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Semi-Lagrangian methods for gyrokinetic delta-f particle-in-cell turbulence simulation[1] YANG CHEN, SCOTT PARKER, University of Colorado at Boulder — It is well-known that the particle weights in the δf method continue to grow in turbulence that has apparently reached a stationary-state, due to test particle diffusion and phase-space granulation. The granulation process is eventually limited due to finite collisionality, but the distribution of particle weights at a phase-space point continues to broaden. This so-called growing weight problem has received attention in the simulation of the ETG turbulence, where long-time simulation is needed to obtain an accurate estimate of the saturated flux. Many questions arise: Does a stationary-state exist in (nearly) collisionless turbulence? Is the long-time simulation noise-dominated? Are these fine structures in the distribution caused by turbulent diffusion important? We investigate these questions by using an algorithm to reset the particle weights periodically, so that the integral of the particle weights at a phase-space location is unchanged (so is δf), but the spread of those particle weights is reduced. By adjusting the size of the phase-space grids used in the resetting scheme, the importance of various scales in the distribution will be assessed. The GEM code [2] will be used to carry out this study.

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[2]Y. Chen and S. E. Parker, J. Comp. Phys. 189 (2003) 463; J. Comp. Phys., 2006, in press

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