High-Dimensionality Challenges in Uncertainty Quantification

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The application of uncertainty quantification (UQ) methods in relevant computational models is faced with high-dimensionality challenges in the representation of random variables/fields and associated integration. I will highlight these challenges in the UQ context from various angles. I will discuss the construction of reduced representations of random fields using Karhunen-Loeve expansions given both the high and low data extremes. I will also address global sensitivity analysis, as well as Bayesian compressive sensing for identification of low-dimensional representations for high-dimensional models. Finally, I will discuss high-dimensional integration challenges in both forward and inverse UQ.