

ON THE DESCRIPTION OF KINETIC BEHAVIOR OF COMPLEX SYSTEMS OF MATHEMATICAL BIOLOGY

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We review a new approach to the description of the collective behavior of complex systems of mathematical biology within the framework of the evolution of observables. This representation of the kinetic evolution seems, in fact, the direct mathematically fully consistent formulation modeling kinetic evolution of biological systems since the notion of the state is more subtle and it is an implicit characteristic of populations of living creatures.

One of the advantages of the developed approach is the opportunity to construct kinetic equations in scaling limits, involving initial correlations, in particular, that can characterize the condensed states of soft matter. We note also that such approach is also related to the problem of a rigorous derivation of the non-Markovian kinetic-type equations from underlying many-cell dynamics which make it possible to describe the memory effects of the kinetic evolution of cells.

Using suggested approach, we establish a mean field asymptotic behavior of the hierarchy of evolution equations for marginal observables of a large system of interacting stochastic processes of collisional kinetic theory, modeling the microscopic evolution of active soft condensed matter.

Furthermore, we established that for initial states specified by means of a one-particle distribution function and correlation functions the evolution of additive-type marginal observables is equivalent to a solution of the Vlasov-type kinetic equation with initial correlations, and a mean field asymptotic behavior of non-additive type marginal observables is equivalent to the sequence of explicitly defined correlation functions which describe the propagation of initial correlations of active soft condensed matter.

REFERENCE

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