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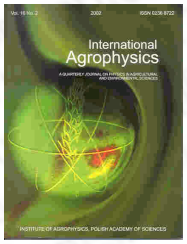

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Concurrent transport of reactive and non-reactive ions in undisturbed soil columns

(get PDF)

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abstract Advective-dispersive contaminant transport in soils continues to be a subject of extensive studies. Transport of conservative tracers, ie non-reactive ions, is mostly affected by soil physical heterogeneity that causes differences in mobility of different parts of soil solution. Transport of reactive contaminants is affected by both physical and chemical heterogeneity. The objective of this study was to observe the effects of soil structure and flow velocity on the transport of reactive calcium and sodium ions. Undisturbed southern chernozem and chestnut soil columns were used to monitor the concurrent chloride, calcium and sodium transport in slow-flow and fast-flow breakthrough experiments. Parameters of the advective-dispersive transport were estimated by fitting the advective-dispersive equation to the reduced break-through data. At low velocities, transport seemed to occur in pores having a wide range of effective diameters. Diffusion and slow transport in fine pores caused slow effluent concentration changes at the late stages of the transport. Creating fast flow resulted in a decrease in the proportion of pore space providing the initial breakthrough and in an increase in the proportion of pore space participating in the diffusion-driven mass exchange as compared with the slow-flow transport. Transport of reactive ions was affected by the flow rates in the same way as the transport of the conservative tracers. Flow rate effects on the transport were more pronounced in the chestnut soil that had poorer structure as compared with the chernozem soil.

keywords transport, reactive and non-reactive ions, soil