Hypocoercivity for a linearized multi-species Boltzmann system

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Abstract

In this joint work with A. Juengel, C. Mouhot and N. Zamponi a new coercivity estimate on the spectral gap of the linearized Boltzmann collision operator for multiple species is proved.
The assumptions on the collision kernels include hard and Maxwellian potentials under Grad's angular cut-off condition. Two proofs are given: a non-constructive one, based on the decomposition of the collision operator into a compact and a coercive part, and a constructive one, which exploits the "cross-effects" coming from collisions between different species and which yields explicit constants.
Furthermore, the essential spectra of the linearized collision operator and the linearized Boltzmann operator are calculated. Based on the spectral-gap estimate, the exponential convergence towards global equilibrium with explicit rate is shown for solutions to the linearized multi-species Boltzmann system on the torus. The convergence is achieved by the interplay between the dissipative collision operator and the conservative transport operator and is proved by using the hypocoercivity method of Mouhot and Neumann.

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