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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Ecohydrological particle model based on representative domains" *by* Conrad Jackisch and Erwin Zehe

Anonymous Referee #2

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The manuscript deals with an extension of the one-dimensional particle based water transport model of the same authors published in HESS in 2016 to two dimensions with diffuse water flow in the matrix. The model is based on a Langevin equation for "saturation particles" that is equivalent to the Richards equation in saturation form. It accounts for macropore flow and exchange with the soil matrix. The approach is original and provides some interesting features. However, I have some rather conceptual comments regarding the particle rules used to model different flow regimes and the conceptual use of "water particles". This is outlined below.

Comments:

p. 6/7: The authors introduce here a relaxation time to LTE for a local non-equilibrium configuration of particles. What is the correspondence of this rule in a Eulerian frame,

i.e., on the level of the Richards equation? Is it a type of first-order relaxation relation as used by Hassanizadeh and Gray for example?

Eq. (7): What is the mass of a water particle? The "water particles" are merely a conceptual picture, in fact, they correspond rather to "saturation particles". Equivalence between Richards equation in saturation form and the Langevin equation is achieved in the limit of infinite number of particles. The authors should clarify these points. Also the assignation of a particle radius (how is this radius determined) to what conceptually is a point particle is unconventional.

Section 3.3.3 How do the rules established for the Macropore-Matrix interaction correspond to the dual porosity models by Gerke and van Genuchten, for example?

Sections 4.2 and 5.1: The authors refer here to generic application tests as benchmarks. It is not clear however against which benchmarks the model results are compared, or in other words, which are the benchmarks? I could imagine a 2D numerical solution of the Richards equation, for example.

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