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A log-FARIMA truncated model generating discrete time multifractal time series

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Many geophysical time series display high intensity fluctuations possessing scaling properties and long-range correlations. Such processes have often been modelled using correlated discrete time stochastic processes such as Farima (discrete-time fractional ARMA). On the other hand, other modelling approaches involve stochastic multifractals. Here we explore a link between these two families.

We consider a discrete time stochastic process as the exponential of a finite moving average with respect to an α-stable noise. The moving average coefficients are chosen to have a logarithmic divergence of the cumulant generating function. We show that this process has multifractal properties belonging to the log-stable multifractal family. We show how this can be used to sequentially generate realistic multifractal time series. We explore also the predictability properties of such process.

We finally discuss the possible applications of such modellling, in fields such as rainfall, turbulence, population dynamics.