

Accounting for uncertainty in pumping rate optimisation for sustainable aquifer management

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Abstract Optimisation of pumping rates for sustainable aquifer management is commonly based on groundwater models. The optimal pumping rate estimate will therefore be affected by uncertainty in input, parameters and model conceptualization. Pumping rates in a hypothetical groundwater model of an alluvial aquifer in a semi-arid climate are maximized subject to constraints on piezometric level, drawdown and fluxes to surface water. A new model is calibrated, using the hypothetical model as reference, to obtain a new estimate of optimal pumping rates. While keeping the mismatch between observed and calculated values below an acceptable level, uncertainty arising from input data and model parameters is propagated through the model to obtain an informal prediction interval for the optimal pumping rate prediction. Instead of a single optimal pumping rate, the informal prediction interval informs management of the range of pumping rates justified by the groundwater model within an acceptable level of calibration.

Key words aquifer management; pumping; optimisation; calibration; uncertainty