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Kinetically modified parametric instabilities of circularly-polarizedAlfven waves: Ion kinetic effects

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Parametric instabilities of parallel propagating, circularly polarized Alfven waves in uniform back ground plasma is studied. We derive a kinetic dispersion relation of parametric instabilities of these waves, which includes kinetic perturbations in the longitudinal direction (Landau damping) using a one-dimensional Vlasov equation for ions, and the Hall effect with the generalized Ohm's law (electrons are treated as massless fluid). The dispersion relation obtained from this model agree well with similar calculations in the past, suggesting that the ion kinetic effects in the longitudinal direction play essential roles in the parametric instabilities of Alfven waves when ion beta is relatively small (in the case that the kinetic effects behave passively to the fluid dynamics). Furthermore, we confirm that kinetic parametric instabilities exist in the case of a very small wave number, and that these instabilities are sensitive to ion temperatures.