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Hydrology and Earth System Sciences Discussions

Interactive comment on "Investigation of solute transport in nonstationary unsaturated flow fields" *by* C.-M. Chang and H.-D. Yeh

Anonymous Referee #1

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Dear Editor, this review represents a very puzzling and delicate situation for me. Indeed, I have already reviewed such a manuscript "two times". I must confess that I have accepted to review the manuscript for the third time since I hoped to see a "significantly revised" paper. Instead, I see no differences as compared with the previous versions. As a consequence, my evaluation (that I am attaching below) is exactly my last one.

EVALUATION Authors have investigated tracer transport in unsaturated non stationary flow fields. The topic is certainly interesting and relevant for the hydrological applications, such as quantifying contaminants arrivals at the groundwater or studying the persistence of agro-chemicals in the upper most soil. However, the paper suffers of

two severe and quite limiting shortcomings.

First, the Authors deal with “steady-transport” which implies that they assume that the transport evolution is time-invariant. This is totally unrealistic especially from an experimental point of view. Indeed, I strongly suggest the Authors to give a look in the literature with respect this issue.

Second, the Authors assume that the water content is a uniformly distributed variable although they consider a soil with spatially variable unsaturated conductivity. In other words, the Authors assume that only the soil hydraulic conductivity can be regarded as a random space function, whereas the soil retention is constant. While this has been a working assumption to investigate in a very simple manner the coupling of the medium heterogeneity with the solute transport (I am mainly referring to the first series of papers from David Russo appeared in the early 90’s), it immediately turned out that the spatial variability of the water content, and concurrently that of the driving velocity v (which is reminded to be equal to the ratio between the flux and water content), can not be neglected. As a consequence, any formulation of transport in the vadose zone should account for that.

Summarizing, although I do really appreciate the effort of the Authors toward a very challenging and quite stimulating topic, with my regret I have to reject the paper because of the above mentioned limitations.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 8885, 2012.

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