Qeios

Peer Review

Review of: "Drift-Cyclotron Loss-Cone Instability in 3D Simulations of a Sloshing-Ion Simple Mirror"

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This work presents a numerical simulation of DCLC relevant to mirror confinement devices. Their work and results are clearly described, but I do have a few comments and questions as follows:

Section 3.1: The transverse magnetic fluctuations ... have small amplitudes ... We therefore neglect electromagnetic fluctuations ...

Section 3.2: The mode spectra ... suggest a partial decoupling of density and electric fluctuations ...

→ Decoupling of density and electric fluctuations seems to suggest that the modes are not entirely electrostatic after all, which somewhat contradicts the statement in Sec. 3.1. Could the Sec. 3.2 paragraph be improved to clarify the implications of the observed partially electromagnetic nature of the modes?

Section 3.2: The fluctuations have k_parallel << k_perp ... which we checked by plotting ... (not shown).

→ It would be better to either show the plot or quote some representative values of k_parallel and k_perp.

Section 3.2: We interpret Fourier power at omega < 0 as a high-omega signal that is aliased ...

→ Does this mean that the time resolution of the simulation is not sufficient? Can the solution be considered converged if the time step is too large to resolve the highest frequency modes excited?

Figure 6

→ The phase velocity of the observed spectra is greater than the ion diamagnetic velocity, whereas the DCLC dispersion is slower. In terms of Rm dependence, DCLC dispersion slows down, if anything, from R_m=20 to R_m 41, but simulated spectra speed up. Possible causes of disagreement between the DCLC dispersion and the simulated spectra should be stated. Could the aliasing in omega be a problem?

Figure 8

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→ This means that the particle confinement time ≠ diffusion time. What is the cause of the discrepancy? This is also a problem for the concluding remark that says “particle losses are due to collisionless v_perp scattering”.

Declarations

Potential competing interests: No potential competing interests to declare.