



# The Joint Hurricane Testbed

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Chris Landsea - NOAA/NWS/NCEP/National Hurricane Center

Shirley Murillo - NOAA/OAR/AOML/Hurricane Research Division

**The Joint Hurricane Testbed is funded by the US  
Weather Research Program in NOAA/OAR's  
Office of Weather and Air Quality**

# The Forecasters (Us)



How to bridge the “valley of death”?

# The Researchers (Them)



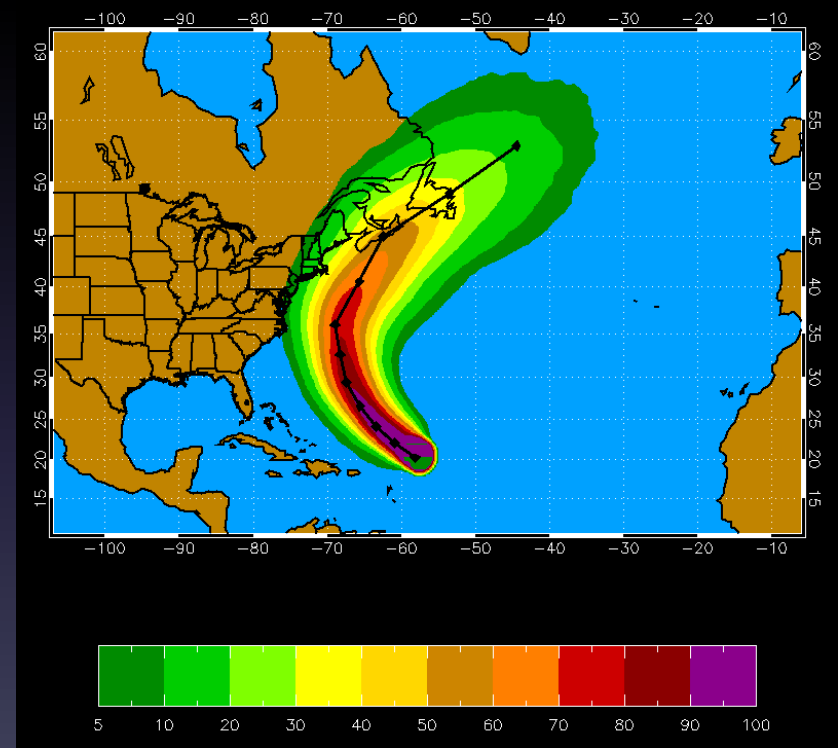
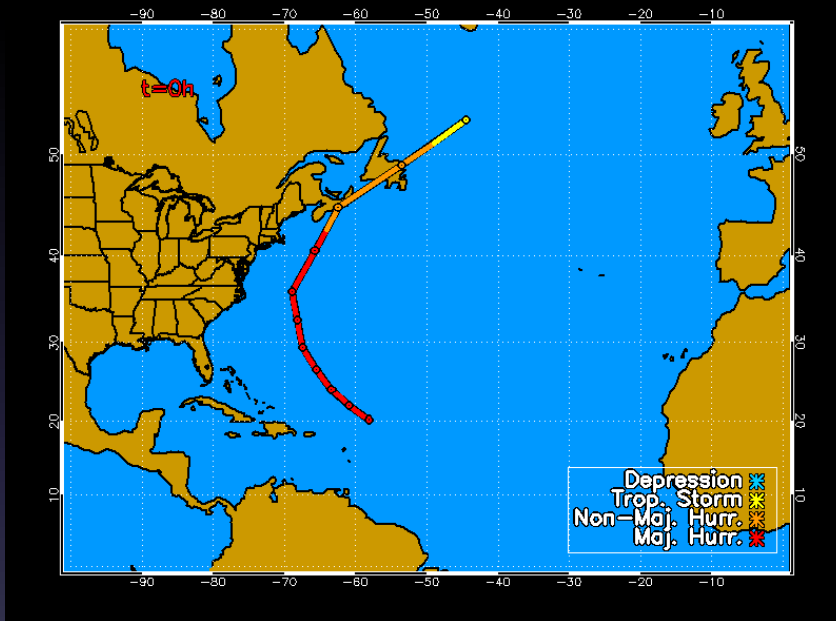
# Joint Hurricane Testbed (JHT)

- Bridge hurricane research and operations
- Began in 2001 under the USWRP
- **Our Mission:** successfully transfer new technology, research results & observational advances from research groups to operational centers
- Testing is done at National Hurricane Center or Environmental Modeling center

# Wind Speed Probabilities

## Hurricane Bill 20 Aug 2009 00 UTC

al032009 082000 BILL 34kt 1000 Realizations Cumulative 0 - 120hrs



1000 Track Realizations

34 kt 0-120 h Cumulative Prob.



# Wind Speed Probabilities



ZCZC MIAPWSAT4 ALL  
 TTA000 KNHC DDHMM  
 HURRICANE WILMA PROBABILITIES NUMBER 20  
 NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL  
 0900Z THU OCT 20 2005

...THIS IS AN EXPERIMENTAL PRODUCT FOR 2005...

AT 0900Z THE CENTER OF HURRICANE  
 WILMA WAS LOCATED NEAR LATITUDE 18.3 NORTH...  
 LONGITUDE 85.0 WEST WITH  
 MAXIMUM SUSTAINED WINDS NEAR 130 KTS...150 MPH...240 KM/HR.

CHANCES OF EXPERIENCING WIND SPEEDS OF AT LEAST  
 ...34 KT (39 MPH... 63 KPH)...  
 ...50 KT (58 MPH... 93 KPH)...  
 ...64 KT (74 MPH...119 KPH)...

FOR LOCATIONS AND TIME PERIODS DURING THE NEXT 5 DAYS

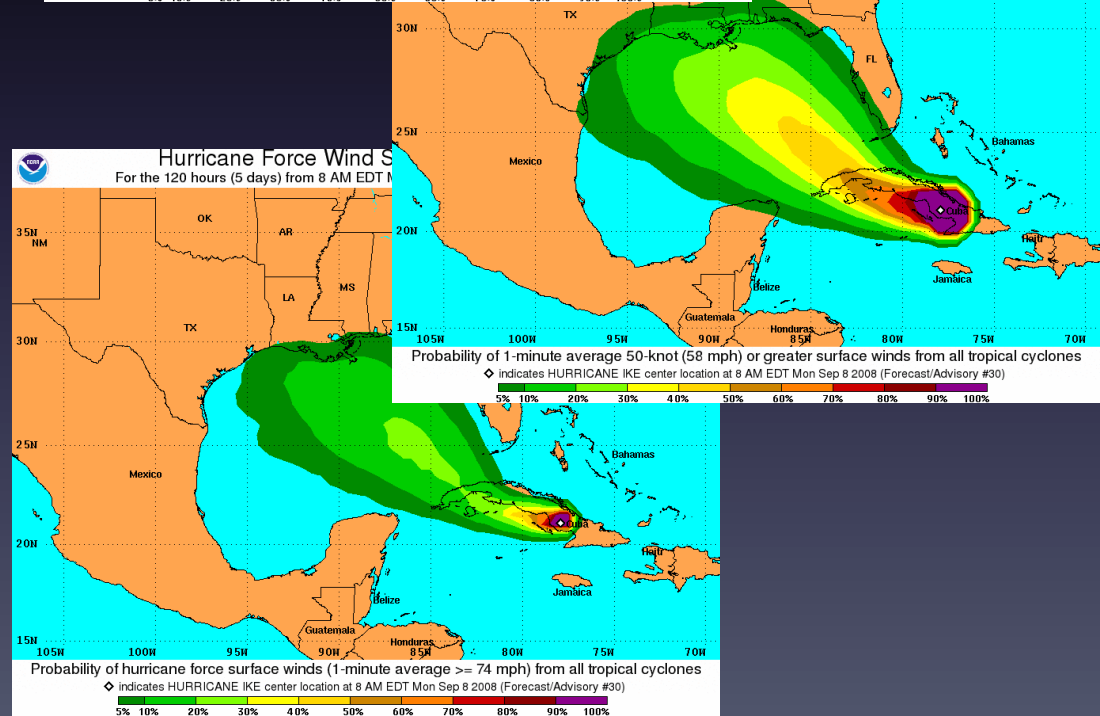
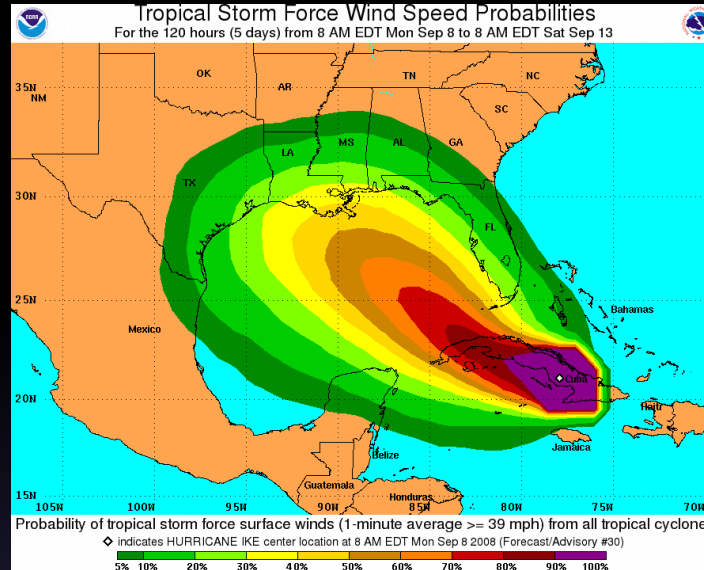
PROBABILITIES FOR LOCATIONS ARE GIVEN AS IP(CP) WHERE  
 IP IS THE PROBABILITY OF THE EVENT BEGINNING DURING  
 AN INDIVIDUAL TIME PERIOD (INDIVIDUAL PROBABILITY)  
 (CP) IS THE PROBABILITY OF THE EVENT OCCURRING BETWEEN  
 06Z THU AND THE FORECAST HOUR (CUMULATIVE PROBABILITY)

PROBABILITIES ARE GIVEN IN PERCENT  
 X INDICATES PROBABILITIES LESS THAN 0.5 PERCENT  
 LOCATIONS SHOWN WHEN THEIR TOTAL CUMULATED 5-DAY  
 PROBABILITY IS AT LEAST 2.5 PERCENT

Z INDICATES UNIVERSAL COORDINATED TIME (GREENWICH)

--- WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS ---

TIME PERIODS	FORECAST HOUR	FROM 06Z THU		FROM 18Z THU		FROM 06Z FRI		FROM 18Z FRI		FROM 06Z SAT		FROM 18Z SAT		FROM 06Z SUN		FROM 18Z SUN		FROM 06Z MON		FROM 18Z MON		
		TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	
LOCATION	KT																					
MIAMI FL	34	X	X ( X)	X ( X)	2 ( 2)	16 (18)	23 (41)	5 (46)														
MIAMI FL	50	X	X ( X)	X ( X)	X ( X)	6 ( 6)	11 (17)	3 (20)														
MIAMI FL	64	X	X ( X)	X ( X)	X ( X)	2 ( 2)	5 ( 7)	1 ( 8)														
KEY WEST FL	34	X	X ( X)	2 ( 2)	7 ( 9)	26 (35)	18 (53)	3 (56)														
KEY WEST FL	50	X	X ( X)	X ( X)	1 ( 1)	14 (15)	11 (26)	1 (27)														
KEY WEST FL	64	X	X ( X)	X ( X)	X ( X)	8 ( 8)	5 (13)	1 (14)														
MARCO ISLAND	34	X	X ( X)	X ( X)	5 ( 5)	20 (25)	23 (48)	4 (52)														
MARCO ISLAND	50	X	X ( X)	X ( X)	1 ( 1)	10 (11)	12 (23)	2 (25)														
MARCO ISLAND	64	X	X ( X)	X ( X)	X ( X)	5 ( 5)	6 (11)	X (11)														



# JHT: The Process

- Call for Proposals - drafted and disseminated (bi-annually)
- Principal Investigators apply for funding through NOAA
- 7 member Steering Committee rates all proposals
- Funded projects are tested during 1 or 2 hurricane seasons in conjunction with NHC/EMC points of contact
- At the project's end, each are evaluated by NHC/EMC staff
- Implementation of successful projects are then carried out by NHC/EMC staff/PIs

# JHT: The statistics

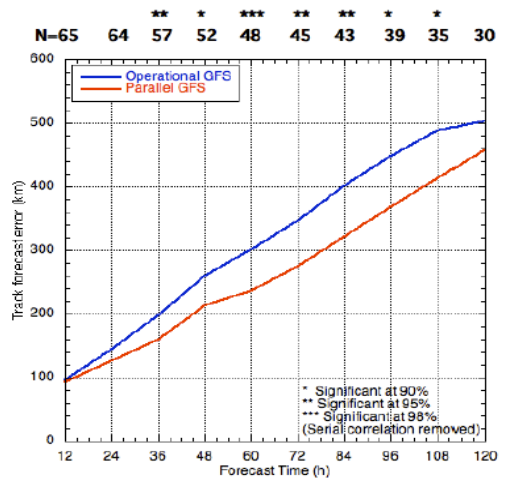
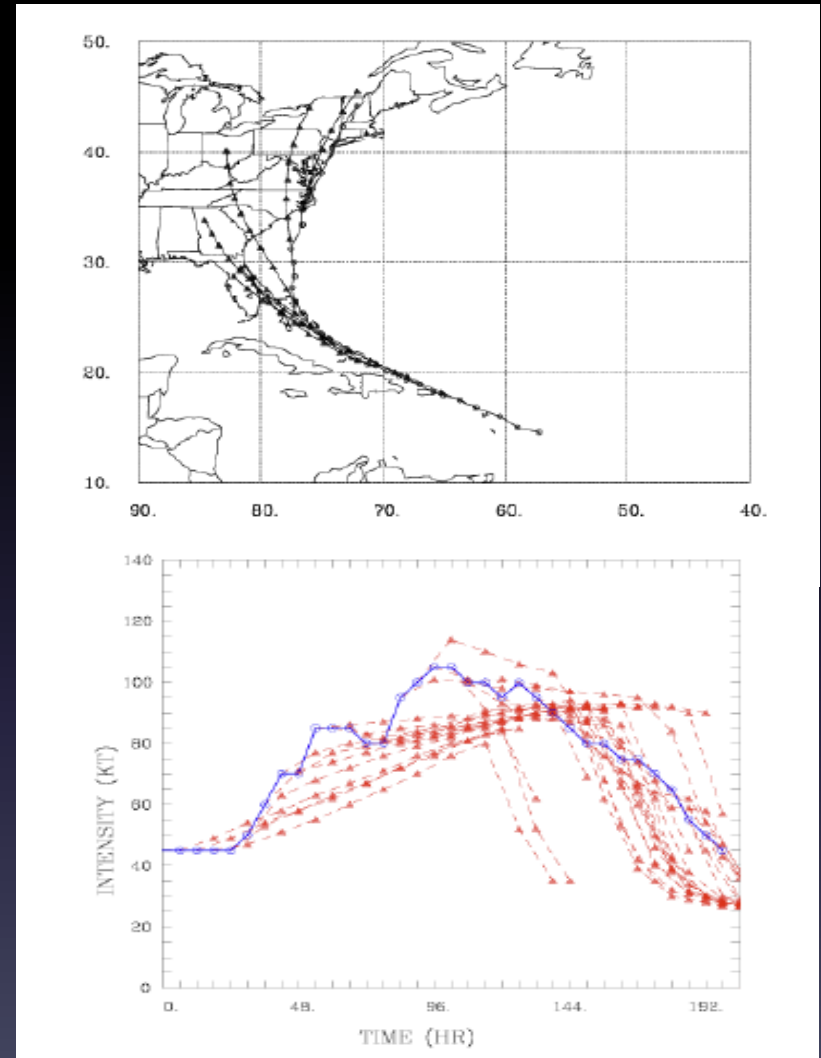
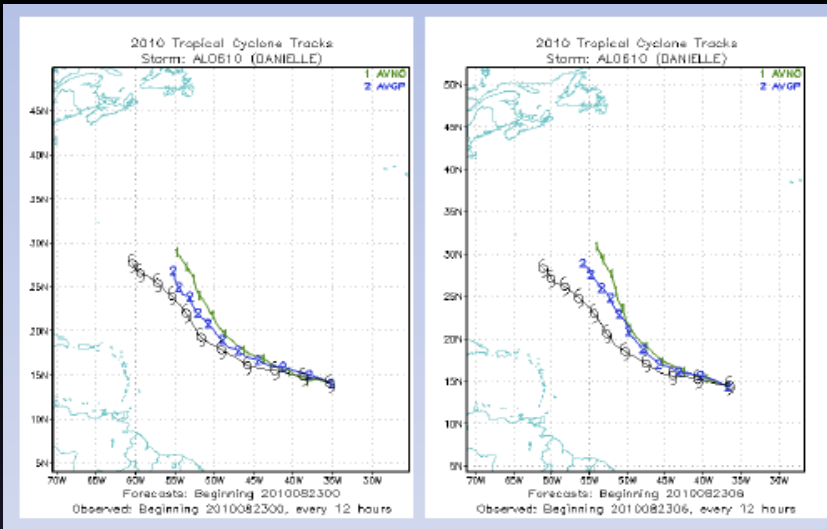
- Number of projects supported: 81
  - 74 completed
    - 50 accepted for operational implementation
    - 9 projects completed but rejected
    - 10 projects completed, deferred pending further investigation
    - 5 projects with decisions soon forthcoming
  - 7 projects started in fall 2013
- Implementation
  - 43 projects implemented:
    - 13 numerical modeling projects implemented by EMC/NCO
    - 30 projects implemented by NHC
  - 5 projects accepted but not yet fully implemented by NHC
  - 2 projects unable to be implemented after acceptance <sup>7</sup>

# On-going JHT Activities

- **6<sup>th</sup> Round Projects**
  - All 12 completed after the 2013 hurricane season
  - Implementation decisions being finalized
- **7<sup>th</sup> Round Projects**
  - 7 projects begun September 2013
  - On-going testing during 2014/2015 hurricane seasons
  - Implementation decisions to be made in 2015/2016
- **8<sup>th</sup> Round Projects**
  - New projects to begin September 2015



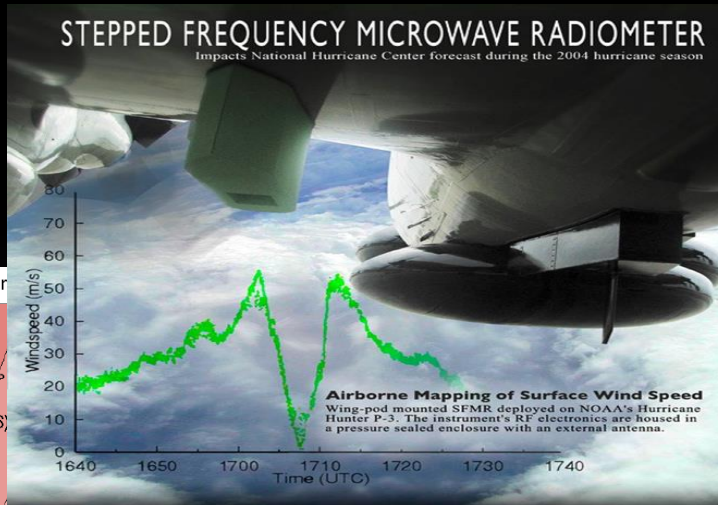
# Projects Accepted for Operational Implementation - 6<sup>th</sup> round



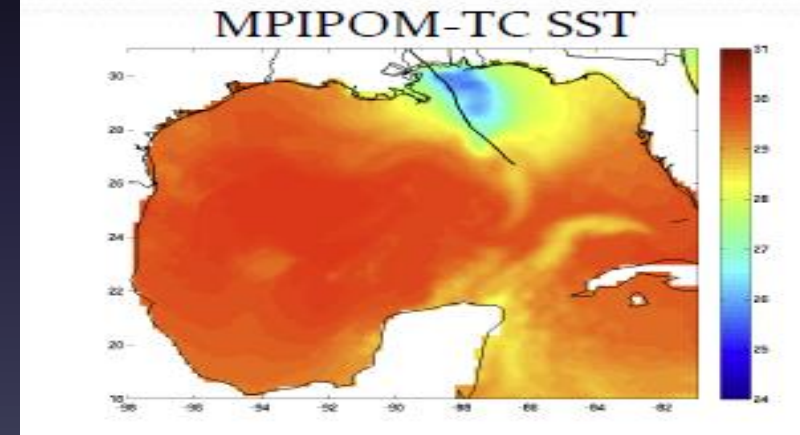
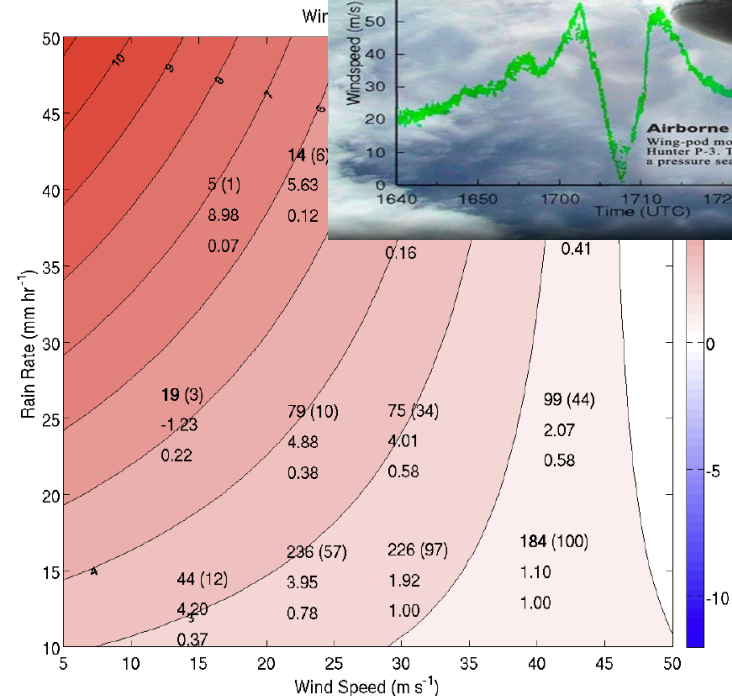
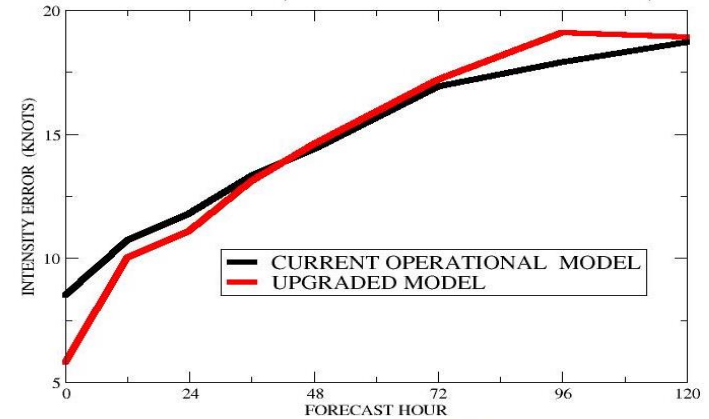
Assimilation of Non-NOAA and Non-AF GPS Dropwindsonde Data into NOAA Numerical Models - Abernson

Improvements in Statistical Tropical Cyclone Forecast Models - DeMañia

# Projects Accepted for Operational Implementation - 6<sup>th</sup> round



2010, 2011, 2012 Atlantic Average Intensity Error (knots)  
Number of Cases : (539, 535, 528, 512, 489, 436, 372, 306)



Improved Stepped Frequency Microwave Radiometer Surface Wind Measurements in Intense Rain conditions - Uhlhorn

Improving the Operational Tropical Cyclone Models at NOAA/NCEP and Navy/FNMOC- Bender/Ginis

# Factors Considered in NHC Decisions on Operational Implementation

- **Forecast or Analysis Benefit:** expected improvement in operational forecast and/or analysis accuracy
- **Efficiency:** adherence to forecaster time constraints and ease of use needs
- **Compatibility:** IT compatibility with operational hardware, software, data, communications, etc.
- **Sustainability:** availability of resources to operate, upgrade, and/or provide support

# 7<sup>th</sup> Round Timetable

- **August 2012**
  - Announcement of Opportunity released
- **October 2012**
  - 36 Letters of Intent reviewed by Steering Committee
- **December 2012 - January 2013**
  - 22 Full proposals reviewed by Steering Committee
- **February - April 2013**
  - Rank and select 7 proposals for funding
  - Point-of-contacts established among NHC/EMC staff
  - Work with PIs to setup timelines for their projects
- **September 2013 – May 2014**
  - PIs begin projects in coordination with points-of-contact
- **March 2014**
  - Present progress at Interdepartmental Hurricane Conf.

# 7<sup>th</sup> Round Timetable (continued)

- April 2014
  - Mid-year report and renewal proposal due
- May-June 2014
  - Steering Committee reviews progress and renewal proposals - all 7 projects are renewed for year two
- June – November 2014
  - Begin real-time testing during hurricane season
- December 2014 – April 2015
  - PI refine their projects and interact with points-of-contact
- March 2015
  - Present progress at Interdepartmental Hurricane Conf.
- June – November 2015
  - Continued real-time testing during hurricane season

# 7<sup>th</sup> Round Timetable (continued)

- December 2015
  - PI provide their final report
- January-May 2015
  - Operational implementation decisions made by NHC/EMC
- June 2015 – April 2016
  - Implementation of accepted projects by NHC/EMC

# 7<sup>th</sup> Round Timetable (continued)

- **December 2015**
  - PI provide their final report
- **January-May 2015**
  - Operational implementation decisions made by NHC/EMC
- **June 2015 – April 2016**
  - Implementation of accepted projects by NHC/EMC

**FOUR YEARS FROM ANNOUNCEMENT TO  
IMPLEMENTATION**

# 7<sup>th</sup> Round JHT Projects - 2013 to 2015

Project Title	Principal Investigator(s)	NHC Point of Contact
A Visualization Application for Distributed ADCIRC-based Coastal Storm Surge, Inundation, and Wave Modeling	Brian Blanton, Rick Luettich (Univ. of N Carolina)	Feyen (NOS), Rhome, Berg, Schauer, Landsea
Improving the GFDL/GFDN Operational Tropical Cyclone Models at NOAA/NCEP and Navy/FNMOC	Isaac Ginis (Univ. of Rhode Island), Morris Bender (NOAA/GFDL)	Pasch, Mattocks, Tallapragada (EMC), Landsea
A Probabilistic TC Genesis Forecast Tool Utilizing an Ensemble of Global Models	Bob Hart, Henry Fuelberg (Florida State Univ.)	Pasch, Mattocks, Kimberlain, Blake, Landsea
Improvement to the Satellite-based 37 GHz Ring Rapid Intensification Index	Haiyan Jiang (Florida Intl Univ.)	Stewart, Cangialosi, Landsea
Guidance on Intensity Guidance	Dave Nolan (U of Miami/RSMAS), Andrea Schumacher (CSU/CIRA)	Avila, Blake, Landsea
Upgrades to the Operational Monte Carlo Wind Speed Probability Program	Andrea Schumacher (CSU/CIRA)	Brown, Brennan, Mattocks, Landsea
Integration of an Objective, Automated TC Center-fixing Algorithm Based on Multispectral Satellite Imagery into NHC/TAFB Operations	Tony Wimmers, Chris Velden (Univ. of Wisc./CIMSS)	Beven, Mundell, Landsea



# 8<sup>th</sup> Round Timetable

- **August 2014**
  - Announcement of Opportunity released
- **October 2014**
  - 35 Letters of Intent reviewed by Steering Committee
- **December 2014**
  - Full proposals due

Review criteria and their maximum points are:

- (1) Importance/relevance and applicability of proposal to the program goals (30 points),
- (2) Technical merit (50 points),
- (3) Overall qualifications of applicants (10 points),
- (4) Project Costs (10 points), and
- (5) Outreach and education (0 points)

# Top 5 Priorities for New Funding

- NHC-1/JTWC-1. Guidance for tropical cyclone intensity change, especially for the onset, duration, and magnitude of **rapid intensification** events, as well as for over-water rapid weakening events.
- NHC-2/JTWC-2. Improved capability to **observe the tropical cyclone and its environment** to support forecaster analysis and model initialization.
- NHC-3/JTWC-8. Statistically based real-time **guidance on guidance** to assist in the determination of official track and intensity forecasts. This could include multi-model consensus approaches, provided in probabilistic and other formats.
- NHC-4/JTWC-9. Enhancements to the **operational environment** (e.g., ATCF, AWIPS-II) to increase forecaster efficiency, by expediting analysis, forecast, coordination, and/or communication activities.
- NHC-5/JTWC-11. Techniques or products to support **pre-genesis** disturbance track, intensity, size, and wind speed probability forecasts.

# The Joint Hurricane Testbed

www.nhc.noaa.gov/jht  
National Hurricane Center

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Local forecast by "City, St" or "ZIP" [ ] Go

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Joint Hurricane Testbed

## JHT Overview

[Overview](#) | [Current Projects](#) | [Past Projects](#)  
[Admin Presentations](#) | [Highlights](#) | [Staff](#) | [Committee](#)

### Mission Statement

The mission of the Joint Hurricane Testbed is to transfer more rapidly technology, research results, and observational advances of the United States Weather Research Program (USWRP), its sponsoring agencies, the academic community, and other interested parties into the operational computing, communication, and display environment to improve tropical cyclone analysis and prediction at operational centers.

### News

20 March 2012: 2012 IHC presentations posted for 2011-2013 projects  
1 November 2011: Press Release on new 2011 funded JHT projects  
30 September 2011: New JHT projects (Round 6, FY11-13) announced

[View News Archive](#)

### Main Activities

- Identify new techniques, models, observing systems, etc. with potential for operational use via an announcement of opportunity and a proposal, review, and funding process.
- Establish and maintain an infrastructure to facilitate the modification and integration of new tools into the operational computing, communication, and display environment.
- Complete tests in a quasi-operational environment of tools, techniques, and procedures, with metrics for scientific performance, ease-of-use, and support.
- Prepare documentation, training, and performance evaluations of tools and procedures to facilitate use and support in operations.

Please see the [Joint Hurricane Testbed Terms of Reference](#) (PDF) for more details.

Rappaport et. al., 2012 - *BAMS*

## THE JOINT HURRICANE TEST BED

Its First Decade of Tropical Cyclone  
Research-To-Operations Activities Reviewed

BY EDWARD N. RAPPAPORT, JIANN-GWO JIING, CHRISTOPHER W. LANDSEA,  
SHIRLEY T. MURILLO, AND JAMES L. FRANKLIN

Collaboration between researchers, forecasters and technology specialists facilitated the development and implementation of numerous projects benefitting forecast operations.