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Solute breakthrough during recurrent ponded infiltration into heterogeneous soil

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Water flow during recurrent ponded infiltration may be influenced by presence of entrapped air in heterogeneous soils. It is assumed that variations of the entrapped air volume cause changes of the water content and flow patterns, with consequences for the solute transport. The aim of this contribution is to investigate the effect of entrapped air on dispersion by means of experiments in laboratory. Two undisturbed samples of sandy loam soils were collected at the experimental sites in the Šumava Mountains and the Jizera Mountains (Czech Republic). Packed sample of fine quartz sand was used as a reference.
Recurrent ponded infiltration, conducted on each soil sample consisted of two or more infiltration runs. The same level of ponding was maintained during each infiltration run at the top of the sample. Water drained freely through the perforated plate at the bottom of the sample. First infiltration run was done into naturally dry soil while subsequent runs were conducted into wetter soil. Suction pressure heads in three heights were continuously measured by tensiometers. Water contents were monitored by TDR probes also in three heights. Outflow fluxes were recorded continuously during the experiments as well as the weight of the sample. During each infiltration run the concentration pulse of potassium bromide solution was applied at the top of the soil core during steady state flow and breakthrough curve was acquired by electrochemical in-line analysis of bromide ions in the effluent. Soil hydraulic properties were obtained by fitting the measured flux, water content and pressure data by the dual permeability model. The dispersion coefficients were determined by fitting a one-dimensional advection-dispersion equation to each breakthrough curve. Differences in the shape of the breakthrough curves obtained for individual infiltration runs will be discussed on the poster. This research has been supported by GACR 103/08/1552.