Modulation Theory for the Steady fKdVB Equation- Constructing Periodic Solutions

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Abstract:

The forced Korteweg-de Vries (fKdV) equation describes near resonance, weakly nonlinear and weakly dispersive long waves propagating in various mediums with external forcing. With the addition of a linear damping term, it becomes the fKdV-Burgers (fKdVB) equation. We present a multiple-scale perturbation technique for obtaining asymptotic solutions to the steady fKdVB equation. The first order solution in the perturbation hierarchy is the modulated cnoidal wave equation. From the second order equation in the hierarchy, we find a system of odes governing the modulation of the properties of the cnoidal wave. Using this, we then construct periodic solutions and examine the stability of these solutions.