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Bromide transport in a sandy and a silty soil - a comparative lysimeter study

L. Schober, S.C. Iden, and W. Durner
Institut für Geoökologie,Technische Universität Braunschweig, Germany (w.durner@tu-bs.de)

The aim of this study was a comparison of bromide leaching through a silty and a sandy soil and the characterization of systematic differences in solute transport in these undisturbed soils of differing texture. The amount of seepage water and bromide concentrations in the water were measured in 5 lysimeters for each soil type for a period of 460 days. Additionally, meteorological data were measured next to the lysimeter station for this period. The water transport regime of the lysimeters was simulated by means of a numerical solution of the Richards equation using the software package HYDRUS 1D. The observed bromide transport was simulated by steady-state approximation, applying the simulation tool CXTFIT, which is implemented in the software package STANMOD, version 2.0. Analysis of the measured data showed that a correct reproduction of the water balance was possible, but required the adaptation of soil-dependent crop coefficients for the potential transpiration of Phacelia and Winter Rape. The mean bromide transport through the sandy soil could be approximately reproduced assuming a bromide uptake by plants. Observed double peaks of some of the individual breakthrough curves, however, indicated that the actual transport regime in the lysimeters was subject to local heterogeneity which cannot be covered by the effective one-dimensional transport model. Bromide transport through the silty soil showed an unexplained mass deficit of nearly 90 % of the applied bromide and the detection of a mean distinct bromide peak in seepage water after percolation of only 0.5 pore volumes. It was not possible to simulate this behaviour with an effective 1D equilibrium or nonequilibrium convection-dispersion model.