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Reduced Basis Approximation for the Sparse Grid Stochastic Collocation Method

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The sparse grid stochastic collocation method is widely used for solving PDEs with random coefficients. However, when the probability space has a high dimensionality, the number of sparse girds can be large. It then becomes every inefficient to construct the collocation solution, by directly solving the discretized problems associated with stochastic realizations at all sampling points. In order to speed up the collocation process, we apply a reduced basis approximation with a greedy algorithm, which can lead to Galerkin equations with very small degrees of freedom. Numerical experiments demonstrate the satisfactory performance of this model reduction technique.