The Joint Hurricane Testbed

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

Vlab Forum – November 19, 2014

The Forecasters (Us)

The Researchers (Them)

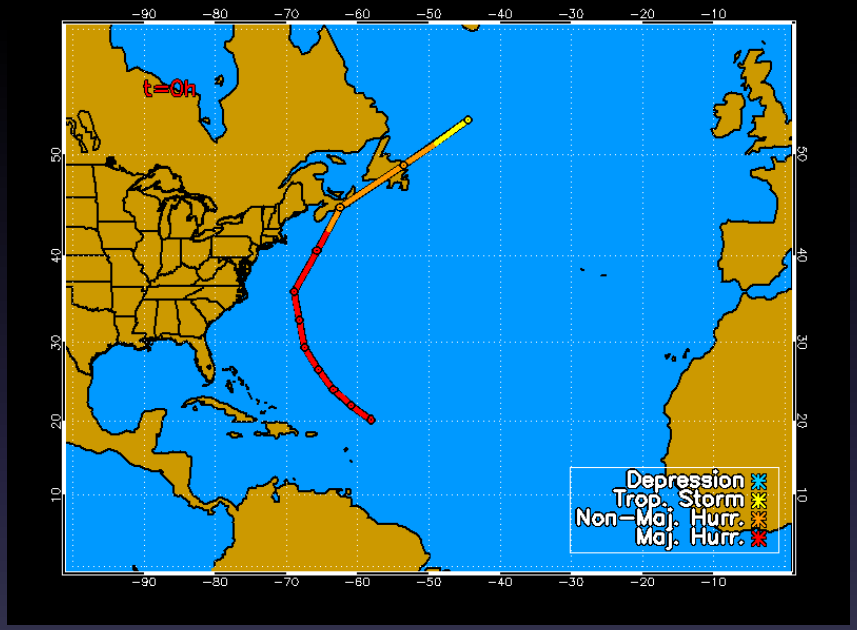
How to bridge the "valley of death"?

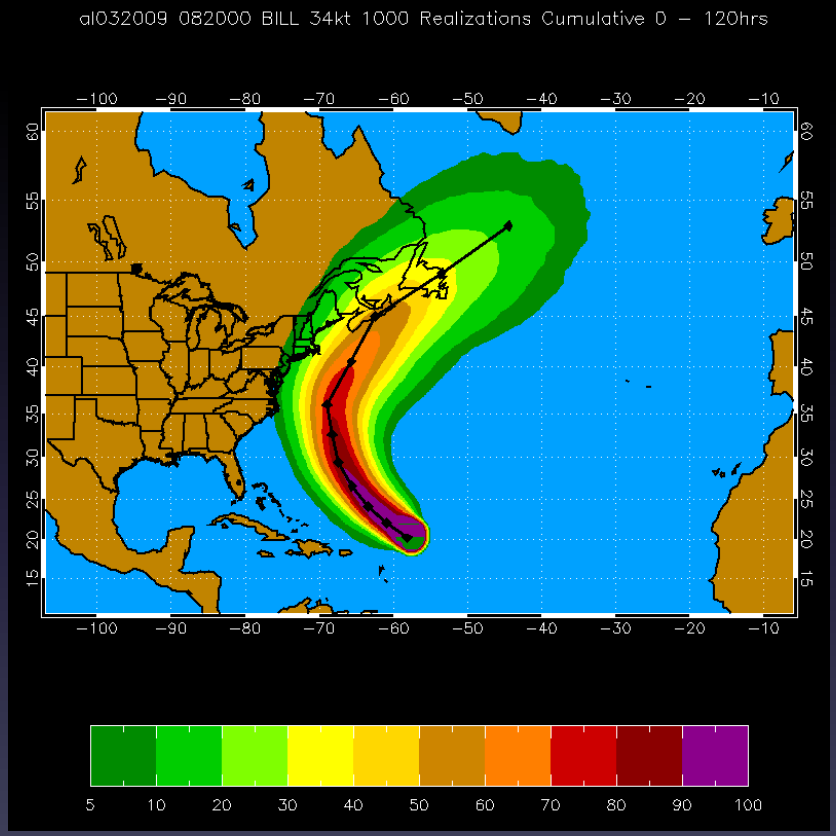
Joint Hurricane Testbed (JHT)

- 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





1000 Track Realizations

34 kt 0-120 h Cumulative Prob.

Wind Speed Probabilities

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ZCZC MIAPWSAT4 ALL
TTAA00 KNHC DDHHMM
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 - - - -

                FROM     FROM     FROM     FROM     FROM     FROM     FROM
  TIME        06Z THU  18Z THU  06Z FRI  18Z FRI  06Z SAT  06Z SUN  06Z MON
PERIODS         TO       TO       TO       TO       TO       TO       TO
              18Z THU  06Z FRI  18Z FRI  06Z SAT  06Z SUN  06Z MON  06Z TUE

FORECAST HOUR    (12)     (24)     (36)     (48)     (72)     (96)    (120)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
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)
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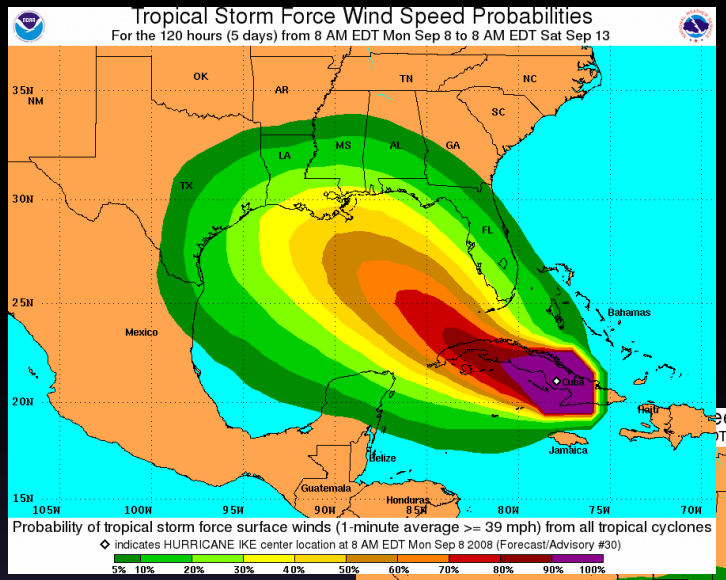
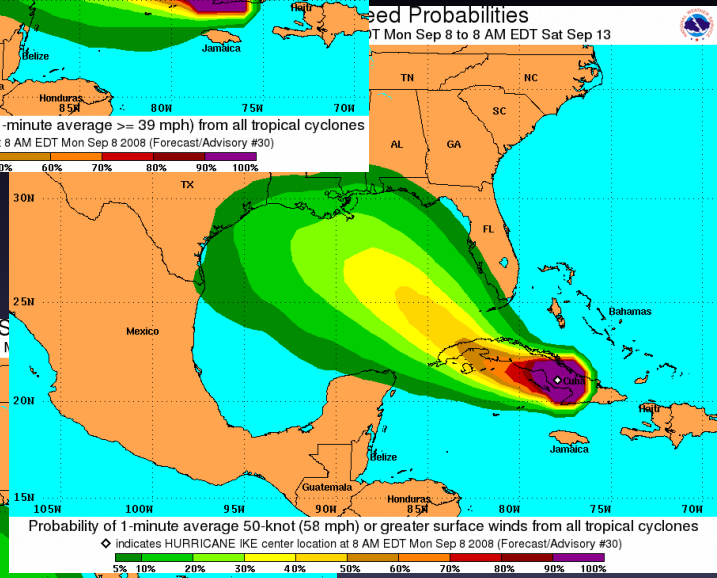
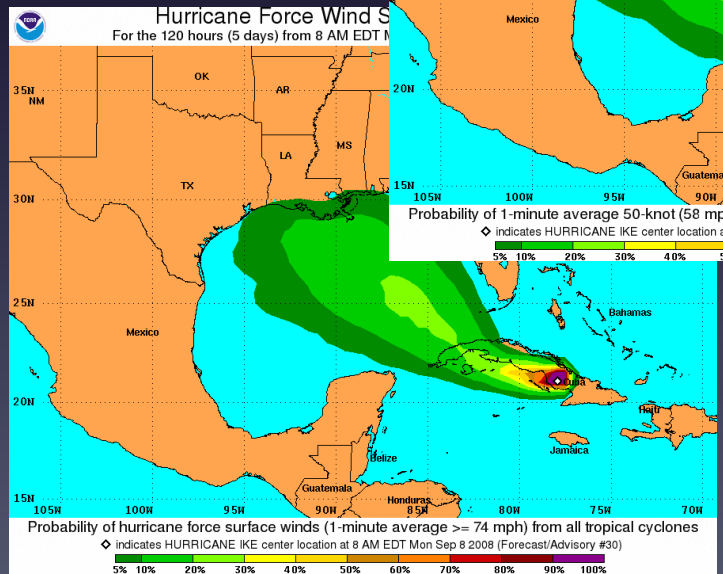






JHT: The Process

- 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

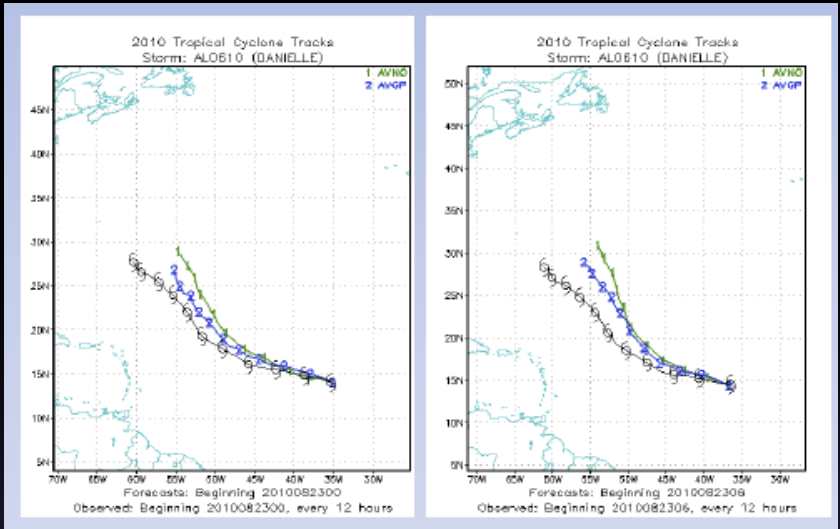
- Number of projects supported: 81
  - 74 completed
    - 50 accepted for operational implementation
    - 9 projects completed but rejected
    - 10 projects completed, deferred pending further investigation
    - 5 projects with decisions soon forthcoming
  - 7 projects started in fall 2013

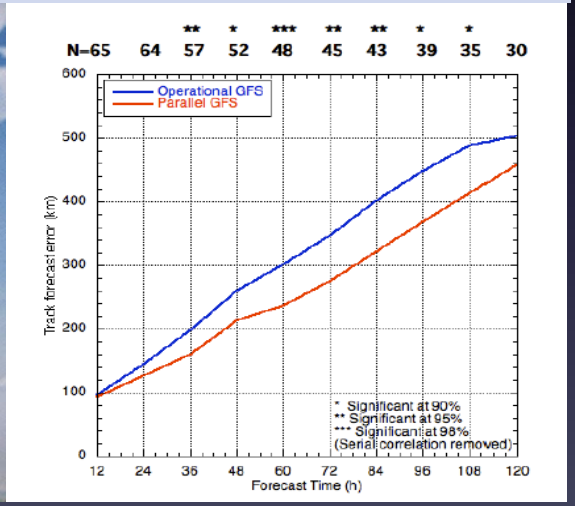
- Implementation
  - 43 projects implemented:
    - 13 numerical modeling projects implemented by EMC/NCO
    - 30 projects implemented by NHC
  - 5 projects accepted but not yet fully implemented by NHC
  - 2 projects unable to be implemented after acceptance

On-going JHT Activities

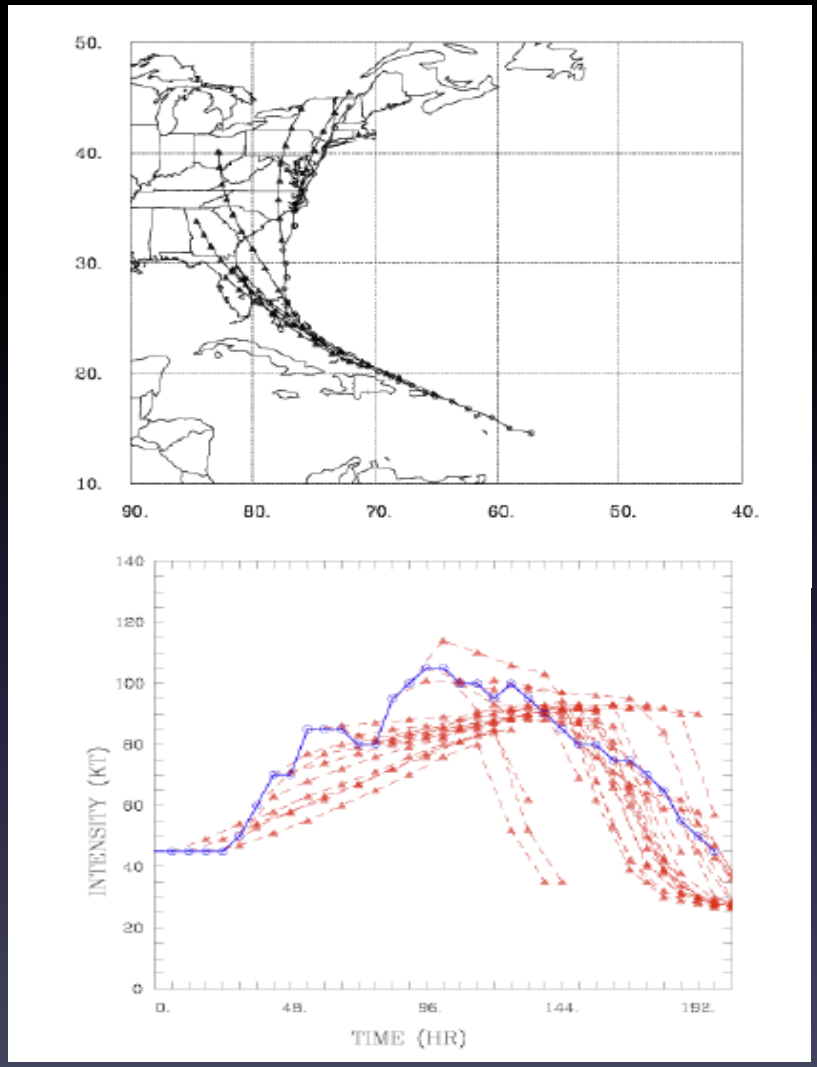
- 6th Round Projects
  - All 12 completed after the 2013 hurricane season
  - Implementation decisions being finalized
- 7th Round Projects
  - 7 projects begun September 2013
  - On-going testing during 2014/2015 hurricane seasons
  - Implementation decisions to be made in 2015/2016
- 8th Round Projects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

Projects Accepted for Operational Implementation - 6th round



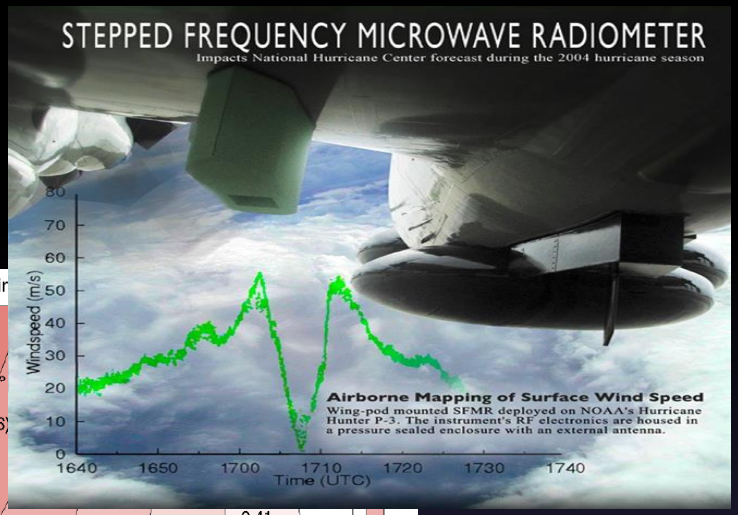


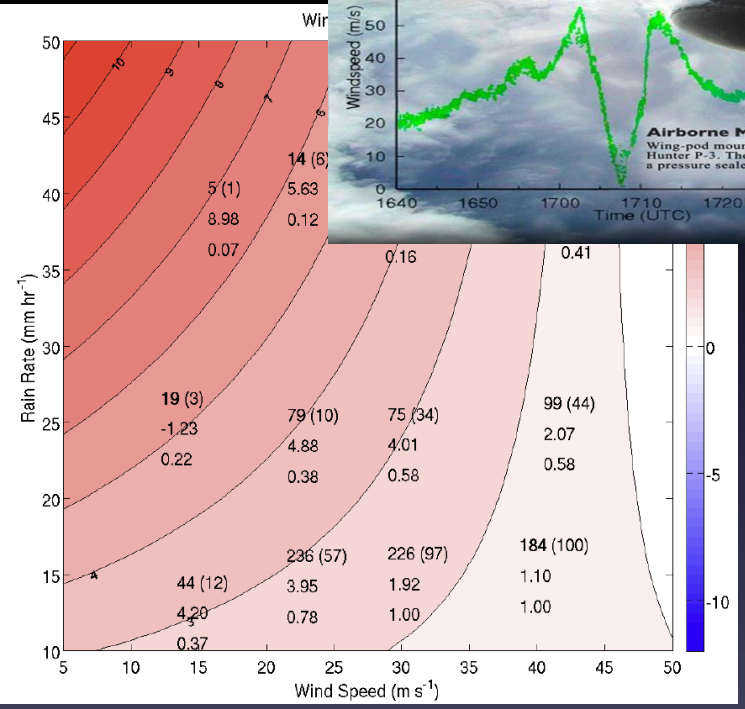
Assimilation of Non-NOAA and Non-AF GPS Dropwindsonde Data into NOAA Numerical Models - Aberson



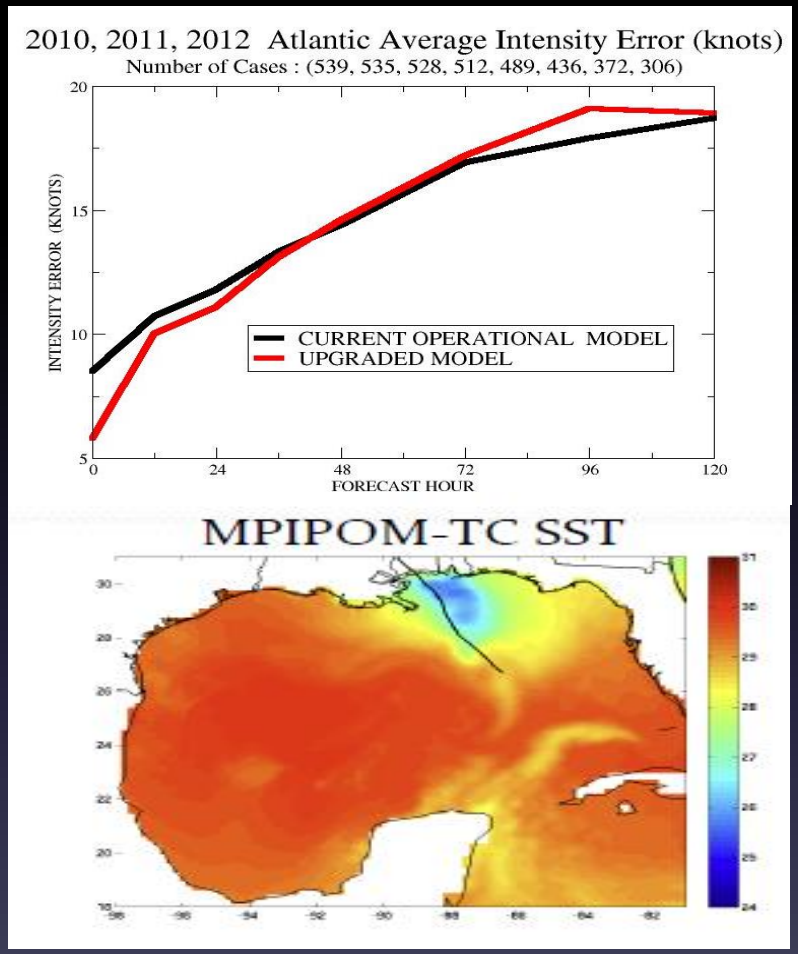
Improvements in Statistical Tropical Cyclone Forecast Models - DeMaria

Projects Accepted for Operational Implementation - 6th round





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

7th 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.

7th 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

7th 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

7th 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

7th 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

8th 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

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.