

Application of Stochastic Weather Generator based Seasonal Ensemble Streamflow Forecasts to Water Resources Management

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Abstract. The National Weather Service produces streamflow forecasts, using a method called Ensemble Streamflow Predictions (ESP) based on the exact sequence of historical daily weather. This method was enhanced¹ to produce a rich variety of ensembles and ensembles conditioned on probabilistic seasonal climate forecast, using a K-nearest neighbor bootstrap based stochastic weather generator (WG). The generated weather sequences are then coupled with the SAC-SMA model within the Community Hydrologic Prediction System (CHPS) to produce weather-generated ensemble streamflow forecast. In Caraway (2012) the WG based streamflow ensemble forecast showed improved long lead skills compared to the traditional ESP. To demonstrate the benefits of the improved forecasts, these ensembles can be coupled with a model that incorporates seasonal forecasts for operational decision-making. In this research, we apply the forecasting techniques in the San Juan River Basin (SJR), the second largest tributary of the Colorado River, with drainage areas in New Mexico, Colorado, Arizona, and Utah. The streamflow ensembles from ESP, WG based ESP and those conditioned on seasonal climate forecasts are proposed to be incorporated in the SJR model that forecasts operations to meet water supply, hydropower and environmental flows several months in advance. Ensembles of decision variables including reservoir levels, storages, releases etc. at Navajo and Vallecito Reservoirs will be obtained and their skills evaluated against variables obtained using historic streamflow (i.e., baseline). Forecasts of the spring streamflow (Apr-Jul) issued at six different lead times on first of each month starting November, will be used and the skills in decision variables evaluated at each lead time.

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