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Approximation of 1D multifractal random measures by integrated Volterra processes

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Multifractal random measures, and in particular the one arising from the theory of Gaussian multiplicative chaos, are known to model the intermittency phenomenon in turbulence. In the Lagrangian setting, the latter can be approximated by an integrated Riemann-Liouville fractional Brownian motion when the Hurst parameter goes to zero. Using the functional Itô formula and the path-dependent Kolmogorov equation, we analyse the sensitivity with respect to the kernel of integrated Volterra processes, and we demonstrate that multifractal random measures may be weakly approximated by integrated sums of Ornstein–Uhlenbeck processes with an exponential rate of convergence.

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