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Operator entanglement entropy of the time evolution operator in chaotic systems TIANCI ZHOU, DAVID LUITZ, University of Illinois at Urbana-Champaign — We study the growth of the operator entanglement entropy (EE) of the time evolution operator in chaotic, many-body localized and Floquet systems. In the random field Heisenberg model we find a universal power law growth of the operator EE at weak disorder, a logarithmic growth at strong disorder, and extensive saturation values in both cases. In a Floquet spin model, the saturation value after an initial linear growth is identical to the value of a random unitary operator (the Page value). We then map the operator EE to a global quench problem evolved with a similar parent-Hamiltonian in an enlarged Hilbert space with the same chaotic, MBL and Floquet properties. The scaling and saturation properties reflect the spreading of the state EE of the corresponding time evolution. We conclude that the EE of the evolution operator should characterize the propagation of information in these systems.

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