The Edge Of Disaster:

Can A Near "Miss" Be Worse Than A Direct "Hit"?

Steve Letro
Meteorologist in Charge
National Weather Service, Jacksonville

After The 2004 and 2005 Hurricane Seasons… Floridians Are Now All Too Familiar With The Devastating Potential Of A Hurricane Landfall

Hurricane Charley… Charlotte Harbor

Hurricane Frances – Fort Pierce/Vero Beach

Hurricane Ivan – Pensacola Beach

Wilma 2005


Hurricane Wilma Eyewall
Miami Beach, Florida
October 24th, 2005
UltimateChase.com

What 2004 Tropical Cyclone Produced This Damage?

F-2 Tornado Damage in Northwest Jacksonville, Fl. From Tropical Storm Bonnie… Which Made Landfall 150 Miles Away!

We Are All Accustomed To The Conceptual Model Of A Tropical Cyclone Where the Worst Weather Occurs Near The Center

But… This Is Not <u>Always</u> The Case!!!

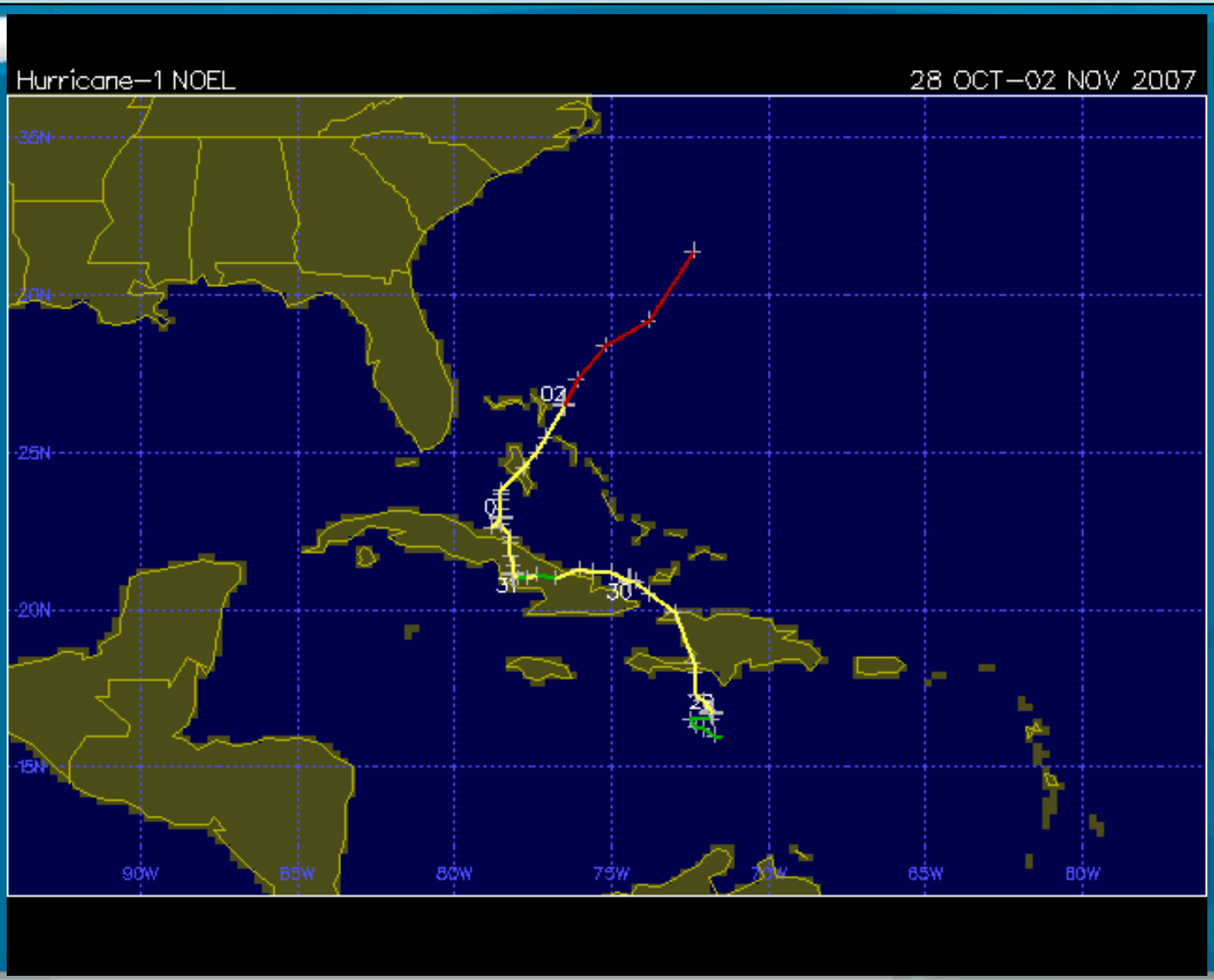
Under The Right (or Wrong) Circumstances… Conditions Can Be Devastating Even At A Great Distance From The Center

Let's Look At Some Of The Ways This Can Happen…

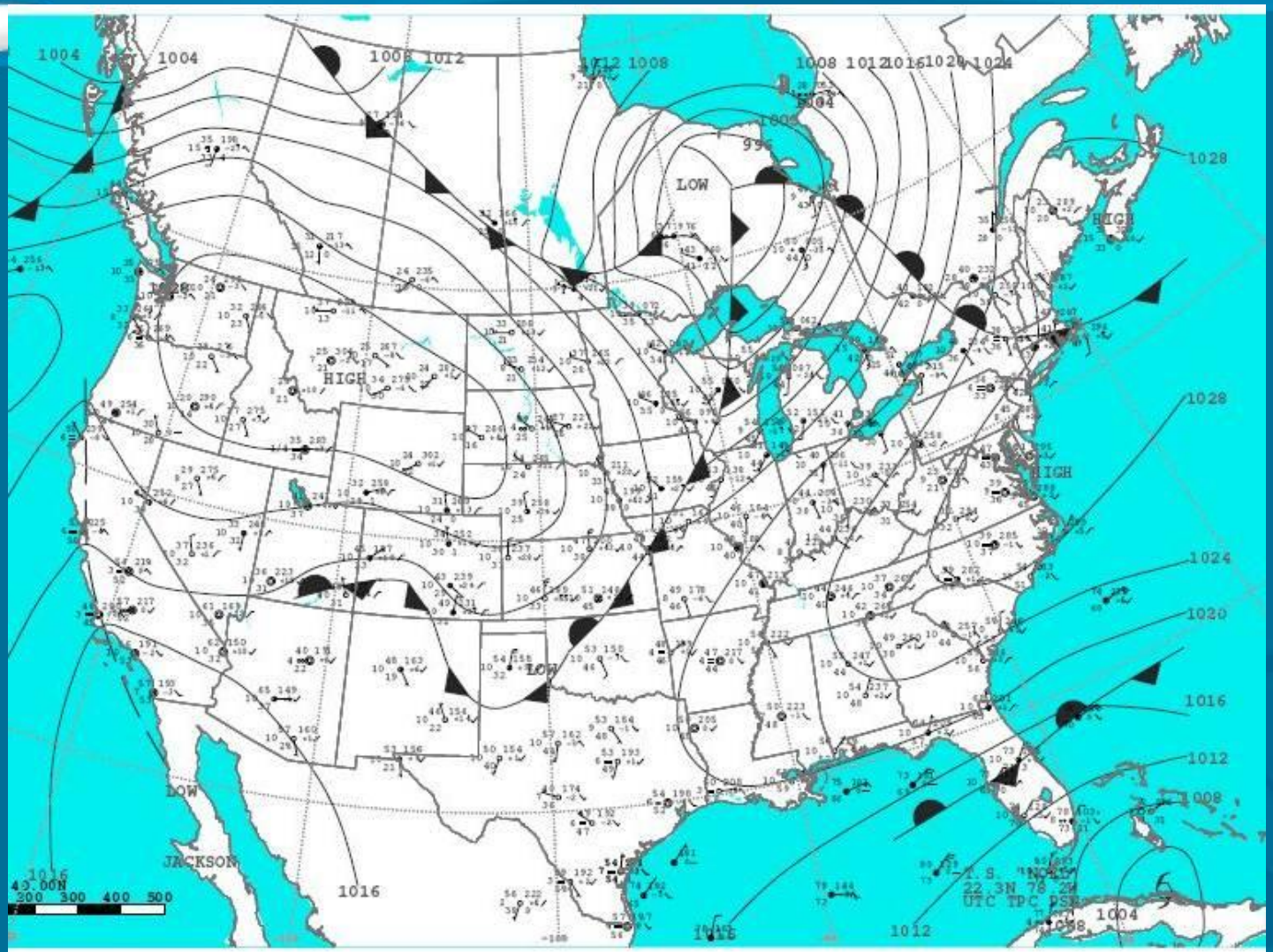
Important Safety Tip!

If A Storm Is Still Immature… Or Only Partially Tropical… It Is Very Possible That The Strongest Winds… And Possibly The Highest Surge May Be Well Removed From The Center

…Consider Hurricane Noel From 2007… Which Was Blamed For Bringing Tropical Storm Force Winds To Coastal South Florida…

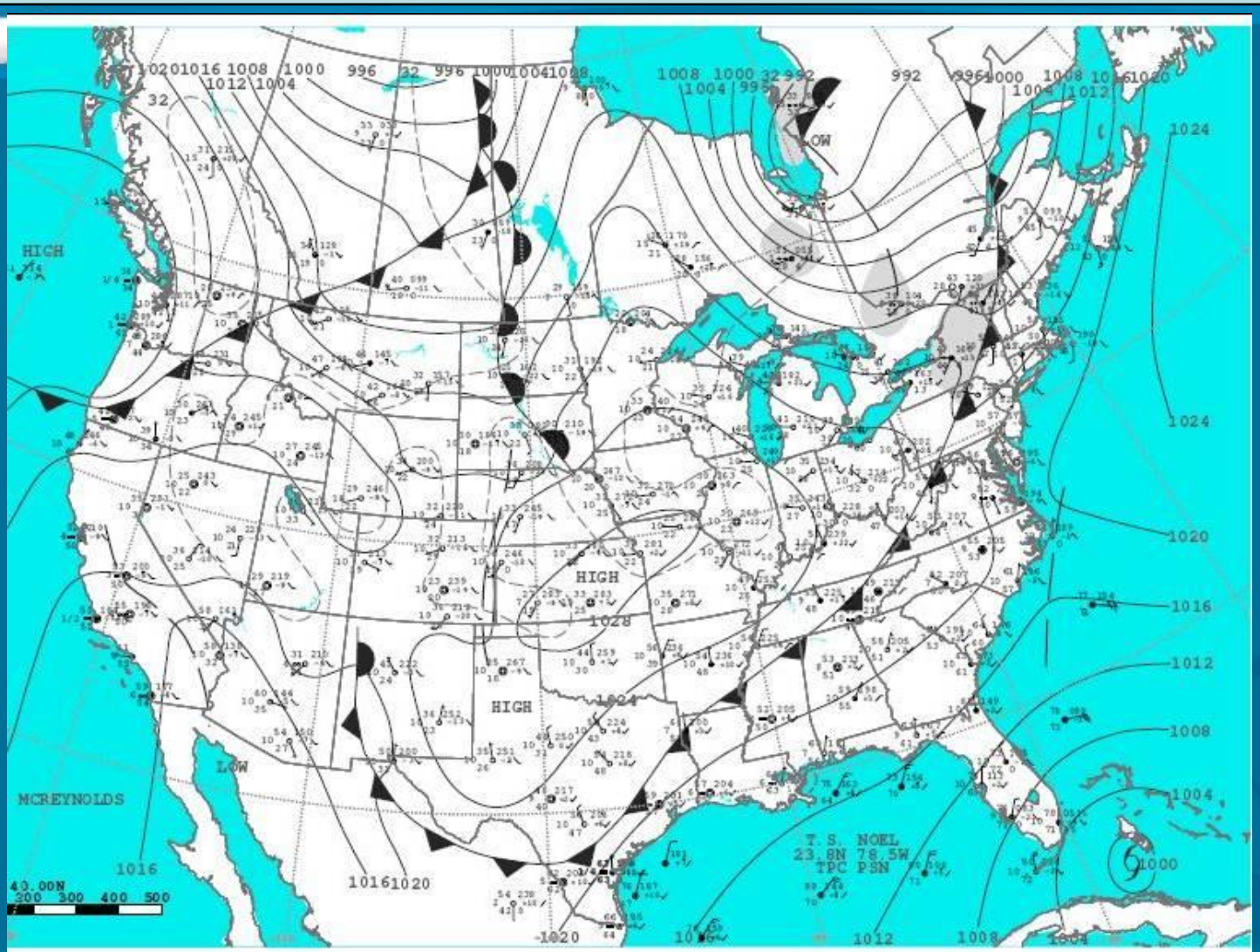


…But Those Winds Actually Occurred On The Outer Edge Of Noel When It's Center Was Over Cuba…And The Pressure Gradient Between Noel And Strong High Pressure To The North Was Strongest



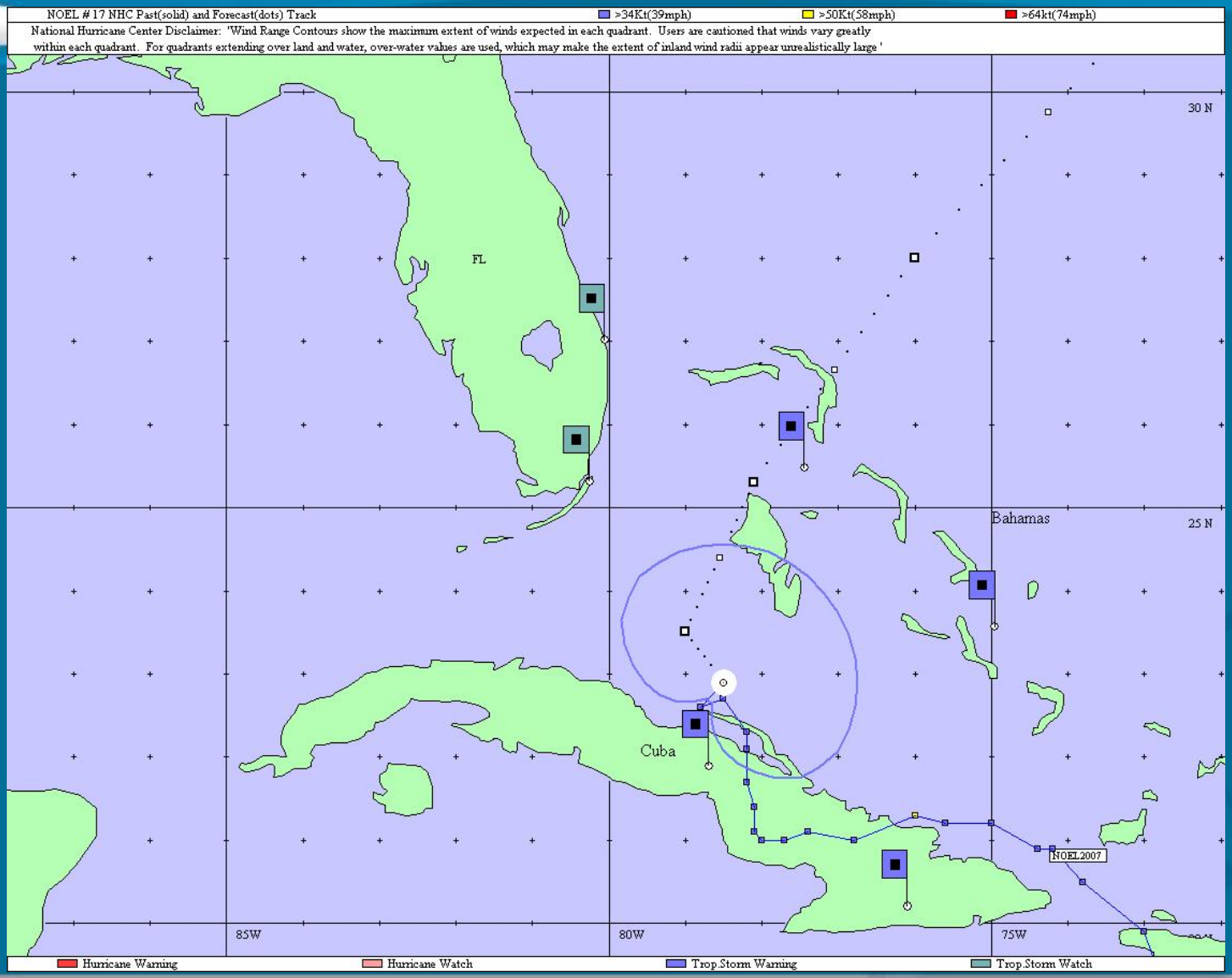
Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.

By The Time Noel Made It's Closest Approach To South Florida… The Winds There Had Actually Decreased Significantly!



Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.

This Type Of Wind Field Cannot Be Accurately Described By Either Conventional Wind Radii Or The Software That Displays It!



Despite The Location Of The Winds Relative To The Center… They Were Still Capable of Causing Minor Damage And Flooding In South Florida! Beach Erosion Alone Caused An Estimated $3-4 Million In Damage in Just The Palm Beach Area!

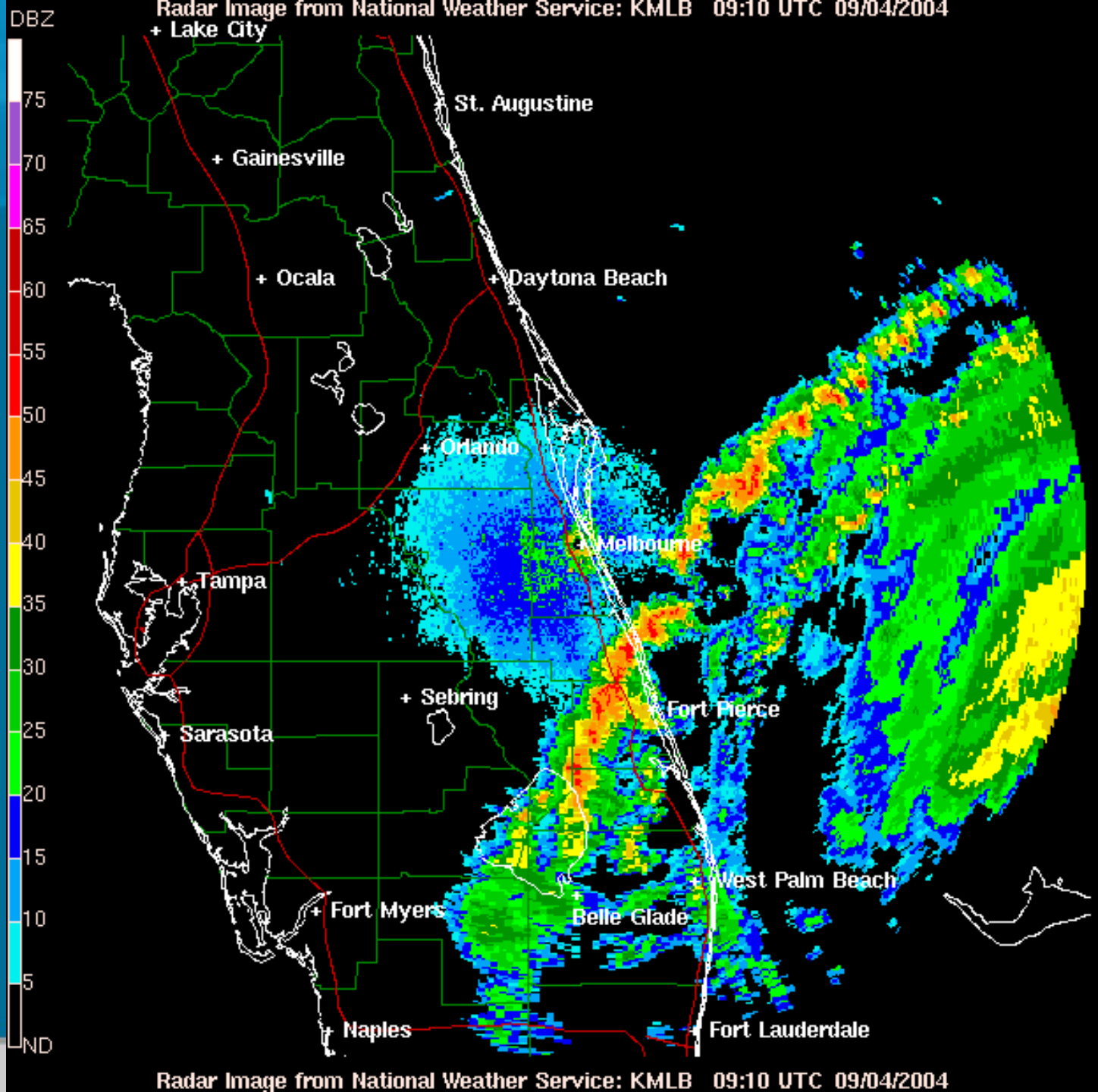
Even In A Mature Hurricane… Where The Strongest Winds Are Where They Are Supposed To Be…

Environmental Conditions Can Sometimes Conspire to Produce Devastating Impacts Well Away From The Center!!!

Here's A Radar Loop Of Frances' Landrall…

Note The Motion and Changes in the Bands and The Areas Of Weaker Echoes Between Them!

The Strong Winds Are In The Bands… With Much Lower Winds In Between



This Can Create Real Forecast Dilemmas… For Example, Consider The Problems Just Involved In Bridge Closures Using A 40 MPH Threshold…

This Problem Stems From The Uncertainties Regarding Wind Radii…

…As Well As Possible Misunderstandings Regarding What They Are Telling You!

The Real Problem…

A Large Percentage Of Key Decisions Are Based on Forecasts of The Hurricane's Overall Windfield… Current And Forecast!

Unfortunately… In Any Given Storm, That Windfield Is Probably Going To Be One Of The More Poorly Observed & Forecasted Storm Parameters… Until The Storm Is Knocking At The Door!

The Question Of Perspective…

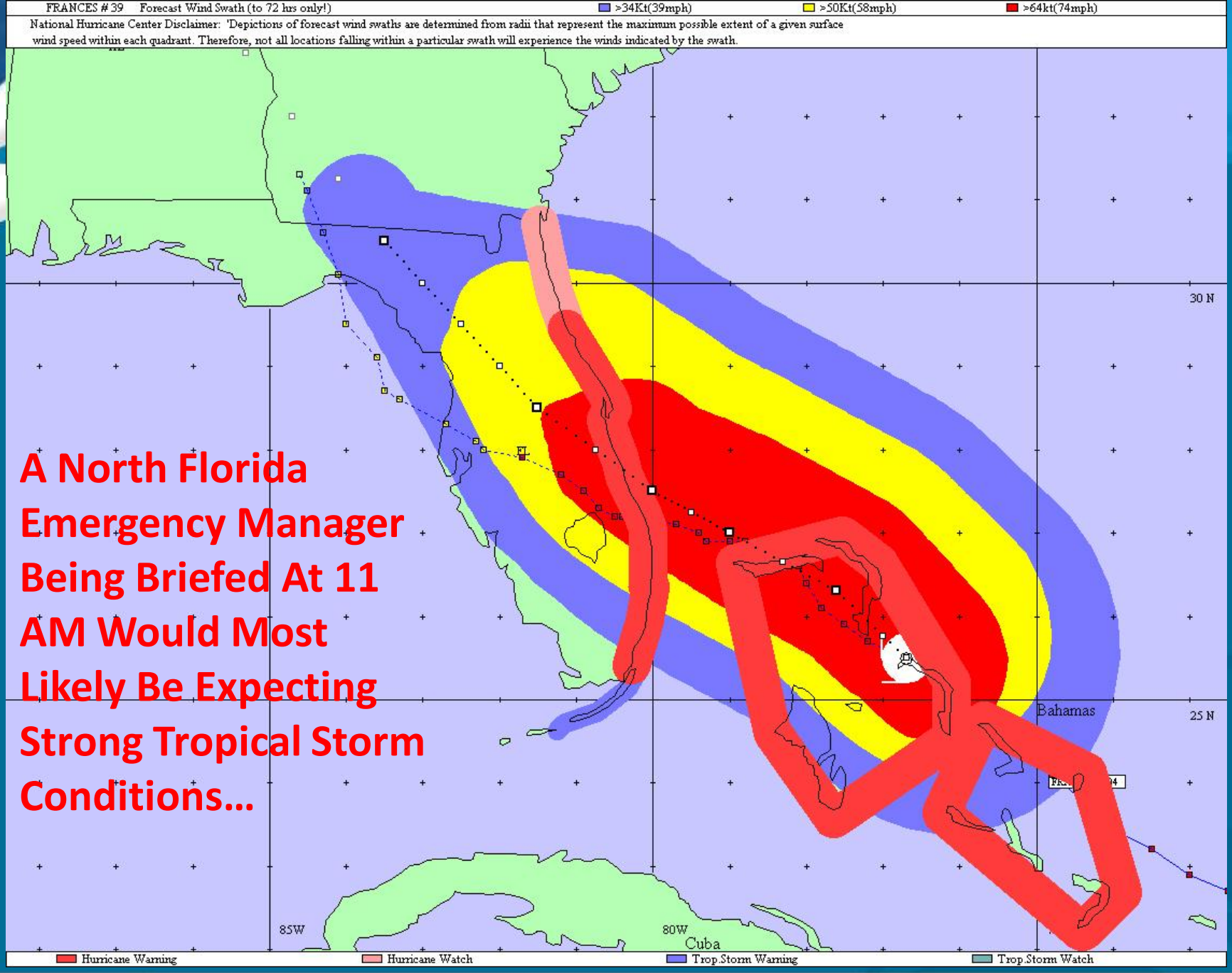
While The Accuracy Of The Wind Radii Might Not Make That Much Difference For Those Bracing For The Arrival Of The Eyewall…

It Can Make A *Great Deal* Of Difference To Those Trying To Prepare For The Outer Bands…

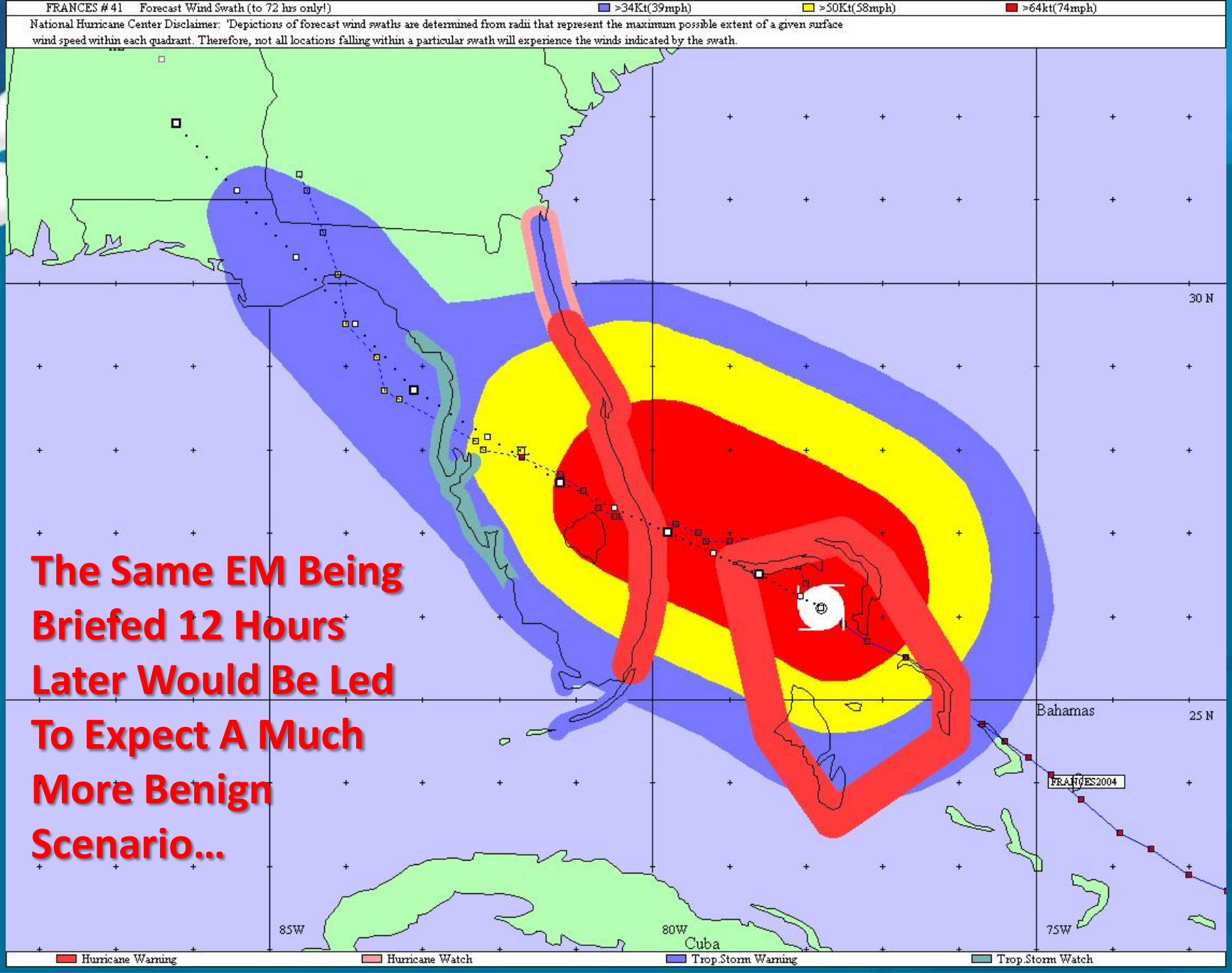
There's A Big Difference Between The Effects Of 35 to 45 MPH Winds (Minimal Tropical Storm Force) And Winds Of 60 to 70 MPH (Strong Tropical Storm).

The Question Of Perspective…

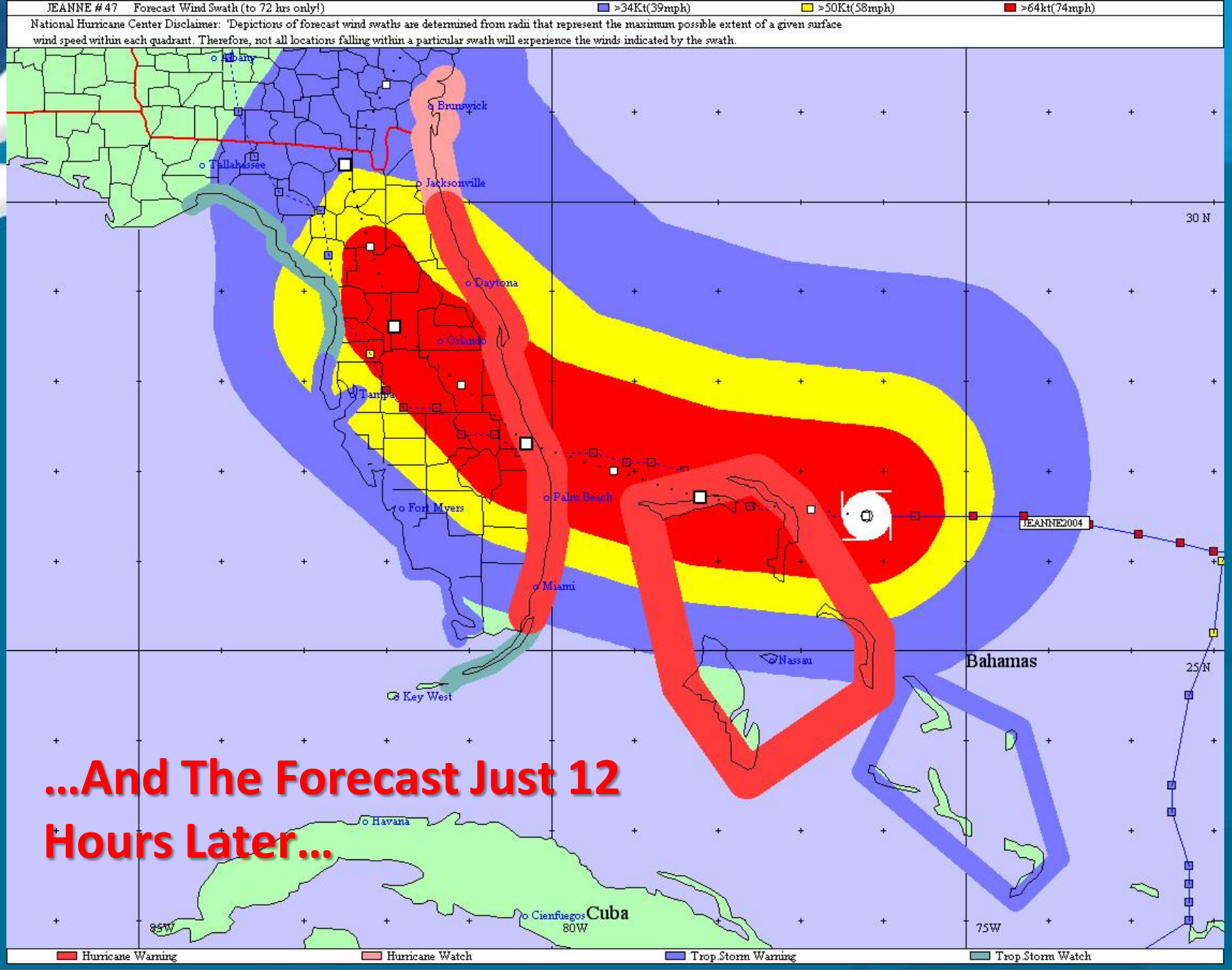
Let's Consider The Wind Swath Forecasts As Frances Approached The Coast… From The Standpoint Of Those Trying To Decide What Preparations To Make In The Outer Portions Of The Storm…



A North Florida Emergency Manager Being Briefed At 11 AM Would Most Likely Be Expecting Strong Tropical Storm Conditions…



The Same EM Being Briefed 12 Hours Later Would Be Led To Expect A Much More Benign Scenario…



…And The Forecast Just 12 Hours Later…

There Is Also The Problem Of Differences In Hurricane Size & Structure… The Effects 50 Miles Away From The Center Of One Storm Could Be *Radically Different* From Those A Similar Distance From Another Storm…

… Or Even A Similar Distance In A Different Direction From The Center Of The SAME Storm!

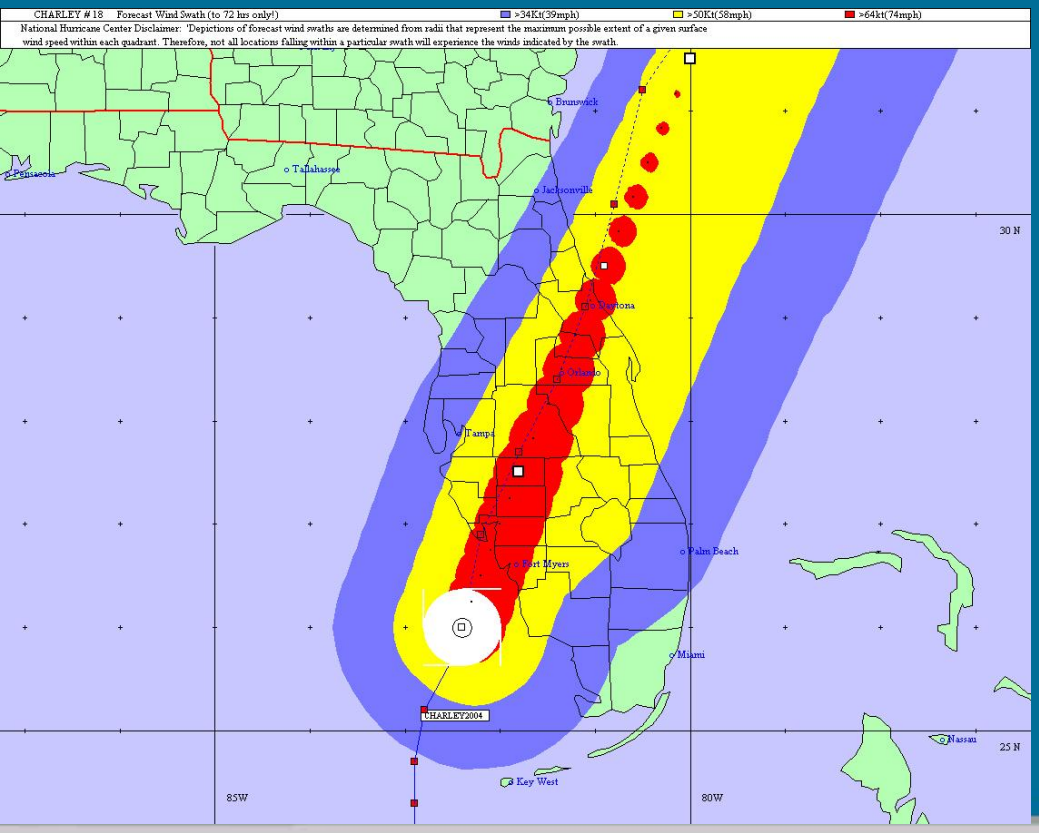
How About Inland Locations?

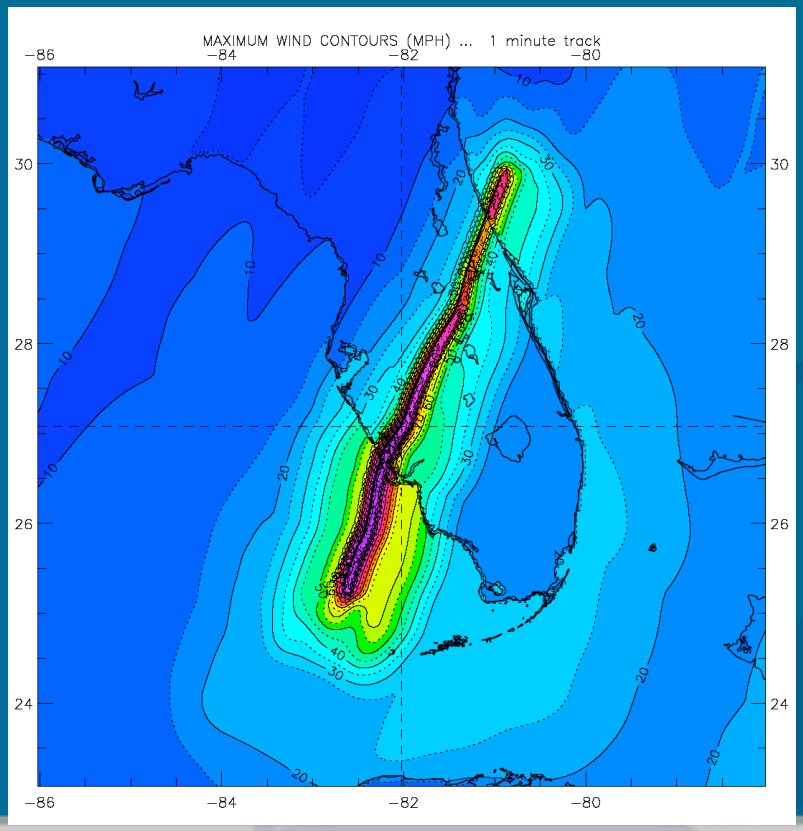
Since Inland Areas Don't Get The Brunt Of Wind And Surge… They Are Often Only Expecting "Fringe" Effects

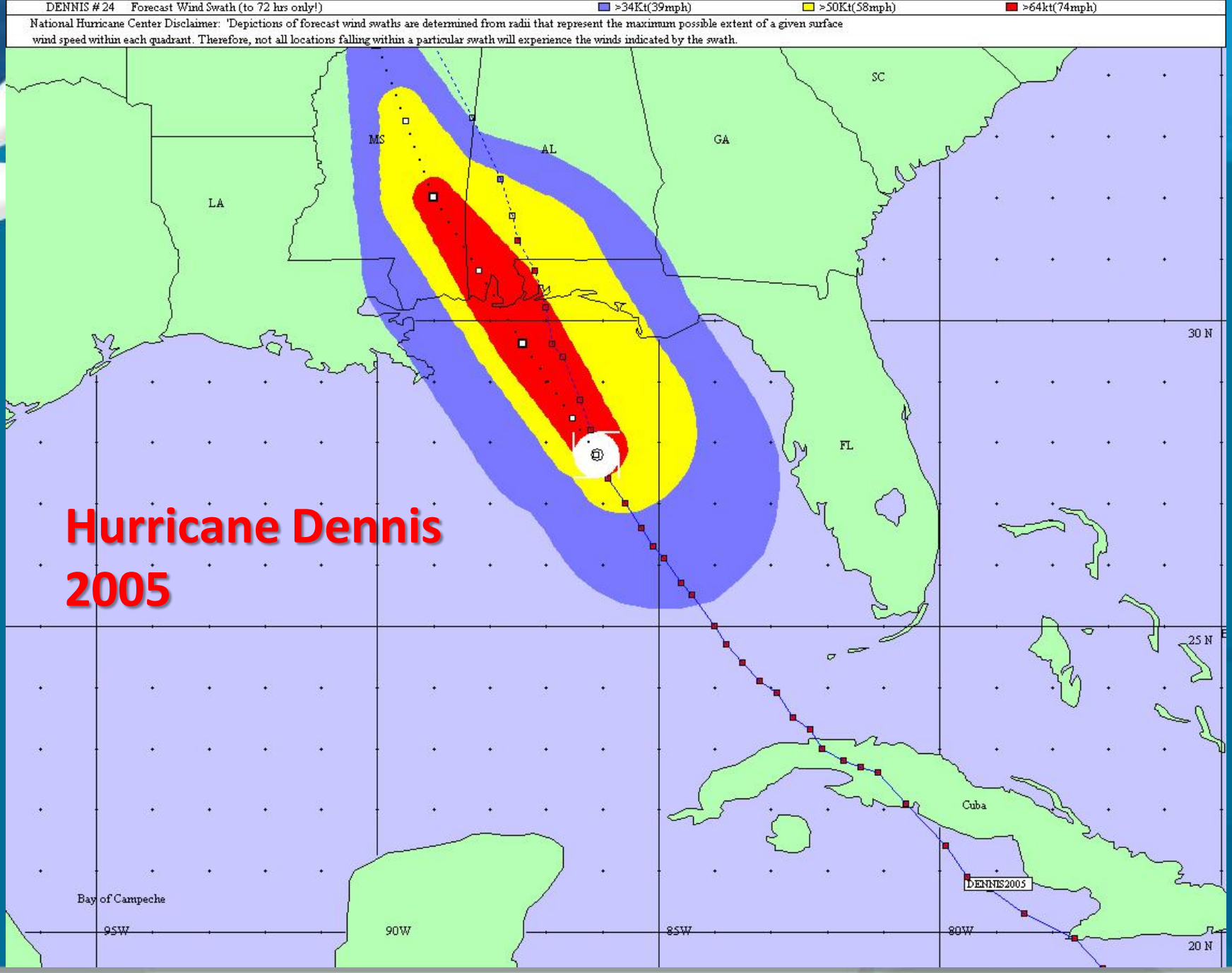
So… Does Evacuating Inland Automatically Make You Safe???

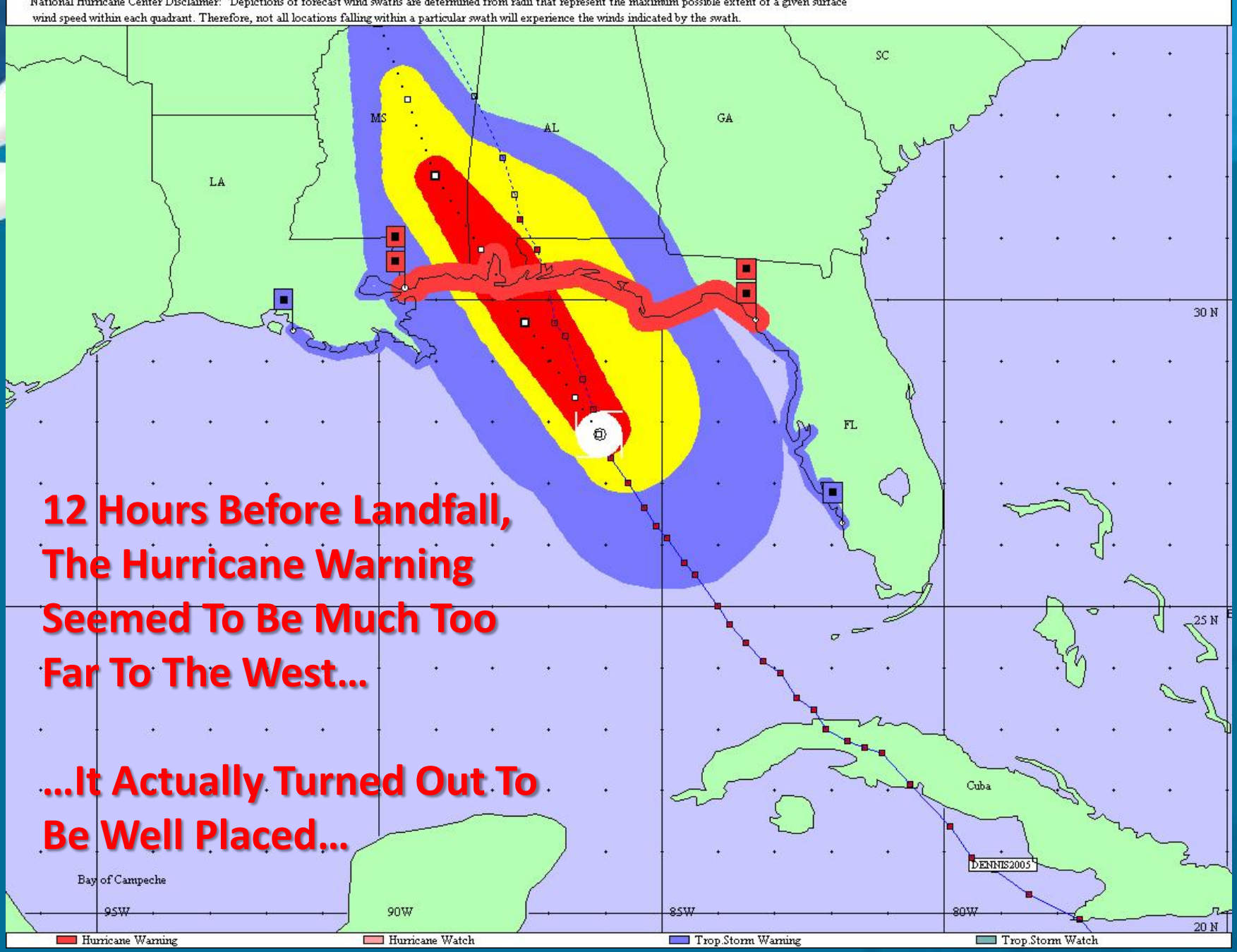
Hurricane Charley - Orlando

Note That The Location Of Maximum Winds Is Very Accurately Depicted… But The Winds On The Edges Of The Storm Were Greatly Overdone!



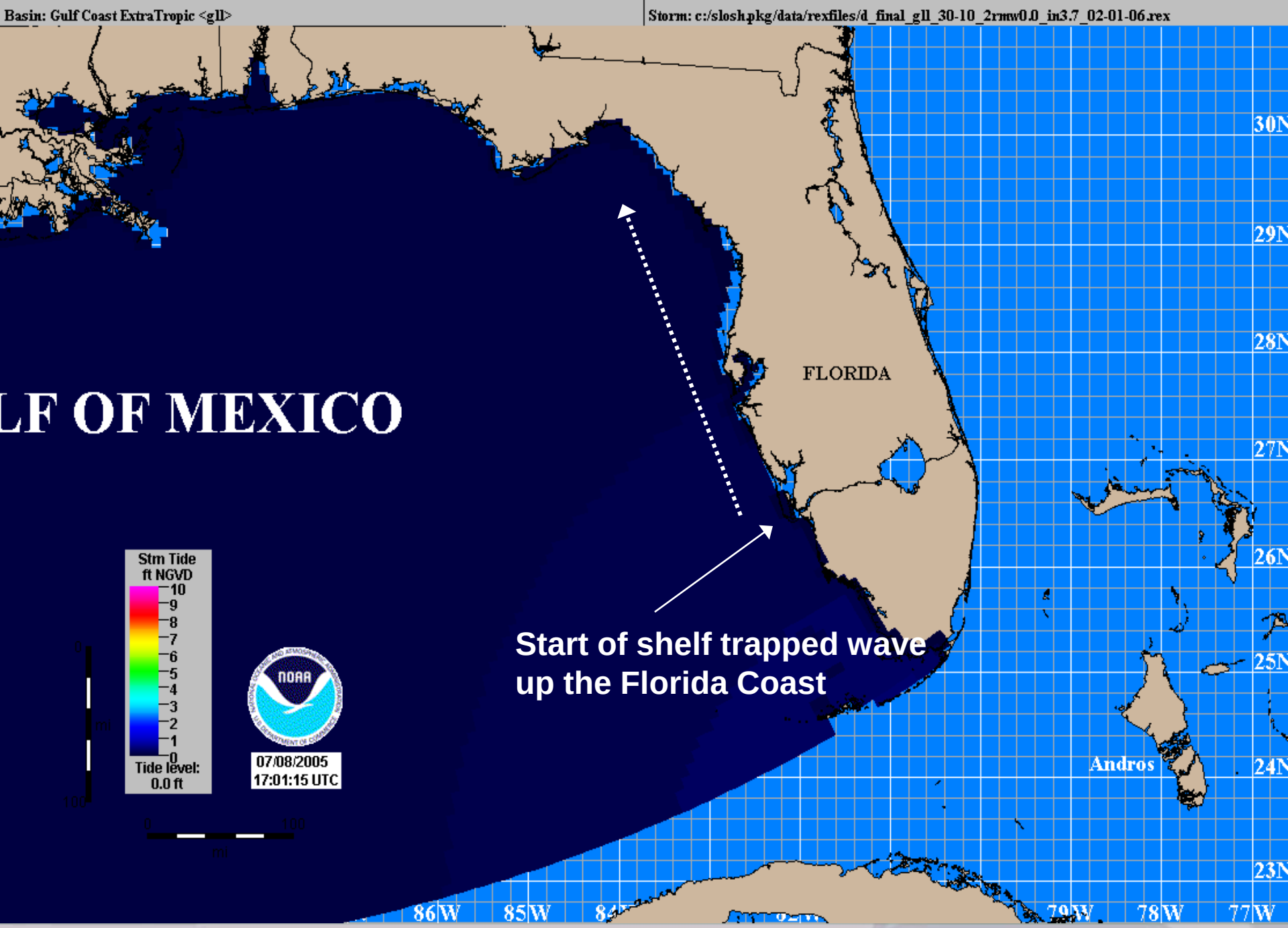


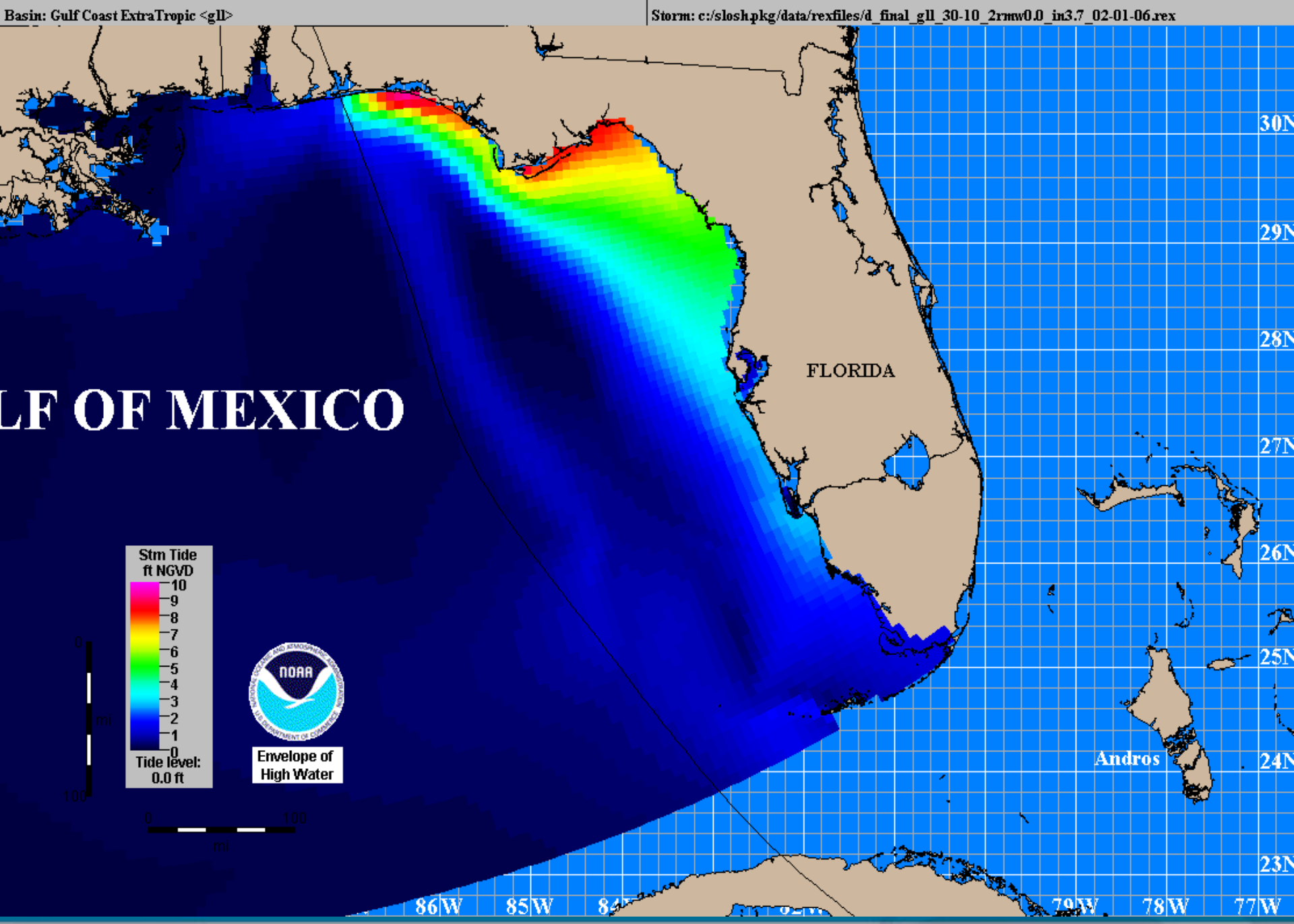

DENNIS # 24 Forecast Wind Swath (to 72 hrs only!)
>34Kt(39mph)
>50Kt(58mph)
>64kt(74mph)
National Hurricane Center Disclaimer: 'Depictions of forecast wind swaths are determined from radii that represent the maximum possible extent of a given surface wind speed within each quadrant. Therefore, not all locations falling within a particular swath will experience the winds indicated by the swath.
SC
MS
AL
GA
LA
FL
30 N
25 N
20 N
Cuba
DENNIS2005
Bay of Campeche
95W
90W
85W
80W
Hurricane Dennis
2005

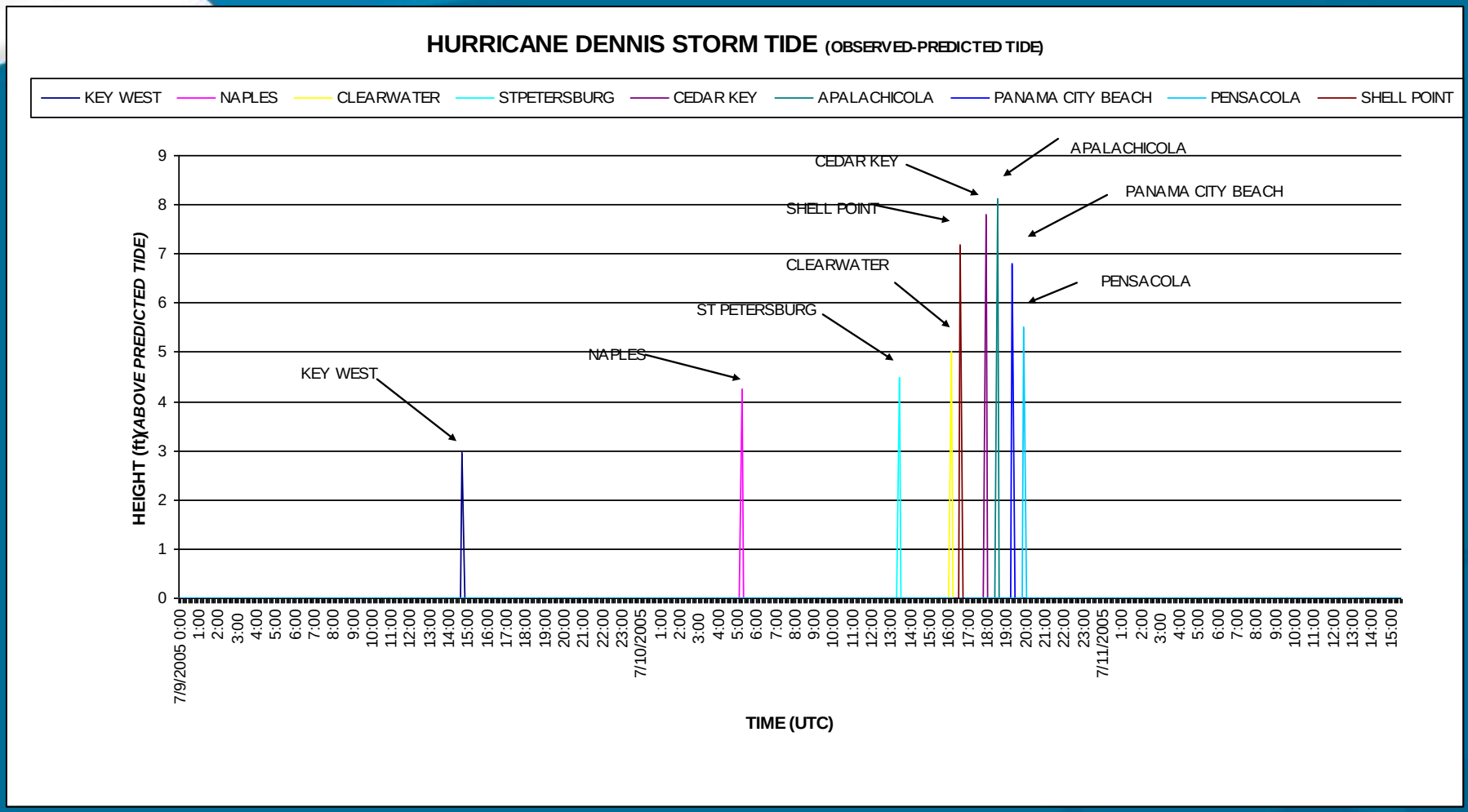


12 Hours Before Landfall, The Hurricane Warning Seemed To Be Much Too Far To The West…

…It Actually Turned Out To Be Well Placed…


Basin: Gulf Coast ExtraTropic <gll>
Storm: c:/sloshpkg/data/rexfiles/d_final_gll_30-10_2rmw0.0_in3.7_02-01-06.rex
LF OF MEXICO
FLORIDA
Andros
Start of shelf trapped wave
up the Florida Coast
Stm Tide
ft NGVD
10
9
8
7
6
5
4
3
2
1
0
Tide level:
0.0 ft
NOAA
07/08/2005
17:01:15 UTC
0
100
mi
30N
29N
28N
27N
26N
25N
24N
23N
86W
85W
79W
78W
77W


Basin: Gulf Coast ExtraTropic <gll>
Storm: c:/sloshpkg/data/rexfiles/d_final_gll_30-10_2rmw0.0_in3.7_02-01-06.rex
LF OF MEXICO
FLORIDA
Andros
30N
29N
28N
27N
26N
25N
24N
23N
86W
85W
79W
78W
77W
Stm Tide
ft NGVD
10
9
8
7
6
5
4
3
2
1
0
Tide level:
0.0 ft
NOAA
Envelope of
High Water
0
100
mi
0
100
mi


HURRICANE DENNIS STORM TIDE (OBSERVED-PREDICTED TIDE)
KEY WEST
NAPLES
CLEARWATER
STPETERSBURG
CEDAR KEY
APALACHICOLA
PANAMA CITY BEACH
PENSACOLA
SHELL POINT
HEIGHT (ft)(ABOVE PREDICTED TIDE)
TIME (UTC)
APALACHICOLA
CEDAR KEY
PANAMA CITY BEACH
SHELL POINT
CLEARWATER
PENSACOLA
ST PETERSBURG
NAPLES
KEY WEST
7/9/2005 0:00
7/10/2005
7/11/2005

The Forecast/Preparation Problem…

Differences Such As We've Just Seen Are Relatively Normal Given The Uncertainties Involved In Both Track & Radii Forecasts...

…But It Doesn't Change The Fact That Those On The Edge Often Walk A Fine Line Between Considerable Damage and Little Or None

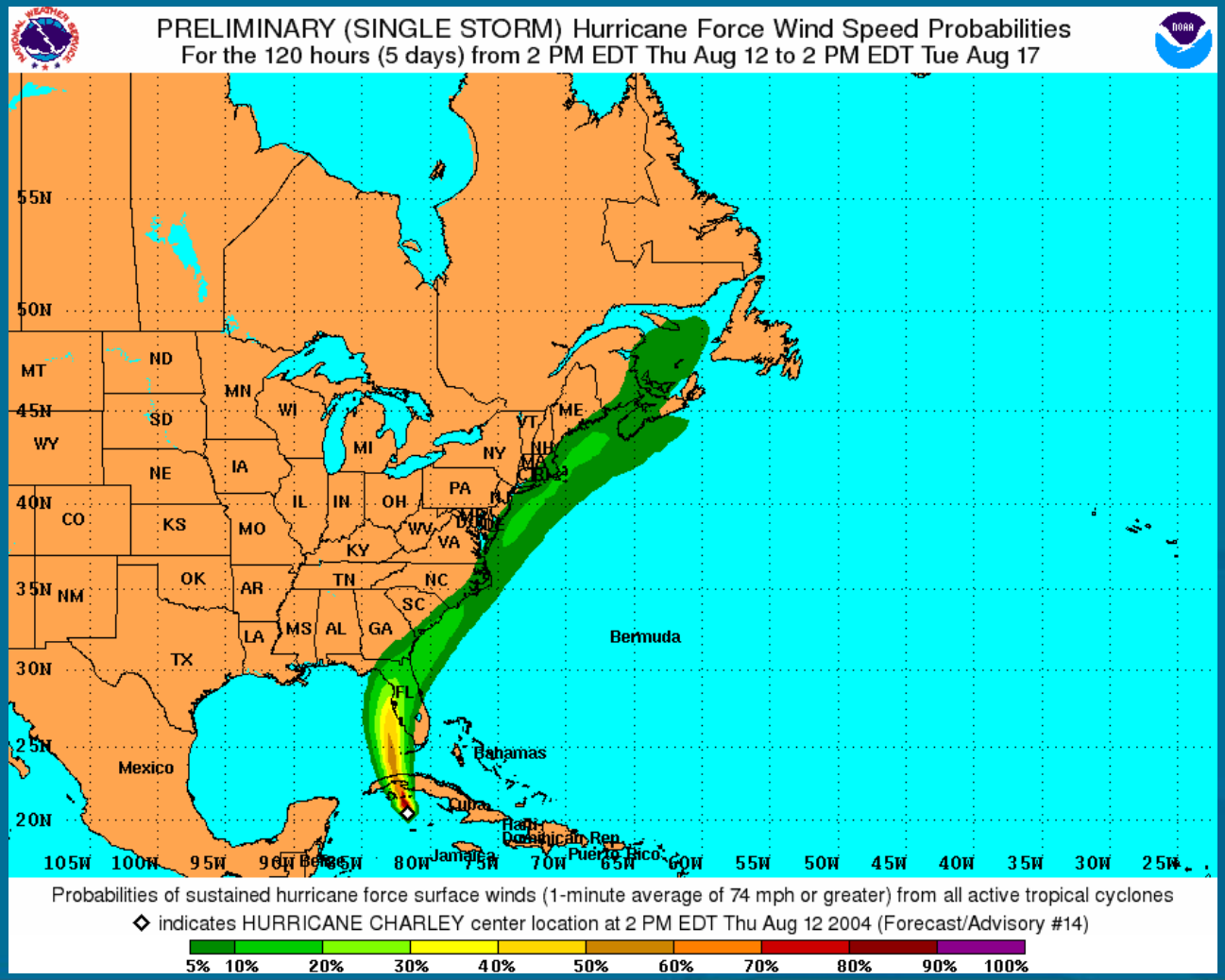
The Forecast/Preparation Problem…

The "Good News" Is That As A Storm Comes Within Range Of Land-Based Radar, Wind Forecasts Can Be "Fine Tuned"

The Bad News Is That Preparations Almost Always Must Be Made Well Before The Storm Gets That Close!

The Forecast/Preparation Problem…

This Makes The Proper Application And Interpretation Of New Wind Probabilities One Of The More Valuable Tools In The Preparation Arsenal!



The Bottom Line…

Given The Limitations Of Forecast And Observational Tools, There Will Always Be Uncertainties… And These Will Often Be Magnified In the Outer Portions Of A Storm Which Cannot Be Nearly As Thoroughly Observed & Sampled!

The Bottom Line…

For The Implementation Of Emergency Plans, Each Of Us Must Find Our Own Level Of Just How Much Uncertainty We Are Willing To Live With Before We "Pull the Trigger"!

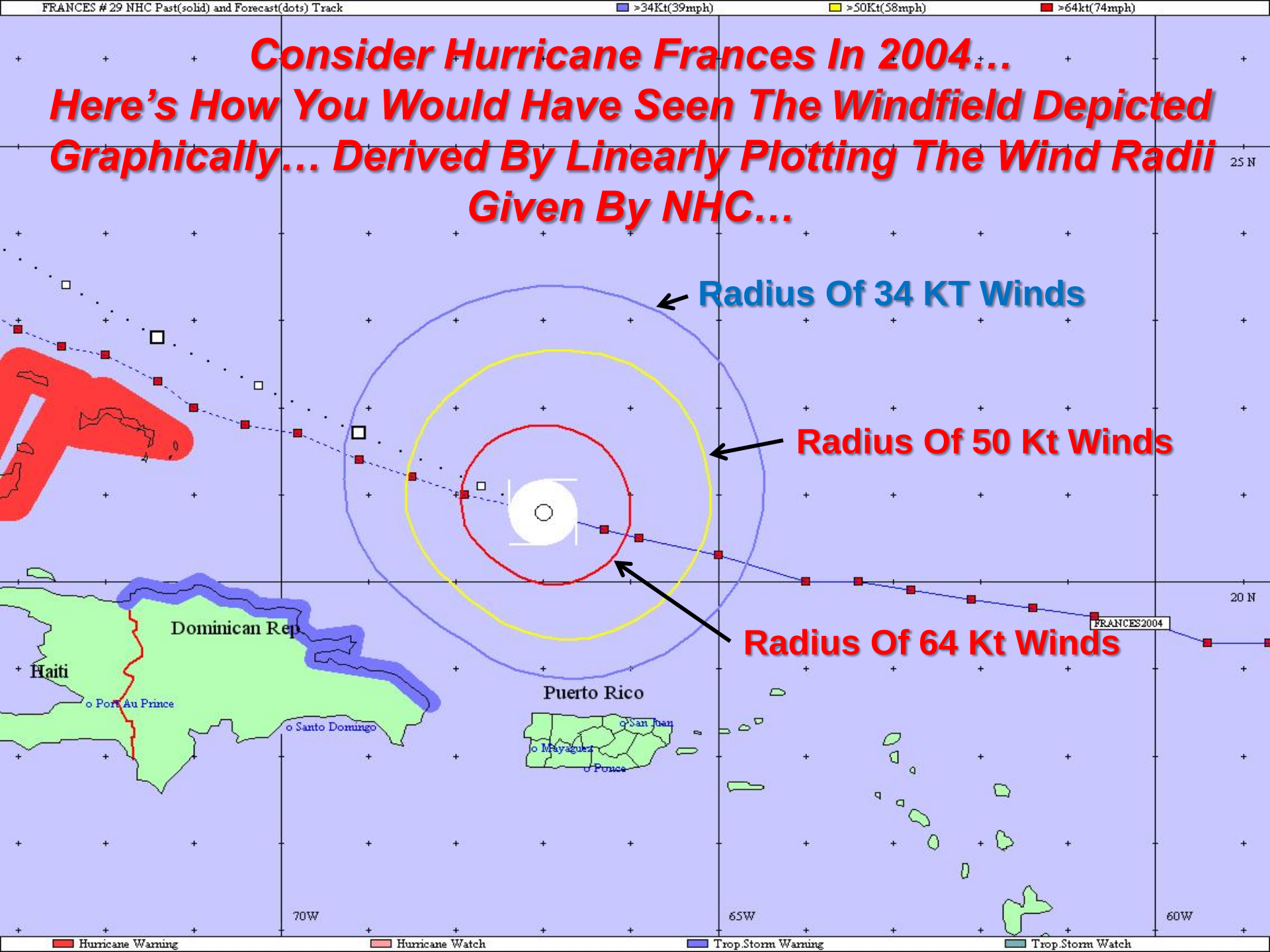

The End!
THIS PRESENTATION IS AVAILABLE AT:
www.weather.gov/jax

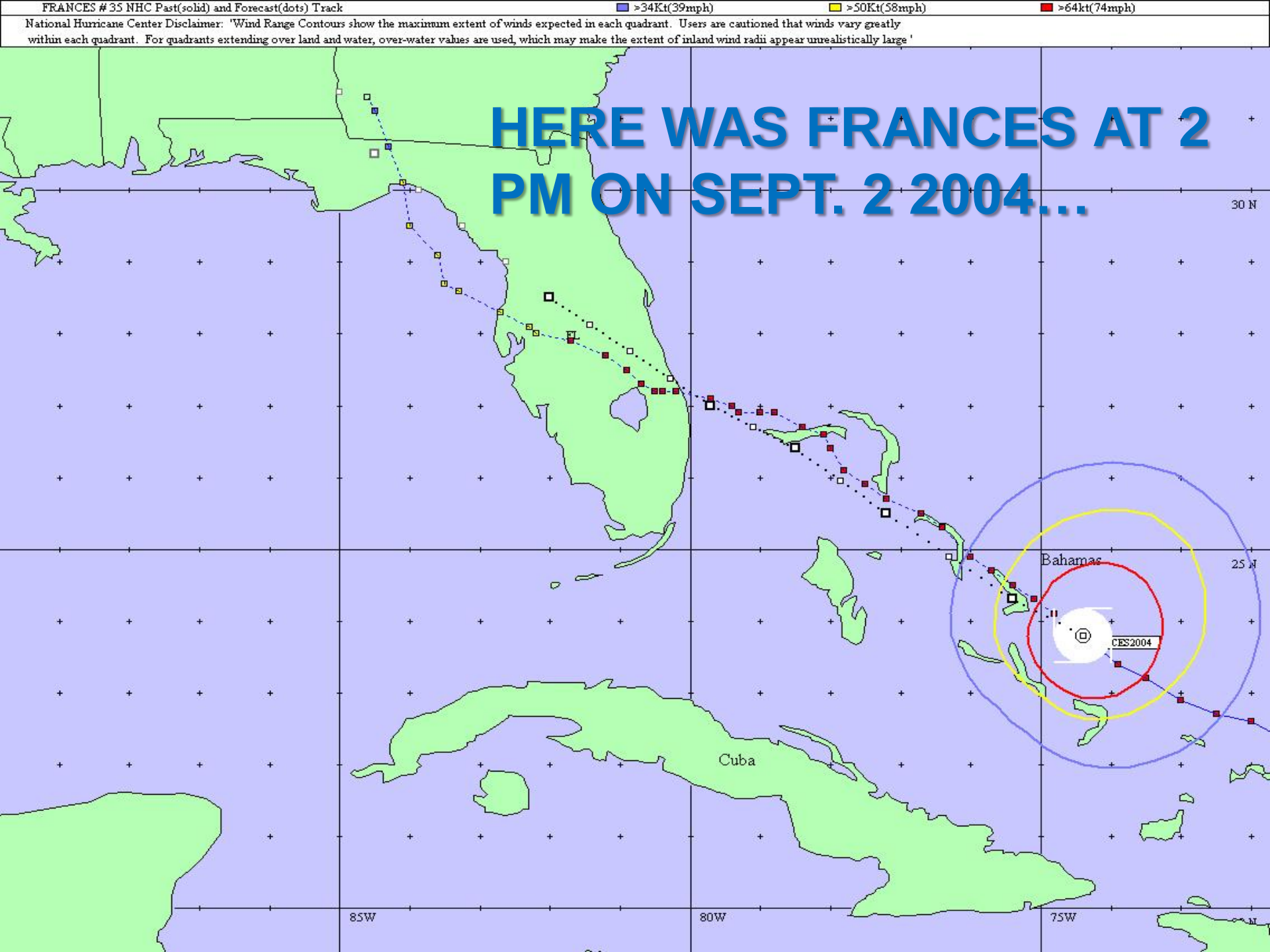
The Relevant Facts…

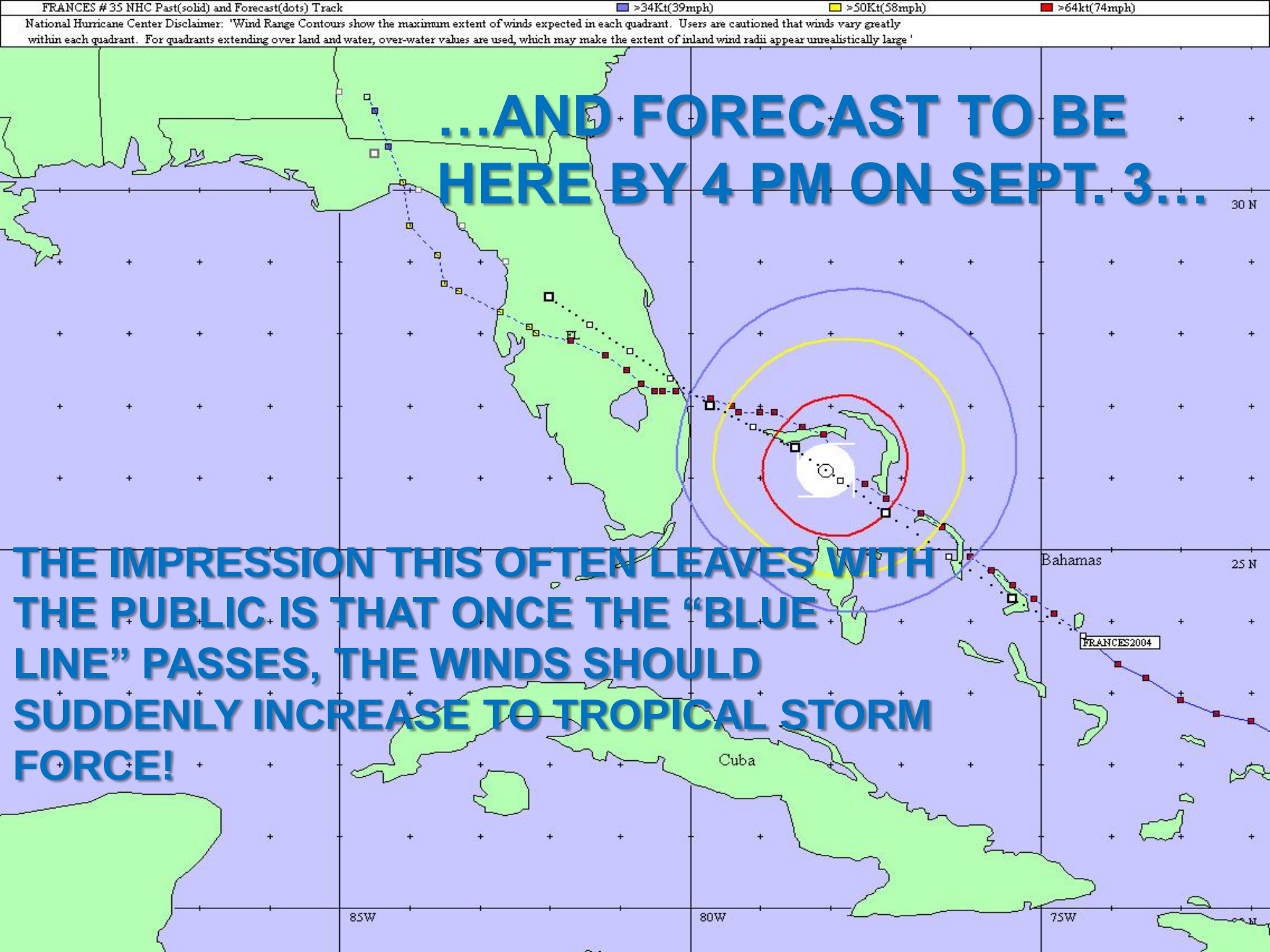
Consider The Problems Involved With Simply *Determining* Accurate Wind Radii To Begin With… Especially At Distance From Any Coastal Observing Systems…

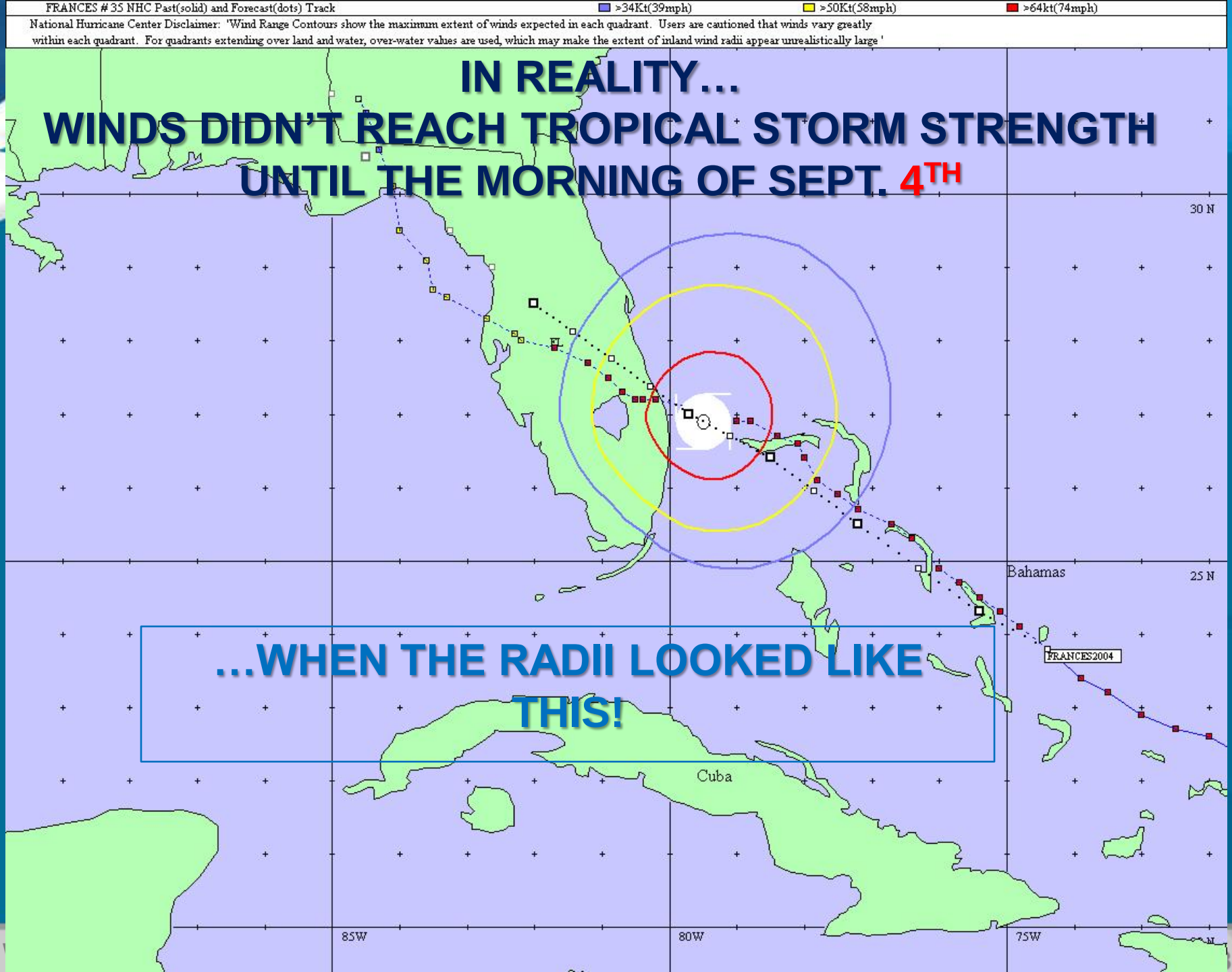
The Primary Method Of Measuring Winds Is Via Aircraft Reconnaissance… Which Takes Place Over Water And Usually Does Not Measure Surface Winds

So… Unless You Live 1500 Feet Or More Above The Open Ocean… The Radii Are Probably *Not* Going To Provide You Extremely Accurate & Useful Information


FRANCES # 29 NHC Past(solid) and Forecast(dots) Track
>34Kt(39mph)
>50Kt(58mph)
>64kt(74mph)
Consider Hurricane Frances In 2004…
Here's How You Would Have Seen The Windfield Depicted Graphically… Derived By Linearly Plotting The Wind Radii Given By NHC…
Radius Of 34 KT Winds
Radius Of 50 Kt Winds
Radius Of 64 Kt Winds
25 N
20 N
FRANCES2004
Dominican Rep
Haiti
Port Au Prince
Santo Domingo
Puerto Rico
San Juan
Mayaguez
Ponce
70W
65W
60W
Hurricane Warning
Hurricane Watch
Trop.Storm Warning
Trop.Storm Watch


FRANCES # 35 NHC Past(solid) and Forecast(dots) Track
>34Kt(39mph)
>50Kt(58mph)
>64kt(74mph)
National Hurricane Center Disclaimer: 'Wind Range Contours show the maximum extent of winds expected in each quadrant. Users are cautioned that winds vary greatly within each quadrant. For quadrants extending over land and water, over-water values are used, which may make the extent of inland wind radii appear unrealistically large '
HERE WAS FRANCES AT 2 PM ON SEPT. 2 2004…
30 N
25 N
Bahamas
CES2004
Cuba
85W
80W
75W


FRANCES # 35 NHC Past(solid) and Forecast(dots) Track
>34Kt(39mph)
>50Kt(58mph)
>64kt(74mph)
National Hurricane Center Disclaimer: 'Wind Range Contours show the maximum extent of winds expected in each quadrant. Users are cautioned that winds vary greatly within each quadrant. For quadrants extending over land and water, over-water values are used, which may make the extent of inland wind radii appear unrealistically large'
...AND FORECAST TO BE HERE BY 4 PM ON SEPT. 3...
30 N
Bahamas
25 N
FRANCES2004
Cuba
85W
80W
75W
THE IMPRESSION THIS OFTEN LEAVES WITH THE PUBLIC IS THAT ONCE THE "BLUE LINE" PASSES, THE WINDS SHOULD SUDDENLY INCREASE TO TROPICAL STORM FORCE!


FRANCES # 35 NHC Past(solid) and Forecast(dots) Track
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IN REALITY…
WINDS DIDN'T REACH TROPICAL STORM STRENGTH UNTIL THE MORNING OF SEPT. 4TH
30 N
Bahamas
25 N
FRANCES2004
…WHEN THE RADII LOOKED LIKE THIS!
Cuba
85W
80W
75W

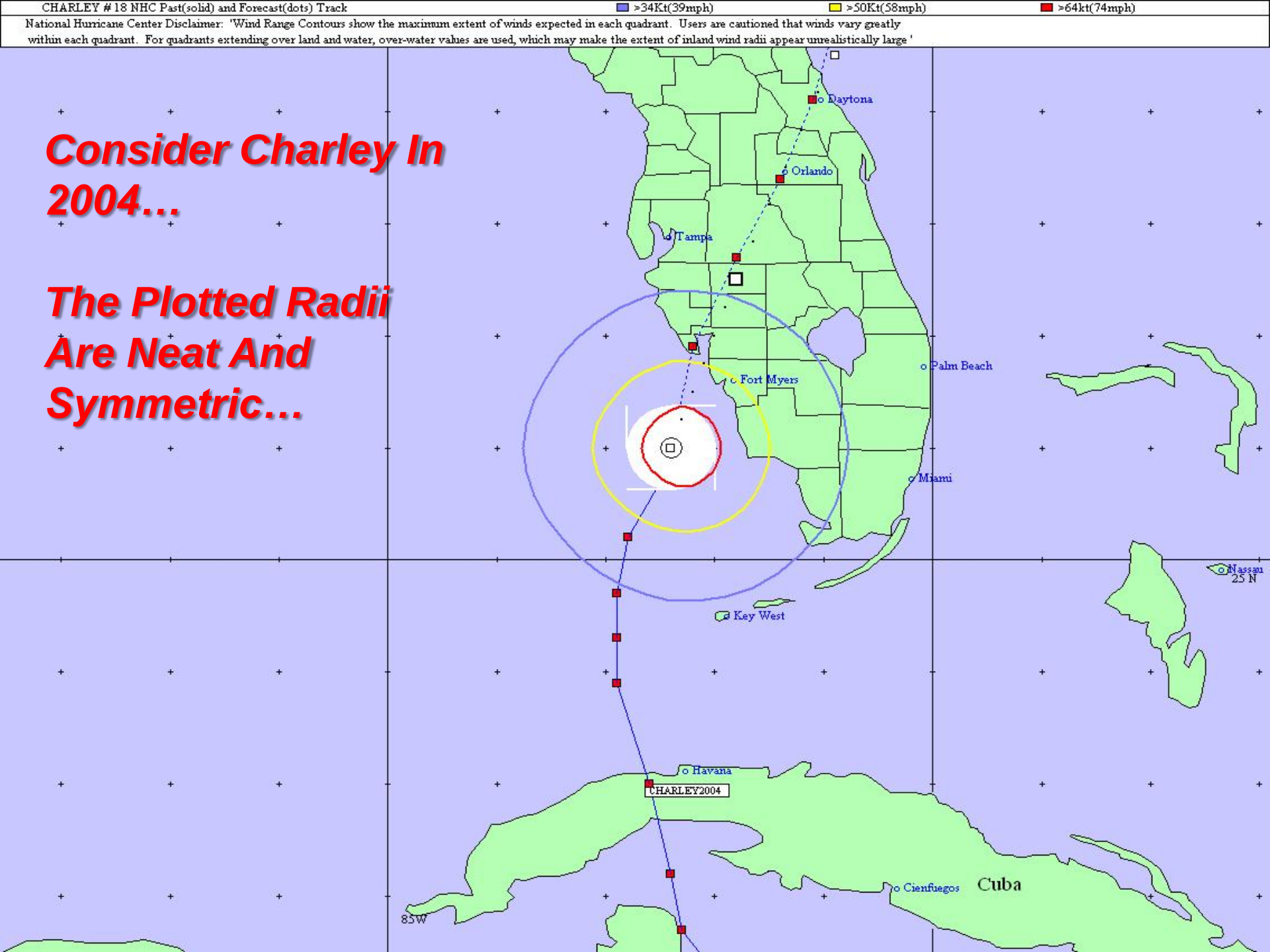
SO WHAT HAPPENED????

ONE IMPORTANT FACTOR WAS THAT THE STORM SLOWED DOWN… BUT THERE'S MORE TO FORECASTING WINDS THAN JUST GETTING THE MOTION RIGHT!

The Relevant Facts…

A Hurricane's Wind Field Is Usually Neither Symmetric NOR Uniform, Even Though Automated Plot Programs Often Make Them Look That Way!

This Makes The Winds Very Difficult To Measure And Even More Difficult To Forecast Specifically At Any Given Location!


CHARLEY # 18 NHC Past(solid) and Forecast(dots) Track
>34Kt(39mph)
>50Kt(58mph)
>64kt(74mph)
National Hurricane Center Disclaimer: 'Wind Range Contours show the maximum extent of winds expected in each quadrant. Users are cautioned that winds vary greatly within each quadrant. For quadrants extending over land and water, over-water values are used, which may make the extent of inland wind radii appear unrealistically large '
Consider Charley In 2004…
The Plotted Radii Are Neat And Symmetric…
Daytona
Orlando
Tampa
Fort Myers
Palm Beach
Miami
Key West
Nassau
25 N
Havana
CHARLEY2004
Cienfuegos
Cuba
85W

…When In Reality The Observed Wind Field Using All Data Sources Actually Looked Like This…