Geophysical Research Abstracts
Vol. 20, EGU2018-8891, 2018
EGU General Assembly 2018


# Evolution of supra-thermal ion distributions and its relation to spontaneous electromagnetic fluctuations

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Observed particle distributions in space plasmas usually exhibit a variety of non-equilibrium features in the form of temperature anisotropies, supra-thermal tails, field aligned beams, etc. The departure from thermal equilibrium provides a source for spontaneous emissions of electromagnetic fluctuations, such as Alfvénic fluctuations at the ion 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 ion distributions. We compare 2.5D hybrid simulations of a finite temperature isotropic magnetized electron–proton plasma modeled with bi-Maxwellian and 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 ion populations in space plasmas at locations where high resolution particle instruments are not available.