Hydrology and Earth System Sciences

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Discussions

Interactive comment on "On the reliability of analytical models to predict solute transport in a fracture network" *by* C. Cherubini et al.

Anonymous Referee #2

The paper presents a comparison between two conceptual schemes to describe solute transport in fractured media: the Mobile/Immobile and Explicit Network Models, under a nonlinear flow regime described by the Forchheimer flow law. These models are used to interpret laboratory experiments conducted by the authors on a fractured limestone block. Results are of interest to the readership of Hydrology and Earth System Sciences. The methods are adequate, the paper subdivision into sections sound, and the figures illustrative. The paper can be shortened to some extent. I have two main concerns about the paper as it stands now. First, it heavily overlaps with Cherubini et al., HESS, 2013. The authors should make an effort to emphasize the original contribution in the present paper, both in terms of tests conducted in the lab and their theoretical interpretation. Secondly, the comparison drawn by the authors between MIM and ENM

does not touch upon the important issue of scale, most often governing the choice between continuum and discrete models; this should be appropriately discussed.

Further specific suggestions and questions are listed below.

1. The Introduction should be reviewed and summarized illustrating succinctly the relevant state-of-the-art and clarifying the authors' contribution. 2. The concentration in Eq. (8) is the solution of Eq. (7), please check consistency of symbols. 3. Please rephrase the sentence on p. 14914, lines 18-20. Are the equations dimensional or dimensionless ? 4. Please explain/rephrase the sentence on p. 14915, line 13; Kirchhoff first rule should be "The algebraic sum of the currents flowing through a junction is zero". 5. Check line 21 p. 14916 for completeness. 6. Check equation numbering on p. 14921 line 13. 7. On p. 14923 lines 8-9 the equivalent area parameter is not defined. 8. On p. 14923 line 11 Eq. (15) should be cited in place of Eq. (16); same for line 15 with Eq. (18)-(19). 9. The difference between ENM2 and ENM3 needs to be better elucidated, I suggest to avoid usage of "estimated" for both the flow test and the BTC. 10. Three different parameter configurations were tested for the ENM model; clearly the model with a larger number of parameters yields a better fit. One could compare the different models on the basis of model selection criteria. This is not requested but could be a valuable addition to this paper or to the authors' future work.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14905, 2013.