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Sparse grid collocation schemes for stochastic convection problems[1] NICHOLAS ZABARAS, BASKAR GANAPATHYSUBRAMANIAN, Cornell University — Stochastic Galerkin methods and Monte Carlo based sampling methods have been used to analyze stochastic convection problems. As the complexity of the problem or the number of random variables involved in describing the input uncertainties increases, these approaches become highly impractical. This is especially true in the context of realistic thermal flow problems, where uncertainties in the topology of the boundary domain, boundary flux conditions and heterogeneous physical properties usually require high dimensional random descriptors. The recently proposed Sparse grid Collocation method based on the Smolyak algorithm offers a viable alternate method for solving high dimensional stochastic partial differential equations. An extension of the collocation approach to include adaptive refinement in important dimensions is proposed. We show case the collocation based approach to efficiently solve natural convection problems involving large stochastic dimensions. Equilibrium jumps occurring due to surface roughness and heterogeneous porosity are captured. Comparison of the present method with the GPCE and Monte-Carlo methods are made.

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