

Localized Coherent Structures with Chaotic and Fractal Behaviors in a (2+1)-Dimensional Modified Dispersive Water-Wave System

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Abstract: In this work, we reveal a novel phenomenon that the localized coherent structures of some (2+1)-dimensional physical models possess chaotic and fractal behaviors. To clarify these interesting phenomena, we take the (2+1)-dimensional modified dispersive water-wave system as a concrete example. Starting from a variable separation approach, a general variable separation solution of this system is derived. Besides the stable localized coherent soliton excitations like dromions, lumps, rings, peakons, and oscillating soliton excitations, some new excitations with chaotic and fractal behaviors are derived by introducing some types of lower dimensional chaotic and fractal patterns.

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Key words: variable separation approach, dispersive water-wave system, fractal, chaos

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