Long-time behaviour for discretization schemes of the Fokker-Planck equation via couplings

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In this talk we construct continuous-time Markov chains associated to finite-volume discretization schemes of Fokker-Planck equations and establish sufficient conditions under which we show quantitative exponential decay in the ϕ-entropy and Wasserstein distance. The decay in ϕ-entropy implies modified logarithmic Sobolev, Poincaré, and discrete Beckner inequalities. The results are not restricted to additive potentials and do not rely on discrete Bochner-type identities. The proof for the ϕ-decay relies on a coupling technique due to Conforti [1], while the proof for the Wasserstein distance uses the path coupling method.

References:

[1] G. Conforti. A probabilistic approach to convex (ϕ)-entropy decay for Markov chains. *Ann. Appl. Probab.* 32 (2022), 932–973.

[2] A. Jüngel, K. Schuh. Long-time behavior for discretization schemes of Fokker–Planck equations via couplings. *Discrete and Continuous Dynamical Systems - B*, 2026, 38: 1-31.