

Unit 2: National Weather Service Products

Unit 2 Objectives



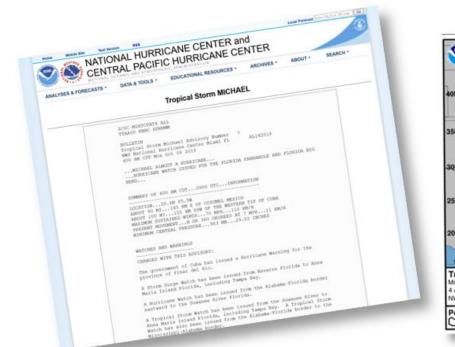
At the end of this unit, you should be able to:

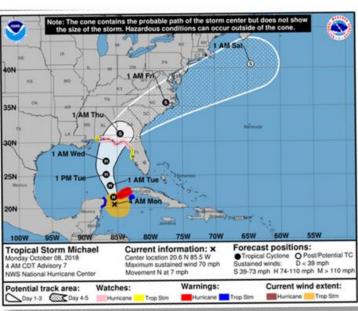
- Use NHC text-based and graphical products
- Explain when NHC products are available
- Explain where to find critical information in NHC products to answer key questions

Tropical Cyclone Products



The NWS national centers (National Hurricane Center (NHC), Weather Prediction Center (WPC), National Water Center (NWC), etc.) provide the 'big picture' that complements and guides local NWS forecast office products

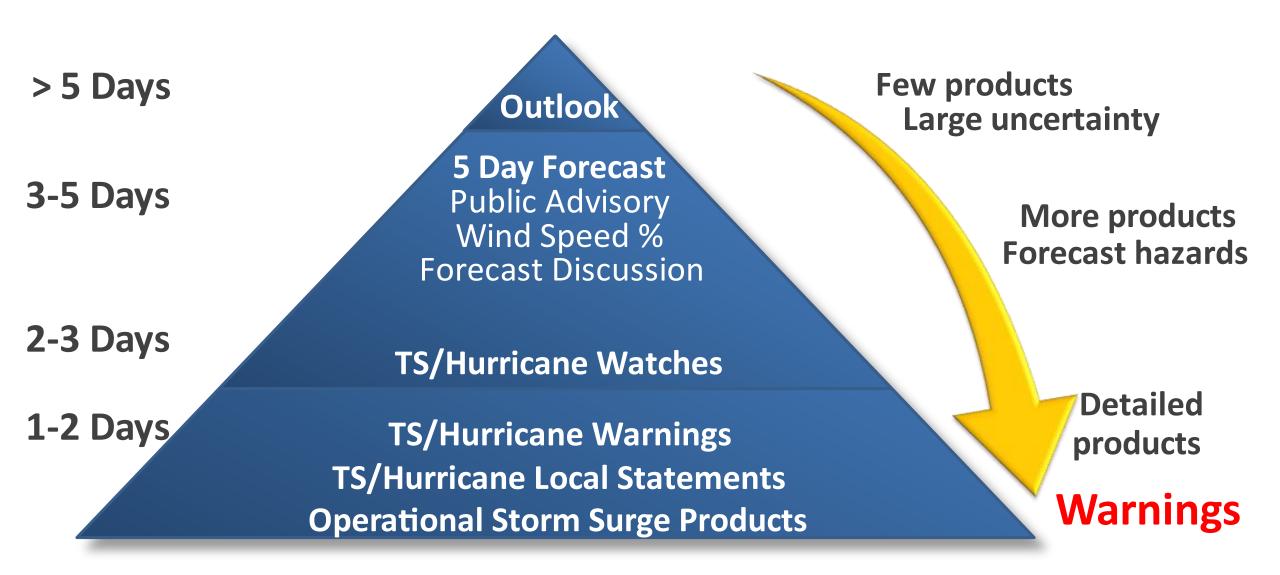






Tropical Cyclone Products Timeframe





NWS Product Overview



Wind-related products

- Tropical Weather Outlook
- Advisories
 - Public Advisory
 - Intermediate Advisory
 - Tropical Cyclone Update
- Forecast Discussion
- Forecast Error Cone
- Wind Speed Probabilities
- Wind Speed Arrival Timing
- Wind-based Watches/Warnings

Water-related products

- SLOSH MEOWs/MOMs
- Rainfall forecasts
 - QPF
 - ERO
- Hydrographs
- Flash Flood Warnings/Emergencies
- Flood Warnings (Mainstem)
- Severe Weather Outlook

Frequently Asked Questions - TWO



FAQs

- What's going on in the tropics?
- Any potential for development?
- Should we be concerned?

Tropical Weather Outlook

Tropical Weather Outlook – Scheduled Updates



Outlook Schedule

- Issued May 15 through November 30
 - 2 am Tropical Outlook
 - 8 am Tropical Outlook
 - 2 pm Tropical Outlook
 - 8 pm Tropical Outlook

Note: A Special Tropical Outlook can be issued at any time for significant or unexpected changes

Tropical Weather Outlook – Text Product 1



NATIONAL HURRICANE CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL WEATHER OUTLOOK NWS NATIONAL HURRICANE CENTER MIAMI FL 800 PM EDT MON OCT 20 2014

For the North Atlantic...Caribbean Sea and the Gulf of Mexico:

Showers and thunderstorms associated with an area of low pressure located over the southwestern Bay of Campeche have changed little in organization since this afternoon. This system has the potential to become a tropical cyclone during the next couple of days while it moves slowly eastward across the southern Bay of Campeche. Later in the week, the low is forecast to interact and possibly merge with a frontal system over the southeastern Gulf of Mexico or northwestern Caribbean Sea. An Air Force Reserve reconnaissance aircraft is scheduled to investigate the disturbance tomorrow afternoon, if necessary. Interests in the Yucatan Peninsula should monitor the progress of this system.

- * Formation chance through 48 hours...medium...50 percent.
- Formation chance through 5 days...medium...60 percent.

Forecaster Brown



Potential for development? Headed where?

Tropical Weather Outlook – Text Product 2



NATIONAL HURRICANE CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL WEATHER OUTLOOK NWS NATIONAL HURRICANE CENTER MIAMI FL 800 PM EDT MON OCT 20 2014

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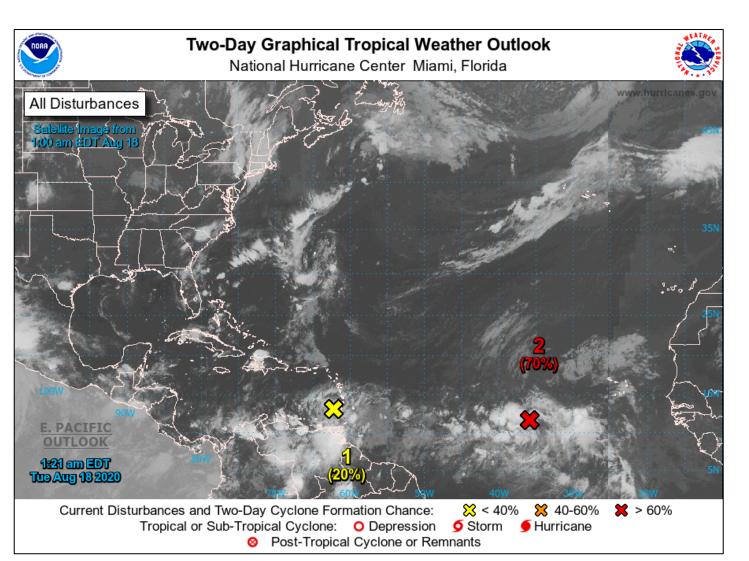
Forecaster Brown

Sending a plane?



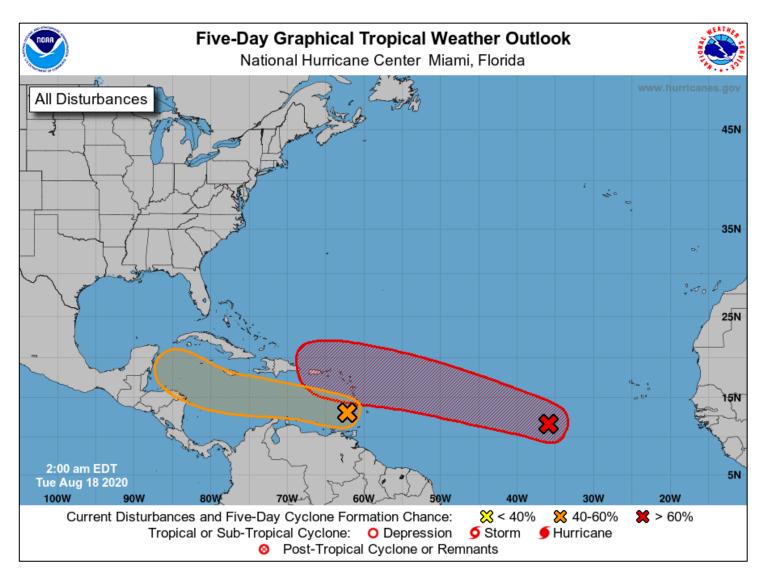
2-Day Formation Potential





- Identifies the current location of disturbed weather (discussed in the Tropical Weather Outlook)
- Formation chance during the next 48 hours:
 - Categorical (Low, Medium, or High)
 - Probabilities

Tropical Weather Outlook Five-Day Graphic

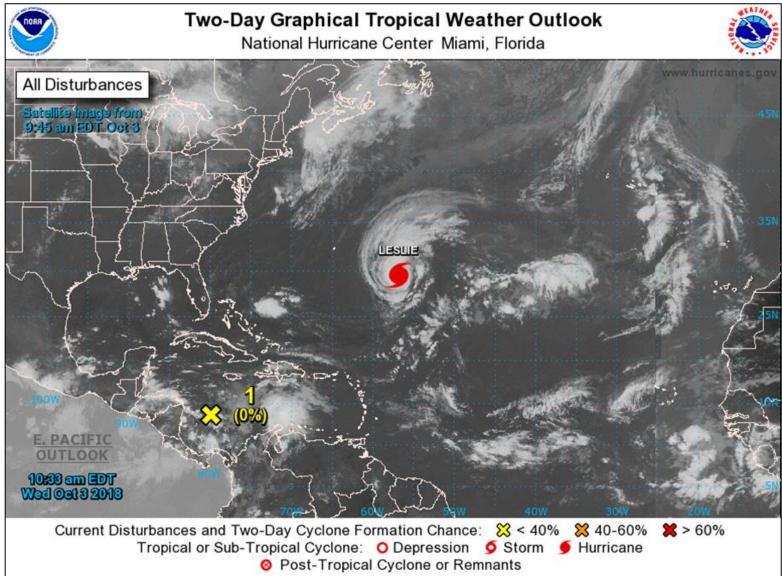


- Shows initial location of disturbance (X), if existing
- Shows formation potential during next 5 days
 - Shading represents the potential formation area
- What's the chance these areas form in the next 5 days?



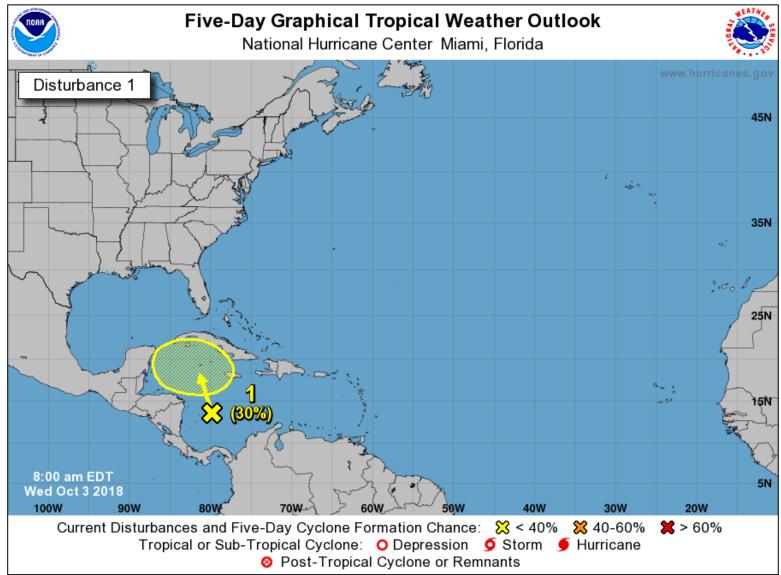


- October 3
 - 2 Day 0%
 - 5 Day 30%



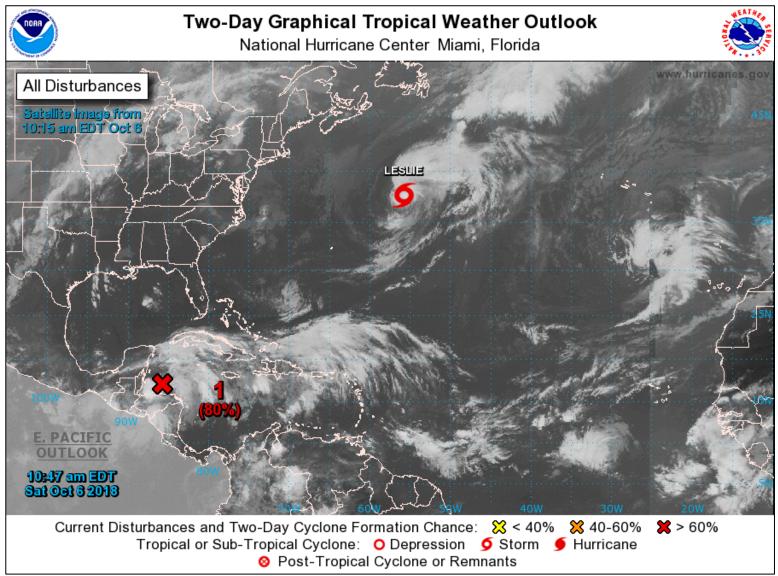


- October 3
 - 2 Day 0%
 - 5 Day 30%



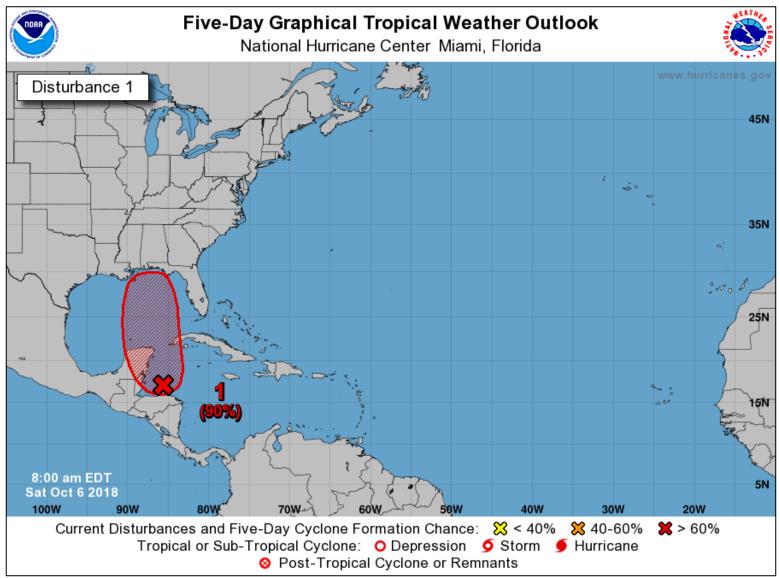


- October 6
 - 2 Day 80%
 - 5 Day 90%

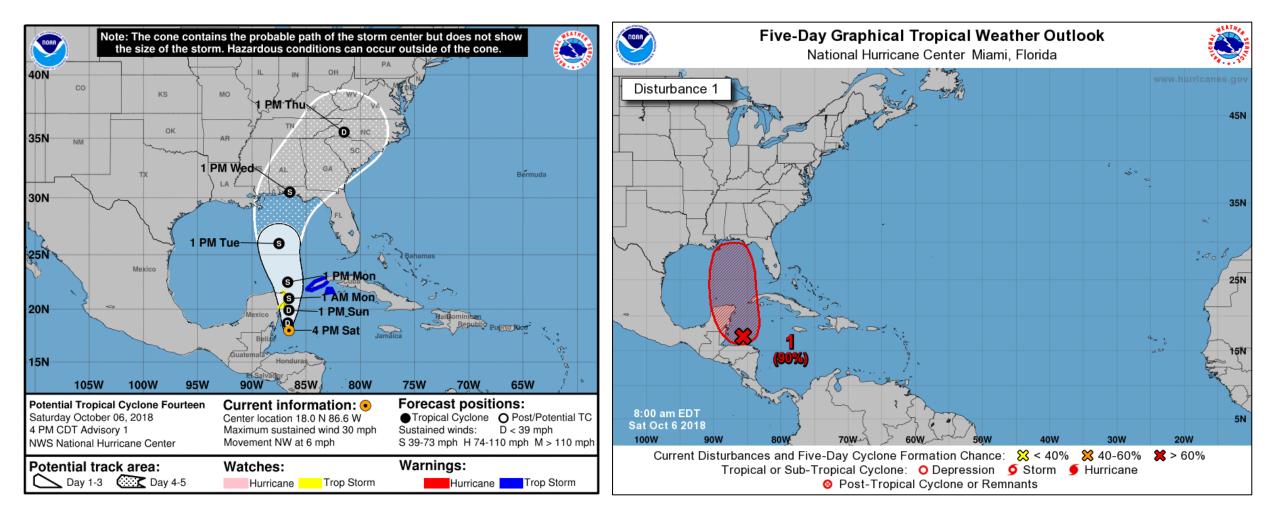




- October 6
 - 2 Day 80%
 - 5 Day 90%







Special Tropical Weather Outlook 1



NATIONAL HURRICANE CENTER

SPECIAL TROPICAL WEATHER OUTLOOK NWS NATIONAL HURRICANE CENTER MIAMI FL 430 PM EDT MON JUN 30 2014

Special outlook issued to update discussion of the area of low pressure east of Florida.

Updated: An Air Force Reserve unit reconnaissance aircraft is investigating the area of low pressure centered about 110 miles east of Melbourne, Florida. While the low is well defined, the associated thunderstorm activity is just below the organizational threshold required to initiate tropical cyclone advisories. Environmental conditions continue to be favorable for development, and only a slight increase in the organization and persistence of the thunderstorm activity would result in the formation of a tropical depression.

Data from the reconnaissance aircraft indicate that peak sustained winds with the low are about 30-35 mph. The low is moving southwestward at around 5 mph, but is expected to turn westward tonight and northward by Wednesday when it will be near the east coast of Florida. If this system becomes a tropical cyclone, a tropical storm watch could be required for portions of the central or northern Atlantic coast of Florida. A turn toward the northeast near the southeastern U.S. coast is expected by Thursday.

- * Formation chance through 48 hours...high...80 percent.
- * Formation chance through 5 days...high...80 percent.

Why is it being issued?

Special Tropical Weather Outlook 2





NATIONAL HURRICANE CENTER

SPECIAL TROPICAL WEATHER OUTLOOK NWS NATIONAL HURRICANE CENTER MIAMI FL 430 PM EDT MON JUN 30 2014

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What did the aircraft find?

Special Tropical Weather Outlook 3



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NATIONAL HURRICANE CENTER

SPECIAL TROPICAL WEATHER OUTLOOK NWS NATIONAL HURRICANE CENTER MIAMI FL 430 PM EDT MON JUN 30 2014

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Watches possible?

Tropical Weather Outlook – Poll Question



How often do you check the Tropical Weather Outlook during hurricane season?

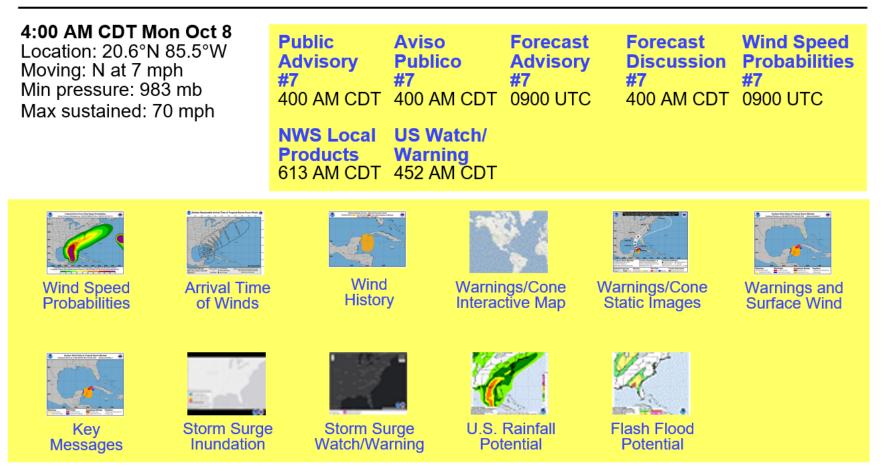
- A. Never
- B. Infrequently
- C. Once a day
- D. Multiple times a day

www.hurricanes.gov



Tropical Storm Michael S

...MICHAEL ALMOST A HURRICANE... ...HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND FLORIDA BIG BEND...



National Hurricane Center Advisories



Tropical Cyclones

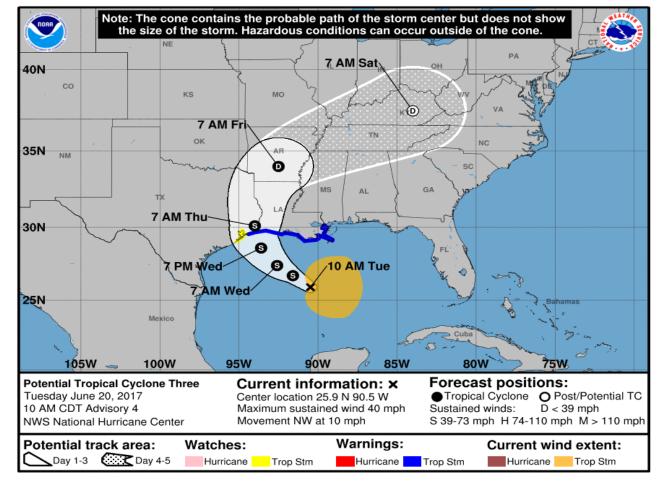
- Tropical Depressions
- Tropical Storms
- Hurricanes

Post-Tropical Cyclones

 Remains a threat to land (e.g., Sandy & Hermine)

Potential Tropical Cyclones

- Systems not yet a tropical cyclone
- Threat of TS-force winds to land within 48 hours. (Introduced in 2017)



Frequently Asked Questions – NHC Advisory Timeline



FAQs

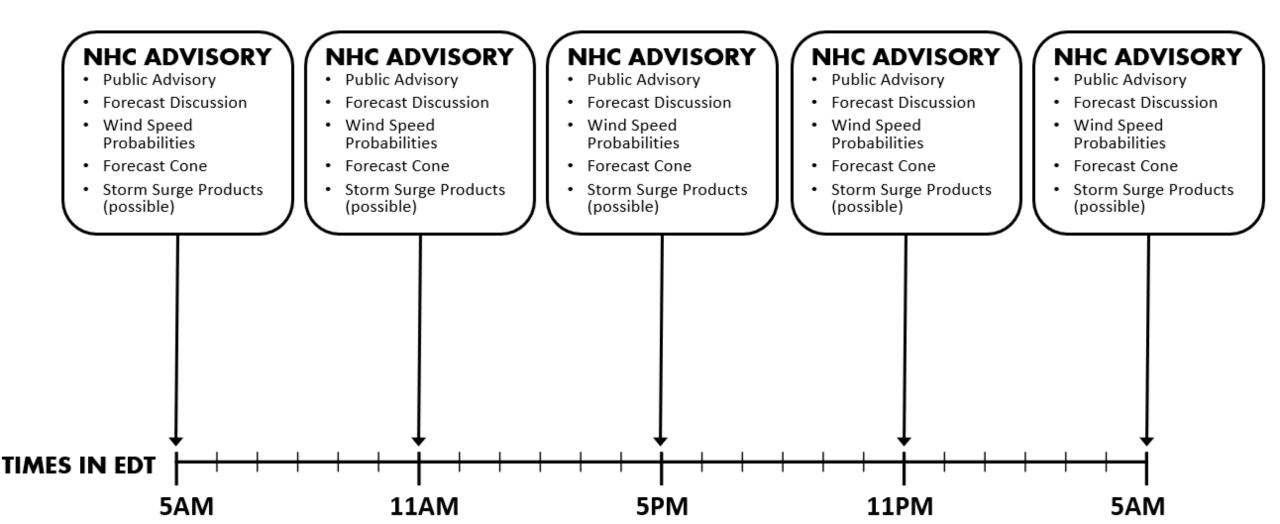
- When is new information available?
- When is a good time for a conference call?

NHC Advisory Timeline

NHC Advisory Timeline



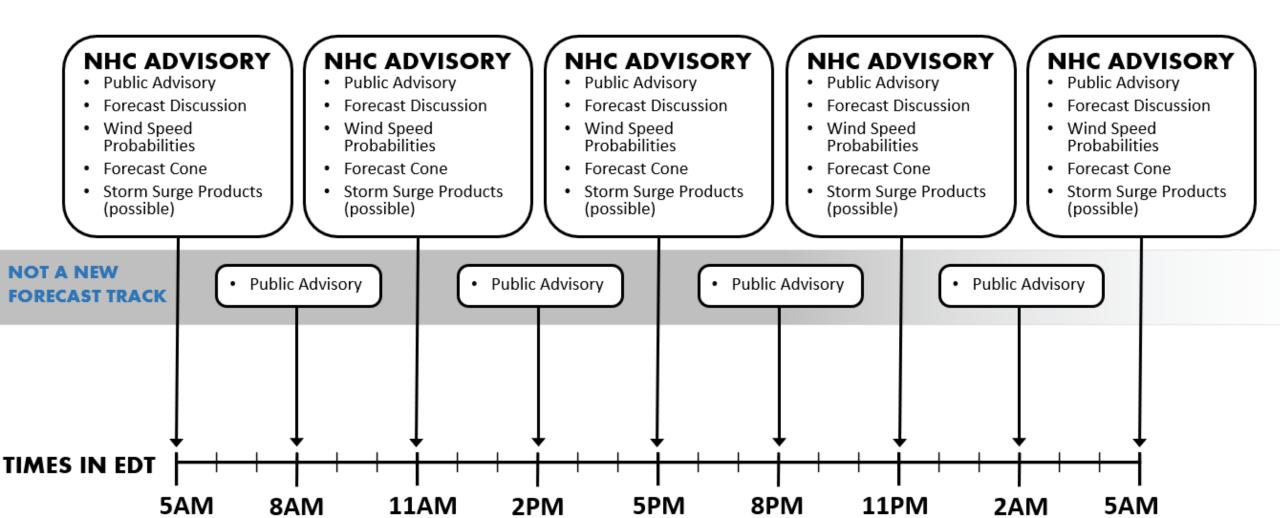
No Watches/Warnings



NHC Advisory Timeline – W/W



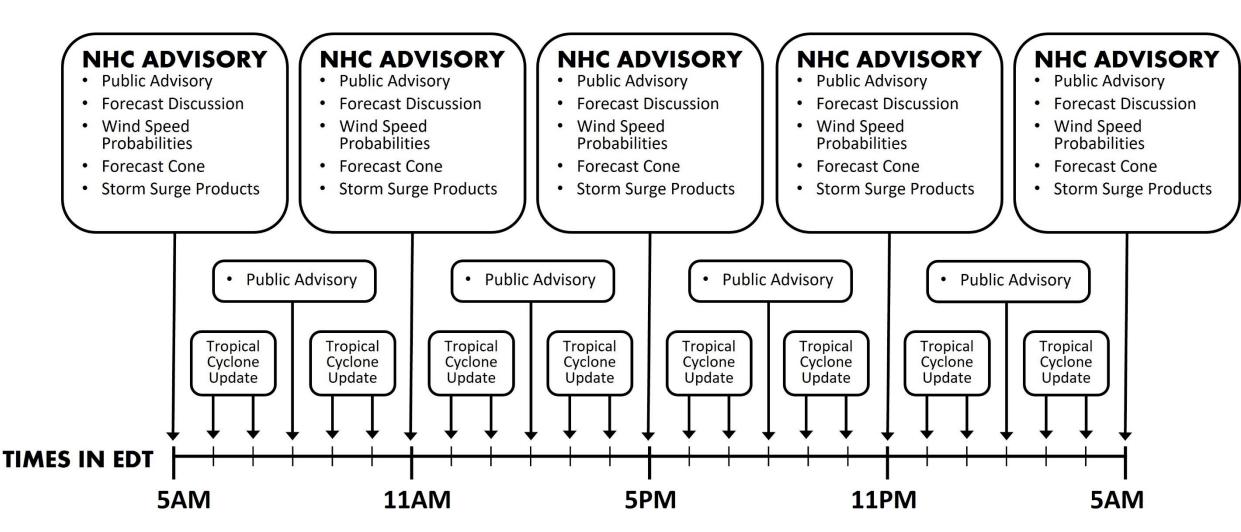
Watches/Warnings in effect



NHC Advisory Timeline – Eye Tracked



Watches/Warnings in effect and eye tracked by radar



Unscheduled Updates



Special Advisories

- Issued at any time whenever an unexpected significant change has occurred
 - Aircraft or satellite estimate finds storm is stronger than forecast
- When U.S. watches or warnings are issued between regularly scheduled advisories
 - Watches or Warnings may be discontinued on intermediate Public Advisories

Frequently Asked Questions – Public Advisory



FAQs

- How strong is the storm?
- What are the hazards?
- Are there any warnings?

• Public Advisory

Public Advisory – Location



NATIONAL HURRICANE CENTER	
Tropical Storm Michael Advisory Number 7 NWS National Hurricane Center Miami FL AL142018 400 AM CDT Mon Oct 08 2018	
MICHAEL ALMOST A HURRICANE HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND BIG BEND	
SUMMARY OF 400 AM CDT0900 UTCINFORMATION	
LOCATION20.6N 85.5W ABOUT 90 MI145 KM E OF COZUMEL MEXICO ABOUT 100 MI155 KM SSW OF THE WESTERN TIP OF CUBA MAXIMUM SUSTAINED WINDS70 MPH110 KM/H	2
PRESENT MOVEMENTN OR 360 DEGREES AT 7 MPH11 KM/H MINIMUM CENTRAL PRESSURE983 MB29.03 INCHES	
WATCHES AND WARNINGS	
A Storm Surge Watch is in effect for * Navarre Florida to Anna Maria Island Florida, including Tampa Bay	
A Hurricane Watch is in effect for * Alabama-Florida border to Suwanee River Florida	
A Tropical Storm Watch is in effect for * Suwanee River to Anna Maria Island Florida, including Tampa Bay * Alabama-Florida border to the Mississippi-Alabama border	

Public Advisory – Strength



NATIONAL HURRICANE CENTER	
Tropical Storm Michael Advisory Number 7 NWS National Hurricane Center Miami FL AL142018 400 AM CDT Mon Oct 08 2018	
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Public Advisory – Watches/Warnings



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NWS	opical Storm Michael Advisory Number 7 S National Hurricane Center Miami FL AL142018 0 AM CDT Mon Oct 08 2018
	.MICHAEL ALMOST A HURRICANE .HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND BIG BEND
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A Tropical Storm Watch is in effect for...

- * Suwanee River to Anna Maria Island Florida, including Tampa Bay
- * Alabama-Florida border to the Mississippi-Alabama border

Watches or Warnings?

Public Advisory – Track Forecast



NATIONAL HURRICANE CENTER

DISCUSSION AND OUTLOOK

At 400 AM CDT (0900 UTC), the center of Tropical Storm Michael was located by an Air Force Reserve Hurricane Hunter aircraft near latitude 20.6 North, longitude 85.5 West. Michael is moving toward the north near 7 mph (11 km/h). A northward motion at a slightly faster forward speed is expected through Tuesday night, followed by a northeastward motion on Wednesday and Thursday. On the forecast track, the center of Michael will move northward across the Yucatan Channel later today, and then across the eastern Gulf of Mexico this evening through Wednesday. Michael is expected to move inland over the Florida Panhandle or Florida Big Bend area on Wednesday, and then move northeastward across the southeastern United States Wednesday night and Thursday.

Data from the Hurricane Hunter aircraft indicate that maximum sustained winds have increased to near 70 mph (110 km/h) with higher gusts. Additional strengthening is forecast, and Michael is expected to become a hurricane later today. Michael is forecast to be near or at major hurricane strength when it reaches the northeastern Gulf of Mexico Tuesday night and Wednesday.

Tropical-storm-force winds extend outward up to 175 miles (280 km) from the center.

The minimum central pressure based on aircraft data is 983 mb (29.03 inches).

Where is the storm headed?

Public Advisory – Intensity Forecast



8

NATIONAL HURRICANE CENTER

DISCUSSION AND OUTLOOK

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Tropical-storm-force winds extend outward up to 175 miles (280 km) from the center.

The minimum central pressure based on aircraft data is 983 mb (29.03 inches).

Covers a 3-day period

Forecast to weaken? Strengthen?

Public Advisory – Surge Forecast



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🖉 🔭 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HAZARDS AFFECTING LAND

STORM SURGE: The combination of a dangerous storm surge and the tide will cause normally dry areas near the coast to be flooded by rising waters moving inland from the shoreline. The water has the potential to reach the following heights above ground if peak surge occurs at the time of high tide...

Indian Pass to Crystal River...7-11 ft Crystal River to Anclote River...4-6 ft Okaloosa/Walton County Line to Indian Pass...4-7 ft Anclote River to Anna Maria Island including Tampa Bay...2-4 ft Navarre to Okaloosa/Walton County Line...2-4 ft

WIND: Hurricane conditions are expected across the far western part of the Cuban province of Pinar del Rio later today. Tropical storm conditions are expected across the remainder of the warning areas in Cuba and the Yucatan Peninsula later today.

Hurricane conditions are possible within the hurricane watch area along the U.S. Gulf coast by Wednesday, with tropical storm conditions possible by Tuesday night or early Wednesday. Tropical storm conditions are possible within the tropical storm watch area by Tuesday night or early Wednesday. How much storm surge is forecast?

Public Advisory – Rain Forecast



NATIONAL HURRICANE CENTER HAZARDS AFFECTING LAND WIND: Hurricane conditions are expected across the far western part of the Cuban province of Pinar del Rio later today. Tropical storm conditions are expected across the remainder of the warning areas in Cuba and the Yucatan Peninsula later today. Hurricane conditions are possible within the hurricane watch area along the U.S. Gulf coast by Wednesday, with tropical storm conditions possible by Tuesday night or early Wednesday. Tropical storm conditions are possible within the tropical storm watch area by Tuesday night or early Wednesday. **RAINFALL:** Michael is expected to produce the following rainfall amounts through Wednesday night... Florida Panhandle and Big Bend into southern Georgia...4 to 8 inches, with isolated maximum amounts of 12 inches. This rainfall may lead to life threatening flash floods. Florida Keys...2 to 4 inches. Yucatan Peninsula...1 to 2 inches.

How much rain is forecast?

Frequently Asked Questions – Forecast Discussion



FAQs

- How confident are the forecasters?
- Key messages?

Forecast Discussion

Forecast Discussion



Tropical Storm Michael Discussion Number 7	
NWS National Hurricane Center Miami FLAL142018400 AM CDT Mon Oct 08 2018	
An Air Force Reserve Hurricane Hunter aircraft made several passes through the system and found that the central pressure has	• Forecast reasonin
fallen to about 983 mb and maximum winds have increased to near 60 kt. This increase in intensity indicates that despite the shear, Michael has by definition rapidly intensified during the	Relevant Observations
past 24 hours. Decreasing vertical shear and very warm sea surface temperatures are expected to support continued	Model Guidance
strengthening, and due to the favorable conditions, the NHC intensity forecast follows a blend of the IVCN consensus and the HCCA model. This new official forecast brings the intensity to just below major hurricane strength in 48 hours, and since the	• Forecast Uncertainties
storm will still be over water for a time between 48 and 72 hours, there is a real possibility that Michael will strengthen to a major hurricane before landfall.	

Nearly all of the track models have shifted westward after 24 hours, which left the previous forecast near the eastern edge of the guidance envelope. Due to this shift, the new NHC track forecast has also been adjusted westward close to the consensus aids. Overall the track guidance is in fairly good agreement up until landfall along the Florida Panhandle or Florida Big Bend, which has yielded a fairly confident track forecast.

Forecast Discussion - Key Messages



NATIONAL HURRICANE CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Key Messages:

1. Hurricane conditions are expected over portions of western Cuba, where a hurricane warning is now in effect. Tropical storm conditions are expected over the northeastern Yucatan Peninsula and the Isle of Youth today.

2. Michael is expected to produce heavy rainfall and flash flooding over portions of western Cuba and the northeastern Yucatan Peninsula of Mexico during the next couple of days.

3. Michael is forecast to be a hurricane, and possibly a major hurricane, when it reaches the northeastern Gulf Coast by midweek, and storm surge and hurricane watches are now in effect for portions of the area. Some areas along the Florida Gulf Coast are especially vulnerable to storm surge, regardless of the storm's exact track or intensity. Residents in the watch areas should monitor the progress of this system and follow any advice given by local officials.

Key Messages

• Forecast Confidence

• Highlight Threats

Key Messages



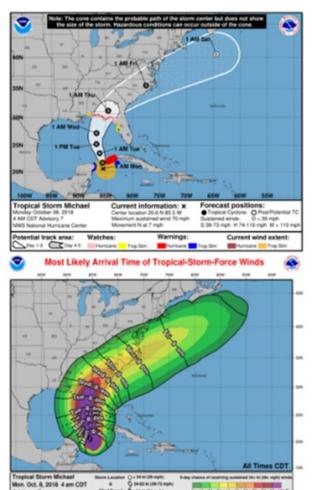


Key Messages for Tropical Storm Michael Advisory 7: 4:00 AM CDT Mon Oct 08, 2018

1. Hurricane conditions are expected over portions of western Cuba, where a hurricane warning is now in effect. Tropical storm conditions are expected over the northeastern Yucatan Peninsula and the Isle of Youth today.

2. Michael is expected to produce heavy rainfall and flash flooding over portions of western Cuba and the northeastern Yucatan Peninsula of Mexico during the next couple of days.

3. Michael is forecast to be a hurricane, and possibly a major hurricane, when it reaches the northeastern Gulf Coast by mid-week, and storm surge and hurricane watches are now in effect for portions of the area. Some areas along the Florida Gulf Coast are especially vulnerable to storm surge, regardless of the storm's exact track or intensity. Residents in the watch areas should monitor the progress of this system and follow any advice given by local officials.



Forecast Discussion – Positions and Intensity



NATIONAL HURRICANE CENTER

3. Michael is forecast to be a hurricane, and possibly a major hurricane, when it reaches the northeastern Gulf Coast by midweek, and storm surge and hurricane watches are now in effect for portions of the area. Some areas along the Florida Gulf Coast are especially vulnerable to storm surge, regardless of the storm's exact track or intensity. Residents in the watch areas should monitor the progress of this system and follow any advice given by local officials.

FORECAST POSITIONS AND MAX WINDS

INIT	08/0900Z	20.6N	85.5W	60	ΚT	70	MPH
12H	08/1800Z	21.7N	85.6W	70	ΚT	80	MPH
24H	09/0600Z	23.5N	86.1W	85	ΚT	100	MPH
36H	09/1800Z	25.2N	86.7W	90	ΚT	105	MPH
48H	10/0600Z	27.2N	86.7W	95	ΚT	110	MPH
72H	11/0600Z	31.2N	84.5W	55	ΚT	65	MPHINLAND
96H	12/0600Z	35.5N	77.5W	50	ΚT	60	MPHINLAND
120H	13/0600Z	40.5N	64.5W	50	ΚT	60	MPHPOST-TROP/EXTRATROP

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Forecaster Berg

NNNN



Table of track andintensity forecasts

Frequently Asked Questions – Forecast Advisory



FAQs

- How large is the storm?
- Where is the storm headed?

Forecast Advisory

Forecast Advisory





NATIONAL HURRICANE CENTER

TROPICAL STORM MICHAEL FORECAST/ADVISORY NUMBER 7 NWS NATIONAL HURRICANE CENTER MIAMI FL AT 142018 0900 UTC MON OCT 08 2018

A TROPICAL STORM WATCH HAS BEEN ISSUED FROM THE SUWANEE RIVER TO ANNA MARIA ISLAND FLORIDA...INCLUDING TAMPA BAY.

SUMMARY OF WATCHES AND WARNINGS IN EFFECT...

A STORM SURGE WATCH IS IN EFFECT FOR ... * NAVARRE FLORIDA TO ANNA MARIA ISLAND FLORIDA...INCLUDING TAMPA BAY

A HURRICANE WATCH IS IN EFFECT FOR ... ALABAMA-FLORIDA BORDER TO SUWANEE RIVER FLORIDA

A TROPICAL STORM WATCH IS IN EFFECT FOR ... * SUWANEE RIVER TO ANNA MARIA ISLAND FLORIDA...INCLUDING TAMPA BAY * ALABAMA-FLORIDA BORDER TO THE MISSISSIPPI-ALABAMA BORDER

TROPICAL STORM CENTER LOCATED NEAR 20.6N 85.5W AT 08/0900Z POSITION ACCURATE WITHIN 15 NM

PRESENT MOVEMENT TOWARD THE NORTH OR 360 DEGREES AT 6 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 983 MB MAX SUSTAINED WINDS 60 KT WITH GUSTS TO 75 KT. 50 KT..... 80NE 80SE ONW. OSW

Only source for all the forecast data

Watches and Warnings

Data is used in HURREVAC and other commercial tracking software

Forecast Advisory – Wind Radii 1



🔿 🔊 NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATIO A TROPICAL STORM WATCH IS IN EFFECT FOR ... * SUWANEE RIVER TO ANNA MARIA ISLAND FLORIDA...INCLUDING TAMPA BAY * ALABAMA-FLORIDA BORDER TO THE MISSISSIPPI-ALABAMA BORDER TROPICAL STORM CENTER LOCATED NEAR 20.6N 85.5W AT 08/0900Z POSITION ACCURATE WITHIN 15 NM PRESENT MOVEMENT TOWARD THE NORTH OR 360 DEGREES AT 6 KT ESTIMATED MINIMUM CENTRAL PRESSURE 983 MB MAX SUSTAINED WINDS 60 KT WITH GUSTS TO 75 KT. 50 KT..... 80NE 80SE OSW ONW. 34 KT.....120NE 150SE 90SW 100NW. 12 FT SEAS..135NE 120SE 30SW 60NW. WINDS AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT. REPEAT...CENTER LOCATED NEAR 20.6N 85.5W AT 08/0900Z AT 08/0600Z CENTER WAS LOCATED NEAR 20.2N 85.5W FORECAST VALID 08/1800Z 21.7N 85.6W MAX WIND 70 KT...GUSTS 85 KT. 64 KT... 30NE 30SE OSW ONW. 50 KT... 90NE 90SE 30SW 30NW. 34 KT...130NE 150SE 90SW 120NW. FORECAST VALID 09/0600Z 23.5N 86.1W

Current wind radii

Forecast wind radii

43

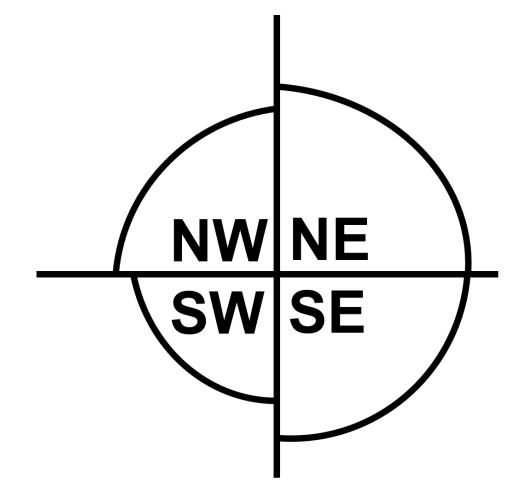
Forecast Advisory - Wind Radii 2



NHC forecasts cyclone size via wind radii in four quadrants

64 KT - 30NE 40SE 0SW 0NW 50 KT - 80NE 70SE 40SW 40NW 34 KT - 150NE 150SE 140SW 100NW

Radii represent the largest distance from the center in a quadrant

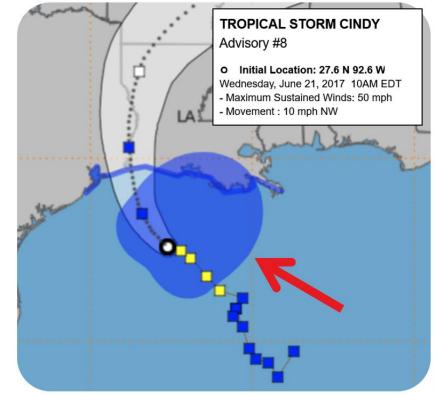


Forecast Advisory – Knowledge Check



What does the blue area around the center of Cindy represent?

- A. Tropical storm winds are occurring everywhere in the blue area
- B. Area with a two-thirds chance of experiencing tropical storm force winds
- C. Maximum extent of tropical storm winds
- D. Area where hurricane winds are occurring

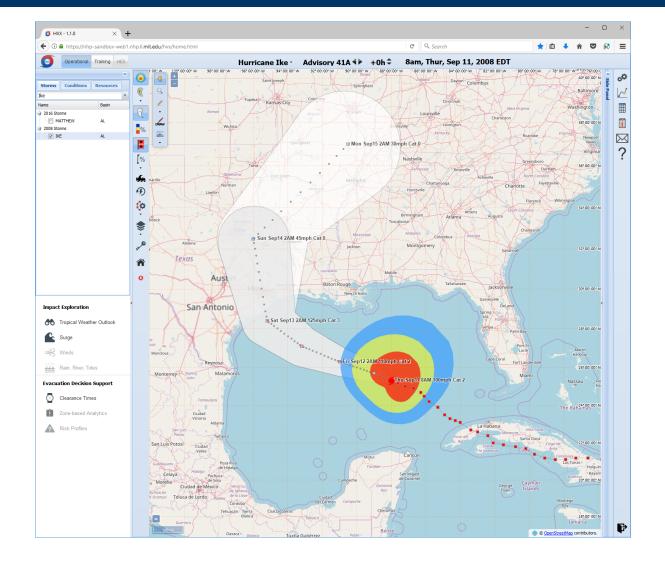


Wind Radii



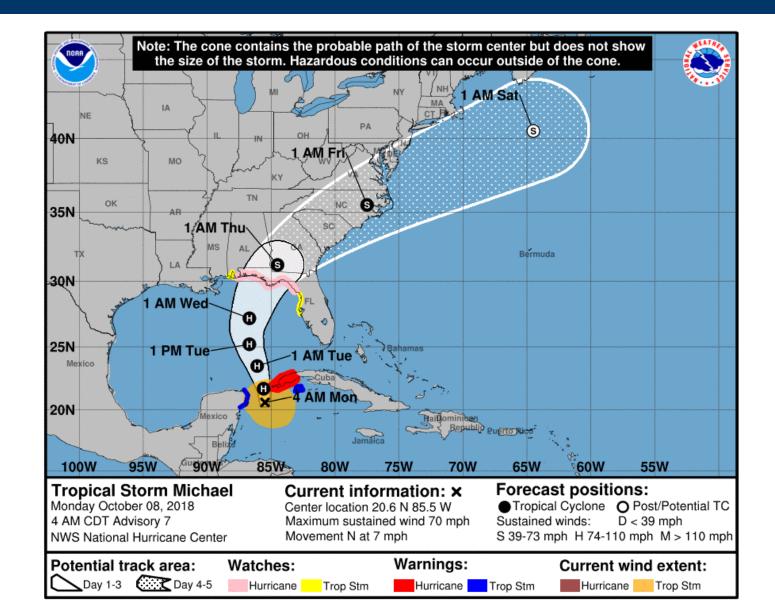
FORECAST TIME

	34 kt (Blue)	50 kt (Yellow)	64 kt (Red)
12 hr	Yes	Yes	Yes
24 hr	Yes	Yes	Yes
36 hr	Yes	Yes	Yes
48 hr	Yes	Yes	Yes
72 hr	Yes	Yes	N/A
96 hr	N/A	N/A	N/A
120 hr	N/A	N/A	N/A



Forecast Error Cone



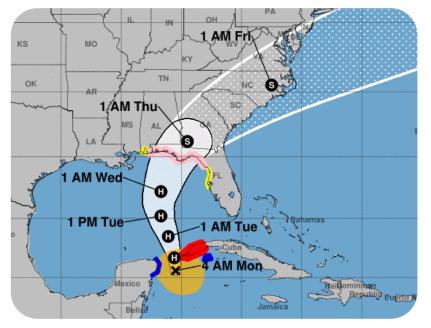


Forecast Error Cone – Knowledge Check



Which one of the following is used to construct the size of the NHC forecast error cone?

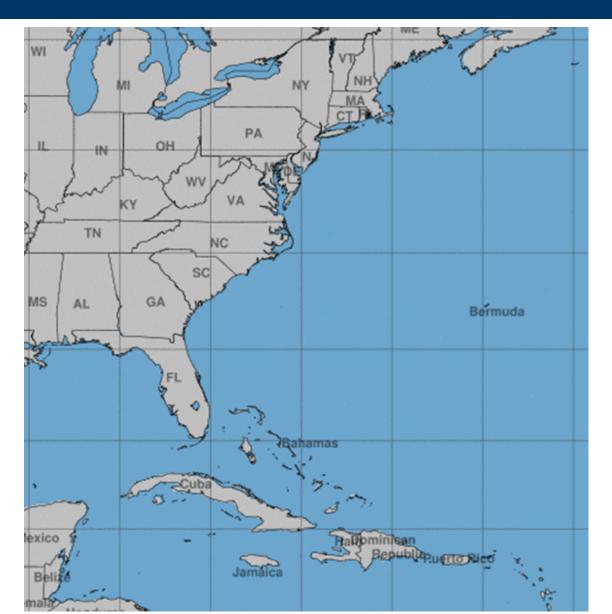
- A. Possible impact areas
- B. Size of the wind field
- C. Model spread
- D. Past 5 years of track forecast error



Forecast Error Cone Explained



- Probable track of the center of the tropical cyclone
- Formed by connecting circles centered on each forecast point
- Each circle uses NHC historical (5-year) track errors
- Actual storm position will be within the circle 67% of the time



Not In The Cone: No Worries?



ERROR CONE

- Only displays information about track uncertainty
- Nothing about specific impacts
- Impacts can occur well outside the area enclosed by the cone
- Center is expected to be outside the cone about 1/3 of the time



Frequently Asked Questions – WSP



FAQs

- Chance for some effects?
- Are staging areas at risk?
- When is the earliest TS winds could begin?

Wind Speed Probabilities

Wind Speed Probabilities – Text Product 1

TROPICAL STORM MICHAEL WIND SPEED PROBABILITIES NUMBER 7 NWS NATIONAL HURRICANE CENTER MIAMI FL AL142018 0900 UTC MON OCT 08 2018 - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS -FROM FROM FROM FROM FROM FROM FROM 06Z MON 18Z MON 06Z TUE 18Z TUE 06Z WED 06Z THU 06Z FRI TIME PERIODS TO TO TO TO TO TO TO 18Z MON 06Z TUE 18Z TUE 06Z WED 06Z THU 06Z FRI 06Z SAT FORECAST HOUR (12)(24)(36)(48)(72)(96)(120)LOCATION KT TALLAHASSEE FL 34 1(1)X(81) Х X(X) 6(7)68(75) 6(81) TALLAHASSEE FL X(X) X(X) 1(1)41 (42) 6(48)X(48) X 50 X(X) TALLAHASSEE FL 64 X X(X) X(X) 20(20)4(24)X(24) 5 (5) APALACHICOLA X(X) 29(34)57 (91) 1(92)X(92) 34 Х APALACHICOLA 50 X X(X) X(X) 6(6) 59(65) 2(67)X(67) 64 X X(X) X(X) 1(1)39(40) APALACHICOLA 1(41)X(41) 4 (4) X(X) 26(30)60(90)1(91)X(91) PANAMA CITY FL 34 X PANAMA CITY FL 50 X(X) X(X) 6(6) 57 (63) 1(64)X(64) X PANAMA CITY FL 64 X X(X) X(X) 1(1)37 (38) X(38) X(38)

🚫 NATIONAL HURRICANE CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

- Tropical-Storm-Force
- •58 mph
- Hurricane-Force



Wind Speed Probabilities – Text Product 2



NATIONAL HURRICANE CENTER

TROPICAL STORM MICHAEL WIND SPEED PROBABILITIES NUMBER7NWS NATIONAL HURRICANE CENTER MIAMI FLAL1420180900 UTC MON OCT 08 20180

- - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS - - - -

TIME PERIODS	FROM 06Z MON TO 18Z MON	FROM 18Z MON TO 06Z TUE	FROM 06Z TUE TO 18Z TUE	FROM 18Z TUE TO 06Z WED	FROM 06Z WED TO 06Z THU	FROM 06Z THU TO 06Z FRI	FROM 06Z FRI TO 06Z SAT
FORECAST HOUR	(12) (24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT						
TALLAHASSEE F	'L 34 X	X(X)	1(1)	6(7)	68(75)	6(81)	X(81)
TALLAHASSEE F	L 50 X	X(X)	X(X)	1(1)	41(42)	6(48)	X(48)
TALLAHASSEE F	'L 64 X	X(X)	X(X)	X(X)	20(20)	4(24)	X(24)
APALACHICOLA	34 X	X(X)	5(5)	29(34)	57(91)	1(92)	X(92)
APALACHICOLA	50 X	X(X)	X(X)	6(6)	59(65)	2(67)	X(67)
APALACHICOLA	64 X	X(X)	X(X)	1(1)	39(40)	1(41)	X(41)
PANAMA CITY F	'L 34 X	X(X)	4 (4)	26(30)	60(90)	1(91)	X(91)
PANAMA CITY F	'L 50 X	X(X)	X(X)	6(6)	57(63)	1(64)	X(64)
PANAMA CITY F	'L 64 X	X(X)	X(X)	1(1)	37(38)	X(38)	X(38)

- Tropical-Storm-Force
- •58 mph
- Hurricane-Force



Wind Speed Probabilities – Text Product 3

NATIONAL HURRICANE CENTER TROPICAL STORM MICHAEL WIND SPEED PROBABILITIES NUMBER 7 NWS NATIONAL HURRICANE CENTER MIAMI FL AL142018 0900 UTC MON OCT 08 2018 - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS -FROM FROM FROM FROM FROM FROM FROM 06Z MON 18Z MON 06Z TUE 18Z TUE 06Z WED 06Z THU 06Z FRI TIME PERIODS TO TO TO TO TO TO TO 18Z MON 06Z TUE 18Z TUE 06Z WED 06Z THU 06Z FRI 06Z SAT (12) (24) FORECAST HOUR (36) (48) (72) (96)(120)LOCATION KT

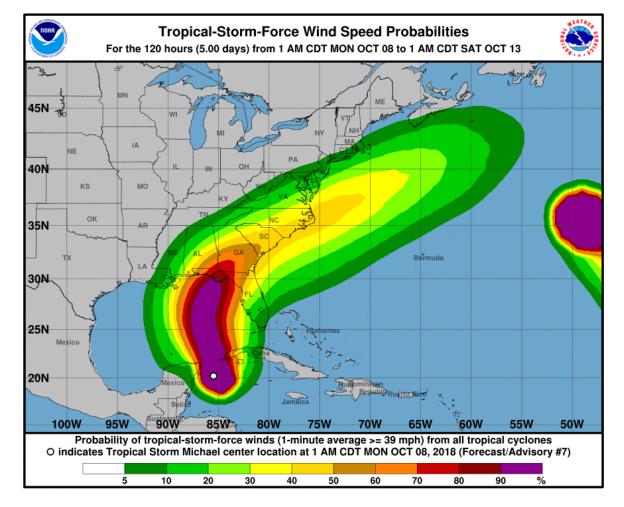
TALLAHASSEE FL	34 X	X (X)	1(1)	6(7)	68(75)	6(81)	X(81)
TALLAHASSEE FL	50 X	X (X)	X(X)	1(1)	41(42)	6(48)	X(48)
TALLAHASSEE FL	64 X	X (X)	X(X)	X(X)	20(20)	4(24)	X(24)
APALACHICOLA	34 X	X (X)	5(5)	29(34)	57(91)	1(92)	X(92)
APALACHICOLA	50 X	X (X)	X(X)	6(6)	59(65)	2(67)	X(67)
APALACHICOLA	64 X	X (X)	X(X)	1(1)	39(40)	1(41)	X(41)
PANAMA CITY FL	34 X	X(X)	4 (4)	26(30)	60 (90)	1(91)	X(91)
PANAMA CITY FL	50 X	X(X)	X (X)	6(6)	57 (63)	1(64)	X(64)
PANAMA CITY FL	64 X	X(X)	X (X)	1(1)	37 (38)	X(38)	X(38)

- Tropical-Storm-Force
- •58 mph
- Hurricane-Force



5-Day Cumulative Graphic: TS-Force

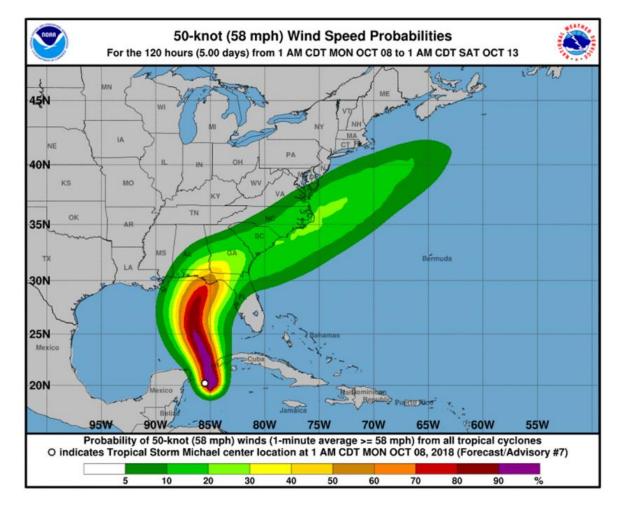




- Tropical Storm-Force
- 58 mph ("Strong" Tropical Storm)
- Hurricane-Force

5-Day Cumulative Graphic: 58 mph

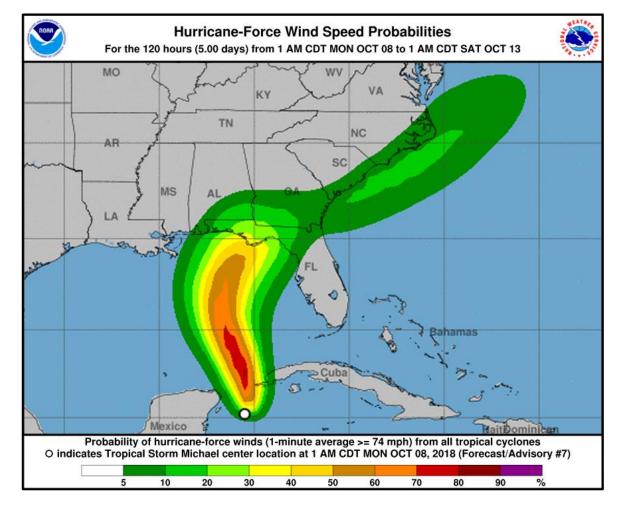




- Tropical Storm-Force
- 58 mph ("Strong" Tropical Storm)
- Hurricane-Force

5-Day Cumulative Graphic: Hurricane-Force





- Tropical Storm-Force
- 58 mph ("Strong" Tropical Winds)
- Hurricane-Force



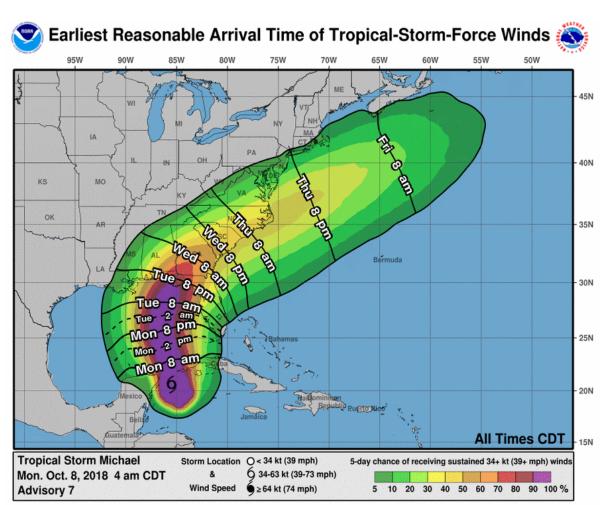


	NAL EANIC A		IUR			E C	ENTER	2		۲
	FRO	М	FR	MC	FF	ROM	FROM	FROM	FROM	FROM
TIME 0	6Z M	ON	18Z 1	MON	06Z	TUE	18Z TUE	06Z WED	06Z THU	06Z FRI
PERIODS	ТО		Т	С	Γ	0	ТО	ТО	ТО	ТО
1	8Z M	ON	06Z	ΓUΕ	18Z	TUE	06Z WED	06Z THU	06Z FRI	06Z SAT
FORECAST HOUR	(12)	(24)	((36)	(48)	(72)	(96)	(120)
LOCATION	KT									
CEDAR KEY FL	34	Х	Х (X)	3 ((3)	15(18)	43(61)	2(63)	X (63)
CEDAR KEY FL	50	Х	Χ(X)	Х	(X)	1(1)	20(21)	1(22)	X(22)
CEDAR KEY FL	64	Х	Χ(X)	X	(X)	X(X)	7(7)	1(8)	X (8)
TALLAHASSEE FL	34	Х	Х (X)	1 ((1)	6(7)	68(75)	6(81)	X (81)
TALLAHASSEE FL	50	Х	X (X)	Х	(X)	1(1)	41(42)	6(48)	X(48)
TALLAHASSEE FL	64	Х		X)	X	(X)	X(X)	20(20)	4 (24)	X (24)
APALACHICOLA	34	Х	Х (X)	5 ((5)	29(34)	57(91)	1(92)	x (92)
APALACHICOLA	50	X	Х (,	-	(X)	6(6)	59(65)	2(67)	X(52)
APALACHICOLA	64	Х	•	X)		(X)	1(1)	39(40)	1(41)	X(41)
PANAMA CITY FL		Х	V (v١	1	(4)	26(20)	60 (00)	1 (01)	x (01)
PANAMA CITY FL PANAMA CITY FL		X	X (л) Х)		(4) (X)	26(30) 6(6)	60(90) 57(63)	1(91) 1(64)	X(91) X(64)
PANAMA CITI FL PANAMA CITY FL		X		A) X)		(X)	1(1)	37 (38)	X (38)	
FANAMA CITI FL	04	Λ	Δ (Λ)			Τ(Τ)	57(50)	A(30)	X (38)
PENSACOLA FL	34	Х	Χ(X)	1 ((1)	8(9)	43(52)	2(54)	X <mark>(54)</mark>
PENSACOLA FL	50	Х	Χ(X)	Х	(X)	1(1)	20(21)	1(22)	X <mark>(22)</mark>
PENSACOLA FL	64	Х	Χ(X)	X	(X)	X(X)	9(9)	X(9)	X <mark>(9)</mark>

Earliest Reasonable Onset of TS Winds

Earliest Reasonable

- 10% chance of onset (Most conservative timing)
- Black Contours: Arrival time of TS winds
- Color fill: 5-day cumulative TS probabilities



FEMA

Most Likely Onset of TS Winds



Most Likely

- 50% chance of onset (Equally likely to occur before as after)
- Black Contours: Arrival time of TS winds
- Color fill: 5-day cumulative TS probabilities



Frequently Asked Questions – W/W



FAQs

- Where is the greatest concern?
- When will hurricane hazards begin?

Watches and Warnings

Storm Surge Watches/Warnings

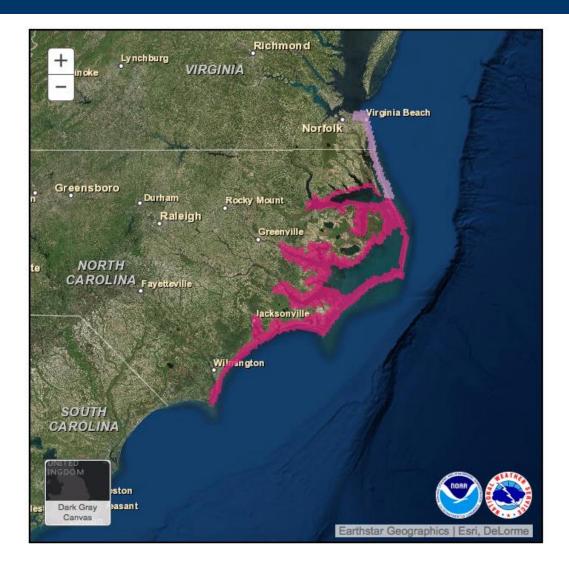


Storm Surge Watch

 There is the possibility of lifethreatening inundation, generally within 48 hours

Storm Surge Warning

 There is a danger of lifethreatening inundation, generally within 36 hours



Hurricane Watches/Warnings



Hurricane Watch

 Hurricane conditions are possible within the watch area, generally within 48 hours

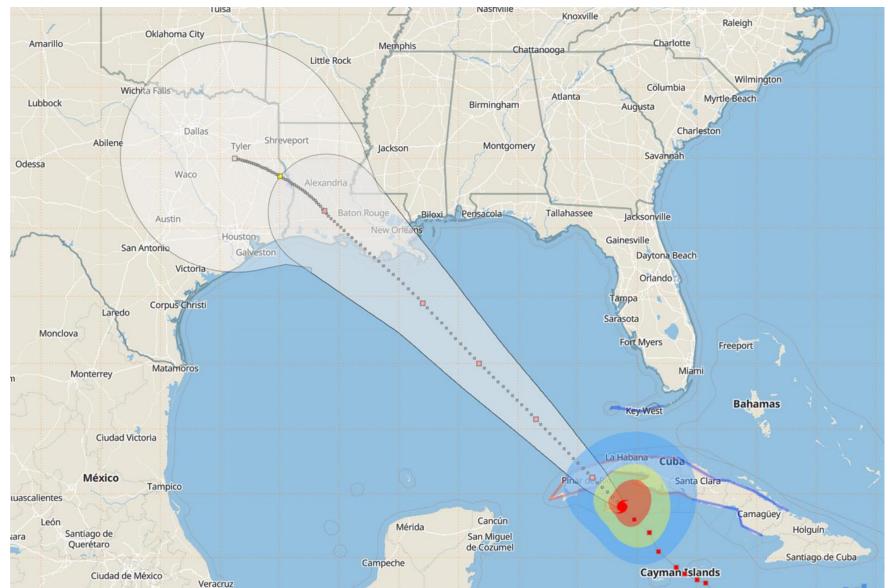
Hurricane Warning

 Hurricane conditions are expected within the warning area, generally within 36 hours



Take What Action, Where, and When?





NHC Forecast – Knowledge Check



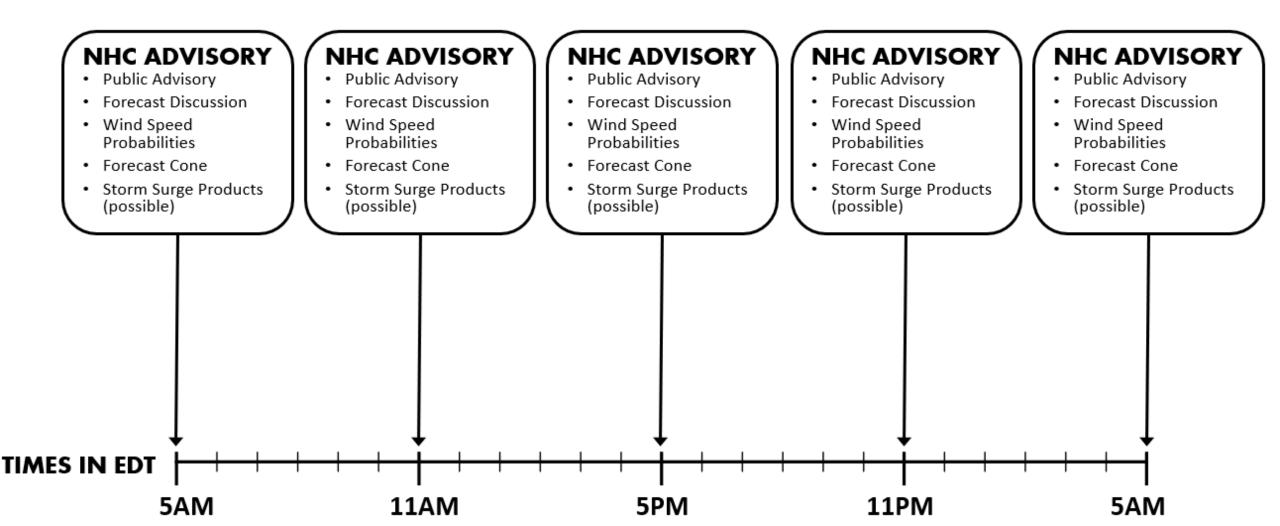
How often is a new NHC track and intensity forecast routinely issued?

- A. Every 3 hours
- B. Every 6 hours
- C. Every 8 hours
- D. Only when there is a change in the models

NHC Advisory Timeline 2



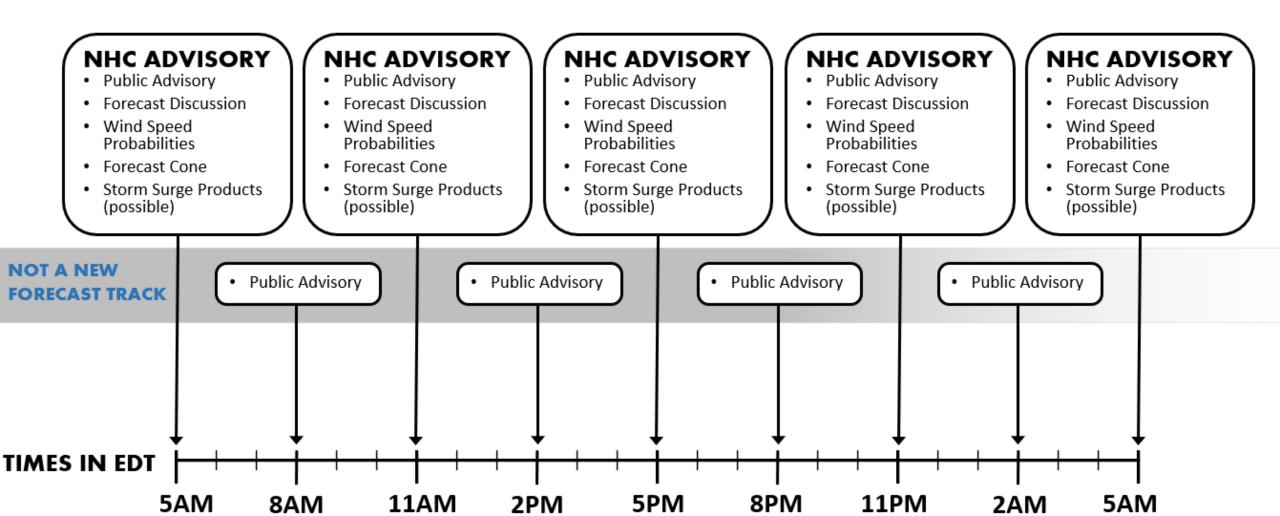
No Watches/Warnings



NHC Advisory Timeline – W/W 2



Watches/Warnings in effect



Intermediate Public Advisory





NATIONAL HURRICANE CENTER

Tropical Storm Michael Intermediate Advisory Number 7A NWS National Hurricane Center Miami FL AL142018 700 AM CDT Mon Oct 08 2018

...MICHAEL EXPECTED TO BECOME A HURRICANE VERY SOON...

SUMMARY OF 700 AM CDT...1200 UTC...INFORMATION _____

LOCATION...20.9N 85.1W ABOUT 70 MI...115 KM S OF THE WESTERN TIP OF CUBA MAXIMUM SUSTAINED WINDS...70 MPH...110 KM/H PRESENT MOVEMENT...N OR 5 DEGREES AT 7 MPH...11 KM/H MINIMUM CENTRAL PRESSURE...982 MB...29.00 INCHES

WATCHES AND WARNINGS

SUMMARY OF WATCHES AND WARNINGS IN EFFECT: A Storm Surge Watch is in effect for... * Navarre Florida to Anna Maria Island Florida, including Tampa Bay

A Hurricane Watch is in effect for... * Alabama-Florida border to Suwannee River Florida

A Tropical Storm Watch is in effect for ...

* Suwannee River to Anna Maria Island Florida, including Tampa Bay

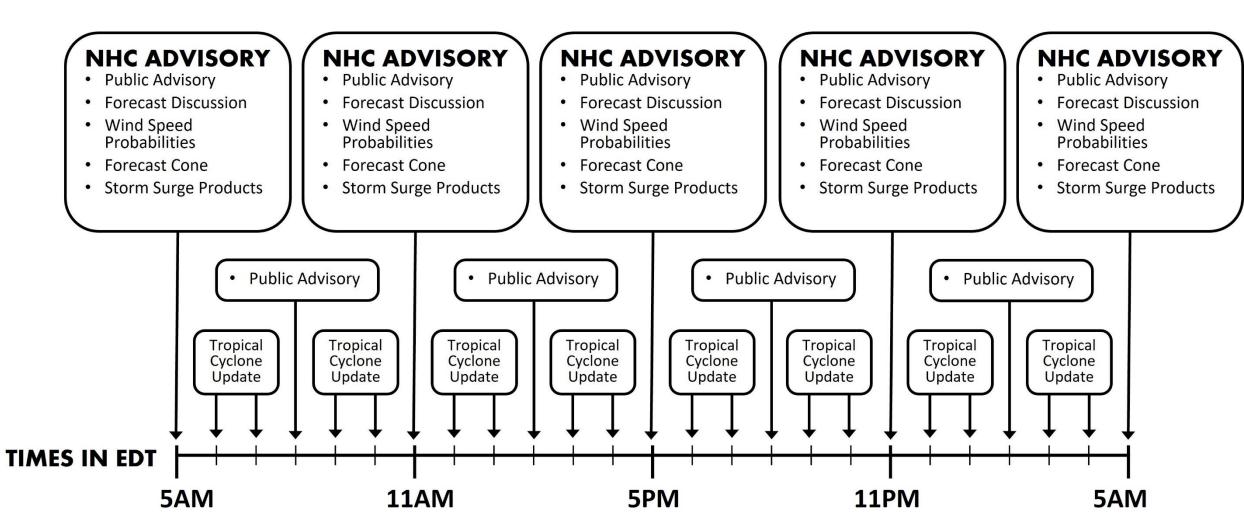
* Alabama-Florida border to the Mississippi-Alabama border

Similar content but issued **3 hours after complete** advisory package

✓ Watch or Warning in effect



Watches/Warnings in effect and eye tracked by radar



Tropical Cyclone Update



NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION Hurricane Michael Tropical Cyclone Update NWS National Hurricane Center Miami FL AL142018 1200 PM CDT Wed Oct 10 2018 ... EYEWALL OF MICHAEL COMING ASHORE ... Unexpected changes occur in the cyclone With the landfall of Michael's eye imminent, everyone in the landfall area is reminded not to venture out into the relative calm of the eye, hazardous winds will increase quickly as the eye passes! Cyclone landfall A weather station at the Gulf County Emergency Operations Center in Port St. Joe recently reported a wind gust of 106 mph (171 km/h). A Weatherflow station in St. Andrew Bay recently reported a sustained wind of 62 mph (100 km/h) and a wind gust of 77 mph (124 Issuing international km/h). The Apalachicola airport recently reported sustained winds of 63 mph (102 km/h) with a gust of 89 mph (143 km/h). watches and warnings Water levels continue to rise quickly along the Florida Panhandle coast. A National Ocean Service water level station at Apalachicola recently reported over 6.5 feet of inundation above ground level. 1-hourly position SUMMARY OF 1200 PM CDT...1700 UTC...INFORMATION estimates when a cyclone with an eye LOCATION...29.9N 85.7W ABOUT 15 MI...25 KM WSW OF MEXICO BEACH FLORIDA is nearing land MAXIMUM SUSTAINED WINDS...150 MPH...240 KM/H PRESENT MOVEMENT...NNE OR 15 DEGREES AT 14 MPH...22 KM/H MINIMUM CENTRAL PRESSURE...919 MB...27.14 INCHES \$\$ Forecaster Brown/Brennan NNNN

Frequently Asked Questions – Storm Surge



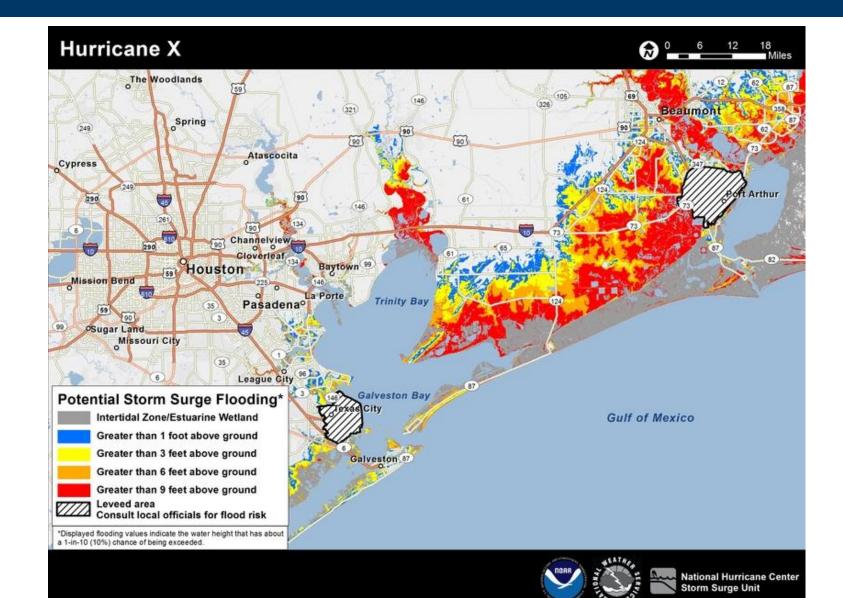
FAQs

- What areas will flood?
- How high could the water get?

Storm Surge Products

Potential Storm Surge Flooding Map

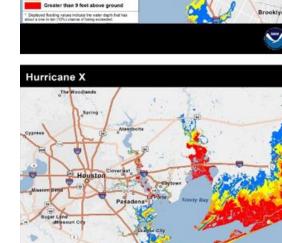




Potential Storm Surge Flooding Map 2

Inundation Map

- Height above ground that the water could reach
 - Reasonable worst-case scenario for any individual location
 - Values have a 10% chance of being exceeded
- Issued with Hurricane Watch
 - Sometimes with Tropical Storm watch
- Available 60+ minutes after the advisory release



Hurricane X

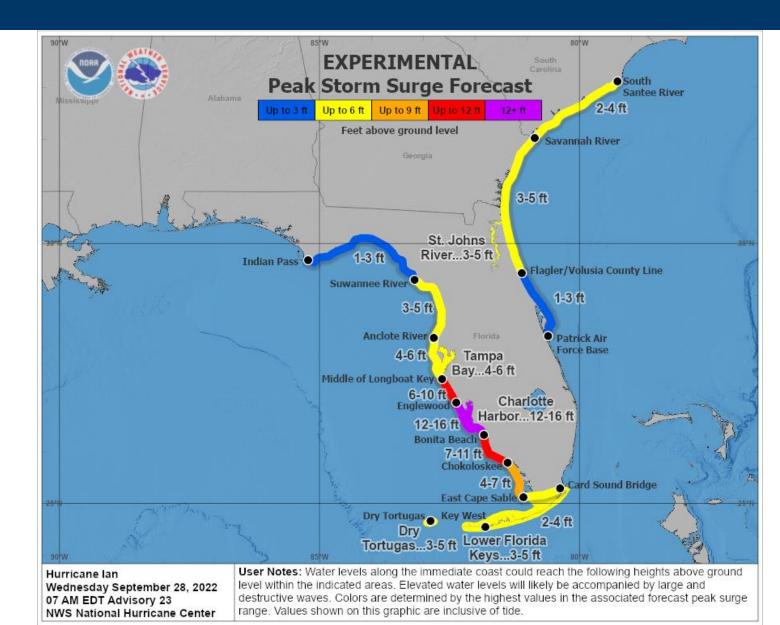


Gulf of Mexico



Peak Storm Surge Forecast Graphic





Frequently Asked Questions – Rainfall



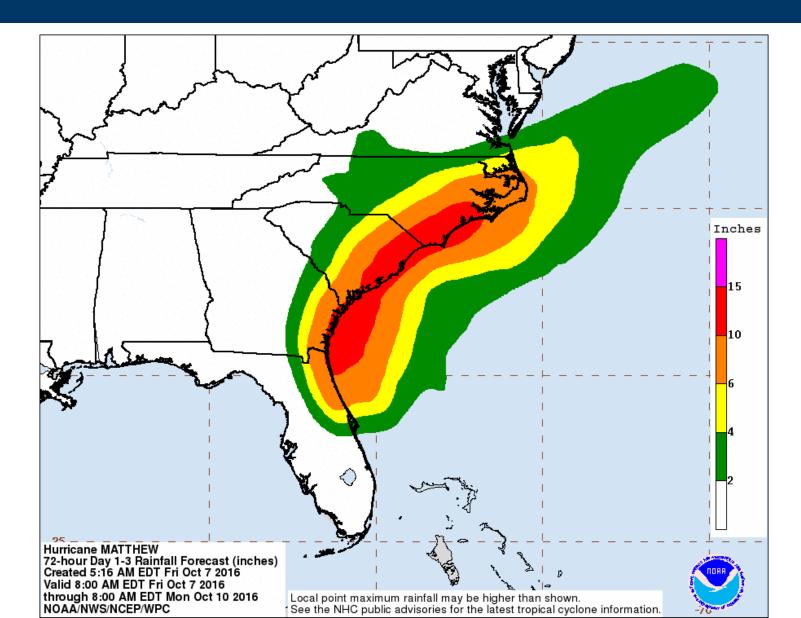
FAQs

- What areas will flood?
- How much rain is forecast?

Rainfall Products

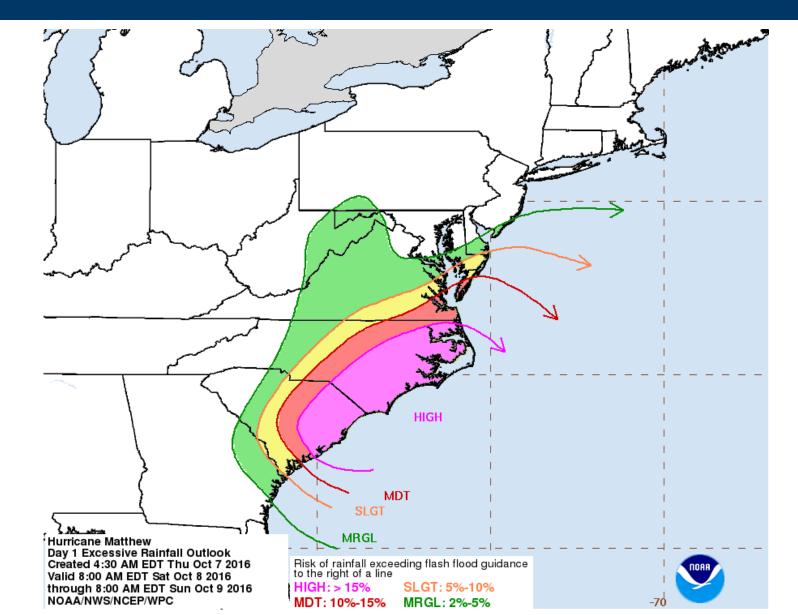
Rainfall Forecast





Excessive Rainfall Outlook (ERO)





Excessive Rainfall Outlook (ERO) 2

High Risk Days

• About 4% of days (Includes tropical and non-tropical events)

What happens during High-Risk days?

- 46% have at least 1 fatality or injury
- 62% have at least \$1 million in damages Stats from 2010 to 2020





Excessive Rainfall Outlook (ERO) 3

High Risk Days

• About 4% of days (Includes tropical and non-tropical events)

High Risk Accounts for:

- 39% of Flood Fatalities
- 83% of Flood Damages

Stats from 2010 to 2020

Fatalities Damages High High Risk Risk flood-related flood-related fatalities damages



Frequently Asked Questions – NWS



FAQs

- Local impacts?
- Localized forecast information?
- Inland Watches and Warnings?
 - NWS Forecast Offices

Hurricane Local Statements 1





NATIONAL HURRICANE CENTER

HURRICANE WILMA LOCAL STATEMENT ADVISORY NUMBER 32 NATIONAL WEATHER SERVICE MIAMI FL AL242005 530 AM EDT SUN OCT 23 2005

THIS PRODUCT COVERS MAINLAND SOUTH FLORIDA

EXTENSIVE TO DEVASTATING DAMAGE AND LIFE-THREATENING CONDITIONS EXPECTED AS HURRICANE WILMA MOVES NORTHEAST ACROSS SOUTH FLORIDA

NEW INFORMATION

* CHANGES TO WATCHES AND WARNINGS:

- A HURRICANE WATCH HAS BEEN UPGRADED TO A HURRICANE WARNING FOR MIAMI-DADE...BROWARD...PALM BEACH...COLLIER...GLADES AND MONROE COUNTIES

* CURRENT WATCHES AND WARNINGS:

- A HURRICANE WARNING IS IN EFFECT FOR MIAMI -DADE...BROWARD...PALM BEACH...COLLIER...HENDRY...GLADES AND MAINLAND MONROE COUNTIES

- * STORM INFORMATION:
- ABOUT 405 MI SW OF NAPLES FL
- 22.1N 86.6W
- STORM INTENSITY 100 MPH WITH HIGHER GUSTS
- MOVING NORTHEAST AT 3 MPH

SITUATION OVERVIEW

EXTREMELY DANGEROUS HURRICANE WILMA IS EXPECTED TO IMPACT SOUTH FLORIDA BEGINNING THIS EVENING. THE MAIN CONCERN IS FOR LIFE-THREATENING INUNDATION IN SURGE-PRONE AREAS OF COLLIER/MAINLAND

Issued by local NWS office

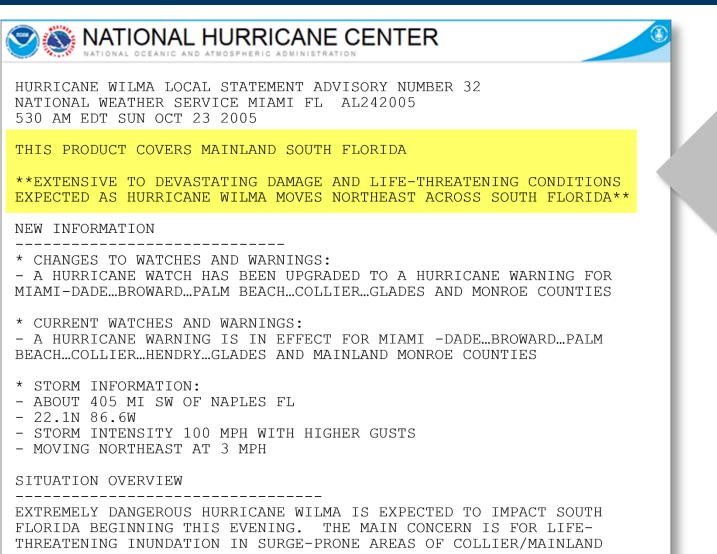
• Hurricane (Tropical Storm) Watch/Warning in effect

Situation overview

- Watch/warning information
- Potential impact information
- Preparedness actions

Hurricane Local Statements 2





What is the affected area?

Hurricane Local Statements 3



NATIONAL HURRICANE CENTER	
HURRICANE WILMA LOCAL STATEMENT ADVISORY NUMBER 32 NATIONAL WEATHER SERVICE MIAMI FL AL242005 530 AM EDT SUN OCT 23 2005	
THIS PRODUCT COVERS MAINLAND SOUTH FLORIDA	
EXTENSIVE TO DEVASTATING DAMAGE AND LIFE-THREATENING CONDITIONS EXPECTED AS HURRICANE WILMA MOVES NORTHEAST ACROSS SOUTH FLORIDA	
NEW INFORMATION	
* CHANGES TO WATCHES AND WARNINGS: - A HURRICANE WATCH HAS BEEN UPGRADED TO A HURRICANE WARNING FOR MIAMI-DADEBROWARDPALM BEACHCOLLIERGLADES AND MONROE COUNTIES	
* CURRENT WATCHES AND WARNINGS: - A HURRICANE WARNING IS IN EFFECT FOR MIAMI -DADEBROWARDPALM BEACHCOLLIERHENDRYGLADES AND MAINLAND MONROE COUNTIES	Are t
* STORM INFORMATION: - ABOUT 405 MI SW OF NAPLES FL - 22.1N 86.6W - STORM INTENSITY 100 MPH WITH HIGHER GUSTS	chang the la
- MOVING NORTHEAST AT 3 MPH	
SITUATION OVERVIEW	

EXTREMELY DANGEROUS HURRICANE WILMA IS EXPECTED TO IMPACT SOUTH FLORIDA BEGINNING THIS EVENING. THE MAIN CONCERN IS FOR LIFE-THREATENING INUNDATION IN SURGE-PRONE AREAS OF COLLIER/MAINLAND Are there any changes since the last update?

Hurricane Threats & Impacts (HTI)

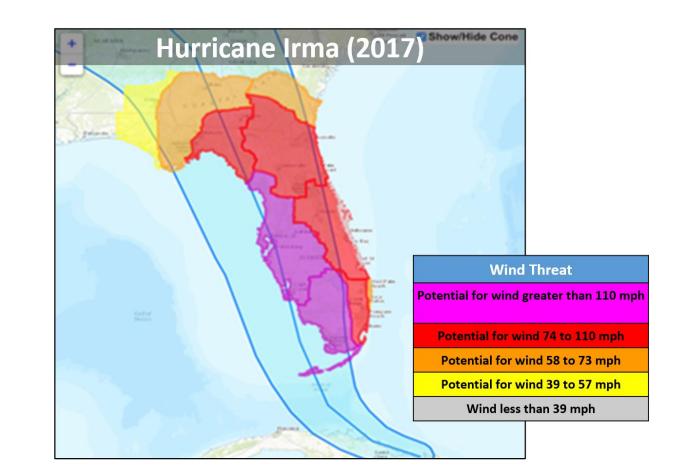
FEMA

Hazards

- Wind
- Storm surge flooding
- Inland flooding
- Tornadoes

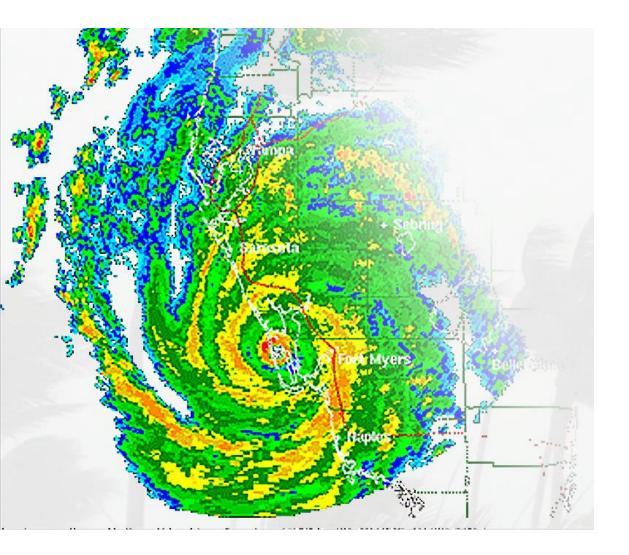
Threat & Impacts

- Elevated (yellow
- Moderate (orange)
- High (red)
- Extreme (magenta)



Extreme Wind Warning





"Inform the public of the need to take **immediate shelter** in an interior portion of a well-built structure **due to the onset of extreme tropical cyclone winds."**

- Issuance criteria:
- Category 3 or greater
- Valid time 2 hours or less

NWS Products – When is Key Info Available?

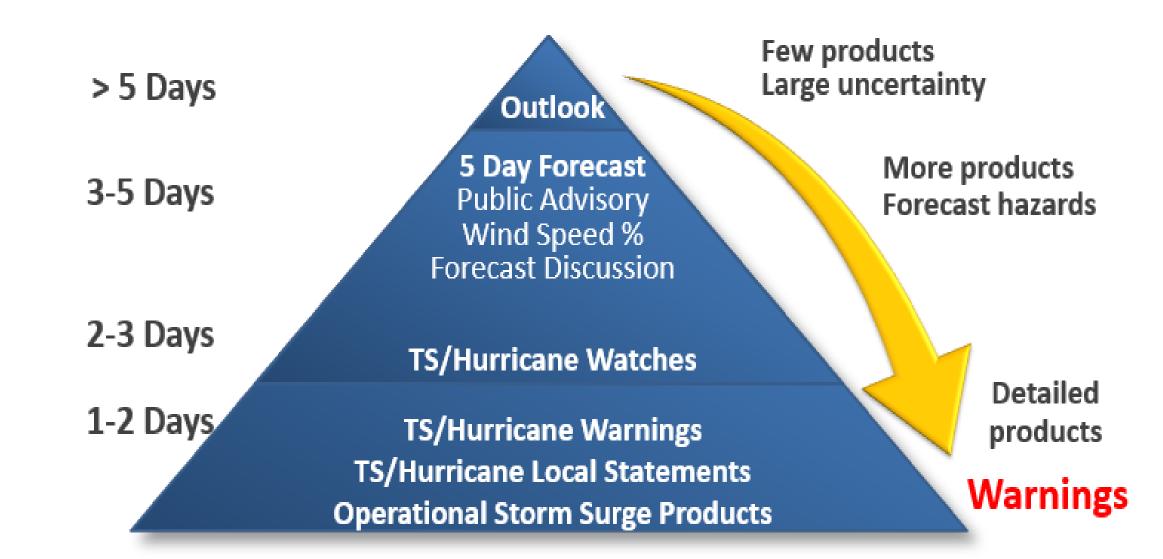


Normal Operations		.b d Threat	1c Credible Threat			2a-3a RAHP Activities	
Year Round	Hurricane Season	120hr - 72hr	72hr - 48hr	48hr - 36hr	36hr - Landfall (Onset of TS Winds)	Post Landfall	
Hurricane Evacu (Surge MOMs, Surg	• •	· •	ce times, other planning o	data)			
Coastal Flood Loss Atlas			HAZUS output				
	Tropical Weat	ther Outlook					
	Public Advisory Forecast Discussion Wind Speed Probabilities Track and Cone Probabilistic wind timing via Hurrevac						
		Wind timing via Hurrevac Extreme Wind Wind Wind timing via Hurrevac Extreme Wind Wai					
			Surge MEOWs -			Tide Gauges/ USGS	
		QPF Rainfall foreca		sts		Flash Flood Warnings	
				River Forecasts	Flood Outlooks	River Flood Warnings	
				TS/Hurricane Watches	TS/Hurricane Warnings		
			Hurricane Local Statements				
			Storm Surge Probabilities & Inundation Ma				
				Storm Surge Watch	Storm Surge Warning		
					Tornado Watches & Wa	arnings	

IIVIE

Tropical Cyclone Products Timeframe 2





Questions/Comments?







- Which product shows the probable track or path of the center of the tropical cyclone?
- A. Cumulative Wind History
- B. Wind Speed Probability Graphic
- C. Cone Graphic
- D. Graphical Tropical Weather Outlook



- Which product gives the chance of tropical cyclone formation?
- A. Tropical Weather Outlook
- B. Tropical Cyclone Discussion
- C. Public Advisory
- D. Wind Speed Probability Graphic



- Which product provides wind timing information beyond 72 hours?
- A. Forecast Advisory
- B. Cone Graphic
- C. Public Advisory
- D. Wind Speed Probabilities



- Which product shows the current size of the tropical cyclone wind field?
- A. NWS Hurricane Threats and Impacts Graphic (HTI)
- B. Wind Speed Probability Graphic
- C. Tropical Cyclone Cumulative Wind History
- D. Cone Graphic



- Which product provides the reasoning behind the tropical cyclone forecast?
- A. Public Advisory
- **B.** Forecast Discussion
- C. Hurricane Local Statement
- D. Forecast Advisory



- Which product shows areas of possible tropical cyclone formation?
- A. Cone Graphic
- B. Tropical Weather Outlook
- C. Graphical Tropical Weather Outlook
- D. Wind Speed Probability Graphic



- Which product contains forecast position, intensity, and wind radii information?
- A. Public Advisory
- B. Tropical Cyclone Discussion
- C. Tropical Weather Outlook
- D. Forecast Advisory



- Question 8
- When are Special Advisories issued?
- A. When a significant, unexpected change in the storm occurs
- B. When a tropical cyclone is within Radar range
- C. Upon request
- D. Before an Emergency Management briefing



- Which products provide continuous flow of information when a tropical cyclone is near land?
- A. Public Advisory & Tropical Outlook
- B. Public Advisory, Intermediate Advisory, & TC Update
- C. Public Advisory & Cone Graphic
- D. Public Advisory & Forecast Discussion



- Question 10
- How often is a new NHC track and intensity forecast routinely issued?
- A. Every 3 hours
- B. Every 6 hours
- C. Every 8 hours
- D. Only when there is a change in the models



- When are intermediate public advisories issued?
- A. All the time
- B. When the 5-day forecast reaches land
- C. When ships are crossing the path of the storm
- D. When coastal watches and warnings are in effect



• Question 12

- Which warning is issued when a major (cat 3 or stronger) hurricane is about to make landfall?
- A. Extreme Wind Warning
- B. Hurricane Warning
- C. Tornado Warning
- D. Severe Thunderstorm Warning



- Question 13
- How many days does the forecast information in the Public Advisory cover?
- A. 1 day
- B. 2 days
- C. 3 days
- D. 5 days



- Question 14
- The lead time for a Hurricane Watch or Warning is tied to the arrival of

- A. Hurricane force winds
- B. Life threatening inundation
- C. The eye
- D. Tropical storm force winds



- NHC track forecasts are most accurate for this (strength) of Tropical Cyclones?
- A. Hurricanes
- **B.** Tropical Storms
- C. Tropical Depressions
- D. All the above



- Question 16
- The NHC assigns Saffir-Simpson Hurricane Scale categories based on what?
- A. Size of the hurricane
- B. Maximum sustained winds
- C. Forecast Storm Surge
- D. Minimum pressure



- Which one of the following is used to construct the size of the NHC forecast error cone?
- A. Possible impact areas
- B. Geographic size of the wind field
- C. Model spread
- D. Past 5 years of track forecast error



Question 18

• The NHC's 24- and 48-hour intensity forecasts are on average off by ______ Saffir-Simpson categories?

A. 1

B. 2

C. 3

D. 4