Consequences of Incomplete Remediation of the DNAPL-Contaminated Aquifers: Intermediate-Scale Experiments and Numerical Modeling Studies

Satawat Saenton and Tissa H. Illangasekare
Division of Environmental Science and Engineering
Colorado School of Mines, Golden, Colorado, 80401 U.S.A.

Abstract. The uncertainty associated with the removal of DNAPLs from source zones could be attributed to a number of factors that include lack of data or information on the extent and timing of the spill, complex entrapment configurations created by the unstable behavior (fingering), geologic heterogeneity, and unavailability of accurate techniques for characterization of these heterogeneities and location of the sources. Laboratory studies of mass transfer under normal and enhanced conditions in intermediate-scale test tanks provide data sets to investigate this issue, as it is possible to conduct controlled spill experiments under known conditions of aquifer heterogeneity. The source depletion and the downstream concentrations in the dissolved plume can be monitored during remediation. The data generated in controlled experiments are used to validate numerical models to conduct theoretical analysis. This paper discusses this approach and presents results from such study where benefits of partial source zone treatment using surfactants was evaluated using intermediate-scale experiments and numerical modeling. Conclusions will be based on the numerical results from a number of hydraulic conductivity fields (or realizations).