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Convergence Analysis of McMC Methods for Subsurface Flow Problems

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In subsurface characterization using a history matching algorithm, we reconstruct the subsurface properties, such as distributions of permeability and porosity, with a set of limited data. As a history matching algorithm, Markov chain Monte Carlo (McMC) method is effective for reconstructing permeability and porosity fields. The McMC method is serial in nature due to its Markov property. Moreover, the calculation of the likelihood information in the McMC is computationally expensive for subsurface flow problems. Running a long McMC chain for a very long period makes the method less attractive for the characterization of subsurface. In contrast, several shorter McMC chains can substantially reduce computation time and can make the framework more suitable to subsurface flows. However, the convergence of those McMC chains should be carefully studied. In this talk, we consider multiple McMC chains for a single-phase flow problem and analyze the chains for a reliable characterization.

References

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