

Title: Hydrodynamics of Groundwater Flow in a Karst Aquifer

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A Navier-stokes equation and Darcy's law are combined to simulate groundwater flow in a Karst aquifer. The aquifer is conceptualized into a two regions, conduits and rock matrix. Flow in conduits is governed by Navier-Stokes equation and flow in matrix is described by Darcy's law. A mathematical model and numerical simulation are developed based on the concept model. To verify the developed model, a laboratory, benchtop model was constructed to study the hydrodynamics of groundwater flow through a confined karst aquifer and gain an understanding of the exchange of water between a limestone matrix and a conduit. The numerical modeling simulations well capture the experiment results. The knowledge gained from this study can be applied to contaminate flow through the aquifer, influences of exchange on flow in both domains, as well as storm recharge of the matrix or conduit or both.