Contour dynamics simulation of Vlasov-Possion plasma

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We have developed a contour dynamics (CD) method for the Vlasov-Poisson system with the periodic boundary condition. The CD method is advantageous in tracking the phase-space dynamics in collisionless plasma where stretching and folding processes of the distribution function are well captured in comparison to the convenctional Vlasov or particle-in-cell approaches.
In this study, we have applied the newly developed CD code to the nonlinear Landau damping of the one-dimensional Vlasov-Poisson system, and have observed successive generation of the phase-space hall structures while preserving the topological constraint on defomation of the distribution function. The obtained results are also compared with the Vlasov simulation results to discuss advantages and/or disadvantages of the CD simulation of the Vlasov-Poisson plasma.

Keywords: plasma simulation, wave-particle interaction

