NOAA Hydrometeorological Testbed
at the Hydrometeorological Prediction Center

FY2010 Accomplishments

Introduction

The NOAA Hydrometeorological Testbed at the Hydrometeorological Prediction Center (HMT-HPC) was very active in 2010 in evaluating new techniques to improve HPC forecasts. HPC participated in the Hazardous Weather Testbed Spring Experiment and initiated a component at HPC. HPC also began planning a Winter Weather Experiment for January-February 2011. In research-to-operations activities, HMT-HPC made progress in migrating the rime factor tool for snow forecasting into operations, made the NSSL WRF available in NAWIPS in response to good ratings during the Spring Experiment, provided training in identifying and forecasting Predecessor Rainfall Events (PREs) and introduced object-oriented variation to quantitative precipitation forecasters.

Experimental Forecast Activities

HPC Collaboration with Storm Prediction Center (SPC) Hazardous Weather Testbed (HWT) - HPC collaborated with the SPC/HWT to add a QPF component to their annual Spring Experiment (May 17-June 18, 2010) based on QPF from high-resolution models and ensembles. Nearly 70 participants representing over 15 organizations rotated through the QPF component.

In preparation for HPC's participation in the 2010 HWT Spring Experiment, Mike Bodner configured a workstation at the HMT-HPC to be utilized remotely by HPC forecasters. This workstation displayed high-resolution model data run at NSSL. Mike also wrote GEMPAK restore files to project the high-resolution model output in the NAWIPS environment.

HPC staff facilitated the QPF component for each of the five week-long sessions at the SPC. The HPC representative led a team of other participants in issuing experimental forecasts for the probability of precipitation (slight=25%, moderate=50%, high=75%) exceeding 0.50" and 1.0" during the 18-00Z and 00-06Z time periods. These forecasts were based primarily on a variety of high-resolution (4 km or less) convection-allowing models and ensembles and a variety of post-processed ensemble output, with the goal of evaluating the value of high-resolution model data and the feasibility of using such output in an operational forecasting environment. Faye Barthold led the QPF component the week of May 17 and David Novak led the week of June 1. Three HPC forecasters, Bob Oravec, Bruce Sullivan, and Rich Bann also participated, each serving as QPF leaders for a week.

Local HPC Component of the Spring Experiment - In addition to the five-week HWT at the SPC, HPC conducted a two-week parallel experiment at the HMT-HPC (June 7-18) focused solely on QPF. Between June 7 and 18, four HPC forecasters and one modeler from EMC participated in the HPC QPF experiment. The purpose of the experiment was to explore the use of high-resolution convection-allowing model guidance for QPF forecasting, evaluate the new model output, and identify some of the challenges associated with using this guidance in an operational environment. This experiment was modeled after the HWT's Spring Experiment, with forecasters producing experimental deterministic QPFs for three 6-hour periods. After the forecasts were completed, model performance from the previous day was evaluated, and participants looked at object-oriented verification from the MODE tool.

As part of the experiment, MODE was configured to evaluate the previous day's forecast. These data were viewed as part of the model verification portion of the experiment and served as an introduction to the idea of object-oriented verification.

Results from the subjective model evaluations conducted as part of the QPF experiment indicate the CAPS ensemble, NSSL WRF-ARW, and the EMC NMMB ("new NAM") largely tended to improve on the operational SREF/NAM forecast, while the MDL HRMOS was of limited utility. Feedback from the experiment was very enthusiastic; with forecasters indicating they enjoyed the opportunity to look at new model data and that they would be interested in participating in a similar experiment in the future. Reactions to MODE output during the local experiment were mixed, although most participants thought it generally identified and matched forecast and observed objects correctly.

Planning for HPC Winter Weather Experiment - At the suggestion of HPC forecasters, a winter experiment at HPC was proposed for the winter of 2010-11. Planning began in September 2010 and a Winter Weather Experiment plan was submitted to HPC management and approved. The experiment ran from Jan 10 – Feb 11, 2011.

Research-to-Operations Projects

High-resolution Guidance - The NSSL WRF was identified as the top-performing deterministic run during the QPF experiments. HPC worked with NCEP Central Operations (NCO) and NSSL to develop a consistent data flow of the model data. The NSSL WRF run was made available to forecasters in August 2010 and is frequently referenced by HPC forecasters in their forecast discussions.

Based on HPC forecaster input from the QPF experiments, EMC and NCO started preserving more NCEP high-resolution window runs in the event of tropical systems. Previously the high-resolution window runs were frequently preempted by hurricane runs. Based on HPC's request, the threshold for preemption was increased from one tropical system to three tropical systems.

Based on the promising results of high-resolution guidance during the QPF experiments, HPC worked with EMC to develop a data feed for the CONUS nest of the experimental NAM. The data will be evaluated during the HMT-HPC Winter Weather Experiment, and, partially based on this evaluation, will be considered for NCEP production suite implementation during Spring 2011.

HPC worked with NOAA HMT to establish a data feed for the nine-member high-resolution HMT ensemble, centered over the CNRFC area.

Rime Factor/Ice Accumulation Rate - The HMT-HPC worked with Environmental Modeling Center (EMC) scientists to make the rime factor tool available to HPC forecasters. A training seminar was given to introduce the rime factor and ice accumulation rate output to HPC forecasters on October 14, 2009, with a second on November 4. Rime factor and ice accumulation rate forecasts are being generated from the 00Z and 12Z 12-km NAM and are available to forecasters.

Summaries of the rime factor/ice accumulation rate forecasts for snow events from the 2009-2010 winter season were compiled in order to monitor the performance of this new output. In addition to showing how well the tool did or did not perform, these summaries helped provide feedback to EMC concerning the technique.

As a result of this project, two new tools were developed. One displays an ice accumulation rate based on a maximum 12:1 snow to liquid ratio, which is similar to the ratio assumed by other tools used at the HPC Winter Weather Desk. The second is a depiction of 6-, 12-, and 24-h total ice accumulation forecasts. Additionally, EMC has started providing hourly NAM output for the 36-84-h period. These data are being evaluated during the 2011 HMT-HPC Winter Weather Experiment.

Predecessor Rainfall Events (PREs) - Work continued to evaluate techniques for identifying and predicting Predecessor Rainfall Events (PREs). In addition to building upon work done at SUNY Albany and the NWS Weather Forecast Office in Binghamton, New York, additional landfall-based composites were computed, including surface and 850-mb streamline composites.

A comparison between convective and nonconvective precipitation in the PRE region was completed, but it did not reveal any obvious relationship between precipitation mode and either forecast quality or forecast lead time.

In July 2010, Mike Bodner delivered a V-Flux tool to evaluate the potential of diagnosing meridional moisture plumes from the tropics into the PRE environment. The V-Flux tool examines normalized anomalies of moisture flux isolating the v-component of the wind.

MET/MODE tool - Use of the MET/MODE tool for object-oriented verification was investigated. This software package was developed by the Developmental Testbed Center and provides a more visual method of forecast verification than the traditional statistics and has the potential to be an important teaching tool.

The tool was installed at HPC and configured to verify the HPC forecasts as well as several models including the ECMWF, NAM, CMC, and GFS. For the HPC local component of the SPC-NSSL Spring Experiment, HRW-ARW, HRW-NMM, and SPCWRF4 models were added. Many of the modifications made for the HPC QPF experiment were transitioned into the daily MODE verification statistics. Comments on MODE output during the local QPF experiment included many useful suggestions about improving object identification. These will be investigated as part of a transition to daily 6-h verification using MODE during 2011.

HMT/ESRL Ensemble Delivered to HPC forecasters – Mike Bodner made the ensemble mean for QPF and mass fields available to HPC QPF. The model data are viewed by HPC during significant West Coast precipitation events.

Excessive Rainfall Verification – Based on the results of the QPF experiments, verification plots showing the observed areas exceeding flash flood guidance versus the forecast areas were created. These plots allow forecasters to assess quickly the accuracy of their excessive rainfall outlook.

Workshops, Meetings, and Papers

HMT Meeting on ESRL-HPC Joint QPF and Verification Research - A meeting between the NOAA HMT, DTC, and the HPC HMT was held January 27-28, 2010, in Boulder, Colorado, to discuss and coordinate the research efforts being undertaken by all groups. Faye Barthold, Michael Bodner, and Edwin Danaher represented HPC.

Second NOAA/USWRP Testbed Workshop - Faye Barthold and Edwin Danaher participated in the 2nd NOAA/USWRP Testbed Workshop in Boulder, Colorado, May 4-5. This workshop provided the opportunity to learn about the activities of the other testbeds and present an overview of the HMT-HPC's main accomplishments over the past year.

Planning Meeting for the 2011 Spring Experiment –HPC, SPC, AWC, and DTC meet to review results of the 2010 Spring Experiment and plan for the 2011 experiment. The meeting was held in September 2010.

First NOAA Users Workshop on GPM – Mike Bodner attended this workshop held August 18-19, 2010, in College Park, Maryland. GOES-R assessments and needs were presented by scientists throughout NOAA.

Training and Professional Development for HMT Staff

Distance Learning Operations Course (DLOC) – Faye Barthold completed the NWS

DLOC training on the use of the WSR-88D radar. The course consisted of both remote and residence training.

QPF Virtual Course - Faye Barthold completed the COMET QPF Virtual Course, a QPF training course.

AWOC Winter training course – Faye Barthold began the NWS AWOC Winter Weather training course.