Gyrokinetic particle simulation of drift-compressional modes in dipole geometry

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Abstract

Gyrokinetic particle simulation of low frequency compressional modes has been developed using flux coordinates in the global magnetic dipole geometry. The compressional component is formulated in a scalar form of the parallel magnetic perturbation and the gyro-averaging is performed explicitly in the configuration space. A reduced gyrokinetic model, in which the compressional perturbations are decoupled from the shear Alfvén and electrostatic perturbations, has been implemented. Linear simulation results have been verified using a numerical Nyquist analysis of the dispersion relation in the slab limit. Global simulations of unstable drift-compressional modes in the dipole geometry with kinetic ions find that finite Larmor radius (FLR) effects reduce the linear growth rate significantly but change little the real frequency. Global eigenmode structures show that the modes are even along the equilibrium magnetic field and broadened by the FLR effects in the radial direction. Radial propagation away from the region of excitation is observed.

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