Effects of the equilibrium velocity distribution function with the apparent temperature on nonlinear evolution of Alfven waves

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Finite amplitude Alfvenic fluctuations are ubiquitously observed in the solar wind plasma. When we model the low-frequency phenomena of the solar wind plasma using one-fluid magnetohydro-dynamic (MHD) system, the fluctuations and the non-equilibrium components of ions are mixed into the pressure tensor (e.g., Chen et al, 770, 125 (2013); Nariyuki et al, POP, 22, 124502 (2015)). It is noteworthy that the local equilibrium velocity distribution function in the one-fluid MHD system can include the effects of the fluctuations as the apparent temperature. In the present study, nonlinear evolution of Alfven waves with the background (equilibrium) VDF including the apparent temperature is discussed by using the classical theoretical method such as the reductive perturbation method. If the isotropic equilibrium VDF is assumed, the apparent temperature can appear as the linear term in the triple-degenerated derivative nonlinear Schrodinger (TDNLS) system. The relationship between the apparent temperature and the Reynolds stress is also discussed.

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