

“Activity: How Difficult Is It to Predict Hurricane Path and Intensity Forecasts? Case Study: “Hurricane “Sandy””

Images used with permission from
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University of Wisconsin-Milwaukee

<http://derecho.math.uwm.edu/models/>

These images shows the set of track paths and intensities for [“Hurricane Sandy” \(2012\)](#) predicted by computer models used by the forecasters and researchers. Click on the link for more information.

- Tracks

These show the path that the models predict the storm will follow for the time periods shown.

Pay attention to the locations where they predict the storm will come ashore (make landfall).

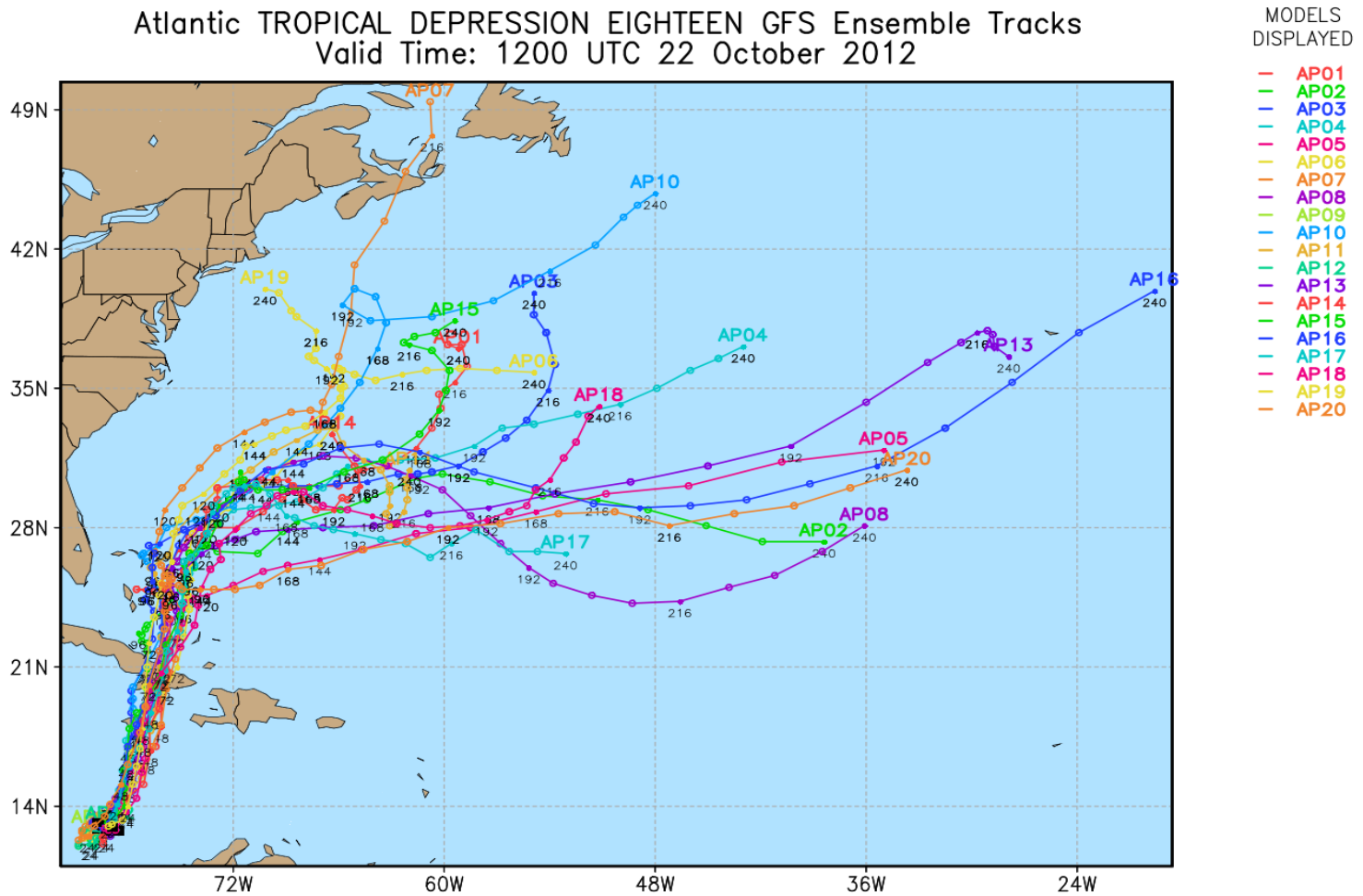
- Intensities

These show the predicted maximum winds during the time period.

Shading also indicates when the storm is a hurricane, tropical storm, or weaker.

Image 1A

Atlantic TROPICAL DEPRESSION EIGHTEEN GFS Ensemble Tracks Valid Time: 1200 UTC 22 October 2012

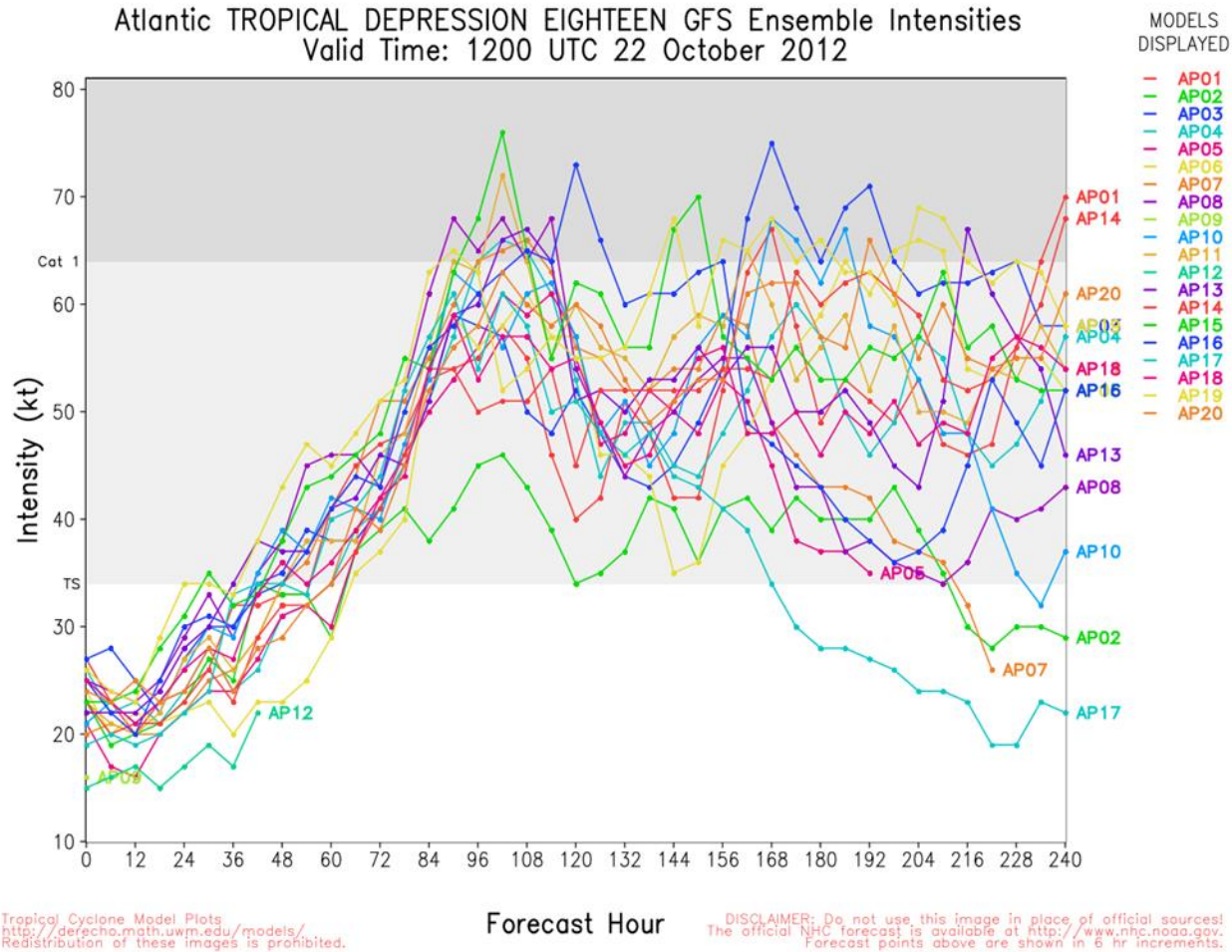


Tropical Cyclone Model Plots
<http://derecho.math.uwn.edu/models/>
Redistribution of these images is prohibited.

DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

Where do most models predict the storm will go over its lifetime?
How many predict landfall somewhere in the US?

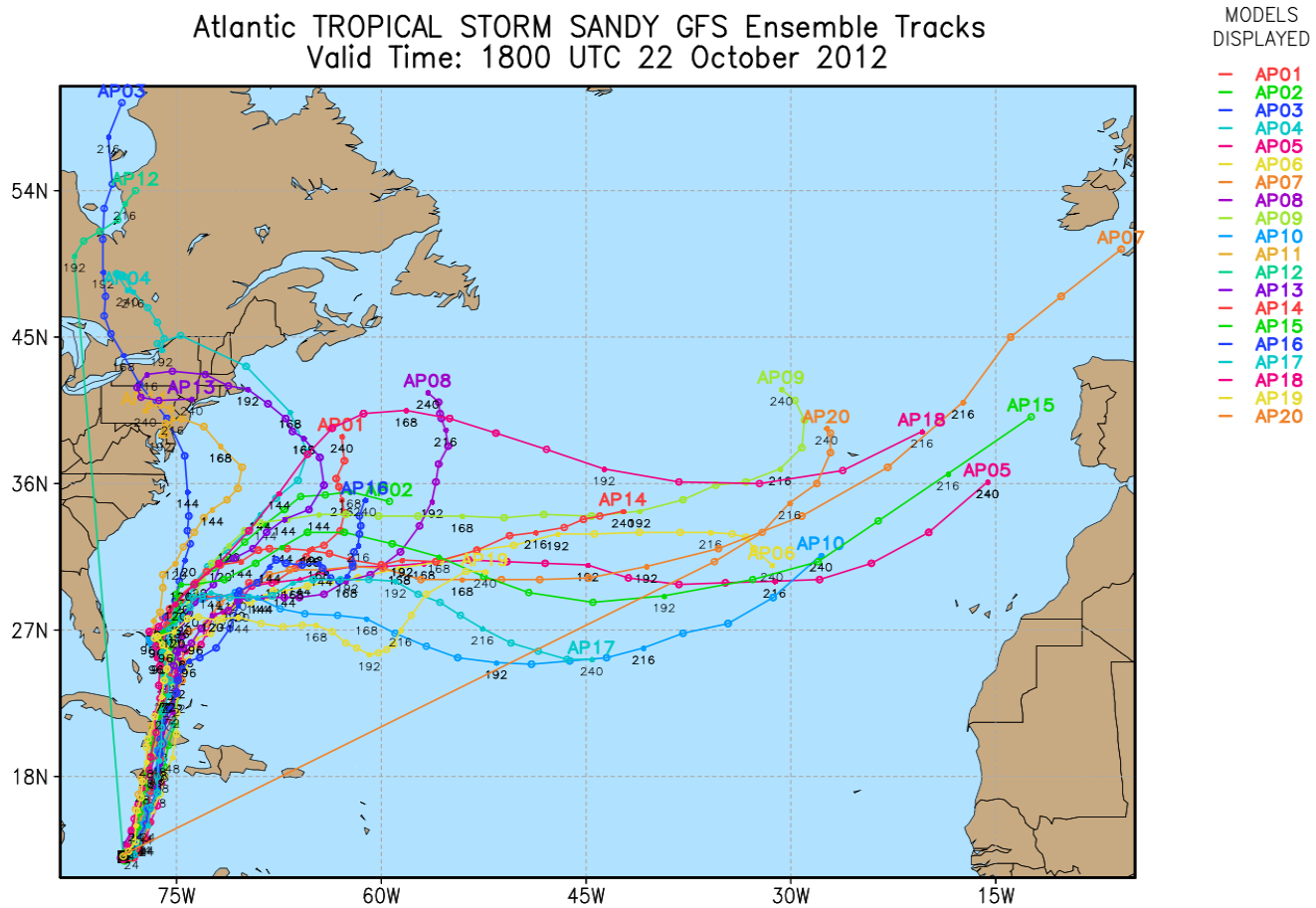
Image 1B



How many models predict this storm will develop into a hurricane?
What are the maximum wind speeds predicted?

Image 2A

Atlantic TROPICAL STORM SANDY GFS Ensemble Tracks
Valid Time: 1800 UTC 22 October 2012

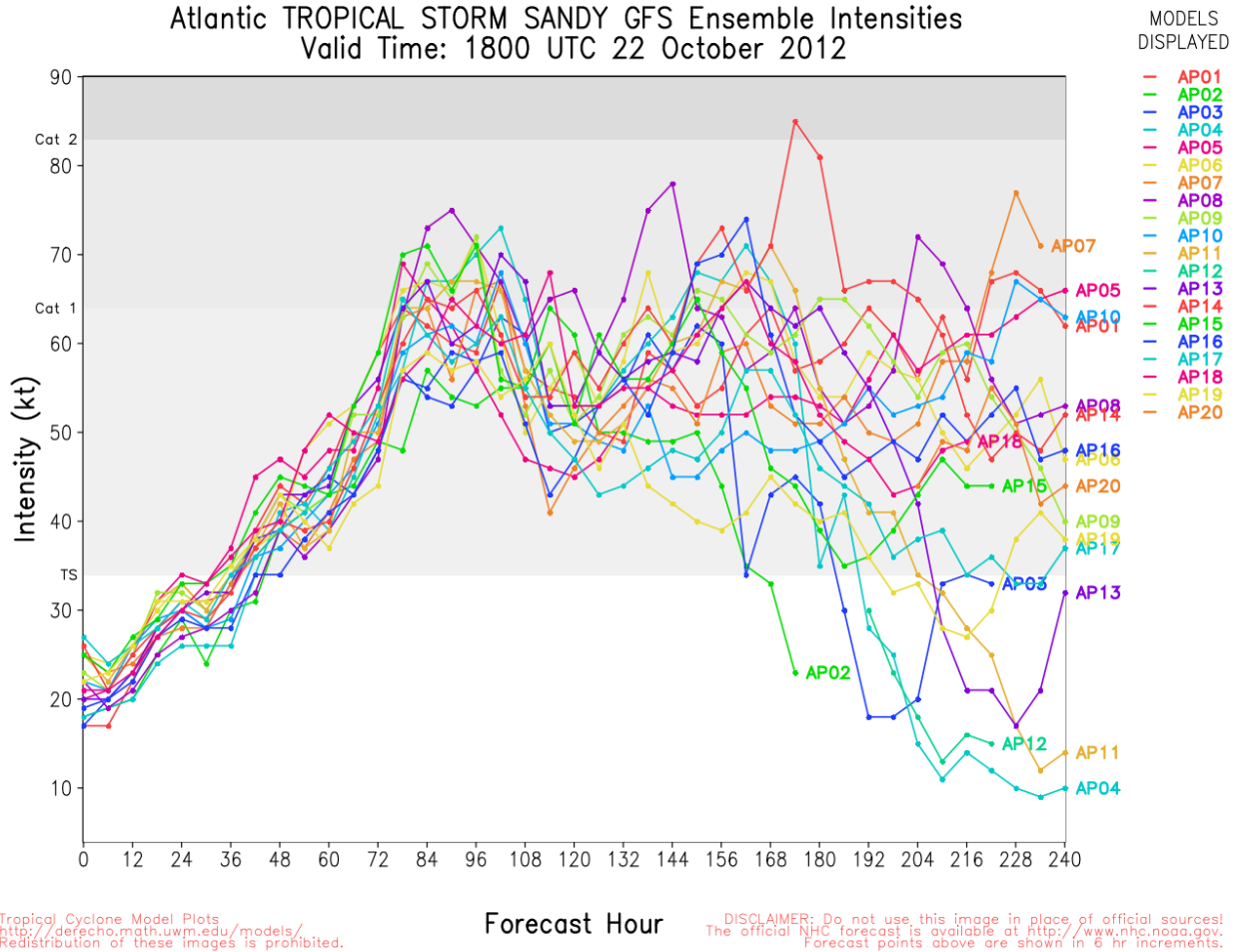


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Six hours later, what is the strength of the storm now?
How many models predict landfall in the US?
In what states is this landfall predicted to occur?
Where do most models predict the storm will go?

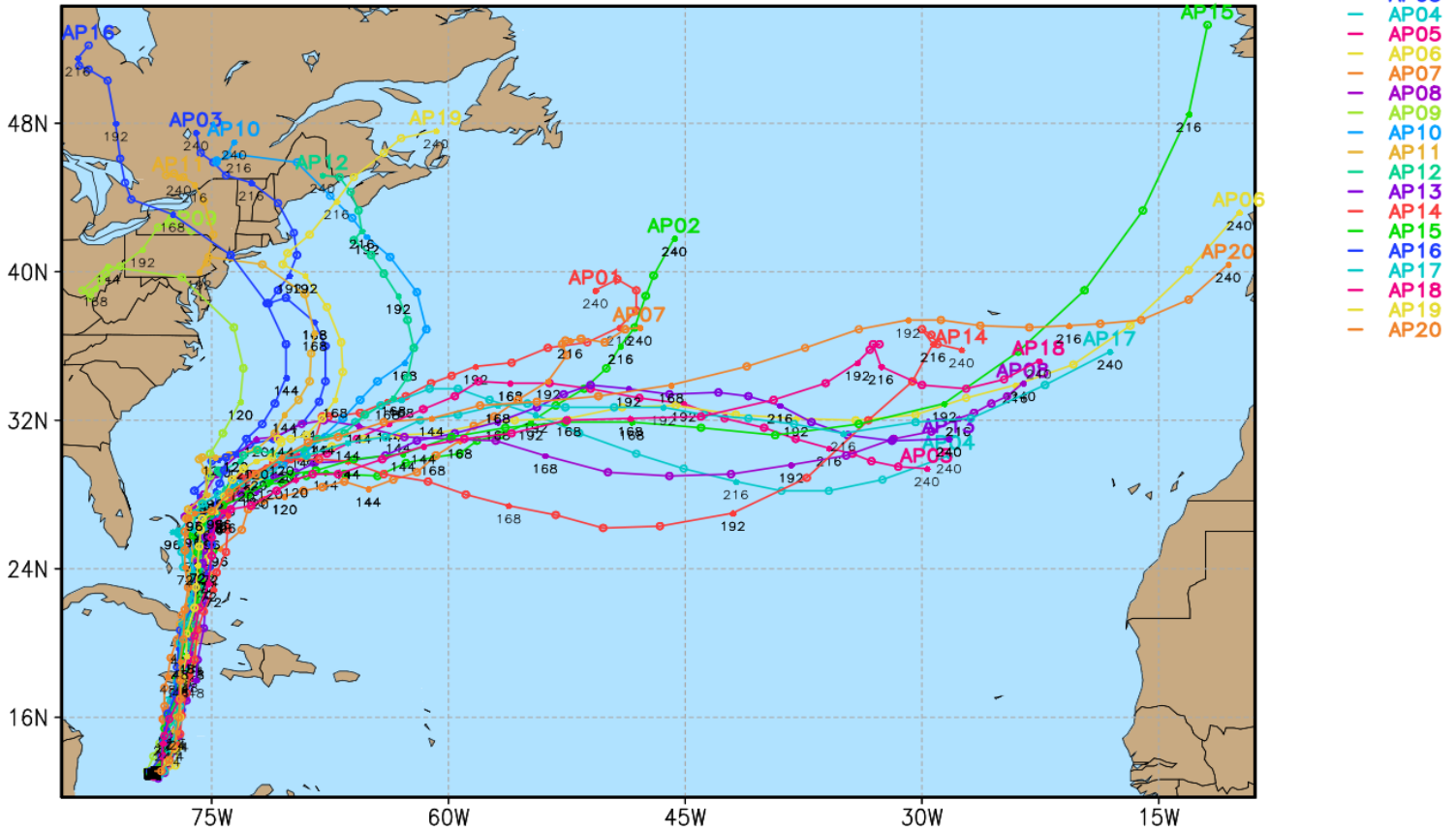
Image 2B



How many models now predict the storm will become a hurricane?
How many predict it might develop into a category 2 storm?
What ocean conditions may have provided the increased energy to the storm?

Atlantic TROPICAL STORM SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 23 October 2012

Image 3



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Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

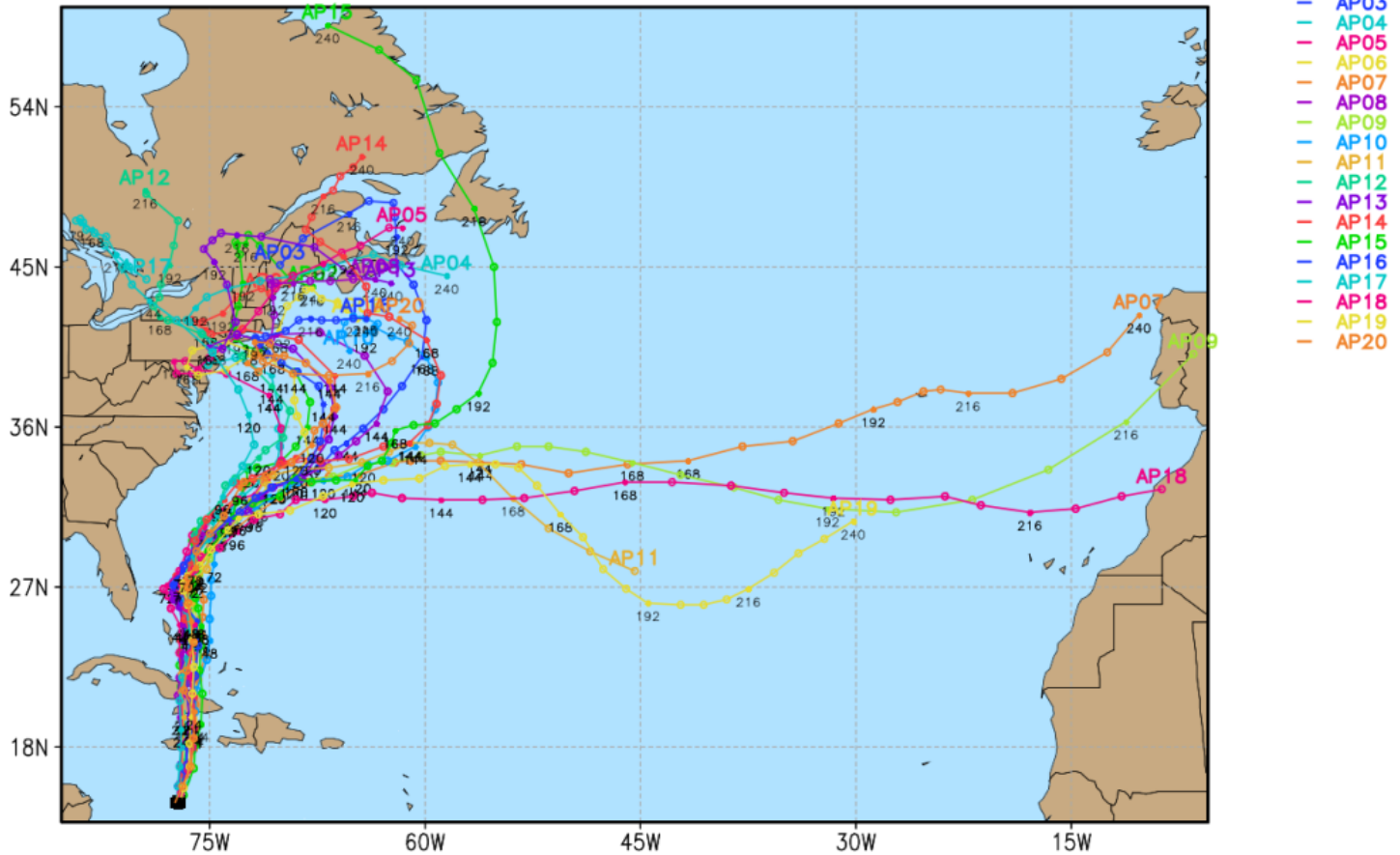
6 hours later, what is the classification of the storm?

How many models think there will be landfall?

In which States/Provinces do these models predict landfall will occur?

Image 4

Atlantic TROPICAL STORM SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 24 October 2012



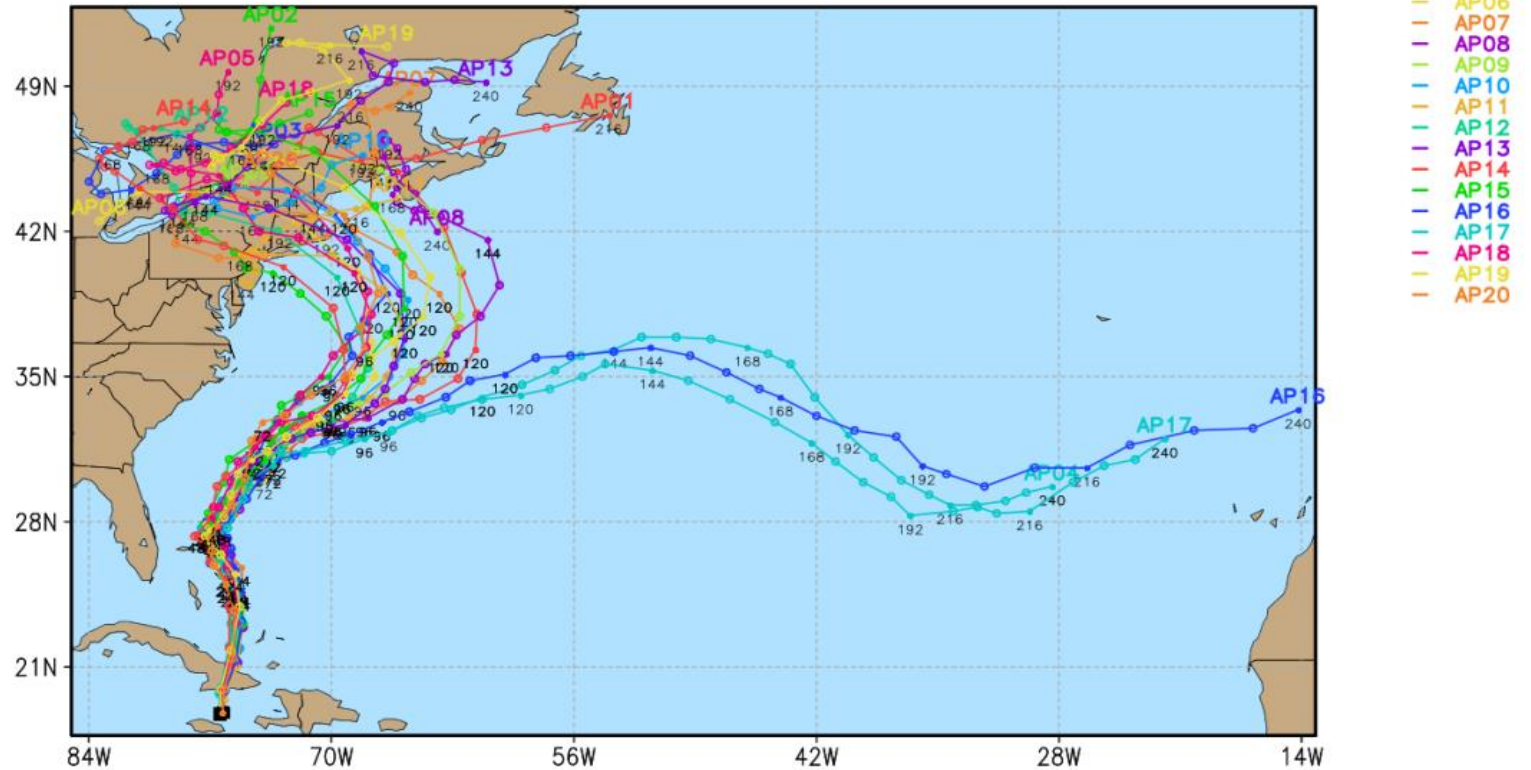
Tropical Cyclone Model Plots
<http://derecho.mgh.uwm.edu/models/>
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The official NHC forecast is available at <http://www.nhc.noaa.gov/>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

24 hours later, where do most models predict the storm will go?
Describe the range of potential landfall locations by State and Province
What factors might create such a wide spread between the models?

Image 5A

Atlantic HURRICANE SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 25 October 2012



Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Redistribution of these images is prohibited.

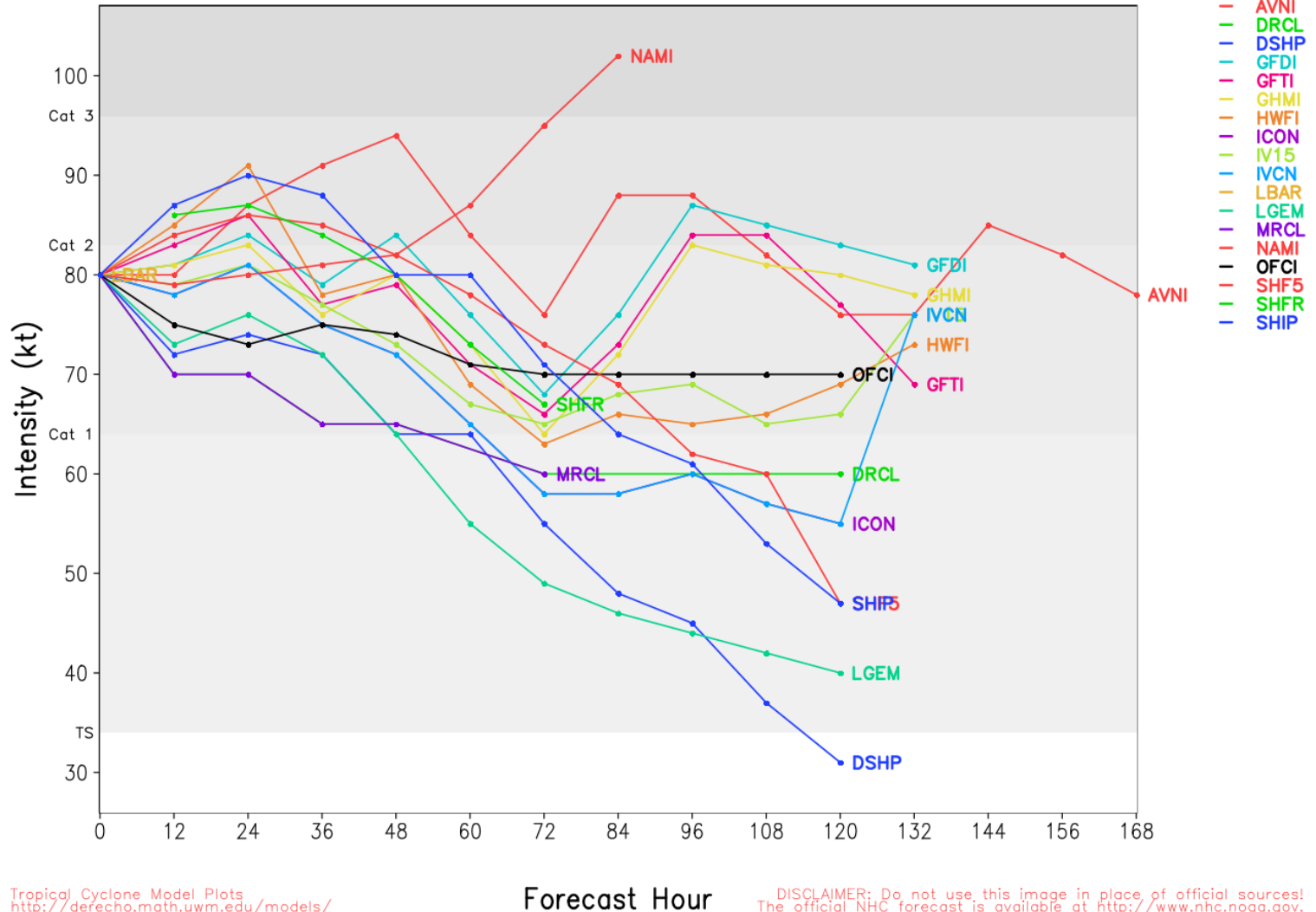
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov/>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

What is the category of the storm now?

Looking at the locations of possible landfalls, in which State would you predict it to come ashore?

Image 5B

Atlantic HURRICANE SANDY Model Intensities Valid Time: 0000 UTC 25 October 2012



Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
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The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 12 hr increments.

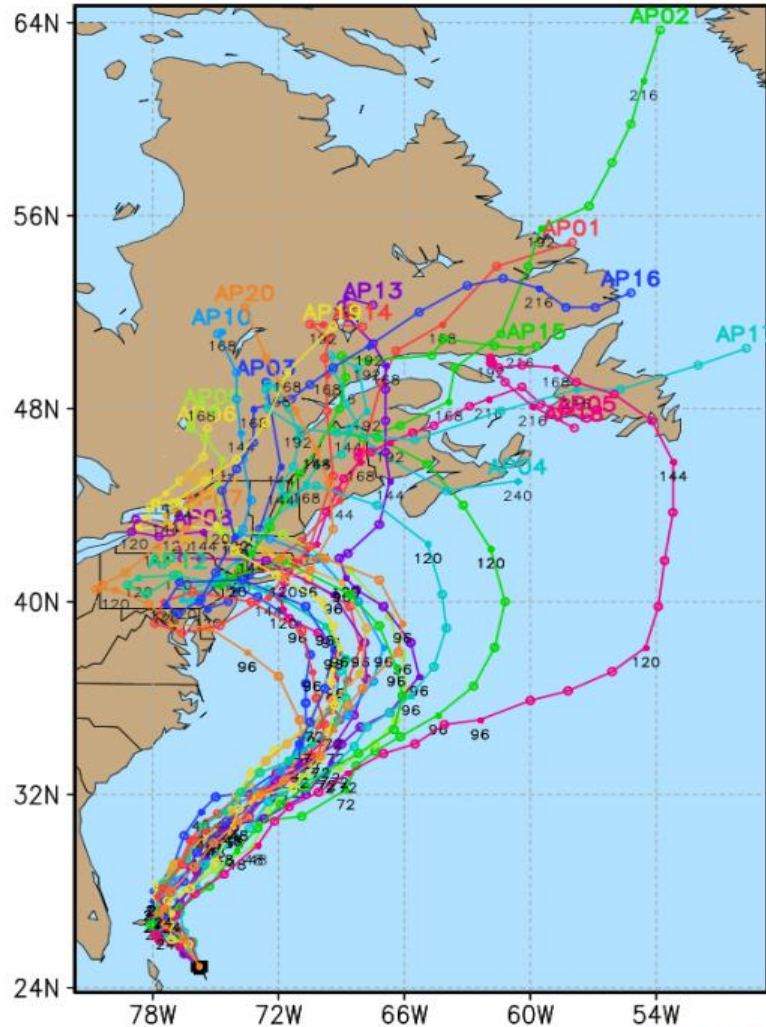
How fast are the maximum winds?

How many models predict it will develop into a Category 3 storm?

How many models predict it will diminish back to a tropical storm?

Image 6A

Atlantic HURRICANE SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 26 October 2012



MODELS
DISPLAYED

- AP01
- AP02
- AP03
- AP04
- AP05
- AP06
- AP07
- AP08
- AP09
- AP10
- AP11
- AP12
- AP13
- AP14
- AP15
- AP16
- AP17
- AP18
- AP19
- AP20

Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Twitter: @HurricaneModels

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The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

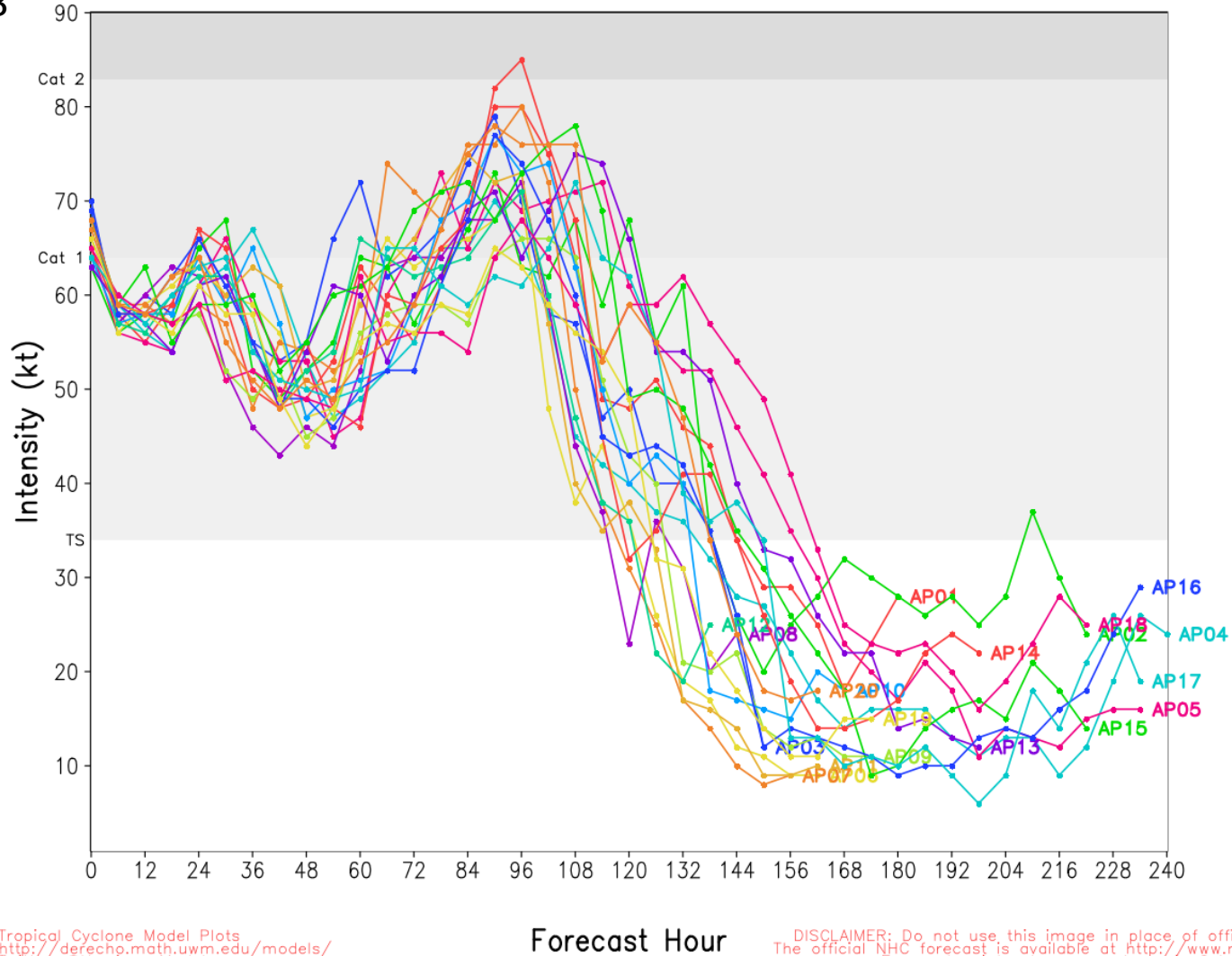
What is an important difference now from the models 24 hours earlier?
Based on these, where would you predict landfall will occur?

Image 6B

Atlantic HURRICANE SANDY GFS Ensemble Intensities

Valid Time: 0000 UTC 26 October 2012

MODELS
DISPLAYED



Tropical Cyclone Model Plots
<http://derechp.math.uwm.edu/models/>
Twitter: @HurricaneModels

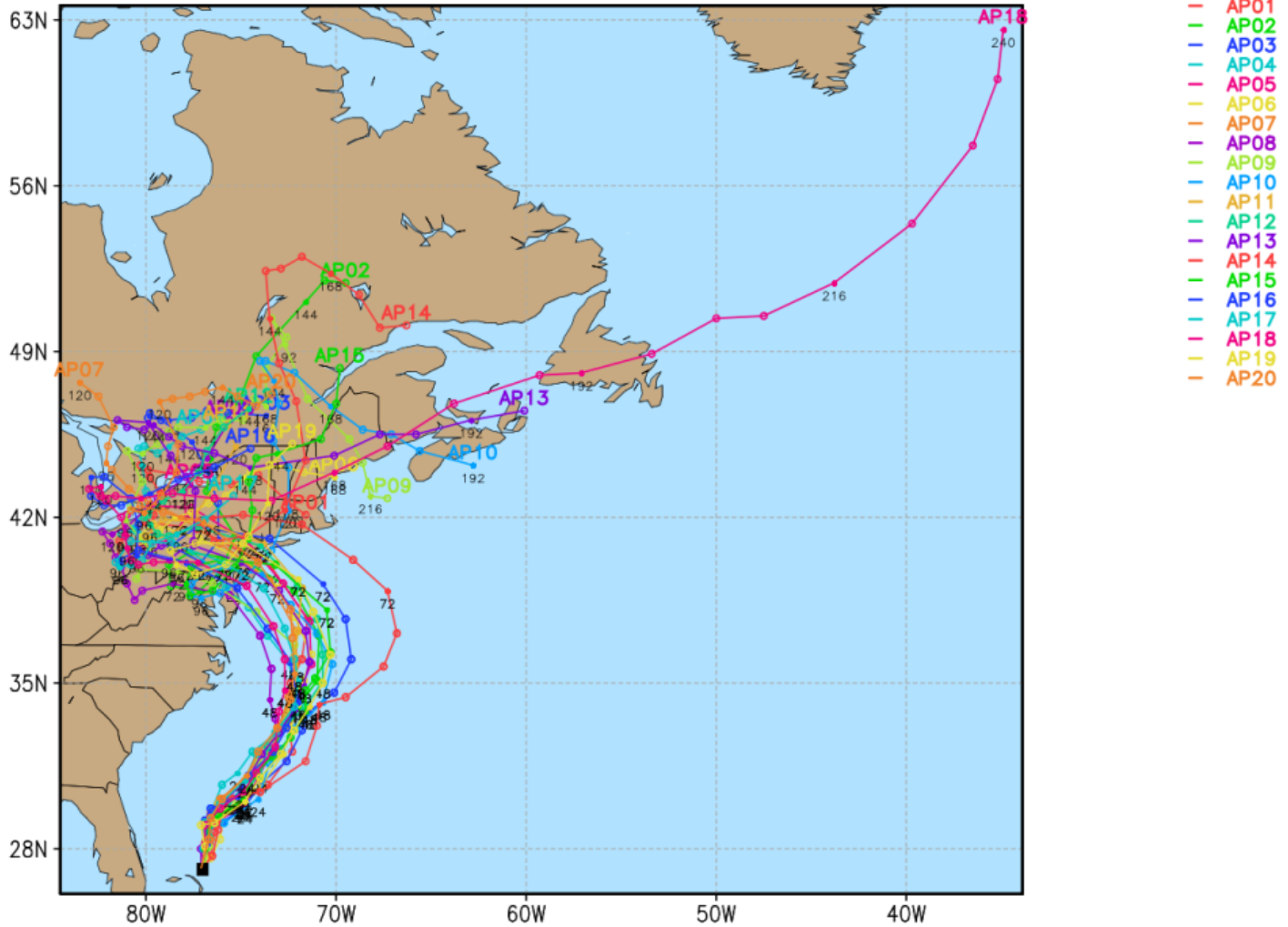
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments.

What is the storm's strength now?

Why might most models predict the storm will begin to weaken 96 hours later?

Image 7

Atlantic TROPICAL STORM SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 27 October 2012



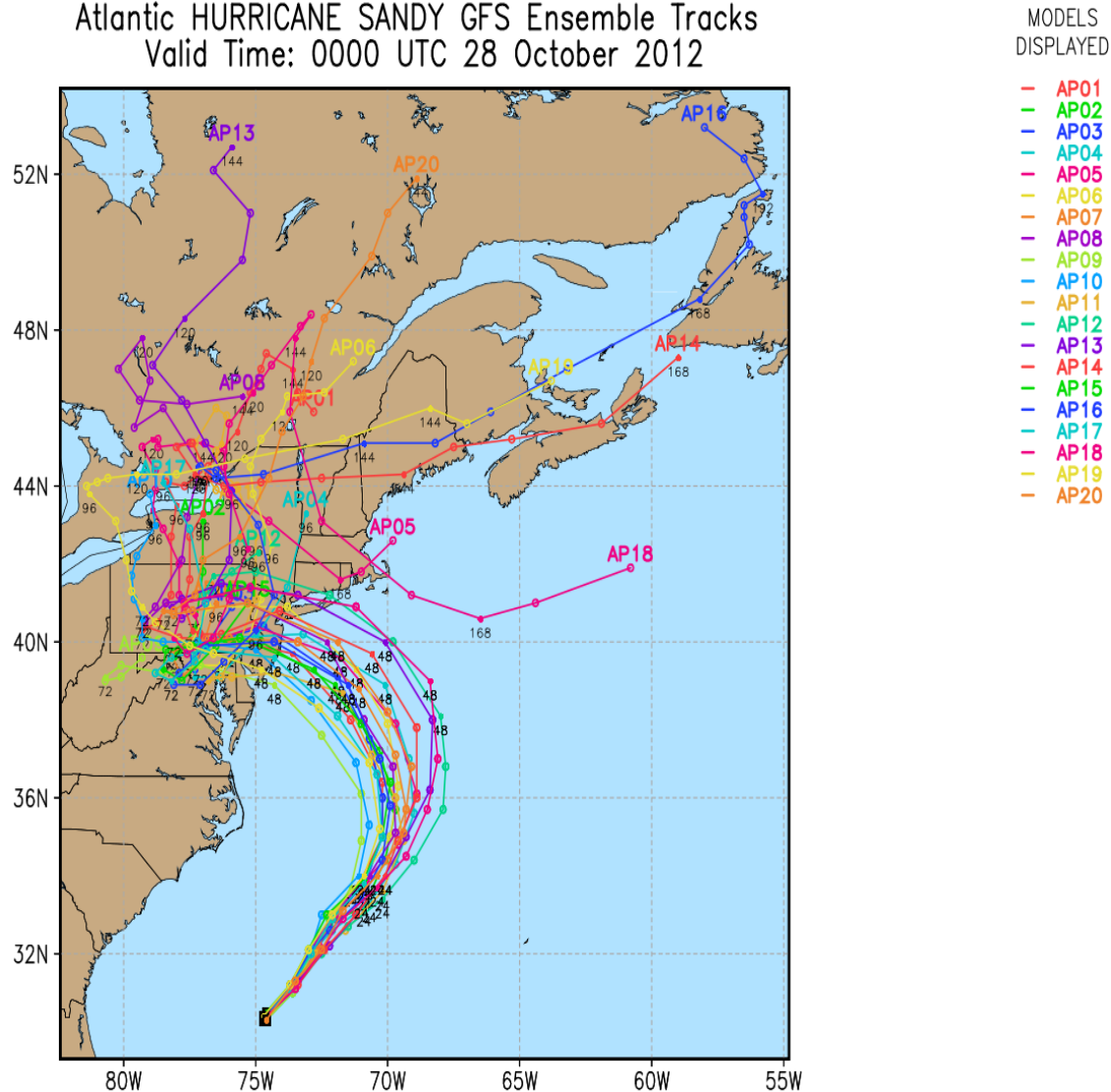
Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Twitter: @HurricaneModels

DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

Where do most models now predict the storm will come ashore?
How does this compare with the predictions you first made (Q19)?

Atlantic HURRICANE SANDY GFS Ensemble Tracks
Valid Time: 0000 UTC 28 October 2012

Image 8



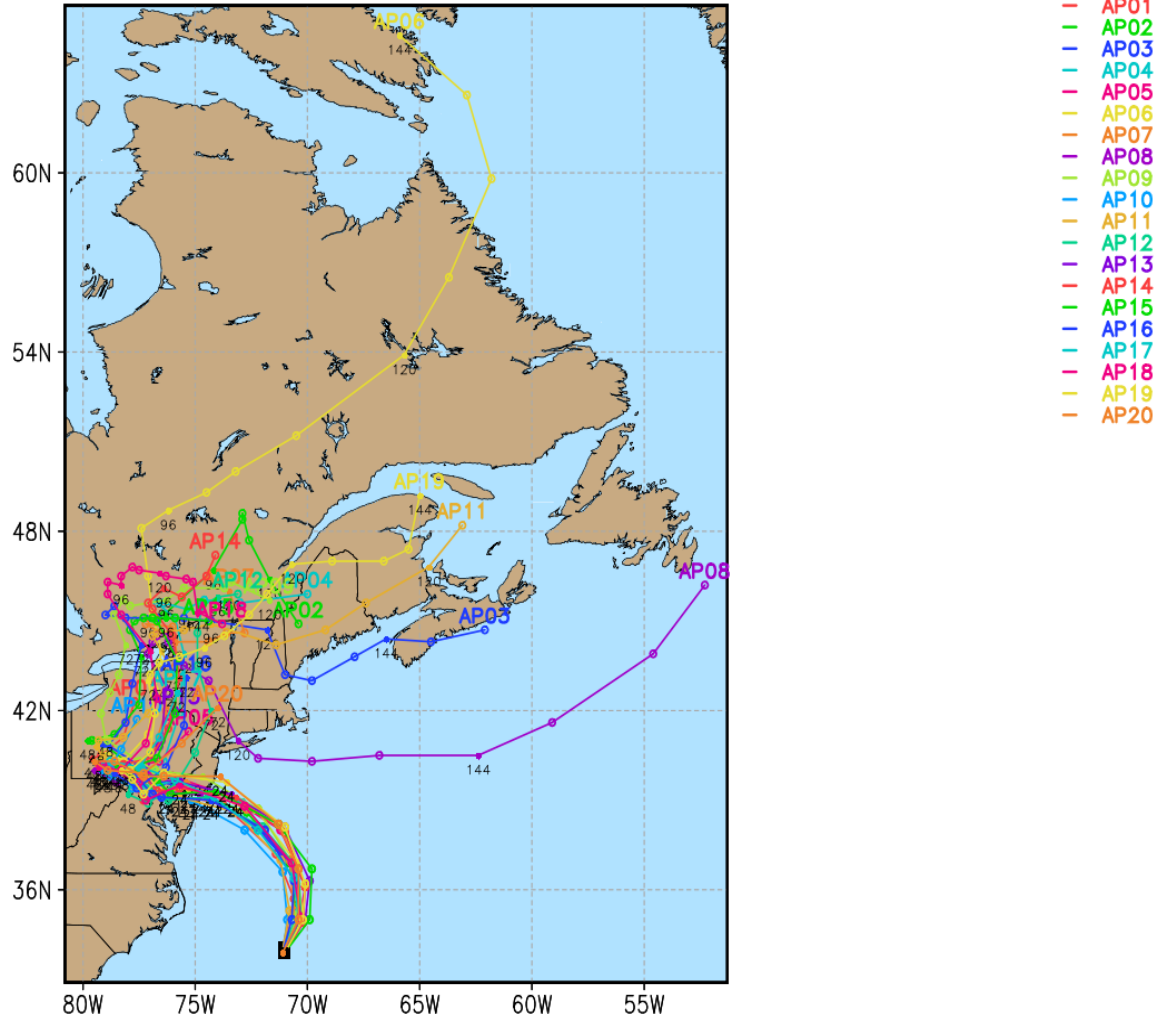
Tropical Cyclone Model Plots
<http://derechp.math.uwm.edu/models/>
 Twitter: @HurricaneModels

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 Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

Off what State is the center of the storm at this time?
 Where do most models predict landfall?
 Is there still a wide difference among the predicted paths?

Atlantic HURRICANE SANDY GFS Ensemble Tracks
Valid Time: 0000 UTC 29 October 2012

Image 9A



Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Twitter: @HurricaneModels

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Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

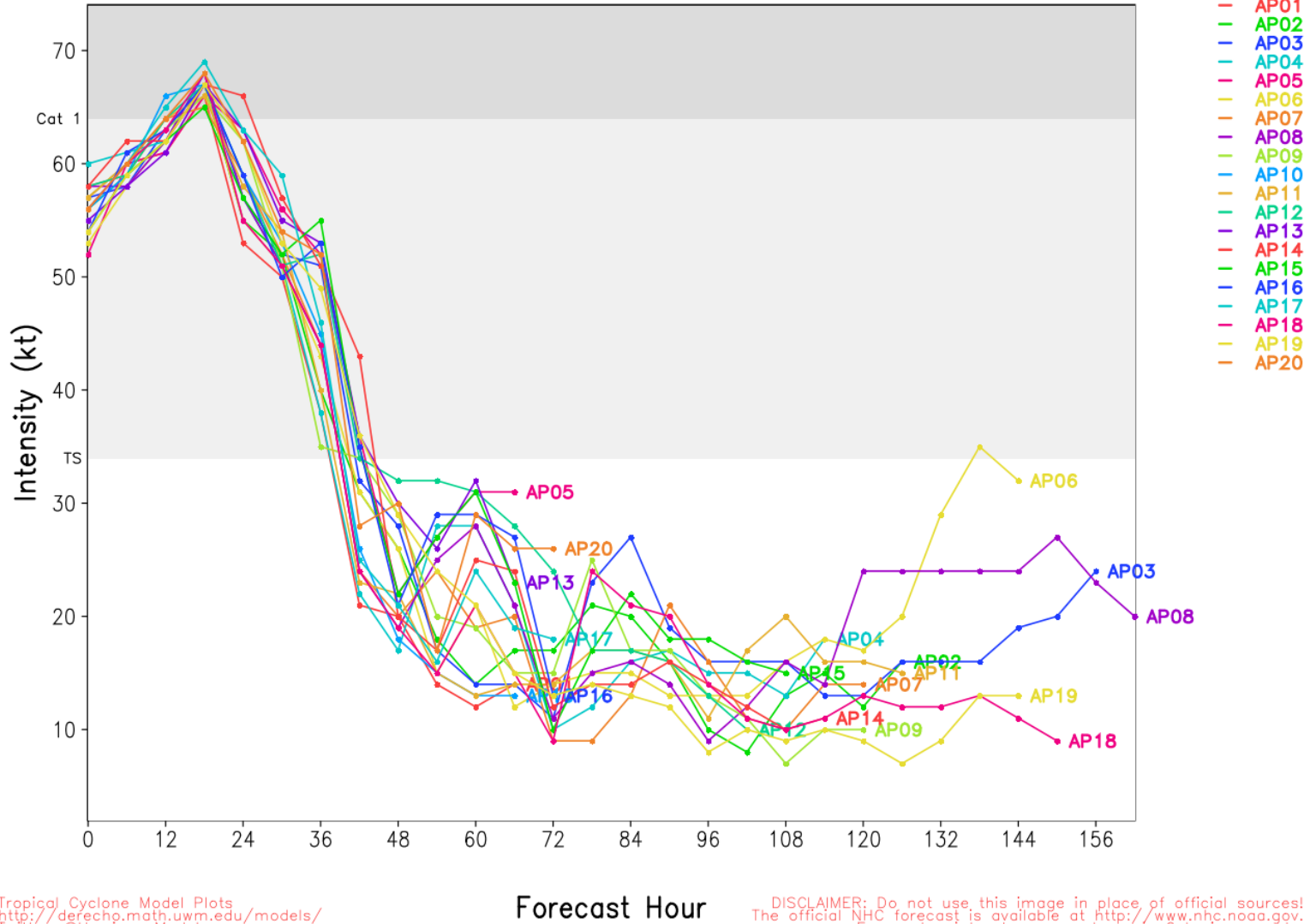
Off which State is the center of the storm now?

What might you guess is different about the sea surface temperatures here from those feeding the storm energy when it was farther south?

Image 9B

Atlantic HURRICANE SANDY GFS Ensemble Intensities

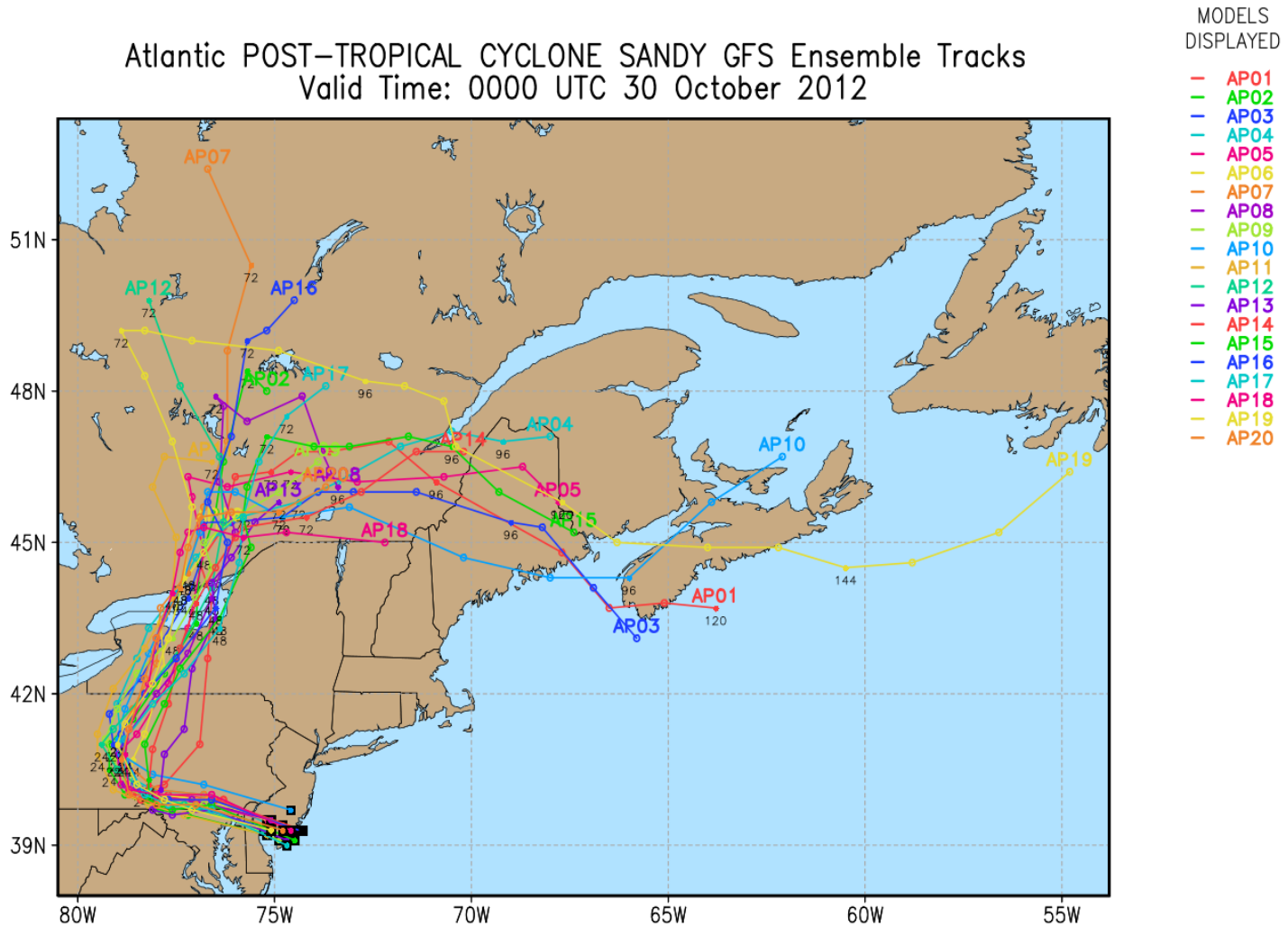
Valid Time: 0000 UTC 29 October 2012



What do these models predict will happen to the storm in the next 48 hours?
Why might the winds become so much weaker in this time period?

Image 10

Atlantic POST-TROPICAL CYCLONE SANDY GFS Ensemble Tracks
Valid Time: 0000 UTC 30 October 2012



Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Twitter: @HurricaneModels

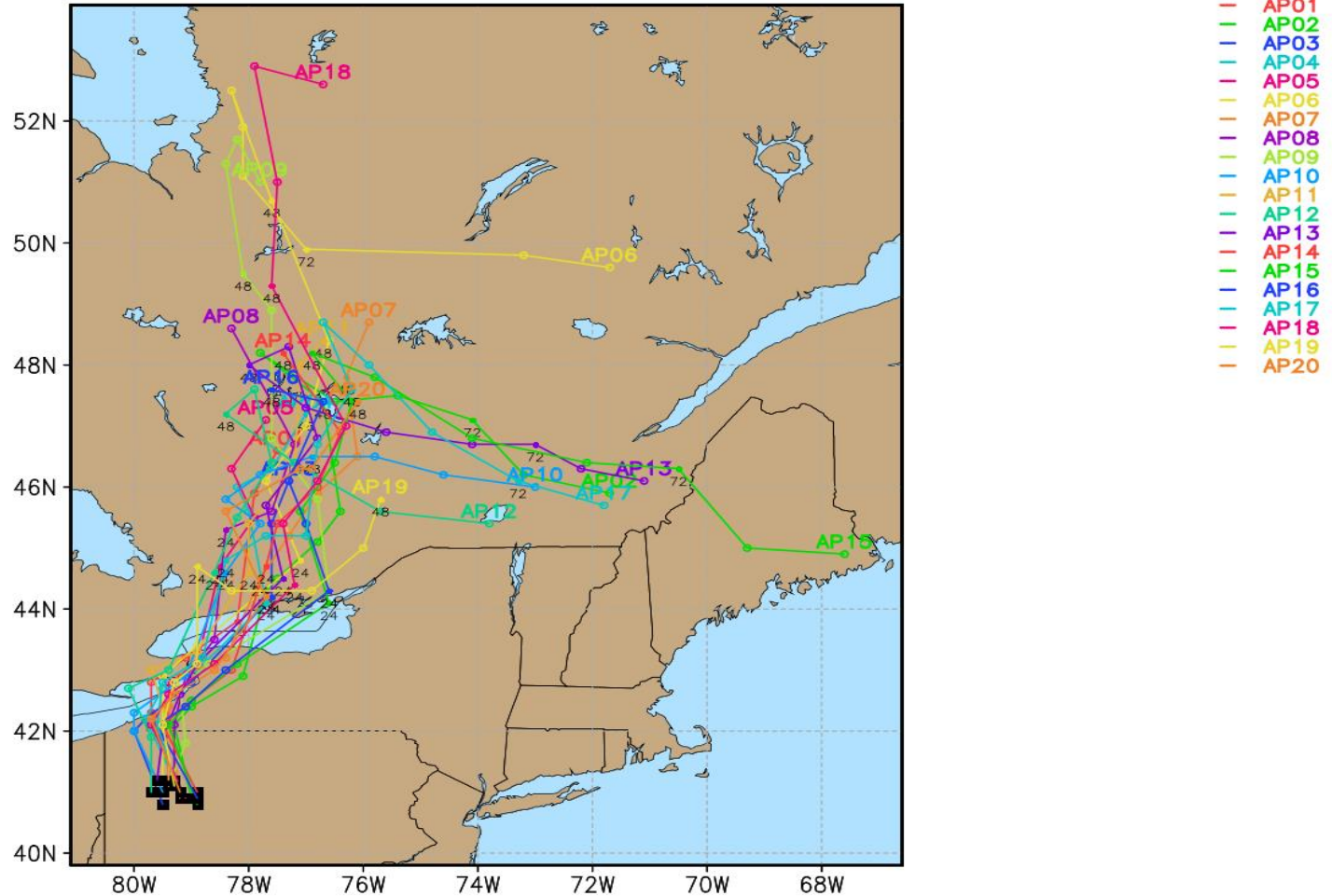
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

What does it mean that the storm is now described as a “Post-Tropical Cyclone”?
Why might there be so much variation in where the storm will eventually end?

Atlantic POST-TROPICAL CYCLONE SANDY GFS Ensemble Tracks Valid Time: 0000 UTC 31 October 2012

MODELS
DISPLAYED

Image 11A



Tropical Cyclone Model Plots
<http://derecho.math.uwm.edu/models/>
Twitter: @HurricaneModels

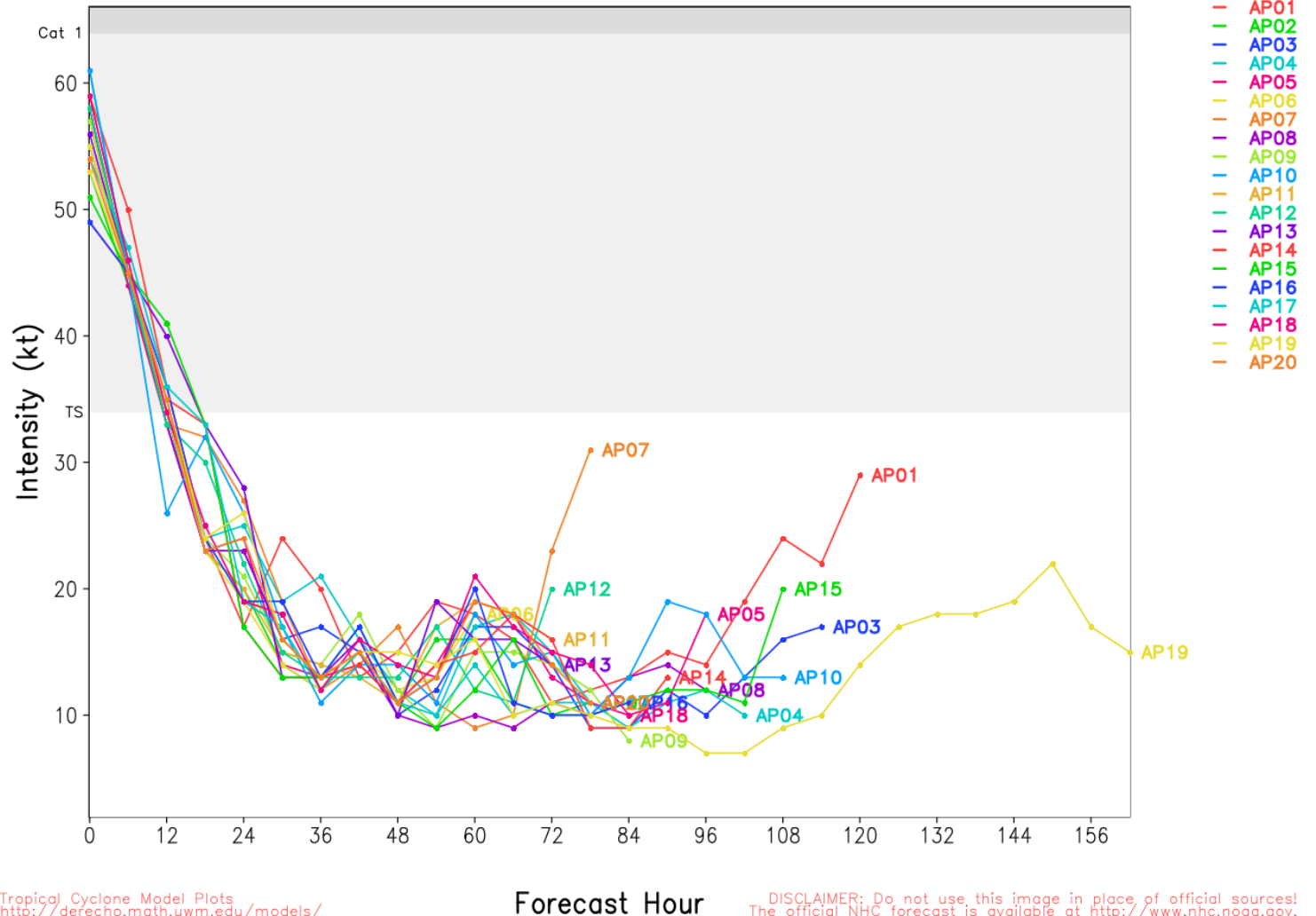
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 6 hr increments. Initial points denoted by black squares.

Where is the center of the storm now?

What factors that affect its path and strength are different from when it was over the ocean?

Image 11B

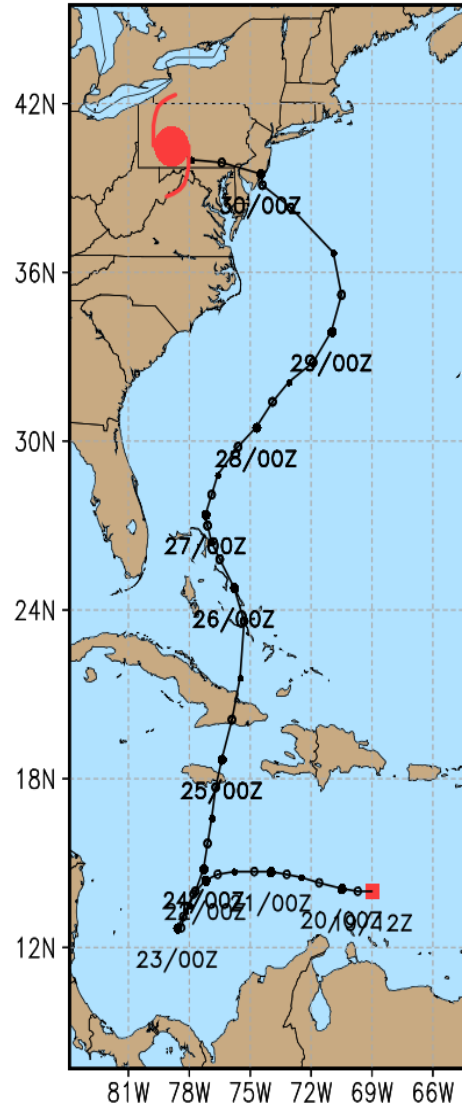
Atlantic POST-TROPICAL CYCLONE SANDY GFS Ensemble Intensities Valid Time: 0000 UTC 30 October 2012



Examine these final intensity predictions, and then compare their range with the differences shown at the beginning of the storm on 22 Oct (slide 4).

Atlantic POST-TROPICAL CYCLONE SANDY Previous Track Through
0000 UTC 31 October 2012 (40 kt, 988 hPa)

Image 12



Here is the actual path of “Sandy” during its lifetime. Based on looking again at the predicted paths, did any of the models prove to be significantly more accurate than the others? Explain your answer.