



Multifractal analysis and simulation of multifractal random walks

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Multifractal time series, characterized by a scale invariance and large fluctuations at all scales, are found in many fields of natural and applied sciences. They are found i.e. in many geophysical fields, such as atmospheric and oceanic turbulence, hydrology, earth sciences. Here we consider a quite general type of multifractal time series, called multifractal random walk, as non stationary stochastic processes with intermittent stationary increments. We first quickly recall how such time series can be analyzed and characterized, using structure functions and arbitrary order Hilbert spectral analysis.

We then discuss the simulation approach. The main object is to provide a stochastic process generating time series having the same multiscale properties. We review recent works on this topic, and provide stochastic simulations in order to verify the theoretical predictions. In the lognormal framework we provide a $h - \mu$ plane expressing the scale invariant properties of these simulations. The theoretical plane is compared to simulation results.