



Possible enhancements to NHC genesis forecasts

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National Hurricane Center

2011 National Hurricane Conference
Atlanta, Georgia
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Outline

- Extending period of Tropical Weather Outlook
- Possible new graphical/text displays
- Watches/Warnings before tropical cyclone formation



Background

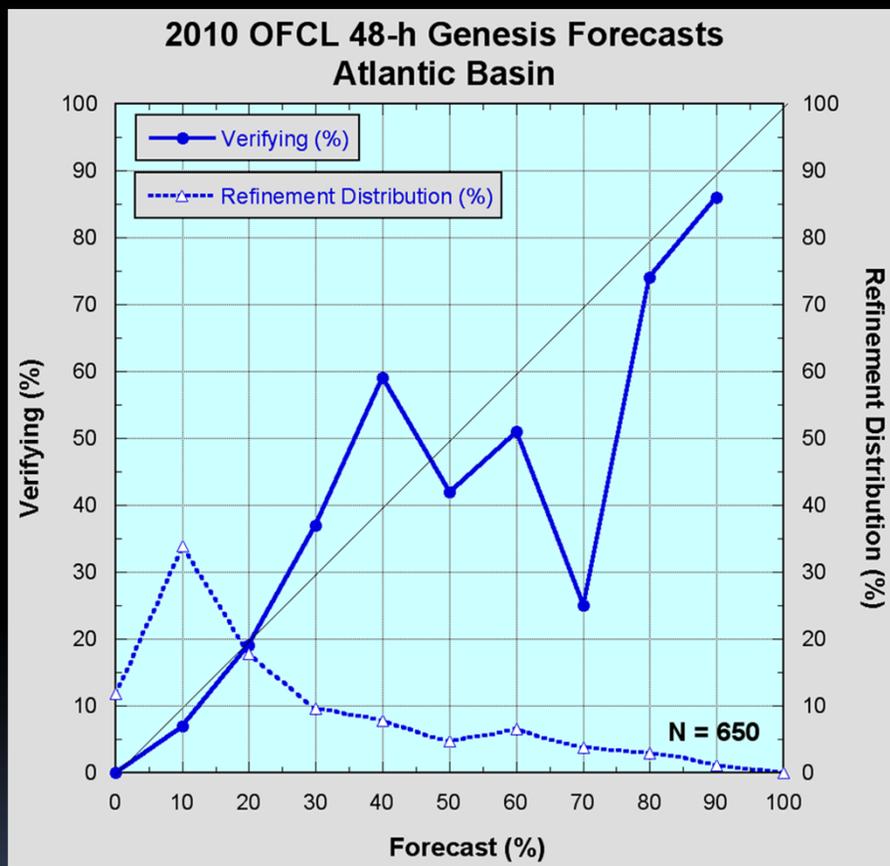
- Transitioning TWO into a probability-based product has been well-received
- Users are also interested in a forecast beyond 48 hours.
- There has been some progress on documenting our ability at medium range genesis forecasts



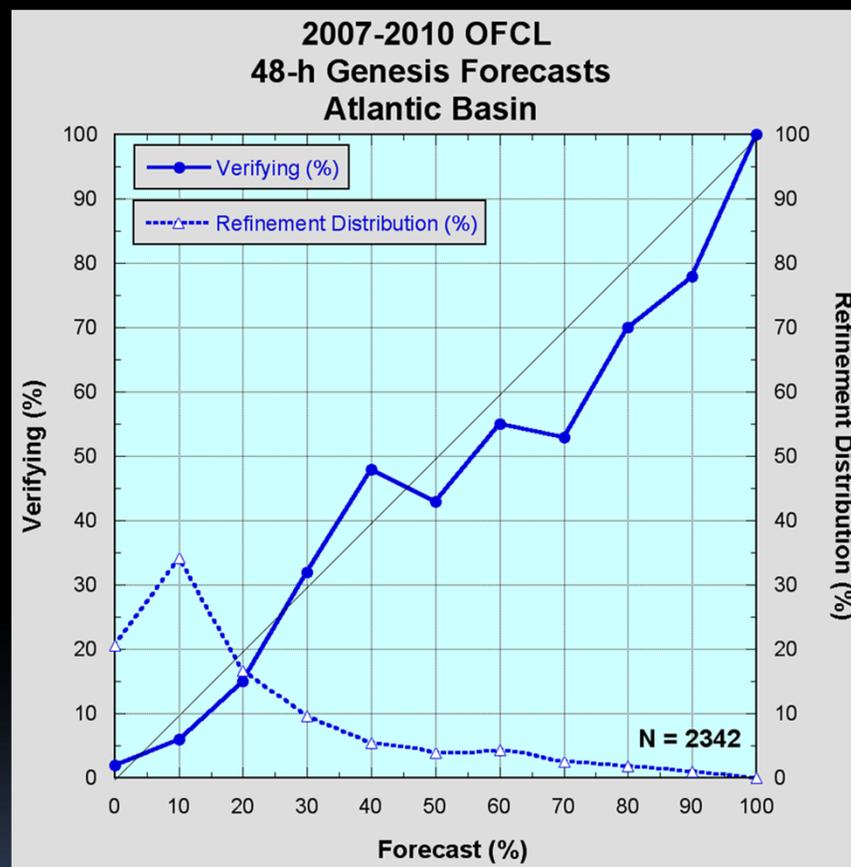
48 h Genesis Forecast Verification



2010



2007-10



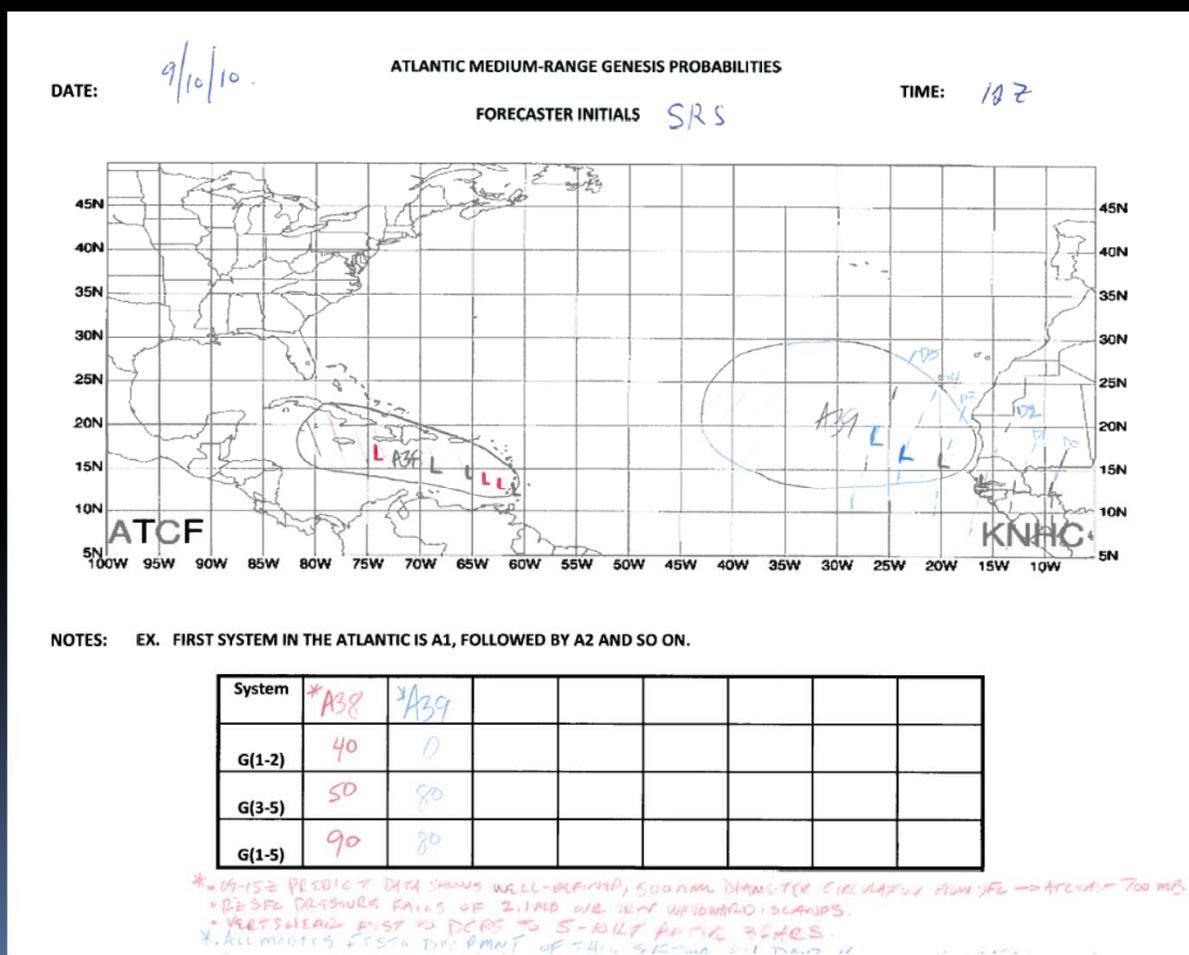
Well calibrated, but slight over-forecast bias at 50% and above.



Extend Lead Time of Genesis Forecasts



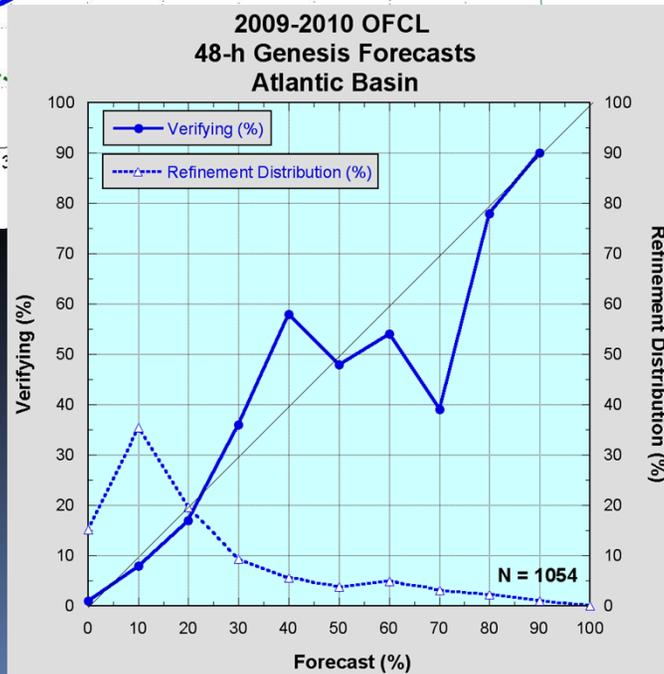
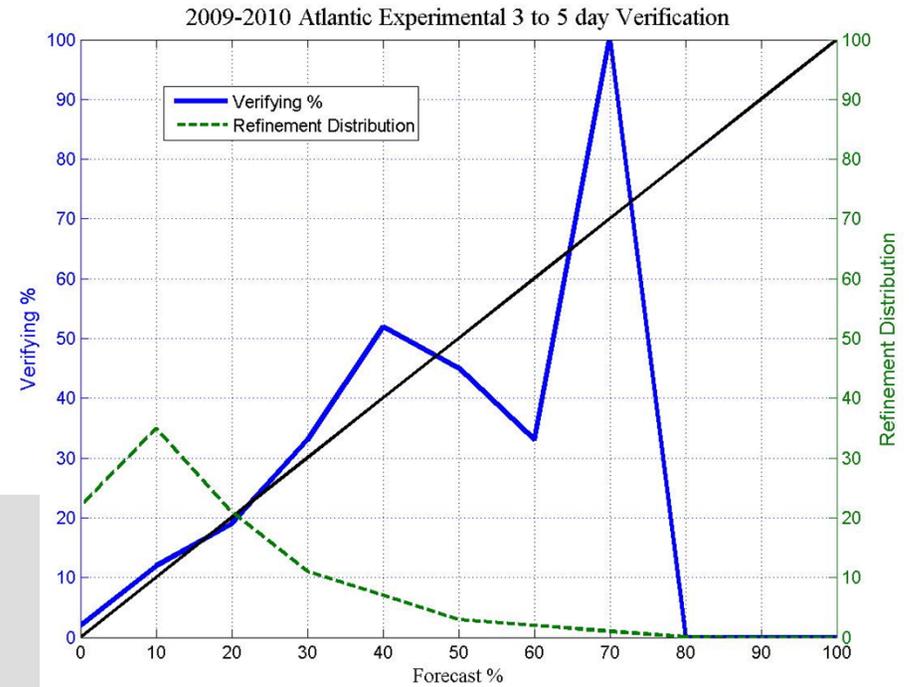
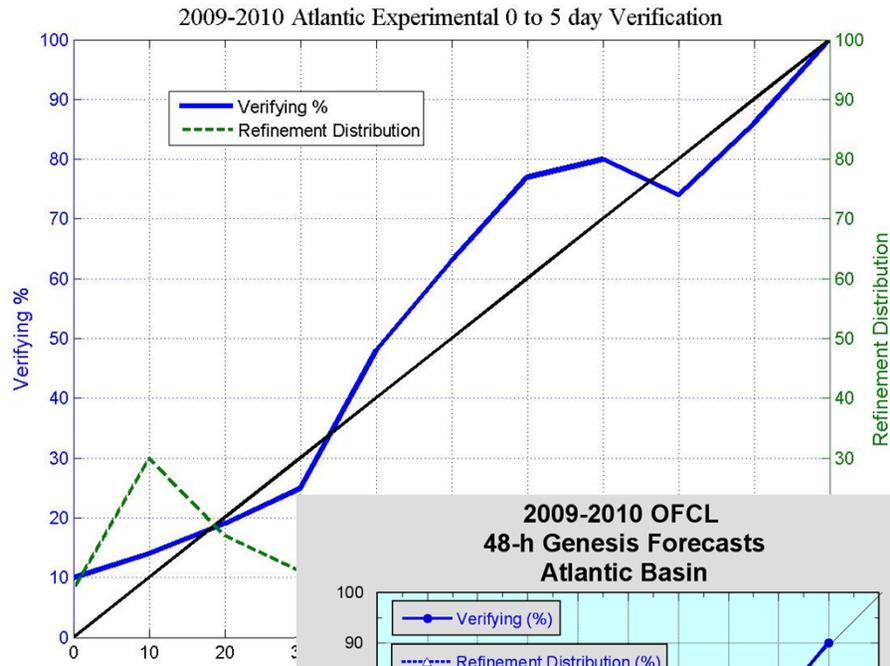
- During the 2009 and 2010 hurricane seasons, NHC has experimented with medium range (3-5 day) genesis forecasts



2009-10 verification of Genesis Probabilities

Days 1-5

Days 3-5



Verification by categorical bins for the Atlantic basin 09-10

3-5 day

<u>Forecast Range</u>	<u>Expected %</u>	<u>Verifying</u>	<u># of Forecasts</u>
0-20% (Low)	10	11	589
30-50% (Medium)	36	41	150
60-100% (High)	64	50	22

1-5 day

<u>Forecast Range</u>	<u>Expected %</u>	<u>Verifying</u>	<u># of Forecasts</u>
0-20% (Low)	12	15	426
30-50% (Medium)	39	43	211
60-100% (High)	77	81	137

2010 Atlantic 1-2 day Genesis Fcsts 48 h Prior to TC Formation

Approximate Hours Prior to Formation							
-48		-36		-24		-12	
40	30	30	40	20	60	20	70
70		70		80		90	
10	30	10	40	0	40		
40		50		40			
10	0			20	0	20	0
10		20		20		20	
30	20	30	40	30	60	0	90
50		70		90		90	
60	0	30	20	20	40	10	60
60		50		60		70	
60	20	50	30	50	40	40	50
80		100		90		90	
40	10	20	60	0	90	0	90
50		80		90		90	
20	80	20	80	20	80	0	90
100		100		100		90	
10	0	10	0	0	10	10	20
10		10		10		30	
20	20	20	40	0	60	0	80
40		60		60		80	
60	0	60	10	30	40	30	70
60		70		70		100	
80	0	50	0	50	30	0	70
80		50		80		70	
40	40	40	40	30	40	0	70
80		80		70		70	
20	60	10	80	0	90	0	90
80		90		90		90	
30	50	20	60	30	60	20	80
80		80		90		100	
60	10	40	30	30	40	80	20
70		70		70		100	
40	20	30	40	30	60	10	80
60		70		90		90	
20	30	20	60	20	60	20	50
50		80		80		70	
20	30	20	40	20	70	20	70
50		60		90		90	
20	10	10	30	0	60		
30		40		60			
20	20	20	20	40	50	10	90
40		40		90		100	

2010 Atlantic 1-5 day Genesis Fcsts 120 h Prior to TC Formation

Approximate Hours Prior to Formation

-48		-36		-24		-12	
40	30	30	40	20	60	20	70
70		70		80		90	
10	30	10	40	0	40		
40		50		40			
10	0			20	0	20	0
10		20		20		20	
30	20	30	40	30	60	0	90
50		70		90		90	
60	0	30	20	20	40	10	60
60		50		60		70	
60	20	50	30	50	40	40	50
80		100		90		90	
40	10	20	60	0	90	0	90
50		80		90		90	
20	80	20	80	20	80	0	90
100		100		100		90	
10	0	10	0	0	10	10	20
10		10		10		30	
20	20	20	40	0	60	0	80
40		60		60		80	
60	0	60	10	30	40	30	70
60		70		70		100	
80	0	50	0	50	30	0	70
80		50		80		70	
40	40	40	40	30	40	0	70
80		80		70		70	
20	60	10	80	0	90	0	90
80		90		90		90	
30	50	20	60	30	60	20	80
80		80		90		100	
60	10	40	30	30	40	80	20
70		70		70		100	
40	20	30	40	30	60	10	80
60		70		90		90	
20	30	20	60	20	60	20	50
50		80		80		70	
20	30	20	40	20	70	20	70
50		60		90		90	
20	10	10	30	0	60		
30		40		60			
20	20	20	20	40	50	10	90
40		40		90		100	

TWO Prototypes (incorporating Medium-Range Genesis probabilities)

ABNT20 KNHC 090553
TWOAT TROPICAL WEATHER OUTLOOK
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
200 AM EDT THU SEP 8 2011

SHOWERS AND THUNDERSTORMS IN THE VICINITY OF THE WINDWARD ISLANDS AND EXTENDING EASTWARD INTO THE ATLANTIC OCEAN FOR A FEW HUNDRED MILES ARE ASSOCIATED WITH A WEAK LOW PRESSURE SYSTEM. ENVIRONMENTAL CONDITIONS APPEAR CONDUCIVE FOR SOME SLOW DEVELOPMENT OF THE LOW AS IT MOVES LITTLE. THERE IS A LOW CHANCE...20 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS. **THE LOW SHOULD MOVE WESTWARD TO WEST-NORTHWESTWARD AFTER 48 HOURS...AND ENVIRONMENTAL CONDITIONS ARE EXPECTED TO REMAIN CONDUCIVE FOR GRADUAL DEVELOPMENT. THERE IS A HIGH CHANCE...70 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 120 HOURS.**

ELSEWHERE...TROPICAL CYCLONE FORMATION IS NOT EXPECTED DURING THE NEXT 48 HOURS.

- **The all in one version.
Not likely to work for a
multitude of systems**

TWO Medium-Range Prototypes #2

ABNT20 KNHC 090553
TWOAT TROPICAL WEATHER OUTLOOK
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
200 AM EDT THU SEP 8 2011

48-HOUR OUTLOOK

SHOWERS AND THUNDERSTORMS IN THE VICINITY OF THE WINDWARD ISLANDS AND EXTENDING EASTWARD INTO THE ATLANTIC OCEAN FOR A FEW HUNDRED MILES ARE ASSOCIATED WITH A WEAK LOW PRESSURE SYSTEM. ENVIRONMENTAL CONDITIONS APPEAR CONDUCTIVE FOR SOME SLOW DEVELOPMENT OF THE LOW AS IT MOVES LITTLE. THERE IS A LOW CHANCE...20 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS.

EXTENDED OUTLOOK

THE LOW SHOULD MOVE WESTWARD TO WEST-NORTHWESTWARD AFTER 48 HOURS...AND ENVIRONMENTAL CONDITIONS ARE EXPECTED TO REMAIN CONDUCTIVE FOR GRADUAL DEVELOPMENT. THERE IS A HIGH CHANCE...70 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 120 HOURS.

ELSEWHERE...TROPICAL CYCLONE FORMATION IS NOT EXPECTED DURING THE NEXT 48 HOURS.

Still all in one but a separation between short and long term

TWO Medium-Range Prototype #2 (cont'd – longer version)

ABNT20 KNHC 081138
TWOAT
TROPICAL WEATHER OUTLOOK
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
800 AM EDT WED SEP 8 2011

FOR THE NORTH ATLANTIC...CARIBBEAN SEA AND THE GULF OF MEXICO...

THE HYDROMETEOROLOGICAL PREDICTION CENTER IS ISSUING PUBLIC ADVISORIES ON TROPICAL DEPRESSION HERMINE... CURRENTLY LOCATED INLAND ABOUT 150 MILES WEST-SOUTHWEST OF DALLAS TEXAS.

SUSPECT AREA #1

SHOWER AND THUNDERSTORM ACTIVITY IS CONTINUING TO ORGANIZE NEAR A WELL-DEFINED LOW PRESSURE AREA LOCATED JUST SOUTH OF THE SOUTHERNMOST CAPE VERDE ISLANDS. STRONG UPPER-LEVEL WINDS OVER THIS SYSTEM ARE EXPECTED TO DECREASE OVER THE NEXT COUPLE OF DAYS...AND THIS LOW HAS THE POTENTIAL TO BECOME A TROPICAL DEPRESSION OVER THE NEXT DAY OR SO. THERE IS A HIGH CHANCE...70 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES WESTWARD AT 10 TO 15 MPH.

BEYOND 48 HOURS...ENVIRONMENTAL CONDITIONS ARE EXPECTED TO BE CONDUCIVE FOR DEVELOPMENT...AND THERE IS A HIGH CHANCE OF THE LOW BECOMING A TROPICAL CYCLONE DURING THE NEXT 120 HOURS.

- SUSPECT AREA #2

- THE REMNANTS OF GASTON...LOCATED A COUPLE HUNDRED MILES SOUTHEAST OF THE DOMINICAN REPUBLIC...ARE PRODUCING DISORGANIZED SHOWER AND THUNDERSTORM ACTIVITY. DEVELOPMENT OF THIS SYSTEM IS NOT EXPECTED AS IT MOVES WESTWARD AT 10 TO 15 MPH. THERE IS A LOW CHANCE... NEAR 0 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE AGAIN DURING THE NEXT 48 HOURS.

- THERE IS A LOW OF THIS SYSTEM BECOMING A TROPICAL CYCLONE AGAIN DURING THE NEXT 120 HOURS.

- **OTHER AREAS WITH THE POTENTIAL FOR TROPICAL CYCLONE FORMATION BETWEEN 48 AND 120 HOURS**

- SUSPECT AREA #4

- A WEAK TROPICAL WAVE A FEW HUNDRED MILES EAST OF THE WINDWARD ISLANDS IS PRODUCING DISORGANIZED SHOWERS AND A FEW THUNDERSTORMS. ALTHOUGH TROPICAL CYCLONE DEVELOPMENT IS NOT EXPECTED DURING THE NEXT COUPLE OF DAYS...THERE IS A LOW CHANCE OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 120 HOURS.

- SUSPECT AREA #5

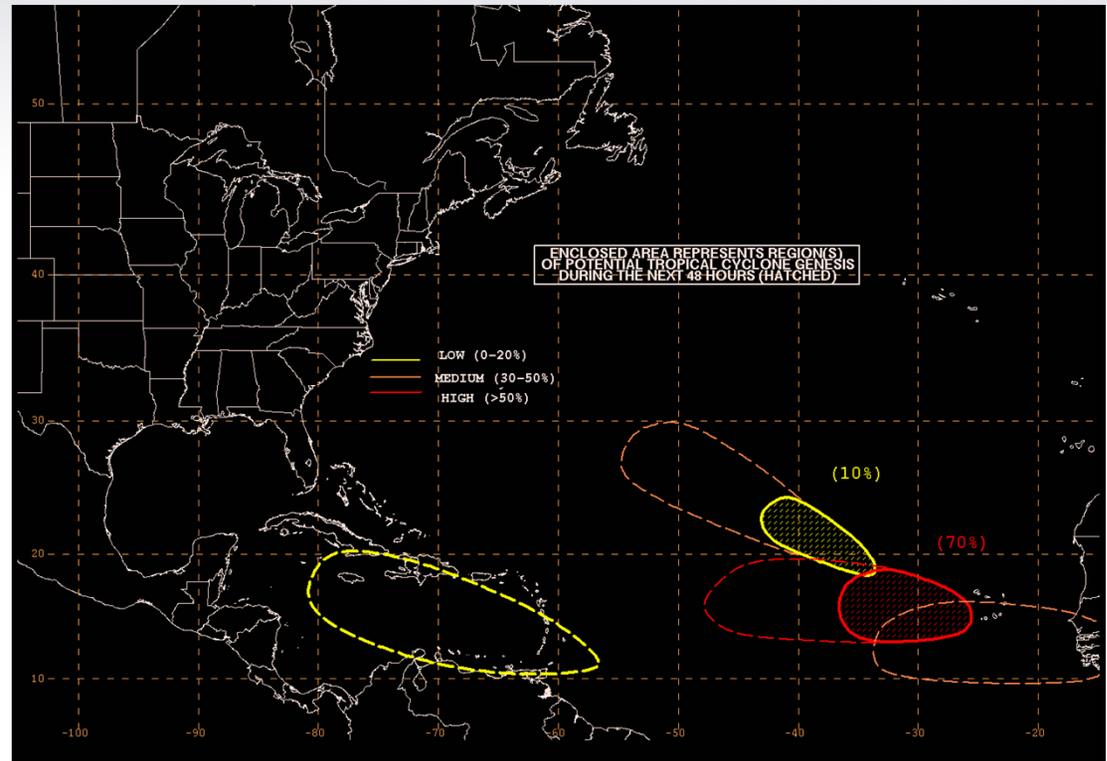
- SHOWERS AND THUNDERSTORM ASSOCIATED WITH A TROPICAL WAVE LOCATED OVER WEST AFRICA IS EXPECTED TO MOVE INTO THE FAR EASTERN ATLANTIC DURING THE NEXT FEW DAYS. ENVIRONMENTAL CONDITIONS ARE EXPECTED TO BE CONDUCIVE FOR DEVELOPMENT ONCE THE SYSTEM AFTER IT MOVES OFFSHORE...AND THERE IS A MEDIUM CHANCE OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 120 HOURS.

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FORECASTER CANGIALOSI/KIMBERLAIN

What could the graphical product ultimately look like?

- Issues associated with depicting medium-range genesis probabilities graphically
- Toggle back and forth between short- and medium-range genesis probabilities?
- What should be displayed? 1-2 d and 1-5 d? 1-2 d and 3-5 d? All three?
- Draw the 5-day area where genesis is most likely to occur?
- Will there be overlapping areas?
- Will variable color coding between short- to medium-range be confusing?



Next Steps

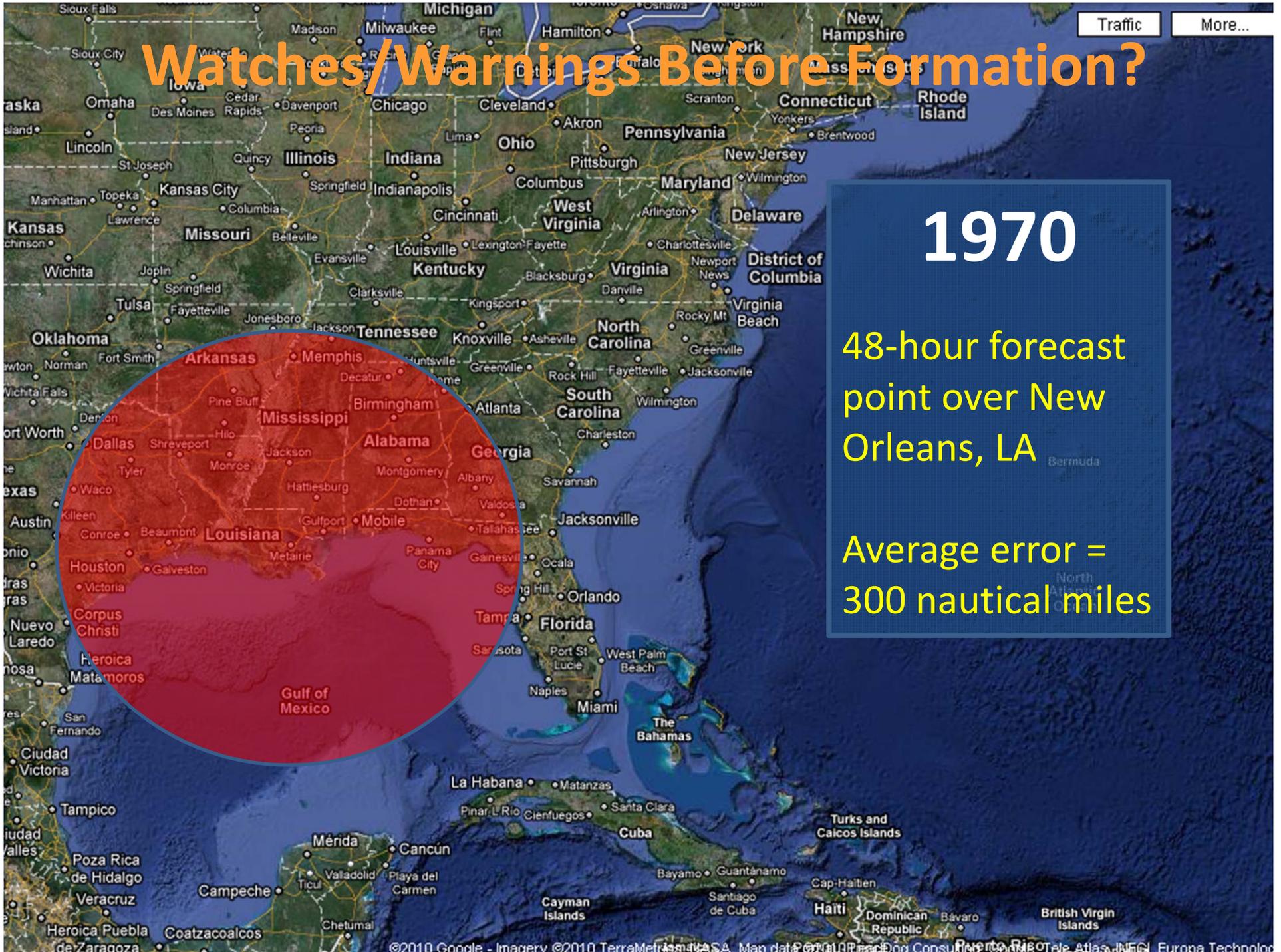
- On a trial basis, produce TWO in-house to include medium-range probabilities in June
- Include questions on the survey of the current GTWO that would help craft a better product
- Evaluate experiment and work out any problems
- In Oct-Nov, resume composing modified TWO and provide to selected end users for feedback
- Work out technical aspects between now and 2012 season
- Assuming genesis forecasts continue to show skill, implement in 2012?

Watches/Warnings Before Formation?

1970

48-hour forecast
point over New
Orleans, LA

Average error =
300 nautical miles

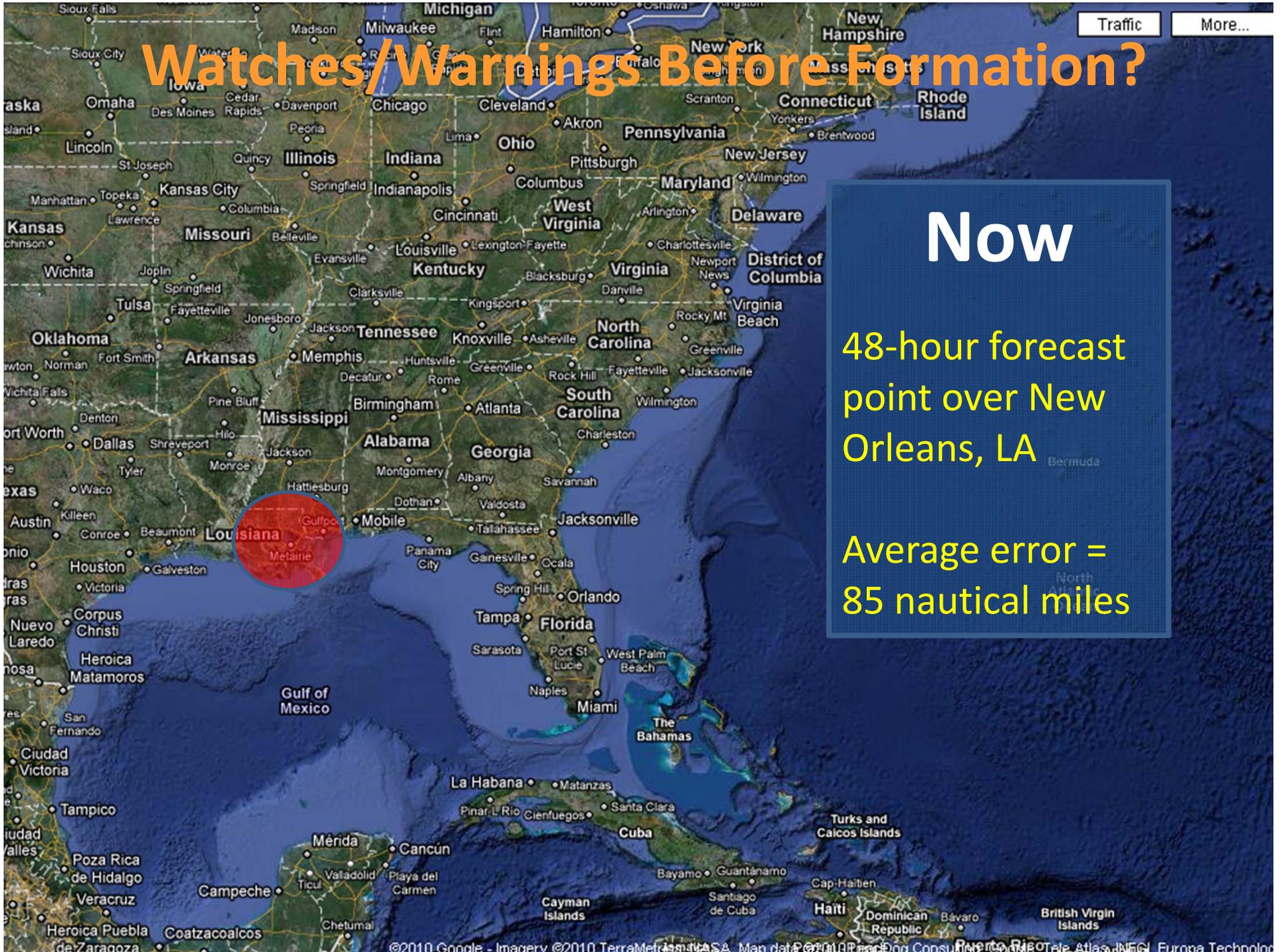


Watches/Warnings Before Formation?

Now

48-hour forecast
point over New
Orleans, LA

Average error =
85 nautical miles





Watches/Warnings Before Formation?



- NHC currently does not issue Tropical Cyclone Watches or Warnings for the U.S. prior to the formation of a tropical cyclone
 - Watches/warnings - independent products, tied administratively to tropical cyclone advisories
 - Difficult to determine placement of watch/warning areas when system is poorly defined and track/intensity prognosis is highly uncertain.
- In these cases, NHC will usually mention the *possibility of short-fused watch or warning issuance* in the Tropical Weather Outlook.



Watches/Warnings Before Formation? 2011 Experiment



- In support of the 2010 Gulf of Mexico oil spill, NHC provided track and intensity forecasts for disturbances threatening the Gulf.
- NHC planning to perform similar in-house experiment in 2011
 - Create track, intensity, and radii forecasts for disturbances that have a high chance of development
 - Will not be released to the public
 - Watches/Warnings could be tied to the forecasts in the future
- Hopefully in the near future NHC will have the ability to issue tropical storm/hurricane watches and warnings before a cyclone develops



National Hurricane Center – Hurricane Specialist Unit



...the faces behind the forecasts