Log-amplitude statistics of non-Gaussian fluctuations

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In the study of hydrodynamic turbulence and nonequilibrium systems [1, 2, 3, 4, 5, 6], it has been demonstrated that the non-Gaussian probability density functions are often effectively described by a superposition of Gaussian distributions with fluctuating variances. Based on this framework we propose a general method to characterize non-Gaussian fluctuations. In our method, we assume that an observed time series can be described by multiplication of Gaussian and amplitude random variables, and estimate the statistical property of the log-amplitude fluctuations. By analyzing random cascade-type multiplicative processes and superstatistical non-Gaussain models, we demonstrate the versatility of our method that can provide the detailed characterization of a wide range of non-Gaussian fluctuations including turbulence statistics [1] and superstatistics [7].

Keywords
non-Gaussian probability density function, intermittency, turbulence, superstatistics

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