

On the value of water quality observations for karst model parameterization

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ABSTRACT

If properly applied, karst hydrological models are a valuable tool for karst water resources management. If they are able to reproduce the relevant flow and storage processes of a karst system, they can be used for prediction of water resources availability when climate or land use are expected to change. A common challenge to apply karst simulation models is the limited availability of observations to identify their model parameters. In this study, we quantify the value of information added to parameter estimation when water quality data (NO_3 and SO_4) is used in addition to discharge observations to estimate the parameters of a process-based karst simulation model at a test site in Southern Spain. We use a three-step procedure (1) to confine an initial sample of 500,000 model parameter sets, (2) to identify alterations of individual model parameters through the confinement, and (3) to quantify the strength of the confinement for each of the model parameters. The last step allows us to quantify the information content of hydrodynamic and water quality observations for model parameter estimation. Our results show that NO_3 provides most information to identify the model parameters controlling soil and epikarst dynamics, while discharge observations provide most information about the recharge area and the groundwater dynamics. SO_4 mostly contributes to the identification of recharge processes. Looking at different flow states of the system, we also find that information provided by our observations varies over time.