# Spontaneous stochasticity in the presence of intermittency

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Spontaneous stochasticity is a modern paradigm for turbulent transport at infinite Reynolds numbers. It suggests that tracer particles advected by rough turbulent flows and subject to additional thermal noise, remain non-deterministic in the limit where the random input, namely the thermal noise, vanishes. The theory is fully substantiated for Kraichnan flows, which constitute minimalistic surrogates of turbulence, and are prescribed as white-in-time, and rough-in-space fractional Gaussian random field.

Here, we address the fate of spontaneous stochasticity in the presence of intermittency, characterized by lognormal multifractal scaling, as usually encountered in turbulence studies. In this setting, one expects the presence of even the tinyest amount of multifractality to drastically enhance spontaneous stochasticity, as multifractal flows are rougher then their Gaussian counterpart.

The present study invalidates this hypothesis by addressing transport within a unidimensional multifractal random environment, characterized by an intermittency level $\alpha$. These intermittent Kraichnan flows are Markovian versions of random turbulent models recently proposed in the turbulent literature[1], which use as essential building blocks the theory of Gaussian multiplicative chaos. Using systematic Monte-Carlo simulations, we show that intermittency has in fact no effect on two-particle separation. We however evidence Lagrangian signatures of the Eulerian intermittency at the level of multi-point statistics, for example when monitoring the statistics of 3-point Lagrangian clusters, and discuss their universality.

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[1] Reneuve and Chevillard, *Physical Review Letters* **125**, 014502 (2020).