

Yan, Guangwu

A lattice Boltzmann equation for waves. (English) Zbl 0969.76076

J. Comput. Phys. 161, No. 1, 61-69 (2000).

Summary: We propose a lattice Boltzmann model for the wave equation. Using a lattice Boltzmann equation and the Chapman-Enskog expansion, we derive one- and two-dimensional wave equations with truncation error of order two. The numerical tests show that the method can be used to simulate the wave motions.

MSC:

76M28 Particle methods and lattice-gas methods

76P05 Rarefied gas flows, Boltzmann equation in fluid mechanics

Cited in **1** Review
Cited in **48** Documents

Keywords:

multiscale technique; lattice Boltzmann model; wave equation; Chapman-Enskog expansion; wave equations; truncation error of order two

Full Text: [DOI](#)

References:

- [1] Qian, Y.H.; d'humieres, D.; Lallemand, P., Lattice BGK model for navier – stokes equation, *Europhys. Lett.*, 17, 479, (1992) · [Zbl 1116.76419](#)
- [2] Chen, H.D.; Chen, S.Y.; Matthaeus, M.H., Recovery of the navier – stokes equations using a lattice Boltzmann method, *Phys. Rev.*, 45A, 5339, (1992)
- [3] Benzi, R.; Succi, S.; Vergassola, M., The lattice Boltzmann equations: theory and applications, *Phys. Rep.*, 222, 147, (1992)
- [4] Alexander, F.J.; Chen, H.D.; Chen, S.Y.; Doolen, G.D., Lattice Boltzmann model for compressible fluids, *Phys. Rev.*, 46A, 1967, (1993)
- [5] Wolf-Gladrow, D., A lattice Boltzmann equation for diffusion, *J. Statist. Phys.*, 79, 1023, (1995) · [Zbl 1106.82363](#)
- [6] Chen, H.D.; Chen, S.Y.; Doolen, G.; Lee, Y.C., Simple lattice gas models for waves, *Complex System*, 2, 259, (1988) · [Zbl 0656.76066](#)
- [7] Chapman, S.; Cowling, T.C., *The mathematical theory of non-uniform gas*, (1939) · [Zbl 65.1541.01](#)
- [8] Hou, S.L.; Zhou, O.S.; Chen, S.Y., Simulation of cavity flow by the lattice Boltzmann method, *J. Comput. Phys.*, 118, 329, (1995) · [Zbl 0821.76060](#)
- [9] Yan, G.W.; Chen, Y.S.; Hu, S.X., A lattice Boltzmann model for KdV equation, *Acta Mech. Sinica*, 14, 18, (1998)
- [10] S. Y. Chen, and, G. D. Doolen, Lattice Boltzmann method for fluids flows, 1997, *Ann. Rev. Fluid Mech.*, 30, 329, 1998.

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.