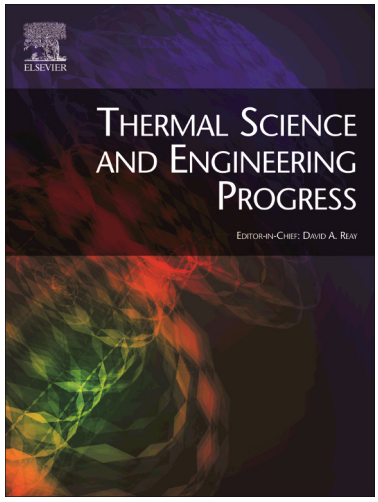

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Lattice Boltzmann Computation of Multiple Solutions in a Double-Sided Square and Rectangular Cavity Flows

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Abstract

This paper uses Lattice Boltzmann computation to obtain multiple fluid flow solutions in square and rectangular cavity that involves movement of the facing and non-facing walls. For some aspect ratios the double-sided lid-driven cavity problem has multiple steady fluid flow solutions. In double-sided rectangular cavities, a single-relaxation-time model is used to over out Lattice Boltzmann computations in order to receive multiple fluid flow solutions. Three numerical examples are taken into consideration on this work. First one is double-sided square cavity with parallel wall movement, double-sided non-facing rectangular lid-driven cavity with parallel wall movement and the final one is the double-sided lid-driven rectangular cavity with antiparallel wall movement. When the walls move in pairs, multiple fluid flow solutions exist above critical Reynolds numbers. In the present work, five multiple solutions of parallel wall movement and seven multiple solutions of antiparallel wall movement is acquired. The boundary conditions used are stable and also correct. It might be inferred that the present mesoscopic Lattice Boltzmann study produces comes about that are in phenomenal similarity with prior customary numerical perceptions.

Keywords: Incompressible Flow, Lattice Boltzmann method, *D2Q9* model, double-sided rectangular cavity, bounce-back boundary condition.

1. Introduction

In the past few decades, analysis into the lid-driven cavity flow is a vicinity of continuous interest and was chosen for a numerical benchmark problem [1]. The incompressible viscous fluid flow in a rectangular cavity represents an easy system appropriate for elementary investigations of vortex dynamics in closed geometries [2]. Lots of engineering situations