ABSTRACT:

We present a detailed analysis of the lattice Boltzmann method 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 mesoscale particle dynamics fits in to the framework of lattice Boltzmann simulations, numerical results of isothermal, thermal and multiphase fluid flow 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.