The Transverse Instability of Periodic Traveling Waves in the Generalized Kadomtsev-Petviashvili (KP) Equation

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Abstract:

We consider the spectral instability of periodic traveling wave solutions of the gKdV equation to low-frequency transverse perturbations in the gKP equation. By analyzing high and low frequency limits of the appropriate periodic Evans function, we derive an orientation index which yields sufficient conditions for such an instability to occur. This index is geometric in nature and applies to arbitrary periodic traveling waves with minor smoothness and convexity assumptions on the nonlinearity. Using the integrable structure of the ordinary differential equation governing the traveling wave profiles we are then able to calculate the resulting orientation index in several examples, such as the elliptic function solutions of the Korteweg-de Vries and modified Korteweg-de Vries equations.