THE JOINT HURRICANE TESTBED

Shirley Murillo – NOAA/OAR/AOML/Hurricane Research Division
Chris Landsea – NOAA/NWS/NCEP/National Hurricane Center

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

5th NOAA Testbed and Proving Ground Workshop
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
JHT: The Process

- Call for Proposals – drafted and disseminated (bi-annually)
  - Includes NHC, EMC, CPHC and JTWC’s area of priorities
- Principal Investigators apply for funding through NOAA
- 7 member Steering Committee rate all proposals
  - Members represent the TC community
- 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
  • 46 accepted for operational implementation
  • 7 projects completed but rejected
  • 9 projects completed, deferred pending further investigation at EMC
  • 12 projects with decisions soon forthcoming
  • 7 projects started in Fall 2013

• Implementation
  • 41 projects implemented:
    • 11 numerical modeling projects implemented by EMC/NCO
    • 30 projects implemented by NHC
    • 3 projects accepted but not yet fully implemented by NHC
    • 2 projects unable to be implemented after acceptance
Wind Speed Probabilities
Hurricane Bill 20 Aug 2009 00 UTC

1000 Track Realizations
34 kt 0-120 h Cumulative Prob.
Wind Speed Probabilities

ECSC KIAP/FSAT ALL
TTAAG0 KMNC DHHMM
HURRICANE WILMA PROBABILITIES NUMBER 10
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
08Z02 THU OCT 10 2005

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

AT MIAMI THE CENTER OF HURRICANE
WILMA WAS LOCATED NEAR LATITUDE 16.3 NORTH
LONGITUDE 05.0 WEST WITH
MAXIMUM SUSTAINED WINDS NEAR 110 KTS...150 MPH...240 KM/HR.

CHANCES OF EXPERIENCING WIND SPEEDS OF AT LEAST
...34 KT (39 MPH...60 KPH)
...50 KT (56 MPH...90 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 OCCURRING 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 UNIVSAL COORDINATED TIME (GREENWICH)

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

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>00Z</th>
<th>02Z</th>
<th>04Z</th>
<th>06Z</th>
<th>08Z</th>
<th>10Z</th>
<th>12Z</th>
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<tbody>
<tr>
<td>MIAMI FL</td>
<td>34</td>
<td>X</td>
<td>X</td>
<td>2</td>
<td>16</td>
<td>23</td>
<td>5</td>
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<tr>
<td>MIAMI FL</td>
<td>50</td>
<td>X</td>
<td>X</td>
<td>6</td>
<td>11</td>
<td>3</td>
<td>2</td>
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<tr>
<td>MIAMI FL</td>
<td>64</td>
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<td>X</td>
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<td>5</td>
<td>1</td>
<td>8</td>
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<tr>
<td>KEY WEST FL</td>
<td>34</td>
<td>X</td>
<td>X</td>
<td>7</td>
<td>16</td>
<td>10</td>
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<tr>
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<td>X</td>
<td>14</td>
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<td>7</td>
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<tr>
<td>KEY WEST FL</td>
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<td>X</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td>4</td>
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<tr>
<td>MARCO ISLAND</td>
<td>34</td>
<td>X</td>
<td>X</td>
<td>5</td>
<td>20</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>MARCO ISLAND</td>
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<td>X</td>
<td>10</td>
<td>12</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>MARCO ISLAND</td>
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<td>X</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Probability of 1-minute average 50-knot (58 mph) or greater surface winds from all tropical cyclones
Finder_HURRICANE KE center location at 8 AM EDT Mon Sep 9 2008 (Forecast/Advisory 350)

Probability of 1-minute average 74-knot (85 mph) or greater surface winds from all tropical cyclones
Finder_HURRICANE KE center location at 8 AM EDT Mon Sep 9 2008 (Forecast/Advisory 350)
2013-2014 Major JHT Activities - 6th round

- **June - November 2013**
  - Final season to test of projects

- **December 2013 – February 2014**
  - Final reports provided by PIs
  - Feedback obtained by points-of-contact
  - Implementation evaluation and decision

- **March-June 2014**
  - Implementation of accepted projects at NHC and EMC
Project Highlights - 6th round

Surface winds: Knaff

Rapid Intensity Forecasting: Jiang

Hurricane model upgrades: Bender

Radar-based central pressure: Lee/Bell
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
2012-2014 JHT activities - 7th Round

- August 2012
  - Announcement of Funding Opportunity released

- October 2012
  - 36 Letters of Intent reviewed

- December 2012-January 2013
  - 22 Full proposals reviewed

- February-April 2013
  - Rank and select proposals for funding - 7
  - Point-of-contacts established among NHC/EMC staff
  - Work with PIs to setup timelines for their projects

- August - November 2013
  - Begin real-time testing during hurricane season

- December 2013- March 2014
  - PI refine their projects and interact with points-of-contact
  - Present progress at Interdepartmental Hurricane Conf.
## New JHT Projects 2013-2015: 7th round

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principal Investigator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Visualization Application for Distributed ADCIRC-based Coastal Storm Surge, Inundation, and Wave Modeling</td>
<td>Brian Blanton and Rick Luettich (Univ. of North Carolina)</td>
</tr>
<tr>
<td>Improving the GFDL/GFDN Operational Tropical Cyclone Models at NOAA/NCEP and Navy/FNMOC</td>
<td>Isaac Ginis (Univ. of Rhode Island) and Morris Bender (NOAA/GFDL)</td>
</tr>
<tr>
<td>A Probabilistic TC Genesis Forecast Tool Utilizing an Ensemble of Global Models</td>
<td>Bob Hart and Henry Fuelberg (Florida State Univ.)</td>
</tr>
<tr>
<td>Improvement to the Satellite-based 37 GHz Ring Rapid Intensification Index</td>
<td>Haiyan Jiang (Florida Intl Univ.)</td>
</tr>
<tr>
<td>Guidance on Intensity Guidance</td>
<td>Dave Nolan (U of Miami/RSMAS) and Andrea Schumacher (CSU/CIRA)</td>
</tr>
<tr>
<td>Upgrades to the Operational Monte Carlo Wind Speed Probability Program</td>
<td>Andrea Schumacher (CSU/CIRA)</td>
</tr>
<tr>
<td>Integration of an Objective, Automated TC Center-fixing Algorithm Based on Multispectral Satellite Imagery into NHC/TAFB Operations</td>
<td>Tony Wimmers and Chris Velden (Univ. of Wisc./CIMSS)</td>
</tr>
</tbody>
</table>
The Joint Hurricane Testbed

www.nhc.noaa.gov/jht

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, Jian-Gwo Jing, 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 benefiting forecast operations.
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