Markov features and Kappa distribution of magnetic field fluctuations at ion/sub-ion scales

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Magnetic field fluctuations at ion/sub-ion scales show a power law spectral density which suggests the occurrence of a novel turbulent regime. However, in this domain - as clearly discussed in several papers - the scaling features of magnetic field fluctuations are mainly mono-fractal (globally scale-invariant). This point seems to suggest that strong turbulence could not be at the basis of this spectral features. Here, we investigate the Markovian nature of fluctuations at these ion/sub-ion scales recovering some information on the nature of the scale-to-scale coupling in this domain. Furthermore, we show how the shape of the PDFs of magnetic field fluctuations can be derived from the stationary solution of the Fokker-Planck equation of the scale-to-scale coupling and that they are isomorphic to a Kappa distribution. A discussion of these findings in the framework of the small-scale plasma dynamics is presented.