Hurricane Myths And Their Role In Florida's Hurricane Climatology

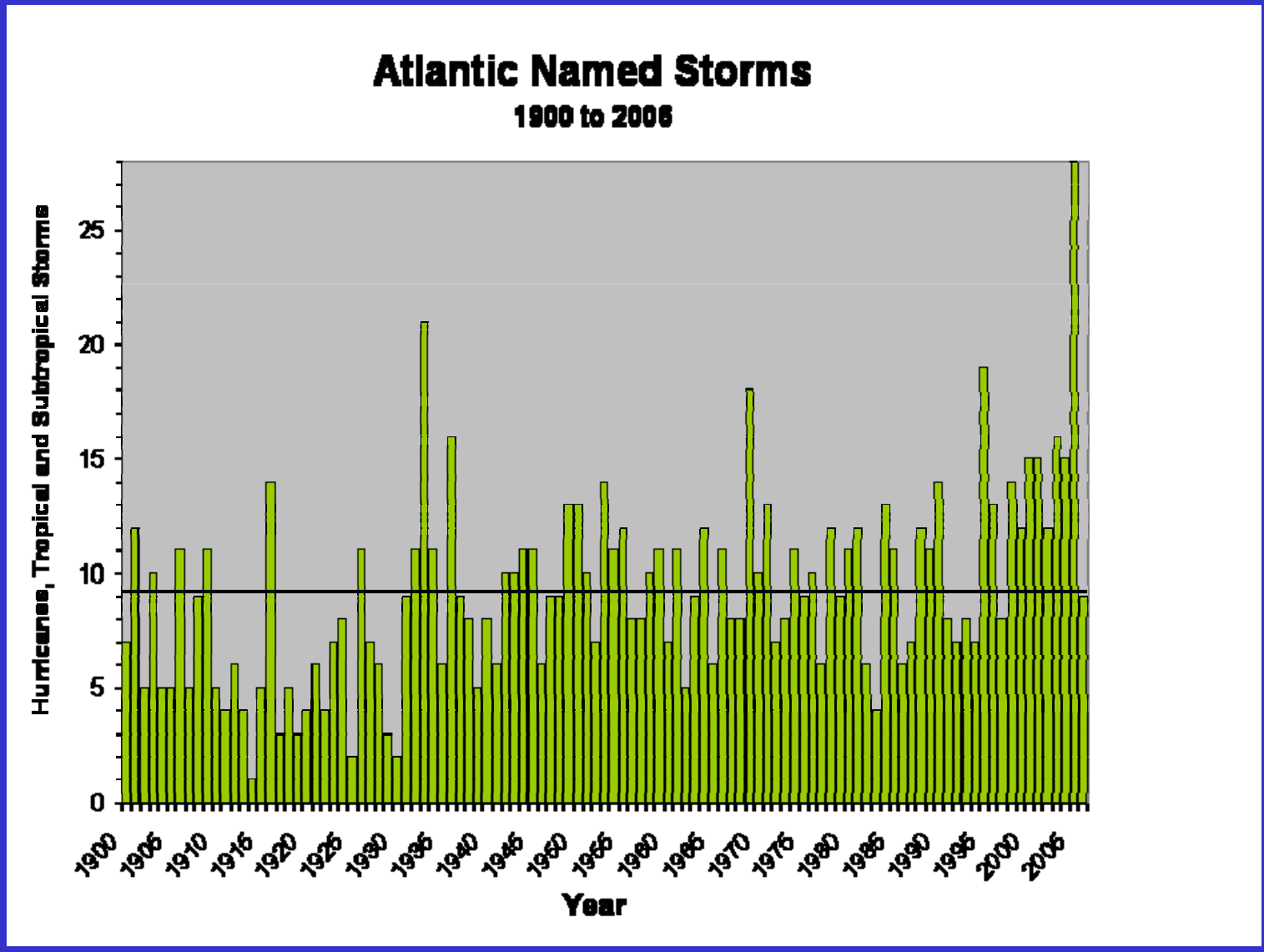
Steve Letro

National Weather Service,
Jacksonville, FL

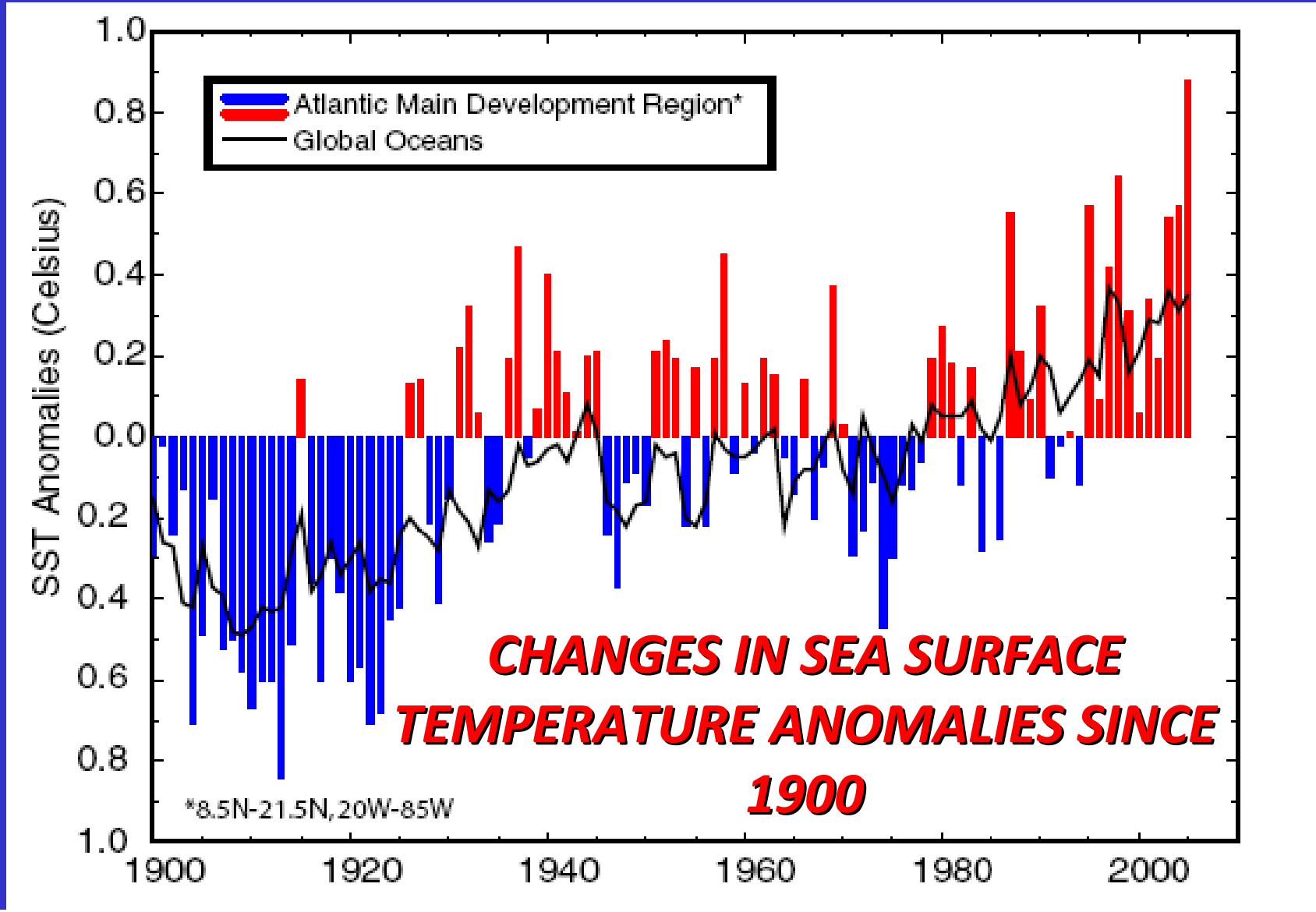
Reality or Myth???

THE HISTORICAL HURRICANE RECORD PROVIDES AN ACCURATE DATABASE FOR DETERMING LONG TERM TRENDS OF HURRICANE ACTIVITY

Here Are The Annual Totals Of "Named" Storms Dating Back To 1900…

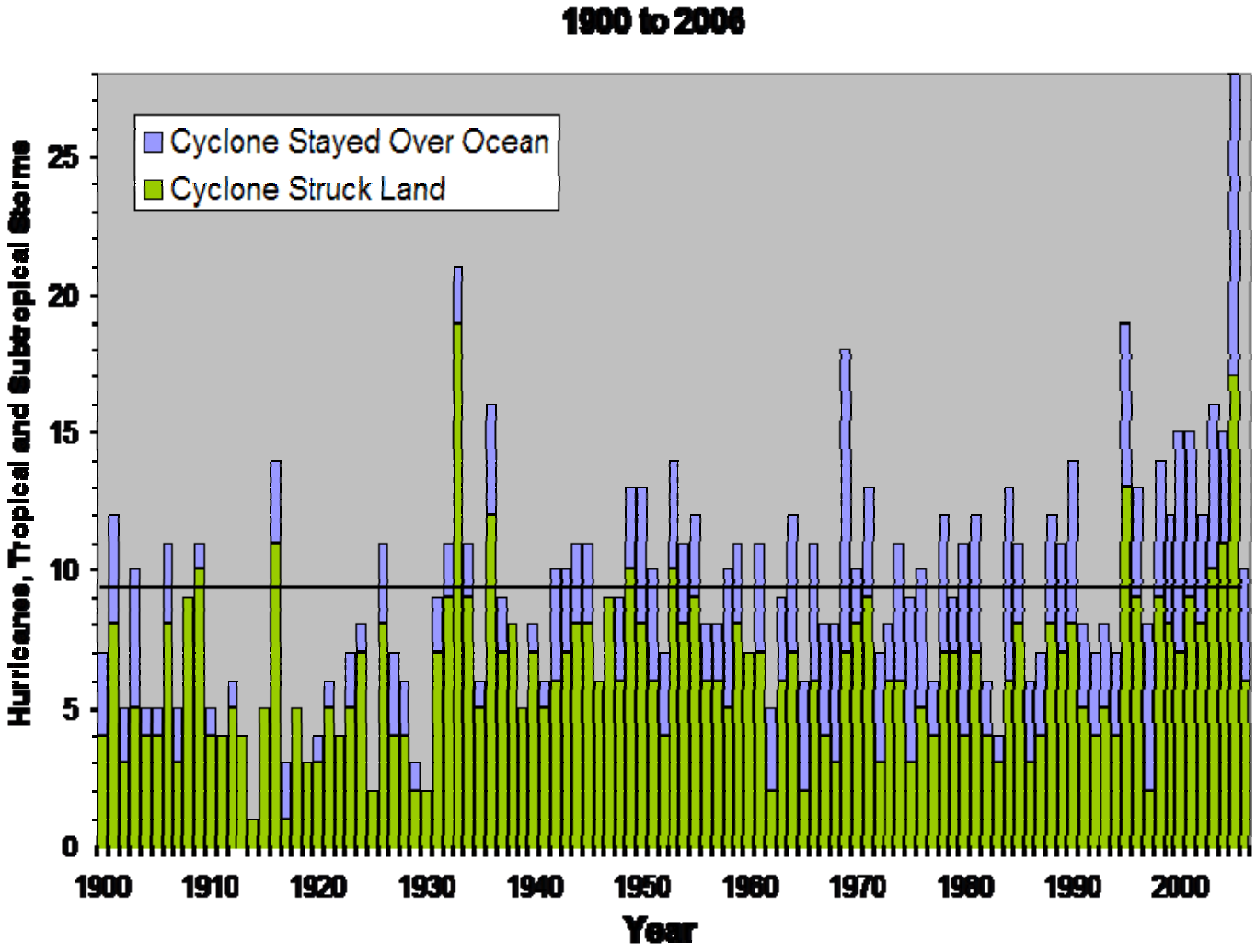


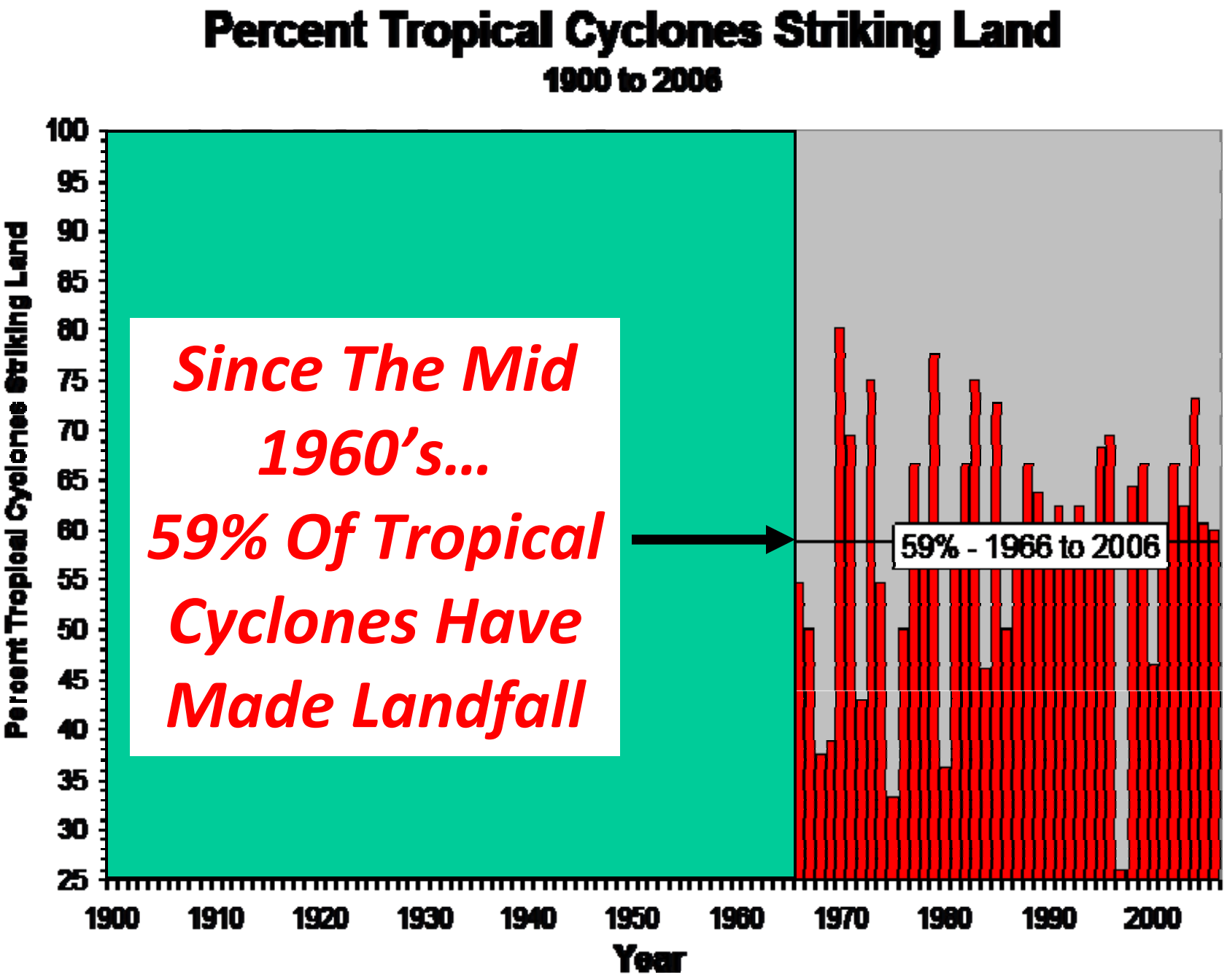
At First Glance, Those Numbers Seem Reasonable… They Coincide Nicely With Periodic Warming And Cooling Of The Atlantic Due The Atlantic MultiDecadal Oscillation



If We Look At The Data A Little Differently Though… Interesting Things Appear!

Purely Oceanic Vs. Landfalling Tropical Cyclones




Percent Tropical Cyclones Striking Land
1900 to 2006
Percent Tropical Cyclones Striking Land
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
1900
1910
1920
1930
1940
1950
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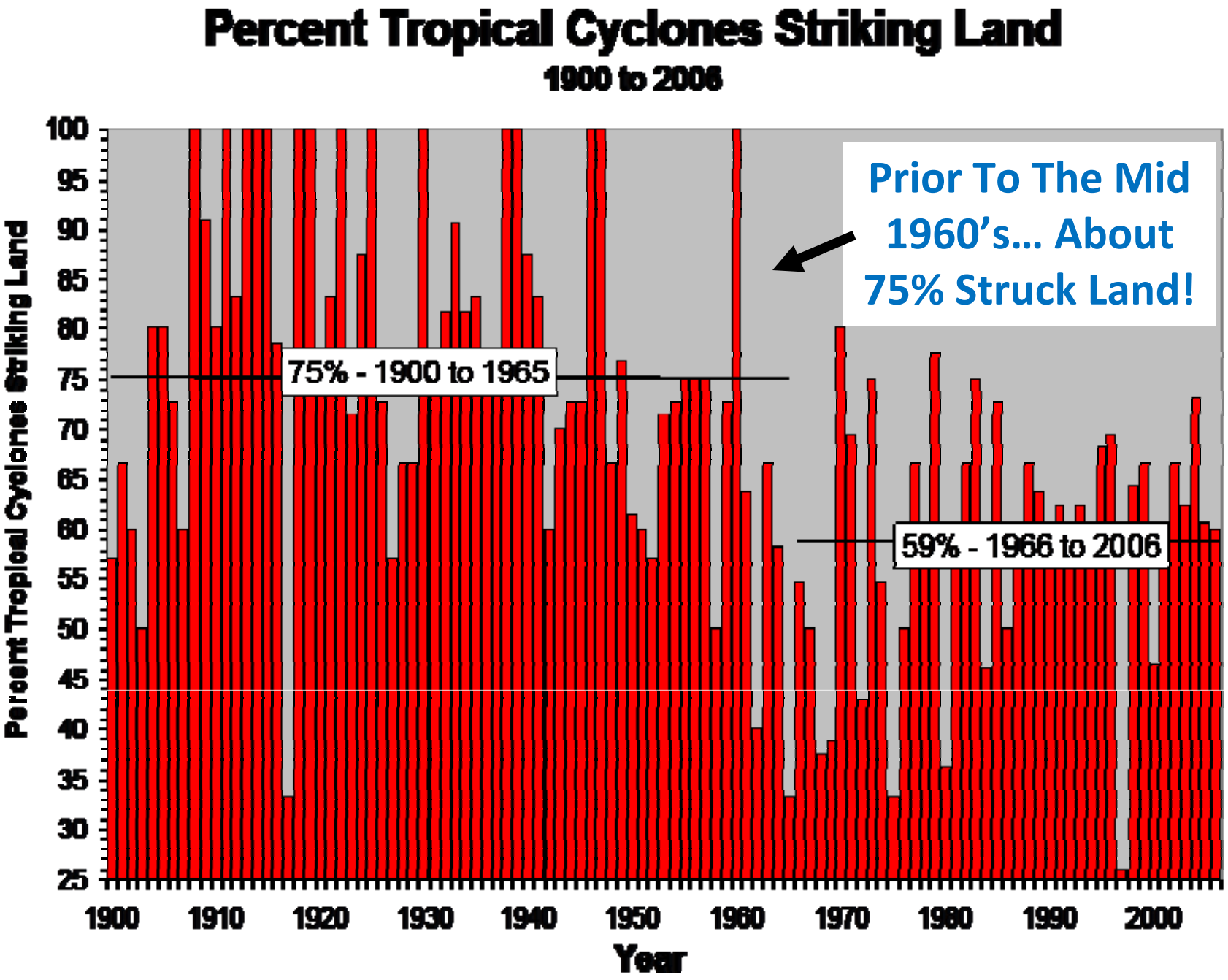
1990
2000
Year
Since The Mid 1960's… 59% Of Tropical Cyclones Have Made Landfall
59% - 1966 to 2006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100
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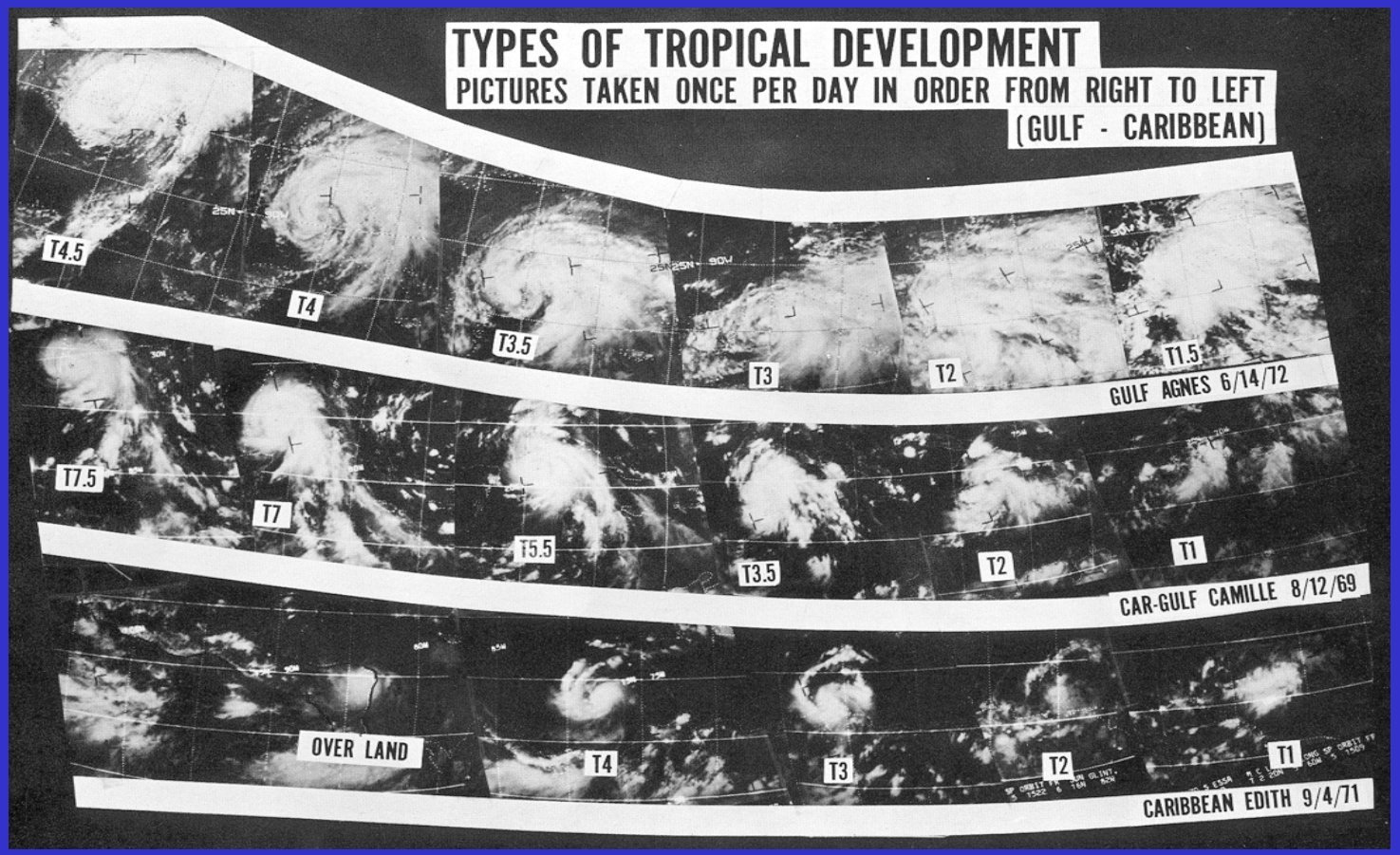
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year
Prior To The Mid 1960's... About 75% Struck Land!
75% - 1900 to 1965
59% - 1966 to 2006

So What Happened???

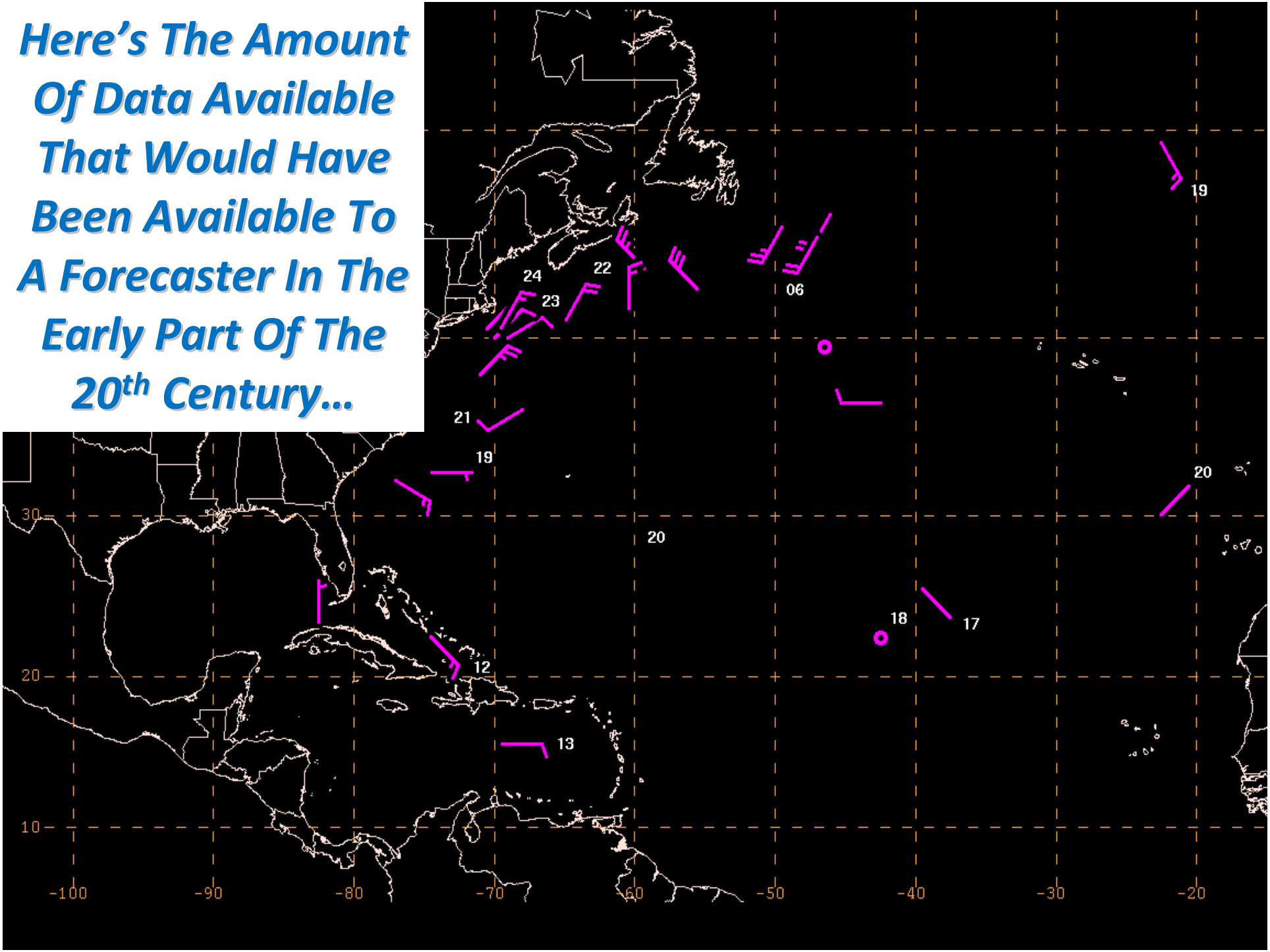
Did Storms Just Mysteriously Stop Striking Land As Often Starting In The Mid 1960's?

Or Is There Something Going On In The Database That Just Makes It *Appear* That Way?

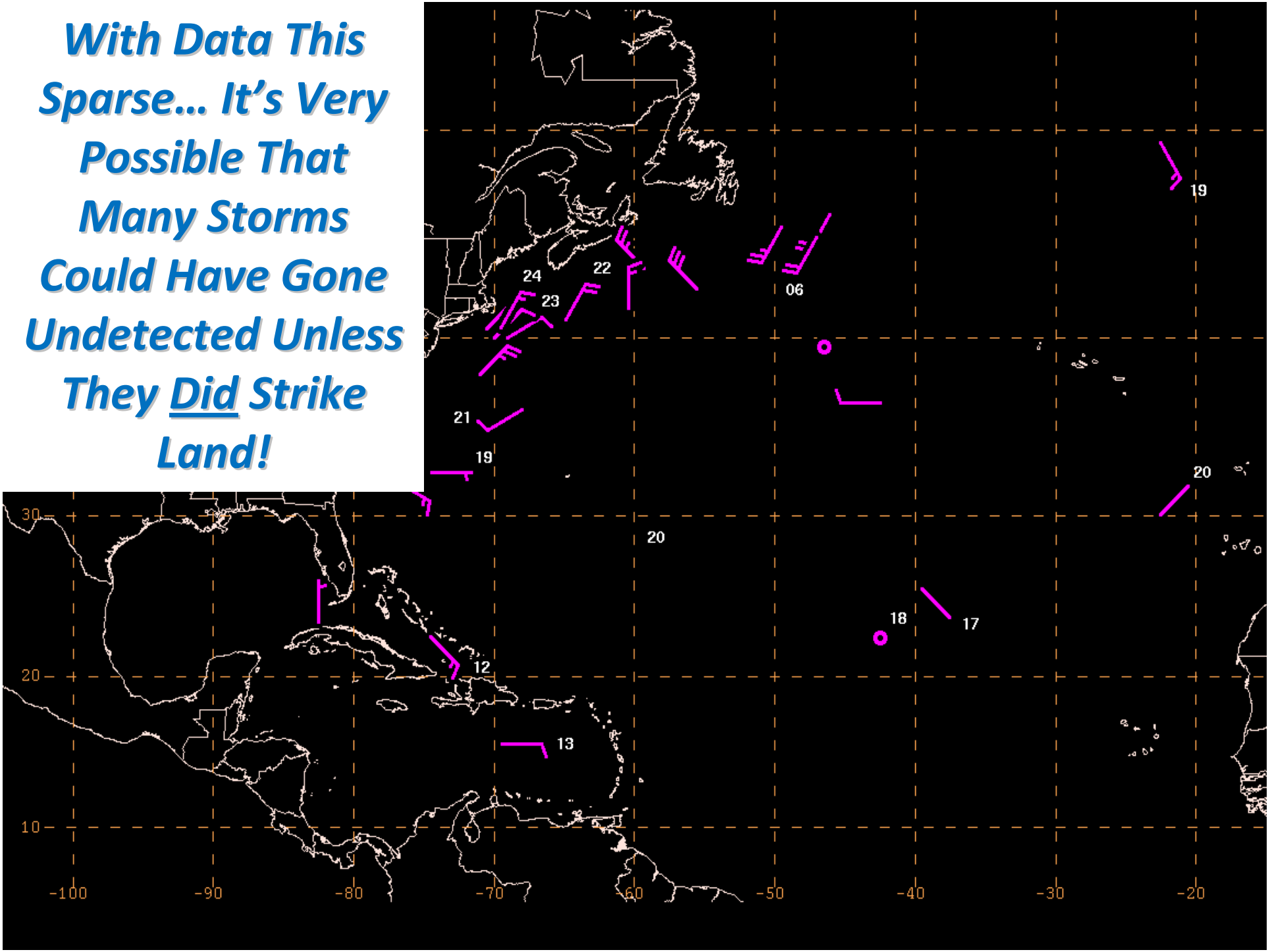
Interestingly… The Mid 1960's Just Happens To Be The Beginning Of The Modern Weather Satellite Era… Which Revolutionized Tropical Cyclone Detection



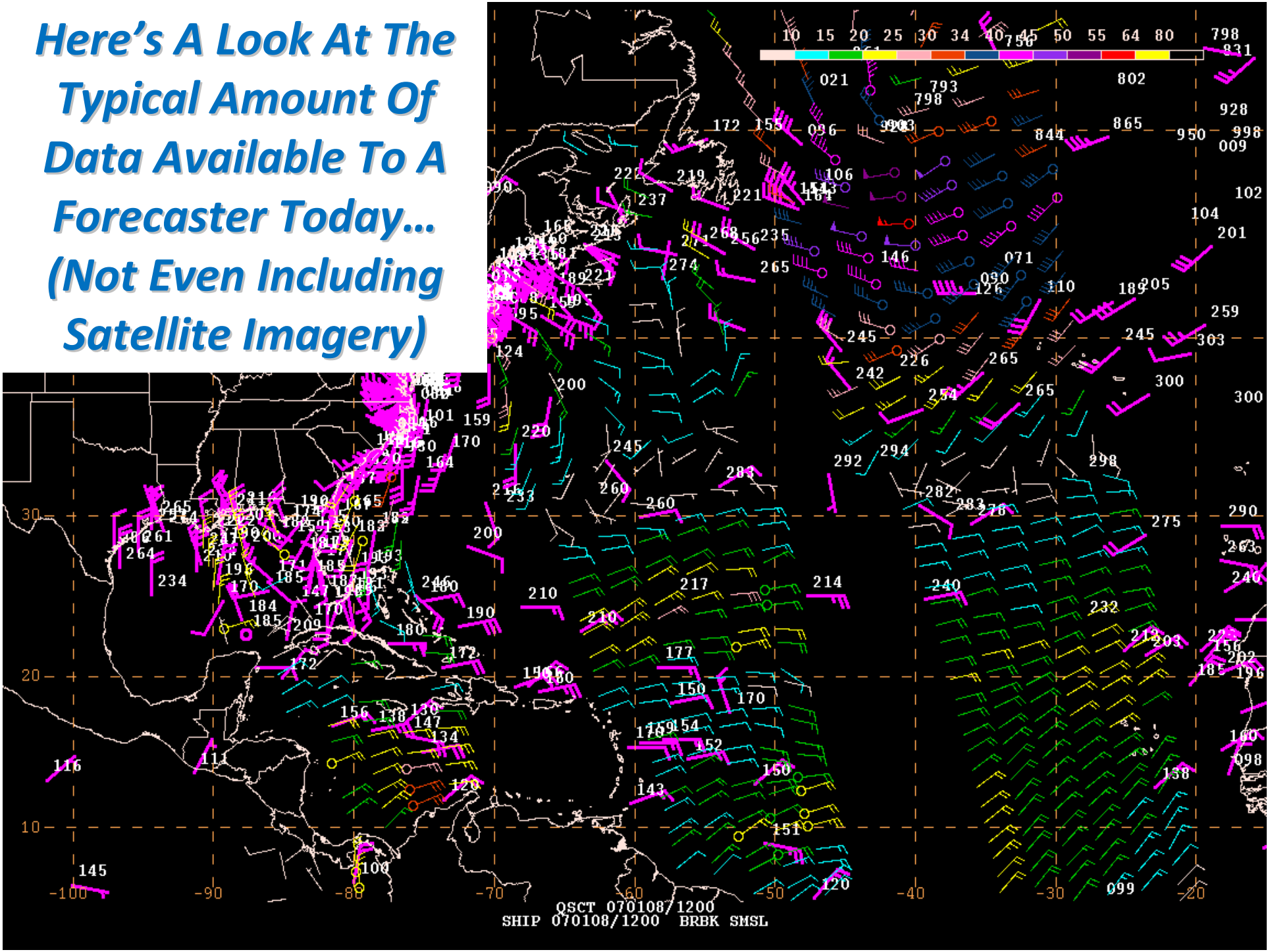
Here's The Amount Of Data Available That Would Have Been Available To A Forecaster In The Early Part Of The 20th Century…



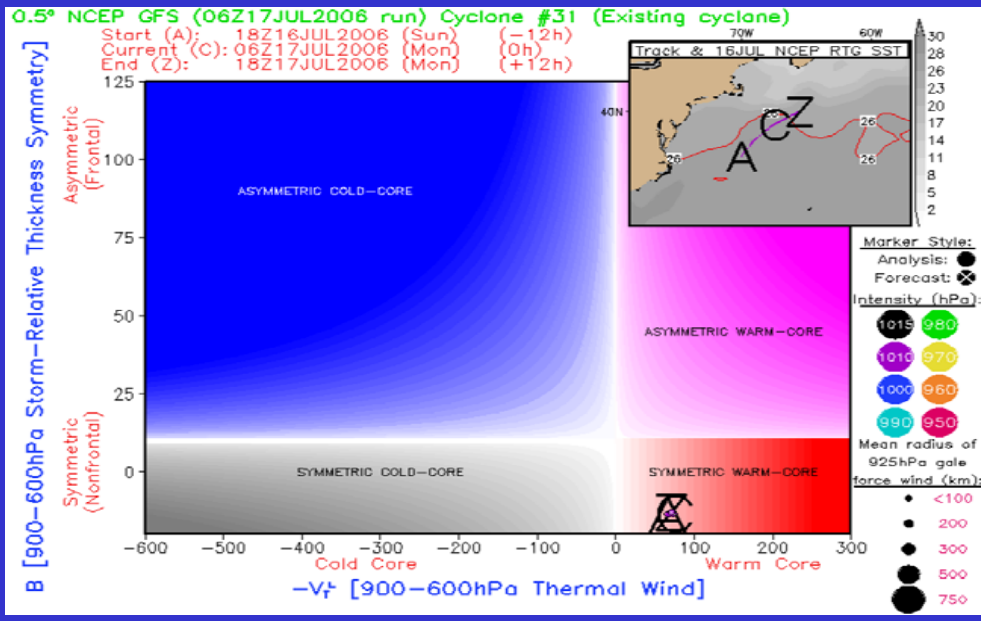
With Data This Sparse… It's Very Possible That Many Storms Could Have Gone Undetected Unless They Did Strike Land!

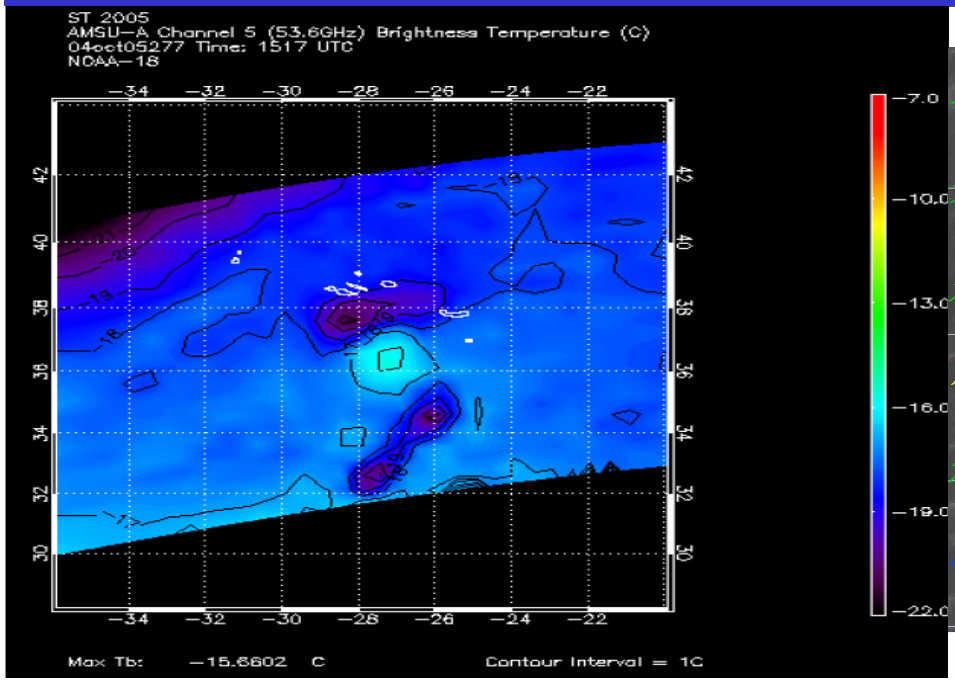


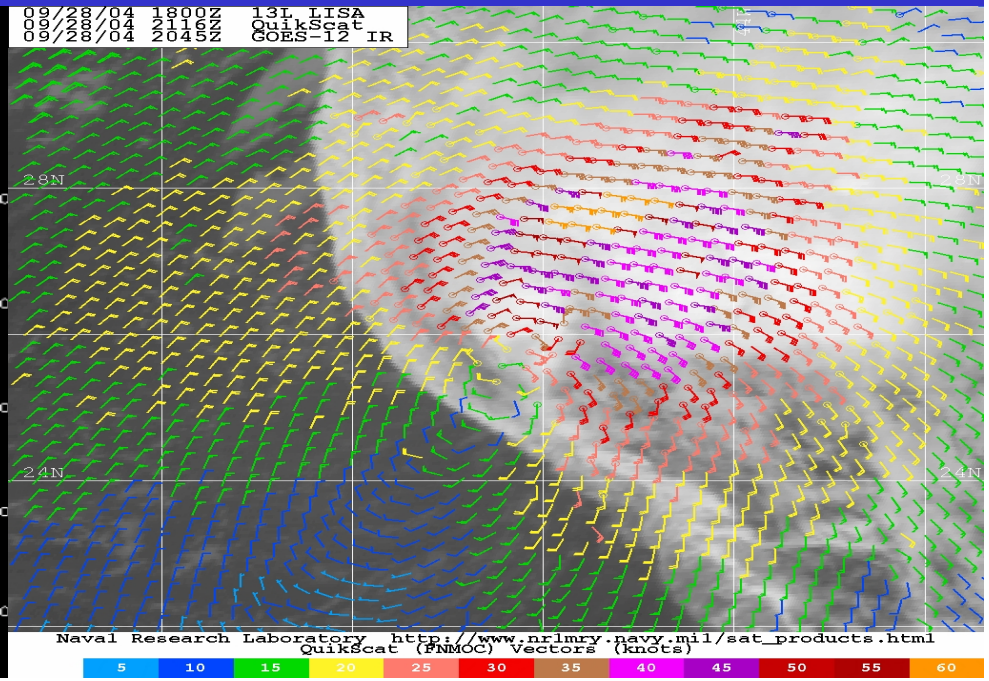
Here's A Look At The Typical Amount Of Data Available To A Forecaster Today… (Not Even Including Satellite Imagery)



The Truth Is… If Modern Observing Technologies And Analysis Tools Had Been Available Earlier In The 20th Century… The Historical Record Would Almost Certainly Have Been Much Different!

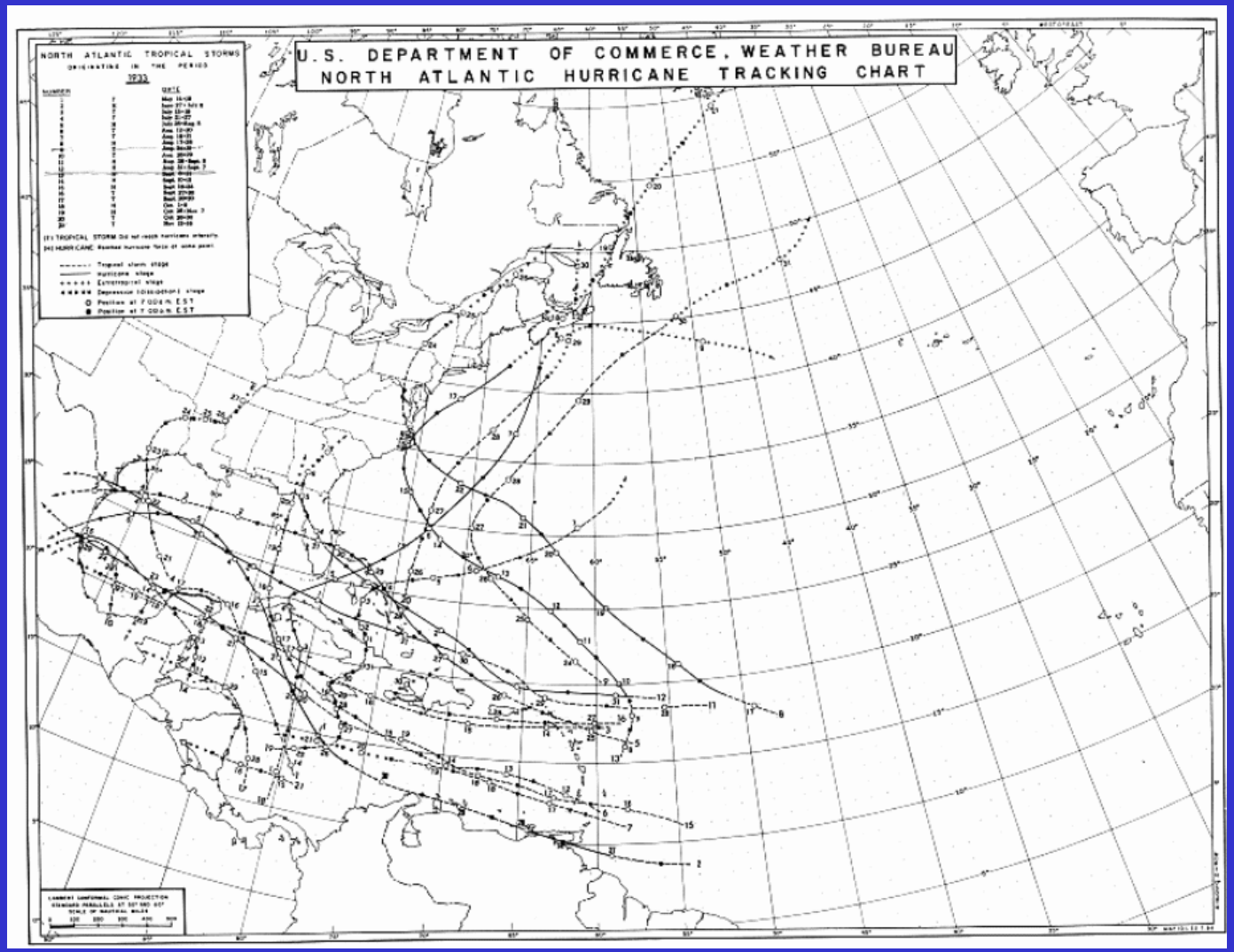




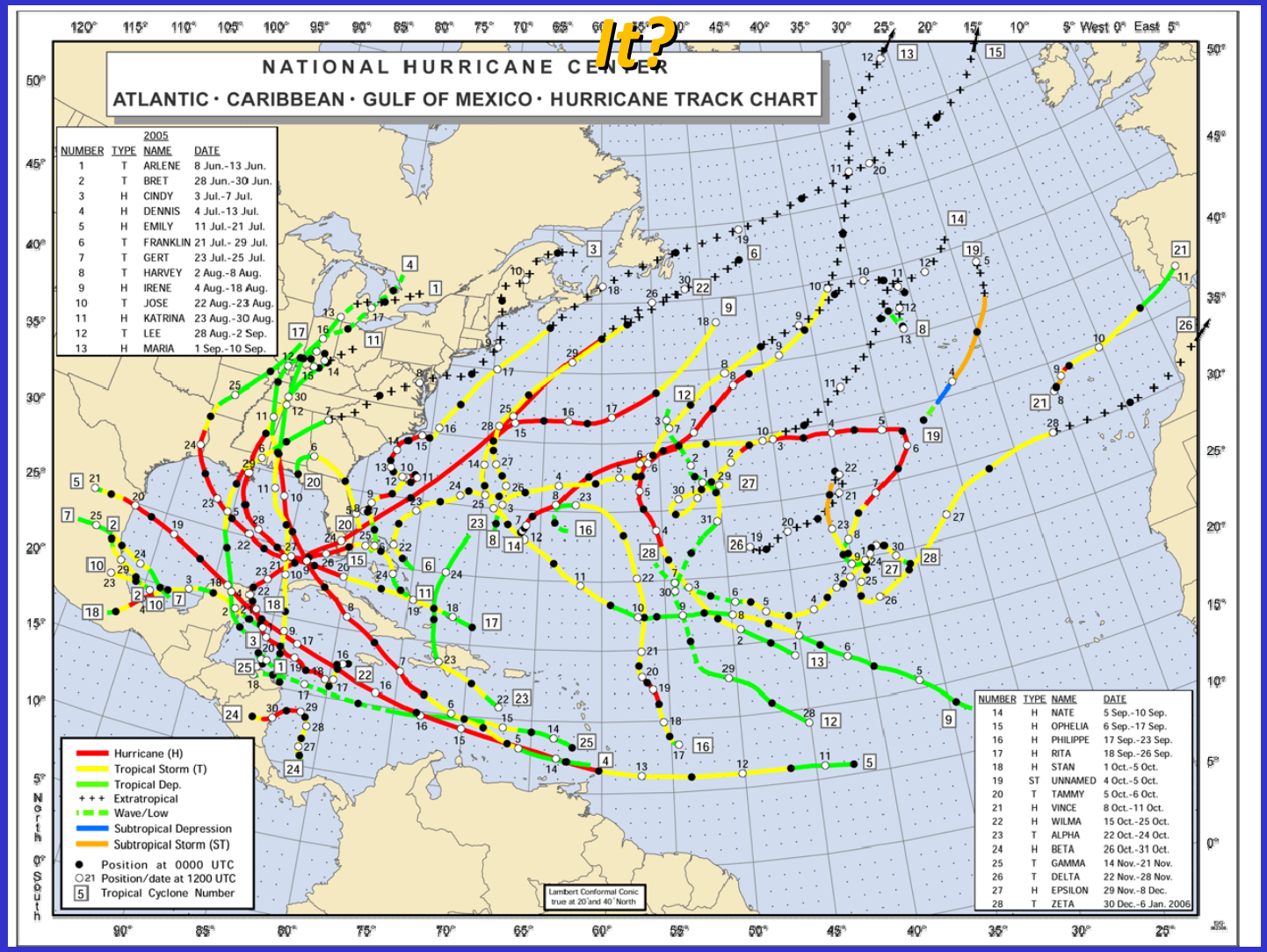


The Impact Of Satellite And Other Technology On the Historical Datasets Becomes More Apparent If We Take A Look At The "Busiest" Seasons On Record

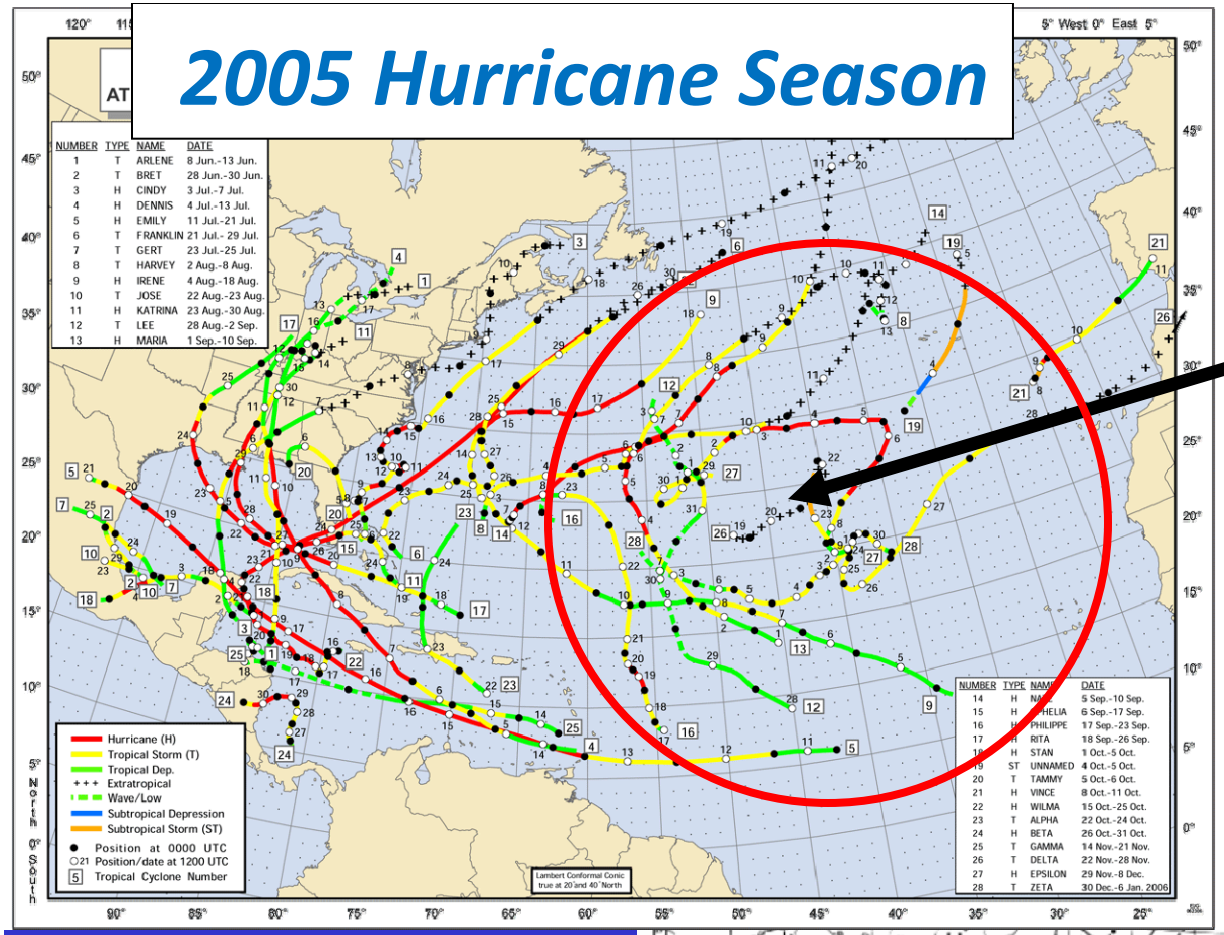
Prior To 2005… 1933 Held The Record For The Most Storms In A Season (21)



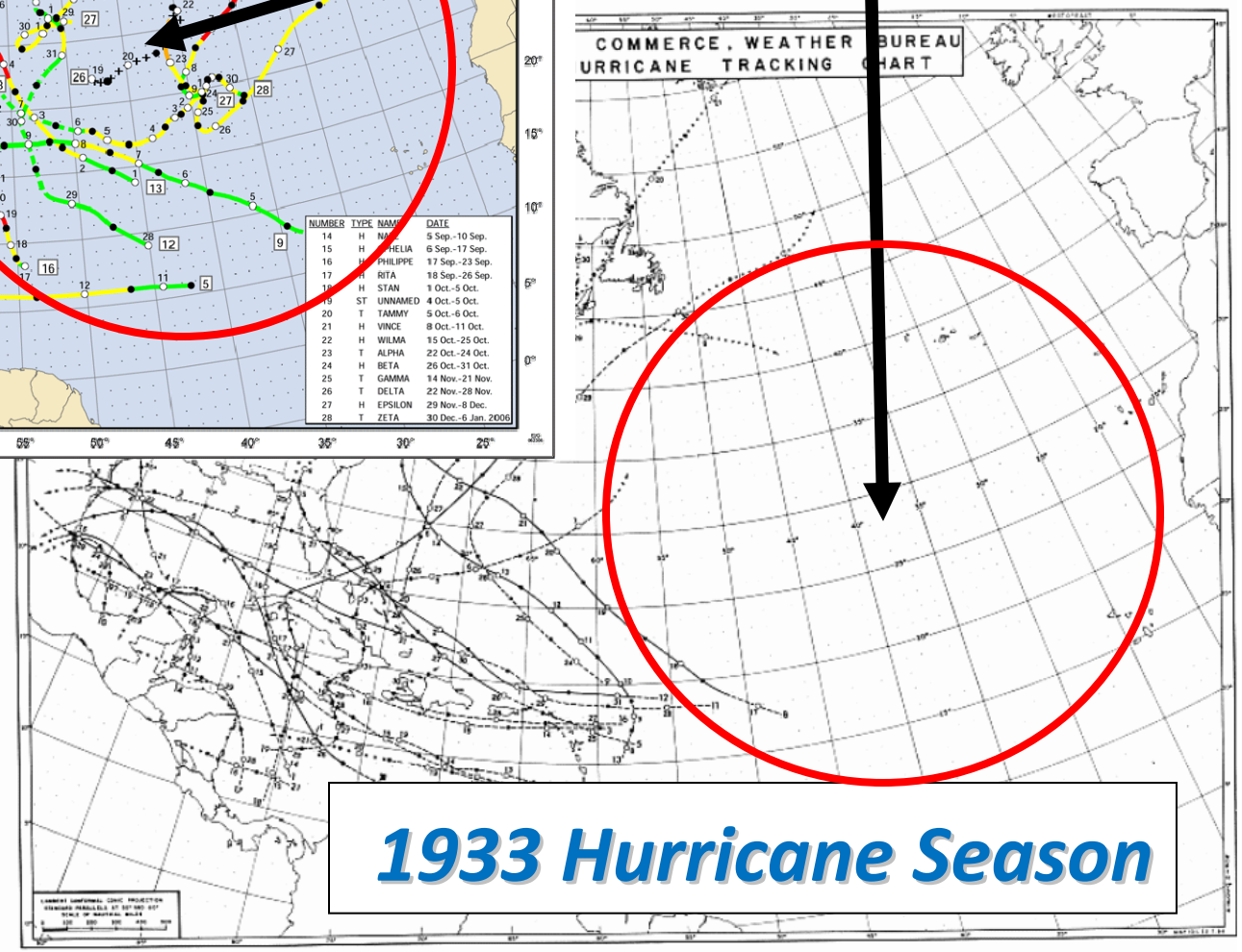
The 2005 Season Destroyed That Record With A Whopping 28 Named Storms… Or Did It?



2005 Hurricane Season



Open Atlantic Ocean Differences



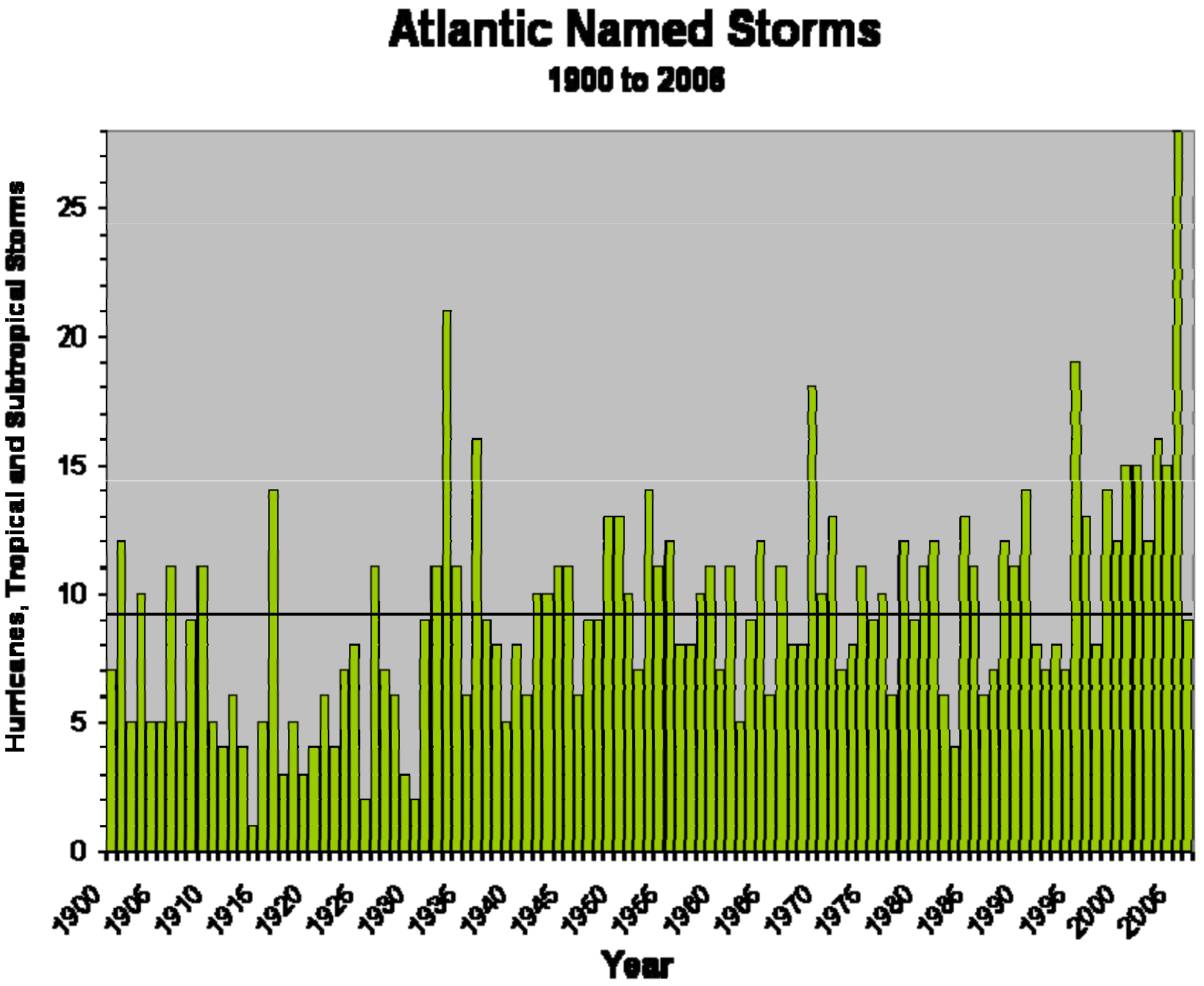
1933 Hurricane Season

Of The 27 Named Storms…

- **Three… Vince, Delta and Epsilon Formed in the Northeast Atlantic And Would Likely Never Have Been Included As Tropical Systems…**

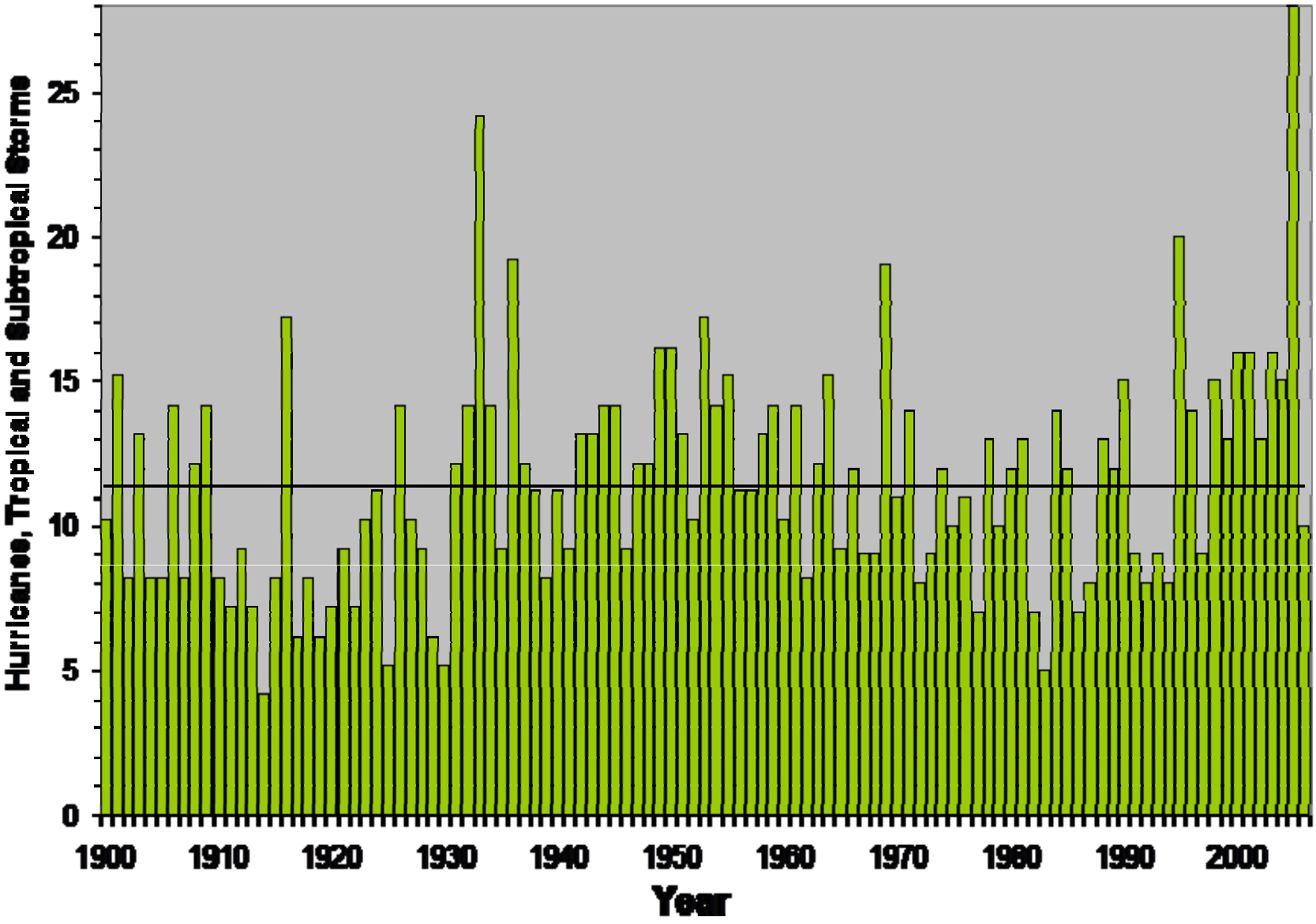
- **Three More… Bret, Gert and Jose Lasted Less Than 36 Hours In The Southwest Gulf And Very Possibly Would Have Been Overlooked.**

- **The Point Is That The Historical Record Prior To The Satellite Era Is Highly Suspect!**


Atlantic Named Storms
1900 to 2006
Hurricanes, Tropical and Subtropical Storms
0
5
10
15
20
25
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year

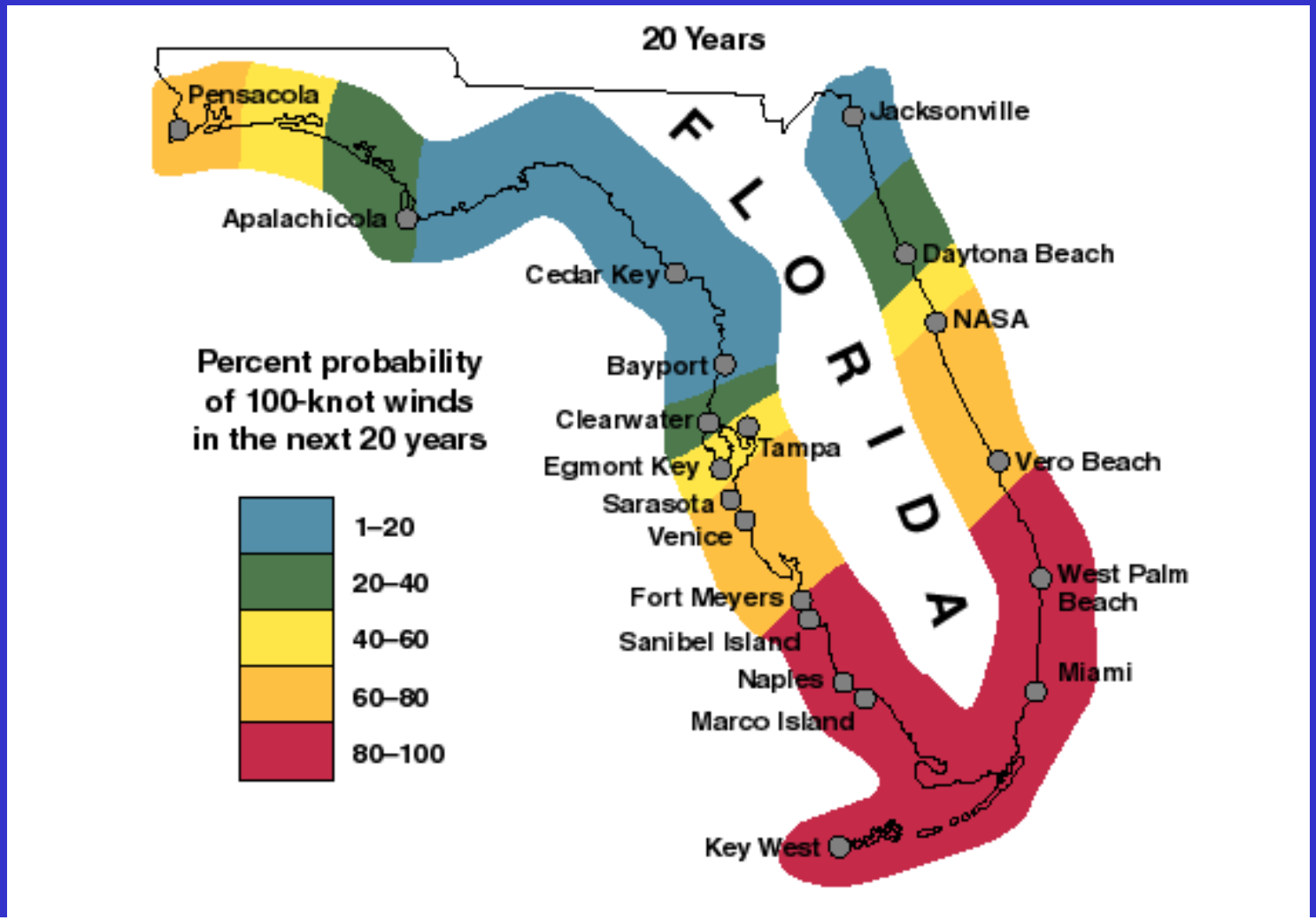
Adjusted Atlantic Named Storms

1900 to 2006 - Additional 3.2 for 1900-65, 1.0 for 1966-2002



The Phenomenon Of Suspect Databases Has Parallels Regarding The Hurricane Return Periods We Use Today…

Return Periods Such As This Are Derived By Taking The Number Of Known Events Over The Historical Record, And Normalizing Them To A Particular Time Period… In This Case, 20 Years

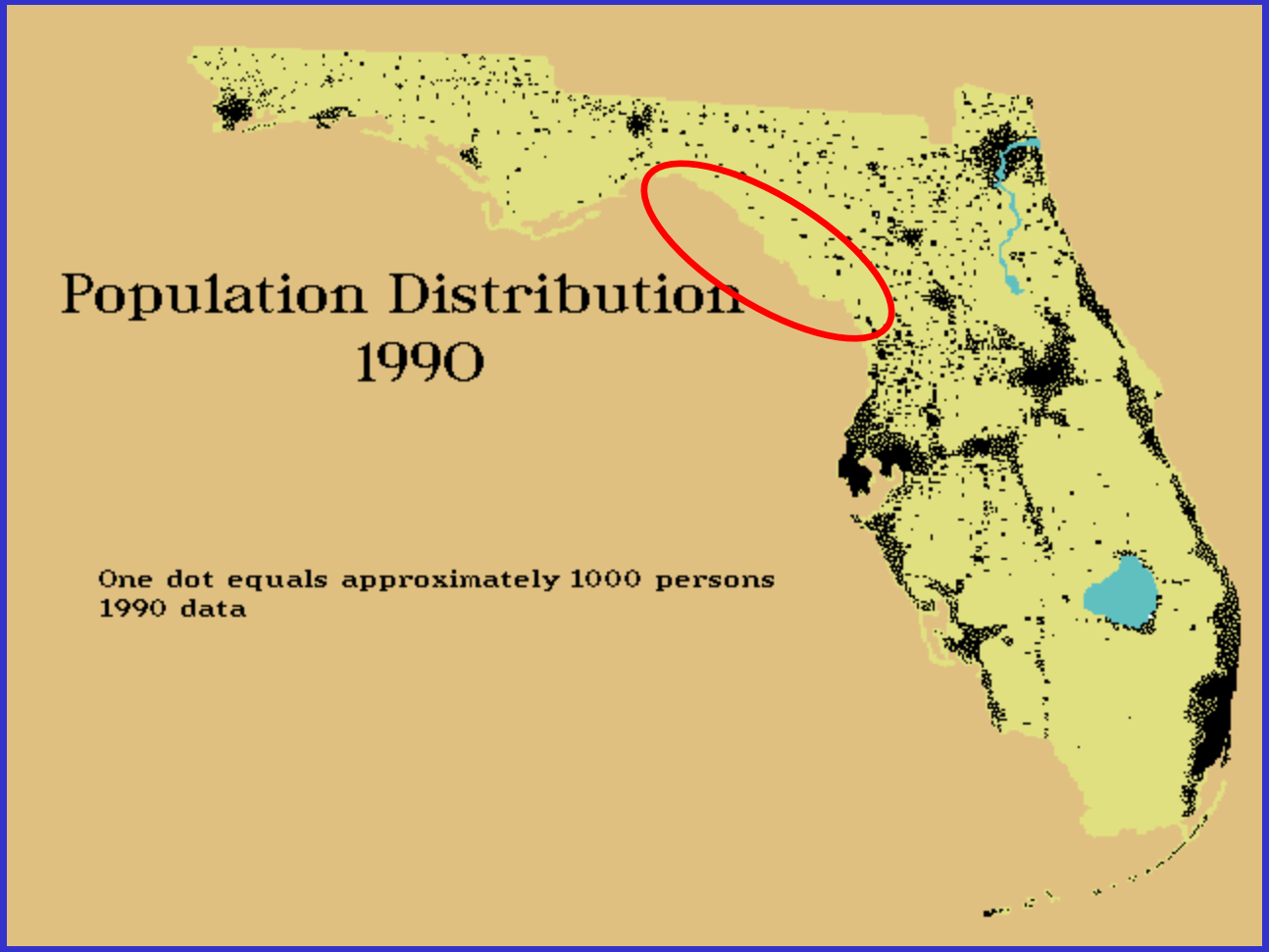


The Fact Is… Florida Has Undergone Major Societal Change During That Period Of Record

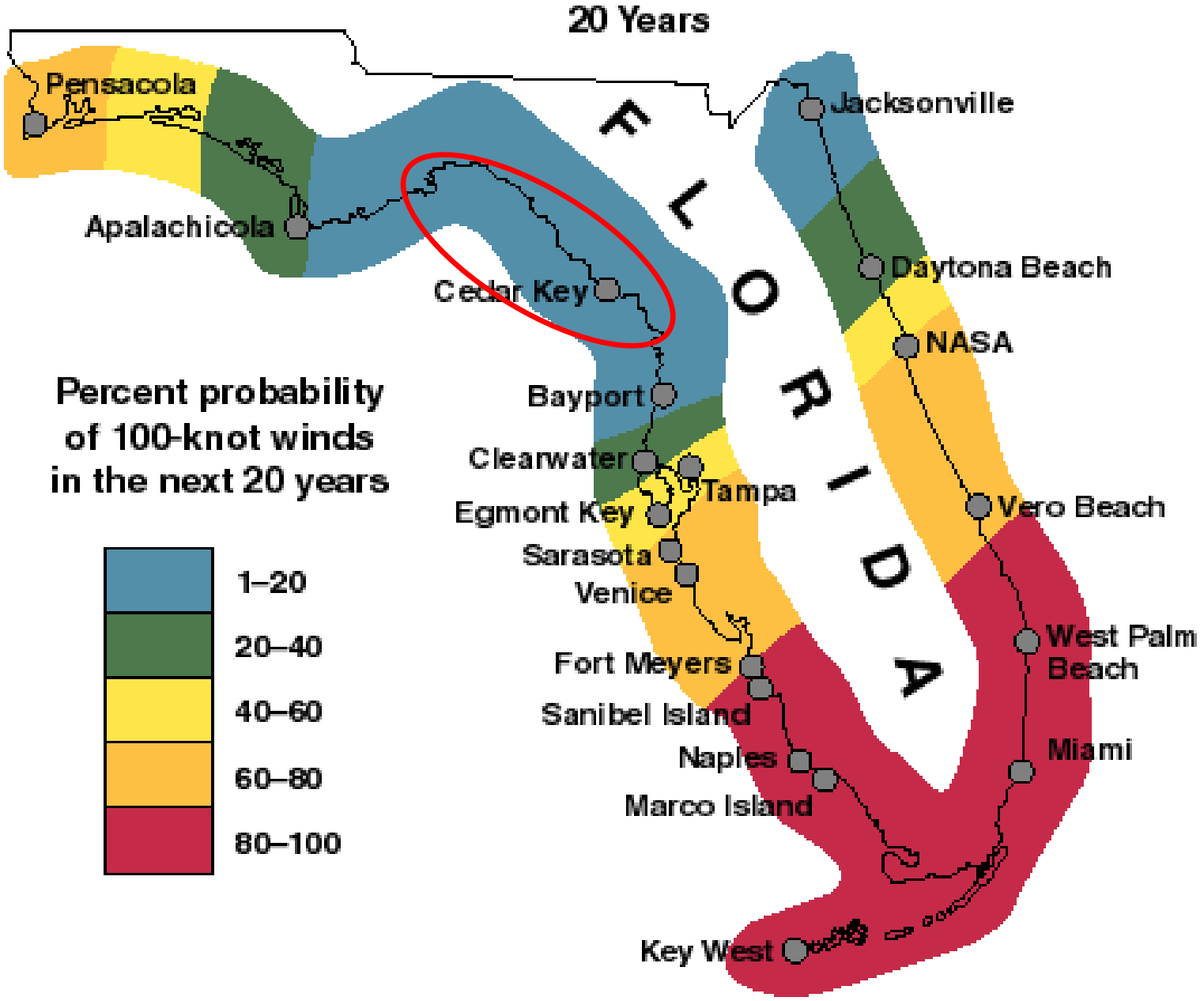
- **Much Of The Historical Record Includes An Era When Most Of Florida Was Sparsely Populated.**

- **This Resulted In Landfalls Being Placed Unrealistically Close To Population Centers Where The Impacts Were Actually Felt**

This Was Florida's Population Distribution in 1990… 100 Years Ago, There Were Many Areas That Were Virtually Unpopulated



With This In Mind… Let's Go Back To The Strike Probability Slide…

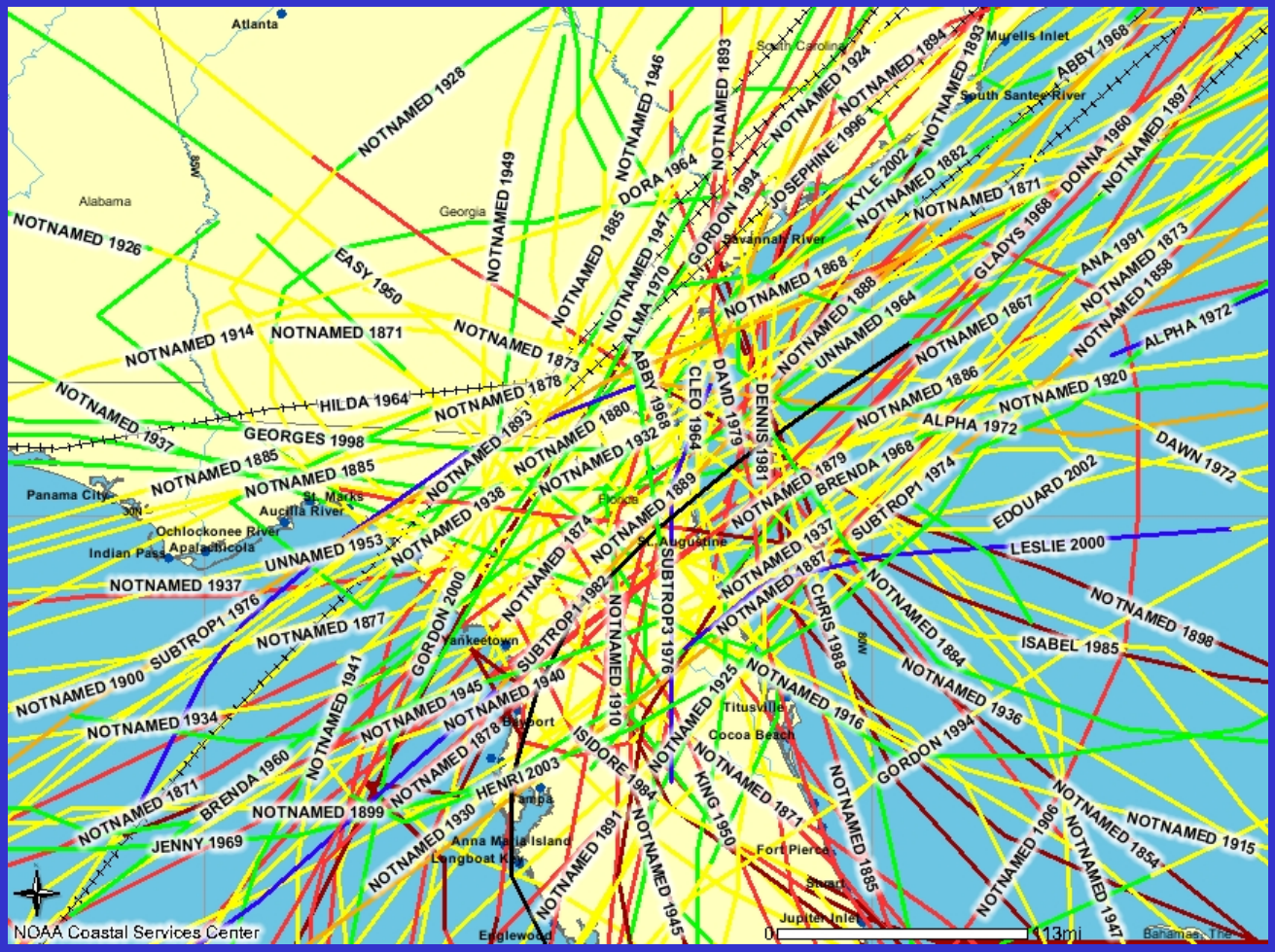

20 Years
Pensacola
Apalachicola
Cedar Key
Bayport
Clearwater
Tampa
Egmont Key
Sarasota
Venice
Fort Meyers
Sanibel Island
Naples
Marco Island
Key West
Jacksonville
Daytona Beach
NASA
Vero Beach
West Palm Beach
Miami
FLORIDA
Percent probability of 100-knot winds in the next 20 years
1–20
20–40
40–60
60–80
80–100

This Begs The Question…

Are The Return Periods In Sparsely Populated Areas Really That Low… Or In Highly Populated Areas Really Than High???

…Or Are They At Least Partially An Artifact Of Inadequacies In The Historical Records!

A Cautionary Note for Northeast Florida…



Return Periods Don't Necessarily Tell The <u>Whole</u> Story!

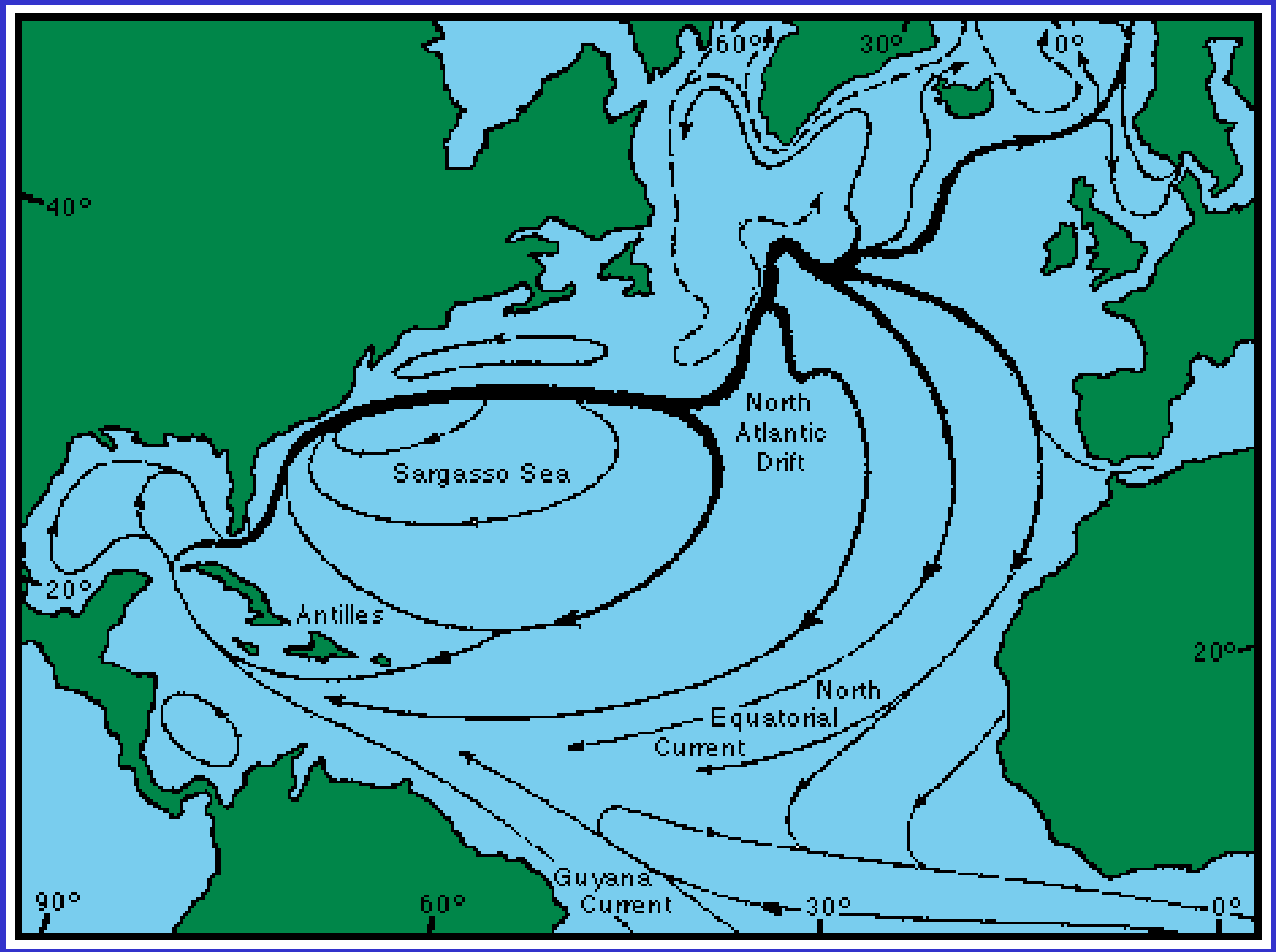
Near Misses? Or Near Hits?

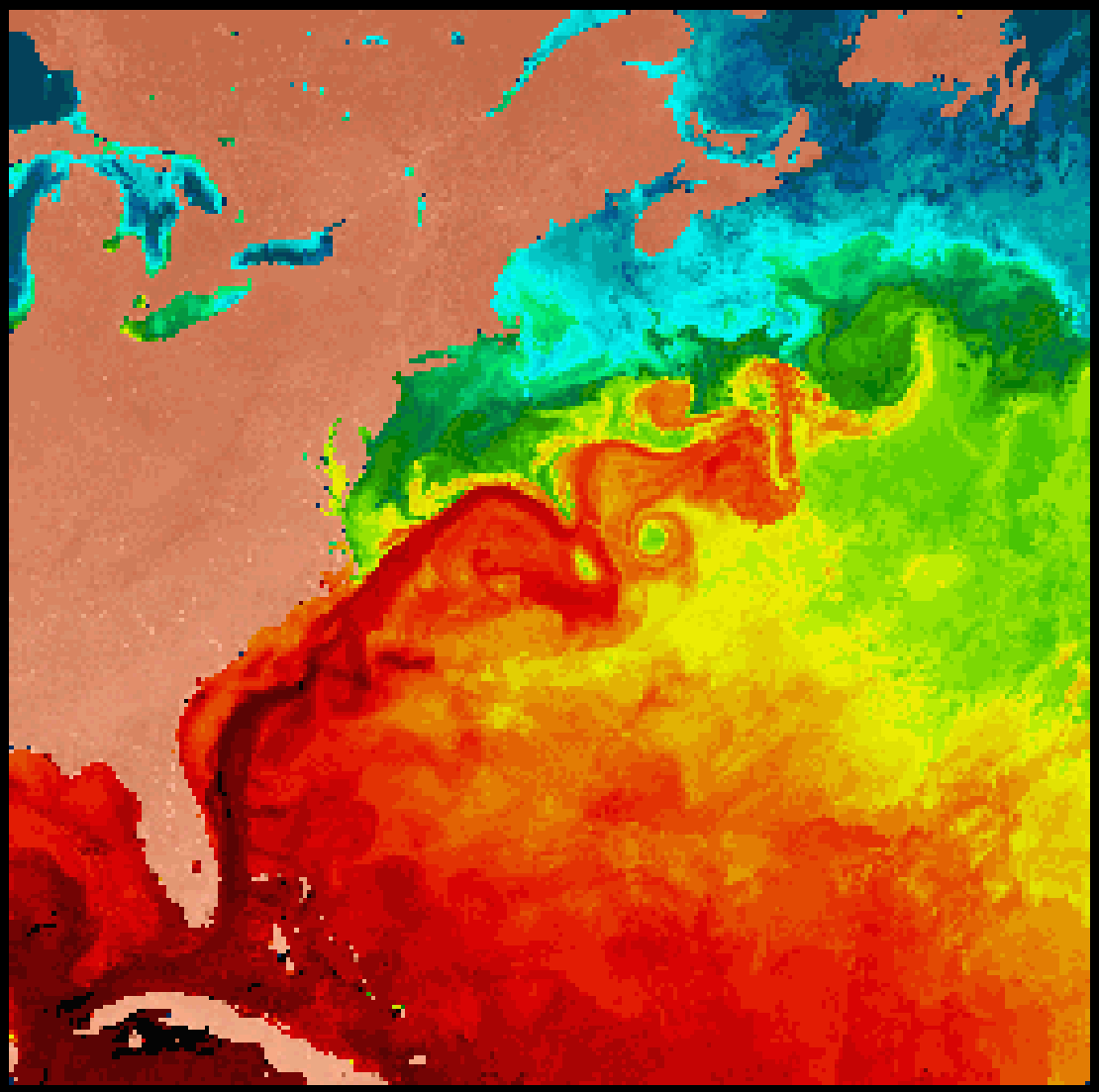
- **While Direct Hurricane Landfalls In Northeast Florida Are Rare… The Center Of A Named Tropical Cyclone Comes Within 50 Miles Once Every 3 Years!**

- **In Recent History, Most Of These Have Been Weak. But One Day…one Of Those Tropical Cyclones *Will* Be A Major Hurricane!**

Reality or Myth???

HURRICANES ARE STEERED BY THE GULF STREAM

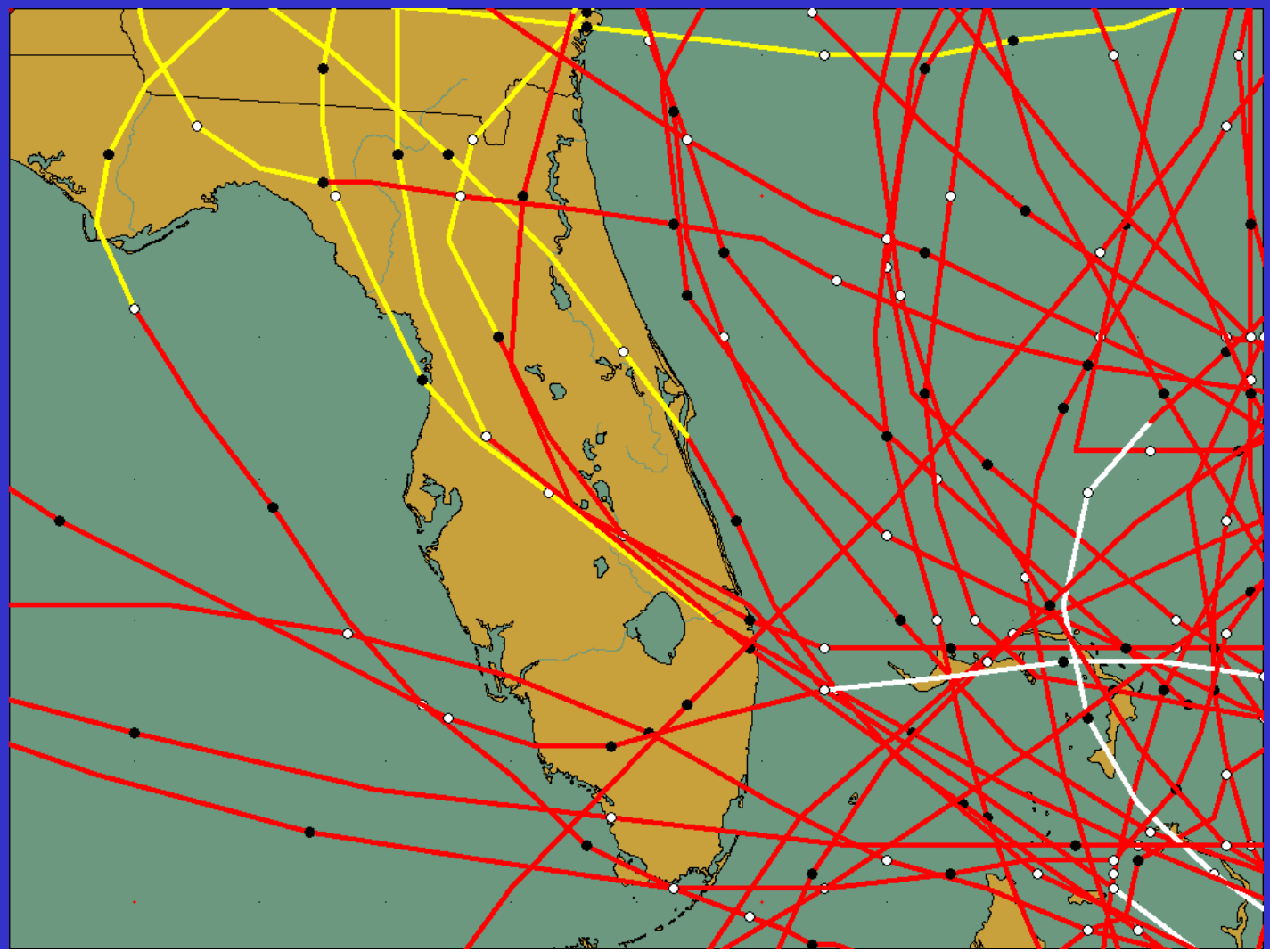

60°
30°
0°
40°
North
Atlantic
Drift
Sargasso Sea
20°
Antilles
20°
North
Equatorial
Current
Guyana
Current
90°
60°
30°
0°



Gulf-Stream and mesoscale eddies pictured on a color-enhanced NOAA/AVHRR image (downloaded from http://seawifs.gsfc.nasa.gov/SEAWIFS/IMAGES/eastcoast.gif).

Figure 1.3.1

THE LAST TIME WE CHECKED… THE GULFSTREAM DID NOT CUT ACROSS FLORIDA!



THEN WHY DO SO MANY STORMS SEEM TO FOLLOW THE GULF STREAM???

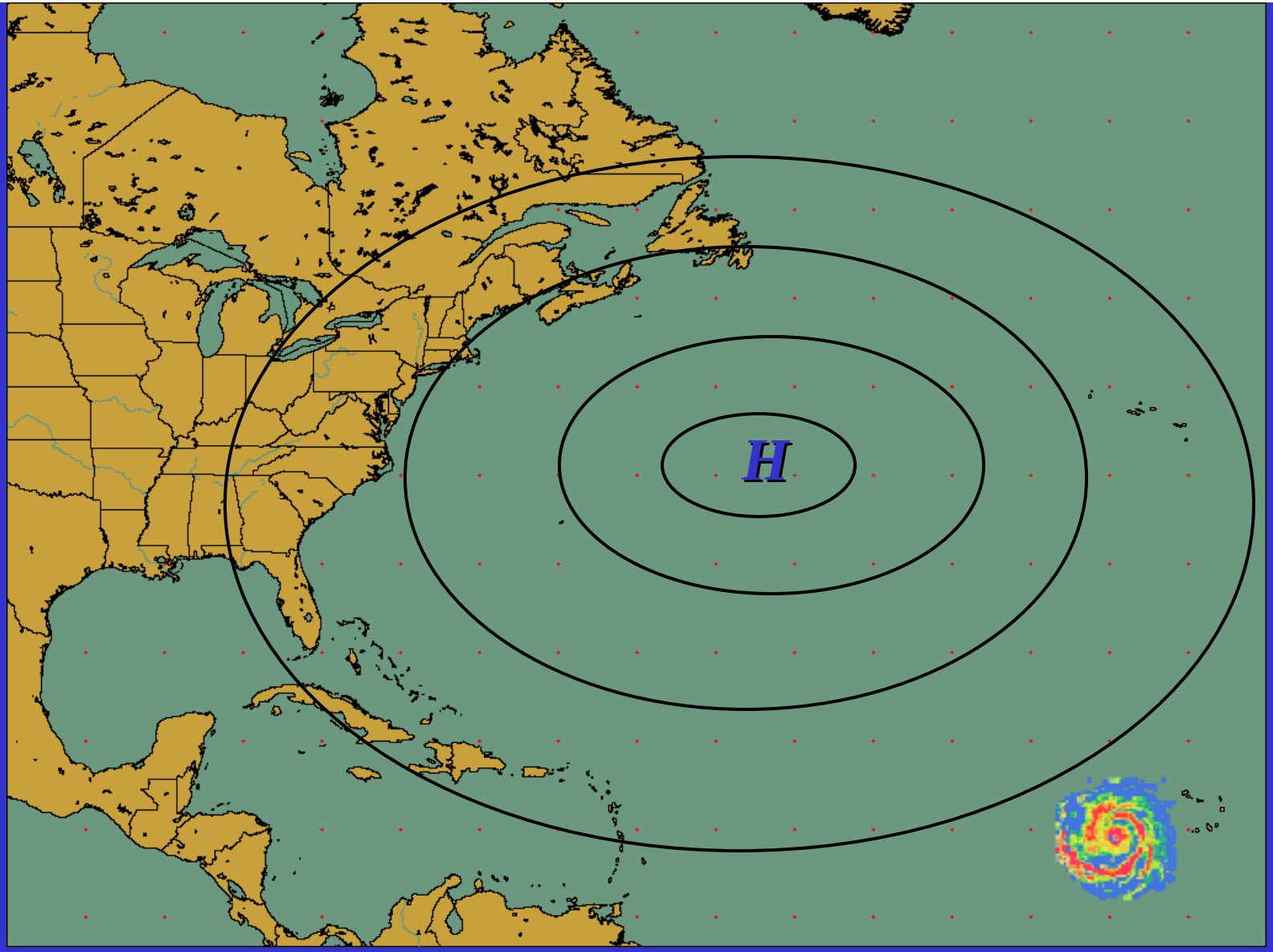
A BETTER QUESTION:

IS THERE SOMETHING THAT INFLUENCES BOTH TROPICAL CYCLONE STEERING CURRENTS *AND* THE GULF STREAM?

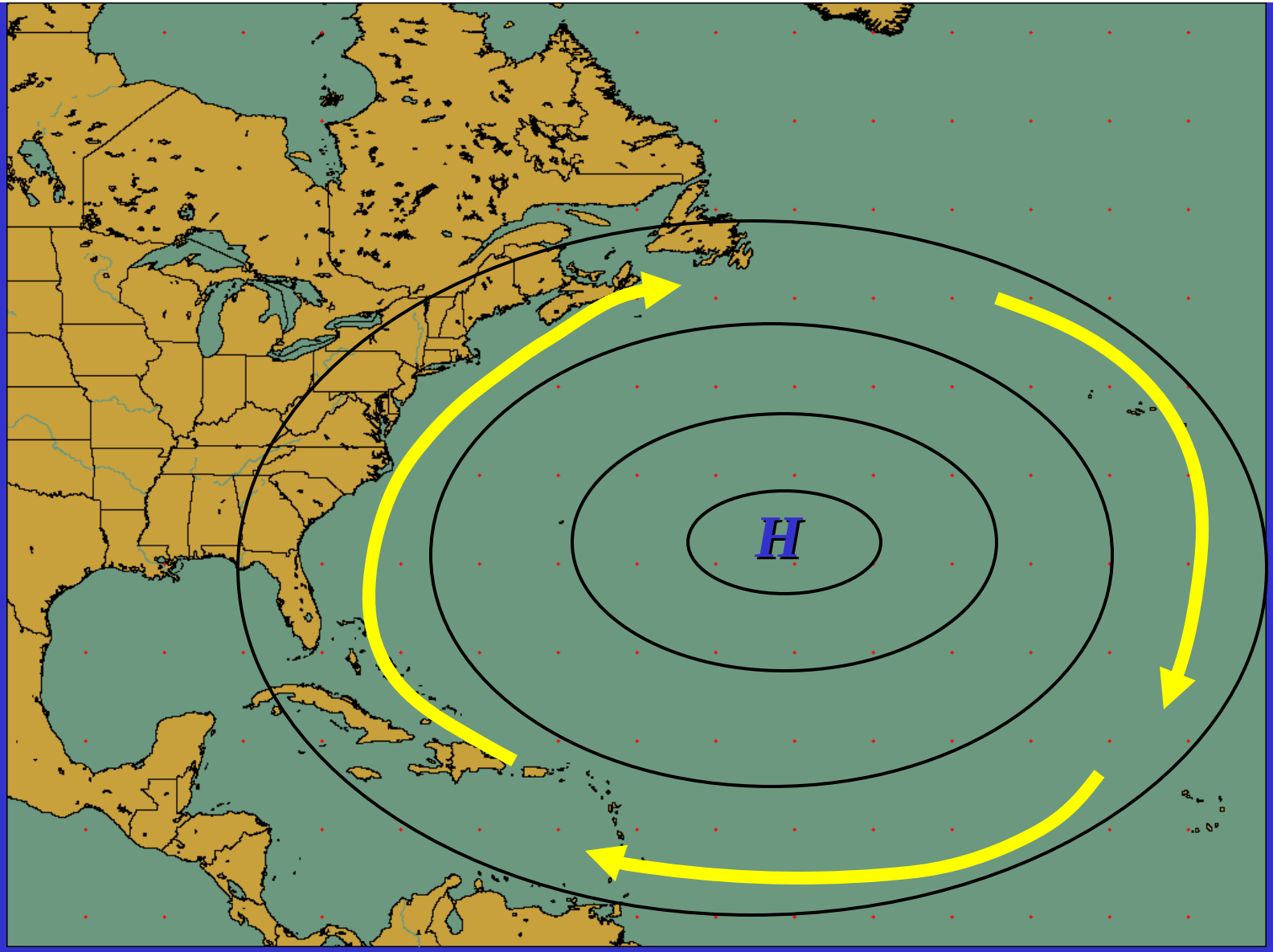
Climatological Tracks of Atlantic Basin Tropical Cyclones

Do the Climatological Tracks Near the Southeast Coast Look Suspiciously Similar To The Gulf Stream?

Do They Have Anything in Common?



Tropical Cyclones Are "Steered" Westward Across The Tropics Along The Underside Of This Atlantic High, Before Eventually Recurving Around The Western Edge.



The Prevailing Wind Flow Around The Atlantic High Is Also An Important Factor In Determining The Placement & Strength Of Ocean Currents… Including The Gulf Stream!

Reality or Myth???

HURRICANES ARE STEERED BY THE GULF STREAM

MYTH!

Hurricanes Are Steered By The Atmospheric Currents In Which They Are Embedded… It Just Turns Out That The Same Forces That Influence Those Currents Also Influence The Gulf Stream!

Reality or Myth???

The Curvature Of The Coastline Protects Northeast Florida From Hurricanes

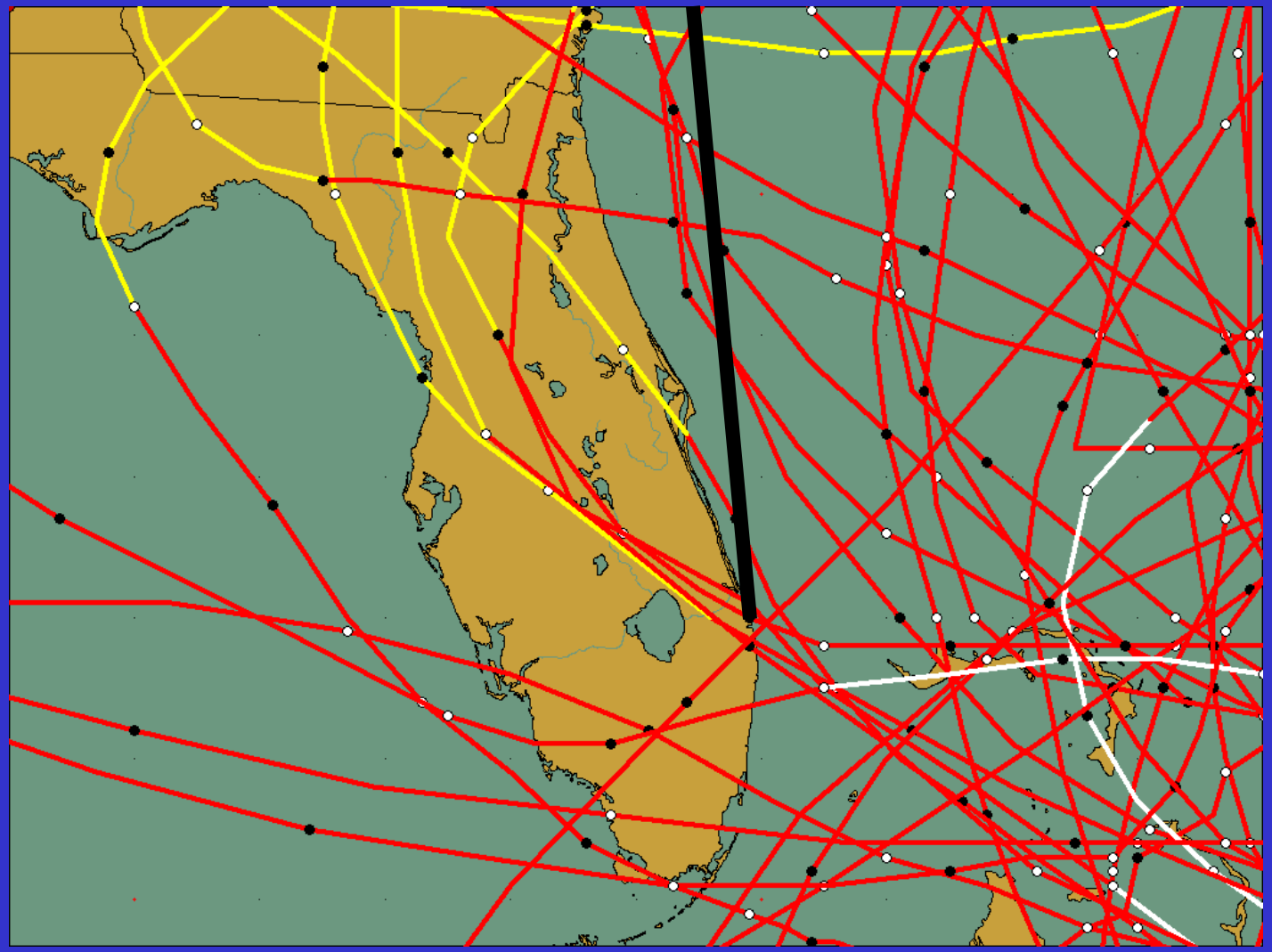
Where Does This Idea Come From???

The Answer Lies Yet Again With The Atlantic, or Bermuda High!

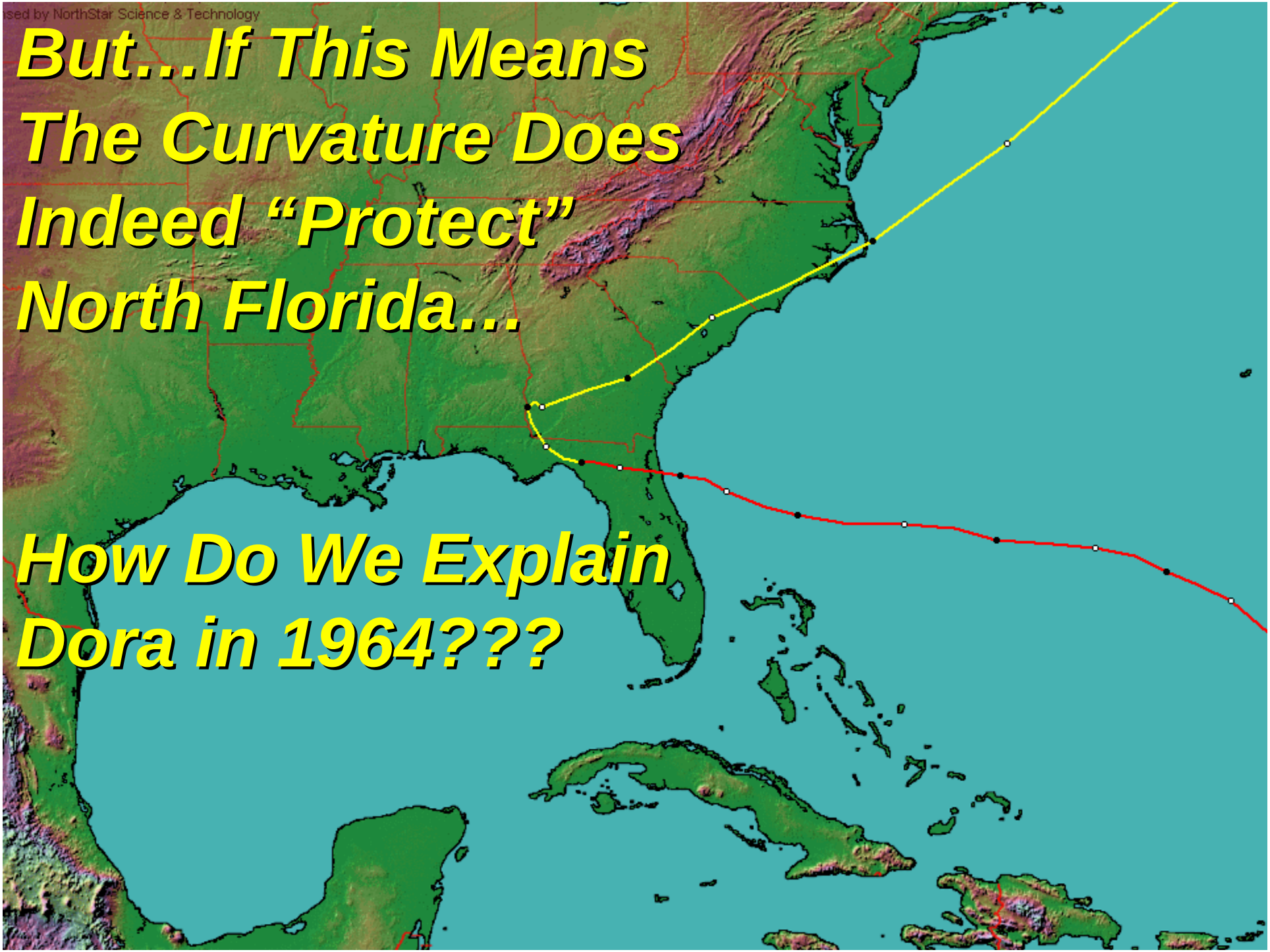
Climatological Tracks of Atlantic Basin Tropical Cyclones

Note That Florida Lies Very Close To The Latitude At Which Storms Start Recurving…Meaning That By The Time They Reach The Latitude of North Florida…They Are Often Well Into Recurvature!

With This In Mind… What Would The Effect Be If Florida's Coastline Did NOT Curve??

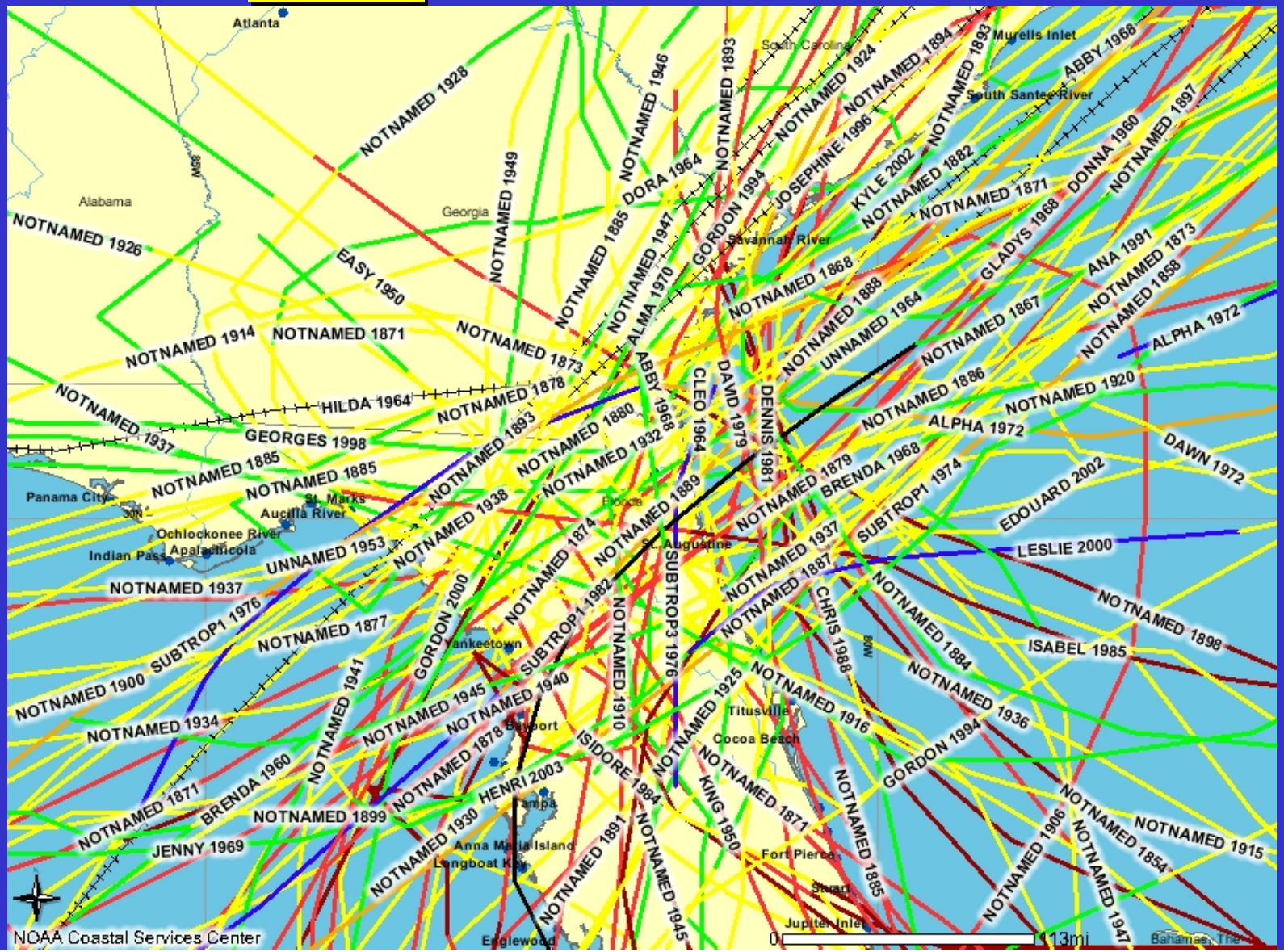


So…It Is Hard To Definitively State That There Would <u>Not</u> Have Been More Landfalls In North Florida!


sed by NorthStar Science & Technology
But…If This Means
The Curvature Does
Indeed "Protect"
North Florida…
How Do We Explain
Dora in 1964???

Taking It A Step Further...

THIS is Protection???



So Is It Reality or Myth???

The Curvature Of The Coastline Protects Northeast Florida From Hurricanes

Pseudo-Myth! ***The Curvature of the Coastline Obviously Does NOT "Protect" Northeast Florida…***

…But It Might Possibly Help A Little!

Reality or Myth???

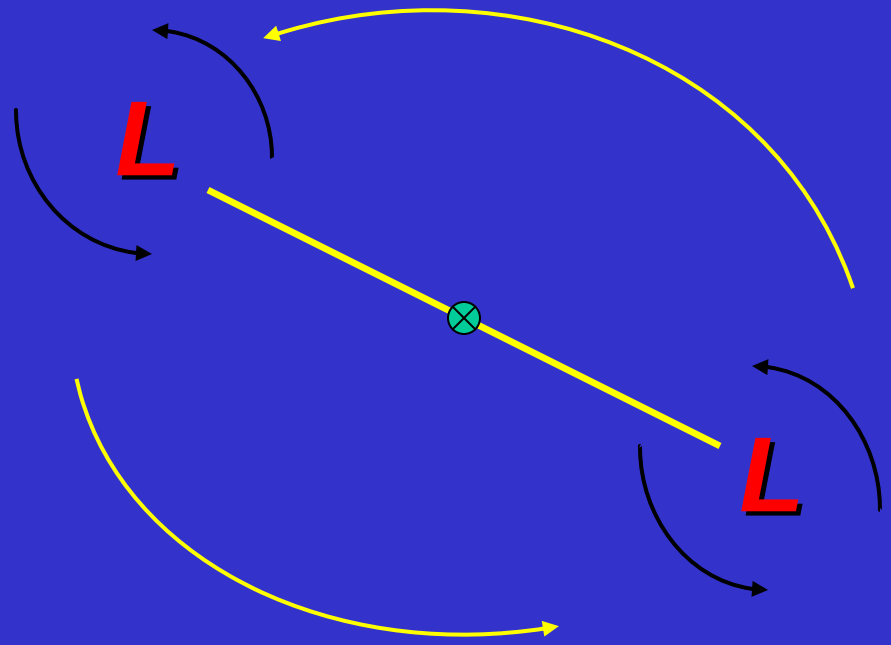
TWO HURRICANES CAN MERGE INTO ONE GIANT STORM

What Really Happens?

- *Tropical Cyclones Of Relatively Similar Strength Do NOT Merge Into A Single Storm*
- *If One Cyclone Is Significantly Weaker Than The Other, It Could Be Absorbed Into The Larger Circulation… But This Would Not Necessarily Strengthen The Dominant Cyclone*
- *A More Common… And Interesting… Result Is For Two Cyclones To Enter What Is Known As A "Fujiwhara" Pattern*

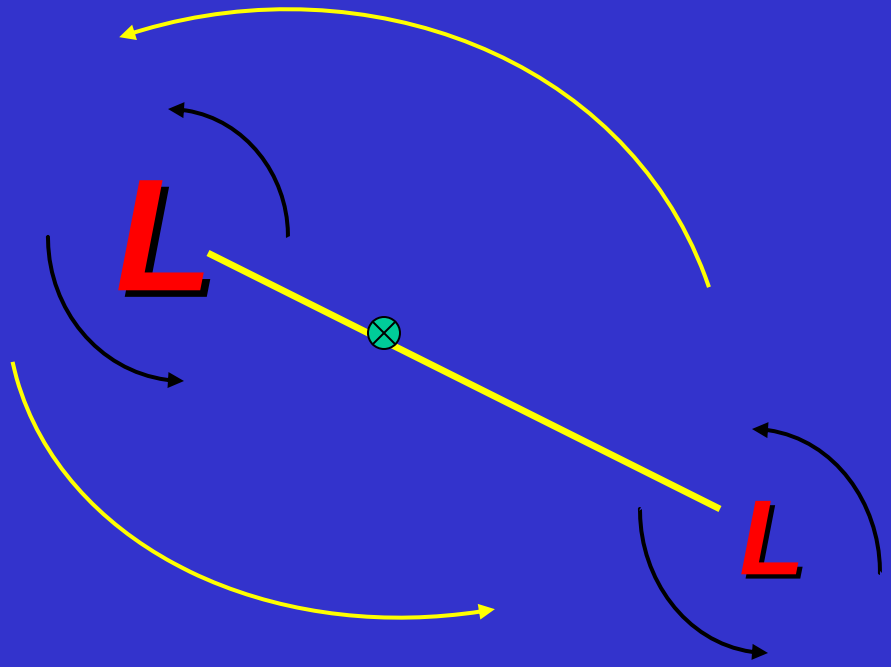
What Is The Fujiwhara Effect?

- As Two Cyclones Approach Each Other, They Will Tend To Rotate In A Counterclockwise Direction About A Common Axis & Center Point…

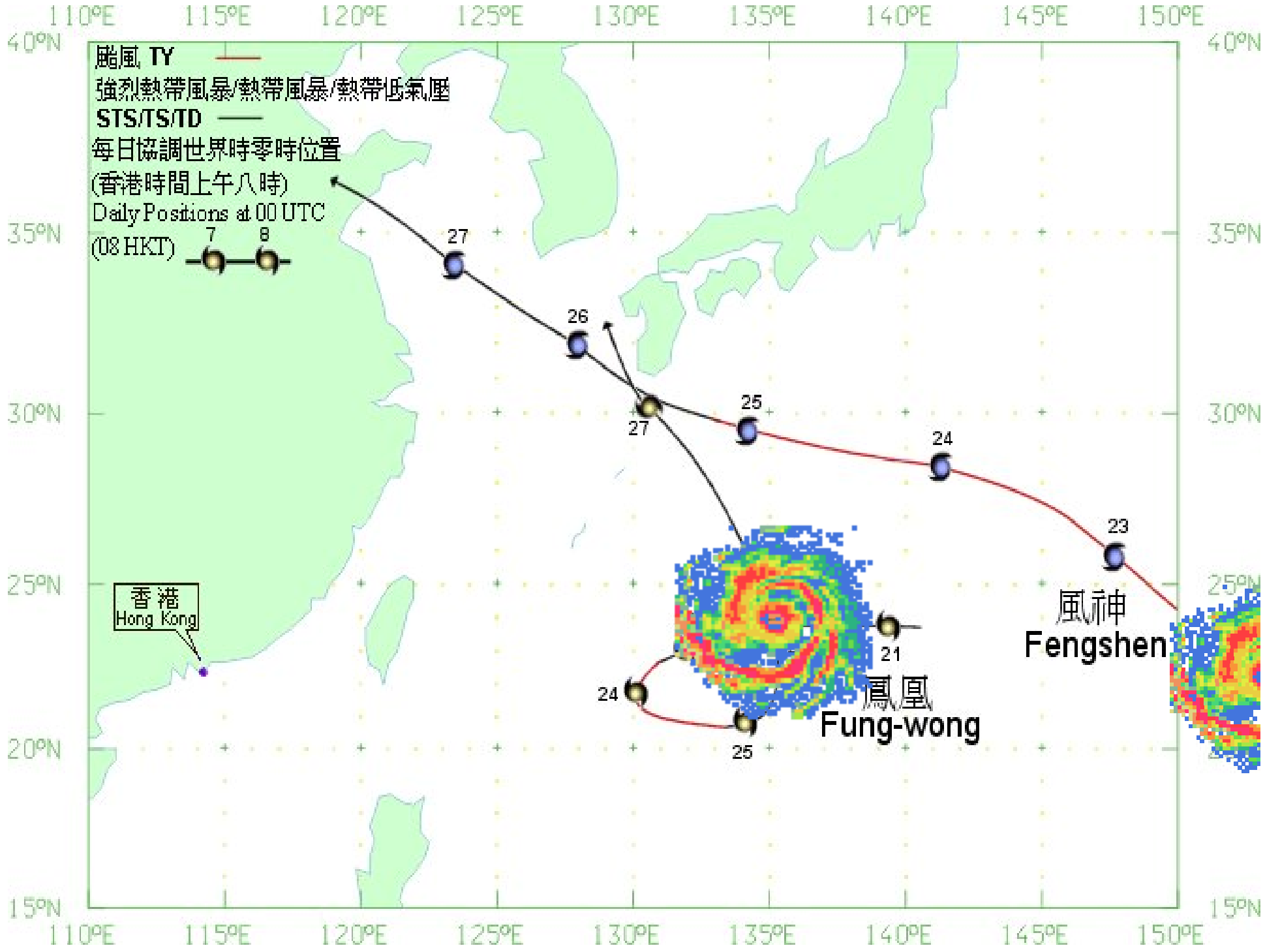


What Is The Fujiwhara Effect?

- *If The Storms Are Of Relatively Equal Intensity The Center of Common Rotation Will Be In The Middle… If Not, It Will Be Displaced Toward The Strongest Storm…*



Consider The Interaction Between Super Typhoon Fengshen and Tropical Storm Fung Wong In July, 2002…


颱風 TY
強烈熱帶風暴/熱帶風暴/熱帶低氣壓
STS/TS/TD
每日協調世界時零時位置
(香港時間上午八時)
Daily Positions at 00 UTC
(08 HKT)
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8
110°E
115°E
120°E
125°E
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135°E
140°E
145°E
150°E
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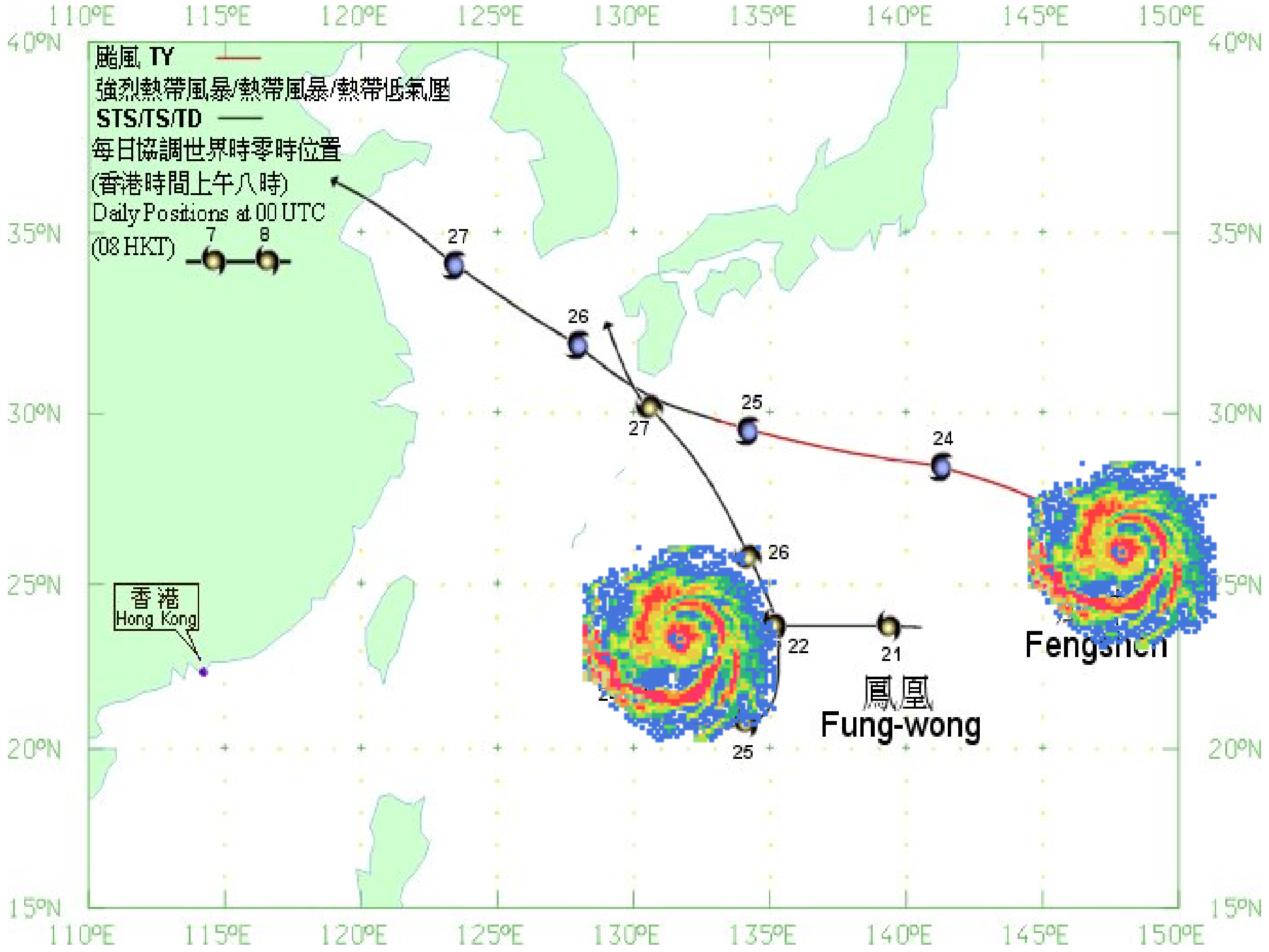
香港
Hong Kong
風神
Fengshen
鳳凰
Fung-wong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STS/TS/TD
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Daily Positions at 00 UTC
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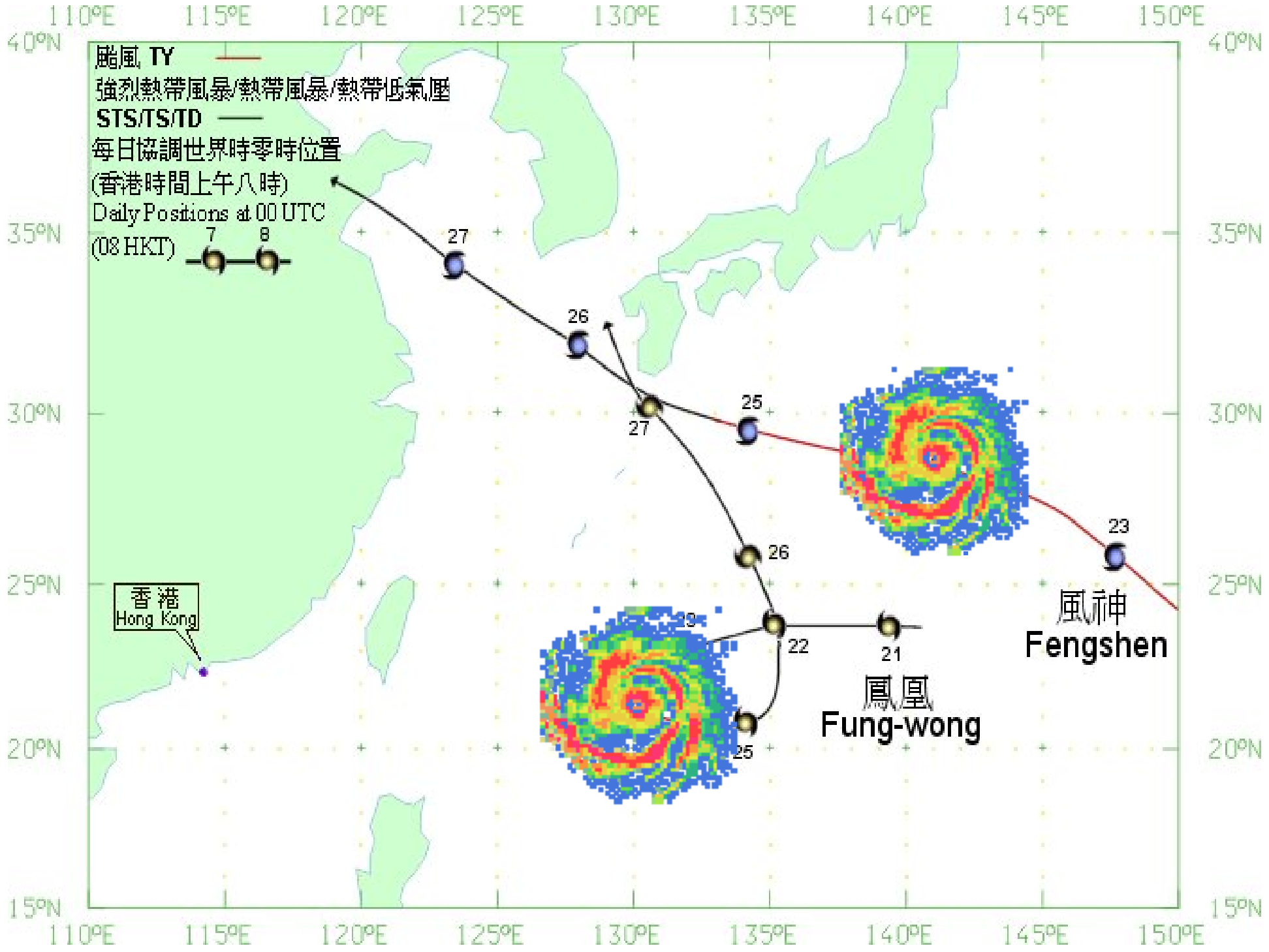
30°N
25°N
20°N
15°N


颱風 TY
強烈熱帶風暴/熱帶風暴/熱帶低氣壓
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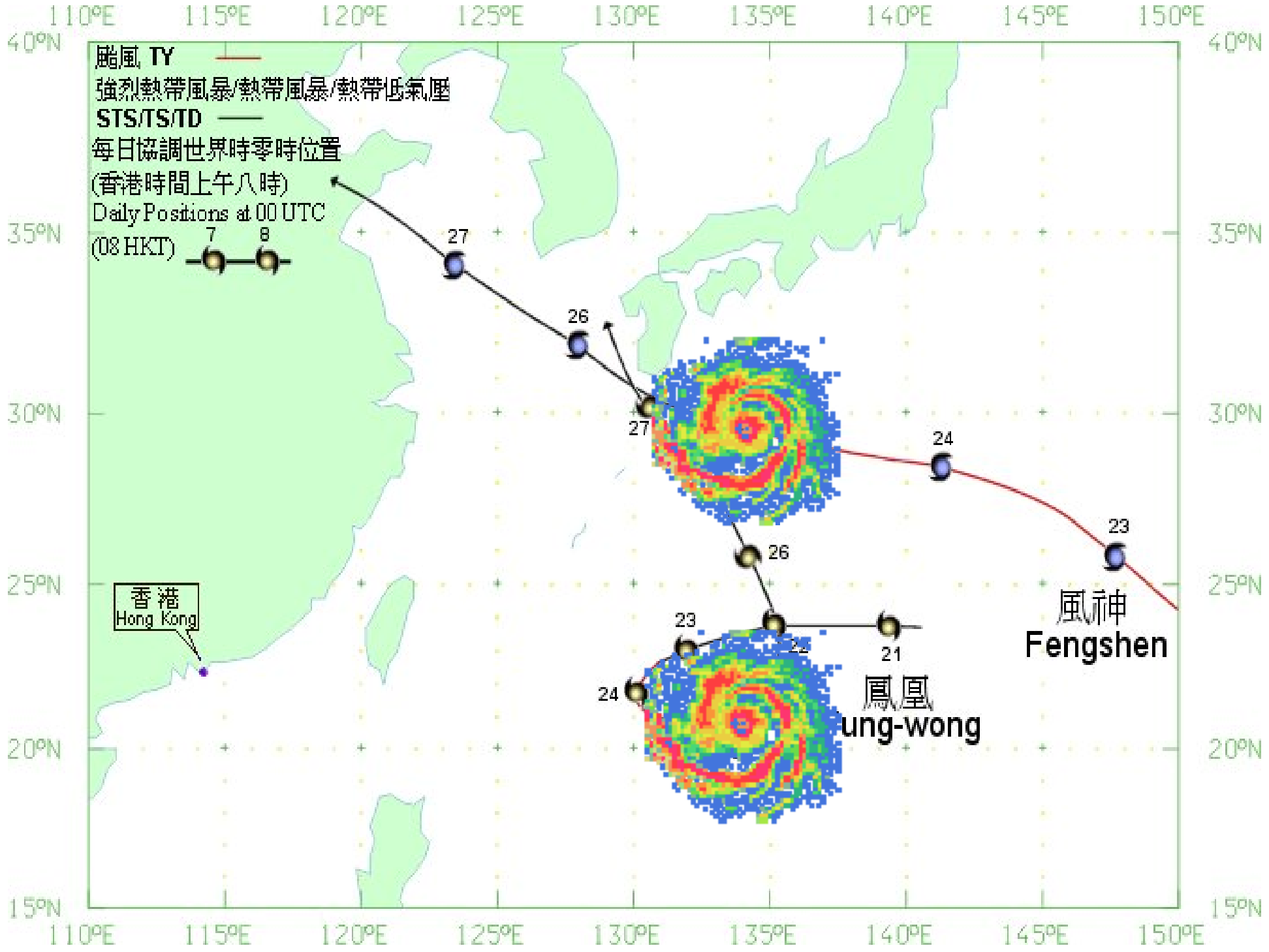
香港
Hong Kong
風神
Fengshen
鳳凰
Fung-wong


颱風 TY
強烈熱帶風暴/熱帶風暴/熱帶低氣壓
STS/TS/TD
每日協調世界時零時位置
(香港時間上午八時)
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8
110°E
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145°E
150°E
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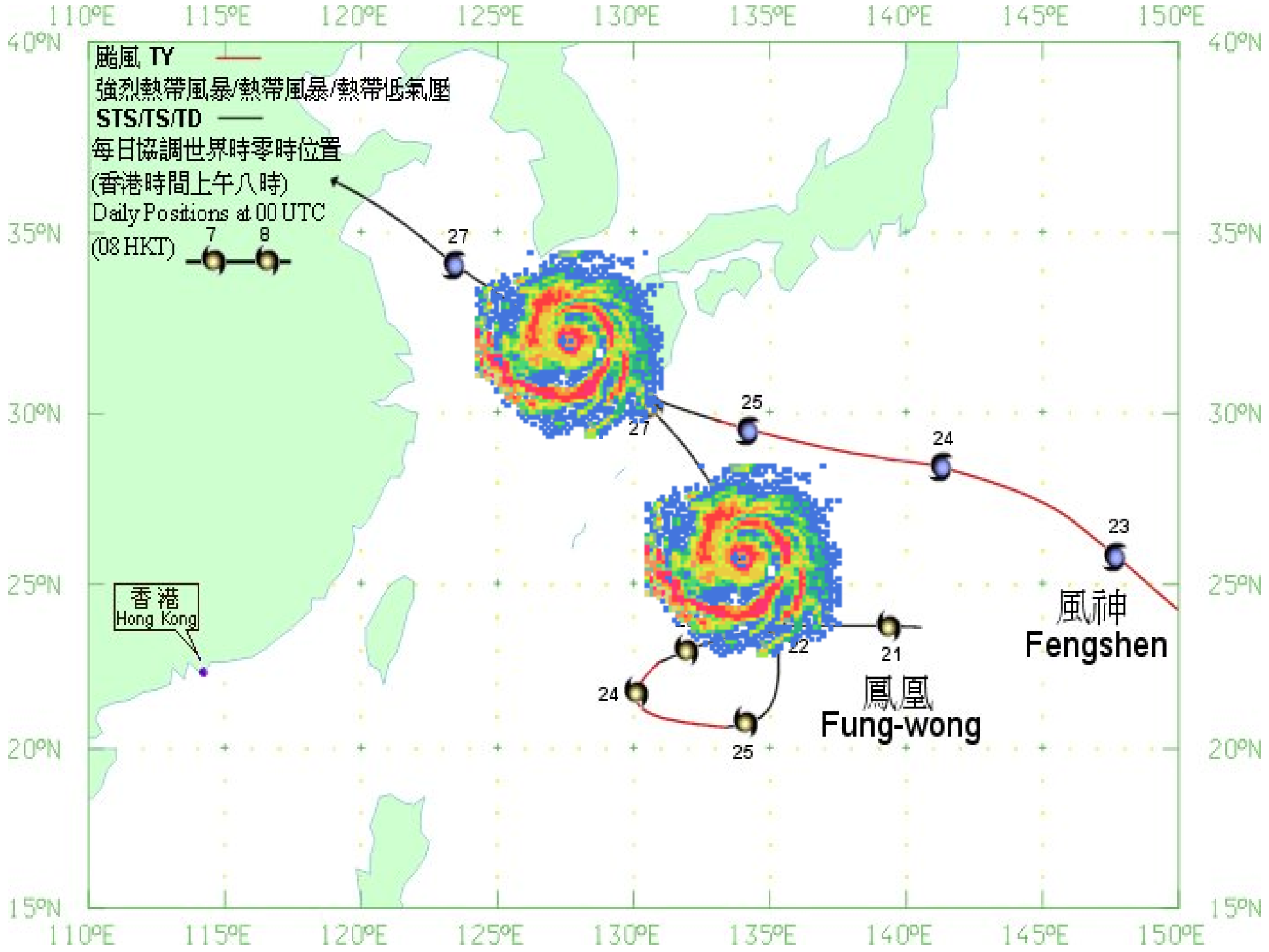
Hong Kong
風神
Fengshen
鳳凰
ung-wong


颱風 TY
強烈熱帶風暴/熱帶風暴/熱帶低氣壓
STS/TS/TD
每日協調世界時零時位置
(香港時間上午八時)
Daily Positions at 00 UTC
(08 HKT)
7
8
110°E
115°E
120°E
125°E
130°E
135°E
140°E
145°E
150°E
40°N
35°N
30°N
25°N
20°N
15°N
27
27
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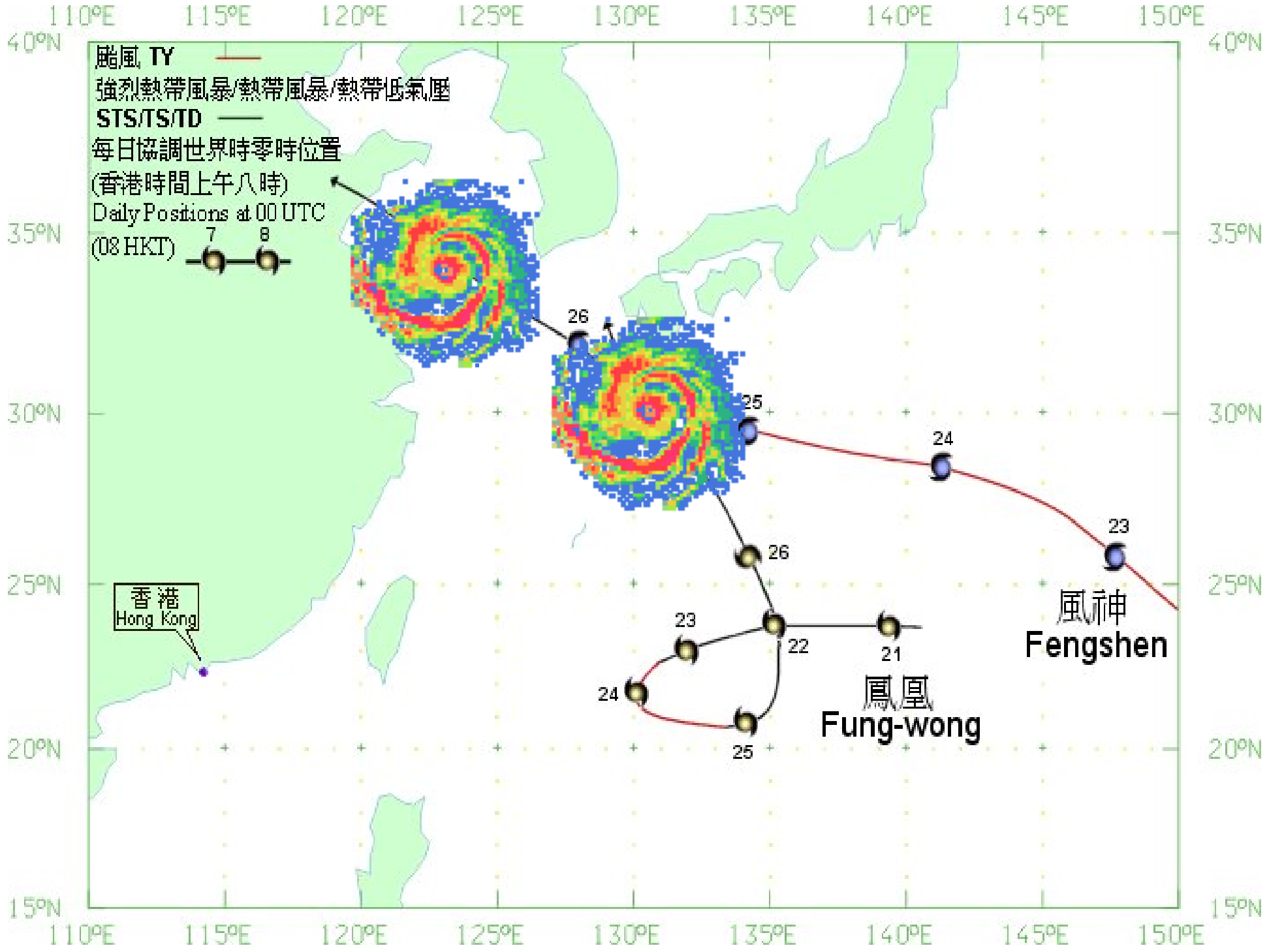
23
22
21
24
25
香港
Hong Kong
風神
Fengshen
鳳凰
Fung-wong


颱風 TY
強烈熱帶風暴/熱帶風暴/熱帶低氣壓
STS/TS/TD
每日協調世界時零時位置
(香港時間上午八時)
Daily Positions at 00 UTC
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7
8
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香港
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110°E
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25°N
20°N
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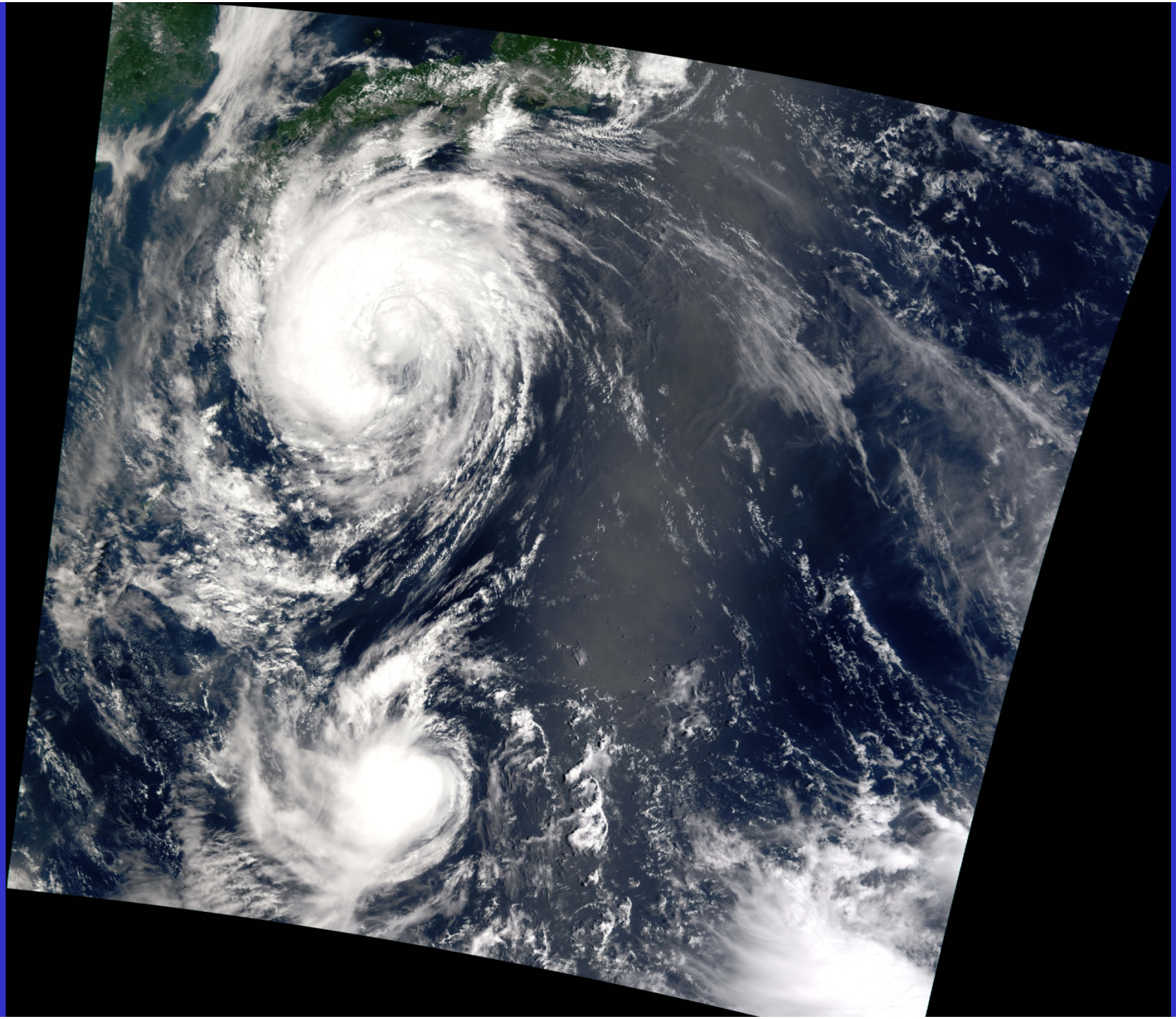
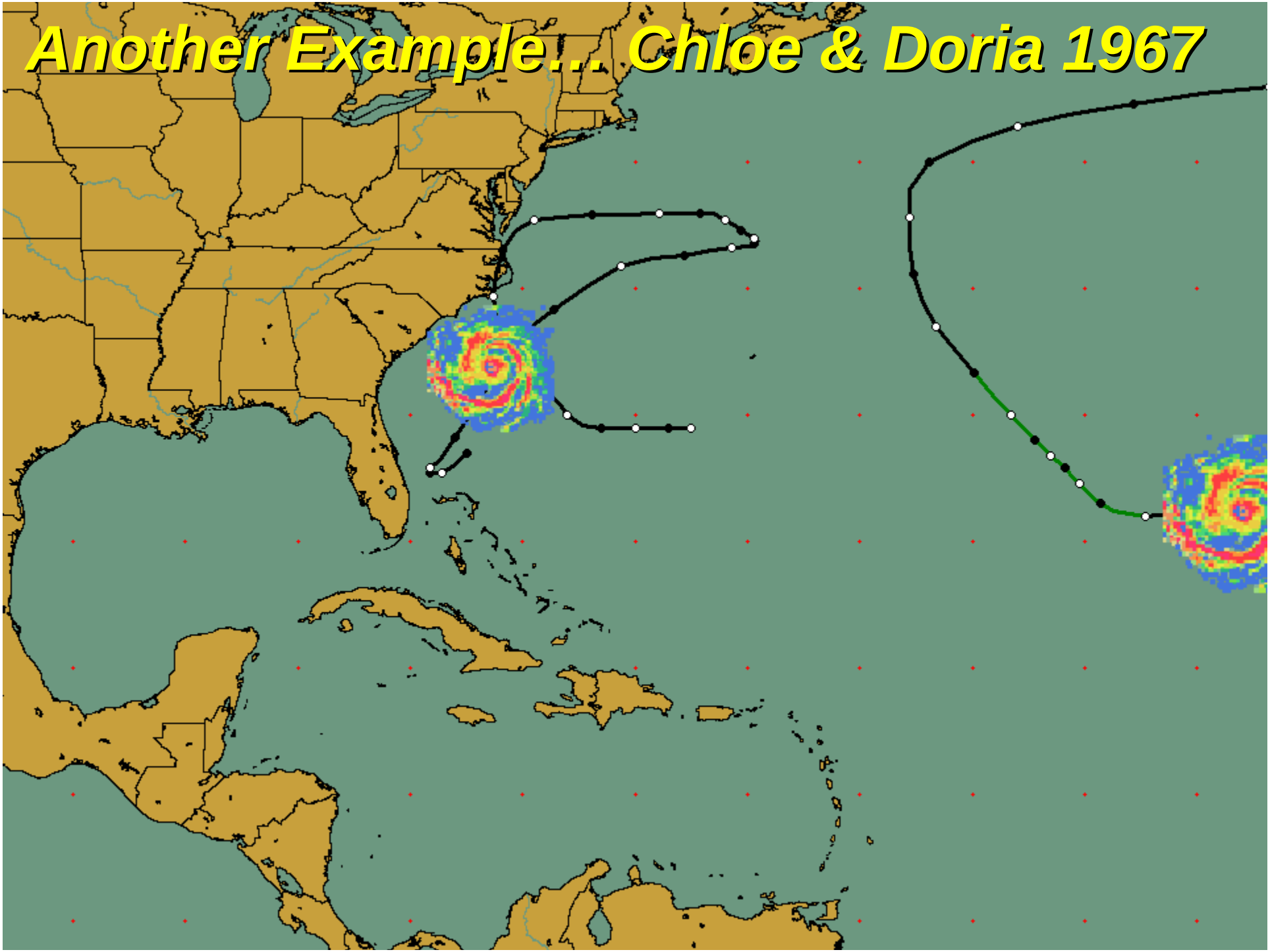
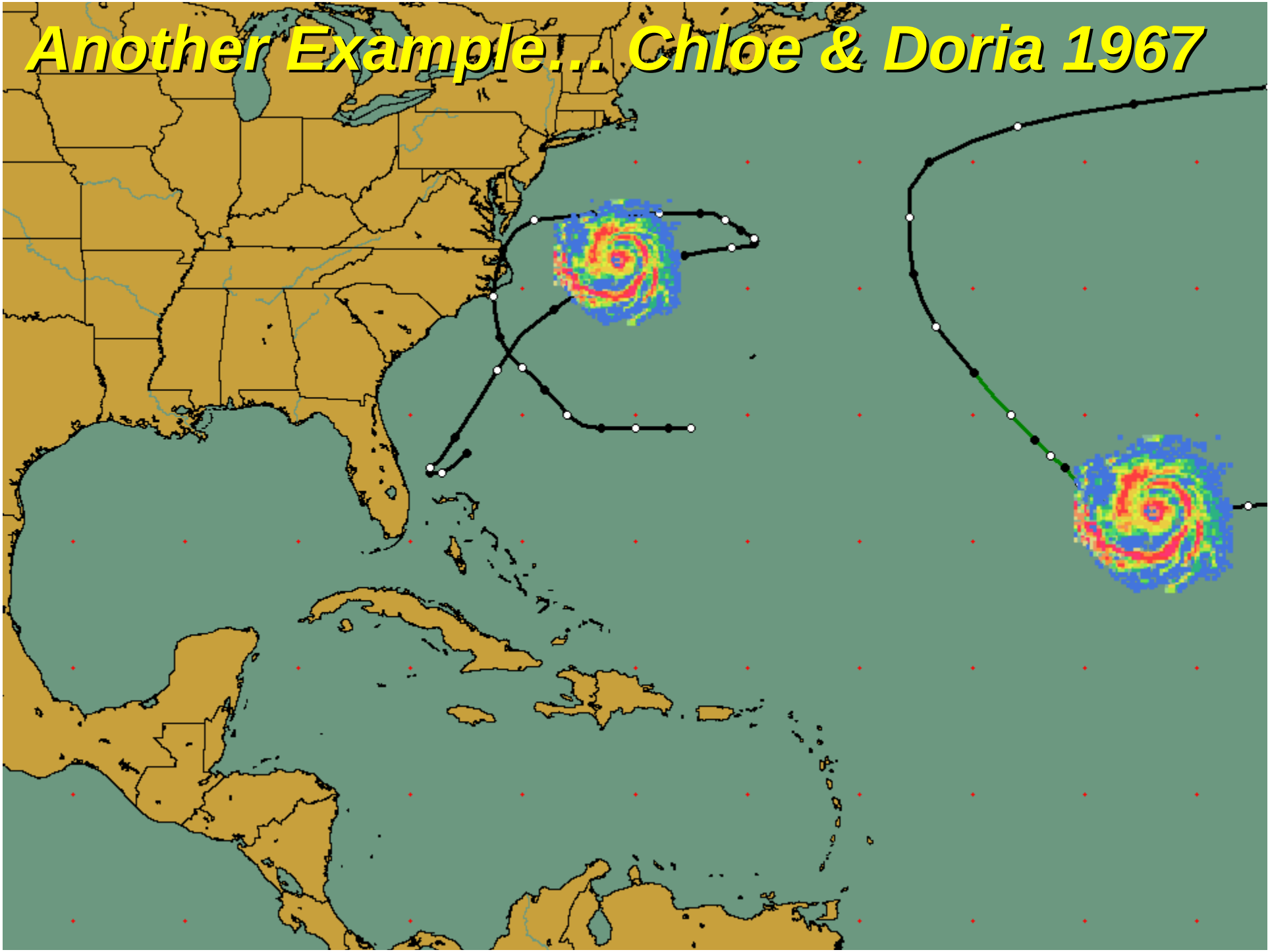
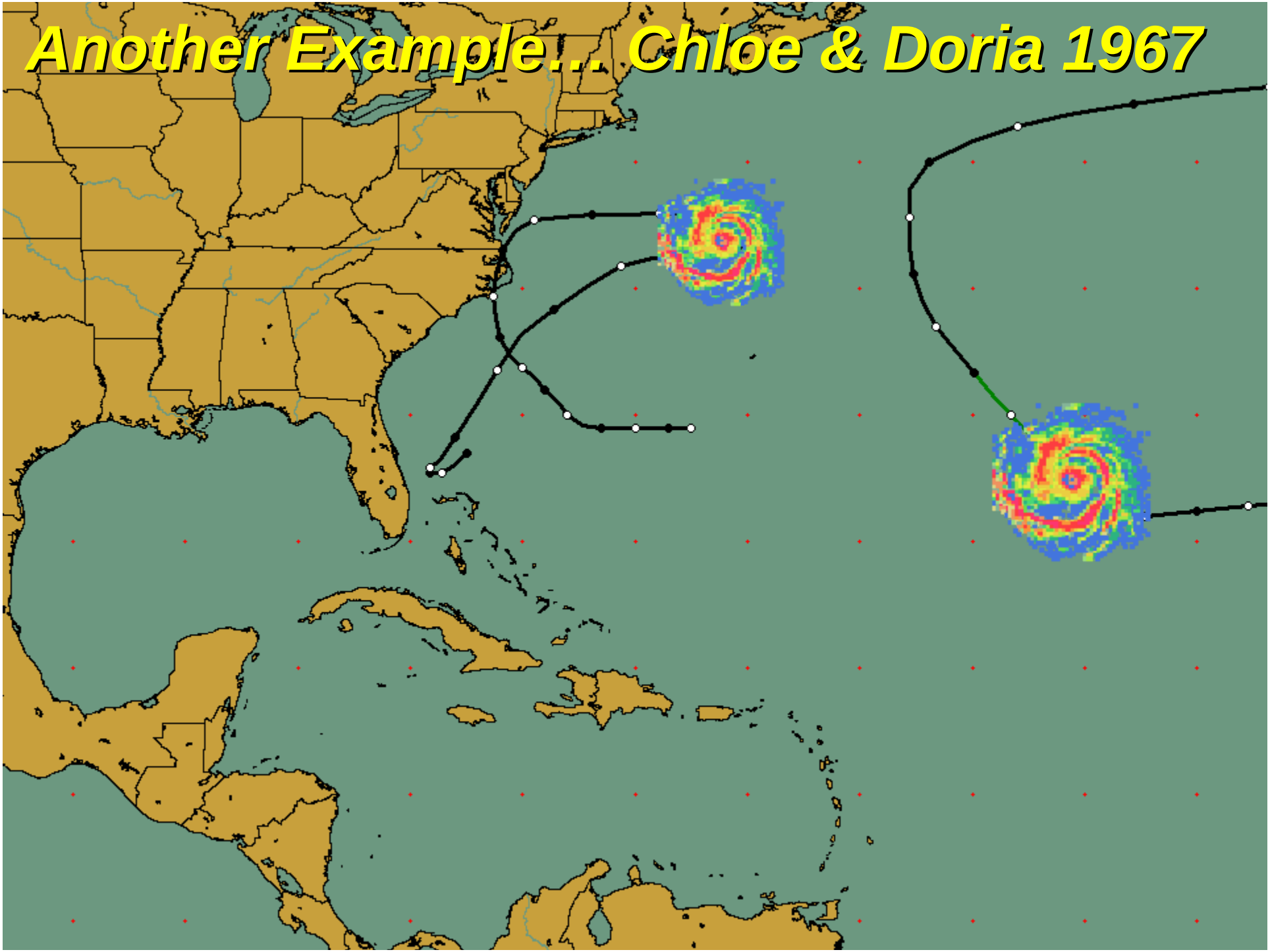



Another Example… Chloe & Doria 1967


Another Example… Chloe & Doria 1967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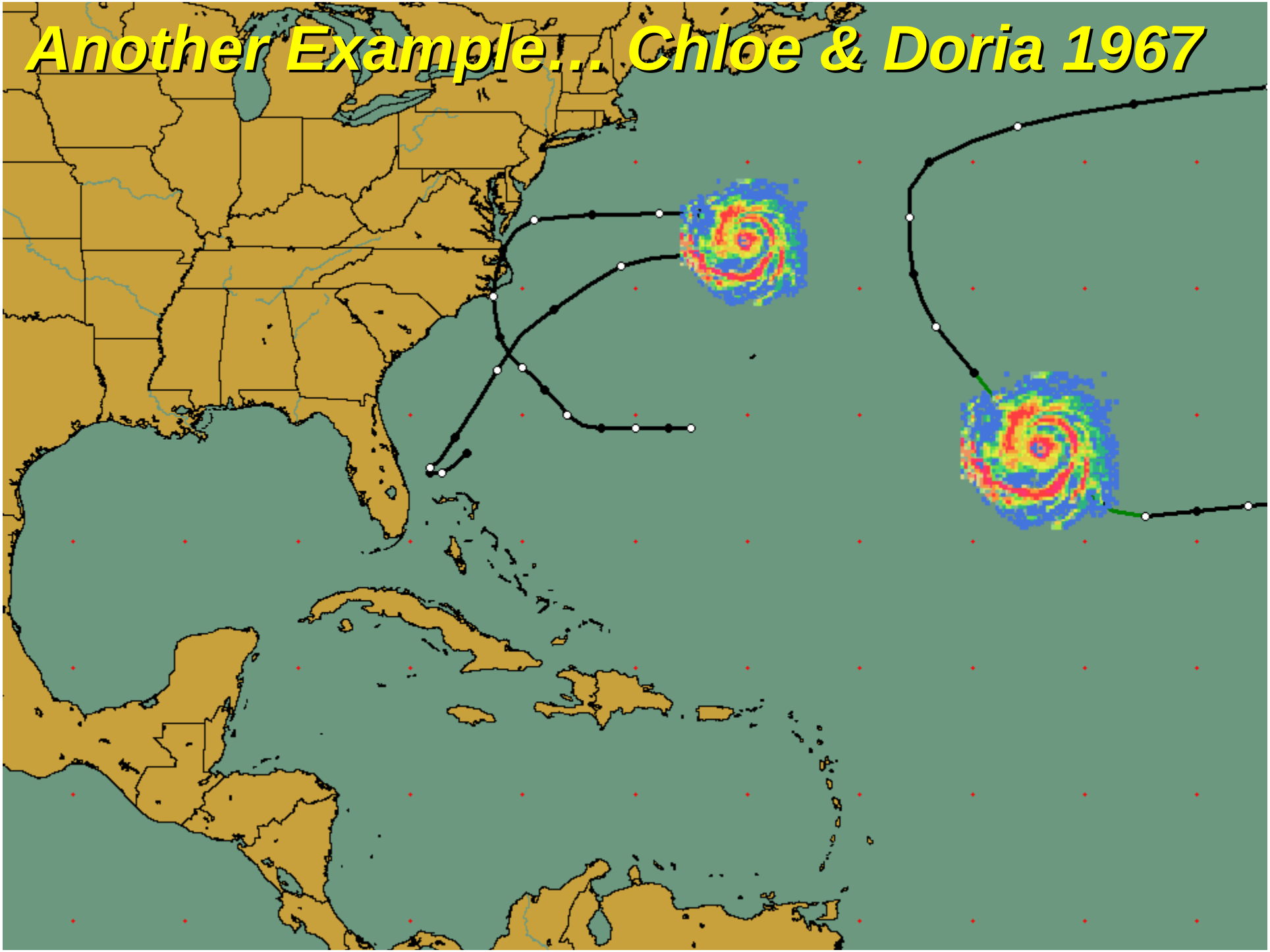
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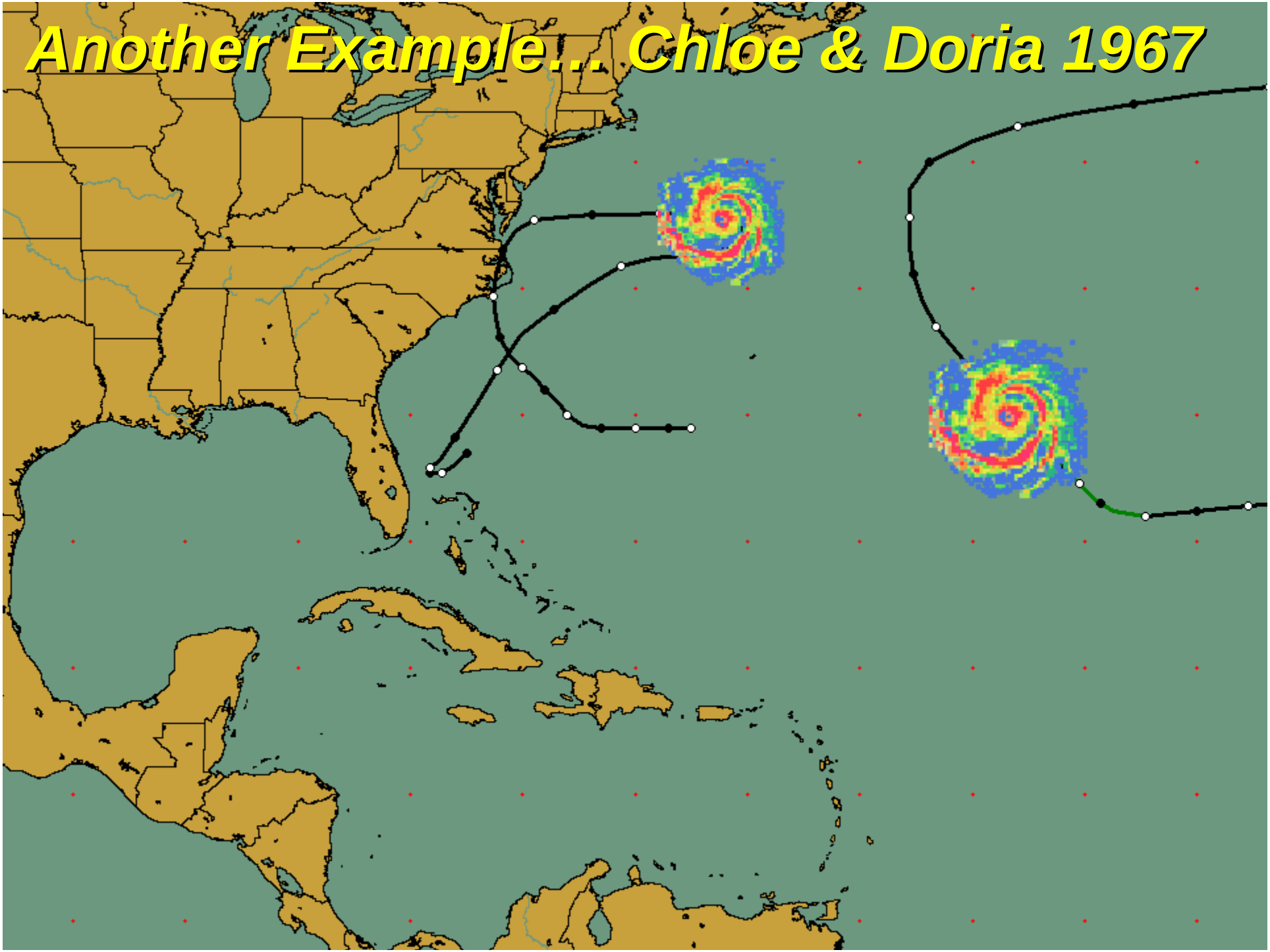
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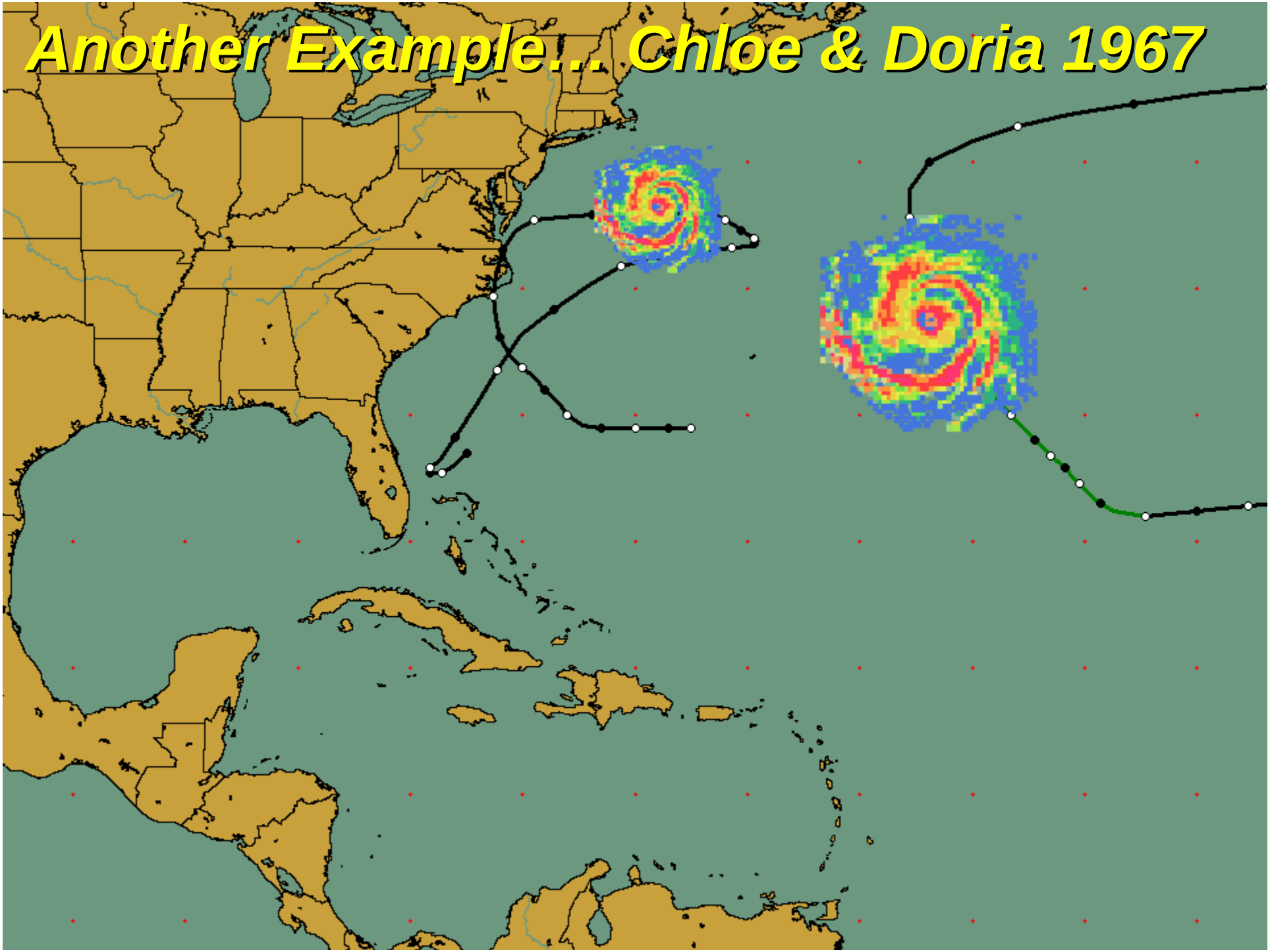
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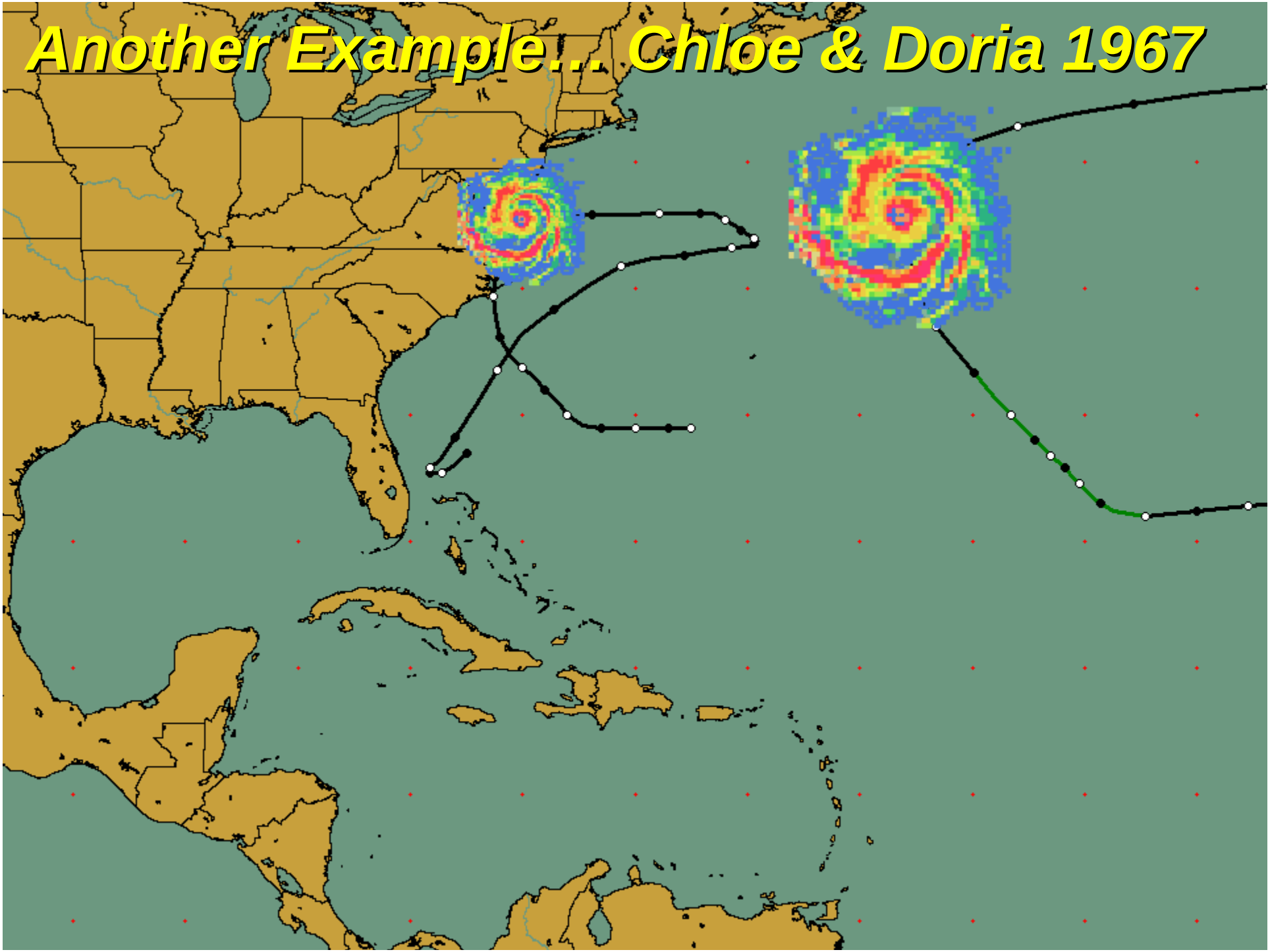
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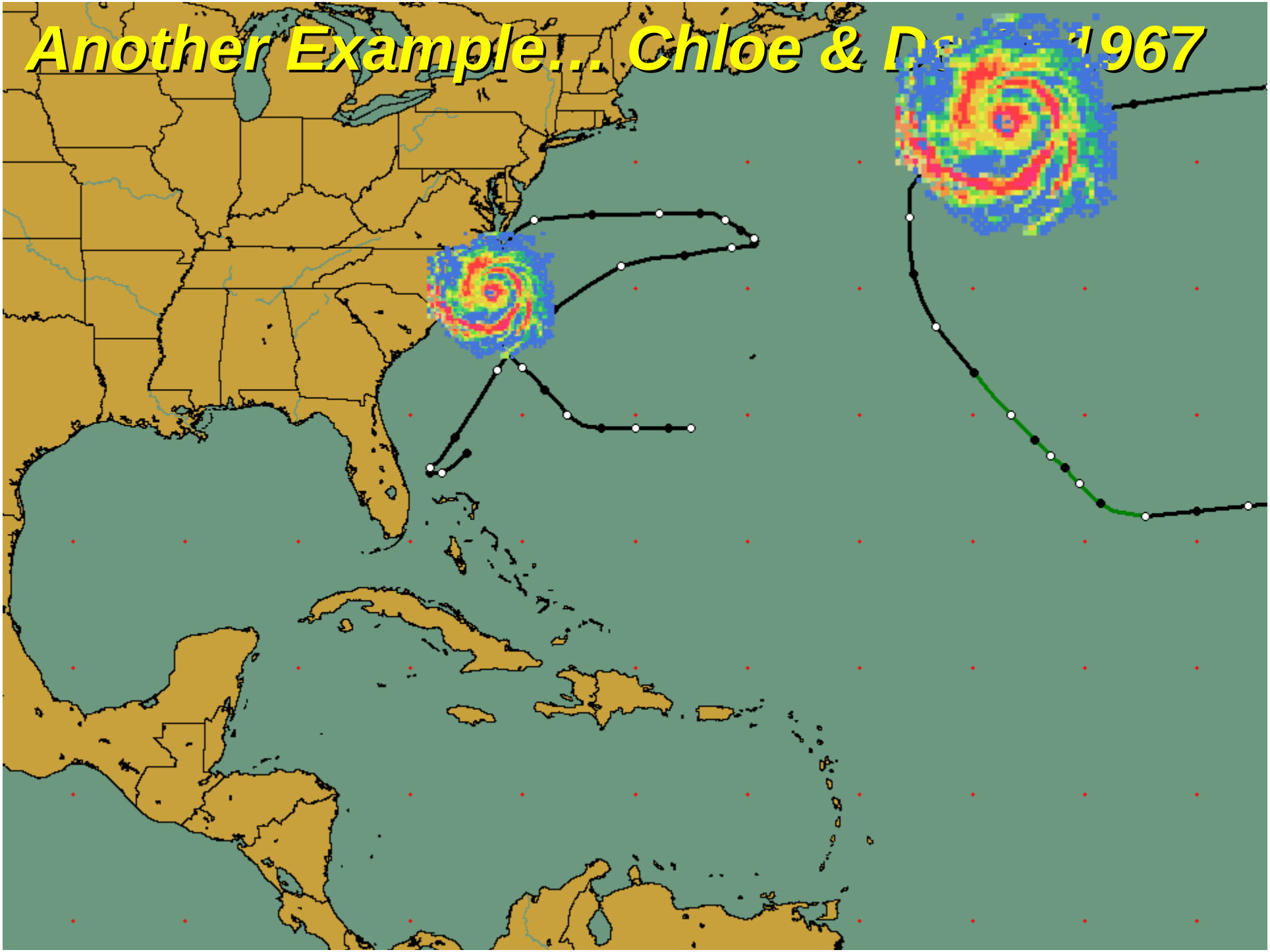
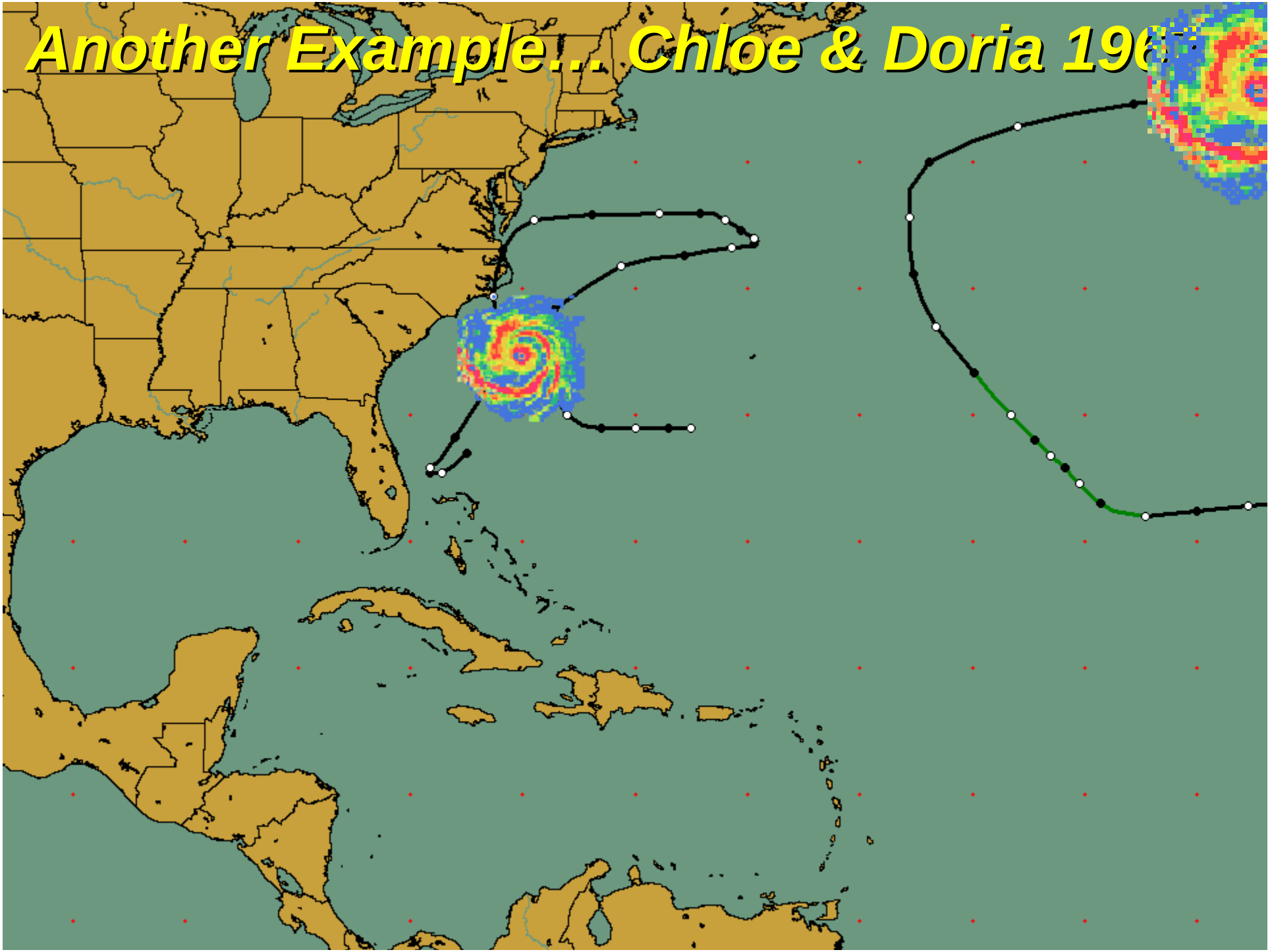

Another Example… Chloe & D… 1967


Another Example… Chloe & Doria 196

The Bottom Line…

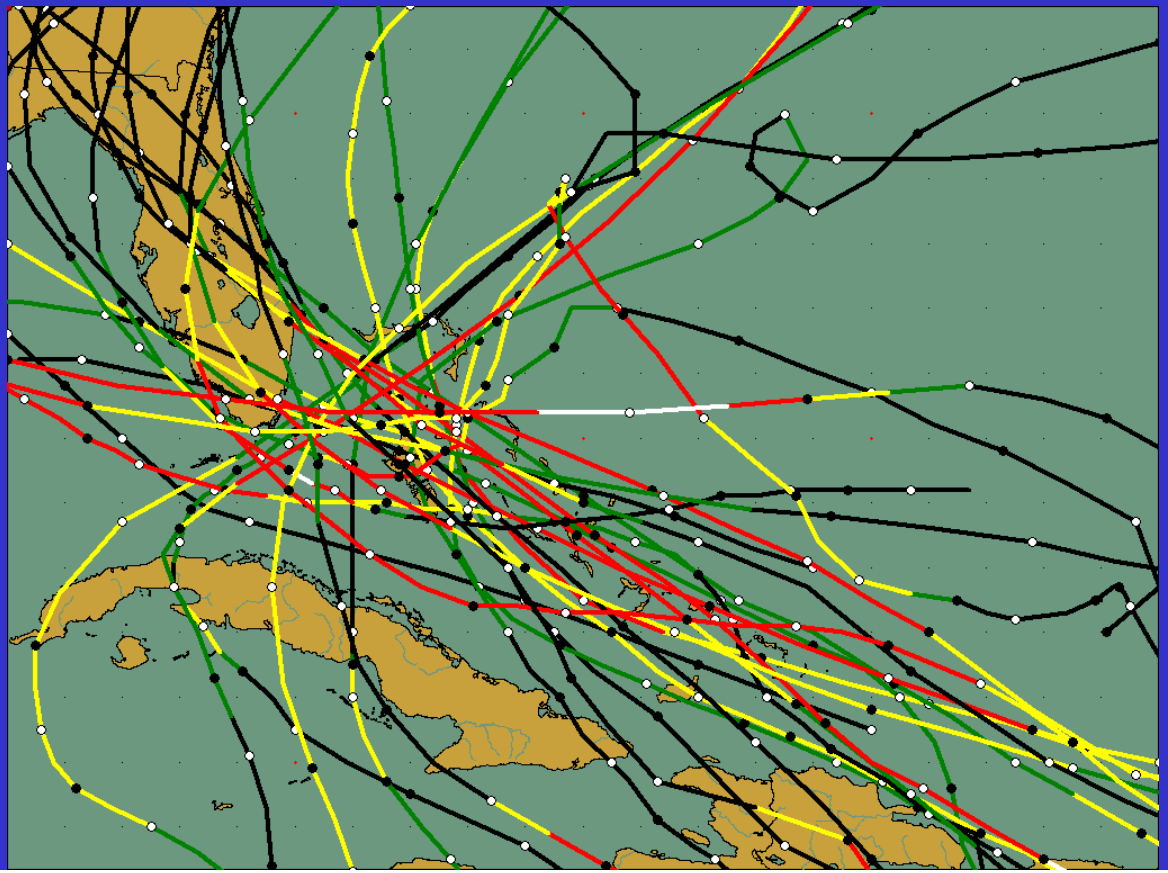
While A Strong Tropical Cyclone Could Absorb A Weaker One, They Will Not Combine To Form a "Super" Hurricane!

However… Two Storms In Close Proximity Can Produce Significant Forecast Complexities Due To The Fujiwhara Effect.

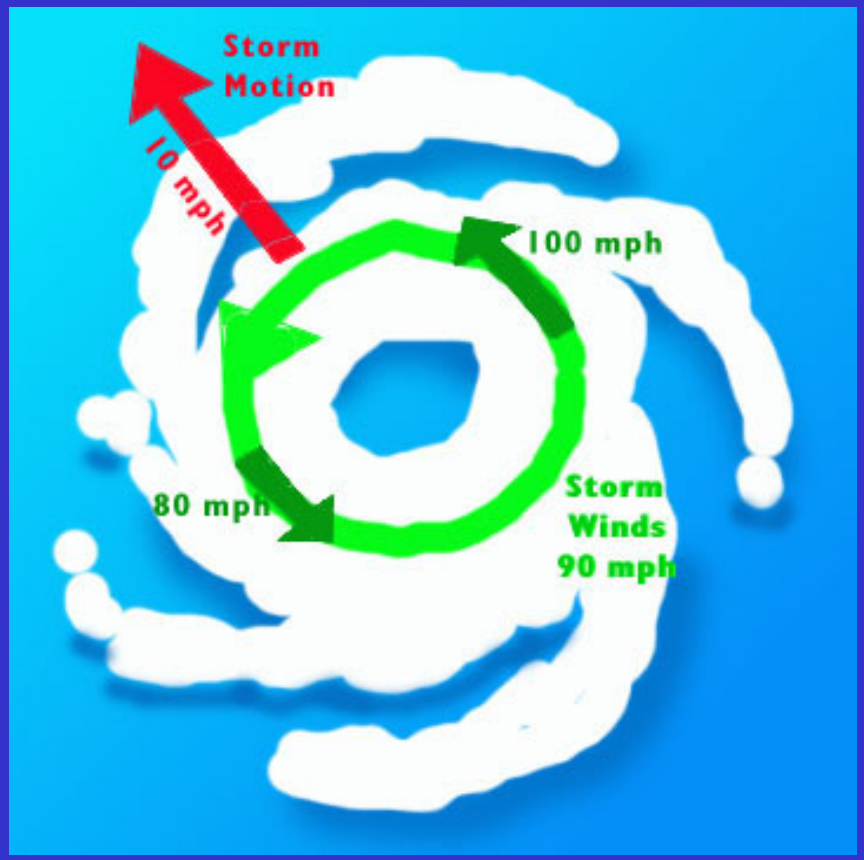
Reality or Myth???

THE NORTHEAST QUADRANT OF A HURRICANE IS USUALLY THE STRONGEST PART

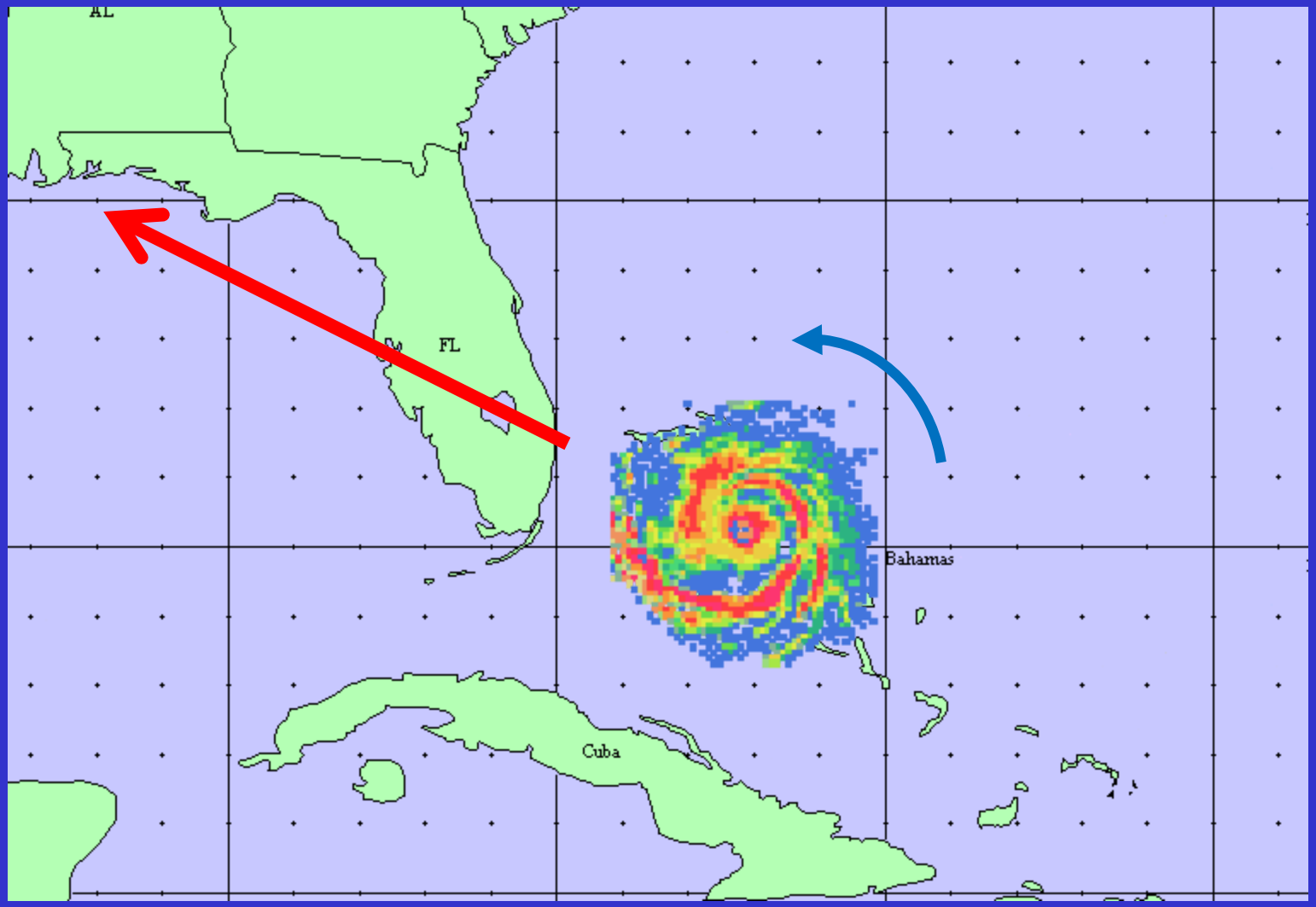
THIS NOTION STEMS FROM THE IDEA THAT STORMS MOST LIKELY TO STRIKE FLORIDA ARE PROBABLY COMING UP FROM THE BAHAMAS MOVING IN A NORTHWESTERLY DIRECTION… THE CLASSIC "HURRICANE ALLEY" STORMS



BECAUSE OF THE SO-CALLED "ADDITIVE" EFFECT OF THE WIND ON THE SIDE OF THE STORM WHERE THE WIND IS THE SAME DIRECTION AS THE STORM MOTION…THIS WOULD PUT THE STRONGEST WINDS IN THE NORTHEAST QUADRANT…



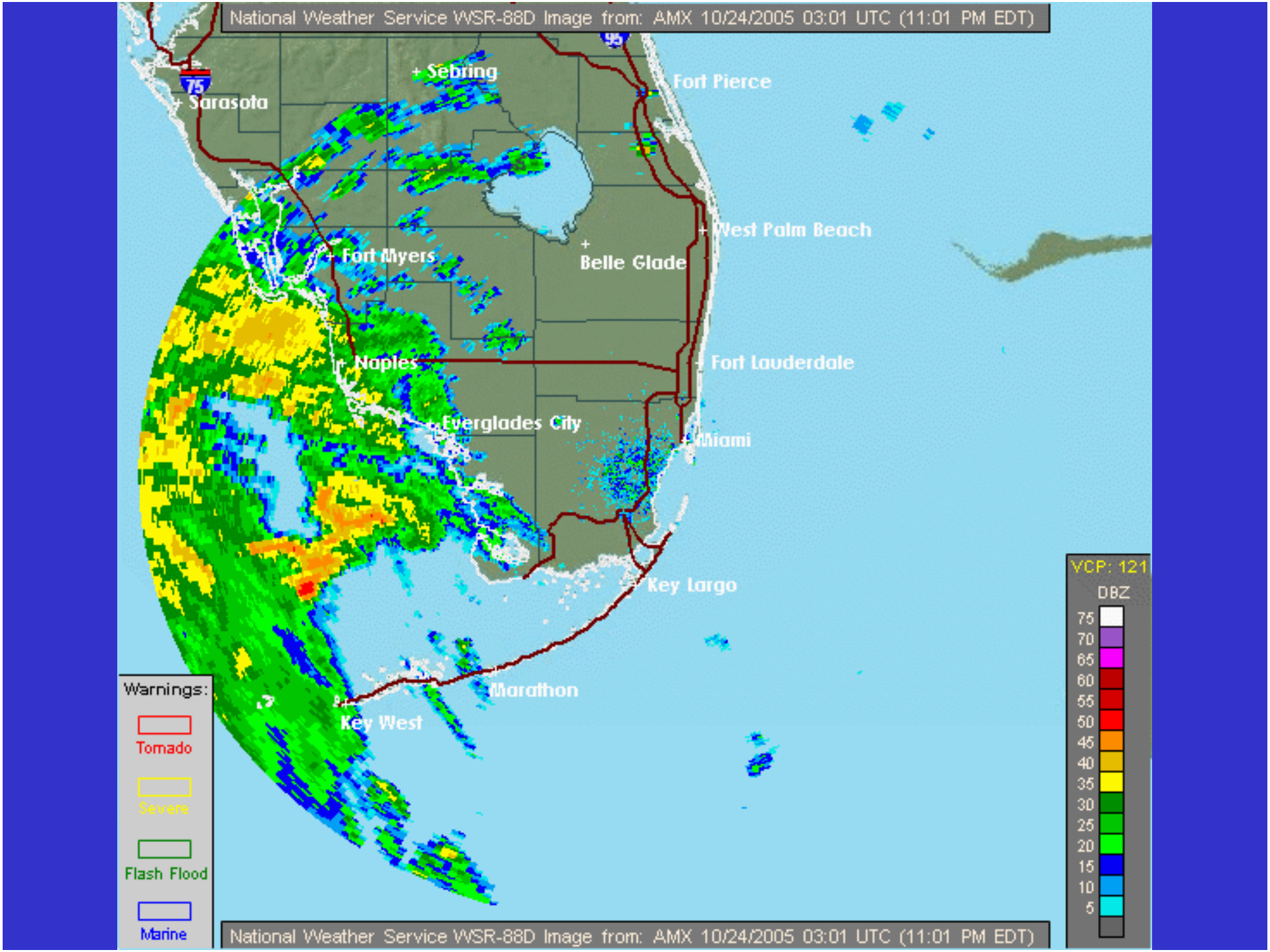
For The Classic Northwestward-Moving Hurricane Approaching Florida… This Means The Strongest Onshore Winds Would Be In The Northeast Quadrant Of The Storm <u>Relative To Its Motion</u>



ONE SMALL PROBLEM THOUGH…

If The Storm Is <u>Not</u> Moving Northwest… The Quadrant Where The Wind Direction Coincides With The Storm Motion Will <u>Not</u> Necessarily Be The Northeast!

Here's An Example From Wilma in 2005 In South Florida…


National Weather Service WSR-88D Image from: AMX 10/24/2005 03:01 UTC (11:01 PM EDT)
Sebring
Fort Pierce
Sarasota
West Palm Beach
Belle Glade
Fort Myers
Naples
Fort Lauderdale
Everglades City
Miami
Key Largo
Marathon
Key West
Warnings:
Tornado
Severe
Flash Flood
Marine
VCP: 121
DBZ
75
70
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National Weather Service WSR-88D Image from: AMX 10/24/2005 03:01 UTC (11:01 PM EDT)

So… Reality or Myth???

THE NORTHEAST QUADRANT OF A HURRICANE IS USUALLY THE STRONGEST PART

Partially **Real… But A Much Better Way To Put It Would Be…**

"The Right Forward Quadrant With Respect To The Direction Of Motion"


The End!
www.srh.noaa.gov/jax