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# Probabilistic streamflow predictions combining ensemble meteorological forecasts and a multi-model approach

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Probabilistic streamflow prediction based on past climate records or meteorological forecasts have drawn much attention in recent years. It is usually incorporated into operational forecasting systems by government agencies and industries to deal with water resources management and regulation problems. This work presents an operational prototype for short to medium term ensemble streamflow predictions over Quebec, Canada. The system uses ensemble meteorological forecasts for short term (up to 7 days) forecasting, transitioning to a stochastic weather generator conditioned on historical data for the period exceeding 7 days. The precipitation and temperature series are then fed into a combination of 32 hydrology models to account for both the meteorological and hydrology modelling uncertainties. A novel post-processing approach was implemented to correct the biases and the under-dispersion of ensemble meteorological forecasts. This post-processing approach links the mean of the ensemble meteorological forecast to parameters of a stochastic weather generator (absolute probability of precipitation and observed precipitation mean in the case of precipitation). The stochastic weather generator is then used to generated unbiased times series with accurate spread. Results show that the post-processed meteorological forecasts displayed skill for a period up to 7 days for both precipitation and temperature. The ensemble streamflow prediction displayed more skill than when using the deterministic forecast or the stochastic weather generator not conditioned on the ensemble meteorological forecasts. To tackle the uncertainty linked to the hydrology model, 4 different models calibrated with up to 9 different efficiency metrics (for a combination of 32 models/calibrations). Nine different averaging schemes were compared to attribute weights to the 32 combinations. The best averaging method (Granger-Ramanathan) produced estimates with a much better efficiency than the best performing model, while removing all biases linked to the hydrology modelling.