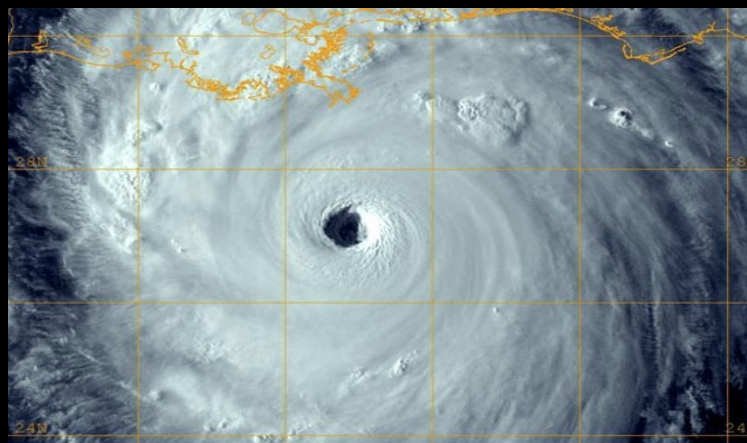
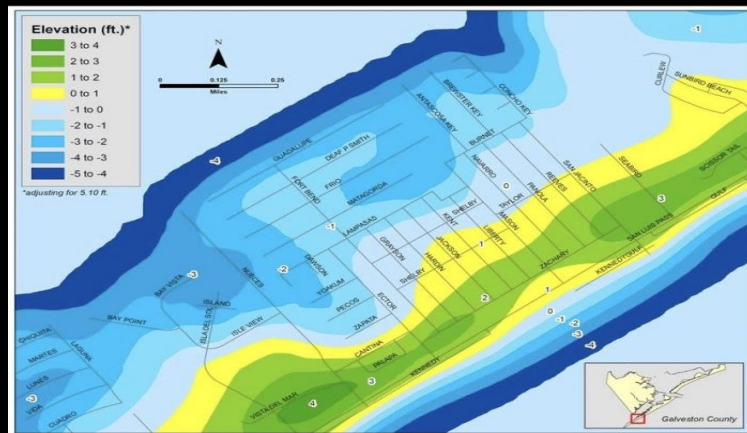
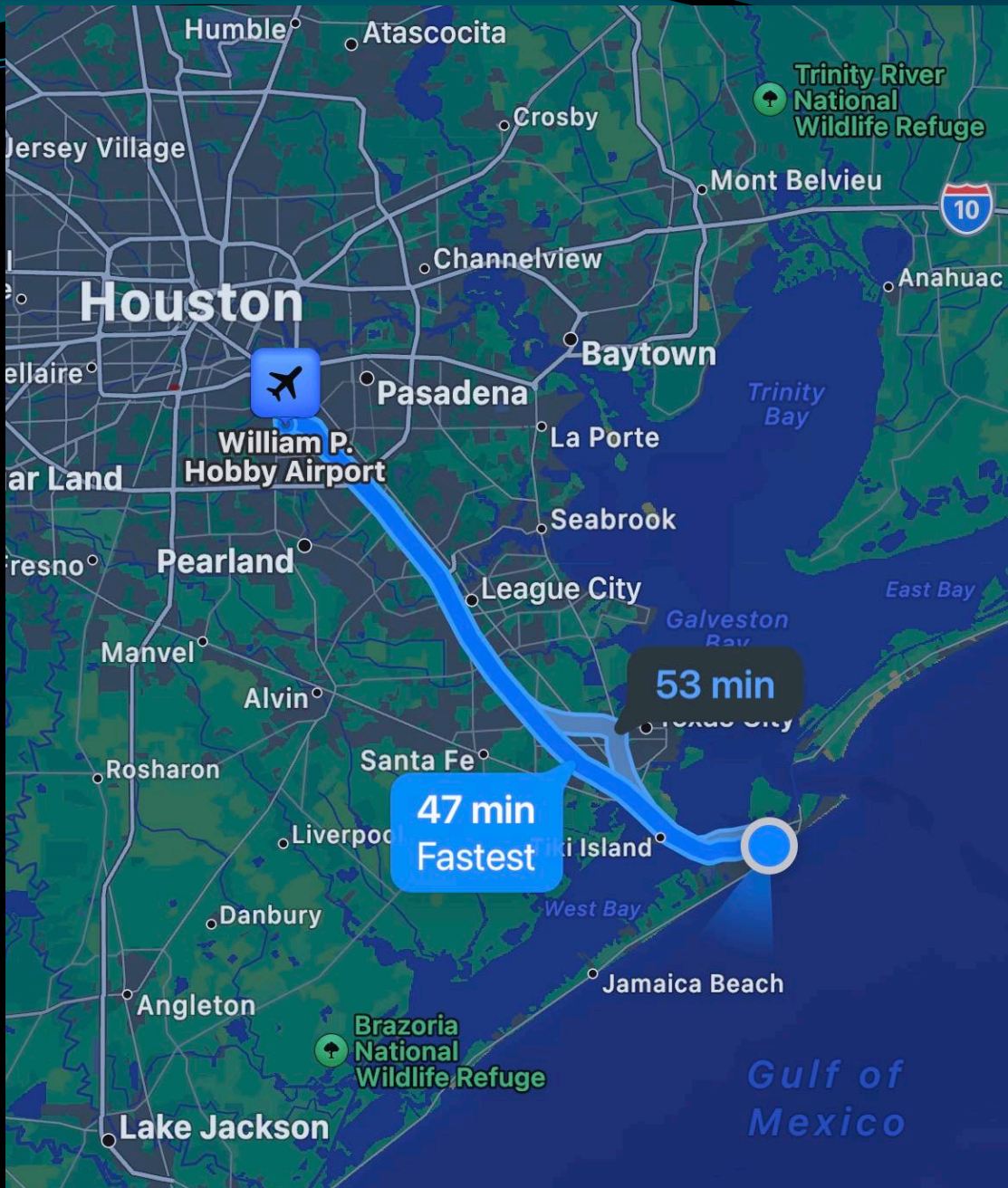


Navigating Evolving Weather Patterns In a Rapidly Changing World







45 NORTH
Houston

EXIT 1C
188 275
Teichman Rd
Harborside Dr

MOTEL 6

EXIT 35
M.P.H.

Get to Your DMV

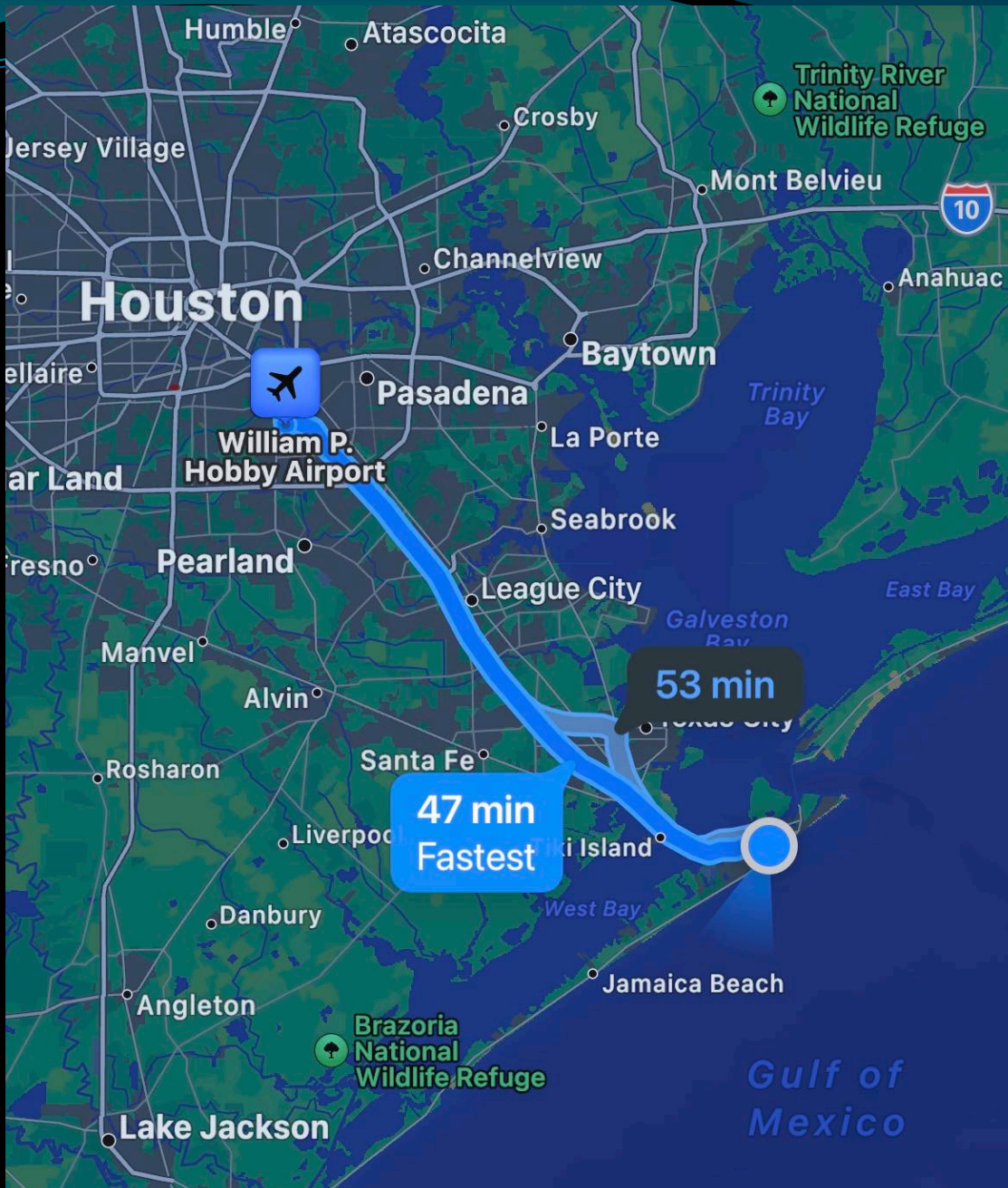
WALMART
TRADING CENTER

TOYOTA

EXIT 1C

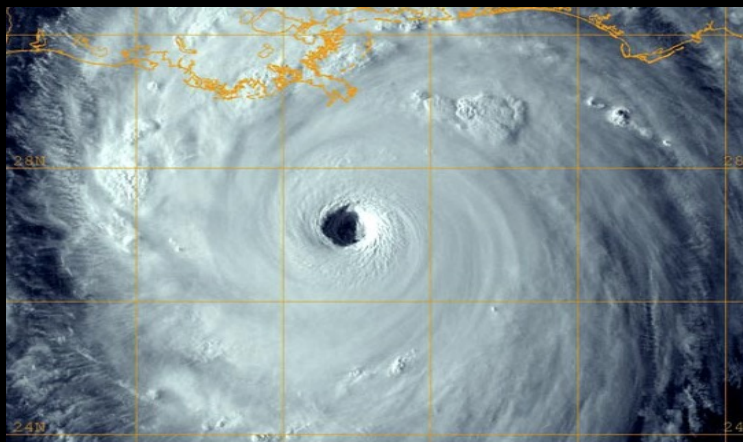
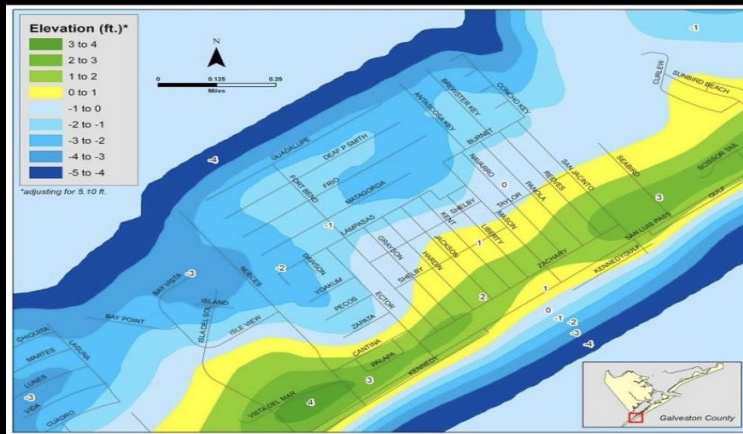








Navigating Evolving Weather Patterns In a Rapidly Changing World





Focus of this talk:

Aligning our perspective with reality

Perspective #1:

“I’ve lived here 30 years and I’ve never flooded... so my flood risk is zero”



The George Manor



Ida Smith Austin: November 6, 1900

I was busy about my domestic affairs Saturday rearranging my house...when I heard a man who ran up the street exclaim, "My God! The waters of the bay and gulf have met on Fifteenth Street." I went on the gallery to realize that what he said was only too true. But I felt no uneasiness and remarked to my niece, "We have nothing to fear, the water has never been over our place," and I just felt that it could not come. In a few minutes we heard the lapping of the salt water against the side-walk, and then it slowly crept into the yard.

In an incredibly short time the water surged over the gallery driven by a furiously blowing wind. Trees began to fall, slate shingles, planks and debris of every imaginable kind were being hurled through the air. We brought our cow on the gallery to save her life but soon had to take her in the dining room where she spent the night. Ten very large trees were soon uprooted and fell crashing, banging, and scraping against our house. We opened all downstairs and let the water flow through. Soon it stood three feet in all the rooms.

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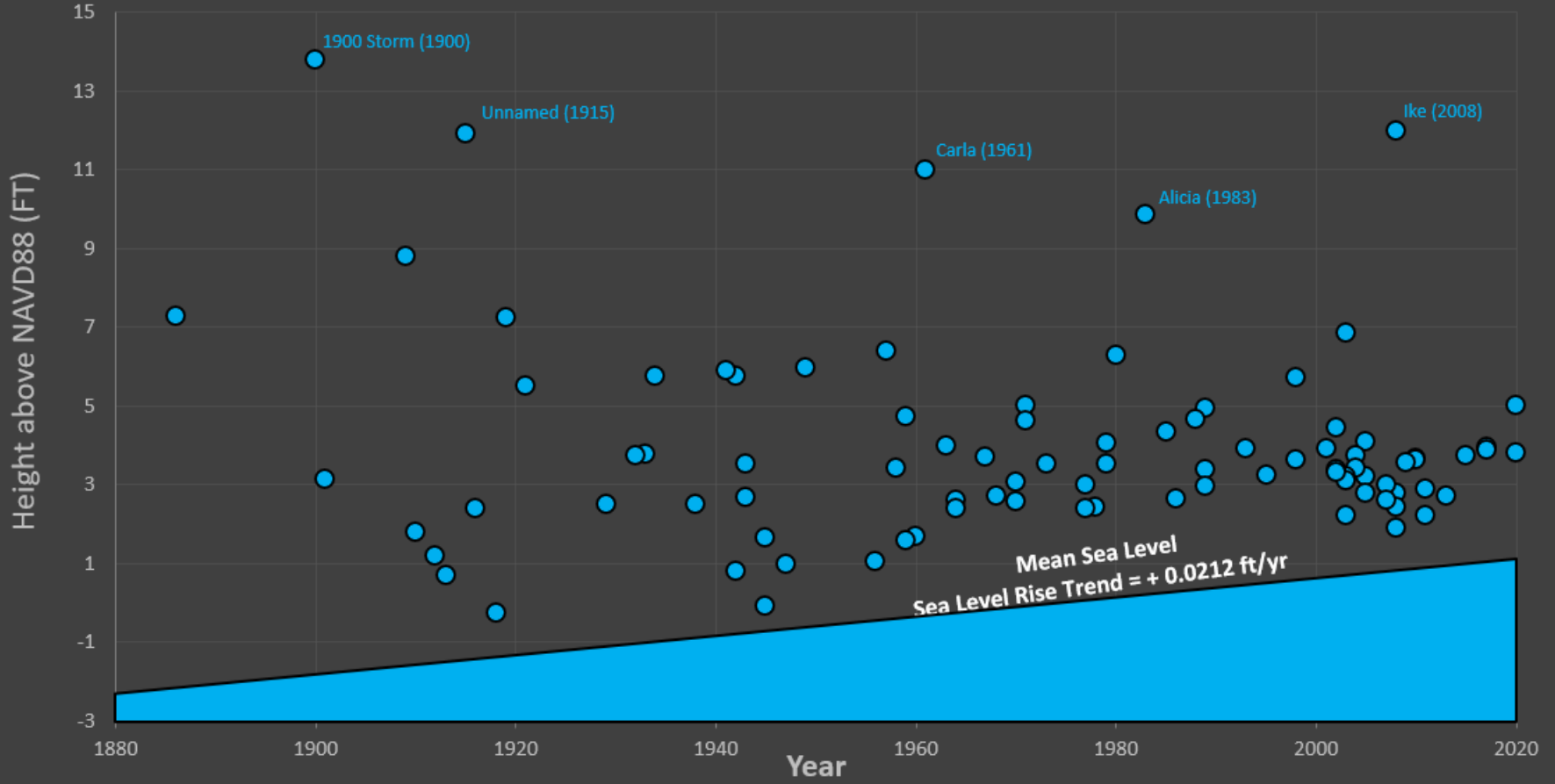
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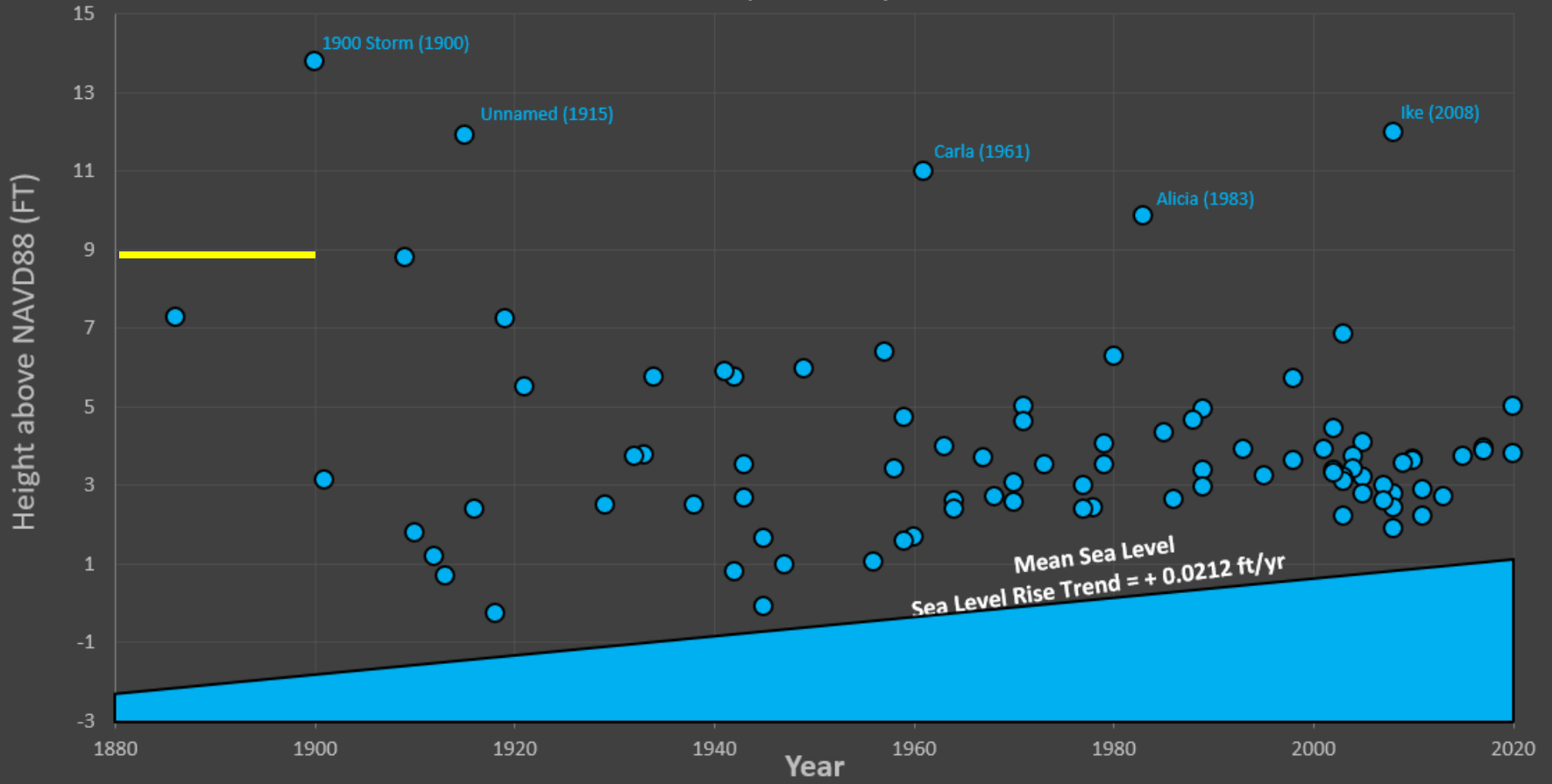
U-SURGE

Time Series of Storm Tides at Galveston, TX
1880 - 2020 (141 Years)



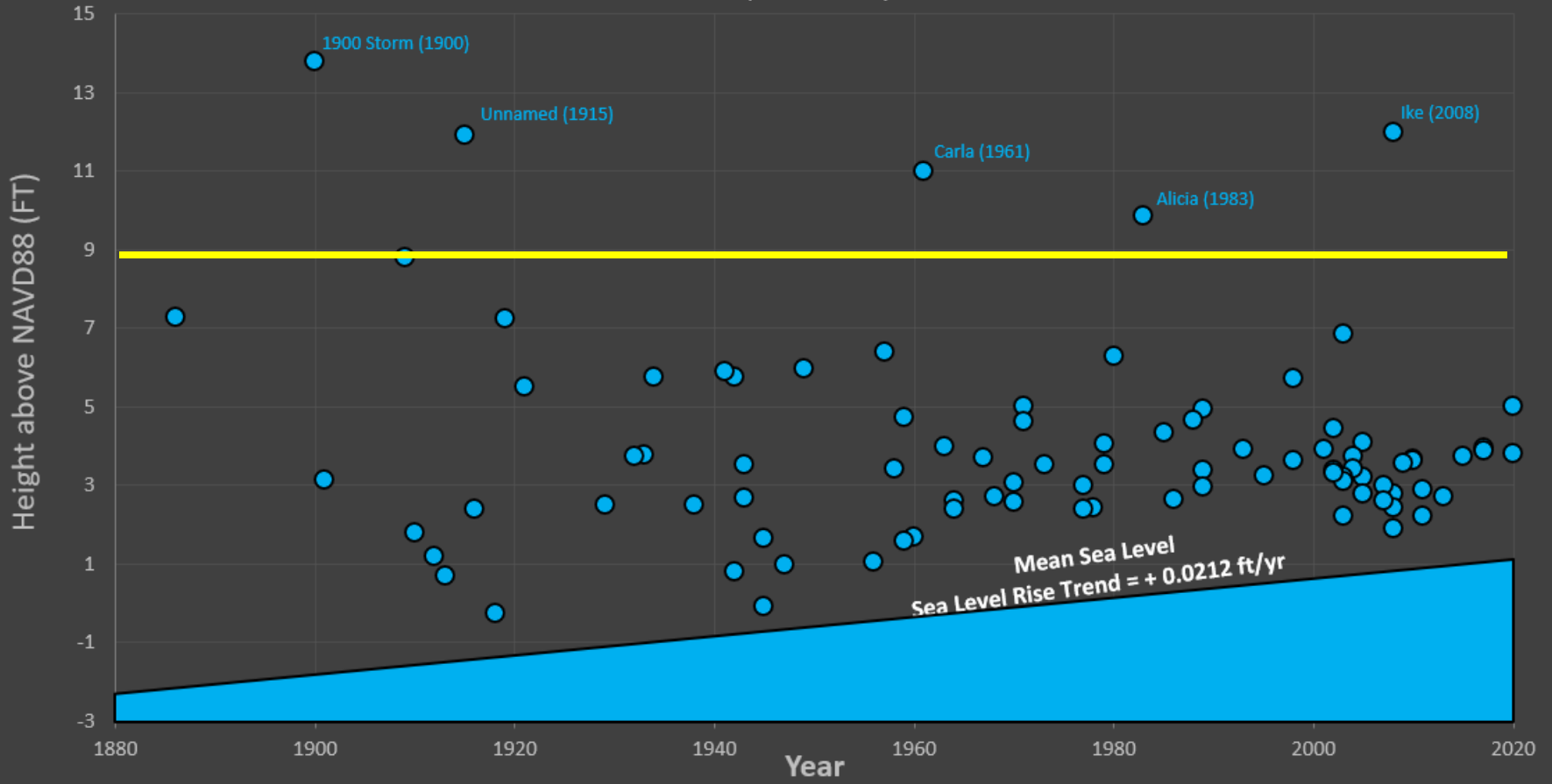
U-SURGE

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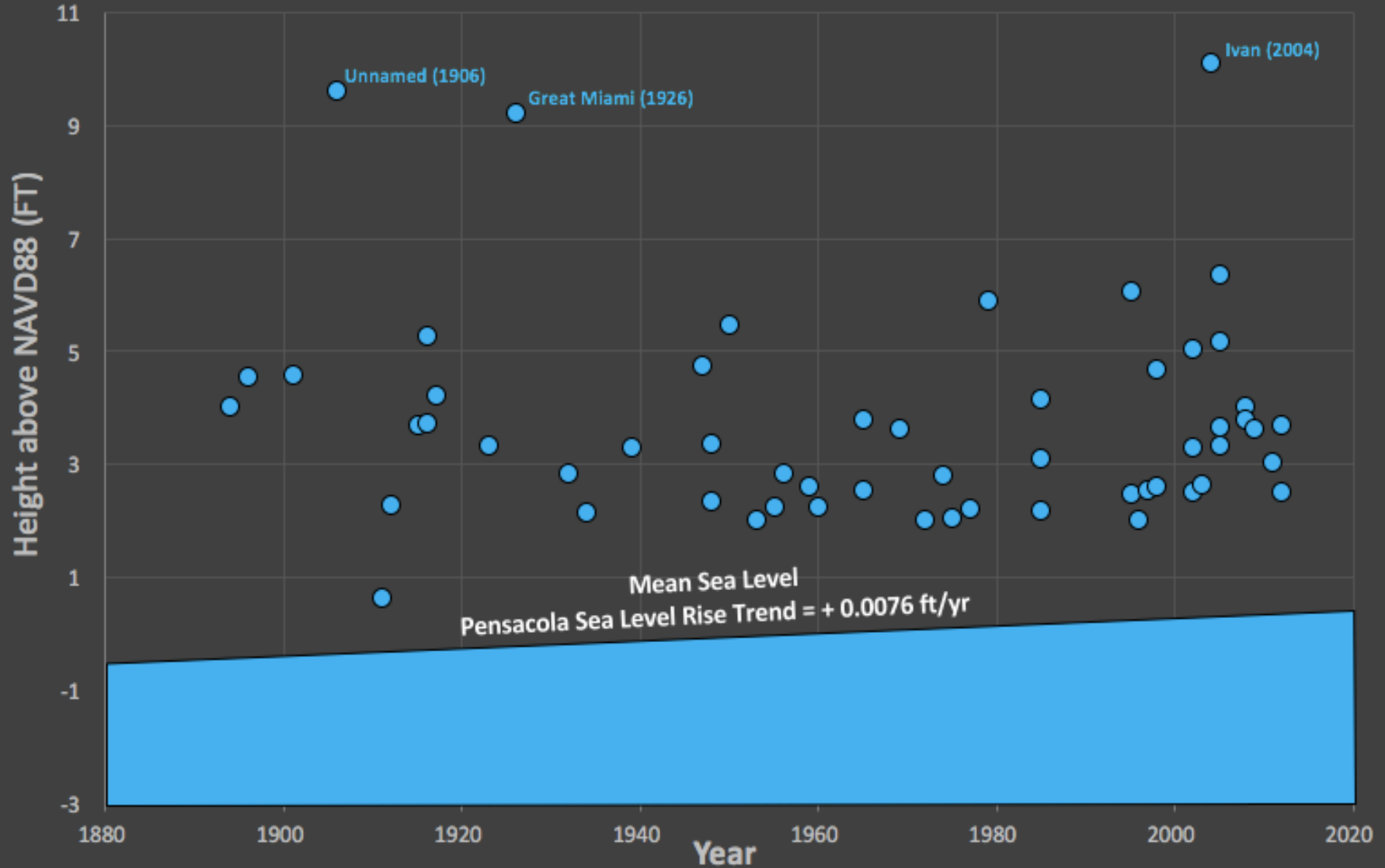




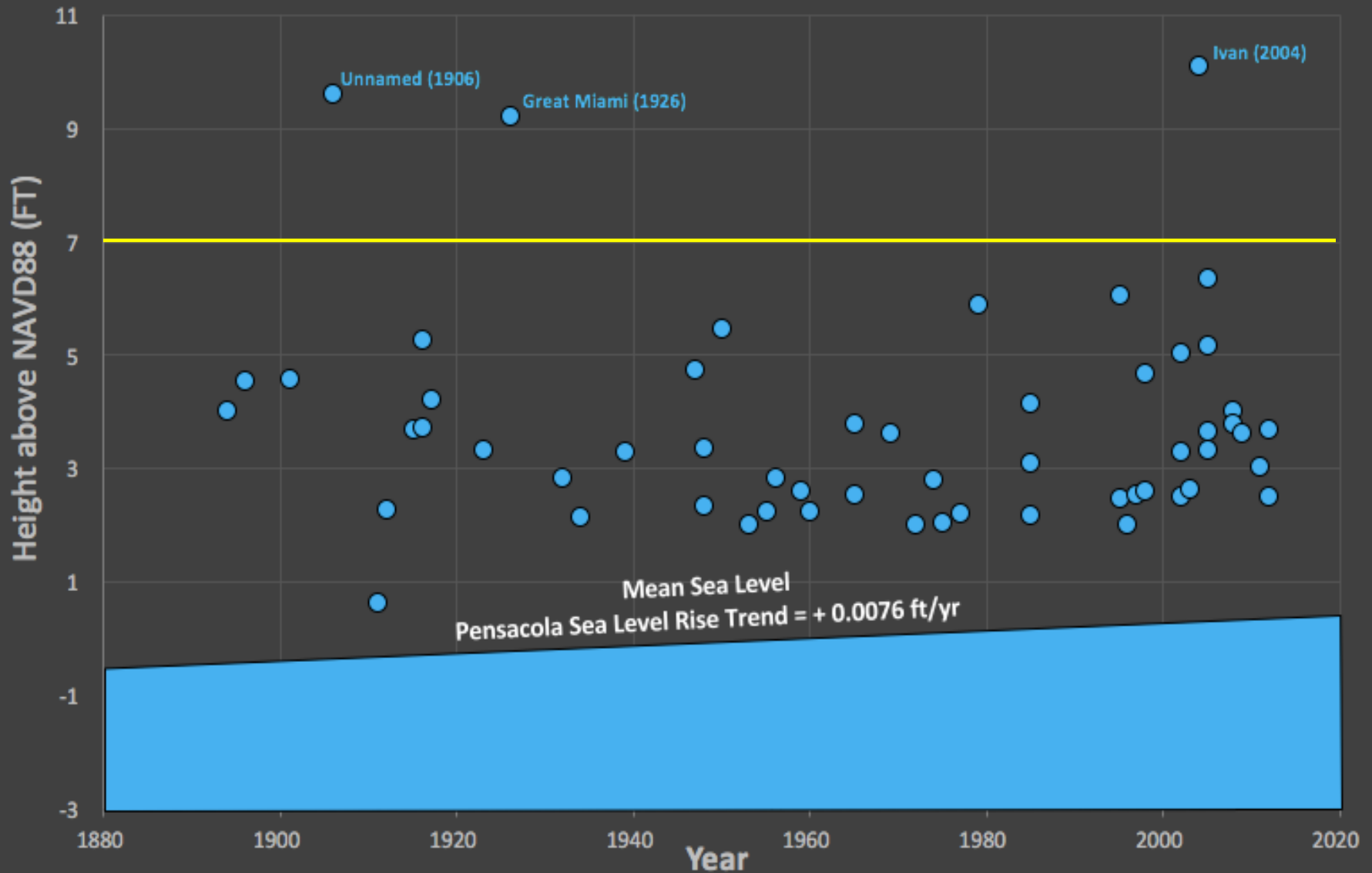
Pensacola

- Native Americans – thousands of years
- Spanish arrived in 1550s
- Five flags have flown over the city
- Storm surge data since 1890

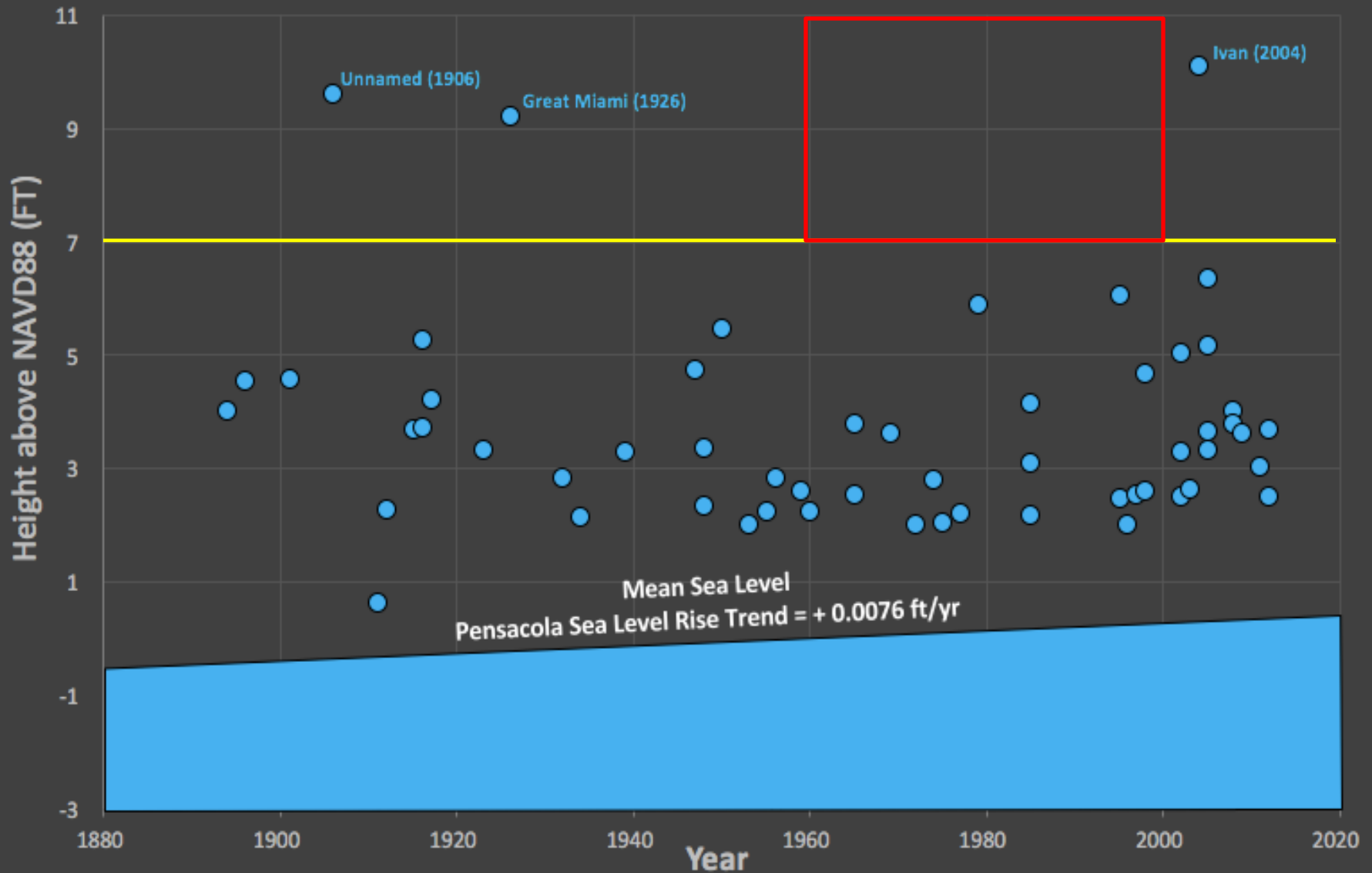
Time Series of Storm Tides at Pensacola, FL 1890 - 2018 (129 Years)



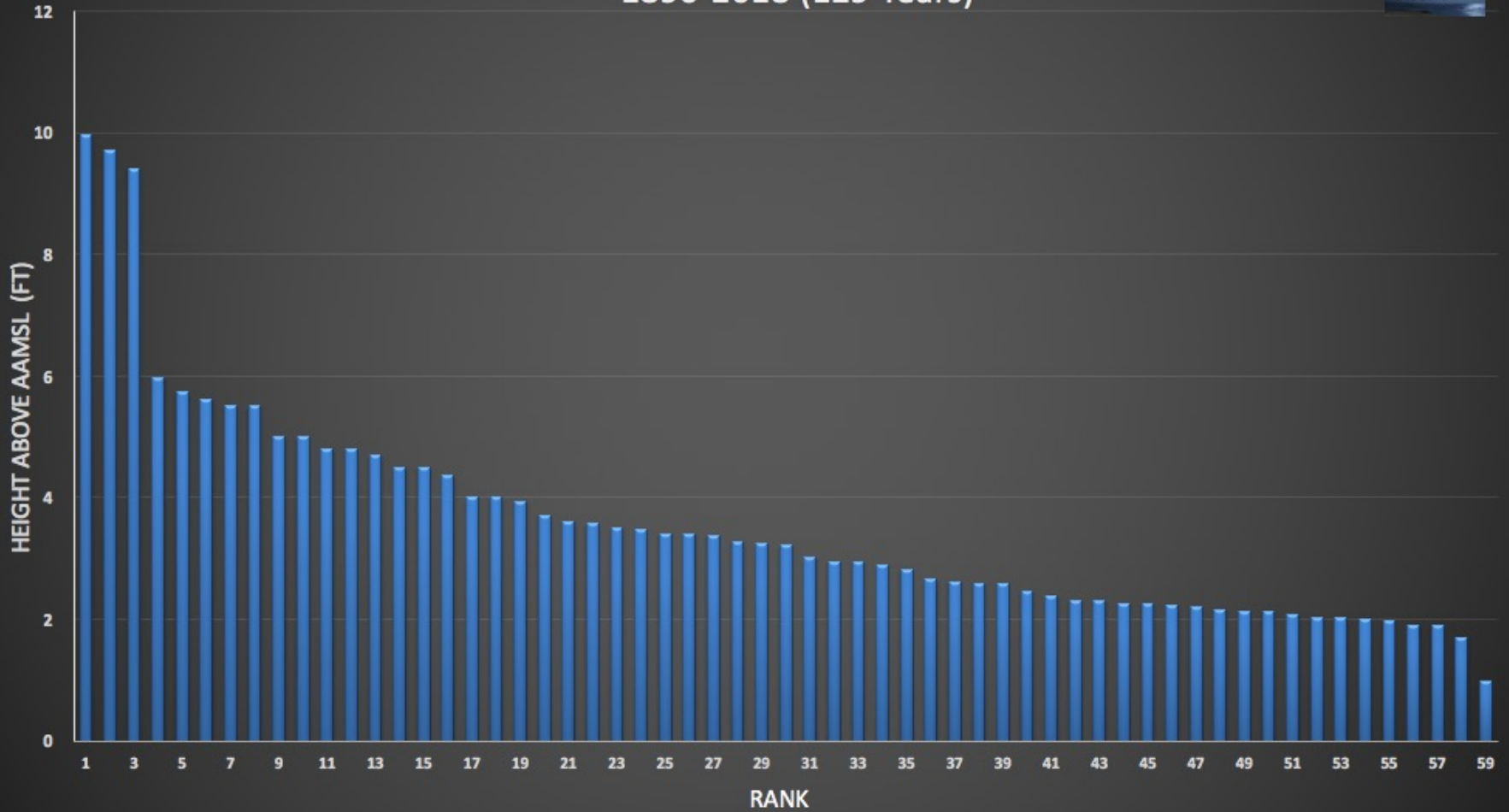
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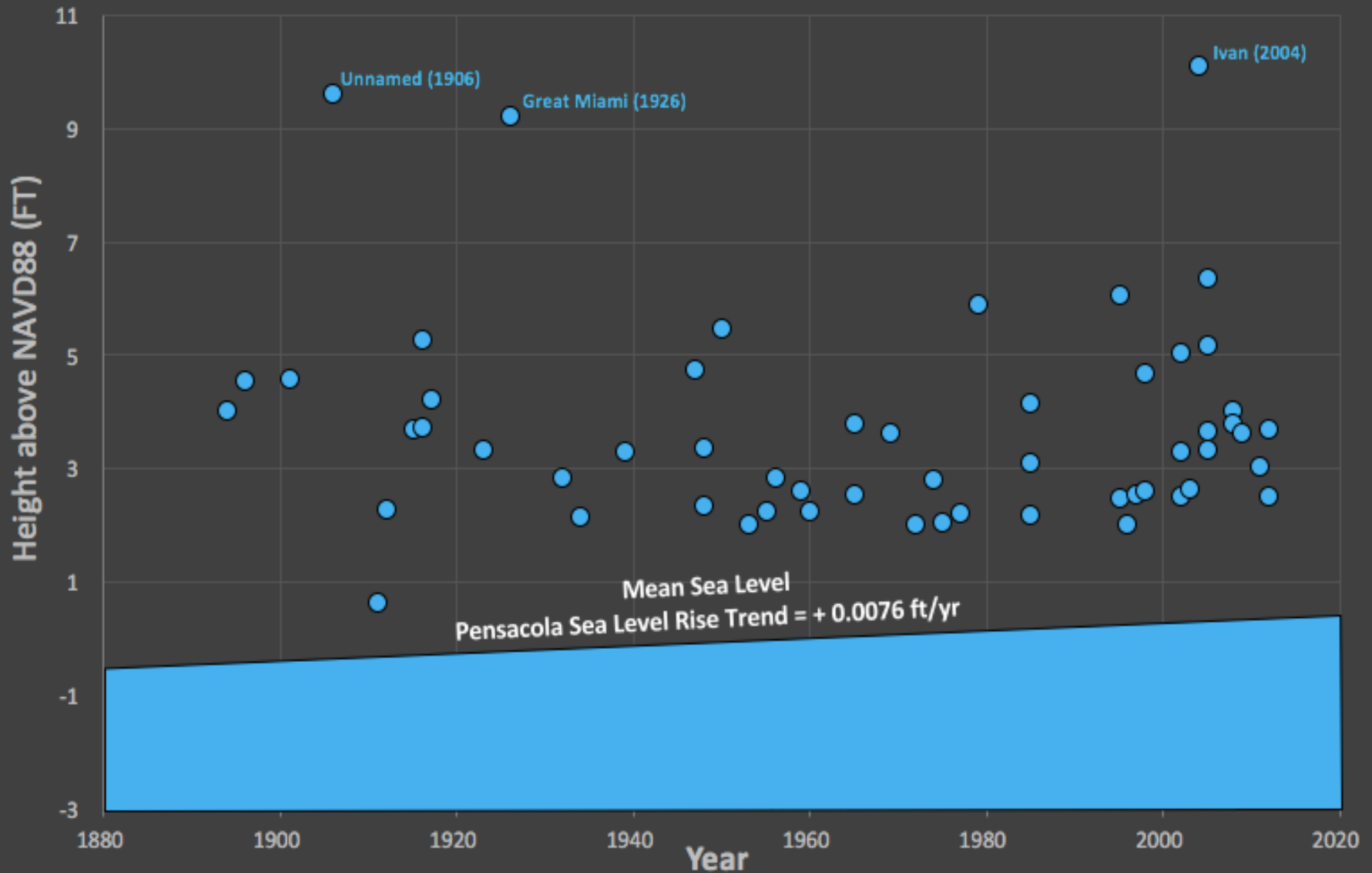
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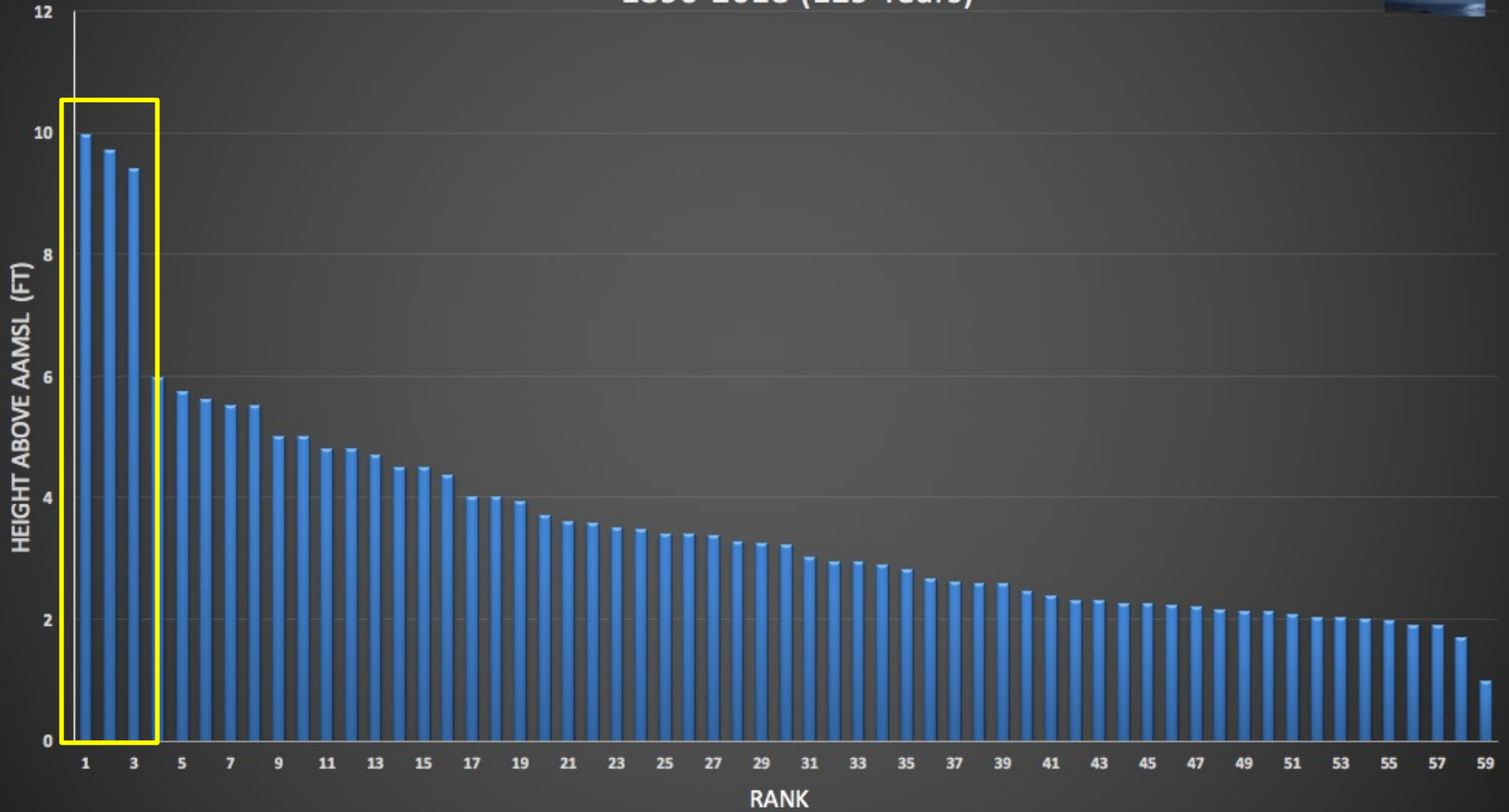
Histogram of Storm Tides at Pensacola, FL 1890-2018 (129 Years)



Time Series of Storm Tides at Pensacola, FL 1890 - 2018 (129 Years)

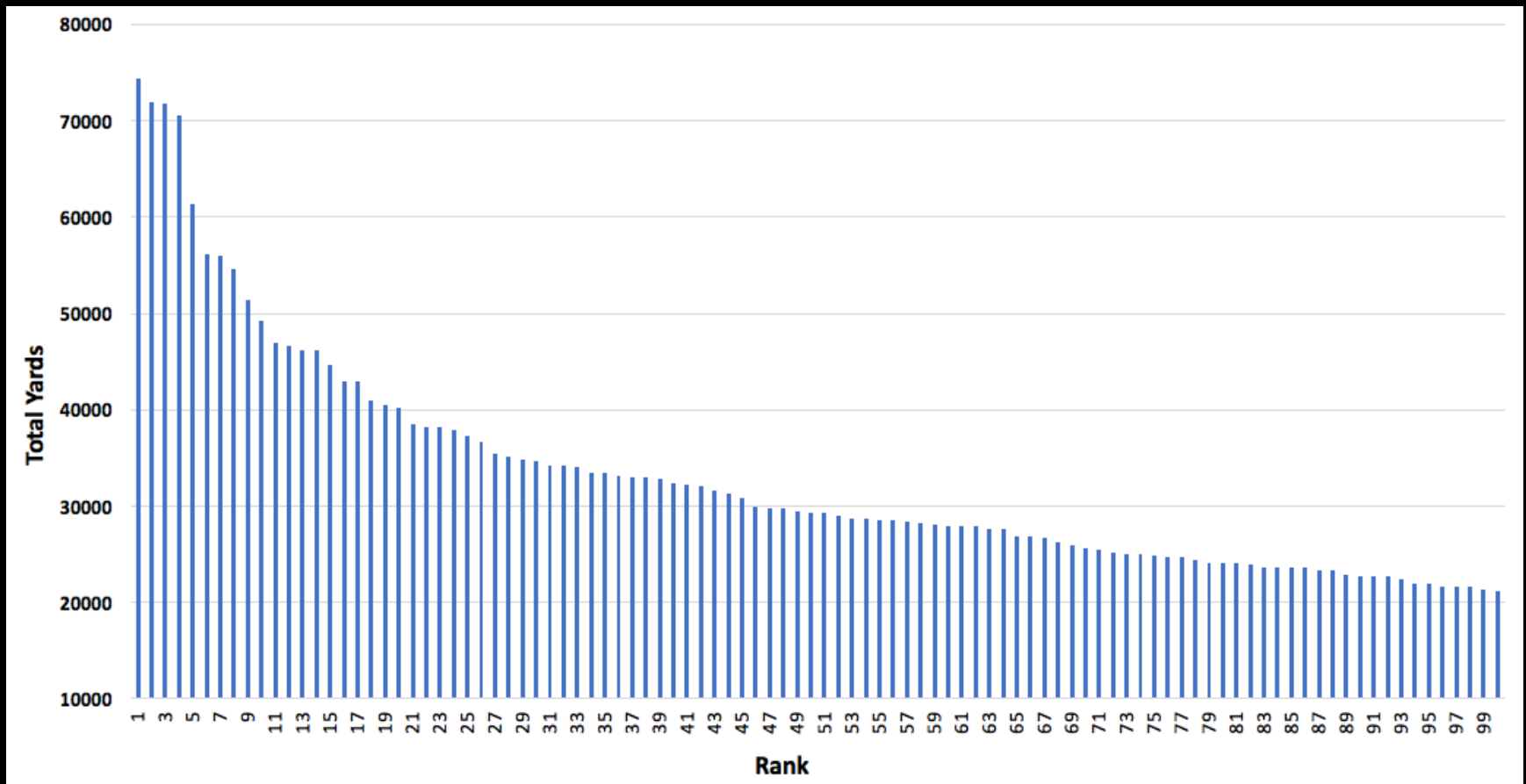


Histogram of Storm Tides at Pensacola, FL 1890-2018 (129 Years)



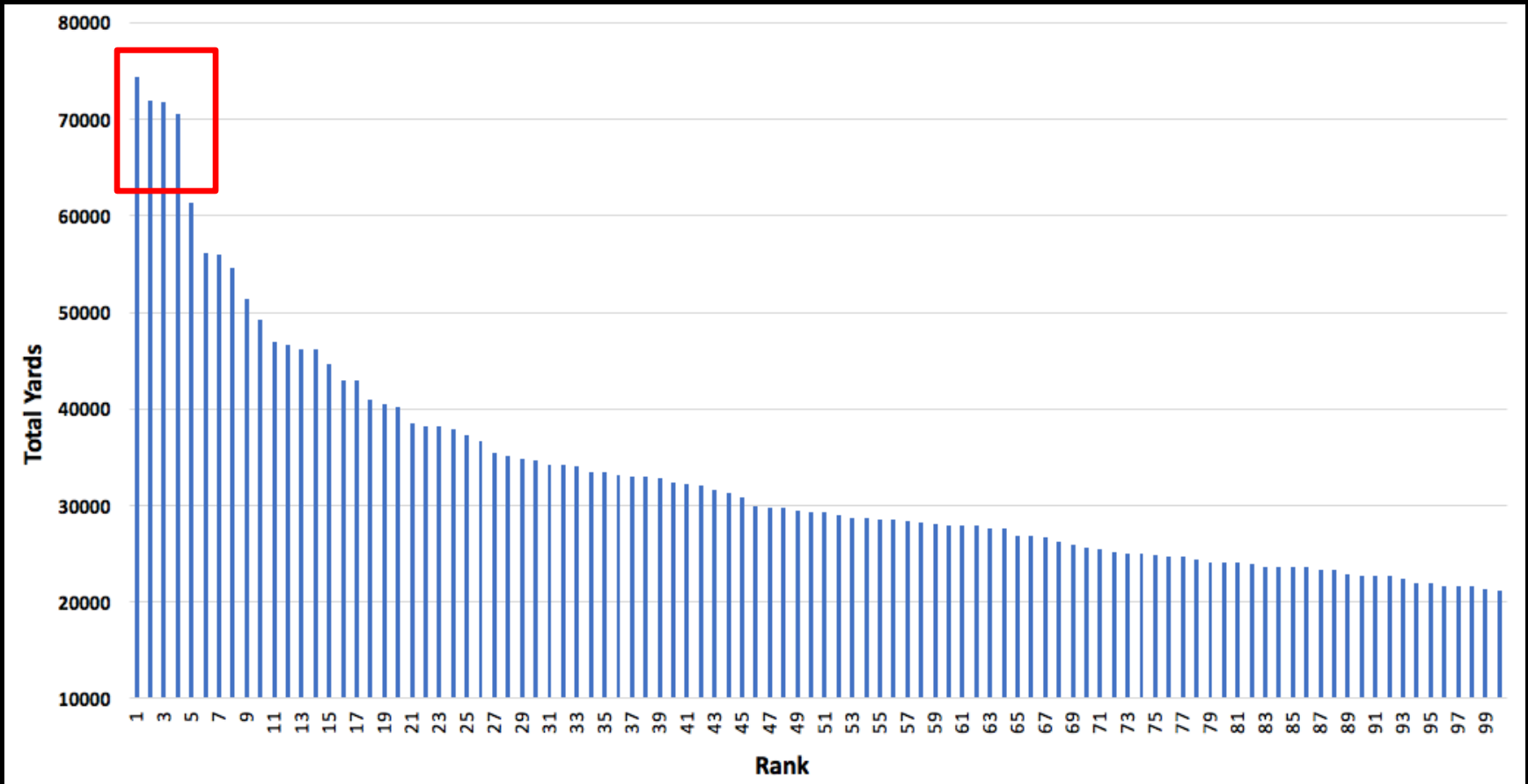


All-Time NFL Passing Leaders





All-Time NFL Passing Leaders





Drew Brees



Peyton Manning



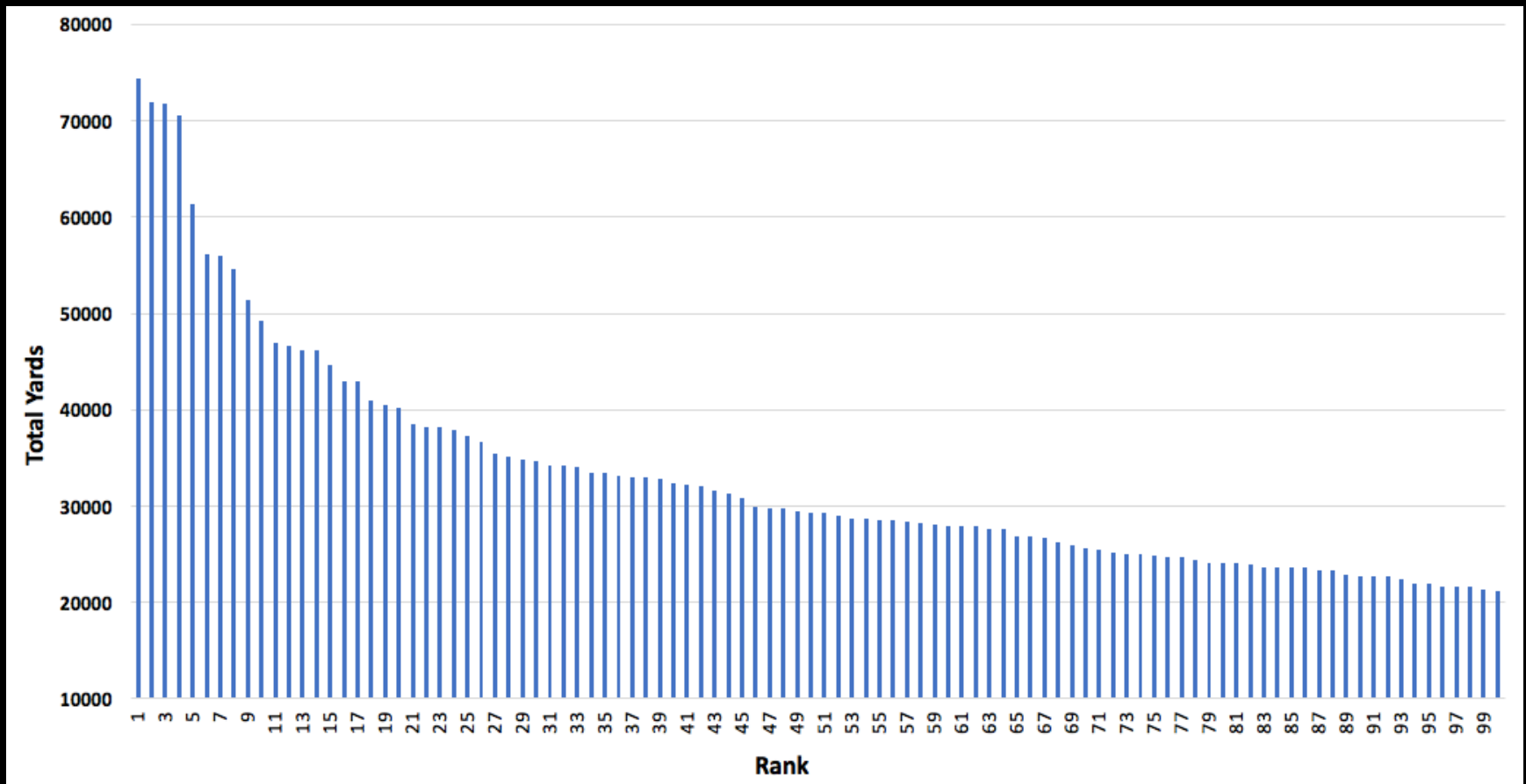
Brett Favre



Tom Brady

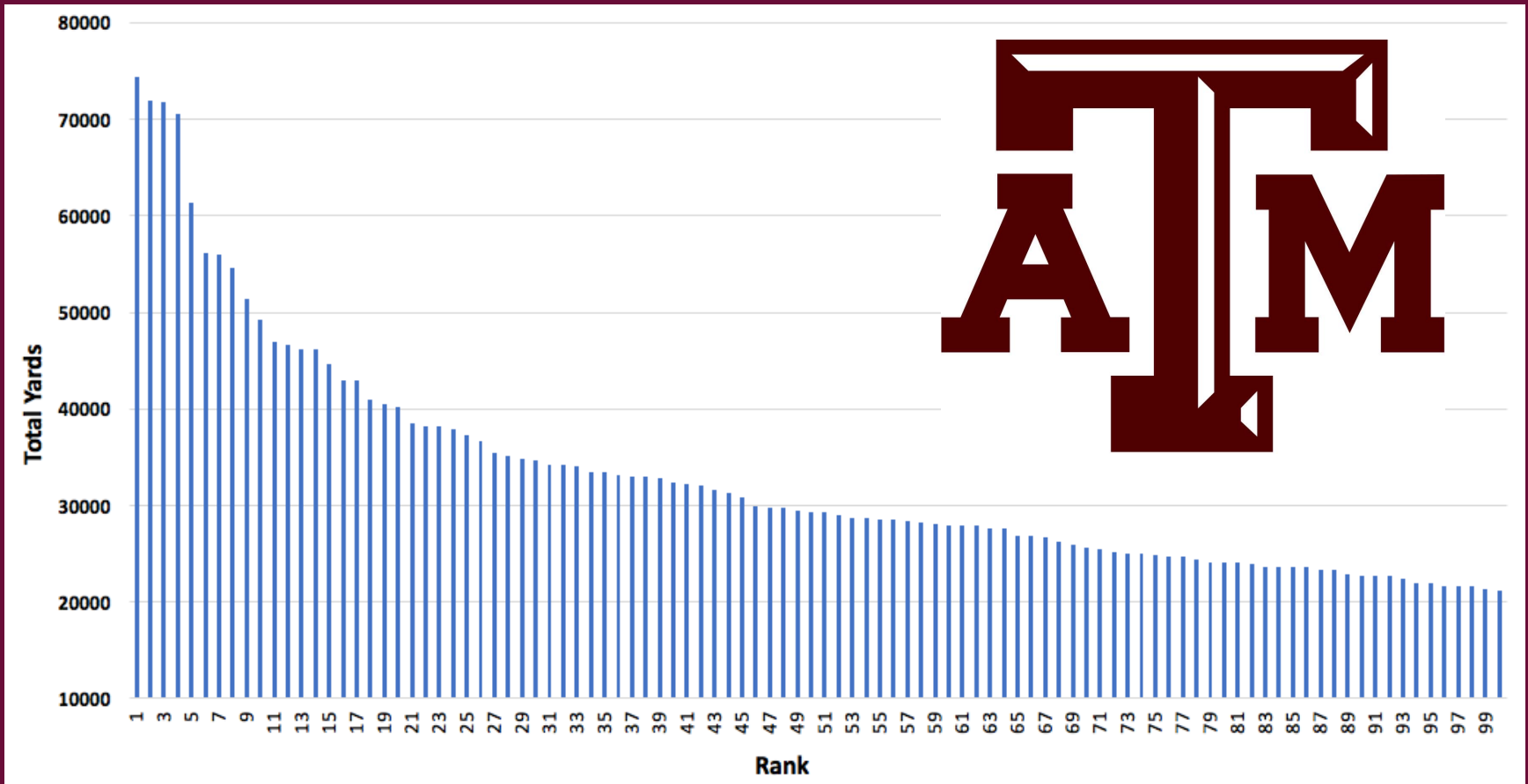


All-Time NFL Passing Leaders



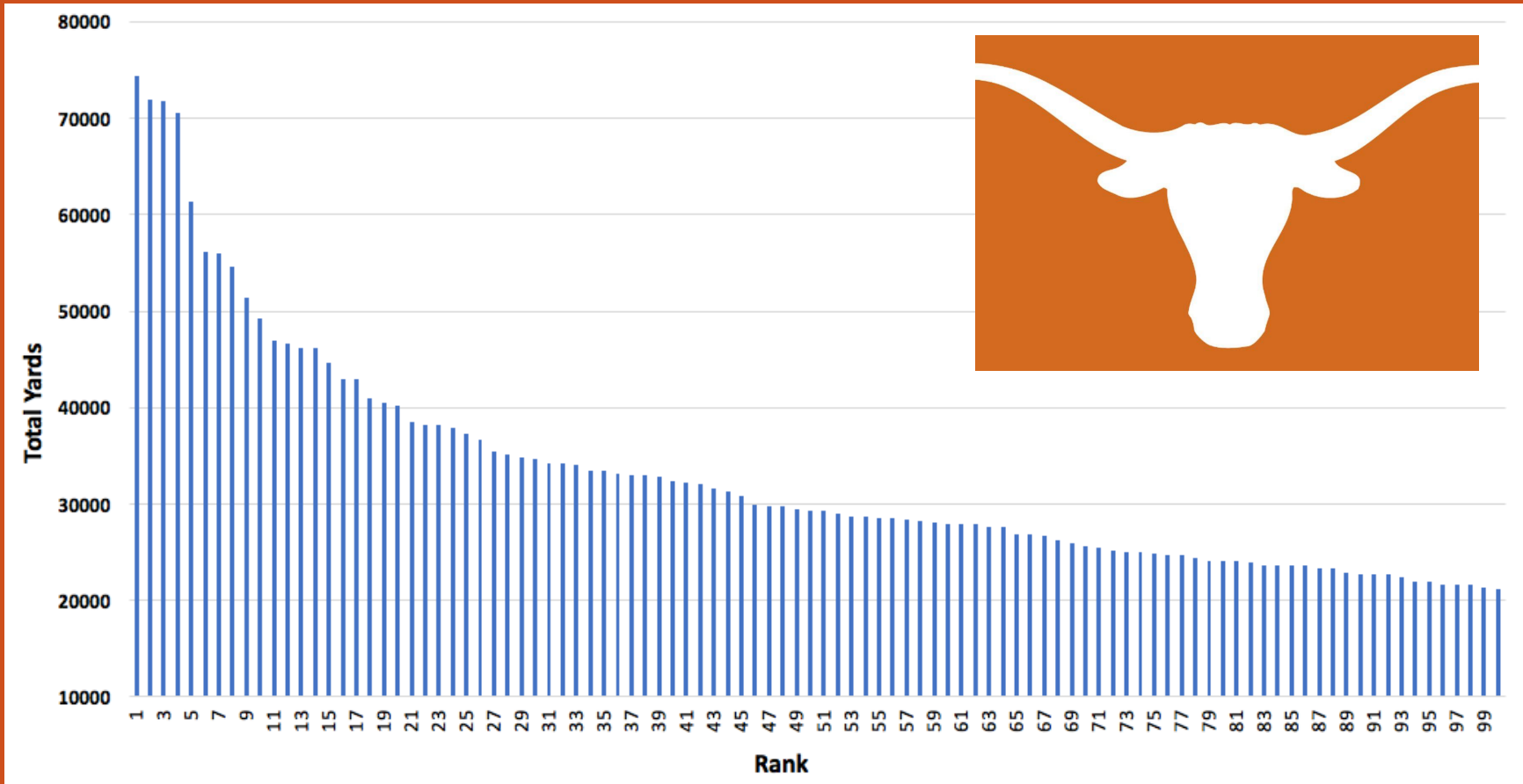


All-Time NFL Passing Leaders





All-Time NFL Passing Leaders



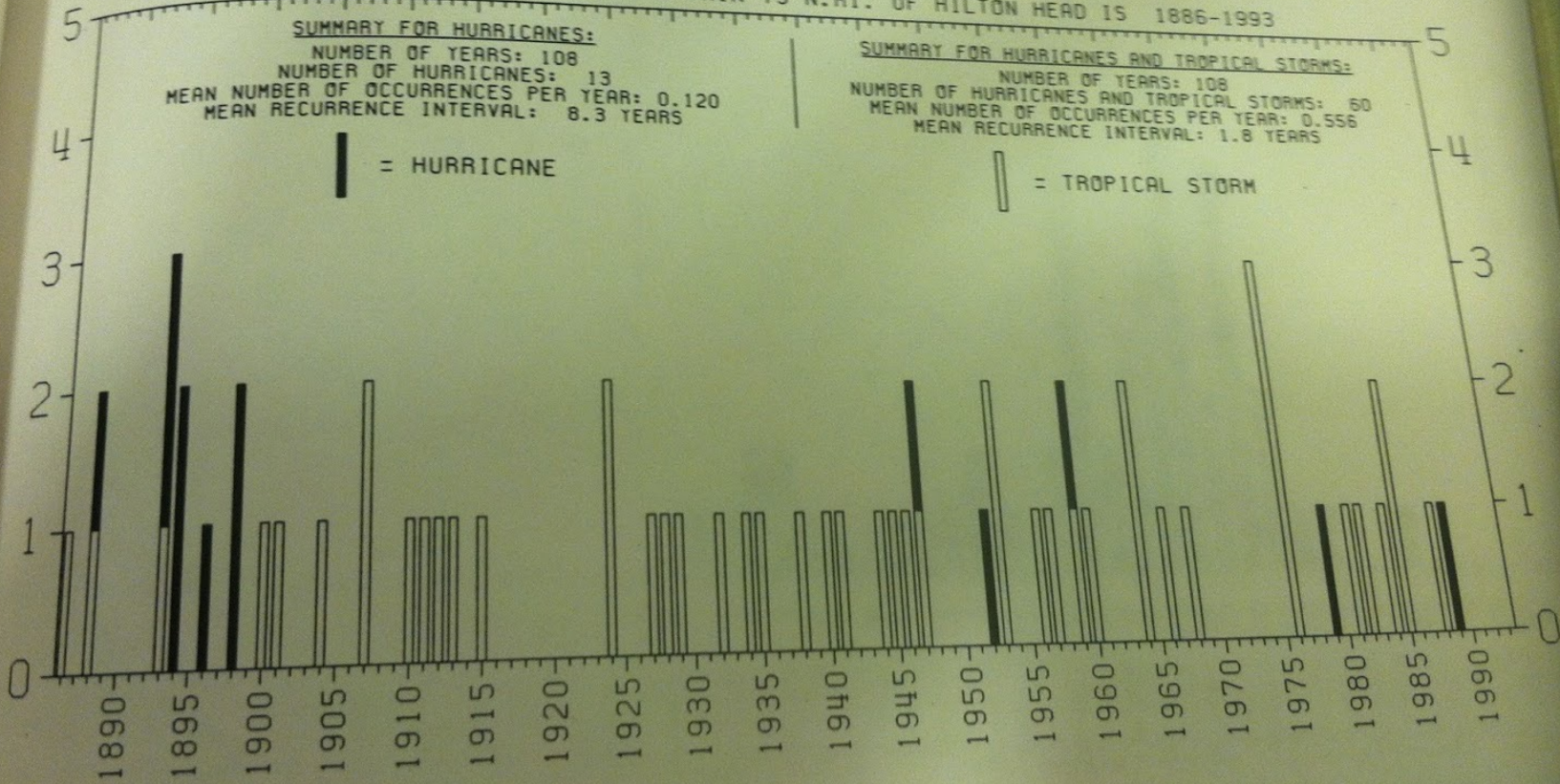
Perspective #1 (Aligned with Reality):

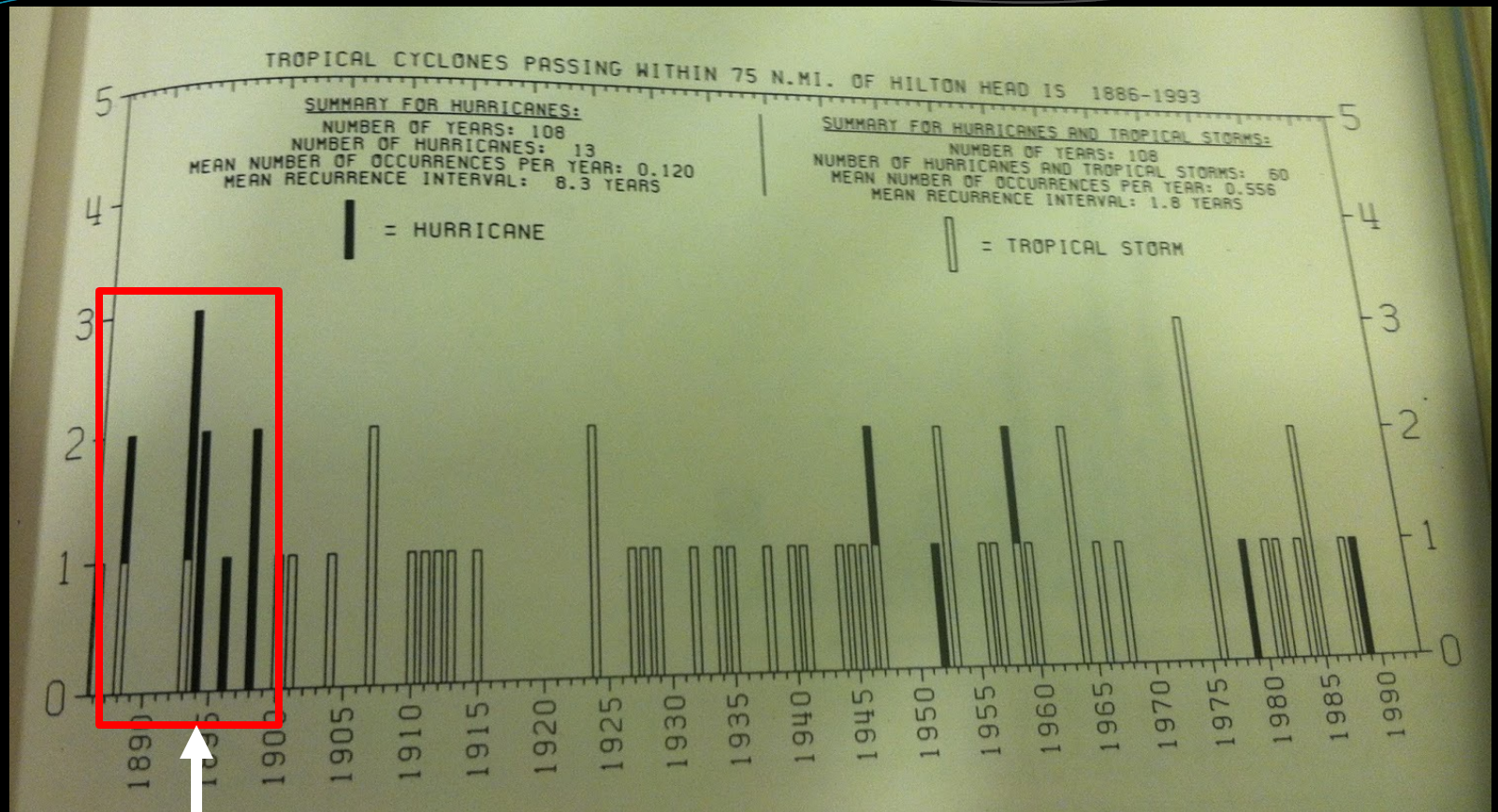
“Although I’ve never flooded in the 30 years I’ve lived here, it could happen one day...”

Perspective #2:

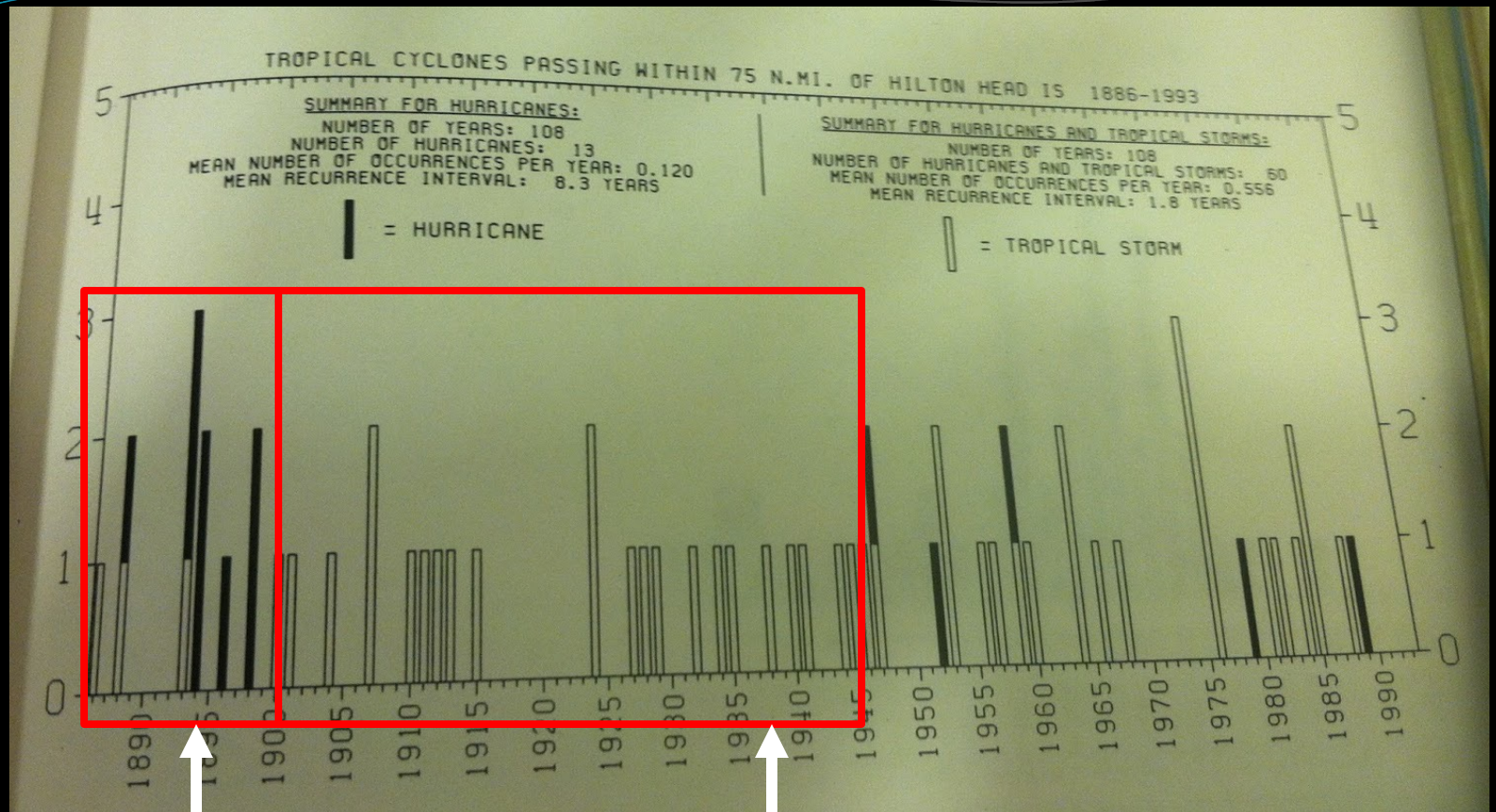
“We don’t have to worry about (floods, fires, freezes) for a long time. We get hit bad around once every 20 years and we just had a big event a few years ago...”

TROPICAL CYCLONES PASSING WITHIN 75 N.MI. OF HILTON HEAD IS 1886-1993





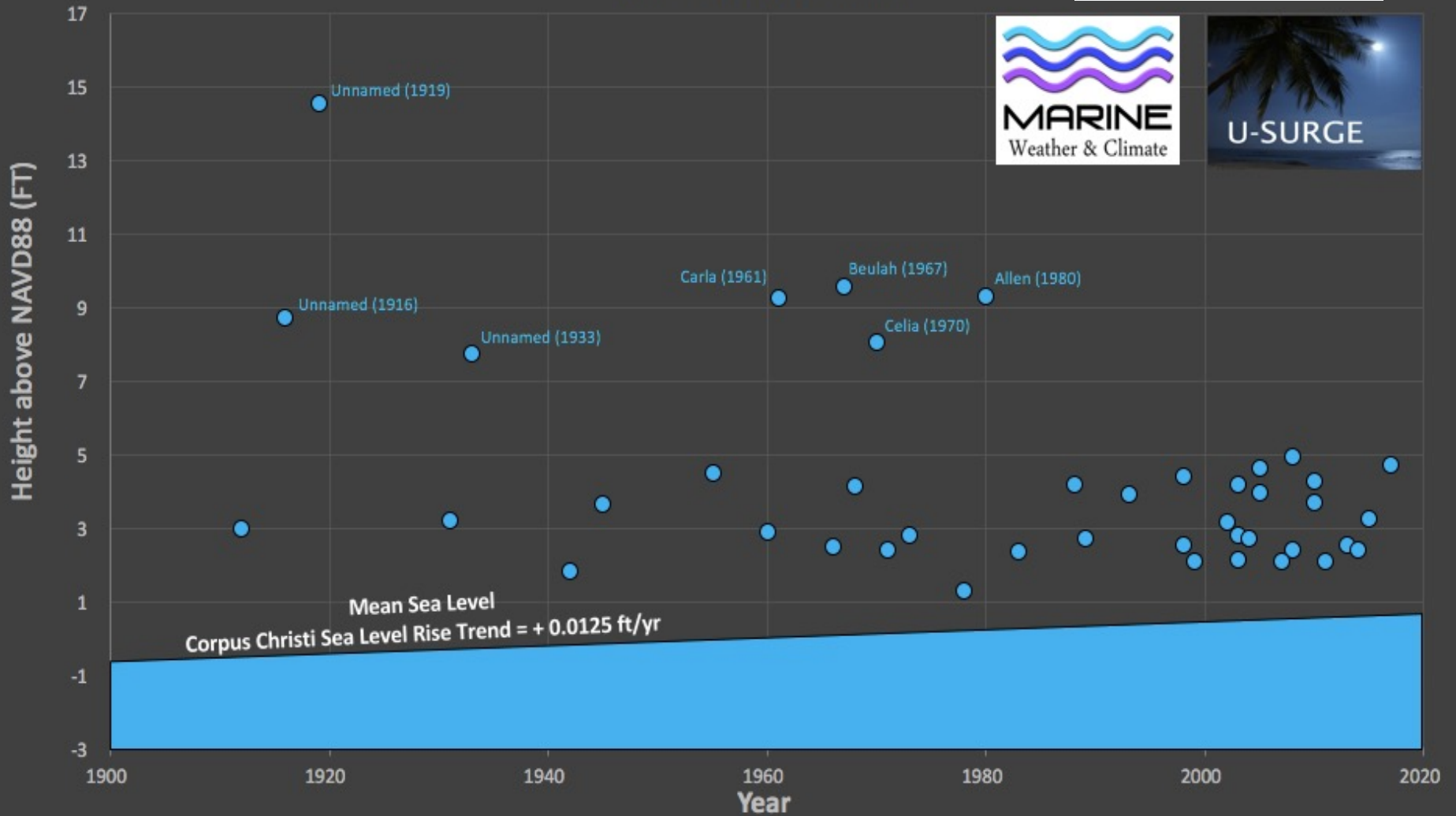
8 Hurricanes
in 11 Years!



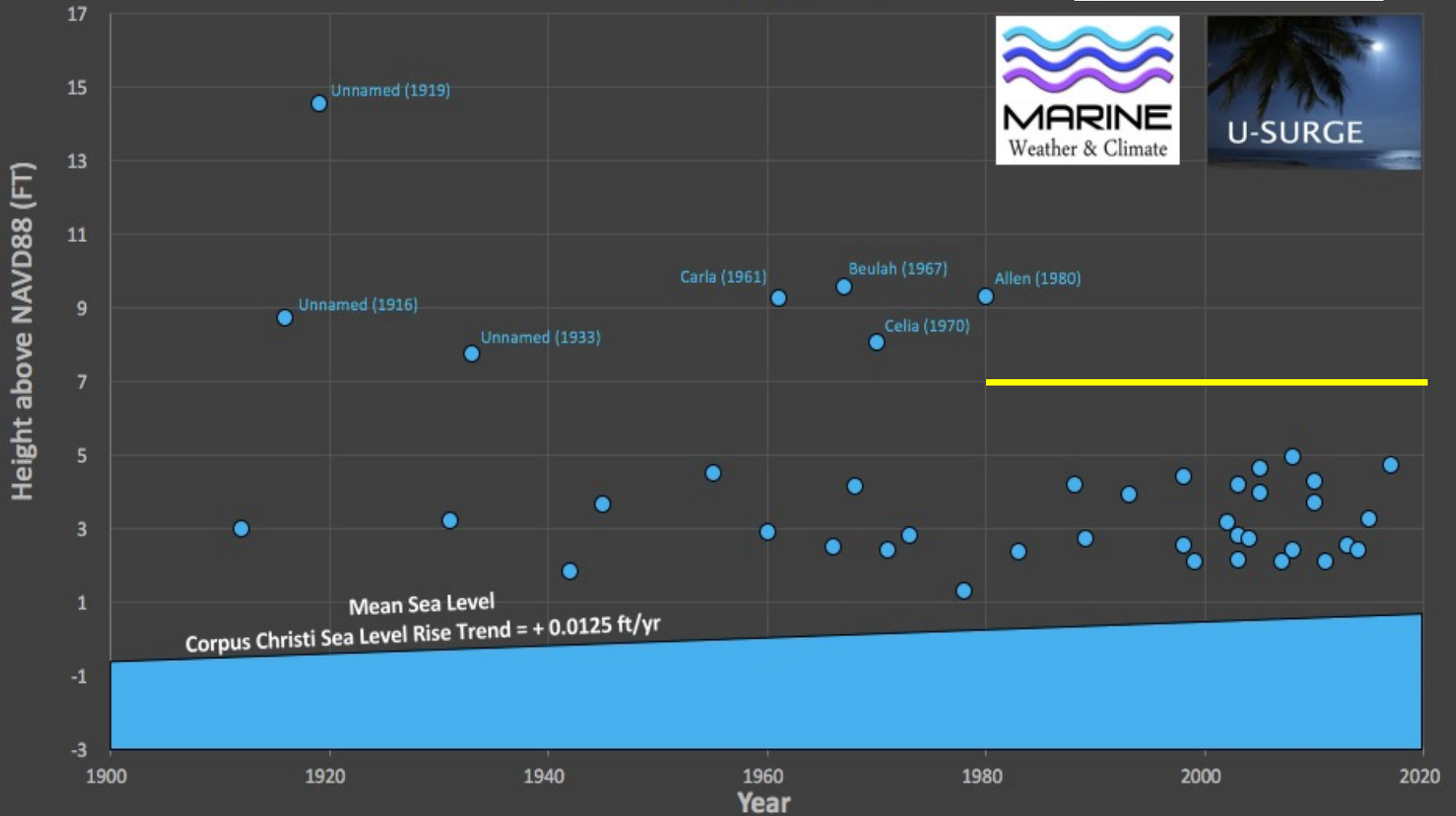
8 Hurricanes
in 11 Years!

0 Hurricanes
in 48 Years!

Time Series of Storm Tides at Corpus Christi, TX 1900 - 2017 (118 Years)



Time Series of Storm Tides at Corpus Christi, TX 1900 - 2017 (118 Years)





UNITED STATES OF AMERICA

LIBERTY

IN
GOD WE
TRUST

QUARTER DOLLAR

S

Fake Sequence

1. H
2. T
3. H
4. H
5. T
6. H
7. T
8. T
9. H
10. H

Real Sequence

Fake Sequence

1. H
2. T
3. H
4. H
5. T
6. H
7. T
8. T
9. H
10. H

Real Sequence

1. H
2. T
3. H
4. H
5. T
6. T
7. T
8. T
9. T
10. H

Perspective #2 (Aligned with Reality):

“Although we recently experienced a (flood, hurricane, extreme drought, wildfire, freeze, etc.) and they hit about once every 20 years, each year has a similar risk...so next year we have a 5% chance of this occurring, just like last year.”

Perspective #3:

“I don’t live in a high-risk area like a flood plain or fire zone, so my risk of a natural disaster is zero...”



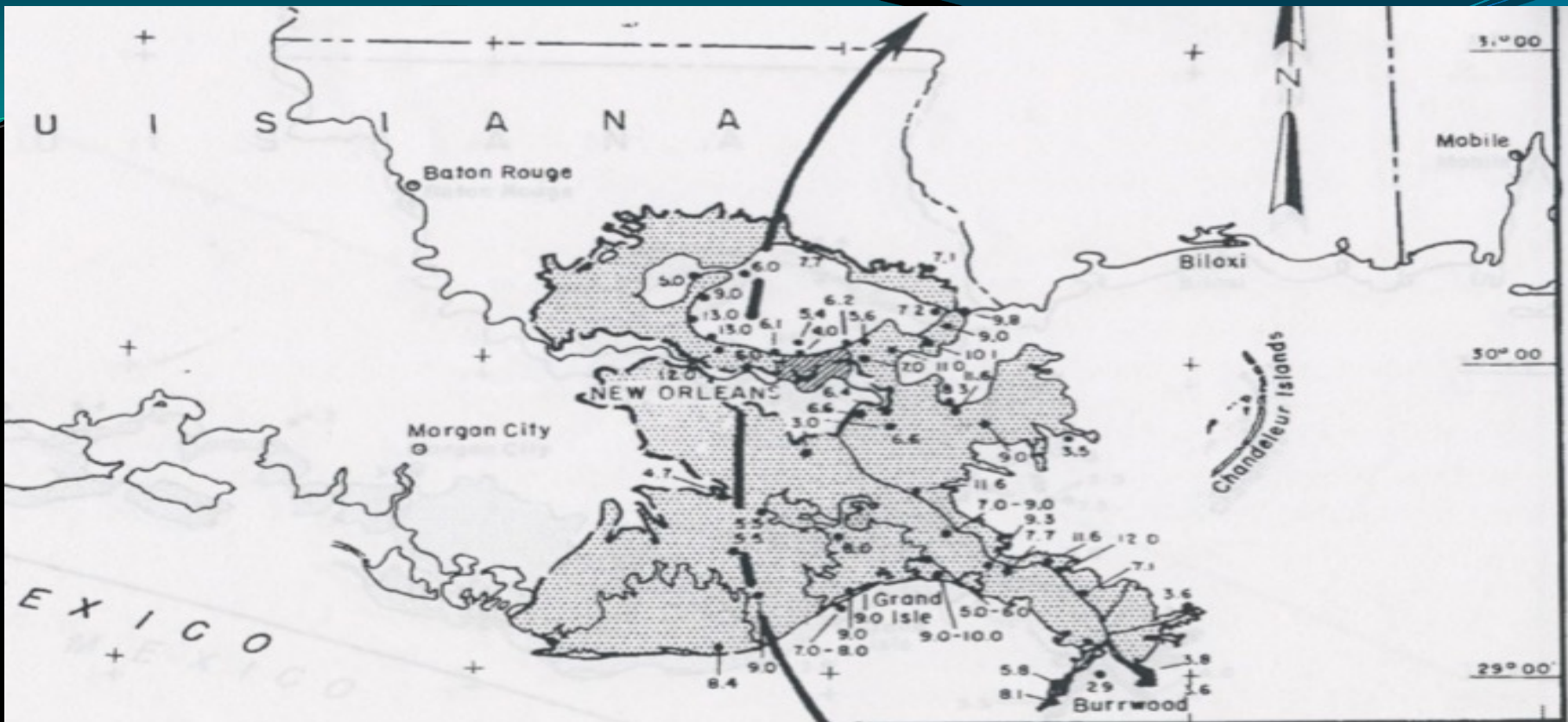
Laplace, LA – Sep 2021



Laplace, LA – Sep 2021



Laplace, LA – Sep 2021



7A 29

HURRICANE STUDY
 COASTAL LOUISIANA AND VICINITY

HURRICANE PATH
22 SEPTEMBER-2 OCTOBER 1915

SCALE AS SHOWN

CORPS OF ENGINEERS, U.S. ARMY
 OFFICE OF THE DISTRICT ENGINEER, N.O.

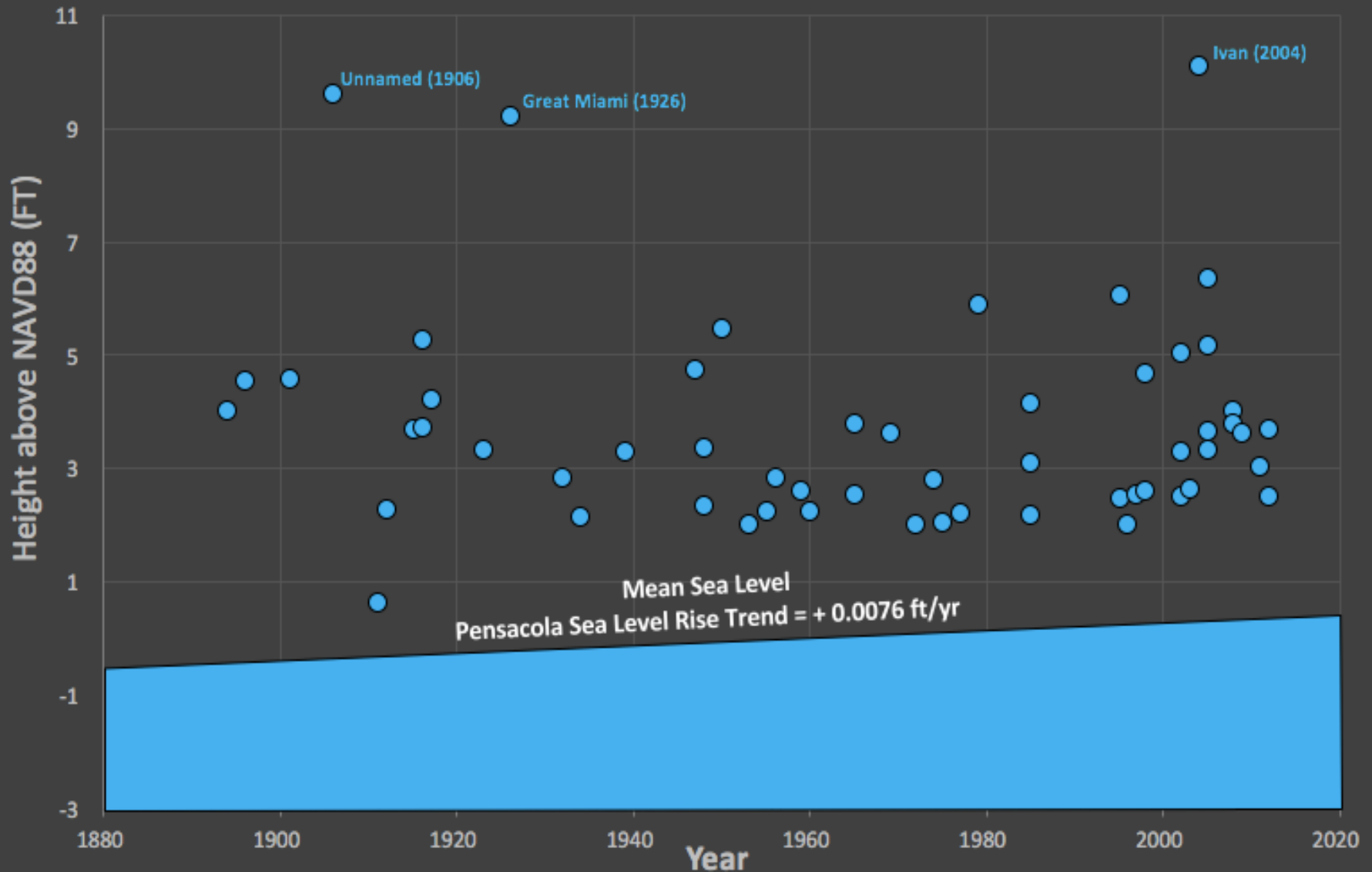
JANUARY 1961 FILE NO. H-20-21863A

Home in Laplace, LA

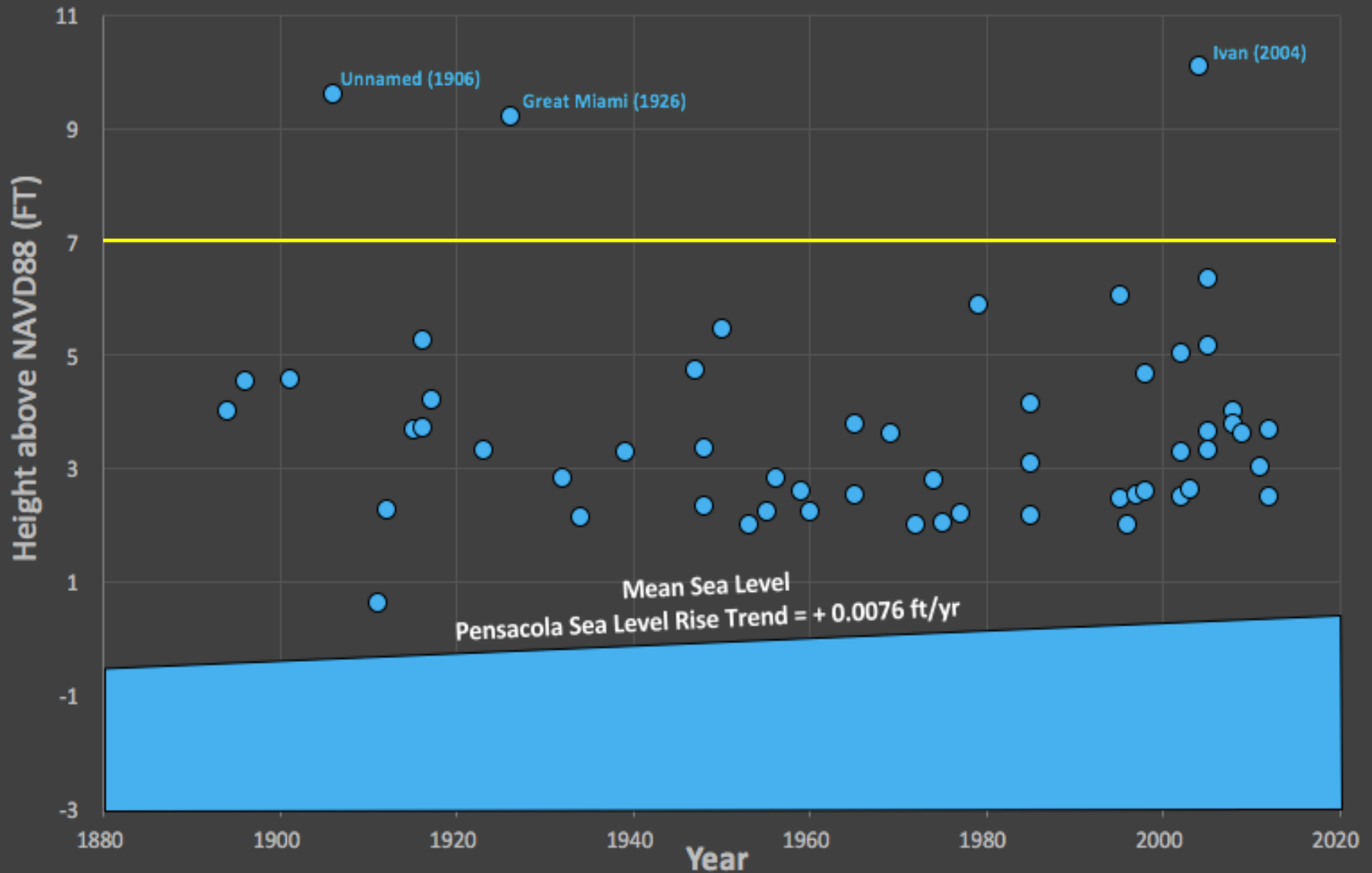
- Family almost died in storm
- In FEMA's X-Zone
(Not in 100-year flood plain)
- Home would have absolutely flooded in:
 - Unnamed Storm (1915)
 - Hurricane Betsy (1965)
 - Hurricane Isaac (2012)
 - Hurricane Ida (2021)
- They flood around every 30 years! (4 times since 1900)



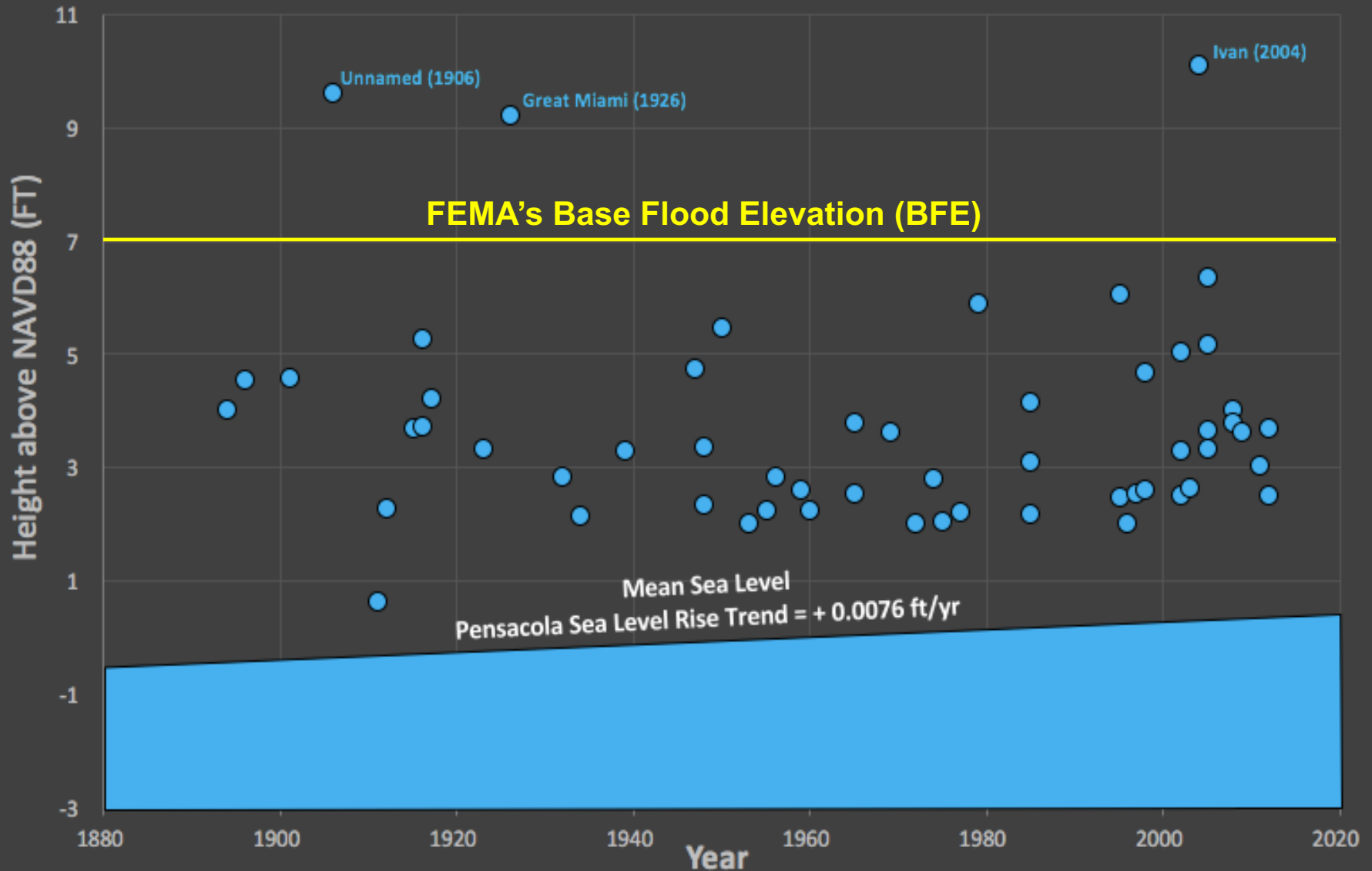
Time Series of Storm Tides at Pensacola, FL 1890 - 2018 (129 Years)



Time Series of Storm Tides at Pensacola, FL 1890 - 2018 (129 Years)



Time Series of Storm Tides at Pensacola, FL 1890 - 2018 (129 Years)





Harvey's floods

Most homes damaged by Harvey were outside flood plain, data show

By David Hunn, Matt Dempsey, and Mihir Zaveri



Article published March 30, 2018



Perspective #4:

“Climate change is responsible for all of the hurricanes, floods, droughts, heat waves, cold snaps, etc. that we are having now. All natural disasters are tied to climate change. We need to do everything we can to stop it.”



Alliance for Climate Education



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Texas' climate is changing, but we can stop it. It starts in your classroom.



**BUT WE HAVE THE
POWER TO STOP IT.**

OURCLIMATEOURFUTURE.ORG

Educate your class today. 📚

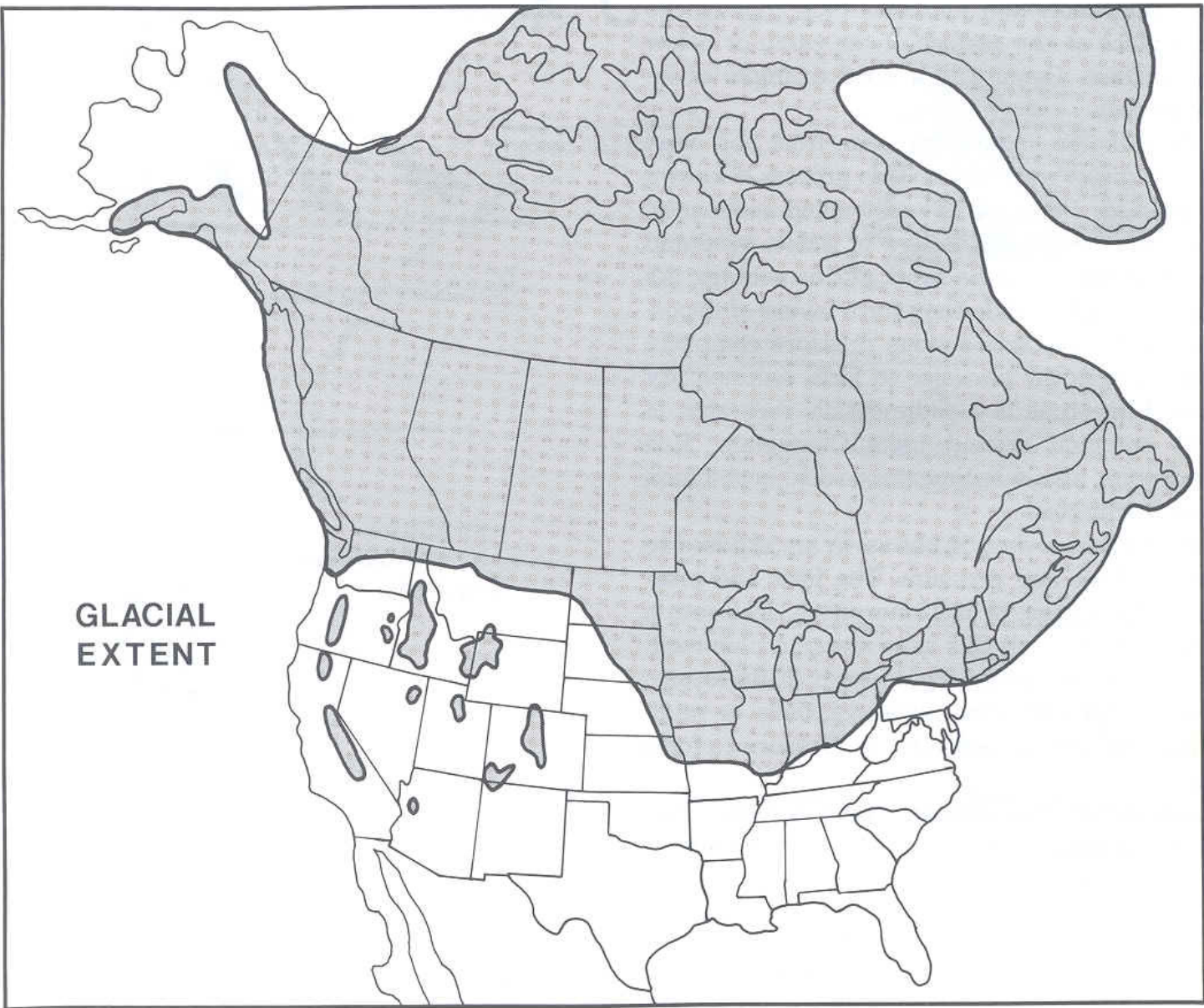
Sign Up

👍👎🗨️ 228 40 Comments 130 Shares 18.7K Views 🌐

👍 Like

🗨️ Comment

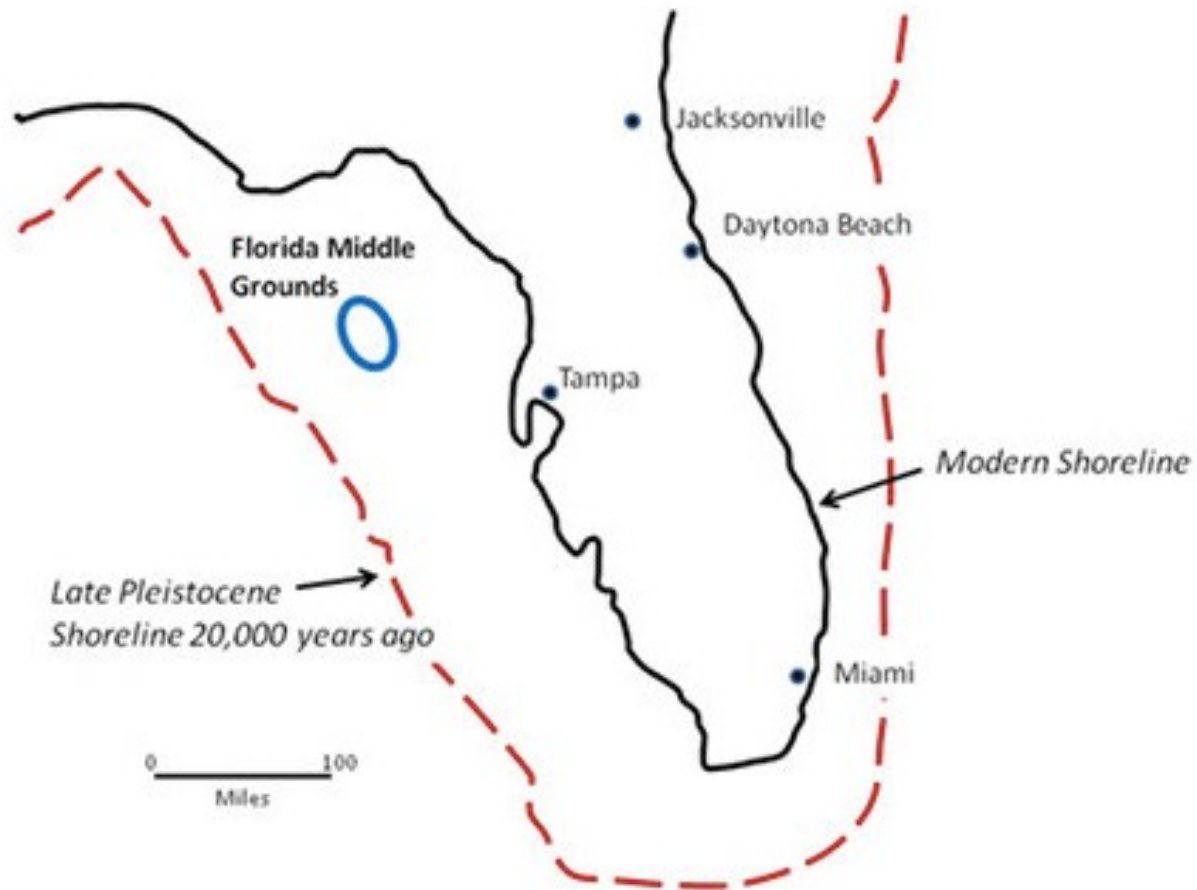
🔗 Share



After Johnson 1980.









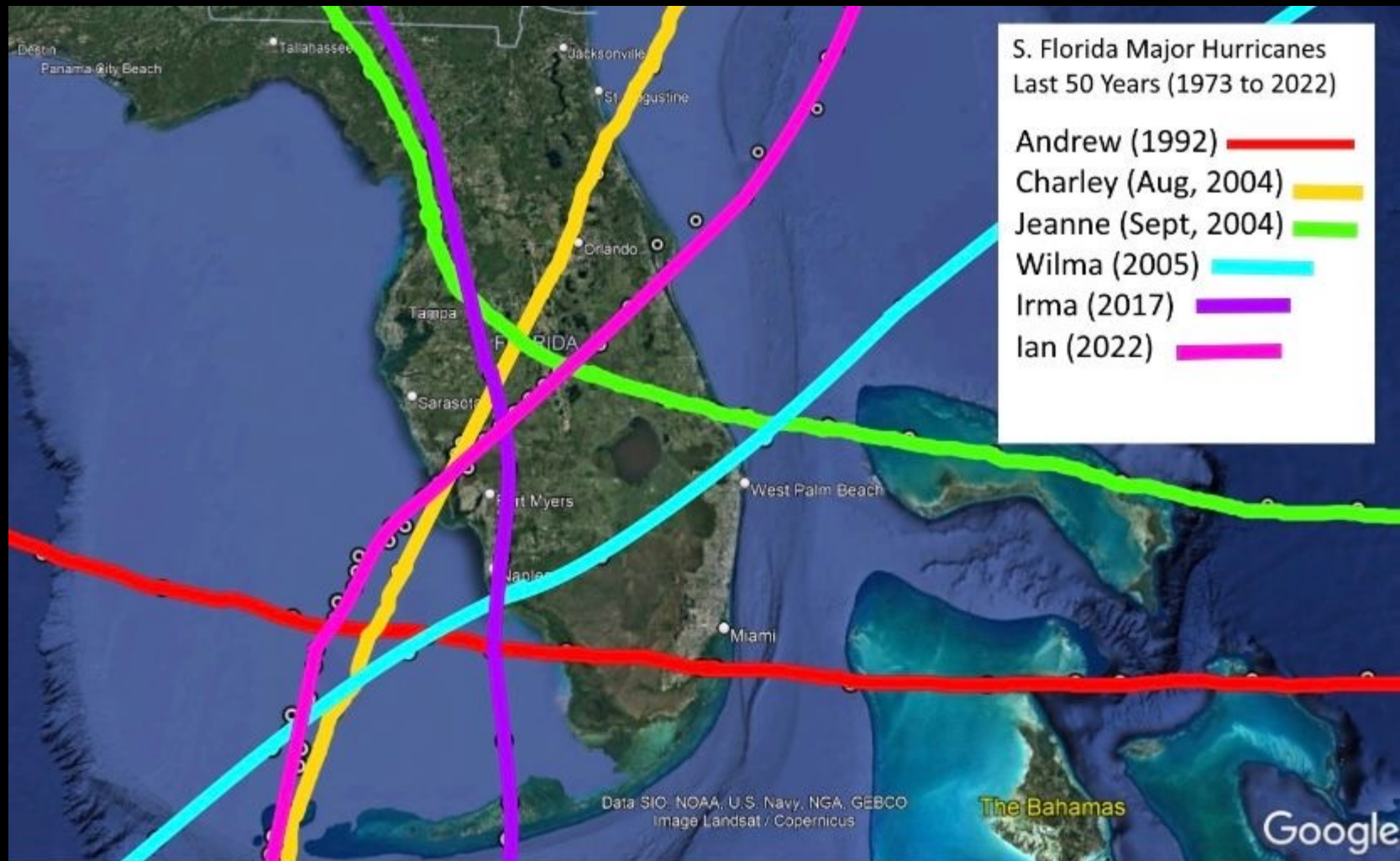


Know your Regional Disaster History

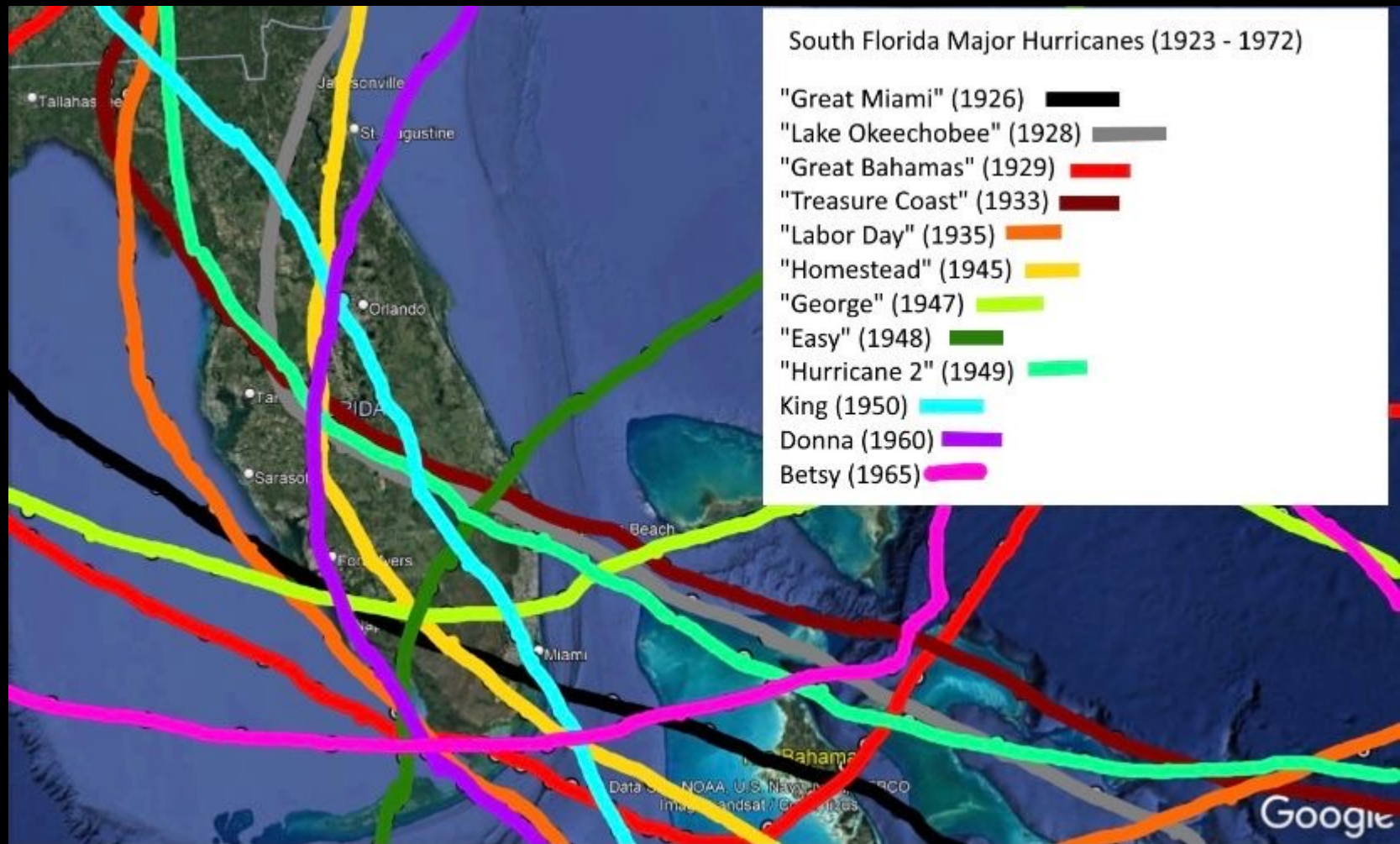


Look back far in time!

Know your Regional Disaster History



Know your Regional Disaster History



Perspective #4 (Aligned with Reality):

“We live on a planet that has experienced extreme environmental changes in the past triggered from trends and variability in temperature and precipitation.”

“However...”

Perspective #5:

“The climate may be changing but this is natural and humans/ the environment has always adapted to it...”

A more realistic view of the topic:

- Humans accelerating a natural trend
- We are changing the chemistry of our atmosphere by emitting heat-trapping gases
- The impacts are extensive to human/ environmental life and economic losses



Sea Level Rise



Photo: Dr. Hal Needham

now you see it



photo: William O. Field

now you don't



photo: Bruce F. Molnia

Muir Glacier, Alaska: August 13, 1941 and August 31, 2004



CLIMATE 365

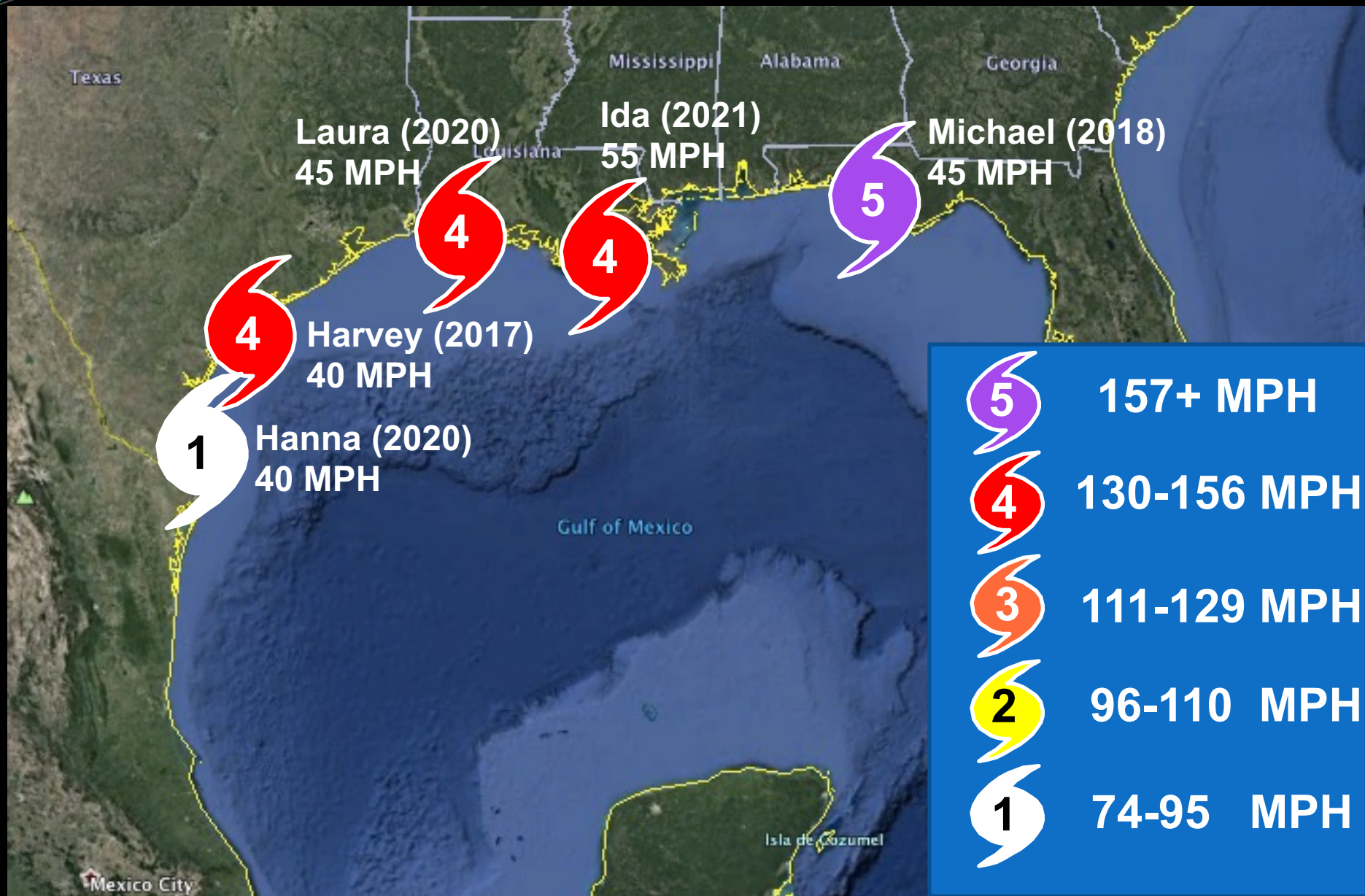
climate365.tumblr.com | go.nasa.gov/climate365





Rapid Intensification of Hurricanes

Rapid Intensification Over the Past Six Years





Since 1950, the greatest 24-hour intensification rates prior to a U.S. landfall:

Humberto (2007): 65 mph increase

King (1950): 60 mph increase

Eloise (1975): 60 mph increase

★ Ida (2021): 55 mph increase

Danny (1997): 50 mph increase

★ Michael (2018): 45 mph increase

★ Laura (2020): 45 mph increase

Cindy (2005): 40 mph increase

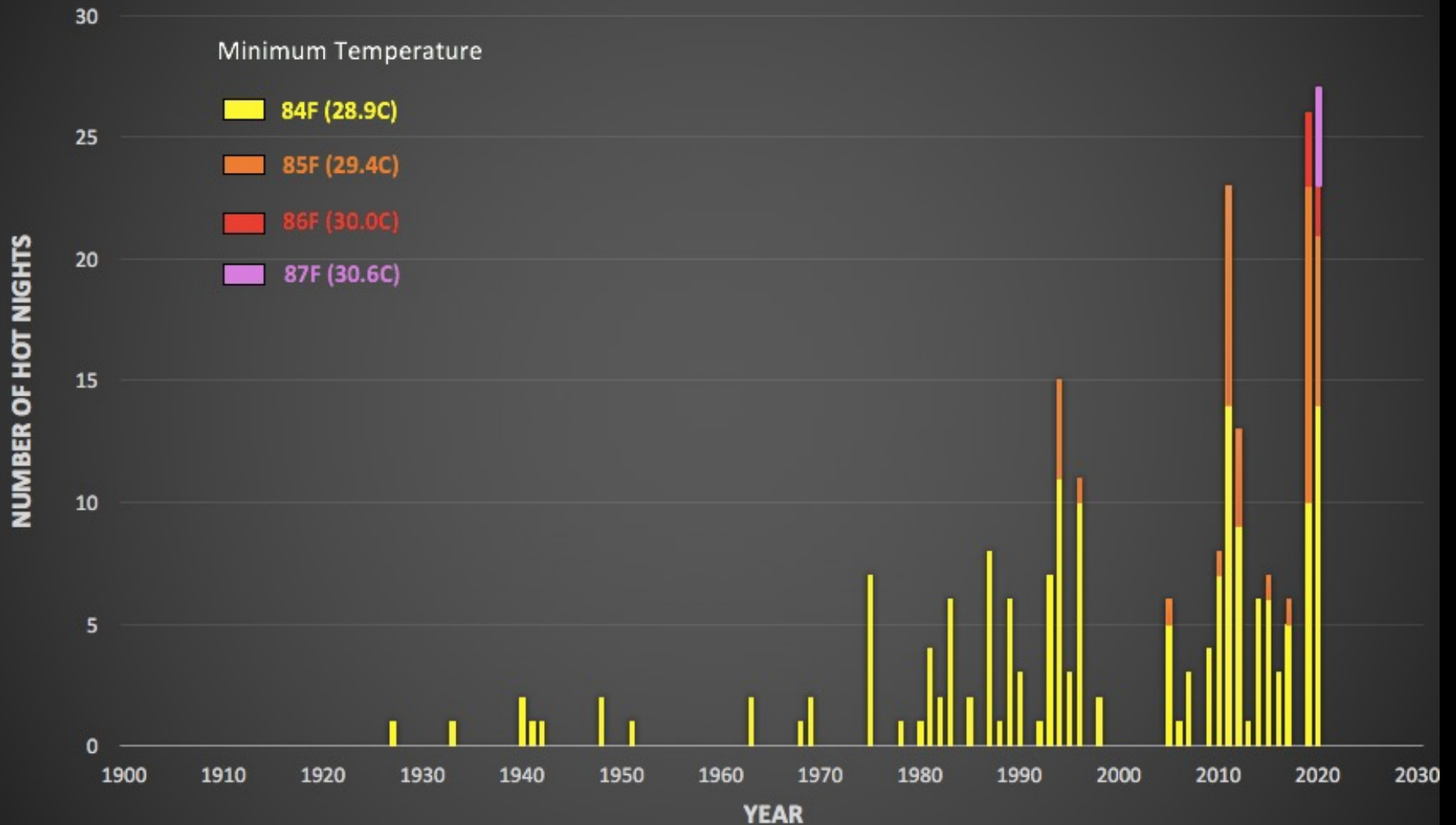
★ Harvey (2017): 40 mph increase

★ Hanna (2020): 40 mph increase

★ 2017-2021 Average = 1 per year

(List adapted from CAT-6 Weather Blog)

Number of Hot Nights in Galveston, Texas from 1900-2020 (121 Years)



6 of Past 8 Years – Stalled Landfalling Storms

South Carolina - 2015



Image: <https://www.nytimes.com/video/us/100000003958698/9-dead-in-south-carolina-weather.html>

South Louisiana - 2016



Hurricane Harvey – Texas (2017)



Photo: Dr. Hal Needham

Hurricane Florence (2018)



Photo: Dr. Hal Needham

Tropical Storm Imelda (2019)



Source: Brett Coomer/ Houston Chronicle

Hurricane Sally (2020)



Photo: Dr. Hal Needham

“How a Warming World May have Caused Hurricane Florence to Stall”





Warmer Ocean = More Rain

1 degree C (1.8 degrees F) = 7% more moisture
= 10-15% more rain?

Perspective #5 (Aligned with Reality):

“Although climate has always changed, accelerating trends due in part to human activity will have a major impact on humans and the environment.”

Path Forward and Action Items:


1. Know your extreme weather/
natural disaster history
2. Look to the right and left to
account for geographic clustering
3. Build in buffers to account for
climate and environmental
changes



Check out the GeoTrek Podcast!



▶ E72 - The Janitor Threw Out the Data- The Back Story of Seasonal Hurricane Forecasting with Phil Klotzbach

 GeoTrek by GeoTrek

A janitor throwing out an important stack of tropical climate research papers led Dr. Bill Gray to redirect his research into seasonal hurricane forecasting at Colorado State University. Dr. Phil Klotzbach shares this story, and the science behind seasonal hurricane forecasts.

Jun 06 2023

Galveston Hurricane Tour

2-hour walking tour in downtown Galveston!



Contact Info

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Geo-trek.com

Floodinformationsystems.com

Check out GeoTrek Podcast!



Navigating Evolving Weather Patterns In a Rapidly Changing World

