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Dynamics of soliton fields in the framework of modified Korteweg – de Vries equation

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The dynamics of soliton field in the framework of modified Korteweg-de Vries (mKdV) equation is studied. Two-soliton interactions play a definitive role in the formation of the structure of soliton field. Three types of soliton interaction are considered: exchange and overtaking for solitons of the same polarity, and absorb-emit for solitons of different polarity. Features of soliton interaction are studied in details. Since the interaction of solitons is an elementary act of soliton turbulence, the moments of the wave field up to fourth are studied, which are usually applied in the turbulence theory. It is shown that in the case of interaction of solitons of the same polarity the third and fourth moments of the wave field, which determine the coefficients of skewness and kurtosis in the turbulence theory, are reduced, while in the case of interaction of solitons of different polarity these moments are increased. Numerical study of the statistical characteristics of multi-soliton fields which are generated from the initially isolated solitons with random phases and amplitudes is made. The effect of the nonlinear interaction between solitons and dispersive trains is analysed. It is confirmed that first two moments being the invariants of the modified Korteweg – de Vries equation remain to be constant. The skewness and kurtosis vary in time in each realization but tends to the constants in the average.