Technische Universität Braunschweig

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# Application of Lattice-Boltzmann Methods for Turbulent Flows

Lecture of

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For many engineering applications the Reynolds-Averaged Navier-Stokes (RANS) approach based on mean values and statistical models for turbulence is the most popular tool for the study of turbulent flows. However, it is recognized that for many real-world applications, scale resolving simulations such as direct numerical simulation (DNS) or large eddy simulation (LES) are required to reliably predict anisotropic turbulence effects, transitional flows or acoustic emissions [1].
Due to its low numerical dissipation [2] and computational efficiency the LB method is a good candidate for the simulation of turbulent flows (DNS/LES). However, the most popular and widely used Bhatnagar-Gross-Krook lattice Boltzmann model (LBGK) is limited to resolved, moderate Reynolds number flows because of its numerical instabilities in under-resolved simulations. One way to solve this problem was the development of collision models beyond the original LBGK model such as, for example, multi-relaxation time (MRT) models based on a cumulant moment basis [3]. In this talk we present turbulent flow simulations using modern LB methods for the study of industrial applications.