Numerical study of natural convection and acoustic waves using Lattice Boltzmann Method

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Résumé

In this paper, the Lattice Boltzmann Method (LBM) is used to simulate the propagation of acoustic waves generated by a point source localized in the center of a square differentially heated cavity. The main purpose of this numerical simulation is to study the effect of thermal convection on the propagation of acoustic waves in air. Results were validated with those obtained in the literature and show that the effect of natural convection on the propagation of acoustic wave is almost neglected for low Rayleigh numbers (Ra $\leq$ 10ˆ4) and considerable for large Rayleigh numbers (Ra $\geq$ 10ˆ5) where the natural convection is important. MRT-D2Q9 and MRT-D2Q5 models were used to solve the flow and the temperature fields, respectively.

Mots-Clés: Lattice Boltzmann method, Natural convection, Propagation, Acoustic waves.

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