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**Low Frequency Electrostatic Waves in Inhomogeneous Plasma Modeled by Kappa Distributions** BAMANDAS BASU, Air Force Research Laboratory — Linear dispersion relations for electrostatic waves in inhomogeneous, current-carrying, anisotropic plasma, where the equilibrium particle velocity distributions are modeled by various Lorentzian (kappa) distributions, are presented. Spatial inhomogeneity includes density gradient, temperature gradients and gradient (shear) in the parallel flow velocity associated with the current. Special attention is given to the low frequency (lower than ion cyclotron frequency) and long perpendicular wavelength (longer than ion gyroradius) modes. Specifically, stability properties of drift waves, current-driven ion-acoustic waves in the presence of velocity shear, velocity shear-driven ion-acoustic modes, and ion temperature gradient-driven modes are studied in details. Growth rates of drift waves and current-driven ion-acoustic waves in the presence of velocity shear are reduced from their values for bi-Maxwellian distribution due to larger ion damping rates associated with kappa distributions. Consequently, the excitation conditions for these two instabilities become more stringent in the case of kappa distributions. Growth rates of velocity shear-driven ion-acoustic modes and ion temperature gradient-driven modes are also reduced from their values for bi-Maxwellian distribution as a consequence of the reduced adiabatic response of the electrons to the perturbed electrostatic potential.

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