

Diagnostic Verification of 6-90 Day Ensemble Streamflow Predictions for AHPS

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Progress Report for 03/01/2007 - 08/31/2007

Project Objective

For water resource managers, ensemble streamflow predictions represent one of the most significant products of the National Weather Service's (NWS) Advanced Hydrologic Prediction Services (AHPS). This project seeks to advance a distributions-oriented (DO) framework for verification of probability distribution forecasts derived from ensemble streamflow predictions. DO forecast quality measures provide a consistent diagnostic framework to quantify the relative sources of forecast skill, which would allow water managers to match decision tools to forecast attributes, and enable forecasters to target research, resources, and development efforts to the most valuable improvements. Expected outcomes from this research include: (1) a consistent framework for verifying probability distribution forecasts, which will be demonstrated through the evaluation and comparison of forecast quality of 6-90 day NWS AHPS ensemble streamflow forecasts for the North-Central and Ohio River Forecast Centers, and (2) a set of diagnostic verification tools for elucidating relevant forecast quality attributes, for the management and targeted improvement of forecasts systems, and interpretation of forecasts for their operational use.

Progress Report

Our efforts during this period have focused (1) development of a prototype online AHPS verification system, and (2) retrospective forecasting for the North Central and Ohio River Forecast Centers.

Development of a Prototype Online AHPS Verification System

To be able to explore the vast amount of forecast verification information for an RFC, and compare forecasts within an RFC, we have developed a web-based verification system for AHPS ensemble forecasts. The AHPS Verification System has access to the entire verification data base of (1) retrospective ensemble streamflow traces, (2) processed ensemble forecasts (and observations) for a suite of variables, and (3) computed forecast quality measures for the ensemble products. The system can quickly display detailed forecast quality information for individual locations and forecast dates, or make custom plots comparing summary forecast quality measures at multiple sites or multiple basins within the domain of an RFC. Interactive exploration of the verification data base can provide

forecasters with diagnostic information to identify pathways for improvement of the forecasting system.

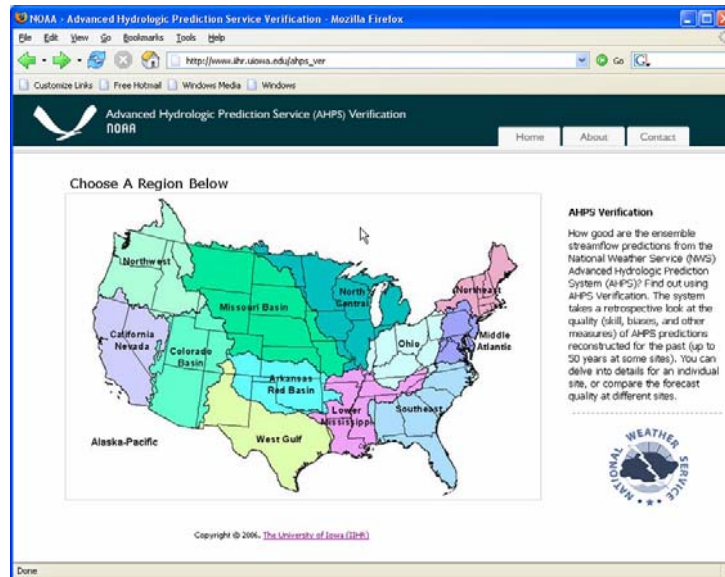


Figure 1: Web-based interactive system for forecast verification of AHPS ensemble streamflow predictions (http://www.iuhr.uiowa.edu/ahps_ver).

Our work over this period has continued to implement portions of the system. Currently, the verification system has capabilities to interactively access and display computed forecast quality measures for the ensemble products. The system uses a MySQL data bases to access pre-computed plot files, or gather forecast quality metrics from multiple locations and forecast dates to dynamically generate plots. We have been working to expand the types of forecast quality information that can be displayed. In addition to summary measures for individual or groups of forecast locations, we have developed scripts for accessing and displaying time series of forecast quality measures (to assess seasonal changes in these measures) and to compare forecasts for the same period at different lead times. Furthermore, the capabilities of the system are being expanded to allow direct access and display on the ensemble forecast products themselves, to let users create and view time series of the forecasts (as box plots) and observations.

Retrospective Forecasting for the North Central and Ohio River Forecast Center

We now have a stand-alone version of the OHRFC implementation running on a Linux machine at IIHR. The system is configured to run a series of program and scripts to generate retrospective forecasts for the forecast groups within the OHRFC, and we have begun generating once-a-week forecasts beginning in 1950 (and running through 1998). As part of this process, the interface with the NWSRFS system is an existing NWS script that manages the ESP simulations (namely *espvs_generate.sh*). Doing retrospective forecasts at downstream forecast groups is a significant challenge with these pre-existing capabilities. In particular, the ESP script use a different naming convention for output files, making them unavailable for forecast groups that require outputs from upstream locations. We have investigated a few options to work around this, and are now creating a customized version of the *espvs_generate* script that copies and renames previously created outputs

files (according to the standard convention) so that they would be available for retrospective forecasting for downstream forecast groups.