Existence and stability for an extended Lugiato-Lefever equation
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Abstract

In applications, locking of the repetition rate of a Kerr soliton comb inside a microresonator by pumping two modes is of particular interest. Mathematically this can be described by a new variation of the Lugiato-Lefever equation (LLE) given by

\[ \text{i} u_t = -d u_{xx} + \text{i} V(x) u_x + (\zeta - \text{i}) u - |u|^2 u + \text{i} f, \]

which is a damped and driven nonlinear Schrödinger equation with an additional potential \( V(x) \). In the first part we discuss the existence of nontrivial stationary \( 2\pi \)-periodic solutions of the LLE using bifurcation theory and show that localized solitons can be found if the potential \( V(x) \) has a sign change. In the second part we discuss stability properties of these solutions and show numerical simulations with \textit{pde2path} that complement our analytical findings.

The talk is based on ongoing work with Dmitry Pelinovsky, and Wolfgang Reichel.