

Abstract Submitted
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Mechanisms generating kappa distributions in plasmas.¹ GEORGIOS LIVADIOTIS, Southwest Research Institute — Kappa distributions have become increasingly widespread across plasma physics. Publication records reveal an exponential growth of papers relevant to kappa distributions. However, the vast majority of publications refer to statistical fits and applications of these distributions in plasmas. Up to date, there is no systematic analysis on the origin of kappa distributions, that is, the mechanisms that can generate kappa distributions in plasmas. The general scheme that characterizes these mechanisms is composed of two parts: (1) the generation of local correlations among particles, and (2) the thermalization, that is, the stabilization of the particle system into stationary states described by kappa distributions or combinations thereof. Several mechanisms are known in the literature, each characterized by a specific relationship between the plasma properties. These relationships serve as conditions that need to be fulfilled for the corresponding mechanisms to be applied in the plasma. Using these relationships, we identify three mechanisms that generate kappa distributions in the solar wind plasma: (i) Debye shielding, (ii) magnetic field binding, and (iii) thermal fluctuations, each one prevailing in different scales of the solar wind plasma and magnetic field properties.

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