



Effect of radial boundary on two-dimensional advective-dispersive transport in geological system with a circular source

Ching-Ping Liang (1) and Jui-Sheng Chen (2)

(1) Department of Environmental Engineering and Science, Fooyin University, Kaohsiung City 83102, Taiwan (sc048@mail.fy.edu.tw), (2) Graduate Institute of Applied Geology, National Central University, Jhongli City, Taoyuan County 32001, Taiwan (jschen@geo.ncu.edu.tw)

Many important sources of subsurface contamination come from ground surface. Surface pollutant may easily move from the top soil to the unconfined aquifer. Infiltration test with a tracer have been proposed as an in-situ method to determine the longitudinal dispersivity from analysis of the breakthrough curves (BTCs). Analytical solution to the two-dimensional ADE in cylindrical coordinates has been derived for interpreting the field test. The analytical model available in literature considered the medium to be infinite in radial direction and the circular source to be as an infinitesimal point source. This study presents a novel analytical solution for interpreting the infiltration tracer test by considering the finite radial boundary and finite circular source. The developed analytical solution is compared against the previously developed solution to demonstrate how the radial boundary affects the solute transport in a cylindrical geological system. Results show that the effect of the radial boundary on solute transport is significant when the magnitude of the transverse dispersion coefficient is large. We also determine the applicable condition for that the finite circular source can be considered as a point source. Moreover, the newly developed model is applied to a field test to determine the longitudinal and transverse dispersion coefficients.