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New coupling techniques for exponential ergodicity of stochastic delay equations and SPDEs

Abstract

(Joint work with Alexey Kulik and Michael Scheutzow)

We will present new coupling techniques for analyzing ergodicity of inifinite dimensional Markov processes including stochastic deay equations and SPDEs. These methods complement the Hairer-Mattingly approach (2006, 2008, 2011). In the first part of the talk, we demonstrate how a generalized coupling approach can be used to study ergodicity for a broad class of nonlinear SPDEs, including 2D stochastic Navier-Stokes equations. The second part of the talk is devoted to SPDEs that satisfy comparison principle (e.g., stochastic reaction-diffusion equation). Using a new version of the coupling method, we establish exponential ergodicity of such SPDEs in the hypoelliptic setting and show how the corresponding Hairer–Mattingly results can be refined.

[1] O. Butkovsky, A. Kulik, M. Scheutzow (2018). Generalized couplings and ergodic rates for SPDEs and other Markov models. arXiv:1806.00395; to appear in 'The Annals of Applied Probability'.

[2] O. Butkovsky, M. Scheutzow (2019). Couplings via comparison principle and exponential ergodicity of SPDEs in the hypoelliptic setting. arXiv:1907.03725; to appear in 'Communications in Mathematical Physics'.