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Kinetic properties of particle-in-cell simulations compromised by Monte Carlo collisions M.M. TURNER, Dublin City University, Ireland — The particle-in-cell method with Monte Carlo collisions is frequently employed when a detailed kinetic simulation of a weakly collisional plasma is required. In such cases, one usually desires, *inter alia*, an accurate calculation of the particle distribution functions in velocity space. However, velocity space diffusion affects most, perhaps all, kinetic simulations to some degree, leading to numerical thermalization, and consequently distortion of the velocity distribution functions, among other undesirable effects. The rate of such thermalization can be considered a figure of merit for kinetic simulations. In this paper, we show that, contrary to previous assumption, the addition of Monte Carlo collisions to a particle-in-cell simulation seriously degrades certain properties of the simulation. In particular, the thermalization time can be reduced by as much as three orders of magnitude. We show that this effect makes obtaining a strictly converged simulation results difficult in many cases of practical interest.

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