Testbeds Help Connect Research to NWS Forecast Operations

• **Testbeds can help, particularly with**
  – Creating partnerships at the forecaster/researcher level
  – incremental improvements in existing forecast tools and
  – field testing high-risk/high-reward options

• **Testbeds have taken different forms depending on the forecast problem and state of the science/technology, e.g.,**
  – Hurricane prediction is very centralized, while severe weather warnings are local
  – QPE depends on advancing observing systems, while HWRF is a key for hurricanes
Testbeds Partly Supported by NOAA-USWRP and W&W/ST&I

<table>
<thead>
<tr>
<th>Testbed</th>
<th>Leading OAR Lab</th>
<th>Partner Labs</th>
<th>Leading NWS recipient</th>
<th>Key applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Hurricane Testbed (JHT)</td>
<td>AOML/Hurricane Research Div.</td>
<td>PSD, GSD</td>
<td>National Hurricane Center</td>
<td>Track Intensity</td>
</tr>
<tr>
<td>Hydrometeorological Testbed (HMT)</td>
<td>ESRL/Physical Sciences Div.</td>
<td>GSD, NSSL</td>
<td>OHD, RFCs, NCEP/HPC</td>
<td>QPF, QPE, Snow level, Flooding</td>
</tr>
<tr>
<td>Developmental Testbed Center (DTC)</td>
<td>ESRL/Global Systems Div.</td>
<td>NCAR</td>
<td>NCEP/Environmental Modeling Center</td>
<td>Mesoscale modeling</td>
</tr>
</tbody>
</table>

Note that the **Joint Center for Satellite Data Assimilation (JCSDA)** and **THORPEX** both developed partly from USWRP-sponsored seed efforts and are now running independently.
<table>
<thead>
<tr>
<th>Capability</th>
<th>Leading Organization</th>
<th>Key Partners</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal Impacts Program (SIP)</td>
<td>NCAR</td>
<td>NSF</td>
<td>Studies use and value of weather predictions</td>
</tr>
<tr>
<td>CSTAR</td>
<td>NOAA/NWS</td>
<td>WFOs</td>
<td>Grants to Universities to work with WFOs</td>
</tr>
</tbody>
</table>
Today’s predictive services exist on a foundation of earlier innovation in science and technology.

- **Service GPRA (e.g., QPF)**
- **Demonstration GPRAs in Testbeds**
- **“Infusion” Performance Measures**
  - **“Science” Performance Measures**
  - **“Technology” Performance Measures**

Performance measures for “service” programs (e.g., LFW)
Performance measures for ST&I (an enabling program)
HMT has worked with forecast users to identify critical needs for extreme event prediction.

Prototype QPF performance measures for extreme precipitation events are being developed and baselines are being created by HMT:
- Probability of Detecting (Forecasting) a >3 inch event
- Bias of QPF in events with >3 inches rain observed

Of 62 events with >3 inches in 24 hours, the QPF bias was low:
- 0.71 (1-day lead)
- 0.61 (2-day lead)
- 0.51 (3-day lead)

Of 16 events with >5 inches of rain in 24 h, 2 were predicted 1 day ahead.
Tuesday, April 28

9:15

**Overview of Testbeds**

- The Developmental Testbed Center: Past, Present & the Future – Steve Koch (ESRL)
- Societal Impacts Program – Rebecca Morss (NCAR)
- An Overview of the Hydrometeorology Testbed – Tim Schneider (ESRL)
- Overview of the CSTAR Program – Sam Contorno (NOAA)
- Joint Hurricane Testbed – Jiann-Gwo Jiing (NWS)

12:45

**Testbed Roundup 1 – Hydrometeorology Testbed & CSTAR**

- ALPS Workstation Development for HMT and Other Workstation Testbed Activities in GSD – Woody Roberts (ESRL)
- A Wind Profiler and GPS-Based Water Vapor Flux Tool for Precipitation Forecasting in Coastal Mountains – Paul Neiman (ESRL)
- Evaluation and Comparison of Microphysical Algorithms in WRF-ARW Model Simulations of Atmospheric River Events Affecting the California Coast – Isidora Jankov (ESRL)
- CSTAR Activities at the University of Utah: Estimating Optimal Distributions of Surface Observing Stations for Existing Networks & Testbeds – John Horel (University of Utah)
- High-Resolution Global Precipitation Analyses Based on Multiple Satellite Observations and In Situ Measurements – Pingping Xie (NCEP)

2:15

**Testbed Roundup 1 – HMT & CSTAR (cont.)**

- Developing a Performance Measure for Snow-Level Forecasts – Allen White (ESRL)
- Status and Plans for the Hydrometeorological Testbed at the Hydrometeorological Prediction Center – Edwin Danaher (NWS)
- A Review of Recent U Albany CSTAR Research on Warm-Season Precipitation Systems Including Predecessor Rain Events Ahead of Tropical Cyclones – Tom Galameau (SUNY)

3:00

**Testbed Roundup 2 – Developmental Testbed Center**

- Verification at the DTC – Tressa Fowler (NCAR)
- Hurricane WRF at the DTC – Shaowu Bao (ESRL)
- The HFIP High-Resolution Hurricane Test – Ligia Bernardet (ESRL)

3:45

**Testbed Collaborations** – Joint Efforts between the DTC and the HMT – Barb Brown (NCAR)
Wednesday, April 29

8:30  **Connections to other NOAA Programs, Projects & Activities that Involve R2O**
Research to Operations in the Joint Center for Satellite Data Assimilation – *Steve Goodman (NOAA/NASA)*

   THORPEX – *John Gaynor (NOAA)*

   SPoRT – An End-to-End R2O Activity – *Gary Jedlovec (NASA)*

   The Hazardous Weather Testbed – *Jack Kain (NSSL)*

   The GOES-R Proving Ground – *Steve Goodman (NOAA/NASA)*

10:30  **Testbed Roundup 3 – Joint Hurricane Testbed**

   Evaluation and Improvement of Ocean Model Performance for Coupled Hurricane Forecast Models – *George Halliwell (NOAA)*

   URI contribution towards improving the GFDL and HWRF operational hurricane models under JHT funding and future plans – *Richard Yablonsky (University of Rhode Island)*

   Impact of Sea Spray on the Balance of Turbulent Kinetic Energy in the Hurricane Surface Boundary Layer – *Jian-Wen Bao (ESRL)*

   Pacific Ocean Tropical Synoptic Regimes and their Effect and Importance on the Globe – *Bill Ward (NWS)*

12:45  **Testbed Roundup 4 – Societal Impacts Program**

   The U.S. public's perceptions of weather forecasts and forecast uncertainty: Results from a survey – *Rebecca Morss (NCAR)*

   Socio-Economic Research on Hurricane Forecasts and Warnings: A Discussion of Results and Research Plans – *Jeff Lazo (NCAR)*

1:15  **Group Discussion** – moderator, *John Gaynor*

2:15  **Testbed Breakout Sessions**

3:30  **Team Report-outs, Group Discussion & Workshop Wrap-up** – *Marty Ralph*