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Optimal real-time management of an integrated water resources system by ANN-based hedging rules

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Abstract The main objective of this study is to develop a hydrological-economic (HE) procedure capable of incorporating long- and short-term hydrological variability for the real-time optimal operation of an integrated water resources system. The long-term information is represented by hedging rules derived by Artificial Neural Networks (ANNs) and Implicit Stochastic Optimization (ISO). The short-term information is assumed to be deterministic since meteorological forecasts are generally available. The procedure is used for the operation of a dam reservoir in the presence of groundwater supply with the purpose of minimizing economic costs and maximizing the system's sustainability. The HE procedure was applied to operate the system over a 10-year daily horizon. The results were shown to be equivalent to those obtained by a perfect-forecast deterministic model and superior to those found by the so-called Standard Operating Policy (SOP).

Key words real-time water management; artificial neural networks; hedging rules; sustainability; economic analysis; implicit stochastic optimization; integrated systems