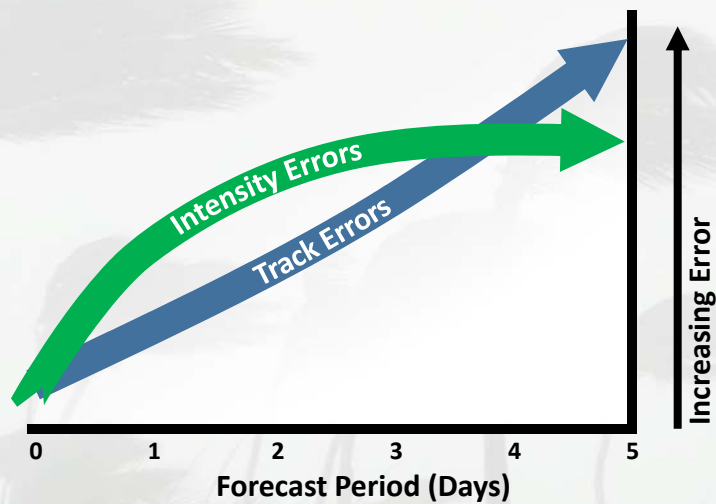


HURRICANE READINESS
L - 311



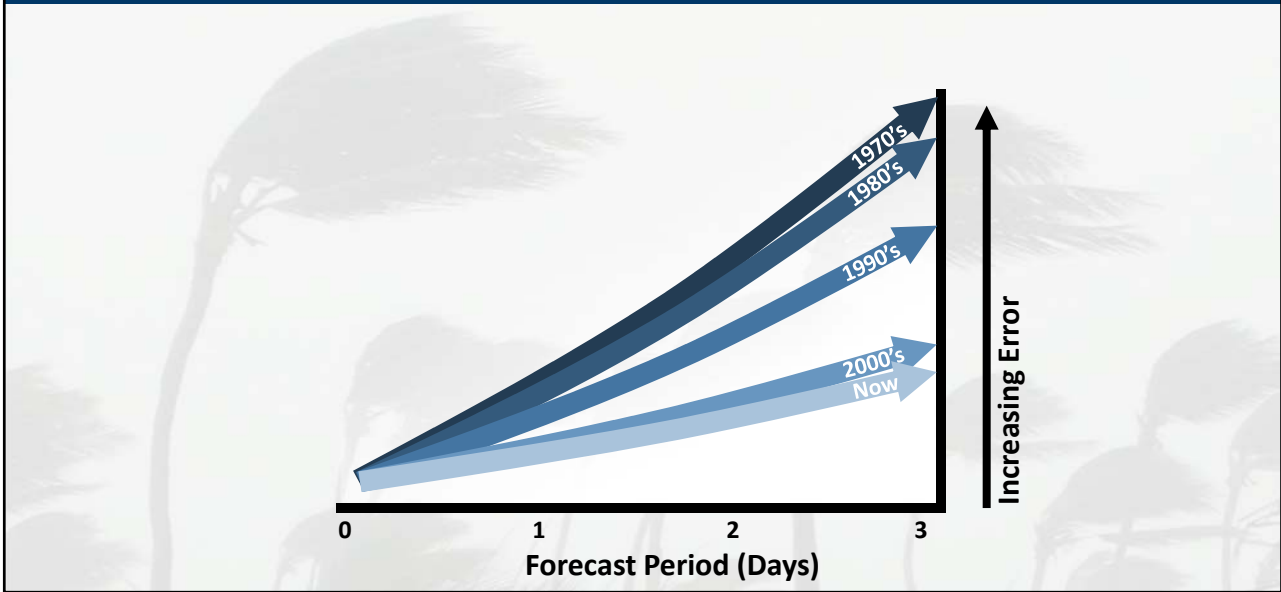
UNIT THREE
Forecast Uncertainty

FORECAST UNCERTAINTY
What, Me Worry?



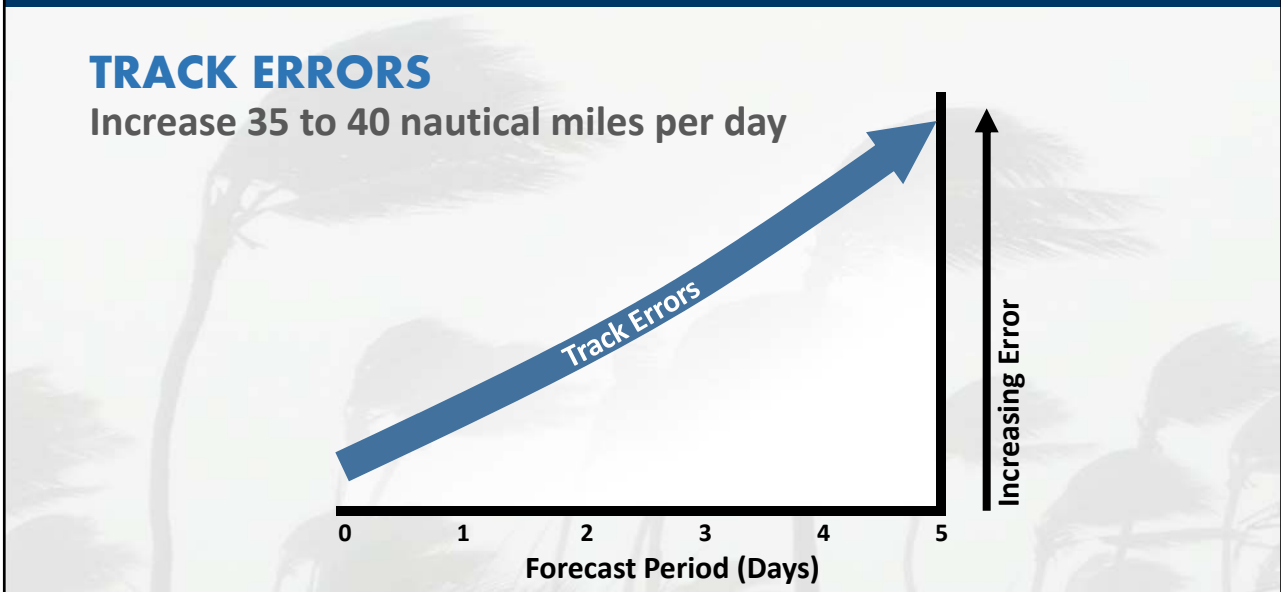
FORECAST TRACK ERRORS

Improving, but not perfect.



FORECAST TRACK ERRORS

NHC 5-year Averages

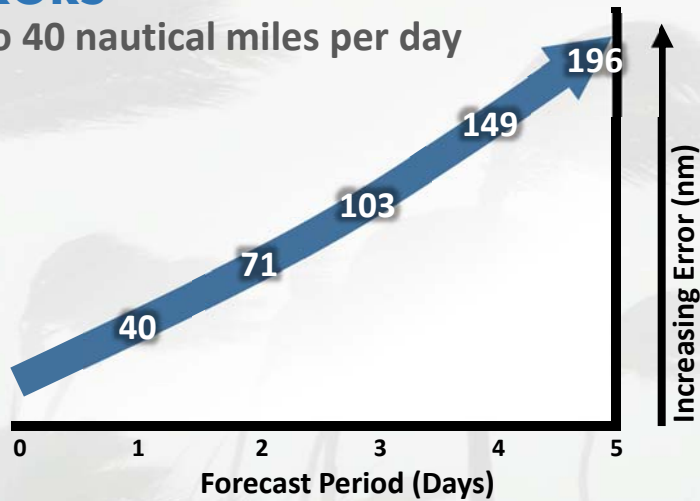


FORECAST TRACK ERRORS
NHC 5-year Averages



TRACK ERRORS

Increase 35 to 40 nautical miles per day

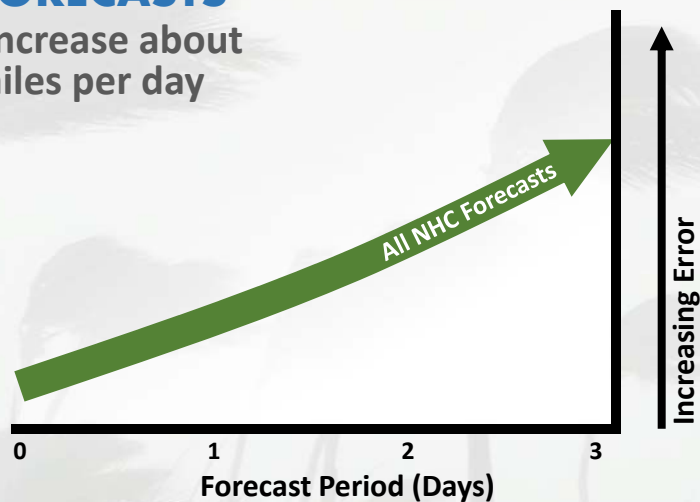


FORECAST TRACK ERRORS
Based on Initial Intensity



ALL NHC FORECASTS

Track errors increase about 35 nautical miles per day

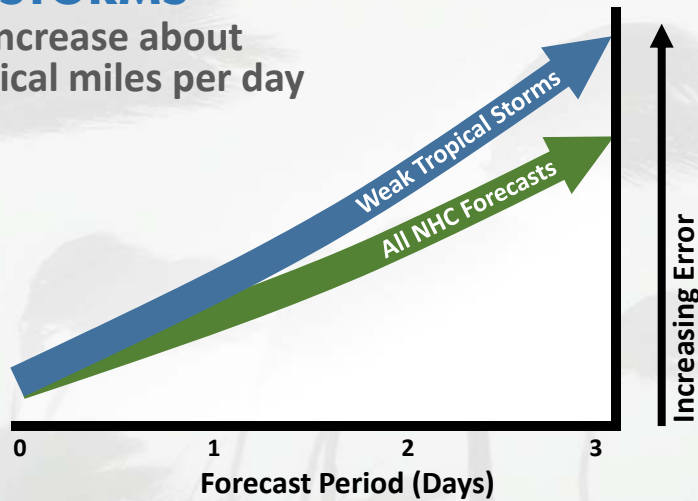


FORECAST TRACK ERRORS *Based on Initial Intensity*



TROPICAL STORMS

Track errors increase about 40 to 45 nautical miles per day

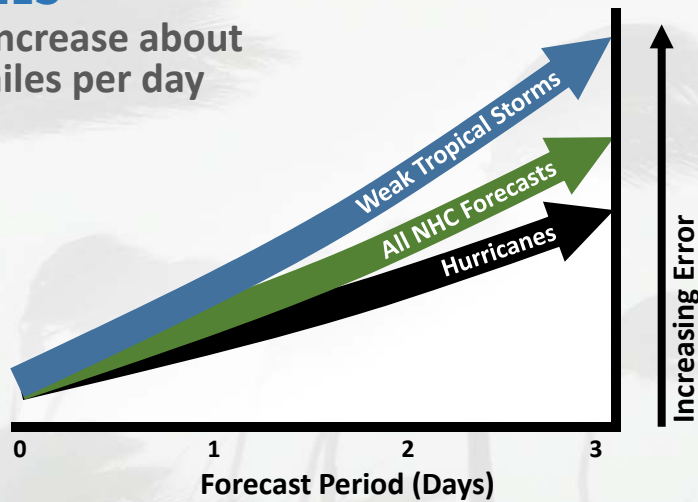


FORECAST TRACK ERRORS *Based on Initial Intensity*



HURRICANES

Track errors increase about 30 nautical miles per day



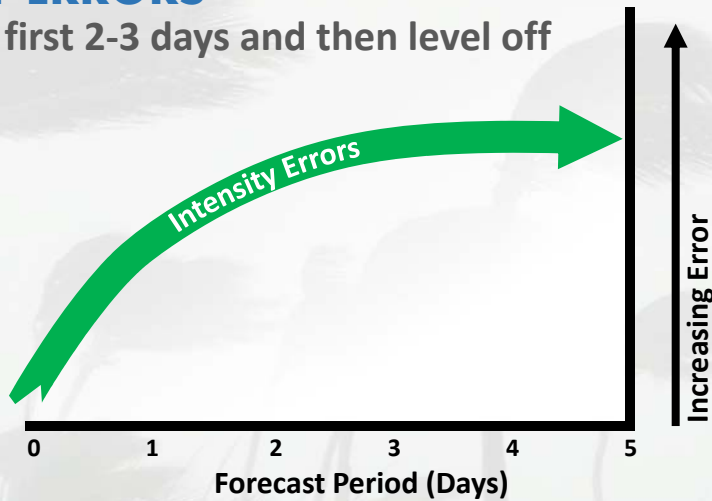
FORECAST INTENSITY ERRORS

NHC 5-year Averages



INTENSITY ERRORS

Increase the first 2-3 days and then level off



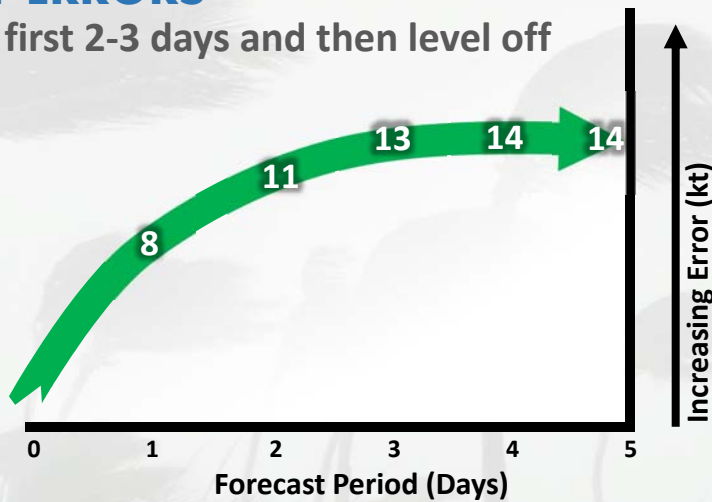
FORECAST INTENSITY ERRORS

NHC 5-year Averages



INTENSITY ERRORS

Increase the first 2-3 days and then level off



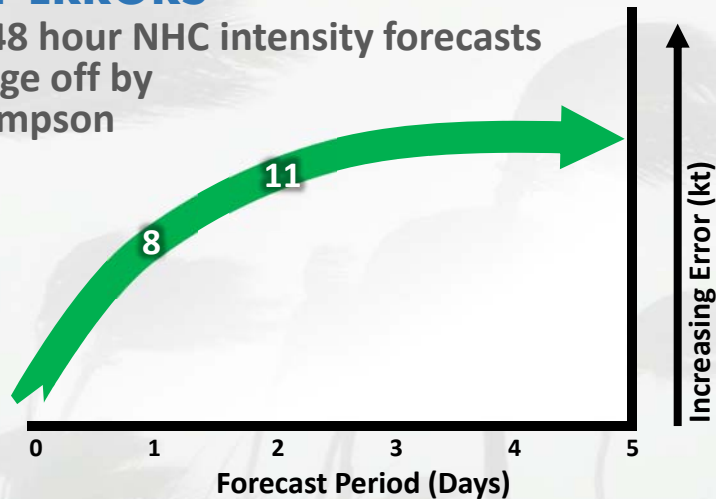
FORECAST INTENSITY ERRORS

NHC 5-year Averages



INTENSITY ERRORS

The 24 and 48 hour NHC intensity forecasts are on average off by one Saffir-Simpson category.



FORECAST INTENSITY ERRORS

Rapid Strengthening



RAPID INTENSIFICATION

Rapid intensification remains a forecast challenge and often results in very large errors

- Our ability to recognize conditions that favor rapid intensification has improved, however forecasting the extent and timing of that intensification remains difficult.

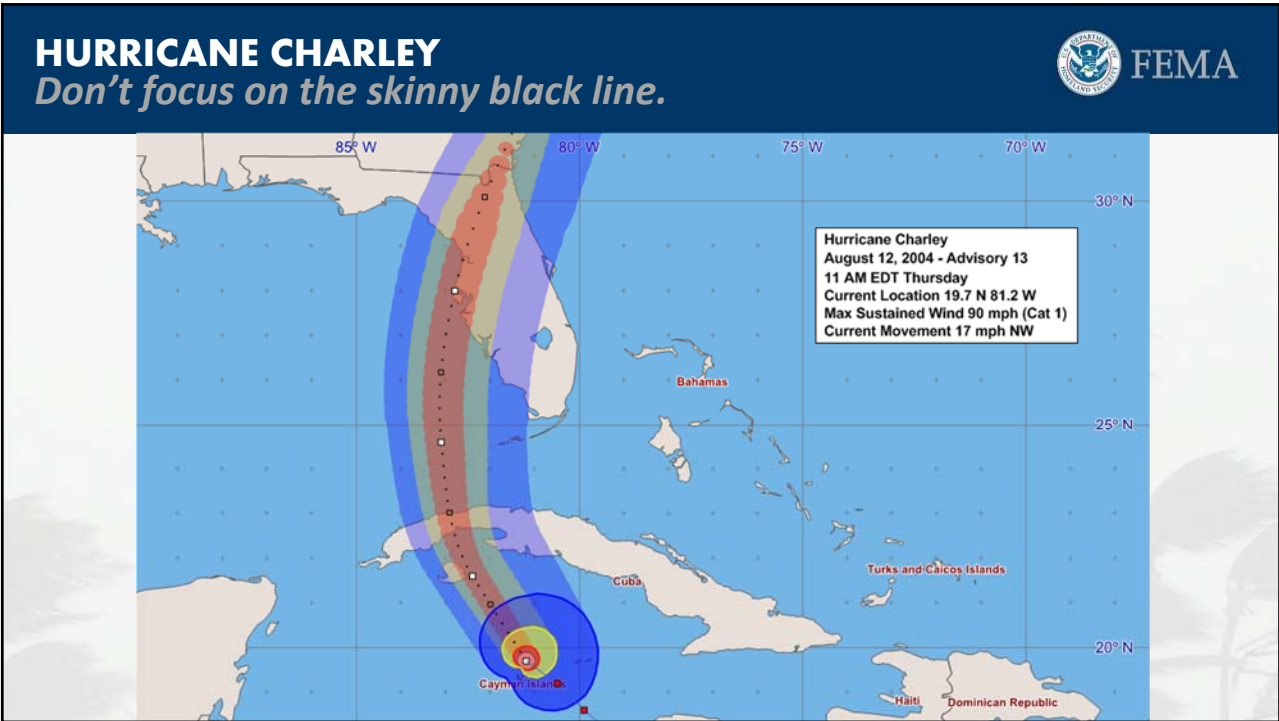
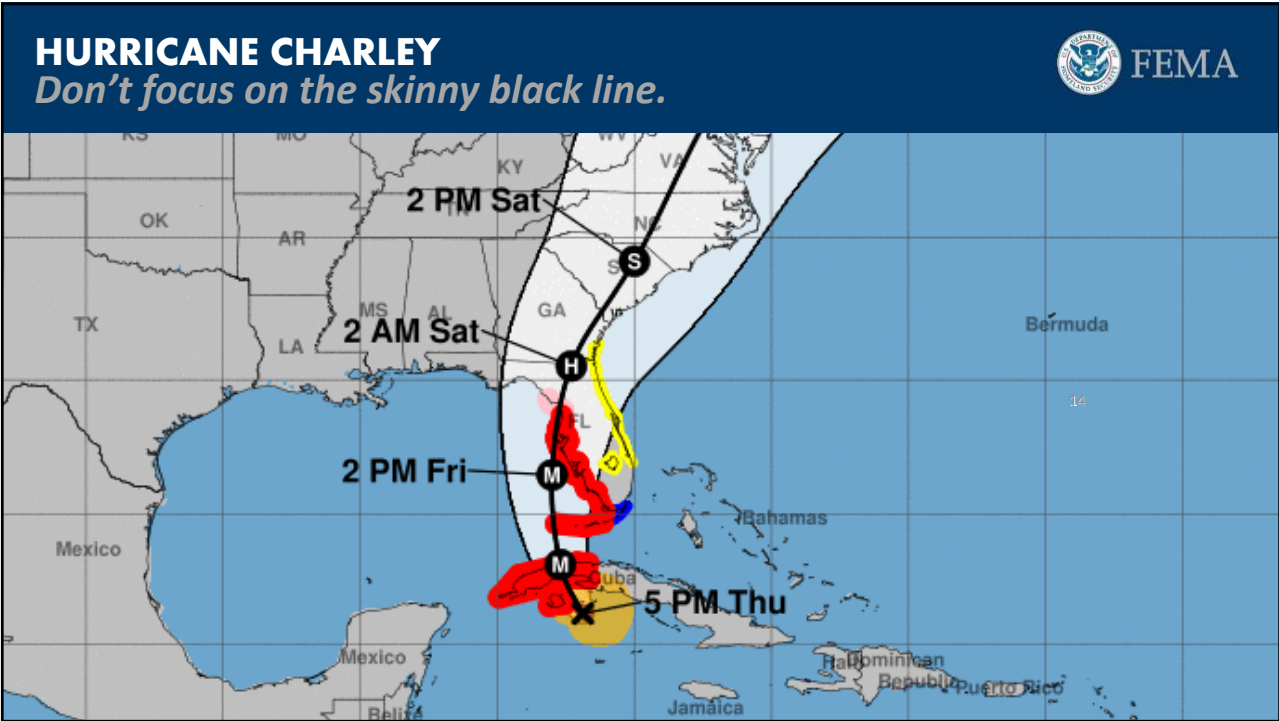
2 Rapid Strengthening Examples

- **Matthew Advisory 7 (2016)**

Initial Intensity: 80 mph
 24h Intensity Forecast: 85 mph
Actual Intensity: 165 mph
 Error: **80 mph**

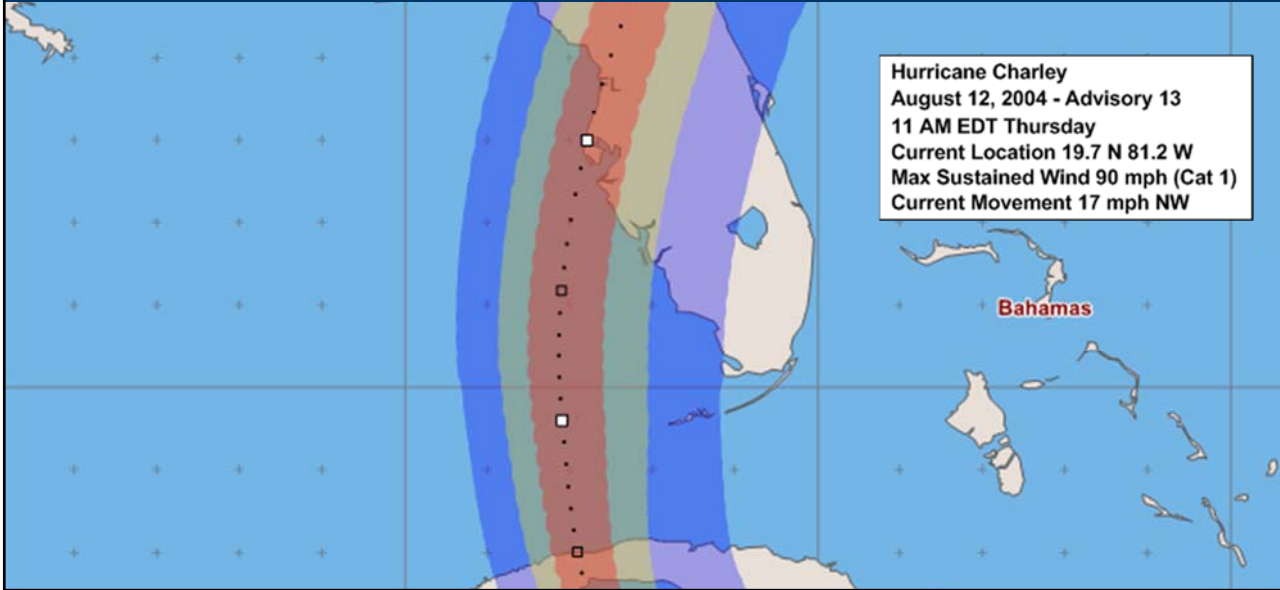
- **Gonzalo Advisory 7 (2014)**

Initial Intensity: 85 mph
 24h Intensity Forecast: 105 mph
Actual Intensity: 130 mph
 Error: **25 mph**



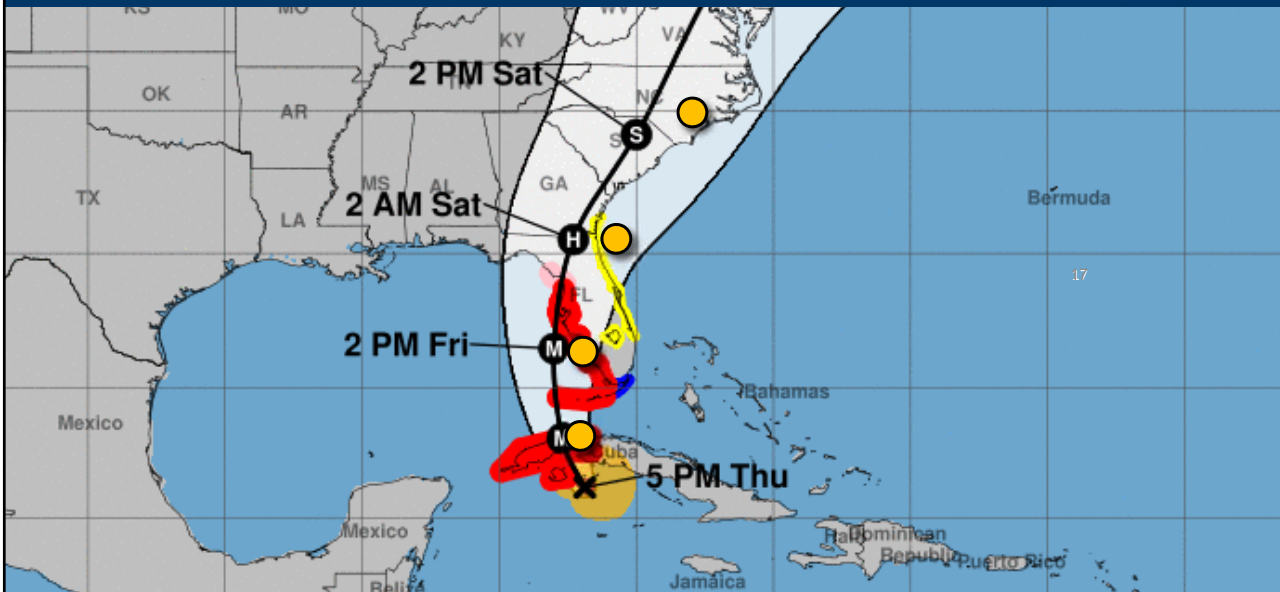
HURRICANE CHARLEY

Don't focus on the skinny black line.



HURRICANE CHARLEY

Don't focus on the skinny black line.



HURRICANE CHARLEY

Would alternate scenarios help?



WIND SPEED PROBABILITIES

How Likely. Arrival Times. Inland Threat.



NATIONAL HURRICANE CENTER
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TROPICAL STORM ISAAC WIND SPEED PROBABILITIES NUMBER 21
 NWS NATIONAL HURRICANE CENTER MIAMI FL AL092012
 0900 UTC SUN AUG 26 2012

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FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT						
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PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
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MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
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MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)

Location-specific Probabilities

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

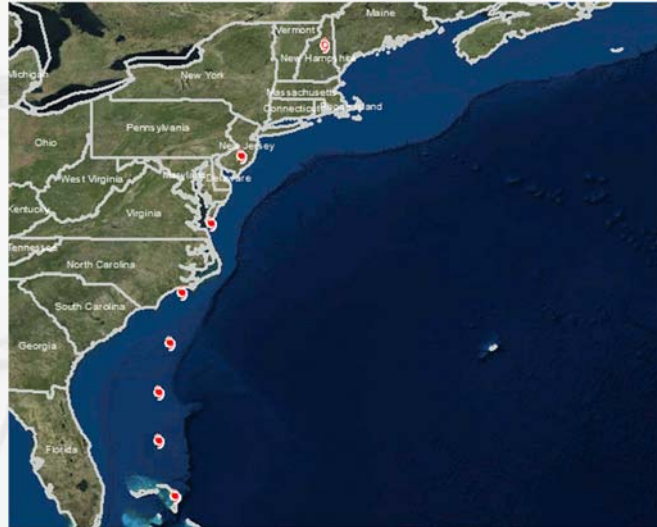
WIND SPEED PROBABILITIES

How are they generated?



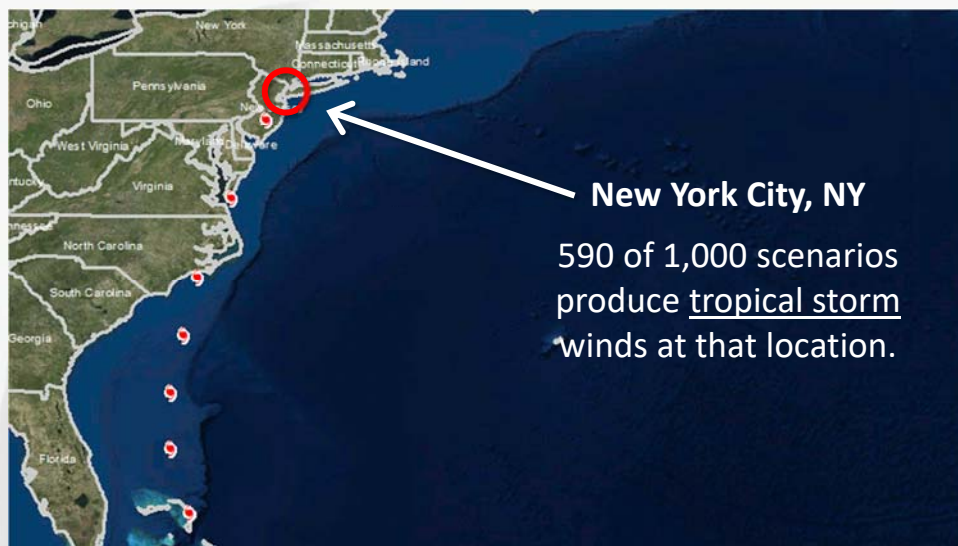
MORE SCENARIOS

- **1,000 realistic alternative scenarios are generated**
 - Official NHC forecast
 - Historical track and intensity forecast errors
- **Weakening over land**
- **Track model spread**
 - Forecast track errors are correlated to the spread of model guidance



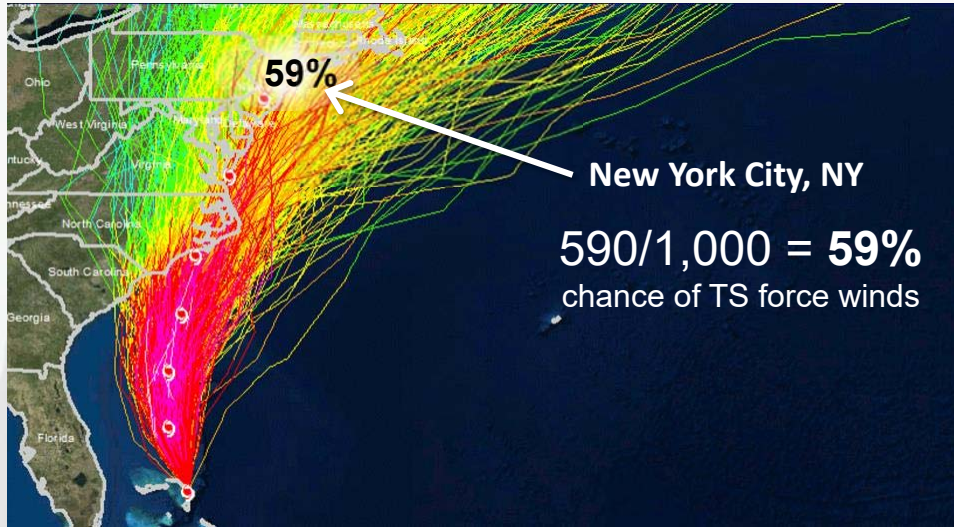
WIND SPEED PROBABILITIES

How are they generated?



WIND SPEED PROBABILITIES

How are they generated?



WIND SPEED PROBABILITIES

How are they generated?



HURRICANE IRENE Sustained Winds (knots)

WIND SPEED PROBABILITIES
What does 59% chance mean?



WIND SPEED PROBABILITIES
What does 59% chance mean?



WIND SPEED PROBABILITIES

Text Product



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GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)

Location-specific Probabilities

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

WIND SPEED PROBABILITIES

Text Product



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WIND SPEED PROBABILITIES

Text Product



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WIND SPEED PROBABILITIES

Text Product



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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL STORM ISAAC WIND SPEED PROBABILITIES NUMBER 21
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GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)

Onset Probabilities

- Timing information

WIND SPEED PROBABILITIES

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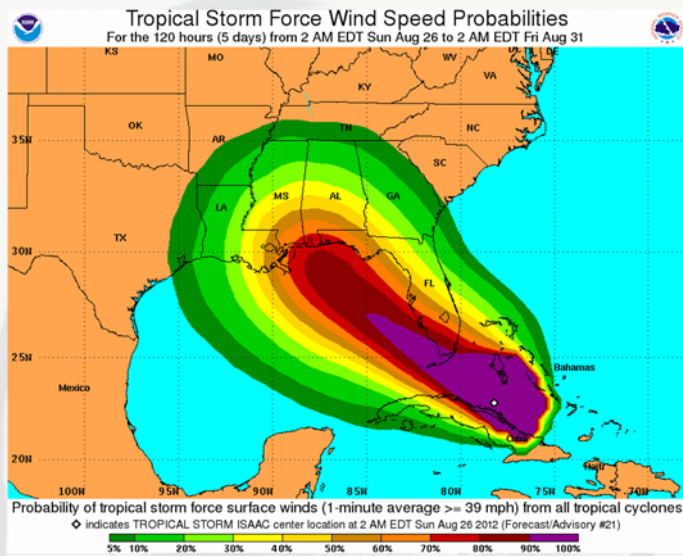
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GULFPORT MS 34	X	X (X)	3 (3)	21 (24)	34 (58)	10 (68)	1 (69)

Cumulative Probabilities
 • Total chance through the time period

WIND SPEED PROBABILITIES

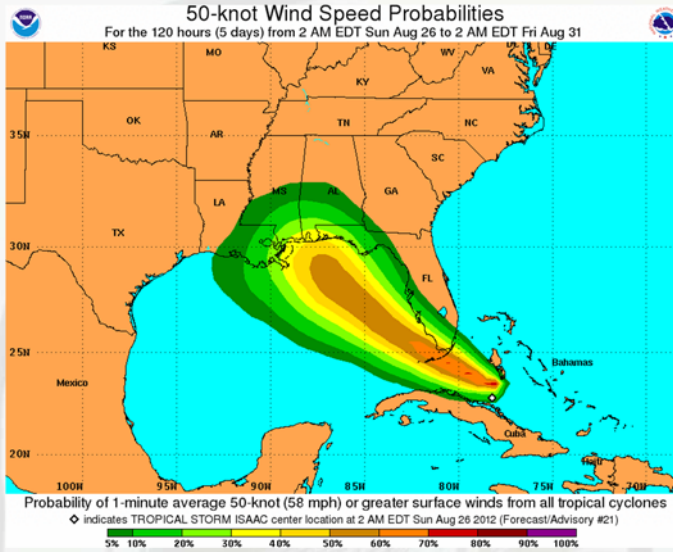
5-Day Cumulative Graphic



Location-specific Probabilities
 • Tropical-Storm-Force
 • 58 mph
 • Hurricane-Force

WIND SPEED PROBABILITIES

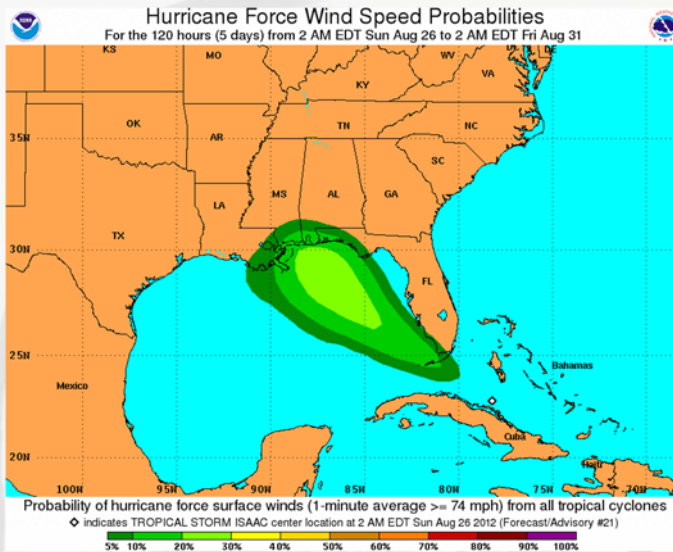
5-Day Cumulative Graphic



- Location-specific Probabilities**
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WIND SPEED PROBABILITIES

5-Day Cumulative Graphic



- Location-specific Probabilities**
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 - 58 mph
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WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
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GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
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BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

12 14 18 12
Location-specific Probabilities
 • Tropical-Storm-Force
 • 58 mph
 • Hurricane-Force

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



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BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

← **Mobile, AL**

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
								FORECAST HOUR
LOCATION		KT						
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

Tropical Storm (34kt)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
								FORECAST HOUR
LOCATION		KT						
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

< 1% chance
Tropical Storm winds begin during the first 12 hours 8am Wed to 8pm Thu (12 hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

< 1% chance

Tropical Storm winds begin between 12 and 24 hours 8pm Wed to 8am Thu (12 hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

5% chance

Tropical Storm winds begin between 24 and 36 hours 8am Thu to 8pm Thu(12hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	3(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

24% chance
Tropical Storm winds begin between 36 and 48 hours
8pm Thu to 8am Fri (12hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

35% chance
Tropical Storm winds begin between 48 and 72 hours
8am Fri to 8am Sat (24hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

When are Tropical Storm (34kt) winds most likely to start at Mobile, AL?

8% chance

Tropical Storm winds begin between 72 and 96 hours
8am Sat to 8am Sun (24hr)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

← Mobile, AL

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

Tropical Storm (34kt)

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

< 1% chance Tropical Storm winds at Mobile, AL over the next 24 hours.

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

5% chance Tropical Storm winds begin between 24 and 36 hours

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

5% chance Tropical Storm winds at Mobile, AL over the next 36 hours.

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	24(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

24% chance
Tropical Storm winds begin between 36 and 48 hours

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	24(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

29% chance
Tropical Storm winds at Mobile, AL over the next 2 days.

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(79)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

35% chance
Tropical Storm winds begin between 48 and 72 hours

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)	
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)	
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)	
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(79)	
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)	
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)	
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)	
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)	
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)	
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)	
GULFPORT MS 50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)	
GULFPORT MS 64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)	
BURAS LA 34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)	
BURAS LA 50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)	
BURAS LA 64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)	

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

64% chance
Tropical Storm winds at Mobile, AL over the next 3 days.

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

8% chance
Tropical Storm winds begin between 72 and 96 hours

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

72% chance
Tropical Storm winds at Mobile, AL over the next 4 days.

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72)	1(73)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

1% chance
Tropical Storm winds begin between 96 and 120 hours

WIND SPEED PROBABILITIES

Tropical Storm Isaac (2012)



		NATIONAL HURRICANE CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						
TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(96)	(120)
LOCATION	KT							
PANAMA CITY FL	34	X	3(3)	22(25)	30(55)	16(71)	2(73)	1(74)
PANAMA CITY FL	50	X	X(X)	1(1)	13(14)	15(29)	2(31)	1(32)
PANAMA CITY FL	64	X	X(X)	X(X)	3(3)	6(9)	2(11)	1(12)
PENSACOLA FL	34	X	X(X)	10(10)	32(42)	31(73)	5(78)	X(78)
PENSACOLA FL	50	X	X(X)	X(X)	6(6)	28(34)	5(39)	1(40)
PENSACOLA FL	64	X	X(X)	X(X)	1(1)	14(15)	3(18)	X(18)
MOBILE AL	34	X	X(X)	5(5)	24(29)	35(64)	8(72) + 1(73)	1(74)
MOBILE AL	50	X	X(X)	X(X)	3(3)	22(25)	8(33)	1(34)
MOBILE AL	64	X	X(X)	X(X)	1(1)	8(9)	4(13)	1(14)
GULFPORT MS	34	X	X(X)	3(3)	21(24)	34(58)	10(68)	1(69)
GULFPORT MS	50	X	X(X)	X(X)	2(2)	19(21)	7(28)	2(30)
GULFPORT MS	64	X	X(X)	X(X)	X(X)	8(8)	3(11)	1(12)
BURAS LA	34	X	X(X)	4(4)	19(23)	31(54)	7(61)	1(62)
BURAS LA	50	X	X(X)	X(X)	2(2)	18(20)	6(26)	1(27)
BURAS LA	64	X	X(X)	X(X)	X(X)	7(7)	4(11)	X(11)

How likely are Tropical Storm (34kt) winds at Mobile, AL over the next 5 days?

73% chance
Tropical Storm winds at Mobile, AL over the next 5 days.

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
LOCATION	KT							
W PALM BEACH	34 1	5 (6)	18 (24)	43 (67)	25 (92)	X (92)	X (92)	
W PALM BEACH	50 X	X (X)	2 (2)	16 (18)	39 (57)	X (57)	X (57)	
W PALM BEACH	64 X	X (X)	X (X)	4 (4)	28 (32)	X (32)	X (32)	
FT LAUDERDALE	34 2	7 (9)	36 (45)	38 (83)	12 (95)	X (95)	X (95)	
FT LAUDERDALE	50 X	X (X)	6 (6)	36 (42)	25 (67)	X (67)	X (67)	
FT LAUDERDALE	64 X	X (X)	1 (1)	12 (13)	25 (38)	X (38)	X (38)	
MIAMI FL	34 2	10 (12)	46 (58)	32 (90)	7 (97)	X (97)	X (97)	
MIAMI FL	50 X	X (X)	11 (11)	46 (57)	20 (77)	X (77)	X (77)	
MIAMI FL	64 X	X (X)	1 (1)	27 (28)	21 (49)	X (49)	X (49)	
MARATHON FL	34 2	24 (26)	58 (84)	14 (98)	1 (99)	X (99)	X (99)	
MARATHON FL	50 X	2 (2)	42 (44)	40 (84)	6 (90)	X (90)	X (90)	
MARATHON FL	64 X	X (X)	18 (18)	47 (65)	8 (73)	X (73)	X (73)	
KEY WEST FL	34 1	11 (12)	56 (68)	22 (90)	3 (93)	X (93)	X (93)	
KEY WEST FL	50 X	X (X)	25 (25)	36 (61)	5 (66)	X (66)	X (66)	
KEY WEST FL	64 X	X (X)	7 (7)	32 (39)	6 (45)	X (45)	X (45)	

How likely are Hurricane (64kt) winds at Miami, FL over the next 5 days?

← Miami

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96)	(120)	
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KEY WEST FL	50 X	X (X)	25 (25)	36 (61)	5 (66)	X (66)	X (66)	
KEY WEST FL	64 X	X (X)	7 (7)	32 (39)	6 (45)	X (45)	X (45)	

How likely are Hurricane (64kt) winds at Miami, FL over the next 5 days?

← 5 days (120 h)

← Hurricane (64kt)

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
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LOCATION	KT							
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KEY WEST FL	50	X	X (X)	25 (25)	36 (61)	5 (66)	X (66)	X (66)
KEY WEST FL	64	X	X (X)	7 (7)	32 (39)	6 (45)	X (45)	X (45)

How likely are Hurricane (64kt) winds at Miami, FL over the next 5 days?

49% chance Hurricane winds at Miami, FL over 5 days.

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
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KEY WEST FL	64	X	X (X)	7 (7)	32 (39)	6 (45)	X (45)	X (45)

When are Tropical Storm (34kt) winds most likely to start at Miami, FL?

← Miami

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
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When are Tropical Storm (34kt) winds most likely to start at Miami, FL?

← Tropical Storm (34kt)

WIND SPEED PROBABILITIES

Hurricane Irma (2017)



NATIONAL HURRICANE CENTER								
TIME PERIODS	FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SAT TO 12Z SUN	FROM 12Z SUN TO 12Z MON	
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KEY WEST FL	64 X	X (X)	7 (7)	32 (39)	6 (45)	X (45)	X (45)	

When are Tropical Storm (34kt) winds most likely to start at Miami, FL?

46% chance
Tropical Storm winds begin between 24 and 36 hours

32% chance
Tropical Storm winds begin between 36 and 48 hours

WIND SPEED PROBABILITIES

Hurricane Matthew (2016)



MATTHEW EXAMPLE

Wind Speed Probability Trends

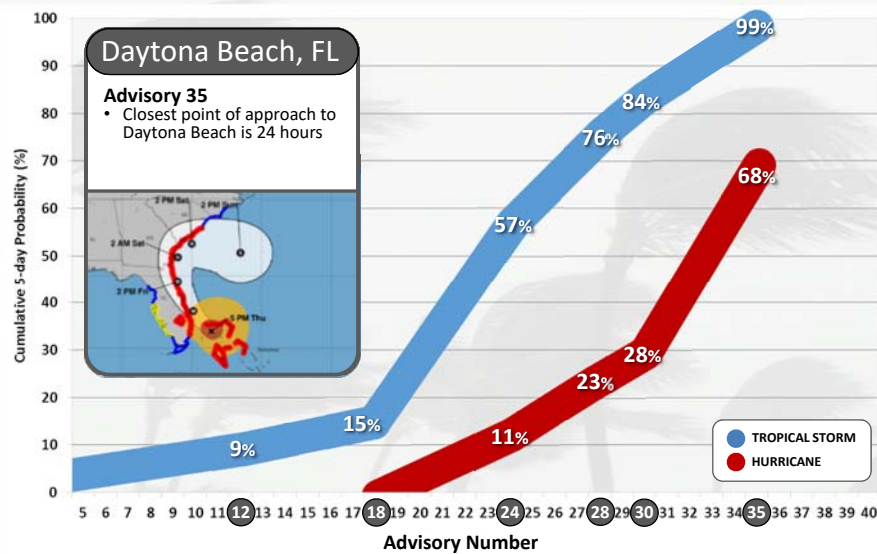
- Daytona Beach
- Westward shift in track forecast
- Decreasing track forecast uncertainty as event approached



35

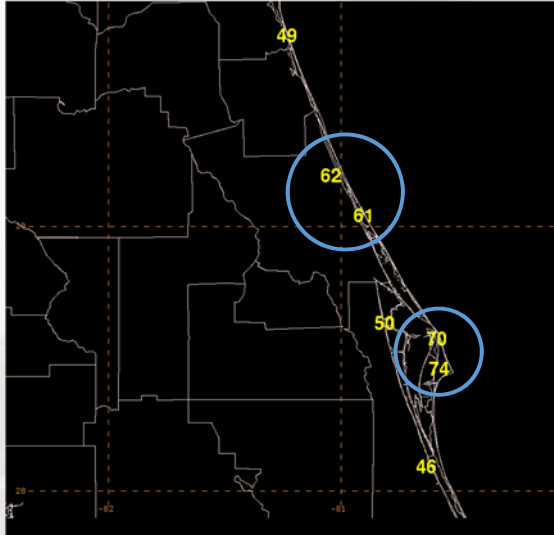
WIND SPEED PROBABILITIES

Hurricane Matthew (2016)



WIND SPEED PROBABILITIES

Hurricane Matthew (2016)



Ground Truth

Official Daytona Beach observations stopped reporting during the event

- **62 kt sustained wind**
Embry-Riddle University (unofficial observing site)
- **Sustained hurricane force winds**
Cape Canaveral (slightly elevated stations)

TIME OF ARRIVAL GRAPHIC

Earliest Reasonable Onset of TS Winds

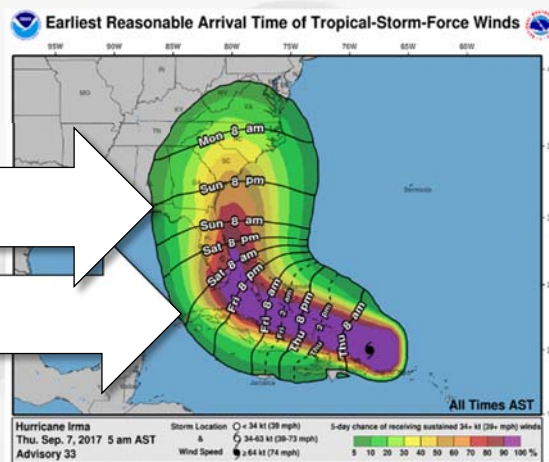


EARLIEST REASONABLE

- **10% chance of onset**
 - Most conservative / Risk-averse
 - Prototype graphic for 2017

- **Arrival time of TS winds**
 - Black contours

- **5-day cumulative TS probabilities**
 - Color fill



TIME OF ARRIVAL GRAPHIC *Most Likely Onset of TS Winds*

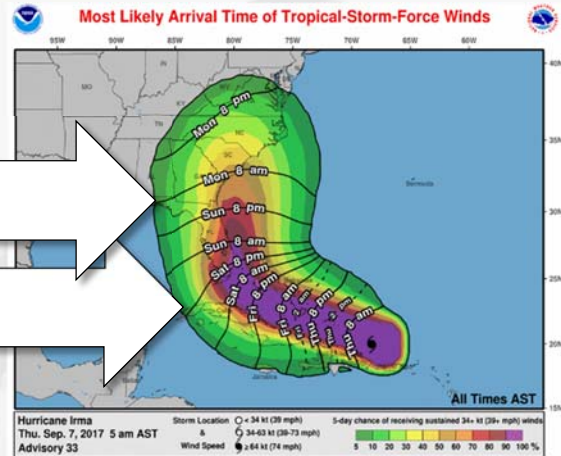


MOST LIKELY

- **50% chance of onset**
 - Equally likely to occur before as after
 - Prototype graphic for 2017

- **Arrival time of TS winds**
 - Black contours

- **5-day cumulative TS probabilities**
 - Color fill

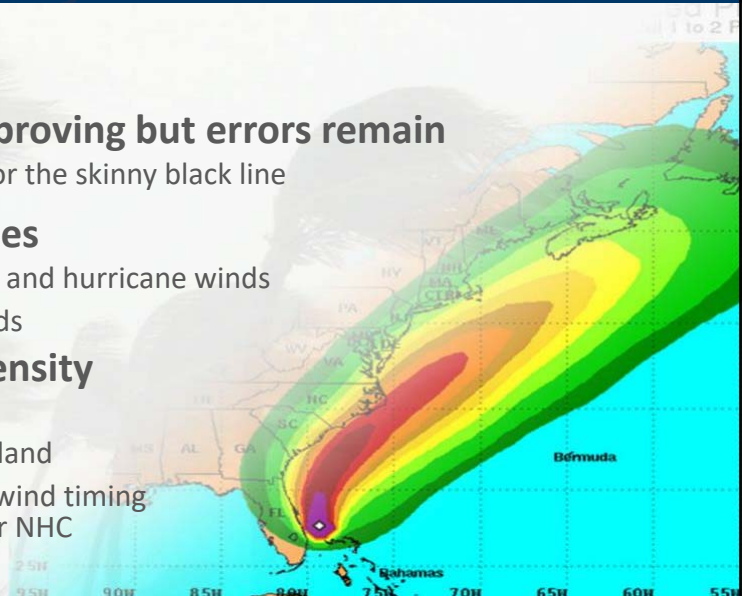


WIND SPEED PROBABILITIES *Summary*



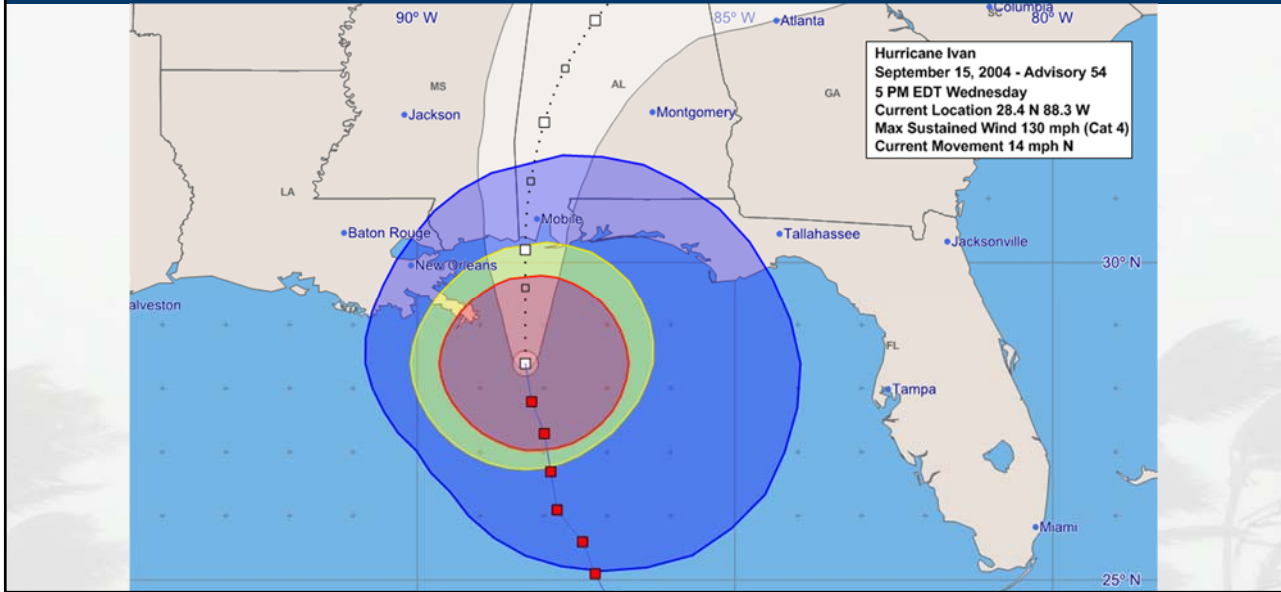
SUMMARY

- **NHC's forecasts are improving but errors remain**
 - Error cone is not the cure for the skinny black line
- **Wind speed probabilities**
 - Likelihood of tropical storm and hurricane winds
 - Onset timing of wind hazards
- **Incorporates track, intensity and size uncertainty**
 - Includes weakening due to land
 - Provides an assessment of wind timing and threat that accounts for NHC forecast errors



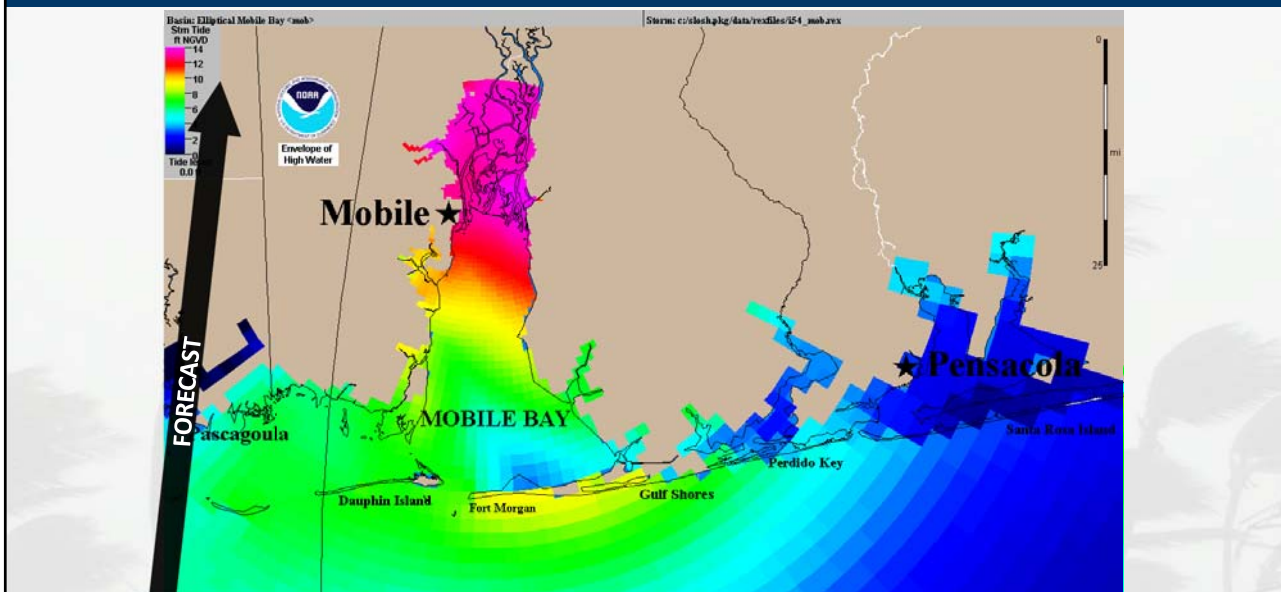
HURRICANE IVAN

What a difference a bay makes.



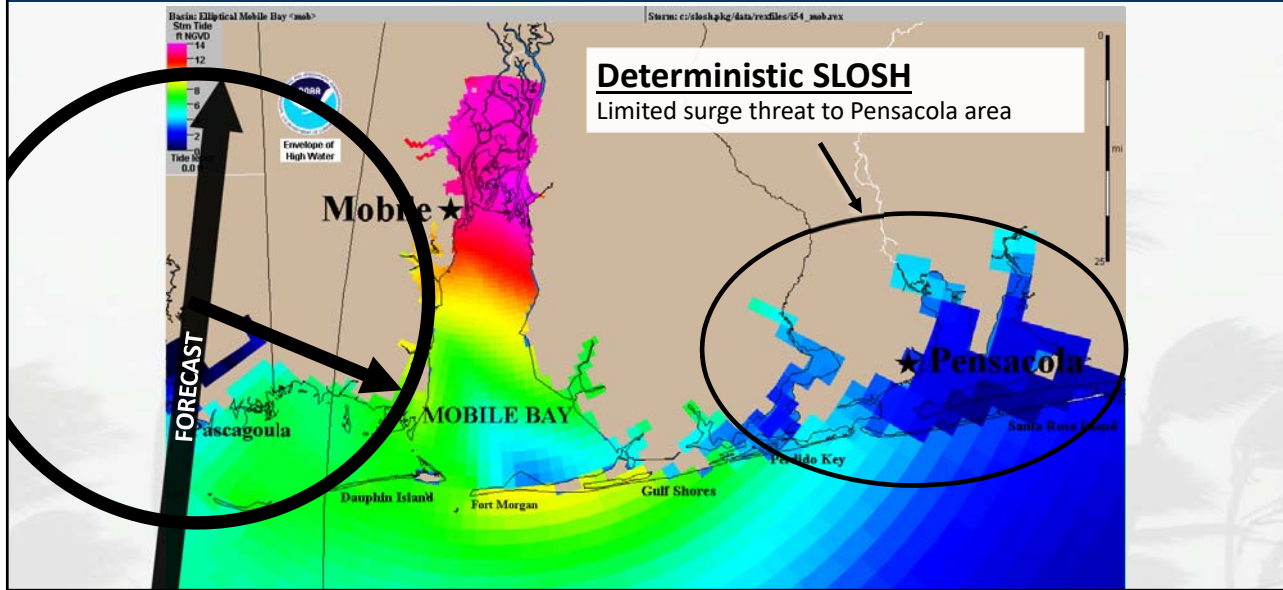
HURRICANE IVAN

What a difference a bay makes.



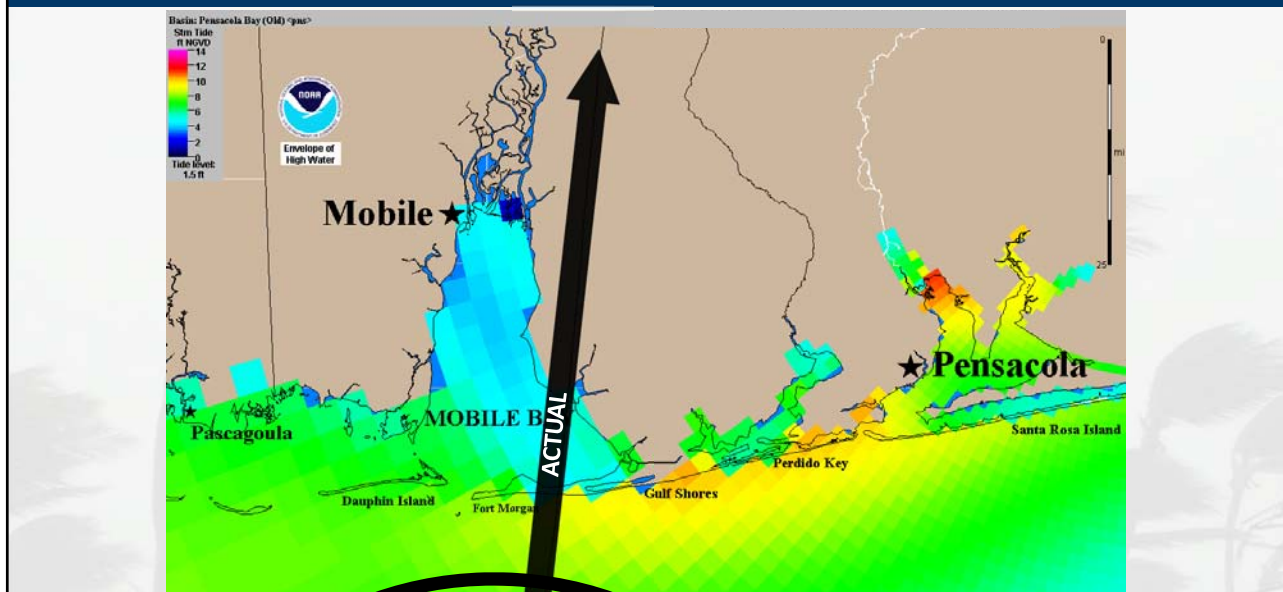
HURRICANE IVAN

What a difference a bay makes.



HURRICANE IVAN

What a difference a bay makes.

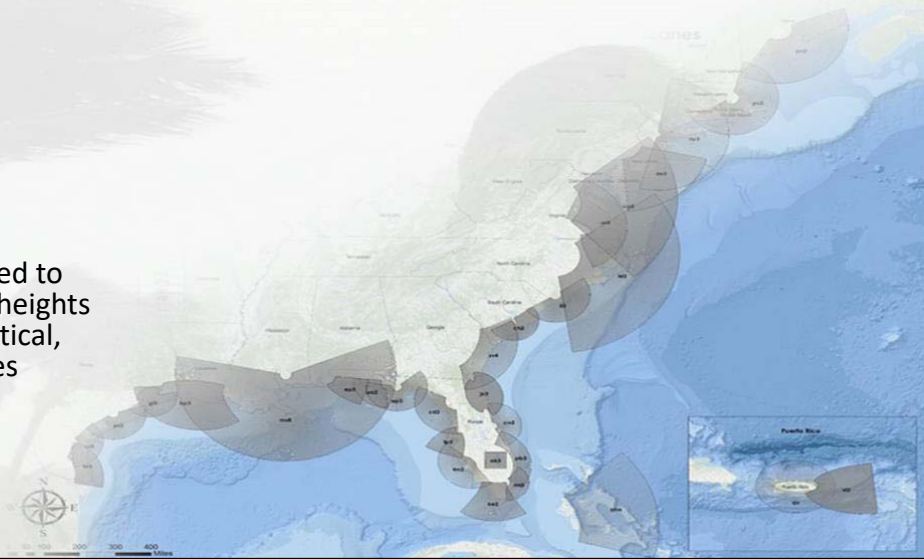


STORM SURGE *SLOSH Model*



Sea, Lake, and Overland Surges from Hurricanes

A numerical model used to estimate storm surge heights for historical, hypothetical, or predicted hurricanes



STORM SURGE *SLOSH Model*



SLOSH

A numerical model used to estimate storm surge heights for historical, hypothetical, or predicted hurricanes

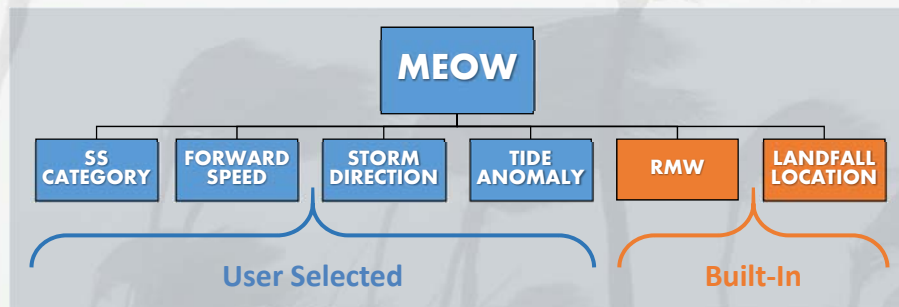


STORM SURGE*Maximum Envelop of Water (MEOW)*

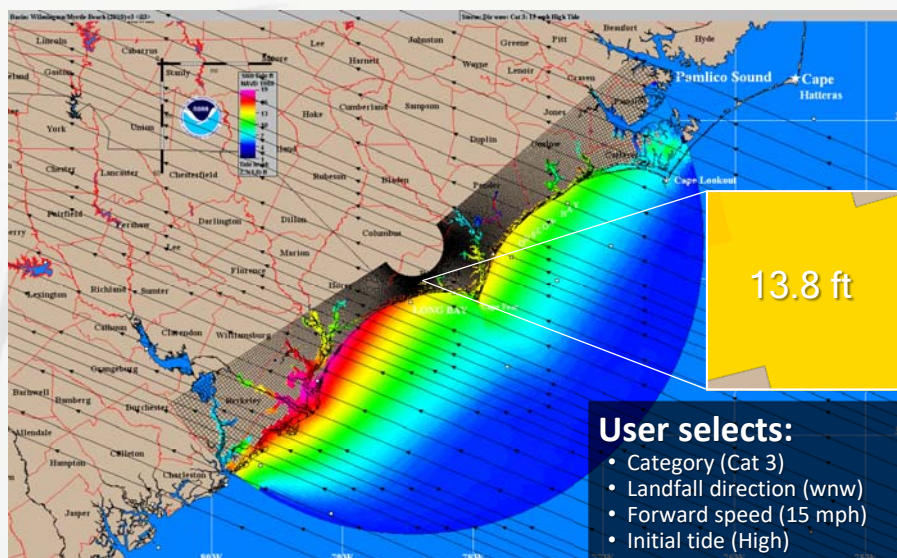
FEMA

MEOWs

- Composite of the maximum storm surge for a given set of parameters (by basin)
- Used as guidance of planning and operations

**STORM SURGE***Maximum Envelop of Water (MEOW)*

FEMA



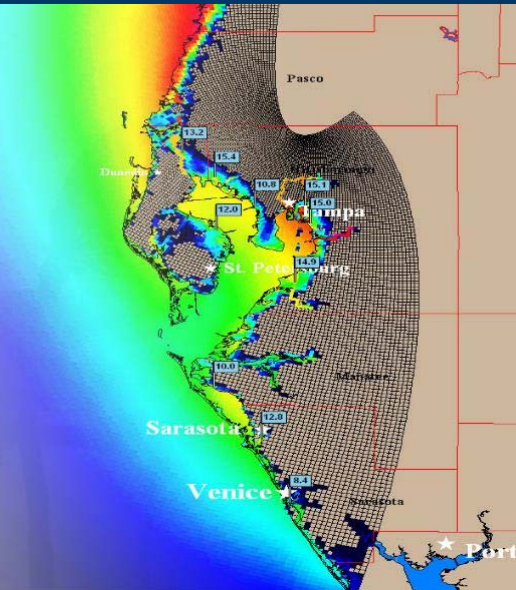
STORM SURGE

Maximum of Maximums (MOM)



MOMs

- **Worst-case for a particular category storm**
- **Combination of many scenarios**
 - Forward speed
 - Angle of approach
 - Size (Radius of maximum wind)
 - Initial tide level
- **No single hurricane will produce the regional flooding depicted in a Maximum of Maximums (MOMs)**



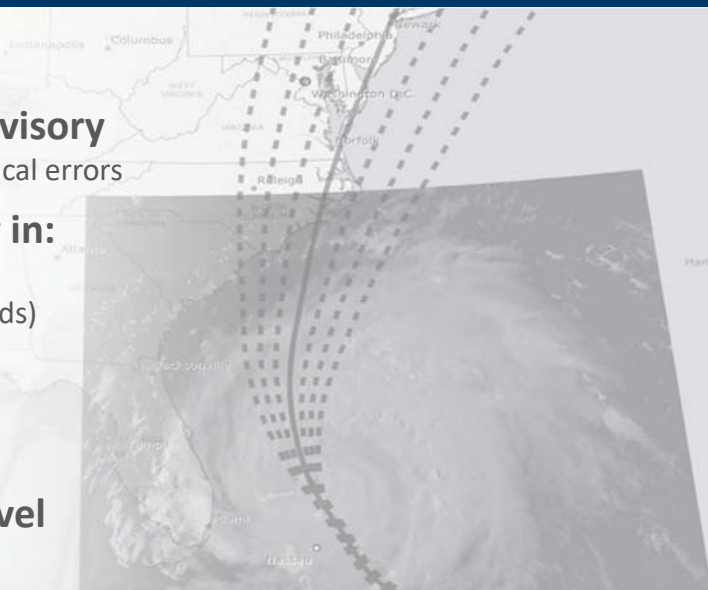
PROBABILISTIC STORM SURGE

Multiple Tracks and Landfall Locations



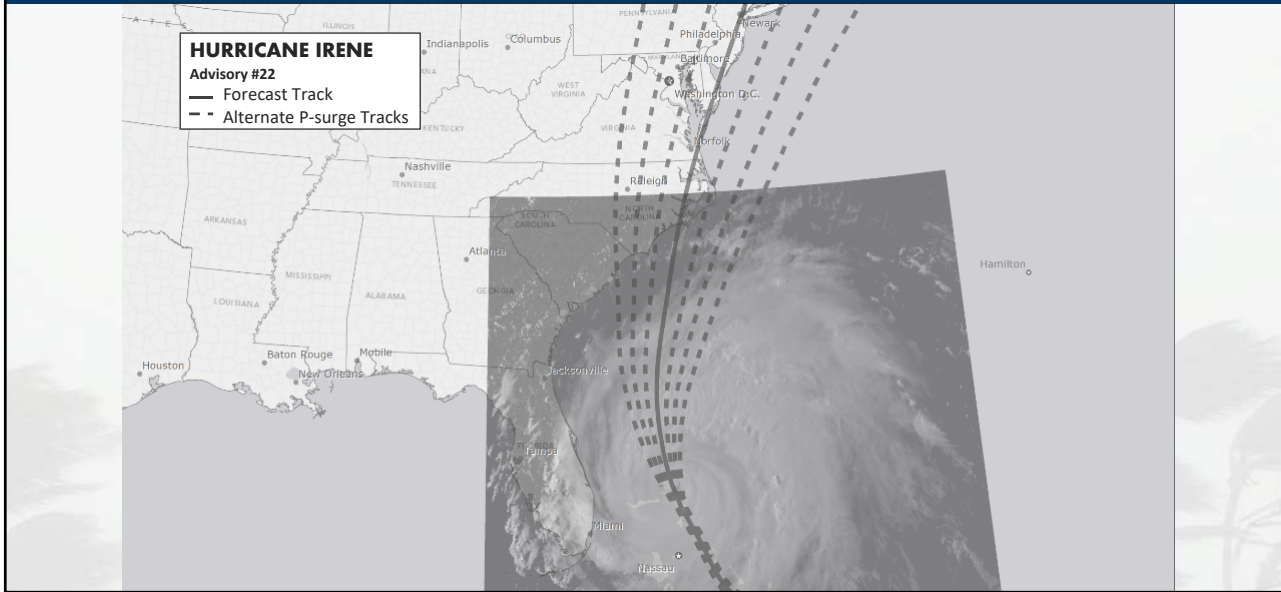
P-SURGE

- **Based on NHC official advisory**
 - Uncertainties based on historical errors
- **Accounts for uncertainty in:**
 - Track (landfall location)
 - Size (Radius of Maximum Winds)
 - Forward speed
 - Intensity
- **Accounts for tide**
- **Heights above ground level**



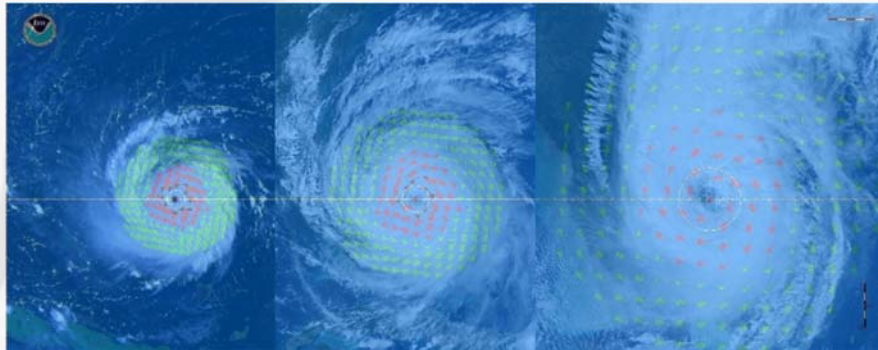
PROBABILISTIC STORM SURGE

Multiple Tracks and Landfall Locations



PROBABILISTIC STORM SURGE

Multiple Sizes, Intensities, Forward Speeds



Size (RMW): Small, Medium, Large
Forward Speed: Fast – Slow
Intensity: Strong, Medium, Weak

PROBABILISTIC STORM SURGE

Web-based. Timing. Availability.



P-SURGE

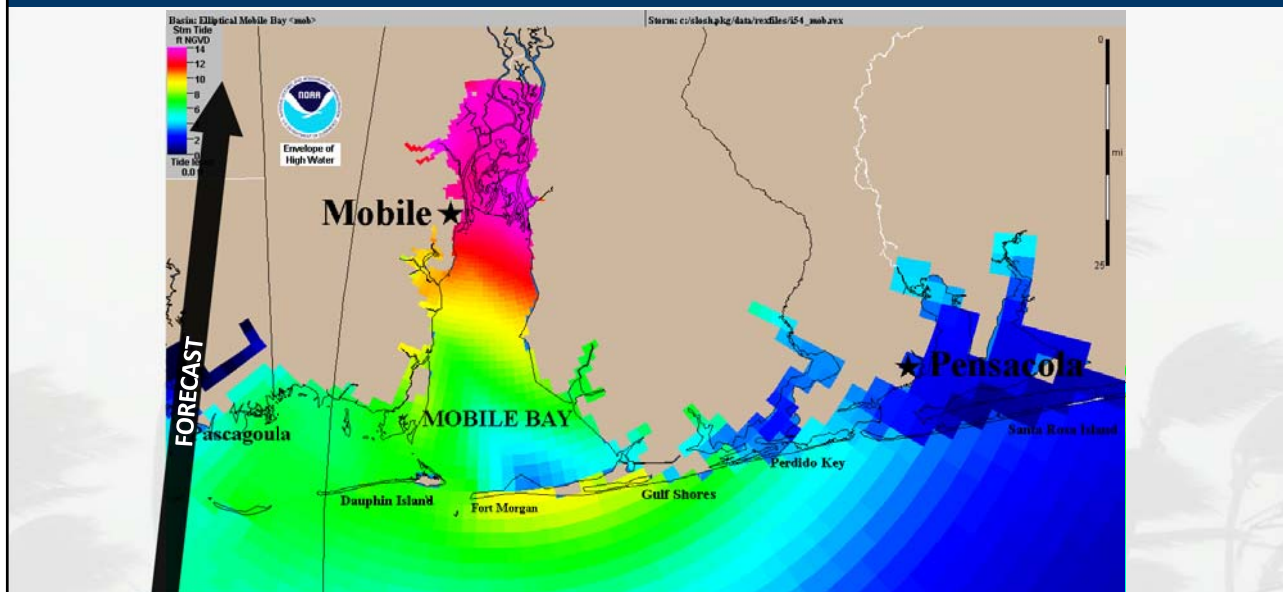
- Available with a Hurricane Watch/Warning
 - 48 hours prior to arrival of TS winds
- Approx 1 hour after advisory

ADV TIME	P-SURGE
• 0500	→ 0600 EDT
• 1100	→ 1200 EDT
• 1700	→ 1800 EDT
• 2300	→ 0000 EDT



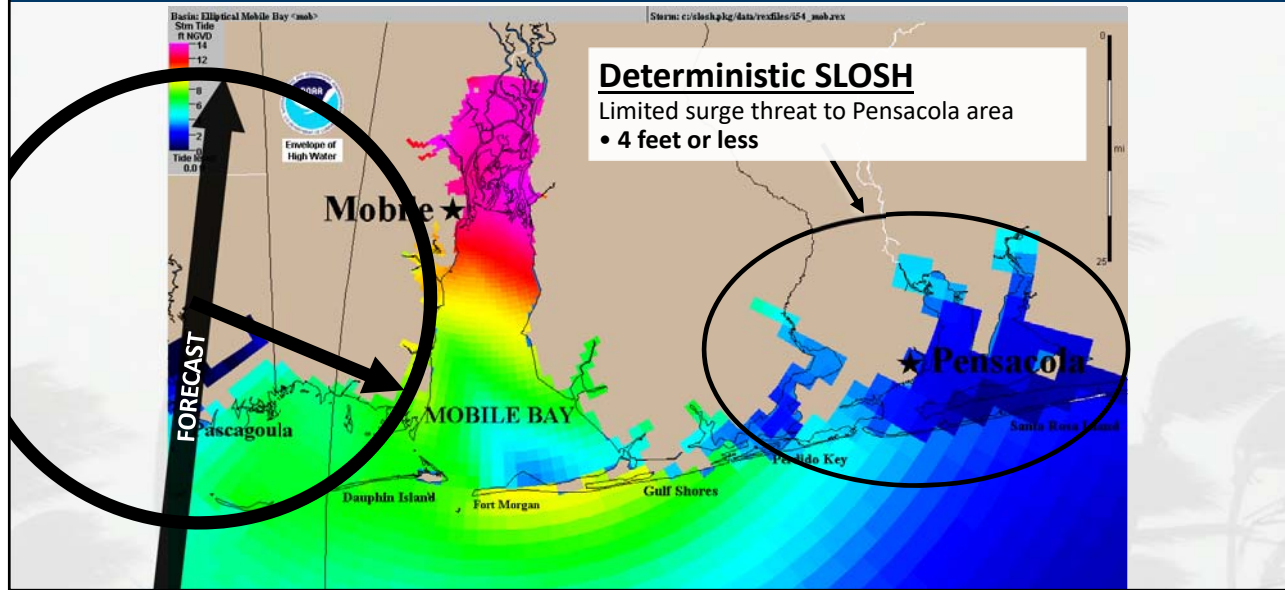
HURRICANE IVAN

What a difference a bay makes.



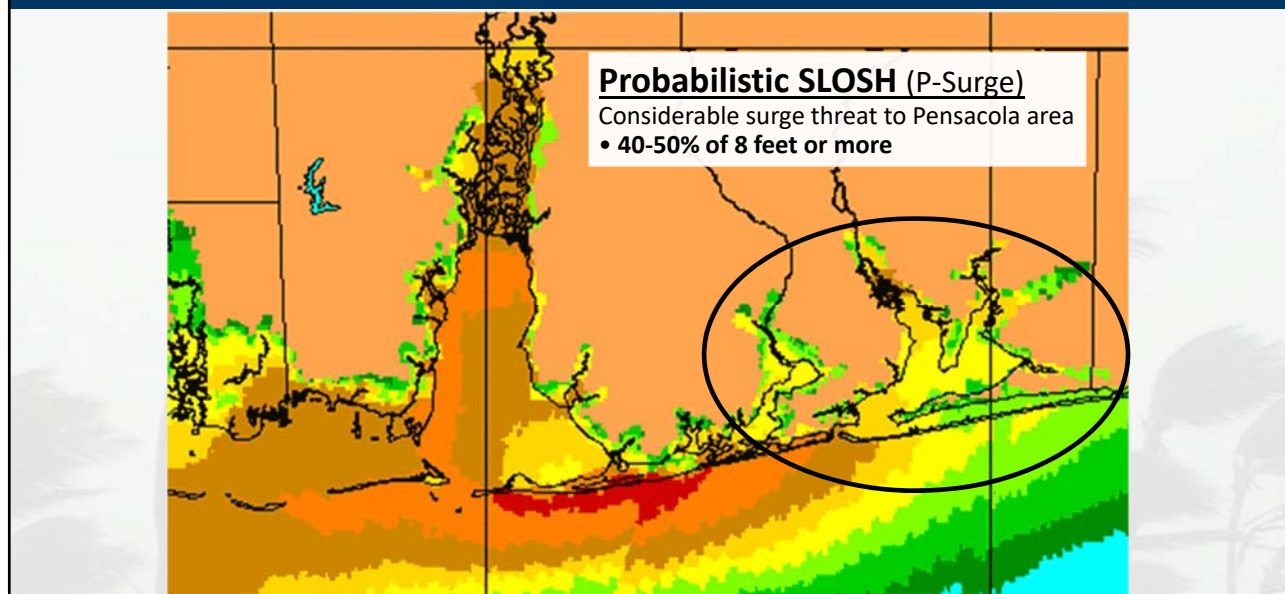
HURRICANE IVAN

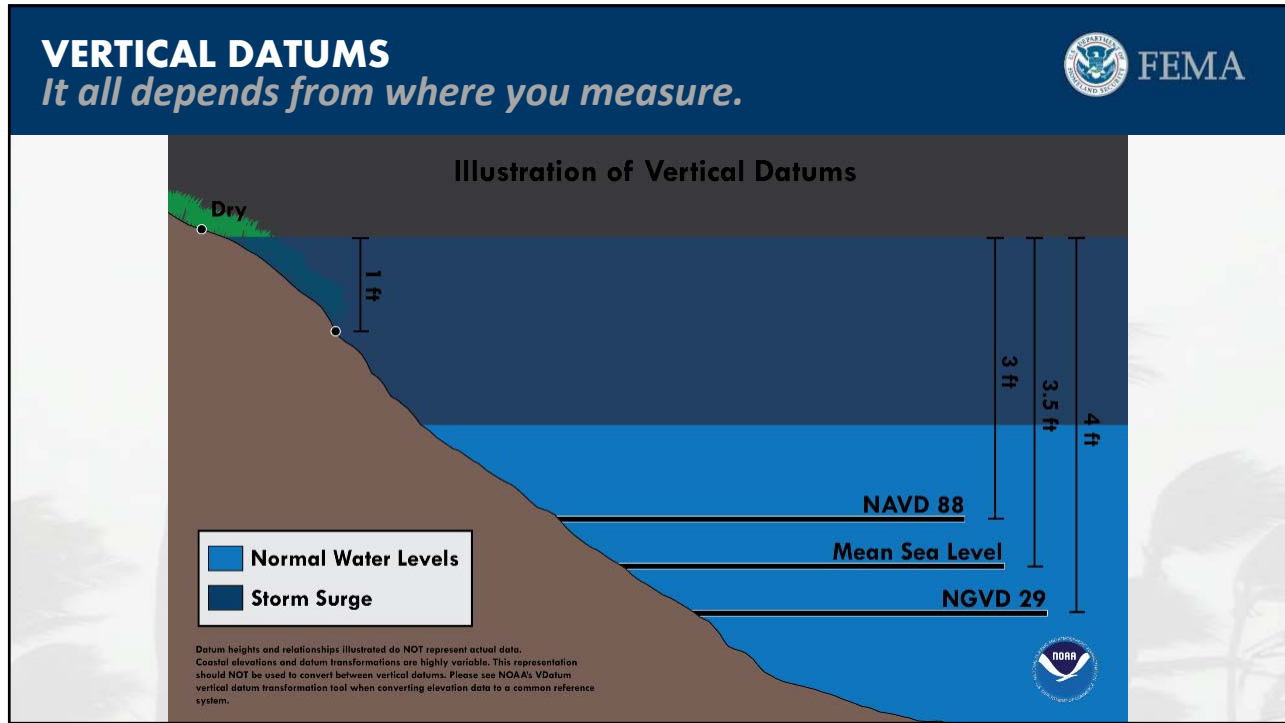
What a difference a bay makes.



HURRICANE IVAN


What a difference a bay makes.





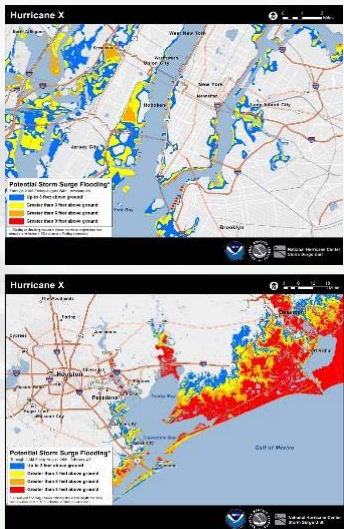
STORM SURGE

Potential Storm Surge Flooding Map


FEMA

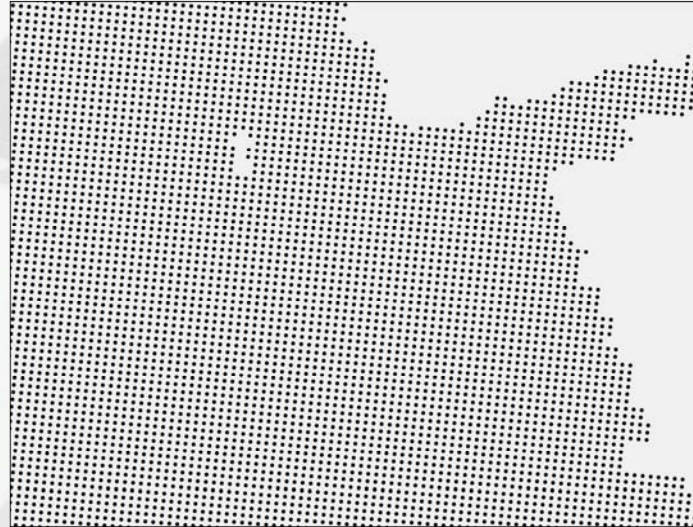
INUNDATION MAP

- **Height above ground that the water could reach**
 - Reasonable worst-case scenario for any individual location
 - Values have a 10% chance of being exceeded
- **Issuance with hurricane watch**
 - In some cases for a tropical storm watch
- **Available 60+ minutes after the advisory release**



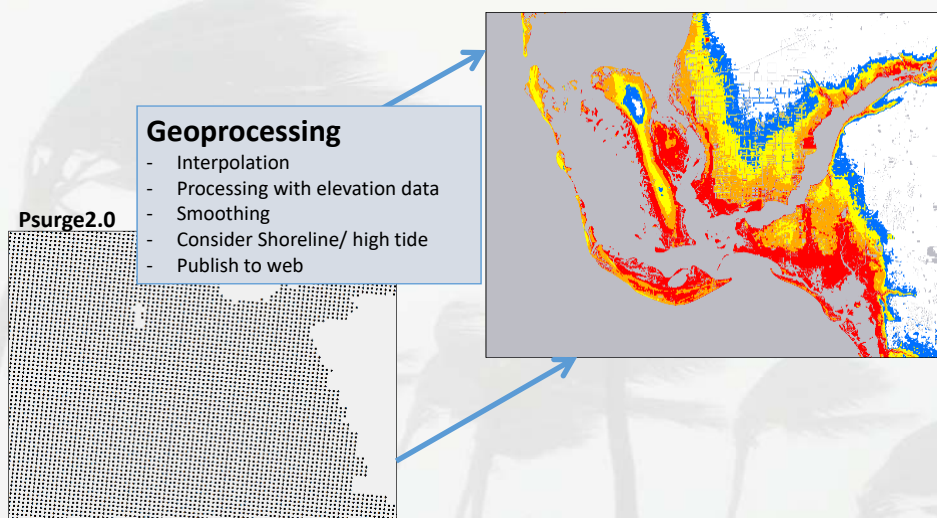
STORM SURGE

Potential Storm Surge Flooding Map



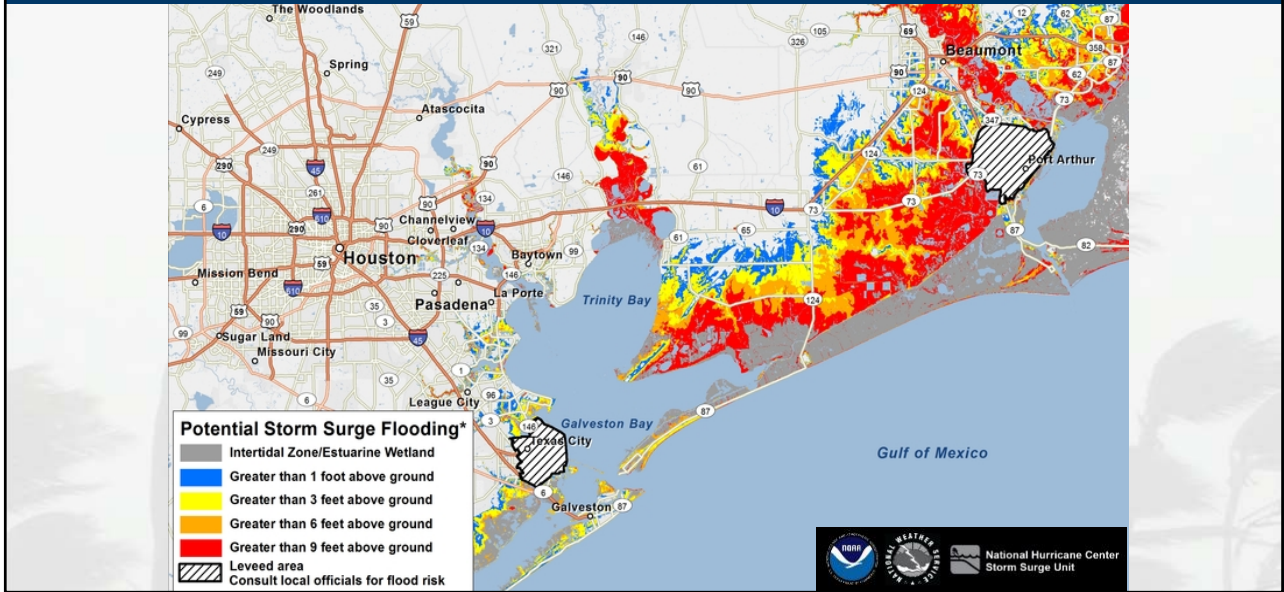
STORM SURGE

Potential Storm Surge Flooding Map



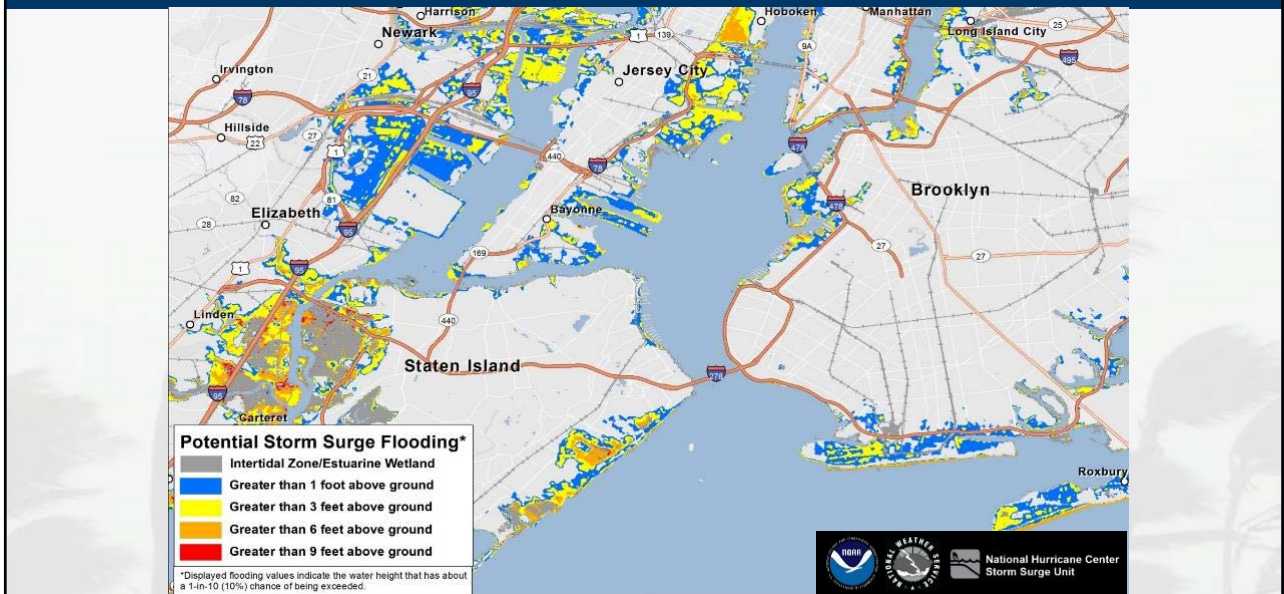
STORM SURGE

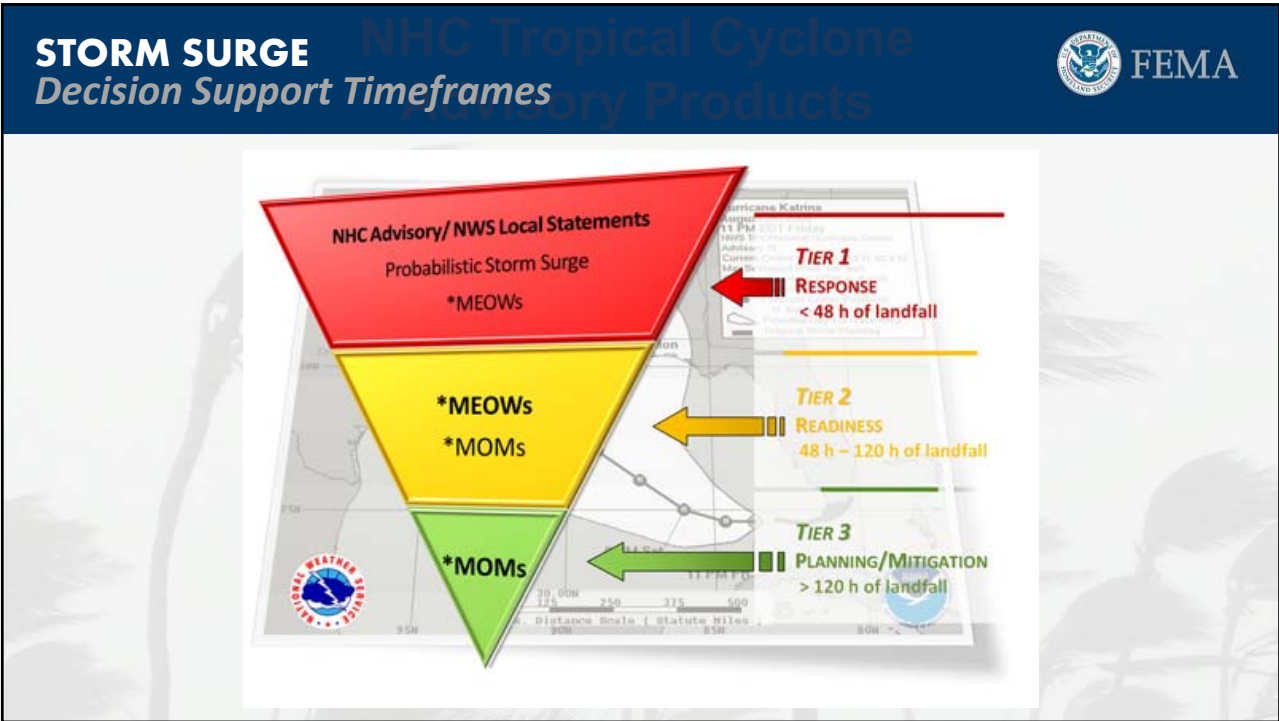
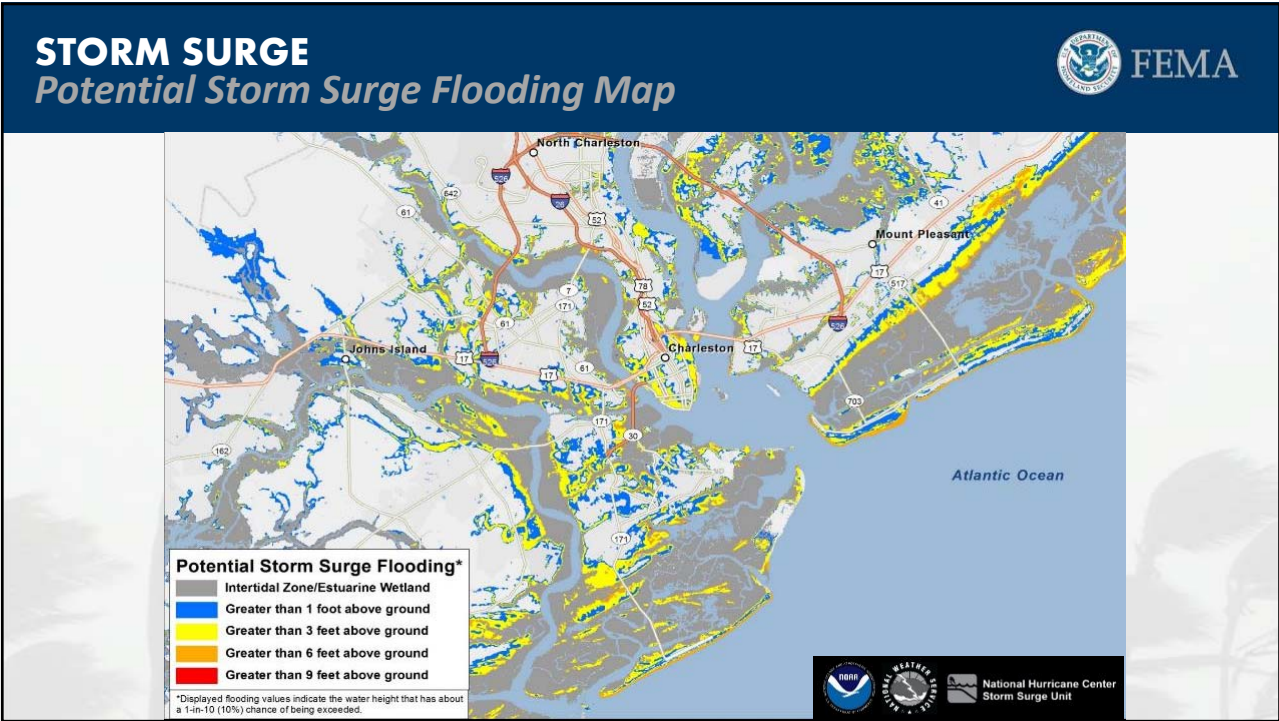
Potential Storm Surge Flooding Map



STORM SURGE

Potential Storm Surge Flooding Map





HURRICANE READINESS

A Short Course



A composite image featuring a screenshot of the National Weather Service National Hurricane Center website on the left and a blue "EVACUATION ROUTE" sign with a white arrow pointing right on the right. The website screenshot shows a satellite image of a hurricane, a news section with headlines about Hurricane ARTHUR and TD DOUGLAS, and a map of Atlantic Tropical Cyclone Activity. The text "Questions/Comments?" is overlaid in large blue font at the bottom of the composite image.

Questions/Comments?