

Title: Predictive Simulation Using Multi-Physics MCMCs for Porous Media Flows

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Abstract:

In forecasting flow patterns in subsurface, the characterization of the subsurface is an important step. To characterize subsurface properties we establish a statistical description of the subsurface properties that are conditioned to existing dynamic data. We use a Bayesian statistical description to reconstruct the spatial distribution of two important subsurface properties: rock permeability and porosity. In this talk we develop computationally fast and effective methods of generating MCMC chains in the Bayesian framework for the subsurface characterization. Our strategy consists of constructing a family of computationally inexpensive preconditioners based on simpler physics as well as on surrogate models such that the number of fine-grid simulations is drastically reduced in the generation MCMC chains. We assess the quality of the proposed multi-physics MCMC methods for forecasting oil production in an oil reservoir.