

# **A multigrid multilevel Monte Carlo method for transport in the Darcy-Stokes system Prashant Kumar**

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## **SUMMARY**

In this talk, a multilevel Monte Carlo (MLMC) method for Uncertainty Quantification (UQ) of advection-dominated contaminant transport in a coupled Darcy-Stokes flow system will be presented. In particular, we will focus on high-dimensional epistemic uncertainty due to an unknown permeability field in the Darcy domain that is modeled as a lognormal random field. Different numerical strategies are explored for the subproblems and an optimal combination for the MLMC estimator is suggested. Specifically, we propose a monolithic multigrid algorithm to efficiently solve the steady-state Darcy-Stokes flow with a highly heterogeneous diffusion coefficient. Furthermore, we describe an Alternating Direction Implicit (ADI) based time-stepping for the fluxlimited quadratic upwinding discretization for the transport problem. Numerical experiments illustrating the performance of the multigrid MLMC method with respect to the smoothness of permeability field will be discussed in detail.

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