Nonlinear Sciences > Exactly Solvable and Integrable Systems

Elliptic Solutions of ABS Lattice Equations

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Elliptic N-soliton-type solutions, i.e. solutions emerging from the application of N consecutive B\"acklund transformations to an elliptic seed solution, are constructed for all equations in the ABS list of quadrilateral lattice equations, except for the case of the Q4 equation which is treated elsewhere. The main construction, which is based on an elliptic Cauchy matrix, is performed for the equation Q3, and by coalescence on certain auxiliary parameters, the corresponding solutions of the remaining equations in the list are obtained. Furthermore, the underlying linear structure of the equations is exhibited, leading, in particular, to a novel Lax representation of the Q3 equation.

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