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Gyrokinetic particle characterization of transport in tokamaks[1]
JEAN-NOEL LEBOEUF, JNL Scientific, VIKTOR DECYK, UCLA, DAVID NEWMAN, UAF, RAUL SANCHEZ, ORNL — We are characterizing transport using particles in gyrokinetic simulations of ion channel turbulence in tokamaks with the 3D global toroidal nonlinear parallel particle-in-cell UCAN code. Tracking of simulation particles through space and time and especially multiple processors, including restarts with different numbers of tagged particles, is now in production mode. The particle data thus tracked and stored comprise the positions and velocities for every tracked particle at each chosen instant of time. These particle data are analyzed with tools previously applied to passive marker particles in fluid turbulence simulations. The data from electrostatic UCAN simulations with adiabatic electrons and gyrokinetic ions show that radial transport is altered fundamentally by the presence of a sheared poloidal zonal flow, changing from diffusive to anti-correlated and subdiffusive. Convergence studies with both particle number and grid size confirm the standard resolution results. To facilitate these resource-intensive calculations two-dimensional domain decomposition is being implemented in UCAN.

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