Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
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Solitary-wave solutions of the full dispersion Kadomtsev-Petviashvili equation

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Abstract

The full dispersion Kadomtsev-Petviashvili (FDKP) equation

$$u_t + m(\mathrm{D})u_x + 2uu_x = 0,$$

where

$$m(\mathrm{D}) = (1+\beta\,|\mathrm{D}|^2)^{\frac{1}{2}} \left(\frac{\tanh(|\mathrm{D}|)}{|\mathrm{D}|}\right)^{\frac{1}{2}} \left(1+\frac{2\mathrm{D}_2^2}{\mathrm{D}_1^2}\right)^{\frac{1}{2}},$$

and $\mathrm{D} = -\mathrm{i}(\partial_x, \partial_y)$, model equation describing three-dimensional long waves of small amplitude. The FDKP equation is a fully dispersive version of the classical KP equation, similar to how the Whitham equation is a fully dispersive version of the KdV equation. Recently Ehrnström and Groves (2018) proved existence of solitary wave solutions for the FDKP equation for strong surface tension ($\beta > 1/3$) using a variational approach. The solitary waves they found can be approximated by rescalings of KP-solitary waves. In my talk I will consider the weak surface tension regime ($\beta < 1/3$) and describe how to prove existence of FDKP-solitary waves that can be approximated by rescalings of the Davey–Stewartson equation.

This talk is based on a work in progress with Mats Ehrnström (NTNU) and Mark Groves (Saarland University)