



The Effect of Local Thermal Equilibrium Assumption for Transport in Porous Medium

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The temperature concurrence between solid phase and fluid phase in the porous medium is commonly assumed in many hydrogeological systems. This assumption, which called local thermal equilibrium (LTE), requires enough time to exchange the thermal energy between them so, under certain conditions such as high velocity or forced injection, the assumption cannot be valid.

In this study, laboratory tracer tests were performed under a variety of background flows to find the conditions on which LTE were violated. Heat and solute were injected as tracers in a 3-D sand tank experimental system. To interpret the heat and solute injection experiments, the pre-tests for evaluating physical properties of the porous medium were conducted. A comparison is made between the velocities computed by both tracers and Darcy flux to find a criterion causing the differences between the heat and the solute. These results revealed the validity of the LTE assumption with dimensionless numbers. Furthermore, it can show the effect of the LTE assumption on the estimation of transport parameters which have important roles in using heat as a tracer or an energy.

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