Contribution ID: **297** Type: **Oral Presentation**

Some analytical results about countercurrent capillary imbibition.

Monday, 30 May 2022 11:20 (15 minutes)

Capillary imbibition is a major process that controls many transport phenomena in porous media for many applications. In the countercurrent case, the process may be represented as the solution of a strongly non-linear diffusion equation $\partial S(x,t)/\partial t = \nabla.[D(S(x,t))\nabla S(x,t)]$ in which S(x, t) denotes the wetting fluid saturation at position x at time t. The function D(S) depends non linearly on S through an expression involving relative permeabilities and capillary pressure. D(S) vanishes as a power law near the extreme saturations, leading to a singular boundary problem that was investigated by many authors. Considering a finite block, two time regimes can be observed: a short time regime involving the Boltzmann variable x/⊠t, and a long time asymptotic regime that remains to be elucidated. We found an ansatz was proposed that yields a complete analytical determination of the spatial part of the asymptotic long time behavior of S(x, t). The corresponding flux at the boundary of the block exhibits a two regimes that may be represented as a non-linear exchange term involving the average saturation on the block, weighted by a shape factor. This feature is well-suited for setting-up a macroscopic dual porosity description.

Selected references.

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Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

In person

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