Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
WS 25/26

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Validity of the NLS Approximation for the Peregrine Soliton Family

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Abstract

In this talk I focus on extending the validity of the Nonlinear Schrödinger (NLS) approximation into various functional spaces that naturally occur when studying solutions of the NLS. We consider a one parameter family of solutions that include the Peregrine soliton(s), Kuznetsov-Ma solitons and Akhmediev breathers, none of which are covered by current approximation results. These have been regarded as possible explanations for phenomena such as rouge waves in water wave systems, and high energy optical pulses in optical systems. The main mathematical difficulty lies in choosing the right functional spaces to do the approximations in. Showing the validity allows us to find this behaviour in more complex systems, and starkly reduce the dimension of numerical computations.