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Specific features of cylindrically converging and diverging nonlinear waves and evolution of the compound soliton of Gardner's equation

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Dynamics of solitons as particle-like structures is now a well-developed area of both mathematical theory of nonlinear waves and its applications in geophysics,especially for nonlinear internal waves commonly observed in the ocean.Such processes as propagation of solitons in inhomogeneous media and their cylindrical converging or divergence are of practical importance.
In particular, the parameters of the surface currents created by internal waves in the non-uniform shelf regions of the oceans are important for diagnosise of wind wave.The calculations performed within the framework of the approximate model demonstrate high radar contrasts caused by currents that create intense internal waves on the sea. Earlier works in this area considered slowly varying solitons in the framework of the Korteweg-de Vries (KdV) equation which are short enough to preserve their structure and adiabatically vary due to inhomogeneity and front geometry. However, in many practical cases strong solitons have a limiting amplitude so that increase of their energy result in their elongation while preserving the amplitude almost unchanged . In these cases a soliton consists of two separated, relatively sharp fronts, kink and antikink. In the interaction of solitons represented as a two-kink structure each was considered; it was shown that for solitons close to limiting such a description can provide better results than the theory of “simple” solitons. In these works each kink pair was still considered belonging to a single soliton. More complicated are the cases when a varying soliton can lose its structural identity upon propagation and can not be described as a quasi-stationary one. In these cases the kinks become independent or interacting via a non-stationary field between them. In this work we consider such behavior for cylindrically converging and diverging kinks and kink pairs in the framework of the Gardner equation with cylindrical geometry. The calculations performed within the framework of the approximate model demonstrate high radar contrasts caused by currents that create intense internal waves on the sea.
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