Mathematics > Analysis of PDEs

Stochastic averaging lemmas for kinetic equations

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We develop a class of averaging lemmas for stochastic kinetic equations. The velocity is multiplied by a white noise which produces a remarkable change in time scale. Compared to the deterministic case and as far as we work in L^2, the nature of regularity on averages is not changed in this stochastic kinetic equation and stays in the range of fractional Sobolev spaces at the price of an additional expectation. However all the exponents are changed; either time decay rates are slower (when the right hand side belongs to L^2), or regularity is better when the right hand side contains derivatives. These changes originate from a different space/time scaling in the deterministic and stochastic cases. Our motivation comes from scalar conservation laws with stochastic fluxes where the structure under consideration arises naturally through the kinetic formulation of scalar conservation laws.

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