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Streched-exponential relaxation in arrays of coupled rotators

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We consider the non-equilibrium dynamics of a chain of classical rotators coupled at its edges to an external reservoir at zero temperature. We find that the energy is released in a strongly discontinuous fashion, with sudden jumps alternated with long stretches during which dissipation is extremely weak. The jumps mark the disappearance of strongly localized structures, akin to the rotobreather solutions of the Hamiltonian model, which act as insulating boundaries of a hot central core. As a result of this complex kinetics, the ensemble-averaged energy follows a stretched exponential law until a residual pseudo-stationary state is attained, where the hot core has reduced to a single localized object. We give a statistical description of the relaxation pathway and connect it to the properties of return periods of rare events in correlated time series. This approach sheds some light into the microscopic mechanism underlying the slow dynamics of the system. Finally, we show that the stretched exponential law remains unaltered in the presence of isotopic disorder.

[1] M. Eleftheriou, S. Lepri, R.Livi, F. Piazza Physica D 204, (2005), 230-239.