Modeling water flow and pesticide transport at five experimental sites in Hawaii, USA

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The field pesticide leaching experiment, conducted at five different sites in Hawaii, USA was subject to numerical modeling. The one-dimensional model, based on Richards equation for water flow and the advection-dispersion equation for solute transport was used. At each site, pressure head data and chemical concentration profiles were measured during a 16-week study period. Hydraulic parameters governing the flow of water in soils were determined independently in the laboratory; however inverse modeling was employed to reduce the differences between measured and simulated pressure heads. Laboratory-measured values of sorption distribution coefficient and half-life were used as input for the model. In an alternative scenario, the reactive transport parameters were also adjusted for improved fit with measured concentration profiles. For some pesticides, reasonable agreement between data and model predictions was difficult to obtain even for scenarios based on inverse modeling of soil water and transport parameters. The observed chemical profiles in the soil did not provide sufficient information needed for predicting the mass flux of pesticides toward the water table. Thus, for pesticides showing good match with measured concentration profiles the mass flux leaving the soil profile was evaluated by the model.