

应用地球物理学

基于时空守恒元和解元(CE/SE)方法的孔隙介质多相流动计算

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摘要 将时空守恒元/解元(CE/SE)方法推广到二维孔隙介质多相流问题的数值计算中, 采用人工压缩法耦合速度和压力, 同时结合杂交粒子水平集方法捕捉物质界面. 提出一套完整的二维欧拉型孔隙介质非稳态多相不可压缩黏性流动计算方案. 通过对溃坝和液滴在重力作用下的运动和变形问题的数值模拟, 验证了方法的精度和有效性. 在此基础上, 提出了一个新的孔隙介质两相流物理模型——双层流体顶盖驱动方腔流.

关键词 [CE/SE算法](#) [杂交粒子水平集方法](#) [孔隙介质](#) [多相不可压缩黏性流动](#)

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Calculation of multiphase flows in porous media based on CE/SE method

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Abstract In this paper, the improved CE/SE (the space-time Conservation Element and Solution Element method) scheme is extended to solve multi-phase flows in porous media. The hybrid particle level set method is used for tracing the interfaces of materials. The artificial compressibility method algorithm is selected to solve the pressure-velocity coupling. The model was developed by coupling an ordinary porous flow model based on extended Navier-Stokes equations for porous media, and a two-phase flow model. The resistance to flow caused by the presence of porous media was modeled in terms of drag and inertia forces. The dam break problem and falling droplet in a closed channel were calculated to validate the method employed in this paper. A model of dual lid-driven cavity flows in porous medium was also proposed as a benchmark problem.

Key words

[CE/SE method](#); [Hybrid particle level set method](#); [Porous media](#); [Multiphase flows](#)

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