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On the spreading rate of entanglement in a many-body localized quantum spin chain ARUN NANDURI, HYUNGWON KIM, DAVID HUSE, Princeton University — Although the many-body localized phase does not allow the transport of local observables, the unbounded logarithmic growth of bipartite entanglement entropy, S, has recently been observed (Bardarson et al., Phys. Rev. Lett. **109**, 017202 (2012)). We aim to elucidate the origin of this logarithmic growth through exact diagonalization methods, analyzing an XXZ spin model with random longitudinal fields. Based on a proposed phenomenology of entanglement spreading (Huse and Oganesyan, arXiv:1305.4915v1), we connect the rate of entanglement spreading with the localization length (ξ) of the system and the saturated entanglement entropy per spin (s_∞). We find that the time dependence of the entanglement spreading takes the form $S \sim \xi s_\infty \log t$.

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