# SENSITIVITY ANALYSIS OF PHYSICAL AND CHEMICAL SOIL PROPERTIES AFFECTING FIELD-SCALE CADMIUM TRANSPORT

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Field-scale transport of reactive solutes to groundwater depends both on spatially variable physical and chemical properties of the unsaturated zone. We describe a sensitivity analysis that ranks the importance of spatially variable water flow and solute transport parameters which determine field-scale Cd flux to the groundwater. Data on the heterogeneity of water flow and solute transport parameters of a layered sandy soil were collected from a 180-m-long and 1-m-deep transect. Each soil layer was described in terms of the probability density function (pdf) of five model parameters: shape parameters ? and *n* of van Genuchten's water retention curve, saturated hydraulic conductivity $K_s$, dispersivity ? and Cd soil-water distribution coefficient $K_d$. Cd redistribution in the heterogeneous soil profile following a 100-year deposition was calculated using a Monte-Carlo simulation approach. Partial rank correlation coefficients (PRCC) were used to quantify the time-dependent effect of parameter variations on the field-scale Cd flux to groundwater. The results show that field-scale Cd flux is most sensitive to contaminant deposition rate and soil-water distribution coefficient $K_d$. Variations in saturated hydraulic conductivity $K_s$ of only the humus-rich top layers affects the maximum Cd concentration. The effect of water retention curve parameters ? and *n* on field-scale Cd flux is generally insignificant. Variations in dispersivity ? for the deeper soil layers have a significant influence on field-scale Cd flux at the beginning and at the end of the Cd breakthrough. Monte-Carlo simulations including nonlinear sorption show that nonlinearity strongly influences Cd breakthrough at the early- and end-stages of the contamination.