Improving Forecast Guidance through the Joint Hurricane Testbed

Mark DeMaria – NOAA/NWS/NCEP/National Hurricane Center
Jason Sippel – NOAA/OAR/AOML Hurricane Research Division

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

73rd Interdepartmental Hurricane Conference
Joint Hurricane Testbed (JHT)

• Bridges hurricane research & operations

• Began in 2001 under the USWRP
  • Currently in 9th round of projects

• Our Mission: successfully transfer new technology, research results & observational advances from research groups to operational centers

• Testing is done at the National Hurricane Center, Central Pacific
  Hurricane Center or at their institutions
Our process

• Call for Proposals – drafted and disseminated (bi-annually)
  • Current call is for three years in conjunction with HWT, HMT
• Principal Investigators apply for funding through NOAA
• Seven member Steering Committee rates all proposals
• Funded projects are tested during 1 to 3* hurricane seasons in conjunction with NHC points of contact
• At the project’s end, each is evaluated by NHC and JHT staff
• Implementation of successful projects is then carried out by NHC staff/PIs
Metrics for Operational Implementation

• **Forecast or Analysis Benefit**: expected improvement operational forecast and/or analysis accuracy

• **Efficiency**: adherence to forecaster time constraints and ease of user’s needs

• **Compatibility**: IT compatibility with operational hardware, software, data, communication, etc.

• **Sustainability**: availability of resources to operate, upgrade, and/or provide support
Administrative Changes

• JHT Director (Chris Landsea) became NHC Tropical Analysis and Forecast Branch Chief May 2018
  • Mark DeMaria (NHC Technology and Science Branch Chief) acting JHT Director
  • Jason Sippel taking on larger role
  • New NHC Science and Operations Office (SOO) by 2019 Hurricane Season

• Latest JHT announcement of opportunity
  • Combined with HWT and HMT
  • LOIs received Nov 2018
  • Full proposals under evaluation by steering committee
  • Project period extended to 3 years
JHT: By the numbers

- 81 projects supported in rounds 1-7 (FY01-FY15)
  - 54 Accepted for operational implementation
  - 23 not accepted
  - 4 deferred
- 8 projects in round 8 (FY15-17)
  - 1 completed, accepted
  - 7 requested no-cost extensions, evaluation in progress
- 6 projects in round 9 (FY17-19)
- RFP out for round 10 (FY19-21)
Round 1-7 Accepted/Deferred Projects

- Numerical Models
- Statistical Models
- Wind/Track Forecast Probabilities
- Satellite Wind Estimation
- Wave Observations
- TC Rainfall
- ATCF Enhancements
- Observation Targeting
- Aircraft Observation Processing
### New JHT Projects - FY17-19: 9th round

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principal Investigator(s)</th>
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<tr>
<td>Improvements to Operational Statistical Tropical Cyclone Intensity Forecast Models Using Wind Structure and Eye Predictors</td>
<td>Galina Chirokova (CSU/CIRA), John Kaplan (AOML/HRD)</td>
</tr>
<tr>
<td>Ensemble-based Pre-genesis Watches and Warnings for Atlantic and North Pacific Tropical Cyclones</td>
<td>Russ Elsberry (UC-CS)</td>
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<tr>
<td>Improvements and Extensions to an Existing Probabilistic TC Genesis Forecast Tool Using and Ensemble of Global Models</td>
<td>Bob Hart (FSU), Dan Halperin (Embry-Riddle)</td>
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<td>Estimation of Tropical Cyclone Intensity Using Satellite Passive Microwave Observations</td>
<td>Haiyan Jiang (Florida Intl Univ.)</td>
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<td>Transition of Machine-Learning Based Rapid Intensification Forecasts to Operations</td>
<td>Andrew Mercer and Kimberly Wood (MSU)</td>
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<tr>
<td>Evolutionary Programming for Probabilistic Tropical Cyclone Intensity Forecast</td>
<td>Paul Roebber and Clark Evans (UW-Milwaukee)</td>
</tr>
</tbody>
</table>
New JHT Project Highlights

FV3 vs. GFS
TC Genesis
probability: Hart/Halperin

Estimating TC intensity with PMW obs: Zhang

Improving RI fcst with machine learning: Mercer

Improving SHIPS forecasts with eye detection: Chirokova
Lessoned Learned for Successful R2O

• Early coordination with project PIs
  • Describe NHC’s operational computer environment
  • NHC forecast cycle and time constraints

• Real-time demonstrations enlightening

• Two categories of successful projects
  1. Major new capabilities
     • Examples: 2003 TC Rapid Intensification Index
                   2007 Windspeed probability model
                   2015 Hart/Halperin TC genesis probabilities

  2. Used compatible software or tested in parallel operational IT environment
     • Examples: 2007 Add GOES and ocean heat content predictors to statistical models
                   2013 Extended-range baseline track/intensity models
                   2017 NRL TC satellite product web page enhancements
Status of Round 1-7 Projects

By Round

Total Rounds 1-7
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