Spontaneous whistler-cyclotron fluctuations of thermal and non-thermal electron distributions.

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Observed particle distributions in space plasmas usually exhibit a variety of non-equilibrium features in the form of temperature anisotropies, suprathermal tails, field aligned beams, etc. The departure from thermal equilibrium provides a source for spontaneous emissions of electromagnetic fluctuations, such as whistler fluctuations at the electron scales. Analysis of these fluctuations provides relevant information about the plasma state and its macroscopic properties. Here we present a comparative analysis of spontaneous fluctuations in plasmas composed by thermal and non-thermal electron distributions. We compare 1.5D PIC simulations of a finite temperature isotropic magnetized electron–proton plasma modeled with Maxwellian and different kappa velocity distributions. Our results suggest a strong dependence between the shape of the velocity distribution function and the spontaneous magnetic fluctuations wave spectrum. This feature may be used as a proxy to identify the nature of electron populations in space plasmas at locations where direct in-situ measurements of particle fluxes are not available.