Abstract Submitted
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2D Particle-In-Cell simulations of the electron-cyclotron instability and associated anomalous transport in Hall-Effect Thrusters.[1] VIVIEN CROES, TREVOR LAFLEUR, Ecole Polytechnique, ZDENEK BONAVENTURA, Masarykova Univerzita, FRANOIS PCHEREAU, CERFACS, ANNE BOURDON, PASCAL CHABERT, Ecole Polytechnique — This work studies the electron-cyclotron instability in Hall-Effect Thrusters (HETs) using a 2D Particle-In-Cell (PIC) simulation. The simulation is configured with a Cartesian coordinate system where a magnetic field, $B_{\mathbf{0}}$, is aligned along the X-axis (radial direction, including absorbing walls), a constant electric field, $E_{\mathbf{0}}$, along the Z-axis (axial direction, perpendicular to simulation plane), and the $E_{\mathbf{0}}$x$B_{\mathbf{0}}$ direction along the Y-axis (O direction, with periodic boundaries). Although for low plasma densities classical electron-neutral collisions theory describes well electron transport, at sufficiently high densities (as measured in HETs) a strong instability can be observed that enhances the electron mobility, even in the absence of collisions. The instability generates high frequency (˜MHz) and short wavelength (˜mm) fluctuations in both the electric field and charged particle densities. We investigate the correlation between these fluctuations and their role with anomalous electron transport; complementing previous 1D simulations. Plasma is self-consistently heated by the instability, but since the latter does not reach saturation in an infinitely long 2D system, saturation is achieved through implementation of a finite axial length that models convection in $E_{\mathbf{0}}$ direction.

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