Macroscopic behavior for a chain of harmonic oscillators, perturbed by a degenerate stochastic noise

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Resumo/Abstract:
One unachieved goal of statistical mechanics is to derive the macroscopic evolution of energy from a microscopic dynamics given by a chain of coupled oscillators. This is expected to hold through a diffusive space-time scaling limit. Here we study the energy diffusion in the disordered harmonic chain of oscillators: the usual Hamiltonian dynamics is provided with random masses and perturbed by a degenerate energy conserving noise. After rescaling space and time diffusively, we prove that energy fluctuations evolve following an infinite dimensional linear stochastic differential equation driven by the linearized heat equation. We also give variational expressions for the thermal diffusivity and an equivalent definition through the Green-Kubo formula. Since the model is of non-gradient type, and the stochastic perturbation is very degenerate, the standard Varadhan's approach is reviewed under new perspectives.