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Evaluation of an operational streamflow forecasting system driven by ensemble precipitation forecasts : a case study for the Gatineau watershed

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Among the various sources of uncertainty for hydrological forecasts, the uncertainty linked to meteorological inputs prevail. Precipitation is particularly difficult to forecast and observed values are often poor representation of the true precipitation field. In order to account for the uncertainty related to precipitation data, it can be interesting to produce ensemble streamflow forecasts by feeding a hydrological model with ensemble precipitation forecasts issued by atmospheric models.

In this study, we use ensemble precipitation forecasts to drive Hydrotel, a distributed hydrological model. We concentrate on the Gatineau watershed, which serves as an experimental watershed for Hydro-Québec, the major hydropower producer in Quebec. The main goal of this study is to demonstrate that ensemble precipitation forecasts can improve streamflow forecasting for the watershed of interest.

The ensemble precipitation forecasts were produced by Environnement Canada from march first of 2002 to december 31st of 2003. They were obtained using two atmospheric models, SEF (8 members plus the control deterministic forecast) and GEM (8 members). The corresponding deterministic precipitation forecast issued by SEF model is also used with Hydrotel in order to compare ensemble streamflow forecasts with their deterministic counterparts.

The quality of the precipitation forecasts is first assessed, using the continuous ranked probability score (CRPS), the logarithmic score, rank histograms and reliability diagrams. The performance of the corresponding streamflow forecasts obtained at the end of the process is also evaluated using the same quality assessment tools.