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# Conditional flood frequency and catchment state: a simulation approach

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Catchments have memory and the conditional flood frequency distribution for a time period ahead can be seen as non-stationary: it varies with the catchment state and climatic factors. From a risk management perspective, understanding the link of conditional flood frequency to catchment state is a key to anticipate potential periods of higher flood risk.
Here, we adopt a simulation approach to explore the link between flood frequency obtained by continuous rainfall-runoff simulation and the initial state of the catchment. The simulation chain is based on i) a three state rainfall generator applied at the catchment scale, whose parameters are estimated for each month, and ii) the GR4J lumped rainfall-runoff model, whose parameters are calibrated with all available data. For each month, a large number of stochastic realizations of the continuous rainfall generator for the next 12 months are used as inputs for the GR4J model in order to obtain a large number of stochastic realizations for the next 12 months. This process is then repeated for 50 different initial states of the soil moisture reservoir of the GR4J model and for all the catchments. Thus, 50 different conditional flood frequency curves are obtained for the 50 different initial catchment states. We will present an analysis of the link between the catchment states, the period of the year and the strength of the conditioning of the flood frequency compared to the unconditional flood frequency. A large sample of diverse catchments in France will be used.