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**A comparative study of lattice Boltzmann models for incompressible flow.** (English)

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Summary: For incompressible flow, a comparative study on the four lattice Boltzmann (LB) models, the standard model, the He-Luo model, Guo's model, and the present model, is performed. Theoretically, the macroscopic equations derived from the involved LB models are compared by the Chapman-Enskog analysis. Then, the analytical framework proposed in M. Junk's work is applied to investigate the finite difference stencils and the equivalent moment systems pertaining to the concerned LB models. Conclusions are drawn from the theoretical derivations that the truncated error terms, which differ among the concerned LB models, have effects on the accuracy of the modeled deviatoric stress. Moreover, the cavity flow in two dimensions is adopted as a benchmark test to confirm the theoretical demonstrations. The resulting velocity fields from the present model are more in line with the reference solutions in the region of high deviatoric stress than other three LB models, which is consistent with the theoretical expectations and is further confirmed by the comparisons of the truncation error terms. In addition, we also conclude from the numerical tests that the present model has the advantage of better convergence efficiency but suffers from the worse stability.

#### MSC:

76M28 Particle methods and lattice-gas methods

76D99 Incompressible viscous fluids

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#### Keywords:

lattice Boltzmann model; incompressible flow; deviatoric stress; finite difference stencils

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