



Exact analytical solutions for three-dimensional multispecies advective-dispersive transport equations sequentially coupled with first-order decay reactions in a semi-infinite domain

Zhong-Yi Liao and Jui-Sheng Chen

National Central University, Zhongli District, Taiwan (fd90005ja@yahoo.com.tw)

Analytical solutions to a set of simultaneous multispecies advective-dispersive transport equations sequentially coupled with first-order decay reactions have been widely used to describe the movements of decaying or degradable contaminants such as chlorinated solvents, nitrogens and pesticides in the subsurface. This study presents an exact analytical solutions for three-dimensional coupled multispecies transport in a semi-finite domain. The analytical model are derived for both the first-type and third-type inlet boundary conditions. A method of consecutive applications of three integral transformation techniques in combination with sequential substitutions is adopted to derive the analytical solutions to the governing equation system. The developed analytical model is robustly verified with a chlorinated solvent transport problem. It is applied to investigate the effect of inlet-boundary conditions on the multispecies plume migration and the model could be a very efficient tool that can be used to simulate the degradable contaminant sites.

□□□□□□□□□□HTML□