Linear stochastic PDEs with fractional noise

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Differential equations with stochastic perturbations that are not necessarily of white noise type have been extensively studied in recent years. One of the most interesting examples is the case of fractional noise that is a formal derivative of the so-called Fractional Brownian Motion (fBm), when the driving stochastic process is a Gaussian process with memory which still preserves certain properties of the standard Brownian motion, e.g. unboundedness of the total variation of sample paths. These properties does not allow integration of the equations neither in the standard Lebesgue-Stieltjes sense nor in the stochastic sense (since (fBm) is not a semimartingale).

The aim of the talk is to present some basic results on linear stochastic evolution equations with additive fractional noise where the driving process is a cylindrical fractional Brownian motion. Recalling the basic concept of the theory (in particular, stochastic integration w.r.t. (fBm)) we present simple existence and regularity results and give several examples. Some results on stochastic bilinear evolution equations driven by finite-dimensional fBm will be reviewed as well. In the commutative case, a formula for solutions is derived and some examples are shown, where the solution blows up in finite time due to the character of the noise and when the corresponding deterministic equation may be stabilized or destabilized by the noise. Most of the results are based on the papers [1], [2] and [3] and a forthcoming paper by T. E. Duncan, B. Pasik-Duncan and the speaker.

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References

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[3] B. Maslowski and D. Nualart, *Evolution equations driven by fractional Brownian motion,* J. Funct. Anal. 202 (2003), 277-305.