



Experimental 5-day genesis forecasts

Eric Blake

National Hurricane Center

2013 National Hurricane Conference

March 28 2013



Outline

- Extending period of Tropical Weather Outlook
- Science behind the longer-term outlooks
- Prototypes of new graphical/text formats
- Timeline

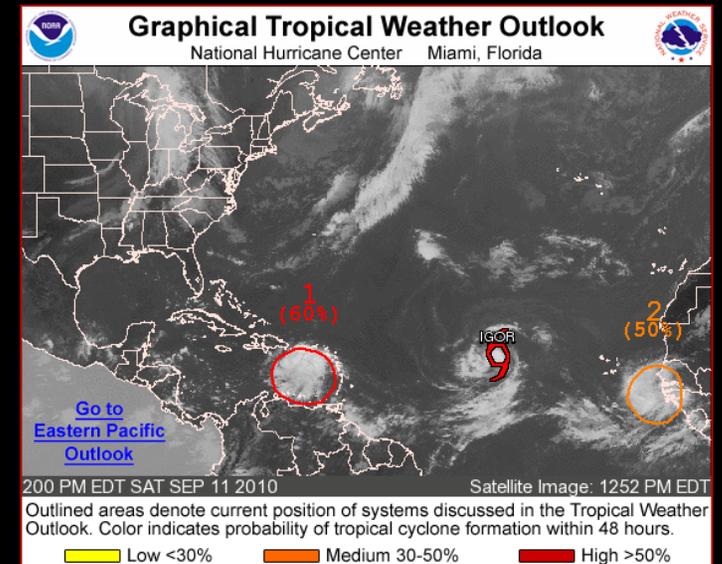


Background

- Transitioning TWO into a probability-based product has been very successful
- Users are also very interested in a forecast beyond 48 hours
- Our ability at medium-range genesis forecasts is now well documented and we are ready to make them available to the public

Tropical Weather Outlook

- General assessment of activity in the tropics, pertaining to tropical cyclone formation
- Discusses areas of disturbed weather and their potential, including probabilities, for genesis during the next 48 hours
- Issued every 6 hours during the hurricane season
 - 0000, 0600, 1200, 1800 UTC
 - 2 AM, 8 AM, 2 PM, 8 PM EDT



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ABNT20 KNHC 111736
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TROPICAL WEATHER OUTLOOK
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
200 PM EDT SAT SEP 11 2010

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

THE NATIONAL HURRICANE CENTER IS ISSUING ADVISORIES ON TROPICAL STORM IGOR...LOCATED ABOUT 1030 MILES WEST OF THE CAPE VERDE ISLANDS.

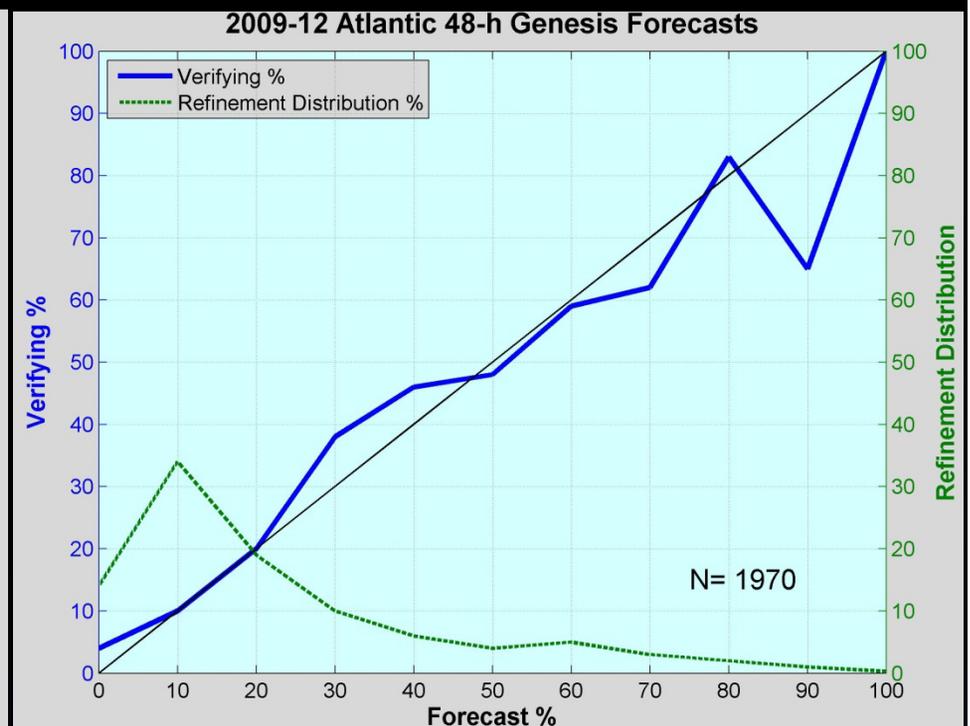
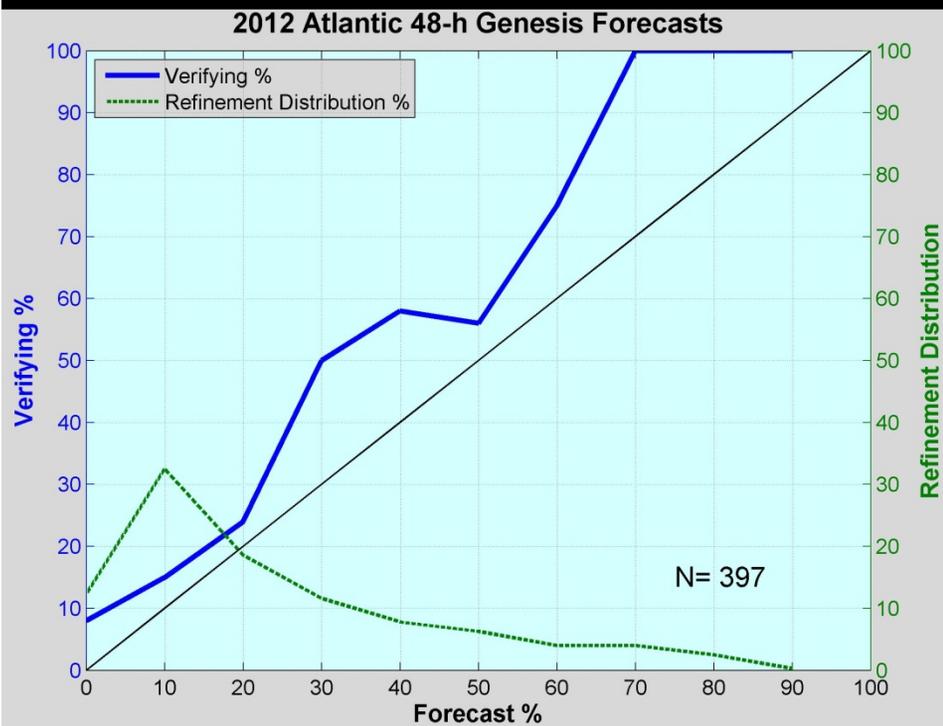
SHOWERS AND THUNDERSTORMS HAVE CHANGED LITTLE IN ASSOCIATION WITH A BROAD AREA OF LOW PRESSURE LOCATED OVER THE EASTERN CARIBBEAN SEA. ENVIRONMENTAL CONDITIONS APPEAR FAVORABLE FOR DEVELOPMENT...AND A TROPICAL DEPRESSION COULD FORM AS THE SYSTEM MOVES WESTWARD INTO THE CENTRAL AND WESTERN CARIBBEAN SEA. THERE IS A HIGH CHANCE...60 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS. REGARDLESS OF DEVELOPMENT...LOCALLY HEAVY RAINFALL IS POSSIBLE IN THE NORTHERN LEEWARD ISLANDS...PUERTO RICO...THE VIRGIN ISLANDS...AND HISPANIOLA DURING THE NEXT DAY OR SO. THESE RAINS COULD CAUSE LIFE-THREATENING FLASH FLOODS AND MUD SLIDES...ESPECIALLY IN MOUNTAINOUS TERRAIN.

SATELLITE IMAGERY AND UPPER-AIR OBSERVATIONS INDICATE THAT THE VIGOROUS TROPICAL WAVE AND ASSOCIATED LOW PRESSURE AREA NEAR THE WEST COAST OF AFRICA HAVE BECOME BETTER ORGANIZED DURING THE PAST SEVERAL HOURS. SURFACE PRESSURES ARE QUITE LOW...AND A TROPICAL DEPRESSION COULD FORM OVER THE NEXT COUPLE OF DAYS AS THIS SYSTEM MOVES TOWARD THE WEST OR WEST-NORTHWEST AT 10 TO 15 MPH. THERE IS A MEDIUM CHANCE...50 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS.

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

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FORECASTER BLAKE/BRENNAN

Verification Results for 2-Day Genesis Forecasts



Sometimes substantial interannual variation in results

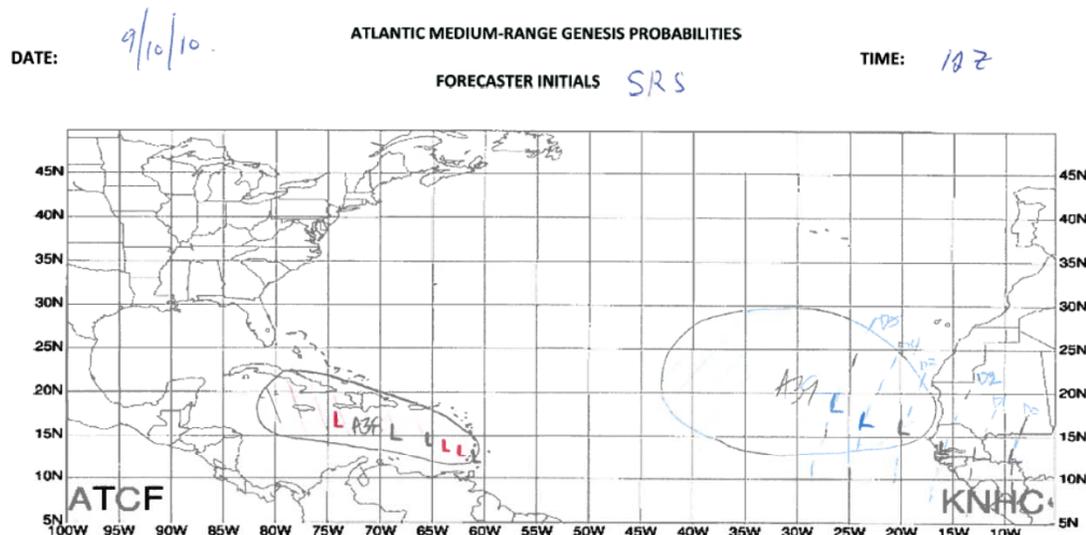
Long-term results have been quite promising



Extend Lead Time of Genesis Forecasts



- Since 2009, NHC has experimented with medium range (1-5 and 3-5 day) genesis forecasts

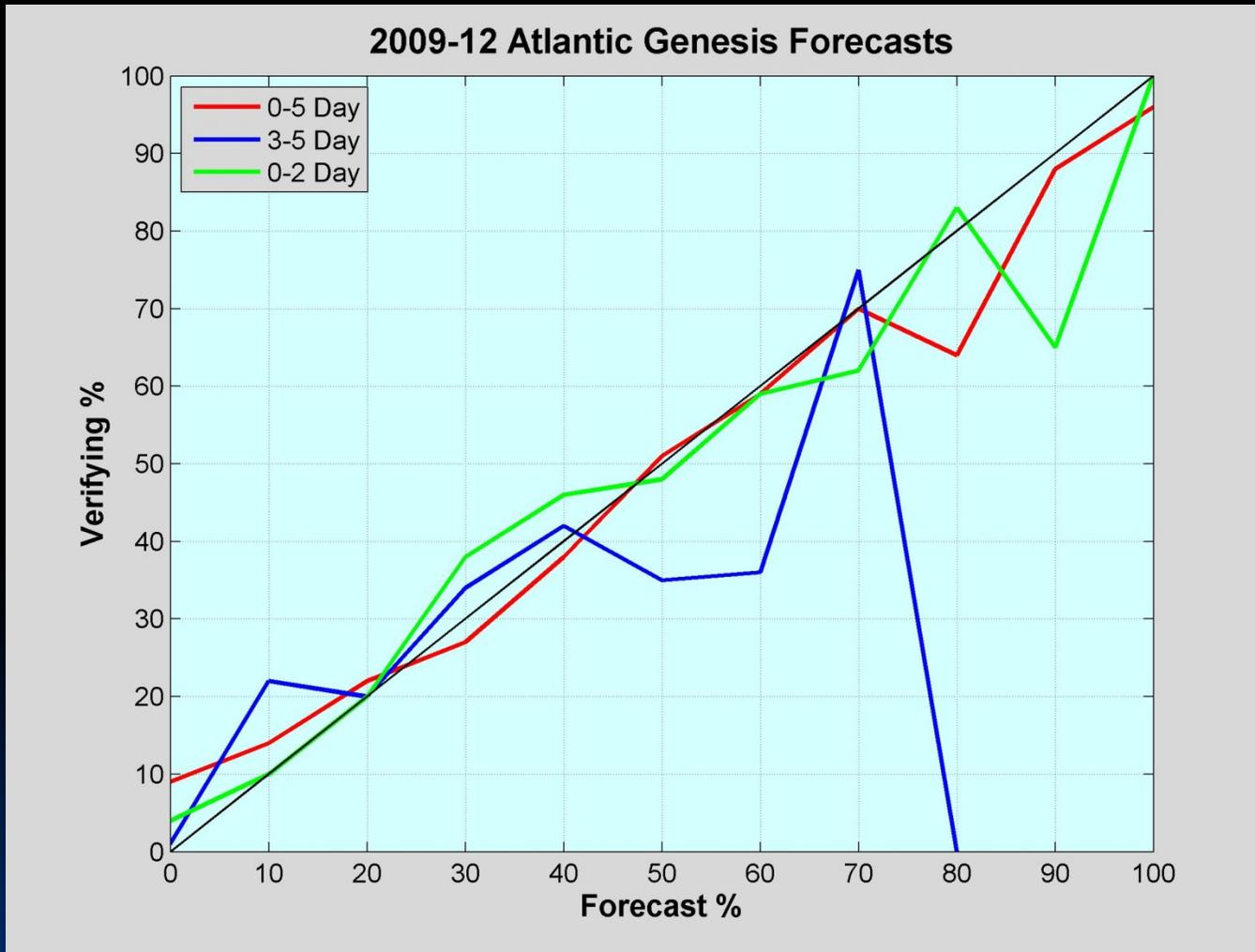


NOTES: EX. FIRST SYSTEM IN THE ATLANTIC IS A1, FOLLOWED BY A2 AND SO ON.

System	*A38	*A39					
G(1-2)	40	0					
G(3-5)	50	80					
G(1-5)	90	80					

* 09-15Z PREDICT DATA SHOWS WELL-DEFINED, 500NM DIAMETER CIRCULAR LOW PRESSURE → APPROX 700 MB.
 * BEST PRESSURE FALLS OF 2.1MB OR MORE UPWARD OF ISLANDS.
 * WINDSHEAR DIST TO DEFS TO 5-10KT PER 300FT.
 * ALL MODELS FFSO TO: POINT OF 5-10 SECTORS AT 1200Z

Verification of 2009-12 Genesis Probabilities



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

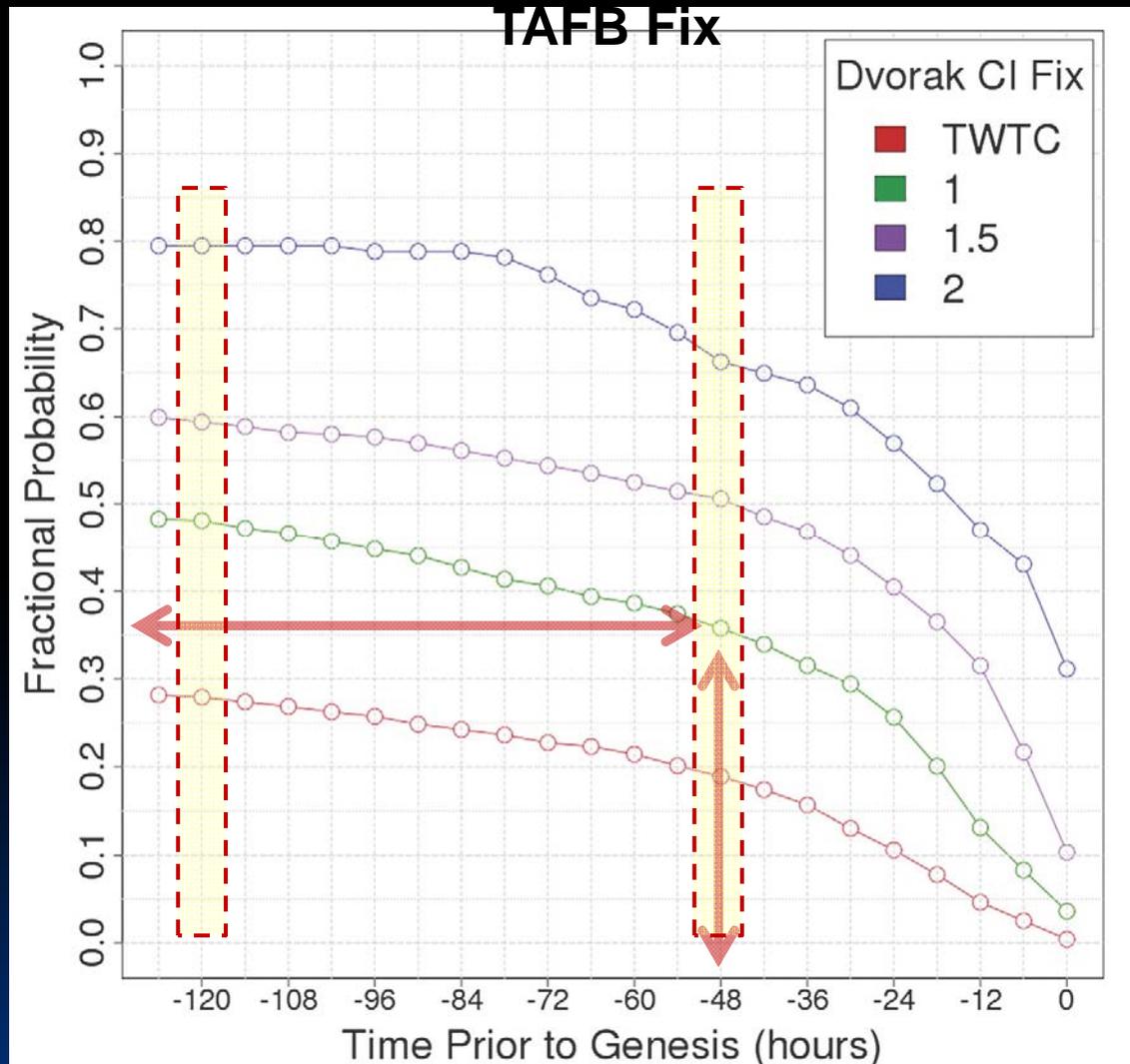
Approximate Hours Prior to Formation							
-48		-36		-24		-12	
40	30	30	40	20	60	20	70
70		70		80		90	
10	30	10	40	0	40		
40		50		40			
10	0			20	0	20	0
10		20		20		20	
30	20	30	40	30	60	0	90
50		70		90		90	
60	0	30	20	20	40	10	60
60		50		60		70	
60	20	50	30	50	40	40	50
80		100		90		90	
40	10	20	60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

TC Genesis Forecasting at the NHC

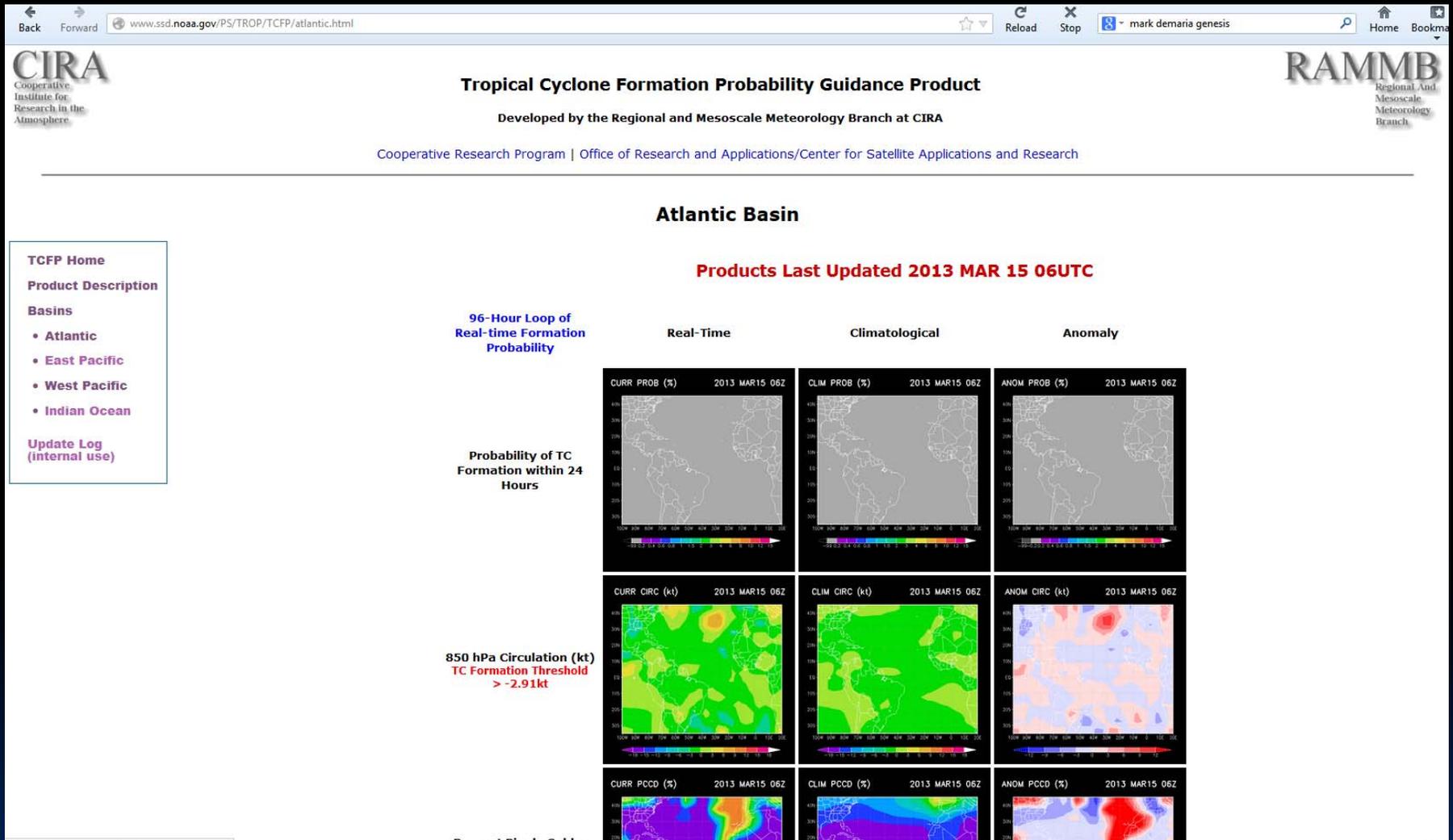
- Primary guidance comes from global models
- GFS and ECMWF seem to have greatest skill, but more systematic verification is needed
- Models appear to have some geographical biases, and perform better in the eastern Atlantic, and worse in the subtropics.
- Genesis forecasts are also more problematic in Gulf of Mexico since models have difficulty depicting genesis in that region (smaller-scale processes play a bigger role?)
- Considerable subjectivity involved in NHC genesis forecasts

Genesis Probability by Dvorak Number

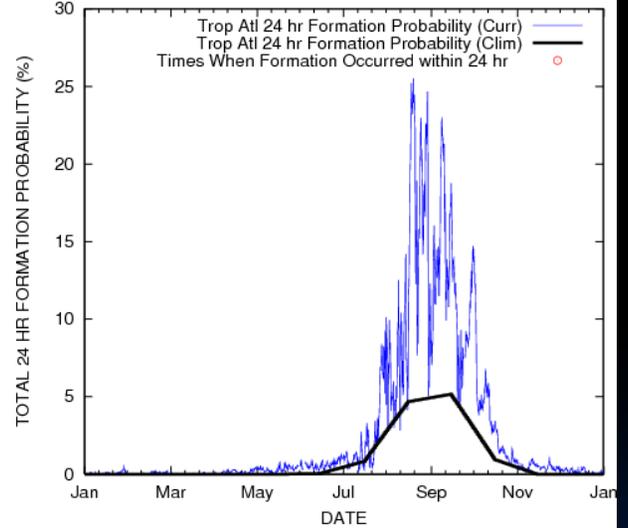
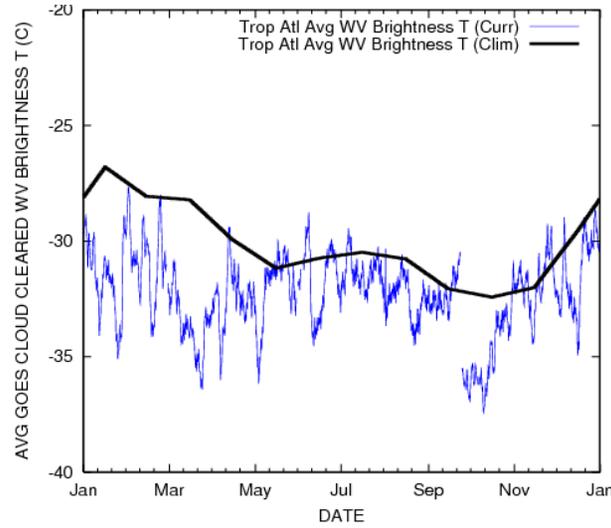
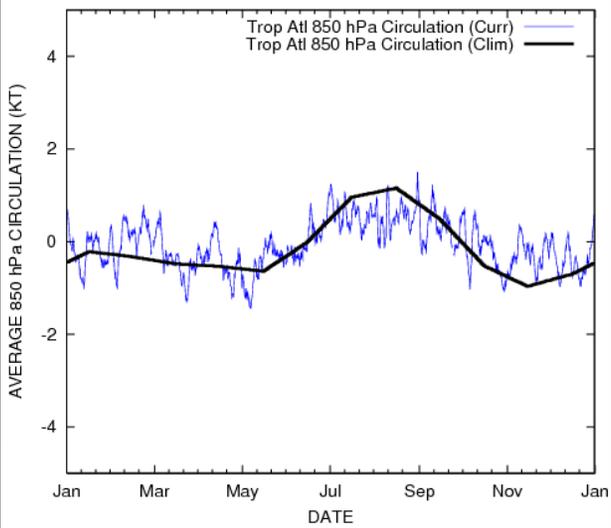
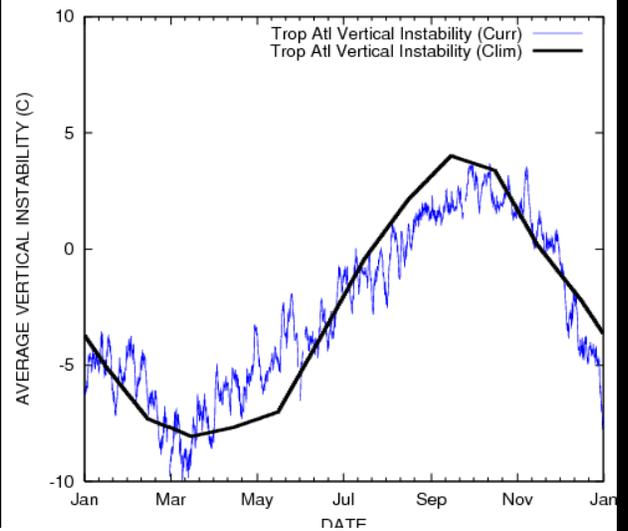
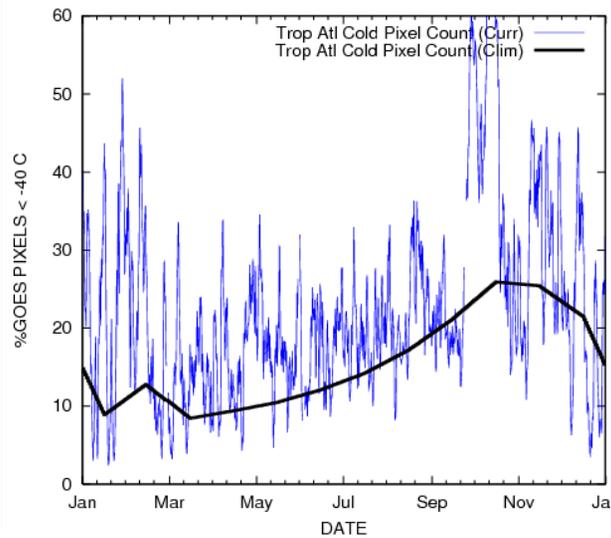
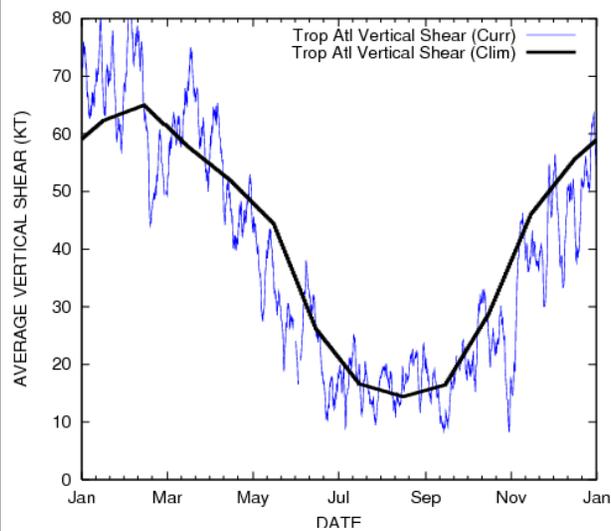
- Uses Dvorak intensity estimates from all invests/disturbances (both developing and non-developing) from 2001-2011.
- Example: Invest with a 1.0 TAFB CI Number has 35% chance of genesis within 48 h.
- Real-time guidance at moe.met.fsu.edu/genesis



CIRA – Tropical Cyclone Formation Probability Guidance Product



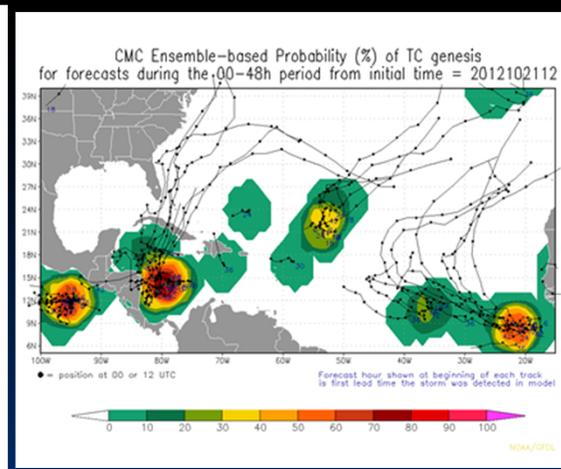
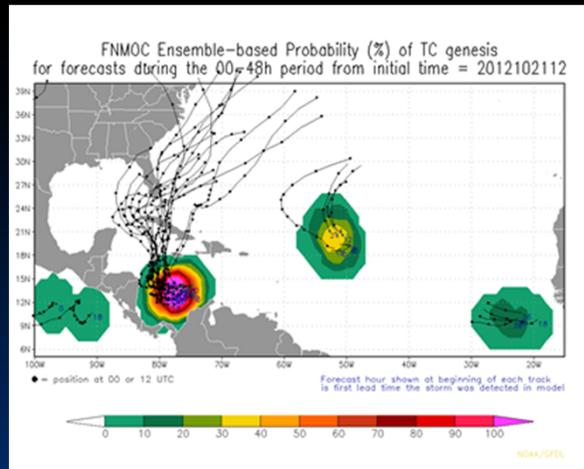
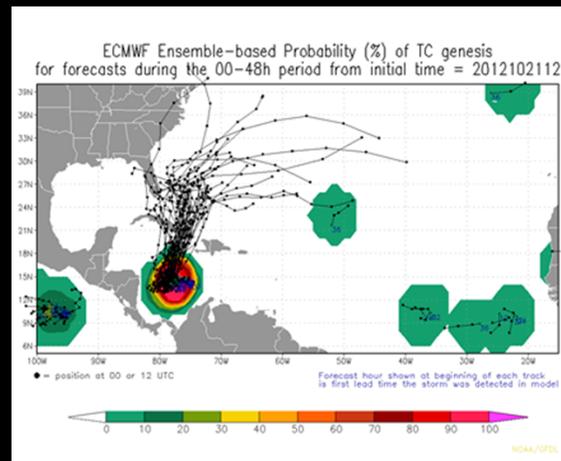
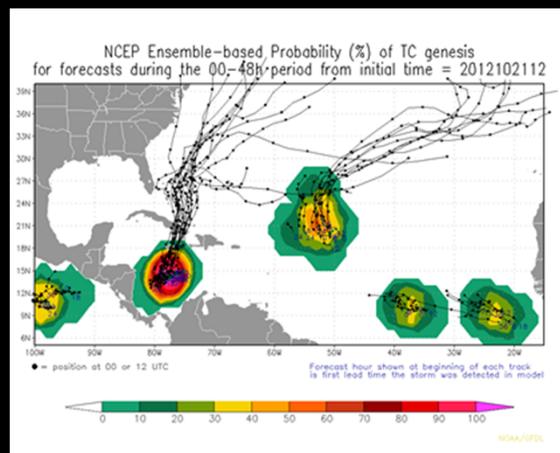
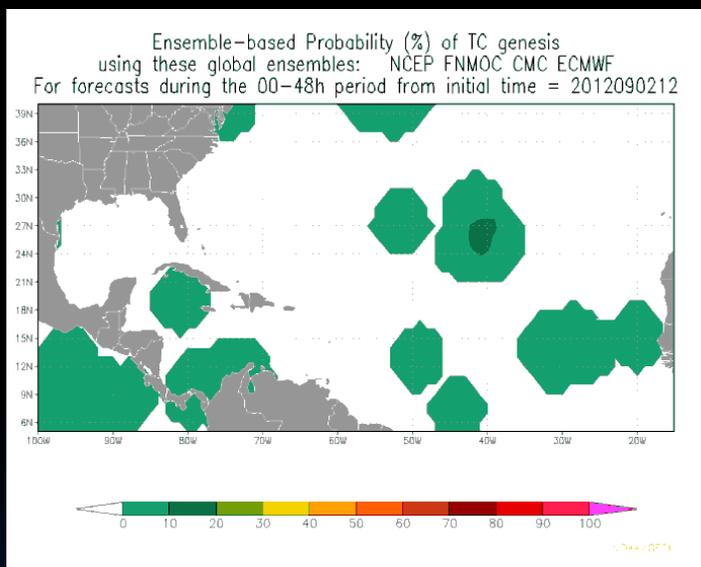
<http://www.ssd.noaa.gov/PS/TROP/TCFP/atlantic.html>



TIME SERIES OF TC GENESIS PARAMETERS -- 2012

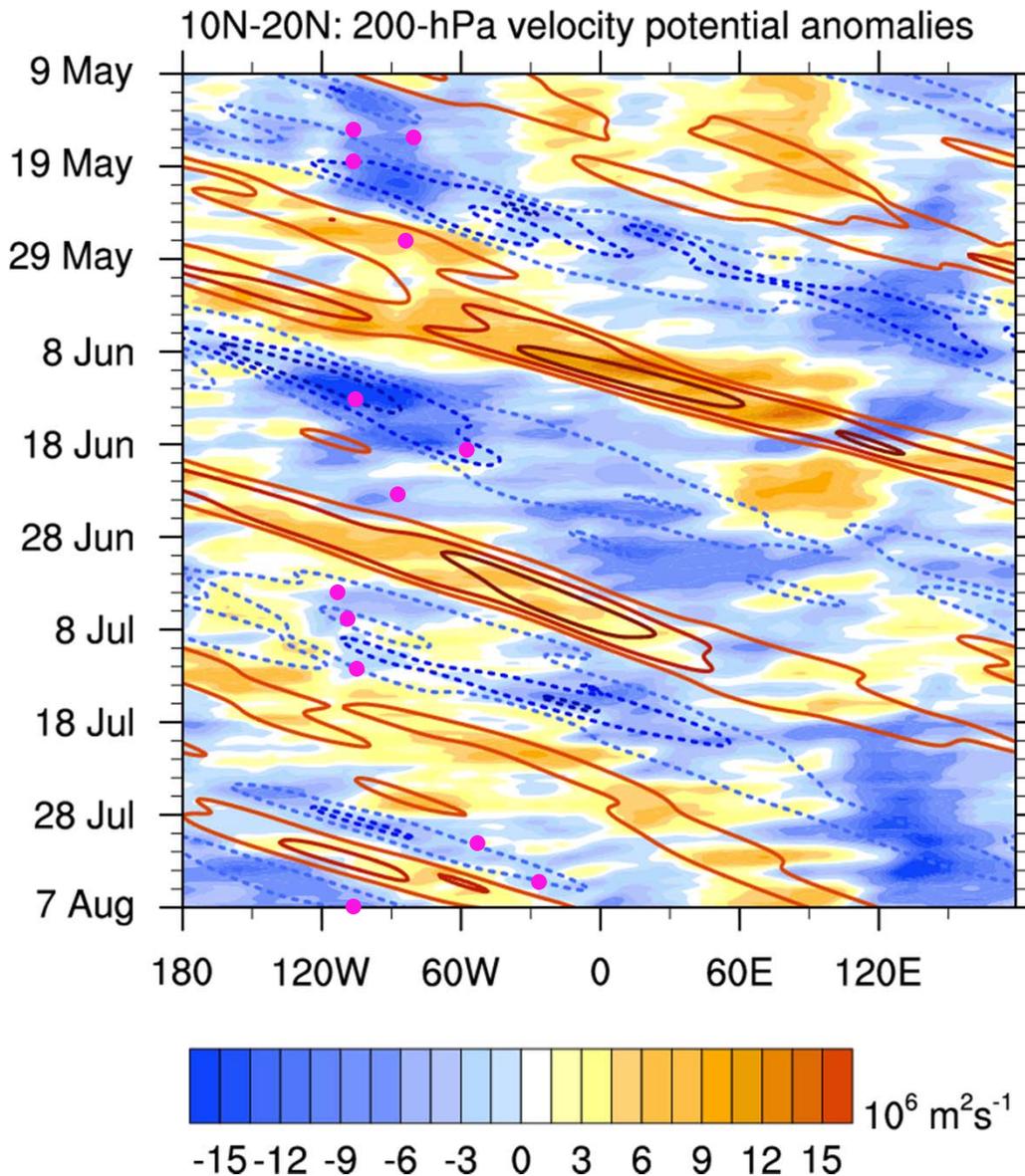
Model Genesis Page Now Includes Global Model Ensembles

Sandy: forecasts from 2012102012 (24h prior to genesis) -- Hit



Important intraseasonal predictors for the 5 day genesis forecasts

Blue—
favorable
upper-level
conditions
(lower shear
and more
unstable)



Magenta dots are
TC genesis points
in early 2012

Unlike conventional tropical waves, this signal moves from west to east

5-day Genesis Forecasts

TROPICAL WEATHER OUTLOOK
NWS NATIONAL HURRICANE CENTER MIAMI FL
800 PM EDT WED OCT 10 2012

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

A VIGOROUS TROPICAL WAVE ACCOMPANIED BY A BROAD LOW PRESSURE SYSTEM IS LOCATED ABOUT 475 MILES EAST-SOUTHEAST OF THE WINDWARD ISLANDS. SHOWERS AND THUNDERSTORMS HAVE BECOME A LITTLE BETTER ORGANIZED THIS EVENING...AND REPORTS FROM BUOYS WELL NORTH OF THE CIRCULATION CENTER INDICATE TROPICAL-STORM-FORCE WINDS HAVE BEEN OCCURRING IN SOME OF THE HEAVIER SQUALLS. ALTHOUGH UPPER-LEVEL WINDS ARE CURRENTLY ONLY MARGINALLY FAVORABLE...SOME SLOW DEVELOPMENT OF THIS LARGE DISTURBANCE WILL BE POSSIBLE DURING THE NEXT COUPLE OF DAYS AS ENVIRONMENTAL CONDITIONS GRADUALLY BECOME MORE CONDUCTIVE. THIS

SYSTEM HAS A MEDIUM CHANCE...40 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES WEST-NORTHWESTWARD AT AROUND 15 MPH. REGARDLESS OF DEVELOPMENT...STRONG GUSTY WINDS AND

HEAVY RAINFALL ARE POSSIBLE ACROSS PORTIONS OF THE LESSER ANTILLES DURING THE NEXT COUPLE OF DAYS. ENVIRONMENTAL CONDITIONS COULD BECOME SLIGHTLY MORE FAVORABLE IN A FEW DAYS WHEN THE DISTURBANCE TURNS NORTHWESTWARD AND PASSES NEAR OR OVER THE NORTHEASTERN CARIBBEAN ISLANDS...AND EMERGES OVER THE WESTERN ATLANTIC IN A FEW DAYS. THIS

SYSTEM HAS A HIGH CHANCE...80 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 5 DAYS.

A WELL-DEFINED LOW PRESSURE SYSTEM LOCATED ABOUT 250 MILES EAST OF THE CENTRAL BAHAMAS HAS CONTINUED TO BECOME BETTER DEFINED OVER THE PAST SEVERAL HOURS. HOWEVER...ENVIRONMENTAL CONDITIONS ARE ONLY MARGINALLY CONDUCTIVE FOR DEVELOPMENT DURING THE NEXT DAY OR SO BEFORE THE LOW MERGES WITH A COLD FRONT THURSDAY NIGHT OR FRIDAY. THIS SYSTEM HAS A LOW CHANCE...20 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES LITTLE. ENVIRONMENTAL CONDITIONS WILL BECOME HOSTILE FOR ANY SIGNIFICANT DEVELOPMENT TO OCCUR BY FRIDAY AS THE LOW MOVES SOUTHWARD INTO A REGION OF STRONG UPPER-LEVEL WINDS. THIS SYSTEM HAS A LOW CHANCE...20 PERCENT... OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 5 DAYS.

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AN EXPERIMENTAL 5-DAY FORMATION PROBABILITY IS ALSO INCLUDED IN THIS PRODUCT FOR THE 2013 HURRICANE SEASON.

FIVE-DAY FORMATION PROBABILITIES ARE EXPERIMENTAL IN 2012.

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FORECASTER STEWART

NNNN

THIS SYSTEM HAS A **MEDIUM CHANCE... 40 PERCENT**...OF BECOMING A TROPICAL CYCLONE DURING THE **NEXT 48 HOURS**...

THIS SYSTEM HAS A **HIGH CHANCE... 80 PERCENT**...OF BECOMING A TROPICAL CYCLONE DURING THE **NEXT 5 DAYS**.

ZCZC MIATWOAT ALL
TTAA00 KNHC DDHHMM

TROPICAL WEATHER OUTLOOK
NWS NATIONAL HURRICANE CENTER MIAMI FL
800 PM EDT THU SEP 20 2012

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

THE NATIONAL HURRICANE CENTER IS ISSUING ADVISORIES ON TROPICAL STORM NADINE...LOCATED ABOUT 250 MILES SOUTHWEST OF THE AZORES.

SHOWERS AND THUNDERSTORMS ASSOCIATED WITH AN AREA OF LOW PRESSURE LOCATED ABOUT 1175 MILES EAST-NORTHEAST OF THE NORTHERN LEEWARD ISLANDS HAVE BECOME A LITTLE BETTER ORGANIZED. ALTHOUGH UPPER-LEVELS WINDS ARE ONLY marginally FAVORABLE FOR DEVELOPMENT... THEY ARE EXPECTED TO BECOME MORE FAVORABLE DURING THE NEXT DAY OR TWO. THIS SYSTEM HAS A MEDIUM CHANCE...40 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES WEST-NORTHWESTWARD AT 10 MPH. AFTER THAT TIME... ENVIRONMENTAL CONDITIONS APPEAR FAVORABLE...AND THIS SYSTEM HAS A HIGH CHANCE...80 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 5 DAYS AS IT TURNS NORTHWESTWARD.

A BROAD LOW PRESSURE AREA ASSOCIATED WITH A TROPICAL WAVE IS LOCATED ABOUT 450 MILES SOUTHWEST OF THE CAPE VERDE ISLANDS. WHILE THIS SYSTEM IS PRODUCING A LARGE AREA OF CLOUDINESS AND SCATTERED SHOWERS...ENVIRONMENTAL CONDITIONS ARE ONLY marginally FAVORABLE FOR DEVELOPMENT. THIS SYSTEM HAS A MEDIUM CHANCE...40 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES GENERALLY WESTWARD AT 10 TO 15 MPH. HOWEVER...THESE CONDITIONS ARE FORECAST TO BECOME MORE CONDUCIVE FOR DEVELOPMENT DURING THE NEXT SEVERAL DAYS...AND THIS SYSTEM HAS A HIGH CHANCE...80 PERCENT...OF BECOMING A TROPICAL CYCLONE AS IT CONTINUES GENERALLY WESTWARD.

AN AREA OF DISTURBED WEATHER HAS FORMED IN ASSOCIATION WITH A BROAD LOW PRESSURE AREA ABOUT 700 MILES NORTHEAST OF THE NORTHERN LEEWARD ISLANDS. SLOW DEVELOPMENT OF THIS SYSTEM IS POSSIBLE DURING THE NEXT SEVERAL DAYS AS THE LOW MOVES GENERALLY WESTWARD AT ABOUT 10 MPH. THIS LOW HAS A LOW CHANCE...NEAR 20 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE 48 HOURS AS IT TURNS NORTHWESTWARD. BEYOND 48 HOURS... ENVIRONMENTAL SHOULD REMAIN marginally FAVORABLE FOR DEVELOPMENT. ..AND THIS SYSTEM HAS A MEDIUM CHANCE...30 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 5 DAYS AS THE LOW GRADUALLY TURNS NORTHWARD.

OTHER SYSTEMS WITH FORMATION POTENTIAL BEYOND 48 HOURS

THE REMANT CIRCULATION OF HURRICANE ISAAC IS LOCATED OVER THE OHIO VALLEY. THIS SYSTEM IS FORECAST TO GENERALLY DRIFT SOUTHWARD AND REACH THE WATERS OF THE NORTH-CENTRAL GULF OF MEXICO IN A FEW DAYS. ENVIRONMENTAL CONDITIONS ARE EXPECTED TO BE FAVORABLE IN THE GULF OF MEXICO FOR SOME SLOW DEVELOPMENT. THERE IS A LOW CHANCE...NEAR 0 PERCENT...OF THIS SYSTEM REFORMING DURING THE NEXT 48 HOURS. HOWEVER...THERE IS A MEDIUM CHANCE... 40 PERCENT...OF THIS SYSTEM REFORMING DURING THE NEXT 5 DAYS AS IT MOVES LITTLE OVER THE GULF OF MEXICO.

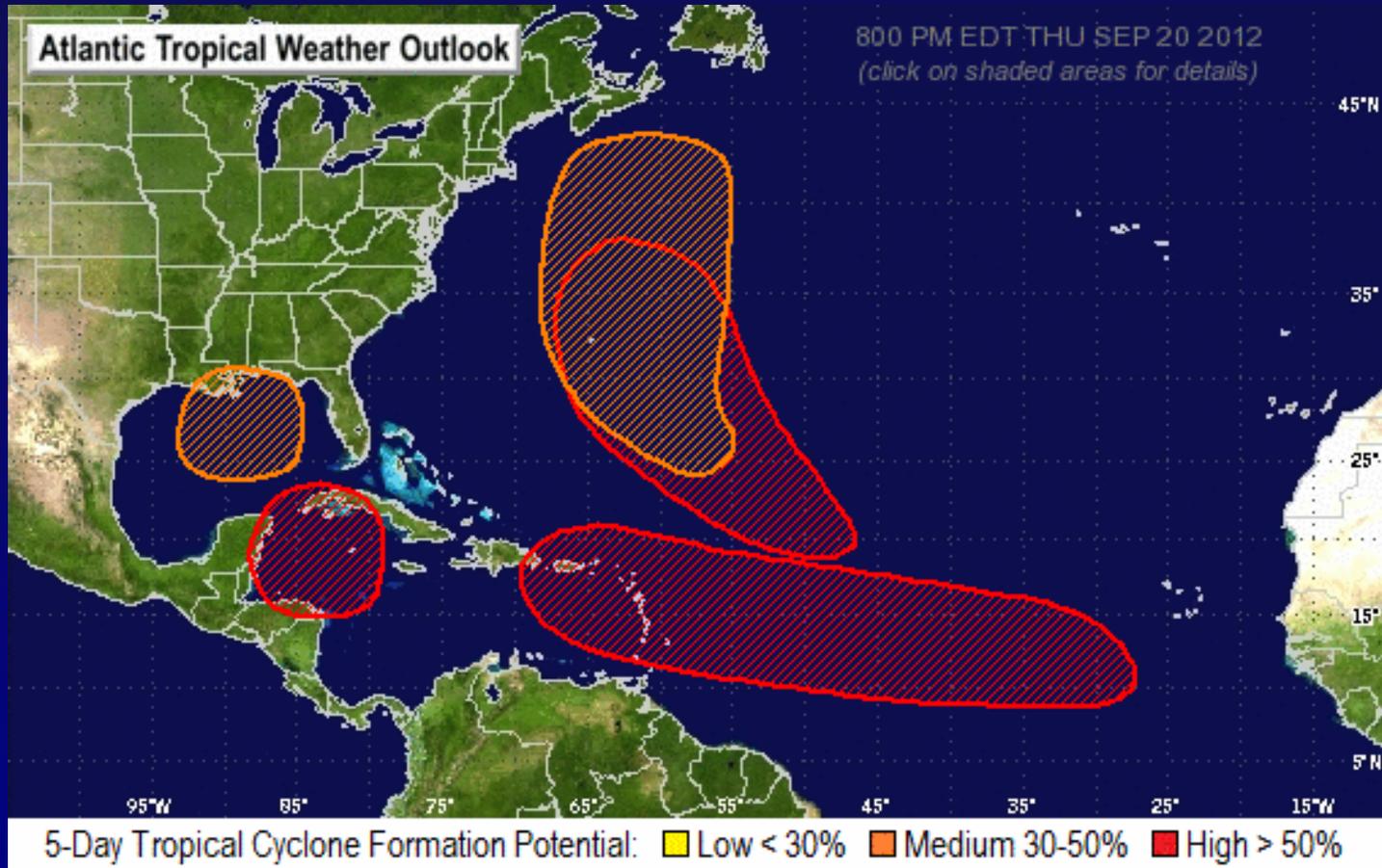
ALTHOUGH THE NORTHWESTERN CARIBBEAN SEA IS CURRENTLY QUIET...AN AREA OF LOW PRESSURE IS EXPECTED TO FORM IN THAT AREA IN 3 TO 5 DAYS. ENVIRONMENTAL CONDITONS APPEAR CONDUCIVE FOR DEVELOPMENT DURING THAT TIME AS THE LOW MOVES SLOWLY NORTHWARD. THERE IS A LOW CHANCE...NEAR 0 PERCENT...OF THIS SYSTEM BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS. HOWEVER...THERE IS A HIGH CHANCE...NEAR 60 PERCENT...OF THIS DISTURBANCE BECOMING A TROPICAL DURING THE NEXT 5 DAYS.

&&
AN EXPERIMENTAL 5-DAY FORMATION PROBABILITY IS ALSO INCLUDED IN THIS PRODUCT FOR THE 2013 HURRICANE SEASON. COMMENTS ON THE EXPERIMENTAL PORTION OF THIS PRODUCT CAN BE SENT TO TPC.HURR@NOAA.GOV.

FIVE-DAY FORMATION PROBABILITIES ARE EXPERIMENTAL IN 2013.

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FORECASTER KIMBERLAIN
NNNN

Graphical Prototype

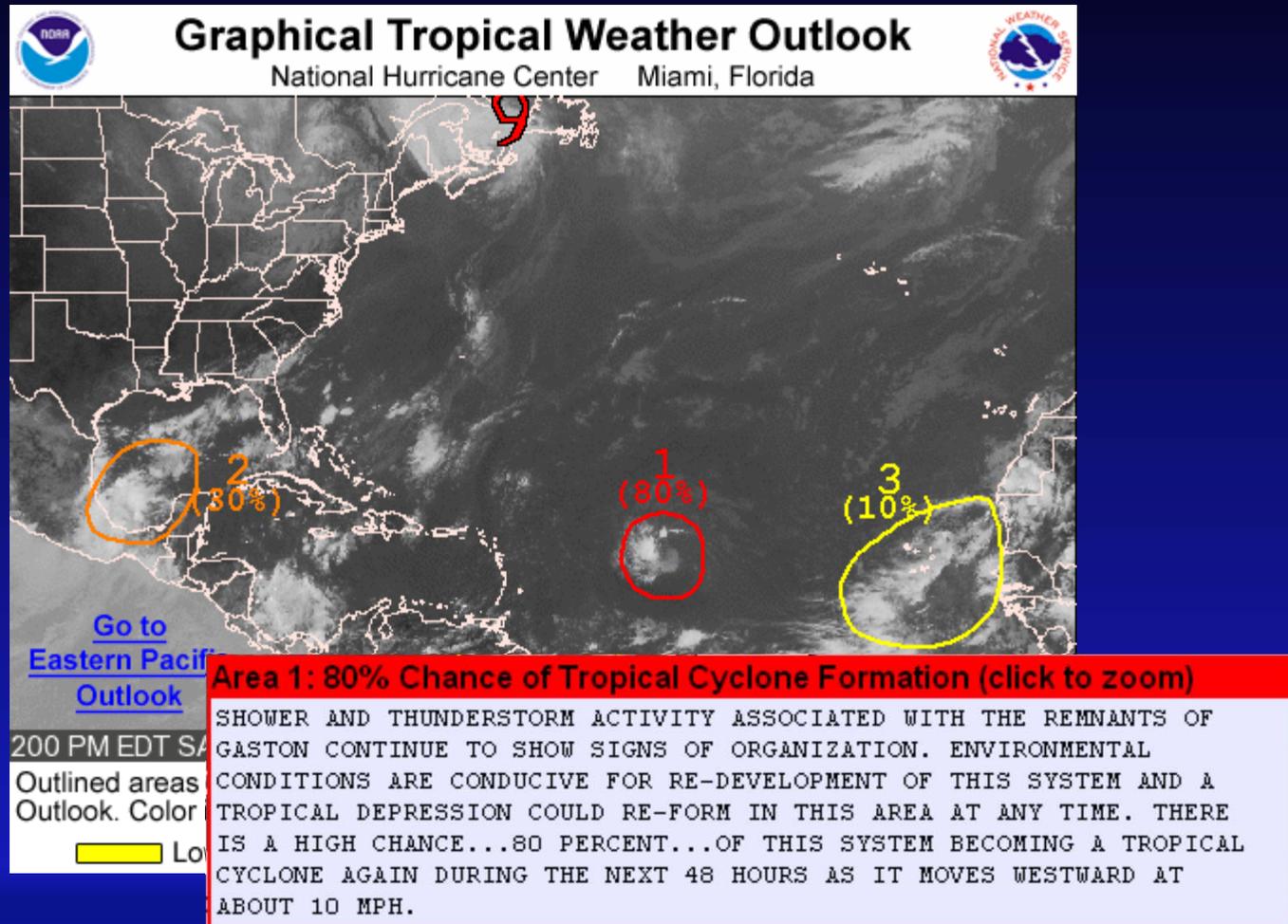


Also available system-by-system



Individual episode of tropical cyclone development from the disturbance initially located at X if exists. The storm can be formed anywhere inside the loop with the indicated probability (%) within five days.

Graphical Tropical Weather Outlook





Timeline

May 15– Produce text products in-house for further testing

July 15-August 31– If technical considerations are worked out, issue text 5-day genesis forecasts

Graphical product is dependent on resources but we are hopeful to have it functional with text



Conclusions

- New 5-day genesis forecasts are accurate enough to be issued publically
- Technically considerations due to understaffing are the biggest concern to prevent experimental issuance
- Optimistic that this will be in place during the busiest part of the hurricane season
- Note that this product will also be issued for the eastern Pacific (where the skill is a bit higher)

National Hurricane Center – Hurricane Specialist Unit



...the faces behind the forecasts