

”Statistical mechanics derivation of hydrodynamic boundary conditions: the diffusion equation”

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Considering the example of interacting Brownian particles we present a linear response derivation of the boundary condition for the corresponding hydrodynamic description (the diffusion equation). This requires us to identify a non-analytic structure in a microscopic relaxation kernel connected to the frequency dependent penetration length familiar for diffusive processes, and leads to a microscopic definition of the position where the hydrodynamic boundary condition has to be applied. Corrections to the hydrodynamic limit are obtained and we derive general amplitudes of spatially and temporally long ranged states in the considered diffusive system.