

Influence of kappa distributions on the sweep rate of whistler mode chorus waves

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Kappa particle distributions typically possess a high-energy power-law tail characterized by a spectral index κ . Here we consider the bi-kappa and kappa-loss-cone distributions. The influence of kappa distributions on the linear growth rate of whistler-mode waves is mediated by the electron anisotropy. The linear growth rate corresponding to kappa distributions (for $\kappa=2$) exceeds that for a bi-Maxwellian distribution for electron anisotropies less than a critical value; for anisotropies greater than the critical value the opposite applies. The influence of kappa distributions on the threshold wave amplitude for nonlinear growth depends on the wave frequency, the electron anisotropy and the temperature of the (hot) energetic electrons that generate the waves. We construct time profiles of the amplitude and frequency of chorus wave elements for various sets of parameters. We examine how the sweep (chirp) rate of the waves depends on the kappa index. Nonlinear growth of whistler mode waves can be enhanced or inhibited by kappa distributions, dependent on the values of the parameters of the background plasma and the properties of the injected energetic electron population that generates the waves.

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