

Effective Messaging:

Changing the Outcome of the Event





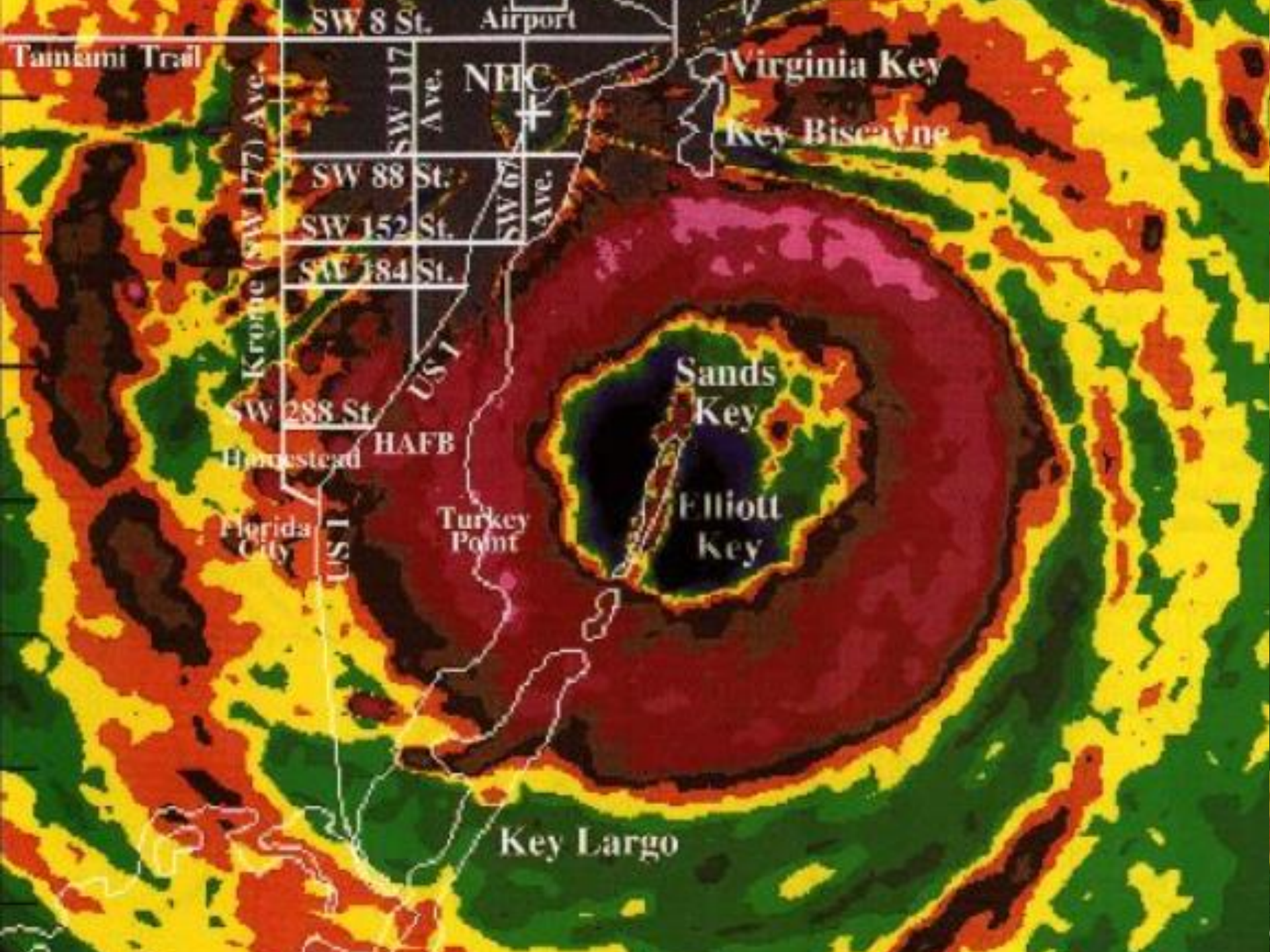
Communicating Hurricane Threats & Impacts

David Sharp

Science & Operations Officer
NOAA/National Weather Service
Melbourne, FL



**“When the
Physical Science
intersects the
Social Science”**





SW 8 St. Airport
Fairchild Trail 117 NHC

Virginia Key



Ultimately, it's about people!

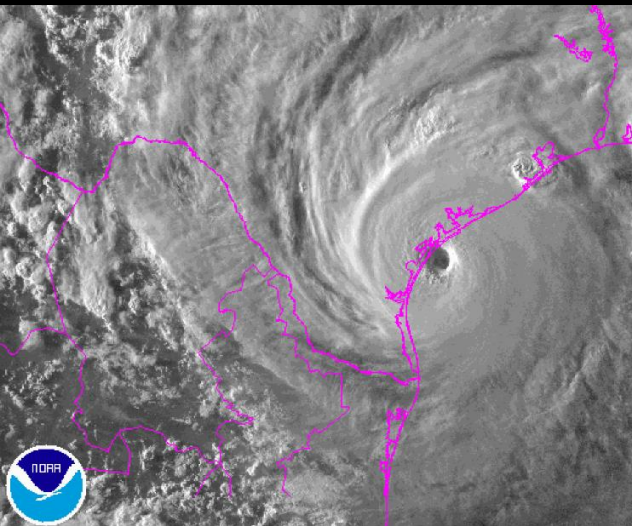


QUESTION: If you could go back in time to about 12-18 hours before Hurricane Andrew's landfall and take with you the knowledge of the wind impacts about to be realized, what **main message** would you have for the people of Homestead, FL?

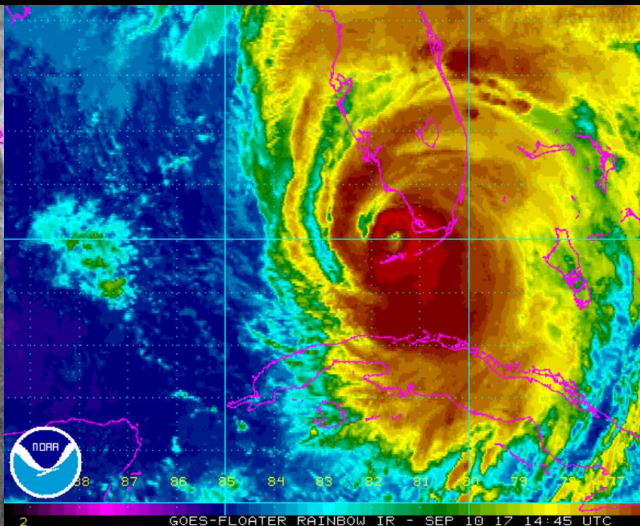
- *"The probability of hurricane force winds is increasing for Homestead."*
- *"A hurricane warning remains in effect for South Florida, which includes the town of Homestead."*
- *"Act now to protect your life! This is an extremely dangerous and potentially catastrophic wind situation for Homestead."*



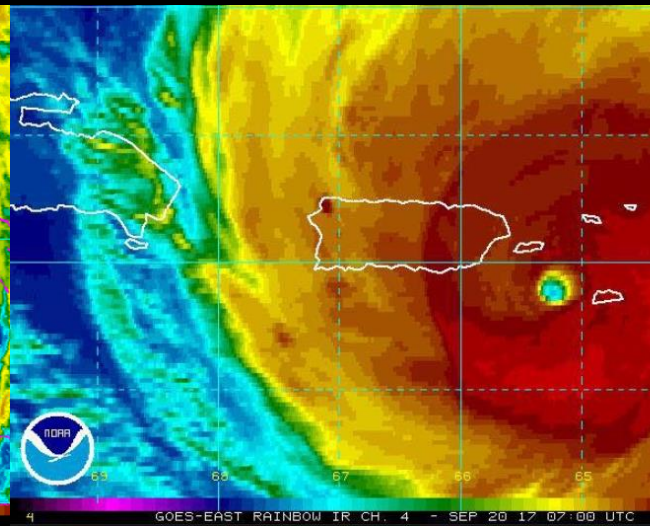
Now, consider the 2017 season ...



Hurricane Harvey



Hurricane Irma



Hurricane Maria





Hurricane
Harvey (2017)



Hurricane
Irma (2017)



Hurricane
Matthew (2016)



Hurricane
Maria (2017)

2016-17 Hurricane Seasons: Over 325 deaths in U.S.



Hurricane
Harvey (2017)



Hurricane
Irma (2017)



Hurricane
Matthew (2016)



Hurricane
Maria (2017)

2016-17 Hurricane Seasons: Over \$270 Billion in Losses



It's All About Impacts

"The Impact Footprint"



- **Hurricane Hazards:**

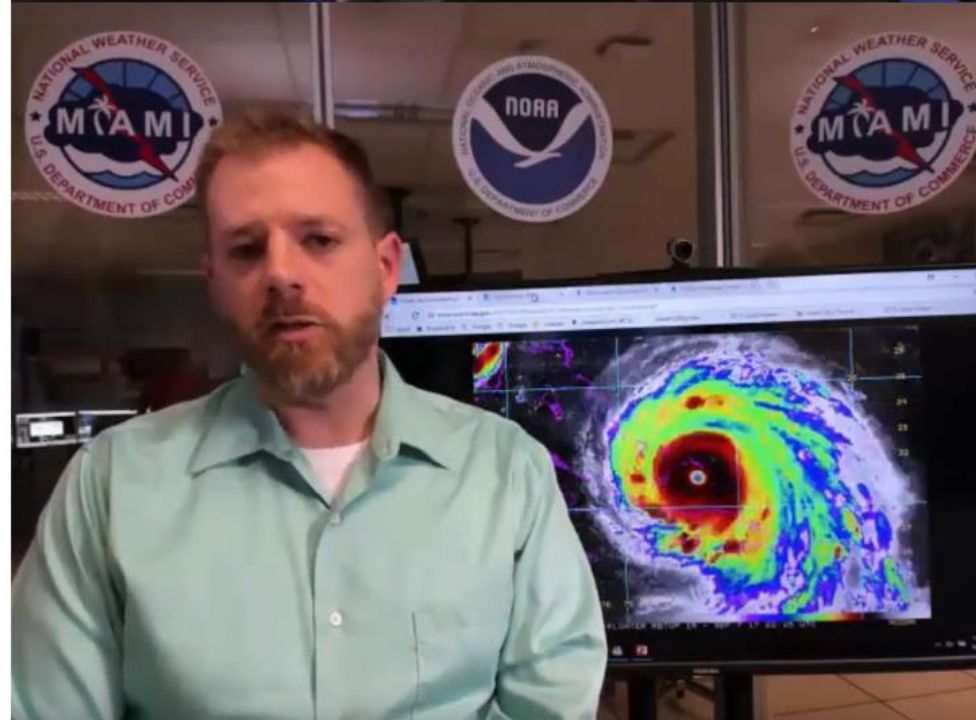
- High Wind
- Storm Surge & Tide
- Flooding Rain
- Pounding Surf/Dangerous Seas
- Tornadoes & Waterspouts



Messaging Types

- **Community Decision-making**
 - Emergency Managers
 - Community plans
 - Potential impacts relative to established weather/water thresholds and triggers
- **Personal Decision-making**
 - Public; Individuals/Families; Small Businesses
 - Personal plans
 - Potential impacts relative to local watches/warnings; any orders issued from local officials

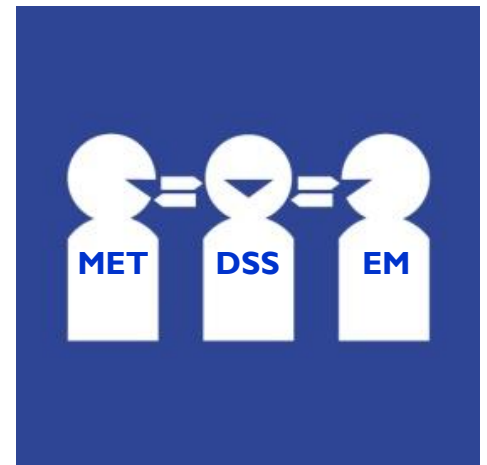
➤ *Limited sophistication with some safety instruction included*





Making Things Simple

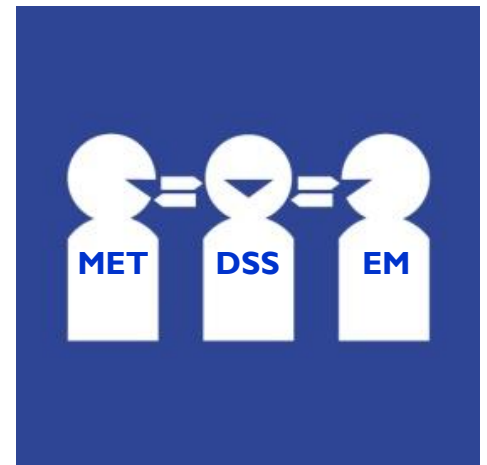
- **FACT:** The majority of our customers are not meteorologists, hydrologists, or oceanographers.
 - *Some are weather-wise; most are other-wise*
- We must learn to speak the language of the customer.





Making Things Simple

- Our science-based hurricane information must be:
 - **Distilled** ... *made succinct; focused*
 - **Translated** ... *put in customer-speak*
 - **Interpreted** ... *maintain meaning*



Communication of Weather-related Hurricane Emergency Information

3 Routes



From *Social and Behavior Influences on Weather-Driven Decisions* (Galluppi et al. 2013)

Public Safety Messaging

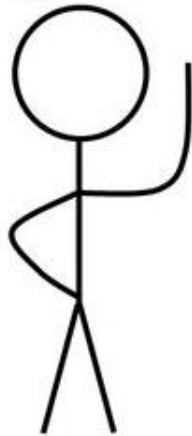
An aerial photograph of a long, multi-lane bridge spanning a body of water. The bridge has multiple support pillars and stretches far into the distance under a cloudy sky.

1. **Coordinate Public Safety Messages**
 - in conjunction with emergency management partners
2. **Communicate Public Safety Messages**
 - in conjunction with media partners

An integrated approach

Public Messaging

THINKING AND FEELING



Thinkers

**focus first on the
use of things**



Feelers

**focus first on the
meaning of things**

*“Act now to protect your life!
This is an extremely dangerous
and potentially catastrophic
wind situation for Homestead.”*



Societal Vulnerability to Hurricanes

Exposure:

Population at Risk

Property at Risk

Community Preparedness

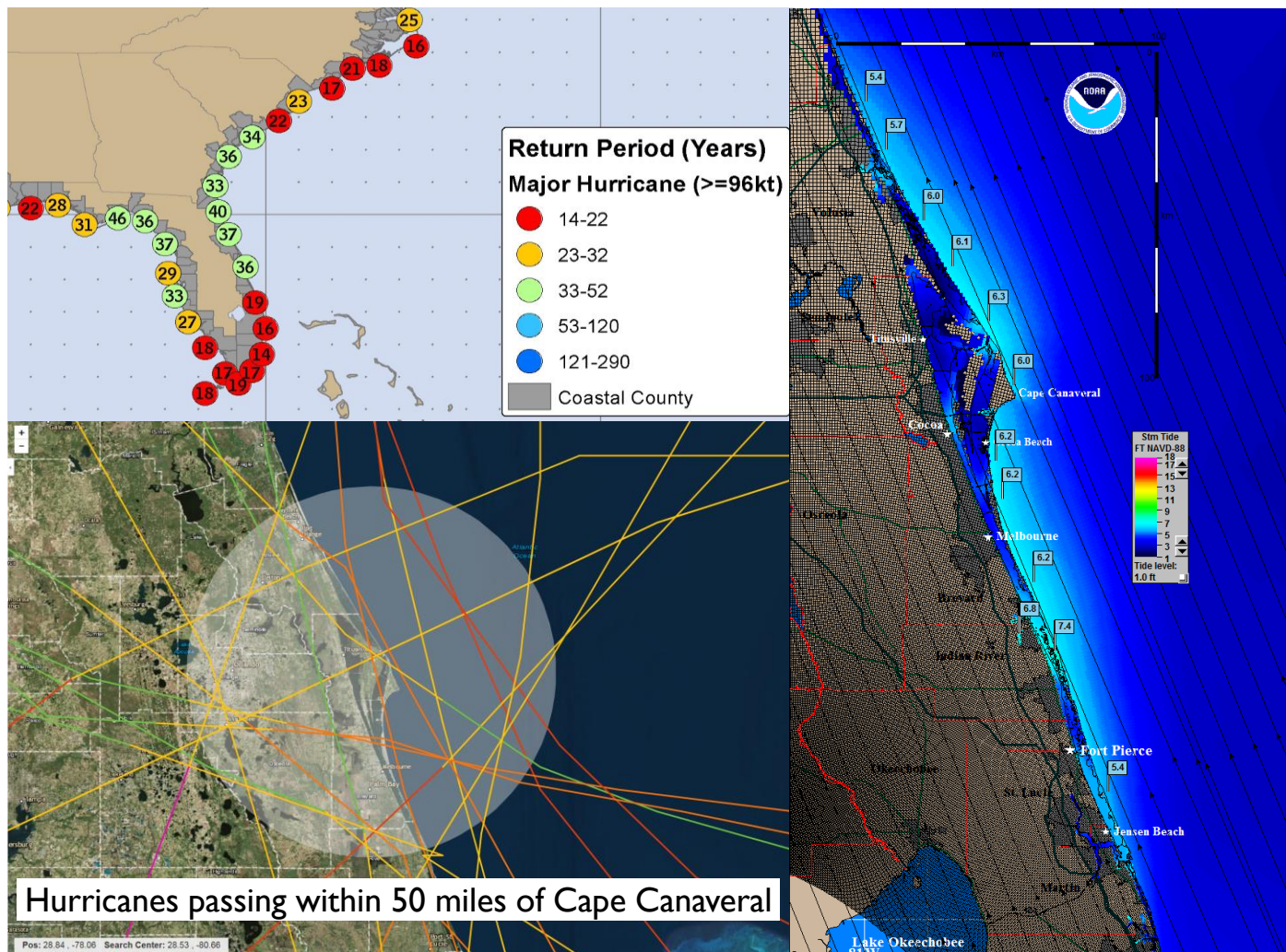
Incidence:

Frequency

Intensity



Pielke & Pielke 1997

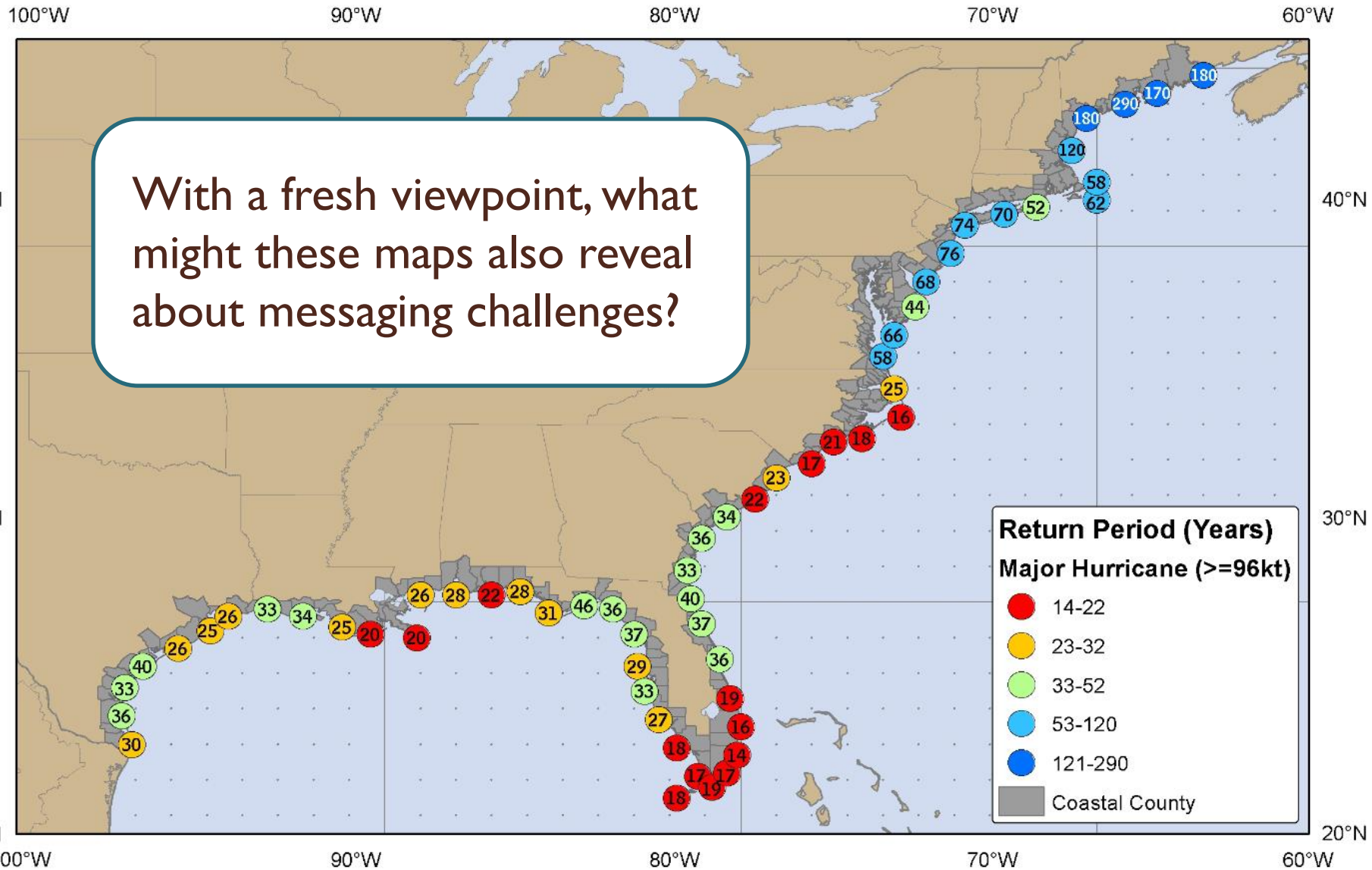


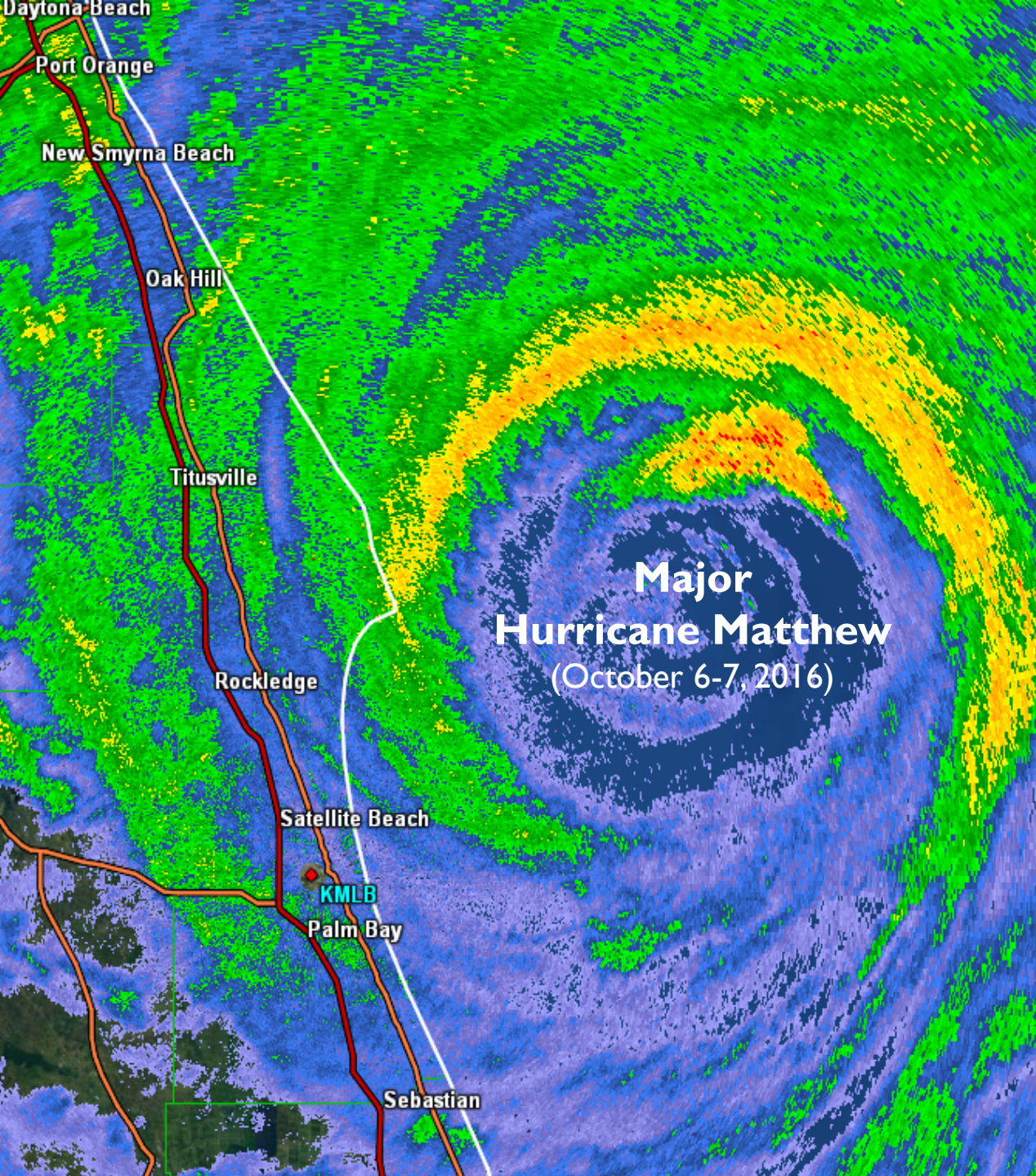
Know the Local Risk & Vulnerability for the Situation

- Local Demographics
- Local Infrastructure
- Local Sensitivities
- Changes since Last Season
- Changes since Last Event
- Changes Planned or in Progress

Return Frequencies

With a fresh viewpoint, what might these maps also reveal about messaging challenges?







It is important to maintain a full appreciation of the precarious nature of low probability (or frequency) vs. high impact events.



In the absence of effective messaging, the risk can be grossly misperceived ... *until it's too late!*



The Nature of Information



- **A Danger of the Information Age** - we can now yield an overwhelming volume of weather/water data and information.
 - But, are we simply adding to the *information fire hose*?





The Nature of Information

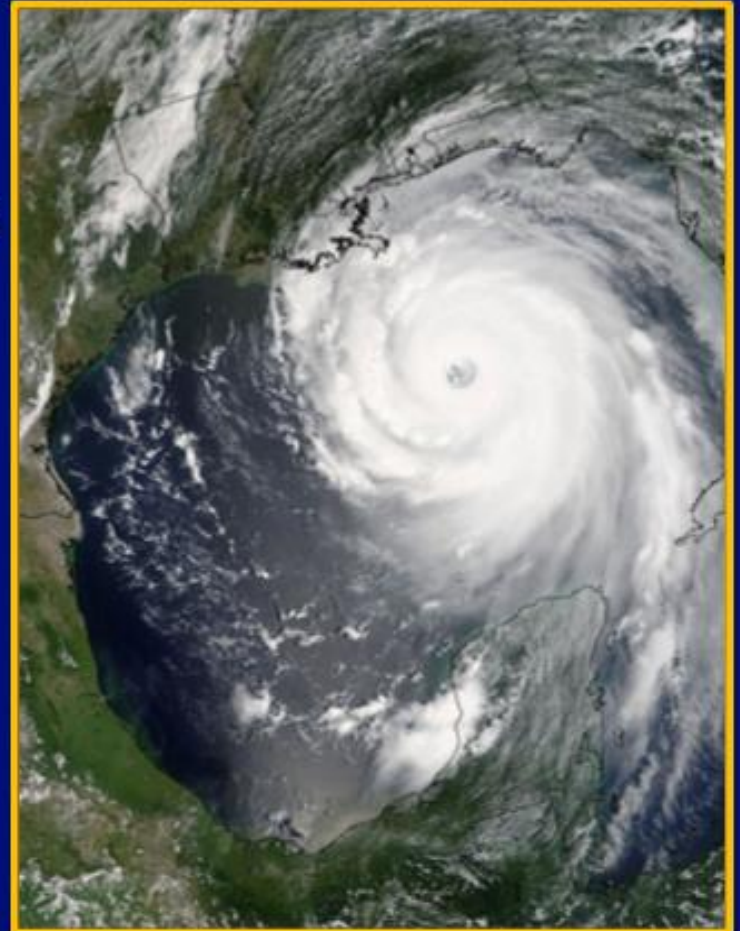


- Providing increasingly more information of ambiguous utility is not helpful.
- ***This neither helps community decision-makers nor serves the public!***
 - “Drowning in Information”
 - “Information Overload & Paralysis”
 - “Over-Anxiety & Hurricane Fatigue ”



Mental Noise Model

- ❑ **Stress affects information processing**
- ❑ **Impact of stress on attention**
(Covello)
 - High stress conditions: people lose 80 – 90% of what they hear
 - Scientific facts account for less than 5%
- ❑ **Effect of emotion on information seeking**
(Turner, et al, 2006)
 - Greater emotion = less information retention





The Nature of Information



- **Information Management Age** - we must move beyond the information age and onward to the **information management** & **decision support** age.
 - Sharing **targeted**, **actionable**, and **timely** information
 - Remaining a **trusted** source



Finding ways...

*“To help get the right people...
to do the right things...
at the right time.”*





Why Should I Listen To You?

For community decision-making ...



Craig Fugate, FEMA Director (retired)

- I need to listen to someone who is credible.
 - **Credibility = Expertise + Trust**
- I want to listen to someone who understands.
 - **Understanding = Empathy + Trust**

“Things really start clicking when these are found in a common source.”

The Common Operating Picture

Common Operating Picture (COP) ... a single depiction of current and relevant operational information that is mutually shared by more than one command or critical decision-making entity during an emergency.

Remember:

- Inconsistencies found within weather information cause hesitation;
- Recurring inconsistencies lead to doubt;
- Systemic inconsistencies cannot be tolerated.





Cause vs. Effect

- The **CAUSE** of a thing
 - Meteorologists like to speak about analyzed and forecast conditions (e.g., the magnitude and likelihood of occurrence).



Cause: The Raindrop



Cause vs. Effect

- The **EFFECT** of a thing
 - Customers like to speak about the resulting impacts, and what should be done to lessen the ill-effects.



Effect: The Ripple on the Pond



Tropical Cyclone Winds



To help with Messaging
the Hurricane Forecast

Saffir-Simpson Hurricane Wind Scale

Category 1 Hurricane	<i>Some Damage</i>
Category 2 Hurricane	<i>Extensive Damage</i>
Category 3 Hurricane	<i>Devastating Damage</i>
Category 4 Hurricane	<i>Catastrophic Damage</i>
Category 5 Hurricane	<i>Catastrophic Damage</i>

Cause

vs.

Effect



Tropical Cyclone Winds



To help with **Community Preparedness Messaging**

Hurricane Threats & Impacts Wind Scale

Threat of **Tropical Storm Winds**
of 39-57 mph

Limited Impacts Possible

Threat of **Strong Tropical Storm Winds**
of 58-73 mph

Significant Impacts Possible

Threat of **Hurricane Winds**
of 74-110 mph

Extensive Impacts Possible

Threat of **Major Hurricane Winds**
of >110 mph

*Devastating to Catastrophic
Impacts Possible*

Threat

vs.

Potential Impacts



What is the one thing everyone wants but we cannot provide?

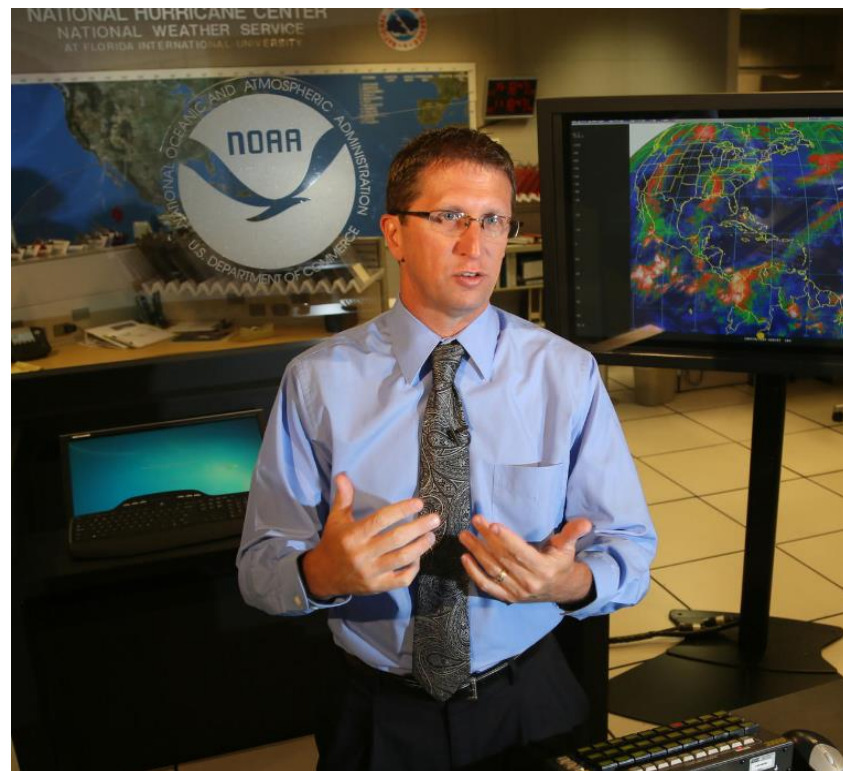
... a perfect forecast !!!

A red, stylized, swirling shape that resembles a comma or a drop, containing the text "DSS" in white.

DSS



What should be our intent?



“Our mutual intent is to change the outcome of the event!”

“Effective Communication”

Decision Support Messaging



...WHAT...WHERE...WHEN...HOW MUCH...HOW LONG...HOW SURE...

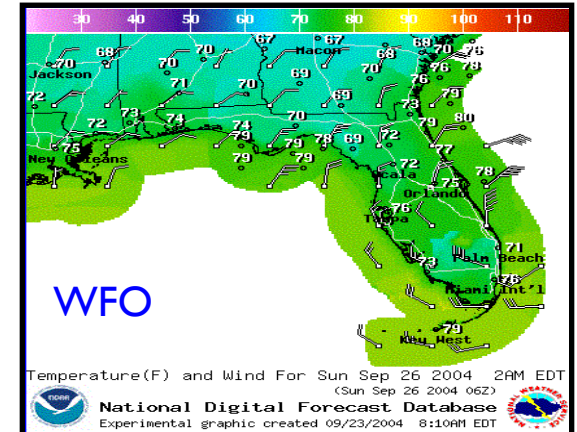
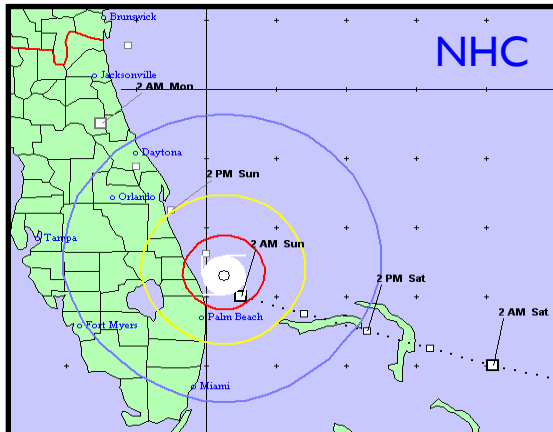
Public Safety Messaging



...WHAT AM I SUPPOSED TO DO ABOUT IT...

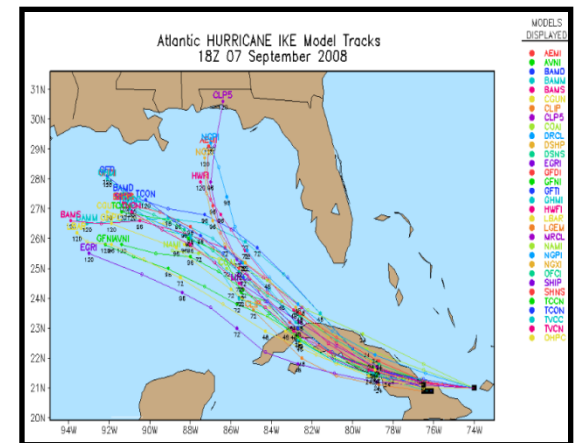
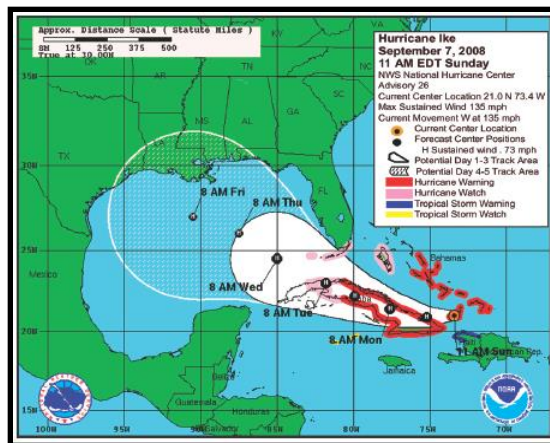
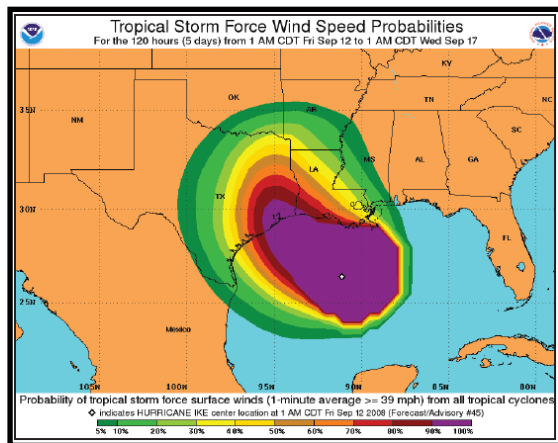
We ...

- Are comfortable with conveying our latest forecast
- But still struggle with conveying forecast uncertainty
 - Rules of Thumb (subjective; empirical)
 - Error Cone (track errors only)

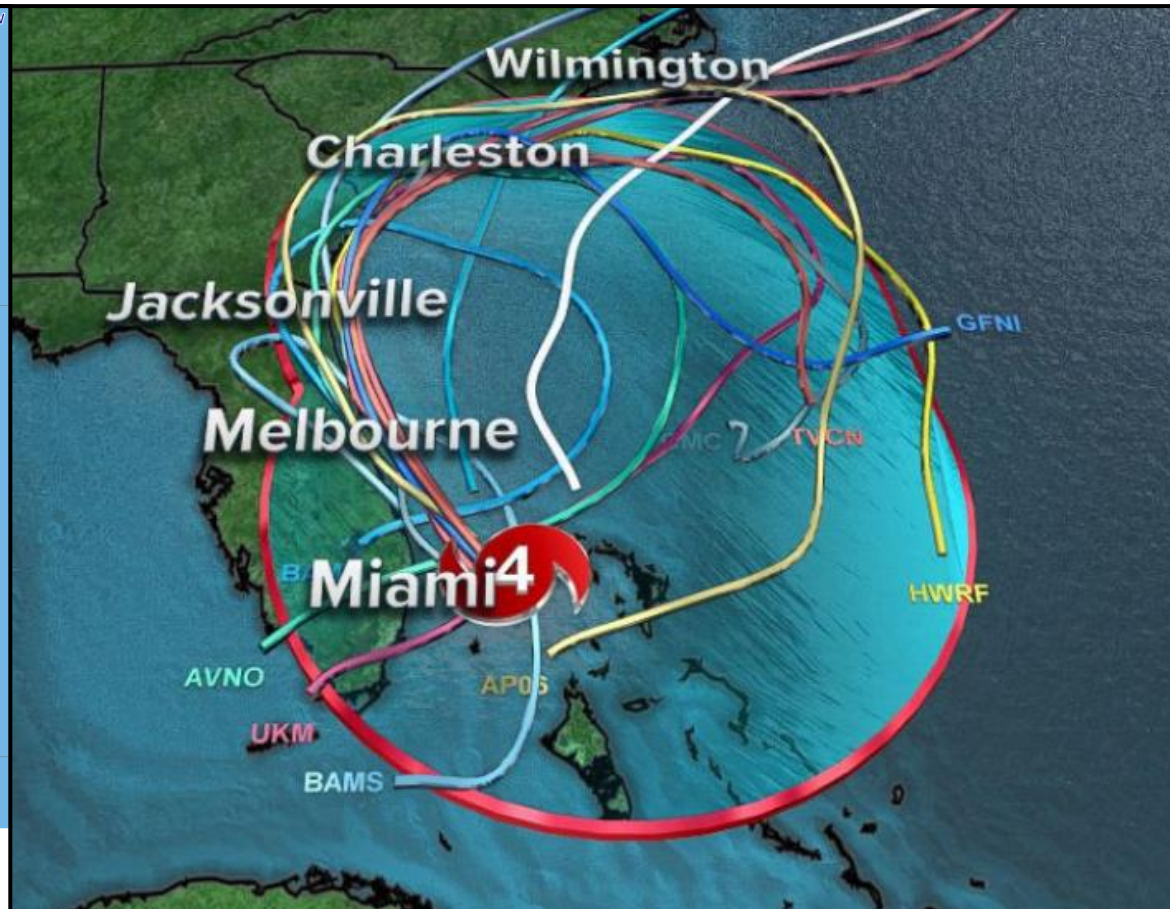
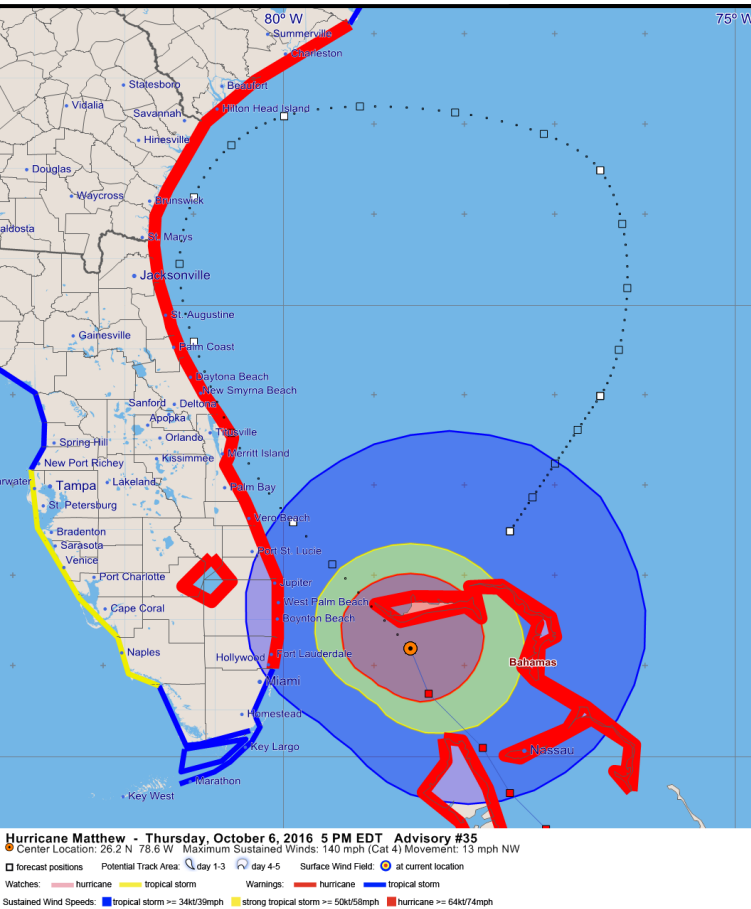


We ...

- Are comfortable with conveying our latest forecast
- But still struggle with conveying forecast uncertainty
 - Rules of Thumb (subjective; empirical)
 - Error Cone (track errors only); Spaghetti Plots (for confidence)
 - Wind Speed Probabilities (for critical thresholds)



Spaghetti Plots (as seen on TV)



What's the main message?

Helping? ... or ... Hurting?

Scenario Types for Decision Support



Simplify

Latest Forecast

Most Likely Scenario

Most Likely Alternate Scenario

Reasonable Worst Case Scenario

Reasonable Best Case Scenario



Situation Overview

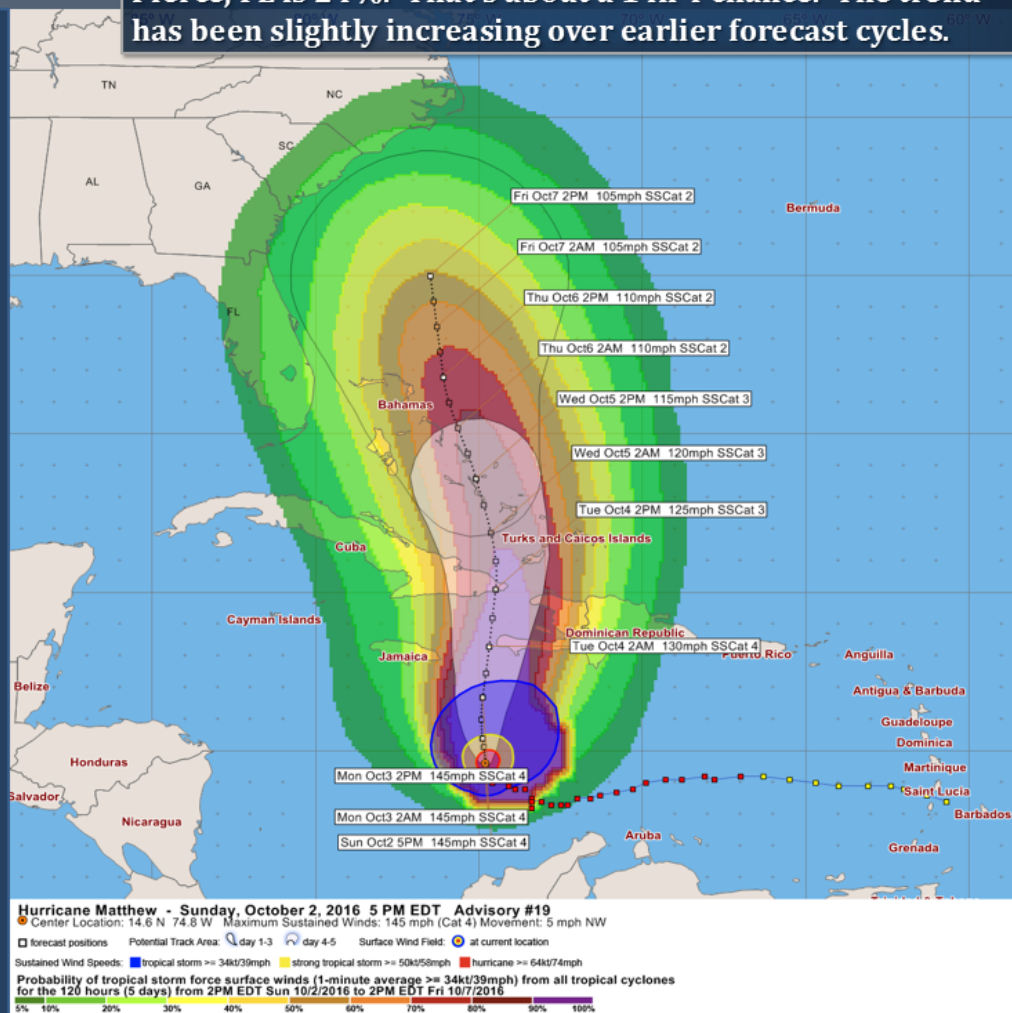
East Central Florida & Adjacent Coastal Waters

The **probability for tropical storm force winds** at Fort Pierce, FL is 24%. That's about a 1 in 4 chance. The trend has been slightly increasing over earlier forecast cycles.

According to the latest forecast...

- A most likely scenario still keeps Matthew to the east of the Florida Peninsula.
 - Offering significant marine and coastal/beach concerns to ECFL
- An alternate scenario could bring Matthew closer to ECFL.
 - Increasing the concern for potential wind impacts for land locations

Key: It is possible for a major hurricane to be in our vicinity by mid-late week.



Melbourne
WEATHER FORECAST OFFICE



<http://www.weather.gov/melbourne>
[facebook.com/NWSMelbourne](https://www.facebook.com/NWSMelbourne)



[@NWSMelbourne](https://twitter.com/NWSMelbourne)

October 2, 2016



Situation Overview

East Central Florida & Adjacent Coastal Waters

The probability for tropical storm force winds at Fort Pierce, FL is 24%. That's about a 1 in 4 chance. The trend is for a decrease in forecast cycles.

According to

Public Safety Message:

It is possible for a major hurricane to be in our vicinity by mid-late week.

**Stay informed of the latest forecast.
Review your hurricane emergency plan and check your seasonal supplies.**



Melbourne
WEATHER FORECAST OFFICE



facebook.com/NWSMelbourne

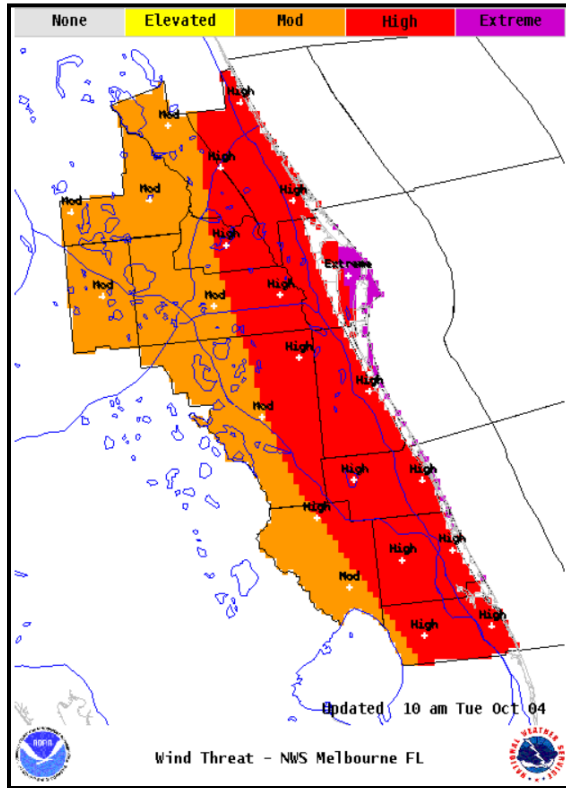


@NWSMelbourne

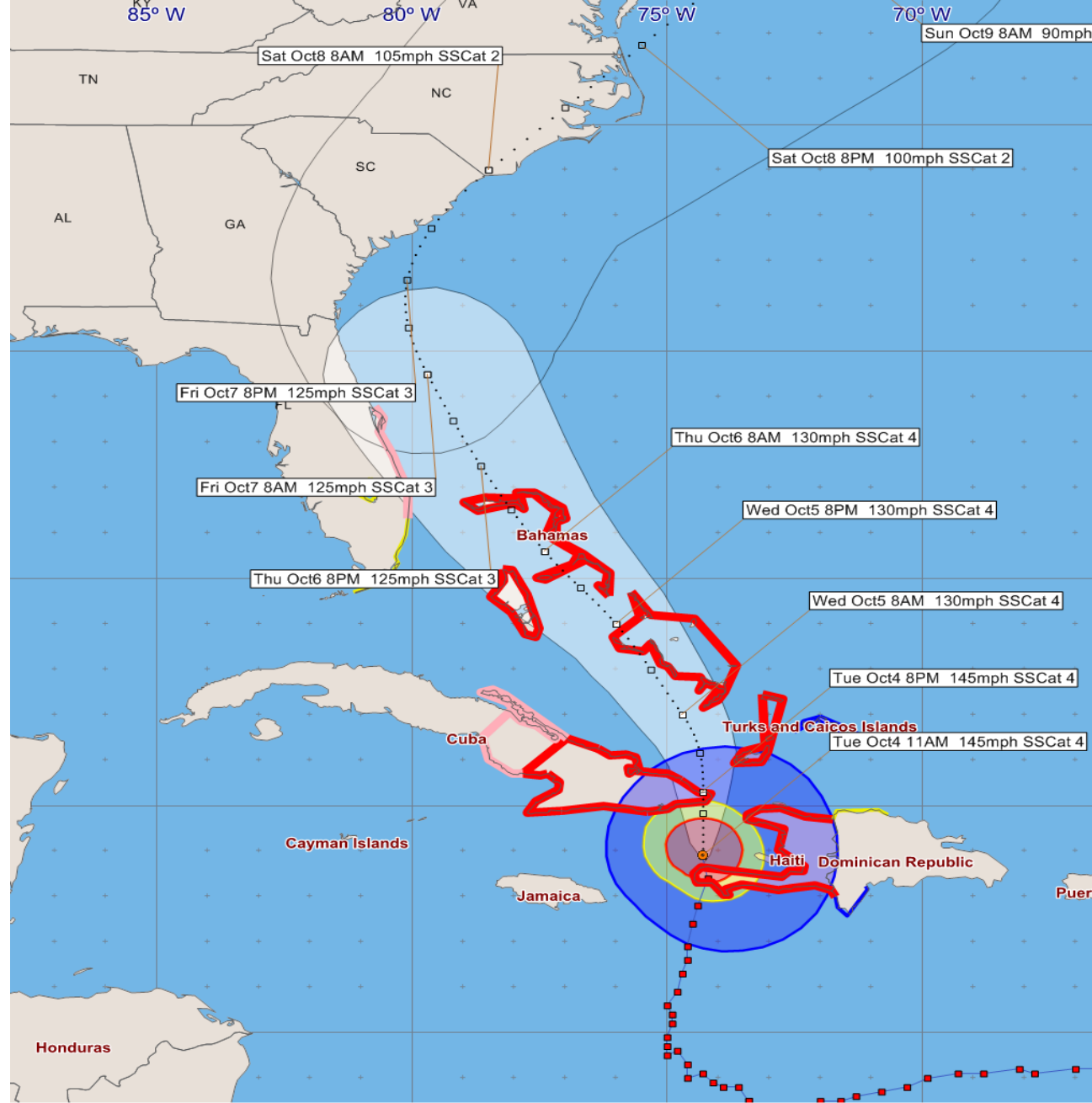
<http://www.weather.gov/melbourne>

October 2, 2016

To be Safe, Prepare for This



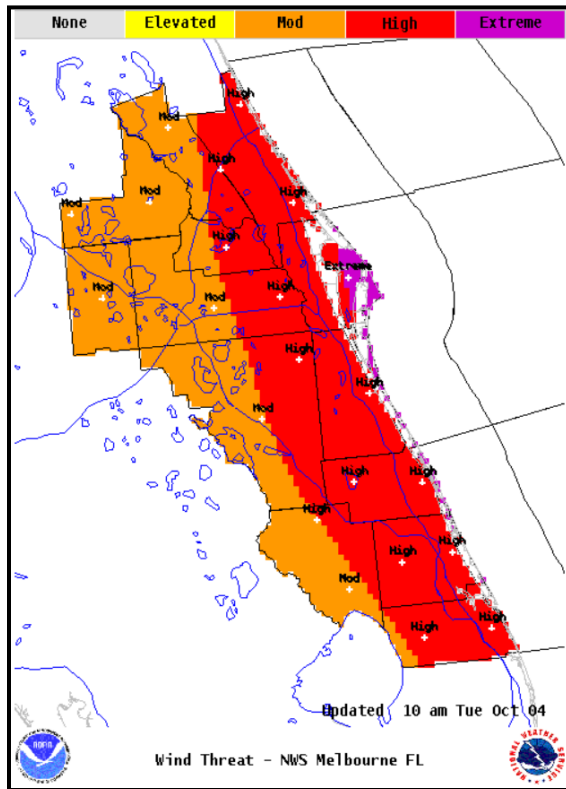
EXTREME THREAT for wind greater than 110 mph
HIGH THREAT for wind 74-110 mph
MODERATE THREAT for wind 58-73 mph
ELEVATED THREAT for wind 39-57 mph
LITTLE TO NO THREAT wind less than 39 mph



Hurricane Matthew - Tuesday, October 4, 2016 11 AM EDT Advisory #26
 Center Location: 18.9 N 74.3 W Maximum Sustained Winds: 145 mph (Cat 4) Movement: 10 mph N

☐ forecast positions Potential Track Area: ☐ day 1-3 ☐ day 4-5 Surface Wind Field: ☉ at current location
 Watches: hurricane tropical storm Warnings: hurricane tropical storm
 Sustained Wind Speeds: tropical storm >= 34kt/39mph strong tropical storm >= 50kt/58mph hurricane >= 64kt/74mph

To be Safe, Prepare for This



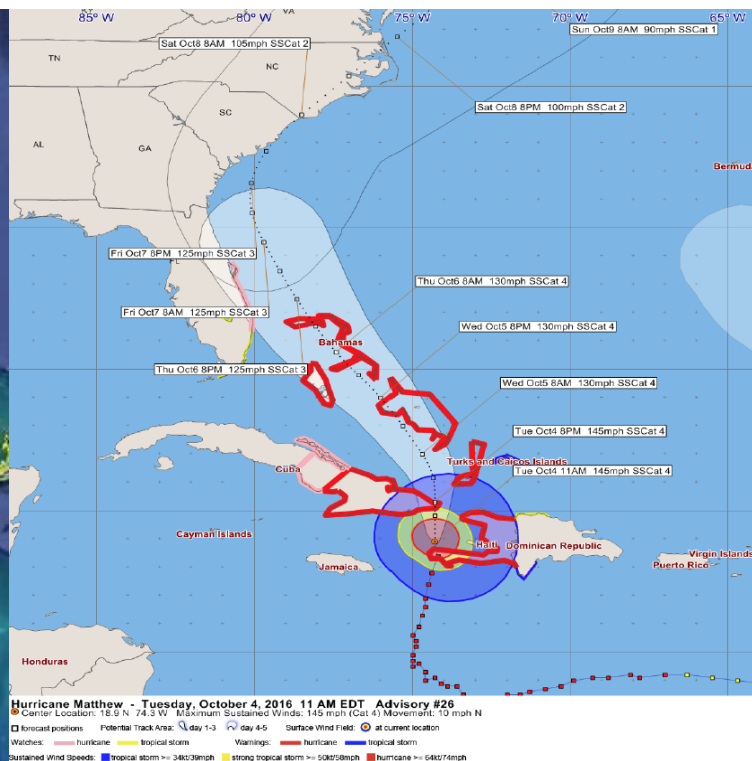
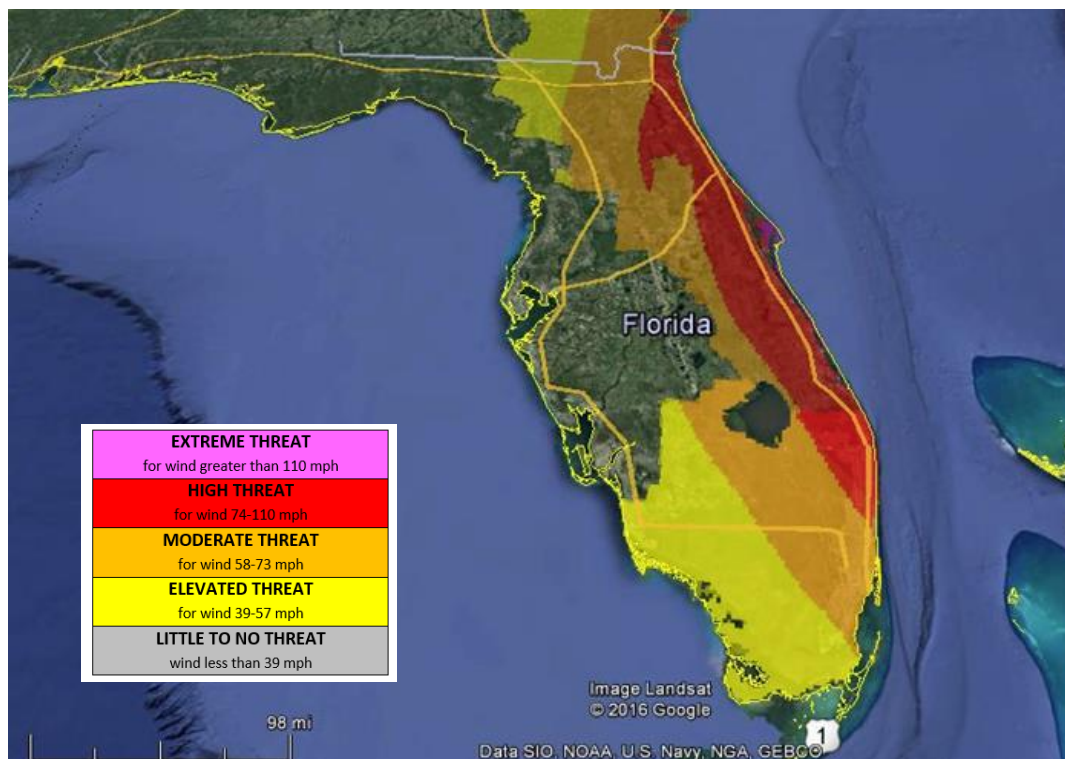
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MODERATE THREAT for wind 58-73 mph
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LITTLE TO NO THREAT wind less than 39 mph

Public Safety Message: (Wind)

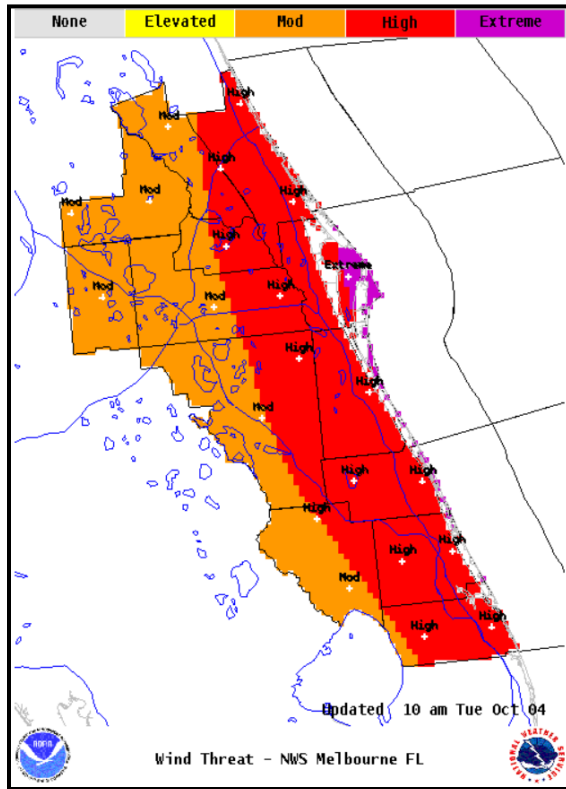
The threat to our area from Hurricane Matthew has increased. A hurricane watch is now in effect.

People located in coastal counties should prepare for the threat of hurricane force winds while those on barrier islands should make ready for possible extreme winds. Listen for evacuation orders, and heed them if issued.

Wind Threat Mosaic (HTI)



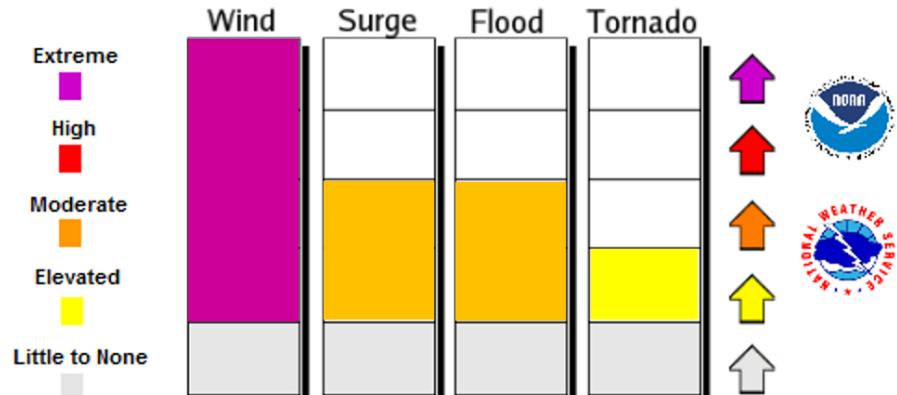
To be Safe, Prepare for This



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LITTLE TO NO THREAT wind less than 39 mph

Hurricane Hazards Threat Meter

Specific to East Central Florida



Effective communication
during evolving situations



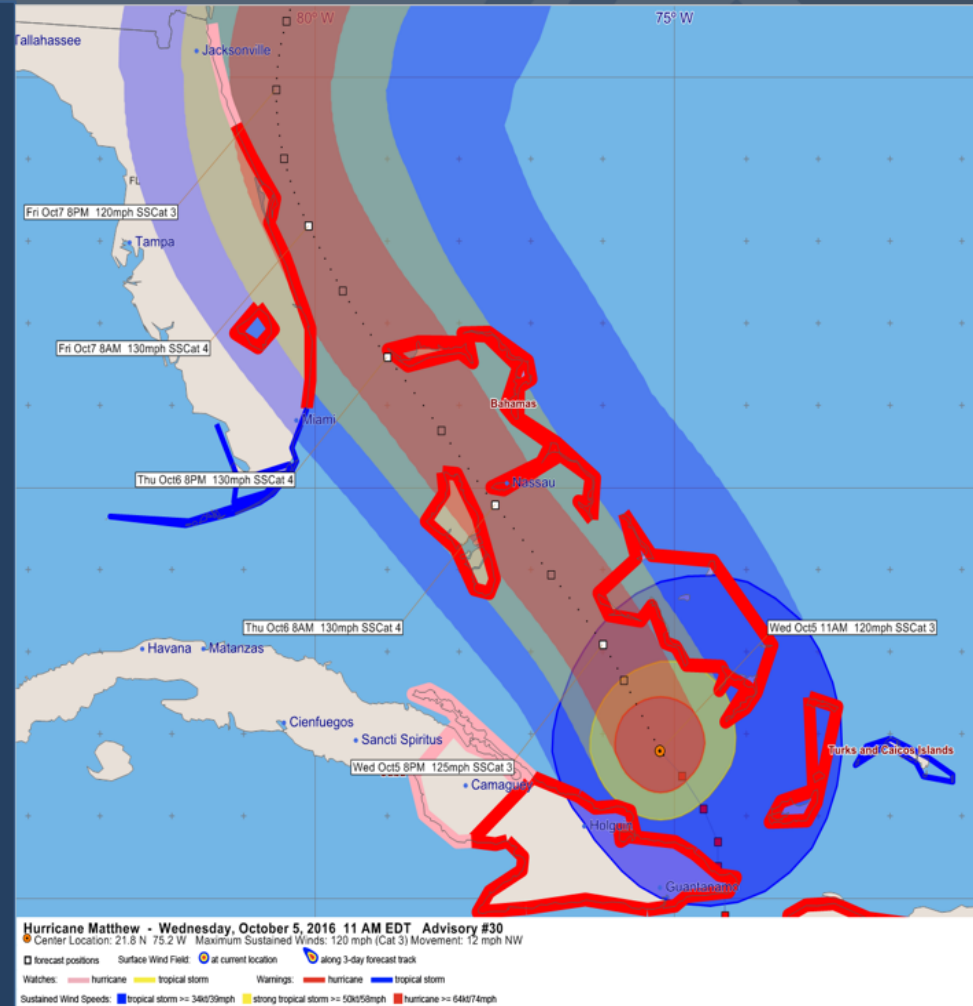
Situation Overview

East Central Florida & Adjacent Coastal Waters

- This is a very serious situation! Major Hurricane Matthew is headed for ECFL!
- Hurricane Warnings are now in effect for all ECFL counties, except for Lake County where a Tropical Storm Warning is now in effect.
- Hurricane Warnings will soon be in effect for all adjacent waters over the marine area.

Key: Rare and historic hurricane event in the making.

Wind and surge impacts to coastal counties could be devastating.



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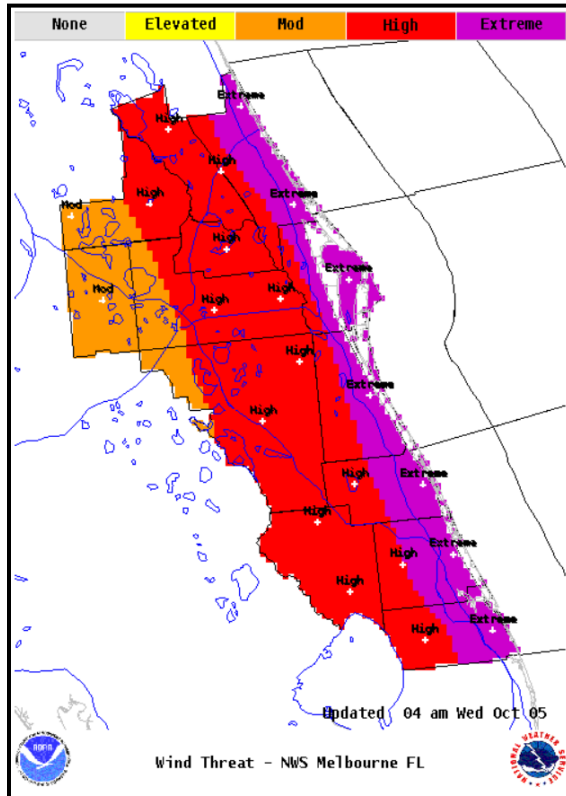
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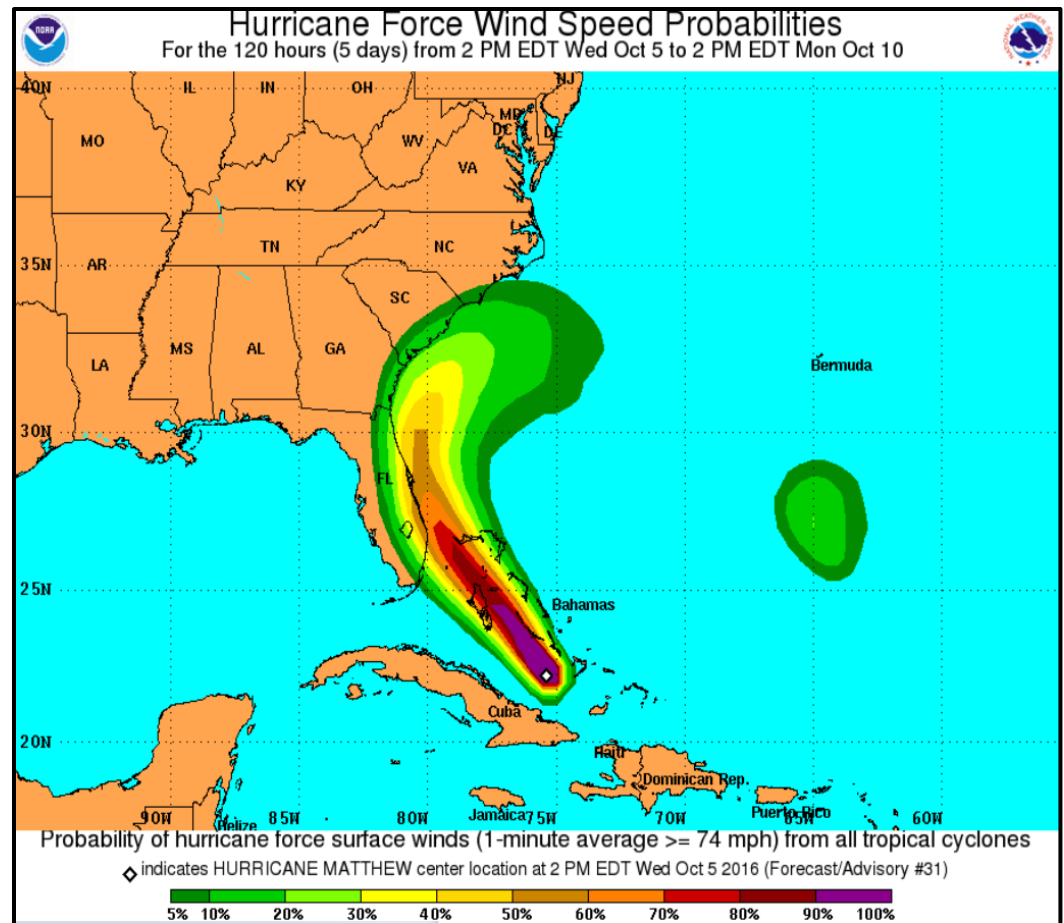
[@NWSMelbourne](https://twitter.com/NWSMelbourne)

October 5, 2016

To be Safe, Prepare for This



EXTREME THREAT for wind greater than 110 mph
HIGH THREAT for wind 74-110 mph
MODERATE THREAT for wind 58-73 mph
ELEVATED THREAT for wind 39-57 mph
LITTLE TO NO THREAT wind less than 39 mph



Extreme Wind Threat

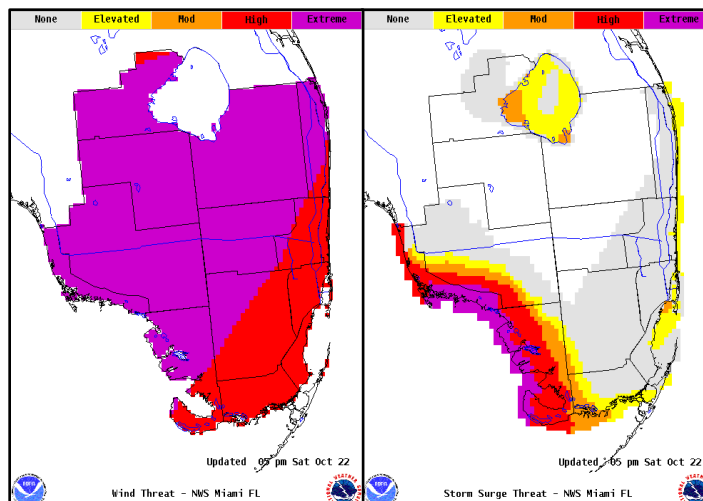
- Most locations along the ECFL coast have a similar chance to receive hurricane force winds
- The best chance for major hurricane force winds is east of I-95, especially for the barrier islands and Cape Canaveral



Threat Assessments x 4

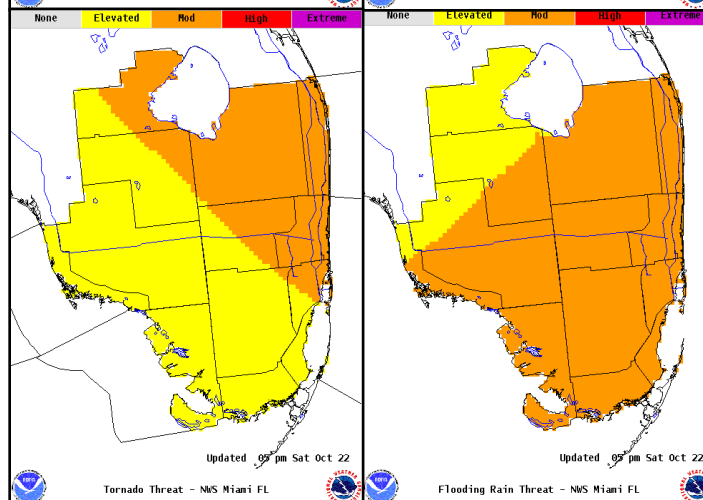
Wind

EXTREME THREAT for wind greater than 110 mph
HIGH THREAT for wind 74-110 mph
MODERATE THREAT for wind 58-73 mph
ELEVATED THREAT for wind 39-57 mph
LITTLE TO NO THREAT wind less than 39 mph



Storm Surge

EXTREME THREAT for surge flooding greater than 9 feet above ground
HIGH THREAT for surge flooding 6-9 feet above ground
MODERATE THREAT for surge flooding 3-6 feet above ground
ELEVATED THREAT for surge flooding 1-3 feet above ground
LITTLE TO NO THREAT little to no surge flooding



EXTREME THREAT for an outbreak of tornadoes
HIGH THREAT for numerous tornadoes
MODERATE THREAT for scattered tornadoes
ELEVATED THREAT for isolated tornadoes
LITTLE TO NO THREAT tornadoes not anticipated

EXTREME THREAT for extreme rainfall flooding
HIGH THREAT for major rainfall flooding
MODERATE THREAT for moderate rainfall flooding
ELEVATED THREAT for minor rainfall flooding
LITTLE TO NO THREAT little to no rainfall flooding

Tornadoes

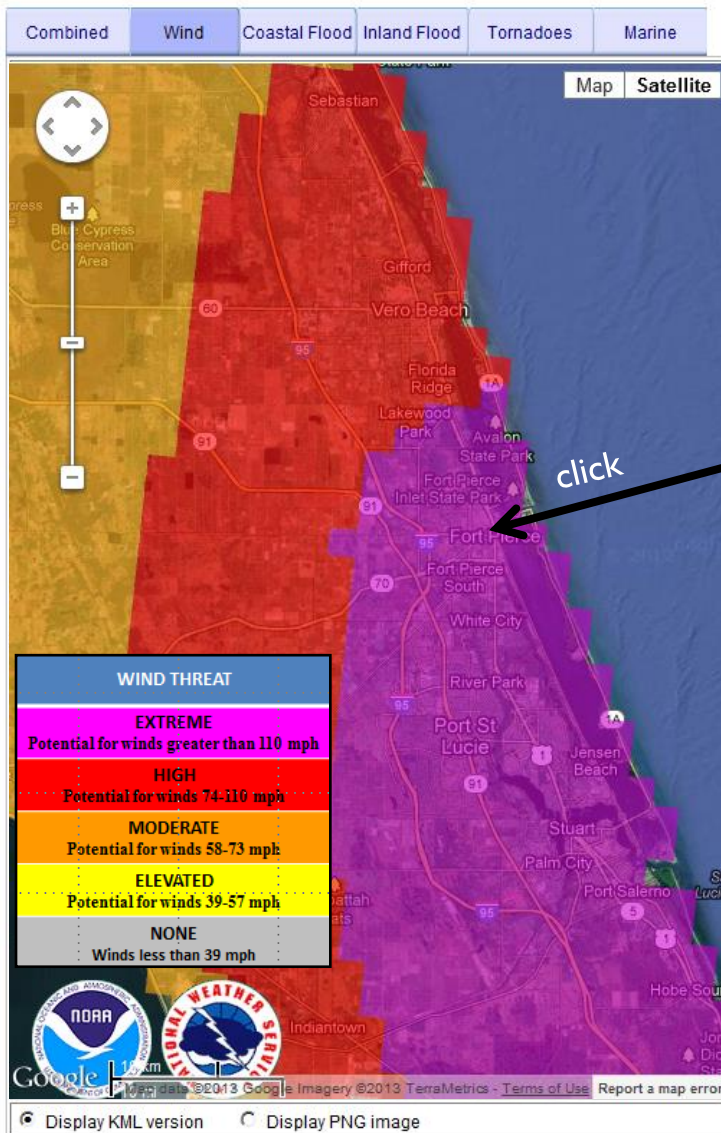
Flooding Rain



East Central Florida - Hurricane Threats & Impacts

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Hurricane Omega

**ZOOM**

Prepare for These Potential Impacts:

Wind Threat	Potential Wind Impacts (generalized)
EXTREME THREAT for wind greater than 110 mph Imperiled Lives Buildings Trees/Signs Roads/Bridges Power/Comms	DEVASTATING TO CATASTROPHIC IMPACTS <ul style="list-style-type: none">To be safe, aggressively prepare for the potential of devastating to catastrophic wind impacts from major hurricane force wind of equivalent Category 3 intensity or greater.Life threatening wind possible. Failure to adequately shelter from extreme wind may result in serious injury, loss of life, or immense human suffering.Structural damage to sturdy buildings with some experiencing complete roof and wall failures. Complete destruction of mobile homes. Damage greatly accentuated by large airborne projectiles. Hardest hit locations may be uninhabitable for weeks or months.Numerous large trees snapped or uprooted along with fences and roadway signs blown over.Many roads impassable from large debris. Many bridges, causeways, and access routes connecting barrier islands impassable.Widespread power and communication outages with many areas suffering extended outages.

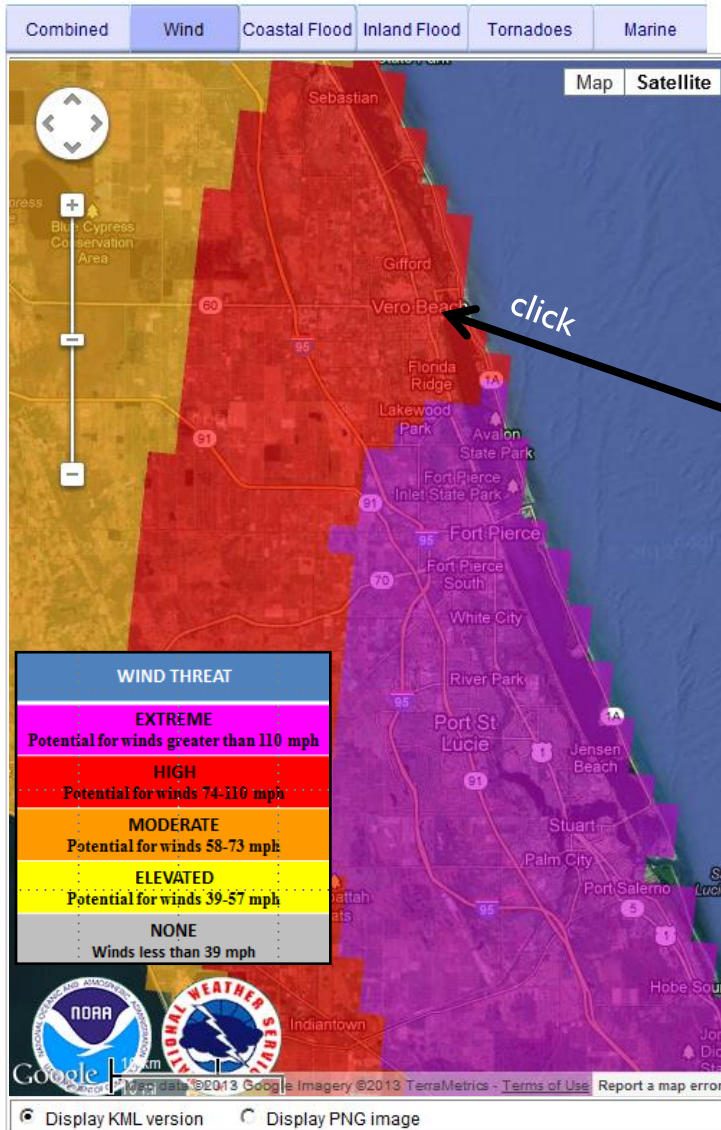
Also good for local hurricane briefings ... with added detail.



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Hurricane Omega



Prepare for These Potential Impacts:

Wind Threat	Potential Wind Impacts (generalized)
HIGH THREAT for wind 74-110 mph	EXTENSIVE IMPACTS <ul style="list-style-type: none">To be safe, aggressively prepare for the potential of extensive wind impacts from hurricane force wind of equivalent Category 1 or 2 intensity.Life threatening wind possible. Failure to adequately shelter may result in serious injury or loss of life.Considerable damage to roofing and siding materials of sturdy buildings, with some having window, door, and garage door failures leading to structural damage. Mobile homes severely damaged, with some destroyed. Damage accentuated by airborne projectiles. Hardest hit locations may be uninhabitable for weeks.Many large trees snapped or uprooted along with fences and roadway signs blown over.Some roads impassable from large debris, and more within urban or heavily wooded places. Several bridges, causeways, and access routes connecting barrier islands impassable.Power and communications outages across large areas, with several places suffering extended outages.

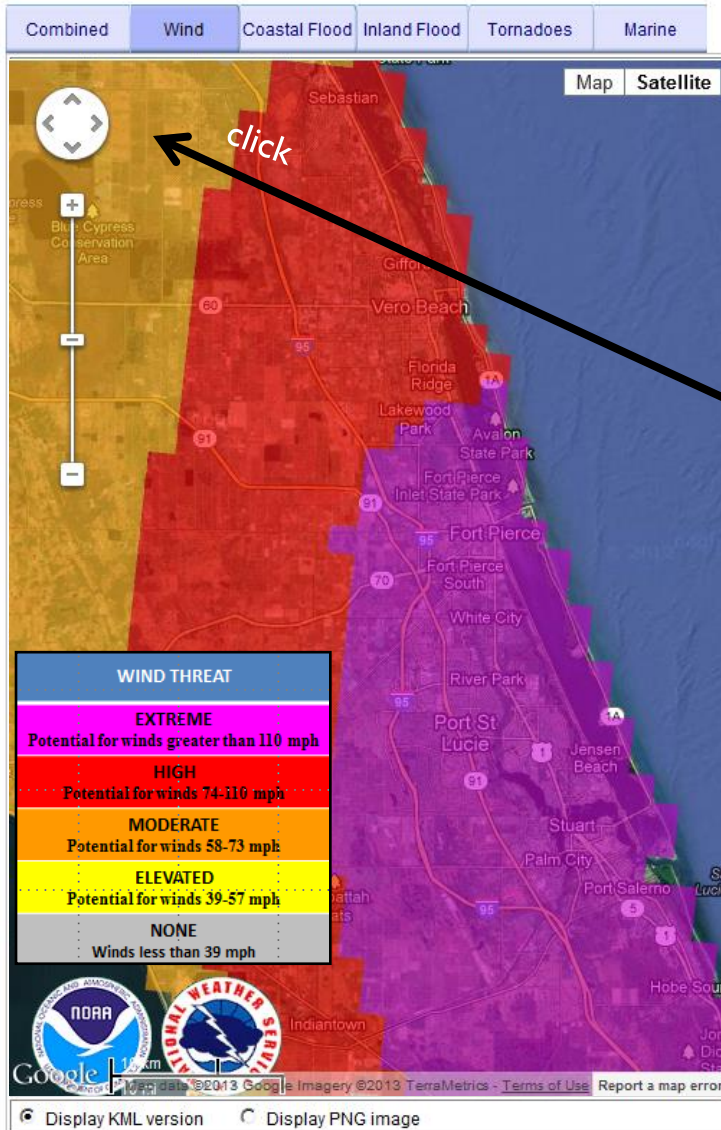
Also good for local hurricane briefings ... with added detail.



East Central Florida - Hurricane Threats & Impacts

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Hurricane Omega



Prepare for These Potential Impacts:

Wind Threat	Potential Wind Impacts (generalized)
MODERATE THREAT for wind 58-73 mph	SIGNIFICANT IMPACTS <ul style="list-style-type: none">To be safe, earnestly prepare for the potential of significant wind impacts from strong tropical storm force wind.Dangerous wind possible. Failure to adequately shelter may result in serious injury, and in some cases loss of life.Some damage to roofing and siding materials, along with damage to porches, awnings, carports, and sheds. A few buildings experiencing window, door, and garage door failures. Mobile homes damaged, especially if unanchored. Unsecured lightweight objects become dangerous projectiles.Several large trees snapped or uprooted, but with greater numbers in places where trees are shallow rooted. Several fences and roadway signs blown over.A few roads impassable from large debris, and more within heavily wooded places. A few bridges, causeways, and access routes connecting barrier islands impassable.Scattered power and communications outages, but more prevalent in areas with above ground lines.

Also good for local hurricane briefings ... with added detail.

Messaging “Blurbs”

“Act now to protect yourself and your family.”

“There is grave concern for dangerous and life-threatening winds.”

“Enact your Emergency Plan for the chance of hurricane winds.”

“Failure to act may result in injury or loss of life. Now is the time to take action.”

“Prepare for the potential of extensive impacts from Hurricane Alpha.”



Instructional Safety Messages

“Preparations should be brought to completion before the onset of tropical storm force winds.”

“Move to more substantial shelter if you are vulnerable to high winds.”

“Secure all loose outdoor objects.”

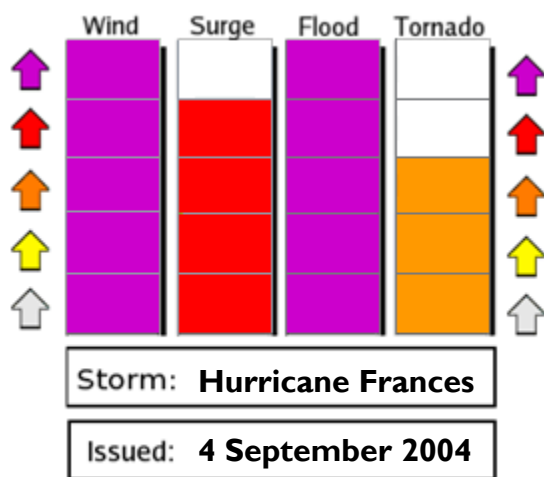
“Evacuation of barrier islands must be complete before the winds increase and driving becomes dangerous.”



All Hazards Assessments

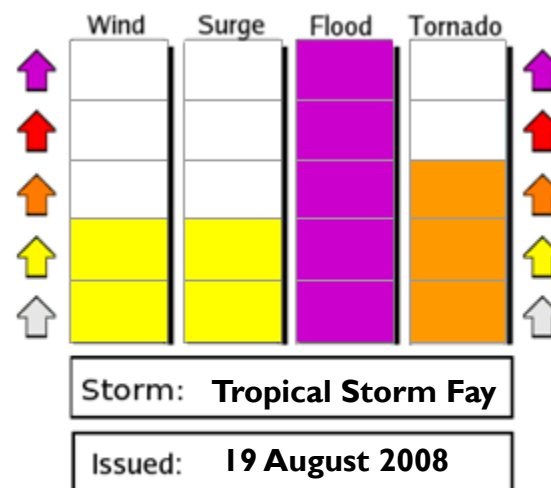
Hurricane Frances - All Hazards

Saint Lucie County, FL



Tropical Storm Fay - All Hazards

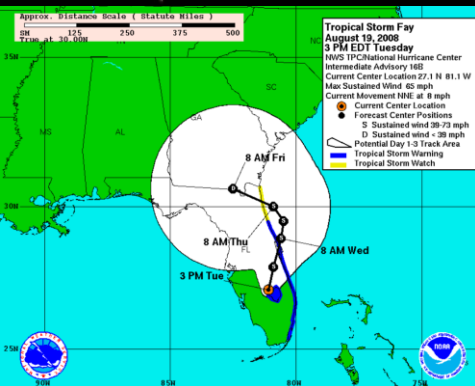
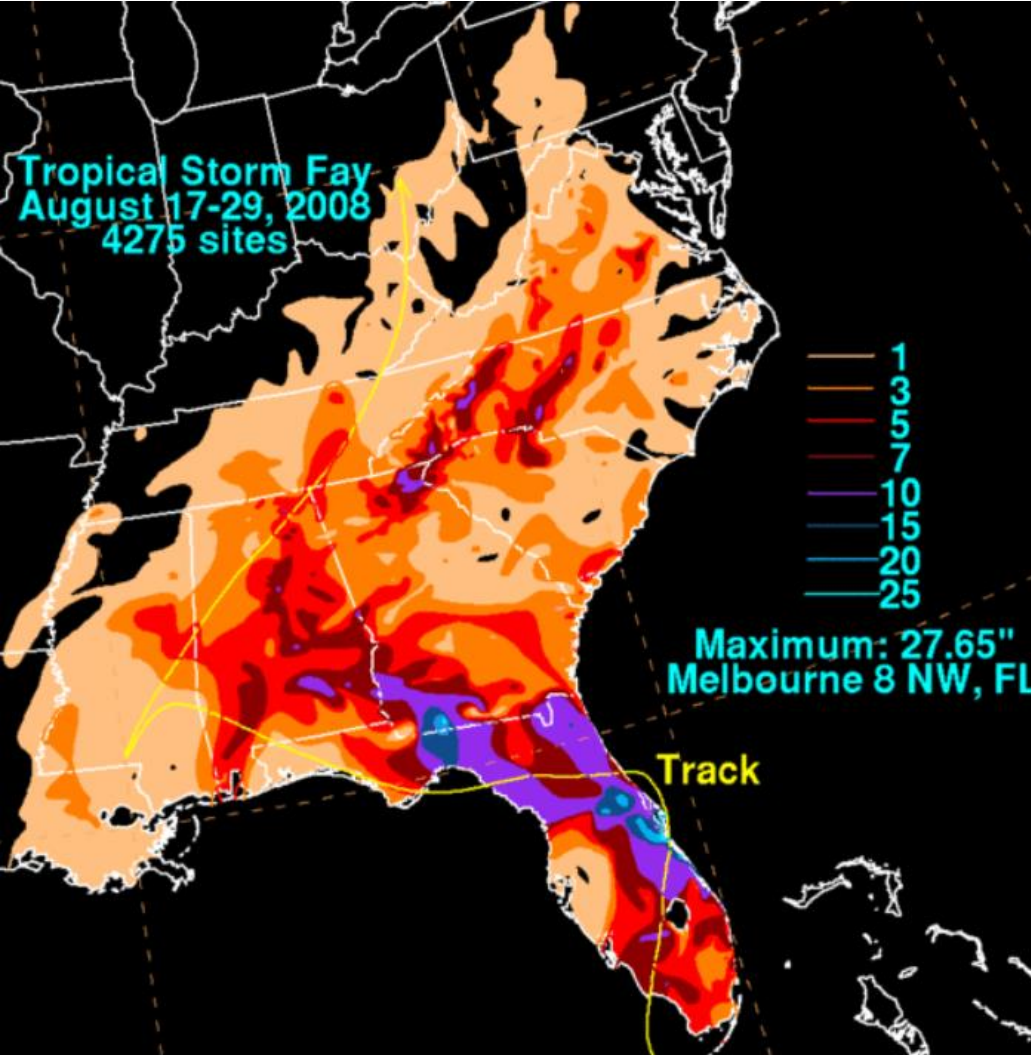
Lat/Lon 28.12N 80.62W



*"Emoticons"
to help overcome
language barriers?*



Community Distress Index



Steps To Effective Warning Response



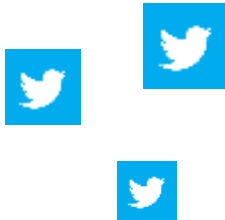
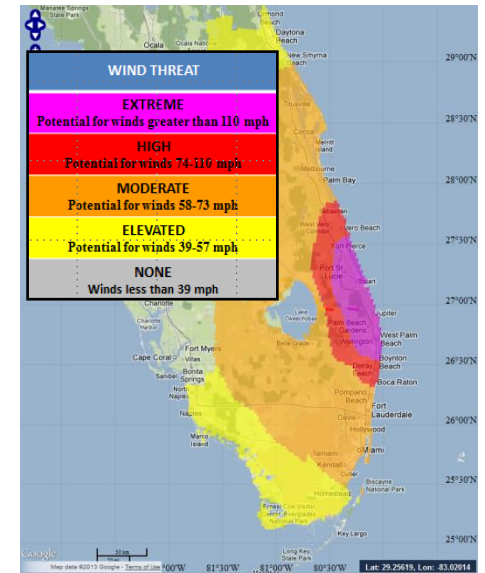
**Resources, Ability,
& Time**

Appropriate Protective Action

Considerations for Public Safety Messaging to evoke Desired Societal Response

What's the Main Message?

- From the “Communications Desk”
 - Messaging Points for Media Interviews
 - NWSSChat
 - Graphiccasts; Graphical Posts
 - Flash Cards
 - Social Media
 - Facebook, Twitter, YouTube, etc.



*“Historic hurricane event unfolding!
Dangerous Hurricane Omega is
coming our way!”*

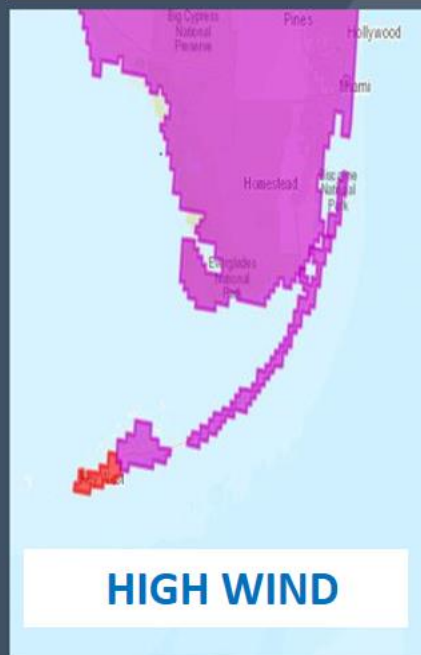


BLUF - Bottom Line Up Front
KISS - Keep It Simple (Stupid)

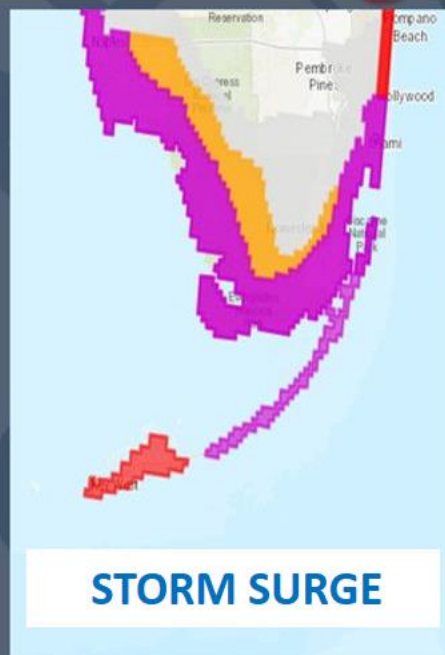
Category 5 Hurricane Irma

Hazard Threats/Impacts as of 5PM EDT Thursday, September 07, 2017

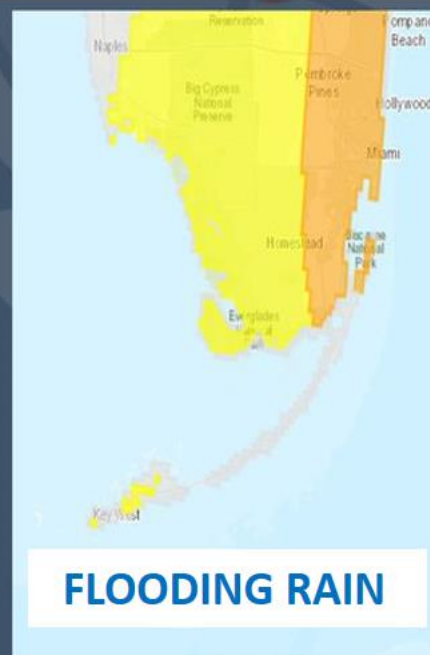
SAFETY MARGIN: To be safe, protect against these potential conditions.



Wind Threat
Extreme - Potential for wind > 110 mph
High - Potential for wind 74 to 110 mph
Moderate - Potential for wind 58 to 73 mph
Elevated - Potential for wind 39 to 57 mph
Little to None - Wind < 39 mph



Storm Surge Threat
Extreme - Potential for storm surge flooding > 9 ft above ground
High - Potential for storm surge flooding > 6 ft above ground
Moderate - Potential for storm surge flooding > 3 ft above ground
Elevated - Potential for storm surge flooding > 1 ft above ground
Little to None - Little to no storm surge flooding



Flooding Rain Threat
Extreme - Potential for extreme flooding rain
High - Potential for major flooding rain
Moderate - Potential for moderate flooding rain
Elevated - Potential for localized flooding rain
Little to None - Little to no potential for flooding rain



Tornado Threat
Extreme - Potential for outbreak of tornadoes
High - Potential for many tornadoes
Moderate - Potential for several tornadoes
Elevated - Potential for a few tornadoes
Little to None - Tornadoes not expected



Florida Keys

WEATHER FORECAST OFFICE

IMPORTANT: Depictions account for the latest forecast, along with related uncertainties such as possible changes in track, intensity, and size of Hurricane Irma.



Hurricane Winds

When wind speeds reach tropical storm strength, they become dangerous. That's why evacuation plans and shelter decisions are based on these speeds. If winds reach hurricane strength, the threat to life and property significantly increases. The wind threat is extreme with hurricanes of Category 3 force or greater.



High Wind Safety Tips:



- Know your vulnerability relative to hurricane winds.
- Those living in mobile homes, high rise buildings, along the immediate coast, and at higher elevations are most susceptible.
- If you are vulnerable to high winds, relocate to safer shelter.
- Securing doors and deploying shutters can help reduce the risk of property damage.
- Securing yard objects can help reduce the chance for dangerous projectiles.



National Weather Service
Melbourne, FL

VCP 121
0.25 km, 0.5 dBZ
MX: 52dBZ

0 - Strikes
0 - Strikes

0001
 0001
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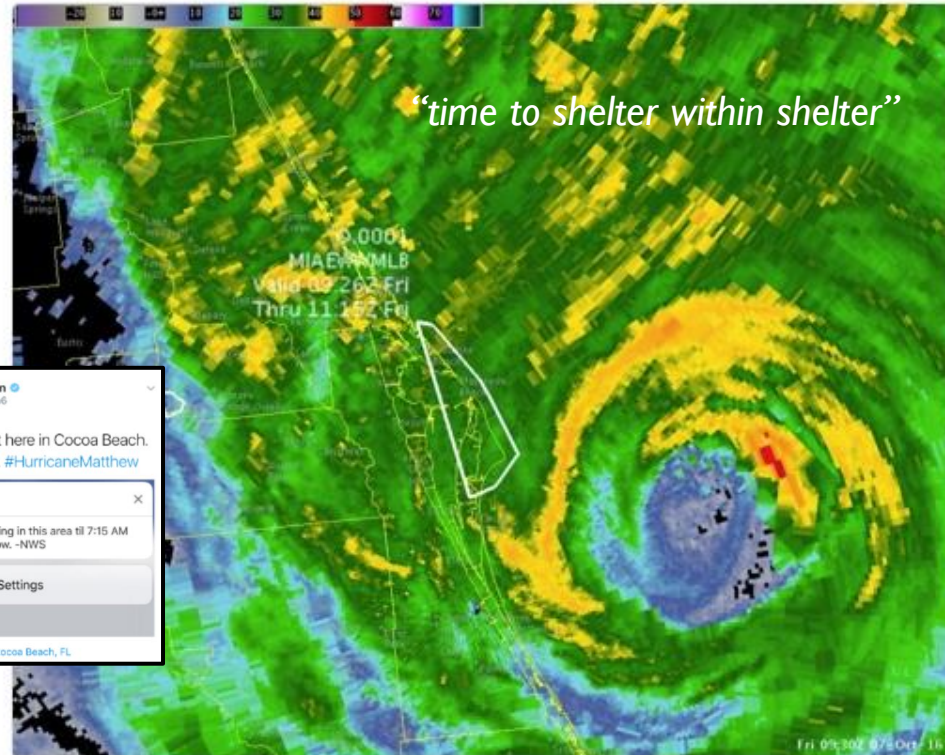
630 AM Fri Oct 7 2016
Valid through 830 AM

Fri 10:30Z 07-Oct-16



NWS Melbourne @NWSMelbourne · Oct 7

543 am | Extreme Wind Warning for
Brevard [FL] till Oct 7, 7:15 AM EDT
[forecast.weather.gov/product.php?si ...](https://forecast.weather.gov/product.php?si...)



 **Mark Lehman** @MarkLehman6

Just got this alert here in Cocoa Beach. Yeah....I'd say so. #HurricaneMatthew

 **EMERGENCY ALERT** ×

Extreme Wind Warning in this area til 7:15 AM EDT. Take shelter now. -NWS

Settings

10/7/16, 6:29 AM from Cocoa Beach, FL

59 32

Using Social Media to Communicate Public Safety Message

Kimberly Prosser, Director
Brevard County Emergency Management

- EM & WFO sharing and commenting on each others' Facebook posts and re-tweeting on Twitter increases the ...
 - **Timeliness** of information received
 - **Visibility** (of posts and agencies themselves)
 - **Credibility** (one agency bolsters credibility of the other)
 - **Accuracy** (EMs no longer need to rewrite WFO alerts/emails)
 - **Interaction** (public is likely to interact with both entities)
 - **Reach** (each agency's audience is largely unique)
 - **Opportunity** to reach those without weather radios, etc.

NWSChat

Use of NWSChat to keep the media “on message” during the event.

The screenshot shows the NWSChat Live web application running in Internet Explorer. The browser's address bar displays <https://nwschat.weather.gov/live/>. The application interface is divided into several sections:

- Top Bar:** Includes the NWSChat Live logo, a search bar, a "Sign in - Google Accounts" button, and a "NWSChat Live" tab.
- Left Panel:**
 - Actions:** A dropdown menu with "Available" selected and a speaker icon.
 - Buddies:** A list of chat groups and individuals, including "SR SOO Group" (with members nwsfwd-soo, nwslix-soo, nwsffc-soo, nwsmeg-soo-Tom S.), "WDTB Group" (with members wdtb-elliott, nws-wdtb-don, nwswdtb-chris-spanagle), "Southern Region HQ", "Southern Region - Regional Op", "NWSChat Admin Team" (with members Daryl Herzmann, nwsbot), and "Chatrooms".
- Map Panel:**
 - Map Valid:** 3:20 PM
 - Tools:** A dropdown menu.
 - Opacity:** A slider control.
 - Map:** A Google Map of Florida showing major cities like Sarasota, Port St Lucie, West Palm Beach, Cape Coral, Bonita Springs, Naples, Fort Lauderdale, Miami, and Homestead. The Everglades National Park is also visible.
 - Layers Control:** A list of map layers including "Base Layer" (Blank, Google Street), "Satellite" (GOES Water, GOES West V, GOES East Vi, GOES Visible, GOES IR), and "Precip/RADAR" (NMQ Q2 3 Da, NMQ Q2 2 Da, NMQ Q2 1 Da).
- Bottom Bar:** Contains buttons for "Help", "All Chats", and several chat room tabs: "sr-roc", "mlbchat", "mlbemchat", "tbwchat", and "tbwemchat".

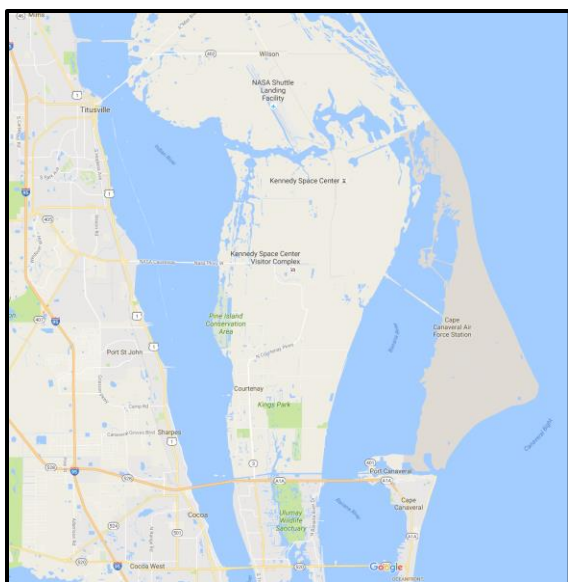
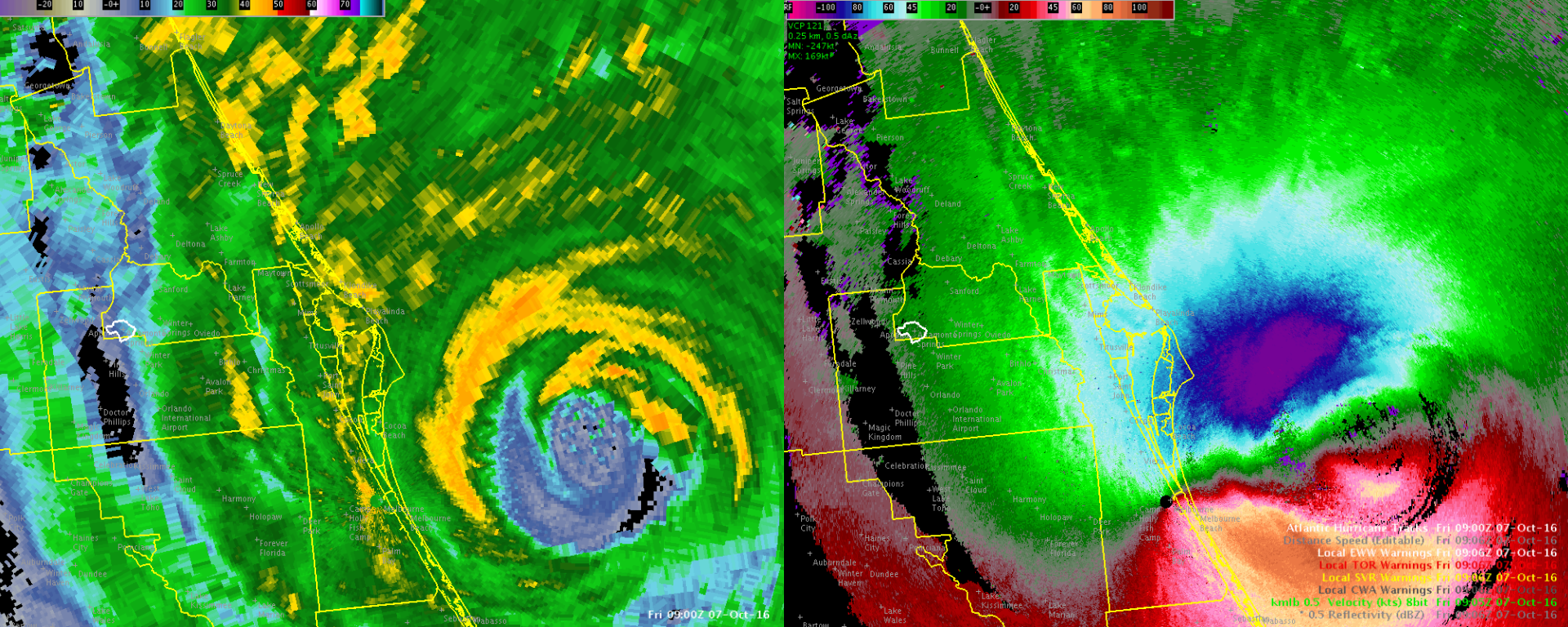
nws-david.sharp: If an EWW is issued, it means that it is time to shelter within shelter. The message - move now to the safest place within your shelter and protect your head and body from extreme winds.



Major Hurricanes & Societal Impacts:

- Lives greatly imperiled
- Devastating to catastrophic damage
- Increased projectile loading
- Numerous rescues
- Difficult initial response
- Community infrastructure collapsed
- Long-term recovery





Extreme Winds & Major Hurricane Matthew

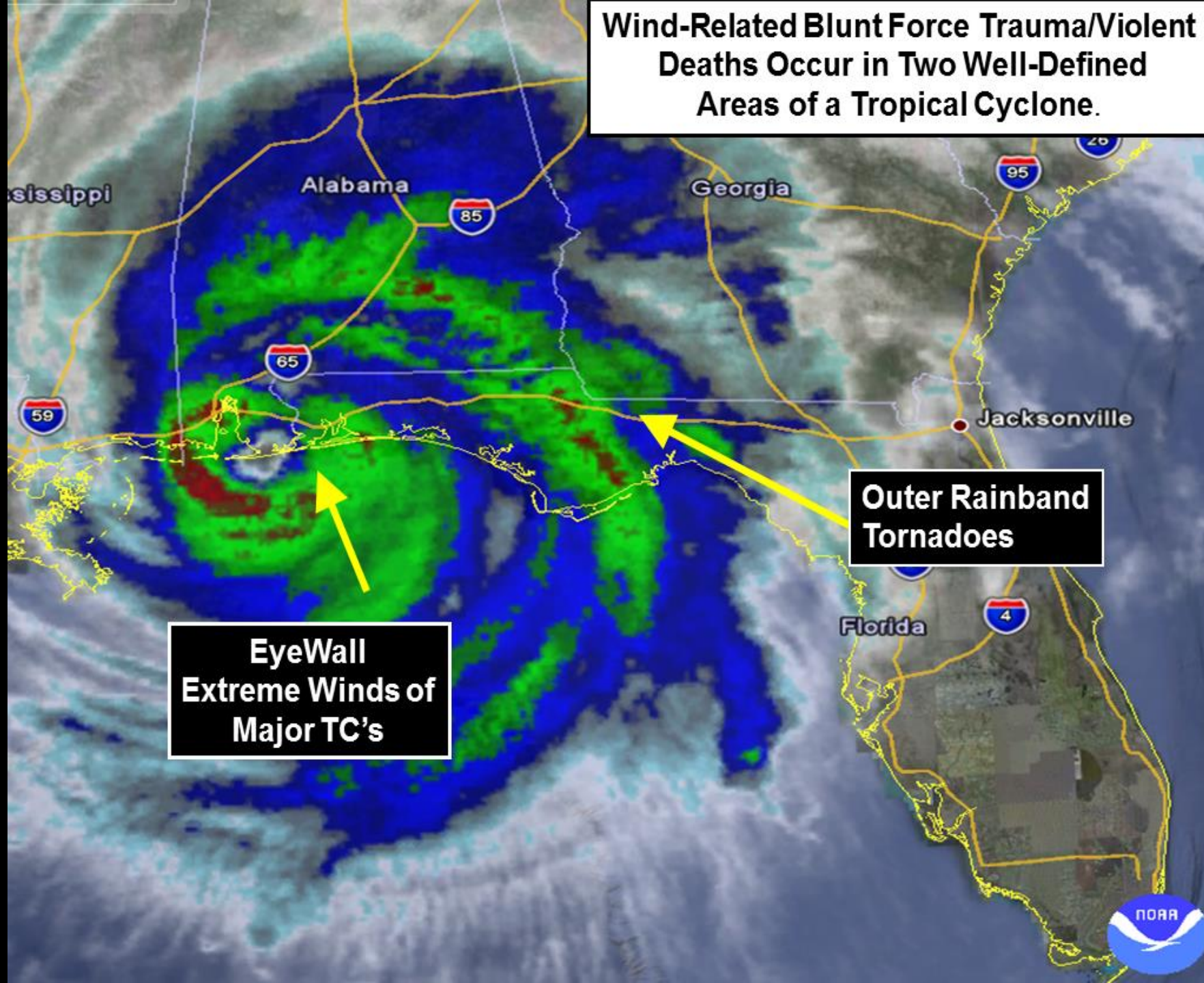


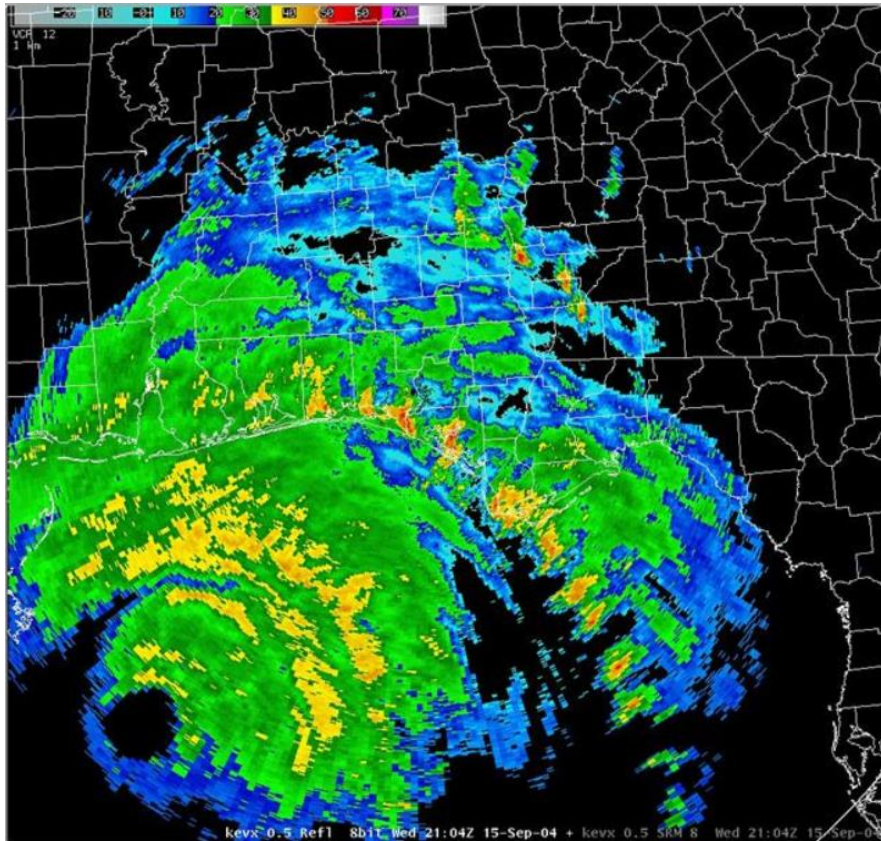
Extreme Wind Warning

- **Issuance Criteria:** An EWW is issued when both of the following criteria are met:
 - The tropical cyclone is a CAT 3 or greater.
 - Sustained winds of 100 kt (115 mph) or greater are expected to occur in a WFO's county warning area within 1 hour; product valid time is not to exceed 2 hours.

Message: Shelter within shelter

Wind-Related Blunt Force Trauma/Violent Deaths Occur in Two Well-Defined Areas of a Tropical Cyclone.

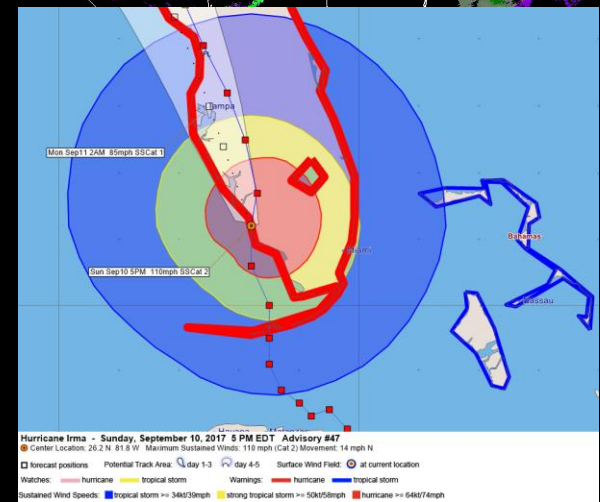
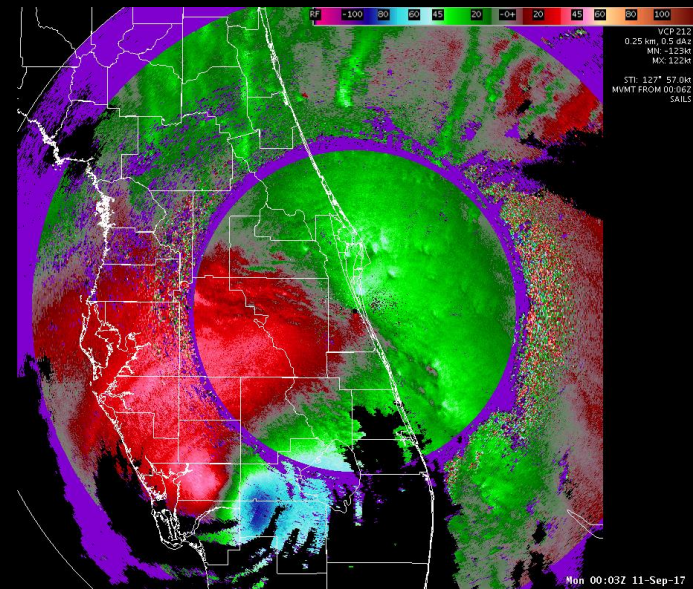
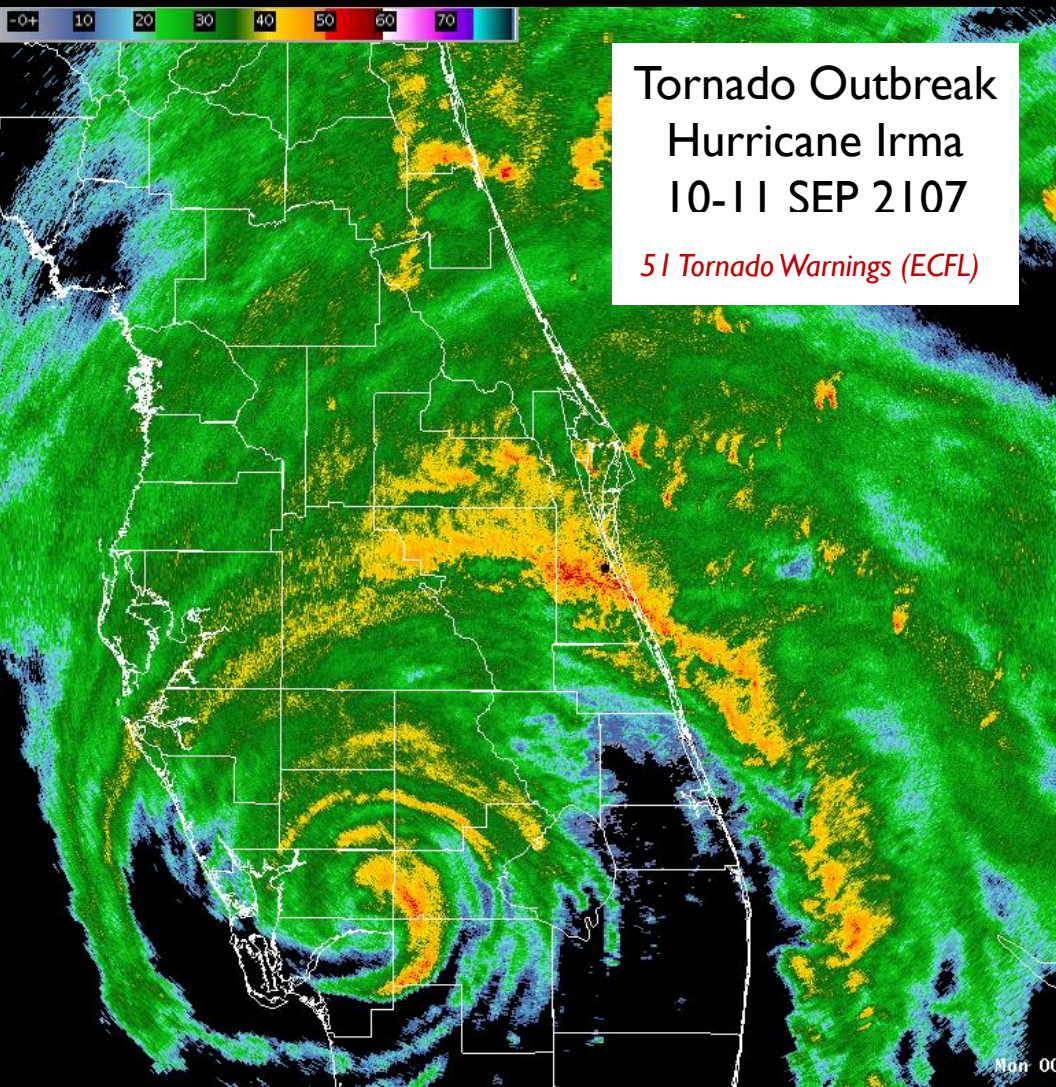




Typically, counties/cities do not have a tornado contingency within their hurricane emergency plans.

- Tornadoes can occur ahead of the main wind event.
- Tornadoes can occur after the main wind event.
- Tornadoes can occur in places away from the main wind event.
- Tornadoes can occur post landfall over inland locations.

Tornado Outbreak !!!



Tornado Outbreak

/O.NEW.KMLB.TO.W.0066.170911T0145Z-170911T0200Z/
BULLETIN - EAS ACTIVATION REQUESTED
Tornado Warning
National Weather Service Melbourne FL
945 PM EDT SUN SEP 10 2017
The National Weather Service in Melbourne has issued a
Tornado Warning for...
Northwestern Brevard County in Florida...
* Until 1000 PM EDT
* At 944 PM EDT, a severe thunderstorm capable of producing a tornado
was located over Cape Canaveral, moving northwest at 80 mph.
HAZARD...Tornado.
SOURCE...Radar indicated rotation.
IMPACT...Flying debris will be dangerous to those caught without
shelter. Mobile homes will be damaged or destroyed. Tree
damage to roofs, windows, and vehicles will occur. Tree
damage is likely.
* Locations impacted include...
Titusville, Cocoa Beach, Cape Canaveral, Port Saint John, and
Palm Bay.
PRECAUTIONARY/PREPAREDNESS ACTIONS...
Heavy rainfall may hide this tornado. Do not wait to see or hear the
tornado. TAKE COVER NOW!
LAT...LON 2832 8057 2838 8060 2859 8095 2860 8095
2861 8098 2862 8097 2865 8097 2875 8088
2837 8056
TIME...MOT...LOC 0144Z 132DEG 69KT 2838 8063
TORNADO...RADAR INDICATED
HAIL...0.00IN

/O.NEW.KMLB.TO.W.0064.170911T0119Z-170911T0145Z/
BULLETIN - EAS ACTIVATION REQUESTED
Tornado Warning
National Weather Service Melbourne FL
919 PM EDT SUN SEP 10 2017
The National Weather Service in Melbourne has issued a
Tornado Warning for...
Southeastern Volusia County in east central Florida...
* Until 945 PM EDT
* At 916 PM EDT, a severe thunderstorm capable of producing a tornado
was located near Playalinda Beach, moving northwest at 70 mph.
HAZARD...Tornado.
SOURCE...Radar indicated rotation.
IMPACT...Flying debris will be dangerous to those caught without
shelter. Mobile homes will be damaged or destroyed. Tree
damage to roofs, windows, and vehicles will occur. Tree
damage is likely.
* Locations impacted include...
New Smyrna Beach, Edgewater, Oak Hill, Haulover Canal and Mims.
PRECAUTIONARY/PREPAREDNESS ACTIONS...
Tornadoes are extremely difficult to see and confirm at night. Do not
wait to see or hear the tornado. TAKE COVER NOW!
LAT...LON 2896 8081 2894 8079 2860 8054 2862 8061
2866 8063 2865 8064 2867 8068 2874 8075
2873 8076 2872 8074 2869 8076 2872 8084
2879 8085 2879 8097 2877 8097 2885 8115
2901 8193
TIME...MOT...LOC 0116Z 1190DEG 62KT 2864 8054
TORNADO...RADAR INDICATED
HAIL...0.00IN

/O.NEW.KMLB.TO.W.0063.170911T0101Z-170911T0115Z/
BULLETIN - EAS ACTIVATION REQUESTED
Tornado Warning
National Weather Service Melbourne FL
901 PM EDT SUN SEP 10 2017
The National Weather Service in Melbourne has issued a
Tornado Warning for...
Central Brevard County in Florida...
* Until 915 PM EDT
* At 900 PM EDT, a severe thunderstorm capable of producing a tornado
was located near Satellite Beach, moving northwest at 80 mph.
HAZARD...Tornado.
SOURCE...Radar indicated rotation.
IMPACT...Flying debris will be dangerous to those caught without
shelter. Mobile homes will be damaged or destroyed. Tree
damage to roofs, windows, and vehicles will occur. Tree
damage is likely.
* Locations impacted include...
Rockledge, Cocoa, Cocoa Beach, Satellite Beach and Cape Canaveral.
PRECAUTIONARY/PREPAREDNESS ACTIONS...
TAKE COVER NOW! Move to an interior room on the lowest floor of a
sturdy building. Avoid windows. If you are outdoors, in a mobile
home, or in a vehicle, move to the closest substantial shelter and
protect yourself from flying debris.
Tornadoes are extremely difficult to see and confirm at night. Do not
wait to see or hear the tornado. TAKE COVER NOW!
LAT...LON 2835 8082 2854 8071 2841 8056 2848 8055
2839 8056 2839 8057 2819 8056 2815 8055
TIME...MOT...LOC 0100Z 131DEG 69KT 2820 8053
TORNADO...RADAR INDICATED
HAIL...0.00IN

In-Shelter Phase:

TAKE COVER NOW! Move to an interior room on the lowest floor of a sturdy building. Avoid windows. If you are outdoors, in a mobile home, or in a vehicle, move to the closest substantial shelter and protect yourself from flying debris.

Sage Advice

Breathe!

Stay Calm

Stay Focused

Be the Voice
of Reason

Stay Connected

Follow Through





Thank You