

There are plenty of macroscopic models of fluids, hence the following question arises: „What are the connections between these models and the kinetic models of fluids?" We consider the three generalizations of the kinetic Boltzmann equation and we take their fluid dynamic limits in order to obtain the corresponding macroscopic models of fluids.

The first generalization introduces the rescaled Boltzmann equation according to the Prandtl scaling and the fluid dynamic limit leads to the Prandtl equations for the compressible boundary layer.

The second generalization introduces the additional (source) terms on the right hand side of the Boltzmann equation including the higher order approximations of the collisional transfer and the fluid dynamic limit leads to the balance equations of the bipolar viscous fluids together with the constitutive relations of the linear bipolar viscous fluids.

The third generalization introduces the additional terms on the left hand side of the Boltzmann equation including the changes of the probability density on the time scale of the duration of collisions. We take the acoustic limit (the most simple uid dynamic regime) and it leads to the system of generalized acoustic equations. In this case also some rigorous, analytical results are obtained for the linearized problem.