

Macroscopic Transport Equations For Rarefied Gas Flows Approximation Methods In Kinetic Theory 1st E

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Macroscopic Transport Equations For Rarefied

Thus, the proper simulation of flows in rarefied gases requires a more detailed description. This book discusses classical and modern methods to derive macroscopic transport equations for rarefied gases from the Boltzmann equation, for small and moderate Knudsen numbers, i.e. at and above the Navier-Stokes-Fourier level.

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Macroscopic Transport Equations for Rarefied Gas Flows ...

Struchtrup H. (2005) Macroscopic transport equations for rarefied gas flows. In: Macroscopic Transport Equations for Rarefied Gas Flows. Interaction of Mechanics and Mathematics.

Macroscopic transport equations for rarefied gas flows ...

Methods to derive macroscopic transport equations for rarefied gases from the Boltzmann equations are presented. Featured methods include the Chapman-Enskog expansion, Grad's moment method, and ...

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ate Knudsen numbers, extended macroscopic transport equations offer an alternative to the Boltzmann equation, from which they are derived. Classical and modern approaches for the derivation of these mod-els are reviewed, and the resulting equations are compared for their ability to describe the multitude of known rarefaction phenomena.

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Macroscopic transport models for rarefied gas flows: a ...

Many macroscopic equations are proposed to describe the rarefied gas dynamics beyond the Navier-Stokes level, either from the mesoscopic Boltzmann equation or some physical arguments, including (i) Burnett, Woods, super-Burnett, augmented Burnett equations derived from the Chapman-Enskog expansion of the Boltzmann equation, (ii) Grad 13, regularized 13/26 moment equations, rational extended thermodynamics equations, and generalized hydrodynamic equations, where the velocity distribution ...

On the accuracy of macroscopic equations for linearized ...

Struchtrup, H. 2005b Macroscopic Transport Equations for Rarefied Gas Flows. Springer . Struchtrup , H. 2012 Unique moment set from the order of magnitude method .

Macroscopic and kinetic modelling of rarefied polyatomic ...

Struchtrup, Macroscopic Transport Equations for Rarefied Gas Flows (Springer, Berlin, Heidelberg, 2005). which has been previously applied to analyze steady 35 35. M. M. Torrilhon, " Modeling nonequilibrium gas flow based on moment equations ," Annu. Rev. Fluid Mech. 48 , 429- 458 (2016).

The effect of a solid boundary on the propagation of ...

The well known transport laws of Navier-Stokes and Fourier fail for the simulation of processes on lengthscales in the order of the mean free path of a particle that is when the Knudsen number is not small enough. Thus, the proper simulation of flows in rarefied gases requires a more detailed description. This book discusses classical and modern methods to derive macroscopic transport ...

Macroscopic Transport Equations for Rarefied Gas Flows ...

A high-order macroscopic model for the accurate description of rarefied polyatomic gas flows is introduced based on a kinetic equation of Bhatnagar-Gross-Krook (BGK)-type, where the different energy exchange processes are accounted for by two collision terms.

Capturing non-equilibrium phenomena in rarefied polyatomic ...

Macroscopic Transport Models for Rarefied Gas Flows: A Brief Review. ... ate Knudsen numbers, extended macroscopic transport equations offer an alternative to the Boltzmann.

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The R13 equations, derived from the Boltzmann equation using the moment method, provide closure to the mass, momentum and energy

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conservation laws in the form of constitutive, transport equations for the stress and heat flux that extend the Navier–Stokes–Fourier model to include non-equilibrium effects.

Thermophoresis of a spherical particle: modelling through ...

The basis of most of the approaches to modeling of rarefied gases is the Boltzmann equation. In the continuum limit, a set of macroscopic transport equations can be obtained from the Boltzmann equation, and the Chapman–Enskog method utilized for their closure.

Influence of angular momentum on transport coefficients in ...

Macroscopic transport equations for rarefied gas flows : approximation methods in kinetic theory. [Henning Struchtrup] -- "This book discusses classical and modern methods to derive macroscopic transport equations for rarefied gases from the Boltzmann equation, for small and moderate Knudsen numbers, i.e. at and above ...

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