NOAA Hydrometeorological Testbed at the Hydrometeorological Prediction Center

FY2012 Accomplishments

Goals

The goal of the Hydrometeorological Testbed at the Hydrometeorological Prediction Center (HMT-HPC) is to accelerate the assessment and implementation of new technology, research results, and other scientific advancements from the research and development communities to enhance HPC products and services.

Experimental Forecast Activities

HMT-HPC Winter Weather Experiment

The second annual HMT-HPC Winter Weather Experiment was held at HPC January 9 – February 10, 2012. This year's experiment focused on using ensemble systems to help quantify and communicate uncertainty in winter weather forecasts. During the five week experiment, 21 forecasters, researchers, and model developers from HPC, EMC, WFOs, other NCEP centers, NOAA research labs, the academic community, and private industry issued experimental probabilistic forecasts of exceeding 2 in, 4 in, and 8 in of snow over a 24 hr period. In addition to the experimental forecasts, participants subjectively evaluated the experimental ensemble guidance, explored potential model diagnostics issues, rated their overall forecast confidence, and participated in mock societal impacts briefings. Organizing the experiment required significant development work in order acquire the experimental ensemble data and display winter weather parameters for use during both the forecast and verification portions of the experiment.

Atmospheric River Retrospective Forecasting Experiment

HMT-HPC partnered with the Earth Systems Research Laboratory (ESRL) to conduct the first Atmospheric River Retrospective Forecasting Experiment (ARRFEX) from September 17 – 28, 2012. Hosted by HPC, the experiment brought together 17 forecasters, model developers and researchers from HPC, ESRL, EMC, RFCs, and WFOs to participate in experimental forecasting exercises for 8 archived west-coast atmospheric river (AR) events. In pseudo-real time, the forecast teams issued experimental probabilistic forecasts of exceeding 3 in of precipitation in 24 hours (3 and 5 day lead times), deterministic 72 hr total precipitation (days 1-3), and an AR duration (start/stop) forecast for a specific point location. The participants then subjectively evaluated the experimental guidance, including the ESRL 2nd generation reforecast dataset and the HMT ensemble, rated their experimental forecasts, and evaluated the utility of using various known AR-forcing mechanisms to improve extreme precipitation forecasts. The project represented a large collaboration between HPC and ESRL in terms of developing, acquiring, and displaying the experimental datasets for use in the forecast and verification process.

Research to Operations Projects

Wave Packet Tool

HMT-HPC continued to work with CSTAR partner Stony Brook University to implement a Rossby wave packet tool at HPC. This tool is available to HPC forecasters in real time through NAWIPS for both the GFS and ECMWF forecasts and is being used by medium range forecasters to help identify potential extreme weather events and erroneous flow regimes in the models.

Building off of the results of the CSTAR collaboration with Stony Brook University, an additional diagnostic was introduced to identify Rossby wave trains initiated by recurving tropical cyclones in the western Pacific. This tool is a research-to-operations test of preliminary results based on work by Heather Archambault of the Naval Postgraduate School and depicts areas of negative

potential vorticity advection at 200 hPa by the non-rotational component of the 200 hPa wind in the vicinity of tropical cyclones moving into the mid-latitudes. More information is available at https://ams.confex.com/ams/30Hurricane/webprogram/Paper206180.html.

Prototype MetWatch Desk

In response to numerous requests, HPC prototyped a 24 hr "meteorological watch" function from May 16 – September 14, 2012. The MetWatch Desk was responsible for issuing short-term event-driven Mesoscale Precipitation Discussions (MPDs) highlighting regions in which the environment was becoming favorable for flash flooding. In support of the prototype, the HMT-HPC worked with others in HPC to develop initial product guidelines and issuance criteria, identify potentially useful training modules focused on flash flooding and mesoscale precipitation forecasting, and gather feedback from WFOs and RFCs. In addition, HMT-HPC developed an orientation presentation that was used to introduce each forecaster to the mechanics of the desk at the start of their first shift and then continued to provide support throughout the summer. As the prototype progressed, HMT-HPC also developed a subjective verification methodology for the MPDs to allow forecasters to track their performance.

MET/MODE Tool

HMT-HPC continues to investigate the MET/MODE tool for object-oriented verification. Model availability was expanded to include the UKMET, ENSBC (an internal pseudo-bias corrected ensemble), NAM nest (NAMCN), and the two eastern high resolution windows (EAST_ARW and EAST_NMM), and verification was extended out to Day 3. In addition to expanding the available verification, statistical output from the MODE tool is now being saved for future use on the website as well as for the creation of monthly, seasonal, and annual summaries.

HPC also collaborated with researchers from Colorado State University (formerly Texas A&M University) on a COMET Partners project that used the MODE tool to investigate whether models have a consistent displacement bias in the predicted location of mesoscale convective systems.

Snowfall Spaghetti Plots

In support of the HPC Winter Weather Desk, HMT-HPC is developing spaghetti plots from the SREF and GEFS ensemble systems that display the predicted snowfall from each ensemble member. This new product will display the area that each ensemble member forecasts greater than 2", 4", 8" and 12" of snow to fall over a given 24 hour period. The product was requested by HPC Winter Weather Desk forecasters, and represents part of HMT-HPC's continued exploration of new ways to gather and display useful information about model spread and uncertainty from ensemble systems. The snowfall spaghetti plots will also be available for forecasters to use and evaluate during the upcoming 2013 Winter Weather Experiment.

Other Activities

Building move

In August 2012, HPC moved from the World Weather Building (WWB) in Camp Springs, MD to the new NOAA Center for Weather and Climate Prediction (NCWCP) in College Park, MD. In preparation for the move, HMT-HPC staff completed numerous software and script transitions to accommodate the new local web and compute farm platforms at NCWCP, participated in the packing and unpacking of workspaces, and set up a new collaboration room in the new building. The new collaboration room was used a few weeks after the move to host the inaugural Atmospheric River Retrospective Forecasting Experiment.

Workshops, Meetings, and Papers

National Weather Association Annual Meeting—Dave Novak attended the National Weather Association Annual Meeting October 15 – 20, 2011 in Birmingham, AL to present results from both the 2011 HMT-HPC Winter Weather Experiment and the QPF component of the 2011 Hazardous Weather Testbed Spring Experiment.

AMS Annual Meeting—Dave Novak attended the AMS Annual Meeting January 22 – 26, 2012 in New Orleans, LA to provide and overview of some of the HMT-HPC's activities and some of the challenges faced by the testbed.

ESRL Coordination Meeting— Tom Workoff attended the ESRL Coordination Meeting March 20 – 22, 2012 in Boulder, CO. The meeting allowed members of ESRL and HMT-HPC to come together and develop an operational plan for the Atmospheric River Retrospective Forecasting Experiment (ARRFEX) as well as to discuss other ongoing projects such as the ESRL 2nd generation reforecast dataset and the newly formed HMT-Southeast.

3rd NOAA Testbed and Proving Ground Workshop—Faye Barthold, Dave Novak, and Tom Workoff attended the NOAA Testbed and Proving Ground Workshop May 1 – 3, 2012 in Boulder, CO. Faye Barthold presented the results and highlighted the operational impacts of HPC's participation in the QPF component of the 2011 Hazardous Weather Testbed's Spring Experiment while Tom Workoff presented plans for the Atmospheric River Retrospective Forecasting Experiment (ARRFEX). In addition to the workshop, the group also met with HMT scientists from ESRL/PSD to discuss progress on ARRFEX, HMT-Southeast, and other ongoing projects.

AMS Conference on Numerical Weather Prediction/Weather Analysis and Forecasting—Faye Barthold attended the AMS Weather Analysis and Forecasting Conference May 29 – June 1, 2012 in Montreal, Quebec, Canada to present the results of the 2012 HMT-HPC Winter Weather Experiment.

National Weather Association Digest paper published—Mike Bodner was the lead author on a paper published in the December 2011 issue of the National Weather Association Digest. The

paper compares the atmospheric conditions associated with the 1993 and 2008 Midwest floods.

Bodner, M.J., N.W. Junker, R.H. Grumm, R.S. Schumacher, 2011: Comparison of the 2008 Midwest floods to the historic 1993 floods: Atmospheric circulation and processes. *Natl. Wea. Dig.*, **35**(2), 103-119.

Bulletin of the American Meteorological Society paper published—Dave Novak, Faye Barthold, and Mike Bodner were coauthors on a paper summarizing the 2010 HWT Spring Experiment in the January 2012 issue of the Bulletin of the American Meteorological Society.

Clark, A.J., S.J. Weiss, J.S. Kain, I.L. Jirak, M. Coniglio, C.J. Melick, C. Siewert, R.A. Sobash, P.T. Marsh, A.R. Dean, M. Xue, F. Kong, K.W. Thomas, Y. Wang, K. Brewster, J. Gao, X. Wang, J. Du, D.R. Novak, F.E. Barthold, M.J. Bodner, J.J. Levit, C.B. Entwistle, T.L. Jensen, and J. Correia, Jr., 2012: An overview of the 2010 Hazardous Weather Testbed Experimental Forecast Program Spring Experiment. *Bull Amer. Meteor. Soc*., **93**, 55-74.

Monthly Weather Review paper published—Faye Barthold was a coauthor on a paper examining the role of atmospheric rivers and mesoscale convective systems in the May 2010 Nashville, TN floods that was published in the February 2012 issue of Monthly Weather Review.

Moore, B.J., P.J. Neiman, F.M. Ralph, F.E. Barthold, 2012: Physical processes associated with heavy flooding rainfall in Nashville, TN and vicinity during 1-2 May 2010: The role of an atmospheric river and mesoscale convective systems. *Mon. Wea. Rev*., **140**, 358-378.

National Weather Association Newsletter article published—Dave Novak, Faye Barthold, and Mike Bodner were coauthors on an article in the July 2012 issue of the National Weather Association Newsletter highlighting the QPF component of the 2011 Hazardous Weather Testbed Spring Experiment.

Novak, D., F. Barthold, R. Oravec, B. Sullivan, A. Orrison, M. Bodner, S. Weiss, A. Dean, I. Jirak, C. Melick, J. Kain, A. Clark, F. Kong, M. Xue, P. Marsh, K. Thomas, K. Brewster, 2012: The quantitative precipitation forecasting component of the 2011 NOAA Hazardous Weather Testbed Spring Experiment. *Natl. Wea. Assn. News.*, **12**(7), 6-7.

Training and Professional Development for HMT Staff

GOES-R Training—Faye Barthold, Mike Bodner, and Tom Workoff participated in training sessions for new GOES-R products.

Dual-Pol Webinars—Faye Barthold, Mike Bodner, and Tom Workoff attended a number of Dual-Pol demonstration webinars.