

# ACCELERATION METHODS OF NONLINEAR ITERATION FOR NONLINEAR PARABOLIC EQUATIONS

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摘要

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# ACCELERATION METHODS OF NONLINEAR ITERATION FOR NONLINEAR PARABOLIC EQUATIONS

Guang-wei Yuan, Xu-deng Hang

Laboratory of Computational Physics, Institute of Applied Physics and Computational Mathematics, P.O.Box 8009, Beijing 100088, China

**Abstract** This paper discusses the accelerating iterative methods for solving the implicit scheme of nonlinear parabolic equations. Two new nonlinear iterative methods named by the implicit-explicit quasi-Newton (IEQN) method and the derivative free implicit-explicit quasi-Newton (DFIEQN) method are introduced, in which the resulting linear equations from the linearization can preserve the parabolic characteristics of the original partial differential equations. It is proved that the iterative sequence of the iteration method can converge to the solution of the implicit scheme quadratically. Moreover, compared with the Jacobian Free Newton-Krylov (JFNK) method, the DFIEQN method has some advantages, e.g., its implementation is easy, and it gives a linear algebraic system with an explicit coefficient matrix, so that the linear (inner) iteration is not restricted to the Krylov method. Computational results by the IEQN, DFIEQN, JFNK and Picard iteration methods are presented in confirmation of the theory and comparison of the performance of these methods.

**Key words** [Nonlinear parabolic equations](#) [Difference scheme](#) [Newton iterative methods.](#)

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