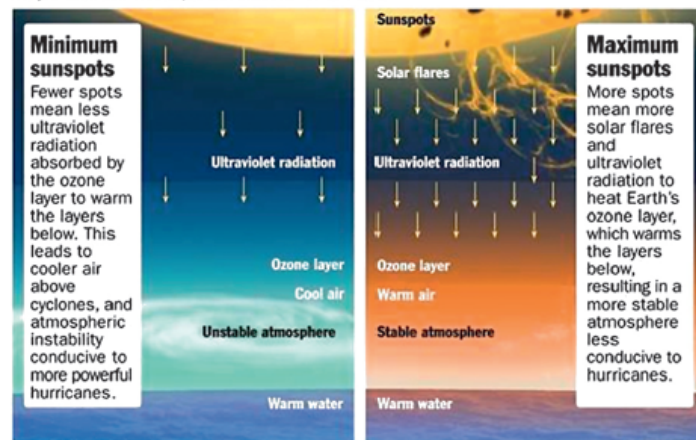


FIGURE 10 Research by Robert Hodges and Jim Elsner of Florida State University found the probability of three or more hurricanes hitting the United States goes up drastically during low points of the 11-year sunspot cycle, such as we're in now. Years with few sunspots and above-normal ocean temperatures spawn a less stable atmosphere and, consequently, more hurricanes, according to the researchers. Years with more sunspots and above-normal ocean temperatures yield a more stable atmosphere and thus fewer hurricanes.

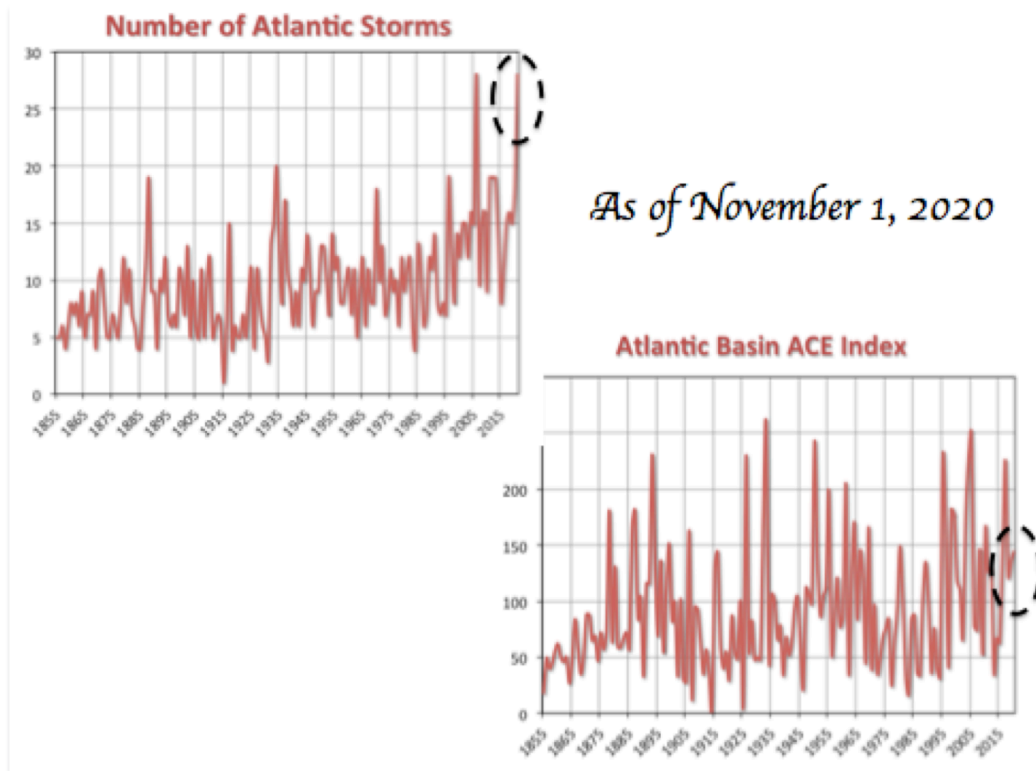
The sun directly or indirectly is a factor but so are ocean cycles.

An Index of AMO and NINO34 for ACE Index in hurricane seasons

By Joseph D'Aleo, CCM

No doubt for areas of the coast affected by the storms, it was a year reminiscent of recent 2017 and 2005 seasons.

Though we about to tie the record for number of named storms (now at 28 same as in 2005), we are running 161% of normal for the Atlantic Basin ACE (Accumulated Cyclone Energy Index) - very close to 2019 (148%) and 2018 (149%) but running well behind 2017 (252%), 2005 (280%) and 1933 (290%).



Note while the Atlantic was active, the Pacific was quiet and the Northern Hemisphere (74.2%) of normal.

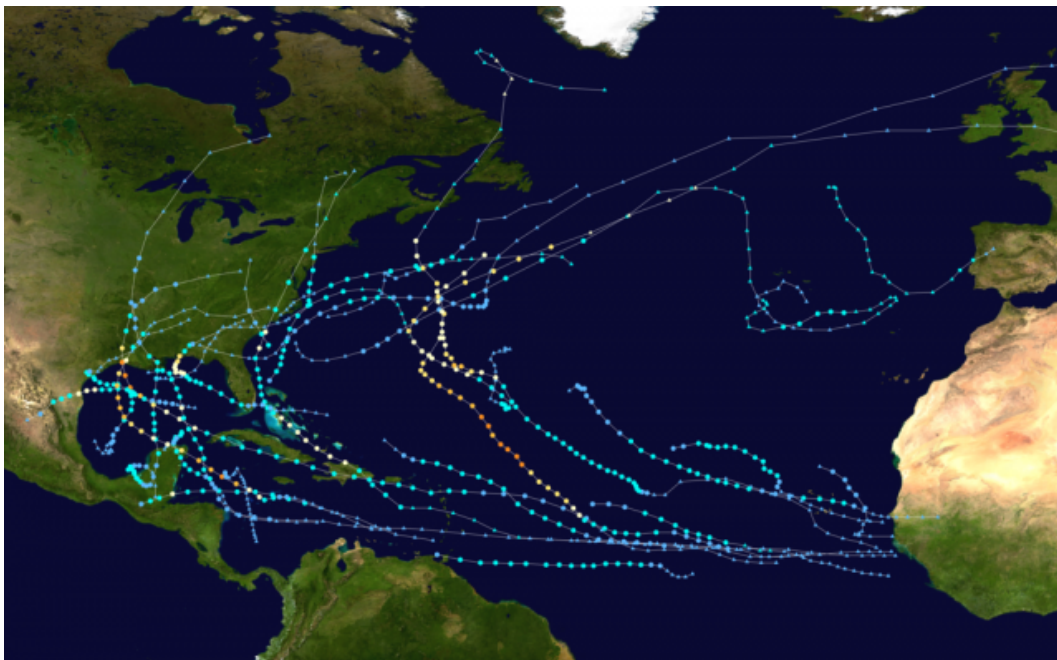
Northern Hemisphere Tropical Cyclone Activity for 2020 (2020/2021 for the Southern Hemisphere)

1981-2010 Climatological Activity Through November 01 in Parentheses

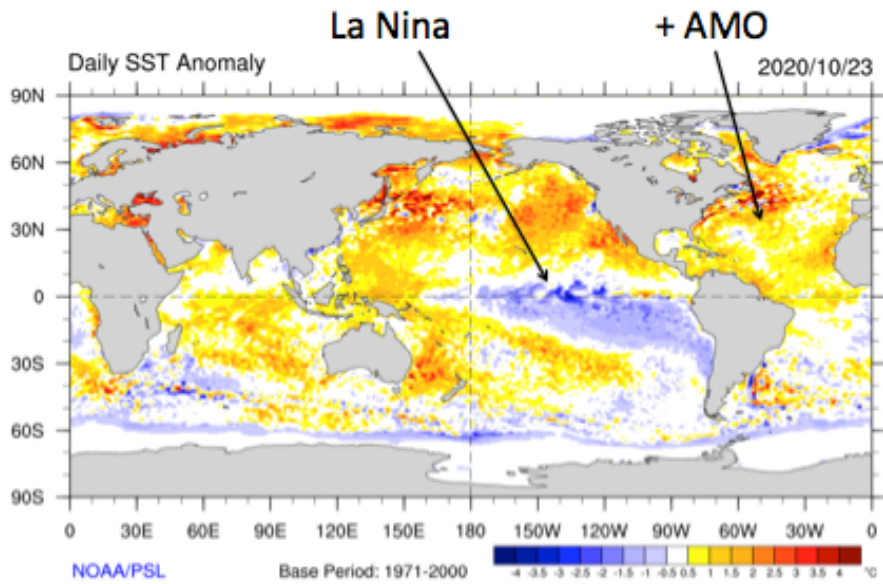
Basin	Named Storms	Named Storm Days	Hurricanes	Hurricane Days	Major Hurricanes	Major Hurricane Days	Accumulated Cyclone Energy
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Global statistics were last modified: November 01 2020 09:00 MT

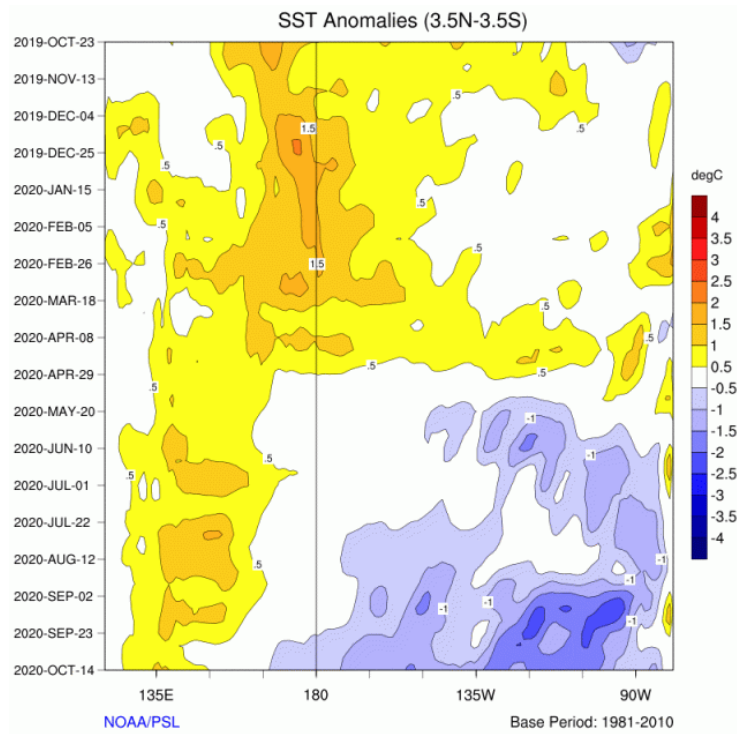
See the storm tracks including 11 hurricanes and 4 majors.



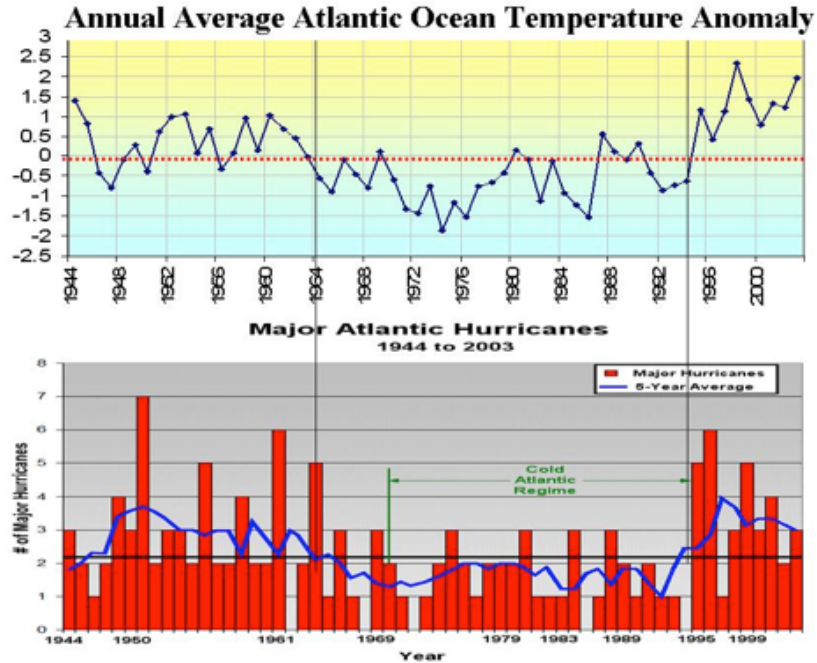
Activity was shown decades ago by Dr. Bill Gray to relate to the AMO (Atlantic Multidecadal Oscillation) cycle with active seasons favored in the warm decades and quieter ones in cold ones. Likewise when La Ninas are present suppressing eastern Pacific storms, action in the Atlantic is more favored. Both are present this year.



See the cooling this summer and fall in the time series of Pacific equatorial temperatures (oldest top, latest bottom with longitude from west (left) to east (right)).



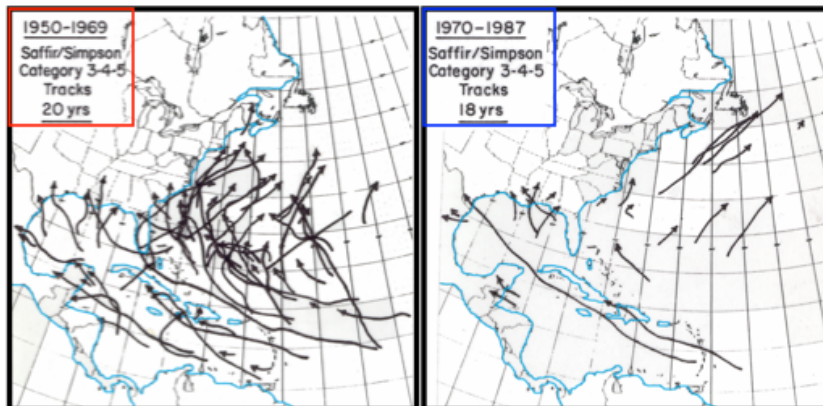
See how major hurricanes tie to the AMO cycle.



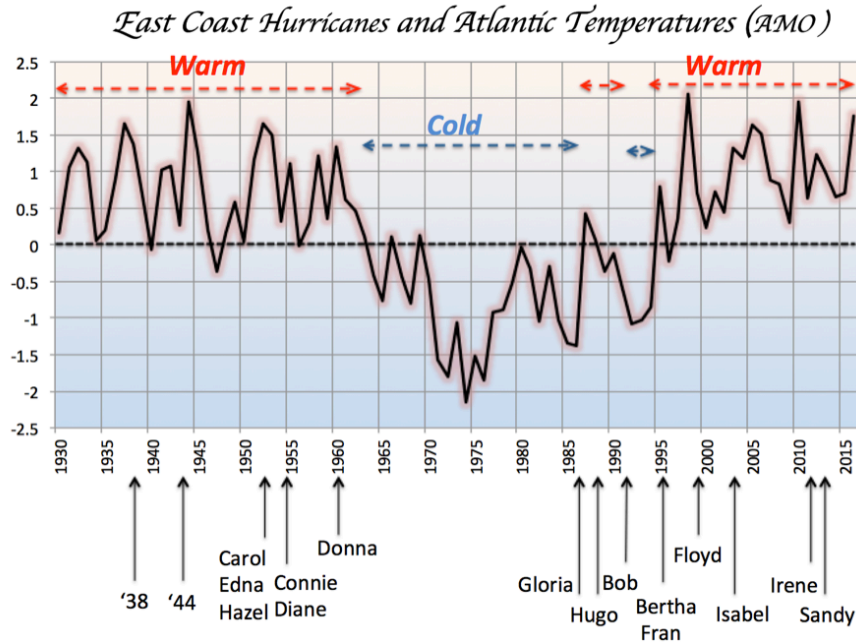
When the AMO >1 STD, the ACE averages 140.1. When it is more than 1 STD negative, the ACE averages just 49.9.

Major hurricanes are much more likely in the warm cycle years.

TRACKS OF CATEGORY 3-4-5 HURRICANES



That holds for landfalling events on the east coast.



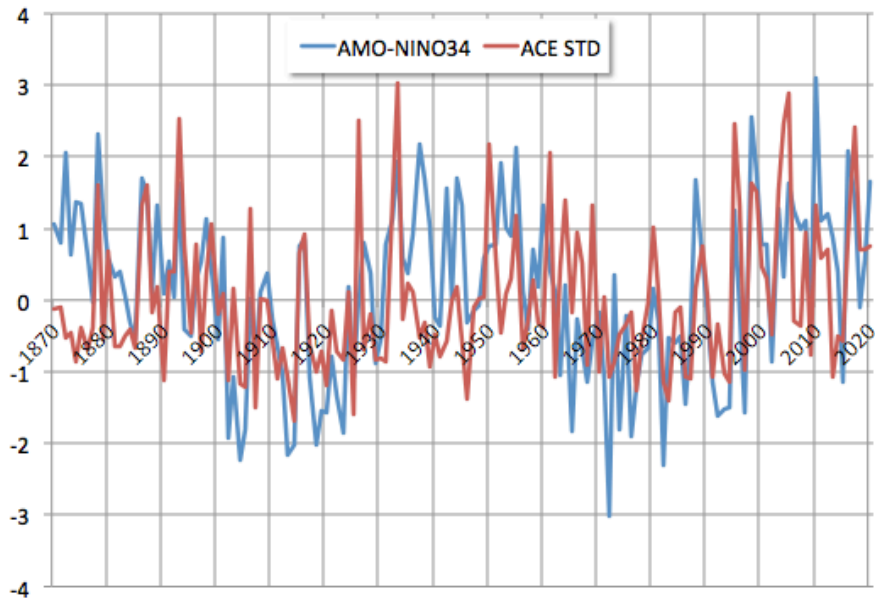
THE IMPORTANCE OF ENSO

As noted, the other key is ENSO. El Ninos increase the upper level shear in the Atlantic by favoring much more action in the eastern Pacific. Those storms disturb the upper level flow. In La Ninas like 2020, the shear is less allowing more disturbances to grow to storm status. Indeed when the NINO34 is warm (>1 STD), the ACE averages 109.2 and when more than 1 STD negative (La Nina), it is just 42.4.

A HURRICANE THREAT INDEX

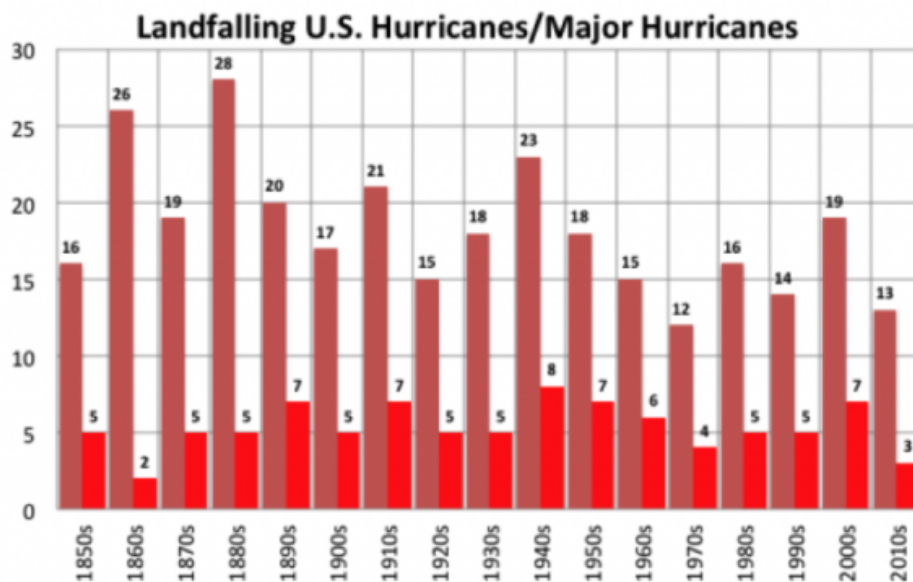
If we create an Index of AMO minus the NINO34 STD values we would expect when significantly positive, the Atlantic Basin should be more active and when > 1 STD negative, quiet. See how the ACE tracks well with that index.

ACE vs AMO-NINO34 Index



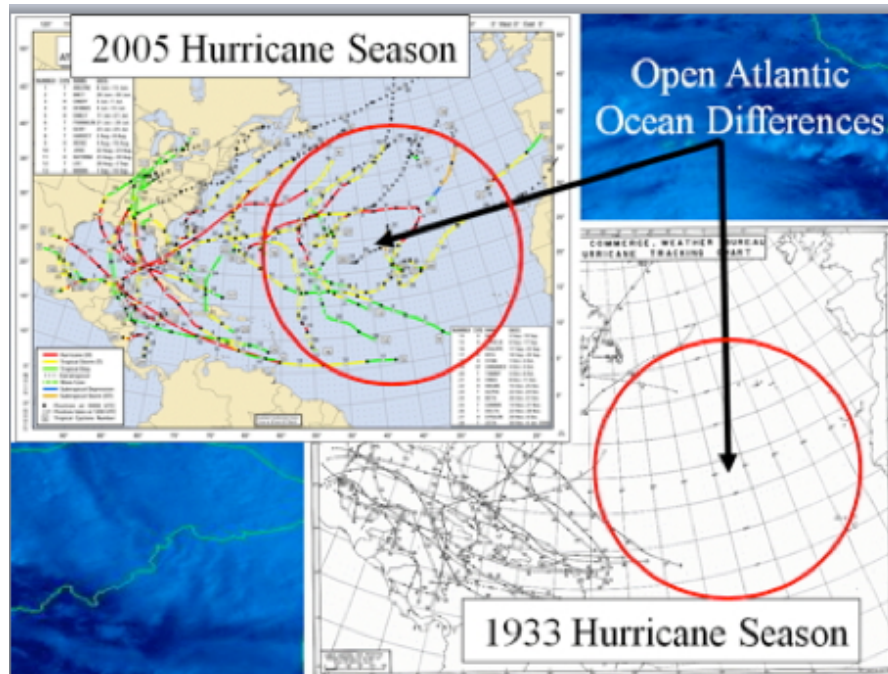
When the Index is > 1 STD, we have an average ACE of 140.1, when it is more than 1 STD negative, the average is 49.9.

Despite years with more storms, the number of landfalling hurricanes and major hurricanes for the mainland has been declining with the last decade the second quietest since 1950.



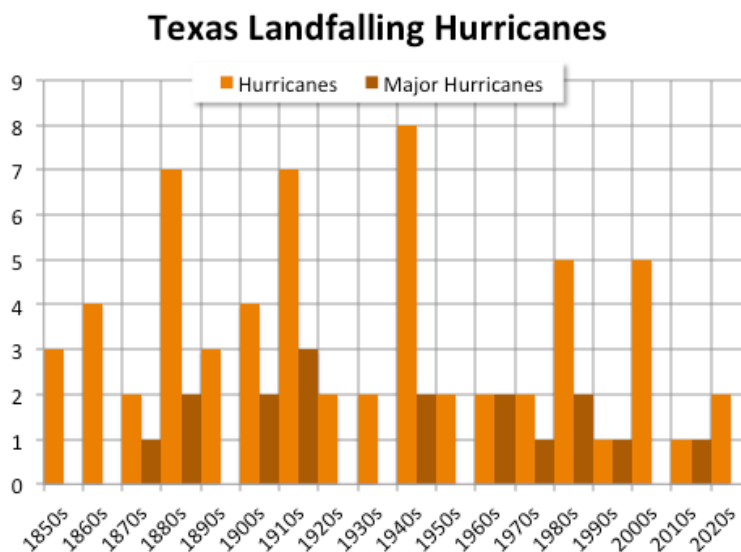
Source: AOML

Landfalling storms may be the best measure of trends as before the satellite era we missed many often short-lived storms in the eastern Atlantic. Even in the record ACE season of 1933 (ACE of 258.6 versus 144.1 this season) you can see we probably missed storms.

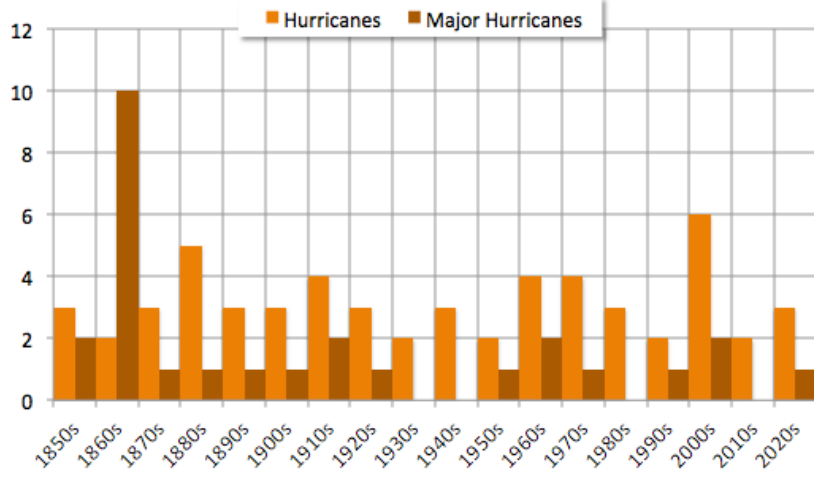


HARD HIT GULF IN 2020

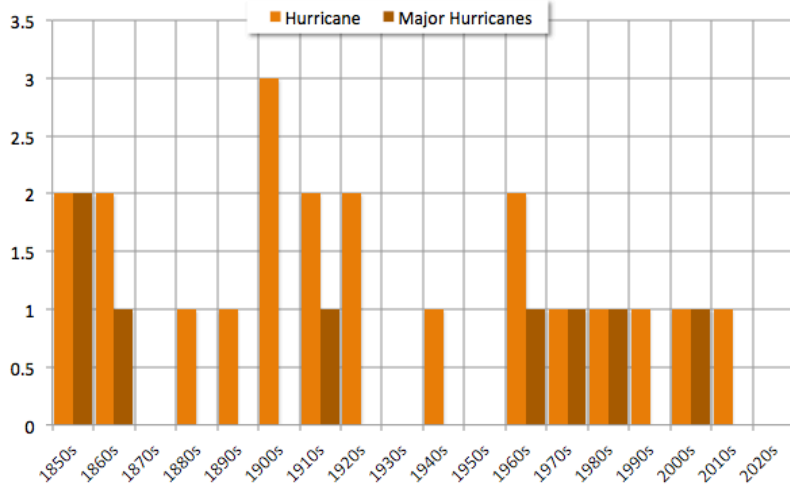
The decadal trends state by state:



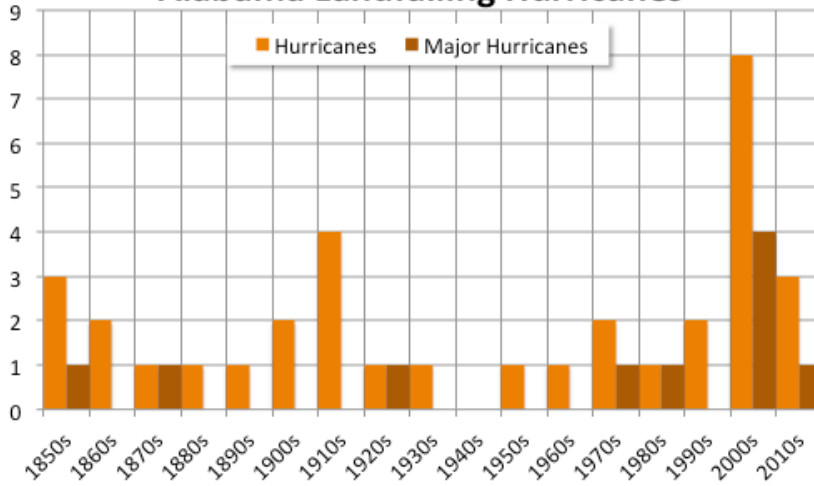
Louisiana Landfalling Hurricanes



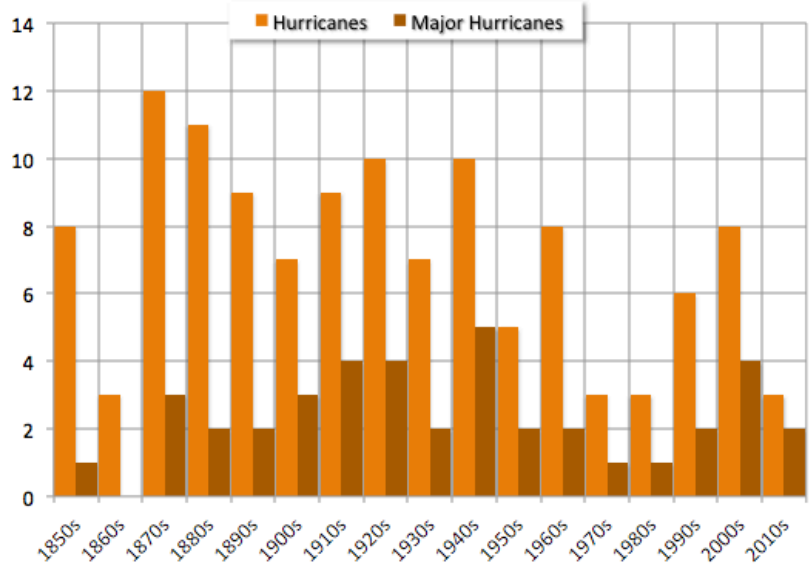
Mississippi Landfalling Hurricanes



Alabama Landfalling Hurricanes



Florida Landfalling Hurricanes



Alabama is the only state with an upward trend.