

The rare interaction limit in a fast-slow mechanical system

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Mathematically rigorous explanations of Fourier's 1822 heat conduction law, in particular of the diffusion equation, have been based on stochastic, mostly random walk type models. Gaspard and Gilbert's 2008 two-step strategy to derive the macroscopic heat equation from the microscopic kinetic equation challenged many experts for its rigorous elaboration. The GG model consists of a chain of localized but interacting hard disks. For a 2-chain, our paradigm replaces one of the disks with a stick moving in an interval with reflecting barriers and interacting rarely with the localized disk. For this model - realizing the first, truly dynamical part of the GG-strategy - we obtain the 'mesoscopic' master equation describing a Markov jump process for the energies of the particles. The results are joint with Péter Bálint, Péter Nándori and Imre Péter Tóth.