



Taking into account reservoirs in a lumped rainfall-runoff model - Assessment of the hydrological impacts of dams on regulated catchments

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Dams have important environmental and socio-economical impacts at different scales. From the hydrological point of view, they can strongly affect the behaviour of the catchment by changing its response to precipitations. Thus, the natural river flow regime and seasonal flow pattern downstream dams are modified, in particular for flood and low flow events. Generally, those impacts are significant right downstream the dam but become more diffuse going downstream. Therefore, assessing the impacts of dams on flow regime with hydraulic approaches classically used to simulate river flow propagation in the channel network becomes more difficult.

The aim of this research is to build a hydrological model allowing to simulate the diffuse impacts of dams on regulated catchments by taking into account the volumes of water stored in the real-life reservoirs. We concentrate on a lumped approach of the problem, keeping a low level of complexity to reduce sources of uncertainties. The methodology used is based on a large database of catchments influenced by dams. Starting from a simple lumped rainfall-runoff model, one searches how to define and incorporate in its structure different modules controlled by the information contained in storage reservoir data. An evaluation framework is set up to quantify the improvements brought by each module.

After presenting the whole methodology, tests carried out on a wide dataset of catchments are detailed and analysed. Results show that the use of reservoir data in a simple lumped rainfall-runoff model can bring clear improvements on flow simulation efficiency. The applicability of this tool to calculate naturalised flows in order to help the evaluation of environmental flow requirements is then discussed.