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Antiferromagnetic Ising Model in Hierarchical Networks[1] XIANG CHENG, STEFAN BOETTCHER, Department of Physics, Emory University —
The Ising antiferromagnet is a convenient model of glassy dynamics. It can introduce geometric frustrations and may give rise to a spin glass phase and glassy relaxation at low temperatures [1]. We apply the antiferromagnetic Ising model to 3 hierarchical networks which share features of both small world networks and regular lattices. Their recursive and fixed structures make them suitable for exact renormalization group analysis as well as numerical simulations. We first explore the dynamical behaviors using simulated annealing and discover an extremely slow relaxation at low temperatures. Then we employ the Wang-Landau algorithm to investigate the energy landscape and the corresponding equilibrium behaviors for different system sizes. Besides the Monte Carlo methods, renormalization group [2] is used to study the equilibrium properties in the thermodynamic limit and to compare with the results from simulated annealing and Wang-Landau sampling.
[1] C. P. Herrero, Phys. Rev. E. **77**, 04112 (2008)
[2] V. Singh, C. T. Brunson, S. Boettcher, arXiv:1408.0669 (2014)

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