On multi-species kinetic modeling of plasma

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This project is inspired by an attempt to compute plasma in a regime found in inertial confinement fusion. To this end, Klingenberg, Pirner and Puppo [1] developed a multi-species kinetic model. For two species, this is modelled by a system of kinetic BGK equations featuring two interaction terms for each species to account for momentum and energy transfer between the species. Our model is an extension of the model [1]. In addition the collision frequency depends on the microscopic velocity. Consistency of this model is shown via a maximum entropy procedure. Next, we present a robust numerical approach, which mimics this theoretical procedure. We expect this to be able to deal with the very stiff case where we model ions and electrons.

This is joint work among others with Jeff Haack, Cory Hauck, Christian Klingenberg and Marlies Pirner.

References

[1] Klingenberg, C., Pirner, M., Puppo, G.: 'A consistent kinetic model for a two component mixture with an application to plasma', Kinetic and Related Models Vol. 10, No. 2, pp. 445 - 465, 2017