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Titel des Beitrags: Indoor air flow analysis based on lattice Boltzmann methods

Abstract: The modeling of convective flows based on a 3D lattice Boltzmann approach for low Mach number flows with variable density combined with a large eddy turbulence model is presented. The ability to handle non-Boussinesq density variation problems is depicted for two-dimensional Rayleigh-Benard convection at a Rayleigh number Ra=800,000. A complex three-dimensional example shows the status of our work with respect to turbulent flow in and around a building, so far without consideration of the energy equation in the full scale 3D case. Integrated within a CAD environment, the spatial geometric model, based on an IFC building product data model, is discretized using a hierarchic data structure. Results are presented for a Reynolds number Re=75,000 computed on a high-performance parallel vector computer. State-of-the-art visualization techniques integrate the simulation results and the CAD model into a virtual reality environment. The VR environment allows also for an interactive analysis of thermal comfort criteria, being demonstrated for an indoor air flow simulation of an open-plan office.

Stichworte: Lattice Boltzmann, large eddy, virtual reality, thermal comfort, indoor air flow, Industry Foundation Classes (IFC), high performance computing

Zeitschriftentitel: Energy and Buildings

Jahr: 2002