Mesoscale numerical prediction of fluid flow in a shear driven cavity

Abstract:

In this paper, a detailed analysis of the lattice Boltzmann method is presented to simulate an incompressible fluid flow problem. Thorough derivation of macroscopic hydrodynamics equations from the continuous Boltzmann equation is performed. After showing how the formulation of the mesocale particle dynamics fits into the framework of lattice Boltzmann simulations, numerical results of lid-driven flow inside square and triangular cavities are presented to highlight the applicability of the approach. The objective of the paper is to gain better understanding of this relatively new approach for applied engineering problems in fluid transport phenomena.