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Intermittency for the stochastic wave and heat equations with fractional noise in time

Stochastic partial differential equations (SPDEs) are mathematical objects that are used for modeling the behaviour of physical phenomena which evolve simultaneously in space and time, and are subject to random perturbations. A key component of an SPDE which determines the properties of the solution is the underlying noise process. An important problem is to study the impact of the noise on the behavior of the solution. In the study of SPDEs using the random field approach, the noise is typically given by a generalization of the Brownian motion, called the space-time white noise. In this talk, we consider the stochastic heat and wave equations driven by a Gaussian noise which is homogeneous in space and behaves in time like a fractional Brownian motion with index $H > 1/2$. We study a property of the solution $u(t,x)$ called intermittency. This property was introduced by physicists as a measure for describing the asymptotic behaviour of the moments of $u(t,x)$ as $t \to \infty$. Roughly speaking, u is "weakly intermittent" if the moments of $u(t,x)$ grow as $\exp(ct)$ for some $c > 0$. It is known that the solution of the heat (or wave) equation driven by space-time white noise is weakly intermittent. We show that when the noise is fractional in time and homogeneous in space, the solution u is "weakly ρ-intermittent", in the sense that the moments of $u(t,x)$ grow as $\exp(ct^{\rho})$, where $\rho > 0$ depends on the parameters of the noise.
This talk is based on joint work with Daniel Conus (Lehigh University).