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Optimization of marker particle distribution by particle merging/splitting for δf PIC simulation WENJUN DENG, GUOYONG FU, Princeton Plasma Physics Laboratory — In typical δf particle-in-cell (PIC) plasma simulations, a huge number of markers are loaded everywhere in phase space. Meanwhile, for some modes, e.g., Alfvén eigenmodes in toroidal geometry, the δf mode structure mainly stays in a small portion of the phase space, which is usually the resonant regions, and δf is nearly zero elsewhere. Markers in those $\delta f \approx 0$ regions can be reduced while retaining the same accuracy, and doing so can save a lot of computing time. Marker merging and splitting methods are being developed in this work to achieve this time saving effect. During simulation, the splitting method splits each marker into multiple markers to increase phase space resolution in the main δf mode structure, while the merging method merges multiple markers into one in the $\delta f \approx 0$ regions to save computing time. This method is applied to a 1D electrostatic Vlasov-Poisson code and performed on both two-stream instability and bump-on-tail instability. The merging method can halve the overall number of markers while retaining the same accuracy. The splitting method is still under development. These two methods are also being implemented in the hybrid MHD gyrokinetic code M3D-K.

Wenjun Deng
Princeton Plasma Physics Laboratory

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