

The role of predictive uncertainty in the operational management of reservoirs

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Abstract The present work deals with the operational management of multi-purpose reservoirs, whose optimisation-based rules are derived, in the planning phase, via deterministic (linear and nonlinear programming, dynamic programming, etc.) or via stochastic (generally stochastic dynamic programming) approaches. In operation, the resulting deterministic or stochastic optimised operating rules are then triggered based on inflow predictions. In order to fully benefit from predictions, one must avoid using them as direct inputs to the reservoirs, but rather assess the “predictive knowledge” in terms of a predictive probability density to be operationally used in the decision making process for the estimation of expected benefits and/or expected losses. Using a theoretical and extremely simplified case, it will be shown why directly using model forecasts instead of the full predictive density leads to less robust reservoir management decisions. Moreover, the effectiveness and the tangible benefits for using the entire predictive probability density instead of the model predicted values will be demonstrated on the basis of the Lake Como management system, operational since 1997, as well as on the basis of a case study on the lake of Aswan.

Key words predictive knowledge; predictive uncertainty; reservoir management