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Coupling SKS and SWMM to solve the inverse problem based on artificial tracer tests data in karst aquifers

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Artificial tracer tests constitute one of the most powerful tools to investigate solute transport in conduit-dominated karst aquifers. One can retrieve information about the internal structure of the aquifer directly by a careful analysis of the residence time distribution (RTD). Moreover, recent studies have shown the strong dependence of solute transport in karst aquifers from boundary conditions. Then, results from artificial tracer tests contain information about the internal structure of the aquifers and about the effect of the boundary conditions (mainly high or low water level). So, a multi-tracer test calibration of the model appears to be more consistent in order to identify the effect of change in boundary conditions and to take into consideration their effects on solute transport. In this study, we propose to run the inverse problems based on artificial tracer tests with a numerical procedure composed by the following three main steps: [1] conduit geometry is simulated using a pseudo-genetic algorithm, [2] hypothesis about boundary conditions are imposed in the simulated conduit network and [3] flow and solute transport are simulated. Then, using a trial-and-error procedure, the simulated RTD is compared to the observed RTD on a large range of simulations allowing to identify the conduit geometry and boundary conditions that better reproduce the field data. This constitutes a new approach in order to better constrain inverse problem using a multi-tracer tests calibration including transient flow.