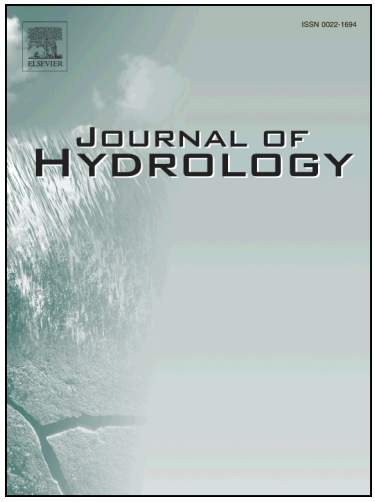

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Heat tracer test in an alluvial aquifer: field experiment and inverse modelling

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Abstract

Using heat as an active tracer for aquifer characterization is a topic of increasing interest. In this study, we investigate the potential of using heat tracer tests for characterization of a shallow alluvial aquifer. A thermal tracer test was conducted in the alluvial aquifer of the Meuse River, Belgium. The tracing experiment consisted in simultaneously injecting heated water and a dye tracer in an injection well and monitoring the evolution of groundwater temperature and tracer concentration in the pumping well and in measurement intervals. To get insights in the 3D characteristics of the heat transport mechanisms, temperature data from a large number of observation wells closely spaced along three transects were used.

Temperature breakthrough curves in observation wells are contrasted with what would be expected in an ideal layered aquifer. They reveal strongly unequal lateral and vertical components of the transport mechanisms. The observed complex behavior of the heat plume is explained by the groundwater flow gradient on the site and heterogeneities in the hydraulic conductivity field. Moreover, due to high injection temperatures during the field experiment a temperature-induced fluid density effect on heat transport occurred. By using

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