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论文

多层非线性渗流耦合系统的特征分数步差分方法

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摘要:

对多层非线性渗流耦合系统提出适合并行计算的特征分数步差分格式, 利用变分形式、能量方法、粗细网格配套、分片双二次插值、差分算子乘积交换性、高阶差分算子的分解、先验估计的理论和技巧, 得到收敛性的最佳阶的l_2误差估计. 该方法已成功的应用到多层油资源评估的生产实际中.

关键词: 非线性耦合系统 多层渗流 特征差分 分数步 收敛性

分类号:

65N12; 65N30; 76M10

The Modified Characteristic Finite Difference Fractional Steps Method for Nonlinear Coupled System of Multilayer Fluid Dynamics in Porous Media

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Abstract:

For nonlinear coupled system of multilayer fluid dynamics in porous media, the modified characteristic finite difference fractional steps method applicable to parallel arithmetic is put forward, and two-dimensional and three-dimensional schemes are used to form a complete set. Some techniques, such as calculus of variations, energy method, piecewise biquadratic interpolation, multiplicative commutation rule of difference operators, decomposition of high order difference operators and prior estimates are adopted. Optimal order estimates in L_2 norm are derived to determine the error of the approximate solution. This method has already been applied to the numerical simulation of multilayer fluid dynamics in porous media. Thus the author has thoroughly and completely solved the well-known problem.

Keywords: Nonlinear coupled system Multilayer fluid dynamics in porous media Characteristic finite difference Fractional steps Convergence

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