Geophysical Research Abstracts
Vol. 18, EGU2016-16716, 2016
EGU General Assembly 2016

A tentative of interpreting Richards' Equation in media with high heterogeneity by Filippov theory

Marco Berardi (1), Fabio Difonzo (2), Maria Clementina Caputo (1), Lorenzo De Carlo (1), and Michele Vurro (1)
(1) IRSA - CNR, Bari, Italy (marco.berardi@ba.irsa.cnr.it), (2) Georgia Tech,School of Mathematics, Atlanta, USA

The numerical solution of Richards' equation is accomplished by means of method of lines, that typically allows the spatial derivative to be approximated by some finite element scheme, in such a way that any solver for ODEs can be used. The ψ-based form is used, i.e.

$$C(\psi)\frac{\partial \psi}{\partial t} = \frac{\partial}{\partial z}\left[K(\psi)\left(\frac{\partial \psi}{\partial z} - 1\right)\right], \tag{1}$$

for suitable choices of hydraulic capacity function C and hydraulic conductivity function K.

The real challenge is modelling the infiltration at the interface between two media with high heterogeneity. The interface between two layered media with very different characteristics can be handled as a discontinuity surface. The effort is to review this case as a differential system with discontinuous right-hand side and to clarify the meaning of *crossing* and *sliding* in this context, according to Filippov theory. For our scopes, the temporal derivative has been approximated by means of a finite difference method in such a way that the numerical integration is accomplished with respect to the spatial variable z in (1): this choice is particularly convenient since it allows to have a Filippov system, with a state-dependent threshold, and to have a possible sliding behavior.