Geophysical Research Abstracts, Vol. 8, 04698, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04698

Using leaching surfaces to evaluate solute fluxes calculated from time moments of local resident concentrations in a heterogeneous aquifer: a numerical test

E. Bloem (1), J. Vanderborght (2) and G.H. de Rooij (1)

(1) Wageningen University, Dept. Environmental Sciences, Sub. Dept. Water Resources, Soil Physics, Ecohydrology and Groundwater management, Wageningen, The Netherlands, (2) ICG-IV Agrosphere, Forschungszentrum Jülich, Germany (Esther.Bloem@wur.nl)

Natural aquifer heterogeneity profoundly affects groundwater remediation projects. To improve treatment strategies we require a better understanding of the effect of heterogeneity on contaminant movement in aquifers.

Solute monitoring in the field is usually limited to observations of resident concentrations, while flux concentrations govern the movement of solutes in aquifers. Time moment analysis is often used to estimate flux concentrations from resident concentrations using the velocity field estimated from local breakthrough curves (BTCs). The influence of heterogeneity on the accuracy of this method is unknown. We investigated the interchangeability of resident and flux concentrations. We also evaluated the potential of moment analysis based on resident concentrations to estimate passage of solutes at various cross-sections of an aquifer.

We simulated transport of a solute injected in a vertical plane by steady flow in a well-defined artificial aquifer. We could therefore exactly determine resident and flux concentrations. The spatio-temporal distribution of solute passage at various distances from the injection plane was visualized with leaching surfaces (an assembly of local-scale BTCs) based on both resident and flux concentrations. We also calculated BTCs based on flux concentrations obtained by moment analysis and constructed leaching surfaces from those as well. The resident concentrations proved unsuitable to assess solute movement in the aquifer. The moment analysis provided reasonable estimates

of the solute fluxes. However, estimated fluxes show a lower variance than those simulated. The occurrence of narrow regions of high flow needs to be included.