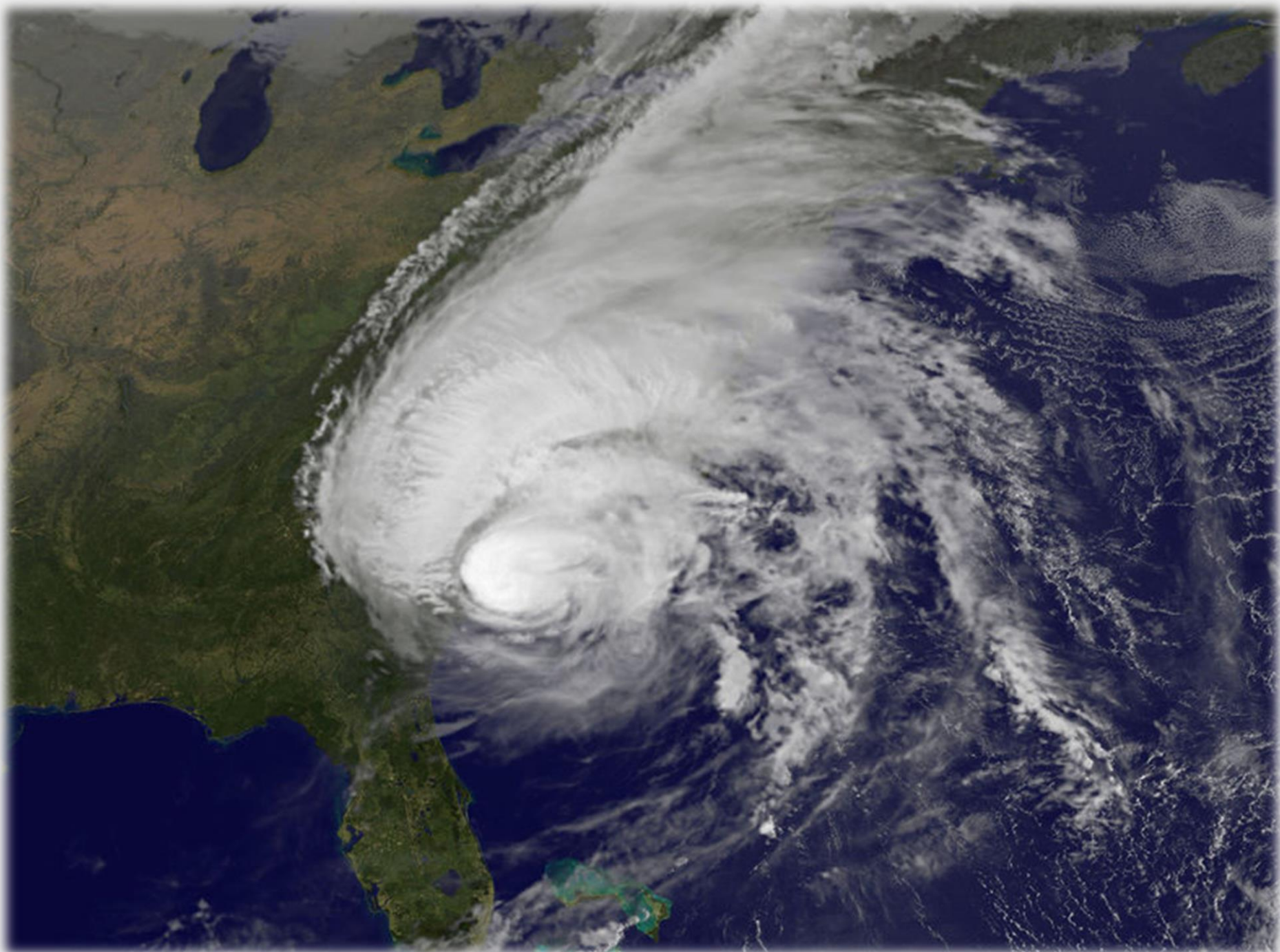


Hurricane  
Matthew  
2016



# What do hurricanes look like from space?

## Hurricane Earl 2010

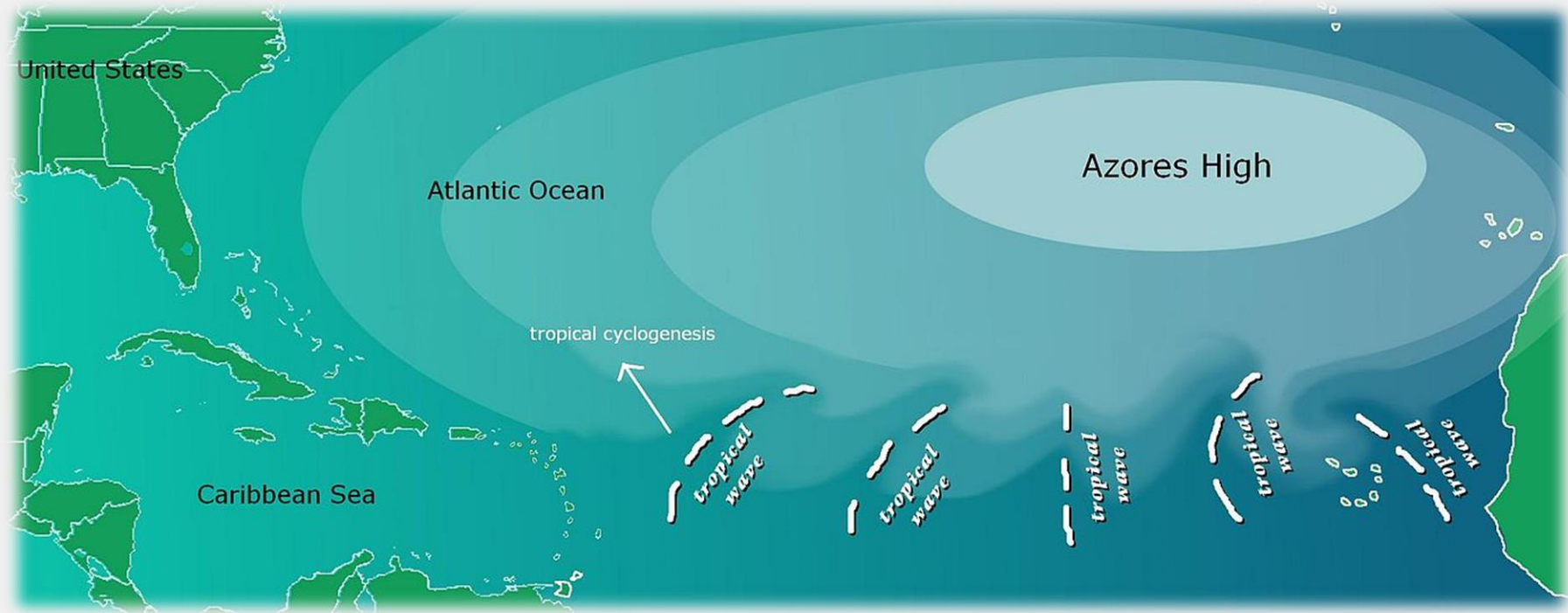


Overview of  
Hurricane  
Matthew....

# Matthew's Track History



# The beginning: September 22

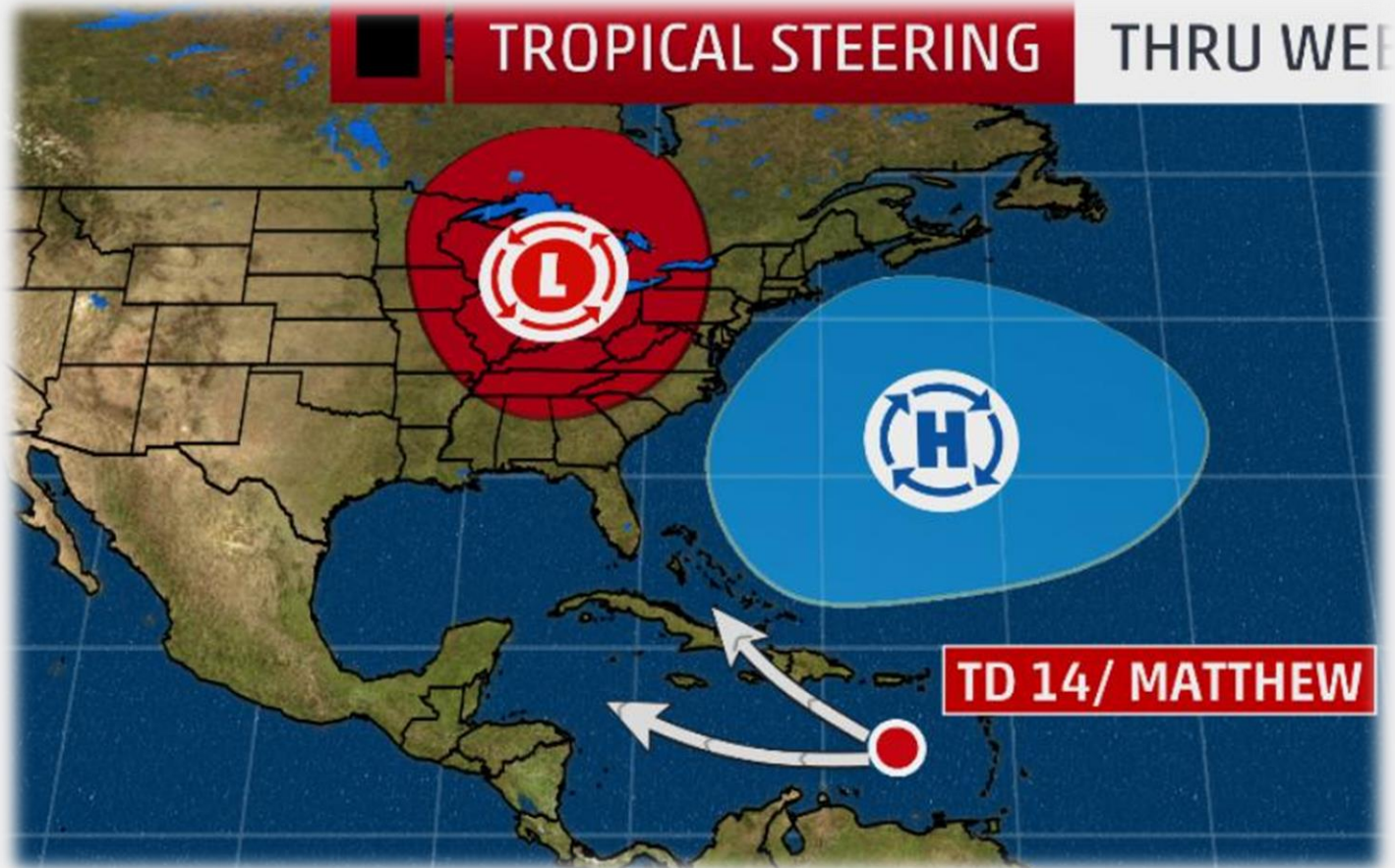


- On September 22, a tropical atmospheric wave exited the west coast of Africa and moved westward across the Atlantic Ocean.
- Two days later, the wave passed south of Cape Verde

# Tropical Disturbance: Invest 97L

- September 25, 2016- Winds were already up to 40-45 mph, but there is no closed surface low pressure area that would lead to a Tropical Storm.
- So far, 97L has been a strong tropical wave, featuring winds shifting from northeasterly ahead of the wave to southeasterly behind the wave, but lacking any west winds at the surface.
- It should be noted this disturbance is starting out at a fairly low latitude, just north of 10 degrees. Therefore, locally heavy rain and gusty winds are expected in such locations as St. Vincent and the Grenadines, Grenada, Trinidad and Tobago, perhaps even coastal Venezuela.

# Tracking the disturbance:



- The track will depend, in part, on the air currents in the atmosphere.
- If a strong high pressure air mass is near or over the Eastern U.S., that may steer "future Matthew" to the west and towards the Eastern U.S.
- On the other hand, if a southward dip in the jet stream is in play over some part of the Eastern U.S., that could help deflect "future Matthew" to the east.

# Tropical Storm Formation

- It took a few days for the storm system to organize as it moved westward in the Atlantic.
- About 3 days later, the system gained enough organization to be named Tropical Storm Matthew near the Windward Islands.





# Hurricane Formation

- Once Matthew reached the eastern Caribbean, it became a hurricane and rapidly intensified. Its peak intensity was late Sept. 30 into early Oct. 1 when it reached Category 5 strength with 160 mph winds.
- Matthew traveled more than 3,000 miles from when it was first designated Invest 97L to when it reached near the Florida coast.

Day by day details of  
Hurricane Matthew...

September 25

Thunderstorm activity increased along the wave, which organized even more during the following days as it approached the Lesser Antilles.

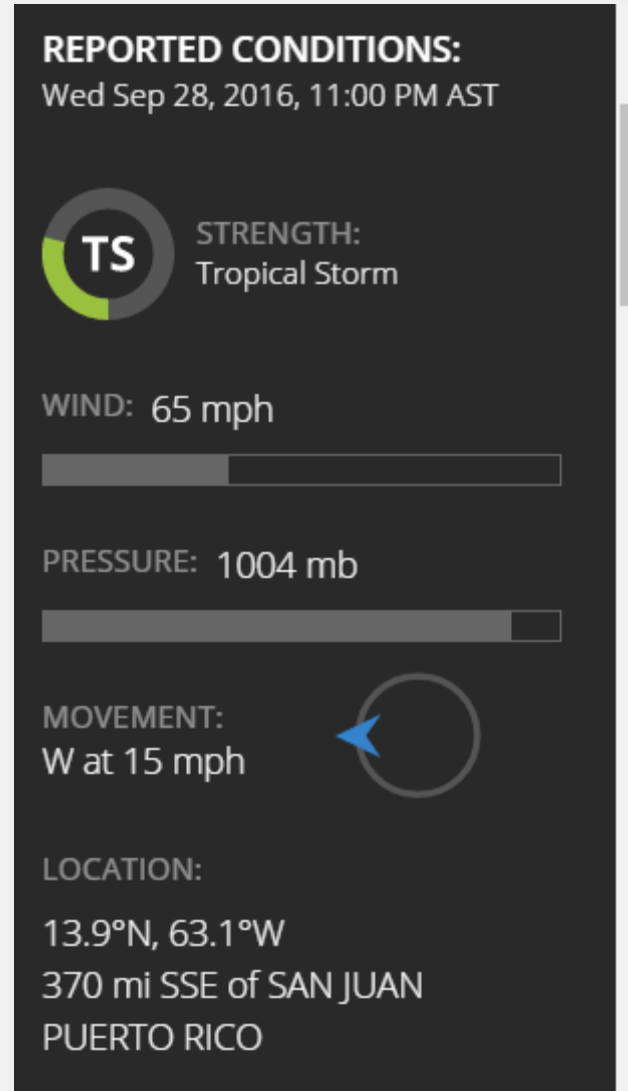


# September 27

- By September 27, the wave was producing sustained tropical storm-force winds – over 40 mph—although the system lacked the closed circulation to be classified a tropical cyclone.
- While the system was passing near Barbados, radar imagery in the Lesser Antilles indicated that the circulation was becoming better organized.

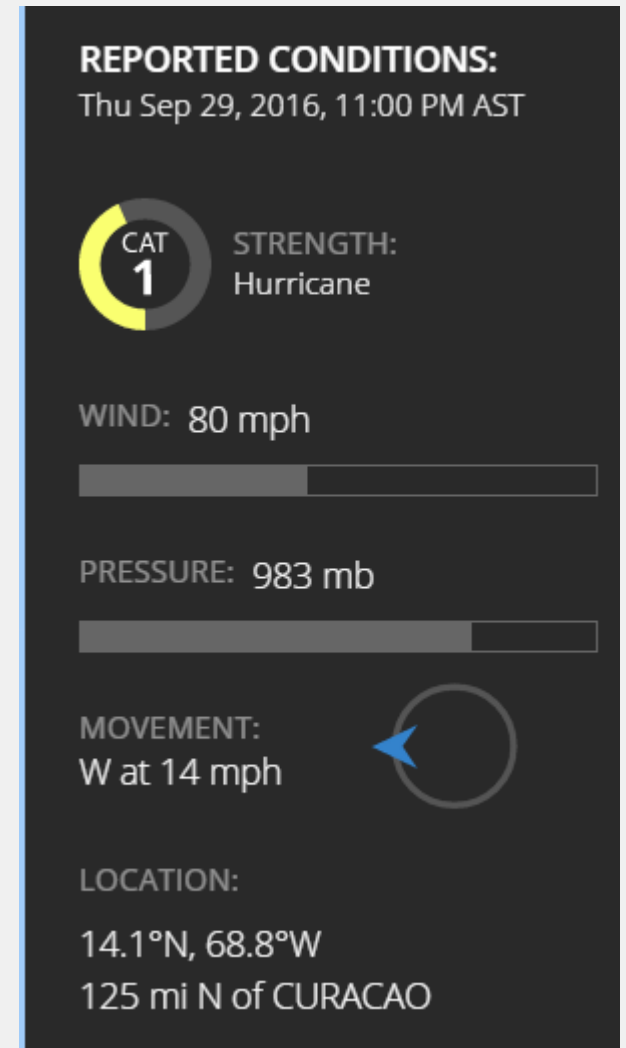
# September 28

- On September 28 a closed circulation finally developed Tropical Storm Matthew. Surface winds of 58 mph, were recorded along with hurricane-force gusts
- Upon its development as a tropical cyclone, Matthew was still moving westward, steered by a strong ridge to its north, into an area of warm sea surface temperatures and low wind shear;
- The center passed between the islands of Saint Lucia and Saint Vincent before entering the Caribbean Sea.



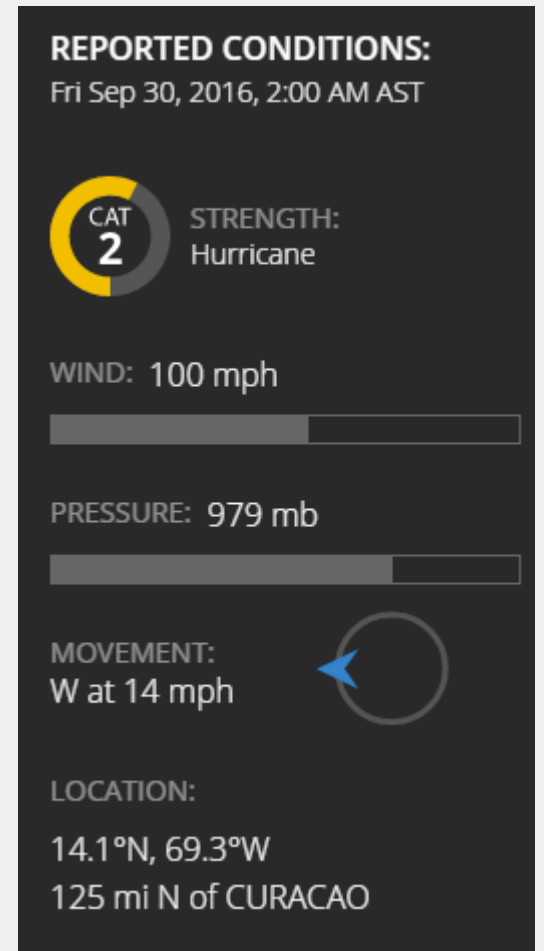
# September 29- Hurricane Status

- On September 29, Hurricane Matthew attained hurricane status, observing sustained winds of 75 mph. Subsequently, convection redeveloped over the center, and the outer thunderstorms organized into rainbands.



# September 30

- An eye feature had developed by early on September 30. Despite northwesterly wind shear, Matthew began to undergo explosive intensification, doubling its wind speed from 80 mph to 160 mph over a period of 24 hours.
- Matthew intensified from a Category 1 hurricane on the Saffir-Simpson scale to a Category 5 hurricane in just 24 hours.
- Matthew became a Category 5 hurricane at 13.3 degrees north, surpassing
- Close to Matthew's peak intensity, a rare phenomenon known as [lightning sprites](#) were observed above the storm in Puerto Rico.





# October 1

- Early on October 1, the hurricane weakened slightly to a high-end Category 4 with winds of around 155 mph an eyewall replacement cycle may have begun, as its eye began to wane in size.
- It further weakened to 140 mph but strengthening resumed, and by 21:00 UTC it had re-acquired winds of 160 mph.



# October 2

- By late on October 1, Matthew had become nearly stationary because of very weak steering currents; however, the storm began to turn northwards and accelerate by October 2.
- During this time, Matthew had begun to fluctuate in intensity.

## REPORTED CONDITIONS:

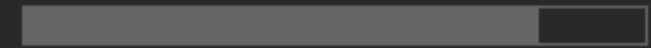
Sun Oct 2, 2016, 2:00 AM EDT



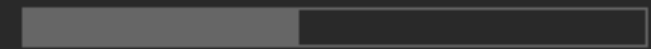
CAT  
4

STRENGTH:  
Hurricane

WIND: 150 mph



PRESSURE: 940 mb



MOVEMENT:  
NNW at 6 mph



LOCATION:

13.8°N, 73.9°W

350 mi SSW of PORT AU

PRINCE HAITI

# October 3

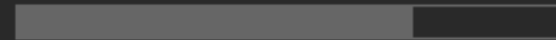
## REPORTED CONDITIONS:

Mon Oct 3, 2016, 2:00 AM EDT



STRENGTH:  
Hurricane

WIND: 130 mph



PRESSURE: 943 mb



MOVEMENT:  
N at 5 mph



LOCATION:

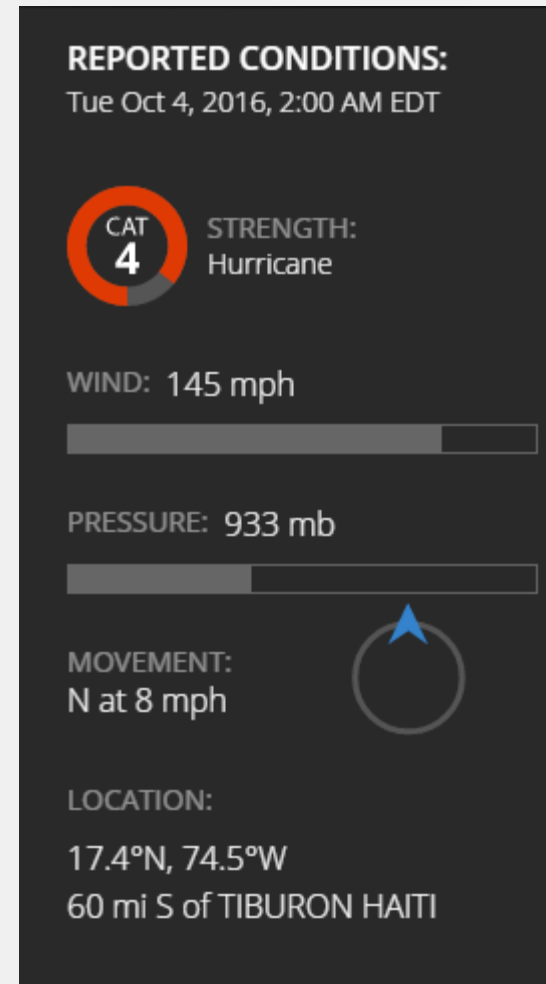
14.9°N, 75°W

310 mi SW of PORT AU

PRINCE HAITI

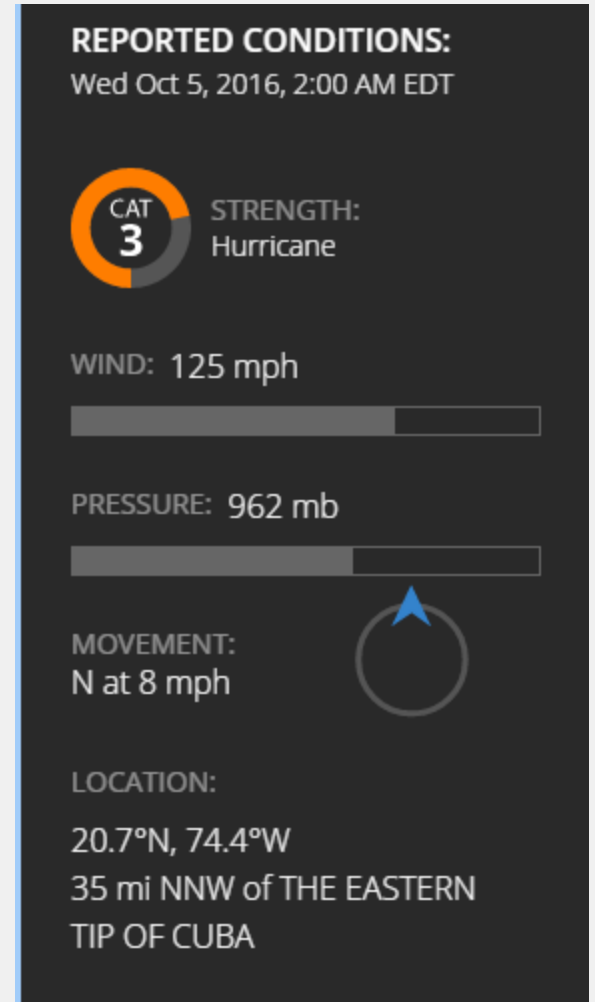
# October 4

- At 7:00 a.m. EDT (11:00 UTC) October 4, Matthew made landfall near Les Anglais, Haiti with winds of 145 mph
- At 8:00 p.m. Matthew made landfall near Jauco, Cuba with winds of 140 mph
- After making its landfall in Cuba, the hurricane re-emerged into the Atlantic as a Category 3 later that night, due to some disruption from the mountains it had been interacting with and the pressure rising to around 963 mbar (28.4 inHg).



# October 5-6

- Matthew then underwent a secondary period of rapid intensification overnight on October 5–6 as its pressure fell 18 millibars (0.53 inHg) to 944 mbar (27.9 inHg).
- Later that same day, the cyclone began to undergo another eyewall replacement cycle, as shown from radar observations from Miami, Florida.
- Turning north-northwestwards, Matthew continued to approach the Florida coastline and by 5.00 a.m. EDT (09:00 UTC) the next day, the western edge of its outer eyewall was located just less than 12 miles offshore.



# October 6

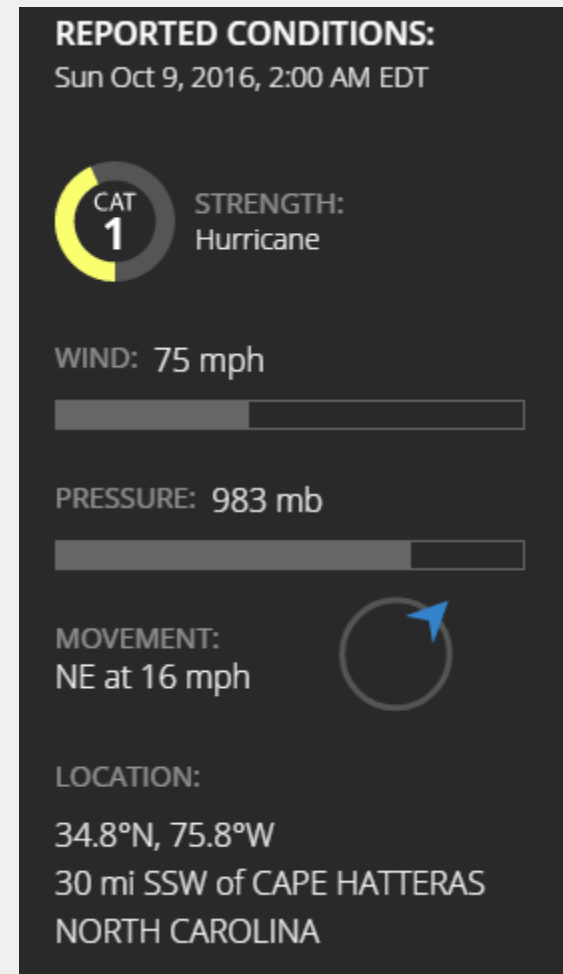


# October 7



# October 8-9

- At around 11:00 a.m. EDT (15:00 UTC) on October 8th, Matthew made landfall at Cape Romain National Wildlife Refuge, near McClellanville, South Carolina as a Category 1 hurricane with winds of 75 mph (120 km/h).
- As it pulled away from the coast, Matthew began to undergo an extratropical transition, with most of the convection becoming displaced to the north, and the hurricane became post-tropical on October 9th while situated to the east of the Outer Banks.



# Reported Conditions for Wilmington, NC



## REPORTED CONDITIONS:

Sat Oct 8, 2016, 5:00 PM EDT

**CAT 1** STRENGTH: Hurricane

WIND: 75 mph

PRESSURE: 976 mb

MOVEMENT: ENE at 13 mph

LOCATION:  
33.8°N, 78.2°W  
15 mi WSW of CAPE FEAR  
NORTH CAROLINA



# Final Stages of Matthew

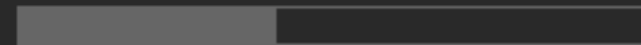
## REPORTED CONDITIONS:

Sun Oct 9, 2016, 5:00 PM EDT



STRENGTH:  
Tropical Depression

WIND: 75 mph



PRESSURE: 988 mb



MOVEMENT:  
ENE at 15 mph

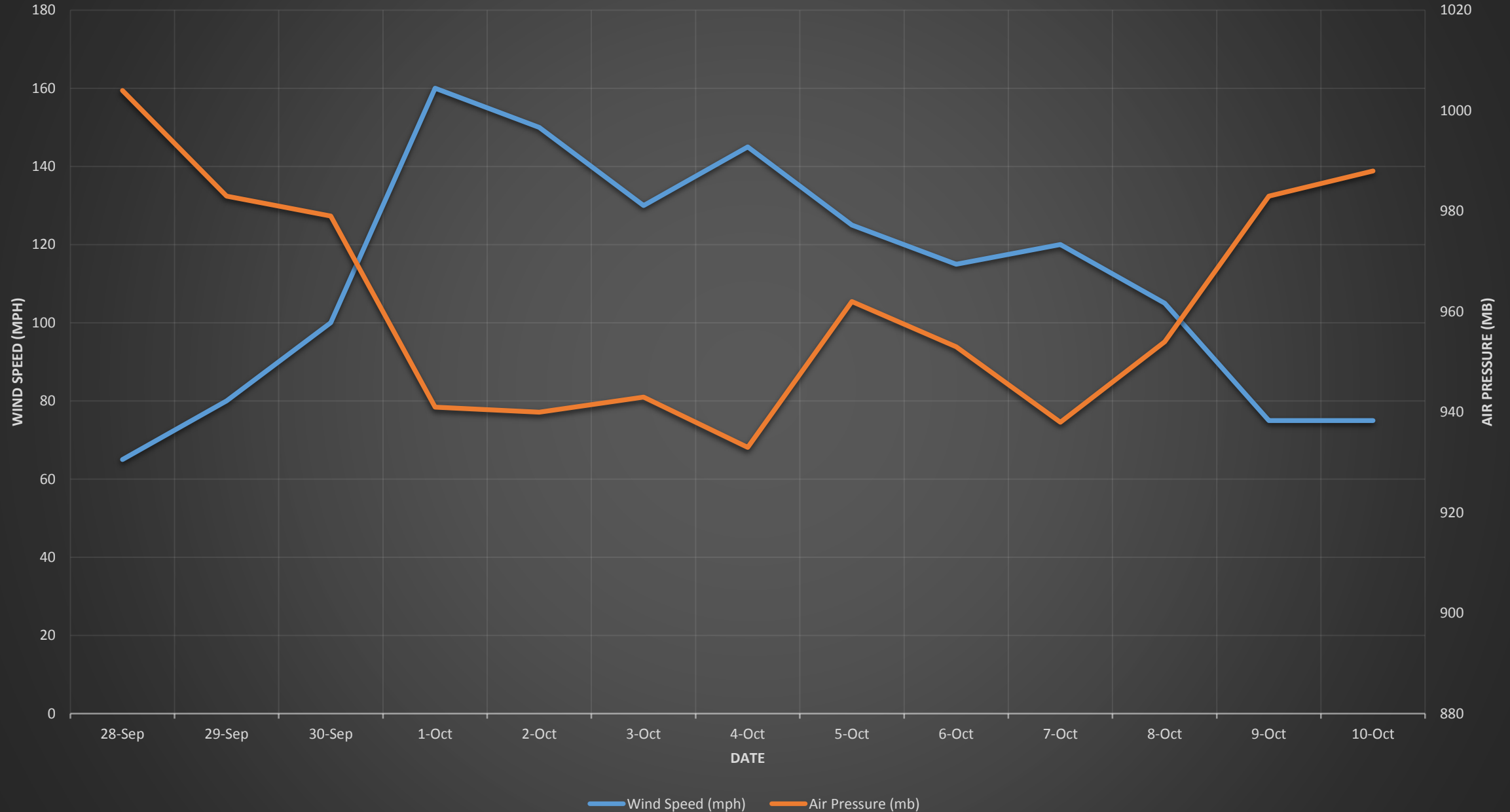


LOCATION:

35.4°N, 72°W

200 mi E of CAPE HATTERAS  
NORTH CAROLINA

# Wind Speed vs Air Pressure for Hurricane Matthew 2016



# Damage from the hurricane



**Matthew Kills 19 in U.S.: Entire North Carolina Town Evacuated As Rising Water Puts Dam at Risk**

[Read the Story](#)

Washed out highway in Flagler Beach, Florida,  
on October 8, 2016,



# More from Flagler Beach



# Flooded water street in Wilmington, NC 10/8



Simpson, NC

