Cold discrete breathers: statistical persistence of localized structures in nonlinear Hamiltonian lattices

Benno Rumpf[1]

[1]Southern Methodist University, Dallas, United States

The localization in nonlinear lattices with no conserved quantities other than the Hamiltonian is explained with statistical methods. The system under consideration is a weakly coupled nonlinear classical Klein-Gordon chain with low energy. Localized nonlinear modes (discrete breathers) that interact with surrounding low-amplitude disordered waves undergo stochastic amplitude fluctuations, but, on average, grow or decay depending on their amplitudes and on the statistical properties of the low-amplitude random waves. The phase space that is available to a discrete breather is crucial in this process: localized modes whose period increases as a function of the amplitude are more likely to gain than to lose energy by their interaction with low-amplitude waves if their amplitude exceeds a critical threshold. Localized modes below this threshold are more likely to decay.