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Application of Stochastic Galerkin Methods (SGM) to Uncertainty Analysis in Computational Aeroacoustics (CAA)[1] MATTHEW MCCLINTOCK, YASER KHALIGHI, GIANLUCA IACCARINO, Stanford University — In problems of CAA, uncertainties in the flow field data inherent in any turbulent flow calculation, e.g. those due to discretization errors, must be incorporated into predictions of the far-field sound. This is particularly relevant for hybrid CAA methods, which require the flow field data as input and then propagate the effects to the far-field by means of an acoustic analogy. We illustrate the application of a SGM to a canonical problem involving the acoustic far-field generated by a monopole source radiating in the vicinity of a rigid, infinite cylinder in an otherwise quiescent medium, in which the location of the source is assumed to be uncertain. The accuracy and efficiency of this method, in this context, are evaluated by comparison with a local sensitivity analysis and an equivalent Monte-Carlo type simulation, respectively. The present method is transparent to the way in which the flow field data and corresponding uncertainties are obtained, implying that further application to complex flow calculations may be feasible.

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