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Effects of electron dynamics on kinetic geodesic acoustic mode in tokamak plasmas

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Abstract

Effects of electron dynamics on kinetic geodesic acoustic modes are numerically studied in tokamak plasmas. The finite Larmor radius and finite orbit width of the ions are all taken into account. Systematic harmonic and ordering analysis is performed in the limit $(k\rho_i)^2 \ll 1$ with k and ρ_i being the radial wave vector and ion Larmor radius, respectively, for collisionless damping of the modes. It is found that the effects of electron parallel dynamics on the modes are negligible when safety factor $q \leqslant 2.0$ whereas the damping is enhanced significantly when $q \geqslant 3.0$ for which almost all the experimental studies on the modes are performed and the residual damping rate is crucial for driving and saturation of the modes.

(Some figures in this article are in colour only in the electronic version)