

OPT-HE : Hydrological high performance forecast for hydropower production – hydrological modelling (2014 – 2017)

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Introduction

The total hydropower production in Switzerland was around 38 000 GWh in 2012. OPT-HE has the objective to increase this production by 1%, which represents 400 GWh, without any structural investments or environmental impacts. This increase would be possible by hydrological high performance forecasts which allow optimizing the management of the dams and reducing water loss by spillage, inside of a complex catchment.

This research project, which is a part of the OPT-HE project, focuses on performing the hydrological modelling required for high quality forecasts.

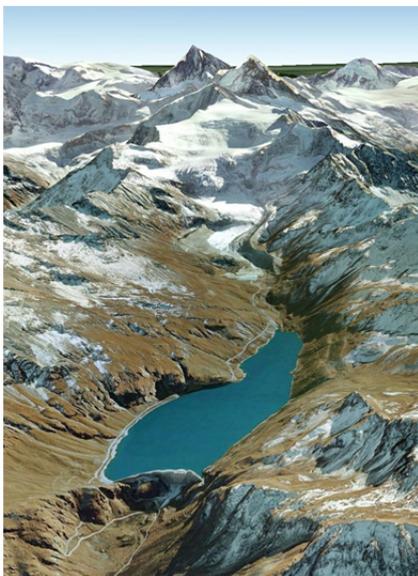


Figure 1 : Moiry dam (Google Earth)

Research objectives

The semi-distributed hydrological modelling, studied in this project, is performed by the software RS 2012 developed firstly by the LCH and more recently by e-dric.ch. This model aims at reproducing, as accurately as possible, the physical behavior of a complex catchment with its dams and water intakes structures, but also its glaciers and snow accumulations, using for input, the precipitations and temperature at several points close to

the catchment. The figure 2 shows the structure of the model with its different components.

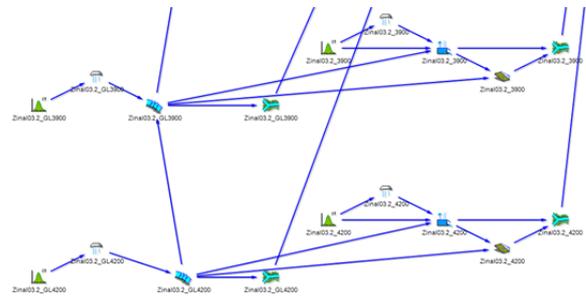


Figure 2 : RS 2012 modelling structure (e-dric.ch)

Although this model has already been highly successful in many cases and for a forecast up to 240 hours, some prediction errors still remain in particular situations. These are shown in figures 3 and 4.

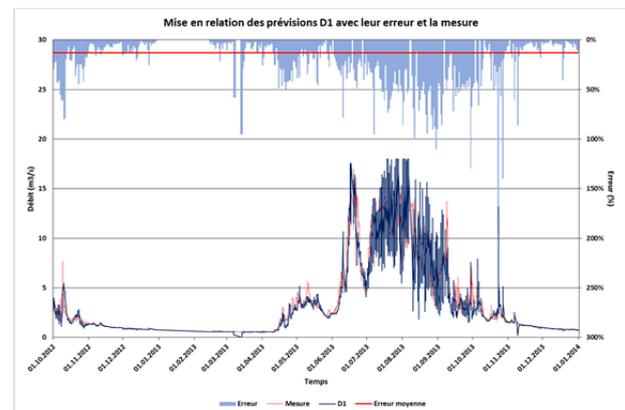


Figure 3 : Forecast at 6 a.m. for the following day at Mottec (e-dric.ch)

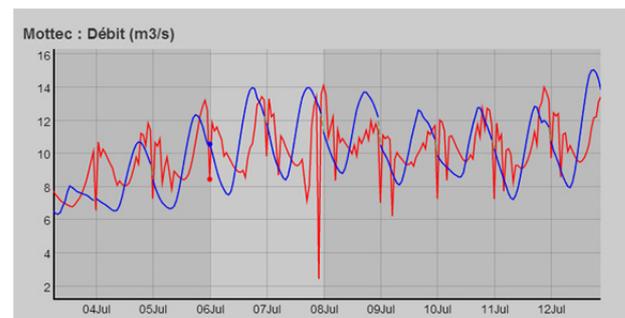


Figure 4 : Forecast at 6 a.m. for the following days at Mottec showing shifts in daily cycles between the prediction and the observed discharge. Red : measured discharge, blue : forecasted discharge. (e-dric.ch)

The aim of this project is to improve the model by identifying the sources of uncertainty (including the interpolation of the meteorological data) and by finding an automatic correction procedure of the variables of the model (inputs, state variables, outputs, initial conditions). This would improve the performance of the forecasting model. Then, the structure of the model would be deeply studied in order to reduce the modelling errors permanently. At the end, a knowledge based automatic calibration procedure will be performed.