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多相流

两相体系宏观拟颗粒模拟并行算法

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摘要 将流体处理为离散粒子的宏观拟颗粒模型，具有与分子动力学模拟类似的算法，是进行两相流直接模拟的一种有效方法. 但其计算量非常大. 为此，本文工作改进了针对该模型的区域分解算法，并在可扩展的集群系统上得以实现，取得了较高的并行计算效率.

关键词 两相流 拟颗粒模型 区域分解 并行计算

分类号

PARALLEL ALGORITHM OF MACRO-SCALE PSEUDO-PARTICLE SIMULATION FOR TWO-PHASE FLOW

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Abstract

The macro-scale pseudo-particle model(MaPPM)is an effective method used in high resolution simulation of particle-fluid systems, which can be implemented with an algorithm similar to molecular dynamics (MD) simulation.However, the wide application of MaPPM is only possible with the advent of high-performance parallel computers.The great size gap between solid particle and pseudo-particle makes MaPPM different from MD simulations during the parallelization process, which is the specialty and difficulty in this paper.The domain decomposition method is used in the parallel algorithm because of the great number of pseudo-particles in particle-fluid systems. The algorithm is also improved according to the specialty in MaPPM to reduce computation cost. The computation is conducted on COW (cluster of workstations) with different system sizes and various numbers of processors to test its performance. Computation results indicate that the new algorithm has high parallel efficiency and good scalability. The parallel implementation will help to make use of MaPPM in large-scale simulations of two-phase flow.

Key words two-phase flow pseudo-particle modeling domain decomposition parallel computation

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