Abstract Submitted
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Instabilities and transport in ExB plasma discharges[1] A. SMOLYAKOV, O. CHAPURIN, M. JIMENEZ, S. JANHUNEN, O. KOSHKAROV, XU LIANG, V. MORIN, I. ROMADANOV, University of Saskatchewan, D. SYDORENKO, University of Alberta, I. KAGANOVICH, Y. RAITSES, Princeton Plasma Physics Laboratory — We present a nonlinear fluid model describing fluctuations and instabilities in partially magnetized plasma discharge supported by the ExB electron current. This model describes several fundamental modes of partially magnetized plasma: ion sound mode, lower-hybrid mode and anti-drift mode due to plasma density gradient. Density and magnetic field gradients and the electron current result in complex coupling of various modes destabilized by the interplay of ExB drift, ion beam velocity, density and magnetic field gradients, collisions and ionization. The nonlinear simulations have been performed to investigate the nonlinear saturation of the instabilities and resulting nonlinear transport. The simulations demonstrate highly intermittent electron current with magnitudes generally consistent with typical experimental parameters. It is shown that while the most unstable are small scale modes, the dominant contribution to the anomalous transport is provided by the large scale modes. The nonlinear energy transfer to large scale modes is demonstrated in nonlinear simulations. Effects of the parallel electron dynamics and sheath boundary conditions is studied. The role of electron cyclotron instabilities detected in PIC simulations is also discussed.

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