Geophysical Research Abstracts, Vol. 8, 04575, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04575

2D dual-permeability analyses of bromide field tracer experiment

H.H. Gerke (1), J. Dusek (2), T. Vogel (2), J.M. Köhne (3)

(1) Inst. Soil Landscape Research, Centre for Agricultural Landscape Research (ZALF), Müncheberg, Germany (hgerke@zalf.de/Fax: +49-33432-82280), (2) Department of Hydraulics & Hydrology, Faculty of Civil Engineering, Czech Technical University, Prague, Czech Republic, (3) Institute for Land Use, Soil Physics, University of Rostock, Germany

Preferential flow was hypothesized as important factor for chemical leaching from tile-drained agricultural fields with structured soils originating from glacial till sediments at Bokhorst experimental site. Although tile water outflow peaks could somehow be reproduced, single- porosity models failed and dual-porosity approaches were limited in explaining both, the field-scale affected tile drain leaching patterns and the plot-scale residual bromide distribution. The objective was to analyze the tile outflow and leaching patterns comparing single- and dual-domain numerical models for high and low between-domain transfer and formulation of solute boundary conditions. For the simulations, soil hydraulic and transport parameter sets of previous studies and rates of individual rainfalls were used; the partial-area irrigation on the field drainage was calculated by weighing the outflow and leaching with data from simulations representing the non-irrigated fields. The application of bromide in dissolved form with the irrigation water yielded initially larger preferential outflow concentrations than application of bromide only in the soil matrix surface layer. The mass transfer rate distribution suggests most intensive redistribution between domains near the water table and in the topsoil. The 2D dual permeability analysis suggests that the conditions at the upper boundary, near the water table, and of the field-scale mixing are affecting bromide leaching patterns in addition to mass transfer effects that were most sensitive in 1D analyses.