



Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 11. Juli 2024, um 17:15 Uhr im Hörsaal 5

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“Macroscopic Modelling of Rarefied and Vacuum Gas Flows”

Zusammenfassung/Abstract

Rarefied gas flows show interesting effects that are not encountered in classical hydrodynamics, such as: thermal stresses, where flow is driven by temperature gradients; transpiration flow, which is driven by temperature gradients in the wall-boundaries; non-Fourier heat flux, which is induced by anisotropic stresses; Knudsen layers in front of the wall, due to strong non-equilibrium induced by particle wall interactions; and more. Any model that aims at describing rarefied gas flows should be able to describe these effects in good approximation.

Since 2002 we have derived and developed the Regularized 13 Moment Equations (R13) which have been shown to describe rarefied flows for moderate Knudsen numbers in excellent detail, and at much lower computational cost than microscopic methods. The equations include all hydrodynamics, but add the description of the above mentioned rarefaction effects. Moreover, the R13 equations avoid problems like instabilities and discontinuous shocks that hamper earlier competing approaches.

The talk will introduce the ideas behind the R13 equations, and then highlight their capabilities by discussion of analytical and numerical results for a variety of interesting flow problems.

Kontakt

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