
Non-equilibrium statistical mechanics from large deviation theory

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Abstract

We derive a Langevin equation for a Brownian particle by using large deviation theory. We then obtain the fluctuation-dissipation theorem of the second kind and Kirkwood's formula. According to the formula, the friction coefficient is expressed in terms of the stress correlation on the surface of the sphere. With the aid of large deviation theory again, we relate the surface stress correlation to the stress correlation in the bulk of the fluid, where the latter is characterized by the viscosity in the Green-Kubo formula. Namely, by combining Kirkwood's formula and the Green-Kubo formula in large deviation theory, we derive Stokes' law without explicitly employing the hydrodynamic equations. This work was done in collaboration with Masato Itami. A part of the result can be seen in Ref. M. Itami and S. Sasa, <http://arxiv.org/abs/1505.01691>

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