Abstract Submitted
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The direct method for gyrokinetic simulation with kinetic electrons and magnetic perturbations YANG CHEN, SCOTT PARKER, University of Colorado at Boulder — Over the past fifteen years we have developed two Particle-in-Cell (PIC) algorithms for gyrokinetic simulation of tokamak plasmas with kinetic electrons and magnetic perturbations. The first, called the Direct Method, uses an adjustable split-weight scheme and a control-variate method to properly handle the "cancellation problem". The second algorithm is the Closure Scheme, which solves the vorticity equation and the generalized Ohm's law, closing with an electron pressure calculated from delta-f PIC electrons. The extention of the Direct Method to handle low-n (long wavelength) fluctuations will be discussed. We will explain the algorithm, describe the low-n geometrical implementation, and present numerical observations in applying the Direct Method to various waves, including shear Alfven waves, ITGs and the $n = 1$ tearing mode. These observations suggest that, whereas the cancellation problem appears to be unavoidable and can be solved by the controlled variate method, the split-weight scheme is primarily a technique for numerical stability, and can probably be replaced by other techniques (such as the mixed-variable approach [1].

[1]Mishchenko et. al. Phys. Plasmas 21, 092110 (2014)

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