

Daily reservoir operating rules by implicit stochastic optimization and artificial neural networks in a semi-arid land of Brazil

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Abstract This paper presents a model based on Implicit Stochastic Optimization (ISO) and Artificial Neural Networks (ANN) for deriving daily operating rules for a reservoir system located in a semi-arid region of Brazil. The ISO procedure consists of optimizing the reservoir system for possible inflow scenarios and then analysing the optimal outcomes in order to generate operating rules. Unlike the common use of regression equations, this study makes use of ANN to develop reservoir hedging rules relating end-of-period reservoir storage to initial storage and other system variables. After the establishment of the ISO-ANN rules, they were tested over a new series of inflows and the outcomes were assessed by means of sustainability criteria. The ISO-ANN rules were shown to be superior to the so-called Standard Linear Operating Policy (SLOP) and equivalent to the results derived by deterministic optimization taking the same inflows as perfect forecasts for one year ahead.

Key words reservoir operation; artificial neural networks; implicit stochastic optimization; hedging rules; sustainability; semi-arid