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Propagation of entanglement in one-dimensional models of many-body localization JENS H. BARDARSON, UC Berkeley & Lawrence Berkeley National Laboratory, FRANK POLLMANN, Max-Planck-Institute for the Physics of Complex Systems, JOEL E. MOORE, UC Berkeley & Lawrence Berkeley National Laboratory — An important and still unanswered fundamental question is whether a closed quantum system of many interacting particles can be localized by disorder. The time evolution of an initially unentangled state is studied for a 1D random-field XXZ Hamiltonian. Even for weak interactions, when the system is thought to be in a many-body localized phase, entanglement shows neither localized nor diffusive behavior: interactions act as a singular perturbation on the truly localized state with no interactions. The logarithmic time dependence of entanglement observed rather suggests a broad range of time scales typical of glassy behavior.

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