

Title: Exploring solitary wave solutions to the simplified modified camassa-holm equation through a couple sophisticated analytical approaches

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Abstract: The simplified modified Camassa-Holm equation, a developed Korteweg-de Vries equation, is an integrable nonlinear dispersive water wave equation with potential applications in diverse fields such as shallow water waves, liquid drop patterning, water surface waves in channels, tsunamis in coastal regions, ocean engineering, etc. In this study, we derived solitary wave solutions to the described equation, employing two reliable approaches: the enhanced modified simple equation and the extended Kudryashov methods. The enhanced modified simple equation technique yields solutions with variable coefficients through a generalized wave transformation. On the other hand, the extended Kudryashov method exploits the solutions of the Riccati and Bernoulli differential equations. The determined results include diverse soliton solutions expressed in the form of trigonometric, hyperbolic, and rational functions. Notably, for specific parameter values, these solutions exhibit wave of distinct shapes, including kink, smooth kink, flat kink, periodic, singular periodic, one-sided kink, etc. To apparently explain the physical behavior and the impact of the fractional parameter in the solutions, we plotted three- and two-dimensional graphs. The obtained solutions have potential applications in oceanography, spanning offshore rigs, ocean gravity waves, and wave energy.

Keywords: Modified Camassa-Holm equation, Extended Kudryashov method, Enhanced modified simple equation method, Soliton

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