Homoclinic Orbits and Melnikov Analysis of Discretized Perturbed NLS equations

Milan Rajkovic
Institute of Nuclear Sciences Vinca, Belgrade, Yugoslavia

Finite discretized form of the perturbed focusing nonlinear Schroedinger equation arising from the geometry of optical fiber array is analyzed using Melnikov method for PDE's. The dynamical system is studied under periodic boundary conditions. More specifically, the existence of the homoclinic orbits is established for external parameters on codimension 1 submanifold. Persistence of homoclinic orbits and invariant manifolds is examined combining geometric singular perturbation theory, normal form analysis and integrable theory. It is shown that in the neighborhood of these homoclinic orbits "Smale horseshoes" exist and it is shown how the system becomes chaotic.

References:

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