Abstract Submitted
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δf simulation of non-local neoclassical effects in tokamaks using Constants of Motion background distribution function. R.A. KOLESNIKOV, W.X. WANG, PPPL, F.L. HINTON, UCSD, W.M. TANG, W.W. LEE, PPPL — While standard δf simulation uses a local shifted Maxwellian for a background distribution, true collisionless neoclassical equilibrium distribution is a function of three Constants of Motion (CoM). The difference between CoM and local Maxwellian is due to particle orbit width, which can become very large for fast ions near sharp pressure gradients. Taking the CoM function as equilibrium in PIC simulations eliminates the large orbit contribution to the rapid growth of the particle weights. We illustrate this by simulating the radial transport using GTC-NEO code [2] which has been modified to support the new equilibrium. New challenges faced by the CoM based simulation include solving moment equations, implementing ion-ion collision operator and particle loading. We introduce deterministic collision oprator between CoM functions together with test-particle and field- paticle opeartors to simulate collisions. In presence of ion density, temperature and parallel flow gradients the new CoM based simulation produces much smaller particle weights compared to the local Maxwellian based results. We present results from the simulation of a system with sharp gradients as well as in presence of impurities using the new algorithm. [1] F. L. Hinton, TTF (2008). [2] W. X. Wang et. al., Physics of Plasmas 13, 082501 (2006).

R. A. Kolesnikov
PPPL

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