

Dynamical structures of solitons and some new types of exact solutions for the (2+1)-dimensional DJKM equation using Lie symmetry analysis

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This paper is devoted to obtaining some new types of exact solutions of the (2+1)-dimensional Date–Jimbo–Kashiwara–Miwa (DJKM) equation utilizing the Lie symmetry method. All the Lie symmetries, infinitesimal generators, and possible geometric vector fields have been obtained by using the invariance condition of the group-theoretic method. Meanwhile, the Lie symmetry reductions and explicit exact solutions are obtained by a one-dimensional (1D) optimal system. All the obtained exact solutions are absolutely new and completely different from the earlier established results in the literature. Moreover, the dynamical behavior of obtained solitons like doubly solitons, dark solitons, kink wave, curved shaped multi-solitons, parabolic waves, solitary waves, and annihilation of elastic multi-soliton profiles is depicted graphically via interesting 3D-shapes. That will be widely used to provide many more attractive complex physical phenomena in the fields of plasma physics, statistical physics, fiber optics, fluid dynamics, condensed matter physics, and so on. Finally, we have verified all the achieved soliton solutions through symbolic computations with Mathematica.

Keywords: Dynamics of solitons; exact solutions; Lie symmetry analysis; (2+1)-dimensional DJKM equation.

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