

## ***Interactive comment on “Assessment of water penetration problem in unsaturated soils” by A. Barari et al.***

**A. Barari et al.**

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Dear Editor

The authors would like to convey their appreciation of the respectful reviewers' precise comments. These comments – once properly addressed - will undoubtedly increase the potential scientific significance of the original manuscript paper. After careful, point by point consideration of the comments, the following text was prepared by the authors, while some changes were implemented into the originally submitted manuscript in order to address some of the comments implicitly. It is hoped that the revisions succeed in dealing with the concerns and doubts as raised by the kind reviewers. Firstly, Richards' equation has significant physical meaning for positive  $z$ -values. However, since there

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are some solutions given for infinite conditions in Richard's equation in the literature, i.e., for (especially for linear variations of  $k$ ), solutions for negative values of  $z$  have also been presented in the figures. The authors acknowledge the respectful reviewer's comment regarding appropriate  $z$ -values and have added a comment on this in the revised manuscript. Secondly, the authors were interested in evaluating the solutions for nonlinear variations of  $K(\theta)$ . The ones selected in the paper were simple cases which are comparable to the values used in examples available from the literature. Physical significance may be obtained through the utilization of relations from Brooks and Corey's model. The authors are currently working on experimentally obtained values of Brooks and Corey's model. Indeed, there are several typos in the paper for which the authors apologize. It is hoped that the revised paper has less mistakes than the initially submitted paper. The critical attention of the reviewer is gratefully appreciated. As for Eq. 12, it is the general form of Burgers' equation and as stated in the text, this equation results from Richards' equation when  $n=0$  and  $k=2$  are used respectively for diffusivity and conductivity in Brooks and Corey's model. Therefore,  $D$  and  $k$  are defined within the equation. Please note that there are two distinct  $\lambda$ 's in the paper. The first appears in Brooks and Corey's model and the other represents a Lagrangian multiplier in the solutions proposed. In order to clarify, the authors have decided to add an asterisk to the second  $\lambda$ . The objective of this paper was to show that the proposed methods are applicable to Richards' equation. As previously probed by other researchers (referred to throughout the paper), certain values of  $n$  and  $k$  will yield the solution of the traveling wave profile or other physical phenomena (refer to Witelski for an example case). In research currently in process, the authors are assessing the various physical problems as described by Richards' equation, through the proposed solution schemes. There are, of course, instances where physical significance is lost or is vague, and these instances need to be thoroughly analyzed and presented – this is presently under study by the authors and will be published separately in the future. Regarding the two methods used in the paper, the authors understand that there are already existing solutions available in the literature for Richards' equation. However,

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it is noteworthy that the methods used are robust, yet easy to apply. Once an initial guess is available, the linearization scheme ensures that the solution is achieved without complex mathematical operations. Moreover, compared to similar methods, the homotopy perturbation method is an asymptotic method in the sense that no convergence proof is needed for the solutions obtained, i.e., a converged solution is achieved within three iterations at the most. What is left then after is merely providing physical significance for the solution. These are merits found in homotopy perturbation method which attracted the authors in applying it to Richards' equation.

Best Regards Amin Barari Department of Civil Engineering Babol University of Technology, Babol, Iran Editor of Research Journal of Appl. Sci. Eng and Tech  
<http://www.widenetpublication.com/ebj2p.php?jid=RJASET>

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