Uncertainty Quantification for Multiscale Kinetic Equations with Uncertain Coefficients

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Abstract: In this talk we will study the generalized polynomial chaos-stochastic Galerkin (gPC-SG) approach to kinetic equations with uncertain coefficients/inputs, and multiple time or space scales, and show that they can be made asymptotic-preserving, in the sense that the gPC-SG scheme preserves various asymptotic limits in the discrete space.

This allows the implementation of the gPC methods for these problems without numerically resolving (spatially, temporally or by gPC modes) the small scales. Rigorous analysis, based on hypocoercivity of the collision operator, will be provided for both linear transport and nonlinear kinetic equations to study the regularity and long-time behavior of the solution in the random space, and to prove that these schemes are stochastically asymptotic preserving.

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