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LATTICE BOLTZMANN MODELLING AND STUDY OF COMPLEX FLOWS

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MINISYMPOSIUM

The lattice Boltzmann method (LBM), which solves a specific discrete Boltzmann equation designed to reproduce the continuous Navier-Stokes (N-S) equations in the low-Mach number limit, has been increasingly applied as a very powerful numerical model for various complex flows and transport phenomena. The mesoscale nature of LBM allows its natural incorporation of micro- and mesoscale physics, leading to straightforward treatment of multiphase/multicomponent interfacial dynamics. The bounce-back type of boundary schemes in LBM is very suitable for flows in complex geometries, e.g., porous media. In addition, the canonical "collision-streaming" algorithm disentangles non-linearity and non-locality, i.e., the nonlinear collision operator is entirely local and the non-local streaming is linear towards the discrete distribution, making it highly efficient in large-scale parallel computations. Due to the above-mentioned strong advantages, LBM has drawn a lot of attention in the past three decades and has been developed into a powerful numerical approach for simulating fluid flows and solving nonlinear problems.

The mini-symposium is dedicated to the discussion of recent developments of LBM and its applications to various complex flow problems, including but not limited to:

1. New collision schemes, forcing schemes, and boundary schemes in LBM
2. Improved multiphase/multicomponent LBM
3. Coupling LBM with other numerical methods (pore-network method, discrete element method, etc.)
4. Lattice Boltzmann study of multiphase flows
5. Lattice Boltzmann study of flows and transport phenomena in porous media
6. Lattice Boltzmann study of phase-change heat and mass transfer
7. Quantum algorithms for Lattice Boltzmann equation