力学学报 2005 37 (3): 356-362 ISSN: 0567-7718 CN: 11-2063/O3

多相流局部混合型质点网格法

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收稿日期 修回日期 网络版发布日期 接受日期

摘要 提出模拟多相流的局部混合型质点网格法，该方法能稳定地模拟高浓度流体颗粒两相流. 在每一个颗粒团尺度的欧拉网格下(本文称之为欧拉微元)，基于Lagrangian 追踪原理，可直接估计体积内颗粒的总量，从而准确求出欧拉微元和控制容积内颗粒的浓度(即颗粒在容积内的体积含量). 同时，假设在新的时间步下，颗粒在欧拉微元里充分混合，形成新颗粒团. 作者对竖直和倾斜容器中单粒径颗粒沉降和竖直容器中双粒径颗粒双峰悬浮液沉降过程进行了计算，结果与实测数据相符.

关键词 多相流,局部混合,质点网格法(PIC法)

分类号 0359

A local mixing particle-in-cell method for fluid-particle multiphase flows

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Abstract

In this paper, a local mixing particle-in-cell method is proposed for multiphase flows. The method can be used for dense particle flows. Under the grid of particle parcel scale, which is called as Euler cell in this paper, the total particle volume in the cell is calculated directly based on the Lagrangian method. Therefore the particle volume fraction (concentration) on the Euler cell and the fluid control volume can be obtained accurately. Meanwhile, at new time step, particles on the Euler cell are assumed to be mixing sufficiently and come into being a new parcel. Comparing with the previous methods, the proposed method is more efficient and accurate. For the sedimentation in vertical and inclined vessels, and the bimodal suspension in a vertical vessel, the numerical results agree with the experimental results.

Key words multiphase flows local mixing particle-in-cell method

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