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A Moving Boundary Condition based on Chapman-Enskog Expansion for the Lattice Boltzmann Method LINA XU, LAURA SCHAEFER, University of Pittsburgh — The lattice Boltzmann method (LBM) has been shown to be an effective numerical method to model various fluid flows, by dealing boundary conditions from the mesoscopic level with straightforward and easy-to-implement approaches, the fundamental understanding of the hydrodynamic interactions between the solid and fluid in the particulate suspensions systems can be further improved. However, most of the previous boundary conditions used for the moving complex boundaries are based on the half way bounce-back boundary condition, where the geometric integrity of the body cannot be maintained. In this presentation, a moving boundary condition based on the Chapman-Enskog expansion is proposed and applied for the moving complex surfaces, where the precise shape of the solid can be preserved. Based on the numerical experiments for modelling the particulate suspensions system, the new moving boundary condition exhibits improved numerical accuracy and stability, stronger capability to preserve the geometry integrity, and better Galilean invariance character. Moreover, this presentation provides a novel concept to construct a boundary condition for the LBM without the limitation of being based on the information from the already existing lattice nodes.

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