HYDRODYNAMIC LIMIT FOR A DISORDERED QUANTUM HARMONIC CHAIN

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We consider a one-dimensional unpinned disordered chain of quantum harmonic oscillators, a hydrodynamic limit in the hyperbolic scaling of time and space is proven; distribution of the elongation, momentum, and energy converges to the solution of the Euler equation in this scaling.

Anderson localization decouples the mechanical and thermal energy, providing the closure of the macroscopic equation out of thermal equilibrium, and indicating that the temperature profile does not evolve in time. Decay of correlation-type phenomena facilitates dealing with the quantum nature of the system. To the best of our knowledge, this is among the first examples where one can prove the hydrodynamic limit for a quantum system rigorously.

We also strengthen the above convergence in the sense of "higher moments" in recent joint work with Francois Huveneers.