Response to the comments of Anonymous Referee #1

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.

Reply

> Previously, this manuscript was submitted to a well-known journal, herein we refer to as Journal A, for review and possible publication. According to our record, five viewers were invited to review this manuscript. Among those five reviewers, reviewer 1 did not respond. Reviewers 2-4 gave constructive and positive comments and recommended re-submission after revisions, while reviewer 5 was against the submission. We then revised the manuscript and provided our responses to those four reviews’ comments. However, the re-submission of the revised version received immediate response from the editor, who required us to submit a revision again because we missed the Ithenticate report available in the manuscript submission system. The report indicated that the manuscript had a fairly high percentage overlap with other papers and several of our previous works appeared at the top of the Ithenticate list. Such an overlap problem we think arises from the fact that the nonstaionary spectral perturbation approach, adopted in this manuscript for modeling unsaturated transport, had been used in our previous works in solving groundwater flow problems. Unfortunately, the twice-revised manuscript was rejected because the percentage of overlap was not significantly lowered and we did not provide an explanation of the overlap with our previous published materials.
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> Later on, we tried hard to reduce the problem of overlap (Similarity Index) and resubmit to Journal A along with our responses to reviewers’ comments and suggestions as a new submission. In the responses, we did explain our opinion clearly to those comments we disagreed. Unfortunately, this new submission was again rejected. The new comments from the reviewers indicated that we did not answer or address the issued appropriately given in their previous reviews. We feel that the editor of Journal A might not forward our “response to the reviewers’ comments” to the reviewers.
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> Recently, this manuscript was revised again, changed its title, and submitted to HESS. Based on the comment shown in HESSD, we suppose the Anonymous Referee #1 is the reviewer 5 for Journal A. The following are the comments given by Reviewer 5 on the manuscript submitted to Journal A and our point-to-point replies.

The paper suffers of two severe and quite limiting shortcomings.
(I) 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.

Reply

(1) Theoretical studies on the field-scale steady-state unsaturated solute transport process in heterogeneous media have been carried out in a number of papers (e.g., Russo, 1993, 1998; Harter and Zhang, 1999).

(2) The asymptotic unsaturated solute transport (steady-state unsaturated transport) occurs in regions that are at least several to tens of correlation lengths away from the source (Russo, 1996, 1998). The following sentence had been stated on page 7, line 17 in the manuscript submitted to HESS:

"It is according to previous studies (Russo, 1996, 1998) that the spreading of the field-scale plume would therefore reach its large-time behavior as long as the lateral length scale which is used to characterize the size of the solute body is much larger than the scale of heterogeneity".

(II) 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.

Reply

Thanks for the comments.

(1) It has been concluded from Russo (1998) and Harter and Zhang (1999) that the pre-asymptotic macrodispersion can be significantly large in soils with variable water content than in those assuming constant water. In the long-term travel limit, asymptotic macrodispersion is however insensitive to variability in water content (Russo, 1998; Harter and Zhang, 1999). We had added the following note on page 4, line 18 in the manuscript submitted to HESS:

"Note that it has been concluded from Russo (1998) and Harter and Zhang (1999) that the field-scale dispersion at the large time is insensitive to variability in water content compared to the variability of $\ln K_s$."

(2) Although the variability in water content is neglected in the manuscript, the effects of water content do consider in the development of statistical properties of the specific discharge and macrodispersion (please see Eqs. (11), (19), (20), and (23) - (25)).

References

Harter, T. and Zhang, D.: Water flow and solute spreading in heterogeneous soils with spatially variable water content, Water Resour. Res., 35(2), 415-426, 1999.

Russo, D.: Stochastic modeling of macrodispersion for solute transport in a heterogeneous unsaturated porous formation, Water Resour. Res., 29(1), 383-397, 1993.

Russo, D.: A note on nonergodic transport of a passive solute in partially saturated anisotropic heterogeneous porous formations, Water Resour. Res., 32(12), 3623-3628, 1996.

Russo, D.: Stochastic analysis of flow and transport in unsaturated heterogeneous porous formation: Effects of variability in water saturation, Water Resour. Res., 34(4), 569-581, 1998.