Rational Solutions of the 2D Toda Lattice Equation

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The two-dimensional Toda lattice equation is a nonlinear integrable system that exhibits a rich variety of wave phenomena and exact solutions. In this work, a class of rational solutions of the 2D Toda lattice is investigated. These solutions, known as lump solutions, are localized waveforms that decay in all spatial directions and display multi-peak structures. We analyze one, two, and three-lump solutions, focusing on their shape, interactions, and peak locations. Asymptotic analysis helps explain their behavior in different regions and gives insight into their dynamics.