IMAGe Seminar

Institute for Mathematics Applied to Geosciences at NCAR

Multiphase Flows in Multiscale Petroleum Reservoirs

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Abstract:

We present recent developments in the modeling and numerical simulation of multiphase flows in multiscale heterogeneous petroleum reservoirs.

We first discuss the important interplay between high resolution numerical simulations and mathematical theory in the investigation of the scale-up problem for single (the tracer flow problem) and two-phase flows.
We examine these flow problems in stochastically described heterogeneous reservoirs; Monte Carlo simulations are used for a quantitative analysis of macroscopic fluid mixing.

Next we describe a new fractional-step numerical procedure for the simulation of immiscible three-phase flow in heterogeneous porous media that takes into account capillary pressure and apply it to indicate the existence of a so-called ``transitional'' wave in at least some multidimensional flows, thereby extending theoretical results for one-dimensional flows. The step procedure combines a second order, conservative central difference scheme for a pertinent system of conservation laws modeling the convective transport of the fluid phases with locally conservative mixed finite elements for the associated parabolic and elliptic problems.

Important open problems related to the body of work presented will be indicated.

Mesa Lab – Main Seminar
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1:30 pm
(Refreshments at 1:15pm)

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