

On kinetic equations of hard sphere fluids

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In our talk we consider a new approach to the description of the kinetic evolution of large hard sphere systems within the framework of the marginal observables governed by the dual BBGKY hierarchy. The relations of the hierarchy of evolution equations for marginal observables and the nonlinear kinetic equations for states described by means of a one-particle marginal distribution function are established.

The Boltzmann–Grad asymptotic behavior of a nonperturbative solution of the Cauchy problem of the dual BBGKY hierarchy with hard sphere collisions is considered. For initial states specified by means of a one-particle distribution function the interplay between the Boltzmann–Grad asymptotic behavior of marginal observables and a solution of the Boltzmann kinetic equation is established [1].

One of the advantages of this approach to the derivation of the Boltzmann kinetic equation from underlying hard sphere dynamics consists in the opportunity to construct the Boltzmann-like kinetic equation with initial correlations, in particular, initial correlations, characterizing the condensed states of collisional large particle systems. Moreover, it gives to describe the propagation of initial correlations in the Boltzmann – Grad scaling limit.

Using suggested approach, we also derive the non-Markovian generalization of the Enskog kinetic equation [2]. The Boltzmann–Grad asymptotic behavior of its non-perturbative solution is established.

- [1] Gerasimenko V.I. *On the approaches to the derivation of the Boltzmann equation with hard sphere collisions*. Proc. Inst. Math. NASU, **10** (2) (2013) 71–95.
- [2] Gerasimenko V.I. and Gapyak I.V. *Hard sphere dynamics and the Enskog equation*. Kinet. Relat. Models, **5** (3) (2012) 459–484.