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The stochastic heat equation with fractional-colored noise

We consider the stochastic heat equation $u_t - \Delta u = \dot{B}$ in $(0,T) \times R^d$, with additive noise. The noise $\dot{B}$ is a Gaussian process, which is fractional in time, with Hurst index $H \in (1/2, 1)$, and colored in space, with spatial covariance kernel f. Our main result gives the necessary and sufficient condition for the existence of the solution. When f is the Riesz or the Bessel kernel of order α, this condition is $H > (d - \alpha)/4$. This is a relaxation of the condition $H > d/4$ encountered when the noise is white in space. When f is the heat or the Poisson kernel, the solution exists for any d and H. The case of the equation with multiplicative noise is examined in the second part of the talk.

Based on joint work with Ciprian Tudor.