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An Efficient Numerical Approach for Nonlinear Fokker-Planck equations DUSTIN OTTEN, PRAKASH VEDULA, University of Oklahoma — Fokker-Planck equations which are nonlinear with respect to their probability densities that occur in many nonequilibrium systems relevant to mean field interaction models, plasmas, classical fermions and bosons can be challenging to solve numerically. To address some underlying challenges in obtaining numerical solutions, we propose a quadrature based moment method for efficient and accurate determination of transient (and stationary) solutions of nonlinear Fokker-Planck equations. In this approach the distribution function is represented as a collection of Dirac delta functions with corresponding quadrature weights and locations, that are in turn determined from constraints based on evolution of generalized moments. Properties of the distribution function can be obtained by solution of transport equations for quadrature weights and locations. We will apply this computational approach to study a wide range of problems, including the Desai-Zwanzig Model (for nonlinear muscular contraction) and multivariate nonlinear Fokker-Planck equations describing classical fermions and bosons, and will also demonstrate good agreement with results obtained from Monte Carlo and other standard numerical methods.

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