

Simulations of gravitational Vlasov-Poisson equations and the study of recurrence for the discontinuous Galerkin methods

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In this talk, we present the recent work about the gravitational Vlasov-Poisson for the self-gravitating collisionless stellar systems. We compute the solutions using a high-order discontinuous Galerkin method for the Vlasov equation, and the classical representation by Green's function for the Poisson equation in the one-dimensional setting.

We study both the case of damping and Jeans instability depending on the wavenumbers, which are taken to be greater than or less than the Jeans wavenumber, respectively.

The method is shown to be stable, accurate and conservative. We report the BGK modes for the gravitational VP system and the behavior of solutions associated with these various wavenumbers. In the second part of the talk, we will consider the free streaming operator, where we performed Fourier analysis to study recurrence of the discontinuous Galerkin methods on Cartesian meshes.

This is a joint work with Irene M. Gamba and Phil Morrison.