Accepted Manuscript

On the time relaxed Monte Carlo computations for the lid-driven micro cavity flow

M. Eskandari, S.S. Nourazar

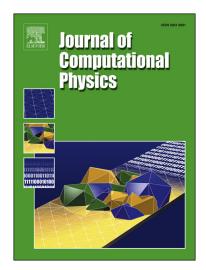
PII: S0021-9991(17)30204-8

DOI: http://dx.doi.org/10.1016/j.jcp.2017.03.017

Reference: YJCPH 7221

To appear in: Journal of Computational Physics

Received date: 22 August 2016 Revised date: 6 March 2017 Accepted date: 8 March 2017



Please cite this article in press as: M. Eskandari, S.S. Nourazar, On the time relaxed Monte Carlo computations for the lid-driven micro cavity flow, *J. Comput. Phys.* (2017), http://dx.doi.org/10.1016/j.jcp.2017.03.017

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

On the time relaxed Monte Carlo computations for the lid-driven micro cavity flow

M. Eskandaria, S.S. Nourazara,*

^aDepartment of Mechanical Engineering, Amirkabir University of Technology, Tehran, Iran

Abstract

In the present study, the first, second and third orders of the TRMC scheme (TRMC1, TRMC2 and TRMC3 schemes) are employed to numerically investigate the lid-driven micro cavity flow with different lid velocities and Knudsen numbers. The simulations cover flow regimes from early slip to early transition regimes $(0.005 \le Kn \le 0.1)$. Higher order terms in the Wild sum expansion are considered to obtain higher order collisions. The results are compared with those from the standard DSMC method. Comparisons show that among the studied schemes, the results obtained from the TRMC3 scheme have excellent agreement with the ones from the DSMC method. On the other hand, the results of TRMC1 and TRMC2 schemes show deviations compared to those from the DSMC method. The deviations are more pronounced for the velocity distributions. Moreover, the present investigation illustrates that as the Knudsen number increases the accuracy of lower orders of the TRMC scheme improves. It is observed that truncating the Wild sum expansion up to the third order approximation of the TRMC scheme, may be a proper alternative method for the DSMC method in simulating the lid-driven micro cavity problem for Knudsen numbers $0.005 \le Kn \le 0.1$ with reasonable accuracy and simplicity in mathematics.

Keywords: Boltzmann equation, direct simulation Monte Carlo, time relaxed Monte Carlo, higher order collision, micro cavity

PACS: 02.70.Tt, 47.11.-j, 51.10.+y

Nomenclature

 μ the mean collision frequency, kinematic viscosity

^{*}Corresponding author. Address: Department of Mechanical Engineering, Amirkabir University of Technology, 424 Hafez Ave, Tehran, Iran. P.O. Box 15875-4413, Tel.: +98 (21) 64540

 $Email\ addresses: me.eskandari@aut.ac.ir\ (M.\ Eskandari), icp@aut.ac.ir\ (S.S.\ Nourazar)$

Download English Version:

https://daneshyari.com/en/article/4967355

Download Persian Version:

https://daneshyari.com/article/4967355

<u>Daneshyari.com</u>