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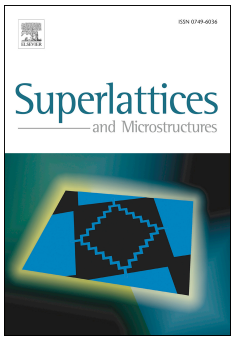

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Conservation laws and rogue wave solutions for the Higher-order nonlinear Schrödinger equation with variable coefficients in the inhomogeneous fibers

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Abstract

The wave propagation in the subpicosecond or femtosecond optical pulse propagation in the inhomogeneous fibers can be described by a higher-order nonlinear Schrödinger equation with variable coefficients, which is investigated in the paper. Via the Ablowitz-Kaup-Newell-Segur system and symbolic computation, the Lax pair and infinitely-many conservation laws are deduced. Based on the Lax pair and a modified Darboux transformation technique, the first- and second-order rogue wave solutions are constructed. The effects of the group-velocity dispersion and third-order dispersion on the properties of the first- and second-order rouge waves are graphically presented and analyzed: The group-velocity dispersion and third-order dispersion both affect the ranges and shapes of the first- and second-order rogue waves. In addition, the third-order dispersion can produce a skew angle of the first-order rogue wave and the skew angle rotates in the counterclockwise direction with the increase of the group-velocity dispersion, when the group-velocity dispersion and third-order dispersion are chosen as the constants. When the group-velocity dispersion and third-order dispersion are taken as the functions of the distance, the linear, X-shaped and parabolic trajectories of the rogue waves are obtained.

Keywords: Inhomogeneous fibers; Higher-order nonlinear Schrödinger equation with variable coefficients; Conservation laws; Rogue waves; Modified Darboux transformation

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