From observational evidence to a consistent theory of suprathermal populations in the solar wind and terrestrial magnetosphere

Marian Lazar (1), Horst Fichtner (1), Stefaan Poedts (2), Shaaban Mohammed Shaaban (2), and Viviane Pierrard (3)

(1) Theoretische Physik IV, Ruhr-University Bochum, D-44780 Bochum, Germa, (2) KU Leuven, Centre for mathematical Plasma-Astrophysics, Belgium (s.m.shaaban88@gmail.com), (3) Royal Belgian Institute for Space Aeronomy, B-1180 Brussels, Belgium

Suprathermal populations present in space plasmas (e.g., solar wind, planetary magnetospheres) are usually described by the Kappa (or κ-) distribution functions. Standard Maxwellian model cannot reproduce the high-energy tails of the observed distributions, but it is usually invoked to describe the bulk (core) of the observed distributions, and as a contrasting limit ($\kappa \rightarrow \infty$) to emphasize the effects of suprathermal particles. However, this limit must be chosen with caution, otherwise, as in the vast majority of the existing studies, the comparison does not have the expected relevance. Only predictions based a realistic interpretation can be confirmed by the observations.