

The Upwind Finite Difference Fractional Steps Method for Nonlinear Coupled System of Dynamics of Fluids in Porous Media

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摘要 For nonlinear coupled system of multilayer dynamics of fluids in porous media, the second order and first order upwind finite difference fractional steps schemes applicable to parallel arithmetic are put forward, and two-dimensional and three-dimensional schemes are used to form a complete set. Some techniques, such as calculus of variations, 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 in the second order approximate solution. This method has already been applied to the numerical simulation of migration-accumulation of oil resources.

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Abstract For nonlinear coupled system of multilayer dynamics of fluids in porous media, the second order and first order upwind finite difference fractional steps schemes applicable to parallel arithmetic are put forward, and two-dimensional and three-dimensional schemes are used to form a complete set. Some techniques, such as calculus of variations, 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 in the second order approximate solution. This method has already been applied to the numerical simulation of migration-accumulation of oil resources.

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