EGU2020-21513
https://doi.org/10.5194/egusphere-egu2020-21513
EGU General Assembly 2020

Solute transport in dual conduit structure: experiment and modelling

Chaoqi Wang, Xiaoguang Wang, Samer Majdalani, Vincent Guinot, and Hervé Jourde
Laboratoire HydroSciences Montpellier, Le Centre national de la recherche scientifique, France
(chaoqi.wang@etu.umontpellier.fr)

An important phenomenon often encountered when interpreting tracer tests in karst aquifers is the occurrence of dual-peaked breakthrough curves (BTCs). The dual-peaked BTCs are usually attributed to tracer transport through a conduit system consisting of a dual-conduit structure: an auxiliary conduit that deviates from the main conduit at the upstream and converges back at the downstream. In order to understand how the geometric configuration of the dual-conduit structure influences the BTCs, laboratory experiments utilizing plastic tubes were conducted. The physical models were constructed by varying: 1) the total length of the conduits, while fixing the length ratio; 2) length ratio between the two conduits, while fixing the length of the main conduit; and 3) conduits connection angle. The tracer experiments are then fitted by a Multi-Region Advection Dispersion model and a Transfer Function model to derive effective transport parameters. This allows us to quantitatively compare the experimental results, and thus to analyse the conduit geometry effects on solute transport and to compare the performance of the two models.

Results show that the dual-conduit structure causes the double peaks of BTCs. Keeping the length ratio of the two conduits and increasing their total length leads to a larger separation of the two peaks of the BTCs. Keeping the length of main conduit while increasing the length of the secondary conduit causes similar effects. As (θ_1-θ_2) increases, the first peak concentration value decreases, the second peak concentration value increases.

Keywords: karst, lab experiment, dual-peaked BTCs, modelling