拟线性对流占优扩散方程的扩展特征混合有限元方法数值模拟

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摘要　讨论了拟线性对流占优扩散问题的数值模拟.对对流部分采用特征线格式进行离散,以消除流动锋线前沿的数值弥散现象,保证格式的稳定性;而对扩散部分采用扩展混合有限元方法,同时逼近未知函数,未知函数的梯度及伴随向量函数.理论分析和数值算例表明, 此方法是稳定的,具有最优L^{2}逼近精度.

关键词　拟线性对流占优扩散方程,扩展特征混合有限元方法,最优L^{2}误差估计.

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An Expanded Characteristics-Mixed Finite Element Method for Quasilinear Convection-Dominated Diffusion Equations

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Abstract An expanded characteristics-mixed finite element method for quasilinear convection-dominated diffusion equations is considered, here the characteristic approximation is to handle the convection part in time and the expanded mixed finite element spatial approximation is to deal with the diffusion part. The scheme is stable since fluid is transported along the approximate characteristics on the discrete level. The method expands the standard mixed finite element method in the sense that three variables are optimally and simulataneously treated: the scalar unknown, its gradient and flux. Theoretical analysis and numerical simulation that this method is stable and its L^{2}-error estimate is optimal.

Key words Quasilinear convection-dominated diffusion equations　expanded characteri- stics-mixed finite element method　optimal L^{2}-error estimate.

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