Geophysical Research Abstracts, Vol. 9, 10619, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10619
© European Geosciences Union 2007

Two-dimensional modelling of preferential water flow and pesticide transport from a tile-drained field.

A. Gärdenäs (1), J. Šimůnek (2), N. Jarvis (3) and M. Th. van Genuchten (4).

(1) Dept. of Soil Sciences, Swedish Univ. of Agricultural Scs, Sweden, (2) Dept. of Environmental Sciences, Univ. of California, Riverside, USA, (3) George Brown, Jr. Salinity Laboratory, Riverside, USA. (Annemieke.Gardenas@mv.slu.se, +46 18 672294)

Preferential flow through soil macropores in tile drained soils significantly increases the risk of pollution of surface water bodies by agricultural chemicals such as pesticides. The objective of this study was to compare conceptually different preferential flow and/or transport approaches for their ability to simulate water drainage and pesticide leaching to tile drains. The four approaches that were implemented into HYDRUS-2D included one equilibrium approach using modified hydraulic properties near saturation, and three non-equilibrium approaches: a mobile-immobile solute transport model, and dual-porosity and dual-permeability formulations. The model predictions were compared against measurements of drainage and pesticide concentrations made at an undulating, tile-drained field in southern Sweden (Näsbygård) during 6 weeks following spray application of the herbicide MCPA.
The dual-permeability approach most accurately simulated preferential drainage flow. The equilibrium and mobile-immobile approaches largely failed to capture the preferential flow process. The dual-porosity approach predicted too distinct and high drainage flow events. The dual-permeability and dual-porosity approaches closely captured the dynamics in measured pesticide concentrations. Both the equilibrium and mobile-immobile approaches strongly underestimated the measured MCPA leaching.
Gärdenäs et al. 2006. J. Hydrol.329. 647-660.