Seminar of Probability and Stochastic Process

Thursday, 16th December, from 11h15 to 12h15
MAA 112, EPFL, Ecublens

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On the chaotic character of the stochastic heat equation, before the onset of intermitttency

Abstract:

We consider a nonlinear stochastic heat heat equation $\partial_t u = \frac{1}{2}\,\partial_{xx} u + \sigma(u)\partial_{xt} W$, where $\partial_{xt} W$ denotes space-time white noise and $\sigma : \mathbb{R} \to \mathbb{R}$ is Lipschitz continuous. We establish that, at every fixed time $t > 0$, the global behavior of the solution depends in a critical manner on the structure of the initial function u_0. Under suitable technical conditions on u_0 and σ, $\sup_{|x|\le R} u_t(x)$ remains bounded in R when u_0 has compact support, whereas with probability one, $\sup_{|x|\le R} u_t(x) \ge \text{const} \cdot (\log R)^{1/6}$ as $R \to \infty$ when u_0 is bounded uniformly away from zero. The mentioned sensitivity to the initial data of the stochastic heat equation is a way to state that the solution to the stochastic heat equation is chaotic at fixed times, well before the onset of intermittency.

This is a joint work with Davar Khoshnevisan and Mathew Joseph, University of Utah.

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