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A Hybrid Monte Carlo Method for Coulomb Collisions[1] RUSSEL CAFLISCH, UCLA, BRUCE COHEN, LLNL, GIACOMO DIMARCO, U. Ferrara , ANDRIS DIMITS, LLNL, YANGHONG HUANG, RICHARD WANG, UCLA —
This presentation describes a hybrid computational method for Coulomb collisions in a plasma that combines a Monte Carlo particle simulation and a fluid dynamic solver in a single uniform method throughout phase space. The new method is based on a hybrid representation of the velocity distribution function $f(v)$, as a combination of a Maxwellian equilibrium $M(v)$ and a collection of discrete particles $g(v)$. The Maxwellian M evolves in space and time through fluid-like equations, and the particles in g convect and collide through Nanbu's Monte Carlo particle method (PRE 1997). Interactions between M and g are represented by a thermalization process that removes particles from g and includes them in M and a dethermalization process that samples particles from M and inserts them into g. As test cases for the hybrid method, we have used relaxation of an anisotropic Maxwellian and evolution of a bump-on-tail.

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