Soliton Resolution for the Perturbed Periodic Toda Lattice

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ABSTRACT

We consider the stability of the periodic Toda lattice (and slightly more generally of the algebro-geometric finite-gap lattice) under a "short range" perturbation. We prove that the perturbed lattice asymptotically approaches a modulated lattice that we describe explicitly. Travelling solitons may exist in such a background. Our method relies on the equivalence of the inverse spectral problem to a matrix Riemann-Hilbert problem defined in a hyperelliptic curve and generalizes the so-called nonlinear stationary phase/steepest descent method for Riemann-Hilbert problem deformations to Riemann surfaces.