Geophysical Research Abstracts
Vol. 13, EGU2011-8246, 2011
EGU General Assembly 2011

Dual-continuum modeling of flow and transport processes in a shallow hillslope soil

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Numerical models utilizing the dual-continuum concept have become useful tools for modeling flow and transport in structured soils with significant preferential flow effects. These models are based on the separation of the soil matrix and preferential flow domains and the replacement of the complex interactions between the two domains by simple transfer formulae.

This presentation focuses on: (i) the basic assumptions of the dual-continuum approach, especially the interpretation of parameters controlling the interdomain transfer of water [1], solute and heat; (ii) the application of the dual-continuum model S1D to numerical analysis of soil water dynamics in a shallow hillslope soil under natural vegetation, involving transport of a natural tracer [2] and transport of heat.

[1] Vogel, T., J. Brezina, M. Dohnal, and J. Dusek. 2010. Physical and numerical coupling in dual-continuum modeling of preferential flow. Vadose Zone Journal, 9, 260–267. (doi:10.2136/vzj2009.0091)

[2] Vogel, T., M. Sanda, J. Dusek, M. Dohnal, J. Votrubova. 2010. Using oxygen-18 to study the role of preferential flow in the formation of hillslope runoff. Vadose Zone Journal, 9, 252-259. (doi:10.2136/vzj2009.0066)