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

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Progress Report for 03/01/2006 - 08/31/2006

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 Ohio River Forecast Center.

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

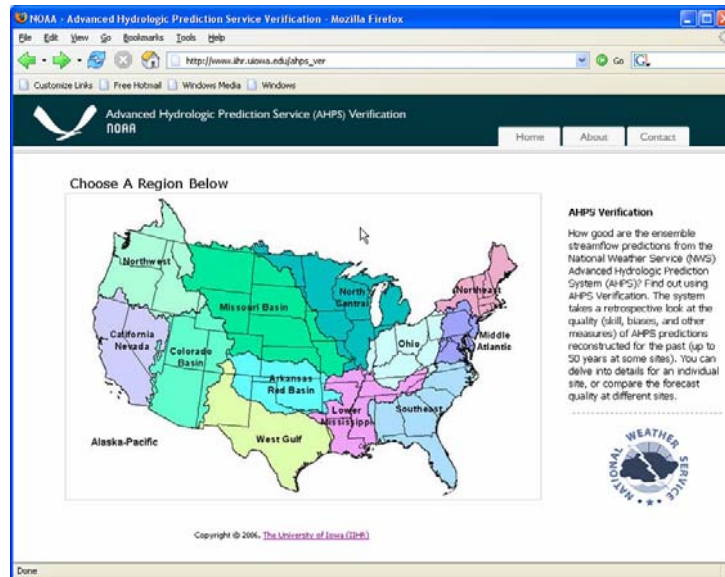forecasters with diagnostic information to identify pathways for improvement of the forecasting system.

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

Our work over this period has continued to expand the capabilities of this system. New summary forecast measures, based on decompositions and geometric attributes of forecast quality functions (e.g., skill as a function of the flow threshold probability) have been added to the data base system and interactive display. Online *help* information is being integrated into the system architecture to allow users to obtain explanations of the contents of data plots and advice on their interpretation.

Retrospective Forecasting for the Ohio River Forecast Center

Currently, the AHPS Verification System has been implemented with prototype verification data sets for the North Central River Forecast Center (NCRFC). Recent efforts have focused on generating similar data sets for the Ohio River Forecast Center (OHRFC). We have obtained the NWSRFS system and model configuration for the OHRFC, and installed it on a Linux machine at IIHR. The system is being configured to run a series of program and scripts to generate retrospective forecasts for forecast groups within the OHRFC. We plan to complete testing of the OHRFC implementation shortly and begin generation of retrospective forecast verification data sets. As with the NCRFC, retrospective forecasts will be generated on a once-a-week basis from 1950 through 1999 for the majority of forecast groups within the OHRFC. These outputs will be transitioned to the verification system for interactive display.