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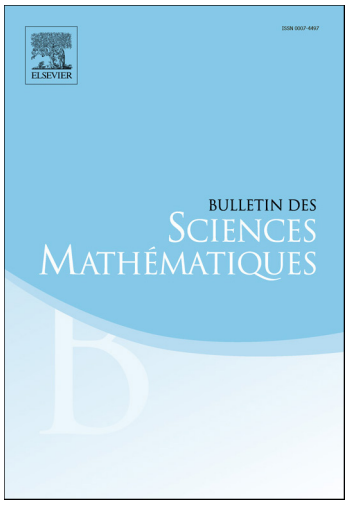


Spectral gap and exponential convergence to equilibrium for a multi-species Landau system

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PII: S0007-4497(17)30065-9
DOI: http://dx.doi.org/10.1016/j.bulsci.2017.07.002
Reference: BULSCI 2722

To appear in: *Bulletin des Sciences Mathématiques*

Received date: 10 March 2016

Please cite this article in press as: M.P. Gualdani, N. Zamponi, Spectral gap and exponential convergence to equilibrium for a multi-species Landau system, *Bull. Sci. math.* (2017), http://dx.doi.org/10.1016/j.bulsci.2017.07.002

# Spectral gap and exponential convergence to equilibrium for a multi-species Landau system

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**Abstract**

In this paper we prove new constructive coercivity estimates and convergence to equilibrium for a spatially non-homogeneous system of Landau equations with moderately soft potentials. We show that the nonlinear collision operator conserves each species' mass, total momentum, total energy and that the Boltzmann entropy is nonincreasing along solutions of the system. The entropy decay vanishes if and only if the Boltzmann distributions of the single species are Maxwellians with the same momentum and energy. A linearization of the collision operator is computed, which has the same conservation properties as its nonlinear counterpart. We show that the linearized system dissipates a quadratic entropy, and prove existence of spectral gap and exponential decay of the solution towards the global equilibrium. As a consequence, convergence of smooth solutions of the nonlinear problem toward the unique global equilibrium is shown, provided the initial data are sufficiently close to the equilibrium. Our proof is based on new spectral gap estimates and uses a strategy similar to [12] based on an hypocoercivity method developed by Mouhot and Neumann in [28].

*Keywords:*

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