Nonequibrium response of stalling systems

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Abstract

The celebrated fluctuation-dissipation relations (FDR) regulate the response of systems to a perturbation out of equilibrium, relating it to the spontaneous fluctuations at equilibrium. We show that FDRs still hold in nonequilibrium steady states, when the currents being perturbed vanish (stall) amidst the flow of other non vanishing currents, hence in a situation of only "local" equilibrium. By contrast, Onsager's symmetry is violated. We present a general theory based on the mathematics of Markov jump processes. When the observational currents are *phenomenological*, in the sense that many transitions in the configuration space of the system contribute to the same current, the validity of nonequilibrium FDRs rely on a property, that we call *marginal thermodynamic consistency*, which is more restrictive than the thermodynamic consistency granted e.g. by local detailed balance.

B. Altaner, M. Polettini, and M. Esposito, *Fluctuation-Dissipation Relations Far from Equilibrium*, Phys. Rev. Lett. 117, 180601 (2016).

M. Polettini, G. Bulnes Cuetara and M. Esposito, *Conservation laws and symmetries in stochastic thermodynamics*, Phys. Rev. E 94, 052117 (2016).

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