

Foundations of upscaling and hysteresis of two phase flow in heterogeneous porous media on macroscopic scales

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The standard model for multiphase flow in porous media on scales of centime The standard model for multiphase flow in porous media on scales of centimeters to hectometers shows several deficiencies when compared with experiments [2]. Its fundamental parameter functions, capillary pressure and relative permeabilities, are the central targets for upscaling. These fundamental functions are not unique due to hysteretic and dynamic effects. Residual saturations cannot be predicted but are injected as parameters into the standard model. Upscaling and hysteresis of multiphase flow require therefore to revisit the foundations of the standard model.

Recently, the standard model has been extended by distinguishing percolating and nonpercolating phases. The extended model eliminates capillary pressure and relative permeabilities as constitutive parameters and yields new targets for upscaling.

The objective of my thesis was a first study of this extended model in dynamic regimes. This study consists of analytical and numerical approaches. Within this talk I will give a survey of my thesis.