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

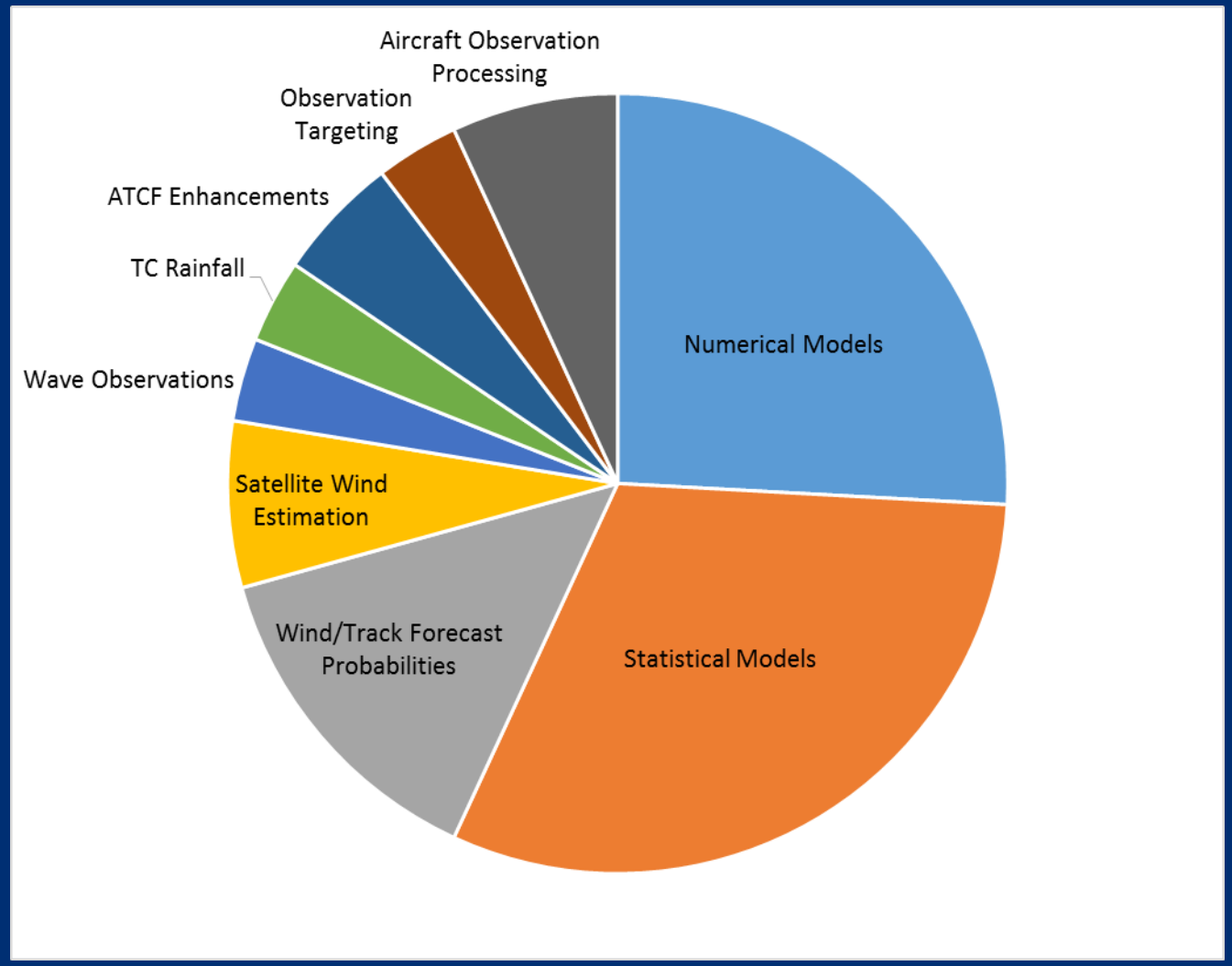
Administrative Changes

- 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)

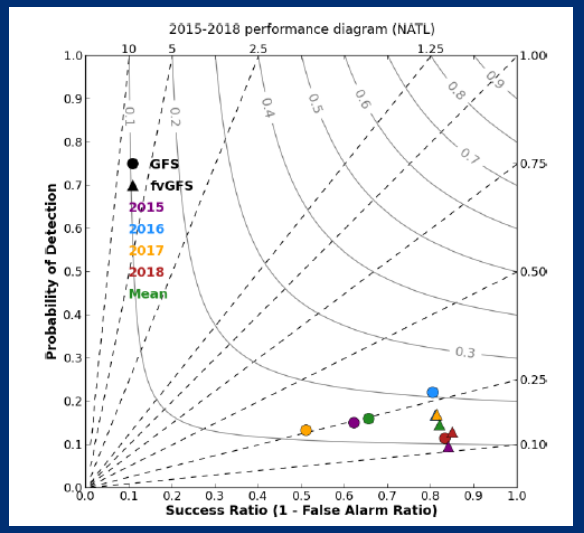
Round 1-7 Accepted/Deferred Projects



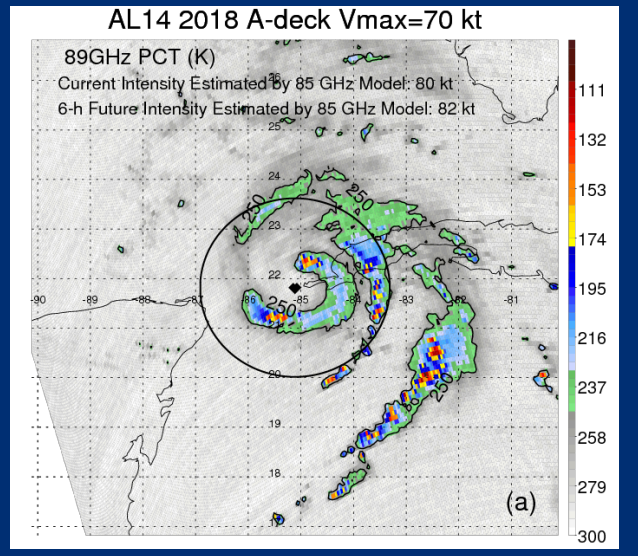
New JHT Projects - FY17-19: 9th round

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

New JHT Project Highlights

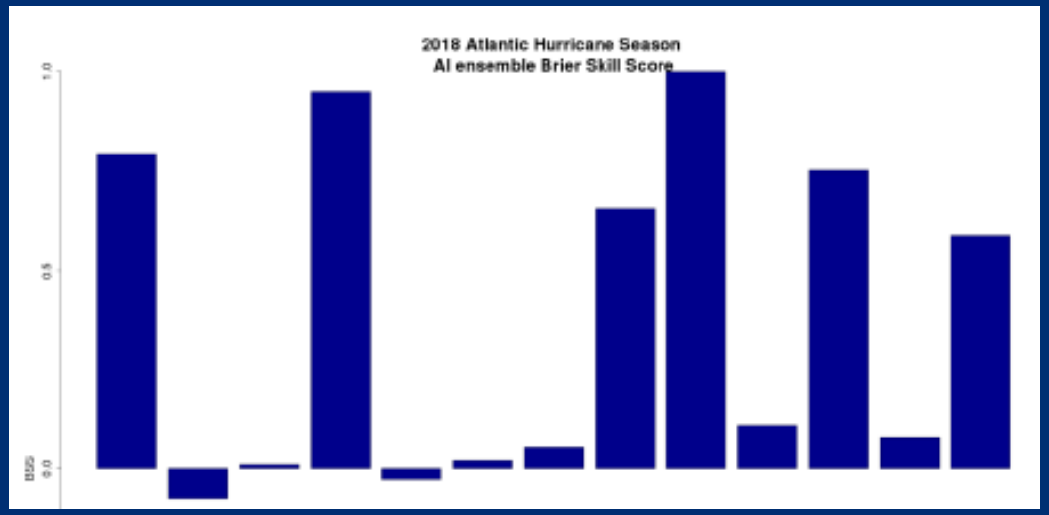


FV3 vs. GFS TC Genesis probability: Hart/Halperin

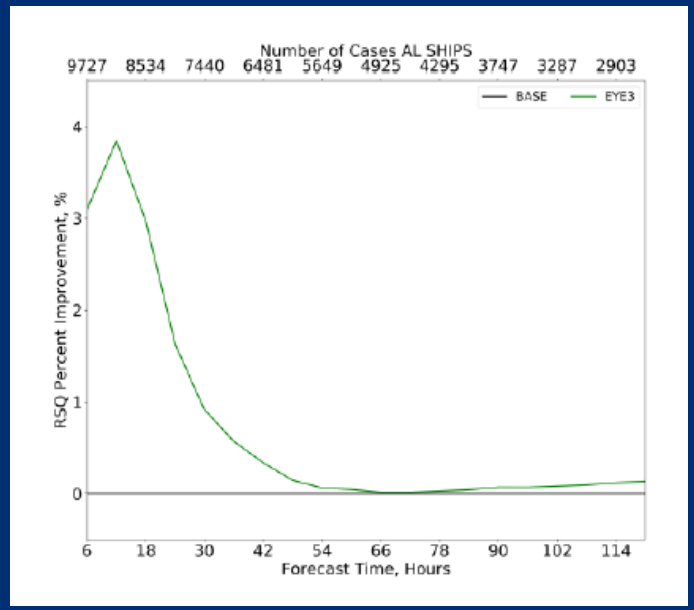


Estimating TC intensity with PMW obs: Zhang

Improving RI fcst with machine learning: Mercer



Improving SHIPS forecasts with eye detection: Chirokova

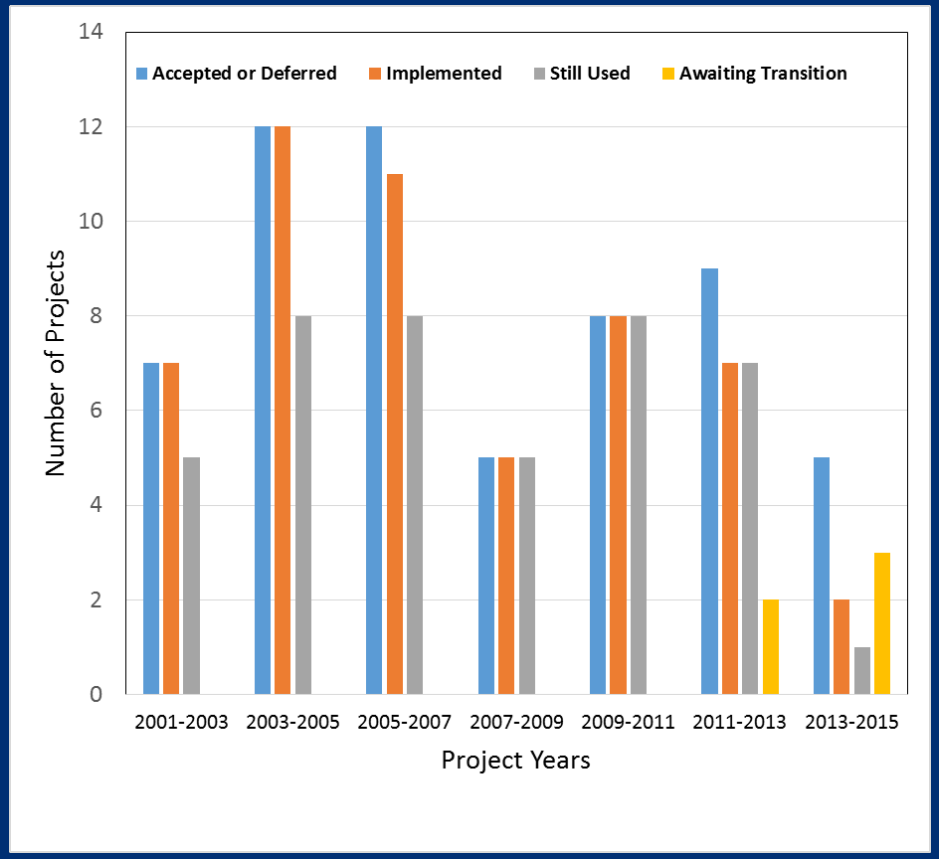


Lessoned Learned for Successful R2O

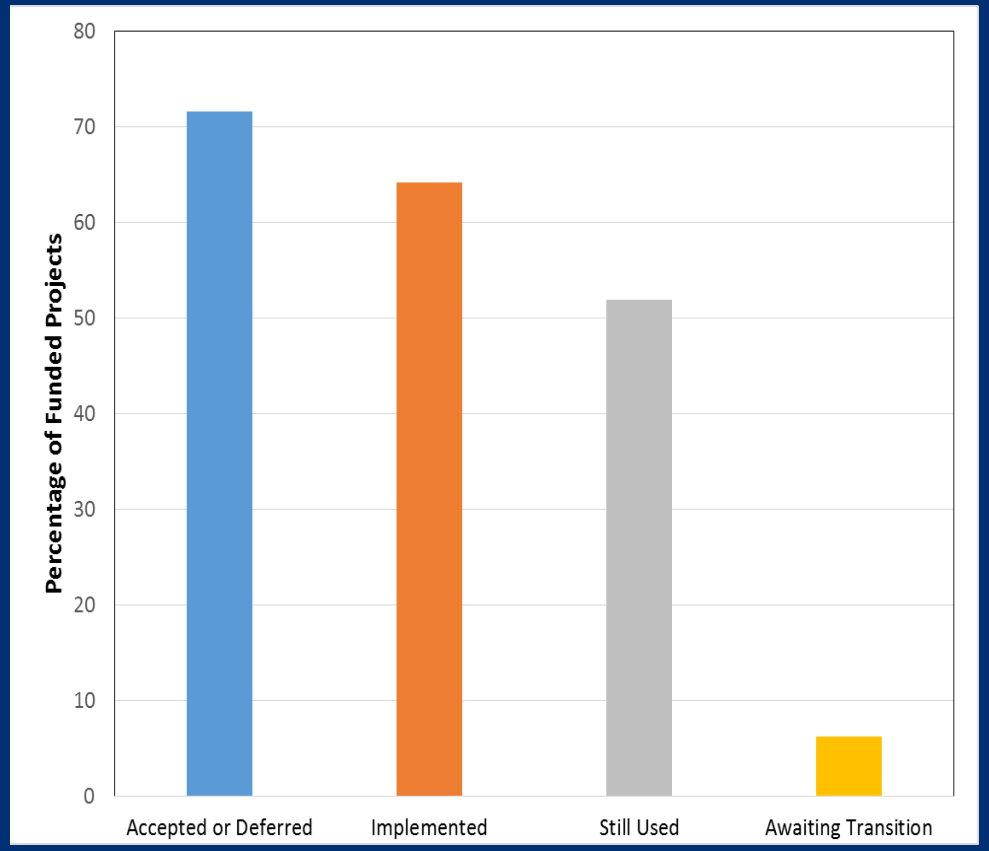
- Early coordination with project PIs
  - Describe NHC's operational computer environment
  - NHC forecast cycle and time constraints
- Real-time demonstrations enlightening
- Two categories of successful projects
  1. Major new capabilities
     - *Examples: 2003 TC Rapid Intensification Index*
       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



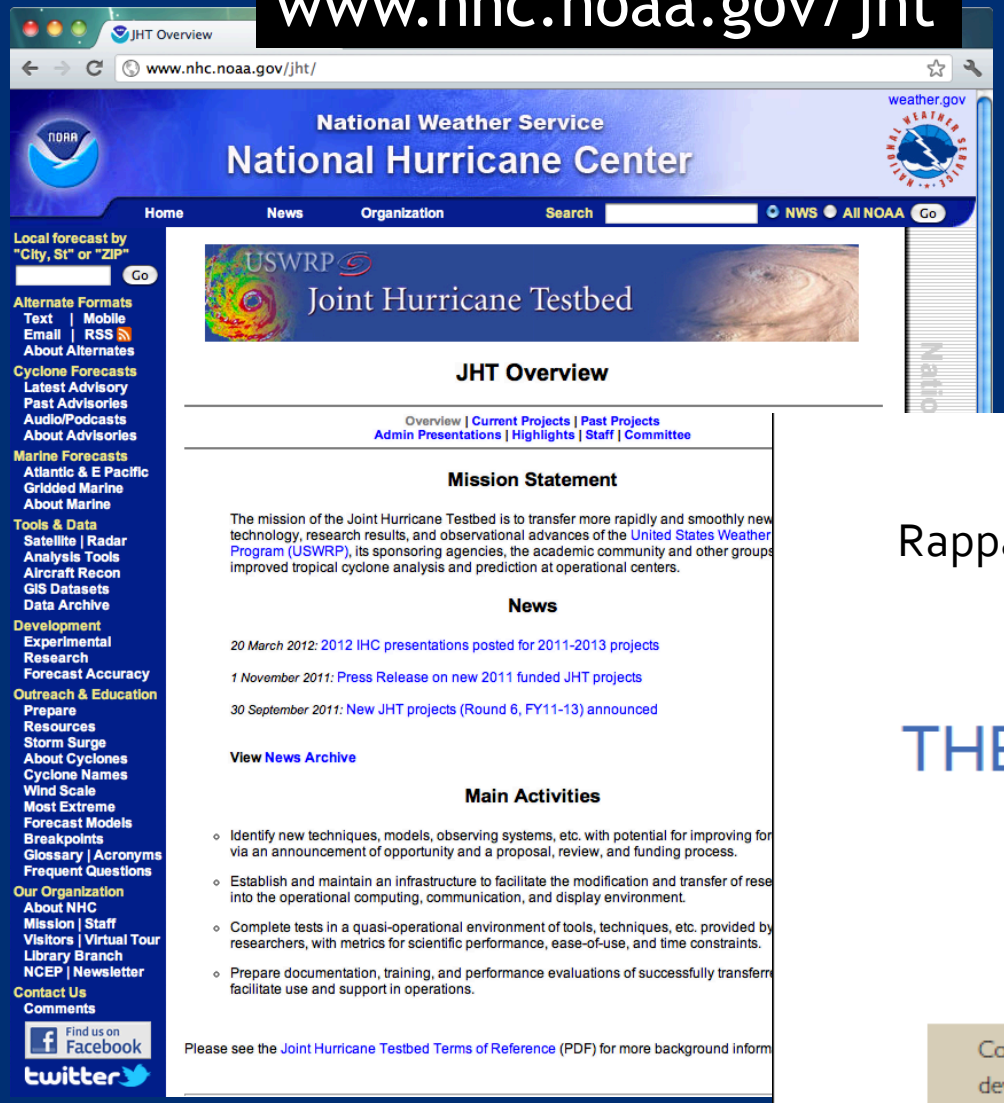
By Round



Total Rounds 1-7

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, 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.

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