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Can we infer the effect of river works on streamflow statistics?

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Most of our river network system is affected by anthropic pressure of different types. While climate and land use change are widely recognized as important factors, the effects of "in-line" water infrastructures on the global behavior of the river system is often overlooked.
This is due to the difficulty in including local "physical" knowledge (e.g., the hydraulic behavior of a river reach with levees during a flood) into large-scale models that provide a statistical description of the streamflow, and which are the basis for the implementation of resources/risk management plans (e.g., regional models for prediction of the flood frequency curve).
This work presents some preliminary applications regarding two widely used hydrological signatures, the flow duration curve and the flood frequency curve. We adopt a pragmatic (i.e. reliable and implementable at large scales) and parsimonious (i.e. that requires a few data) framework of analysis, considering that we operate in a complex system (many river work are already existing, and many others could be built in the future).
In the first case, a method is proposed to correct observations of streamflow affected by the presence of upstream run-of-the-river power plants in order to provide the “natural” flow duration curve, using only simple information about the plant (i.e. the maximum intake flow). The second case regards the effects of flood-protection works on the downstream sections, to support the application of along-stream cost-benefit analysis in the flood risk management context.
Current applications and possible future developments are discussed.