Abstract Submitted
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Guiding Center Theory for Large Electric Field Gradients[1] ILON JOSEPH, Lawrence Livermore Natl Lab — It is important to understand the physics of edge transport barriers, yet the steep gradient region of the pedestal and scrape-off layer of a tokamak challenge the validity of standard guiding center and gyrokinetic theory. In this work, the guiding center equations for magnetized particles are extended to the regime of large electric field gradients perpendicular to the magnetic field. Shear in the electric field modifies the oscillation frequency and causes the particle orbits to deform from circular to elliptical trajectories. In turn, the elliptical orbits modify the polarization and magnetization of the particle. In order to retain a good adiabatic invariant, there can only be strong dependence on a single coordinate at lowest order, so that resonances do not generate chaotic motion that destroys the invariant. In this case, the drift equations are modified, but retain a mathematical form that is similar to the unsheared case and can be used to develop a more accurate gyrokinetic theory in a relatively straightforward manner. It is of great interest to continue exploring the physical implications of the extended ordering and its convergence for strong field variations.

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