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An efficient Jacobi pseudospectral approximation for nonlinear complex generalized Zakharov system. (English) Zbl 1339.65188

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Summary: In this paper, we derive an efficient spectral collocation algorithm to solve numerically the nonlinear complex generalized Zakharov system (GZS) subject to initial-boundary conditions. The Jacobi pseudospectral approximation is investigated for spatial approximation of the GZS. It possesses the spectral accuracy in space. The Jacobi-Gauss-Lobatto quadrature rule is established to treat the boundary conditions, and then the problem with its boundary conditions is reduced to a system of ordinary differential equations in time variable. This scheme has the advantage of allowing us to obtain the spectral solution in terms of the Jacobi parameters α and β, which therefore means that the algorithm holds a number of collocation methods as special cases. Finally, two illustrative examples are implemented to assess the efficiency and high accuracy of the Jacobi pseudo-spectral scheme.

MSC:

65M70 Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
35L70 Second-order nonlinear hyperbolic equations
35Q55 NLS equations (nonlinear Schrödinger equations)

Keywords:

nonlinear complex Zakharov-types equations; pseudo-spectral scheme; Jacobi-Gauss-Lobatto quadrature; two-stage implicit Runge-Kutta

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