

System for evaluating the reliability of hydrological forecasts



WEB interface of the system for evaluating the reliability of hydrological forecasts

On a daily basis, Hydro-Québec produces runoff forecasts for more than 90 watersheds covering the next 1 to 200 days. Based on the forecasts, future water availability is estimated periodically. The forecasts are the starting point in the decision process for generation planning and for undertaking new hydropower developments. To support corporate decision making, IREQ, Hydro-Québec's research institute, has developed a system for evaluating the reliability of hydrological forecasts. It is geared to the probabilistic forecasts that Hydro-Québec issues daily.

Reliable probabilistic forecasts

Hydro-Québec has been making probabilistic forecasts for over 20 years. Evaluating the reliability of such forecasts is a complex problem that has received little attention. The main technical challenge stems from the fact that the evaluation means comparing two mathematical objects of unlike nature: a function (the forecast probability distribution) and a real number (the observation). Work by researchers has made it possible to formalize the process for evaluating the performance of the Hydro-Québec runoff forecasting system and to develop new diagnostic tools better suited to probabilistic forecasts.

The reliability of hydrological forecasts is crucial for Hydro-Québec since their uses include the following:

- > Anticipating extreme and potentially damaging hydrological events
- > Minimizing the risks of spillage
- > Improving hydroelectric generation
- > Profiting from business opportunities for the sale and purchase of energy



Main Hydro-Québec watersheds

Key advantages

The system enables Hydro-Québec to evaluate automatically on a periodic basis the quality of the probabilistic forecasts that it produces every day. It was designed for:

- > Comparing Hydro-Québec's various hydrological models
- > Studying the seasonal performance of the forecasting system
- > Ensuring that the uncertainty of hydrological forecasts is represented
- > Helping forecasters better focus their work
- > Evaluating those supplying meteorological forecasts
- > Targeting evaluation system components in need of improvement

Comprehensive system – A first

The system for evaluating the reliability of hydrological forecasts is supported by a set of graphic and numerical diagnostic tools geared to the probabilistic forecasts released daily. The computer routines for calculating rankings and the other diagnostic tools were programmed in MATLAB. They are arranged as a software library. A web interface called "WebIndicateur" is used to consult and export data from the database and library calculation results. This very comprehensive evaluation system is a first in the field of hydrological forecasting for hydropower generation purposes.

Optimal water management

The development of the system for evaluating the reliability of hydrological forecasts is one part of an innovation project on runoff forecasting in major water systems for energy management purposes. The prime objective of that project is to develop statistical tools for improving long-term forecasts of natural inflows for major water systems. Better estimates of runoff allow optimal use of water resources.

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November 2012

2012G236_Système évaluation_E