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Basis Reduction for Uncertainty Quantification – A Bi-fidelity Approach FELIX NEWBERRY, MICHAELA FARR, ALIREZA DOOSTAN, University of Colorado, Boulder — Minimization of computational cost is a ubiquitous challenge in uncertainty quantification or design space exploration of fluid mechanics simulations. A useful tool to ease the burden of solving complex systems of PDEs, which arise in such simulations, is model reduction. We present a stochastic basis reduction method in which low-fidelity samples are employed to inform the construction of a reduced basis. Approximating the high-fidelity quantities of interest in this reduced basis requires a small number of high-fidelity samples to achieve a bi-fidelity estimate. The premise of this approach is that while a low-fidelity model may be inaccurate in terms of predicting the quantities of interest, it will represent the stochastic space of the problem for an accurate bi-fidelity approximation. We then present the successful application of this algorithm in two scenarios: a lid driven cavity and an airfoil. In both cases we achieve acceptable errors for a minimal number of high-fidelity model evaluations.

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