Vlasov Equation and Violent Relaxation – The Self-Gravitating Ring Model

Tarcísio M. Rocha Filho
Instituto de Física and International Center for Condensed Matter Physics,
Universidade de Brasília, CP 04455, 70919-970 - Brasília, Brazil
Email: marciano@fis.unb.br

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Abstract

Under suitable conditions, the Vlasov equation correctly describes the dynamics of a system of $N$ particles with long-range interactions [1]. Nevertheless a zero distance divergence in the inter-particle potential may cause small deviations from the Vlasov dynamics [2]. In this talk we present results from molecular dynamics simulations and direct integration of the Vlasov equation [3] for the one-dimensional self-gravitating ring model. This model has a small softening parameter that regularizes the potential at zero distance. For sufficiently small values of the parameter, deviations of the molecular dynamics results from the solution of the corresponding Vlasov equation are observed. We also briefly discuss a modification of the Vlasov equation considering explicitly the presence of the divergence of the potential for the present model.

References

