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www.hydrol-earth-syst-sci-discuss.net/10/C8106/2014/

Hydrology and Earth System Sciences
Discussions

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

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The comment was uploaded in the form of a supplement:
http://www.hydrol-earth-syst-sci-discuss.net/10/C8106/2014/hessd-10-C8106-2014-supplement.pdf

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

Answer to reviewer Zihong Zhang

The fracture network in this study is very simple (only including two flow paths), so the authors should discuss the implication of their results for an in-situ fracture network (e.g. including hundreds of fractures).

In the conclusion a long part has been added in which the issue of the scale is discussed, as far as the validity and reliability of continuum and discrete models in relation to the study scale.

1. ***The authors should rewrite this part in an order of background, scientific gap and aim, and in particular with emphasis on the poor understanding of transport behavior in fracture network under non-Darcian flow conditions. In addition, the authors should summarize and discuss the previous works in a compact way, rather than pasting their abstract here.***

The Introduction has been totally restructured

It has been arranged in the following way:

First part: evidence of non-linearity of flow in fractured aquifers and experiments related

Second part: modeling tracer test and non fickian behavior in fractured aquifers. ADE and MIM and relative performances. Experiments related

Third part: introducing the problem of poor understanding of transport behavior in fracture networks under non-Darcian flow. Few studies present up to now. Study of Qian et al (2011) about a single fracture

Fourth part: as requested, summary of the previous studies of Cherubini et al (2012, 2013) about the influence of non Darcian flow on solute transport in a fracture network

Fifth part: introducing the new study about analyzing the performances and reliabilities of MIM and ENM.

2. ***Page 14923 line 2: The sentence of 'a delay of solute transport for high flow rates' is confusing to this reviewer. A decreasing of travel time with the increasing injection flow rate means that high flow rates speed up the solute travel***

'In particular a change of slope is evident in correspondence of the injection flow rate equal to 4×10-6 m3s-1 (Cherubini et al., 2013a), which evidences a delay of solute transport for high flow rates.'

The reviewer is right. The above sentence is not clearly expressed. It has been reformulated into: 'In particular a change of slope is evident in correspondence of the injection flow rate equal to 4×10^{-6} m^3s^{-1} (Cherubini et al., 2013a), which means the setting up of a transitional flow regime; the diagram of velocity profile is flattened because of inertial forces prevailing on viscous one, as already showed by Cherubini et al (2013a). The presence of a transitional flow regime leads to a delay on solute transport with respect to the values that can be obtained under the assumption of a linear flow field.'

Fig. 1.