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Definition of the role of thick solitons in KdV-like soliton turbulence

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So-called “soliton turbulence”, which is a part of more general problem of wave turbulence in integrable systems, is actively discussed nowadays in nonlinear physics. The present work is dedicated to the study of soliton turbulence in integrable systems of Korteweg – de Vries (KdV) type equation. The theoretical model is based on extended version of the Korteweg-de Vries equation (Gardner equation) which takes into account both quadratic and cubic nonlinearity. The case of negative cubic nonlinearity when so-called “thick” or “table-top” solitons may play the essential role is considered. Analytical estimations of thick soliton contribution in statistical moments (mean, variance, skewness and kurtosis) are given and confirmed by numerical modeling. The comparison of the dynamics of soliton gas with the Korteweg – de Vries model (when there is no cubic nonlinearity) is presented. The main attention focuses on the higher statistical moments of wave fields. Extrema and distribution functions are analyzed. It is shown that soliton dynamics is qualitatively the same as in the framework of the Korteweg-de Vries equation but quantitative difference is essential.
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