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Hydrologic Ensemble Forecast Service for Operational Short-to-Long Range Hydrometeorological and Hydrologic Ensembles in the U.S. National Weather Service

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In order to quantify the main sources of uncertainty in hydrologic forecasts for a wide range of practical applications (e.g. flood risk management, water supply management, streamflow regulation, and recreation planning), the NOAA's National Weather Service (NWS) is implementing a short- to long-range Hydrologic Ensemble Forecast Service (HEFS). The HEFS extends the existing hydrologic ensemble services to include short-range forecasts and incorporate additional weather and climate information. It provides, at forecast horizons ranging from 6-hr to about a year, hydrometeorological and hydrologic ensemble forecasts that are reasonably unbiased and skillful over a wide range of spatio-temporal scales.

Based on separate modeling of the input and hydrologic uncertainties, the HEFS includes: 1) the Meteorological Ensemble Forecast Processor (MEFP), which ingests weather and climate forecasts from multiple numerical weather prediction models to produce bias-corrected forcing ensembles at the hydrologic basin scales; 2) the hydrologic Ensemble Post-processor (EnsPost), which models the collective hydrologic uncertainty and corrects for systematic biases in streamflow; 3) the Ensemble Verification Service, which verifies the forcing and streamflow ensembles to help identify the main sources of skill and error in the forecasts and provides forecast quality information for forecasters and users; and 4) the Graphics Generator, which enables forecasters to create configurable plots for analysis and delivery to the public.

The implementation started in 2011 and now five NWS River Forecast Centers are testing the HEFS in real-time over a large number of basins. The New York City Department of Environmental Protection is currently transitioning its water supply system for New York City to make use of the HEFS ensembles for more efficient and effective water management. This presentation describes recent verification results from multi-year hindcasting based on precipitation and temperature forecasts from the NWS Global Forecast System and Global Ensemble Forecast System for a 14-day forecast horizon. Various verification metrics (e.g., Relative Mean Error, Continuous Rank Probability Skill Score) show the relative contribution of the MEFP (along with the raw forcing forecasts) and the EnsPost to the quality of the streamflow ensembles.