Kinetic Ising models with various single-spin flip dynamics on quenched and annealed random regular graphs

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We investigate a kinetic Ising model with several single-spin flip dynamics (including Metropolis and heat-bath) on quenched and annealed random regular graphs. As expected, on the quenched structures all proposed algorithms reproduce the same results since the conditions for the detailed balance and the Boltzmann distribution in an equilibrium are satisfied. However, on the annealed graphs situation is far less clear – the network annealing disturbs the equilibrium moving the system away from it. Consequently, distinct dynamics lead to different steady states. We show that some algorithms are more resistant to the annealed disorder, which causes only small quantitative changes in the model behavior. On the other hand, there are dynamics for which the influence of annealing on the system is significant, and qualitative changes arise like switching the type of phase transition from continuous to discontinuous one. We try to identify features of the proposed dynamics which are responsible for the above phenomenon.