Abstract Submitted
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Delta-f to Full-F Particle-In-Cell Simulation of Microturbulence in Tokamaks[1] W.W. LEE, S. ETHIER, Princeton Plasma Physics Laboratory, Princeton, NJ, J. GANESH, Institute for Plasma Research, Bhat, India — The use of a generalized weight-based particle simulation scheme suitable for simulating tokamak turbulence is reported. The scheme, which is a generalization of the perturbed distribution schemes developed earlier for PIC simulations, is now capable of handling the full distribution of the particles in the simulation. Specifically, we can simulate both the delta-f and the full-F particles within the same code. Its development [1] is based on the concept of multiscale expansion, which separates the scale lengths of the background inhomogeneity from those associated with the perturbed distributions, and on the fact that the intrinsic particle noise level is troublesome only in the beginning of the simulation, where the signal to noise ratio is low. But, when the signal to noise ratio becomes higher afterwards, we can gradually turn on the the full-F particles without interfering with the ensuing fluctuations. We will report on the simulation studies using GTC [2] for the ion temperature gradient (ITG) driven instabilities in the presence of zonal flows. The physics of steady state transport in tokamaks will be discussed.

[1] W. W. Lee, T. G. Jenkins and S. Ethier, Comp. Phys. Comm. 182, 564 (2011).
[2] Z. Lin, T. S. Hahm, W. W. Lee, W. M. Tang, R. White Science 281, 1835 (1998).

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