A moment model for non-equilibrium electrons in a plasma dominated by electron-neutral collisions

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We consider the motion of electrons in a plasma composed of electrons, ions and atoms. The predominant effect on this motion is due to the elastic electron-neuteal collision, corresponding to a weakly ionized plasma. We provide a specific scaling highlighting such an effect and relate all the small parameters in the model to the atom-electron mass ratio ϵ. From this scaling, we compute expansions of the collision operators in order of ϵ, before performing a Hilbert expansion of the distribution function. This method provides a coupled system of equations over the different orders of the distribution function, the first one being isotropic. This property allows simplifications that are used to construct an adapted method of moment. The mathematical structure of the resulting model is finally analyzed.

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