

Numerical study of the recurrence phenomenon for the Vlasov-Poisson system on uniform finite element mesh

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Abstract In this talk, we will focus on one difficulty arising in the numerical simulation of the Vlasov-Poisson system. When using a regular grid-based solver with periodic boundary conditions, perturbations present at the initial time artificially reappear at a later time. For uniform finite-element mesh in velocity, we show that this recurrence time is actually linked to the spectral accuracy of the velocity quadrature when computing the charge density. In particular, choosing trigonometric quadrature weights optimally defers the occurrence of the recurrence phenomenon. Numerical results using the Semi-Lagrangian Discontinuous Galerkin and the Finite Volume / Finite element method confirm the analysis.

This is a work in collaboration with Michel Mehrenberger and Nhung Pham.