

Interactive comment on “Soil–aquifer phenomena affecting groundwater under vertisols: a review” by D. Kurtzman et al.

Anonymous Referee #2

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This paper reviews published research related to several aspects of water and solute transport to aquifers overlain by vertisols. Four main sections cover the topics of preferential flow through shrinkage cracks, processes of salinity enhancement at depth in vertisols, effects of cultivation on the flushing of salts to the aquifer under vertisols, and properties of vertisols that inhibit the transport of nitrate to the aquifer. This is a broad range of subject matter, important for agriculture, contaminant hydrology, and understanding of unsaturated zone processes. The literature selected for inclusion is pertinent to these subjects, and the organization is appropriate. The reasoning is sound, and the material is presented in an easy-to-understand way. However, the manuscript needs further development and revision before publication in HESS.

The paper does not follow a typical pattern of scientific journal articles. As a review, it

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is not very comprehensive. The articles cited represent a smaller portion of the relevant literature, and their contributions are not presented in as much detail, as normally expected for a review article. For example, a quick literature search on one of the subtopics, related to salinization, turned up at least three works that were not included but possibly worthwhile (Adams and Hanks, 1964; Rhoades et al., 1997; Ben-Hur and Assouline, 2002). The authors define and limit the scope of the review, especially in lines 15-21. A limited scope is necessary for a broad and much-studied subject as the hydrology of vertisols. However, even with the four chosen subtopics, the treatment here is less complete and less fully developed than is needed for a major hydrologic journal. It should be extensively augmented, perhaps with a further-reduced topical scope, to be a good review article in HESS.

To some extent the paper progresses toward particular conclusions, such as the inhibition of nitrate transport, and discussion of causes and implications. In this way it reads less like a review paper and more like the discussion section of a paper on a more specific topic. This manuscript could be recast as a different sort of paper. It would be possible to build a paper around the issues it concludes with, without the comprehensiveness of a review paper. But because this manuscript has very little unpublished original research, this direction would require considerable effort.

A review article on these topics with a much deeper and more detailed reach into the existing literature would be an extremely valuable contribution. In addition to a more thorough treatment of previous work, it would be very useful to make comparisons between preferential flow through cracks in vertisols and preferential flow through the macropores of other sorts of soils. I recommend that the authors pursue this course, with reductions of scope as necessary.

Following are minor comments, referenced by page and line number.

9576/21 – The section is limited to solute transport, so the heading would be better as “Preferential solute transport in vertisols.”

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9576/27-28 – What sort of VZ propagation, as contrasted with transport to groundwater?

9577/15-16 – What were the K values? How determined?

9578/17-20 – Awkward sentence. Reorganize.

9578/26 – More critical than what?

9583/22 – Citation of research from a personal communication is inappropriate for a review article.

Adams, J.E., and R.J. Hanks. 1964. Evaporation from Soil Shrinkage Cracks. Soil Science Society of America Journal 28(2):281-284. 10.2136/sssaj1964.03615995002800020043x. Ben-Hur, M., and S. Assouline. 2002. Tillage Effects on Water and Salt Distribution in a Vertisol during Effluent Irrigation and Rainfall. Agronomy Journal 94(6):1295-1304. 10.2134/agronj2002.1295. Rhoades, J.D., S.M. Lesch, S.L. Burch, J. Letey, R.D. LeMert, P.J. Shouse, J.D. Oster, and T. O'Halloran. 1997. Salt Distributions in Cracking Soils and Salt Pickup by Runoff Waters. Journal of Irrigation and Drainage Engineering 123(5):323-328. doi:10.1061/(ASCE)0733-9437(1997)123:5(323).

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