Numerical Study of the Stem in 3142-Soliton Solution of KP

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The Kadomtsev-Petviashvilli (KP) equation admits an important class of solitary wave solutions that are regular, non-decaying, and localized along distinct lines in the xy-plane. The line-soliton solutions of KP have been studied extensively in recent years. These solutions consist of an arbitrary number of line solitons in the far-field region and a complex, web-like interaction pattern of intermediate solitons in the near-field region. Such wave patterns arise in nature as beach waves, and have also been reproduced in laboratory settings in water tank experiments.

Numerically we have studied different initial conditions to see which line-soliton solutions of KP they converge to. In particular, the (3142)-type soliton solution of KP has the rather unique feature that it consists of a high amplitude intermediate soliton we call the stem. Two different initial conditions evolve over time to form this (3142)-type soliton solution of KP. These are the V Shape and Bow Shape initial conditions. Here we present an analysis of the aforementioned stem for both initial conditions.