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Efficient Hybrid Methods for the Simulation of Plasmas with Coulomb Collisions[1] M.S. ROSIN, R.E. CAFLISCH, UCLA, A.M. DIMITS, B.I. COHEN, LLNL — Hybrid algorithms can achieve high efficiency for the kinetic simulation of plasmas with Coulomb collisions at moderately small Knudsen number by combining a fluid solver to evolve the mostly dominant Maxwellian part of the distribution function, and particle-in-cell and Monte-Carlo collision implementations to evolve the non-Maxwellian part of the distribution function. Various choices are possible. Binary or Langevin-equation-based Monte-Carlo collisions may be used. The kinetic component may be treated using a "full" (fixed-weight) or delta-f (variable-weight) particle-in-cell (PIC) method. The implementation of physical conservation laws may involve either shifting and rescaling the particle velocities or changes to the particle weights ("delta-f" sources). This presentation will examine the performance of hybrid simulation schemes and the relative benefits of these various options on relevant kinetic test problems including isotropization, heating, injection, sheath and transport problems.

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