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P. Gervais: On the Boltzmann equation for long-range interactions close to equilibrium

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The Boltzmann equation, introduced by J.C. Maxwell and L. Boltzmann at the end of the 19th century, describes the evolution of a gas at the molecular level using a statistical point of view. More precisely, instead of considering the exact position and velocity of each of the particles making up the gas, we are interested in their statistical distributions for a typical particle. One of the main mathematical difficulties of this equation comes from the interactions between pairs of ”distant”particles. Considered individually, they have little influence on the velocities of the particles, but are extremely frequent, which results in the presence of an ”angular singularity”in the operator modeling their effect. This difficulty is responsible for the very slow evolution of the mathematical theory of the Boltzmann equation. In 1963, H. Grad proposed a way to neglect this singularity, leading to a rapid progress in our understanding of this equation. This angular singularity is however not insignificant, it provides among other things a regularizing effect to the equation, and has been studied in many works since the 1990s. In this talk I will present how to construct solutions to the Boltzmann equation close to equilibrium.