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Construction of some soliton solutions for a Schrödinger equation with space-time dependent non–linearity.

Abstract:

The Gross-Pitaevskii equation

$$i\frac{\partial \psi}{\partial t} = -\Delta\psi - |\psi|^2\psi,$$

represents a one body approximation of an N–body system of linear Schrödinger equations. The non–linear term arises as a mean-field approximation when the interactions between particles in the original system are of the form $\delta(x_i - x_j)$. In this talk we will look at the equation

$$i\frac{\partial \psi}{\partial t} = -\Delta\psi + \overline{V}(x,t)|\psi|^2\psi, \tag{1}$$

where the role of $V(x,t)$ in front of the mean-field term is to possibly consider different spatial-temporal dependencies in the interaction between particles of the original N—body system. For some specific $V(x,t)$ in equation (1) we will present the construction of a family of soliton solutions, by finding "eigen-functions" to the associated reduced equation. This is a joint work with O. Bourget and C. Fernandez.