Nonlinear Sciences > Adaptation and Self-Organizing Systems

1/f noise from nonlinear stochastic differential equations

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We consider a class of nonlinear stochastic differential equations, giving the power-law behavior of the power spectral density in any desirably wide range of frequency. Such equations were obtained starting from the point process models of 1/f^b noise. In this article the power-law behavior of spectrum is derived directly from the stochastic differential equations, without using the point process models. The analysis reveals that the power spectrum may be represented as a sum of the Lorentzian spectra. Such a derivation provides additional justification of equations, expands the class of equations generating 1/f^b noise, and provides further insights into the origin of 1/f^b noise.

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